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# FINAL

# PRE-REMEDIAL INVESTIGATION SCREENING STUDY
# SITES 12, 68, 75, 76, 84, 85 AND 87

## MARINE CORPS BASE
## CAMP LEJEUNE, NORTH CAROLINA

## APPENDICES

## VOLUME II OF II

## CONTRACT TASK ORDER 0314

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**COMPREHENSIVE LONG-TERM**
**ENVIRONMENTAL ACTION NAVY**

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## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AT | Averaging Time |
| AWQC | Ambient Water Quality Criteria |
| | |
| B1 | Probable human carcinogen - limited evidence |
| B2 | Probable human carcinogen - sufficient evidence |
| Baker | Baker Environmental, Incorporated |
| BEHP | Bis(2-ethylhexyl)phthalate |
| bgs | below ground surface |
| BRA | Baseline Human Health Risk Assessment |
| BTAG | Biological Technical Assistance Group |
| BTEX | Benzene, Toluene, Ethylbenzene, and Xylene |
| BW | Body Weight |
| | |
| C | Possible carcinogen |
| CDI | Chronic Daily Intake |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| CLP | Contract Laboratory Program |
| $cm^2$ | square centimeters |
| COC | Contaminants Of Concern |
| COPC | Contaminants Of Potential Concern |
| CRAVE | Carcinogen Risk Assessment Verification Endeavor |
| CRDL | Contract Required Detection Limit |
| CRQL | Contract Required Quantitation Limit |
| CSF | Cancer Slope Factor |
| CSFi | Inhalation Cancer Slope Factor |
| CTO | Contract Task Order |
| | |
| D | Not classifiable as to human carcinoginicity |
| D | Sample concentration required laboratory dilution |
| DEM | Division of Environmental Management |
| DO | Dissolved Oxygen |
| DoD | Department of the Defense |
| DoN | United States Department of the Navy |
| DQO | Data Quality Objective |
| | |
| ECAO | Environmental Criterion Assessment Office |
| ED | Exposure Duration |
| EE/CA | Engineering Evaluation/Cost Analysis |
| EF | Exposure Frequency |
| EM | Electromagnetic |
| EMD | Environmental Management Division (Camp Lejeune) |
| EOD | Explosive Ordance Disposal |
| EPA | Environmental Protection Agency |
| ER-L | Effects Range - Low |
| ER-M | Effects Range - Medium |
| ESE | Environmental Science and Engineering |

## LIST OF ACRONYMS AND ABBREVIATIONS
## (Continued)

| | |
|---|---|
| FFA | Federal Facilities Agreement |
| FS | Feasibility Study |
| ft. | feet |
| gpm | gallons per minute |
| GPS | Global Positioning System |
| HA | Health Advisories |
| HEAST | Health Effects Assessment Summary Tables |
| HHAG | Human Health Assessment Group |
| HI | Hazard Index |
| HPIA | Hadnot Point Industrial Area |
| HQ | Hazard Quotients |
| ICR | Estimated Incremental Lifetime Cancer Risk |
| ID | Inside Diameter |
| IDW | Investigative Derived Waste |
| IRIS | Integrated Risk Information System |
| IRP | Installation Restoration Program |
| J | value estimated |
| K | value estimated, biased high |
| kg | kilogram |
| Kp | permeability constant |
| L/hour | liters per hour |
| LANTDIV | Naval Facilities Engineering Command, Atlantic Division |
| LOAEL | Lowest Observed Adverse Effect Level |
| MCAS | Marine Corps Air Station |
| MCB | Marine Corps Base |
| MCL | Maximum Contaminant Level |
| MF | Modifying Factor |
| $m^3$/day | cubic meter per day |
| mg | milligram |
| mg/$cm^2$ | milligrams per square centimeter |
| mg/day | milligrams per day |
| mg/kg | milligrams per kilogram |
| mg/L | milligrams per liter |
| msl | mean sea level |
| MS/MSD | Matrix Spike / Matrix Spike Duplicate |

## LIST OF ACRONYMS AND ABBREVIATIONS
**(Continued)**

| | |
|---|---|
| N | Tentative identification. Consider present. |
| NA | Not applicable |
| NC DENR | North Carolina Department of Environment and Natural Resources |
| NCEA | National Center for Environmental Assessment |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NC RAF | North Carolina Risk Analysis Framework |
| NC WQS | North Carolina Water Quality Standards |
| ND | Nondetect |
| NE | Not established |
| NEESA | Navy Energy and Environmental Support Activity |
| NEHC | Navy Environmental Health Center |
| NFESC | Naval Facilities Engineering Service Center |
| NFRAP | No Further Response Action Planned |
| NJ | Estimated value |
| NOAA | National Oceanic and Atmospheric Administration |
| NOAEL | No Observed Adverse Effects Level |
| NOEL | No Observed Effect Level |
| NPL | National Priorities List |
| NWI | National Wetland Inventory |
| OD | Outside Diameter |
| O&G | Oil and Grease |
| OSWER | Office of Solid Waste and Emergency Response |
| PAH | Polynuclear Aromatic Hydrocarbons |
| nPAH | noncarcinogenic Polynuclear Aromatic Hydrocarbons |
| cPAH | carcinogenic Polynuclear Aromatic Hydrocarbons |
| PC | Permeability Constant |
| PCB | Polychlorinated Biphenyl |
| PEF | Particulate Emissions Factor |
| PID | Photoionization Detector |
| ppb | parts per billion |
| ppm | parts per million |
| Pre-RI | Pre-Remedial Investigation |
| PVC | Polyvinyl Chloride |
| QA/QC | Quality Assurance/Quality Control |
| RA | Risk Assessment |
| RAF | Risk Analysis Framework |
| RAGS | Risk Assessment Guidance for Superfund |
| RBC | Region III Risk-Based Concentration |
| RCRA | Resource Conservation Recovery Act |
| RfC | Reference Concentration |
| RfD | Reference Dose |

## LIST OF ACRONYMS AND ABBREVIATIONS
**(Continued)**

| | |
|---|---|
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| RRRS | Relative Risk Ranking System |
| | |
| SCS | Soil Conservation Service |
| SD | Sediment |
| SMCL | Secondary Maximum Contaminant Level |
| SOP | Standard Operating Procedure |
| STOLS® | Surface Towed Ordnance Locator System |
| STP | Sewage Treatment Plant |
| SVOC | Semivolatile Organics |
| SW | well graded sand |
| SWMU | Solid Waste Management Unit |
| | |
| TAL | Target Analyte List |
| TBC | To Be Considered |
| TCL | Target Compound List |
| TCLP | Toxicity Characteristic Leachate Procedure |
| TLZ | Tactical Landing Zone |
| TPH | Total Petroleum Hydrocarbon |
| TSCA | Toxic Substances Control Act |
| | |
| µg/dl | micrograms per deciliter |
| µg/kg | micrograms per kilogram |
| µg/L | micrograms per liter |
| UBK | Uptake/Biokinetic |
| UCL | Upper Confidence Level |
| UF | Uncertainty Factor |
| USCS | Unified Soil Classification System |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Society |
| USMC | United States Marine Corps |
| UST | Underground Storage Tank |
| | |
| VOC | Volatile Organic Compounds |
| | |
| WAR | Water and Air Research, Inc. |
| WOE | Weight-of-Evidence |
| WQP | Water Quality Parameters |
| WMPES | Wellhead Management Program Engineering Study |

# EXECUTIVE SUMMARY

## INTRODUCTION

This Pre-Remedial Investigation (Pre-RI) Screening Study evaluates the nature and extent of potential threats to public health and the environment posed by the release or threatened release of hazardous substances, pollutants, or contaminants at seven sites (12, 68, 75, 76, 84, 85, and 87), Marine Corps Base (MCB), Camp Lejeune, North Carolina. The field investigation activities at the above mentioned sites included sampling of soil, groundwater, surface water, and sediment. The resultant analytical data were evaluated, and a human health risk assessment was performed for each of the sites. The objective of the study was to summarize data gathered, evaluate potential risks posed by the sites, and provide recommendations as to what additional activities, if any, may be needed at each site. The conclusions define whether the sites should undergo further investigation, proceed with a removal action or be recommended for "no further action."

## INVESTIGATION ACTIVITIES

The field investigations were conducted during August and October, 1995, January and February of 1996, and March 1998 . The field activities at the seven sites varied depending upon individual site histories and the suspected contaminants. Investigative techniques included geophysical surveys, surface and subsurface soil sampling, temporary and permanent monitoring well installation, groundwater sampling, surface water and sediment sampling, exploratory test pits, and site surveys.

## FINDINGS OF THE STUDY

### Site 12 - Explosive Ordnance Disposal Range

Soil and groundwater samples were collected at Site 12 and were analyzed by an on-site laboratory and a fixed based laboratory. There were no detections of organic compounds in any of the soil samples. Xylenes were detected at low concentrations in four groundwater samples which were analyzed on-site. None of the newly installed monitoring wells at Site 12 detected any organic compounds.

**Site 68 - Rifle Range Dump**

Surface soil, subsurface soil, groundwater, surface water and sediment samples were collected at Site 68. One pesticide and one polychlorinated biphenyl (PCB) compound were detected in the surface soil samples above the established screening criteria. The subsurface soil samples detected one PCB compound at a concentration below the screening standard. Two volatile organic compounds and metals were detected in the groundwater samples collected at the site. Sediment samples detected the presence of pesticides and metals. The risk assessment identified a slight risk due to metals in the shallow groundwater. However, these metals are considered to be naturally occurring and not site related. The detections of metals in groundwater are not considered to be a concern at Site 68.

**Site 75 - MCAS Basketball Court**

Surface soil, subsurface soil, and groundwater samples were collected at Site 75. Semivolatiles, pesticides and metals were detected in the soil samples. There were no detections of organic compounds in the groundwater samples, however, several metals were detected at concentrations exceeding state and/or federal regulatory levels. The risk assessment conducted did not identify any risk from the media sampled at the site.

**Site 76 - MCAS Curtis Road**

Surface soil, subsurface soil, and groundwater samples were collected at Site 76. Some volatile and semivolatile compounds were detected in the soil samples at Site 76. Pesticides were detected in the majority of the soil samples. Only one semivolatile organic compound was detected in the groundwater samples. Metals were detected in each of the groundwater samples, however only aluminum and iron exceeded state and/or federal regulatory levels. A slight risk was identified for future residents ingesting the groundwater at Site 76 due to the presence of the metals arsenic and iron. These metals are considered to be naturally occurring and not site related. The detections of metals in groundwater is not considered to be a concern at Site 76.

**Site 84 - Building 45 Area**

Surface soil, groundwater, surface water, and sediment samples were obtained from Site 84. Each of the surface soil samples and sediment samples collected from the lagoon confirmed the presence of PCB compounds. Detected concentrations were above the established screening standards.

**Site 85 - Camp Johnson Battery Dump**

Surface soil, subsurface soil, and groundwater samples were collected at Site 85. The samples were analyzed for target analyte list (TAL) inorganics only. The majority of the metals detected in the surface soil samples exceeded the screening criteria. Nine metals detected in the groundwater samples exceeded state and/or federal regulatory levels.

Three samples were collected for toxicity characteristic leaching procedure (TCLP) analyses. Three metals were detected in these samples. Of the three, only lead exceeded the TCLP regulatory level. The metals detected in the surface soil and groundwater samples at Site 85 produced a risk for the site.

**Site 87 - MCAS Officer's Housing Area**

Surface soil, subsurface soil, groundwater, surface water, and sediment samples were collected at Site 87. Some semivolatiles, pesticides and metals were detected in the soil samples obtained from Site 87. One groundwater sample detected the presence of a semivolatile compound at a concentration above the North Carolina Water Quality Standard (NC WQS). Both groundwater samples detected metals which exceeded state and/or federal regulatory levels.

Metals were detected in the surface water samples at concentrations above state and/or federal water quality standards. One volatile organic compound (VOC) was detected in the sediment samples along with metals. The risk assessment for Site 87 identified a risk due to the metals iron and manganese via groundwater ingestion. These metals are considered to be naturally occurring and not site related. Therefore, the detection of metals is not considered to be a concern for the groundwater quality for Site 87.

## RECOMMENDATIONS

The recommendations for each of the seven sites investigated as part of the Pre-RI Screening Study are presented below.

**Site 12 - Explosive Ordnance Disposal Range**

- Abandonment of the monitoring wells and preparation of a No Further Response Action Planned (NFRAP) memorandum.

**Site 68 - Rifle Range Dump**

- Abandonment of the monitoring wells and preparation of a No Further Response Action Planned (NFRAP) memorandum.

**Site 75 - MCAS Curtis Road**

- Abandonment of the monitoring wells and preparation of a No Further Response Action Planned (NFRAP) memorandum.

**Site 84 - Building 45 Area**

- Confirm or deny the presence of additional materials buried at the site.
- Implement a supplemental investigation which focuses on defining the vertical and horizontal extent of soil contamination.
- Preparation of an Engineering Evaluation/Cost Analysis (EE/CA) to evaluate remedial alternatives for addressing the lagoon, and impacted soil at the site.
- Based upon the results of the EE/CA, design and implement an appropriate remedial alternative.

**Site 85 - Camp Johnson Battery Dump**

- Preparation of an Engineering Evaluation/Cost Analysis (EE/CA) to evaluate remedial alternatives.

- Based upon the results of the EE/CA, design and implement an appropriate remedial alternative.

**Site 87 - MCAS Officer's Housing Area**

- Abandonment of the monitoring wells and preparation of a No Further Response Action Planned (NFRAP) memorandum.

## 1.0 INTRODUCTION

This document presents the results of a Pre-Remedial Investigation (Pre-RI) Screening Study conducted for seven sites at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The Pre-RI activities have been conducted by Baker Environmental, Inc. (Baker) for the Naval Facilities Engineering Command, Atlantic Division (LANTDIV) Contract Task Order (CTO) 0314 under Contract Number N62470-89-D-4814.

MCB, Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) on October 4, 1989 (54 Federal Register 41015, October 4, 1989). Subsequent to this listing, the United States Environmental Protection Agency (USEPA) Region IV; the North Carolina Department of Environment and Natural Resources (NC DENR); and the United States Department of the Navy (DoN) entered into a Federal Facilities Agreement (FFA) for MCB, Camp Lejeune. The objectives of the FFA are:

- To ensure that the environmental impacts with past and present activities at MCB, Camp Lejeune are thoroughly investigated and appropriate CERCLA response actions are developed and implemented as necessary to protect the public health, welfare and the environment;

- To establish a procedural framework and schedule for developing, implementing and monitoring appropriate response actions at MCB, Camp Lejeune in accordance with CERCLA, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and USEPA policy relevant to remediation at MCB, Camp Lejeune; and

- To facilitate cooperation, exchange of information and participation of the Parties in such action.

The Fiscal Year 1998 Site Management Plan for MCB, Camp Lejeune, the primary document referenced in the FFA, identifies a total of 42 sites; 23 of which require Remedial Investigation/Feasibility Study (RI/FS) activities. The seven sites investigated under this CTO were

identified in the 1991 FFA and have been investigated through the completion of a Pre-RI Screening Study. The Pre-RI Screening Study includes Sites 12, 68, 75, 76, 84, 85, and 87 [formerly Site A]).

The investigations were conducted during various phases, including August and October, 1995, and January and February of 1996. Based upon the results of the Draft Pre-RI Screening Study, a final sampling effort was conducted in March 1998. During this time, an additional round of groundwater sampling was performed at Sites 68, 75, and 76. In addition, surface soil, surface water, and sediment samples were collected at Site 84. Figure 1-1 depicts the location of the seven sites that comprise this investigation [Note: all tables, figures and references for this document are presented at the end of each section]. This report describes the Pre-RI Screening Study conducted at these sites and the investigative results.

This Pre-RI Screening Study was conducted through the sampling of various environmental media (soil, groundwater, surface water, and sediment), evaluating the resultant analytical data, and the performance of a qualitative and quantitative risk assessment. This study provides the information necessary to determine if any of the sites have contributed hazardous substances to the environment. The conclusion of this Pre-RI screening study establishes whether these sites should undergo further investigation (i.e., Remedial Investigation), be considered for "no further action," or have an immediate removal action implemented.

The decision as to whether a site(s) requires a full Remedial Investigation (RI), is considered for "no further action" or is slated for a removal action, is based largely upon the human health risk assessment. If the data demonstrate that a site has not released hazardous substances and does not pose a risk to human health or the environment, the site is considered for "no further action". If the site data indicate that previous activities have presented a risk, further investigations will be performed either through a removal action or as part of a full scale RI under the guidance of the regulations specified in CERCLA. Should a RI study be required, it will provide information necessary to complete a feasibility study (FS) which in turn evaluates and recommends appropriate remedial action.

This Pre-RI Screening Study report has been prepared by Baker and submitted to the USEPA Region IV; the NC DENR; MCB, Camp Lejeune Environmental Management Department (EMD);

the Navy Environmental Health Center (NEHC); the Agency for Toxic Substances and Disease Registry; and to LANTDIV.

## 1.1 Scope and Objectives

The scope of the Pre-RI Screening Study included completion of field investigations at each site to help assess the presence or absence of contamination associated with past activities in these areas. This included various sampling techniques at the sites based upon the site histories and expected contaminants. Sample analysis and risk evaluations have been performed for each of the sites. The objective of the Pre-RI Screening Study was to summarize data gathered, evaluate potential risks posed by the sites, and provide recommendations as to what additional activities, if any, may be needed at each site.

## 1.2 Report Organization

This report is divided into six sections, including Section 1.0, Introduction. The Site Background and Description is presented in Section 2.0. Section 3.0 presents the Study Area Investigation which details the field procedures and sampling strategies. Section 4.0 presents the Findings of the Pre-Remedial Investigation. Section 5.0 presents the human health risk assessment. The conclusions and recommendations for this document are contained in Section 6.0. The appendices referenced throughout the document are included at the end of the report and include Appendices A through M.

# FIGURES

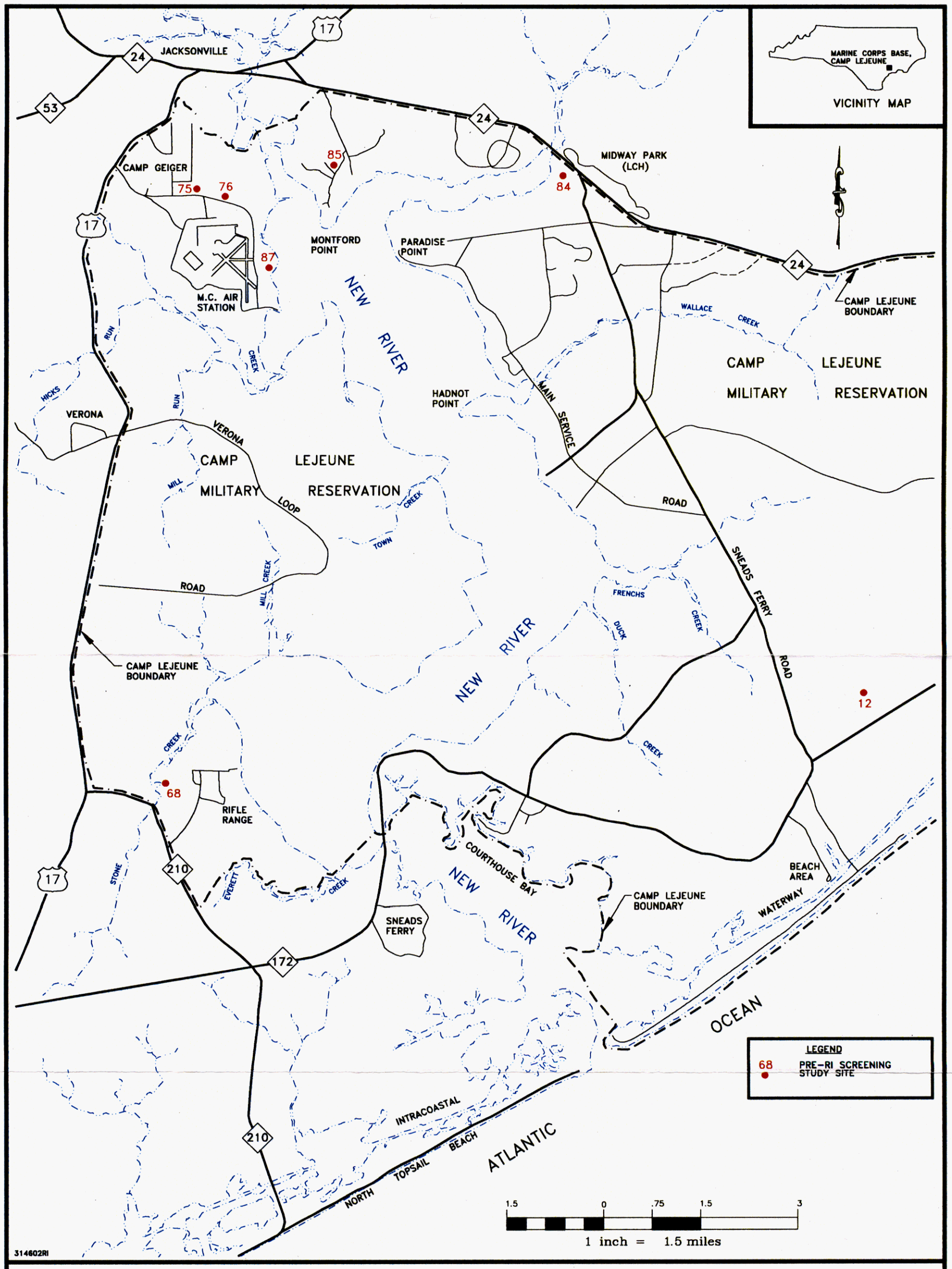


FIGURE 1-1
SITE LOCATION MAP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

02635A01Y

# 2.0 SITE BACKGROUND AND DESCRIPTION

## 2.1 Background and Setting of MCB, Camp Lejeune Background and Setting of MCB, Camp Lejeune

This section summarizes information pertaining to MCB, Camp Lejeune existing background and setting. The text specifically addresses the location and setting of MCB, Camp Lejeune, its history, topography, meteorology, geology, hydrogeology, land use and demography, and ecology.

### 2.1.1 Location and Setting

MCB, Camp Lejeune is located on the coastal plain of North Carolina in Onslow County. The facility encompasses approximately 236 square miles and is bisected by the New River. The New River flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The southeastern border of MCB, Camp Lejeune is the Atlantic Ocean shoreline. The western and northeastern boundaries of the facility are U.S. Route 17 and State Route 24, respectively. The City of Jacksonville borders MCB, Camp Lejeune to the north (Figure 2-1)

### 2.1.2 History

Construction of MCB, Camp Lejeune began in April 1941 at the Hadnot Point Industrial Area (HPIA), where major functions of the base are centered today. The facility was designed to be the "World's Most Complete Amphibious Training Base." The MCB, Camp Lejeune complex consists of 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. Another area also overseen by MCB, Camp Lejeune is Camp Johnson which is located among the five geographical areas of Camp Lejeune.

There are seven sites that are part of this investigation that are located in four different geographical locations. Sites 12 and 84 are located on Mainside, Site 68 is located at the Rifle Range Area, and Site 85 is located at Camp Johnson. The remaining sites, 75, 76, and 87 are located within the Marine Corps Air Station (MCAS), New River operations area. Although MCAS New River is under the jurisdiction of a separate command (i.e., MCAS, Cherry Point), environmental compliance

issues and Installation Restoration Program (IRP) sites are the responsibility of MCB, Camp Lejeune EMD.

### 2.1.3 Topography

The flat topography of MCB, Camp Lejeune is typical of 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, most of MCB, Camp Lejeune is between 20 and 40 feet above msl.

Drainage at MCB, Camp Lejeune is generally toward the New River, except in areas near the coast where flow is into the Intracoastal Waterway that lies between the mainland and barrier islands. In developed areas of the facility, natural drainage has been altered by asphalt cover, storm sewers, and drainage ditches. Approximately 70 percent of MCB, Camp Lejeune is comprised of broad, flat interstream areas with poor drainage (Water and Air Research, Incorporated [WAR], 1983).

### 2.1.4 Meteorology

Although coastal North Carolina lacks distinct wet and dry seasons, there is some seasonal variation in average precipitation. July tends to receive the most precipitation, and rainfall amounts during summer are generally the greatest. Daily showers during the summer are not uncommon, nor are periods of one or two weeks without rain. Convective showers and thunderstorms contribute to the variability of precipitation during the summer months. October tends to receive the least amount of precipitation, on average. Throughout the winter and spring, precipitation occurs primarily in the form of migratory low pressure storms. MCB, Camp Lejeune's average yearly rainfall is 52.4 inches.

Coastal Plain temperatures are moderated by the proximity of the Atlantic Ocean, which effectively reduces the average daily fluctuation of temperature. Lying 50 miles offshore at its nearest point, the Gulf Stream tends to have little direct effect on coastal temperatures. The southern reaches of the cold Labrador Current offset any warming effect the Gulf Stream might otherwise provide.

MCB, Camp Lejeune experiences hot and humid summers; however, ocean breezes frequently produce a cooling effect. The winter months tend to be mild, with occasional brief cold spells. Average daily temperatures range from 34°F to 54°F in January, the coldest month, and 72°F to 89°F

in July, the hottest month. The average relative humidity, between 78 and 89 percent, does not vary greatly from season to season.

Observations of sky conditions indicate yearly averages of approximately 112 days clear, 105 partly cloudy, and 148 cloudy. Measurable amounts of rainfall occur 118 days per year, on the average. Prevailing winds are generally from the south-southwest 10 months of the year and from the north-northwest during September and October. The average wind speed at MCAS, New River is seven miles per hour.

### 2.1.5 Geology

MCB, Camp Lejeune is located within the Atlantic Coastal Plain physiographic province. The sediments of this province consist primarily of sand, silt, and clay. Other sediments may be present, including shell beds and gravel. Sediments may be of marine or continental origin. These sediments are found in interfingering beds and lenses that gently dip and thicken to the southeast. Sediments of this type range in age from early Cretaceous to Quaternary time and overlie igneous and metamorphic rocks of pre-Cretaceous age. Table 2-1 presents a generalized stratigraphic column for the Atlantic Coastal Plain of North Carolina (Harned et. al., 1989).

United States Geological Survey (USGS) studies at MCB, Camp Lejeune indicate that the base is underlain by sand, silt, clay, calcareous clay and partially cemented limestone. The combined thickness of these sediments beneath the base is approximately 1,500 feet.

### 2.1.6 Hydrogeology

The aquifers of primary interest are the surficial aquifer and the underlying Castle Hayne aquifer. Other aquifers that occur beneath the facility include the Beaufort, Peedee, Black Creek, and upper and lower Cape Fear aquifers. The following summary is a compilation of information which pertains to aquifer characteristics within the MCB, Camp Lejeune area. The location of three generalized hydrogeologic cross-sections are shown on Figure 2-2. The cross-sections are shown on Figure 2-3 and present the approximate locations of the study areas.

The surficial aquifer consists of interfingering beds of sand, clay, sandy clay, and silt that contain some peat and shells. The thickness of the surficial aquifer ranges from 0 to 73 feet and averages nearly 25 feet over the MCB, Camp Lejeune area. It is generally thickest in the interstream divide areas and presumed absent where it is cut by the New River and its tributaries. The beds are thin and discontinuous, and have limited lateral continuity. This aquifer is not used for water supply at MCB, Camp Lejeune.

The general lithology of the surficial aquifer and the absence of any thick, continuous clay beds are indications of relatively high vertical conductivity within the aquifer. The estimated lateral hydraulic conductivity of the surficial aquifer in the MCB, Camp Lejeune area is 50 feet per day, and is based on a general composition of fine sand mixed with some silt and clay (Cardinell et al., 1993).

Between the surficial and the Castle Hayne aquifers lies the Castle Hayne confining unit. This unit consists of clay, silt, and sandy clay beds. In general, the Castle Hayne confining unit may be characterized as a group of less permeable beds at the top of the Castle Hayne aquifer that have been partly eroded or incised in places. The Castle Hayne confining unit is discontinuous, and has a thickness ranging from 0 to 26 feet, averaging about 9 feet where present. There is no discernable trend in the thickness of the confining unit seen in these or related investigations, nor is there any information in the USGS literature regarding any trend of the depth of the confining unit.

Previously recorded data indicate that vertical hydraulic conductivity of the confining unit ranged from 0.0014 to 0.41 feet per day (Cardinell et al., 1993). Data obtained from a pump test conducted by Environmental Science and Engineering (ESE) indicated a vertical hydraulic conductivity for this unit ranging from $1.4 \times 10^{-3}$ to $5.1 \times 10^{-2}$ feet per day (ESE, 1988). Based on the moderate conductivity values and the thin, discontinuous nature of the confining unit, this unit may only be partly effective in retarding the downward vertical movement of groundwater from the surficial aquifer.

The Castle Hayne aquifer lies below the surficial aquifer and consists primarily of unconsolidated sand, shell fragments, and fossiliferous limestone. Clay, silt, silty and sandy clay, and indurated limestone also occur within the aquifer. The upper part of the aquifer consists primarily of

calcareous sand with some continuous and discontinuous thin clay and silt beds. The calcareous sand becomes more limey with depth. The lower part of the aquifer consists of consolidated or poorly consolidated limestone and sandy limestone interbedded with clay and sand.

The Castle Hayne aquifer is about 150 to 350 feet thick, increasing in thickness toward the ocean. The top of the aquifer lies approximately 20 to 73 feet below the ground surface. The top of the aquifer dips southward and is deepest near the Atlantic coast, east of the New River. The top of the aquifer also forms a basin in the vicinity of Paradise Point. Estimates of hydraulic conductivity indicate a wide variation in range, from 14 to 91 feet per day.

Onslow County and MCB, Camp Lejeune lie in an area where the Castle Hayne aquifer generally contains freshwater; however, the proximity of saltwater in deeper layers just below the aquifer and in the New River estuary is of concern in managing water withdrawals. Over-pumping of the deeper parts of the aquifer could cause encroachment of saltwater. The aquifer generally contains water having less than 250 milligrams per liter (mg/L) chloride throughout the base, except for one USGS well in the southern portion of the base that is screened in the lower portion of the aquifer. Chloride was measured at 960 mg/L in a sample collected in 1989 from this well.

Rainfall in the MCB, Camp Lejeune area enters the ground in recharge areas, infiltrates the soil, and moves downward until it reaches the surficial aquifer. Recharge areas at Camp Lejeune are mainly comprised of interstream areas. In the surficial aquifer, groundwater flows in the direction of lower hydraulic head until it reaches discharge points or fronts. These discharge areas include the New River and its tributaries and the ocean. Though most of the rainfall entering the surficial aquifer discharges to local streams, a relatively small amount infiltrates to the Castle Hayne. The surficial aquifer supplies the primary recharge to the Castle Hayne aquifer. Like the surficial aquifer, the Castle Hayne naturally discharges to the New River and major tributaries; however, pumping of the Castle Hayne may locally influence flow directions.

The potentiometric surface of the surficial aquifer varies seasonally, as seen through the observation of water levels in monitoring wells. The surficial aquifer 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. As a result, the potentiometric surface is generally highest in the winter months and lowest in the summer or early fall.

Water levels from wells placed in deeper aquifers, such as the Castle Hayne, were also used to establish potentiometric surfaces. Because the Castle Hayne is at least partially confined from the surficial aquifer and is not influenced by rainfall as strongly as the surficial aquifer, the seasonal variations tend to be slower and smaller than in the surficial aquifer.

#### 2.1.6.1 Surface Water Hydrology

The dominant surface water feature at MCB, Camp Lejeune is the New River. It receives drainage from a majority 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 length, the New River is confined to a relatively narrow channel 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. The New River, the Intracoastal Waterway, and the Atlantic Ocean converge at the New River Inlet.

Water quality criteria for surface waters in North Carolina have been published under Title 15 of the North Carolina Administrative Code. At MCB, Camp Lejeune, the New River falls into two classifications: SC (estuarine waters not suited for body-contact sports or commercial shellfishing); and SA (estuarine waters suited for commercial shellfishing). The SC classification applies to only three areas of the New River at MCB, Camp Lejeune; the rest of the New River at MCB, Camp Lejeune falls into the SA classification (ESE, 1990).

### 2.1.7 Land Use and Demography

MCB, Camp Lejeune encompasses an area of approximately 234 square miles. The Installation border is approximately 70 miles, including 21 miles of ocean front and Intracoastal Waterway.

Recently, MCB, Camp Lejeune acquired approximately 41,000 additional acres in the Greater Sandy Run area. Table 2-2 provides a breakdown of land uses within the developed portion of the facility.

Land use within MCB, Camp Lejeune is influenced by topography and ground cover, environmental policy, and base operational requirements. Much of the land within MCB, Camp Lejeune consists of freshwater swamps that are wooded and largely unsuitable for development. In addition, 3,000 acres of sensitive estuary and other areas set aside for the protection of threatened and endangered species are to remain undeveloped. Operational restrictions and regulations, such as explosive quantity safety distances, impact-weighted noise thresholds, and aircraft landing and clearance zones, may also greatly constrain and influence development (LANTDIV, 1988).

The combined military and civilian population of the MCB, Camp Lejeune and Jacksonville area is approximately 112,000. Nearly 90 percent of the surrounding population resides within urbanized areas. The presence of MCB, Camp Lejeune has been the single greatest factor contributing to the rapid population growth of Jacksonville and adjacent communities, particularly during the period from 1940 to 1960.

### 2.1.8 Ecology

The ecology at MCB Camp Lejeune is discussed in three sections that include ecological communities, sensitive environments and threatened and endangered species.

#### 2.1.8.1 Ecological Communities

MCB, Camp Lejeune is located on North Carolina's coastal plain. A number of natural ecological communities are present within this region. In addition, variations of natural communities have occurred in response to disturbance and intervention (e.g., forest clearing, urbanization). The natural communities found in the area are summarized as follows:

- Mixed Hardwood Forest - Found generally on slopes of ravines. Beech, white oak, tulip, sweetgum, and holly are indicator species.

- Southeastern Evergreen Forest - Dominated by pines, especially longleaf pine.

- Loblolly Pine/Hardwoods Community - Second growth forest that includes loblolly pine with a mix of hardwoods (i.e., oak, hickory, sweetgum, sour gum, red maple, and holly).

- Southern Floodplain Forest - Occurs on the floodplains of rivers. Hardwoods dominate with a variety of species present. Composition of species varies with the amount of moisture.

- Maritime Forest - Develops on the lee side of stable sand dunes protected from the ocean. Live oak is an indicator species along with pine, cedar, yaupon, holly, and laurel oak. Deciduous hardwoods may be present where forest is mature.

- Pocosins - Lowland forest community that develops on highly organic soils that are seasonally flooded. Characterized by plants adapted to drought and shrubs. Strongly influenced by fire.

- Cypress Tupelo Swamp Forest - Occurs in the lowest and wettest areas of floodplains. Dominated by bald cypress and tupelo.

- Freshwater Marsh - Occurs upstream from tidal marshes and downstream from non-tidal freshwater wetlands. Cattails, sedges, and rushes are present.

- Salt Marsh - Regularly flooded, tidally influenced areas dominated by salt-tolerant grasses. Saltwater cordgrass is a characteristic species. Tidal mud flats may be present during low tide.

- Salt Shrub Thicket - High areas of salt marshes and beach areas behind dunes. Subjected to salt spray and periodic saltwater flooding. Dominated by salt resistant shrubs.

- Dunes/Beaches - Zones from the ocean shore to the maritime forest. Subjected to sand, salt, wind, and water.

- Ponds and Lakes - Low depressional areas where water table reaches the surface or where ground is impermeable. In ponds rooted plants can grow across the bottom. Fish populations in these ponds include redear, bluegill, largemouth bass, and channel catfish.

- Open Water - Marine and estuarine waters as well as all underlying bottoms below the intertidal zone.

MCB, Camp Lejeune covers approximately 151,000 acres or 236 square miles. Marine and estuarine open water account for 26,000 acres and terrestrial and palustrine land account for 85,000 acres. Forests are predominant as terrestrial cover and pine forest is the dominant habitat type. A total of 21,000 acres of the pine forest is loblolly pine, 7,700 acres are dominated by longleaf pine forest, and 3600 acres are dominated by pond pine forest. These pine forests include natural subcommunities that are maintained by fire.

In addition to the pine forest, mixed pine\hardwood forest is present on MCB, Camp Lejeune and accounts for 15,900 acres. An additional 12,100 acres are covered by hardwood forest. Of the wetlands present, estuarine marsh accounts for 700 acres; open freshwater accounts for 200 acres; and dune, beach, and brackish marsh accounts for 2,200 acres. Industrial, infrastructure, and administrative areas make up 10,000 acres and artillery impact areas and buffer zones account for 11,000 acres (LeBlond, 1994). The base contains 80 miles of tidal streams, 21 miles of marine shoreline, and 12 freshwater ponds. The soil types range from sandy loams to fine sand and muck, with the dominant series being sandy loam (United States Marine Corps [USMC],1987).

The base drains primarily to the New River via its tributaries. These tributaries include Northeast Creek, Southwest Creek, Cogdels Creek, Wallace Creek, Frenchs Creek, Bear Head Creek, Brinson Creek, Edwards Creek, and Duck Creek. Site-specific information regarding surface water and drainage features will be presented later in this report.

Forested areas within the military reservation are actively managed for timber. Game species are also managed for hunting and ponds are maintained for fishing. Game species managed include wild turkey, white-tailed deer, black bear, grey and fox squirrels, bobwhite quail, eastern cottontail and marsh rabbits, raccoons, and wood ducks. About 150 acres are maintained for wildlife food plots.

2.1.8.2 Sensitive Environments

MCB Camp Lejeune supports several areas with exemplary natural communities, including areas harboring many rare species. The most important of these areas have been identified as "Natural Areas." Fourteen Natural Areas are recognized at MCB, Camp Lejeune. Two of these areas are registered with the North Carolina Natural Heritage Program: Longleaf Pine Natural Area and Wallace Creek Swamp Natural Area. In addition, 12 other Natural Areas at MCB Camp Lejeune have been recommended for inclusion in the Natural Heritage Program Registry (LeBlonde et. al., 1994).

In addition to recognizing these Natural Areas on base, MCB, Camp Lejeune adheres to guidance provided by the NC DENR's Division of Environmental Management (DEM) pertaining to activities that may impact wetlands (NC DENR, 1992). Certain activities affecting wetlands are also regulated by the U.S. Army Corps of Engineers.

Wetlands at MCB, Camp Lejeune have been identified on National Wetlands Inventory (NWI) maps by the U.S. Fish and Wildlife Service (FWS). Through stereoscopic analysis of high altitude aerial photographs, wetlands were identified based upon vegetation, visible hydrology, and geography in accordance with Classification of Wetland and Deep-Water Habitats of the United States (Cowardin, et al., 1979). The NWI maps are intended for an initial identification of wetland areas and are not meant to replace an actual wetland delineation survey that may be required by federal, state and local regulatory agencies.

2.1.8.3 Threatened and Endangered Species

Certain species have been granted protection by the FWS under the Federal Endangered Species Act (16 U.S.C. 1531-1543), and by the North Carolina Wildlife Resources Commission, under the North Carolina Endangered Species Act (G.S. 113-331 to 113-337). The protected species fall into one of the following status classifications: federal or state endangered, threatened or candidate species; state special concern; state significantly rare; or state watch list. While only the federal or state threatened or endangered and state special concern species are protected from certain actions, the other classified species may have protection in the future.

Surveys have been conducted to identify threatened and endangered species at MCB, Camp Lejeune and several programs are underway to manage and protect them. Table 2-3 lists federally protected species present at the base and their protected classification. Of these species, the red-cockaded woodpecker, American alligator, and sea turtles are protected by specific regulatory programs.

The red-cockaded woodpecker requires a mature, living longleaf or loblolly pine environment. The birds live in family groups and young are raised cooperatively. At MCB, Camp Lejeune, 2,512 acres of habitat have been identified and marked for protection. Approximately 3,300 acres are in actively managed red-cockaded woodpecker colonies. Research on the bird at MCB, Camp Lejeune began in 1985 and information has been collected to determine home ranges, population size and composition, reproductive success, and habitat use. An annual roost survey is conducted and 36 colonies of birds have been located.

The American alligator is considered a state special concern specie. It is found in freshwater, estuarine, and saltwater wetlands in MCB, Camp Lejeune. Base wetlands are maintained and protected for alligators; signs have been posted where alligators are known to live. Annual surveys of Wallace, Southwest, French, Duck, Mill, and Stone Creeks have been conducted since 1977 to identify alligators and their habitats on base.

Two protected sea turtles, the Atlantic loggerhead and Atlantic green turtle, nest on Onslow Beach at MCB, Camp Lejeune. The green turtle was found nesting in 1980; this sighting was the first time the species had been observed nesting north of Georgia. The turtle returned to nest in 1985. Turtle

nests on the beach are surveyed and protected, turtles are tagged, and annual turtle status reports are issued.

Three bird species, piping plover, Bachmans sparrow, and peregrine falcon have also been identified during surveys at MCB, Camp Lejeune. The piping plover is a shore bird. Piping plovers prefer beaches with broad open sandy flats above the high tide line and feed along the edge of incoming waves. Like the piping plover, Bachmans sparrows have very specific habitat requirements. The sparrows live in open stretches of pines with grasses and scattered shrubs for ground cover. Bachmans sparrows were observed at numerous locations throughout southern portion MCB, Camp Lejeune.

In addition to the protected species that breed or forage at MCB, Camp Lejeune, several protected whales migrate through the coastal waters off the base during spring and fall. These include the Atlantic right whale, finback whale, sei whale, and sperm whale. Before artillery or bombing practice is conducted in the area, aerial surveys are made to assure that whales are not present in the impact areas.

A natural heritage resource study was conducted at MCB, Camp Lejeune (LeBlond, 1994) to identify threatened or endangered plants and areas of significant natural interest. During the resource study 55 rare plant species were documented from Camp Lejeune. These include 1 specie that is classified as Federal Endangered, 1 specie that is classified as Federally Threatened, 9 that are candidates for federal listing as Endangered or Threatened, 4 that are listed as Endangered or Threatened in the State of North Carolina, and 27 species that are State Rare or State Special Concern. These species are summarized on Table 2-3. In addition, species that are candidates for state listing or are on the North Carolina state watch list were noted.

## 2.2 Background and Setting of Sites

This section describes the physical setting, provides a detailed history of both operations and previous investigations, as well as the topography, drainage characteristics, geology and hydrogeology of the seven investigation areas which includes Sites: 12, 68, 75, 76, 84, 85, and 87.

### 2.2.1 Site 12 - Explosive Ordnance Disposal Area

The following section provides detailed information concerning a site description, topography and drainage characteristics, history, previous investigations, geology and hydrogeology specific to Site 12, the Explosive Ordnance Disposal area.

#### 2.2.1.1 Site Description

Site 12 is located in the area referred to as Camp Lejeune Mainside. The site is located approximately two miles northeast of Sneads Ferry Road and State Route 172 (Figure 2-1). The site is accessed from the west via a unimproved road (i.e. dirt road ) that turns east from Sneads Ferry Road at Fire Tower M (Figure 2-4). The Site 12 study area comprises nearly two acres of the ten acre Explosive Ordnance Disposal (EOD) detonation area. The detonation area's relief is flat with a very white to gray sandy surface cover, and is sparsely vegetated with grasses and occasional small brush. Situated within the area are several large pieces of old and rusted equipment including a bulldozer blade and a cannon which remain recognizable. An active tank trail runs along the northern wedge of the site.

Ordnance disposal operations at Site 12 have resulted in extensive ground disturbance. During field activities it was noted that the ground surface was scared by numerous detonation craters. These craters ranged from two to 15 feet in diameter and up to six feet in depth.

#### 2.2.1.2 Site Topography and Drainage

The area within Site 12 is flat and is unpaved. There are no drainage ditches in the immediate vicinity of the site. Because the site is flat, extensive overland drainage and runoff is minimal. There are low lying areas both within the site and bordering the site where standing water is present creating a marshy type environment. A pond is present south of the investigative area. Natural drainage has not been altered by the installation of drainage ditches, storm sewers, or paving.

2.2.1.3 Site History

The site is within an area where unserviceable or defective ordnance is disposed of through burning or exploding. This area has been used to conduct these practices since the early 1960s and is in current use. During a disposal exercise conducted in 1992, an explosive crater (approximately eight feet deep) uncovered an oily sheen, and a suspected petroleum odor was noted. Petroleum fuels have not been documented to be used in the explosive practices. The area surrounding the site has no documented past or present existence of fuel storage tanks. Until the time of this investigation, no documentation existed either to deny or confirm if a release occurred in this area.

During the field activities at Site 12, Baker learned of disposal procedures through casual conversations with on-site EOD personnel. It was related that the disposal of small arms ammunition was carried out by piling up the rounds, sometimes inside a crater from a past disposal, dousing the pile with diesel fuel and exploding the pile with a small explosive. Among the ordnance that was disposed of was white phosphorous ammunition. Baker also learned that the range was used, for a short time, as a target range for aircraft to drop "dummy" bombs onto.

2.2.1.4 Previous Investigations

Until the commencement of this investigation, no previous investigations to determine the presence or absence of contamination have been conducted at this site. A first-hand account of the use of petroleum products is the only information obtained.

2.2.1.5 Site Geology

The surface soil at Site 12 is comprised of fine grained white to gray sand with varying amounts of silt. This loose to medium dense fine sand extends to depths of a minimum 15 feet below ground surface (the final depths of the installed monitoring wells). At approximately 4 feet bgs, groundwater was encountered, turning the dry sand into a wet more dense sand unit. From the top of the encountered water table downward, the sand becomes a dark brown. The dark brown soil appears to be the result of high organic content (i.e. organic material such as roots were observed).

Discolored groundwater, most likely the result of a high organic content, has "stained" the sand formation giving it a banded or striped pattern.

2.2.1.6 Site Hydrogeology

The field investigation at Site 12 included groundwater data collection using both a Geoprobe sampling device and monitoring well installation. Both procedures established groundwater to be approximately four feet bgs. The ground surface comprised of loose to medium grained sand is very permeable which allows for infiltration of falling precipitation.

Initial observations of groundwater that had collected inside blast craters at the site revealed a dark brown color to the water with a "oily" looking sheen on its surface. Further examination of the water indicated that the color and "sheen" was not the result of petroleum products but a naturally occurring condition. Fluid level measurements conducted on January 31, 1996 from four newly installed monitoring wells using an oil/water interface probe confirmed that no free phase petroleum product was present at the site. The results of the measurements are summarized on Table 2-4.

The recorded groundwater elevations, measured to feet above mean sea level (msl), were used to develop a groundwater contour map specific to Site 12 (Figure 2-5). Groundwater contours indicate a general north to south flow direction.

2.2.1.7 Potable Water Supply Well Inventory

It has been determined that upon completion of research and review of the Wellhead Management Program Engineering Study (WMPES) (Geophex Ltd., 1992) Document, there are no potable water supply wells within a one-mile radius of Site 12 (Figure 2-6).

### 2.2.2 Site 68 - Rifle Range Dump

The following section provides detailed information concerning a site description, topography and drainage characteristics, history, previous investigations, and geology and hydrogeology specific to Site 68, the Rifle Range Dump.

2.2.2.1 Site Description

Site 68 is located with in the Rifle Range Area of Camp Lejeune (Figure 2-1). The investigative area of Site 68 is located to the west of Range Road, approximately 200 feet west of the Rifle Range Water Treatment Plant, and about 800 feet east of Stone Creek. The entire suspected disposal area is reported to be less than five acres in size (Figure 2-7).

Site 68 is accessed from the east, along the northern edge of the Rifle Range parking area. An improved dirt road leads into the center of the suspected disposal area. With the exception of the main road (Loop Road) which loops through the center of the site, and a few smaller paths, the surrounding area is densely vegetated. The majority of the vegetation is comprised of younger looking medium sized trees with thick under brush and vines, with the ground surface covered with a moderate layer of humus.

Evidence of clearing and ground disturbance was noted to the south and west of Loop Road on historical aerial photographs of the area. During the 1993 site visit, excavated ravines were observed west of Loop Road. These ravines contained construction debris and road asphalt. In general, ground disturbance and signs of past disposal practices were noted within and surrounding the Loop Road.

Currently, Loop Road is used as a fitness trail with exercise stations along the way. Evidence of military personnel activity and maneuvers such as trench digging, making sand bags, and rock crushing are present throughout the suspected disposal area.

2.2.2.2 Site Topography and Drainage

The site topography is variable with elevations ranging from 50 feet msl to the east to 5 feet msl to the northwest. The slope of the site is to the northwest toward Stone Creek. The soils in this area are primarily sandy and favor rapid infiltration of surface precipitation. There is evidence that surface water runoff does occur in a northwest direction toward Stone Creek (ESE, 1990).

2.2.2.3 Site History

The Site was reportedly utilized as a disposal facility for a period of 30 years from 1942 to 1973. Although not documented, an estimated 2,000 gallons of waste solvents were reportedly disposed of in this area. In addition, it has been reported that approximately 100,000 cubic yards of various types of waste material (i.e., garbage, building debris and waste treatment sludge) were disposed of here. The suspected disposal area, less than 5-acres in size, lies within a 30 to 40-acre area. Signs of activity (i.e. deforested areas), were identified in historical aerial photographs (ESE, 1990).

2.2.2.4 Previous Investigations

This section summarizes the analytical results of the previous groundwater investigations conducted by Water and Air Research (WAR, 1983) and ESE (1988). Note that soil, sediment, and surface water samples were not collected during any of the previous investigations. A detailed description of the investigations can be found in ESE's 1990 report.

In 1984, three monitoring wells (68-GW01, 68-GW02, and 68-GW03) were installed around the Rifle Range Dump. The locations of these monitoring wells are shown on Figure 2-8. The wells were reportedly installed to a depth of 25 feet bgs with a 15-foot long screen section. These three monitoring wells, along with supply wells RR-45 and RR-97 were sampled for volatile organic compounds (VOCs). No compounds of potential concern were detected in groundwater samples collected from these wells.

In 1986, the three monitoring wells were resampled by ESE for analysis of VOCs. Again, no compounds of potential concern were detected in the groundwater samples collected from these wells.

2.2.2.5 Site Geology

The surface soil at Site 68 consists of loosely packed fine grained silty sand which is dark brown to gray in color. The first foot of soil is very moist and contains a very high percentage of organic material such as roots and partially decaying leaves and twigs. The fine grained sand, which remains

moist and loose, extends to an average depth of three feet bgs. The exception was encountered at deep monitoring well 68-GW01DW where this sand extends to a depth of 17 feet bgs. A noticeable color change from the dark brown to a light brown to yellow is obvious for this sand layer, as noted at all the test boring locations.

Immediately below the sand layer is a olive gray clay layer. This moist clay layer contains some small degree of fine grained sands or silts and can be classified as medium stiff. The depth at which the clay was encountered varied from 15 to 18 feet bgs. At some boring locations there was a transitional layer of clayey silt with trace amounts of fine sand. Where present, this transitional layer extended from the upper sand layer to the top of the clay. On average, the thickness of this clay was approximately two to six feet thick. At well boring location 68-GW01DW, a 20 foot thick clay layer was encountered.

Below the clay is another fine grained sand layer which was encountered until the test borings were advanced to their termination depths of 30 to 62 feet bgs. The sands' characteristics include a dark brown color with areas of orange staining, traces of silt and increasingly higher percentages of shell fragments downward, very wet, and with a hardness in the medium dense range.

2.2.2.6 Site Hydrogeology

During the installation of the new monitoring wells, groundwater was encountered from 16 to 20 feet bgs. Well boring 68-GW01DW was substantially different with a depth to groundwater of only 5.5 feet due to a topographically lower area.

On January 31, 1996, a complete round of static water levels measurements were collected from the six newly installed monitoring wells and three existing monitoring wells at Site 68. These measurements are presented on Table 2-5. The measurements represent groundwater in two distinctive shallow monitoring wells, designated with "GW" only (e.g., 68-GW01), that were used to measure groundwater levels within the surficial aquifer. Moreover, deep monitoring wells were designated with "DW" (e.g., 68-GW01DW) and were used to measure groundwater levels within the deeper Castle Hayne aquifer. The depth of the deep monitoring wells ranged from 30 to 62 feet bgs.

Groundwater elevations from the surficial aquifer indicate that the groundwater flow is to the west across the site in a uniform direction (Figure 2-8). Note the large difference in groundwater elevation between 68-GW01 (46.92 feet [ft.] msl) and 68-GW06 (11.69 ft. msl) of over 35 feet. The groundwater elevation difference between measurements on the east side and west side of the study area is due to topographic changes across the site.

As shown on Figure 2-9, groundwater in the Castle Hayne aquifer flows to the southwest, being slightly influence by Stone Creek. Unlike the surficial aquifer, groundwater elevations within the Castle Hayne differ across the site by approximately 4.5 feet.

2.2.2.7 Potable Water Supply Well Inventory

A review of the WMPES Document indicates the existence of seven potable water supply wells within a one-mile radius of the study area (Figure 2-10). Table 2-6 provides detailed information concerning each of these wells.

### 2.2.3 Site 75 - MCAS Basketball Court

The following section provides detailed information concerning a site description, topography and drainage characteristics, history, previous investigations, geology and hydrogeology specific to Site 75, the MCAS Basketball Court.

2.2.3.1 Site Description

Site 75 is located at the MCAS, New River (Figure 2-1). The site is along the north side of Curtis Road between the Seaboard Coastline Railroad and Baxter Road (Figure 2-11). The study area is mostly a well-maintained grass field, divided by a wooded strip of land (approximately 40-50 feet wide) running east to west. Base personnel currently occupy housing units within and on the edge of the study area, along Baxter Road. Within the grass field on the north side of the wooded strip of land is a basketball court, which is almost the center of the study area. The study area reportedly contains an oval-shaped drum burial pit. The dimensions of the oval-shaped pit is reported to be 90

feet long and 70 feet wide; however, its exact location is unknown and the area is not immediately apparent (ESE, 1990).

2.2.3.2 Site Topography and Drainage

The site terrain is relatively flat and is covered by grassy and wooded areas. There are several shallow drainage swails (one foot deep or less) that run north to south across the site. These swails are dry most of the time; however, during periods of rain, water will collect and flow northward off the site through the swails.

2.2.3.3 Site History

Site 75 was reported to be a drum disposal area that was used on at least one occasion in the early 1950s. The excavation for the drum disposal was reported to be an oval shaped pit approximately 90 feet long by 70 feet wide and was sufficiently deep to have cut into the groundwater table approximately five feet bgs. An estimated seventy-five to one-hundred 55-gallon drums were reportedly placed in this pit. The drums reportedly contained a chloroacetophenone tear gas solution which was used for training. Additional VOCs such as chloroform, carbon tetrachloride, and benzene, along with chloropicirin may have also been present in the solution.

2.2.3.4 Previous Investigations

In 1984, shallow monitoring wells 75-GW01, 75-GW02, and 75-GW03 were installed for the purpose of groundwater sampling. Well completion details were not available for 75-GW01, however, the remaining two monitoring wells were comprised of 15 feet of screen and had total depths of 22 and 23 feet respectively. In July 1984 groundwater samples were collected from the three newly installed monitoring wells as well as from three water supply wells (75-GW04, 75-GW05, and 75-GW06) in the vicinity of the site. The six samples were analyzed for VOCs only, but no detections were reported (ESE, 1990). No soil samples were collected during the investigation.

In preparation of this report, research into the results from the analysis conducted during this first round of sampling was undertaken. The ESE report identified water supply wells 75-GW04, 75-GW05, and 75-GW06 which could not be correlated with the present Camp Lejeune water supply well numbering system. Subsequently, the locations of these three water supply wells could not be determined.

In November 1986, monitoring wells 75-GW01, 75-GW02, and 75-GW03 were resampled. The sample analysis included chloropicirin , tetrachlorodioxin and VOCs. Both of these compounds are associated with the tear gas solution suspected to be present on the site. The laboratory report indicated that no sample had a detection of any of the tested parameters (ESE, 1990)

Prior to installation of the shallow monitoring wells, a geophysical survey consisting of electromagnetic (EM) conductivity and other metal detection techniques was conducted on a grid system through this area. Potential dumping areas, identified from aerial photographs (currently unavailable), were investigated during the survey. No areas representative of buried metallic objects were identified.

2.2.3.5 Site Geology

Site 75 is underlain by soils that are predominantly sands and silty sands beneath a foot of surface top soil. From ground surface to a depth of three feet, the soil is a light brown silty sand with a trace of gray clay. The material is loose to medium dense and ranges from moist to damp. At approximately four feet bgs, the silt content decreases transitioning into a "cleaner" sand. The sand's color also changes as depth increases from a light brown to a dark gray.

2.2.3.6 Site Hydrogeology

During the advancement of the borings, groundwater was encountered generally between 3.5 and 4.0 feet bgs. This is approximately the same depth at which the silt content in the soil begins to decrease. Because the study area is open and grass covered, it is most likely a recharge zone characterized by moderate infiltration of precipitation.

Groundwater elevations were measured on February 26, 1996 from three existing monitoring wells, 75-GW01, 75-GW02, and 75-GW03, and two newly installed monitoring wells, 75-GW04 and 75-GW05 at Site 75. Figure 2-12 depicts a groundwater contour map of the surficial aquifer for the site. The measurements were adjusted to mean sea level and are reported on Table 2-7. Shallow groundwater flow is in the northeast direction towards Edwards Creek with a change in elevation of over three feet, from 12.20 feet msl in the southern most monitoring well to 8.86 feet msl in the northern most monitoring well.

2.2.3.7 Potable Water Supply Well Inventory

A review of the WMPES Document indicates the existence of 16 potable water supply wells within a one-mile radius of the study area (Figure 2-13). Table 2-8 provides detailed information concerning each of these wells.

### 2.2.4 Site 76 - MCAS Curtis Road

The following section provides detailed information concerning a site description, topography and drainage characteristics, history, previous investigations, geology and hydrogeology specific to Site 76, Curtis Road.

2.2.4.1 Site Description

Site 76 is also located at the MCAS, New River (Figure 2-1). The site is along the north side of Curtis Road and is bounded by Curtis Road to the south, Compton and Grier Streets to the north, McAvoy Street to the east, and Baxter Road to the west (Figure 2-14). The study area is a mixture of well maintained grassy areas and sparsely wooded areas. There are several base housing units to the immediate north of the Site 76 study area.

2.2.4.2 Site Topography and Drainage

The site terrain is relatively flat with a slightly higher surface elevation within the center portion, creating a gentle slope to the north and south. The ground surface is almost entirely grass and/or

lightly wooded. As noted on Figure 2-14, there is a large drainage ditch approximately 15 feet wide and seven to 10 feet in depth that runs along the southern edge of the site paralleling Curtis Road. This ditch is dry most of the time; however, during periods of rain, water will collect and flow off the site through the ditch. Storm sewer covers are also present throughout the site.

2.2.4.3 Site History

Similar to Site 75, Site 76 allegedly contains a dump site for drums. Although two locations within the study area have been identified as possible disposal sites based on interviews and review of historical aerial photographs, the exact location remains unknown. The alleged dump site was reportedly used as a drum disposal area on two occasions in 1949. The estimated area of the disposal pits is 1/4 acre, and approximately twenty-five to seventy-five 55- gallon drums were allegedly involved. It's believed that the drums contained a chloroacetophenone tear gas agent similar to that allegedly buried at MCAS Basketball Court, Site 75. Additional potential contaminants include: chloroform, carbon tetrachloride, benzene, and chloropicrin (ESE, 1990).

2.2.4.4 Previous Investigations

In 1984, shallow monitoring wells 76-GW01 and 76-GW02 were installed for the purpose of groundwater sampling (Figure 2-14). Both monitoring wells were comprised of 15 feet of screen and set at depths of 22 and 23 feet bgs respectively. In July 1984 groundwater samples were collected from the two newly installed monitoring wells. The two groundwater samples were analyzed for VOCs only, but no detections were reported (ESE, 1990). No soil samples were collected during the investigation.

In November 1986, monitoring wells 76-GW01, 76-GW02 were resampled. The sample analysis included chloropicrin, tetrachlorodioxin, and VOCs. Both of these compounds are associated with the tear gas solution suspected to be present on the site. The laboratory report indicated that no sample had a detection of any of the tested parameters (ESE, 1990)

Prior to installation of the shallow monitoring wells, a geophysical survey consisting of EM conductivity and other metal detection techniques was conducted on a grid system through this area.

Potential dumping areas, identified from aerial photographs (currently unavailable), were investigated during the survey. No areas representative of buried metallic objects were identified.

2.2.4.5 Site Geology

Beneath the foot of organically rich surface top soil, Site 76 is underlain by layers of sand, silty sand, silty clay and clay. The sands are fine grained, light brown to dark gray in color and range from loose to dense. Clay layers from two to five feet in thickness are interbedded throughout the sand layers. This stiff clay is light brown to red in appearance and shows signs of orange mottling. Fine silts are also common at the site and both the sands and clays that are encountered have varying degrees of silt among them.

2.2.4.6 Site Hydrogeology

During the advancement of the borings, groundwater was encountered between 4.0 and 5.0 feet bgs. This is approximately the same depth where the clay layers (if encountered) show the orange mottling. Because the study area is predominantly open and grass covered, the area is a recharge zone characterized by moderate infiltration of precipitation.

Groundwater measurements were collected from the two existing monitoring wells, (76-GW01 and 76-GW02), and the three new monitoring wells (76-GW03, 76-GW04, and 76-GW05) installed during this investigation (Figure 2-15). The groundwater elevations, reported as elevations to mean sea level, ranged from a high of 11.20 feet msl in 76-GW04 to a low of 5.96 feet msl in 76-GW02. Table 2-9 is a summary of groundwater elevations at Site 76.

The groundwater flow direction in the surficial aquifer is to the southwest to northeast across the site. The validity of this northeast flow is confirmed by the fact that Site 76 is immediately adjacent to Site 75 which also has indicated a northeast groundwater flow direction.

2.2.4.7 Potable Water Supply Well Inventory

A review of the WMPES Document indicates the existence of eight potable water supply wells within a one-mile radius of the study area (Figure 2-16). Table 2-10 provides detailed information concerning each of these wells.

### 2.2.5 Site 84 - Building 45 Area

The following section provides detailed information concerning a site description, topography and drainage characteristics, history, previous investigations, geology and hydrogeology specific to Site 84, the Building 45 Area.

2.2.5.1 Site Description

Site 84 is located approximately 200 yards south of Highway 24 on the main side of MCB, Camp Lejeune, one mile west of the main gate entrance (Figure 2-1). The study area is bordered by Building 45 (an electrical substation) to the east and south, Northeast Creek to the west, and railroad tracks to the north. The site area is mostly wooded and vegetated covered by thick vegetation or grass. There is a small lagoon, possibly manmade, hidden by trees near the center of the site. The lagoon is roughly circular in shape with a diameter of approximately 50 feet. There is an unrestricted access road that runs through the site and terminates at Northeast Creek (Figure 2-17).

2.2.5.2 Site Topography and Drainage

The site is relatively flat with some minor surface mounds in the wooded areas. Overland surface water drainage is west in the direction of Northeast Creek.

2.2.5.3 Site History

This site is in proximity to a former electric substation. Transformers reportedly containing polychlorinated biphenyls (PCBs) were known to be used and possibly stored at the substation. A transformer was discovered in the wooded area, east of the substation. Additional transformers

(approximately 20) potentially containing PCB transformer oil were discovered and removed from the lagoon. Maintenance personnel at Building 45 have indicated that additional transformers may still be buried in areas near the lagoon. However, it was reported that public works had performed minor excavations in the area and did not discover any waste materials. The excavation holes are noted on Figure 2-17.

2.2.5.4 Previous Investigations

During an underground storage tank (UST) investigation conducted by O'Brien & Gere (1992), two soil samples, from unknown depths, were collected from the area where the transformer was discovered. Low levels of PCBs (unknown concentrations) were reported in one soil sample. Suspected PCB dielectric fluid was sampled from the discovered transformer and PCBs were reported in the sample (unknown concentrations). The contents of the transformers removed from the lagoon were not sampled (O'Brien and Gere, 1992).

Note that groundwater, surface water, and sediment samples were not collected at the site during previous investigations.

2.2.5.5 Site Geology

In general, the subsurface geology in the vicinity of the site is characterized by unconsolidated sands, silts and\or clay. The initial foot of cover is a dark brown top soil underlain by a three foot layer of fine to medium grained brown sand. The next layer is a six to 12 foot layer of medium grained sand that ranges in color from brown to gray. Some orange and white mottling was also noted. A thin layer (approximately one to 1.5 feet thick) of coarse grained sand separates the gray to brown color zone above from a gray medium grained sand zone eight feet below. Near the bottom of the test borings from previous investigations, the medium grained sands were described as transitioning into a gray green color. All throughout the sand layers, varying degrees of silt and perhaps traces of clay were also present (O'Brien and Gere, 1992).

2.2.5.6 Site Hydrogeology

During the advancement of the borings, groundwater was encountered from four to 15 feet bgs. Because permanent monitoring wells were not installed as part of the Site 84 study, there is no current data available concerning groundwater elevations. Subsequently, a groundwater contour map for Site 84 could not be produced; however, groundwater flow in this area would likely flow in a north to northwesterly direction, towards Northeast Creek.

2.2.5.7. Potable Water Supply Well Inventory

A review of the WMPES Document indicates the existence of 15 potable water supply wells within a one-mile radius of the study area (Figure 2-18). Table 2-11 provides detailed information concerning each of these wells.

### 2.2.6 Site 85 - Camp Johnson Battery Dump

The following section provides detailed information concerning a site description, topography and drainage characteristics, history, previous investigations, geology and hydrogeology specific to Site 85, the Camp Johnson Battery Dump.

2.2.6.1 Site Description

Site 85 is located within the Camp Johnson support operations area (Figure 2-1). The site is accessed from Coolidge Road to the south via a network of improved and unimproved roads (Figure 2-19). With the exception of the roads, the surrounding area is densely wooded and vegetated. The understory thick with brush and small trees (generally less than three inches in diameter). The area of concern is approximately 4.5 acres in size.

Currently, the roads that surround Site 85 are used for vehicle training and support operations. Tactical Landing Zone (TLZ) Mallard serves as a debarkation and landing point for aircraft involved in military personnel maneuvers.

2.2.6.2 Site Topography and Drainage

The site is flat and unpaved. Standing water occurs after heavy rains in low areas which have been graded for roads and other vehicle training. Due to the absence of paved roads or sewer installation, overland runoff is to expected to be minimal.

2.2.6.3 Site History

Site 85 was used as a battery dump during the 1950s. Battery remnants, possibly from the Korean War era, were uncovered during road grading and remain visible in certain areas. During a site visit conducted by Baker personnel in September 1993, five distinct piles of battery packs were identified in this area (Figure 2-19). During sampling activities associated with this investigation two more piles of batteries were discovered (Figure 2-19). The battery piles are comprised of what appear to be severely corroded and/or burned individual batteries and battery packs. The battery packs are approximately 10-inches long and 5-inches wide. The piles of battery debris range in size from 2-foot wide by 2-foot long to 15-feet wide by 20-feet long. The piles vary from 1-foot to 3-feet high. Based on the identified piles, and field measurements with a hand held tape, the total volume of debris at the site has been estimated to be approximately 40 cubic yards.

2.2.6.4 Previous Investigation Findings

No previous investigations have been conducted at Site 85. Baker was requested by the Navy to collect soil and groundwater samples as part of the Relative Risk Ranking System (RRRS). This portion of the field work was completed in September 1995. In addition, Baker completed additional sampling as part of this most recent study. The field operations and sampling methods are discussed in Section 3.0 of this document. Results of the analytical tests are provided in Section 4.0 Prior to the Baker field activities, no known investigations have been conducted in this area to determine the presence or absence of contaminants.

2.2.6.5 Site Geology

Site-specific geologic information is very limited for the study area. This is due to the lack of extensive subsurface investigations conducted at this site or in any nearby areas. A general description of the soils underlying the site, however, can be inferred from the cross-section map of Camp Lejeune

as shown on Figure 2-3. In general, surface soils are primarily silty sand and dark brown, black and gray in color. Site 85 subsurface soils are primarily dark brown to light brown, fine grained sand with trace silt.

2.2.6.6 Site Hydrogeology

Permanent groundwater monitoring wells were not installed at Site 85 and, therefore, limited information is available on the hydrogeologic conditions of the site. Groundwater was encountered at approximately eight feet bgs at the time of drilling. It was noted by Baker field personnel that groundwater extraction at the time of sampling was very slow due to the slow recharge nature of the formation. Based on the site topography and the site's proximity to the New River, the general groundwater flow direction is estimated to be toward the south.

2.2.6.7 Potable Water Supply Well Inventory

A review of the WMPES Document indicates the existence of 12 potable water supply wells within a one-mile radius of the study area (Figure 2-20). Table 2-12 provides detailed information concerning each of these wells.

### 2.2.7 Site 87 - MCAS Officer's Housing Area

The following sections provide information concerning the site description, topography and drainage characteristics, history, previous investigations, geology and hydrogeology specific to Site 87, MCAS Officer's Housing Area.

2.2.7.1 Site Description

Site 87 is located in the MCAS Officer's Housing Area, near the intersection of Longstaff Road and Trotter Street, approximately 375 feet to the east, on the west bank of the New River (Figure 2-1). Some portions of the site are cleared, and some portions are densely vegetated with trees and brush.

Residents of the Officer's Housing Area have unrestricted access to this site. There are houses nearby, in fact, two homes (Buildings 2019 and 2021) are located immediately adjacent to the site (Figure 2-21). The site borders the New River which is used in this area for recreational purposes (e.g., fishing and boating). Ducks, herons, and fish have been observed in and on the water near the site.

#### 2.2.7.2 Site Topography and Drainage

With the exception of the banks of the New River, the land surrounding Site 87 is relatively flat. Overland drainage is unlikely over most of the site due to the flat topography and vegetation. The natural drainage has not been altered in the portion of the site next to the New River, however in the area of the homes, slight regrading and installation of small drainage swales, storm sewers, and paving has taken place. Surface runoff from the eastern portion of the site may drain to the New River.

#### 2.2.7.3 Site History

Information on the history of Site 87 is limited. In 1986, during an investigation conducted by Environmental Science and Engineering, Inc. (ESE, 1990), waste was identified eroding from the cut bank along the New River in the vicinity of the Officer's Housing Area. The waste was tentatively identified as hospital wastes (i.e., hypodermic needles and vials of white powder). This white powder was believed to contain a chlorine-based substance (ESE, 1990).

#### 2.2.7.4 Previous Investigations

Previous work at this site has included the installation of two shallow monitoring wells (87-GW01 and 87-GW02). The wells were installed to a depth of 25 feet bgs with a 15-foot screened interval. Both of the wells have been sampled on two separate occasions, once in December 1986, and again in March 1987. In both cases the groundwater samples were analyzed for free chlorine, oil and grease (O&G), and VOCs. The groundwater was found to be absent of contamination in 1986, with low levels of O&G (unknown concentrations) reported in 1987.

In addition to the groundwater sampling, one surface water sample was collected just off shore of Site 87 in the New River in December 1986. This sample was analyzed for free chlorine, O&G, and VOCs. None of the parameters were detected in this sample.

2.2.7.5 Site Geology

Site-specific geologic information is limited to the data obtained during the installation of two monitoring wells by ESE in 1986 (87-GW01 and 87-GW02). Based on the information collected during the installation of these monitoring wells, the site is underlain by clay at the surface, followed by attenuating layers of silty sand, and sand. The water table was measured at depths ranging from 7.68 to 11.1 feet below the ground surface. Shallow groundwater flow appears to be eastward toward the New River, with a gradient of 0.019 foot per foot (ESE, 1990).

2.2.7.6 Site Hydrogeology

The groundwater data available for Site 87 is very limited because only two monitoring wells are within the study area boundary, (87-GW01 and 87-GW02). The groundwater elevations measured from the two wells (7.59 and 2.32 feet msl for wells 87-GW01 and 87-GW02 respectively) verify the above mentioned conclusions of ESE that groundwater flow is toward the east, directly toward the New River. Groundwater elevations are presented on Table 2-13 and a groundwater contour map for Site 87 is on Figure 2-22.

2.2.7.7 Potable Water Supply Well Inventory

A review of the WMPES Document confirmed that there are no potable water supply wells within a one-mile radius of Site 87 (Figure 2-23).

## 2.3 References

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# TABLES

**TABLE 2-1**

**GEOLOGIC AND HYDROGEOLOGIC UNITS OF NORTH CAROLINA'S COASTAL PLAIN PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314 MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Geologic Units | | | Hydrogeologic Units |
|---|---|---|---|
| System | Series | Formation | Aquifer and Confining Unit |
| Quaternary | Holocene/Pleistocene | Undifferentiated | Surficial aquifer |
| Tertiary | Pliocene | Yorktown Formation[1] | Yorktown confining unit |
| | Miocene | | Yorktown Aquifer |
| | | Eastover Formation[1] | |
| | | Pungo River Formation[1] | Pungo River confining unit |
| | | | 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 | | -- | -- |

Notes:

(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.

**TABLE 2-2**

**LAND UTILIZATION WITHIN DEVELOPED AREAS OF MCB, CAMP LEJEUNE**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Geographic Area | Operation | Training (Instruc.) | Maintenance | Supply/ Storage | Medical | Admin-istration | Family Housing | Troop Housing | CM | CO | Recreation | Utility | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hadnot Point | 31 (2.9) | 15 (1.4) | 154 (14.3) | 157 (14.4) | 10 (0.9) | 122 (11.3) | 22 (2.0) | 196 (18.1) | 115 (10.7) | 36 (3.3) | 182 (16.9) | 40 (3.7) | 1,080 (100) |
| Paradise Point | 1 (0) | | 3 (0.4) | 1 (0) | | | 343 (34) | 19 (1.9) | 31 (3.1) | | 610 (60.4) | 2 (0.2) | 1,010 (100) |
| Berkeley Manor/ Watkins | | | | | | | 406 (80) | | 41 (8.1) | 1 (0.2) | 57 (11.2) | 2 (0.5) | 507 (100) |
| Midway Park | | 1 (0.4) | | 2 (0.7) | | 2 (0.7) | 248 (92.2) | | 8 (3.0) | 3 (1.1) | 4 (1.5) | 1 (0.4) | 269 (100) |
| Tarawa Terrace I and II | | | 3 (0.5) | | | 1 (0.3) | 428 (77.4) | | 55 (9.9) | 11 (2.0) | 47 (8.5) | 8 (1.4) | 553 (100) |
| Knox Trailer | | | | | | | 57 (100) | | | | | | |
| French Creek | 8 (1.4) | 1 (0.2) | 74 (12.7) | 266 (45.6) | 3 (0.5) | 7 (1.2) | | 122 (20.9) | 22 (3.8) | 6 (1.0) | 74 (12.7) | | 583 (100) |
| Courthouse Bay | | 73 (28.6) | 28 (10.9) | 14 (5.5) | | 12 (4.7) | 12 (4.7) | 43 (16.9) | 15 (5.9) | 4 (1.6) | 43 (16.9) | 11 (4.3) | 255 (100) |
| Onslow Beach | 6 (9.8) | 1 (1.6) | 3 (4.8) | 2 (3.2) | 1 (1.6) | 2 (3.2) | | 2 (3.2) | 12 (19.3) | | 25 (40.3) | 8 (13.0) | 62 (100) |
| Rifle Range | | 1 (1.3) | 1 (1.3) | 7 (8.8) | 1 (1.3) | 5 (6.3) | 7 (8.8) | 30 (37.5) | 5 (6.3) | 1 (1.3) | 9 (11.3) | 13 (16.3) | 80 (100) |
| Camp Geiger | 4 (1.9) | 15 (6.9) | 19 (8.8) | 50 (23.1) | | 23 (10.6) | | 54 (25.0) | 27 (12.5) | 2 (1.0) | 16 (7.4) | 6 (2.8) | 216 (100) |
| Montford Point | 6 (2.6) | 48 (20.5) | 2 (0.9) | 4 (1.7) | 2 (0.9) | 9 (3.9) | | 82 (35.2) | 20 (8.6) | 1 (0.4) | 49 (21.0) | 10 (4.3) | 233 (100) |
| Base-Wide Misc. | 1 (0.8) | | | 87 (68.0) | | 3 (2.3) | | | 19 (14.8) | | | 18 (14.1) | 128 (100) |
| **TOTAL** | **57 (1.)** | **155 (3.1)** | **287 (5.7)** | **590 (11.7)** | **17 (0.38)** | **186 (3.7)** | **1,523 (30.2)** | **548 (10.8)** | **370 (7.4)** | **65 (1.3)** | **1,116 (22.2)** | **119 (2.4)** | **5,033 (100)** |

Notes:

Numbers without parentheses represent total acres.
Numbers within parentheses represent percentage of total acres.
Source: Master Plan, 1988

**TABLE 2-3**

**PROTECTED SPECIES WITHIN MCB, CAMP LEJEUNE**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Species | Protected Classification |
|---|---|
| **Animals:** | |
| American alligator (Alligator mississippienis) | SC |
| Bachmans sparrow (Aimophilia aestivalis) | FCan, SC |
| Green (Atlantic) turtle (Chelonia m. mydas) | T(f), T(s) |
| Loggerhead turtle (Caretta caretta) | T(f), T(s) |
| Peregrine falcon (Falco peregrinus) | E(f), (E(s) |
| Piping plover (Charadrius melodus) | T(f), T(s) |
| Red-cockaded woodpecker (Picoides borealis) | E(f), E(s) |
| Southern Hognose Snake (Heterodon simus) | FCan, SR |
| Diamondback Terrapin (Malaclemys terrapin) | FCan, SC |
| Carolina Gopher Frog (Rana capito capito) | FCan, SC |
| Cooper's Hawk (Accipiter cooperii) | SC |
| Eastern Diamondback Rattlesnake (Crotalus adamanteus) | SR |
| Eastern Coral Snake (Micrurus fulvius) | SR |
| Pigmy Rattlesnake (Sistrurus miliarius) | SR |
| Black Bear (Ursus americanus) | SR |
| **Plants:** | |
| Rough-leaf loosestrife (Lysimachia asperulifolia) | E(f), E(s) |
| Seabeach Amaranth (Amaranthus pumilus) | T(f). T(s) |
| Chapman's Sedge (Carex chapmanii) | FCan |
| Hirst's Witchgrass (Dichanthelium sp.) | FCan |
| Pondspice (Litsea aestivalis) | FCan |
| Boykin's Lobelia (Lobelia boykinii) | FCan |
| Loose Watermilfoil (Myriophyllum laxum) | FCan,T(s) |
| Awned Meadowbeauty (Rhexia aristosa) | FCan,T(s) |
| Carolina Goldenrod (Solidago pulchra) | FCan, E(s) |
| Carolina Asphodel (Tofieldia glabra) | FCan |
| Venus Flytrap (Dionaea muscipula) | FCan |
| Flaxleaf Gerardia (Agalinis linifolia) | SR |
| Pinebarrens Goober Grass (Amphicarpum purshii) | SR |
| Longleaf Three-awn (Aristida palustris) | SR |
| Pinebarrens Sandreed (Calamovilfa brevipilis) | E(s) |
| Warty Sedge (Carex verrucosa) | SR |
| Smooth Sawgrass (Cladium mariscoides) | SR |
| Leconte's Flatsedge (Cyperus lecontei) | SR |
| Erectleaf Witchgrass (Dichanthelium erectifolium) | SR |
| Horsetail Spikerush (Eleocharis equisetoides) | SR |
| Sand Spikerush (Eleocharis montevidensis) | SR |

**TABLE 2-3 (Continued)**

**PROTECTED SPECIES WITHIN MCB, CAMP LEJEUNE**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Species | Protected Classification |
|---|---|
| Flaxleaf Seedbox (Ludwigia linifolia) | SR |
| Torrey's Muhley (Muhlenbergia torreyana) | E(s) |
| Southeastern Panic Grass (Panicum tenerum) | SR |
| Spoonflower (Peltandra sagittifolia) | SR |
| Shadow-witch (Ponthieva racemosa) | SR |
| West Indies Meadowbeauty (Rhexia cubensis) | SR |
| Pale Beakrush (Rhynchospora pallida) | SR |
| Longbeak Baldsedge (Rhynchospora scirpoides) | SR |
| Tracy's Beakrush (Rhynchospora tracyi) | SR |
| Canby's Bulrush (Scirpus etuberculatus) | SR |
| Slender Nutrush (Scleria minor) | SR |
| Lejeune Goldenrod (Solidago sp.) | SR |
| Dwarf Bladderwort (Utricularia olivacea) | T(s) |
| Elliott's Yellow-eyed Grass (Xyris elliottii) | SR |
| Carolina Dropseed (Sporobolus sp.) | T(s) |

Legend:
E(f) = Federal Endangered
T(f) = Federal Threatened
FCan = Candidate for Federal Listing
E(s) = State Endangered
T(s) = State Threatened
SC = State Special Concern
SR = State Rare

Source: LeBlond, 1994

**TABLE 2-4**

**SUMMARY OF FLUID LEVEL MEASUREMENTS - JANUARY 31, 1996**
**SITE 12, EXPLOSIVE ORDNANCE DISPOSAL AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Monitoring Well Number | Top of Casing Elevation (Ft. above msl)[1] | Depth to Groundwater (ft. Below top of casing) | Groundwater Elevation (Ft. above msl)[1] | Depth to Product (Ft. below top of casing) | Product Thickness (Ft.) | Product Elevation (Ft. above msl)[1] |
|---|---|---|---|---|---|---|
| 12-GW01 | 54.96 | 5.56 | 49.4 | Not Detected | NA[2] | NA |
| 12-GW02 | 51.35 | 9.02 | 42.33 | Not Detected | NA | NA |
| 12-GW03 | 45.47 | 4.06 | 41.41 | Not Detected | NA | NA |
| 12-GW04 | 49.47 | 10.6 | 38.87 | Not Detected | NA | NA |

Notes:

(1) Mean sea level
(2) Not Applicable

**TABLE 2-5**

**SUMMARY OF FLUID LEVEL MEASUREMENTS - JANUARY 31, 1996**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Monitoring Well Number | Top of Casing Elevation (Ft. above msl)[1] | Depth to Groundwater (ft. Below top of casing) | Groundwater Elevation (Ft. above msl)[1] |
|---|---|---|---|
| 68-GW01 | 54.01 | 7.09 | 46.92 |
| 68-GW01DW | 53.83 | 43.08 | 10.75 |
| 68-GW02 | 24.47 | 12.76 | 11.71 |
| 68-GW03 | 32.61 | 18.75 | 13.86 |
| 68-GW04 | 30.08 | 13.13 | 16.95 |
| 68-GW04DW | 30.73 | 20.31 | 10.42 |
| 68-GW05DW | 24.76 | 18.69 | 6.07 |
| 68-GW06 | 24.11 | 12.42 | 11.69 |
| 68-GW06DW | 23.21 | 15.31 | 7.9 |

Notes:

[1] Mean sea level

**TABLE 2-6**

**SUMMARY OF POTABLE WATER SUPPLY WELLS WITHIN A ONE-MILE RADIUS OF SITE 68 PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314 MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Supply Well Number | Well Depth (ft) | Screened Interval (ft) | Well Dia. (in) | Approx. Dist.(ft) and Dir. | Well Status |
|---|---|---|---|---|---|
| T-18 | 302 | NA | NA | 2229/NE | Inactive |
| RR-47 | 85 | 71 - 81 | 8 | 3300/NE | Inactive |
| RR-45 | 130 | 75 - 80<br>90 - 95<br>105 - 115<br>125 - 130 | 8 | 2692/SE | Inactive |
| RR-97 | 200 | 45 - 60<br>80 -100 | 8 | 3524/SE | Inactive |
| RR-97A | 437 | 365 - 395<br>415 - 425 | 8 | 3985/SE | Inactive |
| T-19 | 161 | NA | NA | 4845/SE | Inactive |
| RR-229 | 253 | 190 - 210<br>223 - 233<br>247 - 252 | 10 | 516/SE | Inactive |

Notes:

NA - Information not available

**TABLE 2-7**

**SUMMARY OF FLUID LEVEL MEASUREMENTS - FEBRUARY 26, 1996**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Monitoring Well Number | Top of Casing Elevation (Ft. above msl)[1] | Depth to Groundwater (ft. Below top of casing) | Groundwater Elevation (Ft. above msl)[1] |
|---|---|---|---|
| 75-GW01 | 17.2 | 6.05 | 11.15 |
| 75-GW02 | 19.56 | 7.36 | 12.2 |
| 75-GW03 | 19.83 | 7.74 | 12.09 |
| 75-GW04 | 12.77 | 3.91 | 8.86 |
| 75-GW05 | 14.25 | 4.54 | 9.71 |

Notes:

[1] Mean sea level

**TABLE 2-8**

**SUMMARY OF POTABLE WATER SUPPLY WELLS WITHIN A ONE-MILE RADIUS OF SITE 75 PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314 MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Supply Well Number | Well Depth (ft) | Screened Interval (ft) | Well Dia. (in) | Approx. Dist.(ft) and Dir. | Status of Well |
|---|---|---|---|---|---|
| NC-52 | 70 | 25 - 66 | NA | 5228/NW | Inactive |
| TC-600 | 70 | 48 - 70 | 8 | 4757/NW | Active |
| TC-700 | 76 | 27.5 - 76 | 18 | 4263/NW | Active |
| TC-901 | 77 | 46 - 56<br>66 - 76 | 8 | 3389/NW | Inactive |
| TC-1256 | 204 | 124 - 134<br>154 - 164<br>182 - 192 | NA | 5138/W | Active |
| TC-1255 | 250 | 124 - 132<br>156 - 166<br>180 - 190 | NA | 4413/W | Active |
| TC-190 | 180 | 130 - 140<br>150 - 180 | NA | 3178/SW | Inactive |
| TC-191 | 180 | 130 - 140<br>150 - 180 | NA | 2451/SW | Inactive |
| MCAS-4150 | NA | NA | NA | 5259/SW | Inactive |
| MCAS-4140 | NA | NA | NA | 4942/SW | Inactive |
| MCAS-131 | 200 | NA | NA | 2536/SE | Inactive |
| MCAS-1254 | NA | NA | NA | 696/SE | Inactive |
| MCAS-203 | 173 | NA | NA | 1505/SE | Inactive |
| MCAS-106 | NA | NA | NA | 977/E | Inactive |
| TC-125 | NA | NA | NA | 602/SW | Inactive |
| TC-1253 | 250 | 120 - 135<br>155 - 170 | NA | 2264/W | Active |

Notes:

NA - Information not available

**TABLE 2-9**

**SUMMARY OF FLUID LEVEL MEASUREMENTS - FEBRUARY 26, 1996**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Monitoring Well Number | Top of Casing Elevation (ft. above msl)[1] | Depth to Groundwater (ft. below top of casing) | Groundwater Elevation (ft. above msl)[1] |
|---|---|---|---|
| 76-GW01 | 18.92 | 8.31 | 10.61 |
| 76-GW02 | 10.27 | 4.31 | 5.96 |
| 76-GW03 | 12.43 | 5.28 | 7.15 |
| 76-GW04 | 16.56 | 5.36 | 11.20 |
| 76-GW05 | 16.60 | 7.67 | 8.93 |

Notes:

[1] Mean sea level

**TABLE 2-10**

**SUMMARY OF POTABLE WATER SUPPLY WELLS WITHIN A ONE-MILE RADIUS OF SITE 76 PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314 MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Supply Well Number | Well Depth (ft) | Screened Interval (ft) | Well Dia. (in) | Approx. Dist. (ft) and Dir. | Well Status |
|---|---|---|---|---|---|
| TC-1253 | 250 | 120 - 135<br>155 - 170 | NA | 4641/NW | Active |
| TC-125 | NA | NA | NA | 2776/W | Inactive |
| TC-191 | 180 | 130 - 140<br>150 - 180 | NA | 5167/SW | Inactive |
| MCAS-4140 | NA | NA | NA | 5689/SW | Inactive |
| MCAS-1254 | NA | NA | NA | 1722/W | Inactive |
| MCAS-131 | 200 | NA | NA | 1922/SW | Inactive |
| MCAS-203 | 173 | NA | NA | 941/W | Inactive |
| MCAS-106 | NA | NA | NA | 1504/NW | Inactive |

Notes:

NA - Information not available

**TABLE 2-11**

**SUMMARY OF POTABLE WATER SUPPLY WELLS WITHIN A ONE-MILE RADIUS OF SITE 84 PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314 MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Supply Well Number | Well Depth (ft) | Screened Interval (ft) | Well Dia. (in) | Approx. Dist. (ft) and Dir. | Well Status |
|---|---|---|---|---|---|
| HP-704 | 124 | 84 - 114 | 10 | 927/SE | Active |
| LCH-4006 | 140 | 90 -114<br>116 - 134 | 8 | 3598/SE | Inactive |
| HP-703 | NA | NA | NA | 2268/SE | Active |
| HP-616 | 170 | 95 - 115<br>130 - 140<br>160 - 170 | 8 | 3705/SE | Active |
| HP-645 | 245 | 90 - 100<br>138 - 148<br>230 - 240 | 10 | 3281/SE | Inactive |
| HP-644 | 255 | 85 - 100<br>235 - 250 | 10 | 3801/SW | Active |
| HP-643 | 250 | 90 - 100<br>138 - 148<br>230 - 240 | 10 | 4355/SW | Active |
| HP-698 | 124 | 84 - 124 | 10 | 5176/SW | Active |
| TT-54 | 104 | NA | NA | 4550/NW | Inactive |
| TT-31 | 94 | NA | NA | 5235/NW | Inactive |
| TT-67 | 98 | NA | NA | 5193/NW | Inactive |
| TT-23 | 263 | NA | NA | 4693/NW | Inactive |
| X-24 | NA | NA | NA | 5176/NW | Inactive |
| TT-26 | 100 | NA | NA | 5117/NW | Inactive |
| TT-25 | 200 | 70 - 95<br>155 - 170 | 8 | 4931/NW | Inactive |

Notes:

NA - Information not available

**TABLE 2-12**

**SUMMARY OF POTABLE WATER SUPPLY WELLS WITHIN A ONE-MILE RADIUS OF SITE 85 PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314 MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Supply Well Number | Well Depth (ft) | Screened Interval (ft) | Well Dia. (in) | Approx. Dist. (ft) and Dir. | Status of Well |
|---|---|---|---|---|---|
| T-14 | 200 | NA | NA | 3202/N | Inactive |
| Z-5 | 246 | NA | NA | 3576/NE | Inactive |
| M-628 | 67 | 43 - 67 | 8 | 3912./NE | Inactive |
| M-142 | 69 | NA | 8 | 1364/SE | Inactive |
| T-12 | 352 | NA | NA | 3934/SW | Inactive |
| M-267 | 150 | 50 - 70<br>125 - 145 | 8 | 1592/SW | Inactive |
| M-243 | 95 | 60 - 65<br>75 - 90 | 8 | 1103/SW | Inactive |
| M-629 | 70 | NA | NA | 789/SW | Inactive |
| M-630 | 80 | NA | NA | 975/NW | Inactive |
| M-197 | 200 | 54 - 64<br>76 - 92<br>124 - 129<br>136 - 145 | 8 | 1272/NE | Inactive |
| M-161 | 250 | NA | NA | 1686/NE | Inactive |
| M-168 | 151 | 46 - 61<br>76 - 86<br>137 - 142 | 8 | 2326/NE | Inactive |

Notes:

NA - Information not available

**TABLE 2-13**

**SUMMARY OF FLUID LEVEL MEASUREMENTS - JANUARY 31, 1996**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Monitoring Well Number | Top of Casing Elevation (Ft. above msl)[1] | Depth to Groundwater (ft. Below top of casing) | Groundwater Elevation (Ft. above msl)[1] |
|---|---|---|---|
| 87-GW01 | 20.55 | 12.96 | 7.59 |
| 87-GW02 | 12.31 | 9.99 | 2.32 |

Notes:

[1] Mean sea level

# FIGURES

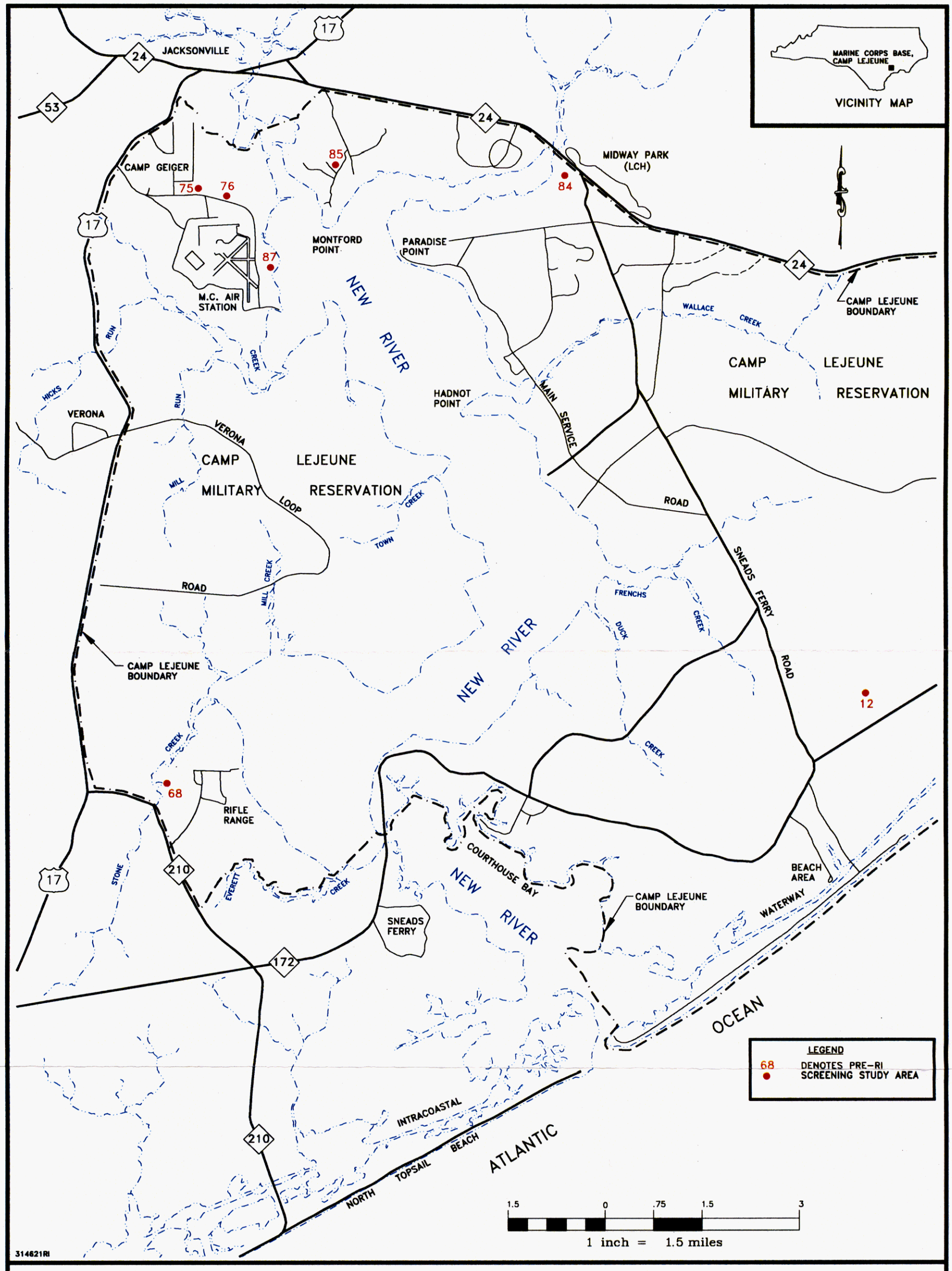
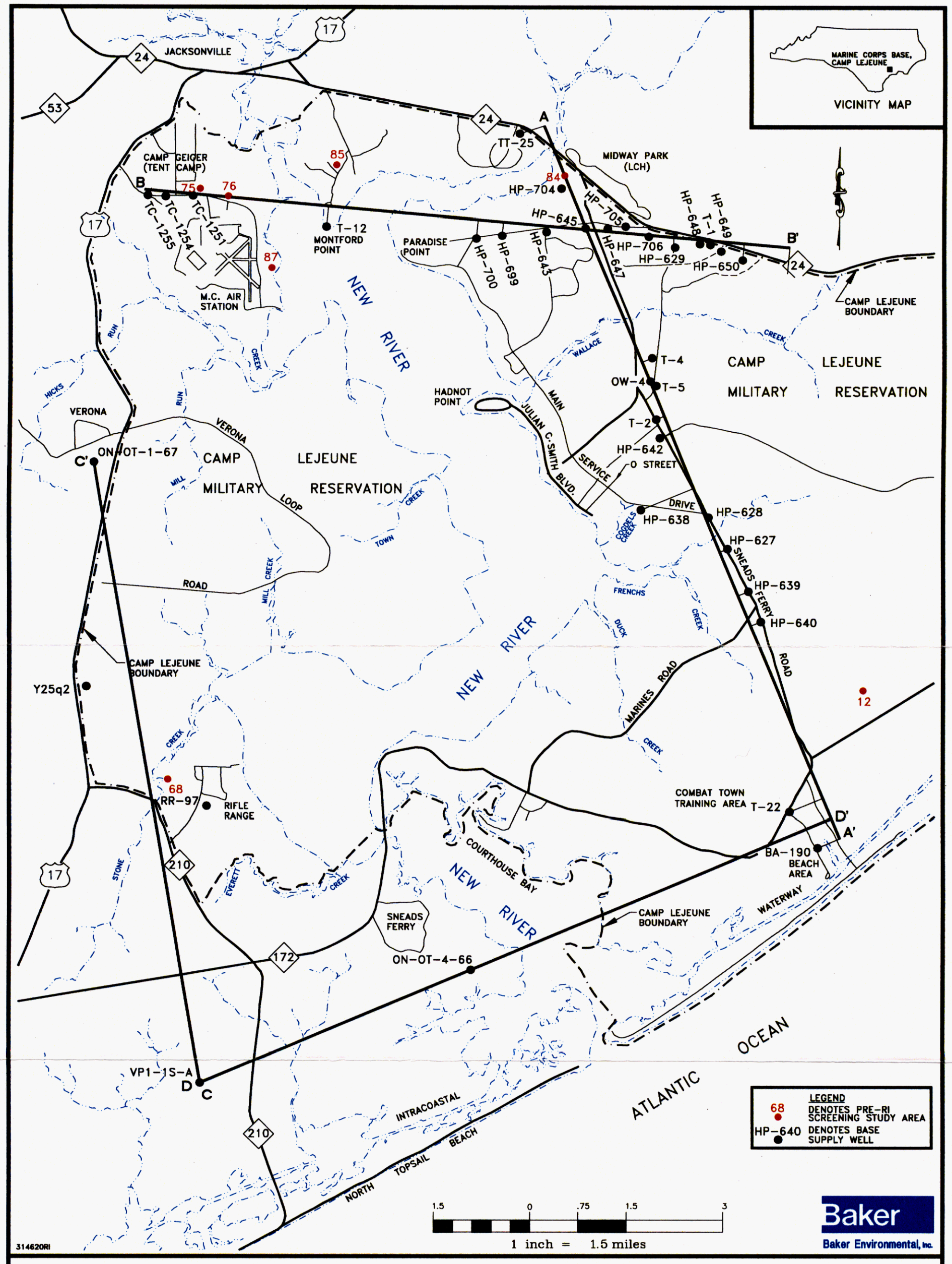



FIGURE 2-1
LOCATION OF INVESTIGATIVE AREAS
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

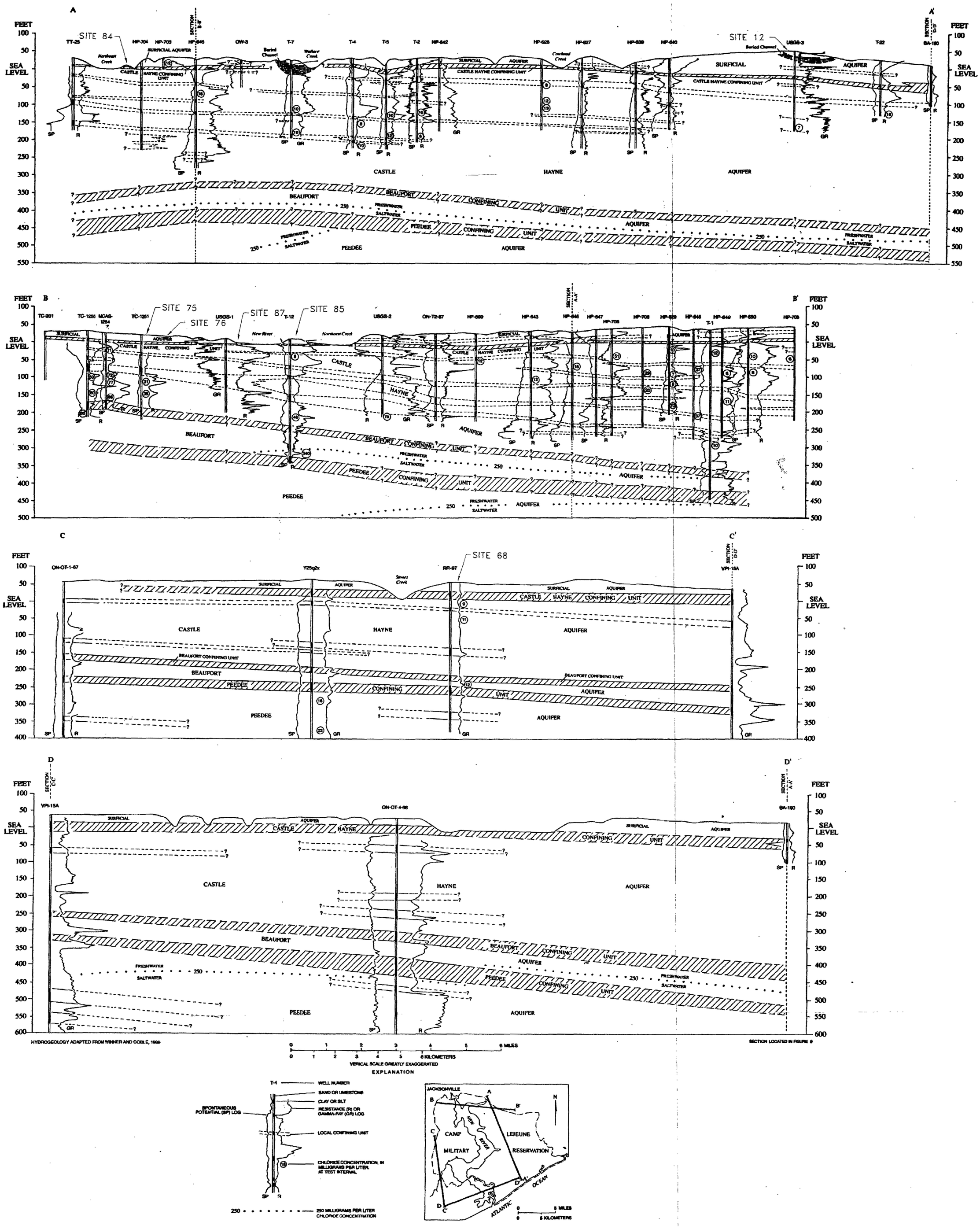
2635AB2V




SOURCE: DEPT. OF INTERIOR, WATER-RESOURCES INVESTIGATIONS REPORT, 89-4096, PLATE 4

FIGURE 2-2
LOCATIONS OF HYDROGEOLOGIC CROSS-SECTIONS
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

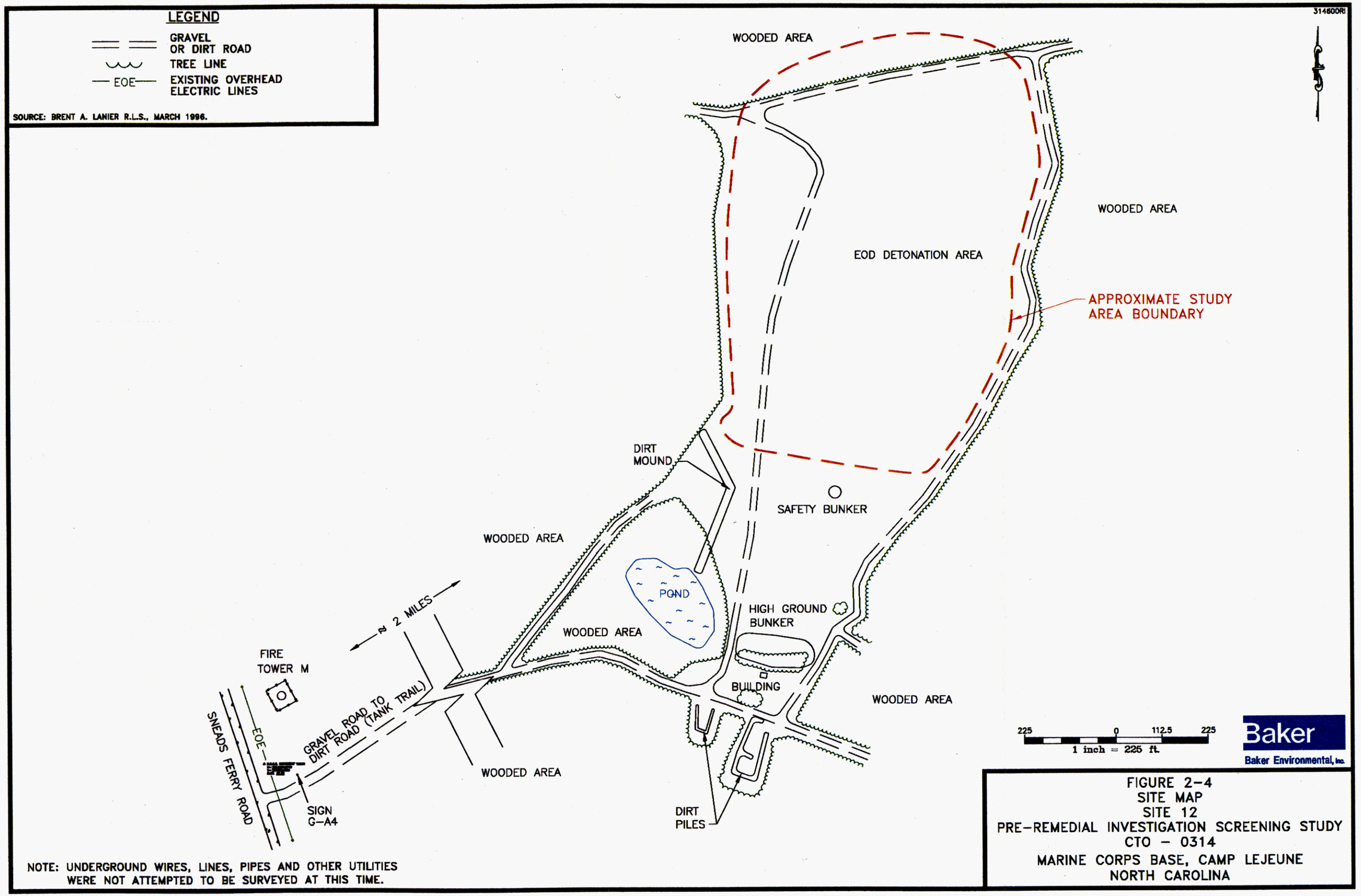



# HYDROGEOLOGIC SECTIONS A-A', B-B', C-C', AND D-D' AT CAMP LEJEUNE, NORTH CAROLINA

By
Alex P. Cardinell, Steven A. Berg, and Orville B. Lloyd, Jr.
1993

Cardinell, A.P., Berg, S.A., and Lloyd, O.B., Jr. 1993, Hydrogeologic framework of U.S. Marine Corps Base at Camp Lejeune, North Carolina: U.S. Geological Survey Water-Resources Investigations Report 93-4049

| REVISIONS | DRAWN WJH<br>REVIEWED JPT<br>S.O.# 62470-314-0000-07000<br>CADD# 314800RI | CTO - 0314<br>MARINE CORPS BASE, CAMP LEJEUNE<br>NORTH CAROLINA<br>BAKER ENVIRONMENTAL, Inc.<br>Coraopolis, Pennsylvania | Baker<br>Baker Environmental, Inc. | HYDROGEOLOGIC CROSS-SECTION<br>SCALE AS SHOWN<br>DATE JUNE 1998 | FIGURE NO.<br>2-3 |
|---|---|---|---|---|---|




NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.

FIGURE 2-4
SITE MAP
SITE 12
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

02635AB4Y

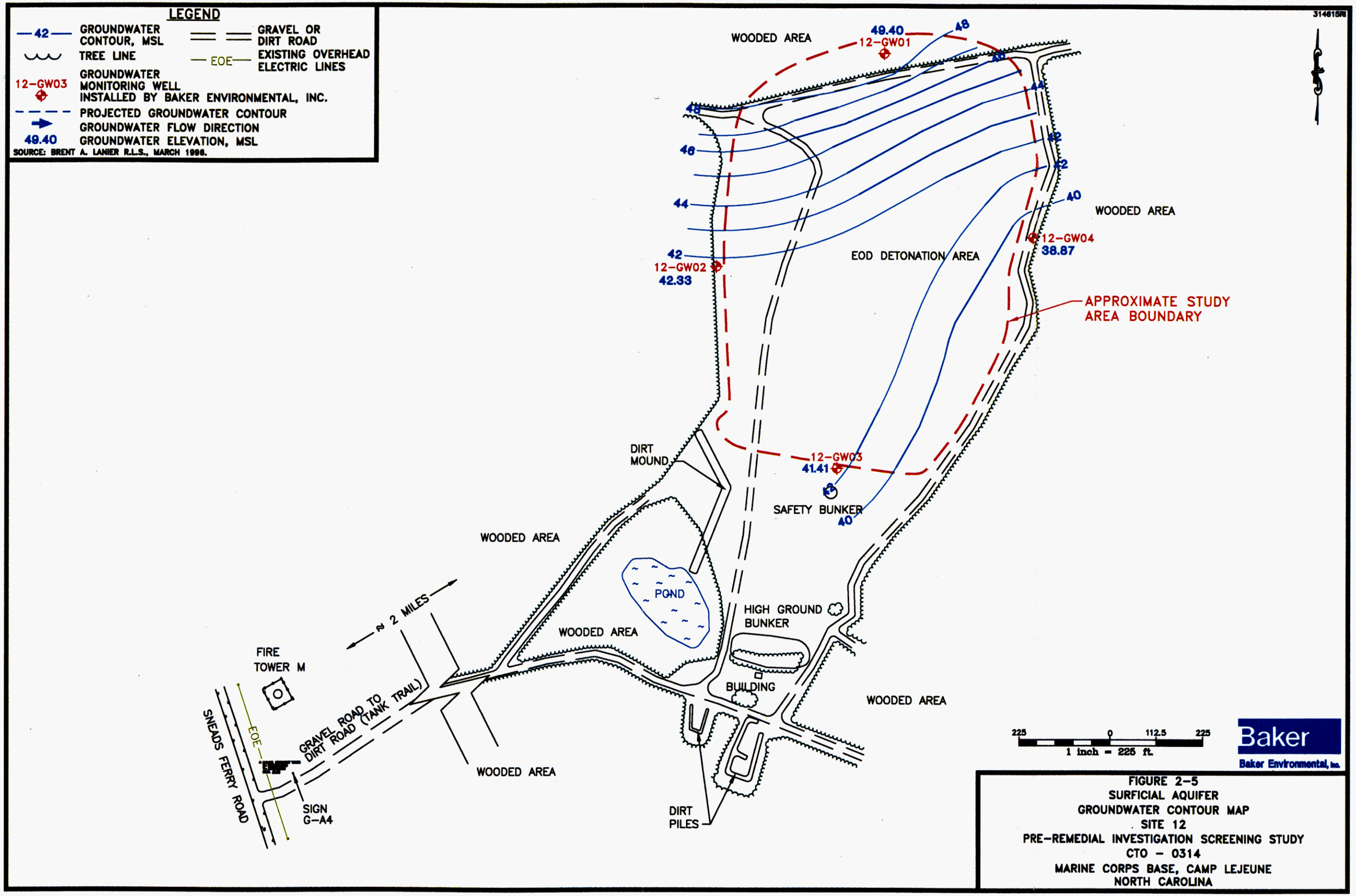
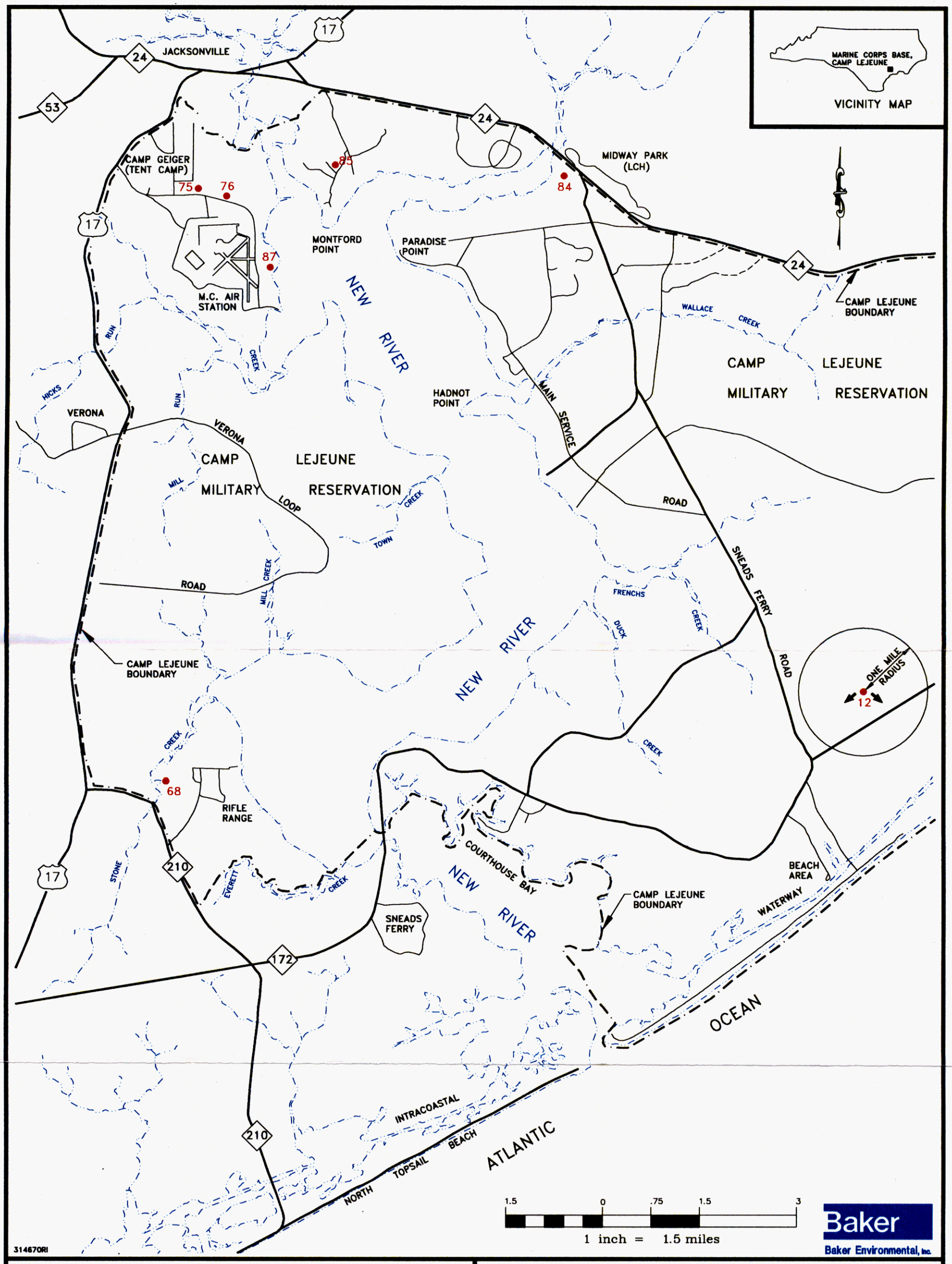



FIGURE 2-5
SURFICIAL AQUIFER
GROUNDWATER CONTOUR MAP
SITE 12
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA




LEGEND

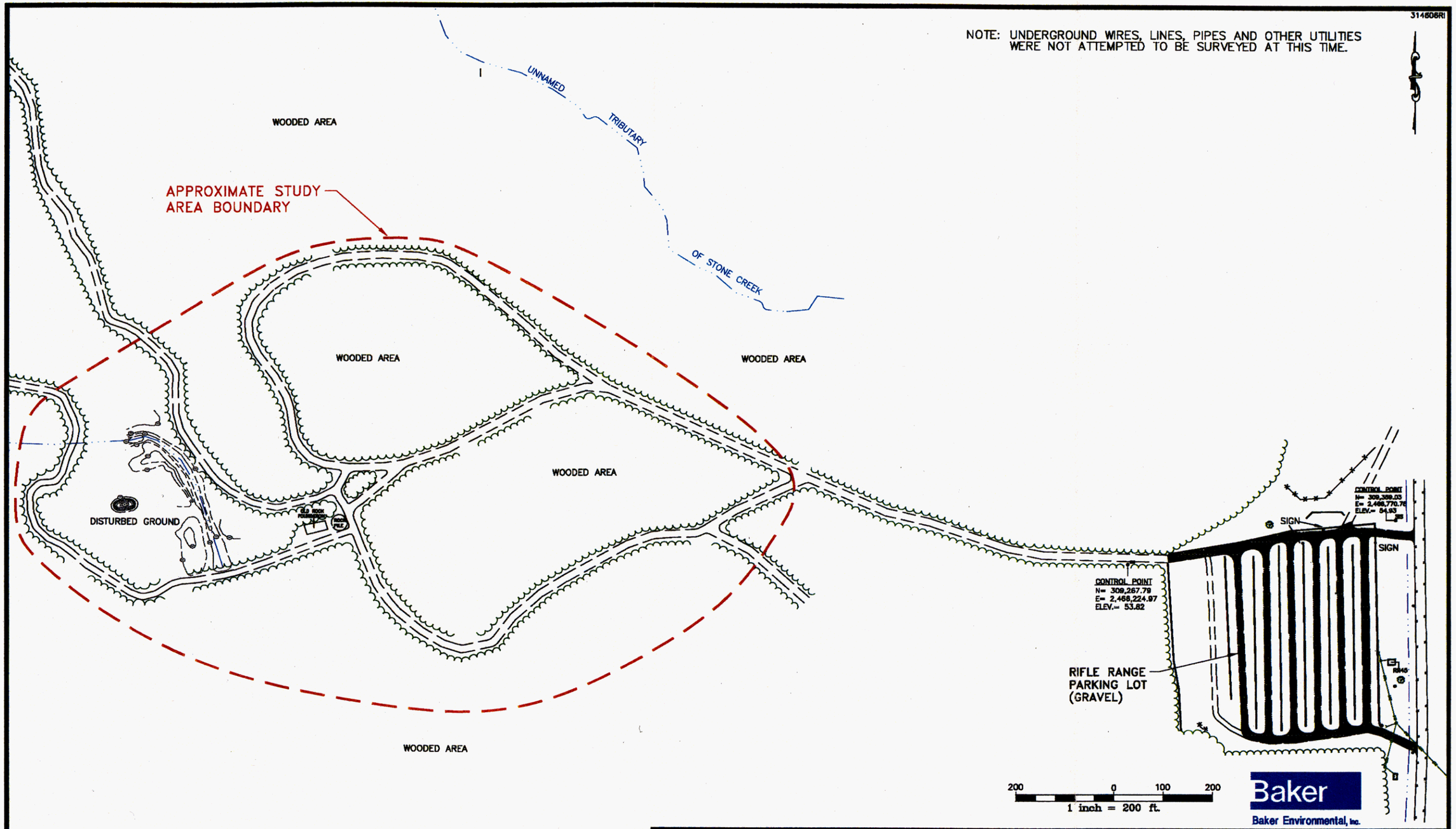
12 ● DENOTES SITE 12

← SHALLOW GROUNDWATER FLOW DIRECTION

FIGURE 2-6
POTABLE WATER SUPPLY WELLS
WITHIN A ONE-MILE RADIUS OF SITE 12
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314606RI

NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.



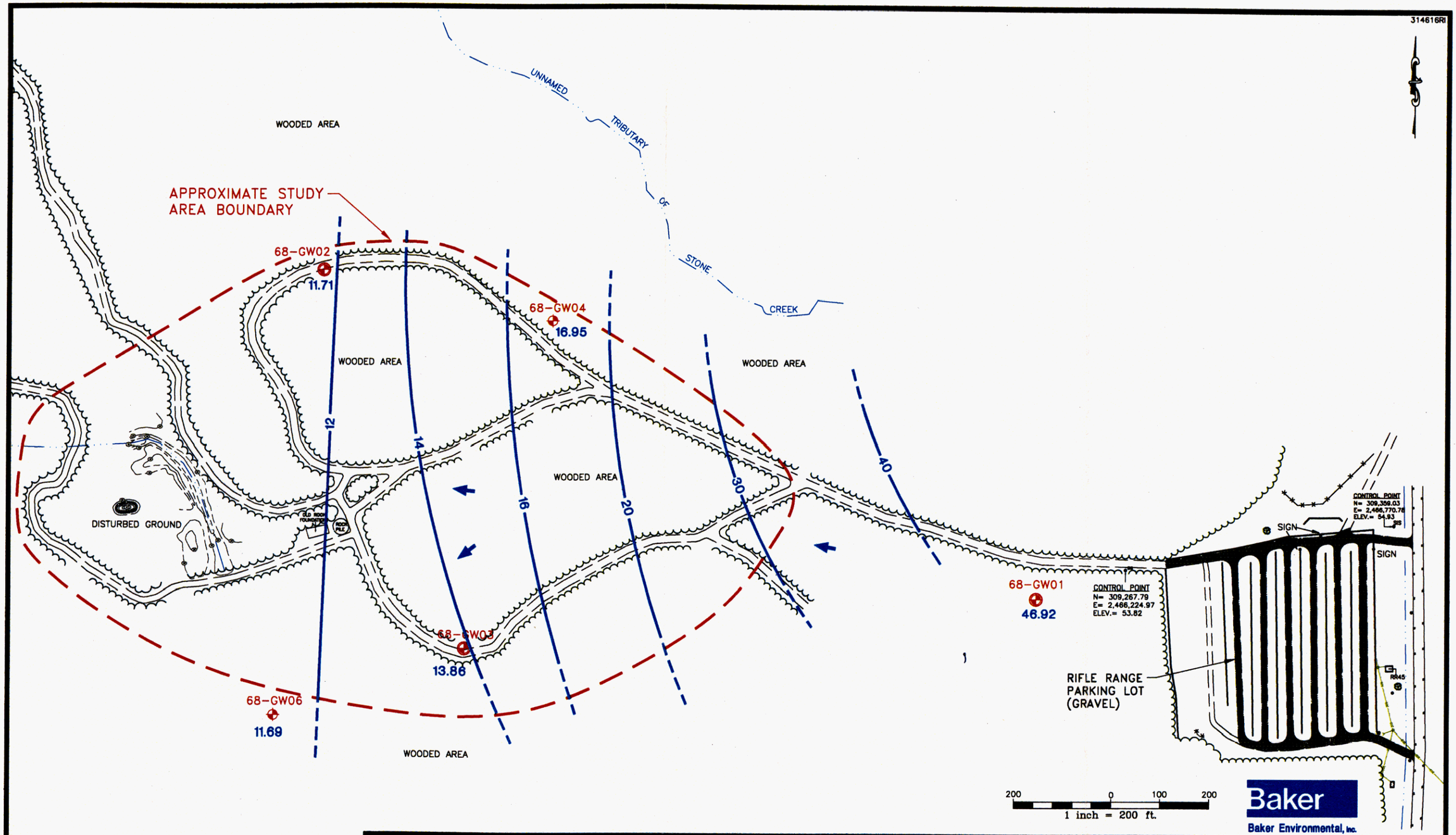

LEGEND

- TREE LINE
- INTERMITTENT STREAM
- DIRT OR GRAVEL ROAD

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 2-7
SITE MAP
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314616RI



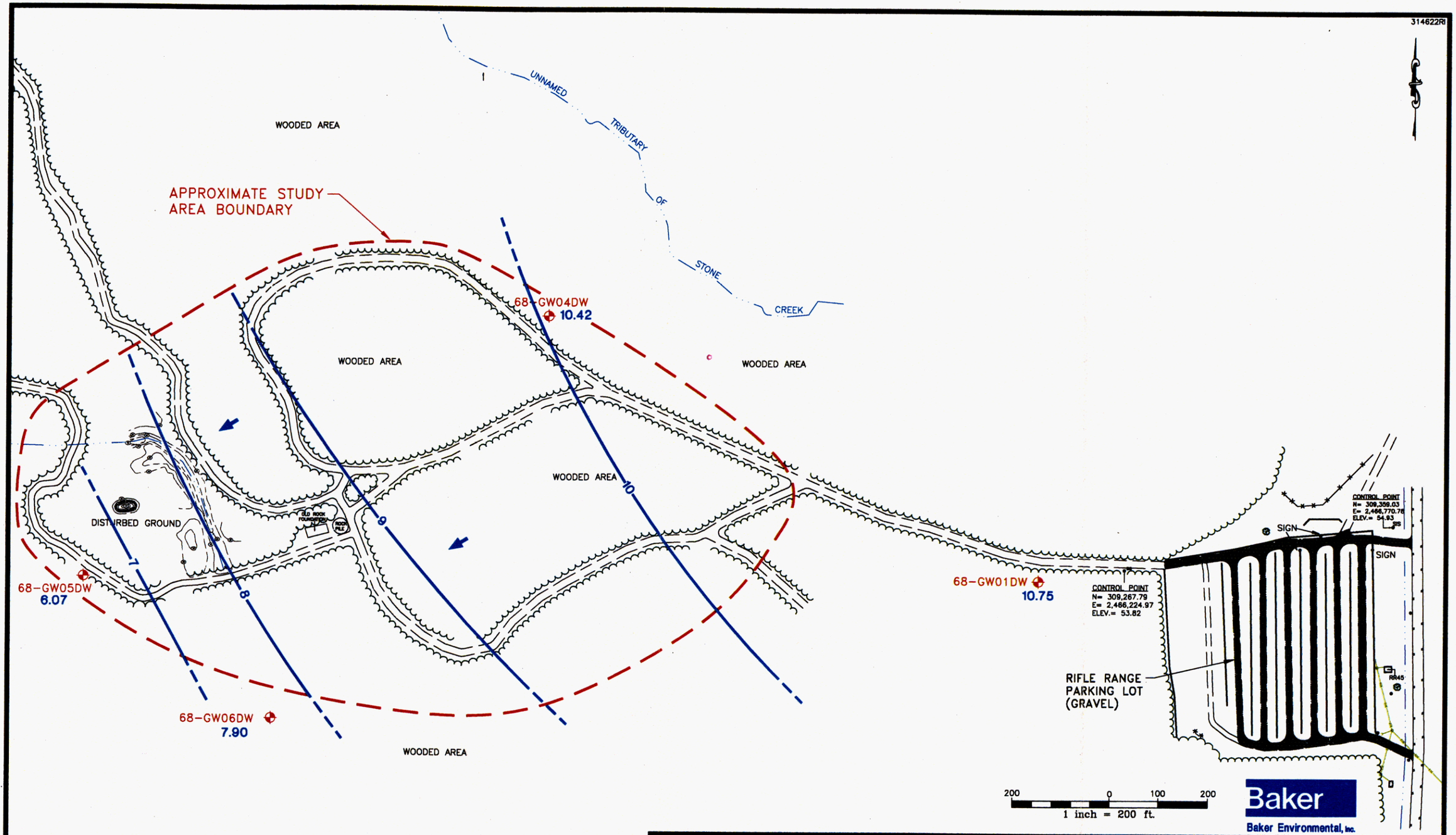

## LEGEND

- 68-GW01 – EXISTING MONITORING WELL LOCATION
- 68-GW04 – MONITORING WELL LOCATION INSTALLED BY BAKER ENVIRONMENTAL, INC.
- 12 – GROUNDWATER ELEVATION, MSL
- -14- – GROUNDWATER CONTOUR, MSL
- PROJECTED GROUNDWATER CONTOUR
- GROUNDWATER FLOW DIRECTION
- TREE LINE
- INTERMITTENT STREAM
- DIRT OR GRAVEL ROAD

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 2-8
SURFICIAL AQUIFER
GROUNDWATER CONTOUR MAP
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314622RI




## LEGEND

68-GW01DW – MONITORING WELL LOCATION INSTALLED BY BAKER ENVIRONMENTAL, INC.

7.90 – GROUNDWATER ELEVATION, MSL

-7- – GROUNDWATER CONTOUR, MSL

– PROJECTED GROUNDWATER CONTOUR

– GROUNDWATER FLOW DIRECTION

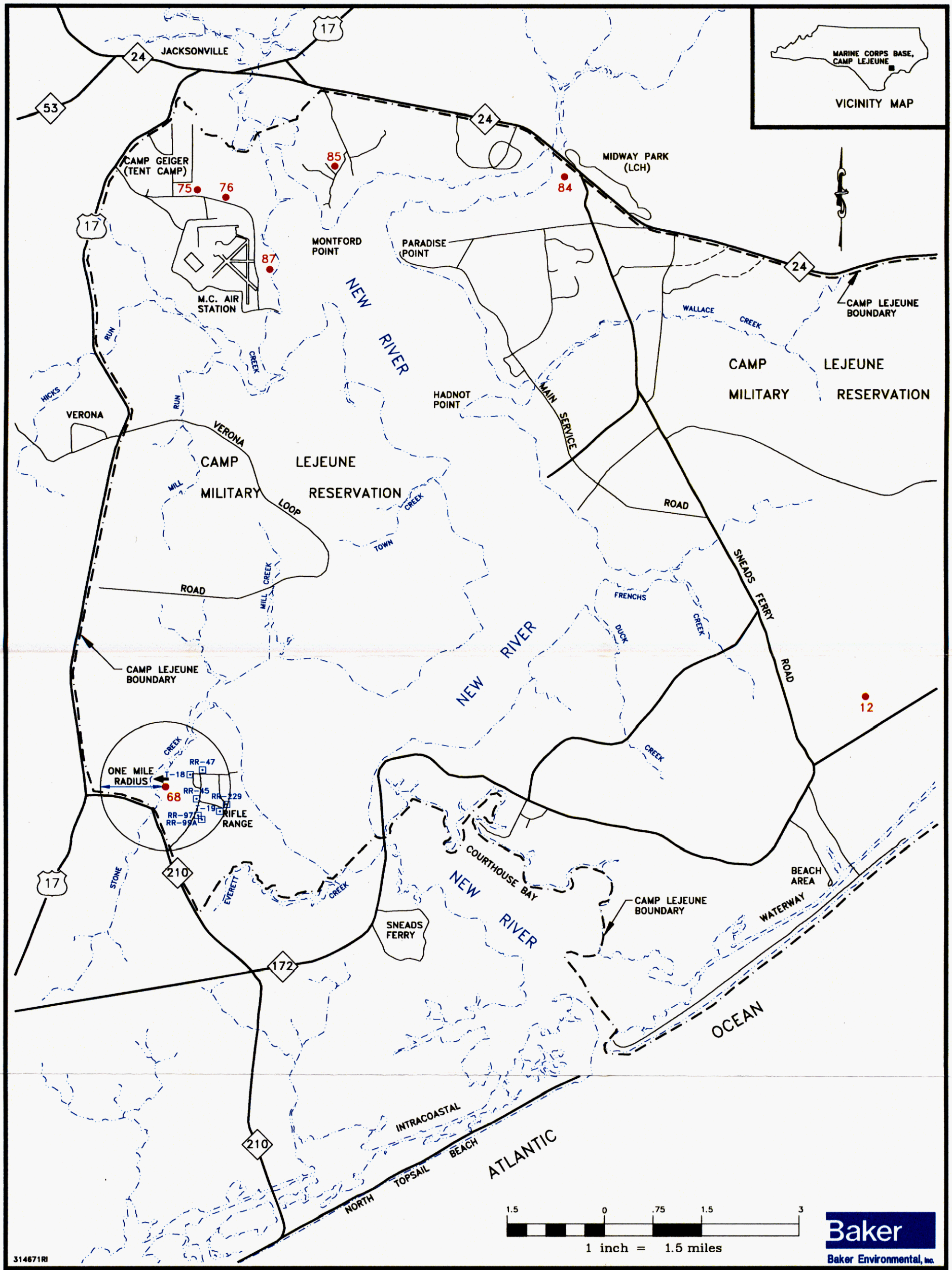
– TREE LINE

– INTERMITTENT STREAM

– DIRT OR GRAVEL ROAD

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 2-9
CASTLE HAYNE AQUIFER
GROUNDWATER CONTOUR MAP
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

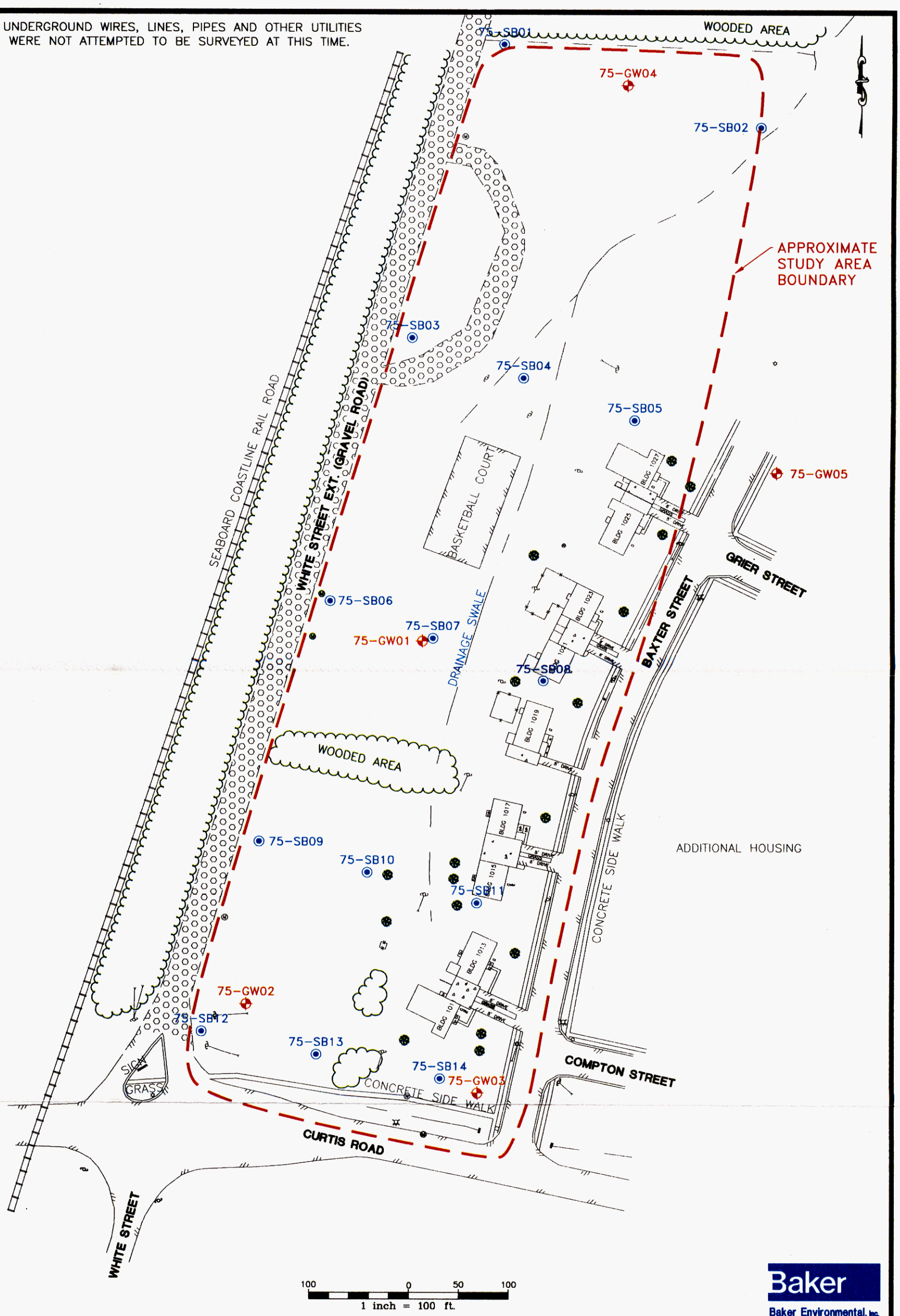



## LEGEND

- 68 ● DENOTES SITE 68
- T-18 ⊡ POTABLE WATER SUPPLY WELLS THAT ARE NO LONGER IN SERVICE
- ← SHALLOW GROUNDWATER FLOW DIRECTION

FIGURE 2-10
POTABLE WATER SUPPLY WELLS
WITHIN A ONE-MILE RADIUS OF SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.




## LEGEND

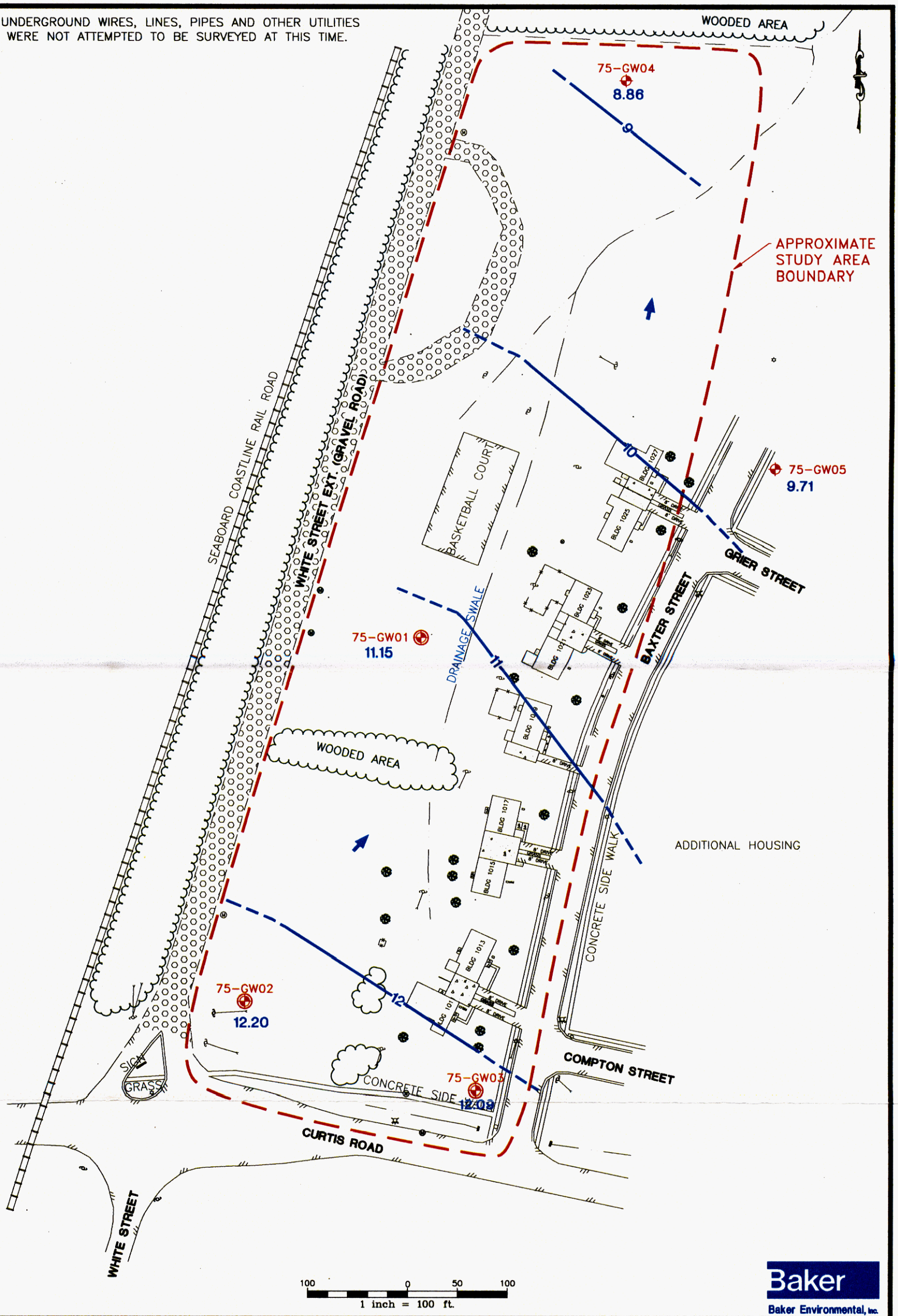
- TREE LINE
- INTERMITTENT DRAINAGE SWALE
- TREE
- MONITORING WELL LOCATION
- SOIL BORING LOCATION

SOURCE: BRENT A. LANIER R.L.S., MARCH 1995.

FIGURE 2-11
SITE MAP
SITE 75
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.




314619RI

Baker
Baker Environmental, Inc.

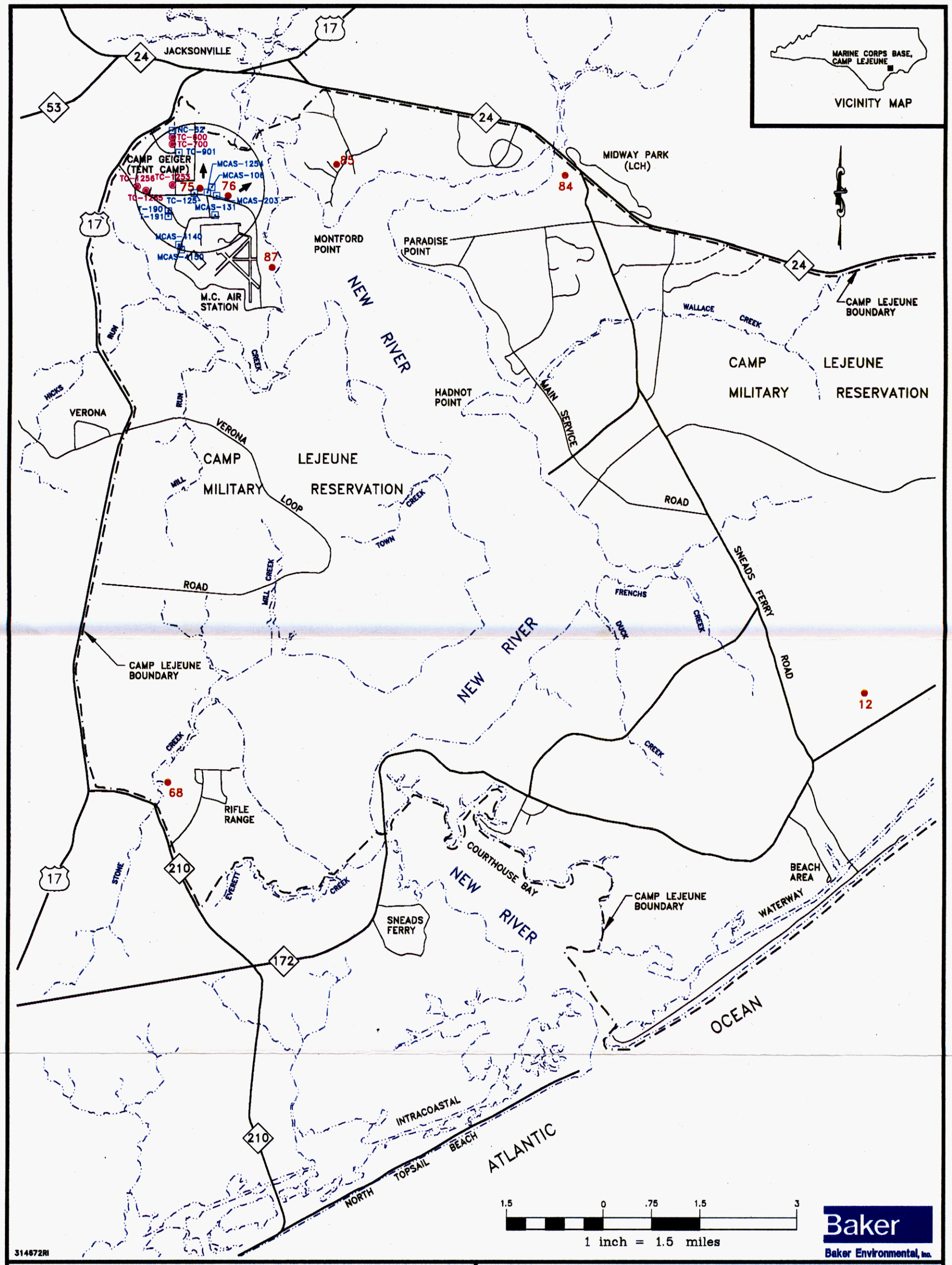
## LEGEND

- 75-GW02 – EXISTING MONITORING WELL LOCATION
- 75-GW04 – NEW MONITORING WELL LOCATION INSTALLED BY BAKER ENVIRONMENTAL, INC.
- 11.15 – GROUNDWATER ELEVATION, MSL
- 11 – GROUNDWATER CONTOUR, MSL
- PROJECTED GROUNDWATER CONTOUR
- GROUNDWATER FLOW DIRECTION
- TREE LINE
- TREE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1995.

FIGURE 2-12
SURFICIAL AQUIFER GROUNDWATER CONTOUR MAP
SITE 75
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

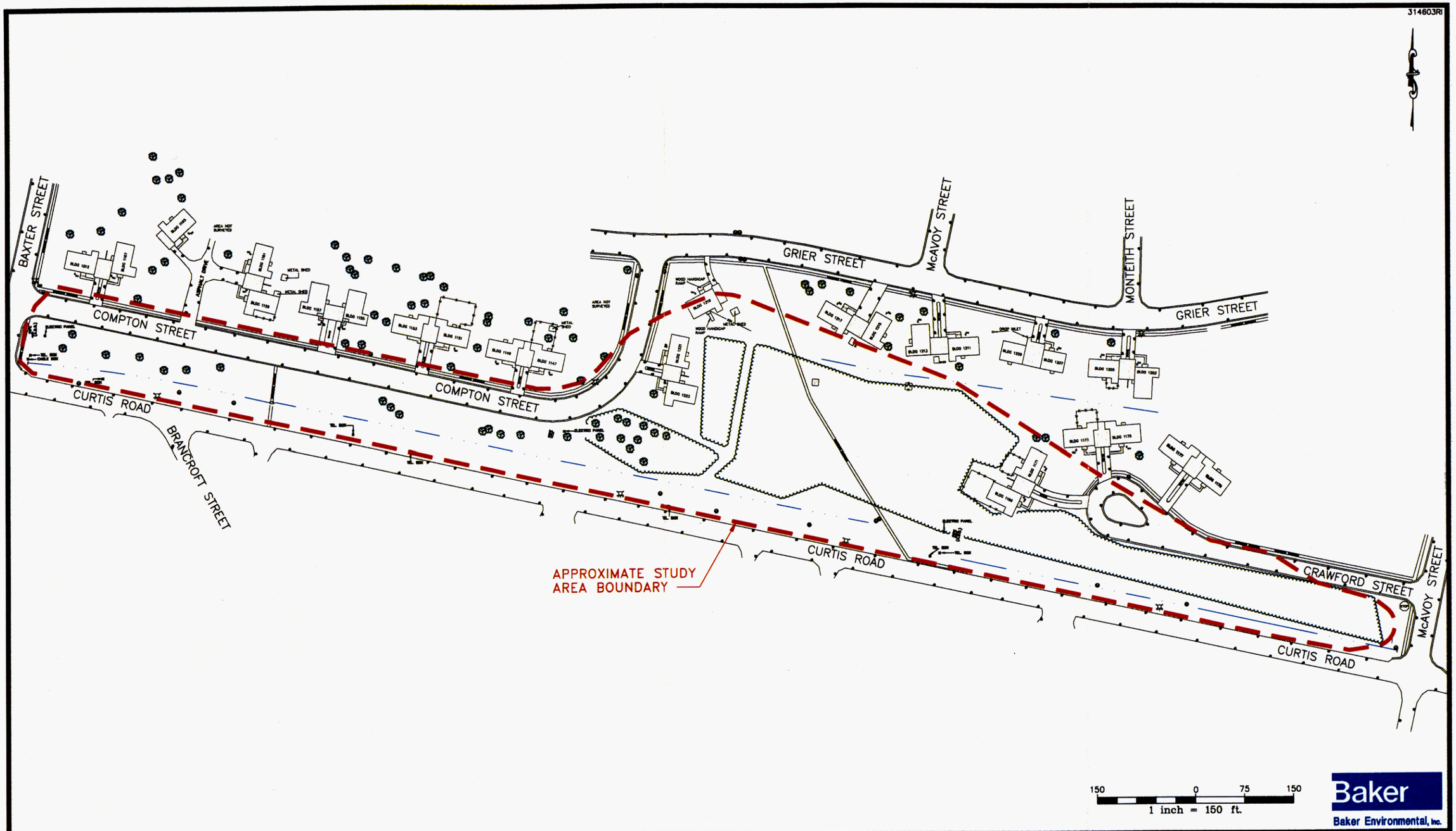



## LEGEND

- 75 — DENOTES SITE 75
- T-125 — POTABLE WATER SUPPLY WELLS THAT ARE NO LONGER IN SERVICE
- TC-1256 — POTABLE WATER SUPPLY WELLS THAT ARE CURRENTLY IN SERVICE
- SHALLOW GROUNDWATER FLOW DIRECTION

FIGURE 2-13
POTABLE WATER SUPPLY WELLS
WITHIN A ONE-MILE RADIUS OF SITE 75
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314603RI




Baker
Baker Environmental, Inc.

NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.

