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FINAL

REMEDIAL INVESTIGATION/
FEASIBILITY STUDY
WORK PLAN
FOR OPERABLE UNIT NO. 1
(SITES 78, 21 AND 24)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0106

Prepared For:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

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LIST OF ACRONYMS AND ABBREVIATIONS

ARARs	Applicable or Relevant and Appropriate Requirements
Baker	Baker Environmental, Inc.
bgs	below ground surface
BRA	Baseline Risk Assessment
BOD	biological oxygen demand
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
COD	chemical oxygen demand
CRP	Community Relations Plan
CTVs	critical toxicity values
1,2-DCE	1,2-Dichloroethene
DO	dissolved oxygen
DoN	Department of the Navy
DQOs	data quality objectives
EPIC	Environmental Photographic Interpretation Center
ESE	Environmental Science and Engineering, Inc.
FSAP	Field Sampling and Analysis Plan
FFA	Federal Facilities Agreement
FMF	Fleet Marine Force
GC	gas chromatograph
HI	hazard index
HPIA	Hadnot Point Industrial Area
HQ	hazard quotient
IAS	Initial Assessment Study
IRA	Interim Remedial Action
IRP	Installation Restoration Program
LANTDIV	Atlantic Division, Naval Facilities Engineering Command
LANTNAVFAC-ENGCOM	Atlantic Division, Naval Facilities Engineering Command
MCB	Marine Corps Base
MCL	Maximum Contaminant Level
MEK	methyl ethyl ketone
msl	mean sea level

NACIP	Navy Assessment and Control of Installation Pollutants Program
N.C. DEHNR	North Carolina Department of Environment, Health and Natural Resources
NCWQS	North Carolina Water Quality Standard
NEESA	Naval Energy and Environmental Support Activity
NPL	National Priorities List
NREA	Natural Resources and Environmental Affairs
NWI	National Wetlands Inventory
OU	Operable Unit
PAHs	polynuclear aromatic hydrocarbons
PA/SI	Preliminary Assessments/Site Investigations
PCBs	polychlorinated biphenyls
ppb	parts per billion
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SQC	Sediment Quality Criteria
TAL	Target Analyte List
TBC	to be considered
TCE	trichloroethylene
TCL	Target Compound List
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
TSS	total suspended solids
TVS	total volatile solids
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TRC	Technical Review Committee
T-1,2-DCE	trans-1,2-dichloroethene
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
VOCs	volatile organic compounds
WAR	Water and Air Research, Inc.

1.0 INTRODUCTION

Marine Corps Base (MCB) Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) effective November 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, Health and Natural Resources (N.C. DEHNR), and the United States Department of the Navy (DoN) entered into a Federal Facilities Agreement (FFA) for MCB Camp Lejeune. The primary purpose of the FFA was to ensure that environmental impacts associated with past and present activities at the MCB are thoroughly investigated and appropriate CERCLA response/Resource Conservation and Recovery Act (RCRA) corrective action alternatives are developed and implemented as necessary to protect the public health, welfare and the environment (FFA, 1989).

The scope of the FFA included provisions for the implementation of a remedial investigation/feasibility study (RI/FS) at 23 sites throughout MCB Camp Lejeune. Remedial investigations will be implemented at these sites to determine fully the nature and extent of the threat to the public health, welfare or the environment caused by the release and threatened release of hazardous substances, pollutants, contaminants or constituents at the site and to establish requirements for the performance of FSs. Feasibility studies will be conducted to identify, evaluate, and select alternatives for the appropriate CERCLA responses to prevent, mitigate, or abate the release or threatened release of hazardous substances, pollutants, contaminants, or constituents at the site in accordance with CERCLA/Superfund Amendments and Reauthorization Act (SARA) and applicable State law (FFA, 1989). This RI/FS Work Plan addresses three of the 23 sites: Site 78 (Hadnot Point Industrial Area), Site 21 (Transformer Storage Lot 140), and Site 24 (Industrial Area Fly Ash Dump). These three sites form Operable Unit No. 1 (the first of nine operable units at the MCB Camp Lejeune).

1.1 Objective of RI/FS Work Plan

The objective of this RI/FS Work Plan is to identify and describe the tasks required to implement an RI/FS for Operable Unit No. 1 at MCB Camp Lejeune. The various studies or investigations required to collect appropriate data are also described in this Work Plan. In addition, the Work Plan documents the scope and objectives of the RI/FS activities. The preparation and contents of the RI/FS Work Plan is based on the scoping process, which is described below.

1.2 RI/FS Scoping

Scoping is the initial planning stage of the RI/FS and of eventual site remediation. The result of the scoping process is documented in the RI/FS Work Plan. Scoping begins once the background information is reviewed and evaluated and consists of the following activities:

- Preliminarily assessing human health and ecological risks, based on existing information.
- Identifying potential interim actions which may need to be undertaken early in the program to mitigate potential threats to the public health and the environment.
- Identifying contaminants of concern.
- Identifying potential contaminant migration pathways.
- Identifying Federal and State Applicable or Relevant and Appropriate Requirements (ARARs).
- Identifying potential technologies/alternatives for mitigating site problems.
- Determining the type, amount, and data quality objectives (DQOs) needed to assess human health and ecological risks, and to effectively evaluate feasible technologies/alternatives.
- Identifying the sampling strategies for the collection of data.
- Defining the optimum sequence of site activities.

The background information reviewed included a number of existing environmental assessment reports, which are identified in Section 8.0 (References), and information collected by conducting site visits at all three sites.

As part of the scoping process, Baker personnel conducted pre-investigation sampling at Sites 78 and 24 during which groundwater samples were collected from selected monitoring wells. Results of sample analyses were used in the design of the RI. The findings of this pre-investigation sampling are in Section 2.2.5.6 (Site 78) and Section 2.4.5.1 (Site 24). Project meetings were also conducted with the Atlantic Division, Naval Facilities Engineering Command (LANTDIV) to discuss the proposed RI/FS Scope of Work for each site, and to obtain technical and administrative input from LANTDIV.

1.3 RI/FS Work Plan Format

The following elements are presented in this Work Plan.

Section 2.0 - Site Background and Setting
Section 3.0 - Evaluation of Existing Information
Section 4.0 - RI/FS Objectives
Section 5.0 - RI/FS Tasks
Section 6.0 - Project Staffing
Section 7.0 - Project Schedule
Section 8.0 - References

Section 2.0 includes information regarding the location and setting of each site, along with a summary of what studies were conducted in the past at each site and their respective findings. The purpose of this section is to define the physical and known environmental characteristics of each site.

Section 3.0 documents the evaluation of background information. This section focuses on identifying potential and/or confirmed contamination, identifying migration pathways, identifying potential (or known) impacts to the public health and environment, listing Federal and/or State applicable or relevant and appropriate requirements (ARARs), and identifying potential remedial technologies/alternatives for mitigating site problems. The purpose of this evaluation is to define site-specific RI/FS objectives. Data or information deemed necessary to identify migration pathways, assess environmental and human health risks, or evaluate the feasibility of remedial actions are presented in this section.

Section 4.0 presents the RI/FS objectives for each site. Data or information required to meet the objectives are subsequently identified and documented in this section. This data may consist of chemical analyses, hydrogeologic information, or engineering analyses.

Section 5.0 identifies and describes the tasks and field investigations that will need to be implemented to complete the RI/FS at each site in terms of meeting the site-specific objectives. These tasks generally follow the description of tasks identified in USEPA's RI/FS Guidance Document (OSWER Directive 9355.3-01). The collection methods for obtaining this information are also identified and described in general terms (more detailed descriptions of the field investigations are documented in the Sampling and Analysis Plan). This section provides the rationale for development of this Work Plan.

Section 6.0 discusses project staffing for implementing the RI/FS for Operable Unit No. 1. The RI/FS schedule is provided in Section 7.0 and references used in developing the RI/FS approach are provided in Section 8.0.

2.0 BACKGROUND AND SETTING

The purpose of this section is to summarize existing background and setting information pertaining to MCB Camp Lejeune, Operable Unit No. 1 (Sites 78, 21, and 24). The current understanding of the physical setting of the sites, the history of the sites, and the existing information related to previous environmental investigative activities are described. This section specifically addresses the location and setting of the three sites, historical events associated with past usage or disposal activities, topography and surface drainage, regional geology and hydrogeology, site-specific geology and hydrogeology, surface water hydrology, climatology, natural resources, ecological features, and land use.

Additional site information regarding the above can be found in the following documents:

- Initial Assessment Study (IAS) of Marine Corps Base Camp Lejeune, North Carolina (WAR, 1983).
- Final Site Summary Report, Marine Corps Base, Camp Lejeune (ESE, 1990).
- Characterization Step Report for Hadnot Point Industrial Area - Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ, Marine Corps Base, Camp Lejeune, North Carolina (ESE, 1988).
- Final Remedial Investigation Report for Hadnot Point Industrial Area Operable Unit Shallow Soils and Castle Hayne Aquifer, Marine Corps Base, Camp Lejeune, North Carolina. Volumes 1, 2, and 3 (ESE, 1992).
- Draft Final Risk Assessment for Hadnot Point Industrial Area Operable Unit Shallow Soils and Castle Hayne Aquifer, Marine Corps Base, Camp Lejeune, North Carolina (ESE, 1991).
- Final Interim Remedial Action Remedial Investigation for the Shallow Aquifer at the Hadnot Point Industrial Area Operable Unit, Camp Lejeune Marine Corps Base, Jacksonville, North Carolina (Baker, 1992a).
- Final Interim Remedial Action Feasibility Study for the Shallow Aquifer at the Hadnot Point Industrial Area Operable Unit, Camp Lejeune Marine Corps Base, Jacksonville, North Carolina (Baker, 1992b).
- Hydrogeology of Aquifers in Cretaceous and Younger Rocks in the Vicinity of Onslow and Southern Jones Counties, North Carolina (USGS, 1990a).
- Continuous Seismic Reflection Profiling of Hydrogeologic Features Beneath New River, Camp Lejeune, North Carolina (USGS, 1990b).
- Assessment of Hydrologic and Hydrogeologic Data at Camp Lejeune Marine Corps Base, North Carolina (USGS, 1989).

2.1 Marine Corps Base Camp Lejeune

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

2.1.1 Location and Setting

MCB Camp Lejeune is located within the coastal plain in Onslow County, North Carolina. The facility covers approximately 170 square miles and is bisected by the New River which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The eastern border of Camp Lejeune is the Atlantic Ocean shoreline. The western and northeastern boundaries are U.S. Route 17 and State Route 24, respectively. The City of Jacksonville, North Carolina, borders Camp Lejeune to the north. The major areas within MCB Camp Lejeune are depicted in Figure 2-1.

2.1.2 History

Construction of MCB Camp Lejeune began in April 1941 with the objective of developing the "Worlds Most Complete Amphibious Training Base". The base was started at the Hadnot Point Industrial Area (HPIA) where the major functions of the base are still centered. Development at the Camp Lejeune complex consists of primarily 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. The three sites included under Camp Lejeune Operable Unit No. 1 are located at the Mainside area (WAR, 1983). The general location of these three sites within MCB Camp Lejeune are identified on Figure 2-1.

2.1.3 Topography and Surface Drainage

The generally flat topography of MCB Camp Lejeune is typical of the seaward portions of the North Carolina coastal plain. Elevations on the base vary from sea level to 72 feet above mean sea level (msl); however, the elevation of most of Camp Lejeune is between 20 and 40 feet above msl (WAR, 1983).

Drainage at Camp Lejeune is generally toward the New River, except for areas near the coast, which drain into the Atlantic Ocean via the Intracoastal Waterway. In developed areas, natural drainage has been altered by asphalt pavement, storm sewers, and drainage ditches.

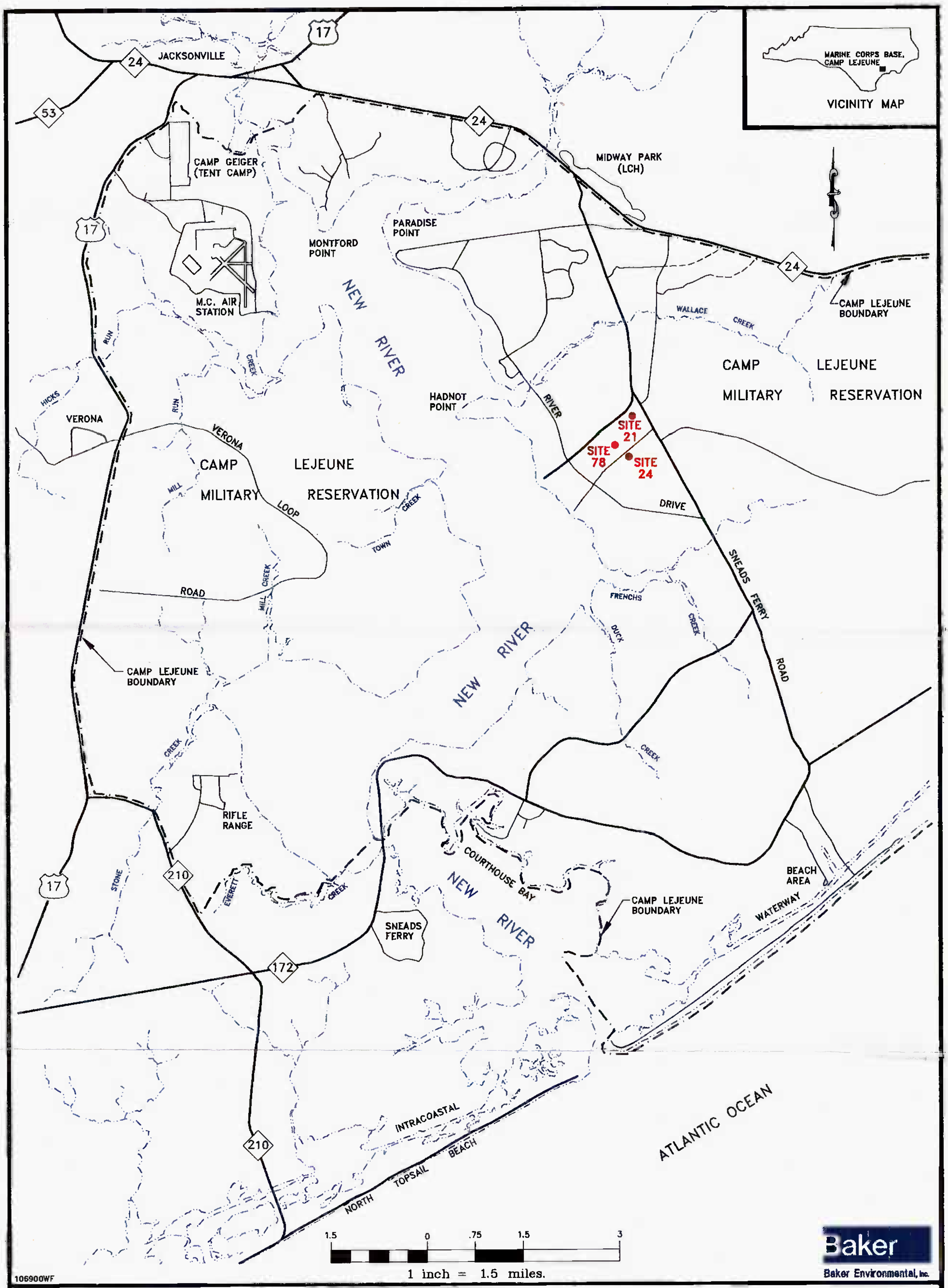


FIGURE 2-1
LOCATION MAP
SITES 78, 21 AND 24

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

Approximately 70 percent of Camp Lejeune is in the broad, flat interstream areas. Drainage is poor in these areas (WAR, 1983).

Flooding is a potential problem for base areas within the 100-year floodplain. The U.S. Army Corps of Engineers has mapped the limits of 100-year floodplain at Camp Lejeune at 7.0 feet above msl in the upper reaches of the New River (WAR, 1983). Only minor portions of Site 24 (near the drainage ways leading to Cogdels Creek) appear to be within the 100-year floodplain. The elevation of the 100-year floodplain increases downstream to 11 feet above msl near the coastal area (WAR, 1983).

2.1.4 Regional Geology

MCB Camp Lejeune is located in the Atlantic Coastal Plain physiographic province. The sediments of the Atlantic Coastal Plain consist of interbedded sands, clays, calcareous clays, shell beds, sandstone, and limestone. These sediments are layered in interfingering beds and lenses that gently dip and thicken to the southeast (ESE, 1992). Regionally, they comprise 10 aquifers and nine confining units which overlie igneous and metamorphic basement rocks of pre-Cretaceous age. These sediments were deposited in marine or near-marine environments and range in age from early Cretaceous to Quaternary time. Table 2-1 presents a generalized stratigraphic column for this area (ESE, 1992).

2.1.5 Regional Hydrogeology

United States Geological Survey (USGS) studies at MCB Camp Lejeune indicate that the Base is underlain by seven sand and limestone aquifers separated by confining units of silt and clay. These include the water table (surficial), Castle Hayne, Beaufort, Peedee, Black Creek, and upper and lower Cape Fear aquifers. The combined thickness of these sediments is approximately 1,500 feet. Less permeable clay and silt beds function as confining units or semi-confining units which separate the aquifers and impede the flow of groundwater between aquifers. A generalized hydrogeologic cross-section of this area is presented in Figure 2-2 which illustrates the relationship between the aquifers in this area (ESE, 1992).

The surficial aquifer is a series of sediments, primarily sand and clay, which commonly extend to depths of 50 to 100 feet. No laterally extensive clay confining units have been encountered in this interval during previous subsurface investigations. This unit is not used for water supply in this part of the Base. In some areas, the surficial aquifer is reported to contain water

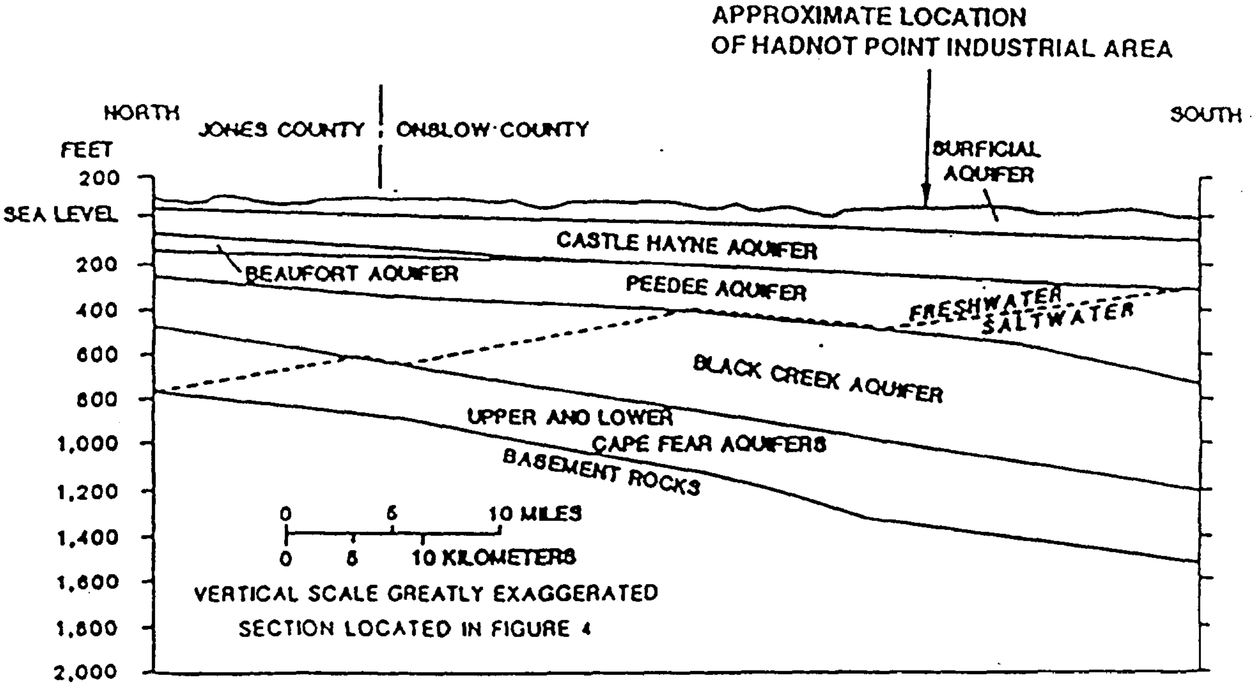
TABLE 2-1

GEOLOGIC AND HYDROGEOLOGIC UNITS IN THE COASTAL PLAIN OF 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 Yorktown aquifer
	Miocene	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) Beaufort aquifer
	Paleocene	Beaufort Formation	
Cretaceous	Upper Cretaceous	Peedee Formation	Peedee confining unit Peedee aquifer
		Black Creek and Middendorf Formations	Black Creek confining unit Black Creek aquifer
		Cape Fear Formation	Upper Cape Fear confining unit Upper Cape Fear aquifer Lower Cape Fear confining unit Lower Cape Fear aquifer
	Lower Cretaceous(1)	Unnamed deposits(1)	Lower Cretaceous confining unit Lower Cretaceous aquifer(1)
Pre-Cretaceous basement rocks		--	--

(1) Geologic and hydrologic units probably not present beneath 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: USGS, 1989.



SOURCE: ESE, 1991

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FIGURE 2-2
GENERALIZED HYDROGEOLOGIC CROSS-SECTION JONES AND ONSLOW COUNTIES, NORTH CAROLINA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

contaminated by waste disposal practices, particularly in the northern and north-central developed areas of the Base (USGS, 1989).

The principal water-supply aquifer for the Base is the series of sand and limestone beds that occur between 50 and 300 feet below land surface. This series of sediments generally is known as the Castle Hayne aquifer. The Castle Hayne aquifer is about 150 to 350 feet thick in the area and is the most productive aquifer in North Carolina (USGS, 1989). Previous investigations in this area indicate that the Castle Hayne aquifer (defined as deeper than 50-100 feet) and the surficial aquifer (defined as less than 50-100 feet) are in hydraulic communication.

Onslow County and Camp Lejeune lie in an area where the Castle Hayne aquifer contains freshwater, although the proximity of saltwater in deeper layers just below this aquifer and in the New River estuary is of concern in managing water withdrawals from the aquifer since overpumping of the deeper parts of the aquifer could cause up coming of saltwater to occur. The aquifer presently contains water having less than 250 mg/L (milligrams per liter) chloride throughout the area of the Base (USGS, 1989).

The aquifers that lie below the Castle Hayne consist of a thick sequence of sand and clay. Although some of these aquifers are used for water supply elsewhere in the Coastal Plain, they contain saltwater in the Camp Lejeune area (USGS, 1989).

Rainfall that occurs in the Camp Lejeune area (and does not exit the site as surface runoff) enters the ground in recharge areas, infiltrates the soil, and moves downward until it reaches the water table, which is the top of the saturated zone. In the saturated zone, ground water flows in the direction of lower hydraulic head, moving through the system to discharge areas like the New River and its tributaries or the ocean (USGS, 1989).

Water levels in wells tapping the surficial aquifer vary seasonally. The surficial aquifer receives more recharge in the winter than in the summer when much of the precipitation evaporates or is transpired by plants before it can reach the water table. Therefore, the water table generally is highest in the winter months and lowest in summer or early fall (USGS, 1989).

2.1.6 Surface Water Hydrology

The dominant surface water feature at MCB Camp Lejeune is the New River. It receives drainage from most of the base. The New River is short, with a course of approximately 50 miles on the central coastal plain of North Carolina. Over most of its course, the New River is confined to a relatively narrow channel entrenched in the 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 and empties into the Atlantic Ocean through the New River Inlet. Several small coastal creeks drain the area of MCB Camp Lejeune that is not drained by 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. (WAR, 1983).

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 three areas of the New River at MCB Camp Lejeune including the Hadnot Point area. The rest of the New River at MCB Camp Lejeune falls into the SA classification (ESE, 1992).

2.1.7 Climatology

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

2.1.8 Natural Resources and Ecological Features

The Camp Lejeune complex is predominantly tree-covered, with large amounts of softwood (shortleaf, longleaf, pond, and primarily loblolly pines) and substantial stands of hardwood species. Approximately 60,000 of the 112,000 acres of Camp Lejeune are under forestry management. Timber producing areas are under even-aged management with the exception of those areas along streams and swamps. These areas are managed to provide both wildlife habitat and erosion control. Forest management provides wood production, increased wildlife populations, enhancement of natural beauty, soil protection, prevention of stream pollution, and protection of endangered species (WAR, 1983).

Upland game species including black bear, whitetail deer, gray squirrel, fox squirrel, quail, turkey, and migratory waterfowl are abundant and are considered in the wildlife management programs (WAR, 1983).

Aquatic ecosystems on MCB Camp Lejeune consist of small lakes, the New River estuary, numerous tributaries, creeks, and part of the Intracoastal Waterway. A wide variety of freshwater and saltwater fish species exist here. Freshwater ponds are under management to produce optimum yields and ensure continued harvest of desirable fish species. Freshwater fish in the streams and ponds include largemouth bass, redbreast sunfish, bluegill, chain pickerel, yellow perch, and catfish. Reptiles include alligators, turtles, and snakes (including venomous) (WAR, 1983).

Wetland ecosystems at MCB Camp Lejeune can be categorized into five habitat types: pond pine or pocosin; sweet gum/water oak/cypress and tupelo; sweet bay/swamp black gum and red maple; tidal marshes; and coastal beaches. Pocosins provide excellent habitat for bear and deer because these areas are seldom disturbed by humans. The presence of pocosin type habitat at Camp Lejeune is primarily responsible for the continued existence of black bear in the area. Many of the pocosins are overgrown with brush and pine species that would not be profitable to harvest. Sweet gum/water oak/cypress and tupelo habitat is found in the rich, moist bottomlands along streams and rivers. This habitat extends to the marine shorelines. Dear, bear, turkey, and waterfowl are commonly found in this type of habitat. Sweet bay/swamp black gum and red maple habitat exist in the floodplain areas of Camp Lejeune. Fauna including waterfowl, mink, otter, raccoon, deer, bear, and gray squirrel frequent this habitat. The tidal marsh at the mouth of the New River is one of the few remaining North Carolina coastal areas relatively free from filling or other manmade changes. This habitat, which consists of marsh and aquatic plants such as algae, cattails, saltgrass, cordgrass, bulrush, and spikerush, provides wildlife with food and cover. Migratory waterfowl, alligators, raccoons, and river otter exist in this habitat. Coastal beaches along the intracoastal waterway and along the outer banks of Camp Lejeune are used for recreation and to house a small military command unit. Basic assault training maneuvers are also conducted along these beaches. Training regulations presently restrict activities that would impact ecological sensitive coastal barrier dunes. The coastal beaches provide habitat for many shorebirds (WAR, 1983).

The Natural Resources and Environmental Affairs (NREA) Division of MCB Camp Lejeune, the U.S. Fish and Wildlife Service, and the North Carolina Wildlife Resource Commission have entered into an agreement for the protection of endangered and threatened species that might inhabit MCB Camp Lejeune. Habitats are maintained at MCB Camp Lejeune for the preservation and protection of rare and endangered species through the base's forest and wildlife management programs. Full protection is provided to such species and critical habitat is designated in management plans to prevent or mitigate adverse effects of base activities. Special emphasis is placed on habitat and sightings of alligators, osprey, bald eagles, cougars, dusky seaside sparrows, and red-cockaded woodpeckers (WAR, 1983).

Within 15 miles of Camp Lejeune are three publicly owned forests: Croatan National Forest; Hofmann Forest; and Camp Davis Forest. The remaining land surrounding Camp Lejeune is primarily used for agriculture. Typical crops include soybeans, small grains, and tobacco (WAR, 1983).

2.1.9 Land Use

Camp Lejeune presently covers an area of approximately 170 square miles. Military and civilian population is approximately 60,000. During World War II, Camp Lejeune was used as a training area to prepares Marines for combat. This has been a continuing function of the facility during the Korean and Vietnam conflicts, and the recent Gulf War (i.e., Desert Storm). Toward the end of World War II, the camp was designated as a home base for the Second Marine Division. Since that time, Fleet Marine Force (FMF) units also have been stationed here as tenant commands.

2.1.10 Water Supply

MCB Camp Lejeune water is supplied entirely from groundwater. Groundwater is obtained from approximately 90 water supply wells and treated. There are eight water treatment plants with a total capacity of 15.821 million gallons per day (MGD). Groundwater usage is estimated at over 7 MGD (USGS, 1989).

The water supply wells are all located within the boundaries of the Base. The average water supply well at the base has a depth of 162 feet, a casing diameter of 8 inches, and yields 174 gpm (USGS, 1989).

All of the water supply wells utilize the Castle Hayne aquifer. The Castle Hayne aquifer is a highly permeable, semiconfined aquifer that is capable of yielding several hundred to 1,000 gallons per minute in municipal and industrial wells in the Camp Lejeune area. The water retrieved is typically a hard, calcium bicarbonate type.

As shown on Figure 2-3, there are eight potable water supply wells located within or nearby Operable Unit No. 1. The depths of these wells range from 160 to 225 feet. They are screened in intervals ranging from 45 feet to 225 feet. Pertinent well information for these eight supply wells are summarized on Table 2-2.

2.2 Site 78 - Hadnot Point Industrial Area

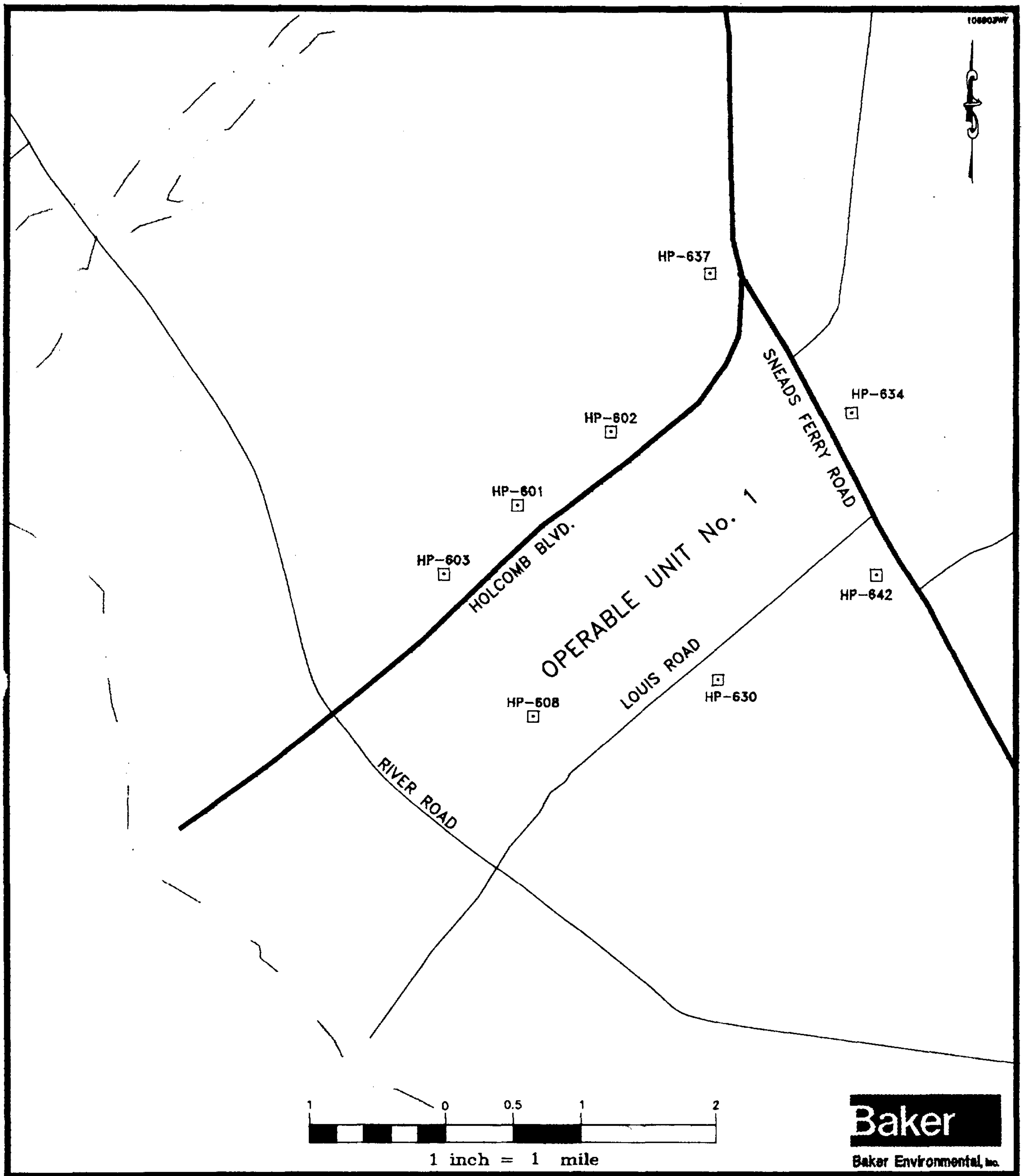
This section addresses the background and setting of Site 78 - the Hadnot Point Industrial Area (HPIA).

2.2.1 Site Location and Setting

Site 78 (HPIA) houses the industrial area of Camp Lejeune. This area is comprised of maintenance facilities, warehouses, painting shops, printing shops, auto body shops, etc. In general, the HPIA is defined as the area bounded by Holcomb Boulevard to the west, Sneads Ferry Road to the north, Duncan Street to the east, and the Main Service Road to the south (see Figure 2-4). The site covers approximately 590 acres. Much of the area is paved (e.g., roadways, parking lots, loading dock areas, and storage lots), however, there are many lawn areas associated with the individual buildings at HPIA and along long stretches of roadways. In addition, there are many areas of open unpaved lots along with many acres of wooded areas.

2.2.2 Site Topography and Drainage

MCB Camp Lejeune is situated on relatively flat coastal terrain which includes swamps, estuaries, savannas, and forest lands. The land within Site 78 is relatively flat with surface elevations ranging between 22 to 32 feet above mean sea level.



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LEGEND

⊡ HP-608 POTABLE WATER SUPPLY WELL

FIGURE 2-3
LOCATION OF NEARBY POTABLE WATER SUPPLY WELLS
OPERABLE UNIT No. 1

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

TABLE 2-2

SUMMARY OF POTABLE WATER SUPPLY WELL INFORMATION

Supply Well Number	Well Depth (feet)	Screened Intervals (feet)	Well Diameter (inches)
HP-601	195	45-60 95-100 115-130 175-195	8
HP-602	160	70-80 100-105 120-125 145-150 155-160	8
HP-603	195	70-80 100-110 130-140 160-170 190-195	8
HP-608	161.5	61.5-81.5 91.5-101.5 121.5-131.5 151.5-161.5	8
HP-630	176	62-67 87-92 107-117 127-142 152-162	8
HP-634	225	65-70 73-78 83-88 93-98 107-117 124-129 135-140 153-163 170-175 195-200 215-225	8
HP-637	172	90-98 102-114 120-128 140-148 156-172	8
HP-642	210	112-124 136-144 157-163 174-178 188-196	8

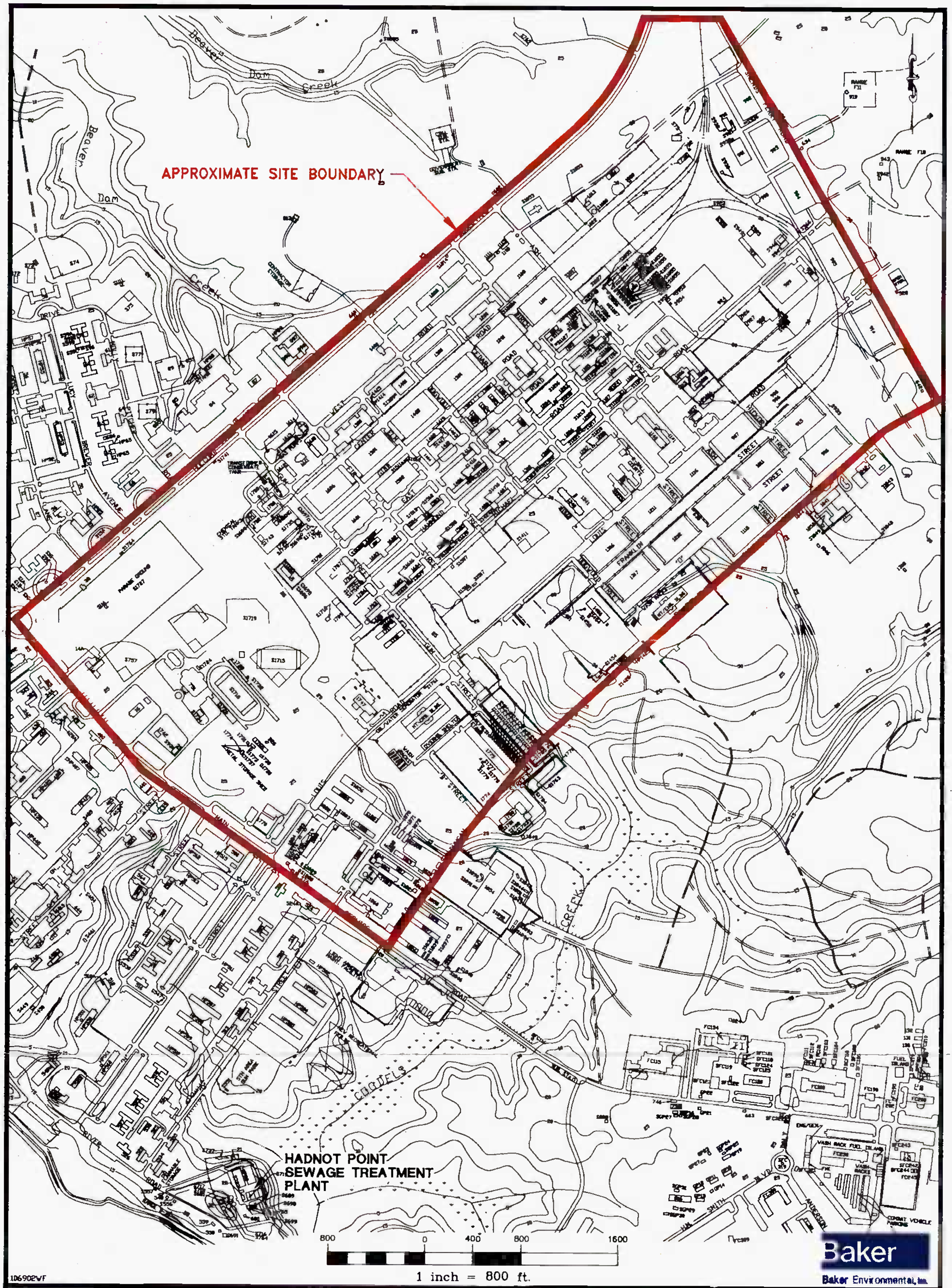

FIGURE 2-4
SITE MAP
SITE 78-HPIA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

SOURCE: LANTDIV, FEBRUARY 1992

The majority of the area within Site 78 is paved. Natural drainage has been altered by the installation of drainage ditches, storm sewers, and extensive paving. Surface runoff not intercepted by a manmade structure from southern portions of the site may drain to Cogdels Creek. Surface runoff from some areas in the northwestern portions of the site may drain to Beaver Dam Creek.

No wetland areas were identified at Site 78, based on a review of National Wetlands Inventory (NWI) maps.

2.2.3 Site History

The HPIA, constructed in the late 1930s, was the first facility at MCB Camp Lejeune. It was comprised of approximately 75 buildings and facilities including: maintenance shops, gas stations, administrative offices, commissaries, snack bars, warehouses, storage yards, and a dry cleaning facility.

There is presently no known uncontrolled disposal of wastes related to the various industrial activities at the site. Due to the industrial nature of the site, many spills and leaks have occurred over the years. Most of these spills and leaks have consisted of petroleum-related products and solvents from underground storage tanks, drums, and uncontained waste storage areas. There is also evidence of spent solvents being disposed onto the ground.

2.2.4 Site Geology and Hydrogeology

Site specific geologic information is limited to information obtained during the installation of monitoring wells. Twenty-seven (27) shallow (25 foot) monitoring wells, seven (7) intermediate (50 foot) monitoring wells and six (6) deep (100+ feet) monitoring wells have been installed at HPIA.

The subsurface at HPIA is composed primarily of unconsolidated sand, silt and clay. A geologic cross-section, generated from lithologic information obtained during previous investigations is presented in Figure 2-5. No laterally continuous clay confining units have been encountered in the HPIA subsurface. It is thus expected that the shallow (25 foot) and deeper (100+ foot) portions of the aquifer are in hydraulic communication.

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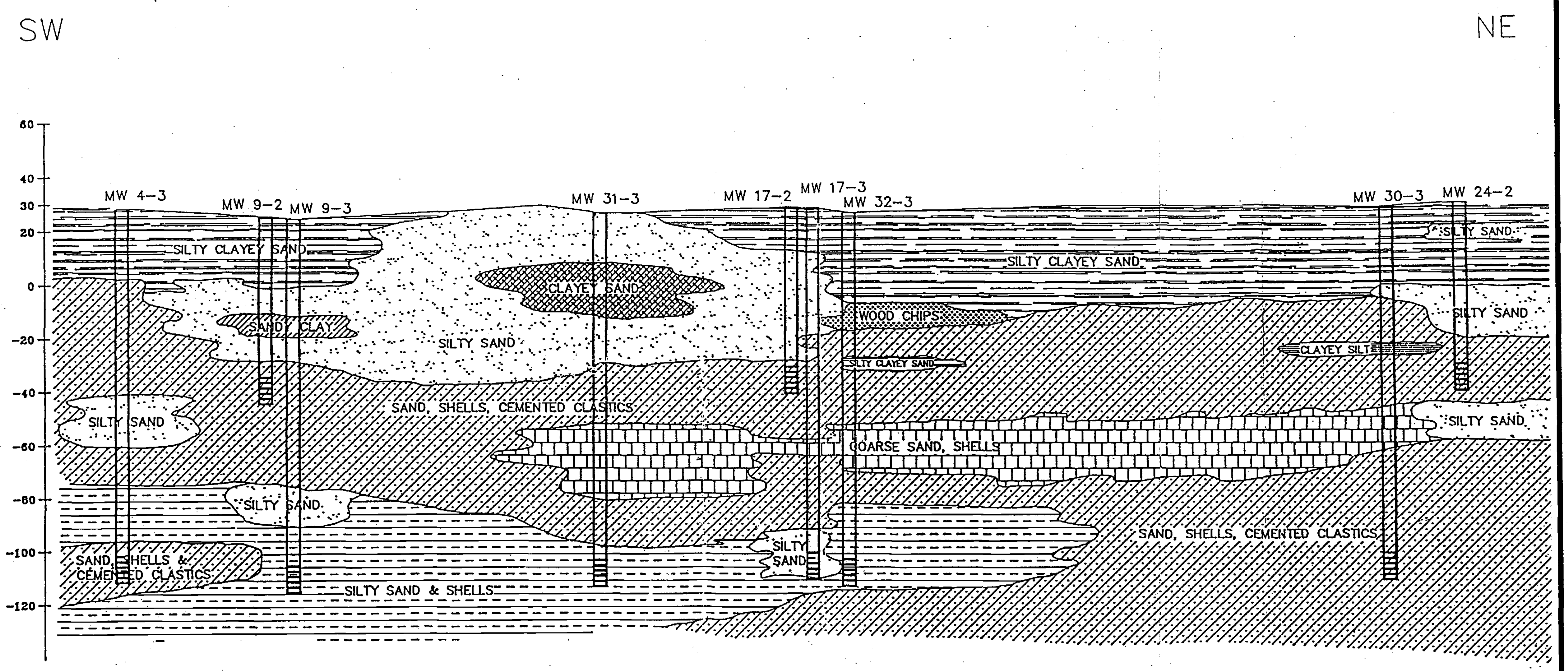


Baker Environmental, Inc.

SOURCE: ESE, 1992

400 0 200 400 800

1 inch = 400 ft.

HORIZONTAL SCALE

40 0 20 40 80

1 inch = 40 ft.

VERTICAL SCALE

FIGURE 2-5
GENERALIZED CROSS SECTION
HADNOT POINT INDUSTRIAL AREA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

01491EE032

Based on water level measurements from the numerous monitoring wells at the HPIA, groundwater flow is generally to the southwest, toward the New River. Table 2-3 presents water elevation measurements collected on January 25, 1991 and February 20, 1991 from 42 monitoring wells. Well information (depth, size, screened interval) is also listed on this table. Some groundwater mounding occurs in the southern part of the site. This may be the result of variations in groundwater discharge throughout the site due to urban features (buildings, parking lots, storm drains).

2.2.5 Previous Investigations and Findings

2.2.5.1 Initial Assessment Study - Site 78

In response to the passage of CERCLA, the DoN initiated the Navy Assessment and Control of Installation Pollutants Program (NACIP) to identify, investigate, and clean up past hazardous waste disposal sites at Navy installations. The NACIP investigations were conducted by the Naval Energy and Environmental Support Activity (NEESA) and consisted of Initial Assessment Studies (IAS) and Confirmation Studies. IAS are similar to the USEPA Preliminary Assessments/Site Investigations (PA/SI). Confirmation Studies are similar to USEPA's RI/FS. When SARA was passed in 1986, the DoN dissolved the NACIP in favor of the Installation Restoration Program (IRP), which adopted USEPA Superfund terminology and procedures.

The IAS for Camp Lejeune was conducted by Water and Air Research, Inc., (WAR) in 1983. The IAS identified a number of sites at MCB Camp Lejeune as potential sources of contamination, including the sites discussed in this RI/FS Work Plan. Based on historical records, aerial photographs, field inspections, and personnel interviews, the IAS identified 76 sites at MCB Camp Lejeune as potential sources of contamination. Of these 76 sites, 22 of them were evaluated (based on contamination characteristics, migration pathways, and pollutant receptors) to warrant further investigation to assess potential long-term impacts. Sites 21 and 24 were among these 22 sites. The HPIA (Site 78) was later added to the list of sites to be further evaluated.

TABLE 2-3

SITE 78 MONITORING WELL INFORMATION AND MEASURED WATER LEVELS

Well I.D.	Well Depth (feet)	Screened Intervals (feet)	Well Diameter (inches)	Water Elevation (MSL)	
				1/25/91	2/20/91
HPGW1	25	5-25	2	NM	8.57
HPGW2	20	5-20	2	25.56	24.08
HPGW3	25	5-25	2	9.68	11.81
HPGW4	24.5	4.5-24.5	2	8.48	8.91
HPGW4-2	78	65-78	4	8.68	9.09
HPGW4-3	153	140-153	4	NM	9.09
HPGW5	25	5-25	2	14.47	15.15
HPGW6	25	5-25	2	9.32	10.41
HPGW7	25	5-25	2	11.08	11.42
HPGW8	25	5-25	2	12.63	13.09
HPGW9	25	5-25	2	NM	11.52
HPGW9-2	75	55-75	2	10.03	10.55
HPGW9-3	150	130-150	2	NM	10.94
HPGW10	25	5-25	2	13.39	13.47
HPGW11	25	5-25	2	11.97	12.55
HPGW12	25	5-25	2	16.31	16.43
HPGW13	25	5-25	2	11.83	12.18
HPGW14	25	5-25	2	13.68	14.10
HPGW15	25	5-25	2	NM	15.47
HPGW16	25	5-25	2	17.99	18.27
HPGW17	25	5-25	2	16.11	16.49
HPGW17-2	73	53-73	2	15.63	16.10
HPGW19	25	5-25	2	19.33	19.06
HPGW20	25	5-25	2	14.52	14.65
HPGW21	25	5-25	2	19.41	21.07
HPGW22	25	5-25	2	NM	22.23
HPGW23	25	5-25	2	NM	19.35
HPGW24	25	5-25	2	23.77	23.97
HPGW24-2	76.5	56.5-76.5	2	16.00	16.26
HPGW24-3	148	128-148	2	18.38	19.31
HPGW25	25	5-25	2	22.28	23.01
HPGW26	25	5-25	2	NM	22.73
HPGW29	25	5-25	2	NM	6.46
HPGW30-2	78	65-78	4	16.45	17.34
HPGW30-3	153	140-153	4	16.30	16.83
HPGW31-2	78	65-78	4	13.06	13.53
HPGW31-3	153	140-153	4	13.12	13.46
HPGW32-2	77	64-77	4	15.16	15.59
HPGW32-3	153	140-153	4	14.69	15.31
21GW1	NA	NA	NA	NM	18.68
22GW1	NA	NA	NA	19.83	20.65
22GW2	NA	NA	NA	19.08	18.91

NOTES:
MSL = Mean Sea Level
NM = Not Measured
NA = Information is Not Available

2.2.5.2 Confirmation Study for HPIA

As a result of the IAS, Environmental Science and Engineering, Inc. (ESE) was contracted by LANTDIV to investigate the HPIA. ESE conducted a two part confirmation study which focused on the potential source areas at HPIA identified in the IAS. The confirmation study included a Verification Step and a Characterization Step. The findings from both of these steps are described below.

Verification Step

The Verification Step of the HPIA was conducted from April 1984 through January 1985. During this study, geological and groundwater quality investigative efforts were conducted at specific study areas within and adjacent to the HPIA (areas identified by the IAS). As part of this investigation, two shallow monitoring wells were installed near the HPIA Fuel Farm (Site 22) to assess whether fuel-derived contamination was present. (Note that Site 22 is being remediated under the Underground Storage Tank program; therefore, it is not included as part of this RI/FS.) One of the wells (22GW1) was installed within the fuel farm area. The second well (22GW2) was installed approximately 500 feet northwest of the fuel farm. The results of this part of the investigation identified the presence of volatile organic compounds (VOCs) in the monitoring well near the HPIA Fuel Farm and in Supply Well 602 (Figure 2-3). Supply Well 602 is located near the intersection of Holcomb Boulevard and Ash Street, approximately 1,200 feet northwest of the fuel farm. Maximum contaminant levels detected in the shallow aquifer included: benzene at 17,000 micrograms per liter (µg/L) and toluene at 27,000 µg/L. Benzene was detected in Supply Well 602 at a level of 380 µg/L (Baker, 1992b).

As a result of the Confirmation Study sampling and analysis, MCB Camp Lejeune closed Supply Well 602 and initiated a sampling program between December 1984 and November 1986 that included all water supply wells within HPIA. The results of this sampling identified that three additional supply wells (601, 608, and 634) were contaminated with VOCs. No compounds were detected in the samples from the other nearby supply wells. Table 2-4 presents a summary of the detected compounds found in the supply wells during this sampling program. Maximum contaminant levels in supply wells 601, 608 and 634 included: trichloroethylene (TCE) at 230 µg/L in Well 601, TCE at 110 µg/L in Well 608, and TCE at 1300 µg/L in Well 634. Other compounds detected in wells 601, 608 and 634 included benzene, trans-1,2-dichloroethene (T-1,2-DCE), tetrachloroethene, and methylene chloride. The four supply wells with detected concentrations were immediately shut down by Camp Lejeune

TABLE 2-4

SUMMARY OF DETECTED ORGANIC COMPOUNDS IN GROUNDWATER COLLECTED FROM HPIA SUPPLY WELLS DURING CONFIRMATION STUDY (1984-1986)

Detected Compounds	Range of Detected Concentrations (µg/L)				
	Supply Wells				
	601	602	608	634	637
Benzene	ND(1)	50 - 720	3.7 - 4.0	ND	ND
1,2-Dichloroethane	ND	9.2 - 46	ND	ND	ND
Trans-1,2-Dichloroethene	8.8 - 99	7.8 - 630	2.4 - 8.5	2.3 - 700	ND
Ethylbenzene	ND	8	ND	ND	ND
Trichloroethylene	26 - 230	2.2 - 1,600	13 - 110	1,300	ND
Tetrachloroethene	4.4 - 5	24	ND	10	ND
Toluene	ND	10 - 54	ND	ND	ND
Trichlorofluoromethane	ND	3	ND	ND	ND
Methylene Chloride	10	ND	14	130	ND
Vinyl Chloride	ND	18	ND	ND	ND

(1) ND = Detected below method detection limit.

utilities staff. Investigations at HPIA were given the highest priority within the overall Confirmation Study (ESE,1988).

Characterization Step

The Characterization Step (the final field investigative step in the Confirmation Study process) was performed at the HPIA in 1986 through 1988. The investigation was designed to define the extent of the VOC contamination identified in the Verification Step. The Characterization Step consisted of the following tasks: (1) records search including review of available base records and a physical inspection of each building within HPIA; (2) soil gas survey targeted to those areas identified by the records search as being potential contamination sources; (3) installation of 27 shallow, three intermediate, and three deep monitoring wells, and sampling of all HPIA monitoring wells and nearby water supply wells; and (4) aquifer testing to evaluate the hydraulic parameters of the deep aquifer. A brief summary of the findings from these tasks follows.

Records Search

A detailed records and physical search within HPIA was conducted to identify the presence of potential waste solvent disposal activities that could account for the observed VOC contamination in the aquifer. The results of this search, which are presented in the ESE Characterization Step Report, May 1988, identified the presence of several primary potential source areas for waste solvent material within HPIA. These included:

- Buildings 901, 902, 903 - TCE underground storage tank (UST), engine degreasing within a large area between Buildings 902 and 903 and along the railroad lines;

- Building 1100 - former service station, solvent usage, drum of 1,1,2,2-tetrachloroethene reportedly leaked onto the ground;

- Building 1202 - maintenance shop, VOC storage and usage;

- Building 1300 - cold storage facility and maintenance shop, solvent usage;

- Buildings 1502, 1601, 1602 - heavy vehicle maintenance facility, TCE UST, heavy solvent and petroleum, oil, and lubricant storage and usage, ground staining; and

- Buildings 1709, 1710 - combat vehicle maintenance area, paint shop, and general maintenance area, underground 'waste' tanks, bags of soil labeled as "contaminated".

Soil Gas Survey

Several soil gas samples were collected from each potential source areas identified in the records search. VOC contamination was detected in the soil gas in the following building areas: Buildings 901, 902, and 903; Building 1100; Building 1202; Building 1300; Buildings 1502, 1601, and 1602; and Buildings 1709 and 1710. A brief description of the soil gas findings are presented below. The actual results of the soil gas survey are presented in the Characterization Step Report for HPIA prepared by ESE, Inc. (ESE, 1988).

TCE vapors were detected between Buildings 902 and 903 at a level of 1,497 parts per billion (ppb). A soil gas sample along the railroad line near Building 901 recorded a TCE vapor level of 570 ppb. These findings and the documented history of TCE usage throughout this area strongly suggest that VOC contamination is present in the groundwater (ESE, 1988).

A single value of TCE (152 ppb) was detected to the west of Building 1100 (ESE, 1988).

TCE vapors were detected in several samples collected around the Building 1202 area (mostly along Gibb Road) at values ranging from 15 ppb to 36,700 ppb. The highest vapor concentrations appeared to be between Buildings 1202 and 1201, and across Birch Street, near Building 1102. These areas correspond with use and disposal history of solvents at Building 1202 (ESE, 1988).

A single value of TCE (295 ppb) was detected on the eastern side of Building 1300. Since Building 1300 has a maintenance shop it was included as a separate potential source of contamination (ESE, 1988).

The soil vapors in the area between Building 1601 and 1502 contained high concentrations of TCE. The detected levels were as high as 703,000 ppb (this was the highest soil gas vapor detected during the survey). TCE vapors were detected at most of the sampling locations surrounding Buildings 1601 and 1502 (ESE, 1988).

TCE was identified in the soil vapors in two locations south of Building 1709. These samples were located adjacent to bags of soil marked as contaminated. The detected TCE concentrations in these two samples were 35 ppb and 53,000 ppb. In several of the samples obtained south of Building 1710, an extremely high method detection limit needed to be employed due to dilution of the samples in an attempt to resolve a large unknown peak in the data. It appeared (possibly by visual observation) that a large amount of oil and grease was present in the soil in this vicinity (ESE,1988).

Monitoring Well Installation and Sampling

A total of 33 monitoring wells (27 shallow, 3 intermediate, and 3 deep) were installed at HPIA during this investigation to enable identification at the subsurface geologic units, assess the groundwater flow directions, and characterize the geochemical character of the groundwater at HPIA. The location of these wells were based on the soil gas survey data and conclusions. The 33 wells plus two shallow monitoring wells previously installed at Site 22 (Hadnot Point Fuel Farm) and five Camp Lejeune water supply wells were sampled and analyzed as part of the Characterization Step (ESE, 1988).

The shallow wells and the existing monitoring wells at Site 22 were sampled three times: January 1987, March 1987, and May 1987. The analytical results indicated that three primary zones of contamination were present in the shallow aquifer at HPIA, centered in the vicinity of Building 902, Site 22, and Building 1602 (ESE, 1988). Appendix A contains the analytical data from the Characterization Study.

After analysis of the data from the shallow wells, it was determined that groundwater quality data from the deeper aquifer zones were needed. At each of three potential source areas, an intermediate well (approximately 75 feet deep) and a deep well (approximately 150 feet deep) were installed. The potential source areas included: Buildings 901,902, and 903; Building 1202; and Building 1601. The analytical results from one round of sampling of these wells identified VOC contamination only in the deep wells near Buildings 1202 and 1601. Note that methyl ethyl ketone (MEK) was the only VOC detected in these wells. MEK was not detected in any of the shallow groundwater samples (ESE, 1988). The analytical results from the Characterization Study are presented in Appendix A.

Aquifer Testing

A 72-hour pump test was conducted utilizing Water Supply Well 642, located in the northeast corner of HPIA (Figure 2-3). This test was conducted to determine the aquifer coefficients for the deeper aquifer zone. The results, which were analyzed by a number of analytical methods, indicated that the aquifer transmissivity ranged from $6.1x10^3$ to $1.3x10^4$ gallons per day per foot (gpd/ft). Storage ranged from $5x10^{-4}$ to $1x10^{-3}$ (ESE, 1988).

2.2.5.3 Supplemental Characterization Step

A Supplemental Characterization Step, performed at HPIA in 1990 through 1991, was designed to further evaluate the extent of contamination in the deep portion of the aquifer and to characterize the contamination within the shallow soils at suspected source locations. This study consisted of 30 soil borings at three suspected source locations (Buildings 902, 1202, and 1601) for the characterization of shallow soil contamination, installation of additional intermediate and deep monitoring wells, and the collection of samples from all new and existing HPIA monitoring wells and several nearby water supply wells (ESE, 1992).

Shallow Soil Sample Results

Thirty shallow soil borings were performed at HPIA to evaluate the extent of shallow soil contamination in three areas of concern (Buildings 1601, 902, and 1202). Ninety-six soils samples (including nine duplicates) were collected. Eight of the samples and one duplicate were analyzed for full Target Compound List (TCL) organics and Target Analyte List (TAL) inorganics. The other 87 samples were analyzed for TCL VOCs, pesticides, and polychlorinated biphenyls (PCBs), and Toxicity Characteristic Leaching Procedure (TCLP) metals.

In general, the soil samples from the Building 902 area identified 1,2-DCE (55 ppm, 120 ppm) and TCE (120 ppm) at one boring location; and phenanthrene (500 ppm), fluoranthene (690 ppm), and pyrene (530 ppm) at another boring location.

The soil samples from Building 1202 contained ethylbenzene and xylene at one boring location at a depth of 8 to 10 feet (near the water table depth). The boring near Building 1103 identified pesticides including dieldrin, 4,4-DDE, and 4,4-DDT at concentrations ranging from 38 to 140 ppb at a depth of 0 to 2 feet. The boring located near Building 1300 identified PCBs

(Aroclor-1260) at concentrations ranging from 290 to 1800 ppb to a depth of six feet. Low levels of the pesticides heptachlor epoxide (12 ppb) and endosulfan I (16 ppb) were detected in this boring at a depth of 2 to 4 feet.

The soil samples collected from the Building 1602 area did not reveal any quantifiable volatile or semivolatile contamination. Pesticides (dieldrin, 4,4-DDE, and 4,4-DDT) were detected at a depth of 0 to 2 feet at one boring location near Building 1601. The detected concentrations of these pesticides ranged from 40 to 92 ppb. Various metals with the exception of silver and mercury were detected in the majority of all of the soil samples collected at the three building areas (ESE, 1992).

The analytical results from the Supplemental Characterization Study are presented in Appendix B.

Groundwater Sample Results

Twenty-six (26) of the 27 existing shallow groundwater monitoring wells were sampled and analyzed for full TCL parameters. One of the monitoring wells (HPGW18) could not be located. In general, the analytical results indicated that benzene, toluene, ethylbenzene, and xylene (BTEX) constituents were identified at the Building 902 area, near the railroad tracks south of Building 902, near the fuel farm (Site 22), and near Building 1601. Other VOCs such as TCE were identified in the same areas in addition to the areas near Buildings 1301, 1709, and 1100.

The results from the intermediate and deep monitoring wells indicated that BTEX constituents were detected downgradient of the fuel farm. Minor levels of BTEX were also detected near the railroad tracks south of Building 902, near Building 1301, and in the area between Buildings 1601 and 1709. Supply Well 602 had detectable levels of BTEX. Other VOCs were detected in the wells near the railroad tracks, and near Buildings 1202 and 1601. Supply Wells 634 and 637 also had detected levels of VOCs. Minor levels of semivolatiles (such as polyaromatic hydrocarbons [PAHs]) were detected near the railroad tracks and near Building 1202.

The analytical results from the Supplemental Characterization Step are presented in Appendix B.

2.2.5.4 Remedial Investigation for the Shallow Soils and Castle Hayne Aquifer at HPIA

ESE conducted an RI for shallow soils and the Castle Hayne Aquifer at HPIA the results of which are provided as present in the three volume April 1992 RI Report. The purpose of this investigation was to delineate the horizontal and vertical extent of contamination within the surficial and lower water bearing zones. In addition, soil contamination within the shallow soils at suspected source locations was characterized as to its nature and extent. This RI report used the data from these previous ESE investigations: Confirmation Study (Verification Step and Characterization Step) and the Supplemental Characterization Step (ESE, 1992).

The RI report concluded that while TCE and other VOCs were the primary concern during the soil gas survey, these compounds were detected in few of the soil samples collected. The only TCE detection in soils appears to be associated with an old TCE UST at Building 902. The detected semivolatiles are fuel related and fit with the use of the area (Building 1202) as vehicle repairs and maintenance. Pesticide contamination is limited and occurs in the surface soils. Many of the metals detected were found in all samples analyzed and therefore may be indicative of the naturally occurring soil matrix and associated clays (ESE, 1992).

2.2.5.5 Interim Remedial Action Remedial Investigation for the Shallow Aquifer at HPIA

Baker Environmental, Inc. (Baker) conducted an interim remedial action (IRA) RI for the shallow aquifer at HPIA, the results of which are provided in the May 1992 RI Report. The objectives of this investigation were: (1) to determine the nature and extent of shallow groundwater contamination in the shallow aquifer at two areas of concern within the HPIA, (2) to qualitatively assess human health risks associated with future potential use of the shallow aquifer, and (3) to document and evaluate existing information pertaining to the shallow aquifer to support the selection of an IRA alternative. This RI report used the data from previous investigations only; no additional field studies were conducted (Baker, 1992a). A summary of the data used for this RI is presented in Appendix C.

The IRA RI report concluded that three contaminant plumes were identified within the HPIA; however, one of the plumes is associated with the Hadnot Point Tank Farm (Site 22) which is being remediated under a separate investigative program. One of the other plumes is located east of Cedar Street and extends from the vicinity of the 900 Building area to the tank farm. The plume exhibits solvent contamination and low levels of fuel-related contamination. The other plume is believed to originate in the vicinity of Buildings 1502, 1601, and 1602. This plume is contaminated with the same constituents as the other plume with the exception of lead. Lead is a containment of concern at the site since it is above naturally occurring levels (Baker, 1992a). Figures 2-6 through 2-9 present isoconcentration maps for BTEX, TCE, 1,2-DCE, and total lead, respectively. These maps were based on the January 1991 sampling data collected as part of the Supplemental Characterization Study.

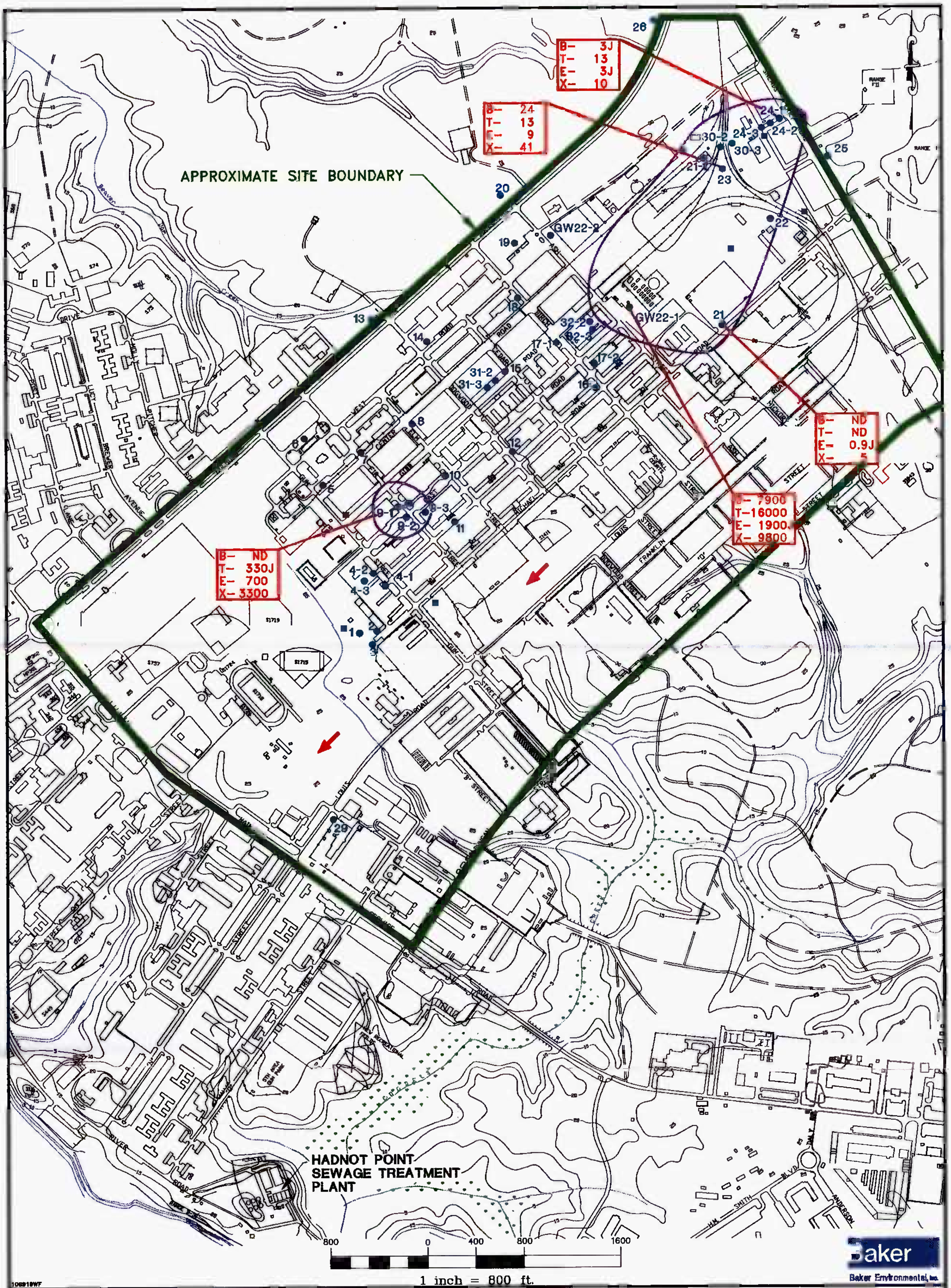
As part of this IRA RI, a qualitative risk assessment was performed to identify receptors and exposure pathways, quantify exposure levels, and evaluate human and/or environmental risk. The contaminants of concern for the site were identified as solvents (TCE and 1,2-DCE), BTEX, semivolatiles (naphthalene and 2-methylnaphthalene), and inorganics (antimony, arsenic, beryllium, chromium, lead, manganese, mercury, nickel, and iron). The qualitative risk assessment concluded that benzene and TCE may impact human health if shallow groundwater migrates into the deep aquifer (potable water), or if the shallow aquifer is utilized in the future as a potable water source (Baker, 1992a).

2.2.5.6 Prescoping Geophysical Survey and Groundwater (Intermediate and Deep Aquifer) Investigation

Prescoping activities were conducted at the site in order to help design the scope for the RI/FS activities included in this work plan and to verify the location of several suspected USTs within HPIA. The prescoping activities included a geophysical survey and groundwater sampling. Both of these activities are described below.

In June 1992, Weston Geophysical conducted a geophysical survey investigation of several suspected underground storage tank areas at Buildings 903, 1202, 1502, and 1601. Potential tanks were identified at Buildings 903, 1502, and 1601. No tanks were identified near Building 1202. The results of the geophysical survey are included in Appendix D of this Work Plan.

In July 1992, Baker collected a round of groundwater samples from several existing intermediate and deep monitoring wells: GW9-2, GW9-3, GW31-2, GW24-2, GW24-3, GW31-3, GW32-2, AND GW32-3. These particular wells were selected for sampling in order to obtain groundwater data from the deeper aquifers in areas where the shallow aquifer has been impacted. In addition, water supply wells 602 and 637 were sampled. The samples were analyzed for full TCL Target Analyte List (TAL) parameters. BTEX was detected in



LEGEND

29 ● EXISTING MONITORING WELL LOCATION

APPROXIMATE GROUNDWATER FLOW DIRECTION

B-BENZENE
T-TOLUENE
E-ETHYLBENZENE
X-XYLENE

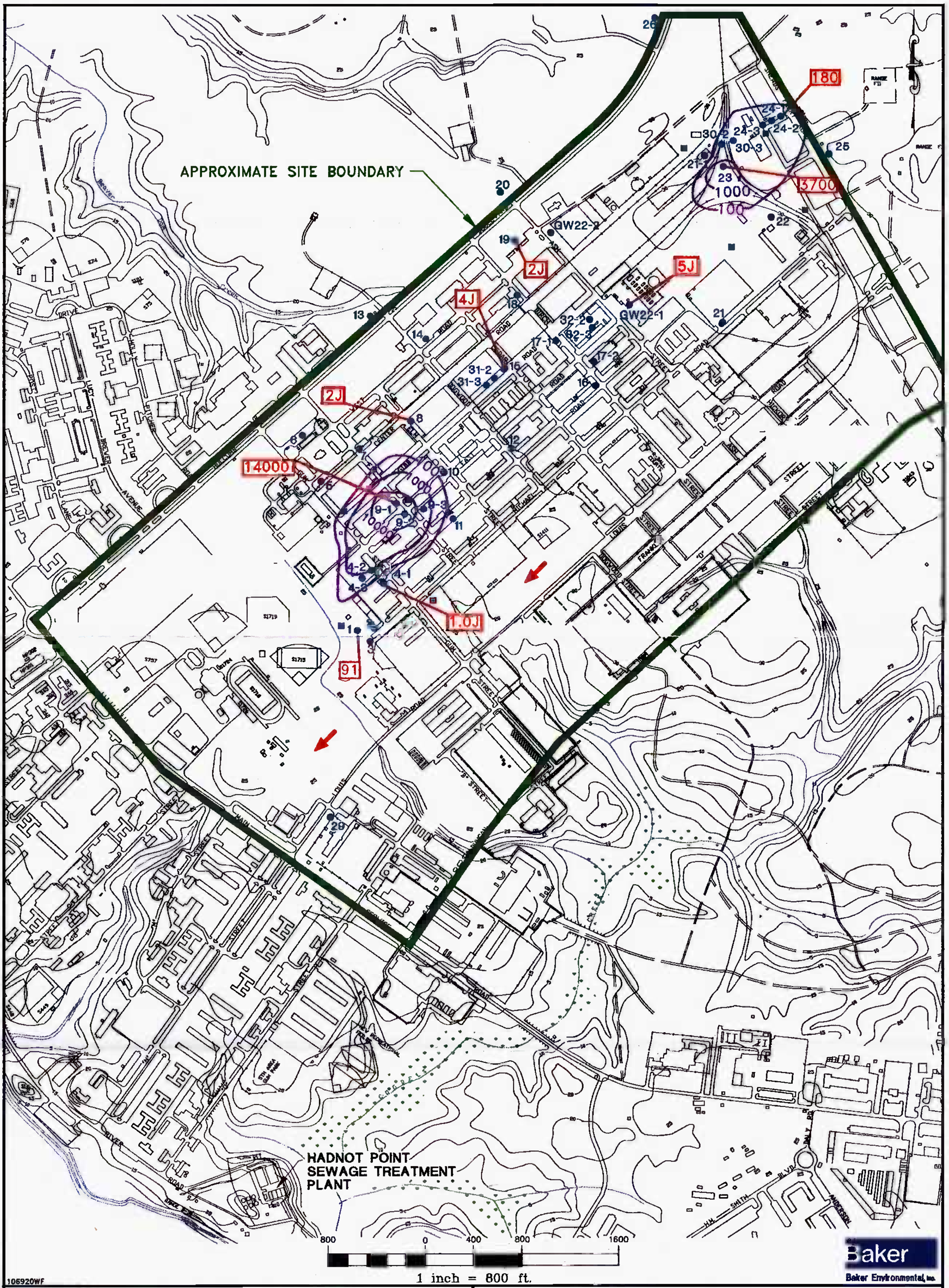
ND-NOT DETECTED
J -ESTIMATED VALUE
○ APPROXIMATE AREA OF BTEX GROUNDWATER CONTAMINATION

CONCENTRATIONS PRESENTED IN ug/L (ppb)
FROM 1/91 DATA
SOURCE: LANTDIV, FEBRUARY 1992

FIGURE 2-6
BENZENE, TOLUENE, ETHYLBEZENE AND XYLENE (BTEX) DETECTED IN SHALLOW MONITORING WELLS HADNOT POINT INDUSTRIAL AREA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

01491EEBIY



LEGEND

29 ● EXISTING MONITORING WELL LOCATION

91 TCE (TOTAL) CONCENTRATION

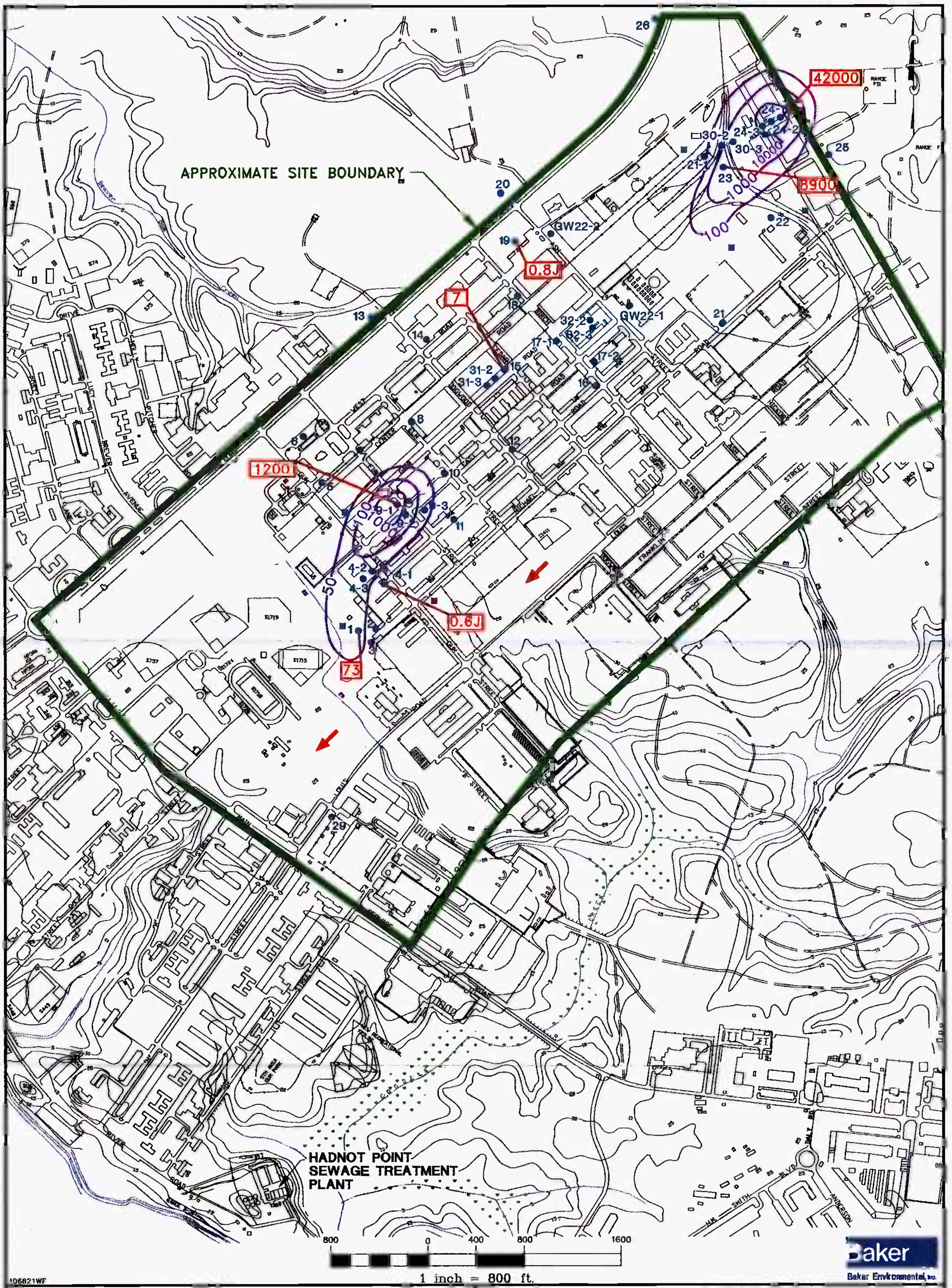
–100– TCE (TOTAL) CONCENTRATION CONTOUR

J ESTIMATED VALUE

APPROXIMATE GROUNDWATER FLOW DIRECTION

CONCENTRATIONS PRESENTED IN ug/L (ppb) FROM 1/91 DATA
SOURCE: LANTDIV, FEBRUARY 1992

FIGURE 2-7
TOTAL TCE DETECTED
IN SHALLOW MONITORING WELLS
HADNOT POINT INDUSTRIAL AREA
MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA



LEGEND

29 ● EXISTING MONITORING WELL LOCATION

1200 DCE (TOTAL) CONCENTRATION

—100— DCE (TOTAL) CONCENTRATION CONTOUR

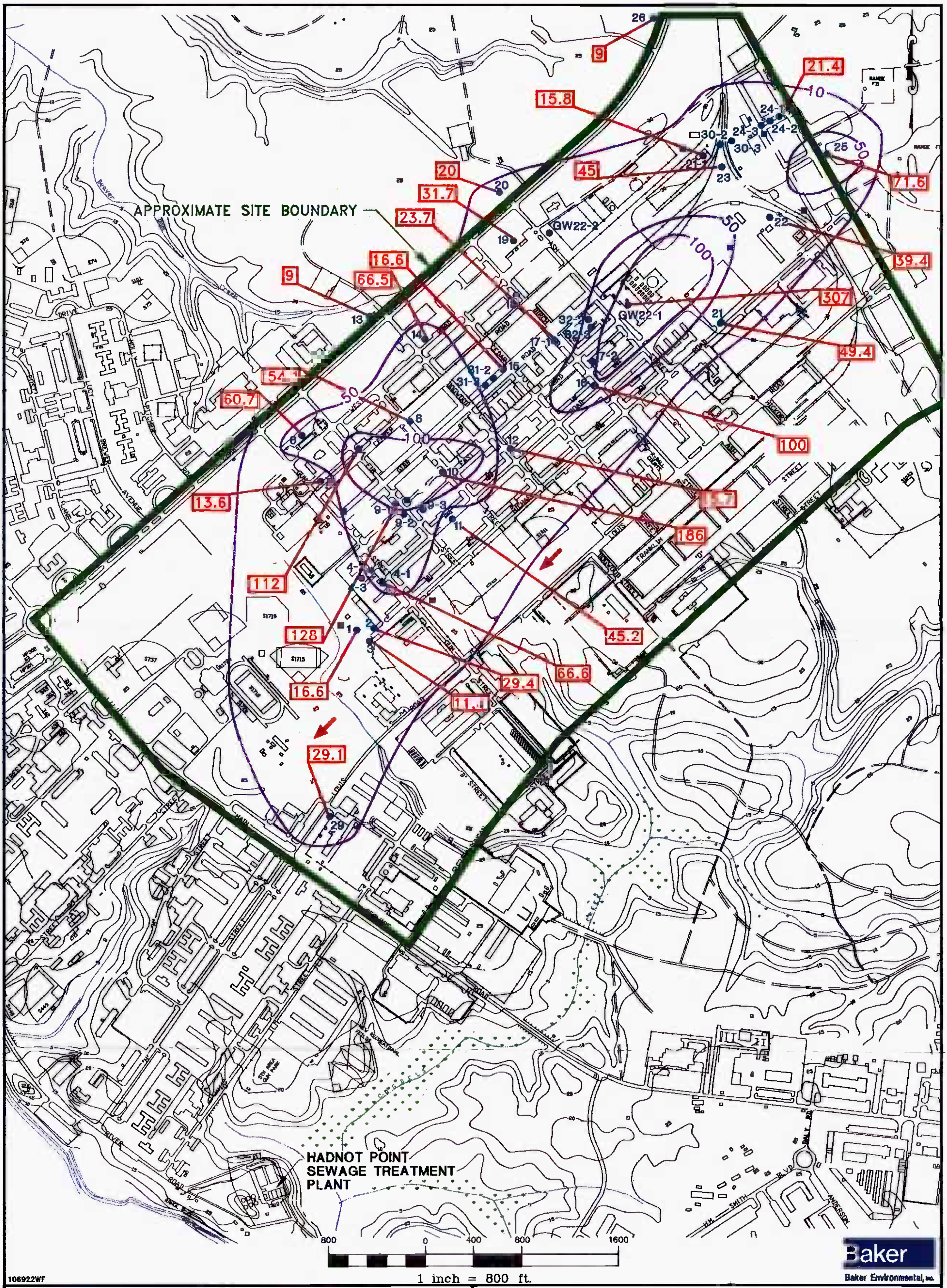
J ESTIMATED VALUE

APPROXIMATE GROUNDWATER FLOW DIRECTION

CONCENTRATIONS PRESENTED IN ug/L (ppb) FROM 1/91 DATA
SOURCE: LANTDIV, FEBRUARY 1992

FIGURE 2-8
1,2 DCE (TOTAL) DETECTED
IN SHALLOW MONITORING WELLS
HADNOT POINT INDUSTRIAL AREA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA



LEGEND

29 ● EXISTING MONITORING WELL LOCATION

21.4 TOTAL LEAD CONCENTRATION

–100– TOTAL LEAD CONCENTRATION CONTOUR

APPROXIMATE GROUNDWATER FLOW DIRECTION

CONCENTRATIONS PRESENTED IN ug/L (ppb) FROM 1/91 DATA
SOURCE: LANTDIV, FEBRUARY 1992

FIGURE 2-9
TOTAL LEAD DETECTED IN SHALLOW MONITORING WELLS HADNOT POINT INDUSTRIAL AREA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

monitoring wells GW32-2 and GW32-3. These wells are located directly downgradient of the fuel farm (Site 22). Benzene was detected at 2 ppb in supply well 602 (near the intersection of Holcomb Boulevard and Ash Street). Xylene was detected in supply well 637 (upgradient corner of the site) at 5 ppb. These detected concentrations are below the Maximum Contaminant Level (MCL). The metals detected in one or more of the wells sampled (GW9-2, GW9-3, and supply well 602) included aluminum, barium, calcium, copper, iron, lead, magnesium, manganese, sodium, and zinc. Elevated levels of total lead (94 ppb) were detected above the MCL in supply well 602. The analytical results from this sampling event are presented in Appendix E.

