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FINAL

PROPOSED REMEDIAL ACTION PLAN
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:

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

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
FFA	Federal Facilities Agreement
HI	hazard index
ICR	incremental lifetime cancer risk
MCB	Marine Corps Base
MCL	Maximum Contaminant Level
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
NC DEHNR	North Carolina Department of Environment, Health, and Natural Resources
NCWQS	North Carolina Water Quality Standard
OU	Operable Unit
PCB	polychlorinated biphenyl
PRAP	Proposed Remedial Action Plan
QI	quotient index
RA	Risk Assessment
RI	Remedial Investigation
ROD	Record of Decision
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
TDS	total dissolved solids
TSS	total suspended solids
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

INTRODUCTION

This Proposed Remedial Action Plan (PRAP) is issued to describe the Marine Corps Base (MCB), Camp Lejeune's and the Department of the Navy's (DoN's) preferred remedial action plan for Operable Unit (OU) No. 11 at MCB, Camp Lejeune. OU No. 11 consists of the following two sites:

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

MCB, Camp Lejeune and the DoN are issuing this PRAP as part of the public participation responsibility under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the Federal Facilities Agreement (FFA) between MCB, Camp Lejeune, the DoN, the United States Environmental Protection Agency (USEPA) Region IV, and the North Carolina Department of Environment, Health, and Natural Resources (NC DEHNR). The purpose of this PRAP is to: identify the preferred remedial action alternatives for OU No. 11 and explain the rationale for the preferences; solicit public review of the alternatives; and provide information on how the public can be involved in the remedial action selection process.

This document summarizes information that can be found in greater detail in the Remedial Investigation (RI) Report, and other documents referenced in the RI Report, prepared for OU No. 11. These documents, which will be the basis for the selection of a remedial action plan at OU No. 11, are contained within an administrative record file. The administrative record file is available for public review at the MCB, Camp Lejeune Installation Restoration Division Office (Building 67, Room 238) and at the Onslow County Library in Jacksonville, North Carolina. The DoN encourages the public to review the administrative record file in order to gain a more comprehensive understanding of OU No. 11.

The public is also encouraged to comment on information contained within the administrative record file and this PRAP. Public comments will be accepted by the DoN, USEPA Region IV, and NC DEHNR representatives listed at the end of this document. The public is encouraged to submit comments on this PRAP since the comments can influence the DoN's, USEPA's and State's preference. The public comment period will begin on February 5, 1997, and end on March 7, 1997. The DoN, with the assistance of the USEPA and the NC DEHNR, may modify the preferred alternative or select another remedial action based on new information or comments received from the public.

MCB, Camp Lejeune and the DoN, with the assistance of USEPA Region IV and the NC DEHNR, will select a final remedy for OU No. 11 only after the public comment period has ended and the information submitted during this time has been reviewed and considered. A Record of Decision (ROD) stating the selected remedial action plan for OU No. 11 will be prepared based upon the results of the RI, the PRAP, and the public comment period. The Final ROD may recommend a different remedial action than is presented in this PRAP depending upon public comments and any new information that may become available.

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.

Report Organization

The remainder of this PRAP document is divided into six main sections under the following headings:

- Site 7
- Site 80
- Proposed Remedial Action Plan for OU No. 11
- Community Participation
- If You Have Questions About OU No. 11
- Mailing List

The first two sections present pertinent background information and the separate preferred alternatives for Sites 7 and 80, respectively. The third section presents the proposed remedial action plan for OU No. 11, which is a combination of the separate preferred alternatives developed for Sites 7 and 80. The fourth section presents guidelines for community participation in the selection of the OU No. 11 remedial action plan. Finally, the last two sections present points of contact where questions may be directed and a mailing list application.

SITE 7

This section, which focuses on Site 7, presents the following information: a site description and history, previous investigations, a summary of the site risks, the scope and role of a remedial action, and a description of the preferred remedial action alternative for Site 7.

Site Description and History

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.

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 the site. However, construction debris, wastewater treatment plant filter media, and household trash are known to have been disposed.

Previous Investigations

Previous investigations conducted at Site 7 include a Site Inspection (1991) and a Remedial Investigation (1994-96). 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 PCB constituent 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, 1994-96

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 - Round One (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])

- Groundwater Investigation - Round Two (3 samples collected from existing wells; samples analyzed for TAL inorganics [total and dissolved fractions], total dissolved solids [TDS] and total suspended solids [TSS])

- Groundwater Investigation - Round Three (3 samples collected from existing wells; samples analyzed for TAL inorganics [total and dissolved fractions], TDS, and TSS)

- 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, round one 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.

Table 4 summarizes inorganics results from groundwater sampling rounds one, two, and three. During the round one sampling event, aluminum, chromium, iron, lead, and manganese were detected at levels exceeding the federal and/or state standards. However, these exceedances were believed to be due to the nature and location of the wells sampled and the sampling procedures that were employed, rather than a site-related inorganics problem. To confirm this, the State of North Carolina requested a second sampling round. Aluminum and iron were the only inorganics detected at levels exceeding standards during the round two sampling event. To further ensure that the site does not contain inorganics contamination, the State requested a third sampling round. Once again, only aluminum and iron were detected above standards. Based on this information, it does not appear as though there is a site-related inorganics problem. Aluminum does not pose a problem because the federal standard for this inorganic is only a secondary, non-enforceable MCL. Iron does not pose a problem because it naturally occurs in groundwater at the Base at levels exceeding standards.

