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FINAL SITE MANAGEMENT PLAN 2012 MCB CAMP LEJEUNE NC

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8-75 MMRP Site UXO-16, ASR #2.212 8-127
8-76 MMRP Site UXO-18, ASR #2.44 8-128
8-77 MMRP Site UXO-20, ASR #2.32 and #2.87 8-129

Acronyms and Abbreviations

AM	Action Memorandum
amsl	above mean sea level
AMTRAC	amphibious tractor
AOC	area of concern
AOPC	areas of potential concern
AST	aboveground storage tank
bgs	below ground surface
BOQ	Bachelor Officers Quarters
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CA	chemical agent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIP	Community Involvement Plan
COC	contaminant of concern
COPC	contaminant of potential concern
CS	chemical smoke
CSI	Confirmatory Site Investigation
CSM	conceptual site model
°F	degrees Fahrenheit
DCE	dichloroethene
DD	Decision Document
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DERP	Defense Environmental Restoration Program
DGM	digital geophysical mapping
DLA	Defense Logistics Agency
DNAPL	dense non-aqueous phase liquid
DoD	Department of Defense
DRMO	Defense Reutilization Marketing Office
EE/CA	Engineering Evaluation/Cost Analysis
EOD	Explosive Ordnance Disposal
ERA	Ecological Risk Assessment
ERD	Enhanced Reductive Dechlorination
ERS	ecological risk screening
ESD	explanation of significant differences
ESI	Expanded Site Investigation
ESS	Explosives Safety Submission
EVO	emulsified vegetable oil
FFA	Federal Facilities Agreement
FS	Feasibility Study
ft^2	square feet
FY	fiscal year
HDD	horizontal directionally drilled
HHRA	human health risk assessment
HHRS	human health risk screening

HPIA	Hadnot Point Industrial Area
HRC®	Hydrogen Release Compound®
IAS	Initial Assessment Study
IC	institutional control
IRA	Interim Removal/Remedial Action
IRACR	Interim Remedial Action Completion Report
IROD	Interim Record of Decision
IRP	Installation Restoration Program
ISCO	*in situ* chemical oxidation
JP	jet propulsion
LTM	long-term monitoring
LUC	land use control
LUCIP	Land Use Control Implementation Plan
LUST	leaking underground storage tank
µg/L	micrograms per liter
MC	munitions constituent
MCAS	Marine Corps Air Station
MCB CamLej	Marine Corps Base Camp Lejeune
MCCS	Marine Corp Community Services
MD	munitions debris
MEC	munitions and explosives of concern
MEK	methyl ethyl ketone
MILCON	Military Construction
MIP	membrane interface probe
mm	millimeter
MMRP	Military Munitions Response Program
MNA	monitored natural attenuation
MPPEH	material potentially presenting an explosive hazard
MTBE	methyl tert-butyl ethylene
NACIP	Navy Assessment and Control of Installation Pollutants
NAE	Natural Attenuation Evaluation
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NBC	nuclear, biological, and chemical
NCDENR	North Carolina Department of Environment and Natural Resources
NCGWQS	North Carolina Groundwater Quality Standards
NCP	National Oil and Hazardous Substances Pollution Control Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NFA	no further action
NPL	National Priorities List
NTCRA	Non-time-critical Removal Action
O&G	oil and grease
ORC®	Oxygen Release Compound®
OU	operable unit
OWS	oil-water separator
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbon

PCA	1,1,2,2-tetrachloroethane
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCP	pentachlorophenol
POL	petroleum, oil, lubricant
ppb	parts per billion
ppm	parts per million
PRAP	Proposed Remedial Action Plan
PRB	permeable reactive barrier
PSI	Preliminary Site Investigation
RA	Remedial Action
RAB	Restoration Advisory Board
RABITT	Reductive Anaerobic Bioremediation *In Situ* Treatment Technology
RAC	Remedial Action Contract
RACR	Remedial Action Closeout Report
RAO	Remedial Action Objective
RASO	Radiological Affairs Service Office
RC	response complete
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RIP	remedy-in-place
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SC	site closeout
SDZ	surface danger zone
SEAR	surfactant enhanced aquifer remediation
SGI	Supplemental Groundwater Investigation
SI	Site Investigation/Site Inspection
SMP	Site Management Plan
SSI	Supplemental Site Investigation
STP	sewage treatment plant
SVE	Soil Vapor Extraction
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TCE	trichloroethene
TCRA	Time-critical Removal Action
TDS	total dissolved solid
TNT	trinitrotoluene
TPH	total petroleum hydrocarbon
TSS	total suspended solid
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOC	volatile organic compound

WW II	World War II
WWTP	wastewater treatment plant
XRF	X-ray fluorescence
yd^3	cubic yard
ZVI	zero valent iron

SECTION 1

Introduction

This document presents the Fiscal Year (FY) 2012 Site Management Plan (SMP) for Marine Corps Base Camp Lejeune (MCB CamLej), North Carolina. This SMP presents planned activities to be conducted at MCB CamLej during FY 2012 and provides projections for long-term progress in accordance with the Department of the Navy (Navy) Installation Restoration Program (IRP) and Military Munitions Response Program (MMRP). This document has been prepared by CH2M HILL for Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Division and MCB CamLej. The SMP is submitted to representatives of the North Carolina Department of Environment and Natural Resources (NCDENR), the United States Environmental Protection Agency (USEPA) Region 4, and members of the MCB CamLej Restoration Advisory Board (RAB).

1.1 Site Management Plan Purpose

The FY 2012 SMP is a forward-looking management tool and one of the primary documents identified in the Federal Facilities Agreement (FFA) (MCB CamLej, 1991). This SMP includes proposed deadlines for completion of deliverables, as specified in the FFA, to be submitted during FY 2012. The prioritization of activities and the conceptual schedules were developed by the MCB CamLej Partnering Team, which includes representatives from NAVFAC, MCB CamLej, USEPA, and NCDENR. The SMP is a working document that is updated yearly to maintain current documentation of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process and summaries of environmental actions at MCB CamLej. This SMP updates and supersedes the FY 2011 SMP (CH2M HILL, 2010).

1.2 Site Management Plan Report Organization

The FY 2012 SMP for MCB CamLej is organized as follows:

Section 1—Provides SMP purpose and report organization.

Section 2—Presents the description and environmental history of MCB CamLej, and the CERCLA process for conducting site investigations and actions. Provides a basewide summary of the IRP and MMRP at MCB CamLej. Summary figures and tables of the current site statuses are also provided.

Sections 3 through 10—Provides brief IRP and MMRP site descriptions and histories, a summary of previous investigations, and planned activities for FY 2012. Each section is organized according to its corresponding phase of the CERCLA process and includes associated tables, figures, and schedules. Section 9 includes other sites that have not been assigned IRP or MMRP site designations but are being investigated following the CERCLA process. Section 10 includes sites that have been transferred from the IRP to the UST program.

Section 11 — Provides References.

SECTION 2

MCB CamLej Description and Environmental History

2.1 Base Description

MCB CamLej was commissioned in 1942 as a training area to prepare Marines for combat. The MCB CamLej complex consists of six geographical locations under the jurisdiction of the Base command. These areas include Camp Geiger, Montford Point, Courthouse Bay, Mainside, the Greater Sandy Run Area, and the Rifle Range Area. MCB CamLej is host to five Marine Corps commands and two Navy commands. All of the real estate and infrastructure are owned, operated, and maintained by the host command. MCB CamLej also provides support and training for the following tenant commands:

- Headquarters Nucleus, Second Marine Expeditionary Force
- Second Marine Division
- Second Marine Logistics Group
- Second Marine Surveillance, Reconnaissance, and Intelligence Group
- Sixth Marine Expeditionary Brigade
- Naval Hospital
- Naval Dental Clinic

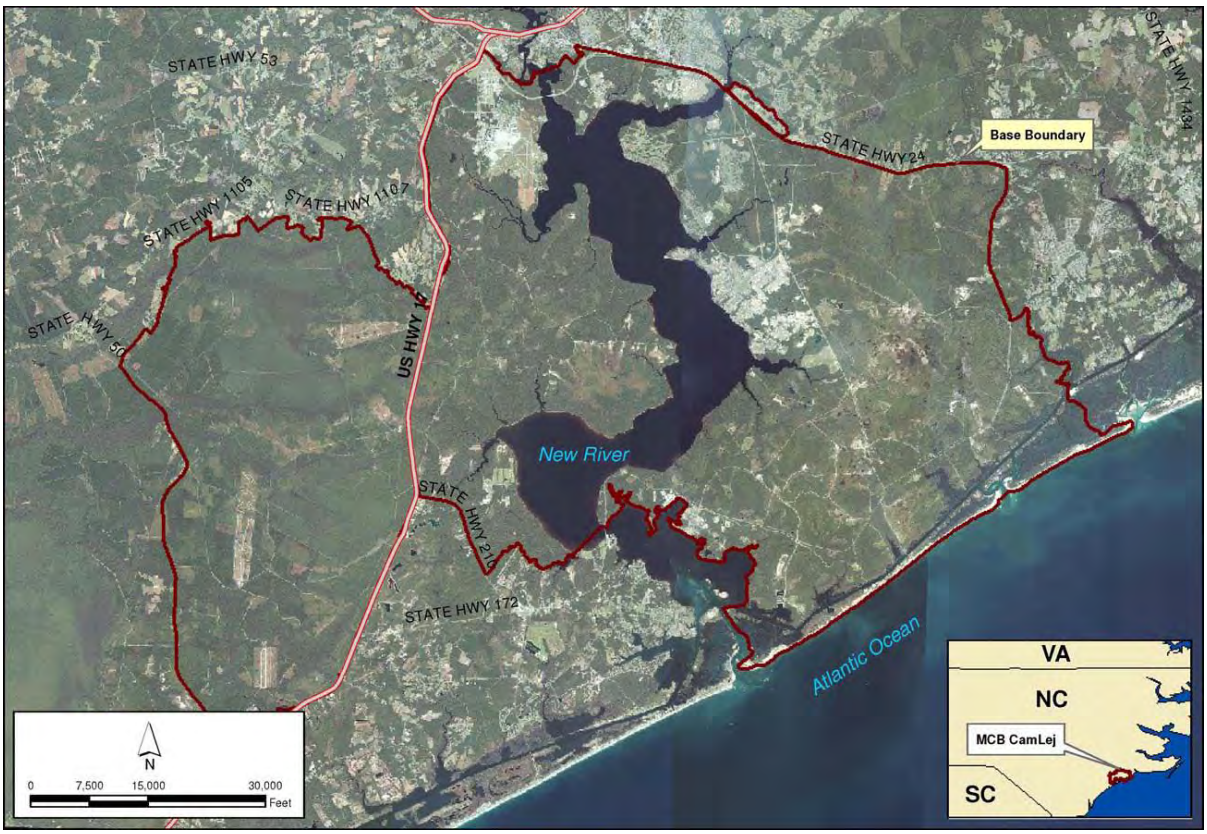
MCB CamLej is located on 236 square miles of land in Onslow County, North Carolina, adjacent to the southern side of the City of Jacksonville (**Figure 2-1**). Jacksonville is the largest city near MCB CamLej and contains approximately half of the county's total population. Since 1990, much of the MCB CamLej complex has been part of Jacksonville. The Base is bisected by the New River, which flows into the Atlantic Ocean in a southeasterly direction. The Base is bordered by the Atlantic Ocean to the east, U.S. Route 17 to the west, and State Route 24 to the north.

2.2 Facility-wide Demography and Land Use

MCB CamLej is home to an active duty, dependent, retiree, and civilian population of approximately 150,000. Approximately 47,000 military personnel are stationed at MCB CamLej, including 39,000 Marines for resident formal school training and 8,000 Marines and Department of Defense (DoD) employees for job enhancement training. MCB CamLej provides housing, training facilities, logistical support, and administrative supplies for Fleet Marine Force units and other assigned units.

Training facilities at the Base include Camp Geiger, Camp Johnson, Stone Bay, Greater Sandy Run Training Area, and Marine Corps Air Station (MCAS) New River. Military training operations also include 78 live-fire ranges, 98 maneuver areas, 34 gun positions, 50 tactical landing zones, and a military operation in an urban terrain training facility. In addition, the 11 miles of beach frontage at the Base is capable of supporting amphibious operations.

FIGURE 2-1
Base Location Map



Located within Onslow County, along the coastal plain of North Carolina, the Base covers more than 153,000 acres consisting of approximately 26,000 acres of water and 127,000 acres of terrestrial features. Elevation at the Base ranges from sea level to 70 feet above mean sea level (amsl), with much of the site topography traversed by swales, wetlands, streams, and creeks that drain into the New River. The Base encompasses a 92-mile perimeter, including approximately 14 miles along the Atlantic Ocean. The ocean frontage of the Base is composed of a barrier island system that is separated from the mainland by salt marshes, small bays, and an intercoastal waterway.

Most of the land surrounding the facility is used for agriculture. Estuaries along the coast support commercial fishing and residential resort areas located adjacent to the Base along the Atlantic Ocean.

2.3 Regional and Facility-wide Physiography, Climate, and Surface Water Hydrology

MCB CamLej lies within the outer part of the Atlantic Coastal Plain Physiographic Province in North Carolina. This physiographic province stretches from Georgia to Long Island, New York. The physiography of the area is typical of the Atlantic Coastal Plain, with stepped terraces consisting of wide, gently eastward-sloping plains separated by linear, steeper, northward, and eastward-facing scarps. Low elevations and relatively low relief characterize topography across MCB CamLej. The surface elevations range from sea level to approximately 70 feet amsl, with most of MCB CamLej's elevation ranging from 20 to 40 feet amsl.

Mild winters and hot, humid summers generally characterize climatic conditions within southeastern North Carolina and at MCB CamLej. Winters are usually short and mild with occasional short, cold periods. Summers are long, hot, and humid, with an average humidity of 75 percent. Average annual net precipitation is approximately 54 inches. Ambient air temperatures generally range from 37 to 60 degrees Fahrenheit (°F) in the

winter months and 71°F to 88°F during the summer months. Winds are generally south-southwesterly in the summer and north-northwesterly in the winter (NOAA, 2002).

The land at MCB CamLej generally slopes toward the New River with a grade of about 0.5 percent. The relief between stream and interstream areas typically ranges from 20 to 30 feet.

2.4 Geology and Hydrogeology

2.4.1 General Regional Geologic and Hydrogeologic Framework

Southeastern North Carolina and MCB CamLej are within the Tidewater region of the Atlantic Coastal Plain Physiographic Province. The Tidewater region is of low relief, with elevations averaging about 20 feet amsl and is generally swampy. The MCB CamLej area is underlain by an eastward-thickening wedge of marine and non-marine sediments ranging in age from early Cretaceous to Holocene. The eastward-thickening wedge of sediment begins at the fall line (western boundary of Atlantic Coastal Plain physiographic province) and dips southeastward towards the coast. Along the coastline, several thousand feet of interlayered, unconsolidated sediment deposited over pre-Cretaceous crystalline basement rock is present, consisting of gravel, sand, silt, clay deposits, calcareous clays, shell beds, sandstone, and limestone. Minor amounts of detrital carbonate shells and secondary minerals, such as glauconite, siderite, and chlorite, often distinguish these sedimentary units.

Historical Coastal Plain sedimentation and deposition was controlled by fluctuations in sea level on a subsiding continental margin in marine and near-shore environments (Winner and Coble, 1989). Confining units associated with specific aquifers within the Coastal Plain region are composed of less permeable beds of clay and silt. Within the MCB CamLej area, approximately 1,500 feet of a sedimentary sequence that overlies the basement rock is composed of seven aquifers (the Surficial, Castle Hayne, Beaufort, Peedee, Black Creek, and Upper and Lower Cape Fear aquifers) and their associated confining units (Cardinell, Berg, and Lloyd, 1993).

Recharge of aquifers within the Coastal Plain region generally occurs within interstream areas. Annual recharge to the aquifers has been estimated in the range of 5 to 21 inches of rainfall (Heath, 1989). Natural discharge of groundwater from the Coastal Plain aquifer system generally flows into streams, swamps, and lakes. Evapotranspiration from the soil zone and upward leakage through confining units into streams, estuaries, swamps, and even the ocean also contribute to groundwater discharge. The New River estuary serves as the principal discharge area for groundwater from the Castle Hayne aquifer within the vicinity of MCB CamLej (Harned, Lloyd, and Treece, 1989).

2.4.2 Regional Water Usage

Potable water is provided to MCB CamLej and the surrounding residential area by water supply wells that pump groundwater from the deeper Castle Hayne aquifer. Although fresh water is present within the Surficial, Castle Hayne, Beaufort, and Peedee aquifers, all of which are located below MCB CamLej, only the Castle Hayne aquifer is used by the Base as a water supply source (Cardinell, Berg, and Lloyd, 1993). Regionally in southeastern North Carolina, the Castle Hayne aquifer may be used as a potable source of domestic water supply and for watering lawns or filling swimming pools.

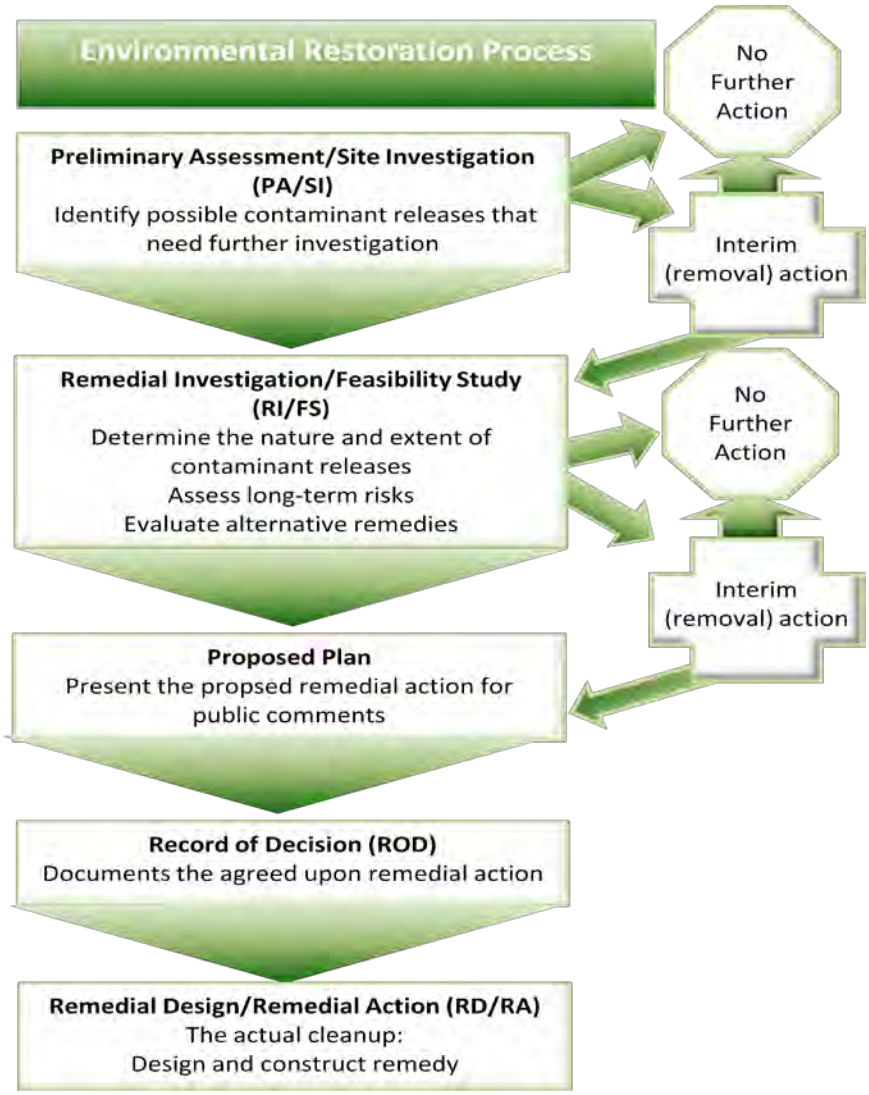
Per Base Utlity personnel, there are currently 50 active water supply wells on Base, which rely entirely on groundwater as the supply source. The supply wells are included in the Base's annual wellhead monitoring program to ensure compliance with drinking water standards (AH Environmental, 2002).

2.5 CERCLA Process

The objectives of the CERCLA process are to evaluate the nature and extent of contamination at a site and to identify, develop, and implement appropriate remedial actions to protect human health and the environment. The major elements of the CERCLA process are presented in **Figure 2-2** and discussed in further detail in the subsections below. The documents prepared for the IRP are maintained in information repositories for public review. MCB CamLej has developed a Community Involvement Plan (CIP) and established a RAB comprised of

members of the community, local environment group members, and state and federal officials, who meet quarterly to maintain community involvement with environmental restoration activities at the Base.

FIGURE 2-2
CERCLA Process



2.5.1 Preliminary Assessment/Site Investigation or Site Inspection

The IRP begins with concerns about a site, area, or potential contaminant source. The Preliminary Assessment/Site Investigation (PA/SI) phase of the CERCLA process evaluates potential sites to determine if the site should be eliminated from further consideration (i.e., no further action [NFA]), identified for an action to address actual or imminent threats to human health or the environment, or further evaluated through the performance of a Remedial Investigation/Feasibility Study (RI/FS).

2.5.1.1 Preliminary Assessment

The PA is a limited-scope assessment designed to distinguish between sites that clearly pose little or no threat to human health or the environment and those that may pose a threat and require further investigation. This stage typically involves a review of historical documents and a visual site inspection. Environmental samples are rarely collected during a PA; rather, a PA is intended to be a relatively quick, low-cost compilation of existing information about a site. The PA may result in a determination of NFA; completion of an SI if there is insufficient

information to reach a NFA decision; a removal action if significant threat to human health or the environment exists; or an RI/FS if remediation is deemed necessary.

2.5.1.2 Site Investigation or Site Inspection

The SI is the most common step after a PA is completed and an NFA determination cannot be made. The SI involves an onsite investigation intended to gather more information needed in determining whether there is a release or potential release, and to characterize the nature of the release and associated threats or potential threats to human health and the environment. The SI typically includes the collection of environmental samples to identify if contaminants are present at a site and a screening risk assessment to determine if they have been released at levels posing an unacceptable risk to human health to the environment. The sites that do not require further investigation or response are designated as NFA. If there is insufficient information to reach an NFA decision a removal action or an RI/FS may be recommended.

For most sites at MCB CamLej, the PA and SI have been completed concurrently as a PA/SI. For MMRP sites, if geophysical anomalies representing potential subsurface munitions and explosives of concern (MEC) are identified during the PA/SI or low-level MC-related constituents are identified, an Expanded SI (ESI) phase is initiated to confirm whether there are site-specific contamination or hazards prior to moving forward with an RI.

2.5.2 Remedial Investigation/Feasibility Study

The purpose of the RI/FS is to determine the nature and extent of contamination and, if sufficient need is documented by site sampling and a risk assessment, to evaluate proposed remedies. The RI and FS can be conducted concurrently; data collected in the RI influences the development of remedial alternatives in the FS, which in turn affect the data needs and scope of treatability studies and additional field investigations. This phased approach encourages the continual scoping of the site characterization, thereby minimizing the collection of unnecessary data and maximizing data quality.

2.5.2.1 Remedial Investigation

The RI is the investigative phase of the response action designed to characterize site conditions, determine the nature and extent of contamination, assess the risk to human health and the environment posed by site contamination, and provide a basis for decisions on further response actions or NFA. The RI provides information to refine the conceptual site model (CSM) and forms the basis for the development of remedial action objectives (RAOs) and remedial strategies that will comprise the FS.

2.5.2.2 Feasibility Study

The FS is the mechanism for the development, screening, and detailed evaluation of alternative remedial actions. The overall objectives of an FS are to develop and evaluate potential remedies that permanently and significantly reduce the threat to public health, welfare, and the environment and aid in selection of a cost-effective remedial action alternative that mitigates the threat(s).

2.5.2.3 Removal Action

A removal action is a response implemented in an expedited manner to address releases or threatened releases in order to mitigate the spread of contamination. Removal actions may be implemented at any time during the CERCLA process. Removal actions include Time-critical Removal Actions (TCRAs) and Non-time-critical Removal Actions (NTCRAs).

Actions taken immediately to mitigate an imminent threat to human health or the environment, such as the removal of corroded or leaking drums, are classified as TCRAs. The planning period for a TCRA is 6 months or less before field work is initiated. An Engineering Evaluation/Cost Analysis (EE/CA) is not required for a TCRA, although an Action Memorandum (AM) and Work Plan must be completed.

Removal actions that may be delayed for 6 months or more without significant additional harm to human health or the environment are classified as NTCRAs. For a NTCRA, an EE/CA is prepared rather than the more extensive FS. An EE/CA focuses only on the substances to be removed rather than on all contaminated substances at the

site. A removal action can become the final remedial action if the risk assessment results indicate that NFA is required to protect human health and the environment.

A removal action can be either the final remedy or an interim action followed by a remedial action as the final remedy, based on the extent to which the threats are mitigated by the action. A removal action, when implemented as the final remedy, can be used for fast and significant reductions in risk and to mitigate long-term threats. In cases where the removal action is the final remedy, the removal action may lead to either Response Complete (RC) or Site Closeout (SC). If the Remedial Action (RA) was accomplished during the RI/FS phase, any final determination of RC and/or SC must be documented in the Record of Decision (ROD). If the NCP nine criteria were not addressed as part of the EE/CA or AM, a focused FS would be needed, followed by a ROD.

2.5.2.4 Treatability Study

Treatability studies involve testing and evaluation of a treatment technology to determine the effectiveness of that technology at a particular site or to establish site-specific design parameters. The primary objectives of treatability testing are to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the FS and to support the remedial design of a selected alternative. Treatability studies may be conducted at any time during the CERCLA process.

The need for a treatability study generally is identified during the FS. Treatability studies may be classified as either bench-scale (laboratory study) or pilot-scale (field studies). For technologies that are well-developed and tested, bench-scale studies are often sufficient to evaluate performance. For innovative technologies, pilot tests may be required to obtain the desired information. Pilot tests simulate the physical and chemical parameters of the full-scale process and are designed to bridge the gap between bench-scale and full-scale operations.

Treatability studies may also be needed during the Remedial Design (RD)/RA phase to obtain more detailed information about the unit operations, performance, and cost for designing a full-scale treatment system. Generally, a pilot-scale system is deployed onsite to collect the required information.

2.5.3 Proposed Remedial Action Plan and Record of Decision

The remedy selection process involves identifying a preferred response action strategy from those alternatives evaluated in the FS. The preferred alternative is based first on each alternative's ability to satisfy the threshold criteria, and then on trade-offs among alternatives considering the primary balancing criteria. Further, results of the risk assessment need to be factored into the selection of the remedy. The remedy selection process includes a Proposed Remedial Action Plan (PRAP) and ROD.

2.5.3.1 Proposed Remedial Action Plan

A PRAP presents the remedial alternatives developed in the FS and recommends a preferred remedial method. The public has an opportunity to comment on the PRAP during an announced formal public comment period. Site information is compiled in an administrative record and placed in the general IRP information repositories established at local libraries for public review. A public meeting is also held to provide supporting information.

2.5.3.2 Record of Decision

At the end of the PRAP public comment period, an appropriate remedial alternative is chosen to protect human health and the environment. The ROD document is then issued, describing the remedy selection process and the remedy selected. All parties directly involved in the IRP (Navy, USEPA, NCDENR, and public) must agree on the selected alternative. Any public comments received are addressed as part of the responsiveness summary in the ROD. A public notice is issued after the ROD is signed and available for public inspection. A public notice is also published for any significant post-ROD changes. Once the ROD has been signed, the RD/RA process is initiated.

2.5.4 Remedial Design and Remedial Action

Following signature of the ROD, the RD and RA phases are implemented. The technical specifications for cleanup remedies and technologies are designed in the RD phase. The RA is the actual construction or implementation phase of the cleanup process.

2.5.4.1 Remedial Design

The purpose of the RD phase is to convert the conceptual design for the selected remedy from the FS into a full-scale, detailed design for implementation. RD includes preparation of technical RD Work Plans, drawings, specifications, and RA Work Plans.

2.5.4.2 Remedial Action

Upon completion of the RD, implementation of the RA (the remedy selected in the ROD) begins. The RA start-date is defined as the date the contractor has mobilized and begun substantial and continuous physical onsite remedial action. The start date is important because it triggers the beginning of the Five-Year Review cycle if one is required. The RA phase involves two main components, remedial action construction and remedial action operation.

Interim RAs (IRAs) are implemented to provide temporary mitigation of human health risks or to mitigate the spread of contamination in the environment. Similar to removal actions, RAs may be implemented at any time during the process. Examples of IRAs include installing a pump-and-treat system for product recovery from groundwater or installing a fence to prevent direct contact with hazardous materials. For IRAs, a focused FS is prepared rather than the more-extensive FS. As with the removal action, an interim action may become the final RA if the results of the risk assessment indicate that NFA is required to protect human health and the environment.

2.5.5 Remedy-in-Place and Response Complete

2.5.5.1 Remedy-in-Place

For long-term remedies where it is anticipated that RAOs will be achieved over a long period, the Remedy-in-Place (RIP) milestone signifies the completion of the RA construction phase and that the remedy has been implemented and has been demonstrated to be functioning as designed (i.e., all testing has been accomplished and the remedy will function properly). Once RIP is completed for a site, an Interim Remedial Action Completion Report (IRACR) is prepared to document that the remedy is constructed and operating successfully.

2.5.5.2 Response Complete

At any point during the CERCLA process, a decision can be made that no further response action is required; properly documented (necessary regulatory notification or application for concurrence has occurred), these decisions constitute RC and/or SC. RC is the point at which the remedy has achieved the required reduction in risk to human health and the environment (cleanup goals/RAOs have been met). Once RC is completed for a site under a ROD, a Remedial Action Completion Report (RACR) is prepared to demonstrate that the remedy is complete and the RAOs are met. RC is followed by individual site closeout.

Once all RIPs and RCs have been documented for every site at the facility and the terms of the FFA have been met, site closeout and NPL deletion is requested.

2.5.5.3 Five-Year Reviews

Five-year reviews are generally required by CERCLA or program policy when hazardous substances remain on a site above levels that permit unlimited use and unrestricted exposure. Five-year reviews provide an opportunity to evaluate the implementation and performance of a remedy and whether it still protects human health and the environment. Generally, reviews are performed 5 years after the initiation of a CERCLA response action and are repeated every 5 years as long as future uses remain restricted. USEPA or the lead agency for a site can perform these reviews, but USEPA is responsible for assessing the protectiveness of the remedy.

2.6 MCB CamLej Environmental Restoration Program

2.6.1 Installation Restoration Program History

MCB CamLej has been actively engaged in environmental investigations and remediation programs since 1981, beginning with the Navy Assessment and Control of Installation Pollutants (NACIP) Program. The Initial Assessment Study (IAS) (WAR, 1983) was the first investigation of potentially hazardous sites at the Base

conducted under NACIP. The IAS, which was initiated in 1981, identified areas of concern (AOCs) that might cause threats to human health and the environment as a result of past storage, handling, and disposal of hazardous materials.

The Navy's IRP was initiated in 1986, following enactment of the Superfund Amendments and Reauthorization Act (SARA) legislation. The IRP, which was implemented to follow the requirements of SARA, replaced NACIP. MCB CamLej was placed on the CERCLA National Priorities List (NPL) on October 4, 1989 (54 *Federal Register* 41015, October 4, 1989). Following that listing, an FFA between USEPA Region 4, North Carolina Department of Environment, Health, and Natural Resources (now NCDENR), and the Navy was signed in February 1991. The FFA was created under CERCLA Section 120 and was prepared to fulfill the following objectives:

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

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

To encourage public participation and to facilitate cooperation and exchange of information among parties associated with the investigation and remediation process

The annual SMP updates include the sites currently under investigation following the CERCLA process and the proposed deadlines for completion of deliverables, as specified in the FFA. The Department of the Navy set a goal for remedy-in-place or response complete at all IRP sites by the end of FY 2014.

Five-Year Reviews were completed in 1999 (Baker, 1999), 2005 (Baker, 2005), and 2010 (CH2M HILL, 2010). In 2010, 16 Operable Units (OUs) were identified at MCB CamLej for review: OUs 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 19, and 21. All ongoing RAs were determined to be protective of human health and the environment. The recommendations from the 2010 Five-Year Review are currently being implemented and the milestones and statuses are provided on **Table 2-1**. The next Five-Year Review is scheduled for 2015.

As part of the requirements established under CERCLA, an administrative record file has been established for the IRP at MCB CamLej. The administrative record is a compilation of all documents that the Navy has used to select a remedial action or removal action for a site. The administrative record also serves as the basis for any future legal review of decisions made by the Navy concerning remedial action taken at a site. A copy of the MCB CamLej administrative record file is available for review at NAVFAC Mid-Atlantic in Norfolk, Virginia. The files can also be viewed online at: http://go.usa.gov/jZi. Access to the website is available at the Onslow County Library.

The fourth update to the Community Involvement Plan (CIP), which provides information on community participation, was completed in FY 2011 (CH2M HILL, 2011) (previous versions in FY 1990, FY 1994, and FY 2006). The CIP will be updated again in five years or when a major change occurs in the ERP.

2.6.2 Munitions Response History

DoD established the MMRP, which was shortened to MRP by the Navy, under the Defense Environmental Restoration Program (DERP) in September 2001. The purpose is to address military MEC (i.e., unexploded ordnance [UXO] and waste military munitions) and munitions constituents (MC) (i.e., chemical residues of munitions) at locations that are not operational ranges. A requirement was established obligating identification, characterization, and the tracking of data on military munitions and military munitions responses at these locations. By September 2002, all locations other than operational ranges requiring a military munitions response were inventoried. DoD set a goal for remedy-in-place or response complete at all MMRP sites by the end of FY 2020.

DoD and the Navy are establishing policy and guidance for munitions and response actions under the MMRP; however, the key program drivers developed to date conclude that munitions response action will be conducted under the process outlined in NCP, as authorized by CERCLA. Therefore, the Navy and Marine Corps will work

with the MCB CamLej Partnering Team to follow the CERCLA process to address MMRP sites identified at the Base.

2.6.3 Current Site Status

A total of 94 sites have been identified under the Base IRP and MMRP (**Figure 2-3**). Of the 68 sites identified in the IRP, 30 are considered currently active (under investigation, remediation, long-term monitoring [LTM], or have land use controls [LUCs] implemented) (**Figure 2-4**), and 38 sites have been formally closed with NFA (**Figure 2-5**). A total of 22 OUs have been identified under the IRP to group sites based on geographic location or similar disposal histories (**Table 2-2**). Of the 26 sites identified in the MMRP, 17 are considered currently active (**Figure 2-6**) and 9 have been formally closed (**Figure 2-7**). **Table 2-3** provides a Basewide summary of the IRP and MMRP sites and previous investigations. **Table 2-4** lists the current status of each site and provides a list of primary documents and anticipated submittal dates for FY 2012, 2013, and 2014.

Descriptions of each IRP and MMRP site are provided in Sections 3 through 8 by phase in the CERCLA process (Section 3: PA/SI, Section, 4: ESI, Section 5:RI/FS, Section 6: PRAP/ROD, Section 7: RD/RA, and Section 8: RIP/RC). Section 9 includes six additional sites that have not been assigned IRP or MMRP site designations but are being investigated following the CERCLA process (**Figure 2-8**). Section 10 includes two sites that have been transferred from the IRP to the Base Underground Storage Tank (UST) Program for further action (**Figure 2-9**).

TABLE 2-1

Summary of Five-Year Review Recommendations and Milestones

FY 2012 Site Management Plan

MCB CamLej, North Carolina

Recommendations	IRP Sites																							Milestones	Current Status
	1	2	3	6	16	28	35	36	41	43	44	54	63	69	73	74	78	80	82	84	88	89	93	96		
Abandon wells at NFA Sites	X				X	X			X	X	X	X	X			X		X		X					2012	In progress
Evaluate LTM monitoring well network and recommend wells for abandonment			X	X			X	X							X		X		X				X		2012	Planned for 2012-2013
Update COCs and cleanup levels for LTM			X	X													X		X				X		2012	Completed as part of Five-Year Review and LTM Program 2010-2011
Update LTM program to reflect current conditions																	X								2012	Planned for 2012
Complete treatment plant evaluations				X													X		X						2012	Completed (Rhea, 2011)
Issue correction to closeout report (CH2M HILL, 2008) to include the Notice of Non-Signifcant Change (USMC, 1997)		X																							2012	Planned for 2011-2012
Evaluate metals in groundwater																	X		X						2013	Planned for 2012
Revise LUCs to reflect current conditions	X				X	X							X				X								2013	Planned for 2012
Prepare ESDs to document LUCs where waste remains in-place					X								X					X							2013	Planned for 2012-2013
Reinstitute LTM														X											2014	Planned by 2014
Complete FS, PRAP, and ROD																					X	X			2011-2014	Ongoing and RIP planned by 2014
Evaluate alternative groundwater treatment technologies				X													X		X						2015	Planned in 2015
Implement remedial action							X								X										2010-2015	Remedial actions implemented in 2010-2011 (Shaw, 2011)
Complete supplemental investigations				X										X			X		X						2012-2015	-Sites 6, 78, and 82 investigations are ongoing -Site 69 is complete (CH2M HILL, 2011)
Evaluate and mitigate vapor intrusion pathway during building and construction planning			X	X			X	X									X		X		X	X	X		Ongoing	Base Master Planning maintains current groundwater plume data in GIS and all construction projects on-Base go through environmental review.

TABLE 2-2

Summary of Sites By Operable Unit

FY 2012 Site Management Plan

MCB CamLej, North Carolina

OU	SITE NO.	SITE DESCRIPTION	PRIMARY REASON FOR OU SELECTION
1	21	Transformer Storage Lot 140	Geographic location of sites.
	24	Industrial Area Fly Ash Dump	
	78	Hadnot Point Industrial Area	
2	6	Storage Lots 201 and 203	Geographic location of sites.
	9	Fire Fighting Training Pit at Piney Green Road	
	82	Piney Green Road VOC Area	
3	48	MCAS Mercury Dump	Similar characteristic of suspected waste (mercury).
4	41	Camp Geiger Dump near Former Trailer Park	Similar characteristic of suspected waste (chemical warfare materials).
	74	Mess Hall Grease Dump Area	
5	2	Former Nursery/Day Care Center	Similar characteristics of material handled at site (pesticides).
6	36	Camp Geiger Dump Area Near Sewage Treatment Plant	Similar characteristics of material disposed (POL, waste oils, solvents) and contaminants detected (metals, VOCs, O&G). Geographic location of sites.
	43	Agan Street Dump	
	44	Jones Street Dump	
	54	Crash Crew Fire Training Burn Pit	
7	1	French Creek Liquids Disposal Area	Geographic location of sites. Similar characteristics of suspected waste (O&G, POL, and metals).
	28	Hadnot Point Burn Dump	
	30	Sneads Ferry Road Fuel Tank Sludge Area	
8	16	Former Montford Point Burn Dump	Geographic location of site.
9	65	Engineer Area Dump	Geographic location of site.
10	35	Camp Geiger Fuel Farm	Accelerated cleanup necessary to abate impacts to Brinson Creek.
11	7	Tarrawa Terrace Dump	Geographic location of sites.
	80	Paradise Point Golf Course Maintenance Area	
12	3	Old Creosote Plant	Isolated site with unique waste source.
13	63	Verona Loop Dump	Isolated site with unique waste source.
14	69	Rifle Range Chemical Dump	Isolated site with unique waste source.
15	88	Base Dry Cleaners	Similar characteristic of suspected waste (dry cleaning solvent).
16	89	Former DRMO	Geographic location of sites and adjacent surface water body. Similar characteristic of suspected waste (solvents).
	93	Building TC-942	
17	90	Building BB-9	Former UST sites with similar contamination detected in groundwater.
	91	Building BB-51	
	92	Building BB-46	
18	94	PCX Service Station	Geographic location of site, within Site 78, and similar contaminants adjacent shallow groundwater plume. Former UST site.
19	84	Building 45	Isolated site with similar waste (PCBs, POL).
20	86	Tank Area AS419-AS421 at MCAS	Site 86 was originally included under OU 6. Separate OU created due to increasing levels of VOCs.
21	73	Courthouse Bay Liquids Disposal Area	Similar characteristic of suspected wastes (POL, solvents).
22	96	Building 1817 UST	Transferred to IRP from RCRA based on chlorinated VOC plume identified.

Notes:

DRMO - Defense Reutilization and Marketing Office
O&G - Oil and Grease
OU - Operable Unit
MCAS - Marine Corps Air Station
PCBs - Polychlorinated biphenyls
POL - Petroleum, oil, lubricants
UST - Underground Storage Tank
VOCs - Volatile Organic Compounds

TABLE 2-3

Summary of Environmental Studies, Investigations, and Actions Completed

FY 2012 Site Management Plan

MCB CamLej, North Carolina

SITE NO.	OU	HISTORIC SITE USE	PRELIMINARY STUDIES: IAS (1983)	PRELIMINARY STUDIES: Confirmation Study (1984-1987)	PRELIMINARY INVESTIGATIONS	PA	SI	RI	FS	PILOT STUDY/ TREATABILITY STUDY	ADDITIONAL INVESTIGATIONS	REMOVAL ACTIONS	PRAP	SIGNED INTERIM ROD	IROD ACTION	SIGNED ROD	ROD ACTION	OU CLOSEOUT	NFA DATE
INSTALLATION RESTORATION PROGRAM SITES																			
PA Site	--	HPIA Buildings 1102, 1409, and 1512	--	--	--	February 7, 2006		--	--	--	--	--	--	--	--	--	--	--	2006
PA Site	--	MCAS New River Buildings SAS113, AS116, and AS119	--	--	--	PA/SI (February 7, 2006) Expanded SI (April 5, 2010)		--	--	--	--	--	--	--	--	--	--	--	April 7, 2010
PA Site	--	Montford Point Buildings M119 and M315	--	--	--	PA/SI (February 7, 2006) Expanded SI (April 5, 2010)		--	--	--	--	--	--	--	--	--	--	--	April 7, 2010
1	7	Artillery units disposing liquid wastes on ground surface (1940s)	X	X	- Soil Assessment (1991) - GW Study (1993) - Project Plans (December 15, 1993)	--	--	June 29, 1995	July 13, 1995	--	--	--	July 13, 1995	--	--	May 16, 1996	- LTM (1996-2001) - LUCs (2001)	September 6, 2002	May 16, 1996
2	5	Bldg. 712 used for storing, handling, and dispensing pesticides (1945-1958)	X	X	- Geophysical Invest.(1992-1994) - Limited GW Sampling (1992) - Project Plans (March 11, 1993)	--	--	June 14, 1994	June 23, 1994	--	--	- TCRA (1994)	June 23, 1994	--	--	September 15, 1994	- LTM (1995-2007) - LUCs (2001, 2002, 2008)	--	--
3	12	Creosote plant (1951-1952)	X	--	- Project Plans (October 2, 1994)	--	June 1991	June 12, 1996	August 14, 1996	--	--	--	October 23, 1996	--	--	- April 3, 1997 - Amended June 20, 2000	- Soil removal & off-site disposal (2000) - LTM (1997-present) - LUCs (2001)	--	--
4	--	Surface disposal of construction debris including asphalt, old bricks, and cement (Unknown)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	September 9, 2011
6	2	Lot 201 stored pesticides & transformers containing PCBs. Lot 203 served as a waste disposal area (1940s-1980s)	X	X	- Lot 203 soil gas survey (1989) - Project Plans (May 18, 1992)	--	--	August 20, 1993	August 20, 1993	--	- Chlorobenzene Invest. (June 2010-2012) - Vapor Intrusion Evaluation (November, 2009)	- TCRA (1994) - TCRA (1995/96) - TCRA (2011)	August 20, 1993	--	--	September 24, 1993	- Excavation & off-site disposal (1994) - LTM (1996-present) - LUCs (2001&2002)	--	--
7	11	Tarawa Terrace dump used during construction of Base housing (Closed 1972)	X	--	- Project Plans (October 2, 1994)	--	June 1991	February 6, 1996	--	--	--	--	November 27, 1996	--	--	August 21, 1997	- NFA	--	August 21, 1997
9	2	Fire fighting training exercises using flammable liquids conducted in an unlined pit (1960s-1981), asphalt-lined pit (1981-2000), & concrete-lined pit (2002-present)	X	X	- Project Plans (May 18, 1992)	--	--	August 20, 1993	August 20, 1993	--	--	RA (2000)	August 20, 1993	--	--	September 24, 1993	- NFA	--	September 24, 1993
10	--	Original Base dump used for construction debris and burn dump (prior to the 1950s)	X	--	- Project Plans (January 20, 1998) - Groundwater Investigation (2001)	--	July 13, 2001	--	--	--	--	--	--	--	--	--	--	--	May 12, 2005
12	--	Explosive ordnance disposal by burning or detonating (early 1960s)	X	--	- Project Plans (January 21, 1995) - Pre-RI Screening Study (November 1998)	--	--	--	--	--	--	--	--	--	--	--	--	--	May 8, 2001
13	--	Surface disposal of construction debris including clippings, branches, and asphalt (1944)	X	--	- Limited Site Assessment (March 20, 2008)	--	--	--	--	--	--	--	--	--	--	--	--	--	X
15	--	Burn landfill area for disposal of sewage treatment sludge, litter, metal, asphalt, sand, etc. (1948-1958)	--	--	--	April 2011		--	--	--	Surface wastes were investigated under the RCRA program (SWMU 46), during which a CSI, RFI, and IM were conducted. (1997-2007)	--	--	--	--	--	--	--	--
16	8	Burn dump for trash from surrounding housing area and disposal of small amounts of waste oil (suspected 1958-1972)	X	--	- Project Plans (October 2, 1994)	--	--	January 31, 1996	--	--	--	--	February 15, 1996	--	--	September 30, 1996	- NFA (LUCs implemented for conservativeness)	--	--
18	--	Disposal of construction materials and debris (1976-1978)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	June 18, 2011
19	--	Naval Research Lab used radionuclides for metabolic studies on animals (1947-1976)	X	--	--	Focused Site Inspection Report (February 2008) Expanded SI (October 2010)		--	--	--	--	--	--	--	--	--	--	--	February 4, 2011

'X' indicates the site was included in the specified report or has achieved the specified status.

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TABLE 2-3
Summary of Environmental Studies, Investigations, and Actions Completed
FY 2012 Site Management Plan
MCB CamLej, North Carolina

SITE NO.	OU	HISTORIC SITE USE	PRELIMINARY STUDIES IAS (1983)	PRELIMINARY STUDIES Confirmation Study (1984-1987)	PRELIMINARY INVESTIGATIONS	PA	SI	RI	FS	PILOT STUDY/ TREATABILITY STUDY	ADDITIONAL INVESTIGATIONS	REMOVAL ACTIONS	PRAP	SIGNED INTERIM ROD	IROD ACTION	SIGNED ROD	ROD ACTION	OU CLOSEOUT	NFA DATE
20	--	Incineration of burnable wastes associated with Naval Research Lab (1956-1960)	X	--	--	Focused Site Inspection Report (February 2008) Expanded SI (October 2010)		--	--	--	--	--	--	--	--	--	--	--	February 4, 2011
21	1	Pit in northern portion of site used as drainage receptor for oil from transformers (1950-1951). Pesticide mixing and washdown area for equipment used for pesticide application (1958-1977)	X	X	- Project Plans (March 11, 1993)	--	--	June 23, 1994	July 22, 1994	--	--	--	July 22, 1994	--	--	September 15, 1994	- Excavation & off-site treatment (1995) - LUCs (2001)	--	--
23	--	Storage of insecticides and herbicides (1958-1977)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	September 9, 2011
24	1	Disposal of fly ash, cinders, solvents, used paint stripping compounds, sewage sludge, and water treatment spiractor sludge (late 1940s-1980)	X	X	- Project Plans (March 11, 1993)	--	--	June 23, 1994	July 22, 1994	--	--	--	July 22, 1994	--	--	September 15, 1994	- LTM (1996-1998)	--	September 15, 1994
25	--	Base incinerator burning trash and classified materials (1940-1960)	X	--	--	Focused Site Inspection Report (February 2008) Expanded SI (October 2010)		--	--	--	--	--	--	--	--	--	--	--	February 4, 2011
28	7	Burn area for disposal of a variety of solid wastes (industrial waste, trash, oil-based paint, and construction debris) generated on Base and covered with soil (1946-1971)	X	X	- Groundwater Study (1993) - Project Plans (December 15, 1993)	--	--	June 29, 1995	July 13, 1995	--	- Additional delineation (2001)	--	July 13, 1995	--	--	May 16, 1996	- LTM (1996-2001) - LUCs (2001)	September 6, 2002	--
30	7	Used by a private contractor as a cleaning area for emptied fuel storage tanks from other locations. Tanks stored leaded gasoline. (1970s)	X	X	- Groundwater Study (1993) - Project Plans (December 15, 1993)	--	--	June 29, 1995	--	--	--	--	July 13, 1995	--	--	May 16, 1996	- NFA	--	May 16, 1996
35	10	Camp Geiger Fuel Farm housing five 15,000-gallon ASTs, underground distribution lines, pump house, fueling pad, distribution island, & OWS (1945-1995)	X	X	- UST Site Characterization (1992) - Project Plans (December 20, 1993)	--	--	- IRA RI for Soil (July 20, 1994) - Comprehensive RI (May 31, 1996) - Final Supplemental RI (March 31, 2009)	- IRA FS for Soil (July 20, 1994) - IRA FS for Surficial GW (June 13, 1995) - Final FS (March 31, 2009)	- Air sparge trench (April 14, 1997) - Modified Fenton's/ Permanganate Pilot Study (2003-2005) - Pilot Study Report (March 29, 2006)	- Groundwater Investigations (1997-2007) - LTM (1999-2004) - Technology Evaluation (February 3, 2004) - EE/CA for GW (January 23, 2007) - Vapor Intrusion Evaluation (November, 2007)	- NTCRA (2007)	- PRAP for Soil (July 20, 1994) - PRAP for GW (June 8, 1995) - Final PRAP (April 14, 2009)	- September 15, 1994 (soil) - September 22, 1995 (shallow gw)	- Soil removal and disposal (1995-1997) - In-situ air sparging (1998-present)	November, 2009	- In situ air sparging - LUCs (2010) - LTM (2011)	--	--
36	6	Disposal area for mixed industrial wastes including trash, waste oils, solvents, and hydraulic fluids. Some materials burned before burial. (1940s-1950s).	X	X	- Project Plans (December 2, 1994)	--	--	August 22, 1996	- FS (June 24, 1998) - Revised FS (June 19, 2002)	--	- Additional GW Sampling (2000) - EE/CA (October 22, 2002) - Action Memo (November 20, 2002) - Response Action WP (February 2003) - Response Action Closeout Report (October 2004)	- TCRA Design (April 1997) - TCRA (June 1997) - NTCRA (2003)	- PRAP (June 18, 1998) - Revised PRAP (June 18, 2002)	--	--	July 6, 2005	- LTM (1998-present) - LUCs (September 2005)	IRACR (August 2007)	--
37	--	Surface disposal of wastes including motor parts, garbage, and wood (1950-1951)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
38	--	Surface disposal of construction debris and branches (Unknown)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	September 9, 2011
40	--	Disposal of auto parts and metal (1969-unknown)	X	--	--	February 28, 2009		--	--	--	--	--	--	--	--	--	--	--	August 12, 2010
41	4	Open burn dump containing construction debris, POL wastes, mirex, solvents, batteries, ordnance, and chemical training agents. (1946-1970)	X	X	- Project Plans (December 2, 1993)	--	--	May 8, 1995	May 8, 1995	--	--	--	May 8, 1995	--	--	December 5, 1995	- LTM (1997-2004) - LUCs (2001&2002)	RACR (July 2006)	December 5, 1995

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MCB CamLej, North Carolina

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42	--	Surface disposal of debris including trees, tree stumps, and boards (1950-1960)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	September 9, 2011
43	6	Dump receiving inert material (i.e., const. debris and trash) and sludge from a former sewage disposal facility. (Unknown)	X	--	- Project Plans (December 2, 1994)	--	1991	August 22, 1996	- Draft FS (June 24, 1998) - Revised FS (June 19, 2002)	--	- EE/CA (October 22, 2002) - Action Memo (November 20, 2002) - Response Action WP (February 2003) - Response Action Closeout Report (October 2004)	- IRA (2003)	- PRAP (June 18, 1998) - Revised PRAP (June 18, 2002)	--	--	July 6, 2005	- LUCs (2005)	IRACR (August 2007)	--
44	6	Active dump site receiving debris, cloth, lumber, and paint cans (1950s)	X	--	- Project Plans (December 2, 1994)	--	1991	August 22, 1996	- FS (June 24, 1998) - Revised FS (June 19, 2002)	--	--	--	- PRAP (June 18, 1998) - Revised PRAP (June 18, 2002)	--	--	July 6, 2005	- LUCs (2007)	IRACR (August 2007)	--
46	--	Disposal of construction and demolition debris (1958-1962)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	June 18, 2011
48	3	Mercury drained from radar units and disposed in small quantities in wooded area near Bldg. AS-804 (1956-1966)	X	X	- Supplemental Characterization (1991) - Project Plans (December 2, 1993)	--	--	June 21, 1993	--	--	--	--	June 21, 1993	--	--	September 10, 1993	- NFA	--	September 10, 1993
49	--	Disposal of paint cans (Unknown)	X	--	- Confirmatory Site Assessment (Draft 2010)	March 2011		--	--	--	--	--	--	--	--	--	--	--	--
51	--	Empty container disposal, including paint cans and hydraulic fluid (1967-1968)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	June 18, 2011
53	--	Liquid wastes sprayed on unimproved dirt roads to control dust. Waste mixture reportedly contained crankcase waste oil, JP fuels, and paint thinners (1970-1975)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	September 9, 2011
54	6	Fire training burn pit using JP-fuel, stored in a nearby UST. Nearby OWS used for temporary storage and collection of spent fuel. (mid 1950s-1975).	X	X	- Project Plans (December 2, 1994)	--	--	August 22, 1996	- FS (June 24, 1998) - Revised FS (June 19, 2002)	--	- LTM (1998-2002)	- Burn pit and contaminated soil removed (2000)	- PRAP (June 18, 1998) - Revised PRAP (June 18, 2002)	--	--	July 6, 2005	- LUCs (2005)	IRACR (August 2007)	--
55	--	Disposal area for barrels, tires, trash, metal planking, and telephone poles (1950s-1960s)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	September 9, 2011
61	--	Disposal area for wastes generated during bivouac exercises (Unknown)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	September 9, 2011
62	--	Disposal area for wastes generated during bivouac exercises (Unknown)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	September 9, 2011
63	13	Waste disposal generated during training exercises (Unknown)	X	--	- Project Plans (September 1, 1995)	--	January 31, 1994	October 18, 1996	--	--	--	--	November 1, 1996	--	--	April 3, 1997	- NFA (LUCs implemented for conservativeness, 2001&2002)	--	--
65	9	Battery acid and POL disposal, burning construction debris (1958-1972)	X	--	- Project Plans (March 7, 1995)	--	1991	November 7, 1997	--	--	- Post-RI Sampling (2001)	--	July 11, 2001	--	--	September 30, 2001	- NFA	--	September 30, 2001
66	--	Vehicle maintenance area during training exercises (Unknown)	X	--	- Confirmatory Site Assessment (April 1, 2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	September 9, 2011
67	--	TNT disposal by burning in 2 3 foot deep pits (1951)	X	--	- Confirmatory Site Assessment (November 2010)	--	--	--	--	--	--	--	--	--	--	--	--	--	November 15, 2010
68	--	Garbage, building debris, waste treatment sludge disposal. (1942-1972).	X	--	- Project Plans (January 21, 1995) - Pre-RI Screening Study (November 1998)	--	--	--	--	--	--	--	--	--	--	May 8, 2001	- LUCs implemented for conservativeness (2001&2002)	--	--

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SITE NO.	OU	HISTORIC SITE USE	PRELIMINARY STUDIES IAS (1983)	PRELIMINARY STUDIES Confirmation Study (1984-1987)	PRELIMINARY INVESTIGATIONS	PA	SI	RI	FS	PILOT STUDY/ TREATABILITY STUDY	ADDITIONAL INVESTIGATIONS	REMOVAL ACTIONS	PRAP	SIGNED INTERIM ROD	IROD ACTION	SIGNED ROD	ROD ACTION	OU CLOSEOUT	NFA DATE
69	14	Chemical waste disposal including PCBs, solvents, pesticides, calcium hypochlorite. Possible drums containing cyanide and other training agents known as CWM. (1950-1976)	X	X	- Project Plans (December 2, 1993)	--	--	October 4, 1999	--	- In-well Aeration Pilot Study (1996-1998) - Treatability Study Report (January 30, 1998)	- Supplemental Investigation (2011)	--	May 1998	June 29, 2000	- LTM (1998-2005) - LUCs (2001)	--	--	--	--
73	21	Waste oil disposal approximately 400,000 gallons. Waste battery acid disposal approximately 20,000 gallons. (1946-1977)	X	X	- UST Investigations (1991-1993) - Preliminary Investigation (1994) - Project Plans (March 7, 1995)	--	--	-RI (November 7, 1997) - Amended RI (October 30, 2006) - Supplemental RI (March 31, 2009)	- FS (March 31, 2009)	- Air sparging (2002) - Hydrogen Sparging (2003-2006) - Air/ozone Sparging (2007)	- GW modeling (April 1998) - LTM (2000-2005) - NAE (January 7, 2002) - Tech Eval (May 8, 2003) - Vapor Intrusion Evaluation (November, 2009)	--	April 14, 2009	--	--	ROD (November 2009)	- in situ air sparging - ERD injections (2011) - LTM (2011) - LUCs (2010)	--	--
74	4	Grease, pesticide, chemical training agents disposal (Early 1950s to early 1960s)	X	X	- Project Plans (December 2, 1993)	--	--	May 8, 1995	May 8, 1995	--	--	--	May 8, 1995	--	--	December 5, 1995	- LTM (1997-1998) - LUCs (2001&2002)	RACR (July 2006)	--
75	--	Estimated 75-100 buried drums thought to contain tear gas. Chloroform., carbon tetrachloride, benzene, and chloropicrin may also be present. (Early 1950s)	X	--	- Project Plans (January 21, 1995) - Pre-RI Screening Study (November 24, 1998)	--	--	--	--	--	--	--	--	--	--	--	--	--	May 8, 2001
76	--	Approximately 25-75 buried drums likely containing tear gas, chloroform, carbon tetrachloride, benzene, and chloropicrin. (1949)	X	--	- Project Plans (January 21, 1995) - Pre-RI Screening Study (November 24, 1998)	--	--	--	--	--	--	--	--	--	--	--	--	--	May 8, 2001
78	1	Petroleum and solvent related spills and leaks (Beginning in 1940s)	X	X	- GW Study at Hadnot Point Fuel Farm (1990) - Supplemental Characterization Study (1990/1991) - Project Plans (March 11, 1993)	--	--	- IRA RI (April 16, 1992) - RI (June 23, 1994)	- IRA FS (April 16, 1992) - FS (July 22, 1994)	- ORC/HRC GW Pilot Study (2003-2005)	- NAE (2002) - Supplemental Investigation (June 2002) - Technology Evaluation (April 16, 2002) - Vapor Intrusion Evaluation (November, 2009)	--	- IRA PRAP (May 8, 1992) - PRAP (July 22, 1994)	September 23, 1992	- GW Pump & Treat	September 15, 1994	- Continued pump & treat (1995-present) - LTM (1995-present) - LUCs (2001&2002)	--	--
80	11	Golf course maintenance, pesticides (Unknown to present)	--	--	- Project plans (October 2, 1994)	--	June 1991	April 5, 1996	--	--	--	- TCRA WP Soils (April 10, 1996) - Closeout Report (September 9, 1996)	November, 1996	--	--	August 21, 1997	- NFA (LUCs implemented for conservativeness, 2007)	--	--
82	2	Storage, disposal, and handling of potentially hazardous waste and material. (prior to late 1980s).	--	--	- Project Plans (May 18, 1992)	--	June 1991	August 20, 1993	August 20, 1993	- ERD Pilot Study (2007)	- Vapor Intrusion Evaluation (November, 2009)	--	August 20, 1993	--	--	September 24, 1993	- Soil excavation (1994 & 1995) - SVE System (1996) - GW Pump & treat (1996-present) - LTM (1996-present) - LUCs (2001)	--	--
84	19	Electrical powerhouse, transformers containing PCBs (possible buried), PCB dielectric oil (Unknown) Building 45 maintenance facility (1965-early 1990s)	--	--	- Pre-RI Screening Study (November 24, 1998) - Concrete and SW sampling (1999) - Preliminary EE/CA (1999) - UST Removal (1999) - Project Plans (June 1, 2001)	--	--	June 4, 2002	- FS (June 18, 2002) - Amended FS (March 31, 2008)	--	- Final EE/CA (October 22, 2002) - Action Memo (October 2002) - CAP (October 10, 2003)	- Phase I NTCRA (2002) - Phase I Closeout Report (January 15, 2003) - Phase II NTCRA (2003/2004) - Phase II Closeout Report (2005) - Phase III NTCRA (2006) -Final Construction Closeout Report (November 30, 2007)	March 31, 2008	--	--	January 21, 2009	- Soil Removal (2002-2007) - LUCs (2009)	--	--
85	--	Battery disposal (1950s)	--	--	- Project Plans (January 21, 1995) - Pre-RI Screening Study (November 24, 1998)	--	--	--	--	--	- EE/CA (September 10, 1999) - Action Memo (September 17, 1999) - Groundwater Monitoring (2001-2005) - ESI (2011)	- TCRA (2000) - Final Closeout Report (December 2000)	--	--	--	--	--	--	August 11, 2011
86	20	Petroleum products storage (1954-1988). Three 25,000 gallon AST used for No. 6 fuel/waste oil storage (1954-1979)	--	--	- Preliminary Site Investigation (November 1990) - AST Removed (1992) - Site Assessment (1992) - Project Plans (December 12, 1994)	--	--	- RI (August 22, 1996) - Amended RI (May 21, 2003) - Expanded SRI (February 24, 2011)	June 24, 1998	- Air sparge pilot study (2005-2006) - Pilot Study Report (September 5, 2006)	- LTM (1998-2005)	--	June 18, 1998	--	--	--	--	--	--

