DRAFT

RECORD OF DECISION
OPERABLE UNIT NO. 11
(SITES 7 AND 80)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0274

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Prepared For:

DEPARTMENT OF THE NAVY
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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirements
Baker	Baker Environmental, Inc.
BCF	bioconcentration factor
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	contaminant of potential concern
DoN	Department of the Navy
HI	hazard index
ICR	incremental lifetime cancer risk
IRP	Installation Restoration Program
MCB	Marine Corps Base
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
NC DEHNR	North Carolina Department of Environment, Health, and Natural Resources
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCWQS	North Carolina Water Quality Standard
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PRAP	Proposed Remedial Action Plan
QI	quotient index
RA	Risk Assessment
RBC	Risk-Based Concentration
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SSV	sediment screening value
SVOC	semivolatile organic compound
SSSV	surface soil screening value
SWSV	surface water screening value
TAL	Total Analyte List
TCL	Target Compound List
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

DECLARATION

Site Name and Location

Operable Unit No. 11
(Site 7 - the Tarawa Terrace Dump, and Site 80 - the Paradise Point Golf Course Maintenance Area)
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purpose

This decision document presents the selected remedy for Operable Unit (OU) No. 11 (Sites 7 and 80) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record file for OU No. 11.

The Department of the Navy (DON) and the Marine Corps have obtained concurrence from the State of North Carolina Department of Environment, Health and Natural Resources (NC DEHNR) and the United States Environmental Protection Agency (USEPA) Region IV on the selected remedy.

Description of the Selected Remedy: No Action

The selected remedy for OU No. 11 is the "no action" plan. The "no action" plan involves taking no further remedial actions at OU No. 11. This includes conducting no further environmental investigations or sampling.

At Site 80, a Time-Critical Removal Action (TCRA) will be implemented prior to implementation of the "no action" plan. Under the TCRA, pesticide and arsenic contaminated surface soil will be excavated, removed from the site, and disposed. The applicability of the "no action" plan at Site 80 is dependent on the implementation of this TCRA. The TCRA will reduce current human health risks to within acceptable limits, and will eliminate contaminated surface soil from being a future potential source of groundwater contamination.

Declaration Statement

At Sites 7 and 80, no remedial action is necessary to ensure protection of human health and the environment. Based on the results of human health and ecological risk assessments conducted, conditions at Sites 7 and 80 appear to be protective of human health and the environment, both now and in the future. No 5-year reviews by the lead agency will be required under the selected remedy for OU No. 11.

_____ _____

Signature (Commanding General, MCB, Camp Lejeune) Date

DECISION SUMMARY

1.0 INTRODUCTION

This Record of Decision (ROD) document presents the final remedial action plan selected for Operable Unit (OU) No. 11 at Marine Corps Base (MCB), Camp Lejeune. OU No. 11, one of 17 operable units at the Base, consists of two sites:

- Site 7, the Tarawa Terrace Dump
- Site 80, the Paradise Point Golf Course Maintenance Area

The environmental media at both sites were investigated as part of a Remedial Investigation (RI) conducted for OU No. 11. Based on the results of the RI, preferred remedial action alternatives were identified for both sites in a Proposed Remedial Action Plan (PRAP) document. Then, the public was given an opportunity to comment on the RI and the PRAP. Based on comments received during the public comment period, and any new information that became available in the interim, a final remedial action plan was selected for OU No. 11. This ROD document presents the final selected remedy for OU No. 11 along with a summary of the remedy selection process.

1.1 Description of Operable Unit No. 11

Located in Onslow County, North Carolina, MCB, Camp Lejeune is a training base for the United States Marine Corps. The Base covers approximately 236 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.

OU No. 11 is one of 17 operable units located within MCB, Camp Lejeune. Operable units were developed at the Base to combine one or more individual sites that share a common element. In the case of OU No. 11, Sites 7 and 80 were grouped together because of their close geographic proximity and the detection of pesticides in soil at both sites.

Figure 1 depicts the location of OU No. 11 within MCB, Camp Lejeune. As shown, OU No. 11 is located on the northeastern portion of the Base, situated on either side of Northeast Creek. Site 7 is located on the creek's northern bank, and Site 80 is located on the southern bank.

1.2 Report Organization

The Decision Summary is organized into six main sections. Section 1.0 presents an introduction to the ROD document. Sections 2.0 and 3.0 present pertinent background information and the selected remedies for Sites 7 and 80, respectively. Section 4.0 presents the selected remedy for OU No. 11, which is a combination of the individual remedies selected for Sites 7 and 80. Section 5.0 evaluates the selected remedy for OU No. 11 with respect to the statutory determinations (i.e., the five requirements identified in the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Section 121). Finally, Section 6.0 presents the responsiveness summary which contains a history of community involvement and a summary of the comments received during the public comment period.

2.0 SITE 7

Section 2.0, which focuses on Site 7, presents the following information: a site name, location, and description; a site history and a summary of previous investigations and enforcement activities; highlights of community participation; the scope and role of the response action; a summary of the site characteristics; a summary of the site risks; and the selected remedy.

2.1 Site Name, Location, and Description

Site 7, located approximately 1/4 mile south of the Tarawa Terrace Housing Complex, is referred to as the Tarawa Terrace Dump. Figure 2 presents a site map depicting the site boundaries and land features. As shown, Site 7 is bordered by the Tarawa Terrace Housing Complex to the north and northwest, the Tarawa Terrace Community Center (Building #TT44) to the northeast, Northeast Creek to the south, the Tarawa Terrace Wastewater Treatment Plant to the southwest, and an unnamed road that leads to the wastewater treatment plant to the west. Most of Site 7, including the marsh/swamp area that borders Northeast Creek, is densely wooded.

Within the site boundaries, two unnamed surface water bodies (referred to in this report as the Eastern and Western Tributaries) flow south into Northeast Creek. Northeast Creek flows west and eventually empties into the New River. The site also contains a smaller tributary (referred to in this report as the drainage ditch) that flows southeast into the Western Tributary. Northeast Creek, the Eastern and Western Tributaries, and the drainage ditch are all tidally influenced. During high tide, ponded water covers most of the marsh/swamp area.

Based on a site reconnaissance (conducted in March 1994 as part of the RI) and a review of historical information, four areas of concern were identified at Site 7. The first area of concern is a potential dump area located east of the utility right-of-way. The second area of concern is a smaller cleared area located west of the utility right-of-way. Both areas of concern were identified using aerial photographs from 1973 and 1978. The third area of concern, identified based on elevated pesticides and polychlorinated biphenyl (PCB) levels detected during previous investigations, is located south of the community center. The fourth area of concern is located east of the Tarawa Terrace Wastewater Treatment Plant and adjacent to the drainage ditch. Visual debris, including paint cans, motor oil cans, and other rusted cans, were observed in this wooded area.

2.2 Site History and Previous Investigations/Enforcement Activities

2.2.1 Site History

Site 7 is known to be a former dump that was used during the construction of the Tarawa Terrace housing complex. The precise years that the dump was in operation are unknown, but it was reportedly closed in 1972. Historical records do not indicate that hazardous materials were disposed at this site. However, construction debris, wastewater treatment plant filter media, and household trash are known to have been disposed.

2.2.2 Previous Investigations/Enforcement Activities

Previous investigations conducted at Site 7 include a Site Inspection (1991) and a Remedial Investigation (1994-95). The following paragraphs briefly describe these investigations. More

detailed information is located in the Site Inspection Report (Halliburton/NUS, 1991) and the Remedial Investigation Report (Baker Environmental, Inc., 1996).

Site Inspection, 1991

In June 1991, Halliburton/NUS conducted a Site Inspection that included the following field activities:

- Soil Investigation (8 surface soil samples collected from 0 to 2 feet below ground surface [bgs]; 5 subsurface soil samples collected from 3 to 12 feet bgs; samples analyzed for full Target Compound List [TCL] organics, Target Analyte List [TAL] inorganics, and cyanide)

- Groundwater Investigation (installation of 3 shallow monitoring wells; 3 samples collected from these wells; samples analyzed for full TCL organics, TAL total inorganics, and cyanide)

Figure 3 identifies sampling locations associated with the Site Inspection.

Table 1 presents the results of soil sample analyses. Both surface and subsurface soil samples collected from locations 7-MW02, 7-SB01, and 7-SB02 contained pesticides and PCBs. The maximum concentrations of dieldrin (2,500 micrograms per kilogram [µg/kg]) and endrin (1,300 µg/kg) were detected at 7-MW02 (7.5 to 9.5 feet bgs). The maximum concentration of endosulfan II (2,000 µg/kg) was detected at 7-SB02 (7 to 9 feet bgs). The compound known as Aroclor 1260 was detected in a total of seven surface and subsurface soil samples. Aroclor-1260 concentrations ranged from 108 µg/kg at 7-SB05 (0 to 2 feet bgs) to 25,000 µg/kg at 7-MW02 (7.5 to 9.5 feet bgs).

Table 2 presents the results of groundwater sample analyses. Two pesticides, dieldrin and endrin ketone, were detected at low levels (0.63 micrograms per liter [µg/l] and 0.09 µg/l, respectively) in the groundwater sample collected from 7-MW02. Four inorganic constituents (manganese, chromium, lead, and iron) were detected at levels that exceeded either North Carolina Water Quality Standards (NCWQSs), or Federal Maximum Contaminant Levels (MCLs) for drinking water (i.e., the state and federal regulatory standards). The concentrations that exceeded state and/or federal standards are shaded in Table 2.

Remedial Investigation, 1994-95

In October 1994, Baker Environmental, Inc. (Baker) initiated an RI at Site 7 which included the following field activities:

- Surface Soil Investigation (35 samples collected from 0 to 1 foot bgs; samples analyzed for full TCL organics and TAL inorganics)

- Confirmatory Surface Soil Investigation (18 samples collected from 0 to 1 foot bgs; samples analyzed for TCL PCBs)

- Subsurface Soil Investigation (28 samples collected from 1 foot bgs to just above the groundwater table; 5 of the 28 were collected from test pit excavations; samples analyzed for full TCL organics and TAL inorganics)

- Confirmatory Subsurface Soil Investigation (16 samples collected from 1 foot bgs to just above the water table; samples analyzed for TCL PCBs)

- Groundwater Investigation (installation of 2 permanent shallow monitoring wells and 3 temporary shallow monitoring wells; 8 samples collected from the 5 newly installed wells and 3 existing shallow wells; samples analyzed for full TCL organics, and TAL inorganics [total and dissolved fractions])

- Surface Water Investigation (a total of 13 samples collected from the drainage ditch that discharges to the Western Tributary, the Western Tributary itself, the Eastern Tributary, and Northeast Creek; samples analyzed for full TCL organics and TAL inorganics)

- Sediment Investigation (a total of 27 samples collected from the drainage ditch that discharges to the Western Tributary, the Western Tributary itself, the Eastern Tributary, and Northeast Creek; samples analyzed for full TCL organics and TAL inorganics)

- Ecological Investigation (a total of 6 benthic macroinvertebrate samples collected from the Western Tributary and Northeast Creek; aquatic survey; earthworm bioaccumulation study)

- Habitat Evaluation (site reconnaissance in which botanical and animal species were identified and documented; collection of unknown botanical species for further identification)

Figures 4, 5, and 6 depict sampling locations associated with the RI. Figure 4 identifies surface and subsurface soil sampling locations; Figure 5 identifies groundwater sampling locations; and Figure 6 identifies surface water, sediment, benthic macroinvertebrate, and earthworm sampling locations.

Table 3 summarizes the results of soil, groundwater, surface water, and sediment sample analyses. In this table, shaded blocks indicate constituents that were detected in exceedence of the comparison criteria (e.g., federal standards, state standards, background levels). As shown, several inorganic constituents exceeded comparison criteria in surface and subsurface soil samples. In groundwater samples, one volatile organic compound (VOC), chloroform, exceeded its state standard. However, the chloroform concentrations were less than 10 times the concentrations detected in quality control samples. As a result, chloroform was most likely a laboratory-related contaminant rather than a site-related contaminant. Five inorganic constituents (aluminum, chromium, iron, lead, and manganese) also exceeded their comparison criteria in groundwater samples. In surface water and sediment, semivolatile organic compounds (SVOCs), pesticides, and inorganic constituents were detected at levels that exceeded comparison criteria.

2.3 Highlights of Community Participation

The RI report for Site 7 and the PRAP for OU No. 11 were released to the public on _____. These documents are available in an administrative record file at information repositories maintained at the Onslow County Public Library and at the Installation Restoration Division Office (Room 238, MCB, Camp Lejeune). Also, all addresses on the OU No. 11 mailing list will be sent a copy of the Final PRAP and Fact Sheet. The notice of availability of the PRAP and RI document was published in the "Jacksonville Daily News" on _____. A public comment period was held from _____ to _____. In addition, a public meeting was held on _____ to respond to questions and to accept public comments on the PRAP for OU No. 11. The public meeting minutes were transcribed and a copy of the transcript is available to the public at the aforementioned locations. A Responsiveness Summary, included as part of this ROD, has been prepared to respond to the significant comments, criticisms, and new relevant information received during the comment period. Upon signing this ROD, MCB, Camp Lejeune and the DoN will publish a notice of availability for the ROD in the local newspaper, and place this ROD in the information repositories.

2.4 Scope and Role of the Response Action

Because Sites 7 and 80 are geographically separated, separate response actions, or selected remedies, were developed for each site. The response action, or selected remedy, for OU No. 11 is a combination of the two separate response actions developed for Sites 7 and 80, respectively. Section 2.4 of this ROD presents the response action developed for Site 7; Section 3.4 presents the response action developed for Site 80; and Section 4.0 presents the response action developed for OU No. 11.

The response action for Site 7 was developed to address site conditions that appear to be protective of human health and the environment. (Site conditions appear to be protective based on the results of the human health and ecological risk assessments [RAs] conducted during the RI.) As a result, the only response action identified and evaluated for Site 7 is the "no action" plan.

2.5 Summary of Site Characteristics

Site 7 exhibited the following site characteristics, as determined during the RI:

- Some VOCs were detected in soil, including acetone, 2-butanone, trichloroethene, and toluene in surface soil, and acetone and methylene chloride in subsurface soil. All of these VOCs, with the exception of toluene in surface soil, are believed to be the result of laboratory contamination. The toluene is believed to be the result of a random, isolated spill that is not indicative of a significant toluene problem at the site. The maximum toluene concentration (46J µg/kg) did not exceed the comparison criteria of 1,600,000 µg/kg which is a United States Environmental Protection Agency (USEPA) Region III Risk-Based Concentration (RBC).

- Polynuclear aromatic hydrocarbons (PAHs) were the most prevalent SVOCs detected in soil. The positive detections of PAHs in both surface and subsurface soil were primarily located in the northern and eastern portions of the site. PAHs were not detected in the groundwater.

- Pesticides were infrequently detected in surface and subsurface soil samples. The pesticides dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, endosulfan II, alpha-chlordane, and gamma-chlordane were the most prevalent pesticides detected in soil. Pesticide concentrations detected at the site are similar to pesticide concentrations detected across the Base. In some cases, pesticide concentrations at the site were lower than Base pesticide concentrations. Consequently, the pesticides are believed to be the result of historical Base-wide pest control spraying. Dieldrin was the only pesticide detected in groundwater, and it was only detected in one groundwater sample.

- Trace levels (i.e., less than 0.10 milligrams per kilogram [mg/kg]) of Aroclors 1254 and 1260 were detected in a limited number of surface and subsurface soil samples. Aroclor 1254 was not detected in the subsurface soil. The random occurrence of these contaminants may be due to the past disposal of oils. These contaminants were not detected in the groundwater.

- The occurrence of inorganics was widespread in both the surface and subsurface soil. Inorganics which exceeded surface soil and subsurface soil Base background concentrations included aluminum, barium, beryllium, calcium, nickel, and zinc. The sporadic and random locations of these exceedences, however, do not suggest a significant inorganic contamination problem in either the surface or subsurface soil.

- In groundwater samples, one VOC, chloroform, exceeded its state standard. However, the chloroform concentrations were less than 10 times the concentrations detected in quality control samples. As a result, chloroform was most likely a laboratory-related contaminant rather than a site-related contaminant. Five inorganic constituents (aluminum, chromium, iron, lead, and manganese) also exceeded their comparison criteria in groundwater samples.

- Levels of arsenic, iron, and manganese in the surface water exceeded federal criteria. With the exception of dieldrin, no other organic contaminants exceeded surface water criteria. No sediment contaminant concentrations exceeded sediment criteria.

2.6 Summary of Site Risks

As part of the RI, a human health RA and an ecological RA were conducted to determine the potential risks associated with the chemical constituents detected at Site 7. The following subsections briefly summarize the findings of these RAs.

2.6.1 Human Health Risk Assessment

During the human health RA, contaminants of potential concern (COPCs) were selected for surface soil, subsurface soil, groundwater, surface water, and sediment, as shown in Table 4. The selection of COPCs was based on criteria provided in the USEPA Risk Assessment Guidance for Superfund.

For each COPC, incremental lifetime cancer risk (ICR) values and hazard index (HI) values were calculated to quantify potential carcinogenic and noncarcinogenic risks, respectively. Table 5 presents ICR and HI values for each environmental medium and receptor evaluated. (Receptors

included current residential children and adults, future residential children and adults, and future construction workers.) Table 5 also presents total ICR and HI values, which represent risks to all environmental media combined, for each receptor.

Shaded blocks in Table 5 indicate an ICR value that exceeds the USEPA acceptable limit of 1E-04, or an HI value that exceeds the USEPA acceptable limit of 1.0. As shown, unacceptable risk values include: the HI for future child residents exposed to groundwater (8.8); the ICR for future adult residents exposed to groundwater (1.6E-04); and the HI for future adult residents exposed to groundwater (3.8). Although these values exceed acceptable limits, the risk they represent appears to be insignificant for the following reasons:

Future Residential Child: Groundwater HI = 8.8

The HI value of 8.8 exceeds the acceptable limit of 1.0, thus indicating only a slight potential for risk upon exposure. However, the future residential development of Site 7 is highly unlikely because it is a tidally influenced swamp area. As a result, the future residential scenario is highly unlikely and so are the risks it generates. Additionally, potable water is currently supplied through the Base's public water supply system. This system will likely be utilized, rather than an on site groundwater source, in the event of future construction.

The main contributor to the HI value of 8.8 was aluminum, which accounted for approximately 64 percent of the risk. The federal standard for aluminum (50 µg/L) is a Secondary MCL that is not enforceable; there is no state standard. There is no apparent pattern to the positive detections of aluminum, and there does not appear to be a significant site-related source of aluminum. Based on this information, the HI of 8.8, primarily based on aluminum concentrations, may be an overestimate of the risk that actually exists at Site 7.