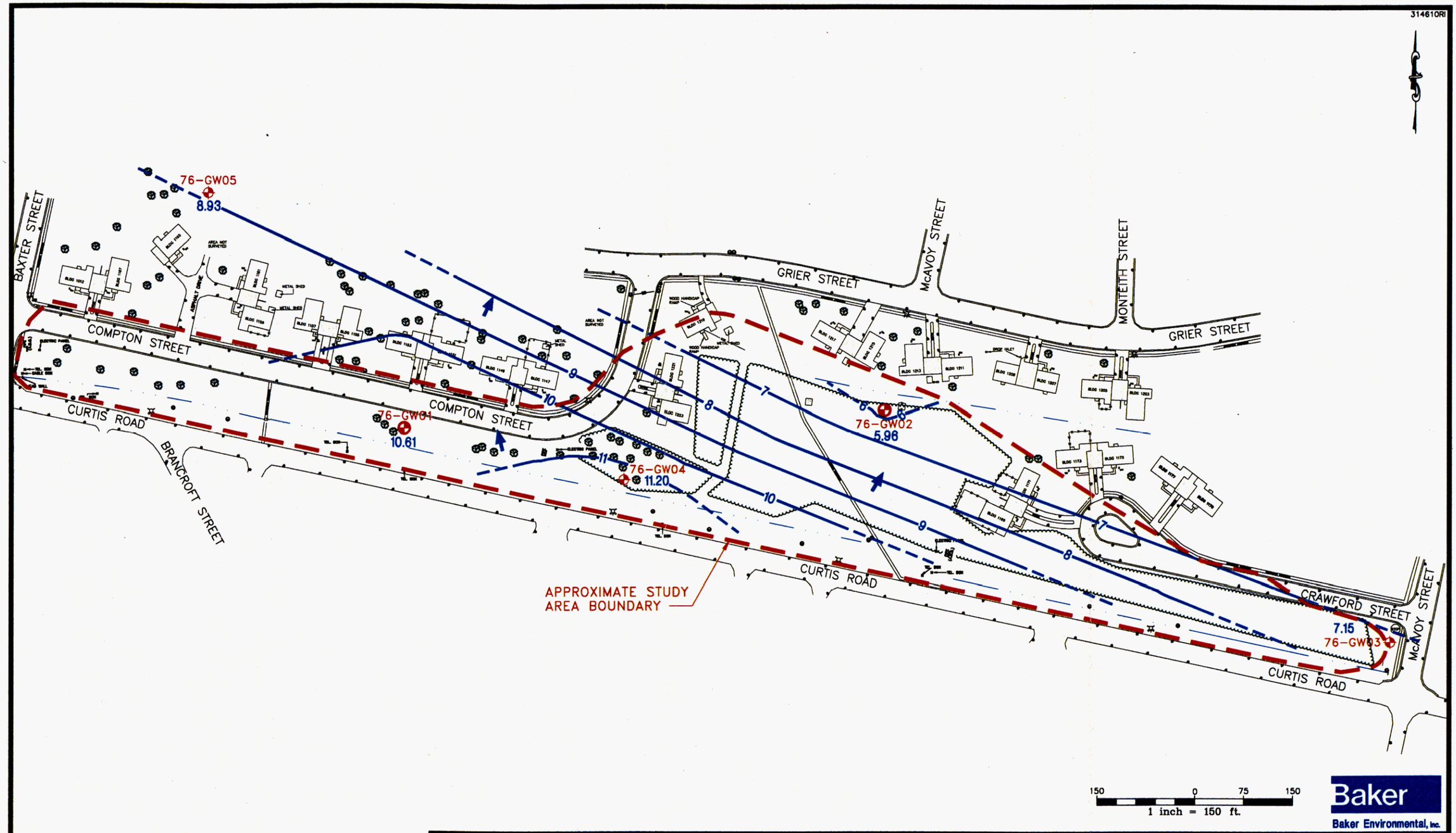
LEGEND

- INTERMITTENT DRAINAGE SWALE
- TREE LINE
- TREE
- MANHOLE
- APPROXIMATE STUDY AREA BOUNDARY

SOURCE: BRENT A. LANIER R.L.S., MARCH 1996.

FIGURE 2-14
SITE MAP
SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

314610RI

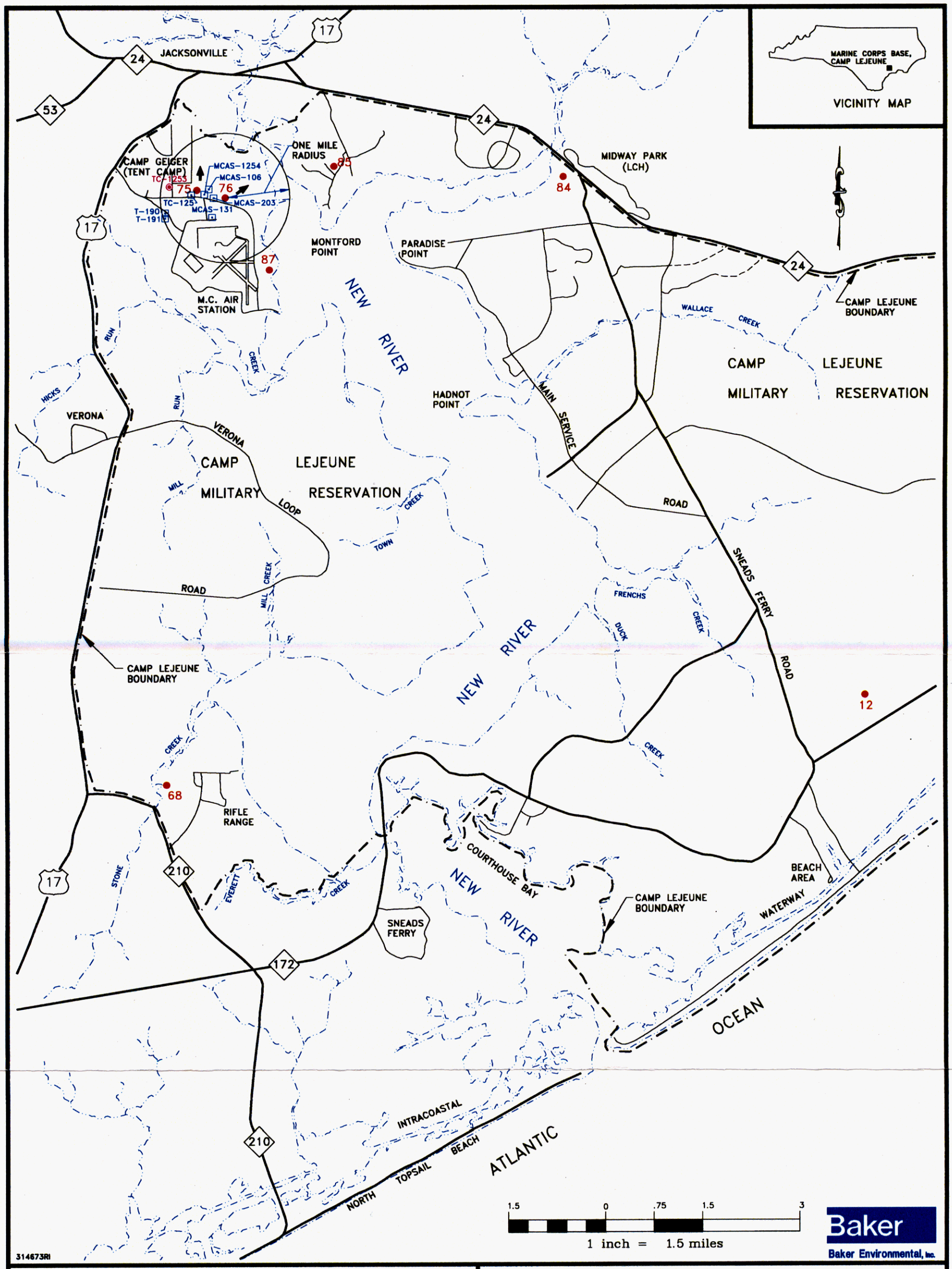



LEGEND

- INTERMITTENT DRAINAGE SWALE
- TREE LINE
- 76-GW01 – EXISTING MONITORING WELL LOCATION
- 76-GW05 – MONITORING WELL LOCATION INSTALLED BY BAKER ENVIRONMENTAL, INC.
- TREE
- 11.20 – GROUNDWATER ELEVATION, MSL
- -11- – GROUNDWATER CONTOUR, MSL
- PROJECTED GROUNDWATER CONTOUR
- GROUNDWATER FLOW DIRECTION

SOURCE: BRENT A. LANIER R.L.S., MARCH 1996.

FIGURE 2-15
SURFICIAL AQUIFER
GROUNDWATER CONTOUR MAP
SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA




## LEGEND

- 76 ● DENOTES SITE 76
- MCAS-1254 ⊡ POTABLE WATER SUPPLY WELLS THAT ARE NO LONGER IN SERVICE
- TC-1253 ◉ POTABLE WATER SUPPLY WELLS THAT ARE CURRENTLY IN SERVICE
- ← SHALLOW GROUNDWATER FLOW DIRECTION

FIGURE 2-16
POTABLE WATER SUPPLY WELLS
WITHIN A ONE-MILE RADIUS OF SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314604R1

NORTHEAST CREEK

EDGE OF BANK

LAGOON

HOLE

HOLE

HOLE

HOLE

HOLE

HOLE

DROP INLET

NC HWY 24

RAILROAD

FORMER AST S781

S779

S791

S792

S938

S937

BLDG. 45

TELEPHONE BOXES

CP&L SUBSTATION

ES

100 0 50 100

1 inch = 100 ft.

Baker

Baker Environmental, Inc.

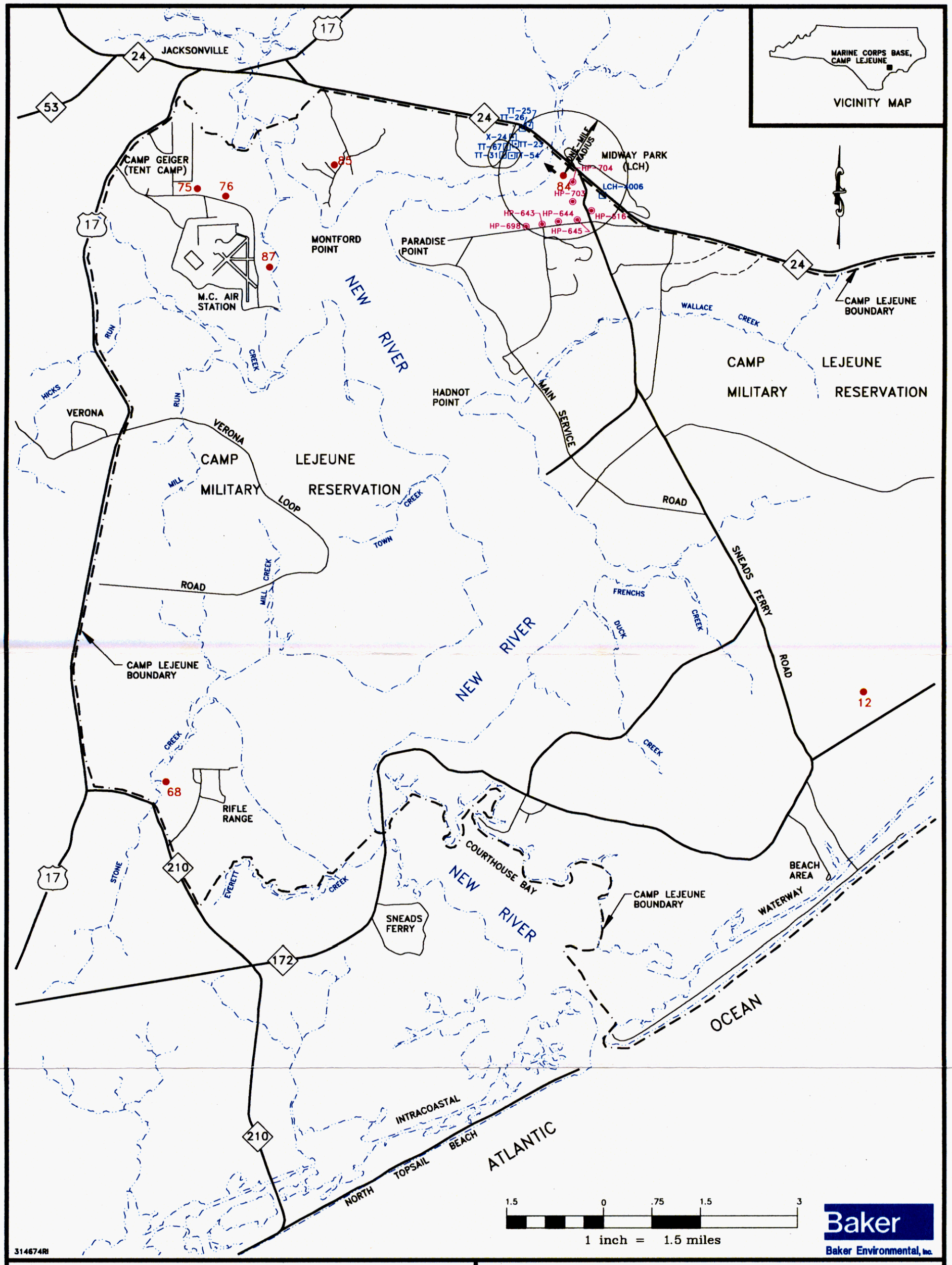
NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.

**LEGEND**

- INTERMITTENT DRAINAGE SWELL
- TREE LINE
- GRAVEL ROAD

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 2-17
SITE MAP
SITE 84
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

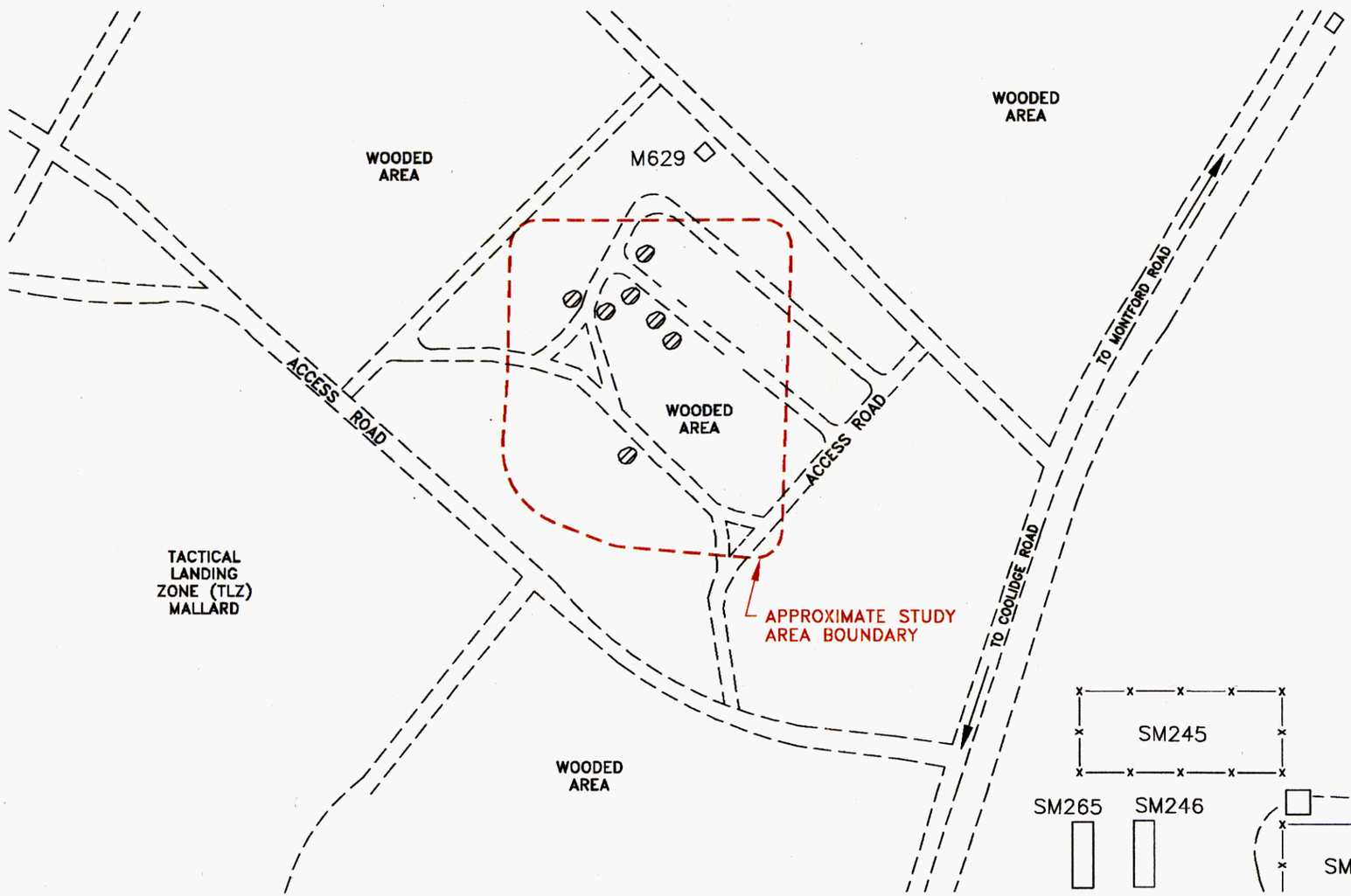



## LEGEND

- 84 ● DENOTES SITE 84
- TT-25 ⊡ POTABLE WATER SUPPLY WELLS THAT ARE NO LONGER IN SERVICE
- HP-704 ◉ POTABLE WATER SUPPLY WELLS THAT ARE CURRENTLY IN SERVICE
- ← SHALLOW GROUNDWATER FLOW DIRECTION

FIGURE 2-18
POTABLE WATER SUPPLY WELLS
WITHIN A ONE-MILE RADIUS OF SITE 84
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314608RI




200 0 100 200
1 inch = 200 ft.

Baker
Baker Environmental, Inc.

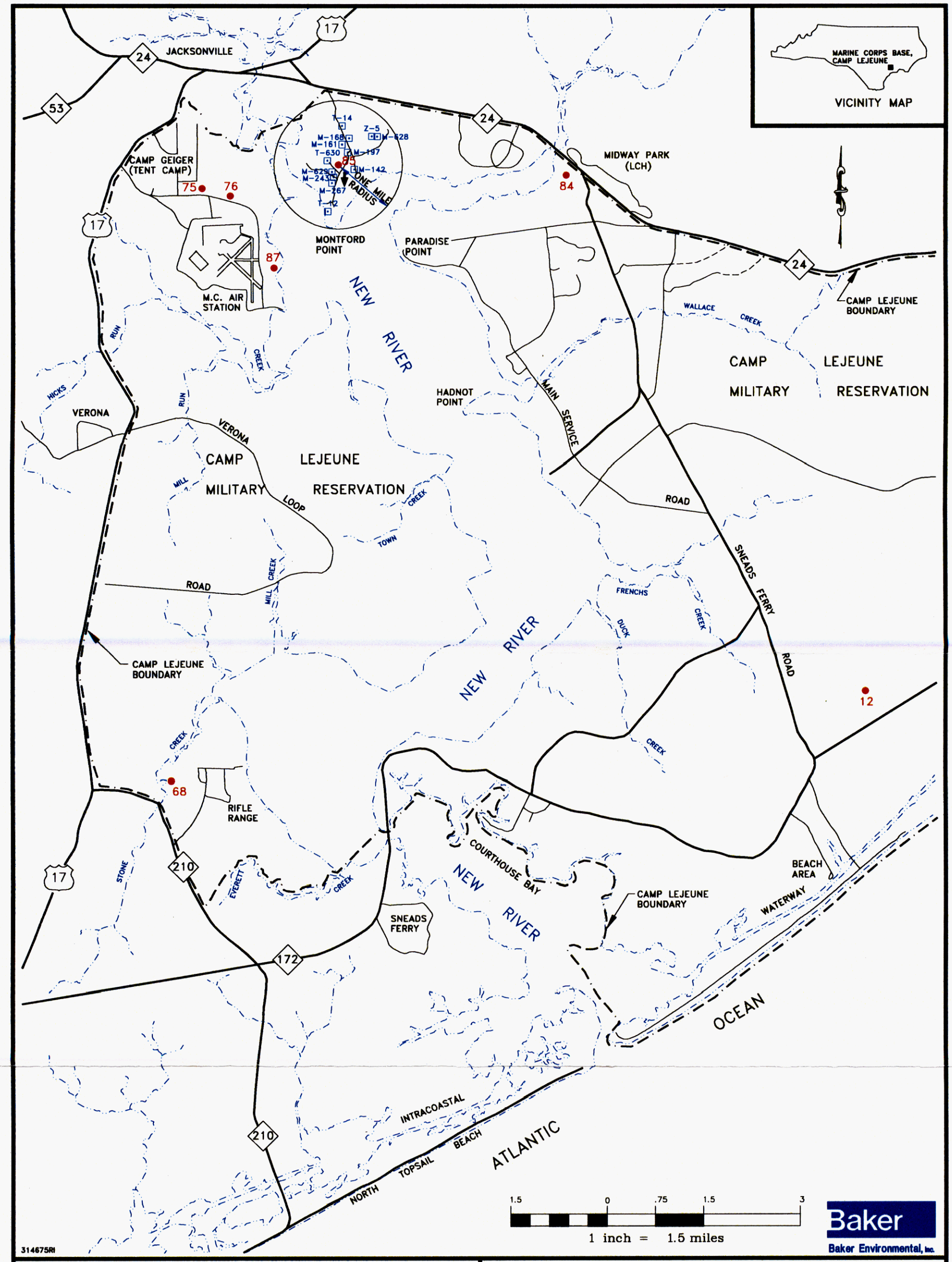
NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.

**LEGEND**

- BATTERY DISPOSAL AREA
- DIRT ACCESS ROAD
- FENCE LINE

SOURCE: LANTDIV, FEB. 1992

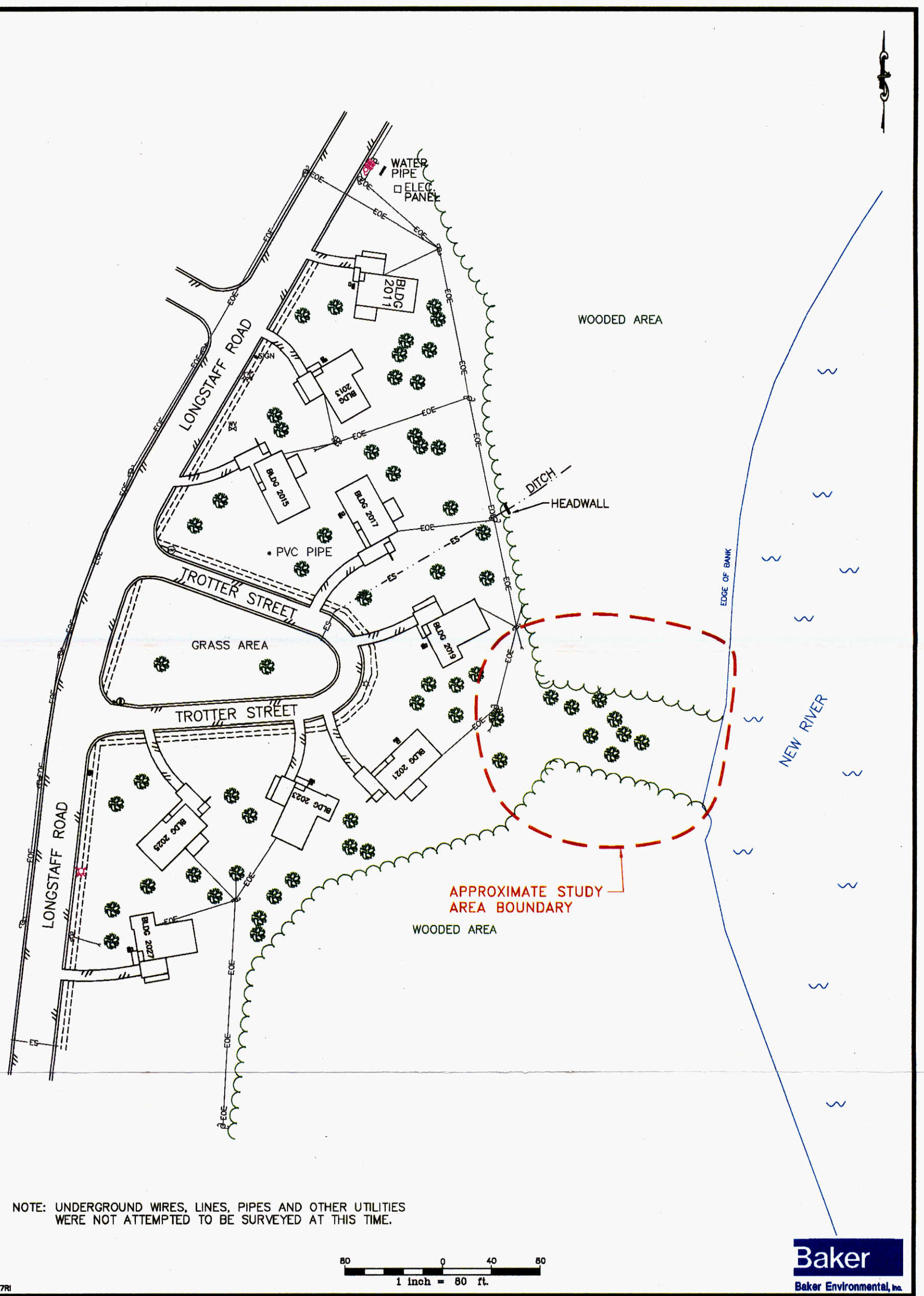
FIGURE 2-19
SITE MAP
SITE 85
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA




## LEGEND

- 85 ● DENOTES SITE 85
- T-14 ⊡ POTABLE WATER SUPPLY WELLS THAT ARE NO LONGER IN SERVICE
- ← SHALLOW GROUNDWATER FLOW DIRECTION

FIGURE 2-20
POTABLE WATER SUPPLY WELLS
WITHIN A ONE-MILE RADIUS OF SITE 85
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA




NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.

80 0 40 80
1 inch = 80 ft.

Baker
Baker Environmental, Inc.

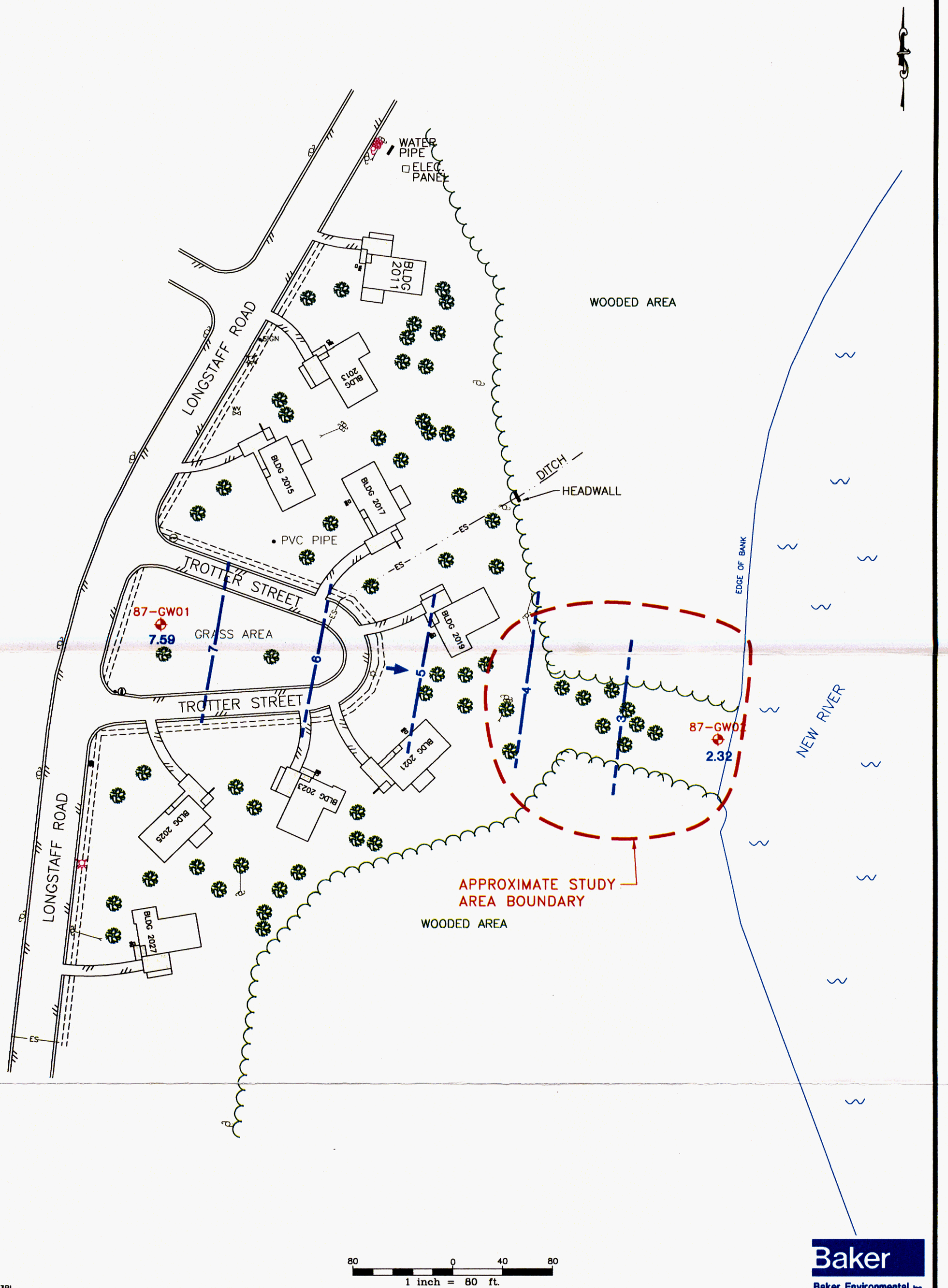
314607RI

LEGEND

- TREE LINE
- EXISTING OVERHEAD ELECTRIC LINES
- TREE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 2-21
SITE MAP
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA




## LEGEND

87-GW01 – EXISTING MONITORING WELL LOCATION

2.32 – GROUNDWATER ELEVATION, MSL

-4- – GROUNDWATER CONTOUR, MSL

– – PROJECTED GROUNDWATER CONTOUR

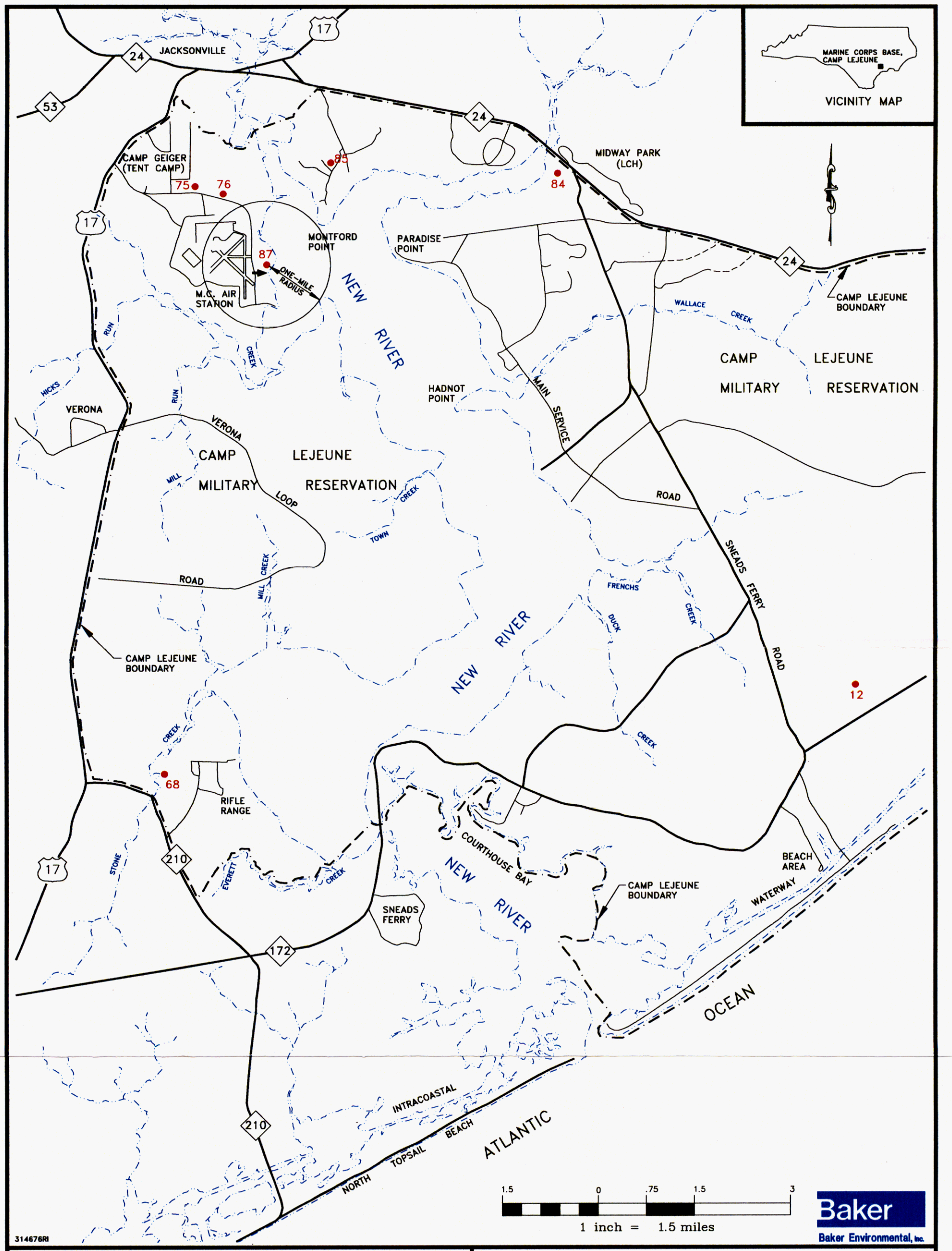
– GROUNDWATER FLOW DIRECTION

– TREE LINE

– TREE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 2-22
SURFICIAL AQUIFER
GROUNDWATER CONTOUR MAP
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA




LEGEND

87 ● DENOTES SITE 87

← SHALLOW GROUNDWATER FLOW DIRECTION

FIGURE 2-23
POTABLE WATER SUPPLY WELLS
WITHIN A ONE-MILE RADIUS OF SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

## 3.0 STUDY AREA INVESTIGATION

Section 3.0 provides a description of the field activities, sample analysis, and data validation associated with the Pre-RI Screening Study. General activities and standard operating procedures followed the guidelines and protocols set forth in the Project Plans completed under CTO 0193 dated January 1994. This section discusses general field activities and graphically depicts or tabulates appropriate investigative points.

### 3.1 Field Activities

The investigative activities completed for the Pre-RI screening study varied by site depending upon individual site histories and the potential contaminants. The following table illustrates which tasks were completed at each of the sites.

| Task | Site 12 | Site 68 | Site 75 | Site 76 | Site 84 | Site 85 | Site 87 |
|---|---|---|---|---|---|---|---|
| Geophysical Survey | | | ● | ● | | | |
| Surface Soil Sampling | ● | ● | ● | ● | ● | ● | ● |
| Drilling and Subsurface Soil Sampling | ● | ● | ● | ● | | ● | |
| Temporary Well Installation | | | | | | ● | ● |
| Monitoring Well Development | ● | ● | ● | ● | | | ● |
| Groundwater Sampling | ● | ● | ● | ● | ● | ● | ● |
| Surface Water and Sediment Sampling | | ● | | | ● | | ● |
| Exploratory Test Pits | | | | | | | ● |
| Land Survey | ● | ● | ● | ● | ● | ● | ● |
| Investigative Derived Waste Management | ● | ● | ● | ● | ● | ● | ● |
| **Additional Sampling Based on results of Draft Pre-RI Screening Study** | | | | | | | |
| Groundwater Sampling (Target Analyte List [TAL] Metals only) | | ● | | ● | | | |
| Surface Soil Sampling (PCBs only) | | | | | ● | | |
| Surface Water Sampling (PCBs only) | | | | | ● | | |
| Sediment Sampling (PCBs only) | | | | | ● | | |
| Groundwater Sampling for Volatile Organic Compounds from MWS near Former AST at Building 84 | | | | | ● | | |

As requested by LANTDIV, the field activities for the Pre-RI Screening Study were completed during different time periods due to the need for data at several of the sites for the Relative Risk Ranking System (RRRS). The RRRS, developed by the Department of Defense (DoD), categorizes sites into High, Medium, and Low relative risk groups. Data was required at Sites 84, 85, and 87 for the RRRS before the scheduled start-up date for the overall field program under this CTO. Therefore, a portion of the field activities for the Pre-RI Screening Study was completed during August and October of 1995. The majority of the field work for this investigation was completed in January and February of 1996. A final sampling effort was performed at Sites 68, 76, and 84 in March of 1998. This sampling was recommended based upon the results of the Draft Pre-RI Screening Study. As shown on the table above, the field effort included groundwater sampling at Sites 68, and 76. Additionally, surface soil samples, surface water samples, and sediment samples were collected at Site 84. It is important to note that the various episodes of field work for the sites including the data requirements for the RRRS did not adversely impact the objectives for the Pre-RI Screening Study. During each field task, applicable parts of the project plans were executed in the manner in which they were outlined, thereby completing the project objectives.

### 3.1.1 Geophysical Survey

A geophysical survey was conducted at Sites 75 and 76 by GeoCenters, Inc. The objective of the survey was to explore the possibility that 55-gallon drums may have been buried at these sites in one or more pits.

A previous EM study was conducted at these sites; however, the investigation focused only on specific areas suspected to be burial locations and not the entire site. The suspect burial locations surveyed during the previous investigation were based upon aerial photographs. The previous investigation did not identify any areas representative of buried metallic objects. The geophysical survey that was completed during the Pre-RI Screening Study was performed while keeping three major objectives in mind:

- Examine the entire site, collecting data in all the accessible areas of the site. (The portable Surface Towed Ordnance Locator System (STOLS®) allows collection of data in normally in-accessible areas)

- Use of state-of-the art equipment, allowing collection of nearly continuous magnetic data

- Identify all targets (magnetic anomalies) and accurately locate them using global positioning system (GPS) technology.

The geophysical investigation for the Pre-RI Screening Study at Sites 75 and 76 were completed using the STOLS system coupled with GPS which tracks the instruments on a grid system over the entire site. These techniques guarantee a complete survey of the site and accurate identification of the magnetic data.

The portable STOLS instrument is mounted on a backpack and carried by one person who traverses the entire site following lines from a pre-determined grid system. Magnetic data are recorded continuously as the instrument passes over the ground. The information is mapped electronically according to the locations established by the GPS. The data are later downloaded and prepared for plotting on a hard copy. Typically, data collected in the field can be downloaded and plotted by the next day's field operations allowing for continual data interpretation as the geophysical survey continues. Figures 3-1 and 3-2 illustrate the areas covered by the geophysical survey at Sites 75 and 76.

### 3.1.2 Surface Soil Sampling

Surface soil samples were collected at Sites 12, 68, 75, 76, 84, 85, and 87. The surface soils were collected primarily for the purpose of risk evaluation and to determine the presence or absence of surficial contamination. The surface soil sample locations were chosen based upon the following criteria:

- Areas of contamination identified during previous investigations
- Areas of suspected disposal from historical information
- Field observations made during site visits or during the field investigations
- Review of historical aerial photographs
- Accessibility of areas

In general, the surface soil encountered was loosely packed, thus facilitating the use of a hand held stainless steel spoon for collecting samples. All of the surface soil samples were collected from single identified locations at depths of approximately four to twelve inches below ground surface (bgs). In cases where topsoil and/or a humic layer was present, the material was removed prior to sample collection. Volatile fractions were collected first while the remaining sample portion was homogenized and placed in the appropriate containers. The locations of the sample points were marked with wooden stakes which were labeled with the sample identification number.

Additional surface soil samples were collected at Site 84, based upon the results of the Draft Pre-RI Screening Study. These samples were collected in an effort to delineate surficial soils impacted by PCB contamination.

### 3.1.3 Drilling and Soil Sampling

Drilling and soil sampling activities were completed at Sites 12, 68, 75, 76, and 85. The drilling and soil sampling activities for the Pre-RI Screening Study involved two types of drilling techniques: 1) Direct-push (GeoProbe) methods and 2) Standard auger/mud rotary methods. The direct-push soil borings were advanced for sample collection, description of subsurface units and at Site 85 for installation of temporary monitoring wells. The remaining borings completed by standard drilling techniques were advanced for the purpose of monitoring well installation. The sections below provide an overview of the drilling and soil sampling procedures.

#### 3.1.3.1 Direct Push Soil Sampling

Direct-push soil sampling was performed at five of the sites (i.e., 12, 68, 75, 76, and 85) at locations based on similar criteria mentioned in Section 3.1.2. This sampling technique uses the GeoProbe drilling equipment mounted on the back of a four-wheel drive pick-up truck. The direct-push borings are advanced using either a truck-mounted GeoProbe or by a hand sampling device in areas where access is extremely limited. The GeoProbe advances a four-foot stainless steel collection tube lined with a dedicated sleeve by using a combination of mechanical hammering and downward hydraulic pressure. As the sampling tube is advanced below ground, soil is collected in the dedicated sleeve. The stainless steel tube is retrieved to the surface and the soil samples are extruded from the dedicated sleeve. The sampling team examines the sample

for classification and performs field screening with a photo ionization detector (PID). Based upon the visual observations and field screening results certain samples are then selected for laboratory analyses.

*Standard Truck/Track Mounted Drilling*

Standard drilling methods were employed at Sites 12, 68, 75, and 76 to complete soil borings for monitoring well installation. Two different drilling methods were used. Shallow (Type II) monitoring wells were installed via hollow stem auguring techniques and deep monitoring wells (Type III) were installed using mud rotary drilling. Initially, soil samples from the boreholes were collected using 2 1/4-inch inside diameter (ID) hollow stem augers. The small diameter augers were used to advance the borehole for sample collection only. Upon completion of the sampling activities, the borehole was reamed with 6 1/4 inch ID hollow stem augers in preparation for monitoring well construction.

Soil samples were collected via split-spoon sampling methods in general accordance with the procedures outlined in the American Society for Testing and Materials (ASTM) Standard Method for Penetration Test and Split-Barrel Sampling of Soils (Designation D 1586). Split-spoons of 24-inch length were used throughout the investigation. Depending upon sample volume requirements, two-inch outside diameter (OD) split-spoons or three-inch OD split-spoons were used. Samples were collected continuously at two-foot intervals starting at one foot below ground surface. Continuous sample collection proceeded until the water table. Below this depth, samples were collected at various intervals that depended upon site conditions.

Each sample was classified in the field by a geologist using visual-manual methods described by the Burmeister soil classification system. The field descriptions were recorded in a logbook and later transposed onto boring log records. Soil classification included characterization of soil type, grain size, color, moisture content, relative density, plasticity, and other pertinent information such as any indication of contamination. The Standard Penetration Test (SPT) blow counts were also recorded. In addition, a PID was used to screen the samples to detect the presence of specific analytes. Selected soil samples from each of the borings were submitted for laboratory analysis (see Section 3.2). The test boring records are presented in Appendix A. Sample information such as boring number, sample identification, time and date of sample

collection, field sampling team, and analytical parameters were recorded for each of the soil samples.

All soil sampling activities were performed in Level D personnel protective equipment. Soil cuttings generated during the soil investigation were collected, handled, and stored according to the procedures outlined in Section 3.1.12.

### 3.1.4 Temporary Monitoring Well Installation

Temporary monitoring wells were installed at Sites 84 and 85 as part of the Pre-RI Screening Study. At Site 84, one temporary monitoring well was installed in November 1995 as part of the RRRS for the purposes of collecting a groundwater sample in the vicinity of the lagoon. The boring was advanced using a GeoProbe drill rig. Ten feet of one-inch OD polyvinyl chloride (PVC) well screen with approximately five feet of riser was installed in the borehole. Once the screen was submerged, the temporary well was left to recharge.

At Site 85, three temporary monitoring wells were installed in August 1995 as part of the RRRS in the vicinity of the battery disposal piles. These wells were also installed using the GeoProbe direct-push technology. During installation, a 0.75 inch OD steel rod with three feet of slotted screen was pushed into the ground with the GeoProbe rig. Four foot sections of steel riser pipe were attached to the screen as the well was advanced. This procedure continued until the screened portion of the well bisected the water table. Once the screen was submerged, the temporary monitoring well was left for 15 minutes to up to 2.5 hours to recharge (depending upon soil conditions).

A peristaltic pump with disposable polyethylene tubing was used to collect the groundwater samples from the temporary monitoring wells at both sites. The samples were collected by pumping groundwater directly into sampling containers from the wells.

### 3.1.5 Monitoring Well Installation

Shallow (Type II) monitoring wells were installed at Sites 12, 68, 75 and 76 using a truck or track mounted drill rig depending upon site access. The wells were situated spatially to provide samples from potentially impacted groundwater, and to characterize the nature and extent of

possible contamination. Existing and newly installed wells were used to collect groundwater samples and to evaluate groundwater flow patterns. Placement of the newly installed monitoring wells was based on review of aerial photographs, previous investigations, site conditions, the location of existing monitoring wells, and the overall scope and objectives of the project.

The shallow (Type II) wells were installed after a pilot hole for soil sampling was completed to the appropriate depth. Each borehole was reamed with 6 1/4-inch ID hollow stem augers prior to well installation. Shallow well depths ranged from 14 to 20 feet below ground surface. In general, the shallow wells were installed approximately 10 feet below the water table encountered during the pilot hole test boring. Shallow monitoring wells were installed with screened intervals bisecting the water table sufficiently to compensate for seasonal variations in the water table which, based upon previous studies conducted by Baker at Camp Lejeune, is known to fluctuate from two to four feet. Well construction details are summarized on Table 3-1 and well construction records are provided on the Test Boring and Well Construction Records in Appendix A. Typical above grade shallow (Type II) well construction details are provided on Figure 3-3.

Four deep (Type III) wells were installed at Site 68 to characterize the groundwater below a semi-confining clay layer (known as the "Castle Hayne Confining Unit") present at the site. Upon completion of the pilot hole test boring drilled for soil sample collection, the borings were reamed with 6 1/4-inch hollow stem augers. A 6-inch steel surface casing was then grouted approximately two feet into the identified clay layer. The boring was then completed using mud rotary drilling with a 5-7/8 inch tri-cone roller bit. The four deep monitoring wells at Site 68 were screened at intervals just below the semi-confining clay layer. Screened intervals for the deep wells ranged from 19.5 to 60 feet below ground surface (refer to Appendix A and Table 3-1 for test boring and well construction records). Deep (Type III) well construction details are provided on Figure 3-4.

All of the monitoring wells were constructed of two-inch diameter, Schedule 40, flush-joint and threaded, PVC casing. The wells utilized either a 10-foot (deep wells) or a 15-foot (shallow wells) screened interval of No. 10 (i.e., 0.010 inch) slotted screen sections. A fine-grained sand pack (i.e., No. 1 silica sand), extending approximately 2 feet above the top to the screen, was placed in the annulus between the screen and the borehole wall from inside the augers during well installation. The sand pack was poured manually down the borehole during well installation

and checked continuously with a weighted tape measure to determine the depth of the sand. A two- to three-foot bentonite pellet seal was placed on top of the sand pack by pouring the pellets down the borehole. The bentonite pellets were hydrated with potable water after placement. The seal was installed to prevent surface run-off from entering the sand pack. The remaining annular space was backfilled with a mixture of Portland cement and powdered bentonite. The "stick-up" wells (Sites 12 and 68) were completed by placing a four-inch protective steel casing with locking cover over the well and into the cement. A five-foot by five-foot concrete pad was placed around the protective casing and four protective bollard posts were installed around the corners of the concrete pad. Well tags, which provide construction information, were installed at the top of each well.

The shallow monitoring wells at Sites 75 and 76 were completed flush with existing grade by placing a steel cover with a bolt down lid over the well. The "flush-mount" cover was set in a 2-foot by 2-foot concrete pad. Well tags, which provide construction information, were placed inside the steel cover at each of the wells. Typical below grade shallow (Type II) well construction details are shown on Figure 3-5.

### 3.1.6 Monitoring Well Development

Following well construction and curing of the bentonite seal and cement grout, each newly installed well was developed to remove fine-grained sediment from the screen/sandpack and to establish interconnection between the well and the surrounding formation. Existing wells at Sites 68, 75, 76, and 87 were also re-developed prior to purging and sampling activities to remove accumulated sediment from the wells. Each of the wells were developed by a combination of surging and pumping. The groundwater recovered during well development was temporarily stored in drums, then transferred into on-site storage tanks (refer to Section 3.1.12). Pumping hoses, made of flexible polyethylene (PE) were used once at each well and discarded to minimize the potential for cross contamination.

A minimum of 3 to 5 borehole volumes were evacuated from each well. Where conditions permitted, purging continued until the groundwater was essentially sediment-free. Measurements of pH, specific conductance, temperature, and turbidity were recorded after each well volume was removed to assist is assessing well stabilization. Additionally, periodic flow

and volume measurements were recorded during development to evaluate flow rates of the aquifer. Well Development Records summarizing this information are provided in Appendix B.

### 3.1.7 Groundwater Sampling

Groundwater samples were collected from new and existing monitoring wells at Sites 12, 68, 75, 76, 85, and 87 as part of the Pre-RI Screening Study to confirm the presence or absence of contaminants and evaluate overall groundwater chemistry. Based on the results of the Draft Pre-RI Screening Study, additional groundwater samples were obtained at Sites 68, 76, 84 and 87 in March 1998. Low flow sampling methods were employed to collect the samples from all of the monitoring wells.

Prior to purging, a static water level measurement from each well was obtained. The total well depth was also recorded from each well to the nearest 0.1 foot using a decontaminated steel tape. The static water level and well depth measurements were used to calculate the volume of water in each well.

A minimum of three to five well volumes were removed during purging activities prior to sample collection. Water quality parameters (WQPs), including pH, specific conductance, temperature, dissolved oxygen (DO), and turbidity were measured after each well volume was removed. Samples were collected only after WQPs were observed to stabilize. Purge water generated during sampling activities was contained and handled as described in Section 3.1.12.

As mentioned above, groundwater sampling was completed using a low flow well purging and sampling technique. This sampling methodology was developed in response to conversations with USEPA Region IV personnel in Athens, Georgia. A surface peristaltic pump (GeoPump), with the intake set two to three feet into the static water column, was used to purge each of the wells. While purging groundwater from each of the monitoring wells, a flow rate of less than 0.25 gallons per minute (gpm) was maintained. Samples collected for both organic and inorganic analyses were obtained directly from the pump discharge. Dedicated Teflon and silicon tubing was used during purging and sampling activities at each well. Rinsate blanks were collected from the Teflon and silicon tubing to verify that the tubing did not introduce any contaminants during sample collection.

Preparation of groundwater samples incorporated procedures similar to those described for soil samples. Sample information including well number, sample identification, time and date of sample collection, field sampling team, and analytical parameters was recorded in a field logbook and on the sample labels. Chain-of-custody documentation (provided in Appendix C) accompanied the samples to the laboratory.

### 3.1.8 Surface Water and Sediment Sampling

Surface water and sediment samples were collected at Sites 84 and 87 in October 1995, and at Site 68 during January, 1996. Based upon the results of the Draft Pre-RI Screening Study, additional surface water and sediment samples were collected from the lagoon at Site 84 in March 1998.

Specific areas sampled were based on surface water drainage preferences, groundwater flow patterns, and accessibility to the water bodies. At Site 84, samples were collected directly from the surface water and sediment contained in the pond The following sections describe the sampling locations, sampling procedures, analytical program, and quality assurance and quality control program.

#### 3.1.8.1 Surface Water Sampling Procedures

Sampling of the surface water and sediments from streams were completed by starting at the downstream sample locations first and then proceeding upstream. Samples collected from the lagoon at Site 84 were obtained directly from the surface water body. Each of the sampling stations were demarcated along the shoreline with wooden stakes labeled with the sample identification.

At each of the surface water sampling stations, samples were collected by dipping the laboratory containers directly into the water. Samples analyzed for volatiles were obtained first, and samples for the additional analytical fractions were collected immediately following. During sample collection care was taken to avoid excessive agitation that may result in loss of the VOCs. Water quality readings were taken at each sampling station (i.e., pH, dissolved oxygen, salinity, specific conductance, and temperature).

3.1.8.2 Sediment Sampling Procedures

The corresponding sediment samples were collected subsequent to the surface water samples to minimize sediment suspension that might contaminate the samples. Sediment samples were collected from the surface of the stream or pond bed to approximately six inches using a stainless steel sampling spoon or a stainless steel sediment corer. Volatile fractions were collected first while the remaining sample portion was thoroughly homogenized, and then placed in the appropriate sample containers.

### 3.1.9 Exploratory Test Pits

A total of four exploratory test pits were completed at Site 87. The test pit investigation was conducted to assess the nature of buried material within the suspected disposal area at Site 87. The exact test pit locations were identified in the field through visual site inspection between the Baker Site Manager and a representative of MCB, Camp Lejeune, EMD. The test pits were positioned close to the bank of the New River and were oriented in such a way as to provide the greatest amount of coverage over the suspected burial area.

The test pits ranged in length of 26 to 44 feet and were approximately two feet wide. Each of the test pits were terminated at the water table which was approximately eight feet below ground surface. Excavation logs, provided in Appendix D, describing the soil conditions of each test pit were maintained during field operations. In addition, the test pitting activities were photographed and recorded on video tape.

Level B personal protective equipment (e.g., positive pressure face mask with supplied air) was used during the excavation of the exploratory test pits.

### 3.1.10 Land Survey

A land survey was conducted by Lanier Surveying, a licensed professional surveyor in the State of North Carolina, under the direction of the Baker Site Manager. Sites 12, 68, 75, 76, 84, 85 and 87 were surveyed as part of this investigation. Monitoring well locations (new and existing), surface soil, subsurface soil and surface water/sediment sample location points were surveyed for vertical and horizontal control using North Carolina State Plane Coordinates.

### 3.1.11 Decontamination Procedures

All of the equipment used during the field activities was decontaminated before and after each use to prevent cross-contamination of samples, with the exception of disposable sampling equipment. The disposable sampling equipment was appropriately discarded subsequent to its initial use. Decontamination procedures performed in the field followed the USEPA Region IV's standard operating procedures (SOPs). Drill rigs and all associated drilling and sampling tools were steam cleaned prior to initiating drilling activities and between borings. Decontamination of the soil and groundwater sampling equipment (i.e., split-spoons and stainless steel sampling equipment) involved:

- scrubbing the item with liquinox soap and potable water
- rinsing with distilled water
- rinsing with 10 percent nitric acid
- rinsing with distilled water
- rinsing with isopropanol
- allowing the item to air dry

Meters and instruments used for measuring dissolved oxygen, pH, temperature, specific conductivity, and turbidity were rinsed with distilled water after each use.

### 3.1.12 Investigation Derived Waste Management

Field investigation activities associated with CTO-0314 resulted in the generation of various investigation derived waste (IDW). The IDW included drilling mud, soil cuttings, well development and purge water, and solutions used to decontaminate non-disposable sampling equipment. The general management techniques utilized for the IDW were:

- Collection and containerization of IDW material
- Temporary storage of IDW while awaiting confirmatory analytical data
- Final disposal of aqueous and solid IDW material

The management of the IDW was performed in accordance with guidelines developed by the USEPA Office of Emergency and Remedial Response, Hazardous Site Control Division

(USEPA, 1992). Both the IDW soils and water were returned, based on confirmatory analytical data, to their respective source areas.

## 3.2 Sample Acquisition and Analytical Program

The following sections provide information on the numbers of samples collected at each of the sites, the type of media sampled and the requested analytical procedures. Tables have been prepared which detail the analytical tests and figures are provided which show the sample locations relative to each of the sites.

### 3.2.1 Surface/Subsurface Soil Sample Acquisition and Analyses

#### 3.2.1.1 Site 12

Thirty soil samples were collected at Site 12 from test borings and analyzed by an on-site mobile laboratory for VOCs according to Environmental Protection Agency (EPA) method 8020. Four of the 30 soil samples were sent to a fixed based laboratory and analyzed for Target Compound List (TCL) VOCs, total petroleum hydrocarbons (TPH) , and O&G. Table 3-2 summarizes the analyses performed at Site 12.

The borings were positioned across the study area in a grid pattern so as to provide complete coverage of the site. Monitoring well locations were placed around the perimeter of the site. The well locations were based primarily on field screening results of groundwater samples collected at the boring locations. The locations are presented on Figure 3-6.

#### 3.2.1.2 Site 68

Surface and subsurface soil samples were collected at Site 68 from test borings and monitoring well test borings, and analyzed for TCL VOCs, semivolatile organic compounds (SVOCs), Pesticides/PCBs, and TAL metals using Contract Laboratory Program (CLP) Protocols. The information concerning the sampling interval and analyses performed in summarized on Table 3-3. The locations of the soil borings and monitoring wells are presented on Figure 3-7. Soil boring locations at Site 68 were laid out in a grid pattern as much as was possible. Access at this site was severely limited by steep topography (refer to Section 2.0) and significant vegetation.

Exiting trails used by military personnel for training exercises provided the majority of site access.

3.2.1.3 Sites 75 and 76

Surface and subsurface soil samples were collected at Sites 75 and 76 from test borings and monitoring well test borings. The samples were analyzed for TCL VOCs, SVOCs, Pesticides/PCBs, TAL metals, and for specific tear gas compounds (chloropicrin and chloroaceto phenone) suspected to have been disposed of at these sites. The analyses were completed using CLP protocol. The sample analyses for Sites 75 and 76 are presented on Table 3-4 and 3-5, respectively.

Based upon the preliminary geophysical results, no suspected disposal areas were identified at either Site 75 or Site 76. Therefore, sample locations at these sites followed a grid pattern. Site access at both locations was virtually unlimited aside from existing homes, lawns and underground utilities. Given the site conditions, a well defined grid pattern of sampling was possible at Sites 75 and 76. Figures 3-8 and 3-9 provide the locations of the monitoring wells and soil borings at Sites 75 and 76.

3.2.1.4 Site 84

Surficial soil samples were collected at Site 84 during the initial field work and as part of the additional investigation performed based upon the Draft Pre-RI Screening Study. These surface soil samples were analyzed for TCL PCBs only, the contaminant of concern at this site based on past disposal practices. During the initial sampling two surface soil samples were taken from each boring location from ground surface to six inches below grade and from six to twelve inches below grade. The existing lagoon was the suspected disposal location of transformers containing PCBs and, therefore, sampling efforts were focused in this area. The initial surface soil sampling points are shown on Figure 3-10.

Based upon the results presented in the Draft Pre-RI Screening Study, additional sampling was recommended at Site 84. The additional sampling was performed in March 1998 and involved the collection of soil samples from zero to six inches and six to twelve inches below ground surface. The locations of the initial borings at Site 84 are provided on Figure 3-10. Figure 3-11

details an expanded view of the site with the locations of the soil borings completed in March 1998. Table 3-6 provides information on the all of the soil samples collected at this site.

3.2.1.5 Site 85

Surface and subsurface soil samples were collected at Site 85 and analyzed for TAL metals, cyanide, Toxicity Characteristic Leaching Procedure (TCLP) metals, and pH using CLP protocol. Table 3-7 presents the analyses performed and the sample depths. Site 85 contains at least seven areas of waste batteries at the surface; therefore, sample points were concentrated around the visible piles of debris. Figure 3-12 provides the locations of the sample points at Site 85 relative to the battery disposal areas.

3.2.1.6 Site 87

Surface soil samples were collected at Site 87 from approximately ground surface to twelve inches below ground surface. In addition subsurface soil samples were collected at this site during the excavation of test pits. The soil samples collected from the test pit locations were taken from the bottom of the excavation, approximately eight feet below ground surface. Each of the samples were analyzed for TCL VOCs, SVOCs, Pesticides/PCBs and TAL metals according to CLP protocol. This information is presented on Table 3-8. Figure 3-13 and 3-14 present the locations of Site 87 surface sample locations and test pits, respectively.

### 3.2.2 Groundwater Sample Analyses

3.2.2.1 Site 12

Groundwater samples were collected at Site 12 from 30 GeoProbe sampling points. These water samples were analyzed in the field for VOCs according to EPA Method 8020 using a mobile laboratory. In addition, four groundwater samples were collected from monitoring wells installed at the site and analyzed for TCL VOCs and SVOCs at a fixed based laboratory. Table 3-9 provides information on the groundwater sample analyses at Site 12. Groundwater quality parameters measured at the time of sample collection are presented on Table 3-10. The locations of the four monitoring wells are shown on Figure 3-6.

3.2.2.2 Site 68

Groundwater samples were collected at Site 68 and analyzed for TCL VOCs, SVOCs, Pesticides/PCBs and TAL metals according to CLP protocol. A total of five samples were collected from the surficial aquifer and four were taken from the deeper Castle Hayne aquifer. Table 3-11 summarizes the requested analyses of the groundwater samples. The groundwater quality parameters measured at the time of sample collection are presented on Table 3-12. Figure 3-7 illustrates the locations of the groundwater monitoring wells.

3.2.2.3 Sites 75 and 76

Groundwater samples were collected at Sites 75 and 76, and analyzed for TCL VOCs, SVOCs, Pesticides/PCBs, TAL metals and specific analyses for tear gas compounds chloropicrin and chloroacetophenone. The laboratory analyses were completed according to CLP protocol. Two samples at each of the sites were analyzed for both total and dissolved metals for comparison between the two sets of analyses. Tables 3-13 and 3-14 summarize the analyses of the groundwater samples at these sites. Tables 3-15 and 3-16 provide information on groundwater quality parameters recorded during sample collection. The locations of the monitoring wells at Sites 75 and 76 are shown on Figure 3-8 and 3-9, respectively.

3.2.2.4 Site 84

During the initial Pre-RI Screening Study, groundwater samples were collected from two existing monitoring wells and one temporary monitoring well at Site 84. The groundwater samples were only analyzed for TCL PCBs due to the disposal history at the site. Upon review of the Draft Pre-RI Screening Study Report and data obtained during the Resource Conservation and Recovery Act (RCRA) Solid Waste Management Unit (SWMU) Confirmation Sampling additional groundwater sampling was recommended. Table 3-17 summarizes the analyses of the groundwater samples at Site 84. The groundwater quality parameters are provided on Table 3-18. Locations of the monitoring wells are shown on Figure 3-10.

During the second phase of fieldwork, groundwater samples were collected at the Site from locations near the former AST located at Building 45. These samples were analyzed for VOCs.

3.2.2.5 Site 85

Three temporary monitoring wells were installed at Site 85 using direct push drilling technology. These wells were installed and immediately sampled for TAL metals, (total and dissolved) and cyanide according to CLP protocol. Table 3-19 summarizes the requested groundwater analyses at this site. The locations of the temporary monitoring wells installed at Site 85 are shown on Figure 3-12.

3.2.2.6 Site 87

Two existing monitoring wells were sampled at Site 87 and analyzed for TCL VOCs, SVOCs, Pesticides/PCBs and TAL metals according to CLP protocol. The sample analysis for these groundwater samples is provided on Table 3-20. Groundwater quality parameters obtained during the sampling efforts are displayed on Table 3-21. The locations of monitoring wells 87-MW01 and 87-MW02 are shown on Figure 3-13.

### 3.2.3 Surface Water and Sediment Sample Analyses

3.2.3.1 Site 68

A total of 10 surface water and 10 sediment samples were collected at Site 68 with each station yielding one surface water and one sediment sample. Five of the sampling stations were located in Stones Creek and five were located in an unnamed tributary which flows north into Stones Creek. Figure 3-15 depicts the locations of the surface water and sediment sampling locations. Surface water samples were assigned the pre-fix "SW" and sediment sample locations were assigned the pre-fix "SD" in the sample identification number.

Both the surface water and the sediment sample locations were sampled for TCL VOCs, SVOCs, Pesticides/PCBs and TAL metals according to CLP protocol. The requested sample analyses are presented on Table 3-22. During collection of the surface water samples, water quality parameters including temperature, pH, dissolved oxygen, conductivity, salinity, and turbidity were recorded at each sample station. The results of these measurements are shown on Table 3-23.

3.2.3.2 Site 84

During the initial investigation at Site 84, surface water and sediment samples were collected from four stations around the existing lagoon and from three stations along the bank of Northeast Creek. Figure 3-16 depicts these initial surface water and sediment sample locations. During this sampling effort, sample 84-SW/SD03 was not collected due to limited access in that area.

Based upon results of the Draft Pre-RI Screening Study additional surface water and sediment samples were collected from inside the lagoon at the approximate locations shown on Figure 3-16. These samples were collected to characterize the water and sediments in the lagoon. Table 3-24 summarizes the laboratory analyses for the surface water and sediment sample locations at Site 84.

3.2.3.3 Site 87

Two surface water and two sediment samples were collected from the New River at Site 87. Figure 3-17 provides the locations of these samples. The samples were analyzed for TCL VOCs, SVOCs, Pesticides/PCBs, and TAL metals according to CLP protocol. The requested sample analyses are presented on Table 3-25.

It is important to note that original sample designators at Sites 84 and 87 followed protocol set forth in the RRRS. For consistency, these sample designators have been changed at both Sites 84 and 87 so that they are consistent with typical sample identifications used at MCB, Camp Lejeune. Table 3-26 provides the original sample designator and the "new" designator which is consistent with MCB, Camp Lejeune protocol. Table 3-26 is included to avoid confusion when referencing original documentation such as chain-of-custody forms, field notes, or original analytical data.

The analytical program initiated during the Pre-RI Screening Study focused on the suspected contaminants of concern, as indicated by information regarding the previous disposal practices and site histories. The samples were prepared and handled as described in the previous sections.

## 3.3 Quality Assurance and Quality Control

Quality Assurance/Quality Control (QA/QC) samples were collected during the Pre-RI Screening Study. Field QA/QC samples were collected at each of the sites according to the procedures outlined in the USEPA Region IV SOPs. These samples were obtained to: 1) ensure that decontamination procedures were effective (equipment rinsate samples); 2) evaluate field methodologies (duplicate samples); (3) establish field background conditions (field blanks); 4) evaluate whether cross-contamination occurred during sampling and shipping (trip blanks); and 5) evaluate laboratory analysis (matrix spike/matrix spike duplicates). Data Quality Objectives (DQOs) for the QA/QC samples were implemented in accordance with DQO Level IV as defined in the Environmental Compliance Branch SOPs and Quality Assurance Manual, USEPA Region IV (USEPA, 1991). This DQO level is equivalent to the Naval Facilities Engineering Service Center (NFESC) DQO Level D, as specified in the "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Programs" document (Naval Energy and Environmental Support Activity [NEESA], 1988). Five types of QA/QC samples were collected and analyzed including: duplicate samples; equipment rinsate samples; field blanks; trip blanks, and matrix spike/matrix spike duplicates (MS/MSD). The definition of each type of QA/QC sample is provided in the Environmental Compliance Branch SOPs and Quality Assurance Manual, USEPA Region IV (USEPA, 1991). A brief summary of the QA/QC samples collected during this investigation is provided below.

- Duplicate Sample: Duplicates were collected in quantities equal to or greater than ten percent of the total number of samples collected during the Pre-RI Screening Study. The duplicate samples were collected at the same time, using the same techniques as the planned original environmental samples. Further details can be found in Appendix E.

- Equipment Blanks: Rinsate blanks were prepared for manual sampling equipment utilized to collect environmental samples. Rinsate samples were analyzed for parameters associated with each sampling event. For example, one equipment rinsate was collected on every day that soil and/or groundwater sampling activities were performed. A complete breakdown of the total number of QA/QC samples is summarized on Table 3-27.

The results of the equipment rinsate blanks were used to assess the efficiency of equipment decontamination procedures in preventing cross contamination between samples and to determine if the contaminants detected in the environmental samples were contributed by the sampling equipment or were representative of site conditions.

- Field Blanks: Three field blanks were collected during the field operations. The results for the field blanks collected during this investigation can be found in Appendix F and a collection summary in Table 3-27. The results of the field blanks were compared sample results of the water used during decontamination procedures.

- Trip Blanks: Trip blanks are prepared prior to the sampling event, placed in the actual sample container, and kept with the investigative samples throughout the sampling event. 24 trip blanks were collected during the Pre-RI Site Screening. A summary of the analysis of the trip blanks is also presented in Appendix F and a collection summary in Table 3-27.

- Matrix Spike/Matrix Spike Duplicates: Matrix spike/matrix spike duplicates (MS/MSDs) were collected at a number equal to or greater than five percent of the total number of environmental samples collected during the Pre-RI Screening Study. As part of the Pre-RI Screening Study QA/QC process, 9 volumes of soil samples were collected as MS/MSD samples. In addition 7 volumes of groundwater were collected as MS/MSD samples.

### 3.3.1 Data Quality

The majority of the analytical data generated during the Pre-RI Screening Study were submitted for third-party validation (TCLP, RCRA characteristics, TPH, O&G, and EPA method 8020 results were not validated). Procedures stipulated by the National Functional Guidelines for Organic (USEPA, 1991a) and Inorganic Analyses (USEPA, 1991b) were observed during the validation process. Validation of the analytical data serves to reduce inherent uncertainties. This process includes attaching letters, often referred to as "qualifiers" to the reported data. The qualifiers give further explanation of the reported values. For example, many values are

qualified with a "U" meaning the compound has not been detected at the reported quantitation value. Data qualified with a "J" are retained as estimated values. Estimated analytical results within a data set are common and considered to be usable by the USEPA (USEPA, 1989). Data may be qualified as estimated for several reasons including an exceedance of holding times, high or low surrogate recovery or intra-sample variability. In addition, values may be assigned an estimated "J" qualifier if the reported value is below the Contract Required Detection Limit (CRDL) or the Contract Required Quantitation Limit (CRQL).

At times, analytes originally reported by the laboratory are eliminated by the data validator and from further consideration because they are not considered to be present in the environment, but have been introduced through the process of sampling, decontamination, or possibly at the laboratory. Values eliminated from the data set by the validator are not considered when assessing the conditions of the site. These data are qualified with a "R" meaning the result is rejected and unusable. Data assigned a rejected "R" qualifier was excluded from the usable data set. Table 3-28 provides a summary of all rejected site data.

An example of some other qualifiers include and "NJ", meaning that a compound was tentatively identified, but the reported value may not be accurate or precise, and "UJ", meaning that the compounds that were not detected but had inaccurate or imprecise quantitation limits.

### 3.3.2 Data Management and Tracking

The management and tracking of data, from time of field collection to receipt of validation report, is of primary importance to the overall quality of laboratory analytical results. Field samples and their corresponding analyses were recorded on chain-of-custody forms, provided in Appendix C. Chain-of-custody forms were compared to the Field Sampling and Analysis Plan (Baker, 1994); this comparison was used to verify that appropriate laboratory analyses had been requested. Upon receipt of laboratory analytical results, a further comparison was performed to verify that each sample received by the laboratory was analyzed for the correct parameters. Finally, the validation report was compared to the requested laboratory analyses.

The management and tracking of data was used to determine the following items:

- Identify and correct chain-of-custody discrepancies prior to laboratory analysis

- Verify the receipt of all samples by the laboratory
- Confirm that requested sample analyses and validation were performed
- Ensure the delivery of a complete data set

## 3.4 References


Baker Environmental, Inc. Draft Site Inspection Work Plan for Sites A, 12, 68, 75, 76, 84, and 85. Marine Corps Base, Camp Lejeune, North Carolina. Contract Task Order 0193. January 21, 1994.

Naval Energy and Environmental Support Activity (NEESA). 1988. Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program. Department of the Navy, Naval Energy and Environmental Support Activity, Port Hueneme, California. NEESA 20.2-047B.

United States Environmental Protection Agency (USEPA). 1991a. National Functional Guidelines for Organic Data Review. Draft. USEPA Contract Laboratory Program. June 1991.

USEPA. February 1991b. Laboratory Guidelines for Evaluating Inorganic Analyses. Prepared for: Hazardous Site Evaluation Division, U.S. Environmental Protection Agency. Complied by: Ruth Bleyler. Prepared by: the USEPA Data Review Work Group.

United States Environmental Protection Agency (USEPA). 1992. Guide to Management of Investigation-Derived Wastes. "Standard Default Exposure Factors" Interim Final. Office of Emergency and Remedial Response Hazardous Site Control Division. Washington, D.C. os-220W. April 1992.

USEPA. February 1996. Laboratory Guidelines for Evaluating Inorganic Analyses. Prepared for: Hazardous Site Evaluation Division, U.S. Environmental Protection Agency. Complied by: Ruth Bleyler. Prepared by: the USEPA Data Review Work Group.

# TABLES

**TABLE 3-1**

**SUMMARY OF WELL CONSTRUCTION DETAILS**
**SITE 12, EXPLOSIVE ORDNANCE DISPOSAL AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Well No. | Date Installed | Top of PVC Casing Elevation (feet, above msl)[1] | Ground Surface Elevation (feet, above msl) | Boring Depth (feet, below ground surface) | Well Depth (feet, below ground surface) | Screen Interval Depth (feet, below ground surface) | Sand Pack Interval Depth (feet, below ground surface) | Bentonite Interval Depth (feet, below ground surface) |
|---|---|---|---|---|---|---|---|---|
| 12-GW01 | 01/23/96 | 54.96 | 52.6 | 15.0 | 14.5 | 4.0 to 14.0 | 2.0 to 15.0 | 0 to 2.0 |
| 12-GW02 | 01/22/96 | 51.35 | 49.1 | 15.0 | 14.5 | 4.0 to 14.0 | 2.0 to 15.0 | 0 to 2.0 |
| 12-GW03 | 01/22/96 | 45.47 | 42.9 | 15.0 | 14.5 | 4.0 to 14.0 | 2.0 to 15.0 | 0 to 2.0 |
| 12-GW04 | 01/23/96 | 49.47 | 46.8 | 15.0 | 14.5 | 4.0 to 14.0 | 2.0 to 15.0 | 0 to 2.0 |

Notes:

[1] msl = mean sea level
Horizontal positions are referenced to N.C. State Plane Coordinate System (NAD 27) CF = 0.9999216 from USMC Monument Toney.
Vertical datum NGVD 29.

TABLE 3-1 (Continued)

SUMMARY OF WELL CONSTRUCTION DETAILS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Well No. | Date Installed | Top of PVC Casing Elevation (feet, above msl)[1] | Ground Surface Elevation (feet, above msl) | Boring Depth (feet, below ground surface) | Well Depth (feet, below ground surface) | Screen Interval Depth (feet, below ground surface) | Sand Pack Interval Depth (feet, below ground surface) | Bentonite Interval Depth (feet, below ground surface) |
|---|---|---|---|---|---|---|---|---|
| 68-GW01 | 1984 | 54.01 | 51.8 | NA[3] | NA | NA | NA | NA |
| 68-GW02 | 1984 | 24.47 | 22.1 | 22[2] | 22[2] | 7.0 to 22.0 | NA | NA |
| 68-GW03 | 1984 | 32.61 | 30.2 | 22[2] | 22[2] | 7.0 to 22.0 | NA | NA |
| 68-GW04 | 01/11/96 | 30.08 | 28.4 | 19.0 | 18.5 | 8.5 to 18.5 | 6.5 to 19.0 | 4.0 to 6.5 |
| 68-GW01DW | 01/16/96 | 53.83 | 51.4 | 62.0 | 60.5 | 50.0 to 60.0 | 48.0 to 62.0 | 39.5 to 48.0 |
| 68-GW04DW | 01/11/96 | 30.73 | 28.4 | 42.0 | 41.5 | 31.0 to 41.0 | 29.0 to 42.0 | 26.4 to 29.0 |
| 68-GW05DW | 01/14/96 | 24.76 | 22.3 | 31.0 | 30.5 | 20.0 to 30.0 | 18.0 to 31.0 | 15.0 to 18.0 |
| 68-GW06DW | 01/13/96 | 23.21 | 21.4 | 30.0 | 29.5 | 19.5 to 29.5 | 17.5 to 30.0 | 15.0 to 17.5 |
| 68-GW06 | 01/13/96 | 24.11 | 21.9 | 16.0 | 15.5 | 5.5 to 15.5 | 3.5 to 16.0 | 1.5 to 3.5 |

Notes:

(1) msl = mean sea level
(2) Values estimated from cross-sections contained in 1990 ESE report.
(3) NA = Information not available in 1990 ESE report.
Horizontal positions are referenced to N.C. State Plane Coordinate System (NAD 27) CF = 0.9999216 from USMC Monument Toney.
Vertical datum NGVD 29.

TABLE 3-1 (Continued)

SUMMARY OF WELL CONSTRUCTION DETAILS
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Well No. | Date Installed | Top of PVC Casing Elevation (feet, above msl)[1] | Ground Surface Elevation (feet, above msl) | Boring Depth (feet, below ground surface) | Well Depth (feet, below ground surface) | Screen Interval Depth (feet, below ground surface) | Sand Pack Interval Depth (feet, below ground surface) | Bentonite Interval Depth (feet, below ground surface) |
|---|---|---|---|---|---|---|---|---|
| 75-GW01 | 1984 | 17.20 | 14.7 | NA[3] | NA | NA | NA | NA |
| 75-GW02 | 1984 | 19.56 | 17.4 | 22[2] | 22[2] | 7.0 to 22.0 | NA | NA |
| 75-GW03 | 1984 | 19.83 | 17.7 | 23[2] | 23[2] | 8.0 to 23.0 | NA | NA |
| 75-GW04 | 1996 | 12.77 | 13.1 | 18.5 | 18.2 | 3.0 to 18.0 | 2.0 to 18.5 | 1.0 to 2.0 |
| 75-GW05 | 1996 | 14.25 | 14.6 | 18.5 | 18.2 | 3.0 to 18.0 | 2.0 to 18.5 | 1.0 to 2.0 |

Notes:

(1) msl = mean sea level
(2) Values estimated from cross-sections contained in 1990 ESE report.
(3) NA = Information not available in 1990 ESE report.
Horizontal positions are referenced to N.C. State Plane Coordinate System (NAD 27) CF = 0.9999216 from USMC Monument Toney.
Vertical datum NGVD 29.

TABLE 3-1 (Continued)

SUMMARY OF WELL CONSTRUCTION DETAILS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGAITON SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Well No. | Date Installed | Top of PVC Casing Elevation (feet, above msl)[1] | Ground Surface Elevation (feet, above msl) | Boring Depth (feet, below ground surface) | Well Depth (feet, below ground surface) | Screen Interval Depth (feet, below ground surface) | Sand Pack Interval Depth (feet, below ground surface) | Bentonite Interval Depth (feet, below ground surface) |
|---|---|---|---|---|---|---|---|---|
| 76-GW01 | 1984 | 18.92 | 14.4 | 22[2] | 22[2] | 7.0 to 22.0 | NA[3] | NA |
| 76-GW02 | 1984 | 10.27 | 7.9 | 22[2] | 22[2] | 8.0 to 23.0 | NA | NA |
| 76-GW03 | 1996 | 12.43 | 12.9 | 18.5 | 18.2 | 3.0 to 18.0 | 2.0 to 18.5 | 1.0 to 2.0 |
| 76-GW04 | 1996 | 16.56 | 16.9 | 18.5 | 18.2 | 3.0 to 18.0 | 2.0 to 18.5 | 1.0 to 2.0 |
| 76-GW05 | 1996 | 16.60 | 16.9 | 18.5 | 18.2 | 3.0 to 18.0 | 2.0 to 18.5 | 1.0 to 2.0 |

Notes:

(1) msl = mean sea level
(2) Values estimated from cross-section contained in 1990 ESE report.
(3) NA = Information not available in 1990 ESE report.
Horizontal positions are referenced to N.C. State Plane Coordinate System (NAD 27) CF = 0.9999216 from USMC Monument Toney.
Vertical datum NGVD 29.

TABLE 3-1 (Continued)

SUMMARY OF WELL CONSTRUCTION DETAILS
SITE 87, MARINE CORPS AIR STATION OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Well No. | Date Installed | Top of PVC Casing Elevation (feet, above msl)[1] | Ground Surface Elevation (feet, above msl) | Boring Depth (feet, below ground surface) | Well Depth (feet, below ground surface) | Screen Interval Depth (feet, below ground surface) | Sand Pack Interval Depth (feet, below ground surface) | Bentonite Interval Depth (feet, below ground surface) |
|---|---|---|---|---|---|---|---|---|
| 87-GW01 | 1986 | 20.55 | 17.8 | 26[2] | 26[2] | 11.0 to 26.0[2] | NA[3] | NA |
| 87-GW02 | 1986 | 12.31 | 10.2 | 27[2] | 27[2] | 11.0 to 26.0[2] | NA | NA |

Notes:

[1] msl = mean sea level
[2] Values estimated from cross-sections contained in the 1990 ESE report.
[3] NA = Information not available in the 1990 ESE report.
Horizontal positions are referenced to N.C. State Plane Coordinate System (NAD 27) CF = 0.9999216 from USMC Monument Toney.
Vertical datum NGVD 29.

TABLE 3-2

SOIL SAMPLING SUMMARY, TEST BORINGS
SITE 12, EXPLOSIVE ORDNANCE DISPOSAL AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Depth of Borehole Feet, bgs[1] | Sampling Interval Feet, bgs[1] | Analytical Parameters | | | | |
|---|---|---|---|---|---|---|---|
| | | | EPA 8020[2] | TCL VOC[3] | TPH[3] | Oil/Grease[3] | Duplicate Sample |
| 12-SB01 | 4 | 2-3 | ● | ● | ● | ● | NA |
| 12-SB02 | 4 | 0-3.6 | ● | NA | NA | NA | NA |
| 12-SB03 | 4 | 0-3.8 | ● | NA | NA | NA | NA |
| 12-SB04 | 4 | 0-3.2 | ● | NA | NA | NA | NA |
| 12-SB05 | 4 | 0-3.6 | ● | ● | ● | ● | NA |
| 12-SB06 | 4 | 0-3.7 | ● | NA | NA | NA | NA |
| 12-SB07 | 4 | 0-2.8 | ● | NA | NA | NA | NA |
| 12-SB08 | 4 | 0-3.2 | ● | NA | NA | NA | NA |
| 12-SB09 | 4 | 0-3.7 | ● | NA | NA | NA | NA |
| 12-SB10 | 4 | 0-3.2 | ● | NA | NA | NA | NA |
| 12-SB11 | 4 | 0-3.2 | ● | NA | NA | NA | NA |
| 12-SB12 | 4 | 0-2.5 | ● | NA | NA | NA | NA |
| 12-SB13 | 4 | 0-3.2 | ● | NA | NA | NA | NA |
| 12-SB14 | 4 | 0-3.2 | ● | NA | NA | NA | NA |
| 12-SB15 | 4 | 0-3.5 | ● | NA | NA | NA | NA |
| 12-SB16 | 4 | 0-3.5 | ● | NA | NA | NA | NA |

Notes:

(1) Below Ground Surface
(2) Analysis by on-site mobile laboratory
(3) Analysis by contracted project laboratory
● = Sample analyzed for indicated parameter
NA = Parameter was not analyzed
VOC = Volatile Organic Compound
TPH = Total Petroleum Hydrocarbons
TCL = Target Compound List

TABLE 3-2 (Continued)

SOIL SAMPLING SUMMARY, TEST BORINGS
SITE 12, EXPLOSIVE ORDNANCE DISPOSAL AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Depth of Borehole Feet, bgs[1] | Sampling Interval Feet, bgs[1] | Analytical Parameters | | | | |
|---|---|---|---|---|---|---|---|
| | | | EPA 8020[2] | TCL VOC[3] | TPH[3] | Oil/Grease[3] | Duplicate Sample |
| 12-SB17 | 4 | 0-3.3 | ● | ● | ● | ● | NA |
| 12-SB18 | 4 | 0-3.4 | ● | NA | NA | NA | NA |
| 12-SB19 | 4 | 0-3.1 | ● | NA | NA | NA | NA |
| 12-SB20 | 4 | 0-3.5 | ● | NA | NA | NA | NA |
| 12-SB21 | 4 | 0-3.6 | ● | NA | NA | NA | NA |
| 12-SB22 | 4 | 0-3.3 | ● | NA | NA | NA | ● |
| 12-SB23 | 4 | 0-3.5 | ● | NA | NA | NA | NA |
| 12-SB24 | 4 | 0-3.5 | ● | NA | NA | NA | NA |
| 12-SB25 | 4 | 0-3.6 | ● | NA | NA | NA | NA |
| 12-SB26 | 4 | 0-2.9 | ● | NA | NA | NA | NA |
| 12-SB27 | 4 | 0-3.0 | ● | NA | NA | NA | NA |
| 12-SB28 | 4 | 0-3.7 | ● | NA | NA | NA | NA |
| 12-SB29 | 4 | 0-3.5 | ● | NA | NA | NA | NA |
| 12-SB30 | 4 | 0-3.7 | ● | ● | ● | ● | NA |

Notes:

(1) Below Ground Surface
(2) Analysis by on-site mobile laboratory
(3) Analysis by contracted project laboratory
● = Sample analyzed for indicated parameter
NA = Parameter was not analyzed
VOC = Volatile Organic Compound
TPH = Total Petroleum Hydrocarbons
TCL = Target Compound List

TABLE 3-3

SOIL SAMPLING SUMMARY, TEST BORINGS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Depth of Borehole Feet, bgs[1] | Sampling | | | Analytical Parameters | | | |
|---|---|---|---|---|---|---|---|---|
| | | Interval Feet, bgs[1] | TCL VOC | TCL SVOC | TCL Pesticide/PCB | TAL Metals | Duplicate Sample | MS/MSD |
| 68-SB01 | 21 | 0-1 | ● | ● | ● | ● | NA | ● |
| | | 17-19 | ● | ● | ● | ● | NA | NA |
| 68-SB02 | 13 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 11-13 | ● | ● | ● | ● | NA | NA |
| 68-SB03 | 17 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 13-15 | ● | ● | ● | ● | NA | NA |
| 68-SB04 | 23 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 19-21 | ● | ● | ● | ● | NA | NA |
| 68-SB05 | 17 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 15-17 | ● | ● | ● | ● | NA | NA |
| 68-SB06 | 17 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 15-17 | ● | ● | ● | ● | ● | NA |
| 68-SB07 | 17 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 13-15 | ● | ● | ● | ● | NA | NA |
| 68-SB08 | 13 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 11-13 | ● | ● | ● | ● | NA | NA |
| 68-SB09 | 9 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 7-9 | ● | ● | ● | ● | NA | NA |
| 68-SB10 | 11 | 0-1 | ● | ● | ● | ● | NA | NA |

Notes:

[1] Below Ground Surface
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
● = Sample Analyzed for indicated parameter
NA = Not applicable

TABLE 3-3 (Continued)

SOIL SAMPLING SUMMARY, TEST BORINGS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Depth of Borehole Feet, bgs[1] | Sampling | | | Analytical Parameters | | | |
|---|---|---|---|---|---|---|---|---|
| | | Interval Feet, bgs[1] | TCL VOC | TCL SVOC | TCL Pesticide/PCB | TAL Metals | Duplicate Sample | MS/MSD |
| | | 11 | ● | ● | ● | ● | ● | NA |
| 68-SB11 | 13 | 0-1 | ● | ● | ● | ● | ● | ● |
| | | 11-13 | ● | ● | ● | ● | NA | NA |
| 68-SB12 | 17 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 15-17 | ● | ● | ● | ● | NA | NA |
| 68-SB13 | 15 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 13-15 | ● | ● | ● | ● | NA | NA |
| 68-SB14 | 7 | 0-1 | ● | ● | ● | ● | ● | NA |
| | | 5-7 | ● | ● | ● | ● | ● | NA |
| 68-SB15 | 7 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 5-7 | ● | ● | ● | ● | ● | NA |
| 68-SB16 | 25 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 19-21 | ● | ● | ● | ● | NA | NA |
| 68-SB17 | 13 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 11-13 | ● | ● | ● | ● | NA | NA |
| 68-SB18 | 19 | 0-1 | ● | ● | ● | ● | NA | NA |
| | | 17-19 | ● | ● | ● | ● | NA | NA |

Notes:

[1] Below Ground Surface
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
● = Sample Analyzed for indicated parameter
NA = Not applicable

TABLE 3-4

**SOIL SAMPLING SUMMARY, TEST BORINGS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Sample Location | Depth of Borehole Feet, bgs[1] | Sampling Interval Feet, bgs[1] | Analytical Parameters | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | TCL VOC | TCL SVOC | TCL Pesticide/PCB | 8270[2] | TAL Metals | Duplicate Sample | MS/MSD |
| 75-SB01 | 5 | 0-0.5 | ● | ● | ● | ● | ● | ● | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB02 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 3-5 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB03 | 7 | 0-.05 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB04 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB05 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 3-5 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB06 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB07 | 5 | 0-0.5 | ● | ● | ● | ● | ● | ● | ● |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |

Notes:

[1] Below Ground Surface
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
● = Sample Analyzed for indicated parameter
NA = Not applicable

TABLE 3-4 (Continued)

SOIL SAMPLING SUMMARY, TEST BORINGS
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Depth of Borehole Feet, bgs[1] | Sampling Interval Feet, bgs[1] | Analytical Parameters | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | TCL VOC | TCL SVOC | TCL Pesticide/PCB | 8270[2] | TAL Metals | Duplicate Sample | MS/MSD |
| 75-SB08 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB09 | 7 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 3-5 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB10 | 7 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB11 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB12 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB13 | 5 | 0-0.5 | ● | ● | ● | ● | ● | ● | ● |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 75-SB14 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |

Notes:

[1] Below Ground Surface
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
● = Sample Analyzed for indicated parameter
NA = Not applicable

TABLE 3-5

**SOIL SAMPLING SUMMARY, TEST BORINGS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Sample Location | Depth of Borehole Feet, bgs[1] | Sampling Interval Feet, bgs[1] | Analytical Parameters | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | TCL VOC | TCL SVOC | TCL Pesticide/PCB | 8270[2] | TAL Metals | Duplicate Sample | MS/MSD |
| 76-SB01 | 7 | 0-0.5 | ● | ● | ● | ● | ● | ● | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 76-SB02 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 3-5 | ● | ● | ● | ● | ● | NA | NA |
| 76-SB03 | 5 | 0-.05 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 76-SB04 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 76-SB05 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 3-5 | ● | ● | ● | ● | ● | NA | NA |
| 76-SB06 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 76-SB07 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |

Notes:

[1] Below Ground Surface
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
● = Sample Analyzed for indicated parameter
NA = Not applicable

TABLE 3-5 (Continued)

SOIL SAMPLING SUMMARY, TEST BORINGS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Depth of Borehole Feet, bgs[1] | Sampling Interval Feet, bgs[1] | Analytical Parameters | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | TCL VOC | TCL SVOC | TCL Pesticide/PCB | 8270[2] | TAL Metals | Duplicate Sample | MS/MSD |
| 76-SB08 | 7 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 76-SB09 | 3 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 3-5 | ● | ● | ● | ● | ● | NA | NA |
| 76-SB10 | 7 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 76-SB11 | 5 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 76-SB12 | 7 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |
| 76-SB13 | 3 | 0-0.5 | ● | ● | ● | ● | ● | NA | NA |
| | | 1-3 | ● | ● | ● | ● | ● | NA | NA |

Notes:

[1] Below Ground Surface
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
● = Sample Analyzed for indicated parameter
NA = Not applicable

**TABLE 3-6**

**SOIL SAMPLING SUMMARY, TEST BORINGS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Sample Location | Depth of Borehole Feet, bgs[1] | Sample Interval Feet, bgs[1] | TCL Pesticide/PCB |
|---|---|---|---|
| 84-SB01A | 1.0 | 0 - 0.5 | ● |
| 84-SB01B | | 0.5 - 1.0 | ● |
| 84-SB02A | 1.0 | 0 - 0.5 | ● |
| 84-SB02B | | 0.5 - 1.0 | ● |
| 84-SB03A | 1.0 | 0 - 0.5 | ● |
| 84-SB03B | | 0.5 - 1.0 | ● |
| 84-SB04A | 1.0 | 0 - 0.5 | ● |
| 84-SB04B | | 0.5 - 1.0 | ● |
| 84-SB05A | 1.0 | 0 - 0.5 | ● |
| 84-SB05B | | 0.5 - 1.0 | ● |
| 84-SB06A | 1.0 | 0 - 0.5 | ● |
| 84-SB06B | | 0.5 - 1.0 | ● |
| 84-SB07A | 1.0 | 0 - 0.5 | ● |
| 84-SB07B | | 0.5 - 1.0 | ● |
| 84-SB08A | 1.0 | 0 - 0.5 | ● |
| 84-SB08B | | 0.5 - 1.0 | ● |
| 84-SB09A | 1.0 | 0 - 0.5 | ● |
| 84-SB09B | | 0.5 - 1.0 | ● |
| 84-SB10A | 1.0 | 0 - 0.5 | ● |
| 84-SB10B | | 0.5 - 1.0 | ● |
| Additional Sampling Based on Results of Draft Pre-RI Screening Study | | | |
| Sample Location | Depth of Borehole Feet, bgs | Sample Interval | TCL PCB |
| 84-SB01-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB01-01 | | 0.5 - 1.0 | ● |
| 84-SB02-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB02-01 | | 0.5 - 1.0 | ● |
| 84-SB03-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB03-01 | | 0.5 - 1.0 | ● |
| 84-SB04-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB04-01 | | 0.5 - 1.0 | ● |
| 84-SB05-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB05-01 | | 0.5 - 1.0 | ● |
| 84-SB05-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB05-01 | | 0.5 - 1.0 | ● |
| 84-SB06-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB06-01 | | 0.5 - 1.0 | ● |
| 84-SB07-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB07-01 | | 0.5 - 1.0 | ● |
| 84-SB08-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB08-01 | | 0.5 - 1.0 | ● |
| 84-SB09-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB09-01 | | 0.5 - 1.0 | ● |

TABLE 3-6 (continued)

SOIL SAMPLING SUMMARY, TEST BORINGS
SITE 84, BUILDING 45 AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Depth of Borehole Feet, bgs | Sample Interval | TCL PCB |
|---|---|---|---|
| 84-SB10-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB10-01 | | 0.5 - 1.0 | ● |
| 84-SB11-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB11-01 | | 0.5 - 1.0 | ● |
| 84-SB12-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB12-01 | | 0.5 - 1.0 | ● |
| 84-SB13-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB13-01 | | 0.5 - 1.0 | ● |
| 84-SB14-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB14-01 | | 0.5 - 1.0 | ● |
| 84-SB15-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB15-01 | | 0.5 - 1.0 | ● |
| 84-SB16-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB16-01 | | 0.5 - 1.0 | ● |
| 84-SB17-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB17-01 | | 0.5 - 1.0 | ● |
| 84-SB18-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB18-01 | | 0.5 - 1.0 | ● |
| 84-SB19-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB19-01 | | 0.5 - 1.0 | ● |
| 84-SB20-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB20-01 | | 0.5 - 1.0 | ● |
| 84-SB21-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB21-01 | | 0.5 - 1.0 | ● |
| 84-SB22-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB22-01 | | 0.5 - 1.0 | ● |
| 84-SB23-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB23-01 | | 0.5 - 1.0 | ● |
| 84-SB24-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB24-01 | | 0.5 - 1.0 | ● |
| 84-SB25-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB25-01 | | 0.5 - 1.0 | ● |
| 84-SB26-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB26-01 | | 0.5 - 1.0 | ● |
| 84-SB27-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB27-01 | | 0.5 - 1.0 | ● |
| 84-SB28-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB28-01 | | 0.5 - 1.0 | ● |
| 84-SB29-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB29-01 | | 0.5 - 1.0 | ● |
| 84-SB30-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB30-01 | | 0.5 - 1.0 | ● |
| 84-SB31-00 | 1.0 | 0 - 0.5 | ● |
| 84-SB31-01 | | 0.5 - 1.0 | ● |

Notes:

(1) Below Ground Surface
TCL = Target Compound List
● = Sample analyzed for indicated parameter

**TABLE 3-7**

**SOIL SAMPLING SUMMARY, TEST BORINGS**
**SITE 85, THE CAMP JOHNSON BATTERY DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Sample Location | Depth of Borehole Feet, bgs[1] | Sampling Interval Feet, bgs[1] | Analytical Parameters | | | |
|---|---|---|---|---|---|---|
| | | | TAL Metals | Cyanide | TCLP Metals | pH |
| 85-SB01 | 9 | 0-0.5 | ● | ● | NA | NA |
| | | 3-5 | ● | ● | NA | NA |
| | | 7-9 | ● | ● | NA | NA |
| | | [2] | NA | NA | ● | ● |
| 85-SB02 | 9 | 0-0.5 | ● | ● | NA | NA |
| | | 3-5 | ● | ● | NA | NA |
| | | 7-9 | ● | ● | NA | NA |
| 85-SB03 | 7 | 0-0.5 | ● | ● | NA | NA |
| | | 3-5 | ● | ● | NA | NA |
| | | 5-7 | ● | ● | NA | NA |
| 85-SB04 | 7 | 0-0.5 | ● | ● | NA | NA |
| | | 3-5 | ● | ● | NA | NA |
| | | 5-7 | ● | ● | NA | NA |
| 85-SB05 | 7 | 0-0.5 | ● | ● | NA | NA |
| | | 3-5 | ● | ● | NA | NA |
| | | 5-7 | ● | ● | NA | NA |

Notes:

[1] Below Ground Surface
[2] Composite Sample
TAL = Target
TCLP = Toxicity Characteristic Leaching Procedure
● = Sample analyzed for indicated parameter
NA = Not applicable

**TABLE 3-8**

**SOIL SAMPLING SUMMARY**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Sample Location | Depth of Borehole or Excavation Feet, bgs[1] | Sampling Interval Feet, bgs[1] | Analytical Parameters | | | |
|---|---|---|---|---|---|---|
| | | | TCL VOC | TCL SVOC | TCL Pesticide/PCB | TAL Metals |
| 87-SB01[2] | 1.0 | 0-1 | ● | ● | ● | ● |
| 87-SB02 | 1.0 | 0-1 | ● | ● | ● | ● |
| 87-SB03 | 1.0 | 0-1 | ● | ● | ● | ● |
| 87-SB04 | 1.0 | 0-1 | ● | ● | ● | ● |
| 87-SB05 | 1.0 | 0-1 | ● | ● | ● | ● |
| 87-SB06 | 1.0 | 0-1 | ● | ● | ● | ● |
| 87-TP01[3] | 8 | 8 | ● | ● | ● | ● |
| 87-TP02 | 8 | 8 | ● | ● | ● | ● |
| 87-TP03 | 8 | 8 | ● | ● | ● | ● |
| 87-TP04 | 8 | 8 | ● | ● | ● | ● |
| 87-TP05 | 8 | 8 | ● | ● | ● | ● |

Notes:

(1) Below Ground Surface
(2) Soil Sampling Identification for Soil Borings
(3) Soil Sampling Identification for Test Pits
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
● = Sample analyzed for indicated parameter

TABLE 3-9

GROUNDWATER SAMPLING SUMMARY
SITE 12, EXPLOSIVE ORDNANCE DISPOSAL AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Analytical Parameters | | | Duplicate Sample | MS/MSD |
|---|---|---|---|---|---|
| | TCL VOC[2] | TCL SVOC[2] | EPA 8020[1] | | |
| 12-GP01 | NA[3] | NA | ● | NA | NA |
| 12-GP02 | NA | NA | ● | NA | NA |
| 12-GP03 | NA | NA | ● | NA | NA |
| 12-GP04 | NA | NA | ● | NA | NA |
| 12-GP05 | NA | NA | ● | ● | ● |
| 12-GP06 | NA | NA | ● | NA | NA |
| 12-GP07 | NA | NA | ● | NA | NA |
| 12-GP08 | NA | NA | ● | NA | NA |
| 12-GP09 | NA | NA | ● | NA | NA |
| 12-GP10 | NA | NA | ● | NA | NA |
| 12-GP11 | NA | NA | ● | NA | NA |
| 12-GP12 | NA | NA | ● | NA | NA |
| 12-GP13 | NA | NA | ● | NA | NA |
| 12-GP14 | NA | NA | ● | NA | NA |
| 12-GP15 | NA | NA | ● | NA | NA |
| 12-GP16 | NA | NA | ● | NA | NA |
| 12-GP17 | NA | NA | ● | NA | NA |
| 12-GP18 | NA | NA | ● | NA | NA |
| 12-GP19 | NA | NA | ● | NA | NA |
| 12-GP20 | NA | NA | ● | NA | NA |
| 12-GP21 | NA | NA | ● | NA | NA |
| 12-GP22 | NA | NA | ● | NA | NA |
| 12-GP23 | NA | NA | ● | NA | NA |
| 12-GP24 | NA | NA | ● | NA | NA |
| 12-GP25 | NA | NA | ● | NA | NA |
| 12-GP26 | NA | NA | ● | NA | NA |

Notes:

(1) EPA Method 8020 performed on-site with Mobil Laboratory.
(2) TCL Analysis performed by CLP Laboratory.
● = Sample analyzed for indicated parameter.
NA = Not Applicable

**TABLE 3-9 (Continued)**

**GROUNDWATER SAMPLING SUMMARY**
**SITE 12, EXPLOSIVE ORDNANCE DISPOSAL AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Sample Location | Analytical Parameters | | | Duplicate Sample | MS/MSD |
|---|---|---|---|---|---|
| | TCL VOC[2] | TCL SVOC[2] | EPA 8020[1] | | |
| 12-GP27 | NA | NA | ● | NA | NA |
| 12-GP28 | NA | NA | ● | NA | NA |
| 12-GP29 | NA | NA | ● | NA | NA |
| 12-GP30 | NA | NA | ● | NA | NA |
| 12-GW01 | ● | ● | NA | ● | ● |
| 12-GW02 | ● | ● | NA | NA | NA |
| 12-GW03 | ● | ● | NA | NA | NA |
| 12-GW04 | ● | ● | NA | NA | NA |

Notes:

(1) EPA Method 8020 performed on-site with Mobil Laboratory.
(2) TCL Analysis performed by CLP Laboratory.
● = Sample analyzed for indicated parameter.
NA = Not Applicable

TABLE 3-10

SUMMARY OF FIELD PARAMETERS
FOR GROUNDWATER SAMPLING
SITE 12, EXPLOSIVE ORDNANCE DISPOSAL AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Well Number Date of Measurement | Measuring Time | Well Volumes | Field Parameters | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Purge Volumes (gals.) | Specific Conductance µmhos/cm | Temperature (°C) | pH (S.U) | Turbidity (N.T.U.) | Dissolved Oxygen (ml/L) |
| 12-GW01 1/29/96 | 1015 | 0 | 0.00 | 100.4 | 12.6 | 4.94 | >200 | 3.31 |
| | 1022 | 1 | 1.76 | 68.1 | 13.2 | 4.97 | >200 | 2.35 |
| | 1030 | 2 | 3.52 | 64.1 | 13.3 | 5.01 | 199.8 | 1.92 |
| | 1040 | 3 | 5.23 | 67.0 | 13.7 | 5.00 | 189.2 | 2.23 |
| | 1045 | 4 | 7.04 | 63.6 | 13.8 | 5.00 | 183.4 | 1.97 |
| | 1050 | 5 | 8.80 | 66.3 | 13.9 | 4.99 | 188.2 | 2.17 |
| | 1058 | 6 | 10.56 | 66.2 | 13.6 | 4.99 | 192.7 | 1.92 |
| | 1105 | 7 | 12.32 | 66.1 | 13.7 | 4.98 | 192.3 | 1.86 |
| | 1117 | 8 | 14.08 | 56.6 | 13.7 | 4.98 | 189.8 | 1.97 |
| | 1123 | 9 | 15.84 | 65.9 | 13.7 | 4.98 | 186.9 | 1.99 |
| | 1127 | 10 | 17.60 | 65.2 | 13.7 | 4.99 | 186.1 | 1.75 |
| | 1139 | 11 | 19.36 | 66.1 | 14.0 | 4.99 | 181.7 | 2.12 |
| | 1147 | 12 | 21.12 | 66.0 | 13.9 | 4.98 | 180.9 | 1.66 |
| | 1151 | 13 | 22.88 | 65.0 | 13.8 | 4.97 | 183.0 | 1.68 |
| | 1158 | 14 | 24.64 | 64.4 | 13.8 | 4.97 | 183.2 | 1.70 |
| | 1201 | 15 | 26.40 | 65.5 | 13.8 | 4.97 | 182.1 | 1.67 |

Notes:

N.T.U = Nephelometric Turbidity Units
S.U. = Standard Units
µmhos/cm = micro ohms per centimeter
ml/L = millilters per liter
°C = Degrees Centigrade

TABLE 3-10 (Contnued)

SUMMARY OF FIELD PARAMETERS
FOR GROUNDWATER SAMPLING
SITE 12, EXPLOSIVE ORDNANCE DISPOSAL AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Well Number Date of Measurement | Measuring Time | Well Volumes | Field Parameters | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Purge Volumes (gals.) | Specific Conductance µmhos/cm | Temperature (°C) | pH (S.U) | Turbidity (N.T.U.) | Dissolved Oxygen (ml/L) |
| 12-GW01 1/29/96 (Continued) | 1213 | 16 | 28.16 | 65.7 | 14.0 | 4.98 | 182.0 | 1.80 |
| | 1219 | 17 | 29.92 | 65.4 | 13.8 | 4.98 | 179.7 | 1.61 |
| | 1227 | 18 | 31.68 | 65.9 | 13.7 | 4.96 | 180.2 | 1.66 |
| | 1231 | 19 | 33.44 | 65.2 | 13.7 | 4.95 | 177.8 | 2.00 |
| | 1247 | 20 | 35.20 | 65.2 | 13.8 | 4.95 | 176.4 | 2.07 |
| | 1255 | 21 | 36.96 | 65.4 | 13.9 | 4.93 | 171.7 | 1.89 |
| | 1300 | 22 | 38.72 | 65.4 | 14.1 | 4.94 | 168.5 | 1.85 |
| | 1302 | 23 | 40.48 | 65.5 | 14.1 | 4.93 | 164.3 | 1.82 |
| | 1306 | 24 | 42.24 | 65.6 | 14.1 | 4.94 | 158.7 | 1.74 |
| | 1310 | 25 | 44.00 | 65.6 | 13.9 | 4.93 | 169.2 | 1.70 |
| | 1315 | 26 | 45.76 | 65.5 | 13.8 | 4.95 | 169.4 | 1.76 |
| 12-GW02 1/29/96 | 1406 | 0 | 0.00 | 42.82 | 15.4 | 5.12 | 13.8 | 4.88 |
| | 1417 | 1 | 1.20 | 41.22 | 15.9 | 5.23 | 21.8 | 4.86 |
| | 1422 | 2 | 2.40 | 41.00 | 15.1 | 5.29 | 11.7 | 4.39 |
| | 1431 | 3 | 3.60 | 40.00 | 15.4 | 5.29 | 6.8 | 4.90 |
| | 1439 | 4 | 4.80 | 41.14 | 14.5 | 5.32 | 3.8 | 4.82 |
| | 1444 | 5 | 6.00 | 40.00 | 14.1 | 5.31 | 3.8 | 4.18 |

Notes:

N.T.U = Nephelometric Turbidity Units
S.U. = Standard Units
µmhos/cm = micro ohms per centimeter
ml/L = millilters per liter
°C = Degrees Centigrade

TABLE 3-10 (Contnued)

SUMMARY OF FIELD PARAMETERS
FOR GROUNDWATER SAMPLING
SITE 12, EXPLOSIVE ORDNANCE DISPOSAL AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Well Number Date of Measurement | Measuring Time | Well Volumes | Field Parameters | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Purge Volumes (gals.) | Specific Conductance µmhos/cm | Temperature (°C) | pH (S.U) | Turbidity (N.T.U.) | Dissolved Oxygen (ml/L) |
| 12-GW02 1/29/96 (Continued) | 1456 | 6 | 7.20 | 40.84 | 13.9 | 5.32 | 2.5 | 3.56 |
| 12-GW03 1/30/96 | 819 | 0 | 0.00 | 37.31 | 10.4 | 5.09 | 6.3 | 3.40 |
| | 821 | 1 | 1.90 | 35.16 | 12.1 | 5.01 | 5.8 | 3.02 |
| | 836 | 2 | 3.80 | 34.11 | 12.4 | 4.94 | 3.3 | 2.65 |
| | 841 | 3 | 5.70 | 34.97 | 12.6 | 4.92 | 2.5 | 2.93 |
| | 847 | 4 | 7.60 | 35.02 | 12.7 | 4.91 | 2.3 | 2.87 |
| | 853 | 5 | 9.50 | 35.02 | 12.7 | 4.91 | 2.2 | 2.79 |
| | 903 | 6 | 11.40 | 34.68 | 12.8 | 4.93 | 1.9 | 2.79 |
| | 908 | 7 | 13.30 | 35.12 | 12.9 | 4.93 | 1.6 | 2.75 |
| | 916 | 8 | 15.20 | 35.12 | 12.9 | 4.92 | 1.3 | 2.54 |
| | 923 | 9 | 17.10 | 35.25 | 12.9 | 4.94 | 1.3 | 2.92 |
| | 928 | 10 | 19.00 | 34.99 | 12.9 | 4.92 | 1.1 | 2.60 |
| 12-GW04 1/30/96 | 928 | 0 | 0.00 | 35.48 | 13.8 | 5.15 | 56.3 | 2.44 |
| | 1005 | 1 | 0.89 | 33.57 | 15.2 | 5.22 | 21.6 | 2.23 |
| | 1010 | 2 | 1.78 | 34.33 | 15.5 | 5.24 | 19.4 | 2.00 |

Notes:

N.T.U = Nephelometric Turbidity Units
S.U. = Standard Units
µmhos/cm = micro ohms per centimeter
ml/L = millilters per liter
°C = Degrees Centigrade

TABLE 3-10 (Contnued)

SUMMARY OF FIELD PARAMETERS
FOR GROUNDWATER SAMPLING
SITE 12, EXPLOSIVE ORDNANCE DISPOSAL AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Well Number Date of Measurement | Measuring Time | Well Volumes | Field Parameters | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Purge Volumes (gals.) | Specific Conductance µmhos/cm | Temperature (°C) | pH (S.U) | Turbidity (N.T.U.) | Dissolved Oxygen (ml/L) |
| 12-GW04 1/30/96 (Continued) | 1020 | 3 | 2.67 | 34.56 | 15.2 | 5.25 | 17.6 | 1.67 |
| | 1027 | 4 | 3.56 | 34.91 | 15.4 | 5.27 | 18.7 | 1.66 |
| | 1033 | 5 | 4.45 | 35.52 | 15.4 | 5.27 | 19.2 | 1.74 |
| | 1041 | 6 | 5.34 | 25.80 | 15.5 | 5.29 | 19.4 | 1.66 |

Notes:

N.T.U = Nephelometric Turbidity Units
S.U. = Standard Units
µmhos/cm = micro ohms per centimeter
ml/L = millilters per liter
°C = Degrees Centigrade

TABLE 3-11

GROUNDWATER SAMPLING SUMMARY
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Analytical Parameters | | | | Duplicate Sample | MS/MSD |
|---|---|---|---|---|---|---|
| | TCL VOC | TCL SVOC | TCL Pesticide/PCB | TAL Metals | | |
| 68-GW01-01 | ● | ● | ● | ● | NA | ● |
| 68-GW01DW-01 | ● | ● | ● | ● | NA | NA |
| 68-GW02-01 | ● | ● | ● | ● | ● | NA |
| 68-GW03-01 | ● | ● | ● | ● | NA | NA |
| 68-GW04-01 | ● | ● | ● | ● | NA | NA |
| 68-GW04DW-01 | ● | ● | ● | ● | NA | NA |
| 68-GW05DW-01 | ● | ● | ● | ● | NA | NA |
| 68-GW06-01 | ● | ● | ● | ● | NA | NA |
| 68-GW06DW-01 | ● | ● | ● | ● | NA | NA |

Notes:

TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
● = Sample analyzed for indicated parameter
NA = Not applicable

**TABLE 3-12**

**SUMMARY OF FIELD PARAMETERS**
**FOR GROUNDWATER SAMPLING**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Well Number / Date of Measurement | Measuring Time | Well Volumes | Purge Volumes (gals.) | Field Parameters | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Specific Conductance (µmhos/cm) | Temperature (°C) | pH (S.U.) | Turbidity (N.T.U.) | Dissolved Oxygen (ml/L) |
| 68-GW01 1/24/96 | 916 | 0 | 0.0 | 48.3 | 15.1 | NA | 24.0 | 2.30 |
| | 930 | 1 | 2.0 | 43.4 | 14.8 | NA | 15.0 | 2.50 |
| | 1000 | 2 | 4.0 | 42.3 | 14.2 | NA | 7.0 | 2.70 |
| | 1019 | 3 | 6.0 | 41.3 | 14.1 | NA | 8.0 | 3.00 |
| 68-GW01D 127/96 | 855 | 0 | 0.0 | 10.9 | 15.4 | 6.39 | 1.0 | 2.90 |
| | 908 | 1 | 3.0 | 400.0 | 19.9 | 6.92 | 139.0 | 0.50 |
| | 916 | 2 | 6.0 | 409.0 | 18.2 | 7.18 | 87.7 | 0.65 |
| | 922 | 3 | 9.0 | 404.0 | 18.3 | 7.56 | 63.9 | 0.75 |
| | 928 | 5 | 15.0 | 412.0 | 18.2 | 7.36 | 47.3 | 0.50 |
| | 935 | 7 | 21.0 | 405.0 | 17.9 | 7.35 | 18.9 | 0.95 |
| | 955 | 11.5 | 35.0 | 406.0 | 17.8 | 7.49 | 15.2 | 1.10 |
| | 1010 | 15 | 45.0 | 400.0 | 17.6 | 4.43 | 17.6 | 1.00 |
| 68-GW02 1/24/96 | 1242 | 0 | 0.0 | 79.9 | 17.4 | NA | 5.0 | 2.35 |
| | 1250 | 1 | 1.5 | 77.9 | 16.8 | NA | 13.0 | 2.25 |
| | 1305 | 2 | 3.0 | 76.8 | 16.3 | NA | 8.0 | 1.90 |
| | 1322 | 3 | 4.5 | 76.7 | 16.2 | NA | 10.0 | 1.50 |
| 68-GW03 1/24/96 | 1413 | 0 | 0.0 | 74.1 | 15.9 | NA | 15.0 | 2.20 |
| | 1515 | 1 | 1.0 | 73.2 | 15.8 | NA | 15.0 | 2.30 |
| | 1600 | 2 | 2.0 | 73.5 | 15.6 | NA | 10.0 | 2.20 |
| 1/25/96 68-GW04 1/25/96 | 825 | 3 | 3.0 | 73.5 | 16.0 | NA | 10.0 | 2.20 |
| | 1250 | 0 | 0.0 | 175.6 | 15.4 | NA | 5.2 | 3.60 |
| | 1300 | 1 | 1.0 | 137.1 | 15.6 | NA | 3.2 | 3.15 |
| | 1307 | 2 | 2.0 | 136.3 | 15.2 | NA | 2.0 | 3.00 |
| | 1313 | 3 | 3.0 | 141.1 | 15.5 | NA | 1.3 | 3.00 |

Notes:

°C = Degrees Centigrade
S.U. = Standard Units
mg/L = Milligrams per Liter
µmhos/cm = micro ohms per Centimeter
ppt = Parts per Thousand
N.T.U. = Neophelometric Turbidity Units

**TABLE 3-12 (Continued)**

**SUMMARY OF FIELD PARAMETERS**
**FOR GROUNDWATER SAMPLING**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Well Number / Date of Measurement | Measuring Time | Well Volumes | Purge Volumes (gals.) | Field Parameters | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Specific Conductance (µmhos/cm) | Temperature (°C) | pH (S.U.) | Turbidity (N.T.U.) | Dissolved Oxygen (ml/L) |
| 68-GW04D 1/25/96 | 1350 | 0 | 0.00 | 612.00 | 15.9 | NA | 2.08 | 3.10 |
| | 1417 | 1 | 3.50 | 616.00 | 15.6 | NA | 0.81 | 1.55 |
| | 1437 | 2 | 4.00 | 608.00 | 15.8 | NA | 0.68 | 1.50 |
| | 1505 | 3 | 10.50 | 605.00 | 14.8 | NA | 0.75 | 1.50 |
| 68-GW05D 1/26/96 | 810 | 0 | 0.00 | 682.00 | 14.4 | 6.61 | 14.10 | 2.25 |
| | 823 | 1 | 2.00 | 613.00 | 15.3 | 6.72 | 12.50 | 1.55 |
| | 840 | 2 | 4.00 | 583.00 | 15.5 | 6.80 | 4.85 | 2.50 |
| | 857 | 3 | 6.00 | 586.00 | 14.6 | 6.82 | 2.70 | 1.60 |
| 68-GW06 | 1114 | 0 | 0.00 | 212.00 | 15.6 | 6.72 | NA | 3.40 |
| 1/26/96 | 1119 | 1 | 0.50 | 191.00 | 16.4 | 6.62 | NA | 3.25 |
| | 1124 | 2 | 1.00 | 211.00 | 16.5 | 6.61 | NA | 3.25 |
| | 1129 | 3 | 1.50 | 220.00 | 16.5 | 6.62 | NA | 2.75 |
| 68-GW06D | 945 | 0 | 0.00 | 592.00 | 15.1 | 7.08 | NA | 1.50 |
| | 1013 | 1 | 2.50 | 566.00 | 15.8 | 6.95 | NA | 1.90 |
| | 1025 | 2 | 5.00 | 518.00 | 16.0 | 6.80 | NA | 1.60 |
| | 1050 | 3 | 7.50 | 500.00 | 15.7 | 6.73 | NA | 1.60 |

Notes:

°C = Degrees Centigrade
S.U. = Standard Units
mg/L = Milligrams per Liter
µmhos/cm = micro ohms per Centimeter
ppt = Parts per Thousand
N.T.U. = Neophelometric Turbidity Units

TABLE 3-13

GROUNDWATER SAMPLING SUMMARY
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Analytical Parameters | | | | | | Duplicate Sample | MS/MSD |
|---|---|---|---|---|---|---|---|---|
| | TCL VOC | TCL SVOC | TCL Pesticide/PCB | TAL Metals | TAL Dissolved Metals | 8270[1] | | |
| 75-GW01-01 | ● | ● | ● | ● | NA | ● | ● | ● |
| 75-GW02-01 | ● | ● | ● | ● | ● | ● | NA | NA |
| 75-GW03-01 | ● | ● | ● | ● | NA | ● | NA | NA |
| 75-GW04-01 | ● | ● | ● | ● | ● | ● | NA | NA |
| 75-GW05-01 | ● | ● | ● | ● | NA | ● | NA | NA |

Notes:

[1] Modified 8270 for Chloropicrin and Chloroacetophenone
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
● = Sample analyzed for indicated parameter
NA = Not applicable

TABLE 3-14

GROUNDWATER SAMPLING SUMMARY
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO 0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Analytical Parameters | | | | | | Duplicate Sample | MS\MSD |
|---|---|---|---|---|---|---|---|---|
| | TCL VOC | TCL SVOC | TCL Pesticides \PCB | TAL Metals | TAL Dissolved Metals | 8270[1] | | |
| 76-GW01-01 | ● | ● | ● | ● | | ● | ● | ● |
| 76-GW02-01 | ● | ● | ● | ● | ● | ● | | |
| 76-GW03-01 | ● | ● | ● | ● | | ● | | |
| 76-GW04-01 | ● | ● | ● | ● | ● | ● | | |
| 76-GW05-01 | ● | ● | ● | ● | | ● | | |

Notes:

(1) Modified 8270 for Chloropicrin and Chloroacetophenone

**TABLE 3-15**

**SUMMARY OF FIELD PARAMETERS**
**FOR GROUNDWATER SAMPLING**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Well Number/ Date of Measurement | Measuring Time | Well Volumes | Purge Volumes (gals.) | Field Parameters | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Specific Conductance µmhos/cm | Temperature (°C) | pH (S.U.) | Turbidity (N.T.U) | Dissolved Oxygen (ml/L) |
| 75-GW01 2/24/96 | 1555 | 0.00 | 0.00 | 72.1 | 14.3 | 4.95 | <60 | 3.20 |
| | 1601 | 0.50 | 1.30 | 71.2 | 14.0 | 5.08 | <40 | 2.90 |
| | 1606 | 1.00 | 2.75 | 71.2 | 14.2 | 5.12 | <25 | 2.90 |
| | 1611 | 1.50 | 4.10 | 70.6 | 14.1 | 5.10 | <20 | 2.90 |
| | 1616 | 2.00 | 5.50 | 70.6 | 13.9 | 5.10 | <20 | 2.70 |
| | 1622 | 2.50 | 6.80 | 71.0 | 14.2 | 5.06 | <10 | 2.40 |
| | 1627 | 3.00 | 8.25 | 70.2 | 14.1 | 5.12 | <10 | 2.40 |
| 75-GW02 2/25/96 | 730 | 0.00 | 0.00 | 132.3 | 12.5 | 6.22 | 36.10 | 3.50 |
| | 735 | 0.50 | 1.25 | 135.8 | 13.1 | 6.23 | 101.80 | 3.10 |
| | 740 | 1.00 | 2.50 | 138.0 | 13.4 | 6.21 | 37.60 | 3.10 |
| | 745 | 1.50 | 3.75 | 139.7 | 13.3 | 6.21 | 17.97 | 3.20 |
| | 750 | 2.00 | 5.00 | 138.0 | 13.6 | 6.21 | 8.75 | 3.10 |
| | 755 | 2.50 | 6.25 | 137.9 | 14.0 | 6.21 | 5.93 | 2.80 |
| | 800 | 3.00 | 7.50 | 139.5 | 13.8 | 6.21 | 4.51 | 3.00 |
| 75-GW03 2/24/96 | 1729 | 0.00 | 0.00 | 62.9 | 13.8 | 4.14 | <20 | 2.70 |
| | 1738 | 1.00 | 2.30 | 63.3 | 14.2 | 4.09 | <20 | 1.80 |
| | 1743 | 1.50 | 3.45 | 63.1 | 14.3 | 4.50 | <15 | 2.00 |
| | 1747 | 2.00 | 4.60 | 64.2 | 14.3 | 4.12 | <10 | 2.00 |
| | 1751 | 2.50 | 5.75 | 64.1 | 14.2 | 4.17 | <10 | 1.90 |
| | 1757 | 3.00 | 6.90 | 64.2 | 14.4 | 4.22 | <10 | 2.00 |
| 75-GW04 02/25/96 | 1430 | 0.00 | 0.00 | 140.3 | 16.0 | 4.48 | 7.0 | 5.10 |
| | 1434 | 0.50 | 1.25 | 132.3 | 15.1 | 5.65 | 3.9 | 5.10 |
| | 1438 | 1.00 | 2.30 | 118.2 | 15.0 | 5.72 | 2.4 | 5.00 |
| | 1441 | 1.50 | 3.45 | 118.2 | 14.7 | 5.65 | 2.3 | 5.30 |
| | 1446 | 2.00 | 4.60 | 119.6 | 14.7 | 5.58 | 2.8 | 5.00 |
| | 1454 | 2.50 | 5.75 | 117.7 | 15.3 | 5.57 | 2.8 | 4.60 |
| | 1457 | 3.00 | 6.90 | 118.4 | 14.7 | 5.54 | 3.3 | 5.00 |

Notes:

N.T.U. = Nephelometric Turbidity Units
S.U. = Standard Units
µmhos/cm = micro ohms per centimeter
ml/L = millilters per liter
°C = Degrees Centigrade

**TABLE 3-15 (Continued)**

**SUMMARY OF FIELD PARAMETERS**
**FOR GROUNDWATER SAMPLING**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Well Number/ Date of Measurement | Measuring Time | Well Volumes | Purge Volumes (gals.) | Field Parameters | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Specific Conductance µmhos/cm | Temperature (°C) | pH (S.U.) | Turbidity (N.T.U) | Dissolved Oxygen (ml/L) |
| 75-GW05 02/25/96 | 1650 | 0.00 | 0.00 | 181.4 | 15.7 | 5.23 | 7.44 | 4.20 |
| | 1654 | 0.50 | 1.10 | 176.2 | 15.8 | 5.33 | 3.38 | 4.50 |
| | 1658 | 1.00 | 2.20 | 176.7 | 16.2 | 5.34 | 1.80 | 4.50 |
| | 1702 | 1.50 | 3.30 | 172.2 | 15.9 | 5.36 | 1.60 | 4.50 |
| | 1706 | 2.00 | 4.40 | 174.8 | 16.0 | 5.37 | 1.20 | 4.30 |
| | 1710 | 2.50 | 5.50 | 175.0 | 16.0 | 5.38 | 0.09 | 4.50 |
| | 1714 | 3.00 | 6.60 | 177.0 | 15.9 | 5.35 | 0.75 | 4.20 |

Notes:

N.T.U. = Nephelometric Turbidity Units
S.U. = Standard Units
µmhos/cm = micro ohms per centimeter
ml/L = millilters per liter
°C = Degrees Centigrade

TABLE 3-16

SUMMARY OF FIELD PARAMETERS
FOR GROUNDWATER SAMPLING
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Well Number/ Date of Measurement | Measuring Time | Well Volumes | Field Parameters | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Purge Volumes (gals.) | Specific Conductance µhmos/cm | Temperature (°C) | pH (S.U.) | Turbidity (N.T.U.) | Dissolved Oxygen (ml/L) |
| 76-GW01 2/25/96 | 917 | 0.00 | 0.00 | 249.5 | 13.1 | 4.43 | 9.07 | 2.50 |
| | 921 | 0.50 | 1.00 | 243.4 | 13.4 | 4.46 | 21.10 | 3.00 |
| | 925 | 1.00 | 2.00 | 242.2 | 13.7 | 4.47 | 38.80 | 2.90 |
| | 929 | 1.50 | 3.00 | 245.4 | 14.1 | 4.45 | 37.80 | 2.75 |
| | 933 | 2.00 | 4.00 | 245.1 | 14.4 | 4.47 | 21.30 | 2.50 |
| | 937 | 2.50 | 5.00 | 243.8 | 14.1 | 4.52 | 14.20 | 2.40 |
| | 941 | 3.00 | 6.00 | 254.5 | 14.6 | 4.51 | 9.89 | 2.40 |
| | 945 | 3.50 | 7.00 | 251.8 | 14.3 | 4.50 | 7.65 | 2.40 |
| 76-GW02 2/25/96 | 1057 | 0.00 | 0.00 | 315.7 | 14.2 | 7.05 | 192.10 | 1.90 |
| | 1101 | 0.50 | 1.15 | 311.9 | 14.6 | 7.11 | 81.30 | 1.70 |
| | 1105 | 1.00 | 2.30 | 307.8 | 14.8 | 7.14 | 25.80 | 1.50 |
| | 1109 | 1.50 | 3.45 | 308.4 | 14.8 | 7.14 | 16.30 | 1.70 |
| | 1113 | 2.00 | 4.60 | 312.8 | 14.9 | 7.13 | 12.60 | 1.70 |
| | 1117 | 2.50 | 5.75 | 309.0 | 14.8 | 7.14 | 8.50 | 1.60 |
| | 1121 | 3.00 | 6.90 | 310.0 | 14.9 | 7.14 | 8.20 | 1.40 |
| 76-GW03 2/25/96 | 1318 | 0.00 | 0.00 | 288.1 | 15.9 | 4.68 | 15.88 | 1.50 |
| | 1322 | 0.50 | 1.00 | 288.5 | 15.9 | 4.64 | 8.13 | 1.60 |
| | 1326 | 1.00 | 2.00 | 275.5 | 16.0 | 4.69 | 1.66 | 1.60 |
| | 1330 | 1.50 | 3.00 | 273.9 | 15.9 | 4.71 | 1.09 | 1.30 |
| | 1334 | 2.00 | 4.00 | 274.4 | 15.8 | 4.72 | 0.81 | 1.50 |
| | 1338 | 2.50 | 5.00 | 271.8 | 16.1 | 4.73 | 0.62 | 1.60 |
| | 1342 | 3.00 | 6.00 | 267.5 | 16.2 | 4.74 | 0.55 | 1.60 |
| 76-GW04 02/25/96 | 1200 | 0.00 | 0.00 | 286.1 | 15.8 | 6.12 | 5.8 | 4.90 |
| | 1204 | 0.50 | 0.85 | 284.3 | 15.1 | 6.20 | 6.0 | 4.00 |
| | 1208 | 1.00 | 1.70 | 292.3 | 15.0 | 6.25 | 32.3 | 3.70 |
| | 1212 | 1.50 | 2.55 | 292.2 | 14.9 | 6.21 | 54.1 | 3.40 |
| | 1216 | 2.00 | 3.40 | 293.5 | 15.1 | 6.21 | 52.1 | 3.20 |
| | 1220 | 2.50 | 4.25 | 296.3 | 15.8 | 6.25 | 35.3 | 3.20 |
| | 1224 | 3.00 | 5.10 | 290.5 | 15.2 | 6.24 | 25.3 | 3.40 |
| | 1228 | 3.50 | 5.95 | 290.0 | 15.1 | 6.22 | 14.8 | 3.50 |
| | 1232 | 4.00 | 6.80 | 289.0 | 15.7 | 6.20 | 7.6 | 2.70 |
| 76-GW05 2/25/96 | 1540 | 0.00 | 0.00 | 172.8 | 14.0 | 6.40 | 5.30 | 2.70 |
| | 1544 | 0.50 | 1.00 | 175.8 | 13.9 | 6.46 | 1.60 | 2.70 |

Notes:

N.T.U. = Nephelometric Turbidity Units
S.U. = Standard Units
µmhos/cm = micro ohms per centimeter
ml/L = millilters per liter
°C = Degrees Centigrade

**TABLE 3-16 (Continued)**

**SUMMARY OF FIELD PARAMETERS**
**FOR GROUNDWATER SAMPLING**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Well Number/ Date of Measurement | Measuring Time | Well Volumes | Field Parameters | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Purge Volumes (gals.) | Specific Conductance µhmos/cm | Temperature (°C) | pH (S.U.) | Turbidity (N.T.U.) | Dissolved Oxygen (ml/L) |
| | 1548 | 1.00 | 2.00 | 177.5 | 13.9 | 6.52 | 1.40 | 2.80 |
| | 1552 | 1.50 | 3.00 | 173.8 | 14.0 | 6.43 | 0.80 | 2.40 |
| | 1556 | 2.00 | 4.00 | 173.2 | 14.1 | 6.41 | 0.70 | 2.40 |
| | 1600 | 2.50 | 5.00 | 175.1 | 14.0 | 6.42 | 1.00 | 2.70 |
| | 1604 | 3.00 | 6.00 | 173.9 | 13.9 | 6.39 | 0.90 | 2.60 |

Notes:

N.T.U. = Nephelometric Turbidity Units
S.U. = Standard Units
µmhos/cm = micro ohms per centimeter
ml/L = millilters per liter
◦C = Degrees Centigrade

TABLE 3-17

GROUNDWATER SAMPLING SUMMARY
SITE 84, BUILDING 45 AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Analytical Parameter<br>TCL<br>PCB | Analytical Parameter<br>TCL<br>VOC |
|---|---|---|
| 84-GW01[1] | ● | |
| 84-GW07[2] | ● | |
| 84-GW13[2] | ● | |
| **Additional sampling based on results of Draft Pre-RI Screening Study and the RCRA SWMU Confirmation Sampling** | | |
| AST781-GW03 | | ● |
| AST781-GW04 | | ● |
| AST781-GW07 | | ● |
| AST781-GW08 | | ● |
| AST781-GW11 | | ● |
| AST781-GW12 | | ● |

Notes:

[1] Temporary well installed by Direct Push Methods
[2] Permanent groundwater monitoring well
TCL = Target Compound List
● = Sample analyzed for indicated parameter

**TABLE 3-18**

**SUMMARY OF FIELD PARAMETERS**
**FOR GROUNDWATER SAMPLING**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| | | | | Field Parameters | | | | |
|---|---|---|---|---|---|---|---|---|
| Well Number | Date of Sampling | Measuring Time | Well Volumes | Purge Volumes (gals.) | Dissolved Oxygen (ml/L) | Turbidity (N.T.U.) | pH (S.U.) | Turbidity (N.T.U.) |
| 84-MW07 | 10/25/95 | 1310 | 0 | 0.0 | 1.8 | 45.0 | -- | -- |
| | | 1315 | 1 | 1.5 | 1.1 | 25.0 | -- | -- |
| | | 1320 | 2 | 3.0 | 1.5 | 8.5 | -- | -- |
| | | 1325 | 3 | 4.5 | 1.4 | 4.2 | -- | -- |
| | | 1330 | 4 | 6.0 | 1.4 | 2.8 | -- | -- |
| | | 1335 | 5 | 7.5 | 1.3 | 2.1 | -- | -- |
| | | 1340 | 6 | 9.0 | 1.5 | 2.8 | -- | -- |
| | | 1345 | 7 | 10.5 | 3.0 | 4.4 | -- | -- |
| | | 1347 | 8 | 12.0 | 1.6 | 1.9 | -- | -- |
| 84-MW13 | 10/25/95 | 1418 | 0 | 0 | 4.4 | 37.0 | -- | -- |
| | | 1420 | 1 | 1 | 3.7 | 28.0 | -- | -- |
| | | 1422 | 2 | 2 | 3.0 | 21.0 | -- | -- |
| | | 1424 | 3 | 3 | 2.0 | 18.0 | -- | -- |
| | | 1426 | 4 | 4 | 2.1 | 12.5 | -- | -- |
| | | 1428 | 5 | 5 | 1.9 | 9.5 | -- | -- |
| | | 1430 | 6 | 6 | 2.0 | 7.6 | -- | -- |
| | | 1432 | 7 | 7 | 1.9 | 6.0 | -- | -- |
| | | 1434 | 8 | 8 | 1.6 | 4.7 | -- | -- |
| | | 1436 | 9 | 9 | 1.9 | 4.5 | -- | -- |
| | | 1438 | 10 | 10 | 1.4 | 4.0 | -- | -- |
| | | 1440 | 11 | 11 | 1.7 | 3.6 | -- | -- |
| | | 1442 | 12 | 12 | 1.8 | 3.2 | -- | -- |
| | | 1444 | 13 | 13 | 1.8 | 2.8 | -- | -- |
| | | 1446 | 14 | 14 | 1.8 | 2.8 | -- | -- |
| | | 1448 | 15 | 15 | 1.9 | 2.8 | -- | -- |
| Additional Sampling Based on Results of Draft Pre-RI Screening Study | | | | | | | | |
| Well Number | Date of Sampling | Measuring Time | Well Volumes | Purge Volumes (gals.) | Specific Conductance mmhs/cm | Temperature °c | pH (S.U.) | Turbidity (N.T.U.) |
| AST781-GW03 | 4/23/98 | 0803 | 0.5 | 0.35 | 683 | 15.9 | 6.03 | 24 |
| | | 0808 | 1.0 | 0.7 | 642 | 15.8 | 6.13 | 12 |
| | | 0822 | 1.5 | 1.05 | 613 | 15.7 | 6.09 | 6.5 |
| | | 0833 | 2.0 | 1.40 | 598 | 15.5 | 6.14 | 9.5 |
| | | 0845 | 2.5 | 1.75 | 595 | 16.0 | 6.14 | 8.0 |
| | | 0853 | 3.0 | 2.10 | 583 | 15.9 | 6.08 | 4.8 |
| AST781-GW04 | 4/23/98 | 0800 | 0.5 | 1.6 | 411.5 | 16.8 | 5.56 | 11 |
| | | 0810 | 1.0 | 3.2 | 405.5 | 16.6 | 5.72 | 8.0 |
| | | 0818 | 1.5 | 4.8 | 399.9 | 16.9 | 5.68 | 6 |
| | | 0829 | 2.0 | 6.4 | 405.9 | 16.2 | 5.68 | 4.5 |
| | | 0839 | 2.5 | 8.0 | 405.5 | 17.1 | 5.74 | 4.0 |
| | | 0848 | 3.0 | 9.6 | 406.6 | 16.9 | 5.75 | 4.3 |

TABLE 3-18 (continued)

SUMMARY OF FIELD PARAMETERS
FOR GROUNDWATER SAMPLING
SITE 84, BUILDING 45 AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Additional Sampling Based on Results of Draft Pre-RI Screening Study | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Well Number | Date of Sampling | Measuring Time | Well Volumes | Purge Volumes (gals.) | Specific Conductance mmhs/cm | Temperature °c | pH (S.U.) | Turbidity (N.T.U.) |
| AST781-GW07 | 4/22/98 | 1559 | 0.5 | 0.95 | 460.3 | 16.0 | 6.73 | 106 |
| | | 1702 | 1.0 | 1.9 | 454.3 | 15.7 | 6.48 | 53 |
| | | 1707 | 1.5 | 2.85 | 470.9 | 15.4 | 6.44 | 29 |
| | | 1714 | 2.0 | 3.80 | 473.9 | 15.5 | 6.39 | 16 |
| | | 1719 | 2.5 | 4.75 | 481.0 | 15.4 | 6.40 | 10.6 |
| | | 1725 | 3.0 | 5.70 | 484.4 | 15.3 | 6.40 | 7.0 |
| AST781-GW08 | 4/22/98 | 1545 | 0.5 | 2.2 | 513.0 | 17.0 | 6.45 | 18 |
| | | 1554 | 1.0 | 4.4 | 503.0 | 16.9 | 6.48 | 16.4 |
| | | 1604 | 1.5 | 6.6 | 494.9 | 16.8 | 6.47 | 10 |
| | | 1615 | 2.0 | 8.8 | 489.2 | 17.0 | 6.47 | 7.0 |
| | | 1631 | 2.5 | 11.0 | 486.1 | 17.2 | 6.47 | 4.5 |
| | | 1647 | 3.0 | 13.2 | 479.4 | 17.2 | 6.49 | 4.2 |
| AST781-GW11 | 4/23/98 | 0958 | 0.5 | 0.8 | 183.9 | 15.8 | 6.70 | 6.5 |
| | | 1004 | 1.0 | 1.6 | 185.0 | 16.1 | 6.80 | 5.0 |
| | | 1012 | 1.5 | 2.4 | 182.6 | 16.0 | 6.80 | 4.0 |
| | | 1016 | 2.0 | 3.2 | 184.4 | 16.1 | 6.85 | 5.0 |
| | | 1023 | 2.5 | 4.0 | 183.4 | 15.8 | 6.78 | 3.4 |
| | | 1032 | 3.0 | 4.8 | 184.4 | 15.9 | 6.82 | 3.2 |
| AST781-GW12 | 4/23/98 | 1001 | 0.5 | 1.5 | 174.0 | 16.4 | 6.53 | 154 |
| | | 1008 | 1.0 | 3.0 | 174.9 | 16.0 | 6.60 | 62 |
| | | 1019 | 1.5 | 4.5 | 173.4 | 16.2 | 6.64 | 24 |
| | | 1028 | 2.0 | 6.0 | 173.3 | 16.1 | 6.60 | 13 |
| | | 1037 | 2.5 | 7.5 | 172.3 | 16.3 | 6.55 | 10.4 |
| | | 1045 | 3.0 | 9.0 | 171.6 | 16.2 | 6.56 | 8.5 |

Notes:

N.T.U. = Nephelometric Turbidity Units
ml/L = milliliter per liter
-- = Not Measured

**TABLE 3-19**

**GROUNDWATER SAMPLING SUMMARY**
**TEMPORARY MONITORING WELLS**
**SITE 85, CAMP JOHNSON BATTERY DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Sample Location | Analytical Parameters | | |
|---|---|---|---|
| | TAL Metals | TAL Dissolved Metals | Cyanide |
| 85-TW01 | ● | ● | ● |
| 85-TW02 | ● | ● | ● |
| 85-TW03 | ● | ● | ● |

Notes:

TAL = Target Analyte List
● = Sample analyzed for indicated parameter

**TABLE 3-20**

**GROUNDWATER SAMPLING SUMMARY**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Sample Location | Analytical Parameters | | | |
|---|---|---|---|---|
| | TCL VOC | TCL SVOC | TCL Pesticides/PCB | TAL Metals |
| 87-GW01[1] | ● | ● | ● | ● |
| 87-GW02[1] | ● | ● | ● | ● |

Notes:

[1] Existing monitoirng well installed by ESE, 1986.
TCL = Target Compound List
TAL = Target Analyte List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compoun
● = Sample analyzed for indicated parameter

**TABLE 3-21**

**SUMMARY OF FIELD PARAMETERS FOR GROUNDWATER**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Well Number | Date of Measurement | Measuring Time | Well Volumes | Field Parameters | | |
|---|---|---|---|---|---|---|
| | | | | Purge Volumes (gals.) | Dissolved Oxygen (ml/L) | Turbidity (N.T.U.) |
| 87-MW01 | 10/26/95 | 1312 | 0.00 | 0 | 4.7 | 58.5 |
| | | 1315 | 0.09 | 0.21 | 4.3 | 49.6 |
| | | 1320 | 0.24 | 0.56 | 4.1 | 41.0 |
| | | 1325 | 0.39 | 0.91 | 4.2 | 27.4 |
| | | 1330 | 0.54 | 1.26 | 4.6 | 16.5 |
| | | 1335 | 0.70 | 1.61 | 4.4 | 10.5 |
| | | 1340 | 0.85 | 1.96 | 4.7 | 8.2 |
| | | 1345 | 1.00 | 2.31 | 4.6 | 7.1 |
| | | 1350 | 1.20 | 2.66 | 4.7 | 6.1 |
| | | 1355 | 1.30 | 3.01 | 4.9 | 5.0 |
| | | 1400 | 1.50 | 3.36 | 4.9 | 5.0 |
| | | 1405 | 1.60 | 3.71 | 4.6 | 5.0 |
| 87-MW02 | 10/26/95 | 935 | 0.08 | 0.25 | 1.6 | >200 |
| | | 940 | 0.17 | 0.5 | 2.0 | >200 |
| | | 945 | 0.26 | 0.75 | 1.9 | >200 |
| | | 950 | 0.35 | 1 | 3.2 | >200 |

Notes:

N.T.U = Nephelometric Turbidity Units
ml/L = milliliter per liter

TABLE 3-21 (Continued)

SUMMARY OF FIELD PARAMETERS FOR GROUNDWATER
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Well Number | Date of Measurement | Measuring Time | Well Volumes | Field Parameters | | |
|---|---|---|---|---|---|---|
| | | | | Purge Volumes (gals.) | Dissolved Oxygen (ml/L) | Turbidity (N.T.U.) |
| 87-MW02 (Continued) | 10/26/96 | 955 | 0.44 | 1.25 | 1.5 | >200 |
| | | 1000 | 0.53 | 1.5 | 2.0 | >200 |
| | | 1010 | 0.62 | 1.75 | 2.5 | >200 |
| | | 1015 | 0.78 | 2.2 | 2.5 | >200 |
| | | 1020 | 0.8 | 2.25 | 2.4 | 120.0 |
| | | 1025 | 0.89 | 2.5 | 2.4 | 80.0 |
| | | 1030 | 0.98 | 2.75 | 2.7 | 70.0 |
| | | 1035 | 1.07 | 3 | 2.9 | 64.0 |
| | | 1040 | 1.16 | 3.25 | 2.9 | 52.0 |
| | | 1045 | 1.25 | 3.5 | 2.5 | 50.8 |
| | | 1050 | 1.33 | 3.75 | 2.9 | 44.0 |
| | | 1055 | 1.42 | 4 | 2.6 | 40.0 |
| | | 1100 | 1.51 | 4.25 | 2.6 | 36.9 |
| | | 1105 | 1.60 | 4.5 | 2.6 | 34.9 |

Notes:

N.T.U = Nephelometric Turbidity Units
ml/L = milliliter per liter

TABLE 3-22

SURFACE WATER AND SEDIMENT SAMPLING SUMMARY
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Analytical Parameters | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sampling Interval Feet, bgs[1] | TCL VOC | TCL SVOC | TCL Pesticides/ PCB | TAL Metals | Duplicate Sample | MS/MSD |
| 68-SW01 | NA | ● | ● | ● | ● | ● | ● |
| 68-SD01 | 0-0.5 | ● | ● | ● | ● | ● | ● |
| 68-SW02 | NA | ● | ● | ● | ● | NA | NA |
| 68-SD02 | 0-0.5 | ● | ● | ● | ● | NA | NA |
| 68-SW03 | NA | ● | ● | ● | ● | NA | NA |
| 68-SD03 | 0-0.5 | ● | ● | ● | ● | NA | NA |
| 68-SW04 | NA | ● | ● | ● | ● | NA | NA |
| 68-SD04 | 0-0.5 | ● | ● | ● | ● | NA | NA |
| 68-SW05 | NA | ● | ● | ● | ● | NA | NA |
| 68-SD05 | 0-0.5 | ● | ● | ● | ● | NA | NA |
| 68-SW06 | NA | ● | ● | ● | ● | NA | NA |
| 68-SD06 | 0-0.5 | ● | ● | ● | ● | NA | NA |
| 68-SW07 | NA | ● | ● | ● | ● | NA | NA |
| 68-SD07 | 0-0.5 | ● | ● | ● | ● | NA | NA |
| 68-SW08 | NA | ● | ● | ● | ● | NA | NA |
| 68-SD08 | 0-0.5 | ● | ● | ● | ● | NA | NA |
| 68-SW09 | NA | ● | ● | ● | ● | NA | NA |
| 68-SD09 | 0-0.5 | ● | ● | ● | ● | NA | NA |
| 68-SW10 | NA | ● | ● | ● | ● | NA | NA |
| 68-SD10 | 0-0.5 | ● | ● | ● | ● | NA | NA |

Notes:

TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
● = Sample Analyzed for indicated parameter
NA = Not applicable

TABLE 3-23

SUMMARY OF FIELD PARAMETERS FOR
SURFACE WATER AND SEDIMENT SAMPLING
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Location | Temperature (°C) | pH S.U. | Dissolved Oxygen (mgL) | Specific Conductance (umhos/cm) | Salinity (ppt) | Turbidity N.T.U. |
|---|---|---|---|---|---|---|
| 68-SW/SD01 | 4.7 | 7.35 | 6.82 | 62 | 0.0 | 2.4 |
| 68-SW/SD02 | 5.2 | 7.33 | 6.96 | 75.2 | 0.1 | 8.0 |
| 68-SW/SD03 | 4.4 | 7.22 | 7.38 | 151.8 | 0.1 | 3.4 |
| 68-SW/SD04 | 2.2 | 7.22 | 8.50 | 699 | 0.6 | 5.2 |
| 68-SW/SD05 | 2.0 | 6.84 | 7.77 | 770 | 0.7 | 4.2 |
| 68-SW/SD06 | 4.0 | 7.24 | 6.99 | 210.3 | 0.2 | 6.2 |
| 68-SW/SD07 | 4.8 | 6.98 | 7.00 | 218.8 | 0.2 | 4.7 |
| 68-SW/SD08 | 5.8 | 7.14 | 7.60 | 130.7 | 0.1 | 2.7 |
| 68-SW09/SD09 | 7.6 | 7.23 | 6.21 | 104.9 | 0.1 | 3.1 |
| 68-SW/SD10 | 7.9 | 7.22 | 6.79 | 101 | 0.1 | 2.9 |

Notes:

°C = Degrees Centigrade
S.U. = Standard Units
mg/L = Milligrams per Liter
umhos/cm = micro ohms per Centimeter
ppt = Parts per Thousand
N.T.U. = Neophelometric Turbitity Units

**TABLE 3-24**

**SURFACE WATER AND SEDIMENT SAMPLING SUMMARY**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Sample Location | Sampling Interval Feet, bgs[1] | Analytical Parameters | | |
|---|---|---|---|---|
| | | TCL Pesticides/ PCB | Duplicate Sample | MS/MSD |
| 84-SW01 | NA | ● | ● | ● |
| 84-SD01 | 0-0.5 | ● | ● | ● |
| 84-SW02 | NA | ● | NA | NA |
| 84-SD02 | 0-0.5 | ● | NA | NA |
| 84-SW03 | NC | NA | NA | NA |
| 84-SD03 | NC | NA | NA | NA |
| 84-SW04 | NA | ● | NA | NA |
| 84-SD04 | 0-0.5 | ● | NA | NA |
| 84-SW05 | NA | ● | NA | NA |
| 84-SD05 | 0-0.5 | ● | NA | NA |
| 84-SW06 | NA | ● | NA | NA |
| 84-SD06 | 0-0.5 | ● | NA | NA |
| 84-SW07 | NA | ● | NA | NA |
| 84-SD07 | 0-0.5 | ● | NA | NA |
| 84-SW08 | NA | ● | NA | NA |
| 84-SD08 | 0-0.5 | ● | NA | NA |

Notes:

[1] Below Ground Surface
NA = Not Applicable
NC = Not Collected. This sample sation was not necessary due to adequate site coverage by adjacent sample stations.
TCL = Target Compound List

**TABLE 3-25**

**SURFACE WATER AND SEDIMENT SAMPLING SUMMARY**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Sampling | | Analytical Parameters | | | |
|---|---|---|---|---|---|
| Sample Location | Interval Feet, bgs [1] | TCL VOC | TCL SVOC | TCL Pesticides/ PCB | TAL Metals |
| 87-SW01 | NA | ● | ● | ● | ● |
| 87-SD01 | 0-0.5 | ● | ● | ● | ● |
| 87-SW02 | NA | ● | ● | ● | ● |
| 87- D02 | 0-0.5 | ● | ● | ● | ● |

Notes:

[1] Below Ground Surface
NA = Not Applicable
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
● = Sample analyzed for indicated parameter
NA = Not applicable

TABLE 3-26

SAMPLE IDENTIFICATION CORRELATION TABLE
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Original Sample ID | ID Used in This Report |
|---|---|
| **Site 87** | |
| CLOAS1 | 87-SB01 |
| CLOAS2 | 87-SB02 |
| CLOAS3 | 87-SB03 |
| CLOAS4 | 87-SB04 |
| CLOAS5 | 87-SB05 |
| CLOAS6 | 87-SB06 |
| CLO4OW1 | 87-GW01 |
| CLO4OW2 | 87-GW02 |
| CL4OF1 | 87-SW01 |
| CL4OF2 | 87-SW02 |
| CL4OE1 | 87-SD01 |
| CL4OE2 | 87-SD02 |
| **Site 84** | |
| CL84S1 | 84-SB01A |
| CL84S2 | 84-SB01B |
| CL84S3 | 84-SB02A |
| CL84S4 | 84-SB02B |
| CL84S5 | 84-SB03A |
| CL84S6 | 84-SB03B |
| CL84S7 | 84-SB04A |
| CL84S8 | 84-SB04B |
| CL84S9 | 84-SB05A |
| CL84SA | 84-SB05B |
| CL84SB | 84-SB06A |
| CL84SC | 84-SB06B |
| CL84SD | 84-SB07A |
| CL84SE | 84-SB07B |
| CL84SF | 84-SB08A |
| CL84SG | 84-SB08B |
| CL84SH | 84-SB09A |
| CL84SI | 84-SB09B |
| CL84W1 | 84-GW01 |
| CL84W2 | 84-GW07 |
| CL84W3 | 84-GW13 |
| CL84F1 | 84-SW01 |
| CL84F2 | 84-SW02 |

TABLE 3-26 (Continued)

SAMPLE IDENTIFICATION CORRELATION TABLE
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Original Sample ID | ID Used in This Report |
|---|---|
| **Sample #3 not collected** | |
| CL84F4 | 84-SW04 |
| CL84F5 | 84-SW05 |
| CL84F6 | 84-SW06 |
| CL84F7 | 84-SW07 |
| CL84F8 | 84-SW08 |
| CL84E1 | 84-SD01 |
| CL84E2 | 84-SD02 |
| **Sample #3 not collected** | |
| CL84E4 | 84-SD04 |
| CL84E5 | 84-SD05 |
| CL84E6 | 84-SD06 |
| CL84E7 | 84-SD07 |
| CL84E8 | 84-SD08 |

**TABLE 3-27**

**QUALITY ASSURANCE/QUALITY CONTROL SAMPLING PROGRAM PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314 MCB, CAMP LEJEUNE, NORTH CAROLINA**

| QA/QC Sample [1] | Frequency of Collection | Number of Samples | Analytical Parameters |
|---|---|---|---|
| Trip Blanks [2] | One per cooler | 24 | TCL VOC |
| Field Blanks [3] | One per event | 2 | TCL VOC, SVOC, Pest/PCB; TAL Metals |
| Equipment Rinsates [4] | One per day | 18 | TCL VOC, SVOC, Pest/PCB; TAL Metals |
| Field Duplicates [5] | 10% of sample frequency | 21 | TCL VOC, SVOC, Pest/PCB; TAL Metals |

Notes:

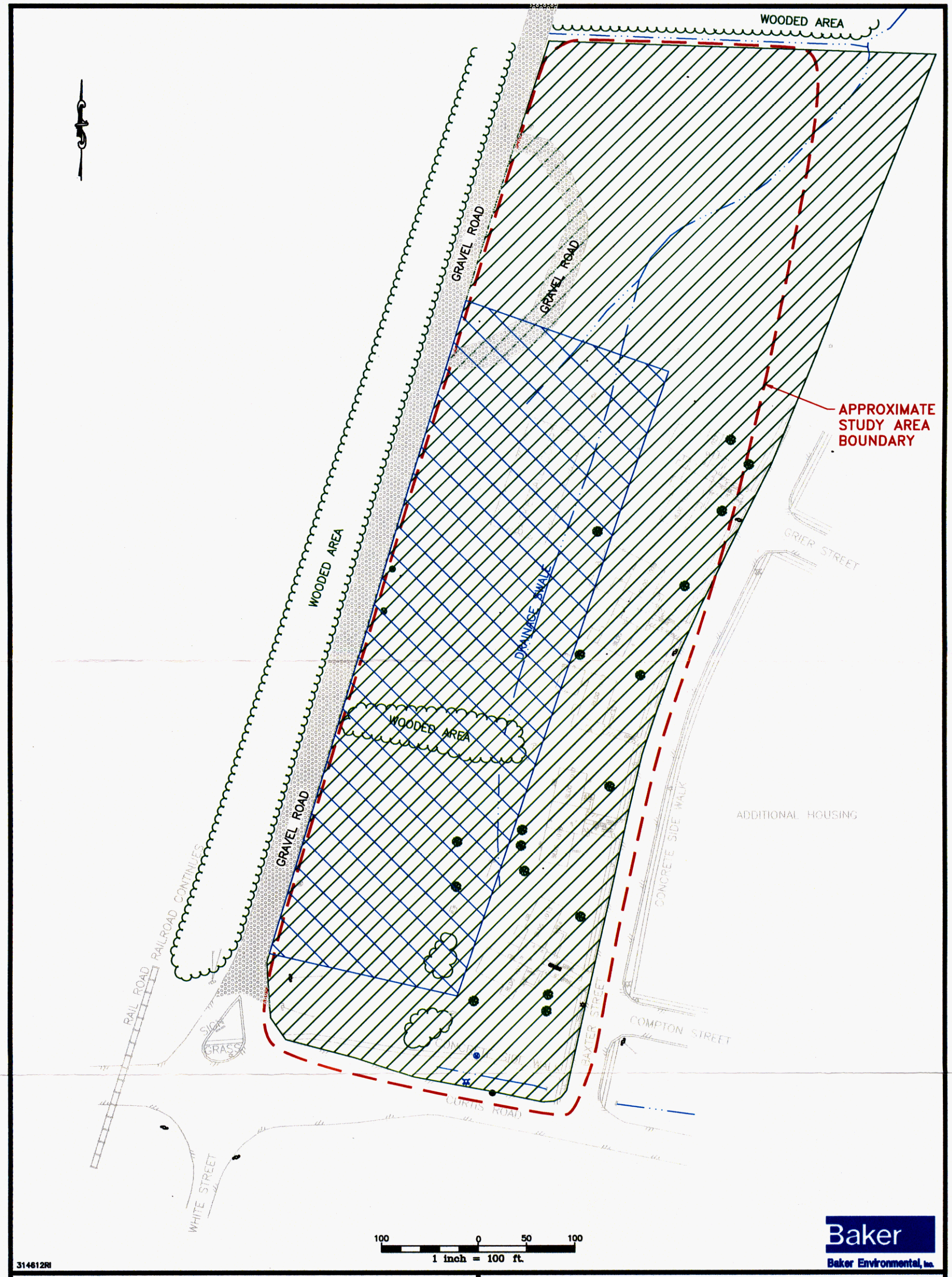
(1) QA/QC sample types defined in Section 3.3
(2) Trip blanks submitted with coolers which contained samples for volatile analysis
(3) Field blank collected during the soil investigation from water used for decontamination
(4) Equipment rinsates collected from various sampling devices (e.g., stainless steel spoon, split spoon, acetate sleeve)
(5) Field duplicate samples presented in Appendix E.