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TABLE 2-3
Summary of Environmental Studies, Investigations, and Actions Completed
FY 2012 Site Management Plan
MCB CamLej, North Carolina

SITE NO.	OU	HISTORIC SITE USE	PRELIMINARY STUDIES: IAS (1983)	PRELIMINARY STUDIES: Confirmation Study (1984-1987)	PRELIMINARY INVESTIGATIONS	PA	SI	RI	FS	PILOT STUDY/ TREATABILITY STUDY	ADDITIONAL INVESTIGATIONS	REMOVAL ACTIONS	PRAP	SIGNED INTERIM ROD	IROD ACTION	SIGNED ROD	ROD ACTION	OU CLOSEOUT	NFA DATE
87	--	Hospital waste materials including hypodermic needles and chlorine-based white powder (1986)	--	--	- Project Plans (January 21, 1995) - Pre-RI Screening Study (November 24, 1998)	--	--	--	--	--	--	--	--	--	--	--	--	--	May 8, 2001
88	15	- Base Dry Cleaners (1940s-2004) - Varsol stored in USTs (1940s-1970s) - PCE stored in ASTs (1970-1980s)	--	--	- Project Plans (February 21, 1997)	--	--	- Focused RI (May 15, 1998) - RI (March 2008)	- Draft FS (February 2008)	- SEAR Pilot Study (1999) - RABITT Pilot Study (2001) - ISCO and ERD Treatability Study (2010) - ISCO and ERD Pilot Study Monitoring (2011)	- DNAPL Investigation (1998) - SEAR Investigation Report (January 25, 2000) - Supplemental Site Investigation (2002/2003) - EE/CA (September 24, 2004) - Vapor Intrusion Evaluation (November ,2009)	- NTCRA (2005)	--	--	--	--	--	--	--
89	16	- Base Motor Pool (until 1988) - DRMO storing scrap and surplus metals, electronic equipment, vehicles, rubber tires, and fuel bladders (1988-2000)	--	--	- Project Plans (February 20, 1997)	--	--	- RI (June 15, 1998) - Comprehensive RI (May 29, 2008) - BERA Addendum (December 17, 2008)	--	- ERH Pilot Study (2003/2004) - Pilot Study Report (July 2005) - Treatability Study (February, 2008)	- Action Memo (June 9, 2000) - Remedial Design (June 16, 2000) - Supplemental Inv. (2002/2003) - EE/CA - GW (December 18, 2002) - LTM (1999-2005) - Vapor Intrusion Evaluation (November, 2009)	- TCRA (2000) - EE/CA (July 2007) and Action Memo (May 2008) - EE/CA (July 2009) - Source Area NTCRA (March 2010) - Ecological NTCRA (July 2010)	--	--	--	--	--	--	--
90	17	Three heating oil USTs, toluene (Unknown)	--	--	- UST Removal (1993) - Project Plans (June 31, 1996)	--	--	April 27, 2001	--	--	--	--	July 11, 2001	--	--	September 30, 2001	- NFA	--	September 30, 2001
91	17	Two waste oil USTs (unknown-1992)	--	--	- UST Removal (1992) - Project Plans (June 31, 1996)	--	--	April 27, 2001	--	--	- Post-RI Monitoring (2000/2001) - Supplemental GW Report (2001)	--	July 11, 2001	--	--	September 30, 2001	- NFA	--	September 30, 2001
92	17	Gasoline UST (1980-1994)	--	--	- UST Removal (1994) - Project Plans (June 31, 1996)	--	--	April 27, 2001	--	--	- Post-RI Monitoring (2000/2001)	--	July 11, 2001	--	--	September 30, 2001	- NFA	--	September 30, 2001
93	16	Heating oil UST (unknown to 1993)	--	--	- UST investigation (1995) - Geotechnical Investigation (1995/1996) - Project Plans (February 20, 1997)	--	--	June 15, 1998	November 14, 2005	--	- Additional Plume Char. (April 2, 2002) - LTM (1999-2005) - NAE (2001) - Supplemental Site Investigation (2005) - Vapor Intrusion Evaluation (November, 2009)	--	February 9, 2006	--	--	October 2, 2006	- Permanganate injection (2006/2007) - LTM (2008 present) - LUCs (2006)	IRACR (2009)	--
94	18	PCX Service Station containing two 10,000-gallon and two 30,000-gallon gasoline USTs (1950s-1995)	--	--	- USTs/contaminated soil removed (1995) - GW Investigation (September 2000) - Project Plans (April 16, 2004)	--	--	September 9, 2005	--	--	--	--	January 30, 2006	--	--	August 26, 2006	- NFA	--	August 26, 2006
95	--	Livestock dipping vats (1906-1961)	--	--	- Initial Assessment (2004) - Site Investigation WP (February 6, 2006)	--	June 2007	--	--	--	--	NTCRA Report (August 2010)	--	--	--	--	--	--	August 25, 2010
96	--	Former 300-gallon waste oil UST	--	--	-	- UST removal and investigations (1997) - Confirmatory Sampling Investigation (2005)		- RFI and Amended RFI (2005 & 2006)	- CMS (2007)	--	-Additional groundwater delineation (2009)	--	--	--	--	--	--	--	--

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Summary of Environmental Studies, Investigations, and Actions Completed
FY 2012 Site Management Plan
MCB CamLej, North Carolina

SITE NO.	OU	HISTORIC SITE USE	PRELIMINARY STUDIES: IAS (1983)	PRELIMINARY STUDIES: Confirmation Study (1984-1987)	PRELIMINARY INVESTIGATIONS	PA	SI	RI	FS	PILOT STUDY/ TREATABILITY STUDY	ADDITIONAL INVESTIGATIONS	REMOVAL ACTIONS	PRAP	SIGNED INTERIM ROD	IROD ACTION	SIGNED ROD	ROD ACTION	OU CLOSEOUT	NFA DATE
MILITARY MUNITIONS RESPONSE PROGRAM SITES																			
UXO-01	--	Former Live Hand Grenade Course (1945-1946)	--	--	--	March 2009		--	--	--	--	--	--	--	--	--	--	--	--
UXO-01	--	D-6 50-ft Indoor Rifle and Pistol Range (before 1954)	--	--	--	October 2009		--	--	--	--	EE/CA (October 2010)	--	--	--	--	--	--	--
UXO-01	--	B-3 Gas Chamber (1953-1958)	--	--	--	July 2009		--	--	--	--	--	--	--	--	--	--	--	--
UXO-02	--	Explosive range (1973-2002)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
UXO-03	--	Practice hand grenade course (1953-1959)	--	--	--	Draft (April 2009)		--	--	--	--	--	--	--	--	--	--	--	--
UXO-04	--	Bulldozer uncovered a live WWII MK-II high-explosive hand grenade during excavation (between 1974 and 1976)	--	--	Expanded SI Work Plan (October 2005) MEC Work Plan (November 2006) Phase II Expanded SI Work Plan (August 2007)	February 2009		--	--	--	--	--	--	--	--	--	--	--	February 4, 2009
UXO-05	--	Miniature Anti-Tank range using .22 caliber small arms to fire at a moving target (1942-1944) Gas chamber using chemical warfare training agents (1953-1958)	--	--	--	July 2009		--	--	--	--	--	--	--	--	--	--	--	July 2, 2009
UXO-06	--	Range using small arms, 3.5-in practice rockets, rifle grenades, hand grenades (1953-1977)	--	--	--	Focused PA/SI (May 2007) Focused SI (2008) Draft (February 2009)		--	--	--	--	--	--	--	--	--	--	--	--
UXO-07	--	Practice hand grenade course (1953)	--	--	--	June 2011		--	--	--	--	--	--	--	--	--	--	--	--
UXO-08	--	Bazooka range (1970s-1990s). Gas chamber using tear gas (1953-1961).	--	--	--	Limited SI (2006) PA/SI 2011		--	--	--	--	--	--	--	--	--	--	--	--
UXO-09	--	Triangulation range using service munitions and automatic rifles (~1953)	--	--	--	July 2009		--	--	--	--	--	--	--	--	--	--	--	June 25, 2009
UXO-10	--	Range using flame throwers and small arms blank ammunition (1970-1977)	--	--	--	July 2011		--	--	--	--	--	--	--	--	--	--	--	--
UXO-11	--	Practice hand grenade course (1953)	--	--	--	June 2011		--	--	--	--	--	--	--	--	--	--	--	--
UXO-12	--	Small arms range, including .33 caliber weapons (1945-1946)	--	--	--	April 2011		--	--	--	--	--	--	--	--	--	--	--	March 31, 2011
UXO-13	--	Maneuver training area used to train troops in non-live fire operations (Unknown)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	March 24, 2004
UXO-14	--	Indoor pistol range using small caliber weapons (1950-1996), and gas chamber using tear gas (1950-1954)	--	--	--	April 2011		--	--	--	--	--	--	--	--	--	--	--	--
UXO-15	--	1000-inch small arms range used for service and target practice (1945-1946)	--	--	--	2009		--	--	--	--	--	--	--	--	--	--	--	March 29, 2010
UXO-16	--	Gun position training ground for 8-inch Howitzers, 4.2 inch mortars, 175 mm guns, and 120 mm mortars. (Unknown)	--	--	--	August 2009		--	--	--	--	--	--	--	--	--	--	--	July 30, 2011
UXO-17	--	Firing Position used for military training (1950-1985)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
UXO-18	--	Small arms ranges (1950-1961)	--	--	--	April 2011		--	--	--	--	--	--	--	--	--	--	--	March 31, 2011
UXO-19	--	Grenade ranges (1950s-1970s)	--	--	--	October 2010		--	--	--	--	--	--	--	--	--	--	--	--

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TABLE 2-3

Summary of Environmental Studies, Investigations, and Actions Completed

FY 2012 Site Management Plan

MCB CamLej, North Carolina

SITE NO.	OU	HISTORIC SITE USE	PRELIMINARY STUDIES		PRELIMINARY INVESTIGATIONS	PA	SI	RI	FS	PILOT STUDY/ TREATABILITY STUDY	ADDITIONAL INVESTIGATIONS	REMOVAL ACTIONS	PRAP	SIGNED INTERIM ROD	IROD ACTION	SIGNED ROD	ROD ACTION	OU CLOSEOUT	NFA DATE
			IAS (1983)	Confirmation Study (1984-1987)															
UXO-20	--	1,000-inch and A-1, 50-foot .22 caliber ranges (1940s-1950s)	--	--	April 2011	Draft (November 2010)		--	--	--	--	--	--	--	--	--	--	--	September 14, 2011
UXO-21	--	Gas Chamber (2nd Mar Div) (1970s)	--	--	--	--	Focused SI (February 2008)	--	--	--	--	--	--	--	--	--	--	--	--
UXO-22	--	Possible disposal trenches (unknown)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
UXO-23	--	D-9 skeet range (1953-2011)	--	--	--	Focused SI (February 2008) Focused PA/SI (April 2010) Expanded SI (October 2010)		--	--	--	--	Draft EE/CA (June 2010)	--	--	--	--	--	--	--
UXO-24	--	Ammunition Burial Site (2010)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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TABLE 2-4

Sites and Status for FY 2012, FY 2013, and FY 2014

FY 2012 Site Management Plan

MCB CamLej, North Carolina

SITE NO.	OU	SITE DESCRIPTION	CURRENT SITE STATUS	FY 2012 Reports		FY 2013 Reports		FY 2014 Reports	
				Document	Anticipated Submittal Date	Document	Anticipated Submittal Date	Document	Anticipated Submittal Date
INSTALLATION RESTORATION PROGRAM SITES									
PA Site	--	HPIA Bldgs 1120 (Auto Hobby Shop), 1409 (Carpenter/Boat Repair), & 1512 (Auto Repair Shop)	NFA	--	--	--	--	--	--
PA Site	--	MCAS New River Buildings SAS113 (Auto Hobby Shop), AS116 (Vehicle Maintenance Shop), & AS119 (Vehicle Maintenance Shop)	NFA	--	--	--	--	--	--
PA Site	--	Montford Point Buildings M119 (Weapons/Auto Maintenance) & M315 (Laundry Pickup Facility)	NFA	--	--	--	--	--	--
1	7	French Creek Liquids Disposal Area	RIP (LUC)	--	--	--	--	--	--
2	5	Former Nursery/Day Care Center	RIP (LUC)	--	--	--	--	--	--
3	12	Old Creosote Plant	RIP (LTM and LUC)	FY 2011 Annual LTM Report	July 2012	FY 2012 Annual LTM Report	July 2013	FY 2013 Annual LTM Report	July 2014
4	--	Sawmill Road Construction Debris Dump	NFA	--	--	--	--	--	--
6	2	Storage Lots 201 and 203	RIP (LTM and LUC)	**Chlorobenzene Summary Report** FY 2011 Annual LTM Report	**March 2012** July 2012	FY 2012 Annual LTM Report	July 2013	FY 2013 Annual LTM Report	July 2014
7	11	Tarrawa Terrace Dump	NFA	--	--	--	--	--	--
9	2	Fire Fighting Training Pit at Piney Green Road	NFA	--	--	--	--	--	--
10	--	Original Base Dump	NFA	--	--	--	--	--	--
12	--	Explosive Ordnance Disposal	NFA	--	--	--	--	--	--
13	--	Golf Course Construction Debris Dump	NFA	--	--	--	--	--	--
15	--	Montford Point Burn Landfill Area	RI/FS	**RI** **FS**	**January 2012** **August 2012**	**PRAP** **ROD**	**October 2012** **March 2013**	**RD/RA** **--**	**January 2014** **--**
16	8	Former Montford Point Burn Dump	RIP (LUC)	--	--	--	--	--	--
18	--	Watkins Village (E) Site	NFA	--	--	--	--	--	--
19	--	Naval Research Lab Dump	NFA	--	--	--	--	--	--
20	--	Naval Research Lab Incinerator	NFA	--	--	--	--	--	--
21	1	Transformer Storage Lot 140	RIP (LUC)	--	--	--	--	--	--
23	--	Roads and Grounds Building 1105	NFA	--	--	--	--	--	--
24	1	Industrial Area Fly Ash Dump	NFA	--	--	--	--	--	--
25	--	Base Incinerator	NFA	--	--	--	--	--	--
28	7	Hadnot Point Burn Dump	RIP (LUC)	--	--	--	--	--	--
30	7	Sneads Ferry Road Fuel Tank Sludge Area	NFA	--	--	--	--	--	--
35	10	Camp Geiger Fuel Farm	RIP (LTM and LUC)	FY 2011 Annual LTM Report	July 2012	FY 2012 Annual LTM Report	July 2013	FY 2013 Annual LTM Report	July 2014
36	6	Camp Geiger Dump Area Near Sewage Treatment Plant	RIP (LTM and LUC)	FY 2011 Annual LTM Report	July 2012	FY 2012 Annual LTM Report	July 2013	FY 2013 Annual LTM Report	July 2014
37	--	Camp Geiger Area Surface Dump	PA/SI	--	--	PA/SI Report	November 2012	--	--
38	--	Camp Geiger Construction Dump	NFA	--	--	--	--	--	--
40	--	Camp Geiger Area Borrow Pit	NFA	--	--	--	--	--	--
41	4	Camp Geiger Dump near Former Trailer Park	RIP (LUC)	--	--	--	--	--	--
42	--	Building 705 BOQ Dump	NFA	--	--	--	--	--	--
43	6	Agan Street Dump	RIP (LUC)	--	--	--	--	--	--
44	6	Jones Street Dump	RIP (LUC)	--	--	--	--	--	--
46	--	MCAS Main Gate Dump	NFA	--	--	--	--	--	--
48	3	MCAS Mercury Dump	NFA	--	--	--	--	--	--
49	--	MCAS Suspected Minor Dump	RI/FS	**RI** **FS**	**January 2012** **August 2012**	**PRAP** **ROD**	**October 2012** **March 2013**	**RD/RA** **--**	**January 2014** **--**
51	--	MCAS Football Field	NFA	--	--	--	--	--	--
53	--	MCAS Warehouse Building 3525 Area	NFA	--	--	--	--	--	--
54	6	Crash Crew Fire Training Burn Pit	RIP (LUC)	--	--	--	--	--	--
55	--	Air Station East Perimeter Dump	NFA	--	--	--	--	--	--
61	--	Rhodes Point Road Dump	NFA	--	--	--	--	--	--
62	--	Race Course Area Dump	NFA	--	--	--	--	--	--
63	13	Verona Loop Dump	RIP (LUC)	--	--	--	--	--	--
65	9	Engineer Area Dump	NFA	--	--	--	--	--	--
66	--	AMTRAC Landing Site and Storage Area	NFA	--	--	--	--	--	--
67	--	Engineer's TNT Burn Site	NFA	--	--	--	--	--	--
68	--	Rifle Range Dump	RIP (LUC)	--	--	--	--	--	--

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FY 2012 Site Management Plan

MCB CamLej, North Carolina

SITE NO.	OU	SITE DESCRIPTION	CURRENT SITE STATUS	FY 2012 Reports		FY 2013 Reports		FY 2014 Reports	
				Document	Anticipated Submittal Date	Document	Anticipated Submittal Date	Document	Anticipated Submittal Date
69	14	Rifle Range Chemical Dump	RI/FS	**FS**	**January 2012**	**ROD**	**December 2012**	--	--
				PRAP	**July 2012**	**RD/RA**	**September 2013**	**--**	**--**
73	21	Courthouse Bay Liquids Disposal Area	RIP (LTM and LUC)	FY 2011 Annual LTM Report	July 2012	FY 2012 Annual LTM Report	July 2013	FY 2013 Annual LTM Report	July 2014
74	4	Mess Hall Grease Dump Area	RIP (LUC)	--	--	--	--	--	--
75	--	MCAS Basketball Court Site	NFA	--	--	--	--	--	--
76	--	MCAS Curtis Road Site	NFA	--	--	--	--	--	--
78	1	Hadnot Point Industrial Area	RIP (LTM and LUC)	FY 2011 Annual LTM Report	July 2012	FY 2012 Annual LTM Report	July 2013	FY 2013 Annual LTM Report	July 2014
80	11	Paradise Point Golf Course Maintenance Area	RIP (LUC)	--	--	--	--	--	--
82	2	Piney Green Road VOC Area	RIP (LTM and LUC)	FY 2011 Annual LTM Report	July 2012	FY 2012 Annual LTM Report	July 2013	FY 2012 Annual LTM Report	July 2013
84	19	Building 45	RIP (LUC)	--	--	--	--	--	--
85	--	Camp Johnson Battery Dump	NFA	--	--	--	--	--	--
86	20	Tank Area AS419-AS421 at MCAS	RI/FS	Treatability Study	March 2012	**PRAP**	**November 2012**	**RD/RA**	**January 2014**
				FS	**July 2012**	**ROD**	**March 2013**	**--**	**--**
87	--	MCAS Officers' Housing Area	NFA	--	--	--	--	--	--
88	15	Base Dry Cleaners	RI/FS	**FS**	**April 2012**	**ROD**	**January 2013**	**RD/RA**	**June 2013**
				PRAP	**August 2012**	**RD/RA**	**September 2013**	**--**	**--**
89	16	Former DRMO	RI/FS	**FS**	**December 2011**	**RD/RA**	**January 2013**	**--**	**--**
				PRAP	**May 2012**	**--**	**--**		
				ROD	**September 2012**	--	--		
90	17	Building BB-9	NFA	--	--	--	--	--	--
91	17	Building BB-51	NFA	--	--	--	--	--	--
92	17	Building BB-46	NFA	--	--	--	--	--	--
93	16	Building TC-942	RIP (LTM and LUC)	FY 2011 Annual LTM Report	July 2012	FY 2012 Annual LTM Report	July 2013	FY 2013 Annual LTM Report	July 2014
94	18	PCX Service Station	NFA	--	--	--	--	--	--
95		Dipping Vat Sites	NFA	--	--	--	--	--	--
96	22	Building 1817 UST	RI/FS	--	--	--	--	**UFP-SAP RI**	**September 2014**

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				Document	Anticipated Submittal Date	Document	Anticipated Submittal Date	Document	Anticipated Submittal Date
MILITARY MUNITIONS RESPONSE PROGRAM SITES									
UXO-01	--	Former Live Hand Grenade Course (ASR# 2.23)	ESI	Expanded SI Report	February 2012	--	--	--	--
UXO-01	--	D-6, 50-ft Indoor Rifle and Pistol Range (ASR# 2.64)	PA/SI	NTCRA Report	September 2012	--	--	--	--
UXO-01		B-3, Gas Chamber (ASR# 2.79a, 2.79b, and 2.79c)	ESI	Expanded SI Report	February 2012	--	--	--	--
UXO-02	--	Unnamed Explosive Range (ASR# 2.201)	ESI	Expanded SI Report	February 2012	--	--	--	--
UXO-03	--	Practice Hand Grenade Course (ASR# 2.78a and 2.78b)	PA/SI	PA/SI Report	December 2011	--	--	--	--
UXO-04	--	Knox Trailer Park	NFA	--	--	--	--	--	--
UXO-05	--	Miniature Anti-Tank Range (ASR# 2.7a, 2.7b, and 2.7c)	NFA	--	--	--	--	--	--
UXO-06	--	Fortified Beach Assault Area (ASR# 2.65)	RI/FS	PA/SI Report	December 2011	**RI/FS**	**September 2013**	**PRAP/ROD**	**June 2014**
UXO-07	--	Practice Hand Grenade Course (ASR# 2.77 a and 2.77b)	ESI	Expanded SI Report	February 2012	--	--	--	--
UXO-08	--	2.36" Bazooka Range, Base CS Chamber and NBC Training Trail (ASR# 2.182), and D-7 Gas Chamber (ASR# 2.80)	PA/SI	PA/SI Report	December 2011	--	--	--	--
UXO-09	--	F-9, Triangulation Range (ASR# 2.83)	NFA	--	--	--	--	--	--
UXO-10	--	D-11A, Flame Tank and Flame Thrower Range (ASR# 2.136)	ESI	Expanded SI Report	February 2012	--	--	--	--
UXO-11	--	B-5, Practice Hand Grenade Course (ASR# 2.81)	ESI	Expanded SI Report	February 2012	--	--	--	--
UXO-12	--	1,000-inch Range (ASR# 2.5)	NFA	--	--	--	--	--	--
UXO-13	--	Naval Regional Medical Center	NFA	--	--	--	--	--	--
UXO-14	--	Indoor Pistol Range (ASR# 2.199) and Gas Chamber (ASR# 2.200)	ESI	--	--	Expanded SI Report	February 2012	--	--
UXO-15	--	1000-inch Range (ASR# 2.19)	NFA	--	--	--	--	--	--
UXO-16	--	Gun Positions 41A and 41B (ASR# 2.212)	NFA	--	--	--	--	--	--
UXO-17	--	Firing Position #2 (ASR# 2.212)	ESI	Expanded SI Report	February 2012	--	--	--	--
UXO-18	--	B-6, 50-foot Small Arms Range (ASR# 2.44)	NFA	--	--	--	--	--	--
UXO-19	--	M-4, Rifle Grenade Range (ASR# 2.104) K-22 Practice Hand Grenade Course (ASR#2.111) M115 Hand Grenade Course (ASR# 2.168)	RI/FS	Expanded SI Report	May 2012	**RI/FS**	**September 2013**	**PRAP/ROD**	**June 2014**
UXO-20	--	1000-inch Range Montford Point (ASR# 2.32) A-1, 50-foot .22 Caliber Range (ASR# 2.87)	NFA	--	--	--	--	--	--
UXO-21	--	Gas Chamber (2D MAR DIV) (ASR# 2.204)	ESI	Expanded SI Report	February 2012	--	--	--	--
UXO-22	--	Sites 6 & 82 (OU 2)	PA/SI	PA/SI Report	August 2012	--	--	--	--
UXO-23	--	D-9 Skeet Range (ASR# 2.82)	ESI	Revised EE/CA Action Memo	February 2012 August 2012	Expanded SI Report	September 2013	NTRCA Report	January 2014
UXO-24	--	Camp Geiger Area	PA/SI	--	--	PA/SI Report	November 2012	--	--

Note:
Reports and deliverable dates in bold text are primary documents.

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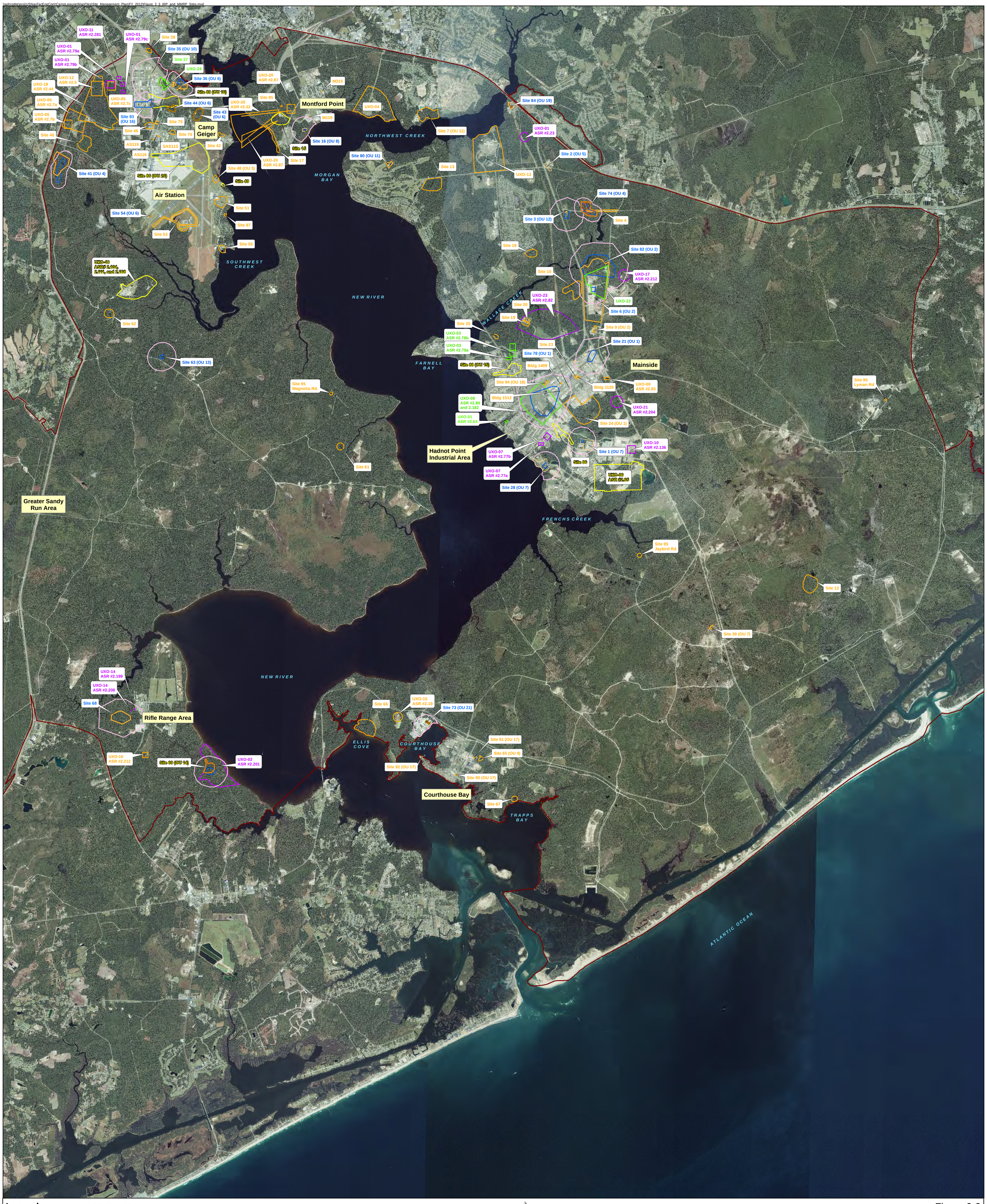


Legend

- Installation Boundary
- ESI Sites
- PA/SI Sites
- RI/FS Sites
- NFA Sites

RIP Sites with LUCs:

- Aquifer Use Control Boundary
- Non-Industrial Use Control Boundary
- Intrusive Activites Control Boundary (Soil)
- Intrusive Activites Control Boundary (Groundwater)
- Access Control Boundary

Note:
LUC boundaries depicted may have multiple LUCs associated and the most conservative LUC is shown

N

0 2,500 5,000 10,000 Feet

1 inch = 2,500 feet

Figure 2-3
IRP and MMRP Sites
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

\\aphrodite\proj\USNavFacEngCom\CampLejeune\MapFiles\Site_Management_Plan\FY_2012\Figure_2_4_Active_IRP_Sites.mxd

Legend

- PA/SI Sites
- RI/FS Sites
- Installation Boundary

RIP Sites with LUCs:

- Aquifer Use Control Boundary
- Non-Industrial Use Control Boundary
- Intrusive Activites Control Boundary (Soil)
- Intrusive Activites Control Boundary (Groundwater)
- Access Control Boundary

Note:
LUC boundaries depicted may have multiple LUCs associated and the most conservative LUC is shown

N

0 2,500 5,000 10,000 Feet

1 inch = 2,500 feet

Figure 2-4
Active IRP Sites
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

\\aphrodite\proj\USNavFacEngCom\CampLejeune\MapFiles\Site_Management_Plan\FY_2012\Figure_2_5_Closed_IRP_Sites.mxd

Legend

- NFA Sites
- Installation Boundary

N

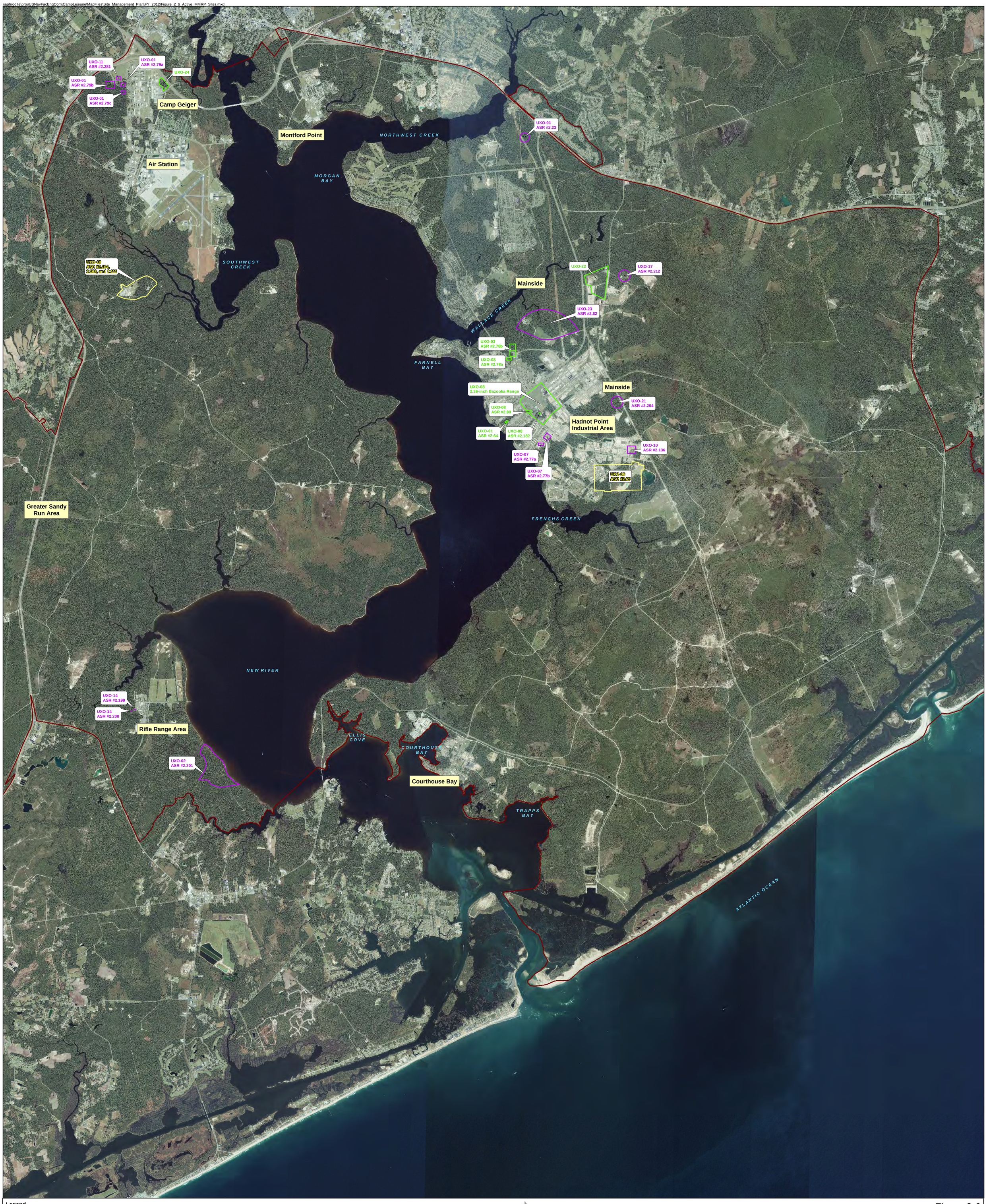
0 2,500 5,000 10,000 Feet

1 inch = 2,500 feet

Figure 2-5
Closed IRP Sites
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

\\aphrodite\proj\USNavFacEngCom\CampLejeune\MapFiles\Site_Management_Plan\FY_2012\Figure_2_6_Active_MMRP_Sites.mxd



Legend

- ESI Sites
- PA/SI Sites
- RI/FS Sites
- Installation Boundary

N

0 2,500 5,000 10,000 Feet

1 inch = 2,500 feet

Figure 2-6
Active MMRP Sites
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

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Legend

- NFA Sites
- Installation Boundary

N

0 2,500 5,000 10,000 Feet

1 inch = 2,500 feet

Figure 2-7
Closed MMRP Sites
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

SECTION 3

Descriptions of PA/SI Sites

The following sections discuss the site history, summarize previous investigations, and present future activities of the 1 IRP site and 5 MMRP sites that are in the PA/SI phase of the CERCLA process.

3.1 IRP PA/SI Sites

3.1.1 Site 37—Camp Geiger Area Surface Dump

Site 37, the Camp Geiger Area Surface Dump, encompasses approximately 4 acres in the Camp Geiger area of the Base (**Figure 3-1**). Between 1950 and 1951, Site 37 was used for the surface disposal of wastes including motor parts, garbage, and wood. In 2010, buried munitions were discovered in the vicinity and the area was identified as UXO-24 under the MMRP (Section 3.2.20).

FIGURE 3-1
IRP Site 37

Previous investigations are listed in **Table 3-1**.

TABLE 3-1
Previous Investigations Summary, IRP Site 37

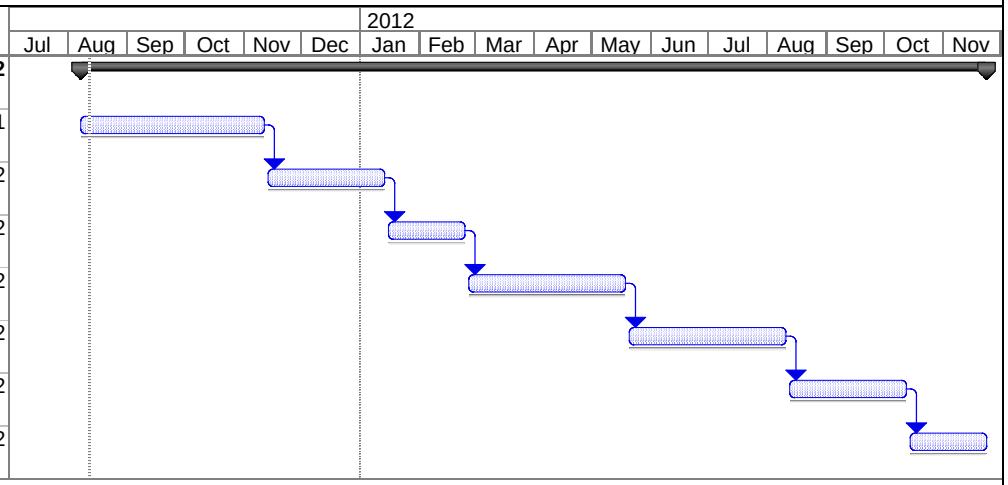
Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at Site 37, and no further assessment was recommended.
Confirmatory Site Assessment (Osage, 2011)	2009-2011	To verify the presence or absence of contamination due to the site's history as a dump, confirmatory sampling was conducted. Soil and groundwater samples were collected for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls [PCBs], herbicides, and metals. Pesticides/herbicides were identified in soil at concentrations potentially posing risk to ecological receptors.

3.1.1.1 Future Activities

Additional sampling for pesticides/herbicides will be conducted as part of the planned PA/SI for the co-located site UXO-24. Site 37 will remain open until a final recommendation is rendered for UXO-24. The UXO-24 PA/SI will be conducted in FY 2012 (**Schedule 3-1**).

Schedule 3-1
IRP Site 37
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**PA/SI for UXO-24/Site 37**	**340 days**	**Mon 8/8/11**	**Fri 11/23/12**
2	Draft PA/SI UFP-SAP	70 days	Mon 8/8/11	Fri 11/11/11
3	Review Period	45 days	Mon 11/14/11	Fri 1/13/12
4	Final PA/SI UFP-SAP	30 days	Mon 1/16/12	Fri 2/24/12
5	Field Investigation	60 days	Mon 2/27/12	Fri 5/18/12
6	Draft PA/SI Report	60 days	Mon 5/21/12	Fri 8/10/12
7	Review Period	45 days	Mon 8/13/12	Fri 10/12/12
8	Final PA/SI Report	30 days	Mon 10/15/12	Fri 11/23/12



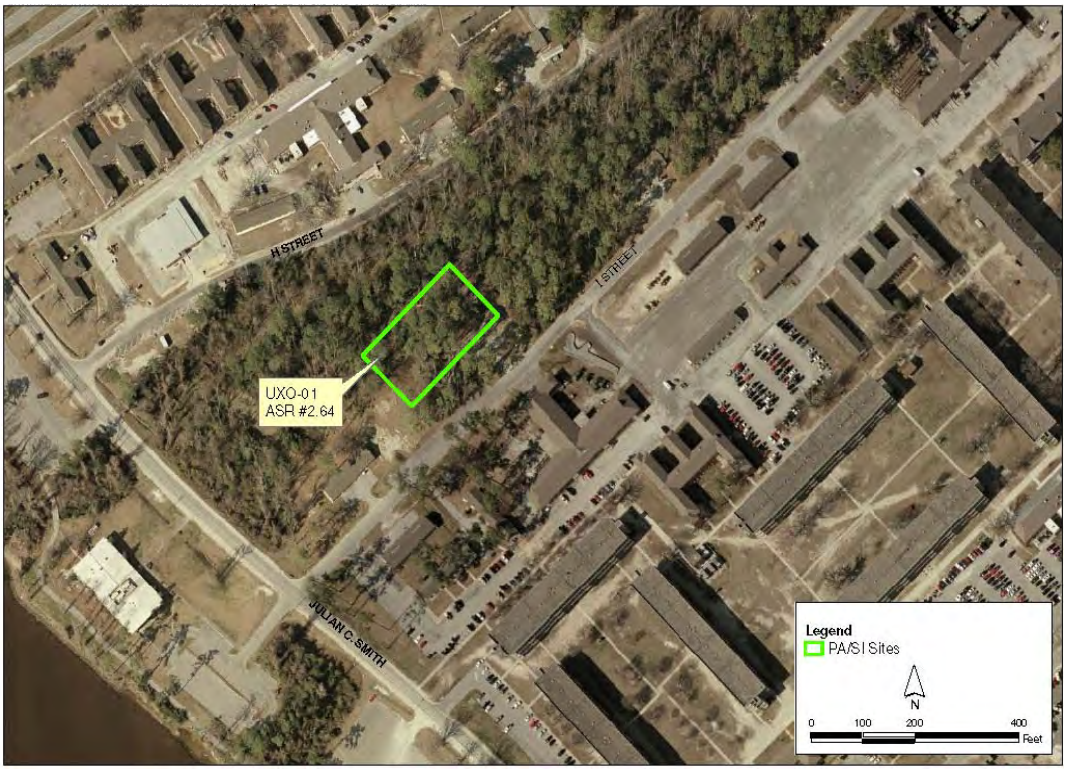
Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

3.2 MMRP PA/SI Sites

3.2.1 UXO-01—D-6 50-Foot Indoor Rifle and Pistol Range (ASR #2.64)

The D-6 50-Foot Indoor Rifle and Pistol Range consists of approximately one acre and is identified as a former .22 caliber indoor range located in Building 451, which included eight manually operated targets (**Figure 3-2**). The range has been in use since before 1954, but exact dates are not known. Building 451 was demolished in 1998.

FIGURE 3-2
MMRP Site UXO-01, ASR #2.64



Previous investigations are listed in **Table 3-2**.

TABLE 3-2
Previous Investigations Summary, MMRP Site UXO-01, ASR #2.64

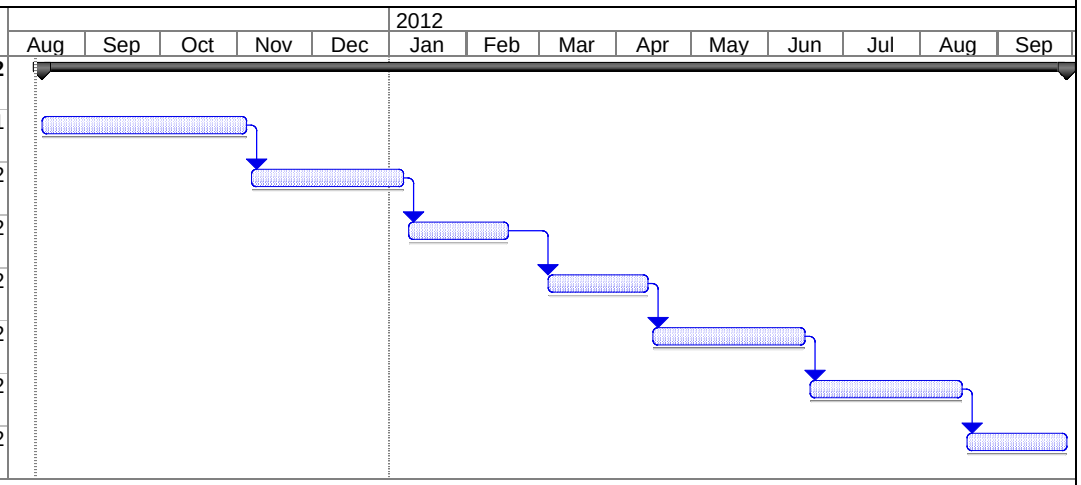
Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (TetraTech, 2009)	2009 - 2010	A field investigation was conducted to identify the presence or absence of contamination at the site. XRF and confirmation soil sampling was conducted to identify potential metals contamination. Three drainage soil samples were collected for metals analysis, and four groundwater samples were collected for metals and perchlorate analysis. Lead concentrations were identified as potential risk to human and ecological receptors in soil and groundwater. A removal action to address the lead contaminated soil was recommended.
EE/CA (TetraTech, 2010) and Action Memorandum (Tetra Tech, 2011)	2010-2011	An EE/CA was prepared to identify removal action alternatives to address the lead contaminated soil. Excavation and offsite disposal was the preferred alternative presented to the public in November 2010. The public comment period was held from November to December 2010 and no comments were received. The Action Memorandum identified excavation and offsite disposal as the NTCRA and was submitted in January 2011 for review.

3.2.1.1 Future Activities

The Action Memorandum will be completed in FY 2011, followed by a NTCRA (**Schedule 3-2**).

Schedule 3-2
MMRP Site UXO-01 ASR# 2.64
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**NTCRA**	**295 days**	**Mon 8/15/11**	**Fri 9/28/12**
2	Draft NTCRA Work Plan	60 days	Mon 8/15/11	Fri 11/4/11
3	Review Period	45 days	Mon 11/7/11	Fri 1/6/12
4	Final NTCRA Work Plan	30 days	Mon 1/9/12	Fri 2/17/12
5	NTCRA	30 days	Mon 3/5/12	Fri 4/13/12
6	Draft NTCRA Report	45 days	Mon 4/16/12	Fri 6/15/12
7	Review Period	45 days	Mon 6/18/12	Fri 8/17/12
8	Final NTCRA Report	30 days	Mon 8/20/12	Fri 9/28/12

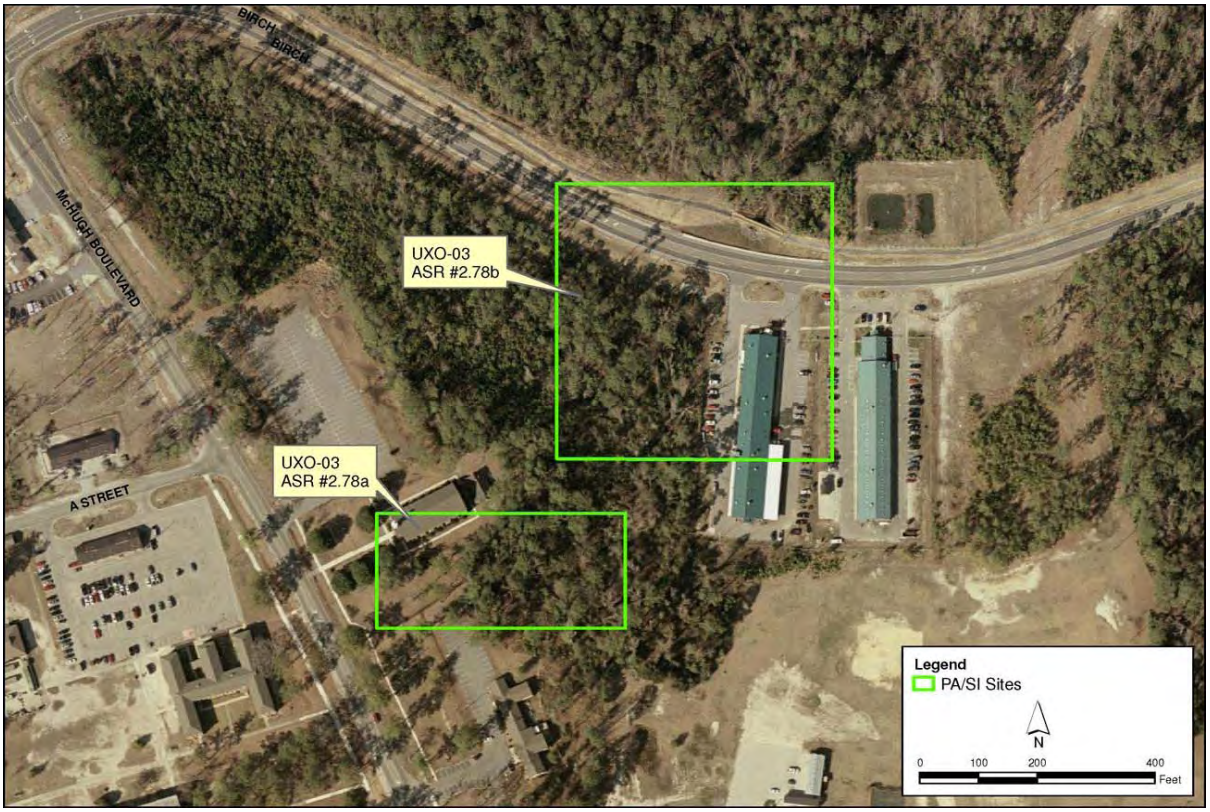


Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

3.2.2 UXO-03—Practice Hand Grenade Course (ASR #2.78a and #2.78b)

Site UXO-03, the former Practice Hand Grenade Course, encompasses approximately 4 acres on the Mainside of the Base (**Figure 3-3**). UXO-03 was used as a practice hand grenade course from 1953 to approximately 1959, and it is assumed that practice hand grenades were used within the vicinity of throwing pits and targets.

FIGURE 3-3
MMRP Site UXO-03, ASR #2.78a and #2.78b



Previous investigations are listed in **Table 3-3**.

TABLE 3-3
Previous Investigations Summary, MMRP Site UXO-03, ASR #2.78a and #2.78b

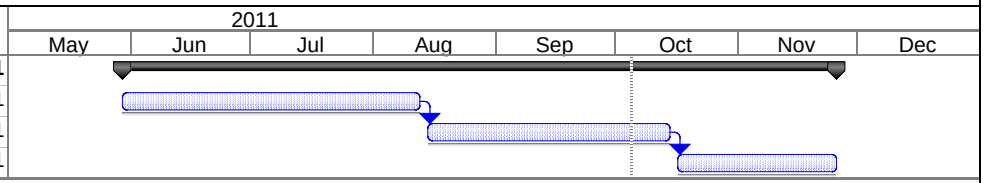
Previous Investigation/Action	Date	Activities
Draft-Final Preliminary Assessment/Site Inspection (CH2M HILL, 2011)	2008 - 2011	A field investigation was conducted to identify the presence and nature of MC contamination and evaluate the number and density of anomalies that represent potential subsurface MEC. Field activities included soil, groundwater, surface water and sediment sampling and 10% digital geophysical mapping (DGM). Samples were analyzed for explosives, metals, and perchlorate. No unacceptable human health or ecological risks were identified in site media. 61 geophysical anomalies were present at the site, and an intrusive investigation was conducted in 2010. Based on the results no additional investigation was recommended.

3.2.2.1 Future Activities

The results of the intrusive anomaly investigation will be incorporated into the site-wide PA/SI report, recommending NFA, to be finalized in 2011 (**Schedule 3-3**).

Schedule 3-3
MMRP Site UXO-03
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**PA/SI**	**130 days**	**Mon 5/30/11**	**Fri 11/25/11**
2	Draft Final PA/SI Report	55 days	Mon 5/30/11	Fri 8/12/11
3	Review Period	45 days	Mon 8/15/11	Fri 10/14/11
4	Final PA/SI Report	30 days	Mon 10/17/11	Fri 11/25/11

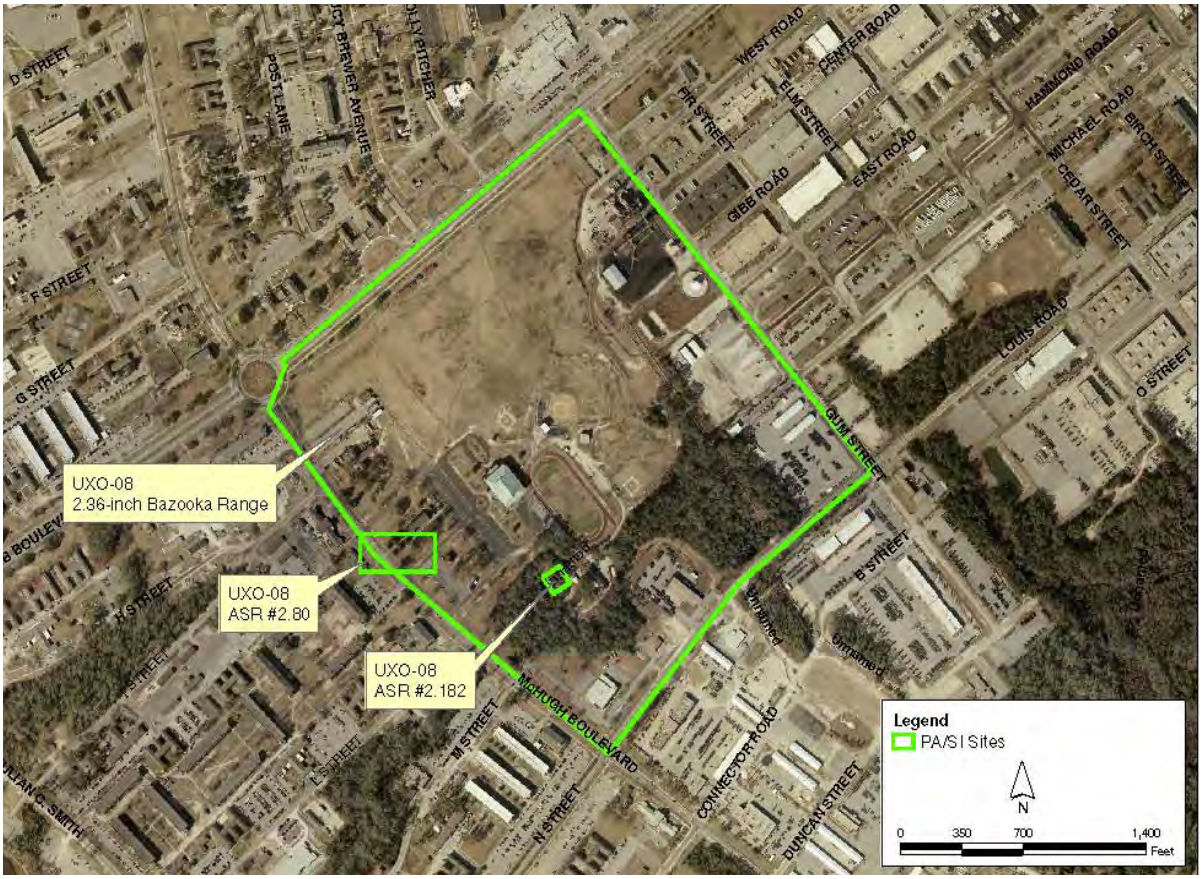


Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

3.2.3 UXO-08—2.36-inch Bazooka Range, Base CS Chamber, and NBC Training Trail (ASR #2.182), and D-7 Gas Chamber (ASR #2.80)

Located within the boundaries of IRP Site 78, Site UXO-08 encompasses approximately 144 acres in the HPIA (**Figure 3-4**). Areas within UXO-08 include the 2.36-inch Bazooka Range, the D-7 Gas Chamber, and the Base Chemical Smoke (CS) Chamber and Nuclear, Biological, and Chemical (NBC) Training Trail. The Range Identification and Preliminary Assessment Report (USACE, 2001) identified the D-7 Gas Chamber as being located at Building 756. The D-7 Gas Chamber is estimated to have been used from 1953 to 1961, and is thought to have primarily used tear gas. Base maps and the Range Identification and Preliminary Assessment Report indicate that the operation of the Base CS Chamber and NBC Training Trail took place from 1985 to 1987. The amount of chemical stimulants used during the facilities operation is unknown. Reports have indicated the presence of a suspected firing range, designated as the Lejeune Cantonment 2.36-inch Bazooka Range. Retired Base Explosive Ordnance Disposal (EOD) personnel have reported the findings of bazooka rounds on several occasions and at various locations within Parade Grounds during the 1970s and 1990s.

FIGURE 3-4
MMRP Site UXO-08, ASR #2.182 and ASR #2.80



Previous investigations are listed in **Table 3-4**.

TABLE 3-4
Previous Investigations Summary, MMRP Site UXO-08, ASR #2.182 and ASR #2.80

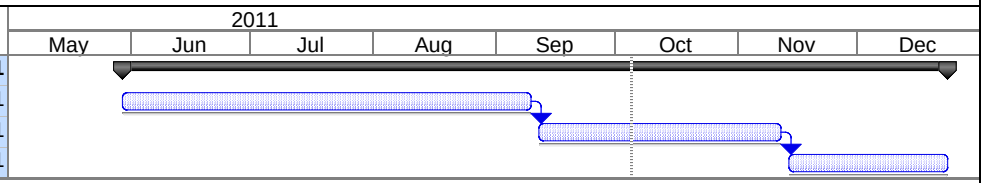
Previous Investigation/Action	Date	Activities
Focused Preliminary Assessment/Site Inspection (CH2M HILL, 2010)	2009-2011	In support of Military Construction (MILCON) activities for the Hadnot Point Construction Area, Post Office Intersection Area, and Fitness Center; soil, groundwater, surface water, and sediment sampling was conducted, along with 100% DGM. Samples were analyzed for VOCs, SVOCs, explosives, perchlorate, and metals. No unacceptable human health or ecological risks were identified in site media in the Fitness Center and Post Office Intersection Area. In the Hadnot Point Construction Area, potential unacceptable human health and ecological risks were identified from exposure to metals and PAHs in a drainage area and in soil. These risks are likely attributable to the industrial area and will be addressed as part of Site 78. Approximately 900 anomalies were identified in the MILCON areas and further investigation was recommended.
Draft-Final Preliminary Assessment/Site Inspection (CH2M HILL, 2011)	2007 - 2011	To identify the presence and nature of MC contamination and evaluate the number and density of anomalies that could represent potential subsurface MEC, a field investigation was conducted. Field activities included soil, groundwater, surface water, and sediment sampling for explosives, metals, perchlorate, VOCs, SVOCs, and pesticides/PCBs, 100% DGM, and 10% intrusive investigation in MILCON areas. Based on the results from the PA/SI, no further action is recommended for Site UXO-08. No unacceptable human health or ecological risks from historical munitions activities were identified. Potential ecological risks identified in surface water and sediment resulted from historical industrial activities and will be addressed as part of the five year review for Site 78.

3.2.3.1 Future Activities

The intrusive anomaly investigation in support of MILCON activities was conducted in 2010 and only one discarded military munitions item (40mm pyrotechnic) was found. No other evidence of historic range activity was found and the results will be incorporated into the site-wide PA/SI report, recommending NFA, to be finalized in 2011 (**Schedule 3-4**). The potential human health and ecological risks identified are likely associated with the industrial activities and will be further evaluated as part of IRP Site 78 (Section 8.1.18).

Schedule 3-4
MMRP Site UXO-08
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**PA/SI**	**150 days**	**Mon 5/30/11**	**Fri 12/23/11**
2	Draft Final PA/SI Report	75 days	Mon 5/30/11	Fri 9/9/11
3	Review Period	45 days	Mon 9/12/11	Fri 11/11/11
4	Final PA/SI Report	30 days	Mon 11/14/11	Fri 12/23/11

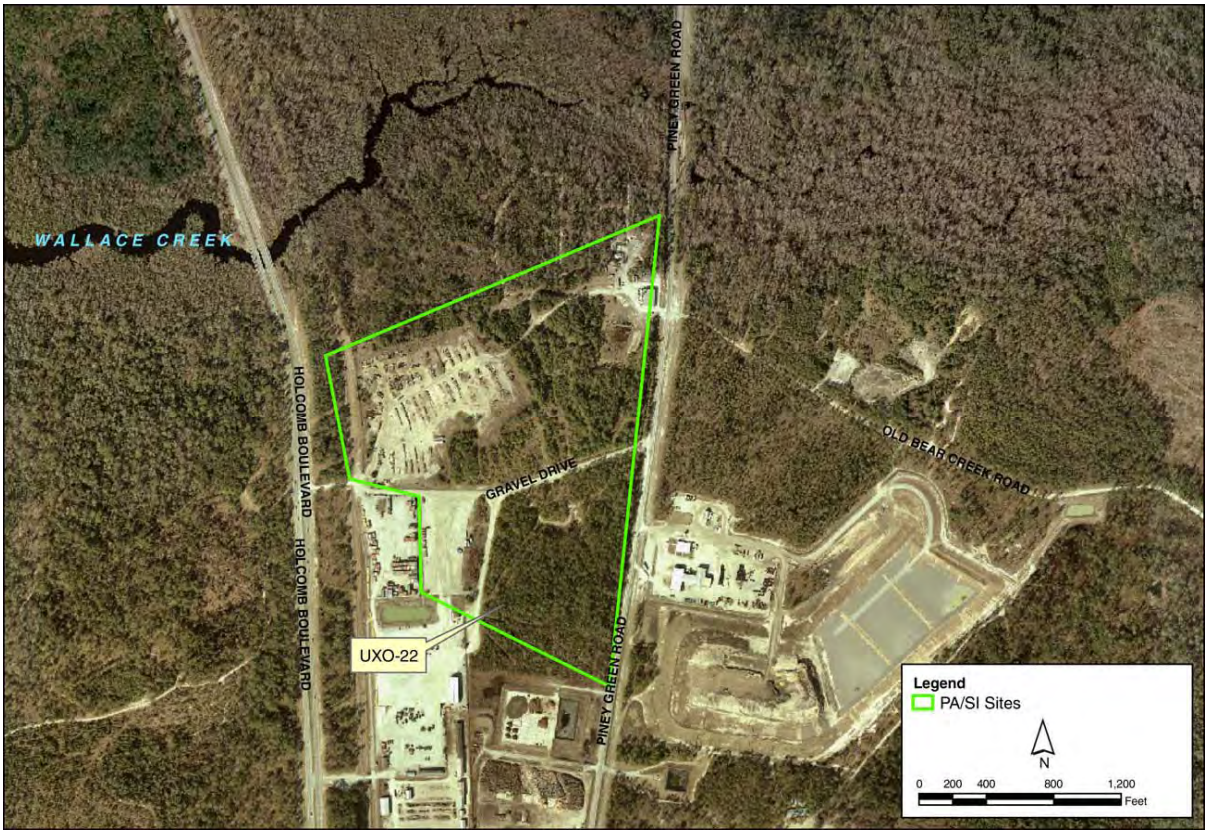


Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

3.2.4 UXO-22—Sites 6 and 82 (OU 2)

UXO-22 covers approximately 75 acres located within OU 2, between Holcomb Boulevard and Piney Green Road, and includes portions of IRP Site 6 and IRP Site 82 (**Figure 3-5**). During recent supplemental investigation activities conducted from 2009 to 2010, MPPEH and munitions debris (MD) were identified at Sites 6 and 82. According to the RI for OU 2 (Baker, 1993), disposal trenches containing MPPEH (including expended 105 millimeter [mm] cartridges), communication wire, graphite battery packs, containers of petroleum, oil, and lubricants, and metal 55-gallon drums were discovered and removed from OU 2. No former range activities are known to have occurred at the site.