2.2.5.7 Aerial Photography EPIC Study - Site 78

Per the DoN's and EPA Region IV's requests, the EPA Environmental Photographic Interpretation Center (EPIC) conducted an aerial photography study for Site 78 in 1992. The study covered the period between 1938 and 1990.

The study concluded that possible staining dating back to 1944 was evident near numerous equipment maintenance/wash racks throughout the site at motor pools and maintenance areas. From the 1949 aerial, liquid and/or stains were visible emanating from buildings and in random areas throughout the study area.

In general, the findings from the EPIC study tend to correlate with the results of records search included as part of the Confirmation Study conducted during 1986-1988.

2.3 Site 21 - Transformer Storage Lot 140

2.3.1 Site Location and Setting

Site 21 is located within the northwest section of Site 78 (HPIA). It is bordered by Ash Street to the southwest, Center Road to the southeast and a wooded area to the northwest (see Figure 2-10). A dirt road surrounds most of the site. Site 21 is basically an open lot. The southern portion of the site (approximately 220 feet by 900 feet) has several fenced in areas, while the northern section (approximately 500 feet long) is an open area. The site consists of grassy, gravel, and concrete areas.

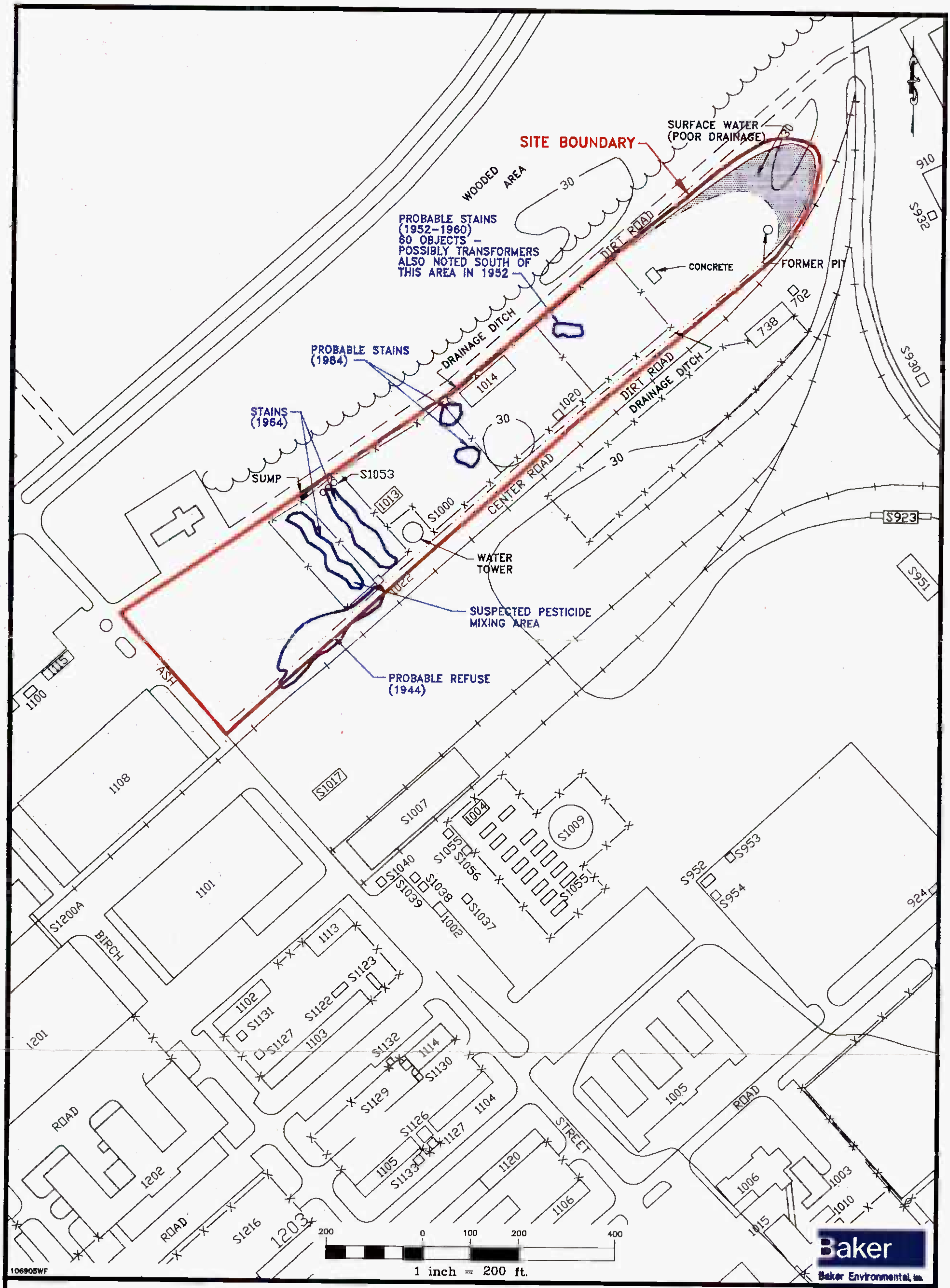


FIGURE 2-10
SITE MAP
SITE 21

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

SOURCE: LANTDIV, FEBRUARY 1992

2.3.2 Site Topography and Drainage

The land within Site 21 is flat (approximately 25 to 30 feet above msl) and is unpaved except for a few concreted areas. A drainage ditch which lies on all sides of the site collects surface drainage. The direction of flow from the drainage ditch is unclear. Previous reports have stated that drainage from the site flows in a north direction towards Bearhead Creek. Based on recent site observations, the drainage from the ditch appears to flow in a southwest direction.

No wetland areas were identified at Site 21, based on a review of NWI maps.

2.3.3 Site History

Site 21 (Lot 140) has a history of pesticide usage and transformer oil disposal. The site was used as a pesticide mixing area and as a cleaning area for pesticide application equipment from 1958 to 1977. This area is believed to be located in the southeast corner of the lot (the exact location is not documented). It is believed that the chemicals stored at this site included diazinon, chlordane dust, lindane, DDT dust, malthion (46% solution), mirex, 2,4-D, silvex, dalpon and dursban. Small spills, washout and indiscriminate disposal is believed to have occurred in this area. In 1977, before these mixing/cleaning activities were moved to a different location, overland discharge of washout was estimated to be approximately 350 gallons per week (ESE, 1990). It is not clear for how long this discharge of washout occurred.

A former transformer oil disposal pit was located in the northeastern portion of the site. The pit was used as a disposal area for transformer oil during 1950-1951. The pit reportedly measured 25 to 30 feet long by 6 feet wide by 8 feet deep. Sand was occasionally placed in the pit when oil was found standing in the bottom of the pit. The total quantity of oil disposed in this pit is unknown (ESE, 1990).

2.3.4 Site Geology and Hydrogeology

Only one monitoring well (shallow) has been installed at this site, therefore, only a limited amount of site-specific geologic information is available. Information from this boring indicates that the site is underlain by sandy gravel (fill material), sandy silt, and sandy clay (ESE, 1990). Note that since Site 21 is located within Site 78, the geology and hydrogeology of Site 21 should be similar to that already discussed for Site 78.

The surface of the shallow groundwater at the site has been measured at nine feet bgs (ESE, 1990).

2.3.5 Previous Investigations and Findings

2.3.5.1 Initial Assessment Study - Site 21

In October 1980, the upper four inches of soil was sampled for PCBs. One ppm PCB or less was found in the topsoil layer (IAS, 1983). It is possible, that the surface sampling only encountered backfill material since the sample depth was only four inches.

2.3.5.2 Confirmation Study - Site 21

As a result of the IAS, ESE was contracted to investigate the HPIA. ESE conducted a two part Confirmation Study which focused on the potential source areas identified in the IAS. The confirmation study included a Verification Step and a Characterization Step. The findings from the Confirmation Study as they pertain to Site 21 are described below.

Groundwater Sample Results

During this study, one shallow monitoring well (21GW1) was installed at Site 21 (approximately 50 feet west of the former oil pit). A groundwater sample was collected in July 1984 and analyzed for organochloride pesticides, organochloride herbicides, and PCBs. No compounds were identified in this sample. The well was sampled again in November 1986 and analyzed for organochloride pesticides, organochloride herbicides, PCBs, VOCs, tetrachlorodioxin, xylene, methylethyl ketone, methyl isobutyl ketone, ethylene dibromide, and oil and grease. Only two parameters, 2,4-D (an organochlorine herbicide) and oil and grease, were detected in the 1986 data at a concentration of 1.17 µg/L and 400 µg/L, respectively (ESE,1990).

Soil Sample Results

In August 1984, ten soil borings were hand augered at this site. Four of the borings were located inside the fenced area and six borings were located outside the fenced area. The exact location of these borings was not documented. Six samples were collected from the four borings located inside the fence and analyzed for organochlorine pesticides and herbicides and PCBs. A summary of the detected compounds are presented on Table 2-5. Detectable amount of DDD, DDE, and DDT were found in all the samples collected from the borings at both sampled depths (surface and 1-2 feet). PCBs were not detected in any of the samples (ESE,1990).

Six soil samples were collected from the six borings located outside the fence area. These samples were analyzed for organochlorine pesticides and herbicides. As shown of Table 2-5, DDD, DDE, and DDT were detected in all of the surface soil samples collected (ESE,1990). It is possible that the surface soil samples may have detected subsequent applications of materials and not contamination.

In November 1986, eight additional soil borings were augered outside the fenced area in order to further delineate the extent of apparent soil contamination. These borings appear to be located immediately adjacent to the fence, four borings along each length. Soil samples were collected from four depths at each of the borings. Thirty-two soil samples were analyzed for organochlorine pesticides and herbicides, PCBs, and tetrachlorodioxin. A summary of the detected compounds are presented on Table 2-5. The most prevalent detected compounds were 2,4-D, DDD, DDE, and DDT. Thirty out of the 32 samples contained the herbicide 2,4-D. DDD was found in the soils down to a depth of five feet. DDE and DDT were detected down to a depth of 3 to 5 feet. PCBs were detected in two soil samples located on the northeast corner of the fenced area (ESE, 1990).

2.3.5.3 Aerial Photography EPIC Study - Site 21

In 1992, the EPA EPIC conducted an aerial photography study for Site 21 (the study covered the area of Site 78 which includes Site 21). Significant findings from this study have been marked on Figure 2-10. Piled probable refuse was evident (on the 1944 aerial photograph) along the railroad tracks in the southern portion of the site. Approximately 60 cylindrical objects (possibly transformers) were visible in the north-central portion of the site (1952 finding). A probable stain area north of these objects appeared to be a leaking hose line. This stain continued to be visible in the 1956 and 1960 aerials. Two large stains near the suspected former pesticide mixing area were identified on the 1964 aerial. Two additional probable stain areas were visible in the central portion of the site in the 1984 aerial photograph.

TABLE 2-5

SUMMARY OF DETECTED COMPOUNDS IN SOIL SAMPLES COLLECTED FROM SITE 21 MCB CAMP LEJEUNE, NORTH CAROLINA

Detected Compounds	Range of Concentrations (μg/g)		
	Inside of Fence Samples August 1984(1)	Outside of Fence Samples August 1984(1)	Outside of Fence Samples November 1986(3)
Aldrin	ND(2) to 0.0011	ND	ND
DDD, p,p'	ND to 0.0074	ND to 0.0230	ND to 0.282
DDE, p,p'	ND to 0.0740	0.0079 to 0.220	ND to 1.980
DDT, p,p'	ND to 0.0870	0.0140 to 2.10	ND to 5.080
Heptachlor	ND	ND to 0.0027	ND
BHC, D	ND	ND	ND to 0.0297
Chlordane	ND	ND	ND to 76.700
PCBs, total	ND	ND	ND to 17.100
2,4-D	ND	ND	ND to 0.685

(1) August 1984 samples analyzed for organochloride pesticides/herbicides and PCBs.

(2) ND = Not detected above method detection limits.

(3) November 1986 samples analyzed for organochlorine pesticides/herbicides, PCBs, and tetrachlorodioxin.

In general, the aerial photograph study corresponded with the previously known information (i.e., the suspected location of the former pesticide mixing). The EPIC study did not identify the presence of the former transformer pit area. It is possible that no aerials were photographed during the one year the pit was documented to be used.

2.4 Site 24 - Industrial Area Fly Ash Dump

2.4.1 Site Location and Setting

Site 24 is located adjacent to the southeast portion of Site 78 (see Figure 2-1). Specifically, the site is located south and east of the intersection of Birch and Duncan Streets and extends south towards Cogdels Creek (Figure 2-11). The site is approximately 100 acres in size and is a wooded area that is somewhat overgrown. Dirt roads are interspersed throughout which lead to the suspected disposal sites. Several areas indicating past disposal activities are evident throughout the site. Site 24 is not currently used for disposal of wastes.

2.4.2 Site Topography and Drainage

The site is hilly (ranging between 5 - 30 feet above msl) and is unpaved. Site drainage is towards Cogdels Creek.

Based on a review of NWI maps, the immediate areas around Cogdels Creek are identified as wetland areas.

2.4.3 Site History

Site 24 was used for the disposal of fly ash, cinders, solvents, used paint stripping compounds, sewage sludge, and water treatment spiractor sludge from the late 1940s to 1980 (ESE, 1990). Spiractor sludge from the wastewater treatment plant and sewage sludge from the sewage treatment plant were reportedly disposed at this site since the late 1940s. Construction rubble was reportedly disposed at the site in the 1960s. During 1972 to 1979, fly ash and cinders were dumped on the ground surface, and solvents used to clean out boilers were poured onto these piles. Furniture stripping wastes were also disposed of at this area during this time period.

Previous reports have identified four separate disposal areas within the site: a spiractor sludge disposal area, a fly ash disposal area, and two borrow and debris areas. The recent geophysical

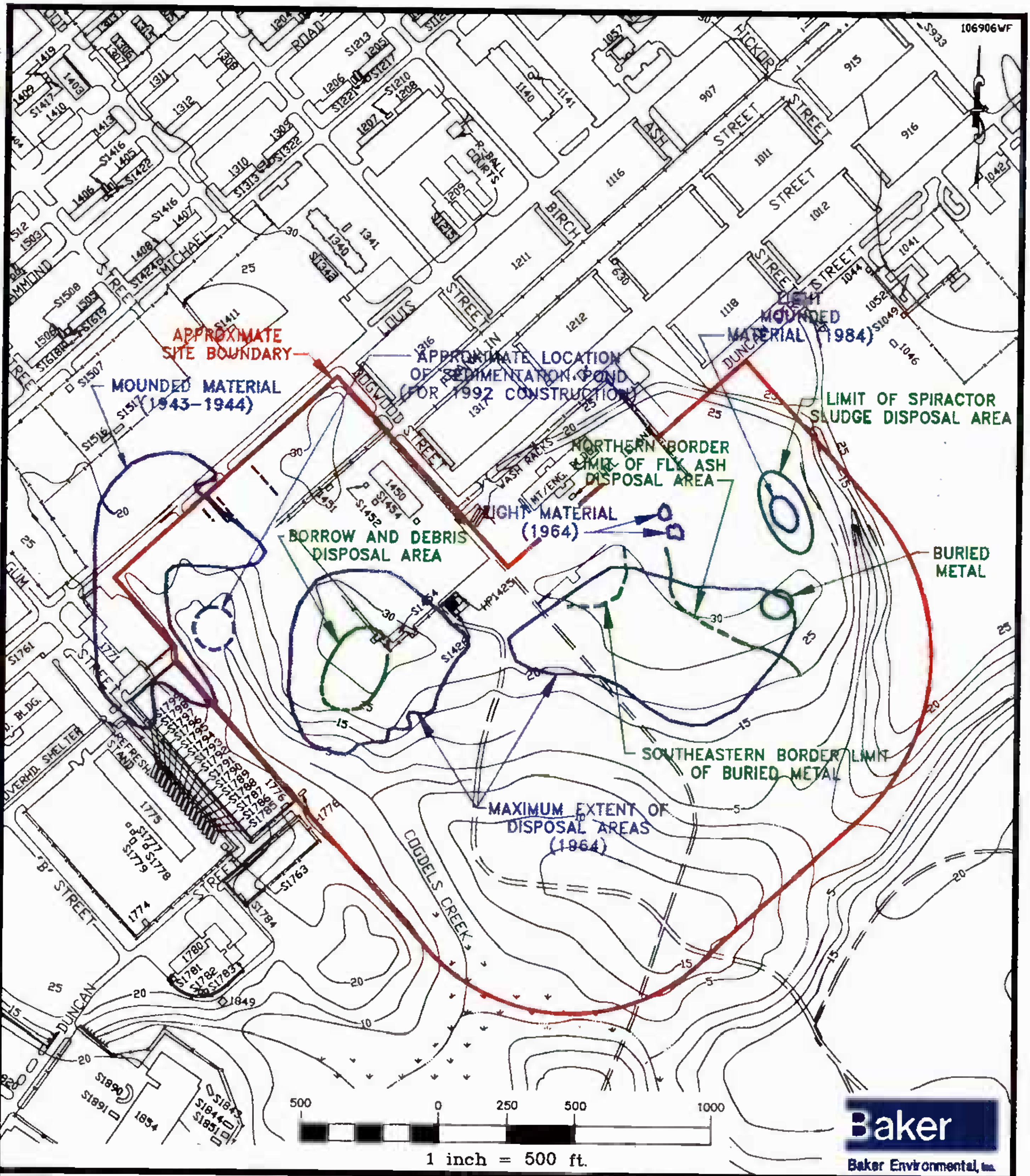


FIGURE 2-11
SITE MAP
SITE 24

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

SOURCE: LANTDIV, OCT. 1991

01491EE05V

survey investigation conducted at the site, confirmed the general location of three of these disposal areas in addition to locating two buried metal areas (Figure 2-11). One of the borrow and debris areas could not be identified. Based on a review of the EPIC aerial photographs of the site, the second borrow and debris area may have been a mound of material that was present at the site during 1943-1944. No other activities were noted in this area, so it is possible that it might not have been a disposal area.

2.4.4 Site Geology and Hydrogeology

Based on the information obtained from the installation of monitoring wells, the site is underlain by layers of sand and silty sand, with limited amounts of sandy gravel. The surface of the shallow groundwater ranges in depth from 2 to 10 feet bgs. Groundwater flow tends to be generally towards the drainage ditches in the south and southwest portions of the site (ESE, 1990).

2.4.5 Previous Investigations and Findings

2.4.5.1 Groundwater

Five shallow monitoring wells were installed and sampled in July 1984 to determine the presence or absence of contaminants in the groundwater beneath the site. Two of the wells were installed on the downgradient side of the borrow and debris disposal area, two wells on the downgradient side of the fly ash area, and one well upgradient of the site. The location of these wells are presented in Section 5.0 of this report. One sample was collected from each of the five wells and analyzed for VOCs and the following metals: arsenic, chromium, copper, lead, nickel, selenium, and zinc.

A summary of the analytical results is presented on Table 2-6. As shown on the table, chromium, copper, and zinc were found in both samples collected downgradient of the borrow and debris disposal areas. Each well contained low levels of either benzene, chloroform, or methylene chloride. The chemical data suggested that, at a minimum, low level contamination of the filled areas is present (ESE, 1990).

In 1986, two additional shallow monitoring wells (GW6 and GW7) were installed downgradient of the filled areas. All of the monitoring wells were resampled in December 1986 and analyzed for: VOCs and the following metals: arsenic, chromium, hexavalent

TABLE 2-6

SUMMARY OF DETECTED COMPOUNDS IN GROUNDWATER, SURFACE WATER AND SEDIMENT SAMPLES COLLECTED FROM SITE 24
MCB CAMP LEJEUNE, NORTH CAROLINA

Detected Compounds	Range of Groundwater Concentrations (µg/L)							Range of Surface Water Concentrations (µg/L)				Range of Sediment Concentrations (mg/kg)			
	GW1(1,2)	GW2(1,2)	GW3(1,2)	GW4(1,2)	GW5(1,2)	GW6(2,3)	GW7(2,3)	SW1(1,2)	SW2(1,2)	SW3(2)	SW4(2)	SE1(1,2)	SE2(1,2)	SE3(2)	SE4(2)
Benzene	ND(4)	ND	ND	ND	ND-3	ND	ND	ND	ND	ND	ND	NA(5)	NA	NA	NA
Chloroform	ND-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Methylene Chloride	ND	ND-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND-2.7	ND	ND	ND	NA	NA	NA	NA
TCE	ND	ND	ND	ND	ND	ND	ND	ND-7.1	ND	ND	ND	NA	NA	NA	NA
Arsenic	ND	ND-3	7.1-9.3	16-47.3	5.6-9.3	ND-5.3	7.5	ND	ND	ND	4	ND-1.2	ND-0.3	0.968	5.15
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND-0.3	ND-1.9	ND	2.16
Chromium	ND-6.6	ND-24	98-130	ND-37	ND	ND-14	52-62	ND	ND-9.7	ND	ND	1.6-5.68	3.87-29.3	3.36	33.8
Chromium (+6)	ND	ND	ND	ND	14.2	ND	ND	ND	20.6	ND	ND	ND	ND	ND	ND
Copper	ND-4	ND-8.6	16-17.4	3-7	ND-3	ND	ND-3	4.5-5.4	ND-2.8	ND	ND	1-4.19	2-7	2.94	21.6
Lead	ND	ND	ND-58	ND	ND	ND	ND	ND	ND	27.4	ND	4-13.2	12.14-180	10.1	162
Nickel	ND	ND	61-66	ND	ND	ND	ND	ND	ND	ND	ND	ND-0.3	ND-1	ND	ND
Selenium	ND	ND	5.2-7.6	ND-2.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	ND-26	ND-87	341-502	ND-8	ND	20-62	69-80	11.7-28	ND-20	14.8	6.8	6-13.1	14.7-95	19.5	155

(1) 1984 samples
(2) 1986 samples
(3) 1987 samples
(4) ND = Not detected above method detection limits.
(5) NA = Not Analyzed

chromium, copper, lead, nickel, selenium, and zinc. The results are presented on Table 2-6. For the most part, this data was consistent with the earlier sampling results (ESE,1990).

In March 1987, the two newer monitoring wells (24GW6 and 24GW7) were sampled. The results indicated that the samples from the well southwest of the disposal areas (24GW6) contained only limited amounts of metals, none of which were above groundwater standards. Well 24GW7 (south of the disposal areas) contained only three metals (ESE, 1990).

Although several metals were detected in the groundwater samples collected at Site 24, North Carolina groundwater standards were only exceeded at two sample locations. These samples were collected in a well downgradient of the fly ash disposal area and in a well south of the disposal areas (ESE, 1990).

In July 1992 (as part of the rescoping activities for the RI/FS), monitoring wells 24GW1, 24GW2, 24GW3, 24GW4, and 24GW6 were sampled and analyzed for full TCL organics and Target Analyte List (TAL) inorganics (both total and dissolved). Monitoring well 24GW5 could not be located during this sampling event. The results of this sampling indicated that no VOCs, semivolatiles, pesticides or PCBs were present. Both total and dissolved inorganics detected in at least one of the wells included aluminum, arsenic, beryllium, calcium, iron, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, vanadium, and zinc.

2.4.5.2 Surface Water and Sediment

In 1984, two surface water and sediment samples were collected downstream of the disposal areas. The samples were analyzed for VOCs and the following metals: arsenic, chromium, copper, lead, nickel, selenium, and zinc. A summary of the analytical results are presented on Table 2-6.

The surface water sample collected from the downgradient edge of the disposal locations contained two VOCs, copper, and zinc. The concentrations for the metals were below North Carolina's standards for freshwater. The water sample collected from the downstream location contained the same two metals also at levels below established standards (ESE, 1990).

In December 1986, the two sampling stations were resampled and two additional stations were established. The samples were analyzed for the same compounds as in the 1984 sampling round with the addition of hexavalent chromium. These samples contained the same metals at concentrations similar to the 1984 samples. The two VOCs that were detected in the 1984 sample were not detected in the 1986 sample. The surface water sample collected at the station southwest of the disposal areas contained lead (27.4 µg/L) and zinc (14.8 µg/L) (ESE,1990).

Sediment samples were collected from each of the four surface water sampling stations during the same sampling events. The analytical results, as summarized on Table 2-6, indicate that as many as seven metals were detected in the samples. The lowest concentrations of metals were identified in the sample collected from the station immediately downgradient of the disposal areas. The sample collected from the tributary to Cogdels Creek contained the highest concentrations of metals (ESE,1990).

2.4.5.3 Aerial Photography EPIC Study - Site 24

In 1992, the EPA EPIC conducted an aerial photography study for Site 24. Significant findings from this study have been identified on Figure 2-11 and/or will be summarized below.

A large area of mounded material (no other description included) was noted within and adjacent to the north western boundary of the site. This material was first visible in 1943. It was not visible on the 1949 aerial or any other aerials. It is possible that this material was excavated soils generated during the various construction activities taking place during that time.

By 1956, activity was visible in two areas in the central portion of the site. The one area (identified on Figure 2-11 as Borrow and Debris Disposal Area), was excavated and a row of stack objects was visible near the east edge of the area. The stacked objects remained through 1964. The other area (Fly Ash Disposal Area) appeared to be a disposal area containing multi-toned probable refuse and piles of medium-toned and dark-toned material.

By 1960, both of the "disposal" areas contained piles of dark-toned material (possibly fly ash or sewage sludge). Excavated areas including a linear trench are evident within the Borrow and Debris area. In the Fly Ash Area, the dark-toned material appeared to have been dumped and spread out in a fairly uniform depth. Rows of stacked objects were visible north of the dark-toned material.

The 1964 aerial shows evidence of increased activity in the Fly Ash Area. Dark-toned mounded material was visible in many mounds in a uniform arrangement (such as that created by emptying numerous consecutive dump truck loads). Piled medium-toned material, possible stains, and pools of probable liquid were also evident in this portion of the disposal area. Two piles of light-toned material were visible near the stacked objects. Dark-and medium-toned material was visible in the Borrow and Debris Area.

In 1970, the Fly Ash Area looked as if it had been capped and the area appeared to be revegetated. Vegetation was also visible throughout the Borrow and Debris Area. The maximum extents of the Borrow and Debris and Fly Ash Areas (1964) have been identified on Figure 2-11. A mound of light-toned material (possibly the Spiractor Sludge Disposal Area) was identified north of the Fly Ash Area in 1984.

By 1988, building site preparations are evident in the northeast corner of the site. By 1990, a building and paved area were visible in this location. Various impoundments were noted throughout the study area from 1984 through to 1990.

As shown on Figure 2-11, a sedimentation pond (built for recent construction activities along Louis Road) is located west of the Borrow and Debris Area. Please note that the location of this pond shown on the figure is approximate.

In general, the results of the EPIC study tends to correlate with the results of the geophysical survey conducted at the site in 1992. Figure 2-11 shows the correlation between these findings.

3.0 EVALUATION OF EXISTING INFORMATION

The existing information was evaluated to provide an understanding of the nature and extent of contamination in order to aid in the design of RI tasks. For this evaluation, this section contains the following: (1) types and volume of known wastes at each site, (2) potential migration and exposure pathways, (3) preliminary ARARs applicable to the sites, (4) potential remedial technologies, and (5) data limitations.

3.1 Site 78 - Hadnot Point Industrial Area

Site 78 houses the industrial area of Camp Lejeune. This area is comprised of maintenance facilities, warehouses, painting shops, printing shops, auto body shops, etc.

3.1.1 Types and Volume of Waste Present

3.1.1.1 Types of Waste Present

There is presently no known uncontrolled disposal of wastes related to the various industrial activities at the site. Due to the industrial nature of the site, many spills and leaks have occurred over the years. Most of these spills and leaks have consisted of petroleum-related products and solvents from underground storage tanks, drums, and uncontained waste storage areas. There is also evidence of spent solvents being disposed onto the ground.

The Characterization Step (1988) investigated past and present chemical usage and disposal activities conducted at most of the buildings within the HPIA. Based on this information and from other information obtained with respect to the HPIA, an evaluation of potential areas of concern was made. Other information includes an in-house underground storage tank data base; previous soil gas and soil sample results; geophysical survey results and the results from the EPIC aerial photography study. Table 3-1 presents a summary of the evaluation. The rationale as to whether or not a building area should be further investigated is also included on Table 3-1. Based on these findings, the building areas that have been evaluated to be potential areas of concern within the HPIA that will require additional investigation are summarized on Table 3-2. Several of these building areas have not been previously investigated with respect to being a potential source of contamination at the site.

Table 3-1: SUMMARY OF EVALUATION OF POTENTIAL AREAS OF CONCERN WITHIN THE HPIA

MCB CAMP LEJEUNE, NORTH CAROLINA

Bldg. No.	Building Type	Comments and Concerns	Potential Area of Concern	To Be Further Investigated	Rationale
900	Instr Repair	No areas of concern identified	No	No	No areas of concern identified
901	Tank Rebuild	Potential inactive UST (used oil); solvent usage; oil usage;	Yes	No	Soil gas and/or geophysical results
902	Maint Shop	Engineer Shop; chemical usage	Yes	No	Soil gas and/or geophysical results
903	Warehouse	Identified UST;	Yes	Yes	Soil gas and/or geophysical results
904	Warehouse	No areas of concern identified	No	No	No areas of concern identified
905	Warehouse	No sign of chemical usage	No	No	No areas of concern identified
906	Warehouse	No areas of concern identified	No	No	No areas of concern identified
907	Warehouse	Potential active UST (hydraulic oil); no areas of concern identified	Yes	Yes	No previous investigations
908	Paint Storage	Storage of large amounts of paint and painting chemicals	Yes	Yes	No previous investigations
909	Equipment Shop	Wastes, solvents, oils; stressed vegetation; degreasers used	Yes	Yes	No previous investigations
910	Welding Shop	Abandoned wash rack; uncontrolled drainage	Yes	No	Soil gas and/or geophysical results
913	Vehicle Maintenance	Potential active USTs (used oil); bagged contaminated soil	Yes	No	Soil gas and/or geophysical results
914	Warehouse	No areas of concern identified	No	No	No areas of concern identified
915	Warehouse	Solvent drain from wash line; stressed vegetation	Yes	Yes	Soil gas and/or geophysical results
916	Warehouse	Drum storage outside of building (kerosene, oil, gasoline)	Yes	Yes	No previous investigations
924	Latrine	No areas of concern identified	No	No	No areas of concern identified
926	Admin/Whse	Past - kerosene tank leaked; contaminated soil removed	Yes	Yes	No previous investigations
927	Admin/Whse	Past - kerosene tank leaked; contaminated soil removed	Yes	Yes	No previous investigations
928	Auto Maint/Whse	Past - kerosene tank leaked; contaminated soil removed	Yes	Yes	No previous investigations
934	C.S. Chamber	No areas of concern identified	No	No	No areas of concern identified
935	C.S. Chamber	No areas of concern identified	No	No	No areas of concern identified
943	Field Storehouse	No areas of concern identified	No	No	No areas of concern identified
951	Not identified	Empty building	No	No	No areas of concern identified
1005	Admin	No areas of concern identified	No	No	No areas of concern identified
1006	Exchange Whse	Empty building	No	No	No areas of concern identified
1010	Food Director	No areas of concern identified	No	No	No areas of concern identified
1011	Warehouse	No chemicals used or stored; oil tank with soil contamination	Yes	Yes	No previous investigations
1012	Warehouse	Leaking kerosene tank; soil contamination	Yes	Yes	No previous investigations
1013	Transformer Storage	No areas of concern identified	No	No	No areas of concern identified
1014	Paint Locker	Paint supply area; solvent storage/usage; outside drum storage area	Yes	No	To be studied under Site 21
1015	Cold Storage	No areas of concern identified	No	No	No areas of concern identified
1041	Guard barracks	No areas of concern identified	No	No	No areas of concern identified
1042	Brig Area	No areas of concern identified	No	No	No areas of concern identified
1044	Guard Shed	No areas of concern identified	No	No	No areas of concern identified
1057	MC Exchange	No areas of concern identified	No	No	No areas of concern identified

Table 3-1: SUMMARY OF EVALUATION OF POTENTIAL AREAS OF CONCERN WITHIN THE HPIA

MCB CAMP LEJEUNE, NORTH CAROLINA

Bldg. No.	Building Type	Comments and Concerns	Potential Area of Concern	To Be Further Investigated	Rationale
1100	Printing Shop	Pot. inactive USTs (gasoline, diesel); former service station; solvents	Yes	No	Soil gas and/or geophysical results
1101	Office Equip Maint	Potential active USTs (diesel); small maintenance area; solvent usage	Yes	No	Soil gas and/or geophysical results
1102	Paint Storage	Solvent waste area; 2 USTs removed 1984/85; past disposal at building	Yes	No	Soil gas and/or geophysical results
1103	Natural Resources	Old grease rack	Yes	Yes	Soil sample results
1104	Telephone Shop	Past use of wash pad without oil/water separator	Yes	No	Proximity to "clean" monitoring well
1105	Equip Storage/Offices	Vehicle washing area; oil seen in nearby ditch	Yes	No	Proximity to "clean" monitoring well
1106	Wood Shop	Potential active UST (used oil);	Yes	Yes	Aerial study results
1107	Ceramic Shop	No areas of concern identified	No	No	No areas of concern identified
1108	Warehouse	No areas of concern identified	No	No	No areas of concern identified
1111	Auto Shop/Storage	Former service station area (with Building 1100);	Yes	No	Soil gas and/or geophysical results
1113	Hobby Shop	No areas of concern identified	No	No	No areas of concern identified
1114	Landscp Storage Bldg	Past stored landscaping matris (lime, ferilizers); chemicals/solvent	Yes	No	Proximity to "clean" monitoring well
1115	Printing Shop	Various chemical usage (solvents); adjacent to Building 1100	Yes	No	Soil gas and/or geophysical results
1116	AC/S Logistics	Engineers area stores caustics and other organic detergents	Yes	Yes	No previous investigations
1117	Warehouse/Armory	Armory; solvent usage	Yes	Yes	No previous investigations
1118	Warehouse	No areas of concern identified	No	No	No areas of concern identified
1120	Auto Shop	No areas of concern identified	No	No	No areas of concern identified
1140	Barracks	No areas of concern identified	No	No	No areas of concern identified
1141	Utility Building	No areas of concern identified	No	No	No areas of concern identified
1200	Commissary	Commissary and warehouse facilities; no areas of concern	No	No	No areas of concern identified
1201	Commissary	Commissary and warehouse facilities; no areas of concern	No	No	No areas of concern identified
1202	Maintenance Shop	history of TCE/other solvent usage; USTs? - removed?	Yes	No	Soil sample results
1203	Maint. Main Bldg.	Tire and antifreeze changing, vehicle washing; soil contamination	Yes	No	Proximity to other investigated areas
1204	Telephone Storage	Probable past use of wash pad withut oil/water separator	Yes	No	Proximity to other investigated areas
1205	Vehicle Service	Potential inactive UST (used oil); solvent usage; waste oil	Yes	Yes	Aerial study results
1206	Vehicle Service	Service area; solvent usage; waste oil	Yes	Yes	Aerial study results
1207	MC Exchange	Former MC Exchange; no areas of concern identified	No	No	No areas of concern identified
1208	MC Exchange	Former MC Exchange; no areas of concern identified	No	No	No areas of concern identified
1209	Mess Hall	No areas of concern identified	No	No	No areas of concern identified
1211	Warehouse	No areas of concern identified	No	No	No areas of concern identified
1212	Warehouse/Acct	Warehouse and accounting complex; no areas of concern	No	No	No areas of concern identified
1300	Cold/Frozen Storage	Refrigeration maintenance shop; solvent storage/usage	Yes	Yes	Soil sample results
1301	AC/S Logistics	No areas of concern identified	No	No	No areas of concern identified
1302	AC/S Logistics	No areas of concern identified	No	No	No areas of concern identified
1303	AC/S Logistics	No areas of concern identified	No	No	No areas of concern identified
1304	AC/S Logistics	No areas of concern; no known storage of chemicals	No	No	No areas of concern identified
1305	AC/S Logistics	No areas of concern identified	No	No	No areas of concern identified

Table 3-1: SUMMARY OF EVALUATION OF POTENTIAL AREAS OF CONCERN WITHIN THE HPIA

MCB CAMP LEJEUNE, NORTH CAROLINA

Bldg. No.	Building Type	Comments and Concerns	Potential Area of Concern	To Be Further Investigated	Rationale
1306	AC/S Logistics	No areas of concern identified	No	No	No areas of concern identified
1307	AC/S Logistics	No areas of concern identified	No	No	No areas of concern identified
1308	Storage/Admin	Potential inactive UST(#2 fuel oil); stressed vegetation	Yes	No	Proximity to 'clean' monitoring well
1310	Auto Maint/Equip Storage	Potential inactive USTs(used oil, #2 fuel oil); visible oil in ditch	Yes	Yes	Aerial study results
1311	Elec/Com Shop	No areas of concern identified	No	No	No areas of concern identified
1312	Elec/Com Shop	No areas of concern identified	No	No	No areas of concern identified
1316	Warehouse	Whse/office machine repair; solvent usage; contracted waste disposal	No	No	No areas of concern identified
1317	Warehouse	No areas of concern identified	No	No	No areas of concern identified
1340	Barrack Building	No areas of concern identified	No	No	No areas of concern identified
1341	Utility Building	No areas of concern identified	No	No	No areas of concern identified
1400	Fire Station	No areas of concern identified	No	No	No areas of concern identified
1401	Package Store	Potential inactive UST(#2 fuel oil)	Yes	No	Evaluated by existing monitoring well
1402	Exchange Whse	Potential active USTs(#2 fuel oil)	Yes	No	Evaluated by existing monitoring well
1403	MC Exchange	No areas of concern identified	No	No	No areas of concern identified
1406	Auto Maint/MT Repair	Pot. inactive USTs(used oil, #2 fuel oil); past disposal oil in ditch?	Yes	No	Proximity to 'clean' monitoring well
1407	MT Offices/Whse	Past oil spills in wash pit??; adjacent to Building 1408	Yes	Yes	Aerial study results
1408	Whse/Equip Storage	Past oil spills in wash pit??; adjacent to Building 1407	Yes	Yes	Aerial study results
1409	Navy Patrol Boat Shop	No areas of concern identified	No	No	No areas of concern identified
1410	Field Training Bldg.	No areas of concern identified	No	No	No areas of concern identified
1413	Exchange Whse	Potential active UST(#2 fuel oil)	Yes	No	Proximity to 'clean' monitoring well
1419	Navy Patrol Boat Shop	No areas of concern identified	No	No	No areas of concern identified
1441	Brig	No areas of concern identified	No	No	No areas of concern identified
1442	Brig	No areas of concern identified	No	No	No areas of concern identified
1444	Brig	No areas of concern identified	No	No	No areas of concern identified
1450	Vehicle Service	Potential active UST (diesel, used oil); solvent usage	Yes	Yes	No previous investigations
1501	Exchange Whse	Potential active UST (#2 fuel oil)	Yes	No	Evaluated by existing monitoring well
1502	Base Maint Motor Repair	Pot. inact. USTs (#2 fuel/gasoline/used oil/diesel); solvents/oils use	Yes	Yes	Soil gas and/or geophysical results
1503	Warehouse	Former vehicle repair; no evidence of chemical usage or disposal	No	No	No areas of concern identified
1504	Warehouse	Former vehicle repair; no evidence of chemical usage or disposal	No	No	No areas of concern identified
1505	Auto Shop	Potential inactive USTs (#2 fuel oil, used oil)	Yes	Yes	Aerial study results
1601	Maintenance	Potential inactive UST (used oil); used of chemical highly suspected	Yes	Yes	Soil sample and geophysical results
1602	Maintenance	Former service area; former use of solvents; visible contamination	Yes	No	Soil gas and/or geophysical results
1603	Maintenance	Former service area; former use of solvents	Yes	No	No areas of concern identified
1604	Auto Shop	Potential inactive UST (used oil); oil contaminated ditch	Yes	Yes	Aerial study results
1607	Vehicle Hold Shed	Potential inactive UST (used oil); past and present solvent usage	Yes	No	Soil gas and/or geophysical results
1613	Filling Station	Potential active USTs (gasoline)	Yes	No	Proximity to 'clean' monitoring well

Table 3-1: SUMMARY OF EVALUATION OF POTENTIAL AREAS OF CONCERN WITHIN THE HPIA

MCB CAMP LEJEUNE, NORTH CAROLINA

Bldg. No.	Building Type	Comments and Concerns	Potential Area of Concern	To Be Further Investigated	Rationale
1700	Base Maintenance	Mach. Repair Shop; solvents and waste solvent used and stored	Yes	No	Proximity to other investigated areas
1708	Steam Line House	No areas of concern identified	No	No	No areas of concern identified
1709	Equipment Bldg/Storage	Former vehicle maintenance	Yes	No	Soil gas and/or geophysical results
1710	Armory/Vehicle Maint.	Past and present solvent usage	Yes	No	Soil gas and/or geophysical results
1711	Armory/Vehicle Maint.	Past and present solvent usage	Yes	No	Evaluated by existing monitoring well
1736	Shelter Misc Pipe	Potential inactive UST (used oil)	Yes	No	Proximity to other investigated areas
1750	Heavy Equipment Maint.	Potential inactive USTs (used oil); past and present solvent usage	Yes	Yes	No previous investigations
1755	Heavy Equipment Maint.	Potential inactive UST (used oil); past and present use of solvnets;	Yes	Yes	No previous investigations
1765	Maintenance	Potential active UST (#2 fuel oil)	Yes	Yes	No previous investigations
1775	Heavy Equipment Maint.	Pot. active USTs(gasoline/used oil/diesel); past/present solvent usage	Yes	Yes	No previous investigations
1771	Elec. Maintenance	No areas of concern identified	No	No	No areas of concern identified
1780	Heavy Equipment Maint.	Pot. active USTs(used oil); past/present solvent usage; waste area	Yes	Yes	No previous investigations
1802	Storage	No signs of past chemical activity	No	No	No areas of concern identified
1804	Storage/Maintenance	Pot. active USTs(used oil); past veh. repair; solvent usage now minimal	Yes	Yes	No previous investigations
1808	Storage Building	Past vehicle repair-solvent use??; present-no signs of chemical usage	Yes	Yes	No previous investigations
1810	Admin Office	Former vehicle maint shop - past solvent use likely	Yes	Yes	No previous investigations
1812	Not Identified	Potential inactive UST (#2 fuel oil)	Yes	Yes	No previous investigations
1815	Auto Shop	Empty building; potential inactive UST (diesel fuel)	Yes	Yes	No previous investigations
1816	Haz Flam Storage	Empty building; no areas of concern identified	No	No	No areas of concern identified
1817	Auto Shop	Previous washing area; contaminated soils	Yes	Yes	No previous investigations
1819	Warehouse	No visible signs of chemical activity	No	No	No areas of concern identified
1820	Latrine	No areas of concern identified	No	No	No areas of concern identified
1826	Auto Shop	Old grease rack with drain to ditch; waste oil tank at grease rack	Yes	Yes	No previous investigations
1827	Warehouse	No areas of concern identified	No	No	No areas of concern identified
1828	Auto Shop	Waste oil tank contaminated surrounding soils	Yes	Yes	No previous investigations
1841	Heavy Equipment Maint.	Pot. inactive USTs (gasoline, used oil, diesel); wide use of solvents	Yes	Yes	No previous investigations
1854	Multipurpose Facility	Pot. active USTs (used oil, diesel); past and present solvent usage	Yes	Yes	No previous investigations
1855	Armory	Past/present solvent usage; min. waste generated;no signs contamination	Yes	No	No areas of concern identified
1860	Maintenance	Pot. active UST (used oil); solvent usage in garage and shop areas	Yes	Yes	No previous investigations
1871	Elec/Com	No areas of concern identified	No	No	No areas of concern identified
1872	Elec/Com	No areas of concern identified	No	No	No areas of concern identified
1880	Heavy Equipment Maint.	Pot. active USTs *(used oil, diesel); large amounts of chemicals used*	Yes	Yes	*No previous investigations*

SOURCE: ESE, Characterization Step Report for the HPIA - Appendices, May 1988; an available UST data base; and other previous investigations

TABLE 3-2

AREAS OF CONCERN WITHIN THE HPIA TO BE FURTHER INVESTIGATED

Building No.	Building Type	Comments and Concerns
903	Warehouse	Identified UST
907	Warehouse	Potential active UST (hydraulic oil)
908	Paint Storage	Storage of large amounts of paint and painting chemicals
909	Equipment Shop	Wastes, solvents, oils; stressed vegetation; degreasers used
915	Warehouse	Solvent drain from wash line; stressed vegetation
916	Warehouse	Drum storage outside of building (kerosene, oil, gasoline)
926	Admin/Warehouse	Past - Kerosene tank leaked; contaminated soil removed
927	Admin/Warehouse	Past - Kerosene tank leaked; contaminated soil removed
928	Auto Maintenance/ Warehouse	Past - Kerosene tank leaked; contaminated soil removed
1011	Warehouse	No chemicals used or stored; oil tank with soil contamination
1012	Warehouse	Leaking kerosene tank; soil contamination
1103	Natural Resources	Old grease rack
1106	Wood Shop	Potential Active UST (used oil); aerial photography study results
1116	AC/S Logistics	Engineers area stores caustics and other organic detergents
1117	Warehouse/Armory	Armory; solvent usage
1205	Vehicle Service	potential inactive UST (used oil); solvent usage; waste oil; aerial photography results
1206	Vehicle Service	Service area; solvent usage; waste oil; aerial photography results
1300	Cold/Frozen Storage	Refrigeration maintenance shop; solvent storage/usage
1310	Auto Maint./Equip. Storage	potential inactive USTs; visible oil in ditch; aerial photography results
1407	MT Offices/Whse.	Past spills in wash pit ??; aerial photography results
1408	Whse./Equip. Storage	Past spills in wash pit ??; aerial photography results
1450	Vehicle Service	Potential active UST (diesel, used oil); solvent usage

TABLE 3-2 (Continued)

AREAS OF CONCERN WITHIN THE HPIA TO BE FURTHER INVESTIGATED

Building No.	Building Type	Comments and Concerns
1502	Base Maint. Motor Repair	Potential inactive USTs (No. 2 fuel/gasoline/ used oil/diesel); solvents/oils use
1505	Auto Shop	Potential inactive USTs; aerial photgraphy results
1601	Maintenance	Potential inactive UST (used oil); use of chemicals highly suspected
1604	Auto Shop	Potential inactive USTs; aerial photgraphy results
1750	Heavy Equipment Maint.	Potential inactive UST (used oil); past and present solvent usage
1755	Heavy Equipment Maint.	Potential inactive UST (used oil); past and present use of solvents
1765	Maintenance	Potential active UST (No. 2 fuel oil)
1775	Heavy Equipment Maint.	Potential active USTs (gasoline/used oil/diesel); past/present solvent usage
1780	Heavy Equipment Maint.	Potential active USTs (used oil); past/present solvent usage; waste area
1804	Storage/Maintenance	Potential active USTs (used oil); past vehicle repair; solvent usage now minimal
1808	Storage Building	Past vehicle repair - solvent use??; present - no signs of chemical usage
1810	Admin Office	Former vehicle maint. shop - past solvent use likely
1812	Not Identified	Potential inactive UST (No. 2 fuel oil)
1815	Auto Shop	Empty building; potential inactive UST (diesel fuel)
1817	Auto Shop	Previous washing area; contaminated soils
1826	Auto Shop	Old grease rack with drain to ditch; waste oil tank at grease rack
1828	Auto Shop	Waste oil tank contaminated surrounding soils
1841	Heavy Equipment Maint.	Potential inactive USTs (gasoline/used oil/diesel); wide use of solvents
1854	Multipurpose Facility	Potential active USTs (used oil, diesel); past and present solvent usage
1860	Maintenance	Potential active UST (used oil); solvent usage in garage and shop areas
1880	Heavy Equipment Maint.	Potential active USTs (used oil/diesel); large amounts of chemicals used.

Based on the results of the previous sampling events conducted at the HPIA, groundwater and soils are the known contaminated media. Surface water and sediment samples have not been collected. The contaminants found in the shallow groundwater aquifer are BTEX constituents, VOCs (such as TCE; T-1,2-DCE; 1,2-DCE; 1,1,1-trichloroethane; trichlorofluoromethane; and vinyl chloride), oil and grease, and various metals. Limited samples from the intermediate wells revealed lower levels of some of these same contaminants (1,2-DCE, vinyl chloride, BTEX, and metals) in addition to low levels of naphthalene, 2-methylnaphthalene, acenaphthene, and carbon disulfide. The analytical results from the most recent sampling (July 1992) of a few of these intermediate wells detected only BTEX constituents and inorganics. Only toluene, ethylbenzene, xylene, carbon disulfide, and MEK were detected in the limited number of samples previously collected from the deep aquifer. The analytical results from the most recent sampling (July 1992) of a few of these deep wells detected only BTEX constituents and inorganics.

Soil gas samples revealed high levels of TCE at several potential source areas within HPIA. The results of the soil sampling did not appear to directly correspond with these soil gas results for all of the locations sampled. Soil samples collected around three potential source areas within HPIA revealed very limited VOC (TCE and 1,2-DCE) and semivolatile (phenanthrene, fluoranthene, and pyrene) contamination. Pesticides/PCBs (dieldrin, hepachlor epoxide, endosulfan I, 4,4-DDE, 4,4,-DDT, and Aroclor-1260) were detected in a few samples at three separate areas.

In general, further evaluation is needed to determine the source of contamination in the soil and groundwater at HPIA. In addition, the nature and extent of any sediment and/or surface water contamination impacted by the HPIA should be evaluated.

3.1.1.2 Volume of Wastes Present

Based on the results of several rounds of groundwater samples collected from the shallow monitoring wells at the site, it appears that there are two known contaminant plumes within the shallow aquifer that are associated with the HPIA (excluding the plume resulting from the fuel farm). One of the plumes is estimated to be approximately 1300 feet in diameter (located near the 900 buildings). The other plume is approximately 1700 feet in diameter (located near Buildings 1601 and 1502). The vertical extent of the plume can not be determined at this time since there are only a limited number of deep wells at the site. The previous sampling results have shown minor contamination (mostly metals) reaching the deep aquifer which is at approximately 150 feet below surface. Limited contamination (mostly metals) has also been detected in the intermediate wells at depths of 75 feet.

Soil samples were collected from 30 soil borings at the site. The location of the soil borings centered around three building (potential source) areas at the site. Samples were collected at intervals ranging from 0 to 12 feet. The results indicated limited contamination. Additional investigations from other areas of concern at the site are needed to make a complete assessment of the extent of soil contamination.

3.1.2 Potential Exposure Pathways

Based on the evaluation of existing conditions at Site 78, the following potential contaminant exposure pathways have been identified:

- Aquatic and terrestrial exposure to contaminants due to incidental sediment and soil ingestion.

- Terrestrial wildlife (e.g., burrowing animals) dermal exposure to contaminants in soil and sediment.

- Human exposure to contaminants due to incidental soil and sediment ingestion.

- Potential human exposure to contaminants from future potential groundwater ingestion (the shallow aquifer is not used as a potable water supply).

- Potential human exposure to VOCs due to volatilization from groundwater and surface water.

- Human dermal exposure to contaminants due to future potential direct contact with groundwater and surface water.

- Human exposure to contaminants due to ingestion of contaminated aquatic organisms and terrestrial wildlife.

3.1.3 Preliminary Public Health and Ecological Health Impacts

One risk assessment pertaining to Site 78 was performed in 1991 (ESE,1991). The areas of concern chosen for the risk assessment included the 900, 1200 and 1600 building areas. In addition it assessed Site 22, which is not part of these Project Plans. Surficial soils (0-2 feet) and intermediate and deep groundwater were assessed. The groundwater at the 900 and 1202 building areas was assessed for risks due to lead, VOCs and PAHs. The soil for these two areas was assessed for lead and PAHs. The 1600 building area was assessed for lead and 1,2-dichloroethene in groundwater, and lead and PAHs in soil. No carcinogenic or noncarcinogenic risks were identified for any of the chemicals of concern for any of the exposure pathways for human health or ecological risks; however, there are uncertainties associated with the data used for the assessment. Limited parameters were sampled for and the data was not validated. In addition, the choice of the chemicals of concern is questionable. For example, PAHs were chosen as chemicals of concern when their concentrations would have been considered to have been in normal ranges for an industrial area such as HPIA.

The preliminary risk evaluation of Site 78 has concluded that there may be potential human risk to receptors due to the contamination detected at this site. Military personnel and trespassers have been identified as the probable human receptors. No ecological receptors have been identified for Site 78.

3.1.4 Preliminary Identification of ARARs

3.1.4.1 Chemical-Specific ARARs

Based on the analytical results from the previous sampling activities conducted for Site 78, it appears that the contaminated media include groundwater (VOCs and various inorganics) and soils (pesticides, PCBs, VOCs, and PAHs). No surface water or sediment samples have been collected in the past, but should be collected to assess potential impacts. Chemical-specific ARARs that may be applicable to the HPIA include the North Carolina Water Quality Standards (NCWQS), the North Carolina Surface Water Standards, the Federal MCLs established under the Safe Drinking Water Act, and the Federal Toxic Substances Control Act (TSCA) regulations. There are no North Carolina or Federal ARARs for soil or sediment; however, EPA Region IV's "Water Quality and Sediment Screening Values" will be used as a To Be Considered (TBC) ARAR when evaluating ecological impacts in surface waters and sediment in the risk assessment.

3.1.4.2 Location-Specific ARARs

Location-specific ARARs set restrictions on certain types of activities in wetlands, floodplains, and historical locations. At this time, the only location-specific ARARs identified for the HPIA may include wetland and floodplain restrictions for areas around Cogdels Creek, Bearhead Run Creek, Beaver Dam Creek and the New River. In addition, all applicable regulations promulgated in the North Carolina Administrative Code Title 15 pertaining to coastal areas and wetlands are potential location-specific ARARs for the site.

3.1.4.3 Action-Specific ARARs

Action-specific ARARs are technology-based restrictions triggered by the type of action under consideration. Action-specific ARARs for the HPIA will not be identified until potential remedial action technologies have been identified. Depending on the selected alternative for the site, some potential action-specific ARARs for the site may include RCRA land disposal restrictions (40 CFR 268) and North Carolina disposal regulations.

3.1.5 Potential Remedial Technologies and Alternatives

The purpose of this section is to identify potential remedial action technologies for each affected medium at the site in order to identify what data may be necessary to better evaluate the technologies during the FS.

3.1.5.1 Soil

Previous investigative studies have identified the presence of VOCs, pesticides, PCBs, PAHs, and various inorganics. Although further investigations are needed to fully characterize the extent of contamination from suspected source areas and/or areas of concern, some remedial technologies have been identified for areas at HPIA. These technologies include: thermal treatment, soil washing, biodegradation, vacuum extraction, and stabilization/fixation (e.g., in-situ vitrification). Each of these technologies will require specific data to evaluate their effectiveness, implementability, and cost.

3.1.5.2 Groundwater

Previous investigations have detected the presence of VOCs and various inorganics in the shallow aquifer at the HPIA. A number of pump and treat technologies may be potentially feasible for the remediation of this type of contamination including: biological (trickling filter), air stripping, carbon adsorption, thermal treatment, chemical reduction, chemical precipitation, and gravity separation.

3.1.6 Present Database Limitations

The purpose of this section is to define the present database limitations with respect to either characterizing the site, assessing health and environmental risk, or evaluating potential feasible technologies. Information pertaining to the analytical methods and the level of quality assurance/quality control (QA/QC) used for the analyses of the data provided for review were not included in the background information received for this site, and therefore could not be reported in this Work Plan. Consequently, the data provided is not suitable for use to fully characterize the site or to make an assessment of human health or ecological risks which may be present as a result of contamination at the site. Site-specific RI/FS objectives and sampling strategies for resolving these data deficiencies are subsequently identified in Section 4.0 of this Work Plan.

Specific data limitations with respect to soil, groundwater, surface water, sediment, and aquatic life are discussed below.

3.1.6.1 Soil

The specific source(s) of soil contamination has not been identified during the previous investigations. In addition, several potential areas of contamination have not been previously investigated. Based on the results of the recently conducted (June 1992) geophysical survey, several potential underground tank areas have been identified. Further investigation at these areas is needed to identify the nature and extent of contamination.

The overall quality of the existing soil data as well as the level of QA/QC to which it was subjected are unknown. Therefore, additional analytical data is required to characterize soil contamination, delineate areas of concern, assess human health and ecological risks, evaluate the extent of soil runoff, and evaluate remedial technologies.

3.1.6.2 Groundwater

The overall quality of the existing groundwater data as well as the level of QA/QC to which it was subjected are unknown. Therefore, additional analytical data is required to fully characterize groundwater contamination, assess human health and ecological risks, and evaluate remedial technologies.

3.1.6.3 Sediment

No previous sediment sampling of the nearby waterways (Cogdels Creek, Beaver Dam Creek, and the New River) has been conducted. In order to evaluate if the HPIA has impacted the sediments in these waters and to assess the sediment quality and the human health and ecological risks, data needs to be collected from these three waterways.

3.1.6.4 Surface Water

No previous surface water sampling of the nearby waterways (Cogdels Creek, Beaver Dam Creek, and the New River) has been conducted. In order to evaluate if the HPIA has impacted these waters and to assess the surface water quality and the human health and ecological risks, data needs to be collected from these three waterways.

3.1.6.5 Aquatic Life

Data is not available to assess the potential impact to aquatic life in Cogdels Creek, Beaver Dam Creek, or the New River. Surface water and sediment data should be evaluated first to determine if aquatic life may be being impacted. Based on the results of the surface water and sediment samples, specific analysis of resident organisms may be needed.

3.2 Site 21 - Transformer Storage Lot 140

3.2.1 Types and Volume of Waste Present

3.2.1.1 Types of Waste Present

Site 21 was used from 1958 to 1977 for pesticide mixing and as a cleaning area for pesticide application equipment. In addition, in 1950 to 1951, an on-site pit was used as a drainage receptor for oil from transformers. Pesticides/herbicides that were mixed at the site included chlordane, DDT, diazinon, lindane, malathion, mirex, 2,4-D, silvex, dalpon, and dursban. Pesticide contamination may have occurred as a result of spills, washout, and excess disposal. Transformer oil was drained into the pit for approximately a one year period. The oil potentially contained PCBs.

3.2.1.2 Volume of Waste Present

In 1977, before pesticide mixing/cleaning activities were moved to a different location, washout was estimated to be approximately 350 gallons per week of overland discharge.

Background information states that the dimensions of the former oil pit were 25 to 30 feet long by 6 feet wide by 8 feet deep (ESE, 1990). Based on these measurements, the volume of the material (including oil and backfill) in the pit is approximately 1,200 to 1,440 cubic feet. The total quantity of oil drained into the pit is unknown.

3.2.2 Potential Exposure Pathways

Based on the evaluation of existing conditions at Site 21, the following potential contaminant exposure pathways have been identified:

- Aquatic and terrestrial wildlife exposure to pesticides/PCBs due to incidental sediment and soil ingestion.
- Terrestrial wildlife (e.g., burrowing animals) dermal exposure to pesticides/PCBs in soil and sediment.
- Human exposure to pesticides/PCBs due to incidental soil and sediment ingestion.

- Potential human exposure to pesticides and oil and grease from future potential groundwater ingestion (the shallow aquifer is not used as a potable water supply).

- Potential human exposure to VOCs, due to volatilization from groundwater and surface water.

- Human dermal exposure to pesticides and oil and grease due to future potential direct contact with groundwater and surface water.

- Human exposure to pesticides and other contaminants due to ingestion of contaminated aquatic organisms and terrestrial wildlife.

3.2.3 Preliminary Public Health and Ecological Health Impacts

There have not been any public or ecological risk assessments conducted for Site 21 to date. Therefore, based on Baker's preliminary risk evaluation of Site 21, there may be potential human and ecological risk to receptors due to the contamination detected at this site. Military personnel and trespassers have been identified as the probable human receptors. The nonhuman population of receptors includes but is not limited to, small mammals such as raccoon, fox, deer, birds, reptiles and aquatic organisms such as fish and benthic invertebrates.

3.2.4 Preliminary Identification of ARARs

3.2.4.1 Chemical-Specific ARARs

Based on the analytical results from the previous sampling activities conducted for Site 21, it appears that the contaminated media include groundwater (pesticides/herbicides, oil and grease, and various inorganics) and soils (pesticides/herbicides and PCBs). No surface water or sediment samples have been collected to date but should be to assess potential impacts. Chemical-specific ARARs that may be applicable to Site 21 include the NCWQS, the North Carolina Surface Water Standards, the Federal MCLs established under the Safe Drinking Water Act, and the Federal TSCA regulations. There are no North Carolina or Federal ARARs for soil or sediment; however, EPA Region IV's "Water Quality and Sediment

Screening Values" will be used as a TBC ARAR when evaluating ecological impacts in surface waters and sediment in the risk assessment.

3.2.4.2 Location-Specific ARARs

Location-specific ARARs set restrictions on certain types of activities in wetlands, floodplains, and historical locations. At this time, the only location-specific ARARs identified for the HPIA may include floodplain restrictions for areas around Bearhead Run Creek, Beaver Dam Creek. As stated in Section 3.1.4.2, North Carolina Administrative Code Title 15 regulations may also be potential location-specific ARARs for the site.

3.2.4.3 Action-Specific ARARs

Action-specific ARARs are technology-based restrictions triggered by the type of action under consideration. Action-specific ARARs for Site 21 will not be identified until potential remedial action technologies have been identified. Some potential action-specific ARARs may include RCRA land disposal restrictions and North Carolina disposal regulations.

3.2.5 Potential Remedial Technologies and Alternatives

The purpose of this section is to identify potential remedial action technologies for each affected medium at the site in order to identify what data may be necessary to better evaluate the technologies during the FS. Some potential action-specific ARARs may include RCRA land disposal restrictions and North Carolina disposal regulations.

3.2.5.1 Soil

Previous investigative studies have identified the presence of pesticides (including DDD, DDE, and DDT), herbicides and PCBs. Although further investigations are needed to fully characterize the extent of contamination from the two suspected source areas within this site (former pesticide mixing area and the former transformer oil pit), some remedial technologies have been identified for these areas. These technologies include: excavation and off-site disposal, thermal treatment, soil washing, biodegradation, and stabilization/fixation. Each of these technologies will require specific data to evaluate their effectiveness, implementability, and cost.

3.2.5.2 Groundwater

Limited investigations have detected the presence of pesticides/herbicides and various inorganics in the shallow aquifer at Site 21. A number of pump and treat technologies may be potentially feasible for the remediation of this type of contamination including: carbon adsorption, thermal treatment, chemical reduction/oxidation, and chemical precipitation.

3.2.6 Present Database Limitations

The purpose of this section is to define the present database limitations with respect to either characterizing the site, assessing health and environmental risk, or evaluating potential feasible technologies. The analytical methods and the level of QA/QC used for the analyses of the data provided for review were not included in the background information received for this site, and therefore could not be reported in this Work Plan. Consequently, the data provided is not suitable for use to fully characterize the site or to make an assessment of human health or ecological risks due to the contamination at the site. Site-specific RI/FS objectives and sampling strategies for resolving these data deficiencies are subsequently identified in Section 4.0 of this Work Plan.

Specific data limitations with respect to soil, groundwater, surface water, sediment, and aquatic life are discussed below.

3.2.6.1 Soil

The previous soil investigation has had limited analysis (included only pesticides, herbicides, PCBs, and/or tetrachlorodioxin). In addition, the exact location of several samples is not known. Most importantly, the overall quality of the existing soil data as well as the level of QA/QC to which it was subjected are unknown. Therefore, additional analytical data is required to characterize soil contamination, delineate areas of concern, assess human health and ecological risks, and evaluate remedial technologies.

3.2.6.2 Groundwater

Only one groundwater monitoring well has been installed to characterize the groundwater quality at the site. In addition, the set of analyzed parameters has been limited. Most importantly, the overall quality of the existing groundwater data as well as the level of QA/QC to which it was subjected are unknown. Therefore, additional analytical data is required to fully characterize groundwater contamination, delineate the extent of contamination, assess human health and ecological risks, and evaluate remedial technologies.

3.2.6.3 Sediment

No previous sediment sampling of the surrounding drainage ditch has been conducted. In order to evaluate if the site has impacted the sediments in these waters and to assess the sediment quality and the human health and ecological risks, data needs to be collected from this drainage ditch. In addition, if Beaver Dam Creek is being contaminated via groundwater and/or surface water discharge from the site, then sediment will need to be sampled in these areas.

3.2.6.4 Surface Water

No previous surface water sampling of the surrounding drainage ditch or Beaver Dam Creek has been conducted. In order to evaluate if Site 21 has impacted these waters and to assess the surface water quality and the human health and ecological risks, data needs to be collected from this drainage ditch.

3.2.6.5 Aquatic Life

Data is not available to assess the potential impact to aquatic life in the drainage ditch at the site. Surface water and sediment data should be first be evaluated to determine if aquatic life may be being impacted. Based on the results of the surface water and sediment samples, specific analysis of resident organisms may be needed.

3.3 Site 24 - Industrial Area Fly Ash Dump

3.3.1 Types and Volume of Waste Present

3.3.1.1 Types of Waste Present

Site 24 was reportedly used for the disposal of fly ash, cinders, solvents, used paint stripping compounds, sewage sludge, and water treatment spiractor sludge from the late 1940s to 1980.

The site is approximately 100 acres in size and lies adjacent to upstream portions of Cogdels Creek, southeast of Site 78.

3.3.1.2 Volume of Waste Present

Based on previous investigations, Site 24 consists of four separate disposal areas. In addition, the geophysical survey performed in June 1992, identified two additional areas of buried metal.

- Fly Ash Area - the geophysical survey identified the eastern boundary of the fly ash disposal area which measures about 800 feet in length. The western and southern boundaries could not be delineated due to dense vegetation overgrowth. The aerial photographs identified this area to be approximately 9 acres in size. The depth of the disposal area is unknown. Fly ash and cinders were dumped on the ground surface and solvents used to clean out boilers were poured onto these piles. In addition, furniture stripping wastes were also disposed in this area. The volume of waste is unknown.

- Spiractor Sludge Disposal Area - the geophysical survey identified the spiractor sludge disposal area to cover approximately 40,000 square feet. From the aerial photographs, it appears that this area was approximately 9,000 square feet in size. The depth of the disposal area is unknown. Spiractor sludge from the wastewater treatment plant and sewage sludge from the sewage treatment plant were disposed of in this area. The volume of waste disposed of is unknown.

- Borrow and Debris Areas - construction rubble was reported disposed in two separate areas in the 1960s. The potential debris area closest to Louis Road currently has construction going on and therefore a geophysical survey in this area was not possible. Based on the aerial photography study, this area had mounded material on it during 1943-1944. No other signs of disposal activities were identified here. Therefore, this probably was not a waste disposal site. The second debris pile, located to the south of Louis Road, measures approximately 1.2 acres based on the geophysical survey. The aerial photographs depicted a larger disposal area (approximately 7.2 acres). The depth of the waste area and the volume of waste disposed of is unknown.

- Buried metal was identified in two areas during the geophysical survey. One area lies to the south of the spiractor sludge disposal area and to the east of the fly ash area. It measures approximately 90 by 30 feet. The depth of the disposal area is unknown. The second area of buried metal lies to the north of the fly ash area. Size and depth of the second buried metal disposal area is unknown. The volume of waste disposed of in these areas is unknown.

3.3.2 Potential Exposure Pathways

Based on the evaluation of existing conditions at Site 24, the following potential contaminant exposure pathways have been identified:

- Aquatic and terrestrial wildlife exposure to contaminants due to surface water ingestion.

- Aquatic and terrestrial wildlife exposure to contaminants due to incidental sediment ingestion.

- Terrestrial wildlife (e.g., burrowing animals) dermal exposure to contaminants in soil and sediment.

- Human exposure to contaminants due to incidental soil ingestion.

- Human exposure to contaminants due to incidental sediment ingestion.

- Human exposure to contaminants due to future potential groundwater ingestion.

- Human exposure to VOCs due to volatilization from groundwater and surface waters.

- Human dermal exposure to contaminants due to future potential direct contact with groundwater and direct contact with surface waters.

- Human exposure to contaminants due to ingestion of contaminated aquatic organisms and terrestrial wildlife.

3.3.3 Preliminary Public Health and Ecological Health Impacts

There have not been any public or ecological risk assessments conducted for Site 24 to date. Therefore, based on Baker's preliminary risk evaluation of Site 24, there may be potential human and ecological risk to receptors due to the contamination detected at this site. Military personnel and trespassers have been identified as the probable human receptors. The nonhuman population of receptors includes but is not limited to, small mammals such as raccoon, fox, deer, birds, reptiles and aquatic organisms such as fish and benthic invertebrates.

3.3.4 Preliminary Identification of ARARs

3.3.4.1 Chemical-Specific ARARs

Based on the analytical results from the previous sampling activities conducted for Site 24, it appears that the contaminated media include groundwater (various inorganics) and surface water/sediment (VOCs and various inorganics). No soil samples have been collected. Chemical-specific ARARs that may be applicable to the HPIA include the NCWQS, the North Carolina Surface Water Standards, the Federal MCLs established under the Safe Drinking Water Act, and the Federal TSCA regulations. There are no North Carolina or Federal ARARs for soil or sediment; however, EPA Region IV's "Water Quality and Sediment Screening Values" will be used as a TBC ARAR when evaluating ecological impacts in surface waters and sediment in the risk assessment.

3.3.4.2 Location-Specific ARARs

Location-specific ARARs set restrictions on certain types of activities in wetlands, floodplains, and historical locations. At this time, the only location-specific ARARs identified for Site 24 may include wetland and floodplain restrictions for areas around Cogdels Creek. As previously stated, North Carolina Administrative Code Title 15 regulations may also be potential location-specific ARARs for the site.

3.3.4.3 Action-Specific ARARs

Action-specific ARARs are technology-based restrictions triggered by the type of action under consideration. Action-specific ARARs for Site 24 will not be identified until potential remedial action technologies have been identified. Some potential action-specific ARARs may include RCRA land disposal restrictions and North Carolina disposal regulations.

3.3.5 Potential Remedial Technologies and Alternatives

The purpose of this section is to identify potential remedial action technologies for each affected medium at the site in order to identify what data may be necessary to better evaluate the technologies during the FS.

3.3.5.1 Groundwater

Limited investigative studies have identified the presence of various inorganics in the groundwater. Although further investigations are needed to fully characterize the contamination from the suspected disposal area within this site (the spiractor sludge area, buried metal areas, fly ash area, and borrow/debris areas), a few remedial technologies have been identified for these areas. These technologies include: carbon adsorption, chemical reduction/oxidation, and chemical precipitation. Each of these technologies will require specific data to evaluate their effectiveness, implementability, and cost.

3.3.5.2 Surface Water

Limited investigations have detected the presence of VOCs and various inorganics in the surface water in the upper portion of Cogdels Creek at Site 24. A number of pump and treat technologies may be potentially feasible for the remediation of this type of contamination including: carbon adsorption, chemical reduction/oxidation, and chemical precipitation. Each of these technologies will require specific data to evaluate their effectiveness, implementability, and cost.

3.3.5.3 Sediments

Limited investigations have detected the presence of various inorganics in the sediments in the upper portion of Cogdels Creek at Site 24. A number of technologies may be potentially feasible for the remediation of this type of contamination including: excavation and off-site disposal, soil washing, and stabilization/fixation. Each of these technologies will require specific data to evaluate their effectiveness, implementability, and cost.

3.3.6 Present Database Limitations

The purpose of this section is to define data limitations with respect to either characterizing the site, assessing health and environmental risk, or evaluating potential feasible technologies. The analytical methods and the level of QA/QC used for the analyses of the data provided for review were not included in the background information received for this site, and therefore could not be reported in this Work Plan. Consequently, the data provided is not suitable for use to fully characterize the site or to make as assessment of human health or ecological risks due to the contamination at the site. Site-specific RI/FS objectives and sampling strategies for resolving these data deficiencies are subsequently identified in Section 4.0 of this Work Plan.

Specific data limitations with respect to soil, groundwater, surface water, sediment, and aquatic life are discussed below.

3.3.6.1 Soil

No previous soil sampling has been conducted at this site. Therefore, analytical data is required to characterize the soil contamination, delineate areas of concern, assess human health and ecological risks, and evaluate remedial technologies.

3.3.6.2 Groundwater

Groundwater wells are needed to be placed within the suspected disposal areas to characterize and assess the nature and extent of contamination. In addition, the set of analyzed parameters from previous investigations has been limited. Most importantly, the overall quality of the existing groundwater data as well as the level of QA/QC to which it was subjected are unknown. Therefore, additional analytical data is required to fully characterize groundwater contamination, delineate the extent of contamination, assess human health and ecological risks, and evaluate remedial technologies.

3.3.6.3 Sediment

The previous sediment investigations from the upper portion of Cogdels Creek had limited analysis (included only metals). Most importantly, the overall quality of the existing sediment data as well as the level of QA/QC to which it was subjected are unknown.

Therefore, additional analytical data is required to characterize sediment contamination, delineate areas of concern, assess human health and ecological risks, and evaluate remedial technologies.

3.3.6.4 Surface Water

The previous surface water investigations from the upper portion of Cogdels Creek has had limited analysis (included only VOCs and metals). Most importantly, the overall quality of the existing surface water data as well as the level of QA/QC to which it was subjected are unknown. Therefore, additional analytical data is required to characterize surface water contamination, delineate areas of concern, assess human health and ecological risks, and evaluate remedial technologies.

3.3.6.5 Aquatic Life

Only limited data is available to assess the potential impact to aquatic life and the environment in Cogdels Creek at Site 24. Validated surface water and sediment data should be collected and used to make such an assessment. Based on the results of additional surface water and sediment samples, specific analysis of resident organisms may be needed.

4.0 REMEDIAL INVESTIGATION/FEASIBILITY STUDY OBJECTIVES

The purpose of this section is to define the site-specific RI/FS objectives in order to fulfill the goals of characterizing the problems at each site, assessing potential impacts to the public health and environment, and providing feasible alternatives for consideration in the preparation of the Record of Decision (ROD). The site-specific remedial objectives presented in this section have been identified based on the review and evaluation of existing background information, assessment of potential risks to the public health and environment, and the consideration of potential feasible technologies/alternatives.

For each site-specific objective identified, the criteria necessary to meet each objective is identified, along with a general description of the study or investigation required to obtain the information.

4.1 Site 78 - Hadnot Point Industrial Area

The project objectives, criteria for meeting the objectives, and general investigative methods for Site 78 - HPIA are presented on Table 4-1.