Future Residential Adult: Groundwater ICR = 1.6E-04

The ICR value of 1.6E-04 only slightly exceeds the acceptable limit of 1E-04, thus indicating only a slight potential for risk. In addition, the future residential development of Site 7 is highly unlikely because it is a tidally influenced swamp area. As a result, the future residential scenario is highly unlikely and so are the risks it generates. As previously mentioned, the Base's public water supply system, rather than an on site groundwater source, will likely be utilized in the event of future construction.

The main contributor to the ICR value of 1.6E-04 was beryllium, which accounted for approximately 76 percent of the risk. However, beryllium was only detected in unfiltered groundwater samples (i.e., total inorganics samples). Beryllium was not detected in any of the filtered groundwater samples (i.e., dissolved inorganics samples). As a result, high beryllium levels appear to be the result of suspended solids in the unfiltered samples rather than a site-related source. Based on this information, the ICR of 1.6E-04, which is primarily based on beryllium concentrations, is most likely an overestimate of the risk that actually exists at Site 7.

Future Residential Adult: Groundwater HI = 3.8

The HI value of 3.8 only slightly exceeds the acceptable limit of 1.0, thus indicating only a slight potential for risk. In addition, the future residential development of Site 7 is highly unlikely because it is a tidally influenced swamp area. As a result, the future residential scenario is highly unlikely and so are the risks it generates. As previously mentioned, the Base's public water supply system, rather than an on site groundwater soruce, will likely be utilized in the event of future construction.

The main contributor to the HI value of 3.8 was aluminum, which accounted for approximately 64 percent of the risk. The federal standard for aluminum (50 µg/L) is a Secondary MCL that is not enforceable; there is no state standard. There is also no apparent pattern to the positive detections of aluminum, and there does not appear to be a significant site-related source of aluminum. Based on this information, the HI of 8.8, primarily based on aluminum concentrations, may be an overestimate of the risk that actually exists at Site 7.

Although these risk values exceed USEPA acceptable limits, the risks they represent appear to be insignificant. As a result, conditions at Site 7 may be considered protective of human health and the environment.

2.6.2 Ecological Risk Assessment

During the ecological RA, COPCs were selected for surface water, sediment, and surface soil, as shown in Table 6. Then, potential ecological risks associated with each COPC were evaluated. The following paragraphs summarize the conclusions made for aquatic and terrestrial receptors at Site 7.

Aquatic Receptors

Based on the results of the surface water, sediment, and benthic macroinvertebrate sampling at the Western Tributary freshwater stations, there may be a reduction in the benthic macroinvertebrate population in this surface water body. However, the source of this reduction is not known. It may be the result of site-related inorganics in the surface water, non site-related pesticides in the sediment tributary washout that occurred during high rainfall events, or periodic high tidal events. Regardless, the population reduction appears to recover by the downstream saltwater station.

In addition, the aquatic population at the Western Tributary (in particular, the species density and diversity) is similar to the population at off site reference stations. There were also no exceedences of surface water screening values (SWSVs) or sediment screening values (SSVs) at the Western Tributary station. As a result, conditions in the Western Tributary do not appear to represent unacceptable ecological risks.

Based on the results of the surface water, sediment, and benthic macroinvertebrate sampling at the Northeast Creek stations, there is no significant reduction in the benthic macroinvertebrate population for this surface water body. Lead was the only potentially site-related contaminant that exceeded a screening value. However, its exceedences were relatively minor (in surface water, lead was detected at a maximum concentration of 27.1 µg/L which slightly exceeds the SWSV of 25 µg/L; in sediment, lead was detected at

a maximum concentration of 86J µg/L which slightly exceeds the SSV of 46.7 µg/L). In addition, the population at Northeast Creek (in particular, the species density and diversity) is similar to the population at off site reference stations. As a result, conditions in Northeast Creek do not appear to represent unacceptable ecological risks.

The benthic community in the drainage ditch and the Eastern Tributary were not determined. However, based on exceedences of SWSVs and SSVs, ecological impacts could potentially occur at these surface water bodies. In particular, some inorganics in surface water and pesticides in sediment could potentially impact the ecology. The pesticides in sediment are not considered site-related, but the inorganics in surface water may be site-related. However, the ecological risks were determined using inorganics concentrations in unfiltered surface water samples. Consequently, the actual ecological risks to inorganics in surface water will most likely be insignificant.

Terrestrial Receptors

Based on the comparisons of surface soil contaminant levels to surface soil screening values (SSSVs), there may be a reduction in the terrestrial flora and fauna population. However, the earthworm bioaccumulation study indicated that the SSSVs may have overestimated the potential risk. In addition, several worms that contained contaminant levels exceeding SSSVs were found in areas containing no visible signs of stressed or dead vegetation.

Quotient Indices (QIs) generated using the Terrestrial Intake Model indicated that the cottontail rabbit, raccoon, and short-tailed shrew may potentially be at risk from contaminants in the surface water and surface soil. The risk to the rabbit, however, does not appear to be significant because the QI of 5.13 only slightly exceeds the acceptable QI level of 1.0. The QIs for the raccoon and short-tailed shrew are 70.4 and 311, respectively. Aluminum was the main contributor to these unacceptable risk values. However, based on the conservative nature of the model, and the assumption that aluminum is most likely not a site-related contaminant, the potential for a decrease in the raccoon and shrew population from site-related COPCs is expected to be low.

The conclusions of the ecological RA (for both aquatic and terrestrial receptors) indicate that although several SWSVs and SSSVs were exceeded, ecological risks at Site 7 appear to be insignificant. As a result, conditions at Site 7 may be considered protective of the environment.

2.7 Selected Remedy

The selected remedy for Site 7 is the "no action" plan. As its name suggests, the "no action" plan involves taking no further action at Site 7. This includes conducting no further environmental investigations or sampling. The site and all environmental media located within the site will remain as they currently are. The "no action" plan is justifiable because, based on the human health and ecological RAs, conditions at Site 7 appear to be protective of human health and the environment.

3.0 SITE 80

Section 3.0, which focuses on Site 80, presents the following information: a site name, location, and description; a site history and a summary of previous investigations and enforcement activities; highlights of community participation; the scope and role of the response action; a summary of the site characteristics; a summary of the site risks; and the selected remedy.

3.1 Site Name, Location, and Description

Site 80, located northwest of Brewster Boulevard within the Paradise Point Golf Course, is referred to as the Paradise Point Golf Course Maintenance Area. The site consists of a one-acre area which is relatively flat, with a slight slope to the northeast.

Figure 7 presents a site map. As shown, Site 80 contains a machine shop (Building # 1916), a maintenance building (Building # 600), and a maintenance wash down area consisting of a concrete wash pad and sump. The wash pad is used to clean golf course maintenance equipment and the sump is used to collect water and oil runoff generated from the equipment cleaning. Water and oil collected by the sump travels into an oil/water separation pit located southeast of the wash pad.

A drainage ditch is located east of the wash down area. During a March 1994 site reconnaissance, surface water runoff was observed flowing southeast across the site toward the drainage ditch. The drainage ditch then flows north past the eastern edge of the soil mound area. As shown on Figure 7, groundwater flow direction in the shallow aquifer is generally toward the northeast with a mounding effect near the wash down area.

The northeast portion of the site contains several large soil mounds that are overgrown with small pines. There is an open area located south of the mounds where golf course maintenance debris (i.e., tree limbs, lawn clippings, wooden timbers, and brush piles) is deposited. Evidence of burning operations conducted within this open area was observed during the March 1994 site reconnaissance. These soil mounds were generated from the installation of golf course ponds along the fairways in the late 1980s. It has been reported that wastes were disposed on or around the mounds. However, the types of waste that were disposed and the exact disposal locations are unknown. Employees of the maintenance garage were instructed not to use the soil from this area for fill material.

In addition, old maintenance equipment is scattered throughout the open and wooded areas surrounding Building # 600. Two drums, identified during the March 1994 site reconnaissance, were removed from the site by Base personnel. These drums were located northeast of Building # 600 just across the machine shop road. However, the contents of the drums are unknown.

Currently, a mobile trailer is stationed within the west/northwest portion of the site (i.e., the area located north of the machine shop road and east of the golf course road). Base personnel reported that a leach field associated with the golf course's sanitary sewer system is also located within this area (see Figure 7). However, the exact location of the leach field is not known. Based on an average groundwater elevation of 13 feet bgs in this area, the leach field is most likely located at a shallow depth.

3.2 Site History and Previous Investigations/Enforcement Activities

3.2.1 Site History

The Paradise Point Golf Course was constructed in the 1940s and Building # 1916 was constructed in 1946. Reportedly, Site 80 has been used as a maintenance area since the initial construction of the golf course. Today, the maintenance area is still in operation. Current golf course maintenance operations include the machine shop (a potential source of waste oils), the equipment wash down area (a potential source of contaminated washwater), and the routine spraying of pesticides and herbicides.

3.2.2 Previous Investigations/Enforcement Activities

Previous investigations conducted at Site 80 include a Site Inspection (1991) and a Remedial Investigation (1994-95). The following paragraphs briefly describe these investigations. More detailed information is located in the Site Inspection Report (Halliburton/NUS, 1991) and the Remedial Investigation Report (Baker, 1996).

Site Inspection, 1991

In June 1991, Halliburton/NUS conducted a Site Inspection that included the following field activities:

- Soil Investigation (3 surface soil samples collected from 0 to 6 inches bgs; 7 near surface soil samples collected from 0 to 2 feet bgs, and 7 subsurface soil samples collected from 3 to 17 feet bgs; samples analyzed for full TCL organics and chlorinated herbicides)

- Groundwater Investigation (installation of 3 shallow monitoring wells; 3 samples collected from these wells; samples analyzed for full TCL organics and chlorinated herbicides)

- Surface Water/Sediment Investigation (3 surface water samples and 5 sediment samples collected from the drainage ditch; samples analyzed for full TCL organics, chlorinated herbicides, and total petroleum hydrocarbons)

Figure 8 identifies sampling locations associated with the Site Inspection.

Table 7 presents the results of soil sample analyses. As shown, several pesticides, including aldrin, chlordane, 4,4'-DDD and its metabolites (4,4'-DDE and 4,4'-DDT), and dieldrin, were detected in these samples. The pesticide 4,4'-DDD was reported at the greatest concentration (700 µg/kg in sample SB02-0002). Herbicides were not detected in any of the samples. In addition, the PCB Aroclor 1254 was detected in two discrete surface soil locations (80-SB02 and 80-MW03) at concentrations of 830 µg/kg and 1,500 µg/kg, respectively.

Table 8 presents the results of groundwater sample analyses. As shown, four VOCs (toluene at 180 µg/L, ethylbenzene at 5 µg/L, xylene at 21 µg/L, and carbon disulfide at 25 µg/L) were detected in the groundwater sample collected from monitoring well 80-MW03.

Table 9 presents the results of surface water sample analyses. It should be noted that originally five surface water samples were proposed. However, when the investigation was conducted, sampling locations 80-SW01 and 80-SW02 contained no water. As shown on Table 9, all three surface water samples contained acetone at concentrations ranging from 11 to 190 µg/L. Surface water samples from locations 80-SW04 and 80-SW05 also exhibited toluene at concentrations of 30 µg/L and 140 µg/L, respectively, and total petroleum hydrocarbons at concentrations of 1390 µg/L and 1660 µg/L, respectively.

No contaminants were detected in sediment sample analyses.

Remedial Investigation, 1994-95

In October 1994, Baker initiated an RI at Site 80 which included the following field activities:

- Site Survey
- Surface Soil Investigation (37 samples, including 3 background samples, collected from ground surface to one foot bgs; analyzed for full TCL organics and TAL inorganics)
- Additional Surface Soil Investigation Focused on the West/Northwest Portion of Site 80 (21 samples collected from ground surface to one foot bgs; samples analyzed for TCL pesticides)
- Subsurface Soil Investigation (38 samples collected from one foot bgs to just above the groundwater table; samples analyzed for full TCL organics and TAL inorganics)
- Additional Subsurface Soil Investigation Focused on the West/Northwest Portion of Site 80 (13 samples collected from one foot bgs to just above the groundwater table; samples analyzed for TCL pesticides)
- Groundwater Investigation (installation of 4 shallow monitoring wells and one intermediate monitoring well; 8 samples from 5 newly installed wells and 3 existing shallow wells; samples analyzed for full TCL organics and TAL inorganics [total and dissolved fractions])
- Additional Groundwater Investigation Focused on the West/Northwest Portion of Site 80 (installation of one shallow monitoring well [80-MW08]; one sample collected from this well; sample analyzed for TCL pesticides)
- Additional Groundwater Investigation of Inorganics in the Shallow Aquifer (9 samples collected from 9 on site wells; samples analyzed for TAL inorganics [total fraction only]; samples designated with -02)
- Habitat Evaluation (site reconnaissance in which botanical and animal species were identified and documented; collection of unknown botanical species for further investigation)

Figure 9 depicts the sampling locations associated with the RI. Table 10 summarizes the results of surface soil, subsurface soil, and groundwater sample analyses. In this table, shaded blocks indicate a constituent that was detected in excess of its comparison criteria (e.g., federal standards, state standards, background levels). As shown, several inorganic constituents exceeded comparison criteria in surface and subsurface soil samples. In groundwater samples, one SVOC, bis (2-ethylhexyl) phthalate, exceeded its comparison criterion. However, bis (2-ethylhexyl) phthalate concentrations were less than 10 times the concentrations detected in quality control samples. As a result, bis (2-ethylhexyl) phthalate appears to be a laboratory-related contaminant rather than a site-related contaminant. Six inorganic constituents (aluminum, arsenic, chromium, iron, lead, and manganese) also exceeded their comparison criteria in groundwater samples.

3.3 Highlights of Community Participation

The RI report for Site 80 and the PRAP for OU No. 11 were released to the public on _____. These documents are available in an administrative record file at information repositories maintained at the Onslow County Public Library and at the Installation Restoration Division Office (Room 238, MCB, Camp Lejeune). Also, all addresses on the OU No. 11 mailing list will be sent a copy of the Final PRAP and Fact Sheet. The notice of availability of the PRAP and RI document was published in the "Jacksonville Daily News" on _____. A public comment period was held from _____ to _____. In addition, a public meeting was held on _____ to respond to questions and to accept public comments on the PRAP for OU No. 11. The public meeting minutes were transcribed and a copy of the transcript is available to the public at the aforementioned locations. A Responsiveness Summary, included as part of this ROD, has been prepared to respond to the significant comments, criticisms, and new relevant information received during the comment period. Upon signing this ROD, MCB, Camp Lejeune and the DoN will publish a notice of availability for the ROD in the local newspaper, and place this ROD in the information repositories.

3.4 Scope and Role of the Response Action

The response action for Site 80 was developed to address site conditions that appear to be protective of human health and the environment. (Site conditions appear to be protective based on the results of the human health and ecological RAs conducted during the RI.) As a result, the only response action identified and evaluated for Site 80 is the "no action" plan. [Note: Section 2.4 of this ROD presents the response action developed for Site 7; and Section 4.0 presents the response action developed for OU No. 11.]

3.5 Summary of Site Characteristics

Site 80 exhibited the following site characteristics, as determined during the RI:

- Concentrations of VOCs detected in the surface and subsurface soil samples (including acetone and carbon disulfide) were less than 10 times the concentrations detected in quality control samples. Therefore, it is believed that the presence of these contaminants is not due to past activities at the site.

- PAHs were infrequently detected in the surface soil at concentrations less than 100 µg/kg. The location of most of the PAH detections and the highest PAH concentrations were located in the soil mound in the northeast area of the site. This

location is near the open area where burning operations of wood and leaves occur; burning may be the source of this contamination. Phenanthrene was the only PAH detected in the subsurface soil (53J µg/kg) at a depth of 5 to 7 feet.

- Pesticides were the most frequently detected contaminants in the surface soil at Site 80. They exhibited the highest concentration ranges of all soil contaminants. Pesticides were detected in 20 of 55 surface soil samples. Pesticides detected in the surface soil included dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-chlordane and gamma-chlordane. Concentrations of pesticides ranged from 0.6J µg/kg for 4,4'-DDE in sample 80-OA-SB04-00 to 260,000 µg/kg for 4,4'-DDD in sample 80-DPA-SB03-00. The highest pesticide levels were detected in the west/northwest portion of the site. Additionally, elevated levels of pesticides were detected in the lawn area near the soil mounds. Pesticide levels in this area were one to three orders of magnitude lower than in the west/northwest area. Pesticides at other locations of the site were four orders of magnitude lower than in the west/northwest area. Pesticide concentrations at this site were higher than what is normally attributed to past historical pest control applications at MCB, Camp Lejeune.

- Pesticides were also the predominant contaminants in the subsurface soil at Site 80. However, concentrations were one to two orders of magnitude less than concentrations in the surface soil. The highest subsurface pesticide contaminant levels were detected in the west/northwest portion of the site. 4,4'-DDD was the most frequently detected pesticide (12 of 45 samples) and exhibited the highest concentration (510J µg/kg) at a depth of 11 to 13 feet at soil boring location 80-MW04. The maximum concentration of 4,4'-DDT (240 µg/kg) was detected at 11 to 13 feet at soil boring location 80-MW04.

- Inorganic contaminant levels detected in the surface soil were within one order of magnitude (or less) of Base background concentrations. The inorganics arsenic, barium, chromium, manganese, mercury, and selenium exhibited concentrations above Base background levels for inorganics in the subsurface soil.

- Carbon disulfide was the only VOC detected in groundwater. Its concentration, 1J µg/L, was well below the state standard of 700 µg/L.

- SVOCs were detected at low levels in a limited number of shallow monitoring wells. The SVOCs included acenaphthene, fluorene, carbazole, and pyrene. The maximum concentration of acenaphthene (4J µg/L) and pyrene (1 µg/L) did not exceed the state standards of 80 µg/L and 210 µg/L, respectively. Fluorene was detected at a concentration (3J µg/L) well below its state standard (280 µg/L).

- The pesticides 4,4'-DDD and 4,4'-DDT were detected in monitoring well 80-MW04 at concentrations of 2.2J µg/L and 0.58 µg/L, respectively. Federal and/or state groundwater standards have not been adopted for these pesticides.

- Two groundwater sampling rounds were conducted for inorganics analyses. During the first sampling round, concentrations of total inorganics in the groundwater were within one order of magnitude or less of the dissolved inorganics concentrations. Aluminum, arsenic, chromium, iron, lead, and manganese were detected at

concentrations exceeding their respective federal and/or state standards during the first sampling round. Nickel and thallium were the only inorganics detected in excess of their federal and/or state standards during the second sampling round. Total inorganics concentrations in the shallow groundwater were within the range of inorganics concentrations typically detected at MCB, Camp Lejeune.

3.6 Summary of Site Risks

As part of the RI, a human health RA and an ecological RA were conducted to determine the potential risks associated with the chemical constituents detected at Site 80. The following subsections briefly summarize the findings of these RAs.