FIGURE 3-5
MMRP Site UXO-22

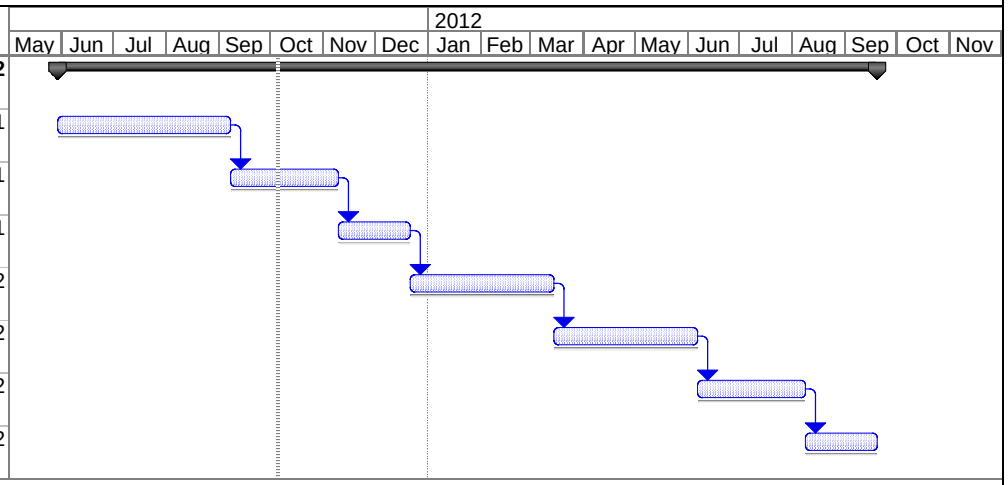


3.2.4.1 Future Activities

A PA/SI will be initiated at UXO-22 in 2011 to evaluate the potential for MC contamination (**Schedule 3-5**).

Schedule 3-5
MMRP Site UXO-22
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**PA/SI**	**343 days**	**Mon 5/30/11**	**Wed 9/19/12**
2	Draft PA/SI UFP-SAP	73 days	Mon 5/30/11	Wed 9/7/11
3	Review Period	45 days	Thu 9/8/11	Wed 11/9/11
4	Final PA/SI UFP-SAP	30 days	Thu 11/10/11	Wed 12/21/11
5	Field Investigation	60 days	Thu 12/22/11	Wed 3/14/12
6	Draft PA/SI Report	60 days	Thu 3/15/12	Wed 6/6/12
7	Review Period	45 days	Thu 6/7/12	Wed 8/8/12
8	Final PA/SI Report	30 days	Thu 8/9/12	Wed 9/19/12

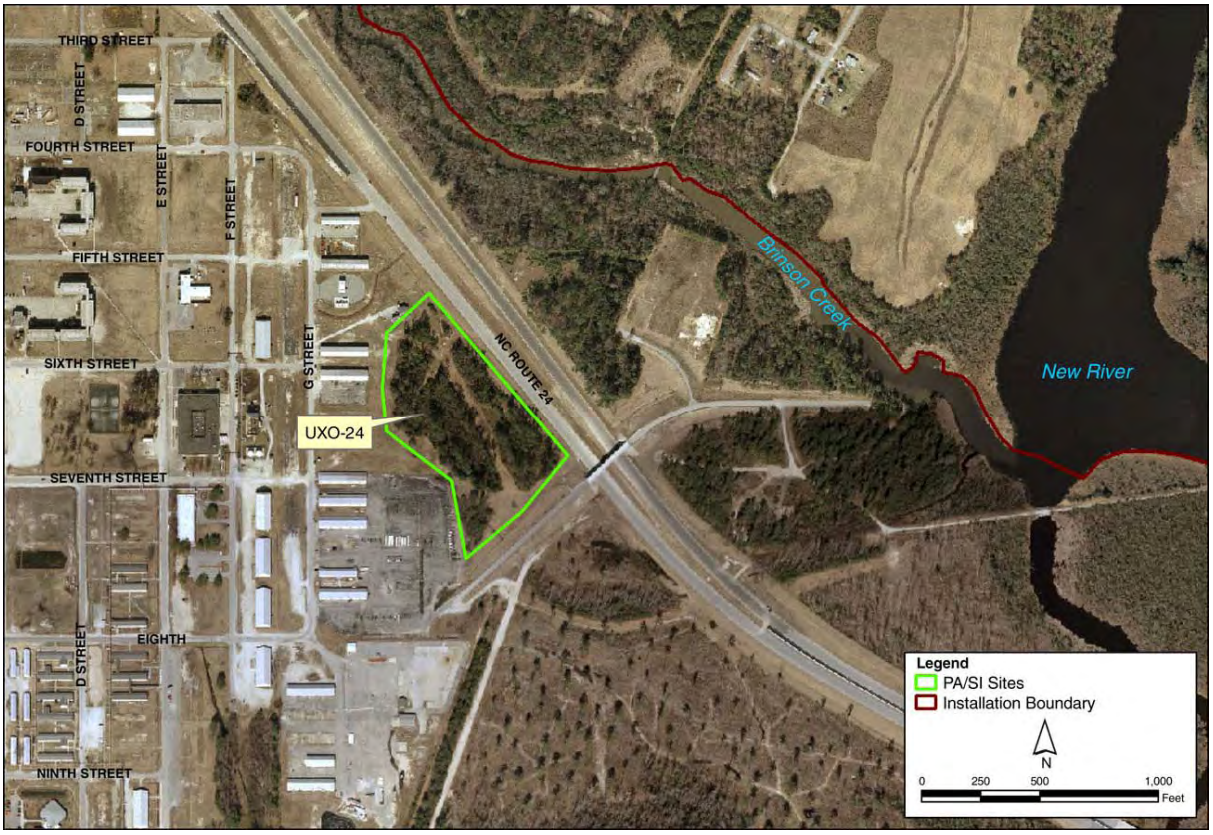


Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

3.2.5 UXO-24—Camp Geiger Area

Site UXO-24 covers approximately 9 acres in the Camp Geiger area where buried munitions were discovered in 2010 (**Figure 3-6**).

FIGURE 3-6
MMRP Site UXO-24

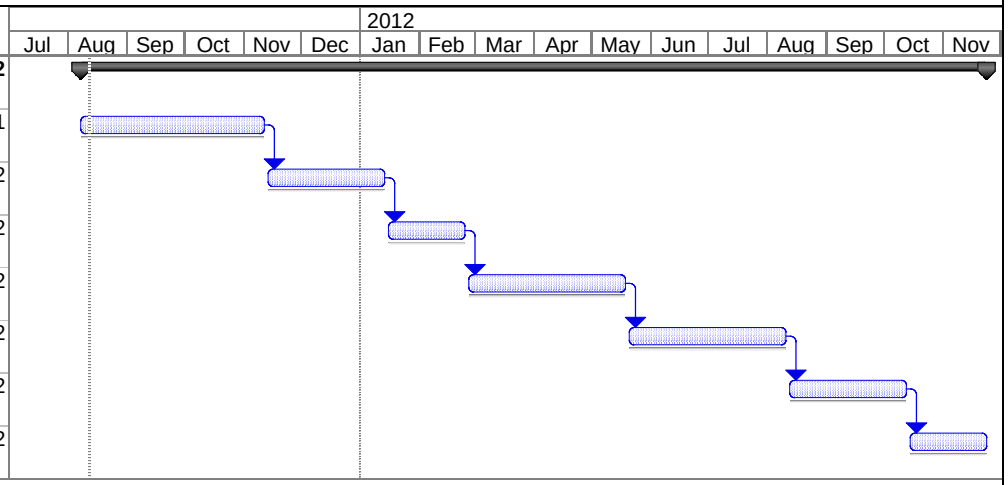


3.2.5.1 Future Activities

A PA/SI will be initiated at UXO-24 in 2011 to identify the nature and density of the subsurface munitions and potential for MC contamination (**Schedule 3-6**). The PA/SI will also include further investigation of pesticides/herbicides in soil based on potential unacceptable risks to ecological receptors identified during the recent confirmatory site assessment at the co-located Site 37 (Section 3.1.1).

Schedule 3-6
MMRP Site UXO-24
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**PA/SI for UXO-24/Site 37**	**340 days**	**Mon 8/8/11**	**Fri 11/23/12**
2	Draft PA/SI UFP-SAP	70 days	Mon 8/8/11	Fri 11/11/11
3	Review Period	45 days	Mon 11/14/11	Fri 1/13/12
4	Final PA/SI UFP-SAP	30 days	Mon 1/16/12	Fri 2/24/12
5	Field Investigation	60 days	Mon 2/27/12	Fri 5/18/12
6	Draft PA/SI Report	60 days	Mon 5/21/12	Fri 8/10/12
7	Review Period	45 days	Mon 8/13/12	Fri 10/12/12
8	Final PA/SI Report	30 days	Mon 10/15/12	Fri 11/23/12



Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

SECTION 4

Descriptions of ESI Sites

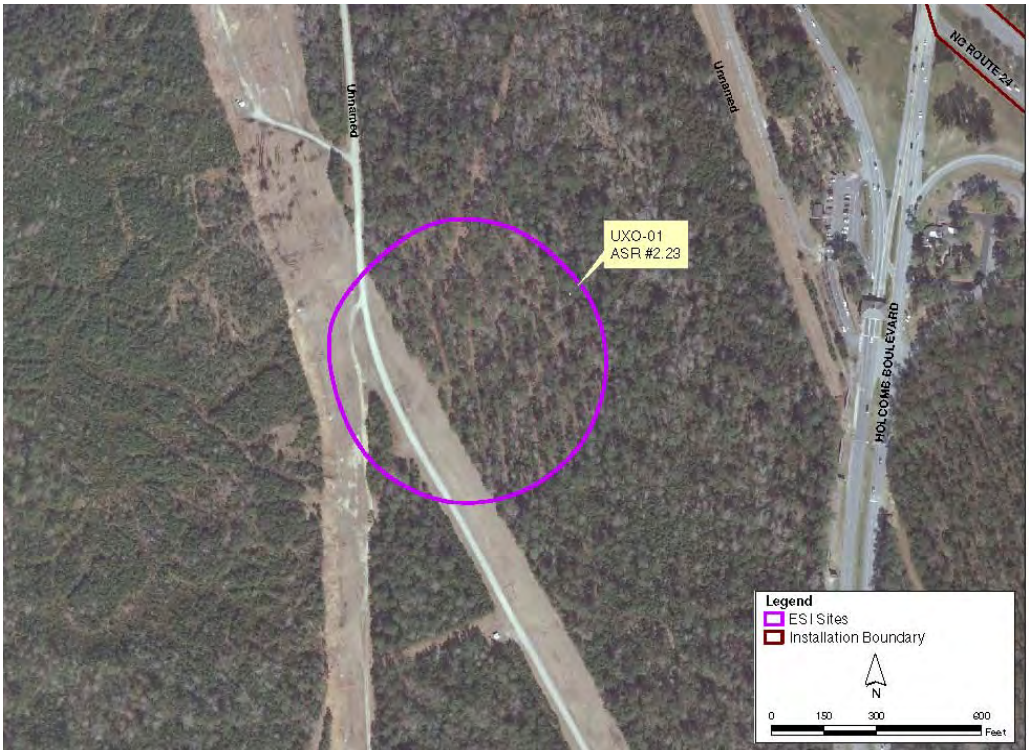
The following sections discuss the site history, summary of previous investigations, and future activities of the 10 MMRP sites which are in the ESI phase of the CERCLA process.

4.1 MMRP ESI Sites

4.1.1 UXO-01—Former Live Hand Grenade Course (ASR #2.23)

The Former Live Hand Grenade Course encompasses approximately 10 acres on the Mainside of the Base (**Figure 4-1**). The Live Hand Grenade Course was established under Camp Training Order Number 7-1945, dated March 19, 1945, and was disestablished in March 1946 and no longer used for the firing of live ammunition. During operation of the site, munitions used included fragmentation, offensive, and practice grenades.

FIGURE 4-1
MMRP Site UXO-01, ASR #2.23



Previous investigations are listed in **Table 4-1**.

TABLE 4-1
Previous Investigations Summary, MMRP Site UXO-01, ASR #2.23

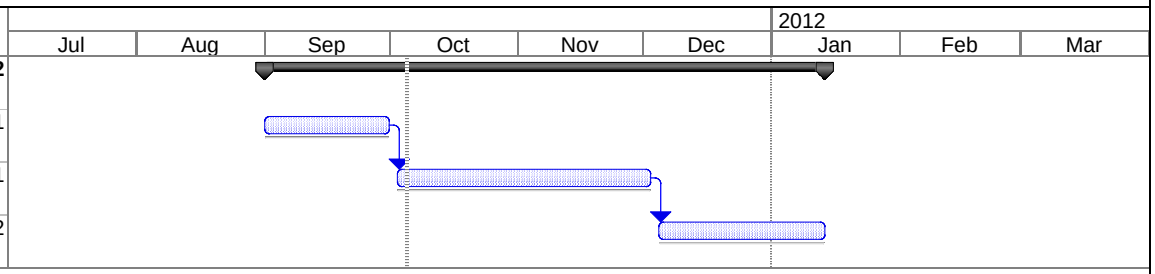
Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL, 2009)	2008 - 2009	A field investigation was conducted to identify the presence and nature of MC contamination and evaluate the number and density of anomalies that represent potential subsurface MEC. Field activities included soil and groundwater sampling and 10% DGM. Samples were analyzed for explosives, metals, and perchlorate. No unacceptable risks to human health or the environment were identified in site media. 249 geophysical anomalies were identified at the site, and an intrusive investigation of subsurface anomalies was recommended.

4.1.1.1 Future Activities

Based on the findings of the PA/SI, an ESI was conducted in 2011 and the report, recommending NFA, was submitted (**Schedule 4-1**).

Schedule 4-1
MMRP Site UXO-01 ASR#2.23
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**ESI**	**97 days**	**Thu 9/1/11**	**Fri 1/13/12**
2	Draft ESI Report	22 days	Thu 9/1/11	Fri 9/30/11
3	Review Period	45 days	Mon 10/3/11	Fri 12/2/11
4	Final ESI Report	30 days	Mon 12/5/11	Fri 1/13/12

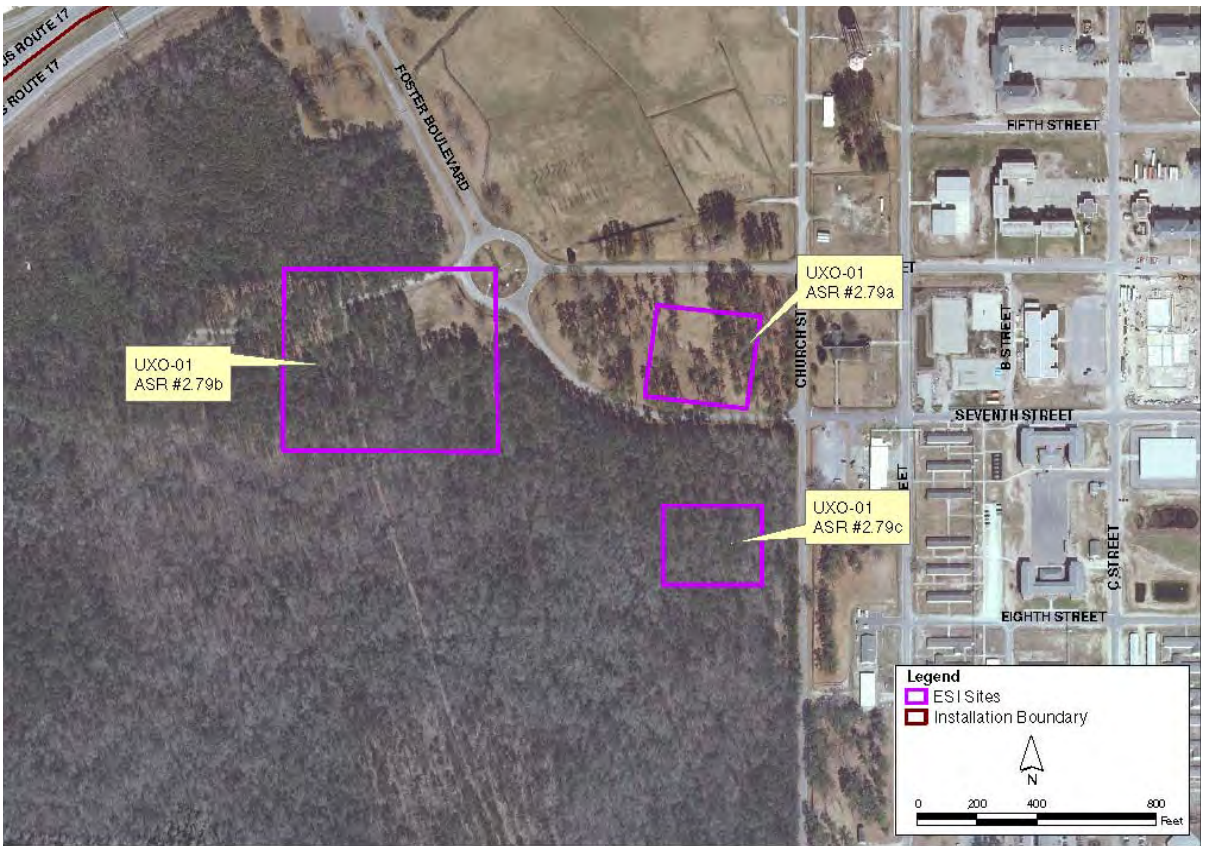


Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

4.1.2 UXO-01—B-3 Gas Chamber (ASR #2.79a, #2.79b, and #2.79c)

The B-3 Gas Chamber is located at the main entrance of the New River Air Station. The site encompasses approximately 14 acres (**Figure 4-2**). The B-3 Gas Chamber facility was used between 1953 and 1958. As part of operational training activities chemical agents (CAs), war gas identification sets, and riot control hand grenades may have been used.

FIGURE 4-2
MMRP Site UXO-01, ASR #2.79a, #2.79b, and #2.79c



Previous investigations are listed in **Table 4-2**.

TABLE 4-2
Previous Investigations Summary, MMRP Site UXO-01, ASR #2.79a, #2.79b, and #2.79c

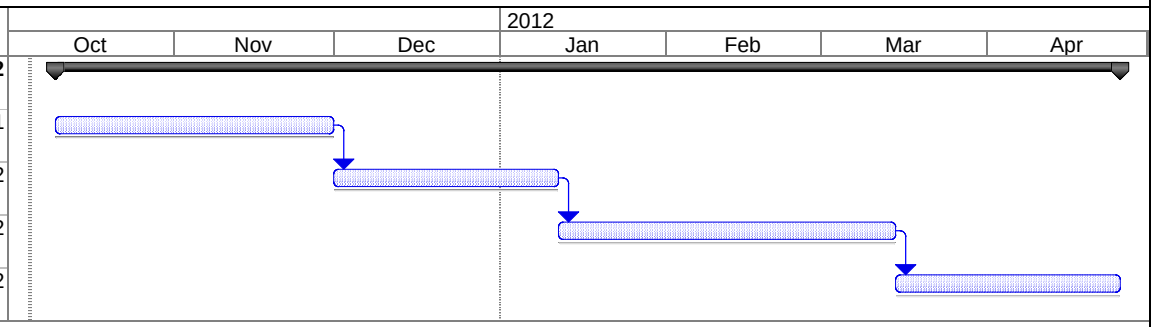
Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL, 2009)	2008 - 2009	A field investigation was conducted to identify the presence and nature of MC contamination and evaluate the number and density of anomalies that represent potential subsurface MEC. Field activities included soil, groundwater, surface water, and sediment sampling and 10% DGM. Samples were analyzed for SVOCs, including tear gas constituents, explosives, metals, and perchlorate. No unacceptable human health or ecological risks were identified in site media. 353 geophysical anomalies were present at the site, and an intrusive investigation was recommended.

4.1.2.1 Future Activities

Based on the findings of the PA/SI, an ESI to investigate the geophysical anomalies will be completed in 2011-2012 (**Schedule 4-2**).

Schedule 4-2
MMRP Site UXO-01 ASR#2.79 a, b, & c
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**ESI**	**143 days**	**Mon 10/10/11**	**Wed 4/25/12**
2	Field Activities	38 days	Mon 10/10/11	Wed 11/30/11
3	Draft ESI Report	30 days	Thu 12/1/11	Wed 1/11/12
4	Review Period	45 days	Thu 1/12/12	Wed 3/14/12
5	Final ESI Report	30 days	Thu 3/15/12	Wed 4/25/12



Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

4.1.3 UXO-02—Unnamed Explosive Range (ASR #2.201)

Site UXO-02, the Unnamed Explosive Range, encompasses approximately 127 acres along the west bank of the New River in the Rifle Range Area of the Base (**Figure 4-3**). UXO-02 encompasses IRP Site 69 (Section 5.1.3). UXO-02 was used as an explosive range from 1973 to 2002; however, the types of munitions employed at this range are unknown.

FIGURE 4-3
MMRP Site UXO-02, ASR #2.201

Previous investigations are listed in **Table 4-3**.

TABLE 4-3
Previous Investigations Summary, MMRP Site UXO-02, ASR #2.201

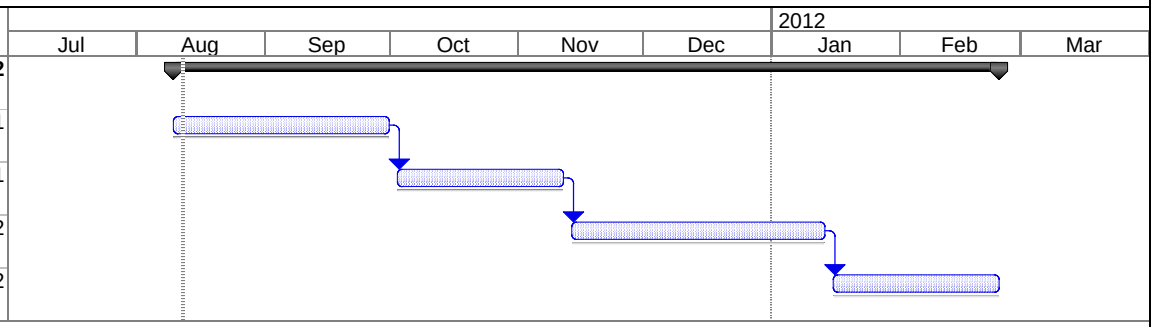
Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL)	2009 - 2011	To identify the presence and nature of MC contamination and evaluate the number and density of anomalies that represent potential subsurface MEC field activities were conducted in FY 2010 concurrently with those at Site 69 field activities. Soil, groundwater, surface water, and sediment samples were collected and analyzed for explosives, metals, and perchlorate. Approximately 1,100 geophysical anomalies were identified during DGM, potentially representing subsurface MEC. Potential unacceptable risks to human health and the environment were identified due to exposure to metals in groundwater and pesticides in soil and sediment. The PA/SI report, recommending further investigation of groundwater and geophysical anomalies, will be submitted in 2011.

4.1.3.1 Future Activities

Based on the findings of the PA/SI, an ESI was initiated in 2011 to further evaluate potential unacceptable human health and ecological risks and investigate the geophysical anomalies. The ESI is planned for completion in 2011 (**Schedule 4-3**).

Schedule 4-3
MMRP Site UXO-02
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**ESI**	**143 days**	**Wed 8/10/11**	**Fri 2/24/12**
2	Field Activities	38 days	Wed 8/10/11	Fri 9/30/11
3	Draft ESI Report	30 days	Mon 10/3/11	Fri 11/11/11
4	Review Period	45 days	Mon 11/14/11	Fri 1/13/12
5	Final ESI Report	30 days	Mon 1/16/12	Fri 2/24/12

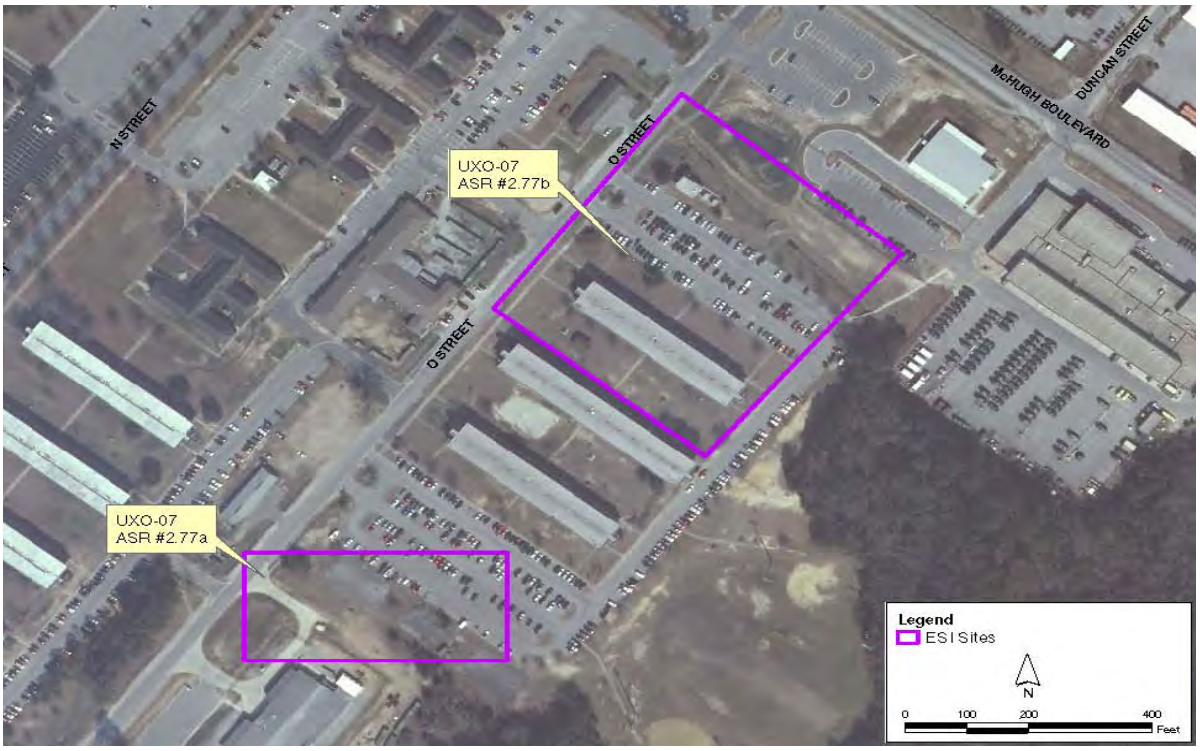


Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

4.1.4 UXO-07—Practice Hand Grenade Course (ASR #2.77a and #2.77b)

Site UXO-07, the Practice Hand Grenade Course, encompasses approximately 2 acres in the HPIA (**Figure 4-4**). UXO-07 was reportedly used as a range in 1953. The types of munitions employed at the site are unknown; however, based on the name of the site it is assumed that practice hand grenades were used.

FIGURE 4-4
MMRP Site UXO-07, ASR #2.77a and #2.77b



Previous investigations are listed in **Table 4-4**.

TABLE 4-4
Previous Investigations Summary, MMRP Site UXO-07, ASR #2.77a and #2.77b

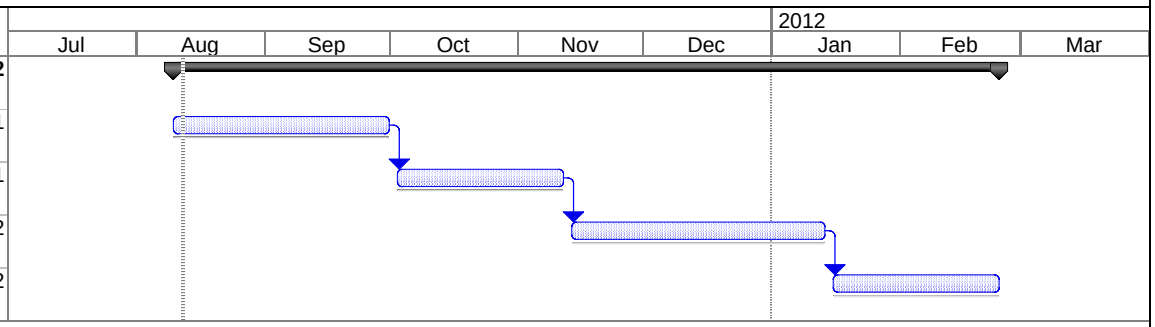
Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL, 2011)	2009 - 2011	A field investigation was conducted to identify the presence and nature of MC contamination and evaluate the number and density of anomalies that represent potential subsurface MEC. Field activities included soil, groundwater, surface water, and sediment sampling and 10% DGM. Samples were analyzed for SVOCs, explosives, metals, and perchlorate. Metals detections exceeded screening criteria in all media except surface water. Nitrobenzene and perchlorate detections also exceeded screening criteria in groundwater. No unacceptable human health or ecological risks were identified during the human health risk screening (HHRS) and ecological risk screening (ERS). 1,118 geophysical anomalies were present at the site, and an intrusive investigation was recommended.

4.1.4.1 Future Activities

Based on the findings of the PA/SI, an ESI was completed and a report will be submitted in 2011 (**Schedule 4-4**).

Schedule 4-4
MMRP Site UXO-07
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**ESI**	**143 days**	**Wed 8/10/11**	**Fri 2/24/12**
2	Field Activities	38 days	Wed 8/10/11	Fri 9/30/11
3	Draft ESI Report	30 days	Mon 10/3/11	Fri 11/11/11
4	Review Period	45 days	Mon 11/14/11	Fri 1/13/12
5	Final ESI Report	30 days	Mon 1/16/12	Fri 2/24/12

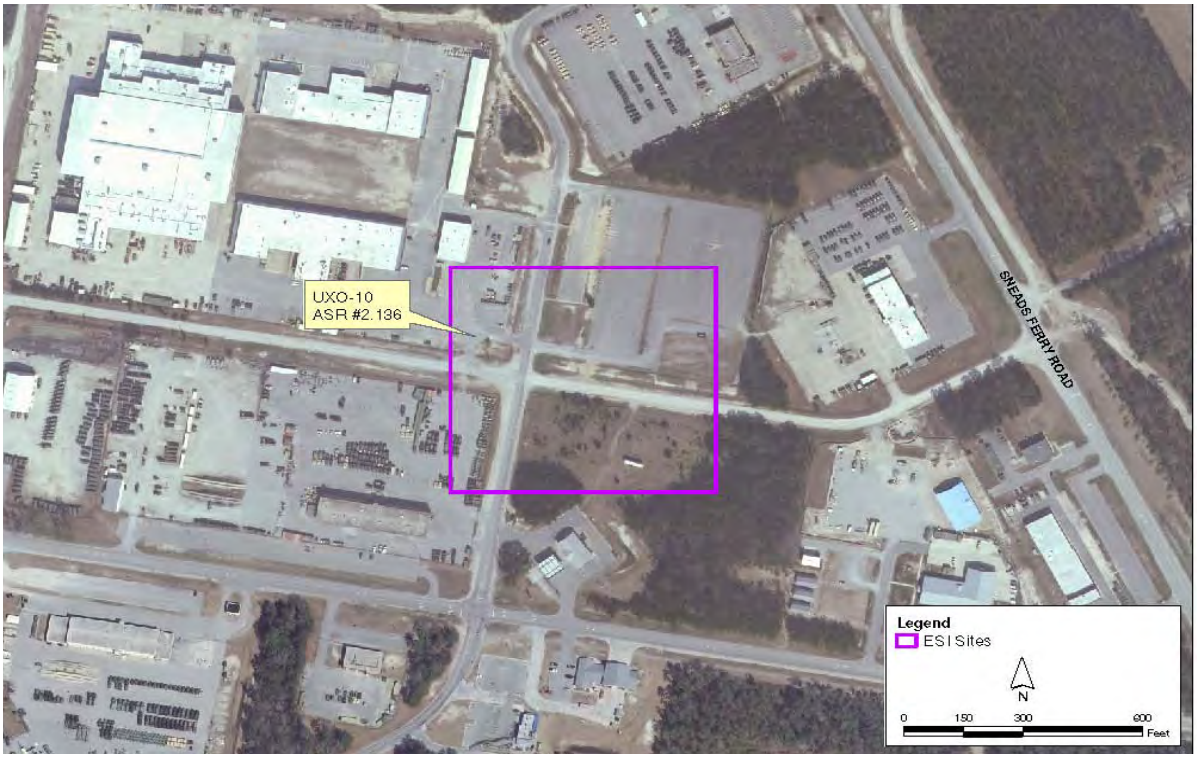


Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

4.1.5 UXO-10—D-11A, Flame Tank and Flame Thrower Range (ASR #2.136)

Site UXO-10, the Flame Tank and Flame Thrower Range, encompasses approximately 10 acres on the Mainside of the Base (**Figure 4-5**). UXO-10 was reportedly used as a range from 1970 to 1977. The types of munitions used at the range include flame throwers and small arms blank ammunition, which was reportedly used on tanks for demonstration purposes. Demolitions (C-4), white smoke grenades, white phosphorous hand grenades, and flame thrower weapons and blank ammunition for small arms were also used on the course.

FIGURE 4-5
MMRP Site UXO-10, ASR #2.136



Previous investigations are listed in **Table 4-5**.

TABLE 4-5
Previous Investigations Summary, MMRP Site UXO-10, ASR #2.136

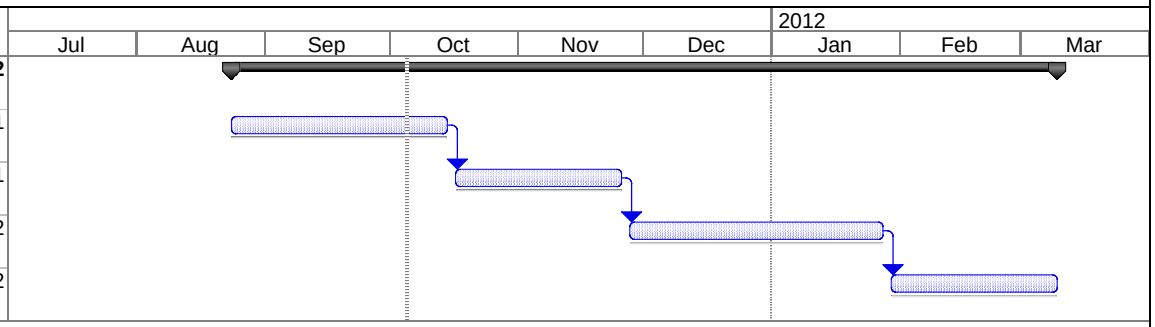
Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL, 2011)	2009 - 2011	A field investigation was conducted to identify the presence and nature of MC contamination and evaluate the number and density of anomalies that represent potential subsurface MEC. Field activities included soil and groundwater sampling and 10% DGM. Samples were analyzed for VOCs, SVOCs, total petroleum hydrocarbon (TPH), explosives, metals, and perchlorate. No unacceptable human health or ecological risks were identified. 1,228 geophysical anomalies were present at the site, and an intrusive investigation was recommended.

4.1.5.1 Future Activities

Based on the findings of the PA/SI, an ESI was completed and a report will be submitted in 2011 (**Schedule 4-5**).

Schedule 4-5
MMRP Site UXO-10
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**ESI**	**143 days**	**Wed 8/24/11**	**Fri 3/9/12**
2	Field Activities	38 days	Wed 8/24/11	Fri 10/14/11
3	Draft ESI Report	30 days	Mon 10/17/11	Fri 11/25/11
4	Review Period	45 days	Mon 11/28/11	Fri 1/27/12
5	Final ESI Report	30 days	Mon 1/30/12	Fri 3/9/12

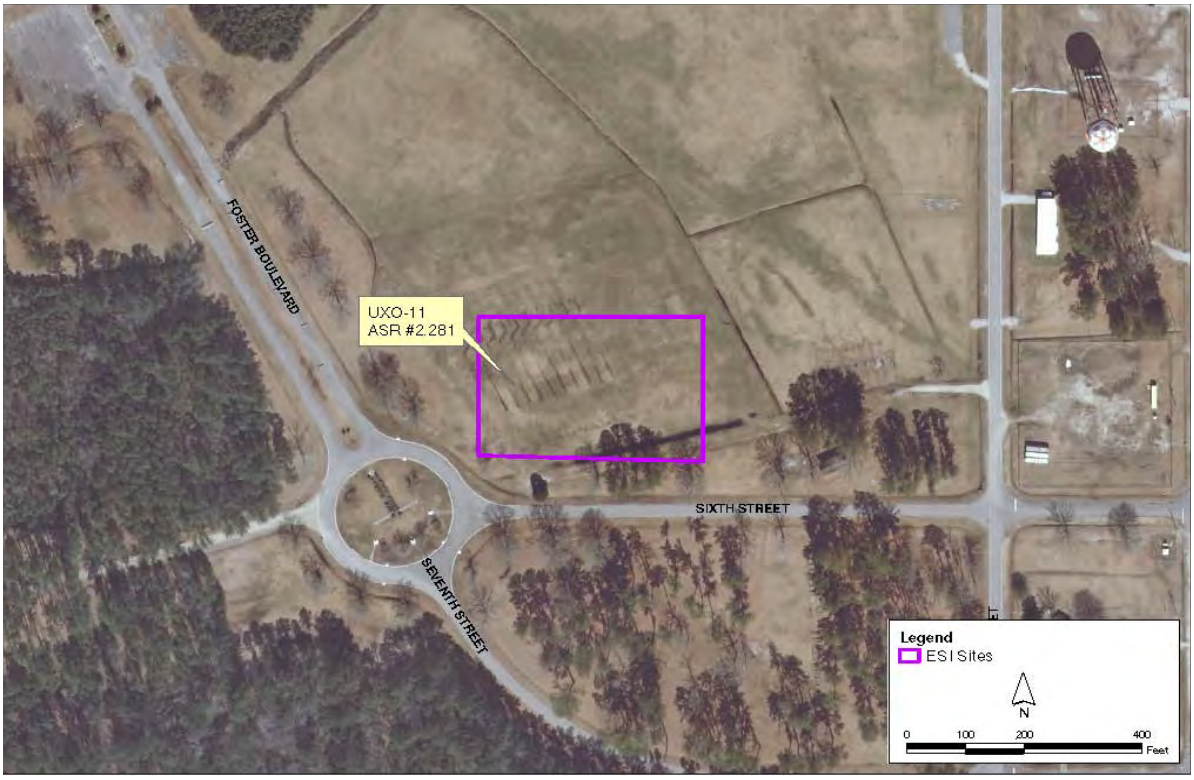


Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

4.1.6 UXO-11—B-5, Practice Hand Grenade Course (ASR #2.281)

Site UXO-11, the Practice Hand Grenade Course, encompasses approximately 2 acres located in Camp Geiger in the northwest portion of the Base (**Figure 4-6**). UXO-11 was reportedly used as a range in 1953. The types of munitions employed at the site are unknown; however, it is assumed that practice hand grenades were used.

FIGURE 4-6
MMRP Site UXO-11, ASR #2.281



Previous investigations are listed in **Table 4-6**.

TABLE 4-6
Previous Investigations Summary, MMRP Site UXO-11, ASR #2.281

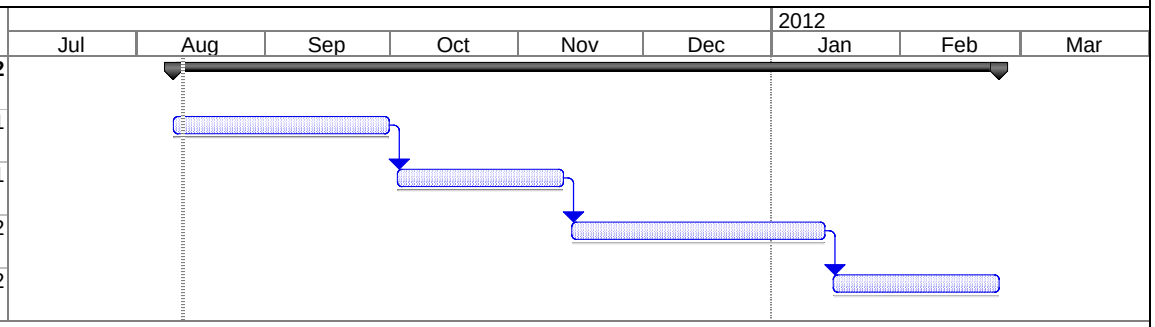
Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL, 2011)	2009 - 2011	A field investigation was conducted to identify the presence and nature of MC contamination and evaluate the number and density of anomalies that represent potential subsurface MEC. Field activities included soil, groundwater, surface water, and sediment sampling and 10% DGM. Samples were analyzed for explosives, metals, and perchlorate. Explosives were detected in site media; however, no unacceptable human health or ecological risks were identified. 70 geophysical anomalies were present at the site, and an intrusive investigation was recommended.

4.1.6.1 Future Activities

Based on the findings of the PA/SI, an ESI was conducted in 2011 to further evaluate explosives detected in site media and investigate the geophysical anomalies. The ESI report, recommending NFA, was submitted (**Schedule 4-6**).

Schedule 4-6
MMRP Site UXO-11
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**ESI**	**143 days**	**Wed 8/10/11**	**Fri 2/24/12**
2	Field Activities	38 days	Wed 8/10/11	Fri 9/30/11
3	Draft ESI Report	30 days	Mon 10/3/11	Fri 11/11/11
4	Review Period	45 days	Mon 11/14/11	Fri 1/13/12
5	Final ESI Report	30 days	Mon 1/16/12	Fri 2/24/12



Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

4.1.7 UXO-14—Indoor Pistol Range (ASR #2.199) and Gas Chamber (ASR #2.200)

Site UXO-14, the Indoor Pistol Range and Gas Chamber, encompasses approximately 1 acre within the Rifle Range area of the Base (**Figure 4-7**). The Indoor Pistol Range (Building RR-53) was reportedly in use from 1950 to 1996. During operation of the range, small arms were used to fire at a fixed target. The Gas Chamber (Building RR-63) was reportedly in use from 1950 through 1954, and is thought to have primarily used tear gas.

FIGURE 4-7
MMRP Site UXO-14, ASR #2.199 and ASR #2.200

Previous investigations are listed in **Table 4-7.**

TABLE 4-7
Previous Investigations Summary, MMRP Site UXO-14, ASR #2.199 and #2.200

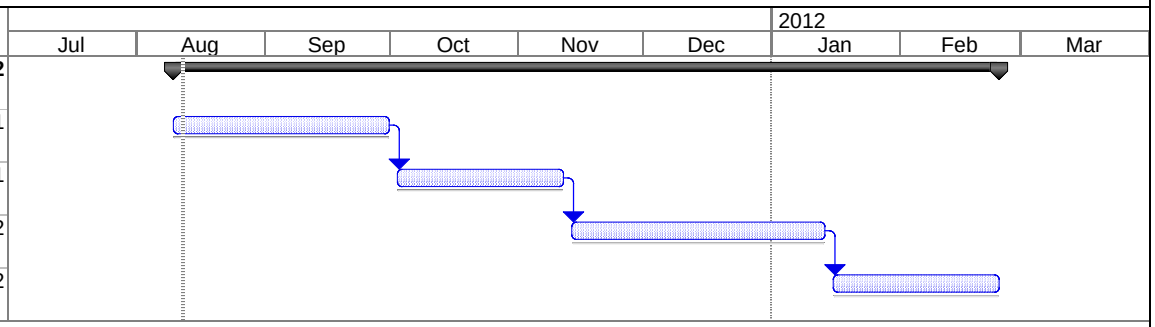
Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL, 2011)	2009 - 2011	A field investigation was conducted to identify the presence and nature of MC contamination and evaluate the number and density of anomalies that represent potential subsurface MEC. Field activities included soil and groundwater sampling and 10% DGM. Samples were analyzed for metals and SVOCs. Potentially unacceptable human health risks were identified due to exposure to antimony, mercury, and lead in soil. No unacceptable ecological risks were identified. 17 geophysical anomalies were present at the site, and an intrusive investigation was recommended.

4.1.7.1 Future Activities

Based on the findings of the PA/SI, an ESI will be completed in 2011 to further evaluate potential unacceptable human health risks and investigate the geophysical anomalies (**Schedule 4-7)**.

Schedule 4-7
MMRP Site UXO-14
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**ESI**	**143 days**	**Wed 8/10/11**	**Fri 2/24/12**
2	Field Activities	38 days	Wed 8/10/11	Fri 9/30/11
3	Draft ESI Report	30 days	Mon 10/3/11	Fri 11/11/11
4	Review Period	45 days	Mon 11/14/11	Fri 1/13/12
5	Final ESI Report	30 days	Mon 1/16/12	Fri 2/24/12



Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

4.1.8 UXO-17—Firing Position #2 (ASR #2.212)

Site UXO-17, Firing Position #2, was a gun position used for military training, which fired into the G-10 impact area (**Figure 4-8**). As a result of the usage and type of training conducted at the site, there should be no discarded military munitions, although ammunition packaging, range residue, barbwire, and buried garbage may be present. Firing Position #2 covers 16 acres and was reportedly used from the 1950s through at least 1985. 105 mm and 155 mm Howitzer guns were used at this site.

FIGURE 4-8
MMRP Site UXO-17, ASR #2.212

Previous investigations are listed in **Table 4-8**.

TABLE 4-8
Previous Investigations Summary, MMRP Site UXO-17, ASR #2.212

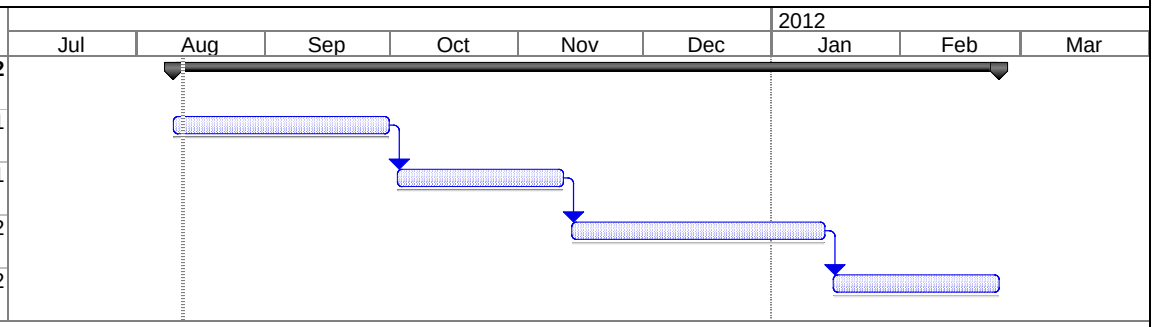
Previous Investigation/Action	Date	Activities
Draft Focused Site Inspection (CH2M HILL, 2010)	2007 - 2010	In support of MILCON activities for expansion of the Base Landfill, soil and groundwater sampling was conducted and 100% DGM was initiated within 4 acres of the site. Samples were analyzed for explosives, metals, and perchlorate. No unacceptable human health or ecological risks were identified in site media. Approximately 1,300 geophysical anomalies were identified and subsurface construction debris was encountered during DGM. Removal of the debris, completion of the DGM, and an intrusive anomaly investigation was completed in 2011. A drum was encountered during the investigation and additional groundwater sampling was proposed.

4.1.8.1 Future Activities

An ESI, to complete the investigation of the remaining 12 acres of the site and further investigate groundwater in the vicinity of the drum encountered during the Focused SI, will be completed in 2011 (**Schedule 4-8**). The ESI report will incorporate the findings of the Focused SI and ESI to provide a complete site-wide report.

Schedule 4-8
MMRP Site UXO-17
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**ESI**	**143 days**	**Wed 8/10/11**	**Fri 2/24/12**
2	Field Activities	38 days	Wed 8/10/11	Fri 9/30/11
3	Draft ESI Report	30 days	Mon 10/3/11	Fri 11/11/11
4	Review Period	45 days	Mon 11/14/11	Fri 1/13/12
5	Final ESI Report	30 days	Mon 1/16/12	Fri 2/24/12



Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

4.1.9 UXO-21— Gas Chamber (2D MAR DIV) (ASR #2.204)

The Former Tear Gas Chamber, 2nd Marine Division site encompasses 17 acres and was used as a gas chamber in the 1970s (**Figure 4-9**). Based on the operational history of the site, chemical warfare training agents (tear gas) would have been used. Other chemical training items, including war gas identification sets and riot control hand grenades, may have been used in the area surrounding the gas chamber.

FIGURE 4-9
MMRP Site UXO-21, ASR #2.204

Previous investigations are listed in **Table 4-9**.

TABLE 4-9
Previous Investigations Summary, MMRP Site UXO-21, ASR #2.204

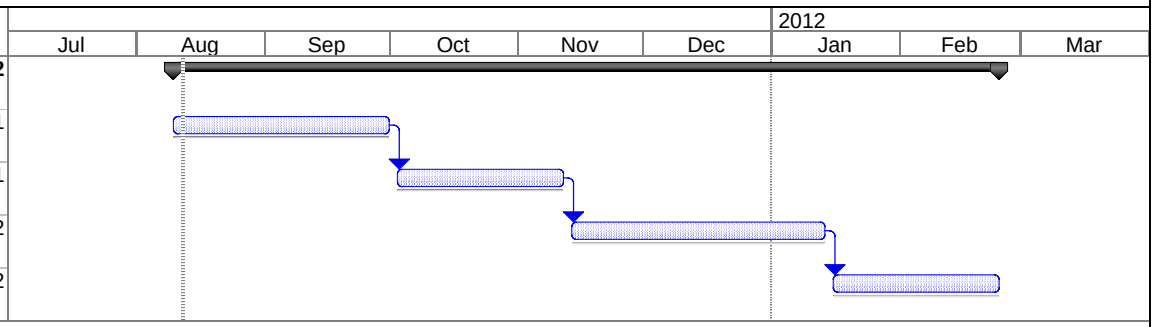
Previous Investigation/Action	Date	Activities
Focused Site Inspection (CH2M HILL, 2008)	2007 - 2008	Based on the potential MILCON projects in the interior 5-acre area of the site, soil and groundwater sampling and DGM were conducted. Groundwater and soil samples were collected and analyzed for VOCs, SVOCs, tear gas constituents, and metals. 143 geophysical anomalies that represented potential subsurface MEC were identified during DGM. Further investigation of the geophysical anomalies was recommended and an intrusive investigation was initiated after submittal and approval of an ESS. A tech memorandum documenting the intrusive activities was submitted in FY 2010.

4.1.9.1 Future Activities

An ESI, to complete the investigation of the remaining 12 acres of the site, will be completed in 2011 (**Schedule 4-9**). The ESI report will incorporate the findings of the Focused SI and ESI to provide a complete site-wide report.

Schedule 4-9
MMRP Site UXO-21
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**ESI**	**143 days**	**Wed 8/10/11**	**Fri 2/24/12**
2	Field Activities	38 days	Wed 8/10/11	Fri 9/30/11
3	Draft ESI Report	30 days	Mon 10/3/11	Fri 11/11/11
4	Review Period	45 days	Mon 11/14/11	Fri 1/13/12
5	Final ESI Report	30 days	Mon 1/16/12	Fri 2/24/12

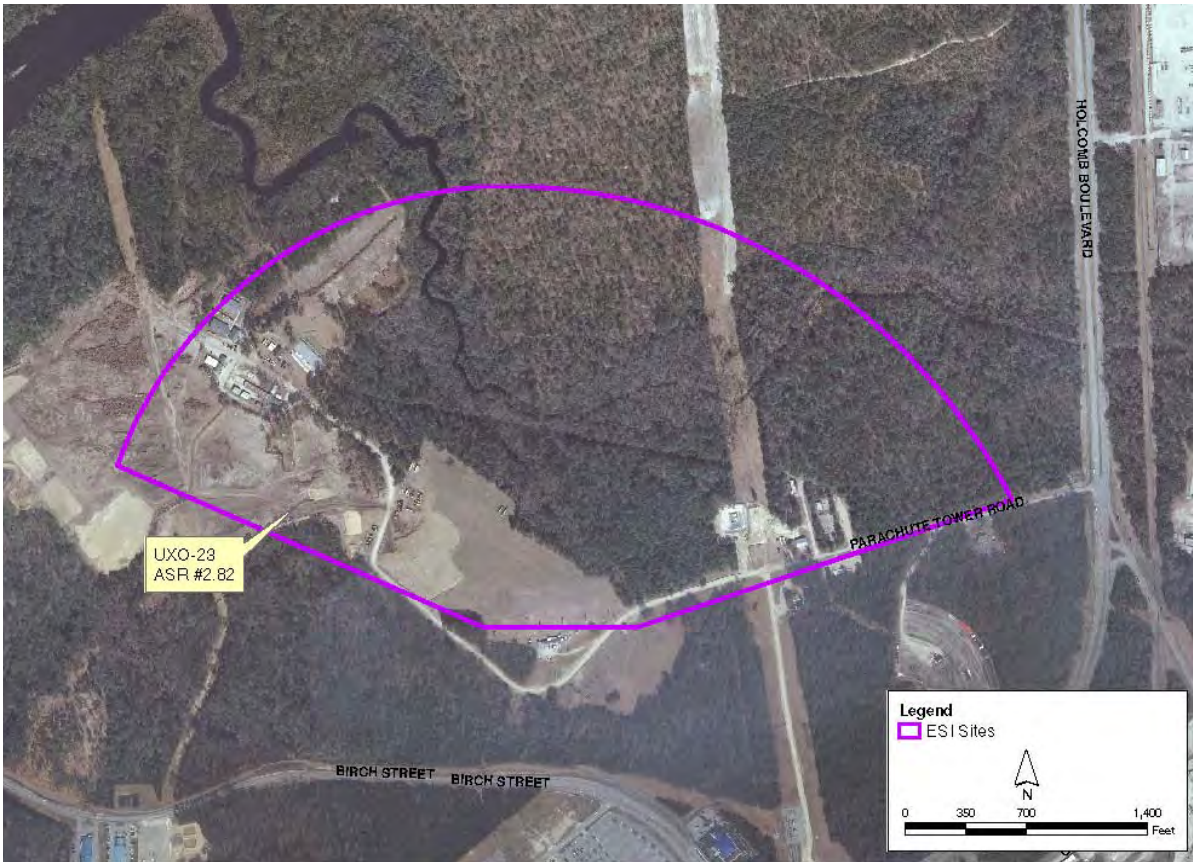


Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

4.1.10 UXO-23— D-9 Skeet Range (ASR #2.82)

The D-9 Skeet Range is located west of Holcomb Boulevard and north of Parachute Tower Road and encompasses approximately 187 acres (**Figure 4-10**). The D-9 Skeet Range began operation in 1953 and was closed in July 2011.

FIGURE 4-10
MMRP Site UXO-23, ASR #2.82



The range was one of four live-fire ranges within a training area known as Area D. The range was used for recreational shooting and is operated by the Marine Corp Community Services (MCCS). The weapons historically accommodated include 12-, 16-, 20-, 28-, and 410-gauge shotguns. The sizes of lead shot used on the range include 7.5 mm, 8 mm, 8.5 mm, and 9 mm. Although the total amounts of ammunition used on the skeet ranges are not available, it is estimated that several hundred thousand rounds are fired each year (Singhas, 2007). There are 10 firing points and 8 skeet houses on the D-9 Skeet Range. The types of sporting clays used included White Flyer and, within the last five years, biodegradable targets. The fields were raked at a minimum of every 6 months to clear the clay pieces, which were disposed offsite.

Covering approximately 100 acres north of Hadnot Point and south of Wallace Creek, the Wallace Creek MILCON project is planned, consisting of barracks support buildings (e.g., mess hall, fitness center) and parking areas, and includes the theoretical shot fall-zone of the D-9 Skeet Range. Based on site use and site features, the D-9 Skeet Range was divided into three areas for investigation purposes: the north area (north of Bearhead Creek), the south area (south of Bearhead Creek, excluding the theoretical shot fall-zone), and the theoretical shot fall-zone.

Previous investigations are listed in **Table 4-10**.

TABLE 4-10
Previous Investigations Summary, MMRP Site UXO-23, ASR #2.82

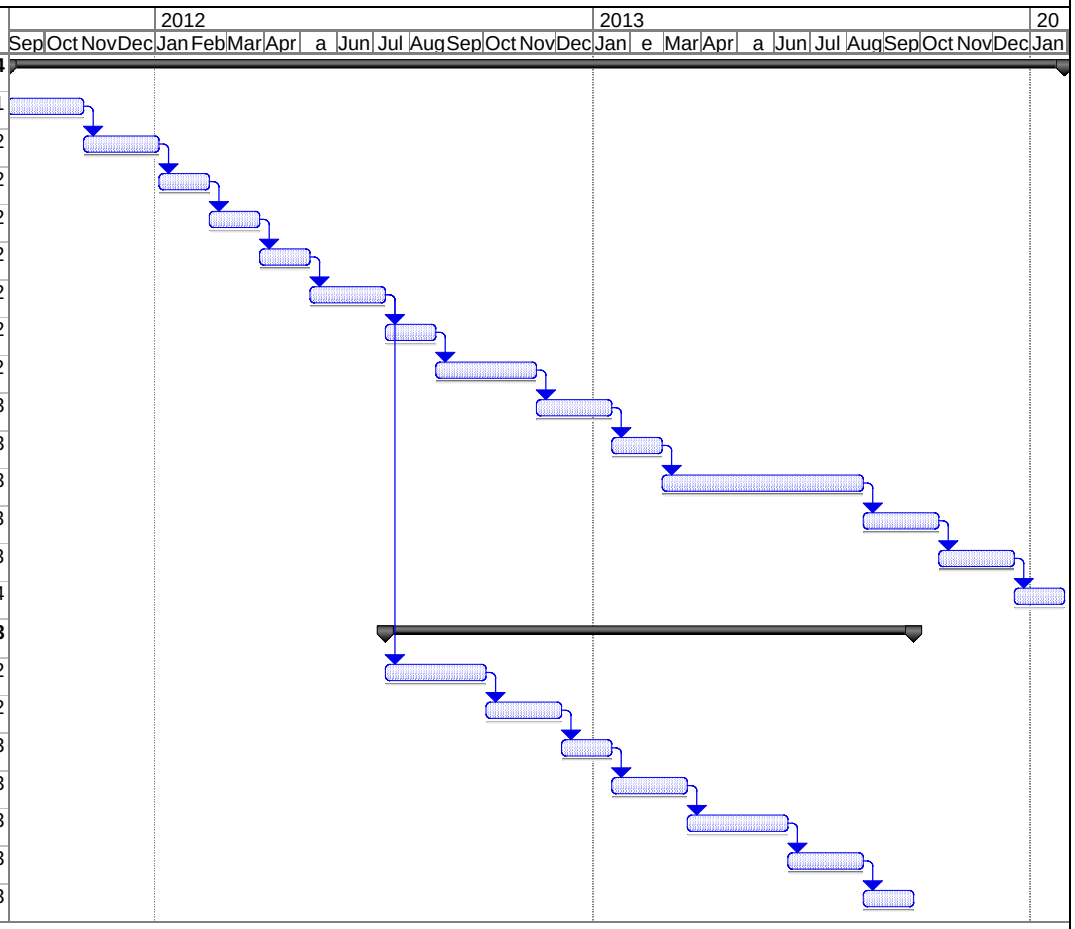
Previous Investigation/Action	Date	Activities
Focused Site Inspection (CH2M HILL, 2008)	2007 - 2008	A field investigation was conducted to evaluate the distribution of lead within the area south of Bearhead Creek. Surficial soil samples were field screened using X-ray fluorescence (XRF) to identify potential lead impacts. Soil and groundwater samples were also collected and analyzed for lead to confirm the XRF results. The highest concentrations of lead were generally found to correspond with the theoretical shot fall-zone for the range. Additional sampling of surface soils and groundwater and a human health risk assessment (HHRA) was recommended.
Focused Preliminary Assessment/Site Investigation (CH2M HILL, 2009)	2008 - 2009	The Focused PA/SI was conducted to evaluate potential impacts to human health and the environment in the area north of Bearhead Creek. Soil, groundwater, surface water, and sediment samples were collected and were analyzed for perchlorate, PAHs, and metals. Potential human health risks to future residents from PAHs in groundwater north of Bearhead Creek and potential ecological risks from metals and PAHs in Bearhead Creek were identified.
Wallace Creek Expanded SI (CH2M HILL, 2010)	2009 - 2010	Additional soil sampling was conducted in the theoretical shot fall-zone to delineate the horizontal and vertical extents of lead impacts and to investigate potential impacts to drainage features that convey surface water runoff from the theoretical shot fall-zone. An HHRS and an ERS were performed on the data collected to-date. In the north area, potential risks have been identified from PAHs in groundwater, metals and PAHs in surface water, and sediment within Bearhead Creek and associated wetlands and drainages. In the southern area of the Skeet Range, outside of the shot fall-zone, no unacceptable risks were identified in soil and groundwater. In the vicinity of the theoretical shot fall-zone, potential unacceptable risks to human health and the environment were identified from exposure to lead and PAHs in surface soil, and a removal action was recommended once the Skeet Range is closed.
Draft Engineering Evaluation/Cost Analysis (CH2M HILL, 2010)	2010	The EE/CA evaluated alternatives for the NTCRA to address potential unacceptable risks from lead and PAHs in the shot fall-zone. The alternatives were no action, excavation with offsite disposal, excavation with particle separation and backfill, excavation with stabilization and offsite disposal, and In-situ stabilization.