4.2 Site 21 - Transformer Storage Lot 140

The project objectives, criteria for meeting the objectives, and general investigative methods for Site 21 - Transformer Storage Lot 140 are presented on Table 4-2.

4.3 Site 24 - Industrial Area Fly Ash Dump

The project objectives, criteria for meeting the objectives, and general investigative methods for Site 24 - Industrial Area Fly Ash Dump are presented on Table 4-3.

TABLE 4-1
SITE 78 - HPIA RI/FS OBJECTIVES

Medium or Area of Concern	RI/FS Objective		Criteria for Meeting Objective	Proposed Investigation/Study
1. Soil	1a.	Assess the extent of soil contamination at suspected UST areas (Buildings 902, 1502, and 1601).	Characterize BTEX and TPH levels in surface and subsurface soils at suspected UST locations (Buildings 902, 1502, and 1601).	Soil Investigation
	1b.	Assess the extent, if any, of soil contamination at suspected pesticide-contaminated areas (Buildings 1103 and 1601).	Characterize pesticide levels in surface and subsurface soils at suspected areas (Buildings 1103 and 1601).	Soil Investigation
	1c.	Assess the extent, if any, of soil contamination at suspected PCB-contaminated area (Building 1300).	Characterize PCB/pesticide levels in surface and subsurface soil at suspected area (Building 1300).	Soil Investigation
	1d.	Assess human health and ecological risks associated with exposure to surface soils.	Characterize contaminant levels in surface and subsurface soils.	Soil Investigation and Risk Assessment
	1e.	Assess the presence or absence of soil contamination at other potential areas of concern not previously investigated (northeast and southeast of Louis Road and along Michael Road).	Characterize contaminant levels in surface and subsurface soils.	Soil Gas Investigation and Contingent Soil Investigation
	1f.	Determine whether or not the suspected USTs are sources of groundwater contamination.	Characterize BTEX and TPH levels in surface and subsurface soils at suspected UST locations (Buildings 902, 1502, and 1601).	Soil Investigation

TABLE 4-1 (Continued)
SITE 78 - HPIA RI/FS OBJECTIVES

Medium or Area of Concern	RI/FS Objective	Criteria for Meeting Objective	Proposed Investigation/Study
2. Groundwater	2a. Assess health risks posed by potential future usage of the shallow groundwater.	Evaluate groundwater quality and compare to ARARs and health-based action levels.	Groundwater Investigation Risk Assessment
	2b. Define hydrogeologic characteristics for fate and transport evaluation and remedial technology evaluation, if required.	Estimate hydrogeologic characteristics of the shallow aquifer (flow direction, transmissivity, permeability, etc).	Groundwater Investigation (Aquifer Tests)
	2c. Assess the presence or absence of groundwater contamination at other potential areas of concern not previously investigated.	Characterize contaminant levels in surface and subsurface soils and potentially in groundwater.	Soil Gas Investigation and Possible Groundwater Investigation
3. Sediment	3a. Assess human health and ecological risks associated with exposure to contaminated sediments.	Characterize the nature and extent of contamination in sediment.	Sediment Investigation in Beaver Dam Creek, Cogdels Creek, and New River Risk Assessment
	3b. Assess potential ecological impacts posed by contaminated sediments.	Qualitatively evaluate stress to benthic and fish communities.	Evaluation of Surface Water and Sediment Data
	3c. Determine the extent of sediment contamination for purposes of identifying areas of possible remediation.	Identify extent of sediment contamination where contaminant levels exceed risk-based action levels or EPA Region IV TBCs for sediment.	Sediment Investigation Risk Assessment

TABLE 4-1 (Continued)
SITE 78 - HPIA RI/FS OBJECTIVES

Medium or Area of Concern	RI/FS Objective	Criteria for Meeting Objective	Proposed Investigation/Study
4. Surface Water	4a. Assess the presence or absence of surface water contamination in Beaver Dam Creek and Cogdels Creek.	Determine surface water quality along Beaver Dam Creek and Cogdels Creek.	Surface Water Investigation
	4b. Assess impacts to Beaver Dam Creek and Cogdels Creek from groundwater discharge from Operable Unit No. 1.	Determine surface water quality in the creeks.	Surface Water Investigation
		Assess groundwater quality from Operable Unit No. 1.	Groundwater Investigation

TABLE 4-2
SITE 21 - TRANSFORMER STORAGE LOT 140 RI/FS OBJECTIVES

Medium or Area of Concern	RI/FS Objective	Criteria for Meeting Objective	Proposed Investigation/Study
1. Soil	1a. Assess the extent of soil contamination at the former pesticide mixing area.	Characterize contaminant levels in surface and subsurface soils at former mixing area.	Soil Investigation
	1b. Assess the extent of soil contamination at former transformer oil pit.	Characterize contaminant levels in surface and subsurface soils at the former transformer oil pit.	Soil Investigation
	1c. Assess human health and ecological risks associated with exposure to surface soils at the site.	Characterize contaminant levels in surface and subsurface soils at the site.	Soil Investigation Risk Assessment
	1d. Determine whether pesticide and/or PCB contamination from soils is migrating to groundwater.	Characterize groundwater quality in pesticide and PCB areas.	Groundwater Investigation
2. Groundwater	2a. Assess health risks posed by potential future usage of the shallow groundwater.	Evaluate groundwater quality and compare to ARARs and health-based action levels.	Groundwater Investigation Risk Assessment
	2b. Define hydrogeologic characteristics for fate and transport evaluation and remedial technology evaluation, if required.	Estimate hydrogeologic characteristics of the shallow aquifer (flow direction, transmissivity, permeability, etc).	Groundwater Investigation (Aquifer Tests)
	2c. Determine whether groundwater is contaminated with site-related constituents.	Evaluate groundwater quality and compare to ARARs.	Groundwater Investigation

TABLE 4-2 (Continued)
SITE 21 - TRANSFORMER STORAGE LOT 140 RI/FS OBJECTIVES

Medium or Area of Concern	RI/FS Objective	Criteria for Meeting Objective	Proposed Investigation/Study
3. Sediment	3a. Assess human health and ecological risks associated with exposure to contaminated sediments.	Characterize the nature and extent of contamination in sediment.	Sediment Investigation in Site Drainage Ditch Risk Assessment
	3b. Assess potential ecological impacts posed by contaminated sediments.	Qualitatively evaluate stress to benthic and fish communities.	Evaluation of Surface Water and Sediment Investigation
	3c. Determine the extent of sediment contamination for purposes of identifying areas potentially requiring remediation.	Identify extent of sediment contamination where contaminant levels exceed risk-based action levels or EPA Region IV TBCs for sediment.	Sediment Investigation in Site Drainage Ditch Risk Assessment
4. Surface Water	4a. Assess the presence or absence of surface water contamination in the site drainage ditch.	Determine surface water quality, if present, in the site drainage ditch.	Surface Water Investigation

TABLE 4-3
SITE 24 - INDUSTRIAL AREA FLY ASH DUMP RI/FS OBJECTIVES

Medium or Area of Concern	RI/FS Objective	Criteria for Meeting Objective	Proposed Investigation/Study
1. Soil	1a. Assess the extent of soil contamination at the spiractor sludge disposal area.	Characterize contaminant levels in surface and subsurface soils.	Soil Investigation
	1b. Assess the extent of soil contamination at the fly ash disposal area.	Characterize contaminant levels in surface and subsurface soils.	Soil Investigation
	1c. Assess the extent of soil contamination at the buried metal areas.	Characterize contaminant levels in surface and subsurface soils.	Soil Investigation
	1d. Identify the buried metal at the buried metal areas.	Characterize the soils within the buried metal areas.	Soil Investigation - Test Pitting
	1e. Assess the extent of soil contamination at the borrow and debris disposal area.	Characterize contaminant levels in surface and subsurface soils.	Soil Investigation
	1f. Assess human health and ecological risks associated with exposure to surface soils.	Characterize contaminant levels in surface and subsurface soils.	Soil Investigation Risk Assessment
2. Groundwater	2a. Assess health risks posed by potential future usage of the shallow groundwater.	Evaluate groundwater quality and compare to ARARs and health-based action levels.	Groundwater Investigation Risk Assessment
	2b. Define hydrogeologic characteristics for fate and transport evaluation and remedial technology evaluation, if required.	Estimate hydrogeologic characteristics of the shallow aquifer (flow direction, transmissivity, permeability, etc).	Groundwater Investigation (Aquifer Tests)

TABLE 4-3 (Continued)
SITE 24 - INDUSTRIAL AREA FLY ASH DUMP RI/FS OBJECTIVES

Medium or Area of Concern	RI/FS Objective	Criteria for Meeting Objective	Proposed Investigation/Study
3. Sediment	3a. Assess human health and ecological risks associated with exposure to contaminated sediments.	Characterize the nature and extent of contamination in sediment.	Sediment Investigation in Cogdels Creek, and New River Risk Assessment
	3b. Assess potential ecological impacts posed by contaminated sediments.	Evaluate stress to benthic and fish communities.	Evaluation of Surface Water and Sediment Data
	3c. Determine the extent of sediment contamination for purposes of identifying areas of remediation.	Identify extent of sediment contamination where contaminant levels exceed risk-based action levels or EPA Region IV TBCs for sediment.	Sediment Investigation Risk Assessment
4. Surface Water	4a. Assess the presence or absence of surface water contamination in Cogdels Creek.	Determine surface water quality along Cogdels Creek.	Surface Water Investigation
	4b. Assess impacts to Cogdels Creek from groundwater discharge from Operable Unit No. 1.	Determine surface water quality in Cogdels Creek.	Surface Water Investigation
		Assess groundwater quality from Operable Unit No. 1.	Groundwater Investigation

5.0 REMEDIAL INVESTIGATION/FEASIBILITY STUDY TASKS

This section identifies the tasks and field investigations that will be needed to complete RI/FS activities at Operable Unit No. 1 (Sites 78, 21, and 24).

5.1 Task 1 - Project Management

Project management activities involved under Task 1 include such activities as daily technical support and guidance; budget and schedule review and tracking; preparation and review of invoices; manpower resources planning and allocation; and communication with LANTDIV and the Activity.

5.2 Task 2 - Subcontract Procurement

Task 2 involves the procurement of subcontractor services such as drilling, test pit excavations, ordnance clearance and monitoring, and laboratory analysis. In the event that treatability studies are warranted, procurement of bench-scale or pilot-scale studies will be performed under this task.

5.3 Task 3 - Field Investigations

The field investigations will be conducted under Task 3. An overview of the field investigations to be conducted at each of the three sites is presented in the following subsections. Specific details with respect to the investigative and analytical methods are provided in the Field Sampling and Analysis Plan (FSAP) and the Quality Assurance Project Plan (QAPP). The field investigations described below will provide data to meet the overall RI/FS objectives presented in Section 4.0 of this RI/FS Work Plan.

5.3.1 Site 78 - HPIA

The following investigations and support activities will be conducted at Site 78:

- Surveying;
- Soil gas surveying;
- Soil investigations;

- Groundwater investigations; and
- Surface water/sediment investigations.

Each of these activities is described below.

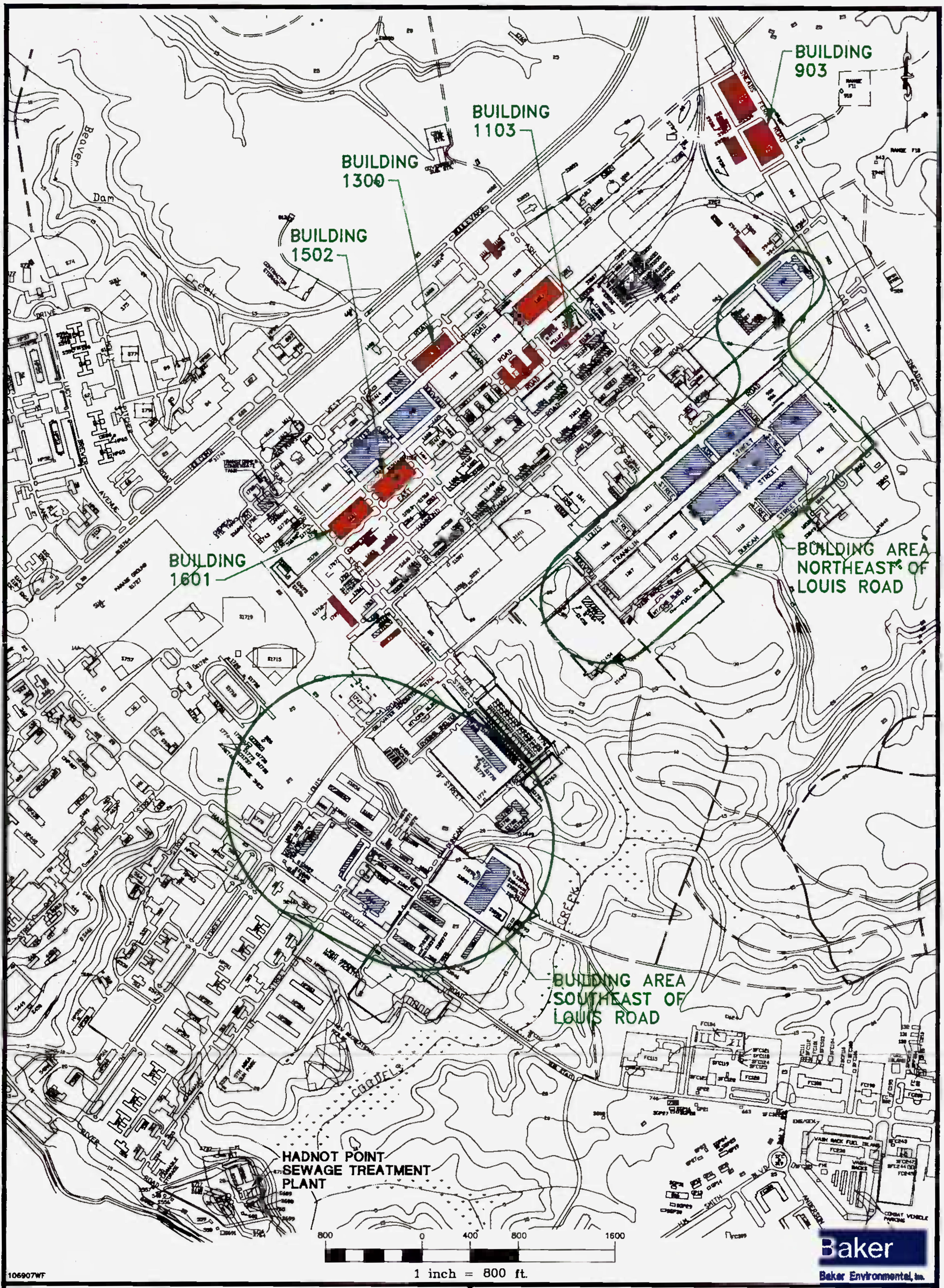
5.3.1.1 Surveying

All existing monitoring wells and any wells installed during the investigation at Site 78 will be surveyed. The top of the protective casing, the top of the well casing, and the elevation of the ground surface will be surveyed. Latitude, longitude, elevation in feet of mean sea level, accuracy, and survey methods will be reported. The vertical accuracy will be 0.01 feet and the horizontal accuracy will be within 0.1 foot. In addition, soil sampling locations (i.e., boreholes) and surface water/sediment sample locations will be surveyed to a horizontal accuracy of 1 foot.

5.3.1.2 Soil Gas Surveying

Based on a review of background information, there are three groups of buildings within HPIA which may be potential areas of concern (due to past and/or present solvent usage/storage). These buildings have not had any previous investigations to determine whether they are a source of contamination at the HPIA.

A soil gas survey will be conducted in the potential area of concern northeast of Louis Road, in the potential area of concern southeast of Louis Road, and along Michael Road in an attempt to evaluate whether these areas are areas of concern. Initially, soil gas samples will be collected around each of the buildings thought to be a potential area of concern. As shown on Figure 5-1, the area northeast of Louis Road includes Buildings 907, 915, 916, 1011, 1012, 1116, 1117, and 1450. In addition, Buildings 908, 909, 926, 927, and 928 will be included in this area. The buildings to be investigated in the southeast area include Buildings 1775, 1780, 1804, 1808, 1810, 1815, 1817, 1826, 1828, 1854, 1755, 1750, 1812, 1841, 1860, and 1880. In addition, Building 1765 will be included in this southeast area. Please note that Buildings 1755, 1750, and 1812 could not be located on the existing maps for Camp Lejeune and therefore are not identified on Figure 5-1. The buildings along Michael Road that will be included in the soil gas survey include buildings 1106, 1205, 1206, 1310, 1407, 1408, 1505, and 1604.



LEGEND

▨ POTENTIAL AREAS OF CONCERN

🟥 AREAS OF CONCERN PREVIOUSLY INVESTIGATED

SOURCE: LANTDIV, FEBRUARY 1992

FIGURE 5-1
POTENTIAL OR KNOWN AREAS OF CONCERN
WITHIN HPIA (SITE 78)
HADNOT POINT INDUSTRIAL AREA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

01491EE06V

A minimum of five soil gas samples will be collected around each of the above-mentioned buildings of concern. To collect the soil gas samples, a small hole will be produced by using a drive rod. Where pavement is present, an electric hammer drill will be used prior to using the drive rod. The sampling system will be purged with ambient air, a sampling probe will be inserted to the full depth of the hole and sealed off from the atmosphere. A sample of in-situ soil gas with then be withdrawn through the probe and encapsulated in a pre-evacuated container. The sample (vapors from the interstitial space) will be analyzed on site using a portable gas chromatograph (GC). TCE, vinyl chloride, BTEX, and 1,2-DCE will be used as the indicator compounds for the analysis since these are the contaminants of concern at Site 78.

Detailed sampling procedures for the soil gas surveying are provided in the FSAP.

5.3.1.3 Soil Investigations

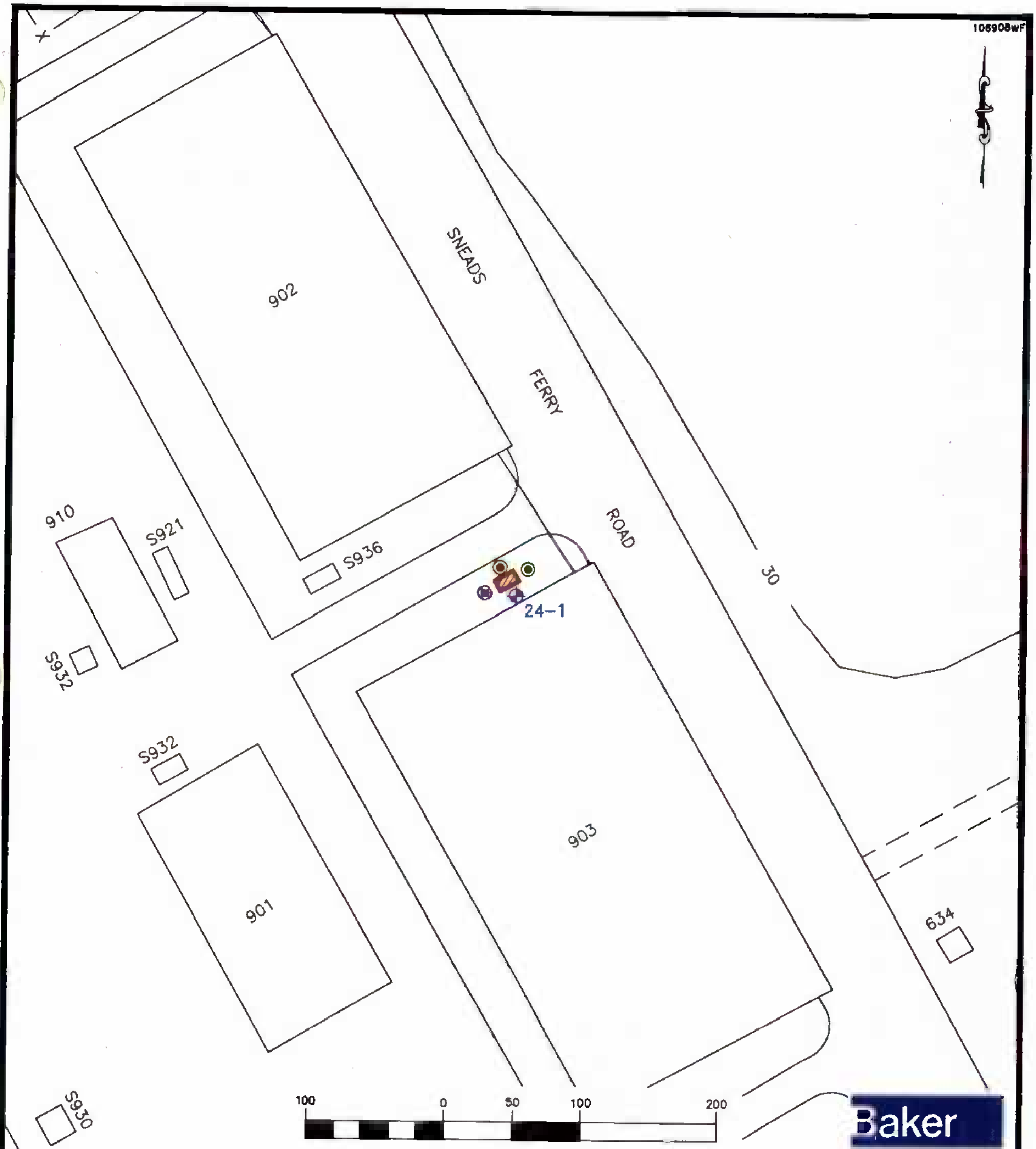
Soil investigations will be conducted at three areas of concern within HPIA which include: (1) underground storage tank (UST) locations identified during the geophysical survey investigation at Buildings 903, 1502, and 1601, (2) Building 1300, and (3) Buildings 1103 and 1601. Representative background soil samples will be collected adjacent to the site. In addition, soil samples may be collected at areas of concern identified by the soil gas survey. Soil samples will also be collected during the installation of new monitoring wells.

UST Locations

The geophysical survey investigation conducted in June 1992 identified potential UST locations at Buildings 903, 1502, and 1601. No potential UST areas were identified at Building 1202.

As shown on Figures 5-2 and 5-3, three soil borings will be installed around each of the suspected UST locations at Buildings 903, 1502, and 1601.

Test borings will be augered and soil samples collected via ASTM Method D1586-84 at each sample station. The borings will initially be hand augered to reduce the possibility of rupturing an existing tank and/or line. A total of fifteen boreholes (three at Building 902, nine at Building 1502, and three at Building 1601) will be augered. Samples will be collected from the ground surface (top six inches) and at 5-foot intervals to the top of the water table, which is



SOURCE: LANTDIV, OCT. 1991

1 inch = 100 ft.

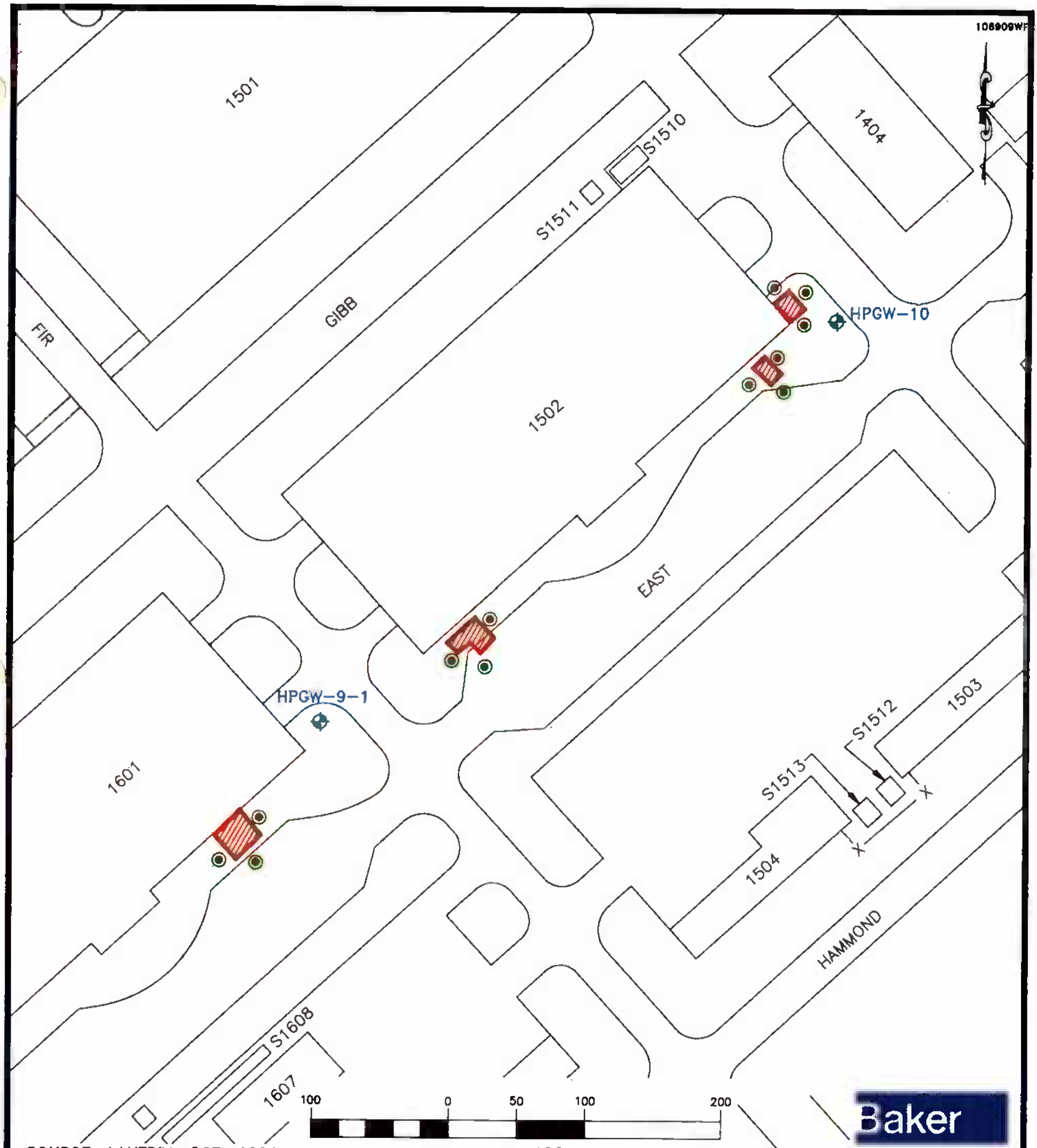
	DESCRIPTION	CHEMICAL ANALYSIS	TURNAROUND TIME
🟥	TANK AREA	-	-
●	SOIL BORING (CONTINUOUS - SS TO 10 FEET)	TCL ORGANICS	ROUTINE (28-40 DAYS)
●	SOIL BORING (CONTINUOUS - SS TO 10 FEET)	FULL TCL/TAL ENGINEERING PARAMETERS	ROUTINE (28-40 DAYS)
24-1 ⊕	EXISTING MONITORING WELL	-	-

NOTE: ALL SURFACE SOIL SAMPLES WILL BE ANALYZED FOR FULL TCL ORGANICS/TAL INORGANICS (ROUTINE TURNAROUND)

FIGURE 5-2
SOIL INVESTIGATION AT SUSPECTED BURIED TANK AREAS
BUILDING 903
SITE 78

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

01491EEB2Y



SOURCE: LANTDIV, OCT. 1991

Baker Environmental, Inc.

	DESCRIPTION	CHEMICAL ANALYSIS	TURNAROUND TIME
▨	TANK AREA	-	-
●	SOIL BORING (CONTINUOUS - SS TO 10 FEET)	TCL ORGANICS	ROUTINE (28-40 DAYS)
HPGW -10 ⊕	EXISTING MONITORING WELL	-	-

NOTE: ALL SURFACE SOIL SAMPLES WILL BE ANALYZED FOR FULL TCL ORGANICS/TAL INORGANICS (ROUTINE TURNAROUND)

FIGURE 5-3
SOIL INVESTIGATION AT SUSPECTED BURIED TANK AREAS BUILDING 1502 AND 1601
SITE 78

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

estimated to be approximately five to ten feet below ground surface across the site. Therefore, it is possible that as many as three soil samples and no less than two soil samples will be collected from each borehole for subsequent laboratory analysis.

All surface soil samples will be analyzed for full Target Compound List (TCL) organics and Target Analyte List (TAL) inorganics via Contract Laboratory Program (CLP) protocol (Level IV data quality.) These samples will allow an assessment of human health and ecological risks to be made and will provide data to more fully characterize the soils. The subsurface soil samples will be analyzed for full TCL organics (Level IV data quality). The surface and subsurface samples will be analyzed within the maximum allowable holding times (i.e., routine analytical turnaround).

Specific details on the analytical methods and data validation are discussed in the QAPP.

As shown on Figure 5-2, the samples from one boring near Building 903 will be subjected to additional analyses to evaluate engineering parameters. All samples from this boring will be analyzed for grain size, moisture density, TCLP, residual chlorine, total fluoride, organic nitrogen, alkalinity, corrosivity, ignitability, reactivity, and total organic carbon (TOC). These parameters will help in evaluating potential applicable technologies such as thermal destruction and solidification/fixation, or off-site treatment and disposal options.

Table 5-1 summarizes the soil sampling programs for the UST locations at Site 78.

Building 1300

During previous investigations, the PCB, Aroclor-1260, was detected at a soil boring located at Building 1300 to a depth of 6 feet. In addition, low levels of the pesticides heptachlor epoxide and endosulfan I were detected at this soil boring. In an attempt to determine the extent of this contamination at Building 1300 or to confirm that there is not a contamination problem at this building, five soil borings (shown on Figure 5-4) will be installed along the eastern side of the building.

Test borings will be augered and soil samples collected via ASTM Method D1586-84 at each sample station. Samples will be collected from the ground surface (top six inches) and at 5-foot intervals to the top of the water table, which is estimated to be approximately five to ten feet below ground surface across the site. Therefore, it is possible that as many as three soil

TABLE 5-1

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAMS AT SITES 78, 21, and 24 MCB CAMP LEJEUNE, NORTH CAROLINA

Study Area	Investigation	Baseline No. of Samples(1)	Analysis(8)	Data Quality Level	Analytical Method	Laboratory Turnaround Time(3)
Site 78	Soil - UST Areas	1 boring/2 to 3 samples(2)	Grain Size	III	ASTM D422	Routine
			Moisture Density	III	ASTM D698	Routine
			Total TCLP	III	40 CFR 261	Routine
			Chlorine, Residual	III	EPA 330.5	Routine
			Total Fluoride	III	SM 4500-F	Routine
			Nitrogen (organic)	III	EPA 351.4	Routine
			Alkalinity (total)	III	SM 2320-B	Routine
			Corrosivity	III	40 CFR 261	Routine
			Ignitability	III	40 CFR 261	Routine
			Reactivity	III	40 CFR 261	Routine
			TOC	III	EPA 415.1	Routine
		15 borings/15 samples(2) (surface soils)	TCL Organics	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
		15 borings/15 to 30 samples(2) (subsurface soils)	TCL Organics	IV	4,5,6	Routine
	Soil - Building 1300	3 borings/3 samples(2) (surface soils)	TCL Organics	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
		3 borings/3 to 6 samples(2) (subsurface soils)	TCL Pesticides	IV	6	Routine
			Chlorinated Herbicides	IV	EPA 8150	Routine
			TCL PCBs	IV	6	Routine
		2 borings/2 samples(2) (surface soils)	TCL Organics	IV	4, 5, 6	14 days
			TAL Inorganics	IV	7	14 days
		2 borings/2 to 4 samples(2) (subsurface soils)	TCL Pesticides	IV	6	14 days
			Chlorinated Herbicides	IV	EPA 8150	14 days
			TCL PCBs	IV	6	14 days

TABLE 5-1 (Continued)

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAMS AT SITES 78, 21, and 24
MCB CAMP LEJEUNE, NORTH CAROLINA

Study Area	Investigation	Baseline No. of Samples(1)	Analysis(8)	Data Quality Level	Analytical Method	Laboratory Turnaround Time(3)
Site 78 (Continued)	Soil - Buildings 1103 and 1601	4 borings/4 samples (surface soils)	TCL Organics TAL Inorganics	IV IV	4, 5, 6 7	Routine Routine
		4 borings/4 samples (subsurface soils)	TCL Pesticides Chlorinated Herbicides	IV IV	6 EPA 8150	Routine Routine
		6 borings/6 samples (surface soils)	TCL Organics TAL Inorganics	IV IV	6 EPA 8150	14 days 14 days
		6 borings/6 samples (subsurface soils)	TCL Pesticides Chlorinated Herbicides	IV IV	4, 5, 6 7	14 days 14 days
	Soil Gas Survey	38 building areas/5 samples per building (estimated); 190 samples	TCE, vinyl chloride, BTEX, 1,2-DCE	II	Field GC	Daily
	Soil -Soil Gas Survey	5 borings per location/2 to 3 samples per boring(2)(11)	TCL Organics TAL Inorganics	IV IV	4,5,6 7	Routine Routine
	Soil - Background	2 borings/4 to 6 samples (2)	TCL Organics TAL Inorganics	IV IV	4,5,6 7	Routine Routine
	Groundwater	42 samples from existing wells (29 shallow, 7 intermediate, 6 deep)	TCL Volatiles TAL Inorganics	IV IV	EPA 601/602 7	Routine Routine
		5 samples from existing wells (3 shallow, 1 intermediate, 1 deep)	TCL Organics TAL Inorganics	IV IV	4, 5, 6 7	Routine Routine
		Newly-installed wells(11)	TCL Organics TAL Inorganics	IV IV	4,5,6 7	Routine Routine
		4 samples (shallow): 2 existing wells and 2 newly-installed wells	BOD COD TOC TSS TDS TVS	III	EPA 405.1 EPA 410.1 EPA 415.1 EPA 160.2 EPA 160.1 EPA 160.4	Routine Routine Routine Routine Routine Routine

TABLE 5-1 (Continued)

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAMS AT SITES 78, 21, and 24
MCB CAMP LEJEUNE, NORTH CAROLINA

Study Area	Investigation	Baseline No. of Samples(1)	Analysis(8)	Data Quality Level	Analytical Method	Laboratory Turnaround Time(3)
Site 78 (Continued)	Surface Water Cogdels Creek and New River	20 samples	TCL Organics TAL Inorganics	IV IV	4, 5, 6 7	Routine Routine
	Surface Water Beaver Dam Creek	7 samples	TCL Organics TAL Inorganics	IV IV	4, 5, 6 7	Routine Routine
	Sediment - Cogdels Creek and New River	20 stations/40 samples	TCL Organics TAL Inorganics	IV IV	4, 5, 6 7	Routine Routine
	Sediment - Beaver Dam Creek	7 stations/14 samples	TCL Organics TAL Inorganics	IV IV	4, 5, 6 7	Routine Routine

TABLE 5-1 (Continued)

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAMS AT SITES 78, 21, and 24
MCB CAMP LEJEUNE, NORTH CAROLINA

Study Area	Investigation	Baseline No. of Samples(1)	Analysis(8)	Data Quality Level	Analytical Method	Laboratory Turnaround Time(3)
Site 21	Soil - Former Pesticide Mixing Area	16 borings/16 samples (surface soils)	TCL Organics	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
		10 borings/10 to 20 samples(2) (subsurface soils)	TCL Pesticides	IV	6	Routine
			Chlorinated Herbicides	IV	EPA 8150	Routine
		4 borings/4 to 8 samples(2) (subsurface soils)	TCL Pesticides	IV	6	14 days
			Chlorinated Herbicides	IV	EPA 8150	14 days
			PCBs	IV	6	14 days
		2 borings/2 to 4 samples(2) (subsurface soils)	TCL Organics	IV	4,5,6	Routine
			TAL Inorganics	IV	7	Routine
		1 boring/2 to 3 samples(2)	Grain Size	III	ASTM D422	Routine
			Moisture Density	III	ASTM D698	Routine
			Total TCLP	III	40 CFR 261	Routine
			Chlorine, Residual	III	EPA 330.5	Routine
			Total Fluoride	III	SM 4500-F	Routine
			Nitrogen (organic)	III	EPA 351.4	Routine
			Alkalinity (total)	III	SM 2320-B	Routine
			Corrosivity	III	40 CFR 261	Routine
			Ignitability	III	40 CFR 261	Routine
			Reactivity	III	40 CFR 261	Routine
			TOC	III	EPA 415.1	Routine
	Soil - MW Bore-holes - Pesticide Mixing Area	1 boring/3 to 4 samples (surface and subsurface soils)	TCL Organics	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
	Soil - Transformer Oil Pit	11 borings/11 samples (surface soils)	TCL Organics	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
		2 borings/2 to 4 samples(2) (subsurface soils)	TCL Organics	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
		5 borings/5 to 10 samples(2) (subsurface soils)	TCL Organics	IV	4,5,6	14 days
			TAL Inorganics	IV	7	14 days
		3 borings/3 to 6 samples(2) (subsurface soils)	PCBs	IV	6	Routine
		1 boring/1 to 2 samples(2) (subsurface soils)	PCBs	IV	6	14 days

TABLE 5-1 (Continued)

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAMS AT SITES 78, 21, and 24
MCB CAMP LEJEUNE, NORTH CAROLINA

Study Area	Investigation	Baseline No. of Samples(1)	Analysis(8)	Data Quality Level	Analytical Method	Laboratory Turnaround Time(3)
Site 21 (Continued)	Soil - Transformer Oil Pit (Cont.)	1 boring/2 to 3 samples(2)	Grain Size	III	ASTM D422	Routine
			Moisture Density	III	ASTMD698	Routine
			Chlorine, Residual	III	EPA 330.5	Routine
			Total Fluoride	III	SM 4500-F	Routine
			Nitrogen (Organic)	III	EPA 351.4	Routine
			TOC	III	EPA 415.1	Routine
		1 boring/1 composite sample	Total TCLP	III	40 CFR 261	Routine
			Alkalinity (Total)	III	SM 2320-B	Routine
			Corrosivity	III	40 CFR 261	Routine
			Ignitability	III	40 CFR 261	Routine
			Reactivity	III	40 CFR 261	Routine
	Soil - MW Boreholes - Transformer Oil Pit	1 boring/2 samples (21GW2)	TCL Organics	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
		1 boring/3 to 4 samples (21GW3)	TCL Organics	IV	4,5,6	Routine
			TAL Inorganics	IV	7	Routine
	Groundwater	3 samples (3 existing wells) (shallow)	TCL Pesticides/Herbicides	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
		4 samples (3 new wells, 1 existing well) (shallow)	TCL Volatiles	IV	EPA 601/602	Routine
			TCL Organics	IV	5, 6	Routine
			TAL Inorganics	IV	7	Routine
		3 samples (3 newly installed wells) (shallow)	BOD	III	EPA 405.1	Routine
			COD	III	EPA 410.1	Routine
			TSS	III	EPA 160.2	Routine
			TDS	III	EPA 160.1	Routine
			TVS	III	EPA 160.4	Routine
			TOC	III	EPA 415.1	Routine

TABLE 5-1 (Continued)

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAMS AT SITES 78, 21, and 24
MCB CAMP LEJEUNE, NORTH CAROLINA

Study Area	Investigation	Baseline No. of Samples(1)	Analysis(8)	Data Quality Level	Analytical Method	Laboratory Turnaround Time(3)
Site 21 (Continued)	Surface Water Site Drainage Ditch	7 stations/7 samples	TCL Organics	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
		10 stations/10 samples	TCL Pesticides/Herbicides	IV	4, 5, 6	Routine
			PCBs	IV	6	Routine
	Sediment - Site Drainage Ditch	7 stations/14 samples	TCL Organics	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
		10 stations/20 samples	TCL Pesticides/Herbicides	IV	4, 5, 6	Routine
			PCBs	IV	6	Routine

TABLE 5-1 (Continued)

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAMS AT SITES 78, 21, and 24
MCB CAMP LEJEUNE, NORTH CAROLINA

Study Area	Investigation	Baseline No. of Samples(1)	Analysis(8)	Data Quality Level	Analytical Method	Laboratory Turnaround Time(3)
Site 24	Soil - Spiractor Sludge Area	6 borings/12 to 18 samples(2)	TCL Organics	IV	4,5,6	Routine
			TAL Inorganics	IV	7	Routine
		4 borings/8 to 12 samples(2)	TCL Organics	IV	4,5,6	14 days
			TAL Inorganics	IV	7	14 days
		1 boring/2 to 3 samples(2)	Grain Size	III	ASTM D422	Routine
			Moisture Density	III	ASTM D698	Routine
			Total TCLP	III	40 CFR 261	Routine
			Chlorine, Residual	III	EPA 330.5	Routine
			Total Fluoride	III	SM 4500-F	Routine
			Nitrogen (organic)	III	EPA 351.4	Routine
			Alkalinity (total)	III	SM 2320-B	Routine
			Corrosivity	III	40 CFR 261	Routine
			Ignitability	III	40 CFR 261	Routine
			Reactivity	III	40 CFR 261	Routine
			TOC	III	EPA 415.1	Routine
	Soil - MW Boreholes - Spiractor Sludge Area	2 borings/4 samples (24GW7, 24GW8)	TCL Organics	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
	Soil - Fly Ash Disposal Area	4 borings/8 samples	TCL Organics	IV	4, 5, 6	Routine
			TAL Inorganics	IV	7	Routine
		4 borings/8 samples	TCL Organics	IV	4, 5, 6	14 days
			TAL Inorganics	IV	7	14 days
		7 borings/14 samples	TAL Inorganics	IV	7	Routine
		1 boring/2 samples	Grain Size	III	ASTM D422	Routine
			Moisture Density	III	ASTM D698	Routine
			Total TCLP	III	40 CFR 261	Routine
			Chlorine, Residual	III	EPA 330.5	Routine
			Total Fluoride	III	SM 4500-F	Routine
			Nitrogen (organic)	III	EPA 351.4	Routine
			Alkalinity (total)	III	SM 2320-B	Routine
			Corrosivity	III	40 CFR 261	Routine
			Ignitability	III	40 CFR 261	Routine
			Reactivity	III	40 CFR 261	Routine
			TOC	III	EPA 415.1	Routine

TABLE 5-1 (Continued)

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAMS AT SITES 78, 21, and 24
MCB CAMP LEJEUNE, NORTH CAROLINA

Study Area	Investigation	Baseline No. of Samples(1)	Analysis(8)	Data Quality Level	Analytical Method	Laboratory Turnaround Time(3)
Site 24 (Continued)	Soil - MW Boreholes - Fly Ash Area	1 boring/2 samples (24GW9)	TCL Organics TAL Inorganics	IV IV	4, 5, 6 7	Routine Routine
	Soil - Test Pits - Buried Metal Areas	7 test pits (estimated) 1 sample per test pit	TCL Organics TAL Inorganics	IV IV	4, 5, 6 7	Routine Routine
	Waste - Test Pits - Buried Metal Areas	1 sample per test pit (if drums or wastes are present)	Total TCLP RCRA Hazardous Characteristics	III IV	40 CFR 261 40 CFR 261	Routine Routine
	Soil - Borrow and Debris Disposal Area	4 borings/8 to 12 samples(2)	TCL Organics TAL Inorganics	IV IV	4, 5, 6 7	Routine Routine
		6 borings/12 to 18 samples(2)	TAL Inorganics	IV	7	Routine
		4 borings/8 to 12 samples(2)	TCL Organics TAL Inorganics	IV IV	4, 5, 6 7	14 days 14 days
		1 boring/2 to 3samples(2)	Grain Size Moisture Density Total TCLP Chlorine, Residual Total Fluoride Nitrogen (organic) Alkalinity (total) Corrosivity Ignitability Reactivity TOC	III III III III III III III III III III III	ASTM D422 ASTM D698 40 CFR 261 EPA 330.5 SM 4500-F EPA 351.4 SM 2320-B 40 CFR 261 40 CFR 261 40 CFR 261 EPA 415.1	Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine
	Soil - MW Boreholes - Borrow and Debris Area	1 boring/2 samples (24GW10)	TCL Organics TAL Inorganics	IV IV	4,5,6 7	Routine Routine

TABLE 5-1 (Continued)

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAMS AT SITES 78, 21, and 24
MCB CAMP LEJEUNE, NORTH CAROLINA

Study Area	Investigation	Baseline No. of Samples(1)	Analysis(8)	Data Quality Level	Analytical Method	Laboratory Turnaround Time(3)
Site 24 (Continued)	Groundwater	5 samples (existing wells) (shallow)	TAL Inorganics	IV	7	Routine
		4 samples (new wells) (shallow)	TCL Volatiles	IV	EPA 601/602	Routine
			TCL Organics	IV	5, 6	Routine
			TAL Inorganics	IV	7	
		4 samples (new shallow wells)	BOD	III	EPA 405.1	Routine
			COD	III	EPA 410.1	Routine
			TSS	III	EPA 160.2	Routine
			TDS	III	EPA 160.1	Routine
			TVS	III	EPA 160.4	Routine
			TOC	III	EPA 415.1	Routine

(1) Baseline number of samples do not include field QA/QC samples.

(2) Assumes 2 to 3 samples per borehole.

(3) Routine analytical turnaround is 28 days following receipt of sample.

(4) Purgeable Organic Compounds - EPA 8240/EPA 624

(5) Base/Neutral Acid Extractables - EPA 3510/EPA 625

(6) Pesticides and PCBs - EPA 3510/3550/EPA 608

(7) TCL Inorganics:

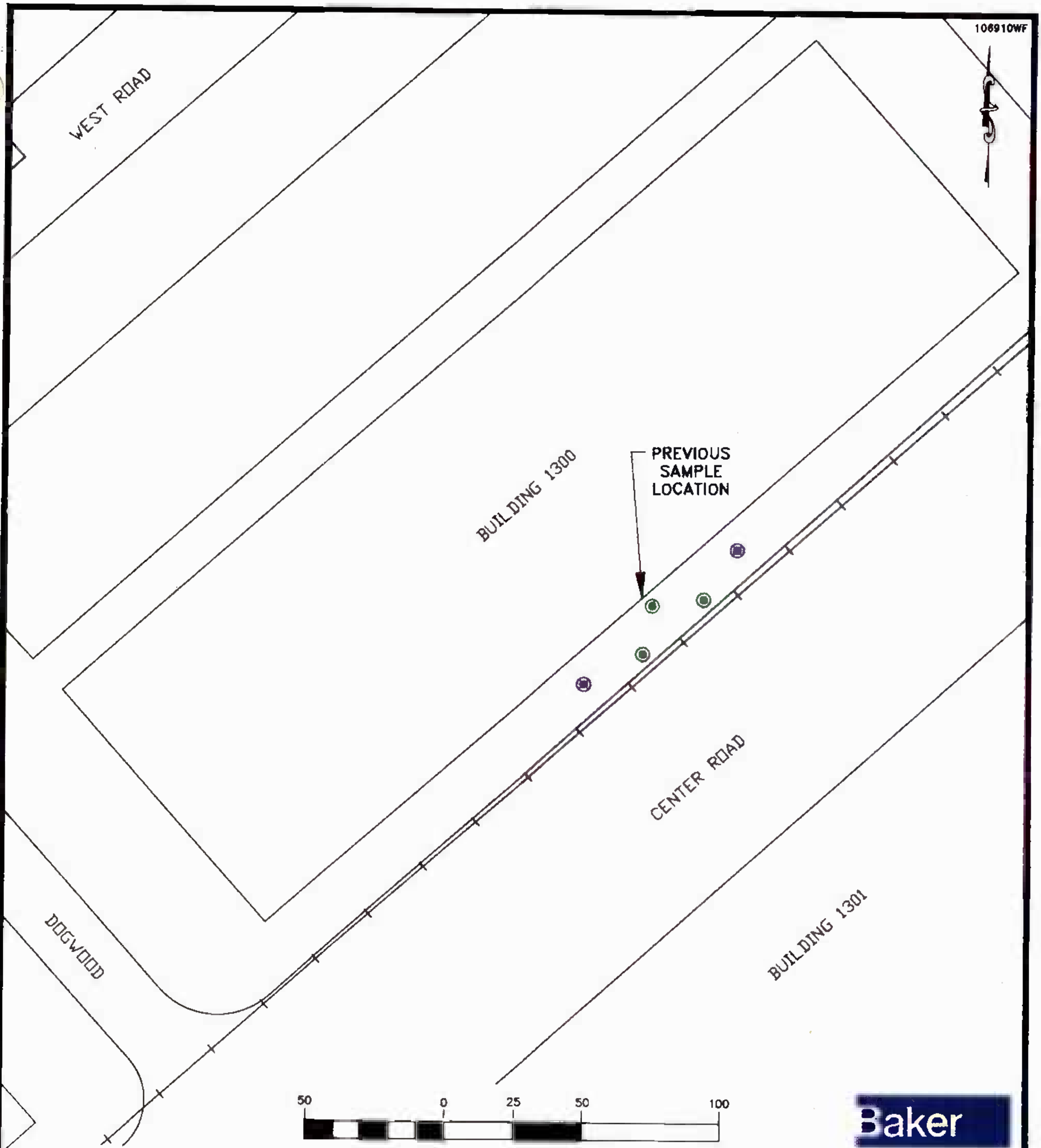
Aluminum	EPA 3010/EPA 200.7	Cobalt	EPA 3010/EPA 200.7	Potassium	EPA 3010/EPA 200.7
Antimony	EPA 3010/EPA 200.7	Copper	EPA 3010/EPA 200.7	Selenium	EPA 3020/EPA 270.2
Arsenic	EPA 3020/EPA 206	Iron	EPA 3010/EPA 200.7	Silver	EPA 3010/EPA 200.7
Barium	EPA 3010/EPA 200.7	Lead	EPA 3020/EPA 239	Sodium	EPA 3010/EPA 200.7
Beryllium	EPA 3010/EPA 200.7	Magnesium	EPA 3010/EPA 200.7	Thallium	EPA 3020/EPA 279
Cadmium	EPA 3010/EPA 200.7	Manganese	EPA 3010/EPA 200.7	Vanadium	EPA 3010/EPA 200.7
Calcium	EPA 3010/EPA 200.7	Mercury	EPA 3010/EPA 245.1	Zinc	EPA 3010/EPA 200.7
Chromium	EPA 3010/EPA 200.7	Nickel	EPA 3010/EPA 200.7	Cyanide	EPA 3010/EPA 335.2

(8) BOD - Biological Oxygen Demand (SM 5210)
COD - Chemical Oxygen Demand (EPA 410.1)
TSS - Total Suspended Solids (EPA 160.2)
TDS - Total Dissolved Solids (EPA 160.1)
TVS - Total Volatile Solids (EPA 160.4)
TOC - Total Organic Carbon (EPA 415.1)

(9) Trip Blank - 1 per cooler (VOCs only)
Equipment Rinsate - 1 per day for each matrix sampled
Matrix Spike/Matrix Spike Duplicate - 1 per 20 samples

(10) BTEX - Benzene, Toluene, Ethylbenzene, Xylenes

(11) Actual number of samples is unknown and will be based on the soil gas survey.



SOURCE: LANTDIV, OCT. 1991

Baker
Baker Environmental, Inc.

	DESCRIPTION	CHEMICAL ANALYSIS	TURNAROUND TIME
●	SOIL BORING (CONTINUOUS – SS TO 10 FEET)	TCL PESTICIDES/ HERBICIDES/PCBS	ROUTINE (28–40 DAYS)
●	SOIL BORING (CONTINUOUS – SS TO 10 FEET)	TCL PESTICIDES/ HERBICIDES/PCBS	QUICK TURNAROUND

NOTE: ALL SURFACE SOIL SAMPLES WILL BE ANALYZED FOR FULL TCL ORGANICS/TAL INORGANICS (ROUTINE TURNAROUND)

FIGURE 5-4
SOIL INVESTIGATION AT
BUILDING 1300
SITE 78

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

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samples and no less than two soil samples will be collected from each borehole for subsequent laboratory analysis.

All surface soil samples will be analyzed for full TCL organics and TAL inorganics via CLP protocol and Level IV data quality. The subsurface soil samples will be analyzed for PCBs and pesticides/herbicides via EPA Methods 608 and 8150 (Level IV data quality).

Samples from three of the borings will be analyzed within the maximum allowable holding times (i.e., routine analytical turnaround). Samples from the other two borings will be analyzed within 14 days (quick analytical turnaround) as indicated on Figure 5-4. These samples will be used to determine whether further soil sampling is required to delineate the extent of surface or subsurface soil contamination. Areas where elevated levels of contaminants are detected will be further investigated. These areas will be determined during the field investigation in consultation with EPA Region IV, the N.C. DEHNR, and LANTDIV.

Table 5-1 summarizes the soil sampling programs for Building 1300.

Buildings 1103 and 1601

During previous investigations, pesticides including dieldrin, 4,4DDT, and 4,4-DDE were detected at a soil boring located at Building 1103 and at a soil boring located across from Building 1601. Pesticides were detected at a depth of 0 to 2 feet at both of these locations. In an attempt to determine the extent of this contamination at these two buildings or to confirm that there is not a contamination problem, five soil borings (shown on Figures 5-5 and 5-6) will be installed at each building.

Test borings will be hand-augered and soil samples collected via ASTM Method D1586-84 at each sample station. Samples will be collected from the ground surface (top six inches) and from the 2 to 4 feet range (composite sample) for subsequent laboratory analysis.

All surface soil samples will be analyzed for full TCL organics and TAL inorganics via CLP protocol (Level IV data quality). The subsurface soil samples will be analyzed for TCL pesticides/herbicides via EPA Methods 608 and 8150 (Level IV data quality).

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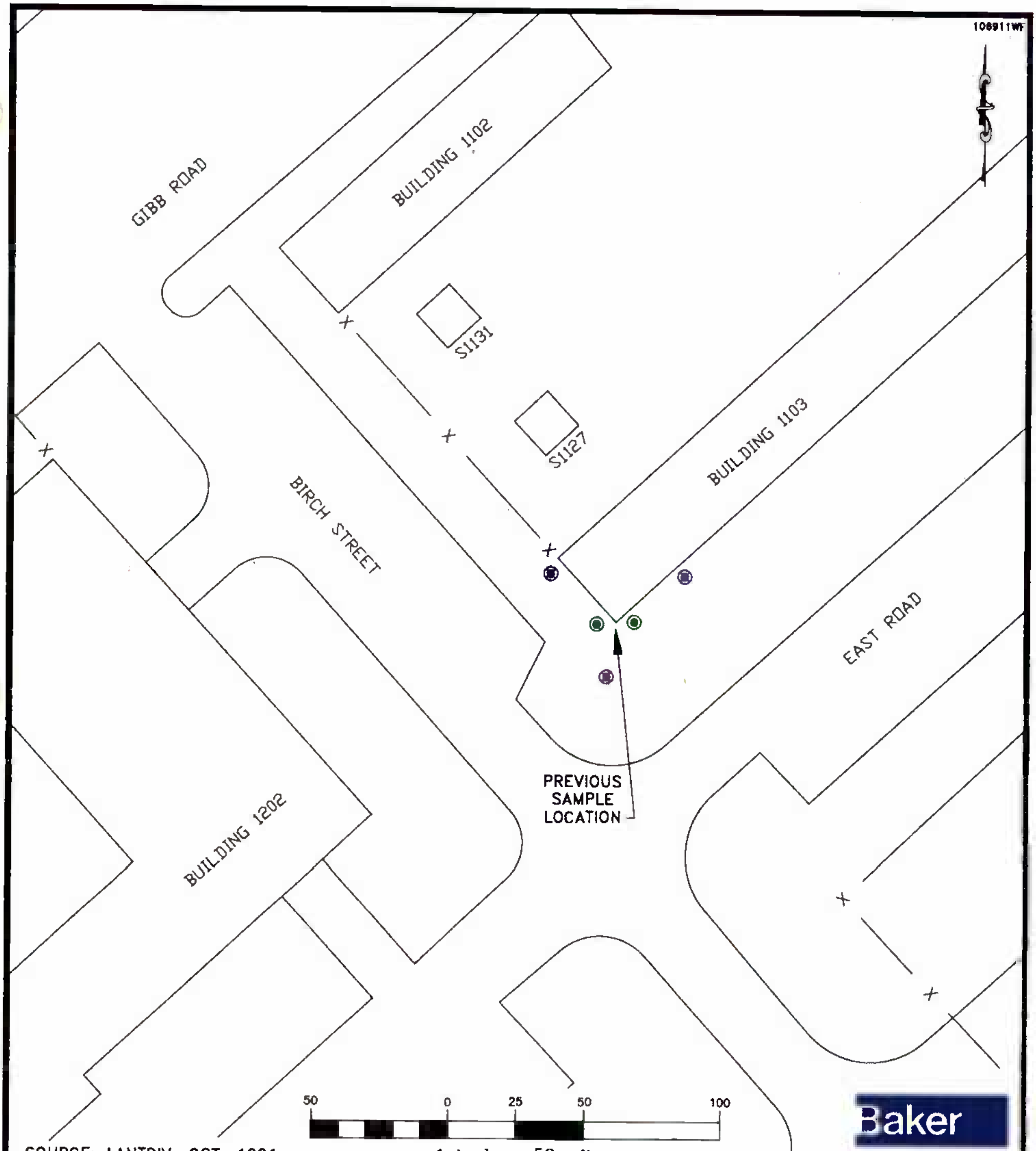

SOURCE: LANTDIV, OCT. 1991

Baker
Baker Environmental, Inc.

	DESCRIPTION	CHEMICAL ANALYSIS	TURNAROUND TIME
🟢	SOIL BORING (0–6 INCHES 2–4 FEET COMPOSITE)	TCL PESTICIDES/ HERBICIDES	ROUTINE (28–40 DAYS)
🔵	SOIL BORING (0–6 INCHES 2–4 FEET COMPOSITE)	TCL PESTICIDES/ HERBICIDES	QUICK TURNAROUND

NOTE: ALL SURFACE SOIL SAMPLES WILL BE ANALYZED FOR FULL TCL ORGANICS/TAL INORGANICS (ROUTINE TURNAROUND)

FIGURE 5-5
SOIL INVESTIGATION AT BUILDING 1103
SITE 78

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

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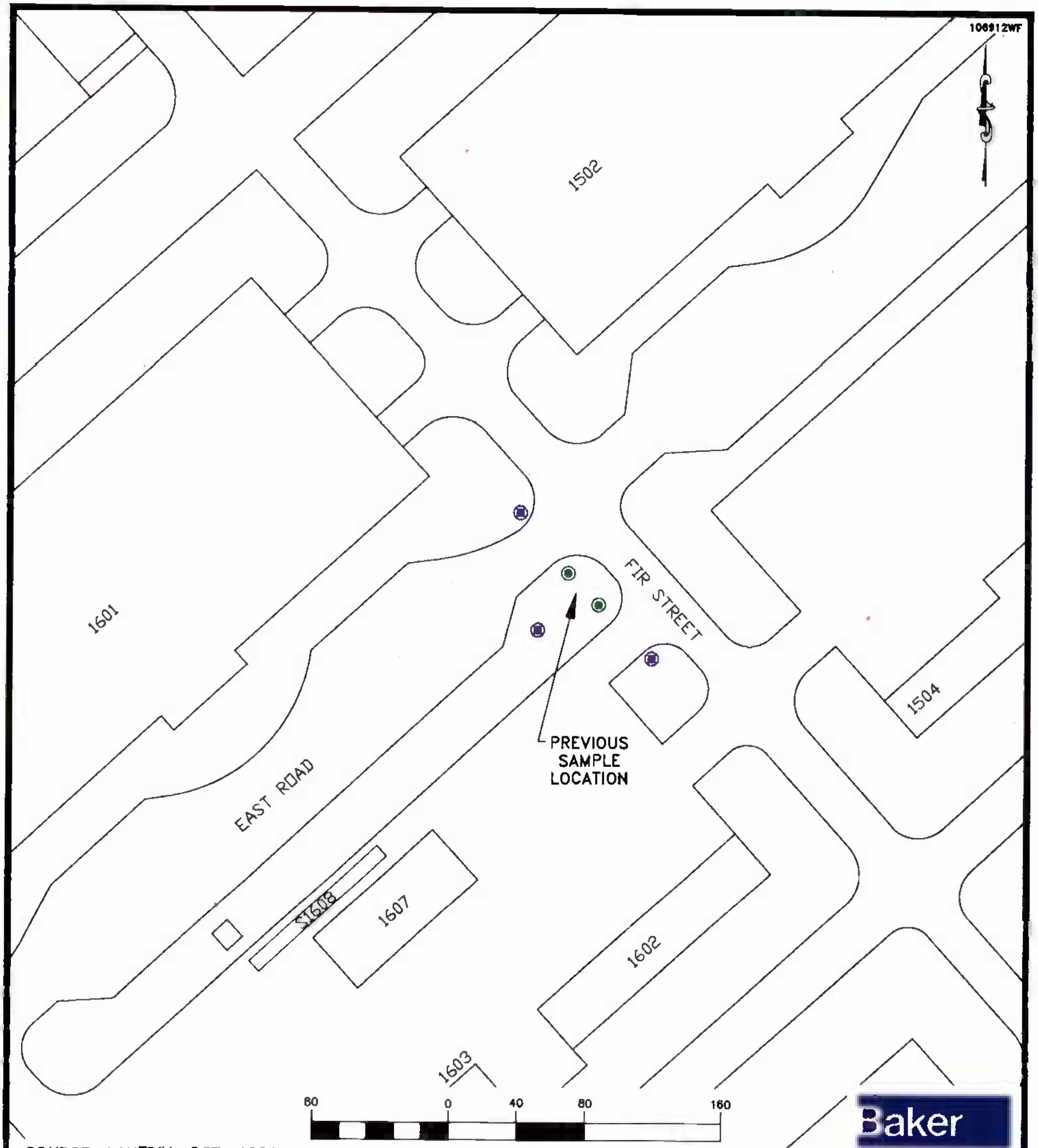


SOURCE: LANTDIV, OCT. 1991

	DESCRIPTION	CHEMICAL ANALYSIS	TURNAROUND TIME
●	SOIL BORING (0–6 INCHES 2–4 FEET COMPOSITE)	TCL PESTICIDES/ HERBICIDES	ROUTINE (28–40 DAYS)
●	SOIL BORING (0–6 INCHES 2–4 FEET COMPOSITE)	TCL PESTICIDES/ HERBICIDES	QUICK TURNAROUND

NOTE: ALL SURFACE SOIL SAMPLES WILL BE ANALYZED FOR FULL TCL ORGANICS/TAL INORGANICS (ROUTINE TURNAROUND)

FIGURE 5-6
SOIL INVESTIGATION AT BUILDING 1601
SITE 78

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

Samples from two of the borings at each building will be analyzed within the maximum allowable holding times (i.e., routine analytical turnaround). Samples from the other three borings from each building will be analyzed within 14 days as indicated on Figures 5-5 and 5-6. These samples will be used to determine whether further soil sampling is required to delineate the extent of surface or subsurface soil contamination. Areas where elevated levels of contaminants are detected will be further investigated. These areas will be determined during the field investigation in consultation with EPA Region IV, the N.C. DEHNR, and LANTDIV.

Table 5-1 summarizes the soil sampling programs for Buildings 1103 and 1601.

Soil Gas Survey Soil Samples

Approximately five (5) soil borings will be installed at areas of concern identified by the soil gas survey. These areas of concern will be determined during the field investigation in consultation with EPA Region IV, the N.C. DEHNR, and LANTDIV. Therefore, the total number of soil borings to be installed and samples can not be estimated at this time.

The borings will be augered and soil samples collected via ASTM Method D1586-84. Samples will be collected from the ground surface (top six inches) and at 5-foot intervals to the top of the water table, which is estimated to be approximately five to ten feet below ground surface.

The soil samples will be analyzed for full TCL organics and TAL inorganics under CLP protocols (Level IV data quality). The samples will be analyzed within the maximum allowable holding times. Table 5-1 summarizes this soil sampling program for the soil gas survey soil samples. Specific details on the analytical methods and data validation are provided in the QAPP.

Background

In order to represent background soil conditions, two soil borings will be installed in the area immediately west of the site, along Lucy Brewer Avenue (exact locations will be identified following utility clearance). This area contains several office buildings and paved roadways and parking lots.

The borings will be augered and soil samples collected via ASTM Method D1586-84. Samples will be collected from the ground surface (top six inches) and at 5-foot intervals to the top of the water table, which is estimated to be approximately five to ten feet below ground surface.

The soil samples will be analyzed for full TCL organics and TAL inorganics under CLP protocols (Level IV data quality). The samples will be analyzed within the maximum allowable holding times. Table 5-1 summarizes this soil sampling program for the background soil samples. Specific details on the analytical methods and data validation are provided in the QAPP.

Please note that the results from these background soil samples will be used to represent background soil conditions for the entire Operable Unit No. 1.

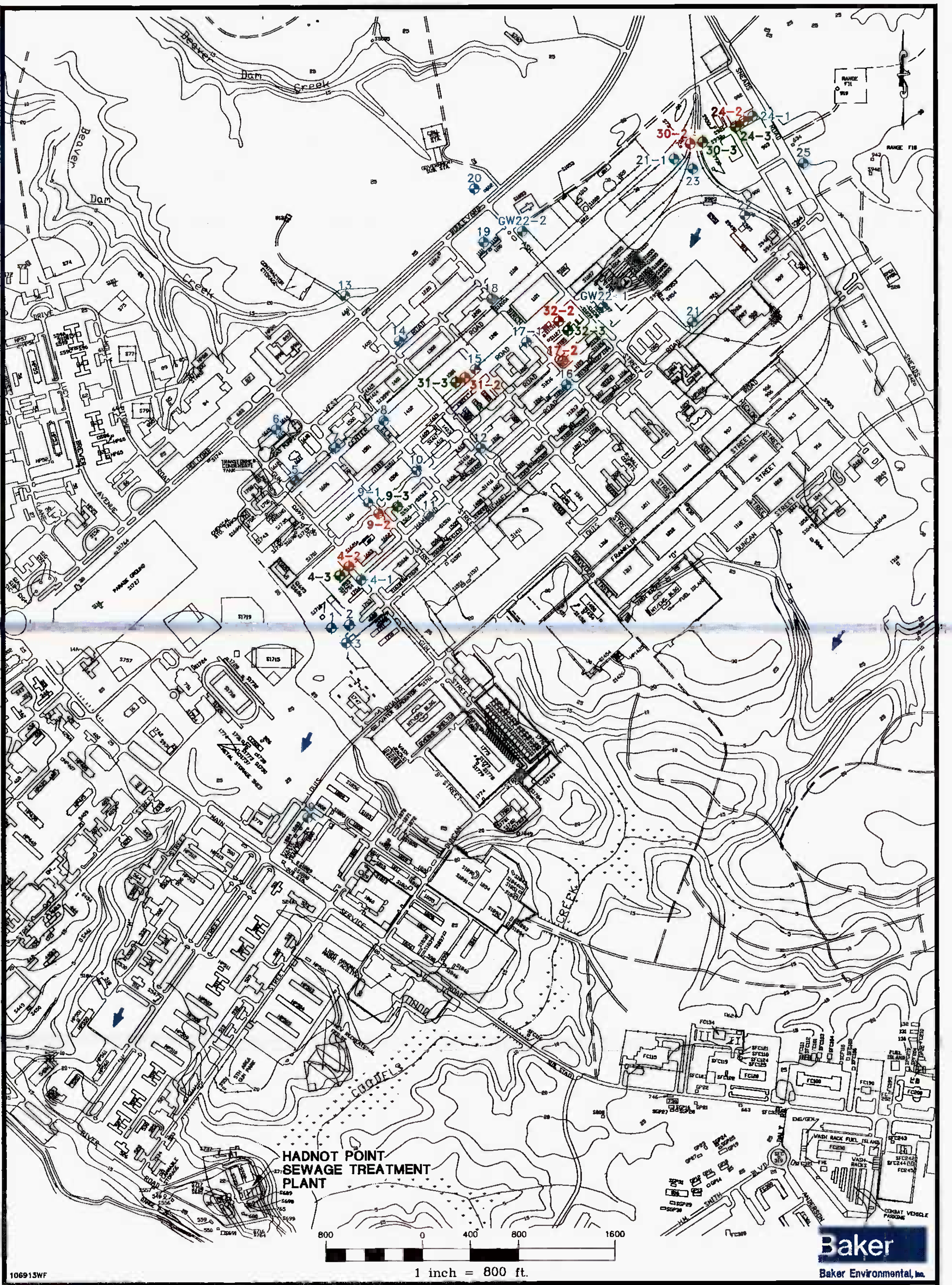
5.3.1.4 Groundwater Investigations

Groundwater investigations will be conducted at Site 78 to assess groundwater quality at HPIA. The groundwater investigations will consist of the collection of one round of groundwater samples and water level measurements from all existing wells at the site (Figure 5-7). Note that based on the results of the soil gas survey to be conducted for the potential areas of concern east of Louis Road and along Michael Road, additional groundwater monitoring wells may be installed at the site. If additional wells are installed, they will be constructed according to standard operating procedures for monitoring well installation and will be included in this sampling event.

Forty monitoring wells were previously installed at Site 78 to monitor groundwater quality. This included 27 shallow monitoring wells, 7 intermediate wells, and 6 deep wells. In addition, two shallow monitoring wells (22GW1 and 22GW2) installed for Site 22 have been used to monitor the groundwater quality at Site 78. The location of all these wells are shown on Figure 5-7. Since the quality of the existing groundwater data is questionable (data validation results unknown), additional groundwater samples within HPIA will be collected.

Groundwater Sampling and Analysis

One round of groundwater samples will be collected from each existing well within HPIA (this includes 42 wells plus any new wells). Groundwater samples collected from the existing wells will be analyzed for TCL volatiles via Method 601/602 and TAL inorganics (refer to Table 5-1



LEGEND

20	EXISTING SHALLOW MONITORING WELL
24-2	EXISTING INTERMEDIATE MONITORING WELL
24-3	EXISTING DEEP MONITORING WELL
➡	APPROXIMATE GROUNDWATER FLOW DIRECTION

SOURCE: LANTDIV, FEBRUARY 1992

FIGURE 5-7
GROUNDWATER SAMPLING LOCATIONS
SITE 78

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

for methods) via CLP protocol (Level IV data quality). The samples will be analyzed within the maximum allowable holding times. The analytical results from several previous investigations have identified volatiles as the contaminants of concern in the groundwater. In addition, some of the intermediate and deep wells within HPIA were recently sampled (July 1992) for full TCL organics and TAL inorganics. The data from this recent sampling is included in Appendix D of this Work Plan and will be evaluated during this RI/FS process.

Approximately, ten percent of the existing monitoring wells and any newly-installed monitoring wells will be analyzed for full TCL organics and TAL inorganics under CLP protocol (Level IV data quality). The samples will be analyzed within the maximum allowable holding times. These samples will allow an assessment of human health and environmental risks to be made and will provide data to more fully characterize the groundwater.

Four of the wells will also be sampled for analysis of engineering parameters to evaluate process options for treatment of the groundwater. These analytical parameters will include: biological oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), total suspended solids (TSS), total dissolved solids (TDS), and total volatile solids (TVS).

Detailed sampling procedures are provided in the FSAP. Specific details of the analytical methods and data validation are provided in the QAPP.

Table 5-1 summarizes the groundwater investigations to be undertaken.

Water Level Measurements

Static water levels measurements will be collected from each well during the sampling event. Water level measurements shall be collected from all wells within a four hour period, if possible. Water level measurement techniques are described in the FSAP. Groundwater level data will be used to evaluate groundwater flow direction.

5.3.1.5 Aquifer Testing

Aquifer tests on the shallow aquifer will be performed at the HPIA under a separate project. Aquifer tests on the deep aquifer may not be required since existing information and testing has been performed.

Data collected during previous pumping tests (e.g., USGS studies) and future planned aquifer tests will be used to assess the following:

- Aquifer parameters (transmissivity, horizontal hydraulic conductivity, vertical hydraulic conductivity, etc.) that influence migration of contaminants in groundwater and the selection of groundwater remediation technologies.

- The degree of hydraulic conductivity between the deep and shallow portion of the aquifer.

- The extent of influence on the aquifer by pumping of groundwater.

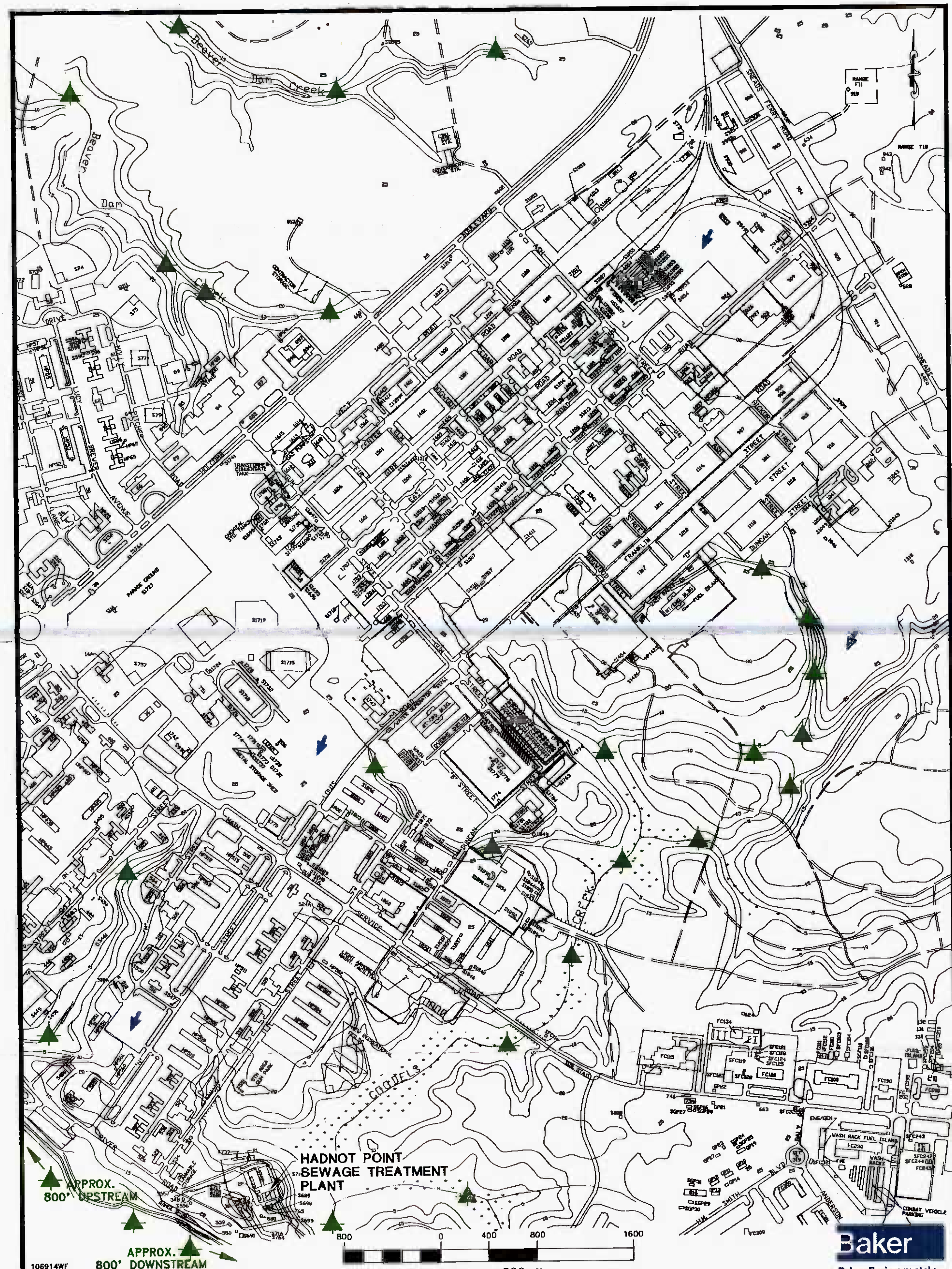
5.3.1.6 Surface Water/Sediment Investigations

Surface water and sediment investigations will be conducted in several drainage tributaries around Site 78 to assess possible impacts to Cogdels Creek and the New River; to Beaver Dam Creek and Wallace Creek, and to the environment. Note that this discussion of surface water and sediment investigations is being included under Site 78, although it pertains to the entire operable unit (Site 21, 24, and 78). The branches of Beaver Dam Creek (which discharges to Wallace Creek) may potentially received runoff/discharge from Site 21 and Site 78. Runoff from Site 24 and Site 78 may drain into the branches/tributaries of Cogdels Creek (which discharges to the New River). Also note that surface water/sediment data has previously been collected north of Hadnot Point in Bearhead Creek during the investigation of another site within MCB Camp Lejeune. This data will be used to represent background conditions when appropriate.

This section outlines the sampling and analytical requirements. Specific sampling procedures can be found in the FSAP.

Tributaries of Cogdels Creek and the New River

As shown on Figure 5-8, twenty (20) surface water and sediment sampling stations have been identified to characterize potential impacts from Site 24 and portions of Site 78. If water is present at the time of sampling, one surface water sample will be collected from the bank of the tributary, creek or river at each of the sampling stations. A surface (top six inches) and a



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SOURCE: LANTDIV, FEBRUARY 1992

	DESCRIPTION	CHEMICAL ANALYSIS	TURNAROUND TIME
SURFACE WATER/SEDIMENT SAMPLE ▲	SURFACE WATER	FULL TCL/TAL	ROUTINE (28-40 DAYS)
	SEDIMENT	FULL TCL/TAL	ROUTINE (28-40 DAYS)
➔	APPROXIMATE GROUNDWATER FLOW DIRECTION		

FIGURE 5-8
SURFACE WATER/SEDIMENT INVESTIGATION
SITE 78

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subsurface (6 to 12 inches below ground surface) sediment sample will be collected at each station. Surface water samples will be collected by dipping the sample bottles directly into the water or by using a clean glass container to obtain the sample, and pouring the sample directly into the appropriate sample bottles.

Surface water samples will be collected at each station prior to obtaining the sediment sample to avoid collecting water containing disturbed sediments. In addition, downstream samples will be collected first, with subsequent samples taken moving upstream. Sediment samples will be obtained using a hand coring device. The FSAP discusses both surface water and sediment sampling procedures.

The surface water and sediment samples will be analyzed for full TCL organics and TAL inorganics under CLP protocols producing Level IV data quality. In addition, all surface water samples will be analyzed in the field for dissolved oxygen (DO), temperature, specific conductivity, and pH (Level I data quality). Specific details on the analytical methods and data validation are provided in the QAPP.

Table 5-1 summarizes the sampling and analytical programs for the surface water and sediment investigations.

No aquatic/ecological surveys will be conducted at the site unless the results from the surface water and sediment sampling indicate that the site is potentially impacting the environment. The need for any aquatic/ecological surveys will be determined in consultation with EPA Region IV, N.C. DEHNR, and LANTDIV.

Branches of Beaver Dam Creek

As shown on Figure 5-8, seven (7) surface water and sediment sampling stations have been identified to characterize potential impacts from Site 21 and portions of Site 78. If water is present at the time of sampling, one surface water sample will be collected from each branch of the creek at each of the sampling stations. A surface (top six inches) and a subsurface (6 to 12 inches below ground surface) sediment sample will be collected from the bank at each station. Surface water samples will be collected by dipping the sample bottles directly into the water or by using a clean glass container to obtain the sample, then pouring the sample directly into the appropriate sample bottles.