TABLE 3-28

SUMMARY OF ALL REJECTED LABORATORY DATA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Sample Number | Analytical Parameter | Reported Concentration | | Units |
|---|---|---|---|---|
| **GROUNDWATER** | | | | |
| 68-GW04-00 | 2,4-DINITROPHENOL | 890.0000 | R | UG/KG |
| 68-GW04DW-00 | 2,4-DINITROPHENOL | 1000.0000 | R | UG/KG |
| 68-GW04DW-07 | 2,4-DINITROPHENOL | 1000.0000 | R | UG/KG |
| 87-SW01-01 | 2,4-DINITROPHENOL | 9.0000 | R | UG/L |
| 87-SW02-01 | THALLIUM, TOTAL | 9.0000 | R | UG/L |
| 87-GW01-01 | ALPHA-BHC | 0.0540 | R | UG/L |
| 87-GW01-01 | BETA-BHC | 0.0540 | R | UG/L |
| 87-GW01-01 | DELTA-BHC | 0.0540 | R | UG/L |
| 87-GW01-01 | GAMMA-BHC (LINDANE) | 0.0540 | R | UG/L |
| 87-GW01-01 | HEPTACHLOR | 0.0540 | R | UG/L |
| 87-GW01-01 | ALDRIN | 0.0540 | R | UG/L |
| 87-GW01-01 | HEPTACHLOR EPOXIDE | 0.0540 | R | UG/L |
| 87-GW01-01 | ENDOSULFAN I | 0.0540 | R | UG/L |
| 87-GW01-01 | DIELDRIN | 0.1100 | R | UG/L |
| 87-GW01-01 | 4,4'-DDE | 0.1100 | R | UG/L |
| 87-GW01-01 | ENDRIN | 0.1100 | R | UG/L |
| 87-GW01-01 | ENDOSULFAN II | 0.1100 | R | UG/L |
| 87-GW01-01 | 4,4'-DDD | 0.1100 | R | UG/L |
| 87-GW01-01 | ENDOSULFAN SULFATE | 0.1100 | R | UG/L |
| 87-GW01-01 | 4,4'-DDT | 0.1100 | R | UG/L |
| 87-GW01-01 | METHOXYCHLOR | 0.5400 | R | UG/L |
| 87-GW01-01 | ENDRIN KETONE | 0.1100 | R | UG/L |
| 87-GW01-01 | ENDRIN ALDEHYDE | 0.1100 | R | UG/L |
| 87-GW01-01 | ALPHA-CHLORDANE | 0.0540 | R | UG/L |
| 87-GW01-01 | GAMMA-CHLORDANE | 0.0540 | R | UG/L |
| 87-GW01-01 | TOXAPHENE | 5.4000 | R | UG/L |
| 87-GW01-01 | AROCLOR-1016 | 1.1000 | R | UG/L |
| 87-GW01-01 | AROCLOR-1221 | 2.2000 | R | UG/L |
| 87-GW01-01 | AROCLOR-1232 | 1.1000 | R | UG/L |
| 87-GW01-01 | AROCLOR-1242 | 1.1000 | R | UG/L |
| 87-GW01-01 | AROCLOR-1248 | 1.1000 | R | UG/L |
| 87-GW01-01 | AROCLOR-1254 | 1.1000 | R | UG/L |
| 87-GW01-01 | AROCLOR-1260 | 1.1000 | R | UG/L |
| 87-GW01-01 | THALLIUM, TOTAL | 0.9000 | R | UG/L |
| **SOILS** | | | | |
| 75-SB07-01 | CHLOROACETOPHENONE | 396 | R | UG/Kg |
| 75-SB07-01 | CHLOROPICRIN | 396 | R | UG/Kg |
| 75-SB09-02 | CHLOROACETOPHENONE | 395 | R | UG/Kg |
| 75-SB09-02 | CHLOROPICRIN | 395 | R | UG/Kg |

# FIGURES




## LEGEND

- AREA OF GEOPHYSICAL SURVEY (1983)
- AREA OF GEOPHYSICAL SURVEY (1996)
- DRAINAGE SWALE
- TREE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1995.

FIGURE 3-1
AREA OF
GEOPHYSICAL SURVEY
SITE 75
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

02635AB5Y

314613RI

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Baker Environmental, Inc.

LEGEND

SWALE
TREE LINE
TREE
MANHOLE
AREA OF GEOPHYSICAL SURVEY (1983)
AREA OF GEOPHYSICAL SURVEY (1996)

SOURCE: BRENT A. LANIER R.L.S., MARCH 1996.

FIGURE 3-2
AREA OF
GEOPHYSICAL SURVEY
SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

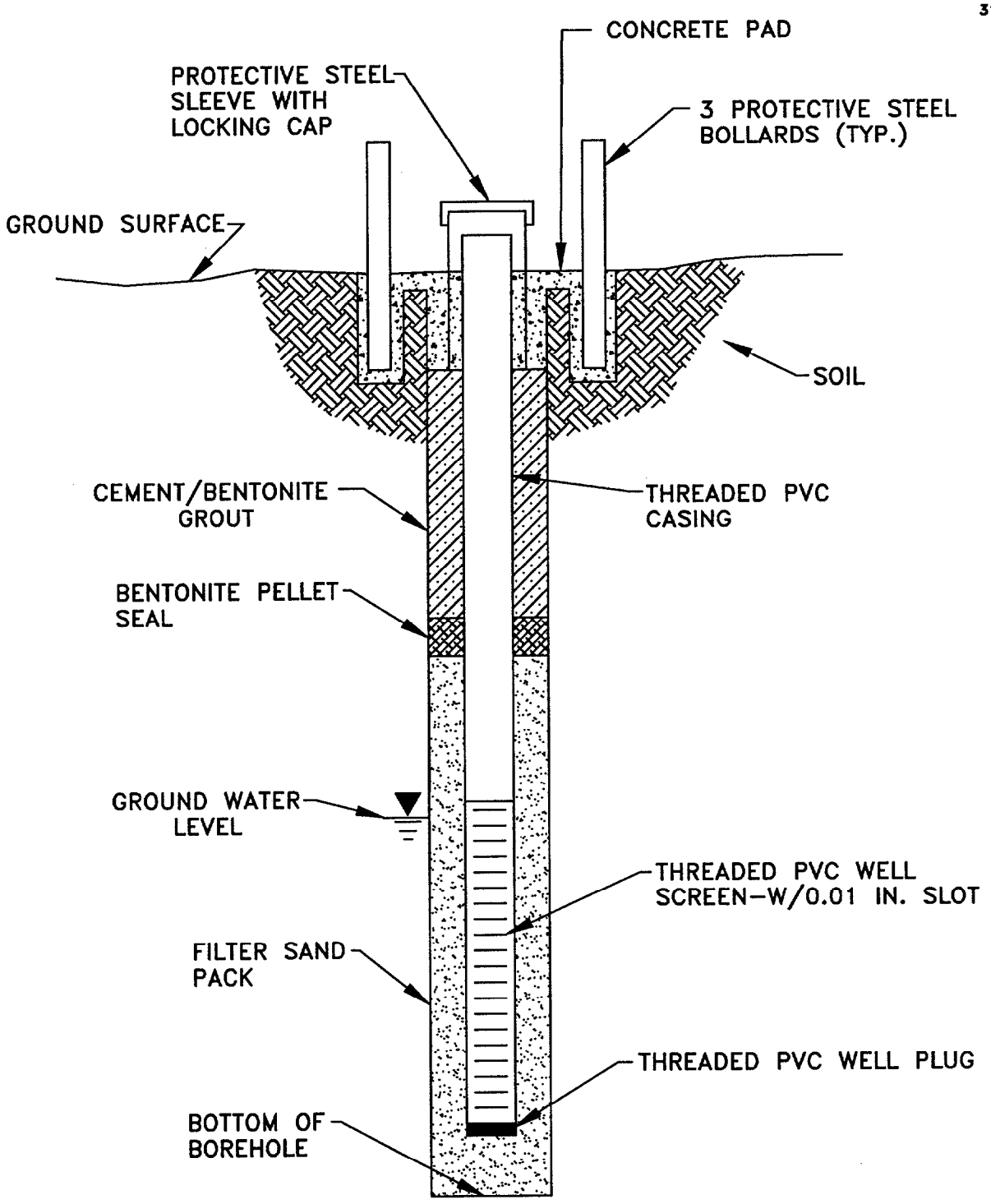
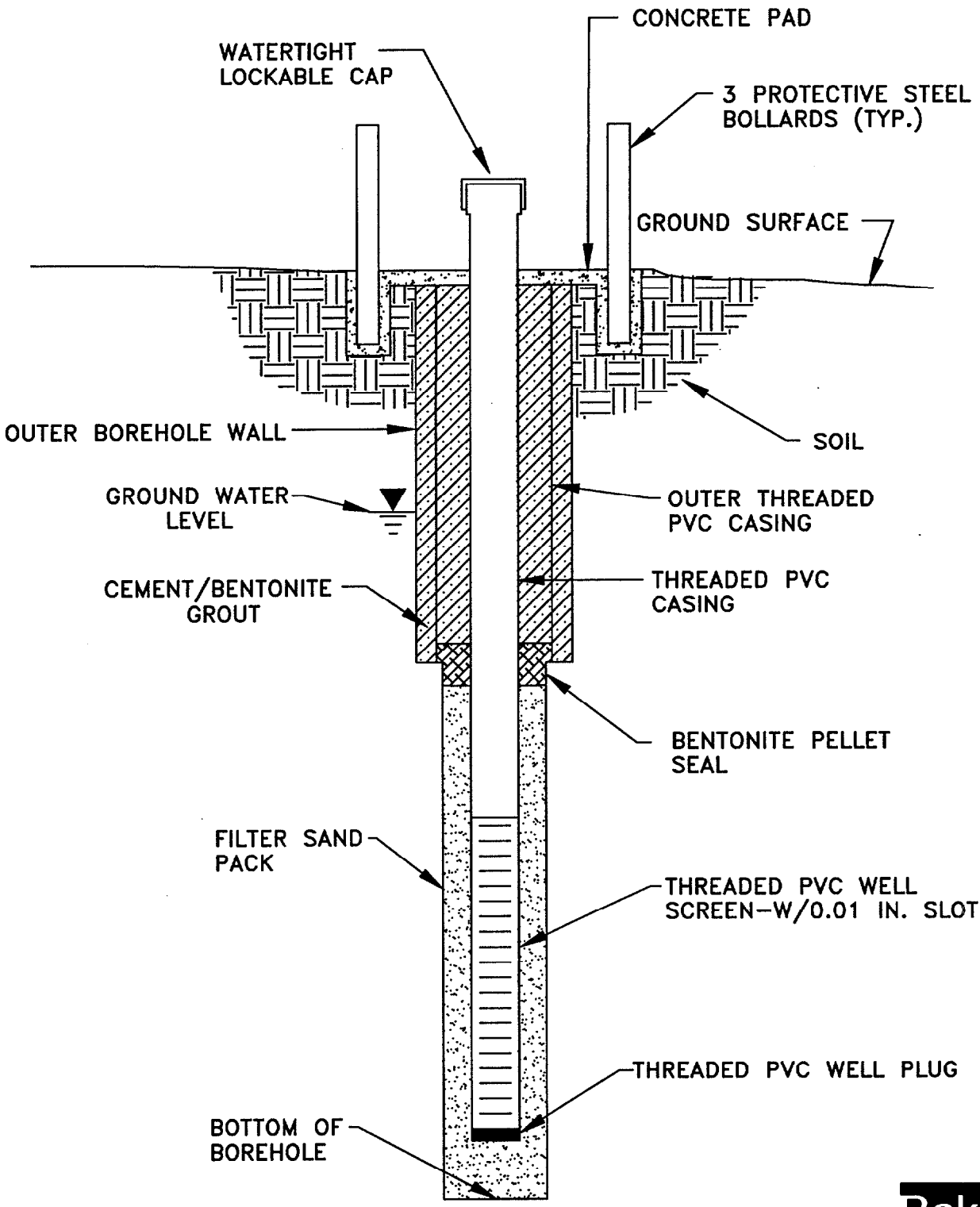


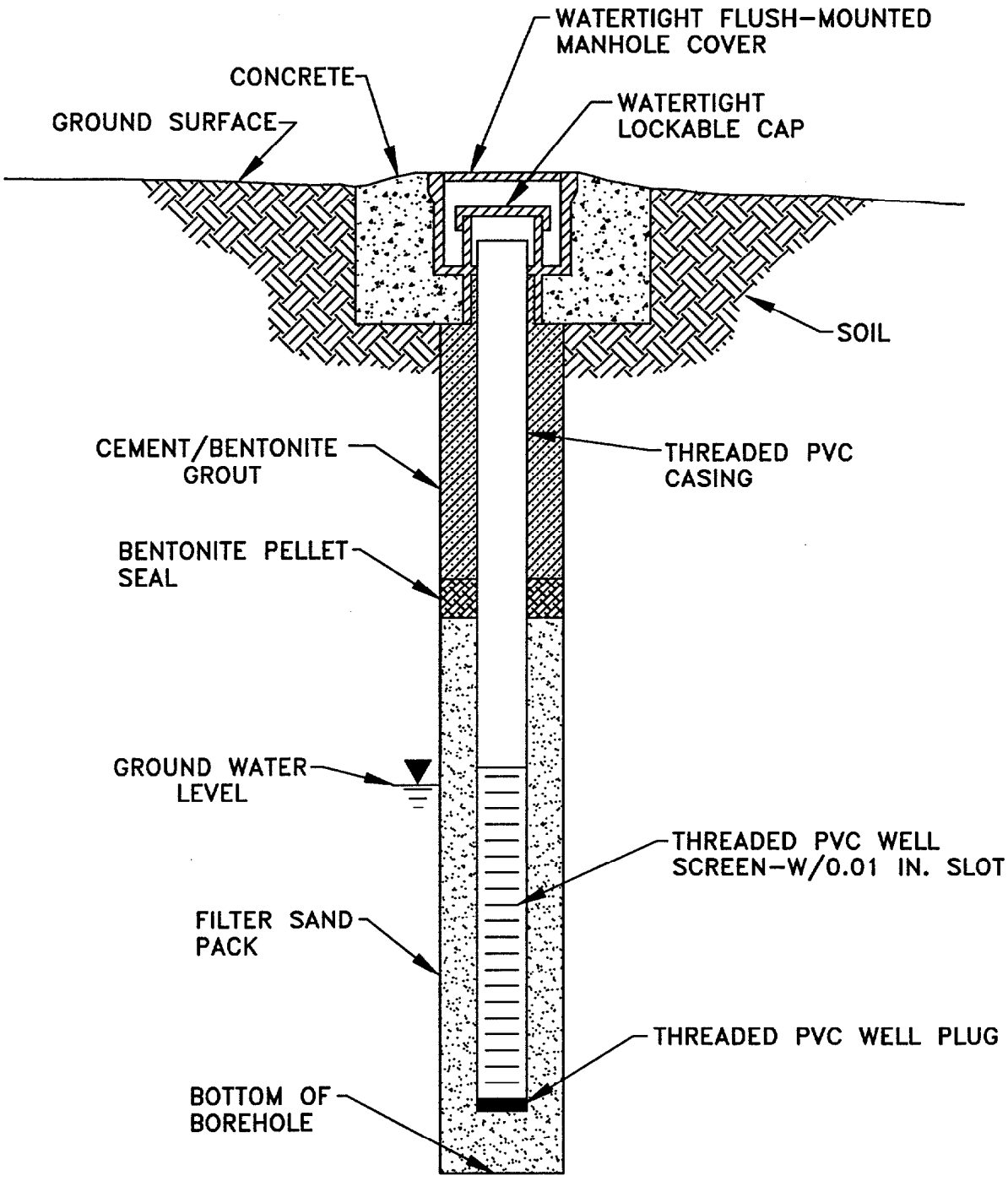

FIGURE 3-3
TYPICAL ABOVE GRADE SHALLOW TYPE II GROUNDWATER MONITORING WELL CONSTRUCTION DIAGRAM
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA




Baker
Baker Environmental, Inc.

FIGURE 3-4
TYPICAL ABOVE GRADE DEEP TYPE III GROUNDWATER MONITORING WELL CONSTRUCTION DIAGRAM
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314601RI




*N.T.S.*

Baker
Baker Environmental, Inc.

FIGURE 3-5
TYPICAL BELOW GRADE SHALLOW TYPE II GROUNDWATER MONITORING WELL CONSTRUCTION DIAGRAM
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

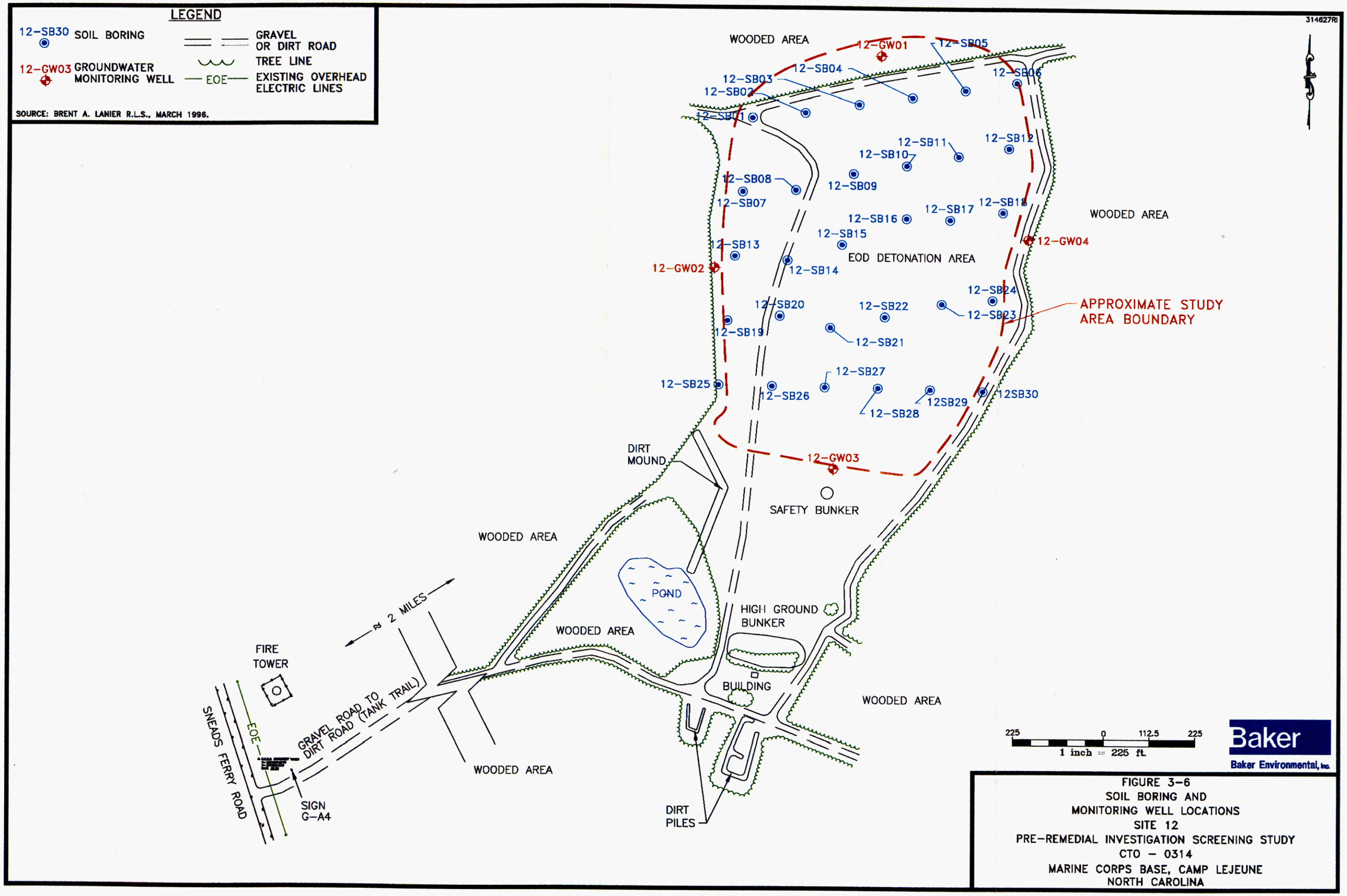



FIGURE 3-6
SOIL BORING AND
MONITORING WELL LOCATIONS
SITE 12
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

02635ABGY

314631RI

68-SB02
68-SB03
68-SB07
UNNAMED TRIBUTARY OF STONE CREEK
WOODED AREA
APPROXIMATE STUDY AREA BOUNDARY
68-SB06
68-GW02
68-SB05
68-GW04DW
68-GW04
68-SB11
WOODED AREA
WOODED AREA
68-SB10
68-SB09
68-SB01
68-SB15
WOODED AREA
DISTURBED GROUND
OLD ROCK FOUNDATION
ROCK PILE
68-SB14
68-GW05DW
68-SB04
68-SB19
68-SB16
68-SB17
68-SB13
68-GW03
68-SB08
68-GW06
68-SB18
68-GW06DW
68-SB12
WOODED AREA
68-GW01DW
68-GW01
CONTROL POINT
N= 309,267.79
E= 2,466,224.97
ELEV.= 53.82
CONTROL POINT
N= 309,359.03
E= 2,466,770.76
ELEV.= 54.93
SIGN
SIGN
RIFLE RANGE PARKING LOT (GRAVEL)
RR45

200 0 100 200
1 inch = 200 ft.

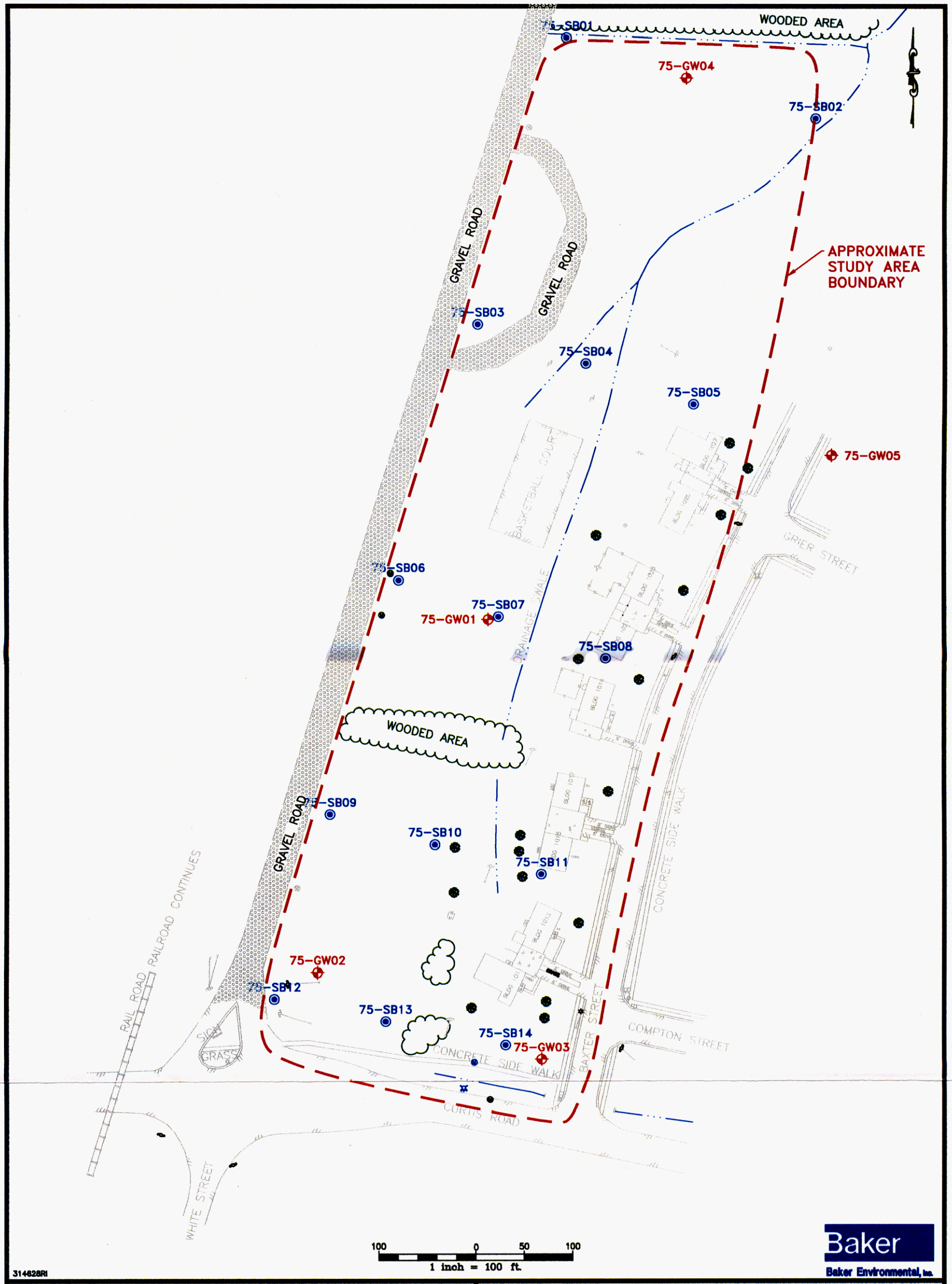
Baker
Baker Environmental, Inc.

LEGEND

68-GW01DW – EXISTING GROUNDWATER MONITORING WELL LOCATION
68-SB12 – SOIL BORING LOCATION
– TREE LINE
– INTERMITTENT STREAM
– DIRT OR GRAVEL ROAD

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 3-7
SOIL BORING AND
MONITORING WELL LOCATIONS
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



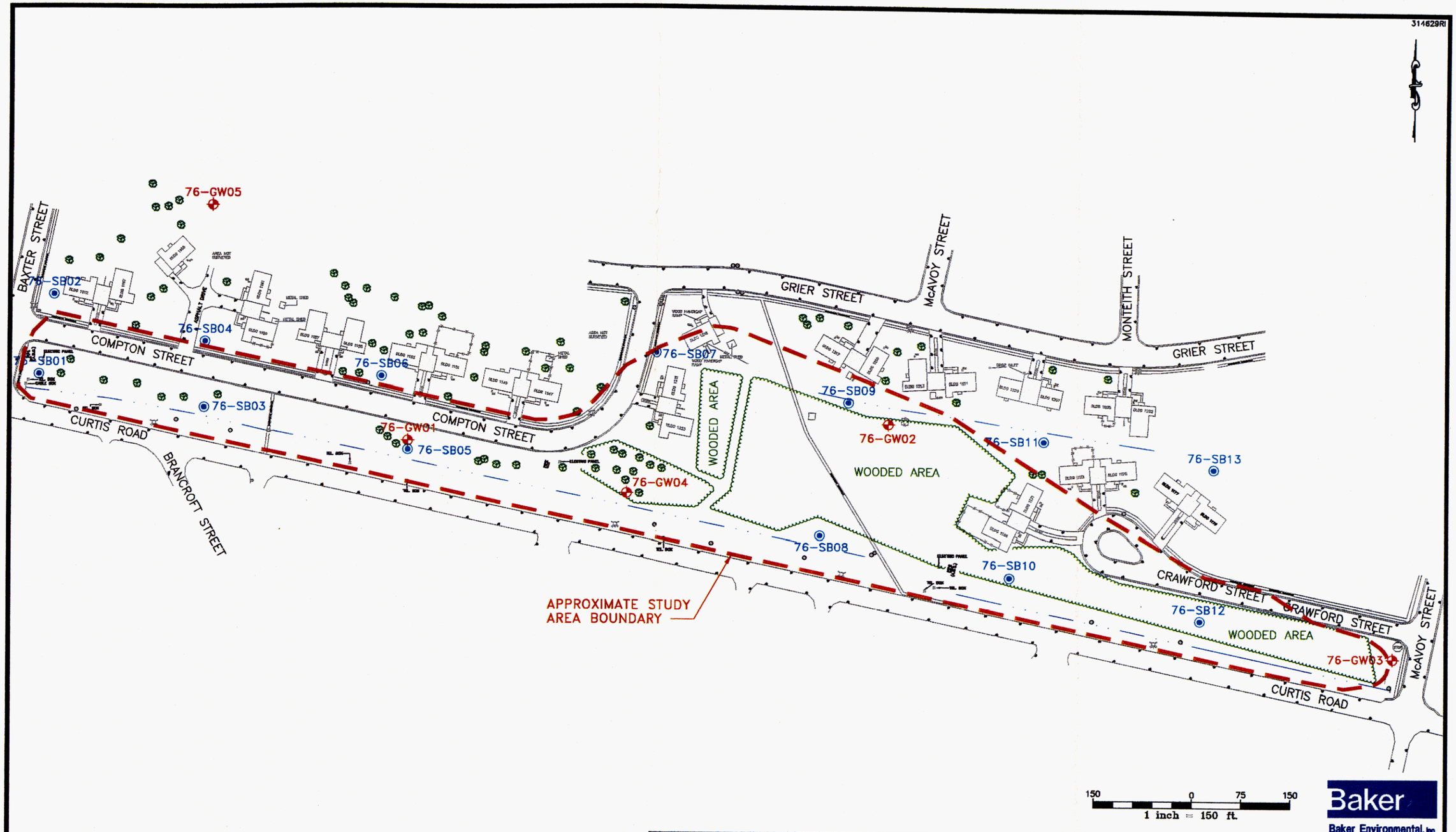

## LEGEND

- TREE LINE
- INTERMITTENT DRAINAGE SWALE
- 75-GW03 – EXISTING GROUNDWATER MONITORING WELL LOCATION
- 75-SB14 – SOIL BORING LOCATION
- TREE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1995.

FIGURE 3-8
SOIL BORING AND
MONITORING WELL LOCATIONS
SITE 75
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

314629RI

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Baker Environmental, Inc.

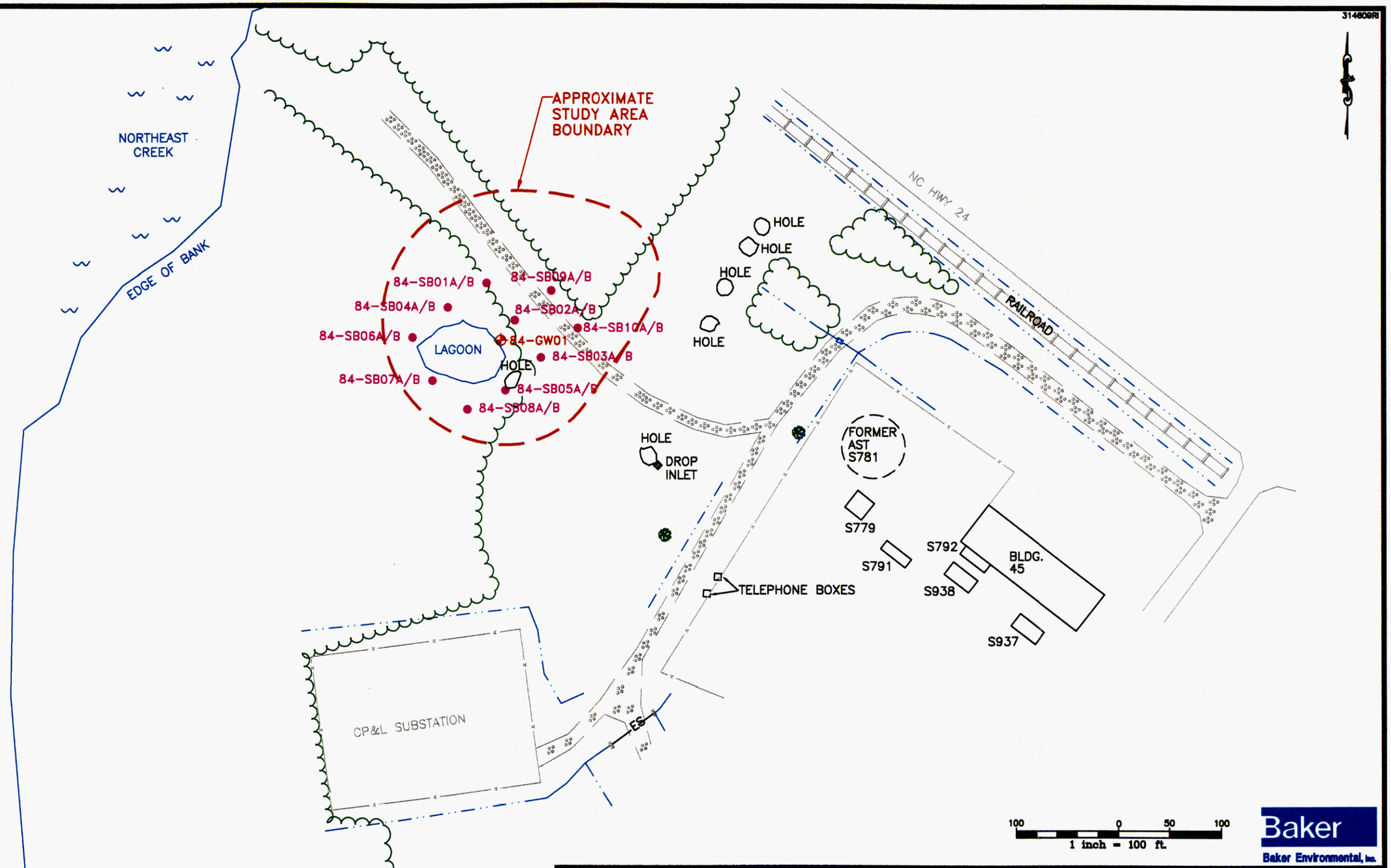
**LEGEND**

76-GW01 MONITORING WELL LOCATION
76-SB05 SOIL BORING LOCATION
— · — INTERMITTENT DRAINAGE SWALE
TREE LINE
TREE
MANHOLE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1996.

FIGURE 3-9
SOIL BORING AND
MONITORING WELL LOCATIONS
SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

314609RI

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Baker Environmental, Inc.

**LEGEND**

84-SB08A/B – SURFACE SOIL SAMPLE LOCATION

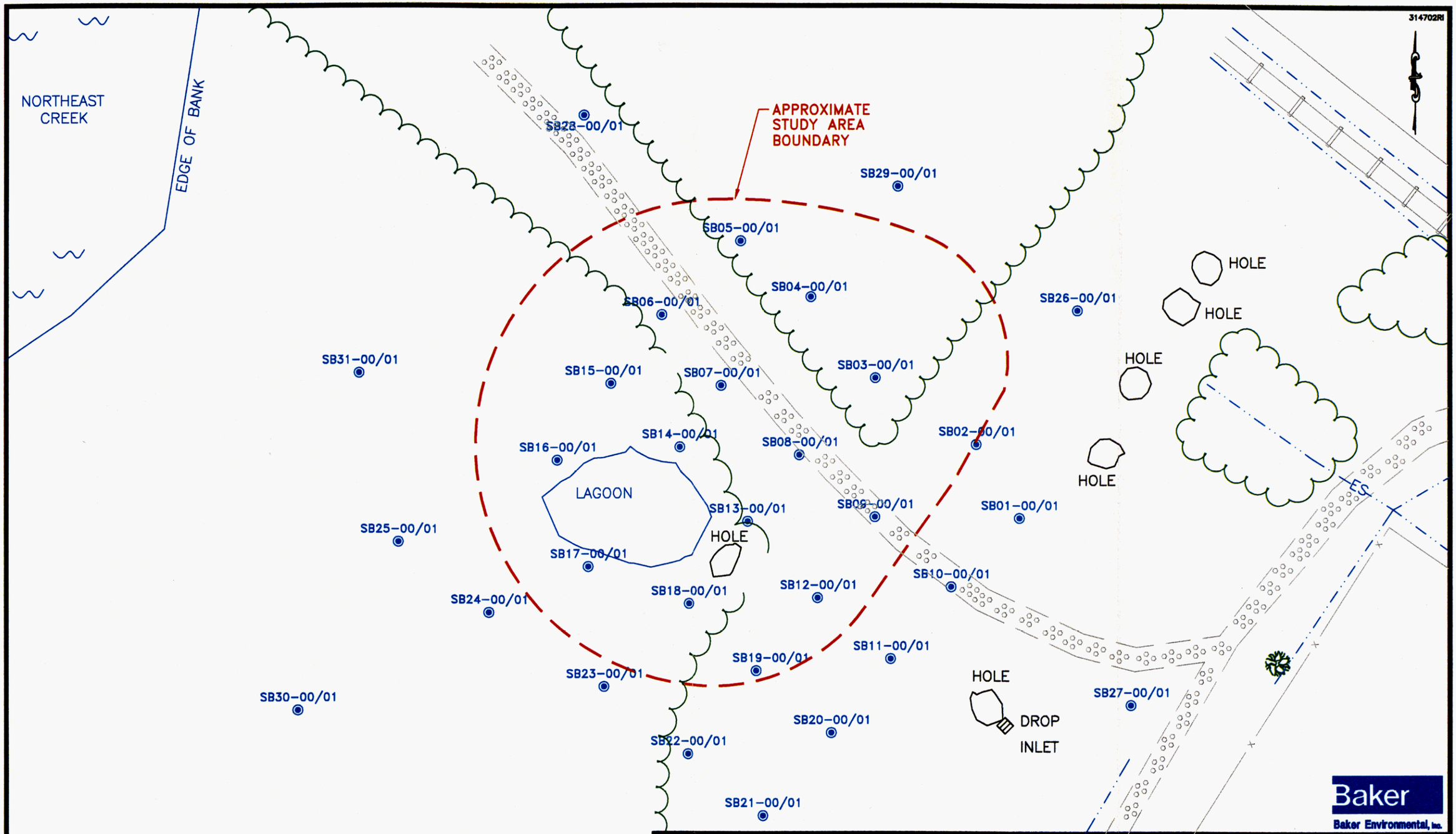
84-GW07 – GROUNDWATER MONITORING WELL LOCATION

– SWALE

– GRAVEL ROAD

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 3-10
LOCATION OF SURFACE SOIL SAMPLES AND MONITORING WELLS
SITE 84
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA




**LEGEND**

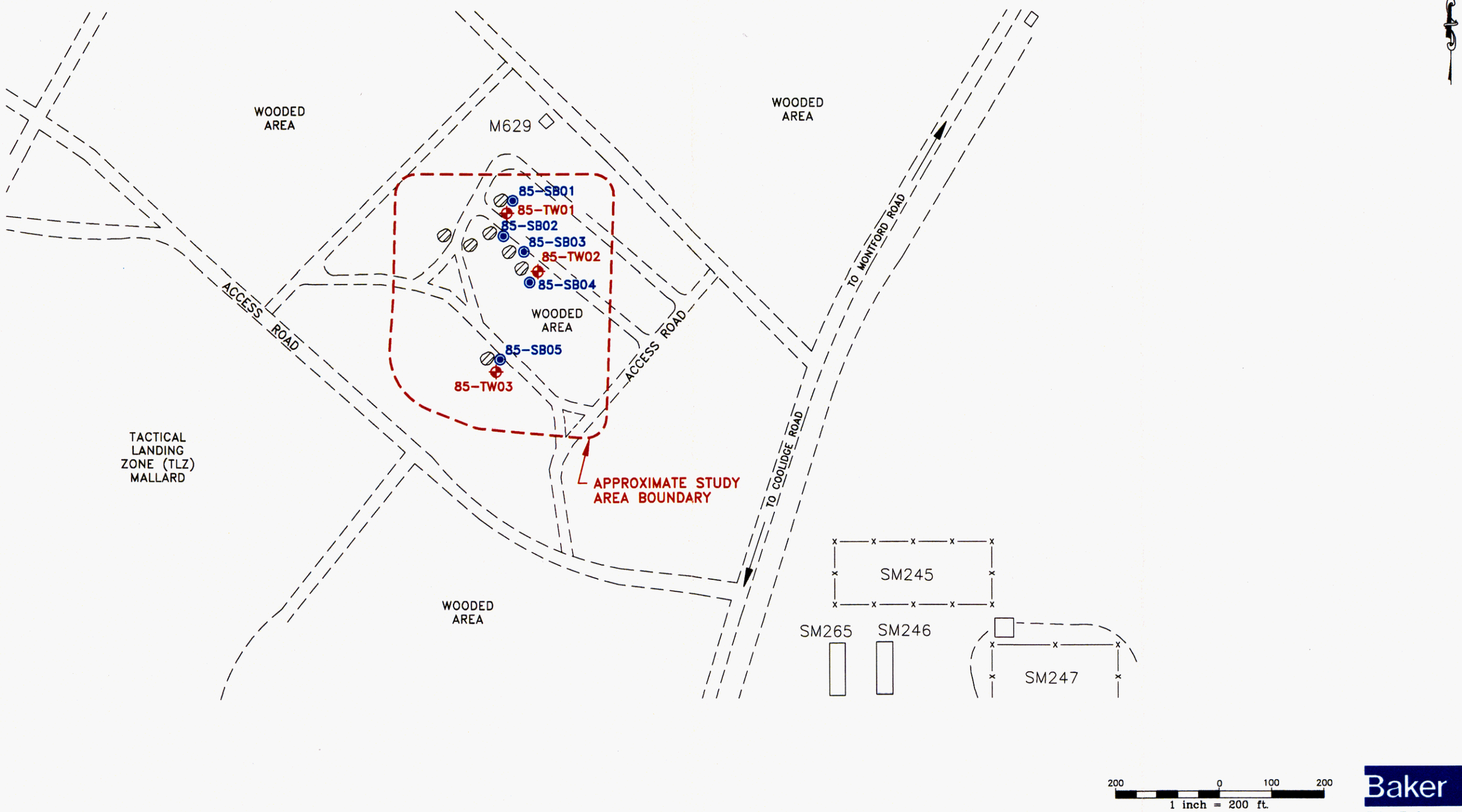
- SOIL SAMPLING LOCATION
- HOLE
- SWALE
- GRAVEL ROAD
- TREE LINE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 3-11
SOIL SAMPLE LOCATIONS
SITE 84
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314630RI



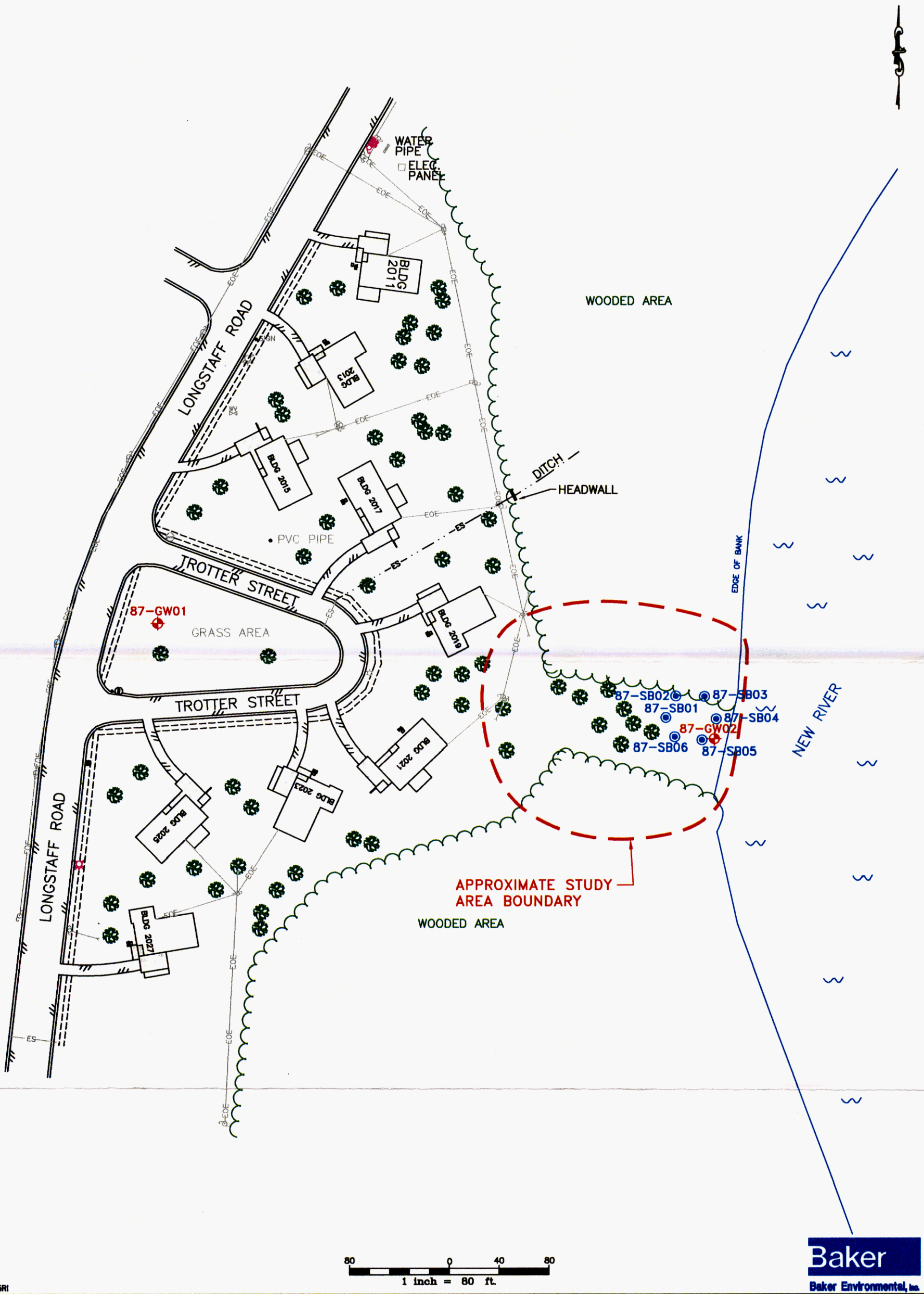

Baker
Baker Environmental, Inc.

LEGEND

| | |
|---|---|
| 85-TW01 | TEMPORARY GROUNDWATER MONITORING WELL WITH CORRESPONDING SOIL BORING |
| 85-SB02 | SOIL BORING LOCATION |
| | BATTERY DISPOSAL AREA |
| | DIRT ACCESS ROAD |
| —x— | FENCE LINE |

SOURCE: LANTDIV, FEB. 1992

FIGURE 3-12
SOIL BORING AND
MONITORING WELL LOCATIONS
SITE 85
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA




## LEGEND

87-GW01 – GROUNDWATER MONITORING WELL LOCATION

87-SB01 – SOIL BORING LOCATION

– TREE LINE

– TREE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 3-13
SURFACE SOIL SAMPLE LOCATIONS
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

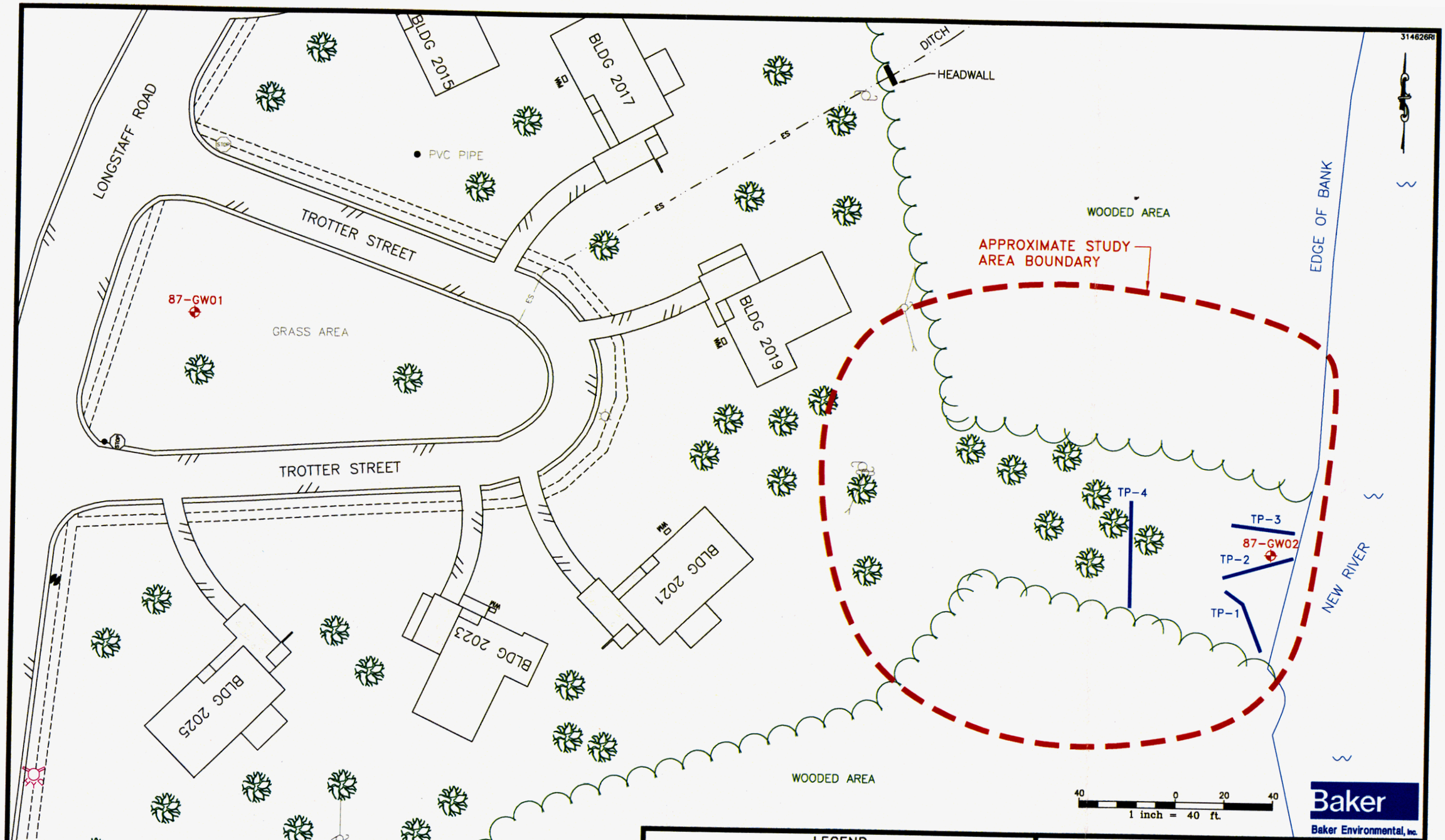
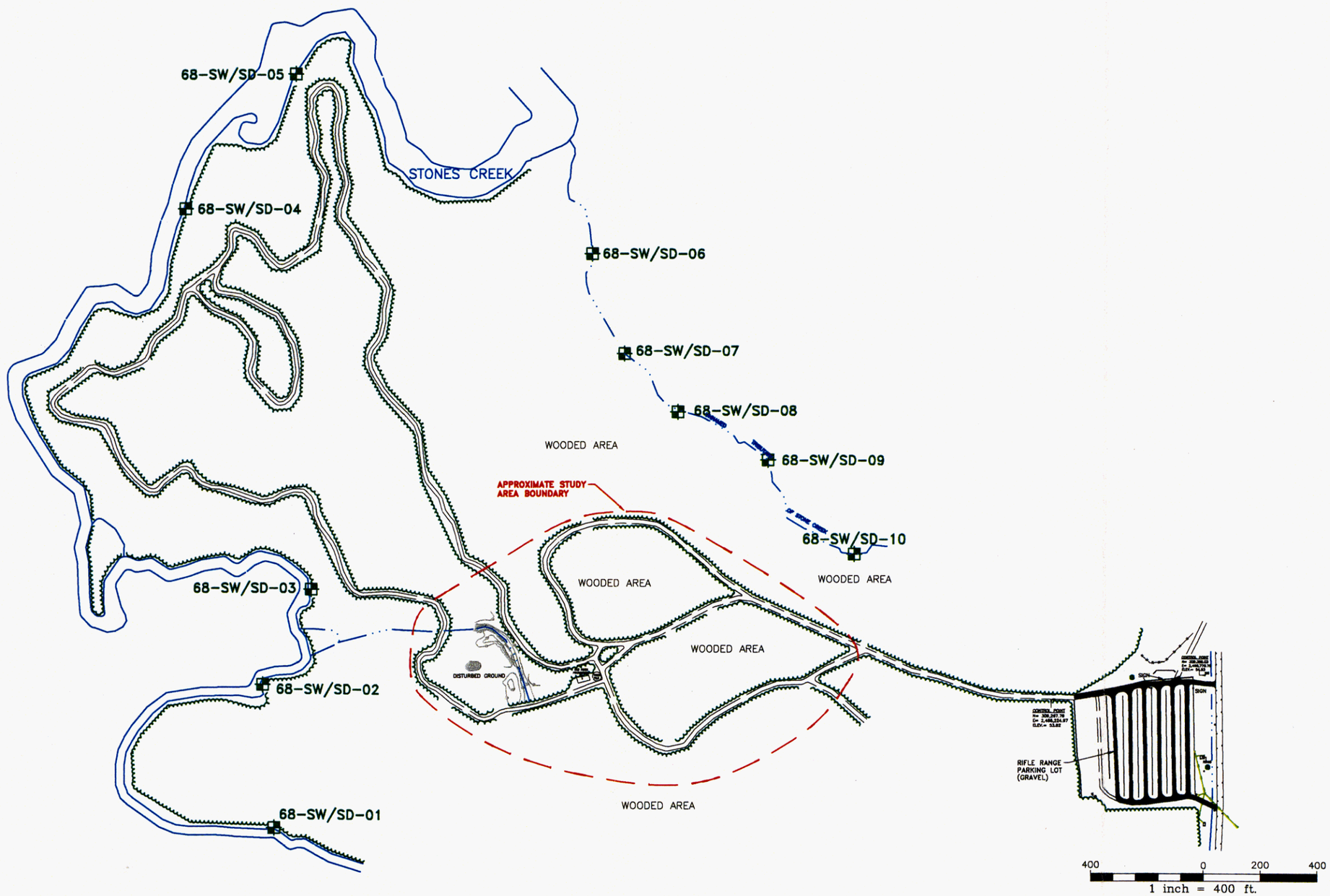



FIGURE 3-14
LOCATIONS OF EXPLORATORY TEST PITS
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

314632RI




Baker
Baker Environmental, Inc.

LEGEND

68-SW/SD-04 – SURFACE WATER AND SEDIMENT SAMPLE STATION
– TREE LINE
– INTERMITTENT STREAM
– DIRT OR GRAVEL ROAD

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 3-15
LOCATION OF SURFACE WATER AND SEDIMENT STATIONS
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314624RI

84-SW/SD01

NORTHEAST CREEK

84-SW/SD02

EDGE OF BANK

APPROXIMATE STUDY AREA BOUNDARY

84-GW08

84-GW07

84-SW/SD07

84-SW/SD06

LAGOON

84-SW/SD05

84-GW13

84-SW/SD08

84-GW14

HOLE

WOODED AREA

84-SW/SD03

WOODED AREA

84-SW/SD04

NC HWY 24

RAILROAD

DROP INLET

FORMER AST S781

S779

S791

S792

S938

BLDG. 45

S937

TELEPHONE BOXES

CP&L SUBSTATION

100 0 50 100

1 inch = 100 ft.

Baker

Baker Environmental, Inc.

**LEGEND**

84-GW08 – GROUNDWATER MONITORING WELL LOCATION

84-SW/SD04 – SURFACE WATER/SEDIMENT SAMPLE STATION

– DRAINAGE SWALE

– TREE LINE

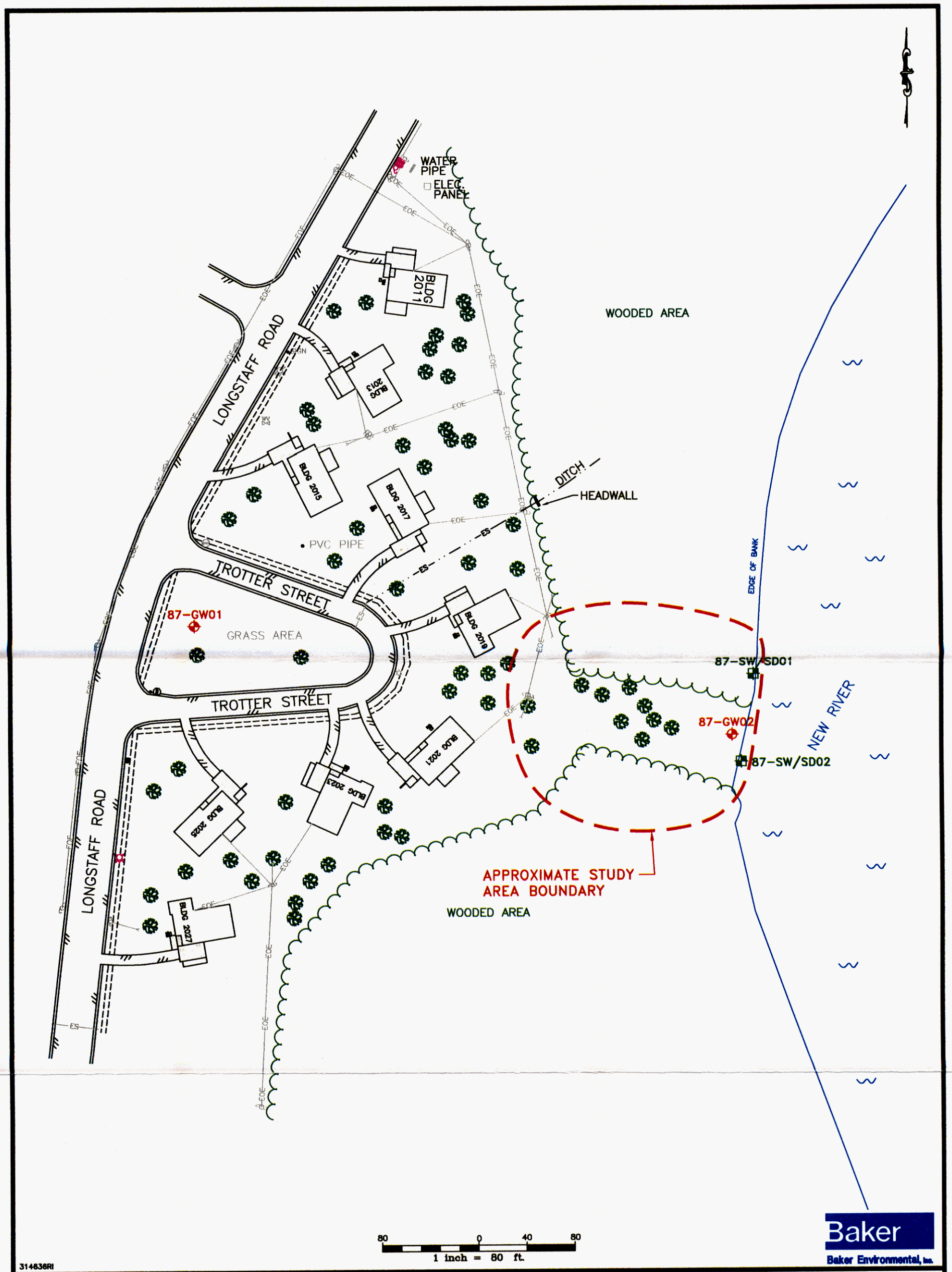
– GRAVEL ROAD

– TREE

NOTE: 84-SW/SD03 NOT COLLECTED.

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 3-16
LOCATION OF SURFACE WATER AND SEDIMENT STATIONS
SITE 84
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA




## LEGEND

87-GW01 – GROUNDWATER MONITORING WELL LOCATION

87-SW/SD01 – SURFACE WATER/SEDIMENT SAMPLE LOCATION

– TREE LINE

– TREE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 3-17
LOCATION OF SURFACE WATER AND SEDIMENT STATIONS
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

## 4.0 FINDINGS OF PRE-REMEDIAL INVESTIGATION SCREENING STUDY

This section presents the findings of the Pre-RI Screening Study. It includes results of the geophysical survey, soil sampling results, groundwater sampling results, and surface water/sediment sampling results. The analytical results for environmental and QA/QC samples also are presented in this section.

Section 4.1 presents the results of the geophysical survey. As discussed in section 3.0, geophysical survey techniques were used at Sites 75 and 76 only. Presentation of the analytical results begin with section 4.2. Discussion of the analytical results includes comparisons of the site data to established standards and criteria. The standards and criteria chosen for evaluation are media-specific. An explanation and justification for using each of the standards and criteria are presented in section 4.2.

Section 4.0 also presents information concerning non-site related analytical results and background data. Site specific background data has been compiled from a number of RI sites at MCB, Camp Lejeune. The locations of these sites are shown on Figure 4-1. A detailed discussion concerning the background data taken from these sites and used for this study is presented in section 4.3. Section 4.4 presents the site analytical sample results, which are presented individually on a site by site basis.

### 4.1 Geophysical Survey Findings

Figures 4-2 and 4-3 provide an illustration of the areas covered by the geophysical survey at Sites 75 and 76, respectively. The figures show the areas covered by the previous geophysical survey as well as the area covered during the Pre-RI Screening Study. The survey performed at these sites used a portable STOLS® magnetometer system linked with GPS technology. The survey was divided into two phases. Phase I involved the surveying of approximately 6 acres of Site 75 and 9 acres at Site 76. Phase II of the survey occurred after examination of the findings from Phase I and required resurveying a selected portion of Site 75, and a continuation of Site 76 (east side).

### 4.1.1 Site 75 Geophysical Survey

During the Phase I survey, a portion of Site 75 produced magnetic anomalies visible in the northern portion of the survey. As can be seen on Figures 4-4 and 4-5, the basketball court shows up as a series of negative (black) and positive (white) streaks. This signature is due to the reinforced rebar.

Immediately north of the basketball court a very large oval shaped positive (white) anomaly was present, in the area where Baker's field trailer was located. This signature is of the type expected to be produced by a large quantity of buried steel drums. The preliminary findings indicated that this area may have been the burial site mentioned in historical records. Although the magnetic data generated were those which indicated a source of ferrous material below ground, the data were suspect due to the presence of significant amounts of metal objects at the surface. As noted above, at the time of the geophysical survey, this area contained Baker's field trailer. Also present, were two large metal conex boxes used for equipment storage, approximately 50 steel drums, a trash bin, an ice machine, power lines, and miscellaneous metallic items at the surface.

Other magnetic anomalies at Site 75 include several negative (black) anomalies which are the steel bollards and protective casings of existing stick-up monitoring wells, and a series of negative (black) and positive (white) anomalies in a straight line along the western border of the surveyed area. This positive and negative linear feature is a utility corridor which contains an electric line and a raw water line which is part of the MCB, Camp Lejeune sewerage treatment system.

Due to the large oval shaped positive anomaly present in the northern portion of the site, this area was resurveyed (Phase II). Prior to initiating the survey, the large surface structures and metallic material (except the trash bin) were either disposed of or moved to another location at MCAS, the New River area. This left the area to be resurveyed void of metal objects (although the metal trash bin remained along with some small metallic trash scattered about the surface). The smaller pieces of material at the surface included items such as scrap metal, nails, pipe fittings, and bolts. The area was surveyed again as part of the Phase II work using the same equipment and techniques as in the Phase I survey.

As can be seen in Figure 4-6, the results of the survey do not show any remarkable features. The Phase II survey confirmed the positive anomaly was a result of the positioning of the Baker field trailers. There is no definite explanation for this phenomena, only that it may have been possible that the steel body of the trailer, coupled with the internal power lines, produced the electromagnetic anomaly observed during the Phase I survey. The Baker field trailers were on rubber wheels approximately three feet above the ground surface, but were tied down with steel bars anchored approximately 18 inches into the ground on all corners. The height of the magnetic sensors for the geophysical equipment are approximately 12 to 18 inches above the ground surface during data collection. This places the sensors slightly below the bottom of the trailers. The fact that the sensors were below the magnetic field may have allowed the registration of only the positive side of the anomaly, unlike other metal objects on or in the ground surface which show up as negative (black) anomalies. The remainder of the site that was resurveyed during Phase II produced a multiple of small anomalies that resulted from the large quantity of scrap metal at the surface. Aside from the surface reflections, the magnetic data from the Phase II survey did not indicate any unusual anomalies.

### 4.1.2 Site 76 Geophysical Survey

Site 76 was surveyed during both Phases of the investigation. The western portion of the site was surveyed during the Phase I investigation and did not produce any unusual magnetic anomalies (Figure 4-7). The diagonal line that transects the mid-portion of the site is an existing sidewalk which shows up as a positive feature.

As part of the Phase II investigation, the geophysical survey area of Site 76 expanded to cover an additional area to the east (Figure 4-8). This was done only because the field schedule permitted some additional work in this part of Site 76 and not because there was any indication of suspected buried material during the Phase I survey, or in the site history. Again, none of the information collected at Site 76 presented any findings that suggested buried metal objects (Refer to Figures 4-7 and 4-8).

### 4.1.3 Geophysical Survey Summary

Based upon the geophysical data collected at both Sites 75 and 76, large buried metallic objects do not appear to be present within the boundaries covered by the survey. The initial indication of

buried objects at Site 75 was determined to be a phenomena most likely attributable to the Baker field trailers and electric power at the site. Once the field trailers and other large metal objects were removed, and the Phase II geophysical survey of this area was completed, it was determined that Site 75 did not contain buried ferrous material indicative of the suspected disposal area. Similar results can be drawn from the information collected at Site 76. The magnetic data collected at this site produced no significant findings, which would suggest the suspected disposal areas to be present within the survey area. Appendix G contains the complete geophysical report with detailed figures illustrating individual quadrants of the entire survey.

## 4.2 Screening Standard Comparisons

The analytical results are presented on summary tables which compare the results to "screening standards". For groundwater and surface water, regulatory limits have been established which define the "screening standard". However, applied standards or criteria to other media, such as soil and sediments, vary. In these cases a number of sources were used for the "screening standard". These values are taken from various sources including, risk-based estimates, values presented in literature, or site specific values. The sections below are presented to define the screening standards applied to each of the media when evaluating the analytical database.

### 4.2.1 Surface Soil

The screening standard applied to surface soil is based on the following sources:

- USEPA Region III soil screening levels for transfer from soil to groundwater (USEPA, May 1996c)
- USEPA Region III risk-based concentrations, April 1998 (residential soil) (USEPA, 1998)
- Draft NC Risk Analysis Framework, December, 1996
- Baseline concentrations specific to MCB, Camp Lejeune were used for pesticide concentrations
- Two times the base average for the specific inorganic compounds (refer to Section 4.3.2.1 and Appendix H)

### 4.2.2 Subsurface Soil

The screening standard applied to subsurface soil is based on the following sources:

- USEPA Region III soil screening levels for transfer from soil to groundwater (USEPA, May 1996c)
- USEPA Region III risk-based concentrations, April 1998 (residential soil) (USEPA, 1998)
- Draft NC Risk Analysis Framework, December 1996
- Two times the base average for the specific inorganic compounds (refer to Section 4.3.2.1 and Appendix H)

### 4.2.3 Groundwater

The screening standard applied to groundwater is based on the following sources:

- North Carolina Water Quality Standards (NC WQS) (NC DENR, 1994a)
- USEPA Maximum Contaminant Levels (MCLs), February, 1996 (USEPA, 1996a)

### 4.2.4 Surface Water

The screening standard applied to surface water is based on the following sources:

- NC WQS for surface water, June 1, 1994 (human health standard) (NC DENR, 1994b)
- NC WQS for surface water, June 1, 1994 (saltwater aquatic life standard) (NC DENR, 1994b)
- USEPA Region IV Water Quality Standards for surface water, 1991 (saltwater aquatic life standard) (USEPA, 1991b)

### 4.2.5 Sediment

The screening standard applied to sediment samples is based on the following sources:

- Literature source titled, "Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments." (Long et. al., 1995)

- USEPA Region III Biological Technical Assistance Group (BTAG) Screening Levels (January 19, 1995) (USEPA, 1995)

- USEPA Region IV Sediment Screening Values (January 27, 1992) (USEPA, 1992)

## 4.3 Non-Site Related Analytical Results

Many of the organic compounds and inorganic analytes detected in environmental media may be attributable to non-site related conditions or activities. Two primary sources of non-site related analytical results include laboratory contaminants and naturally-occurring inorganics. In addition, non-site related operational activities and conditions may contribute to "on-site" contamination. A discussion of non-site related analytical results for the sites is provided in the subsections which follow.

### 4.3.1 Laboratory Contaminants

Field blank and trip blank samples provide a measure of contamination that has been introduced into a sample set during the collection, transportation, preparation, or analysis of samples. To remove non-site related constituents from further consideration, the concentrations of chemicals detected in blanks were compared with concentrations of the same chemicals detected in environmental samples.

Common laboratory contaminants (e.g., acetone, 2-butanone, chloroform, methylene chloride, toluene, and phthalate esters) were retained for use in interpreting site conditions only when observed concentrations in any environmental sample exceeded ten times the maximum

concentration detected in any blank. If the concentration of a common laboratory contaminant was less than ten (10) times the maximum blank concentration, its presence among the sample set was attributed to laboratory contamination in that particular sample and excluded from further evaluation (USEPA, 1994a). The maximum concentrations of detected common laboratory contaminants in blanks were as follows:

| | | |
|---|---|---|
| Acetone | 130 | micrograms per liter (µg/L) |
| Chloroform | 5J | µg/L |
| Toluene | 3J | µg/L |
| Bis(2-ethylhexyl)phthalate | 130 | µg/L |
| Butylbenzylphthalate | 2J | µg/L |

Blanks containing organic compounds that were not considered common laboratory contaminants (i.e., all other TCL compounds) were retained in the site analytical database only when observed concentrations exceeded five (5) times the maximum concentration detected in any QA/QC blank (USEPA, 1994a). All TCL compounds detected at less than five times the maximum level of contamination noted in any QA/QC blank were attributed to blank contamination and excluded from further evaluation. The maximum concentrations of all other detected blank contamination were as follows:

| | | |
|---|---|---|
| 2,6-dinitrotoluene | 4J | µg/L |
| Bromochloromethane | 6J | µg/L |
| Dibromochloromethane | 13 | µg/L |
| Bromoform | 14 | µg/L |
| Phenol | 27 | µg/L |

### 4.3.2 Naturally-Occurring Inorganic Analytes

#### 4.3.2.1 Soil

As discussed above, standards and criteria for specific contaminants in soil can vary. As a result, base-specific background concentrations have been compiled from a number of locations throughout MCB, Camp Lejeune to evaluate reference levels of inorganic analytes in the surface and subsurface soil.

Typical background concentration values for inorganic analytes in soils at MCB, Camp Lejeune are presented in Appendix H. Theses ranges are based on analytical results of background samples collected in areas not known to have been impacted by operations or disposal activities adjacent to Sites 1, 2, 6, 7, 16, 28, 30, 35, 36, 41, 43, 54, 69, 74, 78, 80, and 86 (see Figure 4-1 for site locations throughout MCB, Camp Lejeune). Subsequent discussions of the analytical results from samples collected during the soil investigation only consider those inorganic analytes with concentrations exceeding twice the average base-specific background concentration, as recommended by USEPA Region IV. This is noted in the summary tables under the column "Base Background."

In general, background soil samples have been collected outside the known boundaries of those sites listed above in areas with similar soil types. According to the Soil Conservation Service (SCS) Soil Survey, the greatest portion of MCB, Camp Lejeune is underlain by a number of similar soil units. Soils found on this portion of the coastal plain are moderately to strongly acidic in nature and are classified under the Unified Soil Classification System (USCS) as SM (silty - sands, sand - silt mixtures) to SP (poorly - graded sands, gravelly sands, little or no fines).

4.3.2.2 Groundwater

As presented in Section 4.2, chemical-specific criteria and standards are available for evaluation of analytical results from groundwater samples. In the subsequent sections which address the analytical results of samples collected during the groundwater investigation, only those inorganic parameters with concentrations exceeding applicable state or federal regulations (i.e., screening standard) will be discussed.

Groundwater samples were analyzed for total metals. In some cases (at Sites 75, 76 and 68) selected samples were analyzed for dissolved metals for comparative reasons only. The total metal analyses from unfiltered samples is considered to reflect the concentrations of metals in the natural lithology and metals dissolved in the groundwater. Further, USEPA Region IV requires that unfiltered metals concentrations be used in evaluating standards and risk to human health and the environment. Therefore, groundwater quality was evaluated on results of the total metal concentrations and not dissolved concentrations.

Groundwater in the MCB, Camp Lejeune area is naturally rich in iron and manganese. Iron and manganese concentrations, for both total and filtered samples, in groundwater at MCB, Camp Lejeune often exceed NC WQS of 300 and 50 µg/L, respectively. Elevated levels of iron and manganese, at concentrations above the NC WQS, were reported in samples collected from a number of base potable water supply wells which are installed at depths greater than 162 feet below ground surface (bgs) (Greenhorne and O'Mara, 1992). In this study, iron and manganese concentrations from each of the sites exceeded the established screening criteria but generally fell within the range of concentrations for samples collected elsewhere at MCB, Camp Lejeune. Any exceedances of state and/or federal regulatory limits are properly noted in the following subsections.

#### 4.3.2.3 Surface Water/Sediment

In the sections which address the analytical results of the surface water and sediment samples collected during the investigation, only those metals with concentrations exceeding applicable state or federal regulatory limits (i.e., screening standard) will be discussed. The following text and tables indicate any exceedances of regulatory levels and provide the appropriate references.

## 4.4 Site Analytical Sample Results

This section presents the results of the soil, groundwater, surface water, and sediment investigations performed as part of the Pre-RI Screening Study. A summary of the data by media, is discussed and presented in corresponding tables. The analytical data presented on the figures in this section have been divided into detected organics and detected inorganics (i.e., metals). All of the organics detected in the media are presented on corresponding figures. However, for the inorganic (metals) data, only those concentrations which exceed the screening standard are presented on the figures.

### 4.4.1 Site 12 - EOD Range

#### 4.4.1.1 Subsurface Soil

A total of 30 soil samples were collected at Site 12 using direct push technology. The samples were collected from the shallow subsurface above the water table, ranging in depths from ground

surface to five feet bgs. These samples were analyzed on-site by a mobile laboratory in accordance with EPA Method 8020. None of the samples indicated detections above the method detection. In addition to the on-site analysis, four of the soil samples were shipped to a fixed based laboratory for confirmation. The samples were analyzed for VOCs, O&G, and TPH. The analysis from the fixed based laboratory confirmed the results obtained in the field. Neither VOCs, O&G, nor TPH were detected in the soil samples analyzed by the fixed based laboratory. Since there were no detections of any organics in the subsurface soil samples, the results are not presented in table form.

#### 4.4.1.2 Groundwater

Thirty groundwater samples were collected from Site 12 from the same boring locations where the soil samples were collected. These samples were analyzed for VOCs on-site using a mobile laboratory (EPA Method 8020). The results of the on-site screening indicated that nine of the groundwater samples detected xylenes at the method detection limit of 2 μg/L. The results of the remaining samples were below the method detection limit. Table 4-1 shows the positive detections of VOCs from Site 12 as analyzed by the on-site mobile laboratory. The results are plotted on Figure 4-9.

In addition to the 30 samples collected using direct push techniques, four permanent monitoring wells were installed at locations north, south, east, and west of the site (Figure 4-9). These wells were sampled for TCL VOCs and SVOCs. Results of the groundwater samples from the monitoring wells at Site 12 did not indicate the presence of volatile or semivolatiles.

#### 4.4.1.3 Summary

There were no detections of organics in any of the soil samples collected from Site 12. This was established by both on-site screening with a mobile laboratory and by analysis of four soil samples at a fixed based laboratory.

Xylenes were detected at low concentrations in the groundwater by the on-site laboratory in nine samples. However, the results of the remaining 21 groundwater samples at the site were below the method detection limit. Further, four samples taken from permanently installed monitoring wells which border Site 12 did not detect the presence of any organic compounds in the groundwater.

### 4.4.2 Site 68 - Rifle Range

4.4.2.1 Surface soil

A total of 24 surface soil samples were obtained at Site 68 and submitted for TCL organic and TAL metals analyses. A complete listing of the organic compounds and metals detected at Site 68 is listed on Table 4-2. Only one VOC was detected in three of the 24 samples submitted for laboratory analysis. Acetone was detected at 18J, 12J, and 14J micrograms per kilogram (µg/kg), respectively. No other VOCs were detected in the surface soil samples at Site 68. Table 4-3 provides a summary of the detections at Site 68.

Three semivolatile compounds were detected in six of the 24 surface soil samples (Table 4-3). Phenol was detected in one sample at an estimated concentration of 78J µg/kg. Di-n-butylphthalate was detected at 44J µg/kg and bis(2-ethylhexyl)phthalate (BEHP) was detected in four samples at 49J, 54J, 92J, and 160J µg/kg, respectively. The maximum concentration of BEHP was detected at boring location 68-SB09.

None of the volatile or SVOCs exceeded their respective screening standard (refer to Table 4-3).

Pesticide compounds were detected in a total of 22 of the 24 surface soil samples. The pesticide concentrations appear to be widely scattered over the site. As shown on Table 4-3 and Appendix I, the compounds 4,4'-DDT and 4,4'-DDE were the most common pesticides detected. Pesticide concentrations ranged from 170J µg/kg of 4,4'-DDE to 2.3 µg/kg of 4,4'-DDT. Methoxychlor was detected at an estimated concentration of 18J µg/kg. Only one pesticide compound, dieldrin, exceeded the screening standard. This occurred at soil boring location 68-SB05 where dieldrin was detected at 6.3NJ µg/kg, slightly above the screening standard of 1.0 µg/kg.

One surface soil sample had a positive detection of a PCB compound. Aroclor-1260 was detected at a concentration of 290 µg/kg at soil boring location 68-SB05. This detection is greater than the relative screening standard of 83 µg/kg. No other PCB compounds were detected among any of the 24 surface soil samples obtained from Site 68. Figure 4-10 provides an illustration of the detections of organic compounds observed in the surface soil samples at Site 68. The detections of volatile, semivolatile, pesticide and PCBs are all included on this figure.

Twenty-one of 23 TAL metals were detected among the 24 surface soil samples obtained from Site 68 (silver and thallium were not detected). Table 4-3 provides a summary of the metals detected. The table includes the priority pollutant metals, a subset of TAL metals (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc). Essential nutrients, calcium, magnesium, potassium, and sodium are not reported on Table 4-3.

As provided on Table 4-3, aluminum, barium, beryllium, copper, lead, manganese, nickel, and zinc were detected at concentrations exceeding twice their base-specific (i.e., MCB, Camp Lejeune) background levels. (Refer to Table 4-3 and Appendix H for base-specific inorganic background concentrations). The metals detected in the surface soil at Site 68 are displayed on Figure 4-11.

4.4.2.2 Subsurface Soil

A total of 25 subsurface (i.e., greater than one-foot bgs) soil samples were collected at Site 68 and submitted for TCL organic and TAL inorganic analyses. Carbon disulfide, 2-butanone, and acetone were the only VOCs detected. As shown on Table 4-3, carbon disulfide was detected once at a concentration of 16 µg/kg, acetone was detected at concentrations ranging from 15 to 150 µg/kg, and 2-butanone was detected once at 9J µg/kg. The positive carbon disulfide detection was found in a sample obtained near the disturbed area in the western portion of the site. Acetone was detected at boring locations 68-SB09 and 68-SB14 in the central portion of the site, and 2-butanone was detected at well boring location 68-GW04DW. None of these compounds exceeded their respective screening criteria.

Two semivolatile compounds including pyrene and bis(2-ethylhexyl)phthalate (BEHP) were detected in the subsurface soil samples. Pyrene was detected once at well boring location 68-GW06DW at a concentration of 48J µg/kg, and BEHP ranged from 39J to 110J µg/kg. Neither of these detections were above the respective compound screening criteria.

One pesticide compound, 4,4'-DDT was detected at 3.4J µg/kg. This concentration is well below the screening standard of 1,000 µg/kg.

Three subsurface samples had one positive detection of a PCB compound. Aroclor-1260 was detected at concentrations of 15J, 12J, and 26J µg/kg in samples 68-SB05, 68-SB15, and 68-SB17, respectively. These detections are below the screening standard of 83 µg/kg. Detections of organic compounds in the subsurface soil are displayed on Figure 4-12.

Twenty of 23 TAL metals were detected among the 25 subsurface samples obtained from Site 68 (antimony, mercury and silver were not detected). Table 4-3 provides a summary of the metals detected. As provided on Table 4-3, only barium was detected at a concentration exceeding twice its base-specific (i.e., MCB, Camp Lejeune) background level. The detection of barium occurred at well boring 68-GW06DW, located in the southern portion of the site. As barium was the only inorganic detected above its screening criteria it's concentration is not displayed on a site figure.

4.4.2.3 Groundwater

The groundwater investigation at Site 68 entailed the collection of samples from three existing wells (68-GW01, 68-GW02, and 68-GW03) and six newly installed wells (68-GW01DW, 68-GW04, 68-GW04DW, 68-GW05DW, 68-GW06, and 68-GWDW06). Two rounds of groundwater samples were collected at Site 68. The first round of samples were obtained in January 1996. Each of the groundwater samples collected were analyzed for full TCL organics and TAL inorganics using CLP protocols. Based upon the results of the draft Pre-RI Screening Study, a second round of groundwater was conducted in March 1998. During this sampling event, samples were only analyzed for TAL inorganics. Analytical results from the groundwater investigation at Site 68 are provided in the following paragraphs. A positive detection summary of the results are provided in Table 4-3. Complete analytical results are provided in Appendix I.

The groundwater quality at Site 68 was evaluated by sampling from both the upper portion of the surficial aquifer and below the Castle Hayne confining unit which was present over most of the site. The three existing wells and two new wells provided samples from the upper portion of the surficial aquifer and the four newly installed deep wells provided samples from the upper portion of the Castle Hayne aquifer (refer to Section 3.0 and Appendix A for well construction details).

As indicated in Table 4-3, only two VOCs were detected as part of the organic analyses of groundwater. Carbon disulfide was detected at shallow monitoring wells 68-GW06 and 68-GW04, both at concentrations of 4J µg/L. The compound 2-hexanone was detected at deep monitoring well 68-GW04DW at a concentration of 6J µg/L. There were no other organic compounds detected in the groundwater at Site 68. The VOCs detected are displayed on Figure 4-13.

TAL metals were detected in each of the monitoring wells at Site 68. A complete positive detection summary for inorganics is provided in Table 4-3. In all, 19 of the 23 TAL total metals were detected within at least one groundwater sample at Site 68 (beryllium, mercury, silver and thallium were not detected). As provided in Table 4-3, aluminum, antimony, iron, and manganese were the only TAL metals detected at concentrations which exceeded NC WQS or MCLs. The detections of the metals above the screening standards are presented on Figure 4-14.

4.4.2.4 Surface Water

A total of ten surface water samples were collected at Site 68. Five of the surface water samples were collected from Stones Creek and five samples were collected from an unnamed tributary which flows north into Stones Creek. The samples were collected from the segments of the streams which border the site from the northeast to the southwest. Each of the surface water samples were analyzed for full TCL organics and TAL inorganics using CLP protocols.

Analytical results from the surface water investigation are presented in the paragraphs which follow. Table 4-3 provides a summary of analytical results from the surface water investigation. Positive detection summaries of both organic compounds and inorganic analytes found in the surface water samples are provided. The screening values for the surface water were based upon NC WQS and USEPA Region IV Water Quality Standards.

Of the organic analyses, only one SVOC was detected in the surface water samples. Di-n-butylphthalate was detected at an estimated concentration of 1J µg/L at surface water sample station 68-SW01 located approximately southwest of the site in Stones Creek. This concentration is well below its respective screening standard of 2,700 µg/L. No other organic compounds were detected among the 10 surface water samples. As only one organic compound was detected, its concentration is not displayed on an associated figure.

As presented in Table 4-3, 13 of the 23 TAL total metals were positively identified among the surface water samples (antimony, beryllium, chromium, cobalt, copper, nickel, silver, and thallium were not detected). Positive detections of metals were compared to the screening values mentioned above. None of the detections of inorganic analytes in the surface water samples exceeded their respective screening standard. As such, the results of inorganics in surface water are not presented on a figure.

4.4.2.5 Sediment

Sediment samples were collected from the same sampling stations as the surface water samples. A total of ten samples were collected: five from Stones Creek and five from the unnamed tributary which flows north into Stones Creek. The sediment samples were obtained from zero to six inches into the sediment. Each of the ten sediment samples were analyzed for full TCL organics and TAL inorganics using CLP protocol.

The analytical results from the sediment investigation are provided in the following paragraphs. Positive detection summaries of organic compounds and inorganic analytes found in the samples are shown on Table 4-3. Volatile and PCB compounds were not detected in any of the 10 sediment samples and, therefore, will not be addressed.

Semivolatile organic compounds were detected in three of the 10 sediment samples (refer to Table 4-3). Sample station 68-SD03 detected only one semivolatile compound, BEHP at an estimated concentration of 250J µg/kg. Sampling point 68-SD05 also detected one SVOC, benzo(a)pyrene at a concentration only of 380 µg/kg. The majority of the SVOCs were detected at sampling point 68-SD07. The detections ranged from 420J µg/kg of fluoranthene to 62J µg/kg of anthracene. None of the detections exceeded the associated screening standards. The detections of the SVOCs are displayed on Figure 4-15.

The pesticides 4,4'-DDD and 4,4'-DDE were detected in each of the sediment samples with the exception of sample point 68-SD02. 4,4'-DDT was detected in sampling points 68-SD06 through 68-SD10. Two other pesticide compounds, alpha-chlordane and gamma-chlordane, were detected at sample station 68-SD06 at a concentrations of 13J µg/kg and 14NJ µg/kg. The maximum pesticide concentration, 4,4'-DDT at 4,500 µg/kg, was detected in the sample obtained from station 68-SD07. The pesticide 4,4'-DDE was detected at concentrations ranging from 6.7

µg/kg at station 68-SD06 to 550 µg/kg at the same sampling point. 4,4'-DDD detections ranged from 2.5J µg/kg at station 68-SD03 to 2,900 µg/kg at station 68-SD03. Each of the pesticide compounds detected exceeded their respective screening standards (refer to Table 4-3). No other pesticide compounds were detected among the sediment samples obtained from Stones Creek and its unnamed tributary. The results of pesticide concentrations are also presented on Figure 4-15.

Eighteen of the 23 TAL total metals were positively identified among the 10 sediment samples (antimony, beryllium, potassium, silver, and thallium were not detected). Inorganic analytical results from the 10 sediment samples obtained at Site 68 are provided in Table 4-3. Three inorganic analytes slightly exceeded the associated screening value including cadmium, lead, and mercury. The relative locations of the inorganic detections in the sediment samples are provided on Figure 4-16.

4.4.2.6 Summary

In summary, the surface soil results at Site 68 detected one pesticide compound and one PCB compound slightly above the established screening standards. In addition, several metals were detected above base background concentrations.

The subsurface soil sampling detected one PCB compound that was below the applicable screening standard. Barium was detected in the subsurface soil samples above base background concentrations.

Two VOCs were detected in the groundwater samples, carbon disulfide and 2-hexanone. There are no state or federal regulatory levels established for either of these compounds. Several metals were detected in the groundwater above their applicable state and/or federal screening standards.

One SVOC was detected in the surface water samples at a concentration below the established screening standard. In addition several metals were detected, however, none exceeded the applicable screening standards.

The sediment samples collected at the site detected the presence of SVOCs, however none exceeded the screening criteria. Pesticides were detected in the sediment samples collected at Site 68. Each of the compounds detected exceeded the screening criteria. Metals were detected in the sediment samples. Three, including cadmium, lead, and mercury exceeded their associated screening standards.

### 4.4.3 Site 75 - MCAS Basketball Court

#### 4.4.3.1 Surface Soil

A total of 15 surface soil samples were obtained at Site 75 and submitted for TCL organic and TAL metals analyses. A complete listing of the organic compounds and metals detected at Site 75 is shown on Table 4-4. As indicated on the summary Table 4-5, VOCs were not detected among the surface soil samples obtained at Site 75.

Two semivolatile compounds were detected in 10 of the 15 surface soil samples that were submitted for laboratory analyses. Di-n-butylphthalate was detected in three samples at concentrations ranging from 280J µg/kg to 460 µg/kg. The maximum detection occurred at boring location 75-SB08. BEHP was detected in seven samples at estimated concentrations ranging from 40J to 280J at 75-SB11. These concentrations are below the established screening values.

Pesticide compounds were detected in each of the surface soil samples except for locations 75-SB02 and 75-SB03. The pesticide concentrations were widely scattered across the site and detected at low concentrations. Pesticides 4,4'-DDE and 4,4'-DDT were the most frequently detected compounds. Seven other compounds including 4,4'-DDD, dieldrin, heptachlor, heptachlor epoxide, alpha chlordane, and gamma chlordane were detected sporadically across the site at low concentrations. Pesticide concentrations ranged from 470 µg/kg of gamma chlordane to 1.5J µg/kg of 4,4'-DDT. The compound heptachlor epoxide slightly exceeded its screening standard of 30.0 µg/kg with a concentration of 37J µg/kg at boring 75-SB12. In addition, two detections of dieldrin exceeded the screening standard at boring locations 75-SB01 and 75-SB08.

The organic compounds detected in the surface soil at Site 75 are presented on Figure 4-17. Two semivolatile compounds were detected at boring locations 75-GW05 and 75-SB08. The remaining organics shown on Figure 4-17 are pesticide compounds.

Seventeen of 23 TAL metals were detected among the 15 surface soil samples obtained from Site 75 (antimony, beryllium, cadmium, silver, and thallium were not detected). Table 4-5 provides a summary of the metals detected within the surface soil samples from Site 75. The list of metals includes the priority pollutant metals which are a subset of TAL metals that include antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc. The list of inorganics reported on Table 4-5 does not include the essential nutrients of calcium, magnesium, potassium, and sodium.

Only barium at 43 milligrams per kilogram (mg/kg) exceed its screening standard of 32 mg/kg. Several metals, including aluminum, arsenic, barium, chromium, iron, lead, mercury, nickel, vanadium, and zinc, were detected at concentrations exceeding twice their base-specific background levels within at least one of the surface soil samples. The metals detected in the surface soil at Site 75 are displayed on Figure 4-18.

4.4.3.2 Subsurface Soil

A total of 17 subsurface (i.e., greater than one-foot bgs) soil samples were obtained at Site 75 and submitted for TCL organic and TAL metal analyses. As indicated on Table 4-5, no VOCs or PCB compounds were detected among the subsurface samples. As such, these compounds will not be discussed further.

Two semivolatile compounds were detected in three of the borings at Site 75 (refer to Table 4-5). The semivolatile compound BEHP was detected in two samples from boring 75-SB03 and from one sample in 75-SB08 with estimated concentrations ranging from 40J µg/kg to 66J µg/kg. Di-n-butylphthalate was detected once at boring location 75-SB08 at 64J µg/kg and once at 75-GW05 at 200J µg/kg. Neither of these compounds exceeded their respective screening standards.

Six pesticide compounds were detected among the 15 subsurface soil samples obtained from Site 75. At boring location 75-SB01 the compounds 4,4'-DDE and 4,4'-DDT were detected at concentrations of 6.7 µg/kg and 3.7 µg/kg, respectively. Six pesticide compounds were detected at boring location 75-SB03 including dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha chlordane, and gamma chlordane. The concentrations ranged from 1.1J µg/kg of gamma chlordane to 41 µg/kg of 4,4'-DDD. Only dieldrin detected at concentrations of 1.5J µg/kg and 6.6J µg/kg exceeded its screening standard of 1.0 µg/kg.

The detections of the organic compounds in the subsurface soil, which included semivolatiles and pesticide compounds, are depicted on Figure 4-19.

Nineteen of the 23 TAL metals were detected among the 17 subsurface soils collected at Site 75 (beryllium, cadmium, mercury, and thallium were not detected). Table 4-5 provides a summary of the metals detected within the subsurface soil samples at Site 75. As provided on Table 4-5, arsenic and barium were detected at concentrations which were slightly above their respective screening standards. Further, the elements aluminum, arsenic, barium, lead, manganese, vanadium, and zinc were detected at concentrations which were greater than their base-specific background levels. The detections of these metals are provided on Figure 4-20.

4.4.3.3 Groundwater

The groundwater investigation at Site 75 entailed the collection of samples from three existing wells (75-GW01, 75-GW02, and 75-GW03) and two new wells (75-GW04 and 75GW05). Each of the groundwater samples collected at Site 75 were analyzed for full TCL organics, TAL metals and specific analyses for the tear gas compounds chloroacetophenone and chloropicrin. All of the analysis were completed using CLP protocols. Analytical results from the groundwater investigation at Site 75 are provided in the following paragraphs. A positive detection summary of organic compounds is shown on Table 4-5.

The quality of the groundwater at Site 75 was evaluated using existing wells and newly installed monitoring wells (refer to Section 3.0 and Appendix A for well construction details). A total of five shallow groundwater samples were collected from Site 75 and submitted for laboratory analyses. Volatile, semivolatile, and PCB compounds were not detected in any of the five groundwater samples collected from Site 75 and, therefore, will not be addressed. In addition,

none of the samples detected the presence of the specific tear gas compounds that were suspected at this site. Since there were no detections of organic compounds in the groundwater at Site 75, an associated figure is not included.

TAL metals were detected in each of the monitoring wells at Site 75. A complete positive detection summary for metals is provided in Table 4-5. Twelve of the 23 TAL total metals were detected within at least one groundwater sample at Site 75 (antimony, arsenic, beryllium, cadmium, chromium, lead, mercury, nickel, silver, thallium, and vanadium were not detected). As provided in Table 4-5, aluminum, iron, and manganese were the only TAL metals detected at concentrations which exceeded NC WQS or Federal MCLs. Figure 4-21 presents the results of the metals detected in the groundwater samples at Site 75.

4.4.3.4 Summary

Two SVOCs were detected in the surface soil samples at concentrations below the screening standards. Pesticides were detected in each of the soil samples. Several compounds exceeded their screening standards. Metals were detected in the surface soil samples with barium exceeding its screening standard. Several other metals exceeded their base-background concentrations.

Two SVOCs were detected in the subsurface soil. Neither of the compounds exceeded the screening standard. Six pesticide compounds were detected, however only one exceeded the screening standard. Arsenic and barium were detected in the subsurface soil at concentrations above their respective screening standards. In addition, other metals were detected at concentrations above base-background levels.

There were no detections of organic compounds in the groundwater at Site 75. Metals were detected in each of the samples. Aluminum, iron and manganese exceeded state and/or federal regulatory limits.

### 4.4.4 Site 76 - MCAS Curtis Road

#### 4.4.4.1 Surface Soil

A total of 16 surface soil samples were obtained at Site 76 and submitted for TCL organic and TAL metal analyses. A complete listing of the organic compounds and metals detected at Site 76 is shown on Table 4-6. Table 4-7 provides a summary of positive detections. As indicated on Table 4-7, VOCs were not detected among any of the surface soil samples obtained at Site 76.

Some semivolatile compounds were detected in 10 of the 16 surface soil samples that were submitted for laboratory analyses. The semivolatile compounds that were detected included phenanthrene, chrysene, benzo(a)pyrene, fluoranthene, pyrene, bis(2-ethylhexyl)phthalate, and benzo(b)fluoranthene. As shown on Figure 4-22, concentrations of the semivolatile compounds were relatively low. The highest concentration detected was 490 µg/kg of bis(2-ethylhexyl)phthalate at boring location 76-SB13. The lowest concentration was found at boring 76-GW04 which detected pyrene at 40J µg/kg. None of the detections of the semivolatile compounds exceeded the established screening standards.

Pesticide compounds were detected in the majority of the surface soil samples. Overall, the pesticide concentrations were widely scattered at low concentrations across the site. The pesticides 4,4'-DDE and 4,4'-DDT were the most frequently detected compounds. Six other compounds including heptachlor, heptachlor epoxide, 4,4'-DDD, dieldrin, alpha chlordane and gamma chlordane were detected sporadically across the site at low concentrations. Pesticide concentrations ranged from 510J µg/kg of 4,4'-DDE to 1.6J µg/kg of dieldrin. Concentrations of dieldrin and 4,4'-DDE were slightly above their associated screening standard.

The values of the detected organic compounds in the surface soil samples at Site 76 are provided on Figure 4-22.

Nineteen of 23 TAL metals were detected among the 16 surface soil samples obtained from Site 76 (antimony, cadmium, silver, and thallium were not detected). Table 4-7 provides a summary of the priority pollutant metals detected within soil samples from Site 76. Five metals including aluminum, barium, nickel, vanadium, and zinc were detected at concentrations greater than their base-specific (i.e., MCB, Camp Lejeune) background levels (refer to Table 4-7 and Appendix H

for base specific background concentrations). Figure 4-23 provides an illustration of the metal detections above the screening standard relative to Site 76.

4.4.4.2 Subsurface Soil

A total of 16 subsurface (i.e., greater than one-foot bgs) soil samples were obtained at Site 76 and submitted for TCL organic and TAL metal analyses. In addition, each sample was analyzed for specific tear gas compounds. There were no PCBs or tear gas compounds detected among the subsurface samples.

One volatile compound (acetone) was detected at a concentration of 24 µg/kg at soil boring location 76-SB11 (refer to Table 4-7). This concentration was below the screening standard of 8,000 µg/kg.

Two semivolatile compounds, di-n-butylphthalate and bis(2-ethylhexyl)phthalate, were detected at concentrations below their relative screening standards.

The only other organic compounds detected in the subsurface soil samples at Site 76 were pesticides. Three pesticide compounds were detected among the 16 subsurface soil samples obtained from Site 76. At soil boring location 76-SB09 the compounds 4,4'-DDE and 4,4'-DDT were detected at concentrations of 3.4J µg/kg and 1.7J µg/kg, respectively. At soil boring location 76-SB11, 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT were detected at concentrations of 40J µg/kg, 480 µg/kg, and 5.9J µg/kg, respectively. None of the detected compounds exceeded the established screening standards.

Figure 4-24 presents the results of the detections of the organic compounds in the subsurface soil samples at Site 76.

Fifteen of the 23 TAL metals were detected among the 16 subsurface soils collected at Site 76 (antimony, cadmium, silver, and thallium were not detected). Table 4-7 provides a summary of the metals detected within the subsurface soil samples from Site 76. As provided on Table 4-7, barium exceeded the screening standard of 32 mg/kg with a concentration of 38.9 mg/kg at boring location 76-SB09. Eleven other metals exceeded their respective base background levels (i.e. twice their base specific average), including aluminum, arsenic, barium, beryllium,

chromium, copper, iron, lead, manganese, selenium, and vanadium. The detections of metals above the appropriate screening values are displayed on Figure 4-25.

4.4.4.3 Groundwater

The groundwater investigation at Site 76 entailed the collection of samples from two existing wells (76-GW01, and 76-GW02) and three new wells (76-GW03, 76-GW04, and 76-GW05). Each of the groundwater samples collected at Site 76 were analyzed for full TCL organics, TAL metals and specific analyses for the tear gas compounds chloroacetophenone and chloropicrin. The analyses were completed using CLP protocols. Analytical results from the groundwater investigation at Site 76 are provided in the following paragraphs. A positive detection summary of organic compounds and metals are provided in Table 4-7. Volatile, PCB, pesticide, and tear gas compounds were not detected in any of the five groundwater samples collected from Site 76 and, therefore, will not be addressed.

One SVOC, di-n-butylphthalate was detected at a concentration of 3J µg/L at monitoring well 76-GW02 (Figure 4-26). This concentration is below the NC WQS of 700 µg/L.

TAL metals were detected in each of the monitoring wells at Site 76. A complete positive detection summary for metals is provided in Table 4-7. Thirteen of the 23 TAL total metals were detected within at least one groundwater sample at Site 75 (antimony, beryllium, cadmium, chromium, cobalt, mercury, nickel, silver, thallium, and vanadium were not detected). Of the positive detections, only aluminum and iron exceeded their respective NC WQS or Federal MCLs. Figure 4-27 illustrates the detections on these metals in groundwater at Site 76.

4.4.4.4 Summary

There were no VOCs detected in the surface soil at Site 76. Semivolatile were detected; however, none exceeded their respective screening standards. Pesticides were detected in the majority of the surface soil samples. Dieldrin and 4,4'-DDE were detected at concentrations above their respective screening standards. Five metals were detected at levels above base background levels.

One VOC (acetone) was detected in the subsurface soil samples at a concentration below the relative screening standard. In addition, two SVOCs were detected at levels below their screening standards. Pesticides were detected in two of the 15 subsurface soil samples. None of the detections exceeded the screening standard. Metals were detected in the subsurface soils at levels above their specific base-background concentrations.

One semivolatile was detected in the groundwater samples below the screening standard. No other organic compounds were detected. Metals were detected in each of the groundwater samples, however, only aluminum and iron exceeded state and/or federal regulatory levels.

### 4.4.5 Site 84 - Building 45 Area

#### 4.4.5.1 Surface Soil

The first sampling event at Site 84 occurred in October 1995. At this time, 20 surface soil samples were collected at Site 84 from 10 borings located near the lagoon area (north of Building 45). Ten of the samples were collected from ground surface to six inches bgs and ten samples were collected from six to twelve inches bgs. The samples were analyzed for TCL PCBs only; no other analytical tests were performed on the soil samples collected from the October 1995 event.

The PCB compound Aroclor-1260 was detected in each of the samples collected. Concentrations of the compound ranged from a high of 12,000 µg/kg at borings SB02B (6 to 12-inches) and SB09A (0 to 6-inches) to a low of 360 µg/kg at boring SB07A (0 to 6-inches).

A second sampling event occurred in April 1998. As presented in Section 2.2.5.3, interviews with on-site workers were performed to better define the site history. According to on-site maintenance personnel, it is possible that additional transformers are buried at the site in the area of the lagoon. During the April event, an additional 31 borings were completed at the site. Samples were collected at each of the boring locations from zero to six inches bgs and six to twelve inches bgs. Each of the samples were screened in the field using on-site test kits. Based upon results of the field screening, 28 soil samples were selected for fixed based laboratory analysis. Aroclor-1260 was detected in 17 of the 28 samples sent for laboratory analysis.

Concentrations ranged from and estimated result of 62 J µg/kg at boring SB21-01 (6 to 12-inches) to 200,000 µg/kg at boring SB27-01 (6 to 12-inches).

Figures 4-28 through 4-30 display the concentrations and locations of the PCB detections at Site 84 from the October 1995 sampling event and the March 1998 sampling event. The estimated area of contamination is based upon fixed based laboratory results. These detections were initially compared to the current RBCs for residential soils (320 µg/kg) . As shown on Figure 4-28, contaminated soil appears local to the existing lagoon and extends to the northeast in the direction of Building 45. The soils appear to be impacted to a depth of at least 12 inches bgs. It should be noted, however, that the RBCs are very conservative comparison criteria.

A more realistic criteria would be the clean-up standards for high and low occupancy areas (1,000 µg/kg and 25,000 µg/kg, respectively) under the guidance of Toxic Substances Control Act (TSCA). Figure 4-29 demonstrates the estimated area of concern for high occupancy areas. This is the most probable area of clean-up for Site 84. The contaminated soil still appears local to the existing lagoon and extends to the northeast in the direction of Building 45.

Figure 4-30 demonstrates the estimated area of concern for low occupancy areas. As shown on the figure, soil near sampling point 84-SB27 exceeds the clean-up criteria for high occupancy use. Further definition will be required in the area of 84-SB27.

As mentioned above, the detections of PCBs were compared to the residential RBCs, as well as the more realistic clean-up criteria for high and low occupancy areas. Estimated areas of concern have been established for each of these criteria. Table 4-8 provides a complete listing of the detections at Site 84. Table 4-9 provides a summary of the positive detections.

4.4.5.2 Groundwater

As part of the initial investigation at the site in October 1995, two permanent monitoring wells and one temporary monitoring well were sampled at Site 84 for TCL PCBs only. The groundwater samples were not analyzed for any other organic compounds or inorganic analytes at this time. None of the groundwater samples exhibited PCBs.

In an effort to characterize the groundwater near the former above ground storage tank at Building 45, additional groundwater sampling was conducted in March 1998. Samples were collected from selected wells and analyzed for VOCs only. A total of six monitoring wells were sampled which included a shallow and intermediate well cluster at three separate locations. The monitoring wells were selected based upon typical groundwater flow direction and the proximity to former above ground storage tank AST781. The locations of the monitoring wells and the analytical results are shown on Figure 4-31. As shown on the figure, there were low detections of benzene and ethylbenzene at monitoring well cluster MW03 and MW04. The detections of benzene slightly exceeded the NC WQS of 1.0 µg/l but are below the Federal MCL. Ethylbenzene also was detected in each of these monitoring wells, however, the levels were below both state and federal standards. Chloroform was detected at 16 µg/l in monitoring well cluster MW11 and MW12 which is located approximately 300 feet south of the former AST. This concentration exceeds the NC WQS of 0.19 µg/l but is less than the Federal MCL of 80 µg/l.

4.4.5.3 Surface Water

During the October 1995 sampling event, seven surface water samples were collected at Site 84 and analyzed for TCL PCBs only. The surface water samples were not analyzed for any other organic compounds or inorganic analytes. Three of the surface water samples were collected from Northeast Creek and four of the surface water samples were collected from the lagoon. As shown on Table 4-8, none of the surface water samples collected from the site exhibited PCBs.

Seven surface water samples were obtained in March 1998 from the lagoon. Each of the samples were analyzed for TCL PCBs with one sample analyzed for VOCs and SVOCs. Again none of the surface water samples detected PCBs. There were several VOCs detected in the one surface water sample. They included acetone at 5.6 J µg/l, benzene at 1.2 J µg/l, toluene at 2.7 J µg/l, and xylenes at 3.5 J µg/l. There were no SVOCs detected in the surface water sample.

4.4.5.4 Sediment

In October 1995, seven sediment samples were collected at Site 84 and analyzed for TCL PCBs only. Three of the samples were collected from Northeast Creek and four of the samples were collected from the lagoon. The sediment samples collected from Northeast Creek did not detect

the presence of any PCB compounds; however, each of the four samples collected from the lagoon exhibited PCBs. Sediment sample 84-SD05 detected the PCB compounds Aroclor-1248 at 2,800 µg/kg and Aroclor-1260 at a concentration of 20,000 µg/kg. Aroclor-1260 was also detected at sampling stations 84-SD06, 84-SD07, and 84-SD08 at concentrations of 8,100 µg/kg, 17,000 µg/kg, and 3,700 µg/kg, respectively.

During the March 1998 sampling event an additional three sediment samples were collected from the lagoon. Each of the samples detected Aroclor-1260 at concentrations of 40,000 µg/kg, 5,900 µg/kg, and 4,300 µg/kg. Figure 4-32 displays the locations and concentrations of the PCBs detected in the sediment samples at Site 84. These concentrations are all above the established screening standard of 22.7 µg/kg.

4.4.5.5 Summary

Each of the media sampled at Site 84 (surface soil, groundwater, surface water, and sediments) were analyzed for TCL PCBs. One surface water sample from the lagoon was analyzed for VOCs and SVOCs. A total of 48 surface soil samples were collected at Site 84. The PCB Aroclor-1260 was consistently detected in surface soil samples at concentrations above the screening standard.

The estimated area of concern has been defined in the area of the lagoon. Additional surface and subsurface soil sampling will be required to define the vertical and horizontal extent of PCB contamination in the area of soil boring 84-SB27. This sample location exhibited the highest detected concentrations of Aroclor-1260. In addition, geophysical testing maybe required to confirm or deny the presence of additional buried transformers near the lagoon.

PCBs were not detected in any of the groundwater samples, surface water samples, or sediment samples collected from Northeast Creek. PCBs were, however, detected in each of the sediment samples collected from the lagoon. Aroclor-1248 and Aroclor-1260 were detected at levels above the established screening standards.

### 4.4.6 Site 85 - Camp Johnson Battery Dump

#### 4.4.6.1 Surface Soil

A total of five surface soil samples were obtained at Site 85 and submitted for TAL inorganics analyses only. A complete listing of the inorganics detected at Site 85 is provided on Table 4-10.

Seventeen of 23 TAL metals were detected among the five surface soil samples obtained from Site 85 (antimony, beryllium, silver, selenium, and thallium were not detected). Table 4-11 provides a summary of the priority pollutant metals detected within soil samples from Site 85. As shown on Table 4-11, each of the metals exceeded the established screening value and/or twice the average base background levels. Only aluminum and cyanide were detected at concentrations less that the screening values or base background levels. The inorganic analytes detected in the surface soil at Site 85 are displayed on Figure 4-33.

#### 4.4.6.2 Subsurface Soil

A total of 10 subsurface (i.e., greater than one-foot bgs) soil samples were collected at Site 85 and submitted for TAL inorganic analyses only. Thirteen of 23 TAL inorganics were detected among the 10 samples (antimony, beryllium, silver, selenium, thallium, and cyanide were not detected). Table 4-11 provides a summary of the inorganics detected within subsurface soil samples from Site 85. As provided on Table 4-11, none of the inorganics detected exceeded the screening standard, however ten of the metals had concentrations which exceeded their base-specific background levels (refer to Table 4-11 and Appendix H for base-specific inorganic background concentrations). The inorganic analytes detected in the subsurface soil at Site 85 are illustrated on Figure 4-34.

#### 4.4.6.3 Groundwater

Three groundwater samples were collected from temporary monitoring wells at Site 85 and analyzed for TAL inorganics only. A complete positive detection summary of inorganics is provided in Table 4-11. Nineteen of the 23 TAL inorganics were detected in the groundwater samples (antimony, silver, selenium, and thallium were not detected). As indicated on

Table 4-11, aluminum, cadmium, chromium, iron, lead, manganese, mercury, nickel, and zinc were detected at concentrations which exceeded NC WQS and/or Federal MCLs. Figure 4-32 presents the results of the inorganics detected in the groundwater at Site 85.

4.4.6.4 Composite Soil Sample Results (TCLP)

Three composite soil samples were collected at Site 85 and analyzed for Toxicity Characteristic Leaching Procedure (TCLP metals). One sample was collected as a composite soil sample from the borings advanced at Site 85. As shown on Table 4-11, this sample did not detect any analytes above the method detection limit.

Two other composite samples were collected at Site 85 from the waste battery piles themselves. The results of these analyses are shown on Table 4-11. Three metals were detected as part of the TCLP metals analysis on the waste material and included lead, barium, and cadmium. Of these, only lead exceeded the screening standard of 500 µg/L with concentrations of 1,110 µg/L and 3,640 µg/L for the two waste material samples. Since TCLP samples were composites soil samples and waste material samples which were collected from various areas of the site, a figure presenting the TCLP results is not included.

4.4.6.5 Summary

The media sampled at Site 85 (surface soil, subsurface soil, and groundwater) were analyzed for TAL inorganics only. Five surface soil samples were collected at Site 85. Each of the metals detected exceeded the established screening value or the base background levels. Only aluminum and cyanide were detected at levels below their respective screening standards or base background levels.

Ten subsurface soil samples were collected at Site 85. The metals detected in these samples did not exceed their associated screening standard, however some exceeded base-background levels.

Three groundwater samples were collected from temporary wells at the site. Metals were detected in each of the samples obtained from the wells. Nine of the metals detected exceeded state and/or federal regulatory levels.

Three samples were taken at the site for TCLP analyses. One of the TCLP samples collected from the waste material detected three metals (lead, barium, and cadmium). Of these three, only lead exceeded the TCLP regulatory level.

### 4.4.7 Site 87 - MCAS Officer's Housing Area

#### 4.4.7.1 Surface Soil

As shown on Tables 4-12 and 4-13, there were no detections of VOCs or PCBs in the surface soil at Site 87. Therefore, these compounds will not be addressed in this section.

Eighteen semivolatile compounds were detected at Site 87, primarily in borings 87-SB03, 87-SB04, and 87-SB05. As provided on Table 4-13, the concentrations ranged from 840 µg/kg of fluoranthene at soil boring 87-SB05 to 17J µg/kg of BEHP at 87-SB04. None of the semivolatiles detected at in the surface soil samples had concentrations above their relative screening standards. Low concentrations of bis(2-ethylhexyl)phthalate were detected in borings 87-SB01 and 87-SB06 at 39J µg/kg and 17J µg/kg, respectively. Boring location 87-SB01 did not detect any semivolatile compounds. The detected compounds are shown on Figure 4-36.

Pesticide compounds were detected in the surface soil samples at each of the six boring locations at Site 87. As shown on Table 4-13, five pesticide compounds were detected including 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-chlordane, and gamma-chlordane. Pesticide concentrations ranged from 470 µg/kg of 4,4'-DDD to 10J µg/kg gamma-chlordane. The pesticide concentrations did not exceed the associated screening standards. Figure 4-36 presents the results of the organic compounds detected in the surface soil at Site 87.

Twenty-one of the 23 TAL metals were detected among the 6 surface soils collected at Site 87 (antimony and silver were not detected). Table 4-13 provides a summary of the priority pollutant metals detected within soil samples at Site 87. As shown on Table 4-13, thallium was detected at a concentration of 1.8J mg/kg at one boring location (87-SB01). This concentration is slightly higher than the established screening standard of 0.4 mg/kg.

Fourteen of the metals in the surface soil samples at Site 87 were detected at concentrations exceeding twice their base-specific background levels (refer to Table 4-13 and Appendix H for base-specific inorganic background concentrations). The metals detected in the surface soil at Site 87 are illustrated on Figure 4-37.

4.4.7.2 Subsurface Soil

A total of four subsurface soil samples were obtained from the test pit locations at Site 87 and submitted for TCL organic and TAL metal analyses. The soil samples collected from the test pits were taken from the bottom of the excavation, approximately eight feet bgs. As indicated on Table 4-13, no volatile, SVOCs, or PCBs were detected among the subsurface samples. Accordingly, these compounds will not be discussed further.

Three pesticide compounds were detected among the four subsurface soil samples obtained from the test pits. At test pit location 87-TP03, the compounds 4,4'-DDD, 4,4'-DDE and 4,4'-DDT were detected at maximum concentrations of 5.1 µg/kg and 4.7 µg/kg, and 28NJ µg/kg, respectively. None of the detected pesticide compounds exceeded associated screening standards. The detections of the pesticide compounds in the subsurface soil, are depicted on Figure 4-38.

Seventeen of the 23 TAL metals were detected from the test pits subsurface samples (cadmium, mercury, nickel, selenium, silver, and thallium were not detected). Table 4-13 provides a summary of the metals detected within the subsurface soil samples at Site 87. As shown on Table 4-13, only barium had concentrations greater than its base-specific background level. The concentrations of barium detected in the subsurface soil samples collected from the test pits is shown on Figure 4-39.

4.4.7.3 Groundwater

Groundwater samples were collected from two existing monitoring wells at Site 87 and analyzed for TCL organics and TAL inorganics. Neither of the samples collected at the site exhibited the presence of VOCs, pesticides, or PCBs, therefore these analytical results of the groundwater will not be addressed.

The only indication of organic compounds in the groundwater at Site 87 came from the sample collected from monitoring well 87-GW01. This sample detected two SVOCs. Pentachlorophenol was detected in the groundwater sample at an estimated concentration of 0.8J µg/L and 4-nitrophenol was detected at an estimated 1J µg/L. The concentration of pentachlorophenol slightly exceeded the NC WQS of 0.3 µg/l. No other organic compounds were detected in the two groundwater samples. Figure 4-40 displays the concentrations of the SVOCs detected in the groundwater samples at Site 87.

TAL metals were detected in both of the monitoring wells at Site 87. A complete positive detection summary for inorganics is provided in Table 4-13. Fourteen of the 23 TAL total metals were detected in the groundwater samples at Site 87 (antimony, arsenic, beryllium, cadmium, chromium, mercury, nickel, silver, and vanadium were not detected). As shown on Table 4-13, aluminum, iron, manganese, and thallium were the only TAL metals detected at concentrations which exceeded NC WQS or Federal MCLs. Metals which exceeded the groundwater standards are provided on Figure 4-41.

4.4.7.4 Surface Water

As provided on Table 4-13, organic compounds were not detected in the surface water samples collected from Site 87. Therefore, these analyses are not discussed and a figure has not been prepared.

TAL metals were detected in both of the surface water samples obtained at Site 87 (Figure 4-42). A complete positive detection summary for inorganics is provided in Table 4-12. Fourteen of the 23 TAL total metals were detected in the surface water samples at Site 87 (arsenic, beryllium, cadmium, chromium, cobalt, mercury, nickel, silver, and thallium were not detected).

Surface water sample 87-SW02 detected cyanide at a concentration of 53.4 µg/L. This value is below the associated screening standard of 700 µg/L (refer to Table 4-13). As provided in Table 4-13, antimony and iron were the only TAL metals detected at concentrations which exceeded state or federal screening standards. Antimony was detected at a concentration of 54.5 µg/L at surface water sample location 87-SW01 which exceeds its screening standard of 14 µg/L. Iron was detected at sample location 87-SW01 at a concentration of 326 µg/L; slightly greater

than its screening standard of 300 µg/L. The detections of metals in the surface water at Site 87 are provided on Figure 4-39.

4.4.7.5 Sediment

Only one VOC, acetone, was detected in the sediment samples at Site 87. The detection of acetone was noted at sampling location 87-SD01 at a concentration of 6J µg/kg. There is no screening standard established for this compound in sediments.

Several semivolatile compounds were detected in the sediment samples collected at Site 87. As shown on Table 4-13, sampling station 87-SD02 detected nine semivolatile compounds at relatively low concentrations. The highest detection in this sample was benzo(a)pyrene at 41J µg/kg. The lowest concentration detected was 24J µg/kg which was the concentration of fluoranthene, benzo(a)anthracene, and indeno(1,2,3-cd)pyrene in sample 87-SD02. Sediment sample 87-SD01 detected only one semivolatile compound; bis(2-ethylhexyl)phthalate at 27J µg/kg. None of the detected SVOCs were greater than their associated screening standard.

As shown on Table 4-13, neither pesticide nor PCB compounds were detected in the sediment samples at Site 87. Therefore, these analyses are not discussed in this section. Figure 4-43 displays the concentrations of the organics detected in the sediment samples at Site 87.

TAL metals were detected in both of the sediment samples at Site 87. A complete positive detection summary for metals is provided in Table 4-12. Fifteen of the 23 TAL total metals were detected in the sediment samples at Site 87 (antimony, arsenic, beryllium, cadmium, cobalt, mercury, potassium, and thallium were not detected).

As indicated on Table 4-13, copper and silver were the only TAL metals detected at concentrations which exceeded state or federal screening standards. The detections of the metals exceeding the screening standard in sediments are shown on Figure 4-44.

4.4.7.6 Summary

The test pits at Site 87 did not reveal any buried debris or waste materials. The soils appeared to be natural with no fill material noted. There were no volatile organics detected in the surface soil

samples at Site 87. Semivolatile organic compounds were detected, however, none were detected above established screening standards. Pesticides were detected at each of the surface soil sample locations. Again, none of the detections exceeded screening standards. Metals were detected in the surface soil at the site. Only thallium exceeded the screening standard for soil. Fourteen other metals were detected at concentrations which exceeded base-specific levels.

The samples collected from the subsurface soil did not detect any volatile organics, semivolatile organics, or PCBs. Three pesticide compounds were detected. None of the concentrations exceeded their associated screening standards. Seventeen metals were detected in the subsurface soil samples. However, only barium was detected at a level which exceeded base-background concentrations.

Groundwater samples were collected from two monitoring wells at the site. There were no volatile organics, pesticides, or PCB compounds detected in the groundwater. Two semivolatile compounds were detected. One compound, pentachlorophenol, had a concentration which exceeded NC WQS. In addition, metals were detected in the groundwater at concentrations above NC WQS and/or Federal MCLs.

There were no organic compounds detected in the surface water samples collected at Site 87; however, metals were detected in both of the samples. Of the metals detected, antimony and iron were the only analytes detected at concentrations which exceeded state or federal screening standards.

One VOC (acetone) was detected in the sediment samples from Site 87. There is no screening standard established for this compound. Several semivolatile compounds were detected in the sediment samples, however none of the detections exceeded the associated screening standard. In addition there were no pesticide or PCB compounds detected. Metals were detected in the sediment samples. Copper and silver were detected at concentrations above state or federal screening standards.

## 4.5 References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# TABLES

## TABLE 4-1

**RESULTS OF VOLATILE ORGANIC COMPOUNDS FROM ON-SITE LAB ANALYSIS**
**SITE 12 EXPLOSIVE ORDNANCE DISPOSAL RANGE**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Sample ID | Benzene (µg/L) | Toluene (µg/L) | Chlorobenzene (µg/L) | Ethylbenzene (µg/L) | Xylenes (µg/L) | 1,3-Dichlorobenzene (µg/L) | 1,2-Dichlorobenze (µg/L) | 1,4-Dichlorobenzene (µg/L) |
|---|---|---|---|---|---|---|---|---|
| 12-GP08 | <2 | <2 | <2 | <2 | 2 | <2 | <2 | <2 |
| 12-GP09 | <2 | <2 | <2 | <2 | 2 | <2 | <2 | <2 |
| 12-GP10 | <2 | <2 | <2 | <2 | 2 | <2 | <2 | <2 |
| 12-GP14 | <2 | <2 | <2 | <2 | 2 | <2 | <2 | <2 |
| 12-GP15 | <2 | <2 | <2 | <2 | 2 | <2 | <2 | <2 |
| 12-GP16 | <2 | <2 | <2 | <2 | 2 | <2 | <2 | <2 |
| 12-GP20 | <2 | <2 | <2 | <2 | 2 | <2 | <2 | <2 |
| 12-GP22 | <2 | <2 | <2 | <2 | 2 | <2 | <2 | <2 |
| 12-GP30 | <2 | <2 | <2 | <2 | 2 | <2 | <2 | <2 |

Notes:

1. VOC analysis by EPA Method 8020.
2. Method Detection Limit equals 2 µg/L.
3. Shaded values indicate positive detections.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-GW01DW-00 | 68-GW04-00 | 68-GW04DW-00 | 68-GW05DW-00 | 68-GW06-00 | 68-GW06DW-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/09/96 | 01/11/96 | 01/10/96 | 01/14/96 | 01/13/96 | 01/12/96 |
| DEPTH | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' |
| **VOLATILES (ug/kg)** | | | | | | |
| ACETONE | 11 U | 11 U | 12 U | 18 | 16 U | 12 |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| PHENOL | 360 U | 360 U | 78 J | 410 U | 380 U | 380 U |
| DI-N-BUTYLPHTHALATE | 360 U | 360 U | 410 U | 410 U | 380 U | 380 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 92 J | 360 U | 54 J | 410 U | 380 U | 380 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| BETA-BHC | 1.4 J | 1.8 U | 2 U | 2.1 U | 1.9 U | 1.9 U |
| DIELDRIN | 3.6 U | 3.6 U | 4 U | 4.1 U | 3.8 U | 3.9 U |
| 4,4'-DDE | 16 | 3.6 U | 14 | 4.1 U | 3.8 U | 49 |
| 4,4'-DDT | 5 | 3.6 U | 5.2 J | 4.1 U | 3.8 NJ | 17 |
| METHOXYCHLOR | 18 U | 18 U | 20 U | 21 U | 19 U | 19 U |
| AROCLOR-1260 | 36 U | 36 U | 40 U | 41 U | 38 U | 39 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB01-00 | 68-SB02-00 | 68-SB03-00 | 68-SB04-00 | 68-SB05-00 | 68-SB06-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/15/96 | 01/15/96 | 01/16/96 | 01/15/96 | 01/13/96 | 01/13/96 |
| DEPTH | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' |
| **VOLATILES (ug/kg)** | | | | | | |
| ACETONE | 13 U | 12 U | 12 U | 13 U | 11 U | 12 U |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| PHENOL | 390 U | 410 U | 410 U | 390 U | 370 U | 400 U |
| DI-N-BUTYLPHTHALATE | 390 U | 410 U | 410 U | 390 U | 370 U | 400 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 390 U | 410 U | 410 U | 390 U | 370 U | 400 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| BETA-BHC | 2 U | 2.1 U | 2 U | 2 U | 1.9 U | 2 U |
| DIELDRIN | 3.9 UJ | 4.2 U | 4 UJ | 3.9 U | 6.3 NJ | 4 UJ |
| 4,4'-DDE | 5.8 | 2.9 UJ | 4 U | 3.9 UJ | 12 J | 110 J |
| 4,4'-DDT | 2.3 J | 4.2 U | 4 U | 3.9 U | 32 J | 56 J |
| METHOXYCHLOR | 20 U | 21 UJ | 20 U | 20 UJ | 19 UJ | 20 U |
| AROCLOR-1260 | 39 U | 42 U | 40 U | 39 U | 290 | 40 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB07-00 | 68-SB08-00 | 68-SB09-00 | 68-SB10-00 | 68-SB11-00 | 68-SB12-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/16/96 | 01/13/96 | 01/13/96 | 01/13/96 | 01/16/96 | 01/15/96 |
| DEPTH | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' |
| **VOLATILES (ug/kg)** | | | | | | |
| ACETONE | 15 U | 16 U | 14 U | 14 | 11 U | 12 U |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| PHENOL | 400 U | 370 U | 390 U | 380 U | 360 U | 400 U |
| DI-N-BUTYLPHTHALATE | 400 U | 370 U | 390 U | 380 U | 360 U | 400 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 400 U | 370 U | 160 J | 380 U | 360 U | 400 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| BETA-BHC | 2 U | 1.8 U | 1.9 U | 2 U | 1.8 U | 2 U |
| DIELDRIN | 4 UJ | 3.7 U | 3.9 U | 3.9 U | 3.6 U | 4 U |
| 4,4'-DDE | 4 U | 3.7 U | 13 J | 170 J | 4.6 J | 4 UJ |
| 4,4'-DDT | 4 U | 3.7 U | 6.2 | 56 | 2.5 J | 4 U |
| METHOXYCHLOR | 20 U | 18 U | 19 U | 20 U | 18 UJ | 20 UJ |
| AROCLOR-1260 | 40 U | 37 U | 39 U | 39 U | 36 U | 40 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB13-00 | 68-SB14-00 | 68-SB15-00 | 68-SB16-00 | 68-SB17-00 | 68-SB18-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/13/96 | 01/13/96 | 01/13/96 | 01/15/96 | 01/14/96 | 01/15/96 |
| DEPTH | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' |
| **VOLATILES (ug/kg)** | | | | | | |
| ACETONE | 11 U | 11 U | 11 U | 14 U | 11 U | 11 U |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| PHENOL | 370 U | 380 U | 360 U | 370 U | 360 U | 360 U |
| DI-N-BUTYLPHTHALATE | 370 U | 380 U | 360 U | 44 J | 360 U | 360 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 370 U | 380 U | 49 J | 370 U | 360 U | 360 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| BETA-BHC | 1.9 U | 1.9 U | 1.8 U | 1.8 U | 1.8 U | 1.8 U |
| DIELDRIN | 3.8 UJ | 3.8 UJ | 3.6 U | 3.6 UJ | 3.7 UJ | 3.7 U |
| 4,4'-DDE | 3.8 U | 4.5 J | 74 | 3.6 U | 3.7 U | 3.7 UJ |
| 4,4'-DDT | 3.8 U | 3.4 J | 14 | 3.6 U | 3.7 U | 3.7 U |
| METHOXYCHLOR | 19 U | 19 U | 18 U | 18 U | 18 J | 18 UJ |
| AROCLOR-1260 | 38 U | 38 U | 36 U | 36 U | 37 U | 37 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **VOLATILES (ug/kg)** | | | | | | | | |
| ACETONE | 11 U | 16 U | 12 | 18 | 68-GW05DW-00 | 3/24 | 14.67 | 14.00 |
| **SEMIVOLATILES (ug/kg)** | | | | | | | | |
| PHENOL | 360 U | 410 U | 78 J | 78 J | 68-GW04DW-00 | 1/24 | 78.00 | 78.00 |
| DI-N-BUTYLPHTHALATE | 360 U | 410 U | 44 J | 44 J | 68-SB16-00 | 1/24 | 44.00 | 44.00 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 360 U | 410 U | 49 J | 160 J | 68-SB09-00 | 4/24 | 88.75 | 73.00 |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | | | |
| BETA-BHC | 1.8 U | 2.1 U | 1.4 J | 1.4 J | 68-GW01DW-00 | 1/24 | 1.40 | 1.40 |
| DIELDRIN | 3.6 U | 4.2 U | 6.3 NJ | 6.3 NJ | 68-SB05-00 | 1/24 | 6.30 | 6.30 |
| 4,4'-DDE | 2.9 UJ | 4.1 U | 4.5 J | 170 J | 68-SB10-00 | 11/24 | 42.99 | 14.00 |
| 4,4'-DDT | 3.6 U | 4.2 U | 2.3 J | 56 J | 68-SB10-00 | 12/24 | 16.95 | 5.70 |
| METHOXYCHLOR | 18 U | 21 U | 18 J | 18 J | 68-SB17-00 | 1/24 | 18.00 | 18.00 |
| AROCLOR-1260 | 36 U | 42 U | 290 | 290 | 68-SB05-00 | 1/24 | 290.00 | 290.00 |

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-GW01DW-00 | 68-GW04-00 | 68-GW04DW-00 | 68-GW05DW-00 | 68-GW06-00 | 68-GW06DW-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/09/96 | 01/11/96 | 01/10/96 | 01/14/96 | 01/13/96 | 01/12/96 |
| DEPTH | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 1200 | 2500 | 1850 | 6610 | 6580 | 7250 |
| ANTIMONY, TOTAL | 3.4 UJ | 4.5 J | 4.1 UJ | 4.4 UJ | 4.4 UJ | 3.6 UJ |
| ARSENIC, TOTAL | 0.35 | 0.46 J | 0.31 | 0.44 | 0.39 | 0.82 |
| BARIUM, TOTAL | 3.5 | 10.7 | 16.4 | 26.4 J | 20.6 J | 24.1 J |
| BERYLLIUM, TOTAL | 0.14 U | 0.29 U | 0.17 U | 0.57 | 0.59 | 0.45 |
| CADMIUM, TOTAL | 0.37 U | 0.44 U | 0.46 U | 0.49 U | 0.49 U | 0.4 U |
| CALCIUM, TOTAL | 43.2 U | 119 | 615 | 104 | 196 | 262 |
| CHROMIUM, TOTAL | 1.2 | 1.9 | 1.7 | 3.8 | 3.3 | 3.9 |
| COBALT, TOTAL | 0.51 U | 0.6 U | 0.62 U | 0.91 | 1.3 | 1 |
| COPPER, TOTAL | 0.69 | 7.2 | 1.1 | 0.88 | 2.1 | 2 |
| IRON, TOTAL | 839 | 730 | 695 | 1800 | 1220 | 1470 |
| LEAD, TOTAL | 5 | 19.2 | 14.8 | 9.7 J | 9.1 J | 10.5 J |
| MAGNESIUM, TOTAL | 40 | 62.1 | 117 | 204 | 136 | 173 |
| MANGANESE, TOTAL | 8.2 | 39 | 56.2 | 26 | 125 | 147 |
| MERCURY, TOTAL | 0.04 U | 0.04 U | 0.05 | 0.06 U | 0.05 U | 0.05 U |
| NICKEL, TOTAL | 1.9 U | 2.2 U | 2.3 U | 2.5 U | 3.4 | 2.8 |
| POTASSIUM, TOTAL | 141 U | 164 U | 172 U | 183 U | 185 U | 150 U |
| SELENIUM, TOTAL | 0.25 U | 0.28 U | 0.27 U | 0.26 U | 0.24 U | 0.24 U |
| SODIUM, TOTAL | 8.5 U | 11.6 U | 14.7 U | 13.7 | 12.4 | 19.4 |
| VANADIUM, TOTAL | 2.5 | 2.6 | 5.9 | 5 | 3.2 | 4.5 |
| ZINC, TOTAL | 1.8 | 21 | 7.2 | 5.4 | 9.4 | 10 |

QUALIFIER DEFINITIONS

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UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB01-00 | 68-SB02-00 | 68-SB03-00 | 68-SB04-00 | 68-SB05-00 | 68-SB06-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/15/96 | 01/15/96 | 01/16/96 | 01/15/96 | 01/13/96 | 01/13/96 |
| DEPTH | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 5390 | 4980 | 7460 | 4520 | 2220 | 2550 |
| ANTIMONY, TOTAL | 3.9 UJ | 3.5 UJ | 3.8 UJ | 4.1 UJ | 3.8 UJ | 3.4 UJ |
| ARSENIC, TOTAL | 0.27 | 0.42 | 0.52 | 0.87 | 0.62 J | 0.84 J |
| BARIUM, TOTAL | 17.5 | 15.6 | 28.8 | 16.4 | 7.1 | 12.9 |
| BERYLLIUM, TOTAL | 0.2 | 0.16 | 0.53 | 0.16 U | 0.15 U | 0.14 U |
| CADMIUM, TOTAL | 0.43 U | 0.39 U | 0.44 | 0.45 U | 0.42 U | 0.37 U |
| CALCIUM, TOTAL | 82.4 | 58.6 | 78 | 225 | 46.8 | 430 |
| CHROMIUM, TOTAL | 2.8 | 4.1 | 3.8 | 3.9 | 1.5 | 4 |
| COBALT, TOTAL | 1 | 0.87 | 1 | 0.85 | 0.58 U | 0.51 U |
| COPPER, TOTAL | 0.92 | 0.9 | 0.64 | 1.8 | 1.4 | 1.4 |
| IRON, TOTAL | 1320 | 2630 | 2670 | 982 | 722 | 2990 |
| LEAD, TOTAL | 8.4 J | 7.7 | 8.7 J | 12.6 J | 8.3 | 6 |
| MAGNESIUM, TOTAL | 140 | 187 | 213 | 95 | 51.1 | 88.5 |
| MANGANESE, TOTAL | 27.3 | 7.6 | 11.6 | 29.4 | 25 | 15.9 |
| MERCURY, TOTAL | 0.047 U | 0.05 U | 0.061 U | 0.06 U | 0.07 U | 0.06 U |
| NICKEL, TOTAL | 2.6 | 2 U | 3.8 | 2.3 U | 2.2 U | 2 |
| POTASSIUM, TOTAL | 162 U | 199 | 158 U | 170 U | 159 U | 141 U |
| SELENIUM, TOTAL | 0.22 U | 0.24 | 0.32 U | 0.23 U | 0.27 U | 0.28 U |
| SODIUM, TOTAL | 16.5 U | 13.9 | 14.6 U | 11.2 | 12.8 U | 16.1 U |
| VANADIUM, TOTAL | 4.1 | 6.1 | 5 | 5.7 | 2.6 | 8.2 |
| ZINC, TOTAL | 4.8 | 5.9 | 6.6 | 7.6 | 4.3 | 4.1 U |

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NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB07-00 | 68-SB08-00 | 68-SB09-00 | 68-SB10-00 | 68-SB11-00 | 68-SB12-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/16/96 | 01/13/96 | 01/13/96 | 01/13/96 | 01/16/96 | 01/15/96 |
| DEPTH | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 5060 | 5500 | 1910 | 1400 | 2780 | 4920 |
| ANTIMONY, TOTAL | 3.8 UJ | 4.4 UJ | 3.8 UJ | 4.6 UJ | 3.7 UJ | 3.2 UJ |
| ARSENIC, TOTAL | 0.46 J | 0.49 | 0.24 | 0.62 | 0.14 | 0.45 |
| BARIUM, TOTAL | 23.4 | 16.4 J | 9.4 J | 10.9 J | 10.3 | 20.3 |
| BERYLLIUM, TOTAL | 0.52 | 0.55 | 0.15 U | 0.19 U | 0.15 U | 0.21 |
| CADMIUM, TOTAL | 0.42 U | 0.49 U | 0.42 U | 0.51 U | 0.41 U | 0.36 U |
| CALCIUM, TOTAL | 102 | 90.8 | 197 | 1250 | 45.8 | 78.3 |
| CHROMIUM, TOTAL | 2.9 | 2.5 | 1.7 | 2.5 | 1.7 | 2.9 |
| COBALT, TOTAL | 0.57 U | 1.1 | 0.58 U | 0.7 U | 0.56 U | 0.6 |
| COPPER, TOTAL | 0.45 | 1.8 | 0.94 | 3.5 | 0.56 | 0.93 |
| IRON, TOTAL | 1940 | 781 | 452 | 856 | 609 | 1920 |
| LEAD, TOTAL | 9.2 J | 9.2 J | 5.4 J | 10.3 J | 4 | 7.8 |
| MAGNESIUM, TOTAL | 170 | 102 | 57.7 | 73.6 | 53.2 | 144 |
| MANGANESE, TOTAL | 12.1 | 162 | 78.1 | 32.8 | 12.9 | 67.2 |
| MERCURY, TOTAL | 0.049 U | 0.05 U | 0.04 U | 0.05 U | 0.05 U | 0.05 U |
| NICKEL, TOTAL | 2.2 U | 3.5 | 2.2 U | 3.1 | 2.1 U | 2.1 |
| POTASSIUM, TOTAL | 158 U | 183 U | 160 U | 194 U | 153 U | 135 U |
| SELENIUM, TOTAL | 0.29 U | 0.24 U | 0.26 U | 0.25 U | 0.2 U | 0.24 U |
| SODIUM, TOTAL | 11.2 U | 9.4 | 8.7 | 34.2 | 5.7 | 8.7 |
| VANADIUM, TOTAL | 4.8 | 2.2 | 2.7 | 5.7 | 2.3 | 4.7 |
| ZINC, TOTAL | 5 | 8.5 | 4.3 | 8.7 | 7.4 | 4.7 |

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NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB13-00 | 68-SB14-00 | 68-SB15-00 | 68-SB16-00 | 68-SB17-00 | 68-SB18-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/13/96 | 01/13/96 | 01/13/96 | 01/15/96 | 01/14/96 | 01/15/96 |
| DEPTH | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 3800 | 1230 | 1670 | 5580 | 3140 | 4690 |
| ANTIMONY, TOTAL | 3.3 UJ | 4.3 UJ | 4.2 UJ | 3.6 UJ | 3 UJ | 3 UJ |
| ARSENIC, TOTAL | 0.17 UJ | 0.27 J | 0.43 | 0.8 J | 0.17 UJ | 0.37 |
| BARIUM, TOTAL | 8.4 | 3 | 5.5 J | 14.3 | 13.6 | 13.2 |
| BERYLLIUM, TOTAL | 0.13 U | 0.17 U | 0.17 U | 0.21 | 0.12 U | 0.35 |
| CADMIUM, TOTAL | 0.36 U | 0.48 U | 0.47 U | 0.4 U | 0.33 U | 0.33 U |
| CALCIUM, TOTAL | 50.1 | 70.1 | 8530 | 58.7 | 57.8 | 125 |
| CHROMIUM, TOTAL | 1.5 | 0.86 | 2.6 | 2.9 | 1.1 | 1.9 |
| COBALT, TOTAL | 0.62 | 0.65 U | 0.64 U | 1 | 0.49 | 0.64 |
| COPPER, TOTAL | 0.33 U | 0.44 | 1.7 | 1.8 | 0.66 | 1.5 |
| IRON, TOTAL | 631 | 612 | 1030 | 900 | 364 | 829 |
| LEAD, TOTAL | 5.6 | 122 | 18.2 J | 10.3 J | 5.7 | 6.5 |
| MAGNESIUM, TOTAL | 52.2 | 32.4 | 198 | 90.6 | 47.1 | 82.7 |
| MANGANESE, TOTAL | 49.8 | 2.1 | 14.6 | 76.6 | 67.2 | 99.5 |
| MERCURY, TOTAL | 0.07 U | 0.07 U | 0.04 U | 0.044 U | 0.05 U | 0.05 U |
| NICKEL, TOTAL | 2.9 | 2.5 U | 2.4 U | 3 | 2.5 | 2 |
| POTASSIUM, TOTAL | 137 U | 181 U | 176 U | 150 U | 125 U | 125 U |
| SELENIUM, TOTAL | 0.24 U | 0.26 U | 0.22 U | 0.27 U | 0.24 U | 0.27 U |
| SODIUM, TOTAL | 9.2 U | 10.7 U | 28.4 | 12.1 U | 8 U | 10 |
| VANADIUM, TOTAL | 2.5 | 1.8 | 4 | 3.8 | 1.2 | 2.5 |
| ZINC, TOTAL | 3.8 U | 2.8 U | 10.1 | 10.4 | 2.9 U | 6.7 |

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NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 1200 | 7460 | 68-SB03-00 | 24/24 | 3949.58 | 4160.00 |
| ANTIMONY, TOTAL | 3 UJ | 4.6 UJ | 4.5 J | 4.5 J | 68-GW04-00 | 1/24 | 4.50 | 4.50 |
| ARSENIC, TOTAL | 0.17 UJ | 0.17 UJ | 0.14 | 0.87 | 68-SB04-00 | 22/24 | 0.48 | 0.45 |
| BARIUM, TOTAL | NA | NA | 3 | 28.8 | 68-SB03-00 | 24/24 | 14.53 | 13.95 |
| BERYLLIUM, TOTAL | 0.12 U | 0.29 U | 0.16 | 0.59 | 68-GW06-00 | 11/24 | 0.39 | 0.45 |
| CADMIUM, TOTAL | 0.33 U | 0.51 U | 0.44 | 0.44 | 68-SB03-00 | 1/24 | 0.44 | 0.44 |
| CALCIUM, TOTAL | 43.2 U | 43.2 U | 45.8 | 8530 | 68-SB15-00 | 23/24 | 559.67 | 102.00 |
| CHROMIUM, TOTAL | NA | NA | 0.86 | 4.1 | 68-SB02-00 | 24/24 | 2.54 | 2.55 |
| COBALT, TOTAL | 0.51 U | 0.7 U | 0.49 | 1.3 | 68-GW06-00 | 13/24 | 0.88 | 0.91 |
| COPPER, TOTAL | 0.33 U | 0.33 U | 0.44 | 7.2 | 68-GW04-00 | 23/24 | 1.54 | 1.10 |
| IRON, TOTAL | NA | NA | 364 | 2990 | 68-SB06-00 | 24/24 | 1208.00 | 878.00 |
| LEAD, TOTAL | NA | NA | 4 | 122 | 68-SB14-00 | 24/24 | 13.93 | 8.90 |
| MAGNESIUM, TOTAL | NA | NA | 32.4 | 213 | 68-SB03-00 | 24/24 | 108.76 | 92.80 |
| MANGANESE, TOTAL | NA | NA | 2.1 | 162 | 68-SB08-00 | 24/24 | 49.71 | 31.10 |
| MERCURY, TOTAL | 0.04 U | 0.07 U | 0.05 | 0.05 | 68-GW04DW-00 | 1/24 | 0.05 | 0.05 |
| NICKEL, TOTAL | 1.9 U | 2.5 U | 2 | 3.8 | 68-SB03-00 | 12/24 | 2.81 | 2.85 |
| POTASSIUM, TOTAL | 125 U | 194 U | 199 | 199 | 68-SB02-00 | 1/24 | 199.00 | 199.00 |
| SELENIUM, TOTAL | 0.2 U | 0.32 U | 0.24 | 0.24 | 68-SB02-00 | 1/24 | 0.24 | 0.24 |
| SODIUM, TOTAL | 8 U | 16.5 U | 5.7 | 34.2 | 68-SB10-00 | 12/24 | 14.64 | 11.80 |
| VANADIUM, TOTAL | NA | NA | 1.2 | 8.2 | 68-SB06-00 | 24/24 | 3.90 | 3.90 |
| ZINC, TOTAL | 2.8 U | 4.1 U | 1.8 | 21 | 68-GW04-00 | 20/24 | 7.49 | 6.95 |