Summary of Site Risks

As part of the RI, a human health risk assessment (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 the human health and ecological RAs.

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 5. 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 6 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 6 also presents total ICR and HI values, which represent risks to all environmental media combined, for each receptor.

Shaded blocks in Table 6 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 unlikely 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 on site groundwater, 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 on site groundwater, 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 mentioned previously, the Base's public water supply system, rather than on site groundwater, will likely be utilized in the event of future construction.

In addition, 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 future risk values exceed USEPA acceptable limits, they do not warrant a remedial action. However, institutional controls (i.e., site restrictions) may be appropriate to avoid future use of groundwater at the site.

Ecological Risk Assessment

During the ecological RA, COPCs were selected for surface water, sediment, and surface soil, as shown in Table 7. 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 minimal and do not warrant a remedial action. As a result, conditions at Site 7 may be considered protective of the environment.

Scope and Role of Action

The scope of the preferred remedial action plan for OU No. 11 includes the preferred alternatives selected for both Sites 7 and 80. The preferred alternative for Site 7 constitutes only one half of the preferred remedial action plan for OU No. 11.

Based on the human health and ecological RAs, current conditions at Site 7 appear to be protective of human health and the environment. However, future use of the aquifer may result in unacceptable risks to human health. As a result, the proposed remedial action identified for Site 7 is institutional controls.

Description of the Preferred Alternative for Site 7

The preferred alternative for Site 7 is institutional controls. Institutional controls will include placing site restrictions to prevent the use of groundwater in the future. Site restrictions will be implemented via the Base Master Plan and will prohibit potable use of the groundwater and well placement at the site. Under this alternative, no further environmental investigations, sampling, or remedial actions will be required. The site and all environmental media located within the site will remain as they currently are. This alternative is justifiable because, based on the human health and ecological RAs, current conditions at Site 7 appear to be protective of human health and the environment. Future use of the groundwater, however, would result in unacceptable risks to human health. Therefore, groundwater consumption must be restricted.

SITE 80

This section, which focuses on Site 80, presents the following information: a site description and history, previous investigations, a summary of the site risks, the scope and role of a remedial action, and a description of the preferred remedial action alternative for Site 80.

Site Description and History

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 in 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.

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.

During the RI, pesticide and arsenic contaminated surface soil was detected throughout Site 80. To address this contamination, a time-critical removal action was conducted from March 1996 through August 1996. Under the removal action, 988 tons of contaminated soil were excavated and transported off-site to a disposal facility. Then the excavation area was backfilled and revegetated.

Previous Investigations

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, 1995).

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 8 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 9 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 10 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 in Table 10, 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 11 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 (i.e., federal standards, state

standards, or 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.

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 the human health and ecological RAs.

Human Health Risk Assessment

During the human health RA, COPCs were selected for surface soil, subsurface soil, and groundwater, as shown in Table 12. 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 13 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 13 also presents total ICR and HI values, which represent risks to all environmental media combined, for each receptor.

Shaded blocks in Table 13 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 minimal 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 was conducted for pesticide and arsenic contaminated surface soil at Site 80. Under the removal action, the contaminated surface soil was excavated, removed from the site, and sent to a disposal facility. As a result, the ICR value has been reduced to below the acceptable limit of 1E-04 and there is no longer 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 was conducted for pesticide and arsenic contaminated surface soil at Site 80. Under the removal action, the contaminated surface soil was excavated, removed from the site, and sent to a disposal facility. As a result, the HI value has been reduced to below the acceptable limit of 1.0 and there is no longer 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 prohibits 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 prohibits 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 prohibits 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 prohibits arsenic contaminated surface soil from being a future potential source of groundwater contamination.

Although several future risk values for Site 80 exceed USEPA acceptable limits, the risks they represent appear to be minimal and do not warrant a remedial action. However, institutional controls (i.e., site restrictions) are appropriate to avoid future use of groundwater at the site.

Ecological Risk Assessment

During the ecological RA, COPCs were selected for surface soil as shown in Table 14. 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 minimal. Thus, conditions at Site 80 appear to be protective of the environment.

Scope and Role of Action

The scope of the preferred remedial action plan for OU No. 11 includes the preferred alternatives selected for both Sites 7 and 80. The preferred alternative for Site 80 constitutes only one half of the preferred remedial action plan for OU No. 11.

Based on the human health and ecological RAs, current conditions at Site 80 appear to be protective of human health and the environment. However, future use of the aquifer may result in unacceptable risks to human health. As a result, the proposed remedial action identified for Site 80 is institutional controls.

