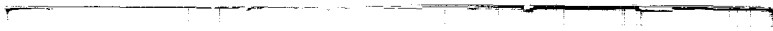


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**FINAL**  
**PROPOSED REMEDIAL ACTION PLAN**  
**FOR OPERABLE UNIT NO. 2**  
**(SITES 6, 9, and 82)**

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

**CONTRACT TASK ORDER 0133**

*Prepared For:*

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

*Under the:*

**LANTDIV CLEAN Program**  
**Contract N62470-89-D-4814**

*Prepared By:*

**BAKER ENVIRONMENTAL, INC.**  
*Coraopolis, Pennsylvania*

**AUGUST 20, 1993**

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## LIST OF ACRONYMS AND ABBREVIATIONS

AOC	area of concern
ARAR	applicable or relevant and appropriate requirement
AST	aboveground storage tank
AWQC	Ambient Water Quality Criteria
Baker	Baker Environmental, Inc.
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	contaminants of concern
cy	cubic yard
DoN	Department of the Navy
ESE	Environmental Science and Engineering, Inc.
FDA	U.S. Food and Drug Administration
FFA	Federal Facilities Agreement
FS	Feasibility Study
gpm	gallons per minute
HI	Hazard Index
IAS	Initial Assessment Study
ICR	incremental cancer risk
IRP	Installation Restoration Program
MBI	Macroinvertebrates Biotic Index
MCB	Marine Corps Base
NC DEHNR	North Carolina Department of Environment, Health, and Natural Resources
NCP	National Contingency Plan
NPL	National Priorities List
NPW	net present worth
NUS	Halliburton NUS Environmental Corporation
O&M	operation and maintenance
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl

PCE	tetrachloroethene
PRAP	Proposed Remedial Action Plan
RAA	remedial action alternative
RI	Remedial Investigation
ROD	Record of Decision
SVOC	semivolatile organic compound
TCE	trichloroethene
TCLP	Toxicity Characteristics Leaching Procedure
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

## **PROPOSED REMEDIAL ACTION PLAN**

### **Introduction**

This Proposed Remedial Action Plan (PRAP) is issued to describe the Marine Corps Base (MCB) Camp Lejeune and the Department of the Navy's (DoN's) preferred remedial action for Operable Unit No. 2 at MCB Camp Lejeune. Operable Unit No. 2 is located approximately two miles east of the New River and two miles south of State Route 24, within MCB Camp Lejeune, Onslow County, North Carolina. Operable Unit No. 2 consists of three sites, Site 6 (Storage Lots 201 and 203), Site 9 (Fire Fighting Training Pit), and Site 82 (Piney Green Road VOC Site).

MCB Camp Lejeune and the DoN are issuing this PRAP as part of the public participation responsibility established under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the Federal Facilities Agreement (FFA) between the DoN, United States Environmental Protection Agency (USEPA) Region IV, and the North Carolina Department of Environment, Health, and Natural Resources (NC DEHNR).

MCB Camp Lejeune and the DoN, with the assistance of USEPA Region IV and the NC DEHNR, will select a remedy for Operable Unit No. 2 only after the public comment period has ended and the information submitted during this time has been reviewed and considered. The Final Record of Decision (ROD) may recommend a different remedial action than is presented in this plan depending upon new information or public comments.

This PRAP briefly summarizes information that can be found in greater detail in the Remedial Investigation (RI) Report, the Feasibility Study (FS), and other documents referenced in the RI and FS Reports prepared for Operable Unit No. 2. The DoN encourages the public to review these other documents in order to gain a more comprehensive understanding of the sites. The administrative record file, which contains information on which the selection of the remedial action will be based, is available for public review at MCB Camp Lejeune, Building 1220 and at the Onslow County Library in Jacksonville, North Carolina. The public is invited to review and comment on the administrative record and this PRAP.

## Operable Unit Description

Camp Lejeune is a training base for the U.S. Marine Corps, located in Onslow County, North Carolina. The Base covers approximately 170 square miles and includes 14 miles of coastline. MCB Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the Base.

The study area, Operable Unit No. 2 is one of 13 operable units within MCB Camp Lejeune. An "operable unit" as defined by the National Contingency Plan (NCP) is a discrete action that comprises an incremental step toward comprehensivity addressing site problems. The cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the site. Operable units may address geographical portions of a site, specific site problems, or initial phases of an action. With respect to MCB Camp Lejeune, operable units were developed to combine one or more individual sites where Installation Restoration Program (IRP) activities are or will be implemented.

Operable Unit No. 2, which covers an area of approximately 210 acres, is comprised of three IRP sites: Sites 6, 9, and 82. Operable Unit No. 2 is located approximately two miles east of the New River and two miles south of State Route 24 (see Figure 1). As shown on Figure 2, the operable unit is bordered to the north by Wallace Creek, to the west by Holcomb Boulevard, to the east by Piney Green Road, and to the south by Sneads Ferry Road.

Within Site 6, there are four main areas of concern: Open Storage Lot 201; Open Storage Lot 203; the wooded areas which surround these storage lots; and a ravine (see Figure 2). Open Storage Lot 201 is a fenced lot located in the southcentral portion of Site 6. This lot is currently used to store military equipment and vehicles, lumber, hydraulic oils and lubricants, non-polychlorinated biphenyl (PCB) transformers, and other supplies. Lot 201 is approximately 25 acres in size.

Open Storage Lot 203 is a fenced lot situated in the northern portion of Site 6, bordering Site 82 to the south. Based on a review of historical aerial photographs, it appears that the fenced boundaries of this lot have changed since the lot was in operation. Currently, the fenced portion of Lot 203 is approximately 41 acres in size. In the past, the storage lot was reportedly used for the disposal of various chemicals including PCBs, cleaning solvents, electrolytes from used batteries, and waste oils. Storage Lot 203 is no longer used as an active

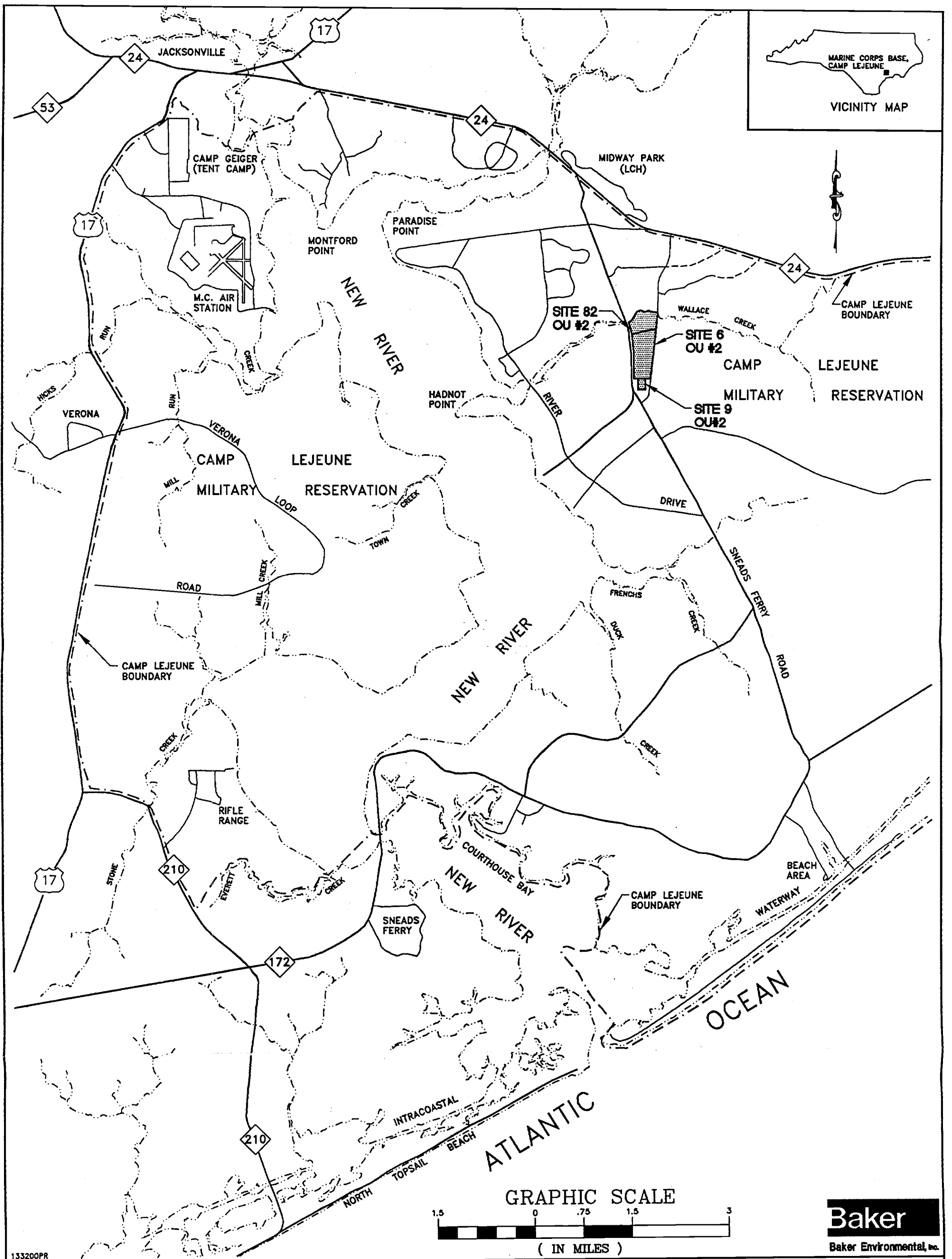


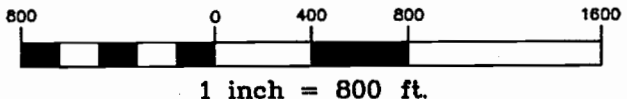
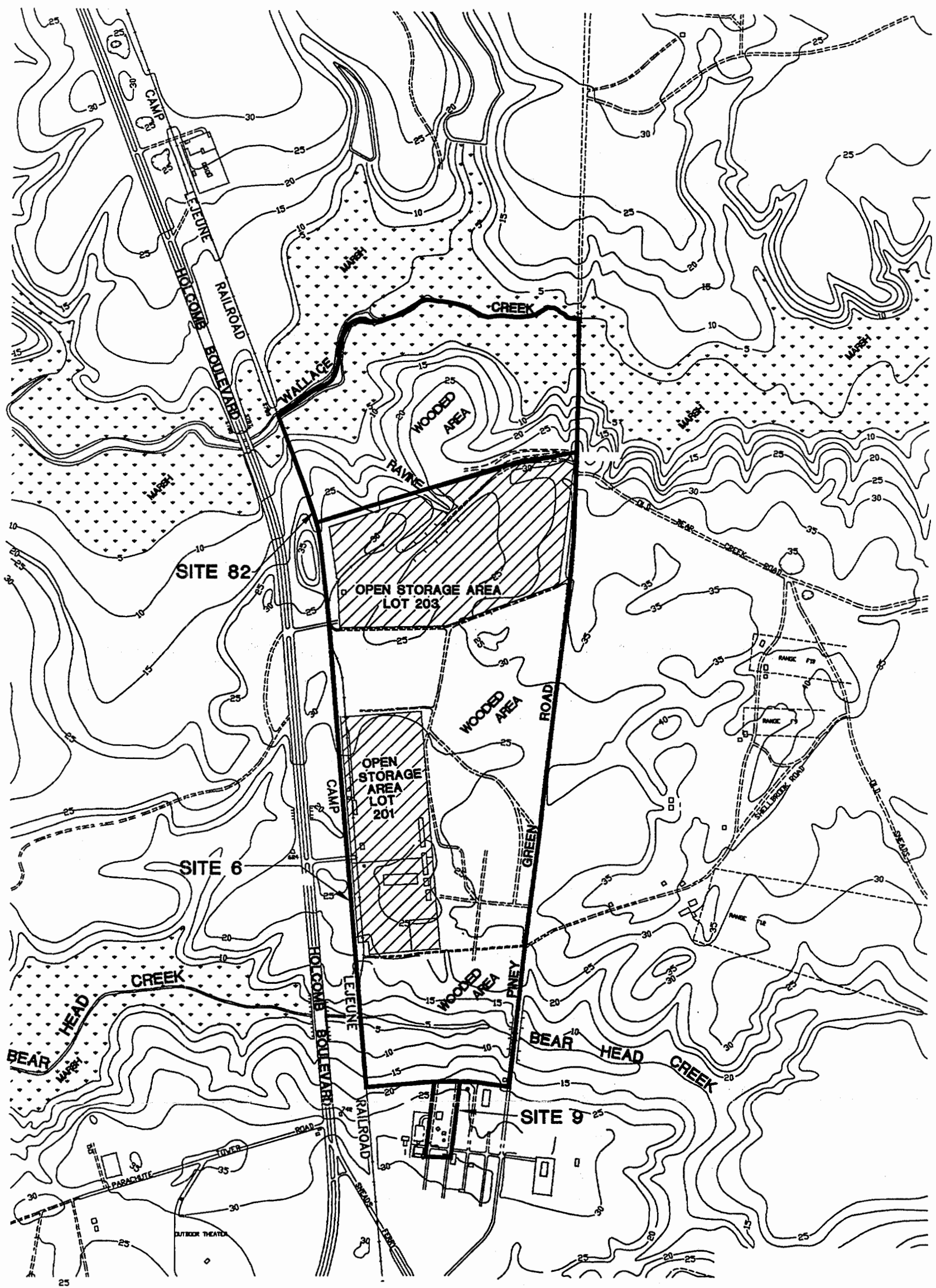
FIGURE 1  
 LOCATION MAP  
 OPERABLE UNIT No.2, SITES 6, 9 and 82  
 PROPOSED REMEDIAL ACTION PLAN CTO-0133

MARINE CORPS BASE, CAMP LEJEUNE  
 NORTH CAROLINA

**Baker**  
 Baker Environmental, Inc.

02362BB B12





1 inch = 800 ft.