3.6.1 Human Health Risk Assessment

During the human health RA, COPCs were selected for surface soil, subsurface soil, and groundwater, as shown in Table 11. The selection of COPCs was based on criteria provided in the USEPA Risk Assessment Guidance for Superfund.

For each COPC, ICR and HI values were calculated to quantify potential carcinogenic and noncarcinogenic risks, respectively. Table 12 presents these ICR and HI values for each environmental medium and receptor. (Receptors included current civilian adult base personnel, future residential children and adults, and future construction workers.) Table 12 also presents total ICR and HI values, which represent risks to all environmental media combined, for each receptor.

Shaded blocks in Table 12 indicate an ICR value that exceeds the USEPA acceptable limit of 1E-04, or an HI value that exceeds the USEPA acceptable limit of 1.0. As shown, unacceptable risk values include: the ICR for current adult base personnel exposed to soil (1.7E-04); the HI for future child residents exposed to soil (1.9); the ICR for future child residents exposed to groundwater (8E-04); the HI for future child residents exposed to groundwater (26.09); the ICR for future adult residents exposed to groundwater (1.7E-03); and the HI for future adult residents exposed to groundwater (11.04). Although these values exceed acceptable limits, the risk they represent appears to be insignificant for the following reasons:

Current Civilian Adult Base Personnel: Soil ICR = 1.7E-04

Pesticides and inorganics in surface soil (including dieldrin, 4,4'-DDD, and arsenic) were the main contributors to the unacceptable ICR value of 1.7E-04. However, a time-critical removal action will be conducted for pesticide and arsenic contaminated surface soil at Site 80. Under the removal action, the contaminated surface soil will be excavated, removed from the site, and sent to a treatment/disposal facility. Soil excavation will continue until the ICR value is reduced to below the acceptable limit of 1E-04. At this point, there will no longer be unacceptable carcinogenic risk associated with soil exposure.

Future Residential Child: Soil HI = 1.9

Pesticides and inorganics in surface soil (including dieldrin, 4,4'-DDT, and arsenic) were the main contributors to the unacceptable HI value of 1.9. However, a time-critical removal action will be conducted for pesticide and arsenic contaminated surface soil at Site 80. Under the removal action, the contaminated surface soil will be excavated, removed from

the site, and sent to a treatment/disposal facility. Soil excavation will continue until the HI value is reduced to below the acceptable limit of 1.0. At this point, there will no longer be unacceptable noncarcinogenic risk associated with soil exposure.

Future Residential Child: Groundwater ICR = 8.0E-04

The ICR value of 8.0E-04 only slightly exceeds the acceptable limit of 1E-04, thus indicating only a slight potential for risk. In addition, the main contributor to this ICR value was arsenic which accounted for approximately 96 percent of the risk. However, arsenic was only detected in one monitoring well at a concentration that exceeded the state and federal standard. (In well 80-MW03, arsenic was detected at 102 µg/L which exceeds the state and federal standard of 50 µg/L. The ICR value of 8.0E-04 was generated using this 102 µg/L detection level.) Upon resampling this well using a low flow peristaltic pump, arsenic was detected at a concentration (42 µg/L) that did not exceed the state and federal standard. The well was observed to have poor groundwater recharge, samples collected from the well were silty, and the total suspended solids reading for water from the well was relatively high (21 µg/L). As a result, it appears as though high arsenic concentrations at well 80-MW03 were the result of suspended solids in the well water rather than a site-related arsenic source. The risk associated with arsenic in groundwater appears to be an overestimate of the risk that actually exists at Site 80. In addition, the time-critical removal action will prohibit arsenic contaminated surface soil from being a future potential source of groundwater contamination.

Future Residential Child: Groundwater HI = 26.09

The main contributor to this HI value of 26.09 is arsenic which accounts for approximately 66 percent of the risk. However, arsenic was only detected in one monitoring well at a concentration that exceeded the state and federal standard. (In well 80-MW03, arsenic was detected at 102 µg/L which exceeds the state and federal standard of 50 µg/L. The HI value of 26.09 was generated using this 102 µg/L detection level.) Upon resampling this well using a low flow peristaltic pump, arsenic was detected at a concentration (42 µg/L) that did not exceed the state and federal standard. The well was observed to have poor groundwater recharge, samples collected from the well were silty, and the total suspended solids reading for water from the well was relatively high (21 µg/L). As a result, it appears as though high arsenic concentrations at well 80-MW03 were the result of suspended solids in the well water rather than a site-related arsenic source. The risk associated with arsenic in groundwater appears to be an overestimate of the risk that actually exists at Site 80. In addition, the time-critical removal action will prohibit arsenic contaminated surface soil from being a future potential source of groundwater contamination.

Future Residential Adult: Groundwater ICR = 1.7E-03

The risk associated with this unacceptable ICR value of 1.7E-03 appears to be insignificant for the same reasons identified for the groundwater ICR value of 8.0E-04. These reasons are: 1) 1.7E-03 only slightly exceeds the acceptable ICR limit of 1E-04, and 2) arsenic accounts for approximately 96 percent of this ICR value, but the risk associated with arsenic in groundwater appears to be an overestimate of the risk that actually exists at Site 80. In addition, the time-critical removal action will prohibit arsenic contaminated surface soil from being a future potential source of groundwater contamination.

Future Residential Adult: Groundwater HI = 11.04

The risk associated with this unacceptable HI value of 11.04 appears to be insignificant for the same reason identified for the groundwater HI value of 26.09. Arsenic accounts for approximately 66 percent of the HI value, but the risk associated with arsenic in groundwater appears to be an overestimate of the risk that actually exists at Site 80. In addition, the time-critical removal action will prohibit arsenic contaminated surface soil from being a future potential source of groundwater contamination.

Although several risk values for Site 80 exceed USEPA acceptable limits, the risks they represent appear to be insignificant. As a result, conditions at Site 80 may be considered protective of human health and the environment.

3.6.2 Ecological Risk Assessment

During the ecological RA, COPCs were selected for surface soil as shown in Table 13. Then, potential ecological risks associated with each COPC were evaluated. The following paragraphs present the conclusions made for terrestrial receptors at Site 80.

Terrestrial Receptors

The ecological RA indicated that pesticides located in grass covered areas could potentially decrease the terrestrial invertebrate and plant populations. Several samples contained pesticide concentrations exceeding the SSSVs by several orders of magnitude. In addition, pesticides in the grass covered areas exhibited high bioconcentration factor (BCF) values indicating that these pesticides may accumulate in species ingesting terrestrial invertebrates and plants. However, a time-critical removal action in which pesticide-contaminated surface soil will be removed from the site is being conducted. This removal action will alleviate the ecological risks associated with pesticides in surface soil.

Several constituents in gravel covered areas at Site 80 also exceeded SSSVs. However, the gravel covered areas have been disturbed by vehicle traffic and are not likely to support a significant terrestrial invertebrate population. With the exception of a few patches of grass, plants do not grow in these areas. Consequently, the potential ecological impacts associated with constituents in gravel covered areas are relatively insignificant.

The rabbit was the only species with a total QI value that exceeded the acceptable level of 1.0. However, the rabbit's QI (2.8) only slightly exceeds the acceptable level of 1.0. Thus, it appears as though there is a relatively low potential for adverse impacts to the rabbit population. In addition, much of the site is gravel covered which reduces the rabbit's potential habitat.

The conclusions of the ecological RA indicate that although several SSSVs were exceeded and the rabbit's QI exceeded the acceptable limit, ecological risks at Site 80 are insignificant. Thus, conditions at Site 80 appear to be protective of the environment.

3.7 Selected Remedy

The selected remedy for Site 80 is the "no action" plan. As its name suggests, the "no action" plan involves taking no further action at Site 80. This includes conducting no further environmental investigations or sampling. The site and all environmental media located within the site will remain as they currently are. The "no action" plan is justifiable because, based on the human health and ecological RAs, conditions at Site 80 appear to be protective of human health and the environment.

4.0 THE SELECTED REMEDY FOR OU NO. 11

The selected remedy for OU No. 11 is a combination of the two separate remedies selected for Sites 7 and 80. For both sites, the selected remedy is the "no action" plan. Consequently, the selected remedy for OU No. 11 is the "no action" plan.

The "no action" plan, as its name suggests, involves taking no further action at OU No. 11. This includes conducting no further environmental investigations or sampling. The operable unit, and all environmental media located within the operable unit, will remain as they currently are. The "no action" plan is justifiable because, based on the results of human health and ecological RAs conducted for Sites 7 and 80, environmental conditions within OU No. 11 appear to be protective of human health and the environment.

5.0 STATUTORY DETERMINATIONS

A selected remedy should satisfy the statutory requirements of CERCLA Section 121 which include: (1) protect human health and the environment; (2) comply with applicable or relevant and appropriate requirements (ARARs); (3) achieve cost-effectiveness; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied. The following paragraphs evaluate the selected remedy for OU No. 11 with respect to these requirements.

5.1 Protection of Human Health and the Environment

Based on the human health and ecological RAs conducted during the RI, conditions at Sites 7 and 80 appear to be protective of human health and the environment, both now and in the future.

Although unacceptable human health risks were generated for both Sites 7 and 80, these risks are considered to be overly conservative estimates of the risks that actually exist. Unacceptable risks to groundwater were generated under the future residential scenario at Site 7. However, this scenario is highly unlikely because the site mainly consists of a tidally influenced swamp area. There is also a potable water distribution system located at the Base that will likely be utilized, rather than an on site groundwater source, in the event of future construction. Unacceptable risks to surface soil were generated under the current Base personnel and future residential scenarios at Site 80. However, a time-critical removal action for pesticide and arsenic contaminated surface soil will be conducted to reduce this current risk to within acceptable limits. Unacceptable risks to groundwater were also generated under the future residential scenario at Site 80. However, the elevated inorganics levels contributing to these risks are believed to be the result of a poorly constructed well rather than a significant site-related problem. [Note: For a more comprehensive discussion of human health risks, refer to Sections 2.6.1 and 3.6.1 of this ROD.]

Unacceptable ecological risks were also generated for Sites 7 and 80. Like the unacceptable human health risks, the unacceptable ecological risks are considered to be overly conservative estimates of the risks that actually exist. At Site 7, several SWSVs, SSVs, and SSSVs were exceeded. However, the exceedences were minor, and/or total inorganics concentrations were used to determine the risks. QIs for cottontail rabbits, raccoons, and short-tailed shrews (5.13, 70.4, and 311, respectively) were also exceeded. However, aluminum (an elemental metal) was the main contributor to these risks, and the terrestrial intake model is known to be extremely conservative. At Site 80, several pesticides exceeded SSSVs. However, the time-critical removal action for pesticide and arsenic contaminated surface soil will alleviate these exceedences. The QI for the rabbit (2.8) also exceeded the acceptable level of 1.0, but this exceedence was minor. [Note: For a more comprehensive discussion of ecological risks, refer to Sections 2.6.2 and 3.6.2 of this ROD.]

Based on the nature of the human health and ecological risks at Sites 7 and 80, conditions at OU No. 11 appear to be protective of human health and the environment, both now and in the future. Therefore, no remedial actions need to be implemented in order to maintain adequate protection. The "no action" plan is a justifiable, protective remedy.

5.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will not comply with all of the chemical-specific ARARs that apply to Sites 7 and 80. Chemical constituents will remain untreated at levels exceeding state and federal standards. Tables 3 and 10 identify the constituents that will exceed chemical-specific ARARs at Sites 7 and 80, respectively. Despite these exceedences, the risks associated with these constituents will be minimal; leaving them untreated at the sites should not have any detrimental impacts on human health or the environment. A waiver of the chemical-specific ARARs, however, may be required before the selected remedy can be implemented.

5.3 Cost-Effectiveness

There are no costs associated with the selected remedy for OU No. 11. The "no action" plan is cost effective since any other action would not provide significant, if any, benefits to public health or the environment.

5.4 Utilization of Permanent Solutions and Alternative Treatment Technologies

The selected remedy for OU No. 11 should be a permanent solution. Future risks at both Sites 7 and 80 are expected to be insignificant, so no further remedial actions will be necessary and the "no action" plan should be a permanent solution.

Alternative treatment technologies were not considered for OU No. 11 because conditions at Sites 7 and 80 appear to be protective of human health and the environment. Treatment technologies were not considered appropriate based on site conditions and potential risks to human health and the environment.

5.5 Preference for Treatment as a Principal Element

The selected remedy for OU No. 11 does not satisfy the statutory preference for treatment as a principal element. However, the remedy is still capable of providing adequate protection of human health and the environment.

6.0 RESPONSIVENESS SUMMARY

6.1 Overview

To be completed after the public meeting.

6.2 Background on Community Involvement

A record review of the MCB, Camp Lejeune files indicates that the community involvement centers mainly on a social nature, including the community outreach programs and Base/community clubs. The file search did not locate written Installation Restoration Program (IRP) concerns of the community. A review of historic newspaper articles indicated that the community is interested in the local drinking and groundwater quality, as well as that of the New River, but that there are no expressed interests or concerns specific to the environmental sites (including Sites 7 and 80). Two local environmental groups, the Stump Sound Environmental Advocates and the Southeastern Watermen's Association, have posed questions to the Base and local officials in the past regarding other environmental issues. These groups were sought as interview participants prior to the development of the Camp Lejeune, IRP, Community Relations Plan. Neither group was available for the interviews.

Community relations activities to date are summarized below:

- Conducted additional community relations interviews, February through March 1990. A total of 41 interviews were conducted with a wide range of persons including base personnel, residents, local officials, and off-base residents.
- Prepared a Community Relations Plan, September 1990.
- Conducted additional community relations interviews, August 1993. Nineteen persons were interviewed, representing local business, civic groups, on- and off-base residents, military and civilian interests.
- Prepared a revised Final Draft Community Relations Plan, February 1994.
- Established two information repositories.
- Established the Administrative Record for all of the sites at the base.
- Released PRAP for public review in repositories,_____ .
- Released public notice announcing public comment and document availability of the PRAP, _____.
- Held Technical Review Committee meeting, _____, to review PRAP and solicit comments.
- Held public meeting on _____, to solicit comments and provide information. Approximately ___ people attended. The public meeting transcript is available in the repositories.

6.3 Summary of Comments Received During the Public Comment Period and Agency Responses

To be completed after the public meeting.

TABLES

TABLE 1

SUMMARY OF THE ANALYTICAL RESULTS FOR SOIL
SITE INSPECTION, 1991
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA

Constituent	Surface Soil (0-2 feet bgs)		Subsurface Soil (3-12 feet bgs)	
	No. of Detections/Total No. of Samples	Range of Detected Concentrations	No. of Detections/Total No. of Samples	Range of Detected Concentrations
Organics [1]				
Bis(2-ethylhexyl)phthalate	1/8	1,000	0/5	ND
Fluoranthene	2/8	220-290	0/5	ND
Benzoic acid	2/8	6,300-15,000	1/5	7,900
Aldrin	1/8	4.3	0/5	ND
4,4'-DDD	3/8	12-20	2/5	58-190
4,4'-DDE	1/8	240	0/5	ND
Dieldrin	3/8	12-540	3/5	400-2,500
Endosulfan II	3/8	7.6-1,400	3/5	73-2,000
Endrin	2/8	91-140	4/5	14-1,300
Aroclor-1260	3/8	108-12,000	4/5	660-25,000
Inorganics [2]				
Aluminum	8/8	3,690-9,700	5/5	1,030-5,030
Arsenic	3/8	1.1-1.7	3/5	1.1-1.5
Barium	8/8	9.1-223	5/5	6.6-72.8
Beryllium	4/8	0.26-2.1	3/5	0.29-3.6
Cadmium	8/8	1.1-5.0	5/5	1.2-4.5
Calcium	7/8	190-58,200	3/5	3,660-9,990
Chromium (Total)	8/8	4.2-10.6	5/5	5.2-12.5
Cobalt	8/8	1.7-8.1	5/5	1.9-10.2
Iron	8/8	876-5,330	5/5	981-5,490
Lead	8/8	3.0-114	5/5	2.4-17.0
Magnesium	8/8	104-1,150	4/5	99.9-541
Manganese	8/8	3.2-69.0	5/5	3.0-47.7
Mercury	8/8	0.11-0.53	5/5	0.12-0.45

TABLE 1 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS FOR SOIL
SITE INSPECTION, 1991
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA

Constituent	Surface Soil (0-2 feet)		Subsurface Soil (3-12 feet)	
	No. of positive Detections/ No. of Samples	Range of Positive Detections	No. of positive Detections/ No. of Samples	Range of Positive Detections
Nickel	8/8	2.8-13.1	5/5	3.1-11.7
Potassium	6/8	110-507	4/5	120-452
Selenium	1/8	0.54	0/5	ND
Silver	8/8	0.66-3.0	5/5	0.72-2.7
Sodium	1/8	754	1/5	1,020
Thallium	8/8	0.44-2.0	5/5	0.47-1.8
Vanadium	8/8	4.5-18.1	5/5	4.5-9.8
Zinc	2/8	1.1-44.5	3/5	1.2-4.5
Cyanide	8/8	0.54-2.5	5/5	0.60-2.3

Notes:

(1) Organic concentrations expressed in μg/kg (microgram per kilogram).
(2) Inorganic concentrations expressed mg/kg (milligram per kilogram).
bgs = Below ground surface.
ND = Not detected.

Reference: Halliburton/NUS, 1991. Site Inspection Report for Site 7 Tarawa Terrace Dump. Marine Corps Base, Camp Lejeune, North Carolina.

TABLE 2

SUMMARY OF THE ANALYTICAL RESULTS FOR GROUNDWATER
SITE INSPECTION, 1991
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA

Constituent	North Carolina Standard[1]	USEPA MCL[1]	No. of Detections/Total No. of Samples	Range of Detected Concentrations	Location of Maximum Concentration
Benzoic Acid	--	--	2/3	9-12	7MW03
Dieldrin	--	--	1/3	0.63	7MW02
Endrin Ketone	2.0	2.0	1/3	0.09	7MW02
Aluminum	--	--	3/3	29,000-137,000	7MW02
Antimony	--	6	1/3	4.75	7MW02
Barium	2,000	2,000	3/3	427-706	7MW02
Beryllium	--	4,000	2/3	3.1-9.4	7MW02
Chromium (Total)	50	1,000	3/3	47.8-251	7MW02
Cobalt	--		2/3	9.6-21.7	7MW01
Copper	1,000	--	3/3	17.7-41.6	7MW02
Iron	300	300[2]	3/3	26,400-228,000	7MW02
Lead	15	--	3/3	30.3-37.3	7MW01
Magnesium	--	--	1/3	13,500	7MW01
Manganese	50	50[2]	3/3	56.9-220	7MW01
Mercury	1.1	2	2/3	0.24-0.36	7MW03
Potassium	--	--	1/3	5,240	7MW02
Selenium	50	50	1/3	3.4	7MW01
Sodium	--	--	1/3	156,000	7MW01
Vanadium	--	--	3/3	37.8-442	7MW02
Zinc	2,100	--	3/3	83.6-151	7MW02

Notes:

[1] Shaded blocks indicate detections above the North Carolina Standard or Federal MCL.
[2] Secondary Maximum Contaminant Level.
USEPA = U.S. Environmental Protection Agency
MCL = Federal Maximum Contaminant Level
-- = No criteria established.
Concentrations expressed in µg/L (microgram per liter)

Reference: Halliburton/NUS, 1991. Site Inspection Report for Site 7 Tarawa Terrace Dump. Marine Corps Base, Camp Lejeune, North Carolina.