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB01-09 | 68-SB02-06 | 68-SB03-07 | 68-SB04-10 | 68-SB05-08 | 68-SB06-08 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/15/96 | 01/15/96 | 01/16/96 | 01/15/96 | 01/13/96 | 01/13/96 |
| DEPTH | 17-19 | 11-13 | 13-15 | 19-21 | 15-17 | 15-17 |
| **VOLATILES (ug/kg)** | | | | | | |
| ACETONE | 21 U | 13 U | 13 U | 89 U | 14 U | 13 U |
| CARBON DISULFIDE | 13 U | 13 U | 13 U | 16 | 14 U | 13 U |
| 2-BUTANONE | 13 U | 13 U | 13 U | 14 U | 14 U | 13 U |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| PYRENE | 430 U | 440 U | 420 U | 450 U | 450 U | 440 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 430 U | 440 U | 420 U | 450 U | 450 U | 440 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| 4,4'-DDT | 4.3 U | 4.3 U | 4.2 U | 4.4 UJ | 4.5 U | 4.4 U |
| AROCLOR-1260 | 43 U | 43 U | 42 U | 44 UJ | 15 J | 44 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
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UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB07-07 | 68-SB08-06 | 68-SB09-04 | 68-SB10-05 | 68-SB11-06 | 68-SB12-08 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/16/96 | 01/13/96 | 01/13/96 | 01/13/96 | 01/16/96 | 01/15/96 |
| DEPTH | 13-15 | 11-13 | 7-9 | 9-11 | 11-13 | 15-17 |
| **VOLATILES (ug/kg)** | | | | | | |
| ACETONE | 20 U | 13 U | 21 | 22 U | 18 U | 13 U |
| CARBON DISULFIDE | 13 U | 13 U | 13 U | 14 U | 13 U | 13 U |
| 2-BUTANONE | 13 U | 13 U | 13 U | 14 U | 13 U | 13 U |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| PYRENE | 420 U | 420 U | 430 U | 440 U | 420 U | 440 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 420 U | 420 U | 430 U | 440 U | 420 U | 440 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| 4,4'-DDT | 4.3 U | 4.3 U | 4.4 U | 4.4 U | 4.2 U | 4.4 U |
| AROCLOR-1260 | 43 U | 43 U | 44 U | 44 U | 42 U | 44 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB13-07 | 68-SB14-03 | 68-SB15-03 | 68-SB16-10 | 68-SB17-06 | 68-SB18-09 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/13/96 | 01/13/96 | 01/13/96 | 01/15/96 | 01/14/96 | 01/15/96 |
| DEPTH | 13-15 | 5-7 | 5-7 | 19-21 | 11-13 | 17-19 |
| **VOLATILES (ug/kg)** | | | | | | |
| ACETONE | 13 U | 15 | 12 U | 29 U | 17 U | 13 U |
| CARBON DISULFIDE | 13 U | 13 U | 12 U | 13 U | 13 U | 13 U |
| 2-BUTANONE | 13 U | 13 U | 12 U | 13 U | 13 U | 13 U |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| PYRENE | 450 U | 420 U | 400 U | 440 U | 440 U | 420 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 450 U | 420 U | 400 U | 440 U | 440 U | 420 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| 4,4'-DDT | 4.4 U | 4.1 U | 4 U | 4.3 U | 3.4 J | 4.2 U |
| AROCLOR-1260 | 44 U | 41 U | 12 J | 43 U | 26 J | 42 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-GW01DW-02 | 68-GW04-07 | 68-GW04DW-07 | 68-GW05DW-08 | 68-GW06-01 | 68-GW06DW-02 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/09/96 | 01/11/96 | 01/10/96 | 01/14/96 | 01/13/96 | 01/12/96 |
| DEPTH | | | 12-14 | 15-17 | | 3-5 |
| **VOLATILES (ug/kg)** | | | | | | |
| ACETONE | 11 U | 61 | 17 | 19 | 17 | 150 |
| CARBON DISULFIDE | 11 U | 13 U | 13 U | 13 U | 12 U | 12 U |
| 2-BUTANONE | 11 U | 13 U | 9 J | 13 U | 12 U | 12 U |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| PYRENE | 360 U | 440 U | 420 U | 430 U | 380 U | 48 J |
| BIS(2-ETHYLHEXYL)PHTHALATE | 360 U | 110 J | 420 U | 91 J | 39 J | 100 J |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| 4,4'-DDT | 3.6 U | 4.4 U | 4.2 U | 4.3 U | 3.9 U | 3.9 U |
| AROCLOR-1260 | 36 U | 44 U | 42 U | 43 U | 39 U | 39 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-GW01DW-02 |
|---|---|
| DATE SAMPLED | 01/09/96 |
| DEPTH | |
| **VOLATILES (ug/kg)** | |
| ACETONE | 11 U |
| CARBON DISULFIDE | 11 U |
| 2-BUTANONE | 11 U |
| **SEMIVOLATILES (ug/kg)** | |
| PYRENE | 360 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 360 U |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDT | 3.6 U |
| AROCLOR-1260 | 36 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **VOLATILES (ug/kg)** | | | | | | | | |
| ACETONE | 11 U | 89 U | 15 | 150 | 68-GW06DW-02 | 7/25 | 42.86 | 19.00 |
| CARBON DISULFIDE | 11 U | 14 U | 16 | 16 | 68-SB04-10 | 1/25 | 16.00 | 16.00 |
| 2-BUTANONE | 11 U | 14 U | 9 J | 9 J | 68-GW04DW-07 | 1/25 | 9.00 | 9.00 |
| **SEMIVOLATILES (ug/kg)** | | | | | | | | |
| PYRENE | 360 U | 450 U | 48 J | 48 J | 68-GW06DW-02 | 1/25 | 48.00 | 48.00 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 360 U | 450 U | 39 J | 110 J | 68-GW04-07 | 4/25 | 85.00 | 95.50 |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | | | |
| 4,4'-DDT | 3.6 U | 4.5 U | 3.4 K | 3.4 K | 68-SB17-06 | 1/25 | 3.40 | 3.40 |
| AROCLOR-1260 | 36 U | 44 UJ | 12 J | 26 J | 68-SB17-06 | 3/25 | 17.67 | 15.00 |

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB01-09 | 68-SB02-06 | 68-SB03-07 | 68-SB04-10 | 68-SB05-08 | 68-SB06-08 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/15/96 | 01/15/96 | 01/16/96 | 01/15/96 | 01/13/96 | 01/13/96 |
| DEPTH (feet) | 17-19 | 11-13 | 13-15 | 19-21 | 15-17 | 15-17 |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 11000 | 11300 | 8910 | 7560 | 11600 | 12900 |
| ARSENIC, TOTAL | 5.6 | 2.7 | 2.9 | 4.2 | 2.8 | 3.7 |
| BARIUM, TOTAL | 14.3 | 15 | 11.7 | 27.9 | 17.6 | 16.1 |
| BERYLLIUM, TOTAL | 0.41 | 0.4 | 0.38 | 0.27 | 0.21 U | 0.25 |
| CADMIUM, TOTAL | 0.47 U | 0.46 U | 0.51 U | 0.82 | 0.59 U | 0.51 U |
| CALCIUM, TOTAL | 133 | 16.2 | 18.3 | 164 | 626 | 384 |
| CHROMIUM, TOTAL | 18.8 | 16.7 | 14.9 | 20 | 16.7 | 21.9 |
| COBALT, TOTAL | 1.3 | 0.91 | 0.7 U | 10.7 | 0.82 | 1.5 |
| COPPER, TOTAL | 4.1 | 3.2 | 3.3 | 5.2 | 3.6 | 4 |
| IRON, TOTAL | 13100 | 12600 | 11800 | 9920 | 9870 | 12800 |
| LEAD, TOTAL | 9.4 J | 6.9 | 7.6 | 8.5 J | 8.7 | 8.6 |
| MAGNESIUM, TOTAL | 775 | 704 | 437 | 974 | 743 | 940 |
| MANGANESE, TOTAL | 14.2 | 15.1 | 10.6 | 64.4 | 15.6 | 17.6 |
| NICKEL, TOTAL | 2.8 | 2.6 | 6.3 | 15.7 | 3.4 | 5.3 |
| POTASSIUM, TOTAL | 988 | 525 | 540 | 1340 | 720 | 913 |
| SELENIUM, TOTAL | 0.53 | 0.34 U | 0.31 U | 0.34 U | 0.34 U | 0.29 U |
| SODIUM, TOTAL | 37.9 | 43.1 | 51.7 | 68.8 | 38.6 | 51.4 |
| VANADIUM, TOTAL | 22.1 | 15.5 | 15.1 | 17.5 | 14.8 | 20.3 |
| ZINC, TOTAL | 19.3 | 12.9 | 10.7 | 75.7 | 14.1 | 17.4 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB07-07 | 68-SB08-06 | 68-SB09-04 | 68-SB10-05 | 68-SB11-06 | 68-SB12-08 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/16/96 | 01/13/96 | 01/13/96 | 01/13/96 | 01/16/96 | 01/15/96 |
| DEPTH (feet) | 13-15 | 11-13 | 7-9 | 9-11 | 11-13 | 15-17 |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 8440 | 12200 | 12200 | 11300 | 10600 | 8910 |
| ARSENIC, TOTAL | 2.1 J | 1.5 J | 4.6 | 4.6 | 2.4 J | 4 |
| BARIUM, TOTAL | 11.3 | 19.5 | 12.1 J | 14 J | 14.6 | 14.2 |
| BERYLLIUM, TOTAL | 0.2 | 0.19 U | 0.44 | 0.34 | 0.52 | 0.5 |
| CADMIUM, TOTAL | 0.45 U | 0.53 U | 0.53 U | 0.55 U | 0.46 U | 0.61 |
| CALCIUM, TOTAL | 70.2 | 682 | 432 | 57.4 | 508 | 302 |
| CHROMIUM, TOTAL | 15.5 | 15.1 | 25.1 | 19.1 | 23.3 | 18.7 |
| COBALT, TOTAL | 0.62 U | 0.72 U | 0.72 U | 0.75 U | 1.2 | 1.6 |
| COPPER, TOTAL | 2.9 | 3 | 4.5 | 4.5 | 11.5 | 4.2 |
| IRON, TOTAL | 10600 | 5130 | 18600 | 6820 | 16200 | 14300 |
| LEAD, TOTAL | 5 J | 6.8 | 7.9 J | 8.2 J | 8.3 J | 7.4 |
| MAGNESIUM, TOTAL | 461 | 522 | 542 | 455 | 804 | 797 |
| MANGANESE, TOTAL | 7.6 | 8.1 | 12.3 | 10.4 | 13 | 16.7 |
| NICKEL, TOTAL | 2.3 U | 2.7 U | 5.6 | 2.8 U | 3.1 | 4.3 |
| POTASSIUM, TOTAL | 490 | 649 | 715 | 848 | 823 | 801 |
| SELENIUM, TOTAL | 0.29 U | 0.27 U | 0.36 | 0.28 U | 0.51 | 0.34 U |
| SODIUM, TOTAL | 61.9 | 29 U | 23.9 | 40.2 | 41.9 | 44.3 |
| VANADIUM, TOTAL | 16.9 | 13.7 | 33.2 | 15.6 | 31.5 | 18.8 |
| ZINC, TOTAL | 8.9 | 8.3 | 9.3 | 10 | 13.7 | 18.2 |

QUALIFIER DEFINITIONS

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NOTES
*mg/kg = milligrams per kilogram.*

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SB13-07 | 68-SB14-03 | 68-SB15-03 | 68-SB16-10 | 68-SB17-06 | 68-SB18-09 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/13/96 | 01/13/96 | 01/13/96 | 01/15/96 | 01/14/96 | 01/15/96 |
| DEPTH (feet) | 13-15 | 5-7 | 5-7 | 19-21 | 11-13 | 17-19 |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 9490 | 8460 | 645 | 6300 | 13200 | 8440 |
| ARSENIC, TOTAL | 7.6 | 2 | 4.4 | 3.5 | 3.3 | 4.3 |
| BARIUM, TOTAL | 15.4 | 8.7 J | 0.59 | 23 | 12.1 J | 17 |
| BERYLLIUM, TOTAL | 0.23 | 0.17 U | 0.17 U | 0.87 | 0.23 | 0.23 |
| CADMIUM, TOTAL | 0.42 U | 0.47 U | 0.47 U | 0.47 U | 0.54 U | 0.56 |
| CALCIUM, TOTAL | 94.8 | 44.3 | 48 | 443 | 117 | 279 |
| CHROMIUM, TOTAL | 21.1 | 14.4 | 2.7 | 15.5 | 22.6 | 15.5 |
| COBALT, TOTAL | 1.3 | 0.64 U | 0.64 U | 10.6 | 0.88 | 1.9 |
| COPPER, TOTAL | 4.4 | 1.5 | 0.43 U | 4.3 | 5.1 | 3.4 |
| IRON, TOTAL | 15500 | 4860 | 1940 | 10600 | 14500 | 6530 |
| LEAD, TOTAL | 8.8 | 7.4 J | 1.1 | 5.9 | 7.9 J | 6.5 |
| MAGNESIUM, TOTAL | 538 | 312 | 15.3 | 1520 | 578 | 697 |
| MANGANESE, TOTAL | 8.8 | 4.7 | 0.74 U | 88.7 | 9.6 | 14.5 |
| NICKEL, TOTAL | 2.5 | 2.4 U | 2.5 | 18.9 | 2.8 U | 10.2 |
| POTASSIUM, TOTAL | 611 | 465 | 178 U | 1020 | 760 | 715 |
| SELENIUM, TOTAL | 0.32 U | 0.27 U | 0.24 U | 0.27 | 0.28 U | 0.32 U |
| SODIUM, TOTAL | 68 | 52.5 | 8.8 U | 44.1 | 40.4 | 45.8 |
| VANADIUM, TOTAL | 20.8 | 17.8 | 5.4 | 14.5 | 21 | 14.5 |
| ZINC, TOTAL | 19.7 | 3.8 | 0.77 U | 92.8 | 11.6 | 21.1 |

QUALIFIER DEFINITIONS

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NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-GW01DW-02 | 68-GW04-07 | 68-GW04DW-07 | 68-GW05DW-08 | 68-GW06-01 | 68-GW06DW-02 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/09/96 | 01/11/96 | 01/10/96 | 01/14/96 | 01/13/96 | 01/12/96 |
| DEPTH (feet) | 3-5 | 12-14 | 12-14 | 15-17 | | 3-5 |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 1410 | 12900 | 12900 | 11700 | 6800 | 11100 |
| ARSENIC, TOTAL | 0.14 U | 3.1 | 3.7 J | 3.1 | 0.27 | 0.59 |
| BARIUM, TOTAL | 2.7 | 12.9 | 16.2 | 16.9 J | 23.6 J | 80.9 J |
| BERYLLIUM, TOTAL | 0.12 U | 0.32 U | 0.35 U | 0.57 | 0.27 | 0.6 |
| CADMIUM, TOTAL | 0.34 U | 0.57 U | 0.54 U | 0.55 U | 0.51 U | 0.45 U |
| CALCIUM, TOTAL | 63 | 134 | 65.2 | 252 | 101 | 121 |
| CHROMIUM, TOTAL | 2 | 21.8 | 20.2 | 22.7 | 2.8 | 4.6 |
| COBALT, TOTAL | 0.46 U | 1.1 | 0.79 | 1.5 | 1.2 | 2.8 |
| COPPER, TOTAL | 0.31 U | 4.3 | 3.3 | 4.5 | 1.1 | 1.4 |
| IRON, TOTAL | 726 | 10800 | 7570 | 16800 | 1120 | 2310 |
| LEAD, TOTAL | 1.6 | 8.2 | 8 | 7.4 J | 8.3 J | 11.9 J |
| MAGNESIUM, TOTAL | 57.3 | 612 | 658 | 982 | 153 | 236 |
| MANGANESE, TOTAL | 3.4 | 11.9 | 11 | 15.7 | 178 | 38 |
| NICKEL, TOTAL | 1.7 U | 2.9 U | 2.8 U | 3.4 | 2.6 U | 6.7 |
| POTASSIUM, TOTAL | 127 U | 971 | 955 | 1040 | 192 U | 169 U |
| SELENIUM, TOTAL | 0.2 U | 0.29 U | 0.31 U | 0.29 U | 0.24 U | 0.26 U |
| SODIUM, TOTAL | 9.7 U | 45.6 U | 69.2 | 47.9 | 12.4 | 17.1 |
| VANADIUM, TOTAL | 1.7 | 21.1 | 21.3 | 28.6 | 3.3 | 5.8 |
| ZINC, TOTAL | 0.84 | 13 | 12 | 26 | 7.9 | 9.5 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
*mg/kg = milligrams per kilogram.*

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-GW01DW-02 |
|---|---|
| DATE SAMPLED | 01/09/96 |
| DEPTH (feet) | |
| **TOTAL METALS (mg/kg)** | |
| ALUMINUM, TOTAL | 1410 |
| ARSENIC, TOTAL | 0.14 U |
| BARIUM, TOTAL | 2.7 |
| BERYLLIUM, TOTAL | 0.12 U |
| CADMIUM, TOTAL | 0.34 U |
| CALCIUM, TOTAL | 63 |
| CHROMIUM, TOTAL | 2 |
| COBALT, TOTAL | 0.46 U |
| COPPER, TOTAL | 0.31 U |
| IRON, TOTAL | 726 |
| LEAD, TOTAL | 1.6 |
| MAGNESIUM, TOTAL | 57.3 |
| MANGANESE, TOTAL | 3.4 |
| NICKEL, TOTAL | 1.7 U |
| POTASSIUM, TOTAL | 127 U |
| SELENIUM, TOTAL | 0.2 U |
| SODIUM, TOTAL | 9.7 U |
| VANADIUM, TOTAL | 1.7 |
| ZINC, TOTAL | 0.84 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH (feet) | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 645 | 13200 | 68-SB17-06 | 25/25 | 9267.00 | 10600.00 |
| ARSENIC, TOTAL | 0.14 U | 0.14 U | 0.27 | 7.6 | 68-SB13-07 | 23/25 | 3.35 | 3.30 |
| BARIUM, TOTAL | NA | NA | 0.59 | 80.9 J | 68-GW06DW-02 | 25/25 | 16.84 | 14.60 |
| BERYLLIUM, TOTAL | 0.12 U | 0.35 U | 0.2 | 0.87 | 68-SB16-10 | 17/25 | 0.39 | 0.38 |
| CADMIUM, TOTAL | 0.34 U | 0.59 U | 0.56 | 0.82 | 68-SB04-10 | 3/25 | 0.66 | 0.61 |
| CALCIUM, TOTAL | NA | NA | 16.2 | 682 | 68-SB08-06 | 25/25 | 208.74 | 121.00 |
| CHROMIUM, TOTAL | NA | NA | 2 | 25.1 | 68-SB09-04 | 25/25 | 15.75 | 16.70 |
| COBALT, TOTAL | 0.46 U | 0.75 U | 0.79 | 10.7 | 68-SB04-10 | 16/25 | 2.51 | 1.30 |
| COPPER, TOTAL | 0.31 U | 0.43 U | 1.1 | 11.5 | 68-SB11-06 | 22/25 | 3.97 | 4.05 |
| IRON, TOTAL | NA | NA | 726 | 18600 | 68-SB09-04 | 25/25 | 9428.88 | 10600.00 |
| LEAD, TOTAL | NA | NA | 1.1 | 11.9 J | 68-GW06DW-02 | 25/25 | 7.12 | 7.90 |
| MAGNESIUM, TOTAL | NA | NA | 15.3 | 1520 | 68-SB16-10 | 25/25 | 582.80 | 578.00 |
| MANGANESE, TOTAL | 0.74 U | 0.74 U | 3.4 | 178 | 68-GW06-01 | 24/25 | 24.72 | 12.65 |
| NICKEL, TOTAL | 1.7 U | 2.9 U | 2.5 | 18.9 | 68-SB16-10 | 15/25 | 6.22 | 4.30 |
| POTASSIUM, TOTAL | 127 U | 192 U | 465 | 1340 | 68-SB04-10 | 20/25 | 794.45 | 780.50 |
| SELENIUM, TOTAL | 0.2 U | 0.34 U | 0.27 | 0.53 | 68-SB01-09 | 4/25 | 0.42 | 0.44 |
| SODIUM, TOTAL | 8.8 U | 45.6 U | 12.4 | 69.2 | 68-GW04DW-07 | 20/25 | 45.06 | 44.20 |
| VANADIUM, TOTAL | NA | NA | 1.7 | 33.2 | 68-SB09-04 | 25/25 | 16.50 | 16.90 |
| ZINC, TOTAL | 0.77 U | 0.77 U | 0.84 | 92.8 | 68-SB16-10 | 24/25 | 18.23 | 12.45 |

**TABLE 4-2**
**POSITIVE DETECTION SUMMARY SUMMARY - SEDIMENT**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SD01-01 | 68-SD02-01 | 68-SD03-01 | 68-SD04-01 | 68-SD05-01 | 68-SD06-01 | 68-SD07-01 | 68-SD08-01 |
|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/15/96 | 01/11/96 | 01/14/96 | 01/14/96 | 01/14/96 | 01/13/96 | 01/13/96 | 01/13/96 |
| DEPTH | 0-0.5 | 0-0.5 | 0-0.5 | 0-0.5 | 0-0.5 | 0-0.5 | 0-0.5 | 0-0.5 |
| **SEMIVOLATILES (ug/kg)** | | | | | | | | |
| PHENANTHRENE | 920 U | 430 U | 2200 U | 1800 U | 2700 U | 1400 U | 280 J | 420 U |
| ANTHRACENE | 920 U | 430 U | 2200 U | 1800 U | 2700 U | 1400 U | 62 J | 420 U |
| FLUORANTHENE | 920 U | 430 U | 2200 U | 1800 U | 2700 U | 1400 U | 420 J | 420 U |
| PYRENE | 920 U | 430 U | 2200 U | 1800 U | 2700 U | 1400 U | 330 J | 420 U |
| BENZO(A)ANTHRACENE | 920 U | 430 U | 2200 U | 1800 U | 2700 U | 1400 U | 190 J | 420 U |
| CHRYSENE | 920 U | 430 U | 2200 U | 1800 U | 2700 U | 1400 U | 210 J | 420 U |
| BIS(2-ETHYLHEXYL)PHTH | 920 U | 430 U | 250 J | 1800 U | 2700 U | 1400 U | 490 U | 420 U |
| BENZO(B)FLUORANTHEN | 920 U | 430 U | 2200 U | 1800 U | 2700 U | 1400 U | 250 J | 420 U |
| BENZO(K)FLUORANTHEN | 920 U | 430 U | 2200 U | 1800 U | 2700 U | 1400 U | 97 J | 420 U |
| BENZO(A)PYRENE | 920 U | 430 U | 2200 U | 1800 U | 380 J | 350 J | 170 J | 420 U |
| INDENO(1,2,3-CD)PYRENE | 920 U | 430 U | 2200 U | 1800 U | 2700 U | 1400 U | 110 J | 420 U |
| BENZO(G,H,I)PERYLENE | 920 U | 430 U | 2200 U | 1800 U | 2700 U | 1400 U | 98 J | 420 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | | | |
| 4,4'-DDE | 15 | 4.2 U | 410 J | 20 J | 61 J | 550 | 48 J | 28 |
| 4,4'-DDD | 20 | 4.2 U | 2900 | 33 | 120 | 640 | 100 | 31 |
| 4,4'-DDT | 9 U | 4.2 U | 140 NJ | 18 U | 16 J | 120 | 4500 | 20 |
| ALPHA-CHLORDANE | 4.5 U | 2.1 U | 56 UJ | 9.2 U | 14 U | 13 J | 25 U | 2.1 U |
| GAMMA-CHLORDANE | 4.5 U | 2.1 U | 56 UJ | 9.2 U | 14 U | 14 NJ | 25 U | 2.1 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

TABLE 4-2
POSITIVE DETECTION SUMMARY SUMMARY - SEDIMENT
ORGANIC COMPOUNDS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 68-SD09-01 | 68-SD10-01 |
|---|---|---|
| DATE SAMPLED | 01/13/96 | 01/13/96 |
| DEPTH | 0-0.5 | 0-0.5 |
| **SEMIVOLATILES (ug/kg)** | | |
| PHENANTHRENE | 420 U | 420 U |
| ANTHRACENE | 420 U | 420 U |
| FLUORANTHENE | 420 U | 420 U |
| PYRENE | 420 U | 420 U |
| BENZO(A)ANTHRACENE | 420 U | 420 U |
| CHRYSENE | 420 U | 420 U |
| BIS(2-ETHYLHEXYL)PHTH | 420 U | 420 U |
| BENZO(B)FLUORANTHEN | 420 U | 420 U |
| BENZO(K)FLUORANTHEN | 420 U | 420 U |
| BENZO(A)PYRENE | 420 U | 420 U |
| INDENO(1,2,3-CD)PYRENE | 420 U | 420 U |
| BENZO(G,H,I)PERYLENE | 420 U | 420 U |
| **PESTICIDE/PCBS (ug/kg)** | | |
| 4,4'-DDE | 15 | 6.7 |
| 4,4'-DDD | 21 | 2.5 J |
| 4,4'-DDT | 8 | 6.3 J |
| ALPHA-CHLORDANE | 2.1 U | 2.1 U |
| GAMMA-CHLORDANE | 2.1 U | 2.1 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
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U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4-2**
**POSITIVE DETECTION SUMMARY SUMMARY - SEDIMENT**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **SEMIVOLATILES (ug/kg)** | | | | | | | | |
| PHENANTHRENE | 420 U | 2700 U | 280 J | 280 J | 68-SD07-01 | 1/10 | 280.00 | 280.00 |
| ANTHRACENE | 420 U | 2700 U | 62 J | 62 J | 68-SD07-01 | 1/10 | 62.00 | 62.00 |
| FLUORANTHENE | 420 U | 2700 U | 420 J | 420 J | 68-SD07-01 | 1/10 | 420.00 | 420.00 |
| PYRENE | 420 U | 2700 U | 330 J | 330 J | 68-SD07-01 | 1/10 | 330.00 | 330.00 |
| BENZO(A)ANTHRACENE | 420 U | 2700 U | 190 J | 190 J | 68-SD07-01 | 1/10 | 190.00 | 190.00 |
| CHRYSENE | 420 U | 2700 U | 210 J | 210 J | 68-SD07-01 | 1/10 | 210.00 | 210.00 |
| BIS(2-ETHYLHEXYL)PHTH | 420 U | 2700 U | 250 J | 250 J | 68-SD03-01 | 1/10 | 250.00 | 250.00 |
| BENZO(B)FLUORANTHEN | 420 U | 2700 U | 250 J | 250 J | 68-SD07-01 | 1/10 | 250.00 | 250.00 |
| BENZO(K)FLUORANTHEN | 420 U | 2700 U | 97 J | 97 J | 68-SD07-01 | 1/10 | 97.00 | 97.00 |
| BENZO(A)PYRENE | 420 U | 2200 U | 170 J | 380 J | 68-SD05-01 | 3/10 | 300.00 | 350.00 |
| INDENO(1,2,3-CD)PYRENE | 420 U | 2700 U | 110 J | 110 J | 68-SD07-01 | 1/10 | 110.00 | 110.00 |
| BENZO(G,H,I)PERYLENE | 420 U | 2700 U | 98 J | 98 J | 68-SD07-01 | 1/10 | 98.00 | 98.00 |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | | | |
| 4,4'-DDE | 4.2 U | 4.2 U | 6.7 | 550 | 68-SD06-01 | 9/10 | 128.19 | 28.00 |
| 4,4'-DDD | 4.2 U | 4.2 U | 2.5 J | 2900 | 68-SD03-01 | 9/10 | 429.72 | 33.00 |
| 4,4'-DDT | 4.2 U | 18 U | 6.3 J | 4500 | 68-SD07-01 | 7/10 | 687.19 | 20.00 |
| ALPHA-CHLORDANE | 2.1 U | 56 UJ | 13 J | 13 J | 68-SD06-01 | 1/10 | 13.00 | 13.00 |
| GAMMA-CHLORDANE | 2.1 U | 56 UJ | 14 NJ | 14 NJ | 68-SD06-01 | 1/10 | 14.00 | 14.00 |

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U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SEDIMENT**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SD01-01 | 68-SD02-01 | 68-SD03-01 | 68-SD04-01 | 68-SD05-01 | 68-SD06-01 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/15/96 | 01/11/96 | 01/14/96 | 01/14/96 | 01/14/96 | 01/13/96 |
| DEPTH | 0-0.5 | 0-0.5 | 0-0.5 | 0-0.5 | 0-0.5 | 0-0.5 |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 6350 | 1820 | 11500 | 9310 | 11000 | 8160 |
| ARSENIC, TOTAL | 0.64 J | 0.17 UJ | 3.1 | 2.9 | 4.2 | 1.6 J |
| BARIUM, TOTAL | 16.6 | 2.6 | 28.1 | 12 | 17 | 25 |
| CADMIUM, TOTAL | 0.92 U | 0.42 U | 2.5 U | 2.3 U | 4.7 | 1.8 |
| CALCIUM, TOTAL | 2400 | 71.3 | 10300 | 7140 | 11900 | 7290 |
| CHROMIUM, TOTAL | 6.2 | 1.7 | 8.8 | 5.9 | 11.9 | 12.6 |
| COBALT, TOTAL | 2.9 | 0.58 U | 3.4 U | 4.1 | 6.3 | 3.5 |
| COPPER, TOTAL | 0.86 | 0.39 U | 6.4 | 3.1 | 8.5 | 14.9 |
| IRON, TOTAL | 9450 | 937 | 9810 | 8330 | 8790 | 16300 |
| LEAD, TOTAL | 7.9 | 1.8 | 23.9 | 26.7 | 24.6 J | 73 J |
| MAGNESIUM, TOTAL | 1190 | 122 | 4930 | 5520 | 8330 | 1510 |
| MANGANESE, TOTAL | 28.5 | 2.7 | 127 | 18.9 | 39.8 | 107 |
| MERCURY, TOTAL | 0.12 U | 0.06 U | 0.4 | 0.27 U | 0.34 U | 0.16 U |
| NICKEL, TOTAL | 5.3 | 2.2 U | 12.6 U | 11.9 U | 15.6 U | 9.7 |
| SELENIUM, TOTAL | 0.79 | 0.24 U | 1.4 U | 1.2 U | 1.9 U | 1.2 |
| SODIUM, TOTAL | 1170 | 112 | 8440 | 6870 | 15400 | 1780 |
| VANADIUM, TOTAL | 6.1 | 3.1 | 18 | 12.4 | 15.1 | 26.6 |
| ZINC, TOTAL | 8.1 | 1.3 U | 38.8 | 18.9 | 30.1 | 86.5 |

QUALIFIER DEFINITIONS

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NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SEDIMENT**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SD07-01 | 68-SD08-01 | 68-SD09-01 | 68-SD10-01 |
|---|---|---|---|---|
| DATE SAMPLED | 01/13/96 | 01/13/96 | 01/13/96 | 01/13/96 |
| DEPTH | 0-0.5 | 0-0.5 | 0-0.5 | 0-0.5 |
| **TOTAL METALS (mg/kg)** | | | | |
| ALUMINUM, TOTAL | 646 | 351 | 466 | 353 |
| ARSENIC, TOTAL | 0.25 UJ | 0.16 UJ | 0.15 UJ | 0.18 UJ |
| BARIUM, TOTAL | 2.7 | 1.8 | 1.9 | 1.5 |
| CADMIUM, TOTAL | 0.52 U | 0.45 U | 0.45 U | 0.5 |
| CALCIUM, TOTAL | 334 | 239 | 271 | 312 |
| CHROMIUM, TOTAL | 1.5 | 0.84 | 1.4 | 0.79 |
| COBALT, TOTAL | 0.72 U | 0.61 U | 0.75 | 0.66 U |
| COPPER, TOTAL | 0.77 | 0.45 | 0.57 | 0.44 U |
| IRON, TOTAL | 684 | 323 | 428 | 296 |
| LEAD, TOTAL | 11 J | 2.7 J | 2.9 J | 1.8 J |
| MAGNESIUM, TOTAL | 85.8 | 23.8 | 33.9 | 23.5 |
| MANGANESE, TOTAL | 4 | 5.1 | 3.5 | 2.7 |
| MERCURY, TOTAL | 0.059 U | 0.05 U | 0.045 U | 0.056 U |
| NICKEL, TOTAL | 2.7 U | 2.3 | 2.3 U | 2.5 U |
| SELENIUM, TOTAL | 0.37 U | 0.23 U | 0.22 U | 0.25 U |
| SODIUM, TOTAL | 55.8 | 25 U | 9.5 U | 14.4 U |
| VANADIUM, TOTAL | 1.6 | 1.4 | 1 | 0.7 |
| ZINC, TOTAL | 7.5 | 4.9 | 4.3 | 3.8 |

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UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SEDIMENT**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 351 | 11500 | 68-SD03-01 | 10/10 | 4995.60 | 4085.00 |
| ARSENIC, TOTAL | 0.15 UJ | 0.25 UJ | 0.64 J | 4.2 | 68-SD05-01 | 5/10 | 2.49 | 2.90 |
| BARIUM, TOTAL | NA | NA | 1.5 | 28.1 | 68-SD03-01 | 10/10 | 10.92 | 7.35 |
| CADMIUM, TOTAL | 0.42 U | 2.5 U | 0.5 | 4.7 | 68-SD05-01 | 3/10 | 2.33 | 1.80 |
| CALCIUM, TOTAL | NA | NA | 71.3 | 11900 | 68-SD05-01 | 10/10 | 4025.73 | 1367.00 |
| CHROMIUM, TOTAL | NA | NA | 0.79 | 12.6 | 68-SD06-01 | 10/10 | 5.16 | 3.80 |
| COBALT, TOTAL | 0.58 U | 3.4 U | 0.75 | 6.3 | 68-SD05-01 | 5/10 | 3.51 | 3.50 |
| COPPER, TOTAL | 0.39 U | 0.44 U | 0.45 | 14.9 | 68-SD06-01 | 8/10 | 4.44 | 1.98 |
| IRON, TOTAL | NA | NA | 296 | 16300 | 68-SD06-01 | 10/10 | 5534.80 | 4633.50 |
| LEAD, TOTAL | NA | NA | 1.8 | 73 J | 68-SD06-01 | 10/10 | 17.63 | 9.45 |
| MAGNESIUM, TOTAL | NA | NA | 23.5 | 8330 | 68-SD05-01 | 10/10 | 2176.90 | 656.00 |
| MANGANESE, TOTAL | NA | NA | 2.7 | 127 | 68-SD03-01 | 10/10 | 33.92 | 12.00 |
| MERCURY, TOTAL | 0.045 U | 0.34 U | 0.4 | 0.4 | 68-SD03-01 | 1/10 | 0.40 | 0.40 |
| NICKEL, TOTAL | 2.2 U | 15.6 U | 2.3 | 9.7 | 68-SD06-01 | 3/10 | 5.77 | 5.30 |
| SELENIUM, TOTAL | 0.22 U | 1.9 U | 0.79 | 1.2 | 68-SD06-01 | 2/10 | 1.00 | 1.00 |
| SODIUM, TOTAL | 9.5 U | 25 U | 55.8 | 15400 | 68-SD05-01 | 7/10 | 4832.54 | 1780.00 |
| VANADIUM, TOTAL | NA | NA | 0.7 | 26.6 | 68-SD06-01 | 10/10 | 8.60 | 4.60 |
| ZINC, TOTAL | 1.3 U | 1.3 U | 3.8 | 86.5 | 68-SD06-01 | 9/10 | 22.54 | 8.10 |

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NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-GW01-01 | 68-GW01DW-01 | 68-GW02-01 | 68-GW03-01 | 68-GW04-01 | 68-GW04DW-01 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/24/96 | 01/27/96 | 01/24/96 | 01/25/96 | 01/25/96 | 01/25/96 |
| **VOLATILES (ug/L)** | | | | | | |
| CARBON DISULFIDE | 10 U | 10 U | 10 U | 10 U | 4 J | 10 U |
| 2-HEXANONE | 10 U | 10 U | 10 U | 10 U | 10 U | 6 J |

QUALIFIER DEFINITIONS

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NOTES
ug/L = micrograms per liter.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-GW05DW-01 | 68-GW06-01 | 68-GW06DW-01 |
|---|---|---|---|
| DATE SAMPLED | 01/26/96 | 01/26/96 | 01/26/96 |
| **VOLATILES (ug/L)** | | | |
| CARBON DISULFIDE | 10 U | 4 J | 10 U |
| 2-HEXANONE | 10 U | 10 U | 10 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | MINIMUM | MAXIMUM | MINIMUM | MAXIMUM | LOCATION OF MAXIMUM | FREQUENCY OF | AVERAGE OF POSITIVE | MEDIAN OF POSITIVE |
|---|---|---|---|---|---|---|---|---|
| **VOLATILES (ug/L)** | | | | | | | | |
| CARBON DISULFIDE | 10 U | 10 U | 4 J | 4 J | 68-GW06-01 | 2/9 | 4.00 | 4.00 |
| 2-HEXANONE | 10 U | 10 U | 6 J | 6 J | 68-GW04DW-01 | 1/9 | 6.00 | 6.00 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
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NOTES
ug/L = micrograms per liter.

TABLE 4-2
POSITIVE DETECTION SUMMARY - GROUNDWATER
TOTAL METALS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 68-GW01-01 | 68-GW01DW-01 | 68-GW02-01 | 68-GW03-01 | 68-GW04-01 | 68-GW04DW-01 | 68-GW05DW-01 | 68-GW06-01 |
|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/24/96 | 01/27/96 | 01/24/96 | 01/25/96 | 01/25/96 | 01/25/96 | 01/26/96 | 01/26/96 |
| **METALS (ug/l)** | | | | | | | | |
| Aluminum | 1050 | 23.3 U | 29.6 U | 373 | 75.3 U | 27.2 U | 77.3 U | 1600 |
| Antimony | 19.8 UJ | 20.3 | 19.8 U | 19.8 U | 19.8 U | 21 | 19.8 U | 19.8 U |
| Arsenic | 0.9 U | 0.96 | 0.9 UJ | 0.9 UJ | 0.9 UJ | 0.9 UJ | 0.9 UJ | 0.9 UJ |
| Barium | 3.6 | 50.9 | 24.6 | 35.5 | 43 | 37 | 21.8 | 17.5 |
| Beryllium | 0.8 U | 0.8 U | 0.8 U | 0.8 U | 0.8 U | 1.2 U | 1.2 U | 0.8 U |
| Cadmium | 2.2 U | 2.2 U | 2.2 U | 4.8 | 2.2 U | 2.2 U | 2.2 U | 2.2 U |
| Calcium | 5240 | 65800 | 4040 | 1890 | 14200 | 109000 | 99600 | 24300 |
| Chromium | 3.5 | 2.4 U | 2.4 U | 2.4 U | 2.4 U | 2.4 U | 2.4 U | 2.4 U |
| Cobalt | 3 U | 3 U | 3 U | 4.8 | 10.8 | 3 U | 3.1 | 3 U |
| Copper | 2.3 | 2 U | 2 U | 9.1 | 4.1 | 2 U | 2.3 | 2.5 |
| Iron | 401 | 158 | 16.4 | 294 | 70.2 | 9.7 U | 128 | 822 |
| Lead | 0.8 U | 1.2 UJ | 0.8 U | 1.4 | 0.97 | 0.8 U | 0.8 U | 0.84 |
| Magnesium | 334 | 4900 | 2370 | 1310 | 2660 | 3650 | 8850 | 1240 |
| Manganese | 3.8 U | 63.8 | 3.7 U | 32.5 | 146 | 73.3 | 401 | 82.5 |
| Mercury | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U |
| Nickel | 11.3 U | 11.3 U | 11.3 U | 14.2 | 20.4 | 11.3 U | 11.3 U | 11.3 U |
| Potassium | 828 U | 1900 J | 828 U | 2180 | 1530 | 1500 | 2640 | 1160 |
| Selenium | 1.3 U | 1.3 U | 2.1 | 1.3 U | 1.3 U | 1.3 U | 1.3 U | 1.3 U |
| Sodium | 1880 | 11900 | 5120 | 5560 | 8230 | 17300 | 15000 | 26100 |
| Thallium | 0.9 U | 1.7 U | 0.9 U | 0.9 U | 0.9 U | 0.9 U | 0.9 U | 0.9 U |
| Vanadium | 2.4 U | 2.4 UJ | 2.4 U | 2.4 U | 2.4 U | 2.4 U | 2.4 U | 2.8 |
| Zinc | 4 | 3.7 U | 3.6 U | 29.7 | 39.8 | 5 | 6.3 | 12.2 |

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NOTES
ug/L = micrograms per liter.

TABLE 4-2
POSITIVE DETECTION SUMMARY - GROUNDWATER
TOTAL METALS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 68-GW06DW-01 | IR68-GW01-98B | IR68-GW01DW-98B | IR68-GW02-98B | IR68-GW03-98B | IR68-GW04-98B | IR68-GW04DW-98B |
|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/26/96 | 04/20/98 | 04/20/98 | 04/22/98 | 04/21/98 | 04/22/98 | 04/22/98 |
| **METALS (ug/l)** | | | | | | | |
| Aluminum | 80.7 U | 3690 | 38.5 U | 1730 | 383 | 2700 | 29.8 U |
| Antimony | 19.8 U | 60 U | 60 U | 60 U | 60 U | 60 U | 60 U |
| Arsenic | 0.9 UJ | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Barium | 21.5 | 12.3 J | 49.2 J | 39.2 J | 31.9 J | 35.6 J | 24.4 J |
| Beryllium | 0.84 U | 5 U | 5 U | 5 U | 5 U | 4.2 J | 5 U |
| Cadmium | 2.2 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Calcium | 46600 | 5530 | 54200 | 4900 J | 4430 J | 8950 | 138000 |
| Chromium | 2.4 U | 10 U | 10 U | 10 U | 10 U | 10 U | 4.8 J |
| Cobalt | 3 U | 50 U | 50 U | 50 U | 50 U | 35.8 J | 50 U |
| Copper | 2 U | 3 J | 25 U | 4.2 J | 4 J | 5.8 J | 4 J |
| Iron | 53.5 | 2120 | 244 | 4130 | 295 | 6170 | 19.8 J |
| Lead | 0.8 U | 2.2 J | 3 U | 2.9 J | 3 U | 2.5 J | 3 U |
| Magnesium | 2460 | 681 J | 3980 J | 2960 J | 1480 J | 6520 | 4900 J |
| Manganese | 73.6 | 6.3 J | 45.9 | 18.6 | 29 | 314 | 3 J |
| Mercury | 0.1 U | 0.031 J | 0.2 U | 0.035 J | 0.2 U | 0.2 U | 0.2 U |
| Nickel | 11.3 U | 40 U | 40 U | 40 U | 40 U | 65.4 | 40 U |
| Potassium | 15100 | 5000 U | 1530 J | 1040 J | 2520 J | 2310 J | 1690 J |
| Selenium | 1.3 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Sodium | 46200 | 3900 J | 10100 | 8500 | 7110 | 10400 | 11500 |
| Thallium | 0.9 U | 5.2 J | 6.6 J | 3.7 J | 4.6 J | 10 U | 4.5 J |
| Vanadium | 2.4 U | 6.6 J | 50 U | 7 J | 50 U | 50 U | 23.1 J |
| Zinc | 7 | 15.6 U | 6.8 U | 24.5 | 18.5 U | 250 | 6 U |

QUALIFIER DEFI

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/L = micrograms per liter.

**TABLE 4-2**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | IR68-GW05DW-98B | IR68-GW06-98B | IR68-GW06DW-98B |
|---|---|---|---|
| DATE SAMPLED | 04/22/98 | 04/22/98 | 04/22/98 |
| **METALS (ug/l)** | | | |
| Aluminum | 62.5 U | 186 J | 48.6 U |
| Antimony | 60 U | 60 U | 60 U |
| Arsenic | 10 U | 10 U | 10 U |
| Barium | 8.3 J | 22.1 J | 54.5 J |
| Beryllium | 5 U | 5 U | 5 U |
| Cadmium | 5 U | 5 U | 5 U |
| Calcium | 96100 | 8380 | 61500 |
| Chromium | 5.9 J | 10 U | 10 U |
| Cobalt | 50 U | 50 U | 50 U |
| Copper | 5.6 J | 2.9 J | 25.6 |
| Iron | 72 J | 121 | 1770 |
| Lead | 3 U | 3 U | 3 U |
| Magnesium | 3290 J | 3180 J | 2480 J |
| Manganese | 2.6 J | 13.6 J | 1390 |
| Mercury | 0.2 U | 0.2 U | 0.2 U |
| Nickel | 9.2 J | 40 U | 40 U |
| Potassium | 1220 J | 5000 U | 2020 J |
| Selenium | 5 U | 5 U | 5 U |
| Sodium | 9660 | 5900 | 10900 |
| Thallium | 3.6 J | 10 U | 10 U |
| Vanadium | 20.7 J | 50 U | 15.2 J |
| Zinc | 17.2 U | 24.2 | 9.7 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/L = micrograms per liter.

TABLE 4-2
POSITIVE DETECTION SUMMARY - GROUNDWATER
TOTAL METALS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION DATE SAMPLED | Minimum Non-Detect | Maximum Non-Detect | Minimum Detected | Maximum Detected | Location of Maximum Detect | Frequency of Detection | Arithmatic Mean Positive Detects | Median Positive Detects |
|---|---|---|---|---|---|---|---|---|
| **METALS (ug/l)** | | | | | | | | |
| Aluminum | 23.3 U | 80.7 U | 186 J | 3690 | IR68-GW01-98B | 8/18 | 1464 | 1325 |
| Antimony | 19.8 U | 60 U | 20.3 | 21 | 68-GW04DW-01 | 2/18 | 20.65 | 20.65 |
| Arsenic | 0.9 UJ | 10 U | 0.96 | 0.96 | 68-GW01DW-01 | 1/18 | 0.96 | 0.96 |
| Barium | ND | ND | 3.6 | 54.5 J | IR68-GW06DW-98B | 18/18 | 29.61 | 28.25 |
| Beryllium | 0.8 U | 5 U | 4.2 J | 4.2 J | IR68-GW04-98B | 1/18 | 4.2 | 4.2 |
| Cadmium | 2.2 U | 5 U | 4.8 | 4.8 | 68-GW03-01 | 1/18 | 4.8 | 4.8 |
| Calcium | ND | ND | 1890 | 138000 | IR68-GW04DW-98B | 18/18 | 41814.44 | 19250 |
| Chromium | 2.4 U | 10 U | 3.5 | 5.9 J | IR68-GW05DW-98B | 3/18 | 4.73 | 4.8 |
| Cobalt | 3 U | 50 U | 3.1 | 35.8 J | IR68-GW04-98B | 4/18 | 13.63 | 7.8 |
| Copper | 2 U | 25 U | 2.3 | 25.6 | IR68-GW06DW-98B | 13/18 | 5.8 | 4 |
| Iron | 9.7 U | 9.7 U | 16.4 | 6170 | IR68-GW04-98B | 17/18 | 993.23 | 244 |
| Lead | 0.8 U | 3 U | 0.84 | 2.9 J | IR68-GW02-98B | 6/18 | 1.8 | 1.8 |
| Magnesium | ND | ND | 334 | 8850 | 68-GW05DW-01 | 18/18 | 3180.28 | 2810 |
| Manganese | 3.7 U | 3.8 U | 2.6 J | 1390 | IR68-GW06DW-98B | 16/18 | 168.48 | 54.85 |
| Mercury | 0.1 U | 0.2 U | 0.031 J | 0.035 J | IR68-GW02-98B | 2/18 | 0.03 | 0.03 |
| Nickel | 11.3 U | 40 U | 9.2 J | 65.4 | IR68-GW04-98B | 4/18 | 27.3 | 17.3 |
| Potassium | 828 U | 5000 U | 1040 J | 15100 | 68-GW06DW-01 | 14/18 | 2738.57 | 1795 |
| Selenium | 1.3 U | 5 U | 2.1 | 2.1 | 68-GW02-01 | 1/18 | 2.1 | 2.1 |
| Sodium | ND | ND | 1880 | 46200 | 68-GW06DW-01 | 18/18 | 11958.89 | 9880 |
| Thallium | 0.9 U | 10 U | 3.6 J | 6.6 J | IR68-GW01DW-98B | 6/18 | 4.7 | 4.55 |
| Vanadium | 2.4 U | 50 U | 2.8 | 23.1 J | IR68-GW04DW-98B | 6/18 | 12.57 | 11.1 |
| Zinc | 3.6 U | 18.5 U | 4 | 250 | IR68-GW04-98B | 10/18 | 40.27 | 18.2 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
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UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**DISSOLVED METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| **DISSOLVED METALS (ug/L)** | | |
|---|---|---|
| ALUMINUM, SOLUBLE | 172 | 65.4 U |
| BARIUM, SOLUBLE | 54.4 | 13.2 |
| CALCIUM, SOLUBLE | 69700 | 24200 |
| CHROMIUM, SOLUBLE | 3.3 | 2.4 U |
| COBALT, SOLUBLE | 3.2 | 3 U |
| IRON, SOLUBLE | 579 | 34.4 |
| MAGNESIUM, SOLUBLE | 4970 | 1200 |
| MANGANESE, SOLUBLE | 66.2 | 74.4 |
| POTASSIUM, SOLUBLE | 2510 J | 991 |
| SODIUM, SOLUBLE | 12600 | 21100 |
| ZINC, SOLUBLE | 3.6 U | 12.8 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**DISSOLVED METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **DISSOLVED METALS (ug/L)** | | | | | | | | |
| ALUMINUM, SOLUBLE | 65.4 U | 65.4 U | 172 | 172 | 68-GW01DW-01 | 1/2 | 172.00 | 172.00 |
| BARIUM, SOLUBLE | NA | NA | 13.2 | 54.4 | 68-GW01DW-01 | 2/2 | 33.80 | 33.80 |
| CALCIUM, SOLUBLE | NA | NA | 24200 | 69700 | 68-GW01DW-01 | 2/2 | 46950.00 | 46950.00 |
| CHROMIUM, SOLUBLE | 2.4 U | 2.4 U | 3.3 | 3.3 | 68-GW01DW-01 | 1/2 | 3.30 | 3.30 |
| COBALT, SOLUBLE | 3 U | 3 U | 3.2 | 3.2 | 68-GW01DW-01 | 1/2 | 3.20 | 3.20 |
| IRON, SOLUBLE | NA | NA | 34.4 | 579 | 68-GW01DW-01 | 2/2 | 306.70 | 306.70 |
| MAGNESIUM, SOLUBLE | NA | NA | 1200 | 4970 | 68-GW01DW-01 | 2/2 | 3085.00 | 3085.00 |
| MANGANESE, SOLUBLE | NA | NA | 66.2 | 74.4 | 68-GW06-01 | 2/2 | 70.30 | 70.30 |
| POTASSIUM, SOLUBLE | NA | NA | 991 | 2510 J | 68-GW01DW-01 | 2/2 | 1750.50 | 1750.50 |
| SODIUM, SOLUBLE | NA | NA | 12600 | 21100 | 68-GW06-01 | 2/2 | 16850.00 | 16850.00 |
| ZINC, SOLUBLE | 3.6 U | 3.6 U | 12.8 | 12.8 | 68-GW06-01 | 1/2 | 12.80 | 12.80 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE WATER**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SW01-01 | 68-SW02-01 | 68-SW03-01 | 68-SW04-01 | 68-SW05-01 | 68-SW06-01 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/15/96 | 01/14/96 | 01/14/96 | 01/14/96 | 01/14/96 | 01/13/96 |
| **SEMIVOLATILES (ug/L)** | | | | | | |
| DI-N-BUTYLPHTHALATE | 1 J | 10 U | 10 U | 9 U | 10 U | 10 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE WATER**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SW07-01 | 68-SW08-01 | 68-SW09-01 | 68-SW10-01 |
|---|---|---|---|---|
| DATE SAMPLED | 01/13/96 | 01/13/96 | 01/13/96 | 01/13/96 |
| **SEMIVOLATILES (ug/L)** | | | | |
| DI-N-BUTYLPHTHALATE | 10 U | 10 U | 10 U | 10 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE WATER**
**ORGANIC COMPOUNDS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **SEMIVOLATILES (ug/L)** | | | | | | | | |
| DI-N-BUTYLPHTHALATE | 9 U | 10 U | 1 J | 1 J | 68-SW01-01 | 1/10 | 1.00 | 1.00 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

TABLE 4 - 2
POSITIVE DETECTION SUMMARY - SURFACE WATER
TOTAL METALS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO 0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 68-SW01-01 | 68-SW02-01 | 68-SW03-01 | 68-SW04-01 | 68-SW05-01 | 68-SW06-01 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 01/15/96 | 01/14/96 | 01/14/96 | 01/14/96 | 01/14/96 | 01/13/96 |
| **TOTAL METALS (ug/L)** | | | | | | |
| ALUMINUM, TOTAL | 401 | 422 | 414 | 410 | 403 | 141 |
| BARIUM, TOTAL | 12.5 | 12.6 | 11.5 | 11.6 | 11.3 | 16.8 |
| CADMIUM, TOTAL | 2.2 U | 2.2 U | 2.2 U | 2.2 U | 2.2 U | 2.2 U |
| CALCIUM, TOTAL | 6620 | 6530 | 6900 | 15800 | 15200 | 26700 |
| IRON, TOTAL | 448 | 427 | 411 | 430 | 415 | 410 |
| LEAD, TOTAL | 0.87 | 0.92 | 0.8 U | 0.8 U | 0.8 U | 2.2 |
| MAGNESIUM, TOTAL | 1260 | 1600 | 1850 | 25500 | 24000 | 6200 |
| MANGANESE, TOTAL | 13.3 | 13 | 11.7 | 15.9 | 15.1 | 39.6 |
| POTASSIUM, TOTAL | 828 U | 865 | 1280 | 7770 | 8030 | 2530 |
| SELENIUM, TOTAL | 1.3 U | 1.3 U | 1.3 U | 1.7 | 1.3 U | 1.3 U |
| SODIUM, TOTAL | 9120 | 12000 | 13800 | 210000 | 200000 | 47500 |
| VANADIUM, TOTAL | 2.4 U | 2.4 U | 2.4 U | 2.4 U | 2.4 U | 2.4 U |
| ZINC, TOTAL | 3.6 U | 3.6 U | 3.6 U | 4.2 | 3.6 U | 3.6 U |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE WATER**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 68-SW07-01 | 68-SW08-01 | 68-SW09-01 | 68-SW10-01 |
|---|---|---|---|---|
| DATE SAMPLED | 01/13/96 | 01/13/96 | 01/13/96 | 01/13/96 |
| **TOTAL METALS (ug/L)** | | | | |
| ALUMINUM, TOTAL | 176 | 206 | 253 | 303 |
| BARIUM, TOTAL | 18.4 | 13.4 | 12.7 | 13.1 |
| CADMIUM, TOTAL | 2.2 U | 2.9 | 2.2 U | 2.2 U |
| CALCIUM, TOTAL | 27300 | 27100 | 21600 | 19600 |
| IRON, TOTAL | 443 | 594 | 509 | 412 |
| LEAD, TOTAL | 2.5 | 1.7 | 0.8 U | 2.2 |
| MAGNESIUM, TOTAL | 4340 | 1510 | 1320 | 1270 |
| MANGANESE, TOTAL | 39.2 | 42.5 | 31.6 | 27.4 |
| POTASSIUM, TOTAL | 1700 | 828 U | 828 U | 828 U |
| SELENIUM, TOTAL | 1.3 U | 1.3 U | 1.3 U | 1.3 U |
| SODIUM, TOTAL | 31600 | 11300 | 7240 | 6650 |
| VANADIUM, TOTAL | 2.4 U | 2.4 U | 2.4 U | 2.4 |
| ZINC, TOTAL | 3.6 U | 4.1 | 3.6 U | 3.6 U |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 2**
**POSITIVE DETECTION SUMMARY - SURFACE WATER**
**TOTAL METALS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO 0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (ug/L)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 141 | 422 | 68-SW02-01 | 10/10 | 312.90 | 352.00 |
| BARIUM, TOTAL | NA | NA | 11.3 | 18.4 | 68-SW07-01 | 10/10 | 13.39 | 12.65 |
| CADMIUM, TOTAL | 2.2 U | 2.2 U | 2.9 | 2.9 | 68-SW08-01 | 1/10 | 2.90 | 2.90 |
| CALCIUM, TOTAL | NA | NA | 6530 | 27300 | 68-SW07-01 | 10/10 | 17335.00 | 17700.00 |
| IRON, TOTAL | NA | NA | 410 | 594 | 68-SW08-01 | 10/10 | 449.90 | 428.50 |
| LEAD, TOTAL | 0.8 U | 0.8 U | 0.87 | 2.5 | 68-SW07-01 | 6/10 | 1.73 | 1.95 |
| MAGNESIUM, TOTAL | NA | NA | 1260 | 25500 | 68-SW04-01 | 10/10 | 6885.00 | 1725.00 |
| MANGANESE, TOTAL | NA | NA | 11.7 | 42.5 | 68-SW08-01 | 10/10 | 24.93 | 21.65 |
| POTASSIUM, TOTAL | 828 U | 828 U | 865 | 8030 | 68-SW05-01 | 6/10 | 3695.83 | 2115.00 |
| SELENIUM, TOTAL | 1.3 U | 1.3 U | 1.7 | 1.7 | 68-SW04-01 | 1/10 | 1.70 | 1.70 |
| SODIUM, TOTAL | NA | NA | 6650 | 210000 | 68-SW04-01 | 10/10 | 54921.00 | 12900.00 |
| VANADIUM, TOTAL | 2.4 U | 2.4 U | 2.4 | 2.4 | 68-SW10-01 | 1/10 | 2.40 | 2.40 |
| ZINC, TOTAL | 3.6 U | 3.6 U | 4.1 | 4.2 | 68-SW04-01 | 2/10 | 4.15 | 4.15 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

TABLE 4-3

SUMMARY OF SITE CONTAMINATION
SITE 68, RIFLE RANGE
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (1) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Surface Soil | Volatiles | Acetone | 8,000 | NA | NA | 12 | 18 | 68-GW05D | 3/24 | 0/24 | NA | NA |
| | Semivolatiles | Phenol | 49,000 | NA | NA | 78J | 78J | 68-GW04D | 1/24 | 0/24 | NA | NA |
| | | Di-n-butylphthalate | 120,000 | NA | NA | 44J | 44J | 68-SB16 | 1/24 | 0/24 | NA | NA |
| | | bis(2-Ethylhexyl)phthalate | 11,000 | NA | NA | 49J | 160J | 68-SB09 | 4/24 | 0/24 | NA | NA |
| | Pesticides | Beta-BHC | 2.0 | NA | 9.78 | 1.4 J | 1.4 J | 68-GW01D | 1/24 | 0/24 | NA | 0/24 |
| | | Dieldrin | 1.0 | NA | 44.7 | 6.3NJ | 6.3NJ | 68-SB05 | 1/24 | 1/24 | NA | 0/24 |
| | | 4,4'-DDE | 500 | NA | 90.55 | 4.5J | 170J | 68-SB10 | 11/24 | 0/24 | NA | 2/24 |
| | | 4,4'-DDT | 1,000 | NA | 1,668.07 | 2.3J | 56J | 68-SB10 | 12/24 | 0/24 | NA | 0/24 |
| | | Methoxychlor | 62,000 | NA | 82.91 | 18J | 18J | 68-SB17 | 1/24 | 0/24 | NA | 0/24 |
| | PCBs | Aroclor-1260 | 83 | NA | NA | 290 | 290 | 68-SB05 | 1/24 | 1/24 | NA | NA |
| | Metals | Aluminum | 78,000 (4) | 5,856 | NA | 1,200 | 7,460 | 68-SB03 | 24/24 | 0/24 | 4/24 | NA |
| | | Antimony | NA | 5.5 | NA | 4.5J | 4.5J | 68-GW04 | 1/24 | 0/24 | 0/24 | NA |
| | | Arsenic | 15 | 1.3 | NA | 0.14 | 0.87 | 68-SB04 | 22/24 | 0/24 | 0/24 | NA |
| | | Barium | 32 | 17.29 | NA | 3 | 28.8 | 68-SB03 | 24/24 | NA | 7/24 | NA |
| | | Beryllium | 180 | 0.2 | NA | 0.16 | 0.59 | 68-GW06 | 11/24 | 0/24 | 9/24 | NA |
| | | Cadmium | 6 | 0.7 | NA | 0.44 | 0.44 | 68-SB03 | 1/24 | 0/24 | 0/24 | NA |
| | | Chromium | 78,000 (4) | 6.6 | NA | 0.86 | 4.1 | 68-SB02 | 24/24 | 0/24 | 0/24 | NA |
| | | Cobalt | 4,700 (4) | 2.05 | NA | 0.49 | 1.3 | 68-GW06 | 13/24 | 0/24 | 0/24 | NA |
| | | Copper | 3,100 (4) | 7.1 | NA | 0.44 | 7.2 | 68-GW04 | 23/24 | 0/24 | 1/24 | NA |
| | | Iron | 23,000 (4) | 3,702 | NA | 364 | 2,990 | 68-SB06 | 24/24 | 0/24 | 0/24 | NA |
| | | Lead | NE | 23.4 | NA | 4 | 122 | 68-SB14 | 24/24 | NA | 1/24 | NA |
| | | Manganese | 1,800 (4) | 18.51 | NA | 2.1 | 162 | 68-SB08 | 24/24 | 0/24 | 16/24 | NA |
| | | Mercury | 3 | 0.09 | NA | 0.05 | 0.05 | 68-GW04D | 1/24 | 0/24 | 0/24 | NA |
| | | Nickel | 21 | 3.5 | NA | 2 | 3.8 | 68-SB03 | 12/24 | 0/24 | 1/24 | NA |
| | | Selenium | 3 | 0.75 | NA | 0.24 | 0.24 | 68-SB02 | 1/24 | 0/24 | 0/24 | NA |
| | | Vanadium | 550 (4) | 11.45 | NA | 1.2 | 8.2 | 68-SB06 | 24/24 | 0/24 | 0/24 | NA |
| | | Zinc | 42,000 | 13.8 | NA | 1.8 | 21 | 68-GW04 | 20/24 | 0/24 | 1/24 | NA |

TABLE 4-3 (continued)

SUMMARY OF SITE CONTAMINATION
SITE 68, RIFLE RANGE
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (1) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Subsurface Soil | Volatiles | Acetone | 8,000 | NA | NA | 15 | 150 | 68-GW06D | 7/25 | 0/25 | NA | NA |
| | | Carbon Disulfide | 14,000 | NA | NA | 16 | 16 | 68-SB04 | 1/25 | 0/25 | NA | NA |
| | | 2-Butanone | 47,000 (4) | NA | NA | 9J | 9J | 68-GW04D | 1/25 | 0/25 | NA | NA |
| | Semivolatiles | Pyrene | 1400000 | NA | NA | 48J | 48J | 68-GW06D | 1/25 | 0/25 | NA | NA |
| | | bis(2-Ethylhexyl)phthalate | 11,000 | NA | NA | 39J | 110J | 68-GW04 | 4/25 | 0/25 | NA | NA |
| | Pesticides | 4,4'-DDT | 1,000 | NA | NA | 3.4K | 3.4K | 68-SB17 | 1/25 | 0/25 | NA | NA |
| | PCBs | Aroclor-1260 | 83 | NA | NA | 12J | 26J | 68-SB17 | 3/25 | 0/25 | NA | NA |
| | Metals | Aluminum | 78,000 (4) | 7,413 | NA | 645 | 13,200 | 68-SB17 | 25/25 | 0/25 | 20/25 | NA |
| | | Arsenic | 15 | 1.97 | NA | 0.27 | 8 | 68-SB13 | 23/25 | 0/25 | 20/25 | NA |
| | | Barium | 32 | 14.4 | NA | 0.59 | 80.9J | 68-GW06D | 25/25 | 1/25 | 13/25 | NA |
| | | Beryllium | 180 | 0.2 | NA | 0.2 | 0.87 | 68-SB16 | 17/25 | 0/25 | 16/25 | NA |
| | | Cadmium | 6 | 0.72 | NA | 0.56 | 0.82 | 68-SB04 | 3/25 | 0/25 | 1/25 | NA |
| | | Chromium | 78,000 (4) | 12.54 | NA | 2 | 25 | 68-SB09 | 25/25 | 0/25 | 20/25 | NA |
| | | Cobalt | 4,700 (4) | 1.6 | NA | 0.79 | 11 | 68-SB04 | 16/25 | 0/25 | 3/25 | NA |
| | | Copper | 3,100 (4) | 2.41 | NA | 1.1 | 12 | 68-SB11 | 22/25 | 0/25 | 19/25 | NA |
| | | Iron | 23,000 (4) | 7134.0 | NA | 726 | 18,600 | 68-SB09 | 25/25 | 0/25 | 16/25 | NA |
| | | Lead | NE | 8.3 | NA | 1.1 | 11.9J | 68-GW06D | 25/25 | NA | 6/25 | NA |
| | | Manganese | 1,800 (4) | 7.99 | NA | 3.4 | 178 | 68-GW06 | 24/25 | 0/25 | 20/25 | NA |
| | | Nickel | 21 | 3.73 | NA | 2.5 | 18.9 | 68-SB16 | 15/25 | 0/25 | 8/25 | NA |
| | | Selenium | 3 | 0.81 | NA | 0.27 | 0.53 | 68-SB01 | 4/25 | 0/25 | 0/25 | NA |
| | | Vanadium | 550 (4) | 13.3 | NA | 1.7 | 33.2 | 68-SB09 | 25/25 | 0/25 | 20/25 | NA |
| | | Zinc | 42,000 | 6.67 | NA | 0.84 | 92.8 | 68-SB16 | 24/25 | 0/25 | 21/25 | NA |

TABLE 4-3 (continued)

SUMMARY OF SITE CONTAMINATION
SITE 68, RIFLE RANGE
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (5) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Groundwater | Volatiles | Carbon Disulfide | NE | NA | NA | 4J | 4J | 68-GW06 | 2/9 | NA | NA | NA |
| | | 2-Hexanone | NE | NA | NA | 6J | 6J | 68-GW04D | 1/9 | NA | NA | NA |
| | Semivolatiles | ND | NA | NA | NA | ND | ND | ND | ND | NA | NA | NA |
| | Pesticides | ND | NA | NA | NA | ND | ND | ND | ND | NA | NA | NA |
| | PCBs | ND | NA | NA | NA | NA | NA | NA | 0/0 | NA | NA | NA |
| | Metals (total) | Aluminum | NE/50 | NA | NA | 186 | 3,690 | 68-GW01 | 8/19 | 8/19 | NA | NA |
| | | Antimony | NE/6 | NA | NA | 20.3 | 21 | 68-GW04D | 2/19 | 2/19 | NA | NA |
| | | Arsenic | 50/50 | NA | NA | 0.96 | 1.0 | 68-GW01D | 1/19 | 0/19 | NA | NA |
| | | Barium | 2,000/2,000 | NA | NA | 3.6 | 55 | 68-GW06D | 19/19 | 0/19 | NA | NA |
| | | Cadmium | 5/5 | NA | NA | 4.8 | 4.8 | 68-GW03 | 1/19 | 0/19 | NA | NA |
| | | Chromium | 50/100 | NA | NA | 3.5 | 6.4 | 68-GW01 | 1/9 | 0/19 | NA | NA |
| | | Cobalt | NE/NE | NA | NA | 3.1 | 35.8 | 68-GW04 | 4/9 | NA | NA | NA |
| | | Copper | 1,000/NE | NA | NA | 2.3 | 25.6 | 68-GW06 | 14/19 | 0/19 | NA | NA |
| | | Iron | 300/300 | NA | NA | 16.4 | 6170.0 | 68-GW04 | 18/19 | 6/19 | NA | NA |
| | | Lead | 15/NE | NA | NA | 0.84 | 2.9 | 68-GW02 | 6/19 | 0/19 | NA | NA |
| | | Manganese | 50/50 | NA | NA | 2.6 | 1390.0 | 68-GW06D | 17/19 | 8/19 | NA | NA |
| | | Nickel | 100/100 | NA | NA | 9.2 | 65.4 | 68-GW04 | 5/19 | 0/19 | NA | NA |
| | | Selenium | 50/50 | NA | NA | 2.1 | 2.1 | 68-GW02 | 1/19 | 0/19 | NA | NA |
| | | Vanadium | NE/NE | NA | NA | 2.8 | 23.1 | 68-GW06 | 7/19 | NA | NA | NA |
| | | Zinc | 2,100/NE | NA | NA | 4 | 250.0 | 68-GW04 | 10/19 | 0/19 | NA | NA |

TABLE 4-3 (continued)

SUMMARY OF SITE CONTAMINATION
SITE 68, RIFLE RANGE
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (6) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Surface Water | Volatiles | ND | NA | NA | NA | ND | ND | ND | 0/10 | NA | NA | NA |
| | Semivolatiles | Di-n-butylphthalate | 2700 | NA | NA | 1J | 1J | 68-SW01 | 1/10 | 0/10 | NA | NA |
| | Pesticides | ND | NA | NA | NA | ND | ND | ND | 0/5 | NA | NA | NA |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/5 | NA | NA | NA |
| | Metals | Aluminum | NE | NA | NA | 141 | 422 | 68-SW02 | 10/10 | NE | NA | NA |
| | | Barium | 1,000 | NA | NA | 11.3 | 18.4 | 68-SW07 | 10/10 | 0/10 | NA | NA |
| | | Cadmium | 5 | NA | NA | 2.9 | 2.9 | 68-SW08 | 1/10 | 0/10 | NA | NA |
| | | Iron | 300 (7) | NA | NA | 410 | 594 | 68-SW08 | 10/10 | 10/10 | NA | NA |
| | | Lead | 25 (8) | NA | NA | 0.87 | 2.5 | 68-SW07 | 6/10 | 0/10 | NA | NA |
| | | Manganese | 200 | NA | NA | 11.7 | 42.5 | 68-SW08 | 10/10 | 0/10 | NA | NA |
| | | Selenium | 71 (9) | NA | NA | 1.7 | 1.7 | 68-SW04 | 1/10 | 0/10 | NA | NA |
| | | Vanadium | NE | NA | NA | 2.4 | 2.4 | 68-SW10 | 1/10 | NA | NA | NA |
| | | Zinc | 86 (8) | NA | NA | 4.1 | 4.2 | 68-SW04 | 2/10 | 0/10 | NA | NA |

TABLE 4-3 (continued)

SUMMARY OF SITE CONTAMINATION
SITE 68, RIFLE RANGE
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (10) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Sediment | Volatiles | ND | NA | NA | NA | ND | ND | ND | 0/0 | NA | NA | NA |
| | Semivolatiles | Phenanthrene | 240 (11) | NA | NA | 280J | 280J | 68-SD07 | 1/10 | 1/10 | NA | NA |
| | | Anthracene | 85 | NA | NA | 62J | 62J | 68-SD07 | 1/10 | 0/10 | NA | NA |
| | | Fluoranthene | 600 | NA | NA | 420J | 420J | 68-SD07 | 1/10 | 0/10 | NA | NA |
| | | Pyrene | 665 | NA | NA | 330J | 330J | 68-SD07 | 1/10 | 0/10 | NA | NA |
| | | Benzo(a)anthracene | 261 | NA | NA | 190J | 190J | 68-SD07 | 1/10 | 0/10 | NA | NA |
| | | Chrysene | 384 | NA | NA | 210J | 210J | 68-SD07 | 1/10 | 0/10 | NA | NA |
| | | Bis(2-ethylhexyl)phthalate | 1,300 (11) | NA | NA | 250J | 250J | 68-SD03 | 1/10 | 0/10 | NA | NA |
| | | Benzo(b)fluoranthene | 3,200 (11) | NA | NA | 250J | 250J | 68-SD07 | 1/10 | 0/10 | NA | NA |
| | | Benzo(k)fluoranthene | NE | NA | NA | 97J | 97J | 68-SD07 | 1/10 | NA | NA | NA |
| | | Benzo(a)pyrene | 430 | NA | NA | 170J | 380J | 68-SD05 | 3/10 | 0/10 | NA | NA |
| | | Indeno(1,2,3-cd)pyrene | 600 (11) | NA | NA | 110J | 110J | 68-SD07 | 1/10 | 0/10 | NA | NA |
| | | Benzo(g,h,i)perylene | 670 (11) | NA | NA | 98J | 98J | 68-SD07 | 1/10 | 0/10 | NA | NA |
| | Pesticides | 4,4'-DDE | 2.2 | NA | NA | 6.7 | 550 | 68-SD06 | 9/10 | 9/10 | NA | NA |
| | | 4,4'-DDD | 2 (12) | NA | NA | 2.5J | 2,900 | 68-SD03 | 9/10 | 9/10 | NA | NA |
| | | 4,4'-DDT | 1.58 | NA | NA | 6.3J | 4,500 | 68-SD07 | 7/10 | 7/10 | NA | NA |
| | | alpha-Chlordane | 0.5 (13) | NA | NA | 13J | 13J | 68-SD06 | 1/10 | 1/10 | NA | NA |
| | | gamma-Chlordane | 0.5 (13) | NA | NA | 14NJ | 14NJ | 68-SD06 | 1/10 | 1/10 | NA | NA |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | ND | NA | NA | NA |
| | Metals | Aluminum | NE | NA | NA | 351 | 11500 | 68-SD03 | 10/10 | NA | NA | NA |
| | | Arsenic | 8.2 | NA | NA | 0.64J | 4.2 | 68-SD05 | 5/10 | 0/10 | NA | NA |
| | | Barium | NE | NA | NA | 1.5 | 28.1 | 68-SD03 | 10/10 | NA | NA | NA |
| | | Cadmium | 1.2 | NA | NA | 0.5 | 4.7 | 68-SD05 | 3/10 | 2/10 | NA | NA |
| | | Chromium | 81 | NA | NA | 0.79 | 12.6 | 68-SD06 | 10/10 | 0/10 | NA | NA |
| | | Cobalt | NE | NA | NA | 0.75 | 6.3 | 68-SD05 | 5/10 | NA | NA | NA |
| | | Copper | 34 | NA | NA | 0.45 | 14.9 | 68-SD06 | 8/10 | 0/10 | NA | NA |
| | | Iron | NE | NA | NA | 296 | 16300 | 68-SD06 | 10/10 | NA | NA | NA |
| | | Lead | 46.7 | NA | NA | 1.8 | 73J | 68-SD06 | 10/10 | 1/10 | NA | NA |
| | | Manganese | NE | NA | NA | 2.7 | 127 | 68-SD03 | 10/10 | NA | NA | NA |
| | | Mercury | 0.15 | NA | NA | 0.4 | 0.4 | 68-SD03 | 1/10 | 1/10 | NA | NA |
| | | Nickel | 20.9 | NA | NA | 2.3 | 9.7 | 68-SD06 | 3/10 | 0/10 | NA | NA |
| | | Selenium | NE | NA | NA | 0.79 | 1.2 | 68-SD06 | 2/10 | NA | NA | NA |
| | | Vanadium | NE | NA | NA | 0.7 | 26.6 | 68-SD06 | 10/10 | NA | NA | NA |
| | | Zinc | 150 | NA | NA | 3.8 | 86.5 | 68-SD06 | 9/10 | 0/10 | NA | NA |

TABLE 4-3 (continued)

SUMMARY OF SITE CONTAMINATION
SITE 68, RIFLE RANGE
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

Notes:
- Concentrations are presented in µg/L for liquid and µg/kg for solids (ppb), metal concentrations for soils and sediments are presented in mg/kg (ppm).
- Calcium, magnesium, potassium, and sodium are not included in the tables

(1) - USEPA Region III Soil Screening Levels for Transfer from Soil to Groundwater (May, 1996)
(2) - Twice the Average Base Background Concentration for Metals in Soil
(3) - Surface Soil Pesticide Levels at MCB Camp Lejeune
(4) - USEPA Region III Risk-Based Concentrations (Residential Soil) were used because no Soil to Groundwater Screening Levels were available (May, 1996).
(5) - North Carolina Water Quality Standards for Groundwater/USEPA Maximum Contaminant Levels
(6) - North Carolina Water Quality Standards for Surface Water (Human Health Standard) unless otherwise indicated
(7) - USEPA Region IV Water Quality Standards for Surface Water (Human Health Standard)
(8) - North Carolina Water Quality Standards for Surface Water (Saltwater Aquatic Life Standard)
(9) - USEPA Region IV Water Quality Standards for Surface Water (Saltwater Aquatic Life Standard)
(10) - Long et.al., 1995 unless otherwise indicated
(11) - USEPA Region III BTAG Screening Levels (January 19, 1995)
(12) - USEPA Region IV Sediment Screening Values (January 27, 1992)
(13) - Total Chlordane Value

NA - Not Applicable
NE - Not Established
ND - Not Detected

**TABLE 4 - 4**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| | | | | | | |
|---|---|---|---|---|---|---|
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| DI-N-BUTYLPHTHALATE | 310 J | 390 U | 430 U | 410 U | 420 U | 460 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 110 J | 390 U | 70 J | 410 U | 87 J | 380 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| HEPTACHLOR | 2 U | 2 U | 2.1 U | 2 U | 2.1 U | 1.9 U |
| HEPTACHLOR EPOXIDE | 2 U | 2 U | 2.1 U | 2 U | 2.1 U | 1.9 U |
| DIELDRIN | 4.1 U | 3.9 U | 4.2 U | 4.1 U | 4.2 U | 1.9 J |
| 4,4'-DDE | 11 J | 37 J | 4.2 UJ | 7 J | 7.1 J | 3.8 UJ |
| ENDRIN | 4.1 U | 3.9 U | 4.2 U | 4.1 U | 4.2 U | 3.8 U |
| 4,4'-DDD | 4.1 U | 3.6 J | 4.2 U | 4.1 U | 2.9 J | 3.8 U |
| 4,4'-DDT | 8.2 | 16 | 4.2 U | 12 | 12 | 1.5 J |
| ALPHA-CHLORDANE | 2 U | 2 U | 2.1 U | 2 U | 2.1 U | 1.9 U |
| GAMMA-CHLORDANE | 2 U | 2 U | 2.1 U | 2 U | 2.1 U | 1.9 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 4**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| | | | | | | |
|---|---|---|---|---|---|---|
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| DI-N-BUTYLPHTHALATE | 380 U | 400 U | 280 J | 380 U | 420 U | 430 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 380 U | 400 U | 69 J | 380 U | 420 U | 430 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| HEPTACHLOR | 1.8 U | 2 U | 2.1 U | 3 J | 2.1 U | 2.1 U |
| HEPTACHLOR EPOXIDE | 1.8 U | 2 U | 2.1 U | 37 J | 2.1 U | 2.1 U |
| DIELDRIN | 3.7 U | 4 U | 4.2 U | 3.8 UJ | 4.1 U | 4.3 U |
| 4,4'-DDE | 3.7 UJ | 2.4 J | 2.5 J | 38 J | 12 J | 8.1 J |
| ENDRIN | 3.7 U | 4 U | 4.2 U | 11 J | 4.1 U | 4.3 U |
| 4,4'-DDD | 3.7 U | 4 U | 4.2 U | 47 NJ | 4.1 U | 4.3 U |
| 4,4'-DDT | 2.2 J | 4 | 4.2 | 3.8 UJ | 7.9 J | 10 |
| ALPHA-CHLORDANE | 1.8 U | 2 U | 2.1 U | 440 | 2.1 U | 2.1 U |
| GAMMA-CHLORDANE | 1.8 U | 2 U | 2.1 U | 470 | 2.1 U | 2.1 U |

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NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 4**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| | | | |
|---|---|---|---|
| **SEMIVOLATILES (ug/kg)** | | | |
| DI-N-BUTYLPHTHALATE | 380 U | 410 U | 380 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 40 J | 87 J | 58 J |
| **PESTICIDE/PCBS (ug/kg)** | | | |
| HEPTACHLOR | 1.9 U | 2 U | 1.9 U |
| HEPTACHLOR EPOXIDE | 1.9 U | 2 U | 1.9 U |
| DIELDRIN | 3.4 J | 4 U | 3.8 U |
| 4,4'-DDE | 3.8 UJ | 8.1 J | 3.8 UJ |
| ENDRIN | 3.8 U | 4 U | 3.8 U |
| 4,4'-DDD | 3.8 U | 1.6 NJ | 3.8 U |
| 4,4'-DDT | 2.3 J | 6.5 | 2.3 J |
| ALPHA-CHLORDANE | 1.1 NJ | 3.2 UJ | 1.9 U |
| GAMMA-CHLORDANE | 1.1 J | 2 | 1.9 U |

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U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

TABLE 4-4
POSITIVE DETECTION SUMMARY - SURFACE SOIL
TOTAL METALS
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 75-GW04-00 | 75-GW05-00 | 75-SB01-00 | 75-SB02-00 | 75-SB04-00 | 75-SB05-00 | 75-SB06-00 | 75-SB07-00 |
|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/21/96 | 02/22/96 | 02/21/96 | 02/22/96 | 02/21/96 | 02/22/96 | 02/21/96 | 02/22/96 |
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | 6860 | 5720 | 6630 | 5610 | 6000 | 6300 | 7110 | 6930 |
| ARSENIC, TOTAL | 1.7 J | 0.65 J | 0.86 J | 1.1 J | 0.82 J | 1 | 0.69 J | 0.67 J |
| BARIUM, TOTAL | 16.9 | 14.7 | 43.1 | 16 | 17.2 | 26.9 | 21.4 | 12.6 |
| CALCIUM, TOTAL | 936 | 1490 | 4830 | 1610 | 1170 | 1060 | 8090 | 1500 |
| CHROMIUM, TOTAL | 8 | 5.6 | 8.1 | 6 | 5.9 | 6.3 | 8.3 | 6.4 |
| COBALT, TOTAL | 0.61 | 0.61 | 0.64 U | 0.79 | 0.82 | 0.57 U | 0.8 | 0.65 U |
| COPPER, TOTAL | 4.2 | 2 | 1.6 | 2.6 | 5.1 | 2.8 | 1.5 | 3.8 |
| IRON, TOTAL | 3900 | 2570 J | 3340 | 2920 J | 2780 | 3120 | 3060 | 2830 |
| LEAD, TOTAL | 58.4 J | 15.6 J | 10.3 J | 16.7 J | 17.2 J | 45.2 | 9.7 J | 16.9 J |
| MAGNESIUM, TOTAL | 314 | 233 | 338 | 184 | 184 | 203 | 403 | 189 |
| MANGANESE, TOTAL | 11.9 | 13.1 | 8.2 | 11.2 | 14.5 | 6.1 | 11 | 8.9 |
| MERCURY, TOTAL | 0.04 U | 0.05 U | 0.05 U | 0.06 U | 0.06 U | 0.05 U | 0.05 U | 0.12 |
| NICKEL, TOTAL | 2.5 | 3.7 | 2.4 U | 2.3 U | 2.6 U | 2.1 U | 2.5 U | 2.5 U |
| POTASSIUM, TOTAL | 177 | 199 | 300 | 168 U | 209 | 156 U | 211 | 180 U |
| SELENIUM, TOTAL | 0.3 J | 0.25 UJ | 0.26 J | 0.25 UJ | 0.26 UJ | 0.23 U | 0.35 J | 0.3 UJ |
| SODIUM, TOTAL | 13.7 | 36.6 J | 22.8 | 28.6 J | 25.7 | 25.7 J | 24.8 | 9.8 |
| VANADIUM, TOTAL | 13.3 | 9.6 | 11.2 | 10.2 | 9.4 | 11.1 | 11.6 | 9.6 |
| ZINC, TOTAL | 30.8 | 8.7 | 7.1 | 15.3 | 64 | 30 | 21.6 | 21.7 |

QUALIFIER DEFINITIONS

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U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4-4**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**TOTAL METALS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 75-SB08-00 | 75-SB09-00 | 75-SB10-00 | 75-SB11-00 | 75-SB12-00 | 75-SB13-00 | 75-SB14-00 |
|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/22/96 | 02/22/96 | 02/22/96 | 02/22/96 | 02/22/96 | 02/22/96 | 02/22/96 |
| **TOTAL METALS (mg/kg)** | | | | | | | |
| ALUMINUM, TOTAL | 8310 | 5520 | 4150 | 5810 | 5120 | 3070 | 4480 |
| ARSENIC, TOTAL | 0.44 J | 0.69 J | 1.1 J | 0.68 J | 0.85 J | 0.74 J | 0.61 J |
| BARIUM, TOTAL | 15.8 | 12.9 | 10.7 | 8.9 | 9.8 | 13.3 | 12.5 |
| CALCIUM, TOTAL | 1120 | 15500 | 1170 | 2250 | 44700 | 1960 | 2000 |
| CHROMIUM, TOTAL | 8 | 6.2 | 4.6 | 5.5 | 6.9 | 4 | 5 |
| COBALT, TOTAL | 0.62 | 0.49 U | 0.52 U | 0.81 | 0.64 U | 0.68 U | 0.65 U |
| COPPER, TOTAL | 1.1 | 1.2 | 1.4 | 1.5 | 2.6 | 5 | 2.4 |
| IRON, TOTAL | 3500 J | 3450 | 1730 J | 2300 J | 3600 J | 1600 J | 1990 J |
| LEAD, TOTAL | 10.5 J | 12 J | 20.6 J | 18.2 J | 27.3 J | 21 J | 32.3 J |
| MAGNESIUM, TOTAL | 274 | 426 | 279 | 221 | 734 | 97 | 175 |
| MANGANESE, TOTAL | 9.9 | 7.7 | 16.7 | 8.6 | 12.2 | 11.9 | 12.1 |
| MERCURY, TOTAL | 0.05 U | 0.05 U | 0.06 U | 0.06 U | 0.1 | 0.08 | 0.06 U |
| NICKEL, TOTAL | 2.1 U | 1.9 U | 1.9 U | 2.8 U | 2.4 U | 2.6 U | 2.4 U |
| POTASSIUM, TOTAL | 153 U | 196 | 143 U | 208 U | 182 | 188 U | 179 U |
| SELENIUM, TOTAL | 0.27 J | 0.27 UJ | 0.26 UJ | 0.32 J | 0.24 UJ | 0.27 J | 0.24 UJ |
| SODIUM, TOTAL | 72.6 | 31.5 | 16.6 J | 38.5 J | 138 | 16.9 J | 19.6 J |
| VANADIUM, TOTAL | 13.1 | 9.8 | 8 | 11.9 | 10.3 | 6 | 8.8 |
| ZINC, TOTAL | 9.2 | 5.5 | 27.1 | 13 | 16.6 | 22 | 19.5 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

TABLE 4-4
POSITIVE DETECTION SUMMARY - SURFACE SOIL
TOTAL METALS
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION<br>DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 3070 | 8310 | 75-SB08-00 | 15/15 | 5841.33 | 5810.00 |
| ARSENIC, TOTAL | NA | NA | 0.44 J | 1.7 J | 75-GW04-00 | 15/15 | 0.84 | 0.74 |
| BARIUM, TOTAL | NA | NA | 8.9 | 43.1 | 75-SB01-00 | 15/15 | 16.85 | 14.70 |
| CALCIUM, TOTAL | NA | NA | 936 | 44700 | 75-SB12-00 | 15/15 | 5959.07 | 1610.00 |
| CHROMIUM, TOTAL | NA | NA | 4 | 8.3 | 75-SB06-00 | 15/15 | 6.32 | 6.20 |
| COBALT, TOTAL | 0.49 U | 0.68 U | 0.61 | 0.82 | 75-SB04-00 | 7/15 | 0.72 | 0.79 |
| COPPER, TOTAL | NA | NA | 1.1 | 5.1 | 75-SB04-00 | 15/15 | 2.59 | 2.40 |
| IRON, TOTAL | NA | NA | 1600 J | 3900 | 75-GW04-00 | 15/15 | 2846.00 | 2920.00 |
| LEAD, TOTAL | NA | NA | 9.7 J | 58.4 J | 75-GW04-00 | 15/15 | 22.13 | 17.20 |
| MAGNESIUM, TOTAL | NA | NA | 97 | 734 | 75-SB12-00 | 15/15 | 283.60 | 233.00 |
| MANGANESE, TOTAL | NA | NA | 6.1 | 16.7 | 75-SB10-00 | 15/15 | 10.93 | 11.20 |
| MERCURY, TOTAL | 0.04 U | 0.06 U | 0.08 | 0.12 | 75-SB07-00 | 3/15 | 0.10 | 0.10 |
| NICKEL, TOTAL | 1.9 U | 2.8 U | 2.5 | 3.7 | 75-GW05-00 | 2/15 | 3.10 | 3.10 |
| POTASSIUM, TOTAL | 143 U | 208 U | 177 | 300 | 75-SB01-00 | 7/15 | 210.57 | 199.00 |
| SELENIUM, TOTAL | 0.23 U | 0.3 UJ | 0.26 J | 0.35 J | 75-SB06-00 | 6/15 | 0.30 | 0.29 |
| SODIUM, TOTAL | NA | NA | 9.8 | 138 | 75-SB12-00 | 15/15 | 34.76 | 25.70 |
| VANADIUM, TOTAL | NA | NA | 6 | 13.3 | 75-GW04-00 | 15/15 | 10.26 | 10.20 |
| ZINC, TOTAL | NA | NA | 5.5 | 64 | 75-SB04-00 | 15/15 | 20.81 | 19.50 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

TABLE 4 - 4
POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL
ORGANIC COMPOUNDS
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 75-SB01-01 | 75-SB02-02 | 75-SBO3-01 | 75-SBO3-02 | 75-SBO4-01 | 75-SB05-02 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/21/96 | 02/22/96 | 02/21/96 | 02/21/96 | 02/21/96 | 02/22/96 |
| DEPTH | 1-3' | 3-5 | 1-3' | 3-5 | 1-3' | 3-5 |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| DI-N-BUTYLPHTHALATE | 370 U | 400 U | 370 U | 380 U | 440 U | 400 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 370 U | 400 U | 66 J | 40 J | 440 U | 400 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| DIELDRIN | 3.7 U | 4.1 U | 1.5 J | 6.6 J | 4.5 U | 3.9 U |
| 4,4'-DDE | 6.7 J | 4.1 UJ | 39 J | 20 J | 4.5 UJ | 3.9 UJ |
| 4,4'-DDD | 3.7 U | 4.1 U | 40 | 41 | 4.5 U | 3.9 U |
| 4,4'-DDT | 3.7 | 4.1 U | 10 J | 4.7 | 4.5 U | 3.9 U |
| ALPHA-CHLORDANE | 1.8 U | 2 U | 1.9 J | 2.7 J | 2.2 U | 2 U |
| GAMMA-CHLORDANE | 1.8 U | 2 U | 1.1 J | 2 | 2.2 U | 2 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

TABLE 4 - 4
POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL
ORGANIC COMPOUNDS
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 75-SBO6-01 | 75-SB07-01 | 75-SB08-01 | 75-SB09-02 | 75-SB10-01 | 75-SB11-01 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/21/96 | 02/22/96 | 02/22/96 | 02/22/96 | 02/22/96 | 02/22/96 |
| DEPTH | 1-3' | 1-3' | 1-3' | 3-5 | 1-3' | 1-3' |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| DI-N-BUTYLPHTHALATE | 380 U | 400 U | 64 J | 390 U | 390 U | 400 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 64 J | 400 U | 400 U | 390 U | 390 U | 400 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| DIELDRIN | 3.8 U | 4 U | 4 UJ | 3.9 U | 4 U | 4 UJ |
| 4,4'-DDE | 3.8 UJ | 4 UJ | 4 UJ | 3.9 UJ | 4 UJ | 4 UJ |
| 4,4'-DDD | 3.8 U | 4 U | 4 UJ | 3.9 U | 4 U | 4 UJ |
| 4,4'-DDT | 3.8 U | 4 U | 4 UJ | 3.9 U | 4 U | 4 UJ |
| ALPHA-CHLORDANE | 1.9 U | 2 U | 2 UJ | 2 U | 2 U | 2 UJ |
| GAMMA-CHLORDANE | 1.9 U | 2 U | 2 UJ | 2 U | 2 U | 2 UJ |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 4**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 75-SB12-01 | 75-SB13-01 | 75-SB14-01 | 75-GW04-01 | 75-GW05-01 |
|---|---|---|---|---|---|
| DATE SAMPLED | 02/22/96 | 02/22/96 | 02/22/96 | 02/21/96 | 02/22/96 |
| DEPTH | 1-3' | 1-3' | 1-3' | | 1-3' |
| **SEMIVOLATILES (ug/kg)** | | | | | |
| DI-N-BUTYLPHTHALATE | 380 U | 400 U | 100 J | 410 U | 200 J |
| BIS(2-ETHYLHEXYL)PHTHALATE | 380 U | 400 U | 400 U | 410 U | 390 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | |
| DIELDRIN | 3.9 UJ | 4 U | 3.9 UJ | 4.1 U | 3.9 U |
| 4,4'-DDE | 3.9 UJ | 4 UJ | 3.9 UJ | 4.1 UJ | 3.9 UJ |
| 4,4'-DDD | 3.9 UJ | 4 U | 3.9 UJ | 4.1 U | 3.9 U |
| 4,4'-DDT | 3.9 UJ | 4 U | 3.9 UJ | 4.1 U | 3.9 U |
| ALPHA-CHLORDANE | 1.9 UJ | 2 U | 2 UJ | 2 U | 2 U |
| GAMMA-CHLORDANE | 1.9 UJ | 2 U | 2 UJ | 2 U | 2 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 4**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **SEMIVOLATILES (ug/kg)** | | | | | | | | |
| DI-N-BUTYLPHTHALATE | 370 U | 440 U | 64 J | 200 J | 75-GW05-01 | 3/17 | 121.33 | 100.00 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 370 U | 440 U | 40 J | 66 J | 75-SBO3-01 | 3/17 | 56.67 | 64.00 |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | | | |
| DIELDRIN | 3.7 U | 4.5 U | 1.5 J | 6.6 J | 75-SBO3-02 | 2/17 | 4.05 | 4.05 |
| 4,4'-DDE | 3.8 UJ | 4.5 UJ | 6.7 J | 39 J | 75-SBO3-01 | 3/17 | 21.90 | 20.00 |
| 4,4'-DDD | 3.7 U | 4.5 U | 40 | 41 | 75-SBO3-02 | 2/17 | 40.50 | 40.50 |
| 4,4'-DDT | 3.8 U | 4.5 U | 3.7 | 10 J | 75-SBO3-01 | 3/17 | 6.13 | 4.70 |
| ALPHA-CHLORDANE | 1.8 U | 2.2 U | 1.9 J | 2.7 J | 75-SBO3-02 | 2/17 | 2.30 | 2.30 |
| GAMMA-CHLORDANE | 1.8 U | 2.2 U | 1.1 J | 2 | 75-SBO3-02 | 2/17 | 1.55 | 1.55 |

QUALIFIER DEFINITIONS

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UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4-4**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**TOTAL METALS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 75-SB01-01 | 75-SB02-02 | 75-SB03-01 | 75-SB03-02 | 75-SB04-01 | 75-SB05-02 | 75-SB06-01 | 75-SB07-01 |
|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/21/96 | 02/22/96 | 02/21/96 | 02/21/96 | 02/21/96 | 02/22/96 | 02/21/96 | 02/22/96 |
| DEPTH | 1-3' | 3-5 | 1-3' | 3-5 | 1-3' | 3-5 | 1-3' | 1-3' |
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | 6340 | 3490 | 9080 | 6120 | 9730 | 7780 | 8170 | 9640 |
| ANTIMONY, TOTAL | 4.2 UJ | 3.5 UJ | 4.5 J | 3.2 UJ | 4.8 UJ | 3.8 UJ | 3.8 UJ | 3.4 UJ |
| ARSENIC, TOTAL | 1.1 J | 0.43 J | 0.92 J | 0.54 J | 0.96 J | 0.47 | 0.16 UJ | 0.15 UJ |
| BARIUM, TOTAL | 20.5 | 31.7 | 41.4 | 36.5 | 20.5 | 11.2 | 9.5 | 12.5 |
| BERYLLIUM, TOTAL | 0.17 U | 0.14 U | 0.17 U | 0.13 U | 0.2 U | 0.15 U | 0.15 U | 0.14 U |
| CALCIUM, TOTAL | 12600 | 355 | 1740 | 2820 | 253 | 126 | 948 | 631 |
| CHROMIUM, TOTAL | 8.1 | 3.4 | 12.6 | 10.4 | 9.4 | 8.1 | 7.3 | 8.5 |
| COBALT, TOTAL | 1.2 | 0.66 | 0.63 U | 0.51 | 0.91 | 0.58 | 0.58 U | 0.65 |
| COPPER, TOTAL | 1.5 | 0.76 | 1.4 | 0.83 | 1.5 | 0.76 | 0.77 | 0.45 |
| IRON, TOTAL | 3010 | 1320 J | 2360 | 1990 | 2770 | 2600 | 1500 | 3370 |
| LEAD, TOTAL | 11.7 J | 5.2 J | 8 J | 6 J | 8.3 J | 5.2 | 4.6 J | 6.5 J |
| MAGNESIUM, TOTAL | 409 | 79.5 | 453 | 310 | 217 | 273 | 327 | 344 |
| MANGANESE, TOTAL | 7.7 | 5.1 | 7.4 | 7 | 4.4 | 4.8 | 5.7 | 5.4 |
| NICKEL, TOTAL | 2.4 U | 2 U | 2.4 U | 16.7 | 2.8 U | 2.1 U | 2.2 U | 2 U |
| POTASSIUM, TOTAL | 177 | 146 U | 359 | 240 | 202 U | 283 | 221 | 187 |
| SELENIUM, TOTAL | 0.29 UJ | 0.27 UJ | 0.2 UJ | 0.21 UJ | 0.55 J | 0.23 U | 0.28 J | 0.21 UJ |
| SODIUM, TOTAL | 22 | 26.9 J | 10.9 | 21.5 | 21.6 | 18.7 J | 19.3 | 10.9 |
| VANADIUM, TOTAL | 10.3 | 4 | 10.3 | 7.8 | 9.8 | 10.4 | 8.3 | 13.8 |
| ZINC, TOTAL | 7.5 | 1.8 U | 4.4 | 3.4 | 3.3 | 4 | 39.2 | 2.3 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4-4**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**TOTAL METALS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 75-SB08-01 | 75-SB09-02 | 75-SB10-01 | 75-SB11-01 | 75-SB12-01 | 75-SB13-01 | 75-SB14-01 |
|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/22/96 | 02/22/96 | 02/22/96 | 02/22/96 | 02/22/96 | 02/22/96 | 02/22/96 |
| DEPTH | 1-3' | 3-5 | 1-3' | 1-3' | 1-3' | 1-3' | 1-3' |
| **TOTAL METALS (mg/kg)** | | | | | | | |
| ALUMINUM, TOTAL | 8020 | 1590 | 9980 | 12200 | 5720 | 8070 | 10500 |
| ANTIMONY, TOTAL | 3.7 UJ | 3.3 UJ | 4.2 UJ | 4 UJ | 4.3 UJ | 4.1 UJ | 4.1 UJ |
| ARSENIC, TOTAL | 0.22 J | 0.2 UJ | 44.6 J | 0.47 | 0.66 J | 0.48 J | 0.45 J |
| BARIUM, TOTAL | 10 | 2.6 | 15.7 | 12.6 | 5.8 | 8.3 | 11.9 |
| BERYLLIUM, TOTAL | 0.15 U | 0.13 U | 0.17 U | 0.17 | 0.17 U | 0.16 U | 0.16 U |
| CALCIUM, TOTAL | 74.6 U | 277 | 2500 | 886 | 542 | 93.7 | 134 |
| CHROMIUM, TOTAL | 7 | 2.4 | 9.1 | 10.1 | 6.4 | 7.6 | 8.9 |
| COBALT, TOTAL | 0.55 U | 0.5 U | 0.91 | 0.75 | 0.65 U | 0.62 U | 0.61 U |
| COPPER, TOTAL | 0.37 U | 0.37 | 0.98 | 0.42 | 0.43 U | 0.41 U | 0.41 U |
| IRON, TOTAL | 1490 J | 449 | 6580 J | 3530 | 7450 J | 7290 J | 4210 J |
| LEAD, TOTAL | 4.7 J | 2.4 J | 17.1 J | 4.9 J | 5 J | 6 J | 5 J |
| MAGNESIUM, TOTAL | 261 | 47 | 1300 | 424 | 192 | 250 | 318 |
| MANGANESE, TOTAL | 5 | 1.8 | 22.3 | 6.4 | 4 | 3.8 | 4.8 |
| NICKEL, TOTAL | 2.5 | 1.9 U | 2.7 | 2.3 U | 2.4 U | 2.3 U | 2.3 U |
| POTASSIUM, TOTAL | 153 U | 139 U | 177 U | 212 | 220 | 170 U | 170 U |
| SELENIUM, TOTAL | 0.25 UJ | 0.29 UJ | 0.23 UJ | 0.27 U | 0.28 J | 0.24 UJ | 0.26 J |
| SODIUM, TOTAL | 46.5 J | 3.6 U | 24.5 J | 62.1 J | 21.3 J | 8 J | 17.7 J |
| VANADIUM, TOTAL | 8.7 | 2.6 | 14.1 | 14.5 | 10.8 | 12.7 | 13.6 |
| ZINC, TOTAL | 5.3 | 0.6 U | 26.7 | 3.7 | 2 U | 2.3 U | 6.7 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

TABLE 4-4
POSITIVE DETECTION SUMMARY - GROUNDWATER
TOTAL METALS
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 75-GW04-01 | 75-GW05-01 |
|---|---|---|
| DATE SAMPLED | 02/21/96 | 02/22/96 |
| DEPTH | | 1-3' |
| **TOTAL METALS (mg/kg)** | | |
| ALUMINUM, TOTAL | 18500 | 12800 |
| ANTIMONY, TOTAL | 4 UJ | 4.1 UJ |
| ARSENIC, TOTAL | 1.3 J | 0.31 J |
| BARIUM, TOTAL | 21.8 | 14.7 |
| BERYLLIUM, TOTAL | 0.16 U | 0.17 U |
| CALCIUM, TOTAL | 200 U | 206 |
| CHROMIUM, TOTAL | 19.7 | 10.9 |
| COBALT, TOTAL | 1.2 | 0.62 U |
| COPPER, TOTAL | 1.2 | 0.63 |
| IRON, TOTAL | 6550 | 6660 J |
| LEAD, TOTAL | 9.8 J | 5.2 J |
| MAGNESIUM, TOTAL | 643 | 409 |
| MANGANESE, TOTAL | 8.1 | 6.6 |
| NICKEL, TOTAL | 2.3 U | 3.1 |
| POTASSIUM, TOTAL | 452 | 192 |
| SELENIUM, TOTAL | 0.34 J | 0.24 UJ |
| SODIUM, TOTAL | 23 | 58.6 J |
| VANADIUM, TOTAL | 24.6 | 16.6 |
| ZINC, TOTAL | 5.8 | 4.2 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4-4**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**TOTAL METALS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 1590 | 18500 | 75-GW04-01 | 17/17 | 8690.00 | 8170.00 |
| ANTIMONY, TOTAL | 3.2 UJ | 4.8 UJ | 4.5 J | 4.5 J | 75-SB03-01 | 1/17 | 4.50 | 4.50 |
| ARSENIC, TOTAL | 0.15 UJ | 0.2 UJ | 0.22 J | 44.6 J | 75-SB10-01 | 14/17 | 3.78 | 0.51 |
| BARIUM, TOTAL | NA | NA | 2.6 | 41.4 | 75-SB03-01 | 17/17 | 16.89 | 12.60 |
| BERYLLIUM, TOTAL | 0.13 U | 0.2 U | 0.17 | 0.17 | 75-SB11-01 | 1/17 | 0.17 | 0.17 |
| CALCIUM, TOTAL | 74.6 U | 200 U | 93.7 | 12600 | 75-SB01-01 | 15/17 | 1607.45 | 542.00 |
| CHROMIUM, TOTAL | NA | NA | 2.4 | 19.7 | 75-GW04-01 | 17/17 | 8.82 | 8.50 |
| COBALT, TOTAL | 0.5 U | 0.65 U | 0.51 | 1.2 | 75-GW04-01 | 9/17 | 0.82 | 0.75 |
| COPPER, TOTAL | 0.37 U | 0.43 U | 0.37 | 1.5 | 75-SB04-01 | 13/17 | 0.89 | 0.77 |
| IRON, TOTAL | NA | NA | 449 | 7450 J | 75-SB12-01 | 17/17 | 3713.47 | 3010.00 |
| LEAD, TOTAL | NA | NA | 2.4 J | 17.1 J | 75-SB10-01 | 17/17 | 6.80 | 5.20 |
| MAGNESIUM, TOTAL | NA | NA | 47 | 1300 | 75-SB10-01 | 17/17 | 368.03 | 318.00 |
| MANGANESE, TOTAL | NA | NA | 1.8 | 22.3 | 75-SB10-01 | 17/17 | 6.49 | 5.40 |
| NICKEL, TOTAL | 1.9 U | 2.8 U | 2.5 | 16.7 | 75-SB03-02 | 4/17 | 6.25 | 2.90 |
| POTASSIUM, TOTAL | 139 U | 202 U | 177 | 452 | 75-GW04-01 | 10/17 | 254.30 | 220.50 |
| SELENIUM, TOTAL | 0.2 UJ | 0.29 UJ | 0.26 J | 0.55 J | 75-SB04-01 | 5/17 | 0.34 | 0.28 |
| SODIUM, TOTAL | 3.6 U | 3.6 U | 8 J | 62.1 J | 75-SB11-01 | 16/17 | 25.84 | 21.55 |
| VANADIUM, TOTAL | NA | NA | 2.6 | 24.6 | 75-GW04-01 | 17/17 | 11.35 | 10.40 |
| ZINC, TOTAL | 0.6 U | 2.3 U | 2.3 | 39.2 | 75-SB06-01 | 13/17 | 8.96 | 4.40 |

**TABLE 4 - 4**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**TOTAL METALS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 75-GW01-01 | 75-GW02-01 | 75-GW03-01 | 75-GW04-01 | 75-GW05-01 |
|---|---|---|---|---|---|
| DATE SAMPLED | 02/24/96 | 02/25/96 | 02/24/96 | 02/25/96 | 02/25/96 |
| | | | | | 1-3' |
| **TOTAL METALS (ug/L)** | | | | | |
| ALUMINUM, TOTAL | 150 U | 211 U | 785 | 265 U | 142 U |
| BARIUM, TOTAL | 19.8 | 5.1 U | 45.9 | 29.8 | 35.7 |
| CALCIUM, TOTAL | 8950 | 33600 | 5270 | 8660 | 4450 |
| COBALT, TOTAL | 3 U | 3 U | 3 U | 3.2 | 3.6 |
| COPPER, TOTAL | 2 U | 2.6 | 2 U | 2.6 | 2 U |
| IRON, TOTAL | 53.4 U | 93.7 U | 439 | 221 U | 181 U |
| MAGNESIUM, TOTAL | 913 | 339 | 863 | 2720 | 875 |
| MANGANESE, TOTAL | 3.2 | 1.6 U | 7.1 | 68.3 | 41.6 |
| POTASSIUM, TOTAL | 828 U | 828 U | 828 U | 1070 | 828 U |
| SELENIUM, TOTAL | 1.3 U | 2.1 J | 1.3 U | 1.3 U | 1.3 U |
| SODIUM, TOTAL | 3310 | 1810 | 2710 | 6780 | 24300 |
| ZINC, TOTAL | 76.7 | 3.6 U | 3.8 | 13.5 | 13.5 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 4**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**TOTAL METALS**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (ug/L)** | | | | | | | | |
| ALUMINUM, TOTAL | 142 U | 265 U | 785 | 785 | 75-GW03-01 | 1/5 | 785.00 | 785.00 |
| BARIUM, TOTAL | 5.1 U | 5.1 U | 19.8 | 45.9 | 75-GW03-01 | 4/5 | 32.80 | 32.75 |
| CALCIUM, TOTAL | NA | NA | 4450 | 33600 | 75-GW02-01 | 5/5 | 12186.00 | 8660.00 |
| COBALT, TOTAL | 3 U | 3 U | 3.2 | 3.6 | 75-GW05-01 | 2/5 | 3.40 | 3.40 |
| COPPER, TOTAL | 2 U | 2 U | 2.6 | 2.6 | 75-GW04-01 | 2/5 | 2.60 | 2.60 |
| IRON, TOTAL | 53.4 U | 221 U | 439 | 439 | 75-GW03-01 | 1/5 | 439.00 | 439.00 |
| MAGNESIUM, TOTAL | NA | NA | 339 | 2720 | 75-GW04-01 | 5/5 | 1142.00 | 875.00 |
| MANGANESE, TOTAL | 1.6 U | 1.6 U | 3.2 | 68.3 | 75-GW04-01 | 4/5 | 30.05 | 24.35 |
| POTASSIUM, TOTAL | 828 U | 828 U | 1070 | 1070 | 75-GW04-01 | 1/5 | 1070.00 | 1070.00 |
| SELENIUM, TOTAL | 1.3 U | 1.3 U | 2.1 J | 2.1 J | 75-GW02-01 | 1/5 | 2.10 | 2.10 |
| SODIUM, TOTAL | NA | NA | 1810 | 24300 | 75-GW05-01 | 5/5 | 7782.00 | 3310.00 |
| ZINC, TOTAL | 3.6 U | 3.6 U | 3.8 | 76.7 | 75-GW01-01 | 4/5 | 26.88 | 13.50 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

TABLE 4 - 4
POSITIVE DETECTION SUMMARY - GROUNDWATER
DISSOLVED METALS
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 75-GW02D-01 | 75-GW04D-01 |
|---|---|---|
| DATE SAMPLED | 02/25/96 | 02/25/96 |
| **DISSOLVED METALS (ug/L)** | | |
| ANTIMONY, SOLUBLE | 25.4 | 19.8 U |
| BARIUM, SOLUBLE | 3.9 U | 29.3 |
| CALCIUM, SOLUBLE | 32900 | 9150 |
| COPPER, SOLUBLE | 2.4 | 3.2 |
| MAGNESIUM, SOLUBLE | 320 | 3140 |
| MANGANESE, SOLUBLE | 1.6 U | 66.1 |
| POTASSIUM, SOLUBLE | 828 U | 1230 |
| SODIUM, SOLUBLE | 1830 | 6930 |
| ZINC, SOLUBLE | 10 | 15 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

TABLE 4 - 4
POSITIVE DETECTION SUMMARY - GROUNDWATER
DISSOLVED METALS
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION<br>DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **DISSOLVED METALS (ug/L)** | | | | | | | | |
| ANTIMONY, SOLUBLE | 19.8 U | 19.8 U | 25.4 | 25.4 | 75-GW02D-01 | 1/2 | 25.40 | 25.40 |
| BARIUM, SOLUBLE | 3.9 U | 3.9 U | 29.3 | 29.3 | 75-GW04D-01 | 1/2 | 29.30 | 29.30 |
| CALCIUM, SOLUBLE | NA | NA | 9150 | 32900 | 75-GW02D-01 | 2/2 | 21025.00 | 21025.00 |
| COPPER, SOLUBLE | NA | NA | 2.4 | 3.2 | 75-GW04D-01 | 2/2 | 2.80 | 2.80 |
| MAGNESIUM, SOLUBLE | NA | NA | 320 | 3140 | 75-GW04D-01 | 2/2 | 1730.00 | 1730.00 |
| MANGANESE, SOLUBLE | 1.6 U | 1.6 U | 66.1 | 66.1 | 75-GW04D-01 | 1/2 | 66.10 | 66.10 |
| POTASSIUM, SOLUBLE | 828 U | 828 U | 1230 | 1230 | 75-GW04D-01 | 1/2 | 1230.00 | 1230.00 |
| SODIUM, SOLUBLE | NA | NA | 1830 | 6930 | 75-GW04D-01 | 2/2 | 4380.00 | 4380.00 |
| ZINC, SOLUBLE | NA | NA | 10 | 15 | 75-GW04D-01 | 2/2 | 12.50 | 12.50 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

TABLE 4-5

SUMMARY OF SITE CONTAMINATION
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (1) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Surface Soil | Volatiles | ND | NA | NA | NA | ND | ND | ND | 0/15 | NA | NA | NA |
| | Semivolatiles | Di-n-butylphthalate | 120,000 | NA | NA | 280J | 460 | 75-SB08 | 3/15 | 0/15 | NA | NA |
| | | bis(2-Ethylhexyl)phthalate | 11,000 | NA | NA | 40J | 110J | 75-GW05 | 7/15 | 0/15 | NA | NA |
| | Pesticides | Heptachlor | 60.0 | NA | 10 | 3J | 3J | 75-SB12 | 1/15 | 0/15 | NA | 0/15 |
| | | Heptachlor Epoxide | 30.0 | NA | 9.81 | 37J | 37J | 75-SB12 | 1/15 | 1/15 | NA | 1/15 |
| | | Dieldrin | 1.0 | NA | 44.7 | 1.9J | 3.4J | 75-SB01 | 2/15 | 2/15 | NA | 0/15 |
| | | 4,4'-DDE | 500 | NA | 90.55 | 2.4J | 38J | 75-SB12 | 10/15 | 0/15 | NA | 0/15 |
| | | Endrin | 400 | NA | 17.06 | 11J | 11J | 75-SB12 | 1/15 | 0/15 | NA | 0/15 |
| | | 4,4'-DDD | 700 | NA | 361.5 | 1.6NJ | 47NJ | 75-SB12 | 4/15 | 0/15 | NA | 0/15 |
| | | 4,4'-DDT | 1,000 | NA | 1,668.07 | 1.5J | 16 | 75-GW04 | 13/15 | 0/15 | NA | 0/15 |
| | | Alpha-Chlordane | 2,000 (4) | NA | 23.31 | 1.1NJ | 440 | 75-SB12 | 2/15 | 0/15 | NA | 1/15 |
| | | Gamma-Chlordane | 2,000 (4) | NA | 19.67 | 1.1J | 470 | 75-SB12 | 3/15 | 0/15 | NA | 1/15 |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/15 | NA | NA | NA |
| | Metals | Aluminum | 78,000 (5) | 5856 | NA | 3070 | 8,310 | 75-SB08 | 15/15 | 0/15 | 7/15 | NA |
| | | Arsenic | 15 | 1.3 | NA | 0.44J | 1.7J | 75-GW04 | 15/15 | 0/15 | 1/15 | NA |
| | | Barium | 32 | 17.3 | NA | 8.9 | 43 | 75-SB01 | 15/15 | 1/15 | 3/15 | NA |
| | | Chromium | 78,000 (5) | 6.6 | NA | 4 | 8.3 | 75-SB06 | 15/15 | 0/15 | 5/15 | NA |
| | | Cobalt | 4,700 (5) | 2 | NA | 0.61 | 0.82 | 75-SB04 | 7/15 | 0/15 | 0/15 | NA |
| | | Copper | 3,100 (5) | 7.1 | NA | 1.1 | 5.1 | 75-SB04 | 15/15 | 0/15 | 0/15 | NA |
| | | Iron | 23,000 (5) | 3702 | NA | 1600J | 3900 | 75-GW04 | 15/15 | 0/15 | 1/15 | NA |
| | | Lead | NE | 23.4 | NA | 9.7J | 58.4J | 75-GW04 | 15/15 | NA | 4/15 | NA |
| | | Manganese | 1,800 (5) | 18.5 | NA | 6.1 | 16.7 | 75-SB10 | 15/15 | 0/15 | 0/15 | NA |
| | | Mercury | 3 | 0.09 | NA | 0.08 | 0.12 | 75-SB07 | 3/15 | 0/15 | 2/15 | NA |
| | | Nickel | 21 | 3.5 | NA | 2.5 | 3.7 | 75-GW05 | 2/15 | 0/15 | 1/15 | NA |
| | | Selenium | 3 | 0.75 | NA | 0.26J | 0.35J | 75-SB06 | 6/15 | 0/15 | 0/15 | NA |
| | | Vanadium | 550 (5) | 11.4 | NA | 6 | 13.3 | 75-GW04 | 15/15 | 0/15 | 4/15 | NA |
| | | Zinc | 42,000 | 13.8 | NA | 5.5 | 64 | 75-SB04 | 15/15 | 0/15 | 10/15 | NA |

TABLE 4-5 (continued)

SUMMARY OF SITE CONTAMINATION
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (1) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Subsurface Soil | Volatiles | ND | NA | NA | NA | ND | ND | ND | 0/17 | NA | NA | NA |
| | Semivolatiles | Di-n-butylphthalate | 120,000 | NA | NA | 64J | 200J | 75-GW05 | 3/17 | 0/17 | NA | NA |
| | | bis(2-Ethylhexyl)phthalate | 11,000 | NA | NA | 40J | 66J | 75-SB03 | 3/17 | 0/17 | NA | NA |
| | Pesticides | Dieldrin | 1.0 | NA | NA | 1.5J | 6.6J | 75-SB03 | 2/17 | 2/17 | NA | NA |
| | | 4,4'-DDE | 500 | NA | NA | 6.7J | 39J | 75-SB03 | 3/17 | 0/17 | NA | NA |
| | | 4,4'-DDD | 700 | NA | NA | 40 | 41 | 75-SB03 | 2/17 | 0/17 | NA | NA |
| | | 4,4'-DDT | 1,000 | NA | NA | 3.7 | 10J | 75-SB03 | 3/17 | 0/17 | NA | NA |
| | | Alpha-Chlordane | 2,000 (4) | NA | NA | 1.9J | 2.7J | 75-SB03 | 2/17 | 0/17 | NA | NA |
| | | Gamma-Chlordane | 2,000 (4) | NA | NA | 1.1J | 2.0 | 75-SB03 | 2/17 | 0/17 | NA | NA |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/17 | NA | NA | NA |
| | Metals | Aluminum | 78,000 (5) | 7413 | NA | 1590 | 18500 | 75-GW04 | 17/17 | 0/17 | 12/17 | NA |
| | | Antimony | 31 (5) | 6.5 | NA | 4.5J | 4.5J | 75-SB03 | 1/17 | 0/17 | 0/17 | NA |
| | | Arsenic | 15 | 2 | NA | 0.22J | 44.6J | 75-SB10 | 14/17 | 1/17 | 1/17 | NA |
| | | Barium | 32 | 14.4 | NA | 2.6 | 41.4 | 75-SB03 | 17/17 | 2/17 | 8/17 | NA |
| | | Beryllium | 180 | 0.2 | NA | 0.17 | 0.17 | 75-SB11 | 1/17 | 0/17 | 0/17 | NA |
| | | Chromium | 78,000 (5) | 12.5 | NA | 2.4 | 19.7 | 75-GW04 | 17/17 | 0/17 | 2/17 | NA |
| | | Cobalt | 4,700 (5) | 1.6 | NA | 0.51 | 1.2 | 75-GW04 | 9/17 | 0/17 | 0/17 | NA |
| | | Copper | 3,100 (5) | 2.4 | NA | 0.37 | 1.5 | 75-SB04 | 13/17 | 0/17 | 0/17 | NA |
| | | Iron | 23,000 (5) | 7,135 | NA | 449 | 7,450J | 75-SB12 | 17/17 | 0/17 | 2/17 | NA |
| | | Lead | NE | 8.3 | NA | 2.4J | 17.1J | 75-SB10 | 17/17 | NA | 3/17 | NA |
| | | Manganese | NE | 8.0 | NA | 1.8 | 22.3 | 75-SB10 | 17/17 | NA | 2/17 | NA |
| | | Nickel | 21 | 3.7 | NA | 2.5 | 16.7 | 75-SB03 | 4/17 | 0/17 | 1/17 | NA |
| | | Selenium | 3 | 0.8 | NA | 0.26J | 0.55J | 75-SB04 | 5/17 | 0/17 | 0/17 | NA |
| | | Vanadium | 550 (5) | 13.3 | NA | 2.6 | 24.6 | 75-GW04 | 17/17 | 0/17 | 6/17 | NA |
| | | Zinc | 42,000 | 6.7 | NA | 2.3 | 39.2 | 75-SB06 | 13/17 | 0/17 | 3/17 | NA |

TABLE 4-5 (continued)

SUMMARY OF SITE CONTAMINATION
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (6) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Groundwater | Volatiles | ND | NA | NA | NA | ND | ND | ND | 0/5 | NA | NA | NA |
| | Semivolatiles | ND | NA | NA | NA | ND | ND | ND | 0/5 | NA | NA | NA |
| | Pesticides | ND | NA | NA | NA | ND | ND | ND | 0/5 | NA | NA | NA |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/5 | NA | NA | NA |
| | Metals (total) | Aluminum | NE/50 | NA | NA | 785 | 785 | 75-GW03 | 1/5 | 1/5 | NA | NA |
| | | Barium | 2,000/2,000 | NA | NA | 19.8 | 45.9 | 75-GW03 | 4/5 | 0/5 | NA | NA |
| | | Cobalt | NE/NE | NA | NA | 3.2 | 3.6 | 75-GW05 | 2/5 | 0/5 | NA | NA |
| | | Copper | 1,000/NE | NA | NA | 2.6 | 2.6 | 75-GW04 | 2/5 | 0/5 | NA | NA |
| | | Iron | 300/300 | NA | NA | 439 | 439 | 75-GW03 | 1/5 | 1/5 | NA | NA |
| | | Manganese | 50/50 | NA | NA | 3.2 | 68.3 | 75-GW04 | 4/5 | 1/5 | NA | NA |
| | | Selenium | 50/50 | NA | NA | 2.1J | 2.1J | 75-GW02 | 1/5 | 0/5 | NA | NA |
| | | Zinc | 2,100/NE | NA | NA | 3.8 | 76.7 | 75-GW01 | 4/5 | 0/5 | NA | NA |

Notes: - Concentrations are presented in µg/L for liquid and µg/kg for solids (ppb), metal concentrations for soils are presented in mg/kg (ppm).
- Calcium, magnesium, potassium, and sodium are not included in the tables

(1) - USEPA Region III Soil Screening Levels for Transfer from Soil to Groundwater (May, 1996)
(2) - Twice the Average Base Background Concentration for Metals in Soil.
(3) - Surface Soil Pesticide Levels at MCB Camp Lejeune
(4) - Total Chlordane Value
(5) - USEPA Region III Risk-Based Concentrations (Residential Soil) were used because no Soil to Groundwater Screening Levels were available (May, 1996).
(6) - North Carolina Water Quality Standards for Groundwater/USEPA Maximum Contaminant Levels

NA - Not Applicable
ND - Not Detected
NE - Not Established

**TABLE 4 - 6**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 76-GWO3-00 | 76-GW04-00 | 76-GWO5-00 | 76-SB01-00 | 76-SB02-00 | 76-SB03-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/21/96 | 02/22/96 | 02/21/96 | 02/23/96 | 02/23/96 | 02/23/96 |
| DEPTH | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| PHENANTHRENE | 440 U | 380 U | 390 U | 400 U | 400 U | 370 U |
| FLUORANTHENE | 440 U | 41 J | 390 U | 400 U | 400 U | 370 U |
| PYRENE | 440 U | 40 J | 390 U | 400 U | 400 U | 370 U |
| CHRYSENE | 440 U | 380 U | 390 U | 400 U | 400 U | 370 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 100 J | 380 U | 46 J | 400 U | 110 J | 370 U |
| BENZO(B)FLUORANTHENE | 46 J | 380 U | 390 U | 400 U | 400 U | 370 U |
| BENZO(A)PYRENE | 440 U | 380 U | 390 U | 400 U | 400 U | 370 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| HEPTACHLOR | 2.2 U | 1.9 U | 1.9 U | 2 U | 1.2 J | 1.9 U |
| HEPTACHLOR EPOXIDE | 2.2 U | 1.9 U | 1.9 U | 2 U | 2.4 NJ | 1.9 U |
| DIELDRIN | 4.3 U | 3.8 U | 3.9 U | 4 U | 4 U | 3.8 U |
| 4,4'-DDE | 69 | 61 J | 3.9 UJ | 510 J | 17 J | 65 J |
| 4,4'-DDD | 3.5 J | 3.8 U | 3.9 U | 4 U | 4 U | 3.8 U |
| 4,4'-DDT | 21 | 53 J | 1.9 J | 120 | 16 J | 57 |
| ALPHA-CHLORDANE | 2.2 U | 1.9 U | 1.9 U | 2 U | 20 J | 1.9 U |
| GAMMA-CHLORDANE | 2.2 U | 1.9 U | 1.9 U | 2 U | 9.9 J | 1.9 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 6**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 76-SB04-00 | 76-SB05-00 | 76-SB06-00 | 76-SB07-00 | 76-SB08-00 | 76-SB09-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 |
| DEPTH | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| PHENANTHRENE | 420 U | 61 J | 430 U | 390 U | 400 U | 440 U |
| FLUORANTHENE | 420 U | 100 J | 430 U | 390 U | 400 U | 440 U |
| PYRENE | 420 U | 93 J | 430 U | 390 U | 400 U | 440 U |
| CHRYSENE | 420 U | 71 J | 430 U | 390 U | 400 U | 440 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 96 J | 100 J | 130 J | 180 J | 400 U | 440 U |
| BENZO(B)FLUORANTHENE | 420 U | 86 J | 430 U | 390 U | 400 U | 440 U |
| BENZO(A)PYRENE | 420 U | 50 J | 430 U | 390 U | 400 U | 440 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| HEPTACHLOR | 2.1 U | 2.3 U | 2.1 U | 2 U | 2 U | 2.2 U |
| HEPTACHLOR EPOXIDE | 2.1 U | 2.3 U | 2.1 U | 2 U | 2 U | 2.2 U |
| DIELDRIN | 4.2 U | 4.6 U | 4.3 U | 4 U | 4 U | 4.4 U |
| 4,4'-DDE | 13 J | 87 J | 4.3 UJ | 4.4 J | 5.2 J | 6.1 J |
| 4,4'-DDD | 4.2 U | 4.6 U | 4.3 U | 4 U | 4 U | 1.8 J |
| 4,4'-DDT | 12 J | 63 J | 3 J | 4.8 J | 13 | 6.6 |
| ALPHA-CHLORDANE | 2.1 U | 2.3 U | 2.1 U | 2 U | 2 U | 2.2 U |
| GAMMA-CHLORDANE | 2.1 U | 2.3 U | 2.1 U | 2 U | 2 U | 2.2 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 6**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 76-SB10-00 | 76-SB11-00 | 76-SB12-00 | 76-SB13-00 |
|---|---|---|---|---|
| DATE SAMPLED | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 |
| DEPTH | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' |
| **SEMIVOLATILES (ug/kg)** | | | | |
| PHENANTHRENE | 390 U | 400 U | 380 U | 400 U |
| FLUORANTHENE | 390 U | 400 U | 380 U | 400 U |
| PYRENE | 390 U | 400 U | 380 U | 400 U |
| CHRYSENE | 390 U | 400 U | 380 U | 400 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 390 U | 400 U | 90 J | 490 |
| BENZO(B)FLUORANTHENE | 390 U | 400 U | 380 U | 400 U |
| BENZO(A)PYRENE | 390 U | 400 U | 380 U | 400 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | |
| HEPTACHLOR | 1.9 U | 2.1 U | 1.9 U | 2 U |
| HEPTACHLOR EPOXIDE | 1.9 U | 2.1 U | 1.9 U | 2 U |
| DIELDRIN | 3.9 U | 4.1 U | 3.8 U | 1.6 J |
| 4,4'-DDE | 63 J | 3.7 J | 310 J | 19 J |
| 4,4'-DDD | 3.9 U | 4.1 U | 8.8 | 4.1 U |
| 4,4'-DDT | 18 | 5.8 | 92 | 23 |
| ALPHA-CHLORDANE | 1.9 U | 2.1 U | 1.9 U | 2 U |
| GAMMA-CHLORDANE | 1.9 U | 2.1 U | 1.9 U | 2 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

TABLE 4 - 6
POSITIVE DETECTION SUMMARY - SURFACE SOIL
ORGANIC COMPOUNDS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **SEMIVOLATILES (ug/kg)** | | | | | | | | |
| PHENANTHRENE | 370 U | 440 U | 61 J | 61 J | 76-SB05-00 | 1/16 | 61.00 | 61.00 |
| FLUORANTHENE | 370 U | 440 U | 41 J | 100 J | 76-SB05-00 | 2/16 | 70.50 | 70.50 |
| PYRENE | 370 U | 440 U | 40 J | 93 J | 76-SB05-00 | 2/16 | 66.50 | 66.50 |
| CHRYSENE | 370 U | 440 U | 71 J | 71 J | 76-SB05-00 | 1/16 | 71.00 | 71.00 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 370 U | 440 U | 46 J | 490 | 76-SB13-00 | 9/16 | 149.11 | 100.00 |
| BENZO(B)FLUORANTHENE | 370 U | 440 U | 46 J | 86 J | 76-SB05-00 | 2/16 | 66.00 | 66.00 |
| BENZO(A)PYRENE | 370 U | 440 U | 50 J | 50 J | 76-SB05-00 | 1/16 | 50.00 | 50.00 |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | | | |
| HEPTACHLOR | 1.9 U | 2.3 U | 1.2 J | 1.2 J | 76-SB02-00 | 1/16 | 1.20 | 1.20 |
| HEPTACHLOR EPOXIDE | 1.9 U | 2.3 U | 2.4 NJ | 2.4 NJ | 76-SB02-00 | 1/16 | 2.40 | 2.40 |
| DIELDRIN | 3.8 U | 4.6 U | 1.6 J | 1.6 J | 76-SB13-00 | 1/16 | 1.60 | 1.60 |
| 4,4'-DDE | 3.9 UJ | 4.3 UJ | 3.7 J | 510 J | 76-SB01-00 | 14/16 | 88.10 | 40.00 |
| 4,4'-DDD | 3.8 U | 4.6 U | 1.8 J | 8.8 | 76-SB12-00 | 3/16 | 4.70 | 3.50 |
| 4,4'-DDT | NA | NA | 1.9 J | 120 | 76-SB01-00 | 16/16 | 31.88 | 17.00 |
| ALPHA-CHLORDANE | 1.9 U | 2.3 U | 20 J | 20 J | 76-SB02-00 | 1/16 | 20.00 | 20.00 |
| GAMMA-CHLORDANE | 1.9 U | 2.3 U | 9.9 J | 9.9 J | 76-SB02-00 | 1/16 | 9.90 | 9.90 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

TABLE 4 - 6
POSITIVE DETECTION SUMMARY - SURFACE SOIL
TOTAL METALS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 76-GWO3-00 | 76-GW04-00 | 76-GWO5-00 | 76-SB01-00 | 76-SB02-00 | 76-SB03-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/21/96 | 02/22/96 | 02/21/96 | 02/23/96 | 02/23/96 | 02/23/96 |
| DEPTH | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 6210 | 6400 | 4780 | 4350 | 3380 | 4360 |
| ARSENIC, TOTAL | 0.66 J | 0.88 | 0.88 J | 0.54 | 0.47 | 0.47 |
| BARIUM, TOTAL | 12.7 | 18.3 | 9.2 | 12.8 | 9.2 | 7.8 |
| BERYLLIUM, TOTAL | 0.18 U | 0.16 U | 0.16 U | 0.16 U | 0.15 U | 0.15 U |
| CALCIUM, TOTAL | 1760 | 826 | 986 | 1680 | 1860 | 1040 |
| CHROMIUM, TOTAL | 7.6 | 6.4 | 5.4 | 4.5 | 4.3 | 4.1 |
| COBALT, TOTAL | 0.67 U | 0.59 U | 0.67 | 0.61 U | 0.57 U | 0.57 U |
| COPPER, TOTAL | 2.7 | 2 | 1.2 | 2.2 | 2.9 | 1.3 |
| IRON, TOTAL | 3960 | 4680 | 2970 | 1440 | 1790 | 1790 |
| LEAD, TOTAL | 46.6 J | 13.3 | 12 J | 24.5 | 21.9 | 19 |
| MAGNESIUM, TOTAL | 300 | 244 | 147 | 159 | 207 | 164 |
| MANGANESE, TOTAL | 6.6 | 12.1 | 10.4 | 5.3 | 10.8 | 5.6 |
| MERCURY, TOTAL | 0.06 U | 0.05 U | 0.05 U | 0.06 U | 0.18 | 0.05 U |
| NICKEL, TOTAL | 2.5 U | 2.2 U | 2.3 U | 2.3 U | 2.1 U | 2.1 U |
| POTASSIUM, TOTAL | 302 | 165 | 187 | 170 U | 156 U | 157 U |
| SELENIUM, TOTAL | 0.32 UJ | 0.2 U | 0.26 UJ | 0.22 U | 0.33 J | 0.28 U |
| SODIUM, TOTAL | 43.6 | 28.3 J | 6.5 | 16.1 J | 19.6 U | 12.2 J |
| VANADIUM, TOTAL | 22 | 12.1 | 9.6 | 7.3 | 9.3 | 7.9 |
| ZINC, TOTAL | 24.9 | 23.9 | 19.3 | 13.3 | 16.7 | 8 |

QUALIFIER DEFINITIONS

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UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

TABLE 4 - 6
POSITIVE DETECTION SUMMARY - SURFACE SOIL
TOTAL METALS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 76-SB04-00 | 76-SB05-00 | 76-SB06-00 | 76-SB07-00 | 76-SB08-00 | 76-SB09-00 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 |
| DEPTH | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 4160 | 6910 | 6560 | 3420 | 7350 | 5340 |
| ARSENIC, TOTAL | 0.73 | 1.1 | 0.87 | 0.69 | 0.44 | 0.62 |
| BARIUM, TOTAL | 11.3 | 18 | 13.1 | 9.2 | 13 | 31.2 |
| BERYLLIUM, TOTAL | 0.16 U | 0.32 | 0.17 U | 0.16 U | 0.15 U | 0.3 |
| CALCIUM, TOTAL | 2860 | 2130 | 1280 | 1130 | 533 | 2660 |
| CHROMIUM, TOTAL | 4.9 | 8 | 7.5 | 3.9 | 7.2 | 5.3 |
| COBALT, TOTAL | 0.6 U | 0.7 | 0.65 U | 0.58 U | 0.56 U | 0.6 U |
| COPPER, TOTAL | 1.9 | 4.3 | 4.6 | 4.7 | 1.5 | 5.3 |
| IRON, TOTAL | 2160 | 3810 | 3980 | 2010 | 3770 | 2350 |
| LEAD, TOTAL | 19 | 39.3 J | 14.9 | 16.4 | 9.6 | 15.2 |
| MAGNESIUM, TOTAL | 236 | 413 | 284 | 176 | 302 | 169 |
| MANGANESE, TOTAL | 15.7 | 17.1 | 6.5 | 17.1 | 5.2 | 22.9 |
| MERCURY, TOTAL | 0.06 U | 0.06 U | 0.05 U | 0.06 U | 0.04 U | 0.06 U |
| NICKEL, TOTAL | 2.3 U | 4 | 2.5 U | 2.2 U | 2.1 U | 2.3 U |
| POTASSIUM, TOTAL | 167 U | 175 U | 220 | 161 U | 154 U | 165 U |
| SELENIUM, TOTAL | 0.25 U | 0.3 U | 0.37 J | 0.23 U | 0.31 U | 0.27 U |
| SODIUM, TOTAL | 22.2 U | 47.4 J | 26.5 U | 16.5 U | 18 J | 44.5 |
| VANADIUM, TOTAL | 10.7 | 24.6 | 14.1 | 8.1 | 14 | 9.6 |
| ZINC, TOTAL | 12.6 | 24 | 10.3 | 30.7 | 5.8 | 20.3 |

QUALIFIER DEFINITIONS

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NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 6**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**TOTAL METALS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 76-SB10-00 | 76-SB11-00 | 76-SB12-00 | 76-SB13-00 |
|---|---|---|---|---|
| DATE SAMPLED | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 |
| DEPTH | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' |
| **TOTAL METALS (mg/kg)** | | | | |
| ALUMINUM, TOTAL | 1580 | 4370 | 4210 | 4210 |
| ARSENIC, TOTAL | 0.59 | 0.61 | 0.91 | 0.8 |
| BARIUM, TOTAL | 6.7 | 14.4 | 12.6 | 13.9 |
| BERYLLIUM, TOTAL | 0.15 U | 0.16 U | 0.15 U | 0.15 U |
| CALCIUM, TOTAL | 540 | 1970 | 781 | 2380 |
| CHROMIUM, TOTAL | 2.4 | 5 | 5.7 | 5.6 |
| COBALT, TOTAL | 0.55 U | 0.59 U | 0.56 U | 0.58 U |
| COPPER, TOTAL | 1 | 3.9 | 2.3 | 6.7 |
| IRON, TOTAL | 1190 | 2830 | 3260 | 3090 |
| LEAD, TOTAL | 18.4 | 12.7 | 21.2 | 23.8 |
| MAGNESIUM, TOTAL | 95.5 | 169 | 161 | 159 |
| MANGANESE, TOTAL | 6.2 | 14.1 | 6.2 | 17.1 |
| MERCURY, TOTAL | 0.06 U | 0.04 U | 0.06 | 0.09 |
| NICKEL, TOTAL | 2.1 U | 2.2 U | 2.5 | 2.2 U |
| POTASSIUM, TOTAL | 152 U | 162 U | 155 U | 159 U |
| SELENIUM, TOTAL | 0.23 U | 0.23 U | 0.25 U | 0.28 |
| SODIUM, TOTAL | 15.7 U | 17.1 J | 28.9 U | 25.5 U |
| VANADIUM, TOTAL | 10.9 | 10.6 | 16.2 | 15.5 |
| ZINC, TOTAL | 5.5 | 10.8 | 18.9 | 20.3 |

QUALIFIER DEFINITIONS

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U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 6**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**TOTAL METALS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 1580 | 7350 | 76-SB08-00 | 16/16 | 4849.38 | 4365.00 |
| ARSENIC, TOTAL | NA | NA | 0.44 | 1.1 | 76-SB05-00 | 16/16 | 0.70 | 0.68 |
| BARIUM, TOTAL | NA | NA | 6.7 | 31.2 | 76-SB09-00 | 16/16 | 13.34 | 12.75 |
| BERYLLIUM, TOTAL | 0.15 U | 0.18 U | 0.3 | 0.32 | 76-SB05-00 | 2/16 | 0.31 | 0.31 |
| CALCIUM, TOTAL | NA | NA | 533 | 2860 | 76-SB04-00 | 16/16 | 1526.00 | 1480.00 |
| CHROMIUM, TOTAL | NA | NA | 2.4 | 8 | 76-SB05-00 | 16/16 | 5.49 | 5.35 |
| COBALT, TOTAL | 0.55 U | 0.67 U | 0.67 | 0.7 | 76-SB05-00 | 2/16 | 0.69 | 0.69 |
| COPPER, TOTAL | NA | NA | 1 | 6.7 | 76-SB13-00 | 16/16 | 3.03 | 2.50 |
| IRON, TOTAL | NA | NA | 1190 | 4680 | 76-GW04-00 | 16/16 | 2817.50 | 2900.00 |
| LEAD, TOTAL | NA | NA | 9.6 | 46.6 J | 76-GWO3-00 | 16/16 | 20.49 | 18.70 |
| MAGNESIUM, TOTAL | NA | NA | 95.5 | 413 | 76-SB05-00 | 16/16 | 211.59 | 172.50 |
| MANGANESE, TOTAL | NA | NA | 5.2 | 22.9 | 76-SB09-00 | 16/16 | 11.18 | 10.60 |
| MERCURY, TOTAL | 0.04 U | 0.06 U | 0.06 | 0.18 | 76-SB02-00 | 3/16 | 0.11 | 0.09 |
| NICKEL, TOTAL | 2.1 U | 2.5 U | 2.5 | 4 | 76-SB05-00 | 2/16 | 3.25 | 3.25 |
| POTASSIUM, TOTAL | 152 U | 175 U | 165 | 302 | 76-GWO3-00 | 4/16 | 218.50 | 203.50 |
| SELENIUM, TOTAL | 0.2 U | 0.32 UJ | 0.28 | 0.37 J | 76-SB06-00 | 3/16 | 0.33 | 0.33 |
| SODIUM, TOTAL | 15.7 U | 28.9 U | 6.5 | 47.4 J | 76-SB05-00 | 9/16 | 25.97 | 18.00 |
| VANADIUM, TOTAL | NA | NA | 7.3 | 24.6 | 76-SB05-00 | 16/16 | 12.66 | 10.80 |
| ZINC, TOTAL | NA | NA | 5.5 | 30.7 | 76-SB07-00 | 16/16 | 16.58 | 17.80 |

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NOTES
mg/kg = milligrams per kilogram.

TABLE 4 - 6
POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL
ORGANIC COMPOUNDS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 76-SB01-01 | 76-SB02-01 | 76-SB03-01 | 76-SB04-01 | 76-SB05-01 | 76-SB06-01 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 |
| DEPTH | 1-3' | 1-3' | 1-3' | 1-3' | 1-3' | 1-3' |
| **VOLATILES (ug/kg)** | | | | | | |
| ACETONE | 12 U | 12 U | 12 U | 11 U | 13 U | 12 U |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| DI-N-BUTYLPHTHALATE | 390 U | 390 U | 390 U | 370 U | 430 U | 390 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 390 U | 390 U | 390 U | 370 U | 430 U | 390 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| 4,4'-DDE | 3.9 UJ | 3.9 UJ | 4 UJ | 3.8 UJ | 4.4 UJ | 4 UJ |
| 4,4'-DDD | 3.9 U | 3.9 U | 4 U | 3.8 U | 4.4 U | 4 U |
| 4,4'-DDT | 3.9 U | 3.9 U | 4 U | 3.8 U | 4.4 U | 4 U |

QUALIFIER DEFINITIONS

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UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 6**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 76-SB07-01 | 76-SB08-02 | 76-SB09-01 | 76-SB10-02 | 76-SB11-01 | 76-SB12-02 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 |
| DEPTH | 1-3' | 3-5 | 1-3' | 3-5 | 1-3' | 3-5 |
| **VOLATILES (ug/kg)** | | | | | | |
| ACETONE | 11 U | 13 U | 13 U | 13 U | 24 | 12 U |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| DI-N-BUTYLPHTHALATE | 380 U | 420 U | 420 U | 440 U | 440 U | 400 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 380 U | 420 U | 420 U | 440 U | 440 U | 400 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| 4,4'-DDE | 3.8 UJ | 4.2 UJ | 3.4 J | 4.4 UJ | 40 J | 4 UJ |
| 4,4'-DDD | 3.8 U | 4.2 U | 4.2 U | 4.4 U | 480 | 4 U |
| 4,4'-DDT | 3.8 U | 4.2 U | 1.7 J | 4.4 U | 5.9 J | 4 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

TABLE 4 - 6
POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL
ORGANIC COMPOUNDS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 76-SB13-01 | 76-GW03-02 | 76-GW04-02 | 76-GW05-01 |
|---|---|---|---|---|
| DATE SAMPLED | 02/23/96 | 02/21/96 | 02/22/96 | 02/21/96 |
| DEPTH | 1-3' | 3-5' | 3-5' | 3-5' |
| **VOLATILES (ug/kg)** | | | | |
| ACETONE | 12 U | 13 U | 12 U | 12 U |
| **SEMIVOLATILES (ug/kg)** | | | | |
| DI-N-BUTYLPHTHALATE | 390 U | 420 U | 680 | 380 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 390 U | 49 J | 380 U | 380 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | |
| 4,4'-DDE | 3.9 UJ | 4.2 UJ | 3.8 UJ | 3.8 UJ |
| 4,4'-DDD | 3.9 U | 4.2 U | 3.8 U | 3.8 U |
| 4,4'-DDT | 3.9 U | 4.2 U | 3.8 U | 3.8 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
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UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 6**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **VOLATILES (ug/kg)** | | | | | | | | |
| ACETONE | 11 U | 13 U | 24 | 24 | 76-SB11-01 | 1/16 | 24.00 | 24.00 |
| **SEMIVOLATILES (ug/kg)** | | | | | | | | |
| DI-N-BUTYLPHTHALATE | 370 U | 440 U | 680 | 680 | 76-GW04-02 | 1/16 | 680.00 | 680.00 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 370 U | 440 U | 49 J | 49 J | 76-GW03-02 | 1/16 | 49.00 | 49.00 |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | | | |
| 4,4'-DDE | 3.8 UJ | 4.4 UJ | 3.4 J | 40 J | 76-SB11-01 | 2/16 | 21.70 | 21.70 |
| 4,4'-DDD | 3.8 U | 4.4 U | 480 | 480 | 76-SB11-01 | 1/16 | 480.00 | 480.00 |
| 4,4'-DDT | 3.8 U | 4.4 U | 1.7 J | 5.9 J | 76-SB11-01 | 2/16 | 3.80 | 3.80 |

QUALIFIER DEFINITIONS

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UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4-6**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**TOTAL METALS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 76-SB01-01 | 76-SB02-01 | 76-SB03-01 | 76-SB04-01 | 76-SB05-01 | 76-SB06-01 | 76-SB07-01 | 76-SB08-02 | 76-SB09-01 |
|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 |
| DEPTH | 1-3' | 1-3' | 1-3' | 1-3' | 1-3' | 1-3' | 1-3' | 3-5 | 1-3' |
| **TOTAL METALS (mg/kg)** | | | | | | | | | |
| ALUMINUM, TOTAL | 10700 | 11200 | 9400 | 8040 | 11300 | 10100 | 6220 | 11800 | 6510 |
| ARSENIC, TOTAL | 0.24 | 0.69 | 0.35 | 0.18 | 0.99 | 0.76 | 0.45 | 1.2 | 0.91 |
| BARIUM, TOTAL | 9.2 | 10.5 | 9.2 | 8.6 | 13.4 | 13.6 | 9.3 | 20.1 | 38.9 |
| BERYLLIUM, TOTAL | 0.17 | 0.15 U | 0.15 U | 0.14 U | 0.17 U | 0.15 U | 0.14 U | 0.17 U | 0.36 |
| CALCIUM, TOTAL | 63.2 | 106 | 93.8 | 487 | 272 | 79.9 | 169 | 85.4 | 951 |
| CHROMIUM, TOTAL | 10.4 | 10.1 | 8.3 | 6.6 | 12.4 | 10.7 | 6.3 | 21.1 | 5.4 |
| COBALT, TOTAL | 0.65 | 0.57 U | 0.56 U | 0.53 U | 0.63 U | 0.56 U | 0.54 U | 0.64 U | 0.63 U |
| COPPER, TOTAL | 0.4 U | 0.38 U | 0.54 | 0.35 U | 0.73 | 0.41 | 0.36 U | 2.3 | 0.73 |
| IRON, TOTAL | 5790 | 3680 | 5730 | 1430 | 6410 | 4160 | 3160 | 4190 | 2470 |
| LEAD, TOTAL | 4.7 | 5.7 | 6 | 5 | 8.2 | 10.1 | 3.7 | 12.5 | 8 |
| MAGNESIUM, TOTAL | 332 | 393 | 288 | 247 | 373 | 279 | 216 | 445 | 150 |
| MANGANESE, TOTAL | 4.3 | 5.7 | 4.1 | 3.9 | 5.9 | 5 | 4.1 | 8.9 | 4.4 |
| MERCURY, TOTAL | 0.04 U | 0.04 U | 0.04 U | 0.04 U | 0.05 U | 0.05 U | 0.05 U | 0.04 U | 0.07 |
| NICKEL, TOTAL | 2.3 U | 2.1 U | 2.1 U | 2 U | 2.4 U | 2.1 U | 2 U | 2.4 U | 2.4 U |
| POTASSIUM, TOTAL | 165 U | 213 | 291 | 145 U | 340 | 264 | 211 | 582 | 173 U |
| SELENIUM, TOTAL | 0.27 U | 0.32 | 0.29 U | 0.24 U | 0.26 U | 0.26 U | 0.23 U | 0.3 U | 0.3 U |
| SODIUM, TOTAL | 16.9 J | 48.3 | 17.9 J | 32.3 U | 36.3 J | 62.7 | 20.9 U | 36.3 J | 32.4 J |
| VANADIUM, TOTAL | 13.7 | 13.4 | 12.2 | 9 | 17 | 15.9 | 10 | 15.2 | 8.2 |
| ZINC, TOTAL | 3.1 | 2.9 | 2 | 2 | 3.9 | 2.9 | 2.3 | 4.5 | 4.4 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

TABLE 4-6
POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL
TOTAL METALS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 76-SB10-02 | 76-SB11-01 | 76-SB12-02 | 76-SB13-01 | 76-GW03-02 | 76-GW04-02 | 76-GW05-01 |
|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/23/96 | 02/23/96 | 02/23/96 | 02/23/96 | 02/21/96 | 02/22/96 | 02/21/96 |
| DEPTH | 3-5 | 1-3' | 3-5 | 1-3' | | | |
| **TOTAL METALS (mg/kg)** | | | | | | | |
| ALUMINUM, TOTAL | 17800 | 6450 | 3950 | 11900 | 8010 | 8690 | 6500 |
| ARSENIC, TOTAL | 13.7 J | 0.76 | 0.54 | 0.54 | 0.54 J | 0.45 J | 0.77 J |
| BARIUM, TOTAL | 25.1 | 24.8 | 5.5 | 13.7 | 10.1 | 11.2 | 6.6 |
| BERYLLIUM, TOTAL | 0.27 | 0.28 | 0.14 U | 0.14 U | 0.15 U | 0.14 U | 0.16 U |
| CALCIUM, TOTAL | 177 | 2410 | 68.7 | 87.6 | 122 U | 66.9 U | 393 |
| CHROMIUM, TOTAL | 26.8 | 6.1 | 4.3 | 8.2 | 10 | 9 | 6.9 |
| COBALT, TOTAL | 0.67 U | 0.62 U | 0.54 U | 0.54 U | 0.55 U | 0.62 | 0.74 |
| COPPER, TOTAL | 3 | 1.4 | 0.36 U | 0.36 U | 0.76 | 0.5 | 0.81 |
| IRON, TOTAL | 12700 | 4250 | 2460 | 2620 | 10600 | 2840 J | 4670 |
| LEAD, TOTAL | 11.6 | 10.1 | 3.5 | 7.9 | 8.7 J | 4.2 J | 4.7 J |
| MAGNESIUM, TOTAL | 738 | 220 | 107 | 369 | 189 | 276 | 157 |
| MANGANESE, TOTAL | 7 | 12.2 | 2.1 U | 5.7 | 3.7 | 5.9 | 4.2 |
| MERCURY, TOTAL | 0.05 U | 0.07 U | 0.06 U | 0.04 U | 0.05 U | 0.04 U | 0.05 U |
| NICKEL, TOTAL | 2.5 U | 2.3 U | 2 U | 2 U | 2.5 | 2.1 | 2.3 U |
| POTASSIUM, TOTAL | 956 | 170 U | 149 U | 184 | 210 | 343 | 185 |
| SELENIUM, TOTAL | 0.83 | 0.27 U | 0.24 U | 0.24 U | 0.33 UJ | 0.26 UJ | 0.29 J |
| SODIUM, TOTAL | 143 | 33.9 J | 23 U | 35.2 U | 49.8 | 41.5 J | 5.6 |
| VANADIUM, TOTAL | 34 | 12 | 8.1 | 16 | 17.2 | 12.9 | 11.4 |
| ZINC, TOTAL | 6.6 | 6.7 | 1.9 | 3.2 | 1.7 | 3.5 U | 2.4 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

TABLE 4-6
POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL
TOTAL METALS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 3950 | 17800 | 76-SB10-02 | 16/16 | 9285.63 | 9045.00 |
| ARSENIC, TOTAL | NA | NA | 0.18 | 13.7 J | 76-SB10-02 | 16/16 | 1.44 | 0.62 |
| BARIUM, TOTAL | NA | NA | 5.5 | 38.9 | 76-SB09-01 | 16/16 | 14.36 | 10.85 |
| BERYLLIUM, TOTAL | 0.14 U | 0.17 U | 0.17 | 0.36 | 76-SB09-01 | 4/16 | 0.27 | 0.28 |
| CALCIUM, TOTAL | 66.9 U | 122 U | 63.2 | 2410 | 76-SB11-01 | 14/16 | 388.83 | 137.50 |
| CHROMIUM, TOTAL | NA | NA | 4.3 | 26.8 | 76-SB10-02 | 16/16 | 10.16 | 8.65 |
| COBALT, TOTAL | 0.53 U | 0.67 U | 0.62 | 0.74 | 76-GW05-01 | 3/16 | 0.67 | 0.65 |
| COPPER, TOTAL | 0.35 U | 0.4 U | 0.41 | 3 | 76-SB10-02 | 10/16 | 1.12 | 0.75 |
| IRON, TOTAL | NA | NA | 1430 | 12700 | 76-SB10-02 | 16/16 | 4822.50 | 4175.00 |
| LEAD, TOTAL | NA | NA | 3.5 | 12.5 | 76-SB08-02 | 16/16 | 7.16 | 6.95 |
| MAGNESIUM, TOTAL | NA | NA | 107 | 738 | 76-SB10-02 | 16/16 | 298.69 | 277.50 |
| MANGANESE, TOTAL | 2.1 U | 2.1 U | 3.7 | 12.2 | 76-SB11-01 | 15/16 | 5.67 | 5.00 |
| MERCURY, TOTAL | 0.04 U | 0.07 U | 0.07 | 0.07 | 76-SB09-01 | 1/16 | 0.07 | 0.07 |
| NICKEL, TOTAL | 2 U | 2.5 U | 2.1 | 2.5 | 76-GW03-02 | 2/16 | 2.30 | 2.30 |
| POTASSIUM, TOTAL | 145 U | 173 U | 184 | 956 | 76-SB10-02 | 11/16 | 343.55 | 264.00 |
| SELENIUM, TOTAL | 0.23 U | 0.33 UJ | 0.29 J | 0.83 | 76-SB10-02 | 3/16 | 0.48 | 0.32 |
| SODIUM, TOTAL | 20.9 U | 35.2 U | 5.6 | 143 | 76-SB10-02 | 12/16 | 43.72 | 36.30 |
| VANADIUM, TOTAL | NA | NA | 8.1 | 34 | 76-SB10-02 | 16/16 | 14.14 | 13.15 |
| ZINC, TOTAL | 3.5 U | 3.5 U | 1.7 | 6.7 | 76-SB11-01 | 15/16 | 3.37 | 2.90 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4-6**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**ORGANIC COMPOUNDS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 6-GW01-01 | 76-GW02-01 | 76-GW03-01 | 76-GW04-01 | 76-GW05-01 |
|---|---|---|---|---|---|
| DATE SAMPLED | 02/25/96 | 02/25/96 | 02/25/96 | 02/25/96 | 02/25/96 |
| **SEMIVOLATILES (ug/L)** | | | | | |
| DI-N-BUTYLPHTHALAT | 10 U | 3 J | 10 U | 9 U | 9 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/L = micrograms per liter.