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133201PR

**LEGEND**

- APPROXIMATE SITE BOUNDARIES
- OPEN STORAGE AREA
- UNPAVED ROAD

SOURCE: LANTDIV, FEBRUARY 1992

**FIGURE 2**  
GENERAL ARRANGEMENT MAP  
SITES 6, 9 and 82  
PROPOSED REMEDIAL ACTION PLAN CTO-0133  
MARINE CORPS BASE, CAMP LEJEUNE  
NORTH CAROLINA

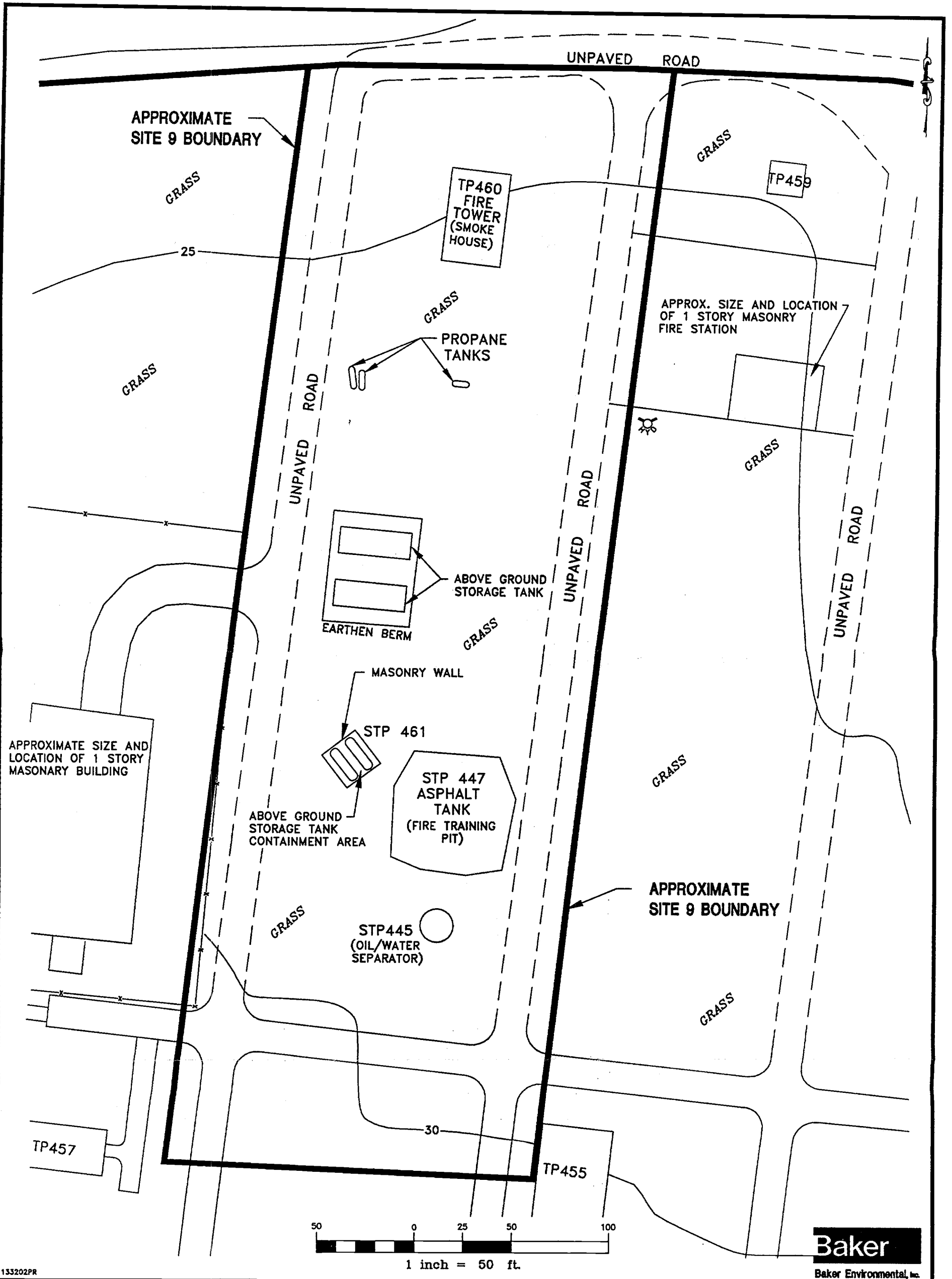
storage area. The lot still contains randomly stored scrap materials from former activities such as rubber rafts, shredded tires, communication wire, wooden pallets, metal debris, barbed wire fencing, and spent ammunition casings. Empty storage tanks were also identified on the lot. They were labeled as diesel fuel, gasoline, and kerosene. A large number of 55-gallon drums have been identified within Lot 203. The majority of the drums, if labeled, were identified as containing lubricants, petroleum products, or corrosives.

The ravine is located in the northwest section of Site 6 (along the northern boundary of Lot 203) and bisects Site 82. The upper portion of the ravine was, at one time, used as a disposal area. The presence of battery packs, drums, fencing, tires, wire cables, respirator cartridges, empty drums, commercial ovens, commodes, and other surficial debris is evidence of past disposal practices.

Woods and open fields surround both Storage Lots 201 and 203 and make up the remaining area of Site 6. These areas are randomly littered with debris including spent ammunition casings, and empty or rusted drums.

Site 9 is the "Fire Fighting Training Pit at Piney Green Road". The site covers an area of approximately 2.6 acres. Site 9 is bounded by Holcomb Boulevard on the west, Bear Head Creek approximately 500 feet to the north, Piney Green Road on the east and Sneads Ferry Road on the south. Site 6 also borders Site 9 to the north. Figure 2 shows the general location of Site 9. Locally, the site is bounded by unnamed streets leading to various storage buildings in the vicinity. Site 9 consists of an asphalt-lined fire training pit, an oil/water separator, four aboveground storage tanks (ASTs), three propane tanks, and a fire tower (smoke house). Figure 3 identifies the general arrangement of Site 9. The fire training pit, located in the southern area of the site, is used to conduct training exercises for extinguishing fires caused by flammable liquids. The oil/water separator is located next to the fire training pit to collect water used in the training exercises and storm water that falls into the pit. The recovered product collected in the oil/water separator is disposed of off site. Two of the ASTs at Site 9 are 2500-gallon steel tanks labeled "DO NOT USE". These tanks are not currently in use. Two additional ASTs located within a concrete containment area are currently in use. These tanks are constructed of steel and have a capacity of 500 gallons each.

Site 82, the Piney Green Road VOC Site, is located directly north and adjacent to Site 6 and encompasses approximately 30 acres (see Figure 2). The site is predominantly covered by



**Baker**  
Baker Environmental, Inc.

FIGURE 3  
GENERAL ARRANGEMENT MAP  
SITE 9  
PROPOSED REMEDIAL ACTION PLAN CTO-0133  
MARINE CORPS BASE, CAMP LEJEUNE  
NORTH CAROLINA

SOURCE: LANTDIV, FEBRUARY 1992

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woodlands and is randomly littered with debris such as communication wire, spent ammunition casings, and empty or rusted drums.

### **Operable Unit Background History**

Site 6 has a history of various uses, including the disposal and storage of wastes and supplies. Pesticides have reportedly been stored in the northeast and southeast portions of Lot 201. Transformers containing PCBs were reportedly stored in the southwest portion of Lot 201. Open Storage Lot 203 previously served as a waste disposal and storage area from as early as the 1940s to the late 1980s. Reports detailing disposal activities within Lot 203 are vague; there is little indication as to the types and quantities of material disposed of throughout the lot, with the exception of pesticides. Pesticides were reported to have been stored in a trailer on Lot 203 as well as in the southeast portion of the lot. Former employees at Lot 203 have reported disposal of various chemicals including PCBs, cleaning solvents, electrolytes from used batteries, and waste oils.

Site 9 has been used for fire fighting training exercises from the early 1960s to the present. Until 1981, training exercises were conducted in an unlined pit. The pit is currently asphalt lined. Flammable liquids including used oil, solvents, and contaminated fuels (unleaded) were used as accelerants during training exercises. Approximately 30,000 to 40,000 gallons of JP-4 and JP-5 fuels were also burned in the fire training pit.

No organized disposal operations are documented for Site 82. It appears that the site area was used for disposal of miscellaneous debris from Lot 203, since similar items were identified at both sites. No known documentation of the quantity or the location of the disposal of volatile organic compounds (VOCs).

### **Previous Investigations**

In 1983 an Initial Assessment Study (IAS) was conducted at MCB Camp Lejeune by Water and Air Research, Inc. The study identified a number of areas within the facility, including Sites 6 and 9, as potential sources of contamination. As a result of this study, Environmental Science and Engineering, Inc. (ESE) was contracted by the DoN to further investigate these sites.

During 1984 through 1987, ESE conducted a Confirmation Study at Operable Unit No. 2 which focused on potential source areas identified in the IAS and the administrative record

file. The study consisted of collecting a limited number of environmental samples (soil, sediment, surface water, and groundwater) for purposes of constituent analysis. In general, the results detected the presence of pesticides in Lot 203, VOCs in the groundwater, and VOCs in the surface water.

A soil gas survey was conducted at Lot 203 in February 1989. The purpose of this survey was to identify the presence of VOCs that may potentially affect personnel working within Lot 203. No imminent hazards were observed from the results of the survey.

On October 4, 1989, Camp Lejeune was placed on the National Priorities List (NPL). The DoN, the USEPA, and the NC DEHNR entered into a Federal Facilities Agreement on February 13, 1991.

In June 1991, a site investigation was conducted at Site 82 by Halliburton NUS Environmental Corporation (NUS). The investigation consisted of drilling and sampling six shallow soil borings; installing and sampling three shallow monitoring wells; and sampling surface water and sediment of Wallace Creek. Organic contamination was detected in all of the media sampled.

A Site Assessment Report was prepared by ESE in March 1992. This report contained a summary of the previously conducted Confirmation Study in addition to a preliminary risk evaluation for Site 6. This report recommended that a full human health and ecological risk assessment be performed at Site 6.

In 1992, Baker Environmental, Inc. (Baker) conducted an RI field program at Operable Unit No. 2 to characterize potential environmental impacts and threats to human health resulting from previous storage, operational, and disposal activities. Investigation activities commenced on August 21, 1992, and continued through November 10, 1992. The field program consisted of a preliminary site survey; an unexploded ordnance survey; a geophysical survey; a soil investigation including drilling and sampling; a groundwater investigation including monitoring well installation (shallow and deep wells) and sampling; drum waste sampling; test pit investigation; a surface water and sediment investigation; and an aquatic and ecological survey. A second phase of the investigation, focused on the groundwater contamination identified at Site 82 was conducted in early 1993 and completed by April 1993. The results of the RI are summarized below.

Levels of organic contamination including PCBs, pesticides, VOCs, and semivolatile organic compounds (SVOCs) are present throughout Operable Unit No. 2 in the various media (i.e., soil, groundwater, surface water, and sediments). Pesticides, PCBs, VOCs, and SVOCs appear to be the predominant contaminants of concern (COCs) in soils (mostly in surface soils) and sediments. VOCs appear to be the COCs in groundwater in both the surficial (less than 25 feet in depth) and deep (greater than 100 feet in depth) portions of the groundwater aquifer. In addition, VOCs appear to be the COCs in the surface water. Several areas were identified within Operable Unit No. 2 which exhibited significant levels of organic contamination. These areas are located within Lot 201 [PCBs, pesticides, VOCs, and SVOCs (northeastern corner of lot)], the ravine area (PCBs, pesticides, and SVOCs), Site 82 (VOCs and SVOCs), and Wallace Creek (VOCs). Table 1 presents a listing of the organic compounds detected within Operable Unit No. 2.

