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Final

No Further Remedial Action Plan
Decision Document
Site 75
MCB, Camp Lejeune, North Carolina

Prepared For

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia

Contract No. N62470-95-D-6007
CTO-0120

April 6, 2000

Prepared by

CH2M HILL
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Environmental, Inc.

CDM
Federal Programs Corp.

FINAL

NO FURTHER REMEDIAL ACTION PLAN DECISION DOCUMENT

SITE 75
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0120

APRIL 6, 2000

Prepared For:

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

Under:

LANTDIV CLEAN Program
Contract N62470-95-D-6007

Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

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ACRONYMS AND ABBREVIATIONS

Baker	Baker Environmental, Inc.
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
DD	Decision Document
DoD	Department of Defense
DoN	Department of Navy
EM	Electromagnetic
F	Fahrenheit
FFA	Federal Facilities Agreement
FS	Feasibility Study
HI	Hazard Index
ICR	Incremental Cancer Risk
LANTDIV	Atlantic Division Naval Facilities Engineering Command
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
msl	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NC DENR	North Carolina Department of Environment and Natural Resources
NFRAP	No Further Remedial Action Plan
NPL	National Priorities List
PA	Preliminary Assessment
PCB	Polychlorinated Biphenyl
Pre-RI	Pre-Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RA	Removal Action or Remedial Action
RBC	Risk-Based Concentrations
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
TAL	Target Analyte List
TCL	Target Compound List

ACRONYMS AND ABBREVIATIONS

USEPA	United States Environmental Protection Agency
USGS	United States Geologic Society
VOC	Volatile Organic Compound

DECLARATION

SITE NAME AND LOCATION

Site 75
Marine Corps Air Station (MCAS) Basketball Court
Marine Corps Base, Camp Lejeune, North Carolina

STATEMENT OF BASIS

This No Further Remedial Action Plan (NFRAP) decision is based on the results of a Pre-Remedial Investigation (Pre-RI) Screening Study conducted at Site 75 in October 1995. The Pre-RI Screening Study included a review of previous investigations, completion of a geophysical survey, installation of groundwater monitoring wells, and associated soil and groundwater sampling.

DESCRIPTION OF THE SELECTED REMEDY

Based on the current conditions at Site 75, it has been determined that no threat to public health exists. Therefore, no further action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), is warranted.

DECLARATION STATEMENT

This NFRAP Decision Document represents the selected action for Site 75, developed in accordance with CERCLA, as amended by SARA, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Because contaminant levels at the site have been determined to present no significant threat to human health, it has been determined that no further action is protective of human health and the environment, attains Federal and state requirements that are applicable or relevant and appropriate, and is cost-effective. The statutory preference for treatment is not satisfied because treatment was not found to be necessary. Contaminant levels at the site have been determined to present no known significant threat to human health or the environment; therefore, treatment is not necessary at the site. A copy of the NC DENR approval letter is presented in Attachment A.

_____ _____

Signature
Major General R. G. Richard
Commanding General
Marine Corps Base, Camp Lejeune

Date

DECISION SUMMARY

1.0 INTRODUCTION

Marine Corps Base (MCB), Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) National Priorities List (NPL) on October 4, 1989 (54 Federal Register 41015, October 5, 1989). Subsequent to this listing, the United States Environmental Protection Agency (USEPA) Region IV; the North Carolina Department of Environment and Natural Resources (NC DENR); and the United States Department of the Navy (DoN) entered into a Federal Facilities Agreement (FFA) on December 6, 1989 for MCB, Camp Lejeune. The objectives of the FFA are:

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

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

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

The Fiscal Year 2000 Site Management Plan for MCB, Camp Lejeune, the primary document referenced in the FFA, accounts for each of the sites at the base and provides detailed strategic planning. Many of the sites listed in the FFA have been investigated through the completion of Remedial Investigation/Feasibility Studies (RI/FS). However, several sites, (Site 75 included) did not warrant a full scale RI/FS. As such, these sites were investigated by completing Pre-Remedial Investigation (Pre-RI) Screening Studies. The goal of these investigations was to determine if a full RI study was necessary or if a decision of no further action was appropriate.

This NFRAP Decision Document (DD) supports no further action for Site 75 at MCAS New River, Camp Lejeune. The purpose of this NFRAP DD is to summarize the existing data for the site and to describe the Marine Corps' rationale for no further action.

Decision Documents of this type can fall into four categories. The category into which a site is placed is determined by the investigation(s) that have been conducted at the site. They are divided as follows: Category I - NFRAP decision is based on the results of a Preliminary Assessment (PA), a PA supplement, or an equivalent effort; Category II - NFRAP decision based on the results of a Site Inspection (SI), an SI supplement, or an equivalent effort; Category III - NFRAP decision based on the results of a Remedial Investigation (RI) and, if required, a Feasibility Study (FS), or an equivalent effort; Category IV - NFRAP decision based on the completion of a removal action or remedial action (RA) (including interim actions), or an equivalent effort.

Site 75 is a Category II designation. The Pre-RI Screening Study was completed to determine if further investigations were warranted. This effort is equivalent to a SI. The Pre-RI Screening Study completed at Site 75 provides sufficient information about the history, nature of the site and the lack of contamination. Therefore, a Category II - NFRAP DD is herein presented in accordance with all Category II requirements.

The objectives of this NFRAP DD for Site 75 are:

- To briefly describe the location, history and environmental setting of Site 75 and its relationship to MCB, Camp Lejeune;
- To describe the current status of the site based on the results of the related investigations; and
- To assess the potential risks to human health at the site.

Data from the Pre-RI Screening Study were used to derive and support no further action for Site 75. The Pre-RI Screening Study was initiated to detect and characterize potential impacts to human health and to determine if the site required further investigative work. The investigation included a review of previous studies, a geophysical survey, soil sampling, permanent monitoring well installation, groundwater sampling, and a site survey.

1.1 Site Location and Description

It is beneficial to provide the reader with the entire framework in which Site 75 exists, therefore, the following subsections discuss site locations and descriptions for both MCB, Camp Lejeune and Site 75.

1.1.1 MCB, Camp Lejeune

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

Construction of MCB, Camp Lejeune began in April 1941 at the Hadnot Point Industrial Area, where major functions of the base are centered today. The facility was designed to be the "World's Most Complete Amphibious Training Base." The MCB, Camp Lejeune complex consists of six geographical locations under the jurisdiction of the Base Command. These areas include Camp Geiger, Montford Point, Courthouse Bay, Mainside, the Rifle Range Area, and the Greater Sandy Run Area. Another area also overseen by MCB, Camp Lejeune is Camp Johnson which is located among the six geographical areas of Camp Lejeune.

The Air Station and Camp Geiger are considered as a single urban area possessing two separate missions and supported by two unrelated groups of personnel. The Marine Corps Air Station (MCAS), New River encompasses 2,772 acres and is located in the northwestern section of the complex and lies approximately five miles south of Jacksonville. The MCAS includes air support

activities, troop housing and personnel support facilities, all of which immediately surround the aircraft operations and maintenance areas. Site 75 is located in the MCAS.

1.1.2 Site 75

Site 75 is located at the MCAS, New River in the northwest portion of the MCB, Camp Lejeune. As shown on Figure 1-1, MCAS, New River is accessed by U.S. Route 17, which borders the eastern portion of the base.