**TABLE 4-6**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**ORGANIC COMPOUNDS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **SEMIVOLATILES (ug/L** | | | | | | | | |
| DI-N-BUTYLPHTHALAT | 9 U | 10 U | 3 J | 3 J | 76-GW02-01 | 1/5 | 3.00 | 3.00 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/L = micrograms per liter.

TABLE 4-6
POSITIVE DETECTION SUMMARY - GROUNDWATER
TOTAL METALS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 76-GW01-01 | 76-GW02-01 | 76-GW03-01 | 76-GW04-01 | 76-GW05-01 | IR76-GW01-98B | IR76-GW02-98B | IR76-GW03-98B |
|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 02/25/96 | 02/25/96 | 02/25/96 | 02/25/96 | 02/25/96 | 04/22/98 | 04/22/98 | 04/22/98 |
| **TOTAL METALS (ug/L)** | | | | | | | | |
| Aluminum | 2450 | 32.8 U | 2190 | 79.7 U | 56.1 U | 3190 | 50.8 U | 3140 |
| Arsenic | 7.8 | 0.9 U | 0.9 U | 0.9 U | 0.9 U | 151 | 3.6 J | 10 U |
| Barium | 41.5 | 4.4 U | 120 | 20.3 | 11.9 U | 39.6 J | 5.1 J | 168 J |
| Calcium | 30600 | 71000 | 8420 | 45900 | 23000 | 27900 | 90400 | 10100 |
| Chromium | 2.4 U | 2.4 U | 2.4 U | 2.4 U | 2.4 U | 5.4 J | 10 U | 10 U |
| Cobalt | 3 U | 3 U | 3 U | 3 U | 3 U | 6.4 J | 50 U | 50 U |
| Copper | 2 U | 2 U | 2 U | 2.4 | 2 U | 2.1 J | 3.5 J | 1.4 J |
| Iron | 1790 | 1860 | 592 | 104 U | 54.8 U | 33100 | 4600 | 3890 |
| Lead | 1.2 | 0.8 U | 2.1 | 0.8 U | 0.8 U | 4.5 | 4.4 | 4 |
| Magnesium | 2230 | 1660 | 3490 | 2920 | 1460 | 1800 J | 2030 J | 4960 J |
| Manganese | 17.2 | 29.7 | 8.9 | 1.6 U | 1.6 U | 18.1 | 40.3 | 15.2 |
| Mercury | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.032 J | 0.2 U | 0.035 J |
| Potassium | 828 U | 828 U | 1680 | 828 U | 828 U | 5000 U | 1390 J | 2980 J |
| Selenium | 1.3 U | 1.3 U | 1.3 U | 1.3 U | 1.6 | 5 U | 4.6 J | 5 U |
| Sodium | 16900 | 6600 | 36500 | 19600 | 7700 | 15800 | 8640 | 39400 |
| Thallium | 1.7 U | 1.7 U | 1.7 U | 1.7 U | 1.7 U | 3.5 J | 12.8 | 10 U |
| Vanadium | 6.2 U | 2.4 U | 2.4 U | 2.4 U | 2.4 U | 105 | 19.5 J | 13.6 J |
| Zinc | 7.5 | 3.6 U | 26.5 | 4.1 | 5.4 | 8.5 U | 6.9 U | 40.6 |

TABLE 4-6
POSITIVE DETECTION SUMMARY - GROUNDWATER
TOTAL METALS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | IR76-GW04-98B | IR76-GW05-98B |
|---|---|---|
| DATE SAMPLED | 04/23/98 | 04/23/98 |
| **TOTAL METALS (ug/L)** | | |
| Aluminum | 322 | 105 U |
| Arsenic | 10 U | 10 U |
| Barium | 40.2 J | 12.1 J |
| Calcium | 101000 | 47800 |
| Chromium | 10 U | 10 U |
| Cobalt | 50 U | 50 U |
| Copper | 25 U | 25 U |
| Iron | 550 | 48.8 J |
| Lead | 3 U | 3 U |
| Magnesium | 5440 | 1840 J |
| Manganese | 6.2 J | 2 J |
| Mercury | 0.2 U | 0.2 U |
| Potassium | 909 J | 824 J |
| Selenium | 5 U | 5 U |
| Sodium | 26200 | 15100 |
| Thallium | 10 U | 10 U |
| Vanadium | 19.9 J | 20.6 J |
| Zinc | 3.5 U | 3.6 U |

**TABLE 4-6**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**TOTAL METALS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | Minimum<br>Non-Detect | Maximum<br>Non-Detect | Minimum<br>Detected | Maximum<br>Detected | Location of<br>Maximum Detect | Frequency<br>of Detection | Arithmatic Mean<br>Positive Detects | Median<br>Positive Detects |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (ug/L)** | | | | | | | | |
| Aluminum | 32.8 U | 105 U | 322 | 3190 | IR76-GW01-98B | 5/10 | 2258.4 | 2450 |
| Arsenic | 0.9 U | 10 U | 3.6 J | 151 | IR76-GW01-98B | 3/10 | 54.13 | 7.8 |
| Barium | 4.4 U | 11.9 U | 5.1 J | 168 J | IR76-GW03-98B | 8/10 | 55.85 | 39.9 |
| Calcium | ND | ND | 8420 | 101000 | IR76-GW04-98B | 10/10 | 45612 | 38250 |
| Chromium | 2.4 U | 10 U | 5.4 J | 5.4 J | IR76-GW01-98B | 1/10 | 5.4 | 5.4 |
| Cobalt | 3 U | 50 U | 6.4 J | 6.4 J | IR76-GW01-98B | 1/10 | 6.4 | 6.4 |
| Copper | 2 U | 25 U | 1.4 J | 3.5 J | IR76-GW02-98B | 4/10 | 2.35 | 2.25 |
| Iron | 54.8 U | 104 U | 48.8 J | 33100 | IR76-GW01-98B | 8/10 | 5803.85 | 1825 |
| Lead | 0.8 U | 3 U | 1.2 | 4.5 | IR76-GW01-98B | 5/10 | 3.24 | 4 |
| Magnesium | ND | ND | 1460 | 5440 | IR76-GW04-98B | 10/10 | 2783 | 2130 |
| Manganese | 1.6 U | 1.6 U | 2 J | 40.3 | IR76-GW02-98B | 8/10 | 17.2 | 16.2 |
| Mercury | 0.1 U | 0.2 U | 0.032 J | 0.035 J | IR76-GW03-98B | 2/10 | 0.03 | 0.03 |
| Potassium | 828 U | 5000 U | 824 J | 2980 J | IR76-GW03-98B | 5/10 | 1556.6 | 1390 |
| Selenium | 1.3 U | 5 U | 1.6 | 4.6 J | IR76-GW02-98B | 2/10 | 3.1 | 3.1 |
| Sodium | ND | ND | 6600 | 39400 | IR76-GW03-98B | 10/10 | 19244 | 16350 |
| Thallium | 1.7 U | 10 U | 3.5 J | 12.8 | IR76-GW02-98B | 2/10 | 8.15 | 8.15 |
| Vanadium | 2.4 U | 6.2 U | 13.6 J | 105 | IR76-GW01-98B | 5/10 | 35.72 | 19.9 |
| Zinc | 3.5 U | 8.5 U | 4.1 | 40.6 | IR76-GW03-98B | 5/10 | 16.82 | 7.5 |

**TABLE 4-6**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**DISSOLVED METALS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 76-GW02D-01 | 76-GW04D-01 |
|---|---|---|
| DATE SAMPLED | 02/25/96 | 02/25/96 |
| **DISSOLVED METALS (ug/L)** | | |
| BARIUM, SOLUBLE | 4.3 U | 17.1 |
| CALCIUM, SOLUBLE | 70500 | 44200 |
| IRON, SOLUBLE | 1350 | 38.5 U |
| MAGNESIUM, SOLUBLE | 1670 | 2800 |
| MANGANESE, SOLUBLE | 30.7 | 1.6 U |
| SODIUM, SOLUBLE | 6590 | 18800 |
| ZINC, SOLUBLE | 5.8 | 3.9 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

**TABLE 4-6**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**DISSOLVED METALS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **DISSOLVED METALS (ug/L)** | | | | | | | | |
| BARIUM, SOLUBLE | 4.3 U | 4.3 U | 17.1 | 17.1 | 76-GW04D-01 | 1/2 | 17.10 | 17.10 |
| CALCIUM, SOLUBLE | NA | NA | 44200 | 70500 | 76-GW02D-01 | 2/2 | 57350.00 | 57350.00 |
| IRON, SOLUBLE | 38.5 U | 38.5 U | 1350 | 1350 | 76-GW02D-01 | 1/2 | 1350.00 | 1350.00 |
| MAGNESIUM, SOLUBLE | NA | NA | 1670 | 2800 | 76-GW04D-01 | 2/2 | 2235.00 | 2235.00 |
| MANGANESE, SOLUBLE | 1.6 U | 1.6 U | 30.7 | 30.7 | 76-GW02D-01 | 1/2 | 30.70 | 30.70 |
| SODIUM, SOLUBLE | NA | NA | 6590 | 18800 | 76-GW04D-01 | 2/2 | 12695.00 | 12695.00 |
| ZINC, SOLUBLE | NA | NA | 3.9 | 5.8 | 76-GW02D-01 | 2/2 | 4.85 | 4.85 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

TABLE 4-7

SUMMARY OF SITE CONTAMINATION
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (1) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Surface Soil | Volatiles | ND | NA | NA | NA | ND | ND | ND | 0/16 | NA | NA | NA |
| | Semivolatiles | Phenanthrene | NE | NA | NA | 61 J | 61 J | 76-SB05 | 1/16 | NA | NA | NA |
| | | Fluoranthene | 980,000 | NA | NA | 41 J | 100 J | 76-SB05 | 2/16 | 0/16 | NA | NA |
| | | Pyrene | 1,400,000 | NA | NA | 40 J | 93 J | 76-SB05 | 2/16 | 0/16 | NA | NA |
| | | Chrysene | 1,000 | NA | NA | 71 J | 71 J | 76-SB05 | 1/16 | 0/16 | NA | NA |
| | | bis(2-Ethylhexyl)phthalate | 11,000 | NA | NA | 46 J | 490 | 76-SB13 | 9/16 | 0/16 | NA | NA |
| | | benzo(b)Fluoranthene | 4,000 | NA | NA | 46 J | 86 J | 76-SB05 | 2/16 | 0/16 | NA | NA |
| | | benzo(a)Pyrene | 4,000 | NA | NA | 50 J | 50 J | 76-SB05 | 1/16 | 0/16 | NA | NA |
| | Pesticides | Heptachlor | 60.0 | NA | 10 | 1.2 J | 1.2 J | 76-SB02 | 1/16 | 0/16 | NA | 0/16 |
| | | Heptachlor Epoxide | 30.0 | NA | 9.81 | 2.4 NJ | 2.4 NJ | 76-SB02 | 1/16 | 0/16 | NA | 0/16 |
| | | Dieldrin | 1.0 | NA | 44.7 | 1.6 J | 1.6 J | 76-SB13 | 1/16 | 1/16 | NA | 0/16 |
| | | 4,4'-DDE | 500 | NA | 90.55 | 3.7 J | 510 J | 76-SB01 | 14/16 | 1/16 | NA | 1/16 |
| | | 4,4'-DDD | 700 | NA | 361.5 | 1.8 J | 8.8 | 76-SB12 | 3/16 | 0/16 | NA | 0/16 |
| | | 4,4'-DDT | 1,000 | NA | 1,668.07 | 1.9 J | 120 | 76-SB01 | 16/16 | 0/16 | NA | 0/16 |
| | | Alpha-Chlordane | 2,000 (4) | NA | 23.31 | 20 J | 20 J | 76-SB02 | 1/16 | 0/16 | NA | 0/16 |
| | | Gamma-Chlordane | 2,000 (4) | NA | 19.67 | 9.9 J | 9.9 J | 76-SB02 | 1/16 | 0/16 | NA | 0/16 |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/16 | NA | NA | NA |
| | Metals | Aluminum | 78,000 (5) | 5,856 | NA | 1,580 | 7,350 | 76-SB08 | 16/16 | 0/16 | 5/16 | NA |
| | | Arsenic | 15 | 1.3 | NA | 0.4 | 1.1 | 76-SB05 | 16/16 | 0/16 | 0/16 | NA |
| | | Barium | 32 | 17.3 | NA | 6.7 | 31.2 | 76-SB09 | 16/16 | 0/16 | 3/16 | NA |
| | | Beryllium | 180 | 0.2 | NA | 0.30 | 0.32 | 76-SB05 | 2/16 | 0/16 | 2/16 | NA |
| | | Chromium | 78,000 (5) | 6.6 | NA | 2.4 | 8.0 | 76-SB05 | 16/16 | 0/16 | 4/16 | NA |
| | | Cobalt | 4,700 (5) | 2 | NA | 0.67 | 0.7 | 76-SB05 | 2/16 | 0/16 | 0/16 | NA |
| | | Copper | 3,100 (5) | 7.1 | NA | 1 | 6.7 | 76-SB13 | 16/16 | 0/16 | 0/16 | NA |
| | | Iron | 23,000 (5) | 3,702 | NA | 1,190 | 4,680 | 76-GW04 | 16/16 | 0/16 | 5/16 | NA |
| | | Lead | NE | 23.4 | NA | 9.6 | 46.6J | 76-GW03 | 16/16 | NA | 4/16 | NA |
| | | Manganese | 1,800 (5) | 18.5 | NA | 5.2 | 22.9 | 76-SB09 | 16/16 | 0/16 | 1/16 | NA |

TABLE 4-7 (CONTINUED)

SUMMARY OF SITE CONTAMINATION

SITE 76, MCAS CURTIS ROAD

PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314

MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (1) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Surface Soil (cont.) | Metals (cont.) | Mercury | 3 | 0.09 | NA | 0.06 | 0.18 | 76-SB02 | 3/16 | 0/16 | 1/16 | NA |
| | | Nickel | 21 | 3.5 | NA | 2.5 | 4.0 | 76-SB05 | 2/16 | 0/16 | 1/16 | NA |
| | | Selenium | 3 | 0.75 | NA | 0.28 | 0.37J | 76-SB06 | 9/16 | 0/16 | 0/16 | NA |
| | | Vanadium | 550 (5) | 11.4 | NA | 7.3 | 24.6 | 76-SB05 | 16/16 | 0/16 | 7/16 | NA |
| | | Zinc | 42,000 | 13.8 | NA | 5.5 | 30.7 | 76-SB07 | 16/16 | 0/16 | 9/16 | NA |
| Subsurface Soil | Volatiles | Acetone | 8,000 | NA | NA | 24 | 24 | 76-SB11 | 1/16 | 0/16 | NA | NA |
| | Semivolatiles | Di-n-butylphthalate | 120,000 | NA | NA | 680 | 680 | 76-GW04 | 1/16 | 0/16 | NA | NA |
| | | bis(2-Ethylhexyl)phthalate | 11,000 | NA | NA | 49 J | 49 J | 76-GW03 | 1/16 | 0/16 | NA | NA |
| | Pesticides | 4,4'-DDE | 500 | NA | NA | 3.4 J | 40 J | 76-SB11 | 2/16 | 0/16 | NA | NA |
| | | 4,4'-DDD | 700 | NA | NA | 480 | 480 | 76-SB11 | 1/16 | 0/16 | NA | NA |
| | | 4,4'-DDT | 1,000 | NA | NA | 1.7 J | 5.9 J | 76-SB11 | 2/16 | 0/16 | NA | NA |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/16 | NA | NA | NA |
| | Metals | Aluminum | 78,000 (5) | 7,314 | NA | 3,950 | 17,800 | 76-SB10 | 16/16 | 0/16 | 11/16 | NA |
| | | Arsenic | 15 | 2.0 | NA | 0.18 | 13.7 J | 76-SB10 | 16/16 | 0/16 | 1/16 | NA |
| | | Barium | 32 | 14.4 | NA | 5.5 | 38.9 | 76-SB09 | 16/16 | 1/16 | 4/16 | NA |
| | | Beryllium | 180 | 0.2 | NA | 0.17 | 0.36 | 76-SB09 | 4/16 | 0/16 | 3/16 | NA |
| | | Chromium | 78,000 (5) | 12.5 | NA | 4.3 | 26.8 | 76-SB10 | 16/16 | 0/16 | 2/16 | NA |
| | | Cobalt | 4,700 (5) | 1.6 | NA | 0.62 | 0.74 | 76-GW05 | 3/16 | 0/16 | 0/16 | NA |
| | | Copper | 3,100 (5) | 2.4 | NA | 0.4 | 3.0 | 76-SB10 | 10/16 | 0/16 | 1/16 | NA |
| | | Iron | 23,000 (5) | 7,135 | NA | 1,430 | 12,700 | 76-SB10 | 16/16 | 0/16 | 2/16 | NA |
| | | Lead | NE | 8.3 | NA | 3.5 | 12.5 | 76-SB08 | 16/16 | NA | 5/16 | NA |
| | | Manganese | NE | 8.0 | NA | 3.7 | 12.2 | 76-SB11 | 15/16 | NA | 2/16 | NA |
| | | Mercury | 3 | 0.1 | NA | 0.07 | 0.07 | 76-SB09 | 1/16 | 0/16 | 0/16 | NA |
| | | Nickel | 21 | 3.7 | NA | 2.1 | 2.5 | 76-GW03 | 2/16 | 0/16 | 0/16 | NA |
| | | Selenium | 3 | 0.80 | NA | 0.29 J | 0.83 | 76-SB10 | 3/16 | 0/16 | 1/16 | NA |
| | | Vanadium | 550 (5) | 13.3 | NA | 8.1 | 34 | 76-SB10 | 16/16 | 0/16 | 8/16 | NA |
| | | Zinc | 42,000 | 6.7 | NA | 1.7 | 6.7 | 76-SB11 | 15/16 | 0/16 | 0/16 | NA |

TABLE 4-7 (CONTINUED)

SUMMARY OF SITE CONTAMINATION
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (6) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Groundwater | Volatiles | ND | NA | NA | NA | ND | ND | ND | 0/5 | NA | NA | NA |
| | Semivolatiles | Di-n-butylphthalate | 700/ NE | NA | NA | 3 J | 3 J | 76-GW02 | 1/5 | 0/5 | NA | NA |
| | Pesticides | ND | NA | NA | NA | ND | ND | ND | 0/5 | NA | NA | NA |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/5 | NA | NA | NA |
| | Metals | Aluminum | NE/50 | NA | NA | 322 | 3,370 | 76-GW03 | 6/11 | 6/11 | NA | NA |
| | | Arsenic | 50/50 | NA | NA | 3.6 | 151.0 | 76-GW01 | 3/11 | 1/11 | NA | NA |
| | | Barium | 2,000/2,000 | NA | NA | 5 | 168 | 76-GW03 | 9/11 | 0/11 | NA | NA |
| | | Copper | 1,000/NE | NA | NA | 1.4 | 3.5 | 76-GW02 | 4/11 | 0/11 | NA | NA |
| | | Iron | 300/300 | NA | NA | 48.8 | 33,100 | 76-GW01 | 9/11 | 8/11 | NA | NA |
| | | Lead | 15/NE | NA | NA | 1.2 | 4.5 | 76-GW01 | 6/11 | 0/11 | NA | NA |
| | | Manganese | 50/50 | NA | NA | 2.0 | 40.3 | 76-GW02 | 9/11 | 0/11 | NA | NA |
| | | Selenium | 50/50 | NA | NA | 1.6 | 4.6 | 76-GW02 | 2/11 | 0/11 | NA | NA |
| | | Zinc | 2,100/NE | NA | NA | 4.1 | 48.3 | 76-GW03 | 6/11 | 0/11 | NA | NA |

Notes: - Concentrations are presented in µg/L for liquid and µg/kg for solids (ppb), metal concentrations for soils and sediments are presented in mg/kg (ppm).
- Calcium, magnesium, potassium, and sodium are not included in the tables

(1) - USEPA Region III Soil Screening Levels for Transfer from Soil to Groundwater (May, 1996)
(2) - Twice the Average Base Background Concentration for Metals
(3) - Surface Soil Pesticide Levels at MCB Camp Lejeune
(4) - Total Chlordane Value
(5) - USEPA Region III Risk-Based Concentrations (Residential Soil) were used because no Soil to Groundwater Screening Levels were available (May, 1996).
(6) - North Carolina Water Quality Standards for Groundwater/USEPA Maximum Contaminant Levels

NA - Not Applicable
NE - Not Established
ND - Not Detected

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID | 84-SB01A | 84-SB01B | 84-SB02A | 84-SB02B | 84-SB03A | 84-SB03B | 84-SB04A | 84-SB04B | 84-SB05A |
|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 |
| DEPTH | 0-6" | 6-12" | 0-6" | 6-12" | 0-6" | 6-12" | 0-6" | 6-12" | 0-6" |
| **PCB's (ug/kg)** | | | | | | | | | |
| Aroclor 1260 | 12000 | 1700 | 4400 | 12000 | 5300 | 5700 | 6200 | 2300 | 5000 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID | 84-SB05B | 84-SB06A | 84-SB06B | 84-SB07A | 84-SB07B | 84-SB08A | 84-SB08B | 84-SB09A | 84-SB09B |
|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 |
| DEPTH | 6-12" | 0-6" | 6-12" | 0-6" | 6-12" | 0-6" | 6-12" | 0-6" | 6-12" |
| **PCB's (ug/kg)** | | | | | | | | | |
| Aroclor 1260 | 4300 J | 1300 J | 2800 | 360 | 880 | 2500 | 6100 | 12000 | 10000 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID | 84-SB10A | 84-SB10B | IR84-SB02-00 | IR84-SB02-01 | IR84-SB04-00 | IR84-SB04-01 | IR84-SB08-00 | IR84-SB08-01 | IR84-SB10-00 |
|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 10/26/95 | 10/26/95 | 04-16-1998 | 04-16-1998 | 04-16-1998 | 04-16-1998 | 04-16-1998 | 04-16-1998 | 04-16-1998 |
| DEPTH | 0-6" | 6-12" | | | | | | | |
| **PCB's (ug/kg)** | | | | | | | | | |
| Aroclor 1260 | 1100 | 7500 | 1000 | 110 | 3900 | 140 | 4300 | 120 | 8100 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID | IR84-SB10-01 | IR84-SB15-00 | IR84-SB15-01 | IR84-SB21-00 | IR84-SB21-01 | IR84-SB23-00 | IR84-SB23-01 | IR84-SB25-00 | IR84-SB25-01 |
|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 04-16-1998 | 04-16-1998 | 04-16-1998 | 04-16-1998 | 04-16-1998 | 04-16-1998 | 04-16-1998 | 04-16-1998 | 04-16-1998 |
| DEPTH | | | | | | | | | |
| **PCB's (ug/kg)** | | | | | | | | | |
| Aroclor 1260 | 2900 | 6800 | 530 J | 36 U | 62 J | 42 U | 36 U | 110 J | 40 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID | IR84-SB26-00 | IR84-SB26-01 | IR84-SB27-00 | IR84-SB27-01 | IR84-SB28-00 | IR84-SB28-01 | IR84-SB29-00 | IR84-SB29-01 | IR84-SB30-00 |
|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 04-23-1998 | 04-23-1998 | 04-23-1998 | 04-23-1998 | 04-23-1998 | 04-23-1998 | 04-23-1998 | 04-23-1998 | 04-23-1998 |
| DEPTH | | | | | | | | | |
| **PCB's (ug/kg)** | | | | | | | | | |
| Aroclor 1260 | 1500 J | 40 U | 26000 | 200000 | 35 U | 35 U | 5800 | 520 | 55 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID | IR84-SB30-01 | IR84-SB31-00 | IR84-SB31-01 |
|---|---|---|---|
| DATE SAMPLED | 04-23-1998 | 04-23-1998 | 04-23-1998 |
| DEPTH | | | |
| **PCB's (ug/kg)** | | | |
| Aroclor 1260 | 44 U | 37 U | 36 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID<br>DATE SAMPLED<br>DEPTH | Minimum Non-Detect | Maximum Non-Detect | Minimum Detected | Maximum Detected | Location of Maximum Detect | Frequency of Detection | Arithmatic Mean Positive Detects | Median Positive Detects |
|---|---|---|---|---|---|---|---|---|
| **PCB's (ug/kg)** | | | | | | | | |
| Aroclor 1260 | 35 U | 55 U | 62 J | 200000 | IR84-SB27-01 | 37/48 | 9873.84 | 3900 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

TABLE 4-8
POSITIVE DETECTION SUMMARY - GROUNDWATER
VOLATILE ORGANICS
SITE 84, BUILDING 45 AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | AST781-GW03-98B | AST781-GW04-98B | AST781-GW07-98B | AST781-GW08-98B | AST781-GW11-98B | AST781-GW12-98B |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 04/23/98 | 04/23/98 | 04/22/98 | 04/22/98 | 04/23/98 | 04/23/98 |
| **VOLATILES (ug/L)** | | | | | | |
| Chloroform | 10 U | 10 U | 10 U | 10 U | 16 | 16 |
| Benzene | 3.4 J | 1.5 J | 10 U | 10 U | 10 U | 10 U |
| Ethylbenzene | 3.6 J | 6.7 J | 10 U | 10 U | 10 U | 10 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/L = micrograms per liter.

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**VOLATILE ORGANICS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | Minimum<br>Non/Detect | Maximum<br>Non/Detect | Minimum<br>Detected | Maximum<br>Detected | Location of<br>Maximum Detect | Frequency<br>of Detection | Arithmatic Mean<br>Positive Detects | Median<br>Positive Detects |
|---|---|---|---|---|---|---|---|---|
| **VOLATILES (ug/L)** | | | | | | | | |
| Chloroform | 10 U | 10 U | 16 | 16 | AST781-GW11-98B,AST781-GW12-98B | 2/6 | 16 | 16 |
| Benzene | 10 U | 10 U | 1.5 J | 3.4 J | AST781-GW03-98B | 2/6 | 2.45 | 2.45 |
| Ethylbenzene | 10 U | 10 U | 3.6 J | 6.7 J | AST781-GW04-98B | 2/6 | 5.15 | 5.15 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/L = micrograms per liter.

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SURFACE WATER**
**ORGANIC COMPOUNDS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID | IR84-SW07-98B |
|---|---|
| DATE SAMPLED | 04/23/98 |
| **VOLTILES (ug/L)** | |
| Acetone | 5.6 J |
| Benzene | 1.2 J |
| Toluene | 2.7 J |
| Xylenes (total) | 3.5 J |

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SEDIMENT**
**ORGANIC COMPOUNDS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 84-SD01-01 | 84-SD02-01 | 84-SD04-01 | 84-SD05-01 | 84-SD06-01 | 84-SD07-01 | 84-SD08-01 | IR84-SD01-98B | IR84-SD05-98B | IR84-SD06-98B |
|---|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 10/26/95 | 04/19/98 | 04/19/98 | 04/19/98 |
| **PCB's (ug/kg)** | | | | | | | | | | |
| Aroclor 1248 | 42 U | 59 U | 58 U | 2800 | 3300 U | 4700 U | 450 U | 810 U | 180 U | 160 U |
| Aroclor 1260 | 42 U | 59 U | 58 U | 20000 | 8100 | 17000 | 3700 | 40000 | 5900 | 4300 |

QUALIFIER DEFINITIONS

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

NOTES
ug/kg = micrograms per kilogram.

TABLE 4-8
POSITIVE DETECTION SUMMARY - SEDIMENT
ORGANIC COMPOUNDS
SITE 84, BUILDING 45 AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| SAMPLE ID | IR84-SD07-98B |
|---|---|
| DATE SAMPLED | 04/23/98 |
| **VOLATILES (ug/kg)** | |
| Xylenes (total) | 910 J |
| **SEMIVOLATILES (ug/kg)** | |
| Naphthalene | 2000 |
| Phenanthrene | 2500 |
| bis(2-Ethylhexyl) phthalate | 2400 J |
| 2-Methylnaphthalene | 10000 |

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SEDIMENT**
**ORGANIC COMPOUNDS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | Minimum<br>Non-Detect | Maximum<br>Non-Detect | Minimum<br>Detected | Maximum<br>Detected | Location of<br>Maximum Detect | Frequency<br>of Detection | Arithmatic Mean<br>Positive Detects | Median<br>Positive Detects |
|---|---|---|---|---|---|---|---|---|
| **PCB's (ug/kg)** | | | | | | | | |
| Aroclor 1248 | 42 U | 4700 U | 2800 | 2800 | 84-SD05-01 | 1/10 | 2800 | 2800 |
| Aroclor 1260 | 42 U | 59 U | 3700 | 40000 | IR84-SD01-98B | 7/10 | 14142.86 | 8100 |

QUALIFIER DEFINITIONS

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

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SEDIMENT**
**ENGINEERING PARAMETERS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | IR84-SD01-98B | IR84-SD01-98BD | IR84-SD05-98B | IR84-SD06-98B | IR84-SD07-98B |
|---|---|---|---|---|---|
| DATE SAMPLED | 04/19/98 | 04/19/98 | 04/19/98 | 04/19/98 | 04/23/98 |
| Diesel Range Organics (mg/kg) | 9200 | 14000 | 4300 | 3500 | NA |
| pH (solid) | 6.6 | 6.6 | 6.9 | 6.3 | 6.6 |
| Percent Moisture (%) | 59.2 | 56.3 | 28 | 19.6 | 43.9 |

**TABLE 4-8**
**POSITIVE DETECTION SUMMARY - SEDIMENT**
**ENGINEERING PARAMETERS**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | Minimum Non-Detect | Maximum Non-Detect | Minimum Detected | Maximum Detected | Location of Maximum Detect | Frequency of Detection | Arithmatic Mean Positive Detects | Median Positive Detects |
|---|---|---|---|---|---|---|---|---|
| Diesel Range Organics (mg/kg) | ND | ND | 3500 | 14000 | IR84-SD01-98BD | 4/4 | 7750 | 6750 |
| pH (solid) | 6.6 | 6.6 | 6.3 | 6.9 | IR84-SD05-98B | 5/5 | 6.6 | 6.6 |
| Percent Moisture (%) | 43.9 | 43.9 | 19.6 | 59.2 | IR84-SD01-98B | 5/5 | 41.4 | 43.9 |

TABLE 4-9

SUMMARY OF SITE CONTAMINATION
SITE 84, BUILDING 45 AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above Screening Standard |
|---|---|---|---|---|---|---|---|---|
| Surface Soil (0-6") | PCBs | Aroclor-1260 | 320 / 1,000 (1) | 110J | 26,000 | 84-SB27 | 19/24 - 17/24 | 19/24 |
| Surface Soil (6-12") | PCBs | Aroclor-1260 | 320 / 1,000 (1) | 62J | 200,000 | 84-SB27 | 18/24 - 11/24 | 18/24 |
| Groundwater | Volatiles | Chloroform | 0.19 / NE (2) | 16 | 16 | AST781-GW11-98B AST781-GW12-98B | 2/7 - NE | 2/7 |
| | | Benzene | 1.0 / 5.0 (2) | 1.5J | 3.4J | AST781-GW03-98B | 3/7 - 0/7 | 3/7 |
| | | Ethylbenzene | 29 / 700 (2) | 3.6J | 6.7J | AST781-GW04-98B | 3/7 - 0/7 | 0/7 |
| | PCBs | ND | NA | ND | ND | ND | 0/7 | NA |
| Surface Water | Volatiles | Acetone | NE | 5.6J | 5.6J | 84-SW07 | 1/1 | NA |
| | | Benzene | 53 (3) | 1.2J | 1.2J | 84-SW07 | 1/1 | 0/1 |
| | | Toluene | 175 (3) | 2.7J | 2.7J | 84-SW07 | 1/1 | 0/1 |
| | | Xylenes (total) | NE | 3.5J | 3.5J | 84-SW07 | 1/1 | NA |
| | Semivolatiles | ND | NA | ND | ND | ND | 0/1 | NA |
| | PCBs | ND | NA | ND | ND | ND | 0/1 | NA |
| Sediment | Volatiles | Xylenes (total) | NE | 910J | 910J | 84-SD07 | 1/1 | NA |
| | Semivolatiles | Naphthalene | 160 (4) | 2,000 | 2,000 | 84-SD07 | 1/1 | 1/1 |
| | | Phenanthrene | 240 (4) | 2,500 | 2,500 | 84-SD07 | 1/1 | 1/1 |
| | | bis(2-Ethylhexyl)phthalate | NE | 2,400J | 2,400J | 84-SD07 | 1/1 | NA |
| | Diesel Range Organics | TOTAL | NE | 3500 | 14000 | 84-SD01 | NA | NA |
| | | 2-Methylnapthalene | 70 (4) | 10,000 | 10,000 | 84-SD07 | 1/1 | 1/1 |
| | PCBs | Aroclor-1248 | 22.7 (4) (5) | 2,800 | 2,800 | 84-SD05 | 1/11 | 1/11 |
| | | Aroclor-1260 | 22.7 (4) (5) | 3,700 | 49,000 | 84-SD01 | 8/11 | 8/11 |

TABLE 4-9 (continued)

SUMMARY OF SITE CONTAMINATION
SITE 84, BUILDING 45 AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

Notes: - Concentrations are presented in µg/kg for solids (ppb).

NA - Not applicable
NE - Not established
ND - Not detected

(1) USEPA Region III Residential RBCs / TSCA (Toxic Substances Control Act) Clean-up Criteria
(2) NC WQC (North Carolina Water Quality Criteria) for groundwater / USEPA Maximum Contaminant Level
(3) Supplemental Guidance to RAGS: Region 4 Bulletins Ecologocial Risk Assessment
(4) Long, et. al., 1995
(5) Value for Total PCBs

TABLE 4 - 10
POSITIVE DETECTION SUMMARY - SURFACE SOIL
METALS AND CYANIDE
SITE 85, THE CAMP JOHNSON BATTERY DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 85-SB01-00 | 85-SB02-00 | 85-SB03-00 | 85-SB04-00 | 85-SB05-00 |
|---|---|---|---|---|---|
| DATE SAMPLED | 09/27/95 | 09/27/95 | 09/27/95 | 09/27/95 | 09/27/95 |
| DEPTH | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' | 0-0.5' |
| **TOTAL ANALYTES (mg/kg)** | | | | | |
| ALUMINUM, TOTAL | 3080 | 1140 | 2910 | 3190 | 1870 |
| ARSENIC, TOTAL | 1.5 | 76.8 | 0.63 | 0.55 | 0.55 |
| BARIUM, TOTAL | 19.2 | 134 | 9.5 | 9.4 | 6.9 |
| CADMIUM, TOTAL | 2.1 | 47.1 | 0.49 U | 0.61 U | 0.63 U |
| CALCIUM, TOTAL | 580 | 823 | 91 | 196 | 91.9 |
| CHROMIUM, TOTAL | 2.3 | 147 | 2.8 | 3.2 | 3.3 |
| COBALT, TOTAL | 0.45 U | 17.3 | 0.38 U | 0.48 U | 0.5 U |
| COPPER, TOTAL | 89.2 | 1870 | 2 | 8.1 | 0.88 |
| IRON, TOTAL | 4590 | 339000 | 1570 | 1990 | 1480 |
| LEAD, TOTAL | 143 | 3030 | 20.5 | 4.9 | 10.8 |
| MAGNESIUM, TOTAL | 118 | 108 | 89.6 | 104 | 62.2 |
| MANGANESE, TOTAL | 739 | 19700 | 19.2 | 218 | 3.8 |
| MERCURY, TOTAL | 2.1 | 70.7 | 0.35 | 0.12 U | 0.12 U |
| NICKEL, TOTAL | 2.4 U | 117 | 2 U | 2.5 U | 3.5 |
| POTASSIUM, TOTAL | 214 | 456 | 159 | 158 | 238 |
| SODIUM, TOTAL | 12.9 | 69 | 9.7 | 12.5 | 10.5 |
| VANADIUM, TOTAL | 4.8 | 13.9 | 4.1 | 5.1 | 5.9 |
| ZINC, TOTAL | 1330 | 63900 | 101 | 359 | 5.2 |
| CYANIDE | 0.9 | 2.1 | 0.51 U | 0.56 U | 0.57 U |

QUALIFIER DEFINITIONS

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

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 10**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**METALS AND CYANIDE**
**SITE 85, THE CAMP JOHNSON BATTERY DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL ANALYTES (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 1140 | 3190 | 85-SB04-00 | 5/5 | 2438.00 | 2910.00 |
| ARSENIC, TOTAL | NA | NA | 0.55 | 76.8 | 85-SB02-00 | 5/5 | 16.01 | 0.63 |
| BARIUM, TOTAL | NA | NA | 6.9 | 134 | 85-SB02-00 | 5/5 | 35.80 | 9.50 |
| CADMIUM, TOTAL | 0.49 U | 0.63 U | 2.1 | 47.1 | 85-SB02-00 | 2/5 | 24.60 | 24.60 |
| CALCIUM, TOTAL | NA | NA | 91 | 823 | 85-SB02-00 | 5/5 | 356.38 | 196.00 |
| CHROMIUM, TOTAL | NA | NA | 2.3 | 147 | 85-SB02-00 | 5/5 | 31.72 | 3.20 |
| COBALT, TOTAL | 0.38 U | 0.5 U | 17.3 | 17.3 | 85-SB02-00 | 1/5 | 17.30 | 17.30 |
| COPPER, TOTAL | NA | NA | 0.88 | 1870 | 85-SB02-00 | 5/5 | 394.04 | 8.10 |
| IRON, TOTAL | NA | NA | 1480 | 339000 | 85-SB02-00 | 5/5 | 69726.00 | 1990.00 |
| LEAD, TOTAL | NA | NA | 4.9 | 3030 | 85-SB02-00 | 5/5 | 641.84 | 20.50 |
| MAGNESIUM, TOTAL | NA | NA | 62.2 | 118 | 85-SB01-00 | 5/5 | 96.36 | 104.00 |
| MANGANESE, TOTAL | NA | NA | 3.8 | 19700 | 85-SB02-00 | 5/5 | 4136.00 | 218.00 |
| MERCURY, TOTAL | 0.12 U | 0.12 U | 0.35 | 70.7 | 85-SB02-00 | 3/5 | 24.38 | 2.10 |
| NICKEL, TOTAL | 2 U | 2.5 U | 3.5 | 117 | 85-SB02-00 | 2/5 | 60.25 | 60.25 |
| POTASSIUM, TOTAL | NA | NA | 158 | 456 | 85-SB02-00 | 5/5 | 245.00 | 214.00 |
| SODIUM, TOTAL | NA | NA | 9.7 | 69 | 85-SB02-00 | 5/5 | 22.92 | 12.50 |
| VANADIUM, TOTAL | NA | NA | 4.1 | 13.9 | 85-SB02-00 | 5/5 | 6.76 | 5.10 |
| ZINC, TOTAL | NA | NA | 5.2 | 63900 | 85-SB02-00 | 5/5 | 13139.04 | 359.00 |
| CYANIDE | 0.51 U | 0.57 U | 0.9 | 2.1 | 85-SB02-00 | 2/5 | 1.50 | 1.50 |

QUALIFIER DEFINITIONS

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

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4-10**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**METALS AND CYANIDE**
**SITE 85, THE CAMP JOHNSON BATTERY DUMP**
**CTO-0314**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID. | 85-SB01-02 | 85-SB01-04 | 85-SB02-02 | 85-SB02-04 | 85-SB03-02 | 85-SB03-03 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 09/27/95 | 09/27/95 | 09/27/95 | 09/27/95 | 09/27/95 | 09/27/95 |
| DEPTH | 3-5' | 7-9' | 3-5' | 7-9' | 3-5' | 5-7' |
| **TOTAL ANALYTES (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 4800 | 702 | 10200 | 348 | 3840 | 592 |
| ARSENIC, TOTAL | 0.96 | 0.37 | 3 | 0.37 U | 1.1 | 0.32 |
| BARIUM, TOTAL | 3.8 | 0.81 | 13.3 | 0.87 | 5.2 | 0.81 |
| CADMIUM, TOTAL | 0.58 U | 0.45 U | 0.66 | 0.45 U | 0.52 U | 0.45 U |
| CALCIUM, TOTAL | 29.9 | 127 | 82.1 | 10.5 | 93.2 | 9.5 |
| CHROMIUM, TOTAL | 5.5 | 1.2 | 11.3 | 0.96 | 4.4 | 0.96 |
| COPPER, TOTAL | 1.7 | 0.5 | 8.8 | 0.39 | 0.65 | 0.35 |
| IRON, TOTAL | 2750 | 398 | 9480 | 385 | 2520 | 980 |
| LEAD, TOTAL | 3.9 | 2.7 | 40.6 | 1.2 | 4.5 | 1.2 |
| MAGNESIUM, TOTAL | 110 | 33 | 232 | 10.6 | 82.5 | 14.3 |
| MANGANESE, TOTAL | 2.1 | 0.95 | 47.5 | 0.92 | 1.7 | 0.65 |
| MERCURY, TOTAL | 0.092 U | 0.11 U | 0.61 | 0.1 U | 0.096 U | 0.11 U |
| NICKEL, TOTAL | 2.6 | 1.9 U | 3 | 1.9 U | 2.1 U | 1.9 U |
| POTASSIUM, TOTAL | 214 | 105 | 238 | 214 | 113 | 116 |
| SODIUM, TOTAL | 12.1 | 11.6 | 17 | 8.6 | 10.4 | 4.7 |
| VANADIUM, TOTAL | 8 | 1.9 | 20 | 1.2 | 6.4 | 2 |
| ZINC, TOTAL | 8.3 | 6.3 | 187 | 4.4 | 7.3 | 1.1 |

QUALIFIER DEFINITIONS

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

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4-10**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**METALS AND CYANIDE**
**SITE 85, THE CAMP JOHNSON BATTERY DUMP**
**CTO-0314**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID. | 85-SB04-02 | 85-SB04-03 | 85-SB05-02 | 85-SB05-03 |
|---|---|---|---|---|
| DATE SAMPLED | 09/27/95 | 09/27/95 | 09/27/95 | 09/27/95 |
| DEPTH | 3-5' | 5-7' | 3-5' | 5-7' |
| **TOTAL ANALYTES (mg/kg)** | | | | |
| ALUMINUM, TOTAL | 3460 | 475 | 5220 | 1540 |
| ARSENIC, TOTAL | 1.1 | 0.98 | 1.6 | 0.38 |
| BARIUM, TOTAL | 4.8 | 0.78 | 7.5 | 2.2 |
| CADMIUM, TOTAL | 0.52 U | 0.48 U | 0.6 U | 0.56 U |
| CALCIUM, TOTAL | 19.7 | 7.8 | 18.8 | 13.3 |
| CHROMIUM, TOTAL | 5.3 | 2.2 | 6.1 | 2.3 |
| COPPER, TOTAL | 0.43 | 0.35 | 1 | 0.38 U |
| IRON, TOTAL | 2590 | 1420 | 3790 | 935 |
| LEAD, TOTAL | 2.7 | 2.2 | 4.8 | 1.7 |
| MAGNESIUM, TOTAL | 87.6 | 11.1 | 148 | 52.9 |
| MANGANESE, TOTAL | 5.2 | 0.26 | 1.9 | 1.5 |
| MERCURY, TOTAL | 0.11 U | 0.15 | 0.1 U | 0.088 U |
| NICKEL, TOTAL | 4.4 | 2 U | 2.5 U | 2.3 U |
| POTASSIUM, TOTAL | 98.7 U | 92.4 U | 242 | 107 U |
| SODIUM, TOTAL | 10.2 | 8 | 11.2 | 8.4 |
| VANADIUM, TOTAL | 7.3 | 2.8 | 10.4 | 3.5 |
| ZINC, TOTAL | 6.1 | 1.8 | 1.5 | 1.5 |

QUALIFIER DEFINITIONS

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

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4-10**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**METALS AND CYANIDE**
**SITE 85, THE CAMP JOHNSON BATTERY DUMP**
**CTO-0314**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID.<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL ANALYTES (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 348 | 10200 | 85-SB02-02 | 10/10 | 3117.70 | 2500.00 |
| ARSENIC, TOTAL | 0.37 U | 0.37 U | 0.32 | 3 | 85-SB02-02 | 9/10 | 1.09 | 0.98 |
| BARIUM, TOTAL | NA | NA | 0.78 | 13.3 | 85-SB02-02 | 10/10 | 4.01 | 3.00 |
| CADMIUM, TOTAL | 0.45 U | 0.6 U | 0.66 | 0.66 | 85-SB02-02 | 1/10 | 0.66 | 0.66 |
| CALCIUM, TOTAL | NA | NA | 7.8 | 127 | 85-SB01-04 | 10/10 | 41.18 | 19.25 |
| CHROMIUM, TOTAL | NA | NA | 0.96 | 11.3 | 85-SB02-02 | 10/10 | 4.02 | 3.35 |
| COPPER, TOTAL | 0.38 U | 0.38 U | 0.35 | 8.8 | 85-SB02-02 | 9/10 | 1.57 | 0.50 |
| IRON, TOTAL | NA | NA | 385 | 9480 | 85-SB02-02 | 10/10 | 2524.80 | 1970.00 |
| LEAD, TOTAL | NA | NA | 1.2 | 40.6 | 85-SB02-02 | 10/10 | 6.55 | 2.70 |
| MAGNESIUM, TOTAL | NA | NA | 10.6 | 232 | 85-SB02-02 | 10/10 | 78.20 | 67.70 |
| MANGANESE, TOTAL | NA | NA | 0.26 | 47.5 | 85-SB02-02 | 10/10 | 6.27 | 1.60 |
| MERCURY, TOTAL | 0.088 U | 0.11 U | 0.15 | 0.61 | 85-SB02-02 | 2/10 | 0.38 | 0.38 |
| NICKEL, TOTAL | 1.9 U | 2.5 U | 2.6 | 4.4 | 85-SB04-02 | 3/10 | 3.33 | 3.00 |
| POTASSIUM, TOTAL | 92.4 U | 107 U | 105 | 242 | 85-SB05-02 | 7/10 | 177.43 | 214.00 |
| SODIUM, TOTAL | NA | NA | 4.7 | 17 | 85-SB02-02 | 10/10 | 10.22 | 10.30 |
| VANADIUM, TOTAL | NA | NA | 1.2 | 20 | 85-SB02-02 | 10/10 | 6.35 | 4.95 |
| ZINC, TOTAL | NA | NA | 1.1 | 187 | 85-SB02-02 | 10/10 | 22.53 | 5.25 |

QUALIFIER DEFINITIONS

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

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 10**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**TOTAL METALS**
**SITE 85, THE CAMP JOHNSON BATTERY DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 85-TW01 | 85-TW02 | 85-TW03 |
|---|---|---|---|
| DATE SAMPLED | 09/27/95 | 09/27/95 | 09/27/95 |
| **ANALYTES (ug/L)** | | | |
| ALUMINUM | 159000 | 429000 | 223000 |
| ARSENIC | 10.9 | 16.7 | 20.2 |
| BARIUM | 242 | 548 | 377 |
| BERYLLIUM | 1.5 U | 3.3 | 2.8 |
| CADMIUM | 6.7 | 24.6 | 4.9 |
| CALCIUM | 2420 | 6180 | 2070 |
| CHROMIUM | 436 | 821 | 383 |
| COBALT | 8.6 | 20.3 | 7.1 |
| COPPER | 138 | 173 | 55.4 |
| IRON | 119000 | 498000 | 180000 |
| LEAD | 207 | 512 | 380 |
| MAGNESIUM | 5530 | 13700 | 11500 |
| MANGANESE | 395 | 1270 | 228 |
| MERCURY | 0.28 | 2.4 | 0.29 |
| NICKEL | 4550 | 206 | 53.3 |
| POTASSIUM | 5480 | 16000 | 8300 |
| SODIUM | 1850 | 2660 | 5580 |
| VANADIUM | 322 | 908 | 436 |
| ZINC | 485 | 3970 | 93.1 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

TABLE 4 - 10
POSITIVE DETECTION SUMMARY - GROUNDWATER
TOTAL METALS
SITE 85, THE CAMP JOHNSON BATTERY DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **ANALYTES (ug/L)** | | | | | | | | |
| ALUMINUM | NA | NA | 159000 | 429000 | 85-TW02 | 3/3 | 270333.33 | 223000.00 |
| ARSENIC | NA | NA | 10.9 | 20.2 | 85-TW03 | 3/3 | 15.93 | 16.70 |
| BARIUM | NA | NA | 242 | 548 | 85-TW02 | 3/3 | 389.00 | 377.00 |
| BERYLLIUM | 1.5 U | 1.5 U | 2.8 | 3.3 | 85-TW02 | 2/3 | 3.05 | 3.05 |
| CADMIUM | NA | NA | 4.9 | 24.6 | 85-TW02 | 3/3 | 12.07 | 6.70 |
| CALCIUM | NA | NA | 2070 | 6180 | 85-TW02 | 3/3 | 3556.67 | 2420.00 |
| CHROMIUM | NA | NA | 383 | 821 | 85-TW02 | 3/3 | 546.67 | 436.00 |
| COBALT | NA | NA | 7.1 | 20.3 | 85-TW02 | 3/3 | 12.00 | 8.60 |
| COPPER | NA | NA | 55.4 | 173 | 85-TW02 | 3/3 | 122.13 | 138.00 |
| IRON | NA | NA | 119000 | 498000 | 85-TW02 | 3/3 | 265666.67 | 180000.00 |
| LEAD | NA | NA | 207 | 512 | 85-TW02 | 3/3 | 366.33 | 380.00 |
| MAGNESIUM | NA | NA | 5530 | 13700 | 85-TW02 | 3/3 | 10243.33 | 11500.00 |
| MANGANESE | NA | NA | 228 | 1270 | 85-TW02 | 3/3 | 631.00 | 395.00 |
| MERCURY | NA | NA | 0.28 | 2.4 | 85-TW02 | 3/3 | 0.99 | 0.29 |
| NICKEL | NA | NA | 53.3 | 4550 | 85-TW01 | 3/3 | 1603.10 | 206.00 |
| POTASSIUM | NA | NA | 5480 | 16000 | 85-TW02 | 3/3 | 9926.67 | 8300.00 |
| SODIUM | NA | NA | 1850 | 5580 | 85-TW03 | 3/3 | 3363.33 | 2660.00 |
| VANADIUM | NA | NA | 322 | 908 | 85-TW02 | 3/3 | 555.33 | 436.00 |
| ZINC | NA | NA | 93.1 | 3970 | 85-TW02 | 3/3 | 1516.03 | 485.00 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 10**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**DISSOLVED METALS**
**SITE 85, THE CAMP JOHNSON BATTERY DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID. | 85-TW01D | 85-TW02D | 85-TW03D |
|---|---|---|---|
| DATE SAMPLED | 09/27/95 | 09/27/95 | 09/27/95 |
| **ANALYTES (ug/L)** | | | |
| ALUMINUM | 79.9 | 175 | 105 |
| BARIUM | 13.8 | 8.3 | 15.4 |
| CADMIUM | 2.8 U | 3.4 | 2.8 U |
| CALCIUM | 766 | 1940 | 633 |
| COPPER | 2.2 | 1.9 U | 1.9 U |
| IRON | 4770 | 10500 | 2600 |
| LEAD | 1.4 U | 1.4 U | 2.2 |
| MAGNESIUM | 866 | 477 | 1790 |
| MANGANESE | 55.1 | 224 | 32.6 |
| NICKEL | 206 | 11.6 U | 11.6 U |
| POTASSIUM | 686 | 1400 | 775 |
| SODIUM | 1640 | 1970 | 4520 |
| ZINC | 58.8 | 473 | 4.6 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 10**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**DISSOLVED METALS**
**SITE 85, THE CAMP JOHNSON BATTERY DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| SAMPLE ID. DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **ANALYTES (ug/L)** | | | | | | | | |
| ALUMINUM | NA | NA | 79.9 | 175 | 85-TW02D | 3/3 | 119.97 | 105.00 |
| BARIUM | NA | NA | 8.3 | 15.4 | 85-TW03D | 3/3 | 12.50 | 13.80 |
| CADMIUM | 2.8 U | 2.8 U | 3.4 | 3.4 | 85-TW02D | 1/3 | 3.40 | 3.40 |
| CALCIUM | NA | NA | 633 | 1940 | 85-TW02D | 3/3 | 1113.00 | 766.00 |
| COPPER | 1.9 U | 1.9 U | 2.2 | 2.2 | 85-TW01D | 1/3 | 2.20 | 2.20 |
| IRON | NA | NA | 2600 | 10500 | 85-TW02D | 3/3 | 5956.67 | 4770.00 |
| LEAD | 1.4 U | 1.4 U | 2.2 | 2.2 | 85-TW03D | 1/3 | 2.20 | 2.20 |
| MAGNESIUM | NA | NA | 477 | 1790 | 85-TW03D | 3/3 | 1044.33 | 866.00 |
| MANGANESE | NA | NA | 32.6 | 224 | 85-TW02D | 3/3 | 103.90 | 55.10 |
| NICKEL | 11.6 U | 11.6 U | 206 | 206 | 85-TW01D | 1/3 | 206.00 | 206.00 |
| POTASSIUM | NA | NA | 686 | 1400 | 85-TW02D | 3/3 | 953.67 | 775.00 |
| SODIUM | NA | NA | 1640 | 4520 | 85-TW03D | 3/3 | 2710.00 | 1970.00 |
| ZINC | NA | NA | 4.6 | 473 | 85-TW02D | 3/3 | 178.80 | 58.80 |

QUALIFIER DEFINITIONS

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

NOTES
ug/L = micrograms per liter.

TABLE 4-11

SUMMARY OF SITE CONTAMINATION
SITE 85, CAMP JOHNSON BATTERY DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (1) | Base Background (2) | Baseline Concs. | | | | | Screening Standard | Base Background | Baseline Concs. |
| Surface Soil | Metals | Aluminum | 78000 (3) | 5,856 | NA | 1,140 | 3,190 | 85-SB04 | 5/5 | 0/5 | 0/5 | NA |
| | | Arsenic | 15 | 1.3 | NA | 0.55 | 76.8 | 85-SB02 | 5/5 | 1/5 | 2/5 | NA |
| | | Barium | 32 | 17.3 | NA | 6.9 | 134.0 | 85-SB02 | 5/5 | 1/5 | 2/5 | NA |
| | | Cadmium | 6 | 0.70 | NA | 2.1 | 47.1 | 85-SB02 | 2/5 | 2/5 | 2/5 | NA |
| | | Chromium | 19 | 6.60 | NA | 2.3 | 147.0 | 85-SB02 | 5/5 | 1/5 | 1/5 | NA |
| | | Cobalt | 47000 (3) | 2.05 | NA | 17.3 | 17.3 | 85-SB02 | 1/5 | 0/5 | 1/5 | NA |
| | | Copper | 3,100 (3) | 7.10 | NA | 0.88 | 1,870.0 | 85-SB02 | 5/5 | 0/5 | 3/5 | NA |
| | | Iron | 23,000 (3) | 3702.00 | NA | 1,480 | 339,000 | 85-SB02 | 5/5 | 1/5 | 2/5 | NA |
| | | Lead | NE | 23.40 | NA | 4.9 | 3,030 | 85-SB02 | 5/5 | NA | 2/5 | NA |
| | | Manganese | 1,800 (3) | 18.51 | NA | 3.8 | 19,700 | 85-SB02 | 5/5 | 1/5 | 4/5 | NA |
| | | Mercury | 3 | 0.09 | NA | 0.35 | 70.7 | 85-SB02 | 3/5 | 1/5 | 3/5 | NA |
| | | Nickel | 21 | 3.46 | NA | 3.50 | 117.0 | 85-SB02 | 2/5 | 1/5 | 2/5 | NA |
| | | Vanadium | 550 (3) | 11.45 | NA | 4.10 | 13.9 | 85-SB02 | 5/5 | 0/5 | 1/5 | NA |
| | | Zinc | 42,000 | 13.76 | NA | 5.20 | 63,900 | 85-SB02 | 5/5 | 1/5 | 4/5 | NA |
| | | Cyanide | 1,600 (3) | 2.90 | NA | 0.90 | 2 | 85-SB02 | 2/5 | 0/5 | 0/5 | NA |
| Subsurface Soil | Metals | Aluminum | 78000 (3) | 7413.00 | NA | 348.00 | 10,200 | 85-SB02 | 10/10 | 0/10 | 1/10 | NA |
| | | Arsenic | 15 | 1.97 | NA | 0.32 | 3 | 85-SB02 | 9/10 | 0/10 | 1/10 | NA |
| | | Barium | 32 | 14.37 | NA | 0.78 | 13 | 85-SB02 | 10/10 | 0/10 | 0/10 | NA |
| | | Cadmium | 6 | 0.72 | NA | 0.66 | 0.66 | 85-SB02 | 1/10 | 0/10 | 0/10 | NA |
| | | Chromium | 19 | 12.54 | NA | 0.96 | 11.3 | 85-SB02 | 10/10 | 0/10 | 0/10 | NA |
| | | Copper | 3,100 (3) | 2.41 | NA | 0.35 | 8.8 | 85-SB02 | 9/10 | 0/10 | 1/10 | NA |
| | | Iron | 23,000 (3) | 7134.64 | NA | 385.00 | 9,480 | 85-SB02 | 10/10 | 0/10 | 1/10 | NA |
| | | Lead | NE | 8.26 | NA | 1.20 | 41 | 85-SB02 | 10/10 | NA | 1/10 | NA |
| | | Manganese | 1,800 (3) | 7.99 | NA | 0.26 | 47.5 | 85-SB02 | 10/10 | 0/10 | 1/10 | NA |
| | | Mercury | 3 | 0.13 | NA | 0.15 | 0.61 | 85-SB02 | 2/10 | 0/10 | 2/10 | NA |
| | | Nickel | 21 | 3.73 | NA | 2.60 | 4 | 85-SB04 | 3/10 | 0/10 | 1/10 | NA |
| | | Vanadium | 550 (3) | 13.34 | NA | 1.20 | 20 | 85-SB02 | 10/10 | 0/10 | 1/10 | NA |
| | | Zinc | 42,000 | 6.67 | NA | 1.10 | 187 | 85-SB02 | 10/10 | 0/10 | 3/10 | NA |

TABLE (Continued)

SUMMARY OF SITE CONTAMINATION
SITE 85, CAMP JOHNSON BATTERY DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (5) | Base Background (2) | Baseline Concs. | | | | | Screening Standard | Base Background | Baseline Concs. |
| Subsurface Soil (continued) | TCLP Metals (Soil Sample) | ND | NA | NA | NA | ND | ND | ND | NA | NA | NA | NA |
| | TCLP Metals (Waste Mat. Composite) | Lead | 500 (4) | NA | NA | 1,110 | 3,640 | 85-WT02 | 2/2 | 2/2 | NA | NA |
| | | Barium | 100,000 (4) | NA | NA | 523 | 523 | 85-WT01 | 1/2 | 0/2 | NA | NA |
| | | Cadmium | 1,000 (4) | NA | NA | 151 | 230 | 85-WT01 | 2/2 | 0/2 | NA | NA |
| Groundwater | Metals (total) | Aluminum | NE/50 | NA | NA | 15,900 | 429,000 | 85TW-02 | 3/3 | 3/3 | NA | NA |
| | | Arsenic | 50/50 | NA | NA | 10.9 | 20 | 85-TW03 | 3/3 | 0/3 | NA | NA |
| | | Barium | 2,000/2,000 | NA | NA | 242 | 548 | 85TW-02 | 3/3 | 0/3 | NA | NA |
| | | Beryllium | NE/4 | NA | NA | 2.8 | 3 | 85TW-02 | 2/3 | 0/3 | NA | NA |
| | | Cadmium | 5/5 | NA | NA | 4.9 | 25 | 85TW-02 | 3/3 | 2/3 | NA | NA |
| | | Chromium | 50/100 | NA | NA | 383 | 821 | 85TW-02 | 3/3 | 3/3 | NA | NA |
| | | Cobalt | NE/NE | NA | NA | 7.1 | 20 | 85TW-02 | 3/3 | NA | NA | NA |
| | | Copper | 1,000/NE | NA | NA | 55.4 | 173 | 85TW-02 | 3/3 | 0/3 | NA | NA |
| | | Iron | 300/300 | NA | NA | 119,000 | 498,000 | 85TW-02 | 3/3 | 3/3 | NA | NA |
| | | Lead | 15/NE | NA | NA | 207 | 512 | 85TW-02 | 3/3 | 3/3 | NA | NA |
| | | Manganese | 50/50 | NA | NA | 228 | 1,270 | 85TW-02 | 3/3 | 3/3 | NA | NA |
| | | Mercury | 1.1/2.0 | NA | NA | 0.28 | 204 | 85TW-02 | 3/3 | 1/3 | NA | NA |
| | | Nickel | 100/100 | NA | NA | 53.3 | 4,550 | 85-TW01 | 3/3 | 2/3 | NA | NA |
| | | Vanadium | NE/NE | NA | NA | 332 | 908 | 85TW-02 | 3/3 | NA | NA | NA |
| | | Zinc | 2,100/NE | NA | NA | 93.1 | 3,970 | 85TW-02 | 3/3 | 1/3 | NA | NA |

Notes:
- Concentrations are presented in µg/L for liquid and µg/kg for solids (ppb), metal concentrations for soils are presented in mg/kg (ppm).
- Calcium, magnesium, potassium, and sodium are not included in the tables

(1) - USEPA Region III Soil Screening Levels for Transfer from Soil to Groundwater (May, 1996)
(2) - Twice the Average Base Background Concentration for Metals in Soil
(3) - USEPA Region III Risk-Based Concentrations (Residential Soil) were used because no Soil to Groundwater Screening Levels were available (May, 1996).
(4) - Maximum Concentration of Contaminants for Toxicity Characteristic (40 CFR Part 261.24 July 1, 1994).
(5) - North Carolina Water Quality Standards for Groundwater/USEPA Maximum Contaminant Levels
NA - Not applicable
ND - Not Detected

TABLE 4 - 12
POSITIVE DETECTION SUMMARY - SURFACE SOIL
ORGANIC COMPOUNDS
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 87-SB01-01 | 87-SB02-01 | 87-SB03-01 | 87-SB04-01 | 87-SB05-01 | 87-SB06-01 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 11/07/95 | 11/07/95 | 11/07/95 | 11/07/95 | 11/07/95 | 11/07/95 |
| DEPTH | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' |
| **SEMIVOLATILES (ug/kg)** | | | | | | |
| ACENAPHTHENE | 390 U | 390 U | 390 U | 37 J | 410 U | 380 U |
| FLUORENE | 390 U | 390 U | 26 J | 27 J | 42 J | 380 U |
| PHENANTHRENE | 390 U | 390 U | 240 J | 320 J | 500 | 380 U |
| ANTHRACENE | 390 U | 390 U | 52 J | 95 J | 110 J | 380 U |
| CARBAZOLE | 390 U | 390 U | 42 J | 25 J | 21 J | 380 U |
| DI-N-BUTYLPHTHALATE | 390 U | 390 U | 390 U | 370 J | 410 U | 380 U |
| FLUORANTHENE | 390 U | 390 U | 400 | 620 | 840 | 380 U |
| PYRENE | 390 U | 390 U | 330 J | 560 | 660 | 380 U |
| BUTYLBENZYLPHTHALATE | 390 U | 390 U | 54 J | 290 J | 46 J | 380 U |
| BENZO(A)ANTHRACENE | 390 U | 390 U | 230 J | 350 J | 380 J | 380 U |
| CHRYSENE | 390 U | 390 U | 290 J | 390 | 400 J | 380 U |
| BIS(2-ETHYLHEXYL)PHTHALATE | 39 J | 390 U | 84 J | 380 | 100 J | 17 J |
| BENZO(B)FLUORANTHENE | 390 U | 390 U | 380 J | 350 J | 320 J | 380 U |
| BENZO(K)FLUORANTHENE | 390 U | 390 U | 380 J | 320 J | 300 J | 380 U |
| BENZO(A)PYRENE | 390 U | 390 U | 340 J | 380 | 310 J | 380 U |
| INDENO(1,2,3-CD)PYRENE | 390 U | 390 U | 250 J | 270 J | 170 J | 380 U |
| DIBENZO(A,H)ANTHRACENE | 390 U | 390 U | 66 J | 100 J | 46 J | 380 U |
| BENZO(G,H,I)PERYLENE | 390 U | 390 U | 240 J | 320 J | 170 J | 380 U |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | |
| 4,4'-DDE | 67 | 16 | 97 | 51 | 35 | 62 |
| 4,4'-DDD | 41 | 3.9 U | 39 | 470 | 110 | 16 J |
| 4,4'-DDT | 230 | 15 | 190 | 310 | 40 | 270 |
| ALPHA-CHLORDANE | 9.7 U | 2 U | 7.8 U | 21 J | 12 J | 1.9 U |
| GAMMA-CHLORDANE | 9.7 U | 2 U | 7.8 U | 26 | 10 J | 1.9 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **SEMIVOLATILES (ug/kg)** | | | | | | | | |
| ACENAPHTHENE | 380 U | 410 U | 37 J | 37 J | 87-SB04-01 | 1/6 | 37.00 | 37.00 |
| FLUORENE | 380 U | 390 U | 26 J | 42 J | 87-SB05-01 | 3/6 | 31.67 | 27.00 |
| PHENANTHRENE | 380 U | 390 U | 240 J | 500 | 87-SB05-01 | 3/6 | 353.33 | 320.00 |
| ANTHRACENE | 380 U | 390 U | 52 J | 110 J | 87-SB05-01 | 3/6 | 85.67 | 95.00 |
| CARBAZOLE | 380 U | 390 U | 21 J | 42 J | 87-SB03-01 | 3/6 | 29.33 | 25.00 |
| DI-N-BUTYLPHTHALATE | 380 U | 410 U | 370 J | 370 J | 87-SB04-01 | 1/6 | 370.00 | 370.00 |
| FLUORANTHENE | 380 U | 390 U | 400 | 840 | 87-SB05-01 | 3/6 | 620.00 | 620.00 |
| PYRENE | 380 U | 390 U | 330 J | 660 | 87-SB05-01 | 3/6 | 516.67 | 560.00 |
| BUTYLBENZYLPHTHALATE | 380 U | 390 U | 46 J | 290 J | 87-SB04-01 | 3/6 | 130.00 | 54.00 |
| BENZO(A)ANTHRACENE | 380 U | 390 U | 230 J | 380 J | 87-SB05-01 | 3/6 | 320.00 | 350.00 |
| CHRYSENE | 380 U | 390 U | 290 J | 400 J | 87-SB05-01 | 3/6 | 360.00 | 390.00 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 390 U | 390 U | 17 J | 380 | 87-SB04-01 | 5/6 | 124.00 | 84.00 |
| BENZO(B)FLUORANTHENE | 380 U | 390 U | 320 J | 380 J | 87-SB03-01 | 3/6 | 350.00 | 350.00 |
| BENZO(K)FLUORANTHENE | 380 U | 390 U | 300 J | 380 J | 87-SB03-01 | 3/6 | 333.33 | 320.00 |
| BENZO(A)PYRENE | 380 U | 390 U | 310 J | 380 | 87-SB04-01 | 3/6 | 343.33 | 340.00 |
| INDENO(1,2,3-CD)PYRENE | 380 U | 390 U | 170 J | 270 J | 87-SB04-01 | 3/6 | 230.00 | 250.00 |
| DIBENZO(A,H)ANTHRACENE | 380 U | 390 U | 46 J | 100 J | 87-SB04-01 | 3/6 | 70.67 | 66.00 |
| BENZO(G,H,I)PERYLENE | 380 U | 390 U | 170 J | 320 J | 87-SB04-01 | 3/6 | 243.33 | 240.00 |
| **PESTICIDE/PCBS (ug/kg)** | | | | | | | | |
| 4,4'-DDE | NA | NA | 16 | 97 | 87-SB03-01 | 6/6 | 54.67 | 56.50 |
| 4,4'-DDD | 3.9 U | 3.9 U | 16 J | 470 | 87-SB04-01 | 5/6 | 135.20 | 41.00 |
| 4,4'-DDT | NA | NA | 15 | 310 | 87-SB04-01 | 6/6 | 175.83 | 210.00 |
| ALPHA-CHLORDANE | 1.9 U | 9.7 U | 12 J | 21 J | 87-SB04-01 | 2/6 | 16.50 | 16.50 |
| GAMMA-CHLORDANE | 1.9 U | 9.7 U | 10 J | 26 | 87-SB04-01 | 2/6 | 18.00 | 18.00 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
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NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**METALS AND CYANIDE**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 87-SB01-01 | 87-SB02-01 | 87-SB03-01 | 87-SB04-01 | 87-SB05-01 | 87-SB06-01 |
|---|---|---|---|---|---|---|
| DATE SAMPLED | 11/07/95 | 11/07/95 | 11/07/95 | 11/07/95 | 11/07/95 | 11/07/95 |
| DEPTH | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' | 0-1' |
| **TOTAL METALS (mg/kg)** | | | | | | |
| ALUMINUM, TOTAL | 3760 | 2900 | 3370 | 2290 | 3220 | 4250 |
| ARSENIC, TOTAL | 3.8 J | 1.3 J | 4 J | 0.94 J | 1.5 J | 4.6 J |
| BARIUM, TOTAL | 13.4 J | 12 J | 13.3 J | 14.6 J | 18 J | 16.1 J |
| BERYLLIUM, TOTAL | 0.49 | 0.76 | 0.76 | 0.34 U | 0.51 | 0.87 |
| CADMIUM, TOTAL | 0.79 U | 0.8 U | 0.8 U | 0.99 | 1.5 | 0.78 U |
| CALCIUM, TOTAL | 221 J | 300 J | 2720 J | 15500 J | 18100 J | 119 J |
| CHROMIUM, TOTAL | 8.7 J | 4.2 J | 16.8 J | 25.2 J | 18.2 J | 10.1 J |
| COBALT, TOTAL | 0.96 | 0.97 | 0.69 | 1.5 | 1.2 | 0.94 |
| COPPER, TOTAL | 3.6 | 2.3 | 5.6 | 16.2 | 10.2 | 3.6 |
| IRON, TOTAL | 5710 | 4560 | 4880 | 3060 | 3050 | 6530 |
| LEAD, TOTAL | 9.3 J | 13.4 J | 52.8 J | 143 J | 129 J | 45 J |
| MAGNESIUM, TOTAL | 321 | 144 | 357 | 466 | 551 | 351 |
| MANGANESE, TOTAL | 10 | 25.8 | 23.7 | 15.5 | 23.1 | 7.7 |
| MERCURY, TOTAL | 0.06 U | 0.06 U | 0.06 U | 0.1 | 0.06 U | 0.06 U |
| NICKEL, TOTAL | 3.5 U | 3.5 U | 3.5 U | 19.7 J | 8 J | 3.4 U |
| POTASSIUM, TOTAL | 575 | 202 | 539 | 233 | 222 | 611 |
| SELENIUM, TOTAL | 0.37 U | 0.37 U | 0.38 U | 0.36 | 0.44 U | 0.55 U |
| SODIUM, TOTAL | 77 | 63.3 | 92 | 138 | 94.7 | 98.1 |
| THALLIUM, TOTAL | 1.8 J | 0.21 UJ | 0.21 UJ | 0.2 UJ | 0.22 UJ | 0.21 UJ |
| VANADIUM, TOTAL | 12 | 10.6 | 13.2 | 19.3 | 19.1 | 14.7 |
| ZINC, TOTAL | 9 J | 17.6 J | 19.6 J | 65.7 J | 53.5 J | 7.9 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - SURFACE SOIL**
**METALS AND CYANIDE**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 2290 | 4250 | 87-SB06-01 | 6/6 | 3298.33 | 3295.00 |
| ARSENIC, TOTAL | NA | NA | 0.94 J | 4.6 J | 87-SB06-01 | 6/6 | 2.69 | 2.65 |
| BARIUM, TOTAL | NA | NA | 12 J | 18 J | 87-SB05-01 | 6/6 | 14.57 | 14.00 |
| BERYLLIUM, TOTAL | 0.34 U | 0.34 U | 0.49 | 0.87 | 87-SB06-01 | 5/6 | 0.68 | 0.76 |
| CADMIUM, TOTAL | 0.78 U | 0.8 U | 0.99 | 1.5 | 87-SB05-01 | 2/6 | 1.25 | 1.25 |
| CALCIUM, TOTAL | NA | NA | 119 J | 18100 J | 87-SB05-01 | 6/6 | 6160.00 | 1510.00 |
| CHROMIUM, TOTAL | NA | NA | 4.2 J | 25.2 J | 87-SB04-01 | 6/6 | 13.87 | 13.45 |
| COBALT, TOTAL | NA | NA | 0.69 | 1.5 | 87-SB04-01 | 6/6 | 1.04 | 0.97 |
| COPPER, TOTAL | NA | NA | 2.3 | 16.2 | 87-SB04-01 | 6/6 | 6.92 | 4.60 |
| IRON, TOTAL | NA | NA | 3050 | 6530 | 87-SB06-01 | 6/6 | 4631.67 | 4720.00 |
| LEAD, TOTAL | NA | NA | 9.3 J | 143 J | 87-SB04-01 | 6/6 | 65.42 | 48.90 |
| MAGNESIUM, TOTAL | NA | NA | 144 | 551 | 87-SB05-01 | 6/6 | 365.00 | 354.00 |
| MANGANESE, TOTAL | NA | NA | 7.7 | 25.8 | 87-SB02-01 | 6/6 | 17.63 | 19.30 |
| MERCURY, TOTAL | 0.06 U | 0.06 U | 0.1 | 0.1 | 87-SB04-01 | 1/6 | 0.10 | 0.10 |
| NICKEL, TOTAL | 3.4 U | 3.5 U | 8 J | 19.7 J | 87-SB04-01 | 2/6 | 13.85 | 13.85 |
| POTASSIUM, TOTAL | NA | NA | 202 | 611 | 87-SB06-01 | 6/6 | 397.00 | 386.00 |
| SELENIUM, TOTAL | 0.37 U | 0.55 U | 0.36 | 0.36 | 87-SB04-01 | 1/6 | 0.36 | 0.36 |
| SODIUM, TOTAL | NA | NA | 63.3 | 138 | 87-SB04-01 | 6/6 | 93.85 | 93.35 |
| THALLIUM, TOTAL | 0.2 UJ | 0.22 UJ | 1.8 J | 1.8 J | 87-SB01-01 | 1/6 | 1.80 | 1.80 |
| VANADIUM, TOTAL | NA | NA | 10.6 | 19.3 | 87-SB04-01 | 6/6 | 14.82 | 13.95 |
| ZINC, TOTAL | 7.9 U | 7.9 U | 9 J | 65.7 J | 87-SB04-01 | 5/6 | 33.08 | 19.60 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

TABLE 4 - 12
POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL
ORGANIC COMPOUNDS
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION | 87-TP01-01 | 87-TP02-01 | 87-TP03-01 | 87-TP04-01 |
|---|---|---|---|---|
| DATE SAMPLED | 01/29/96 | 01/29/96 | 01/30/96 | 01/30/96 |
| DEPTH | 8' | 8' | 8' | 8' |
| **PESTICIDE/PCBS (ug/kg)** | | | | |
| 4,4'-DDE | 2.3 J | 3.7 U | 4.7 J | 3.8 UJ |
| 4,4'-DDD | 3.8 UJ | 3.7 U | 5.1 J | 3.8 UJ |
| 4,4'-DDT | 6.1 NJ | 1.8 NJ | 28 NJ | 1.5 NJ |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL**
**ORGANIC COMPOUNDS**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **PESTICIDE/PCBS (ug/kg)** | | | | | | | | |
| 4,4'-DDE | 3.7 U | 3.8 UJ | 2.3 J | 4.7 J | 87-TP03-01 | 2/4 | 3.50 | 3.50 |
| 4,4'-DDD | 3.7 U | 3.8 UJ | 5.1 J | 5.1 J | 87-TP03-01 | 1/4 | 5.10 | 5.10 |
| 4,4'-DDT | NA | NA | 1.5 NJ | 28 NJ | 87-TP03-01 | 4/4 | 9.35 | 3.95 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL (TEST PITS)**
**TOTAL METALS**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 87-TP01-01 | 87-TP02-01 | 87-TP03-01 | 87-TP04-01 |
|---|---|---|---|---|
| DATE SAMPLED | 01/29/96 | 01/29/96 | 01/30/96 | 01/30/96 |
| DEPTH | 8' | 8' | 8' | 8' |
| **TOTAL METALS (mg/kg)** | | | | |
| ALUMINUM, TOTAL | 2100 | 1450 | 1490 | 1890 |
| ANTIMONY, TOTAL | 3.4 UJ | 4.1 UJ | 3.2 UJ | 3.3 J |
| ARSENIC, TOTAL | 1 | 0.47 | 0.61 | 0.63 |
| BARIUM, TOTAL | 28.3 | 24.6 | 30.4 | 30.3 |
| BERYLLIUM, TOTAL | 0.14 | 0.17 U | 0.13 U | 0.13 U |
| CALCIUM, TOTAL | 53.9 | 49.1 U | 72.8 | 58.3 |
| CHROMIUM, TOTAL | 3.4 U | 2.8 U | 2.4 U | 3.7 |
| COBALT, TOTAL | 0.63 | 0.62 U | 0.49 U | 0.59 |
| COPPER, TOTAL | 0.35 U | 0.42 U | 0.58 | 0.39 |
| IRON, TOTAL | 2480 J | 1400 J | 1640 J | 3130 J |
| LEAD, TOTAL | 3.1 J | 1.2 J | 3 J | 3.2 J |
| MAGNESIUM, TOTAL | 94.5 | 61.7 | 70.2 | 69.4 |
| MANGANESE, TOTAL | 3.8 | 4.5 | 5.9 | 5 |
| VANADIUM, TOTAL | 5 | 3 | 3.3 | 5.4 |
| ZINC, TOTAL | 2.9 | 1.9 | 2.1 | 2.1 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

TABLE 4 - 12
POSITIVE DETECTION SUMMARY - SUBSURFACE SOIL (TEST PITS)
TOTAL METALS
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 1450 | 2100 | 87-TP01-01 | 4/4 | 1732.50 | 1690.00 |
| ANTIMONY, TOTAL | 3.2 UJ | 4.1 UJ | 3.3 J | 3.3 J | 87-TP04-01 | 1/4 | 3.30 | 3.30 |
| ARSENIC, TOTAL | NA | NA | 0.47 | 1 | 87-TP01-01 | 4/4 | 0.68 | 0.62 |
| BARIUM, TOTAL | NA | NA | 24.6 | 30.4 | 87-TP03-01 | 4/4 | 28.40 | 29.30 |
| BERYLLIUM, TOTAL | 0.13 U | 0.17 U | 0.14 | 0.14 | 87-TP01-01 | 1/4 | 0.14 | 0.14 |
| CALCIUM, TOTAL | 49.1 U | 49.1 U | 53.9 | 72.8 | 87-TP03-01 | 3/4 | 61.67 | 58.30 |
| CHROMIUM, TOTAL | 2.4 U | 3.4 U | 3.7 | 3.7 | 87-TP04-01 | 1/4 | 3.70 | 3.70 |
| COBALT, TOTAL | 0.49 U | 0.62 U | 0.59 | 0.63 | 87-TP01-01 | 2/4 | 0.61 | 0.61 |
| COPPER, TOTAL | 0.35 U | 0.42 U | 0.39 | 0.58 | 87-TP03-01 | 2/4 | 0.49 | 0.49 |
| IRON, TOTAL | NA | NA | 1400 J | 3130 J | 87-TP04-01 | 4/4 | 2162.50 | 2060.00 |
| LEAD, TOTAL | NA | NA | 1.2 J | 3.2 J | 87-TP04-01 | 4/4 | 2.63 | 3.05 |
| MAGNESIUM, TOTAL | NA | NA | 61.7 | 94.5 | 87-TP01-01 | 4/4 | 73.95 | 69.80 |
| MANGANESE, TOTAL | NA | NA | 3.8 | 5.9 | 87-TP03-01 | 4/4 | 4.80 | 4.75 |
| VANADIUM, TOTAL | NA | NA | 3 | 5.4 | 87-TP04-01 | 4/4 | 4.18 | 4.15 |
| ZINC, TOTAL | NA | NA | 1.9 | 2.9 | 87-TP01-01 | 4/4 | 2.25 | 2.10 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**ORGANIC COMPOUNDS**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 87-GW01-01 | 87-GW02-01 |
|---|---|---|
| DATE SAMPLED | 10/28/95 | 10/28/95 |
| **SEMIVOLATILES (ug/L)** | | |
| 4-NITROPHENOL | 1 J | 30 U |
| PENTACHLOROPHENOL | 0.8 J | 30 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**ORGANIC COMPOUNDS**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **SEMIVOLATILES (ug/L)** | | | | | | | | |
| 4-NITROPHENOL | 30 U | 30 U | 1 J | 1 J | 87-GW01-01 | 1/2 | 1.00 | 1.00 |
| PENTACHLOROPHENOL | 30 U | 30 U | 0.8 J | 0.8 J | 87-GW01-01 | 1/2 | 0.80 | 0.80 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**METALS AND CYANIDE**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 87-GW01-01 | 87-GW02-01 |
|---|---|---|
| DATE SAMPLED | 10/28/95 | 10/28/95 |
| **TOTAL METALS (ug/L)** | | |
| ALUMINUM, TOTAL | 3770 | 947 |
| BARIUM, TOTAL | 35.1 | 7.1 U |
| CALCIUM, TOTAL | 8400 J | 82300 J |
| COBALT, TOTAL | 3.8 J | 2.7 UJ |
| COPPER, TOTAL | 4.7 U | 18.4 |
| IRON, TOTAL | 115 | 3130 |
| LEAD, TOTAL | 0.8 UJ | 1.1 J |
| MAGNESIUM, TOTAL | 5280 | 3180 |
| MANGANESE, TOTAL | 224 | 37.3 |
| POTASSIUM, TOTAL | 2020 | 1250 |
| SELENIUM, TOTAL | 1.3 UJ | 1.6 J |
| SODIUM, TOTAL | 14200 | 12100 |
| THALLIUM, TOTAL | 0.9 R | 12 J |
| ZINC, TOTAL | 28.2 | 3 U |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
R = Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - GROUNDWATER**
**METALS AND CYANIDE**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (ug/L)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 947 | 3770 | 87-GW01-01 | 2/2 | 2358.50 | 2358.50 |
| BARIUM, TOTAL | 7.1 U | 7.1 U | 35.1 | 35.1 | 87-GW01-01 | 1/2 | 35.10 | 35.10 |
| CALCIUM, TOTAL | NA | NA | 8400 J | 82300 J | 87-GW02-01 | 2/2 | 45350.00 | 45350.00 |
| COBALT, TOTAL | 2.7 UJ | 2.7 UJ | 3.8 J | 3.8 J | 87-GW01-01 | 1/2 | 3.80 | 3.80 |
| COPPER, TOTAL | 4.7 U | 4.7 U | 18.4 | 18.4 | 87-GW02-01 | 1/2 | 18.40 | 18.40 |
| IRON, TOTAL | NA | NA | 115 | 3130 | 87-GW02-01 | 2/2 | 1622.50 | 1622.50 |
| LEAD, TOTAL | 0.8 UJ | 0.8 UJ | 1.1 J | 1.1 J | 87-GW02-01 | 1/2 | 1.10 | 1.10 |
| MAGNESIUM, TOTAL | NA | NA | 3180 | 5280 | 87-GW01-01 | 2/2 | 4230.00 | 4230.00 |
| MANGANESE, TOTAL | NA | NA | 37.3 | 224 | 87-GW01-01 | 2/2 | 130.65 | 130.65 |
| POTASSIUM, TOTAL | NA | NA | 1250 | 2020 | 87-GW01-01 | 2/2 | 1635.00 | 1635.00 |
| SELENIUM, TOTAL | 1.3 UJ | 1.3 UJ | 1.6 J | 1.6 J | 87-GW02-01 | 1/2 | 1.60 | 1.60 |
| SODIUM, TOTAL | NA | NA | 12100 | 14200 | 87-GW01-01 | 2/2 | 13150.00 | 13150.00 |
| THALLIUM, TOTAL | NA | NA | 12 J | 12 J | 87-GW02-01 | 1/1 | 12.00 | 12.00 |
| ZINC, TOTAL | 3 U | 3 U | 28.2 | 28.2 | 87-GW01-01 | 1/2 | 28.20 | 28.20 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
R = Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/L = micrograms per liter.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - SURFACE WATER**
**METALS AND CYANIDE**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 87-SW01-01 | 87-SW02-01 |
|---|---|---|
| DATE SAMPLED | 10/28/95 | 10/28/95 |
| **TOTAL METALS (ug/L)** | | |
| ALUMINUM, TOTAL | 488 | 375 |
| ANTIMONY, TOTAL | 54.5 | 43.2 U |
| BARIUM, TOTAL | 26.7 | 16.1 |
| CALCIUM, TOTAL | 116000 J | 116000 J |
| COPPER, TOTAL | 4.9 | 4.7 U |
| IRON, TOTAL | 326 | 269 |
| LEAD, TOTAL | 8 J | 0.8 UJ |
| MAGNESIUM, TOTAL | 332000 | 334000 |
| MANGANESE, TOTAL | 26.1 | 26.1 |
| POTASSIUM, TOTAL | 107000 | 109000 |
| SELENIUM, TOTAL | 1.3 UJ | 22 J |
| SODIUM, TOTAL | 2900000 | 3040000 |
| VANADIUM, TOTAL | 11.2 | 5.4 |
| ZINC, TOTAL | 11.7 | 9.4 |
| CYANIDE | 5 U | 53.4 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/l = micrograms per liter.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - SURFACE WATER**
**METALS AND CYANIDE**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (ug/L)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 375 | 488 | 87-SW01-01 | 2/2 | 431.50 | 431.50 |
| ANTIMONY, TOTAL | 43.2 U | 43.2 U | 54.5 | 54.5 | 87-SW01-01 | 1/2 | 54.50 | 54.50 |
| BARIUM, TOTAL | NA | NA | 16.1 | 26.7 | 87-SW01-01 | 2/2 | 21.40 | 21.40 |
| CALCIUM, TOTAL | NA | NA | 116000 J | 116000 J | 87-SW02-01 | 2/2 | 116000.00 | 116000.00 |
| COPPER, TOTAL | 4.7 U | 4.7 U | 4.9 | 4.9 | 87-SW01-01 | 1/2 | 4.90 | 4.90 |
| IRON, TOTAL | NA | NA | 269 | 326 | 87-SW01-01 | 2/2 | 297.50 | 297.50 |
| LEAD, TOTAL | 0.8 UJ | 0.8 UJ | 8 J | 8 J | 87-SW01-01 | 1/2 | 8.00 | 8.00 |
| MAGNESIUM, TOTAL | NA | NA | 332000 | 334000 | 87-SW02-01 | 2/2 | 333000.00 | 333000.00 |
| MANGANESE, TOTAL | NA | NA | 26.1 | 26.1 | 87-SW02-01 | 2/2 | 26.10 | 26.10 |
| POTASSIUM, TOTAL | NA | NA | 107000 | 109000 | 87-SW02-01 | 2/2 | 108000.00 | 108000.00 |
| SELENIUM, TOTAL | 1.3 UJ | 1.3 UJ | 22 J | 22 J | 87-SW02-01 | 1/2 | 22.00 | 22.00 |
| SODIUM, TOTAL | NA | NA | 2900000 | 3040000 | 87-SW02-01 | 2/2 | 2970000.00 | 2970000.00 |
| VANADIUM, TOTAL | NA | NA | 5.4 | 11.2 | 87-SW01-01 | 2/2 | 8.30 | 8.30 |
| ZINC, TOTAL | NA | NA | 9.4 | 11.7 | 87-SW01-01 | 2/2 | 10.55 | 10.55 |
| CYANIDE | 5 U | 5 U | 53.4 | 53.4 | 87-SW02-01 | 1/2 | 53.40 | 53.40 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.

NOTES
ug/l = micrograms per liter.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - SEDIMENT**
**ORGANIC COMPOUNDS**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 87-SD01-01 | 87-SD02-01 |
|---|---|---|
| DATE SAMPLED | 10/28/95 | 10/28/95 |
| DEPTH | 0-0.5 | 0-0.5 |
| **VOLATILES (ug/kg)** | | |
| ACETONE | 6 J | 12 U |
| **SEMIVOLATILES (ug/kg)** | | |
| FLUORANTHENE | 430 U | 24 J |
| PYRENE | 430 U | 28 J |
| BENZO(A)ANTHRACENE | 430 U | 24 J |
| CHRYSENE | 430 U | 32 J |
| BIS(2-ETHYLHEXYL)PHTHALATE | 27 J | 410 U |
| BENZO(B)FLUORANTHENE | 430 U | 25 J |
| BENZO(K)FLUORANTHENE | 430 U | 32 J |
| BENZO(A)PYRENE | 430 U | 41 J |
| INDENO(1,2,3-CD)PYRENE | 430 U | 24 J |
| BENZO(G,H,I)PERYLENE | 430 U | 32 J |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - SEDIMENT**
**ORGANIC COMPOUNDS**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **VOLATILES (ug/kg)** | | | | | | | | |
| ACETONE | 12 U | 12 U | 6 J | 6 J | 87-SD01-01 | 1/2 | 6.00 | 6.00 |
| **SEMIVOLATILES (ug/kg)** | | | | | | | | |
| FLUORANTHENE | 430 U | 430 U | 24 J | 24 J | 87-SD02-01 | 1/2 | 24.00 | 24.00 |
| PYRENE | 430 U | 430 U | 28 J | 28 J | 87-SD02-01 | 1/2 | 28.00 | 28.00 |
| BENZO(A)ANTHRACENE | 430 U | 430 U | 24 J | 24 J | 87-SD02-01 | 1/2 | 24.00 | 24.00 |
| CHRYSENE | 430 U | 430 U | 32 J | 32 J | 87-SD02-01 | 1/2 | 32.00 | 32.00 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 410 U | 410 U | 27 J | 27 J | 87-SD01-01 | 1/2 | 27.00 | 27.00 |
| BENZO(B)FLUORANTHENE | 430 U | 430 U | 25 J | 25 J | 87-SD02-01 | 1/2 | 25.00 | 25.00 |
| BENZO(K)FLUORANTHENE | 430 U | 430 U | 32 J | 32 J | 87-SD02-01 | 1/2 | 32.00 | 32.00 |
| BENZO(A)PYRENE | 430 U | 430 U | 41 J | 41 J | 87-SD02-01 | 1/2 | 41.00 | 41.00 |
| INDENO(1,2,3-CD)PYRENE | 430 U | 430 U | 24 J | 24 J | 87-SD02-01 | 1/2 | 24.00 | 24.00 |
| BENZO(G,H,I)PERYLENE | 430 U | 430 U | 32 J | 32 J | 87-SD02-01 | 1/2 | 32.00 | 32.00 |

QUALIFIER DEFINITIONS

J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
ug/kg = micrograms per kilogram.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - SEDIMENT**
**METALS AND CYANIDE**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION | 87-SD01-01 | 87-SD02-01 |
|---|---|---|
| DATE SAMPLED | 10/28/95 | 10/28/95 |
| DEPTH | 0-0.5 | 0-0.5 |
| **TOTAL METALS (mg/kg)** | | |
| ALUMINUM, TOTAL | 1030 | 1060 |
| BARIUM, TOTAL | 35 | 8.8 |
| CALCIUM, TOTAL | 133 | 514 |
| CHROMIUM, TOTAL | 2.5 U | 11.5 |
| COPPER, TOTAL | 1.2 U | 38.4 |
| IRON, TOTAL | 922 | 6040 |
| LEAD, TOTAL | 0.6 B | 6.1 |
| MAGNESIUM, TOTAL | 72.3 U | 136 |
| MANGANESE, TOTAL | 8.4 | 45.2 |
| NICKEL, TOTAL | 3.9 U | 7.2 |
| SELENIUM, TOTAL | 0.67 J | 0.44 J |
| SILVER, TOTAL | 2.1 | 1.1 U |
| SODIUM, TOTAL | 242 | 236 |
| VANADIUM, TOTAL | 2.2 | 2.5 |
| ZINC, TOTAL | 4.6 | 11 |

QUALIFIER DEFINITIONS

B = Not detected substantially above the level reported in laboratory or field blanks.
J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
mg/kg = milligrams per kilogram.

**TABLE 4 - 12**
**POSITIVE DETECTION SUMMARY - SEDIMENT**
**METALS AND CYANIDE**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY**
**CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| LOCATION<br>DATE SAMPLED<br>DEPTH | MINIMUM NONDETECTED | MAXIMUM NONDETECTED | MINIMUM DETECTED | MAXIMUM DETECTED | LOCATION OF MAXIMUM DETECTED | FREQUENCY OF DETECTION | AVERAGE OF POSITIVE DETECTIONS | MEDIAN OF POSITIVE DETECTIONS |
|---|---|---|---|---|---|---|---|---|
| **TOTAL METALS (mg/kg)** | | | | | | | | |
| ALUMINUM, TOTAL | NA | NA | 1030 | 1060 | 87-SD02-01 | 2/2 | 1045.00 | 1045.00 |
| BARIUM, TOTAL | NA | NA | 8.8 | 35 | 87-SD01-01 | 2/2 | 21.90 | 21.90 |
| CALCIUM, TOTAL | NA | NA | 133 | 514 | 87-SD02-01 | 2/2 | 323.50 | 323.50 |
| CHROMIUM, TOTAL | 2.5 U | 2.5 U | 11.5 | 11.5 | 87-SD02-01 | 1/2 | 11.50 | 11.50 |
| COPPER, TOTAL | 1.2 U | 1.2 U | 38.4 | 38.4 | 87-SD02-01 | 1/2 | 38.40 | 38.40 |
| IRON, TOTAL | NA | NA | 922 | 6040 | 87-SD02-01 | 2/2 | 3481.00 | 3481.00 |
| LEAD, TOTAL | 0.6 B | 0.6 B | 6.1 | 6.1 | 87-SD02-01 | 1/2 | 6.10 | 6.10 |
| MAGNESIUM, TOTAL | 72.3 U | 72.3 U | 136 | 136 | 87-SD02-01 | 1/2 | 136.00 | 136.00 |
| MANGANESE, TOTAL | NA | NA | 8.4 | 45.2 | 87-SD02-01 | 2/2 | 26.80 | 26.80 |
| NICKEL, TOTAL | 3.9 U | 3.9 U | 7.2 | 7.2 | 87-SD02-01 | 1/2 | 7.20 | 7.20 |
| SELENIUM, TOTAL | NA | NA | 0.44 J | 0.67 J | 87-SD01-01 | 2/2 | 0.56 | 0.56 |
| SILVER, TOTAL | 1.1 U | 1.1 U | 2.1 | 2.1 | 87-SD01-01 | 1/2 | 2.10 | 2.10 |
| SODIUM, TOTAL | NA | NA | 236 | 242 | 87-SD01-01 | 2/2 | 239.00 | 239.00 |
| VANADIUM, TOTAL | NA | NA | 2.2 | 2.5 | 87-SD02-01 | 2/2 | 2.35 | 2.35 |
| ZINC, TOTAL | NA | NA | 4.6 | 11 | 87-SD02-01 | 2/2 | 7.80 | 7.80 |

QUALIFIER DEFINITIONS

B = Not detected substantially above the level reported in laboratory or field blanks.
J = Analyte present. Reported value may not be accurate or precise.
U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

NOTES
mg/kg = milligrams per kilogram.

TABLE 4-13

SUMMARY OF SITE CONTAMINATION
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (1) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Surface Soil | Volatiles | ND | NA | NA | NA | ND | ND | ND | 0/6 | NA | NA | NA |
| | Semivolatiles | Acenaphthene | 200,000 | NA | NA | 37J | 37J | 87-SB04 | 1/6 | 0/6 | NA | NA |
| | | Fluorene | 160,000 | NA | NA | 26J | 42J | 87-SB05 | 3/6 | 0/6 | NA | NA |
| | | Phenanthrene | NE | NA | NA | 240J | 500 | 87-SB05 | 3/6 | NA | NA | NA |
| | | Anthracene | 4,300,000 | NA | NA | 52J | 110J | 87-SB05 | 3/6 | 0/6 | NA | NA |
| | | Carbazole | 500 | NA | NA | 21J | 42J | 87-SB03 | 3/6 | 0/6 | NA | NA |
| | | Di-n-butylphthalate | 120,000 | NA | NA | 370J | 370J | 87-SB04 | 1/6 | 0/6 | NA | NA |
| | | Fluoranthene | 980,000 | NA | NA | 400 | 840 | 87-SB05 | 3/6 | 0/6 | NA | NA |
| | | Pyrene | 1,400,000 | NA | NA | 330J | 660 | 87-SB05 | 3/6 | 0/6 | NA | NA |
| | | Butylbenzylphthalate | 68,000 | NA | NA | 46J | 290J | 87-SB04 | 3/6 | 0/6 | NA | NA |
| | | Benzo(a)anthracene | 700 | NA | NA | 230J | 380J | 87-SB05 | 3/6 | 0/6 | NA | NA |
| | | Chrysene | 1,000 | NA | NA | 290J | 400J | 87-SB05 | 3/6 | 0/6 | NA | NA |
| | | Bis(2-ethylhexyl)phthalate | 11,000 | NA | NA | 17J | 380 | 87-SB04 | 5/6 | 0/6 | NA | NA |
| | | Benzo(b)fluoranthene | 4,000 | NA | NA | 320J | 380J | 87-SB03 | 3/6 | 0/6 | NA | NA |
| | | Benzo(k)fluoranthene | 4,000 | NA | NA | 300J | 380J | 87-SB03 | 3/6 | 0/6 | NA | NA |
| | | Benzo(a)pyrene | 4,000 | NA | NA | 310J | 380 | 87-SB04 | 3/6 | 0/6 | NA | NA |
| | | Indeno(1,2,3-cd)pyrene | 35,000 | NA | NA | 170J | 270J | 87-SB04 | 3/6 | 0/6 | NA | NA |
| | | Dibenzo(a,h)anthracene | 11,000 | NA | NA | 46J | 100J | 87-SB04 | 3/6 | 0/6 | NA | NA |
| | | Benzo(g,h,i)perylene | NE | NA | NA | 170J | 320J | 87-SB04 | 3/6 | NA | NA | NA |
| | Pesticides | 4,4'-DDE | 500 | NA | 90.55 | 16 | 97 | 87-SB03 | 6/6 | 0/6 | NA | 1/6 |
| | | 4,4'-DDD | 700 | NA | 361.5 | 16J | 470.0 | 87-SB04 | 5/6 | 0/6 | NA | 1/6 |
| | | 4,4'-DDT | 1,000 | NA | 1,668.07 | 15 | 310 | 87-SB04 | 6/6 | 0/6 | NA | 0/6 |
| | | Alpha-Chlordane | 2,000 (4) | NA | 23.31 | 12J | 21J | 87-SB04 | 2/6 | 0/6 | NA | 0/6 |
| | | Gamma-Chlordane | 2,000 (4) | NA | 19.67 | 10J | 26 | 87-SB04 | 2/6 | 0/6 | NA | 1/6 |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/6 | NA | NA | NA |

TABLE 4-13 (CONTINUED)

SUMMARY OF SITE CONTAMINATION
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (1) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Surface Soil (Cont.) | Metals | Aluminum | 78,000 (5) | 5,856 | NA | 2,290 | 4,250 | 87-SB06 | 6/6 | 0/6 | 0/6 | NA |
| | | Arsenic | 15 | 1.3 | NA | 0.94J | 4.6J | 87-SB06 | 6/6 | 0/6 | 4/6 | NA |
| | | Barium | 32 | 17.3 | NA | 12J | 18J | 87-SB05 | 6/6 | 0/6 | 1/6 | NA |
| | | Beryllium | 180 | 0.2 | NA | 0.49 | 0.87 | 87-SB06 | 5/6 | 0/6 | 5/6 | NA |
| | | Cadmium | 6 | 0.7 | NA | 0.99 | 1.5 | 87-SB05 | 2/6 | 0/6 | 2/6 | NA |
| | | Chromium | 78,000 (5) | 6.6 | NA | 4.2J | 25.2J | 87-SB04 | 6/6 | 0/6 | 5/6 | NA |
| | | Cobalt | 4,700 (5) | 2 | NA | 0.69 | 1.5 | 87-SB04 | 6/6 | 0/6 | 0/6 | NA |
| | | Copper | 3,100 (5) | 7.1 | NA | 2.3 | 16.2 | 87-SB04 | 6/6 | 0/6 | 2/6 | NA |
| | | Iron | 23,000 (5) | 3,702 | NA | 3,050 | 6,530 | 87-SB06 | 6/6 | 0/6 | 4/6 | NA |
| | | Lead | NE | 23.4 | NA | 9.3J | 143J | 87-SB04 | 6/6 | NA | 4/6 | NA |
| | | Manganese | 1,800 (5) | 18.5 | NA | 7.7 | 25.8 | 87-SB02 | 6/6 | 0/6 | 2/6 | NA |
| | | Mercury | 3 | 0.09 | NA | 0.1 | 0.1 | 87-SB04 | 1/6 | 0/6 | 1/6 | NA |
| | | Nickel | 21 | 3.5 | NA | 8J | 19.7J | 87-SB04 | 2/6 | 0/6 | 2/6 | NA |
| | | Selenium | 3 | 0.75 | NA | 0.36 | 0.36 | 87-SB04 | 1/6 | 0/6 | 0/6 | NA |
| | | Thallium | 0.4 | 0.9 | NA | 1.8J | 1.8J | 87-SB01 | 1/6 | 1/6 | 1/6 | NA |
| | | Vanadium | 550 (5) | 11.4 | NA | 10.6 | 19.3 | 87-SB04 | 6/6 | 0/6 | 5/6 | NA |
| | | Zinc | 42,000 | 13.8 | NA | 9J | 65.7J | 87-SB04 | 5/6 | 0/6 | 4/6 | NA |

TABLE 4-13 (CONTINUED)

SUMMARY OF SITE CONTAMINATION
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (1) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Subsurface Soil (Test Pits) | Volatiles | ND | NA | NA | NA | ND | ND | ND | 0/4 | NA | NA | NA |
| | Semivolatiles | ND | NA | NA | NA | ND | ND | ND | 0/4 | NA | NA | NA |
| | Pesticides | 4,4'-DDE | 500 | NA | NA | 2.3J | 4.7J | 87-TP03 | 2/4 | 0/4 | NA | NA |
| | | 4,4'-DDD | 700 | NA | NA | 5.1J | 5.1J | 87-TP03 | 1/4 | 0/4 | NA | NA |
| | | 4,4'-DDT | 1,000 | NA | NA | 1.5NJ | 28NJ | 87-TP03 | 4/4 | 0/4 | NA | NA |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/4 | NA | NA | NA |
| | Metals | Aluminum | 78,000 (5) | 7,314 | NA | 1,450 | 2,100 | 87-TP01 | 4/4 | 0/4 | 0/4 | NA |
| | | Antimony | 31 (5) | 6.5 | NA | 3.3J | 3.3J | 87-TP04 | 1/4 | 0/4 | 0/4 | NA |
| | | Arsenic | 15 | 2.0 | NA | 0.47 | 1 | 87-TP01 | 4/4 | 0/4 | 0/4 | NA |
| | | Barium | 32 | 14.4 | NA | 24.6 | 30.4 | 87-TP03 | 4/4 | 0/4 | 4/4 | NA |
| | | Beryllium | 180 | 0.2 | NA | 0.14 | 0.14 | 87-TP01 | 1/4 | 0/4 | 0/4 | NA |
| | | Chromium | 78,000 (5) | 12.5 | NA | 3.7 | 3.7 | 87-TP04 | 1/4 | 0/4 | 0/4 | NA |
| | | Cobalt | 4,700 (5) | 1.6 | NA | 0.59 | 0.63 | 87-TP01 | 2/4 | 0/4 | 0/4 | NA |
| | | Copper | 3,100 (5) | 2.4 | NA | 0.39 | 0.58 | 87-TP03 | 2/4 | 0/4 | 0/4 | NA |
| | | Iron | 23,000 (5) | 7,135 | NA | 1,400J | 3,130J | 87-TP04 | 4/4 | 0/4 | 0/4 | NA |
| | | Lead | NE | 8.3 | NA | 1.2J | 3.2J | 87-TP04 | 4/4 | NA | 0/4 | NA |
| | | Manganese | 1,800 (5) | 8.0 | NA | 3.8 | 5.9 | 87-TP03 | 4/4 | 0/4 | 0/4 | NA |
| | | Vanadium | 550 (5) | 13.3 | NA | 3 | 5.4 | 87-TP04 | 4/4 | 0/4 | 0/4 | NA |
| | | Zinc | 42,000 | 6.7 | NA | 1.9 | 2.9 | 87-TP01 | 4/4 | 0/4 | 0/4 | NA |

TABLE 4-13 (CONTINUED)

SUMMARY OF SITE CONTAMINATION
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (6) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Groundwater | Volatiles | ND | NA | NA | NA | ND | ND | ND | 0/2 | NA | NA | NA |
| | Semivolatiles | 4-Nitrophenol | NE/NE | NA | NA | 1J | 1J | 87-GW01 | 1/2 | NA | NA | NA |
| | | Pentachlorophenol | 0.3/1 | NA | NA | 0.8J | 0.8J | 87-GW01 | 1/2 | 1/2 | NA | NA |
| | Pesticides | ND | NA | NA | NA | ND | ND | ND | 0/2 | NA | NA | NA |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/2 | NA | NA | NA |
| | Metals | Aluminum | NE/50 | NA | NA | 947 | 3,770 | 87-GW01 | 2/2 | 2/2 | NA | NA |
| | | Barium | 2,000/2,000 | NA | NA | 35.1 | 35.1 | 87-GW01 | 1/2 | 0/2 | NA | NA |
| | | Cobalt | NE/NE | NA | NA | 3.8J | 3.8J | 87-GW01 | 1/2 | NA | NA | NA |
| | | Copper | 1,000/NE | NA | NA | 18.4 | 18.4 | 87-GW02 | 1/2 | 0/2 | NA | NA |
| | | Iron | 300/300 | NA | NA | 115 | 3,130 | 87-GW02 | 2/2 | 1/2 | NA | NA |
| | | Lead | 15/NE | NA | NA | 1.1J | 1.1J | 87-GW02 | 1/2 | 0/2 | NA | NA |
| | | Manganese | 50/50 | NA | NA | 37.3 | 224.0 | 87-GW01 | 2/2 | 1/2 | NA | NA |
| | | Selenium | 50/50 | NA | NA | 1.6J | 1.6J | 87-GW02 | 1/2 | 0/2 | NA | NA |
| | | Thallium | NE/2 | NA | NA | 12J | 12J | 87-GW02 | 1/1 | 1/1 | NA | NA |
| | | Zinc | 2,100/NE | NA | NA | 28.2 | 28.2 | 87-GW01 | 1/2 | 0/2 | NA | NA |

TABLE 4-13 (CONTINUED)

SUMMARY OF SITE CONTAMINATION
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard [7] | Base Background [2] | Baseline Concs. [3] | | | | | Screening Standard | Base Background | Baseline Concs. |
| Surface Water | Volatiles | ND | NA | NA | NA | ND | ND | ND | 0/2 | NA | NA | NA |
| | Semivolatiles | ND | NA | NA | NA | ND | ND | ND | 0/2 | NA | NA | NA |
| | Pesticides | ND | NA | NA | NA | ND | ND | ND | 0/2 | NA | NA | NA |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/2 | NA | NA | NA |
| | Metals | Aluminum | NE | NA | NA | 375.0 | 488.0 | 87-SW01 | 2/2 | NA | NA | NA |
| | | Antimony | 14 [8] | NA | NA | 54.5 | 54.5 | 87-SW01 | 1/2 | 1/2 | NA | NA |
| | | Barium | 1,000 | NA | NA | 16.1 | 26.7 | 87-SW01 | 2/2 | 0/2 | NA | NA |
| | | Copper | 1300 [8] | NA | NA | 4.9 | 4.9 | 87-SW01 | 1/2 | 0/2 | NA | NA |
| | | Iron | 300 [8] | NA | NA | 269.0 | 326.0 | 87-SW01 | 2/2 | 1/2 | NA | NA |
| | | Lead | 25 [9] | NA | NA | 8J | 8J | 87-SW01 | 1/2 | 0/2 | NA | NA |
| | | Manganese | 200 | NA | NA | 26.1 | 26.1 | 87-SW02 | 2/2 | 0/2 | NA | NA |
| | | Selenium | 71 [10] | NA | NA | 22J | 22J | 87-SW02 | 1/2 | 0/2 | NA | NA |
| | | Vanadium | NE | NA | NA | 5.4 | 11.2 | 87-SW01 | 2/2 | NA | NA | NA |
| | | Zinc | 86 [9] | NA | NA | 9.4 | 11.7 | 87-SW01 | 2/2 | 0/2 | NA | NA |
| | | Cyanide | 700 [8] | NA | NA | 53.4 | 53.4 | 87-SW02 | 1/2 | 0/2 | NA | NA |

TABLE 4-13 (CONTINUED)

SUMMARY OF SITE CONTAMINATION
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Media | Fraction | Detected Contaminants or Analytes | Comparison Criteria | | | Min. | Max. | Location of Maximum Detection | Detection Frequency | Detections Above | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Screening Standard (11) | Base Background (2) | Baseline Concs. (3) | | | | | Screening Standard | Base Background | Baseline Concs. |
| Sediment | Volatiles | Acetone | NE | NA | NA | 6J | 6J | 87-SD01 | 1/2 | NA | NA | NA |
| | Semivolatiles | Fluoranthene | 600 | NA | NA | 24J | 24J | 87-SD02 | 1/2 | 0/2 | NA | NA |
| | | Pyrene | 665 | NA | NA | 28J | 28J | 87-SD02 | 1/2 | 0/2 | NA | NA |
| | | Benzo(a)anthracene | 261 | NA | NA | 24J | 24J | 87-SD02 | 1/2 | 0/2 | NA | NA |
| | | Chrysene | 384 | NA | NA | 32J | 32J | 87-SD02 | 1/2 | 0/2 | NA | NA |
| | | Bis(2-ethylhexyl)phthalate | 1,300 (12) | NA | NA | 27J | 27J | 87-SD01 | 1/2 | 0/2 | NA | NA |
| | | Benzo(b)fluoranthene | 3,200 (12) | NA | NA | 25J | 25J | 87-SD02 | 1/2 | 0/2 | NA | NA |
| | | Benzo(k)fluoranthene | NE | NA | NA | 32J | 32J | 87-SD02 | 1/2 | NA | NA | NA |
| | | Benzo(a)pyrene | 430 | NA | NA | 41J | 41J | 87-SD02 | 1/2 | 0/2 | NA | NA |
| | | Indeno(1,2,3-cd)pyrene | 600 (12) | NA | NA | 24J | 24J | 87-SD02 | 1/2 | 0/2 | NA | NA |
| | | Benzo(g,h,i)perylene | 670 (12) | NA | NA | 32J | 32J | 87-SD02 | 1/2 | 0/2 | NA | NA |
| | Pesticides | ND | NA | NA | NA | ND | ND | ND | 0/2 | NA | NA | NA |
| | PCBs | ND | NA | NA | NA | ND | ND | ND | 0/2 | NA | NA | NA |
| | Metals | Aluminum | NE | NA | NA | 1030.0 | 1060.0 | 87-SD02 | 2/2 | NA | NA | NA |
| | | Barium | NE | NA | NA | 8.8 | 35.0 | 87-SD01 | 2/2 | NA | NA | NA |
| | | Chromium | 81 | NA | NA | 11.5 | 11.5 | 87-SD02 | 1/2 | 0/2 | NA | NA |
| | | Copper | 34 | NA | NA | 38.4 | 38.4 | 87-SD02 | 1/2 | 1/2 | NA | NA |
| | | Iron | NE | NA | NA | 922.0 | 6040.0 | 87-SD02 | 2/2 | NA | NA | NA |
| | | Lead | 46.7 | NA | NA | 6.1 | 6.1 | 87-SD02 | 1/2 | 0/2 | NA | NA |
| | | Manganese | NE | NA | NA | 8.4 | 45.2 | 87-SD02 | 2/2 | NA | NA | NA |
| | | Nickel | 20.9 | NA | NA | 7.2 | 7.2 | 87-SD02 | 1/2 | 0/2 | NA | NA |
| | | Selenium | NE | NA | NA | 0.44J | 0.67J | 87-SD01 | 2/2 | NA | NA | NA |
| | | Silver | 1 | NA | NA | 2.1 | 2.1 | 87-SD01 | 1/2 | 1/2 | NA | NA |
| | | Vanadium | NE | NA | NA | 2.2 | 2.5 | 87-SD02 | 2/2 | NA | NA | NA |
| | | Zinc | 150 | NA | NA | 4.6 | 11.0 | 87-SD02 | 2/2 | 0/2 | NA | NA |

TABLE 4-13 (CONTINUED)

SUMMARY OF SITE CONTAMINATION
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-314
MCB, CAMP LEJEUNE, NORTH CAROLINA

Notes: - Concentrations are presented in µg/L for liquid and µg/kg for solids (ppb), metal concentrations for soils and sediments are presented in mg/kg (ppm).
- Calcium, magnesium, potassium, and sodium are not included in the tables

(1) - USEPA Region III Soil Screening Levels for Transfer from Soil to Groundwater (May, 1996)
(2) - Twice the Average Base Background Concentration for Metals in Soil
(3) - Surface Soil Pesticide Levels at MCB Camp Lejeune
(4) - Total Chlordane Value
(5) - USEPA Region III Risk-Based Concentrations (Residential Soil) were used because no Soil to Groundwater Screening Levels were available (May, 1996).
(6) - North Carolina Water Quality Standards for Groundwater/USEPA Maximum Contaminant Levels
(7) - North Carolina Water Quality Standards for Surface Water (Human Health Standard) unless otherwise indicated
(8) - USEPA Region IV Water Quality Standards for Surface Water (Human Health Standard)
(9) - North Carolina Water Quality Standards for Surface Water (Saltwater Aquatic Life Standard)
(10) - USEPA Region IV Water Quality Standards for Surface Water (Saltwater Aquatic Life Standard)
(11) - Long et.al., 1995 unless otherwise indicated
(12) - USEPA Region III BTAG Screening Levels

NA - Not Applicable
ND - Not Detected
NE - Not Established

# FIGURES

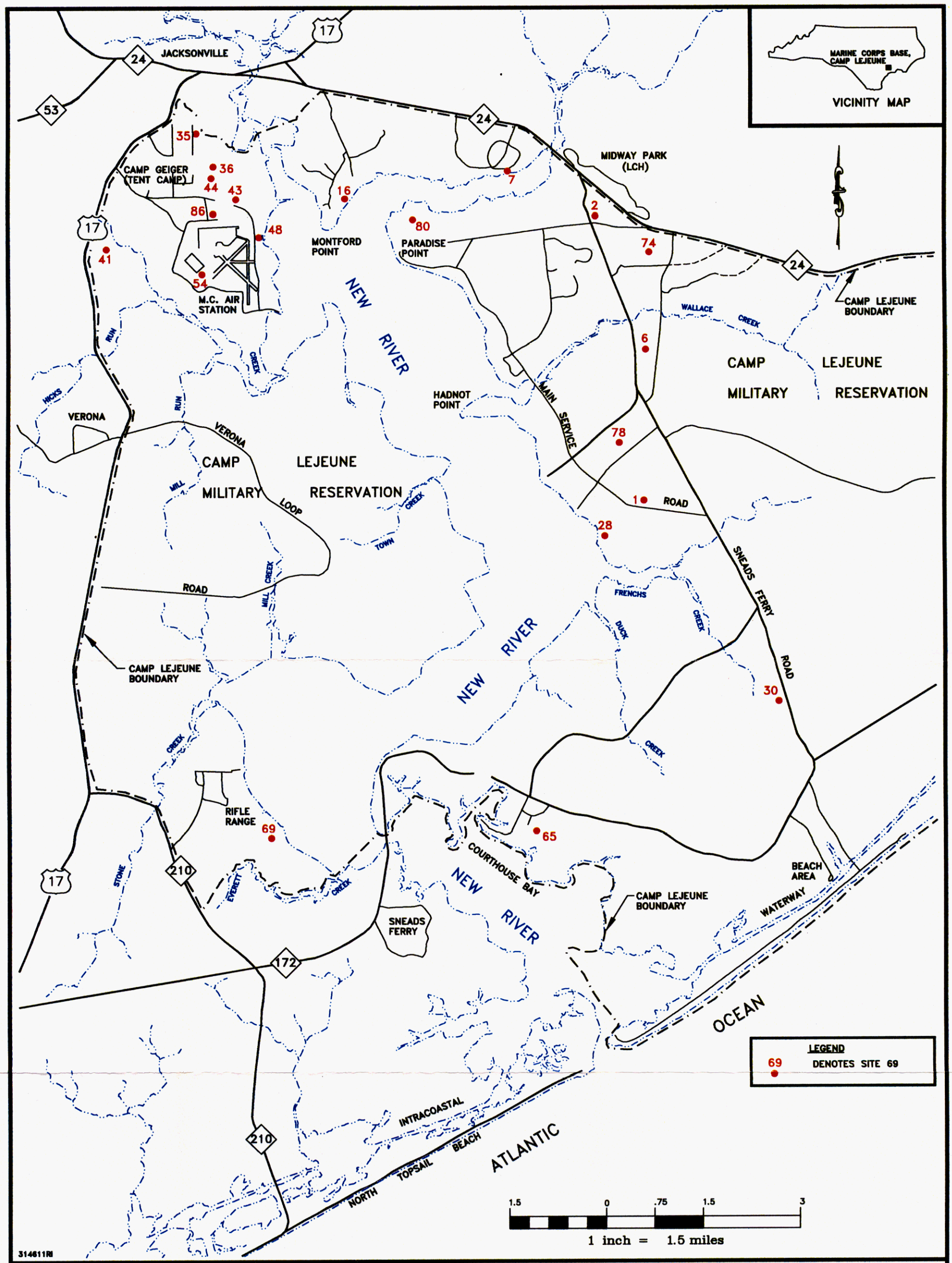
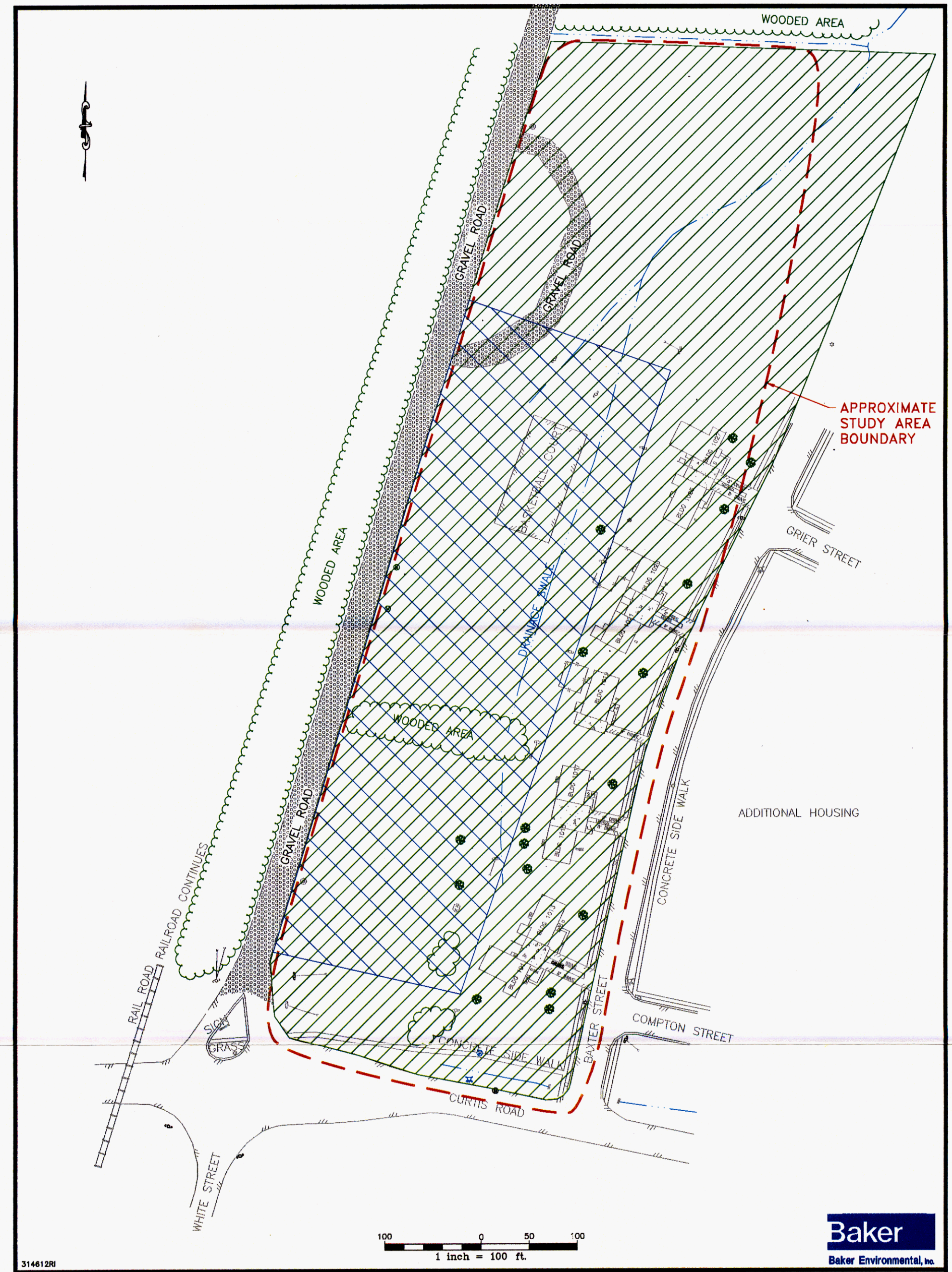



FIGURE 4-1
INSTALLATION RESTORATION PROGRAM SITES AT MARINE CORPS BASE, CAMP LEJEUNE
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

02635AB7Y



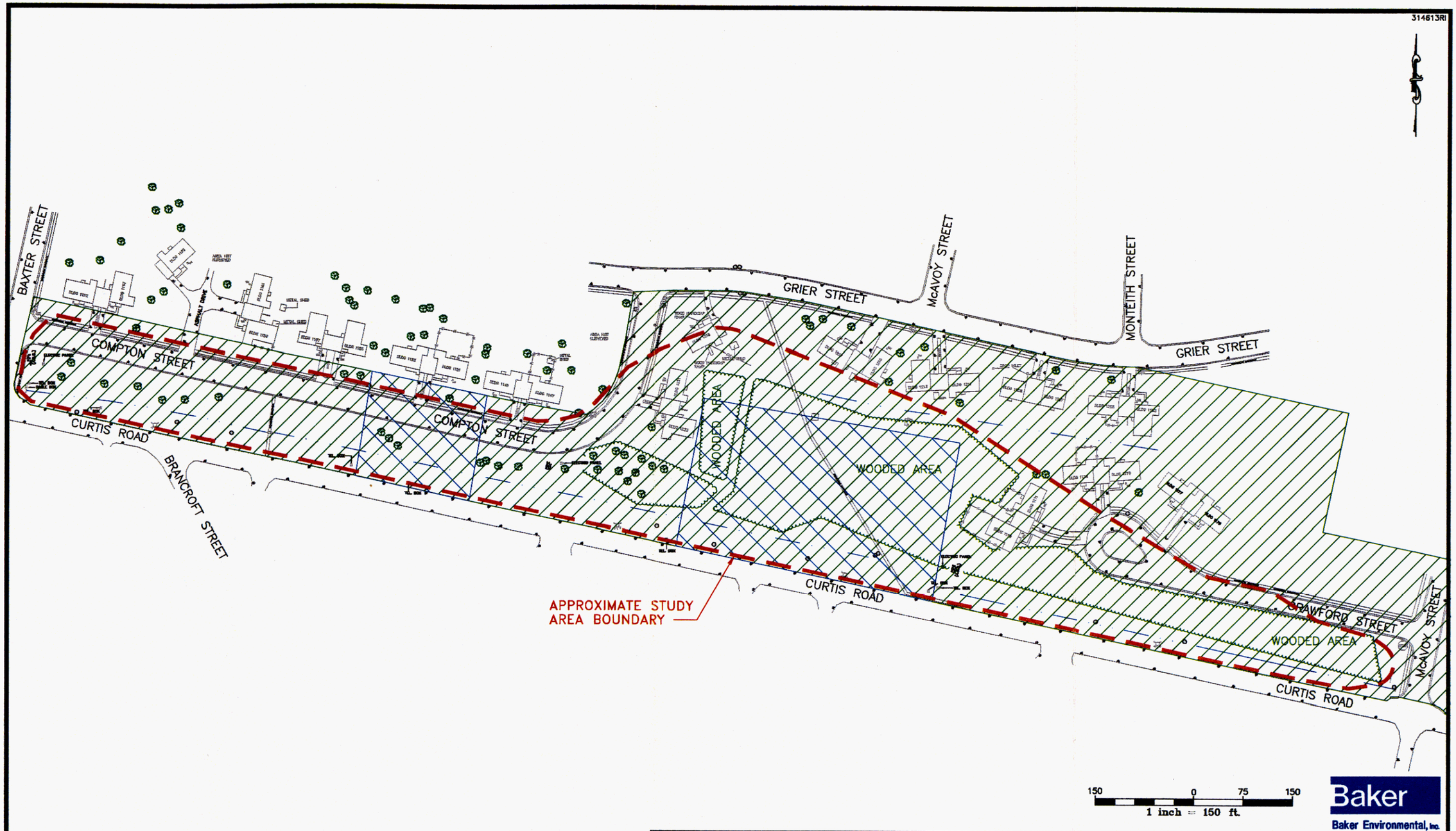

## LEGEND

- AREA OF GEOPHYSICAL SURVEY (1983)
- AREA OF GEOPHYSICAL SURVEY (1996)
- DRAINAGE SWALE
- TREE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1995.

FIGURE 4-2
AREA OF
GEOPHYSICAL SURVEY
SITE 75
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

314613RI




LEGEND

- SWALE
- TREE LINE
- TREE
- MANHOLE
- AREA OF GEOPHYSICAL SURVEY (1983)
- AREA OF GEOPHYSICAL SURVEY (1996)

SOURCE: BRENT A. LANIER R.L.S., MARCH 1996.

FIGURE 4-3
AREA OF
GEOPHYSICAL SURVEY
SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

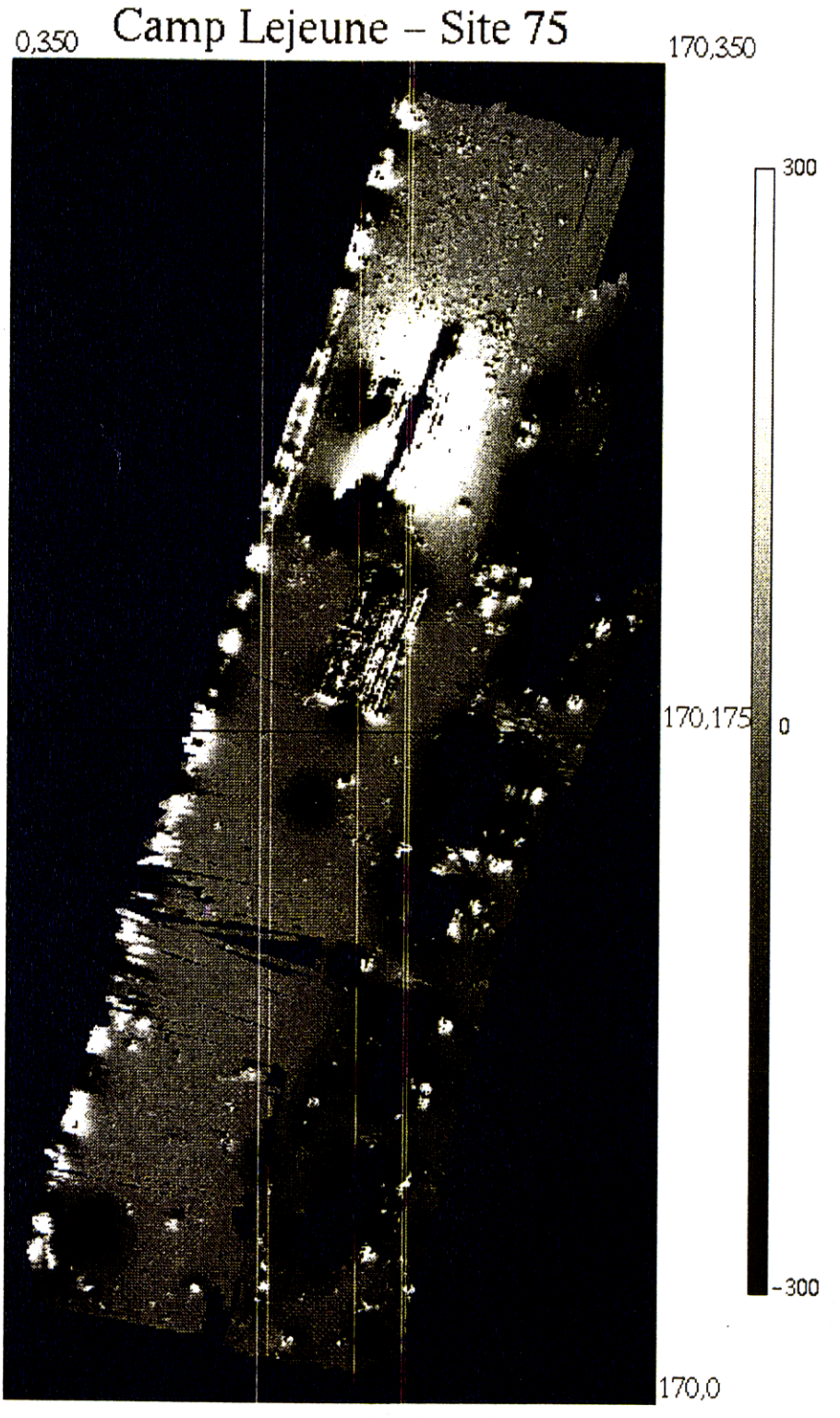
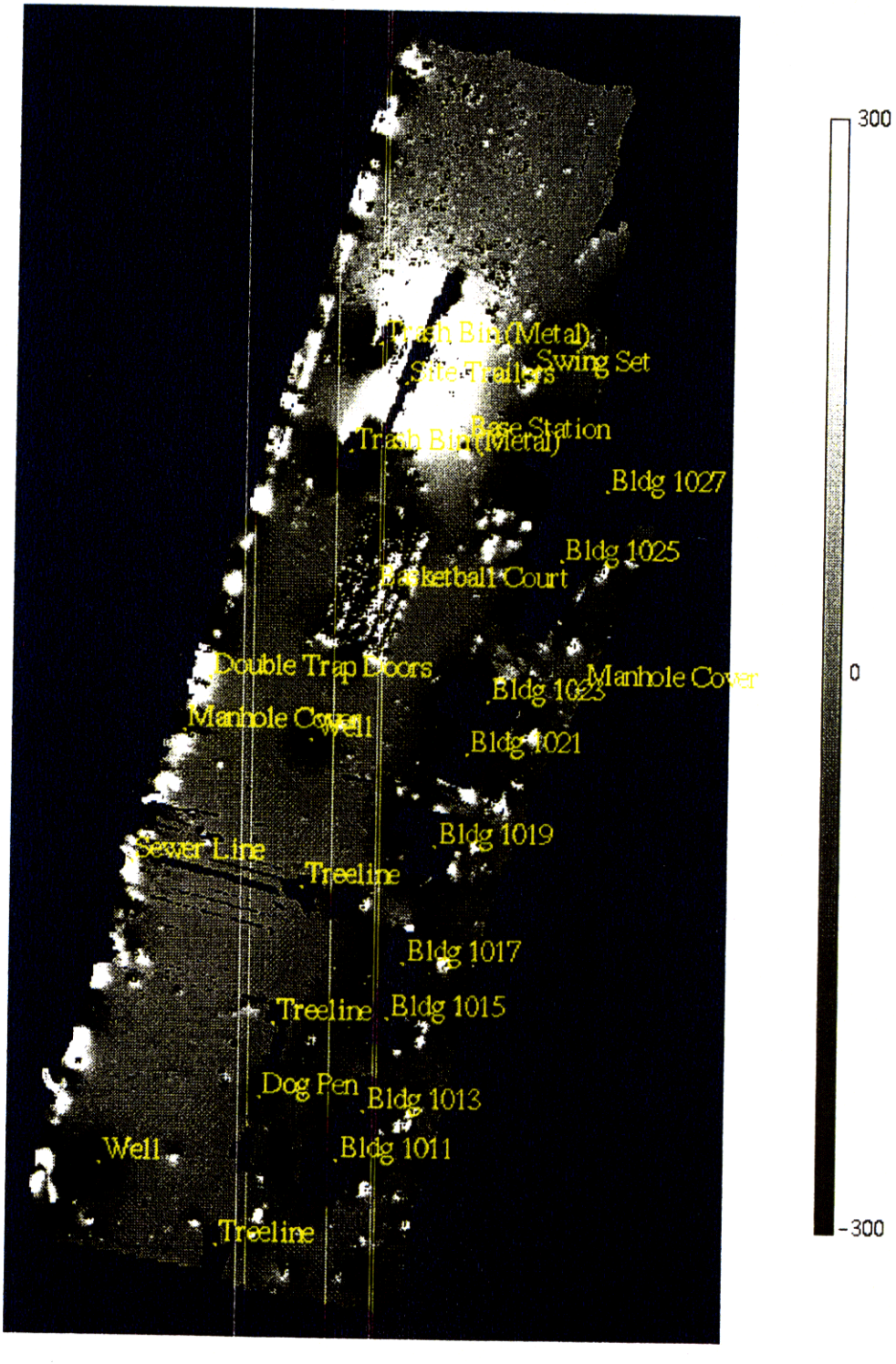



FIGURE 4-4
GEOPHYSICAL SURVEY RESULTS
SITE 75
(PHASE I)
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

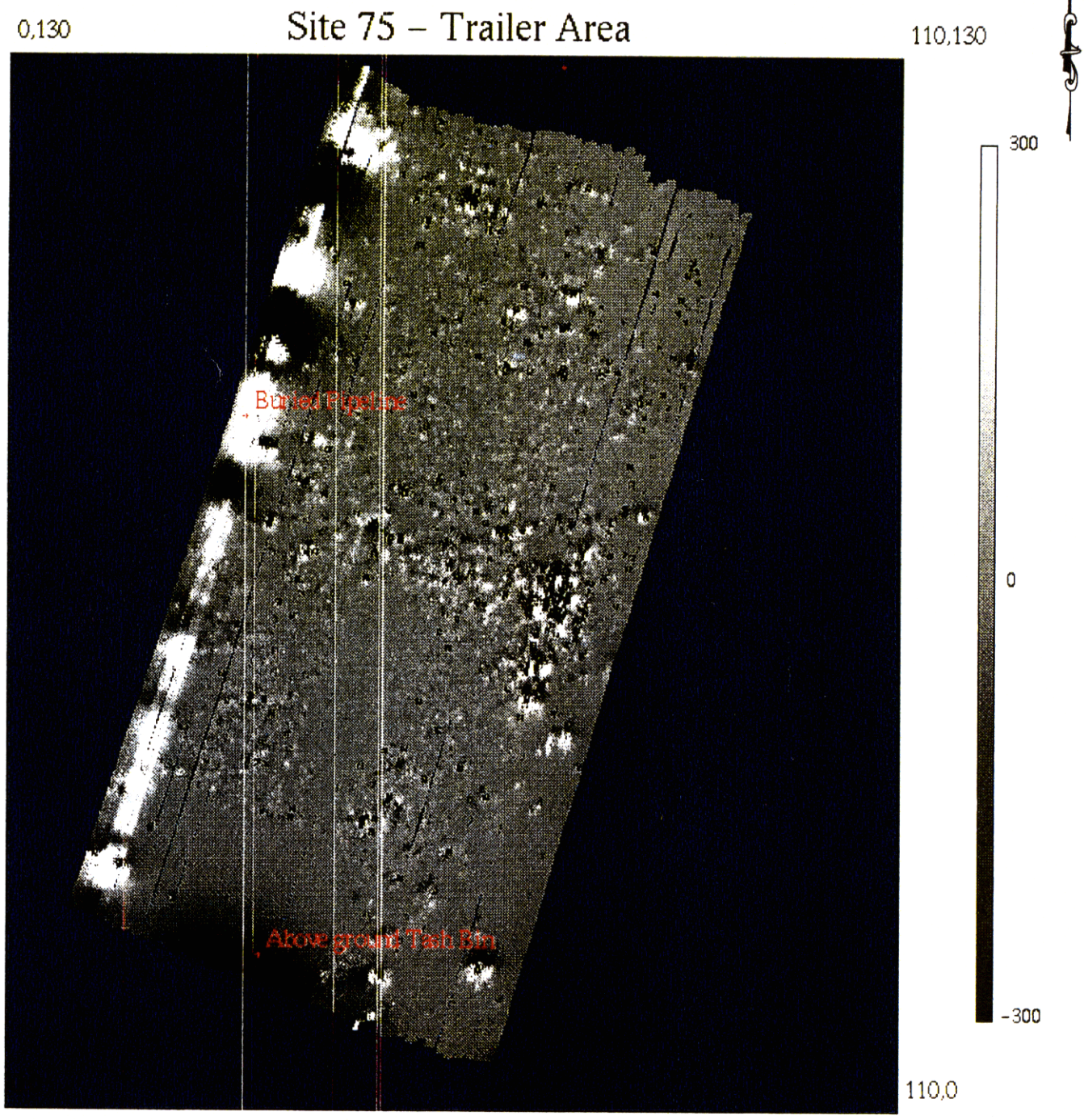
314836RI

# Camp Lejuene – Site 75




Baker
Baker Environmental, Inc.

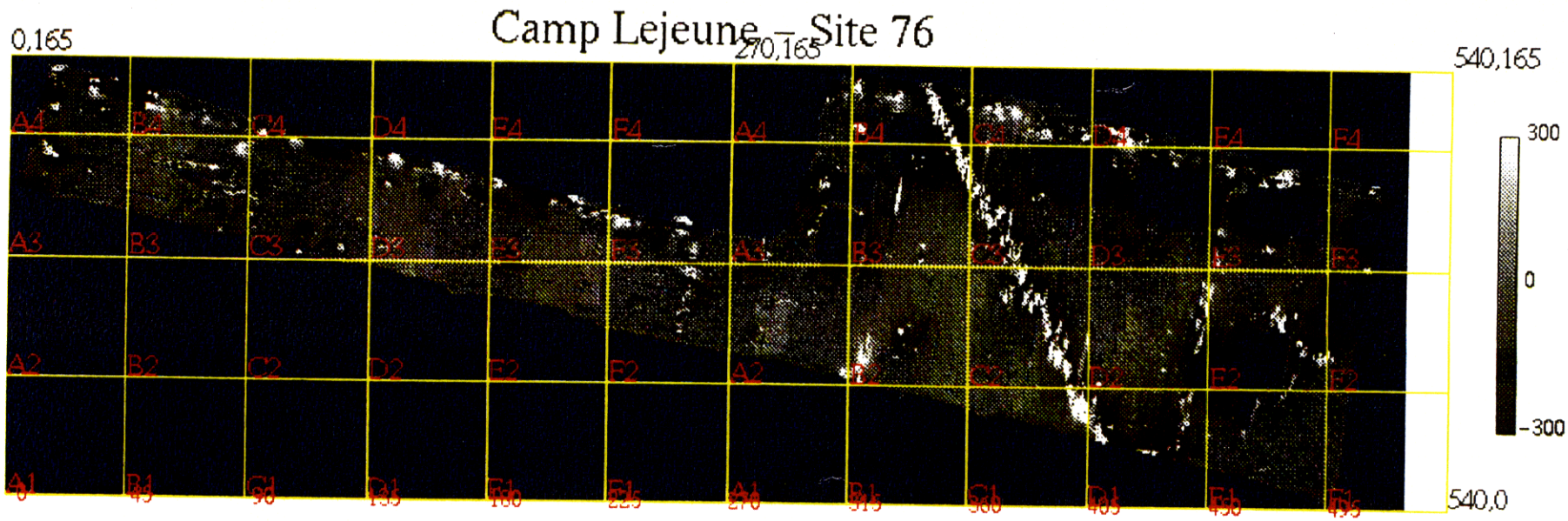
FIGURE 4–5
GEOPHYSICAL SURVEY RESULTS
SITE 75
(PHASE I)
PRE–REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA




Baker
Baker Environmental, Inc.

FIGURE 4-6
GEOPHYSICAL SURVEY RESULTS
SITE 75
(PHASE II)
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314634RI

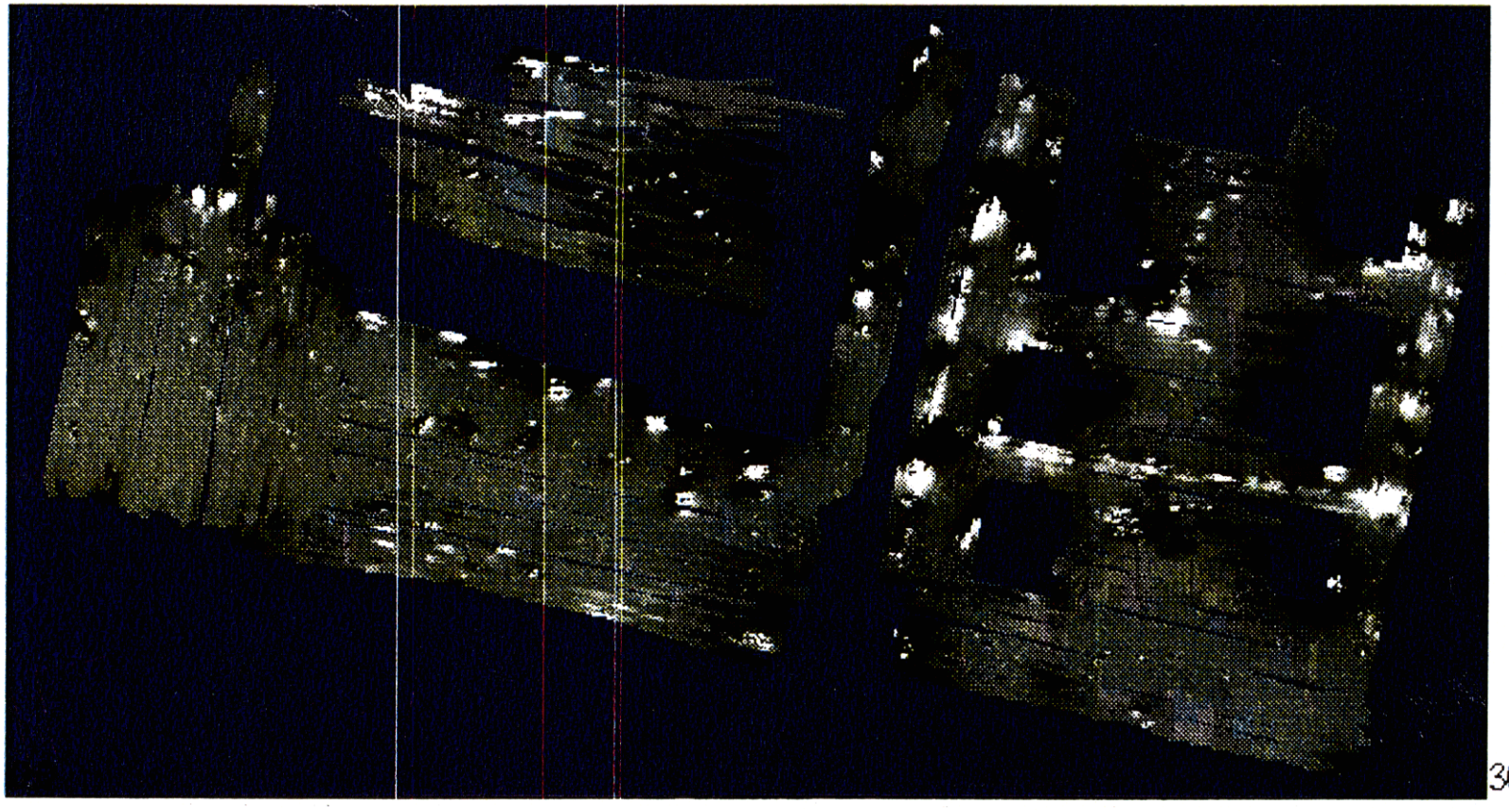



Baker
Baker Environmental, Inc.

FIGURE 4-7
GEOPHYSICAL SURVEY RESULTS
SITE 76
(PHASE I)
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314835RI

# Camp Lejeune – Site 76 East

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Baker Environmental, Inc.