Inorganic contaminants are also present throughout Operable Unit No. 2 in the various media. The predominant inorganic COCs appear to be barium, cadmium, chromium, lead, manganese, and zinc. These contaminants were identified in soils above background levels (i.e., compared to normal background levels for Camp Lejeune soils). In some cases, the inorganic contaminants identified in groundwater were detected above the Federal drinking water standards and/or the North Carolina Water Quality Standards. Additionally, several of these contaminants were detected above ambient water quality guidelines.

Based on the results of the various environmental investigations conducted at Operable Unit No. 2 during the RI, conclusions with respect to the nature and extent of contamination at the three sites were developed as listed below. Please note that various drums and containers were noted throughout Sites 6 and 82. All surficial drums/containers and known buried drums are being removed from Operable Unit No. 2 through a Time Critical Removal Action which will be conducted prior to implementing any remedial alternative at the operable unit.

#### *Site 6*

- The northeast corner of Lot 201 at the former pesticide storage area is contaminated with elevated levels of pesticides and VOCs that may be associated with former waste storage/handling activities. The extent of soil contamination is limited in area since only two sampling locations exhibited elevated contaminant levels.

TABLE 1

ORGANIC COMPOUNDS DETECTED WITHIN OPERABLE UNIT NO. 2  
 PROPOSED REMEDIAL ACTION PLAN CTO-0133  
 MCB CAMP LEJEUNE, NORTH CAROLINA

<u>PCBs</u>	<u>Volatile Organic Compounds</u>	<u>Semivolatile Organic Compounds</u>
Aroclor-1248	1,1,1-Trichloroethane	1,2-Dichlorobenzene
Aroclor-1254	1,1,2,2-Tetrachloroethene	1,4-Dichlorobenzene
Aroclor-1260	1,1,2-Trichloroethane	2-Methyl naphthalene
	1,1-Dichloroethene	4-Methylphenol
	1,2-Dichloroethane	Acenaphthylene
	Benzene	Anthracene
	Bromomethane	Benzo(a)anthracene
	Chlorobenzene	Benzo(a)pyrene
	Chloromethane	Benzo(b)fluoranthene
	Ethylbenzene	Benzo(g,h,i)perylene
	Tetrachloroethene	Benzo(k)fluoranthene
	Toluene	Carbazole
	Total Xylenes	Chrysene
	Trans-1,2-Dichloroethene	Dibenzo(a,h)anthracene
	Trichloroethene	Dibenzofuran
	Vinyl Chloride	Dibenzofuran
		Fluoranthene
		Fluorene
		Fluorene
		Ideno(1,2,3-cd)pyrene
		Naphthalene
		Pentachlorophenol
		Phenanthrene
		Phenol
		Pyrene

Pesticides

4,4'-DDD  
 4,4'-DDE  
 4,4'-DDT  
 Alpha Chlordane  
 Dieldren  
 Endin  
 Endosulfan II  
 Gamma Chlordane

- Former waste storage/handling activities at Lot 201 have not adversely impacted groundwater quality in this portion of Operable Unit No. 2.
- The area of Lot 203 near the former railroad spur may be associated with previous disposal activities. A limited number of surface and subsurface soil samples collected near the former railroad spur have revealed elevated levels of PCB (Aroclor-1260) and polynuclear aromatic hydrocarbons (PAHs). Historical aerial photographs indicate significant activity (i.e., surficial anomalies) in this area of Lot 203.
- Disposal activities may have occurred in the north central portion of Lot 203 where elevated levels of PCBs were detected in subsurface soil samples. In addition to PCBs, elevated levels of PAHs were also detected in this area.
- Military training operations at Lot 203 resulted in a substantial amount of buried debris including communication wire, shell casings, battery packs, small 5-gallon containers, and bivouac wastes. No 55-gallon drums were uncovered in any of the test pit excavations. Trenches identified in historical photographs were primarily excavated as a means to dispose of military-type wastes and not for purposes of disposing hazardous wastes.
- Numerous drums on the surface of Lot 203 present a potential impact to human health and the environment. Samples collected from these drums indicate that some of the drum contents are characteristically hazardous. None of the drums were noted to be leaking.
- Groundwater quality at Lot 203 has not been significantly impacted by former disposal and storage practices. Trace levels of trichloroethene (TCE) were detected in well 6GW15, which is located in the north central portion of Lot 203 where disposal activities may have occurred. Trace levels of TCE and tetrachloroethene (PCE) were detected in well 6GW23.

Well 6GW23 is located in the south central portion of Lot 203. The source of VOC contamination in well 6GW23 is unknown. Soil samples collected from this borehole as well as other nearby soil borings did not indicate a source.



- Groundwater quality in the wooded area south of Lot 203 (near the above-mentioned disposal area) has been impacted by former disposal practices. Low levels of VOCs (chloroform, chlorobenzene, phenol) were encountered in two wells.
- The presence of elevated levels of PAHs in soil and low levels of PCBs in sediment in the upper portion of the ravine (i.e., near Lot 203) is most likely due to former disposal practices. This portion of the ravine is filled with debris, including empty and partially-filled 55-gallon drums. In addition, canisters with "DDT" markings were found in the middle section of the ravine (between Lot 203 and Wallace Creek). However, no elevated levels of pesticides were detected in the ravine sediments.
- Soil contamination detected in the ravine has likely migrated to Wallace Creek via surface runoff. Wallace Creek sediments revealed the same constituents detected in ravine soils and sediments.
- PCBs were detected in surface soil near Piney Green Road east of Lot 201. Disposal activities may have occurred in this area, which once served as a training area.
- Disposal activities may have occurred in the wooded area between Lot 201 and 203. One location exhibited moderate levels of PCBs, PAHs, and pesticides in surface soil. The horizontal and vertical extent of this contamination is limited.
- A former disposal area was identified during the test pit investigation in the wooded area between Lot 201 and Lot 203. Numerous 5-gallon containers, bivouac wastes, and battery packs were encountered. All of the containers were rusted and destroyed to the point where their contents could not be identified; however, solvent-like odors were observed by the sampling team. A sample of the sludge material near the containers revealed that the material is characteristically hazardous due to elevated levels of lead. Chloroform was also detected, but was below Toxicity Characteristics Leaching Procedure (TCLP) regulatory levels.

*Site 9*

- Ongoing fire training exercises at Site 9 have not significantly impacted either soil or groundwater quality.

- Low levels of pesticides present at Site 9 are likely the result of former pest control practices and not associated with waste disposal.

#### *Site 82*

- Shallow and deep groundwater exhibited elevated levels of VOC contaminants. Deep groundwater quality was found to be significantly more contaminated than shallow groundwater quality.
- The horizontal extent of shallow groundwater contamination is defined. The plume apparently originates just north of Lot 203 (in the southern portion of Site 82) and discharges into Wallace Creek. Contaminants have migrated into the deeper portion of the aquifer as evidenced by elevated VOC levels in deep groundwater monitoring wells.
- The horizontal and vertical extent of deep groundwater contamination has been evaluated. The horizontal extent of off-site contamination west of Site 82 (beyond well 6GW37D), however, has not been fully defined. Moreover, the vertical extent has been evaluated to a depth of 230 feet. It is unknown at this time whether contamination extends below 230 feet. A clay layer is present at approximately 230 feet which may impede the vertical migration of contamination.
- A large quantity of surficial drums and debris were observed within Site 82. Samples collected of the waste material analyzed the waste as No. 6 fuel, which is typically used for heating. Other drums uncovered could not be identified. This area may also be a source of groundwater contamination at Site 82.

#### *Wallace Creek*

- The presence of TCE, PCE, and other VOC contaminants in Wallace Creek is due to shallow and possibly deep groundwater discharge.
- Surface runoff from the ravine has impacted sediment quality. Elevated levels of PAHs and PCBs are present in Wallace Creek. These contaminants were also detected in the ravine.

- The source of pesticide contamination may be due to either runoff from the ravine and/or historical pest control spraying practices. The highest levels of pesticides were detected in two sampling stations that were located just downstream of where the ravine discharges into Wallace Creek.
- The fish population and diversity in Wallace Creek appears to be healthy, based on population statistics. No anomalies were observed on any of the fish collected during the aquatic survey.
- Some of the fish collected in Wallace Creek exhibited tissue concentrations of PCBs, pesticides, and TCE, which may be attributable to Site 82 and the ravine area. The levels detected in the fish do not exceed U.S. Food and Drug Administration (FDA) levels for "safe" consumption.

#### *Bear Head Creek*

- Sediment quality in Bear Head Creek may be impacted via surface runoff from the wooded areas. Low levels of PAHs, pesticides, and PCBs were detected in sampling stations which border Site 6. VOC contaminants were also detected in sediment samples; however, the source of VOC contamination unknown given that soil and groundwater in this area was not contaminated with VOCs. Pesticides in sediment are not likely associated with disposal practices.
- Inorganic constituents detected in sediment are not likely the result of disposal practices at Sites 6 or 9.
- The fish community at Bear Head Creek appears to be healthy, based on population statistics and observations. None of the fish collected at Bear Head Creek exhibited lesions or other anomalies that would represent adverse conditions.
- The fish community in Bear Head Creek had elevated levels of pesticides, PCBs, and zinc in tissue.

### **Scope and Role of Action**

The proposed remedial action identified in this PRAP is the overall strategy for the entire operable unit in that it remediates both media of concern: groundwater and soil. The contaminant plumes identified in both the shallow and deep portions of the aquifer will be remediated along with contaminated soils that may be a source of groundwater contamination. Implementation of this remedial action will reduce the potential for the migration of contamination, which in turn will reduce the risk to human health and to the environment.

Surface water and sediment will not be addressed under this action for the following reasons:

- The overall risk to human health posed by either Wallace Creek or Bear Head Creek is low.
- Based on studies conducted at each creek, there does not appear to be any impact to the benthic or fish communities.
- The remediation of contaminated groundwater and soil at Operable Unit No. 2 will mitigate further contamination of Wallace Creek and Bear Head Creek.
- Direct treatment of surface water or sediment in either creek may result in a greater risk to the environment.

Please note that based on the fact that PCBs were detected in a few of the fish samples collected from Wallace Creek, additional studies (sampling and analysis) are planned for Wallace Creek to determine if there may be a bioaccumulation problem. The results of this additional study will be part of the predesign.

A Time-Critical Removal Action will also be conducted by the Department of the Navy Marine Corps to remove surficial drums that may pose a threat to human health and/or the environment. In addition, buried drums at Site 6 (south of Lot 203) and at Site 82 (just north of Lot 203) will be excavated and disposed/treated offsite. This removal action will be initiated prior to the implementation of groundwater or soil remedial actions.

## Summary of Site Risks

As part of the RI, a Human Health Risk Assessment and an Ecological Risk Assessment were conducted to evaluate the current or future potential risks to human health and the environment resulting from the presence of contaminants identified at Operable Unit No. 2. A summary of the key findings from both of these studies is presented below.

### *Human Health Risk Assessment*

The risk assessment was conducted for several environmental media including soil, groundwater, surface water, sediments, and biota. Potential contaminants of concern (COCs) for each of these media were selected based on prevalence, mobility, persistence, and toxicity. Table 2 lists the potential COCs which were identified and assessed for each media. For soil, the potential COCs included pesticides, PCBs, polynuclear aromatic hydrocarbons (PAHs), and inorganics. For groundwater, the potential COCs included VOCs, phenol, and inorganics. Surface water COCs included VOCs and inorganics. Sediment COCs included VOCs, PAHs, pesticides, PCBs, and inorganics. The potential COCs for biota included pesticides, PCBs, and a few inorganics.

The exposure routes evaluated in the risk assessment included ingestion, dermal contact, and particulate inhalation of surface soils; future potential ingestion and dermal contact of groundwater; ingestion and dermal contact of surface water and sediments; and ingestion of aquatic biota. Several exposed populations were evaluated in the risk assessment with respect to both current and future potential scenarios for the operable unit. For surface soil and groundwater, civilian personnel and future on-site residents (adults and children) were retained as potentially exposed populations. Adults and adolescents were retained for surface water and sediment exposures. For aquatic biota, adults were evaluated as the potentially exposed population.