4.1.10.1 Future Activities

After submission of the Draft EE/CA, several MILCON projects were planned/initiated adjacent to the NTCRA area and additional investigation was conducted in 2011. The EE/CA will be updated to incorporate these results in 2012 (**Schedule 4-10**). As part of the MMRP, an ESI will be initiated in 2012/2013 to further evaluate the groundwater in the northern area of the Skeet Range and within Bearhead Creek and its associated wetlands and drainages.

Schedule 4-10
MMRP Site UXO-23
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**NTCRA**	**630 days**	**Thu 9/1/11**	**Wed 1/29/14**
2	Update EE/CA	45 days	Thu 9/1/11	Wed 11/2/11
3	Review Period	45 days	Thu 11/3/11	Wed 1/4/12
4	Final EE/CA	30 days	Thu 1/5/12	Wed 2/15/12
5	Public Meeting/Review Period	30 days	Thu 2/16/12	Wed 3/28/12
6	Draft Action Memo	30 days	Thu 3/29/12	Wed 5/9/12
7	Review Period	45 days	Thu 5/10/12	Wed 7/11/12
8	Final Action Memo	30 days	Thu 7/12/12	Wed 8/22/12
9	Draft NTCRA Work Plan	60 days	Thu 8/23/12	Wed 11/14/12
10	Review Period	45 days	Thu 11/15/12	Wed 1/16/13
11	Final NTCRA Work Plan	30 days	Thu 1/17/13	Wed 2/27/13
12	NTCRA	120 days	Thu 2/28/13	Wed 8/14/13
13	Draft NTCRA Report	45 days	Thu 8/15/13	Wed 10/16/13
14	Review Period	45 days	Thu 10/17/13	Wed 12/18/13
15	Final NTCRA Report	30 days	Thu 12/19/13	Wed 1/29/14
16	**ESI**	**315 days**	**Thu 7/12/12**	**Wed 9/25/13**
17	Draft ESI UFP-SAP	60 days	Thu 7/12/12	Wed 10/3/12
18	Review Period	45 days	Thu 10/4/12	Wed 12/5/12
19	Final ESI UFP-SAP	30 days	Thu 12/6/12	Wed 1/16/13
20	Field Investigation	45 days	Thu 1/17/13	Wed 3/20/13
21	Draft ESI Report	60 days	Thu 3/21/13	Wed 6/12/13
22	Review Period	45 days	Thu 6/13/13	Wed 8/14/13
23	Final ESI Report	30 days	Thu 8/15/13	Wed 9/25/13



Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

SECTION 5

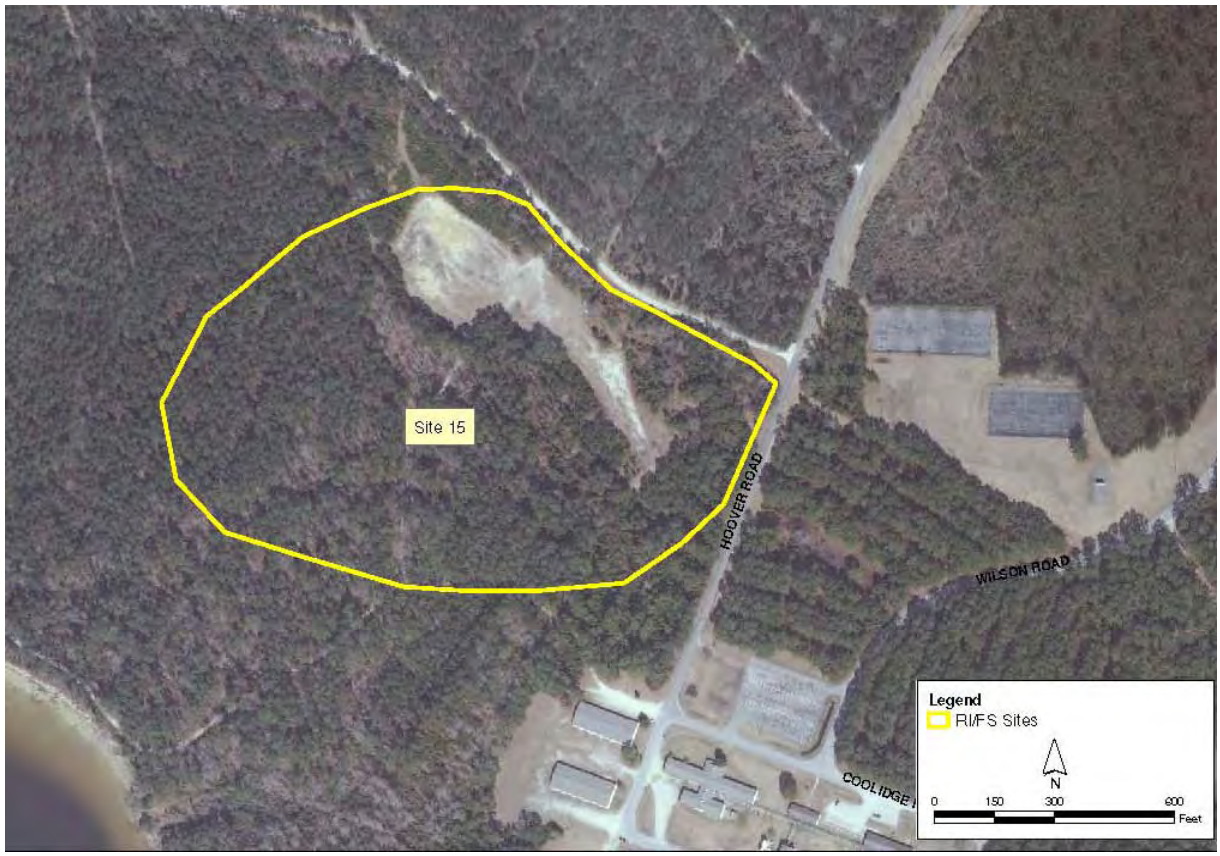
Descriptions of RI/FS Sites

The following sections discuss the site history, summary of previous investigations, and future activities of the seven IRP sites and two MMRP sites that are in the RI/FS phase of the CERCLA process. Because these sites are currently under investigation, the site boundaries encompass the current nature and extent of contamination.

5.1.1 Site 15 (SWMU 46)—Montford Point Burn Landfill Area

Site 15, the former Montford Point Burn Landfill Area operated between 1948 and 1958 and was used for the disposal of sewage treatment sludge and other materials, including litter, metal, asphalt, and sand (**Figure 5-1**). Surface wastes in this area were investigated under the Resource Conservation and Recovery Act (RCRA) program as Solid Waste Management Unit (SWMU) 46. Upon removal of surface wastes, Site 15 was transferred to the IRP on December 28, 2007. The site initially covered approximately 24 acres and the waste disposal area is 2 acres.

FIGURE 5-1
IRP Site 15



Previous investigations are listed in **Table 5-1**.

TABLE 5-1
Previous Investigations Summary, IRP Site 15

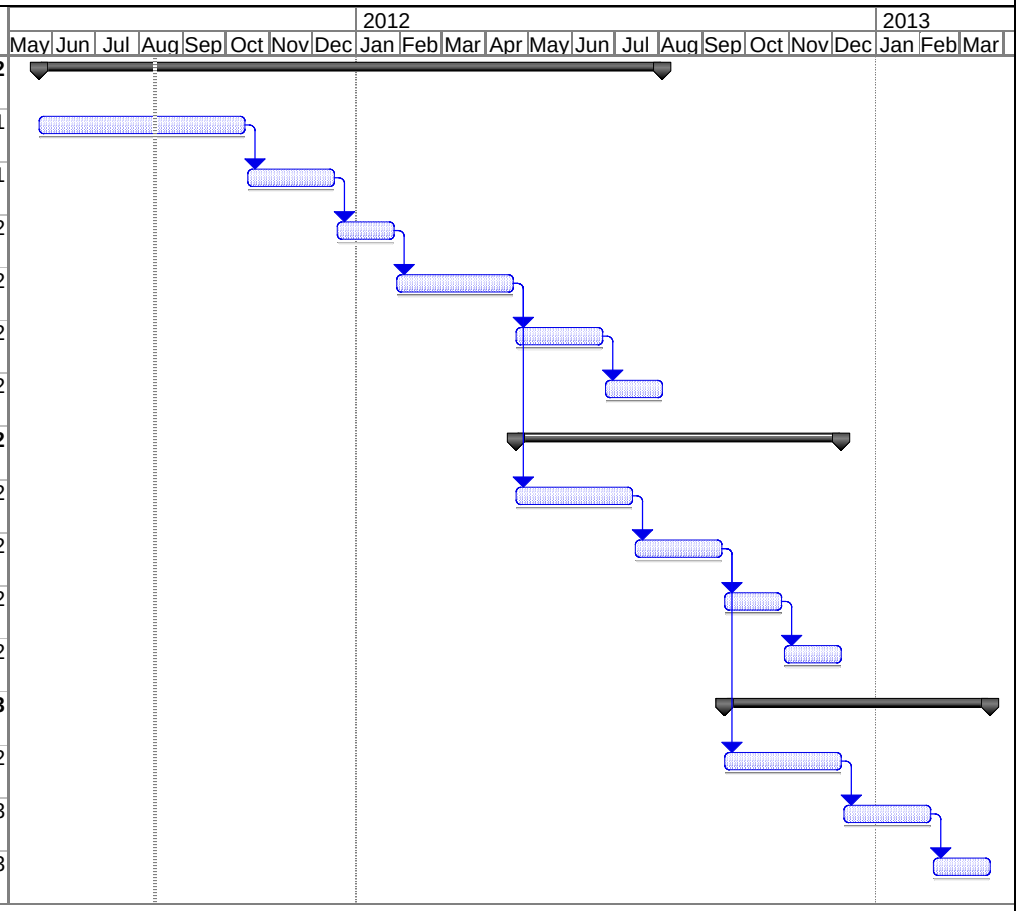
Previous Investigation/Action	Date	Activities
Confirmatory Site Investigation (Baker, 2001; 2002)	1997 - 2002	A Phase I CSI was conducted in 1997 and recommended a Phase II CSI, which was performed in 2002. Together the CSIs included soil sampling for metals and SVOCs, groundwater sampling for metals, and a geophysical survey to identify the location of the buried waste. The results indicated that an anomaly consistent with a small landfill was present in the central portion of the site.
RCRA Facility Investigation (RFI) (CH2M HILL/Baker, 2005)	2004 - 2005	An RFI was conducted to further identify the waste locations and evaluate potential contamination. The RFI consisted of additional geophysical testing, test pit trenching, surface and subsurface soil sampling, installation of one monitoring well, and groundwater sampling. Soil samples were analyzed for VOCs, SVOCs, metals, and pesticides and groundwater was analyzed for metals. The RFI concluded that metals in surface soil and metals and pesticides in the landfill posed potential risks to human and ecological receptors. It was recommended that surface mounds and contaminated surface soil should be managed as RCRA waste and the landfill waste be managed under CERCLA as Site 15.
Site Reconnaissance and Soil Sampling (CH2M HILL, 2006)	2006	Mound and surface soil sampling for VOCs, SVOCs, pesticides/PCBs, and RCRA metals was conducted to identify the area for removal. Pesticides and metals that exceeded screening criteria were identified for Interim Measures removal.
Interim Measures (Shaw, 2007)	2007	Removal of three mounds and a surface soil area to a depth of 1 foot below ground surface (bgs) was conducted. A total of 1,039 tons of soil and debris were removed and confirmation soil sampling indicated pesticide and metal concentrations below screening criteria.
Preliminary Assessment/Site Inspection (CH2M HILL, 2010)	2009-2010	A field investigation was completed at Site 15 in support of the potential Camp Johnson MILCON project. Field activities included soil and groundwater sampling for VOCs, SVOCs, pesticides/PCBs, and metals, and the excavation of 8 test pits for waste delineation. Based on the preliminary results, additional sampling and risk assessment were recommended.

5.1.1.1 Future Activities

Based on the results for the PA/SI, an ESI was initiated in 2010. Preliminary results indicated elevated concentrations of SVOCs, pesticides/PCBs, and metals in soils at concentrations exceeding screening criteria, as well as SVOCs and metals in groundwater at concentrations exceeding screening criteria. Because waste remains in-place at Site 15, an RI was recommended to present the nature and extent of contamination and assess risks to human health and the environment. The RI report will be completed in 2011/2012, followed by a FS, PRAP, and ROD (**Schedule 5-1**).

Schedule 5-1
IRP Site 15
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**RI/FS**	**315 days**	**Mon 5/23/11**	**Fri 8/3/12**
2	Draft RI Report	105 days	Mon 5/23/11	Fri 10/14/11
3	Review Period	45 days	Mon 10/17/11	Fri 12/16/11
4	Final RI Report	30 days	Mon 12/19/11	Fri 1/27/12
5	Draft FS	60 days	Mon 1/30/12	Fri 4/20/12
6	Review Period	45 days	Mon 4/23/12	Fri 6/22/12
7	Final FS	30 days	Mon 6/25/12	Fri 8/3/12
8	**PRAP**	**165 days**	**Mon 4/23/12**	**Fri 12/7/12**
9	Draft PRAP	60 days	Mon 4/23/12	Fri 7/13/12
10	Review Period	45 days	Mon 7/16/12	Fri 9/14/12
11	Final PRAP	30 days	Mon 9/17/12	Fri 10/26/12
12	Public Notice/Review Period	30 days	Mon 10/29/12	Fri 12/7/12
13	**ROD**	**135 days**	**Mon 9/17/12**	**Fri 3/22/13**
14	Draft ROD	60 days	Mon 9/17/12	Fri 12/7/12
15	Review Period	45 days	Mon 12/10/12	Fri 2/8/13
16	Final ROD	30 days	Mon 2/11/13	Fri 3/22/13



Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

5.1.2 Site 49—MCAS Suspected Minor Dump

Site 49, the MCAS Suspected Minor Dump, encompasses approximately 2 acres and is located within MCAS New River, in the northwest portion of the Base (**Figure 5-2**). The dates of operation are unknown, but Site 49 is suspected of having been used for the disposal of paint cans. Building AS810 is located approximately 50 feet from the northeast boundary of the site and is currently used for the storage of miscellaneous industrial materials and paint supplies. A drainage pipe exits the building and ends in the northeast portion of Site 49. A drainage ditch for taxiways, runways, and miscellaneous buildings along Curtis Road and Longstaff Street bisects the site. Various types of construction-related surface debris have been observed at the site.

FIGURE 5-2
Site IRP 49

Previous investigations are listed in **Table5-2**.

TABLE 5-2
Previous Investigations Summary, IRP Site 49

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The quantity of waste disposed of was determined to be insignificant and did not warrant further investigation.
Preliminary Assessment/ Site Inspection (CH2M HILL, 2011)	2009-2011	To verify the presence or absence of contamination due to the site's history as a dump, confirmatory sampling was conducted. Soil and groundwater samples were collected in July 2009 and analyzed for SVOCs, VOCs, and metals. Based on analytical results, additional groundwater samples were collected in February 2010 and analyzed for VOCs. VOCs, SVOCs, and metals were detected at concentrations exceeding screening criteria in soil. VOCs and metals were detected in groundwater at concentrations exceeding screening criteria. Potential human health and ecological risks were identified due to exposure to VOCs in groundwater. The PA/SI recommended an additional investigation to assess VOCs in groundwater.

5.1.2.1 Future Activities

An RI was initiated in 2011 to further delineate VOCs identified during the PA/SI. Field activities included surface and subsurface soil, groundwater, pore water, surface water, and sediment sampling for VOC analysis. The RI report will be completed in 2011/2012 followed by a FS, PRAP, and ROD (**Schedule 5-2**).

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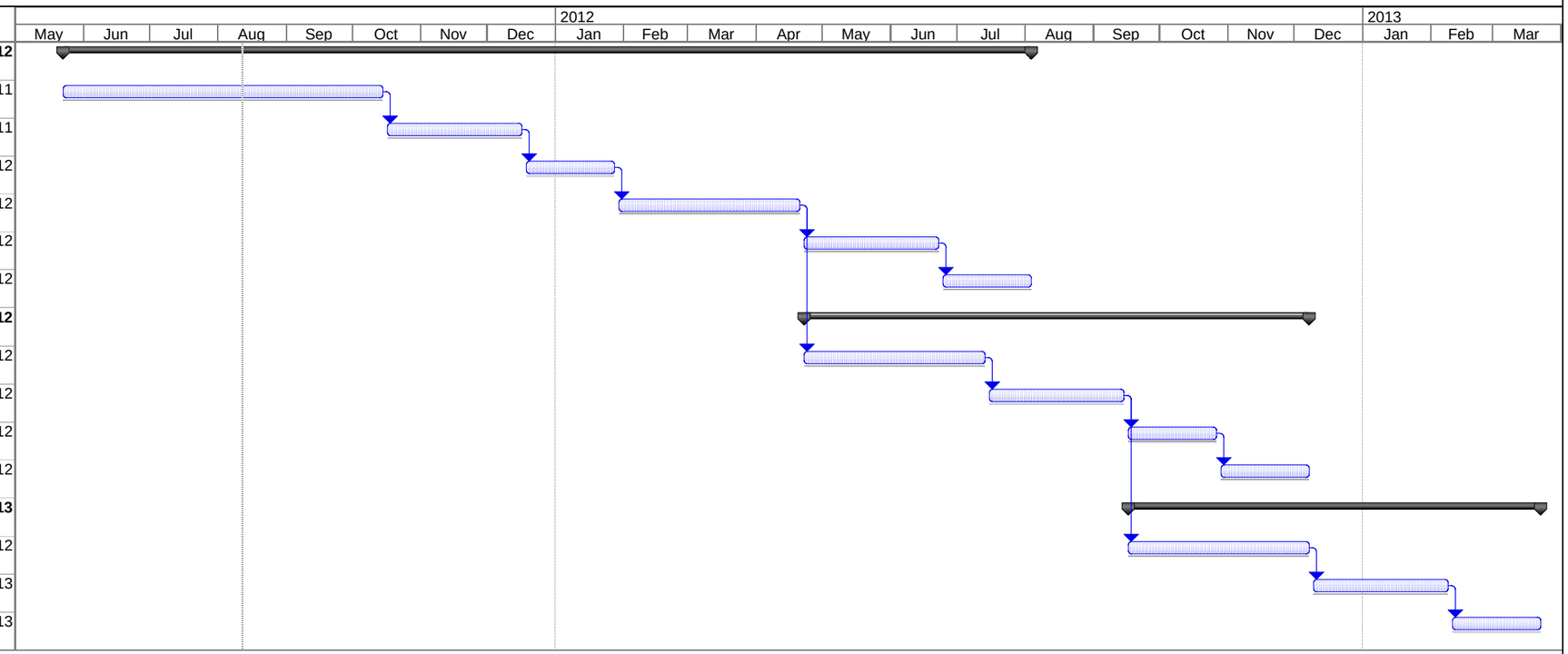
Schedule 5-2
IRP Site 49
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**RI/FS**	**315 days**	**Mon 5/23/11**	**Fri 8/3/12**
2	Draft RI Report	105 days	Mon 5/23/11	Fri 10/14/11
3	Review Period	45 days	Mon 10/17/11	Fri 12/16/11
4	Final RI Report	30 days	Mon 12/19/11	Fri 1/27/12
5	Draft FS	60 days	Mon 1/30/12	Fri 4/20/12
6	Review Period	45 days	Mon 4/23/12	Fri 6/22/12
7	Final FS	30 days	Mon 6/25/12	Fri 8/3/12
8	**PRAP**	**165 days**	**Mon 4/23/12**	**Fri 12/7/12**
9	Draft PRAP	60 days	Mon 4/23/12	Fri 7/13/12
10	Review Period	45 days	Mon 7/16/12	Fri 9/14/12
11	Final PRAP	30 days	Mon 9/17/12	Fri 10/26/12
12	Public Notice/Review Period	30 days	Mon 10/29/12	Fri 12/7/12
13	**ROD**	**135 days**	**Mon 9/17/12**	**Fri 3/22/13**
14	Draft ROD	60 days	Mon 9/17/12	Fri 12/7/12
15	Review Period	45 days	Mon 12/10/12	Fri 2/8/13
16	Final ROD	30 days	Mon 2/11/13	Fri 3/22/13

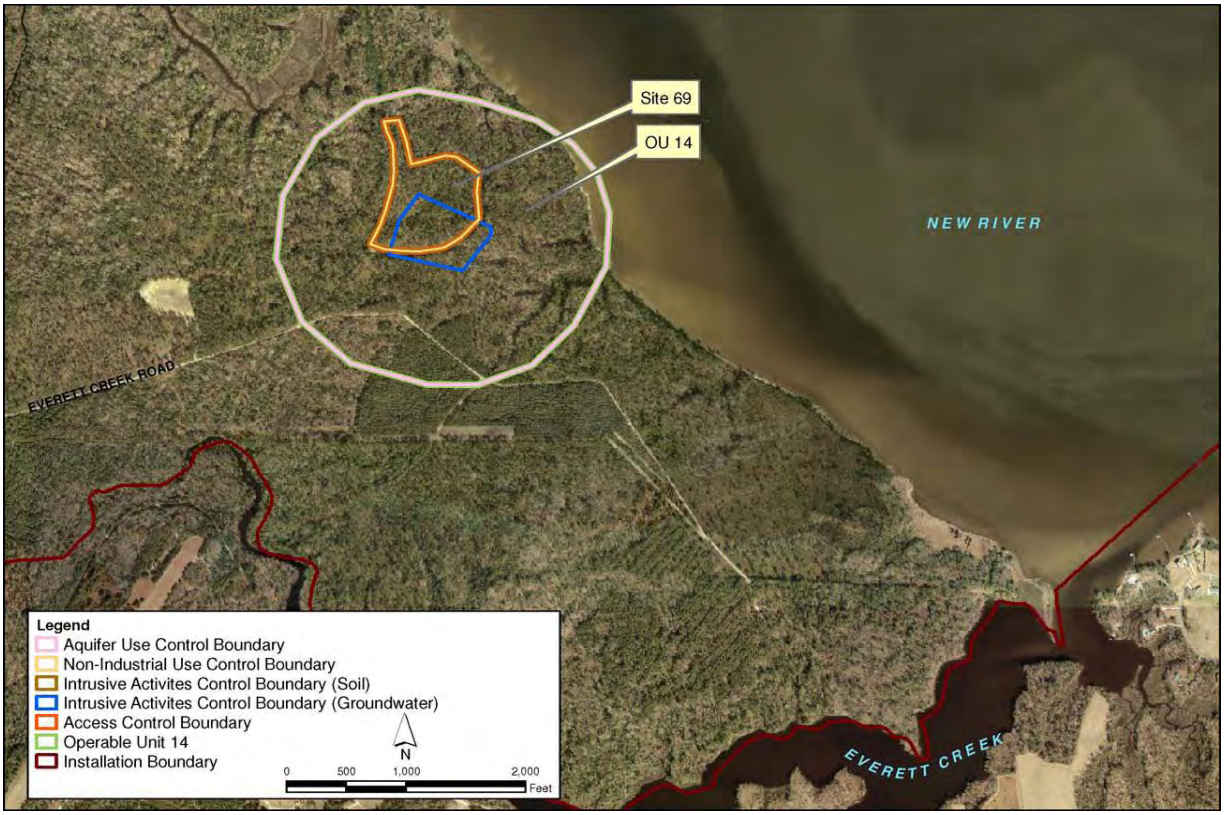


Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

5.1.3 Site 69 (OU 14)—Rifle Range Chemical Dump

Site 69, the Rifle Range Chemical Dump, encompasses approximately 14 acres located approximately 1,300 feet west of the New River in the Rifle Range area of MCB CamLej (**Figure 5-3**). From 1950 to 1976, Site 69 was reportedly used to dispose of chemical wastes including PCBs, solvents, pesticides, and drums of "gas" that possibly contained cyanide (i.e., tear gas) or other training agents, also known as CA. Site 69 is located within Site UXO-02 (Section 4.1.3), which was used as an explosive range from 1973 to 2002 and is currently being addressed under the MMRP.

FIGURE 5-3
IRP Site 69, Operable Unit 14



Previous investigations are listed in **Table 5-3.** A LUC Summary is provided in **Table 5-4**.

TABLE 5-3
Previous Investigations Summary, IRP Site 69

Previous Investigation/Action	Date	Activities
Radiation Survey and Soil Sampling (NEESA, 1981)	1980 - 1981	Based on the reported history that Site 69 was a suspected radioactive waste disposal site, a radiation survey and soil sampling were conducted. Radioactivity was not detected at higher than average natural concentrations and soil sample results indicated naturally-occurring radioactivity.
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. A confirmation study was recommended at Site 69 based on the presence of buried hazardous or toxic wastes and the potential for migration into the aquifer.

Previous Investigation/Action	Date	Activities
Confirmation Study (ESE, 1987)	1984 - 1987	To verify the presence or absence of contamination due to the site's history as a dump, confirmatory sampling was conducted. Groundwater, surface water, and sediment samples were collected and analyzed for VOCs, pesticides/PCBs, select SVOCs, select metals, and residual chlorine. Analytical results identified VOCs in groundwater and surface water and pentachlorophenol (PCP) in one sediment sample.
Remedial Investigation (Baker, 1995)	1992 - 1995	Field activities were conducted to assess the nature and extent of contamination and potential human health and environmental impacts of the site. Geophysical investigations were conducted and groundwater, surface water, sediment, fish, shellfish, and benthic macro invertebrate samples were collected. Samples were analyzed for VOCs, SVOCs, metals, and pesticides/PCBs. Geophysical investigations indicated buried metallic objects near the groundwater source area. Potential human health risks were identified for future residents due to exposure of VOCs and metals in groundwater. No unacceptable ecological risks were identified and surface water and sediment analytical results indicated that the New River, Everett Creek, and the unnamed tributary north of the site were not impacted by the former disposal operations.
In-Well Aeration Pilot Study (Baker, 1998)	1996 - 1998	A pilot study was initiated to assess the effectiveness of In-well aeration for treatment of VOCs in groundwater. After 2 years of operation and testing, the method was determined to be ineffective at reducing groundwater contamination and the pilot study was discontinued.
Proposed Remedial Action Plan (Baker, 1998)	1998	The PRAP identified monitored natural attenuation (MNA) and LUCs as the preferred alternative to address potential risks from groundwater and waste. The PRAP was submitted for public review and comment. General comments for informational purposes were addressed during the public meeting and no written comments were received.
Interim Record of Decision (Baker, 2000)	2000	The interim selected remedy was LTM for MNA of VOCs in groundwater and to monitor potential migration and LUCs to prevent exposure to waste, soil, and groundwater.
Interim Remedial Action	1998 - 2005	Groundwater LTM for VOCs and NAIPs was implemented in 1998 and continued until 2005, as the site is a part of ongoing investigations and studies in which the LTM requirements are being fulfilled or exceeded by site-specific monitoring programs. LUCs were implemented in 2001 and updated in 2002 and remain in place.
Surface Water and Sediment Sampling	2005	Due to a request by Onslow County Commissioners, NCDENR–Department of Water Quality and the Base performed split surface water and sediment sampling in surface waters adjacent to Site 69. NCDENR recommended no further sampling and no advisory to be issued.
Radiation Survey (RASO, 2007)	2007	A radiation survey was conducted and radioactivity was not detected at higher than average natural concentrations, which confirmed the 1980 to 1981 findings.
Supplemental Investigation (CH2M HILL, 2011)	2008 - 2011	A supplemental investigation was conducted simultaneously with the UXO-02 PA/SI to further delineate the nature and extent of contamination and move the site towards a final ROD. Field activities included a geophysical survey, monitoring well installation, and soil, groundwater, surface water, and sediment sampling. Potential human health risks were identified due to exposure to pesticides, PCBs, VOCs, and metals in groundwater. Potential ecological risks were identified due to exposure to pesticides in surface soil and sediment. An FS was recommended to identify RAOs and evaluate potential treatment alternatives. The current site CSM is shown on Figure 5-4.

TABLE 5-4
Land Use Control Summary, IRP Site 69

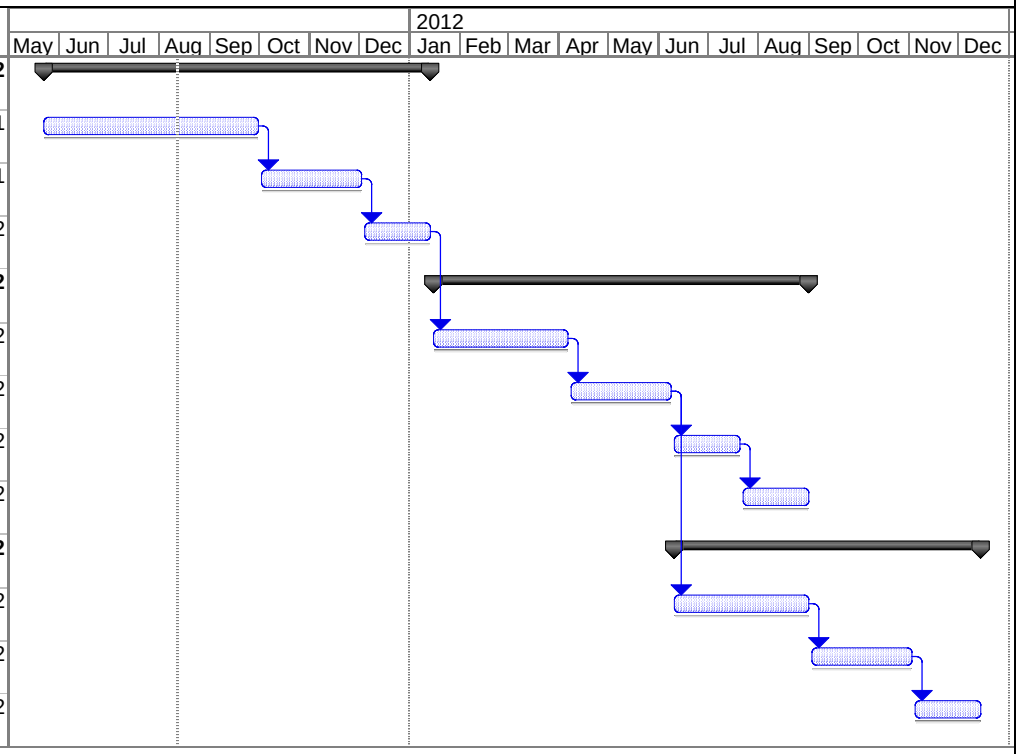
LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary	13.9	June 15, 2001	July, 2002
Intrusive Activities Control Boundary (Soil)	13.9		
Intrusive Activities Control Boundary (Groundwater)	8		
Aquifer Use Control Boundary (1,000 feet)	127.2		
Access Control Boundary	13.9		

5.1.3.1 Future Activities

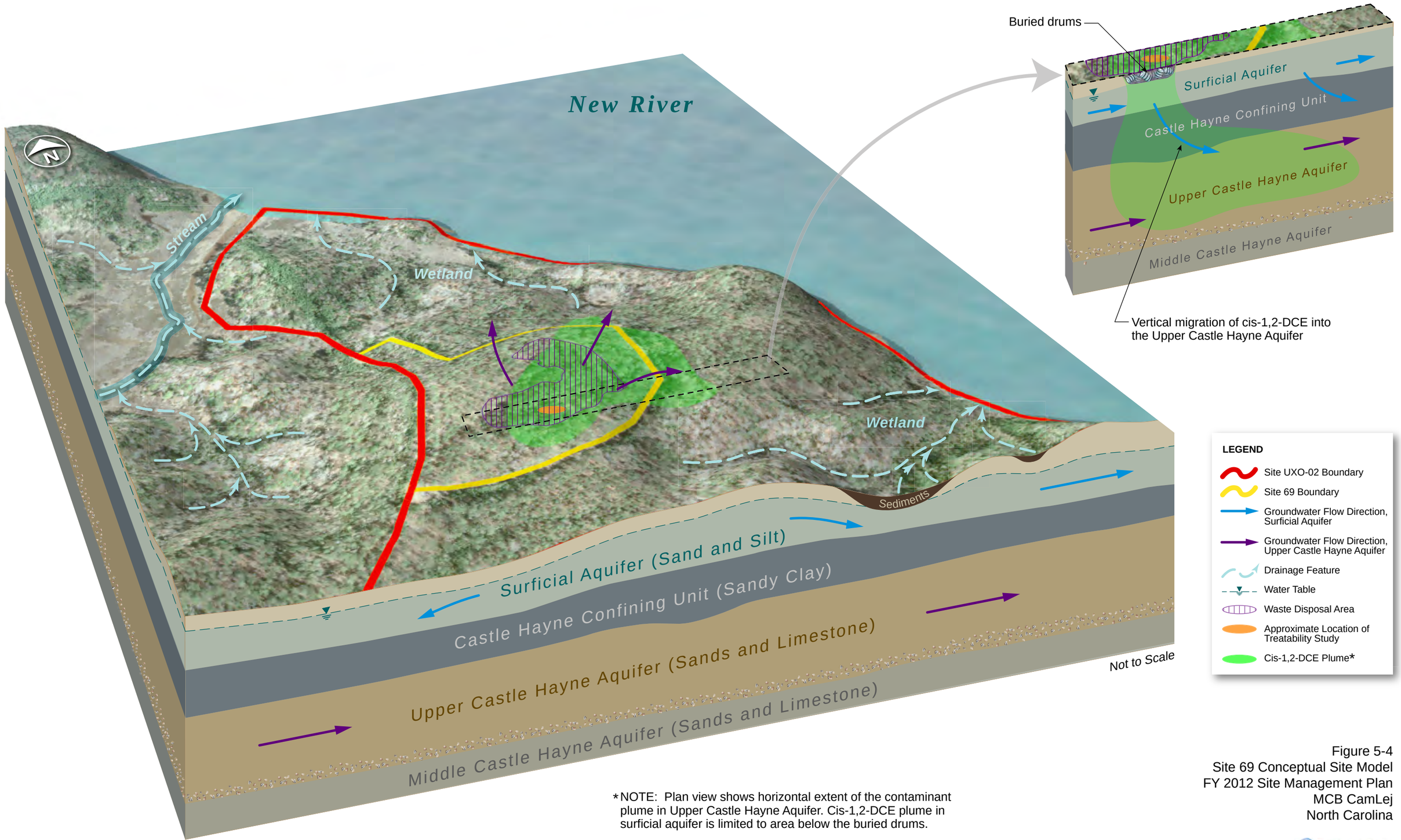
An FS will be issued in FY 2011, followed by a PRAP and ROD (**Schedule 5-3**). Follow-up actions from the 2010 Five-Year Review are being implemented, and the milestones and current status are presented in **Table 2-1**.

Schedule 5-3
IRP Site 69
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**FS**	**170 days**	**Mon 5/23/11**	**Fri 1/13/12**
2	Draft FS	95 days	Mon 5/23/11	Fri 9/30/11
3	Review Period	45 days	Mon 10/3/11	Fri 12/2/11
4	Final FS	30 days	Mon 12/5/11	Fri 1/13/12
5	**PRAP**	**165 days**	**Mon 1/16/12**	**Fri 8/31/12**
6	Draft PRAP	60 days	Mon 1/16/12	Fri 4/6/12
7	Review Period	45 days	Mon 4/9/12	Fri 6/8/12
8	Final PRAP	30 days	Mon 6/11/12	Fri 7/20/12
9	Public Notice/Review Period	30 days	Mon 7/23/12	Fri 8/31/12
10	**ROD**	**135 days**	**Mon 6/11/12**	**Fri 12/14/12**
11	Draft ROD	60 days	Mon 6/11/12	Fri 8/31/12
12	Review Period	45 days	Mon 9/3/12	Fri 11/2/12
13	Final ROD	30 days	Mon 11/5/12	Fri 12/14/12



Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	



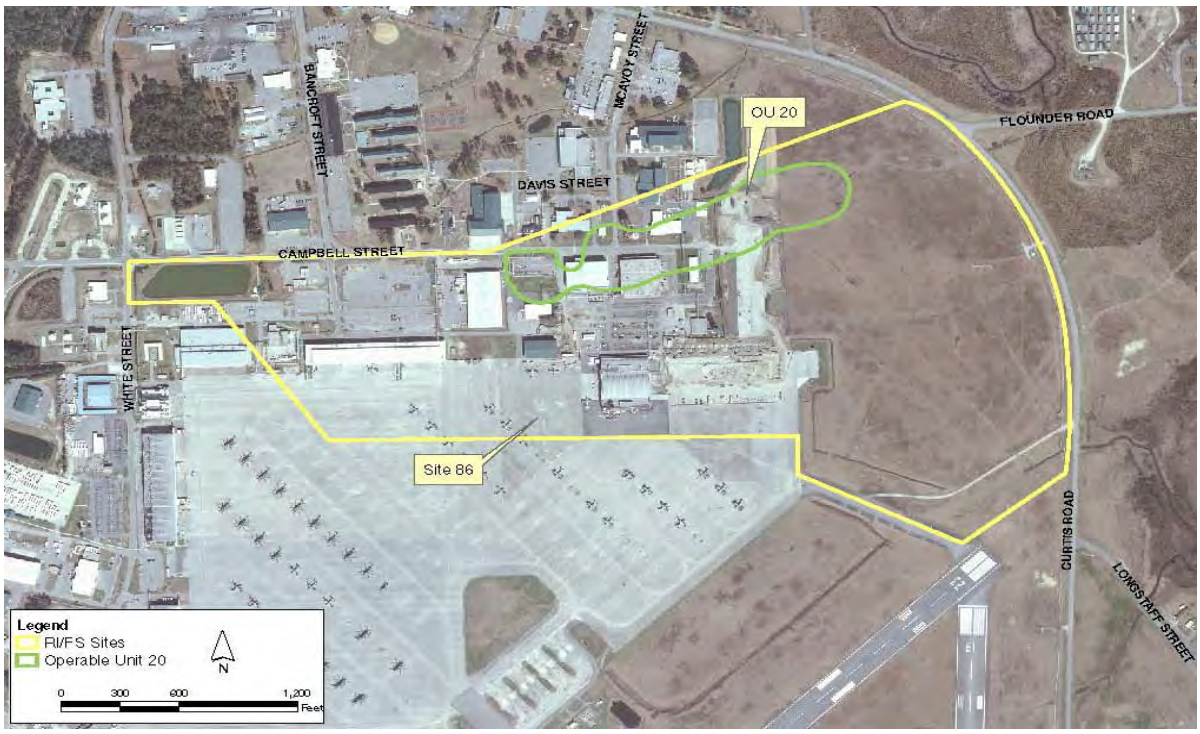
*NOTE: Plan view shows horizontal extent of the contaminant plume in Upper Castle Hayne Aquifer. Cis-1,2-DCE plume in surficial aquifer is limited to area below the buried drums.

Figure 5-4
Site 69 Conceptual Site Model
FY 2012 Site Management Plan
MCB CamLej
North Carolina

5.1.4 Site 86 (OU 20)—Tank Area AS419-AS421 at MCAS

Site 86, Tank Area AS419-AS421, is located within the operations area of MCAS New River and covers approximately 130 acres (**Figure 5-5**). From 1954 to 1988, Site 86 served as a storage area for petroleum products. In 1954, three 25,000-gallon aboveground storage tanks (ASTs) were installed within an earthen berm. The three tanks were reportedly used for No. 6 fuel oil storage until 1979. From 1979 to 1988, the tanks were used for temporary storage of waste oil. The three tanks were emptied in 1988 and were removed in 1992. Today, the former location of the tanks is grass-covered and only a slight depression remains. In 2006, an RFI was completed for SWMU 303/318 (located south of Site 86) and identified chlorinated VOCs in groundwater from an undetermined source. Based on these results, the IRP Partnering Team agreed that Site 86 would be expanded to include the SWMU area.

FIGURE 5-5
IRP Site 86, Operable Unit 20



Previous investigations are listed in **Table 5-5.**

TABLE 5-5
Previous Investigations Summary, IRP Site 86

Previous Investigation/Action	Date	Activities
Preliminary Site Investigation (ESE, 1990)	1990	A Preliminary Site Investigation (PSI) was initiated to determine the presence or absence of contamination based on the site's history. Soil samples were collected and analyzed for VOCs and TPH. The results revealed limited TPH contamination and low-level detections of VOCs, likely attributable to localized surface spills.
UST Assessment (O'Brien & Gere, 1992)	1992	Soil and groundwater sampling was conducted to determine the nature and extent of contamination as a result of three onsite ASTs used for temporary storage of waste petroleum products. Results revealed TPH contamination in soil and identified VOCs in groundwater. Due to the lack of significant petroleum-related impacts and the discovery of chlorinated solvent contamination in groundwater, UST-AS419-21 (original Site 86) was transferred from the UST Program to the IRP in April 1994. Further investigation and remediation of groundwater were recommended.

Previous Investigation/Action	Date	Activities
Remedial Investigation (Baker, 1996)	1995 - 1996	A soil and groundwater investigation was conducted to analyze the nature and extent of contamination. Samples were analyzed for VOCs, SVOCs, metals, and TPH. Soil results indicated localized VOC and metals contamination in samples collected within and immediately adjacent to the former AST area and wide-spread, low-level SVOC contamination (primarily PAHs). Groundwater analytical results indicated the presence of VOC contamination limited to the surficial aquifer in the central and southeastern portion of the Site. Although VOCs were not present in the Castle Hayne aquifer, the VOCs appeared to have migrated vertically to the lower portion of the surficial aquifer and were migrating horizontally in the general direction of groundwater flow.
Post-Remedial Investigation Fieldwork (Baker, 2000)	1997 - 2000	To delineate the vertical and horizontal extent of the VOC contamination and to collect additional data to determine the appropriate remedial alternative, post-RI field work was implemented. Soil and groundwater samples were collected for VOCs and NAIPs. A large plume was identified, extending east-northeast from Site 86, and a much smaller plume was identified to the southwest, near a former wash rack area at Building AS513. The plumes were not fully delineated.
Long-term Monitoring	1998 - 2005	Groundwater LTM was conducted for VOCs, NAIPs, and metals at Site 86 to assess whether contamination remained present, had migrated, or was degrading through natural processes. In 2005, the site was removed from the LTM program, as other ongoing investigations and studies were being conducted.
Amended Remedial Investigation (CH2M HILL, Baker, and CDM, 2002)	2001 - 2002	Based on the findings of post-RI monitoring, an Amended RI was conducted in order to further delineate the nature and extent of contamination. Soil and groundwater samples were collected and analyzed for VOCs. Potential human health risks were identified from VOCs in groundwater. No unacceptable ecological risks were identified.
Air/Ozone Sparging Pilot Study (AGVIQ and CH2M HILL, 2006)	2004 - 2006	The Technology Evaluation Report and Pilot Study Work Plan were completed in 2004, which recommended injection of ozone through a horizontal well. The pilot study was conducted from 2005 to 2006 for the main trichloroethene (TCE) groundwater plume at the site. The report concluded that TCE concentrations were reduced by 99% in groundwater.
Expanded Supplemental Remedial Investigation (CH2M HILL, 2011)	2007 - 2011	The Supplemental RI was conducted to identify the potential source of VOCs, characterize the nature and extent of contamination east of the flight line, and assess potential risk to human health and the environment. Soil, groundwater, sediment, and surface water samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. Potential human health risks were identified based on future exposure to chromium in soil and VOCs and chromium in groundwater. The current site CSM is shown on Figure 5-6. An FS was recommended to evaluate remedial alternatives.

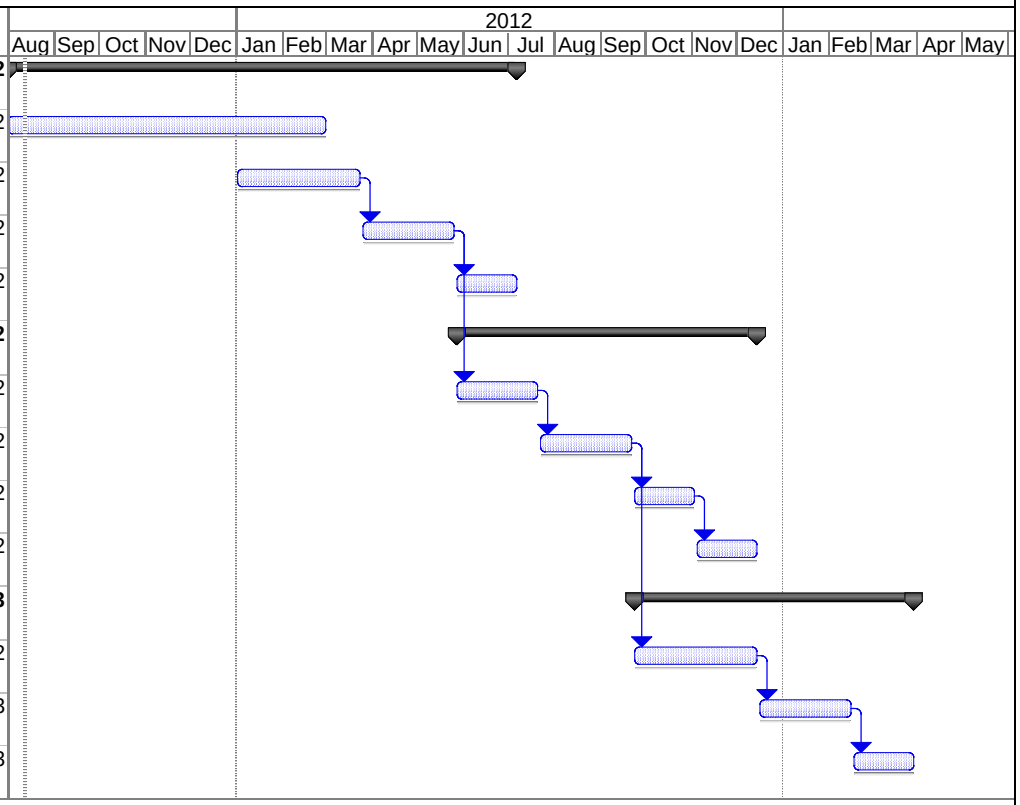
5.1.4.1 Future Activities

In support of the FS, a treatability study is planned for 2011-2012. Based on the results, an FS will be prepared in 2012, followed by a PRAP and ROD (**Schedule 5-4**).

If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. Base Master Planning maintains current groundwater plume data in GIS and all construction projects on-Base go through environmental review.

Schedule 5-4
IRP Site 86
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**FS**	**245 days**	**Mon 8/1/11**	**Fri 7/6/12**
2	Treatability Study	153 days	Mon 8/1/11	Wed 2/29/12
3	Draft FS	60 days	Mon 1/2/12	Fri 3/23/12
4	Review Period	45 days	Mon 3/26/12	Fri 5/25/12
5	Final FS	30 days	Mon 5/28/12	Fri 7/6/12
6	**PRAP**	**145 days**	**Mon 5/28/12**	**Fri 12/14/12**
7	Draft PRAP	40 days	Mon 5/28/12	Fri 7/20/12
8	Review Period	45 days	Mon 7/23/12	Fri 9/21/12
9	Final PRAP	30 days	Mon 9/24/12	Fri 11/2/12
10	Public Meeting/Review Period	30 days	Mon 11/5/12	Fri 12/14/12
11	**ROD**	**135 days**	**Mon 9/24/12**	**Fri 3/29/13**
12	Draft ROD	60 days	Mon 9/24/12	Fri 12/14/12
13	Review Period	45 days	Mon 12/17/12	Fri 2/15/13
14	Final ROD	30 days	Mon 2/18/13	Fri 3/29/13



Project: CT0-81
Date: Fri 8/12/11

Task | Milestone | Summary
Progress | Tentative Schedule

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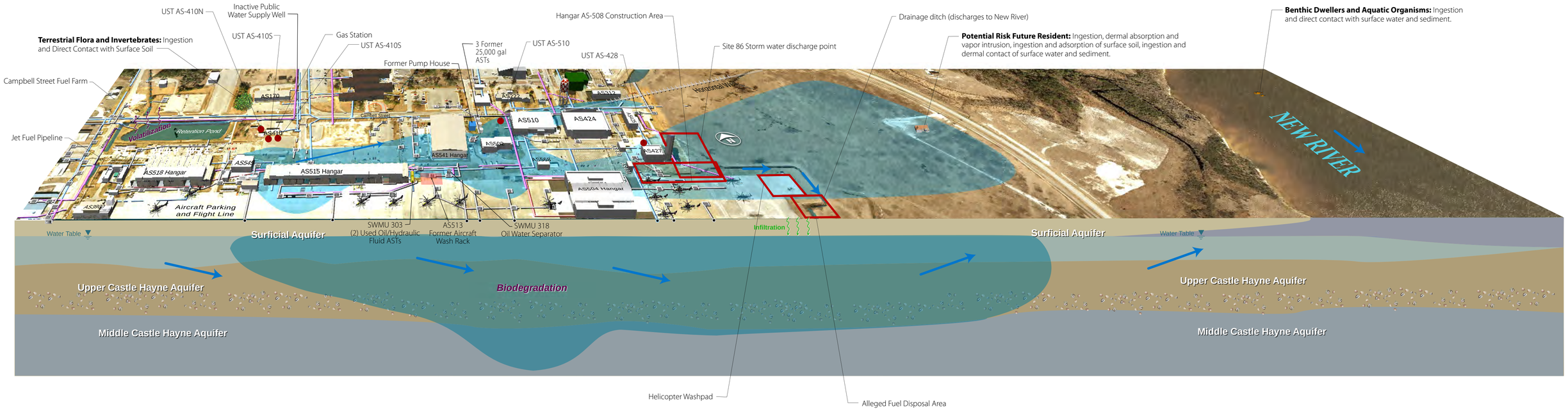


Legend

- Groundwater Flow Direction
- Approximate extent of Total VOCs plume
- Horizontal Well
- New Potential Source Area
- Underground Storage Tank

Utilities

- Stormwater Drain
- Water Line
- Wastewater Line
- Industrial Waste Collection and Treatment Facilities
- Historic Wastewater (replaced in 1998)

Note: Not to scale.

FIGURE 5-6
Site 86 Conceptual Site Model
FY 2012 Site Management Plan
MCB CamLej
North Carolina

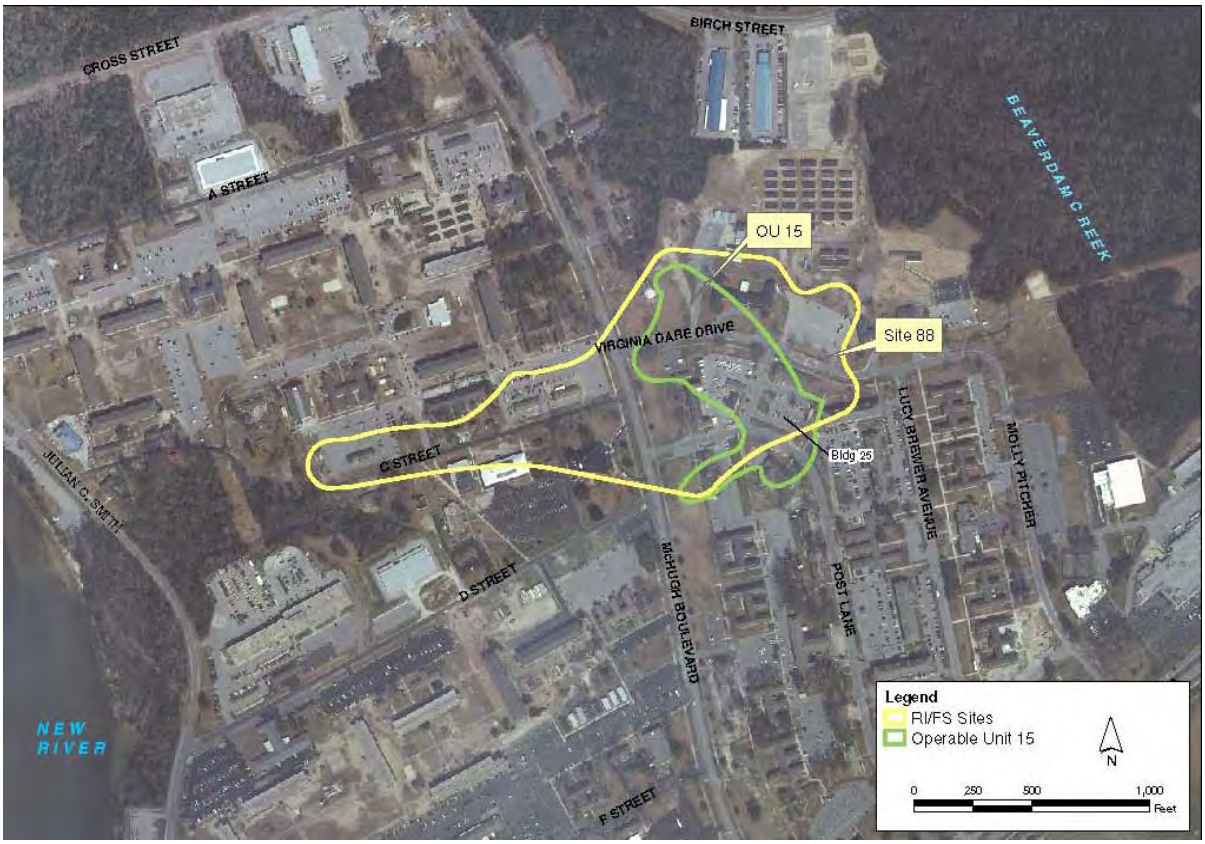
CH2MHILL

ES061110203910MKE MCBCamLej_OU20_Site86_ExpandedSupplementalRI_CSM_Revisions_v18.ai 7-19-2010 LEDjjs Generated by: K.Howell/CLT Checked by: T.Grim/CLT

5.1.5 Site 88 (OU 15)—Base Dry Cleaners

Site 88, the former Base Dry Cleaning Facility (former Building 25), is located within the HPIA of MCB CamLej and covers approximately 27 acres. Building 25 operated as a dry cleaning facility beginning in the 1940s (**Figure 5-7**). Five 750-gallon USTs were installed on the north side of the building to store dry cleaning fluids. Initially, Varsol™ was used in dry cleaning operations at Building 25. Because of flammability concerns, Varsol's use was discontinued in the 1970s and it was replaced with tetrachloroethene (PCE). The PCE was stored in one 150-gallon AST adjacent to the north wall of Building 25, in the same vicinity as the USTs. PCE was reportedly stored in the AST from the 1970s until 1995. During this time, facility employees have reported that spent PCE was disposed of in floor drains. In December 1986 and March 1995, self-contained dry cleaning machines were installed in Building 25, eliminating the need for bulk storage of PCE. The USTs and AST were removed in November 1995. The dry cleaning operations ceased in January 2004, and the building was demolished to slab in August 2004.

FIGURE 5-7
IRP Site 88, Operable Unit 15



Previous investigations are listed in **Table 5-6.**

TABLE 5-6
Previous Investigations Summary, IRP Site 88

Previous Investigation/Action	Date	Activities
Focused Remedial Investigation (Baker, 1998)	1996 - 1998	During removal of the USTs and ASTs, chlorinated VOCs and metals were detected in soil samples, and chlorinated VOCs, TPH, and naphthalene were detected in groundwater samples. As a result of these findings, a Focused RI was initiated. Field activities included soil and groundwater sampling for VOC's, and NAIPs. Subsurface soil contamination was identified under and near Building 25, and adjacent to the underground sewer line. Chlorinated solvent contamination was identified in surficial and upper Castle Hayne aquifer groundwater, and Building 25 was confirmed as the source area, suggesting the presence of a dense non-aqueous phase liquid (DNAPL).
DNAPL Recovery (Duke Engineering and Services, 1999)	1998 - 2000	Based on the results of the Focused RI, Site 88 was selected as a candidate for a surfactant enhanced aquifer remediation (SEAR) demonstration for DNAPL remediation. The presence of PCE DNAPL was confirmed, ranging from 16-20 feet bgs, directly beneath Building 25 and in an area adjacent to the north side of the building. The SEAR demonstration was conducted in the area north of Building 25 and DNAPL was extracted. Post-SEAR investigations indicated the DNAPL plume was removed from the upper, more permeable regions in the aquifer.
Long-term Monitoring (2002)	1999 - 2002	LTM at Site 88 was implemented in April 1999 and discontinued in 2002 when an Amended RI was initiated.
Reductive Anaerobic Bioremediation *In Situ* Treatment Technology (RABITT) (Battelle Memorial Institute, 2001)	2000 - 2002	RABITT treatability testing was performed to the northwest of Building 25 to investigate if “microbially-catalyzed reductive dechlorination of chloroethenes could be stimulated in-situ”. PCE-contaminated groundwater was pumped from 88-MW05IW, amended with electron donor solution (butyric acid and yeast extract), and then injected into 88-MW05IW and groundwater samples were collected and analyzed over a period of 30 weeks. The study concluded that native microbial populations were capable of sequentially reducing PCE to ethene. Also, PCE and TCE concentrations were reduced to below detectable levels in almost all pilot study wells after 14 weeks and remained depressed throughout the remainder of the demonstration.
Supplemental Site Investigation (CH2M HILL, 2003)	2002 - 2003	The SSI was conducted to determine the nature and extent of contamination and to provide recommendations for completing a comprehensive RI. Groundwater samples were collected and analyzed for VOCs, metals, and NAIPs. The analytical results indicated a general northwest migration of contaminants. Further, the vertical distribution of VOCs suggested that although appreciable volumes of DNAPL are observed to have accumulated upon the shallow silt layer, this layer was not impermeable, and was evidently allowing dissolved-phase VOCs to migrate vertically to the intermediate-depth aquifer zone.
Membrane Interface Probe Investigation (CH2M HILL, 2004)	2004	A membrane interface probe (MIP) investigation was conducted to refine previous source area characterization efforts and conduct vertical soil profiling in the vicinity of Building 25 and the nearby sewer systems. Information provided by the MIP investigation was used to evaluate the horizontal and vertical distribution of the DNAPL source area.
NTCRA (AGVIQ and CH2M HILL, 2006)	2004 - 2006	An EE/CA for the source area beneath Building 25 was completed and presented at a public meeting in June 2004 and shallow soil mixing with clay-zero valent iron (ZVI) was the recommended technology. In 2005, the removal action was completed, treating approximately 7,050 cubic yards (yd^3) of impacted soil. Within the treatment area, PCE concentrations in the soil were reduced by greater than 99 percent. Despite the significant source area reduction, residual dissolved phase groundwater contamination remained over a large portion of the surrounding and down gradient areas.

TABLE 5-6
Previous Investigations Summary, IRP Site 88

Previous Investigation/Action	Date	Activities
Remedial Investigation (CH2M HILL, 2008)	2005 - 2008	An RI was completed to address previous data gaps and complete the source identification and delineation of the release. Field activities included monitoring well installation and groundwater sampling. Samples were analyzed for VOCs and NAIPs. Results indicated a delineated VOC plume in groundwater that extended south of the source area. Potential human health risks were identified from VOCs in groundwater. No unacceptable ecological risks were identified.
Basewide Vapor Intrusion Evaluation (CH2M HILL, AGVIQ, 2009)	2007 - 2011	Site 88 was included in the phased basewide vapor intrusion investigation to determine if complete or significant exposure pathways exist for vapor intrusion into buildings. Based on the initial phase III results from sampling in 2010, potential risks were identified at three buildings at Site 88 where VOCs in indoor air samples exceeded screening levels. Follow-up indoor air samples were collected by the Base Industrial Hygiene personnel using OSHA-recommended methods and the indoor-air concentrations were consistent with those measured using USEPA methods and were well below OSHA standards for the protection of worker health and safety. Vapor intrusion mitigation systems are planned for installation in FY 2010/2011 at several buildings located at Site 88 where elevated subslab concentrations were observed. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed.
Treatability Study (CH2M HILL)	2010-2011	*In situ* chemical oxidation (ISCO) and ERD treatment options with bioaugmentation were implemented to determine their effectiveness in reducing VOC concentrations in preparation for the FS. Monitoring will continue through 2011. The current site CSM is shown on Figure 5-8.

5.1.5.1 Future Activities

The Treatability Study will continue through 2011 and an FS will be prepared in 2012, followed by a PRAP and ROD (**Schedule 5-5**). Follow up actions from the 2010 Five-Year Review are being implemented, and the milestones and current status are presented in **Table 2-1**. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. Base Master Planning maintains current groundwater plume data in GIS, and all construction projects on-Base go through environmental review.