TABLE 3

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
Surface Soils	Volatile Organic Compounds		Region III RBC (µg/kg)		(µg/kg)	(µg/kg)			RBC		
		Acetone	7,800,000	NE	150	170	7-EA-SB09-00	2/31	0	NA	East Area
		2-Butanone	4,700,000	NE	52	52	7-EA-SB09-00	1/31	0	NA	East Area
		Trichloroethene	58,000	NE	1J	1J	7-EA-SB06-00	1/30	0	NA	East Area
		Toluene	1,600,000	NE	9J	46J	7-EA-SB09-00	3/30	0	NA	East Area, North Area
	Semivolatile Organic Compounds	Phenol	4,700,000	NE	170NJ	170NJ	7-EA-SB10-00	1/32	0	NA	East Area
		Acenaphthene	4,700,000	NE	37J	37J	7-NA-SB04-00	1/32	0	NA	North Area
		Fluorene	160,000	NE	38J	38J	7-NA-SB04-00	1/32	0	NA	North Area
		Phenanthrene	NE	NE	63J	400	7-NA-SB04-00	3/32	NA	NA	North Area, East Area
		Anthracene	2,300,000	NE	100J	100J	7-NA-SB04-00	1/32	0	NA	North Area
		Carbazole	32,000	NE	110J	110J	7-NA-SB04-00	1/32	0	NA	North Area
		di-n-Butyl-phthalate	NE	NE	170J	170J	7-SW-SB02-00	1/32	NA	NA	Southwest Area
		Fluoranthene	3,100,000	NE	110J	750	7-NA-SB04-00	4/32	0	NA	North Area, East Area
		Pyrene	2,300,000	NE	85J	580	7-NA-SB04-00	4/32	0	NA	North Area, East Area
		Benzo(a)anthracene	880	NE	50J	420	7-NA-SB04-00	4/32	0	NA	North Area, East Area
		Chrysene	88,000	NE	55J	420	7-NA-SB04-00	4/32	0	NA	North Area, East Area
		bis(2-Ethylhexyl)phthalate	46,000	NE	38J	600	7-MW04-00	8/32	0	NA	North Area, East Area
		Benzo(b)fluoranthene	880	NE	45J	380	7-NA-SB04-00	4/32	0	NA	North Area, East Area
		Benzo(k)fluoranthene	8,880	NE	60J	370	7-NA-SB04-00	4/32	0	NA	North Area, East Area
		Benzo(a)pyrene	88	NE	55J	340J	7-NA-SB04-00	3/32	1	NA	North Area, East Area
		Indeno(1,2,3-cd)pyrene	880	NE	41J	250J	7-NA-SB04-00	3/32	0	NA	North Area, East Area
		Benzo(g,h,i)perylene	NE	NE	44J	220J	7-NA-SB04-00	2/32	NA	NA	North Area

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
Surface Soils (Cont.)	Pesticides/ PCBs		Region III RBC (µg/kg)		(µg/kg)	(µg/kg)			RBC		
		delta-BHC	NE	NE	3.3NJ	3.3NJ	7-SWA-SB03-00	1/30	NA	NA	Southwest Area
		Aldrin	38	NE	3	3	7-NA-SB04-00	1/30	0	NA	North Area
		Dieldrin	40	NE	4.7J	57	7-NA-SB04-00	7/30	1	NA	North Area, East Area, Community Center
		4,4'-DDE	1,900	NE	3.8	65J	7-MW05-00	7/30	0	NA	Southwest Area, North Area, East Area
		Endosulfan II	470,000	NE	7.9J	37NJ	7-SWA-SB03-00	3/30	0	NA	Southwest Area, North Area
		4,4'-DDD	2,700	NE	4.3J	94J	7-MW05-00	3/31	0	NA	Southwest Area, North Area
		4,4'-DDT	1,900	NE	14J	280J	7-MW05-00	4/30	0	NA	Southwest Area, North Area, East Area
		Endrin aldehyde	NE	NE	39NJ	39NJ	7-SWA-SB03-00	1/30	NA	NA	Southwest Area
		alpha-Chlordane	490	NE	11J	26J	7-NA-SB04-00	3/30	0	NA	North Area, Southwest Area
		gamma-Chlordane	490	NE	6.9J	22J	7-NA-SB04-00	3/30	0	NA	North Area, Southwest Area
		Aroclor 1254	1,600	NE	43J	43J	7-SWA-SB04-00	1/30	0	NA	Southwest Area
		Aroclor 1260	83	NE	80NJ	80NJ	7-NA-SB04-00	1/30	0	NA	North Area

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
Surface Soils (Cont.)			Region III RBC (µg/kg)	Base Background (mg/kg)	(mg/kg)	(mg/kg)			RBC	Base Background	
	Inorganics	Aluminum	78,000	17.7 - 9,570	690J	12,900J	7-CC-SB02-00	32/32	0	4[a]	Community Center, East Area, Southwest Area
		Arsenic	0.37	0.065 - 3.9	1.1	5.1J	7-CC-SB02-00	6/32	6	1	Community Center
		Barium	5,500	0.65 - 20.8	5.2	172	7-EA-SB07-00	29/32	0	6	East Area, North Area, Southwest Area
		Beryllium	0.15	0.02 - 0.26	0.15	1.9	7-EA-SB10-00	10/32	10	7	East Area, North Area, Southwest Area
		Calcium	NE	4.25 - 10,700	72.7	206,000J	7-SWA-SB05-00	19/32	NA	3	Southwest Area, North Area
		Chromium	78,000	0.33 - 12.5	2.5	23.1J	7-CC-SB02-00	23/32	0	4	Community Center, East Area, Southwest Area
		Cobalt	4,700	0.185 - 2.355	1.6	4.4	7-EA-SB10-00	2/32	0	1	East Area
		Copper	2,900	0.5 - 87.2	2.6	7.6	7-MW05-00	7/32	0	0	--
		Iron	NE	69.7 - 9,640	14.4	17,600J	7-CC-SB02-00	32/32	NA	1	Community Area
		Lead	NE	0.47 - 142	4.2	2,620	7-NA-SB03-00	29/32	NA	1	North Area
		Magnesium	NE	2.55 - 610	36.1	1,110	7-MW05-00	15/32	NA	2	Southwest Area, North Area
		Manganese	390	0.87 - 66	1.7J	42.9	7-MW05-00	18/32	0	0	--
		Mercury	23	0.01 - 0.08	0.23	0.23	7-SWA-SB04-00	2/32	0	2	Southwest Area, East Area
		Nickel	1,600	0.6 - 3.55	6.3	13.8	7-EA-SB10-00	2/32	0	2	East Area, Southwest Area
		Potassium	NE	1 - 416	246J	776J	7-CC-SB02-00	5/32	NA	1	Community Center
		Selenium	390	0.075 - 1.3	1.1	2.1	7-EA-SB10-00	7/32	0	3	East Area, Community Center, North Area
		Silver	390	0.0435 - 4.3	1.2	1.2	7-NA-SB07-00	1/32	0	0	--
		Sodium	NE	4.7 - 126	24.8	153	7-MW05-00	15/32	NA	1	Southwest Area

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
Surface Soils (Cont.)	Inorganics (Cont.)		Region III RBC (µg/kg)	Base Background (mg/kg)	(mg/kg)	(mg/kg)			RBC	Base Background	
		Vanadium	550	0.305 - 18.2	2.5	41J	7-CC-SB02-00	28/32	0	5	Community Center, East Area, Southwest Area
		Zinc	23,000	0.3 - 28.3	7.8	58.9J	7-MW05-00	15/32	0	2	Southwest Area

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
Subsurface Soils			Region III SSL (µg/kg)		(µg/kg)	(µg/kg)			SSL		
	Volatile Organic Compounds	Methylene Chloride	10	NE	12J	12J	7-SWA-SB04-01	1/30	1	NA	Southwest Area
		Acetone	8,000	NE	13	2,300	7-EA-SB05-07	11/30	0	NA	Scattered
	Semivolatile Organic Compounds	Naphthalene	30,000	NE	120J	120J	7-NA-SB07-02	1/29	0	NA	North Area
		2-Methylnaphthalene	NE	NE	48J	48J	7-NA-SB07-02	1/29	NA	NA	North Area
		Acenaphthene	200,000	NE	190J	190J	7-NA-SB07-02	1/29	0	NA	North Area
		Dibenzofuran	120,000	NE	120J	120J	7-NA-SB07-02	1/29	0	NA	North Area
		Fluorene	160,000	NE	260J	260J	7-NA-SB07-02	1/29	0	NA	North Area
		Phenanthrene	NE	NE	1,700	1,700	7-NA-SB07-02	1/29	NA	NA	North Area
		Anthracene	4,300,000	NE	350J	350J	7-NA-SB07-02	1/29	0	NA	North Area
		Carbazole	500	NE	450	450	7-NA-SB07-02	1/29	0	NA	North Area
		di-n-Butyl-phthalate	NE	NE	42J	220J	7-SWA-SB02-04	3/29	NA	NA	Southwest Area
		Fluoranthene	980,000	NE	1,800	1,800	7-NA-SB07-02	1/29	0	NA	North Area
		Pyrene	1,400,000	NE	1,300	1,300	7-NA-SB07-02	1/29	0	NA	North Area
		Benzo(a)anthracene	700	NE	740	740	7-NA-SB07-02	1/29	1	NA	North Area
		Chrysene	1,000	NE	770	770	7-NA-SB07-02	1/29	0	NA	North Area
		bis(2-Ethylhexyl)phthalate	11,600	NE	39J	80J	7-NA-SB04-02	5/29	0	NA	North Area, Southwest Area
		Benzo(b)fluoranthene	4,000	NE	690	690	7-NA-SB07-02	1/29	0	NA	North Area
		Benzo(k)fluoranthene	4,000	NE	610	610	7-NA-SB07-02	1/29	0	NA	North Area
		Benzo(a)pyrene	4,000	NE	460	460	7-NA-SB07-02	1/29	0	NA	North Area
		Indeno(1,2,3-cd)pyrene	35,000	NE	390	390	7-NA-SB07-02	1/29	0	NA	North Area
		Dibenz(a,h)anthracene	11,000	NE	210J	210J	7-NA-SB07-02	1/29	0	NA	North Area
		Benzo(g,h,i)perylene)	NE	NE	330J	330J	7-NA-SB07-02	1/29	NA	NA	North Area

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
Subsurface Soils (Cont.)			Region III SSL (µg/kg)		(µg/kg)	(µg/kg)			SSL		
	Pesticides/ PCBs	delta-BHC	NE	NE	3J	3J	7-EA-SB06-01	1/28	NA	NA	East Area
		Aldrin	5	NE	6.3	6.3	7-SWA-TP02	1/28	1	NA	Southwest Area
		Dieldrin	1	NE	17	98J	7-SWA-SB04-01	3/28	3	NA	Southwest Area
		4,4'-DDE	500	NE	0.82J	38	7-SWA-SB04-01	4/28	0	NA	Southwest Area
		Endrin	400	NE	4.8J	4.8J	7-SWA-SB04-01	1/28	0	NA	Southwest Area
		Endosulfan II	3,000	NE	17J	19J	7-SWA-SB04-01	2/28	0	NA	Southwest Area, East Area
		4,4-'DDD	700	NE	1.9J	15J	7-SWA-SB04-01	4/28	0	NA	Southwest Area
		4,4'-DDT	1,000	NE	1.7J	19J	7-SWA-SB04-01	2/28	0	NA	Southwest Area
		Endrin Aldehyde	NE	NE	8.1J	8.1J	7-EA-SB06-01	1/28	NA	NA	East Area
		alpha-chlordane	2,000	NE	120J	120J	7-SWA-SB04-01	1/28	0	NA	Southwest Area
		gamma-chlordane	2,000	NE	2.9	110J	7-SWA-SB04-01	2/28	0	NA	Southwest Area
		Aroclor 1260	8,200	NE	91J	91J	7-SWA-SB04-01	1/28	0	NA	Southwest Area

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
Subsurface Soils (Cont.)			Region III SSL (mg/kg)	Base Background (mg/kg)	(mg/kg)	(mg/kg)			SSL	Base Background	
	Inorganics	Aluminum	NE	16.9 - 11,000	607	11,600	7-SWA-TP02	29/29	NA	1[D]	Southwest Area
		Arsenic	15	0.033 - 15.4	2.4J	2.6	7-NA-SB09-02	2/29	0	0	--
		Barium	32	0.65 - 22.6	5.7	147	7-SWA-SB01-04	28/29	NA	11	Scattered
		Beryllium	180	0.01 - 0.31	0.08	0.74	7-SWA-SB01-04	7/29	0	2	Southwest Area, North Area
		Calcium	NE	4.75 - 4,410	45.5	93,300	7-SWA-TP05	16/29	NA	4	Southwest Area, North Area
		Chromium	19	0.65 - 66.4	2.1	15.2	7-SWA-TP02	26/29	0	0	--
		Copper	NE	0.47 - 9.5	0.43J	74.7	7-NA-SB04-02	6/29	NA	2	North Area, Southwest Area
		Iron	NE	63.3 - 90,500	163	8,000	7-NA-SB09-02	26/29	NA	0	--
		Lead	NE	0.465 - 21.4	1	18.3	7-SWA-SB04-01	24/29	NA	0	--
		Magnesium	NE	2.85 - 852	24.3	662	7-NA-SB04-02	17/29	NA	0	--
		Manganese	NE	0.395 - 19.9	1.7	47.6	7-NA-SB04-02	18/29	NA	1	North Area
		Mercury	3	0.01 - 0.68	0.56	0.56	7-SWA-SB04-01	1/29	0	0	--
		Nickel	21	0.45-4.7	6.8	6.8	7-NA-SB04-02	1/29	0	1	North Area
		Potassium	NE	1.05 - 1,250	369	462J	7-NA-SB04-02	2/29	NA	0	--
		Selenium	3	0.085 - 2.4	1.2	1.2	7-NA-SB09-02	1/29	0	0	--
		Sodium	NE	5.4 - 141	22.7	81.2	7-NA-SB04-02	9/29	NA	0	--
		Vanadium	NE	0.34 - 69.4	1.5	18.2	7-NA-SB09-02	22/29	NA	0	--
		Zinc	42,000	0.32 - 26.6	4.5	135	7-SWA-SB04-01	11/29	0	2	Southwest Area, North Area

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
			MCL (µg/L)	NCWQS (µg/L)	(µg/L)	(µg/L)			MCL	NCWQS	
Groundwater	Volatile Organic Compounds	Chloroform	80[2]	0.19	4J	7J	7-MW02-01	2/8	0	2	North Area, Southwest Area
		2-Hexanone	NE	NE	1J	1J	7-MW05-01	1/8	NA	NA	Southwest Area
		Toluene	1,000	1,000	4J	4J	7-TW01-01	1/8	NA	0	--
	Semivolatile Organic Compounds	Phenol	NE	300	4J	4J	7-TW01-01	1/8	0	0	--
		4-Methylphenol	NE	NE	10	10	7-TW01-01	1/8	NA	NA	--
	Pesticides/ PCBs	Dieldrin	NE	NE	0.41	0.41	7-MW02-01	1/8	NA	NA	--
	Inorganics	Aluminum	50-200[3]	NE	1,660	88,800	7-MW03-01	5/8	5	NA	Scattered
		Barium	2,000	2,000	3.2J	370	7-MW03-01	8/8	0	0	--
		Baryllium	4.0	NE	1.2	3	7-MW03-01	3/8	0	NA	--
		Calcium	NE	NE	590	174,000	7-TW02-01	8/8	NA	NA	--
		Chromium	100	50	11.7	104	7-MW03-01	4/8	1	1	Southwest Area
		Copper	1,300[4]	1,000	10.6	20.8	7-MW03-01	2/8	0	0	--
		Iron	300[3]	300	969	25,400	7-MW-3-01	5/8	5	5	Scattered
		Lead	15[4]	15	27.1J	67.5J	7-MW03-01	3/8	3	3	Scattered
		Magnesium	NE	NE	1,860	13,000	7-TW02-01	8/8	NA	NA	--
		Manganese	50[3]	50	5J	445	7-TW02-01	8/8	2	2	North Area, Southwest Area
		Mercury	2.0	1.1	0.32	0.4	7-MW03-01	2/8	0	0	--
		Potassium	NE	NE	1,020	6,430	7-TW02-01	8/8	NA	NA	--
		Selenium	50	50	9.4	9.4	7-MW03-01	1/8	0	0	--
		Sodium	NE	NE	4,420	39,800	7-MW01-01	8/8	NA	NA	--
		Vanadium	NE	NE	24.1	167	7-MW03-01	3/8	NA	NA	--
		Zinc	5,000[2]	2,100	167	180	7-TW02-01	2/8	0	0	--

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
			AWQC (µg/L)	NCWQS (µg/L)	(µg/L)	(µg/L)			AWQC	NCWQS	
Surface Water	Volatile Organic Compounds	Chloroform	5.7	NE	1J	3J	7-WT-SW01	3/13	0	NA	Western Tributary
		2-Butanone	NE	NE	2J	2J	7-NC-SW03	1/13	NA	NA	Northeast Creek
		2-Hexanone	NE	NE	1J	1J	7-NC-SW03	1/13	NA	NA	Northeast Creek
		Xylene (total)	2	NE	1J	1J	7-ET-SW02	1/13	0	NA	Eastern Tributary
	Semivolatile Organic Compounds	bis(2-Ethylhexyl)phthalate	1.8	NE	77B	77B	7-ET-SW02	1/13	1	NA	Eastern Tributary
	Pesticides/ PCBs	Dieldrin	0.00014	0.000144	0.4	0.5	7-WT-SW01	2/13	2	2	Western Tributary
		Endrin Ketone	NE	NE	0.12	0.13	7-WT-SW02	2/13	NA	NA	Western Tributary
	Inorganics	Aluminum	NE	NE	77.1	2,200J	7-NC-SW03	13/13	0	NA	Widespread
		Arsenic	0.018	NE	2.1J	2.4J	7-NC-SW02	2/13	2	NA	Northeast Creek
		Barium	2,000	NE	16.4	37.2	7-NC-SW03	13/13	0	NA	Widespread
		Calcium	NE	NE	5.940	171,000J	7-NC-SW03	13/13	NA	NA	Widespread
		Copper	NE	NE	12.3	12.3	7-ET-SW01	1/13	NA	NA	Eastern Tributary
		Iron	300	NE	175J	2,160J	7-NC-SW03	13/13	9	NA	Widespread
		Lead	NE	NE	2.5J	27.1	7-NC-SW03	10/13	NA	NA	Widespread
		Magnesium	4	NE	1,680	573,000	7-NC-SW03	13/13	NA	NA	Widespread
		Manganese	50	NE	10.1	68.9	7-NC-SW03	13/13	1	NA	Widespread
		Potassium	NE	NE	39,600	179,000	7-NC-SW03	9/13	NA	NA	Scattered
		Silver	NE	NE	5.1J	9.6	7-NC-SW03	6/13	NA	NA	Scattered
		Sodium	NE	NE	7,100	4,650,000	7-NC-SW01	13/13	NA	NA	Widespread
		Zinc	NE	NE	6.4	168J	7-WT-SW01	9/13	NA	NA	Scattered