As part of the risk assessment, incremental cancer risks (ICRs) and hazard indices (HIs) were calculated for each of the exposure routes and potentially exposed populations. An ICR refers to the cancer risk that is over and above the background cancer risk in unexposed individuals. For example, an ICR of  $10E-4$  means that one additional person out of ten thousand may be at risk of developing cancer due to excessive exposure at the site if no actions are conducted. The HI refers to noncarcinogenic effects and is a ratio of the level of exposure to an acceptable level

TABLE 2

**SUMMARY OF POTENTIAL COCs EVALUATED IN THE  
HUMAN HEALTH RISK ASSESSMENT  
PROPOSED REMEDIAL ACTION PLAN - CTO-0133  
MCB CAMP LEJEUNE, NORTH CAROLINA**

Contaminant	Soil	Groundwater	Surface Water	Sediment	Biota
Bromodichloromethane		X			
1,2-Dichloroethane		X			
1,1-Dichloroethene		X			
1,1,2-Trichloroethane		X			
Chlorobenzene		X			
T-1,2-Dichloroethene		X	X	X	
Tetrachloroethene		X	X		
Ethylbenzene		X			
Total Xylenes		X		X	
1,1,2,2-Tetrachloroethane		X			
1,1,1-Trichloroethane		X			
Trichloroethene		X	X		
Vinyl Chloride		X	X		
Toluene			X	X	
1,4-Dichlorobenzene	X				
Chrysene	X			X	
Acenaphthene	X				
Phenanthrene	X				
Anthracene	X				
Fluoranthene	X			X	
Pyrene	X			X	
Benzo(a)anthracene	X			X	
Benzo(b)fluoranthene	X			X	
Benzo(k)fluoranthene	X				
Benzo(a)pyrene	X			X	
Indeno(1,2,3-cd)pyrene	X				
Dibenz(a,h)anthracene	X				
Phenol		X			
4,4'-DDD	X			X	X
4,4'-DDE	X			X	X
4,4'-DDT	X			X	X
Dieldrin	X			X	
Endrin	X				X
PCB-1260	X			X	X
Antimony		X			
Arsenic	X	X	X	X	
Barium	X	X	X	X	
Beryllium		X	X	X	X
Cadmium	X		X	X	X
Chromium	X	X	X	X	
Copper		X	X	X	
Lead		X	X	X	
Manganese	X	X	X	X	
Mercury		X	X		
Nickel		X	X	X	
Vanadium	X	X	X	X	
Zinc	X	X	X	X	X

for all COCs. A HI greater than or equal to unity (i.e., 1.0) indicates that there may be a concern for noncarcinogenic health effects.

With respect to Operable Unit No. 2, all of the exposure routes/exposure populations evaluated had ICRs within the USEPA's acceptable risk range of  $10E-4$  to  $10E-6$  except for groundwater and biota. USEPA considers this risk range to be safe and protective of public health. Groundwater at Operable Unit No. 2 had calculated ICRs of  $1.7E-4$ ,  $2.0E-4$ , and  $3.6E-4$  for future on-site residential children, civilian base employees, and future on-site residential adults, respectively. The individual risks from vinyl chloride, arsenic, and beryllium were estimated to contribute 80 percent to the total risk for all of the receptors. With respect to biota, adults who ingest fish obtained from Wallace Creek displayed an ICR value of  $1.8E-4$ , which exceeds the USEPA's risk range. Approximately 98 percent of this ICR value is due to the presence of PCB-1260 detected in one stripped mullet fillet (Note: the stripped mullet is a migratory fish; therefore, the presence of PCB may not be due to contamination at Operable Unit No. 2). The level of PCB-1260 detected in the fish sample is below the FDA level for "unsafe" consumption. As previously stated, additional studies along Wallace Creek will be conducted to better evaluate bioaccumulation of organic and inorganic contaminants.

The calculated HIs for all of the media ranged from 0.01 to 3.0. The HIs were below 1.0 except for groundwater which had HIs of 0.9, 1.3, and 3.0 for base employees, future on-site residential adults, and future on-site residential children, respectively.

It is important to note that actual or threatened releases of hazardous substance from Operable Unit No. 2, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

### *Ecological Risk Assessment*

An Ecological Risk Assessment was conducted at Operable Unit No. 2 in conjunction with the RI. The objectives of this risk assessment were to determine if past reported disposal activities are adversely impacting the ecological integrity of Wallace Creek, Bear Head Creek, or the ravine; and to evaluate the potential effects on sensitive environments at the operable unit such as wetlands, protected species, and fish nursery areas.

The Ecological Risk Assessment was conducted for several environmental media including soil, surface water, sediments, and fish and crab. Table 3 lists the potential COCs which were identified and assessed in this risk assessment for each media. For soil, the potential COCs included a few VOCs, PAHs, pesticides, PCBs, and inorganics. For groundwater, the potential COCs included VOCs, phenol, and inorganics. Surface water COCs included VOCs and inorganics. Sediment COCs included VOCs, PAHs, pesticides, PCBs, and inorganics. The potential COCs for the fish and crab tissues included a few VOCs, pesticides, PCBs, and a few inorganics.

The exposure routes evaluated in the risk assessment included ingestion and dermal contact of soil, surface water, sediment, and groundwater. Several exposed populations were evaluated in the Ecological Risk Assessment. For surface water and groundwater, fish, crab, benthic macroinvertebrates, birds, and other aquatic and terrestrial life were evaluated as potentially exposed populations. Bottom feeding fish and crabs, benthic macroinvertebrates, aquatic vegetation, and other aquatic life were evaluated with respect to sediment exposure. For soil, terrestrial species were evaluated as the potentially exposed population.

Significant findings from the Ecological Risk Assessment are summarized below. Based on the concentrations of several inorganics detected in the surface water and several organics and inorganics sediment samples collected from Wallace Creek, Bear Head Creek and the ravine, the potential risk for aquatic life in the creeks to be adversely affected by chronic toxicity from the COCs may be moderate to high, provided that the exposure concentration evaluated occurs for sufficient duration to elicit chronic toxicity. However, based on studies conducted to date, there does not appear to be any impact on the fish or benthic communities due to site contamination.

Total exposure to the COCs in the soil and surface waters by the terrestrial receptors was evaluated by estimating the chronic daily dose and comparing this dose to terrestrial reference values (TRVs). Indicator species used in this analysis were the whitetailed deer, cottontail rabbit and the quail. The exposure points for these receptors are the surface soils and surface water (surface soils from Site 6, Lot 201; Site 6, Lot 203; Sites Site 6, Wooded areas and Ravine; Site 82 and Site 9, Surface Water from Wallace Creek). The routes for terrestrial exposure to the COCs in the soil and water incidental soil ingestion, drinking water ingestion, and vegetation ingestion. Estimates of the potential risk to the terrestrial receptors were made by comparing the total exposure of the COCs to the TRVs using the Quotient Index (QI) method. Ratios of less than unity indicate a low likelihood of adverse effects while a ratio



TABLE 3

**SUMMARY OF POTENTIAL COCs EVALUATED IN THE  
ECOLOGICAL RISK ASSESSMENT  
PROPOSED REMEDIAL ACTION PLAN - CTO-0133  
MCB CAMP LEJEUNE, NORTH CAROLINA**

Contaminant	Soil	Surface Water	Sediment	Fish and Crab
Bromodichloromethane				
1,2-Dichloroethane		X	X	
1,1-Dichloroethene				
1,1,2-Trichloroethane				
Chlorobenzene				
T-1,2-Dichloroethene				
Tetrachloroethene	X	X	X	
Benzene			X	X
Ethylbenzene			X	
Total Xylenes			X	
1,1,2,2-Tetrachloroethane				
1,1,1-Trichloroethane	X			
Trichloroethene		X	X	X
Vinyl Chloride		X		
Toluene		X	X	X
Carbon Disulfide			X	
1,4-Dichlorobenzene	X			
Chrysene	X		X	
Acenaphthene				
Phenanthrene			X	
Anthracene	X			
Fluoranthene	X		X	
Pyrene	X		X	
Benzo(a)anthracene	X		X	
Benzo(b)fluoranthene	X		X	
Benzo(k)fluoranthene	X		X	
Benzo(a)pyrene	X		X	
Indeno(1,2,3-cd)pyrene	X			
Dibenz(a,h)anthracene	X			
Phenol	X		X	X
4,4'-DDD	X		X	X
4,4'-DDE	X		X	X
4,4'-DDT	X		X	X
Dieldrin	X		X	
Endrin	X		X	
PCB-1260	X		X	X
Aluminum		X		
Antimony				
Arsenic	X	X		
Barium	X	X		
Beryllium		X		
Cadmium	X	X		X
Chromium	X	X		
Copper	X	X		
Iron		X		
Lead	X	X		
Manganese		X		
Mercury	X	X		
Nickel	X	X		
Selenium				X
Silver		X		X
Vanadium		X		
Zinc	X	X		X

above unity indicate the likelihood of an adverse effect to the receptor. For the COCs that had available TRVs, the QI did not exceed unity for any of the indicator terrestrial receptors.

Based on these findings, past reported disposal practices at OU No. 2 potentially are adversely impacting the ecological integrity of Wallace Creek, Bear Head Creek, or the ravine. The findings do not indicate a potentially adverse impact to vertebrate terrestrial receptors.

With respect to fish, the fish community at Wallace Creek and Bear Head Creek appeared healthy, and the population statistics did not indicate that the environment was impacted by the COCs from Operable Unit No. 2. In addition, no anomalies such as lesions, or bacterial or viral infections were observed on any fish. Fish tissue samples collected from Wallace and Bear Head Creeks had elevated concentrations of pesticides, PCBs, TCE, and/or zinc. The risk assessment preliminarily concluded that due to the nature of these COCs, they may be attributed to Operable Unit No. 2; however, further studies are required to verify this conclusion.

With respect to benthic macroinvertebrates, the Macroinvertebrates Biotic Index (MBI) ranged from good/fair in the upper reaches of Wallace Creek to poor in the lower reaches. The MBI was poor in Bear Head Creek. The risk assessment concluded that the adverse habitat in both of these creeks may be created by factors not associated with COCs from Operable Unit No. 2 (e.g., the presence of a salt wedge and low dissolved oxygen).

It is important to note that actual or threatened releases of hazardous substance from Operable Unit No. 2, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

### **Summary of Alternatives**

The Remedial Action Alternatives (RAAs) were developed to address contaminated media at various areas of concern (AOCs) within Operable Unit No. 2. The AOCs include:

- VOC-contaminated groundwater plume (shallow and deep) originating from Site 82.
- Four small areas of groundwater contamination south and west of Open Storage Lot 203.

- Source of groundwater VOC contamination at Site 82 (referred to as Soil AOC1).
- Upper portion of the ravine at Site 6 with detected levels of PAHs, PCBs and metals in soil and sediment (Soil AOC2). This may be a source of contamination to Wallace Creek.
- North-central portion of Lot 203 with elevated levels of PCBs in soil (Soil AOC3).
- Northwestern portion of Lot 203 with elevated levels of PCBs in soil (Soil AOC4).
- Northeast corner of Lot 201 with elevated levels of pesticides in soil (Soil AOC5).
- Wooded area east of Lot 201 and adjacent to Piney Green Road with elevated levels of PCBs in soil (Soil AOC6).

Figures 4 and 5 show the general location of the above-mentioned AOCs for groundwater and soil, respectively.