Figure 1-2 is a site location map which shows the boundary and features of the surrounding area. The site is located between Baxter Street and a gravel road which is considered a part of White Street (i.e., White Street Extension). Curtis Road borders the southern portion of the site and a heavily wooded area is present to the north. The Seaboard Coastline Railroad is located west of the site.

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

1.2 Site History and Enforcement Activities

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

Investigative activities at Site 75 have included geophysical surveys in an attempt to locate the buried material and sampling of various environmental media. In addition to the geophysical survey, the Pre-RI Screening Study also included sampling of surface soil, subsurface soil, and groundwater, evaluating the resultant analytical data, and the performance of a qualitative and quantitative risk assessment. This study provided the information necessary to determine if the site had contributed hazardous substances to the environment.

The NCP states that sites which the USEPA determines to need no additional evaluation are given a "NFRAP" designation within the CERCLA Information System (CERCLIS). Through this designation, no supplemental investigation or remediation work will be performed at the site unless new information is presented indicating that the initial decision was not appropriate. This NFRAP DD presents the pertinent information that supports the conclusion that Site 75 poses little or no potential threat to human health or the environment.

There are currently no enforcement activities in place at the site.

1.2.1 Investigative Activities

As mentioned above, the conditions at Site 75 have been evaluated through several separate investigative activities. The following subsections provide a summary of the previous studies completed at the site along with the results of the Pre-RI Screening Study.

1.2.1.1 Previous Investigations

In 1984, shallow monitoring wells 75-GW01, 75-GW02, and 75-GW03 were installed at the site for the purpose of groundwater sampling as part of the Site Summary Report which was completed in 1990 by Environmental Science and Engineering, Inc. (ESE). Well completion details were not available for 75-GW01, however, the remaining two monitoring wells were constructed with 15 feet of screen and had total depths of 22 and 23 feet, respectively. In July 1984, groundwater samples were collected from these three newly installed monitoring wells as well as from three existing water supply in the vicinity of the site. These water supply wells were identified as 75-GW04, 75-GW05, and 75-GW06, however, these identifications could not be correlated with the present Camp Lejeune water supply well numbering system. Subsequently, the locations of these wells could not be determined. The six groundwater samples were analyzed for VOCs only. The results of the groundwater analysis did not detect any VOCs. There were no soil samples collected during this investigation.

Prior to the installation of the three monitoring wells in 1984, a geophysical survey consisting of electromagnetic (EM) conductivity and other metal detection techniques was conducted on a grid system throughout the area. Potential dumping areas, identified from aerial photographs (currently unavailable), were investigated during the survey. No areas representative of buried metallic objects were identified as part of this initial geophysical survey.

Monitoring wells 75-GW01, 75-GW02, and 75-GW03 were resampled in November 1986. The sample analysis included VOCs along with chloropicirin and tetrachlorodioxin, both of which are associated with tear gas solution which was suspected to be present at the site. The laboratory report indicated that none of the samples detected any of the tested parameters.

1.2.1.2 Pre-RI Screening Study

Field work for a Pre-RI Screening Study was completed by Baker Environmental, Inc. (Baker) in October 1995 with the subsequent final report completed in November 1998. The investigation included researching the previous studies and completing additional investigative tasks. The field activities included a geophysical survey, surface and subsurface soil sampling, and groundwater sampling. The scope of the geophysical survey completed as part of the Pre-RI Screening Study was significantly broader than the initial EM survey. It not only covered the area of the initial EM investigation, but was expanded further to cover additional areas. The survey conducted at Site 75 was designed to explore the possibility that 55-gallon drums may have been buried at the site. Aside from surface reflections, the magnetic data collected from Site 75 did not indicate any magnetic anomalies. Based on the data, the suspected buried drums do not appear to be present within the boundaries covered by the survey.

Surface soil, subsurface soil, and groundwater samples were collected at Site 75. The soil samples were analyzed for Target Compound List (TCL) organics and Target Analyte List (TAL) metals. Groundwater samples were analyzed for the same parameters, but also included specific analyses

for tear gas compounds which were expected at the site. Surface water and sediment samples were not collected because the drainage swales on site were dry and there was no evidence of sedimentation.

Surface Soil

There were no VOCs or polychlorinated biphenyls (PCBs) detected in the surface soil samples. However, two semivolatiles were detected in the surface soil samples submitted for laboratory analyses. The compound di-n-butylphthalate was detected in three surface soil samples at concentrations ranging from 280 µg/kg to 460 µg/kg. Bis(2-ethylhexyl)phthalate was detected in seven samples at estimated concentrations ranging from 40J µg/kg to 110J µg/kg.

Pesticide compounds were detected in each of the surface soil samples except for boring locations 75-SB02 and 75-SB03. The pesticides 4,4'-DDE and 4,4'-DDT were the most frequently detected. Seven other compounds were detected, including 4,4'-DDD, dieldrin, heptachlor, heptachlor epoxide, endrin, alpha chlordane, and gamma chlordane. Pesticide concentrations ranged from 1.5J µg/kg of 4,4'-DDT to 470 µg/kg of gamma chlordane.

Eighteen metals were detected among the 15 surface soil samples obtained from Site 75 including aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, vanadium, and zinc. Of these, aluminum, arsenic, and iron exceeded their associated screening values.

Subsurface Soil

A total of 17 subsurface (i.e., greater than one-foot below ground surface) soil samples were obtained at Site 75 and submitted for TCL organic and TAL metal analyses. There were no VOCs or PCB compounds detected among the subsurface samples.

Two semivolatile compounds were detected in three of the borings at the site. Bis(2-ethylhexyl)phthalate was detected at concentrations ranging from 40J µg/kg to 66J µg/kg. Di-n-butylphthalate was detected once at boring location 75-SB08 at 64 µg/kg and once at 75-GW05 at 200J µg/kg.

Various pesticide compounds were detected among the 15 subsurface soil samples collected at Site 75. The compounds 4,4'-DDE and 4,4'-DDT were detected at concentrations of 6.7 µg/kg and 3.7 µg/kg, respectively at boring location 75-SB01. An additional, four pesticide compounds were detected at boring location 75-SB03 including dieldrin, 4,4'-DDD, alpha chlordane, and gamma chlordane. The concentrations ranged from 1.1J µg/kg of gamma chlordane to 41 µg/kg of 4,4'-DDD.

Nineteen metals were detected among the 17 subsurface soils collected at Site 75, including aluminum, antimony, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, sodium, vanadium, and zinc. The metals aluminum, antimony, arsenic, beryllium, and iron were detected at concentrations which exceeded their respective screening criteria.

Groundwater

The groundwater investigation at Site 75 entailed the collection of samples from five monitoring wells. Each of the groundwater samples obtained at the site, were analyzed for full TCL organics, TAL metals, and specific analyses for the tear gas compounds chloroacetophenone and chloropicrin. There were no detections of any organic compounds in the groundwater samples collected at the site. In addition, the samples did not detect the presence of the specific tear gas compounds.

TAL metals were detected in each of the groundwater samples obtained at Site 75. The detected metals included aluminum, barium, calcium, cobalt, copper, iron, magnesium, manganese, potassium, selenium, sodium, and zinc. Of the detected metals, only aluminum, iron, and manganese were detected at concentrations exceeding state or federal water quality standards.
In summary, analytical testing of the soil samples at Site 75 detected semivolatiles and pesticide organic compounds. Metals were detected in both the surface and subsurface soil samples. There were no detections of organic compounds in the groundwater samples, however, several metals were detected at concentrations exceeding state and/or federal regulatory levels. Table 1-1 provides a summary of the compounds and anlaytes detected in the soil and groundwater at Site 75.