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
			NOAA ER-L (µg/kg)	NOAA ER-M (µg/kg)	(µg/kg)	(µg/kg)			NOAA ER-L	NOAA ER-M	
Sediments	Volatile Organic Compounds	2-Butanone	NE	NE	1J	250J	7-ET-SD01-06	14/27	NA	NA	Scattered
		Toluene	NE	NE	10J	39J	7-MA-SD04-612	9/27	NA	NA	Scattered
		Styrene	NE	NE	28J	28J	7-MA-SD02-06	1/27	NA	NA	Swamp Area
	Semivolatile Organic Compounds	Acenaphthylene	NE	NE	250J	250J	7-MA-SD04-06	1/27	NA	NA	Swamp Area
		Dibenzofuran	NE	NE	130J	130J	7-DD-SD02-06	1/27	NA	NA	Drainage Ditch
		Phenanthrene	225	1,380	91J	210J	7-MA-SD04-06	3/27	0	0	--
		Anthracene	85	960	350J	350J	7-MA-SD04-06	1/27	1	0	--
		Di-n-Butyl-phthalate	NE	NE	76J	1,300J	7-MA-SD04-06	9/27	NA	NA	Scattered
		Fluoranthene	600	3,600	42J	450J	7-MA-SD04-06	5/27	0	0	--
		Pyrene	350	2,200	43J	430J	7-MA-SD04-06	6/27	1	0	Swamp Area
		Butyl benzyl phthalate	NE	NE	47J	47J	7-NC-SD04-612 & 7-WT-SD03-06	2/27	NA	NA	Northeast Creek, Western Tributary
		3,3'-Dichlorobenzidine	NE	NE	110J	110J	7-DD-SD02-06	1/27	NA	NA	Drainage Ditch
		Benzo(a)anthracene	230	1,600	74J	74J	7NC-SD04-612	1/27	0	0	--
		Chrysene	400	2,800	70J	320J	7-MA-SD04-06	3/27	0	0	--
		bis(2-Ethylhexyl)phthalate	NE	NE	510	810	7-WT-SD03-06	2/27	NA	NA	Western Tributary
		di-n-Octylphthalate	NE	NE	500J	500J	7-NC-SD05-06	1/27	NA	NA	Northeast Creek
		Benzo(b)fluoranthene	NE	NE	46J	270NJ	7-MA-SD04-06	3/27	NA	NA	Swamp Area
		Benzo(k)fluoranthene	NE	NE	57J	230NJ	7-MA-SD04-06	3/27	NA	NA	Swamp Area
		Benzo(a)pyrene	400	2,500	110J	11J	7-DD-SD02-06	1/27	0	0	--
		Indeno(1,2,3-cd)pyrene	NE	NE	53J	53J	7-NC-SD04-612	1/27	NA	NA	Northeast Creek
		Benzo(g,h,i)perylene	NE	NE	65J	65J	7-DD-SD02-06	1/27	NA	NA	Drainage Ditch

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
Sediments (Cont.)			NOAA ER-L (µg/kg)	NOAA ER-M (µg/kg)	(µg/kg)	(µg/kg)			NOAA ER-L	NOAA ER-M	
	Pesticides/ PCBs	Aldrin	NE	NE	3.1J	3.1J	7-DD-SD02-06	1/26	NA	NA	Drainage Ditch
		Dieldrin	0.02	8	5.4	71	7-WT-SD01-06	8/26	8	5	Scattered
		4,4'-DDE	2	15	4.5	180J	7-MA-SD04-06	13/26	13	9	Scattered
		4,4'-DDD	2	20	4.3	120J	7-DD-SD02-06	11/26	11	8	Scattered
		4,4'-DDT	1	7	2.3J	110J	7-DD-SD02-06	7/26	7	6	Scattered
		Endrin Ketone	NE	NE	6.5J	6.5J	7-DD-SD02-06	1/26	NA	NA	Drainage Ditch
		alpha-Chlordane	NE	NE	2.7	42J	7-MA-SD01-06	11/26	NA	NA	Scattered
		gamma-Chlordane	NE	NE	4.7J	29J	7-MA-SD01-06	5/26	NA	NA	Scattered
		Aroclor 1260	NE	NE	450J	450J	7-MA-SD01-06	1/26	NA	NA	Swamp Area

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min. Concentration	Max. Concentration	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
Sediments (Cont.)			NOAA ER-L (mg/kg)	NOAA ER-M (mg/kg)	(mg/kg)	(mg/kg)			NOAA ER-L	NOAA ER-M	
	Inorganics	Aluminum	NE	NE	320J	10,500	7-MA-SD01-06	27/27	NA	NA	Widespread
		Arsenic	8.2	70	0.8	3	7-ET-SD02-06	3/27	0	0	--
		Barium	NE	NE	1.4	270	7-ET-SD01-06	27/27	NA	NA	Widespread
		Beryllium	NE	NE	0.28	8	7-ET-SD01-06	4/27	NA	NA	--
		Calcium	NE	NE	299	39,500	7-NC-SD06-06	27/27	NA	NA	Widespread
		Chromium	81	370	2.9	19.4	7-MA-SD01-06	11/27	0	0	--
		Copper	70	390	3.2	95.8	7-MA-SD01-06	7/27	1	0	Swamp Area
		Iron	NE	NE	197	6,060	7-MA-SD01-06	27/27	NA	NA	Widespread
		Lead	46.7	218	3.9J	90.8	7-MA-SD03-06	27/27	6	0	Scattered
		Magnesium	NE	NE	138	13,900	7-NC-SD01-06	25/27	NA	NA	Widespread
		Manganese	NE	NE	1.9	30.6	7-MA-SD01-06	27/27	NA	NA	Widespread
		Mercury	0.15	0.71	1.6	2.6	7-MA-SD01-06	2/27	2	2	Swamp Area
		Potassium	NE	NE	1,540	1,780	7-MA-SD01-06	3/27	NA	NA	Swamp Area
		Selenium	NE	NE	23.4	23.4	7-ET-SD01-06	1/27	NA	NA	Eastern Tributary
		Sodium	NE	NE	29.2	48,700	7-NC-SD01-06	27/27	NA	NA	Widespread
		Thallium	NE	NE	0.61J	4.9J	7-NC-SD05-612	6/27	NA	NA	Scattered
		Vanadium	NE	NE	2.9	37.5	7-ET-SD01-06	14/27	NA	NA	Scattered
		Zinc	150	410	2.9	536	7-MA-SD01-06	26/27	2	2	Swamp Area

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Notes:

(1) Detections compared to maximum base background concentrations.
(2) 1994 Proposed rule for Disinfectants and Disinfectant By-Products: Total for all Trihalomethanes cannot exceed the 80 parts per billion (ppb) level.
(3) SCML = Secondary Maximum Contaminant Level (not enforced).
(4) Action Level.
(5) Shaded blocks indicate detections above comparison criteria

NE = No Criteria Established
NA = Not Applicable
NJ = Estimated/tentative value
J = Estimated value
RBC = Region III Risk Based Concentration
SSL = Region III Soil Screening Level for the Protection of Groundwater
MCL = Federal Maximum Contaminant Level
NCWQS = North Carolina Water Quality Standard
AWQC = Ambient Water Quality Standard
µg/L = microgram per liter (ppb)
µg/kg = microgram per kilogram (ppb)
mg/kg = milligram per kilogram (parts per million [ppm])
NOAA ER-L = National Oceanic Atmospheric Administration Effective Range - Low
NOAA ER-M = National Oceanic Atmospheric Administration Effective Range -Median
-- = Undefined

Reference: Baker Environmental, Inc., 1996. Remedial Investigation Report Operable Unit No. 11 (Site 7). Marine Corps Base, Camp Lejeune, North Carolina.

TABLE 4

**CONTAMINANTS OF POTENTIAL CONCERN (COPCs)
EVALUATED DURING THE HUMAN HEALTH RISK ASSESSMENT
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA**

Contaminant	Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment
Volatiles					
Chloroform					
2-Butanone				X	X
2-Hexanone				X	
Toluene					X
Styrene					X
Xylenes (Total)				X	
Semivolatiles					
Phenol					
4-Methylphenol					
Acenaphthylene					X
Dibenzofuran					X
Phenanthrene					X
Anthracene					X
Di-n-butylphthalate					X
Fluoranthene					X
Pyrene					X
Butylbenzylphthalate					X
3,3-Dichlorobenzidine					X
Benzo(a)anthracene					X
Chrysene					X
bis(2-Ethylhexyl)phthalate				X	X
Di-n-octylphthalate					X
Benzo(b)fluoranthene					X
Benzo(k)fluoranthene					X
Benzo(a)pyrene	X				X
Indeno(1,2,3-cd)pyrene					X
Benzo(g,h,i)perylene					X
Pesticide/PCBs					
delta-BHC					
Aldrin					X
Dieldrin	X	X	X	X	X
4,4'-DDE					X
4,4'-DDD					X
4,4'-DDT					X
Endrin ketone				X	X

TABLE 4 (Continued)

CONTAMINANTS OF POTENTIAL CONCERN (COPCs)
EVALUATED DURING THE HUMAN HEALTH RISK ASSESSMENT
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA

Contaminant	Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment
alpha-Chlordane					X
gamma-Chlordane					X
Aroclor-1260					X
Inorganics					
Aluminun	X	X	X		
Arsenic	X	X			X
Barium			X	X	X
Beryllium	X	X	X		X
Calcium					
Chromium			X		X
Copper				X	X
Iron					
Lead	X		X	X	X
Magnesium					
Manganese			X	X	X
Mercury					X
Potassium					
Selenium					X
Silver				X	
Sodium					
Thallium					X
Vanadium			X		X
Zinc				X	X

X = Selected as a COPC for human health risk assessment.

TABLE 5

SUMMARY OF HUMAN HEALTH RISKS
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA

Receptors	Soil		Groundwater		Surface Water/Sediment Tributary		Surface Water/Sediment Northeast Creek		Total	
	ICR	HI	ICR	HI	ICR	HI	ICR	HI	ICR	HI
Current Residential Child	6.2E-06 (67)	0.2 (63)	NA	NA	2.7E-06 (29)	0.09 (28)	3.9E-07 (4)	0.03 (9)	9.3E-06	0.32
Current Residential Adult	7.4E-07 (47)	0.02 (40)	NA	NA	7.8E-07 (50)	0.02 (40)	4.7E-08 (3)	0.01 (20)	1.6E-06	0.05
Future Residential Child	8.8E-06 (10)	0.2 (2)	7.3E-05 (84)	8.84 (97)	4.1E-06 (5)	0.09 (1)	5.8E-07 (<1)	0.03 (<1)	8.6E-05	9.16
Future Residential Adult	4.43E-06 (3)	0.02 (<1)	1.6E-04 (94)	3.8 (98)	5.3E-06 (3)	0.02 (<1)	3.5E-07 (<1)	0.01 (<1)	1.7E-04	3.85
Future Construction Worker	7.2E-08 (100)	0.02 (100)	NA	NA	NA	NA	NA	NA	7.2E-09	0.02

Notes:

ICR = Incremental Lifetime Cancer Risk
HI = Hazard Index
( ) = Approximate percent contribution to the total ICR or HI values
Total = Soil + Groundwater + Surface Water/Sediment
NA = Not Applicable

Shaded blocks indicate an ICR value that exceeds the acceptable limit of 1E-04, or an HI value that exceeds the acceptable limit of 1.0.

TABLE 6

**CONTAMINANTS OF POTENTIAL CONCERN (COPCs)
EVALUATED DURING THE ECOLOGICAL RISK ASSESSMENT
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA**

Contaminant	Freshwater Stations			Saltwater Stations			
	Surface Water			Surface Water			
	Aquatic Receptors	Terrestrial Receptors	Sediment	Aquatic Receptors	Terrestrial Receptor	Sediment	Surface Soil
Inorganics							
Aluminum	X	X	X	X	X		X
Arsenic							X
Barium	X	X		X	X		X
Beryllium			X			X	X
Chromium							X
Cobalt							X
Copper			X	X	X		
Iron	X	X		X	X		X
Lead	X	X	X	X	X	X	X
Manganese		X		X	X		X
Mercury			X				X
Nickel							X
Selenium						X	
Silver							
Thallium						X	
Vanadium			X			X	X
Zinc	X	X	X		X		X
Volatiles							
2-Butanone				X	X	X	
2-Hexanone				X	X		
Styrene			X				
Toluene			X				X
Xylenes					X		
Semivolatiles							
Acenaphthylene			X				
Anthracene			X				
Benzo(a)anthracene							X
Benzo(b)fluoranthene							X
Benzo(k)fluoranthene							X

TABLE 6 (Continued)

**CONTAMINANTS OF POTENTIAL CONCERN (COPCs)
EVALUATED DURING THE ECOLOGICAL RISK ASSESSMENT
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA**

Contaminant	Freshwater Stations			Saltwater Stations			
	Surface Water			Surface Water			
	Aquatic Receptors	Terrestrial Receptors	Sediment	Aquatic Receptors	Terrestrial Receptor	Sediment	Surface Soil
Benzo(g,h,i)perylene							X
Benzo(a)pyrene							X
Bis(2-ethylhexyl)phthalate			X		X		X
Chrysene							X
Di-n-butylphthalate			X				X
3,3'Dichlorobenzidine			X				
Fluoranthene							X
Indeno(1,2,3-cd) pyrene							X
Phenanthrene			X				X
Pyrene							X
Pesticides/PCBs Aldrin			X				
Alpha-chlordane			X			X	X
Gamma-chlordane			X			X	X
4,4'-DDE			X			X	X
4,4'-DDD			X			X	X
4,4'-DDT			X			X	X
Dieldrin	X	X	X			X	X
Endosulfan II							X
Endrin ketone	X	X	X				
Aroclor-1254							X
Aroclor-1260			X				X

Notes:

X = Indicates contaminant of potential concern

TABLE 7

SUMMARY OF THE ANALYTICAL RESULTS FOR SOIL
SITE INSPECTION, 1991
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Constituent	Surface Soil (0-6 inches bgs)		Near Subsurface Soil (0-2 feet bgs)		Subsurface Soil (3-17 feet bgs)	
	No. of Positive Detections/ No. of Samples	Range of Positive Detections	No. of Positive Detections/ No. of Samples	Range of Positive Detections	No. of Positive Detections/ No. of Samples	Range of Positive Detections
Methylene Chloride	1/3	7	0/7	ND	0/7	ND
Aldrin	0/3	ND	1/7	6.8-220	0/7	ND
alpha-Chlordane	0/3	ND	1/7	60	0/7	ND
4,4'-DDD	1/3	ND	3/7	20-700	0/7	ND
4,4'-DDE	0/3	ND	5/7	16-210	0/7	ND
4,4'-DDT	0/3	ND	4/7	15-290	0/7	ND
Dieldrin	0/3	ND	4/7	16-440	0/7	ND
Aroclor-1254	0/3	ND	2/7	830-1,500	0/7	ND

Notes:

Concentrations expressed in µg/kg (microgram per kilogram)
ND = Not detected.
bgs = Below ground surface.

Reference: Halliburton/NUS, 1991. Site Inspection Report for Site 80 Paradise Point Golf Course. Marine Corps Base, Camp Lejeune, North Carolina.

TABLE 8

SUMMARY OF THE ANALYTICAL RESULTS FOR GROUNDWATER
SITE INSPECTION, 1991
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Constituent	North Carolina Standards	USEPA MCLs	No. of Positive Detections/ No. of Samples	Range of Positive Detections	Location of Maximum Concentration
Toluene	1,000	1,000	1/3	180	80MW03
Ethylbenzene	29	700	1/3	5	80MW03
Xylenes	400	10,000	1/3	21	80MW03
Carbon Disulfide	--	--	1/3	25	80MW03

Notes:

Concentrations expressed in µg/L (microgram per liter)
USEPA = U.S. Environmental Protection Agency
MCL = Federal Maximum Contaminant Level
-- = Criteria not established.

Reference: Halliburton/NUS, 1991. Site Inspection Report for Site 80 Paradise Point Golf Course. Marine Corps Base, Camp Lejeune, North Carolina.

TABLE 9

SUMMARY OF THE ANALYTICAL RESULTS FOR SURFACE WATER
SITE INSPECTION, 1991
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Constituent	Near Site (80-SW03, 80-SW04, 80-SW05)	
	No. of Positive Detections/ No. of Samples	Range of Positive Detections
Acetone	3/3	11-190
Toluene	2/3	30-104
Carbon Disulfide	1/3	6
Total Petroleum Hydrocarbons	2/3	1390-1660

Notes:

Concentrations expressed in µg/L (microgram per liter)

Reference: Halliburton/NUS, 1991. Site Inspection Report for Site 80 Paradise Point Golf Course. Marine Corps Base, Camp Lejeune, North Carolina.