Description of the Preferred Alternative for Site 80

The preferred alternative for Site 80 is institutional controls. Institutional controls will include placing site restrictions to prevent the future use of groundwater. Site restrictions will be implemented via the Base Master Plan and will prohibit potable use of the groundwater and well placement at the site. Under this alternative, no further environmental investigations, sampling, or remedial action will be required. The site and all environmental media located within the site will remain as they currently are. This alternative is justifiable because, based on the human health and ecological RAs, current conditions at Site 80 appear to be protective of human health and the environment. Unacceptable future risks for soil have been reduced to acceptable levels by performing the time-critical removal action. Unacceptable future risks for groundwater will be addressed via the institutional controls.

PROPOSED REMEDIAL ACTION PLAN FOR OU NO. 11

The proposed remedial action plan for OU No. 11 is a combination of the preferred remedial action alternatives identified for Sites 7 and 80. For both sites, the preferred alternative is institutional controls. Institutional controls include site restrictions implemented via the Base Master Plan to prohibit potable use of the groundwater and well placement at the site.

Institutional controls are proposed for both Sites 7 and 80 based on the results of the human health and ecological RAs. Current conditions at both sites are protective of human health and the environment. (The time-critical removal action at Site 80 lowered current risks to within the acceptable limits.) Future conditions may present some unacceptable risks if the groundwater is used as a potable water source. The institutional controls, however, will prohibit the future potable use of groundwater at both sites.

COMMUNITY PARTICIPATION

A critical part of the selection of a remedial action alternative is community involvement. The following information is provided to solicit the community's input into the selection of a remedy for OU No. 11 (Sites 7 and 80).

Public Comment Period

The 30-day public comment period for the proposed remedial action plan at OU No. 11 will begin on February 5, 1997, and end on March 7, 1997. Written comments should be forwarded to the following addresses:

Commander
Atlantic Division
Naval Facilities Engineering Command
1510 Gilbert Street (Bldg. N-26)
Norfolk, Virginia 23511-2699
Attn: Ms. Katherine Landman, Code 18232

or Commanding General
ACIS EMD (IRD)
Marine Corps Base
PSC Box 20004
Camp Lejeune, North Carolina 28542-0004

A public meeting will be held at the Onslow County Library in Jacksonville, North Carolina on February 5, 1997. Representatives of the Navy, and their consultant, will be available at the meeting to answer questions and accept public comments on the proposed plan for OU No. 11. In addition, an overview of the site characterization will be presented.

Meeting minutes will be made available to the public through the information repositories at the libraries listed below. A responsiveness summary will be prepared at the conclusion of the comment period to summarize significant comments and new relevant information submitted to MCB, Camp Lejeune and the DoN during the comment period. The summary will include the responses to each issue/question raised at the public meeting. After the ROD is signed, MCB, Camp Lejeune and the DoN will publish a notice of availability of the ROD (including the responsiveness summary) in the Jacksonville and MCB, Camp Lejeune newspapers, and place a copy of the ROD in each information repository.

Information Repositories

Information repositories, which include a collection of general information pertaining to OU No. 11 including the administrative record file, are available to the community at the following locations:

MCB, Camp Lejeune
Building 67, Room 238
Marine Corps Base
Camp Lejeune, NC 28542
(910) 451-5068

Hours:
M-F: 7:00 a.m.- 4:00 p.m.
Closed Saturday and Sunday

Onslow County Library
58 Doris Avenue East
Jacksonville, NC 28540
(910) 455-7358

Hours:
M-Thu: 9:00 a.m.- 9:00 p.m.
F-Sat: 9:00 a.m.- 6:00 p.m.
Closed Sunday

IF YOU HAVE ANY QUESTIONS ABOUT OU NO. 11, PLEASE CONTACT ONE OF THE FOLLOWING:

Commanding General
AC/S EMD, (IRD)
Marine Corps Base
PSC Box 20004
Camp Lejeune, North Carolina 28542-0004
Attention: Mr. Neal Paul
(910) 451-5068

Commander
Atlantic Division
Naval Facilities Engineering Command
1510 Gilbert Street (Bldg. N-26)
Norfolk, Virginia 23511-2699
Attention: Ms. Katherine Landman, Code 18232
(804) 322-4818

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

N.C. Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
Superfund Section
P.O. Box 27687
Raleigh, North Carolina 27611-7687
Attention: Mr. David Lown
(919) 733-2801 ext. 349

Community Information Line
Public Affairs Office
Marine Corps Base, PSC Box 2004
Camp Lejeune, North Carolina 28542-0004
Attention: Major Stephen Little
(910) 451-5782

MAILING LIST

If you are not on the mailing list and would like to receive future information pertaining to OU No. 11 as it becomes available, please call or complete and mail a copy of this form to the point of contact listed below:

Commanding General
AC/S EMD (IRD)
Marine Corps Base
PSC Box 20004
Camp Lejeune, North Carolina 28542-0004
Attn: Mr. Neal Paul
(910) 451-5068

Name _____

Address _____

Affiliation _____

Phone ( ) _____

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[1]	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