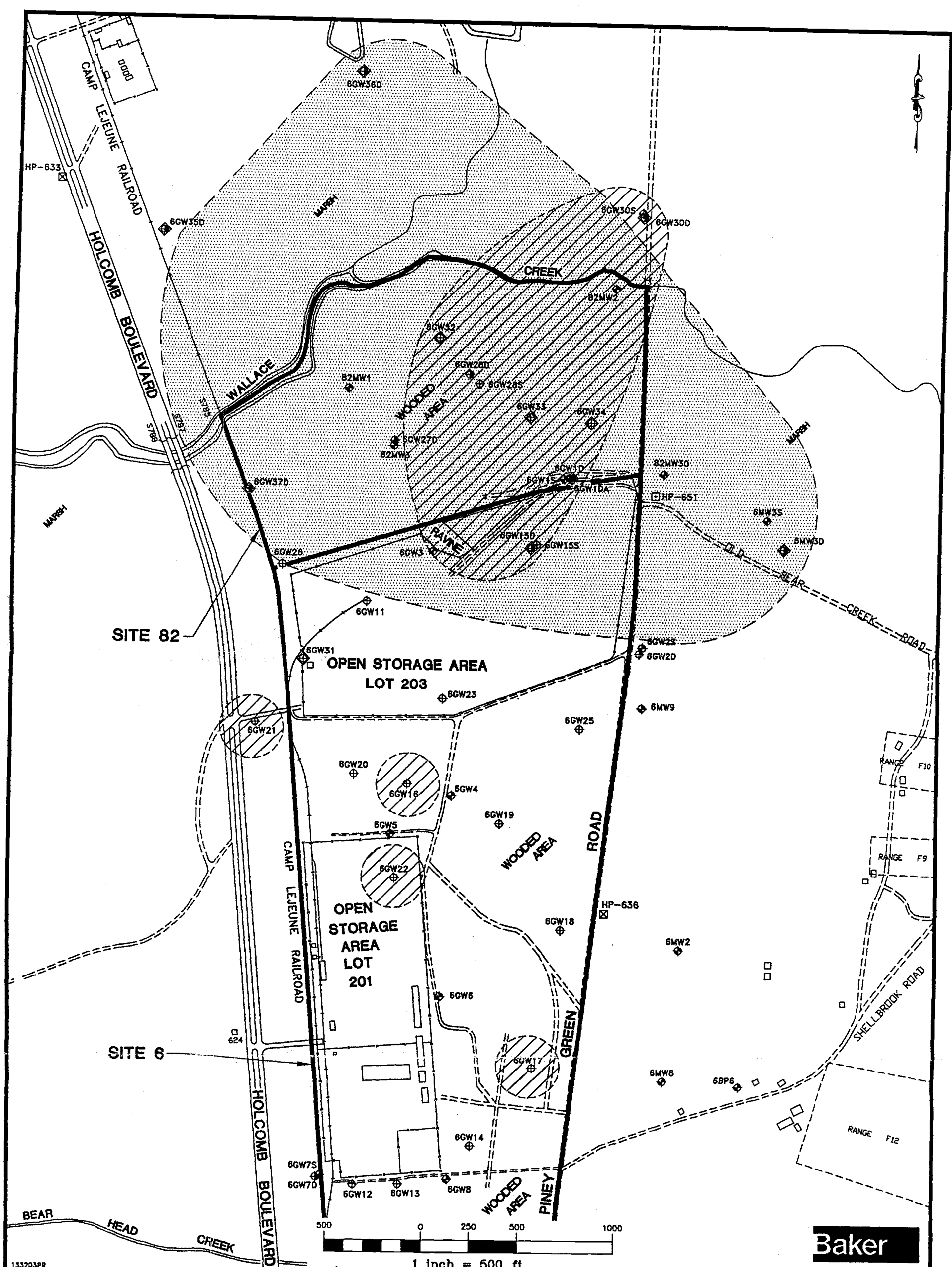
No AOCs were identified within Site 9. In addition, areas where drums and containers have been identified at the sites are being removed from Operable Unit No. 2 through a Time Critical Removal Action. This removal action will be conducted prior to implementing any RAA presented in this PRAP.

Based on the AOCs identified above, five groundwater RAAs and seven soil RAAs were developed and evaluated in the FS. A brief overview of each of the RAAs per media is included below. All costs and implementation times are estimated.

#### *Groundwater RAAs*

The following groundwater RAAs were developed and evaluated for Operable Unit No. 2:

- RAA No. 1 No Action
- RAA No. 2 Limited Action
- RAA No. 3 Containment
- RAA No. 4 Intensive Groundwater Extraction and Treatment
- RAA No. 5 Groundwater Extraction and Treatment



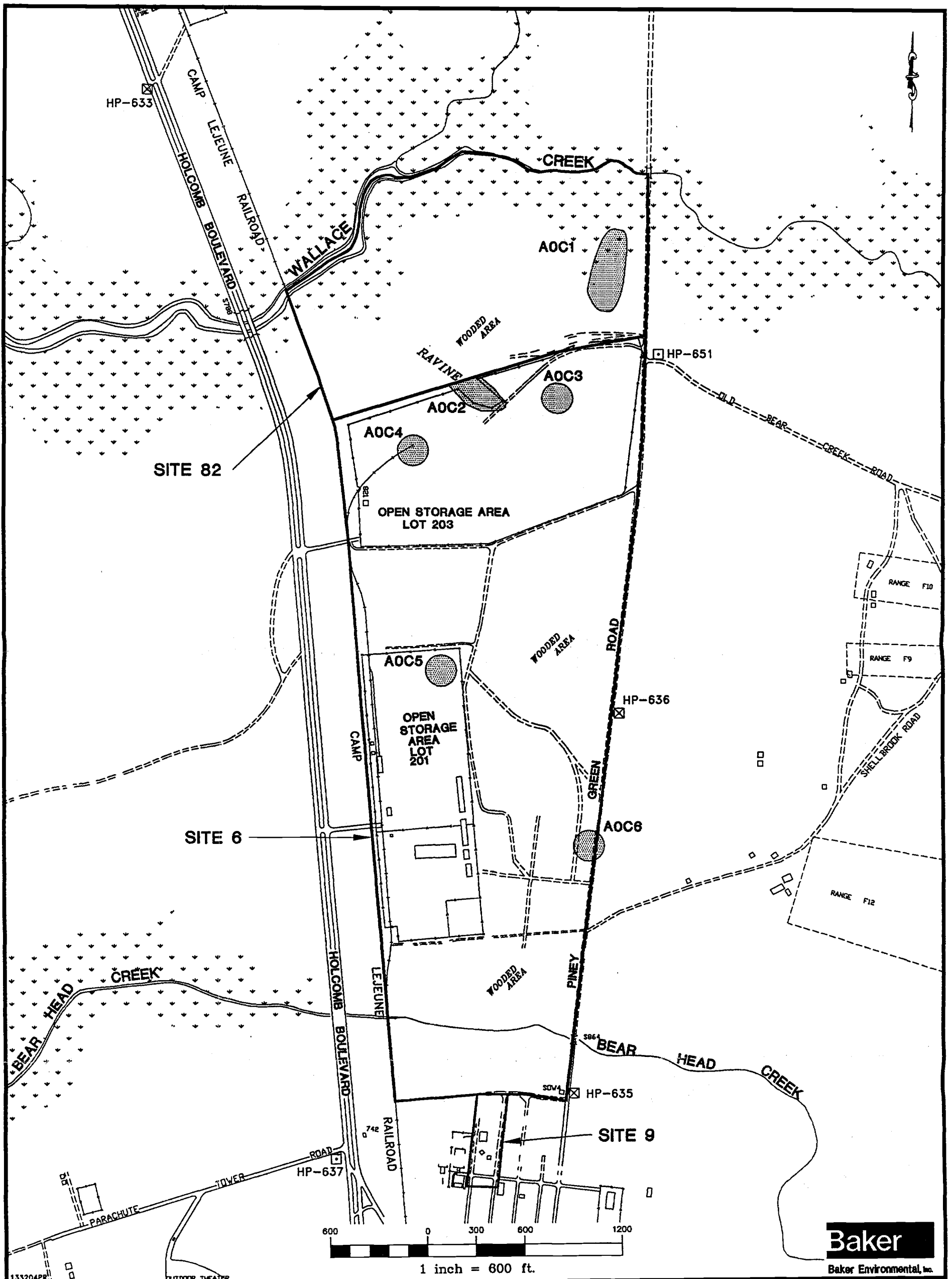
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LEGEND	
6GW15	EXISTING MONITORING WELL
6GW9	PHASE I SHALLOW MONITORING WELL
6GW10	PHASE I DEEP MONITORING WELL
HP-651	WATER SUPPLY WELL (CURRENTLY INACTIVE)
HP-637	WATER SUPPLY WELL (CURRENTLY ACTIVE)
6GW31	PHASE II SHALLOW MONITORING WELL
6GW1DA	PHASE II DEEP MONITORING WELL
(Dotted Circle)	APPROXIMATE AREA OF GROUNDWATER (DEEPER PORTION) CONTAMINATION EXCEEDING REMEDIATION GOALS
(Hatched Circle)	APPROXIMATE AREA OF GROUNDWATER (SHALLOW PORTION) CONTAMINATION EXCEEDING REMEDIATION GOALS

FIGURE 4  
 APPROXIMATE LOCATION OF  
 GROUNDWATER CONTAMINATION  
 PROPOSED REMEDIAL ACTION PLAN CTO-0133  
 MARINE CORPS BASE, CAMP LEJEUNE  
 NORTH CAROLINA



02362BB22



**Baker**  
Baker Environmental, Inc.

**LEGEND**

HP-651	WATER SUPPLY WELL (CURRENTLY INACTIVE)
HP-637	WATER SUPPLY WELL (CURRENTLY ACTIVE)
AOC1	APPROXIMATE LOCATION OF SOIL AREAS OF CONCERN

SOURCE: LANTDIV, FEBRUARY 1992

**FIGURE 5**  
APPROXIMATE LOCATION OF  
SOIL AREAS OF CONCERN  
PROPOSED REMEDIAL ACTION PLAN CTO-0133  
MARINE CORPS BASE, CAMP LEJEUNE  
NORTH CAROLINA

**Common Elements** - Except for the "No Action" RAA, all of the Groundwater RAAs include a few common components. RAAs 2 through 5 will include institutional controls such as a long-term groundwater monitoring, aquifer-use restrictions, and deed restrictions. The monitoring activities will be conducted to gauge the effectiveness of the selected remedy. Deed restrictions will be placed on the operable unit to prohibit the installation of any new water supply wells. Aquifer-use restrictions will be implemented to control the use of existing potable water supply wells that are contaminated. RAAs 3 through 5 include the extraction and on-site treatment of contaminated groundwater followed by discharge to Wallace Creek.

A description of each alternative as well as the estimated cost and timeframe to implement the alternative follows:

- **RAA No. 1: No Action**

Capital Cost: \$0  
Annual Operation and Maintenance (O&M) Costs: \$0  
Net Present Worth (NPW): \$0  
Months to Implement: None

The No Action RAA is required under CERCLA to establish a baseline for comparison. Under this RAA, no further action at the operable unit will be implemented to prevent exposure to groundwater contamination.

- **RAA No. 2: Limited Action**

Capital Cost: \$0  
Annual O&M Costs: \$39,080  
NPW: \$600,000  
Months to Implement: 3

RAA No. 2 will include the three institutional controls that are common with RAA Nos. 2 through 5, as mentioned above. The long-term monitoring program will consist of semiannual sampling and analysis of the groundwater from 21 existing monitoring wells and 3 operational water supply wells. Aquifer-use restrictions will be placed on Supply Wells 637 and 651 which are both currently inactive. Deed restrictions will be implemented which will restrict the installation of any new wells within the vicinity of Operable Unit No. 2.

- **RAA No. 3: Containment**

Capital Cost: \$2.6 million  
Annual O&M Costs: \$285,000  
NPW: \$7.0 million  
Months to Implement: 15

Under RAA No. 3, the contaminated groundwater plumes (shallow and deep) originating from Site 82 will be contained to eliminated further contaminant migration via a network of extraction wells placed along the boundaries of the two plumes. Approximately six deep extraction wells will be installed to a depth of 110 feet and pumped at a rate of 150 gallons per minute (gpm). In addition, approximately six shallow extraction wells will be installed to a depth of 35 feet and pumped at a rate of 5 gpm. The extracted groundwater will be treated on site via a combination of applicable treatment options (or treatment train), and then discharged to Wallace Creek. The treatment train may consist, but not be limited to, filtration, neutralization, precipitation, air stripping, and activated carbon adsorption.

The overall objective of this RAA is to reduce the potential for continued groundwater contaminant migration. Even though treatment of the extracted groundwater will be conducted, the RAA will not be designed to treat all of the groundwater from all affected plume areas.

- **RAA No. 4: Intensive Groundwater Extraction and Treatment**

Capital Cost: \$1.4 million  
Annual O&M Costs: \$227,000  
NPW: \$4.9 million  
Months to Implement: 12

Under RAA No. 4, the contaminated groundwater (shallow and deep) originating from Site 82 with the highest level of contamination will be extracted and treated on site. A network of extraction wells will be placed in the plume areas with the highest contaminant levels. Approximately two deep extraction wells (110 feet deep) will be installed and pumped at a rate of 150 gpm. In addition, three shallow (35 feet deep) extraction wells will be installed and pumped at a rate of 5 gpm. The extracted groundwater will be treated via a treatment train similar to the one mentioned in RAA No. 3 (with the exception of size). Treated groundwater will be discharged to Wallace Creek.

The overall objective of this RAA is to focus on the worst area of groundwater contamination. The rationale for this approach is that the major source areas of the groundwater contamination can be isolated and handled more feasibly than the entire area of impacted groundwater. The cone of influence created by extraction wells are expected to reach the downgradient boundary of the plume. Groundwater extraction and treatment will be employed until the remediation goals of the aquifer are met.

- **RAA No. 5: Complete Groundwater Treatment**

Capital Cost: \$3.5 million  
Annual O&M Costs: \$355,000  
NPW: \$8.9 million  
Months to Implement: 15-20

Under RAA No. 5, the contaminated groundwater plumes (shallow and deep) originating from Site 82 will be remediated via extraction and on-site treatment. A network of extraction wells will be placed along the boundaries and within the two plume areas. Approximately eight deep extraction wells will be installed to a depth of 110 feet and pumped at a rate of 150 gpm. In addition, approximately twelve shallow extraction wells will be installed to a depth of 35 feet and pumped at a rate of 5 gpm. The extracted groundwater will be treated via a treatment train similar to the one mentioned in RAA No. 3 (with the exception of size). Treated groundwater will be discharged to Wallace Creek.