TABLE 10

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min.	Max.	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria[2]	Number of Detections Above Comparison Criteria[2]	Distribution
			Region III RBC (µg/kg)		(µg/kg)	(µg/kg)			RBC		
Surface Soils	Volatile Organic Compounds	Acetone	7,800,000	NE	28	28	80-MW-05-00	1/34	0	NA	Drum Area
	Semivolatile Organic Compounds	Phenanthrene	NE	NE	100J	100J	80-SM-SB04-00	1/34	NA	NA	Soil Mounds
		di-n-Butyl-phthalate	NE	NE	60J	4,400	80-MW03IW-00	20/34	NA	NA	Open Area and Soil Mounds
		Fluoranthene	3,100,000	NE	100J	100J	80-SM-SB04-00	1/34	0	NA	Soil Mounds
		Pyrene	2,300,000	NE	60J	92J	80-SM-SB04-00	2/34	0	NA	Soil Mounds
		Butyl benzyl phthalate	16,000,000	NE	96J	96J	80-SM-SB04-00	1/34	0	NA	Lawn Area
		Benzo(a)anthracene	880	NE	47J	47J	80-MW03IW-00	1/34	0	NA	Soil Mound
		Chrysene	88,000	NE	40J	53J	80-SM-SB04-00	2/34	0	NA	Soil Mound
		bis(2-Ethylhexyl)Phthalate	46,000	NE	38J	66J	80-LA-SB01-00	4/34	0	NA	Lawn Area, Open Area, Soil Mounds
		Benzo(b)fluoranthene	880	NE	40J	48J	80-MW04-00	2/34	0	NA	Soil Mounds
		Benzo(k)fluoranthene	8,800	NE	38J	38J	80-SM-SB04-00	1/34	0	NA	Soil Mounds
		Benzo(a)pyrene	88	NE	43J	43J	80-SM-SB04-00	1/34	0	NA	Soil Mounds
		Benzo(g,h,i)perylene	NE	NE	180J	180J	80-LA-SB01-00	1/34	NA	NA	Lawn Area
	Pesticides/ PCBs	delta-BHC	NE	NE	1.2J	2.1J	80-DPA-SB13-00	2/55	NA	NA	Open Area, Northwest Area
		Aldrin	38	NE	5.4	49	80-DPA-SB10-00	7/55	1	NA	Lawn Area and Open Area, Northwest Area
		Heptachlor Epoxide	70	NE	2.7J	9.9	80-DPA-SB05-00	2/55	0	NA	Open Area, Northwest Area
		Dieldrin	40	NE	1.1J	5,600	80-DPA-SB10-00	38/55	22	NA	Widespread, Northwest Area
		4,4'-DDE	1,900	NE	0.6J	1,500J	80-MW04-00	45/55	0	NA	Widespread, Northwest Area
		4,4'-DDD	2,700	NE	1.5J	260,000	80-DPA-SB03-00	41/55	5	NA	Widespread, Northwest Area
		4,4'-DDT	1,900	NE	1.3J	40,000	80-MW04-00	44/55	5	NA	Widespread, Northwest Area
		Endrin Ketone	23,000	NE	7.7J	7.7J	80-LA-SB07-00	1/55	0	NA	Lawn Area
		Endrin Aldehyde	23,000	NE	5.2J	5.2J	80-DPA-SB05-00	1/55	0	NA	Northwest Area

TABLE 10 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min.	Max.	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria[2]	Number of Detections Above Comparison Criteria[2]	Distribution
Surface Soil (Cont.)	Pesticides/PCBs (Cont.)		Region III RBC (µg/kg)		(µg/kg)	(µg/kg)			RBC		
		alpha-Chlordane	NE	NE	0.82J	670J	80-DPA-SB10-00	29/55	1	NA	Scattered, Northwest Area
		gamma-Chlordane	NE	NE	1.2J	640J	80-DPA-SB10-00	22/55	1	NA	Scattered, Northwest Area
			Region III RBC (mg/kg)	Base Background (mg/kg)	(mg/kg)	(mg/kg)			RBC	Base Background	
	Inorganics	Aluminum	78,000	17.7 - 9,570	1,740	12,000J	80-LA-SB04-00	34/34	0	1	Lawn Area
		Arsenic	0.37	0.065 - 3.9	0.845	63.3	80-LA-SB01-00	28/34	28	11	Scattered
		Barium	5,500	0.65 - 20.8	5.1	71.3	80-LA-SB03-00	34/34	0	5	Widespread
		Beryllium	0.15	0.02 - 0.26	0.03	0.25	80-MW06-00	20/34	5	0	--
		Cadmium	39	0.04 - 0.6	0.39	2.8J	80-LA-SB03-00	6/34	0	2	Lawn Area
		Calcium	NE	4.25 - 10,700	29.8	91,200J	80-MA-SB04-00	33/34	NA	7	Lawn Area, Maintenance Area
		Chromium	78,000	0.33 - 12.5	1.5J	22.7	80-MA-SB04-00	34/34	0	5	Lawn Area, Maintenance Area
		Cobalt	NE	0.185 - 2.355	0.4	1.4	80-LA-SB07-00	6/34	NA	0	--
		Copper	4,700	0.5 - 87.2	0.44J	30.2	80-LA-SB03-00	27/34	0	0	--
		Iron	NE	69.7 - 9,640	565	7,420J	80-LA-SB06-00	34/34	NA	0	--
		Lead	NE	0.47 - 142	3.1	211J	80-LA-SB06-00	33/34	NA	1	Lawn Area
		Magnesium	NE	2.55 - 610	65.1	2,030	80-MA-SB04-00	34/34	NA	9	Lawn Area, Maintenance Area, Open Area
		Manganese	390	0.87 - 66	2.7	133	80-LA-SB07-00	34/34	0	3	Lawn Area, Maintenance Area
		Mercury	23	0.01 - 0.08	0.13	2.7	80-LA-SB03-00	16/34	0	16	Scattered
		Nickel	1,600	0.6 - 3.55	1.1J	5.2J	80-LA-SB03-00	10/34	0	2	Lawn Area, Maintenance Area
		Potassium	NE	1 - 416	90.7J	1,110	80-MA-SB04-00	24/34	NA	5	Lawn Area, Maintenance Area, Open Area, Soil Mounds
		Selenium	390	0.075 - 1.3	1.2	1.7	80-LA-SB02-00	2/34	0	1	Lawn Area
		Silver	390	0.0435 - 4.3	1.1	6.6	80-LA-SB03-00	2/34	0	1	Lawn Area
		Sodium	NE	4.7 - 126	21.6	176	80-MA-SB04-00	28/34	NA	1	Maintenance Area
		Thallium	NE	--	0.9	0.9	80-0A-SB05-00	1/34	NA	--	

TABLE 10 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min.	Max.	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria[2]	Number of Detections Above Comparison Criteria[2]	Distribution
Surface Soil (Cont.)	Inorganics (Cont.)		Region III RBC (mg/kg)	Base Background (mg/kg)	(mg/kg)	(mg/kg)			RBC	Base Background	
		Vanadium	500	0.305 - 18.2	2.1	39	80-MA-SB04-00	34/34	0	1	Maintenance Area
		Zinc	23,000	0.3 - 28.3	4.4	210J	80-LA-SB03-00	20/34	0	8	Lawn Area, Maintenance Area

TABLE 10 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min.	Max.	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
			Region III SSL (µg/kg)		(µg/kg)	(µg/kg)			SSL		
Subsurface Soils	Volatile Organic Compounds	Acetone	8,000	NE	11J	110J	80-MW03IW-03	4/32	0	NA	Lawn Area, Drum Area, Open Area
		Carbon Disulfide	14,000	NE	13	13	80-SM-SB02-03	1/32	0	NA	Soil Mounds
	Semivolatile Organic Compounds	Phenanthrene	NE	NE	53J	53J	80-MW03IW-03	1/32	NA	NA	Soil Mounds
		di-n-Butyl-phthalate	NE	NE	56J	3100	80-MW03IW-03	17/32	NA	NA	Scattered
		Butyl benzyl phthalate	68,000	NE	46J	46J	80-MW03IW-03	1/32	0	NA	Lawn Area
		bis(2-Ethylhexyl)phthalate	11,000	NE	81J	85J	80-MW07-06	2/32	0	NA	Lawn Area
	Pesticides/ PCBs	delta-BHC	NE	NE	0.63J	0.63J	80-SM-SB06-03	1/45	NA	NA	Soil Mounds
		Aldrin	5	NE	2.6	2.6	80-LA-SB04-06	1/45	0	NA	Lawn Area
		Dieldrin	1	NE	0.73J	1.4J	80-OA-SB02-07	4/45	1	NA	Drum Area, Open Area, Soil Mounds
		4,4'-DDE	500	NE	1.4J	35	80-0A-SB02-07	7/45	0	NA	Open Area, Soil Mounds, Northwest
		4,4'-DDD	700	NE	1.1J	510J	80-MW-04-06	12/45	0	NA	Lawn Area, Drum Area, Open Area, Soil Mounds, Northwest
		4,4'-DDT	1,000	NE	4.7	240	80-MW-04-06	9/45	0	NA	Lawn Area, Open Area, Northwest
			Region III SSL (mg/kg)	Base Background (mg/kg)	(mg/kg)	(mg/kg)			SSL	Base Background	
	Inorganics	Aluminum	NE	16.9 - 11,000	477	9,900	80-MW05-04	32/32	NA	0[1]	--
		Antimony	NE	0.355-6.9	3.1J	3.1J	80-MW07-04	1/32	NA	0	--
		Arsenic	15	0.033 - 15.4	0.53	27.8	80-MW05-04	11/32	1	1	Drum Area
		Barium	32	0.65 - 22.6	2	29.8	80-MW06-06	32/32	0	1	Open Area
		Beryllium	180	0.01 - 0.31	0.02	0.26	80-MA-SB01-06	15/32	0	0	--
		Calcium	NE	4.75 - 4,410	28.5J	821J	80-MW03-1W-03	28/32	NA	0	--

TABLE 10 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min.	Max.	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
Subsurface Soils (Cont.)	Inorganics (Cont.)		Region III SSL (µg/kg)		(µg/kg)	(µg/kg)			SSL		
		Chromium	19	0.65 - 66.4	2J	88.1J	80-LA-SB06-06	32/32	3	1	Lawn Area
		Cobalt	NE	0.175-7	0.47J	2.4J	80-MW05-04	10/32	NA	0	--
		Copper	NE	0.47 - 9.5	0.43J	5.5	80-MW05-04	18/32	NA	0	--
		Iron	NE	63.3 - 90,500	255	56,100J	80-LA-SB06-06	32/32	NA	0	--
		Lead	NE	0.465 - 21.4	2.5	13.2	80-MW05-04	30/32	NA	0	--
		Magnesium	NE	2.85 - 852	21	516	80-MW05-04	31/32	NA	0	--
		Manganese	NE	0.395 - 19.9	2.2J	43.3	80-LA-SB01-03	32/32	NA	1	Lawn Area
		Mercury	3	0.01 - 0.68	0.93J	0.93	80-MA-SB03-06	1/32	0	1	Maintenance Area
		Nickel	21	0.45-4.7	1J	1.6J	80-MW05-04	4/32	0	0	--
		Potassium	NE	1.05 - 1,250	82.4J	696	80-MW05-04	22/32	NA	0	--
		Selenium	3	0.085 - 2.4	0.94	3.3	80-LA-SB06-06	6/32	0	1	Lawn Area
		Sodium	NE	5.4 - 141	17.5	83.6	80-MW07-04	28/32	NA	0	--
		Vanadium	NE	0.34 - 69.4	1.5	56.7J	80-MW05-04	32/32	NA	0	--
		Zinc	42,000	0.32 - 26.6	1.6	18.1J	80-LA-SB06-06	9/32	0	0	--

TABLE 10 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min.	Max.	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
			Region III SSL (µg/kg)		(µg/kg)	(µg/kg)			SSL		
Subsurface Soils	Volatile Organic Compounds	Acetone	8,000	NE	11J	110J	80-MW03IW-03	4/32	0	NA	Lawn Area, Drum Area, Open Area
		Carbon Disulfide	14,000	NE	13	13	80-SM-SB02-03	1/32	0	NA	Soil Mounds
	Semivolatile Organic Compounds	Phenanthrene	NE	NE	53J	53J	80-MW03IW-03	1/32	NA	NA	Soil Mounds
		di-n-Butyl-phthalate	NE	NE	56J	3100	80-MW03IW-03	17/32	NA	NA	Scattered
		Butyl benzyl phthalate	68,000	NE	46J	46J	80-MW03IW-03	1/32	0	NA	Lawn Area
		bis(2-Ethylhexyl)phthalate	11,000	NE	81J	85J	80-MW07-06	2/32	0	NA	Lawn Area
	Pesticides/ PCBs	delta-BHC	NE	NE	0.63J	0.63J	80-SM-SB06-03	1/45	NA	NA	Soil Mounds
		Aldrin	5	NE	2.6	2.6	80-LA-SB04-06	1/45	0	NA	Lawn Area
		Dieldrin	1	NE	0.73J	1.4J	80-OA-SB02-07	4/45	1	NA	Drum Area, Open Area, Soil Mounds
		4,4'-DDE	500	NE	1.4J	35	80-0A-SB02-07	7/45	0	NA	Open Area, Soil Mounds, Northwest
		4,4'-DDD	700	NE	1.1J	510J	80-MW-04-06	12/45	0	NA	Lawn Area, Drum Area, Open Area, Soil Mounds, Northwest
		4,4'-DDT	1,000	NE	4.7	240	80-MW-04-06	9/45	0	NA	Lawn Area, Open Area, Northwest
			Region III SSL (mg/kg)	Base Background (mg/kg)	(mg/kg)	(mg/kg)			SSL	Base Background	
	Inorganics	Aluminum	NE	16.9 - 11,000	477	9,900	80-MW05-04	32/32	NA	0[1]	--
		Antimony	NE	0.355-6.9	3.1J	3.1J	80-MW07-04	1/32	NA	0	--
		Arsenic	15	0.033 - 15.4	0.53	27.8	80-MW05-04	11/32	1	1	Drum Area
		Barium	32	0.65 - 22.6	2	29.8	80-MW06-06	32/32	0	1	Open Area
		Beryllium	180	0.01 - 0.31	0.02	0.26	80-MA-SB01-06	15/32	0	0	--
		Calcium	NE	4.75 - 4,410	28.5J	821J	80-MW03-IW-03	28/32	NA	0	--

TABLE 10 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min.	Max.	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria	Number of Detections Above Comparison Criteria	Distribution
Subsurface Soils	Inorganics (Cont.)		Region III SSL (µg/kg)		(µg/kg)	(µg/kg)			SSL		
		Chromium	19	0.65 - 66.4	2J	88.1J	80-LA-SB06-06	32/32	3	1	Lawn Area
		Cobalt	NE	0.175-7	0.47J	2.4J	80-MW05-04	10/32	NA	0	--
		Copper	NE	0.47 - 9.5	0.43J	5.5	80-MW05-04	18/32	NA	0	--
		Iron	NE	63.3 - 90,500	255	56,100J	80-LA-SB06-06	32/32	NA	0	--
		Lead	NE	0.465 - 21.4	2.5	13.2	80-MW05-04	30/32	NA	0	--
		Magnesium	NE	2.85 - 852	21	516	80-MW05-04	31/32	NA	0	--
		Manganese	NE	0.395 - 19.9	2.2J	43.3	80-LA-SB01-03	32/32	NA	1	Lawn Area
		Mercury	3	0.01 - 0.68	0.93J	0.93	80-MA-SB03-06	1/32	0	1	Maintenance Area
		Nickel	21	0.45-4.7	1J	1.6J	80-MW05-04	4/32	0	0	--
		Potassium	NE	1.05 - 1,250	82.4J	696	80-MW05-04	22/32	NA	0	--
		Selenium	3	0.085 - 2.4	0.94	3.3	80-LA-SB06-06	6/32	0	1	Lawn Area
		Sodium	NE	5.4 - 141	17.5	83.6	80-MW07-04	28/32	NA	0	--
		Vanadium	NE	0.34 - 69.4	1.5	56.7J	80-MW05-04	32/32	NA	0	--
		Zinc	42,000	0.32 - 26.6	1.6	18.1J	80-LA-SB06-06	9/32	0	0	--

TABLE 10 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min.	Max.	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria[2]	Number of Detections Above Comparison Criteria[2]	Distribution
			MCL (µg/L)	NCWQS (µg/L)	(µg/L)	(µg/L)			MCL	NCWQS	
Groundwater	Volatile Organic Compounds	Carbon Disulfide	NE	700[5]	1J	1J	80-MW03-01	1/8	NA	NA	Central Area
	Semivolatile Organic Compounds	Acenaphthene	NE	80[5]	4J	4J	80-MW03-01	1/8	NA	NA	Central Area
		Dibenzofuran	NE	NE	2J	2J	80-MW03-01	1/8	NA	NA	Central Area
		Fluorene	NE	280	3J	3J	80-MW03-01	1/8	NA	0	Central Area
		Carbazole	NE	NE	3J	3J	80-MW03-01	1/8	NA	NA	Central Area
		Pyrene	NE	210[5]	1J	1J	80-MW03-01	1/8	NA	NA	Central Area
		bis(2-Ethylhexyl)phthalate	6.0	3.0	2J	5J	80-MW01-01	4/8	0	3	Scattered
		di-n-octyl-phthalate	NE	140	1J	1J	80-MW02-01	1/8	NA	0	North Area
	Pesticides/PCBs	4,4'-DDD	NE	NE	2.2J	2.2J	80-MW04-01	1/9	NA	NA	Northwest Area
		4,4'-DDT	NE	NE	0.58J	0.58J	80-MW04-01	1/9	NA	NA	Northwest Area
	Inorganics - Round 1	Aluminum	50-200[3]	NE	274	43,000	80-MW02-01	7/8	7	NA	Widespread
		Arsenic	50	50	13.6	102	80-MW03-01	2/8	1	1	Lawn Area
		Barium	2,000	2,000	19.6J	252	80-MW04-01	7/8	0	0	--
		Beryllium	4.0	NE	1.2	1.5	80-MW02-01	2/8	0	NA	--
		Calcium	NE	NE	2,360	64,900	80-MW03-01	7/8	NA	NA	Widespread
		Chromium	100	50	53.3	65	80-MW02-01	2/8	0	2	Downgradient Areas
		Copper	1,300[4]	1,000	13.5	14.5	80-MW02-01	2/8	0	0	--
		Iron	300[3]	300	9,460	23,800	80-MW04-01	3/8	3	3	Scattered
		Lead	15[4]	15	5.7J	30J	80-MW02-01	3/8	2	2	Downgradient Areas
		Magnesium	NE	NE	3,330	21,000	80-MW02-01	7/8	NA	NA	Widespread
		Manganese	50[3]	50	43.9	369	80-MW03-01	5/8	3	3	Scattered
		Mercury	2.0	1.1	0.42	0.42	80-MW02-01	1/8	0	0	--
		Nickel	100	100	24	24	80-MW04-01	1/8	0	0	--
		Potassium	NE	NE	1,680	14,600	80-MW03-01	6/8	NA	NA	Widespread
		Sodium	NE	NE	6,260	23,100	80-MW05-01	7/8	NA	NA	Widespread
		Vanadium	NE	NE	40.7	44.9	80-MW02-01	2/8	NA	NA	--
		Zinc	5,000[3]	2,100	76.5J	106	80-MW06-01	2/8	0	0	--

TABLE 10 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Constituent	Comparison Criteria	Comparison Criteria	Detection Summary						
					Min.	Max.	Max. Concentration Location	No. of Detections/ Total No. of Samples	Number of Detections Above Comparison Criteria[2]	Number of Detections Above Comparison Criteria[2]	Distribution
Groundwater (Cont.)			MCL (µg/L)	NCWQS (µg/L)	(µg/L)	(µg/L)			MCL	NCWQS	
	Inorganics - Round 2	Aluminum	50-200[3]	NE	491	17,100	80-MW05-02	7/8	7	0	Widespread
		Barium	2,000	2,000	11.7	405	80-MW05-02	8/8	0	0	Widespread
		Calcium	NE	NE	1,630	78,700	80-MW03IW-02	8/8	NA	NA	Widespread
		Iron	300[3]	300	251	266	80-MW08-02	2/8	0	0	Scattered
		Lead	15[4]	15	2.4	12.8	80-MW06-02	3/8	0	0	Scattered
		Magnesium	NE	NE	2,580	39,000	80-MW05-02	8/8	NA	NA	Widespread
		Manganese	50[3]	50	17.9J	90.8	80-MW06-02	7/8	0	0	Widespread
		Mercury	2.0	1.1	0.54	0.54	80-MW05-02	1/8	0	0	Lawn Area
		Nickel	100	100	10.1	10.1	80-MW06-02	1/8	8	8	Lawn Area
		Potassium	NE	NE	1,130	14,300	80-MW02-02	8/8	NA	NA	Widespread
		Silver	NE	NE	3.8	3.8	80-MW05-02	1/8	NA	NA	Lawn Area
		Sodium	NE	NE	6,760	26,100	80-MW05-02	8/8	NA	NA	Widespread
		Thallium	2	NE	5.1	13.4	80-MW02-02	2/8	2	NA	Scattered
		Zinc	5,000[3]	2,100	21.5	26.4	80-MW07-02	2/8	0	0	Scattered

TABLE 10 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Notes:

(1) Detections compared to maximum base background concentrations
(2) Shaded boxes indicate detections above comparison criteria
(3) SMCL = Secondary Maximum Contaminant Level
(4) Action Level
(5) NCDEHNR Interim maximum allowable concentration

NE	=	No Criteria Established
NA	=	Not Applicable
J	=	estimated value
µg/kg	=	microgram per kilogram (ppb)
µg/L	=	microgram per liter (ppb)
mg/kg	=	milligram per kilogram (ppm)
--	=	Undefined
RBC	=	Region III Risk Based Concentration
SSL	=	Region III Soil Screening Level
MCL	=	Maximum Contaminant Level
NCWQS	=	North Carolina Water Quality Standard

Reference: Baker Environmental, Inc., 1996. Remedial Investigation Report Operable Unit No. 11 (Site 80). Marine Corps Base, Camp Lejeune, North Carolina.