FIGURE 4-8
GEOPHYSICAL SURVEY RESULTS
SITE 76
(PHASE II)
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

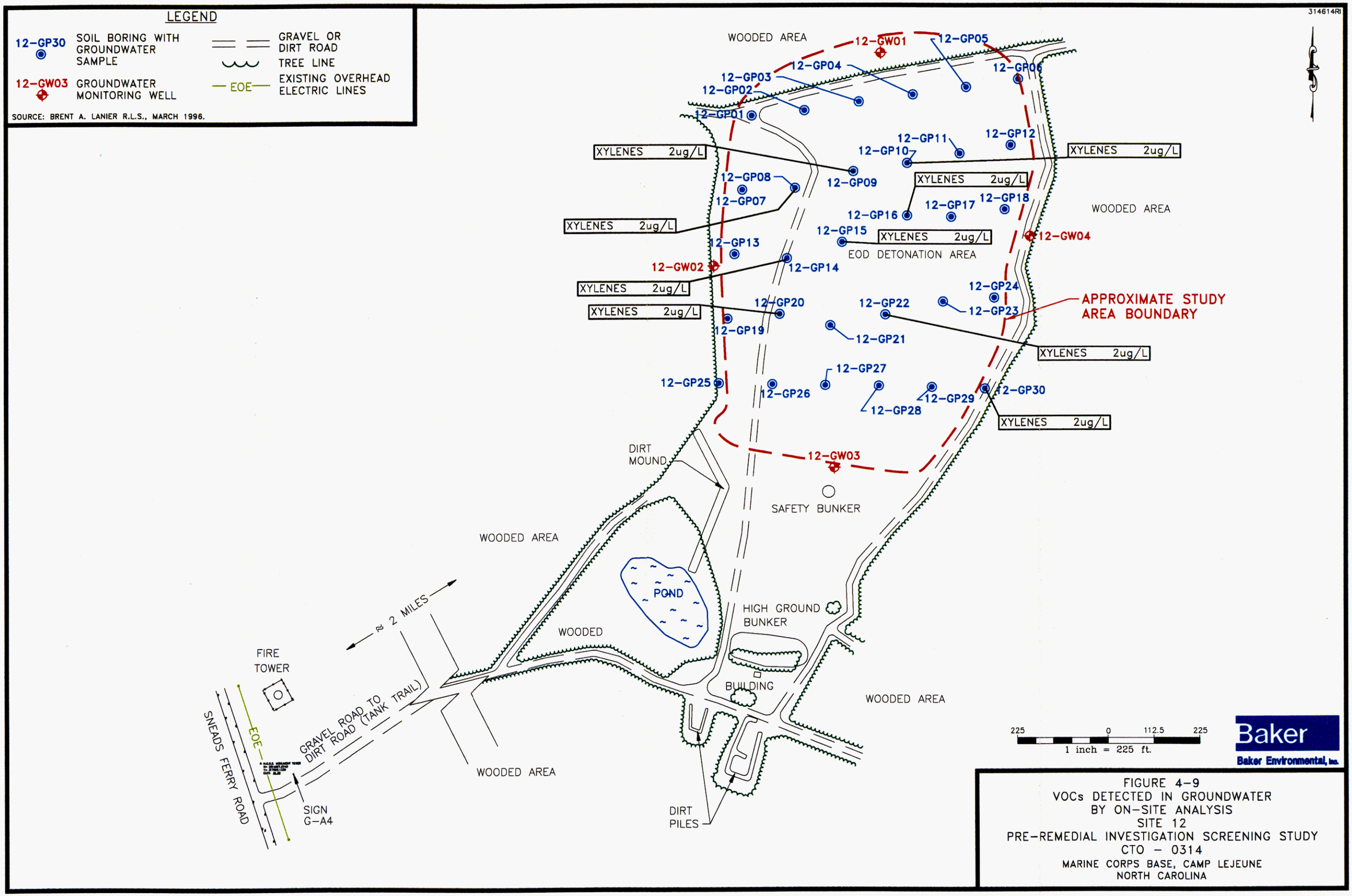
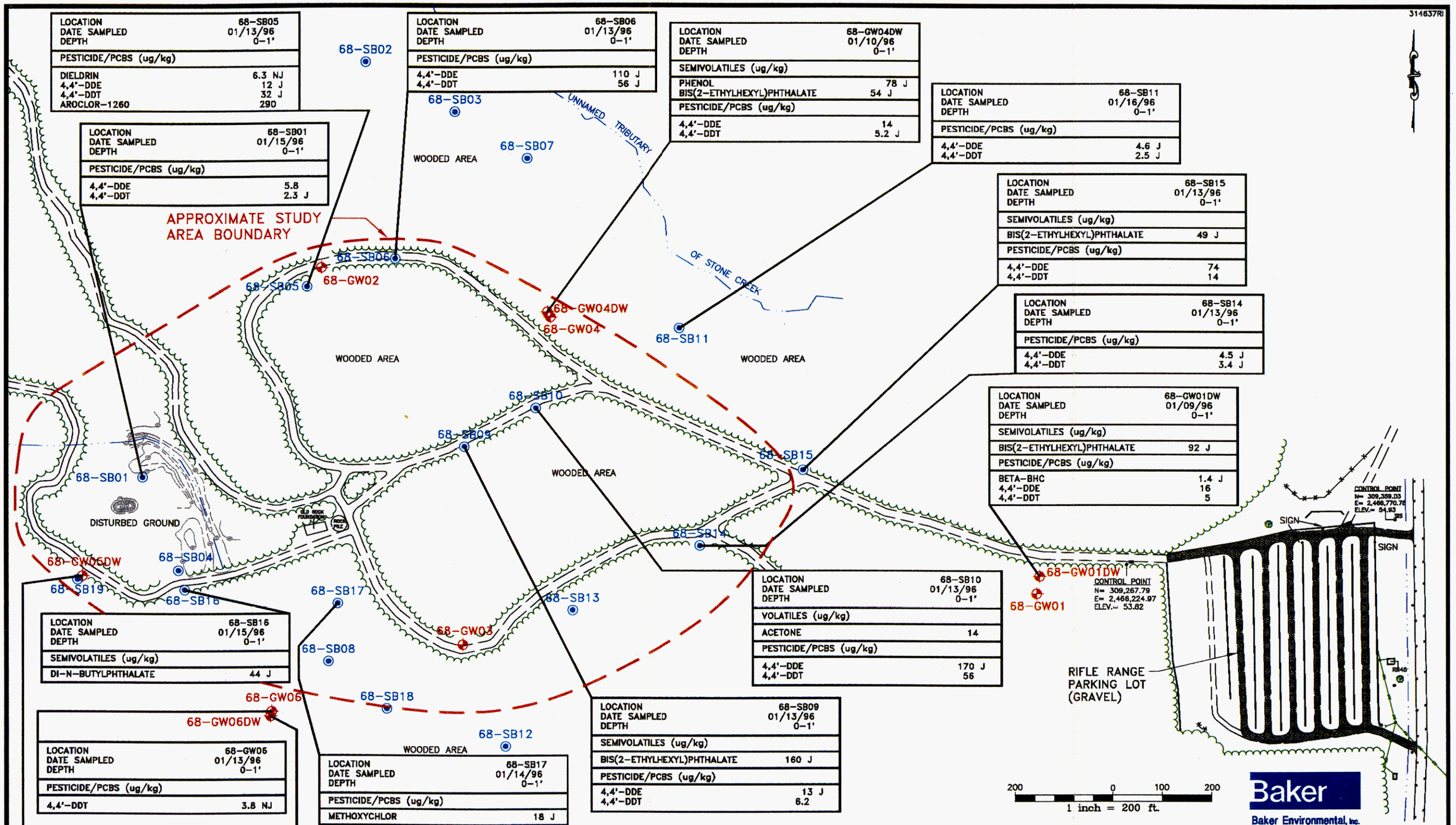



FIGURE 4-9
VOCs DETECTED IN GROUNDWATER
BY ON-SITE ANALYSIS
SITE 12
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314637RI




| LOCATION | 68-SB05 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| PESTICIDE/PCBS (ug/kg) | |
| DIELDRIN | 6.3 NJ |
| 4,4'-DDE | 12 J |
| 4,4'-DDT | 32 J |
| AROCLOR-1260 | 290 |

| LOCATION | 68-SB01 |
|---|---|
| DATE SAMPLED | 01/15/96 |
| DEPTH | 0-1' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 5.8 |
| 4,4'-DDT | 2.3 J |

| LOCATION | 68-SB06 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 110 J |
| 4,4'-DDT | 56 J |

| LOCATION | 68-GW04DW |
|---|---|
| DATE SAMPLED | 01/10/96 |
| DEPTH | 0-1' |
| SEMIVOLATILES (ug/kg) | |
| PHENOL | 78 J |
| BIS(2-ETHYLHEXYL)PHTHALATE | 54 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 14 |
| 4,4'-DDT | 5.2 J |

| LOCATION | 68-SB11 |
|---|---|
| DATE SAMPLED | 01/16/96 |
| DEPTH | 0-1' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 4.6 J |
| 4,4'-DDT | 2.5 J |

| LOCATION | 68-SB15 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 49 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 74 |
| 4,4'-DDT | 14 |

| LOCATION | 68-SB14 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 4.5 J |
| 4,4'-DDT | 3.4 J |

| LOCATION | 68-GW01DW |
|---|---|
| DATE SAMPLED | 01/09/96 |
| DEPTH | 0-1' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 92 J |
| PESTICIDE/PCBS (ug/kg) | |
| BETA-BHC | 1.4 J |
| 4,4'-DDE | 16 |
| 4,4'-DDT | 5 |

| LOCATION | 68-SB10 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| VOLATILES (ug/kg) | |
| ACETONE | 14 |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 170 J |
| 4,4'-DDT | 56 |

| LOCATION | 68-SB16 |
|---|---|
| DATE SAMPLED | 01/15/96 |
| DEPTH | 0-1' |
| SEMIVOLATILES (ug/kg) | |
| DI-N-BUTYLPHTHALATE | 44 J |

| LOCATION | 68-SB09 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 160 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 13 J |
| 4,4'-DDT | 6.2 |

| LOCATION | 68-GW06 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDT | 3.8 NJ |

| LOCATION | 68-SB17 |
|---|---|
| DATE SAMPLED | 01/14/96 |
| DEPTH | 0-1' |
| PESTICIDE/PCBS (ug/kg) | |
| METHOXYCHLOR | 18 J |

| LOCATION | 68-GW05DW |
|---|---|
| DATE SAMPLED | 01/14/96 |
| DEPTH | 0-1' |
| VOLATILES (ug/kg) | |
| ACETONE | 18 |

| LOCATION | 68-GW06DW |
|---|---|
| DATE SAMPLED | 01/12/96 |
| DEPTH | 0-1' |
| VOLATILES (ug/kg) | |
| ACETONE | 12 |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 49 |
| 4,4'-DDT | 17 |

LEGEND

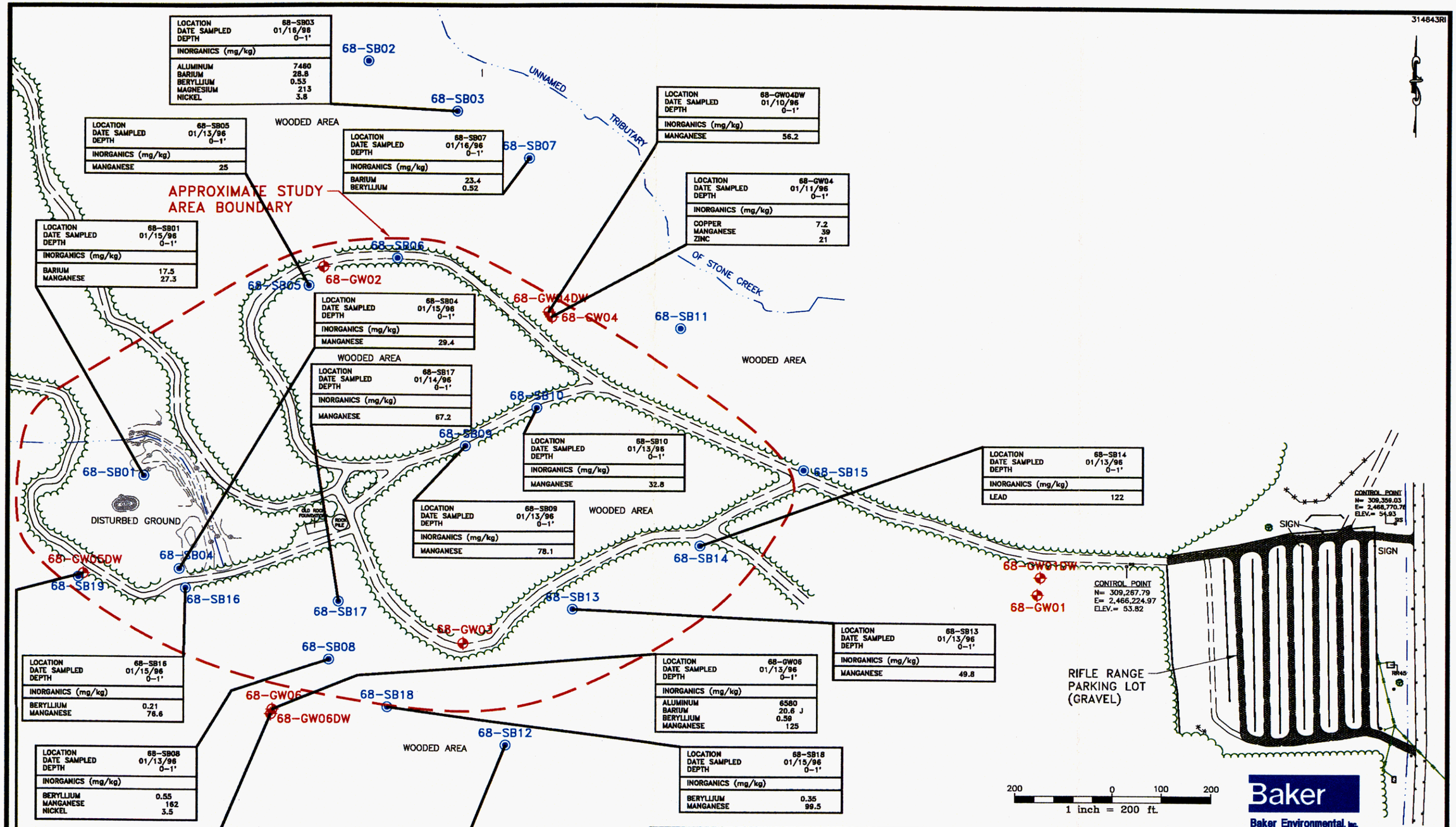
- TREE LINE
- INTERMITTENT STREAM
- DIRT OR GRAVEL ROAD
- 68-GW01DW – GROUNDWATER MONITORING WELL LOCATION
- 68-SB12 – SOIL BORING LOCATION

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 4-10
ORGANICS DETECTED IN SURFACE SOIL
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314843RI




| LOCATION | 68-SB03 |
|---|---|
| DATE SAMPLED | 01/16/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 7460 |
| BARIUM | 28.8 |
| BERYLLIUM | 0.53 |
| MAGNESIUM | 213 |
| NICKEL | 3.8 |

| LOCATION | 68-SB05 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| MANGANESE | 25 |

| LOCATION | 68-SB07 |
|---|---|
| DATE SAMPLED | 01/16/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| BARIUM | 23.4 |
| BERYLLIUM | 0.52 |

| LOCATION | 68-GW04DW |
|---|---|
| DATE SAMPLED | 01/10/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| MANGANESE | 56.2 |

| LOCATION | 68-GW04 |
|---|---|
| DATE SAMPLED | 01/11/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| COPPER | 7.2 |
| MANGANESE | 39 |
| ZINC | 21 |

| LOCATION | 68-SB01 |
|---|---|
| DATE SAMPLED | 01/15/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| BARIUM | 17.5 |
| MANGANESE | 27.3 |

| LOCATION | 68-SB04 |
|---|---|
| DATE SAMPLED | 01/15/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| MANGANESE | 29.4 |

| LOCATION | 68-SB17 |
|---|---|
| DATE SAMPLED | 01/14/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| MANGANESE | 67.2 |

| LOCATION | 68-SB10 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| MANGANESE | 32.8 |

| LOCATION | 68-SB09 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| MANGANESE | 78.1 |

| LOCATION | 68-SB14 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| LEAD | 122 |

| LOCATION | 68-SB13 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| MANGANESE | 49.8 |

| LOCATION | 68-GW06 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 6580 |
| BARIUM | 20.6 J |
| BERYLLIUM | 0.59 |
| MANGANESE | 125 |

| LOCATION | 68-SB16 |
|---|---|
| DATE SAMPLED | 01/15/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| BERYLLIUM | 0.21 |
| MANGANESE | 76.6 |

| LOCATION | 68-SB08 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| BERYLLIUM | 0.55 |
| MANGANESE | 162 |
| NICKEL | 3.5 |

| LOCATION | 68-SB18 |
|---|---|
| DATE SAMPLED | 01/15/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| BERYLLIUM | 0.35 |
| MANGANESE | 99.5 |

| LOCATION | 68-GW05DW |
|---|---|
| DATE SAMPLED | 01/14/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 6610 |
| BARIUM | 26.4 J |
| BERYLLIUM | 0.57 |
| MAGNESIUM | 204 |
| MANGANESE | 26 |

| LOCATION | 68-GW06DW |
|---|---|
| DATE SAMPLED | 01/12/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 7250 |
| BARIUM | 24.1 J |
| BERYLLIUM | 0.45 |
| MANGANESE | 147 |

| LOCATION | 68-SB12 |
|---|---|
| DATE SAMPLED | 01/15/96 |
| DEPTH | 0-1' |
| INORGANICS (mg/kg) | |
| BARIUM | 20.3 |
| BERYLLIUM | 0.21 |
| MANGANESE | 67.2 |

## LEGEND

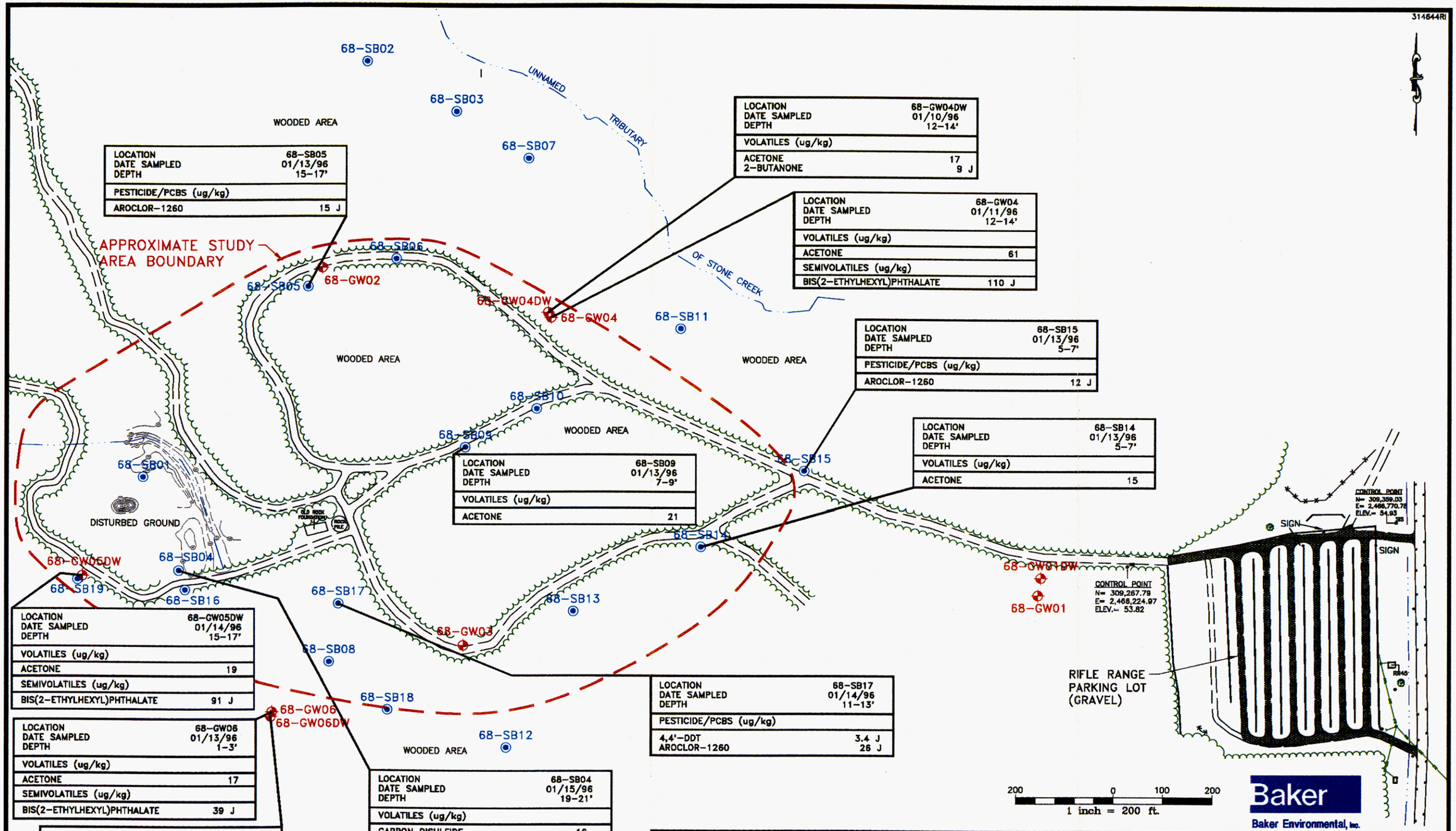
- TREE LINE
- INTERMITTENT STREAM
- DIRT OR GRAVEL ROAD
- 68-GW01DW – GROUNDWATER MONITORING WELL LOCATION
- 68-SB12 – SOIL BORING LOCATION

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 4-11
METALS DETECTED IN SURFACE SOIL
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314644RI




| LOCATION | 68-SB05 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 15-17' |
| PESTICIDE/PCBS (ug/kg) | |
| AROCLOR-1260 | 15 J |

| LOCATION | 68-GW04DW |
|---|---|
| DATE SAMPLED | 01/10/96 |
| DEPTH | 12-14' |
| VOLATILES (ug/kg) | |
| ACETONE | 17 |
| 2-BUTANONE | 9 J |

| LOCATION | 68-GW04 |
|---|---|
| DATE SAMPLED | 01/11/96 |
| DEPTH | 12-14' |
| VOLATILES (ug/kg) | |
| ACETONE | 61 |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 110 J |

| LOCATION | 68-SB15 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 5-7' |
| PESTICIDE/PCBS (ug/kg) | |
| AROCLOR-1260 | 12 J |

| LOCATION | 68-SB14 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 5-7' |
| VOLATILES (ug/kg) | |
| ACETONE | 15 |

| LOCATION | 68-SB09 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 7-9' |
| VOLATILES (ug/kg) | |
| ACETONE | 21 |

| LOCATION | 68-GW05DW |
|---|---|
| DATE SAMPLED | 01/14/96 |
| DEPTH | 15-17' |
| VOLATILES (ug/kg) | |
| ACETONE | 19 |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 91 J |

| LOCATION | 68-GW06 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 1-3' |
| VOLATILES (ug/kg) | |
| ACETONE | 17 |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 39 J |

| LOCATION | 68-GW06DW |
|---|---|
| DATE SAMPLED | 01/12/96 |
| DEPTH | 3-5' |
| VOLATILES (ug/kg) | |
| ACETONE | 150 |
| SEMIVOLATILES (ug/kg) | |
| PYRENE | 48 J |
| BIS(2-ETHYLHEXYL)PHTHALATE | 100 J |

| LOCATION | 68-SB04 |
|---|---|
| DATE SAMPLED | 01/15/96 |
| DEPTH | 19-21' |
| VOLATILES (ug/kg) | |
| CARBON DISULFIDE | 16 |

| LOCATION | 68-SB17 |
|---|---|
| DATE SAMPLED | 01/14/96 |
| DEPTH | 11-13' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDT | 3.4 J |
| AROCLOR-1260 | 26 J |

## LEGEND

- TREE LINE
- INTERMITTENT STREAM
- DIRT OR GRAVEL ROAD
- 68-GW01DW – GROUNDWATER MONITORING WELL LOCATION
- 68-SB12 – SOIL BORING LOCATION

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 4-12
ORGANICS DETECTED IN SUBSURFACE SOIL
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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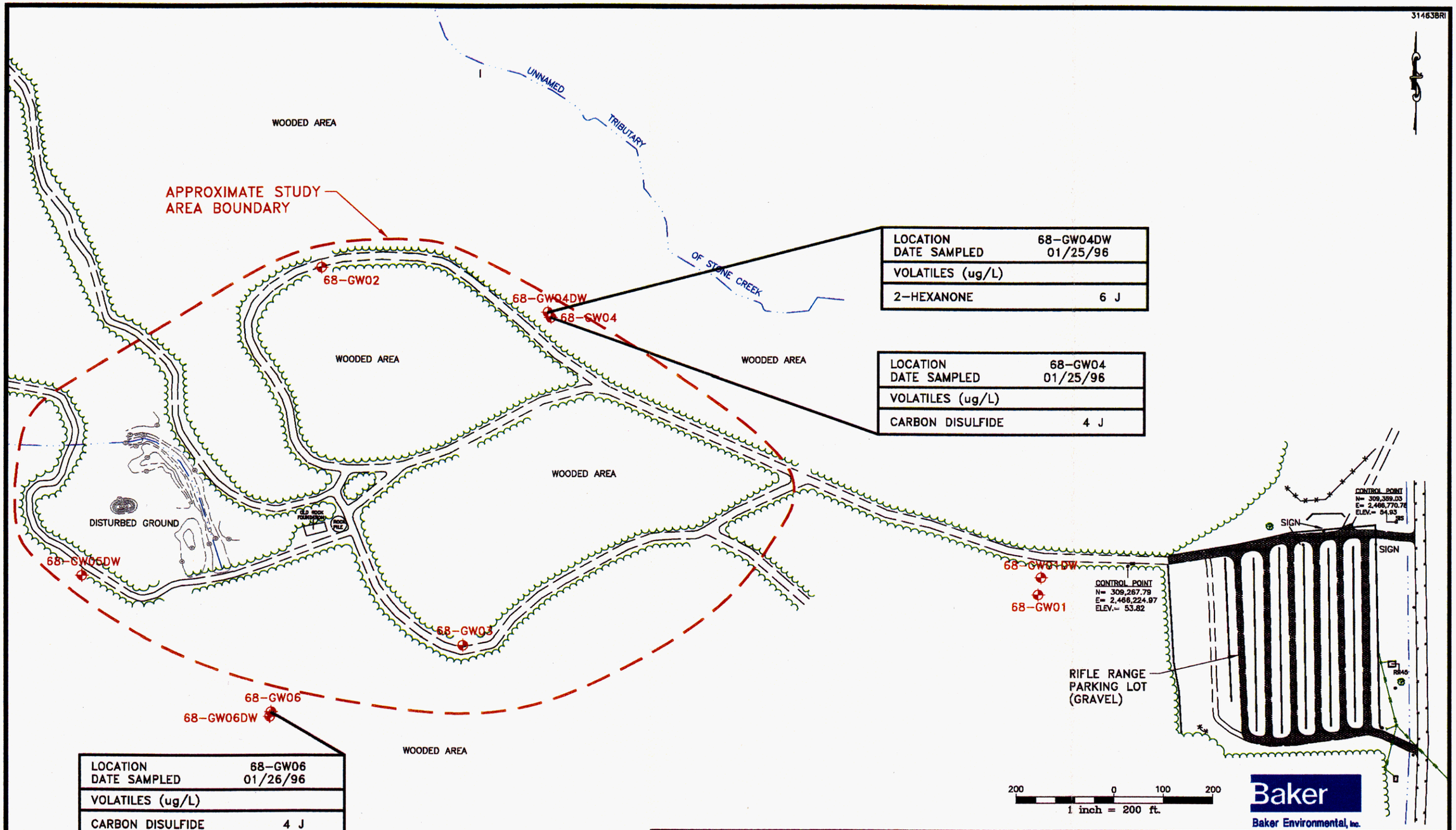


| LOCATION | 68-GW04DW |
|---|---|
| DATE SAMPLED | 01/25/96 |
| VOLATILES (ug/L) | |
| 2-HEXANONE | 6 J |

| LOCATION | 68-GW04 |
|---|---|
| DATE SAMPLED | 01/25/96 |
| VOLATILES (ug/L) | |
| CARBON DISULFIDE | 4 J |

| LOCATION | 68-GW06 |
|---|---|
| DATE SAMPLED | 01/26/96 |
| VOLATILES (ug/L) | |
| CARBON DISULFIDE | 4 J |

LEGEND

- TREE LINE
- INTERMITTENT STREAM
- DIRT OR GRAVEL ROAD
- 68-GW01DW – GROUNDWATER MONITORING WELL LOCATION

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 4-13
ORGANICS DETECTED IN GROUNDWATER
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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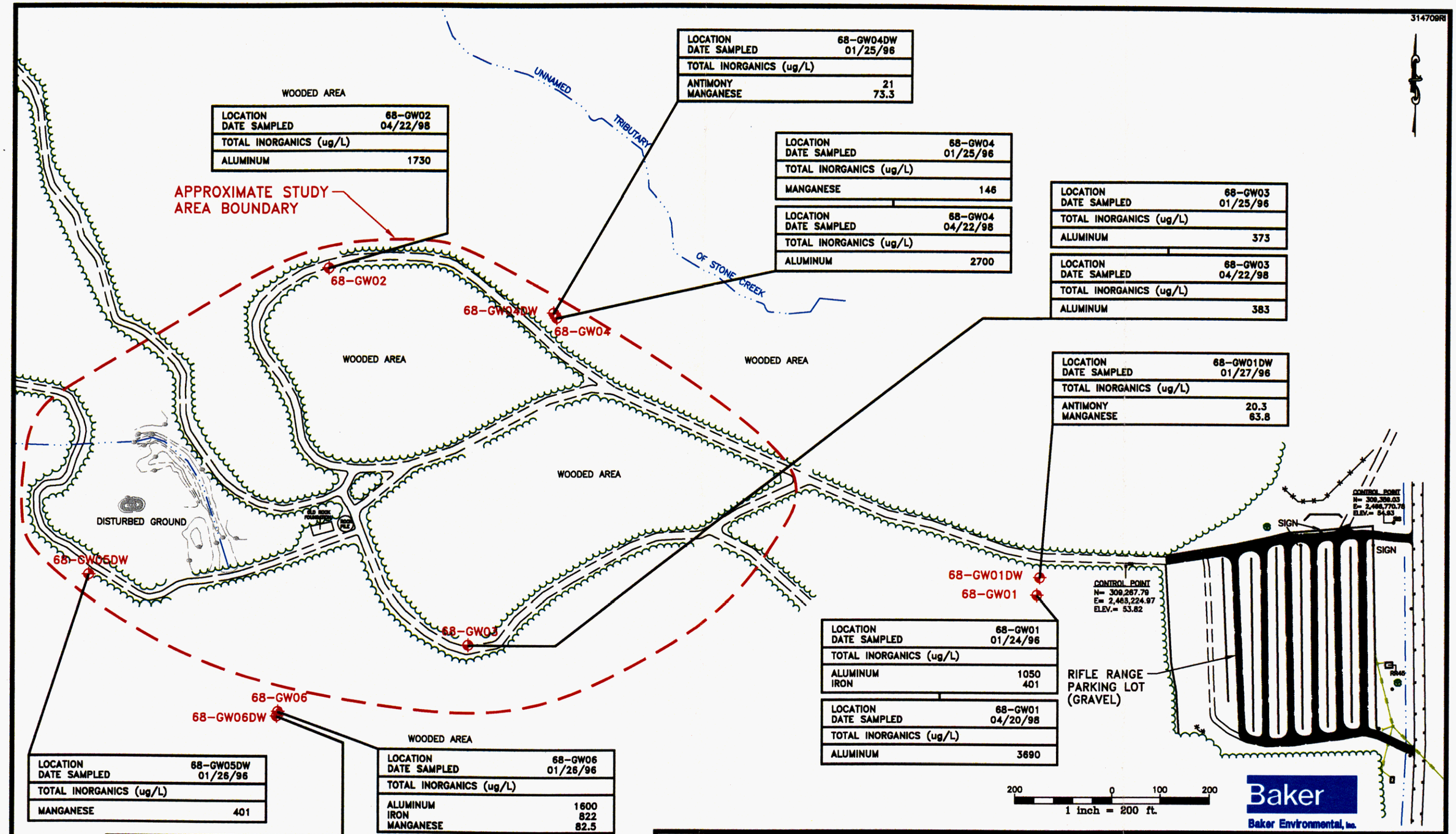


| LOCATION | 68-GW02 |
|---|---|
| DATE SAMPLED | 04/22/98 |
| TOTAL INORGANICS (ug/L) | |
| ALUMINUM | 1730 |

| LOCATION | 68-GW04DW |
|---|---|
| DATE SAMPLED | 01/25/96 |
| TOTAL INORGANICS (ug/L) | |
| ANTIMONY | 21 |
| MANGANESE | 73.3 |

| LOCATION | 68-GW04 |
|---|---|
| DATE SAMPLED | 01/25/96 |
| TOTAL INORGANICS (ug/L) | |
| MANGANESE | 146 |

| LOCATION | 68-GW04 |
|---|---|
| DATE SAMPLED | 04/22/98 |
| TOTAL INORGANICS (ug/L) | |
| ALUMINUM | 2700 |

| LOCATION | 68-GW03 |
|---|---|
| DATE SAMPLED | 01/25/96 |
| TOTAL INORGANICS (ug/L) | |
| ALUMINUM | 373 |

| LOCATION | 68-GW03 |
|---|---|
| DATE SAMPLED | 04/22/98 |
| TOTAL INORGANICS (ug/L) | |
| ALUMINUM | 383 |

| LOCATION | 68-GW01DW |
|---|---|
| DATE SAMPLED | 01/27/96 |
| TOTAL INORGANICS (ug/L) | |
| ANTIMONY | 20.3 |
| MANGANESE | 63.8 |

| LOCATION | 68-GW01 |
|---|---|
| DATE SAMPLED | 01/24/96 |
| TOTAL INORGANICS (ug/L) | |
| ALUMINUM | 1050 |
| IRON | 401 |

| LOCATION | 68-GW01 |
|---|---|
| DATE SAMPLED | 04/20/98 |
| TOTAL INORGANICS (ug/L) | |
| ALUMINUM | 3690 |

| LOCATION | 68-GW05DW |
|---|---|
| DATE SAMPLED | 01/26/96 |
| TOTAL INORGANICS (ug/L) | |
| MANGANESE | 401 |

| LOCATION | 68-GW06DW |
|---|---|
| DATE SAMPLED | 01/26/96 |
| TOTAL INORGANICS (ug/L) | |
| MANGANESE | 73.6 |

| LOCATION | 68-GW06 |
|---|---|
| DATE SAMPLED | 01/26/96 |
| TOTAL INORGANICS (ug/L) | |
| ALUMINUM | 1600 |
| IRON | 822 |
| MANGANESE | 82.5 |

| LOCATION | 68-GW06 |
|---|---|
| DATE SAMPLED | 04/22/98 |
| TOTAL INORGANICS (ug/L) | |
| ALUMINUM | 186 J |

LEGEND

- TREE LINE
- INTERMITTENT STREAM
- DIRT OR GRAVEL ROAD
- 68-GW01DW – GROUNDWATER MONITORING WELL LOCATION

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 4-14
METALS DETECTED IN GROUNDWATER
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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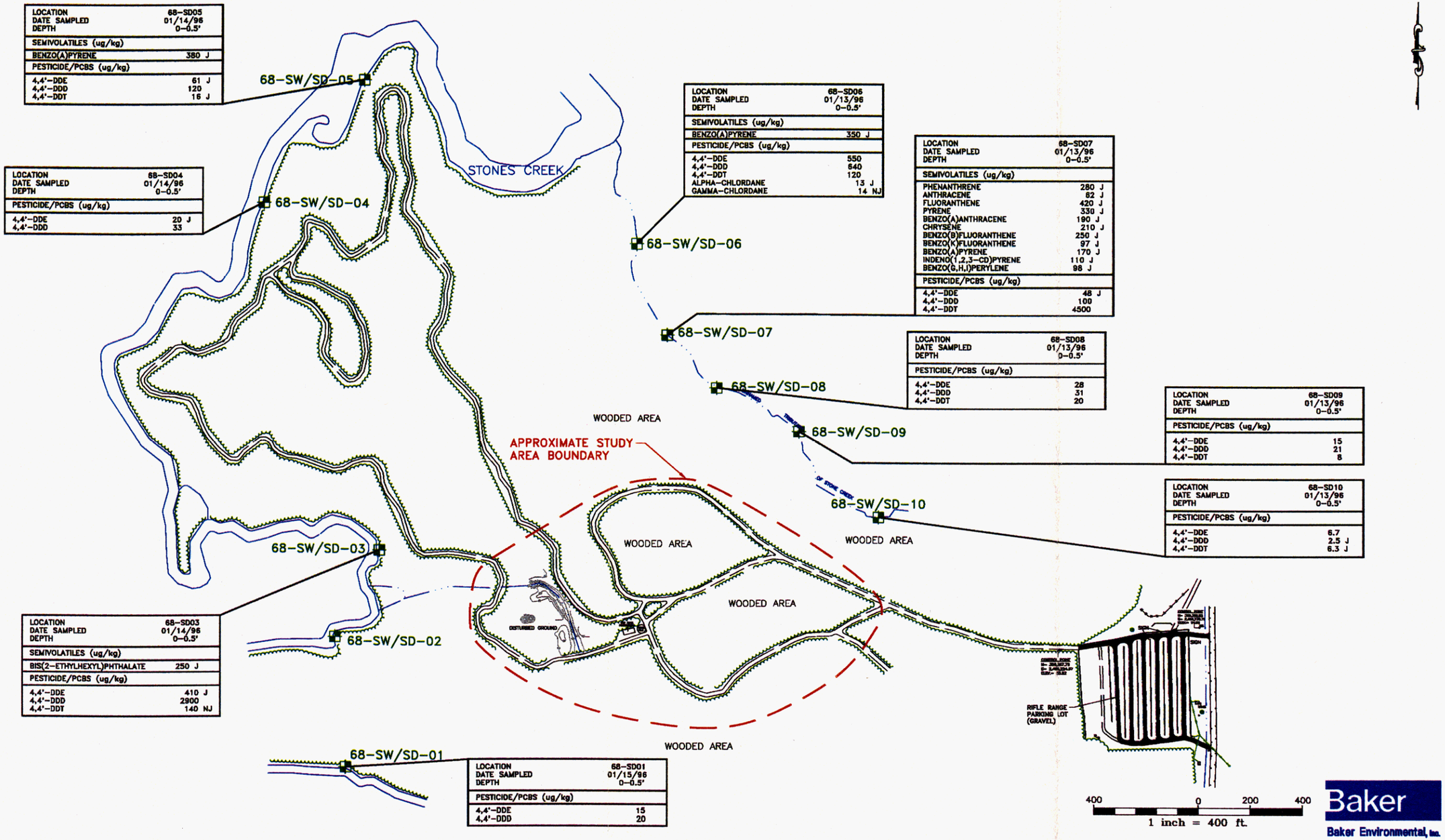


| LOCATION | 68-SD05 |
|---|---|
| DATE SAMPLED | 01/14/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| BENZO(A)PYRENE | 380 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 61 J |
| 4,4'-DDD | 120 |
| 4,4'-DDT | 16 J |

| LOCATION | 68-SD04 |
|---|---|
| DATE SAMPLED | 01/14/96 |
| DEPTH | 0-0.5' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 20 J |
| 4,4'-DDD | 33 |

| LOCATION | 68-SD06 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| BENZO(A)PYRENE | 350 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 550 |
| 4,4'-DDD | 640 |
| 4,4'-DDT | 120 |
| ALPHA-CHLORDANE | 13 J |
| GAMMA-CHLORDANE | 14 NJ |

| LOCATION | 68-SD07 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| PHENANTHRENE | 280 J |
| ANTHRACENE | 62 J |
| FLUORANTHENE | 420 J |
| PYRENE | 330 J |
| BENZO(A)ANTHRACENE | 190 J |
| CHRYSENE | 210 J |
| BENZO(B)FLUORANTHENE | 250 J |
| BENZO(K)FLUORANTHENE | 97 J |
| BENZO(A)PYRENE | 170 J |
| INDENO(1,2,3-CD)PYRENE | 110 J |
| BENZO(G,H,I)PERYLENE | 98 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 48 J |
| 4,4'-DDD | 100 |
| 4,4'-DDT | 4500 |

| LOCATION | 68-SD08 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-0.5' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 28 |
| 4,4'-DDD | 31 |
| 4,4'-DDT | 20 |

| LOCATION | 68-SD09 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-0.5' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 15 |
| 4,4'-DDD | 21 |
| 4,4'-DDT | 8 |

| LOCATION | 68-SD10 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-0.5' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 6.7 |
| 4,4'-DDD | 2.5 J |
| 4,4'-DDT | 6.3 J |

| LOCATION | 68-SD03 |
|---|---|
| DATE SAMPLED | 01/14/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 250 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 410 J |
| 4,4'-DDD | 2900 |
| 4,4'-DDT | 140 NJ |

| LOCATION | 68-SD01 |
|---|---|
| DATE SAMPLED | 01/15/96 |
| DEPTH | 0-0.5' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 15 |
| 4,4'-DDD | 20 |

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Baker Environmental, Inc.

## LEGEND

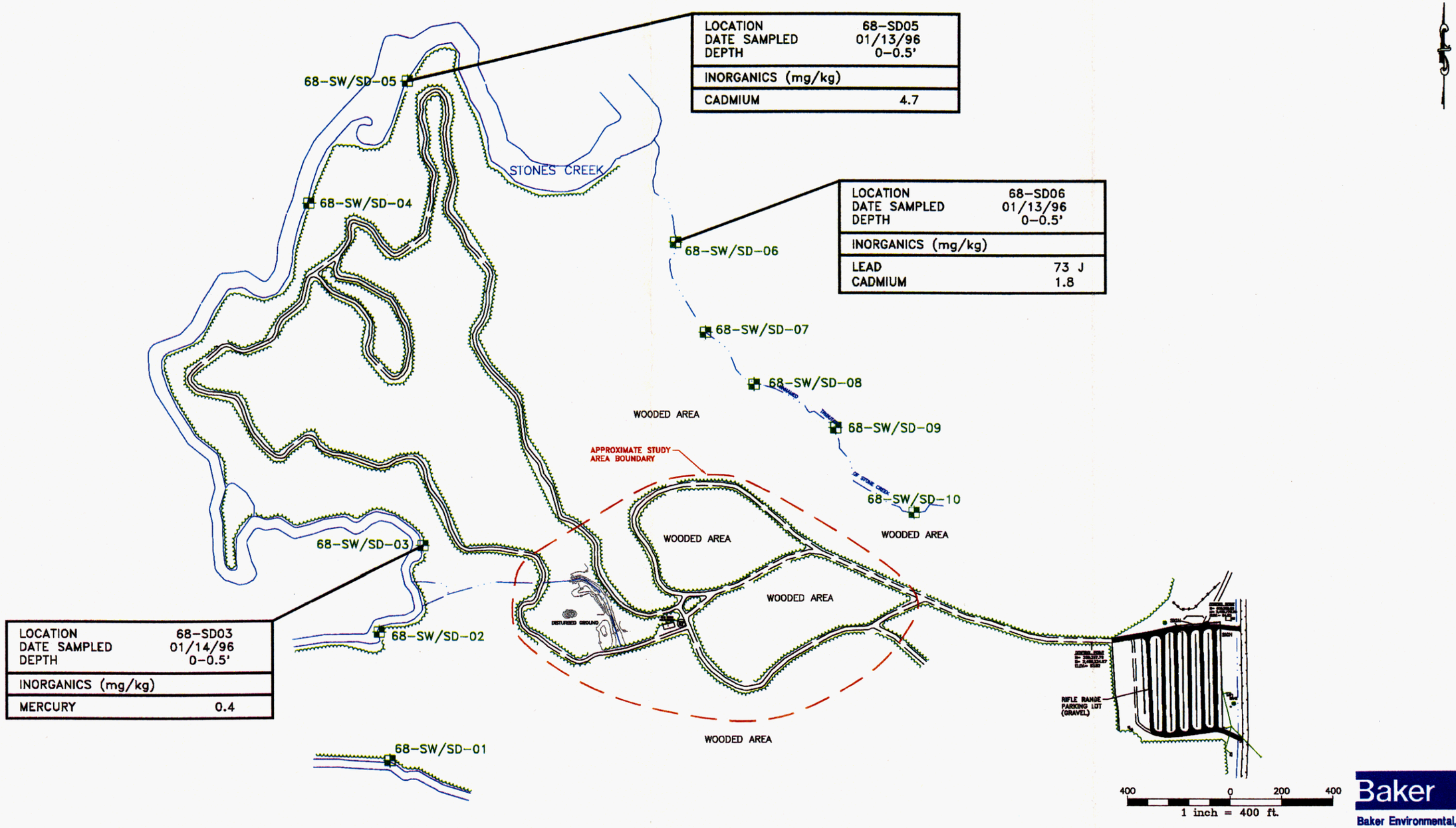
68-SW/SD-04 – SURFACE WATER AND SEDIMENT SAMPLE STATION
– TREE LINE
– INTERMITTENT STREAM
– DIRT OR GRAVEL ROAD

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 4-15
ORGANICS DETECTED IN SEDIMENTS
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314642RI




| LOCATION | 68-SD05 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| CADMIUM | 4.7 |

| LOCATION | 68-SD06 |
|---|---|
| DATE SAMPLED | 01/13/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| LEAD | 73 J |
| CADMIUM | 1.8 |

| LOCATION | 68-SD03 |
|---|---|
| DATE SAMPLED | 01/14/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| MERCURY | 0.4 |

Baker
Baker Environmental, Inc.

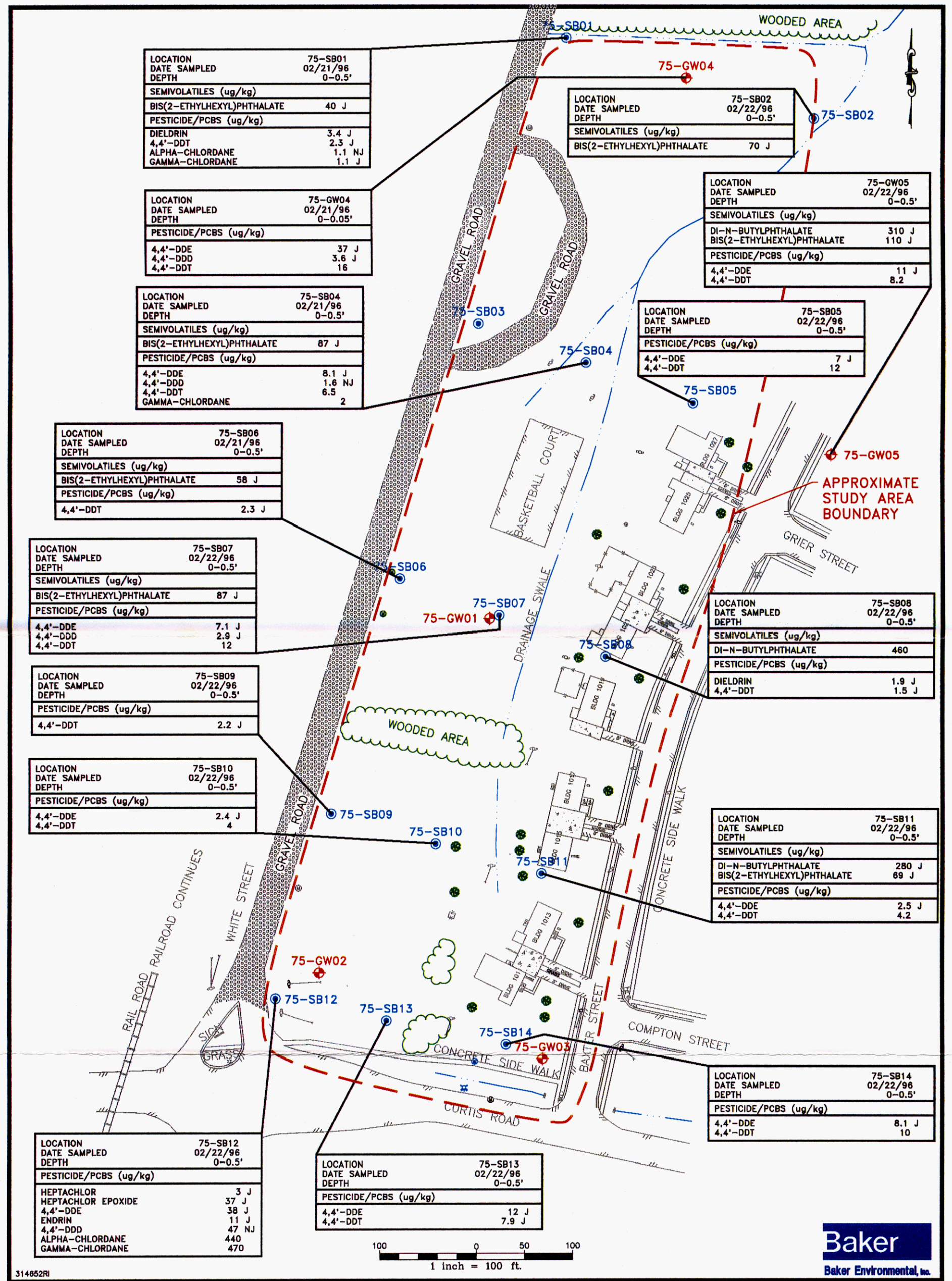
LEGEND

68-SW/SD-04 – SURFACE WATER AND SEDIMENT SAMPLE STATION
– TREE LINE
– INTERMITTENT STREAM
– DIRT OR GRAVEL ROAD

SOURCE: BRENT A. LANIER R.L.S., FEBRUARY 1996.

FIGURE 4-16
METALS DETECTED IN SEDIMENTS
SITE 68
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA




| LOCATION | 75-SB01 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 40 J |
| PESTICIDE/PCBS (ug/kg) | |
| DIELDRIN | 3.4 J |
| 4,4'-DDT | 2.3 J |
| ALPHA-CHLORDANE | 1.1 NJ |
| GAMMA-CHLORDANE | 1.1 J |

| LOCATION | 75-SB02 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 70 J |

| LOCATION | 75-GW04 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.05' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 37 J |
| 4,4'-DDD | 3.6 J |
| 4,4'-DDT | 16 |

| LOCATION | 75-GW05 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| DI-N-BUTYLPHTHALATE | 310 J |
| BIS(2-ETHYLHEXYL)PHTHALATE | 110 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 11 J |
| 4,4'-DDT | 8.2 |

| LOCATION | 75-SB04 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 87 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 8.1 J |
| 4,4'-DDD | 1.6 NJ |
| 4,4'-DDT | 6.5 |
| GAMMA-CHLORDANE | 2 |

| LOCATION | 75-SB05 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 7 J |
| 4,4'-DDT | 12 |

| LOCATION | 75-SB06 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 58 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDT | 2.3 J |

| LOCATION | 75-SB07 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 87 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 7.1 J |
| 4,4'-DDD | 2.9 J |
| 4,4'-DDT | 12 |

| LOCATION | 75-SB08 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| DI-N-BUTYLPHTHALATE | 460 |
| PESTICIDE/PCBS (ug/kg) | |
| DIELDRIN | 1.9 J |
| 4,4'-DDT | 1.5 J |

| LOCATION | 75-SB09 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDT | 2.2 J |

| LOCATION | 75-SB10 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 2.4 J |
| 4,4'-DDT | 4 |

| LOCATION | 75-SB11 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| SEMIVOLATILES (ug/kg) | |
| DI-N-BUTYLPHTHALATE | 280 J |
| BIS(2-ETHYLHEXYL)PHTHALATE | 69 J |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 2.5 J |
| 4,4'-DDT | 4.2 |

| LOCATION | 75-SB14 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 8.1 J |
| 4,4'-DDT | 10 |

| LOCATION | 75-SB12 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| PESTICIDE/PCBS (ug/kg) | |
| HEPTACHLOR | 3 J |
| HEPTACHLOR EPOXIDE | 37 J |
| 4,4'-DDE | 38 J |
| ENDRIN | 11 J |
| 4,4'-DDD | 47 NJ |
| ALPHA-CHLORDANE | 440 |
| GAMMA-CHLORDANE | 470 |

| LOCATION | 75-SB13 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 12 J |
| 4,4'-DDT | 7.9 J |

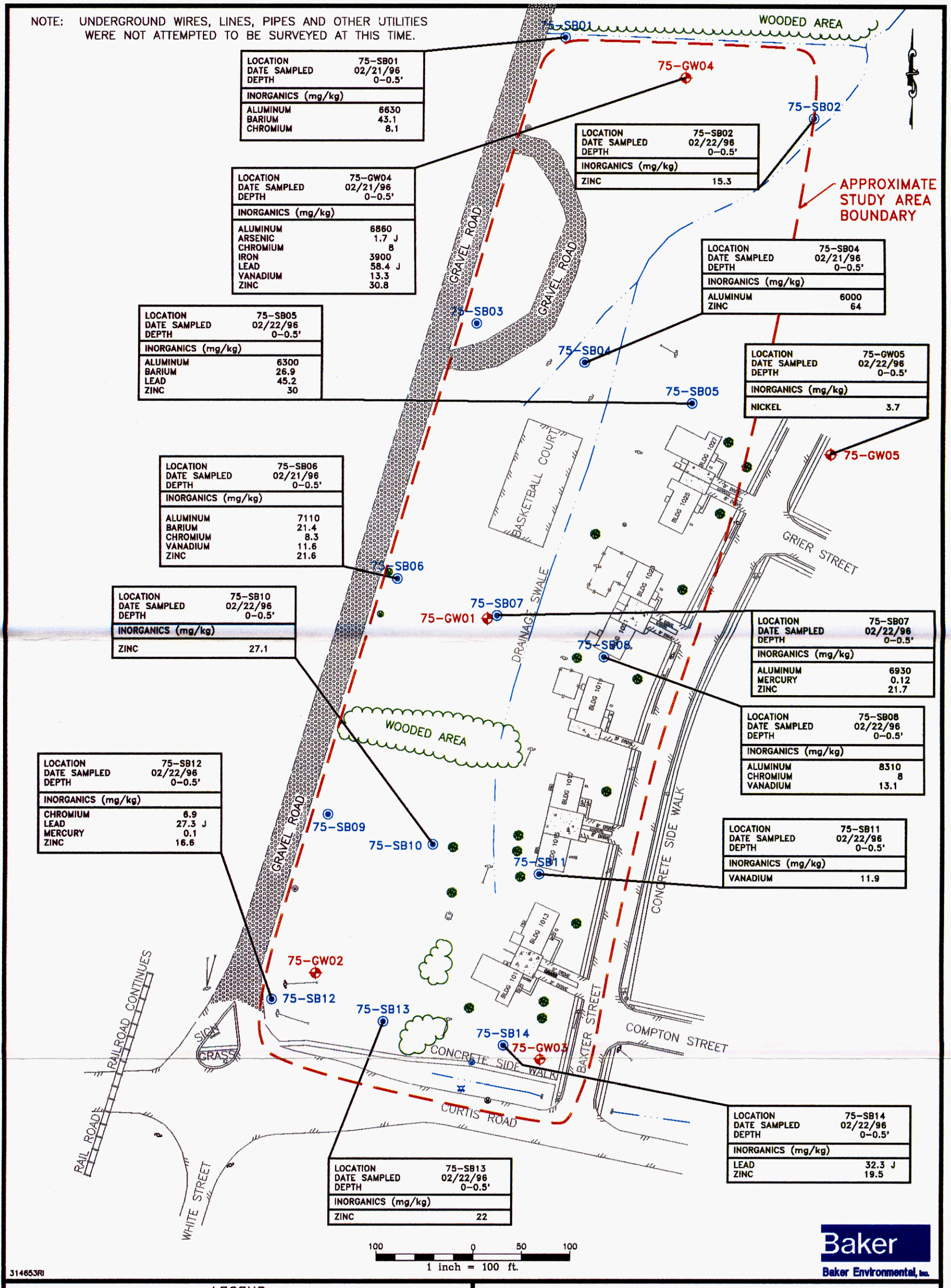
LEGEND

- TREE LINE
- INTERMITTENT DRAINAGE SWALE
- 75-GW03 – EXISTING GROUNDWATER MONITORING WELL LOCATION
- 75-SB14 – SOIL BORING LOCATION
- TREE
- MANHOLE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1995.

FIGURE 4-17
ORGANICS DETECTED IN SURFACE SOIL
SITE 75
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.




| LOCATION | 75-SB01 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 6630 |
| BARIUM | 43.1 |
| CHROMIUM | 8.1 |

| LOCATION | 75-GW04 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 6860 |
| ARSENIC | 1.7 J |
| CHROMIUM | 8 |
| IRON | 3900 |
| LEAD | 58.4 J |
| VANADIUM | 13.3 |
| ZINC | 30.8 |

| LOCATION | 75-SB02 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| ZINC | 15.3 |

| LOCATION | 75-SB04 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 6000 |
| ZINC | 64 |

| LOCATION | 75-SB05 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 6300 |
| BARIUM | 26.9 |
| LEAD | 45.2 |
| ZINC | 30 |

| LOCATION | 75-GW05 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| NICKEL | 3.7 |

| LOCATION | 75-SB06 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 7110 |
| BARIUM | 21.4 |
| CHROMIUM | 8.3 |
| VANADIUM | 11.6 |
| ZINC | 21.6 |

| LOCATION | 75-SB10 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| ZINC | 27.1 |

| LOCATION | 75-SB07 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 6930 |
| MERCURY | 0.12 |
| ZINC | 21.7 |

| LOCATION | 75-SB08 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 8310 |
| CHROMIUM | 8 |
| VANADIUM | 13.1 |

| LOCATION | 75-SB12 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| CHROMIUM | 6.9 |
| LEAD | 27.3 J |
| MERCURY | 0.1 |
| ZINC | 16.6 |

| LOCATION | 75-SB11 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| VANADIUM | 11.9 |

| LOCATION | 75-SB14 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| LEAD | 32.3 J |
| ZINC | 19.5 |

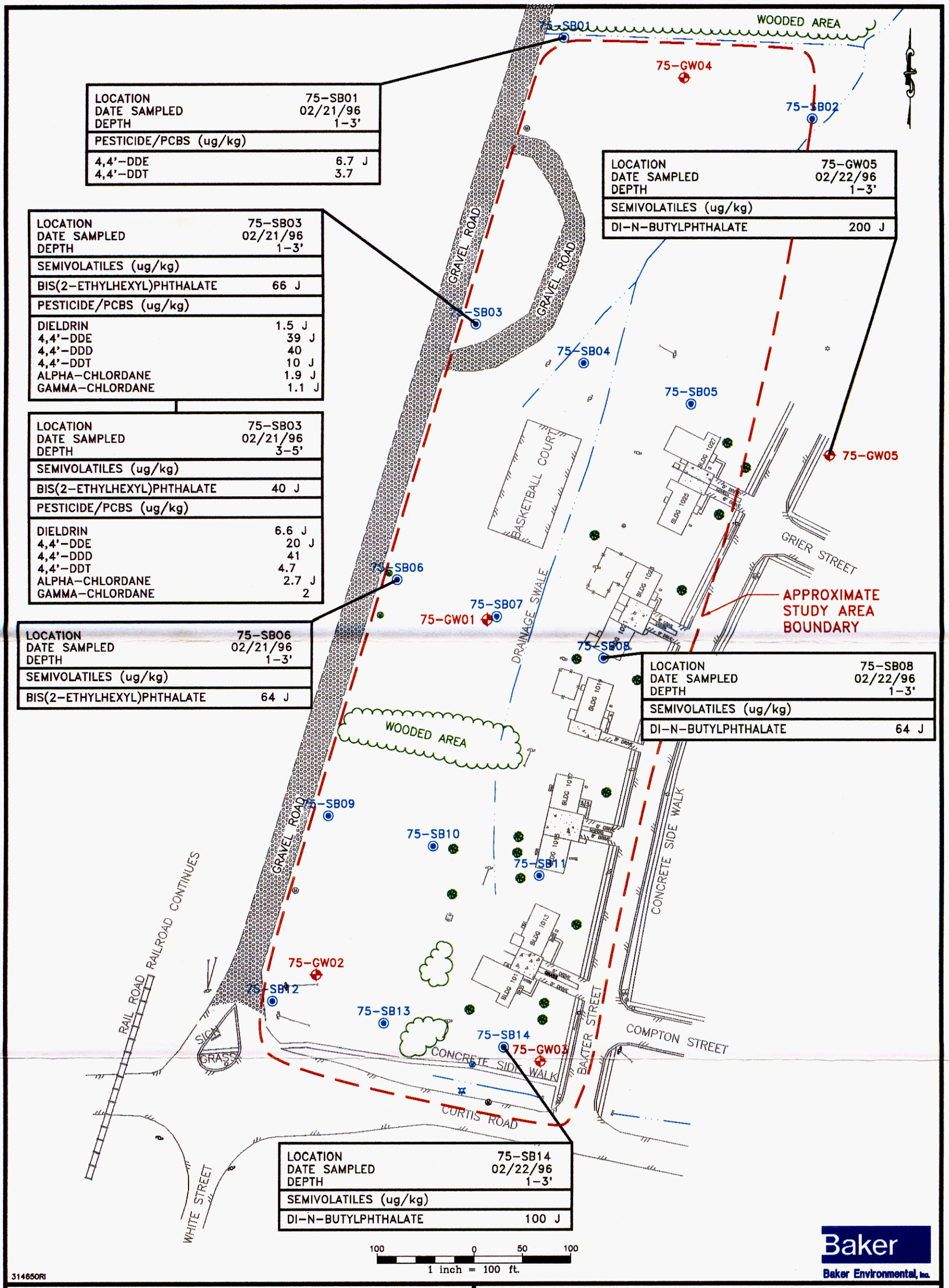
| LOCATION | 75-SB13 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.5' |
| INORGANICS (mg/kg) | |
| ZINC | 22 |

## LEGEND

- TREE LINE
- INTERMITTENT DRAINAGE SWALE
- 75-GW03 – EXISTING GROUNDWATER MONITORING WELL LOCATION
- 75-SB14 – SOIL BORING LOCATION
- TREE
- MANHOLE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1995.

FIGURE 4-18
METALS DETECTED IN SURFACE SOIL
SITE 75
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA




| LOCATION | 75-SB01 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 1-3' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 6.7 J |
| 4,4'-DDT | 3.7 |

| LOCATION | 75-GW05 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 1-3' |
| SEMIVOLATILES (ug/kg) | |
| DI-N-BUTYLPHTHALATE | 200 J |

| LOCATION | 75-SB03 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 1-3' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 66 J |
| PESTICIDE/PCBS (ug/kg) | |
| DIELDRIN | 1.5 J |
| 4,4'-DDE | 39 J |
| 4,4'-DDD | 40 |
| 4,4'-DDT | 10 J |
| ALPHA-CHLORDANE | 1.9 J |
| GAMMA-CHLORDANE | 1.1 J |

| LOCATION | 75-SB03 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 3-5' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 40 J |
| PESTICIDE/PCBS (ug/kg) | |
| DIELDRIN | 6.6 J |
| 4,4'-DDE | 20 J |
| 4,4'-DDD | 41 |
| 4,4'-DDT | 4.7 |
| ALPHA-CHLORDANE | 2.7 J |
| GAMMA-CHLORDANE | 2 |

| LOCATION | 75-SB06 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 1-3' |
| SEMIVOLATILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 64 J |

| LOCATION | 75-SB08 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 1-3' |
| SEMIVOLATILES (ug/kg) | |
| DI-N-BUTYLPHTHALATE | 64 J |

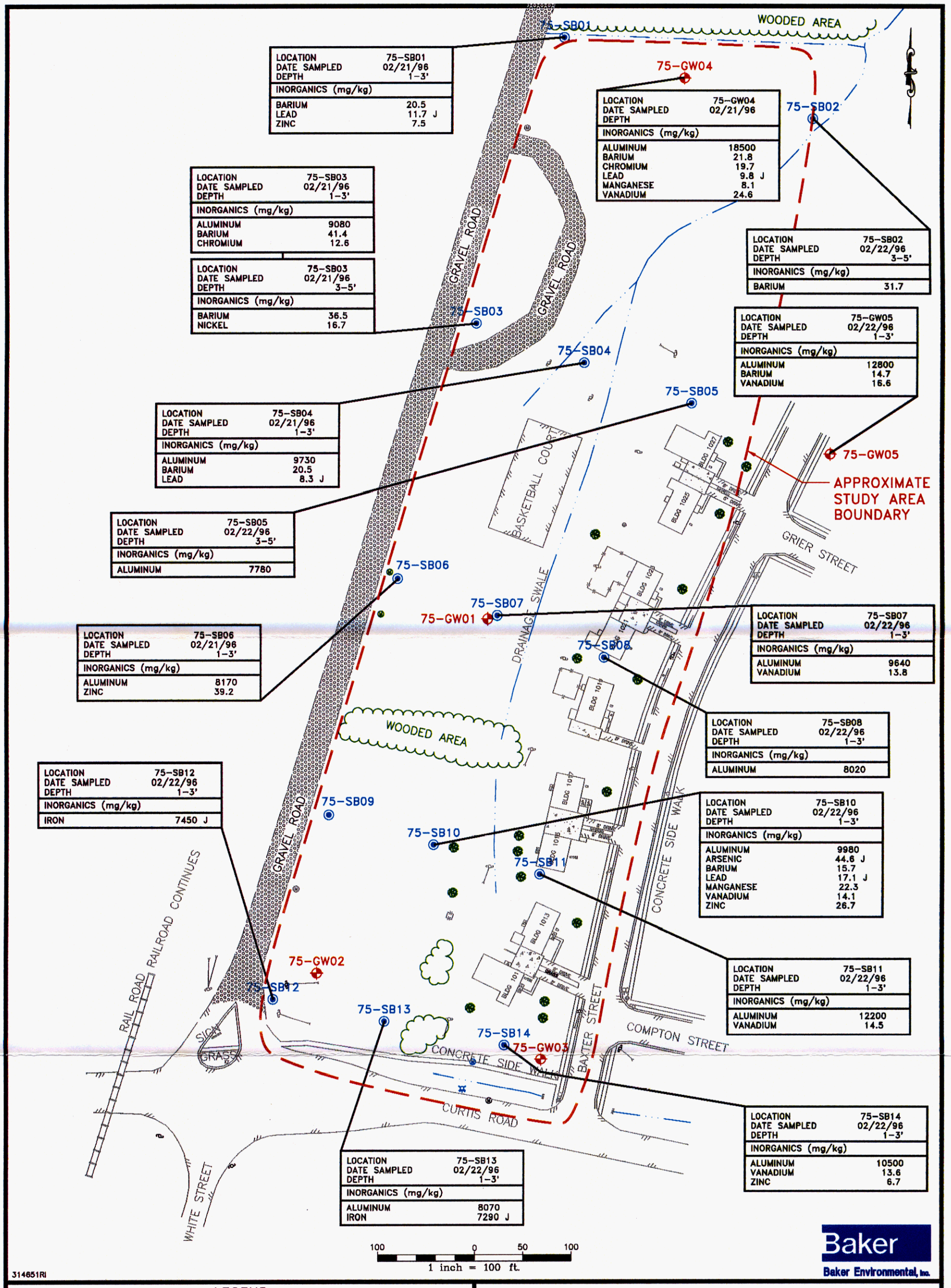
| LOCATION | 75-SB14 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 1-3' |
| SEMIVOLATILES (ug/kg) | |
| DI-N-BUTYLPHTHALATE | 100 J |

LEGEND

- TREE LINE
- INTERMITTENT DRAINAGE SWALE
- 75-GW03 – EXISTING GROUNDWATER MONITORING WELL LOCATION
- 75-SB14 – SOIL BORING LOCATION
- TREE
- MANHOLE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1995.

FIGURE 4-19
ORGANICS DETECTED IN SUBSURFACE SOIL
SITE 75
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA




| LOCATION | 75-SB01 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| BARIUM | 20.5 |
| LEAD | 11.7 J |
| ZINC | 7.5 |

| LOCATION | 75-GW04 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | |
| INORGANICS (mg/kg) | |
| ALUMINUM | 18500 |
| BARIUM | 21.8 |
| CHROMIUM | 19.7 |
| LEAD | 9.8 J |
| MANGANESE | 8.1 |
| VANADIUM | 24.6 |

| LOCATION | 75-SB03 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 9080 |
| BARIUM | 41.4 |
| CHROMIUM | 12.6 |

| LOCATION | 75-SB03 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 3-5' |
| INORGANICS (mg/kg) | |
| BARIUM | 36.5 |
| NICKEL | 16.7 |

| LOCATION | 75-SB02 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 3-5' |
| INORGANICS (mg/kg) | |
| BARIUM | 31.7 |

| LOCATION | 75-GW05 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 12800 |
| BARIUM | 14.7 |
| VANADIUM | 16.6 |

| LOCATION | 75-SB04 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 9730 |
| BARIUM | 20.5 |
| LEAD | 8.3 J |

| LOCATION | 75-SB05 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 3-5' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 7780 |

| LOCATION | 75-SB06 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 8170 |
| ZINC | 39.2 |

| LOCATION | 75-SB07 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 9640 |
| VANADIUM | 13.8 |

| LOCATION | 75-SB08 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 8020 |

| LOCATION | 75-SB12 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| IRON | 7450 J |

| LOCATION | 75-SB10 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 9980 |
| ARSENIC | 44.6 J |
| BARIUM | 15.7 |
| LEAD | 17.1 J |
| MANGANESE | 22.3 |
| VANADIUM | 14.1 |
| ZINC | 26.7 |

| LOCATION | 75-SB11 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 12200 |
| VANADIUM | 14.5 |

| LOCATION | 75-SB13 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 8070 |
| IRON | 7290 J |

| LOCATION | 75-SB14 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 10500 |
| VANADIUM | 13.6 |
| ZINC | 6.7 |

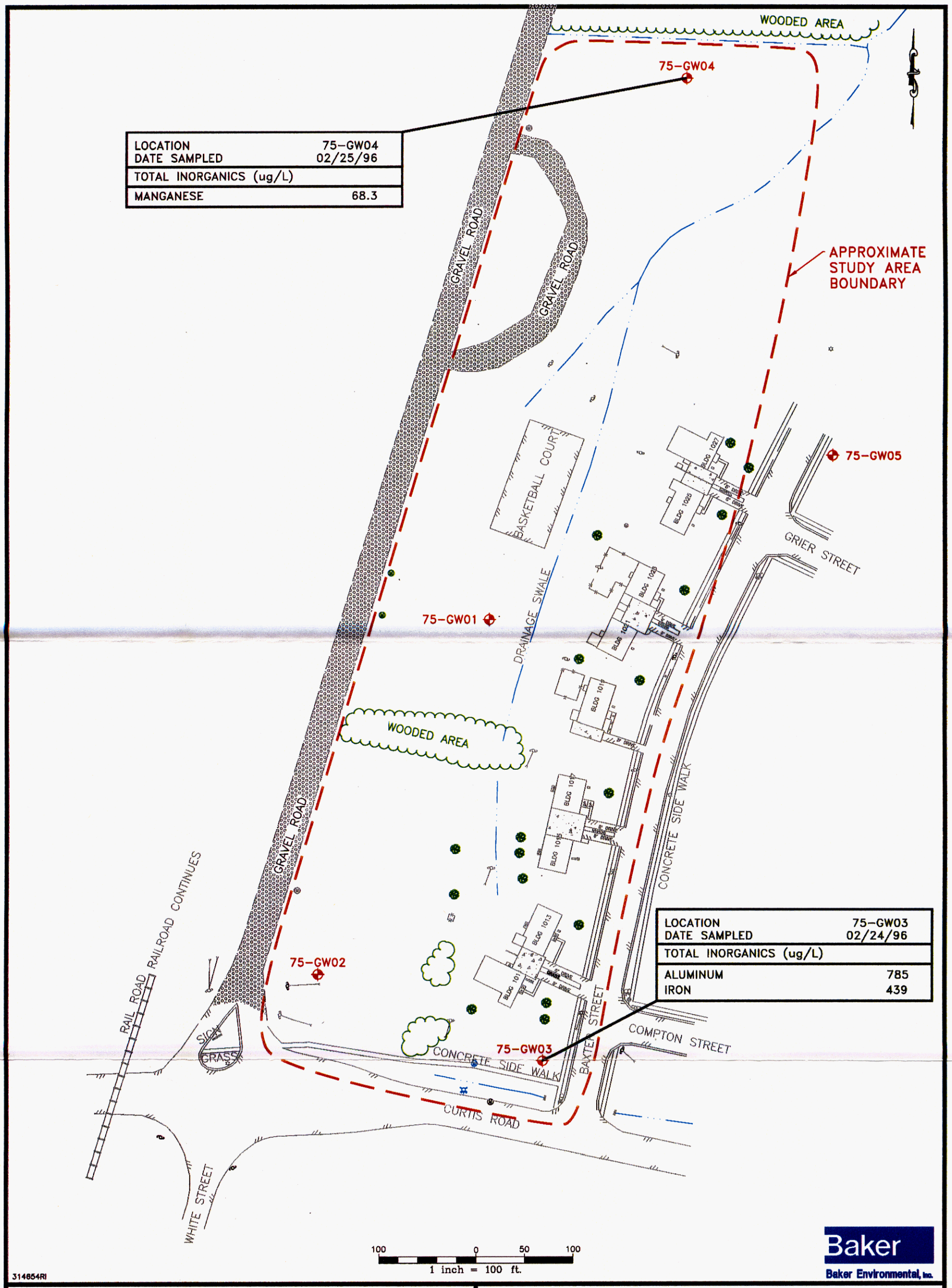
LEGEND

- TREE LINE
- INTERMITTENT DRAINAGE SWALE
- 75-GW03 – EXISTING GROUNDWATER MONITORING WELL LOCATION
- 75-SB14 – SOIL BORING LOCATION
- TREE
- MANHOLE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1995.

FIGURE 4-20
METALS DETECTED IN SUBSURFACE SOIL
SITE 75
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314

MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA




LEGEND

- TREE LINE
- INTERMITTENT DRAINAGE SWALE
- 75-GW03 – EXISTING GROUNDWATER MONITORING WELL LOCATION
- TREE
- MANHOLE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1995.

FIGURE 4-21
METALS DETECTED IN GROUNDWATER
SITE 75
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

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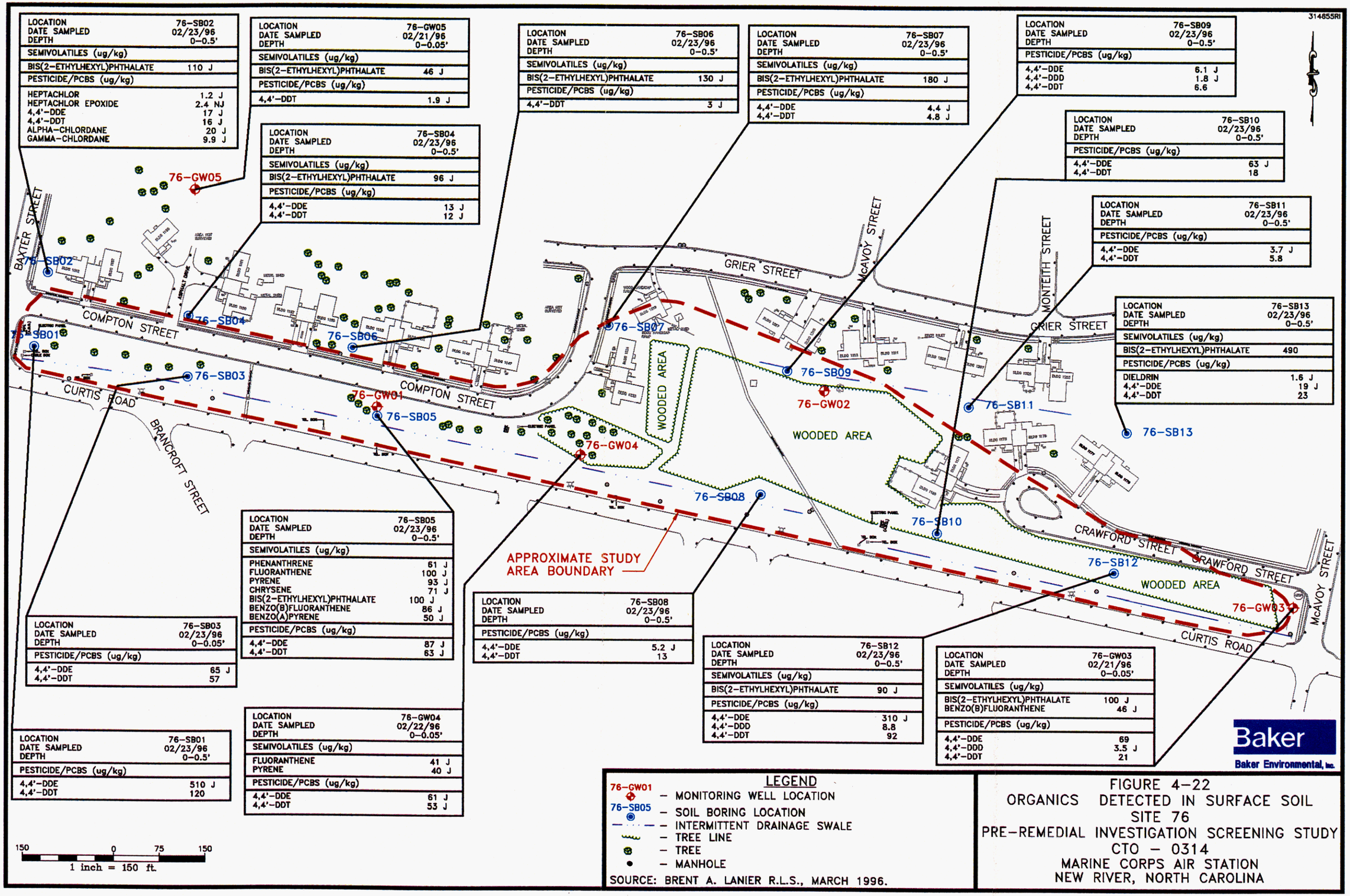



| LOCATION | 76-SB02 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **SEMIVOLATILES (ug/kg)** | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 110 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| HEPTACHLOR | 1.2 J |
| HEPTACHLOR EPOXIDE | 2.4 NJ |
| 4,4'-DDE | 17 J |
| 4,4'-DDT | 16 J |
| ALPHA-CHLORDANE | 20 J |
| GAMMA-CHLORDANE | 9.9 J |

| LOCATION | 76-GW05 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.05' |
| **SEMIVOLATILES (ug/kg)** | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 46 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDT | 1.9 J |

| LOCATION | 76-SB04 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **SEMIVOLATILES (ug/kg)** | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 96 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 13 J |
| 4,4'-DDT | 12 J |

| LOCATION | 76-SB06 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **SEMIVOLATILES (ug/kg)** | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 130 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDT | 3 J |

| LOCATION | 76-SB07 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **SEMIVOLATILES (ug/kg)** | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 180 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 4.4 J |
| 4,4'-DDT | 4.8 J |

| LOCATION | 76-SB09 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 6.1 J |
| 4,4'-DDD | 1.8 J |
| 4,4'-DDT | 6.6 |

| LOCATION | 76-SB10 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 63 J |
| 4,4'-DDT | 18 |

| LOCATION | 76-SB11 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 3.7 J |
| 4,4'-DDT | 5.8 |

| LOCATION | 76-SB13 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **SEMIVOLATILES (ug/kg)** | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 490 |
| **PESTICIDE/PCBS (ug/kg)** | |
| DIELDRIN | 1.6 J |
| 4,4'-DDE | 19 J |
| 4,4'-DDT | 23 |

| LOCATION | 76-SB03 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.05' |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 65 J |
| 4,4'-DDT | 57 |

| LOCATION | 76-SB05 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **SEMIVOLATILES (ug/kg)** | |
| PHENANTHRENE | 61 J |
| FLUORANTHENE | 100 J |
| PYRENE | 93 J |
| CHRYSENE | 71 J |
| BIS(2-ETHYLHEXYL)PHTHALATE | 100 J |
| BENZO(B)FLUORANTHENE | 86 J |
| BENZO(A)PYRENE | 50 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 87 J |
| 4,4'-DDT | 63 J |

| LOCATION | 76-SB08 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 5.2 J |
| 4,4'-DDT | 13 |

| LOCATION | 76-SB12 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **SEMIVOLATILES (ug/kg)** | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 90 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 310 J |
| 4,4'-DDD | 8.8 |
| 4,4'-DDT | 92 |

| LOCATION | 76-GW03 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.05' |
| **SEMIVOLATILES (ug/kg)** | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 100 J |
| BENZO(B)FLUORANTHENE | 46 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 69 |
| 4,4'-DDD | 3.5 J |
| 4,4'-DDT | 21 |

| LOCATION | 76-SB01 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 510 J |
| 4,4'-DDT | 120 |

| LOCATION | 76-GW04 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.05' |
| **SEMIVOLATILES (ug/kg)** | |
| FLUORANTHENE | 41 J |
| PYRENE | 40 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 61 J |
| 4,4'-DDT | 53 J |

## LEGEND

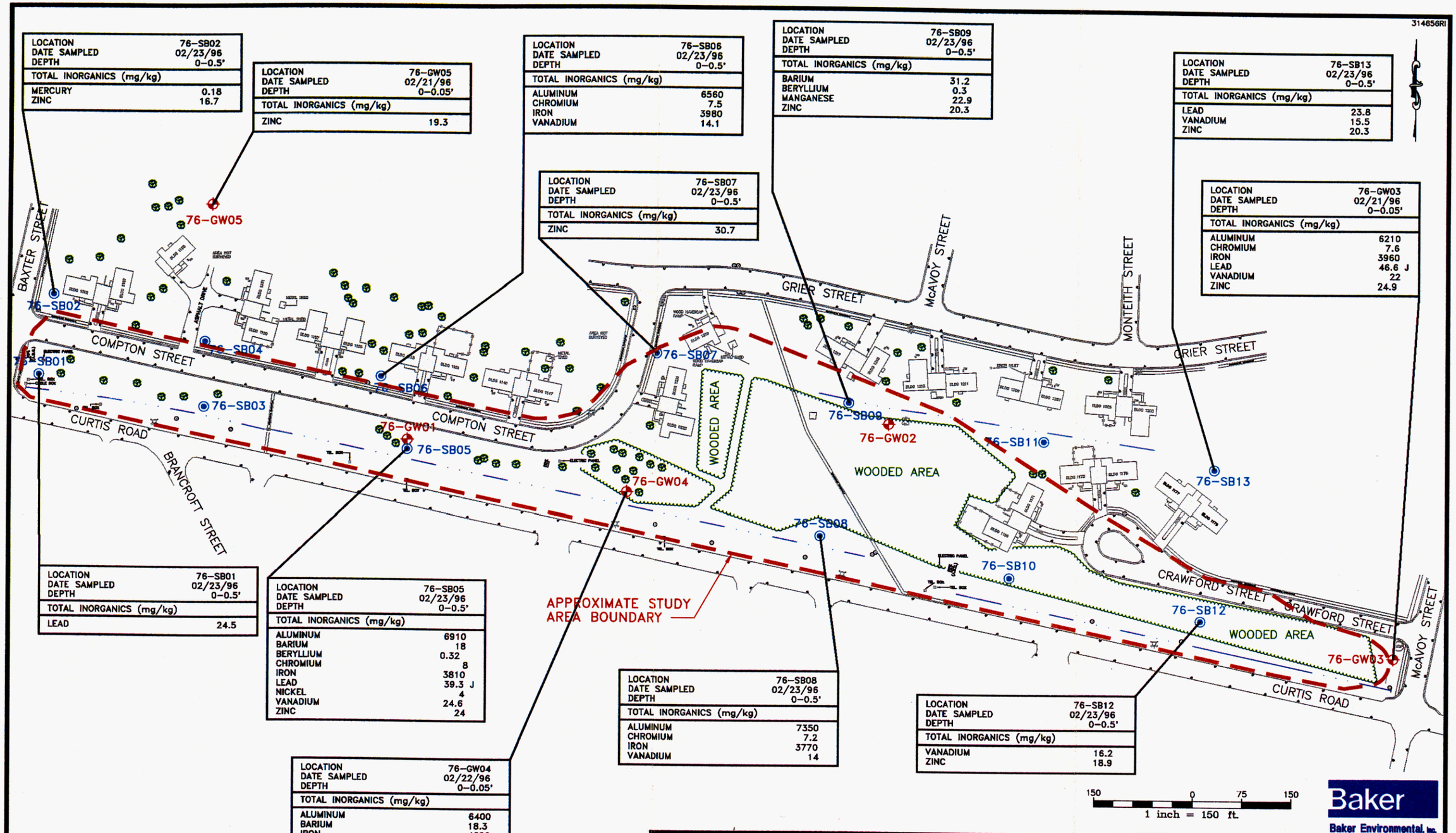
- 76-GW01 — MONITORING WELL LOCATION
- 76-SB05 — SOIL BORING LOCATION
- INTERMITTENT DRAINAGE SWALE
- TREE LINE
- TREE
- MANHOLE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1996.

Baker
Baker Environmental, Inc.

FIGURE 4-22
ORGANICS DETECTED IN SURFACE SOIL
SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

314656RI




| LOCATION | 76-SB02 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| TOTAL INORGANICS (mg/kg) | |
| MERCURY | 0.18 |
| ZINC | 16.7 |

| LOCATION | 76-GW05 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.05' |
| TOTAL INORGANICS (mg/kg) | |
| ZINC | 19.3 |

| LOCATION | 76-SB06 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| TOTAL INORGANICS (mg/kg) | |
| ALUMINUM | 6560 |
| CHROMIUM | 7.5 |
| IRON | 3980 |
| VANADIUM | 14.1 |

| LOCATION | 76-SB07 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| TOTAL INORGANICS (mg/kg) | |
| ZINC | 30.7 |

| LOCATION | 76-SB09 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| TOTAL INORGANICS (mg/kg) | |
| BARIUM | 31.2 |
| BERYLLIUM | 0.3 |
| MANGANESE | 22.9 |
| ZINC | 20.3 |

| LOCATION | 76-SB13 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| TOTAL INORGANICS (mg/kg) | |
| LEAD | 23.8 |
| VANADIUM | 15.5 |
| ZINC | 20.3 |

| LOCATION | 76-GW03 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 0-0.05' |
| TOTAL INORGANICS (mg/kg) | |
| ALUMINUM | 6210 |
| CHROMIUM | 7.6 |
| IRON | 3960 |
| LEAD | 46.6 J |
| VANADIUM | 22 |
| ZINC | 24.9 |

| LOCATION | 76-SB01 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| TOTAL INORGANICS (mg/kg) | |
| LEAD | 24.5 |

| LOCATION | 76-SB05 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| TOTAL INORGANICS (mg/kg) | |
| ALUMINUM | 6910 |
| BARIUM | 18 |
| BERYLLIUM | 0.32 |
| CHROMIUM | 8 |
| IRON | 3810 |
| LEAD | 39.3 J |
| NICKEL | 4 |
| VANADIUM | 24.6 |
| ZINC | 24 |

| LOCATION | 76-GW04 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 0-0.05' |
| TOTAL INORGANICS (mg/kg) | |
| ALUMINUM | 6400 |
| BARIUM | 18.3 |
| IRON | 4680 |
| VANADIUM | 12.1 |
| ZINC | 23.9 |

| LOCATION | 76-SB08 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| TOTAL INORGANICS (mg/kg) | |
| ALUMINUM | 7350 |
| CHROMIUM | 7.2 |
| IRON | 3770 |
| VANADIUM | 14 |

| LOCATION | 76-SB12 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 0-0.5' |
| TOTAL INORGANICS (mg/kg) | |
| VANADIUM | 16.2 |
| ZINC | 18.9 |

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## LEGEND

76-GW01 – MONITORING WELL LOCATION
76-SB05 – SOIL BORING LOCATION
– INTERMITTENT DRAINAGE SWALE
– TREE LINE
– TREE
– MANHOLE

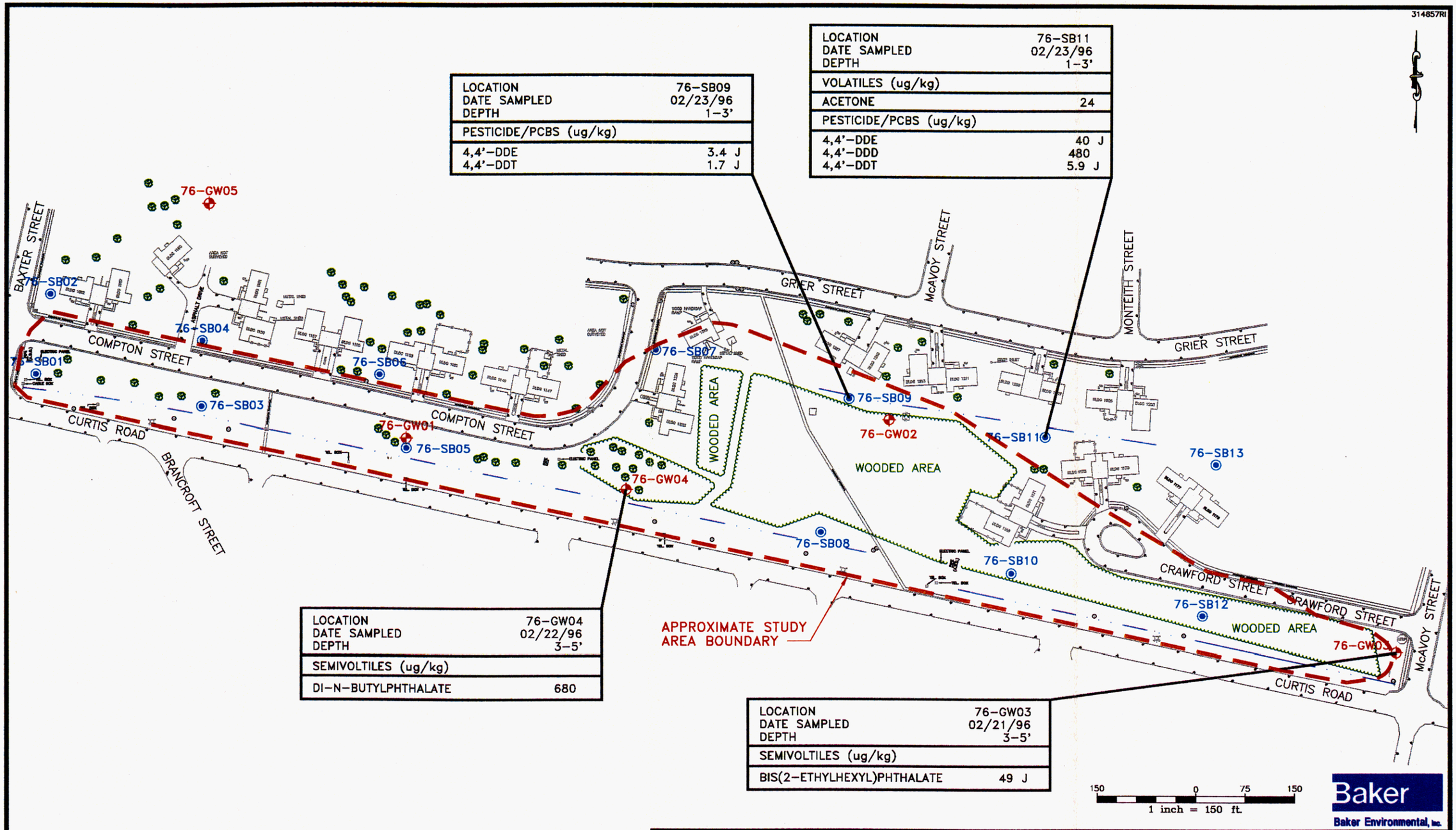
SOURCE: BRENT A. LANIER R.L.S., MARCH 1996.

FIGURE 4-23
METALS DETECTED IN SURFACE SOIL
SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

314857RI

| LOCATION | 76-SB09 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 1-3' |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 3.4 J |
| 4,4'-DDT | 1.7 J |

| LOCATION | 76-SB11 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 1-3' |
| VOLATILES (ug/kg) | |
| ACETONE | 24 |
| PESTICIDE/PCBS (ug/kg) | |
| 4,4'-DDE | 40 J |
| 4,4'-DDD | 480 |
| 4,4'-DDT | 5.9 J |




| LOCATION | 76-GW04 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | 3-5' |
| SEMIVOLTILES (ug/kg) | |
| DI-N-BUTYLPHTHALATE | 680 |

| LOCATION | 76-GW03 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | 3-5' |
| SEMIVOLTILES (ug/kg) | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 49 J |

Baker
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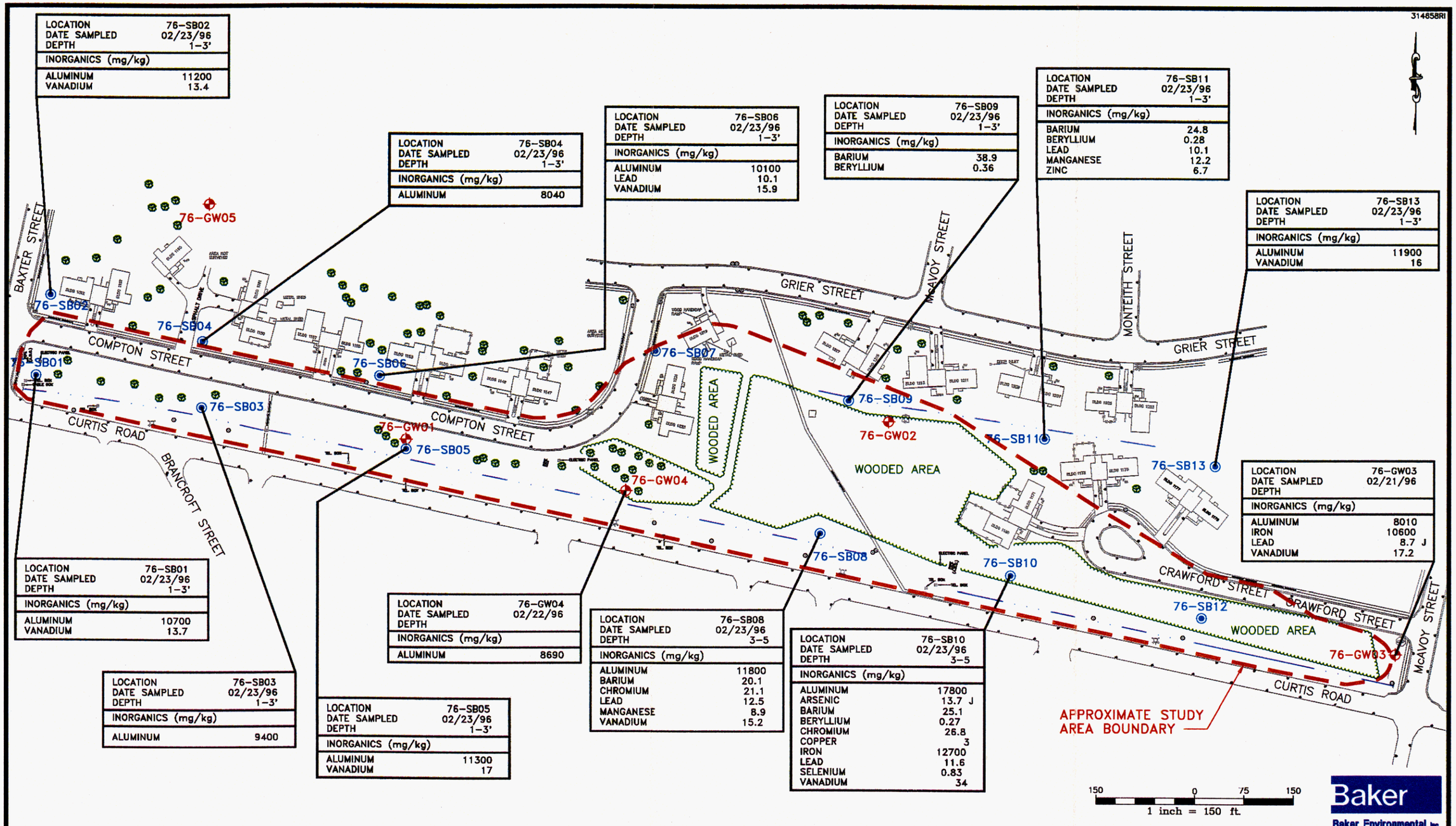
LEGEND

76-GW01 – MONITORING WELL LOCATION
76-SB05 – SOIL BORING LOCATION
– INTERMITTENT DRAINAGE SWALE
– TREE LINE
– TREE
– MANHOLE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1996.

FIGURE 4-24
ORGANICS DETECTED IN SUBSURFACE SOIL
SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

314858RI




| LOCATION | 76-SB02 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 11200 |
| VANADIUM | 13.4 |

| LOCATION | 76-SB04 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 8040 |

| LOCATION | 76-SB06 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 10100 |
| LEAD | 10.1 |
| VANADIUM | 15.9 |

| LOCATION | 76-SB09 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| BARIUM | 38.9 |
| BERYLLIUM | 0.36 |

| LOCATION | 76-SB11 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| BARIUM | 24.8 |
| BERYLLIUM | 0.28 |
| LEAD | 10.1 |
| MANGANESE | 12.2 |
| ZINC | 6.7 |

| LOCATION | 76-SB13 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 11900 |
| VANADIUM | 16 |

| LOCATION | 76-GW03 |
|---|---|
| DATE SAMPLED | 02/21/96 |
| DEPTH | |
| INORGANICS (mg/kg) | |
| ALUMINUM | 8010 |
| IRON | 10600 |
| LEAD | 8.7 J |
| VANADIUM | 17.2 |

| LOCATION | 76-SB01 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 10700 |
| VANADIUM | 13.7 |

| LOCATION | 76-SB03 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 9400 |

| LOCATION | 76-GW04 |
|---|---|
| DATE SAMPLED | 02/22/96 |
| DEPTH | |
| INORGANICS (mg/kg) | |
| ALUMINUM | 8690 |

| LOCATION | 76-SB05 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 1-3' |
| INORGANICS (mg/kg) | |
| ALUMINUM | 11300 |
| VANADIUM | 17 |

| LOCATION | 76-SB08 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 3-5 |
| INORGANICS (mg/kg) | |
| ALUMINUM | 11800 |
| BARIUM | 20.1 |
| CHROMIUM | 21.1 |
| LEAD | 12.5 |
| MANGANESE | 8.9 |
| VANADIUM | 15.2 |

| LOCATION | 76-SB10 |
|---|---|
| DATE SAMPLED | 02/23/96 |
| DEPTH | 3-5 |
| INORGANICS (mg/kg) | |
| ALUMINUM | 17800 |
| ARSENIC | 13.7 J |
| BARIUM | 25.1 |
| BERYLLIUM | 0.27 |
| CHROMIUM | 26.8 |
| COPPER | 3 |
| IRON | 12700 |
| LEAD | 11.6 |
| SELENIUM | 0.83 |
| VANADIUM | 34 |

## LEGEND

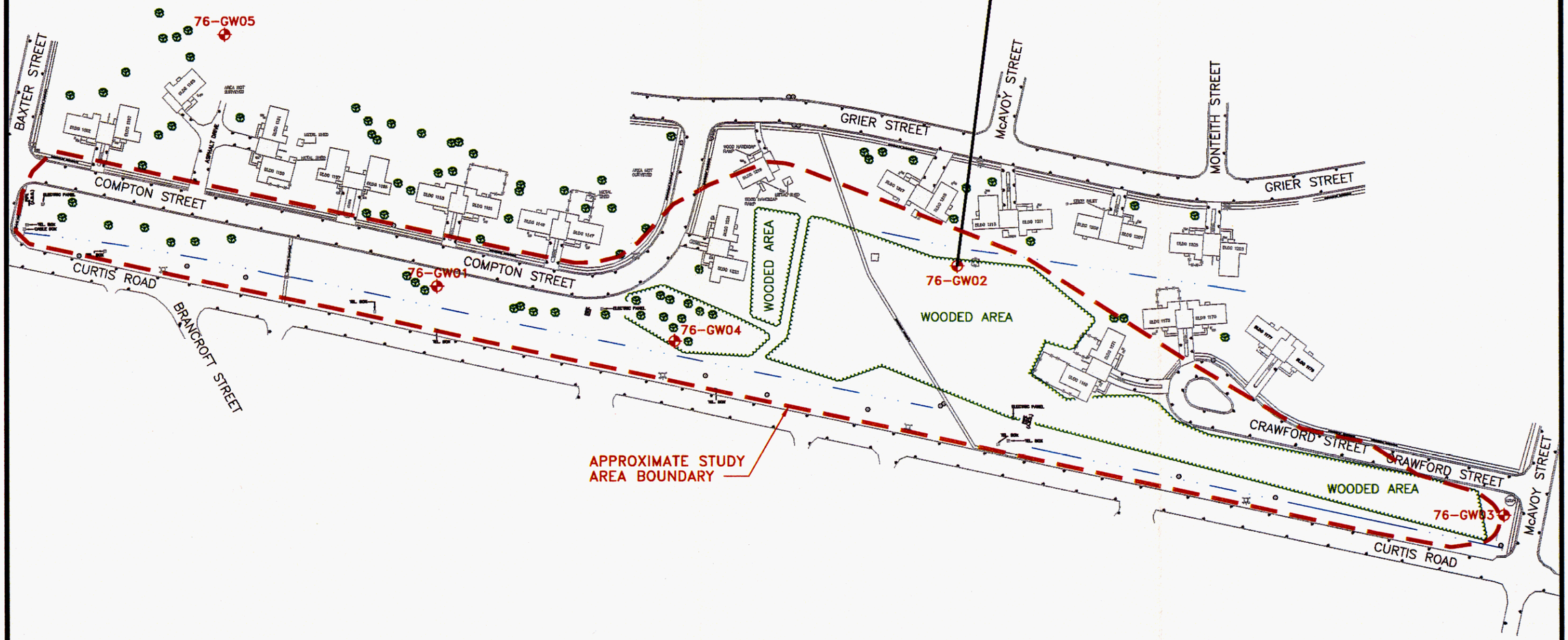
76-GW01 – MONITORING WELL LOCATION
76-SB05 – SOIL BORING LOCATION
– INTERMITTENT DRAINAGE SWALE
– TREE LINE
– TREE
– MANHOLE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1996.

FIGURE 4-25
METALS DETECTED IN SUBSURFACE SOIL
SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

314659RI

| LOCATION | 76-GW02 |
|---|---|
| DATE SAMPLED | 02/25/96 |
| SEMIVOLATILES (ug/L) | |
| DI-N-BUTYLPHTHALATE | 3 J |

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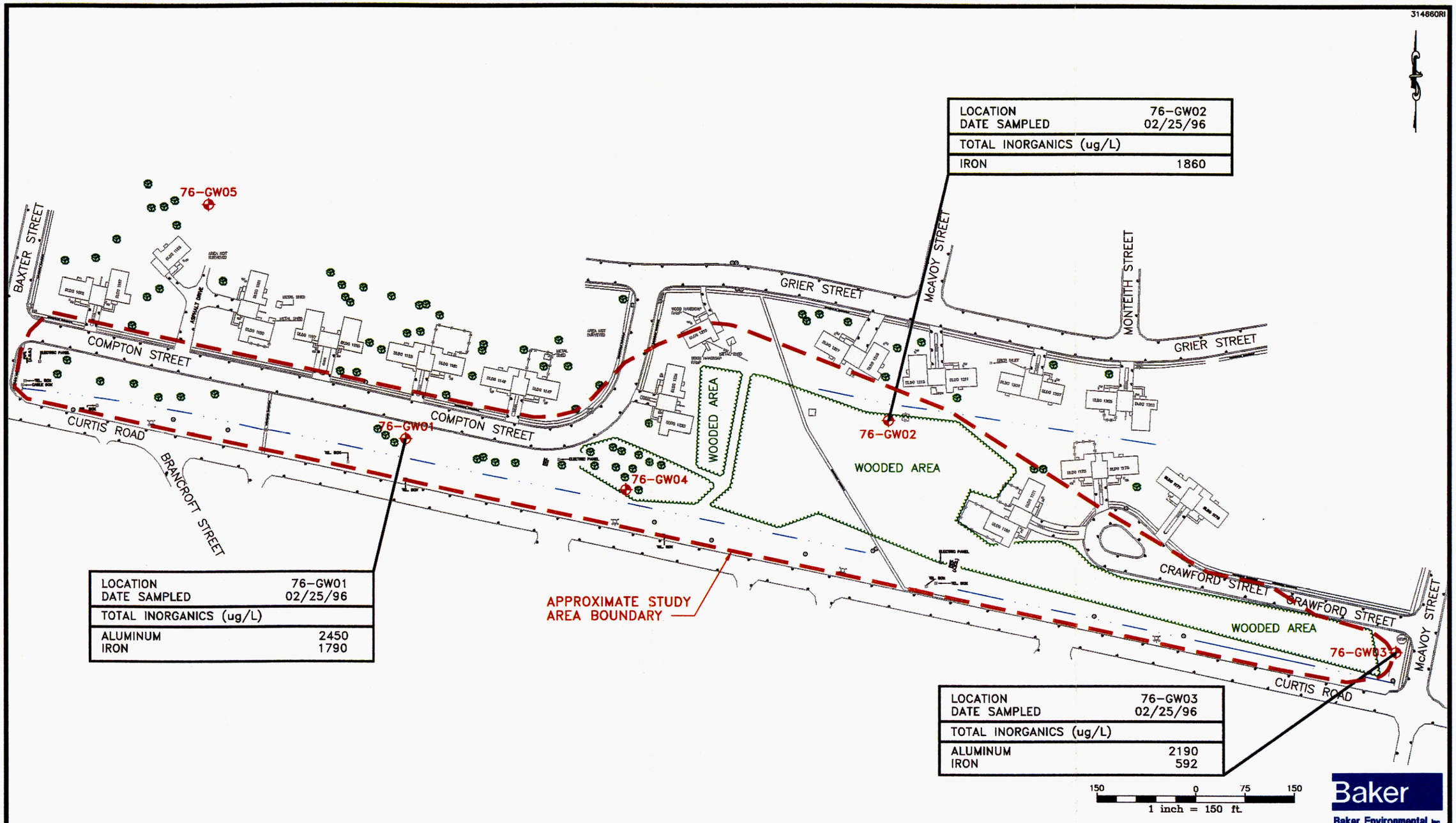
LEGEND

76-GW01 – MONITORING WELL LOCATION
– INTERMITTENT DRAINAGE SWALE
– TREE LINE
– TREE
– MANHOLE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1996.

FIGURE 4-26
ORGANICS DETECTED IN GROUNDWATER
SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

314660RI




| LOCATION | 76-GW02 |
|---|---|
| DATE SAMPLED | 02/25/96 |
| TOTAL INORGANICS (ug/L) | |
| IRON | 1860 |

| LOCATION | 76-GW01 |
|---|---|
| DATE SAMPLED | 02/25/96 |
| TOTAL INORGANICS (ug/L) | |
| ALUMINUM | 2450 |
| IRON | 1790 |

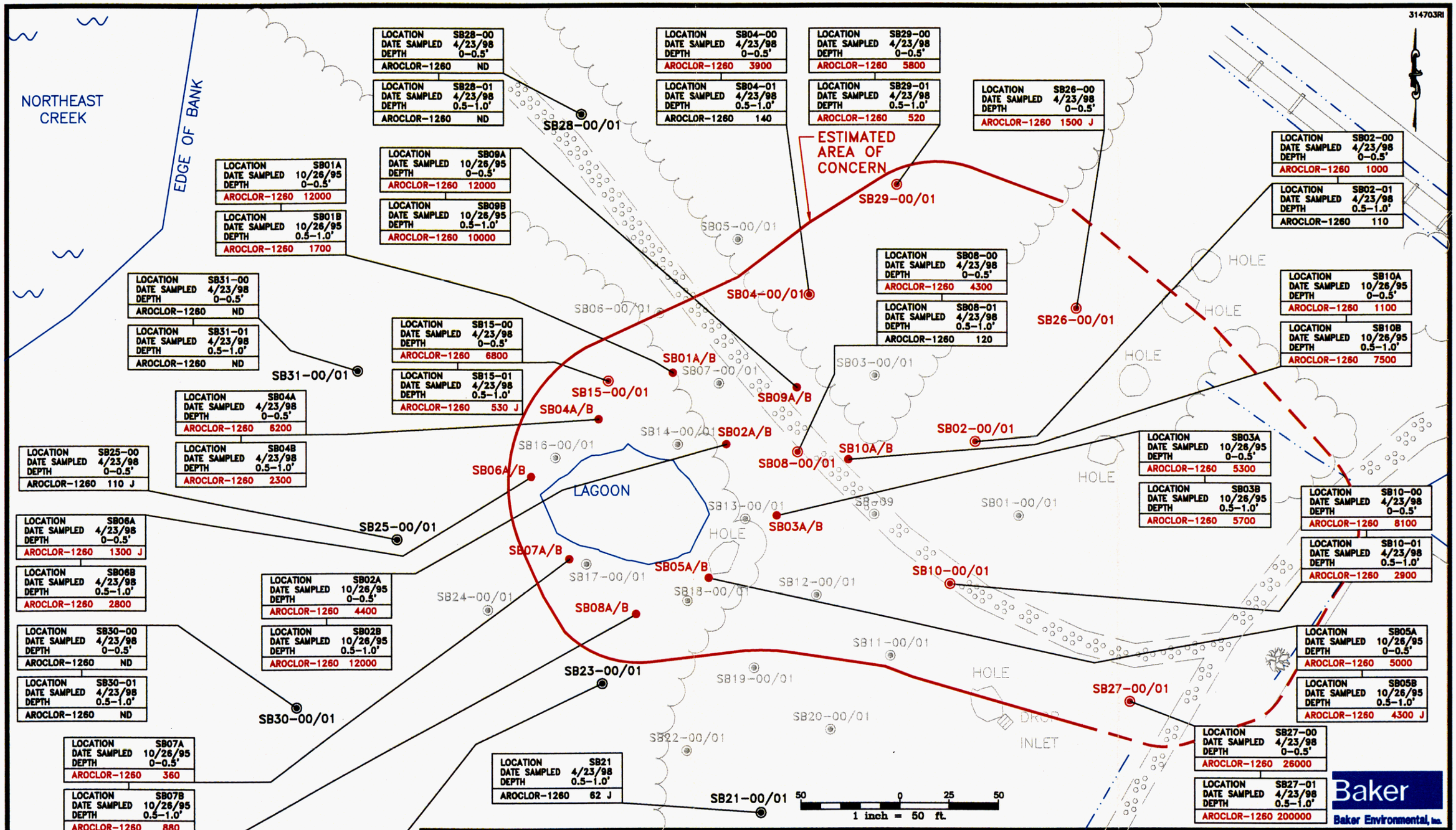
| LOCATION | 76-GW03 |
|---|---|
| DATE SAMPLED | 02/25/96 |
| TOTAL INORGANICS (ug/L) | |
| ALUMINUM | 2190 |
| IRON | 592 |

LEGEND

76-GW01 – MONITORING WELL LOCATION
– INTERMITTENT DRAINAGE SWALE
– TREE LINE
– TREE
– MANHOLE

SOURCE: BRENT A. LANIER R.L.S., MARCH 1996.

FIGURE 4-27
METALS DETECTED IN GROUNDWATER
SITE 76
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA



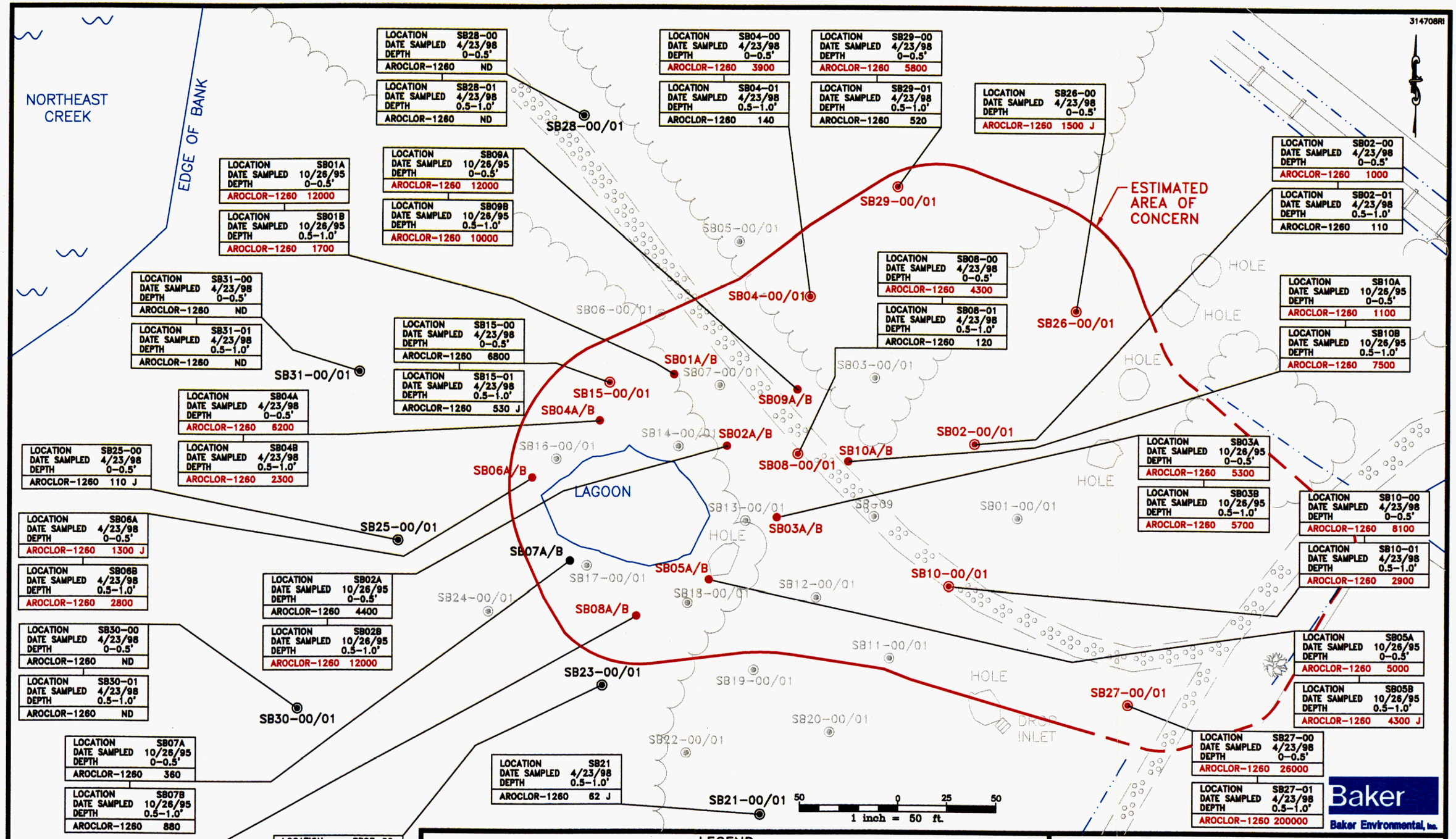

## LEGEND

- ● – SOIL SAMPLING LOCATION – OCTOBER 1995
- ◉ – SOIL SAMPLING LOCATION – MARCH 1998
- – SOIL SAMPLE NOT ANALYZED AT FIXED BASE LABORATORY
- – HOLE
- – SWALE
- – GRAVEL ROAD
- – TREE LINE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

NOTES: 1.) RED INDICATES CONCENTRATIONS IN EXCEEDANCE OF RESIDENTIAL RBCs (320 ug/kg).
2.) CONCENTRATIONS ARE ug/kg.

FIGURE 4-28
ESTIMATED AREA OF CONCERN
DETECTED PCBs GREATER THAN 320 ug/kg
SITE 84
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



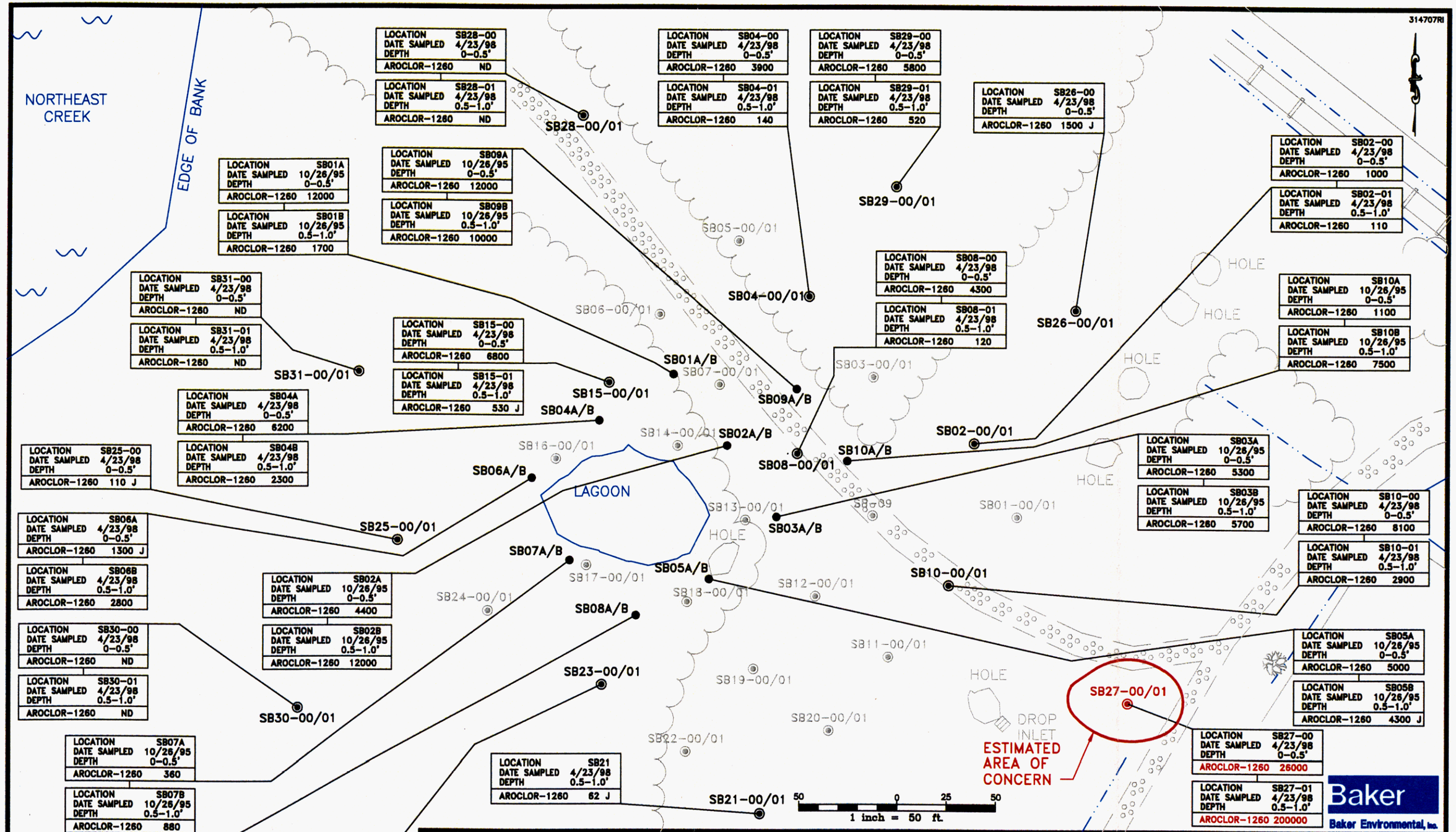

## LEGEND

- SOIL SAMPLING LOCATION - OCTOBER 1995
- SOIL SAMPLING LOCATION - MARCH 1998
- SOIL SAMPLE NOT ANALYZED AT FIXED BASE LABORATORY
- HOLE
- SWALE
- GRAVEL ROAD
- TREE LINE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

NOTES: 1.) RED INDICATES CONCENTRATIONS IN EXCEEDANCE OF CLEAN-UP STANDARDS FOR HIGH OCCUPANCY USE (1,000 ug/kg).
2.) CONCENTRATIONS ARE ug/kg.

FIGURE 4-29
ESTIMATED AREA OF CONCERN
DETECTED PCBs GREATER THAN 1,000 ug/kg
SITE 84
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA




## LEGEND

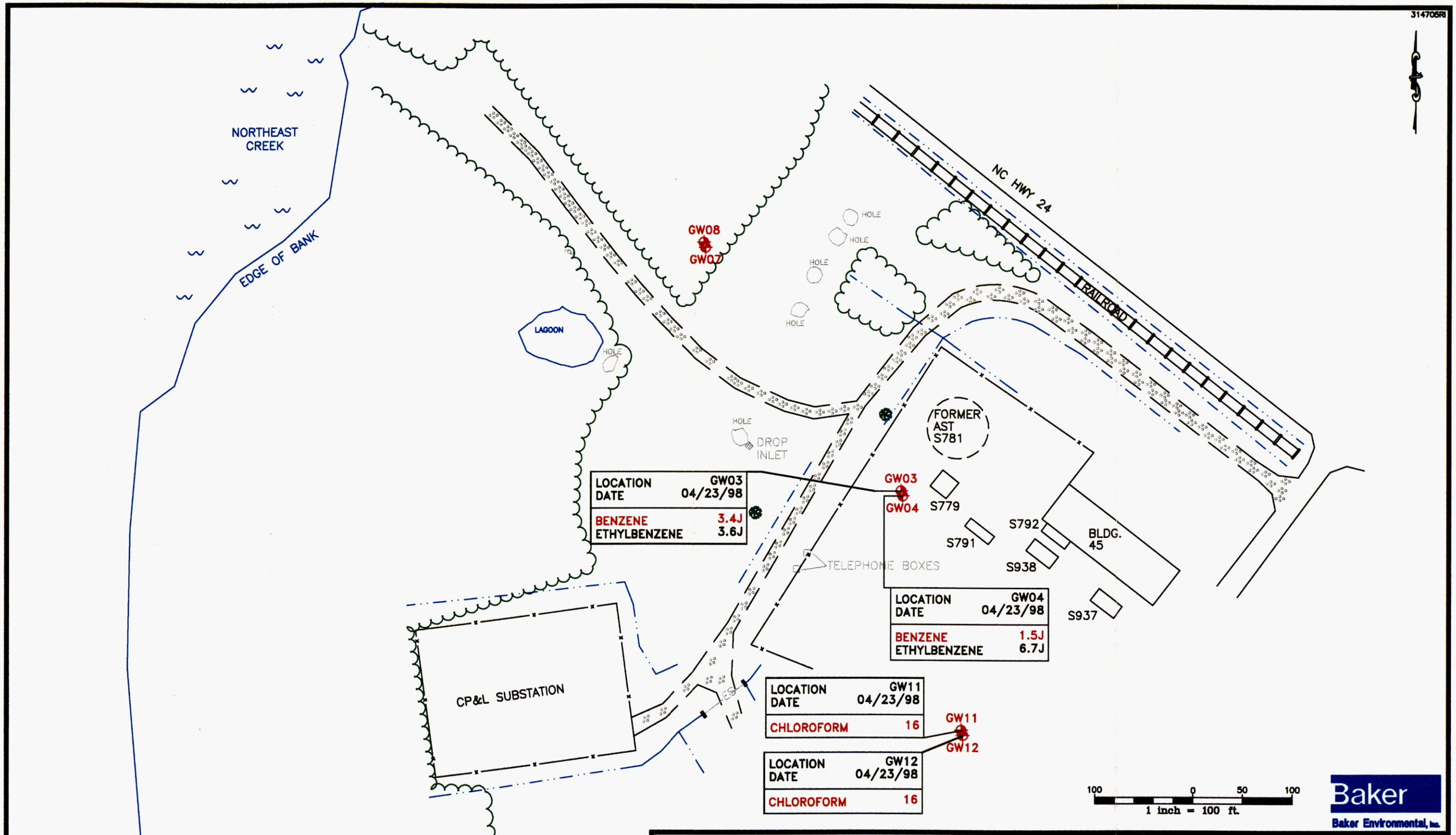
- ● – SOIL SAMPLING LOCATION – OCTOBER 1995
- ◉ – SOIL SAMPLING LOCATION – MARCH 1998
- – SOIL SAMPLE NOT ANALYZED AT FIXED BASE LABORATORY
- – HOLE
- – SWALE
- – GRAVEL ROAD
- – TREE LINE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

NOTES: 1.) RED INDICATES CONCENTRATIONS IN EXCEEDANCE OF CLEAN-UP STANDARDS FOR LOW OCCUPANCY USE (25,000 ug/kg).
2.) CONCENTRATIONS ARE ug/kg.

FIGURE 4-30
ESTIMATED AREA OF CONCERN
DETECTED PCBs GREATER THAN 25,000 ug/kg
SITE 84
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314705RI

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NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.

**LEGEND**

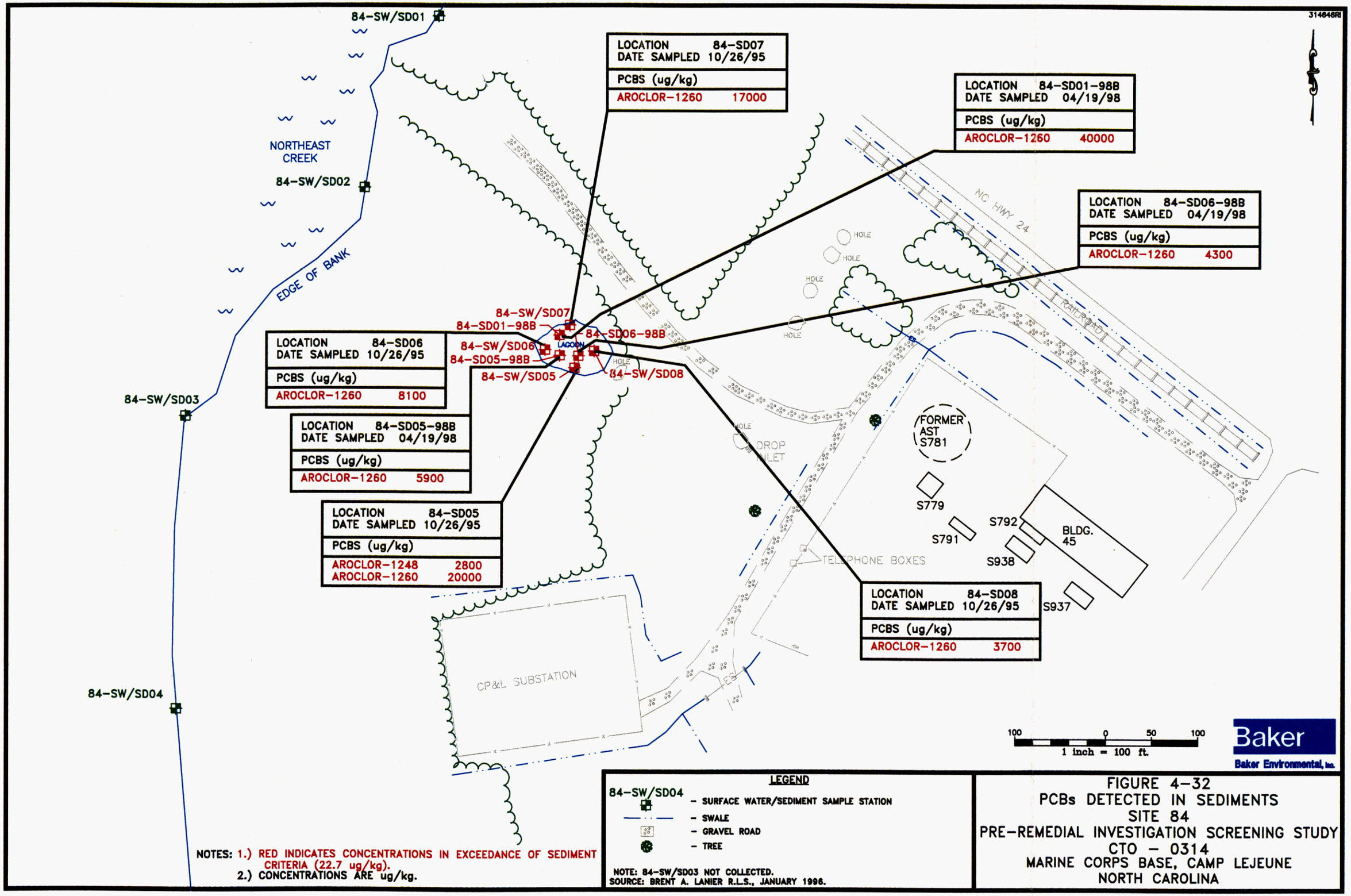
- INTERMITTENT DRAINAGE SWELL
- TREE LINE
- GRAVEL ROAD

NOTE: 1.) RED INDICATES CONCENTRATIONS IN EXCEEDANCE OF NC WQS.

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 4-31
ORGANICS DETECTED IN GROUNDWATER
SITE 84
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314646RI




NOTES: 1.) RED INDICATES CONCENTRATIONS IN EXCEEDANCE OF SEDIMENT CRITERIA (22.7 ug/kg).
2.) CONCENTRATIONS ARE ug/kg.

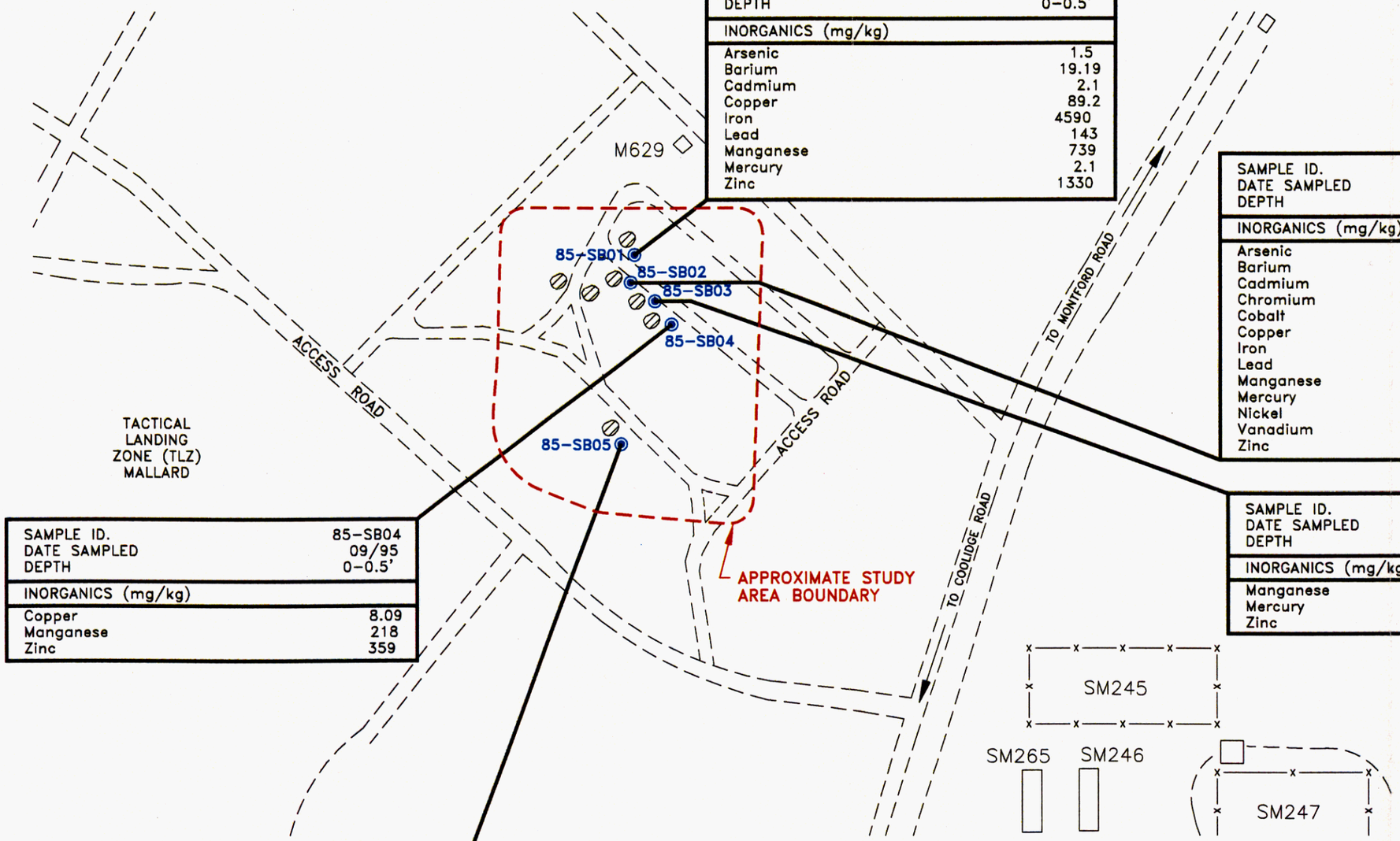
**LEGEND**

84-SW/SD04 – SURFACE WATER/SEDIMENT SAMPLE STATION
– SWALE
– GRAVEL ROAD
– TREE

NOTE: 84-SW/SD03 NOT COLLECTED.
SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 4-32
PCBs DETECTED IN SEDIMENTS
SITE 84
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314647RI




| SAMPLE ID. | 85-SB01 |
|---|---|
| DATE SAMPLED | 09/95 |
| DEPTH | 0-0.5' |
| **INORGANICS (mg/kg)** | |
| Arsenic | 1.5 |
| Barium | 19.19 |
| Cadmium | 2.1 |
| Copper | 89.2 |
| Iron | 4590 |
| Lead | 143 |
| Manganese | 739 |
| Mercury | 2.1 |
| Zinc | 1330 |

| SAMPLE ID. | 85-SB02 |
|---|---|
| DATE SAMPLED | 09/95 |
| DEPTH | 0-0.5' |
| **INORGANICS (mg/kg)** | |
| Arsenic | 76.79 |
| Barium | 134 |
| Cadmium | 47.1 |
| Chromium | 147 |
| Cobalt | 17.3 |
| Copper | 1870 |
| Iron | 339000 |
| Lead | 3030 |
| Manganese | 19700 |
| Mercury | 70.7 |
| Nickel | 117 |
| Vanadium | 13.9 |
| Zinc | 63900 |

| SAMPLE ID. | 85-SB03 |
|---|---|
| DATE SAMPLED | 09/95 |
| DEPTH | 0-0.5' |
| **INORGANICS (mg/kg)** | |
| Manganese | 19.19 |
| Mercury | 0.349 |
| Zinc | 101 |

| SAMPLE ID. | 85-SB04 |
|---|---|
| DATE SAMPLED | 09/95 |
| DEPTH | 0-0.5' |
| **INORGANICS (mg/kg)** | |
| Copper | 8.09 |
| Manganese | 218 |
| Zinc | 359 |

| SAMPLE ID. | 85-SB05 |
|---|---|
| DATE SAMPLED | 09/95 |
| DEPTH | 0-0.5' |
| **INORGANICS (mg/kg)** | |
| Nickel | 3.5 |

200 0 100 200
1 inch = 200 ft.

Baker
Baker Environmental, Inc.

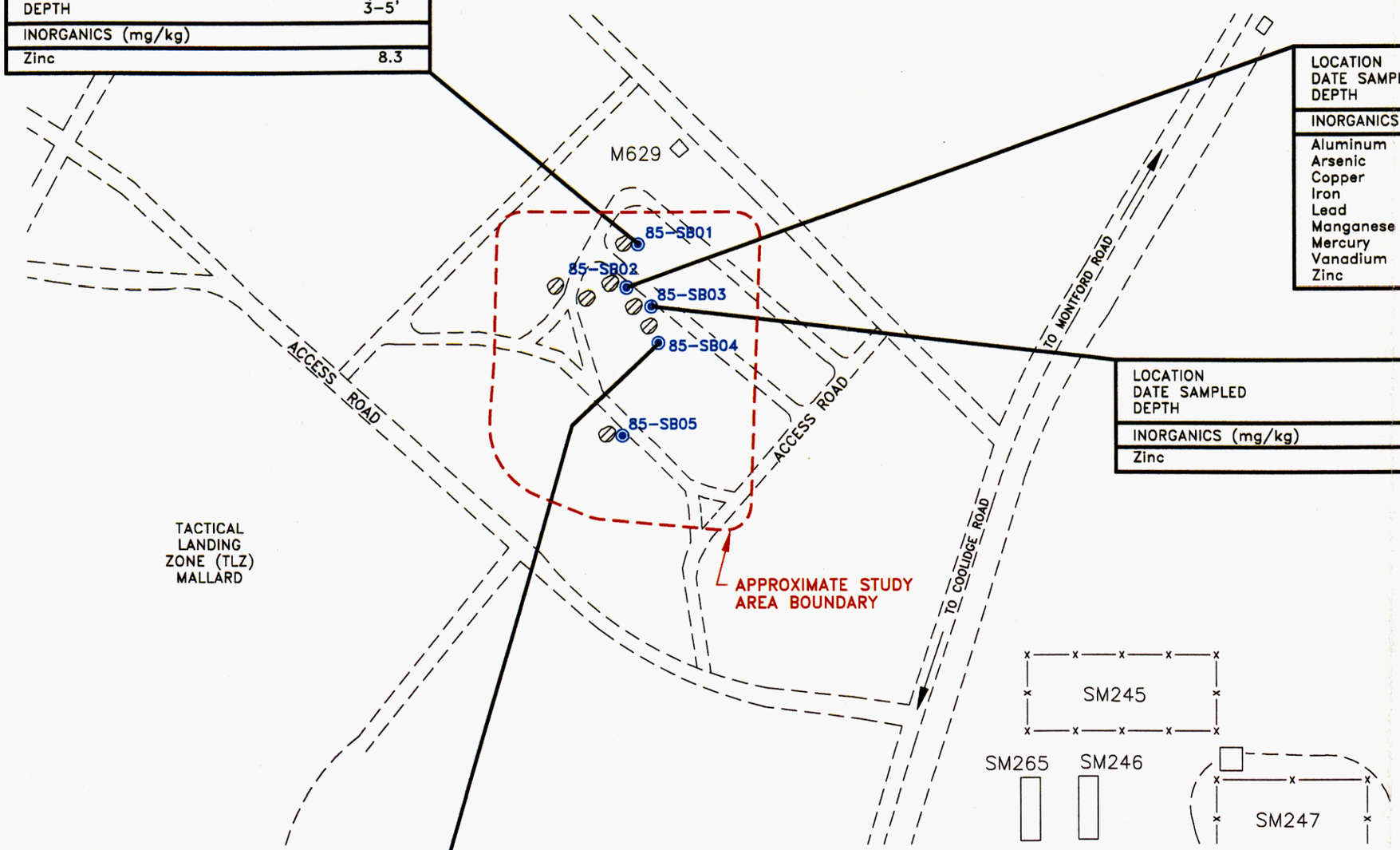
LEGEND

85-SB02 SOIL BORING LOCATION
BATTERY DISPOSAL AREA
DIRT ACCESS ROAD
FENCE LINE

SOURCE: LANTDIV, FEB. 1992

FIGURE 4-33
METALS DETECTED IN SURFACE SOIL
SITE 85
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314649RI




| LOCATION | 85-SB01 |
|---|---|
| DATE SAMPLED | 09/95 |
| DEPTH | 3-5' |
| INORGANICS (mg/kg) | |
| Zinc | 8.3 |

| LOCATION | 85-SB02 |
|---|---|
| DATE SAMPLED | 09/95 |
| DEPTH | 3-5' |
| INORGANICS (mg/kg) | |
| Aluminum | 10200 |
| Arsenic | 3 |
| Copper | 8.8 |
| Iron | 9480 |
| Lead | 40.6 |
| Manganese | 47.5 |
| Mercury | 0.6 |
| Vanadium | 20 |
| Zinc | 187 |

| LOCATION | 85-SB03 |
|---|---|
| DATE SAMPLED | 09/95 |
| DEPTH | 3-5' |
| INORGANICS (mg/kg) | |
| Zinc | 7.29 |

| LOCATION | 85-SB04 |
|---|---|
| DATE SAMPLED | 09/95 |
| DEPTH | 3-5' |
| INORGANICS (mg/kg) | |
| Nickel | 4.4 |

| LOCATION | 85-SB04-03 |
|---|---|
| DATE SAMPLED | 09/95 |
| DEPTH | 5-7' |
| INORGANICS (mg/kg) | |
| Mercury | 0.14 |

200 0 100 200
1 inch = 200 ft.

Baker
Baker Environmental, Inc.

LEGEND

85-SB02 SOIL BORING LOCATION
BATTERY DISPOSAL AREA
DIRT ACCESS ROAD
FENCE LINE

SOURCE: LANTDIV, FEB. 1992

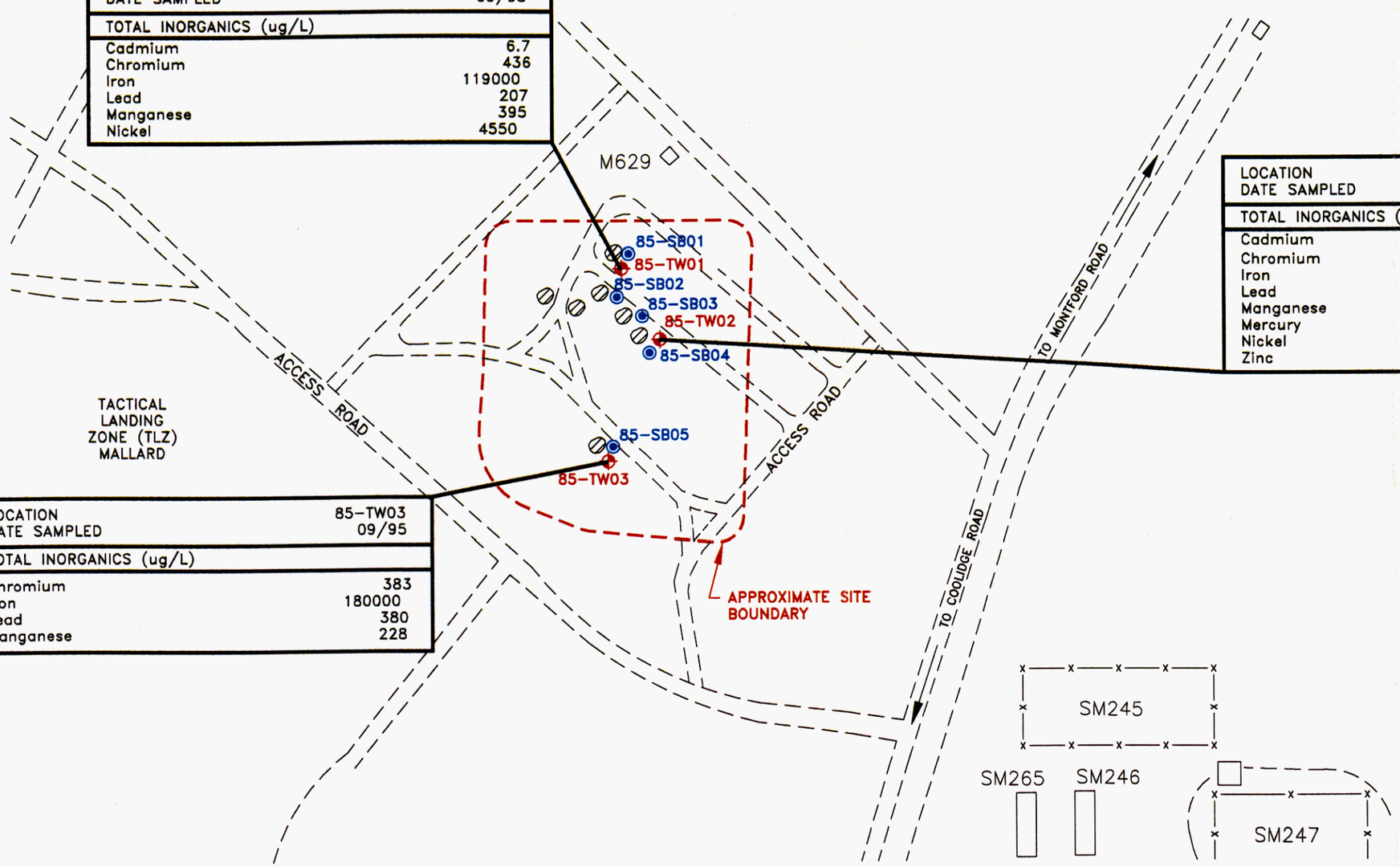
FIGURE 4-34
METALS DETECTED IN
SUBSURFACE SOIL
SITE 85
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

314648RI

| LOCATION | 85-TW01 |
|---|---|
| DATE SAMPLED | 09/95 |
| TOTAL INORGANICS (ug/L) | |
| Cadmium | 6.7 |
| Chromium | 436 |
| Iron | 119000 |
| Lead | 207 |
| Manganese | 395 |
| Nickel | 4550 |

| LOCATION | 85-TW02 |
|---|---|
| DATE SAMPLED | 09/95 |
| TOTAL INORGANICS (ug/L) | |
| Cadmium | 24.6 |
| Chromium | 821 |
| Iron | 498000 |
| Lead | 512 |
| Manganese | 1270 |
| Mercury | 2.39 |
| Nickel | 206 |
| Zinc | 3970 |

| LOCATION | 85-TW03 |
|---|---|
| DATE SAMPLED | 09/95 |
| TOTAL INORGANICS (ug/L) | |
| Chromium | 383 |
| Iron | 180000 |
| Lead | 380 |
| Manganese | 228 |




200 0 100 200
1 inch = 200 ft.

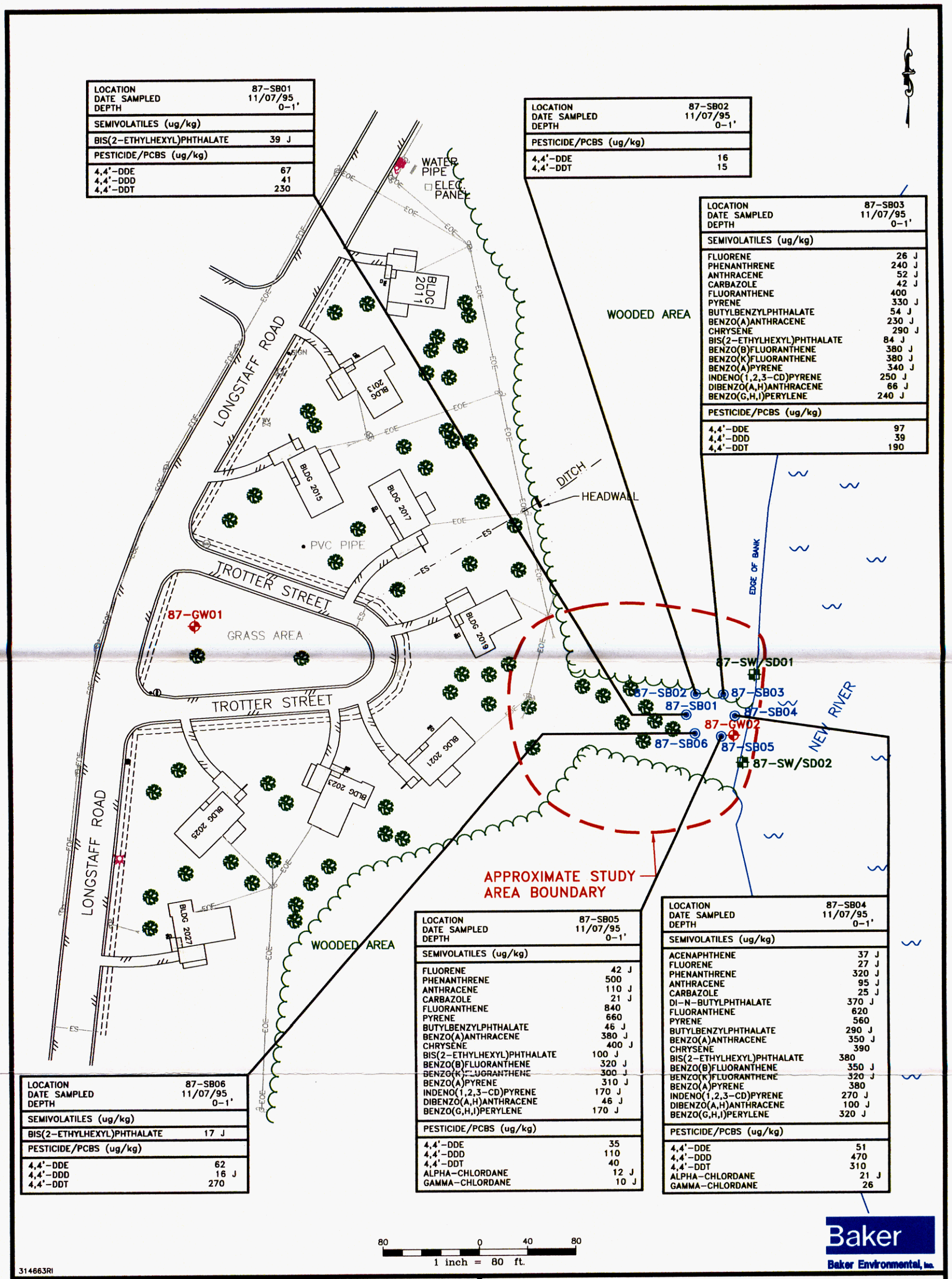
Baker
Baker Environmental, Inc.