1.2.2 Regulatory Agency/Public Involvement

The USEPA and North Carolina Department of Natural Resources (NC DENR) have been actively involved with the investigation of this site through report review and partnering meetings. Based on these results, no further investigative activities are needed at Site 75. The USEPA Region III and the NC DENR concur with the no further remedial action decision.

Public involvement is summarized in the following section.

1.3 Community Participation

A public meeting was held at MCAS, New River on August 27, 1996 to discuss the results of the Pre-RI Screening Study. The meeting included members of the local base community, personnel from MCB, Camp Lejeune, Naval Facilities Engineering Command (LANTDIV), and Baker Environmental, Inc. The members of the project team presented the findings of the investigation and discussed the results of the risk assessment. Members of the community were given the opportunity to ask questions and comment on the related information. These comments and questions were immediately and informally addressed at the public meeting.

2.0 SUMMARY OF SITE CHARACTERISTICS

This section summarizes information pertaining to MCB, Camp Lejeune existing background information. In addition, specific information relevant to Site 75 is presented.

2.1 Physiography and Climatology

The flat topography of MCB, Camp Lejeune is typical of seaward portions of the North Carolina coastal plain. Elevations on the base vary from sea level to 72 above mean sea level (msl); however, most of the base is between 20 and 40 feet above msl. At Site 75, the terrain is relatively flat and covered by grassy and wooded areas. There are several shallow drainage swales (one foot deep or less) that run north to south across the site. These swales are dry most of the time; however, during periods of rain, water will collect and flow northward off the site through the swales.

MCB, Camp Lejeune experiences hot and humid summers; however, ocean breezes frequently produce a cooling effect. The winter months tend to be mild, with occasional brief cold spells. Average daily temperatures range from 34° Fahrenheit (F) to 54° F in January, the coldest month, and 72° F to 89° F in July, the hottest month. The average relative humidity, between 78 and 89 percent, does not vary greatly from season to season. The average yearly rainfall is 52.4 inches. Measurable amounts of rainfall occur 118 days per year, on average. Observations of sky conditions indicate yearly averages of approximately 112 days clear, 105 partly cloudy, and 148 cloudy. Prevailing winds are generally from the south-southwest 10 months of the year and from the north-northwest during September and October. The average wind speed at MCAS, New River is seven miles per hour.

2.2 Geology and Soils

MCB, Camp Lejeune is located in the Atlantic Coastal Plain physiographic province. The sediments of this province consist primarily of sand, silt, and clay. Other sediments may be present, including shell beds and gravel. Sediments may be of marine or continental origin. These sediments are found in interfingering beds and lenses that gently dip and thicken to the southeast. Sediments of this type range in age from early Cretaceous to Quaternary time and overlie igneous and metamorphic rocks of pre-Cretaceous age. United States Geological Survey (USGS) studies at MCB, Camp Lejeuene indicate that the base is underlain by sand, silt, clay, calcareous clay and partially cemented limestone. The combined thickness of these sediments beneath the base is approximately 1,500 feet.

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

2.3 Hydrogeology

The aquifers of primary interest are the surficial aquifer and the underlying Castle Hayne Aquifer. Other aquifers that occur beneath the facility include the Beaufort, Peedee, Black Creek, and upper and lower Cape Fear aquifers. The following summary is a compilation of information which pertains to aquifer characteristics within MCB, Camp Lejeune area.

The surficial aquifer consists of interfingering beds of sand, clay, sandy clay, and silt that contain some peat and shells. The thickness of the surficial aquifer ranges from 0 to 73 feet and averages nearly 25 feet over MCB, Camp Lejeune. The beds are thin and discontinuous, and have limited lateral continuity. This aquifer is not used for water supply at MCB, Camp Lejeune. The Castle Hayne aquifer lies below the surficial aquifer and consists primarily of unconsolidated sand, shell fragments, and fossiliferous limestone. Between the surficial aquifer and Castle Hayne aquifer lies the Castle Hayne confining unit. In general, the Castle Hayne confining unit may be characterized as a group of less permeable beds at the top of the Castle Hayne aquifer that have been partly eroded or incised in places. The Castle Hayne aquifer is about 150 to 350 feet thick, increasing in thickness to the ocean. The top of the aquifer lies approximately 20 to 73 feet bgs. Onslow County and MCB, Camp Lejeune lie in an area where the Castle Hayne aquifer generally contains freshwater; therefore, the Castle Hayne aquifer is a viable potable water source for the region's population.

At Site 75, groundwater was encountered between 3.5 and 4.0 feet bgs. Shallow groundwater flow is in the northeast direction towards Edward Creek with a change in elevation of over three feet, from 12.20 feet above mean sea level (msl) in the southern most monitoring well to 8.86 feet above msl in the northern most monitoring well. Sixteen potable water supply wells are within a one-mile radius of Site 75.

2.4 Surface Water

The dominant surface water feature at MCB, Camp Lejeune is the New River. It receives drainage from a majority of the base. The New River is short with a course of approximately 50 miles on the central Coastal Plain of North Carolina. At MCB, Camp Lejeune, the New River flows in a southerly direction into the Atlantic Ocean through the New River Inlet. Several small coastal creeks drain the area of MCB, Camp Lejeune not associated with the New River and its tributaries. These creeks flow into the Intracoastal Waterway, which is connected to the Atlantic Ocean by Bear Inlet, Brown's Inlet, and the New River Inlet. The New River, the Intracoastal Waterway, and the Atlantic Ocean converge at the New River Inlet.

Aside from the drainage swales, there are no significant surface water bodies at Site 75. The nearest stream is Edwards Creek which is located immediately north, approximately 500 feet from the northern boundary of the site. Edwards Creek flows in an easterly direction and empties into the New River.

2.5 Land Use

MCB, Camp Lejeune encompasses an area of approximately 236 square miles. The installation border is approximately 70 miles, including 21 miles of ocean front and Intracoastal Waterway. Recently, MCB, Camp Lejeune acquired approximately 41,000 additional acres in the Greater Sandy Run area. Land use within the base is influenced by topography and ground cover, environmental policy, and base operational requirements. Much of the land within MCB, Camp Lejeune consists of freshwater swamps that are wooded and largely unsuitable for development. In addition, 3,000 acres of sensitive estuary and other areas set aside for the protection of threatened and endangered species are to remain undeveloped. Operational restrictions and regulations, such as explosive quantity safety distances, impact-weighted noise thresholds, and aircraft landing and clearance zones, may also greatly constrain an influence development (Master Plan, 1988). The combined military and civilian population of MCB, Camp Lejeune and Jacksonville area is approximately 112,000. Nearly 90 percent of the surrounding population resides within urbanized areas. The

presence of MCB, Camp Lejeune has bee the single greatest factor contributing to the rapid population growth of Jacksonville and adjacent communities, particularly during the period from 1940 to 1960.