TABLE 11

CONTAMINANTS OF POTENTIAL CONCERN (COPCs) EVALUATED DURING THE HUMAN HEALTH RISK ASSESSMENT OPERABLE UNIT NO. 11 (SITE 80) MCB CAMP LEJEUNE, NORTH CAROLINA

Contaminant of Potential Concern	Surface Soil	Subsurface Soil	Groundwater
Volatiles			
Carbon disulfide			
Semivolatiles			
Acenaphthene			
Dibenzofuran			
Fluorene			
Carbazole			
Pyrene			
Bis(2-ethylhexyl)phthalate			X
Di-n-octylphthalate			
Pesticide/PCBs			
Aldrin	X		
Dieldren	X		
4,4'-DDD	X		X
4,4'-DDT	X		X
Alpha-Chlordane	X		
Gamma-Chlordane	X		
Inorganics			
Aluminum	X		X
Arsenic	X	X	X
Barium	X		
Beryllium			X
Calcium			
Chromium			X
Copper			
Iron			
Lead		X	X
Magnesium			
Manganese	X		X
Mercury	X		
Nickel			
Potassium			
Sodium			
Vanadium			X
Zinc			

Notes:

X = Selected as a COPC for human health risk assessment.

Reference: Baker Environmental, Inc., 1996. Remedial Investigation Report Operable Unit No. 11 (Site 80). Marine Corps Base, Camp Lejeune, North Carolina.

TABLE 12

SUMMARY OF HUMAN HEALTH RISKS
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA

Receptors	Soil		Groundwater		Total	
	ICR	HI	ICR	HI	ICR	HI
Current Civilian Adult Base Personnel	1.7E-04 (100)	0.69 (100)	NA	NA	1.7E-04	0.69
Future Child Resident	8.6E-05 (10)	1.9 (7)	8.0E-04 (90)	26.09 (93)	8.9E-04	28
Future Adult Resident	5.2E-05 (25)	0.26 (2)	1.7E-03 (75)	11.04 (98)	1.8E-03	11.3
Future Construction Worker	1.7E-07 (100)	0.02 (100)	NA	NA	1.7E-07	0.02

Notes:

Shaded blocks indicate an ICR value that exceeds the acceptable limit of 1E-04, or an HI value that exceeds the acceptable limit of 1.0.

ICR = Incremental Lifetime Cancer Risk
HI = Hazard Index
( ) = Approximate percent contribution to the total ICR or HI values
Total = Soil + Groundwater
NA = Not Applicable

TABLE 13

**CONTAMINANTS OF POTENTIAL CONCERN (COPCs)
EVALUATED DURING THE ECOLOGICAL RISK ASSESSMENT
OPERABLE UNIT NO. 11 (SITE 80)
MCB CAMP LEJEUNE, NORTH CAROLINA**

Contaminant of Potential Concern in Surface Soil
Inorganics
Aluminum
Arsenic
Barium
Beryllium
Cadmium
Chromium
Copper
Iron
Lead
Manganese
Mercury
Nickel
Selenium
Silver
Vanadium
Zinc
Semivolatiles
Benzo(b)fluoranthene
Bis(2-ethylhexyl)phthalate
Chyrsene
Di-n-butylphthalate
Pyrene
Pesticides
Aldrin
Alpha-chlordane
Gamma-chlordane
4,4'-DDE
4,4'-DDD
4,4'-DDT
Dieldrin

FIGURES

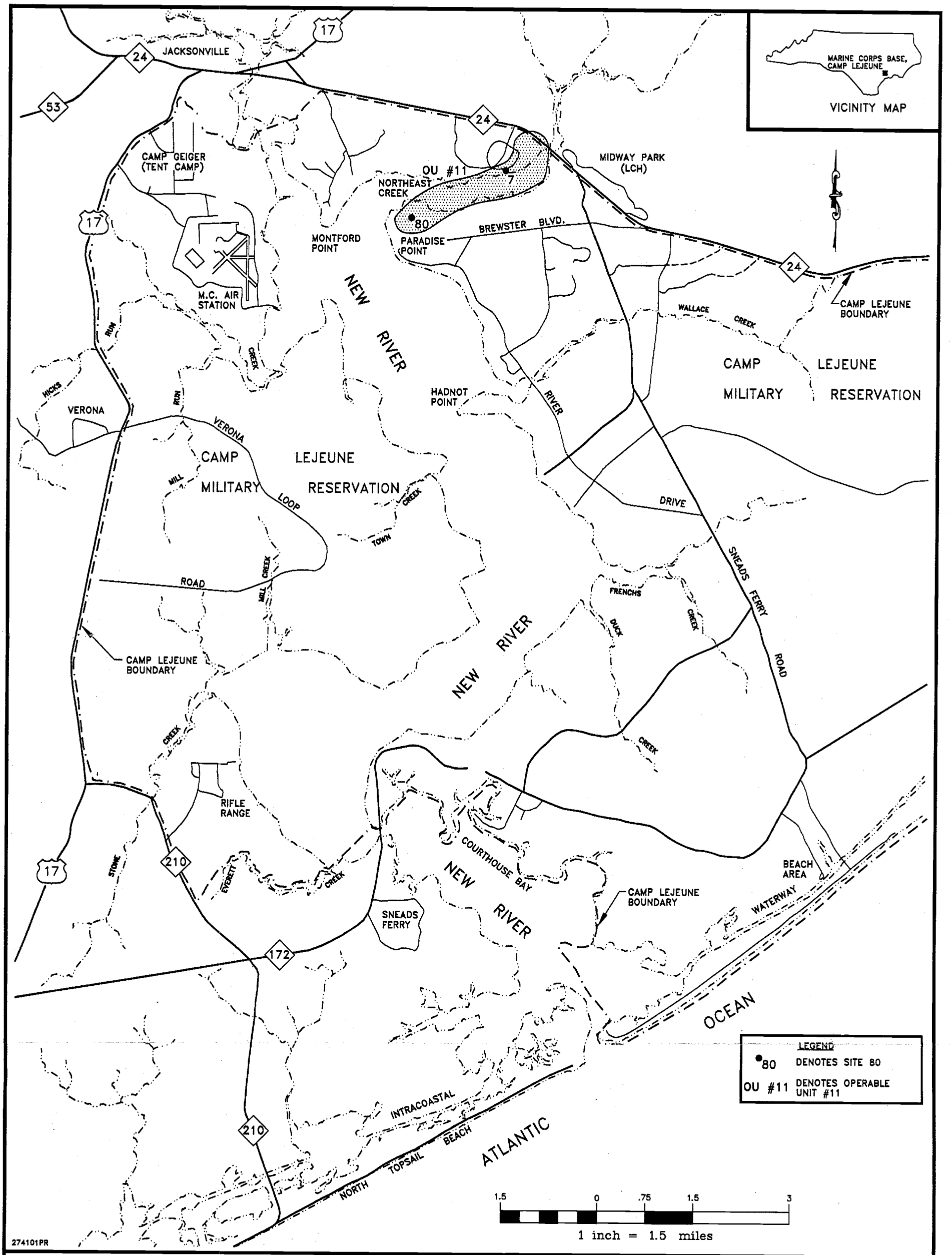


FIGURE 1
OPERABLE UNIT NO. 11 (SITES 7 AND 80)
MARINE CORPS BASE, CAMP LEJEUNE

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

00327 II BIZ

274102PR

TARAWA TERRACE HOUSING COMPLEX

APPROXIMATE SITE BOUNDARY

ROAD LEADING FROM TARAWA TERRACE HOUSING COMPLEX TO WASTEWATER TREATMENT PLANT

TARAWA BLVD.

TARAWA TERRACE COMMUNITY CENTER– BLDG # TT44

SIDEWALK

CONC WALK

ASPHALT DRIVE

ASPHALT PARKING

GRASS

ASPHALT PARKING

PLAYGROUND

30" RCP

HEADWALL

INV OUT=9.54

TOP =15.53

INV OUT=10.98

24" RCP

INV OUT=6.52

INV OUT=2.88

INV OUT=2.93

CONC SPILLWAY

CREEK

EASTERN TRIBUTARY

WESTERN TRIBUTARY

POWER LINE R/W

DRAINAGE DITCH

WOODS

SWAMP

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

TARAWA TERRACE WASTEWATER TREATMENT PLANT

NORTHEAST CREEK

25 20 15 10 5

125 0 62.5 125

1 inch = 125 ft.

Baker

Baker Environmental, Inc.

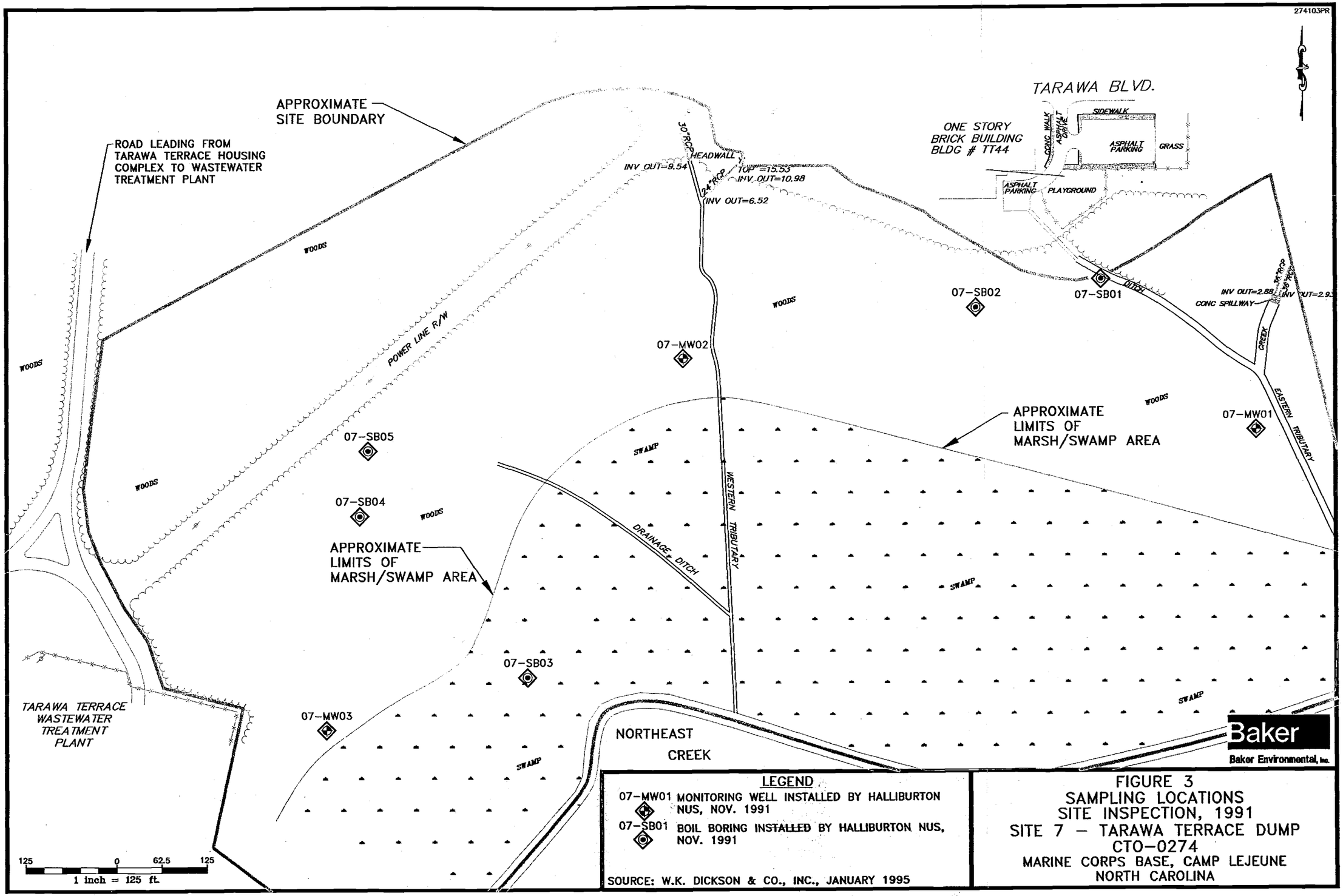
LEGEND

- POWER POLE
- FENCE
- VEGETATION
- APPROXIMATE DIRECTION OF SHALLOW GROUNDWATER FLOW
- -5- TOPOGRAPHIC ELEVATION LINES (FEET, MSL)

SOURCE: W.K. DICKSON & CO., INC., JANUARY 1995

FIGURE 2
SITE MAP
SITE 7 – TARAWA TERRACE DUMP
CTO–0274
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

274103PR



Baker

Baker Environmental, Inc.

LEGEND

07-MW01 MONITORING WELL INSTALLED BY HALLIBURTON NUS, NOV. 1991

07-SB01 BOIL BORING INSTALLED BY HALLIBURTON NUS, NOV. 1991

SOURCE: W.K. DICKSON & CO., INC., JANUARY 1995

FIGURE 3
SAMPLING LOCATIONS
SITE INSPECTION, 1991
SITE 7 – TARAWA TERRACE DUMP
CTO-0274
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

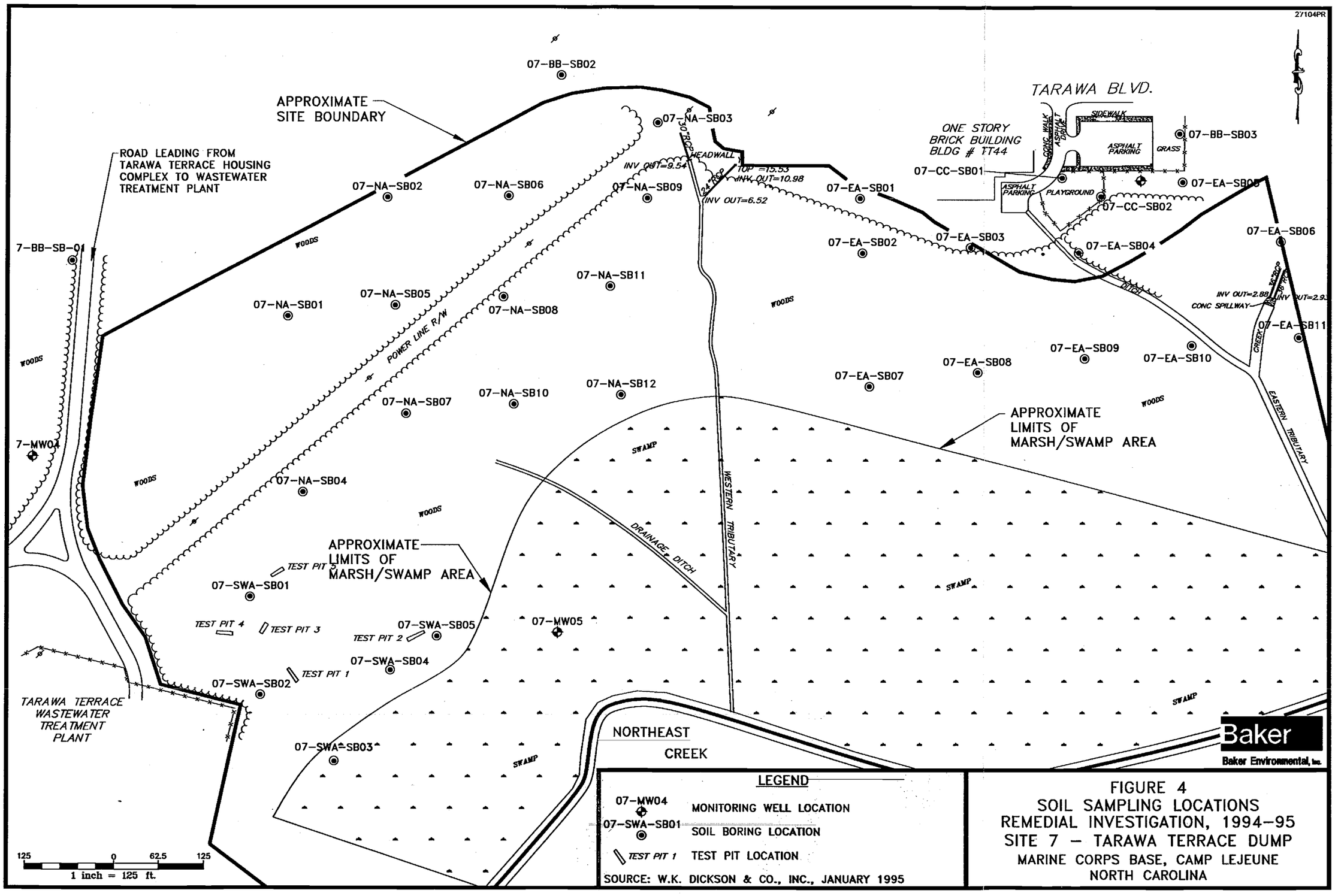


FIGURE 4
SOIL SAMPLING LOCATIONS
REMEDIAL INVESTIGATION, 1994-95
SITE 7 – TARAWA TERRACE DUMP
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

APPROXIMATE SITE BOUNDARY

ROAD LEADING FROM TARAWA TERRACE HOUSING COMPLEX TO WASTEWATER TREATMENT PLANT

TARAWA BLVD.