Surface water samples will be collected at each station prior to obtaining the sediment sample to avoid inclusion of disturbed sediment in the water sample. In addition, the further downstream samples will be collected first, with subsequent samples taken moving upstream. Sediment samples will be obtained using a hand coring device. The FSAP discusses both surface water and sediment sampling procedures.

The surface water and sediment samples will be analyzed for full TCL organics and TAL inorganics using CLP Methods producing Level IV data quality. In addition, all surface water samples will be analyzed in the field for DO, temperature, specific conductivity, and pH (Level I data quality).

Table 5-1 summarizes the sampling and analytical programs for the surface water and sediment investigations. Specific details on the analytical methods and data validation are provided in the QAPP.

No aquatic/ecological surveys will be conducted at the site unless the results from the surface water and sediment sampling indicate that the site is potentially impacting the environment. The need for any aquatic/ecological surveys will be determined in consultation with EPA Region IV, N.C. DEHNR, and LANTDIV.

5.3.2 Site 21 - Transformer Storage Lot 140

The following investigations and support activities will be conducted at Site 21:

- Surveying;
- Soil investigations;
- Groundwater investigations; and
- Surface water/sediment investigations.

Each of these activities are described below.

5.3.2.1 Surveying

All existing monitoring wells and any wells installed during the investigation at Site 21 will be surveyed. The top of the protective casing, the top of the well casing, and the elevation of the ground surface will be surveyed. The vertical accuracy will be 0.01 feet and the horizontal accuracy will be within 0.1 foot. In addition, soil sampling locations (i.e., boreholes) and surface water/sediment sample locations will be surveyed to a horizontal accuracy of 1 foot.

5.3.2.2 Soil Investigations

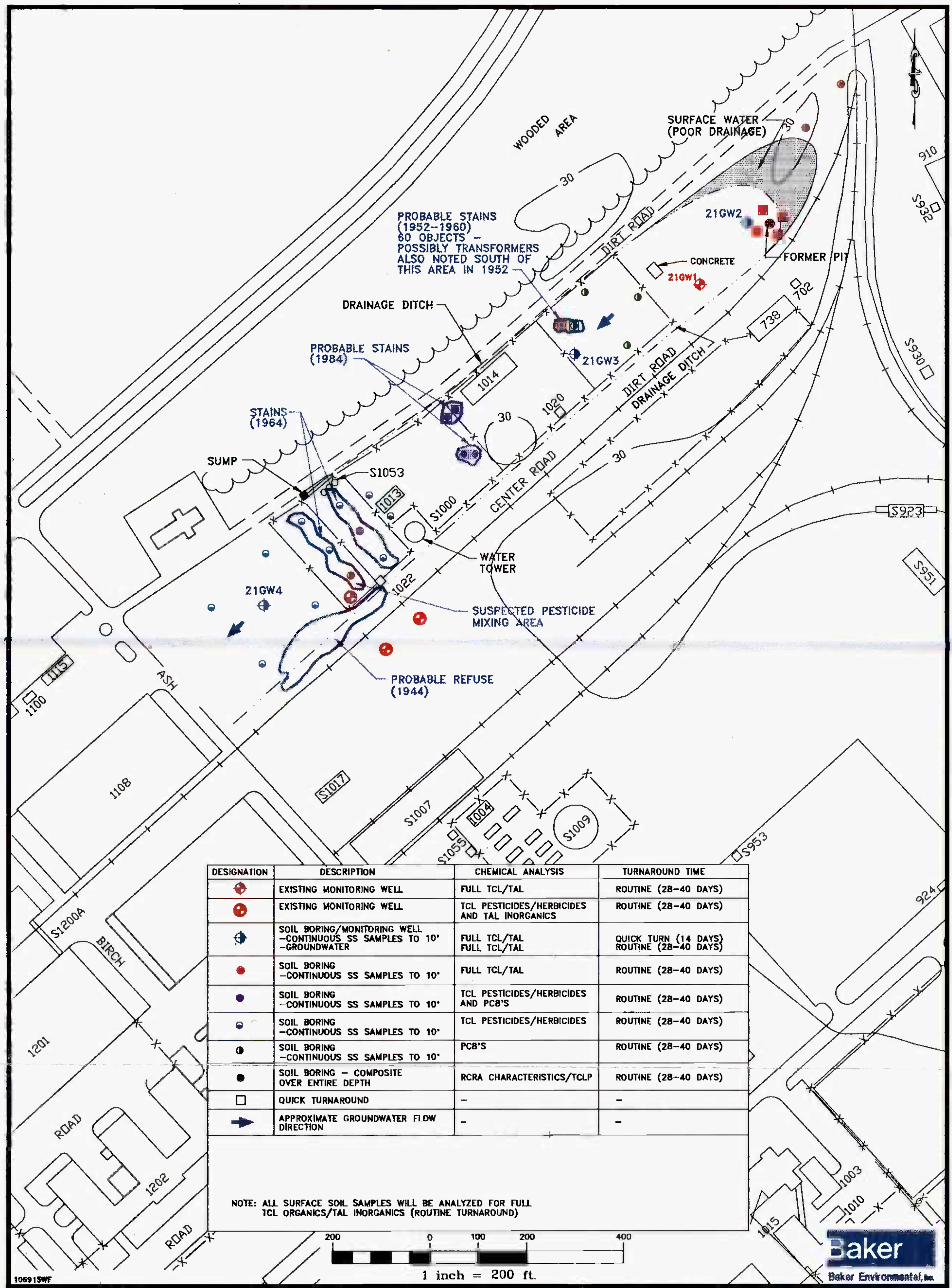
Soil investigations will be conducted throughout Site 21 but will primarily focus on two areas of concern; the former pesticide mixing area (both inside and outside of the fenced-in area) and the former transformer disposal pit. In addition, soil samples will also be collected during the construction of the new monitoring wells.

Former Pesticide Mixing Area

As shown on Figure 5-9, seventeen (17) soil borings (including one soil boring/monitoring well) will be installed at Site 21 for the purpose of more fully characterizing the extent of contamination at the former pesticide mixing area.

Test borings will be augered and soil samples collected using ASTM Method D1586-84 at each sample station. Samples will be collected from the ground surface (top six inches) and at 5-foot intervals to the top of the water table, which is estimated to be approximately five to ten feet below ground surface across the site. Therefore, it is possible that as many as three soil samples and no less than two soil samples will be collected from each borehole for subsequent laboratory analysis. An additional sample just below the water table will be collected from the soil boring/monitoring well (21GW4).

The soil samples collected from this area will be analyzed for various compounds. Surface soil samples collected from all 17 borings (including 21GW4) will be analyzed for full TCL organics and TAL inorganics per CLP protocol. Subsurface soil samples from ten of the borings will be analyzed for TCL pesticides and herbicides. Subsurface soil samples from four of the borings (northeast of the water tower) will be analyzed for TCL pesticides/herbicides and PCBs. Subsurface soil samples from two of the borings (in the formerly stained areas within the suspected pesticide mixing area) will be analyzed for full TCL organics and TAL inorganics. These samples will provide data required to assess human health and ecological risks and will more fully characterize surface and subsurface soils. The soil samples collected from the newly-installed monitoring well will be analyzed for full TCL organics and TAL inorganics. The monitoring well samples will receive routine analysis. All of the samples will be analyzed per CLP protocols (Level IV data quality).



DESIGNATION	DESCRIPTION	CHEMICAL ANALYSIS	TURNAROUND TIME
⊕	EXISTING MONITORING WELL	FULL TCL/TAL	ROUTINE (28–40 DAYS)
⊕	EXISTING MONITORING WELL	TCL PESTICIDES/HERBICIDES AND TAL INORGANICS	ROUTINE (28–40 DAYS)
⊕	SOIL BORING/MONITORING WELL –CONTINUOUS SS SAMPLES TO 10' –GROUNDWATER	FULL TCL/TAL FULL TCL/TAL	QUICK TURN (14 DAYS) ROUTINE (28–40 DAYS)
●	SOIL BORING –CONTINUOUS SS SAMPLES TO 10'	FULL TCL/TAL	ROUTINE (28–40 DAYS)
●	SOIL BORING –CONTINUOUS SS SAMPLES TO 10'	TCL PESTICIDES/HERBICIDES AND PCB'S	ROUTINE (28–40 DAYS)
◒	SOIL BORING –CONTINUOUS SS SAMPLES TO 10'	TCL PESTICIDES/HERBICIDES	ROUTINE (28–40 DAYS)
◑	SOIL BORING –CONTINUOUS SS SAMPLES TO 10'	PCB'S	ROUTINE (28–40 DAYS)
●	SOIL BORING – COMPOSITE OVER ENTIRE DEPTH	RCRA CHARACTERISTICS/TCLP	ROUTINE (28–40 DAYS)
☐	QUICK TURNAROUND	–	–
➡	APPROXIMATE GROUNDWATER FLOW DIRECTION	–	–

NOTE: ALL SURFACE SOIL SAMPLES WILL BE ANALYZED FOR FULL TCL ORGANICS/TAL INORGANICS (ROUTINE TURNAROUND)

FIGURE 5–9
GROUNDWATER AND SOIL INVESTIGATION
SITE 21

SOURCE: LANTDIV, FEBRUARY 1992

MARINE CORPS BASE CAMP LEJEUNE
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The samples collected from the two probable stain areas identified in the 1984 aerials will receive quick turnaround analysis (14 days) so that the determination as to whether additional wells are needed in this area. Areas requiring further investigation will be determined during the field investigation in consultation with EPA Region IV, N.C. DEHNR, and LANTDIV.

Samples from one boring from the pesticide mixing area will be analyzed for engineering parameters. All samples from this boring will be analyzed for grain size, moisture density, TCLP, residual chlorine, total fluoride, organic nitrogen, alkalinity, corrosivity, ignitability, reactivity, and TOC. These parameters will help in evaluating potential applicable technologies such as thermal destruction and solidification/fixation, or off-site treatment and disposal options.

Table 5-1 summarizes the soil sampling program for the pesticide mixing area at Site 21. Specific details on the analytical methods and data validation are provided in the QAPP.

Former Transformer Oil Disposal Pit

As shown on Figure 5-9, fourteen (14) soil borings (including two soil boring/monitoring wells) will be installed at Site 21 for purposes of more fully characterizing the extent of contamination at the former transformer oil disposal pit and the surrounding area.

Test borings will be augered and soil samples collected via ASTM Method D1586-84 at each sample station. Samples will be collected from the ground surface (top six inches) and at 5-foot intervals to the top of the water table, which is estimated to be approximately five to ten feet below ground surface across the site. Therefore, it is possible that as many as three soil samples and no less than two soil samples will be collected from each borehole for subsequent laboratory analysis. For the one soil boring/monitoring well (21GW3), an additional sample will be collected just below the water table. For soil boring/monitoring well 21GW2, only two samples will be collected; one just above the water table and one just below the water table. Only one composite sample will be collected from the borehole near the center of the former oil pit.

Surface soil samples collected from eleven of the borings (this does not include 21GW2, 21GW3 or the oil pit borehole) will be analyzed for full TCL organics and TAL inorganics per CLP protocol. In addition, the subsurface soil samples from seven (7) of the borings will be analyzed for full TCL organics and TAL inorganics via CLP protocols (Level IV data quality). Samples from two of these borings (near the northern end of the site) will be analyzed within the maximum allowable holding times (i.e., routine analytical turnaround of 28 to 40 days). Samples from the other five borings (located near the former disposal pit and the 1952-1960 probable stain area) will be analyzed for quick laboratory turnaround (i.e., 14 days). These samples will be used to determine whether further soil sampling is required to delineate the extent of surface or subsurface soil contamination. Areas where elevated levels of contaminants are detected will be further investigated. Areas requiring further investigation will be determined in consultation with EPA Region IV, N.C. DEHNR, and LANTDIV.

The subsurface soil samples collected from four of the borings (in the area where possible transformers were identified in 1952) will be analyzed for PCBs only. Samples from one of these borings will receive quick turnaround in the laboratory. These samples will be used to determine whether further soil sampling is required to delineate the extent of surface or subsurface soil contamination. Areas where elevated levels of contaminants are detected will be further investigated. Areas requiring further investigation will be determined in consultation with EPA Region IV, N.C. DEHNR, and LANTDIV.

Two soil samples from soil boring/monitoring well 21GW2 will be collected for chemical analysis. One sample will be from the interval just above the water table; the other sample from just below the water table. These samples will be analyzed for full TCL organics and TAL inorganics. The samples collected from soil boring/monitoring well 21GW3 (one surface sample and up to three subsurface samples) will be analyzed for full TCL organics and TAL inorganics.

One composite sample will be collected from the soil boring located at the center of the pit area. This sample will be analyzed for RCRA characteristics and TCLP in order to determine if the material is hazardous.

Samples from one of the soil borings in this area of the site will be analyzed to evaluate engineering parameters. All samples from this boring will be analyzed for grain size, moisture density, residual chlorine, total fluoride, organic nitrogen, and TOC. The above-mentioned analyses will help in evaluating potential applicable technologies such as thermal destruction, solidification/ fixation, and off-site treatment, and disposal options.

5.3.2.3 Groundwater Investigations

Groundwater investigations will be conducted at Site 21 to assess groundwater quality at the former pesticide mixing area and at the former transformer oil disposal pit area. The groundwater investigations will consist of the installation of monitoring wells within the site and the collection of one round of groundwater samples and water level measurements.

Monitoring Well Construction

As shown on Figure 5-9, one monitoring well (21GW1) was previously installed at Site 21 to monitor groundwater quality. In addition, three other monitoring wells (well numbers not known) were previously installed near the southeast portion of the site. These other three wells may have been installed as part of the product recovery system associated with Site 22 (Hadnot Point Fuel Farm). Since there are areas that need further evaluation at the site, specifically the oil pit and the pesticide mixing area, at least three shallow monitoring wells (21GW2 through 21GW4) will be installed during the RI. The proposed well locations are shown on Figure 5-9.

The shallow wells will be constructed of 4-inch PVC to a depth of at least 15 feet below the top of the water table. Four-inch wells are proposed since they can easily be converted into extraction wells if required. Well screens will be a standard 10 foot length. This well depth and screen length will allow for seasonal fluctuations in the water table thereby providing the ability to obtain samples that are representative of the surficial aquifer at the site. Detailed well construction procedures are provided in the FSAP.

Groundwater Sampling and Analysis

One round of groundwater samples will be collected from each existing well and any newly-installed wells. Groundwater samples collected from the three existing monitoring wells within the former pesticide mixing area will be analyzed for TCL pesticides/herbicides and TAL inorganics. The groundwater samples collected from the newly-installed monitoring wells and existing well (21GW1) near the former transformer oil pit will be analyzed for full TCL organics and TAL inorganics. TCL volatiles will be analyzed using Method 601/602. All other organic and inorganic analyses will be analyzed under CLP protocols. Inorganic samples will be analyzed for total (unfiltered) constituents. All of the groundwater samples will be analyzed within the maximum allowable holding times (i.e., routine analytical turnaround of 28 to 40 days).

The three newly-installed wells will also be sampled for analysis of engineering parameters to evaluate process options for treatment of the groundwater. These analytical parameters will include: BOD, COD, TSS, TDS, TOC, and TVS.

Table 5-1 summarizes the groundwater program for Site 21. Detailed sampling procedures are provided in the FSAP. Specific details on the analytical methods and data validation are provided in the QAPP.

Water Level Measurements

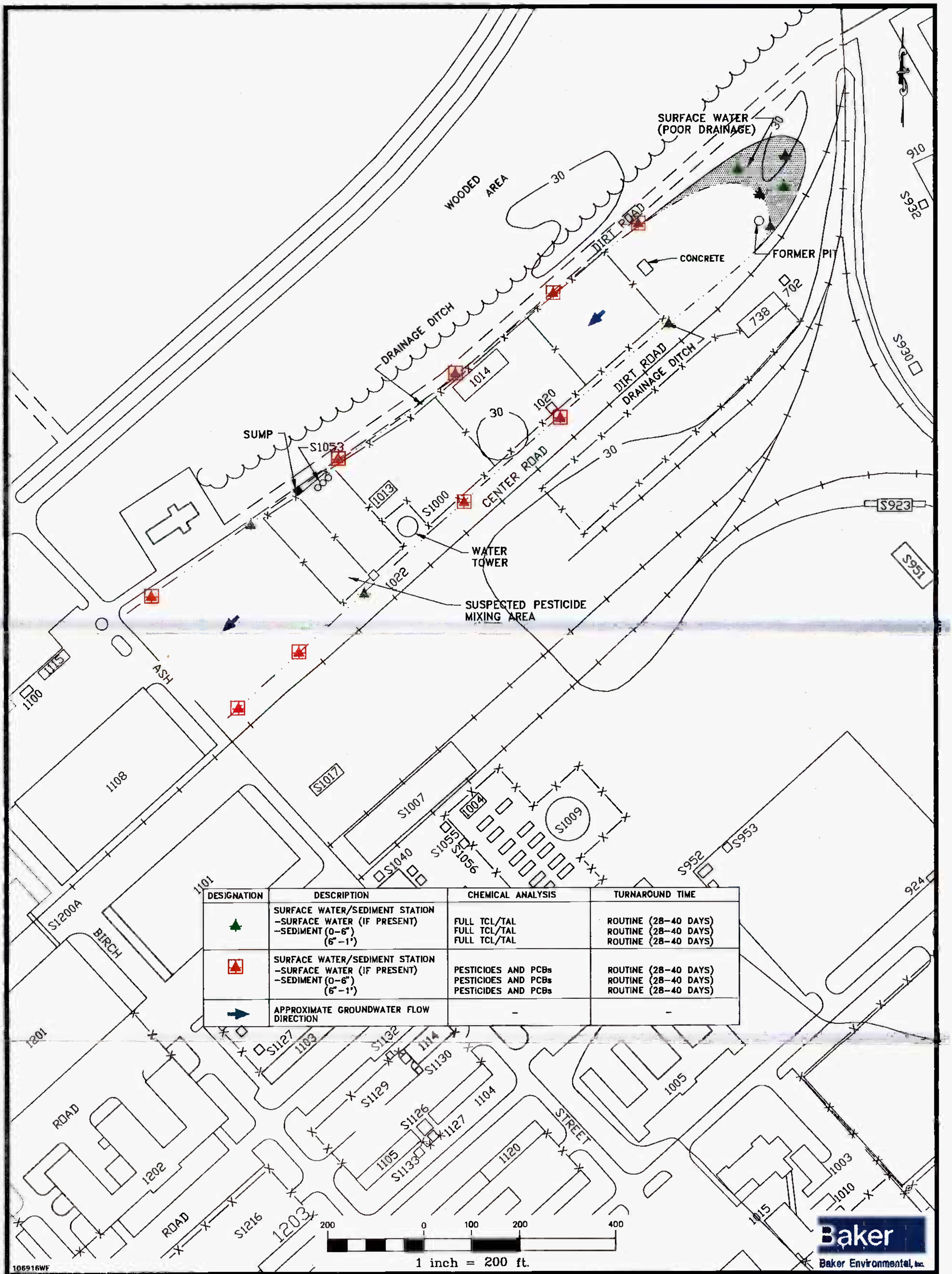
Static water level measurements will be collected from each well during the sampling event. Water level measurements will be collected within a four hour period, if possible. Water level measurement techniques are described in the FSAP. Groundwater level data will be used to evaluate groundwater flow direction.

5.3.2.4 Surface Water/Sediment Investigations

Surface water and sediment investigations will be conducted in the drainage ditch surrounding Site 21 to assess possible impacts to this drainage ditch and the environment from the two areas of concern at the site. This section outlines the sampling and analytical requirements. Specific sampling procedures can be found in the FSAP.

Former Pesticide Mixing Area

As shown on Figure 5-10, twelve (12) surface water and sediment sampling stations have been identified to characterize potential impacts related to the former pesticide mixing area at Site 21. If water is present at the time of sampling, one surface water sample will be collected from the drainage ditch at each of the sampling stations. A surface (top six inches) and a subsurface (6 to 12 inches below ground surface) sediment sample will also be collected at each station. Surface water samples will be collected by dipping the sample bottles directly into the water or by using a clean glass container to obtain the sample and pouring the sample directly into the appropriate sample bottles.



DESIGNATION	DESCRIPTION	CHEMICAL ANALYSIS	TURNAROUND TIME
▲	SURFACE WATER/SEDIMENT STATION -SURFACE WATER (IF PRESENT) -SEDIMENT (0-6") (6"-1')	FULL TCL/TAL FULL TCL/TAL FULL TCL/TAL	ROUTINE (28-40 DAYS) ROUTINE (28-40 DAYS) ROUTINE (28-40 DAYS)
🟥	SURFACE WATER/SEDIMENT STATION -SURFACE WATER (IF PRESENT) -SEDIMENT (0-6") (6"-1')	PESTICIDES AND PCBs PESTICIDES AND PCBs PESTICIDES AND PCBs	ROUTINE (28-40 DAYS) ROUTINE (28-40 DAYS) ROUTINE (28-40 DAYS)
➡	APPROXIMATE GROUNDWATER FLOW DIRECTION	-	-

FIGURE 5-10
SURFACE WATER AND SEDIMENT INVESTIGATION
SITE 21

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

SOURCE: LANTDIV, FEBRUARY 1992

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Surface water samples will be collected at each station prior to obtaining the sediment sample to avoid the possibility of disturbed sediments being included with the water sample. In addition, downstream samples will be collected first, with subsequent samples taken moving upstream. Sediment samples will be obtained using a hand coring device. The FSAP discusses both surface water and sediment sampling procedures.

As shown on Figure 5-10, ten of the twelve surface water/sediment samples will be analyzed for TCL pesticides/herbicides and PCBs using CLP Methods (Level IV data quality). Two of the surface water and sediment samples will be analyzed for full TCL organics and TAL inorganics using CLP Methods, which result in Level IV data quality. In addition, all surface water samples will be analyzed in the field for DO, temperature, specific conductivity, and pH (Level II data quality).

Table 5-1 summarizes the sampling and analytical programs for the surface water and sediment investigations.

No aquatic/ecological surveys will be conducted at the site unless the results from the surface water and sediment sampling indicate that the site is potentially impacting the environment. Consultation with EPA Region IV, N.C. DEHNR, and LANTDIV will determine if any aquatic/ecological surveys need to be performed.

Former Transformer Oil Disposal Area

As shown on Figure 5-10, five (5) surface water and sediment sampling stations have been identified as necessary to more fully characterize potential impacts from the former transformer oil disposal pit area at Site 21. If water is present at the time of sampling, one surface water sample will be collected from the drainage ditch at each of the sampling stations. A surface (top six inches) and a subsurface (6 to 12 inches below ground surface) sediment sample will also be collected at each station. Surface water samples will be collected by dipping the sample bottles directly into the water or by using a clean glass container to obtain the sample and pouring the sample directly into the appropriate sample bottles.

Surface water samples will be collected at each station prior to obtaining the sediment sample to avoid obtaining disturbed sediment in the water sample. In addition, downstream samples will be collected first, with subsequent samples taken moving upstream. Sediment samples will be obtained using a hand coring device. The FSAP discusses both surface water and sediment sampling procedures.

The surface water and sediment samples collected at this portion of the site will be analyzed for full TCL organics and TAL inorganics using CLP Methods resulting in Level IV data quality. In addition, all surface water samples will be analyzed in the field for DO, temperature, specific conductivity, and pH (Level II data quality).

Table 5-1 summarizes the sampling and analytical programs for the surface water and sediment investigations.

5.3.3 Site 24 - Industrial Area Fly Ash Dump

The following investigations and support activities will be conducted at Site 24:

- Surveying;
- Soil investigations (including test pitting); and
- Groundwater investigations.

Each of these activities is described below.

5.3.3.1 Surveying

All existing monitoring wells and any wells installed during the investigation at Site 24 will be surveyed. The top of the protective casing, the top of the well casing, and the elevation of the ground surface will be surveyed. The vertical accuracy will be 0.01 feet and the horizontal accuracy will be within 0.1 foot. In addition, soil sampling locations (i.e., boreholes) and surface water/sediment sample locations will be surveyed to a horizontal accuracy of 1 foot.

5.3.3.2 Soil Investigations

Soil investigations will be conducted throughout Site 24 but will primarily focus on four areas of concern: the spiractor sludge disposal area, the fly ash disposal area, buried metal areas, and the borrow and debris disposal area. In addition, soil samples will also be collected during the construction of any new monitoring wells.

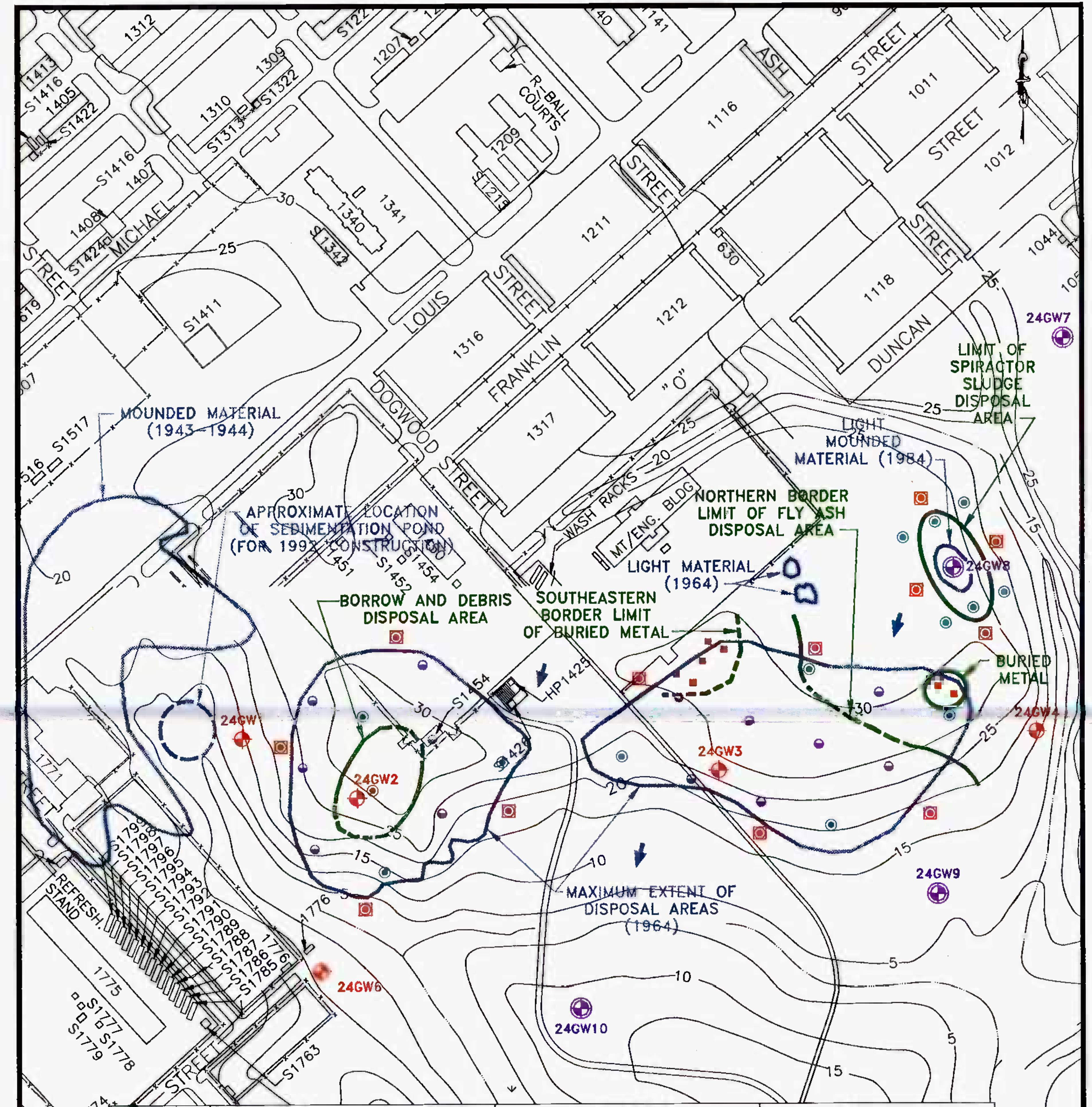
Spiractor Sludge Disposal Area

Eleven (11) soil borings (including one soil boring/monitoring well) will be installed at Site 24 (as shown on Figure 5-11) for purposes of more fully characterizing the extent of contamination at the spiractor sludge disposal area. In addition, one soil boring/monitoring well will be installed upgradient of the site as a background sample location. (This monitoring well will be used to obtain representative background groundwater data for the entire Operable Unit No. 1.)

Test borings will be augered and soil samples collected via ASTM Method D1586-84 at each sample station. Samples will be collected from the ground surface (top six inches) and at 5-foot intervals to the top of the water table, which is estimated to be approximately five to ten feet below ground surface across the site. Therefore, it is possible that as many as three soil samples and no less than two soil samples will be collected from each borehole for subsequent laboratory analysis.

Soil samples will be analyzed for TCL organics and TAL inorganics under CLP protocols (Level IV data quality). The samples from eight (8) of the borings will be analyzed within the maximum allowable holding times (i.e., routine analytical turnaround of 28 to 40 days). As shown on Figure 5-11, samples from several of the borings surrounding the suspected limits of the disposal area will be analyzed within 14 days. These samples will be used to determine whether further soil sampling is required to delineate the extent of surface or subsurface soil contamination. Areas where elevated levels of contaminants are detected will be further investigated. These areas will be determined during the field investigation in consultation with EPA Region IV, N.C. DEHNR, and LANTDIV.

The samples collected from the soil boring/monitoring well located at the center of the spiractor sludge disposal area will be analyzed for RCRA characteristics and TCLP in order to determine if the material is hazardous. This same boring will be used to evaluate engineering parameters. All samples from this boring will be analyzed for grain size, moisture density, total TCLP, residual chlorine, total fluoride, organic nitrogen, alkalinity, corrosivity, ignitability, reactivity, and TOC. These parameters will help in evaluating potential applicable technologies such as thermal destruction, solidification/fixation, and off-site treatment, and disposal options.



DESIGNATION	DESCRIPTION	CHEMICAL ANALYSIS	TURNAROUND TIME
24GW1 ⊕	EXISTING MONITORING WELL	METALS ONLY	ROUTINE (28–40 DAYS)
⊕	SOIL BORING/MONITORING WELL	FULL TCL/TAL	ROUTINE (28–40 DAYS)
◉	SOIL BORING (0–6") (2'–5')	FULL TCL/TAL	ROUTINE (28–40 DAYS)
▣	SOIL BORING (0–6") (2'–5')	FULL TCL/TAL	QUICK TURN (14 DAYS)
●	SOIL BORING (0–6") (2'–5')	TAL ONLY	ROUTINE (28–40 DAYS)
■	TEST PIT –SOIL FROM FLOOR –WASTE (IF PRESENT)	FULL TCL/TAL RCRA HAZ TCLP	ROUTINE (28–40 DAYS) ROUTINE (28–40 DAYS)
➡	APPROXIMATE GROUNDWATER FLOW DIRECTION	–	–

300 0 150 300 600

1 inch = 300 ft.

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Baker

Baker Environmental, Inc.

FIGURE 5-11
GROUNDWATER AND SOIL INVESTIGATION
SITE 24

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

SOURCE: LANTDIV, FEBRUARY 1992

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Table 5-1 summarizes the soil sampling program for the spiractor sludge disposal area at Site 24. Specific details on the analytical methods and data validation are provided in the QAPP.

Fly Ash Disposal Area

As shown on Figure 5-11, sixteen (16) soil borings [including one soil boring/monitoring well (24GW9)] will be installed at Site 24 for purposes of more fully characterizing the extent of contamination at the fly ash disposal area.

Test borings will be augered and soil samples collected using ASTM Method D1586-84 at each sample station. Samples will be collected from the ground surface (top six inches) and from the 2- to 5-foot interval (unless the water table is reached). Because of the dense vegetation, these samples will be obtained through hand augered boreholes.

Soil samples collected from nine of the borings (including 24GW9) will be analyzed for full TCL organics and TAL inorganics under CLP protocols (Level IV data quality). As shown on Figure 5-11, samples from four (4) of the borings will be analyzed within 14 days. These samples will be used to determine whether further soil sampling is required to adequately delineate the extent of surface or subsurface soil contamination. Areas where elevated levels of contaminants are detected will be further investigated. These areas will be determined during the field investigation in consultation with EPA Region IV, N.C. DEHNR, and LANTDIV.

Soil samples collected from seven (7) of the borings will be analyzed for TAL inorganics only. These samples will be analyzed within the maximum allowable holding times and will be analyzed under CLP protocols.

The samples collected from one of the soil borings located within the limits of the disposal area will be analyzed for RCRA hazardous waste characteristics (including TCLP) in order to determine if the material is hazardous. The samples from the same boring will be analyzed to evaluate engineering parameters. All samples from this boring will be analyzed for grain size, moisture density, residual chlorine, total fluoride, organic nitrogen, and TOC. These parameters will help in evaluating potential applicable technologies such as thermal destruction, solidification/fixation, and off-site treatment, and disposal options.

Table 5-1 summarizes the soil sampling program for the fly ash disposal area at Site 24.

Buried Metal Areas

Based on the geophysical survey findings, there are two areas of buried metal within Site 24. As shown on Figure 5-11, two test pits will be excavated within the smaller buried metal area directly south of the spiractor sludge disposal area. Five test pits will be excavated within the other (larger) buried metal area.

The test pits will be excavated to the water table. The areal extent of excavation will be determined in the field based on the areal extent of the area of concern detected by the previous geophysical survey. The excavation will extend from center to center and from end to end of the area of concern unless it is exceptionally large (i.e., over 30 feet in either direction).

Soil samples will be collected from the floor of each test pit. All samples will be collected from the bucket of the backhoe. All soil samples will be analyzed for full TCL organics and TAL inorganics via CLP Methods.

In the event that wastes or drums are encountered, samples of the waste or drum contents (unless the drums are intact) shall be obtained. The samples will only be obtained from the bucket of the backhoe. These soil samples shall be analyzed for RCRA hazardous waste characteristics (including TCLP).

Following sampling activities, the test pits will be backfilled. Table 5-1 summarizes the test pitting program for the buried metal areas.

Borrow and Debris Disposal Area

As shown on Figure 5-11, fifteen (15) soil borings [including one soil boring/monitoring well (24GW10)] will be installed at Site 24 for purposes of more fully characterizing the extent of contamination at the borrow and debris disposal area.

Test borings will be augered and soil samples collected via ASTM Method D1586-84 at each sample station. Samples will be collected from the ground surface (top six inches) and at 5-foot intervals to the top of the water table, which is estimated to be approximately five to ten feet below ground surface across the site. Therefore, it is possible that as many as three soil samples and no less than two soil samples will be collected from each borehole for subsequent laboratory analysis.

Soil samples collected from nine (9) of the borings (including 24GW10) will be analyzed for TCL organics and TAL inorganics under CLP protocols (Level IV data quality). As shown on Figure 5-11, samples from four of the borings surrounding the suspected limits of the disposal area will be analyzed within 14 days. These samples will be used to determine whether further soil sampling is required to delineate the extent of surface or subsurface soil contamination. Areas where elevated levels of contaminants are detected will be further investigated. These areas will be determined during the field investigation in consultation with EPA Region IV, N.C. DEHNR, and LANTDIV.

Soil samples collected from six (6) of the borings will be analyzed for TAL inorganics only. These samples will be analyzed within the maximum allowable holding times and will be analyzed under CLP protocols.

The samples collected from the soil boring located in the center of the disposal area will be analyzed for RCRA hazardous waste characteristics (including TCLP) in order to determine if the material is hazardous. Samples from this same boring will also be analyzed to evaluate engineering parameters. All samples from this boring will be analyzed for grain size, moisture density, organic chlorine, total fluoride, organic nitrogen, and TOC. These parameters will help in evaluating potential applicable technologies such as thermal destruction, solidification/fixation, and off-site treatment, and disposal options.

Table 5-1 summarizes the soil sampling program for the borrow and debris disposal area at Site 24.

Monitoring Well Test Borings

Two soil samples from each monitoring well test boring will be collected for chemical analysis. One sample will be from the interval just above the water table; the other sample from just below the water table. These samples will be analyzed for full TCL organics and TAL inorganics.

5.3.3.3 Groundwater Investigations

Groundwater investigations will be conducted at Site 24 to assess groundwater quality at the four areas of concern at the site. The groundwater investigations will consist of the installation of monitoring wells within the site and the collection of one round of groundwater samples and water level measurements from the newly installed wells and all existing wells at the site.

Monitoring Well Construction

Six monitoring wells (24GW1 through 24GW6) were previously installed at Site 24 to monitor groundwater quality. The location of these wells with the exception of 24GW5 are shown on Figure 5-11. Well 24GW5 was not found during the recent site visit conducted in June 1992. Since there are areas within Site 24 that need further evaluation, specifically the suspected disposal areas, a minimum of four shallow monitoring wells (24GW7 through 24GW10) will be installed during the RI. Well 24GW7 will be identified as a "background" well for the entire Operable Unit No. 1. The proposed well locations are shown on Figure 5-11.

The shallow wells will be constructed of 4-inch PVC casing to a depth of at least 15 feet below the top of the water table. Four-inch wells are proposed since they can easily be converted into extraction wells if required. Well screens will be a standard 10 foot length. This well depth and screen length will allow for seasonal fluctuations in the water table and will provide the ability to obtain samples that are representative of the surficial aquifer at the site. Detailed well construction procedures are provided in the FSAP.

Groundwater Sampling and Analysis

One round of groundwater samples will be collected from each existing well (24GW1, 24GW2, 24GW3, 24GW4, and 24GW6). All of the groundwater samples will be analyzed for TAL inorganics under CLP protocols. These wells were recently sampled (July 1992) for full TCL organics and TAL inorganics. Based on this new data and also on previous data, there does not appear to be a need for organic analysis. All of the groundwater samples will be analyzed within the maximum allowable holding times (i.e., routine analytical turnaround of 28 to 40 days).

One round of groundwater samples will be collected from each of the newly-installed wells. All of these samples will be analyzed for full TCL organics and TAL inorganics. TCL volatiles will be analyzed via Method 601/602. Method 601/602 will provide lower detection levels than other methods. All other organic and inorganic analyses will be analyzed via CLP protocols. Inorganic samples will be analyzed for total (unfiltered) constituents. All of the groundwater samples will be analyzed within the maximum allowable holding times (i.e., routine analytical turnaround of 28 to 40 days).

The new wells will also be sampled for analysis of engineering parameters to evaluate process options for treatment of the groundwater. These analytical parameters will include: BOD, COD, TSS, TDS, TOC, and TVS.

Table 5-1 summarizes the groundwater sampling program. Detailed sampling procedures are provided in the FSAP. Specific details on the analytical methods and data validation is provided in the QAPP.

Water Level Measurements

Static water levels measurements will be collected from each well during the sampling event. Water level measurements will be collected within a four hour period, if possible. Water level measurement techniques are described in the FSAP. Groundwater level data will be used to evaluate groundwater flow direction.

5.4 Task 4 - Sample Analysis and Validation

Task 4 involves efforts relating to the following post-field sampling activities:

- Sample Management;
- Laboratory Analysis; and
- Data Validation.

Sample management activities involve coordination with subcontracted laboratories, tracking of analyses received, and tracking of samples submitted and received from a third party validator. Sample management also involves resolving potential problems (reanalysis, resubmission of information, etc.) between Baker, the laboratory, and the validator.

Validation begins when the "raw" laboratory data is received by the validator from Baker. Baker will first receive the data from the laboratory, log it into a data base for tracking purposes, and then forward it to the validator. A validation report will be expected within three weeks following receipt of laboratory data packages (Level IV) by the validator. Level IV data will be validated per the CLP criteria as outlined in the following documents:

- National Functional Guidelines for Organic Data Review, USEPA, 1991.
- National Validation Functional Guidelines for Inorganic Data Review, USEPA, 1988.

5.5 Task 5 - Data Evaluation

This task involves efforts related to the data once it is received from the laboratory and is validated. It also involves the evaluation of any field-generated data including: water level measurements, in-situ permeability tests, test boring logs, test pit logs, and other field notes. Efforts under this task will include the tabulation of validated data and field data, generation of test boring logs and monitoring well construction logs, generation of geologic cross-section diagrams, and the generation of other diagrams associated with field notes or data received from the laboratory (e.g., sampling location maps, isoconcentration maps).

5.6 Task 6 - Risk Assessment

This section of the Work Plan will serve as the guideline for the baseline risk assessments (BRAs) to be conducted for MCB Camp Lejeune during the RI.

Baseline risk assessments evaluate the potential human health and/or ecological impacts that would occur in the absence of any remedial action. The risk assessment will provide the basis for determining whether or not remedial action is necessary and the justification for performing remedial actions.

The risk assessments will be performed in accordance with EPA guidelines. The primary documents that will be utilized include:

- Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A), EPA 1989.

- Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals), EPA 1991.

- Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives), EPA 1991.

- Risk Assessment Guidance for Superfund: Volume II, Environmental Evaluation Manual, EPA 1989.

- Supplemental Guidance to RAGS: Standard Default Values, EPA 1991a.

- Superfund Exposure Assessment Manual, EPA 1988.

- Exposure Factors Handbook, EPA 1989b.

- Guidance for Data Usability in Risk Assessment, EPA 1990.

EPA Region IV will be consulted for Federal guidance, and the N.C. DEHNR will be consulted for guidance in the State of North Carolina.

The technical components of the BRA are contaminant identification, exposure assessment, toxicity assessment, and risk characterization. The objectives of the risk assessment process can be accomplished by:

- Characterizing the toxicity and levels of contaminants in relevant media (e.g., groundwater, surface water, soil, sediment, air, and biota).

- Characterizing the environmental fate and transport mechanisms within specific environmental media.

- Identifying potential human and/or environmental receptors.

- Identifying potential exposure routes and the extent of the actual or expected exposure.

- Defining the extent of the expected impact or threat.

- Identifying the levels of uncertainty associated with the above items.

As outlined in the Scope of Work,the quantitative BRAs to be performed at MCB Camp Lejeune for Sites 78, 21, and 24 are to utilize all available data to date that has been properly validated in accordance with EPA guidelines plus all data to be collected from additional sampling during this RI.

5.6.1 Human Health Evaluation Process

5.6.1.1 Site Location and Characterization

A background section will be presented at the beginning of each risk assessment to provide an overview of the characteristics of each site. This section will provide a general site description and the site-specific chemicals as discussed in past reports. The physical characteristics of the site and the geographical areas of concern will be discussed. This site description will help to characterize the exposure setting.

5.6.1.2 Data Summary

Because decisions regarding data use may influence the resultant risk assessment, careful consideration must be given to the treatment of those data. For purposes of risk evaluation, the sites at MCB Camp Lejeune may be partitioned into zones or operable units for which chemical concentrations will be characterized and risks will be evaluated. Sites will be grouped into operable units if they are close to one another, have similar contamination, and/or may impact the same potential receptors. In selecting data to include in the risk assessment, the objective is to characterize, as accurately as possible, the distribution and concentration of chemicals in each operable unit.

Data summary tables will be developed for each medium sampled (e.g., surface water, sediment, groundwater, soil). Each data summary table will indicate the frequency of detection, observed range of concentrations, and the means and upper 95 percent confidence limit value for each contaminant detected in each medium. The arithmetic or geometric mean and the upper 95 percent confidence limit of that mean will be used in the summary of potential chemical data. The selection of arithmetic or geometric means will depend on whether the sample data are normally or log- normally distributed. In the calculation of the mean, concentrations presented as "ND" (nondetect) will be incorporated at one-half the sample detection limit.

5.6.1.3 Identifying Chemicals of Potential Concern

The chemical data will be evaluated to identify site-specific chemicals on which to focus subsequent efforts in the risk assessment process. For example, although numerous chemicals may be detected in surface water or soil samples, they may be unrelated to contamination (i.e., they may be naturally occurring at the levels observed), and/or they may be of relatively little concern toxicologically, such as iron, magnesium, calcium, potassium, and sodium. Therefore, if sufficient background samples are collected, a statistical comparison between background and site data will be performed to determine whether site concentrations exceeded background at a statistically significant level (e.g., 95 percent confidence).

All of the available sample data will undergo review upon initiation of the risk assessment. Common laboratory contaminants such as acetone, methylene chloride, phthalate esters, toluene, and methyl ethyl ketone will be addressed only if concentrations are 10 times greater than the corresponding blanks. In addition, chemicals that are not common laboratory contaminants will be evaluated if they are greater than five times the laboratory blank. The number of chemicals analyzed in the risk assessment will be a subset of the total number of chemicals detected at a site based on the elimination criteria discussed previously.

Tables will be prepared that list chemical concentrations for all media by site. Data will be further grouped according to organic and inorganic species within each table.

5.6.1.4 Exposure Assessment

The objectives of the exposure assessment at MCB Camp Lejeune will be to characterize the exposure setting, identify exposure pathways, and quantify the exposure. When characterizing the exposure setting, the potentially exposed populations will be described. The exposure pathway will identify: the source and the mechanism of medium for the released chemical (e.g., groundwater), the point of potential human contact with the contaminated medium, and the exposure route(s) (e.g., ingestion). The magnitude, frequency, and duration for each exposure pathway identified will be quantified during this process.

The identification of potential exposure pathways at the four sites will include the activities described in the subsections that follow.

Analysis of the Probable Fate and Transport of Site- Specific Chemicals

To determine the environmental fate and transport of the chemicals of concern at the site, the physical/chemical and environmental fate properties of the chemicals will be reviewed. Some of these properties include volatility, photolysis, hydrolysis, oxidation, reduction, biodegradation, accumulation, persistence, and migration potential. This information will assist in predicting potential current and future exposures. It will help in determining those media that are currently receiving site-related chemicals or may receive site-related chemicals in the future. Sources that may be consulted in obtaining this information include computer databases (e.g., AQUIRE, ENVIROFATE), as well as the open literature.

The evaluation of fate and transport may be necessary where the potential for changes in future chemical characteristics is likely and for those media where site-specific data on the chemical distribution is lacking.

Identification of Potentially Exposed Human Populations

Human populations, that may be potentially exposed to chemicals at the MCB Camp Lejeune, include base personnel and their families, base visitors, and on-site workers and recreational fishermen/women. The Base Master Plan will be consulted to confirm or modify these potential exposures. Nonworking residents who might be exposed to site-specific chemicals could include spouses and/or children of base personnel and resident workers. Resident and nonresident workers could be exposed to chemicals as they carry out activities at any of the sites located at MCB Camp Lejeune. The list of potential receptors and pathways to be evaluated will be refined during discussions with regulators prior to performing the BRA.

Identification of Potential Exposure Scenarios Under Current and Future Land Uses

The exposure scenarios will be developed after consulting with the Base Master Plan, EPA and the State of North Carolina. Generally, exposure pathways will be considered preliminarily as follows:

- Soil Pathway
    - Direct ingestion (worker, resident, recreational fishermen/women)
    - Inhalation of dust (worker, resident)
    - Dermal contact (worker, resident, recreational fishermen/women)

- Sediment Pathway
    - Dermal contact (worker, resident, recreational fishermen/women)
    - Ingestion of shellfish (worker, resident, recreational fishermen/women)

- Surface Water
    - Dermal contact (worker, resident, recreational fishermen/women)
    - Ingestion of contaminated fish (worker, resident, recreational fishermen/women)

- Groundwater
    - Direct ingestion (base personnel, on-site resident, on-site worker, visitor)
    - Inhalation (base personnel, on-site resident, on-site worker, visitor)
    - Dermal contact (base personnel, on-site resident, on-site worker, visitor)

Exposure Point Concentrations

After the potential exposure points and potential receptors have been defined, exposure point concentrations must be calculated. The chemical concentrations at these contact points are critical in determining intake and, consequently, risk to the receptor. The data from site investigations will be used to estimate exposure point concentrations.

The means and the upper 95 percent confidence limits of the means will be used throughout the risk assessment. If the data are log- normally distributed, the means will be based on the geometric mean rather than the arithmetic mean. In cases where maximum concentrations are exceeded by upper 95 percent confidence limit, the maximum concentrations will be used.

Exposure doses will be estimated for each exposure scenario from chemical concentrations at the point of contact by applying factors that account for contact frequency, contact duration, average body weight, and other route-specific factors such as breathing rate (inhalation). These factors will be incorporated into exposure algorithms that convert the environmental concentrations into exposure doses. Intakes will be reported in milligrams of chemical taken in by the receptor (i.e., ingested, inhaled, etc.) per kilogram body weight per day (mg/kg-day). Intakes for potentially exposed populations will be calculated separately for the appropriate exposure routes and chemicals.

5.6.1.5 Toxicity Assessment

Toxicity values (i.e., numerical values derived from dose-response toxicity data for individual compounds) will be used in conjunction with the intake determinations to characterize risk. Toxicity values may be taken or derived from the following sources:

- Integrated Risk Information System (IRIS, 1992) - The principal toxicology database, which provides updated information from EPA on cancer slope factors, reference doses, and other standards and criteria for numerous chemicals.
- Health Effects Assessment Summary Tables (EPA, 1991b) - A tabular summary of noncarcinogenic and carcinogenic toxicity information contained in IRIS.

For some chemicals, toxicity values (i.e., reference doses) may have to be derived if the principal references previously mentioned do not contain the required information. These derivations will be provided in the risk assessment for review by EPA Region IV. The toxicity assessment will include a brief description of the studies on which selected toxicity values were based, the uncertainty factors used to calculate noncarcinogenic reference doses (RfDs), the EPA weight-of-evidence classification for carcinogens, and their respective slope factors.

5.6.1.6 Risk Characterization

Risk characterization involves the integration of exposure doses and toxicity information to quantitatively estimate the risk of adverse health effects. Quantitative risk estimates based on the reasonable maximum exposures to the site contaminants will be calculated based on available information. For each exposure scenario, the potential risk for each chemical will be based on intakes from all appropriate exposure routes. Carcinogenic risk and noncarcinogenic hazard indices are assumed to be additive across all exposure pathways and across all of the chemicals of concern for each exposure scenario. Potential carcinogenic risks will be evaluated separately from potential noncarcinogenic effects, as discussed in the following subsections.

Carcinogenic Risk

For the potential carcinogens that are present at the site, the carcinogenic slope factor (q_1*) will be used to estimate cancer risks at low dose levels. Risk will be directly related to intake at low levels of exposure. Expressed as an equation, the model for a particular exposure route is:

$$\text{Excess lifetime cancer risk} = \text{Estimated dose x carcinogenic slope factor; or CDI x } q_1{}^*$$

Where: CDI = Chronic daily intake

This equation is valid only for risk less than 10^{-2} (1 in 100) because of the assumption of low dose linearity. For sites where this model estimates carcinogenic risks of 10^{-2} or higher, an alternative model will be used to estimate cancer risks as shown in the following equation:

$$\text{Excess lifetime cancer risk} = 1 - \exp(-\text{CDI x } q_1{}^*)$$

Where: exp = the exponential

For quantitative estimation of risk, it will be assumed that cancer risks from various exposure routes are additive. Since there are no mathematical models that adequately describe antagonism or synergism, these issues will be discussed in narrative fashion in the uncertainty analysis.

<u>Noncarcinogenic Risk</u>

To assess noncarcinogenic risk, estimated daily intakes will be compared with RfDs for each chemical of concern. The potential hazard for individual chemicals will be presented as a hazard quotient (HQ). A hazard quotient for a particular chemical through a given exposure route is the ratio of the estimated daily intake and the applicable RfD, as shown in the following equation:

$$\text{HQ} = \text{EDI/RfD}$$

Where: HQ = Hazard quotient
EDI = Estimated daily intake or exposure (mg/kg-day)
RfD = Reference dose (mg/kg-day)

To account for the additivity of noncarcinogenic risk following exposure to numerous chemicals through a variety of exposure routes, a hazard index (HI), which is the sum of all the hazard quotients, will be calculated. Ratios greater than one, or unity, indicate the potential for adverse effects to occur. Ratios less than one indicate that adverse effects are unlikely. This procedure assumes that the risks from exposure to multiple chemicals are additive, an assumption that is probably valid for compounds that have the same target organ or cause the same toxic effect. In some cases when the HI exceeds unity it may be appropriate to segregate effects (as expressed by the HI) by target organ since those effects would not be additive. As previously mentioned, where information is available about the antagonism or synergism of chemical mixtures, it will be appropriately discussed in the uncertainty analysis.

5.6.1.7 Uncertainty Analysis

There is uncertainty associated with any risk assessment. The exposure modeling can produce very divergent results unless standardized assumptions are used and the possible variation in others are clearly understood. Similarly, toxicological assumptions, such as extrapolating from chronic animal studies to human populations, also introduce a great deal of uncertainty into the risk assessment. Uncertainty in a risk assessment may arise from many sources including:

- Environmental chemistry sampling and analysis.

- Misidentification or failure to be all-inclusive in chemical identification.

- Choice of models and input parameters in exposure assessment and fate and transport modeling.

- Choice of models or evaluation of toxicological data in dose-response quantification.

- Assumptions concerning exposure scenarios and population distributions.

The variation of any factor used in the calculation of the exposure concentration will have an impact on the total carcinogenic and noncarcinogenic risk. The uncertainty analysis will qualitatively discuss non-site and site-specific factors that may produce uncertainty in the risk assessment. These factors may include key modeling assumptions, exposure factors, assumptions inherent in the development of toxicological end points, and spatio-temporal variance in sampling.

5.6.2 Ecological Risk Assessment

5.6.2.1 Purpose and Approach

The purpose of an ecological risk assessment is to evaluate the likelihood that adverse ecological effects would occur or are occurring as a result of contamination at MCB Camp Lejeune. It would focus on identifying potential adverse effects of area-specific contamination on selected/targeted flora and fauna at each site, or group of sites (operable unit). The technical approach parallels that used in the human health risk assessment; however, since the protocols for evaluating the ecological risk have not been sufficiently developed, the ecological risk assessment may be more qualitative than its human health counterpart. In general, the approach to be taken in the conduct of the ecological risk assessments at MCB Camp Lejeune will be comparing sampled media concentrations to existing toxicological endpoints for selected target species. In addition, incomplete exposure pathways and data gaps will be identified. If this comparison indicates the potential for significant ecological risks, the conduct of a quantitative biosurvey may be recommended as Phase II of the RI.

The primary technical guidance for the performance of the ecological risk assessment is offered by the following sources:

- Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference (EPA, 1989b).

- Risk Assessment Guidance for Superfund -- Volume II, Environmental Evaluation Manual (EPA, 1989c).

- User's Manual for Ecological Risk Assessment (Oak Ridge National Laboratory, 1986).

The subsections that follow describe the general approach proposed to evaluate potential ecological impacts associated with contamination found at MCB Camp Lejeune. It focuses on environmental receptors that may be affected directly or indirectly by contamination associated with particular areas of concern, and the likelihood and extent of those effects. At each site or operable unit, potential target organisms, populations, and/or communities will be identified and the potential exposure pathways determined.

5.6.2.2 Selection of Chemicals of Potential Concern

The objective of this subtask is to evaluate the available information on contamination present at MCB Camp Lejeune, and to identify contaminants of potential concern on which to focus subsequent risk assessment efforts.

The selection of chemicals of concern will be based on frequency of detection, comparison to background concentrations, persistence of the chemical, bioaccumulation potential, and the availability of toxicological information (to the selected target species) for those chemicals. Because of the differential toxicity of some chemicals to ecological as compared with human receptors, the chemicals of potential concern for ecological receptors may differ from those selected in the human health risk assessment.

5.6.2.3 Exposure Assessment

The objectives of the exposure assessment are to:

- Identify habitats that may have detected exposure point concentrations.
- Identify plants, fish, and/or wildlife that may be potentially exposed to the contaminants of concern.
- Identify significant pathways/routes of exposure.
- Select target species, and/or communities of potential concern.
- Estimate potential exposure concentrations for contaminants of concern.

In general, an ecological exposure assessment evaluates the potential magnitude and frequency of contact with the contaminants specific to the area through all appropriate exposure pathways for the selected species and/or communities. The first step of the exposure assessment is to identify (1) potential pathways of exposure specific to the individual areas of concern and (2) the habitats potentially affected by those areas of concern.

Pathway Identification and Habitat Evaluation

Chemical migration pathways and habitats that may be potentially affected by area-specific contamination will be identified. No modeling will be performed to evaluate the exposure assessment. Information that may be used in determining potential chemical migration pathways include:

- Location of contamination sources.
- Local topography.
- Local land use.
- Media-specific and area-specific contamination data.
- Persistence and mobility of area-specific chemicals.
- Qualitative prediction of contaminant migration.

To conduct this evaluation, the ecological exposure assessment will consist of a literature search to characterize the populations, communities, and/or habitats in the potentially affected area. The characterizations will be developed from existing reports on the ecological systems of the areas. Literature search of "reference" areas in the region also will be performed to establish an ecological "baseline" from which comparisons can be made. If the data permits, a comparison will be made between reference areas and study site areas to determine the extent to which habitat function and structure at the site may have been impaired.

The determination of which habitats warrant special attention will be based on the importance of each habitat within the environmental system, incorporating factors such as:

- Resource use by fish and wildlife.
- Probable species using these habitats.
- Availability and quality of substitute habitats.
- Importance of species using these habitats.
- Regulatory status.

Specific attention will be devoted to aquatic and terrestrial environmentals that may be impacted by site-related contamination (i.e., creeks and wetlands).

Selection of Target Species

As available from the literature, ecological exposure scenarios will be developed. These will include scenarios involving the existing and future land use of the area. Identification of the plant, fish, and wildlife species and/or communities that may be potentially exposed to contaminants will be determined for terrestrial and aquatic habitats. From this list of potential ecological receptors, target species will be based on the following criteria:

- A species that is threatened, endangered, or of special concern.
- A species that is valuable for recreational or commercial purposes.
- A species that is important to the well being of either or both of the above groups.
- A species that is critical to the structure and function of the particular ecosystem which it inhabits.
- A species that is a sensitive indicator of ecological change.

To help identify potential target species, data collected from information provided through contact with State and Federal natural resource agencies will be reviewed.

Estimation of Exposure Point Concentrations

After the potential contamination migration pathways and affected habitats have been defined and potential target receptors identified, points of likely exposure will be described. The concentrations at these contact points (i.e., exposure point concentrations) are critical in evaluating contaminant exposure and subsequent risk to the receptor.

Exposure Estimation

Exposure potential will be estimated for each terrestrial and aquatic exposure pathway from the conduct of an ecological characterization for each of the target species. This characterization will identify tropic level, habitat utilization, and potential exposure points and routes for the selected target species.

5.6.2.4 Toxicity Assessment

The toxicities of the contaminants of concern will be assessed by using AWQC and, if possible, Sediment Quality Criteria (SQC) for aquatic life, terrestrial wildlife, and vegetation where relevant. In addition, scientific literature and regulatory guidelines will be reviewed for media-specific and/or species-specific toxicity data. To the extent literature data allow, a range of toxicological responses or endpoints also will be evaluated. These data will be used to determine critical toxicity values (CTVs) for the contaminants of concern, which will be compared with media concentrations or estimated daily intakes. Toxicity values from the literature are derived using the most closely related species, where possible. Toxicity values selected for the assessment are the lowest exposure doses reported to be toxic or the highest doses associated with no adverse effect. Data for chronic or subchronic toxicity are used wherever available.

Potential sources of toxicity data for the ecological assessment include:

- AQUIRE database
- PHYTOTOX database
- ENVIROFATE database
- Hazardous Substances Database (HSDB)
- RTECS

5.6.2.5 Risk Characterization

A risk characterization integrates the exposure and toxicity assessments to estimate the potential risk to the environmental receptors. The media concentrations or estimated daily intakes will be compared with critical toxicity values using toxicity data that are expressed in terms of medium concentrations (e.g., Ambient Water Quality Criteria, species-specific toxicity data, phytotoxicity data, sediment biological effects data). In these cases, comparing predicted environmental media exposure point concentrations with media-specific and/or species-specific toxicity data will be made. If this comparison indicates the potential for significant ecological risks to the target receptors, the conduct of a quantitative biosurvey may be recommended as Phase II of the RI.

$$HQ = C/CTV$$

Where: C = Concentration of chemical (mg/kg, mg/l).

CTV = Critical toxicity value for the same chemical in the same medium (mg/kg, mg/l).

Anything over the number one (1), indicates potential significant risks to the species.

5.6.2.6 Data Gaps

Incomplete exposure data gap pathways will be identified and recommendations for addressing same will be provided.

5.6.2.7 Uncertainty Analysis

An ecological risk assessment, like a human health risk assessment, is subject to a wide variety of uncertainties. Virtually every step in the risk assessment process involves numerous assumptions that contribute to the total uncertainty in the ultimate evaluation of risk. Assumptions are made in the exposure assessment regarding potential for exposure and exposure point locations. An effort is made to use assumptions that are conservative, yet realistic. The interpretation and application of toxicological data in the toxicity assessment is probably the greatest source of uncertainty in the ecological risk assessment. The uncertainty analysis will attempt to address the factors that affect the results of the ecological risk assessment.

5.7 Task 7 - Treatability Study/Pilot Testing

This task includes the efforts to prepare and conduct bench- or pilot-scale treatability studies should they be necessary. This task begins with the development of a Treatability Study Work Plan for conducting the tests and is completed upon submittal of the Final Report. The following are typical activities:

- Work plan preparation;
- Test facility and equipment procurement;
- Vendor and analytical service procurement;

- Testing;
- Sample analysis and validation;
- Evaluation of results;
- Report preparation; and,
- Project management.

Based on the preliminary information pertaining to Sites 78, 21, and 24, the following bench or pilot studies may be considered for soils:

Site 78:	Solidification/fixation of soils Thermal treatment Soil washing/biodegradation
Site 21:	Soil washing/biodegradation Thermal treatment In-situ solidification/fixation In-situ biodegradation
Site 24:	None at this time since on-site soil investigations and soil characteristics are unknown.

Bench- or pilot-scale treatability studies for groundwater may be required to assess pretreatment options (e.g., metal reduction).

5.8 Task 8 - Remedial Investigation Report

This task is intended to cover all work efforts related to the preparation of the document providing the findings once the data have been evaluated under Tasks 5 and 6. The task covers the preparation of a Preliminary Draft, Draft, Draft Final, and Final RI Report. This task ends when the Final RI report is submitted.

5.9 Task 9 - Remedial Alternatives Screening

This task includes the efforts necessary to select the alternatives that appear feasible and require full evaluation. The task begins during data evaluation when sufficient data are available to initiate the screening of potential technologies. For reporting and tracking purposes, the task is defined as complete when a final set of alternatives is chosen for detailed evaluation.

5.10 Task 10 - Remedial Alternatives Evaluation

This task involves the detailed analysis and comparison of alternatives using the following criteria:

● Threshold Criteria:	Overall Protection of Human Health and the Environment
	Compliance With ARARs
● Primary Balancing Criteria:	Long-Term Effectiveness and Permanence
	Reduction of Toxicity, Mobility, and Volume Through Treatment
	Short-Term Effectiveness
	Implementability
	Cost
● Modifying Criteria:	State and EPA Acceptance
	Community Acceptance

5.11 Task 11 - Feasibility Study Report

This task is comprised of reporting the findings of the Feasibility Study. The task covers the preparation of a Preliminary Draft, Draft, Draft Final, and Final FS report. This task ends when the Final FS report is submitted.

5.12 Task 12 - Post RI/FS Support

This task involves the technical and administrative support to LANTDIV to prepare a Draft, Draft Final, and Final Responsiveness Summary, Proposed Remedial Action Plan, and Record of Decision. These reports will be prepared using EPA applicable guidance documents.

5.13 Task 13 - Meetings

This task involves providing technical support to LANTDIV during the RI/FS. It is anticipated that the following meetings will be required:

- Technical Review Committee (TRC) meeting to present the RI/FS Work Plan.

- A TRC meeting to present the findings of the RI/FS.

- Public meeting to present the proposed remedial alternatives.

- RI start-up meeting between LANTDIV and Baker.

- Meeting between Baker and LANTDIV to discuss the RI and risk assessment following submission of the preliminary draft RI report.

- Meeting between Baker and LANTDIV to discuss the FS following submission of the preliminary draft FS report.

5.14 Task 14 - Community Relations

This task includes providing support to LANTDIV during the various public meetings identified under Task 13. This support includes the preparation of fact sheets, meeting minutes, coordination with Camp Lejeune EMD in contacting local officials and media, and the procurement of a stenographer.

This task also includes updating the existing Community Relations Plan (CRP) with respect to changes in personnel, contacts, phone numbers, or the addition of information relevant to this RI/FS. An addendum to the CRP will be prepared which summarizes these changes. Replacement pages to the existing CRP will be issued.

6.0 PROJECT MANAGEMENT AND STAFFING

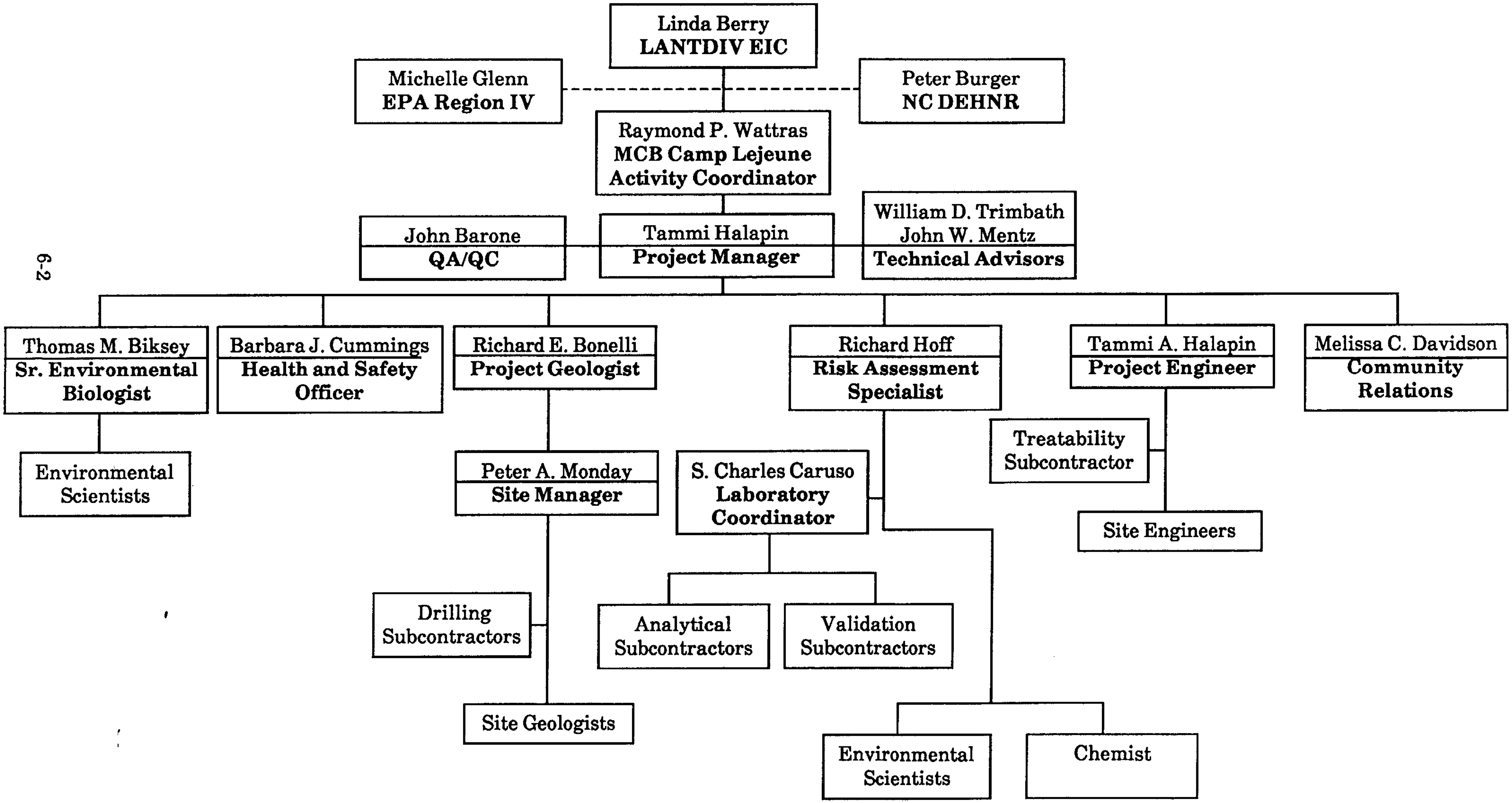
The proposed management and staffing of this RI/FS is depicted in Figure 6-1. The primary participants for this project include:

- Mr. Raymond P. Wattras, Activity Coordinator
- Ms. Tammi Halapin, Project Manager
- Mr. John Barone, QA/QC
- Mr. Richard Bonelli, Project Geologist
- Ms. Tammi Halapin, Project Engineer
- Mr. Richard Hoff, Risk Assessment
- Mr. Charles Caruso, Laboratory Coordinator
- Mr. Thomas M. Biksey, Environmental Assessment
- Ms. Barbara J. Cummings, Health and Safety Officer
- Ms. Melissa C. Davidson, Community Relations Specialist

From a responsibility and coordination standpoint, Mr. Richard Bonelli, Mr. Richard Hoff and Mr. Thomas Biksey will have the overall responsibility of completing the RI Report. Ms. Tammi Halapin will be responsible for overseeing the preparation of the FS report. These personnel will report directly to the Project Manager and the Activity Coordinator. They will be supported by geologists, engineers, biologists, chemists, data technicians, and clerical personnel.

Overall field and reporting QA/QC will be the responsibility of Mr. John Barone. Mr. William D. Trimbath, P.E. and Mr. John W. Mentz will provide Program-level technical and administrative support.

FIGURE 6-1
PROJECT ORGANIZATION
RI/FS AT OPERABLE UNIT NO. 1
(SITES 78, 21, AND 24)
MCB CAMP LEJEUNE, NORTH CAROLINA



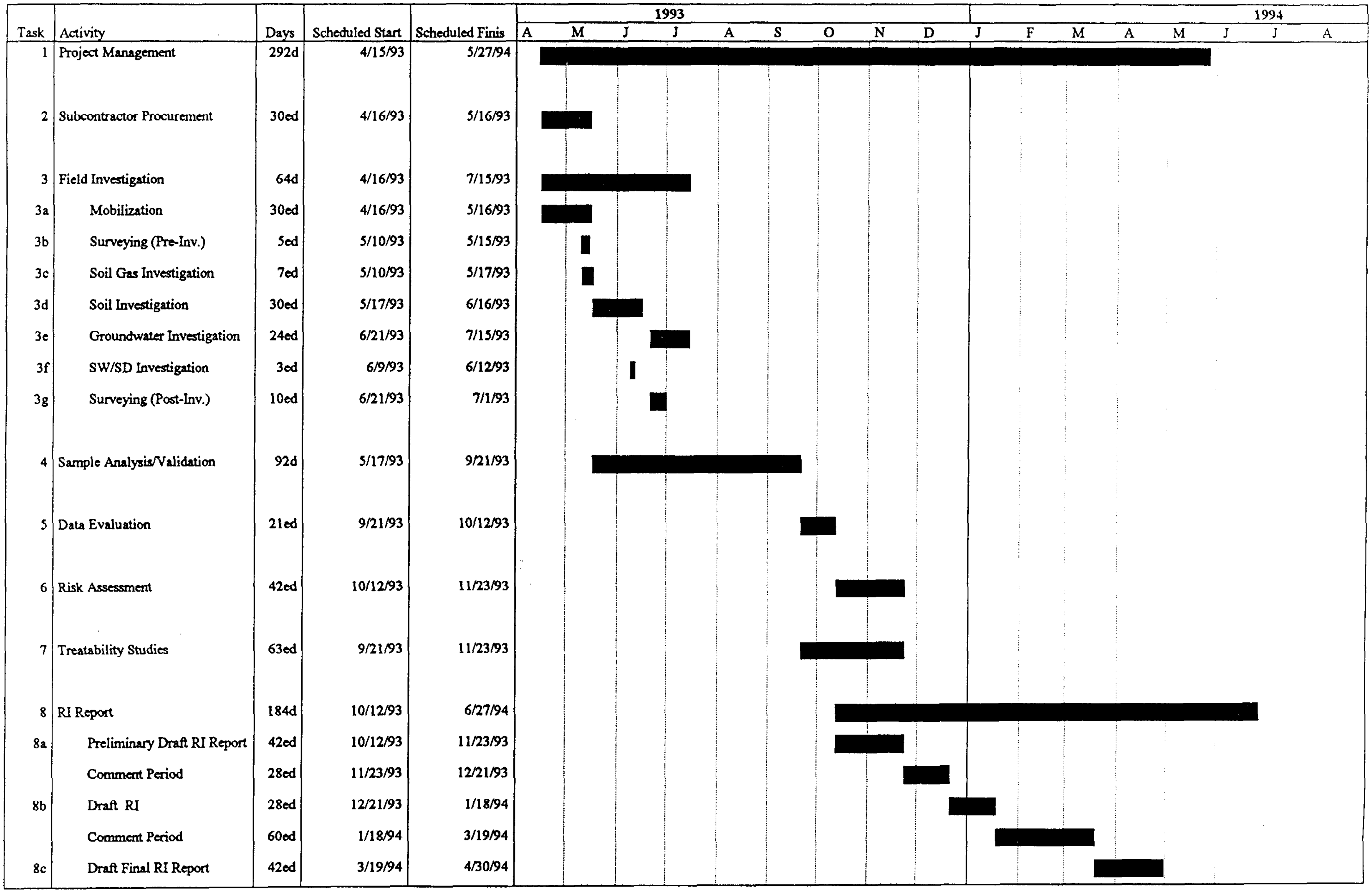
7.0 SCHEDULE

The proposed schedule for this project is presented in Figure 7-1.