					Detection Summary						
Environmental Medium	Fraction	Constituent	Comparison Criteria	Comparison Criteria	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[1]	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 - Round One	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	50	2.1J	2.4J	7-NC-SW02	2/13	2	0	Northeast Creek
		Barium	2,000	1,400	16.4	37.2	7-NC-SW03	13/13	0	0	Widespread
		Calcium	NE	NE	5.940	171,000J	7-NC-SW03	13/13	NA	NA	Widespread
		Copper	NE	3	12.3	12.3	7-ET-SW01	1/13	NA	1	Eastern Tributary
		Iron	300	1,000	175J	2,160J	7-NC-SW03	13/13	9	3	Widespread
		Lead	NE	25	2.5J	27.1	7-NC-SW03	10/13	NA	1	Widespread
		Magnesium	4	200	1,680	573,000	7-NC-SW03	13/13	NA	13	Widespread
		Manganese	50	3,500	10.1	68.9	7-NC-SW03	13/13	1	0	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	86	6.4	168J	7-WT-SW01	9/13	NA	1	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

INORGANICS IN GROUNDWATER - ROUNDS ONE, TWO, AND THREE
REMEDIAL INVESTIGATION, 1994-96
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA

Inorganic	NCWQS	MCL	TW01-01	TW01-02	TW01-03	TW03-01	TW03-02	TW03-03	MW03-01	MW03-02	MW03-03
Aluminum	NE	50-200	15,600	959	2,660	17,800	3,980	1,460	88,000	927	739
Barium	2,000	2,000	225	51	44.7	142	58	44.8	370	10.3	9.9
Beryllium	NE	4	1.2	ND	ND	3	ND	ND	1.6	ND	ND
Chromium	50	100	17.1	ND	ND	11.7	4	ND	104	ND	ND
Copper	1,000	1,300	10.6	3.8	1.9	ND	2.7	ND	20.8	4.4	ND
Iron	300	300	8,330	3,390	2,870	6,200	4,140	3,330	25,400	2,680	2,230
Manganese	50	50	42.4	38	38.4	18.4	15	11.6	13000	3.3	2.3
Lead	15	15	41.6	1.4	10.6	27.1	7.9	3.4	67.5	1.3	ND
Zinc	2,100	5,000	ND	7.2	7.4	167	6.6	7.1	180	ND	1.4

Notes:

(1) Concentrations are reported in micrograms per liter (µg/L).
(2) Shading indicates an exceedance of the state and/or federal standard.

-01 = Round One
-02 = Round Two
-03 = Round Three
ND = Not Detected
NE = No Criteria Established
MCL = Maximum Contaminant Level
NCWQS = North Carolina Water Quality Standard

TABLE 5

**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
alpha-Chlordane					X
gamma-Chlordane					X

TABLE 5 (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
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 6

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 7

**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
Benzo(g,h,i)perylene							X

TABLE 7 (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(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 8

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	18	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 9

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 10

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 11

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-96
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	3	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 11 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-96
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	1	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 11 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-96
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	1	Lawn Area, Maintenance Area

TABLE 11 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-96
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[3]	--
		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 11 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-96
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 11 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-96
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 11 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-96
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 11 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-96
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[3]	1J	1J	80-MW03-01	1/8	NA	NA	Central Area
	Semivolatile Organic Compounds	Acenaphthene	NE	80[3]	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[3]	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 11 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-96
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	0	0	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