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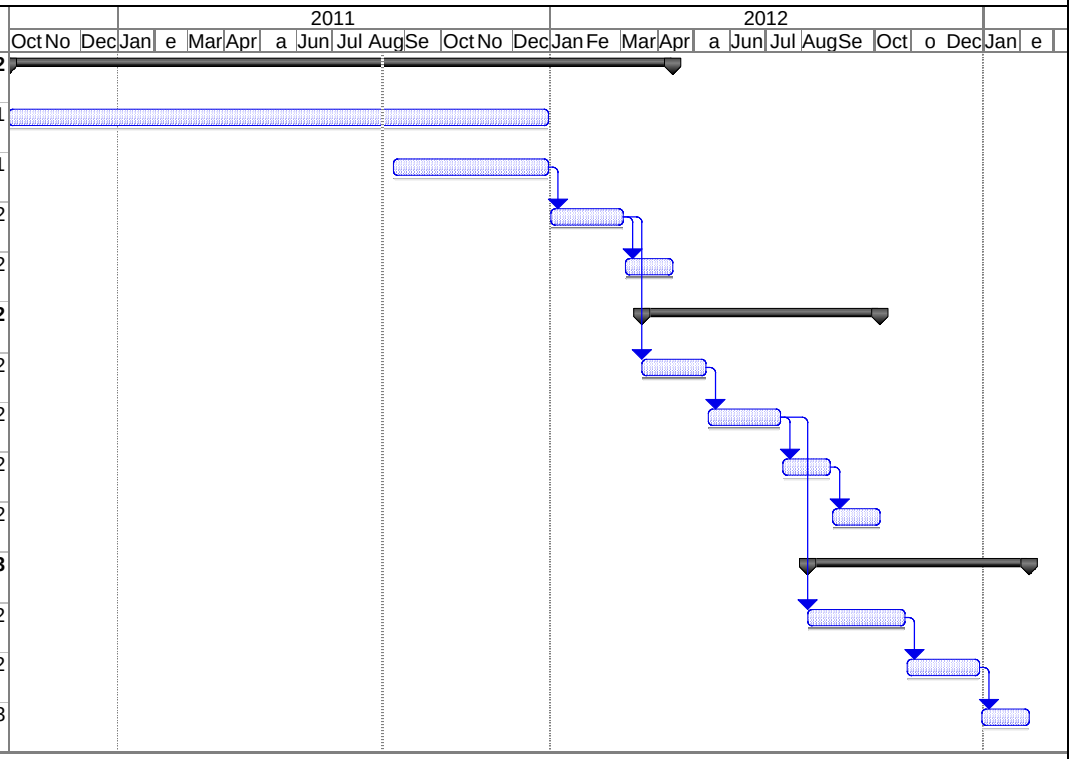
Schedule 5-5
IRP Site 88
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**FS**	**401 days**	**Fri 10/1/10**	**Fri 4/13/12**
2	Treatability Study	326 days	Fri 10/1/10	Fri 12/30/11
3	Draft FS	95 days	Mon 8/22/11	Fri 12/30/11
4	Review Period	45 days	Mon 1/2/12	Fri 3/2/12
5	Final FS	30 days	Mon 3/5/12	Fri 4/13/12
6	**PRAP**	**145 days**	**Mon 3/19/12**	**Fri 10/5/12**
7	Draft PRAP	40 days	Mon 3/19/12	Fri 5/11/12
8	Review Period	45 days	Mon 5/14/12	Fri 7/13/12
9	Final PRAP	30 days	Mon 7/16/12	Fri 8/24/12
10	Public Meeting/Review Period	30 days	Mon 8/27/12	Fri 10/5/12
11	**ROD**	**135 days**	**Mon 8/6/12**	**Fri 2/8/13**
12	Draft ROD	60 days	Mon 8/6/12	Fri 10/26/12
13	Review Period	45 days	Mon 10/29/12	Fri 12/28/12
14	Final ROD	30 days	Mon 12/31/12	Fri 2/8/13



Project: CT0-81
Date: Fri 8/12/11

Task | Milestone | Summary
Progress | Tentative Schedule

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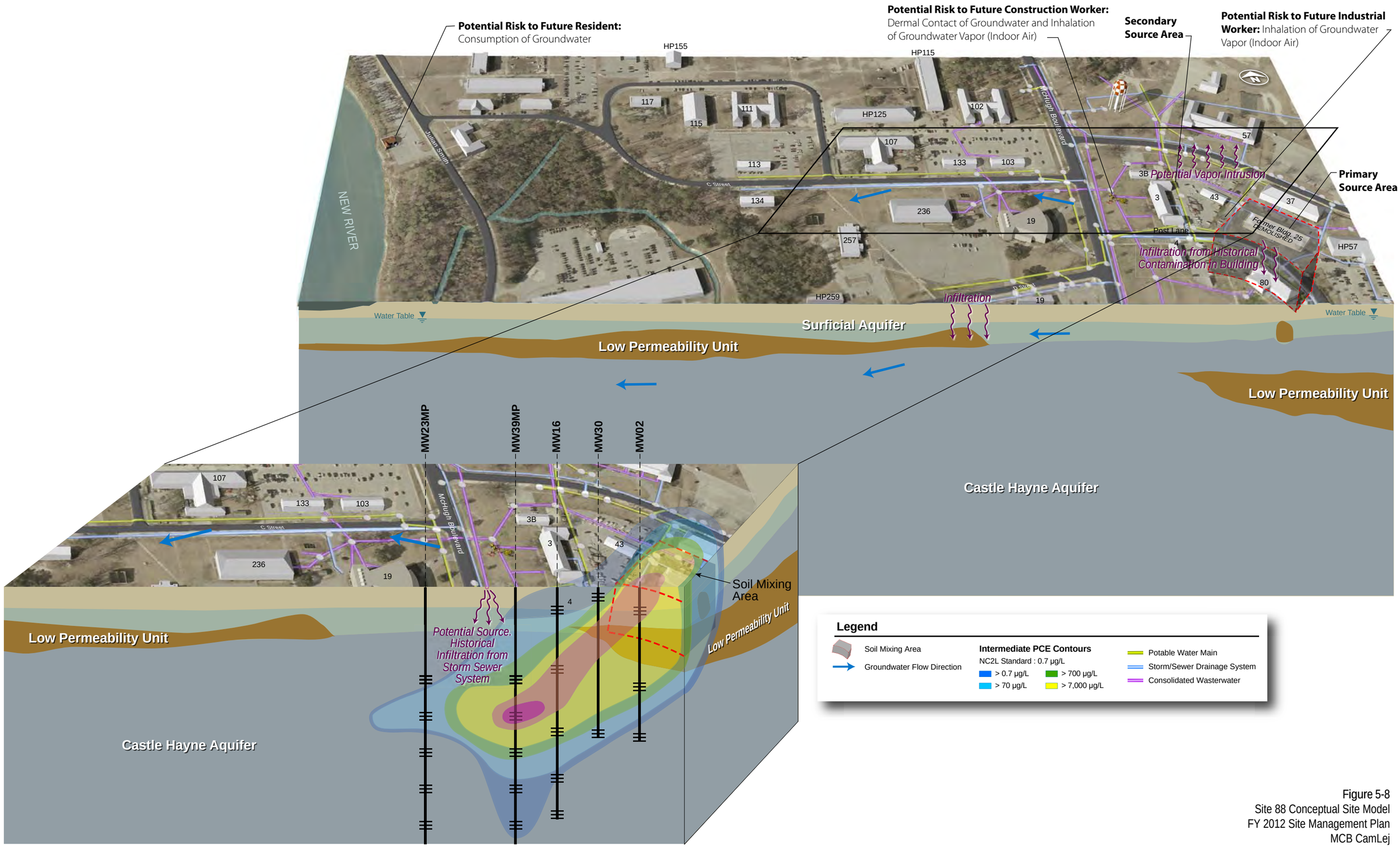


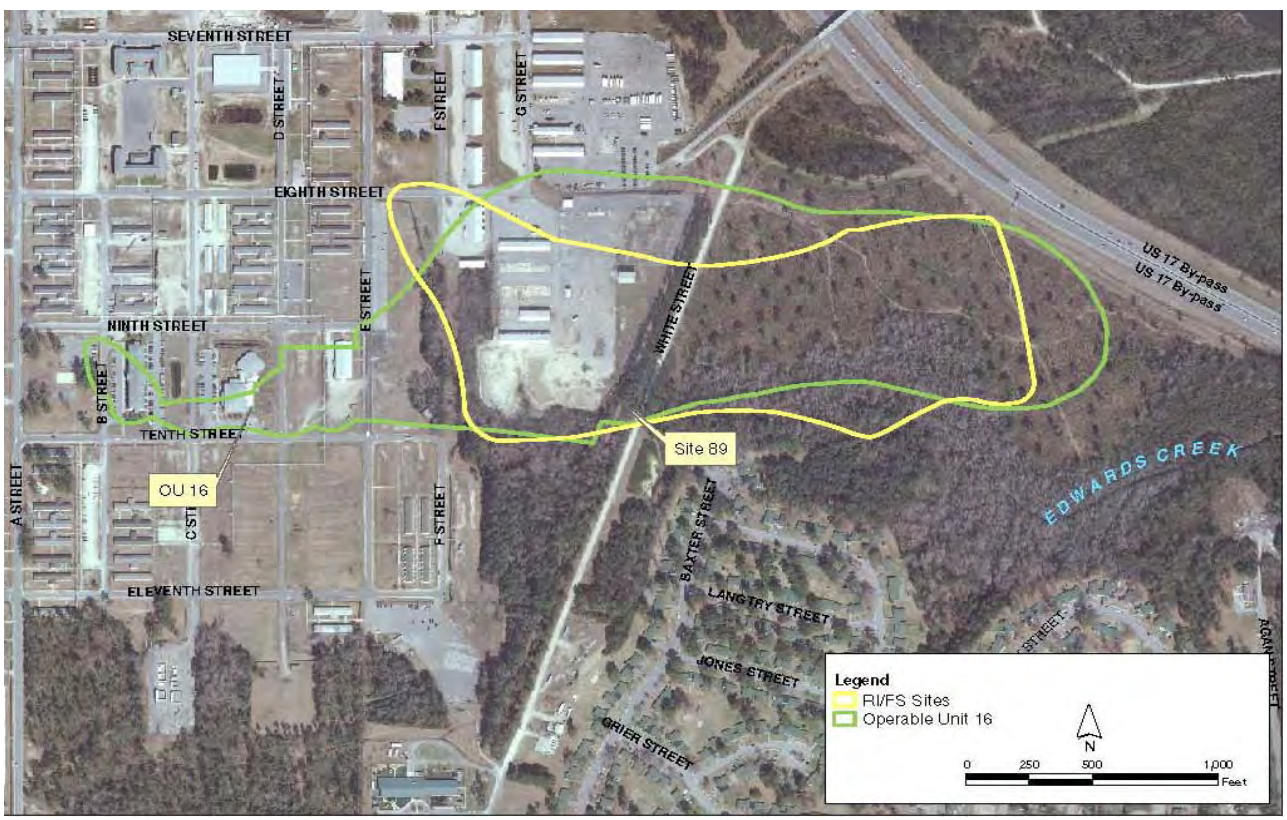
Figure 5-8
Site 88 Conceptual Site Model
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

5.1.6 Site 89 (OU 16)—Former DRMO

Site 89, the former Defense Reutilization and Marketing Office (DRMO), covers approximately 42 acres within OU 16, which is located within Camp Geiger in the extreme northwest corner of the Base (**Figure 5-9**). OU 16 includes Sites 89 and 93**.** Historical records for Site 89 indicate that the Base Motor Pool operated onsite until approximately 1988, when it was relocated. The Base Motor Pool reportedly used solvents (acetone, TCE, and methyl ethyl ketone [MEK]) for parts cleaning while located within Site 89. From 1988 to 2000, the site was used as the DRMO by the Defense Logistics Agency (DLA). The facility was used as a storage yard for items such as scrap and surplus metal, electronic equipment, vehicles, and rubber tires. In the early 1990s, fuel bladders were placed onsite. The bladders ranged in size from 600 to 20,000 gallons and were used in training exercises for helicopter refueling. Base personnel reported that the bladders were emptied on the ground, cleaned with solvents, re-emptied on the ground, and capped prior to storage at the DRMO. The bladders were stored for 3 to 4 years in a pile approximately 75-feet in diameter by 25-feet high. A shredder was then brought onsite and located immediately north of the bladder pile. The bladders were shredded into small cubes and placed into roll-off boxes. During shredding operations, liquids were observed escaping from the bladders. These liquids were not contained or removed. The site has not been used since the DRMO relocated in 2000. Access to most of Site 89 is restricted. Several vacant buildings are located within the restricted area. The unrestricted area is currently in use by the Marine Infantry School. All buildings onsite are planned for demolition. Investigations at Site 89 have historically been focused on a small area within the DRMO that formerly contained a 550-gallon steel UST used to store waste oil. The UST was reportedly installed in 1983 and removed in 1993. The initial UST investigation detected chlorinated VOCs in the groundwater, which led to the inclusion of the site into the MCB CamLej IRP.

FIGURE 5-9
IRP Site 89, Operable Unit 16



Previous investigations are listed in **Table 5-7.**

TABLE 5-7
Previous Investigations Summary, IRP Site 89

Previous Investigation/Action	Date	Activities
UST STC-868 Investigation (R.E. Wright, 1994)	1994	A limited soil and groundwater investigation was conducted at UST STC-868 located within the Site 89 area. Oil and grease was detected in soil and chlorinated solvents were detected in groundwater. The results were used to develop recommendations for additional assessment of Site 89 under the IRP.
Focused Remedial Investigation (Baker, 1998)	1996 - 1998	A Focused RI was conducted to characterize the nature and extent of soil and groundwater contamination. Field activities included the collection of soil, groundwater, surface water, and sediment samples. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. Results identified chlorinated solvent contamination in soil and groundwater. Potential human health and environmental risks were identified for future receptors due to exposure to chlorinated VOCs in groundwater and sediment.
Long-term Monitoring	1999 - 2003	Based on the results of the RI, LTM was implemented in order to assess plume stability. LTM was discontinued in 2003 due to the ongoing site investigation.
Post-Remedial Investigation (Baker, 1999)	1999	A post RI was completed to further assess the VOC plume. Investigation activities included soil, groundwater, surface water, and sediment sampling. Samples were analyzed for VOCs. Results verified the extensive chlorinated VOCs contamination to the immediate and surrounding areas of the site. Soil sample results indicated that extremely high levels of chlorinated VOCs were affecting an extensive area within the southern portion of the site.
Low Temperature Thermal Desorption TCRA (2000)	2000	A TCRA was completed for the removal and treatment of vadose zone contaminants in the southern portion of the site. Low temperature thermal desorption units were used to treat the contaminated soil and roughly 32,000 tons were treated. In addition, an aeration system was installed in Edwards Creek to assist in the remediation of VOCs. The aeration system remains in place and is operational.
Supplemental Site Investigation (Baker, 2001)	2001	An SSI was conducted in an area south of the DRMO. Soil and groundwater samples were collected for VOCs analysis. Two separate DNAPL plumes were identified.
Electrical Resistive Heating Pilot Study (Shaw, 2005)	2003 - 2005	The electrical resistance heating pilot study was conducted to treat one of the DNAPL plumes identified during the SSI. An estimated 48,000 pounds of VOCs were removed from the subsurface.
Treatability Study (CH2M HILL, 2008)	2006 - 2008	A treatability study was implemented to evaluate the performance and effectiveness of four remedial alternatives, including air sparging using a horizontal directionally drilled (HDD) well; permeable reactive barrier (PRB), using mulch/compost as backfill; chemical reduction via ZVI injection through pneumatic fractures; and ERD using a combination of sodium lactate and emulsified vegetable oil (EVO), with direct push emplacement. While air sparging and ERD reduced contaminant mass for a similar cost per volume treated, air sparging was the most practical technology for full scale implementation. The results of the studies will be used to develop a better exit strategy for the site, and to provide options for future treatment train approaches.

TABLE 5-7
Previous Investigations Summary, IRP Site 89

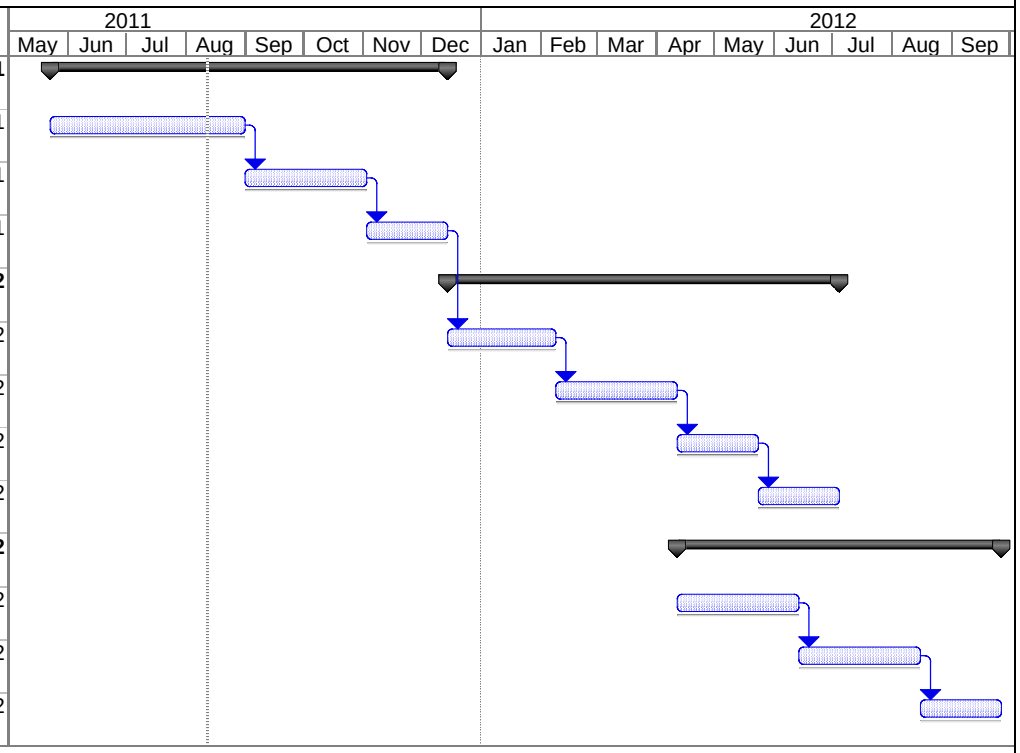
Previous Investigation/Action	Date	Activities
Comprehensive Remedial Investigation (CH2M HILL, 2008)	2006 - 2008	A Comprehensive RI was completed to address previous data gaps. Field activities included a MIP investigation; monitoring well installation; slug testing; groundwater, soil, vapor, sediment, surface water, and pore water sampling; and a benthic community survey. TCE and 1,1,2,2-tetrachloroethane (PCA) and their respective degradation products were detected at elevated concentrations in soil, groundwater, and adjacent surface water and sediment from Edwards Creek. The HHRA identified potential human health risks based on hypothetical potable use of the groundwater and future residential exposure to subsurface soil, primarily from exposure to VOCs. The Ecological Risk Assessment (ERA) identified potential ecological risks to benthic-dwelling organisms and amphibians from exposure to PAHs and pesticides in sediment in an adjacent wetland area. The RI recommended an FS be completed to evaluate remedial alternatives.
NTCRA (CH2M HILL, AGVIQ, 2010)	2007 - 2010	In 2007, an EE/CA was prepared to evaluate removal action alternatives to reduce risks to human health and environment in the DNAPL source area. Five alternatives were evaluated and soil mixing with ZVI-clay addition was the selected NTCRA. A Bench-Scale Study was conducted to optimize the amount of ZVI and clay for treatment. The area treated was 32,000 ft2 at a depth of 25 feet resulting in a total treated volume of 30,000 yd3. Follow-up monitoring has indicated significant reduction in VOC concentrations in the soil, groundwater, and adjacent creek.
Baseline Ecological Risk Assessment Addendum (CH2M HILL, 2008)	2008	Based on the results of the RI, additional sediment and surface soil samples were collected for PAHs and pesticides (DDD, DDE, and DDT) analysis. Results confirmed an isolated area of elevated sediment contaminant concentrations posing potential ecological risks. The Final BERA Addendum was completed to document the results and the identified isolated risk.
NTCRA (CH2M HILL, Osage, 2010)	2009 - 2010	An EE/CA to address potential ecological risks in the adjacent western wetland area was submitted identifying three alternatives for evaluation; no action, soil capping and LUCs, and excavation and offsite disposal. An AM was submitted documenting excavation and offsite disposal as the preferred NTCRA. The NTCRA was completed in 2009 to address the potential ecological risks in the western wetland area. After excavation, confirmation sampling was conducted and the results were below cleanup levels. Excavated soil was disposed of offsite.
Basewide Vapor Intrusion Evaluation (CH2M HILL, AGVIQ, 2009)	2007 – 2011	Site 89 was included in the phased basewide vapor intrusion investigation to determine if complete or significant exposure pathways exist for vapor intrusion into buildings. No current vapor intrusion impacts were identified for any of the buildings located in the vicinity of Site 89. The report recommended additional sampling for temporal and spatial variability and/or evaluation of preferential pathways at several buildings at Site 89. The follow-up sampling was conducted and the report will be completed in 2011. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed.

5.1.6.1 Future Activities

The FS will be completed in 2011 to evaluate remedial alternatives to address the remaining VOC contamination at Site 89, followed by a PRAP and ROD(**Schedule 56**). Follow up actions from the 2010 Five-Year Review are being implemented, and the milestones and current status are presented in **Table 2-1**. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. Base Master Planning maintains current groundwater plume data in GIS, and all construction projects on-Base go through environmental review.

Schedule 5-6
IRP Site 89
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**FS**	**148 days**	**Mon 5/23/11**	**Wed 12/14/11**
2	Draft FS	73 days	Mon 5/23/11	Wed 8/31/11
3	Review Period	45 days	Thu 9/1/11	Wed 11/2/11
4	Final FS	30 days	Thu 11/3/11	Wed 12/14/11
5	**PRAP**	**145 days**	**Thu 12/15/11**	**Wed 7/4/12**
6	Draft PRAP	40 days	Thu 12/15/11	Wed 2/8/12
7	Review Period	45 days	Thu 2/9/12	Wed 4/11/12
8	Final PRAP	30 days	Thu 4/12/12	Wed 5/23/12
9	Public Meeting/Review Period	30 days	Thu 5/24/12	Wed 7/4/12
10	**ROD**	**120 days**	**Thu 4/12/12**	**Wed 9/26/12**
11	Draft ROD	45 days	Thu 4/12/12	Wed 6/13/12
12	Review Period	45 days	Thu 6/14/12	Wed 8/15/12
13	Final ROD	30 days	Thu 8/16/12	Wed 9/26/12



Project: CT0-81
Date: Fri 8/12/11

Task
Progress
Milestone
Tentative Schedule
Summary

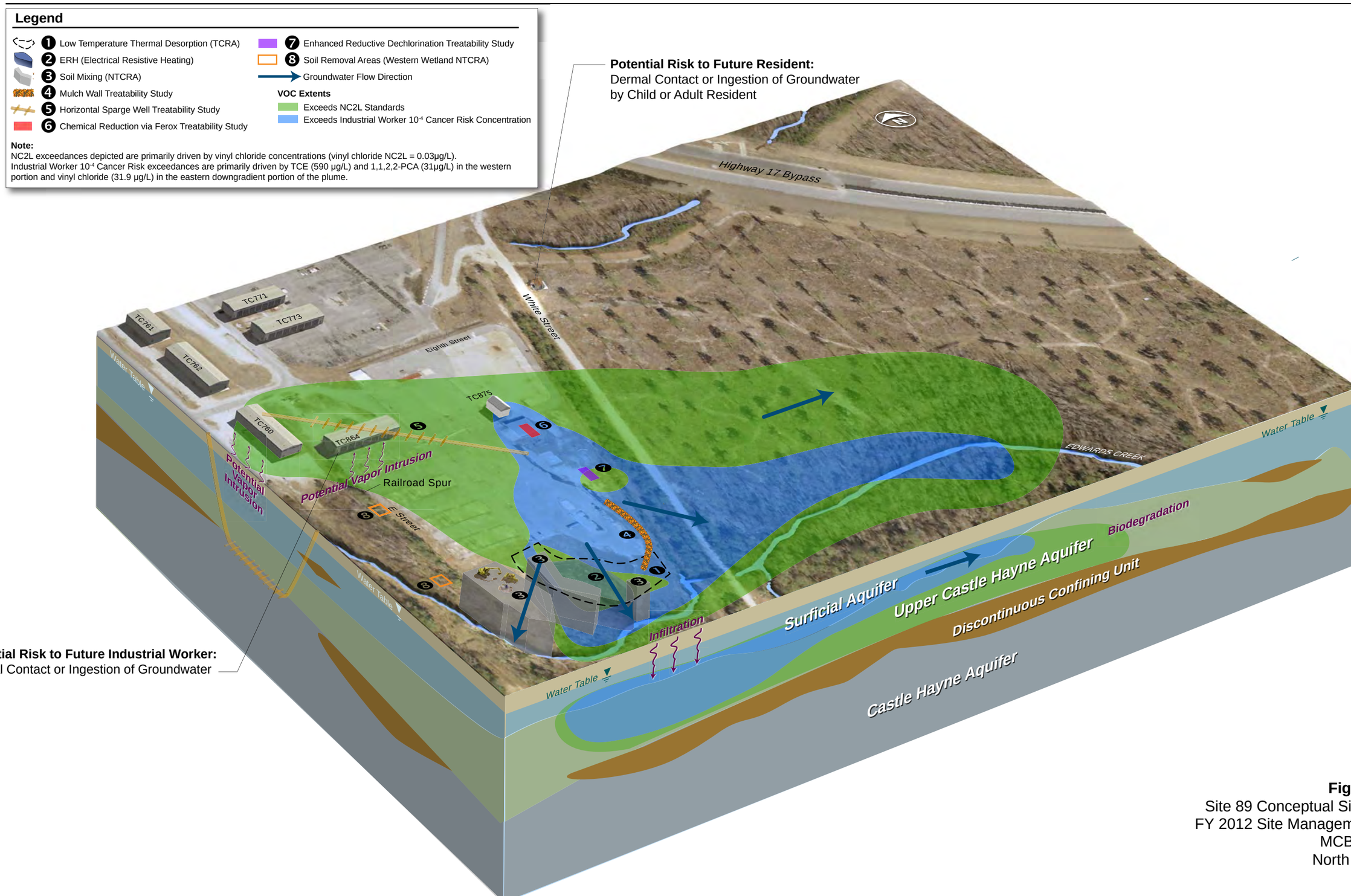


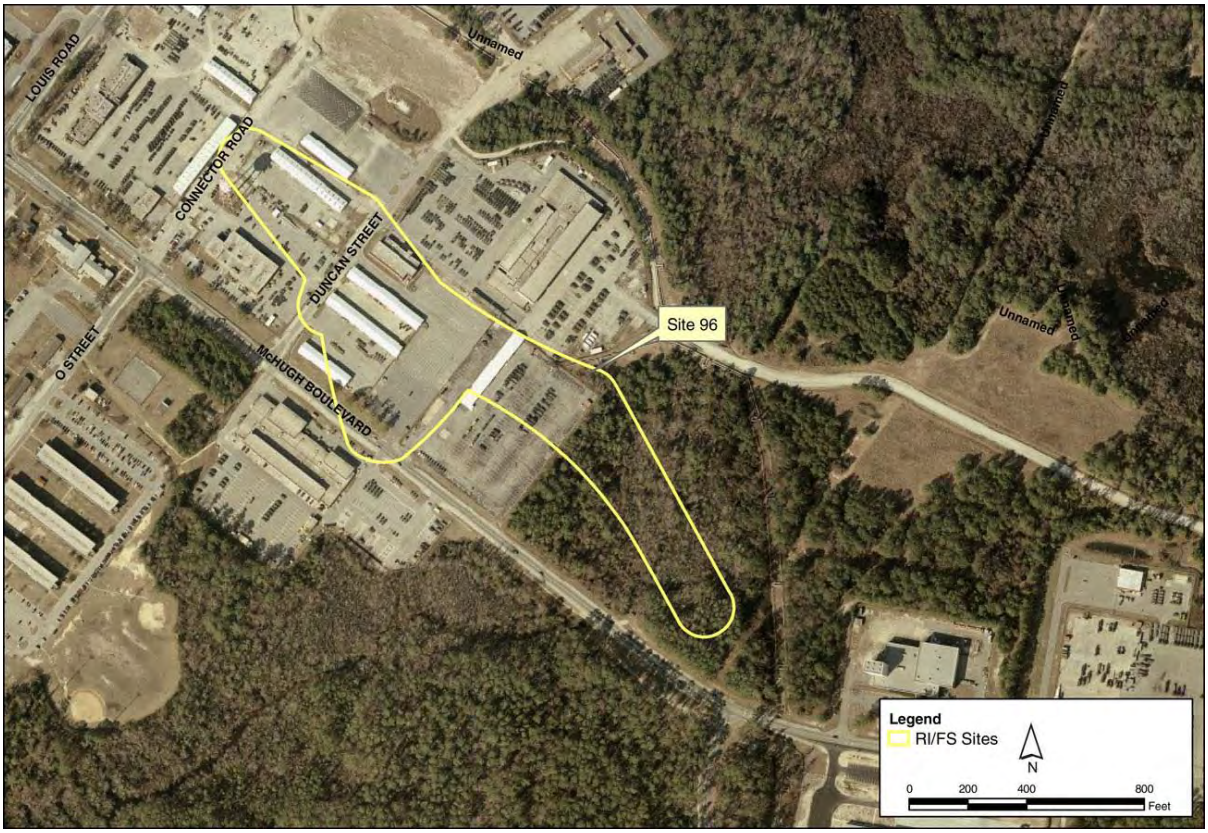
Figure 5-10
Site 89 Conceptual Site Model
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

5.1.7 Site 96 (OU 22)—Building 1817 UST

Site 96, previously SWMU 360, is the site of a former 300-gallon waste-oil UST positioned near Building 1817 (**Figure 5-11**). Building 1817 is located in the Mainside HPIA between Duncan Street and "O" Street and one block north east of McHugh Boulevard. Building 1817 is a Hazardous Materials Consolidation Center. The former UST was located in the eastern portion of the compound, which is being used as a temporary staging area for batteries, refrigeration units, and other used equipment prior to disposal and or reutilization.

FIGURE 5-11
IRP Site 96, Operable Unit 22



Previous investigations are listed in **Table 5-8.**

TABLE 5-8
Previous Investigations Summary, IRP Site 96

Previous Investigation/Action	Date	Activities
UST Removal and Investigations (Catlin, 1997)	1997	The 300-gallon waste oil UST was removed in July 1997, and confirmatory samples were collected under the UST program. Additional sampling was completed in December 1997, indicating a petroleum release had occurred at the UST. A Limited Site Assessment was also conducted under the UST program, which included installing monitoring well 1817MW01 within the former UST excavation. Upon discovery of elevated concentrations of chlorinated compounds in groundwater, the site was removed from the UST program and included in the CSI under RCRA.
Confirmatory Sampling Investigation (Baker, 2005)	2002 - 2005	The CSI included soil and groundwater sampling for VOCs, SVOCs, pesticides, and RCRA metals analyses. The CSI identified VOCs, SVOCs, and pesticides in groundwater that exceeded screening criteria.

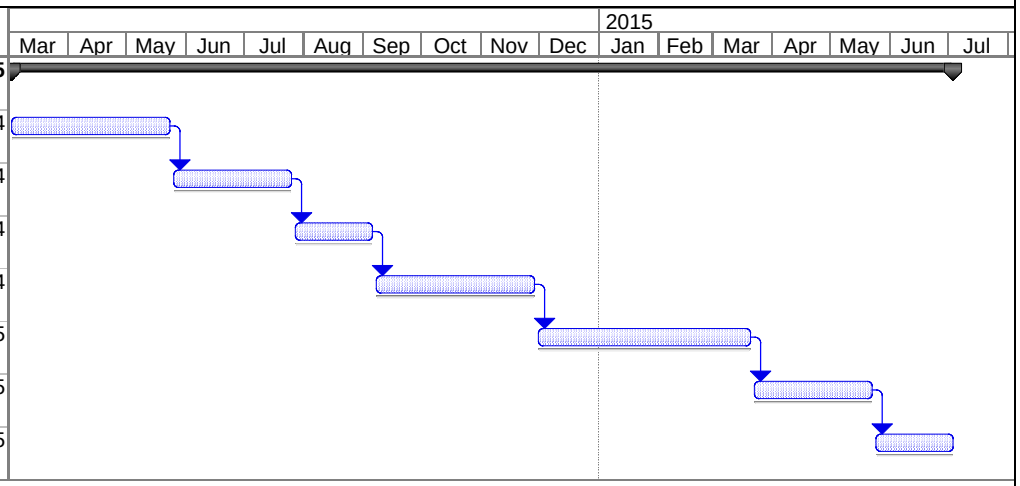
Previous Investigation/Action	Date	Activities
RFI (Baker, 2005) and Amended RFI (CH2M HILL, 2006)	2005 - 2006	The RFI included soil and groundwater sampling for VOCs, pesticides, and RCRA metals analysis. A chlorinated VOC plume was identified in groundwater. Potential unacceptable human health risks to future residents were identified from exposure to PCE, TCE, and heptachlor epoxide in groundwater.
Corrective Measures Study (CH2M HILL, 2007)	2007	A CMS was conducted to develop RGOs for the site and to evaluate management options for groundwater at SWMU 360. The corrective measures evaluated were ERD, air sparging, and ISCO.
Additional Groundwater Delineation (Osage, 2009)	2007 - 2009	The downgradient and vertical extent of the chlorinated VOC plume was not fully delineated and additional groundwater samples were collected for analysis of PCE and its daughter products. As a result, the vertical extent of contamination was delineated but the plume extends horizontally more than 1,800 feet southeast from the source area and is not fully delineated to North Carolina Groundwater Quality Standards (NCGWQS). Because the contamination is not associated with the former UST, the SWMU was transferred to the IRP to complete the delineation under an RI/FS.

5.1.7.1 Future Activities

Additional delineation is planned at Site 96 in FY 2014, and the results and the previous RFI and CMS will be summarized as an RI/FS to document the nature and extent of the groundwater contamination, potential risks to human health and the environment, and identify remedial alternatives for consideration, followed by a PRAP and ROD (**Schedule 5-7**). Follow up actions from the 2010 Five-Year Review are being implemented, and the milestones and current status are presented in **Table 2-1**.

Schedule 5-7
IRP Site 96
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**RI/FS**	**350 days**	**Mon 3/3/14**	**Fri 7/3/15**
2	Draft RI UFP-SAP	60 days	Mon 3/3/14	Fri 5/23/14
3	Review Period	45 days	Mon 5/26/14	Fri 7/25/14
4	Final RI UFP-SAP	30 days	Mon 7/28/14	Fri 9/5/14
5	Field Activities	60 days	Mon 9/8/14	Fri 11/28/14
6	Draft RI/FS Report	80 days	Mon 12/1/14	Fri 3/20/15
7	Review Period	45 days	Mon 3/23/15	Fri 5/22/15
8	Final RI/FS Report	30 days	Mon 5/25/15	Fri 7/3/15



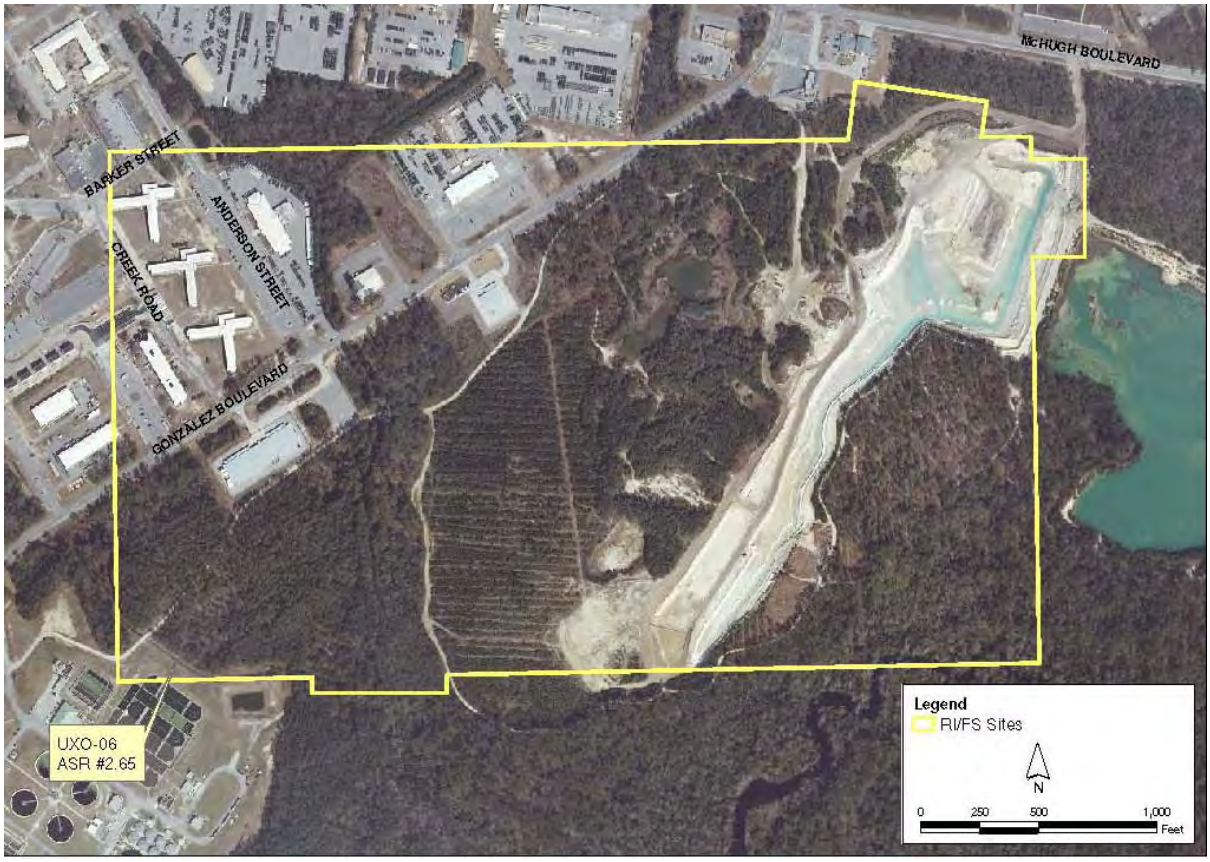
Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

5.2 MMRP RI/FS Sites

5.2.1 UXO-06—Fortified Beach Assault Area (ASR #2.65)

Site UXO-06, the Fortified Beach Assault Area, encompasses approximately 177 acres in the HPIA (**Figure 5-12**). This range was reportedly in use from 1953 until approximately 1977. The types of munitions that have been used onsite include small arms, 3.5-inch practice rockets, practice rifle grenades, and smoke and white phosphorus hand grenades. In addition, cleaning solvents and solutions were used at the site to clean equipment. Currently, the eastern side of Site UXO-06 is being used as a borrow pit that is planned for expansion to support construction projects across the Base.

FIGURE 5-12
MMRP Site UXO-06, ASR #2.65



Previous investigations are listed in **Table 5-9**.

TABLE 5-9
Previous Investigations Summary, MMRP Site UXO-06, ASR #2.65

Previous Investigation/Action	Date	Activities
Focused Site Inspection (CH2M HILL, 2007; 2008)	2006 - 2008	In support of MILCON activities for an armory and extended parking area, soil and groundwater sampling, and 100% DGM were conducted in a 4 acre area at UXO-06. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, explosives, perchlorate, TPH, and metals. No unacceptable human health or ecological risks were identified in site media. The 1,368 anomalies that were identified during DGM were investigated and removed prior to MILCON activities. Several MEC items were discovered and removed including a practice rocket, colored smoke hand grenade, and hand signal flare. Because it is not possible to provide 100% assurance that all MEC items have been removed from the site, "3R" (Recognize, Retreat, Report) training was provided for protection of construction workers.

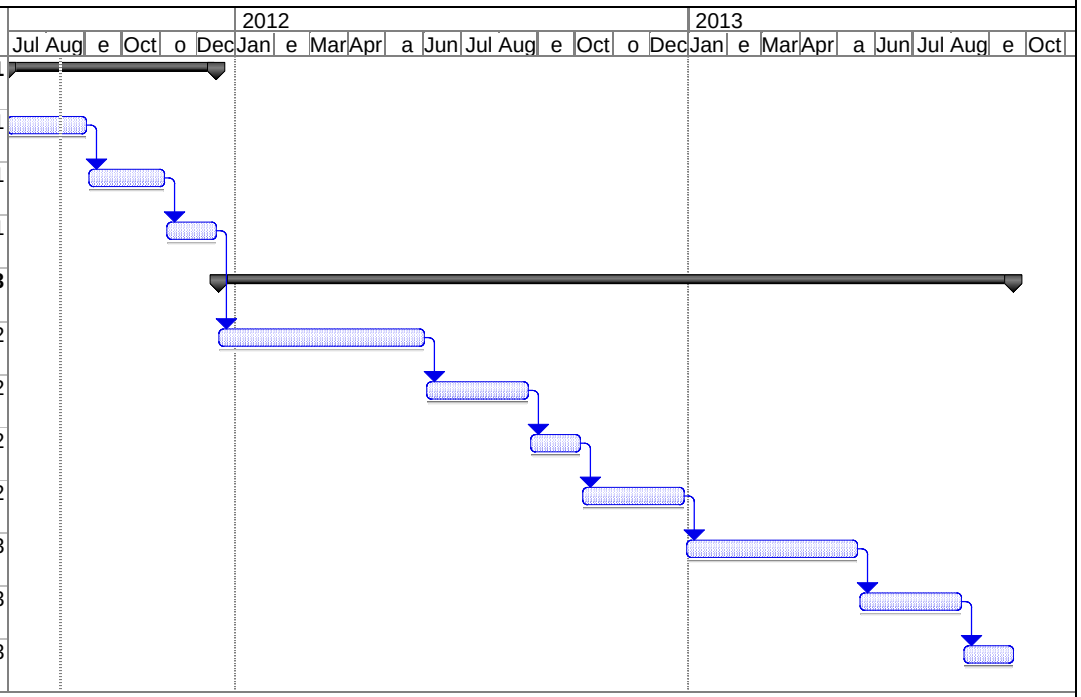
Previous Investigation/Action	Date	Activities
Focused Preliminary Assessment/Site Inspection (Arcadis, 2007)	2007	To evaluate the presence of UXO and impacted soil or groundwater within a proposed sewer line easement, the ONWASA initiated a Focused PA/SI at UXO-06. Field activities included soil and groundwater sampling and DGM. Samples were analyzed for VOCs, SVOCs, TPH, explosives, perchlorate, and metals. No unacceptable risks to construction workers were identified in site media. 790 geophysical anomalies that were identified during DGM were investigated and were removed. All anomalies with the exception of two practice 3.5" rockets and one expended smoke rifle grenade were construction/cultural debris.
Draft Preliminary Assessment/Site Inspection (CH2M HILL, 2009)	2008 - 2009	A site-wide field investigation was conducted to identify the presence and nature of MC contamination and evaluate the number and density of anomalies that represent potential subsurface MEC. Field activities included soil, groundwater, surface water and sediment sampling and 10% DGM. Samples were analyzed for VOCs, SVOCs, pesticides, explosives, TPH, perchlorate, and metals. No unacceptable ecological risks were identified in site media. Potential human health risks were identified from potable use of groundwater based on metals concentrations and confirmation sampling was recommended. 1,335 geophysical anomalies were present at the site, and an intrusive investigation was recommended. Additional surface clearance, DGM surveys, intrusive investigations, and focused soil sampling were also recommended to protect worker safety and to confirm materials planned for reuse have not been adversely impacted by MEC or MC.
Focused Site Investigation (CH2M HILL)	2010 - 2012	To ensure protection of worker safety and to confirm soils planned for reuse have not been adversely impacted by MEC or MC, an intrusive investigation is being conducted in three phases. DGM and an intrusive anomaly investigation has been completed for all phased areas with the exception of the onsite ponds which are currently being investigated. Over 8,000 geophysical anomalies were identified and 24 MEC and over 3,000 MPPEH items were discovered. The Phase 1, Phase 1A, and portions of the Phase 2 areas have been turned over for borrow material. Because it is not possible to provide 100% assurance that all MEC items have been removed from the site, "3R" (Recognize, Retreat, Report) training has been provided for protection of construction workers.

5.2.1.1 Future Activities

Dewatering and intrusive investigation of the ponds, disposal of scrap and construction debris, and soil mitigation are currently being conducted to complete the borrow pit investigation. The remaining Phase 2 area is planned for turnover by December 2011. The PA/SI report will be finalized in 2011 to summarize activities conducted to-date and move towards an RI. The RI will be initiated in 2012 to further delineate whether MC contamination is present in the area surrounding the borrow pit and further assess human health and ecological risks (**Schedule 5-8**).

Schedule 5-8
MMRP Site UXO-06
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**PA/SI**	**121 days**	**Fri 7/1/11**	**Fri 12/16/11**
2	Draft Final PA/SI Report	46 days	Fri 7/1/11	Fri 9/2/11
3	Review Period	45 days	Mon 9/5/11	Fri 11/4/11
4	Final PA/SI Report	30 days	Mon 11/7/11	Fri 12/16/11
5	**RI/FS**	**460 days**	**Mon 12/19/11**	**Fri 9/20/13**
6	Draft RI UFP-SAP	120 days	Mon 12/19/11	Fri 6/1/12
7	Review Period	60 days	Mon 6/4/12	Fri 8/24/12
8	Final RI UFP-SAP	30 days	Mon 8/27/12	Fri 10/5/12
9	Field Activities	60 days	Mon 10/8/12	Fri 12/28/12
10	Draft RI/FS Report	100 days	Mon 12/31/12	Fri 5/17/13
11	Review Period	60 days	Mon 5/20/13	Fri 8/9/13
12	Final RI/FS Report	30 days	Mon 8/12/13	Fri 9/20/13

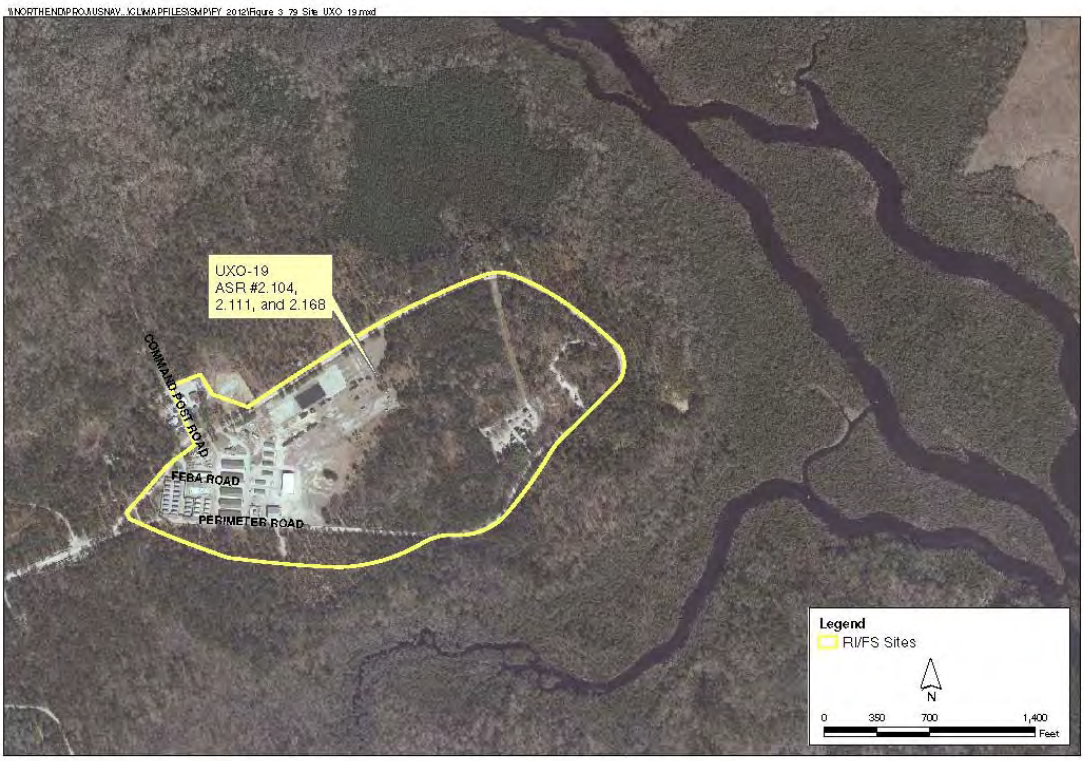


Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

5.2.2 UXO-19—M-4, Rifle Grenade Range (ASR #2.104), K-22 Practice Hand Grenade Course (ASR #2.111), and M115 Hand Grenade Course (ASR #2.168)

Site UXO-19 includes three former grenade ranges in the Camp Devil Dog training area and covers approximately 80 acres (**Figure 5-13**). The M-4 Rifle Grenade Range (ASR #2.104) was used between 1950 and 1960. Reported munitions used were M28 and M29 rifle grenades, white phosphorous hand and rifle grenades, pyrotechnics, and demolitions. The K-22 Practice Hand Grenade Course (ASR #2.111) was used between 1950 and 1960 to practice grenade throwing techniques prior to throwing live grenades. Facilities included a bunker and foxhole. The M115 Hand Grenade Course (ASR #2.168) was used from 1970 to 1977 for high explosive hand grenades. The range consisted of six throwing pits, six control pits, and a barricade with two observation ports.

FIGURE 5-13
MMRP Site UXO-19, ASR #2.104, ASI #2.111, and ASR #2.168



Previous investigations are listed in **Table 5-10**.

TABLE 5-10
Previous Investigations Summary, MMRP Site UXO-19, ASR #2.104, ASR #2.111, and ASR #2.168

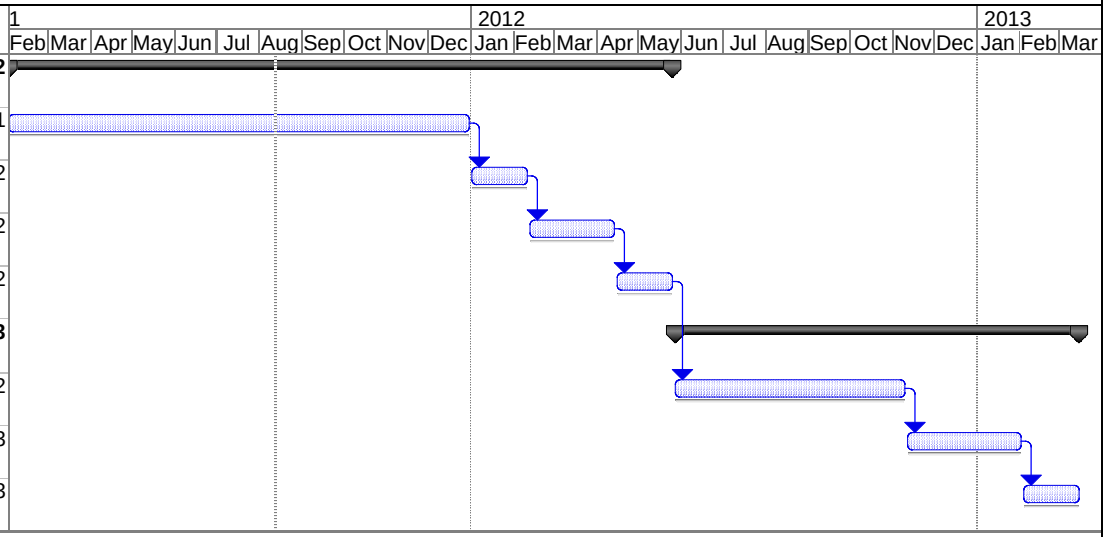
Previous Investigation/Action	Date	Activities
Preliminary Assessment/ Site Inspection (CH2M HILL, 2010)	2010	In support of MILCON activities in the vicinity of the former grenade ranges, soil and groundwater sampling, 10% DGM of the former range area, 100% DGM of the MILCON footprint, and an intrusive MEC investigation were initiated in FY 2009. Samples were analyzed for explosives, metals, and perchlorate, and two subsurface soil samples were analyzed for VOCs. No unacceptable risks to human health or the environment were identified in site media. Approximately 4,465 geophysical anomalies were identified during DGM, 4,417 of which were intrusively investigated. 42 items were classified as UXO and detonated on site, and other MEC items were discovered and removed.

5.2.2.1 Future Activities

Based on the results of the PA/SI, 100% intrusive investigation was initiated as an ESI in a phased approach within the UXO-19 area and adjacent MILCON areas. The field activities and reporting will continue through 2011/2012 followed by an RI/FS (**Schedule 5-9)**.

Schedule 5-9
MMRP Site UXO-19
FY 2012 Site Management Plan
MCB CamLej North Carolina

ID	Task Name	Duration	Start	Finish
1	**ESI**	**344 days**	**Tue 2/1/11**	**Fri 5/25/12**
2	Field Activities	239 days	Tue 2/1/11	Fri 12/30/11
3	Draft ESI Report	30 days	Mon 1/2/12	Fri 2/10/12
4	Review Period	45 days	Mon 2/13/12	Fri 4/13/12
5	Final ESI Report	30 days	Mon 4/16/12	Fri 5/25/12
6	**RI/FS**	**210 days**	**Mon 5/28/12**	**Fri 3/15/13**
7	Draft RI/FS Report	120 days	Mon 5/28/12	Fri 11/9/12
8	Review Period	60 days	Mon 11/12/12	Fri 2/1/13
9	Final RI/FS Report	30 days	Mon 2/4/13	Fri 3/15/13



Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

SECTION 6

Descriptions of PRAP and ROD Sites

There are currently no IRP or MMRP sites in the PRAP and ROD phase of the CERCLA process.

SECTION 7

Descriptions of RD and RA Sites

There are currently no IRP or MMRP sites in the RD/RA phase of the CERCLA process.

SECTION 8

Descriptions of RIP and RC Sites

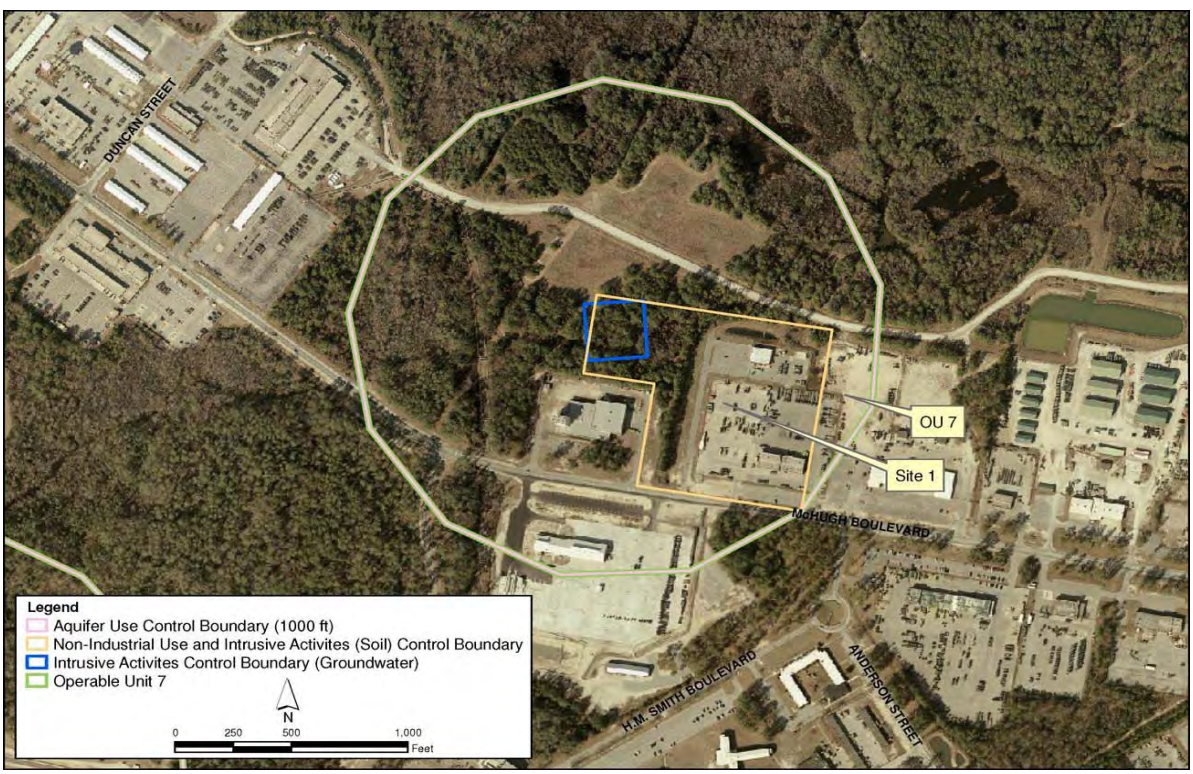
The following sections discuss the site history for the 61 IRP sites and 9 MMRP Sites which are in the RIP and RC phase of the CERCLA process. Remedies are in-place (e.g., groundwater treatment, LTM, and/or LUCs) for 22 of the IRP sites. Response is complete with NFA for 39 IRP sites and 9 MMRP sites.

8.1 IRP RIP Sites

8.1.1 Site 1 (OU 7)—French Creek Liquids Disposal Area

Site 1, the French Creek Liquids Disposal Area, covers approximately 17 acres located within OU 7 on the Mainside of the Base (**Figure 8-1**). OU 7 consists of three sites (Sites 1, 28, and 30) that have been grouped together into one OU because of their similar characteristics of suspected waste (petroleum, oil, lubricant [POL]) and geographic location. Site 1 has been used by several different mechanized, armored, and artillery units since the 1940s. Reportedly, liquid wastes generated from vehicle maintenance were routinely poured onto the ground surface. The wastes were reported to be primarily POL; however, battery acid was also reportedly disposed of. The suspected POL and battery acid disposal areas lie in the northern and southern portions of the Site. The estimated quantity of POL waste disposed at the areas is between 5,000 and 20,000 gallons, and the quantity of battery acid waste is between 1,000 and 10,000 gallons. Currently, Site 1 continues to serve as a vehicle and equipment maintenance and staging area.

FIGURE 8-1
IRP Site 1, Operable Unit 7



Previous investigations are listed in **Table 8-1** and the LUC Summary is presented in **Table 8-2.**

TABLE 8-1
Previous Investigations Summary, IRP Site 1

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Results indicated that waste POL and used battery acid could potentially migrate to groundwater and surface water; and thus recommended that a Confirmation Study be conducted.
Confirmation Study (ESE, 1984-1987)	1984 - 1987	A Confirmation Study was conducted to further investigate the findings of the IAS. Field activities included groundwater, surface water, and sediment sampling for VOCs, metals, and O&G. Groundwater samples collected from the surficial aquifer identified the presence of chlorinated VOCs, metals, and O&G.
Soil Assessment (1991)	1991	A soil assessment was completed for an area in the southern portion of the site in support of a potential MILCON project. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. Analytical results identified metals constituents at levels generally consistent with background concentrations.
Groundwater Study (1993)	1993	To determine current site conditions during scoping of the RI/FS groundwater sampling was conducted. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. Analytical results identified metals constituents at concentrations generally consistent throughout the site.
RI/FS (Baker, 1995)	1994 - 1995	An RI was completed to assess the nature and extent of contamination that may have resulted from previous disposal practices. Field activities consisted of a site survey, and soil and groundwater sampling for VOCs, SVOCs, pesticides/PCBs, metals, and TPH. VOCs and metals were detected in groundwater and soil. Potential human health risks were identified for future child and adult residents due to exposure to metals in groundwater. Minimal ecological risks were identified for terrestrial receptors due to exposure from metals. Remedial alternatives for groundwater were evaluated during preparation of the FS.
PRAP(1995) and ROD (Baker, 1996)	1995 - 1996	A PRAP was issued to solicit public input on the preferred alternative (LTM and LUCs) and a public meeting was held. The Final ROD was issued and signed in October 1996 followed by initiation of LTM.
Remedy-in-Place and RACR (CH2M HILL, 2002)	1996 - 2002	Groundwater LTM was initiated in 1996 and included sampling of eight monitoring wells twice a year for VOCs analysis. In 2001, the concentrations of VOCs were below the cleanup levels for at least four consecutive quarters. A RACR was prepared to document the completion of LTM. LUCs were implemented in 2001 and updated in 2002.

TABLE 8-2
Land Use Control Summary, IRP Site 1

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary (Soil)	16.6	June 15, 2001	July, 2002
Intrusive Activities Control Boundary (Groundwater)	1.5		
Aquifer Use Control Boundary (1,000 feet)	79.2		

8.1.1.1 Future Activities

LUCs are in-place to prohibit non-industrial use. Follow up actions from the 2010 Five-Year Review are being implemented, and the milestones and current status are presented in **Table 2-1**.

8.1.2 Site 2 (OU 5)—Former Nursery/Daycare Center

Site 2, the Former Nursery/Daycare Center, encompasses approximately 5 acres just inside the Main Gate in the northeast portion of the Base (**Figure 8-2**). From 1945 to 1958, an onsite building (Building 712) was used for storing, handling, and dispensing pesticides. Chemicals known to have been used at Site 2 include chlordane, 4,4'-DDT, diazinon, and 4,4'-DDD. Chemicals known to have been stored at Building 712 include dieldrin, lindane, malathion, and silvex. A preliminary soil sampling investigation conducted in 1982 indicated the presence of pesticides, resulting in the transfer of the daycare center to another location. Building 712 is currently being used as office space.