Figure 7-1

RI/FS Project Schedule

Sites 21, 24, and 78 (Operable Unit No. 1) MCB Camp Lejeune, NC



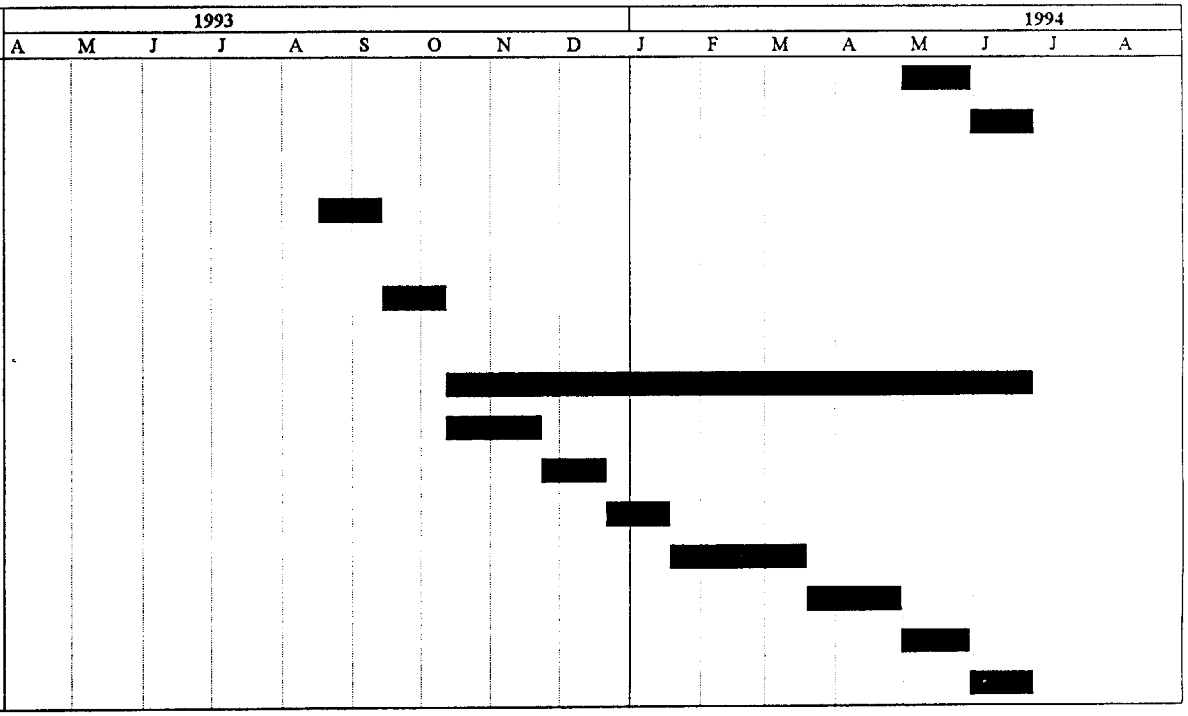
Task	Activity	Days	Scheduled Start	Scheduled Finis
1	Project Management	292d	4/15/93	5/27/94
2	Subcontractor Procurement	30ed	4/16/93	5/16/93
3	Field Investigation	64d	4/16/93	7/15/93
3a	Mobilization	30ed	4/16/93	5/16/93
3b	Surveying (Pre-Inv.)	5ed	5/10/93	5/15/93
3c	Soil Gas Investigation	7ed	5/10/93	5/17/93
3d	Soil Investigation	30ed	5/17/93	6/16/93
3e	Groundwater Investigation	24ed	6/21/93	7/15/93
3f	SW/SD Investigation	3ed	6/9/93	6/12/93
3g	Surveying (Post-Inv.)	10ed	6/21/93	7/1/93
4	Sample Analysis/Validation	92d	5/17/93	9/21/93
5	Data Evaluation	21ed	9/21/93	10/12/93
6	Risk Assessment	42ed	10/12/93	11/23/93
7	Treatability Studies	63ed	9/21/93	11/23/93
8	RI Report	184d	10/12/93	6/27/94
8a	Preliminary Draft RI Report	42ed	10/12/93	11/23/93
	Comment Period	28ed	11/23/93	12/21/93
8b	Draft RI	28ed	12/21/93	1/18/94
	Comment Period	60ed	1/18/94	3/19/94
8c	Draft Final RI Report	42ed	3/19/94	4/30/94

Figure 7-1

RI/FS Project Schedule

Sites 21, 24, and 78 (Operable Unit No. 1) MCB Camp Lejeune, NC

Task	Activity	Days	Scheduled Start	Scheduled Finis
	Comment Period	30ed	4/30/94	5/30/94
8d	Final RI	28ed	5/30/94	6/27/94
9	Alternative Screening	28ed	8/17/93	9/14/93
10	Alternative Evaluation	28ed	9/14/93	10/12/93
11	FS Report	184d	10/12/93	6/27/94
11a	Preliminary Draft FS/PRAP	42ed	10/12/93	11/23/93
	Comment Period	28ed	11/23/93	12/21/93
11b	Draft FS/PRAP	28ed	12/21/93	1/18/94
	Comment Period	60ed	1/18/94	3/19/94
11c	Draft Final FS/PRAP	42ed	3/19/94	4/30/94
	Comment Period	30ed	4/30/94	5/30/94
11d	Final FS/PRAP	28ed	5/30/94	6/27/94



8.0 REFERENCES

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APPENDIX A
ANALYTICAL DATA FROM THE CHARACTERIZATION STUDY

JANUARY 1987
GROUNDWATER DATA
SHALLOW WELLS

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJHP-1 LAB COORDINATOR J.D. SHAMIS

SAMPLE ID/#

PARAMETERS UNITS	STORET # METHOD	22GW1 LJHP-1 1	22GW2 LJHP-1 2	HPGW1 LJHP-1 3	HPGW2 LJHP-1 4	HPGW3 LJHP-1 5	HPGW4 LJHP-1 6	HPGW5 LJHP-1 7	HPGW6 LJHP-1 8	HPGW7 LJHP-1 9	HPGW8 LJHP-1 10	HPGW9 LJHP-1 11	HPGW10 LJHP-1 12	HPGW11 LJHP-1 13	HPGW12 LJHP-1 14	HPGW13 LJHP-1 15
DATE		01/09/87	01/09/87	01/09/87	01/09/87	01/09/87	01/12/87	01/12/87	01/12/87	01/12/87	01/13/87	01/14/87	01/14/87	01/14/87	01/14/87	01/14/87
TIME		11:02	10:05	12:05	13:20	14:25	10:00	12:05	14:08	16:40	14:55	10:25	11:45	12:55	13:59	15:55
LEAD,TOTAL UG/L	1051 ICAP	33.0	28.0	27.0	<27.0	40.0	29.0	<27.0	<27.0	<27.0	<27.0	130	29.0	<27.0	<27.0	<27.0
OIL&GR,IR MG/L	560 1	7	0.8	0.7	0.7	0.8	0.3	0.9	0.2	3	0.1	32	0.4	0.3	0.2	0.2
BENZENE UG/L	34030 GMS	12000	<1.0	43	12	1.4	25	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<1.0	<1.0	<1.0
BROMODICHLOROMETHANE UG/L	32101 GMS	<22	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<220	<2.2	<2.2	<2.2	<2.2
BROMOFORM UG/L	32104 GMS	<47	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<470	<4.7	<4.7	<4.7	<4.7
BROMOMETHANE UG/L	34413 GMS	<58	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<580	<5.8	<5.8	<5.8	<5.8
CARBON TETRACHLORIDE UG/L	32102 GMS	<28	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<280	<2.8	<2.8	<2.8	<2.8
CHLOROBENZENE UG/L	34301 GMS	<60	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<600	<6.0	<6.0	<6.0	<6.0
CHLOROETHANE UG/L	34311 GMS	<82	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<820	<8.2	<8.2	<8.2	<8.2
2-CHLOROETHYLVINYL ETHER UG/L	34576 GMS	<150	<26	<15	<15	<15	<15	<15	<15	<15	<15	<1500	<15	<15	<15	<15
CHLOROFORM UG/L	32106 GMS	<16	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<160	<1.6	3.2	<1.6	<1.6
CHLOROMETHANE UG/L	34418 GMS	<43	<4.3	<4.3	5.0	<4.3	<4.3	<4.3	<4.3	<4.3	7.2	<430	<4.3	<4.3	<4.3	<4.3
DIBROMOCHLOROMETHANE UG/L	32105 GMS	<31	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<310	<3.1	<3.1	<3.1	<3.1
1,1-DICHLOROETHANE UG/L	34496 GMS	<47	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<470	<4.7	<4.7	<4.7	<4.7
1,2-DICHLOROETHANE UG/L	34531 GMS	<28	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<280	<2.8	<2.8	<2.8	<2.8
1,1-DICHLOROETHYLENE UG/L	34501 GMS	<28	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<280	<2.8	<2.8	<2.8	<2.8
TRANS-1,2-DICHLORO ETHENE UG/L	34546 GMS	<16	<1.6	<1.6	<1.6	<1.6	1.9	<1.6	<1.6	<1.6	<1.6	740	<1.6	13	<1.6	<1.6
1,2-DICHLOROPROPANE UG/L	34541 GMS	<60	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<600	<6.0	<6.0	<6.0	<6.0
CIS-1,3-DICHLORO PROPENE UG/L	34704 GMS	<50	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<500	<5.0	<5.0	<5.0	<5.0
TRANS-1,3-DICHLORO PROPENE UG/L	34699 GMS	<64	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<640	<6.4	<6.4	<6.4	<6.4

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJHP-1 LAB COORDINATOR J.D. SHAMIS

SAMPLE ID/#

PARAMETERS UNITS	STORET # METHOD	22GW1 LJHP-1 1	22GW2 LJHP-1 2	HPGW1 LJHP-1 3	HPGW2 LJHP-1 4	HPGW3 LJHP-1 5	HPGW4 LJHP-1 6	HPGW5 LJHP-1 7	HPGW6 LJHP-1 8	HPGW7 LJHP-1 9	HPGW8 LJHP-1 10	HPGW9 LJHP-1 11	HPGW10 LJHP-1 12	HPGW11 LJHP-1 13	HPGW12 LJHP-1 14	HPGW13 LJHP-1 15
DATE		01/09/87	01/09/87	01/09/87	01/09/87	01/09/87	01/12/87	01/12/87	01/12/87	01/12/87	01/13/87	01/14/87	01/14/87	01/14/87	01/14/87	01/14/87
TIME		11:02	10:05	12:05	13:20	14:25	10:00	12:05	14:08	16:40	14:55	10:25	11:45	12:55	13:59	15:55
ETHYLBENZENE UG/L	34371 GMS	1800	<7.2	12	<7.2	8.2	<7.2	<7.2	<7.2	<7.2	<7.2	1100	<7.2	<7.2	<7.2	<7.2
METHYLENE CHLORIDE UG/L	34423 GMS	<28	7.3	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	20	<280	<2.8	<2.8	<2.8	<2.8
1,1,2,2-TETRACHLORO ETHANE UG/L	34516 GMS	<41	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<410	<4.1	<4.1	<4.1	<4.1
TETRACHLOROETHENE UG/L	34475 GMS	<30	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<300	<3.0	<3.0	<3.0	<3.0
TOLUENE UG/L	34010 GMS	15000	<6.0	100	38	<6.0	35	<6.0	<6.0	<6.0	<6.0	<600	<6.0	<6.0	<6.0	<6.0
1,1,1-TRICHL'ETHANE UG/L	34506 GMS	<38	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<380	<3.8	<3.8	<3.8	<3.8
1,1,2-TRICHL'ETHANE UG/L	34511 GMS	<50	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<500	<5.0	<5.0	<5.0	<5.0
TRICHLOROETHENE UG/L	39180 GMS	<30	<1.0	<3.0	<3.0	<3.0	3.4	<3.0	<3.0	<3.0	<3.0	5000	7.4	49	<3.0	<3.0
TRICHLOROFLUORO-METHANE UG/L	34488 GMS	<32	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	14	<320	<3.2	<3.2	<3.2	<3.2
VINYL CHLORIDE UG/L	39175 GMS	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<1.0	<1.0	<1.0
ACROLEIN UG/L	34210 GMS	<1000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<10000	<100	<100	<100	<100
ACRYLONITRILE UG/L	34215 GMS	<1000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<10000	<100	<100	<100	<100
DICHLORODIFLUORO-METHANE UG/L	34668 GMS	<100	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1000	<10	<10	<10	<10
M-XYLENE UG/L	98553 GMS	4400	<12	30	14	<12	<12	<12	<12	<12	<12	2400	<12	<12	<12	<12
O-AND/OR-P XYLENE UG/L	98554 GMS	4600	<12	32	14	<12	<12	<12	<12	<12	<12	2100	<12	<12	<12	<12
METHYL ETHYL KETONE UG/L	81595 GMS	<480	<48	<48	<48	<48	<48	<48	<48	<48	<48	<4800	<48	<48	<48	<48
METHYL ISOBUT'KETONE UG/L	81596 GMS	<120	<12	<12	<12	<12	<12	<12	<12	<12	<12	<1200	<12	<12	<12	<12

PROJECT NUMBER 86447 0400 · PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJHP-1 LAB COORDINATOR J.D. SHAMIS

SAMPLE ID/#

PARAMETERS UNITS	STORET # METHOD	HPCW14 LJHP-1 16	HPCW15 LJHP-1 17	HPCW16 LJHP-1 18	HPCW17 LJHP-1 19	HPCW18 LJHP-1 20	HPCW19 LJHP-1 21	HPCW20 LJHP-1 22	HPCW21 LJHP-1 23	HPCW22 LJHP-1 24	HPCW23 LJHP-1 25	HPCW24 LJHP-1 26	HPCW25 LJHP-1 27	HPCW26 LJHP-1 28	HPCW29 LJHP-1 31
DATE		01/14/87	01/15/87	01/15/87	01/15/87	01/15/87	01/16/87	01/16/87	01/16/87	01/19/87	01/19/87	01/19/87	01/19/87	01/19/87	01/20/87
TIME		17:37	10:46	12:27	13:56	17:25	10:12	11:50	14:35	10:20	11:30	14:00	14:50	16:30	11:20
LEAD,TOTAL UG/L	1051 ICAP	<27.0	46.0	45.0	<27.0	<27.0	<27.0	46.0	<27.0	27.0	38.0	<27.0	<27.0	31.0	<27.0
OIL&GR,IR MG/L	560 1	0.2	<0.1	0.2	<0.1	<0.1	0.2	<0.1	0.2	1	0.6	0.1	0.2	0.2	0.2
BENZENE UG/L	34030 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	2.0	<1.0	<1.0	<1.0
BROMODICHLOROMETHANE UG/L	32101 GMS	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<22	<220	<2.2	<2.2	<2.2
BROMOFORM UG/L	32104 GMS	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<47	<470	<4.7	<4.7	<4.7
BROMOMETHANE UG/L	34413 GMS	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<58	<580	<5.8	<5.8	<5.8
CARBON TETRACHLORIDE UG/L	32102 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<28	<280	<2.8	<2.8	<2.8
CHLOROBENZENE UG/L	34301 GMS	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<60	<600	<6.0	<6.0	<6.0
CHLOROETHANE UG/L	34311 GMS	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<82	<820	<8.2	<8.2	<8.2
2-CHLOROETHYLVINYL ETHER UG/L	34576 GMS	<15	<15	<15	<15	<26	<15	<15	<15	<15	<150	<1500	<15	<15	<15
CHLOROFORM UG/L	32106 GMS	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<16	<160	<1.6	<1.6	<1.6
CHLOROMETHANE UG/L	34418 GMS	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<43	<430	<4.3	<4.3	<4.3
DIBROMOCHLOROMETHANE UG/L	32105 GMS	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<31	<310	<3.1	<3.1	<3.1
1,1-DICHLOROETHANE UG/L	34496 GMS	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<47	12	<4.7	<4.7	<4.7
1,2-DICHLOROETHANE UG/L	34531 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<28	<280	<2.8	<2.8	<2.8
1,1-DICHLOROETHYLENE UG/L	34501 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<28	<280	<2.8	<2.8	<2.8
TRANS-1,2-DICHLORO ETHENE UG/L	34546 GMS	<1.6	<1.6	<1.6	<1.6	<1.6	2.5	<1.6	<1.6	<1.6	830	6400	<1.6	<1.6	<1.6
1,2-DICHLOROPROPANE UG/L	34541 GMS	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<60	<600	<6.0	<6.0	<6.0
CIS-1,3-DICHLORO PROPENE UG/L	34704 GMS	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	<500	<5.0	<5.0	<5.0
TRANS-1,3-DICHLORO PROPENE UG/L	34699 GMS	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<64	<640	<6.4	<6.4	<6.4

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJHP-1 LAB COORDINATOR J.D. SHAMIS

SAMPLE ID/#

PARAMETERS UNITS	STORET # METHOD	HPGW14 LJHP-1 16	HPGW15 LJHP-1 17	HPGW16 LJHP-1 18	HPGW17 LJHP-1 19	HPGW18 LJHP-1 20	HPGW19 LJHP-1 21	HPGW20 LJHP-1 22	HPGW21 LJHP-1 23	HPGW22 LJHP-1 24	HPGW23 LJHP-1 25	HPGW24 LJHP-1 26	HPGW25 LJHP-1 27	HPGW26 LJHP-1 28	HPGW29 LJHP-1 31
DATE		01/14/87	01/15/87	01/15/87	01/15/87	01/15/87	01/16/87	01/16/87	01/16/87	01/19/87	01/19/87	01/19/87	01/19/87	01/19/87	01/20/87
TIME		17:37	10:46	12:27	13:56	17:25	10:12	11:50	14:35	10:20	11:30	14:00	14:50	16:30	11:20
ETHYLBENZENE UG/L	34371 GMS	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<72	<720	<7.2	<7.2	<7.2
METHYLENE CHLORIDE UG/L	34423 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<28	<280	<2.8	<2.8	<2.8
1,1,2,2-TETRACHLORO ETHANE UG/L	34516 GMS	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<41	<410	<4.1	<4.1	<4.1
TETRACHLOROETHENE UG/L	34475 GMS	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<30	<300	<3.0	<3.0	<3.0
TOLUENE UG/L	34010 GMS	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<60	<600	<6.0	<6.0	<6.0
1,1,1-TRICHL'ETHANE UG/L	34506 GMS	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<38	<380	<3.8	<3.8	<3.8
1,1,2-TRICHL'ETHANE UG/L	34511 GMS	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	<500	<5.0	<5.0	<5.0
TRICHLOROETHENE UG/L	39180 GMS	<3.0	<3.0	<3.0	<3.0	<1.0	6.0	<3.0	<3.0	<3.0	830	57	<3.0	<3.0	<3.0
TRICHLOROFLUORO-METHANE UG/L	34488 GMS	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<32	<320	<3.2	<3.2	<3.2
VINYL CHLORIDE UG/L	39175 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	190	<1.0	<1.0	<1.0
ACROLEIN UG/L	34210 GMS	<100	<100	<100	<100	<100	<100	<100	<100	<100	<1000	<10000	<100	<100	<100
ACRYLONITRILE UG/L	34215 GMS	<100	<100	<100	<100	<100	<100	<100	<100	<100	<1000	<10000	<100	<100	<100
DICHLORODIFLUORO-METHANE UG/L	34668 GMS	<10	<10	<10	<10	<10	<10	<10	<10	<10	<100	<1000	<10	<10	<10
M-XYLENE UG/L	98553 GMS	<12	<12	<12	<12	<12	<12	<12	<12	<12	<120	<1200	<12	<12	<12
O-AND/OR-P XYLENE UG/L	98554 GMS	<12	<12	<12	<12	<12	<12	<12	<12	<12	<120	<1200	<12	<12	<12
METHYL ETHYL KETONE UG/L	81595 GMS	<48	<48	<48	<48	<48	<48	<48	<48	<48	<480	<4800	<48	<48	<48
METHYL ISOBUT'KETONE UG/L	81596 GMS	<12	<12	<12	<12	<12	<12	<12	<12	<12	<120	<1200	<12	<12	<12

MARCH 1987
GROUNDWATER DATA
SHALLOW WELLS

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PROJECT NUMBER 86447 0404 PROJECT NAME NAVY - LEJEUNE HP2
FIELD GROUP LJHP-2 LAB COORDINATOR J.D. SHAMIS

SAMPLE ID/#

PARAMETERS UNITS	STORET # METHOD	22GW1 LJHP-2 1	22GW2 LJHP-2 2	HPGW1 LJHP-2 3	HPGW2 LJHP-2 4	HPGW3 LJHP-2 5	HPGW4 LJHP-2 6	HPGW5 LJHP-2 7	HPGW6 LJHP-2 8	HPGW7 LJHP-2 9	HPGW8 LJHP-2 10	HPGW9 LJHP-2 11	HPGW10 LJHP-2 12	HPGW11 LJHP-2 13	HPGW12 LJHP-2 14	HPGW13 LJHP-2 15
DATE TIME		03/08/87 11:03	03/08/87 11:30	03/08/87 12:45	03/08/87 16:18	03/08/87 14:20	03/08/87 15:12	03/08/87 16:55	03/08/87 17:10	03/09/87 10:05	03/09/87 11:10	03/09/87 10:30	03/09/87 11:20	03/09/87 12:19	03/09/87 12:33	03/09/87 13:45
LEAD,TOTAL UG/L	1051 ICAP	29.0	<27.0	<27.0	<27.0	<27.0	<27.0	<27.0	<27.0	29.0	<27.0	92.0	<27.0	<27.0	<27.0	<27.0
OIL&GR,IR MG/L	560 1	11	<0.1	<0.1	<0.1	0.2	0.3	<0.1	<0.1	0.2	<0.1	11	<0.1	0.6	<0.1	<0.1
BENZENE UG/L	34030 GMS	10000	<1.0	3.9	<1.0	<1.0	3.2	<1.0	<1.0	<1.0	<1.0	<250	<1.0	<1.0	<1.0	<1.0
BROMODICHLOROMETHANE UG/L	32101 GMS	<2200	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<550	<2.2	<2.2	<2.2	<2.2
BROMOFORM UG/L	32104 GMS	<4700	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<1200	<4.7	<4.7	<4.7	<4.7
BROMOMETHANE UG/L	34413 GMS	<5800	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<1500	<5.8	<5.8	<5.8	<5.8
CARBON TETRACHLORIDE UG/L	32102 GMS	<2800	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<700	<2.8	<2.8	<2.8	<2.8
CHLOROBENZENE UG/L	34301 GMS	<6000	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<1500	<6.0	<6.0	<6.0	<6.0
CHLOROETHANE UG/L	34311 GMS	<8200	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<2100	<8.2	<8.2	<8.2	<8.2
2-CHLOROETHYLVINYL ETHER UG/L	34576 GMS	<15000	<15	<15	<15	<15	<15	<15	<15	<15	<15	<3800	<15	<15	<15	<15
CHLOROFORM UG/L	32106 GMS	<1600	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<400	<1.6	2.2	<1.6	<1.6
CHLOROMETHANE UG/L	34418 GMS	<4300	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<1100	<4.3	<4.3	<4.3	<4.3
DIBROMOCHLOROMETHANE UG/L	32105 GMS	<3100	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<780	<3.1	<3.1	<3.1	<3.1
1,1-DICHLOROETHANE UG/L	34496 GMS	<4700	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<1200	<4.7	<4.7	<4.7	<4.7
1,2-DICHLOROETHANE UG/L	34531 GMS	<2800	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<700	<2.8	<2.8	<2.8	<2.8
1,1-DICHLOROETHYLENE UG/L	34501 GMS	<2800	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<700	<2.8	<2.8	<2.8	<2.8
TRANS-1,2-DICHLORO ETHENE UG/L	34546 GMS	<1600	<1.6	<1.6	<1.6	<1.6	2.2	<1.6	<1.6	<1.6	<1.6	<400	<1.6	7.2	<1.6	<1.6
1,2-DICHLOROPROPANE UG/L	34541 GMS	<6000	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<1500	<6.0	<6.0	<6.0	<6.0
CIS-1,3-DICHLORO PROPENE UG/L	34704 GMS	<5000	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<1300	<5.0	<5.0	<5.0	<5.0
TRANS-1,3-DICHLORO PROPENE UG/L	34699 GMS	<6400	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<1600	<6.4	<6.4	<6.4	<6.4

PROJECT NUMBER 86447 0404 PROJECT NAME NAVY - LEJEUNE HP2
FIELD GROUP LJHP-2 LAB COORDINATOR J.D. SHAMIS

SAMPLE ID/#

PARAMETERS UNITS	STORET # METHOD	22GW1 LJHP-2 1	22GW2 LJHP-2 2	HPGW1 LJHP-2 3	HPGW2 LJHP-2 4	HPGW3 LJHP-2 5	HPGW4 LJHP-2 6	HPGW5 LJHP-2 7	HPGW6 LJHP-2 8	HPGW7 LJHP-2 9	HPGW8 LJHP-2 10	HPGW9 LJHP-2 11	HPGW10 LJHP-2 12	HPGW11 LJHP-2 13	HPGW12 LJHP-2 14	HPGW13 LJHP-2 15
DATE		03/08/87	03/08/87	03/08/87	03/08/87	03/08/87	03/08/87	03/08/87	03/08/87	03/09/87	03/09/87	03/09/87	03/09/87	03/09/87	03/09/87	03/09/87
TIME		11:03	11:30	12:45	16:18	14:20	15:12	16:55	17:10	10:05	11:10	10:30	11:20	12:19	12:33	13:45
ETHYLBENZENE UG/L	34371 GMS	<7200	<7.2	<7.2	<7.2	9.0	<7.2	<7.2	<7.2	<7.2	<7.2	<1800	<7.2	<7.2	<7.2	<7.2
METHYLENE CHLORIDE UG/L	34423 GMS	<2800	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<700	<2.8	<2.8	<2.8	<2.8
1,1,2,2-TETRACHLORO ETHANE UG/L	34516 GMS	<4100	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<1000	<4.1	<4.1	<4.1	<4.1
TETRACHLOROETHENE UG/L	34475 GMS	<2000	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<750	<3.0	<3.0	3.6	<3.0
TOLUENE UG/L	34010 GMS	18000	<6.0	12	<6.0	<6.0	8.2	<6.0	<6.0	<6.0	<6.0	<1500	<6.0	<6.0	<6.0	<6.0
1,1,1-TRICHL'ETHANE UG/L	34506 GMS	<3800	<3.8	<3.8	<3.8	13	<3.8	<3.8	<3.8	<3.8	<3.8	<950	<3.8	<3.8	<3.8	<3.8
1,1,2-TRICHL'ETHANE UG/L	34511 GMS	<5000	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<1300	<5.0	<5.0	<5.0	<5.0
TRICHLOROETHENE UG/L	39180 GMS	<1000	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	6100	8.6	34	<3.0	<3.0
TRICHLOROFLUORO-METHANE UG/L	34488 GMS	<3200	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	96	<800	<3.2	<3.2	<3.2	<3.2
VINYL CHLORIDE UG/L	39175 GMS	<1000	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<250	<1.0	<1.0	<1.0	<1.0
ACROLEIN UG/L	34210 GMS	<100000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<25000	<100	<100	<100	<100
ACRYLONITRILE UG/L	34215 GMS	<100000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<25000	<100	<100	<100	<100
DICHLORODIFLUORO-METHANE UG/L	34668 GMS	<10000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<2500	<10	<10	<10	<10
M-XYLENE UG/L	98553 GMS	<12000	<12	<12	<12	<12	<12	<12	<12	<12	<12	<3000	<12	<12	<12	<12
O-AND/OR-P XYLENE UG/L	98554 GMS	<12000	<12	<12	<12	<12	<12	<12	<12	<12	<12	<3000	<12	<12	<12	<12
METHYL ETHYL KETONE UG/L	81595 GMS	<48000	<48	<48	<48	<48	<48	<48	<48	<48	<48	<12000	<48	<48	<48	<48
METHYL ISOBUT'KETONE UG/L	81596 GMS	<12000	<12	<12	<12	<12	<12	<12	<12	<12	<12	<3000	<12	<12	<12	<12

PROJECT NUMBER 86447 0404 PROJECT NAME NAVY - LEJEUNE HP2
FIELD GROUP LJHP-2 LAB COORDINATOR J.D. SHAMIS

SAMPLE ID/#

PARAMETERS UNITS	STORET # METHOD	HPGW14 LJHP-2 16	HPGW15 LJHP-2 17	HPGW16 LJHP-2 18	HPGW17 LJHP-2 19	HPGW18 LJHP-2 20	HPGW19 LJHP-2 21	HPGW20 LJHP-2 22	HPGW21 LJHP-2 23	HPGW22 LJHP-2 24	HPGW23 LJHP-2 25	HPGW24 LJHP-2 26	HPGW25 LJHP-2 27	HPGW26 LJHP-2 28	HPGW29 LJHP-2 29
DATE		03/09/87	03/09/87	03/10/87	03/10/87	03/10/87	03/10/87	03/10/87	03/10/87	03/11/87	03/11/87	03/11/87	03/11/87	03/12/87	03/12/87
TIME		13:55	15:10	12:07	12:26	11:40	13:35	13:50	16:26	10:42	10:25	12:01	12:15	13:10	14:00
LEAD, TOTAL UG/L	1051 ICAP	<27.0	<27.0	41.0	<27.0	<27.0	<27.0	33.0	<27.0	<27.0	<27.0	<27.0	<27.0	<27.0	52.0
OIL&GR, IR MG/L	560 I	<0.1	<0.1	3	3	2	2	3	2	2	3	2	0.3	2	<0.1
BENZENE UG/L	34030 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<100	<100	<1.0	<1.0	<1.0
BROMODICHLOROMETHANE UG/L	32101 GMS	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<220	<220	<2.2	<2.2	<2.2
BROMOFORM UG/L	32104 GMS	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<470	<470	<4.7	<4.7	<4.7
BROMOMETHANE UG/L	34413 GMS	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<580	<580	<5.8	<5.8	<5.8
CARBON TETRACHLORIDE UG/L	32102 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<280	<280	<2.8	<2.8	<2.8
CHLOROBENZENE UG/L	34301 GMS	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<600	<600	<6.0	<6.0	<6.0
CHLOROETHANE UG/L	34311 GMS	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<820	<820	<8.2	<8.2	<8.2
2-CHLOROETHYLVINYL ETHER UG/L	34576 GMS	<15	<15	<15	<15	<15	<15	<26	<26	<26	<1500	<1500	<26	<26	<15
CHLOROFORM UG/L	32106 GMS	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<160	<160	<1.6	<1.6	<1.6
CHLOROMETHANE UG/L	34418 GMS	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<430	<430	<4.3	<4.3	<4.3
DIBROMOCHLOROMETHANE UG/L	32105 GMS	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<310	<310	<3.1	<3.1	<3.1
1,1-DICHLOROETHANE UG/L	34496 GMS	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<470	<470	<4.7	<4.7	<4.7
1,2-DICHLOROETHANE UG/L	34531 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<200	<280	<2.8	<2.8	<2.8
1,1-DICHLOROETHYLENE UG/L	34501 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<280	<280	<2.8	<2.8	<2.8
TRANS-1,2-DICHLORO ETHENE UG/L	34546 GMS	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	6100	4300	<1.6	<1.6	<1.6
1,2-DICHLOROPROPANE UG/L	34541 GMS	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<600	<600	<6.0	<6.0	<6.0
CIS-1,3-DICHLORO PROPENE UG/L	34704 GMS	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<500	<500	<5.0	<5.0	<5.0
TRANS-1,3-DICHLORO PROPENE UG/L	34699 GMS	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<640	<640	<6.4	<6.4	<6.4

PROJECT NUMBER 86447 0404 PROJECT NAME NAVY - LEJEUNE HP2
FIELD GROUP LJHP-2 LAB COORDINATOR J.D. SHAMIS

SAMPLE ID/#

PARAMETERS UNITS	STORET # METHOD	HPGW14 LJHP-2 16	HPGW15 LJHP-2 17	HPGW16 LJHP-2 18	HPGW17 LJHP-2 19	HPGW18 LJHP-2 20	HPGW19 LJHP-2 21	HPGW20 LJHP-2 22	HPGW21 LJHP-2 23	HPGW22 LJHP-2 24	HPGW23 LJHP-2 25	HPGW24 LJHP-2 26	HPGW25 LJHP-2 27	HPGW26 LJHP-2 28	HPGW29 LJHP-2 29
DATE		03/09/87	03/09/87	03/10/87	03/10/87	03/10/87	03/10/87	03/10/87	03/10/87	03/11/87	03/11/87	03/11/87	03/11/87	03/12/87	03/12/87
TIME		13:55	15:10	12:07	12:26	11:40	13:35	13:50	16:26	10:42	10:25	12:01	12:15	13:10	14:00
ETHYLBENZENE UG/L	34371 GMS	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<720	<720	<7.2	<7.2	<7.2
METHYLENE CHLORIDE UG/L	34423 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	3.4	<2.8	<2.8	300	<280	2.9	6.5	<2.8
1,1,2,2-TETRACHLORO ETHANE UG/L	34516 GMS	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<410	<410	<4.1	<4.1	<4.1
TETRACHLOROETHENE UG/L	34475 GMS	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<200	<200	<3.0	<3.0	<3.0
TOLUENE UG/L	34010 GMS	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<600	<600	<6.0	<6.0	<6.0
1,1,1-TRICHL'ETHANE UG/L	34506 GMS	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<380	<380	<3.8	<3.8	<3.8
1,1,2-TRICHL'ETHANE UG/L	34511 GMS	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<500	<500	<5.0	<5.0	<5.0
TRICHLOROETHENE UG/L	39180 GMS	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<1.0	<1.0	<1.0	13000	<100	<1.0	<1.0	<3.0
TRICHLOROFLUORO- METHANE UG/L	34488 GMS	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<320	<320	<3.2	<3.2	<3.2
VINYL CHLORIDE UG/L	39175 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<100	<100	<1.0	<1.0	<1.0
ACROLEIN UG/L	34210 GMS	<100	<100	<100	<100	<100	<100	<100	<100	<100	<10000	<10000	<100	<100	<100
ACRYLONITRILE UG/L	34215 GMS	<100	<100	<100	<100	<100	<100	<100	<100	<100	<10000	<10000	<100	<100	<100
DICHLORODIFLUORO- METHANE UG/L	34668 GMS	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1000	<1000	<10	<10	<10
M-XYLENE UG/L	98553 GMS	<12	<12	<12	<12	<12	<12	<12	<12	<12	<1200	<1200	<12	<12	<12
O-AND/OR-P XYLENE UG/L	98554 GMS	<12	<12	<12	<12	<12	<12	<12	<12	<12	<1200	<1200	<12	<12	<12
METHYL ETHYL KETONE UG/L	81595 GMS	<48	<48	<48	<48	<48	<48	<48	<48	<48	<4800	<4800	<48	<48	<48
METHYL ISOBUT'KETONE UG/L	81596 GMS	<12	<12	<12	<12	<12	<12	<12	<12	<12	<1200	<1200	<12	<12	<12

MAY 1987
GROUNDWATER DATA
SHALLOW WELLS

PROJECT NUMBER 86447 0405 PROJECT NAME NAVY - LEJEUNE HP3
FIELD GROUP LJHP-3 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

SAMPLE ID/#

PARAMETERS UNITS	STORET # METHOD	22GW1 LJHP-3 1	22GW2 LJHP-3 2	HPGW1 LJHP-3 3	HPGW2 LJHP-3 4	HPGW3 LJHP-3 5	HPGW4 LJHP-3 6	HPGW5 LJHP-3 7	HPGW6 LJHP-3 8	HPGW7 LJHP-3 9	HPGW8 LJHP-3 10	HPGW9 LJHP-3 11	HPGW10 LJHP-3 12	HPGW11 LJHP-3 13	HPGW12 LJHP-3 14	HPGW13 LJHP-3 15
DATE		05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/28/87	05/28/87	05/28/87	05/28/87	05/28/87
TIME		11:20	10:58	12:45	14:30	11:59	13:30	14:55	15:47	16:05	16:45	08:07	09:22	09:59	10:25	11:29
LEAD,TOTAL UG/L	1051 ICAP	78.0	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	70.0	<49.2	<49.2	<49.2	<49.2
OIL&GR,IR MG/L	560 I	9	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	6	<0.2	<0.2	<0.2	<0.2
BENZENE UG/L	34030 GMS	13000	<1.0	<1.0	<1.0	<1.0	1.6	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<1.0	<1.0	<1.0
BROMODICHLOROMETHANE UG/L	32101 GMS	<2200	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<220	<2.2	<2.2	<2.2	<2.2
BROMOFORM UG/L	32104 GMS	<4700	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<470	<4.7	<4.7	<4.7	<4.7
BROMOMETHANE UG/L	34413 GMS	<5800	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<580	<5.8	<5.8	<5.8	<5.8
CARBON TETRACHLORIDE UG/L	32102 GMS	<2800	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<280	<2.8	<2.8	<2.8	<2.8
CHLOROBENZENE UG/L	34301 GMS	<6000	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<600	<6.0	<6.0	<6.0	<6.0
CHLOROETHANE UG/L	34311 GMS	<8200	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<820	<8.2	<8.2	<8.2	<8.2
2-CHLOROETHYLVINYL ETHER UG/L	34576 GMS	<15000	<26	<26	<26	<26	<26	<26	<26	<26	<26	<1500	<26	<26	<26	<26
CHLOROFORM UG/L	32106 GMS	<1600	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<160	<1.6	2.6	<1.6	<1.6
CHLOROMETHANE UG/L	34418 GMS	<4300	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<430	<4.3	<4.3	<4.3	<4.3
DIBROMOCHLOROMETHANE UG/L	32105 GMS	<3100	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<310	<3.1	<3.1	<3.1	<3.1
1,1-DICHLOROETHANE UG/L	34496 GMS	<4700	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<470	<4.7	<4.7	<4.7	<4.7
1,2-DICHLOROETHANE UG/L	34531 GMS	<2800	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<280	<2.8	<2.8	<2.8	<2.8
1,1-DICHLOROETHYLENE UG/L	34501 GMS	<2800	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<280	<2.8	<2.8	<2.8	<2.8
TRANS-1,2-DICHLOROETHENE UG/L	34546 GMS	<1600	<1.6	<1.6	<1.6	<1.6	4.4	<1.6	<1.6	<1.6	<1.6	2700	<1.6	6.0	<1.6	<1.6
1,2-DICHLOROPROPANE UG/L	34541 GMS	<6000	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<600	<6.0	<6.0	<6.0	<6.0
CIS-1,3-DICHLOROPROPENE UG/L	34704 GMS	<5000	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<500	<5.0	<5.0	<5.0	<5.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699 GMS	<6400	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<640	<6.4	<6.4	<6.4	<6.4

PROJECT NUMBER 86447 0405 PROJECT NAME NAVY - LEJEUNE HP3
FIELD GROUP LJHP-3 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS UNITS	STORET # METHOD	SAMPLE ID/#														
		22GW1 LJHP-3 1	22GW2 LJHP-3 2	HPGW1 LJHP-3 3	HPGW2 LJHP-3 4	HPGW3 LJHP-3 5	HPGW4 LJHP-3 6	HPGW5 LJHP-3 7	HPGW6 LJHP-3 8	HPGW7 LJHP-3 9	HPGW8 LJHP-3 10	HPGW9 LJHP-3 11	HPGW10 LJHP-3 12	HPGW11 LJHP-3 13	HPGW12 LJHP-3 14	HPGW13 LJHP-3 15
DATE		05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/27/87	05/28/87	05/28/87	05/28/87	05/28/87	05/28/87
TIME		11:20	10:58	12:45	14:30	11:59	13:30	14:55	15:47	16:05	16:45	08:07	09:22	09:59	10:25	11:29
ETHYLBENZENE UG/L	34371 GMS	<7200	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<720	<7.2	<7.2	<7.2	<7.2
METHYLENE CHLORIDE UG/L	34423 GMS	<50000	<50	<50	<50	<50	<50	<50	<50	<50	<50	<280	<50	<50	<50	<50
1,1,2,2-TETRACHLORO ETHANE UG/L	34516 GMS	<4100	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<410	<4.1	<4.1	<4.1	<4.1
TETRACHLOROETHENE UG/L	34475 GMS	<2000	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<200	<3.0	<3.0	<3.0	<3.0
TOLUENE UG/L	34010 GMS	24000	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<600	<6.0	<6.0	<6.0	<6.0
1,1,1-TRICHL'ETHANE UG/L	34506 GMS	<3800	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<380	<3.8	<3.8	<3.8	<3.8
1,1,2-TRICHL'ETHANE UG/L	34511 GMS	<5000	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<500	<5.0	<5.0	<5.0	<5.0
TRICHLOROETHENE UG/L	39180 GMS	<1000	<1.0	<1.0	<1.0	<1.0	7.7	<1.0	<1.0	<1.0	<1.0	<100	<1.0	24	<1.0	<1.0
TRICHLOROFLUORO- METHANE UG/L	34488 GMS	<3200	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<320	<3.2	<3.2	<3.2	<3.2
VINYL CHLORIDE UG/L	39175 GMS	<1000	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<1.0	<1.0	<1.0
ACROLEIN UG/L	34210 GMS	<100000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<10000	<100	<100	<100	<100
ACRYLONITRILE UG/L	34215 GMS	<100000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<10000	<100	<100	<100	<100
DICHLORODIFLUORO- METHANE UG/L	34668 GMS	<10000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1000	<10	<10	<10	<10
M-XYLENE UG/L	98553 GMS	<12000	<12	<12	<12	<12	<12	<12	<12	<12	<12	2000	<12	<12	<12	<12
O-AND/OR-P XYLENE UG/L	98554 GMS	<12000	<12	<12	<12	<12	<12	<12	<12	<12	<12	2000	<12	<12	<12	<12
METHYL ETHYL KETONE UG/L	81595 GMS	<48000	<48	<48	<48	<48	<48	<48	<48	<48	<48	<4800	<48	<48	<48	<48
METHYL ISOBUT'KETONE UG/L	81596 GMS	<12000	<12	<12	<12	<12	<12	<12	<12	<12	<12	<1200	<12	<12	<12	<12

PROJECT NUMBER 86447 0405
FIELD GROUP LJHP-3

PROJECT NAME NAVY - LEJEUNE HP3
PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

		SAMPLE ID/#													
PARAMETERS UNITS	STORET # METHOD	HPGW14 LJHP-3 16	HPGW15 LJHP-3 17	HPGW16 LJHP-3 18	HPGW17 LJHP-3 19	HPGW18 LJHP-3 20	HPGW19 LJHP-3 21	HPGW20 LJHP-3 22	HPGW21 LJHP-3 23	HPGW22 LJHP-3 24	HPGW23 LJHP-3 25	HPGW24 LJHP-3 26	HPGW25 LJHP-3 27	HPGW26 LJHP-3 28	HPGW29 LJHP-3 29
DATE		05/28/87	05/28/87	05/28/87	05/28/87	05/28/87	05/28/87	05/28/87	05/28/87	05/29/87	05/29/87	05/29/87	05/29/87	05/29/87	05/29/87
TIME		11:45	13:00	13:20	14:14	13:57	15:10	15:50	18:12	10:03	09:35	11:05	11:23	12:45	13:05
LEAD,TOTAL UG/L	1051 ICAP	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2	<49.2
OIL&GR,IR MG/L	560 1	<0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BENZENE UG/L	34030 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<100	<100	<1.0	<1.0	<1.0
BROMODICHLOROMETHANE UG/L	32101 GMS	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<220	<220	<2.2	<2.2	<2.2
BROMOFORM UG/L	32104 GMS	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<470	<470	<4.7	<4.7	<4.7
BROMOMETHANE UG/L	34413 GMS	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<5.8	<580	<580	<5.8	<5.8	<5.8
CARBON TETRACHLORIDE UG/L	32102 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<280	<280	<2.8	<2.8	<2.8
CHLOROBENZENE UG/L	34301 GMS	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<600	<600	<6.0	<6.0	<6.0
CHLOROETHANE UG/L	34311 GMS	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<820	<820	<8.2	<8.2	<8.2
2-CHLOROETHYLVINYL ETHER UG/L	34576 GMS	<26	<26	<26	<26	<26	<26	<26	<26	<26	<1500	<1500	<26	<26	<26
CHLOROFORM UG/L	32106 GMS	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<160	<160	<1.6	<1.6	<1.6
CHLOROMETHANE UG/L	34418 GMS	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	<430	<430	<4.3	<4.3	<4.3
DIBROMOCHLOROMETHANE UG/L	32105 GMS	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<310	<310	<3.1	<3.1	<3.1
1,1-DICHLOROETHANE UG/L	34496 GMS	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<470	<470	<4.7	<4.7	<4.7
1,2-DICHLOROETHANE UG/L	34531 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<280	<280	<2.8	<2.8	<2.8
1,1-DICHLOROETHYLENE UG/L	34501 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<280	<280	<2.8	<2.8	<2.8
TRANS-1,2-DICHLORO ETHENE UG/L	34546 GMS	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	7100	4000	<1.6	<1.6	<1.6
1,2-DICHLOROPROPANE UG/L	34541 GMS	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<600	<600	<6.0	<6.0	<6.0
CIS-1,3-DICHLORO PROPENE UG/L	34704 GMS	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<500	<500	<5.0	<5.0	<5.0
TRANS-1,3-DICHLORO PROPENE UG/L	34699 GMS	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<640	<640	<6.4	<6.4	<6.4

PROJECT NUMBER 86447 0405
FIELD GROUP LJHP-3

PROJECT NAME NAVY - LEJEUNE HP3
PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

SAMPLE ID/#

PARAMETERS UNITS	STORET # METHOD	HPGW14 LJHP-3 16	HPGW15 LJHP-3 17	HPGW16 LJHP-3 18	HPGW17 LJHP-3 19	HPGW18 LJHP-3 20	HPGW19 LJHP-3 21	HPGW20 LJHP-3 22	HPGW21 LJHP-3 23	HPGW22 LJHP-3 24	HPGW23 LJHP-3 25	HPGW24 LJHP-3 26	HPGW25 LJHP-3 27	HPGW26 LJHP-3 28	HPGW29 LJHP-3 29
DATE		05/28/87	05/28/87	05/28/87	05/28/87	05/28/87	05/28/87	05/28/87	05/28/87	05/29/87	05/29/87	05/29/87	05/29/87	05/29/87	05/29/87
TIME		11:45	13:00	13:20	14:14	13:57	15:10	15:50	18:12	10:03	09:35	11:05	11:23	12:45	13:05
ETHYLBENZENE UG/L	34371 GMS	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<7.2	<720	<720	<7.2	<7.2	<7.2
METHYLENE CHLORIDE UG/L	34423 GMS	<50	<50	<50	<50	<50	<50	<50	<50	<50	<5000	<5000	<50	<50	<50
1,1,2,2-TETRACHLOROETHANE UG/L	34516 GMS	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<410	<410	<4.1	<4.1	<4.1
TETRACHLOROETHENE UG/L	34475 GMS	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<200	<200	<3.0	<3.0	<3.0
TOLUENE UG/L	34010 GMS	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<600	<600	<6.0	<6.0	<6.0
1,1,1-TRICHL'ETHANE UG/L	34506 GMS	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<380	<380	<3.8	<3.8	<3.8
1,1,2-TRICHL'ETHANE UG/L	34511 GMS	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<500	<500	<5.0	<5.0	<5.0
TRICHLOROETHENE UG/L	39180 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4300	<100	<1.0	<1.0	<1.0
TRICHLOROFLUOROMETHANE UG/L	34488 GMS	<3.2	7.1	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<320	<320	<3.2	<3.2	<3.2
VINYL CHLORIDE UG/L	39175 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<100	250	<1.0	<1.0	<1.0
ACROLEIN UG/L	34210 GMS	<100	<100	<100	<100	<100	<100	<100	<100	<100	<10000	<10000	<100	<100	<100
ACRYLONITRILE UG/L	34215 GMS	<100	<100	<100	<100	<100	<100	<100	<100	<100	<10000	<10000	<100	<100	<100
DICHLORODIFLUOROMETHANE UG/L	34668 GMS	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1000	<1000	<10	<10	<10
M-XYLENE UG/L	98553 GMS	<12	<12	<12	<12	<12	<12	<12	<12	<12	<1200	<1200	<12	<12	<12
O-AND/OR-P XYLENE UG/L	98554 GMS	<12	<12	<12	<12	<12	<12	<12	<12	<12	<1200	<1200	<12	<12	<12
METHYL ETHYL KETONE UG/L	81595 GMS	<48	<48	<48	<48	<48	<48	<48	<48	<48	<4800	<4800	<48	<48	<48
METHYL ISOBUT'KETONE UG/L	81596 GMS	<12	<12	<12	<12	<12	<12	<12	<12	<12	<1200	<1200	<12	<12	<12

AUGUST 1987
GROUNDWATER DATA
INTERMEDIATE AND DEEP WELLS

APPENDIX B
ANALYTICAL DATA FROM THE SUPPLEMENTAL CHARACTERIZATION STUDY

SOIL DATA

CAMP LEJEUNE IA
VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-V1

		SB-1				SB-2		
		HPS01-1	HPS01-1D (HPSOO1)	HPS01-2	HPS01-3	HPS02-1	HPS02-2	HPS02-2D (HPSOO2)
COMPOUND	depth:	0-2′	0-2′	2-4′	4-6′	0-2′	2-4′	2-4′
Chloromethane		11U	11U	11U	11U	12U	11U	11U
Bromomethane		11U	11U	11U	11U	12U	11U	11U
Vinyl Chloride		11U	11U	11U	11U	12U	11U	11U
Chloroethane		11U	11U	11U	11U	12U	11U	11U
Methylene Chloride		1BJ	2BJ	1BJ	2BJ	2BJ	2BJ	2BJ
Acetone		8BJ	11U	9BJ	11U	18B	11U	11U
Carbon Disulfide		5U	6U	6U	5U	6U	6U	6U
1,1-Dichloroethene		5U	6U	6U	5U	6U	6U	6U
1,1-Dichloroethane		5U	6U	6U	5U	6U	6U	6U
1,2-Dichloroethene (total)		5U	6U	6U	5U	6U	6U	6U
Chloroform		5U	6U	6U	5U	6U	6U	6U
1,2-Dichloroethane		5U	6U	6U	5U	6U	6U	6U
2-Butanone		11U	11U	11U	11U	12U	11U	11U
1,1,1-Trichloroethane		5U	6U	6U	5U	6U	6U	6U
Carbon Tetrachloride		5U	6U	6U	5U	6U	6U	6U
Vinyl Acetate		11U	11U	11U	11U	12U	11U	11U
Bromodichloromethane		5U	6U	6U	5U	6U	6U	6U
1,2-Dichloropropane		5U	6U	6U	5U	6U	6U	6U
cis-1,3-Dichloropropene		5U	6U	6U	5U	6U	6U	6U
Trichloroethene		5U	6U	6U	5U	6U	6U	6U
Dibromochloromethane		5U	6U	6U	5U	6U	6U	6U
1,1,2-Trichloroethane		5U	6U	6U	5U	6U	6U	6U
Benzene		5U	6U	6U	5U	6U	6U	6U
trans-1,3-Dichloropropene		5U	6U	6U	5U	6U	6U	6U
Bromoform		5U	6U	6U	5U	6U	6U	6U
4-Methyl-2-Pentanone		11U	11U	11U	11U	12U	11U	11U
2-Hexanone		11U	11U	11U	11U	12U	11U	11U
Tetrachloroethene		5U	6U	6U	5U	6U	6U	6U
1,1,2,2-Tetrachloroethane		5U	6U	6U	5U	6U	6U	6U
Toluene		5U	6U	6U	5U	6U	6U	6U
Chlorobenzene		5U	6U	6U	5U	6U	6U	6U
Ethylbenzene		5U	6U	6U	5U	6U	6U	6U
Styrene		5U	6U	6U	5U	6U	6U	6U
Total Xylenes		5U	6U	6U	5U	6U	6U	6U

CAMP LEJEL HPIA
VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-V2

		SB-3		SB-4			
		HPSO3-1	HPSO3-1D (HPSOO-3)	HPSO4-1	HPSO4-2	HPSO4-2D (HPSOO-4)	HPSO4-3
COMPOUND	depth:	0-2'	0-2'	0-2'	2-4'	2-4'	4-6'
Chloromethane		11U	11U	7BJ	9BJ	12U	11U
Bromomethane		11U	11U	11U	12U	12U	11U
Vinyl Chloride		11U	11U	11U	12U	12U	11U
Chloroethane		11U	11U	11U	12U	12U	11U
Methylene Chloride		2BJ	2BJ	6U	6U	6U	6U
Acetone		11U	11U	5BJ	12U	77B	54B
Carbon Disulfide		5U	5U	6U	6U	6U	6U
1,1-Dichloroethene		5U	5U	6U	6U	6U	6U
1,1-Dichloroethane		5U	5U	6U	6U	6U	6U
1,2-Dichloroethene (total)		5U	5U	6U	6U	6U	6U
Chloroform		5U	5U	6U	6U	6U	6U
1,2-Dichloroethane		5U	5U	6U	6U	6U	6U
2-Butanone		11U	11U	11U	12U	12U	11U
1,1,1-Trichloroethane		5U	5U	6U	6U	6U	6U
Carbon Tetrachloride		5U	5U	6U	6U	6U	6U
Vinyl Acetate		11U	11U	11U	12U	12U	11U
Bromodichloromethane		5U	5U	6U	6U	6U	6U
1,2-Dichloropropane		5U	5U	6U	6U	6U	6U
cis-1,3-Dichloropropene		5U	5U	6U	6U	6U	6U
Trichloroethene		5U	5U	6U	4J	6U	6U
Dibromochloromethane		5U	5U	6U	6U	6U	6U
1,1,2-Trichloroethane		5U	5U	6U	6U	6U	6U
Benzene		5U	5U	6U	6U	6U	6U
trans-1,3-Dichloropropene		5U	5U	6U	6U	6U	6U
Bromoform		5U	5U	6U	6U	6U	6U
4-Methyl-2-Pentanone		11U	11U	11U	12U	12U	11U
2-Hexanone		11U	11U	11U	12U	12U	11U
Tetrachloroethene		5U	5U	6U	6U	6U	6U
1,1,2,2-Tetrachloroethane		5U	5U	6U	6U	6U	6U
Toluene		5U	5U	6U	6U	6U	6U
Chlorobenzene		5U	5U	6U	6U	6U	6U
Ethylbenzene		5U	5U	6U	6U	6U	6U
Styrene		5U	5U	6U	6U	6U	6U
Total Xylenes		5U	5U	6U	6U	6U	6U

CAMP LEJEL HPIA
VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-V3

		SB-5			SB-6		
		HPS05-1	HPS05-2	HPS05-3	HPS06-1	HPS06-2	HPS06-3
COMPOUND	depth:	0-2′	2-4′	4-6′	0-2′	2-4′	4-6′
Chloromethane		11U	12U	12U	11U	12U	12U
Bromomethane		11U	12U	12U	11U	12U	12U
Vinyl Chloride		11U	12U	12U	11U	12U	12U
Chloroethane		11U	12U	12U	11U	12U	12U
Methylene Chloride		6U	6U	6U	6U	6U	6U
Acetone		11U	12U	4BJ	21B	35	13B
Carbon Disulfide		6U	6U	6U	6U	6U	6U
1,1-Dichloroethene		6U	6U	6U	6U	6U	6U
1,1-Dichloroethane		6U	6U	6U	6U	6U	6U
1,2-Dichloroethene (total)		6U	55	120	6U	6U	6U
Chloroform		6U	6U	6U	6U	6U	6U
1,2-Dichloroethane		6U	6U	6U	6U	6U	6U
2-Butanone		11U	12U	12U	11U	12U	12U
1,1,1-Trichloroethane		6U	6U	6U	6U	6U	6U
Carbon Tetrachloride		6U	6U	6U	6U	6U	6U
Vinyl Acetate		11U	12U	12U	11U	12U	12U
Bromodichloromethane		6U	6U	6U	6U	6U	6U
1,2-Dichloropropane		6U	6U	6U	6U	6U	6U
cis-1,3-Dichloropropene		6U	6U	6U	6U	6U	6U
Trichloroethene		6U	6U	120	6U	6U	6U
Dibromochloromethane		6U	6U	6U	6U	6U	6U
1,1,2-Trichloroethane		6U	6U	6U	6U	6U	6U
Benzene		6U	6U	6U	6U	6U	6U
trans-1,3-Dichloropropene		6U	6U	6U	6U	6U	6U
Bromoform		6U	6U	6U	6U	6U	6U
4-Methyl-2-Pentanone		11U	12U	12U	11U	12U	12U
2-Hexanone		11U	12U	12U	11U	12U	12U
Tetrachloroethene		6U	6U	6U	6U	6U	6U
1,1,2,2-Tetrachloroethane		6U	6U	6U	6U	6U	6U
Toluene		6U	10	4J	6U	6U	6U
Chlorobenzene		6U	6U	6U	6U	6U	6U
Ethylbenzene		6U	6U	6U	6U	6U	6U
Styrene		6U	6U	6U	6U	6U	6U
Total Xylenes		6U	6U	6U	6U	6U	6U

PROJECT Camp Lejeune
PREPARED BY
DATE 5/9/91
CHECKED BY
DATE 5-15-91
COMMENTS

CAMP LEJEL HPIA
VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-V4

		SB-7			SB-8		
		HPS07-1	HPS07-2	HPS07-3	HPS08-1	HPS08-2	HPS08-3
COMPOUND	depth:	0-2'	2-4'	4-6'	0-2'	2-4'	4-6'
Chloromethane		11U	11U	12U	12U	11U	11U
Bromomethane		11U	11U	12U	12U	11U	11U
Vinyl Chloride		11U	11U	12U	12U	11U	11U
Chloroethane		11U	11U	12U	12U	11U	11U
Methylene Chloride		2BJ	4BJ	2BJ	2BJ	6U	2BJ
Acetone		27B	23B	15B	12U	11U	6J
Carbon Disulfide		6U	6U	6U	6U	6U	6U
1,1-Dichloroethene		6U	6U	6U	6U	6U	6U
1,1-Dichloroethane		6U	6U	6U	6U	6U	6U
1,2-Dichloroethene (total)		6U	6U	6U	6U	6U	6U
Chloroform		6U	6U	6U	6U	6U	6U
1,2-Dichloroethane		6U	6U	6U	6U	6U	6U
2-Butanone		11U	11U	12U	12U	11U	11U
1,1,1-Trichloroethane		6U	6U	6U	6U	6U	6U
Carbon Tetrachloride		6U	6U	6U	6U	6U	6U
Vinyl Acetate		11U	11U	12U	12U	11U	11U
Bromodichloromethane		6U	6U	6U	6U	6U	6U
1,2-Dichloropropane		6U	6U	6U	6U	6U	6U
cis-1,3-Dichloropropene		6U	6U	6U	6U	6U	6U
Trichloroethene		6U	6U	6U	6U	6U	6U
Dibromochloromethane		6U	6U	6U	6U	6U	6U
1,1,2-Trichloroethane		6U	6U	6U	6U	6U	6U
Benzene		6U	6U	6U	6U	6U	6U
trans-1,3-Dichloropropene		6U	6U	6U	6U	6U	6U
Bromoform		6U	6U	6U	6U	6U	6U
4-Methyl-2-Pentanone		11U	11U	12U	12U	11U	11U
2-Hexanone		11U	11U	12U	12U	11U	11U
Tetrachloroethene		6U	6U	6U	6U	6U	6U
1,1,2,2-Tetrachloroethane		6U	6U	6U	6U	6U	6U
Toluene		6U	6U	6U	6U	6U	6U
Chlorobenzene		6U	6U	6U	6U	6U	6U
Ethylbenzene		6U	6U	6U	6U	6U	6U
Styrene		6U	6U	6U	6U	6U	6U
Total Xylenes		6U	6U	6U	6U	6U	6U

See back.
E.K.
5/15/91

CAMP LEJEU HPIA
VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-V7

		SB-13			SB-14		
		HPSO13-1	HPSO13-2	HPSO13-3	HPSO14-1	HPSO14-2	HPSO14-3
COMPOUND	depth:	0-2′	6-8′	8-10′	2-4′	4-6′	8-10′
Chloromethane		11U	11U	12U	11U	11U	60U
Bromomethane		11U	11U	12U	11U	11U	60U
Vinyl Chloride		11U	11U	12U	11U	11U	60U
Chloroethane		11U	11U	12U	11U	11U	60U
Methylene Chloride		4BJ	2BJ	3BJ	3BJ	2BJ	10BJ
Acetone		8BJ	47B	16B	20B	21B	100B
Carbon Disulfide		6U	5U	6U	6U	6U	30U
1,1-Dichloroethene		6U	5U	6U	6U	6U	30U
1,1-Dichloroethane		6U	5U	6U	6U	6U	30U
1,2-Dichloroethene (total)		6U	5U	6U	6U	6U	30U
Chloroform		6U	5U	6U	6U	6U	30U
1,2-Dichloroethane		6U	5U	6U	6U	6U	30U
2-Butanone		11U	11U	12U	11U	11U	60U
1,1,1-Trichloroethane		6U	5U	6U	6U	6U	30U
Carbon Tetrachloride		6U	5U	6U	6U	6U	30U
Vinyl Acetate		11U	11U	12U	11U	11U	60U
Bromodichloromethane		6U	5U	6U	6U	6U	30U
1,2-Dichloropropane		6U	5U	6U	6U	6U	30U
cis-1,3-Dichloropropene		6U	5U	6U	6U	6U	30U
Trichloroethene		6U	5U	6U	6U	6U	30U
Dibromochloromethane		6U	5U	6U	6U	6U	30U
1,1,2-Trichloroethane		6U	5U	6U	6U	6U	30U
Benzene		6U	5U	6U	6U	6U	30U
trans-1,3-Dichloropropene		6U	5U	6U	6U	6U	30U
Bromoform		6U	5U	6U	6U	6U	30U
4-Methyl-2-Pentanone		11U	11U	12U	11U	11U	60U
2-Hexanone		11U	11U	12U	11U	11U	60U
Tetrachloroethene		6U	5U	6U	6U	6U	30U
1,1,2,2-Tetrachloroethane		6U	5U	6U	6U	6U	30U
Toluene		6U	5U	6U	6U	6U	30U
Chlorobenzene		1J	5U	6U	6U	6U	30U
Ethylbenzene		6U	5U	6U	6U	6U	62
Styrene		6U	5U	6U	6U	6U	30U
Total Xylenes		6U	5U	6U	1J	6U	580

PROJECT Camp Lejeune
5/9/91
5-15-91

CAMP LEJEUNE HPIA
VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-V8

		SB-15			SB-16		
		HPSO15-1	HPSO15-2	HPSO15-3	HPSO16-1	HPSO16-2	HPSO16-3
COMPOUND	depth:	0-2′	6-8′	8-10′	0-2′	6-8′	8-10′
Chloromethane		11U	11U	11U	11U	11U	12U
Bromomethane		11U	11U	11U	11U	11U	12U
Vinyl Chloride		11U	11U	11U	11U	11U	12U
Chloroethane		11U	11U	11U	11U	11U	12U
Methylene Chloride		3BJ	6U	6U	6U	6U	6U
Acetone		11U	11U	25B	23	15	43
Carbon Disulfide		6U	6U	6U	6U	6U	6U
1,1-Dichloroethene		6U	6U	6U	6U	6U	6U
1,1-Dichloroethane		6U	6U	6U	6U	6U	6U
1,2-Dichloroethene (total)		6U	6U	6U	6U	6U	6U
Chloroform		6U	6U	6U	6U	6U	6U
1,2-Dichloroethane		6U	6U	6U	6U	6U	6U
2-Butanone		11U	11U	11U	11U	11U	12U
1,1,1-Trichloroethane		6U	6U	6U	6U	6U	6U
Carbon Tetrachloride		6U	6U	6U	6U	6U	6U
Vinyl Acetate		11U	11U	11U	11U	11U	12U
Bromodichloromethane		6U	6U	6U	6U	6U	6U
1,2-Dichloropropane		6U	6U	6U	6U	6U	6U
cis-1,3-Dichloropropene		6U	6U	6U	6U	6U	6U
Trichloroethene		2J	6U	6U	2J	6U	3J
Dibromochloromethane		6U	6U	6U	6U	6U	6U
1,1,2-Trichloroethane		6U	6U	6U	6U	6U	6U
Benzene		6U	6U	6U	6U	6U	6U
trans-1,3-Dichloropropene		6U	6U	6U	6U	6U	6U
Bromoform		6U	6U	6U	6U	6U	6U
4-Methyl-2-Pentanone		11U	11U	11U	11U	11U	12U
2-Hexanone		11U	11U	11U	11U	11U	12U
Tetrachloroethene		6U	6U	6U	6U	6U	6U
1,1,2,2-Tetrachloroethane		6U	6U	6U	6U	6U	6U
Toluene		6U	6U	6U	6U	6U	6U
Chlorobenzene		6U	6U	6U	6U	6U	6U
Ethylbenzene		6U	6U	6U	6U	6U	6U
Styrene		6U	6U	6U	6U	6U	6U
Total Xylenes		6U	6U	6U	6U	6U	6U

PROJECT Camp Lejeune
PREPARED BY
DATE 5/9/91
CHECKED BY
DATE 5-15-91

CAMP LE - HPIA
VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-V9

	SB-17				SB-18		
	HPSO17-1	HPSO17-1D (HPSO06)	HPSO17-2	HPSO17-3	HPSO18-1	HPSO18-2	HPSO18-3
COMPOUND depth:	0-2′	0-2′	6-8′	8-10′	4-6′	6-8′	8-10′
Chloromethane	11U	11U	11U	12U	11U	11U	11U
Bromomethane	11U	11U	11U	12U	11U	11U	11U
Vinyl Chloride	11U	11U	11U	12U	11U	11U	11U
Chloroethane	11U	11U	11U	12U	11U	11U	11U
Methylene Chloride	6U	5U	5U	3BJ	6U	4BJ	6U
Acetone	12	11U	22	20	59	39	10J
Carbon Disulfide	6U	5U	5U	6U	6U	6U	6U
1,1-Dichloroethene	6U	5U	5U	6U	6U	6U	6U
1,1-Dichloroethane	6U	5U	5U	6U	6U	6U	6U
1,2-Dichloroethene (total)	6U	5U	5U	6U	6U	6U	6U
Chloroform	6U	5U	5U	6U	6U	6U	6U
1,2-Dichloroethane	6U	5U	5U	6U	6U	6U	6U
2-Butanone	11U	11U	11U	12U	11U	11U	11U
1,1,1-Trichloroethane	6U	5U	5U	6U	6U	6U	6U
Carbon Tetrachloride	6U	5U	5U	6U	6U	6U	6U
Vinyl Acetate	11U	11U	11U	12U	11U	11U	11U
Bromodichloromethane	6U	5U	5U	6U	6U	6U	6U
1,2-Dichloropropane	6U	5U	5U	6U	6U	6U	6U
cis-1,3-Dichloropropene	6U	5U	5U	6U	6U	6U	6U
Trichloroethene	6U	5U	5U	6U	6U	6U	6U
Dibromochloromethane	6U	5U	5U	6U	6U	6U	6U
1,1,2-Trichloroethane	6U	5U	5U	6U	6U	6U	6U
Benzene	6U	5U	5U	6U	6U	6U	6U
trans-1,3-Dichloropropene	6U	5U	5U	6U	6U	6U	6U
Bromoform	6U	5U	5U	6U	6U	6U	6U
4-Methyl-2-Pentanone	11U	11U	11U	12U	11U	11U	11U
2-Hexanone	11U	11U	11U	12U	11U	11U	11U
Tetrachloroethene	6U	5U	5U	6U	6U	6U	6U
1,1,2,2-Tetrachloroethane	6U	5U	5U	6U	6U	6U	6U
Toluene	6U	5U	5U	6U	6U	6U	6U
Chlorobenzene	6U	5U	5U	6U	6U	6U	6U
Ethylbenzene	6U	5U	5U	6U	6U	6U	6U
Styrene	6U	5U	5U	6U	6U	6U	6U
Total Xylenes	6U	5U	5U	6U	6U	6U	6U

CAMP LEJEUNE - HPIA
VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-V10

		SB-19			SB-20		
		HPSO19-1	HPSO19-2	HPSO19-3	HPSO20-1	HPSO20-2	HPSO20-3
COMPOUND	depth:	0-2'	2-4'	8-10'	0-2'	6-8'	8-10'
Chloromethane		16U	11U	12U	11U	11U	11U
Bromomethane		16U	11U	12U	11U	11U	11U
Vinyl Chloride		16U	11U	12U	11U	11U	11U
Chloroethane		16U	11U	12U	11U	11U	11U
Methylene Chloride		8U	6U	6U	6U	5U	6U
Acetone		15J	15	12U	19	14	13
Carbon Disulfide		8U	6U	6U	6U	5U	6U
1,1-Dichloroethene		8U	6U	6U	6U	5U	6U
1,1-Dichloroethane		8U	6U	6U	6U	5U	6U
1,2-Dichloroethene (total)		8U	6U	6U	6U	5U	6U
Chloroform		8U	6U	6U	6U	5U	6U
1,2-Dichloroethane		8U	6U	6U	6U	5U	6U
2-Butanone		16U	11U	12U	11U	11U	11U
1,1,1-Trichloroethane		8U	6U	6U	6U	5U	6U
Carbon Tetrachloride		8U	6U	6U	6U	5U	6U
Vinyl Acetate		16U	11U	12U	11U	11U	11U
Bromodichloromethane		8U	6U	6U	6U	5U	6U
1,2-Dichloropropane		8U	6U	6U	6U	5U	6U
cis-1,3-Dichloropropene		8U	6U	6U	6U	5U	6U
Trichloroethene		8U	6U	6U	6U	5U	6U
Dibromochloromethane		8U	6U	6U	6U	5U	6U
1,1,2-Trichloroethane		8U	6U	6U	6U	5U	6U
Benzene		8U	6U	6U	6U	5U	6U
trans-1,3-Dichloropropene		8U	6U	6U	6U	5U	6U
Bromoform		8U	6U	6U	6U	5U	6U
4-Methyl-2-Pentanone		16U	11U	12U	11U	11U	11U
2-Hexanone		16U	11U	12U	11U	11U	11U
Tetrachloroethene		8U	6U	6U	6U	5U	6U
1,1,2,2-Tetrachloroethane		8U	6U	6U	6U	5U	6U
Toluene		8U	6U	6U	6U	5U	6U
Chlorobenzene		8U	6U	6U	6U	5U	6U
Ethylbenzene		8U	6U	6U	6U	5U	6U
Styrene		8U	6U	6U	6U	5U	6U
Total Xylenes		8U	6U	6U	6U	5U	6U

PROJECT Camp Lejeune
PREPARED BY
DATE 5/9/91
CHECKED BY
DATE 5-15-91

CAMP LEJEL. - HPIA

VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES

Concentration in ug/kg

CHART = SOIL-V11

		SB-21			SB-22			
		HPSO21-1	HPSO21-2	HPSO21-3	HPSO22-1	HPSO22-1D (HPSOD-7)	HPSO22-2	HPSO22-3
COMPOUND	depth:	0-2′	2-4′	4-6′	0-2′	0-2′	2-4′	4-6′
Chloromethane		11U	11U	13U	11U	3J	11U	13U
Bromomethane		11U	11U	13U	11U	11U	11U	13U
Vinyl Chloride		11U	11U	13U	11U	11U	11U	13U
Chloroethane		11U	11U	13U	11U	11U	11U	13U
Methylene Chloride		2BJ	2BJ	2BJ	6U	6U	6U	6U
Acetone		5BJ	3BJ	17B	25	11J	26	31
Carbon Disulfide		6U	6U	6U	6U	6U	6U	6U
1,1-Dichloroethene		6U	6U	6U	6U	6U	6U	6U
1,1-Dichloroethane		6U	6U	6U	6U	6U	6U	6U
1,2-Dichloroethene (total)		6U	6U	6U	6U	6U	6U	6U
Chloroform		6U	6U	6U	6U	6U	6U	6U
1,2-Dichloroethane		6U	6U	6U	6U	6U	6U	6U
2-Butanone		11U	11U	13U	11U	11U	11U	13U
1,1,1-Trichloroethane		6U	6U	6U	6U	6U	6U	6U
Carbon Tetrachloride		6U	6U	6U	6U	6U	6U	6U
Vinyl Acetate		11U	11U	13U	11U	11U	11U	13U
Bromodichloromethane		6U	6U	6U	6U	6U	6U	6U
1,2-Dichloropropane		6U	6U	6U	6U	6U	6U	6U
cis-1,3-Dichloropropene		6U	6U	6U	6U	6U	6U	6U
Trichloroethene		6U	6U	6U	6U	6U	6U	6U
Dibromochloromethane		6U	6U	6U	6U	6U	6U	6U
1,1,2-Trichloroethane		6U	6U	6U	6U	6U	6U	6U
Benzene		6U	6U	6U	6U	6U	6U	6U
trans-1,3-Dichloropropene		6U	6U	6U	6U	6U	6U	6U
Bromoform		6U	6U	6U	6U	6U	6U	6U
4-Methyl-2-Pentanone		11U	11U	13U	11U	11U	11U	13U
2-Hexanone		11U	11U	13U	11U	11U	11U	13U
Tetrachloroethene		6U	6U	6U	6U	6U	6U	6U
1,1,2,2-Tetrachloroethane		6U	6U	6U	6U	6U	6U	6U
Toluene		6U	6U	6U	6U	6U	6U	6U
Chlorobenzene		6U	6U	6U	6U	6U	6U	6U
Ethylbenzene		6U	6U	6U	6U	6U	6U	6U
Styrene		6U	6U	6U	6U	6U	6U	6U
Total Xylenes		6U	6U	6U	6U	6U	6U	6U

CAMP LEJEU HPIA
VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-V12

		SB-23			SB-24			
		HPSO23-1	HPSO23-2	HPSO23-3	HPSO24-1	HPSO24-1D (HPSOD-9)	HPSO24-2	HPSO24-3
COMPOUND	depth:	0-2′	2-4′	4-6′	0-2′	0-2′	4-6′	6-8′
Chloromethane		11U	12U	11U	11U	11U	11U	11U
Bromomethane		11U	12U	11U	11U	11U	11U	11U
Vinyl Chloride		11U	12U	11U	11U	11U	11U	11U
Chloroethane		11U	12U	11U	11U	11U	11U	11U
Methylene Chloride		2BJ	6U	5U	4BJ	1J	6U	6U
Acetone		11U	12U	5J	20	38B	14	40
Carbon Disulfide		6U	6U	5U	5U	5U	6U	6U
1,1-Dichloroethene		6U	6U	5U	5U	5U	6U	6U
1,1-Dichloroethane		6U	6U	5U	5U	5U	6U	6U
1,2-Dichloroethene (total)		6U	6U	5U	5U	5U	6U	6U
Chloroform		6U	6U	5U	5U	5U	6U	6U
1,2-Dichloroethane		6U	6U	5U	5U	5U	6U	6U
2-Butanone		11U	12U	11U	11U	11U	11U	11U
1,1,1-Trichloroethane		6U	6U	5U	5U	5U	6U	6U
Carbon Tetrachloride		6U	6U	5U	5U	5U	6U	6U
Vinyl Acetate		11U	12U	11U	11U	11U	11U	11U
Bromodichloromethane		6U	6U	5U	5U	5U	6U	6U
1,2-Dichloropropane		6U	6U	5U	5U	5U	6U	6U
cis-1,3-Dichloropropene		6U	6U	5U	5U	5U	6U	6U
Trichloroethene		6U	6U	5U	5U	5U	6U	6U
Dibromochloromethane		6U	6U	5U	5U	5U	6U	6U
1,1,2-Trichloroethane		6U	6U	5U	5U	5U	6U	6U
Benzene		6U	6U	5U	5U	5U	6U	6U
trans-1,3-Dichloropropene		6U	6U	5U	5U	5U	6U	6U
Bromoform		6U	6U	5U	5U	5U	6U	6U
4-Methyl-2-Pentanone		11U	12U	11U	11U	11U	11U	11U
2-Hexanone		11U	12U	11U	11U	2J	11U	11U
Tetrachloroethene		6U	6U	5U	5U	5U	6U	6U
1,1,2,2-Tetrachloroethane		6U	6U	5U	5U	5U	6U	6U
Toluene		6U	6U	5U	5U	5U	6U	6U
Chlorobenzene		6U	6U	5U	5U	5U	6U	6U
Ethylbenzene		6U	6U	5U	5U	5U	6U	6U
Styrene		6U	6U	5U	5U	5U	6U	6U
Total Xylenes		6U	6U	5U	5U	5U	6U	6U

CAMP LEJEU HPIA
VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-V14

		SB-27			SB-28		
		HPS027-1	HPS027-2	HPS027-3	HPS028-1	HPS028-2	HPS028-3
COMPOUND	depth:	2-4′	4-6′	8-10′	0-2′	2-4′	8-10′
Chloromethane		11U	11U	12U	11U	11U	12U
Bromomethane		11U	11U	12U	11U	11U	12U
Vinyl Chloride		11U	11U	12U	11U	11U	12U
Chloroethane		11U	11U	12U	11U	11U	12U
Methylene Chloride		4BJ	15B	5BJ	5U	6U	6U
Acetone		11U	30B	50B	97	3BJ	8BJ
Carbon Disulfide		5U	5U	6U	5U	6U	6U
1,1-Dichloroethene		5U	5U	6U	5U	6U	6U
1,1-Dichloroethane		5U	5U	6U	5U	6U	6U
1,2-Dichloroethene (total)		5U	5U	6U	5U	6U	6U
Chloroform		5U	5U	6U	5U	6U	6U
1,2-Dichloroethane		5U	5U	6U	5U	6U	6U
2-Butanone		11U	11U	12U	11U	11U	12U
1,1,1-Trichloroethane		5U	5U	6U	5U	6U	6U
Carbon Tetrachloride		5U	5U	6U	5U	6U	6U
Vinyl Acetate		11U	11U	12U	11U	11U	12U
Bromodichloromethane		5U	5U	6U	5U	6U	6U
1,2-Dichloropropane		5U	5U	6U	5U	6U	6U
cis-1,3-Dichloropropene		5U	5U	6U	5U	6U	6U
Trichloroethene		5U	5U	6U	5U	6U	6U
Dibromochloromethane		5U	5U	6U	5U	6U	6U
1,1,2-Trichloroethane		5U	5U	6U	5U	6U	6U
Benzene		5U	5U	6U	5U	6U	6U
trans-1,3-Dichloropropene		5U	5U	6U	5U	6U	6U
Bromoform		5U	5U	6U	5U	6U	6U
4-Methyl-2-Pentanone		2J	11U	12U	11U	11U	12U
2-Hexanone		11U	11U	12U	11U	11U	12U
Tetrachloroethene		5U	5U	6U	5U	6U	6U
1,1,2,2-Tetrachloroethane		5U	5U	6U	5U	6U	6U
Toluene		5U	5U	6U	5U	6U	6U
Chlorobenzene		5U	5U	6U	5U	6U	6U
Ethylbenzene		5U	5U	6U	5U	6U	6U
Styrene		5U	5U	6U	5U	6U	6U
Total Xylenes		5U	5U	6U	5U	6U	6U

PROJECT Camp Lejeune
PREPARED BY E.C. [illegible]
DATE 5/9/91
CHECKED BY Judy [illegible]
DATE 5-15-91
COMMENTS

CAMP LEJEU HPIA

VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES

Concentration in ug/kg

CHART = SOIL-V15

	SB-29			SB-30		
	HPS029-1	HPS029-2	HPS029-3	HPS030-1	HPS030-2	HPS030-3
COMPOUND depth:	0-2′	2-4′	10-12′	0-2′	2-4′	10-12′
Chloromethane	11U	11U	11U	11U	11U	12U
Bromomethane	11U	11U	11U	11U	11U	12U
Vinyl Chloride	11U	11U	11U	11U	11U	12U
Chloroethane	11U	11U	11U	11U	11U	12U
Methylene Chloride	14B	2BJ	8B	2BJ	2BJ	1BJ
Acetone	6BJ	7BJ	6BJ	6BJ	7BJ	7BJ
Carbon Disulfide	5U	5U	5U	6U	6U	6U
1,1-Dichloroethene	5U	5U	5U	6U	6U	6U
1,1-Dichloroethane	5U	5U	5U	6U	6U	6U
1,2-Dichloroethene (total)	5U	5U	5U	6U	6U	6U
Chloroform	5U	5U	5U	6U	6U	6U
1,2-Dichloroethane	5U	5U	5U	6U	6U	6U
2-Butanone	11U	11U	11U	11U	11U	12U
1,1,1-Trichloroethane	5U	5U	5U	6U	6U	6U
Carbon Tetrachloride	5U	5U	5U	6U	6U	6U
Vinyl Acetate	11U	11U	11U	11U	11U	12U
Bromodichloromethane	5U	5U	5U	6U	6U	6U
1,2-Dichloropropane	5U	5U	5U	6U	6U	6U
cis-1,3-Dichloropropene	5U	5U	5U	6U	6U	6U
Trichloroethene	5U	5U	5U	6U	6U	6U
Dibromochloromethane	5U	5U	5U	6U	6U	6U
1,1,2-Trichloroethane	5U	5U	5U	6U	6U	6U
Benzene	5U	5U	5U	6U	6U	6U
trans-1,3-Dichloropropene	5U	5U	5U	6U	6U	6U
Bromoform	5U	5U	5U	6U	6U	6U
4-Methyl-2-Pentanone	11U	11U	11U	11U	11U	12U
2-Hexanone	11U	11U	11U	11U	11U	12U
Tetrachloroethene	5U	5U	5U	6U	6U	6U
1,1,2,2-Tetrachloroethane	5U	5U	5U	6U	6U	6U
Toluene	5U	5U	5U	6U	6U	6U
Chlorobenzene	5U	5U	5U	6U	6U	6U
Ethylbenzene	5U	5U	5U	6U	6U	6U
Styrene	5U	5U	5U	6U	6U	6U
Total Xylenes	5U	5U	5U	6U	6U	6U

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-S1A

		SB-1		SB-6	SB-10
		HPS01-1	HPS01-1D (HPSOD-1)	HPS06-1	HPS010-1
COMPOUND	depth:	0-2′	0-2′	0-2′	0-2′
Phenol		370U	370U	350U	380U
bis(2-Chloroethyl)ether		370U	370U	350U	380U
2-Chlorophenol		370U	370U	350U	380U
1,3-Dichlorobenzene		370U	370U	350U	380U
1,4-Dichlorobenzene		370U	370U	350U	380U
Benzyl Alcohol		370U	370U	350U	380U
1,2-Dichlorobenzene		370U	370U	350U	380U
2-Methylphenol		370U	370U	350U	380U
bis(2-Chloroisopropyl)ether		370U	370U	350U	380U
4-Methylphenol		370U	370U	350U	380U
N-Nitroso-di-n-propylamine		370U	370U	350U	380U
Hexachloroethane		370U	370U	350U	380U
Nitrobenzene		370U	370U	350U	380U
Isophorone		370U	370U	350U	380U
2-Nitrophenol		370U	370U	350U	380U
2,4-Dimethylphenol		370U	370U	350U	380U
Benzoic acid		1800U	1800U	1700U	1900U
bis(2-Chloroethoxy)methane		370U	370U	350U	380U
2,4-Dichlorophenol		370U	370U	350U	380U
1,2,4-Trichlorobenzene		370U	370U	350U	380U
Naphthalene		370U	370U	350U	380U
4-Chloroaniline		370U	370U	350U	380U
Hexachlorobutadiene		370U	370U	350U	380U
4-Chloro-3-methylphenol		370U	370U	350U	380U
2-Methylnaphthalene		370U	370U	350U	380U
Hexachlorocyclopentadiene		370U	370U	350U	380U
2,4,6-Trichlorophenol		370U	370U	350U	380U
2,4,5-Trichlorophenol		1800U	1800U	1700U	1900U
2-Chloronaphthalene		370U	370U	350U	380U
2-Nitroaniline		1800U	1800U	1700U	1900U
Dimethylphthalate		370U	370U	350U	380U
Acenaphthylene		370U	370U	350U	380U
2,6-Dinitrotoluene		370U	370U	350U	380U