LEGEND

| | |
|---|---|
| 85-TW01 | TEMPORARY GROUNDWATER MONITORING WELL WITH CORRESPONDING SOIL BORING |
| 85-SB02 | SOIL BORING LOCATION |
| | BATTERY DISPOSAL AREA |
| | DIRT ACCESS ROAD |
| | FENCE LINE |

SOURCE: LANTDIV, FEB. 1992

FIGURE 4-35
METALS DETECTED IN GROUNDWATER
SITE 85
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA




| LOCATION | 87-SB01 |
|---|---|
| DATE SAMPLED | 11/07/95 |
| DEPTH | 0-1' |
| **SEMIVOLATILES (ug/kg)** | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 39 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 67 |
| 4,4'-DDD | 41 |
| 4,4'-DDT | 230 |

| LOCATION | 87-SB02 |
|---|---|
| DATE SAMPLED | 11/07/95 |
| DEPTH | 0-1' |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 16 |
| 4,4'-DDT | 15 |

| LOCATION | 87-SB03 |
|---|---|
| DATE SAMPLED | 11/07/95 |
| DEPTH | 0-1' |
| **SEMIVOLATILES (ug/kg)** | |
| FLUORENE | 26 J |
| PHENANTHRENE | 240 J |
| ANTHRACENE | 52 J |
| CARBAZOLE | 42 J |
| FLUORANTHENE | 400 |
| PYRENE | 330 J |
| BUTYLBENZYLPHTHALATE | 54 J |
| BENZO(A)ANTHRACENE | 230 J |
| CHRYSENE | 290 J |
| BIS(2-ETHYLHEXYL)PHTHALATE | 84 J |
| BENZO(B)FLUORANTHENE | 380 J |
| BENZO(K)FLUORANTHENE | 380 J |
| BENZO(A)PYRENE | 340 J |
| INDENO(1,2,3-CD)PYRENE | 250 J |
| DIBENZO(A,H)ANTHRACENE | 66 J |
| BENZO(G,H,I)PERYLENE | 240 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 97 |
| 4,4'-DDD | 39 |
| 4,4'-DDT | 190 |

| LOCATION | 87-SB04 |
|---|---|
| DATE SAMPLED | 11/07/95 |
| DEPTH | 0-1' |
| **SEMIVOLATILES (ug/kg)** | |
| ACENAPHTHENE | 37 J |
| FLUORENE | 27 J |
| PHENANTHRENE | 320 J |
| ANTHRACENE | 95 J |
| CARBAZOLE | 25 J |
| DI-N-BUTYLPHTHALATE | 370 J |
| FLUORANTHENE | 620 |
| PYRENE | 560 |
| BUTYLBENZYLPHTHALATE | 290 J |
| BENZO(A)ANTHRACENE | 350 J |
| CHRYSENE | 390 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 380 |
| BENZO(B)FLUORANTHENE | 350 J |
| BENZO(K)FLUORANTHENE | 320 J |
| BENZO(A)PYRENE | 380 |
| INDENO(1,2,3-CD)PYRENE | 270 J |
| DIBENZO(A,H)ANTHRACENE | 100 J |
| BENZO(G,H,I)PERYLENE | 320 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 51 |
| 4,4'-DDD | 470 |
| 4,4'-DDT | 310 |
| ALPHA-CHLORDANE | 21 J |
| GAMMA-CHLORDANE | 26 |

| LOCATION | 87-SB05 |
|---|---|
| DATE SAMPLED | 11/07/95 |
| DEPTH | 0-1' |
| **SEMIVOLATILES (ug/kg)** | |
| FLUORENE | 42 J |
| PHENANTHRENE | 500 |
| ANTHRACENE | 110 J |
| CARBAZOLE | 21 J |
| FLUORANTHENE | 840 |
| PYRENE | 660 |
| BUTYLBENZYLPHTHALATE | 46 J |
| BENZO(A)ANTHRACENE | 380 J |
| CHRYSENE | 400 J |
| BIS(2-ETHYLHEXYL)PHTHALATE | 100 J |
| BENZO(B)FLUORANTHENE | 320 J |
| BENZO(K)FLUORANTHENE | 300 J |
| BENZO(A)PYRENE | 310 J |
| INDENO(1,2,3-CD)PYRENE | 170 J |
| DIBENZO(A,H)ANTHRACENE | 46 J |
| BENZO(G,H,I)PERYLENE | 170 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 35 |
| 4,4'-DDD | 110 |
| 4,4'-DDT | 40 |
| ALPHA-CHLORDANE | 12 J |
| GAMMA-CHLORDANE | 10 J |

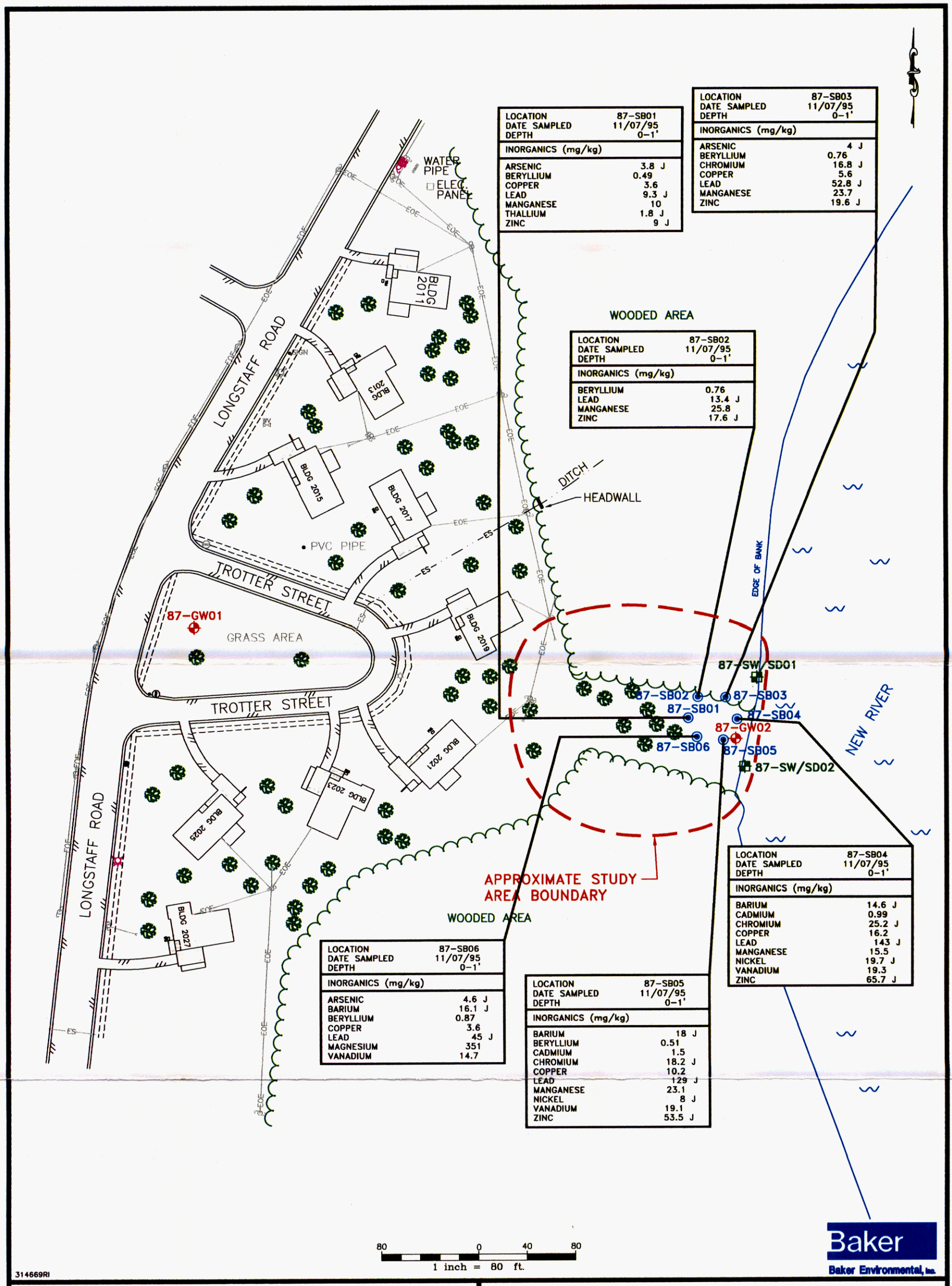
| LOCATION | 87-SB06 |
|---|---|
| DATE SAMPLED | 11/07/95 |
| DEPTH | 0-1' |
| **SEMIVOLATILES (ug/kg)** | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 17 J |
| **PESTICIDE/PCBS (ug/kg)** | |
| 4,4'-DDE | 62 |
| 4,4'-DDD | 16 J |
| 4,4'-DDT | 270 |

## LEGEND

- 87-GW01 – GROUNDWATER MONITORING WELL LOCATION
- 87-SB01 – SOIL BORING LOCATION
- 87-SW/SD01 – SURFACE WATER/SEDIMENT SAMPLE STATION
- – TREE LINE
- – TREE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 4-36
ORGANICS DETECTED IN SURFACE SOIL
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

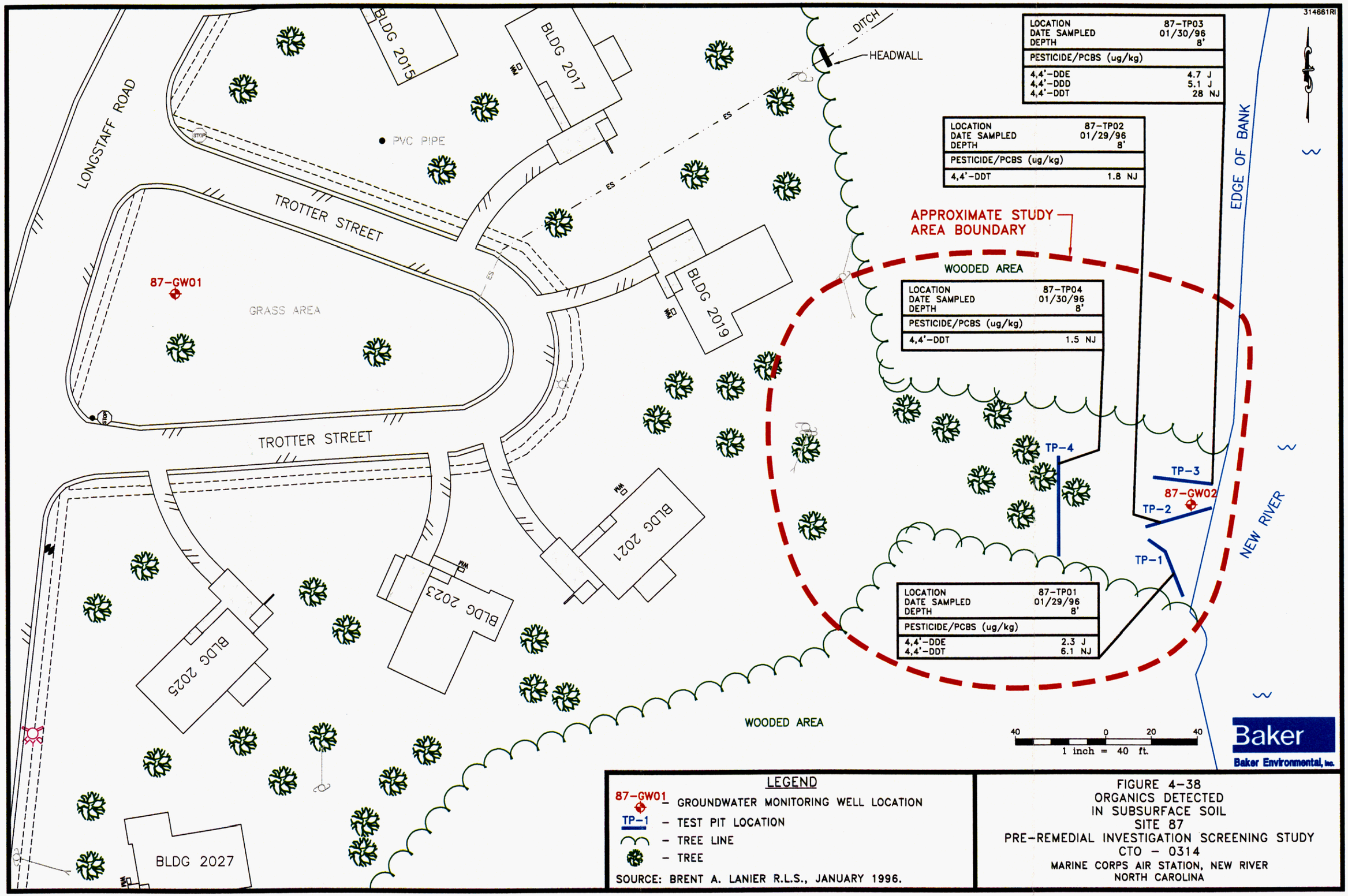


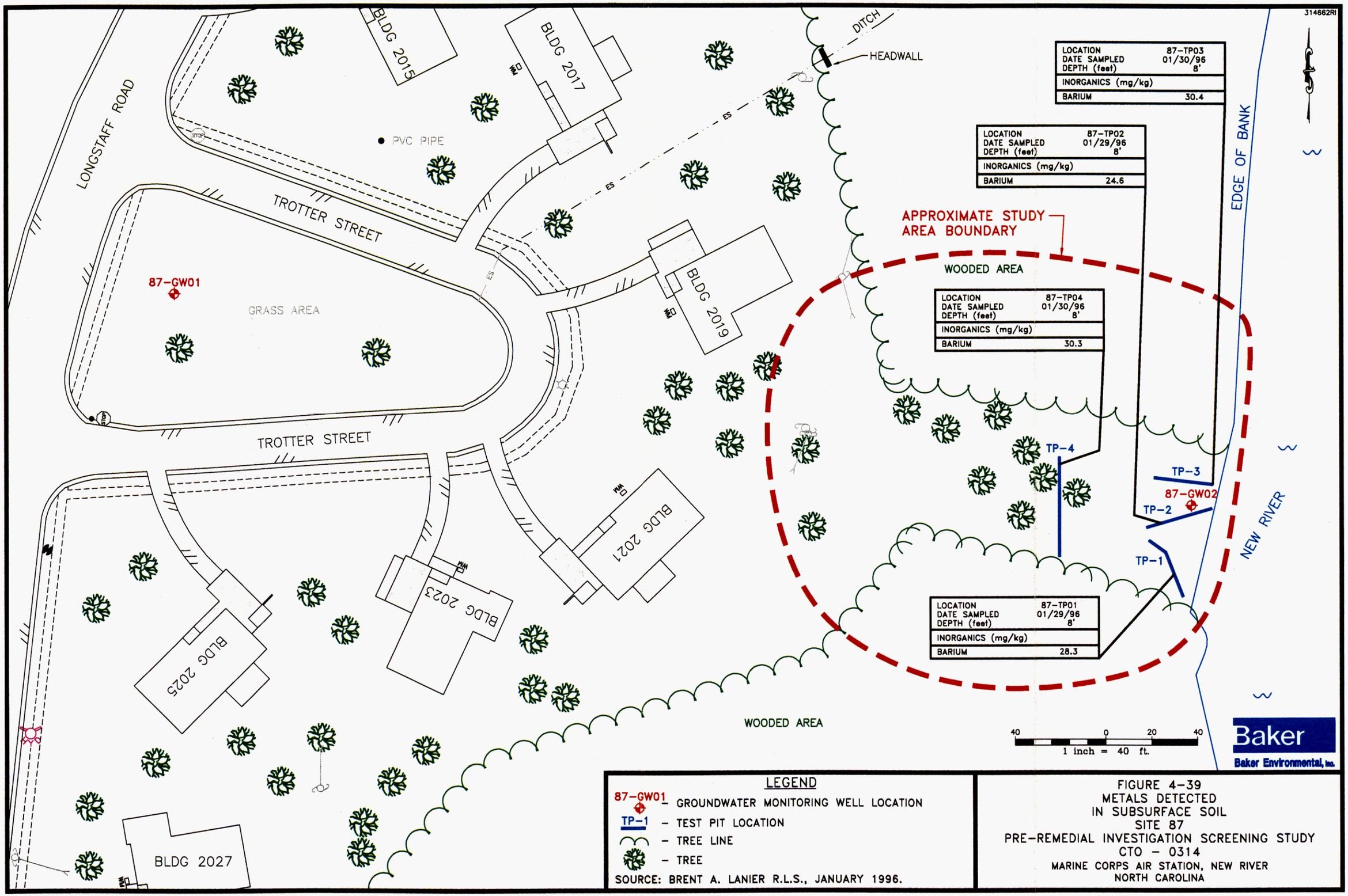

## LEGEND

- 87-GW01 – GROUNDWATER MONITORING WELL LOCATION
- 87-SB01 – SOIL BORING LOCATION
- 87-SW/SD01 – SURFACE WATER/SEDIMENT SAMPLE STATION
- – TREE LINE
- – TREE

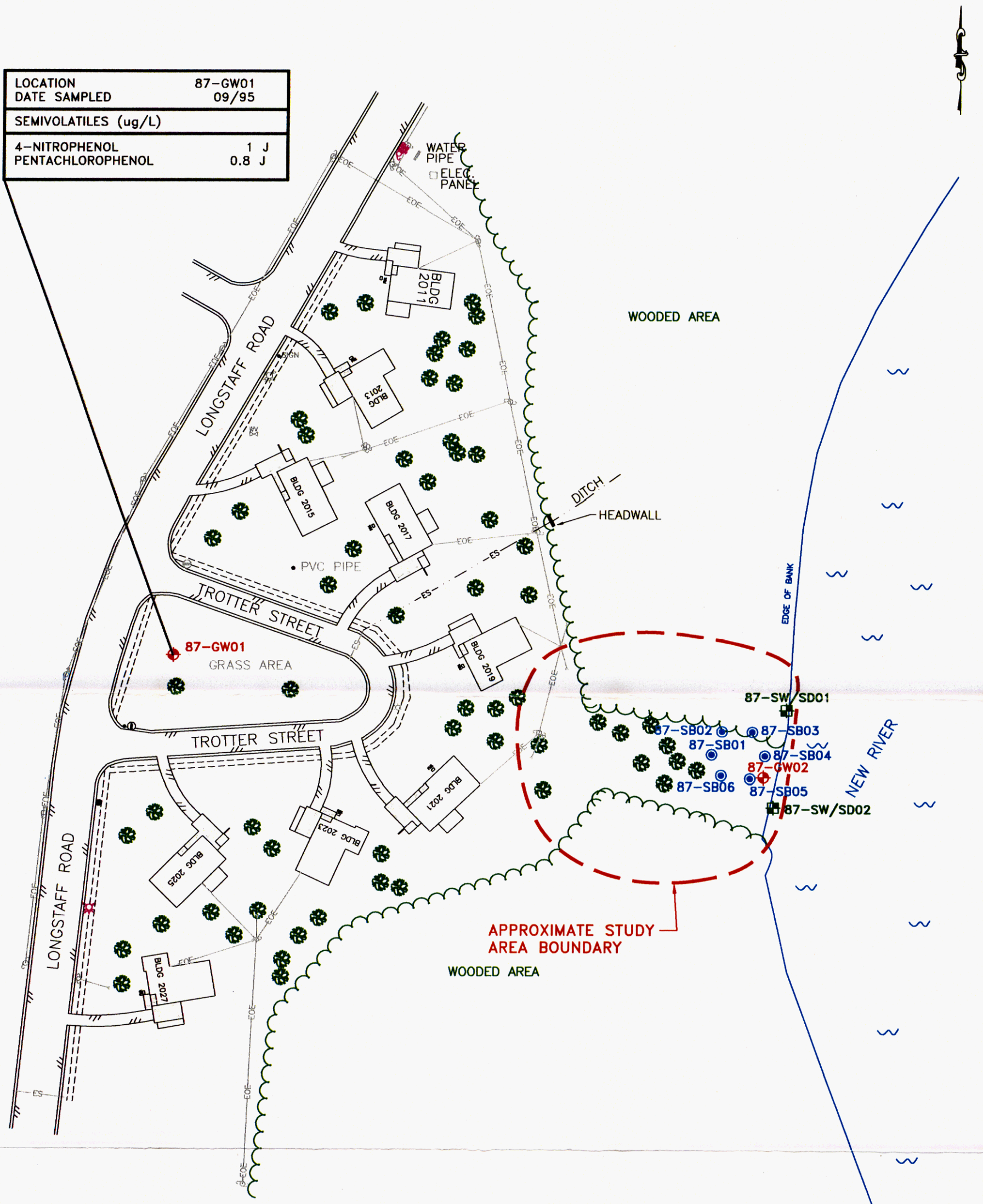
SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 4-37
METALS DETECTED IN SURFACE SOIL
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA


314661RI
LONGSTAFF ROAD
TROTTER STREET
TROTTER STREET
BLDG 2015
BLDG 2017
BLDG 2019
BLDG 2021
BLDG 2023
BLDG 2025
BLDG 2027
PVC PIPE
GRASS AREA
87-GW01
87-GW02
DITCH
HEADWALL
ES
WM
STOP
APPROXIMATE STUDY AREA BOUNDARY
WOODED AREA
WOODED AREA
EDGE OF BANK
NEW RIVER
TP-1
TP-2
TP-3
TP-4
LOCATION 87-TP03
DATE SAMPLED 01/30/96
DEPTH 8'
PESTICIDE/PCBS (ug/kg)
4,4'-DDE 4.7 J
4,4'-DDD 5.1 J
4,4'-DDT 28 NJ
LOCATION 87-TP02
DATE SAMPLED 01/29/96
DEPTH 8'
PESTICIDE/PCBS (ug/kg)
4,4'-DDT 1.8 NJ
LOCATION 87-TP04
DATE SAMPLED 01/30/96
DEPTH 8'
PESTICIDE/PCBS (ug/kg)
4,4'-DDT 1.5 NJ
LOCATION 87-TP01
DATE SAMPLED 01/29/96
DEPTH 8'
PESTICIDE/PCBS (ug/kg)
4,4'-DDE 2.3 J
4,4'-DDT 6.1 NJ
40 0 20 40
1 inch = 40 ft.
Baker
Baker Environmental, Inc.
LEGEND
87-GW01 - GROUNDWATER MONITORING WELL LOCATION
TP-1 - TEST PIT LOCATION
- TREE LINE
- TREE
SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.
FIGURE 4-38
ORGANICS DETECTED
IN SUBSURFACE SOIL
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA


314662RI
LONGSTAFF ROAD
TROTTER STREET
TROTTER STREET
BLDG 2015
BLDG 2017
BLDG 2019
BLDG 2021
BLDG 2023
BLDG 2025
BLDG 2027
PVC PIPE
GRASS AREA
87-GW01
DITCH
HEADWALL
ES
WM
STOP
LOCATION 87-TP03
DATE SAMPLED 01/30/96
DEPTH (feet) 8'
INORGANICS (mg/kg)
BARIUM 30.4
LOCATION 87-TP02
DATE SAMPLED 01/29/96
DEPTH (feet) 8'
INORGANICS (mg/kg)
BARIUM 24.6
APPROXIMATE STUDY AREA BOUNDARY
WOODED AREA
LOCATION 87-TP04
DATE SAMPLED 01/30/96
DEPTH (feet) 8'
INORGANICS (mg/kg)
BARIUM 30.3
EDGE OF BANK
TP-4
TP-3
87-GW02
TP-2
TP-1
NEW RIVER
LOCATION 87-TP01
DATE SAMPLED 01/29/96
DEPTH (feet) 8'
INORGANICS (mg/kg)
BARIUM 28.3
WOODED AREA
40 0 20 40
1 inch = 40 ft.
Baker
Baker Environmental, Inc.
LEGEND
87-GW01 - GROUNDWATER MONITORING WELL LOCATION
TP-1 - TEST PIT LOCATION
- TREE LINE
- TREE
SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.
FIGURE 4-39
METALS DETECTED
IN SUBSURFACE SOIL
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

| LOCATION | 87-GW01 |
|---|---|
| DATE SAMPLED | 09/95 |
| SEMIVOLATILES (ug/L) | |
| 4-NITROPHENOL | 1 J |
| PENTACHLOROPHENOL | 0.8 J |




LEGEND

87-GW01 – GROUNDWATER MONITORING WELL LOCATION

87-SB01 – SOIL BORING LOCATION

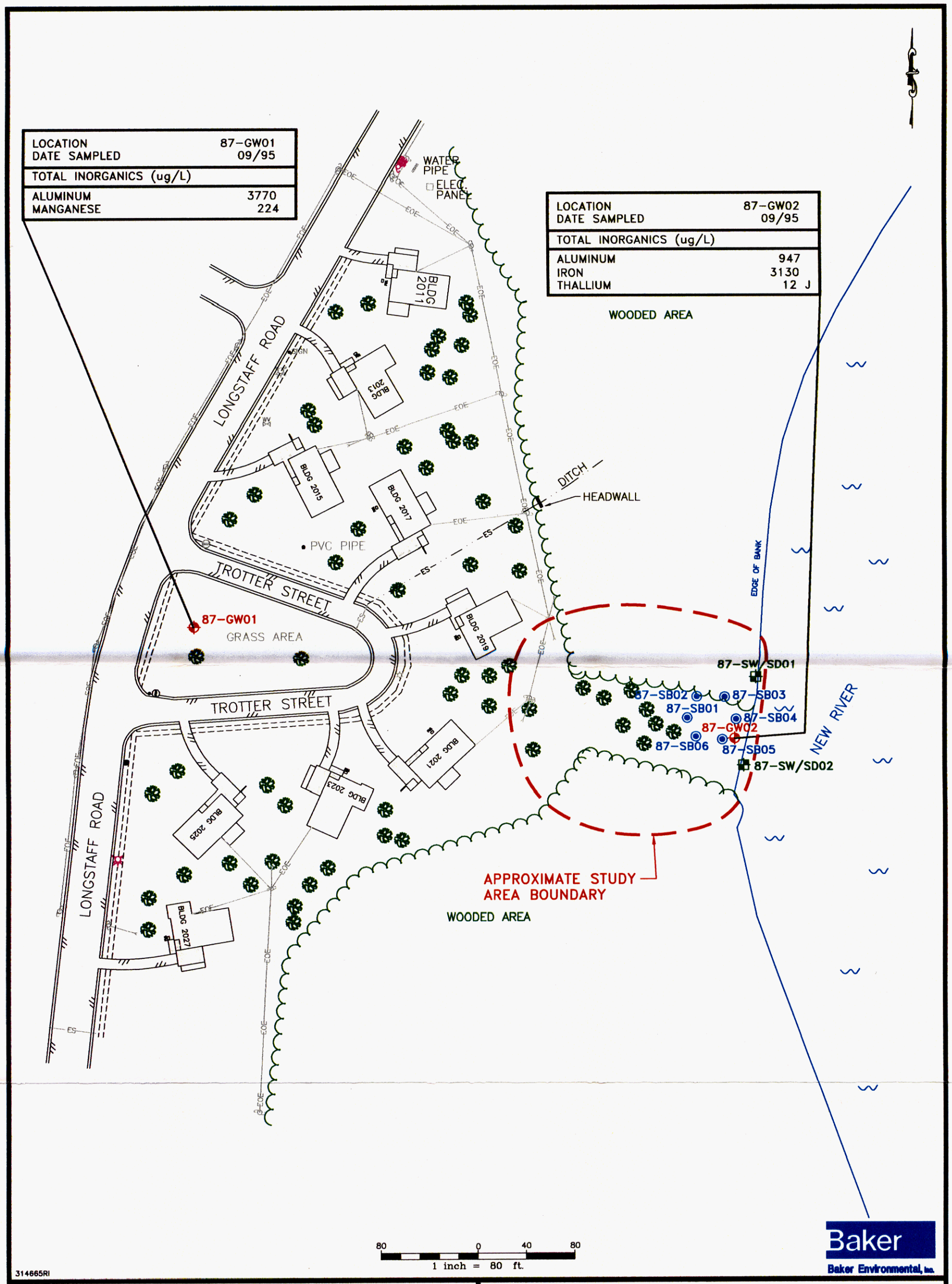
87-SW/SD01 – SURFACE WATER/SEDIMENT SAMPLE STATION

– TREE LINE

– TREE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 4-40
ORGANICS DETECTED IN GROUNDWATER
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO - 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA




LEGEND

87-GW01 – GROUNDWATER MONITORING WELL LOCATION

87-SB01 – SOIL BORING LOCATION

87-SW/SD01 – SURFACE WATER/SEDIMENT SAMPLE STATION

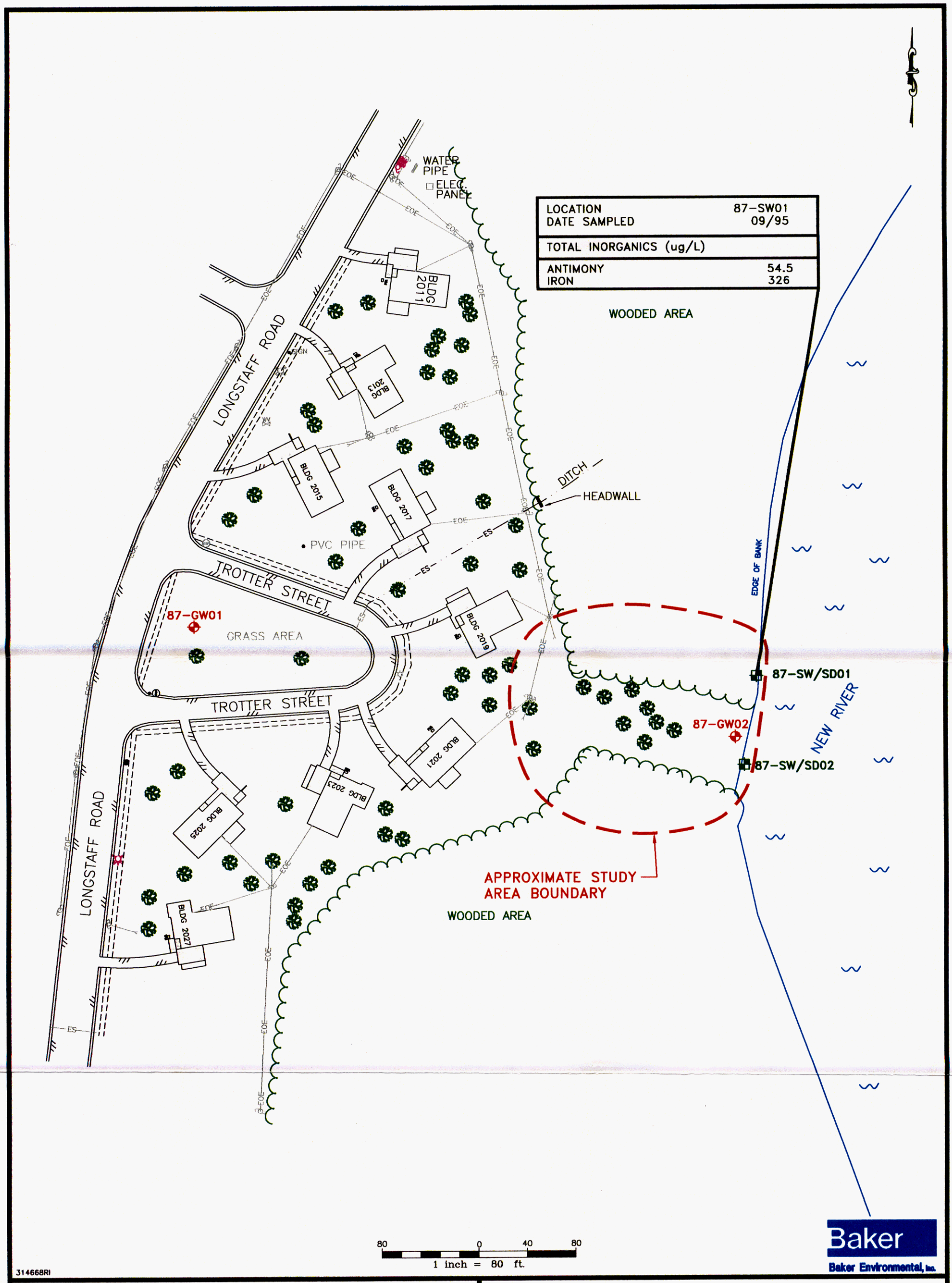
– TREE LINE

– TREE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 4-41
METALS DETECTED IN GROUNDWATER
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314

MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA




LEGEND

87-GW01 – GROUNDWATER MONITORING WELL LOCATION

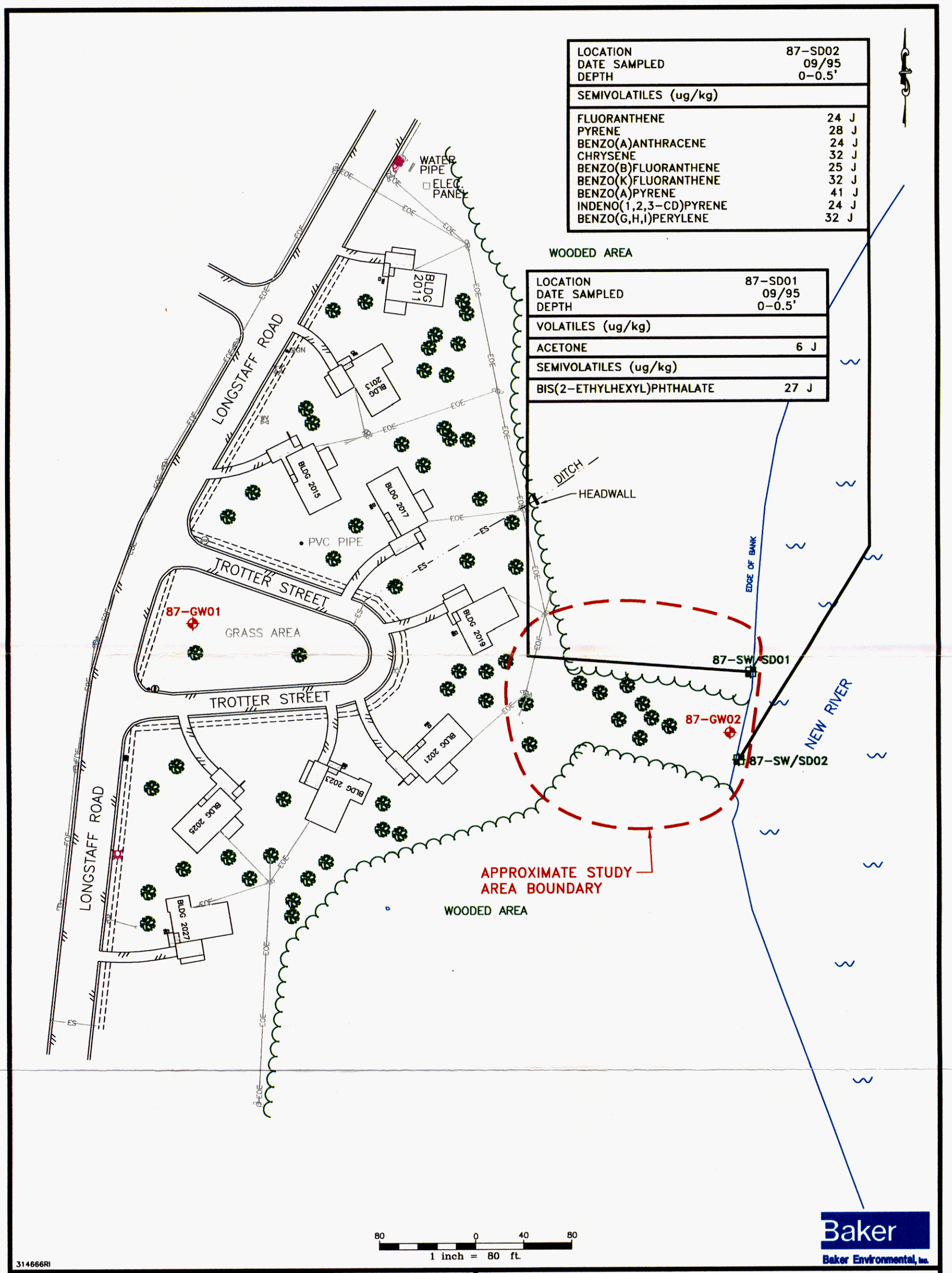
87-SW/SD01 – SURFACE WATER/SEDIMENT SAMPLE STATION

– TREE LINE

– TREE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 4-42
METALS DETECTED IN SURFACE WATER
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA




LEGEND

87-GW01 – GROUNDWATER MONITORING WELL LOCATION

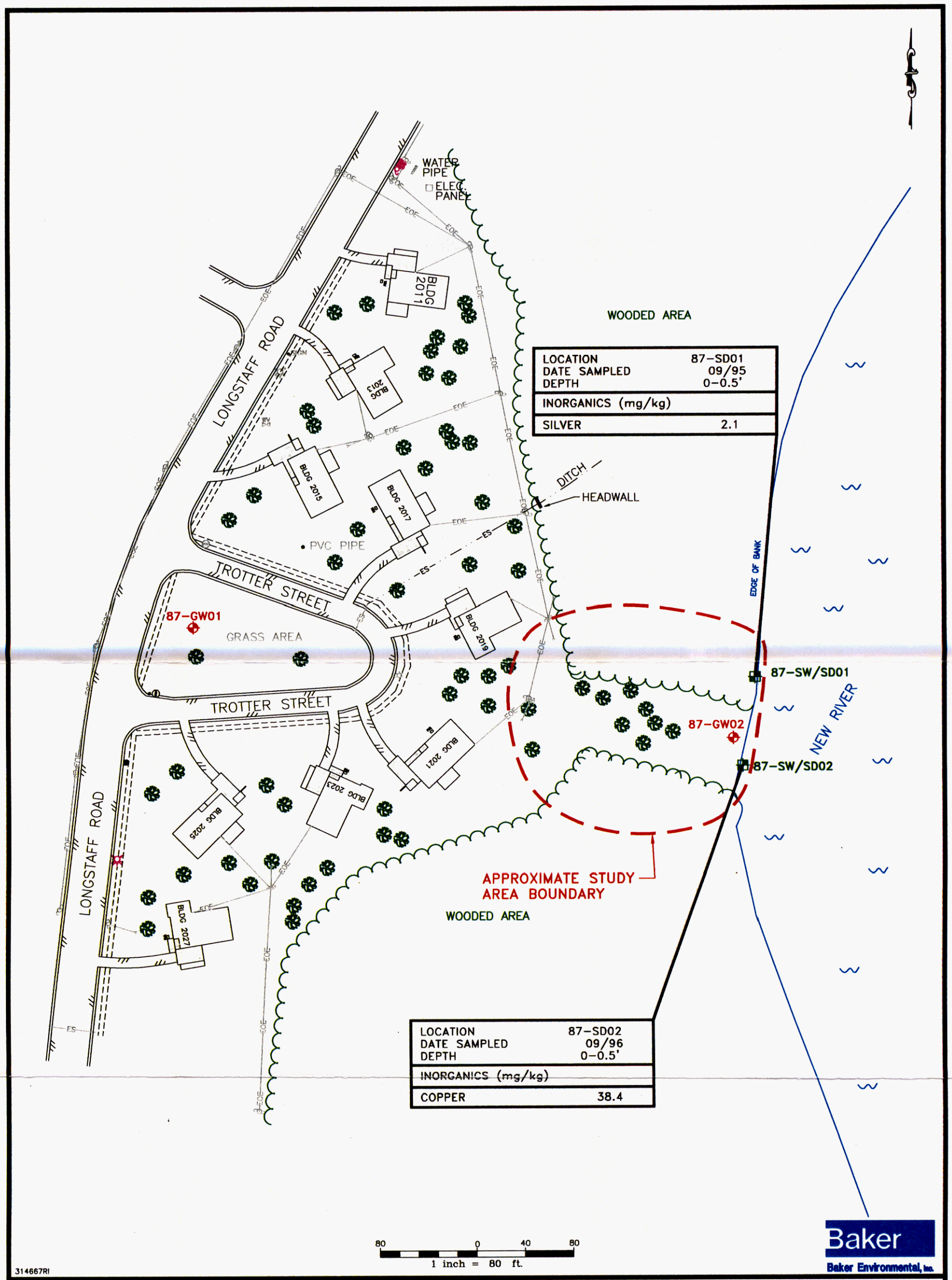
87-SW/SD01 – SURFACE WATER/SEDIMENT SAMPLE STATION

– TREE LINE

– TREE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 4-43
ORGANICS DETECTED IN SEDIMENTS
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA




LEGEND

87-GW01 – GROUNDWATER MONITORING WELL LOCATION

87-SW/SD01 – SURFACE WATER/SEDIMENT SAMPLE STATION

– TREE LINE

– TREE

SOURCE: BRENT A. LANIER R.L.S., JANUARY 1996.

FIGURE 4-44
METALS DETECTED IN SEDIMENTS
SITE 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY
CTO – 0314
MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

# 5.0 BASELINE RISK ASSESSMENT

## 5.1 Introduction

This Baseline Risk Assessment (BRA) for the Pre-RI Screening Study evaluates the projected impact of contaminants of potential concern (COPCs) on human health and/or the environment, now and in the future, in a "no further remedial action scenario". The BRA process examines the data generated during the sampling and analytical phase of the Pre-RI Screening Study, identifying areas of concern (AOCs) and COPCs with respect to geographical, demographic, physical and biological characteristics of the study area. These factors are combined with an understanding of physical and chemical properties of site-associated constituents, (relative to environmental fate and transport processes) and are then used to estimate contaminant concentrations at logical exposure pathway endpoints. Finally, contaminant intake levels are calculated for hypothetical receptors. Toxicological properties are applied in order to estimate potential public health threats posed by detected contaminants.

The BRA for MCB, Camp Lejeune Sites 12, 68, 75, 76, 84, 85, and 87 has been conducted in accordance with current USEPA Risk Assessment Guidance (USEPA, 1989a and USEPA, 1991a) and USEPA Region IV Supplemental Risk Guidance (USEPA, 1991b).

The components of the BRA include:

- Identification of contaminants of potential concern
- The exposure assessment
- The toxicity assessment
- Risk characterization
- Uncertainty analysis
- Conclusions of the BRA and potential site risk

The BRA is divided into eight sections, including the introduction. Section 5.2 presents criteria for selecting COPCs. COPCs are chosen, for each environmental medium at each site, from an overall list of detected contaminants. Section 5.3 lists site characteristics, identifies potential exposure pathways, and describes current and future exposure scenarios. In section 5.4, potential

exposure is calculated by estimating daily intakes, incremental cancer risks and hazard indices. In addition, advisory criteria for evaluating human health risk is presented. Section 5.5 addresses risk characterization. Section 5.7 addresses sources of uncertainty in the BRA. Section 5.8 provides conclusions regarding potential human health impacts, in terms of total site risk. Section 5.9 lists references sited in the BRA text. Referenced tables and figures are presented after the text portion of this section.

## 5.2 Contaminants of Potential Concern

COPCs are site-related contaminants used to quantitatively estimate human exposures and associated health effects. Five environmental media (where applicable) were investigated during this Pre-RI Screening Study: surface soil, subsurface soil, groundwater, surface water, and sediment. This section presents COPC selection for these media. The following media were investigated by site during for the Pre-RI Screening Study:

Site 12: *subsurface soil, groundwater*

Site 68: *surface soil, subsurface soil, groundwater, surface water, sediment*

Site 75: *surface soil, subsurface soil, groundwater*

Site 76: *surface soil, subsurface soil, groundwater*

Site 84: *surface soil, groundwater, surface water, sediment*

Site 85: *surface soil, subsurface soil, groundwater*

Site 87: *surface soil, subsurface soil, groundwater, surface water, sediment*

### 5.2.1 Criteria for Selecting Contaminants of Potential Concern

Following is a list of criteria used to select COPCs, with respect to human health risk. COPCs are selected from the list of constituents detected during the field sampling and analytical phase of the RI. Criteria are listed in hierarchical order:

- Historical information
- Comparison to Contaminants of Concern (COC) Screening Values
- Comparison to background or naturally occurring levels
- Comparison to field and laboratory blank data
- Prevalence
- Persistence
- Mobility
- Comparison to anthropogenic levels
- Toxicity

Federal and state criteria and standards are not used to select human health risk-based COPCs. They are, however, used in the Pre-RI Screening Study quantitative and qualitative RA to determine if further investigation is necessary. In other words, COPCs selected as a result of a comparison to criteria and standards are not risk-based COPCs, and are not used as such to evaluate human health risk. An explanation of the federal and state criteria and standards used for qualitative evaluation of contaminants is presented in Section 5.2.1.10.

USEPA's Risk Assessment Guidance for Superfund provides the criteria used to establish COPCs (USEPA, 1989a). COPC selection also involves comparing detection levels to additional contaminant-specific criteria. A brief description of the selection criteria used in choosing final COPCs is presented below. A contaminant must not necessarily fit into all of these categories to be retained as a COPC.

#### 5.2.1.1 Historical Information

Using historical information to associate contaminants with site activities, when combined with the following selection procedures, helps determine contaminant retention or elimination.

5.2.1.2 USEPA Region III COC Screening Values

COC screening values are derived using conservative USEPA promulgated default values and the most recent toxicological criteria available. COC screening values for potentially carcinogenic and noncarcinogenic chemicals are individually derived based on a target incremental lifetime cancer risk (ICR) of $1x10^{-6}$ and a target hazard quotient of 0.1, respectively. For potential carcinogens, the toxicity criteria applicable to the derivation of COC screening values are oral and inhalation cancer slope factors; for noncarcinogens, they are chronic oral and inhalation reference doses. These toxicity criteria are subject to change as more updated information and results from the most recent toxicological/epidemiological studies become available. Therefore, the use of toxicity criteria in the derivation of COC screening values requires that the screening concentrations be updated periodically to reflect changes in the toxicity criteria.

The COC screening values can be updated by incorporating information from another set of tables containing risk-based concentrations (RBCs) that are issued by USEPA Region III on a semi-annual basis. The RBCs are derived using the same equations and USEPA promulgated default exposure assumptions that were used by Region III to derive the COC screening values. In addition, the quarterly RBCs for potentially carcinogenic chemicals are based on a target ICR of $1x10^{-6}$. The only difference in the derivation methodologies for the COC screening values and the RBCs is that the RBCs for noncarcinogens are based on a target hazard quotient of 1.0 rather than 0.1. The COC screening values for noncarcinogens are to be derived based on a target hazard quotient of 0.1, to account for cumulative risk from multiple chemicals in a medium. Re-derivation of the quarterly noncarcinogenic RBCs based on a target hazard quotient of 0.1, while using the most recent toxicological criteria available, results in a set of values that can be used as COC screening values. In other words, an updated set of COC screening values can be attained twice a year by using the carcinogenic RBCs issued semi-annually by USEPA Region III and dividing the accompanying noncarcinogenic RBCs by a factor of 10. It should be noted that the most recent update was published in June of 1996.

5.2.1.3 Background or Naturally Occurring Levels

Naturally occurring levels of chemicals are present under ambient conditions. Generally, a comparison to naturally occurring levels applies only to inorganic analytes, because the majority

of organic contaminants are not naturally occurring. Background samples are collected from areas that are known to be uninfluenced by site contamination. An inorganic concentration is considered site-related only if it exceeds two times the mean concentration estimated for the site-specific background samples. The mean for surface soil inorganics is estimated using results from 51 sample locations. The mean for subsurface soil inorganics is estimated using results from 46 sample locations. Background soil data is presented in Appendix H.

5.2.1.4 Contaminant Concentrations in Blanks

Associating contaminants detected in field related QA/QC samples (i.e., trip blanks, equipment rinsates and/or field blanks) or laboratory method blanks with the same contaminants detected in analytical samples can eliminate non-site-related contaminants from the list of COPCs. Blank data should be compared to sample results with which the blanks are associated; however, due to the comprehensive nature of data sets, it is difficult to associate specific blanks with specific environmental samples. Thus, in order to evaluate contaminant levels, maximum contaminant concentrations reported in a given set of blanks are applied to an entire data set for a given medium.

In accordance with the National Functional Guidelines for Organics, common lab contaminants (i.e., acetone, 2-butanone, methylene chloride, toluene, and phthalate esters) should be regarded as a direct result of site activities only when sample concentrations exceed 10 times the maximum blank concentration. For other contaminants not considered common in a lab, concentrations exceeding five times the maximum blank concentration indicate contamination resulting from site activities (USEPA, 1991).

When evaluating contaminant concentrations in soil, Contract Required Quantitation Limits (CRQLs) and percent moisture are employed, in order to correlate solid and aqueous quantitation limits. The CRQL for semivolatiles (SVOCs) in soil is 33 to 66 times that of aqueous samples, depending on the contaminant. In order to assess SVOC contaminant levels in soil using aqueous blanks, blank concentrations must be multiplied by 33 or 66 to account for variances in the CRQL. The final value is divided by the sample percent moisture, in order to account for the aqueous-to-solid blank medium adjustment.

Eliminating a sample result correlates directly to a reduction in the contaminant prevalence in that medium. Consequently, if elimination due to blank concentration reduces the prevalence of a contaminant to less than five percent, a contaminant that may have been included according to its prevalence is eliminated as a COPC. Maximum concentrations of common laboratory contaminants detected in blanks are presented in Table 5-1.

Blanks containing organic constituents that are not considered common laboratory contaminants (i.e., all other TCL compounds) are regarded as positive results only when observed concentrations exceed five times the maximum concentration detected in any blank (USEPA, 1989b). All TCL compounds at concentrations less than five times the maximum level of contamination noted in any blank are considered not detected in that sample. Maximum concentrations of other contaminants detected in blanks are presented in Table 5-1.

QA/QC data summaries are presented in Appendix F.

5.2.1.5 Prevalence

The frequency of positive detections in sample sets and the level at which a contaminant is detected in a given medium are factors that determine a chemical's prevalence. The judicious use of data sets limits for including infrequently detected contaminants. Chemical occurrence must be evaluated with respect to the number of samples taken in order to determine frequency criteria warranting the inclusion of a chemical as a COPC. Contaminants that are infrequently detected, (i.e., less than 5 percent when at least 20 samples of a medium are available) do not necessarily indicate contamination. Such detections may result from certain sampling or analytical practices.

A contaminant may not be retained for quantitative evaluation in the BRA if: (1) it is detected infrequently in an environmental medium, (2) it is absent or detected at low concentrations in other media, or (3) site history does not provide evidence to suggest that the contaminant should be present.

5.2.1.6 Persistence

Contaminant persistence in the environment varies in accordance with factors such as microbial content in soil and water, organic carbon content, contaminant concentration, climate and potential for microbes to degrade a contaminant under site conditions. In addition, chemical degradation (i.e., hydrolysis), photochemical degradation and certain fate processes such as absorption may contribute to the elimination or retention of a particular compound in a given medium.

5.2.1.7 Mobility

A contaminant's physical and chemical properties are responsible for its transport in the environment. These properties, in conjunction with site conditions, determine whether a contaminant will have a greater tendency to volatilize into the air, out of surface soils or surface waters, or to relocate via advection or diffusion through soils, groundwaters, and surface waters. Physical and chemical properties also determine tendency for contaminant adsorption onto soil/sediment particles. In summary, environmental mobility factors can increase or decrease contaminant effects on human health and/or the environment.

5.2.1.8 Anthropogenic Levels

Ubiquitous anthropogenic background concentrations result from sources of contamination not related to the site, such as combustion of fossil fuels (i.e., automobiles), plant synthesis, natural fires and factories. Polynuclear aromatic hydrocarbons (PAHs) are examples of ubiquitous, anthropogenic chemicals. Sometimes it is difficult to determine whether contamination is actually site-incurred, or caused by contaminant-producing activities that are not site-related (i.e., anthropogenic). It then follows that systematically omitting anthropogenic background chemicals from the risk assessment may produce false negative results. For this reason, anthropogenic chemicals are typically not eliminated as COPCs without considering other selection criteria.

The remaining sections apply the aforementioned selection criteria, beginning with comparison of detected analytical results to COC screening values in each medium of interest, in order to establish a preliminary list of COPCs for the sites investigated in the Pre-RI Screening Study. Once this task is completed, a final list of media-specific COPCs is selected using the remaining criteria (persistence, mobility, toxicity, ARARs, blank concentrations, background concentrations, and anthropogenic concentrations).

5.2.1.9 Toxicity

Contaminant toxicity assessment must be incorporated when selecting COPCs with respect to human health risk. Toxic properties to be considered in COPC selection include weight-of-evidence classification, carcinogenicity, mutagenicity, teratogenicity, systemic effects and reproductive toxicity. Bioaccumulation and bioconcentration properties may affect the severity of toxic response in an organism and/or subsequent receptors; these additional properties are evaluated if relevant data exist.

Despite their inherent toxicity, certain inorganic contaminants are essential nutrients (e.g., calcium, sodium). As such, these contaminants need not be considered in a quantitative risk assessment, if one of the following conditions applies: (1) they are detected at relatively low concentrations, (i.e., below two times average base-specific background levels or slightly elevated above naturally occurring levels) or (2) the contaminant is toxic at doses much higher than those which can be assimilated through exposures at the site.

5.2.1.10 State and Federal Criteria and Standards

Contaminant concentrations in aqueous media can be compared to contaminant-specific state and federal criteria. This risk assessment utilizes North Carolina Water Quality Standards (NC WQS) for groundwater and surface water. The only enforceable federal regulatory standards for water are Federal Maximum Contaminant Levels (MCLs).

Regulatory guidelines are used, when necessary, to infer potential health risks and environmental impacts. Health Advisories (HA) are relevant regulatory guidelines. An explanation of the

federal and state criteria and standards used for qualitative evaluation of contaminants is presented below.

**North Carolina Water Quality Standards (Groundwater)** - NC WQSs are the maximum allowable concentrations, resulting from any discharge of contaminants to the lands or waters of the state, that may be tolerated without threatening human health or otherwise rendering the groundwater unsuitable for its intended purposes.

**Maximum Contaminant Levels** - MCLs are enforceable standards for public water supplies, designed to protect human health and promulgated under the Safe Drinking Water Act. MCLs also account for the technical feasibility of removing contamination from a public water supply. MCLs are based on laboratory or epidemiological studies and are applied to analyses of drinking water supplies consumed by a minimum of 25 persons. MCLs establish limits under which 70 kg adults, drinking 2 liters of water a day for 70 years, can avoid detrimental health effects.

**Health Advisories** - HAs are guidelines developed by the USEPA Office of Drinking Water for nonregulated constituents in drinking water. These guidelines are designed to consider both acute and chronic toxic effects in children (assumed body weight 10 kg) who consume 1 liter of water per day or in adults (assumed body weight 70 kg) who consume 2 liters of water per day. HAs are generally available for acute (1 day), subchronic (10 days), and chronic (longer-term) exposure scenarios. These guidelines are designed to consider only threshold effects and, as such, are not used to set acceptable levels for potential human carcinogens.

### 5.2.2 Selection of Contaminants of Potential Concern

The following sections present an overview of the analytical data obtained for each environmental medium during the Pre-RI and the subsequent retention or elimination of COPCs using the aforementioned selection criteria. The primary criterion used in selecting a chemical as a COPC at each site was comparing the maximum detected sample concentration to the USEPA Region III COC Screening Table (USEPA, 1994). In conjunction with the concentration comparisons to the USEPA Region III screening values, evaluation of laboratory contaminants, chemical prevalence, and site history were conducted. Furthermore, calcium, magnesium,

potassium, and sodium were detected in almost every sample, regardless of the medium; however, these constituents were considered to be essential nutrients (USEPA, 1995) and were therefore, not retained as COPCs in any medium under investigation at Sites 12, 68, 75, 76, 84, 85, and 87.

Tables 5-2 through 5-30 present the selection of COPCs for each environmental medium based on the maximum detected concentration with the USEPA Region III COC values, and other applicable criteria. Constituents retained as COPCs for the human health risk assessment are indicated by the shaded areas in the tables. Information is presented in these tables only for those constituents detected at least once, in the medium of interest. Other statistical information is presented in Appendix J.

5.2.2.1 Site 12, Explosive Ordnance Disposal Range

*Soil*

Six soil samples were analyzed for the organic compounds benzene, toluene, ethylbenzene, and xylene. There were no detections of organic compounds in any of the soil samples collected from Site 12. Consequently, there were no soil COPCs retained for Site 12.

*Groundwater*

Four groundwater samples were analyzed for volatile organic contaminants (VOCs) and semivolatile organic contaminants (SVOCs). There were no detections of organic compounds in any of the groundwater samples collected from Site 12. Consequently, there were no groundwater COPCs retained for Site 12.

5.2.2.2 Site 68, Rifle Range Dump

*Surface Soil*

Twenty-four surface soil samples were analyzed for VOCs. Acetone was detected at concentrations less than its respective residential soil COC screening value. For this reason, this contaminant is not retained as a COPC.

Twenty-four surface soil samples were analyzed for SVOCs. The following contaminants were detected at concentrations less than respective residential soil COC screening values: phenol, di-n-butylphthalate, bis(2-ethylhexyl)phthalate. For this reason, these SVOCs were not retained as COPCs.

Twenty-four surface soil samples were analyzed for pesticides/PCBs. The following pesticides were detected at concentrations less than their respective residential soil COC screening values: beta-BHC, dieldrin, 4,4'-DDE, 4,4'-DDT, and methoxychlor. Therefore, these pesticides were not retained as COPCs.

One PCB, Aroclor-1260 was detected in one of twenty-four surface soil samples at a concentration that exceeded its residential soil COC screening value. Although this is a low frequency of detection (less than 5%), it was retained as a COPC because it is considered a Class A carcinogen. Table 5-2 presents the COPC selection results for organics for Site 68 surface soil.

Twenty-four surface soil samples were analyzed for inorganic analytes. Inorganics were detected in all Site 68 surface soil samples. The following analytes were detected at maximum concentrations that exceeded their respective residential soil COC screening values: arsenic, beryllium, and iron. Consequently, these analytes were retained as COPCs. Table 5-3 presents the COPC selection results for inorganic analytes for Site 68 surface soil.

*Subsurface Soil*

Twenty-five subsurface soil samples were analyzed for VOCs. Acetone, carbon disulfide, and 2-butanone were detected at maximum concentrations less than their respective residential soil COC screening values. For this reason, these compounds were not retained as a COPCs.

Twenty-five subsurface soil samples were analyzed for SVOCs. The following contaminants were detected at concentrations less than respective residential soil COC screening values: pyrene and bis(2-ethylhexyl)phthalate. For this reason, these SVOCs were not retained as COPCs.

Twenty-five subsurface soil samples were analyzed for pesticides/PCBs. The following pesticides were detected at concentrations less than their respective residential soil COC screening values: 4,4'-DDT and Aroclor-1260. Therefore, these pesticides were not retained as COPCs. Table 5-4 presents the COPC selection results for organics for Site 68 subsurface soil.

Twenty-four subsurface soil samples were analyzed for inorganic analytes. Inorganics were detected in all Site 68 subsurface soil samples. The following analytes were detected at maximum concentrations that exceeded their respective residential soil COC screening values: aluminum, arsenic, beryllium, and iron. Consequently, these analytes were retained as COPCs. Table 5-5 presents the COPC selection results for inorganic analytes for Site 68 subsurface soil.

*Groundwater*

Nine groundwater samples were analyzed for VOCs. Carbon disulfide and 2-hexanone were detected at maximum concentrations less than respective tap water COC screening values. For this reason, these compounds were not retained as COPCs.

Nine groundwater samples were analyzed for SVOCs. There were no SVOCs detected in groundwater. For this reason, SVOCs were not retained as COPCs.

Nine groundwater samples were analyzed for pesticides/PCBs. There were no pesticides or PCBs detected in groundwater. Therefore, pesticides/PCBs were not retained as COPCs.

Nine groundwater samples were analyzed for inorganic analytes. Inorganics were detected in all Site 68 groundwater samples. The following analytes were detected at maximum concentrations that exceeded their respective tap water COC screening values: antimony, arsenic, cadmium, and manganese. Consequently, these analytes were retained as COPCs. Table 5-6 presents the COPC selection results for organics and inorganic analytes for Site 68 groundwater.

*Surface Water*

Ten surface water samples were analyzed for VOCs. There were no VOCs detected in Site 68 surface water. Therefore, no VOCs were retained as COPCs.

Ten surface water samples were analyzed for SVOCs. Di-n-butylphthalate was detected in one out of ten surface water samples. Therefore, di-n-butlyphthalate was retained as a surface water COPC.

Ten surface water samples were analyzed for pesticides/PCBs. There were no pesticides or PCBs were detected in Site 68 surface water. Therefore, no pesticides/PCBs were retained as COPCs.

Ten surface water samples were analyzed for inorganic analytes. Inorganics were detected in all Site 68 surface water samples. The following analytes were retained as surface water COPCs: aluminum, barium, cadmium, iron, lead, manganese, vanadium, and zinc. Table 5-7 presents the COPC selection results for organics and inorganic analytes for Site 68 surface water.

*Sediment*

Ten sediment samples were analyzed for VOCs. There were no VOCs detected in Site 68 sediment. Therefore, no VOCs were retained as COPCs.

Ten sediment samples were analyzed for SVOCs. Phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene were detected in Site 68 sediment samples. Therefore, these SVOCs were retained as a surface water COPC.

Ten sediment samples were analyzed for pesticides/PCBs. 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-chlordane, and gamma-chlordane were detected Site 68 sediment. Therefore, these pesticides were retained as COPCs.

Ten sediment samples were analyzed for inorganic analytes. Inorganics were detected in all Site 68 surface water samples. The following analytes were retained as surface water COPCs: aluminum, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, vanadium, and zinc. Table 5-8 presents the COPC selection results for organics and inorganic analytes for Site 68 sediment.

5.2.2.3 Site 75, MCAS Basketball Court

*Surface Soil*

Fifteen surface soil samples were analyzed for VOCs. There were no VOCs detected in Site 75 surface soil samples. Consequently, no VOCs were retained as COPCs.

Fifteen surface soil samples were analyzed for SVOCs. The following compounds were detected at maximum concentrations less than residential soil COC screening values: di-n-butylphthalate, and bis(2-ethylhexyl)phthalate. Thus, these SVOCs were not retained as COPCs.

Fifteen surface soil samples were analyzed for pesticides and PCBs. The following pesticides were detected at maximum concentrations less than respective residential soil COC screening values: heptachlor, heptachlor epoxide, dieldrin, 4,4'-DDE, endrin, 4,4'-DDD, 4,4'-DDT, alpha-Chlordane, and gamma-Chlordane. For this reason, these pesticides were not retained as surface soil COPCs. Table 5-9 presents the COPC selection results for organics for Site 75 surface soil.

Fifteen surface soil samples were analyzed for inorganic analytes. Inorganics were detected in all Site 75 surface soil samples. The following analytes were detected at maximum concentrations that exceeded respective soil COC screening values: aluminum, arsenic, and iron. Consequently, these analytes were retained as COPCs. Table 5-10 presents the COPC selection results for inorganic analytes for Site 75 surface soil.

*Subsurface Soil*

Seventeen subsurface soil samples were analyzed for VOCs. There were no VOCs detected in Site 75 subsurface soil samples. Consequently, no VOCs were retained as COPCs.

Seventeen subsurface soil samples were analyzed for SVOCs. The following compounds were detected at maximum concentrations less than residential soil COC screening values: di-n-butylphthalate and bis(2-ethylhexyl)phthalate. Thus, these SVOCs were not retained as COPCs.

Seventeen subsurface soil samples were analyzed for pesticides and PCBs. The following pesticides were detected at maximum concentrations less than respective residential soil COC screening values: dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-Chlordane, and gamma-Chlordane. For this reason, these pesticides were not retained as subsurface soil COPCs. Table 5-11 presents the COPC selection results for organics for Site 75 subsurface soil.

Seventeen subsurface soil samples were analyzed for inorganic analytes. Inorganics were detected in all Site 75 subsurface soil samples. The following analytes were detected at maximum concentrations that exceeded respective soil COC screening values: aluminum, antimony, arsenic, beryllium, and iron. Consequently, these analytes were retained as COPCs. Table 5-12 presents the COPC selection results for inorganic analytes for Site 75 subsurface soil.

*Groundwater*

Five groundwater samples were analyzed for VOCs. There were no VOCs detected in Site 75 groundwater samples. Consequently, no VOCs were retained as COPCs.

Five groundwater samples were analyzed for SVOCs. There were no SVOCs detected in Site 75 groundwater samples. Thus, SVOCs were not retained as COPCs.

Five groundwater samples were analyzed for pesticides and PCBs. There were no pesticides/PCBs detected in Site 75 groundwater. For this reason, pesticides/PCBs were not retained as groundwater COPCs.

Five groundwater samples were analyzed for inorganic analytes. Inorganics were detected in all Site 75 groundwater samples. However, there were no analytes exceeding tap water COC screening values. Therefore, no analytes were retained as COPCs. Table 5-13 presents the COPC selection results for organics and inorganic analytes for Site 75 groundwater.

5.2.2.4 Site 76, MCAS Curtis Road

*Surface Soil*

Sixteen surface soil samples were analyzed for VOCs. There were no VOCs detected in Site 76 surface soil samples. Consequently, no VOCs were retained as COPCs.

Sixteen surface soil samples were analyzed for SVOCs. The following compounds were detected at maximum concentrations less than residential soil COC screening values: phenanthrene, fluoranthene, pyrene, chrysene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, and benzo(a)pyrene. For this reason, these SVOCs were not retained as surface soil COPCs.

Sixteen surface soil samples were analyzed for pesticides/PCBs. The following pesticides were detected at maximum concentrations less than respective residential soil COC screening values: heptachlor, heptachlor epoxide, dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-chlordane, and gamma-chlordane. Consequently, these pesticides were not retained as COPCs. Table 5-14 presents the COPC selection results for organics for Site 76 surface soil.

Sixteen surface soil samples were analyzed for inorganic analytes. There were inorganic analytes detected in all Site 76 surface soil samples. The following analytes were detected at

maximum concentrations that exceeded respective soil COC screening values: arsenic, beryllium, and iron. Therefore, these analytes were retained as COPCs. Table 5-15 presents the COPC selection results for inorganic analytes for Site 76 surface soil.

*Subsurface Soil*

Sixteen subsurface soil samples were analyzed for VOCs. Acetone was detected at a concentration less than its residential soil COC screening value. Consequently, this VOC was not retained as a COPC.

Sixteen subsurface soil samples were analyzed for SVOCs. The following compounds were detected at maximum concentrations less than residential soil COC screening values: di-n-butylphthalate and bis(2-ethylhexyl)phthalate. For this reason, these SVOCs were not retained as subsurface soil COPCs.

Sixteen subsurface soil samples were analyzed for pesticides/PCBs. The following pesticides were detected at maximum concentrations less than respective residential soil COC screening values: 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT. Consequently, these pesticides were not retained as COPCs. Table 5-16 presents the COPC selection results for organics for Site 76 subsurface soil.

Sixteen subsurface soil samples were analyzed for inorganic analytes. There were inorganic analytes detected in all Site 76 subsurface soil samples. The following analytes were detected at maximum concentrations that exceeded respective soil COC screening values: aluminum, arsenic, beryllium, and iron. Therefore, these analytes were retained as COPCs. Table 5-17 presents the COPC selection results for inorganic analytes for Site 76 subsurface soil.

*Groundwater*

Five groundwater samples were analyzed for VOCs. There were no VOCs detected in Site 76 groundwater samples. Consequently, no VOCs were retained as COPCs.

Five groundwater samples were analyzed for SVOCs. Di-n-butylphthalate was detected at a concentration less than its tap water COC screening value. For this reason, di-n-butylphthalate was not retained as a groundwater COPC.

Five groundwater samples were analyzed for pesticides/PCBs. There were no pesticides or PCBs detected in Site 76 groundwater. Consequently, pesticides/PCBs were not retained as COPCs.

Five groundwater samples were analyzed for inorganic analytes. There were inorganic analytes detected in all Site 76 groundwater samples. The following analytes were detected at maximum concentrations that exceeded respective soil COC screening values: arsenic and iron. Therefore, these analytes were retained as COPCs. Table 5-18 presents the COPC selection results for organics and inorganic analytes for Site 76 groundwater.

5.2.2.5 Site 84, Building 45 Area

*Surface Soil*

Twenty surface soil samples were analyzed for PCBs only. Only one PCB, Aroclor-1260, was detected. Aroclor-1260 was detected in twenty out of twenty surface soil samples with all detected concentrations exceeding its residential soil COC screening value. Consequently, Aroclor-1260 was retained as a surface soil COPC. Table 5-19 presents the COPC selection results for PCBs for Site 84 surface soil.

*Groundwater*

Five groundwater samples were analyzed for PCBs only. There were no PCBs detected in Site 84 groundwater. For this reason, no PCBs were retained as groundwater COPCs.

*Surface Water*

Seven surface water samples were analyzed for PCBs only. There were no PCBs detected in Site 84 surface water. Therefore, no PCBs were retained as COPCs.

*Sediment*

Ten sediment samples were analyzed for PCBs only. Aroclor-1248 and Aroclor-1260 were detected in Site 84 sediment. Therefore, these PCBs were retained as COPCs. Table 5-20 presents the COPC selection results for PCBs for Site 84 sediment.

5.2.2.6 Site 85, Camp Johnson Battery Dump

*Surface Soil*

Five surface soil samples were analyzed for inorganic analytes only. Inorganics were detected in all Site 85 surface soil samples. The following analytes were detected at maximum concentrations that exceeded respective soil COC screening values: arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, and zinc. Consequently, these analytes were retained as surface soil COPCs. Table 5-21 presents the COPC selection results for inorganic analytes for Site 85 surface soil.

*Subsurface Soil*

Five subsurface soil samples were analyzed for inorganic analytes only. Inorganics were detected in all Site 85 subsurface soil samples. The following analytes were detected at maximum concentrations that exceeded respective soil COC screening values: aluminum, arsenic, and iron. Consequently, these analytes were retained as subsurface soil COPCs. Table 5-22 presents the COPC selection results for inorganic analytes for Site 85 subsurface soil.

*Groundwater*

Three groundwater samples were analyzed for inorganic analytes only. Inorganics were detected in all Site 85 groundwater samples. The following analytes were detected at maximum concentrations that exceeded respective soil COC screening values: aluminum, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, vanadium, and zinc. Consequently, these analytes were retained as groundwater COPCs. Table 5-23 presents the COPC selection results for inorganic analytes for Site 85 groundwater.

5.2.2.7 Site 87, MCAS Officer's Housing Area

*Surface Soil*

Six surface soil samples were analyzed for VOCs. There were no VOCs detected in Site 87 surface soil. Therefore, no VOCs were retained as COPCs.

Six surface soil samples were analyzed for SVOCs. Several nPAHs and phthalate esters were detected at maximum concentrations less than respective residential COC screening values: acenaphthene, fluorene, phenanthrene, anthracene, carbazole, fluoranthene, pyrene, benzo(g,h,i)perylene, di-n-butylphthalate, butylbenzylphthalate, and bis(2-ethylhexylphthalate. In addition, five cPAHs, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene were detected at maximum concentrations less respective residential COC screening values. Consequently, these SVOCs were not retained as COPCs.

Two cPAHs, benzo(a)pyrene and dibenzo(a,h)anthracene, were detected at concentrations that exceeded respective residential soil COC screening values. For this reason, they were retained as surface soil COPCs. Although it is known that cPAHs often occur together, the aforementioned cPAHs that did not exceed screening values were not re-included as COPCs. This reasoning is based on the wooded nature of the sample locations at Site 87. The detected PAHs were believed to result from the mulched soil.

Six surface soil samples were analyzed for pesticides/PCBs. The following pesticides were detected at maximum concentrations less than respective residential soil COC screening values: 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-chlordane, and gamma-chlordane. Consequently, these pesticides were not retained as COPCs. Table 5-24 presents the COPC selection results for organics for Site 87 surface soil.

Six surface soil samples were analyzed for inorganic analytes. Inorganics were detected in all Site 87 surface soil samples. The following analytes were detected at concentrations that exceeded respective residential soil COC screening values: arsenic, beryllium, and iron. For this reason, these analytes were retained as COPCs. Table 5-25 presents the COPC selection results for inorganic analytes for Site 87 surface soil.

*Subsurface Soil*

Four subsurface soil samples were analyzed for VOCs. There were no VOCs detected in Site 87 subsurface soil. Therefore, no VOCs were retained as COPCs.

Four subsurface soil samples were analyzed for SVOCs. There were no SVOCs detected in Site 87 subsurface soil. Therefore, no SVOCs were retained as COPCs.

Four subsurface soil samples were analyzed for pesticides/PCBs. The following pesticides were detected at maximum concentrations less than respective residential soil COC screening values: 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT. Consequently, these pesticides were not retained as COPCs. Table 5-26 presents the COPC selection results for organics for Site 87 subsurface soil.

Four subsurface soil samples were analyzed for inorganic analytes. Inorganics were detected in all Site 87 subsurface soil samples. The following analytes were detected at concentrations that exceeded respective residential soil COC screening values: antimony, arsenic, and iron. For this reason, these analytes were retained as COPCs. Table 5-27 presents the COPC selection results for inorganic analytes for Site 87 subsurface soil.

*Groundwater*

Two groundwater samples were analyzed for VOCs. There were no VOCs detected in Site 87 groundwater. Therefore, no VOCs were retained as COPCs.

Two groundwater samples were analyzed for SVOCs. 4-Nitrophenol was detected at a concentration less than its respective residential COC screening value. For this reason, 4-nitrophenol was not retained as a groundwater COPC.

Pentachlorophenol was detected at a concentration that exceeded its tap water COC screening value. For this reason, it is retained as a groundwater COPC.

Two groundwater samples were analyzed for pesticides/PCBs. There were no pesticides or PCBs detected in Site 87 groundwater samples. Consequently, pesticides/PCBs were not retained as COPCs.

Two groundwater samples were analyzed for inorganic analytes. Inorganics were detected in all Site 87 groundwater samples. The following analytes were detected at concentrations that exceeded respective tap water COC screening values: aluminum, iron, and manganese. For this reason, these analytes were retained as COPCs. Table 5-28 presents the COPC selection results for organics and inorganic analytes for Site 87 groundwater.

*Surface water*

Two surface water samples were analyzed for VOCs. There were no VOCs detected in surface water samples. Therefore, no VOCs were retained as COPCs.

Two surface water samples were analyzed for SVOCs. There were no SVOCs detected in surface water samples. Therefore, no SVOCs were retained as COPCs.

Two surface water samples were analyzed for pesticides/PCBs. There were no pesticides or PCBs detected in surface water samples. Therefore, no pesticides/PCBs were retained as COPCs.

Two surface water samples were analyzed for inorganic analytes. Inorganics were detected in all Site 87 surface water samples. The following analytes were retained as surface water COPCs: aluminum, antimony, barium, copper, cyanide, iron, lead, manganese, selenium, vanadium, and zinc. Table 5-29 presents the COPC selection results for organics and inorganic analytes for Site 87 surface water.

*Sediment*

Two sediment samples were analyzed for VOCs. Acetone was detected in sediment samples. Therefore, acetone was retained as COPCs.

Two sediment samples were analyzed for SVOCs. Fluoranthene, pyrene, benzo(a)anthracene, chrysene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene. Therefore, these SVOCs were retained as COPCs.

Two sediment samples were analyzed for pesticides/PCBs. There were no pesticides or PCBs detected in sediment samples. Therefore, no pesticides/PCBs were retained as COPCs.

Two sediment samples were analyzed for inorganic analytes. Inorganics were detected in all Site 87 sediment samples. The following analytes were retained as sediment COPCs: aluminum, barium, copper, cyanide, iron, lead, manganese, nickel, selenium, silver, vanadium, and zinc. Table 5-30 presents the COPC selection results for organics and inorganic analytes for Site 87 sediment.

5.2.2.6 Summary of COPCs

Tables 5-31 through 5-34 present a detailed summary of COPCs identified in each environmental medium sampled at the sites.

## 5.3 Exposure Assessment

This section addresses potential human exposure pathways at each site and presents the rationale for their evaluation. Potential source areas and potential migration routes, in conjunction with contaminant fate and transport information, are combined to produce a site conceptual model. Exposure pathways to be retained for quantitative evaluation are subsequently selected, based on the conceptual site model.

### 5.3.1 Site Conceptual Model of Potential Exposure

A site conceptual model of potential sources, migration pathways and human receptors is developed to encompass all current and future routes for potential exposure at each site. Figures 5-1 through 5-6 present the site conceptual models. Inputs to the conceptual model include qualitative descriptions of current and future land use patterns in the vicinity of each site. All available analytical data and meteorological data are considered, in conjunction with a general understanding of surrounding habitat demographics. The following list of receptors is developed for a quantitative health risk analysis:

- Current military personnel
- Current base residents (young child [ages 1-6 years] and adult)
- Future on-site residents (young child [ages 1-6 years] and adult)

Contaminants detected in surface and subsurface soils are discussed in Section 4.0 (Nature and Extent of Contamination) and in section 5.2.2, Selection of COPCs. Migration of COPCs from these sources can occur in the following ways:

- Vertical migration of contaminants from surface soil to subsurface soil.
- Leaching of contaminants from subsurface soil to water-bearing zones.
- Vertical migration from shallow water-bearing zones to deeper flow systems.
- Horizontal migration in groundwater in the direction of groundwater flow.
- Wind erosion and subsequent deposition of windblown dust.

The potential for a contaminant to migrate spatially and persist in environmental media is important in estimating exposure.

### 5.3.2 Exposure Pathways

This section presents exposure pathways, shown in Figures 5-1 through 5-6, associated with each environmental medium and each human receptor group. It then qualitatively evaluates each pathway for further consideration in the quantitative risk analysis. Table 5-38 presents the summary of exposure pathways evaluated for each site.

#### 5.3.2.1 Surface Soil

Potential exposure to surface soil may occur by incidental soil ingestion, contaminant absorption through the skin and inhalation of airborne particulates. Surface soil exposure is evaluated for current residential children and adults at Sites 75, 76, and 87. It is evaluated for future residential children and adults at Sites 68, 75, 76, 85, and 87. Current military personnel were evaluated for surface soil exposure at Sites 68, 84, and 85. Surface soil was not analyzed at Site 12. Consequently, this exposure pathway was not evaluated at Site 12.

#### 5.3.2.2 Subsurface Soil

Subsurface soil is available for contact only during excavation activities, so potential exposure to subsurface soil is limited to current military personnel involved in training exercises and maneuvers. Potential exposure to subsurface soil may occur by incidental soil ingestion, contaminant absorption through the skin and inhalation of airborne particulates. During maneuvers, personnel entrenchments are often constructed to simulate battle conditions;

therefore, it was assumed that military receptors could potentially be exposed to subsurface soil at Sites 68, 84, and 85. There were no COPCs retained in Site 12 subsurface soil. Consequently, this exposure pathway was not evaluated at Site 12.

5.3.2.3 Groundwater

Currently, shallow groundwater in the vicinity of the sites evaluated in this BRA is not used as a potable supply for residents or base personnel. However, in the future, (albeit unlikely due to poor transmissivity and insufficient flow) shallow groundwater may be tapped for potable water. Groundwater exposure is evaluated for future residential children and adults. Potential exposure pathways are ingestion, dermal contact, and inhalation of volatile contaminants while showering. However, it should be noted that no VOCs were selected as groundwater COPCs at any of the sites. Therefore, inhalation of VOCs while showering was not evaluated as an exposure pathway. Future residents are evaluated for groundwater exposure at Sites 68, 75, 76, 85, and 87. In addition, there were no COPCs retained in Site 12 groundwater. Consequently, this exposure pathway was not evaluated at Site 12.

5.3.2.4 Surface Water/Sediment

Potential exposure to surface water/sediment may occur by incidental soil ingestion and contaminant absorption through the skin. Military personnel were evaluated for sediment exposure at Site 84. Current residents were evaluated for surface water/sediment exposure at Site 87. Future residents were evaluated for surface water/sediment at Sites 68, 85, and 87. There were no surface water bodies in the vicinity of Sites 12, 75, or 76. Consequently, exposure to surface water/sediment was not evaluated at these sites.

### 5.3.3 Quantification of Exposure

The concentrations used in the estimation of chronic daily intakes (CDIs) must be representative of the type of exposure being considered. Exposure to groundwater, sediments, and surface waters can occur discretely or at a number of sampling locations. These media are transitory in that concentrations change frequently over time. Averaging transitory data obtained from

multiple locations is difficult and requires many more data points at discrete locations than exist within the sites evaluated in the Pre-RI Screening Study. As a result, the best way to represent groundwater, sediment, and surface water contaminants from an exposure standpoint is to use a representative exposure concentration. Soils are less transitory than the aforementioned media and in most cases, exposure occurs over a wider area (i.e., residential exposure). Therefore, an upper confidence interval was used to represent a soil exposure concentration. Soil data collected from each of these areas was used separately in estimating the potential human health risks under current and future exposure scenarios. The human health assessment for future groundwater use considered groundwater data collected from all of the monitoring wells within a site and estimated risks to individuals per area of concern.

The manner in which environmental data are represented depends on the number of samples and sampling locations available for a given area and a given medium. Ninety-fifth percent (95%) upper confidence limit (UCL) values of the arithmetic mean for a lognormal distribution were used as exposure point concentrations for surface soil, subsurface soil, groundwater, surface water, and sediment. The 95% UCL for the lognormal distribution was used rather than the normal distribution, since the former is generally more conservative than the latter. For exposure areas with limited amounts of data or extreme variability in measured data, the 95% UCL can be greater than the maximum measured concentration; therefore, in cases where the 95% UCL for a contaminant exceeds the maximum detected value in a given data set, the maximum result was used in the estimate of exposure of the 95% UCL However, the true mean may still be higher than this maximum value (i.e., the 95% UCL indicates a higher mean is possible), especially if the most contaminated portion of the site has not been sampled.

The 95% UCL of the lognormal distribution was calculated using the following equation (USEPA, 1992b):

$$UCL = e^{(\bar{x} + sH/\sqrt{n-1})}$$

where:

UCL = upper confidence limit

e = constant (base of the natural log, equal to 2.718)

$\bar{x}$ = mean of the transformed data

s = standard deviation of the transformed data

H = H-statistic (Gilbert, 1987)

n = number of samples

For results reported as "nondetect" (i.e., results flagged with the following validation qualifiers: U, UJ, UL, and UK), a value of one half of the sample-specific detection limit was used to calculate the lognormal 95% UCL. A value of half the detection limit was assigned to nondetects when estimating the lognormal 95% UCL and the mean because the actual value could be between zero and a value just below the detection limit. Lognormal 95% UCLs were calculated only for the constituents detected in at least on sample collected from the environmental medium of interest. Estimated concentrations also were used to calculate the lognormal 95% UCL, such as "J"-qualified (estimated) data. Reported concentrations qualified with an "R" (rejected) were not used in the statistical evaluation. Frequency of detection as well as maximum detected values are presented in Appendix I. Lognormal 95% UCL values and lognormal arithmetic mean values, derived for COPCs in all media at all sites (with sample sets of three or more) are presented in Appendix J. The equations for estimating intakes due to direct exposures to site-related compounds and/or analytes for the various identified pathways are presented in Appendix L as example calculations presented along with the CDI spreadsheets.

### 5.3.4 Exposure Factors Used To Derive Chronic Daily Intakes

The following paragraphs present the general equations and input parameters used to calculate CDIs. Input parameters are taken from USEPA's default exposure factors guidelines. All inputs not defined by this source are derived either from other USEPA exposure documents or by using best professional judgment. All exposure assessments incorporate representative contaminant concentrations; only one exposure scenario is developed for each exposure route/receptor combination. Tables 5-35 through 5-37 present the exposure factors used in the estimation of potential CDIs for COPCs retained for each receptor identified below.

Carcinogenic risk is calculated as an incremental lifetime risk, and thereby involves exposure duration (years) over the course of a lifetime (70 years, or 25,550 days).

Noncarcinogenic risk, on the other hand, involves average annual exposure. Exposure time and frequency represent the number of hours of exposure per day, and days of exposure per year, respectively. Generally, noncarcinogenic risk for certain exposure routes (e.g., soil ingestion) is greater for children, as the combination of a lower body weight and an exposure frequency equal to that of an adult increases their ingestion rates.

Future residential exposure scenarios address 1 to 6-year old children weighing 15 kg, and adults weighing 70 kg, on average. An exposure duration of 4 years is used to estimate the military personnel and current resident exposure duration.

5.3.4.1 Current Military Personnel

Currently, only military personnel have access to Sites 68, 84, and 85. Therefore, current military personnel were evaluated for potential exposures via ingestion and dermal contact with COPCs in surface soil, as well as inhalation of COPCs emitted as fugitive dust. Similar routes of exposure were evaluated for subsurface soil due to training activities that occur at Site 68, as well as the potential excavation activities that could occur at Sites 84 and 85. In addition, potential exposure to surface water and sediment via ingestion and dermal contact was evaluated. Exposure parameter input values for current military personnel are presented in Table 5-35.

*Surface and Subsurface Soil*

During the course of daily activities at Sites 68, 84, or 85, military personnel could potentially be exposed to COPCs by the incidental ingestion, dermal contact, and inhalation of surface and subsurface soils. The IR for military personnel exposed to surface soils, as well as subsurface soils, was assumed to be 100 mg/day (USEPA, 1989a) and 100 percent of the exposure was assumed to be with facility soils containing COPCs. The exposed skin surficial area (4,300 $cm^2$) was limited to the head (1,180 $cm^2$), arms (2,280 $cm^2$), and hands (840 $cm^2$) (USEPA, 1992a). An inhalation rate of 20 $m^3$/day was used for military personnel (USEPA, 1991d). An

adherence factor (AF) of 1 mg/cm$^2$ and absorption factors (ABS) of 0.01 for organics and 0.001 for inorganics were used in accordance with USEPA and Region IV guidance (USEPA, 1991c). An exposure frequency (EF) of 250 days per year (USEPA, 1991d) was used in conjunction with an exposure duration of 4 years (professional judgement). An averaging time (AT) of 70 years or 25,550 days was used for exposure to potentially carcinogenic compounds while an averaging time of 1,460 (4 years x 365 days/year) days was used for noncarcinogenic exposures. An adult average body weight (BW) of 70 kg was used (USEPA, 1989a).

*Surface Water*

There is potential for base personnel to come into contact with surface water during training activities. The IR for military personnel exposed to surface water was assumed to be 0.05 L/hour (USEPA, 1989a) for 2.6 hours per day (USEPA, 1989a). An exposure frequency of 48 days/year (8 days/month x 6 months) was used in conjunction with an exposure duration (ED) of four years. In addition, the values for skin surface area, averaging time, and body weight are the same as those given under the soil scenario. The permeability constant (PC) values were chemical-specific. For COPCs with no PC values available, the values were calculated (see Appendix K).

*Sediment*

Incidental ingestion and dermal contact of COPCs in sediment is possible during military training exercises. An IR of 100 mg/day was used in calculating the chronic daily intake for military personnel. An EF of 48 days/year and ED of 4 years were used. The skin surface area, body weight, and averaging time for military personnel is the same as the values given under the soil scenario. Also, the values for AF and ABS are the same as those given in the soil scenario.

5.4.3.2 Current Base Residents

Current residents of base housing (Sites 75, 76, and 87), child and adult, were evaluated for potential exposures via ingestion and dermal contact with COPCs in surface soil, as well as inhalation of COPCs emitted as fugitive dust. In addition, current base residents at Site 87 were also evaluated for potential exposures from accidental ingestion and dermal contact with surface

water and sediment. Current residents are not evaluated for potential exposures to shallow groundwater, which is not currently used as a potable water source. Potable water is supplied by the base treatment facilities via water supply wells that are set in the lower reaches of the Castle Hayne aquifer. Exposure parameter input values for current base residents are presented in Table 5-36.

*Surface Soil*

Current base residents could potentially be exposed to COPCs in the surficial soils during recreational activities around their homes. Ingestion rates (IR) for adults and children in this scenario were assumed to be 100 mg/day and 200 mg/day, respectively (USEPA, 1989a). Inhalation rates (IR) used in the on-site resident exposure scenario were 20 $m^3$/day (USEPA, 1991d) and 15 $m^3$/day (USEPA, 1995) for adults and children, respectively. EFs for both receptor groups were assumed to be 350 days per year. The exposure duration (ED) for base residents was assumed to be four years. The BW for a resident child was assumed to be 15 kg, representing younger individuals. The rationale was that the younger child (1 to 6 years), as a resident, will have access to affected on-site soils. The body weight for the future resident adult is assumed to be 70 kg. Averaging times of 25,550 days for potential carcinogens and 1,460 days (4 years x 365 days/year) for noncarcinogenic constituents was used for estimating potential CDIs for adults and children.

Skin surface areas (SA) used in this exposure scenario were developed for a reasonable worse case scenario for an individual wearing a short-sleeved shirt, shorts, and shoes. The exposed skin surface area was limited to the head, hands, forearms, and lower legs. Thus, applying 25 percent of the mean total body surface area results in a default of 5,800 $cm^2$ for adults. The exposed skin surface for a child (2,300 $cm^2$) was estimated using an average of the 50th (8660 $cm^2$) and the 95th (10,060 $cm^2$) percentile body surface for a six year old child multiplied by 25 percent (USEPA, 1992a). The values for AF and ABS are the same as those provided under the current military personnel receptor.

*Surface Water*

Adults and children who may potentially come into contact with the surface water were assumed to conservatively ingest surface water at a rate of 0.05 L/hour. In addition, an exposure frequency (EF) of 48 days/year (8 days/month x 6 months), an ET of 2.6 hours/day and an exposure duration (ED) of 4 years were used. The SA values for adult and child residents and trespassers who may potentially come into contact with the surface water during wading activities were assumed to be 5,800 $cm^2$ and 2,300 $cm^2$, respectively. The values for PC were chemical-specific.

*Sediment*

Incidental ingestion of COPCs in sediments is also possible during wading activities. Ingestion rates of 200 mg/day and 100 mg/day, respectively, were used in calculating the chronic daily intake for children and adults. The exposure frequency (EF) of 48 days/year (8 days/month x 6 months) was used as a conservative site-specific assumption. An exposure duration (ED) of 4 years was used in the estimation of potential exposure to COPCs. As in the surface water exposure scenario, the total body surface area was 5,800 $cm^2$ for adults and 2,300 $cm^2$ for children. The values for AF and ABS were provided under the current military personnel scenario.

5.4.3.3 Future On-Site Residents

In the Master Plan for MCB, Camp Lejeune, future residential development of Sites 68, 84, and 85 is not projected. It should also be noted that Site 84 is located in an industrial area and is excluded from future residential development. For this reason, Site 84 is not evaluated under the future residential scenario. Site 75, 76, and 87 are projected to remain base housing. However, to maintain a conservative approach in accordance with USEPA guidance, the potential exposure pathways associated with future potential residential development were estimated for Sites 68, 75, 76, 85, and 87. Future adult and young child (ages 1-6 years) residents were evaluated for potential exposures via ingestion and dermal contact with COPCs in surface soil, as well as inhalation of COPCs emitted as fugitive dust. Development of the shallow aquifer for potable

use is unlikely because of its general water quality and poor flow rates. However, it has been assumed that a private well will be installed on-site in the future case. Consequently, groundwater exposure to a future residential adult and child receptor was assessed. In addition, potential exposure to surface water and sediment via ingestion and dermal contact was evaluated for future residents. Exposure parameter input values for future residents are presented in Table 5-37.

*Surface Soil*

Future residents could potentially be exposed to COPCs in the surficial soils during recreational activities around their homes. Ingestion rates (IR) for adults and children in this scenario were assumed to be 100 mg/day and 200 mg/day, respectively. Inhalation rates (IR) used in the on-site resident exposure scenario were 20 $m^3$/day (USEPA, 1991d) and 15 $m^3$/day (USEPA, 1995) for adults and children, respectively. As with the current residents, the SAs for the adult and child were 5,800 $cm^2$ and 2,300 $cm^2$, respectively. EFs for both receptor groups were assumed to be 350 days per year. The residential exposure duration (ED) was divided into two parts. First, a six-year exposure duration was evaluated for young children which accounts for the period of highest soil ingestion (200 mg/day), and second a 30-year exposure was assessed for older children and adults by using a lower soil ingestion rate (100 mg/day). The BW for a resident child was assumed to be 15 kg, representing younger individuals. The rationale was that the younger child (1 to 6 years), as a resident, will have access to affected on-site soils. The body weight for the future resident adult is assumed to be 70 kg. Averaging times of 25,550 days for potential carcinogens and 10,950 days (30 years x 365 days/year) for noncarcinogenic constituents was used for estimating potential CDIs for adults. An AT of 2,190 days (6 years x 365 days/year) was used to estimate potential CDIs for children potentially exposed to noncarcinogens. The values for AF and ABS are the same as those provided under the current military personnel scenario.

*Groundwater*

Exposure to COPCs via ingestion of groundwater was retained as a potential future exposure pathway for both children and adults. An IR of 1 L/day was used for the amount of water

consumed by a 1 to 6 year old child weighing 15 kg. The IR was 2 L/day for the adult receptor. This ingestion rate provides a conservative exposure estimate (for systemic, noncarcinogenic toxicants) designed to protect young children who may be more affected than adolescents, or adults. This value assumes that children obtain all the tap water they drink from the same source for 350 days/year (which represents the exposure frequency [EF]). The whole body skin surface area (SA)available for dermal absorption was estimated to be 10,000 $cm^2$ for children and 23,000 $cm^2$ for adults (USEPA, 1992). An averaging time (AT) of 2,190 days (6 years x 365 days/year) is used for noncarcinogenic compound exposure. The ingestion rate (IR) for adults was 2 liters/day (USEPA, 1989a). The ED used for the estimation of adult CDIs was 30 years (USEPA, 1989), which represents the national upper-bound (90th percentile) time at one residence. The averaging time for noncarcinogens was 10,950 days. An averaging time (AT) of 25,550 days (70 years x 365 days/year) was used to evaluate exposure for both children and adults to potential carcinogenic compounds. PC values are provided in Appendix K. There were no volatiles detected in groundwater at any site; therefore inhalation of VOCs in groundwater was not evaluated.

*Surface Water*

Adults and children who may potentially come into contact with the surface water were assumed to conservatively ingest surface water at a rate of 0.05 L/hour. In addition, an exposure frequency (EF) of 48 days/year (8 days/month x 6 months), an ET of 2.6 hours/day and an exposure duration (ED) of 6 years (age 1-6) for a child, and 30 years for an adult were used (USEPA, 1989). As with the current base residents, the SA values were assumed to be 5,800 $cm^2$ and 2,300 $cm^2$ for adults and children, respectively. PC values are provided in Appendix K.

*Sediment*

Ingestion rates of 200 mg/day and 100 mg/day, respectively, were used in calculating the chronic daily intake for children and adults. Future on-site residents and current trespassers could also be potentially exposed to COPCs in sediment via dermal contact. As in the surface water exposure scenario, the total body surface area was 5,800 $cm^2$ for adults and 2,300 $cm^2$ for children. Exposure duration, exposure frequencies, body weights, and averaging times were the

same as those discussed for the surface water exposure scenario presented previously. The values for AF and ABS were provided under the current military personnel scenario.

Appendix L contains CDI calculation spreadsheets for specific exposure scenarios.

## 5.4 Toxicity Assessment

This section reviews toxicological information available for COPCs identified in Section 5.2.

### 5.4.1 Toxicological Evaluation

Toxicological evaluation addresses the inherent toxicity of chemical compounds. It consists of the review of scientific data to determine the nature and extent of the potential human health and environmental effects associated with exposure to various contaminants.

Because of uncertainties in exposure estimates and inherent difficulties in determining causal relationships established by epidemiological studies, human data from occupational exposures are often insufficient for determining quantitative indices of toxicity. For this reason, animal bioassays are conducted under controlled conditions, and results are extrapolated to humans. There are several stages in this extrapolation. First, to account for species differences, conversion factors are used to apply test animal data to human studies. Second, high dosage administered to test animals must be translated into lower dosage, more typical of human exposure. When developing acceptable human doses of noncarcinogenic contaminants, safety factors and modifying factors are applied to animal test results. When studying carcinogens, mathematical models are used to convert high dosage effects to effects at lower dosages. Epidemiological data can then be used to determine credibility of these experimentally derived indices.

Reference dose (RfD) is an experimentally derived exposure index for noncarcinogenic contaminants, and carcinogenic slope factor (CSF) is an experimentally derived exposure index for carcinogens. These values are addressed, within the context of dose-response evaluation, in the next section.

Available toxicological information indicates that many COPCs have both carcinogenic and noncarcinogenic health effects in humans and/or experimental animals. Although COPCs may cause adverse health and environmental effects, dose-response relationships and exposure must be evaluated before receptor risk can be determined. Dose-response relationships correlate dose magnitude with the probability of toxic effects, as discussed in the following section.

### 5.4.2 Dose-Response Evaluation

An important component in risk assessment is the relationship between the dose of a compound and the potential for adverse health effects resulting from the exposure to that dose. Dose-response relationships provide a means by which potential public health impacts may be evaluated. The published information on doses and responses is used in conjunction with information on the nature and magnitude of exposure to develop an estimate of risk.

#### 5.4.2.1 Carcinogenic Slope Factor

CSFs are used to estimate upper-bound lifetime probability of developing cancer as a result of exposure to a particular dose of a potential carcinogen (USEPA, 1989a). This factor is generally reported in $(mg/kg/day)^{-1}$ CSF is derived by converting high dose-response values produced by animal studies to low dose-response values, and by using an assumed low-dosage linear multistage model. The value used in reporting the slope factor is the upper 95th percent confidence limit.

USEPA WOE classifications accompany CSFs. They provide the weight of evidence according to which particular contaminants are defined as potential human carcinogens.

The USEPA's Human Health Assessment Group (HHAG) classifies carcinogenic potential by placing chemicals into one of the following groups, according to weight of evidence from epidemiological and animal studies:

Group A - Human Carcinogen (sufficient evidence of carcinogenicity in humans)

Group B - Probable Human Carcinogen (B1 - limited evidence of carcinogenicity in humans; B2 - sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans)

Group C - Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data)

Group D - Not Classifiable as to Human Carcinogenicity (inadequate or no evidence)

Group E - Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in adequate studies)

5.4.2.2 Reference Dose

RfD is developed for chronic and/or subchronic chemical exposure and is based solely on noncarcinogenic effects of chemical substances. It is defined as an estimate of the daily exposure level for a human population that is not likely to produce 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). It is generally derived by dividing a no-observed-(adverse)-effect-level (NOAEL or NOEL) or a lowest observed-adverse-effect-level (LOAEL) for the critical toxic effect, by the appropriate "uncertainty factor (UF)". Effect levels are determined by laboratory or epidemiological studies. The UF is based on the availability of toxicity data.

UFs usually consist of multiples of 10, where each factor represents a specific area of uncertainty naturally present in the extrapolation process. These UFs are presented below and were taken from the Risk Assessment Guidance Document for Superfund, Volume I, Human Health Evaluation Manual (Part A) (USEPA, 1989a):

- A UF of 10 is to account for variation in the general population and is intended to protect sensitive populations (e.g., elderly; children).

- A UF of 10 is used when extrapolating from animals to humans. This factor is intended to account for the interspecies variability between humans and other mammals.

- A UF of 10 is used when a NOAEL derived from a subchronic instead of a chronic study is used as the basis for a chronic RfD.

- A UF of 10 is used 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.

In addition to UFs, a modifying factor (MF) is applied to each reference dose and is defined as:

- An MF ranging from >0 to 10 is included to reflect a qualitative professional assessment of additional uncertainties in the critical study and in the entire data base for the chemical not explicitly addressed by the preceding uncertainty factors. The default for the MF is 1.

Thus, the RfD incorporates the uncertainty of the evidence for chronic 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.

Toxicity factors and the USEPA WOE classifications are presented in Table 5-15. The hierarchy for choosing these values is as follows (USEPA, 1989a):

- Integrated Risk Information System (IRIS)
- Health Effects Assessment Summary Table (HEAST)
- USEPA Environmental Criterion Assessment Office (EPA-ECAO) (USEPA, 1995)

The IRIS database is updated monthly and contains both verified CSFs and RfDs. The USEPA has formed the Carcinogen Risk Assessment Verification Endeavor (CRAVE) Workgroup to

review and to validate toxicity values used in developing CSFs. Once the slope factors have been verified with extensive peer review, they appear in the IRIS database. Like the CSF Workgroup, an RfD Workgroup has been formed by the USEPA to review existing data used to derive RfDs. Once RfDs have been verified, they also appear in IRIS.

HEAST, on the other hand, provides both interim (unverified) and verified CSFs and RfDs. This document is published quarterly and incorporates any applicable changes to its database.

### 5.4.3 Lead

Lead was identified as a COPC in the surface soil and groundwater samples collected from Site 85. Currently, health-based criteria are not available for evaluating either the noncarcinogenic or carcinogenic effects of lead exposure. The USEPA has not developed health-based criteria because a threshold level for many noncancer health effects has not been identified in infants and younger children (i.e., the most sensitive populations). Consequently, risk from lead exposure was not calculated for the site.

To evaluate lead at waste sites, the USEPA had developed a lead uptake/biokinetic (UBK) model. This model utilizes site-specific exposure parameters to estimate blood lead levels in infants and young children. The USEPA considers remediation necessary if a 5 percent probability or greater exists that the predicted child blood level will exceed 10 µg/dl as a result of contact with lead-containing media at the site.

There are several criteria available for lead level comparisons in the form of standards, criteria and/or TBCs. These standards/criteria/TBCs include federal and state MCLs and AWQC. In addition, there is an Office of Solid Waste and Emergency Response (OSWER) directive for lead in soil (USEPA, 1994c). This value is 400 mg/kg in residential soil. At Site 85, the maximum concentrations of lead found in surface soil exceeded this OSWER level. In addition, the maximum concentration of lead found in Site 85 groundwater samples exceeded 15 µg/L, the action level for lead in groundwater(USEPA, 1994a). Consequently, the lead UBK model was utilized to evaluate the risk associated with exposure to lead-containing soil and groundwater.

### 5.4.4 Dermal Adjustment of Toxicity Factors

Because there are few toxicity reference values for dermal exposure, oral values are frequently used to assess risk from dermal exposure. Most RfDs and some slope factors are expressed as the amount of substance administered per unit time and unit body weight, while exposure estimates for the dermal route are expressed as absorbed dose. Consequently, it may be necessary to adjust an oral toxicity value from an administered dose to an absorbed dose.

Region IV provides absorption efficiency values for each class of chemicals. They are as follows:

| | | |
|---|---|---|
| VOCs | = | 0.80 |
| SVOCs | = | 0.50 |
| Pesticides/PCBs | = | 0.50 |
| Inorganics | = | 0.20 |

An adjusted oral RfD is the product of the absorption efficiency and the oral toxicity reference value. The adjusted oral CSF is the ratio of the oral toxicity value and the absorption efficiency. Table 5-39 presents of summary of the dermally-adjusted toxicity values used in this BRA.

## 5.5 Risk Characterization

This section presents estimated incremental lifetime cancer risks (ICRs) and hazard indices (HIs) for identified receptor groups possibly exposed to COPCs by the exposure pathways presented in Section 5.3.

### 5.5.1 Carcinogenic Compounds

Quantitative risk calculations for carcinogenic compounds estimate ICR levels for individuals in a given population. An ICR of $1 \times 10^{-6}$, for example, indicates that, within a lifetime of exposure to site-specific contamination, one additional case of cancer may occur per one million exposed individuals.

The following represents an individual's ICR:

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

where $CDI_i$ is the chronic daily intake (mg/kg/day) for compound i, and $CSF_i$ is the compound's carcinogenic slope factor [(mg/kg/day)-1]. The CSF is defined as an upper 95th percentile confidence limit of the probability of a carcinogenic response, based on experimental animal data. The CDI defines exposure, expressed as a mass of a substance contracted per unit body weight per unit time, averaged over a period of time (i.e., six years to a lifetime). The above equation is derived assuming that cancer is a non-threshold process and that the potential excess risk level is proportional to the cumulative intake over a lifetime.

### 5.5.2 Noncarcinogenic Compounds

Quantitative noncarcinogenic risk calculations assume that noncarcinogenic compounds have threshold values for toxicological effects. Noncarcinogenic effect weighs CDI against threshold levels (RfDs). Noncarcinogenic effect is estimated by calculating the hazard index (HI), defined by the following equation:

$$HI = HQ_1 + HQ_2 + ...Hq_n \text{ or}$$

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

$$\text{where } HQ_i = CDI_i / RfD_i$$

Where HQi is the hazard quotient for contaminant i, $CDI_i$ is chronic daily intake (mg/kg/day) and $RfD_i$ is the reference dose (mg/kg/day) for contaminant i, over a prolonged period of exposure.

### 5.5.3 Human Health Risks

ICR and HI values associated with exposure to environmental media at Sites 68, 75, 76, 84, 85, and 87 are presented in Tables 5-40 through 5-49. Total site carcinogenic and noncarcinogenic

risks, per medium, for all relevant receptor groups, are provided in these tables. The following paragraphs present the quantitative results of the human health evaluation for each medium for each site.

A cancer risk range of $1x10^{-4}$ to $1x10^{-6}$ is used to evaluate calculated ICR levels. Any ICR value within this range is considered "acceptable"; an ICR greater than $1x10^{-4}$ denotes an existing cancer risk. A noncarcinogenic risk of 1.0 is used as an upper limit to which calculated HI values are compared. Any HI exceeding 1.0 indicates an existing noncarcinogenic risk (USEPA 1989a). If total site carcinogenic and/or noncarcinogenic risks exceed acceptable levels, ICR and HI values are also broken down to show risks from specific exposure pathways: ingestion, dermal contact and inhalation (where applicable).

5.5.3.1 Site 68, Rifle Range Dump

*Current Military Personnel*

The current military receptor was evaluated for potential noncarcinogenic and carcinogenic risk from exposure to the surface soil, subsurface soil, surface water, and sediment. ICR values calculated for military personnel fell within the USEPA acceptable risk range. HI values calculated for military personnel were less than 1.0, below the acceptable risk level. These results are presented in Table 5-40.

*Future Residential Child*

The future child receptor was evaluated for potential risk from exposure to surface soil, surface water, and sediment. ICR values calculated for the future residential child fell within the USEPA acceptable risk range. However, the total site HI value exceeded the USEPA's acceptable risk level of 1.0. A break down of this elevated HI is presented in Table 5-41. All calculated HI values were less than 1.0 except for the noncarcinogenic risk from groundwater ingestion (HI=4.0). Antimony (HQ=2.5) contributed 62% of the elevated HI, while manganese (HQ=1.1) contributed 28%.

*Future Residential Adult*

The adult receptor was also evaluated for potential risk from exposure to surface soil, surface water, and sediment. ICR values calculated for the future residential adult were well within USEPA's acceptable risk range. However, the total site HI value exceeded the USEPA's acceptable risk level of 1.0. A break down of this elevated HI is presented in Table 5-41. All HI values were less than one with the exception of the groundwater ingestion HI (HI=1.8). Similar to the child receptor, antimony (HQ=1.1) and manganese (HQ=0.48) totaled approximately 90% of the elevated HI.

5.5.3.2 Site 75, MCAS Basketball Court

*Current Base Residential Child*

The current base child resident was evaluated for potential risk from exposure to surface soil. Current residents are not evaluated for potential exposure to shallow groundwater since they get their water from supply wells set in the Castle Hayne aquifer. ICR values calculated for the current child receptor fell within the USEPA acceptable risk range. In addition, calculated HI values are less than 1.0, the acceptable risk level. These results are presented in Table 5-42.

*Future Residential Child*

The future residential child was evaluated for potential risk from exposure to surface soil. There were no COPCs retained in Site 75 groundwater. ICR values calculated for the future child receptor fell within the USEPA acceptable risk range. In addition, calculated HI values were less than unity. These results are presented in Table 5-42.

*Current Base Residential Adult*

The current base adult resident was evaluated for potential risk from exposure to surface soil. ICR values calculated for the current adult receptor fell within the USEPA acceptable risk range. Also, calculated HI values were less than unity. These results are presented in Table 5-42.

*Future Residential Adult*

The future residential adult was evaluated for potential risk from exposure to surface soil. ICR values calculated for the future adult receptor fell within the USEPA acceptable risk range. Also, calculated HI values were less than unity. These results are shown in Table 5-42.

5.5.3.3 Site 76, MCAS Curtis Road

*Current Base Residential Child*

The current base child resident was evaluated for potential risk from exposure to surface soil. Current residents are not evaluated for potential exposure to shallow groundwater since they get their water from supply wells set in the Castle Hayne aquifer. ICR values calculated for the current child receptor fell within the USEPA acceptable risk range. In addition, calculated HI values are less than 1.0, the acceptable risk level. These results are presented in Table 5-43.

*Future Residential Child*

The future residential child was evaluated for potential risk from exposure to surface soil and shallow groundwater. ICR values calculated for the future child receptor fell within the USEPA acceptable risk range. HI values calculated for surface soil fell below 1.0, the acceptable risk level. However, the total site HI value exceeded the USEPA's acceptable risk level of 1.0. A break down of this elevated HI is presented in Table 5-44. The total HI calculated for groundwater exceeded unity. This is due primarily to the groundwater ingestion pathway (HI=2.1). Arsenic (HQ=1.7) and iron (HQ=0.4) drive this noncarcinogenic risk.

*Current Base Residential Adult*

The current base adult resident was evaluated for potential risk from exposure to surface soil. ICR values calculated for the current adult receptor fell within the USEPA acceptable risk range. Also, calculated HI values were less than unity. These results are presented in Table 5-43.

*Future Residential Adult*

The future residential adult was evaluated for potential risk from exposure to surface soil. HI values calculated for the future adult receptor fell below the USEPA acceptable risk level of 1.0. However, the total site ICR exceeded USEPA's acceptable risk range. A break down of this elevated ICR is presented in Table 5-44. All ICR values fell within USEPA's acceptable risk range except the carcinogenic risk from groundwater ingestion (ICR=$1.4 \times 10^{-4}$). Arsenic is the driver for this elevated risk value.

5.5.3.4 Site 84, Building 45 Area

A current military personnel receptor was evaluated for potential risk to PCBs in surface soil, surface water, and sediment. There were no COPCs retained in Site 84 surface water. ICR values calculated for current military personnel fell within the USEPA acceptable risk range. These results are presented in Table 5-45. There were no noncarcinogens retained as COPCs at Site 84; therefore, HI values were not calculated for the military personnel receptor.

5.5.3.5 Site 85, Camp Johnson Battery Dump

*Current Military Personnel*

A military personnel receptor was evaluated for potential risk to inorganics in surface soil and subsurface soil. ICR values calculated for current military personnel fell within USEPA's acceptable risk range. These results are presented in Table 5-46. The total site HI exceeded USEPA's acceptable risk level of 1.0. A break down of this elevated HI is presented in Table 5-47. The HI calculated for exposure to subsurface soil fell below 1.0, the acceptable risk level. However, the noncarcinogenic risk level for exposure to surface soil exceeded unity for all pathways evaluated. The ingestion pathway (HI=10.1) contributed approximately 70% of the total surface soil HI, while the dermal (HI=2.2) and inhalation of fugitive dusts (HI=2.0) contributed the remaining 30%. Manganese was the risk driver for these elevated noncarcinogenic risk values.

*Future Residential Child*

A child receptor was evaluated for potential risk to inorganics in surface soil and groundwater. Both the ICR and HI values calculated for the future child resident exceeded USEPA's acceptable carcinogenic and noncarcinogenic risk values, respectively. The total site ICR of 3.8 x $10^{-4}$ exceeded the USEPA acceptable risk range due primarily to the ingestion of surface soil (ICR=1.3 x $10^{-4}$) and the ingestion of groundwater (ICR=2.4 x $10^{-4}$). Arsenic is responsible for the unacceptable surface soil and groundwater ingestion ICRs. Likewise, the surface soil and groundwater ingestion pathways (HI=135 and 180, respectively) are primarily responsible for the total site HI of 334. It should also be noted that all exposure pathways evaluated for surface soil and groundwater exceed 1.0. Manganese was the risk driver in surface soil, while iron and aluminum drove the risk in groundwater. These results are presented in Tables 5-46 and 5-47.

*Future Residential Adult*

An adult receptor was evaluated for potential risk from exposure to inorganics in surface soil and groundwater. As with the future residential child, both the ICR and HI values calculated for the future adult resident exceeded USEPA's acceptable carcinogenic and noncarcinogenic risk values, respectively. The total site ICR of 6.1 x $10^{-4}$ exceeded the USEPA acceptable risk range due primarily to the ingestion of surface soil (ICR=6.8 x $10^{-5}$) and the ingestion of groundwater (ICR=5.3 x $10^{-4}$). Arsenic is responsible for the unacceptable surface soil and groundwater ingestion ICRs. Likewise, the surface soil and groundwater ingestion pathways (HI=14 and 77, respectively) are primarily responsible for the total site HI of 100. It should also be noted that all exposure pathways evaluated for surface soil and groundwater exceed 1.0. Manganese was the risk driver in surface soil, while iron and aluminum drove the risk in groundwater. These results are presented in Tables 5-46 and 5-47.

5.5.3.6 Site 87, MCAS Officer's Housing Area

*Current Base Residential Child*

A current child receptor was evaluated for potential risk from exposure to surface soil, surface water, and sediment. Current residents are not evaluated for potential exposure to shallow

groundwater since they get their water from supply wells set in the Castle Hayne aquifer. ICR values calculated for a current residential child fell within the USEPA acceptable risk range. Also, calculated HI values were less than unity. These results are presented in Table 5-48.

*Future Residential Child*

A future child receptor was evaluated for potential risk from exposure to surface soil, shallow groundwater, surface water, and sediment. ICR values calculated for the future child receptor fell within the USEPA acceptable risk range. These results are presented in Table 5-48. The total site HI exceeded the USEPA's acceptable risk level. All HI values fell below the acceptable risk level of 1.0 except for the noncarcinogenic risk from groundwater ingestion (HI=1.5). Iron (44%), manganese (41%), and aluminum (16%) are the risk drivers. The break down of this elevated HI is presented in Table 5-49.

*Current Base Residential Adult*

A current adult receptor was evaluated for potential risk from exposure to surface soil, surface water, and sediment. ICR values calculated for a current residential adult fell within the USEPA acceptable risk range. Also, calculated HI values were less than unity. These results are presented in Table 5-48.

*Future Residential Adult*

A future adult receptor was evaluated for potential risk from exposure to surface soil, shallow groundwater, surface water, and sediment. ICR values calculated for a future residential adult fell within the USEPA acceptable risk range. Also, calculated HI values were less than unity. These results are presented in Table 5-48.

## 5.6 Lead UBK Model Results

The USEPA lead UBK model (Appendix M) was used to determine if exposure to site media would result in unacceptable blood lead levels in younger children upon exposure to the soil at

Site 63. Blood lead levels are considered unacceptable when a greater than 5 percent probability exists that the blood lead levels will exceed 10 μg/dl.

The maximum concentration of lead found in Site 85 surface soil was used in the model. Likewise, the maximum concentration of lead found in Site 85 groundwater was used in a separate model. The remaining model parameters used were the default factors supplied in the model. The maximum concentration in surface soil resulted in a greater than 5 percent probability of the blood lead levels exceeding 10 μg/dl, which is not within acceptable levels. Also, the maximum concentration in groundwater resulted in a greater than 5 percent probability of the blood lead levels exceeding 10 μg/dl. Figures 5-7 through 5-8 illustrate these results.

## 5.7 Sources of Uncertainty

Uncertainties may arise during the risk assessment process. This section presents site specific sources of uncertainty in the risk assessment:

- Analytical data
- Exposure Assessment
- Toxicity Assessment
- Compounds Not Qualitatively Evaluated
- Surrogates Substituted Contaminants Without Toxicity Information
- Permeability Constant ($K_p$)

### 5.7.1 Analytical Data

The credibility of the BRA relies on the quality of the analytical data available to the risk assessor. Analytical data are limited by the precision and accuracy of the analytical method of analysis. In addition, the statistical methods used to compile and analyze data (mean concentration, standard deviation, and detection frequencies) are subject to uncertainty in the ability to acquire data.

Data validation serves to reduce some of the inherent uncertainty associated with analytical data by establishing the usability of the data to the risk assessor who may or may not choose to

include the data point in risk estimation. Data can be qualified as "J" (estimated) for many reasons, including a slight exceedance of holding times, high or low surrogate recovery, or intra-sample variability. Data qualified with "J" were retained for risk assessment. Organic data qualified with "B" (detected in blank) or "R" (rejected/unreliable) were not applied to risk analysis. Because the sampling and analytical program was so comprehensive, dismissing data points qualified with "B" or "R" did not significantly increase uncertainty in the risk assessment.

### 5.7.2 Exposure Assessment

When performing exposure assessments, uncertainties can arise from two main sources. First, the chemical concentration to which a receptor may be exposed must be estimated for every medium of interest. Second, uncertainties can arise in estimating contaminant intakes resulting from contact with a particular medium.

Estimating the contaminant concentration in a given medium to which a human receptor may be exposed can be as simple as deriving the 95% upper confidence limit of the mean for a given data set. More complex methods for deriving contaminant concentration are necessary when exposure to COPCs in a given medium occurs subsequent to contaminant release from another medium, or when analytical data are not available to characterize the release. In this case, modeling is usually employed to estimate potential human exposure.

Potential inhalation of fugitive dusts from affected soils is estimated by using USEPA's Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination (Cowherd et al., 1985). The Cowherd model uses a default PEF for wind erosion based on a one-half acre source area and 50 percent vegetative cover. Modeling results for fugitive dust emission exposure suggested that the potential risk associated with this pathway was not significant.

Groundwater samples were analyzed for total (unfiltered) and dissolved (filtered) inorganic contaminants. These samples were obtained from wells which were constructed using USEPA Region IV monitoring well design specifications. Groundwater taken from monitoring wells cannot be considered representative of potable groundwater, or groundwater which is obtained from a domestic well at the tap. The use of total inorganic analytical results overestimates the potential human health risks associated with potable use scenarios. However, in order to produce

the most conservative risk estimates, total organic results were used to calculate the potential intake associated with groundwater use.

As stated previously, the shallow groundwater at Camp Lejeune is currently not used as a potable source. Receptors are only exposed to groundwater drawn from the deep zone. For this reason, exposure to shallow groundwater is not evaluated for current receptors. Groundwater exposure is evaluated for future residents only, as there is a possibility that shallow groundwater may be tapped someday.

To estimate receptor intake, certain assumptions must be made about exposure events, exposure durations and the corresponding assimilation of contaminants by the receptor. Exposure factors have been created from a range of values generated by studies conducted by the scientific community, and have been reviewed by the USEPA. Conservative assumption for daily intakes are employed throughout the BRA when values are not available; they are designed to produce low error, to protect human health and to yield reasonable clean-up goals. In all instances, the values, conservative scientific judgments and conservative assumptions used in the risk assessment concur with USEPA guidelines.

### 5.7.3 Sampling Strategy

As an environmental medium, soil is available for direct contact exposure and it is often the main source of contamination released to other media. Soil sampling intervals should be appropriate for the exposure pathways and contaminant transport routes of concern. Surface soil exposure assessment is based on samples collected from the shallowest depth, 0 to 1 foot below the ground surface. Subsurface soil samples are necessary to generate data for exposure assessment when soil excavation is possible, or if leaching of chemicals to groundwater is likely. Subsurface soil samples are collected at depths greater than 1 foot below the ground surface.

### 5.7.4 Toxicity Assessment

In making quantitative estimates about the toxicity of varying chemical doses, uncertainties arise from two sources. First, existing data usually provide insufficient information about toxic exposure and subsequent effects. Human exposure data display inherent temporal variability and

often lack adequate concentration estimates. Animal studies are often used to subsidize available human data. In the process of extrapolating animal results to humans; however, more uncertainties can arise. Second, in order to obtain visible toxic effects in experimental animals, high chemical doses are employed over short periods of time. Doses typical of human exposure, however, are much lower, relative to those doses administered to experimental animals. In order to apply animal test results to human exposure assessments, then, data must be adjusted to extrapolate from high dose effects to low dose effects.

In extrapolating effects from animal receptors to human receptors, and from high doses to low doses, 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 in which the animal closely mimics human pharmacokinetics

- Studies are preferred in which dose intake most closely mimics intake route and duration for humans

- Studies are preferred in which the most sensitive responses to the compound in question is demonstrated

In order to evaluate compounds that cause threshold effects, (i.e., noncarcinogens) safety factors are taken into account when experimental results are extrapolated from animals to humans, and from high to low doses.

Employing conservative assumptions yields quantitative toxicity indices that are not expected to underestimate potential toxic effects, but may overestimate these effects by some magnitude.

### 5.7.5 Compounds Not Quantitatively Evaluated

The following contaminants detected at one or more of the sites were not quantitatively evaluated in the BRA, as there is no toxicity information promulgated by the USEPA, and no appropriate surrogates to substitute for them:

- 2-hexanone
- thallium

### 5.7.6 Surrogates Substituted for Contaminants Without Toxicity Information

In the event that the list of COPCs contains contaminants with no toxicity information, other contaminants are substituted as surrogates for them. Toxicity values (i.e., RBC, CSF and RfD) for the surrogate contaminants are used in CDI calculations. Following is a list of the COPCs retained at one or more of the Pre-RI screening study sites without toxicity values, and their corresponding chemical surrogates:

- phenanthrene, benzo(g,h,i)perylene:pyrene
- 2-methylnaphthalene:naphthalene
- alpha-chlordane, gamma-chlordane:chlordane
- Aroclor-1260:PCB

### 5.7.7 Permeability Constant ($K_p$)

In order to calculate CDI for dermal contact with groundwater, $K_p$ must be calculated for COPCs that do not have published $K_p$ values. The following equation is used to calculate $K_p$ (USEPA, 1992a):

$$\log K_p = -2.72 + 0.71 \log K_{ow} - 0.0061 \text{ MW}$$

$K_p$ calculations are presented in Appendix K.

## 5.8 BRA Conclusions

The BRA highlights the media of interest from the human health standpoint at Sites 68, 75, 76, 84, 85, and 87 by identifying areas with risk values greater than acceptable levels. Current and future potential receptors at the sites included current military personnel, current base residents, and future residents. The total risk from the site for these receptors was estimated by logically summing the multiple pathways likely to affect the receptor during a given activity. Exposure to

surface soil, subsurface soil, surface water, and sediment was assessed for the current military receptor. Exposure to surface soil, surface water, and sediment was assessed for the current residents. Finally, surface soil, groundwater, surface water, and sediment were evaluated for the future receptors.

### 5.8.1 Current Scenario

In the current case, the following receptors were assessed (where applicable): military personnel and base residents. Receptor exposure to surface soil, surface water, and sediment was assessed. The potential risks associated with current receptors for all sites except Site 85 were within acceptable risk levels. The total site noncarcinogenic risk for the military personnel receptor (HI=14) exceeded the USEPA acceptable risk level of 1.0. This indicates a potential for adverse health effects. This elevated HI is primarily due to the presence of manganese.

### 5.8.2 Future Scenario

In the future case, adult and child residents were assessed for potential exposure to groundwater, surface soil, surface water, and sediment. There were no unacceptable carcinogenic or noncarcinogenic risks associated with the Site 75 child and adult or the Site 87 adult. In addition, the total site HI calculated for the Site 76 adult fell below the USEPA acceptable risk level.

However, there were potential carcinogenic risks calculated for the Site 76 adult and the Site 85 child and adult. The unacceptable total site ICR of $1.4 \times 10^{-4}$ for the Site 76 adult is due to the presence of arsenic in the groundwater. Arsenic in surface soil and groundwater is also responsible for the total site ICR values for the Site 85 child and adult (child ICR=$3.8 \times 10^{-4}$, adult ICR=$6.1 \times 10^{-4}$) exceeding USEPA's acceptable risk range.

There were also risk values that exceeded the hazard index of 1.0 for noncarcinogenic effects. The Site 76 child HI (2.3) exceeded unity. Arsenic and iron in the groundwater drove this noncarcinogenic risk. In the case of the Site 85 child and adult receptor, the surface soil and groundwater ingestion pathways are primarily responsible for the total site HI values of 334 and 100, respectively. Manganese was the risk driver in surface soil, while iron and aluminum drove

the risk in groundwater. The total site HI calculated for the Site 87 child (HI=2.3) also exceeded the acceptable risk level. Iron, manganese, and aluminum in groundwater contributed to this unacceptable HI.

As stated previously, shallow groundwater is not currently used as a potable source at these sites, and future residential development of these sites is unlikely. Based on this information, the future groundwater exposure scenario evaluated in this BRA, although highly protective of human health, is unlikely to occur.

## 5.9 References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# TABLES

TABLE 5-1

SUMMARY OF ORGANIC BLANK CONTAMINANT RESULTS
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Constituent | Maximum Concentration Detected in Blank (µg/L) | Medium Associated with Maximum Concentration Detected in Blank | Type of Blank with Maximum Detected Value | Concentration for Comparison[1] (Aqueous - µg/L) | Concentration for Comparison[2] (Solid - µg/kg) |
|---|---|---|---|---|---|
| **SITE 12** | | | | | |
| **Volatiles** | | | | | |
| Chloroform | 4J | Soil | Rinsate | 20 | 20 |
| **Semivolatiles** | | | | | |
| Bis(2-ethylhexyl)phthalate | 1J | Soil | Rinsate | 100 | 3,300[3] |
| **Volatiles** | | | | | |
| Acetone | 28 | Groundwater | Trip | 280 | NA |
| Toluene | 2J | Groundwater | Rinsate | 20 | NA |
| **Semivolatiles** | | | | | |
| Bis(2-ethylhexyl)phthalate | 130 | Groundwater | Field | 1,300 | NA |
| **SITE 68** | | | | | |
| **Volatiles** | | | | | |
| Acetone | 22J | Groundwater | Trip | 220 | NA |
| Chloroform | 5J | Groundwater | Field | 25 | NA |
| Bromodichloromethane | 6J | Groundwater | Field | 30 | NA |
| Dibromochloromethane | 13 | Groundwater | Field | 65 | NA |
| Bromoform | 14 | Groundwater | Field | 70 | NA |
| Toluene | 3J | Groundwater | Rinsate | 30 | NA |
| **Semivolatiles** | | | | | |
| Phenol | 19 | Groundwater | Rinsate | 95 | NA |
| Butylbenzylphthalate | 1J | Groundwater | Rinsate | 10 | NA |
| Bis(2-ethylhexyl)phthalate | 6J | Groundwater | Rinsate | 60 | NA |
| **Volatiles** | | | | | |
| Acetone | 50J | Surface Water/ Sediment | Field | 500 | 500 |
| Chloroform | 4J | Surface Water/ Sediment | Rinsate | 20 | 20 |
| **Semivolatiles** | | | | | |
| Phenol | 20 | Surface Water/ Sediment | Field | 100 | 100 |
| 2,6-Dinitrotoluene | 4J | Surface Water/ Sediment | Field | 20 | 20 |
| Bis(2-ethylhexyl)phthalate | 14 | Surface Water/ Sediment | Rinsate | 140 | 140 |

TABLE 5-1 (Continued)

SUMMARY OF ORGANIC BLANK CONTAMINANT RESULTS
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Constituent | Maximum Concentration Detected in Blank (µg/L) | Medium Associated with Maximum Concentration Detected in Blank | Type of Blank with Maximum Detected Value | Concentration for Comparison[1] (Aqueous - µg/L) | Concentration for Comparison[2] (Solid - µg/kg) |
|---|---|---|---|---|---|
| **SITE 76** | | | | | |
| **Volatiles** | | | | | |
| Acetone | 130 | Soil | Field | 1,300 | 1,300 |
| Chloroform | 5J | Soil | Rinsate | 25 | 25 |
| **Semivolatiles** | | | | | |
| Phenol | 27 | Soil | Field | 135 | 135 |
| Bis(2-ethylhexyl)phthalate | 2 | Soil | Rinsate | 20 | 660 |
| **SITE 87** | | | | | |
| **Volatiles** | | | | | |
| Acetone | 23 | Soil | Trip | 230 | 230 |

Notes:

(1) Concentration is five or ten times (for common laboratory blank contaminants) the maximum detected concentration in a blank.

(2) Concentration is five or ten times the maximum detected concentration in a blank; converted to µg/kg.

(3) Semivolatile blank concentrations are multiplied by 33 or 66 to account for matrix difference.

NA = Not applicable

TABLE 5-2

SURFACE SOIL ORGANIC DATA AND COPC SELECTION SUMMARY
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Contaminant Range/Frequency | | Region III Criteria | Comprison to Criteria |
|---|---|---|---|---|
| | Range of Positive Detections (µg/kg) | No. of Positive Detects/ No. of Samples | Residential RBC Value[1] (µg/kg) | Positive Detects Above Residential RBC Value |
| **Volatiles** | | | | |
| Acetone | 12-18 | 3/24 | 780,000 | 0 |
| **Semivolatiles** | | | | |
| Phenol | 78J | 1/24 | 130,000 | 0 |
| Di-n-butylphthalate | 44J | 1/24 | 780,000 | 0 |
| bis(2-Ethylhexyl)phthalate | 49J-160J | 4/24 | 46,000 | 0 |
| **Pesticide/PCBs** | | | | |
| Beta-BHC | 1.4J | 1/24 | 350 | 0 |
| Dieldrin | 6.3NJ | 1/24 | 40 | 0 |
| 4,4'-DDE | 4.5J-170J | 10/24 | 1,900 | 0 |
| 4,4'-DDT | 2.3J-56J | 11/24 | 1,900 | 0 |
| Methoxychlor | 18J | 1/24 | 39,000 | 0 |
| Aroclor-1260 | 290 | 1/24 | 320 | 0 |

Notes:

Shading indicates contaminant selected as COPC for human health risk assessment.
J = Estimated value
N = Tentative identification. Consider present.
[1] USEPA Region III Risk-Based Concentrations (RBC) Table (April 15, 1998).

TABLE 5-3

SURFACE SOIL INORGANIC DATA AND COPC SELECTION SUMMARY
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | Range/Frequency | | Comparison to Criteria | | | |
|---|---|---|---|---|---|---|
| Analyte | Range of Positive Detections (mg/kg) | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background[1] Concentration (mg/kg) | No. of Times Exceeded Twice the Average Background Concentration | Residential RBC Value[2] (mg/kg) | Positive Detects Above Residential RBC Value |
| Aluminum | 1,200 - 7,460 | 24/24 | 5,856.083 | 4 | 7,800 | 0 |
| Antimony | 4.5J | 1/24 | 5.455 | 0 | 3.1 | 1 |
| Arsenic | 0.14 - 0.87 | 22/24 | 1.322 | 0 | 0.43 | 11 |
| Barium | 3 - 28.8 | 24/24 | 17.292 | 7 | 550 | 0 |
| Beryllium | 0.16 - 0.59 | 11/24 | 0.205 | 9 | 16 | 0 |
| Cadmium | 0.44 | 1/24 | 0.696 | 0 | 3.9 | 0 |
| Calcium+ | 45.8 - 8,530 | 23/24 | 1,372.977 | 1 | -- | -- |
| Chromium | 0.86 - 4.1 | 24/24 | 6.607 | 0 | 39 | 0 |
| Cobalt | 0.49 - 1.3 | 13/24 | 2.046 | 0 | 470 | 0 |
| Copper | 0.44 - 7.2 | 23/24 | 7.104 | 1 | 310 | 0 |
| Iron+ | 364 - 2,990 | 24/24 | 3,702.427 | 0 | 2,300 | 3 |
| Lead | 4 - 122 | 24/24 | 23.37 | 1 | 400[3] | 0 |
| Magnesium+ | 32.4 - 213 | 24/24 | 202.96 | 2 | -- | -- |
| Manganese | 2.1 - 162 | 24/24 | 18.51 | 16 | 160 | 1 |
| Mercury | 0.05 | 1/24 | 0.094 | 0 | 2.3[4] | 0 |
| Nickel | 2 - 3.8 | 12/24 | 3.455 | 2 | 160 | 0 |
| Potassium+ | 199 | 1/24 | 200.06 | 0 | -- | -- |
| Selenium | 0.24 | 1/24 | 0.753 | 0 | 39 | 0 |
| Sodium+ | 5.7 - 34.2 | 12/24 | 59.013 | 0 | -- | -- |
| Vanadium | 1.2 - 8.2 | 24/24 | 11.447 | 0 | 55 | 0 |
| Zinc | 1.8 - 21 | 20/24 | 13.763 | 1 | 2,300 | 0 |

Notes:

Shaded areas indicate analyte selected as COPC for human health risk assessment.
+ = Essential Nutrient
-- = No criteria published
J - Estimated Value
(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.
(2) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(3) Action Level for residential soils (USEPA, 1994b).

TABLE 5-4

SUBSURFACE SOIL ORGANIC DATA AND COPC SELECTION SUMMARY
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Contaminant Range/Frequency | | Region III Criteria | Comprison to Criteria |
|---|---|---|---|---|
| | Range of Positive Detections (µg/kg) | No. of Positive Detects/ No. of Samples | Residential COC Value[1] (µg/kg) | Positive Detects Above Residential COC Value |
| **Volatiles** | | | | |
| Acetone | 15 - 150 | 7/25 | 780,000 | 0 |
| Carbon Disulfide | 16 | 1/25 | 780,000 | 0 |
| 2-Butanone | 9J | 1/25 | 4,700,000 | 0 |
| **Semivolatiles** | | | | |
| Pyrene | 48J | 1/25 | 230,000 | 0 |
| bis(2-Ethylhexyl)phthalate | 39J - 110J | 4/25 | 46,000 | 0 |
| **Pesticide/PCBs** | | | | |
| 4,4'-DDT | 3.4J | 1/25 | 1,900 | 0 |
| Aroclor-1260 | 12J - 26J | 3/25 | 320 | 0 |

Notes:

J = Estimated value
[1] USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).

TABLE 5-5

SUBSURFACE SOIL INORGANIC DATA AND COPC SELECTION SUMMARY
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | Range/Frequency | | Comparison to Criteria | | | |
|---|---|---|---|---|---|---|
| Analyte | Range of Positive Detections (mg/kg) | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background[1] Concentration (mg/kg) | No. of Times Exceeded Twice the Average Background Concentration | Residential RBC Value[2] (mg/kg) | Positive Detects Above Residential COC Value |
| Aluminum | 645 - 13,200 | 25/25 | 7,413.23 | 20 | 7,800 | 19 |
| Arsenic | 0.27 - 7.6 | 23/25 | 1.971 | 20 | 0.43 | 22 |
| Barium | 0.59 - 80.9J | 25/25 | 14.37 | 13 | 550 | 0 |
| Beryllium | 0.2 - 0.87 | 17/25 | 0.191 | 16 | 16 | 0 |
| Cadmium | 0.56 - 0.82 | 3/25 | 0.718 | 1 | 3.9 | 0 |
| Calcium+ | 16.2 - 682 | 25/25 | 387.824 | 5 | -- | -- |
| Chromium | 2 - 25.1 | 25/25 | 12.537 | 20 | 39 | 0 |
| Cobalt | 0.79 - 10.7 | 16/25 | 1.611 | 3 | 470 | 0 |
| Copper | 1.1 - 11.5 | 22/25 | 2.41 | 19 | 310 | 0 |
| Iron+ | 726 - 18,600 | 25/25 | 7,134.639 | 16 | 2,300 | 21 |
| Lead | 1.1 - 11.9J | 25/25 | 8.264 | 6 | 400[3] | 0 |
| Magnesium+ | 15.3 - 1,520 | 25/25 | 263.398 | 20 | -- | -- |
| Manganese | 3.4 - 178 | 24/25 | 7.99 | 20 | 160 | 1 |
| Nickel | 2.5 - 18.9 | 15/25 | 3.725 | 8 | 160 | 0 |
| Potassium+ | 465 - 1,340 | 20/25 | 344.252 | 20 | -- | -- |
| Selenium | 0.27 - 0.53 | 4/25 | 0.806 | 0 | 39 | 0 |
| Sodium+ | 12.4 - 69.2 | 20/25 | 54.57 | 4 | -- | -- |
| Vanadium | 1.7 - 33.2 | 25/25 | 13.34 | 20 | 55 | 0 |
| Zinc | 0.84 - 92.8 | 24/25 | 6.668 | 21 | 2,300 | 0 |

Notes:

Shaded areas indicate analyte selected as COPC for human health risk assessment.
+ = Essential Nutrient
-- = No criteria published
J - Estimated Value
(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.
(2) USEPA Region III Risk Based Concentration Table (April 15, 1998).
(3) Action Level for residential soils (USEPA, 1994b).

TABLE 5-6

GROUNDWATER DATA AND COPC SELECTION SUMMARY
ORGANICS AND INORGANICS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Groundwater Criteria | | | | | Frequency/Range | | Comparison to Criteria | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NCWQS[1] (µg/L) | MCL[2] (µg/L) | Region III Tapwater RBC Value[3] (µg/L) | Federal Health Advisories[4] (µg/L) | | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | No. of Detects Above NCWQS | No. of Detects Above MCL | No. of Detects Above RBC | No. of Detects Above Health Advisories | |
| | | | | 10 kg Child | 70 kg Adult | | | | | | 10 kg Child | 70 kg Adult |
| **Volatiles** | | | | | | | | | | | | |
| Carbon Disulfide | NE | NE | 100 | NE | NE | 2/9 | 4J - 4J | NA | NA | 0 | NA | NA |
| 2-Hexanone | NE | NE | NE | NE | NE | 1/9 | 6J | NA | NA | NA | NA | NA |
| **Inorganics** | | | | | | | | | | | | |
| Aluminum | NE | 50/200[5] | 3,700 | NE | NE | 8/18 | 373 - 1,600 | NA | 3/3 | 0 | NA | NA |
| Antimony | NE | 6 | 1.5 | 10 | 15 | 2/18 | 20.3 - 21 | NA | 2 | 2 | 2 | 2 |
| Arsenic | 50 | 50 | 0.045 | NE | NE | 1/18 | 0.96 | 0 | 0 | 1 | NA | NA |
| Barium | 2,000 | 2,000 | 260 | NE | NE | 18/18 | 3.6 - 50.9 | 0 | 0 | 0 | NA | NA |
| Beryllium | NE | 4 | 7.3 | 4,000 | 20,000 | 1/18 | 4.2J | NA | 1 | 0 | 0 | 0 |
| Cadmium | 5 | 5 | 1.8 | 5 | 20 | 1/18 | 4.8 | 0 | 0 | 1 | 0 | 0 |
| Calcium+ | NE | NE | NE | NE | NE | 18/18 | 1,890-109,000 | NA | NA | NA | NA | NA |
| Chromium | 50 | 100 | 18 | 200 | 800 | 3/18 | 3.5 - 5.9J | 0 | 0 | 0 | 0 | 0 |
| Cobalt | NE | NE | 220 | NE | NE | 4/18 | 3.1 - 35.8J | NA | NA | 0 | NA | NA |
| Copper | 1,000 | 1,300[6] | 150 | NE | NE | 13/18 | 2.3 - 25.6 | 0 | 0 | 0 | NA | NA |
| Iron | 300 | 300[5] | 1,100 | NE | NE | 17/18 | 16.4 - 6,170 | 2 | 2 | 0 | NA | NA |
| Lead | 15 | 15[6] | NE | NE | NE | 6/18 | 0.84 - 2.9J | 0 | 0 | NA | NA | NA |
| Magnesium+ | NE | NE | NE | NE | NE | 18/18 | 334 - 8,850 | NA | NA | NA | NA | NA |
| Manganese | 50 | 50[5] | 73 | NE | NE | 16/18 | 2.6J - 1,390 | 6 | 6 | 2 | NA | NA |
| Mercury | 1.1 | 2 | 1.1[7] | NE | 2 | 2/18 | 0.031J - 0.035J | 0 | 0 | 0 | NA | 0 |
| Nickel | 100 | 100 | 73 | 500 | 1,700 | 4/18 | 9.2J - 65.4 | 0 | 0 | 0 | 0 | 0 |
| Potassium+ | NE | NE | NE | NE | NE | 14/18 | 1,040J - 15,100 | NA | NA | NA | NA | NA |
| Selenium | 50 | 50 | 18 | NE | NE | 1/18 | 2.1 | 0 | 0 | 0 | NA | NA |
| Sodium+ | NE | NE | NE | NE | NE | 18/18 | 1,880 - 46,200 | NA | NA | NA | NA | NA |

TABLE 5-6 (Continued)

GROUNDWATER DATA AND COPC SELECTION SUMMARY
ORGANICS AND INORGANICS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Groundwater Criteria | | | | | Frequency/Range | | Comparison to Criteria | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NCWQS[1] (µg/L) | MCL[2] (µg/L) | Region III Tapwater RBC Value[3] (µg/L) | Federal Health Advisories[4] (µg/L) | | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | No. of Detects Above NCWQS | No. of Detects Above MCL | No. of Detects Above RBC | No. of Detects Above Health Advisories | |
| | | | | 10 kg Child | 70 kg Adult | | | | | | 10 kg Child | 70 kg Adult |
| Thallium | NE | 2 | 0.26 | 7 | 20 | 6/18 | 3.6J - 6.6J | NA | 6 | 6 | 0 | 0 |
| Vanadium | NE | NE | 26 | NE | NE | 6/18 | 2.8 - 23.1J | NA | NA | 0 | NA | NA |
| Zinc | 2,100 | 5,000[5] | 1,100 | 3,000 | 10,000 | 10/18 | 4 - 250 | 0 | 0 | 0 | 0 | 0 |

Notes:

Shaded areas indicate parameter selected as COPC.
(1) NC WQS = North Carolina Water Quality Standards for Groundwater
(2) MCL = Safe Drinking Water Act Maximum Contaminant Level
(3) USEPA Region III RBC Table (April 15, 1998).
(4) Longer Term Health Advisories for a 10 kg Child and 70 kg Adult
(5) SMCL = Secondary Maximum Contaminant Level
(6) Action Level for drinking water.
(7) Value for mercuric chloride used as a surrogate.
+ - Essential Nutrient
NE - No Criteria Established
NA - Not Applicable
J - Estimated Value

TABLE 5-7

SURFACE WATER DATA AND COPC SELECTION SUMMARY
ORGANICS AND INORGANICS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Contaminant | Surface Water Criteria | | | Contaminant Frequency/Range | | Comparison to Criteria | | |
|---|---|---|---|---|---|---|---|---|
| | NCWQS[1] (µg/L) | Federal Health AWQCs[2] | | | | Positive Detects Above NCWQS | Positive Detects Above AWQC | |
| | | Water & Organisms (µg/L) | Organisms Only (µg/L) | No. of Positive Detects/ No. of Samples | Contaminant Range (µg/L) | | Water & Organisms | Organisms Only |
| **Semivolatiles** | | | | | | | | |
| Di-n-butylphthalate | 2,700 | 2,700 | 12,000 | 1/10 | 1J | 0 | 0 | 0 |
| **Inorganics** | | | | | | | | |
| Aluminum | NE | NE | NE | 10/10 | 141 - 422 | NA | NA | NA |
| Barium | 1,000 | 1,000 | NE | 10/10 | 11.3 - 18.4 | 0 | 0 | NA |
| Cadmium | NE | NE | NE | 1/10 | 2.9 | NE | NE | NE |
| Calcium+ | NE | NE | NE | 10/10 | 6,530 - 27,300 | NA | NA | NA |
| Iron | NE | 300 | NE | 10/10 | 410 - 594 | NA | 10 | NA |
| Lead | NE | 50 | NE | 6/10 | 0.87 - 2.5 | NA | 0 | NA |
| Magnesium+ | NE | NE | NE | 10/10 | 1,260 - 25,500 | NA | NA | NA |
| Manganese | 200 | 50 | 100 | 10/10 | 11.7 - 42.5 | 0 | 0 | 0 |
| Potassium+ | NE | NE | NE | 6/10 | 865 - 8,030 | NA | NA | NA |
| Selenium | NE | NE | NE | 1/10 | 1.7 | NA | NA | NA |
| Sodium+ | NE | NE | NE | 10/10 | 6,650 - 210,000 | NA | NA | NA |
| Vanadium | NE | NE | NE | 1/10 | 2.4 | NA | NAN | NA |
| Zinc | NE | NE | NE | 2/10 | 4.1 - 4.2 | NA | NA | NA |

Notes:

Shaded areas indicate parameter selected as COPC for human health risk assessment.
(1) NC WQS = North Carolina Water Quality Standards for Surface Water
(2) AWQC = Ambient Water Quality Criteria
+ = Essential Nutrients
NE = Not Established
NA = Not Applicable
J = Estimated value

TABLE 5-8

SEDIMENT DATA AND COPC SELECTION SUMMARY
ORGANICS AND INORGANICS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Sediment Screening Values[1] | | Range/Frequency | | Comparison to Criteria Positive Detects Above | |
|---|---|---|---|---|---|---|
| | ER-L Concentration | ER-M Concentration | Range of Positive Detections | No. of Positive Detects/ No. of Samples | ER-L | ER-M |
| **Semivolatiles (µg/kg)** | | | | | | |
| Phenanthrene | 240 | 1,500 | 280J | 1/10 | 1 | 0 |
| Anthracene | 85.3 | 1,100 | 62J | 1/10 | 0 | 0 |
| Fluoranthene | 600 | 5,100 | 420J | 1/10 | 0 | 0 |
| Pyrene | 665 | 2,600 | 330J | 1/10 | 0 | 0 |
| Benzo(a)anthracene | 261 | 1,600 | 190J | 1/10 | 0 | 0 |
| Chrysene | 384 | 2,800 | 210J | 1/10 | 0 | 0 |
| Bis(2-ethylhexyl)phthalate | NE | NE | 250J | 1/10 | NA | NA |
| Benzo(b)fluoranthene | NE | NE | 250J | 1/10 | NA | NA |
| Benzo(k)fluoranthene | NE | NE | 97J | 1/10 | NA | NA |
| Benzo(a)pyrene | 430 | 1,600 | 170J - 380J | 3/10 | 0 | 0 |
| Indeno(1,2,3-cd)pyrene | NE | NE | 110J | 1/10 | NA | NA |
| Benzo(g,h,i)perylene | NE | NE | 98J | 1/10 | NA | NA |
| **Pesticides/PCBs (µg/kg)** | | | | | | |
| 4,4'-DDE | 2.2 | 27 | 6.7 - 550 | 9/10 | 9 | 5 |
| 4,4'-DDD | 1.58[2] | 46.1[2] | 2.5J - 2,900 | 9/10 | 9 | 4 |
| 4,4'-DDT | 1.58[2] | 46.1[2] | 6.3J - 4,500 | 7/10 | 7 | 3 |
| Alpha-chlordane | 0.5[3,4] | 6[3,4] | 13J | 1/10 | 1 | 1 |
| Gamma-chlordane | 0.5[3,4] | 6[3,4] | 14NJ | 1/10 | 1 | 1 |
| **Inorganics (mg/kg)** | | | | | | |
| Aluminum | NE | NE | 351 - 11,500 | 10/10 | NA | NA |
| Arsenic | 8.2 | 70 | 0.64J - 4.2 | 5/10 | 0 | 0 |
| Barium | NE | NE | 1.5 - 28.1 | 10/10 | NA | NA |
| Cadmium | 1.2 | 9.6 | 0.5 - 4.7 | 3/10 | 2 | 0 |
| Calcium+ | NE | NE | 71.3 - 11,900 | 10/10 | NA | NA |
| Chromium | 81 | 370 | 0.79 - 12.6 | 10/10 | 0 | 0 |
| Cobalt | NE | NE | 0.75 - 6.3 | 5/10 | NA | NA |
| Copper | 34 | 270 | 0.45 - 14.9 | 8/10 | 0 | 0 |
| Iron | NE | NE | 296 - 16,300 | 10/10 | NA | NA |
| Lead | 46.7 | 218 | 1.8 - 73J | 10/10 | 1 | 0 |

TABLE 5-8 (continued)

SEDIMENT DATA AND COPC SELECTION SUMMARY
ORGANICS AND INORGANICS
SITE 68, RIFLE RANGE DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Sediment Screening Values[1] | | Range/Frequency | | Comparison to Criteria Positive Detects Above | |
|---|---|---|---|---|---|---|
| | ER-L Concentration | ER-M Concentration | Range of Positive Detections | No. of Positive Detects/ No. of Samples | ER-L | ER-M |
| Magnesium+ | NE | NE | 23.5 - 8,330 | 10/10 | NA | NA |
| Manganese | NE | NE | 2.7 - 127 | 10/10 | NA | NA |
| Mercury | 0.15 | 0.71 | 0.4 | 1/10 | 1 | 0 |
| Nickel | 20.9 | 51.6 | 2.3 - 9.7 | 3/10 | 0 | 0 |
| Selenium | NE | NE | 0.79 - 1.2 | 2/10 | NA | NA |
| Sodium+ | NE | NE | 55.8 - 15,400 | 7/10 | NA | NA |
| Vanadium | NE | NE | 0.7 - 26.6 | 10/10 | NA | NA |
| Zinc | 150 | 410 | 3.8 - 86.5 | 9/10 | 0 | 0 |

Notes:

Shaded areas indicate parameter selected as COPC for human health risk assessment.
ER-L - Effects Range-Low
ER-M - Effects Range-Medium
(1) Long et al., 1995.
(2) Value for total DDT
(3) Region IV National Oceanic and Atmospheric Administration (NOAA) sediment screening value
+ = Essential Nutrients
NA - Not Applicable
NE - Not Established
J - Estimated value

TABLE 5-9

SURFACE SOIL ORGANIC DATA AND COPC SELECTION SUMMARY
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Contaminant Range/Frequency | | Region III Criteria | Comprison to Criteria |
|---|---|---|---|---|
| | Range of Positive Detections (µg/kg) | No. of Positive Detects/ No. of Samples | Residential RBC Value[1] (µg/kg) | Positive Detects Above Residential RBC Value |
| **Semivolatiles** | | | | |
| Di-n-butylphthalate | 280J - 460 | 3/15 | 780,000 | 0 |
| bis(2-Ethylhexyl)phthalate | 40J - 110J | 7/15 | 46,000 | 0 |
| **Pesticide/PCBs** | | | | |
| Heptachlor | 3J | 1/15 | 140 | 0 |
| Heptachlor epoxide | 37J | 1/15 | 70 | 0 |
| Dieldrin | 1.9J - 3.4J | 2/15 | 40 | 0 |
| 4,4'-DDE | 2.4J - 38J | 10/15 | 1,900 | 0 |
| Endrin | 11J | 1/15 | 2,300 | 0 |
| 4,4'-DDD | 1.6NJ - 47NJ | 4/15 | 2,700 | 0 |
| 4,4'-DDT | 1.5J - 16 | 13/15 | 1,900 | 0 |
| Alpha-Chlordane | 1.1NJ - 440 | 2/15 | 1,800[2] | 0 |
| Gamma-Chlordane | 1.1J - 470 | 3/15 | 1,800[2] | 0 |

Notes:

J - Estimated value
N - Tentative identification. Consider present.
(1) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(2) USEPA Region III RBC value for Chlordane used as a surrogate.

TABLE 5-10

SURFACE SOIL INORGANIC DATA AND COPC SELECTION SUMMARY
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Analyte | Range/Frequency | | Comparison to Criteria | | | |
|---|---|---|---|---|---|---|
| | Range of Positive Detections (mg/kg) | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background[1] Concentration (mg/kg) | No. of Times Exceeded Twice the Average Background Concentration | Residential COC Value[2] (mg/kg) | Positive Detects Above Residential COC Value |
| Aluminum | 3,070 - 8,310 | 15/15 | 5,856.083 | 7 | 7,800 | 1 |
| Arsenic | 0.44J - 1.7J | 15/15 | 1.322 | 1 | 0.43 | 15 |
| Barium | 8.9 - 43.1 | 15/15 | 17.292 | 3 | 550 | 0 |
| Calcium+ | 936 - 44,700 | 15/15 | 1,372.977 | 10 | -- | -- |
| Chromium | 4 - 8.3 | 15/15 | 6.607 | 5 | 39 | 0 |
| Cobalt | 0.61 - 0.82 | 7/15 | 2.046 | 0 | 470 | 0 |
| Copper | 1.1 - 5.1 | 15/15 | 7.104 | 0 | 310 | 0 |
| Iron+ | 1,600J - 3,900 | 15/15 | 3,702.427 | 1 | 2,300 | 11 |
| Lead | 9.7J - 58.4J | 15/15 | 23.37 | 4 | 400[3] | 0 |
| Magnesium+ | 97 - 734 | 15/15 | 202.96 | 10 | -- | -- |
| Manganese | 6.1 - 16.7 | 15/15 | 18.51 | 0 | 160 | 0 |
| Mercury | 0.08 - 0.12 | 3/15 | 0.094 | 2 | 2.3[4] | 0 |
| Nickel | 2.5 - 3.7 | 2/15 | 3.455 | 1 | 160 | 0 |
| Potassium+ | 177 - 300 | 7/15 | 200.06 | 3 | -- | -- |
| Selenium | 0.26J - 0.35J | 6/15 | 0.753 | 0 | 39 | 0 |
| Sodium+ | 9.8 - 138 | 15/15 | 59.013 | 2 | -- | -- |
| Vanadium | 6 - 13.3 | 15/15 | 11.447 | 4 | 55 | 0 |
| Zinc | 5.5 - 64 | 15/15 | 13.763 | 7 | 2,300 | 0 |

Notes:

Shaded areas indicate analyte selected as COPC for human health risk assessment.
+ = Essential Nutrient
-- = No criteria published
J - Estimated Value
(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.
(2) USEPA Region III Risk Based Concentration Table (April 15, 1998).
(3) Action Level for residential soils (USEPA, 1994b).
(4) Value for mercuric chloride used as a surrogate.