2.6 Receptors

Site 75 is situated in a residential area of MCAS. The risk assessment recognizes this fact by preparing conceptual site models that included the following receptors:

- Current military personnel
- Current base residents (young child [ages 6-12 years] and adult)
- Future on-site residents (young child [ages 1-6 years] and adult)

The contaminants detected at the site in surface soils, subsurface soils, and groundwater can migrate from the various media in several ways, including:

- Vertical migration of contaminants from surface soil to subsurface soil.
- Leaching of contaminants from subsurface soil to water-bearing zones.
- Vertical migration from shallow water-bearing zones to deeper flow systems.
- Horizontal migration in groundwater in the direction of groundwater flow.
- Wind erosion and subsequent deposition of windblown dust.

3.0 DATA ANALYSIS/RISK ASSESSMENT

The risk assessment completed for Site 75 examined exposure pathways associated with each environmental medium and each human receptor. Pathways were evaluated both qualitatively and quantitatively, considering site conditions and associated receptors. The exposure to current military personnel, current base residents, and future on-site residents from soil and groundwater was considered.

Potential exposure to surface soil may occur by incidental soil ingestion, contaminant absorption through the skin and inhalation of airborne particulates. Surface soil exposure was evaluated for current and future residential children and adults.

Subsurface soil is available for contact only during excavation activities, so potential exposure to subsurface soil is limited to current military personnel involved in training exercises and maneuvers. These activities do not take place at Site 75, therefore exposure to subsurface soils was not considered.

Future residents were evaluated for groundwater exposure at Site 75. At the present time, shallow groundwater in the vicinity of the site is not used as a potable supply for residents or base personnel. However, in the future, (albeit unlikely due to poor transmissivity and insufficient flow) shallow groundwater may be tapped for potable water. Groundwater exposure was evaluated for future residential children and adults. Potential exposure pathways are ingestion, dermal contact, and inhalation of volatile contaminants while showering. However, it should be noted, that there were no VOCs detected in the groundwater samples. Therefore, inhalation, of VOCs while showering was not evaluated as an exposure pathway.

Table 3-1 presents a summary of the detected compounds and analytes at the site. The table presents the range of positive detections for each contaminant of concern. These detections were compared to USEPA Risk Based Concentrations (RBCs) for residential soils and values stipulated by the USEPA Soil Screening Guidance. As shown on the table, none of the detections of VOCs in the surface or subsurface soil exceed the screening criteria. However, some metals detected in the surface and subsurface soil samples exceeded their respective screening criteria. The metals aluminum, arsenic, and iron were detected at concentrations greater than the applied screening standards. Each of the detections were considered in the risk assessment completed for Site 75, and none were identified as posing any significant risks to the receptors considered. Table 3-2 presents the calculated carcinogenic and non-carcinogenic human health risks associated with these soil contaminants for current and future residential exposure scenarios. Risk calculations were not performed for subsurface soil contaminants because subsurface soil is not considered an exposure pathway for residential receptors.

As shown on Table 3-2, no potential carcinogenic risk is indicated for Site 75. The ingestion, dermal, and inhalation pathways for each human receptor resulted in a incremental cancer risk (ICR) risk less than, or within the appropriate USEPA acceptable target risk range of $1.0x10^{-6}$ to $1.0x10^{-4}$. Potential noncarcinogenic risks are presented in terms of hazard indices (HI). The ingestion, dermal, and inhalation pathways for each human receptor resulted in HI values less than the USEPA's acceptable value of 1.0. Based on this, there are no potential carcinogenic or noncarcinogenic human health risks at Site 75.

4.0 DESCRIPTION OF THE NFRAP ALTERNATIVE

No evidence exists to suggest that the soil or groundwater are sufficiently contaminated to pose a threat to human health. Current site conditions and environmental testing data indicated that no further action is warranted at Site 75.

5.0 RESPONSIVENESS SUMMARY

This NFRAP was made available to the public for comment at a public meeting held on April 19, 1998. However, there was no formal comment period. No comments have been received from the public on the draft NFRAP. Comments were received from Camp Lejeune and the NC DENR. These comments were incorporated into this final NFRAP and are presented in the following pages.

ACTIVITY COMMENTS OF MAY 26, 1998
& NAVY RESPONSES
DRAFT NO FURTHER RESPONSE ACTION PLAN - SITE 75
MCB CAMP LEJEUNE, NORTH CAROLINA

Specific Comments

Activity Comment #1: "Page v, Declaration Page, Declaration Statement, The last sentence in the statement is repetitive relative to statement's second sentence; therefore, please omit the last sentence. Also, please correct the Deputy Assistant Chief of Staff's name from 'Brewster' to 'Brewer'."

Response: Agreed. However, to be consistent with Activity comments on other NFRAPs, the second and last sentences in this paragraph have been merged. The name that should appear on the 'Declaration Statement' has been changed to Major General R. G. Richard, Commanding General.

Activity Comment #2: "Page 1-5, Section 1.2.1.2 Pre-RI Screening Study, paragraph 12, sentences 1 and 2, The first sentence in the paragraph states that only semivolatile organic compounds and pesticides were detected in soils at the site; however, the next sentence indicates that metals were detected in both surface and subsurface soils. Please clarify."

Response: The word 'only' was eliminated in the text to clarify that semivolatiles, pesticides and metals were detected in surface and subsurface soils.

Activity Comment #3: "Page 3-1, Section 3.0, Data Analysis/Risk Assessment, paragraph 5, We recommend that a table be inserted into the document which will show the calculated values from the risk assessment for each contaminant of concern above RBC values for all media."

Response: Table 3-2, "Surface Soil Human Health Risk Calculations', has been added to the document. It presents all the risk calculations that were performed for Site 75 COCs that exceeded RBCs (aluminum, arsenic, and iron). These calculations included surface soil ingestion, dermal contact, and inhalation for current and future residential receptors. No potential carcinogenic or non-carcinogenic risk is indicated by these calculations.

NC SUPERFUND SECTION COMMENTS OF JULY 13, 1999
& NAVY RESPONSES
DRAFT NO FURTHER RESPONSE ACTION PLAN - SITE 75
MCB CAMP LEJEUNE, NORTH CAROLINA

NC Superfund Comment #1: "Site 75: Attached are our comments on risk assessment."

Response: Comments on the risk assessment in the NFRAP are addressed below.

Dave Lilley Comment #1: "Page 1-4, Section 1.2.1.2, end of second paragraph: It is claimed groundwater samples were analyzed for tear gas compounds which were expected at the site. There is no mention of this in the Baseline Risk Assessment contained within the Pre-Remedial Investigation Screening Study, and no sample results for tear gas compounds in Appendix I of the mentioned document. Please submit the sample results of the tear gas compounds for review."

Response: Agreed. Baker will forward this data to Mr. Dave Lilley of the NC DENR for his review prior to the finalization of this NFRAP.

Dave Lilley Comment #2: "Page 3-1, last paragraph: The screening levels contained with the NC Risk Analysis Framework (RAF) document are DRAFT numbers and NOT to be used or cited in Risk Assessments or cleanup level determinations. The use of the METHODOLOGIES contained within the RAF is acceptable."

Response: Agreed. All references to the NC Risk Analysis Framework will be removed from text and tables. However, based on discussions between Baker Environmental, Inc. and Mr. David Lown, the final clean up goals were to be chosen between the following RGOs: Region III RBCs multiplied by a factor of 0.2, base background, and Soil Screening Levels (developed from USEPA Soil Screening Guidance, 1996). Therefore, the RGOs will not be recalculated based on the methodologies outlined in Region 4 Bulletin No. 5 (USEPA , 1995).