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 12

**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 13

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 14

**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

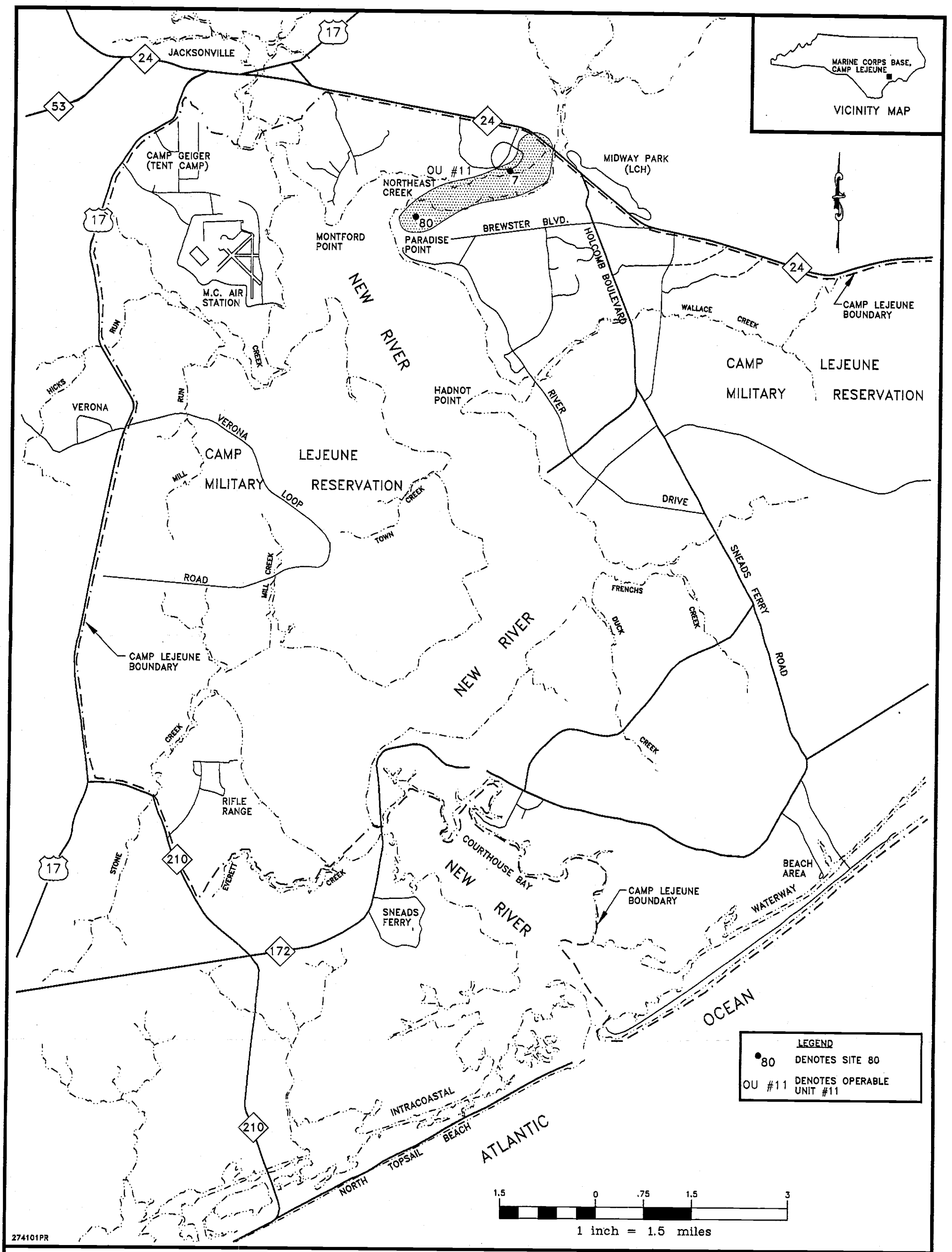

FIGURE 1
OPERABLE UNIT NO. 11 (SITES 7 AND 80)
MARINE CORPS BASE, CAMP LEJEUNE

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01746 DD 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

CONC WALK

ASPHALT DRIVE

SIDEWALK

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

DITCH

INV OUT=2.88

INV OUT=2.9

CONC SPILLWAY

18" RCP

CREEK

EASTERN TRIBUTARY

WOODS

POWER LINE R/W

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

SWAMP

WESTERN TRIBUTARY

DRAINAGE DITCH

TARAWA TERRACE WASTEWATER TREATMENT PLANT

NORTHEAST CREEK

125 0 62.5 125

1 inch = 125 ft.

Baker

Baker Environmental, Inc.

LEGEND

- POWER POLE
- FENCE
- VEGETATION
- APPROXIMATE DIRECTION OF SHALLOW GROUNDWATER FLOW
- 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

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 DRIVE

ASPHALT PARKING

GRASS

ASPHALT PARKING

PLAYGROUND

30"RCP

HEADWALL

INV OUT=9.54

TOP =10.53

INV OUT=10.98

24"RCP

INV OUT=6.52

07-SB02

07-SB01

DITCH

INV OUT=2.88

CONC SPILLWAY

18"RCP

INV OUT=2.93

CREEK

EASTERN TRIBUTARY

07-MW02

WOODS

POWER LINE R/W

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

07-MW01

07-SB05

SWAMP

WESTERN TRIBUTARY

07-SB04

DRAINAGE DITCH

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

07-SB03

TARAWA TERRACE WASTEWATER TREATMENT PLANT

07-MW03

NORTHEAST CREEK

125 0 62.5 125

1 inch = 125 ft.

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

Baker

Baker Environmental, Inc.

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

27104PR

07-BB-SB02

APPROXIMATE SITE BOUNDARY

ROAD LEADING FROM TARAWA TERRACE HOUSING COMPLEX TO WASTEWATER TREATMENT PLANT

07-NA-SB03

30"RCP

HEADWALL

INV OUT=9.54

24"RCP

TOP =15.53

INV OUT=10.98

INV OUT=6.52

07-NA-SB02

07-NA-SB06

07-NA-SB09

07-EA-SB01

TARAWA BLVD.

SIDEWALK

ONE STORY BRICK BUILDING BLDG # TT44

CONC WALK

ASPHALT DRIVE

ASPHALT PARKING

GRASS

07-BB-SB03

07-CC-SB01

ASPHALT PARKING

PLAYGROUND

07-CC-SB02

07-EA-SB05

07-EA-SB06

7-BB-SB-01

WOODS

07-NA-SB11

07-NA-SB05

07-NA-SB01

07-NA-SB08

POWER LINE R/W

07-EA-SB02

07-EA-SB03

07-EA-SB04

DITCH

36"RCP

INV OUT=2.88

CONC SPILLWAY

INV OUT=2.93

07-EA-SB11

CREEK

07-EA-SB09

07-EA-SB10

07-EA-SB08

07-EA-SB07

EASTERN TRIBUTARY

WOODS

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

07-NA-SB12

07-NA-SB07

07-NA-SB10

7-MW04

SWAMP

WESTERN TRIBUTARY

WOODS

07-NA-SB04

WOODS

DRAINAGE DITCH

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

TEST PIT 5

07-SWA-SB01

SWAMP

TEST PIT 4

TEST PIT 3

07-SWA-SB05

TEST PIT 2

07-MW05

07-SWA-SB04

TEST PIT 1

07-SWA-SB02

TARAWA TERRACE WASTEWATER TREATMENT PLANT

NORTHEAST CREEK

07-SWA-SB03

SWAMP

SWAMP

125 0 62.5 125

1 inch = 125 ft.