ONE STORY BRICK BUILDING BLDG # TT44

SIDEWALK

ASPHALT PARKING

GRASS

CONC WALK

ASPHALT DRIVE

ASPHALT PARKING

PLAYGROUND

30" RCP

HEADWALL

INV OUT=9.54

TOP =15.53

INV OUT=10.98

24" RCP

INV OUT=6.52

07-TW03

INV OUT=2.88

INV OUT=2.9

CONC SPILLWAY

DITCH

CREEK

EASTERN TRIBUTARY

07-MW01

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

WOODS

POWER LINE R/W

7-MW04

07-MW02

SWAMP

WESTERN TRIBUTARY

DRAINAGE DITCH

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

07-MW05

07-TW02

07-MW03

07-TW01

TARAWA TERRACE WASTEWATER TREATMENT PLANT

NORTHEAST CREEK

125 0 62.5 125

1 inch = 125 ft.

Baker

Baker Environmental, Inc.

LEGEND

07-MW01 EXISTING MONITORING WELL LOCATION

07-MW04 NEWLY INSTALLED MONITORING WELL LOCATION

07-TW01 TEMPORARY MONITORING WELL LOCATION

SOURCE: W.K. DICKSON & CO., INC., JANUARY 1995

FIGURE 5
MONITORING WELL SAMPLING LOCATIONS
REMEDIAL INVESTIGATION, 1994-95
SITE 7 - TARAWA TERRACE DUMP
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

274106PR

APPROXIMATE SITE BOUNDARY

ROAD LEADING FROM TARAWA TERRACE HOUSING COMPLEX TO WASTEWATER TREATMENT PLANT

TARAWA BLVD.

ONE STORY BRICK BUILDING BLDG # TT44

SIDEWALK

CONC. WALK

ASPHALT

ASPHALT PARKING

GRASS

ASPHALT PARKING

PLAYGROUND

30"RCP

HEADWALL

INV OUT=9.54

24"RCP

TOP =15.53

INV OUT=10.98

INV OUT=6.52

7-WT-SW01
7-WT-SD01
7-WT-BN01

7-ET-SW01
7-ET-SD01

AREA 1
07-WM-SB01

DITCH

INV OUT=2.88

INV OUT=2.93

CONC SPILLWAY

30"RCP

36"RCP

CREEK

EASTERN TRIBUTARY

WOODS

POWER LINE R/W

AREA 2
07-WM-SB02

AREA 3
(BACKGROUND)
07-WM-SB01
(50' DIRECTLY WEST)

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

SWAMP

7-DD-SW01
7-DD-SD01

WESTERN TRIBUTARY

DRAINAGE DITCH

7-MA-SD02

7-DD-SW02
7-DD-SD02

7-WT-SW02
7-WT-SD02
7-WT-BN02

7-MA-SD03

7-MA-SD04
LOCATED 100' EAST OF EAST TRIBUTARY

LOCATED 1000' UPSTREAM OF EAST TRIBUTARY

7-NC-SW01
7-NC-SD01
7-NC-BN01

LOCATED 300' UPSTREAM OF EAST TRIBUTARY

7-WT-SW03
7-WT-SD03
7-WT-BN03

7-NC-SW04
7-NC-SD04
7-NC-BN03

NORTHEAST CREEK

LOCATED AT MOUTH OF EAST TRIBUTARY

7-NC-SW03
7-NC-SD03
7-NC-BN02

7-NC-SW02
7-NC-SD02

LOCATED 20' UPSTREAM OF CONFLUENCE WITH NORTHEAST CREEK

7-ET-SW02
7-ET-SD02

TARAWA TERRACE WASTEWATER TREATMENT PLANT

7-MA-SD01

7-NC-SW05
7-NC-SD05

LOCATED 30' UPSTREAM OF TREATMENT PLANT OUTFALL

7-NC-SW06
7-NC-SD06
7-NC-BN04

125 0 62.5 125
1 inch = 125 ft.

LEGEND

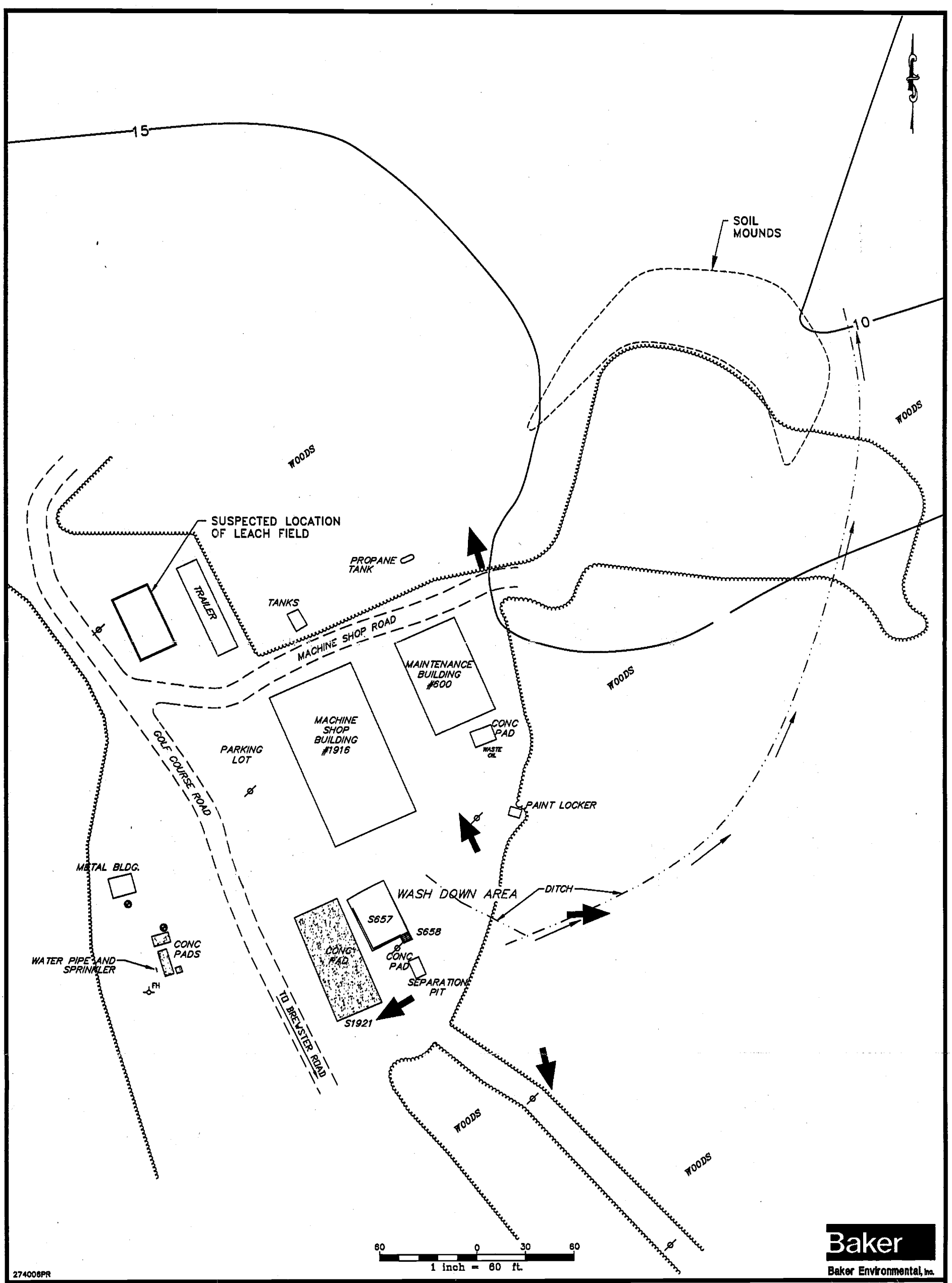
- 07-WM-SB01 — EARTH WORM SOIL BORING LOCATION
- 7-NC-SW05 / 7-NC-SD05 — SURFACE WATER/SEDIMENT SAMPLING STATION
- 7-NC-SW06 / 7-NC-SD06 / 7-NC-BN04 — SURFACE WATER/SEDIMENT/BENTHIC MACROINVERTEBRATE SAMPLING STATION
- 7-MA-SD01 — SEDIMENT SAMPLING STATION
- EARTHWORM BIOACCUMULATION STATION

SOURCE: W.K. DICKSON & CO., INC., JANUARY 1995

Baker

Baker Environmental, Inc.

FIGURE 6
SURFACE WATER, SEDIMENT, BENTHIC MACROINVERTEBRATE, AND EARTHWORM SAMPLING LOCATIONS
REMEDIAL INVESTIGATION, 1994-95
SITE 7 - TARAWA TERRACE DUMP
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



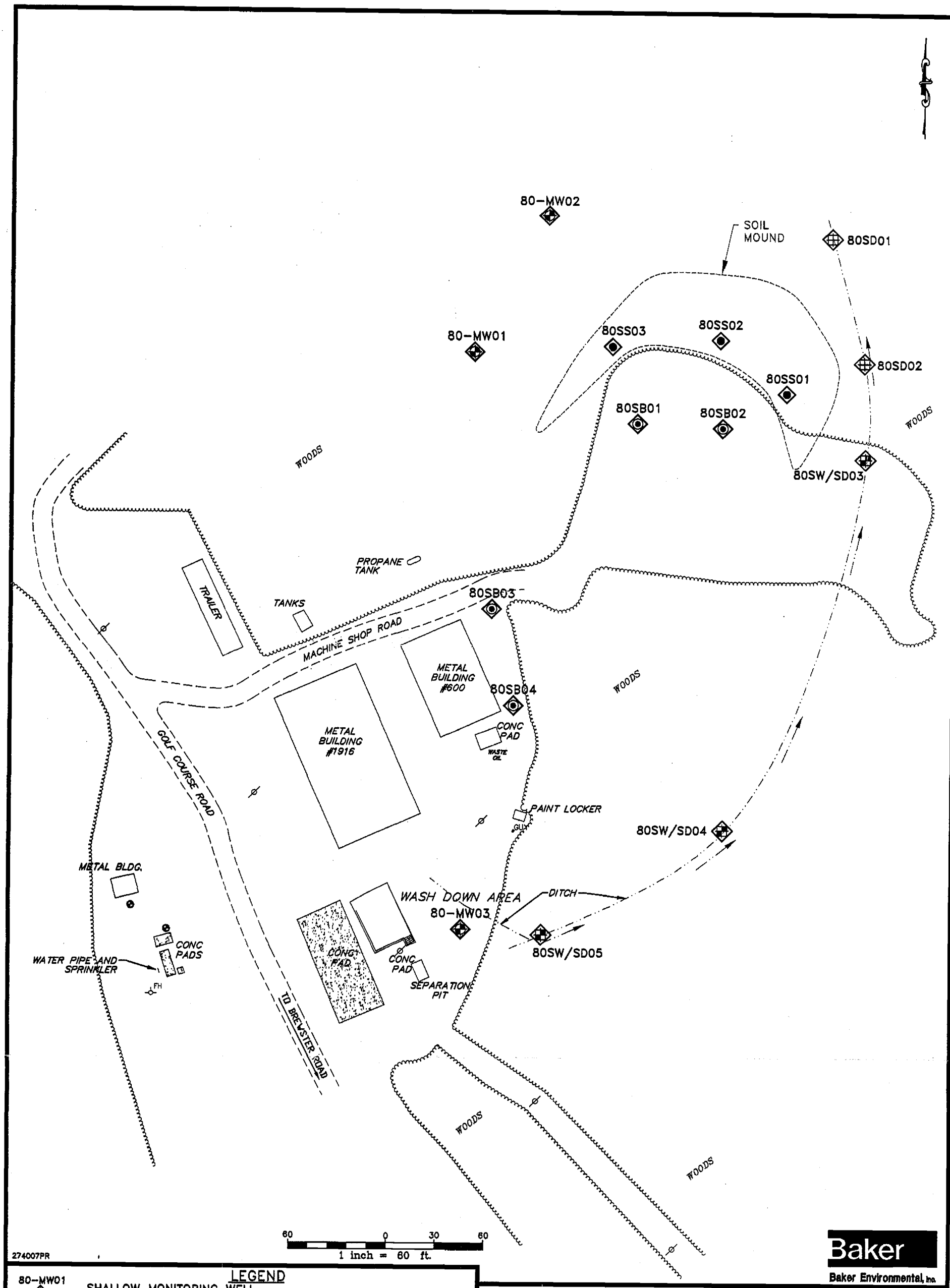
LEGEND

- 15 — TOPOGRAPHIC ELEVATION LINES (FEET, MSL)
- UNIMPROVED ROAD
- UTILITY POLE
- DRAINAGE DITCH
- WOODS LINE
- APPARENT FLOW DIRECTION OF DITCH
- FH — FIRE HYDRANT
- APPROXIMATE DIRECTION OF SHALLOW GROUNDWATER FLOW

SOURCE: W.K. DICKSON & CO., INC., JANUARY 1995

FIGURE 7
SITE MAP
SITE 80 — PARADISE POINT GOLF COURSE MAINTENANCE AREA

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

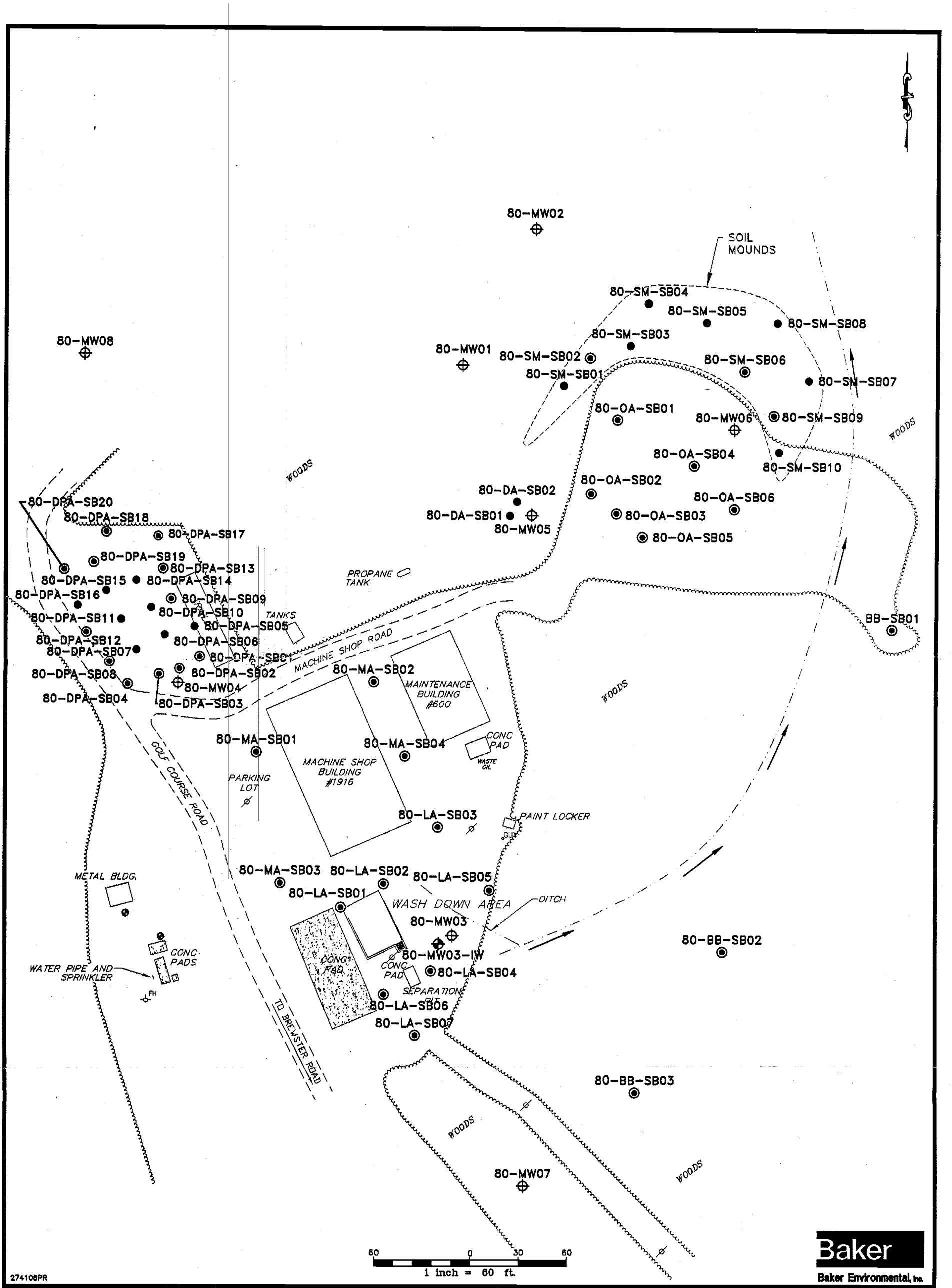


LEGEND

80-MW01	SHALLOW MONITORING WELL
80SB01	SOIL BORING
80SS01	SURFACE SOIL SAMPLE
80SD01	SEDIMENT SAMPLE
80SW/SD03	SURFACE WATER/SEDIMENT SAMPLE

SOURCE: W.K. DICKSON & CO., INC., JANUARY 1995

FIGURE 8
SAMPLING LOCATIONS
SITE INSPECTION, 1991
SITE 80 – PARADISE POINT GOLF COURSE MAINTENANCE AREA
MARINE CORPS BASE, CAMP, LEJEUNE
NORTH CAROLINA



LEGEND

- 80-MW04 — SHALLOW MONITORING WELL LOCATION
- 80-MW03IW — INTERMEDIATE MONITORING WELL LOCATION
- 80-MA-SB01 — SOIL BORING LOCATION
- 80-DA-SB01 — SURFACE SOIL BORING LOCATION

SOURCE: W.K. DICKSON & CO., INC., JANUARY 1995

FIGURE 9
SAMPLING LOCATIONS
REMEDIAL INVESTIGATION, 1994-95
SITE 80 - PARADISE POINT
GOLF COURSE MAINTENANCE AREA
MARINE CORPS BASE, CAMP, LEJEUNE
NORTH CAROLINA