TABLE 5-11

SUBSURFACE SOIL ORGANIC DATA AND COPC SELECTION SUMMARY
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Contaminant Range/Frequency | | Region III Criteria | Comparison to Criteria |
|---|---|---|---|---|
| | Range of Positive Detections (µg/kg) | No. of Positive Detects/ No. of Samples | Residential RBC Value[1] (µg/kg) | Positive Detects Above Residential RBC Value |
| **Semivolatiles** | | | | |
| Di-n-butylphthalate | 64J - 200J | 3/17 | 780 | 0 |
| bis(2-Ethylhexyl)phthalate | 40J - 66J | 3/17 | 46,000 | 0 |
| **Pesticide/PCBs** | | | | |
| Dieldrin | 1.5J - 6.6J | 2/17 | 40 | 0 |
| 4,4'-DDE | 6.7J - 39J | 3/17 | 1,900 | 0 |
| 4,4'-DDD | 40 - 41 | 2/17 | 2,700 | 0 |
| 4,4'-DDT | 3.7 - 10J | 3/17 | 1,900 | 0 |
| Alpha-Chlordane | 1.9J - 2.7J | 2/17 | 1,800[2] | 0 |
| Gamma-Chlordane | 1.1J - 2 | 2/17 | 1,800[2] | 0 |

Notes:

J - Estimated value
(1) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(2) USEPA Region III RBC value for Chlordane used as a surrogate.

TABLE 5-12

SUBSURFACE SOIL INORGANIC DATA AND COPC SELECTION SUMMARY
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Analyte | Range/Frequency | | Comparison to Criteria | | | |
|---|---|---|---|---|---|---|
| | Range of Positive Detections (mg/kg) | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background[1] Concentration (mg/kg) | No. of Times Exceeded Twice the Average Background Concentration | Residential RBC Value[2] (mg/kg) | Positive Detects Above Residential RBC Value |
| Aluminum | 1,590 - 18,500 | 17/17 | 7,413.23 | 12 | 7,800 | 11 |
| Antimony | 4.5J | 1/17 | 6.498 | 0 | 3.1 | 1 |
| Arsenic | 0.22J - 44.6J | 14/17 | 1.971 | 1 | 0.43 | 11 |
| Barium | 2.6 - 41.4 | 17/17 | 14.37 | 8 | 550 | 0 |
| Beryllium | 0.17 | 1/17 | 0.191 | 0 | 16 | 0 |
| Calcium+ | 93.7 - 12,600 | 15/17 | 387.824 | 8 | -- | -- |
| Chromium | 2.4 - 19.7 | 17/17 | 12.537 | 2 | 39 | 0 |
| Cobalt | 0.51 - 1.2 | 9/17 | 1.611 | 0 | 470 | 0 |
| Copper | 0.37 - 1.5 | 13/17 | 2.41 | 0 | 310 | 0 |
| Iron+ | 449 - 7,450J | 17/17 | 7,134.639 | 2 | 2,300 | 12 |
| Lead | 2.4J - 17.1J | 17/17 | 8.264 | 3 | 400[3] | 0 |
| Magnesium+ | 47 - 1,300 | 17/17 | 263.398 | 11 | -- | -- |
| Manganese | 1.8 - 22.3 | 17/17 | 7.99 | 2 | 160 | 0 |
| Nickel | 2.5 - 16.7 | 4/17 | 3.725 | 1 | 160 | 0 |
| Potassium+ | 177 - 452 | 10/17 | 344.252 | 2 | -- | -- |
| Selenium | 0.26J - 0.55J | 5/17 | 0.806 | 0 | 39 | 0 |
| Sodium+ | 8J - 62.1J | 16/17 | 54.57 | 2 | -- | -- |
| Vanadium | 2.6 - 24.6 | 17/17 | 13.34 | 6 | 55 | 0 |
| Zinc | 2.3 - 39.2 | 13/17 | 6.668 | 3 | 2,300 | 0 |

Notes:

Shaded areas indicate analyte selected as COPC for human health risk assessment.
+ = Essential Nutrient
-- = No criteria published
J - Estimated Value
(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.
(2) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(3) Action Level for residential soils (USEPA, 1994b).

TABLE 5-13

GROUNDWATER DATA AND COPC SELECTION SUMMARY
INORGANICS
SITE 75, MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Groundwater Criteria | | | | | Frequency/Range | | Comparison to Criteria | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NCWQS[1] (µg/L) | MCL[2] (µg/L) | Region III Tapwater RBC Value[3] (µg/L) | Federal Health Advisories[4] (µg/L) | | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | No. of Detects Above NCWQS | No. of Detects Above MCL | No. of Detects Above RBC | No. of Detects Above Health Advisories | |
| | | | | 10 kg Child | 70 kg Adult | | | | | | 10 kg Child | 70 kg Adult |
| **Inorganics** | | | | | | | | | | | | |
| Aluminum | NE | 50/200[5] | 3,700 | NE | NE | 1/5 | 785 | NA | 1/1 | 0 | NA | NA |
| Barium | 2,000 | 2,000 | 260 | NE | NE | 4/5 | 19.8 - 45.9 | 0 | 0 | 0 | NA | NA |
| Calcium+ | NE | NE | NE | NE | NE | 5/5 | 4,450 - 33,600 | NA | NA | NA | NA | NA |
| Cobalt | NE | NE | 220 | NE | NE | 2/5 | 3.2 - 3.6 | NA | NA | 0 | NA | NA |
| Copper | 1,000 | 1,300[6] | 150 | NE | NE | 2/5 | 2.6 - 2.6 | 0 | 0 | 0 | NA | NA |
| Iron | 300 | 300[5] | 1,100 | NE | NE | 1/5 | 439 | 1 | 1 | 0 | NA | NA |
| Magnesium+ | NE | NE | NE | NE | NE | 5/5 | 339 - 2,720 | NA | NA | NA | NA | NA |
| Manganese | 50 | 50[5] | 73 | NE | NE | 4/5 | 3.2 - 68.3 | 1 | 1 | 0 | NA | NA |
| Potassium+ | NE | NE | NE | NE | NE | 1/5 | 1,070 | NA | NA | NA | NA | NA |
| Selenium | 50 | 50 | 18 | NE | NE | 1/5 | 2.1J | 0 | 0 | 0 | NA | NA |
| Sodium+ | NE | NE | NE | NE | NE | 5/5 | 1,810 - 24,300 | NA | NA | NA | NA | NA |
| Zinc | 2,100 | 5,000[5] | 1,100 | 3,000 | 10,000 | 4/5 | 3.8 - 76.7 | 0 | 0 | 0 | 0 | 0 |

Notes:

(1) NC WQS = North Carolina Water Quality Standards for Groundwater
(2) MCL = Safe Drinking Water Act Maximum Contaminant Level
(3) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(4) Longer Term Health Advisories for a 10 kg Child and 70 kg Adult
(5) SMCL = Secondary Maximum Contaminant Level
(6) Action Level for drinking water.
+ = Essential Nutrient
NE = No Criteria Established
NA = Not Applicable
J = Estimated Value

TABLE 5-14

SURFACE SOIL ORGANIC DATA AND COPC SELECTION SUMMARY
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Contaminant Range/Frequency | | Region III Criteria | Comprison to Criteria |
|---|---|---|---|---|
| | Range of Positive Detections (µg/kg) | No. of Positive Detects/ No. of Samples | Residential COC Value[1] (µg/kg) | Positive Detects Above Residential COC Value |
| **Semivolatiles** | | | | |
| Phenanthrene | 61J | 1/16 | 230,000[2] | 0 |
| Fluoranthene | 41J - 100J | 2/16 | 310,000 | 0 |
| Pyrene | 40J - 93J | 2/16 | 230,000 | 0 |
| Chrysene | 71J | 1/16 | 88,000 | 0 |
| bis(2-Ethylhexyl)phthalate | 46J - 490 | 9/16 | 46,000 | 0 |
| Benzo(b)fluoranthene | 46J - 86J | 2/16 | 880 | 0 |
| Benzo(a)pyrene | 50J | 1/16 | 88 | 0 |
| **Pesticide/PCBs** | | | | |
| Heptachlor | 1.2J | 1/16 | 140 | 0 |
| Heptachlor epoxide | 2.4NJ | 1/16 | 70 | 0 |
| Dieldrin | 1.6J | 1/16 | 40 | 0 |
| 4,4'-DDE | 3.7J - 510J | 14/16 | 1,900 | 0 |
| 4,4'-DDD | 1.8J - 8.8 | 3/16 | 2,700 | 0 |
| 4,4'-DDT | 1.9J - 120 | 16/16 | 1,900 | 0 |
| Alpha-Chlordane | 20J | 1/16 | 1,800[3] | 0 |
| Gamma-Chlordane | 9.9J | 1/16 | 1,800[3] | 0 |

Notes:

J - Estimated value
N - Tentative identification. Consider present.
(1) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(2) USEPA Region III RBC value for pyrene used as a surrogate.
(3) USEPA Region III RBC value for Chlordane used as a surrogate.

TABLE 5-15

SURFACE SOIL INORGANIC DATA AND COPC SELECTION SUMMARY
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Analyte | Range/Frequency | | Comparison to Criteria | | | |
|---|---|---|---|---|---|---|
| | Range of Positive Detections (mg/kg) | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background[1] Concentration (mg/kg) | No. of Times Exceeded Twice the Average Background Concentration | Residential RBC Value[2] (mg/kg) | Positive Detects Above Residential RBC Value |
| Aluminum | 1,580 - 7,350 | 16/16 | 5,856.083 | 5 | 7,800 | 0 |
| Arsenic | 0.44 - 1.1 | 16/16 | 1.322 | 0 | 0.43 | 16 |
| Barium | 6.7 - 31.2 | 16/16 | 17.292 | 3 | 550 | 0 |
| Beryllium | 0.3 - 0.32 | 2/16 | 0.205 | 2 | 16 | 2 |
| Calcium+ | 533 - 2,860 | 16/16 | 1,372.977 | 8 | -- | -- |
| Chromium | 2.4 - 8 | 16/16 | 6.607 | 4 | 39 | 0 |
| Cobalt | 0.67 - 0.7 | 2/16 | 2.046 | 0 | 470 | 0 |
| Copper | 1 - 6.7 | 16/16 | 7.104 | 0 | 310 | 0 |
| Iron+ | 1,190 - 4,680 | 16/16 | 3,702.427 | 5 | 2,300 | 10 |
| Lead | 9.6 - 46.6J | 16/16 | 23.37 | 4 | 400[3] | 0 |
| Magnesium+ | 95.5 - 413 | 16/16 | 202.96 | 2 | -- | -- |
| Manganese | 5.2 - 22.9 | 16/16 | 18.51 | 1 | 160 | 0 |
| Mercury | 0.06 - 0.18 | 3/16 | 0.094 | 1 | 2.3 | 0 |
| Nickel | 2.5 - 4 | 2/16 | 3.455 | 4 | 160 | 0 |
| Potassium+ | 165 - 302 | 4/16 | 200.06 | 2 | -- | -- |
| Selenium | 0.28 - 0.37J | 3/16 | 0.753 | 0 | 39 | 0 |
| Sodium+ | 6.5 - 47.4J | 9/16 | 59.013 | 0 | -- | -- |
| Vanadium | 7.3 - 24.6 | 16/16 | 11.447 | 7 | 55 | 0 |
| Zinc | 5.5 - 30.7 | 16/16 | 13.763 | 9 | 2,300 | 0 |

Notes:

Shaded areas indicate analyte selected as COPC for human health risk assessment.

+ = Essential Nutrient

-- = No criteria published

J = Estimated Value

(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.

(2) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).

(3) Action Level for residential soils (USEPA, 1994b)

TABLE 5-16

SUBSURFACE SOIL ORGANIC DATA AND COPC SELECTION SUMMARY
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Contaminant Range/Frequency | | Region III Criteria | Comprison to Criteria |
|---|---|---|---|---|
| | Range of Positive Detections (µg/kg) | No. of Positive Detects/ No. of Samples | Residential RBC Value[1] (µg/kg) | Positive Detects Above Residential RBC Value |
| **Volatiles** | | | | |
| Acetone | 24 | 1/16 | 780,000 | 0 |
| **Semivolatiles** | | | | |
| Di-n-butylphthalate | 680 | 1/16 | 780,000 | 0 |
| bis(2-Ethylhexyl)phthalate | 49J | 1/16 | 46,000 | 0 |
| **Pesticide/PCBs** | | | | |
| 4,4'-DDE | 3.4J - 40J | 2/16 | 1,900 | 0 |
| 4,4'-DDD | 480 | 1/16 | 2,700 | 0 |
| 4,4'-DDT | 1.7J - 5.9J | 2/16 | 1,900 | 0 |

Notes:

J - Estimated value
[1] USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).

TABLE 5-17

SUBSURFACE SOIL INORGANIC DATA AND COPC SELECTION SUMMARY
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Analyte | Range/Frequency | | Comparison to Criteria | | | |
|---|---|---|---|---|---|---|
| | Range of Positive Detections (mg/kg) | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background[1] Concentration (mg/kg) | No. of Times Exceeded Twice the Average Background Concentration | Residential RBC Value[2] (mg/kg) | Positive Detects Above Residential RBC Value |
| Aluminum | 3,950 - 17,800 | 16/16 | 7,413.23 | 11 | 7,800 | 11 |
| Arsenic | 0.18 - 13.7J | 16/16 | 1.971 | 1 | 0.43 | 13 |
| Barium | 5.5 - 38.9 | 16/16 | 14.37 | 4 | 550 | 0 |
| Beryllium | 0.17 - 0.36 | 4/16 | 0.191 | 3 | 16 | 0 |
| Calcium+ | 63.2 - 2,410 | 14/16 | 387.824 | 3 | -- | -- |
| Chromium | 4.3 - 26.8 | 16/16 | 12.537 | 2 | 39 | 0 |
| Cobalt | 0.62 - 0.74 | 3/16 | 1.611 | 0 | 470 | 0 |
| Copper | 0.41 - 3 | 10/16 | 2.41 | 1 | 310 | 0 |
| Iron+ | 1,430 - 12,700 | 16/16 | 7,134.639 | 2 | 2,300 | 15 |
| Lead | 3.5 - 12.5 | 16/16 | 8.264 | 5 | 400[3] | 0 |
| Magnesium+ | 107 - 738 | 16/16 | 263.398 | 9 | -- | -- |
| Manganese | 3.7 - 12.2 | 15/16 | 7.99 | 2 | 160 | 0 |
| Mercury | 0.07 | 1/16 | 0.129 | 0 | 2.3[4] | 0 |
| Nickel | 2.1 - 2.5 | 2/16 | 3.725 | 0 | 160 | 0 |
| Potassium+ | 184 - 956 | 11/16 | 344.252 | 2 | -- | -- |
| Selenium | 0.29J - 0.83 | 3/16 | 0.806 | 1 | 39 | 0 |
| Sodium+ | 5.6 - 143 | 12/16 | 54.57 | 2 | -- | -- |
| Vanadium | 8.1 - 34 | 16/16 | 13.34 | 8 | 55 | 0 |
| Zinc | 1.7 - 6.7 | 15/16 | 6.668 | 1 | 2,300 | 0 |

Notes:

Shaded areas indicate analyte selected as COPC for human health risk assessment.
+ = Essential Nutrient
-- = No criteria published
J - Estimated Value
(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.
(2) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(3) Action Level for residential soils (USEPA, 1994b).
(4) Value for mercuric chloride used as a surrogate.

TABLE 5-18

GROUNDWATER DATA AND COPC SELECTION SUMMARY
ORGANICS AND INORGANICS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Groundwater Criteria | | | | | Frequency/Range | | Comparison to Criteria | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NCWQS[1] (µg/L) | MCL[2] (µg/L) | Region III Tapwater RBC Value[3] (µg/L) | Federal Health Advisories[4] (µg/L) | | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | No. of Detects Above NCWQS | No. of Detects Above MCL | No. of Detects Above RBC | No. of Detects Above Health Advisories | |
| | | | | 10 kg Child | 70 kg Adult | | | | | | 10 kg Child | 70 kg Adult |
| **Semivolatiles** | | | | | | | | | | | | |
| Di-n-butylphthalate | 700 | NE | 370 | NE | NE | 1/5 | 3J | 0 | NA | 0 | NA | NA |
| **Inorganics** | | | | | | | | | | | | |
| Aluminum | NE | 50/200[5] | 3,700 | NE | NE | 5/10 | 322 - 3,190 | NA | 5/5 | 0 | NA | NA |
| Arsenic | 50 | 50 | 0.045 | NE | NE | 3/10 | 3.6J - 151 | 0 | 0 | 3 | NA | NA |
| Barium | 2,000 | 2,000 | 260 | NE | NE | 8/10 | 5.1J - 168J | 0 | 0 | 0 | NA | NA |
| Calcium+ | NE | NE | NE | NE | NE | 10/10 | 8,420 - 101,000 | NA | NA | NA | NA | NA |
| Chromium | 50 | 100 | 18 | 200 | 800 | 1/10 | 5.4J | 0 | 0 | 0 | 0 | 0 |
| Cobalt | NE | NE | 220 | NE | NE | 1/10 | 6.4J | NA | NA | 0 | NA | NA |
| Copper | 1,000 | 1,300[6] | 150 | NE | NE | 4/10 | 1.4J - 3.5J | 0 | 0 | 0 | NA | NA |
| Iron | 300 | 300[5] | 1,100 | NE | NE | 8/10 | 48.8J - 33,100 | 7 | 7 | 5 | NA | NA |
| Lead | 15 | 15[6] | NE | NE | NE | 5/10 | 1.2 - 4.5 | 0 | 0 | NA | NA | NA |
| Magnesium+ | NE | NE | NE | NE | NE | 10/10 | 1,460 - 5,440 | NA | NA | NA | NA | NA |
| Manganese | 50 | 50[5] | 73 | NE | NE | 8/10 | 2J - 40.3 | 0 | 0 | 0 | NA | NA |
| Mercury | 1.1 | 2 | 1.1[7] | NE | 2 | 2/10 | 0.032J - 0.035J | 0 | 0 | 0 | NA | 0 |
| Potassium+ | NE | NE | NE | NE | NE | 5/10 | 824J - 2,980J | NA | NA | NA | NA | NA |
| Selenium | 50 | 50 | 18 | NE | NE | 2/10 | 1.6 - 4.6J | 0 | 0 | 0 | NA | NA |
| Sodium+ | NE | NE | NE | NE | NE | 10/10 | 6,600 - 39,400 | NA | NA | NA | NA | NA |
| Thallium | NE | 2 | 0.26 | 7 | 20 | 2/10 | 3.5J - 12.8 | NA | 2 | 2 | 1 | 0 |
| Vanadium | NE | NE | 26 | NE | NE | 5/10 | 13.6J - 105 | NA | NA | 1 | NA | NA |

TABLE 5-18 (Continued)

GROUNDWATER DATA AND COPC SELECTION SUMMARY
ORGANICS AND INORGANICS
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Groundwater Criteria | | | | | Frequency/Range | | Comparison to Criteria | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NCWQS[1] (µg/L) | MCL[2] (µg/L) | Region III Tapwater RBC Value[3] (µg/L) | Federal Health Advisories[4] (µg/L) | | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | No. of Detects Above NCWQS | No. of Detects Above MCL | No. of Detects Above RBC | No. of Detects Above Health Advisories | |
| | | | | 10 kg Child | 70 kg Adult | | | | | | 10 kg Child | 70 kg Adult |
| Zinc | 2,100 | 5,000[5] | 1,100 | 3,000 | 10,000 | 5/10 | 4.1 - 40.6 | 0 | 0 | 0 | 0 | 0 |

Notes:

Shaded areas indicate parameter selected as COPC for human health risk assessment.
(1) NC WQS = North Carolina Water Quality Standards for Groundwater
(2) MCL = Safe Drinking Water Act Maximum Contaminant Level
(3) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(4) Longer Term Health Advisories for a 10 kg Child and 70 kg Adult
(5) SMCL = Secondary Maximum Contaminant Level
(6) Action Level for drinking water.
(7) Value for mercuric chloride used as a surrogate.
+ = Essential Nutrient
NE = No Criteria Established

NA = Not Applicable
NJ = Estimated Value

TABLE 5-19

SURFACE SOIL ORGANIC DATA AND COPC SELECTION SUMMARY
SITE 84, BUILDING 45 AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Contaminant Range/Frequency | | Region III Criteria | Comprison to Criteria |
|---|---|---|---|---|
| | Range of Positive Detections (µg/kg) | No. of Positive Detects/ No. of Samples | Residential RBC Value[1] (µg/kg) | Positive Detects Above Residential RBC Value |
| **PCBs** | | | | |
| Aroclor-1260 | 62J - 200,000 | 37/48 | 320 | 32 |

Notes:

Shading indicates contaminant selected as COPC for human health risk assessment.
[1] USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).

TABLE 5-20

GROUNDWATER DATA AND COPC SELECTION SUMMARY
ORGANICS
SITE 84, BUILDING 45 AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Groundwater Criteria | | | | | Frequency/Range | | Comparison to Criteria | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NCWQS[1] (µg/L) | MCL[2] (µg/L) | Region III Tapwater RBC Value[3] (µg/L) | Federal Health Advisories[4] (µg/L) | | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | No. of Detects Above NCWQS | No. of Detects Above MCL | No. of Detects Above RBC | No. of Detects Above Health Advisories | |
| | | | | 10 kg Child | 70 kg Adult | | | | | | 10 kg Child | 70 kg Adult |
| **Volatiles** | | | | | | | | | | | | |
| Chloroform | 0.19 | 80 | 0.15 | 100 | 400 | 2/6 | 16 - 16 | 2 | 0 | 2 | 0 | 0 |
| Benzene | 1.0 | 5 | 0.36 | NE | NE | 2/6 | 1.5J - 3.4J | 2 | 0 | 2 | NA | NA |
| Ethylbenzene | 29 | 700 | 130 | 1,000 | 3,000 | 2/6 | 3.6J - 6.7J | 0 | 0 | 0 | 0 | 0 |

Notes:

Shaded areas indicate parameter selected as COPC for human health risk assessment.
(1) NC WQS = North Carolina Water Quality Standards for Groundwater
(2) MCL = Safe Drinking Water Act Maximum Contaminant Level
(3) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(4) Longer Term Health Advisories for a 10 kg Child and 70 kg Adult
NE = No Criteria Established
NA = Not Applicable
J = Estimated Value

TABLE 5-21

SEDIMENT DATA AND COPC SELECTION SUMMARY
ORGANICS
SITE 84, BUILDING 45 AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Sediment Screening Values[1] | | Range/Frequency | | Comparison to Criteria Positive Detects Above | |
|---|---|---|---|---|---|---|
| | ER-L Concentration | ER-M Concentration | Range of Positive Detections | No. of Positive Detects/ No. of Samples | ER-L | ER-M |
| **PCBs (µg/kg)** | | | | | | |
| Aroclor-1248 | 50[2] | 400[2] | 2,800 | 1/10 | 1 | 1 |
| Aroclor-1260 | 50[2] | 400[2] | 3,700 - 40,000 | 7/10 | 7 | 7 |

Notes:

Shaded areas indicate parameter selected as COPC for human health risk assessment.
[1] Long et al., 1995.
[2] Value for total PCBs.
ER-L = Effects Range-Low
ER-M = Effects Range-Medium
+ = Essential Nutrients

TABLE 5-22

SURFACE SOIL INORGANIC DATA AND COPC SELECTION SUMMARY
SITE 85, CAMP JOHNSON BATTERY DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | Range/Frequency | | Comparison to Criteria | | | | | |
|---|---|---|---|---|---|---|---|---|
| Analyte | Range of Positive Detections (mg/kg) | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background[1] Concentration (mg/kg) | No. of Times Exceeded Twice the Average Background Concentration | USEPA Region III RBC Value[2] (mg/kg) | Positive Detects Above Residential RBC Value | Method I, S-3:G-1 Screening Level[3] | Positive Detects Above S-3:G-1 Screening Level |
| Aluminum | 1,140 - 3,190 | 5/5 | 5,856.083 | 0 | 7,800 | 0 | -- | -- |
| Arsenic | 0.55 - 76.8 | 5/5 | 1.322 | 2 | 0.43 | 5 | 26.2 | 1 |
| Barium | 6.9 - 134 | 5/5 | 17.292 | 2 | 550 | 0 | 848 | 0 |
| Cadmium | 2.1 - 47.1 | 2/5 | 0.696 | 2 | 7.8 | 1 | 2.7 | 1 |
| Calcium+ | 91 - 823 | 5/5 | 1,372.977 | 0 | -- | -- | -- | -- |
| Chromium | 2.3 - 147 | 5/5 | 6.607 | 1 | 39 | 1 | 27.2 | 1 |
| Cobalt | 17.3 | 1/5 | 2.046 | 1 | 470 | 0 | -- | 0 |
| Copper | 0.88 - 1,870 | 5/5 | 7.104 | 3 | 310 | 1 | 704 | 1 |
| Cyanide | 0.9 - 2.1 | 2/5 | 2.905 | 0 | 160 | 0 | 31.1 | 0 |
| Iron+ | 1,480 - 339,000 | 5/5 | 3,702.427 | 2 | 2,300 | 2 | 151 | 5 |
| Lead | 4.9 - 3,030 | 5/5 | 23.37 | 2 | 400[4] | 1 | 270 | 1 |
| Magnesium+ | 62.2 - 118 | 5/5 | 202.96 | 0 | -- | -- | -- | -- |
| Manganese | 3.8 - 19,700 | 5/5 | 18.51 | 4 | 160 | 3 | 65 | 3 |
| Mercury | 0.35 - 70.7 | 3/5 | 0.094 | 3 | 2.3[5] | 1 | 0.0154 | 3 |
| Nickel | 3.5 - 117 | 2/5 | 3.455 | 2 | 160 | 0 | 56.4 | 1 |
| Potassium+ | 158 - 456 | 5/5 | 200.06 | 3 | -- | -- | -- | -- |
| Sodium+ | 9.7 - 69 | 5/5 | 59.013 | 1 | -- | -- | -- | -- |
| Vanadium | 4.1 - 13.9 | 5/5 | 11.447 | 1 | 55 | 0 | 520 | 0 |
| Zinc | 5.2 - 63,900 | 5/5 | 13.763 | 4 | 2,300 | 1 | 1,100 | 2 |

Notes: Shaded areas indicate analyte selected as COPC for human health risk assessment.
+ = Essential Nutrient
-- = No criteria published
(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.
(2) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(3) NC Risk Analysis Framework (RAF), NC DENR, December 1996. Use of NC RAF screening levels for Site 85 based on discussions with regulatory agencies.
(4) Action Level for residential soils (USEPA, 1994b).
(5) Mercuric chloride used as a surrogate.

TABLE 5-23

SUBSURFACE SOIL INORGANIC DATA AND COPC SELECTION SUMMARY
SITE 85, CAMP JOHNSON BATTERY DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | Range/Frequency | | Comparison to Criteria | | | | | |
|---|---|---|---|---|---|---|---|---|
| Analyte | Range of Positive Detections (mg/kg) | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background[1] Concentration (mg/kg) | No. of Times Exceeded Twice the Average Background Concentration | USEPA Region III RBC Value[2] (mg/kg) | Positive Detects Above Residential COC Value | Method I, S-3:G-1 Screening Level[3] | Positive Detects Above S-3:G-1 Screening Level |
| Aluminum | 348 - 10,200 | 10/10 | 7,413.23 | 1 | 7,800 | 1 | -- | -- |
| Arsenic | 0.32 - 3 | 9/10 | 1.971 | 1 | 0.43 | 6 | 26.2 | 0 |
| Barium | 0.78 - 13.3 | 10/10 | 14.37 | 0 | 550 | 0 | 848 | 0 |
| Cadmium | 0.66 | 1/10 | 0.718 | 0 | 3.9 | 0 | 2.7 | 0 |
| Calcium+ | 7.8 - 127 | 10/10 | 387.824 | 0 | -- | -- | -- | -- |
| Chromium | 0.96 - 11.3 | 10/10 | 12.537 | 0 | 39 | 0 | 27.2 | 0 |
| Copper | 0.35 - 8.8 | 9/10 | 2.41 | 1 | 310 | 0 | 704 | 0 |
| Iron+ | 385 - 9,840 | 10/10 | 7,134.639 | 1 | 2,300 | 5 | 151 | 10 |
| Lead | 1.2 - 40.6 | 10/10 | 8.264 | 1 | 400[4] | 0 | 270 | 0 |
| Magnesium+ | 10.6 - 232 | 10/10 | 263.398 | 0 | -- | -- | -- | -- |
| Manganese | 0.26 - 47.5 | 10/10 | 7.99 | 1 | 160 | 0 | 55 | 0 |
| Mercury | 0.15 - 0.61 | 2/10 | 0.129 | 2 | 2.3[5] | 0 | 0.0154 | 2 |
| Nickel | 2.6 - 4.4 | 3/10 | 3.725 | 1 | 160 | 0 | 56.4 | 0 |
| Potassium+ | 105 - 242 | 7/10 | 344.252 | 0 | -- | -- | -- | -- |
| Sodium+ | 4.7 - 17 | 10/10 | 54.57 | 0 | -- | -- | -- | -- |
| Vanadium | 1.2 - 20 | 10/10 | 13.34 | 1 | 55 | 0 | 520 | 0 |
| Zinc | 1.1 - 187 | 10/10 | 6.668 | 3 | 2,300 | 0 | 1,100 | 0 |

Notes: Shaded areas indicate analyte selected as COPC for human health risk assessment.
+ = Essential Nutrient
-- = No criteria published
(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.
(2) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(3) NC Risk Analysis Framework (RAF), NC DENR, December 1996. Use of NC RAF screening levels for Site 85 based on discussions with regulatory agencies.
(4) Action Level for residential soils (USEPA, 1994b).
(5) Mercuric chloride used as a surrogate.

TABLE 5-24

GROUNDWATER DATA AND COPC SELECTION SUMMARY
INORGANICS
SITE 85, CAMP JOHNSON BATTERY DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Groundwater Criteria | | | | | Frequency/Range | | Comparison to Criteria | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NCWQS[1] (µg/L) | MCL[2] (µg/L) | Region III Tapwater RBCValue[3] (µg/L) | Federal Health Advisories[4] (µg/L) | | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | No. of Detects Above NCWQS | No. of Detects Above MCL | No. of Detects Above RBC | No. of Detects Above Health Advisories | |
| | | | | 10 kg Child | 70 kg Adult | | | | | | 10 kg Child | 70 kg Adult |
| **Inorganics** | | | | | | | | | | | | |
| Aluminum | NE | 50/200[5] | 3,700 | NE | NE | 3/3 | 159,000-429,000 | NA | 3/3 | 3 | NA | NA |
| Arsenic | 50 | 50 | 0.045 | NE | NE | 3/3 | 10.9 - 20.2 | 0 | 0 | 3 | NA | NA |
| Barium | 2,000 | 2,000 | 260 | NE | NE | 3/3 | 242 -548 | 0 | 0 | 2 | NA | NA |
| Beryllium | NE | 4 | 7.3 | 4,000 | 20,000 | 2/3 | 2.8 - 3.3 | NA | 0 | 0 | 0 | 0 |
| Cadmium | 5 | 5 | 1.8 | 5 | 20 | 3/3 | 4.9 - 24.6 | 2 | 2 | 3 | 2 | 1 |
| Calcium+ | NE | NE | NE | NE | NE | 3/3 | 2,070 - 6,180 | NA | NA | NA | NA | NA |
| Chromium | 50 | 100 | 18 | 200 | 800 | 3/3 | 383 - 821 | 3 | 3 | 3 | 3 | 1 |
| Cobalt | NE | NE | 220 | NE | NE | 3/3 | 7.1 - 20.3 | NA | NA | 0 | NA | NA |
| Copper | 1,000 | 1,300[6] | 150 | NE | NE | 3/3 | 55.4 - 173 | 0 | 0 | 1 | NA | NA |
| Iron | 300 | 300[5] | 1,100 | NE | NE | 3/3 | 119,00-498,000 | 3 | 3 | 3 | NA | NA |
| Lead | 15 | 15[6] | NE | NE | NE | 3/3 | 207 - 512 | 3 | 3 | NA | NA | NA |
| Magnesium+ | NE | NE | NE | NE | NE | 3/3 | 5,530 - 13,700 | NA | NA | NA | NA | NA |
| Manganese | 50 | 50[5] | 73 | NE | NE | 3/3 | 228 - 1,270 | 3 | 3 | 3 | NA | NA |
| Mercury | 1.1 | 2 | 1.1[7] | NE | 2 | 3/3 | 0.28 - 2.4 | 1 | 1 | 1 | NA | 1 |
| Nickel | 100 | 100 | 73 | 500 | 1,700 | 3/3 | 53.3 - 4,550 | 2 | 2 | 2 | 1 | 1 |
| Potassium+ | NE | NE | NE | NE | NE | 3/3 | 5,480 - 16,000 | NA | NA | NA | NA | NA |
| Sodium+ | NE | NE | NE | NE | NE | 3/3 | 1,850 - 5,580 | NA | NA | NA | NA | NA |

TABLE 5-24 (Continued)

GROUNDWATER DATA AND COPC SELECTION SUMMARY
INORGANICS
SITE 85, CAMP JOHNSON BATTERY DUMP
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Groundwater Criteria | | | | | Frequency/Range | | Comparison to Criteria | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NCWQS[1] (µg/L) | MCL[2] (µg/L) | Region III Tapwater RBC Value[3] (µg/L) | Federal Health Advisories[4] (µg/L) | | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | No. of Detects Above NCWQS | No. of Detects Above MCL | No. of Detects Above RBC | No. of Detects Above Health Advisories | |
| | | | | 10 kg Child | 70 kg Adult | | | | | | 10 kg Child | 70 kg Adult |
| Vanadium | NE | NE | 26 | NE | NE | 3/3 | 322 - 908 | NE | NE | 3 | NE | NE |
| Zinc | 2,100 | 5,000[5] | 1,100 | 3,000 | 10,000 | 3/3 | 93.1 - 3,970 | 1 | 1 | 1 | 1 | 0 |

Notes:

Shaded areas indicate parameter selected as COPC for human health risk assessment.
(1) NC WQS = North Carolina Water Quality Standards for Groundwater
(2) MCL = Safe Drinking Water Act Maximum Contaminant Level
(3) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(4) Longer Term Health Advisories for a 10 kg Child and 70 kg Adult
(5) SMCL = Secondary Maximum Contaminant Level
(6) Action Level for drinking water.
(7) Value for mercuric chloride used as a surrogate.
+ - Essential Nutrient
NE - No Criteria Established
NA - Not Applicable

TABLE 5-25

SURFACE SOIL ORGANIC DATA AND COPC SELECTION SUMMARY
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Contaminant Range/Frequency | | Region III Criteria | Comprison to Criteria |
|---|---|---|---|---|
| | Range of Positive Detections (µg/kg) | No. of Positive Detects/ No. of Samples | Residential RBC Value[1] (µg/kg) | Positive Detects Above Residential RBC Value |
| **Semivolatiles** | | | | |
| Acenaphthene | 37J | 1/6 | 470,000 | 0 |
| Fluorene | 26J - 42J | 3/6 | 310,000 | 0 |
| Phenanthrene | 240J - 500 | 3/6 | 230,000[2] | 0 |
| Anthracene | 52J - 110J | 3/6 | 2,300,000 | 0 |
| Carbazole[4] | 21J - 42J | 3/6 | 32,000 | 0 |
| Di-n-butylphthalate | 370J | 1/6 | 780,000 | 0 |
| Fluoranthene | 400 - 840 | 3/6 | 310,000 | 0 |
| Pyrene | 330J - 660 | 3/6 | 230,000 | 0 |
| Butylbenzylphthalate | 46J - 290J | 3/6 | 1,600,000 | 0 |
| Benzo(a)anthracene[4] | 230J - 380J | 3/6 | 880 | 0 |
| Chrysene[4] | 290J - 400J | 3/6 | 88,000 | 0 |
| bis(2-Ethylhexyl)phthalate | 17J - 380 | 5/6 | 46,000 | 0 |
| Benzo(b)fluoranthene[4] | 320J - 380J | 3/6 | 880 | 0 |
| Benzo(k)fluoranthene[4] | 300J - 380J | 3/6 | 8,800 | 0 |
| Benzo(a)pyrene | 310J - 380 | 3/6 | 88 | 3 |
| Indeno(1,2,3-cd)pyrene[4] | 170J - 270J | 3/6 | 880 | 0 |
| Dibenzo(a,h)anthracene | 46J - 100J | 3/6 | 88 | 1 |
| Benzo(g,h,i)perylene | 170J - 320J | 3/6 | 230,000[2] | 0 |
| **Pesticide/PCBs** | | | | |
| 4,4'-DDE | 16 - 97 | 6/6 | 1,900 | 0 |
| 4,4'-DDD | 16J - 470 | 5/6 | 2,700 | 0 |
| 4,4'-DDT | 15 - 310 | 6/6 | 1,900 | 0 |
| Alpha-Chlordane | 12J - 21J | 2/6 | 1,800[3] | 0 |
| Gamma-Chlordane | 10J - 26 | 2/6 | 1,800[3] | 0 |

Notes:

Shaded area indicates contaminant selected as COPC for human health risk assessment.
J - Estimated value.
(1) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(2) USEPA Region III RBC value for pyrene used as a surrogate.
(3) USEPA Region III RBC value for Chlordane used as a surrogate.
(4) Compound retained as a COPC for human health risk assessment since it is a carcinogenic PAH (i.e., possible synergistic effects).

TABLE 5-26

SURFACE SOIL INORGANIC DATA AND COPC SELECTION SUMMARY
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | Range/Frequency | | Comparison to Criteria | | | |
|---|---|---|---|---|---|---|
| Analyte | Range of Positive Detections (mg/kg) | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background[1] Concentration (mg/kg) | No. of Times Exceeded Twice the Average Background Concentration | Residential RBC Value[2] (mg/kg) | Positive Detects Above Residential RBC Value |
| Aluminum | 2,290 - 4,250 | 6/6 | 5,856.083 | 0 | 7,800 | 0 |
| Arsenic | 0.94J - 4.6J | 6/6 | 1.322 | 4 | 0.43 | 6 |
| Barium | 12J - 18J | 6/6 | 17.292 | 1 | 550 | 0 |
| Beryllium | 0.49 - 0.87 | 5/6 | 0.205 | 5 | 16 | 0 |
| Cadmium | 0.99 - 1.5 | 2/6 | 0.696 | 2 | 3.9 | 0 |
| Calcium+ | 119J - 18,100J | 6/6 | 1,372.977 | 3 | -- | -- |
| Chromium | 4.2J - 25.2J | 6/6 | 6.607 | 5 | 39 | 0 |
| Cobalt | 0.69 - 1.5 | 6/6 | 2.046 | 0 | 470 | 0 |
| Copper | 2.3 - 16.2 | 6/6 | 7.104 | 2 | 310 | 0 |
| Iron+ | 3,050 - 6,530 | 6/6 | 3,702.427 | 4 | 2,300 | 6 |
| Lead | 9.3J - 143J | 6/6 | 23.37 | 4 | 400[3] | 0 |
| Magnesium+ | 144 - 551 | 6/6 | 202.96 | 5 | -- | -- |
| Manganese | 7.7 - 25.8 | 6/6 | 18.51 | 3 | 160 | 0 |
| Mercury | 0.1 | 1/6 | 0.094 | 1 | 2.3[4] | 0 |
| Nickel | 8J - 19.7J | 2/6 | 3.455 | 2 | 160 | 0 |
| Potassium+ | 202 - 611 | 6/6 | 200.06 | 6 | -- | -- |
| Selenium | 0.36 | 1/6 | 0.753 | 0 | 39 | 0 |
| Sodium+ | 63.3 -138 | 6/6 | 59.013 | 6 | -- | -- |
| Thallium | 1.8J | 1/6 | 0.924 | 1 | -- | -- |

TABLE 5-26 (Continued)

SURFACE SOIL INORGANIC DATA AND COPC SELECTION SUMMARY
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | Range/Frequency | | Comparison to Criteria | | | |
|---|---|---|---|---|---|---|
| Analyte | Range of Positive Detections (mg/kg) | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background[1] Concentration (mg/kg) | No. of Times Exceeded Twice the Average Background Concentratio n | Residential RBC Value[2] (mg/kg) | Positive Detects Above Residential RBC Value |
| Vanadium | 10.6 - 19.3 | 6/6 | 11.447 | 5 | 55 | 0 |
| Zinc | 9J - 65.7J | 5/6 | 13.763 | 4 | 2,300 | 0 |

Notes:

Shaded areas indicate analyte selected as COPC for human health risk assessment.
+ = Essential Nutrient
-- = No criteria published
J - Estimated Value
(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.
(2) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(3) Action Level for residential soils (USEPA, 1994b).
(4) Mercuric chloride used as a surrogate.

TABLE 5-27

SUBSURFACE SOIL* ORGANIC DATA AND COPC SELECTION SUMMARY
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Contaminant Range/Frequency | | Region III Criteria | Comprison to Criteria |
|---|---|---|---|---|
| | Range of Positive Detections (µg/kg) | No. of Positive Detects/ No. of Samples | Residential COC Value[1] (µg/kg) | Positive Detects Above Residential COC Value |
| **Pesticide/PCBs** | | | | |
| 4,4'-DDE | 2.3J - 4.7J | 2/4 | 1,900 | 0 |
| 4,4'-DDD | 5.1J | 1/4 | 2,700 | 0 |
| 4,4'-DDT | 1.5NJ - 28NJ | 4/4 | 1,900 | 0 |

Notes:

J - Estimated value.
N - Tentative identification. Consider present.
* - Test pits
[1] USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).

TABLE 5-28

SUBSURFACE SOIL* INORGANIC DATA AND COPC SELECTION SUMMARY
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | Range/Frequency | | Comparison to Criteria | | | |
|---|---|---|---|---|---|---|
| Analyte | Range of Positive Detections (mg/kg) | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background[1] Concentration (mg/kg) | No. of Times Exceeded Twice the Average Background Concentration | Residential COC Value[2] (mg/kg) | Positive Detects Above Residential COC Value |
| Aluminum | 1,450 - 2,100 | 4/4 | 7,413.23 | 0 | 7,800 | 0 |
| Antimony | 3.3J | 1/4 | 6.498 | 0 | 3.1 | 1 |
| Arsenic | 0.47 - 1 | 4/4 | 1.971 | 0 | 0.43 | 4 |
| Barium | 24.6 - 30.4 | 4/4 | 14.37 | 4 | 550 | 0 |
| Beryllium | 0.14 | 1/4 | 0.191 | 0 | 16 | 0 |
| Calcium+ | 53.9 - 72.8 | 3/4 | 387.824 | 0 | -- | -- |
| Chromium | 3.7 | 1/4 | 12.537 | 0 | 39 | 0 |
| Cobalt | 0.59 - 0.63 | 2/4 | 1.611 | 0 | 470 | 0 |
| Copper | 0.39 - 0.58 | 2/4 | 241 | 0 | 310 | 0 |
| Iron+ | 1,400J - 3,130J | 4/4 | 7,134.639 | 0 | 2,300 | 2 |
| Lead | 1.2J - 3.2J | 4/4 | 8.264 | 0 | 400[3] | 0 |
| Magnesium+ | 61.7 - 94.5 | 4/4 | 263.398 | 0 | -- | -- |
| Manganese | 3.8 - 5.9 | 4/4 | 7.99 | 0 | 160 | 0 |
| Vanadium | 3 - 5.4 | 4/4 | 13.34 | 0 | 55 | 0 |
| Zinc | 1.9 - 2.9 | 4/4 | 6.668 | 0 | 2,300 | 0 |

Notes:

Shaded areas indicate analyte selected as COPC for human health risk assessment.
* = Test Pits
+ = Essential Nutrient
-- = No criteria published
J = Estimated Value
(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.
(2) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(3) Action Level for residential soils (USEPA, 1994b).

TABLE 5-29

GROUNDWATER DATA AND COPC SELECTION SUMMARY
ORGANICS AND INORGANICS
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Groundwater Criteria | | | | | Frequency/Range | | Comparison to Criteria | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NCWQS[1] (µg/L) | MCL[2] (µg/L) | Region III Tapwater COC Value[3] (µg/L) | Federal Health Advisories[4] (µg/L) | | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | No. of Detects Above NCWQS | No. of Detects Above MCL | No. of Detects Above COC | No. of Detects Above Health Advisories | |
| | | | | 10 kg Child | 70 kg Adult | | | | | | 10 kg Child | 70 kg Adult |
| **Semivolatiles** | | | | | | | | | | | | |
| 4-Nitrophenol | NE | NE | 230 | NE | NE | 1/2 | 1J | NA | NA | 0 | NA | NA |
| Pentachlorophenol | 0.3 | 1 | 0.56 | 300 | 1,000 | 1/2 | 0.8J | 1 | 0 | 1 | 0 | 0 |
| **Inorganics** | | | | | | | | | | | | |
| Aluminum | NE | 50/200[5] | 3,700 | NE | NE | 2/2 | 947 - 3,770 | NA | 3/3 | 1 | NA | NA |
| Barium | 2,000 | 2,000 | 260 | NE | NE | 1/2 | 35.1 | 0 | 0 | 0 | NA | NA |
| Calcium+ | NE | NE | NE | NE | NE | 2/2 | 8,400J - 82,300J | NA | NA | NA | NA | NA |
| Cobalt | NE | NE | 220 | NE | NE | 1/2 | 3.8J | NA | NA | 0 | NA | NA |
| Copper | 1,000 | 1,300[6] | 150 | NE | NE | 1/2 | 18.4 | 0 | 0 | 0 | NA | NA |
| Iron | 300 | 300[5] | 1,100 | NE | NE | 2/2 | 115 - 3,130 | 1 | 1 | 1 | NA | NA |
| Lead | 15 | 15[6] | NE | NE | NE | 1/2 | 1.1J | 0 | 0 | NA | NA | NA |
| Magnesium+ | NE | NE | NE | NE | NE | 2/2 | 3,180 - 5,280 | NA | NA | NA | NA | NA |
| Manganese | 50 | 50[5] | 73 | NE | NE | 2/2 | 37.3 - 224 | 1 | 1 | 1 | NA | NA |
| Potassium+ | NE | NE | NE | NE | NE | 2/2 | 1,250 - 2,020 | NA | NA | NA | NA | NA |
| Selenium | 50 | 50 | 18 | NE | NE | 1/2 | 1.6J | 0 | 0 | 0 | NA | NA |
| Sodium+ | NE | NE | NE | NE | NE | 2/2 | 12,100 - 14,200 | NA | NA | NA | NA | NA |
| Thallium | NE | 2 | NE | 7 | 20 | 1/1 | 12J | NA | 1 | NA | 1 | 0 |
| Zinc | 2,100 | 5,000[5] | 1,100 | 3,000 | 10,000 | 1/2 | 28.2 | 0 | 0 | 0 | 0 | 0 |

Notes:

Shaded areas indicate parameter selected as COPC for human health risk assessment.
(1) NC WQS = North Carolina Water Quality Standards for Groundwater
(2) MCL = Safe Drinking Water Act Maximum Contaminant Level
(3) USEPA Region III Risk Based Concentration (RBC) Table (April 15, 1998).
(4) Longer Term Health Advisories for a 10 kg Child and 70 kg Adult
(5) SMCL = Secondary Maximum Contaminant Level
(6) Action Level for drinking water
+ = Essential Nutrient
NE = No Criteria Established
NA = Not Applicable
J = Estimated Value

TABLE 5-30

SURFACE WATER DATA AND COPC SELECTION SUMMARY
INORGANICS
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Contaminant | Surface Water Criteria | | | Contaminant Frequency/Range | | Comparison to Criteria | | |
|---|---|---|---|---|---|---|---|---|
| | NCWQS[1] (μg/L) | Federal Health AWQCs[2] | | | | Positive Detects Above NCWQS | Positive Detects Above AWQC | |
| | | Water & Organisms (μg/L) | Organisms Only (μg/L) | No. of Positive Detects/ No. of Samples | Contaminant Range (μg/L) | | Water & Organisms | Organisms Only |
| **Inorganics** | | | | | | | | |
| Aluminum | NE | NE | NE | 2/2 | 375 - 488 | NA | NA | NA |
| Antimony | NE | 14 | 4,300 | 1/2 | 54.5 | NA | 1 | 0 |
| Barium | 1,000 | 1,000 | NE | 2/2 | 16.1 - 26.7 | 0 | 0 | NA |
| Calcium+ | NE | NE | NE | 2/2 | 116,000J | NA | NA | NA |
| Copper | NE | 1,300 | NE | 1/2 | 4.9 | NA | 0 | NA |
| Cyanide | NE | 700 | 220,000 | 1/2 | 53.4 | NA | 0 | 0 |
| Iron | NE | 300 | NE | 2/2 | 269 - 326 | NA | 10 | NA |
| Lead | NE | 50 | NE | 1/2 | 8J | NA | 0 | NA |
| Magnesium | NE | NE | NE | 2/2 | 332,000 - 334,000 | NA | NA | NA |
| Manganese | 200 | 50 | 100 | 2/2 | 26.1 - 26.1 | 0 | 0 | 0 |
| Potassium+ | NE | NE | NE | 2/2 | 107,000 - 109,000 | NA | NA | NA |
| Selenium | NE | NE | NE | 1/2 | 22J | NA | NA | NA |
| Sodium+ | NE | NE | NE | 2/2 | 2,900,000-3,040,000 | NA | NA | NA |
| Vanadium | NE | NE | NE | 2/2 | 5.4 - 11.2 | NA | NA | NA |
| Zinc | NE | NE | NE | 2/2 | 9.4 - 11.7 | NA | NA | NA |

Notes:

Shaded areas indicate parameter selected as COPC for human health risk assessment.
(1) NC WQS = North Carolina Water Quality Standards for Surface Water
(2) AWQC = Ambient Water Quality Criteria
+ = Essential Nutrients
NE - Not Established
NA - Not Applicable
J - Estimated value

TABLE 5-31

SEDIMENT DATA AND COPC SELECTION SUMMARY
ORGANICS AND INORGANICS
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Sediment Screening Values[1] | | Range/Frequency | | Comparison to Criteria Positive Detects Above | |
|---|---|---|---|---|---|---|
| | ER-L Concentration | ER-M Concentration | Range of Positive Detections | No. of Positive Detects/ No. of Samples | ER-L | ER-M |
| **Volatiles (µg/kg)** | | | | | | |
| Acetone | NE | NE | 6J | 1/2 | NE | NE |
| **Semivolatiles (µg/kg)** | | | | | | |
| Fluoranthene | 600 | 5,100 | 24J | 1/2 | 0 | 0 |
| Pyrene | 665 | 2,600 | 28J | 1/2 | 0 | 0 |
| Benzo(a)anthracene | 261 | 1,600 | 24J | 1/2 | 0 | 0 |
| Chrysene | 384 | 2,800 | 32J | 1/2 | 0 | 0 |
| Bis(2-ethylhexyl)phthalate | NE | NE | 27J | 1/2 | NA | NA |
| Benzo(b)fluoranthene | NE | NE | 25J | 1/2 | NA | NA |
| Benzo(k)fluoranthene | NE | NE | 32J | 1/2 | NA | NA |
| Benzo(a)pyrene | 430 | 1,600 | 41J | 1/2 | 0 | 0 |
| Indeno(1,2,3-cd)pyrene | NE | NE | 24J | 1/2 | NA | NA |
| Benzo(g,h,i)perylene | NE | NE | 32J | 1/2 | NA | NA |
| **Inorganics (mg/kg)** | | | | | | |
| Aluminum | NE | NE | 1,030 - 1,060 | 2/2 | NA | NA |
| Barium | NE | NE | 8.8 - 35 | 2/2 | NA | NA |
| Calcium+ | NE | NE | 133 - 514 | 2/2 | NA | NA |
| Chromium | 81 | 370 | 11.5 | 1/2 | 0 | 0 |
| Copper | 34 | 270 | 38.4 | 1/2 | 0 | 0 |
| Iron | NE | NE | 922 - 6,040 | 2/2 | NA | NA |
| Lead | 46.7 | 218 | 6.1 | 1/2 | 0 | 0 |
| Magnesium+ | NE | NE | 136 | 1/2 | NA | NA |
| Manganese | NE | NE | 8.4 - 45.2 | 2/2 | NA | NA |
| Nickel | 20.9 | 51.6 | 7.2 | 1/2 | 0 | 0 |
| Selenium | NE | NE | 0.44J - 0.67J | 2/2 | NA | NA |
| Silver | 1 | 3.7 | 2.1 | 1/2 | 1 | 0 |
| Sodium+ | NE | NE | 236 - 242 | 2/2 | NA | NA |

TABLE 5-31 (continued)

SEDIMENT DATA AND COPC SELECTION SUMMARY
ORGANICS AND INORGANICS
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING AREA, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Parameter | Sediment Screening Values[1] | | Range/Frequency | | Comparison to Criteria Positive Detects Above | |
|---|---|---|---|---|---|---|
| | ER-L Concentration | ER-M Concentration | Range of Positive Detections | No. of Positive Detects/ No. of Samples | ER-L | ER-M |
| Vanadium | NE | NE | 2.2 - 2.5 | 2/2 | NA | NA |
| Zinc | 150 | 410 | 4.6 - 11 | 2/2 | 0 | 0 |

Notes:

Shaded areas indicate parameter selected as COPC for human health risk assessment.
ER-L - Effects Range-Low
ER-M - Effects Range-Medium
(1) Long et al., 1995.
(2) Value for total DDT
(3) Region IV National Oceanic and Atmospheric Administration (NOAA) sediment screening value.
+ = Essential Nutrients
NA - Not Applicable
NE - Not Established
J - Estimated value

TABLE 5-32

SUMMARY OF SURFACE SOIL COPCs
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| COPCs | Site 68 | | Site 75 | | Site 76 | | Site 84 | | Site 85 | | Site 87 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatiles:** | | | | | | | | | | | | |
| Acetone | ● | | | | | | NA | | NA | | | |
| **Semivolatiles:** | | | | | | | | | | | | |
| Phenol | ● | | | | | | NA | | NA | | | |
| Acenaphthene | | | | | | | NA | | NA | | ● | |
| Fluorene | | | | | | | NA | | NA | | ● | |
| Phenanthrene | | | | | ● | | NA | | NA | | ● | |
| Anthracene | | | | | | | NA | | NA | | ● | |
| Carbazole | | | | | | | NA | | NA | | ● | X |
| Fluoranthene | | | | | ● | | NA | | NA | | ● | |
| Pyrene | | | | | ● | | NA | | NA | | ● | |
| Chrysene | | | | | ● | | NA | | NA | | ● | X |
| Benzo(a)anthracene | | | | | | | NA | | NA | | ● | X |
| Benzo(a)pyrene | | | | | ● | | NA | | NA | | ● | X |
| Benzo(b)fluoranthene | | | | | ● | | NA | | NA | | ● | X |
| Benzo(k)fluoranthene | | | | | | | NA | | NA | | ● | X |
| Indeno(1,2,3-cd)pyrene | | | | | | | NA | | NA | | ● | X |
| Butylbenzylphthalate | | | | | | | NA | | NA | | ● | |
| Di-n-butylphthalate | ● | | ● | | | | NA | | NA | | ● | |
| Bis(2-ethylhexyl)phthalate | ● | | ● | | ● | | NA | | NA | | ● | |
| Dibenz(a,h)anthracene | | | | | | | NA | | NA | | ● | X |
| Benzo(g,h,i)perylene | | | | | | | NA | | NA | | ● | |

TABLE 5-32 (Continued)

SUMMARY OF SURFACE SOIL COPCs
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| COPCs | Site 68 | | Site 75 | | Site 76 | | Site 84 | | Site 85 | | Site 87 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pesticides:** | | | | | | | | | | | | |
| 4,4'-DDE | ● | | ● | | ● | | NA | | NA | | ● | |
| 4,4'-DDD | | | ● | | ● | | NA | | NA | | ● | |
| 4,4'-DDT | ● | | ● | | ● | | NA | | NA | | ● | |
| Beta-BHC | ● | | | | | | NA | | NA | | | |
| Dieldrin | ● | | ● | | ● | | NA | | NA | | | |
| Endrin | | | ● | | | | NA | | NA | | | |
| Heptachlor | | | ● | | ● | | NA | | NA | | | |
| Heptachlor epoxide | | | ● | | ● | | NA | | NA | | | |
| alpha-Chlordane | | | ● | | ● | | NA | | NA | | ● | |
| gamma-Chlordane | | | ● | | ● | | NA | | NA | | ● | |
| Methoxychlor | ● | | | | | | NA | | NA | | | |
| **PCBs:** | | | | | | | | | | | | |
| Aroclor-1260 | ● | | | | | | ● | X | | | | |
| **Inorganics:** | | | | | | | | | | | | |
| Aluminum | ● | | ● | X | ● | | NA | | ● | | ● | |
| Antimony | ● | | | | | | NA | | | | | |
| Arsenic | ● | X | ● | X | ● | X | NA | | ● | X | ● | X |
| Barium | ● | | ● | | ● | | NA | | ● | | ● | |
| Beryllium | ● | | | | ● | | NA | | | | ● | |
| Cadmium | ● | | | | | | NA | | ● | X | ● | |
| Calcium | ● | | ● | | ● | | NA | | ● | | ● | |
| Chromium | ● | | ● | | ● | | NA | | ● | X | ● | |

TABLE 5-32 (Continued)

SUMMARY OF SURFACE SOIL COPCs
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| COPCs | Site 68 | | Site 75 | | Site 76 | | Site 84 | | Site 85 | | Site 87 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (Continued):** | | | | | | | | | | | | |
| Cobalt | ● | | ● | | ● | | NA | | ● | | ● | |
| Copper | ● | | ● | | ● | | NA | | ● | X | ● | |
| Cyanide | NA | | NA | | NA | | NA | | ● | | | |
| Iron | ● | X | ● | X | ● | X | NA | | ● | X | ● | X |
| Lead | ● | | ● | | ● | | NA | | ● | X | ● | |
| Magnesium | ● | | ● | | ● | | NA | | ● | | ● | |
| Manganese | ● | X | ● | | ● | | NA | | ● | X | ● | |
| Mercury | ● | | ● | | ● | | NA | | ● | X | ● | |
| Nickel | ● | | ● | | ● | | NA | | ● | | ● | |
| Potassium | ● | | ● | | ● | | NA | | ● | | ● | |
| Selenium | ● | | ● | | ● | | NA | | | | ● | |
| Sodium | ● | | ● | | ● | | NA | | ● | | ● | |
| Thallium | | | | | | | NA | | | | ● | |
| Vanadium | ● | | ● | | ● | | NA | | ● | | ● | |
| Zinc | ● | | ● | | ● | | NA | | ● | X | ● | |

Notes:

● = Detected in media; compared to relevent criteria and standards.
X = Compound or analyte identified as a COPC for human health risk assessment.
NA = Not analyzed

TABLE 5-33

SUMMARY OF SUBSURFACE SOIL COPCs
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| COPCs | Site 68 | | Site 75 | | Site 76 | | Site 84 | | Site 85 | | Site 87 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatiles:** | | | | | | | | | | | | |
| Acetone | ● | | | | ● | | NA | | NA | | | |
| Carbon Disulfide | ● | | | | | | NA | | NA | | | |
| 2-Butanone | ● | | | | | | NA | | NA | | | |
| **Semivolatiles:** | | | | | | | | | | | | |
| Pyrene | ● | | | | | | NA | | NA | | | |
| Di-n-butylphthalate | | | ● | | ● | | | | | | | |
| Bis(2-ethylphthalate | ● | | ● | | ● | | NA | | NA | | | |
| **Pesticides:** | | | | | | | | | | | | |
| 4,4'-DDE | | | ● | | ● | | NA | | NA | | ● | |
| 4,4'-DDT | ● | | ● | | ● | | | | | | ● | |
| 4,4'-DDD | | | ● | | ● | | | | | | ● | |
| Dieldrin | | | ● | | | | NA | | NA | | | |
| alpha-Chlordane | | | ● | | | | NA | | NA | | | |
| gamma-Chlordane | | | ● | | | | NA | | NA | | | |
| **PCBs:** | | | | | | | | | | | | |
| Aroclor-1260 | ● | | | | | | | | NA | | | |
| **Inorganics:** | | | | | | | | | | | | |
| Aluminum | ● | X | ● | X | ● | X | NA | | ● | X | ● | |
| Antimony | | | ● | X | | | NA | | | | ● | X |
| Arsenic | ● | X | ● | X | ● | X | NA | | ● | X | ● | X |
| Barium | ● | | ● | | ● | | NA | | ● | | ● | |
| Beryllium | ● | X | ● | | ● | | NA | | | | ● | |

TABLE 5-33 (Continued)

SUMMARY OF SUBSURFACE SOIL COPCs
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| COPCs | Site 68 | | Site 75 | | Site 76 | | Site 84 | | Site 85 | | Site 87 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (Continued):** | | | | | | | | | | | | |
| Cadmium | ● | | | | | | NA | | ● | | | |
| Calcium | ● | | ● | | ● | | NA | | ● | | ● | |
| Chromium | ● | | ● | | ● | | NA | | ● | | ● | |
| Cobalt | ● | | ● | | ● | | NA | | | | ● | |
| Copper | ● | | ● | | ● | | NA | | ● | | ● | |
| Cyanide | NA | | NA | | NA | | NA | | | | | |
| Iron | ● | X | ● | X | ● | X | NA | | ● | X | ● | X |
| Lead | ● | | ● | | ● | | NA | | ● | | ● | |
| Magnesium | ● | | ● | | ● | | NA | | ● | | ● | |
| Manganese | ● | X | ● | | ● | | NA | | ● | | ● | |
| Mercury | | | | | ● | | NA | | ● | | | |
| Nickel | ● | | ● | | ● | | NA | | ● | | | |
| Potassium | ● | | ● | | ● | | NA | | ● | | | |
| Selenium | ● | | ● | | ● | | NA | | | | | |
| Sodium | ● | | ● | | ● | | NA | | ● | | | |
| Vanadium | ● | | ● | | ● | | NA | | ● | | ● | |
| Zinc | ● | | ● | | ● | | NA | | ● | | ● | |

Notes:

● = Detected in media; compared to relevent criteria and standards.
X = Compound or analyte identified as a COPC for human health risk assessment.
NA = Not analyzed

TABLE 5-34

SUMMARY OF GROUNDWATER COPCs
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| COPCs | Site 68 | | Site 75 | | Site 76 | | Site 84 | | Site 85 | | Site 87 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatiles:** | | | | | | | | | | | | |
| Carbon Disulfide | ● | | | | | | | | NA | | | |
| 2-Hexanone | ● | | | | | | | | NA | | | |
| Chloroform | | | | | | | ● | X | NA | | | |
| Benzene | | | | | | | ● | X | NA | | | |
| Ethylbenzene | | | | | | | ● | | NA | | | |
| **Semivolatiles:** | | | | | | | | | | | | |
| Di-n-butylphthalate | | | | | ● | | NA | | NA | | | |
| 4-Nitrophenol | | | | | | | NA | | NA | | ● | |
| Pentachlorophenol | | | | | | | NA | | NA | | ● | X |
| **Inorganics:** | | | | | | | | | | | | |
| Aluminum | ● | | ● | | ● | | NA | | ● | X | ● | X |
| Antimony | ● | X | | | | | NA | | | | | |
| Arsenic | ● | X | | | ● | X | NA | | ● | X | | |
| Barium | ● | | ● | | ● | | NA | | ● | X | ● | |
| Beryllium | | | | | | | NA | | ● | | | |
| Cadmium | ● | X | | | | | NA | | ● | X | | |
| Calcium | ● | | ● | | ● | | NA | | ● | | ● | |
| Chromium | ● | | | | ● | | NA | | ● | X | | |
| Cobalt | ● | | ● | | ● | | NA | | ● | | ● | |
| Copper | ● | | ● | | ● | | NA | | ● | X | ● | |
| Cyanide | NA | | NA | | NA | | NA | | | | | |
| Iron | ● | | ● | | ● | X | NA | | ● | X | ● | X |

TABLE 5-34 (Continued)

SUMMARY OF GROUNDWATER COPCs
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| COPCs | Site 68 | | Site 75 | | Site 76 | | Site 84 | | Site 85 | | Site 87 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (Continued):** | | | | | | | | | | | | |
| Lead | ● | | | | ● | | NA | | ● | X | ● | |
| Magnesium | ● | | ● | | ● | | NA | | ● | | ● | |
| Manganese | ● | X | ● | | ● | | NA | | ● | X | ● | X |
| Mercury | | | | | ● | | NA | | ● | X | | |
| Nickel | ● | | | | | | NA | | ● | X | | |
| Potassium | ● | | ● | | ● | | NA | | ● | | | |
| Selenium | ● | | ● | | ● | | NA | | | | ● | |
| Sodium | ● | | ● | | ● | | NA | | ● | | ● | |
| Thallium | ● | X | | | ● | X | NA | | | | ● | |
| Vanadium | ● | | | | ● | X | NA | | ● | X | | |
| Zinc | ● | | ● | | ● | | NA | | ● | X | ● | |

Notes:

● = Detected in media; compared to relevent criteria and standards.
X = Compound or analyte identified as a COPC for human health risk assessment.
NA = Not analyzed

TABLE 5-35

SUMMARY OF SURFACE WATER/SEDIMENT COPCs
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| COPCs | Surface Water | | | | | | Sediment | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site 68 | | Site 84 | | Site 87 | | Site 68 | | Site 84 | | Site 87 | |
| **Volatiles:** | | | | | | | | | | | | |
| Acetone | | | NA | | | | | | NA | | ● | X |
| **Semivolatiles:** | | | | | | | | | | | | |
| Phenanthrene | | | NA | | | | ● | X | NA | | | |
| Anthracene | | | NA | | | | ● | X | NA | | | |
| Fluoranthene | | | NA | | | | ● | X | NA | | ● | X |
| Pyrene | | | NA | | | | ● | X | NA | | ● | X |
| Chrysene | | | NA | | | | ● | X | NA | | ● | X |
| Benzo(a)anthracene | | | NA | | | | ● | X | NA | | ● | X |
| Benzo(a)pyrene | | | NA | | | | ● | X | NA | | ● | X |
| Benzo(b)fluoranthene | | | NA | | | | ● | X | NA | | ● | X |
| Benzo(k)fluoranthene | | | NA | | | | ● | X | NA | | ● | X |
| Indeno(1,2,3-c,d)pyrene | | | NA | | | | ● | X | NA | | ● | X |
| Di-n-butylphthalate | ● | X | NA | | | | | | NA | | | |
| Bis(2-ethylhexyl)phthalate | | | NA | | | | ● | X | NA | | ● | X |
| Benzo(g,h,i)perylene | | | NA | | | | ● | X | NA | | ● | X |
| **Pesticides:** | | | | | | | | | | | | |
| 4,4'-DDE | | | NA | | | | ● | X | NA | | | |
| 4,4'-DDD | | | NA | | | | ● | X | NA | | | |
| 4,4'-DDT | | | NA | | | | ● | X | NA | | | |
| alpha-Chlordane | | | NA | | | | ● | X | NA | | | |
| gamma-Chlordane | | | NA | | | | ● | X | NA | | | |

TABLE 5-35 (Continued)

SUMMARY OF SURFACE WATER/SEDIMENT COPCs
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| COPCs | Surface Water | | | | | | Sediment | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site 68 | | Site 84 | | Site 87 | | Site 68 | | Site 84 | | Site 87 | |
| **PCBs:** | | | | | | | | | | | | |
| Aroclor-1248 | | | | | | | | | ● | X | | |
| Aroclor-1260 | | | | | | | | | ● | X | | |
| **Inorganics:** | | | | | | | | | | | | |
| Aluminum | ● | X | NA | | ● | X | ● | X | NA | | ● | X |
| Antimony | | | NA | | ● | X | | | NA | | | |
| Arsenic | | | NA | | | | ● | X | NA | | | |
| Barium | ● | X | NA | | ● | X | ● | X | NA | | ● | X |
| Cadmium | ● | X | NA | | | | ● | X | NA | | | |
| Calcium | ● | | NA | | ● | | ● | | NA | | ● | |
| Chromium | | | NA | | | | ● | X | NA | | ● | X |
| Cobalt | | | NA | | | | ● | X | NA | | | |
| Copper | | | NA | | ● | X | ● | X | NA | | ● | X |
| Cyanide | NA | | NA | | ● | X | NA | | NA | | | |
| Iron | ● | X | NA | | ● | X | ● | X | NA | | ● | X |
| Lead | ● | X | NA | | ● | X | ● | X | NA | | ● | X |
| Magnesium | ● | | NA | | ● | | ● | | NA | | ● | |
| Manganese | ● | X | NA | | ● | X | ● | X | NA | | ● | X |
| Mercury | | | NA | | | | ● | X | NA | | | |
| Nickel | | | NA | | | | ● | X | NA | | ● | X |
| Potassium | ● | | NA | | ● | | | | NA | | | |

TABLE 5-35 (Continued)

SUMMARY OF SURFACE WATER/SEDIMENT COPCs
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| COPCs | Surface Water | | | | | | Sediment | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site 68 | | Site 84 | | Site 87 | | Site 68 | | Site 84 | | Site 87 | |
| **Inorganics (Continued):** | | | | | | | | | | | | |
| Selenium | | | NA | | ● | X | ● | X | NA | | ● | X |
| Silver | | | NA | | | | | | NA | | ● | X |
| Sodium | ● | | NA | | ● | | ● | | NA | | ● | |
| Vanadium | ● | X | NA | | ● | X | ● | X | NA | | ● | X |
| Zinc | ● | X | | | ● | X | ● | X | | | ● | X |

Notes:

● = Detected in media; compared to relevent criteria and standards.
X = Compound or analyte identified as a COPC for human health risk assessment.
NA = Not analyzed

TABLE 5-36

EXPOSURE INPUT PARAMETERS
CURRENT MILITARY PERSONNEL
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Input Parameter | Media | Units | Adult Military Personnel | Comments/References |
|---|---|---|---|---|
| ED, Exposure Duration | All media | year | 4 | Professional Judgment |
| EF, Exposure Frequency | Soil | days/year | 250 | USEPA, 1991b |
| | Surface Water/ Sediment | days/year | 48 | Professional Judgement |
| ET, Exposure Time | Surface Water | hr/day | 2.6 | USEPA, 1989a |
| IR, Ingestion Rate | Soil | mg/day | 100 | USEPA, 1989a |
| | Surface Water | L/hr | 0.05 | USEPA, 1989a |
| SA, Surface Area | All Media | $cm^2$ | 4,300 | USEPA, 1992a |
| RR, Respiration Rate | Air | $m^3$/day | 20 | USEPA, 1991b |
| FI, Fraction Ingested | Soil/Sediment | unitless | 1 | USEPA, 1989a |
| ABS, Absorption Factor | Soil/Sediment | unitless | Organics - 1% Inorganics - 0.1% | USEPA, 1991c |
| AF, Adherence Factor | Soil/Sediment | $mg/cm^2$ | 1 | USEPA, 1992a |
| BW, Body Weight | All Media | kg | 70 | USEPA, 1989a |
| PC, Permeability Constant | Surface Water | cm/hr | Chemical Specific | USEPA, 1992a |
| AT, Averaging Time $AT_{nc}$, noncarcinogens | All Media | day | 1,460 | USEPA, 1989a |
| $AT_c$, carcinogens | All Media | day | 25,550 | USEPA, 1989a |

TABLE 5-37

EXPOSURE INPUT PARAMETERS
CURRENT ADULT AND CHILD BASE RESIDENTS
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Input Parameter | Media | Units | Current Receptor | | Comments/References |
|---|---|---|---|---|---|
| | | | Child (1-6 years) | Adult | |
| ED, Exposure Duration | All media | year | 4 | 4 | Professional Judgment |
| EF, Exposure Frequency | Soil | days/year | 350 | 350 | USEPA, 1989a |
| | Surface Water/ Sediment | days/year | 48 | 48 | Professional Judgement |
| ET, Exposure Time | Surface Water | hr/day | 2.6 | 2.6 | USEPA, 1989a |
| IR, Ingestion Rate | Soil | mg/day | 200 | 100 | USEPA, 1989a |
| | Surface Water | L/hr | 0.05 | 0.05 | USEPA, 1989a |
| SA, Surface Area | All Media | $cm^2$ | 2,300 | 5,800 | USEPA, 1992a |
| RR, Respiration Rate | Air | $m^3$/day | 15 | 20 | USEPA, 1995/1991b |
| FI, Fraction Ingested | Soil/Sediment | unitless | 1 | 1 | USEPA, 1989a |
| ABS, Absorption Factor | Soil/Sediment | unitless | Organics -1% Inorganics - 0.1% | Organics - 1% Inorganics - 0.1% | USEPA, 1991c |
| AF, Adherence Factor | Soil/Sediment | $mg/cm^2$ | 1 | 1 | USEPA, 1992a |
| BW, Body Weight | All Media | kg | 15 | 70 | USEPA, 1989a |
| PC, Permeability Constant | Surface Water | cm/hr | Chemical Specific | Chemical Specific | USEPA, 1992a |
| AT, Averaging Time $AT_{nc}$, noncarcinogens | All Media | day | 1,460 | 1,460 | USEPA, 1989a |
| $AT_c$, carcinogens | All Media | day | 25,550 | 25,550 | USEPA, 1989a |

TABLE 5-38

EXPOSURE INPUT PARAMETERS
FUTURE CHILD AND ADULT ON-SITE RESIDENTS
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Input Parameter | Media | Units | Future Receptor | | Comments/References |
|---|---|---|---|---|---|
| | | | Child (1 to 6 years) | Adult | |
| ED, Exposure Duration | All media | years | 6 | 30 | USEPA, 1991a |
| EF, Exposure Frequency | Soil/Groundwater | days/year | 350 | 350 | USEPA, 1989a |
| | Sediment/ Surface Water | days/year | 48 | 48 | Professional Judgment |
| ET, Exposure Time | Surface Water | hrs/day | 2.6 | 2.6 | USEPA, 1989a |
| | Groundwater | hrs/day | 0.25 | 0.25 | USEPA, 1989a |
| IR, Ingestion Rate | Groundwater | L/day | 1 | 2 | USEPA, 1991b |
| | Soil/Sediment | mg/day | 200 | 100 | USEPA, 1989a |
| | Surface Water | L/day | 0.05 | 0.05 | USEPA, 1989a |
| SA, Surface Area | Groundwater | $cm^2$ | 10,000 | 23,000 | USEPA, 1992a |
| | Soil/Sediment/ Surface Water | $cm^2$ | 2,300 | 5,800 | USEPA, 1992a |
| RR, Respiration Rate | Air | $m^3$/day | 15 | 20 | USEPA, 1995/1991b |
| FI, Fraction Ingested | Soil/Sediment | unitless | 1.0 | 1.0 | USEPA, 1989a |
| ABS, Absorbance Factor | Soil/Sediment | unitless | Organics - 1% Inorganics - 0.1% | Organics - 1% Inorganics - 0.1% | USEPA, 1991c |
| AF, Adherence Factor | Soil/Sediment | $mg/cm^2$ | 1 | 1 | USEPA, 1992a |
| BW, Body Weight | All Media | kg | 15 | 70 | USEPA, 1989a |
| PC, Permeability Constant | Groundwater/ Surface Water | cm/hr | Chemical-Specific | Chemical-Specific | USEPA, 1992a |
| AT, Averaging Time $AT_{nc}$, noncarcinogens | All Media | day | 2,190 | 10,950 | USEPA, 1989a |
| $AT_c$, carcinogens | All Media | day | 25,550 | 25,550 | USEPA, 1989a |

TABLE 5-39

SUMMARY OF EXPOSURE PATHWAYS
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Receptor | Exposure Pathway |
|---|---|
| Current Adult Military Personnel | Surface soil ingestion, dermal contact and inhalation of fugitive dusts - Sites 68, 84, 85<br>Subsurface soil ingestion, dermal contact and inhalation of fugitive dusts- Sites 68, 85<br>Surface water ingestion and dermal contact - Site 68<br>Sediment ingestion and dermal contact - Site 68, 84 |
| Current Adult and Child Residents | Surface soil ingestion, dermal contact and inhalation of fugitive dusts - Sites 75, 76, 87<br>Surface water ingestion and dermal contact - Site 87<br>Sediment ingestion and dermal contact - Site 87 |
| Future Adult and Child Residents | Surface soil ingestion, dermal contact, and inhalation of fugitive dusts - Sites 68, 75, 76, 85, 87<br>Groundwater ingestion, dermal contact and inhalation - Sites 68, 75, 76, 85, 87<br>Surface water ingestion and dermal contact - Sites 68, 87<br>Sediment ingestion and dermal contact - Sites 68, 87 |

TABLE 5-40

HUMAN HEALTH RISK ASSESSMENT TOXICITY FACTORS
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | RfD | Dermally Adjusted RfD* | RfC | CSF | Dermally Adjusted CSF* | CSFI | Oral Absorption Factors[1] | WOE | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Volatiles:** | | | | | | | | | |
| Acetone | 1.0E-01 | 8.0E-02 | ND | ND | ND | ND | 80% | D | IRIS |
| Carbon Disulfide | 1.0E-01 | 8.0E-02 | 2.0E-01 | ND | ND | ND | 80% | D | IRIS |
| 2-Butanone | 6.0E-01 | 4.8E-01 | 2.86E-01 | ND | ND | ND | 80% | D | IRIS |
| 2-Hexanone | 4.0E-02 | 3.2E-02 | 1.4E-03 | ND | ND | ND | 80% | D | NCEA |
| Chloroform | 1.0E-02 | 8.0E-3 | 8.6E-05 | 6.1E-03 | 7.6E-03 | 8.1E-02 | 80% | C | IRIS |
| Benzene | 3.0E-03 | 2.4E-03 | 1.7E-03 | 2.9E-02 | 3.6E-02 | 2.9E-02 | 80% | A | NCEA |
| Ethylbenzene | 1.0E-01 | 8.0E-02 | 2.9E-01 | ND | ND | ND | 80% | D | IRIS |
| **Semivolatiles:** | | | | | | | | | |
| Anthracene | 3.0E-01 | 1.5E-01 | ND | ND | ND | ND | 50% | D | IRIS |
| Fluoranthene | 4.0E-02 | 2.0E-02 | ND | ND | ND | ND | 50% | D | IRIS |
| Pyrene | 3.0E-02 | 1.5E-02 | ND | ND | ND | ND | 50% | D | IRIS |
| Benzo(a)anthracene | ND | ND | ND | 7.3E-01 | 1.46 | 3.1E-01 | 50% | B2 | EPA-NCEA |
| Benzo(b)fluoranthene | ND | ND | ND | 7.3E-01 | 1.46 | 3.1E-01 | 50% | B2 | EPA-NCEA |
| Benzo(k)fluoranthene | ND | ND | ND | 7.3E-02 | 1.46E-01 | 3.1E-02 | 50% | B2 | EPA-NCEA |
| Benzo(a)pyrene | ND | ND | ND | 7.3E+00 | 1.46E+01 | 3.1E+00 | 50% | B2 | IRIS |
| Indeno(1,2,3-cd)pyrene | ND | ND | ND | 7.3E-01 | 1.46 | 3.1E-01 | 50% | B2 | EPA-NCEA |
| Dibenz(a,h)anthracene | ND | ND | ND | 7.3E+00 | 1.46E+01 | 3.1E+00 | 50% | B2 | EPA-NCEA |
| Chrysene | ND | ND | ND | 7.3E-03 | 1.46E-02 | 3.1E-03 | 50% | B2 | EPA-NCEA |
| Bis(2-ethylhexyl)phthalate | 2.0E-02 | 1.0E-03 | ND | 1.4E-02 | 2.8E-02 | ND | 50% | B2 | IRIS |
| Benzo(g,h,i)perylene[2] | 3.0E-02 | 1.5E-03 | ND | ND | ND | ND | 50% | D | IRIS |
| Dibenzofuran | 4.0E-03 | 2.0E-03 | ND | ND | ND | ND | 50% | D | EPA-NCEA |
| Carbazole | ND | ND | ND | 2.0E-02 | 4.0E-02 | ND | 50% | B2 | HEAST |
| 2-Nitrophenol | ND | ND | ND | ND | ND | ND | 50% | ND | IRIS |
| 2-Methylphenol | 5.0E-02 | 2.5E-02 | ND | ND | ND | ND | 50% | C | IRIS |
| 4-Methylphenol | 5.0E-03 | 2.5E-03 | ND | ND | ND | ND | 50% | ND | HEAST |

TABLE 5-40 (Continued)

HUMAN HEALTH RISK ASSESSMENT TOXICITY FACTORS
PRE-REMEDIAL INVESTIGATION SCREENING FACTORS, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | RfD | Dermally Adjusted RfD* | RfC | CSF | Dermally Adjusted CSF* | CSFI | Oral Absorption Factors(1) | WOE | Reference |
|---|---|---|---|---|---|---|---|---|---|
| 2,4-Dimethylphenol | 2.0E-02 | 1.0E-01 | ND | ND | ND | ND | 50% | ND | IRIS |
| Naphthalene | 4.0E-02 | 2.0E-02 | ND | ND | ND | ND | 50% | D | EPA-NCEA |
| Acenaphthene | 6.0E-02 | 3.0E-02 | ND | ND | ND | ND | 50% | ND | IRIS |
| Fluorene | 4.0E-02 | 2.0E-02 | ND | ND | ND | ND | 50% | D | IRIS |
| Phenanthrene(2) | 3.0E-02 | 1.5E-02 | ND | ND | ND | ND | 50% | D | IRIS |
| 2-Methylnaphthalene(3) | 4.0E-02 | 2.0E-02 | ND | ND | ND | ND | 50% | D | IRIS |
| **Pesticides:** | | | | | | | | | |
| 4,4'-DDE | ND | ND | ND | 3.4E-01 | 6.8E-01 | ND | 50% | B2 | HEAST |
| 4,4'-DDD | ND | ND | ND | 2.4E-01 | 4.8E-01 | ND | 50% | B2 | IRIS |
| 4,4'-DDT | 5.0E-04 | 2.5E-04 | ND | 3.4E-01 | 6.8E-01 | 3.4E-01 | 50% | B2 | IRIS |
| alpha-Chlordane | 5.0E-04 | 3.0E-05 | ND | 3.5E-01 | 2.6 | 3.5E-01 | 50% | B2 | IRIS |
| gamma-Chlordane | 5.0E-04 | 3.0E-05 | ND | 3.5E-01 | 2.6 | 3.5E-01 | 50% | B2 | IRIS |
| **PCBs:** | | | | | | | | | |
| Aroclor-1248 | 2.0 | 15.4 | ND | ND | ND | ND | 50% | B2 | IRIS |
| Aroclor-1260 | 2.0 | 15.4 | ND | ND | ND | ND | 50% | B2 | IRIS |
| **Inorganics:** | | | | | | | | | |
| Aluminum | 1.0E+00 | 2.0E-01 | ND | ND | ND | ND | 20% | ND | EPA-NCEA |
| Antimony | 4.0E-04 | 8.0E-05 | ND | ND | ND | ND | 20% | D | IRIS |
| Arsenic | 3.0E-04 | 6.0E-05 | ND | 1.5 | 7.5 | 15.1 | 20% | A | IRIS |
| Barium | 7.0E-02 | 1.4E-02 | ND | ND | ND | ND | 20% | D | IRIS |
| Beryllium | 2.0E-03 | 4.0E-04 | 5.7E-06 | ND | ND | 8.4 | 20% | B2 | IRIS |
| Cadmium (water) | 5.0E-04 | 1.0E-04 | ND | ND | ND | 6.3 | 20% | B1 | IRIS |
| Cadmium (food) | 1.0E-03 | 2.0E-04 | 5.71E-05 | ND | ND | 6.3 | 20% | B1 | IRIS |
| Chromium(4) | 5.0E-03 | 1.0E-03 | ND | ND | ND | 4.2E+01 | 20% | D | IRIS |
| Cobalt | 6.0E-02 | 1.2E-02 | ND | ND | ND | ND | 20% | ND | EPA-NCEA |
| Copper | 4.0E-02 | 8.0E-03 | ND | ND | ND | ND | 20% | D | EPA-NCEA |

TABLE 5-40 (Continued)

HUMAN HEALTH RISK ASSESSMENT TOXICITY FACTORS
PRE-REMEDIAL INVESTIGATION SCREENING FACTORS, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | RfD | Dermally Adjusted RfD* | RfC | CSF | Dermally Adjusted CSF* | CSFI | Oral Absorption Factors[1] | WOE | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (Continued):** | | | | | | | | | |
| Iron | 3.0E-01 | 6.0E-02 | ND | ND | ND | ND | 20% | D | EPA-NCEA |
| Lead | ND | ND | ND | ND | ND | ND | | ND | ND |
| Manganese | 2.3E-02 | 4.6E-03 | ND | ND | ND | ND | 20% | ND | IRIS |
| Mercury[5] | 3.0E-04 | 6.0E-05 | 8.57E-05 | ND | ND | ND | 20% | D | HEAST |
| Nickel | 2.0E-02 | 4.0E-03 | ND | ND | ND | ND | 20% | D | IRIS |
| Selenium | 5.0E-03 | 1.0E-03 | ND | ND | ND | ND | 20% | ND | IRIS |
| Vanadium | 7.0E-03 | 1.4E-03 | ND | ND | ND | ND | 20% | D | HEAST |
| Zinc | 3.0E-01 | 6.0E-02 | ND | ND | ND | ND | 20% | D | IRIS |

Notes:

RfD = Oral Reference Dose (mg/kg - day)
RfC = Inhalation Reference Concentration (mg/cu m)
CSF = Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$
CSFI = Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$
WOE = Weight of Evidence
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables
EPA-NCEA = Environmental Protection Agency - National Center for Environmental Assessment
ND = Not Determined
A = Human Carcinogen
B1 = Probable Human Carcinogen - Limited Evidence
B2 = Probable Human Carcinogen - Sufficient Evidence
C = Possible Human Carcinogen
D = Not Classifiable as to Human Carcinogenicity
* Only oral toxicity values were dermally adjusted; inhalation toxicity values were not adjusted.
Dermally-adjusted RfD = oral RfD*oral absorption factor
Dermally-adjusted CSF = oral CSF/oral absorption factor
[1] Region IV recommended values (i.e., 80% for VOCs, 50% for SVOCs/Pesticides, and 20% for Inorganics).

TABLE 5-40 (Continued)

HUMAN HEALTH RISK ASSESSMENT TOXICITY FACTORS
PRE-REMEDIAL INVESTIGATION SCREENING FACTORS, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

(2) Pyrene is used as a surrogate.
(3) Naphthalene is used as a surrogate.
(4) Chromium VI
(5) Mercuric chloride used as a surrogate.

TABLE 5-41

**TOTAL SITE RISK**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

| Receptors | Surface Soil | | Subsurface Soil | | Groundwater | | Surface Water | | Sediment | | Total Site Risk | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ICR | HI | ICR | HI | ICR | HI | ICR | HI | ICR | HI | ICR | HI |
| Military Personnel | $6.3 \times 10^{-8}$ (6) | 0.02 (10) | $7.8 \times 10^{-7}$ (75) | 0.15 (75) | NE | NE | NA | <0.01 | $1.9 \times 10^{-7}$ (19) | 0.03 (15) | $1.0 \times 10^{-6}$ | 0.2 |
| Future Child Resident | $1.1 \times 10^{-6}$ (10) | 0.2 | NE | NE | $8.0 \times 10^{-6}$ (72) | 14 (100) | NA | 0.01 | $2.0 \times 10^{-6}$ (18) | 0.2 | $1.1 \times 10^{-5}$ | 14 |
| Future Adult Resident | $7.1 \times 10^{-7}$ (4) | 0.02 (1) | NE | NE | $1.7 \times 10^{-5}$ (89) | 6.0 (98) | NA | <0.01 | $1.6 \times 10^{-6}$ (7) | 0.03 (1) | $1.9 \times 10^{-5}$ | 6.1 |

Notes:

ICR = Incremental Lifetime Cancer Risk
HI = Hazard Index
Total = Surface Soil + Subsurface Soil + Groundwater + Surface Water + Sediment
NE = Not Evaluated for Potential Receptor
NA = Not Applicable (no carcinogenic COPCs)
( ) = Percent contribution to total risk
Shaded values in tables represent exceedences of USEPA acceptable risk criteria (i.e., target ICR range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$ and target HI value of 1.0).

**TABLE 5-42**

**INCREMENTAL LIFETIME CANCER RISK (ICR) AND HAZARD INDEX (HI)**
**FUTURE ADULT AND CHILD ON-SITE RESIDENTS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Pathway | Receptors | | | |
|---|---|---|---|---|
| | Adults | | Children (1-6 yrs.) | |
| | ICR | HI | ICR | HI |
| Surface Soil | | | | |
| Ingestion | $5.5 \times 10^{-7}$ (77) | 0.02 (100) | $1.0 \times 10^{-6}$ (91) | 0.2 (100) |
| Dermal Contact | $1.6 \times 10^{-7}$ (23) | <0.01 | $5.9 \times 10^{-8}$ (9) | 0.01 |
| Inhalation | $8.3 \times 10^{-10}$ | <0.01 | $5.8 \times 10^{-10}$ | 0.01 |
| Subtotal | $7.1 \times 10^{-7}$ | 0.02 | $1.1 \times 10^{-6}$ | 0.2 |
| Groundwater | | | | |
| Ingestion | $1.7 \times 10^{-5}$ (100) | 5.9 (100) | $7.9 \times 10^{-6}$ (99) | 14 (100) |
| Dermal Contact | $2.4 \times 10^{-7}$ | 0.09 | $9.9 \times 10^{-8}$ (1) | 0.2 |
| Subtotal | $1.7 \times 10^{-5}$ | 6.0 | $8.0 \times 10^{-6}$ | 14 |
| Surface Water | | | | |
| Ingestion | NA | <0.01 | NA | 0.01 (100) |
| Dermal Contact | NA | <0.01 | NA | <0.01 |
| Subtotal | NA | <0.01 | NA | 0.01 |

TABLE 5-42 (Continued)

**INCREMENTAL LIFETIME CANCER RISK (ICR) AND HAZARD INDEX (HI)**
**FUTURE ADULT AND CHILD ON-SITE RESIDENTS**
**SITE 68, RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| | Receptors | | | |
|---|---|---|---|---|
| | Adults | | Children (1-6 yrs.) | |
| Pathway | ICR | HI | ICR | HI |
| Sediment | | | | |
| Ingestion | $9.6 \times 10^{-7}$ (59) | 0.02 (67) | $1.8 \times 10^{-6}$ (88) | 0.2 (100) |
| Dermal Contact | $6.7 \times 10^{-7}$ (41) | 0.01 (33) | $2.5 \times 10^{-7}$ (12) | 0.01 |
| Subtotal | $1.6 \times 10^{-6}$ | 0.03 | $2.0 \times 10^{-6}$ | 0.2 |
| **TOTAL** | $1.9 \times 10^{-5}$ | 6.1 | $1.1 \times 10^{-5}$ | 14 |

Notes:

Shaded values in table represent exceedences of USEPA acceptable risk criteria (i.e., target ICR range of $1 \times 10^{-06}$ to $1 \times 10^{-04}$ and target HI value of 1.0).

() = Percent contribution of exposure pathway to media subtotal risk.
NE = Exposure pathway not evaluated due to lack of inhalation RfDs for COPCs.
NA = Not applicable. No carcinogenic COPCs selected.

TABLE 5-43

**TOTAL SITE RISK**
**SITE 75, MCAS BASKETBALL COURT**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

| Receptors | Surface Soil | | Subsurface Soil | | Groundwater | | Total Site Risk | |
|---|---|---|---|---|---|---|---|---|
| | ICR | HI | ICR | HI | ICR | HI | ICR | HI |
| Current Child Resident | $1.1 \times 10^{-6}$ (100) | 0.3 (100) | NE | NE | NE | NE | $1.1 \times 10^{-6}$ | 0.3 |
| Future Child Resident | $9.9 \times 10^{-6}$ (100) | 0.99 (100) | NE | NE | NA | NA | $9.9 \times 10^{-6}$ | 0.99 |
| Current Adult Resident | $1.5 \times 10^{-7}$ (100) | 0.04 (100) | NE | NE | NE | NE | $1.5 \times 10^{-7}$ | 0.04 |
| Future Adult Resident | $1.1 \times 10^{-6}$ (100) | 0.04 (100) | NE | NE | NA | NA | $1.1 \times 10^{-6}$ | 0.04 |

Notes:

ICR = Incremental Lifetime Cancer Risk
HI = Hazard Index
Total = Surface Soil + Subsurface Soil + Groundwater
NE = Not Evaluated for Potential Receptor
NA = Not Applicable (no groundwater COPCs)
( ) = Percent contribution to total risk

TABLE 5-44

TOTAL SITE RISK
SITE 76, MCAS CURTIS ROAD
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB CAMP LEJEUNE, NORTH CAROLINA

| Receptors | Surface Soil | | Subsurface Soil | | Groundwater | | Total Site Risk | |
|---|---|---|---|---|---|---|---|---|
| | ICR | HI | ICR | HI | ICR | HI | ICR | HI |
| Current Child Resident | $9.3 \times 10^{-7}$ (100) | 0.2 (100) | NE | NE | NE | NE | $9.3 \times 10^{-7}$ | 0.2 |
| Future Child Resident | $1.4 \times 10^{-6}$ (3) | 0.2 | NE | NE | $6.5 \times 10^{-5}$ (97) | 15 (100) | $6.6 \times 10^{-5}$ | 15 |
| Current Adult Resident | $1.2 \times 10^{-7}$ (100) | 0.03 (100) | NE | NE | NE | NE | $1.2 \times 10^{-7}$ | 0.03 |
| Future Adult Resident | $9.0 \times 10^{-7}$ | 0.03 | NE | NE | $1.4 \times 10^{-4}$ (100) | 6.4 (100) | $1.4 \times 10^{-4}$ | 6.4 |

Notes:

ICR = Incremental Lifetime Cancer Risk
HI = Hazard Index
Total = Surface Soil + Subsurface Soil + Groundwater
NE = Not Evaluated for Potential Receptor
( ) = Percent contribution to total risk
Shaded values in tables represent exceedences of USEPA acceptable risk criteria (i.e., target ICR range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$ and target HI value of 1.0).

TABLE 5-45

**INCREMENTAL LIFETIME CANCER RISK (ICR) AND HAZARD INDEX (HI)**
**FUTURE ADULT AND CHILD ON-SITE RESIDENTS**
**SITE 76, MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Pathway | Receptors | | | |
|---|---|---|---|---|
| | Adults | | Children (1-6 yrs.) | |
| | ICR | HI | ICR | HI |
| Surface Soil | | | | |
| Ingestion | $7.0 \times 10^{-7}$ (77) | 0.02 (100) | $1.3 \times 10^{-6}$ (93) | 0.2 (90) |
| Dermal Contact | $2.0 \times 10^{-7}$ (23) | 0.01 | $7.6 \times 10^{-8}$ (7) | 0.01 (10) |
| Inhalation | $1.1 \times 10^{-9}$ | NE | $7.5 \times 10^{-10}$ | NE |
| Subtotal | $9.0 \times 10^{-7}$ | 0.03 | $1.4 \times 10^{-6}$ | 0.2 |
| Groundwater | | | | |
| Ingestion | $1.4 \times 10^{-4}$ (100) | 6.3 (99) | $6.4 \times 10^{-5}$ (100) | 15 (100) |
| Dermal Contact | $2.0 \times 10^{-6}$ | 0.09 (1) | $8.0 \times 10^{-7}$ | 0.2 |
| Subtotal | $1.4 \times 10^{-4}$ | 6.4 | $6.5 \times 10^{-5}$ | 15 |
| **TOTAL** | $1.4 \times 10^{-4}$ | 6.4 | $6.6 \times 10^{-5}$ | 15 |

Notes:

Shaded values in table represent exceedences of USEPA acceptable risk criteria (i.e., target ICR range of $1 \times 10^{-06}$ to $1 \times 10^{-04}$ and target HI value of 1.0).

() = Percent contribution of exposure pathway to media subtotal risk.
NE = Exposure pathway not evaluated due to lack of inhalation RfDs for COPCs.

TABLE 5-46

**TOTAL SITE RISK**
**SITE 84, BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

| Receptors | Surface Soil | | Subsurface Soil | | Groundwater | | Surface Water | | Sediment | | Total Site Risk | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ICR | HI | ICR | HI | ICR | HI | ICR | HI | ICR | HI | ICR | HI |
| Military Personnel | $2.6 \times 10^{-5}$ (94) | NA | NA | NA | NE | NE | NA | NA | $1.7 \times 10^{-6}$ (6) | NA | $2.8 \times 10^{-5}$ | NA |

Notes:

ICR = Incremental Lifetime Cancer Risk
HI = Hazard Index
Total = Surface Soil + Subsurface Soil + Groundwater + Surface Water + Sediment
NE = Not Evaluated for Potential Receptor
NA = Not Applicable (no carcinogenic and/or noncarcinogenic COPCs)
( ) = Percent contribution to total risk

TABLE 5-47

**TOTAL SITE RISK**
**SITE 85, CAMP JOHNSON BATTERY DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

| Receptors | Surface Soil | | Subsurface Soil | | Groundwater | | Total Site Risk | |
|---|---|---|---|---|---|---|---|---|
| | ICR | HI | ICR | HI | ICR | HI | ICR | HI |
| Military Personnel | $7.9 \times 10^{-6}$ | 14 (100) | $2.5 \times 10^{-7}$ | 0.06 | NE | NE | $8.1 \times 10^{-6}$ | 14 |
| Future Child Resident | $1.3 \times 10^{-4}$ (34) | 152 (46) | NE | NE | $1.6 \times 10^{-4}$ (66) | 182 (54) | $2.9 \times 10^{-4}$ | 334 |
| Future Adult Resident | $8.8 \times 10^{-5}$ (14) | 21 (21) | NE | NE | $3.6 \times 10^{-4}$ (86) | 78 (79) | $4.5 \times 10^{-4}$ | 99 |

Notes:

ICR = Incremental Lifetime Cancer Risk
HI = Hazard Index
Total = Surface Soil + Subsurface Soil + Groundwater
NE = Not Evaluated for Potential Receptor
( ) = Percent contribution to total risk
Shaded values in tables represent exceedences of USEPA acceptable risk criteria (i.e., target ICR range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$ and target HI value of 1.0).

TABLE 5-48

**INCREMENTAL LIFETIME CANCER RISK (ICR) AND HAZARD INDEX (HI)**
**FUTURE ADULT AND CHILD ON-SITE RESIDENTS, CURRENT MILITARY PERSONNEL**
**SITE 85, CAMP JOHNSON BATTERY DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| | Receptors | | | | | |
|---|---|---|---|---|---|---|
| | Adults | | Children (1-6 yrs.) | | Military Personnel | |
| Pathway | ICR | HI | ICR | HI | ICR | HI |
| Surface Soil | | | | | | |
| Ingestion | $6.8 \times 10^{-5}$ (76) | 14 (66) | $1.3 \times 10^{-4}$ (100) | 134 (88) | $6.4 \times 10^{-6}$ (81) | 10 (72) |
| Dermal Contact | $2.0 \times 10^{-5}$ (23) | 4.2 (20) | $7.3 \times 10^{-6}$ | 8 (5) | $1.4 \times 10^{-6}$ (19) | 2 (14) |
| Inhalation | $6.5 \times 10^{-7}$ (1) | 2.9 (14) | $4.6 \times 10^{-7}$ | 10 (7) | $6.2 \times 10^{-8}$ | 2 (14) |
| Subtotal | $8.8 \times 10^{-5}$ | 21 | $1.3 \times 10^{-4}$ | 152 | $7.9 \times 10^{-6}$ | 14 |
| Subsurface Soil | | | | | | |
| Ingestion | NA | NA | NA | NA | $2.0 \times 10^{-7}$ (82) | 0.05 (83) |
| Dermal Contact | NA | NA | NA | NA | $4.3 \times 10^{-8}$ (18) | 0.01 (17) |
| Inhalation | NA | NA | NA | NA | $3.1 \times 10^{-10}$ | <0.01 |
| Subtotal | NA | NA | NA | NA | $2.4 \times 10^{-7}$ | 0.06 |
| Groundwater | | | | | | |
| Ingestion | $3.5 \times 10^{-4}$ (97) | 77 (99) | $1.6 \times 10^{-4}$ (100) | 180 (99) | NA | NA |
| Dermal Contact | $5.1 \times 10^{-6}$ (3) | 1.0 (1) | $2.1 \times 10^{-6}$ | 2 (1) | NA | NA |
| Subtotal | $3.6 \times 10^{-4}$ | 78 | $1.6 \times 10^{-4}$ | 182 | NA | NA |

**TABLE 5-48 (Continued)**

**INCREMENTAL LIFETIME CANCER RISK (ICR) AND HAZARD INDEX (HI)**
**FUTURE ADULT AND CHILD ON-SITE RESIDENTS, CURRENT MILITARY PERSONNEL**
**SITE 85, CAMP JOHNSON BATTERY DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

| Pathway | Receptors | | | | | |
|---|---|---|---|---|---|---|
| | Adults | | Children (1-6 yrs.) | | Military Personnel | |
| | ICR | HI | ICR | HI | ICR | HI |
| **TOTAL** | $4.5 \times 10^{-4}$ | 99 | $2.9 \times 10^{-4}$ | 334 | $8.1 \times 10^{-6}$ | 14 |

Notes:

Shaded values in table represent exceedences of USEPA acceptable risk criteria (i.e., target ICR range of $1 \times 10^{-06}$ to $1 \times 10^{-04}$ and target HI value of 1.0).

() = Percent contribution of exposure pathway to media subtotal risk.

NA = Exposure pathway not applicable for receptor.

TABLE 5-49

**TOTAL SITE RISK**
**SITE 87, MCAS OFFICER'S HOUSING AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

| Receptors | Surface Soil | | Subsurface Soil | | Groundwater | | Surface Water | | Sediment | | Total Site Risk | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ICR | HI | ICR | HI | ICR | HI | ICR | HI | ICR | HI | ICR | HI |
| Current Child Resident | $9.2 \times 10^{-6}$ (76) | 0.5 (67) | NE | NE | NE | NE | NA | 0.2 (27) | $4.4 \times 10^{-8}$ (24) | 0.05 (6) | $1.2 \times 10^{-5}$ | 0.8 |
| Future Child Resident | $1.4 \times 10^{-5}$ (87) | 0.5 (21) | NE | NE | $1.3 \times 10^{-6}$ (8) | 1.5 (69) | NA | 0.2 (9) | $6.6 \times 10^{-6}$ (5) | 0.05 (2) | $1.6 \times 10^{-5}$ | 2.3 |
| Current Adult Resident | $1.4 \times 10^{-6}$ (100) | 0.07 (50) | NE | NE | NE | NE | NA | 0.06 (43) | $8.2 \times 10^{-9}$ | 0.01 (7) | $1.4 \times 10^{-6}$ | 0.1 |
| Future Adult Resident | $1.1 \times 10^{-5}$ (73) | 0.07 (8) | NE | NE | $4.3 \times 10^{-6}$ (27) | 0.7 (83) | NA | 0.06 (7) | $6.2 \times 10^{-8}$ | 0.01 (2) | $1.5 \times 10^{-5}$ | 0.8 |

Notes:

ICR = Incremental Lifetime Cancer Risk
HI = Hazard Index
Total = Surface Soil + Subsurface Soil + Groundwater + Surface Water + Sediment
NE = Not Evaluated for Potential Receptor
NA = Not Applicable (no carcinogenic COPCs)
( ) = Percent contribution to total risk
Shaded values in tables represent exceedences of USEPA acceptable risk criteria (i.e., target ICR range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$ and target HI value of 1.0).

TABLE 5-50

INCREMENTAL LIFETIME CANCER RISK (ICR) AND HAZARD INDEX (HI)
FUTURE CHILD ON-SITE RESIDENT
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Pathway | ICR | HI |
|---|---|---|
| Surface Soil | | |
| Ingestion | $1.2 \times 10^{-5}$ (91) | 0.5 (100) |
| Dermal Contact | $1.5 \times 10^{-6}$ (9) | 0.03 |
| Inhalation | $4.4 \times 10^{-9}$ | NE |
| Subtotal | $1.4 \times 10^{-5}$ | 0.5 |
| Groundwater | | |
| Ingestion | $5.3 \times 10^{-7}$ (29) | 1.5 (100) |
| Dermal Contact | $1.3 \times 10^{-6}$ (71) | 0.02 |
| Subtotal | $1.8 \times 10^{-6}$ | 1.5 |
| Surface Water | | |
| Ingestion | NA | 0.2 (100) |
| Dermal Contact | NA | 0.04 |
| Subtotal | NA | 0.2 |

TABLE 5-50 (Continued)

INCREMENTAL LIFETIME CANCER RISK (ICR) AND HAZARD INDEX (HI)
FUTURE CHILD ON-SITE RESIDENT
SITE 87, MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| Pathway | ICR | HI |
|---|---|---|
| Sediment | | |
| Ingestion | $5.3 \times 10^{-8}$ (82) | 0.05 (100) |
| Dermal Contact | $1.2 \times 10^{-8}$ (18) | <0.01 |
| Subtotal | $6.6 \times 10^{-8}$ | 0.05 |
| **Total** | $1.6 \times 10^{-5}$ | 2.3 |

Notes:

Shaded values in table represent exceedences of USEPA acceptable risk criteria (i.e., target ICR range of $1 \times 10^{-06}$ to $1 \times 10^{-04}$ and target HI value of 1.0).

NE = Exposure pathway not evaluated due to lack of inhalation RfDs for COPCs.

NA = Not Applicable. No carcinogenic COPCs selected.

TABLE 5-51

SUMMARY OF UNCERTAINTIES IN THE RESULTS OF THE
HUMAN HEALTH RISK ASSESSMENT
SITES 12, 68, 75, 76, 84, 85, 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | Potential Magnitude for Over-Estimation of Risks | Potential Magnitude for Under-Estimation of Risks | Potential Magnitude for Over or Under-Estimation of Risks |
|---|---|---|---|
| Environmental Sampling and Analysis<br><br>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 |
| Selection of COPCs<br><br>The use of USEPA Region III COPC screening concentrations in selecting COPCs in soil and groundwater. | | | Low |
| Exposure Assessment<br><br>The standard assumptions regarding body weight, exposure period, life expectancy, population characteristics, and lifestyle may not be representative of the actual exposure situations. | | | Moderate |
| The use of the 95th percentile upper confidence level data of the lognormal distribution in the estimation of the RME. | | | Low |
| Assessing future residential property use when the likelihood of residential development is low. | High | | |
| The amount of media intake is assumed to be constant and representative of any actual exposure. | | | Low |
| Toxicological Assessment<br><br>Toxicological indices derived from high dose animal studies, extrapolated to low dose human exposure. | Moderate | | |
| Lack of promulgated toxicological indices for inhalation pathway. | | Low | |
| Risk Characterization<br><br>Assumption of additivity in the quantitation of cancer risks without consideration of synergism, antagonism, promotion and initiation. | | | Moderate |
| Assumption of additivity in the estimation of systemic health effects without consideration of synergism, antagonism, etc. | | | Moderate |

TABLE 5-51 (Continued)

SUMMARY OF UNCERTAINTIES IN THE RESULTS OF THE
HUMAN HEALTH RISK ASSESSMENT
SITES 12, 68, 75, 76, 84, 85, 87
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

| | Potential Magnitude for Over-Estimation of Risks | Potential Magnitude for Under-Estimation of Risks | Potential Magnitude for Over or Under-Estimation of Risks |
|---|---|---|---|
| Additivity of risks by individual exposure pathways (dermal and ingestion and inhalation). | Low | | 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, Part A: Human Health Evaluation Manual. USEPA, 1989a.

# FIGURES

FIGURE 5-1

**FLOWCHART OF POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS**
**SITE 68: RIFLE RANGE DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

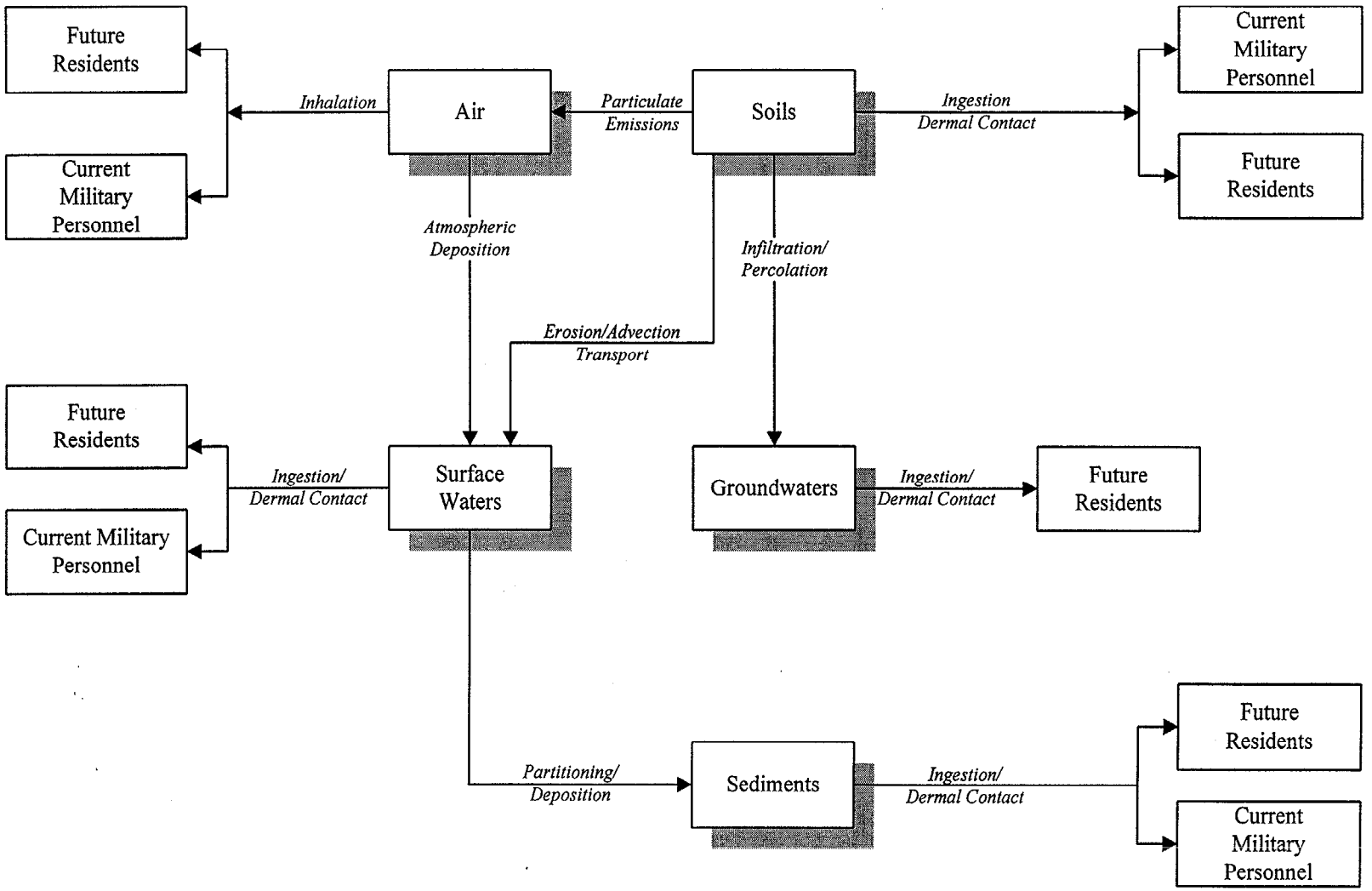


FIGURE 5-2

FLOWCHART OF POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS
SITE 75: MCAS BASKETBALL COURT
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA

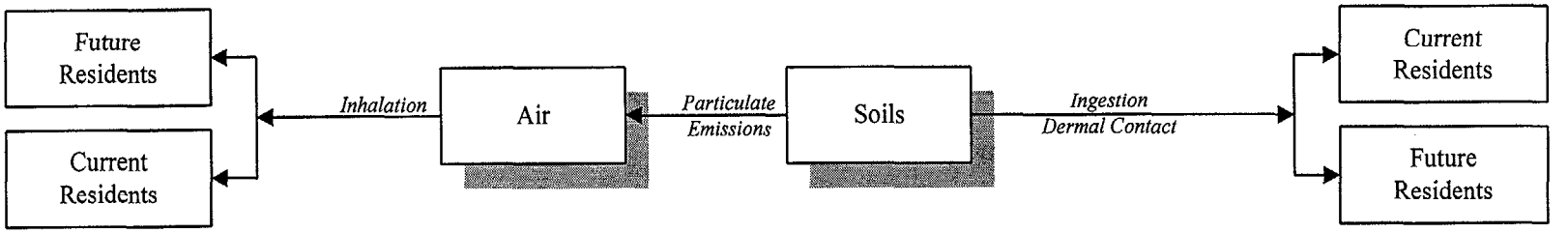


FIGURE 5-

**FLOWCHART OF POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS**
**SITE 76: MCAS CURTIS ROAD**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

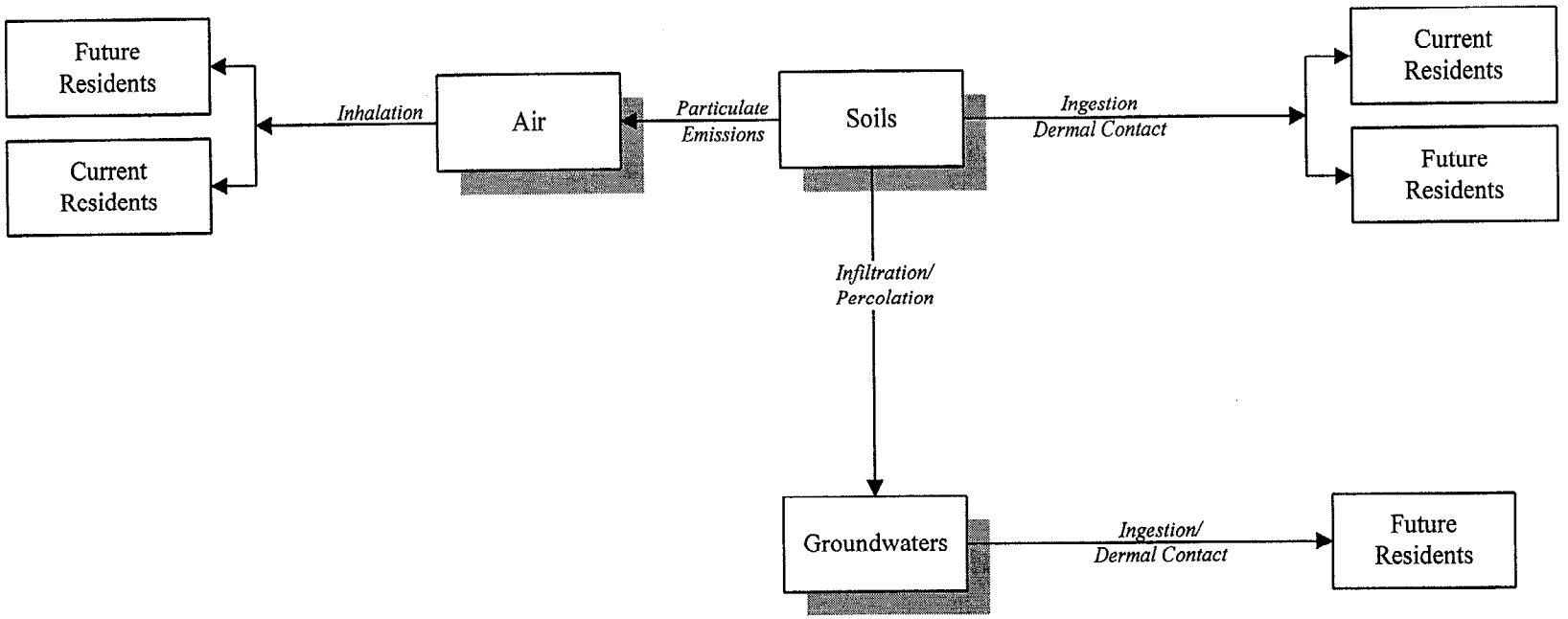
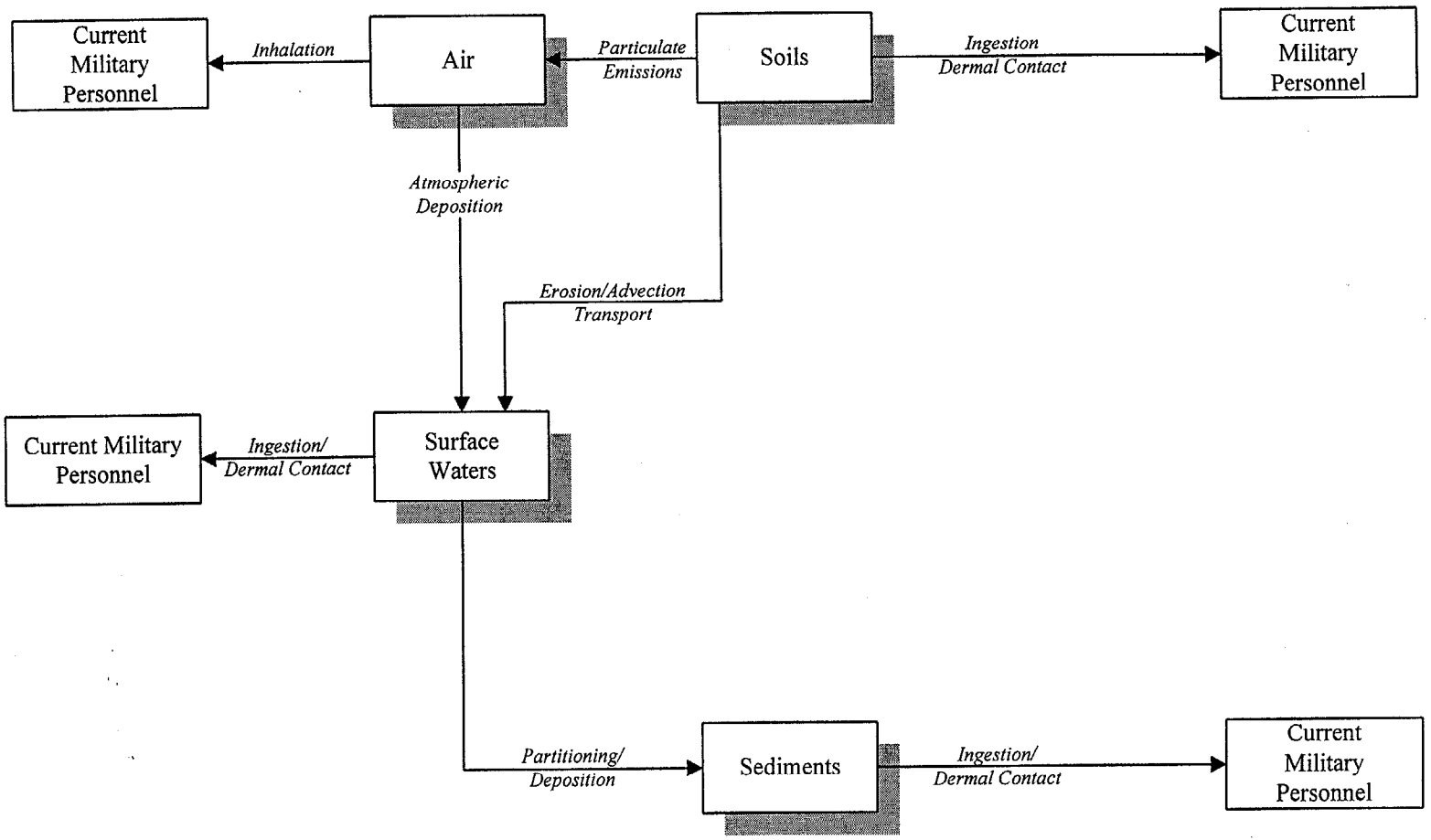


FIGURE 5-

**FLOWCHART OF POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS**
**SITE 84: BUILDING 45 AREA**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**



FIGURE

**FLOWCHART OF POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS**
**SITE 85: CAMP JOHNSON BATTERY DUMP**
**PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

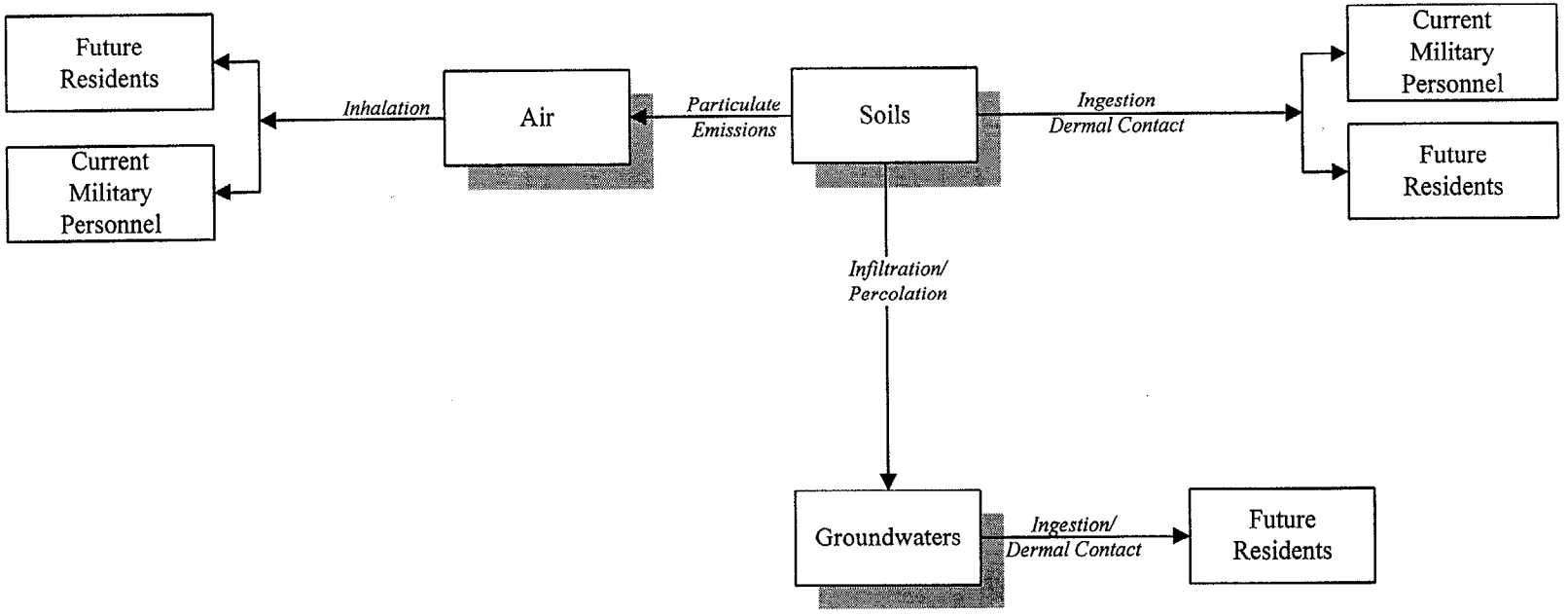
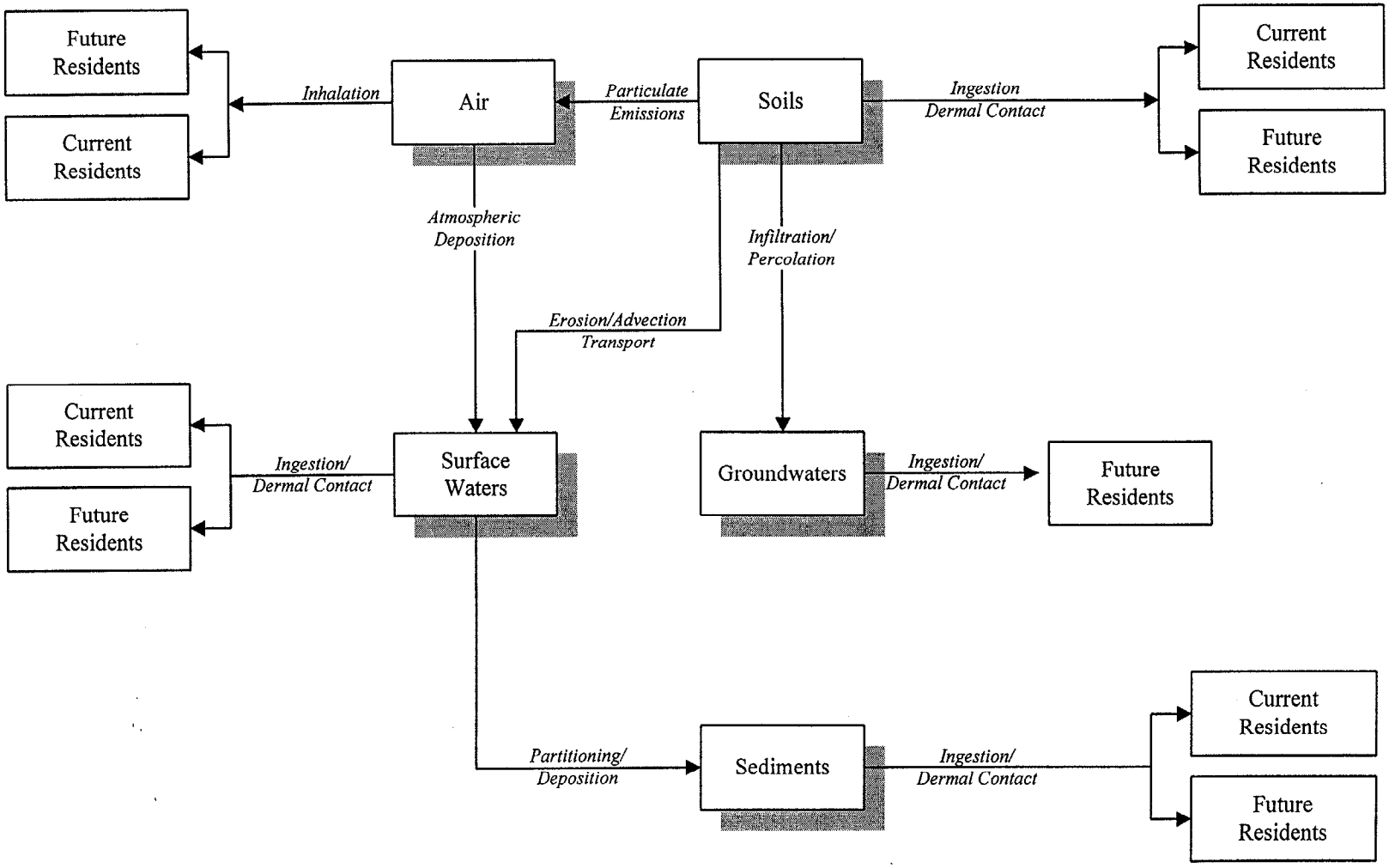


FIGURE 5-6

FLOWCHART OF POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS
SITE 87: MCAS OFFICER'S HOUSING AREA
PRE-REMEDIAL INVESTIGATION SCREENING STUDY, CTO-0314
MCB, CAMP LEJEUNE, NORTH CAROLINA



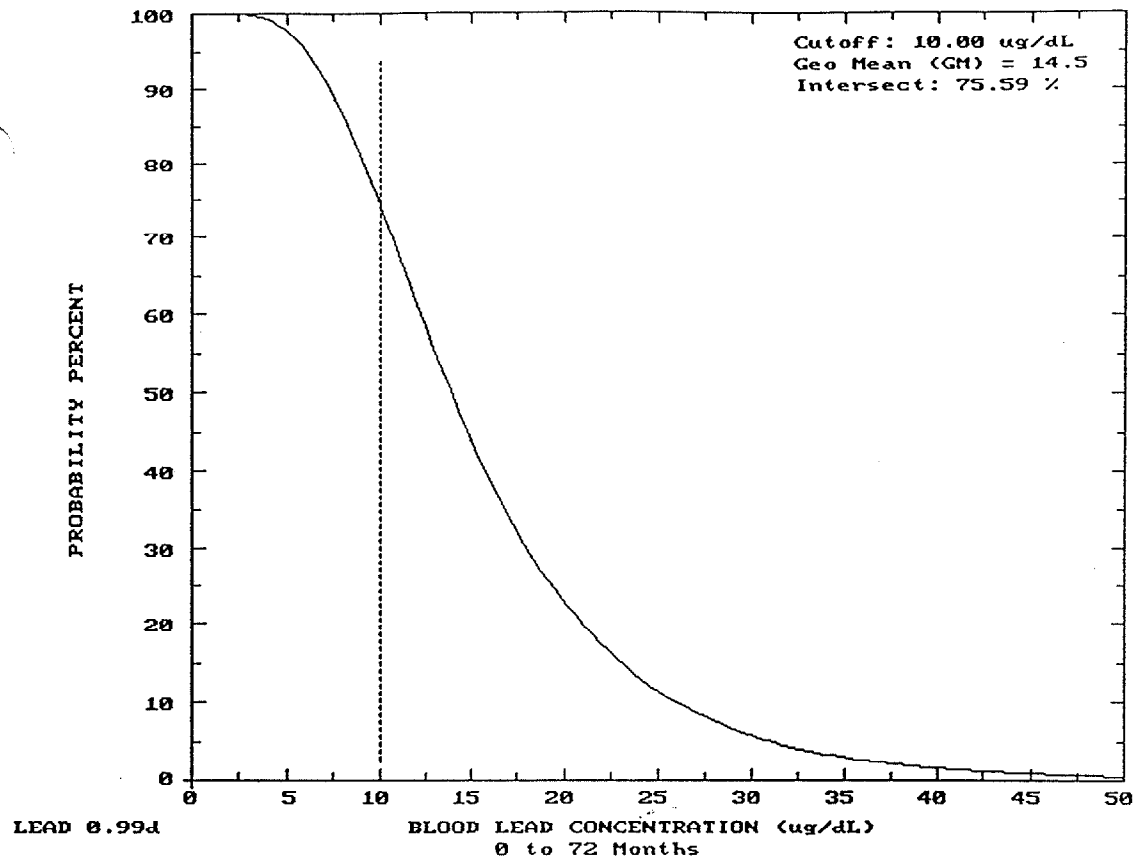



**Figure 5-7**
**Cumulative Probability Percent of Blood Lead Levels**
**Site 85 Surface Soil Exposure**

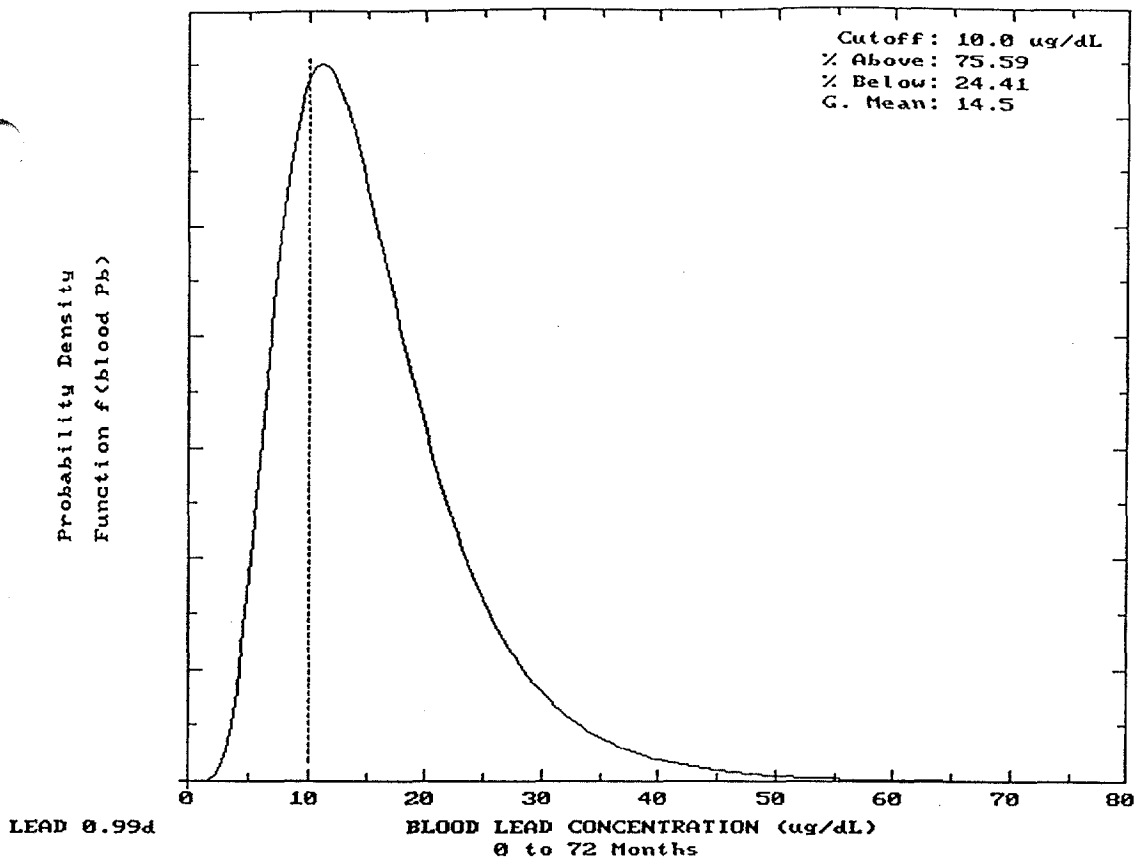



**Figure 5-8**
**Probability Distribution of Blood Lead Levels**
**Site 85 Surface Soil Exposure**

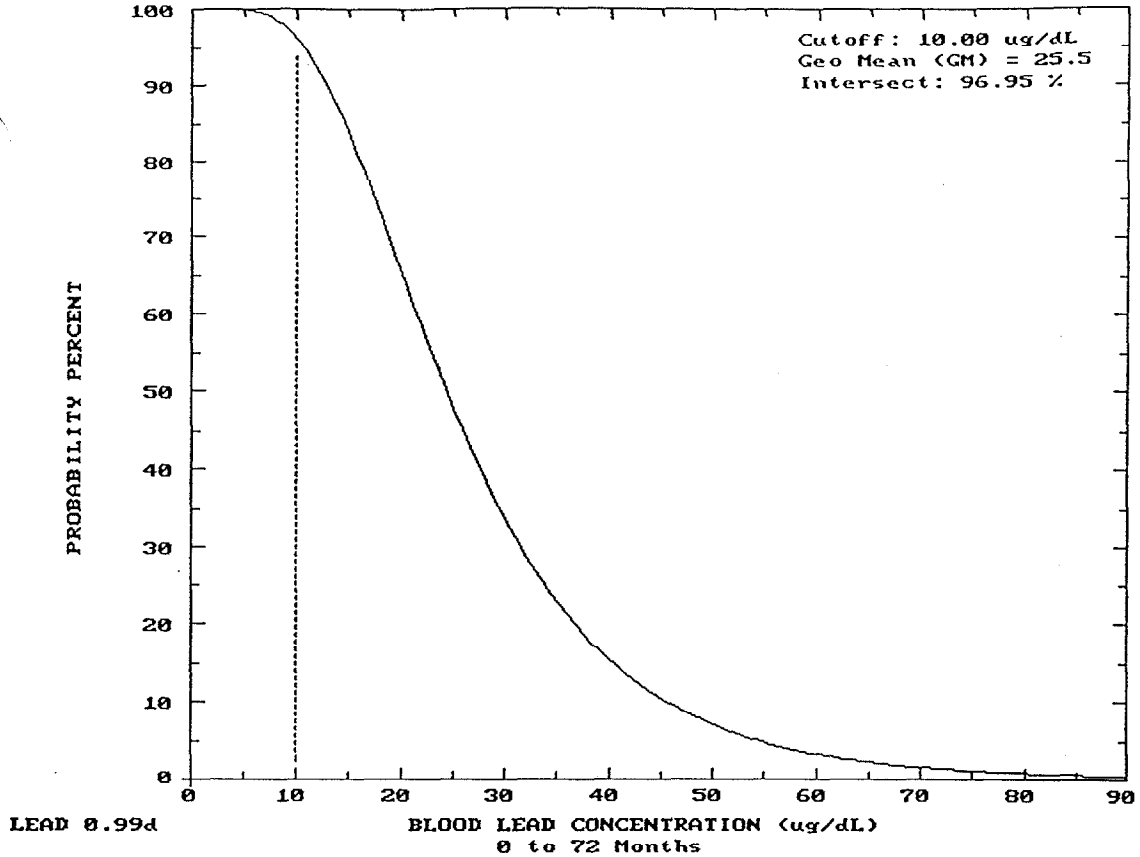



Figure 5-9
Cumulative Probability Percent of Blood Lead Levels
Site 85 Groundwater Exposure

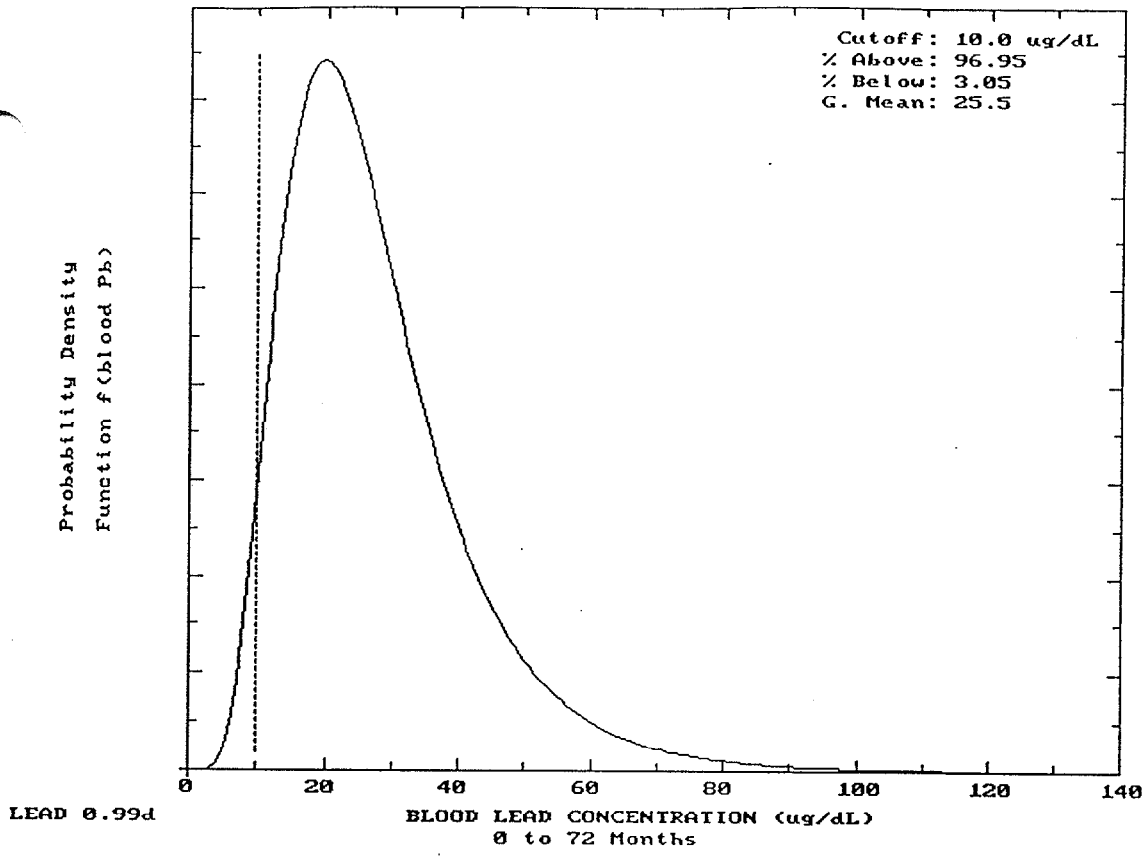



Figure 5-10
**Probability Distribution of Blood Lead Levels**
Site 85 Groundwater Exposure

# 6.0 CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the findings of the Pre-RI Screening Study and presents conclusions and recommendations developed from the data collected at each of the seven sites. The recommendations for each of the sites are based upon the risk assessment findings. Results are presented on a site-by-site basis with regard to the specific chemicals of concern.

Upon completion of the Pre-RI Screening Study, three general recommendations are possible: 1) removal action and confirmatory sampling; 2) further investigation; and 3) "no further action". Once a site is recommended for "no further action" it will be considered exempt from further Federal Superfund considerations. It is important to note that any site may be reassessed if new information becomes available; however, it is the intention of this document to provide information on which sites require further investigation and which do not.

## 6.1 Conclusions

The conclusions for each of the seven sites investigated as part of the Pre-RI Screening Study are summarized below. In general, the text below focuses only on those compounds detected at concentrations above screening standards or regulatory levels.

### 6.1.1 Site 12 - Explosive Ordnance Disposal Range

There were no detections of organic compounds in any of the soil samples collected from Site 12. Thirty soil samples were analyzed on-site by a mobile laboratory. Of these 30 samples, four were sent to a fixed based laboratory for confirmation. The analysis from the fixed based laboratory confirmed the results obtained in the field. None of the soil samples detected the presence of organic compounds.

Xylenes were detected at low concentrations in the GeoProbe groundwater samples analyzed on-site by a mobile laboratory. Four groundwater samples taken from permanent monitoring wells bordering the site, however, did not detect the presence of any organic compounds. Based on

this data, groundwater at Site 12 does not appear to have been adversely impacted by site operations.

### 6.1.2 Site 68 - Rifle Range Dump

One pesticide and one polychlorinated biphenyl (PCB) compound were detected in the surface soil at Site 68 above the screening standards. One PCB compound was detected below the applicable screening standard in the subsurface soil samples.

Two volatile organic compounds (carbon disulfide and 2-hexanone) were detected in the groundwater samples at Site 68. There are no state or federal regulatory levels established for either of these compounds. Several metals were detected in the groundwater at concentrations above their respective state and/or federal screening standards.

Pesticides were detected in the sediment samples at Site 68 at concentrations above the applicable screening standard. The sediment samples detected three metals (cadmium, lead, and mercury) which exceeded the screening criteria.

A risk assessment was conducted at Site 68 under three scenarios: current military personnel, future residential child, and future resident adult. For these three scenarios, all incremental cancer risk (ICR) values fell within acceptable risk ranges. Likewise, the hazard index (HI) for current military personnel was within acceptable risk ranges. The HI for the future residential child and adult, however, exceeded the acceptable risk range of 1.0 due to ingestion of antimony and manganese in the groundwater.

The presence of manganese in the groundwater samples of MCB, Camp Lejeune is not uncommon. Manganese is a naturally occurring analyte that is found throughout the majority of wells at MCB, Camp Lejeune including monitoring wells and deep water supply wells. For these reasons, manganese is not considered to be a concern for the groundwater quality at Site 68.

The presence of metals in the groundwater was addressed through additional sampling and risk calculations. This additional analysis demonstrated that a risk is present due to metals in the

shallow groundwater. However, these metals are considered to be naturally occurring and not site related. In addition, the shallow aquifer is not expected to be used as a groundwater resource.

### 6.1.3 Site 75 - MCAS Basketball Court

Several pesticide compounds were detected in the surface soil which exceeded their screening standards. In addition, barium was detected at a concentration exceeding the screening standard.

One pesticide compound, along with the metals arsenic and barium, were detected in the subsurface soil samples at a concentration above the screening standards. Aluminum, iron, and manganese were detected in the groundwater samples at concentrations above their respective screening standards.

A risk assessment was conducted at Site 75 under four scenarios, current base residential child, future residential child, current base residential adult, and future residential adult. For each of these four scenarios, the ICR values fell within the USEPA acceptable risk range. In addition, each of the calculated HIs were less than 1.0, within the acceptable risk level.

### 6.1.4 Site 76 - MCAS Curtis Road

Two pesticide compounds were detected at concentrations above their respective screening standards in the surface soil at Site 76. There were no organic compounds or metals detected in the subsurface samples that exceeded the screening standard. Only aluminum and iron exceeded state and/or federal regulatory levels in the groundwater samples at Site 76.

A risk assessment was conducted at Site 76 under four scenarios: current base residential child, future residential child, current base residential adult, and future residential adult. For current residents, the ICR values were within USEPA acceptable risk ranges. Likewise, the HI values were less than 1.0.

The risk assessment produced an unacceptable risk for future residents from exposure to groundwater. For the future residential child scenario, the ICR value was within acceptable

ranges and HI values calculated for soil were less than 1.0. The total HI value, however, exceeded unity due to ingestion of arsenic and iron in the groundwater.

The presence of iron in the groundwater is not uncommon. Iron is found throughout the majority of wells at MCB, Camp Lejeune including monitoring wells and deep water supply wells. For this reason, the presence of iron in the groundwater is not considered to be a concern.

The HI values for future resident adults fell below 1.0, and all ICR values fell within USEPA's acceptable risk range, except the carcinogenic risk from groundwater ingestion. Arsenic was the driver for this elevated risk value.

### 6.1.5 Site 84 - Building 45 Area

The PCB Aroclor-1260 was detected in each of the surface soil samples at concentrations above its screening standard. In addition, the sediment samples collected from the lagoon at Site 84 detected the PCBs Aroclor-1248 and Aroclor-1260 at levels above the screening standard.

Current military personnel were considered as receptors for the risk assessment at Site 84. The ICR values calculated for current military personnel fell within the USEPA acceptable risk range. There were no noncarcinogens retained as COPCs at Site 84; therefore, HI values were not calculated for the military personnel receptor.

Although the ICR values were within acceptable ranges, the samples collected at Site 84 confirm the presence of PCBs in the sediments of the lagoon and in surface soils at the site. Concentrations of PCBs exceeded residential RBCs and TSCA guidance for the clean-up of PCB contaminated soils. The effected area will require further investigation to confirm or deny the presence of any buried materials and to determine the horizontal and vertical extent of contamination. These recommendations are discussed in Section 6.2.5

### 6.1.6 Site 85 - Camp Johnson Battery Dump

Each of the metals detected in the surface soil samples at Site 85 exceeded the established

screening values or twice the average base-background levels. Nine of the metals detected in the groundwater samples exceeded state and/or federal regulatory levels. The concentration of lead exceeded the Toxicity Characteristic Leaching Procedure (TCLP) regulatory levels.

The risk assessment at Site 85 focused on three scenarios: current military personnel, future residential child, and future residential adult. The ICR values calculated for current military personnel fell within USEPA's acceptable risk range. The HI calculated for exposure to subsurface soil fell below 1.0, or the acceptable risk level; however, the noncarcinogenic risk level for exposure to surface soil exceeded 1.0 for all pathways evaluated. Manganese was the risk driver for the noncarcinogenic risk values.

Both the ICR and HI values calculated for the future child resident exceeded USEPA's acceptable carcinogenic and noncarcinogenic risk values due to ingestion of surface soil and groundwater. Arsenic was responsible for the carcinogenic risks in the surface soil and groundwater. All of the noncarcinogenic exposure pathways evaluated for surface soil and groundwater exceeded 1.0. Manganese was the risk driver in the surface soil, while iron and aluminum drove the risk in groundwater.

As with the future resident child, both the ICR and HI values calculated for the future adult resident exceeded USEPA's acceptable carcinogenic and noncarcinogenic risk values due to ingestion of surface soil and groundwater. Arsenic was responsible for the carcinogenic risks in the surface soil and groundwater. All of the noncarcinogenic exposure pathways evaluated for surface soil and groundwater exceeded 1.0. Manganese was the risk driver in the surface soil, while iron and aluminum drove the risk in groundwater.

### 6.1.7 Site 87 - MCAS Officer's Housing Area

Of the surface soil samples collected at Site 87, only the metal thallium exceeded its screening standard. Two semivolatile compounds were detected in the groundwater samples. The concentration of pentachlorophenol exceeded the North Carolina Water Quality Standard

(NC WQS). In addition, metals were detected in the groundwater at concentrations above the NC WQS and/or Federal maximum contaminant levels (MCLs). Antimony and iron were detected in the surface water samples at concentrations above state and/or federal water quality standards. One volatile organic compound (acetone) was detected in the sediment samples from Site 87. There is no screening standard established for this compound. Copper and silver were the only metals detected in the sediment samples which exceeded state or federal screening standards.

The risk assessment conducted for Site 87 considered four scenarios, current base residential child, future residential child, current base residential adult, and future residential adult. The ICR and HI values fell within USEPA's acceptable risk range for current base residential child, current base residential adult, and future residential adult.

The ICR values calculated for the future child receptor also fell within the USEPA acceptable risk range. All of the HI values fell below the acceptable risk level of 1.0 with the exception of the noncarcinogenic risk from groundwater ingestion. Iron, manganese, and aluminum were the risk drivers for the groundwater ingestion pathway. Although these metals produced a noncarcinogenic risk, the presence of iron, manganese, and aluminum in the groundwater samples is not a concern because they are naturally occurring and found throughout the majority of wells at MCB, Camp Lejeune.

## 6.2 Recommendations

Based on the an evaluation of the data collected during the Pre-RI Screening Study it is recommended that five of the sites be closed out by preparing a No Further Response Action Planned (NFRAP) memorandum. These include:

- Site 12 - Explosive Ordnance Disposal Range
- Site 68 - Rifle Range Dump
- Site 75 - MCAS Curtis Road

- Site 76 - MCAS Curtis Road

- Site 87 - MCAS Officer's Housing Area

Two of the sites require further investigation and/or remediation these include Site 84 - Building 45 Area and Site 85 - Camp Johnson Battery Dump. Specific recommendations concerning these sites are provided below.

- Site 84 - Building 45 Area

  Soil and sediment at Site 84 contain PCBs which exceed the applied screening values. Concentrations in the soil exceed residential RBCs and guidance provided under TSCA. In addition, the presence of buried materials at the site is suspected. The following summarizes the proposed recommendations for Site 84:

  - Geophysical techniques should be applied to confirm or deny the presence of buried materials at the site. Various geophysical techniques may be used including magnetometer surveys, ground penetrating radar, and electromagnetic surveys .

  - Further soil sampling should be performed to define the vertical and horizontal extent of PCB contamination. This is especially evident north of the site in the direction of Building 45, where contaminant concentrations are relatively high. Sampling should include both on-site screening and fixed based laboratory testing.

  - An Engineering Evaluation/Cost Analysis should be completed to evaluate remedial alternatives.

- Site 85 - Camp Johnson Battery Dump

The risk assessment completed for Site 85 identified a current risk from soil and groundwater at the site. In addition, soil samples exceeded the screening standards and nine metals detected in the groundwater were above state and/or federal regulatory levels. Some of the detected metals in the groundwater are those which are associated with the waste battery piles (i.e. cadmium, lead, nickel, and zinc). Based on these conclusions, the following recommendations are proposed for Site 85:

- An Engineering Evaluation/Cost Analysis should be completed to evaluate remedial alternatives. It is expected that the most appropriate remedial alternative will entail removal of the waste battery piles at the site along with a limited amount of soil immediately below the waste piles.

- Upon removal of the waste material and surface soil, complete confirmatory sampling at each of the excavated areas.