Baker

Baker Environmental, Inc.

LEGEND

07-MW04 MONITORING WELL LOCATION

07-SWA-SB01 SOIL BORING LOCATION

TEST PIT 1 TEST PIT LOCATION

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

FIGURE 4
SOIL SAMPLING LOCATIONS
REMEDIAL INVESTIGATION, 1994-96
SITE 7 - TARAWA TERRACE DUMP
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

27105PR

ROAD LEADING FROM TARAWA TERRACE HOUSING COMPLEX TO WASTEWATER TREATMENT PLANT

TARAWA BLVD.

SIDEWALK

ONE STORY BRICK BUILDING BLDG # TT44

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

07-MW02

07-TW03

DITCH

18"RCP

16"RCP

INV OUT=2.88

INV OUT=2.93

CONC SPILLWAY

CREEK

EASTERN TRIBUTARY

WOODS

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

07-MW01

7-MW04

SWAMP

WESTERN TRIBUTARY

DRAINAGE DITCH

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

07-MW05

07-TW02

TARAWA TERRACE WASTEWATER TREATMENT PLANT

07-MW03

07-TW01

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, 1994-96
SITE 7 - TARAWA TERRACE DUMP
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

274106PR

ROAD LEADING FROM TARAWA TERRACE HOUSING COMPLEX TO WASTEWATER TREATMENT PLANT

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

7-ET-SW01
7-ET-SD01

AREA 1
07-WM-SB01

AREA 2
07-WM-SB02

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

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

7-DD-SW01
7-DD-SD01

APPROXIMATE LIMITS OF MARSH/SWAMP AREA

LOCATED 20' UPSTREAM OF CONFLUENCE WITH NORTHEAST CREEK
7-ET-SW02
7-ET-SD02

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

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

LOCATED 1000' UPSTREAM OF EAST TRIBUTARY
7-NC-SW01
7-NC-SD01
7-NC-BN01

LOCATED 300' UPSTREAM OF EAST TRIBUTARY

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

NORTHEAST CREEK

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

7-NC-SW02
7-NC-SD02

LOCATED AT MOUTH OF EAST TRIBUTARY

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.

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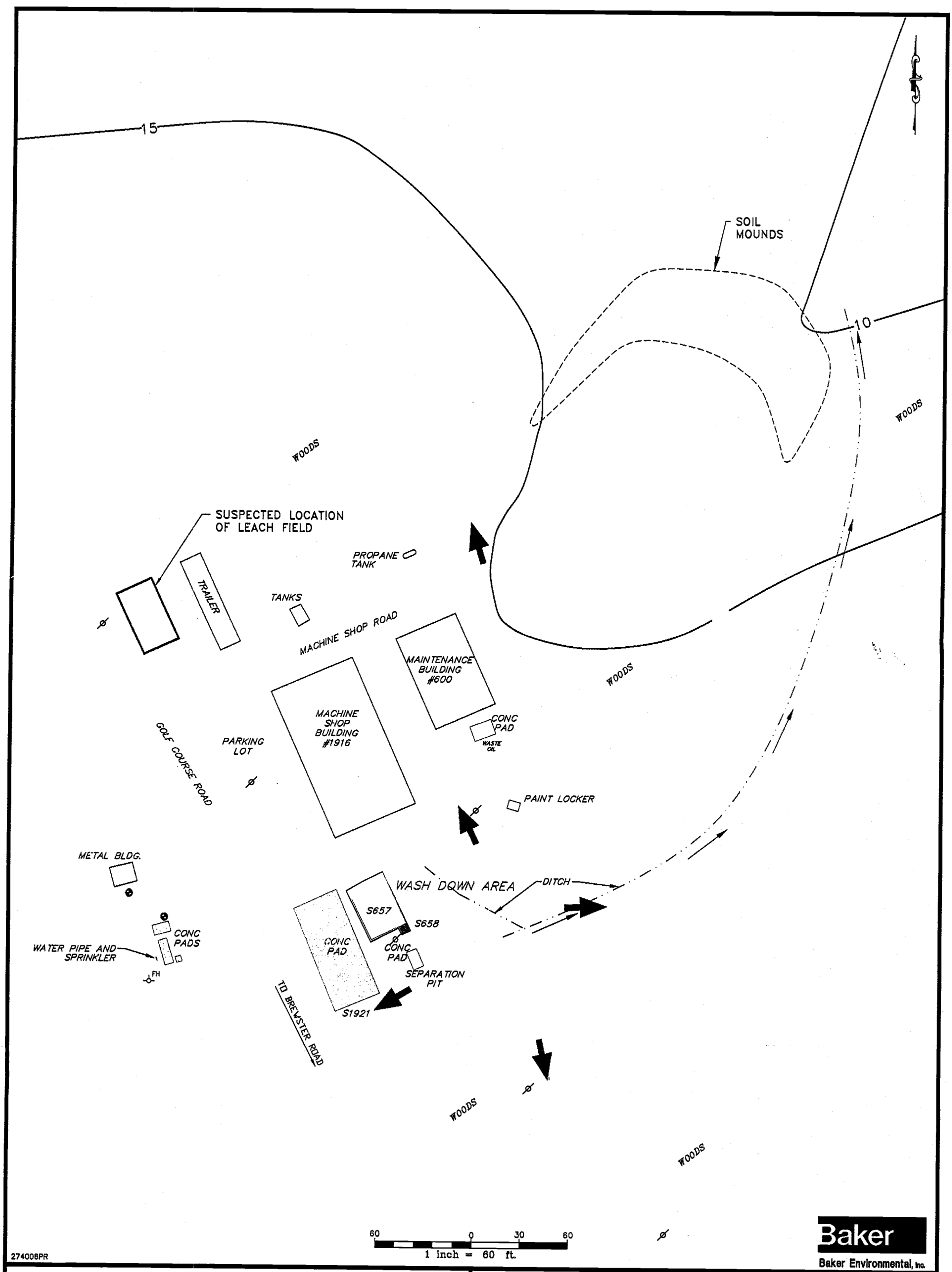
LEGEND