The overall objective of this RAA is to reduce the COCs in the groundwater to drinking water standards for Class I aquifers and to mitigate the potential for further migration of the existing groundwater plumes. The primary difference between this alternative and RAA No. 4 is the shorter timeframe expected to meet the remediation goals.

### *Soil RAAs*

The following Soil RAAs were developed and evaluated for Operable Unit No. 2:

- RAA No. 1 No Action
- RAA No. 2 Capping
- RAA No. 3 On-Site Treatment
- RAA No. 4 Capping, and On-Site Treatment (All AOCs)



- RAA No. 5 Off-Site Treatment/Disposal
- RAA No. 6 Capping and On-Site Treatment (Limited AOCs)
- RAA No. 7 On-Site Treatment and Off-Site Disposal

A description of each alternative as well as the estimated cost and timeframe to implement the alternative follows:

- **RAA No. 1: No Action**

Capital Cost: \$0  
Annual O&M Costs: \$0  
NPW: \$0  
Months to Implement: None

The No Action RAA is required under CERCLA to establish a baseline for comparison. Under this RAA, no further action at the operable unit will be implemented to prevent exposure to contaminated soil.

- **RAA No. 2: Capping**

Capital Cost: \$2.8 million  
Annual O&M Costs: \$39,000  
NPW: \$3.4 million  
Months to Implement: 6

Soil RAA No. 2 includes the excavation and consolidation of the soils from all of the Soil AOCs and placement under a fenced multilayered cap located within Open Storage Lot 203 (Site 6).

Approximately 19,000 cubic yards (cy) of contaminated soil will be excavated and spread as a one to two foot layer in the cap area. The cap will have approximate dimensions of 400 feet wide by 700 feet long. The cap will consist of a vegetated top cover, a middle drainage layer, and a low permeability bottom layer. Long-term groundwater monitoring of six existing monitoring wells will be included under this RAA. In addition, deed restrictions will be placed on the capped area restricting any earth-moving activities.

The objectives of this RAA are to consolidate the contaminated soils into one area, to prevent the potential for direct contact with the soils, and to prevent the potential for the migration of contaminants via storm water infiltration.

- **RAA No. 3: On-Site Treatment**

Capital Cost: \$1.5 to \$6.6 million

Annual O&M Costs: \$0 to \$330,000 (up to five years)

NPW: \$1.7 to \$6.6 million

Months to Implement: 15-60 (dependent on treatment option)

RAA No. 3 includes the excavation of up to 19,000 cy of contaminated soil and treatment on site via a combination of one or more treatment options such as land treatment, in situ volatilization, chemical dechlorination, or incineration. Land treatment would be applicable to three of the AOCs at the operable unit. In situ volatilization would be applicable to only Soil AOC 1 (contaminated with VOCs); whereas chemical dechlorination would only be applicable to the three AOCs with PCBs. Mobile incineration would be applicable to all of the AOCs. Table 4 presents a listing of the technologies that are applicable to each of the six soil AOCs. For purposes of the FS, four possible combinations of these treatment options were evaluated: (1) on-site incineration of soils from all of the AOCs, (2) land treatment of soil from AOCs 1, 2, and 5 with incineration of the soil from AOCs 3, 4 and 6, (3) in situ volatilization of the soil from AOC1 with incineration of the remaining soil, and (4) in situ volatilization of the soil from AOC1, land treatment of soil from AOCs 2 and 5, and chemical dechlorination of soil from the AOCs 3, 4 and 6.

- **RAA No. 4: Capping and On-Site Treatment (All AOCs)**

Capital Cost: \$926,000

Annual O&M Costs: \$31,000 - \$81,000

NPW: \$1.6 million

Months to Implement: 12-60 (dependent on treatment option)

Under RAA No. 4, the soils at PCB-contaminated AOCs (800 cy) will be excavated and placed under a soil cover placed with Open Storage Lot 203; and the soil from the remaining AOCs (18,200 cy) will be treated on site by a combination or one of the four treatment options mentioned under RAA No. 3.

The principle objectives of this RAA are to consolidate the PCB-contaminated (more difficult to treat) soils in one area and to treat the other contaminated soils on site.

**TABLE 4**  
**APPLICABLE ON-SITE TREATMENT TECHNOLOGIES**  
**FOR THE SOIL AOCs**  
**PROPOSED REMEDIAL ACTION PLAN CTO-0133**  
**MCB CAMP LEJEUNE, NORTH CAROLINA**

Technology	Soil AOCs					
	1	2	3	4	5	6
Land Treatment	X	X			X	
In Situ Volatilization	X					
Chemical Dechlorination			X	X		X
Incineration	X	X	X	X	X	X

- **RAA No. 5: Off-Site Treatment/Disposal**

Capital Cost: \$5.5 million (disposal); \$20.4 million (treatment)  
Annual O&M Costs: \$0  
NPW: \$5.5 million (disposal); \$20.4 million (treatment)  
Months to Implement: 8-12

Soil RAA No. 5 includes the excavation of soil from all of the Soil AOCs (19,000 cy) and off-site treatment and/or disposal. The treatment/disposal facility will have to be permitted to accept low levels (i.e., less than 50 parts per million) of PCBs.

- **RAA No. 6: Capping and Partial On-Site Treatment (Limited AOCs)**

Capital Cost: \$710,000  
Annual O&M Costs: \$31,000 - \$81,000  
NPW: \$1.4 million  
Months to Implement: Up to 60 months to complete

RAA No. 6 is essentially the same as Soil RAA No. 4 except that three of the Soil AOCs (Nos. 2, 3, and 6) will not be remediated. This RAA is based on a land use scenario that Operable Unit No. 2 would only be used for open storage and not residential housing (future scenario). Based on this rationale, only Soil AOC1, AOC4 and AOC5 exhibit contaminants levels exceeding the established action levels for the protection of base personnel working at the sites, and therefore, would require remediation.

Under this RAA, soils from AOC4 and AOC5 (1,400 cy) will be excavated and placed under a soil cover, and soils from AOC1 (16,500 cy) will be treated on site via in situ volatilization.

- **RAA No. 7: On-Site Treatment, Off-Site Disposal**

*OHM*

Capital Cost: \$1.3 million  
Annual O&M Costs: \$50,000 for 5 years  
NPW: \$1.5 million  
Months to Implement: Up to 60 months to complete

*SOIL VAPOR EXTRACTION*

Under RAA No. 7, the soils from Soil AOC1 (16,500 cy) will be treated on site via in situ volatilization and the soils from the remaining AOCs (2,500 cy) will be excavated and disposed off site. The soils should be able to be landfilled as nonhazardous waste since the levels of PCBs detected at the site were below 50 parts per million and the soil is not characteristically hazardous. A possible landfill is located in Pinewood, South Carolina, approximately 200 miles from Operable Unit No. 2.

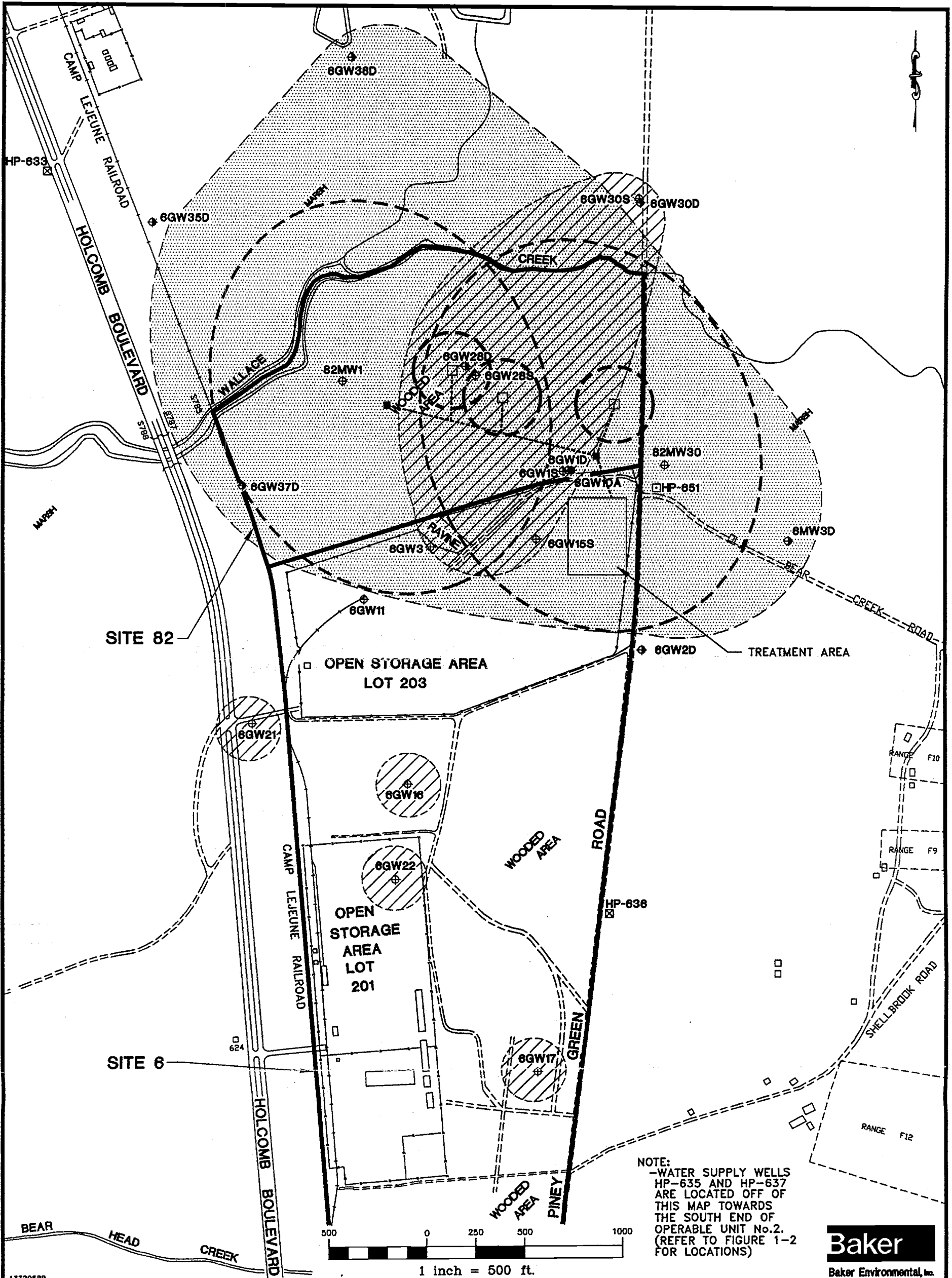
## Evaluation of Alternatives and the Preferred Alternative

The preferred RAA for Operable Unit No. 2 is Groundwater RAA No. 4: Intensive Groundwater Extraction and Treatment and Soil RAA No. 7: On-Site Treatment and Off-Site Disposal. The principal components of both of these RAAs are presented on Figures 6 and 7. Based on available information, these alternatives appear to provide the best balance with respect to the nine CERCLA evaluation criteria used to evaluate alternatives. Based on new information or public comments, MCB Camp Lejeune/DoN, in consultation with USEPA and the State of North Carolina, may later modify the preferred alternative or select another treatment alternative presented in this PRAP and the RI/FS. The public, therefore, is encouraged to review and comment on all of the information on these RAAs identified in this plan.

A profile of the performance of alternatives with respect to seven of the nine criteria is presented on Tables 5, and 6. With respect to USEPA/State Acceptance (the eighth evaluation criteria), both the USEPA and the North Carolina DEHNR concur with the selection of Groundwater RAA No. 4 and Soil RAA No. 7. The remaining criteria for Community Acceptance will be assessed in the Responsiveness Summary and Record of Decision (ROD) following a review of the public comments on the RI/FS Reports and this PRAP. A glossary of the evaluation criteria is presented on Table 7.

## Summary of the Preferred Alternative

In summary, the preferred alternatives (Groundwater RAA No. 4 and Soil RAA No. 7) will achieve substantial risk reduction through treatment or removal of the principal threats at the operable unit (i.e., the VOC-contaminated soil and groundwater, and the PCB and pesticide contaminated soils). These two RAAs are believed to provide the best balance of trade-offs among the RAAs with respect to the pertinent evaluation criteria. Based on the available information, MCB Camp Lejeune/DoN believe the preferred RAAs will be protective of human health and the environment, will comply with pertinent ARARs, will be cost effective, and will utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Since the contaminated groundwater and contaminated soil will be treated under these RAAs, the statutory preference for the use of a remedy that involves treatment as a principal element is satisfied.