Dave Lilley Comment #3: "Page 4-1: The detection limits for VOCs and SVOCs (groundwater) in the BRA contained within the Pre-Remedial Investigation Screening Study are not acceptable. At the detection limits listed in Appendix I, about 60% of the VOCs and 33% of the SVOCs would not be detected at the screening levels. These wells must be resampled and detection limits consistent with the scope of work of this report (usually around 1 µg/l) must be achieved."

Response: The detection limits for the organic analyses presented in the Pre-Remedial Investigation Screening Study report are the Contract Required Quantitation Limits (CRQLs) put forth under CLP protocol. Under the Navy CLEAN contract, laboratories are required to produce a Contract Laboratory Program (CLP) data package (or equivalent).

In keeping with the high QA/QC standards of CLP, the CRQLs are levels that a CLP laboratory should routinely and reliably detect and quantitate in a variety of sample matrices. These levels are not necessarily the lowest detectable levels achievable. However, laboratory instrument detection limits (IDLs) and method detection limits (MDLs) typically fall well below the CRQLs. It has been Baker's experience that while the laboratory will report the CRQL, it will also report a positively detected concentration of a compound below the CRQL (in some cases by an order of magnitude) and qualify the value with a "J," indicating the reported value is estimated. As stated in the Risk Assessment Guidance for Superfund (RAGS), Part A (USEPA, 1989), data qualified as such indicate uncertainty in the reported concentration but may be used just as positive data with no qualifiers. The appendix presenting the analytical data sets for the site shows positively detected compounds qualified with a "J" at concentrations below the CRQL. While there is a level of uncertainty associated using an estimated value reported below the CRQL, Baker feels the level of uncertainty does not warrant additional sampling. In addition, this data was validated by an independent third-party validator and found to be acceptable. Therefore, Baker is satisfied that the level of data quality meets the requirements of the Pre-Remedial Investigation Screening Study. It should be noted that with the more recent site investigations conducted at MCB, Camp Lejeune, Baker is now requesting a CLP data package with a lower detection limit (e.g, from 10 µg/L to 1 µg/L for VOCs).

TABLES

TABLE 1-1

SUMMARY OF SITE CONTAMINATION
SITE 75, MCAS BASKETBALL COURT
MCB, CAW LEJEUNE, NORTH CAROLINA
NFRAP DECISION DOCUMENT, CTO-0120

Media	Fraction	Detected Contaminants or Analytes	Detection Frequency	Concentration Range		Location of Maximum Detection
				Min.	Max.	
Surface Soil	Semivolatiles	Di-n-butylphthalate	3/15	280J	460	75-SB08
		bis(2-Ethylhexyl)phthalate	7/15	40J	110J	75-GW05
	Pesticides	Heptachlor	1/15	3J	3J	75-SB12
		Heptachlor Epoxide	1/15	37J	37J	75-SB12
		Dieldrin	2/15	1.9J	3.4J	75-SB01
		4,4'-DDE	15-Oct	2.4J	38J	75-SB12
		Endrin	1/15	11J	11J	75-SB12
		4,4'-DDD	4/15	1.6J	47J	75-SB12
		4,4'-DDT	13/15	1.5J	16	75-GW04
		Alpha-Chlordane	2/15	1.1J	440	75-SB12
		Gamma-Chlordane	3/15	1.1J	470	75-SB12
	Metals	Aluminum	15/15	3070	8,310	75-SB08
		Arsenic	15/15	0.44J	1.7J	75-GW04
		Barium	15/15	8.90	43	75-SB01
		Calcium	15/15	936	44,700	75-SB12
		Chromium	15/15	4	8.3	75-SB06
		Cobalt	7/15	0.61	0.82	75-SB04
		Copper	15/15	1.1	5.1	75-SB04
		Iron	15/15	1600J	3900	75-GW04
		Lead	15/15	9.7J	58.4J	75-GW04
		Magnesium	15/15	97	734	75-SB12
		Manganese	15/15	6.1	16.7	75-SB10
		Mercury	3/15	0.08	0.12	75-SB07
		Nickel	2/15	2.5	3.7	75-GW05
		Potassium	7/15	177	300	75-SB01
		Selenium	6/15	0.26J	0.35J	75-SB06
		Sodium	15/15	9.8	138	75-SB12
		Vanadium	15/15	6	13.3	75-GW04
		Zinc	15/15	5.5	64	75-SB04
Subsurface Soil	Sernivolatiles	Di-n-butylphthalate	3/17	64J	200J	75-GW05
		bis(2-Ethylhexyl)phthalate	3/17	40J	66J	75-SB03
	Pesticides	Dieldrin	2/17	1.5J	6.6J	75-SB03
		4,4'-DDE	3/17	6.7J	39J	75-SB03
		4,4'-DDD	2/17	40	41	75-SB03
		4,4'-DDT	3/17	3.7	10J	75-SB03
		Alpha-Chlordane	2/17	1.9J	2.7J	75-SB03
		Gamma-Chlordane	2/17	1.1J	2.0	75-SB03

TABLE 1-1 (Continued)

SUMMARY OF SITE CONTAMINATION
SITE 75, MCAS BASKETBALL COURT
MCB, CAMP LEJEUNE, NORTH CAROLINA
NFRAP DECISION DOCUMENT, CTO-0120

Media	Fraction	Detected Contaminants or Analytes	Detection Frequency	Concentration Range		Location of Maximum Detection
				Min.	Max.	
Subsurface Soil	Metals	Aluminum	17/17	1,590	18,500	75-GW04
		Antimony	1/17	4.5J	4.5J	75-SB03
		Arsenic	14/17	0.22J	44.6J	75-SB10
		Barium	17/17	2.6	41.4	75-SB03
		Beryllium	1/17	0.17	0.17	75-SB11
		Calcium	15/17	93.7	12,600	75-SB01
		Chromium	17/17	2.4	19.7	75-GW04
		Cobalt	9/17	0.51	1.2	75-GW04
		Copper	13/17	0.37	1.5	75-SB04
		Iron	17/17	449	7,450J	75-SB12
		Lead	17/17	2.4J	17AJ	75-SB10
		Magnesium	17/17	47	1,300	75-SB10
		Manganese	17/17	1.8	22.3	75-SB10
		Nickel	4/17	2.5	16.7	75-SB03
		Potassium	10/17	177.0	452	75-SB01
		Selenium	5/17	0.26J	0.55J	75-SB04
		Sodium	16/17	8J	62.1J	75-SB11
		Vanadium	17/17	2.6	24.6	75-GW04
		Zinc	13/17	2.3	39.2	75-SB06
Groundwater	Metals	Aluminum	115	785	785	75-GW03
		Barium	4/5	19.8	45.9	75-GW03
		Calcium	515	4,450	33,600	75-GW02
		Cobalt	2/5	3.2	3.6	75-GW05
		Copper	2/5	2.6	2.6	75-GW04
		Iron	1/5	439	439	75-GW03
		Magnesium	5/5	339	2,720	75-GW04
		Manganese	4/5	3.2	68.3	75-GW04
		Potassium	115	1,070	1070	75-GW04
		Selenium	115	2.1J	2AJ	75-GW02
		Sodium	5/5	1,810	24,300	75-GW05
		Zinc	4/5	3.8	76.7	75-GW01

Notes: Organic concentrations are presented in ug/L for liquid and ug/kg for solids (ppb)
Metals concentrations for soils are presented in mg/kg (ppm)