PROJECT Camp Lejeune
PREPARED BY
DATE May 1991
CHECKED BY
DATE 5/21/91

CAM IEUNE - HPIA

SEMI-VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES

Concentration in ug/kg

CHART=SOIL-S1B

	SB-1		SB-6	SB-10
	HPS01-1	HPS01-1D (HPSOD-1)	HPS06-1	HPS010-1
COMPOUND depth:	0-2'	0-2'	0-2'	0-2'
3-Nitroaniline	1800U	1800U	1700U	1900U
Acenaphthene	370U	370U	42J	380U
2,4-Dinitrophenol	1800U	1800U	1700U	1900U
4-Nitrophenol	1800U	1800U	1700U	1900U
Dibenzofuran	370U	370U	350U	380U
2,4-Dinitrotoluene	370U	370U	350U	380U
Diethylphthalate	370U	370U	350U	380U
4-Chlorophenyl-phenylether	370U	370U	350U	380U
Fluorene	370U	370U	48J	380U
4-Nitroaniline	1800U	1800U	1700U	1900U
4,6-Dinitro-2-methylphenol	1800U	1800U	1700U	1900U
N-Nitrosodiphenylamine (1)	370U	370U	350U	380U
4-Bromophenyl-phenylether	370U	370U	350U	380U
Hexachlorobenzene	370U	370U	350U	380U
Pentachlorophenol	1800U	1800U	1700U	1900U
Phenanthrene	94J	290J	500	380U
Anthracene	370U	67J	180J	380U
Di-n-butylphthalate	370U	370U	350U	380U
Fluoranthene	100J	360J	690	380U
Pyrene	94J	320J	530	380U
Butylbenzylphthalate	370U	370U	350U	380U
3,3'-Dichlorobenzidine	740U	730U	710U	770U
Benzo(a)anthracene	41J	100J	280J	380U
Chrysene	44J	110J	260J	380U
bis(2-Ethylhexyl)phthalate	370U	370U	16J	380U
Di-n-octylphthalate	370U	370U	350U	380U
Benzo(b)fluoranthene	39J	59J	250J	380U
Benzo(k)fluoranthene	48JX	82JX	210J	380U
Benzo(a)pyrene	370U	65J	240J	380U
Indeno(1,2,3-cd)pyrene	370U	37J	130J	380U
Dibenz(a,h)anthracene	370U	370U	350U	380U
Benzo(g,h,i)perylene	370U	370U	110J	380U

(1) Cannot be separated from Diphenylamine

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-S2A

		SB-11	SB-15	SB-20
		HPS011-1	HPS015-1	HPS020-1
COMPOUND	depth:	0-2'	0-2'	0-2'
Phenol		350U	370U	370U
bis(2-Chloroethyl)ether		350U	370U	370U
2-Chlorophenol		350U	370U	370U
1,3-Dichlorobenzene		350U	370U	370U
1,4-Dichlorobenzene		350U	48J	47J
Benzyl Alcohol		350U	370U	370U
1,2-Dichlorobenzene		350U	370U	370U
2-Methylphenol		350U	370U	370U
bis(2-Chloroisopropyl)ether		350U	370U	370U
4-Methylphenol		350U	370U	370U
N-Nitroso-di-n-propylamine		350U	370U	370U
Hexachloroethane		350U	370U	370U
Nitrobenzene		350U	370U	370U
Isophorone		350U	370U	370U
2-Nitrophenol		350U	370U	370U
2,4-Dimethylphenol		350U	370U	370U
Benzoic acid		1700U	1800U	1800U
bis(2-Chloroethoxy)methane		350U	370U	370U
2,4-Dichlorophenol		350U	370U	370U
1,2,4-Trichlorobenzene		350U	370U	370U
Naphthalene		350U	370U	370U
4-Chloroaniline		350U	370U	370U
Hexachlorobutadiene		350U	370U	370U
4-Chloro-3-methylphenol		350U	370U	370U
2-Methylnaphthalene		350U	370U	370U
Hexachlorocyclopentadiene		350U	370U	370U
2,4,6-Trichlorophenol		350U	370U	370U
2,4,5-Trichlorophenol		1700U	1800U	1800U
2-Chloronaphthalene		350U	370U	370U
2-Nitroaniline		1700U	1800U	1800U
Dimethylphthalate		350U	370U	370U
Acenaphthylene		350U	370U	370U
2,6-Dinitrotoluene		350U	370U	370U

PROJECT Camp Lejeune
PREPARED BY Judy Greene
DATE May 1991
CHECKED BY
DATE 5/21/91

CAMP NE - HPIA

SEMI-VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES

Concentration in ug/kg

CHART=SOIL-S2B

		SB-11	SB-15	SB-20
		HPS011-1	HPS015-1	HPS020-1
COMPOUND	depth:	0-2'	0-2'	0-2'
3-Nitroaniline		1700U	1800U	1800U
Acenaphthene		72J	370U	370U
2,4-Dinitrophenol		1700U	1800U	1800U
4-Nitrophenol		1700U	1800U	1800U
Dibenzofuran		72J	370U	370U
2,4-Dinitrotoluene		350U	370U	370U
Diethylphthalate		350U	370U	370U
4-Chlorophenyl-phenylether		350U	370U	370U
Fluorene		63J	370U	370U
4-Nitroaniline		1700U	1800U	1800U
4,6-Dinitro-2-methylphenol		1700U	1800U	1800U
N-Nitrosodiphenylamine (1)		350U	370U	370U
4-Bromophenyl-phenylether		350U	370U	370U
Hexachlorobenzene		350U	370U	370U
Pentachlorophenol		1700U	1800U	1800U
Phenanthrene		210J	210J	370U
Anthracene		350U	43J	370U
Di-n-butylphthalate		350U	72J	370U
Fluoranthene		200J	370J	370U
Pyrene		120J	290J	370U
Butylbenzylphthalate		350U	370U	370U
3,3'-Dichlorobenzidine		690U	740U	740U
Benzo(a)anthracene		70J	140J	370U
Chrysene		95J	170J	370U
bis(2-Ethylhexyl)phthalate		350U	54J	370U
Di-n-octylphthalate		350U	370U	370U
Benzo(b)fluoranthene		120J	140J	370U
Benzo(k)fluoranthene		79J	150JX	370U
Benzo(a)pyrene		64J	140J	370U
Indeno(1,2,3-cd)pyrene		37J	82J	370U
Dibenz(a,h)anthracene		350U	370U	370U
Benzo(g,h,i)perylene		350U	72J	370U

(1) Cannot be separated from Diphenylamine

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-S3A

	SB-21	SB-30
	HPS021-1	HPS030-1
COMPOUND depth:	0-2'	0-2'
Phenol	370U	370U
bis(2-Chloroethyl)ether	370U	370U
2-Chlorophenol	370U	370U
1,3-Dichlorobenzene	370U	370U
1,4-Dichlorobenzene	370U	370U
Benzyl Alcohol	370U	370U
1,2-Dichlorobenzene	370U	370U
2-Methylphenol	370U	370U
bis(2-Chloroisopropyl)ether	370U	370U
4-Methylphenol	370U	370U
N-Nitroso-di-n-propylamine	370U	370U
Hexachloroethane	370U	370U
Nitrobenzene	370U	370U
Isophorone	370U	370U
2-Nitrophenol	370U	370U
2,4-Dimethylphenol	370U	370U
Benzoic acid	1800U	1800U
bis(2-Chloroethoxy)methane	370U	370U
2,4-Dichlorophenol	370U	370U
1,2,4-Trichlorobenzene	370U	370U
Naphthalene	370U	220J
4-Chloroaniline	370U	370U
Hexachlorobutadiene	370U	370U
4-Chloro-3-methylphenol	370U	370U
2-Methylnaphthalene	370U	300J
Hexachlorocyclopentadiene	370U	370U
2,4,6-Trichlorophenol	370U	370U
2,4,5-Trichlorophenol	1800U	1800U
2-Chloronaphthalene	370U	370U
2-Nitroaniline	1800U	1800U
Dimethylphthalate	370U	370U
Acenaphthylene	370U	370U
2,6-Dinitrotoluene	370U	370U

PROJECT Camp Lejeune
PREPARED BY Sally Gunza
DATE May 1991
CHECKED BY E. Kropfl
DATE 5/21/91
COMMENTS

CAMP LE[illegible] - HPIA

SEMI-VOLATILE ORGANIC COMPOUNDS IN SOIL SAMPLES

Concentration in ug/kg

CHART=SOIL-S3B

	SB-21	SB-30
	HPS021-1	HPS030-1
COMPOUND depth:	0-2'	0-2'
3-Nitroaniline	1800U	1800U
Acenaphthene	370U	370U
2,4-Dinitrophenol	1800U	1800U
4-Nitrophenol	1800U	1800U
Dibenzofuran	370U	51J
2,4-Dinitrotoluene	370U	370U
Diethylphthalate	370U	370U
4-Chlorophenyl-phenylether	370U	370U
Fluorene	370U	370U
4-Nitroaniline	1800U	1800U
4,6-Dinitro-2-methylphenol	1800U	1800U
N-Nitrosodiphenylamine (1)	370U	370U
4-Bromophenyl-phenylether	370U	370U
Hexachlorobenzene	370U	370U
Pentachlorophenol	1800U	1800U
Phenanthrene	370U	110J
Anthracene	370U	370U
Di-n-butylphthalate	370U	370U
Fluoranthene	370U	370U
Pyrene	370U	370U
Butylbenzylphthalate	370U	370U
3,3'-Dichlorobenzidine	730U	740U
Benzo(a)anthracene	370U	370U
Chrysene	370U	370U
bis(2-Ethylhexyl)phthalate	370U	370U
Di-n-octylphthalate	370U	370U
Benzo(b)fluoranthene	370U	370U
Benzo(k)fluoranthene	370U	370U
Benzo(a)pyrene	370U	370U
Indeno(1,2,3-cd)pyrene	370U	370U
Dibenz(a,h)anthracene	370U	370U
Benzo(g,h,i)perylene	370U	370U

(1) Cannot be separated from Diphenylamine

CAMP LEJEUNE - HPIA
INORGANICS IN SOIL SAMPLES
Concentration in mg/kg

CHART = SOIL-11

METAL/COMPOUND		SB-1		SB-6	SB-10
		HPS01-1	HPS01-1D (HPSOD-1)	HPS06-1	HPS010-1
	depth:	0-2'	0-2'	0-2'	0-2'
Aluminum		3590.00	4140.00	3400.00	3920.00
Antimony		5.40UN	5.90BN	7.40BN	9.60BN
Arsenic		0.55B	0.50B	0.66B	0.57B
Barium		6.00B	6.10B	6.00B	19.60B
Beryllium		0.20U	0.16U	0.17U	0.19U
Cadmium		0.80B	0.47U	1.70	0.94
Calcium		1450.00	1660.00	4410.00	1830.00
Chromium		5.00	5.00	4.10	11.80
Cobalt		1.40B	0.93B	1.40B	1.70B
Copper		1.40B	1.10B	1.00B	4.90
Iron		1790.00E	2030.00E	1790.00E	2020.00E
Lead		2.40N*	3.70N*S	3.20N*	56.90N*S
Magnesium		128.00B	116.00B	134.00B	121.00B
Manganese		3.80	2.50	2.90	7.70
Mercury		0.11U	0.09U	0.10U	0.09U
Nickel		2.60B	1.70B	1.70B	2.80B
Potassium		124.00B	127.00B	113.00B	155.00B
Selenium		0.16U	0.21BW	0.39BW	0.45B
Silver		0.80U	0.62U	0.69U	1.10B
Sodium		120.00B	297.00B	92.20B	121.00B
Thallium		0.16UW	0.17UW	0.18UW	0.19UW
Vanadium		5.20B	6.10B	4.60B	5.30B
Zinc		0.80B	1.40B	1.20B	32.30
Cyanide		0.69U	0.69U	0.70U	0.70U

PROJECT Camp Lejeune
PREPARED BY
DATE May 1991
CHECKED BY
DATE 5/16/91

CAMP LEJEUNE - HPIA
INORGANICS IN SOIL SAMPLES
Concentration in mg/kg

CHART = SOIL-12

		SB-11	SB-15	SB-20
		HPS011-1	HPS015-1	HPS020-1
METAL/COMPOUND	depth:	0-2′	0-2′	0-2′
Aluminum		1740.00	2180.00	4.10U
Antimony		6.50BN	5.40BN	5.70BN
Arsenic		0.38U	1.40B	0.43U
Barium		13.20B	13.20B	0.39U
Beryllium		0.20U	0.17U	0.20U
Cadmium		3.00	1.20	0.59U
Calcium		19700.00	62700.00	19.60U
Chromium		8.30	9.40	0.59B
Cobalt		2.60B	1.60B	1.20B
Copper		2.00B	8.90	0.39B
Iron		5090.00E	2050.00E	1.80UE
Lead		3.60N*S	84.80N*S	2.30N*
Magnesium		1100.00	1210.00	26.70U
Manganese		155.00	16.00	0.20U
Mercury		0.09U	0.11U	0.09U
Nickel		2.80B	2.40B	2.20B
Potassium		1190.00	125.00B	167.00B
Selenium		0.19U	0.21B	0.21U
Silver		0.79U	0.70U	0.98B
Sodium		242.00B	206.00B	68.00B
Thallium		0.19U	0.18UW	0.21U
Vanadium		2.60B	5.90B	0.59U
Zinc		19.10	61.20	2.50B
Cyanide		0.31U	0.79U	0.70U

PROJECT Camp Lejeune
PREPARED BY
DATE May 1991
CHECKED BY
DATE 5/16/91
COMMENTS

CAMP LEJEUNE - HPIA
INORGANICS IN SOIL SAMPLES
Concentration in mg/kg

CHART = SOIL-13

METAL/COMPOUND	depth:	SB-21 HPS021-1 0-2'	SB-30 HPS030-1 0-2'
Aluminum		5620.00	3710.00
Antimony		7.50BN	6.30BN
Arsenic		0.53B	0.34U
Barium		11.00B	12.40B
Beryllium		0.17U	0.16U
Cadmium		1.00	1.30
Calcium		7480.00	3360.00
Chromium		7.20	8.90
Cobalt		1.00U	1.10B
Copper		3.30B	11.80
Iron		2840.00E	4320.00E
Lead		36.60N*+	5.40N*
Magnesium		295.00B	163.00B
Manganese		5.70	37.90
Mercury		0.11U	0.11U
Nickel		2.60B	5.80B
Potassium		145.00B	134.00B
Selenium		0.15U	0.24B
Silver		0.69U	0.65U
Sodium		103.00B	122.00B
Thallium		0.15U	0.17UW
Vanadium		7.40B	4.80B
Zinc		8.70	8.60
Cyanide		0.73U	0.70U

PROJECT Camp Lejeune
PREPARED BY
DATE May 1, 91
CHECKED BY
DATE 5/16/91
COMMENTS

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T1

		SB-1		SB-2			SB-3	
		HPS01-2	HPS01-3	HPS02-1	HPS02-2	HPS02-2D (HPS00-2)	HPS03-1	HPS03-1D (HPS00-3)
TCLP METALS	depth:	2-4′	4-6′	0-2′	2-4′	2-4′	0-2′	0-2′
Arsenic		112.00B	785.00B	100.00B	75.00B	112.00B	75.00B	92.00B
Barium		334.00	201.00	153.00B	255.00	584.00	382.00	244.00
Cadmium		5.00B	3.00U	6.00B	4.00B	3.00B	27.00	15.00
Chromium		5.00B	6.00B	5.00B	3.00B	6.00B	5.00B	4.00B
Lead		56.00B	56.00B	41.00B	69.00B	54.00B	79.00B	47.00B
Mercury		0.20U	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U
Selenium		121.00BN	530.00BN	65.00BN	110.00BN	63.00UN	76.00BN	100.00BN
Silver		4.00U	4.00U	4.00U	4.00U	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY
DATE 5/91
CHECKED BY
DATE 5-21-91

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T2

	SB-4				SB-5		
	HPS04-1	HPS04-2	HPS04-2D (HPS00-4)	HPS04-3	HPS05-1	HPS05-2	HPS05-3
TCLP METALS depth:	0-2'	2-4'	2-4'	4-6'	0-2'	2-4'	4-6'
Arsenic	161.00B	111.00B	101.00B	95.00B	86.00B	122.00B	120.00B
Barium	306.00	188.00B	166.00B	240.00	210.00	277.00	231.00
Cadmium	10.00	3.00B	3.00B	3.00U	3.00B	3.00U	3.00U
Chromium	7.00B	5.00B	4.00B	4.00B	5.00B	6.00B	4.00B
Lead	57.00B	53.00B	50.00B	70.00B	65.00B	53.00B	48.00B
Mercury	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U
Selenium	75.00BN	89.00BN	168.00BN	130.00BN	63.00UN	63.00UN	113.00BN
Silver	4.00U	4.00U	4.00U	4.00U	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY Ed Knapl
DATE 5/91
CHECKED BY Judy Guma
DATE 5-22-91

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T3

		SB-6		SB-7		
		HPS06-2	HPS06-3	HPS07-1	HPS07-2	HPS07-3
TCLP METALS	depth:	2-4'	4-6'	0-2'	2-4'	4-6'
Arsenic		128.00B	40.00U	90.00B	48.00B	109.00B
Barium		191.00B	207.00	191.00B	158.00B	186.00B
Cadmium		3.00B	7.00B	8.00B	3.00U	9.00B
Chromium		3.00B	5.00B	3.00B	3.00B	4.00B
Lead		47.00B	45.00B	44.00B	45.00B	44.00B
Mercury		0.20U	0.20U	0.20U	0.20U	0.20U
Selenium		63.00UN	63.00UN	147.00BN	75.00BN	63.00UN
Silver		4.00U	5.00B	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY Ed Knysol
DATE 5/91
CHECKED BY Judy Guma
DATE 5-20-91

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T4

		SB-8			SB-9			SB-10	
		HPS08-1	HPS08-2	HPS08-3	HPS09-1	HPS09-2	HPS09-3	HPS010-2	HPS010-3
TCLP METALS	depth:	0-2′	2-4′	4-6′	0-2′	2-4′	4-6′	2-4′	4-6′
Arsenic		78.00B	40.00U	54.00B	58.00B	62.00B	58.00B	90.00B	49.00B
Barium		257.00	218.00E	164.00BE	542.00E	182.00BE	185.00BE	173.00BE	149.00BE
Cadmium		4.00B	3.00B	3.00B	12.00	3.00U	3.00B	3.00U	3.00U
Chromium		3.00B	4.00B	3.00U	5.00B	4.00B	4.00B	5.00B	3.00B
Lead		42.00B	27.00U	39.00B	57.00B	47.00B	30.00B	45.00B	63.00B
Mercury		0.20U	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U
Selenium		100.00BN	102.00B	73.00B	68.00B	67.00B	94.00B	70.00B	75.00B
Silver		4.00U	4.00U	4.00U	4.00U	4.00U	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY
DATE 5/91
CHECKED BY
DATE 5-21-91

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T5

		SB-11			SB-12		
		HPSO11-2	HPSO11-3	HPSO11-3D (HPSOD-5)	HPSO12-1	HPSO12-2	HPSO12-3
TCLP METALS	depth:	2-4′	4-6′	4-6′	0-2′	2-4′	8-10′
Arsenic		55.00B	81.00B	63.00B	47.00B*	50.00B*	64.00B*
Barium		268.00E	199.00BE	299.00E	210.00E	206.00E	181.00BE
Cadmium		4.00B	4.00B	3.00U	3.00U	3.00U	3.00U
Chromium		3.00B	7.00B	6.00B	9.00B	9.00B	10.00B
Lead		70.00B	45.00B	30.00B	48.00B	34.00B	27.00B
Mercury		0.20U	0.20U	1.00	0.20U	0.20U	0.20U
Selenium		63.00U	63.00U	63.00U	102.00B	66.00B	87.00B
Silver		4.00U	4.00U	4.00U	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY Judy Guna
DATE May 1991
CHECKED BY
DATE 5/21/91
COMMENTS

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T6

	SB-13			SB-14			SB-15	
	HPSO13-1	HPSO13-2	HPSO13-3	HPSO14-1	HPSO14-2	HPSO14-3	HPSO15-2	HPSO15-3
TCLP METALS	0-2′	6-8′	8-10′	2-4′	4-6′	8-10′	6-8′	8-10′
Arsenic	70.00B	64.00B	62.00B	49.00B	62.00B	40.00U	59.00B	72.00B
Barium	213.00	162.00B	356.00	183.00B	213.00	246.00	178.00BE	128.00BE
Cadmium	3.00B	3.00B	3.00B	5.00B	3.00B	6.00B	3.00B	5.00B
Chromium	3.00B	9.00B	7.00B	6.00B	7.00B	4.00B	6.00B	4.00B
Lead	27.00U	27.00U	27.00U	40.00B	46.00B	27.00U	48.00B	41.00B
Mercury	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U
Selenium	74.00B	63.00U	63.00U	63.00U	83.00B	69.00B	82.00B	65.00B
Silver	4.00U	4.00B	4.00U	4.00U	4.00U	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY Ed Knyzl
DATE 5/91
Judy Guerma
5-20-91

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T7

		SB-16			SB-17			
		HPS016-1	HPS016-2	HPS016-3	HPS017-1	HPS017-1D (HPSOD-6)	HPS017-2	HPS017-3
TCLP METALS	depth:	0-2′	6-8′	8-10′	0-2′	0-2′	6-8′	8-10′
Arsenic		70.00B	51.00B	61.00B	117.00B	102.00B	66.00B	58.00B
Barium		148.00B	179.00B	161.00B	331.00	363.00	165.00B	167.00B
Cadmium		5.00B	3.00U	3.00U	4.00B	6.00B	4.00B	5.00B
Chromium		4.00B	6.00B	6.00B	7.00B	6.00B	6.00B	6.00B
Lead		32.00B	27.00U	31.00B	57.00B	80.00B	27.00U	31.00B
Mercury		0.20U	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U
Selenium		70.00B	82.00B	63.00U	63.00U	84.00B	81.00B	63.00U
Silver		4.00U	4.00U	4.00B	4.00U	4.00B	4.00U	4.00U

PROJECT Camp Lejeune

PREPARED BY Judy Guma

DATE May 1991

CHECKED BY El Knyfel

DATE 5/21/91

COMMENTS

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T8

		SB-18			SB-19			SB-20	
		HPSO18-1	HPSO18-2	HPSO18-3	HPSO19-1	HPSO19-2	HPSO19-3	HPSO20-2	HPSO20-3
TCLP METALS	depth:	4-6'	6-8'	8-10'	0-2'	2-4'	8-10'	6-8'	8-10'
Arsenic		79.00B	81.00B	100.00B	80.00B	90.00B	75.00B	40.00U	40.00U
Barium		174.00B	152.00B	163.00B	245.00	178.00B	179.00B	110.00BE	121.00BE
Cadmium		5.00B	4.00B	4.00B	3.00B	3.00B	5.00B	3.00U	3.00B
Chromium		6.00B	5.00B	5.00B	6.00B	10.00B	3.00B	4.00B	3.00B
Lead		27.00U	45.00B	34.00B	47.00B	41.00B	34.00B	27.00U	27.00U
Mercury		0.20U	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U
Selenium		87.00B	74.00B	63.00U	63.00U	114.00B	63.00U	63.00U	63.00U
Silver		4.00U	4.00U	4.00U	5.00B	4.00U	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY Judy Gurna
DATE May 1991
CHECKED BY Ed Knopf
DATE 5/21/91
COMMENTS

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T9

	SB-21		SB-22			
	HPSO21-2	HPSO21-3	HPSO22-1	HPSO22-1D (HPSOD-7)	HPSO22-2	HPSO22-3
TCLP METALS depth:	2-4	4-6′	0-2′	0-2′	2-4′	4-6′
Arsenic	51.00B	74.00B	58.00B	111.00B	137.00B	40.00U
Barium	110.00BE	140.00BE	320.00NE	247.00NE	298.00NE	335.00NE
Cadmium	4.00B	3.00B	3.00U	3.00U	3.00U	3.00U
Chromium	3.00U	4.00B	4.00B	3.00U	6.00B	4.00B
Lead	42.00B	50.00B	45.00B	46.00B	49.00B	49.00B
Mercury	0.20U	0.70B	0.20U	0.20U	0.20U	0.20U
Selenium	63.00U	86.00B	63.00U	63.00U	63.00U	63.00U
Silver	4.00U	4.00U	4.00U	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY
DATE 5/91
CHECKED BY
DATE 5-21-91

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T10

		SB-23			SB-24			
		HPSO23-1	HPSO23-2	HPSO23-3	HPSO24-1	HPSO24-1D (HPSOO-9)	HPSO24-2	HPSO24-3
TCLP METALS	depth:	0-2′	2-4′	4-6′	0-2′	0-2′	4-6′	6-8′
Arsenic		160.00B*	142.00B*	73.00B*	92.00B*	554.00*	40.00U	42.00B
Barium		297.00E	236.00E	146.00BE	137.00BE	136.00BE	232.00NE	223.00NE
Cadmium		16.00	3.00B	4.00B	3.00B	3.00B	3.00B	3.00B
Chromium		13.00B	10.00B	8.00B	10.00B	7.00B	5.00B	4.00B
Lead		207.00	76.00B	33.00B	27.00U	37.00B	34.00B	55.00B
Mercury		0.20U	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U
Selenium		106.00B	79.00B	133.00B	100.00B	96.00B	63.00U	63.00U
Silver		4.00U	4.00U	4.00U	4.00U	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY Judy Glenna
DATE May 1991
CHECKED BY Ed Knopf
DATE 5/21/91

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T11

		SB-25			SB-26			
		HPS025-1	HPS025-2	HPS025-3	HPS026-1	HPS026-1D (HPS00-8)	HPS026-2	HPS026-3
TCLP METALS	depth:	0-2′	2-4′	6-8′	0-2′	0-2′	6-8′	8-10′
Arsenic		40.00U*	85.00B*	114.00B*	40.00U	56.00B	68.00B	80.00B
Barium		162.00BE	187.00BE	200.00E	596.00NE	609.00NE	176.00BNE	201.00NE
Cadmium		3.00U	3.00U	3.00U	3.00U	3.00U	3.00U	3.00B
Chromium		8.00B	9.00B	10.00B	5.00B	3.00B	6.00B	4.00B
Lead		39.00B	27.00B	29.00B	38.00B	47.00B	28.00B	57.00B
Mercury		0.20U	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U
Selenium		67.00B	63.00U	141.00B	63.00U	63.00U	63.00U	63.00U
Silver		4.00U	4.00U	4.00U	4.00U	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY El Knysel
DATE 5/91
CHECKED BY Judy Guma
5-21-91

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T12

		SB-27			SB-28		
		HPS027-1	HPS027-2	HPS027-3	HPS028-1	HPS028-2	HPS028-3
TCLP METALS	depth:	2-4′	4-6′	8-10′	0-2′	2-4′	8-10′
Arsenic		50.00B*	90.00B*	46.00B*	64.00B*	40.00U*	102.00B*
Barium		174.00BE	143.00BE	196.00BE	146.00BE	184.00BE	165.00BE
Cadmium		3.00U	3.00U	3.00U	3.00U	3.00U	5.00B
Chromium		9.00B	10.00B	8.00B	11.00B	8.00B	9.00B
Lead		27.00U	55.00B	59.00B	39.00B	33.00B	55.00B
Mercury		0.20U	0.20U	0.20U	0.20U	0.20U	0.20U
Selenium		116.00B	109.00B	123.00B	115.00B	147.00B	119.00B
Silver		4.00U	4.00U	4.00U	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY Ed Knepfel
DATE 5/91
CHECKED BY Judy Gruna
DATE 5-22-91

CAMP LEJEUNE - HPIA
TCLP METALS IN SOIL SAMPLES
Concentration in ug/l

CHART = SOIL-T13

	SB-29			SB-30	
	HPS029-1	HPS029-2	HPS029-3	HPS030-2	HPS030-3
TCLP METALS depth:	0-2'	2-4'	10-12'	2-4'	10-12'
Arsenic	48.00B	40.00U	40.00U	49.00B	40.00U
Barium	549.00NE	400.00NE	200.00NE	135.00BE	130.00BE
Cadmium	3.00U	3.00U	3.00U	3.00U	4.00B
Chromium	3.00B	4.00B	4.00B	3.00U	6.00B
Lead	40.00B	42.00B	60.00B	43.00B	27.00B
Mercury	0.20U	0.20U	0.20U	0.20U	0.20U
Selenium	63.00U	63.00U	63.00U	63.00U	107.00B
Silver	4.00U	4.00U	4.00U	4.00U	4.00U

PROJECT Camp Lejeune
PREPARED BY Judy Guerra
DATE May 1991
CHECKED BY Ed Kropf
DATE 5/21/91
COMMENTS

CAMP LEJEUNE - HPIA
PESTICIDES IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-P1

	SB-1				SB-2		
	HPSO1-1	HPSO1-1D (HPSOO-1)	HPSO1-2	HPSO1-3	HPSO2-1	HPSO2-2	HPSO2-2D (HPSOO-2)
PESTICIDE/PCB depth:	0-2′	0-2′	2-4′	4-6′	0-2′	2-4′	2-4′
alpha-BHC	9.0U	8.9U	9.2U	9.2U	8.9U	9.3U	9.5U
beta-BHC	9.0U	8.9U	9.2U	9.2U	8.9U	9.3U	9.5U
delta-BHC	9.0U	8.9U	9.2U	9.2U	8.9U	9.3U	9.5U
gamma-BHC (Lindane)	9.0U	8.9U	9.2U	9.2U	8.9U	9.3U	9.5U
Heptachlor	9.0U	8.9U	9.2U	9.2U	8.9U	9.3U	9.5U
Aldrin	9.0U	8.9U	9.2U	9.2U	8.9U	9.3U	9.5U
Heptachlor epoxide	9.0U	8.9U	9.2U	9.2U	8.9U	9.3U	9.5U
Endosulfan I	9.0U	8.9U	9.2U	9.2U	8.9U	9.3U	9.5U
Dieldrin	18U	18U	18U	18U	18U	19U	19U
4,4′-DDE	18U	18U	18U	18U	18U	19U	19U
Endrin	18U	18U	18U	18U	18U	19U	19U
Endosulfan II	18U	18U	18U	18U	18U	19U	19U
4,4′-DDD	18U	18U	18U	18U	18U	19U	19U
Endosulfan sulfate	18U	18U	18U	18U	18U	19U	19U
4,4′-DDT	18U	18U	18U	18U	18U	19U	19U
Methoxychlor	90U	89U	92U	92U	89U	93U	95U
Endrin ketone	18U	18U	18U	18U	18U	19U	19U
alpha-Chlordane	90U	89U	92U	92U	89U	93U	95U
gamma-Chlordane	90U	89U	92U	92U	89U	93U	95U
Toxaphene	180U	180U	180U	180U	180U	190U	190U
Aroclor-1016	90U	89U	92U	92U	89U	93U	95U
Aroclor-1221	90U	89U	92U	92U	89U	93U	95U
Aroclor-1232	90U	89U	92U	92U	89U	93U	95U
Aroclor-1242	90U	89U	92U	92U	89U	93U	95U
Aroclor-1248	90U	89U	92U	92U	89U	93U	95U
Aroclor-1254	180U	180U	180U	180U	180U	190U	190U
Aroclor-1260	180U	180U	180U	180U	180U	190U	190U

CAMP LEJEUNE-HPIA
PESTICIDES IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-P2

		SB-3		SB-4			
		HPSO3-1	HPSO3-1D (HPSOD-3)	HPSO4-1	HPSO4-2	HPSO4-2D (HPSOD-4)	HPSO4-3
PESTICIDE/PCB	depth:	0-2'	0-2'	0-2'	2-4'	2-4'	4-6'
alpha-BHC		8.9U	9.0U	8.9U	9.0U	9.3U	9.4U
beta-BHC		8.9U	9.0U	8.9U	9.0U	9.3U	9.4U
delta-BHC		8.9U	9.0U	8.9U	9.0U	9.3U	9.4U
gamma-BHC (Lindane)		8.9U	9.0U	8.9U	9.0U	9.3U	9.4U
Heptachlor		8.9U	9.0U	8.9U	9.0U	9.3U	9.4U
Aldrin		8.9U	9.0U	8.9U	9.0U	9.3U	9.4U
Heptachlor epoxide		8.9U	9.0U	8.9U	9.0U	9.3U	9.4U
Endosulfan I		8.9U	9.0U	8.9U	9.0U	9.3U	9.4U
Dieldrin		18U	18U	18U	18U	19U	19U
4,4'-DDE		18U	18U	18U	18U	19U	19U
Endrin		18U	18U	18U	18U	19U	19U
Endosulfan II		18U	18U	18U	18U	19U	19U
4,4'-DDD		18U	18U	18U	18U	19U	19U
Endosulfan sulfate		18U	18U	18U	18U	19U	19U
4,4'-DDT		18U	18U	18U	18U	19U	19U
Methoxychlor		89U	90U	89U	90U	93U	94U
Endrin ketone		18U	18U	18U	18U	19U	19U
alpha-Chlordane		89U	90U	89U	90U	93U	94U
gamma-Chlordane		89U	90U	89U	90U	93U	94U
Toxaphene		180U	180U	180U	180U	190U	190U
Aroclor-1016		89U	90U	89U	90U	93U	94U
Aroclor-1221		89U	90U	89U	90U	93U	94U
Aroclor-1232		89U	90U	89U	90U	93U	94U
Aroclor-1242		89U	90U	89U	90U	93U	94U
Aroclor-1248		89U	90U	89U	90U	93U	94U
Aroclor-1254		180U	180U	180U	180U	190U	190U
Aroclor-1260		180U	180U	180U	180U	190U	190U

CAMP LEJEUNE - HPIA
PESTICIDES IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-P10

	SB-19			SB-20		
	HPSO19-1	HPSO19-2	HPSO19-3	HPSO20-1	HPSO20-2	HPSO20-3
PESTICIDE/PCB depth:	0-2'	2-4'	8-10'	0-2'	6-8'	8-10'
alpha-BHC	13U	8.9U	9.5U	8.9U	8.4U	9.0U
beta-BHC	13U	8.9U	9.5U	8.9U	8.4U	9.0U
delta-BHC	13U	8.9U	9.5U	8.9U	8.4U	9.0U
gamma-BHC (Lindane)	13U	8.9U	9.5U	8.9U	8.4U	9.0U
Heptachlor	13U	8.9U	9.5U	8.9U	8.4U	9.0U
Aldrin	13U	8.9U	9.5U	8.9U	8.4U	9.0U
Heptachlor epoxide	13U	8.9U	9.5U	8.9U	8.4U	9.0U
Endosulfan I	13U	8.9U	9.5U	8.9U	8.4U	9.0U
Dieldrin	26U	18U	19U	18U	17U	18U
4,4'-DDE	26U	18U	19U	18U	17U	18U
Endrin	26U	18U	19U	18U	17U	18U
Endosulfan II	26U	18U	19U	18U	17U	18U
4,4'-DDD	26U	18U	19U	18U	17U	18U
Endosulfan sulfate	26U	18U	19U	18U	17U	18U
4,4'-DDT	26U	18U	19U	18U	17U	18U
Methoxychlor	130U	89U	95U	89U	84U	90U
Endrin ketone	26U	18U	19U	18U	17U	18U
alpha-Chlordane	130U	89U	95U	89U	84U	90U
gamma-Chlordane	130U	89U	95U	89U	84U	90U
Toxaphene	260U	180U	190U	180U	170U	180U
Aroclor-1016	130U	89U	95U	89U	84U	90U
Aroclor-1221	130U	89U	95U	89U	84U	90U
Aroclor-1232	130U	89U	95U	89U	84U	90U
Aroclor-1242	130U	89U	95U	89U	84U	90U
Aroclor-1248	130U	89U	95U	89U	84U	90U
Aroclor-1254	260U	180U	190U	180U	170U	180U
Aroclor-1260	260U	180U	190U	180U	170U	180U

CAMP LEJEUNE - HPIA
PESTICIDES IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-P11

		SB-21			SB-22			
		HPS021-1	HPS021-2	HPS021-3	HPS022-1	HPS022-1D (HPS00-7)	HPS022-2	HPS022-3
PESTICIDE/PCB	depth:	0-2′	2-4′	4-6′	0-2′	0-2′	2-4′	4-6′
alpha-BHC		8.9U	9.2U	10U	9.2U	9.2U	9.0U	10U
beta-BHC		8.9U	9.2U	10U	9.2U	9.2U	9.0U	10U
delta-BHC		8.9U	9.2U	10U	9.2U	9.2U	9.0U	10U
gamma-BHC (Lindane)		8.9U	9.2U	10U	9.2U	9.2U	9.0U	10U
Heptachlor		8.9U	9.2U	10U	9.2U	9.2U	9.0U	10U
Aldrin		8.9U	9.2U	10U	9.2U	9.2U	9.0U	10U
Heptachlor epoxide		8.9U	9.2U	10U	9.2U	9.2U	9.0U	10U
Endosulfan I		8.9U	9.2U	10U	9.2U	9.2U	9.0U	10U
Dieldrin		18U	18U	20U	18U	18U	18U	21U
4,4′-DDE		18U	18U	20U	18U	18U	18U	21U
Endrin		18U	18U	20U	18U	18U	18U	21U
Endosulfan II		18U	18U	20U	18U	18U	18U	21U
4,4′-DDD		18U	18U	20U	18U	18U	18U	21U
Endosulfan sulfate		18U	18U	20U	18U	18U	18U	21U
4,4′-DDT		18U	18U	20U	18U	18U	18U	21U
Methoxychlor		89U	92U	100U	92U	92U	90U	100U
Endrin ketone		18U	18U	20U	18U	18U	18U	21U
alpha-Chlordane		89U	92U	100U	92U	92U	90U	100U
gamma-Chlordane		89U	92U	100U	92U	92U	90U	100U
Toxaphene		180U	180U	200U	180U	180U	180U	210U
Aroclor-1016		89U	92U	100U	92U	92U	90U	100U
Aroclor-1221		89U	92U	100U	92U	92U	90U	100U
Aroclor-1232		89U	92U	100U	92U	92U	90U	100U
Aroclor-1242		89U	92U	100U	92U	92U	90U	100U
Aroclor-1248		89U	92U	100U	92U	92U	90U	100U
Aroclor-1254		180U	180U	200U	180U	180U	180U	210U
Aroclor-1260		180U	180U	200U	180U	180U	180U	210U

CAMP LEJEUNE - HPIA
PESTICIDES IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-P12

		SB-23			SB-24			
		HPSO23-1	HPSO23-2	HPSO23-3	HPSO24-1	HPSO24-1D (HPSOD-9)	HPSO24-2	HPSO24-3
PESTICIDE/PCB	depth:	0-2'	2-4'	4-6'	0-2'	0-2'	4-6'	6-8'
alpha-BHC		8.9U	9.2U	8.7U	8.6U	8.4U	8.9U	9.1U
beta-BHC		8.9U	9.2U	8.7U	8.6U	8.4U	8.9U	9.1U
delta-BHC		8.9U	9.2U	8.7U	8.6U	8.4U	8.9U	9.1U
gamma-BHC (Lindane)		8.9U	9.2U	8.7U	8.6U	8.4U	8.9U	9.1U
Heptachlor		8.9U	9.2U	8.7U	8.6U	8.4U	8.9U	9.1U
Aldrin		8.9U	9.2U	8.7U	8.6U	8.4U	8.9U	9.1U
Heptachlor epoxide		8.9U	9.2U	8.7U	8.6U	8.4U	8.9U	9.1U
Endosulfan I		8.9U	9.2U	8.7U	8.6U	8.4U	8.9U	9.1U
Dieldrin		92	18U	17U	17U	17U	18U	18U
4,4'-DDE		78	18U	17U	17U	17U	18U	18U
Endrin		18U	18U	17U	17U	17U	18U	18U
Endosulfan II		18U	18U	17U	17U	17U	18U	18U
4,4'-DDD		18U	18U	17U	17U	17U	18U	18U
Endosulfan sulfate		18U	18U	17U	17U	17U	18U	18U
4,4'-DDT		40	18U	17U	17U	17U	18U	18U
Methoxychlor		89U	92U	87U	86U	84U	89U	91U
Endrin ketone		18U	18U	17U	17U	17U	18U	18U
alpha-Chlordane		89U	92U	87U	86U	84U	89U	91U
gamma-Chlordane		89U	92U	87U	86U	84U	89U	91U
Toxaphene		180U	180U	170U	170U	170U	180U	180U
Aroclor-1016		89U	92U	87U	86U	84U	89U	91U
Aroclor-1221		89U	92U	87U	86U	84U	89U	91U
Aroclor-1232		89U	92U	87U	86U	84U	89U	91U
Aroclor-1242		89U	92U	87U	86U	84U	89U	91U
Aroclor-1248		89U	92U	87U	86U	84U	89U	91U
Aroclor-1254		180U	180U	170U	170U	170U	180U	180U
Aroclor-1260		180U	180U	170U	170U	170U	180U	180U

CAMP LEJEUNE - HPIA
PESTICIDES IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-P13

		SB-25			SB-26			
		HPS025-1	HPS025-2	HPS025-3	HPS026-1	HPS026-1D (HPSOD-8)	HPS026-2	HPS026-3
PESTICIDE/PCB	depth:	0-2′	2-4′	6-8′	0-2′	0-2′	6-8′	8-10′
alpha-BHC		8.4U	8.5U	8.9U	8.4U	8.4U	9.2U	9.0U
beta-BHC		8.4U	8.5U	8.9U	8.4U	8.4U	9.2U	9.0U
delta-BHC		8.4U	8.5U	8.9U	8.4U	8.4U	9.2U	9.0U
gamma-BHC (Lindane)		8.4U	8.5U	8.9U	8.4U	8.4U	9.2U	9.0U
Heptachlor		8.4U	8.5U	8.9U	8.4U	8.4U	9.2U	9.0U
Aldrin		8.4U	8.5U	8.9U	8.4U	8.4U	9.2U	9.0U
Heptachlor epoxide		8.4U	8.5U	8.9U	8.4U	8.4U	9.2U	9.0U
Endosulfan I		8.4U	8.5U	8.9U	8.4U	8.4U	9.2U	9.0U
Dieldrin		17U	17U	18U	17U	17U	18U	18U
4,4′-DDE		17U	17U	18U	17U	17U	18U	18U
Endrin		17U	17U	18U	17U	17U	18U	18U
Endosulfan II		17U	17U	18U	17U	17U	18U	18U
4,4′-DDD		17U	17U	18U	17U	17U	18U	18U
Endosulfan sulfate		17U	17U	18U	17U	17U	18U	18U
4,4′-DDT		17U	17U	18U	17U	17U	18U	18U
Methoxychlor		84U	85U	89U	84U	84U	92U	90U
Endrin ketone		17U	17U	18U	17U	17U	18U	18U
alpha-Chlordane		84U	85U	89U	84U	84U	92U	90U
gamma-Chlordane		84U	85U	89U	84U	84U	92U	90U
Toxaphene		170U	170U	180U	170U	170U	180U	180U
Aroclor-1016		84U	85U	89U	84U	84U	92U	90U
Aroclor-1221		84U	85U	89U	84U	84U	92U	90U
Aroclor-1232		84U	85U	89U	84U	84U	92U	90U
Aroclor-1242		84U	85U	89U	84U	84U	92U	90U
Aroclor-1248		84U	85U	89U	84U	84U	92U	90U
Aroclor-1254		170U	170U	180U	170U	170U	180U	180U
Aroclor-1260		170U	170U	180U	170U	170U	180U	180U

CAMP LEJEUNE - HPIA
PESTICIDES IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-P14

		SB-27			SB-28		
		HPSO27-1	HPSO27-2	HPSO27-3	HPSO28-1	HPSO28-2	HPSO28-3
PESTICIDE/PCB	depth:	2-4'	4-6'	8-10'	0-2'	2-4'	8-10'
alpha-BHC		8.5U	8.7U	9.7U	8.6U	8.8U	9.7U
beta-BHC		8.5U	8.7U	9.7U	8.6U	8.8U	9.7U
delta-BHC		8.5U	8.7U	9.7U	8.6U	8.8U	9.7U
gamma-BHC (Lindane)		8.5U	8.7U	9.7U	8.6U	8.8U	9.7U
Heptachlor		8.5U	8.7U	9.7U	8.6U	8.8U	9.7U
Aldrin		8.5U	8.7U	9.7U	8.6U	8.8U	9.7U
Heptachlor epoxide		8.5U	8.7U	9.7U	8.6U	8.8U	9.7U
Endosulfan I		8.5U	8.7U	9.7U	8.6U	8.8U	9.7U
Dieldrin		17U	17U	19U	17U	18U	19U
4,4'-DDE		17U	17U	19U	17U	18U	19U
Endrin		17U	17U	19U	17U	18U	19U
Endosulfan II		17U	17U	19U	17U	18U	19U
4,4'-DDD		17U	17U	19U	17U	18U	19U
Endosulfan sulfate		17U	17U	19U	17U	18U	19U
4,4'-DDT		17U	17U	19U	17U	18U	19U
Methoxychlor		85U	87U	97U	86U	88U	97U
Endrin ketone		17U	17U	19U	17U	18U	19U
alpha-Chlordane		85U	87U	97U	86U	88U	97U
gamma-Chlordane		85U	87U	97U	86U	88U	97U
Toxaphene		170U	170U	190U	170U	180U	190U
Aroclor-1016		85U	87U	97U	86U	88U	97U
Aroclor-1221		85U	87U	97U	86U	88U	97U
Aroclor-1232		85U	87U	97U	86U	88U	97U
Aroclor-1242		85U	87U	97U	86U	88U	97U
Aroclor-1248		85U	87U	97U	86U	88U	97U
Aroclor-1254		170U	170U	190U	170U	180U	190U
Aroclor-1260		170U	170U	190U	170U	180U	190U

CAMP LEJEUNE - HPIA
PESTICIDES IN SOIL SAMPLES
Concentration in ug/kg

CHART = SOIL-P15

		SB-29			SB-30		
		HPS029-1	HPS029-2	HPS029-3	HPS030-1	HPS030-2	HPS030-3
PESTICIDE/PCB	depth:	0-2′	2-4′	10-12′	0-2′	2-4′	10-12′
alpha-BHC		9.0U	8.8U	9.2U	9.0U	9.0U	9.6U
beta-BHC		9.0U	8.8U	9.2U	9.0U	9.0U	9.6U
delta-BHC		9.0U	8.8U	9.2U	9.0U	9.0U	9.6U
gamma-BHC (Lindane)		9.0U	8.8U	9.2U	9.0U	9.0U	9.6U
Heptachlor		9.0U	8.8U	9.2U	9.0U	9.0U	9.6U
Aldrin		9.0U	8.8U	9.2U	9.0U	9.0U	9.6U
Heptachlor epoxide		9.0U	8.8U	9.2U	9.0U	9.0U	9.6U
Endosulfan I		9.0U	8.8U	9.2U	9.0U	9.0U	9.6U
Dieldrin		18U	18U	18U	18U	18U	19U
4,4′-DDE		18U	18U	18U	18U	18U	19U
Endrin		18U	18U	18U	18U	18U	19U
Endosulfan II		18U	18U	18U	18U	18U	19U
4,4′-DDD		18U	18U	18U	18U	18U	19U
Endosulfan sulfate		18U	18U	18U	18U	18U	19U
4,4′-DDT		18U	18U	18U	18U	18U	19U
Methoxychlor		90U	88U	92U	90U	90U	96U
Endrin ketone		18U	18U	18U	18U	18U	19U
alpha-Chlordane		90U	88U	92U	90U	90U	96U
gamma-Chlordane		90U	88U	92U	90U	90U	96U
Toxaphene		180U	180U	180U	180U	180U	190U
Aroclor-1016		90U	88U	92U	90U	90U	96U
Aroclor-1221		90U	88U	92U	90U	90U	96U
Aroclor-1232		90U	88U	92U	90U	90U	96U
Aroclor-1242		90U	88U	92U	90U	90U	96U
Aroclor-1248		90U	88U	92U	90U	90U	96U
Aroclor-1254		180U	180U	180U	180U	180U	190U
Aroclor-1260		180U	180U	180U	180U	180U	190U

GROUNDWATER DATA
SHALLOW WELLS

CAMP LEJEUNE - HPIA
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPVOL1

wp8b\hp-vol.wr1 (1)

COMPOUND	HPGW1	HPGW2	HPGW3	HPGW4-1	HPGW4-1D (GWDUP5)	HPGW5	HPGW6	HPGW7
Chloromethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Bromomethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Vinyl Chloride	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Chloroethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Methylene Chloride	5.U	5.U	5.U	5.U	2.J	3.BJ	3.BJ	5.U
Acetone	10.J	10.U	10.U	40.	26.	10.U	10.U	10.U
Carbon Disulfide	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1-Dichloroethene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1-Dichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethene (total)	73.	5.U	5.U	5.U	.6J	5.U	5.U	5.U
Chloroform	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
2-Butanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,1,1-Trichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Carbon Tetrachloride	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Vinyl Acetate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Bromodichloromethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloropropane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
cis-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Trichloroethene	91.	5.U	5.U	.9J	1.J	5.U	5.U	5.U
Dibromochloromethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1,2-Trichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Benzene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
trans-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Bromoform	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
4-Methyl-2-Pentanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Hexanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Tetrachloroethene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1,2,2-Tetrachloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Toluene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Chlorobenzene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Ethylbenzene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Styrene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Xylene (total)	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U

CAMP LEJEUNE - HPIA

VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (SHALLOW WELLS)

Concentration in ug/l

CHART = HPVOL3

wp8b\hp-vol.wr1 (3)

COMPOUND	HPGW15	HPGW16	HPGW17-1	HPGW19	HPGW20	HPGW21	HPGW22	HPGW23
Chloromethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Bromomethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Vinyl Chloride	10.U	10.U	10.U	10.U	10.U	10.U	10.U	8.J
Chloroethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Methylene Chloride	5.U	5.U	5.U	5.U	.9J	4.J	9.	5.U
Acetone	10.U	10.U	10.U	10.U	10.U	4.BJ	10.U	10.U
Carbon Disulfide	5.U	5.U	5.U	5.U	2.J	5.U	5.U	5.
1,1-Dichloroethene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1-Dichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethene (total)	7.	5.U	5.U	.8J	5.U	5.U	5.U	8900.
Chloroform	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
2-Butanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,1,1-Trichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Carbon Tetrachloride	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Vinyl Acetate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Bromodichloromethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloropropane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
cis-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Trichloroethene	4.J	5.U	5.U	2.J	5.U	3.J	5.U	3700.
Dibromochloromethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1,2-Trichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Benzene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	24.
trans-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Bromoform	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
4-Methyl-2-Pentanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Hexanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Tetrachloroethene	5.U	5.U	5.U	2.J	5.U	5.U	5.U	5.U
1,1,2,2-Tetrachloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Toluene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	13.
Chlorobenzene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Ethylbenzene	5.U	5.U	5.U	5.U	5.U	.9J	5.U	9.
Styrene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Xylene (total)	5.U	5.U	5.U	5.U	5.U	5.	5.U	41.

CAMP LEJEUNE - HPIA
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPVOL4 wp8b\hp-vol.wr1 (4)

COMPOUND	HPGW24-1	HPGW25	HPGW26	HPGW26D (GWDUP8)	HPGW29	21GW1	22GW1	22GW2
Chloromethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Bromomethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Vinyl Chloride	25000.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Chloroethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Methylene Chloride	5.U	5.U	3.J	5.U	.9J	5.U	5.U	5.U
Acetone	10.U	10.U	7.BJ	6.BJ	10.U	10.U	10.U	10.U
Carbon Disulfide	7.	5.U	2.J	8.	5.U	5.U	5.U	5.U
1,1-Dichloroethene	65.	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1-Dichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethene (total)	42000.D	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Chloroform	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethane	.8J	5.U	5.U	5.U	5.U	5.U	110.B	5.U
2-Butanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,1,1-Trichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Carbon Tetrachloride	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Vinyl Acetate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Bromodichloromethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloropropane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
cis-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Trichloroethene	180.	5.U	5.U	5.U	5.U	5.U	5.J	5.U
Dibromochloromethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1,2-Trichloroethane	3.J	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Benzene	3.J	5.U	5.U	5.U	5.U	5.U	7900.	5.U
trans-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Bromoform	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
4-Methyl-2-Pentanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Hexanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Tetrachloroethene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1,2,2-Tetrachloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Toluene	13.	5.U	5.U	5.U	5.U	5.U	16000.	5.U
Chlorobenzene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Ethylbenzene	3.J	5.U	5.U	5.U	5.U	5.U	1900.J	5.U
Styrene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Xylene (total)	10.	5.U	5.U	5.U	5.U	5.U	9800.	5.U

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPSV1B   wp8c\hp-sv.wr1 (1-B)

COMPOUND	HPGW1	HPGW2	HPGW3	HPGW4-1	HPGW4-1D (GWDUP5)	HPGW5	HPGW6	HPGW7
3-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Acenaphthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dinitrophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
4-Nitrophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Dibenzofuran	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dinitrotoluene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Diethylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chlorophenyl-phenylether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Fluorene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
4,6-Dinitro-2-methylphenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
N-Nitrosodiphenylamine	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Bromophenyl-phenylether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Pentachlorophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Phenanthrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Anthracene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Di-n-butylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Butylbenzylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
3,3'-Dichlorobenzidine	20.U	20.U	20.U	20.U	20.U	20.U	20.U	20.U
Benzo(a)anthracene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Chrysene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Ethylhexyl)phthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Di-n-octylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(b)fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(k)fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(a)pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Indeno(1,2,3-cd)pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Dibenz(a,h)anthracene	10.U	10.U"	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(g,h,i)perylene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U

PROJECT [illegible]
PREPARED BY [illegible]
DATE April 1991
CHECKED BY
DATE [illegible]

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPSV2A

wp8c\hp-sv.wr1 (2-A)

COMPOUND	HPGW8	HPGW9-1	HPGW10	HPGW11	HPGW12	HPGW12D (GWDUP2)	HPGW13	HPGW14
Phenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Chloroethyl)ether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Chlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,3-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,4-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzyl Alcohol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,2-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Chloroisopropyl)ether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
N-Nitroso-di-n-propylamine	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachloroethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Nitrobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Isophorone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitrophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dimethylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzoic acid	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
bis(2-Chloroethoxy)methane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,2,4-Trichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Naphthalene	10.U	190.	10.U	10.U	10.U	10.U	10.U	10.U
4-Chloroaniline	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorobutadiene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chloro-3-methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylnaphthalene	10.U	49.	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorocyclopentadiene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4,6-Trichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4,5-Trichlorophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
2-Chloronaphthalene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Dimethylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Acenaphthylene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,6-Dinitrotoluene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U

PROJECT Camp Lejeune
PREPARED BY Judy Shuma
DATE April 1991
CHECKED BY [illegible]
DATE 5/6/91

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPSV3A

wp8c\hp-sv.wr1 (3-A)

COMPOUND	HPGW15	HPGW16	HPGW17-1	HPGW19	HPGW20	HPGW21	HPGW22	HPGW23
Phenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Chloroethyl)ether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Chlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,3-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,4-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzyl Alcohol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,2-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Chloroisopropyl)ether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
N-Nitroso-di-n-propylamine	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachloroethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Nitrobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Isophorone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitrophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dimethylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzoic acid	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
bis(2-Chloroethoxy)methane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,2,4-Trichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Naphthalene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chloroaniline	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorobutadiene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chloro-3-methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylnaphthalene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorocyclopentadiene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4,6-Trichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4,5-Trichlorophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
2-Chloronaphthalene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Dimethylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Acenaphthylene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,6-Dinitrotoluene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPSV3B wp8c\hp-sv.wr1 (3-B)

COMPOUND	HPGW15	HPGW16	HPGW17-1	HPGW19	HPGW20	HPGW21	HPGW22	HPGW23
3-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Acenaphthene	10.U	10.U	10.U	10.U	10.U	10.U	3.J	10.U
2,4-Dinitrophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
4-Nitrophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Dibenzofuran	10.U	10.U	10.U	10.U	10.U	10.U	2.J	10.U
2,4-Dinitrotoluene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Diethylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chlorophenyl-phenylether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Fluorene	10.U	10.U	10.U	10.U	10.U	10.U	5.J	10.U
4-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
4,6-Dinitro-2-methylphenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
N-Nitrosodiphenylamine	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Bromophenyl-phenylether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Pentachlorophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Phenanthrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Anthracene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Di-n-butylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Butylbenzylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
3,3'-Dichlorobenzidine	20.U	20.U	20.U	20.U	20.U	20.U	20.U	20.U
Benzo(a)anthracene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Chrysene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Ethylhexyl)phthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	3.J
Di-n-octylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(b)fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(k)fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(a)pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Indeno(1,2,3-cd)pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Dibenz(a,h)anthracene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(g,h,i)perylene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPSV4A

wp8c\hp-sv.wr1 (4-A)

COMPOUND	HPG24-1	HPGW25	HPGW26	HPGW26D (GWDUP8)	HPGW29	21GW1	22GW1	22GW2
Phenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Chloroethyl)ether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Chlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,3-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,4-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzyl Alcohol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,2-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.J	10.U
bis(2-Chloroisopropyl)ether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
N-Nitroso-di-n-propylamine	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachloroethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Nitrobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Isophorone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitrophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dimethylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzoic acid	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
bis (2-Chloroethoxy) methane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,2,4-Trichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Naphthalene	130.	10.U	10.U	10.U	10.U	10.U	230.	10.U
4-Chloroaniline	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorobutadiene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chloro-3-methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylnaphthalene	3.J	10.U	10.U	10.U	10.U	10.U	28.	10.U
Hexachlorocyclopentadiene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4,6-Trichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4,5-Trichlorophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
2-Chloronaphthalene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Dimethylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Acenaphthylene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,6-Dinitrotoluene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U

PROJECT Camp Lejeune
PREPARED BY
DATE April 1991
CHECKED BY
DATE

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPSV4B 　　wp8c\hp-sv.wr1 (4-B)

COMPOUND	HPG24-1	HPGW25	HPGW26	HPGW26D (GWDUP8)	HPGW29	21GW1	22GW1	22GW2
3-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Acenaphthene	6.J	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dinitrophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
4-Nitrophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Dibenzofuran	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dinitrotoluene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Diethylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chlorophenyl-phenylether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Fluorene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
4,6-Dinitro-2-methylphenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
N-Nitrosodiphenylamine	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Bromophenyl-phenylether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Pentachlorophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Phenanthrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Anthracene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Di-n-butylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Butylbenzylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
3,3'-Dichlorobenzidine	20.U	20.U	20.U	20.U	20.U	20.U	20.U	20.U
Benzo(a)anthracene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Chrysene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Ethylhexyl)phthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Di-n-octylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(b)fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(k)fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(a)pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Indeno(1,2,3-cd)pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Dibenz(a,h)anthracene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(g,h,i)perylene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U

PROJECT Camp Lejeune
PREPARED BY
DATE April 1991
CHECKED BY
DATE 5/13/91

CAMP LEJEUNE - HPIA
INORGANICS IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPING1

wp8e\hp-inor.wr1 (1)

METAL/COMPOUND	HPGW1	HPGW2	HPGW3	HPGW4-1	HPGW4-1D (GWDUP5)	HPGW5	HPGW6	HPGW7
Aluminum	30600	56000	19300	97000	96800	3580	1050000	161000
Antimony	13.3U	15.6B	46.5B	21.9B	34.6B	13.3U	13.3U	22.0U
Arsenic	8.0B	24.1	15.6	15.5	19.4	1.5U	31.5	18.3
Barium	166B	84.4B	55.5B	268	273	13.6B	1960	670
Beryllium	6.0	1.7B	1.2B	6.7	6.4	0.86B	20.0	4.8B
Cadmium	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U
Calcium	30100	46800	29800	296000	310000	80100	11200	10500
Chromium	87.0	64.3	16.7	187	195	3.6B	1590	313
Cobalt	6.0U	6.1B	8.0U	14.4B	18.2B	6.0U	51.9	17.7B
Copper	17.4B	17.3B	5.5B	35.4	39.2	4.1B	194	44.2
Iron	64100	34800	10400	100000	106000	3100	265000	65700
Lead	16.6	29.4	11.4	66.6	45.6	13.6	60.7	112
Magnesium	5590	3980B	2580B	12100	12500	11100	49700	18200
Manganese	168	77.7	53.9	425	436	162	487	136
Mercury	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	1.4	0.25
Nickel	31.3B	16.9B	12.1B	57.0	64.3	5.2U	161	50.7
Potassium	3940B	4820B	2230B	9710	9520	3930B	55300	12000
Selenium	3.4U	3.6B	3.4U	3.4U	3.4U	4.4B	3.4U	2.6B
Silver	4.7B	1.6U	1.6U	1.6U	2.4B	1.6U	2.3B	6.2U
Sodium	10900	3680B	6390	11400	11100	22400	14800	11500
Thallium	4.4U	4.4U	4.4U	4.4U	4.4U	4.4U	4.4U	1.1U
Vanadium	92.1	160	35.9B	213	222	2.4U	1610	285
Zinc	163	88.2	59.8	228	272	71.3	537	218
Cyanide	10.0U	11.2U	11.2	10.0U	10.0U	10.0U	10.0U	10.0U

CAMP LEJEUNE - HPIA

INORGANICS IN GROUNDWATER (SHALLOW WELLS)

Concentration in ug/l

CHART = HPING2

METAL/COMPOUND	HPGW8	HPGW9-1	HPGW10	HPGW11	HPGW12	HPGW12D (GWDUP2)	HPGW13	HPGW14
Aluminum	91700	59100	348000	95200	24000	2110	13500	109000
Antimony	22.0U	17.6B	22.0U	22.0U	22.0U	22.0U	13.3U	13.3U
Arsenic	28.4	3.0B	39.9	9.1B	1.8U	1.8U	47.0	45.6
Barium	173B	126B	492	298	91.5B	46.3B	129B	299
Beryllium	2.1U	0.79B	5.6	2.1U	2.1U	2.1U	0.59B	2.7B
Cadmium	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U
Calcium	10600	23500	56200	9730	34100	117000	4100B	4340B
Chromium	91.8	66.4	310	140	25.5	5.2U	48.9	127
Cobalt	7.9B	6.0U	31.4B	6.4U	6.4B	6.4U	9.3B	12.9B
Copper	19.5B	27.1	72.2	30.0	5.9B	3.2B	17.0B	34.8
Iron	40900	19800	119000	31800	5600	100	33500	87200
Lead	54.1	128	186	45.2	15.7	1.0U	9.0	66.5
Magnesium	5780	11000	14900	11200	7700	119B	7700	8770
Manganese	46.5	45.0	255	103	18.3	1.8U	30.3	80.0
Mercury	0.13B	0.10U	0.82	0.10B	0.10U	0.10U	0.10U	0.26
Nickel	25.2B	15.1B	92.2	23.6B	11.0U	11.0U	21.1B	41.6
Potassium	5300	5370	17100	7320	2600B	5280	4520B	6890
Selenium	3.6B	3.6B	1.6U	3.7B	5.8	1.6U	3.4U	3.4U
Silver	6.2U	1.6U	6.2U	6.2U	6.2U	6.2U	2.1B	2.5B
Sodium	8600	20400	3950B	5410	9310	6560	18100	11500
Thallium	1.1U	4.4U	1.1U	1.1U	1.1U	1.1U	4.4U	4.4U
Vanadium	945	75.3	376	166	31.1	6.6B	40.5B	163
Zinc	118	115	224	94.0	46.6	44.5	127	206
Cyanide	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U

CAMP LEJEUNE - HPIA
INORGANICS IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPING3

wp8e\hp-inor.wr1 (3)

METAL/COMPOUND	HPGW15	HPGW16	HPGW17-1	HPGW19	HPGW20	HPGW21	HPGW22	HPGW23
Aluminum	18500	213000	29000	6840	289000	38500	71800	82500
Antimony	22.0U	22.0U	22.0U	13.3U	21.9B	13.3U	24.6B	24.6B
Arsenic	1.8U	17.3	1.8U	5.0B	49.4	12.1	7.2B	6.6B
Barium	119B	276	70.1B	92.9B	814	114B	102B	196B
Beryllium	2.1U	5.3	2.1U	2.3B	9.5	3.7B	0.60B	1.0B
Cadmium	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U
Calcium	12000	33400	60800	3120B	6370	26100	96300	7890
Chromium	21.4	209	37.0	13.8	424	45.0	79.8	76.3
Cobalt	6.4U	18.7B	6.4U	6.0U	80.8	17.6B	6.0U	11.9B
Copper	12.2B	44.6B	20.0B	8.6B	97.7	28.3	40.0	30.5
Iron	4800	47200	10500	36200	152000	56600	24400	23300
Lead	16.6	100	23.7	31.7	20.0	49.4	39.4	45.0
Magnesium	5650	8110	6790	4200B	18000	10200	5210	6050
Manganese	18.3	98.3	31.3	79.0	217	136	94.1	68.8
Mercury	0.10U	0.13B	0.10U	0.10U	0.50	0.10U	0.10U	0.10U
Nickel	11.0U	41.0	11.9B	7.3B	168	30.8B	23.2B	33.2B
Potassium	3390B	12100	3530B	2370B	16600	5160	6930	3880B
Selenium	1.6U	1.6U	1.6U	3.4U	3.4U	3.5B	3.4U	3.4U
Silver	6.2U	6.2U	6.2U	2.9B	4.3B	1.6U	2.5B	6.6B
Sodium	6950	4960	4480B	23500	11000	11800	5300	6260
Thallium	1.1U	1.4B	1.1U	4.4U	4.4U	4.4U	4.4U	4.4U
Vanadium	24.9B	225	52.1	19.8B	419	178	100	77.6
Zinc	88.1	157	76.5	81.1	637	273	77.4	89.3
Cyanide	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U

CAMP LEJEUNE - HPIA
INORGANICS IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPING4 wp8e\hp-inor.wrl (4)

METAL/COMPOUND	HPGW24-1	HPGW25	HPGW26	HPGW26-D (GWDUP8)	HPGW29	21GW1	22GW1	22GW2
Aluminum	15400	218000	10400	7830N	47800	40400	587000	16900
Antimony	22.0U	13.3U	13.3U	13.3U	13.3U	17.0B	20.9B	13.3U
Arsenic	4.2B	13.2	1.5U	1.5U	25.6	41.4	50.3	11.0
Barium	60.1B	289	72.0B	67.7B	633	71.0B	804	67.0B
Beryllium	2.1U	2.8B	0.50U	0.50U	8.7	1.1B	5.8	0.50U
Cadmium	4.3U	4.3U	4.3U	4.3UN	4.3U	4.3U	4.3UN	4.3U
Calcium	16600	6270	2830B	2770B	59200	60400	33800	127000
Chromium	26.3	205	13.0	10.3	179	39.0	457	26.3
Cobalt	6.4U	10.5B	6.0U	6.0U	17.8B	10.8B	30.9B	10.9B
Copper	11.5B	57.7	9.1B	7.2B	39.9	13.2B	81.4	11.2B
Iron	19200	46600	19000	10900	76200	54900	101000	16200
Lead	21.4	71.6	9.0	5.2	29.1	15.8	307	16.2
Magnesium	2430B	10000	1830B	1710B	15000	10300	21200	7730
Manganese	54.8	118	10.6B	8.8B	236	200	284	763
Mercury	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.35	0.10U
Nickel	14.0U	39.2B	5.2U	5.2U	93.5	21.4B	186	17.0B
Potassium	3130B	13100	2230B	1580B	5900	4400B	24000	3030B
Selenium	1.6U	3.4U	3.4U	3.4UN	3.4U	3.4U	3.4U	4.2B
Silver	6.2U	3.9B	1.6U	1.6U	3.1B	1.6U	4.1B	1.6U
Sodium	11800	18200	5910	5690	7850	17400	9560	8570
Thallium	1.1U	4.4U	4.4U	4.4U	4.4U	4.4U	4.4U	4.4U
Vanadium	39.2B	259	149	83.6	108	138	518	40.3B
Zinc	70.5	119	68.1	43.1	329	233	295	91.8
Cyanide	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U

CAMP LEJEUNE - HPIA
PESTICIDES IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPPEST1 sy\wp8b\hp-pest.wr1 (1)

PESTICIDE/PCB	HPGW1	HPGW2	HPGW3	HPGW4-1	HPGW4-1D (GWDUP5)	HPGW5	HPGW6	HPGW7
alpha-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
beta-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
delta-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
gamma-BHC (Lindane)	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Aldrin	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor epoxide	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Endosulfan I	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Dieldrin	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDE	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endrin	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan II	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDD	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan sulfate	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDT	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Methoxychlor	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Endrin ketone	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
alpha-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
gamma-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Toxaphene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1016	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1221	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1232	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1242	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1248	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1254	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1260	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U

PROJECT Camp Lejeune
PREPARED BY
DATE April 1991
CHECKED BY
DATE 5/6/91

C1
E6

CAMP LEJEUNE - HPIA
PESTICIDES IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPPEST2 sy\wp8b\hp-pest.wr1 (2)

PESTICIDE/PCB	HPGW8	HPGW9-1	HPGW10	HPGW11	HPGW12	HPGW12D (GWDUP2)	HPGW13	HPGW14
alpha-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
beta-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
delta-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
gamma-BHC (Lindane)	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Aldrin	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor epoxide	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Endosulfan I	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Dieldrin	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDE	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endrin	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan II	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDD	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan sulfate	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDT	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Methoxychlor	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Endrin ketone	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
alpha-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
gamma-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Toxaphene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1016	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1221	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1232	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1242	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1248	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1254	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1260	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U

CAMP LEJEUNE - HPIA
PESTICIDES IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPPEST3 sy\wp8b\hp-pest.wr1 (3)

PESTICIDE/PCB	HPGW15	HPGW16	HPGW17-1	HPGW19	HPGW20	HPGW21	HPGW22	HPGW23
alpha-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
beta-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
delta-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
gamma-BHC (Lindane)	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Aldrin	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor epoxide	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Endosulfan I	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Dieldrin	.10U	.10U	.11	.10U	.10U	.10U	.10U	.10U
4,4'-DDE	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endrin	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan II	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDD	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan sulfate	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDT	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Methoxychlor	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Endrin ketone	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
alpha-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
gamma-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Toxaphene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1016	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1221	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1232	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1242	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1248	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1254	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1260	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U

PROJECT Camp Lejeune
PREPARED BY
DATE April 1991
CHECKED BY
DATE 5/6/91

CAMP LEJEUNE - HPIA
PESTICIDES IN GROUNDWATER (SHALLOW WELLS)
Concentration in ug/l

CHART = HPPEST4 sy\wp8b\hp-pest.wr1 (4)

PESTICIDE/PCB	HPGW24-1	HPGW25	HPGW26	HPGW26D (GWDUP8)	HPGW29	21GW1	22GW1	22GW2
alpha-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
beta-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
delta-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
gamma-BHC (Lindane)	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Aldrin	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor epoxide	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Endosulfan I	.05U	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Dieldrin	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDE	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endrin	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan II	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDD	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan sulfate	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDT	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Methoxychlor	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Endrin ketone	.10U	.10U	.10U	.10U	.10U	.10U	.10U	.10U
alpha-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
gamma-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Toxaphene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1016	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1221	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1232	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1242	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1248	.50U	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1254	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1260	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U

PROJECT Camp Lejeune
PREPARED BY
DATE April 1991
CHECKED BY
DATE 5/6/91

GROUNDWATER DATA
INTERMEDIATE AND DEEP WELLS

CAMP LEJEUNE - HPIA

SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (INTERMEDIATE WELLS)

Concentration in ug/l

CHART = HPSV5A

wp8c\hp-sv.wr1 (5-A)

COMPOUND	HPGW4-2	HPGW9-2	HPGW17-2	HPGW24-2	HPGW30-2	HPGW30-2D (GWDUP4)
Phenol	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Chloroethyl)ether	10.U	10.U	10.U	10.U	10.U	10.U
2-Chlorophenol	10.U	10.U	10.U	10.U	10.U	10.U
1,3-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U
1,4-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U
Benzyl Alcohol	10.U	10.U	10.U	10.U	10.U	10.U
1,2-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Chloroisopropyl)ether	10.U	10.U	10.U	10.U	10.U	10.U
4-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U
N-Nitroso-di-n-propylamine	10.U	10.U	10.U	10.U	10.U	10.U
Hexachloroethane	10.U	10.U	10.U	10.U	10.U	10.U
Nitrobenzene	10.U	10.U	10.U	10.U	10.U	10.U
Isophorone	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitrophenol	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dimethylphenol	10.U	10.U	10.U	10.U	10.U	10.U
Benzoic acid	50.U	50.U	50.U	50.U	48.U	50.U
bis(2-Chloroethoxy)methane	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U
1,2,4-Trichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U
Naphthalene	10.U	10.U	56.	10.U	270.	88.
4-Chloroaniline	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorobutadiene	10.U	10.U	10.U	10.U	10.U	10.U
4-Chloro-3-methylphenol	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylnaphthalene	10.U	10.U	2.J	10.U	9.J	10.U
Hexachlorocyclopentadiene	10.U	10.U	10.U	10.U	10.U	10.U
2,4,6-Trichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U
2,4,5-Trichlorophenol	50.U	50.U	50.U	50.U	48.U	50.U
2-Chloronaphthalene	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitroaniline	50.U	50.U	50.U	50.U	48.U	50.U
Dimethylphthalate	10.U	10.U	10.U	10.U	10.U	10.U
Acenaphthylene	10.U	10.U	10.U	10.U	10.U	10.U
2,6-Dinitrotoluene	10.U	10.U	10.U	10.U	10.U	10.U

PROJECT Camp Lejeune

PREPARED BY

DATE April 1991

CHECKED BY

DATE 5/13/91

COMMENTS

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (INTERMEDIATE WELLS)
Concentration in ug/l

CHART = HPSV5B wp8c\hp-sv.wr1 (5-B)

COMPOUND	HPGW4-2	HPGW9-2	HPGW17-2	HPGW24-2	HPGW30-2	HPGW30-2D (GWDUP4)
3-Nitroaniline	50.U	50.U	50.U	50.U	48.U	50.U
Acenaphthene	10.U	10.U	5.J	10.U	1.J	10.U
2,4-Dinitrophenol	50.U	50.U	50.U	50.U	48.U	50.U
4-Nitrophenol	50.U	50.U	50.U	50.U	48.U	50.U
Dibenzofuran	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dinitrotoluene	10.U	10.U	10.U	10.U	10.U	10.U
Diethylphthalate	10.U	10.U	10.U	10.U	10.U	10.U
4-Chlorophenyl-phenylether	10.U	10.U	10.U	10.U	10.U	10.U
Fluorene	10.U	10.U	10.U	10.U	10.U	10.U
4-Nitroaniline	50.U	50.U	50.U	50.U	48.U	50.U
4,6-Dinitro-2-methylphenol	50.U	50.U	50.U	50.U	48.U	50.U
N-Nitrosodiphenylamine	10.U	10.U	10.U	10.U	10.U	10.U
4-Bromophenyl-phenylether	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U
Pentachlorophenol	50.U	50.U	50.U	50.U	48.U	50.U
Phenanthrene	10.U	10.U	10.U	10.U	10.U	10.U
Anthracene	10.U	10.U	10.U	10.U	10.U	10.U
Di-n-butylphthalate	10.U	10.U	10.U	10.U	10.U	10.U
Fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U
Pyrene	10.U	10.U	10.U	10.U	10.U	10.U
Butylbenzylphthalate	10.U	10.U	10.U	10.U	10.U	10.U
3,3'-Dichlorobenzidine	20.U	20.U	20.U	20.U	20.U	20.U
Benzo(a)anthracene	10.U	10.U	10.U	10.U	10.U	10.U
Chrysene	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Ethylhexyl)phthalate	10.U	2.J	1.J	2.J	10.U	10.U
Di-n-octylphthalate	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(b)fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(k)fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(a)pyrene	10.U	10.U	10.U	10.U	10.U	10.U
Indeno(1,2,3-cd)pyrene	10.U	10.U	10.U	10.U	10.U	10.U
Dibenz(a,h)anthracene	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(g,h,i)perylene	10.U	10.U	10.U	10.U	10.U	10.U

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (INTERMEDIATE WELLS)
Concentration in ug/l

CHART = HPSV6A

COMPOUND	HPGW31-2	HPGW32-2
Phenol	10.U	10.U
bis(2-Chloroethyl)ether	10.U	10.U
2-Chlorophenol	10.U	10.U
1,3-Dichlorobenzene	10.U	10.U
1,4-Dichlorobenzene	10.U	10.U
Benzyl Alcohol	10.U	10.U
1,2-Dichlorobenzene	10.U	10.U
2-Methylphenol	10.U	10.U
bis(2-Chloroisopropyl)ether	10.U	10.U
4-Methylphenol	10.U	10.U
N-Nitroso-di-n-propylamine	10.U	10.U
Hexachloroethane	10.U	10.U
Nitrobenzene	10.U	10.U
Isophorone	10.U	10.U
2-Nitrophenol	10.U	10.U
2,4-Dimethylphenol	10.U	10.U
Benzoic acid	50.U	50.U
bis(2-Chloroethoxy)methane	10.U	10.U
2,4-Dichlorophenol	10.U	10.U
1,2,4-Trichlorobenzene	10.U	10.U
Naphthalene	10.U	10.U
4-Chloroaniline	10.U	10.U
Hexachlorobutadiene	10.U	10.U
4-Chloro-3-methylphenol	10.U	10.U
2-Methylnaphthalene	10.U	10.U
Hexachlorocyclopentadiene	10.U	10.U
2,4,6-Trichlorophenol	10.U	10.U
2,4,5-Trichlorophenol	50.U	50.U
2-Chloronaphthalene	10.U	10.U
2-Nitroaniline	50.U	50.U
Dimethylphthalate	10.U	10.U
Acenaphthylene	10.U	10.U
2,6-Dinitrotoluene	10.U	10.U

PROJECT Camp Lejeune
PREPARED BY Judi Hunna
DATE April 1991
CHECKED BY E.C. Knight
DATE 5/10/91
COMMENTS

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (INTERMEDIATE WELLS)
Concentration in ug/l

CHART = HPSV6B

wp8c\hp-sv.wr1 (6-B)

COMPOUND	HPGW31-2	HPGW32-2
3-Nitroaniline	50.U	50.U
Acenaphthene	10.U	10.U
2,4-Dinitrophenol	50.U	50.U
4-Nitrophenol	50.U	50.U
Dibenzofuran	10.U	10.U
2,4-Dinitrotoluene	10.U	10.U
Diethylphthalate	10.U	10.U
4-Chlorophenyl-phenylether	10.U	10.U
Fluorene	10.U	10.U
4-Nitroaniline	50.U	50.U
4,6-Dinitro-2-methylphenol	50.U	50.U
N-Nitrosodiphenylamine	10.U	10.U
4-Bromophenyl-phenylether	10.U	10.U
Hexachlorobenzene	10.U	10.U
Pentachlorophenol	50.U	50.U
Phenanthrene	10.U	10.U
Anthracene	10.U	10.U
Di-n-butylphthalate	10.U	10.U
Fluoranthene	10.U	10.U
Pyrene	10.U	10.U
Butylbenzylphthalate	10.U	10.U
3,3'-Dichlorobenzidine	20.U	20.U
Benzo(a)anthracene	10.U	10.U
Chrysene	10.U	10.U
bis(2-Ethylhexyl)phthalate	10.U	10.U
Di-n-octylphthalate	10.U	10.U
Benzo(b)fluoranthene	10.U	10.U
Benzo(k)fluoranthene	10.U	10.U
Benzo(a)pyrene	10.U	10.U
Indeno(1,2,3-cd)pyrene	10.U	10.U
Dibenz(a,h)anthracene	10.U	10.U
Benzo(g,h,i)perylene	10.U	10.U

CAMP LEJEUNE - HPIA
INORGANICS IN GROUNDWATER (INTERMEDIATE WELLS)
Concentration in ug/l

CHART = HPING5

wp8e\hp-inor.wr1 (5)

METAL/COMPOUND	HPGW4-2	HPGW9-2	HPGW17-2	HPGW24-2	HPGW30-2	HPGW30-2D (GWDUP4)
Aluminum	230	170B	2760	2330	1860	1830
Antimony	13.3U	22.0U	22.0U	22.0U	13.3U	13.3U
Arsenic	1.5U	1.8U	1.8U	1.8U	1.5U	1.5U
Barium	33.6B	24.2B	82.1B	22.9B	28.7B	19.0B
Beryllium	1.5U	2.1	2.1	2.1U	0.61B	0.61B
Cadmium	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U
Calcium	20100	101000	190000	105000	138000	132000
Chromium	7.6B	5.2U	14.6	11.0	4.9B	7.0B
Cobalt	6.0U	6.4U	6.4U	6.4U	6.0U	6.0U
Copper	7.3B	9.3B	9.2B	8.3B	7.3B	11.2B
Iron	354	461	2920	3460	4950	4850
Lead	27.1	2.7B	8.9	13.5	5.0	6.2
Magnesium	932B	2480B	3290B	1720B	2350B	2260B
Manganese	9.2B	9.3B	35.7	29.7	51.1	49.0
Mercury	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U
Nickel	5.2U	11.0U	11.0U	11.0U	5.2U	5.2U
Potassium	106000	1040B	2050B	1230B	7180	7230
Selenium	3.4U	1.6U	1.8U	1.6U	3.4U	3.4U
Silver	1.8B	6.2U	6.2U	6.2U	1.6U	1.6U
Sodium	32900	7810	9930	7710	18600	215000
Thallium	4.4U	1.1U	1.1U	1.1U	4.4U	4.4U
Vanadium	2.4U	4.3U	11.2B	10.4B	5.7B	6.1B
Zinc	104	79.9	85.7	106	44.5	61.3
Cyanide	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U

PROJECT Camp Lejeune
PREPARED BY
DATE April 1991
CHECKED BY
DATE 5-8-91

CAMP LEJEUNE - HPIA
INORGANICS IN GROUNDWATER (INTERMEDIATE WELLS)
Concentration in ug/l

CHART = HPING6

wp8e\hp-inor.wr1 (6)

METAL/COMPOUND	HPGW31-2	HPGW32-2
Aluminum	1100	322
Antimony	13.3U	13.3U
Arsenic	1.5U	1.5U
Barium	17.8B	67.3B
Beryllium	0.50U	0.50U
Cadmium	4.3U	4.3U
Calcium	68200	21500
Chromium	2.4B	11.0
Cobalt	6.0U	6.0U
Copper	12.7B	10.6B
Iron	1320	432
Lead	5.6	6.5
Magnesium	1770B	727B
Manganese	30.0	6.6B
Mercury	0.10U	0.10U
Nickel	6.9B	5.2U
Potassium	1680B	73500
Selenium	3.4U	3.4U
Silver	1.6U	2.2B
Sodium	7720	31800
Thallium	4.4U	4.4U
Vanadium	4.0B	2.4U
Zinc	46.1	62.1
Cyanide	10.0U	10.0U

PROJECT Camp Lejeune
PREPARED BY Judy Gunza
DATE April 1991
CHECKED BY E C King
DATE 5/13/91
COMMENTS

CAMP LEJEUNE - HPIA
PESTICIDES IN GROUNDWATER (INTERMEDIATE WELLS)
Concentration in ug/l

CHART = HPPEST5 sy\wp8b\hp-pest.wr1 (5)

PESTICIDE/PCB	HPGW4-2	HPGW9-2	HPGW17-2	HPGW24-2	HPGW30-2	HPGW30-2D (GWDUP-4)
alpha-BHC	.05U	.05U	.05U	.05U	.05U	.05U
beta-BHC	.05U	.05U	.05U	.05U	.05U	.05U
delta-BHC	.05U	.05U	.05U	.05U	.05U	.05U
gamma-BHC (Lindane)	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor	.05U	.05U	.05U	.05U	.05U	.05U
Aldrin	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor epoxide	.05U	.05U	.05U	.05U	.05U	.05U
Endosulfan I	.05U	.05U	.05U	.05U	.05U	.05U
Dieldrin	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDE	.10U	.10U	.10U	.10U	.10U	.10U
Endrin	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan II	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDD	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan sulfate	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDT	.10U	.10U	.10U	.10U	.10U	.10U
Methoxychlor	.50U	.50U	.50U	.50U	.50U	.50U
Endrin ketone	.10U	.10U	.10U	.10U	.10U	.10U
alpha-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U
gamma-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U
Toxaphene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1016	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1221	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1232	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1242	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1248	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1254	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1260	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U

PROJECT Camp Lejeune
PREPARED BY Judy Yurka
DATE April 1991
CHECKED BY Mendy Sawyer
DATE 5/6/91

CAMP LEJEUNE - HPIA
PESTICIDES IN GROUNDWATER (INTERMEDIATE WELLS)
Concentration in ug/l

CHART = HPPEST6 sy\wp8b\hp-pest.wr1 (6)

PESTICIDE/PCB	HPGW31-2	HPGW32-2
alpha-BHC	.05U	.05U
beta-BHC	.05U	.05U
delta-BHC	.05U	.05U
gamma-BHC (Lindane)	.05U	.05U
Heptachlor	.05U	.05U
Aldrin	.05U	.05U
Heptachlor epoxide	.05U	.05U
Endosulfan I	.05U	.05U
Dieldrin	.10U	.10U
4,4'-DDE	.10U	.10U
Endrin	.10U	.10U
Endosulfan II	.10U	.10U
4,4'-DDD	.10U	.10U
Endosulfan sulfate	.10U	.10U
4,4'-DDT	.10U	.10U
Methoxychlor	.50U	.50U
Endrin ketone	.10U	.10U
alpha-Chlordane	.50U	.50U
gamma-Chlordane	.50U	.50U
Toxaphene	1.0U	1.0U
Aroclor-1016	.50U	.50U
Aroclor-1221	.50U	.50U
Aroclor-1232	.50U	.50U
Aroclor-1242	.50U	.50U
Aroclor-1248	.50U	.50U
Aroclor-1254	1.0U	1.0U
Aroclor-1260	1.0U	1.0U

PROJECT Camp Lejeune
PREPARED BY
DATE April 1991
CHECKED BY
DATE 5-6-91
COMMENTS

CAMP LEJEUNE - HPIA
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (INTERMEDIATE WELLS)
Concentration in ug/l

CHART = HPVOL5

COMPOUND	HPGW4-2	HPGW9-2	HPGW17-2	HPGW24-2	HPGW30-2	HPGW30-2D (GWDUP4)
Chloromethane	10.U	10.U	10.U	10.U	10.U	10.U
Bromomethane	10.U	10.U	10.U	10.U	10.U	10.U
Vinyl Chloride	10.U	10.U	10.U	10.U	12.	12.
Chloroethane	10.U	10.U	10.U	10.U	10.U	10.U
Methylene Chloride	1.J	5.U	5.U	5.U	5.U	5.U
Acetone	19.	10.U	10.U	10.U	7.J	10.U
Carbon Disulfide	10.	22.	14.	9.	5.U	5.U
1,1-Dichloroethene	5.U	5.U	5.U	5.U	5.U	5.U
1,1-Dichloroethane	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethene (total)	5.U	11.	1.J	5.U	12.	11.
Chloroform	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethane	5.U	5.U	5.U	5.U	5.U	5.U
2-Butanone	10.U	10.U	10.U	10.U	10.U	10.U
1,1,1-Trichloroethane	5.U	5.U	5.U	5.U	5.U	5.U
Carbon Tetrachloride	5.U	5.U	5.U	5.U	5.U	5.U
Vinyl Acetate	10.U	10.U	10.U	10.U	10.U	10.U
Bromodichloromethane	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloropropane	5.U	5.U	5.U	5.U	5.U	5.U
cis-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U
Trichloroethene	5.U	5.U	5.U	5.U	5.U	5.U
Dibromochloromethane	5.U	5.U	5.U	5.U	5.U	5.U
1,1,2-Trichloroethane	5.U	5.U	5.U	5.U	5.U	5.U
Benzene	5.U	5.U	3.J	5.U	2.J	2.J
trans-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U
Bromoform	5.U	5.U	5.U	5.U	5.U	5.U
4-Methyl-2-Pentanone	10.U	10.U	10.U	10.U	10.U	10.U
2-Hexanone	10.U	10.U	10.U	10.U	10.U	10.U
Tetrachloroethene	5.U	5.U	5.U	5.U	5.U	5.U
1,1,2,2-Tetrachloroethane	5.U	5.U	5.U	5.U	5.U	5.U
Toluene	1.J	5.U	5.U	5.U	2.J	2.J
Chlorobenzene	5.U	5.U	5.U	5.U	5.U	5.U
Ethylbenzene	5.U	5.U	5.U	5.U	.7J	.6J
Styrene	5.U	5.U	5.U	5.U	5.U	5.U
Xylene (total)	5.U	5.U	5.U	5.U	2.J	1.J

PROJECT Camp Lejeune
PREPARED BY Paul M. Finley
DATE April 1991
Judy Luna
5-10-91

CAMP LEJEUNE - HPIA
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (INTERMEDIATE WELLS)
Concentration in ug/l

CHART = HPVOL6

wp8b\hp-vol.wr1 (6)

COMPOUND	HPGW31-2	HPGW32-2
Chloromethane	10.U	10.U
Bromomethane	10.U	10.U
Vinyl Chloride	10.U	10.U
Chloroethane	10.U	10.U
Methylene Chloride	5.U	5.U
Acetone	6.BJ	19.
Carbon Disulfide	1.J	5.J
1,1-Dichloroethene	5.U	5.U
1,1-Dichloroethane	5.U	5.U
1,2-Dichloroethene (total)	5.U	5.U
Chloroform	5.U	5.U
1,2-Dichloroethane	5.U	5.U
2-Butanone	10.U	10.U
1,1,1-Trichloroethane	5.U	5.U
Carbon Tetrachloride	5.U	5.U
Vinyl Acetate	10.U	10.U
Bromodichloromethane	5.U	5.U
1,2-Dichloropropane	5.U	5.U
cis-1,3-Dichloropropene	5.U	5.U
Trichloroethene	5.U	5.U
Dibromochloromethane	5.U	5.U
1,1,2-Trichloroethane	5.U	5.U
Benzene	5.U	27.
trans-1,3-Dichloropropene	5.U	5.U
Bromoform	5.U	5.U
4-Methyl-2-Pentanone	10.U	10.U
2-Hexanone	10.U	10.U
Tetrachloroethene	5.U	5.U
1,1,2,2-Tetrachloroethane	5.U	5.U
Toluene	5.U	31.
Chlorobenzene	5.U	5.U
Ethylbenzene	5.U	2.J
Styrene	5.U	5.U
Xylene (total)	1.J	8.