FIGURE 8-2
IRP Site 2, Operable Unit 5

Previous investigations are listed in **Table 8-3** and the LUC Summary is presented in **Table 8-4.**

TABLE 8-3
Previous Investigations Summary, IRP Site 2

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The potential for adverse impacts was identified from pesticides that could potentially migrate to groundwater and surface water and additional investigation was recommended.
Confirmation Study (ESE,1990)	1984 - 1990	A Confirmation Study was conducted to verify the presence of contaminants. Field activities included groundwater, surface water, soil, and sediment sampling for VOCs, pesticides, and herbicides. Analytical results indicated the presence of pesticides and VOCs in environmental media. Further characterization of groundwater and supplemental surface water and sediment investigations were recommended.

Previous Investigation/Action	Date	Activities
Geophysical Investigation (Baker,1992)	1991 - 1992	A surface geophysical investigation was performed to establish the source of groundwater contamination. No anomalies that could serve as sources (i.e., tanks or drums) of groundwater contamination were identified. However, an atypical subsurface feature was detected. The data from this anomaly was not conclusive to ascertain whether or not it was a tank, large diameter utility line or other buried structure.
Remedial Investigation/Feasibility Study (Baker, 1994)	1993 - 1994	An RI was conducted to characterize potential environmental impacts and threats to human health resulting from previous site activities. A geophysical investigation and soil gas survey were conducted and soil, groundwater, surface water, and sediment samples were collected and analyzed for VOCs, SVOCs, pesticides/PCBs, herbicides, and metals. Unacceptable human health risks were identified due to the presence of pesticides in soil and VOCs in groundwater. Potential unacceptable risks to ecological receptors were also identified due to the presence of pesticides in sediment and soil. A TCRA was recommended for soil and remedial alternatives for groundwater were evaluated in the FS.
Time-critical Removal Action (OHM, 1995)	1994 - 1995	Based on the findings of the RI, a TCRA was recommended for removal of pesticide-contaminated soil to achieve industrial land use. The TCRA included the excavation and offsite treatment of pesticide-contaminated soil and concrete. A total of 1,049 tons of pesticide-contaminated soil was excavated and sent for offsite disposal.
Proposed Remedial Action Plan and Record of Decision (Baker, 1994)	1994	A PRAP was issued to solicit public input on the preferred alternative (LTM and LUCs) and a public meeting was held. The Final ROD was issued and signed in September 1994.
Remedy-in-Place and LTM Closeout Report (CH2M HILL, 2008),	1995 - 2008	Groundwater LTM was initiated in 1995 and included annual sampling of six shallow monitoring wells for VOC analysis. In 2007, groundwater concentrations fell below cleanup levels for four consecutive events, LTM was discontinued, and a Site Closeout Report was submitted. LUCs were implemented in 2001 and updated in 2002 and 2008.

TABLE 8-4
Land Use Control Summary, IRP Site 2

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary (Soil)	3.3	June 15, 2001	July, 2002 June, 2008

8.1.2.1 Future Activities

LUCs will be maintained to prohibit non-industrial use within the extent of the former soil removal action areas where pesticides remain in soil above levels that allow for UU/UE.

Follow up actions from the 2010 Five-Year Review are being implemented, and the milestones and current status are presented in **Table 2-1**.

8.1.3 Site 3 (OU 12)—Old Creosote Plant

Site 3, the Old Creosote Plant, encompasses approximately 5 acres on the Mainside of the Base (**Figure 8-3**). The Creosote Plant reportedly operated from 1951 to 1952 to supply treated lumber during construction of the Camp Lejeune Railroad. An onsite sawmill, reportedly located in the northern portion of the Site, supplied cut timbers for the creosote treatment.

FIGURE 8-3
IRP Site 3, Operable Unit 12

Previous investigations are listed in **Table 8-5** and the LUC Summary is presented in **Table 8-6.**

TABLE 8-5
Previous Investigations Summary, IRP Site 3

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at Site 3, and it was concluded that no further assessment was necessary. However, the USEPA requested an additional investigation to determine whether hazardous waste contamination existed.
Site Investigation (1991)	1991	An SI was conducted to confirm the presence or absence of contamination at Site 3. Field activities included soil, groundwater and sediment sampling. The analytical results identified SVOCs in soil and groundwater, and an RI was proposed.

TABLE 8-5
Previous Investigations Summary, IRP Site 3

Previous Investigation/Action	Date	Activities
RI/FS (Baker,1996)	1994 - 1996	An RI was conducted to characterize the nature and extent of contamination discovered during the SI. Field activities included installation of monitoring wells, and the collection of soil and groundwater samples. PAHs (primarily naphthalene) were identified in both soil and groundwater. Fuel constituents, such as ethylbenzene and xylenes, were also detected in soil and groundwater. Potential unacceptable human health risks were identified due to PAHs in soils and VOCs and PAHs in groundwater. No unacceptable ecological risks were identified. In 1996, an FS was prepared to screen remedial alternatives for addressing soil and groundwater contamination.
PRAP (1996) and ROD (Baker, 1997; 2000)	1996 - 2000	A PRAP was issued in 1996 to solicit public input on the preferred alternative (source removal with onsite biological treatment of PAH-contaminated subsurface soils, LTM, and LUCs) and a public meeting was held. The Final ROD was issued and signed in 1997. However, a pilot scale treatability study conducted in 1998 indicated that biological treatment of soils was not effective. As a result, an Amended ROD was signed in June 2000, identifying soil excavation with offsite disposal, LTM, and LUCs as the preferred remedial alternative. The current CSM is shown on Figure 8-4.
Remedy-in-Place	1997 - present	The selected remedy for soil identified in the Amended ROD was conducted as an NTCRA in 2000, during which 3,295 tons of PAH-contaminated soil was removed to achieve industrial cleanup levels. Groundwater LTM for VOCs and SVOCs was implemented in 1997 and is ongoing. LUCs were implemented in 2001 and updated in 2002. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed.

TABLE 8-6
Land Use Control Summary, IRP Site 3

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary (Soil)	0.14	June 15, 2001	July, 2002
Intrusive Activities Control Boundary (Soil)	0.14		
Intrusive Activities Control Boundary (Groundwater)	4.1		
Aquifer Use Control Boundary (1,000 feet)	134.1		

8.1.3.1 Future Activities

LUCs will be maintained to prohibit soil intrusive activities and prohibit non-industrial use within the extent of the former soil removal action areas where PAHs remain in soil above levels that allow for UU/UE. LTM is ongoing to monitor the concentrations of VOCs and SVOCs in groundwater, and LUCs are in-place to prohibit groundwater intrusive activities and aquifer use until cleanup levels are achieved. Follow up actions from the 2010 Five-Year Review are being implemented, and the milestones and current status are presented in **Table 2-1**.

If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. Base Master Planning maintains current groundwater plume data in GIS, and all construction projects on-Base go through environmental review.

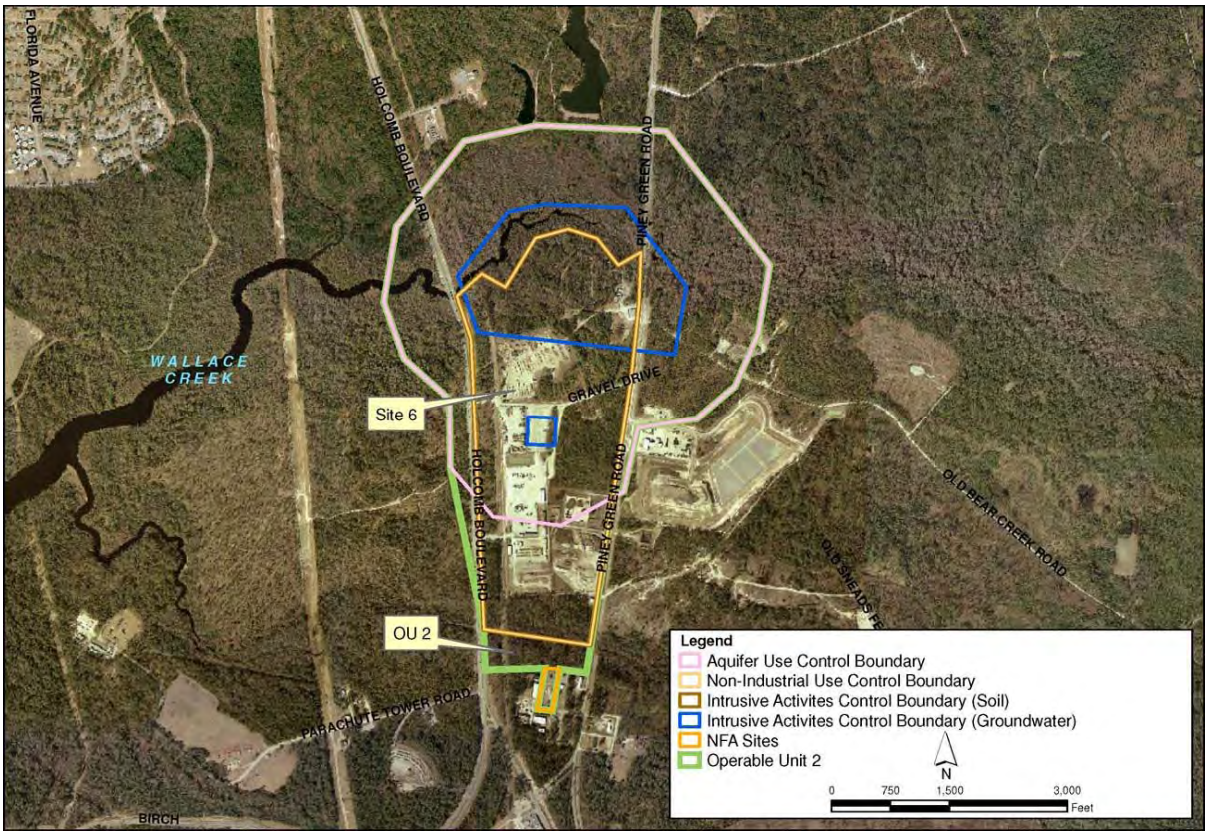
FIGURE 8-4
Site 3 Conceptual Site Model
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

8.1.4 Site 6 (OU 2)—Lots 201 and 203

Site 6 is located within OU 2, approximately 2 miles east of the New River and 2 miles south of State Route 24 (**Figure 8-5**). OU 2 consists of three sites (Sites 6, 9, and 82) that have been grouped together because of their proximity to one another. Site 6 covers an area of approximately 177 acres that incorporates Storage Lots 201 and 203, a wooded area between the storage lots, and a ravine. From the 1940s to the late 1980s, Site 6 was used for disposal and storage of wastes and supplies, including pesticides transformers containing PCBs, solvents, electrolytes, and waste oils. Currently, Lot 201 is used to store military equipment, vehicles, hydraulic oils, and other "non-hazardous" supplies. Most of Lot 203 remains an open field; 21 acres are temporarily being used by the DRMO for metal staging operations.

FIGURE 8-5
IRP Site 6, Operable Unit 2



Previous investigations are listed in **Table 8-7** and the LUC Summary is presented in **Table 8-8.**

TABLE 8-7
Previous Investigations Summary, IRP Site 6

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Wastes present reportedly originated from dumping and storage activities and the IAS recommended that a Confirmation Study be conducted to verify the presence of contamination.
Confirmation Study (1987)	1984 - 1987	Field activities including soil, groundwater, surface water, and sediment sampling, were conducted to verify the presence or absence of contamination. Soil samples were analyzed for pesticides, and all other media were analyzed for VOCs and pesticides. Low levels of pesticides were detected in soil samples. Groundwater

TABLE 8-7
Previous Investigations Summary, IRP Site 6

Previous Investigation/Action	Date	Activities
		samples collected from shallow monitoring wells revealed low levels of VOCs and benzene.
Soil Gas Survey (1989)	1989	A soil gas survey was conducted to identify the presence of VOCs that may potentially affect personnel working within Lot 203. No imminent hazards were identified with the results of the survey.
RI/FS (Baker,1993)	1992 - 1993	Field activities consisted of a preliminary site survey, a geophysical survey, a soil investigation including drilling and sampling, a groundwater investigation including monitoring well installation and sampling, drum waste sampling, test pit investigation, a surface water and sediment investigation, and an aquatic and ecological survey. Pesticides/PCBs, VOCs, SVOCs, and metals were identified in soil, groundwater, surface water, and sediment across the OU. The HHRA identified potential human health risks due to exposure to soil and groundwater. Potential adverse ecological impacts were identified for Wallace Creek and Bear Head Creek. The FS developed and screened remedial alternatives for addressing groundwater and soil contamination.
PRAP and ROD (Baker, 1993)	1993	A PRAP was to solicit public input on the preferred alternative (soil removal, groundwater extraction and treatment, LTM, and LUCs) and a public meeting was held. The Final ROD was issued and signed in September 1993.
Remedy-in-Place	1994 - present	The selected remedy identified in the ROD was conducted as a TCRA in 1994, during which twenty drums containing DDT were removed and contaminated soil was excavated. A second TCRA was conducted from 1995 to 1996 to remove more than 2,655 yd^3 of drums, batteries, and communications wire. Groundwater extraction and treatment and LTM for VOCs was implemented in 1996 and is ongoing. LUCs were implemented in 2001 and updated in 2002. The current CSM is shown on Figure 8-6.
Chlorobenzene Summary Report (CH2M HILL, 2010)	2008 - 2010	To identify the potential source of chlorobenzene contamination and delineate the extent in groundwater, a Supplemental Site Investigation was conducted. During vegetation clearing activities, MD was discovered and an ESS was submitted to remove and dispose of the MD. The geophysical survey results indicated the presence of several linear features, potentially representing trenches containing metallic debris. Chlorobenzene concentrations in groundwater continue to fluctuate, the dissolved chlorobenzene is migrating downgradient, and the chlorobenzene plume has not been fully delineated vertically and horizontally. The potential source of the chlorobenzene is likely disposal trenches and test pitting and additional groundwater delineation was recommended.
Basewide Vapor Intrusion Evaluation (CH2M HILL, AGVIQ, 2009)	2007 – 2011	A Basewide Vapor Intrusion Study was conducted to determine if complete or significant exposure pathways exist for vapor intrusion into buildings. At OU 2, no buildings were identified within 100 feet of a monitoring well containing VOC concentrations above NCGWQS. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed.
Chlorobenzene Test Pitting Investigation (CH2M HILL, 2011)	2010-2011	As a follow-up to the recommendations of the Chlorobenzene Summary Report, test pit activities to investigate the large geophysical anomalies were conducted. 12 test pit excavations were completed and cultural debris, MD, drums, buckets, communication batteries, communication wires, and scrap metal were uncovered. No munitions-related items were encountered. Soil samples were collected from the test pits and results indicated chlorobenzene concentrations in soil at 70,000,000 µg/kg at one location. Based on the results of the test pitting and soil sampling, a TCRA was recommended. Groundwater monitoring wells were installed to further delineate the groundwater plume and sampling is ongoing.

TABLE 8-7
Previous Investigations Summary, IRP Site 6

Previous Investigation/Action	Date	Activities
Action Memorandum and Time Critical Removal Action (CH2M HILL, 2011)	2011	An AM was prepared to document the decision to conduct a TCRA at Site 6 for the buried drums and chlorobenzene impacted soil discovered during test pitting activities. The TCRA was conducted in May 2011. Approximately 42 cubic yards of soil and debris were removed. Samples were collected from the excavated material to determine proper disposal methods. Confirmation samples were collected in the excavated area and the site was restored with clean backfill.

TABLE 8-8
Land Use Control Summary, IRP Site 6

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary (Soil)	206.75	June 15, 2001	July, 2002
Intrusive Activities Control Boundary (Soil)	206.75		
Intrusive Activities Control Boundary (Groundwater)	99.4		
Aquifer Use Control Boundary (1,000 feet)	404.91		

8.1.4.1 Future Activities

The supplemental groundwater investigation is ongoing at Site 6. A technical memorandum to summarize chlorobenzene activities to-date will be prepared in 2011-2012. Following the TCRA and ongoing supplemental groundwater investigation, the remedy for Site 6 will be revisited to ensure continued protection of human health and the environment.

The groundwater extraction and treatment system and LTM will be continued to prevent and monitor migration of VOC contamination. LUCs will be maintained to prohibit groundwater intrusive activities and aquifer use until cleanup levels are achieved. LUCs are also in-place to prohibit soil intrusive activities and non-industrial use within the extent of the former soil removal action areas where VOCs, pesticides, PCBs, and metals remain in soil above levels that allow for UU/UE.

Follow up actions from the 2010 Five-Year Review are being implemented, and the milestones and current status are presented in **Table 2-1**. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. Base Master Planning maintains current groundwater plume data in GIS, and all construction projects on-Base go through environmental review.

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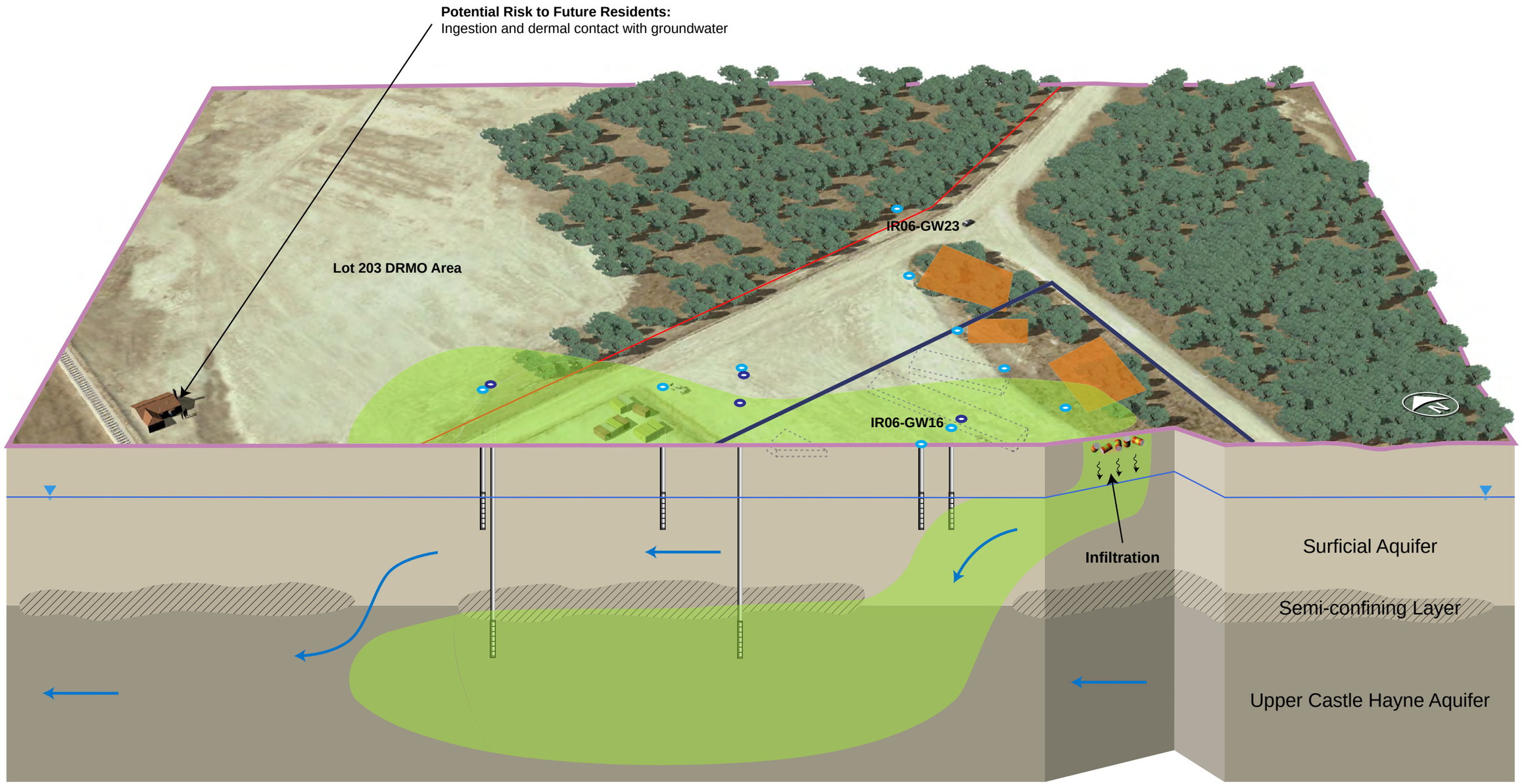


LEGEND

- Groundwater Flow Direction
- Water Table
- TCRA Excavated Disposal Trenches
- Chlorobenzene Plume
- Lot 203 Boundary
- Geophysical Anomaly Areas
- Upper Castle Hayne Aquifer Well
- Surficial Aquifer Monitoring Well (Labeled wells are in the LTM program)
- Aquifer Use Control Boundary
- Intrusive Activities Control Boundary

FIGURE 8-6
Site 6 Conceptual Site Model
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

ES072009020MKE Figure 5-2 Camp_Lejeune_Site_6_CSM_v4.ai 4.1.11 cat/jls

8.1.5 Site 16 (OU 8)—Former Montford Point Burn Dump

Site 16, the Former Montford Point Burn Dump, encompasses approximately 4 acres in the Montford Point area of the Base (**Figure 8-7**). The Montford Point Burn dump was open from approximately 1958 to 1972, although unauthorized dumping subsequently occurred. Trash from the surrounding housing area and buildings is suspected to have been burned and then covered with soil at Site 16. Records indicate that building debris, garbage, tires, and small amounts of waste oils were disposed of at the site. Materials, including asbestos insulating material for pipes, were also dumped on the surface. The quantity of asbestos material was estimated at less than 1 yd^3, and mitigation was completed. Currently, Site 16 is vacant.

FIGURE 8-7
IRP Site 16, Operable Unit 8

Previous investigations are listed in **Table 8-9** and the LUC Summary is presented in **Table 8-10.**

TABLE 8-9
Previous Investigations Summary, IRP Site 16

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Research indicated that unauthorized dumping of asbestos posed a possible health threat and recommended an investigation or removal be completed. Corrective measures were undertaken to remove the asbestos material.
RI/FS (Baker, 1996)	1994 - 1996	An RI was conducted to assess the nature and extent of contamination. Field activities included a site survey, soil, groundwater, surface water, and sediment sampling. Minimal potential human health risks were identified for future residents due to the presence of PCBs in the soil. However, the maximum detected PCB concentration (2.1 parts per million [ppm]) was below the recommended cleanup level for PCBs of 10 to 25 ppm for industrial areas. No unacceptable ecological risks were identified for terrestrial or aquatic receptors.

Previous Investigation/Action	Date	Activities
PRAP and ROD (Baker, 1996)	1996	A Final PRAP was issued to solicit public input on the preferred alternative (no remedial action) and a public meeting was held. The ROD for OU 8 was signed on September 30, 1996. Minimal risks were identified in the RI; therefore, no remedial actions were required in the ROD.
Remedy-in-Place	2001 - 2002	Although the ROD did not require remedial action, for conservativeness LUCs were implemented by the Base in 2001 and updated in 2002 due to the site's past use as a dump.

TABLE 8-10
Land Use Control Summary, IRP Site 16

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary (Soil)	2.1	June 15, 2001	July, 2002
Intrusive Activities Control Boundary (Groundwater)	0.169		
Aquifer Use Control Boundary (1,000 feet)	60.2		

8.1.5.1 Future Activities

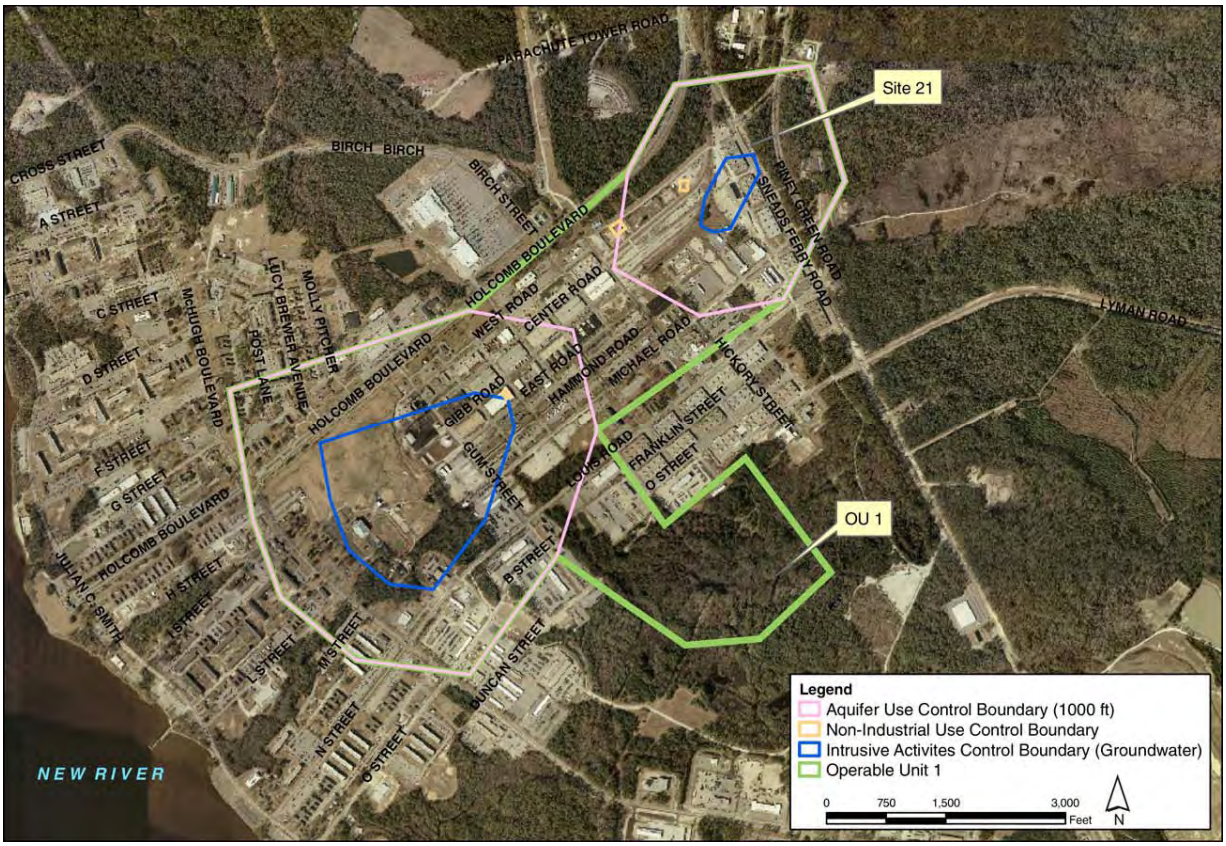
Because the waste remains in-place, the LUCs prohibiting aquifer use, intrusive activities for groundwater, and non-industrial land use will be maintained.

Follow up actions from the 2010 Five-Year Review are being implemented, and the milestones and current status are presented in **Table 2-1**.

8.1.6 Site 21 (OU 1)—Transformer Storage Lot 140

Site 21, the Transformer Storage Lot 140, covers approximately 10 acres within OU 1, and is 1 mile east of the New River and 2 miles south of State Route 24 (**Figure 8-8**). OU 1 consists of three sites (Sites 21, 24, and 78) that have been grouped together into one OU because of their proximity to one another. From 1950 to 1951, a pit located in the northern portion of Site 21 was used as a drainage receptor for oil from transformers. Surface discharge of transformer oils was also reported. The quantity of oil disposal is unknown. The pit reportedly measured 25 to 30 feet long by 6 feet wide and 8 feet deep. In 1958, a pest control shop was moved from Building 712 (Site 2) to Building 1105, located in the southern portion of Site 21. From 1958 to 1977, Building 1105 was used for pesticide mixing and as a cleaning area for pesticide application equipment. Overland discharge of wastewater generated during cleaning operations was documented. The estimated quantity of wastewater discharged was approximately 350 gallons per week in 1977.

FIGURE 8-8
IRP Site 21, Operable Unit 1



Previous investigations are listed in **Table 8-11** and the LUC Summary is presented in **Table 8-12.**

TABLE 8-11
Previous Investigations Summary, IRP Site 21

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Research indicated that past site operations may have impacted soil, groundwater, and surface water and recommended an additional investigation.
Confirmation Study (1987)	1984 - 1987	The Confirmation Study included soil and groundwater investigations. Analytical results confirmed the presence of pesticides/PCBs in soils.

Previous Investigation/Action	Date	Activities
RI/FS (Baker, 1994)	1994	An RI was conducted to assess the nature and extent of contamination. Field activities included groundwater, soil, sediment, and surface water sampling. No potential risks to human health were identified. Potential ecological risks were identified based on exposure to pesticides and PCBs in soil at Site 21. An FS was completed, which developed and screened remedial alternatives for addressing soil contamination at three separate areas on the site.
PRAP and ROD (Baker, 1994)	1994	A PRAP was issued to solicit public input on the preferred alternative (excavation and offsite disposal to address soil contamination) and a public meeting was held. The Final ROD was issued in September 1994.
Explanation of Significant Differences (ESD) (Baker, 1995)	1995	Before implementing the soil remedy, an ESD was issued to revise the cleanup level for PCBs to the Federal PCB action level for industrial sites due to the industrial nature of site activities.
Remedy-in-Place	1995 - 2002	The removal action identified in the ROD was performed in 1995, and approximately 650 tons of pesticide-contaminated soil and 161 tons of PCB-contaminated soil were excavated and disposed offsite. Because the removal action was only considered protective for industrial site use, Land Use Control Implementation Plan (LUCIP) was completed in 2001 that restricted development to industrial land use. LUCs were implemented as part of OU 1 in 2001 and amended in 2002.

TABLE 8-12
Land Use Control Summary, IRP Site 21

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary (Soil)	0.815	June 15, 2001	July, 2002

8.1.6.1 Future Activities

LUCs will be maintained to prohibit non-industrial use within the extent of the former soil removal action areas where pesticides and PCBs remain in soil above levels that allow for UU/UE.

8.1.7 Site 28 (OU 7)—Hadnot Point Burn Dump

Site 28, the Hadnot Point Burn Dump, is located within OU 7 on the Mainside of the Base. OU 7 consists of three sites (Sites 1, 28, and 30) that have been grouped together into one OU because of their unique characteristics of suspected waste (POL) and geographic location (**Figure 8-9**). Site 28 operated from 1946 to 1971 as a burn area for a variety of solid wastes generated on the Base and covers approximately 17 acres. Industrial waste, trash, oil-based paint, and construction debris were reportedly burned and then covered with soil. In 1971, the burn dump ceased operations and was graded and seeded with grass. The total volume of fill within the dump is estimated to be between 185,000 and 375,000 yd3. Currently, most of Site 28 is used for recreation and physical training exercises

FIGURE 8-9
IRP Site 28, Operable Unit 7

Previous investigations are listed in **Table 8-13** and the LUC Summary is presented in **Table 8-14.**

TABLE 8-13
Previous Investigations Summary, IRP Site 28

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The IAS concluded potential impact to surface water due to past disposal practices and recommended an additional investigation to determine the boundaries of the disposal area and verify the presence of hazardous wastes.
Confirmation Study (1987)	1984 - 1987	The Confirmation Study included groundwater, surface water, sediment, and fish tissue investigations. Metals detected in groundwater, surface water, and sediment were determined to be related to past site activities. Additionally, VOCs and O&G were detected in groundwater samples.
RI/FS (1994)	1994 - 1995	An RI was conducted to further characterize the nature and extent of contamination.

Previous Investigation/Action	Date	Activities
		RI field activities consisted of a site survey, soil, groundwater, surface water, and sediment sampling, and an aquatic and ecological survey. Low levels of VOCs were detected in soil and metals in groundwater. Potential human health risks were identified due to the presence of metals in soil and sediment, and the presence of metals and VOC in groundwater. The concentrations of metals in soil were just above the screening criteria; therefore, the risks associated with exposure to soils were deemed low. No unacceptable ecological risks were identified. Remedial alternatives for groundwater were evaluated during preparation of the FS, submitted in July 1995.
PRAP (1995) and ROD (Baker, 1996)	1995 - 1996	A PRAP was issued to solicit public input on the preferred alternative (LTM and LUCs) and a public meeting was held. The Final ROD was issued and signed in October 1996 followed by initiation of LTM.
Remedy-in-Place and RACR (CH2M HILL, 2002)	1996 - 2002	Groundwater LTM was initiated in 1996 and included sampling of eight monitoring wells twice a year for VOCs and metals analysis. In 2001, the concentrations of VOCs were below the cleanup levels for at least four consecutive quarters. A RACR was prepared to document the completion of LTM. LUCs were implemented in 2001 and updated in 2002.

TABLE 8-14
Land Use Control Summary, IRP Site 28

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary (Soil)	17.3	June 15, 2001	July, 2002
Intrusive Activities Control Boundary (Groundwater)	2.6		
Aquifer Use Control Boundary (1,000 feet)	92.5		

8.1.7.1 Future Activities

LUCs are in-place to prohibit non-industrial use. Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**.

8.1.8 Site 35 (OU 10)—Camp Geiger Area Fuel Farm

Site 35, formerly the Camp Geiger Area Fuel Farm, is located within Camp Geiger, in the northwest portion of the Base and covers approximately 45 acres (**Figure 8-10**). The fuel farm was composed of five 15,000-gallon ASTs, underground fuel transmission lines, a pump house, a fuel unloading pad, an oil-water separator (OWS), and a distribution island. The ASTs were installed in 1945 as part of the original Camp Geiger construction. The fuel farm was active until it was decommissioned in the spring of 1995 to make way for the construction of the US Highway 17 Bypass. During the active life of the fuel farm, several releases of fuel occurred. A vehicle maintenance garage (former Building TC474, north of Building TC470) and weapons cleaning area (south of Building G560) were also present at Site 35. Currently, an armory occupies Building G480 with additional armory operations in Buildings TC341 and TC342. Several warehouses, general storage buildings, and troop barracks also occupy the area.

FIGURE 8-10
IRP Site 35, Operable Unit 10

Previous investigations are listed in **Table 8-15** and the LUC Summary is presented in **Table 8-16**.

TABLE 8-15
Previous Investigations Summary, IRP Site 35

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Due to potential for petroleum hydrocarbon impacts from historical site activities and recorded spills, the site was recommended for further investigation.
Confirmation Study (ESE, 1985)	1985	Soil, groundwater, sediment, and surface water samples were collected to delineate contamination. Results indicated that all media were potentially impacted by previous site activities.
Focused Feasibility Study (NUS Corporation, 1990)	1990	Soil, groundwater, surface water, and sediment samples were collected to evaluate a 1990 petroleum release. Risks to human health or the environment and interim measures to remediate the area were evaluated. Although no unacceptable risks were found, remediation was recommended because petroleum hydrocarbon levels exceeded cleanup standards.
Comprehensive Site Assessment (Law, 1992)	1991 - 1992	Soil and groundwater samples were collected to identify the source, nature, and extent of petroleum hydrocarbon impacts. Petroleum hydrocarbon related contamination was found in soil (generally located at or below groundwater table) and in shallow groundwater. CVOC contamination was found in shallow and intermediate groundwater.
Interim Remedial Action Remedial Investigation/ Feasibility Study (Baker, 1994)	1993 - 1994	Additional sampling and excavation of a shallow trench along Brinson Creek were conducted to support selection of an IRA to address soil contamination. Soil samples were collected for petroleum hydrocarbons. Analytical results identified three areas of petroleum hydrocarbon contamination in the soil, which corresponded to past unauthorized discharges of fuel products.
Interim Record of Decision (Baker, 1994)	1994 - 1997	An Interim PRAP was submitted to address soils and was followed by an Interim Record of Decision (IROD). The selected remedy was excavation and offsite disposal of contaminated soil. From 1995 to 1997 approximately 15,700 tons of petroleum hydrocarbon contaminated soil was excavated and shipped offsite for disposal or recycling. Confirmatory sampling was conducted and revealed concentrations below clean-up goals. The site was restored and a Closeout Report was completed in 1997.
RI (Baker, 1995)	1994 - 1995	A soil gas survey, and soil, groundwater, surface water, and sediment sampling was conducted to evaluate the nature and extent of contamination and potential risks to human health and the environment. Results revealed soil and groundwater contamination; the extent of groundwater contamination was not delineated. The HHRA concluded that the overall site risk was above the acceptable risk range and the ERA concluded that contamination had the potential to affect the integrity of ecological receptors.
Interim FS (Baker, 1995b)	1995	The Interim FS addressed groundwater impacts and identified remedial actions for a focused area near the fuel farm, a known source of groundwater contamination. Although the extent of groundwater contamination was not adequately defined during the RI, an Interim FS was deemed necessary because groundwater contamination in the vicinity of the Fuel Farm was a known source of ongoing contamination to Brinson Creek.
Interim ROD (Baker, 1995)	1995	An Interim PRAP was submitted to address shallow groundwater and was followed by an IROD. The IROD was issued based on the Interim FS for remediation of surficial groundwater near the fuel farm. In Situ Air sparging was the selected remedy for shallow groundwater and the 100 ft trench was installed in 1998.
Supplemental Groundwater Investigation (Baker, 1996)	1995 to 1996	Soil, groundwater, surface water, and sediment samples were collected to fill data gaps from the RI and support the air sparging pilot study. Contamination was identified in groundwater and sediment. The supplemental HHRA concluded that the overall future site risk was above the acceptable risk range.
Draft In-situ Air Sparging Treatability Study (Baker 1996)	1996	A pilot study was conducted for in-situ air sparging in the shallow aquifer. Groundwater, soil, and sediment sampling results indicated that air sparging had limited effectiveness for VOC removal, and no further investigation was recommended.

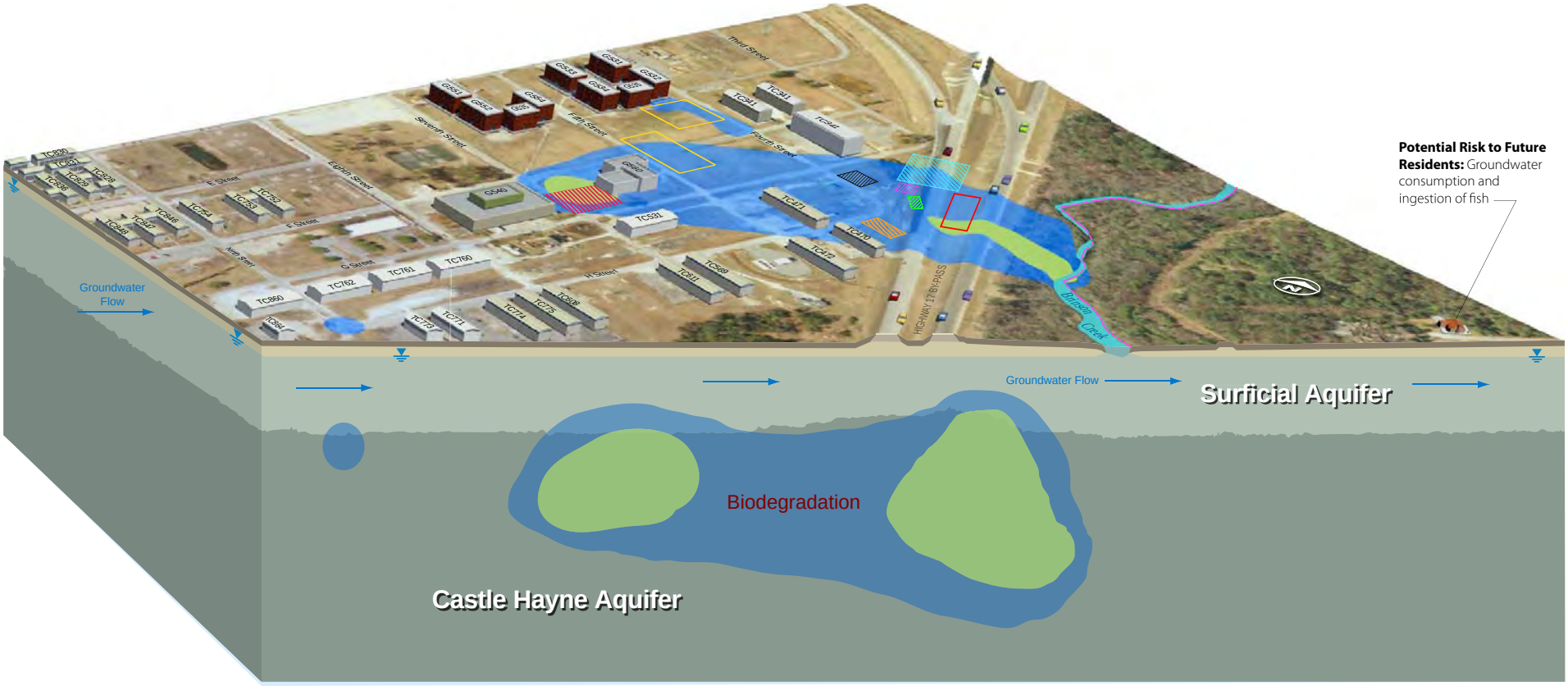
Previous Investigation/Action	Date	Activities
Closeout Report (OHM, 1997)	1995 - 1997	In response to the interim ROD, a removal action for petroleum hydrocarbon soil was initiated. Approximately 15,700 tons of contaminated soil was removed from the former fuel farm area.
Long-term Monitoring (CH2M HILL, 2005)	1999 - 2004	Groundwater samples were collected, quarterly in 1999 and semiannually from 2000 to 2004, to assess seasonal changes in contaminant distribution. LTM was discontinued in 2004 when a Supplemental RI was initiated.
Natural Attenuation Evaluation (CH2M HILL, et al., 2003)	1998 - 2002	Seasonal changes, plume stability, and presence of natural degradation were evaluated to determine if the natural attenuation process could reduce groundwater contamination to levels of compliance. Groundwater and surface water samples were collected and analyzed for VOCs, metals, and NAIPs. Results indicated natural attenuation was degrading CVOCs but biological degradation appeared stalled in some locations.
Hot Spot Characterization (Baker, 2003)	2002 - 2003	Characterization was completed to delineate any continuing sources. Field activities included soil and groundwater sampling for VOCs, SVOCs, VPH, EPH, and TOC. Based on the analytical results, one shallow hot spot was co-mingled with petroleum hydrocarbons near Building G480, and a deeper, larger hot spot extended from Building TC470 under the US Highway 17 Bypass to wetland area west of Brinson Creek.
Technical Evaluation (CH2M HILL, 2003)	2003	A Technical Evaluation was conducted to develop and evaluate remedial action alternatives for groundwater. ISCO via modified Fenton's Reagent followed by potassium permanganate was recommended for TCE removal. In-situ air sparging with vertical wells was recommended for the petroleum hydrocarbon contamination.
Pilot Study (CH2M HILL, 2006)	2003 - 2005	The Pilot Study evaluated the effectiveness of ISCO for the remediation of TCE-impacted groundwater. Final results revealed that TCE was reduced by 80 to 98 percent and total VOCs were reduced by 72 to 85 percent within the pilot study area.
Supplemental RI (CH2M HILL, 2009)	2005 - 2008	Soil, groundwater, surface water, and sediment samples were collected to delineate extent of contamination. VOCs exceeded criteria and presented unacceptable risks in groundwater.
Non-time-critical Removal Action (CH2M HILL, 2008)	2006 - 2008	After the submittal of an EE/CA in 2007, an AM was prepared to document ERD as the preferred NTCRA to address CVOCs in groundwater east of Building G533. ERD via injection of EVO and lactate using direct-push technology was implemented. The results indicated minimal contaminant reduction based on limited distribution of substrate and limited microbial bioavailability.
Feasibility Study (CH2M HILL, 2009)	2009	Remedial alternatives to address CVOC-impacted groundwater were assessed including, no action, monitored natural attenuation, ERD with bioaugmentation, ISCO, and *in situ* air sparging.
PRAP and ROD (CH2M HILL, 2009)	2009	A PRAP was issued in April 2009 to solicit public input on the preferred alternative (in situ air sparging using a horizontal well, LTM and MNA, and LUCs) and a public meeting was held. Questions received during the public meeting were general inquiries and no comments were received during the public comment period. The Final ROD was issued and signed in November 2009. The site CSM is shown on Figure 8-11.
Basewide Vapor Intrusion Evaluation (CH2M HILL, AGVIQ, 2009)	2007 – 2010	Site 35 was included in the phased basewide vapor intrusion investigation to determine if complete or significant exposure pathways exist for vapor intrusion into buildings. No risks were identified from indoor air related to vapor intrusion; therefore, it was concluded that vapor intrusion is not a current significant pathway of concern for any of the buildings located in the vicinity of Site 35. The report recommended additional sampling for temporal and spatial variability and/or evaluation of preferential pathways at several buildings at Site 35. The follow-up sampling was conducted and the report will be completed in 2010. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed.
Remedy-In Place and IRACR (Shaw, 2011)	2010 - 2011	The RD was completed for in situ air sparging using a horizontal well, LTM and MNA, and LUCs. The horizontal well was installed and air sparging was initiated in FY 2010 to address VOCs in groundwater. LUCs were also finalized to prohibit aquifer use until cleanup levels for UU/UE are achieved. Groundwater LTM and MNA for VOCs and NAIPs was initiated in 2011 to evaluate the effectiveness of the system and monitor plume migration. An IRACR was submitted in 2011.

TABLE 8-16
Land Use Control Summary, IRP Site 35

LUC Boundary	Estimated Area (Acres)	Final Submitted
Aquifer Use Control Boundary	178.6	August 2010

8.1.8.1 Future Activities

The air sparging, LTM, and MNA will be continued to treat and monitor migration of VOC contamination. LUCs will be maintained to prohibit aquifer use until cleanup levels are achieved. Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. Base Master Planning maintains current groundwater plume data in GIS, and all construction projects on-Base go through environmental review.



Legend

- In Situ Chemical Oxidation Pilot Study
- NTCRA ERD Area
- Base Boundary
- Groundwater Flow Direction
- Potential Source Former Vehicle Maintenance Garage
- Potential Source Former AST Fuel Farm
- Potential Source Former Waste Oil AST
- Potential Source Former Weapons Cleaning
- Potential Source Former Fuel Uploading Pad
- Former Gas Station
- Water Table
- Vinyl Chloride Concentrations
- >5 µg/L
- >0.5µg/L

Figure 8-11
IRP Site 35 CSM
FY 2012 Site Management Plan
MCB CamLej
North Carolina

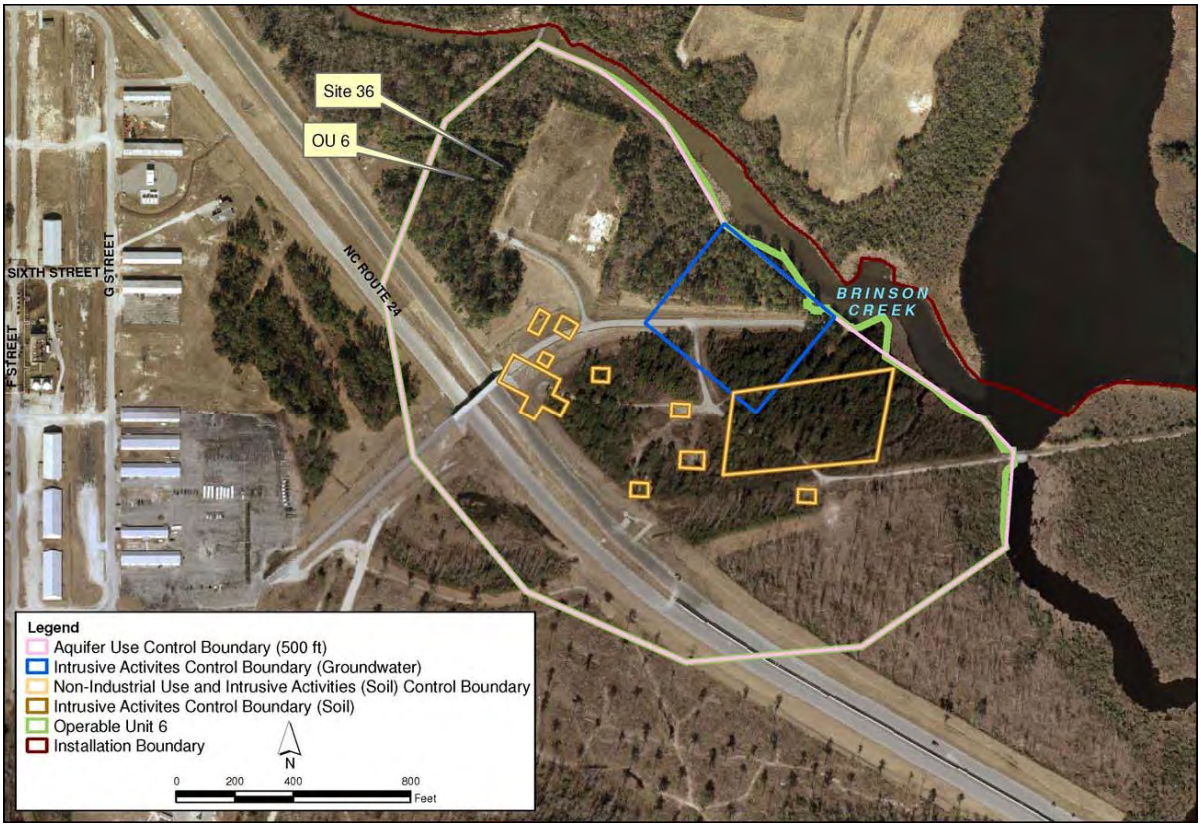
CH2MHILL

Created by: Krstin Rogers 4/22/10 Checked by: Dan Hockett 4/2 /10
ES072009020MKE OU2S6CI_FigX_Operable_Unit-2_Site-6_CSM_ver20 05-28-10 cat

8.1.9 Site 36 (OU 6)—Camp Geiger Dump Area Near Sewage Treatment Plant

Site 36, the Camp Geiger Dump Area, is located within OU 6 in the northwest portion of the Base (**Figure 8-12**). OU 6 covers approximately four sites (Sites 36, 43, 44, and 54) that have been grouped together into one OU because of the similar characteristics of material disposed and geographic location. Site 36 is reported to have been used for the disposal of municipal wastes and mixed industrial wastes including trash, waste oils, solvents, and hydraulic fluids that were generated at MCAS New River. The dump was active from the late 1940s to the late 1950s and covers approximately 5 acres. Most of the material was burned and buried.

FIGURE 8-12
IRP Site 36, Operable Unit 6



Previous investigations are listed in **Table 8-17** and the LUC Summary is presented in **Table 8-18.**

TABLE 8-17
Previous Investigations Summary, IRP Site 36

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. A Confirmation Study was recommended due to the indication that hazardous substances were disposed of.
Confirmation Study (1987)	1984 - 1987	A Confirmation Study was conducted to verify the presence of potential contaminants in groundwater, surface water, and sediment. An RI/FS was recommended to further characterize VOCs and metals in groundwater.
Remedial Investigation (Baker, 1996)	1994 - 1996	To further characterize the nature and extent of contamination an RI was conducted. Field activities included the installation of additional monitoring wells and the collection of soil, groundwater, surface water, and sediment samples. Potential human health risks were identified due to exposure to lead, PAH's, pesticides, and PCBs in soil and VOCs in groundwater. Minimal potential ecological risks were identified for aquatic receptors at

Previous Investigation/Action	Date	Activities
		Site 36.
Time-critical Removal Action (1997)	1997	A TCRA was conducted to remove PCB-contaminated surface soil at concentrations posing an imminent threat to human health and the environment. Approximately 92 tons of regulated PCB-contaminated soils and 148 tons of non-regulated soils were excavated.
Post-Remedial Investigation Groundwater Monitoring	(1998-present)	A post-RI monitoring program consisting of quarterly groundwater and surface water sampling was initiated. Monitoring was implemented to determine if MNA could be a viable remedial alternative for VOCs in groundwater and to evaluate plume movement. Annual groundwater and semi-annual surface water sampling is currently conducted at Site 36 in accordance with the ROD, RD, and LTM optimization report.
Feasibility Study (Baker, 1998; 2002)	1998 - 2002	Based on the results of the RI, FSs were completed in 1998 and 2002 to evaluate remedial alternatives to mitigate risks from lead, PAHs, and pesticides in soil and VOCs in groundwater. The preferred alternative was excavation and offsite disposal for soil and MNA for groundwater.
IRA (Shaw, 2003)	2003	An EE/CA was presented at a public meeting for completing an interim response removal action. Excavation and off-site disposal of PAH and pesticide-contaminated soil was the selected NTCRA. A total of 1,630 tons of soil was removed from four areas within the south central portion of the site. The NTCRA was completed before the Final ROD was issued.
PRAP (Baker, 2002) and ROD (Baker, 2005)	2002 - 2005	A PRAP was issued to solicit public input on the preferred alternative (excavation and off-site disposal and LUCs for soil and MNA and LUCs for groundwater) and a public meeting was held. The Final ROD was issued and signed in July 2005.
Remedy-in-Place and IRACR (CH2M HILL, 2005; 2007)	1998 - present	LTM of groundwater and surface water for VOCs and NAIPs was initiated in 1998. An RD was completed for OU 6 in 2005 to document the LUC implementation and maintenance actions and LTM activities for MNA at Site 36. LUCs were implemented in 2005. In 2007, an IRACR was completed to document the RIP. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. The CSM is shown on Figure 8-13.

TABLE 8-18
Land Use Control Summary, IRP Site 36

LUC Boundary	Estimated Area (Acres)	Final Submitted
Non-Industrial Use Control Boundary (Soil)	4.8	September 22, 2005
Intrusive Activities Control Boundary (Soil)	4.8	
Intrusive Activities Control Boundary (Groundwater)	4.8	
Aquifer Use Control Boundary (1,000 feet)	64.8	

8.1.9.1 Future Activities

The groundwater and surface water LTM will be continued to monitor the VOC plume and migration. LUCs will be maintained to prohibit groundwater intrusive activities and aquifer use until cleanup levels are achieved. LUCs are also in-place to prohibit soil intrusive activities and non-industrial use within the extent of former soil removal action areas where PAHs, PCBs, and/or lead remain in soil above levels that allow for UU/UE.

Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. Base Master Planning maintains current groundwater plume data in GIS, and all construction projects on-Base go through environmental review.

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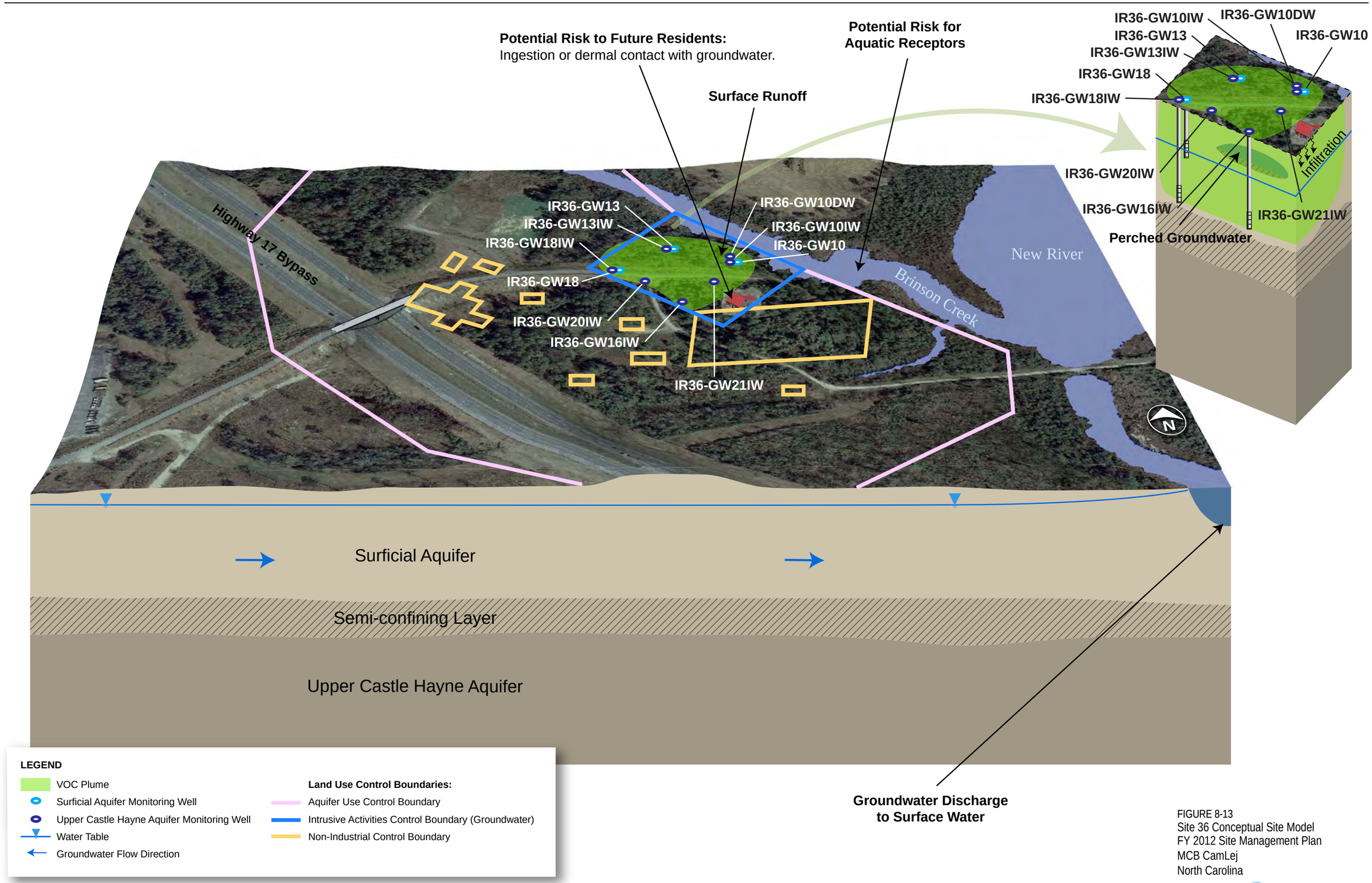


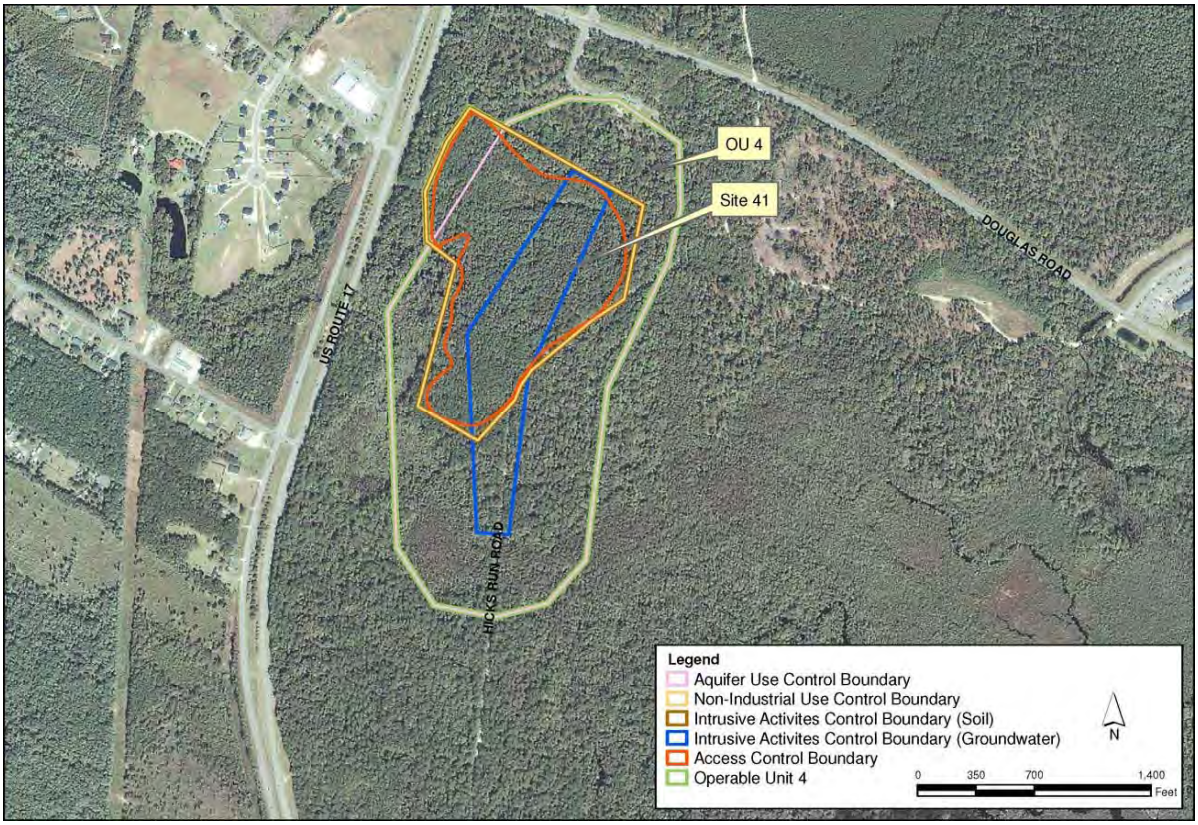
FIGURE 8-13
Site 36 Conceptual Site Model
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

8.1.10 Site 41 (OU 4)—Camp Geiger Dump near Former Trailer Park

Site 41, the Camp Geiger Dump near the Former Trailer Park, encompasses approximately 37 acres within OU 4 in the Camp Geiger area of the Base (**Figure 8-14**). OU 4 is consists of two sites (Sites 41 and 74) that have been grouped together based on the unique characteristic of suspected waste (chemical agents). Construction debris, POL compounds, solvents, batteries, ordnance, chemical training agents, and, in 1964, mirex (a pesticide), was reportedly disposed at Site 41. The debris was reportedly burned and graded over with soil. The dump area contains an estimated 110,000 yd^3 of waste. The amount of solvents and oil disposed was estimated to be between 10,000 and 15,000 gallons; and the quantity of mirex was estimated at several tons.