- 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

FIGURE 6
SURFACE WATER, SEDIMENT, BENTHIC MACROINVERTEBRATE, AND EARTHWORM SAMPLING LOCATIONS
REMEDIAL INVESTIGATION, 1994-96
SITE 7 – TARAWA TERRACE DUMP
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



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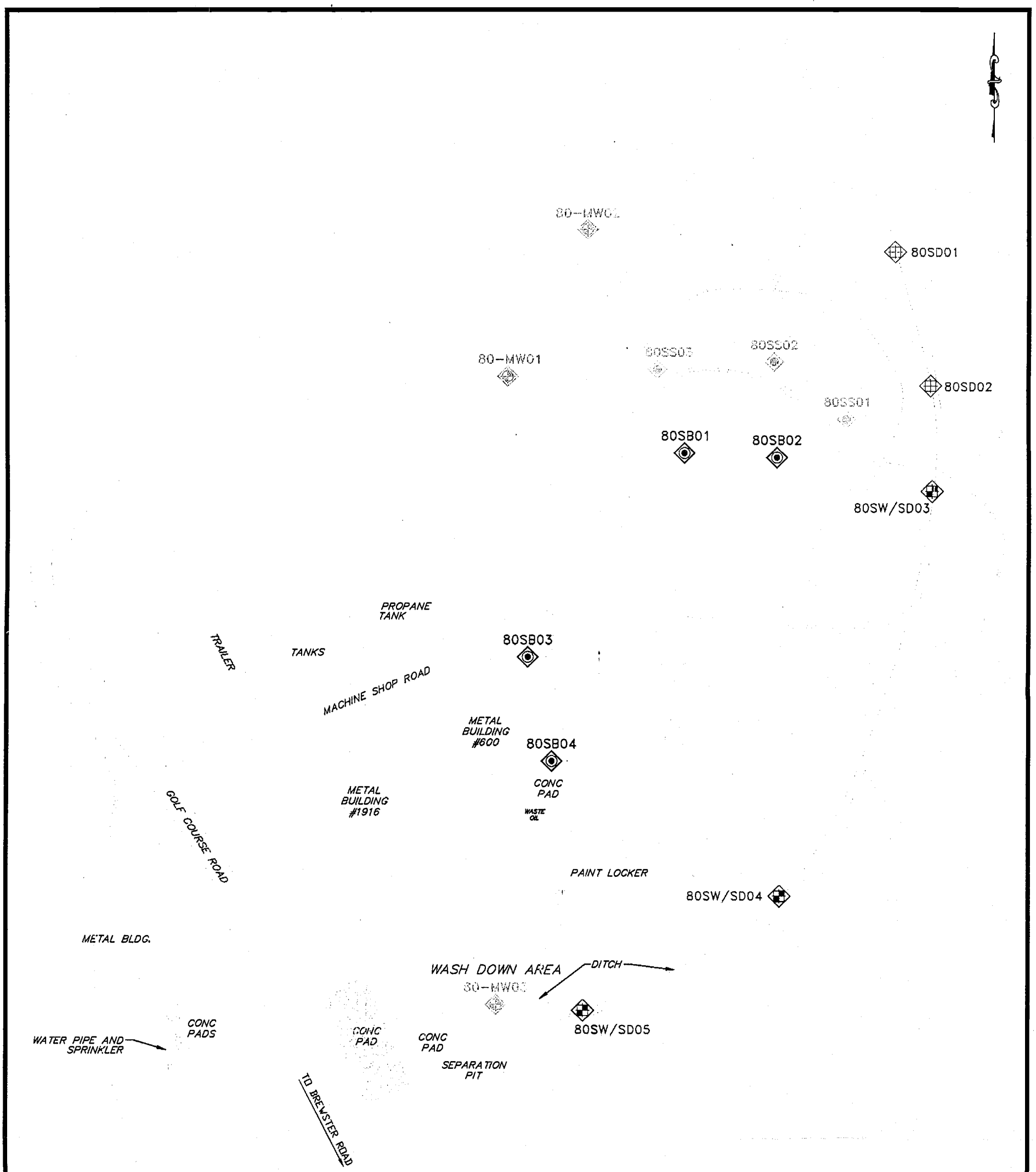
LEGEND