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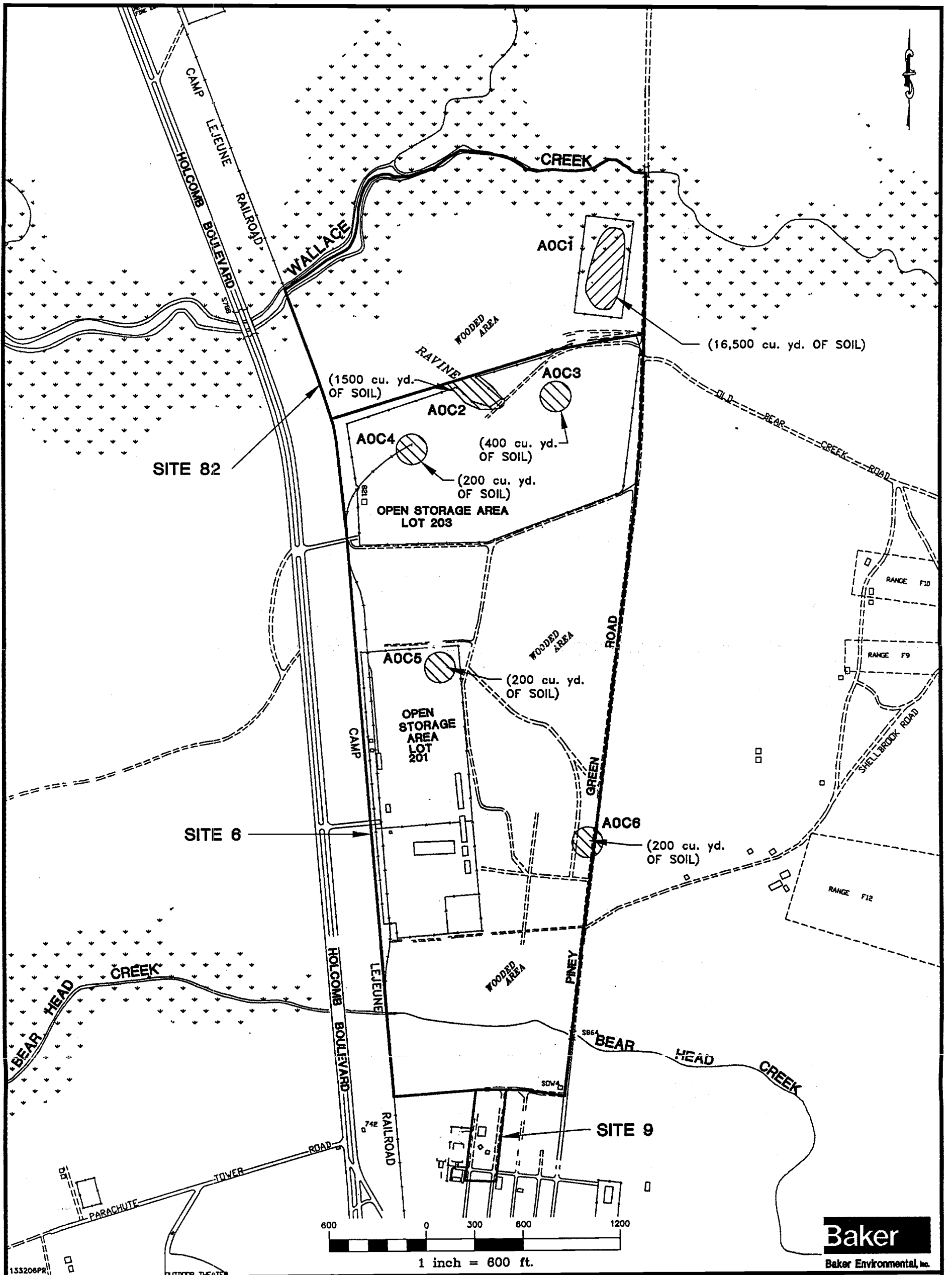
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LEGEND	
—	PIPING PROPOSED DEEP EXTRACTION WELLS
—	PIPING PROPOSED SHALLOW EXTRACTION WELLS
⊕	6GW15 SHALLOW MONITORING WELL INCLUDED IN MONITORING PROGRAM
⊕	6GW16 DEEP MONITORING WELL INCLUDED IN MONITORING PROGRAM
⊕	HP-636 WATER SUPPLY WELL (TO BE MONITORED)
⊕	HP-651 WATER SUPPLY WELL (CLOSED)
⊕	APPROXIMATE AREA OF GROUNDWATER (DEEPER PORTION) CONTAMINATION EXCEEDING REMEDIATION GOALS
⊕	APPROXIMATE AREA OF GROUNDWATER (SHALLOW PORTION) CONTAMINATION EXCEEDING REMEDIATION GOALS
⊕	ESTIMATED ZONE OF CAPTURE

SOURCE: LANTDIV, FEBRUARY 1992

**FIGURE 6**  
**PREFERRED GROUNDWATER RAA:**  
**INTENSIVE GROUNDWATER EXTRACTION**  
**AND TREATMENT (RAA No.4)**  
**PROPOSED REMEDIAL ACTION PLAN CTO-0133**  
**MARINE CORPS BASE, CAMP LEJEUNE**  
**NORTH CAROLINA**

02362BBB32



**Baker**  
Baker Environmental, Inc.

**FIGURE 7**  
PREFERRED SOIL RAA: ON-SITE TREATMENT AND OFF-SITE DISPOSAL (RAA No.7)  
PROPOSED REMEDIAL ACTION PLAN CTO-0133  
MARINE CORPS BASE, CAMP LEJEUNE  
NORTH CAROLINA

TABLE 5

SUMMARY OF DETAILED ANALYSIS - GROUNDWATER RAAs  
 FEASIBILITY STUDY CTO-0133  
 MCB CAMP LEJEUNE, NORTH CAROLINA

Evaluation Criteria	RAA No. 1 No Action	RAA No. 2 Limited Action	RAA No. 3 Containment	RAA No. 4 Intensive Extraction and Groundwater Treatment	RAA No. 5 Extraction and Groundwater Treatment
<b>OVERALL PROTECTIVENESS</b>					
<ul style="list-style-type: none"> <li>Human Health Protection</li> </ul>	No reduction in risk.	Institutional controls provide protection against risk from groundwater ingestion.	Migration of plume mitigated. Pump and treat provide protection against risk from groundwater ingestion.	Groundwater plumes treated. Pump and treat provide protection against risk from groundwater ingestion.	Groundwater plumes treated. Pump and treat provide protection against risk from groundwater ingestion.
<ul style="list-style-type: none"> <li>Environmental Protection</li> </ul>	Allows continued contamination of the groundwater.	Allows continued contamination of the groundwater.	Migration of contaminated groundwater is reduced by pump and treat.	Migration of contaminated groundwater is reduced by pump and treat.	Migration of contaminated groundwater is reduced by pump and treat.
<b>COMPLIANCE WITH ARARS</b>					
<ul style="list-style-type: none"> <li>Chemical-Specific ARARs</li> </ul>	Will exceed Federal and/or NC groundwater quality ARARs.	Will exceed Federal and/or NC groundwater quality ARARs.	May not meet Federal and NC groundwater quality ARARs.	Should meet Federal and NC groundwater quality ARARs in time.	Should meet Federal and NC groundwater quality ARARs in time.
<ul style="list-style-type: none"> <li>Location-Specific ARARs</li> </ul>	Not applicable.	Not applicable.	Will meet location-specific ARARs.	Will meet location-specific ARARs.	Will meet location-specific ARARs.
<ul style="list-style-type: none"> <li>Action-Specific ARARs</li> </ul>	Not applicable.	Not applicable.	Will meet action-specific ARARs.	Will meet action-specific ARARs.	Will meet action-specific ARARs.
<b>LONG-TERM EFFECTIVENESS AND PERMANENCE</b>					
<ul style="list-style-type: none"> <li>Magnitude of Residual Risk</li> </ul>	As area of contamination increases, potential risks may increase.	Risk reduced to human health since the use of the groundwater aquifer is restricted.	Risk reduced by extracting contaminated groundwater.	Risk reduced by extracting contaminated groundwater.	Risk reduced by extracting contaminated groundwater.
<ul style="list-style-type: none"> <li>Adequacy and Reliability of Controls</li> </ul>	Not applicable - no controls.	Reliability of institutional controls is uncertain.	Groundwater pump and treat is reliable.	Groundwater pump and treat is reliable.	Groundwater pump and treat is reliable.
<ul style="list-style-type: none"> <li>Need for 5-year Review</li> </ul>	Review would be required to ensure adequate protection of human health and the environment is maintained.	Review would be required to ensure adequate protection of human health and the environment is maintained.	Review not needed once remediation goals are met.	Review not needed once remediation goals are met.	Review not needed once remediation goals are met.



TABLE 5 (Continued)

SUMMARY OF DETAILED ANALYSIS - GROUNDWATER RAAs  
FEASIBILITY STUDY CTO-0133  
MCB CAMP LEJEUNE, NORTH CAROLINA

Evaluation Criteria	RAA No. 1 No Action	RAA No. 2 Limited Action	RAA No. 3 Containment	RAA No. 4 Intensive Extraction and Groundwater Treatment	RAA No. 5 Extraction and Groundwater Treatment
<b>REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT</b>					
• Treatment Process Used	None.	None.	Treatment train for metals removal, air stripping, and activated carbon.	Treatment train for metals removal, air stripping, and activated carbon.	Treatment train for metals removal, air stripping, and activated carbon.
• Amount Destroyed or Treated	None.	None.	Majority of contaminants in groundwater out edges of plumes.	Majority of contaminants in groundwater.	Majority of contaminant in groundwater plumes.
• Reduction of Toxicity, Mobility or Volume	None.	None.	Reduced volume and toxicity of contaminated groundwater.	Reduced volume and toxicity of contaminated groundwater.	Reduced volume and toxicity of contaminated groundwater.
• Residuals Remaining After Treatment	Not applicable - no treatment.	Not applicable - no treatment.	Minimal residuals after goals are met.	Minimal residuals after goals are met.	Minimal residuals after goals are met.
• Statutory Preference for Treatment	Not satisfied.	Not satisfied.	Satisfied.	Satisfied.	Satisfied.
<b>SHORT-TERM EFFECTIVENESS</b>					
• Community Protection	Risks to community not increased by remedy implementation.	Risks to community not increased by remedy implementation.	Minimal, if any, risks during extraction and treatment.	Minimal, if any, risks during extraction and treatment.	Minimal, if any, risks during extraction and treatment.
• Worker Protection	No significant risk to workers.	No significant risk to workers.	Protection required during treatment.	Protection required during treatment.	Protection required during treatment.
• Environmental Impacts	Continued impacts from existing conditions.	Still would be continued migration of contamination.	Aquifer drawdown during extraction could potentially reduce flow in Wallace Creek.	Aquifer drawdown during extraction not expected to be problematic in Wallace Creek.	Aquifer drawdown during extraction could potentially reduce flow in Wallace Creek.
• Time Until Action is Complete	Not applicable.	Risks from potential groundwater ingestion reduced within 3 to 6 months due to institutional controls.	Estimated 30 years.	Estimated 30 years.	Estimated 30 years.
<b>IMPLEMENTABILITY</b>					
• Ability to Construct and Operate	No construction or operation activities.	No construction or operation activities.	Groundwater extraction and treatment systems requires installation.	Groundwater extraction and treatment systems requires installation.	Groundwater extraction and treatment systems requires installation.
• Ability to Monitor Effectiveness	No monitoring. Failure to detect contamination will result in potential ingestion of contaminated groundwater.	Proposed monitoring will give notice of failure before significant exposure occurs.	Adequate system monitoring.	Adequate system monitoring.	Adequate system monitoring.
• Availability of Services and Capacities; Equipment	None required.	None required.	Needs groundwater treatment equipment.	Needs groundwater treatment equipment.	Needs groundwater treatment equipment.
<b>COSTS NPW</b>	\$0	\$600,000	\$7.0 million	\$4.9 million	\$8.9 million