TABLE 3-1

SURFACE SOIL ORGANIC AND INORGANIC DATA
SITE 75
MCB, CAMP LEJEUNE, NORTH CAROLINA
NO FURTHER RESPONSE ACTION PLAN DECISION DOCUMENT, CTO-0120

Parameter	Range of Positive Detections (µg/kg)	No. of Positive Detects/No. of Samples	Region III RBC Value[1] (µg/kg)	Positive Detects Above Residential COC Value	Soil to Groundwater Soil Screening Levels[3] (µg/kg)	Detections Above Soil to Groundwater Soil Screening Level
Semivolatiles						
Di-n-butylphthalate	280J-460	3/15	780,000	0	1,560,000	0
bis(2-Ethylhexyl)phthalate	40J-110J	7/15	46,000	0	46,000	0
Pesticide/PCBs						
Heptachlor	3J	1/15	140	0	140	0
Heptachlor epoxide	37J	1/15	70	0	70	0
Dieldrin	1.9J-3.4J	2/15	40	0	40	0
4,4'-DDE	2.4J-38J	10/15	1,900	0	1,900	0
Endrin	11J	1/15	2,300	0	4,600	0
4,4'-DDD	1.6J-47J	4/15	2,700	0	2,700	0
4,4'-DDT	1.5J-16	13/15	1,900	0	1,900	0
Alpha-Chlordane	1.1J-440	2/15	1,800[2]	0	490	0
Gamma-Chlordane	1.1J-470	3/15	1,800[2]	0	490	0

Notes:

J – Estimated value
[1] USEPA Region III Contaminants of Concern (COC) Screening Criteria Table derived from USEPA Region III RBC Table, October 1997.
[2] USEPA Region III COC value for Chlordane used as a surrogate.
[3] USEPA Soil Screening Levels for Transfer from Soil to Groundwater (May 1996).

TABLE 3-1
(Continued)

SURFACE SOIL ORGANIC AND INORGANIC DATA
SITE 75
MCB, CAMP LEJEUNE, NORTH CAROLINA
NO FURTHER RESPONSE ACTION PLAN DECISION DOCUMENT, CTO-0120

Analyte	Range of Positive Detections (mg/kg)	No. of Positive Detects/No. of Samples	Twice the Average Base Specific Background[1] Concentration (mg/kg)	No of Times Exceeded Twice the Average Background Concentration	Region III RBC Value[1] (mg/kg)	Detections Above RBC Value	Soil to Groundwater Soil Screening Levels[4] (µg/kg)	Detections Above Soil to Groundwater Soil Screening Level
Aluminum	3,070 - 8,310	15/15	5,856.083	7	7,800	1	15,600	0
Arsenic	0.44J - 1.7J	15/15	1.322	1	0.43	15	4.6	0
Barium	8.9 – 43.1	15/15	17.292	3	550	0	100	0
Calcium+	936 – 44,700	15/15	1,372.977	10	--	--	--	--
Chromium	4 – 8.3	15/15	6.607	5	39	0	78	0
Cobalt	0.61 – 0.82	7/15	2.046	0	470	0	940	0
Copper	1.1 – 5.1	15/15	7.104	0	310	0	620	0
Iron+	1,600J – 3,900	15/15	3,702.427	1	2,300	11	4,600	0
Lead	9.7J – 58.4J	15/15	23.37	4	400[3]	0	400	0
Magnesium+	97 – 734	15/15	202.96	10	--	--	--	--
Manganese	6.1 – 16.7	15/15	18.51	0	190	0	360	0
Mercury	0.08 – 0.12	3/15	0.094	2	2.3	0	4.6	0
Nickel	2.5 – 3.7	2/15	3.455	1	160	0	320	0
Potassium+	177 – 300	7/15	200.06	3	--	--	--	--
Selenium	0.26J – 0.35J	6/15	0.753	0	39	0	78	0
Sodium+	9.8 – 138	15/15	59.013	2	--	--	--	--
Vanadium	6 – 13.3	15/15	11.447	4	55	0	110	0
Zinc	5.5 - 64	15/15	13.763	7	2,300	0	4,600	0

Notes:

Shaded areas indicate analyte selected as COPC for human health risk assessment.
+ = Essential Nutrient
-- = No criteria published
J – Estimated value
(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.
(2) USEPA Region III Contaminants of Concern (COC) Screening Criteria Table derived from USEPA Region III RBC Table, October 1997.
(3) Action Level for residential soils (USEPA, 1994).
(4) USEPA Soil Screening Levels for Transfer from Soil to Groundwater (May 1996).

TABLE 3-1
(Continued)

SURFACE SOIL ORGANIC AND INORGANIC DATA
SITE 75
MCB, CAMP LEJEUNE, NORTH CAROLINA
NO FURTHER RESPONSE ACTION PLAN DECISION DOCUMENT, CTO-0120

Parameter	Range of Positive Detections (µg/kg)	No. of Positive Detects/No. of Samples	Residential COC Value[1] (µg/kg)	Detections Above Region III ROC RDL Value	Soil to Groundwater Soil Screening Levels[3] (µg/kg)	Detections Above Soil to Groundwater Soil Screening Level
Semivolatiles						
Di-n-butylphthalate	64J – 200J	3/17	780	0	24,800	0
bis(2-Ethylhexyl)phthalate	40J – 66J	3/17	46,000	0	--	--
Pesticide						
Dieldrin	1.5J – 6.6J	2/17	40	0	--	--
4,4'-DDE	6.7J – 39J	3/17	1,900	0	--	--
4,4'-DDD	40 – 41	2/17	2,700	0	--	--
4,4'-DDT	3.7 – 10J	3/17	1,900	0	--	--
Alpha-Chlordane	1.9J – 2.7J	2/17	1,800[2]	0	27.8	0
Gamma-Chlordane	1.1J - 2	2/17	1,800[2]	0	27.8	0

Notes:

-- - No criteria published
J - Estimated value
(1) USEPA Region III Contaminants of Concern (COC) Screening Criteria Table.
(2) USEPA Region III COC value for Chlordane used as a surrogate.
(3) USEPA Soil Screening Levels for Transfer from Soil to Groundwater (May 1996).

TABLE 3-1
(Continued)

SURFACE SOIL ORGANIC AND INORGANIC DATA
SITE 75
MCB, CAMP LEJEUNE, NORTH CAROLINA
NO FURTHER RESPONSE ACTION PLAN DECISION DOCUMENT, CTO-0120