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

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



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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

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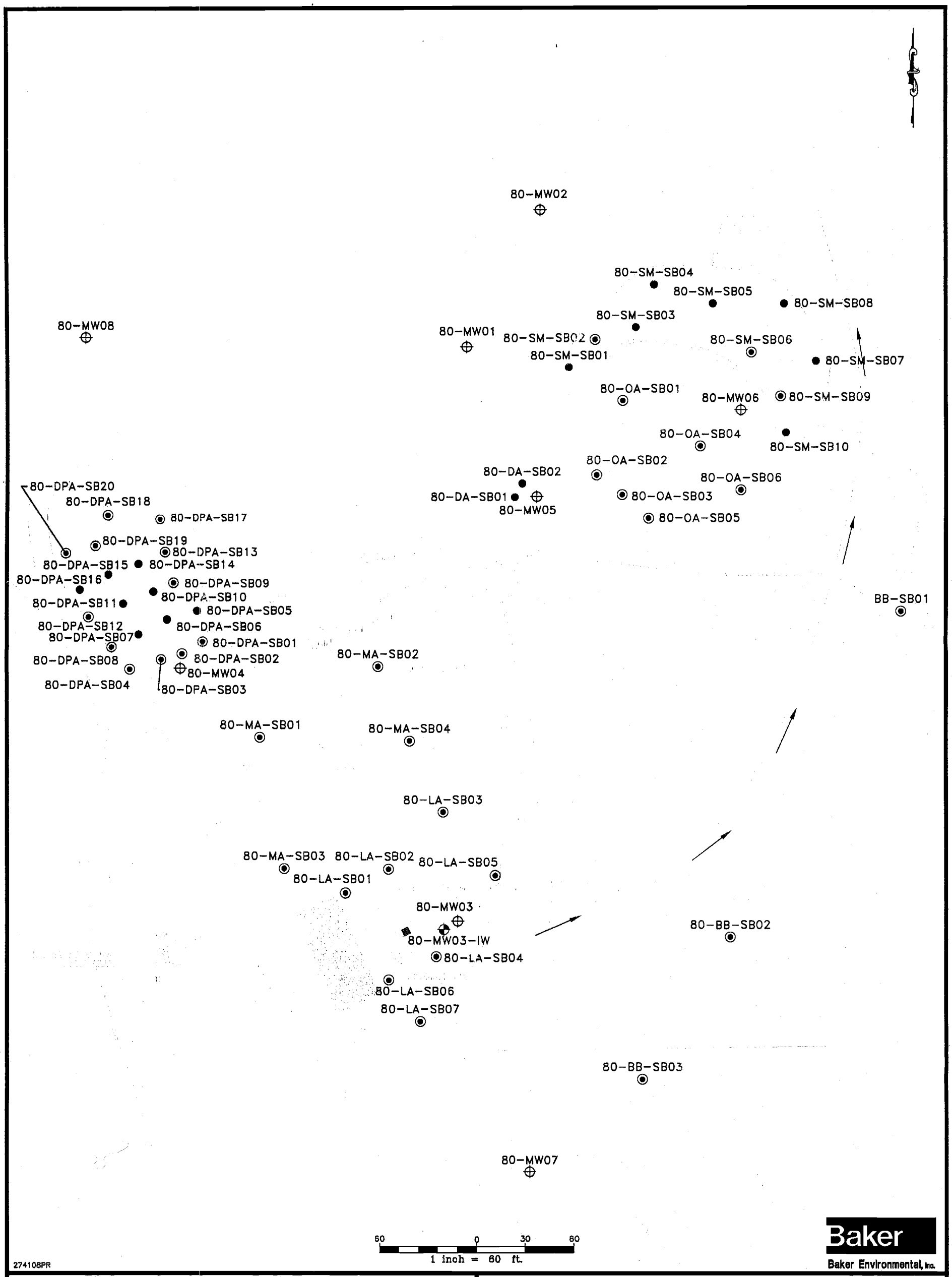
FIGURE 8
SAMPLING LOCATIONS
SITE INSPECTION, 1991
SITE 80 – PARADISE POINT GOLF COURSE MAINTENANCE AREA
MARINE CORPS BASE, CAMP, LEJEUNE
NORTH CAROLINA



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, 1994-96
SITE 80 - PARADISE POINT
GOLF COURSE MAINTENANCE AREA
MARINE CORPS BASE, CAMP, LEJEUNE
NORTH CAROLINA