PROJECT Camp Lejeune
PREPARED BY Paul M. [illegible]
DATE April 1991
CHECKED BY Judy Guma
5-7-91

CAMP LEJEUNE - HPIA

VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (DEEP WELLS)

Concentration in ug/l

CHART = HPVOL7 wp8b\hp-vol.wr1 (7)

COMPOUND	HPGW4-3	HPGW9-3	HPGW9-3D (GWDUP3)	HPGW24-3	HPGW30-3	HPGW31-3	HPGW32-3
Chloromethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Bromomethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Vinyl Chloride	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Chloroethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Methylene Chloride	2.J	5.U	5.U	.8BJ	5.U	5.U	1.BJ
Acetone	4.J	10.U	10.U	10.U	10.U	27.B	13.
Carbon Disulfide	4.J	5.U	5.U	5.U	5.U	6.	5.U
1,1-Dichloroethene	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1-Dichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethene (total)	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Chloroform	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U
2-Butanone	10.U	5.J	10.U	10.U	10.U	10.U	10.U
1,1,1-Trichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Carbon Tetrachloride	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Vinyl Acetate	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Bromodichloromethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloropropane	5.U	5.U	5.U	5.U	5.U	5.U	5.U
cis-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Trichloroethene	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Dibromochloromethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1,2-Trichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Benzene	5.U	5.U	5.U	5.U	5.U	5.U	5.U
trans-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Bromoform	5.U	5.U	5.U	5.U	5.U	5.U	5.U
4-Methyl-2-Pentanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Hexanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Tetrachloroethene	5.U	5.U	.6J	5.U	5.U	5.U	5.U
1,1,2,2-Tetrachloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Toluene	5.U	5.U	5.U	5.U	5.U	5.U	34.
Chlorobenzene	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Ethylbenzene	5.U	5.U	5.U	5.U	5.U	5.U	12.
Styrene	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Xylene (total)	5.U	5.U	5.U	5.U	5.U	5.U	51.

PROJECT Camp Lejeune

PREPARED BY

DATE April 1991

CHECKED BY

DATE 5-7-91

COMMENTS

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (DEEP WELLS)
Concentration in ug/l

CHART = HPSV7A wp8c\hp-sv.wr1 (7-A)

COMPOUND	HPGW4-3	HPGW9-3	HPGW9-3D (GWDUP3)	HPGW24-3	HPGW30-3	HPGW31-3	HPGW32-3
Phenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Chloroethyl)ether	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Chlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,3-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,4-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzyl Alcohol	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,2-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Chloroisopropyl)ether	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U
N-Nitroso-di-n-propylamine	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachloroethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Nitrobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Isophorone	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitrophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dimethylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzoic acid	50.U	50.U	50.U	50.U	50.U	50.U	50.U
bis(2-Chloroethoxy)methane	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,2,4-Trichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Naphthalene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chloroaniline	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorobutadiene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chloro-3-methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylnaphthalene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorocyclopentadiene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4,6-Trichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4,5-Trichlorophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U
2-Chloronaphthalene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Dimethylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Acenaphthylene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,6-Dinitrotoluene	10.U	10.U	10.U	10.U	10.U	10.U	10.U

PROJECT Camp Lejeune
PREPARED BY Judy Bird
DATE April 1991
CHECKED BY E.C. Knight
DATE 5/16/91
COMMENTS

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (DEEP WELLS)
Concentration in ug/l

CHART = HPSV7B

wp8c\hp-sv.wr1 (7-B)

COMPOUND	HPGW4-3	HPGW9-3	HPGW9-3D (GWDUP3)	HPGW24-3	HPGW30-3	HPGW31-3	HPGW32-3
3-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Acenaphthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dinitrophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U
4-Nitrophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Dibenzofuran	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dinitrotoluene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Diethylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chlorophenyl-phenylether	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Fluorene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U
4,6-Dinitro-2-methylphenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U
N-Nitrosodiphenylamine	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Bromophenyl-phenylether	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Pentachlorophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Phenanthrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Anthracene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Di-n-butylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Butylbenzylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U
3,3'-Dichlorobenzidine	20.U	20.U	20.U	20.U	20.U	20.U	20.U
Benzo(a)anthracene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Chrysene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Ethylhexyl)phthalate	10.U	3.J	10.U	2.J	10.U	10.U	10.U
Di-n-octylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(b)fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(k)fluoranthene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(a)pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Indeno(1,2,3-cd)pyrene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Dibenz(a,h)anthracene	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzo(g,h,i)perylene	10.U	10.U	10.U	10.U	10.U	10.U	10.U

CAMP LEJEUNE - HPIA
INORGANICS IN GROUNDWATER (DEEP WELLS)
Concentration in ug/l

CHART = HPING7

wp8e\hp-inor.wr1 (7)

METAL/COMPOUND	HPGW4-3	HPGW9-3	HPGW9-3D (GWDUP3)	HPGW24-3	HPGW30-3	HPGW31-3	HPGW32-3
Aluminum	142B	2200	19000	1060	186B	105B	326
Antimony	13.5B	22.0U	22.0U	22.0U	13.3U	13.3U	13.3U
Arsenic	5.6B	1.8U	2.4B	1.8U	1.5U	1.6B	1.5U
Barium	26.8B	49.1B	88.8B	7.6B	8.7B	235	19.3B
Beryllium	0.89B	2.1U	2.1U	2.1U	0.50U	0.50U	0.50U
Cadmium	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U
Calcium	55100	120000	33200	71300	58900	55900	36100
Chromium	3.0B	5.2U	25.6	7.4B	2.5B	10.3	6.6B
Cobalt	6.0U	6.4U	8.4B	6.4U	6.0U	6.0U	6.0U
Copper	12.6B	4.6B	12.2B	6.4B	5.4B	11.4B	10.6B
Iron	23700	149	4490	2870	836	371	555
Lead	2.0B	1.0U	12.3	1.2B	1.7B	3.9	1.7U
Magnesium	2150B	131B	7700	1560B	1690B	786B	1010B
Manganese	65.4	1.8U	17.1	42.4	23.6	3.8B	15.4
Mercury	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U
Nickel	9.6B	11.0U	11.0U	11.0U	5.2U	6.0B	5.2U
Potassium	2350B	5540	2990B	1160B	1500B	63400	43200
Selenium	3.4U	1.6U	4.0B	1.6U	3.4U	3.4U	3.4U
Silver	2.5B	6.2U	6.2U	6.2U	1.6U	1.6U	1.6U
Sodium	12500	6440	7040	7390	16700	39100	21300
Thallium	4.4U	1.1U	1.1U	1.1U	4.4U	4.4U	4.4U
Vanadium	2.4U	7.3B	28.8B	6.2B	2.4U	2.4U	2.4U
Zinc	49.7	38.6	40.4	87.4	34.3	37.8	61.8
Cyanide	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U

CAMP LEJEUNE - HPIA
PESTICIDES IN GROUNDWATER (DEEP WELLS)
Concentration in ug/l

CHART = HPPEST7

sy\wp8b\hp-pest.wr1 (7)

PESTICIDE/PCB	HPGW4-3	HPGW9-3	HPGW9-3D (GWDUP3)	HPGW24-3	HPGW30-3	HPGW31-3	HPGW32-3
alpha-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U
beta-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U
delta-BHC	.05U	.05U	.05U	.05U	.05U	.05U	.05U
gamma-BHC (Lindane)	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Aldrin	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Heptachlor epoxide	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Endosulfan I	.05U	.05U	.05U	.05U	.05U	.05U	.05U
Dieldrin	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDE	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endrin	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan II	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDD	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Endosulfan sulfate	.10U	.10U	.10U	.10U	.10U	.10U	.10U
4,4'-DDT	.10U	.10U	.10U	.10U	.10U	.10U	.10U
Methoxychlor	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Endrin ketone	.10U	.10U	.10U	.10U	.10U	.10U	.10U
alpha-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U	.50U
gamma-Chlordane	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Toxaphene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1016	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1221	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1232	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1242	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1248	.50U	.50U	.50U	.50U	.50U	.50U	.50U
Aroclor-1254	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Aroclor-1260	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U

PROJECT Camp Lejeune
PREPARED BY Judy [illegible]
DATE April 1991
CHECKED BY [illegible]
DATE 5/6/91

GROUNDWATER DATA
WATER SUPPLY WELLS

CAMP LEJ - HPIA
VOLATILE ORGANIC COMPOUNDS IN WATER SUPPLY WELLS
Concentration in ug/l

CHART = HPVOL8

wp8b\hp-vol.wr1 (8)

COMPOUND	WS602	WS603	WS634	WS634D (GWDUP9)	WS637	WS642	WS652	WS660
Chloromethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Bromomethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Vinyl Chloride	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Chloroethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Methylene Chloride	21.	5.U	5.U	5.U	5.U	5.U	20.	5.U
Acetone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Carbon Disulfide	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1-Dichloroethene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1-Dichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethene (total)	12.	5.U	1.J	5.U	5.U	5.U	5.U	2.J
Chloroform	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloroethane	8.	5.U	5.U	5.U	5.U	5.U	5.U	5.U
2-Butanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,1,1-Trichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Carbon Tetrachloride	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Vinyl Acetate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Bromodichloromethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,2-Dichloropropane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
cis-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Trichloroethene	.7J	1.J	5.U	5.U	.9J	5.U	5.U	1.J
Dibromochloromethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1,2-Trichloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Benzene	17.	5.U	5.U	5.U	5.U	5.U	5.U	5.U
trans-1,3-Dichloropropene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Bromoform	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
4-Methyl-2-Pentanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Hexanone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Tetrachloroethene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
1,1,2,2-Tetrachloroethane	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Toluene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Chlorobenzene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Ethylbenzene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Styrene	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U
Xylene (total)	5.U	5.U	5.U	5.U	5.U	5.U	5.U	5.U

CAMP LEJEUNE - HPIA
INORGANICS IN GROUNDWATER (WATER SUPPLY WELLS)
Concentration in ug/l

CHART = HPWSING

wp8e\hp-inor.wr1 (8)

METAL/COMPOUND	WS-602	WS-603	WS-634	WS-634D (GWDUP9)	WS-637	WS-642	WS-652	WS-660
Aluminum	95.2B	20.7U	20.7U	20.7U	20.7U	20.7U	20.7U	20.7U
Antimony	13.3U	13.3U	13.3U	13.3U	13.3U	13.3U	13.3U	13.3U
Arsenic	1.5U	1.5U	1.5U	1.5U	1.5U	1.5U	1.5U	1.5U
Barium	4.8B	8.7B	10.2B	10.4B	9.5B	7.6B	376	10.3B
Beryllium	0.50U	0.50U	0.50U	0.86B	0.50U	0.50U	0.50U	0.50U
Cadmium	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U	4.3U
Calcium	128000	91400	58900	61200	62700	74100	69000	91900
Chromium	1.5U	1.5U	1.5U	1.5U	1.5U	1.5U	1.7B	1.5U
Cobalt	6.0U	6.0U	6.0U	6.0U	6.0U	6.0U	6.0U	6.0U
Copper	97.1	3.2U	4.9B	4.0B	17.9B	8.5B	22.5B	5.0B
Iron	12800	1030	1420	1550	4620	1150	65000	11500
Lead	8.8	1.7U	1.7U	1.7U	3.3	1.7U	32.8	21.8
Magnesium	5440	3240B	1190B	1240B	1650B	1690B	1910B	2800B
Manganese	120	22.2	12.5B	12.5B	28.3	24.6	151	75.6
Mercury	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U
Nickel	5.2U	5.2U	5.2U	5.2U	5.2U	5.2U	5.2U	5.2U
Potassium	2100B	2620B	890B	1090B	1370B	1390B	1200B	2040B
Selenium	3.4U	3.4U	3.4U	3.4U	3.4U	3.4U	3.4U	3.4U
Silver	1.6U	1.6U	1.6U	1.6U	1.6U	1.6U	2.2B	1.6U
Sodium	12500	11000	5410	5900	7900	7730	8680	8730
Thallium	4.4U	4.4U	4.4U	4.4U	4.4U	4.4U	4.4U	4.4U
Vanadium	2.4B	2.4U	2.4U	2.5B	2.4U	2.4U	2.4U	2.7B
Zinc	112	39.9	23.4	14.3B	86.7	38.6	18100	4590
Cyanide	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U	10.0U

PROJECT Camp Lejeune

PREPARED BY

DATE 5/11/91

CHECKED BY

DATE 5/10/91

CAMP LEJEUNE - HPIA
SEMI-VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (WATER SUPPLY WELLS)
Concentration in ug/l

CHART = HPSV8A wp8c\hp-sv.wr1 (8-A)

COMPOUND	WS602	WS603	WS634	WS634D (GWDUP9)	WS637	WS642	WS652	WS660
Phenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Chloroethyl)ether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Chlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,3-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,4-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzyl Alcohol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,2-Dichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
bis(2-Chloroisopropyl)ether	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
N-Nitroso-di-n-propylamine	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachloroethane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Nitrobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Isophorone	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitrophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dimethylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Benzoic acid	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
bis(2-Chloroethoxy)methane	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4-Dichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
1,2,4-Trichlorobenzene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Naphthalene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chloroaniline	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorobutadiene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
4-Chloro-3-methylphenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Methylnaphthalene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Hexachlorocyclopentadiene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4,6-Trichlorophenol	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,4,5-Trichlorophenol	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
2-Chloronaphthalene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2-Nitroaniline	50.U	50.U	50.U	50.U	50.U	50.U	50.U	50.U
Dimethylphthalate	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
Acenaphthylene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U
2,6-Dinitrotoluene	10.U	10.U	10.U	10.U	10.U	10.U	10.U	10.U

APPENDIX C

SUMMARY OF ANALYTICAL DATA FROM THE INTERIM REMEDIAL ACTION/ REMEDIAL INVESTIGATION, MAY 1992

TABLE 4-1
CONSTITUENTS DETECTED IN GROUNDWATER
TANK FARM AREA

WELL NUMBER	22GW1				22GW2				STANDARDS	
UNITS	ug/L				ug/L				NORTH CAROLINA*	PRIMARY MCLs
DATE SAMPLED	1/9/87	3/8/87	5/27/87	1/18/91	1/9/8	3/8/8	5/27/87	1/18/91	ug/L	ug/L
VOLATILES:										
Benzene	12000	10000	13000	7900	< 1	< 1	< 1	< 5	1	5
Dichloroethane,1,2-	< 28	< 2800	< 2800	110 B	< 3	< 3	< 3	< 5	0.38	5
Ethyl benzene	1800	< 7200	< 7200	1900 J	< 7	< 7	< 7	< 5	29	700
Methylene chloride	< 28	< 2800	< 50000	5 U	7	< 3	< 50	< 5	5	5(1)
Trichloroethylene	< 30	< 1000	< 1000	5 J	< 1	< 3	< 1	< 5	2.8	5
Toluene	15000	18000	24000	16000	< 6	< 6	< 6	< 5	1000	1000
Xylene (total)	9000	< 12000	< 12000	9800	< 12	< 12	< 12	< 5	400	10000
SEMIVOLATILES:										
Methylnaphthalene,2-	NA	NA	NA	10 J	NA	NA	NA	< 10	-	-
Methylphenol,2-	NA	NA	NA	230	NA	NA	NA	< 10	-	-
Naphthalene	NA	NA	NA	28	NA	NA	NA	< 10	-	-
Oil & Grease	7000	11000	9000	NA	800	< 100	< 200	NA	-	-
Total Lead	33	29	78	307	28	< 27	< 49.2	16.2	50	15(2)
INORGANICS:										
Aluminum	NA	NA	NA	587000	NA	NA	NA	16900	-	-
Antimony				20.9 B				13.3 U	-	10/5(3)
Arsenic				50.3				11	50	50
Barium				804				67 B	1000	2000
Beryllium				5.8				0.5 U	-	1(1)
Calcium				33800				127000	-	-
Chromium				457				26.3	50	100
Cobalt				30.9 B				10.9 B	-	-
Copper				81.4				11.2 B	1000	1300(2)
Iron				101000				16200	300	-
Mercury				0.35				0.1 U	1.1	2
Nickel				186				17 B	150	100(1)
Potassium				24000				3030 B	-	-
Selenium				3.4 U				4.2 B	10	50
Silver				4.1 B				1.6 U	50	50(4)
Sodium				9560				8570	-	-
Vanadium				518				40.3 B	-	-
Zinc				295				91.8	5000	-
Cyanide				10 U				10 U	154	200(1)

NOTES:
- * - North Carolina water quality criteria for groundwater.
- NA - Not analyzed
- (-) - No standard set
- < - Less than detection limit
- 1 - Proposed maximum contaminant level (MCL)
- 2 - MCL is Action Level for Public Water Supply Systems, effective November 6, 1991.
- 3 - Two proposed MCLs
- 4 - Silver currently has an MCL of 50 ug/L; as of 7/30/92 silver will no longer have a primary MCL, its secondary MCL of 100 ug/L will become effective.

QUALIFIERS:
- U - Compound was analyzed, but not detected.
- B - Analyte found in associated blank, organics
- \- Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics
- J - Value is estimated

TABLE 4-2
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 1709 AND 1710

													STANDARDS	
WELL NUMBER	HPGW1				HPGW2				HPGW3				NORTH CAROLINA*	Primary MCLs
UNIT	ug/L				ug/L				ug/L					
DATE SAMPLED	1/9/87	3/8/87	5/27/8	1/18/91	1/9/87	3/8/87	5/27/8	1/18/91	1/9/87	3/8/87	5/27/8	1/18/91	ug/L	ug/L
VOLATILES:														
Acetone	NA	NA	NA	10 J	NA	NA	NA	10 U	NA	NA	NA	10 U	-	-
Benzene	43	3.9	< 1	5 U	12	< 1	< 1	5 U	1.4	< 1	< 1	5 U	1	5
Chloromethane	< 4.3	< 4.3	< 4.3	10 U	5	< 4.3	< 4.3	10 U	< 4.3	< 4.3	< 4.3	10 U	-	-
Dichloroethylene, trans-1,2-	< 1.6	< 1.6	< 1.6	N/A	< 1.6	< 1.6	< 1.6	NA	< 1.6	< 1.6	< 1.6	NA	-	100
Dichloroethylene, (total),1,2-	NA	NA	NA	73	NA	NA	NA	5 U	NA	NA	NA	5 U	-	-
Ethyl benzene	12	< 7.2	< 7.2	5 U	< 7.2	< 7.2	< 7.2	5 U	8.2	9	< 7.2	5 U	29	700
Methylene chloride	< 2.8	< 2.8	< 50	5 U	< 2.8	< 2.8	< 50	5 U	< 2.8	< 2.8	< 50	5 U	5	5 (1)
Trichloroethylene	< 3	< 3	< 1	91	< 3	< 3	< 1	5 U	< 3	< 3	< 1	5 U	2.8	5
Toluene	100	12	< 6	5 U	38	< 6	< 6	5 U	< 6	< 6	< 6	5 U	1000	1000
Trichloroethane, 1,1,1-	< 3.8	< 3.8	< 3.8	5 U	< 3.8	< 3.8	< 3.8	5 U	< 3.8	13	< 3.8	5 U	200	200
Xylene (total)	62	< 12	< 12	5 U	28	< 12	< 12	5 U	< 12	< 12	< 12	5 U	400	10000
Oil & Grease	700	< 100	< 200	NA	700	< 100	< 200	NA	800	200	< 200	NA	-	-
Total Lead	27	< 27	< 49.2	16.6	< 27	< 27	< 49.2	29.4	40	< 27	< 49.2	11.4	50	15 (2)

NOTES:
* - North Carolina water quality criteria for groundwater.
< - Less than detection limit
NA - Not analyzed
(-) - No standard set
1 - Proposed maximum contaminant level (MCL)
2 - MCL is Action Level for Public Water Supply Systems.
3 - Two proposed MCLs
4 - Silver currently has an MCL of 50 ug/L; as of July 30, 1992 silver will no longer have a primary MCL,its secondary MCL of 100 ug/L will become effective.

QUALIFIERS:
U - Compound was analyzed for but not detected.
B - Analyte found in associated blank, organics
- Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics
J - Value is estimated

continued

TABLE 4-2 (cont)
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 1709 AND 1710

													STANDARDS	
WELL NUMBER	HPGW1				HPGW2				HPGW3				NORTH CAROLINA*	Primary MCLs
UNIT	ug/L				ug/L				ug/L					
DATE SAMPLED	1/9/87	3/8/87	5/27/8	1/18/91	1/9/87	3/8/87	5/27/8	1/18/91	1/9/87	3/8/87	5/27/8	1/18/91	ug/L	ug/L
INORGANICS:														
Aluminum	NA	NA	NA	30600	NA	NA	NA	56000	NA	NA	NA	19300	-	-
Antimony				13.3 U				15.6 B				46.5 B	-	10/5(3)
Arsenic				8 B				24.1				15.6	50	50
Barium				166 B				84.4 B				55.5 B	1000	2000
Beryllium				6				1.7 B				1.2 B	-	1 (1)
Calcium				30100				46800				29800	-	-
Chromium				87				64.3				16.7	50	100
Cobalt				6 U				6.1 B				8 U	-	-
Copper				17.4 B				17.3 B				5.5 B	1000	1300(2)
Iron				64100				34800				10400	300	-
Lead				16.6				29.4				11.4	50	15(2)
Magnesium				5590				3980 B				2580 B	-	-
Manganese				168				77.7				53.9	50	-
Mercury				0.1 U				0.1 U				0.1 U	1.1	2
Nickel				31.3 B				16.9 B				12.1 B	150	100(1)
Potassium				3940 B				4820 B				2230 B	-	-
Selenium				3.4 U				3.6 B				3.4 U	10	50
Silver				4.7 B				1.6 U				1.6 U	50	50 (4)
Sodium				10900				3680 B				6390	-	-
Vanadium				92.1				160				35.9 B	-	-
Zinc				163				88.2				59.8	5000	-
Cyanide				10 U				11.2 U				11.2	154	200(1)

NOTES:
* - North Carolina water quality criteria for groundwater.
< - Less than detection limit
NA - Not analyzed
(-) - No standard set
1 - Proposed MCL
2 - MCL is Action Level for Public Water Supply Systems, effective November 6, 1991.
3 - Two proposed MCLs
4 - Silver currently has an MCL of 50 ug/L; as of July 30, 1992
silver will no longer have a primary MCL,its secondary MCL
of 100 ug/L will become effective.

QUALIFIERS:
U - Compound was analyzed for but not detected.
B - Analyte found in associated blank, organics
- Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics
J - Value is estimated

continued

TABLE 4-2 (cont)
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 1709 AND 1710

						STANDARDS	
WELL NUMBER	HPGW4-1				HPGW4-1	NORTH CAROLINA*	Primary MCLs
UNIT	ug/L				ug/L		
DATE SAMPLED	1/12/8	3/8/87	5/27/8	1/18/91	1/18/91	ug/L	ug/L
VOLATILES:							
Acetone	NA	NA	NA	40	26	-	-
Benzene	25	3.2	1.6	5 U	5 U	1	5
Chloromethane	< 4.3	4.3	< 4.3	10 U	10 U	-	-
Dichloroethylene, trans-1,2-	1.9	2.2	4.4	NA	NA	-	100
Dichloroethylene, (total),1,2-	NA	NA	NA	5 U	0.6 J	-	-
Ethyl benzene	< 7.2	7.2	< 7.2	5 U	5 U	29	700
Methylene chloride	< 2.8	2.8	< 50	5 U	2 J	5	5 (1)
Trichloroethylene	3.4	3	7.7	0.9 J	1 J	2.8	5
Toluene	35	8.2	< 6	5 U	5 U	1000	1000
Trichloroethane, 1,1,1-	< 3.8	3.8	< 3.8	5 U	5 U	200	200
Xylene (total)	< 12	12	< 12	5 U	5 U	400	10000
Oil & Grease	300	300	< 200	NA	-	-	-
Total Lead	29	27	< 49.2	66.6	-	50	15 (2)

NOTES:
* - North Carolina water quality criteria for groundwater.
< - Less than detection limit
NA - Not analyzed
(-) - No standard set
1 - Proposed maximum contaminant level (MCL)
2 - MCL is Action Level for Public Water Supply Systems.
3 - Two proposed MCLs
4 - Silver currently has an MCL of 50 ug/L; as of July 30, 1992 silver will no longer have a primary MCL,its secondary MCL of 100 ug/L will become effective.

QUALIFIERS:
U - Compound was analyzed for but not detected.
B - Analyte found in associated blank, organics
- Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics
J - Value is estimated

continued

TABLE 4-2 (cont)
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 1709 AND 1710

						STANDARDS	
WELL NUMBER	HPGW4-1				HPGW4-1	NORTH CAROLINA*	Primary MCLs
UNIT	ug/L				ug/L		
DATE SAMPLED	1/12/8	3/8/87	5/27/8	1/18/91	1/18/91	ug/L	ug/L
INORGANICS:							
Aluminum	NA	NA	NA	97000	96800	-	-
Antimony				21.9 B	34.6 B	-	10/5(3)
Arsenic				15.5	19.4	50	50
Barium				268	273	1000	2000
Beryllium				6.7	6.4	-	1 (1)
Calcium				296000	310000	-	-
Chromium				187	195	50	100
Cobalt				14.4 B	18.2 B	-	-
Copper				35.4	39.2	1000	1300(2)
Iron				100000	106000	300	-
Lead				66.6	45.6	50	15(2)
Magnesium				12100	12500	-	-
Manganese				425	436	50	-
Mercury				0.1 U	0.1 U	1.1	2
Nickel				57	64.3	150	100(1)
Potassium				9710	9520	-	-
Selenium				3.4 U	3.4 U	10	50
Silver				1.6 U	2.4 B	50	50 (4)
Sodium				11400	11100	-	-
Vanadium				213	222	-	-
Zinc				228	272	5000	-
Cyanide				10 U	10 U	154	200(1)

NOTES:
* - North Carolina water quality criteria for groundwater.
< - Less than detection limit
NA - Not analyzed
(-) - No standard set
1 - Proposed MCL
2 - MCL is Action Level for Public Water Supply Systems, effective November 6, 1991.
3 - Two proposed MCLs
4 - Silver currently has an MCL of 50 ug/L; as of July 30, 1992
silver will no longer have a primary MCL,its secondary MCL
of 100 ug/L will become effective.
QUALIFIERS:
U - Compound was analyzed for but not detected.
B - Analyte found in associated blank, organics
- Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics
J - Value is estimated

TABLE 4-3
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDING 1613

													STANDARDS	
WELL NUMBER	HPGW5				HPGW6				HPGW7				North Carolina*	Primary MCLs
UNITS	ug/L				ug/L				ug/L					
DATE SAMPLED	1/12/87	3/8/87	5/27/87	1/18/91	1/12/87	3/8/87	5/27/87	1/18/91	1/12/87	3/9/87	5/27/87	1/18/91	ug/L	ug/L
Oil & Grease	900	< 100	< 200	NA	200	< 100	< 200	NA	3000	200	< 200	NA	-	-
Total Lead	< 27	< 27	< 49.2	13.6	< 27	< 27	< 49.2	60.7	< 27	29	< 49.2	112	50	15 (1)
INORGANICS:														
Aluminum	NA	NA	NA	3580	NA	NA	NA	1050000	NA	NA	NA	161000	-	-
Antimony				13.3 U				13.3 U				22 U	-	10/5(2)
Arsenic				1.5 U				31.5				18.3	50	50
Barium				13.6 B				1960				670	1000	2000
Beryllium				0.86 B				20				4.8 B	-	1 (3)
Calcium				80100				11200				10500	-	-
Chromium				3.6 B				1590				313	50	100
Cobalt				6 U				51.9				17.7 B	-	-
Copper				4.1 B				194				44.2	1000	1300(1)
Iron				3100				265000				65700	300	-
Lead				13.6				60.7				112	50	15 (1)
Magnesium				11100				49700				18200	-	-
Manganese				162				487				136	50	-
Mercury				0.1 U				1.4				0.25	1.1	2
Nickel				5.2 U				161				50.7	150	100(3)
Potassium				3930 B				55300				12000	-	-
Selenium				4.4 B				3.4 U				2.6 B	10	50
Silver				1.6 U				2.3 B				6.2 U	50	50 (4)
Sodium				22400				14800				11500	-	-
Vanadium				2.4 U				1610				285	-	-
Zinc				71.3				537				218	5000	-
Cyanide				10 U				10 U				10 U	154	200(3)

NOTES:

* - These standards are water quality standards applicable to the groundwaters of North Carolina.

<X - Less than detection limit

NA - Not analyzed

(-) - No standard set

1 - Maximum contaminant level (MCL) is Action Level for Public Water Supply System.

2 - Two proposed MCLs

3 - Proposed MCL

4 - Silver currently has an MCL of 50 ug/L; as of 7/30/92 silver will no longer have a primary MCL, its secondary MCL of 100 ug/L will become effective.

QUALIFIERS:

U - Compound was analyzed, but not detected.

B - Reported value is < Contract Required Detection Limit, but > Instrument Detection Limit, inorganics

TABLE 4-4
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 1502, 1601 AND 1602

									STANDARDS	
WELL NUMBER	HPGW8				HPGW9-1				North Carolina*	Primary MCLs
UNIT	ug/L				ug/L					
DATE SAMPLED	3/13/87	3/9/87	5/28/87	1/18/91	1/14/87	3/9/87	5/28/87	1/18/91	ug/L	ug/L
VOLATILES:										
Carbon Disulfide	NA	NA	NA	5 U	NA	NA	NA	13	-	-
Chloroform	< 1.6	< 1.6	< 1.6	5 U	< 160	< 400	< 160	15	0.19	-
Chloromethane	7.2	< 4.3	< 4.3	10 U	< 430	< 1100	< 430	10 U	-	-
Dichloroethylene (total), 1,2-	< 2.8	< 2.8	< 2.8	5 U	< 280	< 700	< 280	1200	-	-
Dichlorothylene, trans,1,2-	< 1.6	< 1.6	< 1.6	NA	740	< 400	2700	NA	70	100
Ethyl Benzene	< 7.2	< 7.2	< 7.2	5 U	1100	< 1800	< 720	700	29	700
Methylene Chloride	20	< 2.8	< 50	5 U	< 280	< 700	< 280	5 U	5	5(1)
Toluene	< 6	< 6	< 6	5 U	< 600	< 1500	< 600	330 J	1000	1000
Trichloroethene	< 3	< 3	< 1	2 J	5000	6100	< 100	14000	2.8	5
Trichlorofluoromethane	14	96	< 3.2	NA	< 320	< 800	< 320	NA	-	-
Xylene (total)	< 12	< 12	< 12	5 U	4500	< 3000	4000	3300	400	10000
SEMI-VOLATILES:										
bis(2-Ethylhexyl)phthalate	NA	NA	NA	2 J	NA	NA	NA	10 U	-	-
Methylnaphthalene, 2-	NA	NA	NA	10 U	NA	NA	NA	49	-	-
Naphthalene	NA	NA	NA	10 U	NA	NA	NA	190	-	-
Oil & Grease	100	< 100	< 200	NA	32000	11000	6000	NA	-	-
Total Lead	< 27	< 27	< 49.2	54.1	130	92	70	128	50	15 (2)

NOTES:
* - North Carolina water quality standards for groundwater.
<X - Less than detection limit
NA - Not analyzed
(-) - No standard set
1 - *Proposed MCL*
2 - MCL is Action Level for Public Water Supply Systems, effective November 6, 1991.
3 - Two proposed MCLs
QUALIFIERS:
U - Compound was analyzed, but not detected.
B - Analyte found in associated blank, organics
- Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics

continued

TABLE 4-4 *(cont)*
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 1502, 1601 AND 1602

WELL NUMBER	HPGW8				HPGW9-1				STANDARDS	
UNIT	ug/L				ug/L				North Carolina*	Primary MCLs
DATE SAMPLED	3/13/87	3/9/87	5/28/87	1/18/91	1/14/87	3/9/87	5/28/87	1/18/91	ug/L	ug/L
INORGANICS:										
Aluminum	NA	NA	NA	91700	NA	NA	NA	59100	-	-
Antimony				22 U				17.6 B	-	10/5 (3)
Arsenic				28.4				3 B	50	50
Barium				173 B				126 B	1000	2000
Beryllium				2.1 U				0.79 B	-	1 (1)
Calcium				10600				23500	-	-
Chromium				91.8				66.4	50	100
Cobalt				7.9 B				6 U	-	-
Copper				19.5 B				27.1	1000	1300 (2)
Iron				40900				19800	300	-
Lead				54.1				128	50	15 (2)
Magnesium				5780				11000	-	-
Manganese				46.5				45	50	-
Mercury				0.13 B				0.1 U	1.1	2
Nickel				25.2 B				15.1 B	150	100(1)
Potassium				5300				5370	-	-
Selenium				3.6 B				3.6 B	10	50
Sodium				8600				20400	-	-
Vanadium				945				75.3	-	-
Zinc				118				115	5000	-
Cyanide				10 U				10 U	154	200(1)

NOTES:

* - North Carolina water quality standards for groundwater.
<X - Less than detection limit
NA - Not analyzed
(-) - No standard set
1 - Proposed maximum contaminant level (MCL)
2 - MCL is Action Level for Public Water Supply Systems.
3 - Two proposed MCLs

QUALIFIERS:

U - Compound was analyzed, but not detected.
B - Analyte found in associated blank, organics
- Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics

continued

TABLE 4-4 (cont)
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 1502, 1601 AND 1602

WELL NUMBER	HPGW10				HPGW11				STANDARDS	
									North Carolina*	Primary MCLs
UNIT	ug/L				ug/L					
DATE SAMPLED	1/14/87	3/9/87	5/28/8	1/18/91	1/14/87	3/9/87	5/28/87	1/18/91	ug/L	ug/L
VOLATILES:										
Carbon Disulfide	NA	NA	NA	5 U	NA	NA	NA	11	-	-
Chloroform	< 1.6	< 1.6	< 1.6	5 U	3.2	2.2	2.6	5 U	0.19	-
Chloromethane	< 4.3	< 4.3	< 4.3	10 U	< 4.3	< 4.3	< 4.3	10 U	-	-
Dichloroethylene (total), 1,2-	< 2.8	< 2.8	< 2.8	5 U	< 2.8	< 2.8	< 2.8	5 U	-	-
Dichlorothylene, trans,1,2-	< 1.6	< 1.6	< 1.6	NA	13	7.2	6	NA	70	100
Ethyl Benzene	< 7.2	< 7.2	< 7.2	5 U	< 7.2	< 7.2	< 7.2	5 U	29	700
Methylene Chloride	< 2.8	< 2.8	< 50	5 U	< 2.8	< 2.8	< 50	5 U	5	5(1)
Toluene	< 6	< 6	< 6	5 U	< 6	< 6	< 6	5 U	1000	1000
Trichloroethene	7.4	8.6	< 1	5 U	49	34	24	5 U	2.8	5
Trichlorofluoromethane	< 3.2	< 3.2	< 3.2	NA	< 3.2	< 3.2	< 3.2	NA	-	-
Xylene (total)	< 12	< 12	< 12	5 U	< 12	< 12	< 12	5 U	400	10000
SEMI-VOLATILES:										
bis(2-Ethylhexyl)phthalate	NA	NA	NA	10 U	NA	NA	NA	10 U	-	-
Methylnaphthalene, 2-	NA	NA	NA	10 U	NA	NA	NA	10 U	-	-
Naphthalene	NA	NA	NA	10 U	NA	NA	NA	10 U	-	-
Oil & Grease	400	< 100	< 200	NA	300	600	< 200	NA	-	-
Total Lead	29	< 27	< 49.2	186	< 27	< 27	< 49.2	45.2	50	15 (2)

NOTES:
* - North Carolina water quality standards for groundwater.
<X - Less than detection limit
NA - Not analyzed
(-) - No standard set
1 - Proposed MCL
2 - MCL is Action Level for Public Water Supply Systems, effective November 6, 1991.
3 - Two proposed MCLs
QUALIFIERS:
U - Compound was analyzed, but not detected.
B - Analyte found in associated blank, organics
- Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics

continued

TABLE 4-4 (cont)
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 1502, 1601 AND 1602

									STANDARDS	
WELL NUMBER	HPGW10				HPGW11				North Carolina*	Primary MCLs
UNIT	ug/L				ug/L					
DATE SAMPLED	1/14/87	3/9/87	5/28/8	1/18/91	1/14/87	3/9/87	5/28/87	1/18/91	ug/L	ug/L
INORGANICS:										
Aluminum	NA	NA	NA	348000	NA	NA	NA	95200	-	-
Antimony				22 U				22 U	-	10/5 (3)
Arsenic				39.9				9.1 B	50	50
Barium				492				298	1000	2000
Beryllium				5.6				2.1 U	-	1 (1)
Calcium				56200				9730	-	-
Chromium				310				140	50	100
Cobalt				31.4 B				6.4 U	-	-
Copper				72.2				30	1000	1300 (2)
Iron				119000				31800	300	-
Lead				186				45.2	50	15 (2)
Magnesium				14900				11200	-	-
Manganese				255				130	50	-
Mercury				0.82				0.1 B	1.1	2
Nickel				92.2				23.6 B	150	100(1)
Potassium				17100				7320	-	-
Selenium				1.6 U				3.7 B	10	50
Sodium				3950 B				5410	-	-
Vanadium				376				166	-	-
Zinc				224				94	5000	-
Cyanide				10 U				10 U	154	200(1)

NOTES:

* - North Carolina water quality standards for groundwater.
<X - Less than detection limit
NA - Not analyzed
(-) - No standard set
1 - Proposed maximum contaminant level (MCL)
2 - MCL is Action Level for Public Water Supply Systems.
3 - Two proposed MCLs

QUALIFIERS:

U - Compound was analyzed, but not detected.
B - Analyte found in associated blank, organics
- Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics

TABLE 4-5
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDING 1202

WELL NUMBER	HPGW15				HPGW16				STANDARDS	
									North Carolina*	Primary MCLs
UNITS	ug/L				ug/L				ug/L	ug/L
DATE SAMPLED	1/15/87	3/9/87	5/28/87	1/18/91	1/15/87	3/10/87	5/28/87	1/18/91		
VOLATILES:										
Dichloroethylene (total), 1,2-	< 2.8	2.8	2.8	7	< 2.8	< 2.8	< 2.8	5 U	-	-
Trichloroethene	< 3	3	1	4 J	< 3	< 3	< 1	5 U	2.8	5
Trichlorofluoromethane	< 3.2	3.2	7.1	N/A	< 3.2	< 3.2	< 3.2	N/A	-	-
Oil & Grease	< 100	100	200	N/A	200	3000	< 200	N/A	-	-
Total Lead	46	27	49.2	16.6	45	41	< 49.2	100	50	15 (2)
INORGANICS:										
Aluminum	NA	NA	NA	18500	NA	NA	NA	213000	-	-
Antimony				22 U				22 U	-	10/5(3)
Arsenic				1.8 U				17.3	50	50
Barium				119 B				276	1000	2000
Beryllium				2.1 U				5.3	-	1 (4)
Calcium				12000				33400	-	-
Chromium				21.4				209	-	100
Cobalt				6.4 U				18.7 B	-	-
Copper				12.2 B				44.6 B	1000	1300 (2)
Iron				4800				47200	300	-
Lead				16.6				100	50	15 (2)
Magnesium				5650				8110	-	-
Manganese				18.3				98.3	50	-
Mercury				0.1 U				0.13 B	1.1	2
Nickel				11 U				41	150	100(4)
Potassium				3390 B				12100	-	-
Sodium				6950				4960	-	-
Thallium				1.1 U				1.4 B	-	2/1(3)
Vanadium				24.9 B				225	-	-
Zinc				88.1				157	5000	-
PESTICIDES:										
Dieldrin				0.1 U				0.1 U	-	-

NOTES:

* - North Carolina water quality criteria for groundwater.
NA - Not analyzed
(-) - No standard set
<X - Less than detection limit
1 - Well HPGW18 could not be located during the supplemental investigation.
2 - Maximum contaminant level (MCL) is Action Level for Public Water Supply Systems.
3 - Two proposed MCLs
4 - Proposed MCL

QUALIFIERS:

U - Compound was analyzed, but not detected
B - Analyte found in associated blank, organics
- Reported value is < Contract Required Detection Limit
- but > Instrument Detection Limit, inorganics
J - Value is estimated

continued

TABLE 4-5 (cont)
CONSTITUENTS FOUND IN GROUNDWATER
BUILDING 1202

WELL NUMBER	HPGW17				HPGW18 (1)				STANDARDS	
UNITS	ug/L				ug/L				North Carolina*	Primary MCLs
DATE SAMPLED	1/15/87	3/10/87	5/28/87	1/18/91	1/15/87	3/8/87	5/27/87	1/18/91	ug/L	ug/L
VOLATILES:										
Dichloroethylene (total), 1,2-	< 2.8	< 2.8	< 2.8	5 U	< 2.8	< 2.8	< 2.8	NA	-	-
Trichloroethene	< 3	< 3	< 1	5 U	< 1	< 3	< 1	NA	2.8	5
Trichlorofluoromethane	< 3.2	< 3.2	< 3.2	N/A	< 3.2	< 3.2	< 3.2	NA	-	-
Oil & Grease	< 100	3000	< 200	N/A	< 100	2000	< 200	NA	-	-
Total Lead	< 27	< 27	< 49.2	23.7	< 27	< 27	< 49.2	NA	50	15 (2)
INORGANICS:										
Aluminum	NA	NA	NA	29000	NA	NA	NA	NA	-	-
Antimony				22 U					-	10/5(3)
Arsenic				1.8 U					50	50
Barium				70.1 B					1000	2000
Beryllium				2.1 U					-	1 (4)
Calcium				60800					-	-
Chromium				37					-	100
Cobalt				6.4 U					-	-
Copper				20 B					1000	1300 (2)
Iron				10500					300	-
Lead				23.7					50	15 (2)
Magnesium				6790					-	-
Manganese				31.3					50	-
Mercury				0.1 U					1.1	2
Nickel				11.9 B					150	100(4)
Potassium				3530 B					-	-
Sodium				4480 B					-	-
Thallium				1.1 U					-	2/1(3)
Vanadium				52.1					-	-
Zinc				76.5					5000	-
PESTICIDES:										
Dieldrin				0.11					-	-

NOTES:
* - North Carolina water quality criteria for groundwater.
NA - Not analyzed
(-) - No standard set
<X - Less than detection limit
1 - Well HPGW18 could not be located during the supplemental investigation.
2 - Maximum contaminant level (MCL) is *Action Level for Public Water Supply Systems.*
3 - Two proposed MCLs
4 - Proposed MCL

QUALIFIERS:
U - Compound was analyzed, but not detected
B - Analyte found in associated blank, organics
- Reported value is < Contract Required Detection Limit
- but > Instrument Detection Limit, inorganics
J - Value is estimated

TABLE 4-6
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDING 1100

					STANDARDS	
WELL NUMBER	HPGW19				North Carolina*	Primary MCLs
UNIT	ug/L					
DATE SAMPLED	1/16/87	3/10/87	5/28/87	1/18/91	ug/L	ug/L
VOLATILES:						
Dichloroethylene (total),1,2-	NA	NA	NA	0.8 J	-	-
Dichloroethylene, trans,1,2-	2.5	< 1.6	< 1.6	NA	70	100
Tetrachloroethene	< 3	< 3	< 3	2 J	0.7	5
Trichloroethene	6	< 3	< 1	2 J	2.8	5
Oil & Grease	200	2000	< 200	NA	-	-
Total Lead	< 27	< 27	< 49.2	31.7	50	15 (1)
INORGANICS:						
Aluminum	NA	NA	NA	6840	-	-
Antimony				13.3 U	-	10/5 (2)
Arsenic				5 B	50	50
Barium				92.9 B	1000	2000
Beryllium				2.3 B	-	1 (1)
Calcium				3120 B	-	-
Chromium				13.8	50	100
Copper				8.6 B	1000	1300 (1)
Iron				36200	300	-
Lead				31.7	50	15 (1)
Magnesium				4200 B	-	-
Manganese				79	50	-
Nickel				7.3 B	150	100(1)
Potassium				2370 B	-	-
Silver				2.9 B	50	50 (4)
Sodium				23500	-	-
Vanadium				19.8 B	-	-
Zinc				81.1	5000	-

NOTES:
* - North Carolina water quality standards for groundwater.
NA - Not analyzed
(-) - No standard set
1 - Proposed MCL
2 - MCL is Action Level for Public Water Supply Systems.
3 - Two proposed MCLs
4 - Silver currently has an MCL of 50 ug/L; as of 7/30/92 silver's secondary MCL of 100 ug/L will become effective.

QUALIFIERS:
B - Reported value is < Contract Required Detection Limit but > Instrument Detection Limit.
J - Estimated value

TABLE 4-7
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 901, 902, 903

WELL NUMBER	HPGW22				HPGW23				STANDARDS	
									North Carolina*	Primary MCLs
UNITS	ug/L				ug/L					
DATE SAMPLED	1/19/87	3/11/87	5/29/87	1/18/91	1/19/87	3/11/87	5/29/87	1/18/91	ug/L	ug/L
VOLATILES:										
Benzene	< 1	< 1	< 1	5 U	< 10	100	< 100	24	1	5
Carbon Disulfide	NA	NA	NA	5 U	NA	NA	NA	5	-	-
Dichloroethane,1,1-	< 4.7	< 4.7	< 4.7	5 U	< 47	470	< 470	5 U	-	-
Dichloroethane,1,2-	< 2.8	< 2.8	< 2.8	5 U	< 28	280	< 280	5 U	0.38	5
Dichloroethene,1,1-	NA	NA	NA	5 U	NA	NA	NA	5 U	7	7
Dichloroethylene (total), 1,2-	NA	NA	NA	5 U	NA	NA	NA	8900	-	-
Dichloroethylene, trans,1,2-	< 1.6	< 1.6	< 1.6	NA	830	6100	7100	NA	70	100
Ethyl Benzene	< 7.2	< 7.2	< 7.2	5 U	< 72	720	< 720	9	29	700
Methylene Chloride	< 2.8	< 2.8	< 50	9	< 28	300	< 5000	5 U	5	5 (1)
Tetrachloroethene	< 3	< 3	< 3	5 U	< 30	200	< 200	5 U	0.7	5
Toluene	< 6	< 6	< 6	5 U	< 60	600	< 600	13	1000	1000
Trichloroethene	< 3	< 1	< 1	5 U	830	13000	4300	3700	2.8	5
Trichloroethane, 1,1,2-	< 5	< 5	< 5	5 U	< 50	500	< 500	5 U	-	200
Vinyl Chloride	< 1	< 1	< 1	10 U	< 10	100	< 100	8 J	0.015	2
Xylene (total)	< 12	< 12	< 12	5 U	< 120	1200	< 1200	41	400	10000
SEMI-VOLATILES:										
Acenaphthene	NA	NA	NA	3 J	NA	NA	NA	10	-	-
Dibenzofuran				2 J				10	-	-
Fluorene				5 J				10	-	-
bis(2-ethylhexyl)Phthalate				10 U				3	-	-
Naphthalene				10 U				10	-	-
Methylnaphthalene, 2-				10 U				10	-	-
Oil & Grease	1000	2000	< 200	NA	600	3000	< 200	NA	-	-
Total Lead	27	< 27	< 49.2	39.4	38	27	< 49.2	45	50	15 (2)

continued

TABLE 4-7 (cont)
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 901, 902, 903

WELL NUMBER	HPGW22				HPGW23				STANDARDS North Carolina*	STANDARDS Primary MCLs
UNITS	ug/L				ug/L					
DATE SAMPLED	1/19/87	3/11/87	5/29/87	1/18/91	1/19/87	3/11/87	5/29/87	1/18/91	ug/L	ug/L
INORGANICS:										
Aluminum	NA	NA	NA	71800	NA	NA	NA	82500	-	-
Antimony				24.6 B				24.6 B	-	10/5(3)
Arsenic				7.2 B				6.6 B	50	50
Barium				102 B				196 B	1000	1000
Beryllium				0.6 B				1 B	-	1(1)
Calcium				96300				7890	-	-
Chromium				79.8				76.3	50	100
Cobalt				6 U				11.9 B	-	-
Copper				40				30.5	1000	1300(2)
Iron				24400				23300	300	-
Lead				39.4				45	50	15(2)
Magnesium				5210				6050	-	-
Manganese				94.1				68.8	50	-
Mercury				0.1 U				0.1 U	1.1	2
Nickel				23.2 B				33.2 B	150	100(1)
Potassium				6930				3880 B	-	-
Silver				2.5 B				6.6 B	50	50(4)
Sodium				5300				6260	-	-
Vanadium				100				77.6	-	-
Zinc				77.4				89.3	5000	-
Cyanide				10 U				10 U	154	200(1)

NOTES:
- * - North Carolina water quality criteria for groundwater.
- NA - Not analyzed
- (-) - No standard set
- < - Less than detection limit
- 1 - Proposed maximum contaminant levels MCLs
- 2 - MCL is Action Level for Public Water Supply Systems.
- 3 - Two proposed MCLs
- 4 - Silver currently has an MCL of 50 ug/L;as of 7/30/92 silver will no longer have a primary MCL, its secondary MCL of 100 ug/L will become effective.

QUALIFIERS:
- U - Compound was analyzed but not detected
- B - Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics
- J - estimated value
- D - Compound analyzed at a secondary dilution factor

continued

TABLE 4-7 (cont)
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 901, 902, 903

									STANDARDS	
WELL NUMBER	HPGW24				HPGW25				North Carolina*	Primary MCLs
UNITS	ug/L				ug/L					
DATE SAMPLED	1/19/87	3/11/87	5/29/87	1/18/91	1/19/87	3/11/87	5/29/87	1/18/91	ug/L	ug/L
VOLATILES:										
Benzene	2	< 100	< 100	3 J	< 1	< 1	< 1	5 U	1	5
Carbon Disulfide	NA	NA	NA	7	NA	NA	NA	5 U	-	-
Dichloroethane,1,1-	12	< 470	< 470	5 U	< 4.7	< 4.7	< 4.7	5 U	-	-
Dichloroethane,1,2-	< 280	< 280	< 280	0.8 J	< 2.8	< 2.8	< 2.8	5 U	0.38	5
Dichloroethene,1,1-	NA	NA	NA	65	NA	NA	NA	5 U	7	7
Dichloroethylene (total), 1,2-	NA	NA	NA	42000 D	NA	NA	NA	5 U	-	-
Dichloroethylene, trans,1,2-	6400	4300	4000	NA	< 1.6	< 1.6	< 1.6	NA	70	100
Ethyl Benzene	< 720	< 720	< 720	3 J	< 7.2	< 7.2	< 7.2	5 U	29	700
Methylene Chloride	< 280	< 280	< 5000	5 U	< 2.8	2.9	< 50	5 U	5	5 (1)
Tetrachloroethene	< 300	< 200	< 200	5 U	< 3	< 3	< 3	5 U	0.7	5
Toluene	< 600	< 600	< 600	13	< 6	< 6	< 6	5 U	1000	1000
Trichloroethene	57	< 100	< 100	180	< 3	< 1	< 1	5 U	2.8	5
Trichloroethane, 1,1,2-	< 500	< 500	< 500	3 J	< 5	< 5	< 5	5 U	-	200
Vinyl Chloride	190	< 100	250	25000 U	< 1	< 1	< 1	10 U	0.015	2
Xylene (total)	< 1200	< 1200	< 1200	10	< 12	< 12	< 12	5 U	400	10000
SEMI-VOLATILES:										
Acenaphthene	NA	NA	NA	6 J	NA	NA	NA	10 U	-	-
Dibenzofuran				10 U				10 U	-	-
Fluorene				10 U				10 U	-	-
bis(2-ethylhexyl)Phthalate				10 U				10 U	-	-
Naphthalene				130				10 U	-	-
Methylnaphthalene, 2-				3 J				10 U	-	-
Oil & Grease	100	2000	< 200	NA	200	300	< 200	NA	-	-
Total Lead	< 27	< 27	< 49.2	21.4	< 27	< 27	< 49.2	71.6	50	15 (2)

continued

TABLE 4-7 (cont)
CONSTITUENTS DETECTED IN GROUNDWATER
BUILDINGS 901, 902, 903

									STANDARDS	
WELL NUMBER	HPGW24				HPGW25				North Carolina*	Primary MCLs
UNITS	ug/L				ug/L					
DATE SAMPLED	1/19/87	3/11/87	5/29/87	1/18/91	1/19/87	3/11/87	5/29/87	1/18/91	ug/L	ug/L
INORGANICS:										
Aluminum	NA	NA	NA	15400	NA	NA	NA	218000	-	-
Antimony				22 U				13.3 U	-	10/5(3)
Arsenic				4.2 B				13.2	50	50
Barium				60.1 B				289	1000	1000
Beryllium				2.1 U				2.8 B	-	1(1)
Calcium				16600				6270	-	-
Chromium				26.3				205	50	100
Cobalt				6.4 U				10.5 B	-	-
Copper				11.5 B				57.7	1000	1300(2)
Iron				19200				46600	300	-
Lead				21.4				71.6	50	15(2)
Magnesium				2430 B				10000	-	-
Manganese				54.8				118	50	-
Mercury				0.1 U				0.1 U	1.1	2
Nickel				14 U				39.2 B	150	100(1)
Potassium				3130 B				13100	-	-
Silver				6.2 U				3.9 B	50	50(4)
Sodium				11800				18200	-	-
Vanadium				39.2 B				259	-	-
Zinc				70.5				119	5000	-
Cyanide				10 U				10 U	154	200(1)

NOTES:
* - North Carolina water quality criteria for groundwater.
NA - Not analyzed
(-) - No standard set
< - Less than detection limit
1 - Proposed maximum contaminant levels MCLs
2 - MCL is Action Level for Public Water Supply Systems.
3 - Two proposed MCLs
4 - Silver currently has an MCL of 50 ug/L;as of 7/30/92 silver will no longer have a primary MCL, its secondary MCL of 100 ug/L will become effective.

QUALIFIERS:
U - Compound was analyzed but not detected
B - Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics
J - estimated value
D - Compound analyzed at a secondary dilution factor

TABLE 4-8
CONSTITUENTS DETECTED IN GROUNDWATER
TRANSFORMER STORAGE AREA

			STANDARDS	
WELL NUMBER	21GW1		North Carolina*	Primary MCLs
UNITS	ug/L			
DATE SAMPLED	1/18/91		ug/L	ug/L
INORGANICS:				
Aluminum	40400		-	-
Antimony	17	B	-	10/5(1)
Arsenic	41.4		50	50
Barium	71	B	1000	2000
Beryllium	1.1	B	-	1 (2)
Calcium	60400		-	-
Chromium	39		50	100
Cobalt	10.8	B	-	-
Copper	13.2	B	1000	1300(3)
Iron	54900		300	-
Lead	15.8		50	15 (3)
Magnesium	10300		-	-
Manganese	200		50	-
Mercury	0.35		1.1	2
Nickel	21.4	B	150	100(2)
Potassium	4400	B	-	-
Sodium	17400		-	-
Vanadium	138		-	-
Zinc	233		5000	-
Cyanide	10	U	154	200(2)

NOTES:

* - North Carolina water quality criteria for groundwater.

1 - Two proposed MCLs

2 - Proposed MCL

3 - MCL is Action Level for Public Water Supply Systems.

4 - Silver currently has an MCL of 50 ug/L; as of 7/30/92 silver will no longer have a primary MCL, its secondary MCL of 100 ug/L will become effective.

QUALIFIERS:

U - Compound was analyzed for but not detected

B - Reported value is < Contract Required Detection Limit but > Instrument Detection Limit, inorganics

TABLE 4-9
CONSTITUENTS DETECTED IN GROUNDWATER MONITORING WELLS PAIRED TO WATER SUPPLY WELLS

													STANDARDS	
WELL NUMBER	HPGW2				HPGW13				HPGW20				North Carolina*	Primary MCLs
SUPPLY WELL NUMBER	Well 608				Well 601/660				Well 602					
UNITS	ug/L				ug/L				ug/L					
DATE SAMPLED	1/09/8	3/08/8	5/27/8	1/18/91	1/14/8	3/09/8	5/28/8	1/18/91	1/16/8	3/10/8	5/28/8	1/18/91	ug/L	ug/L
ORGANICS:														
Acetone	NA	NA	NA	10 U	NA	N/A	NA	10 U	NA	NA	NA	10 U	-	-
Benzene	12	< 1	< 1	5 U	< 1	< 1	< 1	5 U	< 1	< 1	< 1	5 U	1	5
Carbon disulfide	NA	NA	NA	5 U	NA	N/A	NA	5 U	NA	NA	NA	2 J	-	-
Chloromethane	5	< 4.3	< 4.3	10 U	< 4.3	< 4.3	< 4.3	10 U	< 4.3	< 4.3	< 4.3	10 U	-	-
Methylene chloride	< 2.8	< 2.8	< 50	5 U	< 2.8	< 2.8	< 50	1 J	< 2.8	3.4	< 50	0.9 J	5	5 (1)
Toluene	38	< 6	< 6	5 U	< 6	< 6	< 6	5 U	< 6	< 6	< 6	5 U	1000	1000
Xylene (total)	28	< 12	< 12	5 U	< 12	< 12	< 12	5 U	< 12	< 12	< 12	5 U	400	10000
Oil & Grease	700	< 100	< 200	NA	200	< 100	< 200	NA	< 100	3000	< 200	NA	-	-
Total Lead	< 27	< 27	< 49.2	29.4	< 27	< 27	< 49.2	9	46	33	< 49.2	20	50	15 (2)
INORGANICS:														
Aluminum	NA	NA	NA	56000	NA	NA	NA	13500	NA	NA	NA	289000	-	-
Antimony				15.6 B				13.3 U				21.9 B	-	10/5(3)
Arsenic				24.1				47				49.4	50	50
Barium				84.4 B				129 B				814	1000	2000
Beryllium				1.7 B				0.59 B				9.5	-	1 (1)
Calcium				46800				4100 B				6370	-	-
Chromium				64.3				48.9				424	50	100
Cobalt				6.1 B				9.3 B				80.8	-	-
Copper				17.3 B				17 B				97.7	1000	1300(2)
Iron				34800				33500				152000	300	-
Lead				29.4				9				20	50	15 (2)
Magnesium				3980 B				7700				18000	-	-
Manganese				77.7				30.3				217	50	-
Mercury				0.1 U				0.1 U				0.5	1.1	2
Nickel				16.9 B				21.1 B				168	150	100(1)
Potassium				4820 B				4520 B				16600	-	-
Selenium				3.6 B				3.4 U				3.4 U	10	50
Silver				1.6 U				2.1 B				4.3 B	50	50 (4)
Sodium				3680 B				18100				11000	-	-
Vanadium				160				40.5 B				419	-	-
Zinc				88.2				127				637	5000	-
Cyanide				11.2 U				10 U				10 U	154	200(1)

NOTES:

* - North Carolina water quality criteria for groundwater.

NA - Not analyzed

(-) - No standard set

<X - Less than detection limit

1 - Proposed MCL

2 - MCL is Action Level for Public Water Supply Systems.

3 - Two proposed MCLs

4 - Silver currently has an MCl of 50 ug/L; as of 7/30/92 silver will no longer have a MCL, it's secondary MCL of 100 ug/L will become effective.

QUALIFIERS:

U- Compound was analyzed for but not detected.

B- Analyte found in associated blank, organics

- Reported value is <Contract Required Detection Limit
- but >Instrument Detection Limit, inorganics

J - Value is estimated

continued

TABLE 4-9 (cont)
CONSTITUENTS DETECTED IN GROUNDWATER MONITORING WELLS PAIRED TO WATER SUPPLY WELLS

									STANDARDS	
WELL NUMBER	HPGW25				HPGW26				North Carolina*	Primary MCLs
SUPPLY WELL NUMBER	Well 634				Well 637					
UNITS	ug/L				ug/L					
DATE SAMPLED	1/19/87	3/11/87	5/29/87	1/18/91	1/19/87	3/12/87	5/29/87	1/18/91	ug/L	ug/L
ORGANICS:										
Acetone	NA	NA	NA	10 U	NA	NA	NA	7 B	-	-
Benzene	< 1	< 1	< 1	5 U	< 1	< 1	< 1	5 U	1	5
Carbon disulfide	NA	NA	NA	5 U	NA	NA	NA	2 J	-	-
Chloromethane	< 4.3	< 4.3	< 4.3	10 U	< 4.3	< 4.3	< 4.3	10 U	-	-
Methylene chloride	< 2.8	2.9	< 50	5 U	< 2.8	6.5	< 50	3 J	5	5 (1)
Toluene	< 6	< 6	< 6	5 U	< 6	< 6	< 6	5 U	1000	1000
Xylene (total)	< 12	< 12	< 12	5 U	< 12	< 12	< 12	5 U	400	10000
Oil & Grease	200	300	< 200	NA	200	2000	< 200	NA	-	-
Total Lead	< 27	< 27	< 49.2	71.6	31	< 27	< 49.2	9	50	15 (2)
INORGANICS:										
Aluminum	NA	NA	NA	218000	NA	NA	NA	10400	-	-
Antimony				13.3 U				13.3 U	-	10/5(3)
Arsenic				13.2				1.5 U	50	50
Barium				289				72 B	1000	2000
Beryllium				2.8 B				0.5 U	-	1 (1)
Calcium				6270				2830 B	-	-
Chromium				205				13	50	100
Cobalt				10.5 B				6 U	-	-
Copper				57.7				9.1 B	1000	1300(2)
Iron				46600				19000	300	-
Lead				71.6				9	50	15 (2)
Magnesium				10000				1830 B	-	-
Manganese				118				10.6 B	50	-
Mercury				0.1 U				0.1 U	1.1	2
Nickel				39.2 B				5.2 U	150	100(1)
Potassium				13100				2230 B	-	-
Selenium				3.4 U				3.4 U	10	50
Silver				3.9 B				1.6 U	50	50 (4)
Sodium				18200				5910	-	-
Vanadium				259				149	-	-
Zinc				119				68.1	5000	-
Cyanide				10 U				10 U	154	200(1)

NOTES:

* - North Carolina water quality criteria for groundwater.
NA - Not analyzed
(-) - No standard set
<X - Less than detection limit
1 - Proposed MCL
2 - MCL is Action Level for Public Water Supply Systems.
3 - Two proposed MCLs
4 - Silver currently has an MCl of 50 ug/L; as of 7/30/92 silver will no longer have a MCL, it's secondary MCL of 100 ug/L will become effective.

QUALIFIERS:

U- Compound was analyzed for but not detected.
B- Analyte found in associated blank, organics
- Reported value is <Contract Required Detection Limit
- but >Instrument Detection Limit, inorganics
J - Value is estimated

TABLE 4-10
CONSTITUENTS DETECTED IN GROUNDWATER
OTHER MONITORING WELLS

									STANDARDS	
WELL NUMBER	HPGW12				HPGW14				North Carolina*	Primary MCLs
LOCATION DESCRIP	Midway between Bldgs. 1202 & 1501				Midway between HPIA & Well 601					
UNITS	ug/L				ug/L					
DATE SAMPLED	1/14/87	3/08/87	5/27/87	1/18/91	1/14/87	3/09/87	5/28/87	1/18/91	ug/L	ug/L
ORGANICS:										
Acetone	NA	NA	NA	10 U	NA	N/A	NA	10 U	-	-
Ethylbenzene	< 7.2	< 7.2	< 7.2	5 U	< 7.2	< 7.2	< 7.2	5 U	29	700
Methylene chloride	< 2.8	< 2.8	< 50	5 U	< 2.8	< 2.8	< 50	5 U	5	5 (1)
Tetrachloroethene	< 3	3.6	< 3	5 U	< 3	< 3	< 3	5 U	0.7	5
Trichloroethene	< 3	< 3	< 1	5 U	< 3	< 3	< 1	5 J	2.8	5
Xylene (total)	< 12	< 12	< 12	5 U	< 12	< 12	< 12	5 U	400	10000
Oil & Grease	200	< 100	< 200	NA	200	< 100	< 300	NA	-	-
Total Lead	< 27	< 27	< 49.2	15.7	< 27	< 27	< 49.2	66.5	50	15 (2)
INORGANICS:										
Aluminum	NA	NA	NA	24000	NA	NA	NA	109000	-	-
Antimony				22 U				13.3 U	-	10/5(3)
Arsenic				1.8 U				45.6	50	50
Barium				91.5 B				299	1000	2000
Beryllium				2.1 U				2.7 B	-	1 (1)
Calcium				34100				4340 B	-	-
Chromium				25.5				127	50	100
Cobalt				6.4 B				12.9 B	-	-
Copper				5.9 B				34.8	1000	1300(2)
Iron				5600				87200	300	-
Lead				15.7				66.5	50	15 (2)
Magnesium				7700				8770	-	-
Manganese				18.3				80	50	-
Mercury				0.1 U				0.26	1.1	2
Nickel				11 U				41.6	150	100(1)
Potassium				2600 B				6890	-	-
Selenium				5.8				3.4 U	10	50
Silver				6.2 U				2.5 B	50	50 (4)
Sodium				9310				11500	-	-
Vanadium				31.1				163	-	-
Zinc				46.6				206	5000	-
Cyanide				10 U				10 U	154	200(1)

NOTES:
* - North Carolina water quality standards for groundwater.
<X - Less than detection limit
NA - Not analyzed
1 - Proposed MCL
2 - MCL is Action Level for Public Water Supply Systems.
3 - Silver currently has an MCL of 50 ug/L; as of 7/30/92 silver will no longer have a primary MCL, its secondary MCL of 100 ug/L will become effective.
4 - Two proposed MCLs

QUALIFIERS:
U - Compound was analyzed for but not detected.
B - Analyte found in associated blank, organics
Reported value is <Contract Required Detection Limit but >Instrument Detection Limit, inorganics
J - Value is estimated

continued

TABLE 4-10 (cont)
CONSTITUENTS DETECTED IN GROUNDWATER
OTHER MONITORING WELLS

									STANDARDS	
WELL NUMBER	HPGW21				HPGW29				North Carolina*	Primary MCLs
LOCATION DESCRIP	NW of Fuel Tank Farm				Next to Building 1801					
UNITS	ug/L				ug/L					
DATE SAMPLED	1/16/87	3/10/87	5/28/87	1/18/91	1/20/87	3/12/87	5/29/87	1/18/91	ug/L	ug/L
ORGANICS:										
Acetone	NA	NA	NA	4 B	NA	NA	NA	10 U	-	-
Ethylbenzene	< 7.2	< 7.2	< 7.2	0.9 J	< 7.2	< 7.2	< 7.2	5 U	29	700
Methylene chloride	< 2.8	< 2.8	< 50	4 J	< 2.8	< 2.8	< 50	0.9 J	5	5 (1)
Tetrachloroethene	< 3	< 3	< 3	5 U	< 3	< 3	< 3	5 U	0.7	5
Trichloroethene	< 3	< 1	< 1	3 J	< 3	< 3	< 1	5 U	2.8	5
Xylene (total)	< 12	< 12	< 12	5	< 12	< 12	< 12	5 U	400	10000
Oil & Grease	200	2000	< 200	NA	200	< 100	< 200	NA	-	-
Total Lead	< 27	< 27	< 49.2	49.4	< 27	52	< 49.2	29.1	50	15 (2)
INORGANICS:										
Aluminum	NA	NA	NA	38500	NA	NA	NA	47800	-	-
Antimony				13.3 U				13.3 U	-	10/5(3)
Arsenic				12.1				25.6	50	50
Barium				114 B				633	1000	2000
Beryllium				3.7 B				8.7	-	1 (1)
Calcium				26100				59200	-	-
Chromium				45				179	50	100
Cobalt				17.6 B				17.8 B	-	-
Copper				28.3				39.9	1000	1300(2)
Iron				56600				76200	300	-
Lead				49.4				29.1	50	15 (2)
Magnesium				10200				15000	-	-
Manganese				136				236	50	-
Mercury				0.1 U				0.1 U	1.1	2
Nickel				30.8 B				93.5	150	100(1)
Potassium				5160				5900	-	-
Selenium				3.5 B				3.4 U	10	50
Silver				1.6 U				3.1 B	50	50 (4)
Sodium				11800				7850	-	-
Vanadium				178				108	-	-
Zinc				273				329	5000	-
Cyanide				10 U				10 U	154	200(1)

NOTES:

* - North Carolina water quality standards for groundwater.