TABLE 6

**SUMMARY OF DETAILED ANALYSIS - SOIL RAAs  
FEASIBILITY STUDY CTO-0133  
MCB CAMP LEJEUNE, NORTH CAROLINA**

Evaluation Criteria	RAA No. 1 No Action	RAA No. 2 Capping	RAA No. 3 On-Site Treatment	RAA No. 4 Capping and On-Site Treatment (All Areas of Concern)	RAA No. 5 Off-Site Treatment	RAA No. 6 Capping and On-Site Treatment (Limited Areas of Concern)	RAA No. 7 On-Site Treatment, Off- Site Disposal
<b>OVERALL PROTECTIVENESS</b>							
<ul style="list-style-type: none"> <li>Human Health Protection</li> </ul>	No reduction in risk.	Would reduce potential for direct contact with contaminated soil.	Excavation removes source of contamination.	Reduces potential for direct contact with PCB-contaminated soil and removes other contaminated soils.	Excavation removes source of contamination.	Reduces potential for direct contact with PCB-contaminated soil and removes other contaminated soils - based on existing land use scenario.	Excavation and/or treatment removes source of contamination.
<ul style="list-style-type: none"> <li>Environmental Protection</li> </ul>	Allows contaminated soils to remain on site.	Allows contaminated soils to remain on site.	No additional environmental impacts.	No additional environmental impacts.	Contaminated soils exceeding remediation goal removed and treated.	No additional environmental impacts.	No additional environmental impacts.
<b>COMPLIANCE WITH ARARs</b>							
<ul style="list-style-type: none"> <li>Chemical-Specific ARARs</li> </ul>	Will exceed ARARs.	Will exceed ARARs.	Will meet contaminant-specific ARARs.	PCB ARAR not met; other contaminant-specific ARARs met.	Will meet ARARs.	PCB ARAR not met; other contaminant-specific ARARs met (with respect to existing land use scenario).	Will meet ARARs.
<ul style="list-style-type: none"> <li>Location-Specific ARARs</li> </ul>	Not applicable.	Will meet location-specific ARARs.	Will meet location-specific ARARs.	Will meet location-specific ARARs.	Will meet location-specific ARARs.	Will meet location-specific ARARs.	Will meet location-specific ARARs.
<ul style="list-style-type: none"> <li>Action-Specific ARARs</li> </ul>	Not applicable.	Will meet action-specific ARARs.	Will meet action-specific ARARs.	Will meet action-specific ARARs.	Will meet action-specific ARARs.	Will meet action-specific ARARs.	Will meet action-specific ARARs.
<b>LONG-TERM EFFECTIVENESS AND PERMANENCE</b>							
<ul style="list-style-type: none"> <li>Magnitude of Residual Risk</li> </ul>	Source has not been removed. Potential risks not reduced.	Contaminated soils are not removed from the site, but potential risk due to exposure to COCs are reduced as long as the cap is maintained.	Potential risk due to exposure to soil COCs removed.	Potential risks reduced as long as the cover is maintained.	Potential risk due to exposure to soil COCs removed.	Potential risks with respect to existing land use scenario reduced as long as the cap is maintained.	Potential risk due to exposure to soil COCs removed.
<ul style="list-style-type: none"> <li>Adequacy and Reliability of Controls</li> </ul>	Not applicable - no controls.	Multilayered cap controls contaminated soil - can be a reliable option if maintained properly.	All treatment options are reliable.	Soil cover can be reliable and adequate. Treatment option reliable and adequate.	Off-site treatment is very reliable because contaminated soils are removed.	Soil cover can be reliable and adequate. Treatment option reliable and adequate.	Treatment option and off-site disposal are reliable.
<ul style="list-style-type: none"> <li>Need for 5-year Review</li> </ul>	Review would be required to ensure adequate protection of human health and the environment is maintained.	Review would be required to ensure adequate protection of human health and the environment is maintained.	Review may not be needed since contaminated soil treated (unless treatment process lasts longer than 5 years).	Review would be required to ensure adequate protection of human health and the environment is maintained.	Review not needed since contaminated soil removed.	Review would be required to ensure adequate protection of human health and the environment is maintained.	Review may not be needed since contaminated soil treated (unless treatment process lasts longer than 5 years).

TABLE 6 (Continued)

SUMMARY OF DETAILED ANALYSIS - SOIL RAA's  
 FEASIBILITY STUDY CTO-0133  
 MCB CAMP LEJEUNE, NORTH CAROLINA

Evaluation Criteria	RAA No. 1 No Action	RAA No. 2 Capping	RAA No. 3 On-Site Treatment	RAA No. 4 Capping and On-Site Treatment (All Areas of Concern)	RAA No. 5 Off-Site Treatment	RAA No. 6 Capping and On-Site Treatment (Limited Areas of Concern)	RAA No. 7 On-Site Treatment, Off- Site Disposal
<b>REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT</b>							
• Treatment Process Used	None.	None.	Combination of land treatment, in situ volatilization, chemical dechlorination, and/or incineration.	In situ volatilization, land treatment, or incineration.	Off-site treatment.	In situ volatilization, land treatment, or incineration.	In situ volatilization, off-site disposal.
• Amount Destroyed or Treated	None.	None.	Majority of soil COCs.	Majority of soil COCs with the exception of PCBs.	Majority of soil COCs.	Majority of soil COCs with the exception of PCBs.	Majority of soil COCs.
• Reduction of Toxicity, Mobility or Volume	None.	None (not through treatment).	Reduction in toxicity, mobility and volume of contaminated soil.	Reduction in toxicity, mobility and volume of non-PCB contaminated soils.	Reduction in toxicity, mobility and volume of contaminated soil.	Reduction in toxicity, mobility and volume of non-PCB contaminated soils.	Reduction in toxicity, mobility and volume of contaminated soil.
• Residuals Remaining After Treatment	Not applicable - no treatment.	Residuals are capped.	No residuals.	Only PCB-contaminated soils remain at sites.	No residuals.	PCB-contaminated soils and some other soil COCs.	No residuals.
• Statutory Preference for Treatment	Not satisfied.	Not satisfied.	Satisfied.	Satisfied for non-PCB contaminated soils, not for PCB-contaminated soils.	Satisfied.	Satisfied for non-PCB contaminated soils, not for PCB-contaminated soils (with respect to existing land use scenario).	Satisfied.
<b>SHORT-TERM EFFECTIVENESS</b>							
• Community Protection	Risks to community not increased by remedy implementation.	Temporary potential risks during soil excavation and cap installation activities.	Limited potential risks during soil excavation and treatment activities.	Temporary potential risks during soil excavation and cap installation activities and treatment activities.	Limited potential risks during soil excavation activities.	Temporary potential risks during soil excavation and cap installation activities and treatment activities.	Limited potential risks during soil excavation and treatment activities.
• Worker Protection	No significant risks to workers.	Temporary potential risks during soil excavation and cap installation activities.	Potential risks during soil excavation and treatment activities.	Temporary potential risks during soil excavation and cap installation activities and treatment activities.	Potential risks during excavation and transportation activities.	Temporary potential risks during soil excavation and cap installation activities and treatment activities.	Potential risks during soil excavation and treatment activities.
• Environmental Impacts	Continued impacts from existing conditions.	No additional environmental impacts.	Air quality and odors - but treatment system will be designed to meet standards.	Air quality and odors - but treatment system will be designed to meet standards and treatment activities.	No additional environmental impacts.	Air quality and odors - but treatment system will be designed to meet standards.	Air quality and odors - but treatment system will be designed to meet standards.
• Time Until Action is Complete	Not applicable.	Six to twelve months.	Up to five years.	Up to five years.	Six to twelve months.	Up to five years.	Up to five years.

TABLE 6 (Continued)

**SUMMARY OF DETAILED ANALYSIS - SOIL RAAs  
FEASIBILITY STUDY CTO-0133  
MCB CAMP LEJEUNE, NORTH CAROLINA**

Evaluation Criteria	RAA No. 1 No Action	RAA No. 2 Capping	RAA No. 3 On-Site Treatment	RAA No. 4 Capping and On-Site Treatment (All Areas of Concern)	RAA No. 5 Off-Site Treatment	RAA No. 6 Capping and On-Site Treatment (Limited Areas of Concern)	RAA No. 7 On-Site Treatment, Off- Site Disposal
<b>IMPLEMENTABILITY</b>							
<ul style="list-style-type: none"> <li>Ability to Construct and Operate</li> </ul>	No construction or operation activities.	Simple to construct and maintain. Requires materials handling procedures.	Requires soil excavation activities. Requires assembly of treatment systems.	Simple to construct and maintain. Requires materials handling procedures. Requires soil excavation activities. Requires assembly of treatment systems.	Requires soil excavation activities. No other on-site operations.	Simple to construct and maintain. Requires materials handling procedures. Requires soil excavation activities. Requires assembly of treatment systems.	Requires soil excavation activities. Requires assembly of treatment systems.
<ul style="list-style-type: none"> <li>Ability to Monitor Effectiveness</li> </ul>	No monitoring included.	Cap maintenance and groundwater monitoring will adequately monitor effectiveness.	Adequate system monitoring.	Adequate system monitoring.	No monitoring other than confirmation soil sampling.	Adequate system monitoring.	Adequate system monitoring.
<ul style="list-style-type: none"> <li>Availability of Services and Capacities; Equipment</li> </ul>	None required.	No special services or equipment required. Cap materials should be readily available.	May need on-site mobile incinerator.	Equipment and material should be readily available.	Needs off-site treatment services.	Equipment and material should be readily available.	Equipment and material should be readily available. Needs off-site disposal services.
<b>COSTS NPW</b>	\$0	\$3.4 million	\$1.7 million to \$6.6 million	\$1.6 million	\$5.5 million to \$20 million	\$1.4 million	\$1.5 million

**TABLE 7**  
**GLOSSARY OF EVALUATION CRITERIA**

- **Overall Protection of Human Health and Environment** - addresses whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment engineering controls or institutional controls.
- **Compliance with ARARs** - addresses whether or not an alternative will meet all of the applicable or relevant and appropriate requirements (ARARs) or other Federal and State environmental statutes and/or provide grounds for invoking a waiver.
- **Long-term Effectiveness and Permanence** - refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.
- **Reduction of Toxicity, Mobility, or Volume through Treatment** - is the anticipated performance of the treatment options that may be employed in an alternative.
- **Short-term Effectiveness** - refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.
- **Implementability** - is the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the chosen solution.
- **Cost** - includes capital and operation and maintenance costs. For comparative purposes, presents present worth values.
- **USEPA/State Acceptance** - indicates whether, based on review of the RI and FS reports and the PRAP, the USEPA and State concur with, oppose, or have no comments on the preferred alternative.
- **Community Acceptance** - will be assessed in the Record of Decision (ROD) following a review of the public comments received on the RI and FS reports and the PRAP.

## **COMMUNITY PARTICIPATION**

A critical part of the selection of a remedial action alternative is community involvement. The following information is provided to the community in order to obtain input that addresses the selection of remedial action alternative for Operable Unit No. 2.

### **Public Comment Period**

The public comment period will begin on August 24, 1993 and end on September 24, 1993 for the Proposed Remedial Action Plan for Operable Unit No. 2. Written comments should be sent to the following address:

Commander  
Atlantic Division Naval Facilities Engineering Command  
1510 Gilbert Street (Bldg. N-26)  
Norfolk, Virginia 23511-2699  
Attention: Ms. Linda Berry, Code 1823

### **Information Repositories**

A collection of information, including the administrative record, is available to the community at the following locations:

Onslow County Library  
58 Doris Avenue East  
Jacksonville, NC 28540  
(919) 455-7350

Hours:  
M-Th: 9:00 a.m.- 9:00 p.m.  
F-Sa: 9:00 a.m.- 6:00 p.m.  
Closed Sunday

MCB Camp Lejeune Central Library  
Building 1220  
Marine Corps Base  
Camp Lejeune, NC 28542  
(919) 451-5724

Hours:  
M-Th: 9:00 a.m.-10:00 p.m.  
F: 9:00 a.m.- 4:30 p.m.  
Sa-Su: 10:00 a.m.- 10:00 p.m.

**IF YOU HAVE ANY QUESTIONS ABOUT OPERABLE UNIT NO. 2,  
PLEASE CONTACT ONE OF THE FOLLOWING:**

**Commanding General  
AC/S EMD (IRD)  
Marine Corps Base  
PSC Box 20004  
Camp Lejeune, North Carolina 28452-0004  
Attention: Mr. Neal Paul  
(919) 451-5874**

**Commander  
Atlantic Division  
Naval Facilities Engineering Command  
1510 Gilbert Street (Bldg. N-26)  
Norfolk, Virginia 23511-2699  
Attention: Ms. Linda Berry, Code 1823  
(804) 445-8637**

**Remedial Project Manager  
U.S. EPA, Region IV  
345 Courtland Street, NE  
Atlanta, Georgia 30365  
Attention: Ms. Gena Townsend  
(404) 347-3016**

**NC Department of Environment, Health, and Natural Resources  
Division of Solid Waste Management  
Superfund Section  
P.O. Box 27687  
Raleigh, North Carolina 27611-7687  
Attention: Mr. Patrick Watters  
(919) 733-2801**

**Community Information Line  
Public Affairs Office  
Marine Corps Base, Camp Lejeune, North Carolina  
(919) 451-5782**

**MAILING LIST**

If you are not on the mailing list and would like to receive future publications pertaining to Operable Unit No. 2, please fill out, detach, and mail this form to:

Commanding General  
AC/S EMD (IRD)  
Marine Corps Base  
PSC Box 20004  
Camp Lejeune, North Carolina 28452-0004  
(919) 451-5874

Name \_\_\_\_\_

Address \_\_\_\_\_

Affiliation \_\_\_\_\_

Phone (     ) \_\_\_\_\_