Analyte	Range of Positive Detections (mg/kg)	No. of Positive Detects/No. of Samples	Twice the Average Base Specific Background[1] Concentration (mg/kg)	No of Times Exceeded Twice the Average Background Concentration	Region III RBC Value[1] (mg/kg)	Detections Above RBC Value	Soil to Groundwater Soil Screening Levels[4] (µg/kg)	Detections Above Soil to Groundwater Soil Screening Level
Aluminum	1,590 – 18,500	17/17	7,413.23	12	7,800	11	--	--
Antimony	4.5J	1/17	6.498	0	3.1	1	--	--
Arsenic	0.22J – 44.6J	14/17	1.971	1	0.43	11	26.2	1
Barium	2.6 – 41.4	17/17	14.37	8	550	0	848	0
Beryllium	0.17	1/17	0.191	0	0.15	1	--	--
Calcium+	93.7 – 12,600	15/17	387.824	8	--	--	--	--
Chromium	2.4 – 19.7	17/17	12.537	2	39	0	27.2	0
Cobalt	0.51 – 1.2	9/17	1.611	0	470	0	--	--
Copper	0.37 – 1.5	13/17	2.41	0	310	0	704	--
Iron+	449 – 7,450J	17/17	7,134.639	2	2,300	12	151.2	17
Lead	2.4J – 17.1J	17/17	8.264	3	400(3)	0	270.06	0
Magnesium+	47 – 1,300	17/17	263.398	11	--	--	--	--
Manganese	1.8 – 22.3	17/17	7.99	2	180	0	65.2	0
Nickel	2.5 – 16.7	4/17	3.725	1	160	0	56.4	0
Potassium+	177 – 452	10/17	344.252	2	--	--	--	--
Selenium	0.26J – 0.55J	5/17	0.806	0	39	--	0.223	5
Sodium+	8J – 62.1J	16/17	54.57	2	--	--	--	--
Vanadium	2.6 – 24.6	17/17	13.34	6	55	0	--	--
Zinc	2.3 – 39.2	13/17	6.668	3	2,300	0	1100.4	--

Notes:

Shaded areas indicate analyte selected as COPC for human health risk assessment.
+ = Essential Nutrient
-- = No criteria published
J – Estimated value
(1) Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.
(2) USEPA Region III Contaminants of Concern (COC) Screening Criteria Table derived from USEPA Region III RBC Table, October 1997.
(3) Action Level for residential soils (USEPA, 1994).
(4) USEPA Soil Screening Levels for Transfer from Soil to Groundwater (May 1996).

TABLE 3-1
(Continued)

SURFACE SOIL ORGANIC AND INORGANIC DATA
SITE 75
MCB, CAMP LEJEUNE, NORTH CAROLINA
NO FURTHER RESPONSE ACTION PLAN DECISION DOCUMENT, CTO-0120

Parameter	NCWQS[1] (µg/L)	MCL[2] (µg/L)	Region III Tapwater RBC Value[3] (µg/L)	No. of Positive Detects/No. of Samples	Concentration Range (µg/L)	Comparison to Criteria			Soil to Groundwater Soil Screening Levels[6] (µg/L)	Positive Detects Above Soil to Groundwater Soil Screening Levels
						No. of Detects Above NCWQS	No. of Detects Above MCL	No. of Detects Above RBC		
Inorganics										
Aluminum	--	50/200[4]	3,700	1/5	785	--	1/1	0	--	--
Barium	2,000	2,000	260	4/5	19.8 – 45.9	0	0	0	2000	0
Calcium+	--	--	--	5/5	4,450 – 33,600	--	--	--	--	--
Cobalt	--	--	220	2/5	3.2 – 3.6	--	--	0	--	--
Copper	1,000	1,300(5)	150	2/5	2.6 – 2.6	0	0	0	1000	0
Iron	300	300(4)	1,100	1/5	439	1	1	0	300	1
Magnesium+	--	--	--	5/5	339 – 2,720	--	--	--	--	--
Manganese	50	50(4)	84	4/5	3.2 – 68.3	1	1	0	50	1
Potassium+	--	--	--	1/5	1,070	--	--	--	--	--
Selenium	50	50	18	1/5	2.1J	0	0	0	50	0
Sodium+	--	--	--	5/5	1,810-24,300	--	--	--	--	--
Zinc	2,100	5,000(4)	1,100	4/5	3.8 – 76.7	0	0	0	2,100	0

Notes:

\+ = Essential Nutrient
-- = No Criteria Published
J = Estimated Value
(1) NCWQS = North Carolina Water Quality Standards for Groundwater
(2) MCL = Safe Drinking Water Act Maximum Contaminant Level
(3) USEPA Region III Contaminants of Concern (COC) Screening Criteria Table derived from USEPA Region III RBC Table, October 1997.
(4) SMCL = Secondary Maximum Contaminant Level
(5) Action Level for drinking water.
(6) USEPA Soil Screening Levels for Transfer from Soil to Groundwater (May 1996.)

TABLE 3-2

SURFACE SOIL HUMAN HEALTH RISK CALCULATIONS
SITE 75
MCB, CAMP LEJEUNE NORTH CAROLINA
NO FURTHER RESPONSE ACTION PLAN DECISION DOCUMENT, CTO-0120

Receptor	Exposure Pathway	Contaminant	Carcinogenic Risk (ICR)	Non-Carcinogenic Risk (HI)
Current Residential Adult	Ingestion	Aluminum	0.0E+00	9.1E-03
		Arsenic	1.16E-07	4.5E-03
		Iron	0.0E+00	1.5E-02
	Dermal	Aluminum	0.0E+00	2.6E-03
		Arsenic	3.37E-08	1.3E-03
		Iron	0.0E+00	4.3E-03
	Inhalation	Aluminum	0.0E+00	1.4E-03
		Arsenic	1.8E-10	0.0E+00
		Iron	0.0E+00	0.0E+00
Current Residential Child	Ingestion	Aluminum	0.0E+00	8.5E-02
		Arsenic	1.08E-06	4.2E-02
		Iron	0.0E+00	1.4E-01
	Dermal	Aluminum	0.0E+00	4.9E-03
		Arsenic	6.24E-08	2.4E-03
		Iron	0.0E+00	8.0E-03
	Inhalation	Aluminum	0.0E+00	4.8E-03
		Arsenic	6.2E-10	0.0E+00
		Iron	0.0E+00	0.0E+00
Future Residential Adult	Ingestion	Aluminum	0.0E+00	9.1E-03
		Arsenic	8.72E-07	4.5E-03
		Iron	0.0E+00	1.5E-02
	Dermal	Aluminum	0.0E+00	2.6E-03
		Arsenic	2.53E-07	1.3E-03
		Iron	0.0E+00	4.3E-03
	Inhalation	Aluminum	0.0E+00	1.4E-03
		Arsenic	1.3E-09	0.0E+00
		Iron	0.0E+00	0.0E+00
Future Residential Child	Ingestion	Aluminum	0.0E+00	8.5E-02
		Arsenic	1.63E-06	4.2E-02
		Iron	0.0E+00	1.4E-01
	Dermal	Aluminum	0.0E+00	4.9E-03
		Arsenic	9.36E-08	2.4E-03
		Iron	0.0E+00	8.0E-03
	Inhalation	Aluminum	0.0E+00	4.8E-03
		Arsenic	9.3E-10	0.0E+00
		Iron	0.0E+00	0.0E+00

Notes:

HI – hazard index
ICR – incremental cancer risk

FIGURES

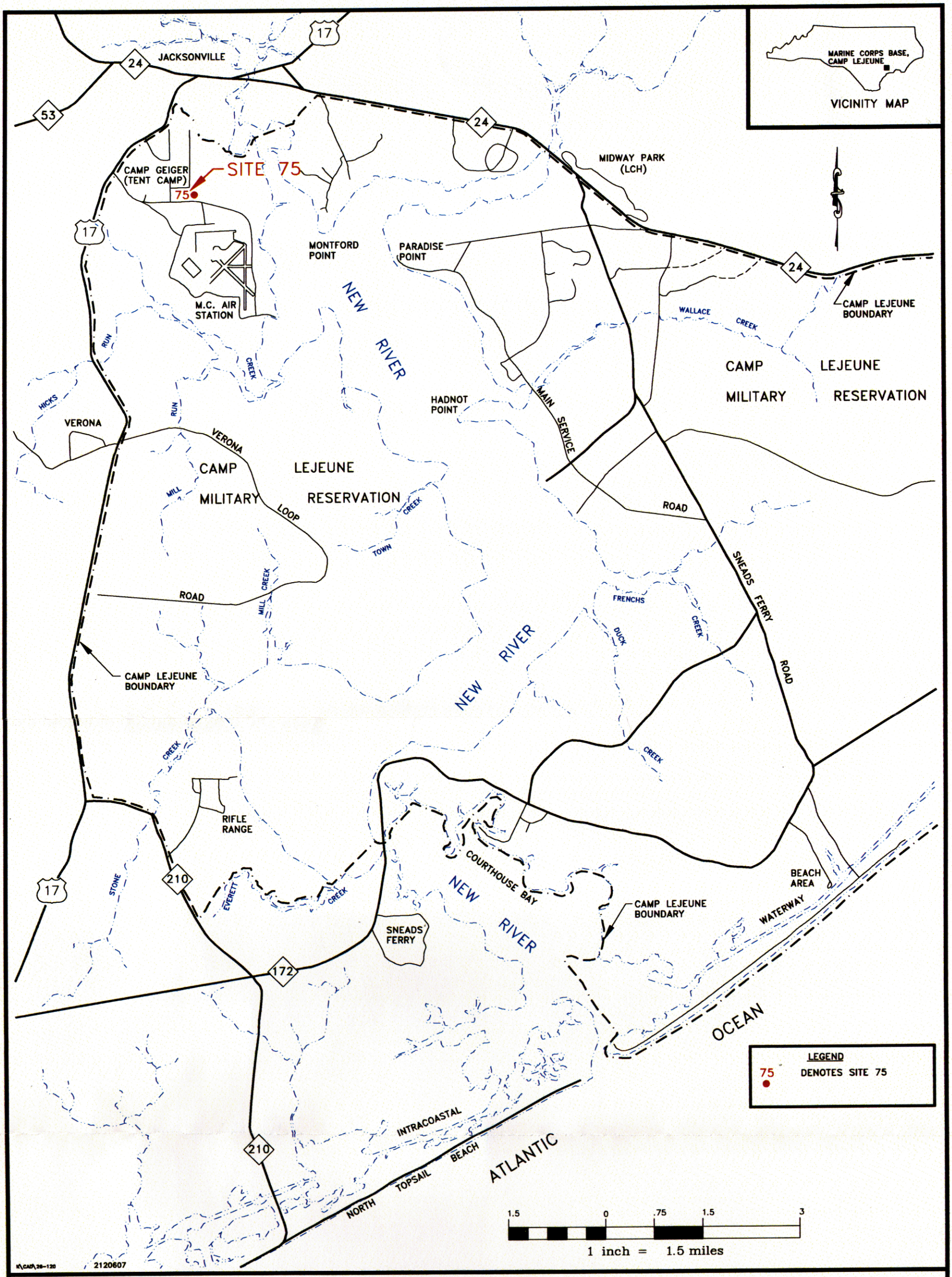
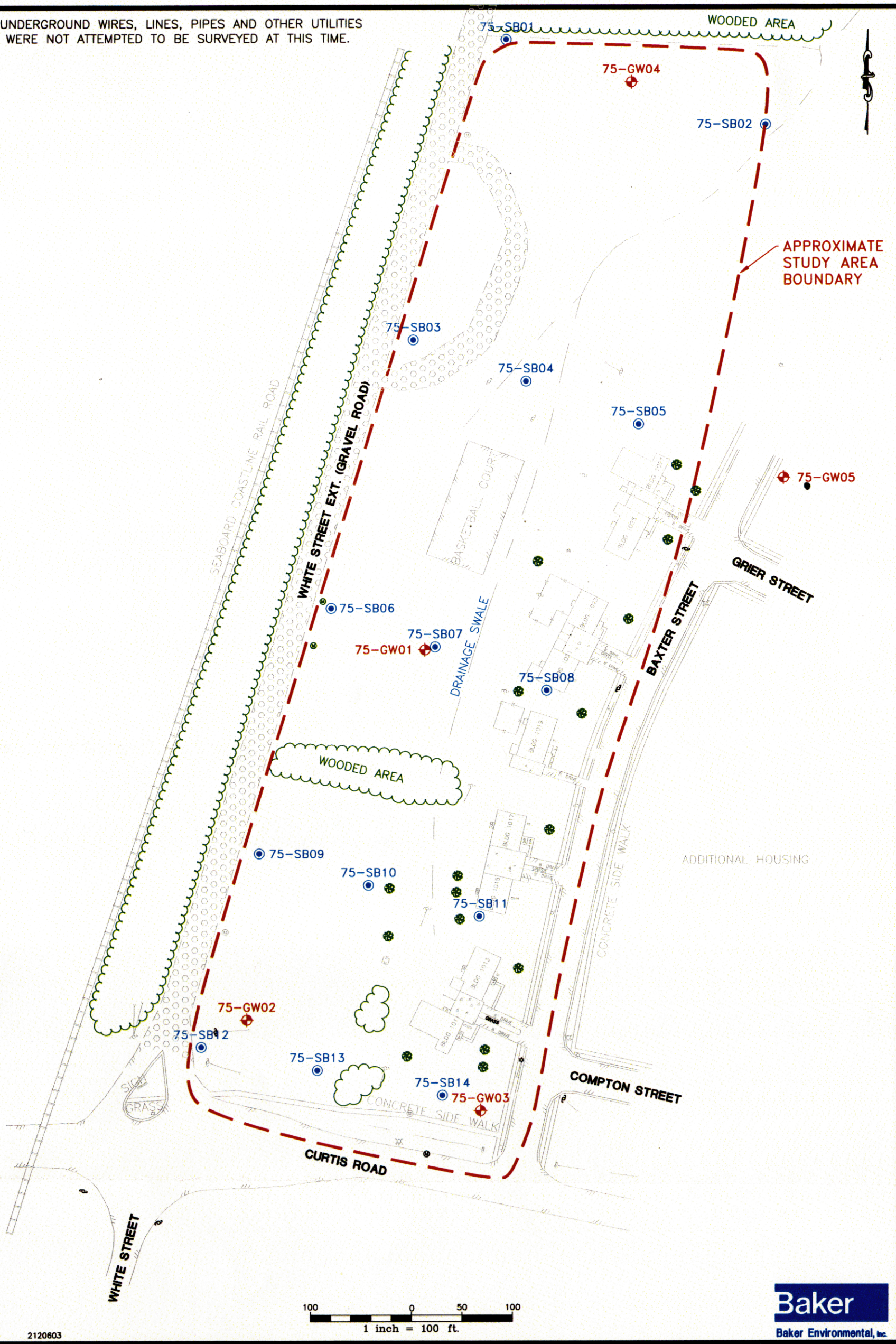


FIGURE 1–1
LOCATION OF SITE 75
MARINE CORPS AIR STATION BASKETBALL COURT
NFRAP DECISION DOCUMENT
CTO – 0120

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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



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Baker Environmental, Inc.

LEGEND

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

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

FIGURE 1-2
SITE 75 - SITE LOCATION MAP
MCAS BASKETBALL COURT
NFRAP DECISION DOCUMENT
CTO - 0120

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

ATTACHMENT A
STATE OF NORTH CAROLINA APPROVAL LETTER

THIS PAGE INTENTIONALLY LEFT BLANK