<X - Less than detection limit

NA - Not analyzed

1- Proposed MCL

2 - MCL is Action Level for Public Water Supply Systems.

3 - Silver currently has an MCL of 50 ug/L; as of 7/30/92 silver will no longer have a primary MCL, its secondary MCL of 100 ug/L will become effective.

4 - Two proposed MCLs

QUALIFIERS:

U - Compound was analyzed for but not detected.

B - Analyte found in associated blank, organics Reported value is <Contract Required Detection Limit but >Instrument Detection Limit, inorganics

J - Value is estimated

APPENDIX D
GEOPHYSICAL SURVEY RESULTS
JUNE, 1992

DRAFT

REMEDIAL INVESTIGATION/ FEASIBILITY STUDY GEOPHYSICAL REPORT FOR OPERABLE UNIT NO. 1 (SITES 78, 21 AND 24) MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0106

Prepared for:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

Under the:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared by:

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Coraopolis, Pennsylvania

SEPTEMBER 28, 1992

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1.0 INTRODUCTION AND PURPOSE

A multi-disciplinary geophysical survey at Marine Corps Base (MCB) Camp Lejeune, Jacksonville, North Carolina, has been conducted to characterize subsurface conditions at two sites. The survey objective at Site 24 (Industrial Area Fly Ash Dump) was to delineate areas of suspected waste disposal. At Site 78 (Hadnot Point Industrial Area), the survey objective was to locate underground storage tanks at suspected building locations.

The field investigation was completed on June 15-20, 1992.

2.0 METHODS OF INVESTIGATION

To accomplish the specific project objectives, non-invasive geophysical techniques included electromagnetic terrain conductivity, magnetometry, and ground penetrating radar.

2.1 Survey Control

Geophysical data obtained during this survey were referenced by taped distance measurements to monitoring wells, roads, fences, and other physical and cultural features on site.

Survey traverses were staked and/or painted to facilitate subsequent identification by others.

2.2 Electromagnetic Terrain Conductivity

Electromagnetic (EM) terrain conductivity profiling was performed to map the lateral extent of buried waste and to identify buried metal objects and other debris. Instrumentation utilized for this survey included a Geonics model EM-31, with a maximum investigative depth of approximately 15 feet. EM-31 data were acquired in the vertical dipole mode at five-foot intervals along each traverse. Conductivity and in-phase measurements were performed at each station to more confidently distinguish metallic objects from non-metallic wastes or natural earth materials with high electrical conductivity.

EM-31 data were recorded using a digital datalogger and downloaded to a portable computer for profiling and interpretation.

2.3 Magnetometry

Magnetic profiling was performed to complement the interpretation of subsurface objects and wastes within Site 24. A digital proton precession magnetometer, Geometrics model G-856X, was utilized during this survey. Magnetic data were acquired at 10-foot stations along selected traverses, and a magnetic base station was reoccupied at approximately one hour intervals to facilitate adjustment of the data for natural daily variations due to solar activity.

The magnetic data were downloaded to a portable computer, corrected for diurnal drift, and profiled prior to interpretation. The magnetic data was then compared to EM conductivity and in-phase data to determine whether specific EM anomalies were caused by ferrous or non-ferrous buried objects or fill.

2.4 Ground Penetrating Radar

Ground penetrating radar (GPR) profiling was completed at five buildings within the Hadnot Point Industrial Area to determine whether or not underground storage tanks were present.

GPR profiling was completed with analog instrumentation that consisted of a GSSI SIR-7 mainframe, Adtek graphic recorder, and 500 megahertz antenna. This antenna was selected to provide high-resolution recordings of objects within a few feet of the ground surface. GPR profiles were obtained along traverses crossing each suspected site.

3.0 RESULTS

The geophysical survey at Sites 24 and 78 are presented in the following subsections.

3.1 Site 24

Four suspected disposal areas had been previously identified at this site based on existing information. Three of the areas, i.e., spiractor sludge, fly ash, and borrow/debris disposal areas, were investigated as part of this geophysical survey. Access to the fourth disposal area along Louis Road was restricted due to ongoing construction activities.

3.1.1 Spiractor Sludge Disposal Area

Disposal of spiractor sludge was suspected in the northeast corner of Site 24, in an area south of Duncan Street and west of Cogdels Creek. A geophysical survey grid was established in this area, extending from the Maintenance/Engineering Building parking lot, south and east to Cogdels Creek. Lines of geophysical coverage and surface features at Site 24 are shown in Figure A3-1.

EM measurements showed a distinct increase in conductivity levels (5-10 millimhos/meter) in an area west of Cogdels Creek and south and east of the tree line. The area of increased conductivity, interpreted to be due to the disposal of sludge, is delineated on Figure A3-1. Background levels in this portion of the site, immediately south of the parking lot and within the wooded areas, ranged between 2-4 millimhos/meter (mmhos/m). Figure A3-2 shows the east-west and north-south conductivity profiles across the sludge area with levels above 5 mmhos/m highlighted.

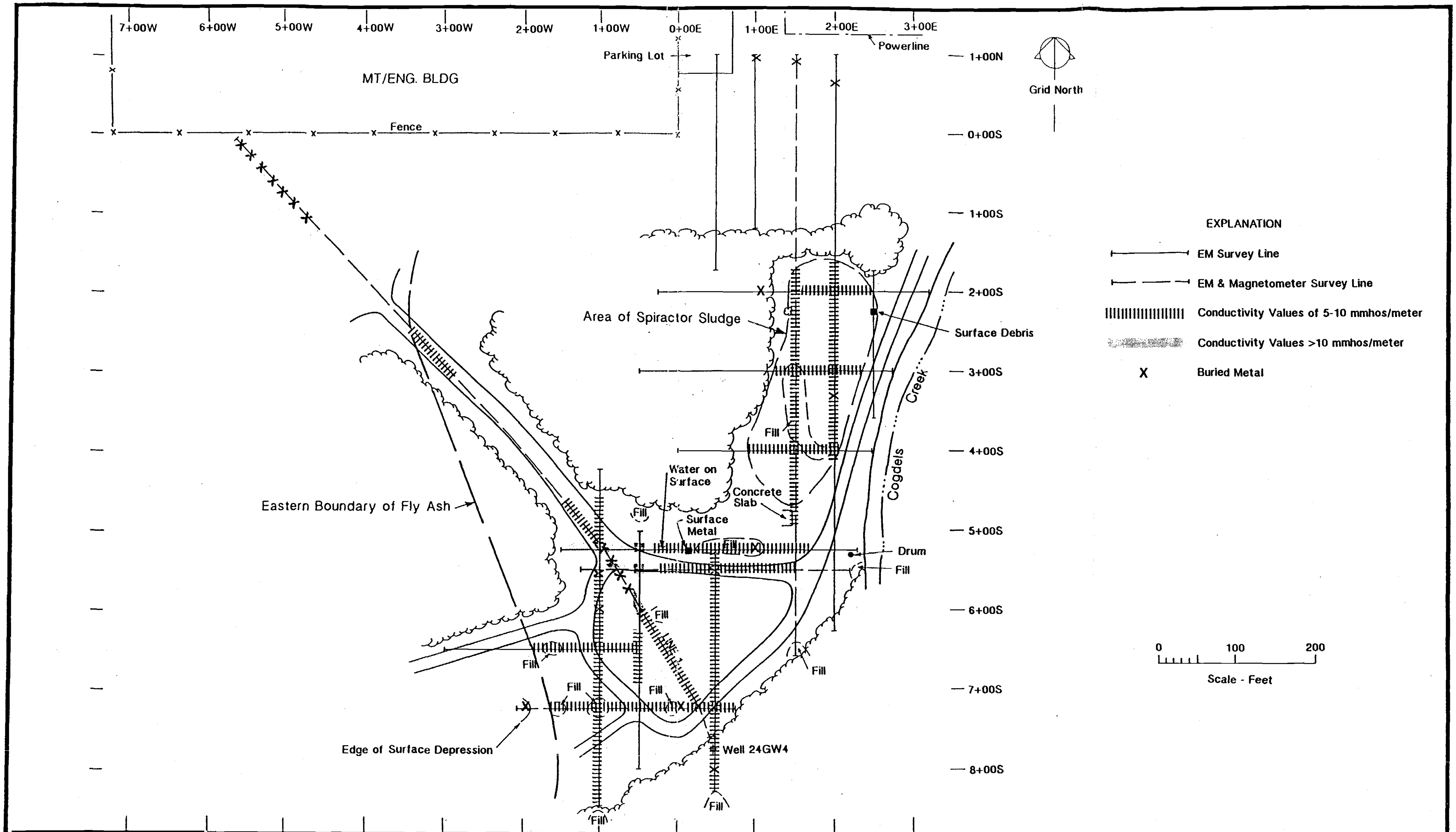
3.1.2 Fly Ash Disposal Area

Disposal of fly ash was suspected over a wide area in the south-central section of Site 24. The geophysical survey grid was extended from the spiractor sludge area to the south and west as shown on Figure A3-1. However, due to dense vegetation and understory, geophysical coverage was restricted to the eastern limits of ash disposal.

EM measurements showed elevated conductivity levels over most of this area as shown on Figure A3-1. Conductivity values in the range of 5-10 mmhos/m extended from the tree line on the north, into the wooded portion of the site on the south. Levels of conductivity only slightly above background indicate that this area may have been used for limited disposal of fly ash.

A distinct increase in conductivity above 10 mmhos/m, interpreted to be more representative of fly ash deposits, was measured at the western limits of the geophysical coverage. Figure A3-3 shows the east-west conductivity profiles across the fly ash area with levels above 10 mmhos/m highlighted. The estimated boundary of fly ash disposal shown on Figure 3-1 corresponds to increased levels of conductivity.

Several locations of buried metal were detected along the geophysical traverses and are indicated on Figure A3-1. Most are isolated occurrences except for three areas which are



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North Carolina

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Baker
Baker Environmental, Inc.

Results of Geophysical Investigation
Site 24 - Sludge & Fly Ash Disposal Areas

SCALE

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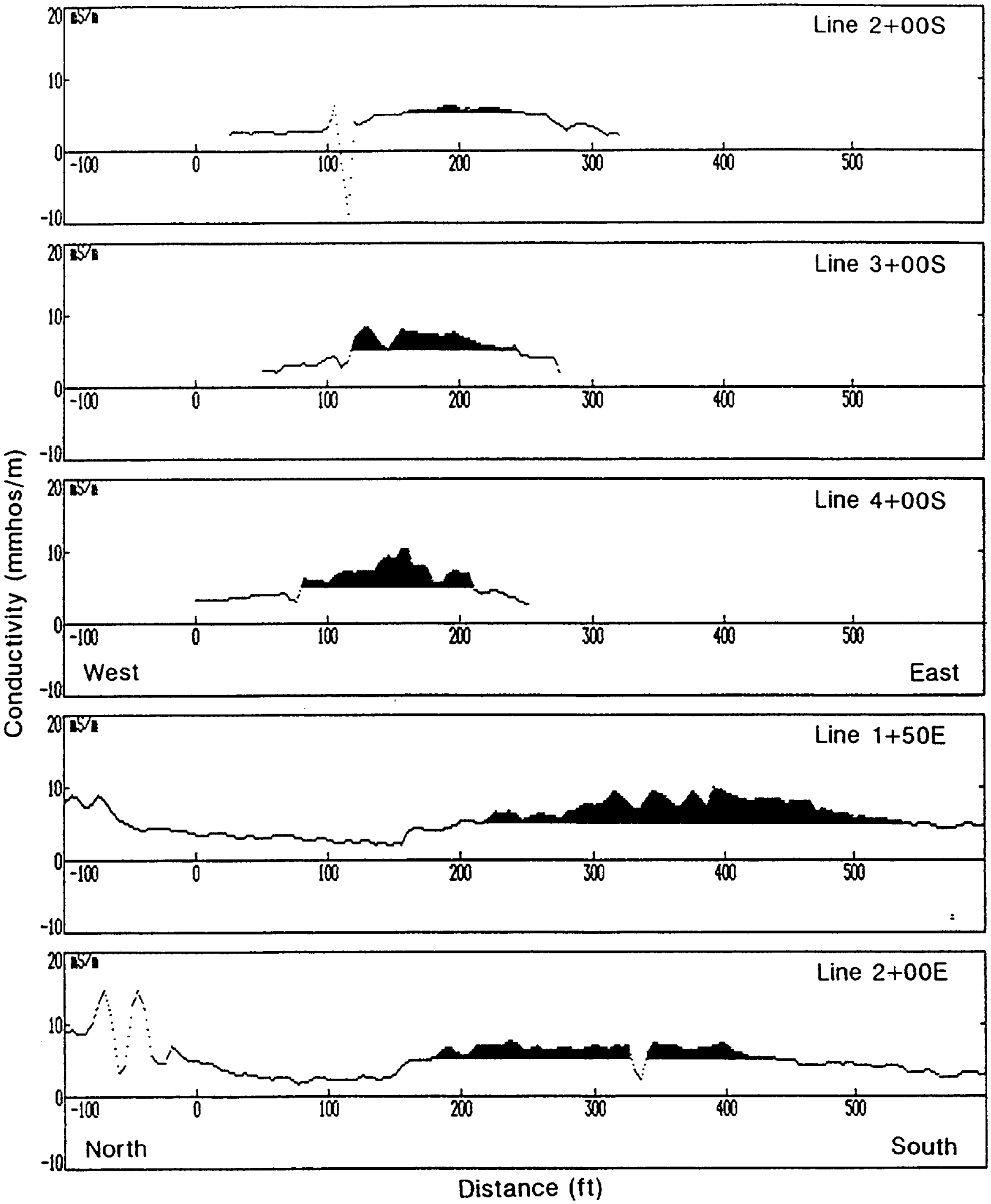
FIGURE NO.

A3-1



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MCB Camp Lejeune
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EM Conductivity Profiles
Site 24 - Spiractor Sludge
Disposal Area

WESTON GEOPHYSICAL CORP.
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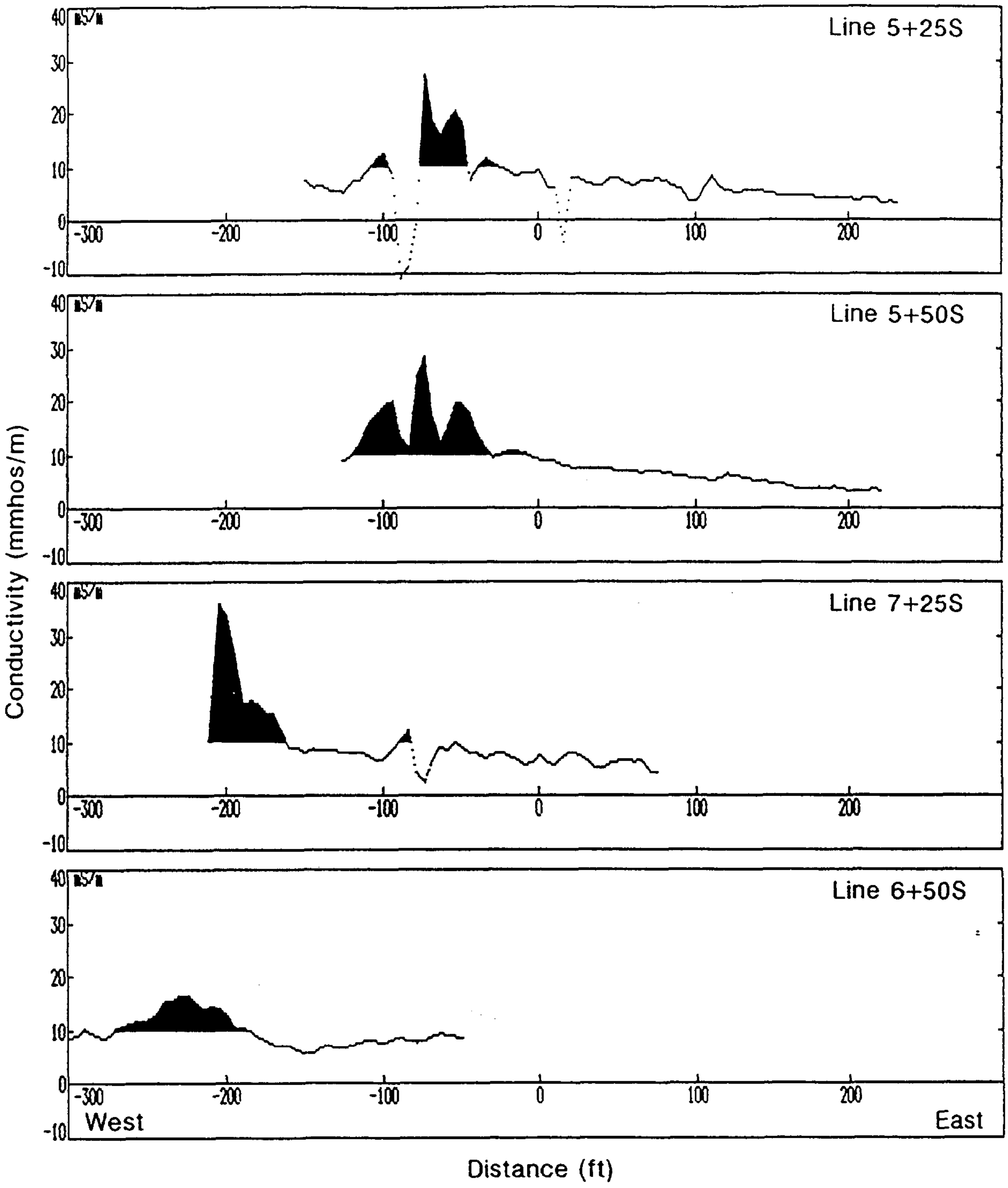
Date

Figure No. **A3-2**



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EM Conductivity Profiles
Site 24 - Fly Ash Disposal Area

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Figure No. **A3-3**

characteristic of more widespread burial of metal and debris. These areas are centered at geophysical grid coordinates 0+90W/5+50S, 2+00W/7+25S, and 5+00W/0+40S.

3.1.3 Borrow and Debris Disposal Area

An area of borrow and subsequent disposal of waste is suspected in the west portion of Site 24, in an area southwest of building 1450. A geophysical survey grid was established for this area, extending from the parking lot, to the south and west. Coverage to the north extended to the construction site. Lines of geophysical coverage and surface features at this portion of Site 24 are shown on Figure A3-4.

EM measurements showed an increase in conductivity levels (greater than 10 mmhos/m) for an area extending southwest of the parking lot towards well 24GW2. Figure A3-5 shows the conductivity profiles across the debris area with levels above 10 mmhos/m highlighted. The area of increased conductivity, interpreted to be due to disposal, is delineated on Figure A3-4. Background levels in this portion of the site ranged between 3-5 mmhos/m. Three locations of isolated buried metal were detected west of the parking lot.

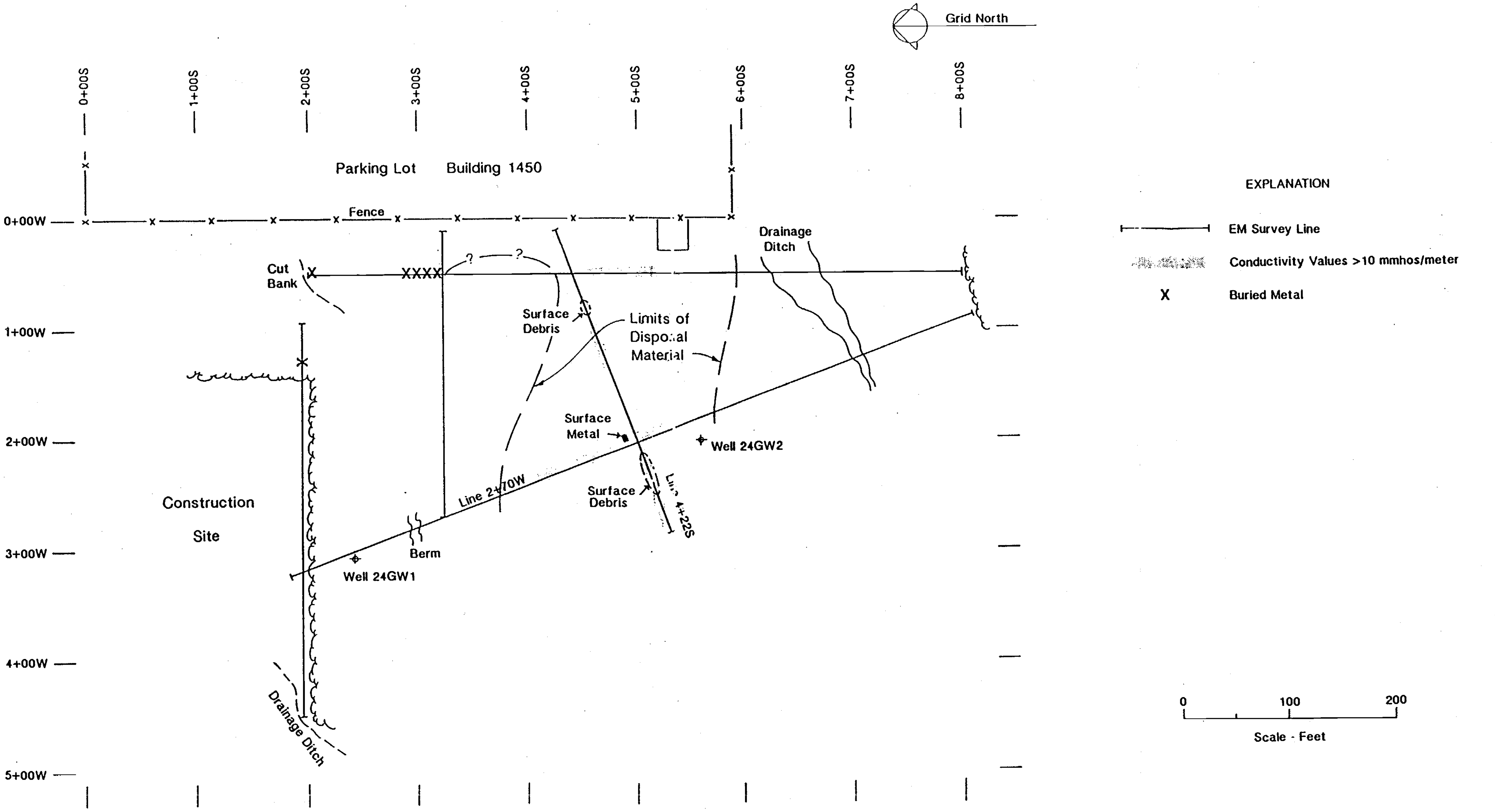
3.2 Site 78 - Hadnot Point Industrial Area

Several buildings in the Hadnot Point Industrial Area had been identified as suspected sites of underground storage tanks. Due to the presence of potential sources of interference in this industrialized area for both the EM and magnetometry techniques, GPR was utilized to determine the absence/presence of any tanks. GPR also offered better resolution capabilities for delineating the tank locations and establishing depths of burial.

At each building, a geophysical survey grid was established and served as lines of coverage for the radar. Surface features, such as buildings, roads, utilities, etc., were related to the grid and shown on the figure of results along with interpreted subsurface conditions, i.e., tanks, buried utilities, and other buried objects.

3.2.1 Building 1502

Tanks were reported at three locations surrounding building 1502: 1) along East Road at the southeast corner of the building, 2) along East Road at the southwest corner of the building, and 3) along Fir Street at the southwest corner of the building.



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Results of Geophysical Investigation
Site 24 - Borrow and Debris Disposal Area

SCALE

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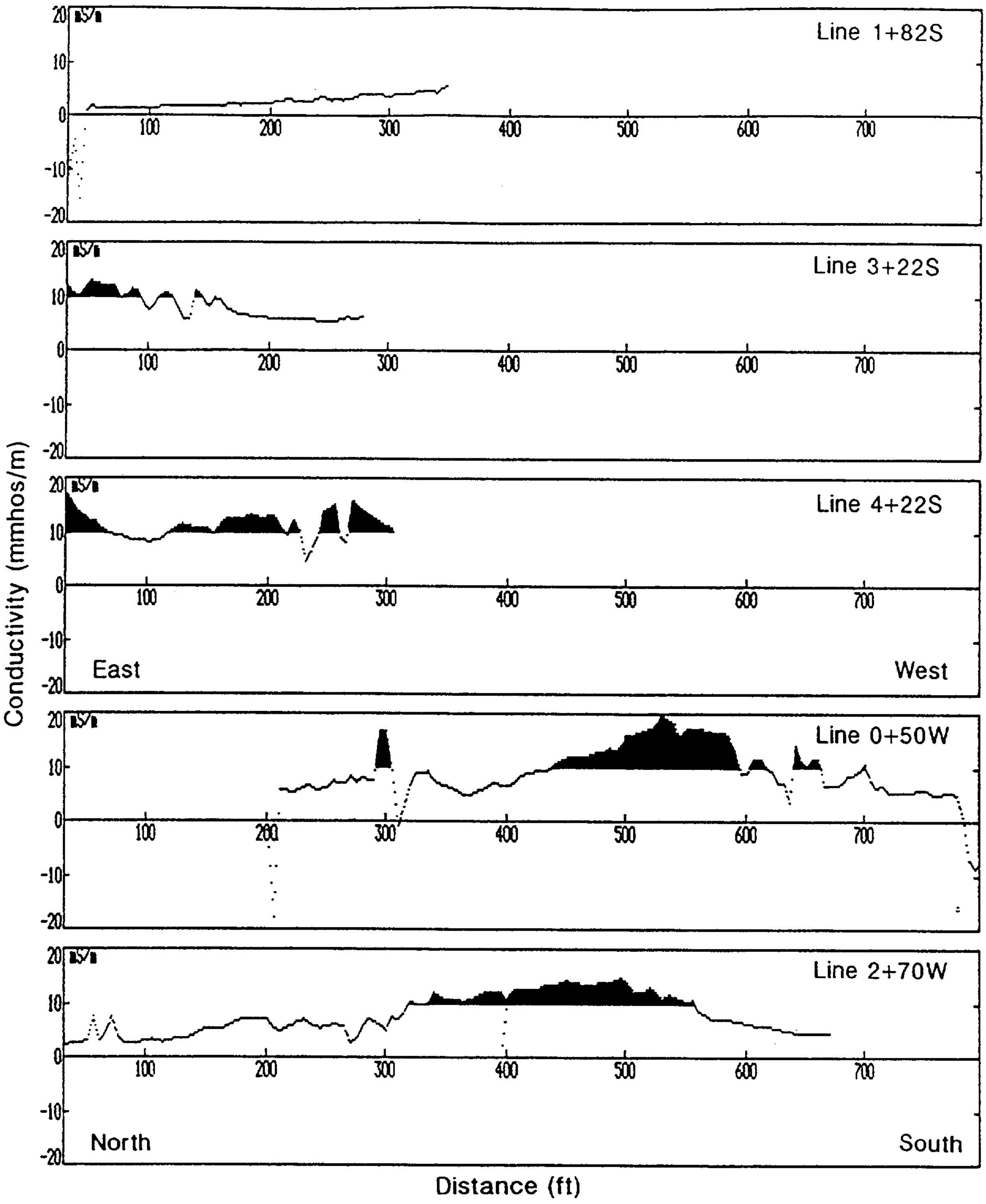
FIGURE NO.
A3-4

01491EE142



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EM Conductivity Profiles
Site 24 - Borrow & Debris
Disposal Area

WESTON GEOPHYSICAL CORP.
Coraopolis, Pennsylvania

Date

Figure No. **A3-5**

Figure A3-6 presents the results of the radar survey at the southeast corner of the building. Two tanks are interpreted at a depth of approximately three feet and possibly a third tank at a depth of six feet along the outside wall of the building. Figure A3-7 shows the radar record obtained along Line 0+85E, exhibiting large parabolic reflections characteristic of underground storage tanks.

Figure A3-8 presents similar results obtained at the southwest corner of the building, where two tanks are interpreted at a depth of approximately three feet and possibly a third tank at five feet. The two shallower tanks are located adjacent to fill caps observed at ground surface.

No tanks were detected on the Fir Street side of building 1502.

3.2.2 Building 1601

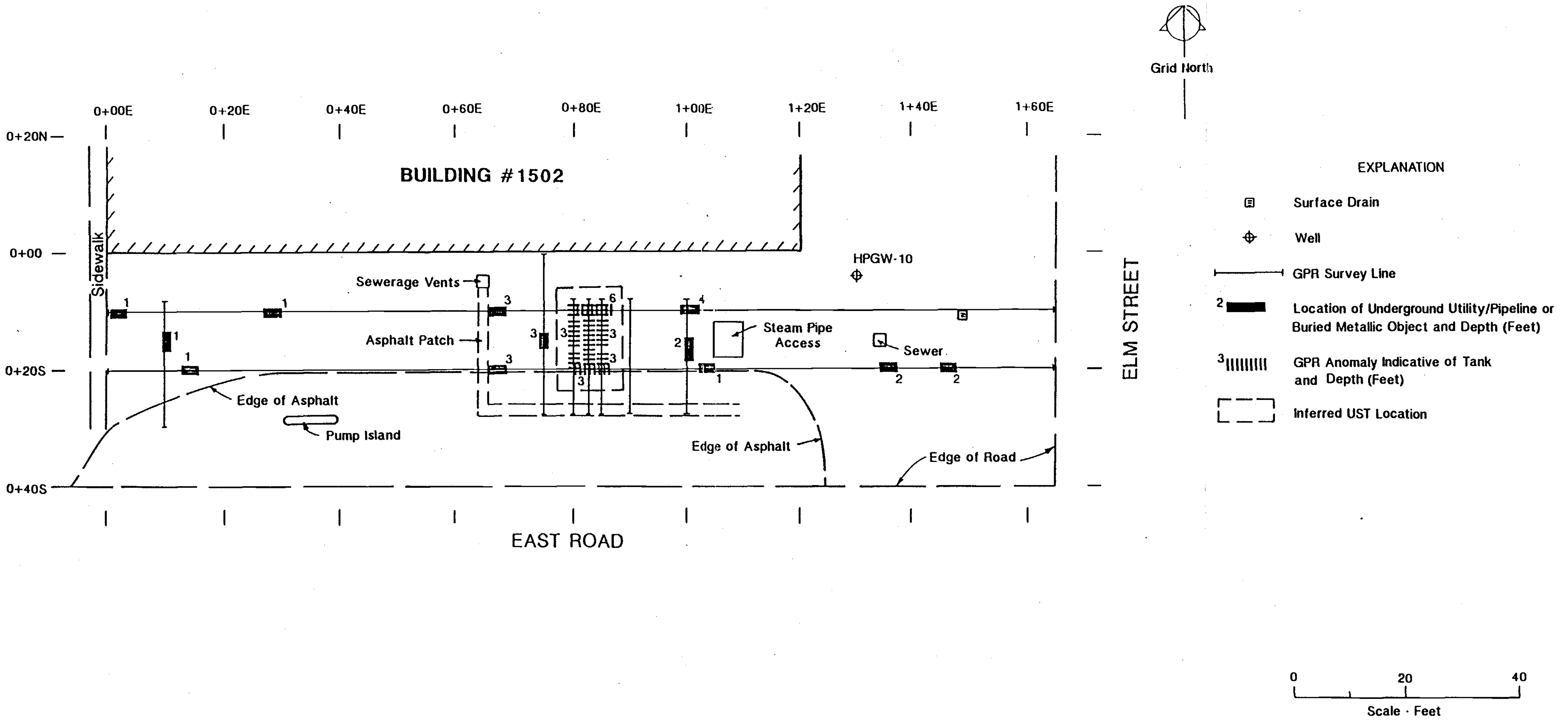
Tanks were reported at two locations surrounding building 1601: 1) along East Road at the southeast corner of the building and 2) along East Road at the southwest corner of the building.

Figure A3-9 presents the results of the radar survey at the southeast corner of the building. At least one and possibly two tanks are interpreted at a depth of five to six feet in the area delineated. Figure A3-10 shows the radar record obtained along Line 0+40E, exhibiting parabolic reflections characteristic of underground storage tanks at depths of five to six feet and a small, near surface pipeline or utility.

Figure A3-11 presents the results obtained at the southwest corner of the building. Radar coverage was restricted in this area due to the presence of several parked trailers. A possible tank or large utility was detected at a depth of two to three feet, northeast of the pump island.

3.2.3 Buildings 902 and 903

A single tank had been reported between buildings 902 and 903. Figure A3-12 presents the results of the radar survey in this area. One small tank is suspected at a depth of approximately two feet along the outside wall of building 902 near well 24-1. Figure A3-13 shows the radar record obtained along Line 0+10N, exhibiting large parabolic reflections



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Results of Geophysical Investigation
Site 78 - Hadnot Point Industrial Area
Building 1502

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FIGURE NO.

A3-6

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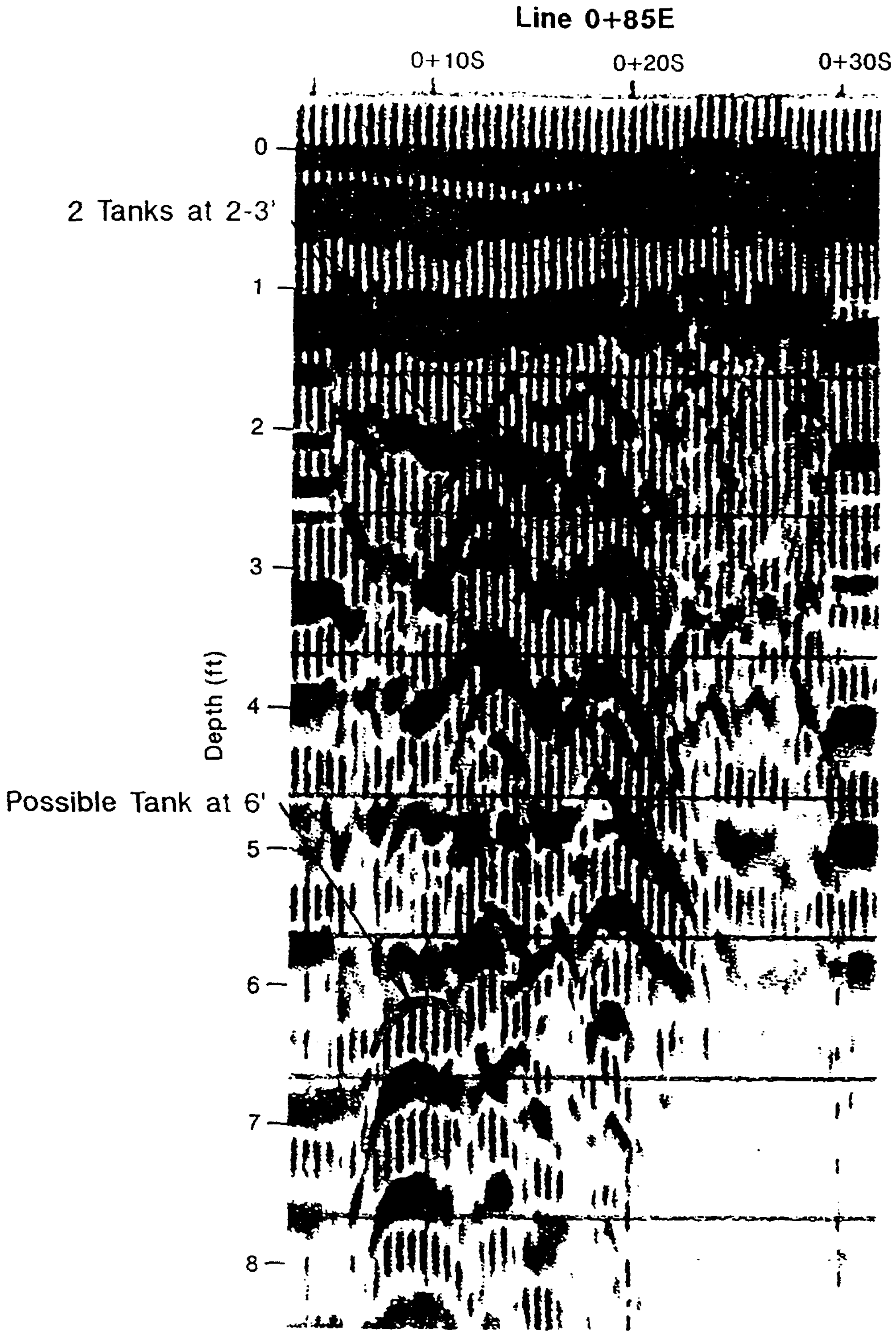

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GPR Profile
Site 78 - Building 1502

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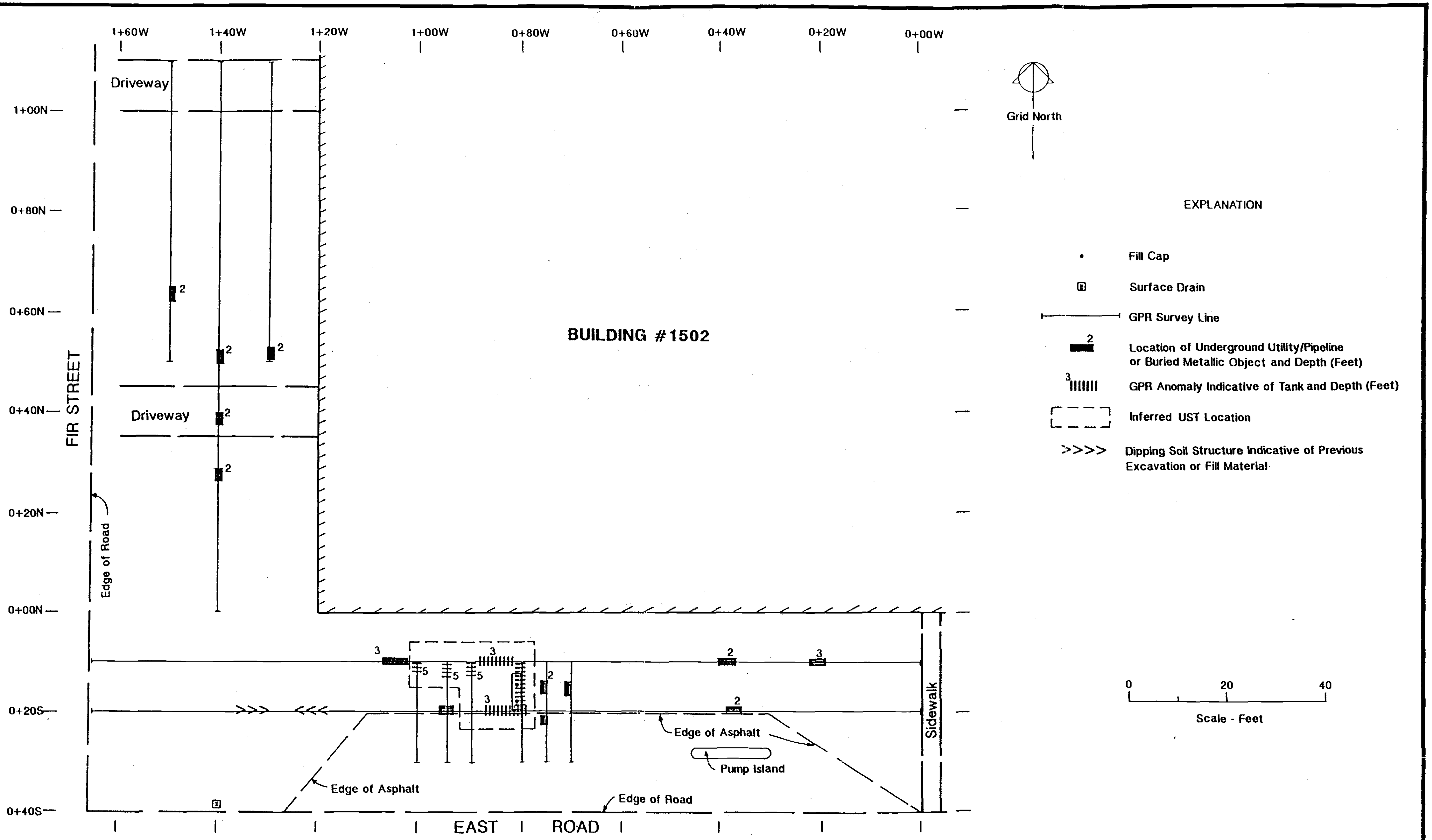
Figure No. **A3-7**



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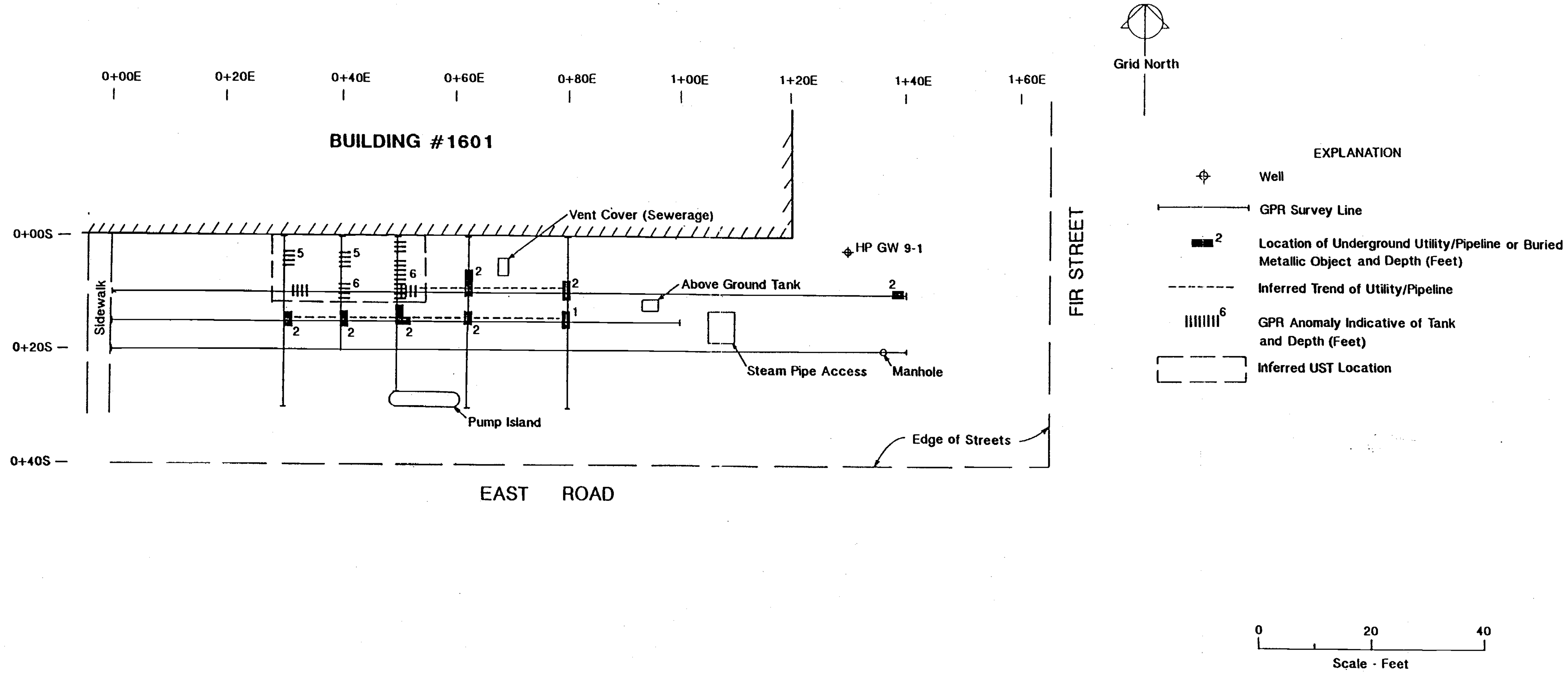
01491EEB42



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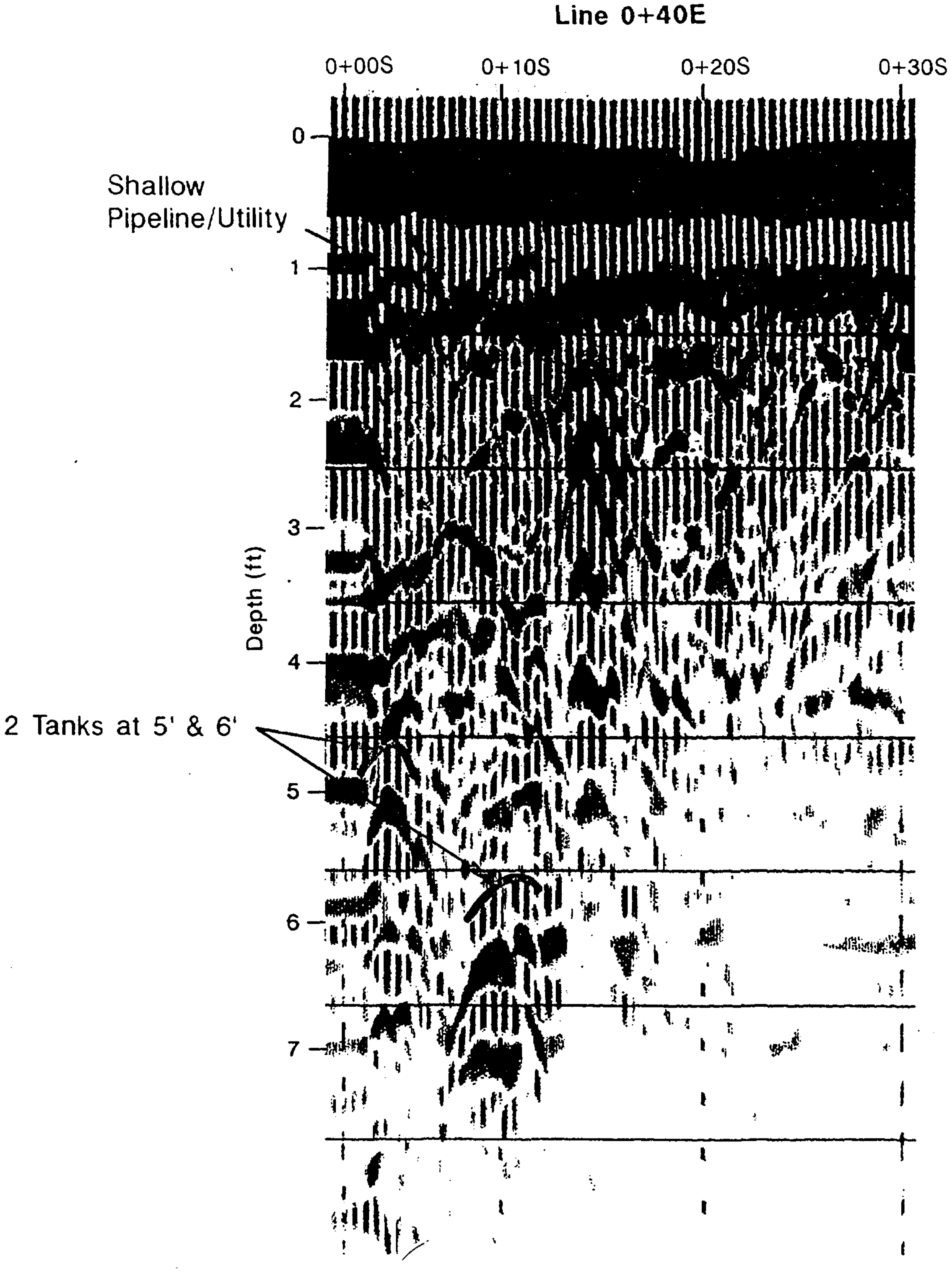
Results of Geophysical Investigation
Site 78 - Hadnot Point Industrial Area
Building 1601

SCALE

DATE

FIGURE NO.

A3-9



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GPR Profile
Site 78 - Building 1601

WESTON GEOPHYSICAL CORP.
Coraopolis, Pennsylvania

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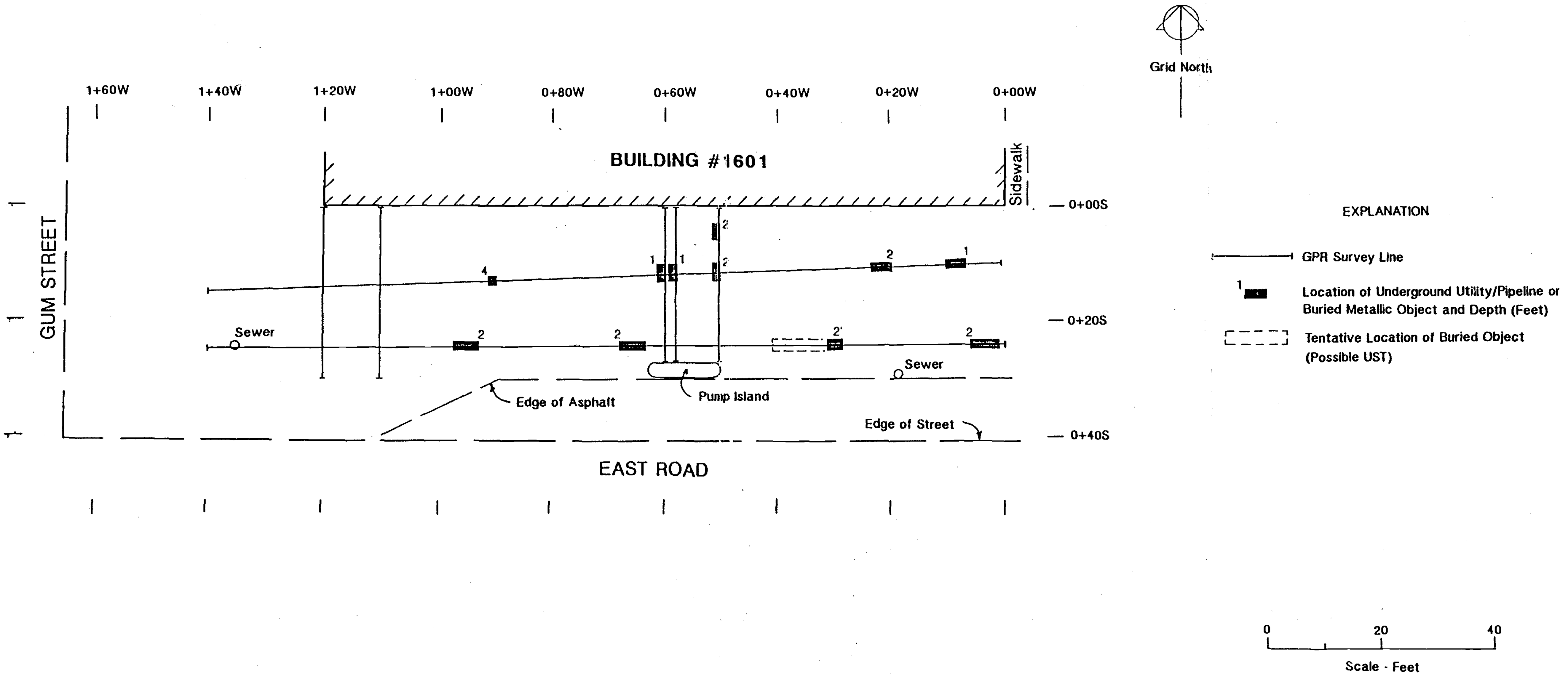
Figure No. **A3-10**



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Results of Geophysical Investigation
Site 78 - Hadnot Point Industrial Area
Building 1601

SCALE

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FIGURE NO.

A3-11

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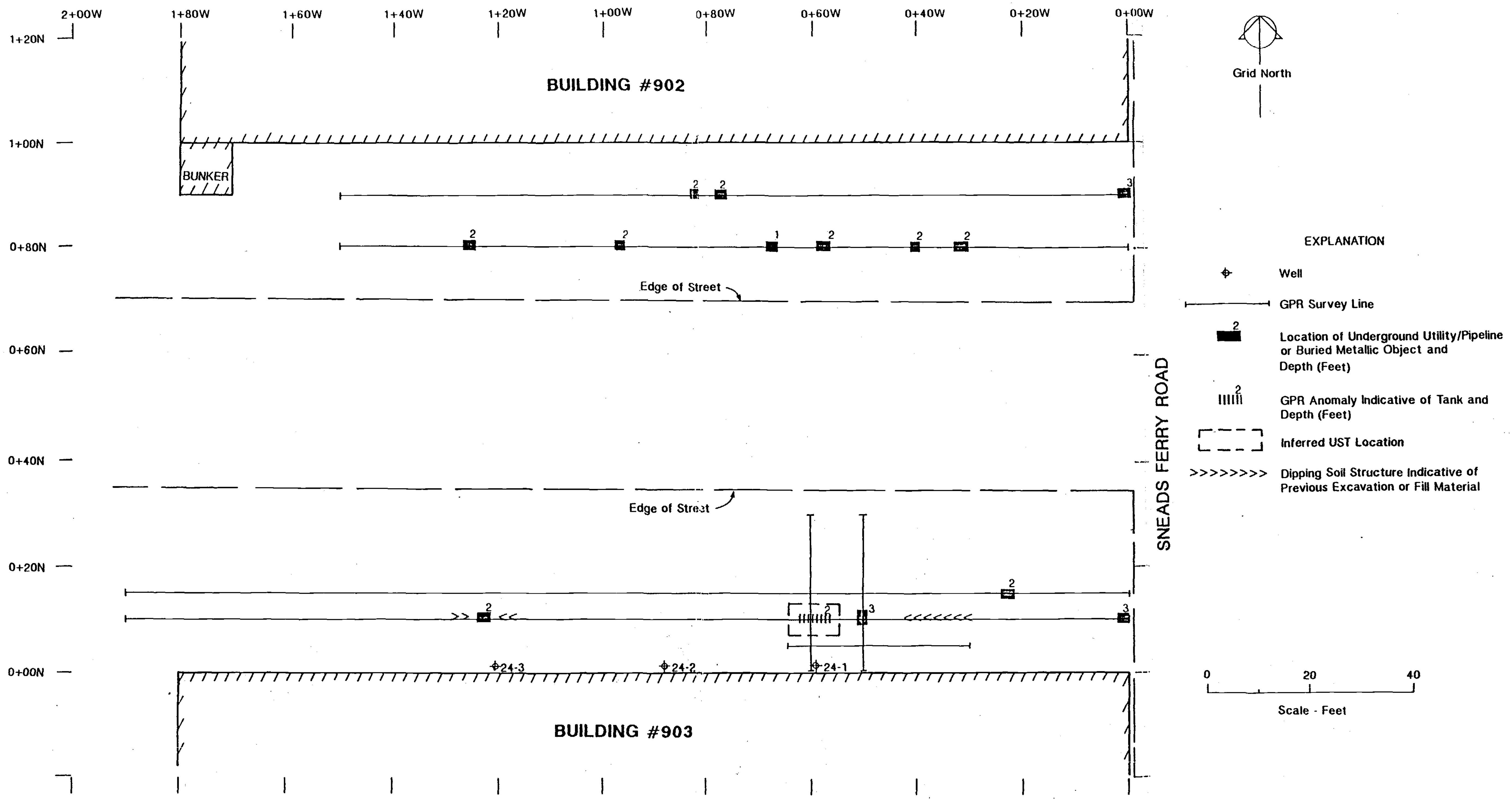

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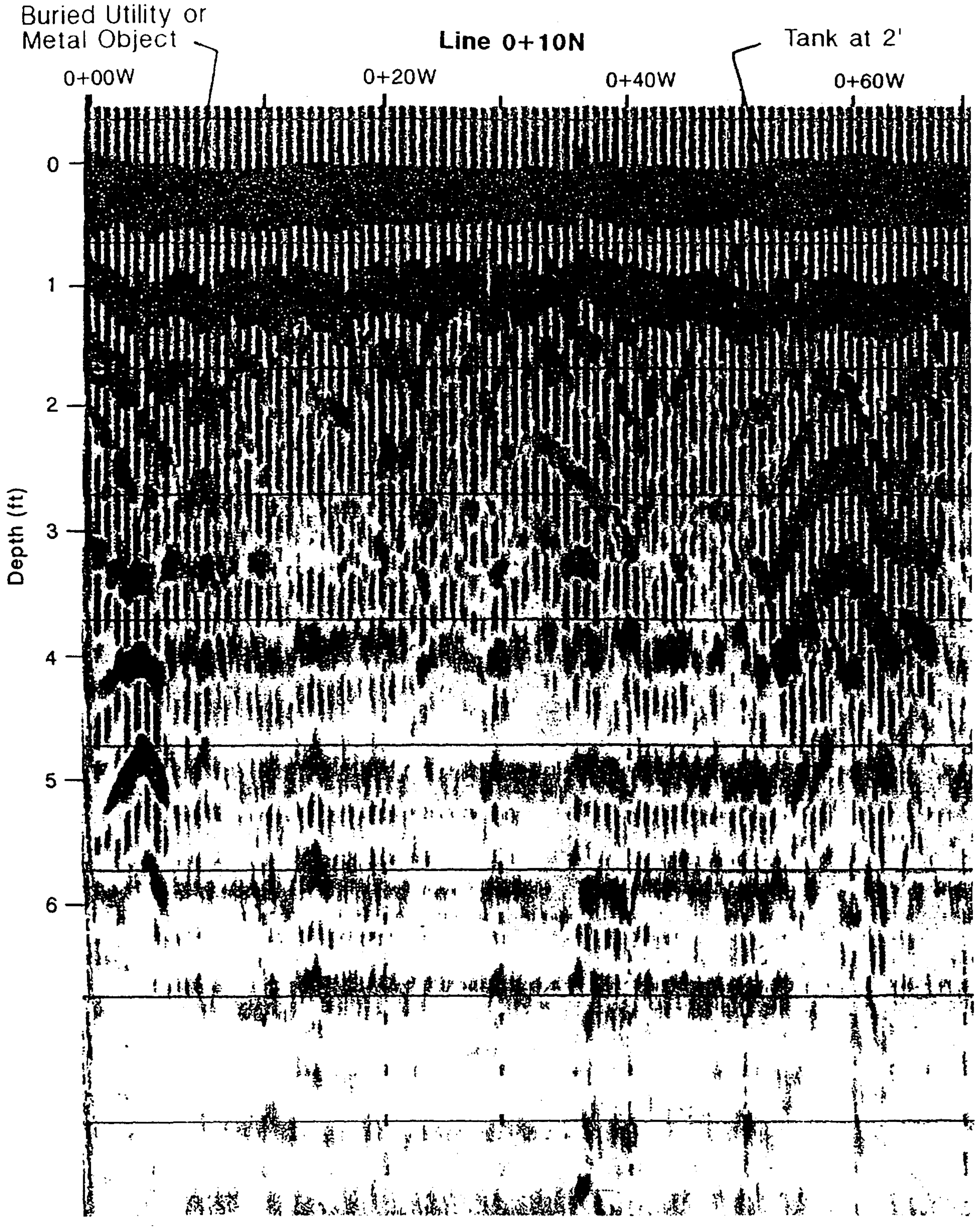
Results of Geophysical Investigation
Site 78 - Hadnot Point Industrial Area
Building 902 & 903

SCALE

DATE

FIGURE NO.

A3-12



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GPR Profile
Site 78 - Building 903

WESTON GEOPHYSICAL CORP.
Coraopolis, Pennsylvania

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Figure No. **A3-13**

characteristic of an underground storage tank at a depth of two feet. No evidence of other tanks at buildings 902 or 903 was observed.

3.2.4 Buildings 1202 and 1709

A storage tank had been reported in the alcove on the backside of building 1202 and somewhere surrounding building 1709. Figure A3-14 presents the results of the radar survey at building 1202 which detected no evidence of an underground tank.

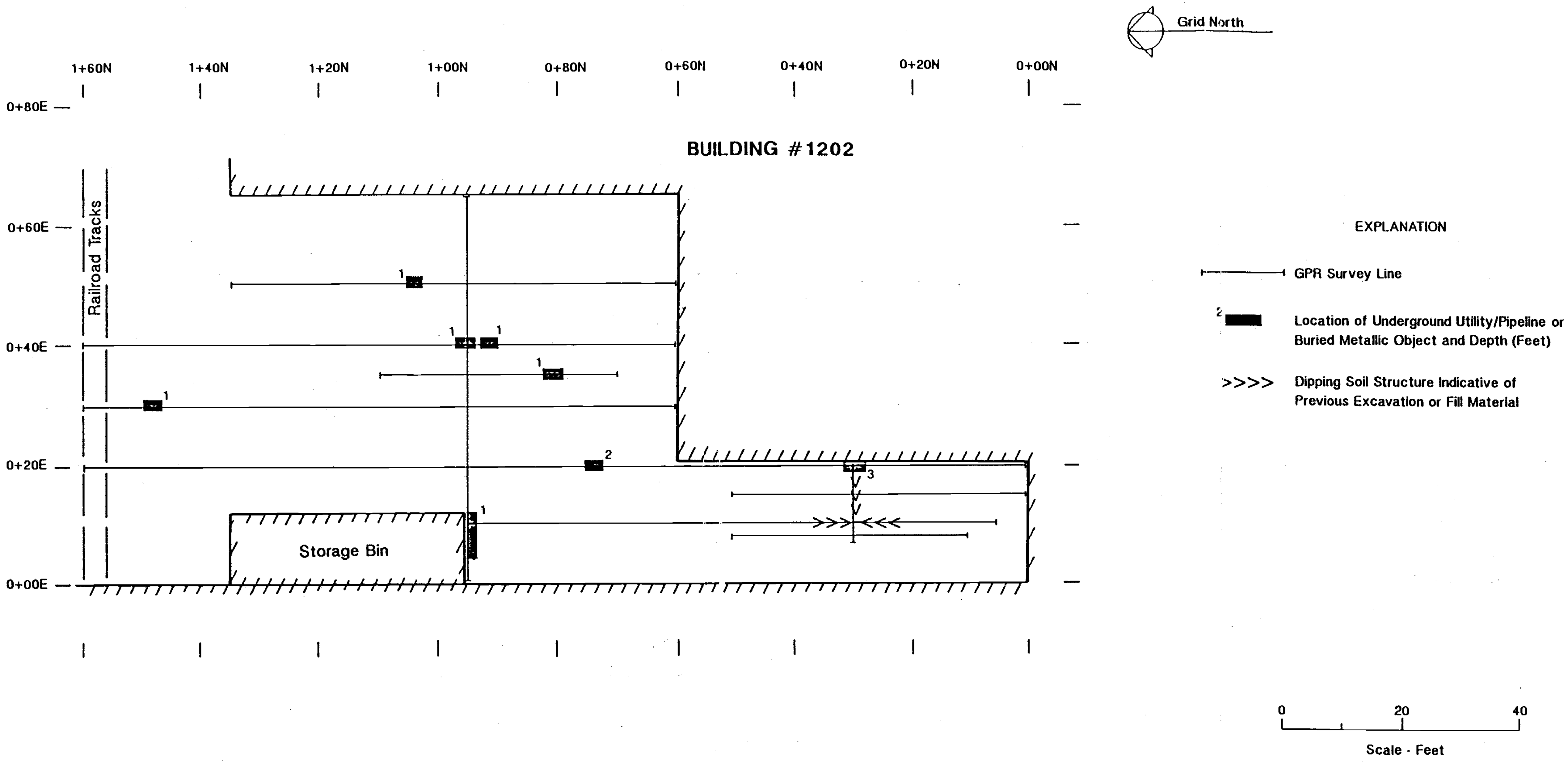
Similarly for building 1709, no tank is suspected. However, as shown on Figure A3-15, a large buried object or possibly a utility, was detected on the east side of the building. Likewise, on the west side of the building at 0+30S to 0+45S, two large, shallow objects were detected, which cannot be identified.

4.0 CONCLUSIONS

Multi-disciplinary geophysical techniques were effective in delineating limits of disposal at three separate areas on Sites 24 and in locating underground storage tanks at several buildings on Site 78.

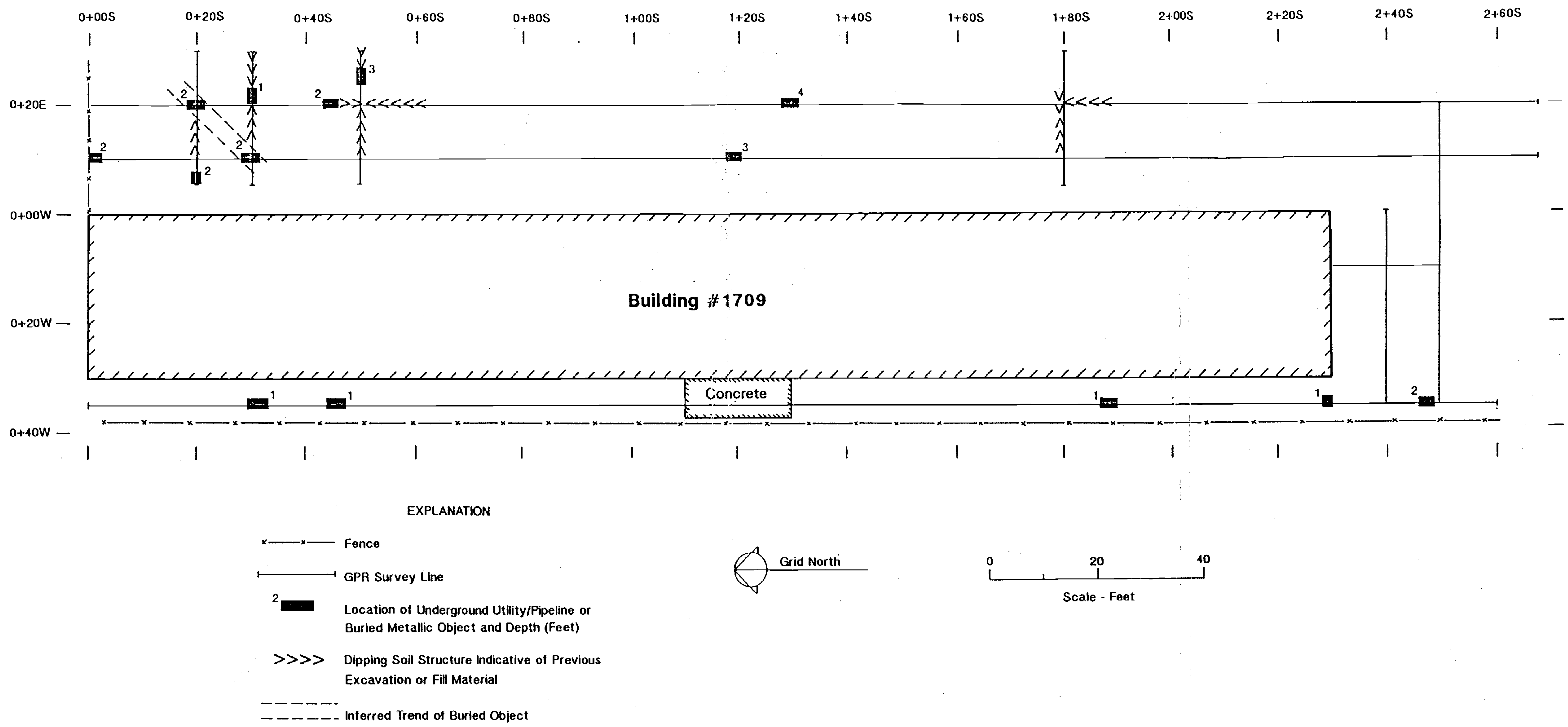
At Site 24, the extent of spiractor sludge disposal was correlated with slightly elevated values of conductivity above measured background levels. The eastern boundary of fly ash disposal was defined by a distinct increase in conductivity, characteristic of fly ash material. Disposal at the borrow area was also delineated by increased values of conductivity. Locations of buried metal at all three disposal areas were identified for subsequent investigation via test pitting.

At Site 78, Hadnot Point Industrial Area, suspected locations of underground storage tanks were identified at buildings 1502, 1601, and 903. The presence of tanks at buildings 1202 and 1709 was not confirmed.



REVISIONS WESTON GEOPHYSICAL CORP. IS A WHOLLY OWNED SUBSIDIARY OF BAKER ENVIRONMENTAL, INC.	DATE SCALE DRAWN REVIEWED S.O.# CADD#	Geophysical Investigation MCB Camp Lejeune North Carolina WESTON GEOPHYSICAL CORP. Coraopolis, Pennsylvania	Baker Baker Environmental, Inc.	Results of Geophysical Investigation Site 78 - Hadnot Point Industrial Area Building 1202 SCALE DATE	FIGURE NO. A3-14

0149IEEB62



REVISIONS	DATE SCALE DRAWN REVIEWED S.O.# CADD#	Geophysical Investigation MCB Camp Lejeune North Carolina	Baker Baker Environmental, Inc.	Results of Geophysical Investigation Site 78 - Hadnot Point Industrial Area Building 1709	FIGURE NO.
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APPENDIX E
PRESCOPING GROUNDWATER SAMPLING DATA
JULY 1992

ORGANIC CONTAMINANTS IN GROUNDWATER
SITES 2, 24, 74 AND HPIA
MCB CAMP LEJEUNE, NORTH CAROLINA
JULY 1992

ker Sample Number:	2GW2	2GW3	2GW3 DUP	2GW5	24GW1	24GW2	24GW3	24GW4	24GW6	74GW1	74GW2	GW9-2	GW9-2 DUP	GW9-3	PW-602
te Sampled:	7/9/92	7/9/92	7/9/92	7/9/92	7/7/92	7/7/92	7/7/92	7/7/92	7/7/92	7/7/92	7/7/92	7/8/92	7/8/92	7/8/92	7/9/92
lution Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
oncentration Units:	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
hemical															
TCL Volatiles															
ethylene Chloride	2 B	58 B	14 B	7 B	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA
luene	10 U	67 U	8 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA
thylbenzene	10 U	190	190	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA
tal Xylenes	5 J	1800 J	1900 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA
TCL Semivolatiles															
4-Dimethylphenol	22 U	10 J	12 J	NA	20 U	NA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
aphthalene	22 U	24 J	24	NA	20 U	NA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Methylnapthalene	22 U	15 J	15 J	NA	20 U	NA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
cenaphthene	22 U	67 U	3 J	NA	20 U	NA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
i-n-Butylphthalate	22 U	67 U	22 U	NA	20 U	NA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	13 BJ
is(2-Ethylhexyl)Phthalate	5 B	18 B	6 B	NA	8 B	NA	3 B	13 B	9 B	20 U	20 U	20 U	20 U	20 U	7 B
TCL Pesticides/PCBs	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

otes:

A = Not Analyzed

D = Not Detected at Method Detection Limit

emivolatile and pesticide/PCB analysis not conducted on sample 2GW5. Sample bottle was broken in shipment.

emivolatile analysis not conducted on sample 24GW2. Sample was lost during extraction.

olatile analysis conducted on sample 2GW3 was done at 6.7X dilution factor.

olatile analysis conducted on sample 2GW3 DUP was done at 5X dilution factor.

ata Qualifiers:

- *The associated numerial value is estimated*
- The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.
- Not detected substantially above the level reported in laboratory blanks.

VOLATILE ORGANICS IN GROUNDWATER
SITES 2, 24, 74 AND HPIA
MCB CAMP LEJEUNE, NORTH CAROLINA
JULY 1992

Baker Sample Number:	GW9-2	GW9-2DUP	GW9-3	GW24-2	GW24-3	GW31-2	GW31-3	GW32-2	GW32-3	PW-602	PW-637
Date Sampled:	7/8/92	7/8/92	7/8/92	7/9/92	7/9/92	7/8/92	7/8/92	7/8/92	7/8/92	7/9/92	7/9/92
Dilution Factor:	1	1	1	1	1	1	1	1	1	1	1
Concentration Units:	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Chemical											
EPA 601											
Methylene chloride	ND	1 B	ND	1 B	4 B	ND	ND	ND	ND	ND	3 B
EPA 602											
Benzene	ND	1	ND	ND	ND	ND	ND	28	6	2	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	2	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	2	9	ND	ND
Xylenes	ND	ND	ND	ND	ND	ND	ND	2	17	ND	5

Notes:
ND = Not Detected at Method Detection Limit
B = Not detected substantially above the level reported in laboratory blanks
Analytical results reported with validation qualifiers

TAL TOTAL METALS IN GROUNDWATER
SITES 2, 24, 74, AND HADNOT POINT
MCB CAMP LEJEUNE, NORTH CAROLINA
JULY 1992

Baker Sample Number:	2GW2	2GW3	2GW3 DUP	2GW5	24GW1	24GW2	24GW3	24GW4	24GW6	74GW1	74GW2	GW9-2	GW9-2 DUP	GW9-3	PW-602
Date Sampled:	7/9/92	7/9/92	7/9/92	7/9/92	7/7/92	7/7/92	7/7/92	7/7/92	7/7/92	7/7/92	7/7/92	7/8/92	7/8/92	7/8/92	7/8/92
Dilution Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Concentration Units:	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Analyte															
Aluminum	149000	1120	891	2390	3820	4020	4250	1090	3560	1980	233 U	87 U	76 U	2860	149 U
Antimony	49 U	49 U	49 U	49 U	49 U	49 U	49 U	49 U	50 J	49 U	49 U	49 U	49 U	49 U	49 U
Arsenic	711	2 U	2 U	2 U	2 U	2 U	2 U	64.5	13.10	2 U	2 U	2 U	2 U	2 U	2 U
Barium	85 J	28 J	31 J	100 J	35 J	68 J	145 J	43 J	54 J	28 J	32 J	25 J	25 J	34 J	21 U
Beryllium	18 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Cadmium	148	3 U	3 U	3 U	3 U	4 U	4 U	5 U	7 U	3 U	3 U	5 U	3 U	3 U	3 U
Calcium	25600	6880	7840	20900	1370 U	785 U	92300	57000	90100	1030 U	3460 U	110000	107000	106000	81300
Chromium	39	5 U	5 U	5 U	7 U	18 U	13 U	9 U	16 U	5 U	5 U	5 U	5 U	5 U	5 U
Cobalt	13 J	8 J	6 U	7 J	6 J	6 U	45 J	6 U	13 J	6 U	6 U	6 U	6 U	7 J	7 J
Copper	10 J	5 J	6 J	4 U	4 J	4 J	4 U	4 U	4 U	4 J	4 U	4 U	4 U	4 J	392
Iron	814000	2610	2600	8310	843	13400	3190	13100	25100	301	41 J	627	664	13 U	21800
Lead	85.4	3.1 U	2.4 U	1.7 U	4.6 U	9.4 U	6.4 U	9.4 U	19.2 U	3 U	5.4 U	8.4 U	15 U	6.5 U	100
Magnesium	725 J	921 J	991 J	4310 J	2110 J	1450 J	24500	3210 J	2620 J	1030 J	957 J	2290 J	2360 J	57 J	5320
Manganese	1 U	9 J	9 J	42	3 U	22	201	10 J	257	4 U	2 U	28	27	1 U	300
Mercury	0.2 U	0.2 U	0.24	0.24	0.2 U	0.52	0.2 U	0.2 U	0.82	0.2 U	0.24	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	17 U	17 U	17 U	17 U	17 U	17 U	50	17 U	19 J	17 U	17 U	17 U	17 U	17 U	17 U
Potassium	1940 J	960 J	1160 J	2550 J	1210 J	1370 J	10500 J	1130 J	1690 J	923 J	605 J	1070 J	1220 J	4060 J	1950 J
Selenium	25 U	5 U	5 U	5 U	5 U	5 U	6.6	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Sodium	25300	5820	6560	8870	6110	11100	16700	5200	8270	3860 J	2900 J	5610	5910	5340	13000
Thallium	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vanadium	1550	5 U	5 U	5 U	5 J	17 J	11 J	6 J	12 J	5 J	5 U	5 U	5 U	5 U	5 U
Zinc	252	26 U	17 U	4 U	8 U	22 U	357	12 U	70	17 U	4 U	43 U	34 U	18 U	1010

Qualifiers:

U - The analyte was analyzed for, but was not above the sample quantitation limit.

TAL DISSOLVED METALS IN GROUNDWATER
SITES 2, 24, 74, AND HADNOT POINT
MCB CAMP LEJEUNE, NORTH CAROLINA
JULY 1992

Baker Sample Number:	2GW2	2GW3	2GW3 DUP	2GW5	24GW1	24GW2	24GW3	2GW4	24GW6	74GW1	74GW2	GW9-2	GW9-2 DU	GW9-3	PW-602
Date Sampled:	7/9/92	7/9/92	7/9/92	7/9/92	7/7/92	7/7/92	7/7/92	7/7/92	7/7/92	7/7/92	7/7/92	7/8/92	7/8/92	7/8/92	7/8/92
Dilution Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Concentration Units:	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Analyte															
Aluminum	59 U	77 U	84 U	1240	138 U	115 U	262 U	59 U	59 U	125 U	224 U	59 U	59 U	2140	59 U
Antimony	49 U	49 U	49 U	49 U	49 U	49 U	49 U	49 U	49 U	49 U	49 U	49 U	49 U	49 U	49 U
Arsenic	2.2 U	2 U	2 U	2 U	2 U	2 U	2 U	6.8 U	2 U	2 U	2 U	2 U	2 U	2 U	2.3 U
Barium	21 J	21 U	22 J	75 J	32 J	31 J	122 J	24 J	32 J	27 J	32 J	23 J	22 J	31 J	21 U
Beryllium	4 U	4 U	4 U	4 U	4 U	4 U	3 U	3 U	3 U	3 U	4 U	3 U	3 U	3 U	4 U
Cadmium	3 U	4 U	3 U	4 U	3 U	3 U	3 U	3 U	4 U	3 U	5 U	3 U	3 U	3 U	3 U
Calcium	24900	7250	7340	18000	1460 J	925 J	76900	54300	87200	2100 J	3780 J	109000	105000	101000	81100
Chromium	5 U	9 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U	5 U	5 U
Cobalt	6 U	6 U	6 U	6 U	6 U	6 U	36 J	7 J	7 J	6 U	6 U	6 U	6 U	6 U	6 U
Copper	17 J	5 J	5 J	9 J	4 U	4 U	4 U	4 U	4 J	4 U	4 J	9 J	7 J	11 J	4 U
Iron	169	1860	1920	6460	135	10 U	990	15 J	21 J	10 U	10 U	370	272	11 J	536
Lead	6 U	1.8 J	2.8 J	2.3 J	8.4 J	5.8 J	7.4 J	5 J	18 J	8.6 J	4.6 J	7.6 J	3.1 J	7.9 J	4.9 J
Magnesium	959 J	1010 J	1030 J	3860 J	2030 J	1200 J	20900	2860 J	2350 J	916 J	936 J	2370	2310 J	118 J	5530
Manganese	7 J	8 J	8 J	36	3 U	7 J	166	9 J	206 J	3 U	2 U	28	26	1 U	273
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	17 U	17 U	17 U	17 U	17 U	17 U	37 J	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U
Potassium	3370 J	1150 J	1030 J	2350 J	1260 J	1200 J	9070	982 J	1380 J	913 J	703 J	1100 J	1300 J	4870 J	1880 J
Selenium	25 U	5 U	5 U	5 U	5 U	5 U	6.6	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Sodium	4780 J	6300	6350	7380	5430	10800	15800	4580 J	7850	3850 J	2970 J	5860	5700	5760	13100
Thallium	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vanadium	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Zinc	37 U	23 U	31 U	21 U	17 U	18 U	264 J	4 U	9 U	39 U	10 U	6 U	5 U	4 U	13 U

Qualifiers:

U - The analyte was analyzed for, but was not above the level of sample quantitation.

J - The associated value is an estimated quantity.