FIGURE 8-14
IRP Site 41, Operable Unit 4



Previous investigations are listed in **Table 8-19** and the LUC Summary is presented in **Table 8-20.**

TABLE 8-19
Previous Investigations Summary, IRP Site 41

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The IAS concluded that disposal of industrial wastes and pesticides could impact groundwater and recommended an additional investigation to verify the presence of hazardous wastes.
Confirmation Study (1987)	1984 - 1987	The Confirmation Study included groundwater, surface water, and sediment investigations. O&G and phenols were detected in groundwater, surface water, and sediment samples. VOCs, metals, and one nitroaromatic were detected in groundwater samples.
RI/FS (Baker, 1995)	1993 - 1995	To further characterize the nature and extent of contamination an RI was conducted. Field activities included a geophysical investigation, soil, groundwater, surface water, and sediment sampling, and an aquatic and ecological survey. The geophysical investigation

Previous Investigation/Action	Date	Activities
		indicated that the site contained a significant amount of buried construction debris. Although there was reported history of chemical agent disposal, no chemical surety degradation compounds were detected in soil. Potential human health risks were identified due to exposure to metals in groundwater and seep surface water. Minimal potential ecological risks were identified for aquatic receptors at Site 41. An FS was prepared which developed and screened remedial alternatives for addressing soil, groundwater, and surface water contamination.
PRAP and ROD (Baker, 1995)	1995	A PRAP was issued to solicit public input on the preferred alternative (LTM to monitor contaminant migration and LUCs) and a public meeting was held. The Final ROD was issued and signed in December 1995.
Remedy-in-Place and RACR (CH2M HILL, 2006)	1997 - 2008	LTM was initiated in 1997 and included sampling of five monitoring wells and eight surface water and sediment locations twice a year for analysis of VOCs, metals, TDS, and TSS. In 2005 the groundwater cleanup levels were achieved and LTM was discontinued. LUCs were implemented in 2001 and updated in 2002. A RACR was prepared to document the completion of LTM. A fence was installed around the perimeter of the site in 2008 to restrict access.

TABLE 8-20
Land Use Control Summary, IRP Site 41

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary	36.6	June 15, 2001	July, 2002
Intrusive Activities Control Boundary (Groundwater)	16.4		
Intrusive Activities Control Boundary (Soil)	36.6		
Aquifer Use Control Boundary (500 feet)	86.4		
Access Control Boundary	30		

8.1.10.1 Future Activities

The LUCs to prohibit intrusive activities, aquifer use, and non-industrial use at the site are protective of human health and the environment because exposure to waste that could result in unacceptable risks are being controlled. Perimeter fencing also restricts access to the waste area. Because LTM was conducted and the cleanup levels in groundwater have been achieved, there is no risk to human health and the environment from exposure to groundwater at Site 41. Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**.

8.1.11 Site 43 (OU 6)—Agan Street Dump

Site 43, the Agan Street Dump, encompasses approximately 14 acres within OU 6 in the operations area of MCAS New River (**Figure 8-15**). OU 6 consists of four sites (Sites 36, 43, 44, and 54) that have been grouped together into one OU because of the similar characteristics of material disposed and geographic location. An abandoned sewage treatment plant (STP) is adjacent to the site. The Agan Street Dump reportedly received inert material such as construction debris and trash. Sludge from the former STP was also reportedly dumped onto the ground surface of Site 43; however, it is not clear when disposal operations took place.

FIGURE 8-15
IRP Site 43, Operable Unit 6

Previous investigations are listed in **Table 8-21** and the LUC Summary is presented in **Table 8-22.**

TABLE 8-21
Previous Investigations Summary, IRP Site 43

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The IAS concluded that waste quantities at the site, regardless of their nature, were minor; therefore, a Confirmation Study was not recommended. However, the USEPA requested an additional investigation to determine whether hazardous waste contamination existed.
Site Inspection (1991)	1991	An SI was conducted to determine the presence or absence of hazardous waste contamination. Field activities included soil, groundwater, surface water, and sediment sampling. The SI identified PAHs in surface soil, carbon disulfide and metals in groundwater, benzoic acid and metals in surface water, and PAHs and pesticides in sediment. Further characterization as part of an RI/FS was recommended.

Previous Investigation/Action	Date	Activities
RI/FS (Baker, 1995; 2002)	1995 - 2002	To further assess contamination at the site an RI field investigation was initiated. Field activities included a site survey and soil, groundwater, surface water, and sediment sampling. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. Exploratory test pits completed as part of the soil investigation identified miscellaneous debris associated with the disposal of construction material from the nearby housing area. Potential human health risks were identified for current and future receptors due to exposure to soils. Minimal potential ecological risks were identified. Based on the findings of the RI, a removal action for PAH contaminated soil was recommended in the revised OU6 FS.
IRA (1995; 2003)	1995	IRAs were conducted at Site 43 for surficial metallic debris and PAH-contaminated soil in 1995 and 2003, respectively. Approximately 7.3 tons of metallic debris was removed for recycling and a total of 1,477 tons of soil was excavated.
PRAP and ROD (Baker, 2002; 2005)	2002 - 2005	The preferred alternative, Excavation and Off-Site Disposal and LUCs for soil, for Site 43 was presented in the PRAP in 2002. A public notice of availability, public comment period, and public meeting were held to solicit community input on the preferred alternative. The Excavation and Off-Site Disposal for soil was completed in 2003 during the IRA. Therefore, LUCs for soil were selected as the remedy for Site 43 as documented in the ROD for OU 6, signed in July 2005.
Remedy-in-Place and IRACR (CH2M HILL, 2007)	2005 - 2007	Soil LUCs were implemented in 2005, and an IRACR was completed to document the RIP.

TABLE 8-22
Land Use Control Summary, IRP Site 43

LUC Boundary	Estimated Area (Acres)	Final Submitted
Non-Industrial Use Control Boundary (Soil)	0.14	September 22, 2005
Intrusive Activities Control Boundary (Soil)	13.2	

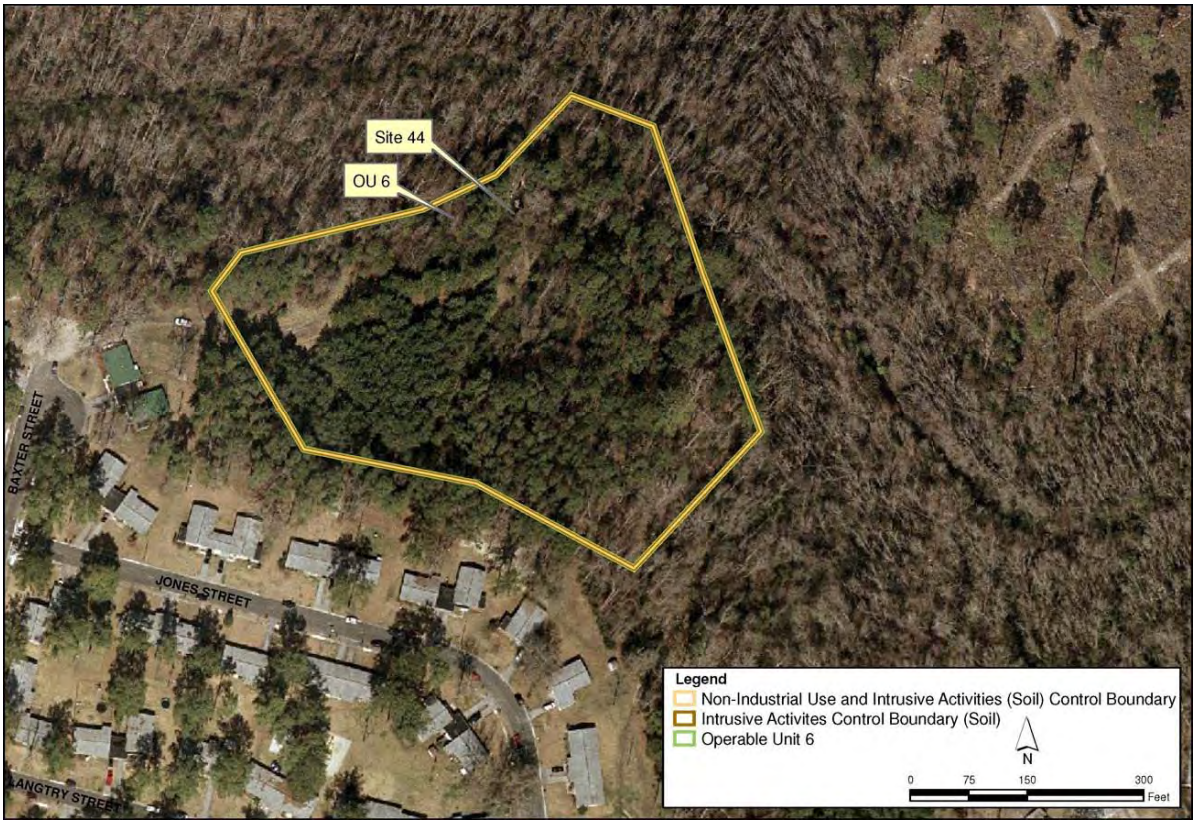
8.1.11.1 Future Activities

LUCs will be maintained to prohibit soil intrusive activities and non-industrial use within the extent of former soil removal action areas where PAHs remain in soil above levels that allow for UU/UE. Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**.

8.1.12 Site 44 (OU 6)—Jones Street Dump

Site 44, the Jones Street Dump, encompasses approximately 6 acres within OU 6 in the operations area of MCAS New River (**Figure 8-16**). OU 6 consists of four sites (Sites 36, 43, 44, and 54) that have been grouped together into one OU because of the similar characteristics of material disposed and geographic location. Site 44 was reportedly in operation during the 1950s. Although the quantity of waste is not known, debris, cloth, lumber, and paint cans were reportedly disposed of at the site.

FIGURE 8-16
IRP Site 44, Operable Unit 6



Previous investigations are listed in **Table 8-23** and the LUC Summary is presented in **Table 8-24.**

TABLE 8-23
Previous Investigations Summary, IRP Site 44

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Due to the negligible quantity of inert material reportedly disposed at Site 44, a Confirmation Study was not recommended. However, the EPA later requested an additional investigation to determine whether hazardous waste contamination existed.
Site Inspection (1991)	1991	An SI was conducted to verify the presence or absence of contamination. Field activities included soil, groundwater, surface water, and sediment sampling. The analytical results identified PAHs, pesticides, and metals in soil; VOCs, PAHs, and metals in groundwater; VOCs and metals in surface water; and pesticides and metals in sediment. Based on these results, an RI was proposed.

Previous Investigation/Action	Date	Activities
RI/FS (Baker, 1995 and 2002)	1995 - 2002	An RI was completed to characterize the nature and extent of contamination and potential impacts to human health and the environment. Field activities included a site survey and soil, groundwater, surface water, and sediment sampling. No unacceptable risks to human health or the environment were identified, and therefore no action was recommended in the FS.
PRAP and ROD (Baker, 2002 and 2005)	2002 - 2005	Although no action was recommended during the FS, for conservativeness, MCB CamLej identified potential risks based on the OU 6 sites formerly used for waste disposal. Therefore, LUCs were the preferred alternative presented in the PRAP in 2002. A public notice of availability, public comment period, and public meeting were held to solicit community input on the preferred alternative. LUCs were selected as the remedy for Site 44 as documented in the ROD for OU 6, signed in July 2005.
Remedy-in-Place and IRACR (CH2M HILL, 2007)	2005 - 2007	An RD was completed for OU 6 in September 2005 to document the LUC implementation. A Final OU 6 IRACR was completed in August 2007 to document the RIP at Site 44 (LUCs).

TABLE 8-24
Land Use Control Summary, IRP Site 44

LUC Boundary	Estimated Area (Acres)	Final Submitted
Intrusive Activities Control Boundary (Soil)	5.6	September 22, 2005
Non-Industrial Use Control Boundary	5.6	

8.1.12.1 Future Activities

LUCs will be maintained to prohibit soil intrusive activities and non-industrial use in the formal waste disposal area. Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**.

8.1.13 Site 54 (OU 6)—Crash Crew Fire Training Burn Pit

Site 54, the Crash Crew Fire Training Burn Pit, covers approximately 1 acre near the southwest end of Runway 5-23 within the MCAS New River operations area (**Figure 8-17**). OU 6 consists of four sites (Sites 36, 43, 44, and 54) that have been grouped together into one OU because of the similar characteristics of material disposed and geographic location. The site has served as the fire training burn pit since the mid-1950s. The former Crash Crew Fire Training Burn Pit was 90 feet in diameter and situated at the center of this site. Originally, fire training was conducted on the ground surface within a bermed area using JP-type fuel, which was stored in an 8,000-gallon UST, northwest of the burn pit. An OWS, located approximately 100 feet southeast of the burn pit, was used for temporary storage and collection of the spent fuel. In 1975, a lined burn pit was constructed and was used until 1999. Beginning in August 2000, the burn pit was converted to a training area that employs clean-burning fuels with operational and engineering controls. It is estimated that nearly 500,000 gallons of POL may have been used at Site 54.

FIGURE 8-17
IRP Site 54, Operable Unit 6

Previous investigations are listed in **Table 8-25** and the LUC Summary is presented in **Table 8-26.**

TABLE 8-25
Previous Investigations Summary, IRP Site 54

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. It was concluded that waste fuels, oils, and solvents may remain in the soil and recommended an additional investigation to verify the presence of hazardous wastes.
Confirmation Study (1987)	1984 - 1987	A Confirmation Study was conducted to verify the presence or absence of hazardous waste. Field activities included groundwater and sediment investigations. Due to the presence of low levels of petroleum compounds, further characterization was recommended.

Previous Investigation/Action	Date	Activities
Remedial Investigation (Baker, 1995 and 2002)	1995 - 2002	An RI was conducted to further characterize contamination at the site. Field activities included a site survey and soil and groundwater sampling. The RI identified potential risks from lead, SVOCs, and VOCs in groundwater. A Revised FS (the original FS only included Site 36) was completed for OU 6. Based on the findings of the RI, the FS recommended no action at Site 54.
Post-Remedial Investigation Monitoring (2002)	1998 - 2002	The post-RI monitoring program at Site 54 began in 1998 consisting of quarterly groundwater sampling. Based on the groundwater data collected following the IRA conducted in 2001, it was determined that lead, SVOCs and VOCs no longer posed an impact to the groundwater. Subsequently, groundwater monitoring was discontinued in 2002.
IRA (2001)	2001	An IRA for the UST, POL-contaminated soils, and construction debris from the former burn pit was completed at Site 54 in 2001. The removal area was 128 ft long by 96.5 ft wide and extended 9 ft below ground surface to the depth of groundwater. Construction activities also included a new concrete lined fire training area and two propane tanks.
FS (Baker, 2002)	2002	Based on the results of the IRA and post-RI groundwater monitoring, it was determined that lead, SVOCs, and VOCs no longer impacted the groundwater; therefore, no action was identified during the FS.
PRAP and ROD (Baker, 2002 and 2005)	2002 - 2005	Although no action was recommended during the FS, for conservativeness, MCB Camp Lejeune identified potential risks based on the OU 6 sites formerly used for waste disposal. Therefore, LUCs was the preferred alternative presented in the PRAP in 2002. A public notice of availability, public comment period, and public meeting were held to solicit community input on the preferred alternative. LUCs were selected as the remedy for Site 54 as documented in the ROD for OU 6, signed in July 2005.
Remedy-in-Place and IRACR (CH2M HILL, 2007)	2005 - 2007	An RD was completed for OU 6 in 2005 to document the LUC implementation and maintenance actions at Site 54. A Final OU 6 IRACR was completed to document the RIP (LUCs).

TABLE 8-26
Land Use Control Summary, IRP Site 54

LUC Boundary	Estimated Area (Acres)	Final Submitted
Non-Industrial Use Control Boundary (Soil)	0.29	September 22, 2005
Intrusive Activities Control Boundary (Soil)	0.29	

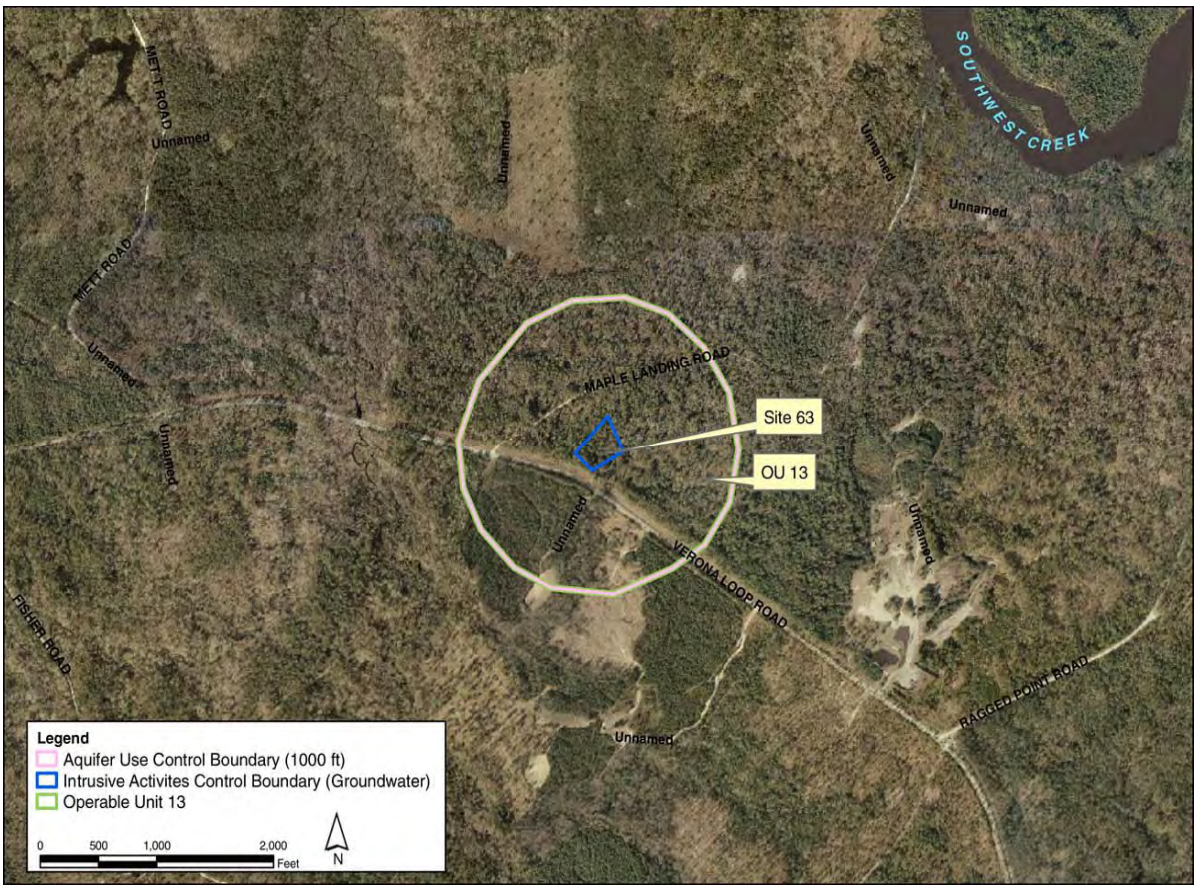
8.1.13.1 Future Activities

LUCs will be maintained to prohibit soil intrusive activities and non-industrial use. Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**.

8.1.14 Site 63 (OU 13)—Verona Loop Dump

Site 63, the Verona Loop Dump, encompasses approximately 5 acres, nearly 2 miles south of the MCAS New River operations area (**Figure 8-18**). The area reportedly received bivouac wastes generated during training exercises. No hazardous wastes were reportedly disposed of at Site 63. Currently, training exercises, maneuvers, and recreational hunting frequently take place in the area.

FIGURE 8-18
IRP Site 63, Operable Unit 13



Previous investigations are listed in **Table 8-27** and the LUC Summary is presented in **Table 8-28.**

TABLE 8-27
Previous Investigations Summary, IRP Site 63

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The quantities of waste reportedly disposed of at the site, whether hazardous or not, were insignificant and it was concluded that no further assessment was necessary. However, the USEPA requested an additional investigation to determine whether hazardous waste contamination existed.
Site Inspection (Baker, 1994)	1994	An SI was conducted to determine whether hazardous waste contamination existed. Field activities included soil, groundwater, surface water, and sediment sampling for VOCs, SVOCs, pesticides/PCBs, and metals. Fill materials were encountered in soils, confirming that disposal of waste materials occurred at the site. The analytical results identified metals and organic compounds detected in soil and groundwater samples. Based on these findings, the SI recommended further evaluation.

Previous Investigation/Action	Date	Activities
Remedial Investigation (Baker, 1995)	1995	An RI was conducted to evaluate the nature and extent of contamination and potential risks to human health and the environment. Field activities consisted of a site survey and soil, groundwater, surface water, and sediment sampling. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. No unacceptable human health or ecological risks were identified.
PRAP and ROD (Baker, 1996 and 1997)	1996 - 1997	A PRAP was issued to solicit public input on the preferred alternative (no action) and a public meeting was held. The Final ROD was issued and signed in April 1997.
Remedy-in-Place	2001 - 2002	Although the ROD did not require remedial action, for conservativeness the Base implemented LUCs in 2001 and updated them in 2002.

TABLE 8-28
Land Use Control Summary, IRP Site 63

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Intrusive Activities Control Boundary (Groundwater)	2	June 15, 2001	July, 2002
Aquifer Use Control Boundary (1,000 feet)	100.1		

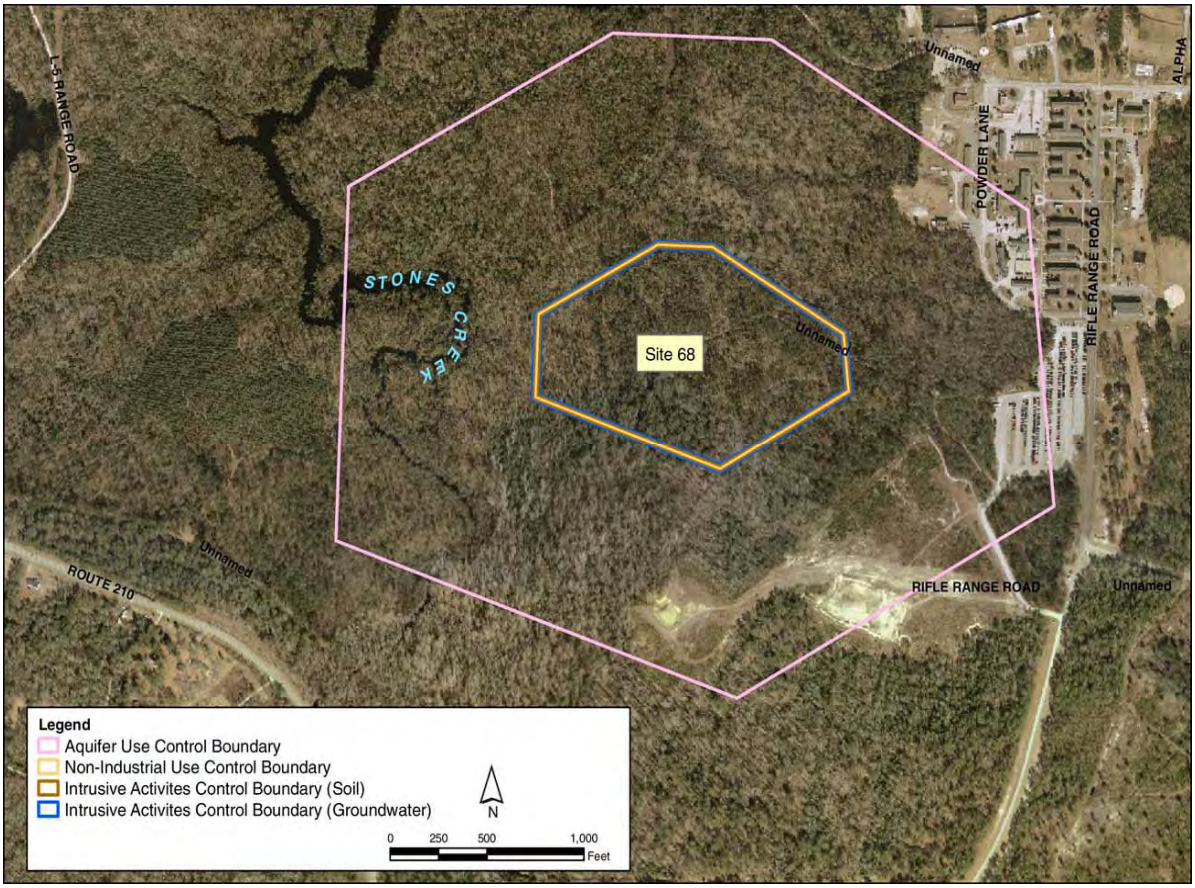
8.1.14.1 Future Activities

LUCs will remain in-place to restrict groundwater intrusive activities and aquifer use. Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**.

8.1.15 Site 68 (Pre-RI)—Rifle Range Dump

Site 68, the Rifle Range Dump, covers approximately 4 acres and is located in the Rifle Range Area of the Base (**Figure 8-19**). From 1942 to 1972, this area was used as a disposal site for various types of wastes, including garbage, building debris, waste treatment sludge, and solvents. The depth of the fill area is approximately 10 feet and the amount of material deposited has been estimated to be 100,000 yd^3. The amount of solvents disposed at Site 68 was estimated to be between 1,000 and 2,000 gallons.

FIGURE 8-19
IRP Site 68



Previous investigations are listed in **Table 8-29** and the LUC Summary is presented in **Table 8-30.**

TABLE 8-29
Previous Investigations Summary, IRP Site 68

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Organic compounds were identified in potable supply wells, located upgradient from the site. Even though these wells are located upgradient from the site, it was suspected that continuous pumping may have drawn contaminants to the wells. Based on these findings, the IAS recommended an additional investigation.
Site Summary Report (ESE, 1990)	1984 - 1990	Monitoring wells were installed and groundwater samples were collected for VOCs analysis from the monitoring wells and potable supply wells in 1984 and again in 1986. No compounds of potential concern were detected in groundwater samples collected from these wells.

Previous Investigation/Action	Date	Activities
Pre-Remedial Investigation Screening Study (Baker,1998)	1995 - 1998	A Pre-RI screening study was conducted to determine whether contamination was present at the site. Field activities included soil, groundwater, surface water, and sediment sampling. Pesticide/PCBs were detected in soil samples, VOCs and metals were detected in groundwater samples, and pesticides and metals were detected in sediment. No unacceptable human health risks were identified and no further remedial action was recommended
No Further Action Decision Document (2001)	2001	The Final NFA DD was completed May 8, 2001, which stated that all investigations or activities for the IRP for Site 68 are complete.
Remedy-in-Place	2001 - Present	Although no remedial action was required, for conservativeness, the Base implemented LUCs in 2001 and updated them in 2002, due to the site's history as a dump.

TABLE 8-30
Land Use Control Summary, IRP Site 68

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary (Soil)	26.9	June 15, 2001	July, 2002
Intrusive Activities Control Boundary (Soil)	26.9		
Intrusive Activities Control Boundary (Groundwater)	26.9		
Aquifer Use Control Boundary (1,000 feet)	202.8		

8.1.15.1 Future Activities

LUCs will be maintained to prohibit soil intrusive activities and non-industrial use, groundwater intrusive activities, and aquifer use.

8.1.16 Site 73 (OU 21)—Courthouse Bay

Site 73, the Amphibious Vehicle Maintenance Facility covers approximately 13 acres located along the northwest shore of Courthouse Bay (**Figure 8-20**). The Amphibious Vehicle Maintenance Facility was constructed in 1946. Maintenance activities were historically conducted in the former Building A3 located southeast of the current Building A47. Used motor oil and battery acid resulting from maintenance activities were reportedly discharged directly to the ground surface northeast of Building A3. Between 1983 and 1989, Building A3 was demolished and Building A47 was constructed. Based on the nature of maintenance activities conducted and CVOCs identified in groundwater, it is likely that other hazardous substances including chlorinated solvents, were also disposed of in this area. Ten USTs containing various petroleum hydrocarbon products (diesel fuel, gasoline, and/or waste oil) were formerly located at Site 73 to support the operations. All USTs except A47-1 have been removed (approximate location of A47-1 is within the footprint of the former maintenance building). UST A47-1 is currently not in use and is believed to be closed in-place. NCDENR issued NFA for five of the USTs (A47-2, A47-4, A47-5, A-2, and A-10/SA26). Investigations are currently being completed under the UST Program for four of the USTs (A47-3, UST-A47/SA21, A12-1, and A12-2). Significant development of the Courthouse Bay area surrounding Site 73 has occurred in the last 10 to 15 years and the current land use is industrial.

FIGURE 8-20
IRP Site 73, Operable Unit 21

Previous investigations are listed in **Table 8-31** and the LUC Summary is presented in **Table 8-32.**

TABLE 8-31
Previous Investigations Summary, IRP Site 73

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. A review of historical records, aerial photographs, and field inspections found that an estimated 400,000 gallons of waste oil was discharged directly onto the ground surface. Approximately 20,000 gallons of waste battery acid was also reportedly disposed in the area. Therefore, Site 73 was recommended for additional study.
Confirmation Study (Environmental Science and Engineering, Inc. [ESE], 1985)	1985	To confirm the presence or absence of contamination groundwater samples were collected in areas where washing had occurred, or locations of existing or suspected former USTs. Results indicated that shallow groundwater was impacted by VOCs and metals.
Underground Storage Tank Investigations (1993)	1991 - 1993	Between 1991 and 1993, several UST investigations were completed, which included the collection of soil and groundwater samples in the vicinity of several USTs at the site. Analytical results identified TPH and benzene, toluene, ethylbenzene, and total xylenes (BTEX) compounds in soil and groundwater.
Preliminary Investigation (1994)	1994	A soil gas survey and groundwater screening program was conducted. The analytical results identified nine AOCs at Site 73, segregated by potential sources of contamination.
Remedial Investigation (Baker, 1997)	1997	Surface soil, subsurface soil, groundwater, sediment, and surface water samples, and benthic and aquatic species were collected to evaluate the nature and extent of contamination and potential risks to human health and the environment. Several VOCs were identified as contaminants of concern (COCs) in groundwater and the HHRA identified potential risk to future receptors. The ERA identified a potential risk to terrestrial receptors due to contaminants in soil and surface water.
Supplemental Groundwater Investigation and Feasibility Study (Baker, 1998)	1998	Groundwater sampling was conducted for further delineation. Results indicated that natural attenuation was occurring. The shallow benzene plume was stable and decreasing in concentration; and the shallow CVOC area of concern had not changed in shape or size but was not fully delineated. The Supplemental Groundwater Investigation (SGI) concluded that additional delineation was necessary and recommended a Natural Attenuation Evaluation (NAE). Remedial alternatives were developed and presented in an FS to mitigate the potential for direct exposure and to treat impacted groundwater.
Groundwater Modeling Report (Baker, 1998)	1998	Groundwater modeling was conducted to predict the fate and transport of CVOCs. The results indicated that natural degradation was occurring in the deep aquifer zone and that intermediate and deep groundwater was discharging to Courthouse Bay and the New River.
Long Term Monitoring Optimization Report (CH2M HILL, 2005)	2000-2005	LTM of CVOCs and benzene in shallow, intermediate, and deep groundwater was conducted to verify the plumes were stable and not expanding. Because of ongoing investigations at Site 73 LTM was discontinued.
Natural Attenuation Evaluation Study (CH2M HILL, et al., 2002)	2002	A study was conducted to evaluate the extent and rate of natural attenuation. Benzene was the only fuel-related compound detected in the shallow and intermediate aquifer zones; it was degrading by natural, in-situ processes and was not discharging to Courthouse Bay. Reduced levels of TCE, cis-1,2-dichloroethene (DCE), and VC and their patterns of occurrence in the shallow aquifer zone, were indicative of natural attenuation, but the potential for VC to discharge into Courthouse Bay was identified. TCE, cis-1,2-DCE, and VC were identified in the intermediate aquifer zone but were considered not likely discharging to Courthouse Bay. Additional delineation was recommended to verify the extent of impacts.
Technology Evaluation (Baker, 2003)	2003	Potential remedial options were evaluated for treatment of intermediate groundwater with TCE concentrations above 1,000 micrograms per liter (µg/L) (“hot spot” area), near Building A47. Five treatment technologies (in-situ chemical oxidation using permanganate, abiotic reduction using colloidal iron injection, ERD promoted by HRC™, bio-augmentation, sparging with hydrogen, cometabolic sparging with air and propane, or sparging with ozone using horizontal wells) were evaluated based on effectiveness, site constraints, depth of the contaminant mass, presence of underground utilities, land use, and cost. Hydrogen sparging delivered via a HDD well was recommended

Previous Investigation/Action	Date	Activities
Hydrogen Sparging Pilot Study (MicroPact, Baker, 2006)	2003 - 2006	A 900-foot-long horizontal well with 400 feet of screened area was installed to a depth of 85 feet below ground surface in the "hot spot" area. Approximately 40 hydrogen injections were completed in 2004 and 2005. The average TCE concentration decreased by approximately 35% and the average total VOC concentration decreased by approximately 8%.
Phase 2 Pilot Study (AGVIQ, CH2M HILL, 2008)	2008	A pilot study was conducted to evaluate air and ozone sparging for removal of CVOCs present in the "hot spot" area using the existing HDD well. Results indicated that TCE concentrations in the intermediate aquifer zone decreased by 75% with ERD and sparging being the primary treatment mechanisms.
Supplemental RI (SRI) (CH2M HILL, 2009)	2006 - 2009	An SRI was completed to summarize the nature and extent of impacts and potential risks to human health and the environment. Primary COCs identified were VOCs (TCE, cis-1,2-DCE, 1,1-DCE, VC, and benzene). The greatest VOC concentrations are located beneath the paved area associated with Building A47. COCs detected in the surficial aquifer (TCE, VC, and benzene) appear to originate in the vicinity of UST A47-3. The greatest concentrations of COCs detected within the Castle Hayne aquifer were detected between Building A47 and the approximate footprint of the former maintenance building. Soil samples were collected to delineate the extent of petroleum-related impacts. No significant source of free-phase petroleum was identified; however, an area of petroleum hydrocarbon-impacted soil was delineated in the area corresponding with historic waste oil discharge. The source of contamination was likely from multiple surficial spills associated with maintenance activities that occurred before the concrete-paved parking area was constructed.
Feasibility Study (CH2M HILL, 2009)	2009	Potential remedial alternatives were identified to address CVOCs in groundwater and petroleum hydrocarbon impacted soil. Four remedial alternatives were selected for detailed comparative analysis: (1) no action, (2) MNA, (3) ERD using existing horizontal well and downgradient ERD injections, and (4) air sparging with downgradient ERD injections.
PRAP and ROD (CH2M HILL, 2009)	2009	A PRAP was issued in April 2009 to solicit public input on the preferred alternative (in situ air sparging using the horizontal well, downgradient ERD injections, LTM for MNA, and LUCs) and a public meeting was held. Questions received during the public meeting were general inquiries and no comments were received during the public comment period. The Final ROD was issued and signed in November 2009. The site CSM is shown on **Figure 8-21**.
Basewide Vapor Intrusion Evaluation (CH2M HILL, AGVIQ, 2009)	2007 – 2011	Site 73 was included in the phased basewide vapor intrusion investigation to determine if complete or significant exposure pathways exist for vapor intrusion into buildings. No current vapor intrusion impacts were identified for any of the buildings located in the vicinity of Site 73. The report recommended additional sampling for temporal variability at Building A-47. The follow-up sampling was conducted and the report will be completed in 2010. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed.
Remedy-in-Place and IRACR (Shaw, 2011)	2009-2011	A Bench Scale and Tracer Study was completed to determine the appropriate injection substrate, amendments, and quantity for downgradient ERD injections and is presented as part of the RD. The RD was prepared for in situ air sparging by the horizontal well, downgradient ERD injections, LTM and MNA, and LUCs. In FY 2010, the horizontal well was initiated for air sparging to treat the highest VOC concentrations in groundwater and LUCs were finalized to prohibit aquifer use and exposure to soil until cleanup levels for UU/UE are achieved. Quarterly groundwater LTM and MNA for analysis of VOCs and NAIPs was initiated in 2010 to evaluate the effectiveness of treatment and monitor plume migration. ERD injections were completed in June 2011 and an IRACR was submitted.

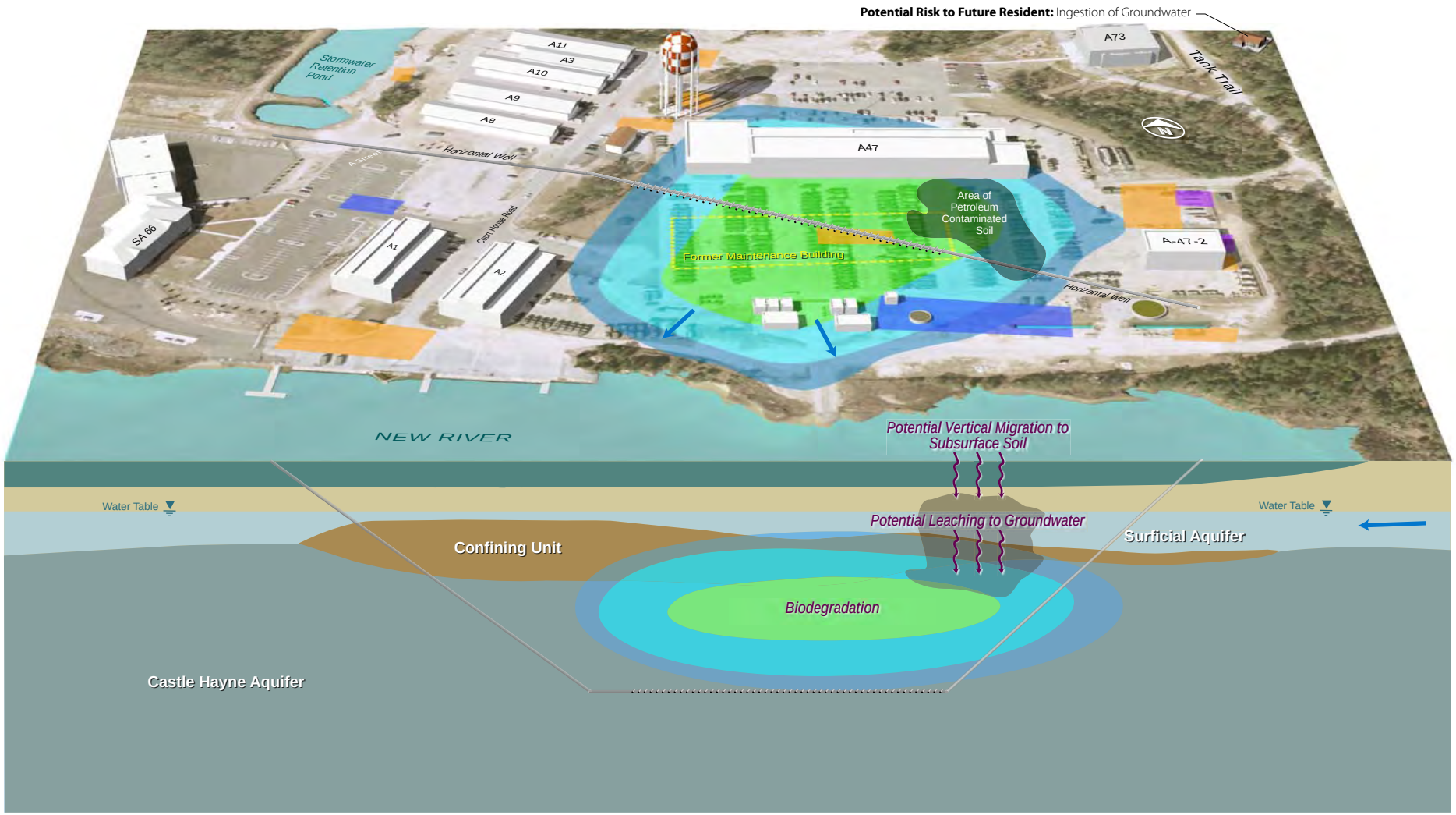
TABLE 8-32
Land Use Control Summary, IRP Site 73

LUC Boundary	Estimated Area (Acres)	Final Submitted
Intrusive Activities Control Boundary (Soil)	0.8096	August 2010
Aquifer Use Control (1,000 feet)	47.063	

8.1.16.1 Future Activities

The air sparging, LTM, and MNA will be continued to treat and monitor migration of VOC contamination. LUCs will be maintained to prohibit aquifer use until cleanup levels are achieved. LUCs are also in-place to prohibit intrusive activities where soil contamination remains in-place above concentrations that allow for UU/UE.

Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. Base Master Planning maintains current groundwater plume data in GIS, and all construction projects on-Base go through environmental review.



Legend

- Horizontal Well
- Groundwater Flow Direction
- Location of Existing/Former UST
- Hazmat Storage
- Vehicle Washdown Areas

TCE Concentrations

- 50 < x < 100 µg/L
- 5 < x < 50 µg/L
- 2.8 < x < 5 µg/L

Figure 8-21
IRP Site 73 CSM
FY 2012 Site Management Plan
MCB CamLej
North Carolina

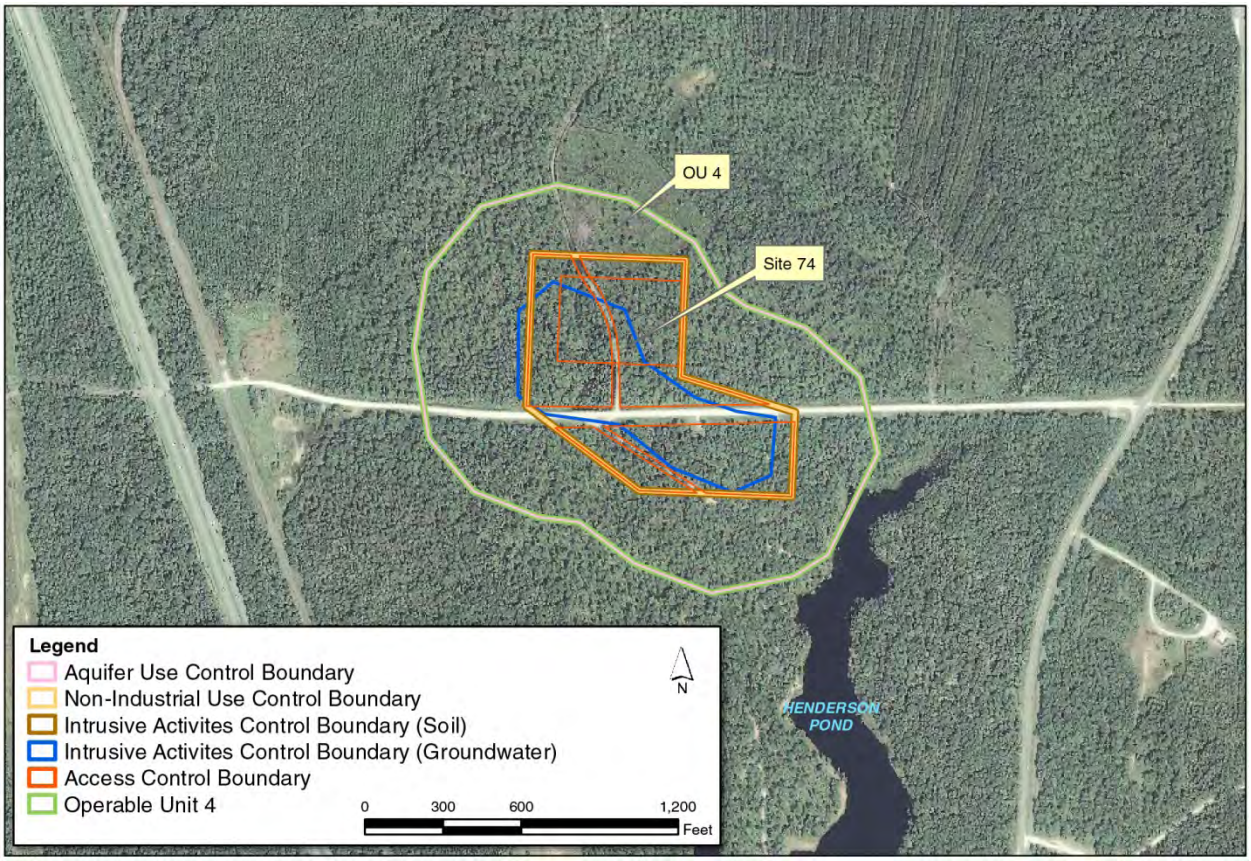
CH2MHILL

ES072008011GNV CSMCJS73_Conceptual_Site_Model_Site-73_ver4.ai

8.1.17 Site 74 (OU 4)—Mess Hall Grease Dump Area

Site 74, the Mess Hall Grease Dump, was used from the early 1950s through the early 1960s and covers approximately 24 acres within OU4 (**Figure 8-22**). OU 4 consists of two sites (Sites 41 and 74) that have been grouped together based on the unique characteristic of suspected waste. Grease from the mess hall at Site 74 was reportedly disposed of in trenches. It was also reported that drums containing PCBs and pesticide-soaked bags were buried near the grease pit. Estimates of quantities include 1,100 gallons of PCB oil, 50 to 500 gallons of DDT, and 2,200 gallons of drummed pesticides. One internal memorandum reports chemical training agents in the form of test kits were reportedly disposed at Site 74. A former Pest Control Area was also reportedly located in the southeastern portion of the Site.

FIGURE 8-22
IRP Site 74, Operable Unit 4



Previous investigations are listed in **Table 8-33** and the LUC Summary is presented in **Table 8-34.**

TABLE 8-33
Previous Investigations Summary, IRP Site 74

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The IAS concluded that disposal of industrial wastes and pesticides could impact groundwater and recommended an additional investigation to verify the presence of hazardous wastes.
Confirmation Study (1987)	1984 - 1987	The Confirmation Study included groundwater, surface water, and sediment investigations. O&G and phenols were detected in groundwater, surface water, and sediment samples. VOCs, metals, and one nitroaromatic were detected in groundwater samples.

Previous Investigation/Action	Date	Activities
RI/FS (Baker, 1995)	1993 - 1995	To further characterize the nature and extent of contamination an RI was conducted. Field activities included a geophysical investigation, soil, groundwater, surface water, and sediment sampling, and an aquatic and ecological survey. The geophysical investigation indicated that the site contained a significant amount of buried construction debris. Although there was reported history of chemical agent disposal, no chemical surety degradation compounds were detected in soil. Potential human health risks were identified due to exposure to metals in groundwater and seep surface water. Minimal potential ecological risks were identified for aquatic receptors at Site 41. An FS was prepared which developed and screened remedial alternatives for addressing soil, groundwater, and surface water contamination.
PRAP and ROD (Baker, 1995)	1995	A PRAP was issued to solicit public input on the preferred alternative (LTM to monitor contaminant migration and LUCs) and a public meeting was held. The Final ROD was issued and signed in December 1995.
Remedy-in-Place and RACR (CH2M HILL, 2006)	1997 - 2008	LTM was initiated in 1997 and included sampling of five monitoring wells and eight surface water and sediment locations twice a year for analysis of VOCs, metals, TDS, and TSS. In 2005 the groundwater cleanup levels were achieved and LTM was discontinued. LUCs were implemented in 2001 and updated in 2002. A RACR was prepared to document the completion of LTM. A fence was installed around the perimeter of the site in 2008 to restrict access.

TABLE 8-34
Land Use Control Summary, IRP Site 74

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary (Soil)	23.8	June 15, 2001	July, 2002
Intrusive Activities Control Boundary (Groundwater)	13.9		
Intrusive Activities Control Boundary (Soil)	23.8		
Aquifer Use Control Boundary (500 feet)	71.2		
Access Control Boundary	20.5	August 2011	

8.1.17.1 Future Activities

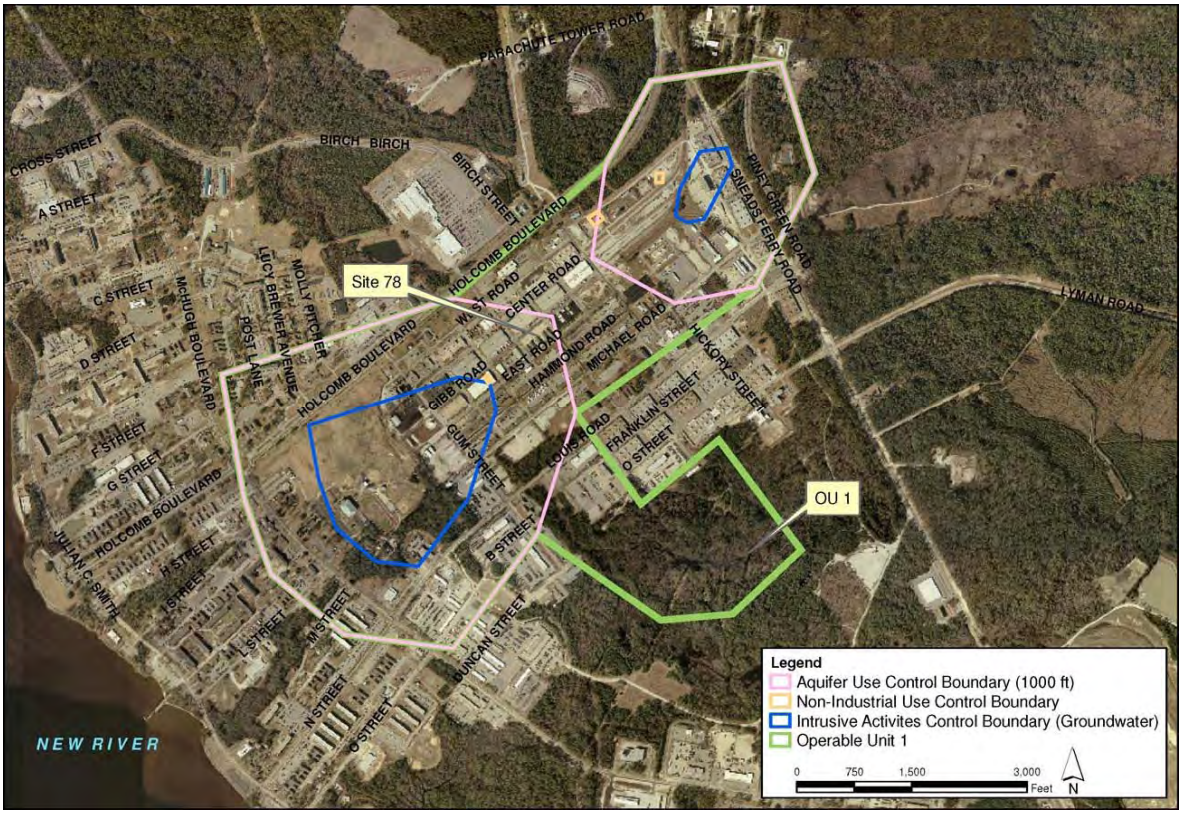
The LUCs to prohibit intrusive activities, aquifer use, and non-industrial use at the site are protective of human health and the environment because exposure to waste that could result in unacceptable risks are being controlled. Perimeter fencing also restricts access to the waste area. MILCON activities are planned in the vicinity of Henderson Pond and Site 74 and additional investigation is planned in 2011-2012 to confirm no unacceptable risks to human health and the environment are present within the MILCON area.

Because LTM was conducted and the cleanup levels in groundwater have been achieved, there is no risk to human health and the environment from exposure to groundwater at Site 74. Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**.

8.1.18 Site 78 (OU 1)—Hadnot Point Industrial Area

Site 78, the Hadnot Point Industrial Area (HPIA), covers approximately 590 acres and is located within OU 1, one mile east of the New River and two miles south of State Route 24 (**Figure 8-23**). OU 1 consists of three sites (Sites 21, 24, and 78) that have been grouped together into one OU because of their proximity to one another. The HPIA, constructed in the late 1930s, was the first developed area at MCB CamLej. The HPIA consists of maintenance shops, warehouses, painting shops, printing shops, auto body shops, and other small industrial facilities. Due to the industrial nature of the site, many spills and leaks have occurred over the years. Most of these spills and leaks have consisted of petroleum-related products and solvents from USTs and drums.

FIGURE 8-23
IRP Site 78, Operable Unit 1



Previous investigations are listed in **Table 8-35** and the LUC Summary is presented in **Table 8-36.**

TABLE 8-35
Previous Investigations Summary, IRP Site 78

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The IAS recommended additional investigations based on historical operations in HPIA.
Interim RI/Interim FS/Interim PRAP/Interim ROD for Surficial Aquifer (Baker, 1992)	1984 - 1992	Several investigations were conducted to evaluate the nature and extent of the threat to human health and the environment caused by the release or threatened release of hazardous substances, pollutants, or contaminants. Field events included a geophysical survey and groundwater and soil sampling. Elevated levels of organic compounds (primarily PCBs, pesticides, and VOCs) and inorganic compounds (metals) were identified throughout OU1 in various media. Potential unacceptable human health risks were identified due to VOCs in groundwater. The preferred alternative for addressing the shallow groundwater VOC contamination was groundwater extraction and treatment systems to prevent migration of the VOC plumes in the shallow groundwater at Site 78 North and Site 78 South and LUCs to prevent exposure to groundwater. The Interim ROD was signed on September 23, 1992.
RI/FS and PRAP and ROD (Baker, 1994)	1984 - 1994	Additional investigations and risk assessments were conducted to define the nature and extent of contamination in soil and groundwater. Potential ecological risks were identified based on exposure to pesticides and PCBs in soil. Potential human health risks were identified for future residents due to exposure to VOCs in groundwater at Site 78. The Final ROD for addressing soil and groundwater at OU 1 was signed September 15, 1994. The selected remedy was excavation and offsite disposal of pesticide and PCB-contaminated soil to achieve industrial cleanup levels, continuation and expansion of the groundwater extraction/treatment systems at Site 78 North and Site 78 South, LTM, and LUCs.
Explanation of Significant Difference (Baker, 1995)	1995	An ESD was issued to revise the cleanup level for PCBs to the Federal PCB action level for industrial sites due to the industrial nature of site activities.
Notice of Non-significant Changes (USMC, 1997)	1997	A Notice of Non-significant Changes was submitted which identified ROD changes including removal of heptachlor epoxide, metals, total suspended solids (TSS), total dissolved solids (TDS), and oil and grease (O&G) from the LTM Program.
Optimization Study (Radian, 2000)	2000	The optimization study recommended shutting down operation of the Site 78 South system in the short-term and shutting down the Site 78 North system when mass removal from recovery wells reached asymptotic levels. The recommendations were not implemented.
NAE (2002)	2001 - 2002	Based on the findings of the LTM sampling, a NAE was conducted to further delineate the contaminant plume and to determine whether natural attenuation of chlorinated VOCs was occurring. Field activities included groundwater sampling for VOCs. The NAE concluded that there was evidence for natural attenuation processes occurring at the site.
ORC® and HRC® Pilot Study (CH2M HILL, 2005)	2003 - 2005	Two pilot studies were initiated to evaluate effectiveness of *in situ* technologies to remediate chlorinated compounds in groundwater. The pilot study performed at Site 78 North, near the corner of Building 903, included injection of Oxygen Release Compound® (ORC®) into groundwater at locations with vinyl chloride concentrations higher than 1,000 mg/L. The pilot study performed at Site 78 South, near the corner of Building 1601, included the injection of Hydrogen Release Compound® (HRC®), into groundwater at locations with TCE concentrations greater than 1,000 mg/L. The Final Pilot Study report, concluded that the concentration of vinyl chloride in groundwater at Site 78 North was reduced by 25 to 50 percent and that the concentration of TCE in groundwater at Site 78 South was reduced by an order of magnitude at the majority of wells, but dechlorination was not complete and appeared to stall at the DCE daughter product.

Previous Investigation/Action	Date	Activities
Remedy-in-Place	1995 - present	The soil excavation to remove pesticide and PCB-contaminated soils was completed in 1995. The groundwater extraction and treatment systems at Site 78 North and South have been in operation since 1995. Groundwater LTM for VOCs and NAIPs was implemented in 1995 and is ongoing on a quarterly and annual basis. LUCs were implemented in June 2001 and updated in July 2002 to prohibit soil and groundwater use at Site 78. The current CSM is shown on Figure 8-24.
HPIA Evaluation (CH2M HILL, 2010)	2009 - 2010	An extensive Groundwater Investigation was conducted across the HPIA to assess the current chlorinated VOC and petroleum hydrocarbon impacts and identify any data gaps. The report recommended expansion of the LTM program and LUC boundaries and treatment system optimization,
Plume Delineation (Rhea, 2011)	2009 - 2011	A field screening was conducted to further delineate VOCs in groundwater. Analytical results suggested that VOC contamination was present outside of the current LUC boundaries and recovery well and LTM network. Further investigation to confirm these results was recommended.
Basewide Vapor Intrusion Evaluation (CH2M HILL, AGVIQ, 2009)	2007 – 2011	Site 78 was included in the phased basewide vapor intrusion investigation to determine if complete or significant exposure pathways exist for vapor intrusion into buildings. No risks were identified from indoor air related to vapor intrusion; therefore, it was concluded that vapor intrusion is not a current significant pathway of concern for any of the buildings located in the vicinity of Site 78. The report recommended additional sampling for temporal and spatial variability and/or evaluation of preferential pathways at several buildings at Site 78 North and Site 78 South. The follow-up sampling was conducted and the report will be completed in 2011. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed.

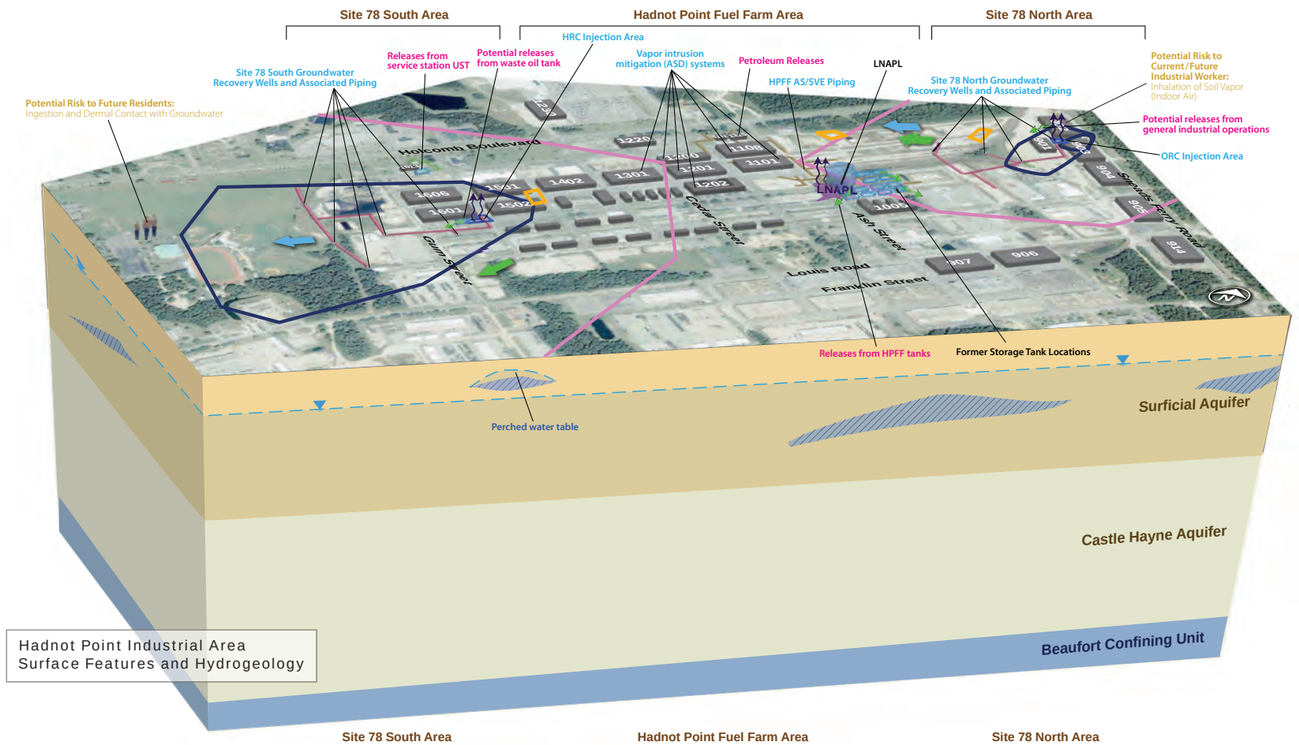
TABLE 8-36
Land Use Control Summary, IRP Site 78

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary (Soil)	0.815	June 15, 2001	July, 2002
Intrusive Activities Control Boundary (Groundwater)	102.28		
Aquifer Use Control Boundary (1,000 feet)	501.54		

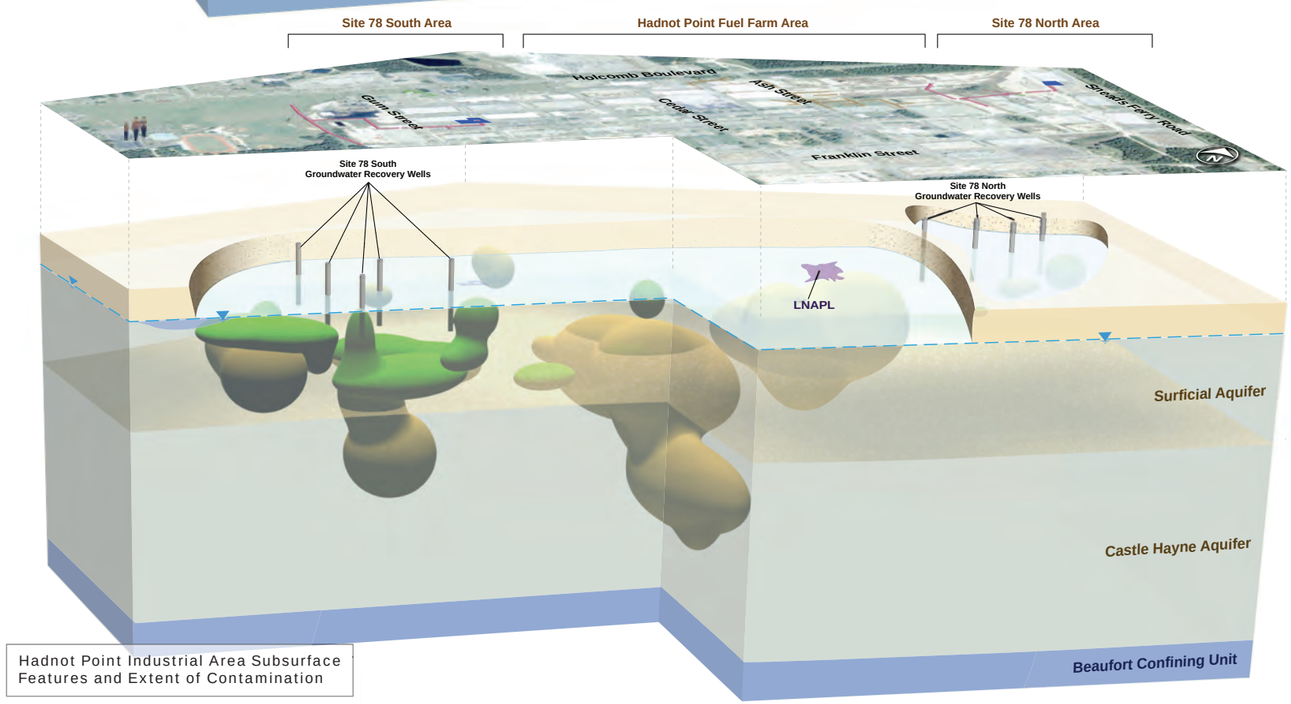
8.1.18.1 Future Activities

The groundwater extraction and treatment systems at Site 78 North and South, LTM, and LUCs will be maintained. Evaluations are ongoing in 2011 to confirm the results of the recent plume delineation. Based on the results of the delineation, LUCs will be updated and a Treatability Study is planned in 2012.

Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. Base Master Planning maintains current groundwater plume data in GIS, and all construction projects on-Base go through environmental review.

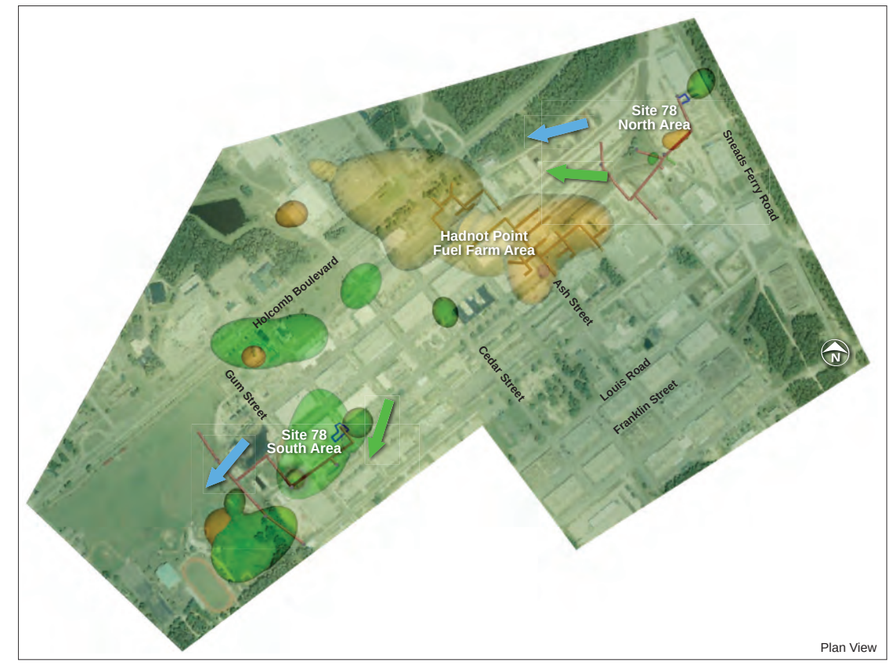


Hadnot Point Industrial Area
Surface Features and Hydrogeology



Hadnot Point Industrial Area Subsurface
Features and Extent of Contamination

KEY



LEGEND

- Water Table
- Sand with Interbedded Silts and Clays
- Sands, Interbedded Limestone, and Partially Cemented Sand

Groundwater Flow Direction

- Surficial Aquifer
- Castle Hayne Aquifer
- Chlorinated Solvents
- Dissolved Petroleum Hydrocarbons
- Groundwater Recovery Well
- Clay
- Potential Vapor Intrusion Pathway
- Aquifer Use Control Boundary
- Non-Industrial Use Control Boundary
- Intrusive Activities Control Boundary

Remedial Actions and Treatments

Potential Releases/Sources

Potential Risks and Receptors

ORC – Oxygen Release Compound
HRC – Hydrogen Release Compound
HPFF – Hadnot Point Fuel Farm
AS/SVE – Air Sparge/Soil Vapor Extraction
UST – Underground Storage Tank
ASD – Active Soil Depressurization

FIGURE 8-24
Conceptual Site Model
Hadnot Point Industrial Area
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

8.1.19 Site 80 (OU 11)—Paradise Point Golf Course Maintenance Area

Site 80, the Paradise Point Golf Course Maintenance Area, encompasses approximately 3 acres northwest of Brewster Boulevard within OU 11 (**Figure 8-25**). OU 11 consists of two sites (Sites 7 and 80) that have been grouped together into one OU because of their similar disposal history and proximity to one another. Information regarding past maintenance procedures at Site 80 is unknown; however, the facility is currently in operation. Golf course maintenance operations which include the machine shop (a potential source of waste oils) and the routine spraying of pesticides and herbicides may have contributed to potential contamination at this site. It is unknown when the wash pad was constructed, and what the exact procedure was for cleaning the maintenance equipment prior to the construction of the wash pad. The facility is currently in operation as a maintenance facility for the Base golf course.

FIGURE 8-25
IRP Site 80, Operable Unit 11

Previous investigations are listed in **Table 8-37** and the LUC Summary is presented in **Table 8-38.**

TABLE 8-37
Previous Investigations Summary, IRP Site 80

Previous Investigation/Action	Date	Activities
Site Inspection (Halliburton/NUS, 1991)	1991	An SI was conducted to determine the presence or absence of contamination at Site 80. Field activities included soil, groundwater, surface water, and sediment sampling for VOCs, SVOCs, pesticides/PCBs, herbicides, and TPH (surface water and sediment only). The analytical results identified pesticides and PCBs in soil, low level VOCs in groundwater and petroleum hydrocarbons in surface water. Based on these results, an RI was proposed.

Previous Investigation/Action	Date	Activities
Remedial Investigation (Baker, 1995)	1994 - 1995	An RI was completed to characterize the nature and extent of contamination and potential impacts to human health and the environment. Field activities consisted of a site survey, soil and groundwater sampling. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. Pesticides were detected in soil samples. Low levels of pesticides, SVOCs, and metals were detected in groundwater. Potential unacceptable human health risks were identified due to the presence of pesticides in soil. No unacceptable ecological risks were identified.
TCRA (1996)	1996	Based on the potential human health risk identified in the RI, a TCRA was recommended to remove soil contaminated with pesticides to industrial levels. In July 1996, approximately 988 tons of contaminated soil was excavated and transported off-site to a disposal facility.
PRAP (1996) and ROD (Baker, 1997)	1996 - 1997	A PRAP was issued in November 1996 to solicit public input on the preferred alternative (no remedial actions) and a public meeting was held. The Final ROD for OU 11 (Sites 7 and 80) was issued and signed in August 1997.
Remedy-in-Place	2007 - present	Although the ROD did not require remedial action, the soil remediation goals for the TCRA were based on industrial risk-based concentrations; to protect human health and the environment, the Base implemented LUCs in May 2007 to prohibit future exposure to surface and subsurface soil within the site boundary, including the previous soil removal action area.

TABLE 8-38
Land Use Control Summary, IRP Site 80

LUC Boundary	Estimated Area (Acres)	Final Submitted
Non-Industrial Use Control Boundary (Soil)	3.2	May 24, 2007
Intrusive Activities Control Boundary (Soil)	3.2	

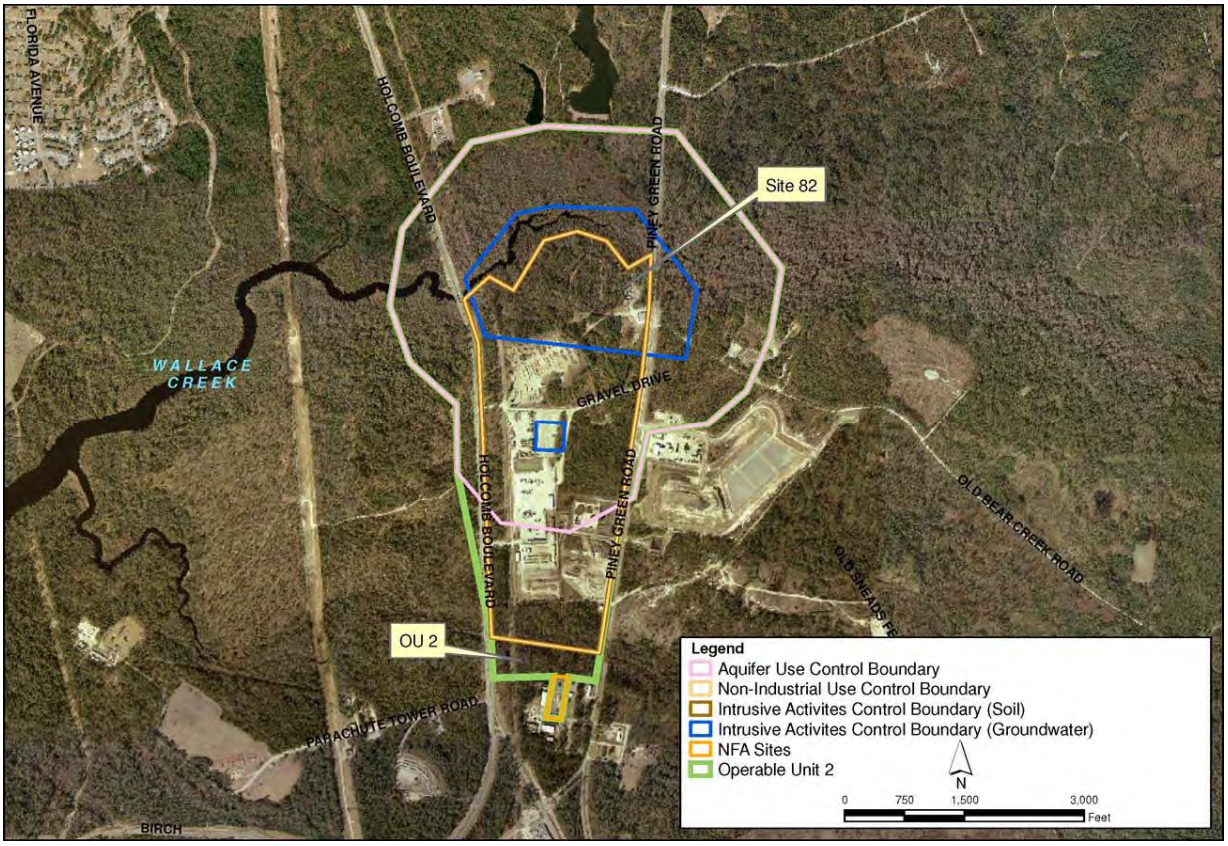
8.1.19.1 Future Activities

LUCs are in-place to prohibit soil intrusive activities and prohibit non-industrial use within the extent of the former soil removal action areas where pesticides remain in soil above levels that allow for UU/UE. Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**.

8.1.20 Site 82 (OU 2)—Piney Green Road VOC Area

Site 82, the Piney Green Road VOC Area, covers approximately 30 acres and is located within OU 2 (**Figure 8-26**). OU 2 covers approximately 210 acres and consists of three sites (Sites 6, 9, and 82) that have been grouped together because of their proximity to one another. Before the late 1980s, much of the site was reportedly used for storage, disposal, and handling of potentially hazardous waste and material. Site 82 was identified during the CS at Site 6 in 1986, when Site 82 was randomly littered with debris including spent ammunition casings, and empty or rusted drums. Some of the drums were marked as “lubrication oil” and “anti-freeze”.

FIGURE 8-26
IRP Site 82, Operable Unit 2



Previous investigations are listed in **Table 8-39** and the LUC Summary is presented in **Table 8-40.**

TABLE 8-39
Previous Investigations Summary, IRP Site 82

Previous Investigation/Action	Date	Activities
Site Investigation (Halliburton NUS,1991)	1991	An SI was conducted to determine the presence or absence of contamination. Field activities included soil, groundwater, surface water, and sediment sampling. VOCs were detected in surface water samples, which were considered attributable to activities conducted at Site 82.
RI/FS and PRAP and ROD (Baker,1993)	1992 - 1993	An RI was completed to characterize the nature and extent of contamination and potential impacts to human health and the environment. Field activities included a preliminary site survey, a geophysical survey, soil, groundwater, surface water and sediment sampling. Samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. Potential unacceptable human health risks were identified for current and

Previous Investigation/Action	Date	Activities
		future receptors due to exposure to soil and groundwater. Potential adverse ecological impacts were identified for Wallace Creek and Bearhead Creek. The FS was completed to address PCB and pesticide contaminated soil and VOC contaminated groundwater. The PRAP for OU 2 was submitted for public review and comment in August 1993. The preferred alternative was excavation and offsite disposal of pesticide and PCB contaminated soil to industrial cleanup levels, soil vapor extraction (SVE) to address vadose zone VOC contamination, groundwater extraction and treatment to address VOCs, LTM, and LUCs. The Final ROD for OU 2 was issued and signed in September 1993.
Remedy-in-Place	1994 - present	The soil excavation to remove pesticide- and PCB-contaminated soil was completed in 1994 and 1995. The SVE system operated for 6 months in 1996 to remediate residual VOC contamination in the vadose zone. The groundwater extraction and treatment system began full-scale operation in July 1996. Groundwater and surface water LTM began in 1997 and is ongoing. LUCs were implemented in 2001 and updated in 2002. The current CSM is shown on Figure 8-27.
Groundwater Pilot Study (CH2M HILL,2008)	2007 - 2008	In February 2007, a groundwater pilot study was initiated at Site 82 to evaluate the performance of ERD via EVO and lactate injection and to determine whether it is a viable alternative to supplement, enhance, or replace the current groundwater extraction and treatment system. After the treatment system was turned off to implement the study, higher concentrations were identified elsewhere. Although the location of the Pilot Study was not optimal, the study demonstrated that ERD is a viable remedial technology for contaminant mass removal.
Supplemental Source Investigation (Rhea, 2011)	2008 - 2011	The SSI was initiated to identify additional potential sources of chlorinated VOC contamination in groundwater at Site 82. During vegetation clearing activities, MD was discovered and an ESS was submitted to remove and dispose of the MD. An ESS Amendment was also submitted for OU 2 to complete the SSI. A geophysical survey, monitoring well installation, groundwater sampling, and test pitting was conducted. Soil samples collected from the test pits and groundwater samples were analyzed for VOCs. Cis-1,2-DCE, TCE, PCE, ethylbenzene, and PCA were detected at concentrations exceeding screening criteria.
Basewide Vapor Intrusion Evaluation (CH2M HILL, AGVIQ, 2009)	2007 – 2011	A Basewide Vapor Intrusion Study was conducted to determine if complete or significant exposure pathways exist for vapor intrusion into buildings. At OU 2, no buildings were identified within 100 feet of a monitoring well containing VOC concentrations above NCGWQS. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed.

TABLE 8-40
Land Use Control Summary, IRP Site 82

LUC Boundary	Estimated Area (Acres)	Final Submitted	Updates
Non-Industrial Use Control Boundary (Soil)	206.75	June 15, 2001	July, 2002
Intrusive Activities Control Boundary (Soil)	206.75		
Intrusive Activities Control Boundary (Groundwater)	99.4		
Aquifer Use Control Boundary (1,000 feet)	404.91		

8.1.20.1 Future Activities

Based on results of the Supplemental Source Investigation (Rhea, 2011), a supplemental investigation is planned for 2012 to determine the source of the PCA.

The groundwater extraction and treatment system, LTM, and LUCs will be maintained. Follow up actions, including evaluation of the groundwater extraction system, from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. Base Master Planning maintains current groundwater plume data in GIS, and all construction projects on-Base go through environmental review.

Because MD was discovered and remains on-site, the OU 2 area will also be investigated under the MMRP as UXO-22 (Section 3.2.4).

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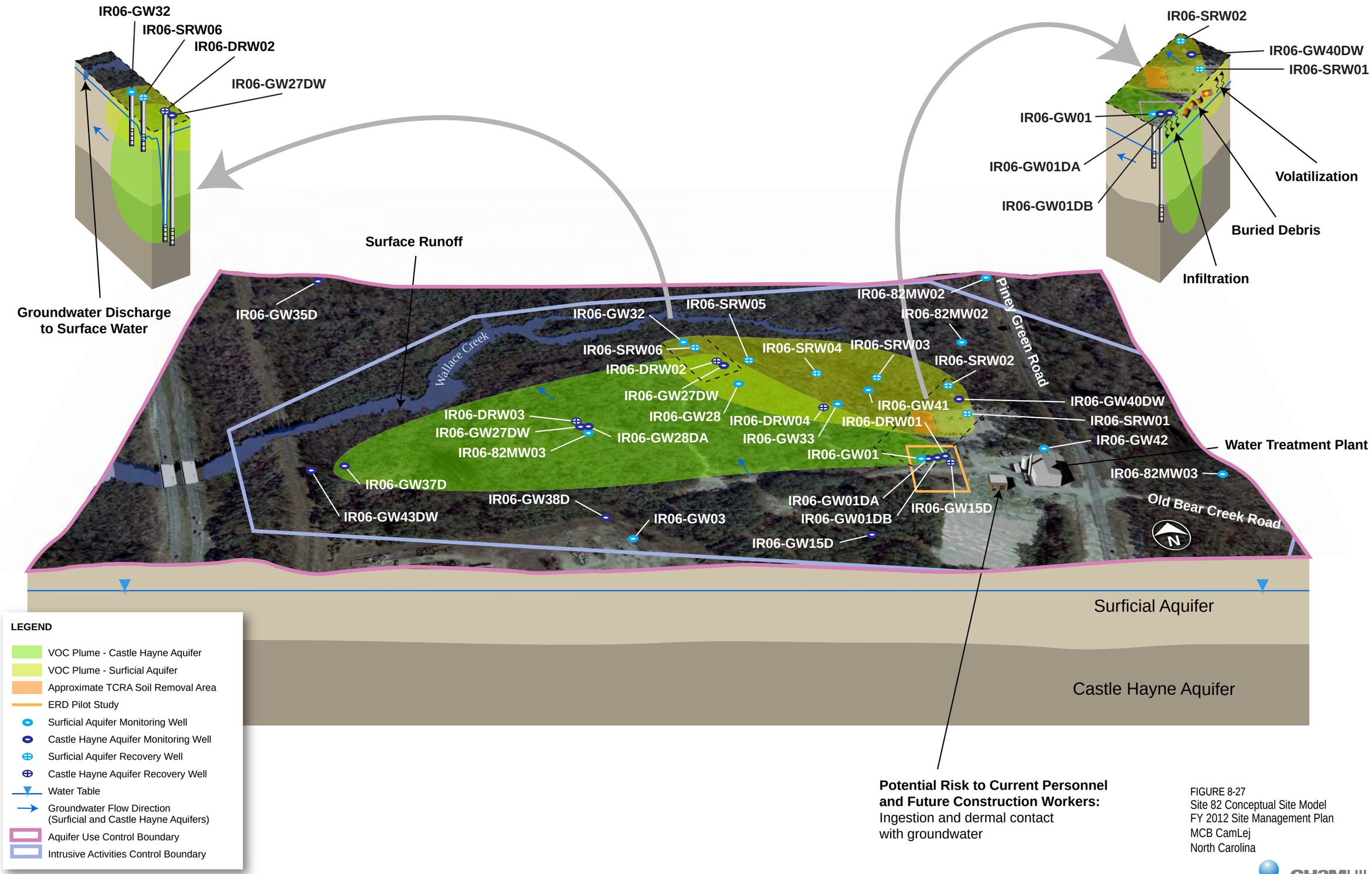


FIGURE 8-27
Site 82 Conceptual Site Model
FY 2012 Site Management Plan
MCB CamLej
North Carolina

CH2MHILL

ES050610083009WDC Camp_Lejeune_Site_82_CSM_v12.ai 4-1-11 cat/jls/roy

8.1.21 Site 84 (OU 19)—Building 45

Site 84, Building 45, covers approximately 5 acres just south of State Route 24, one mile west of the Main Gate (**Figure 8-28**). The property was purchased by the federal government in 1941 and Building 45 was a former electric substation, where transformers reportedly containing PCBs were used and possibly stored. The building was constructed by the Navy soon after purchasing the property, and leased to Tidewater Electric, who operated the building through 1965. In 1965, Building 45 was converted to a maintenance facility for large machinery. While no official operational history exists for the building and the surrounding property, former employees recalled that site activities included PCB transformer maintenance, recycling, and onsite disposal of spent transformer casings. A transformer was discovered near a wooded area and additional transformers (approximately 20), potentially containing PCB dielectric oil, were discovered near the woods of the powerhouse. Maintenance personnel at Building 45 have previously indicated that additional transformers may still be buried in areas near a former lagoon; however, an excavation is reported to have been performed by Public Works Center personnel and no waste materials were discovered. The site is currently not in use and access is restricted.

FIGURE 8-28
IRP Site 84, Operable Unit 19

Previous investigations are listed in **Table 8-41** and the LUC Summary is presented in **Table 8-42.**

TABLE 8-41
Previous Investigations Summary, IRP Site 84

Previous Investigation/Action	Date	Activities
UST Investigation	1992	During a UST Investigation conducted in 1992, low levels of PCBs were detected in a soil sample collected from the area where a transformer was discovered.

Previous Investigation/Action	Date	Activities
Pre-RI Screening Study (1995)	1995 - 1998	A Pre-RI Screening study was conducted to analyze the nature and extent of contamination. Field activities included soil, groundwater, surface water, and sediment sampling. Samples were analyzed for PCBs. PCBs were detected at levels above 500 parts per billion (ppb) in soil collected from around the lagoon, and in surface water and sediment (above 1,000 ppb) collected from within the lagoon. Based on the results of the Pre-RI, a Draft EE/CA was prepared to present removal action options for the NTCRA of PCB-contaminated sediments and soil at Site 84. The EE/CA was not finalized and the removal action was delayed to allow for more complete PCB delineation at the site.
UST Removal (1999)	1999	In July 1999, a 500-gallon UST used for storing heating oil was removed in the vicinity of Building 45. Confirmatory soil samples identified petroleum hydrocarbons in the soil. The UST removal report concluded that the detected petroleum hydrocarbons might not be from the UST, rather it was suggested that the contamination might have come from other unidentified source(s), based on the long industrial operation history at Building 45.
Building 45 Removal (1999)	1999	Concrete sampling and surface soil sampling was conducted at Building 45 in August 1999 in preparation for razing and offsite disposal of material from the aboveground portions of Building 45. Analytical results identified PCBs in the concrete. As a result, the aboveground portion of Building 45 was removed between August and September 1999, with the foundation left in place.
RI/FS (Baker, 2002)	2001 - 2002	An RI was conducted to assess the nature and extent of contamination and potential human health and environmental impacts of the site. Field activities included soil and groundwater investigation. Potential unacceptable human health risks were identified due to the presence of PCBs and PAHs in surface soil and pesticides and metals in groundwater. Potential unacceptable ecological risks were identified due to the presence of pesticides, PCBs, and metals in soils and VOCs, SVOCs, and PCBs in sediments. The Final RI recommended completion of a NTCRA to remove surface soils surrounding Building 45, in the lagoon area, and in the midfield area as well as remove the Building 45 foundation materials. The Final FS was completed in June 2002, which developed and screened remedial alternatives for addressing soil contamination.
PRAP and EE/CA (2002)	2002	A PRAP was issued in 2002 to solicit public input on the preferred alternative for soil and groundwater contamination and a public meeting was held. Excavation and landfill disposal was the preferred alternative for soil recommended in the PRAP. Owing to the national debate between USEPA and DoD regarding enforcement issues of the LUCs, the Navy decided not to implement the preferred alternative from the PRAP. Accordingly an Action Memo proposing removal actions was developed to address sediment and soil contamination.
Phase I NTCRA (2002)	2002	Based on the recommendations of previous documents, an NTCRA was completed to remove the remaining building foundation at Building 45 and some surrounding PCB-contaminated soil. 4,857 tons of non-hazardous PCB-contaminated soil and 142 tons of petroleum-contaminated soil were removed from the site.
Phase II NTCRA (2004)	2002 - 2004	Excavation and offsite disposal of contaminated soil and lagoon sediments was completed. Approximately 12,000 tons of contaminated soil/sediment was removed from the site. However remediation goals were not met as the Phase II NTCRA uncovered additional areas of contamination.
Supplemental Investigation (Rhea, 2006)	2005 - 2006	A Supplemental Investigation was conducted and the geophysical investigation uncovered two underground pipes originating from the area of former Building 45. One of the pipes corresponded to the location of a concrete-encased steel pipe partially excavated during the Phase II NTCRA. PCB concentrations in soil samples collected from both pipes were less than 10 mg/kg and the pipes were left in-place. A confirmation groundwater sample collected during the investigation indicated no exceedances of the NCGWQS.

Previous Investigation/Action	Date	Activities
Phase III NTCRA and CCR (Rhea, 2007)	2006 - 2007	The Phase III NTCRA was conducted to remove additional PCB-contaminated soil to the south and west of the previous NTCRA locations. Complete excavation was deemed impractical in areas with buried, active utility and communication lines. In these areas, a 2-ft thick vegetative soil cover was placed over the PCB-contaminated soil.
Amended FS, PRAP, and ROD (Rhea, 2008 and 2009)	2008 - 2009	The Amended FS was prepared to evaluate remedial alternatives to address PCB soil contamination and the PRAP was completed followed by a public meeting and public comment period to solicit community input on the preferred alternative: removal of PCB-contaminated soil and LUCs. The ROD was signed in 2009 and removal of PCB-contaminated soil and LUCs were identified as the Selected Remedy.
Remedy-in-Place and RACR (Rhea, 2010)	2002 – 2010	Three NTCRAs were conducted from 2002 through 2006 to remove PCB-contaminated soil and a soil cover has been put in-place across the site. In 2009, LUCs were implemented in the extent of PCB soil contamination greater than 10 mg/kg to restrict intrusive activities and a fence and signs were installed to restrict access. LUCs were also implemented to prohibit non-industrial use in the extent of PCB soil contamination greater than 1 mg/kg.

TABLE 8-42
Land Use Control Summary, IRP Site 84

LUC Boundary	Estimated Area (Acres)	Final Submitted
Non-Industrial Use Control Boundary (Soil)	4.6	March 19, 2010
Access Control Boundary	0.14	
Intrusive Activities Control Boundary (Soil)	0.55	

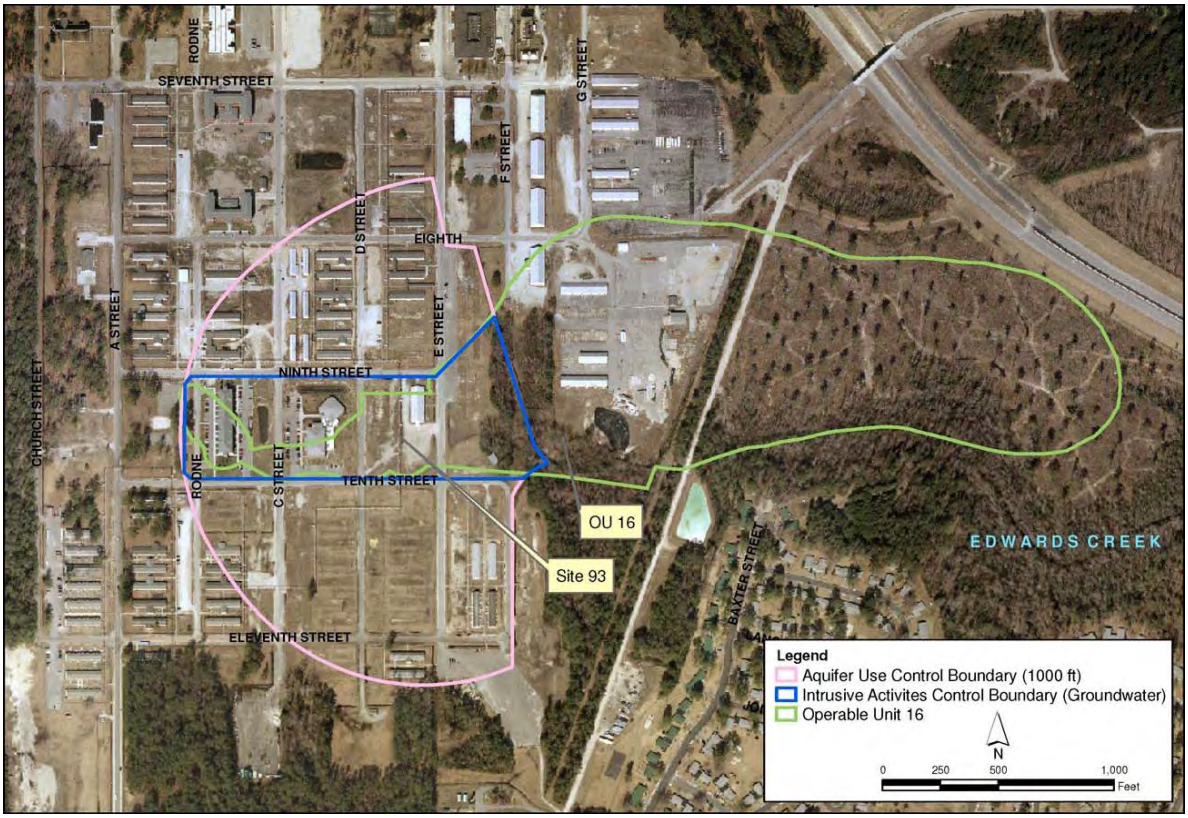
8.1.21.1 Future Activities

LUCs are in-place to prohibit soil intrusive activities and prohibit non-industrial use within the extent of the former soil removal action areas where PCBs remain in soil above levels that allow for UU/UE. A fence and signs were also installed to restrict access. Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**.

8.1.22 Site 93 (OU 16)—Building TC-942

Site 93, Building TC-942, covers approximately 16 acres and is located at the intersection of Ninth and "E" Streets in the Camp Geiger section of MCAS New River (**Figure 8-29**). OU 16 consists of two sites (Sites 89 and 93) that have been grouped together because of their proximity to one another and unique characteristic of suspected waste (solvents). The buildings in this portion of Camp Geiger were constructed during the Korean War and currently function as classrooms, barracks, and supply rooms for the Marine Infantry School. Historical records indicate that a 550-gallon UST storing waste oil was previously located on Site 93, off the southwest corner of Building TC-942. The UST was permanently closed in December 1993.

FIGURE 8-29
IRP Site 93, Operable Unit 16



Previous investigations are listed in **Table 8-43** and the LUC Summary is presented in **Table 8-44.**

TABLE 8-43
Previous Investigations Summary, IRP Site 93

Previous Investigation/Action	Date	Activities
Geotechnical Investigation (R.E. Wright, 1996)	1995 - 1996	To determine the presence or absence of contamination at the site, a geotechnical investigation and environmental screening were conducted near the barracks area. Field activities included soil and groundwater sampling. Soil samples were analyzed for oil and grease and halogenated solvents. Groundwater samples were analyzed for VOCs, SVOCs and metals. Oil and grease, naphthalene, and tetrachloroethene were detected in soil samples. Chlorinated VOCs, SVOCs, and metals were detected in groundwater samples.
Remedial Investigation (Baker, 1997)	1996 - 1997	An RI was conducted to characterize the nature and extent of soil and groundwater contamination at OU 16. Field activities included the collection of soil and groundwater samples analyzed for VOCs. Groundwater analytical results identified chlorinated VOC contamination (primarily TCE) concentrated in the surficial aquifer within the

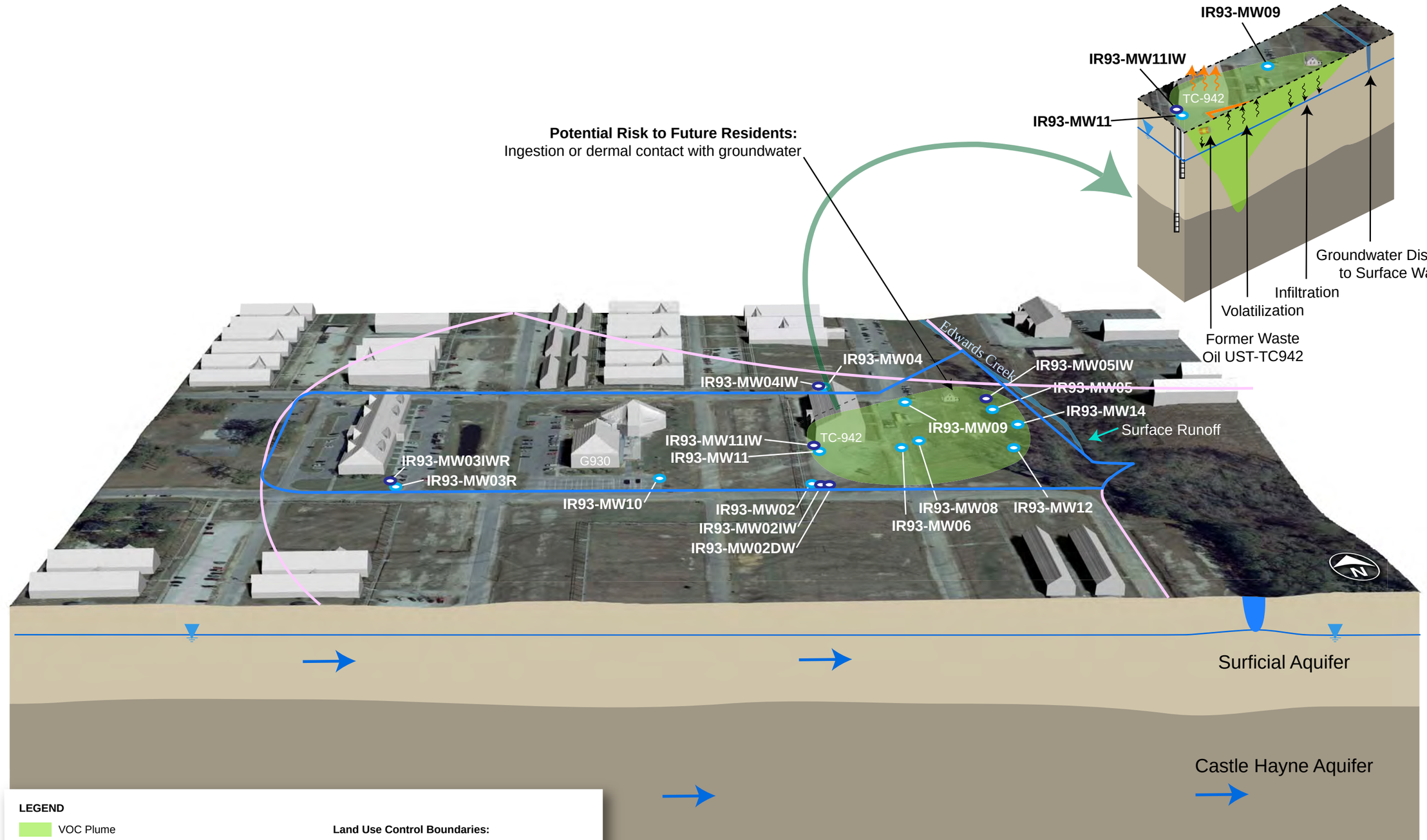
Previous Investigation/Action	Date	Activities
		immediate area of the former UST. Potential unacceptable human health risks were identified due to exposure to PCE and cis-1,2-DCE in groundwater. No potential unacceptable ecological risks were identified.
NAE	2001	In 2001, a preliminary NAE was conducted to determine whether natural site conditions would encourage the natural attenuation process of degrading chlorinated VOCs. The results indicated limited natural attenuation was occurring and the reductive dechlorination process appeared to be stalling, indicating that the reduced state of the aquifer is not enough to encourage optimal dechlorination.
Additional Plume Characterization (Baker, 2002)	2002	Additional plume characterization activities were conducted in 2002 to further delineate groundwater contamination, and provide additional data to support the selection of an active remedial system. Field activities included groundwater sampling. The primary plume appeared related to the former UST area, with smaller "hot spot" areas downgradient. The results indicated horizontal migration of groundwater contamination had been minimal since 1995; however, vertical migration was observed.
Supplemental Site Investigation (2005)	2004 - 2005	A supplemental site investigation was conducted to determine the current conditions of groundwater contamination in the surficial aquifer, and collect additional data to support the selection of a remedial alternative. Groundwater samples were collected from boring locations at three depths, and analyzed for VOCs and NAIPs. Once the groundwater screening results were analyzed, additional permanent monitoring wells were installed in order to complete the horizontal and vertical delineation of the shallow groundwater contamination.
Feasibility Study (CH2M HILL, 2005)	2005	In November 2005, the Final FS was completed for Site 93, which developed and screened remedial alternatives for addressing groundwater contamination (PCE, TCE, 1,2-DCE, PCA, and vinyl chloride).
PRAP and ROD (CH2M HILL, 2006)	2006	A PRAP was issued to solicit public input on the preferred alternative (ISCO via permanganate injections, MNA, and LUCs) and a public meeting was held. The final Site 93 ROD was issued and signed in October 2006.
Remedy-in-Place and IRACR (Shaw, 2009)	2006 - present	Phased ISCO injections were conducted from 2006 through 2008. After reviewing the baseline and follow-up data, it was determined that the ISCO treatment was not cost effective and would be suspended and MNA initiated. Groundwater LTM for VOCs and NAIPs was initiated in 2008, upon completion of the ISCO injections. LUCs to prohibit aquifer use and restrict intrusive activities within the extent of groundwater VOC contamination were established in 2009. An IRACR was prepared in 2009 to document the remedy was implemented and is operational. The current CSM is shown on Figure 8-30.
Basewide Vapor Intrusion Evaluation (CH2M HILL, AGVIQ, 2009)	2007 – 2011	Site 93 was included in the phased basewide vapor intrusion investigation to determine if complete or significant exposure pathways exist for vapor intrusion into buildings. No current vapor intrusion impacts were identified for any of the buildings located in the vicinity of Site 93. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed.

TABLE 8-44
Land Use Control Summary, IRP Site 93

LUC Boundary	Estimated Area (Acres)	Final Submitted
Intrusive Activities Control Boundary (Groundwater)	16.1	July 24, 2009
Aquifer Use Control Boundary (1,000 feet)	40.8	

8.1.22.1 Future Activities

LTM is ongoing to monitor MNA of VOCs in groundwater and potential migration. LUCs are in-place to prohibit groundwater intrusive activities and aquifer use until cleanup levels are achieved. Follow up actions from the 2010 Five-Year Review are being implemented and the milestones and current status are presented in **Table 2-1**. If buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway will be evaluated and mitigated if needed. Base Master Planning maintains current groundwater plume data in GIS, and all construction projects on-Base go through environmental review.



LEGEND

- VOC Plume
- Surficial Aquifer Monitoring Well
- Upper Castle Hayne Aquifer Monitoring Well
- Water Table
- Groundwater Flow Direction
- Potential Vapor Intrusion Pathway

Land Use Control Boundaries:

- Aquifer Use Control Boundary
- Intrusive Activities Control Brpundary (Groundwater)

FIGURE 8-30
Site 93 Conceptual Site Model
FY 2012 Site Management Plan
MCB CamLej
North Carolina

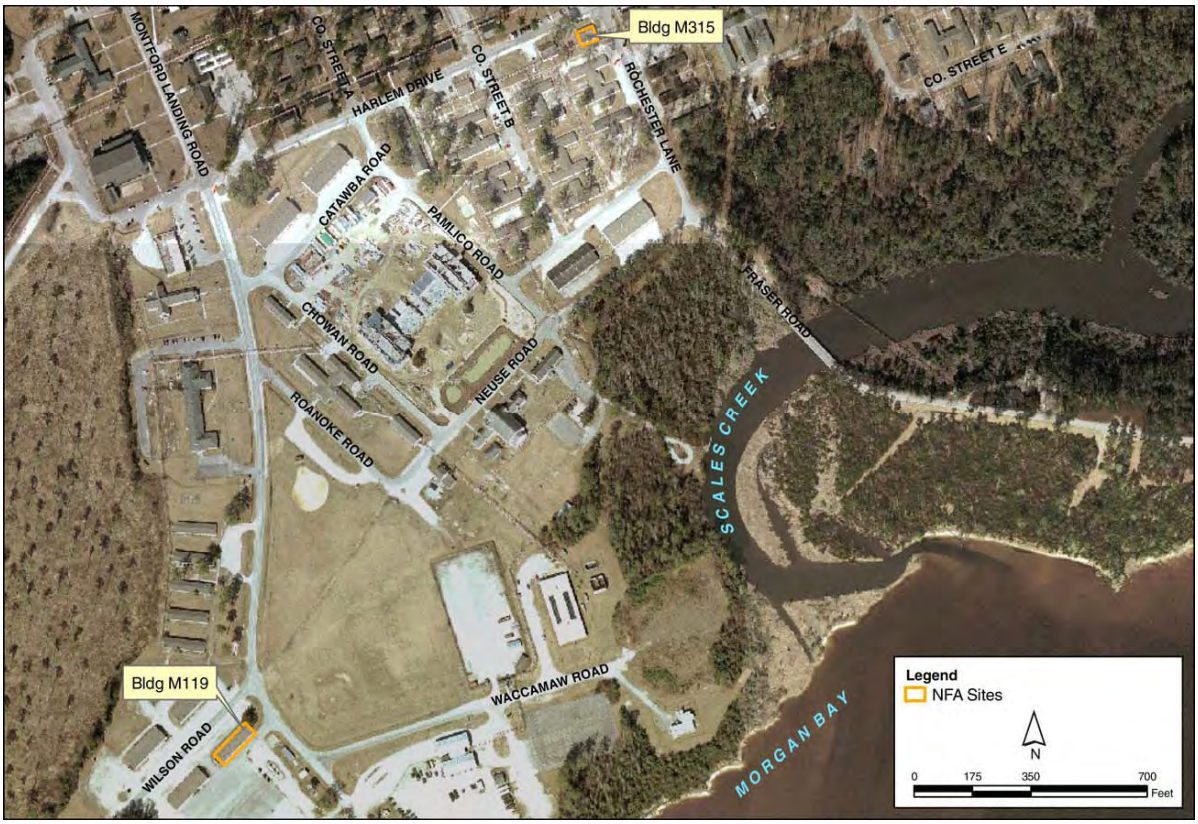
CH2MHILL

8.2 IRP RC Sites

8.2.1 Montford Point Buildings M119 and M315

The Montford Point PA site includes Buildings M119 and M315, located in the Montford Point portion of the Base (**Figure 8-31**). Building M119 was constructed in 1943 as a Gun Shed; most likely storing Howitzers. Over the years the building has been renovated, and has been used as a classroom and vehicle repair shop. There are several fuel oil tanks that are used for heating this building. Known chemicals/compounds that were used or stored in Building M119 include solvents, waste oils, gasoline, and vehicle repair related materials. Potential vehicle repair related materials used or stored at this building may include paint and paint thinners, parts cleaning wastes (solvents and parts washers), automotive batteries, automotive oils, and shop cleaning wastes (floor cleaning wastes, absorbents used for spills or leaks and shop rags). Building M315 was thought to be a former dry cleaning facility. However, no records were located that indicated past dry cleaner operations. Rather, the building was used as a laundry pick-up facility until the 1980s.

FIGURE 8-31
Montford Point (Buildings M119 and M315)



Previous investigations are listed in **Table 8-45.**

TABLE 8-45
Previous Investigations Summary, Montford Point (Buildings M119 and M315)

Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Investigation (Baker, CH2M HILL, 2006)	2002 - 2006	A PA/SI was conducted between 2002 and 2004 to identify sites that may have used, stored, or handled potentially hazardous materials and evaluate potential risks to human health and the environment. Buildings M119 and M315 at Montford Point were identified and soil and groundwater samples were collected for VOCs, SVOCs, pesticides/PCBs, and metals. The PA/SI recommended further investigation of metals in groundwater at both buildings.

Previous Investigation/Action	Date	Activities
Expanded Site Inspection (CH2M HILL, 2010)	2010	The Expanded SI was conducted to confirm the results of the PA/SI and document the basis for recommendation of no further action where appropriate. Upon further review by the Partnering Team in 2009, it was determined that the isolated detections of iron and lead in groundwater at did not warrant additional investigation.

8.2.2 MCAS New River Buildings SAS113, AS116, and AS119

The MCAS New River site includes Buildings SAS113, AS116, and AS119, located in the northwest portion of the Base (**Figure 8-32**).

FIGURE 8-32
MCAS New River Buildings SAS113, AS116, and AS119

Building SAS113 is located 100 feet west of Bancroft Road and consists of a covered four-bay open metal structure, constructed on a 6-inch thick slab. Building SAS113 was constructed in 1986 as a vehicle support area when surrounding buildings were converted into automotive hobby shops. A new automotive hobby shop opened at MCAS New River in 2009 and Building SAS113 is no longer actively used. The waste disposal practices are also unknown.

MCAS New River Building AS116 is a one-story metal frame building attached to a brick building on Bancroft Street. Fencing surrounds the building, with access from Bancroft Street only. Building AS116 was constructed to replace a temporary wooden building in 1954 and to provide the MCAS New River with vehicle maintenance facilities. From 1979 to 1981, Building AS116 served as a hazardous materials and flammables storage area. In the early 1980s, a new complex was constructed for the Combat Vehicle Maintenance Shop, and Building AS116 was converted into an automotive hobby shop along with Buildings SAS113 and AS114. A new automotive hobby shop was opened at the MCAS New River in 2009, and Building AS116 has since been used as a storage facility for MCCS.

Building AS119 is a single-story metal frame building located approximately 200 ft east of White Street. Building AS119 was constructed in 1963 as an automotive vehicle maintenance facility with parts storage, service bays, and exterior service or wash rack. Records indicate that during remodeling work performed in 1988, a number of structures, including a boiler and plumbing fixtures, were removed from the building. An existing oil heater and associated piping and valves were replaced and a new fuel oil AST was installed. Currently, the building is used as a storage and vehicle maintenance facility.

Previous investigations are listed in **Table 8-46.**

TABLE 8-46
Previous Investigations Summary, MCAS New River Buildings SAS113, AS116, and AS119

Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Investigation (2006)	2001 - 2006	A PA/SI was conducted between 2002 and 2004 to identify sites that may have used, stored, or handled potentially hazardous materials and evaluate potential risks to human health and the environment. Based on the analytical results, further investigation of groundwater at Buildings SAS113, AS116, and AS119 due to the presence of metals was recommended. Although the PA/SI also recommended further investigation of soils at Building AS119 due to the presence of SVOCs, pesticides, and metals, concentrations were below background and/or regulatory screening criteria and the IRP Partnering Team concluded no further investigation of soil was necessary.
Expanded Site Investigation (CH2M HILL, 2010)	2009 - 2010	The Expanded SI was conducted to confirm the presence or absence of elevated metals concentrations detected during the PA/SI. Although metals were detected at concentrations exceeding screening levels at two of the three buildings, no unacceptable risks to human health or the environment were identified. The Expanded SI concluded that NFA was necessary. In 2009, the IRP Partnering Team concurred with this conclusion.

8.2.3 Hadnot Point Industrial Area Buildings 1120, 1409, and 1512

The HPIA site includes Buildings 1120, 1409, and 1512, located in the HPIA. Building HP1120 is located between Hammond Road, Birch Street, and Ash Street (**Figure 8-33**). It was constructed as an automobile hobby shop in 1955 with additions to the building constructed in 1964 and 1969. Building HP1120 has historically been used for auto body repair and painting.

Building HP1409 is located on Gibb Road. The building was constructed in 1943 and was used as the Upholstery and Carpenter shop in the late 1940s. Since that time, Building HP1409 has been used as a classroom, Public Works storage, and a furniture repair shop.

Building HP1512 was historically located between Buildings HP1504 and HP1503 on Hammond Road. The operational history of the building is unknown; however, it is assumed that it was used as an automotive repair support structure for the series of vehicle maintenance buildings in the surrounding area. Building HP1512 is no longer present. The date of demolition is unknown.

FIGURE 8-33
Hadnot Point Industrial Area (Buildings 1120, 1409, and 1512)

Previous investigations are listed in **Table 8-47.**

TABLE 8-47
Previous Investigations Summary, Hadnot Point Industrial Area (Buildings 1120, 1409, and 1512)

Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Investigation (2006)	2001 - 2006	A PA/SI was conducted between 2002 and 2004 to identify sites that may have used, stored, or handled potentially hazardous materials and evaluate potential risks to human health and the environment. Field activities included soil and groundwater investigations. The analytical results indicated that there was no impact to the area from past site operations and no further investigation was recommended at the buildings. In 2002, the IRP Partnering Team concurred with this conclusion.

8.2.4 Site 4—Sawmill Road Construction Debris Dump

Site 4, the Sawmill Road Construction Debris Dump, encompasses approximately 0.3 acres located on the Mainside of the Base (**Figure 8-34**). The dates of operation are unknown, but Site 4 was reportedly used for surface disposal of construction debris including asphalt, old bricks, and concrete.

FIGURE 8-34
IRP Site 4

TABLE 8-48
Previous Investigations Summary, IRP Site 4

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at Site 4, and no further assessment was recommended.
Confirmatory Site Assessment (CH2M HILL, 2011)	2009 - 2011	To verify the presence or absence of contamination, a Confirmatory Site Assessment is underway due to its history as a dump. Soil and groundwater sampling for VOCs, SVOCs, and metals was completed. Based on the results, no human health or ecological risks were identified and NFA was recommended.

8.2.5 Site 7 (OU 11)—Tarawa Terrace Dump

Site 7, the Tarawa Terrace Dump, encompasses approximately 5 acres within OU11. OU 11 consists of two sites (Sites 7 and 80) that have been grouped together into one OU because of their similar disposal history and proximity to one another (**Figure 8-35**). Site 7 is a former dump that was used during the construction of the Base housing located in Tarawa Terrace. Precise years of operation are unknown, but it has been reported that the dump was closed in 1972. Historical records do not indicate that hazardous materials were disposed at this facility; only construction debris, water treatment plant filter media, and household trash.

FIGURE 8-35
IRP Site 7, Operable Unit 11

Previous investigations are listed in **Table 8-49.**

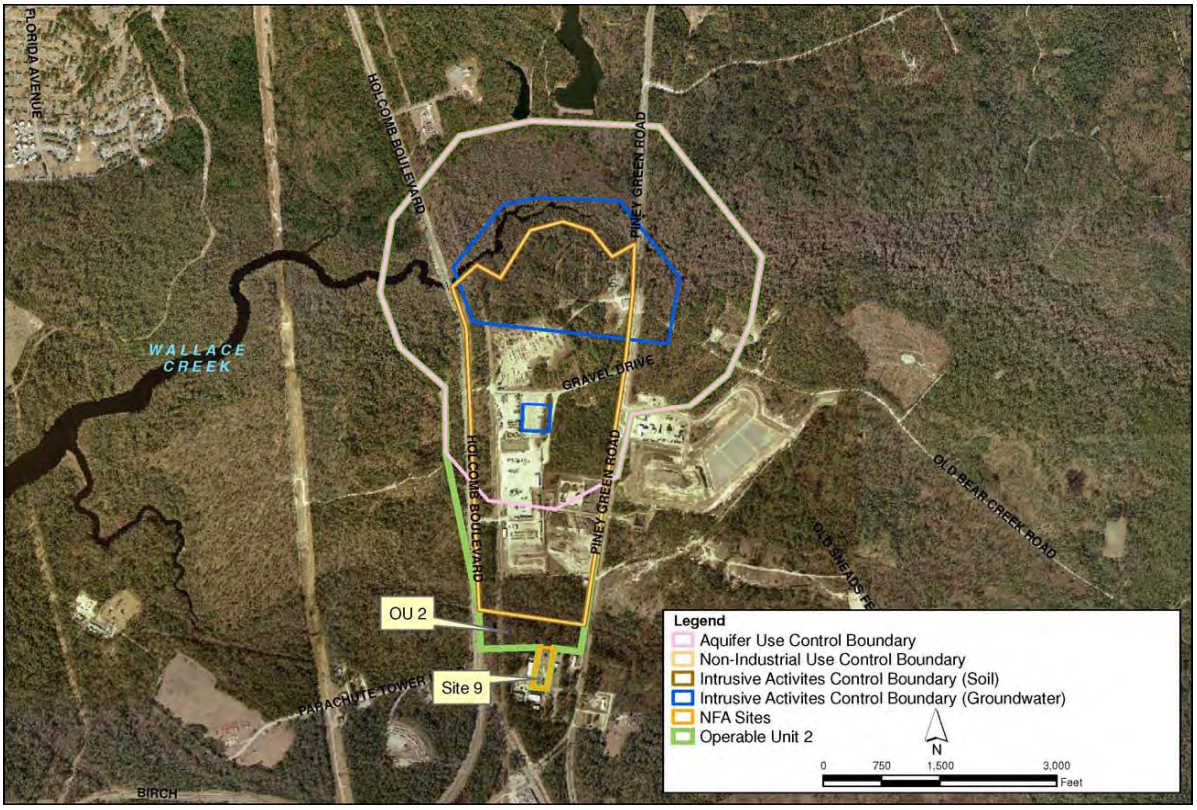
TABLE 8-49
Previous Investigations Summary, IRP Site 7

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The quantity of any waste reportedly disposed of at the site was insignificant and did not warrant further investigation.
Site Investigation (Halliburton NUS, 1991)	1991	To determine the presence or absence of site related contamination, an SI was conducted. Field activities included soil and groundwater investigations. Samples were analyzed for SVOCs, VOCs, pesticides/PCBs, and metals. The analytical results identified SVOCs and pesticides in soil and groundwater. Based on these results, an RI was proposed.
Remedial Investigation (Baker,1996)	1994 - 1996	An RI was completed to characterize the nature and extent of contamination and potential impacts to human health and the environment. Field activities included a site survey, soil, groundwater, surface water, and sediment sampling, a habitat evaluation, and an earthworm bioaccumulation study. Samples were analyzed for VOAs, SVOAs, pesticides/PCBs, and metals. No site-related contamination and no unacceptable risks were identified to human health and the environment.
PRAP (1996) and ROD (Baker, 1997)	1996 - 1997	Based on the findings of the RI, a PRAP was issued in 1996 to solicit public input on the preferred alternative (no remedial action) and a public meeting was held. The Final ROD was issued and signed in August 1997, and the site was closed with NFA.

8.2.6 Site 9 (OU 2)—Fire Fighting Training Pit at Piney Green Road

From the early 1960s to 1981, training exercises were conducted in an 800 square foot (ft2) unlined fire training pit, located in the southern area of the site (**Figure 8-36**). In 1981 the pit was lined with asphalt and an OWS was installed next to the pit; and in 2002 the pit was lined with concrete. Flammable liquids including solvents, used oil, and contaminated fuels were used as accelerants during the training exercises. In addition, approximately 30,000 to 40,000 gallons of JP-4 and JP-5 fuels were burned in the training pit. Four 500-gallon ASTs were located near the training area but are no longer present. The site is still currently used as a fire training facility with a concrete-lined pit.

FIGURE 8-36
IRP Site 9, Operable Unit 2



Previous investigations are listed in **Table 8-50.**

TABLE 8-50
Previous Investigations Summary, IRP Site 9

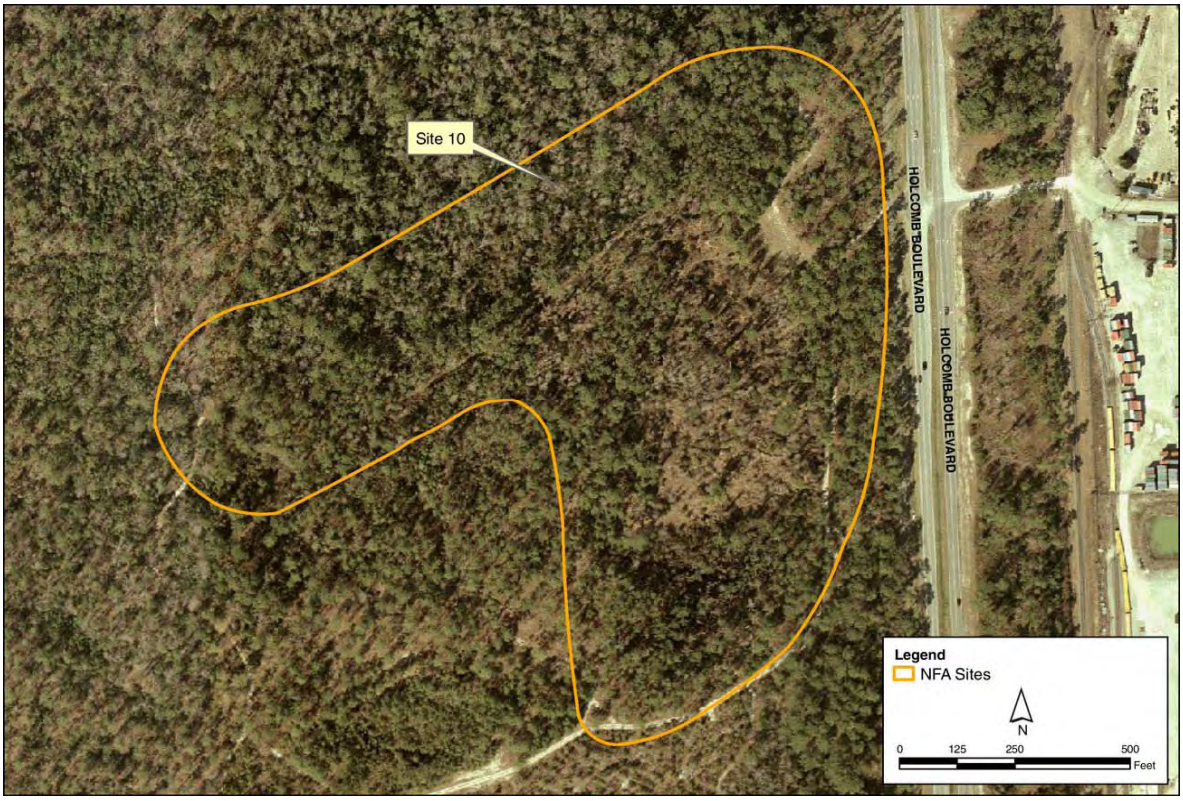
Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. An estimated 30,000 gallons per year of used oil, solvents, and contaminated fuels were burned during training exercises. Based on its findings, the IAS recommended that a Confirmation Study be conducted to verify the presence of contamination and determine whether migration was occurring.
Confirmation Study (1987)	1984 - 1987	A Confirmation Study was conducted to confirm the presence of contamination discovered during the IAS. Field activities included soil, groundwater, sediment, and surface water sampling. Chromium, lead, phenols, and ethylene dibromide were detected in groundwater samples.
Remedial Investigation	1992 - 1993	An RI was conducted to further investigate areas of concern at OU2. Field activities

Previous Investigation/Action	Date	Activities
(Baker,1993)		consisted of a preliminary site survey and soil and groundwater sampling for VOCs, SVOCs, pesticide/PCBs, and metals. Analytical results did not reveal extensive contamination. Soil and groundwater samples collected during the RI did not reveal extensive contamination at Site 9 and no potential sources of contamination were identified.
PRAP and ROD (Baker, 1993)	1993	A PRAP was issued in August 1993 to solicit public input on the preferred alternative (no remedial action) and a public meeting was held. The Final ROD for OU 2 was issued and signed in September 1993 and the site was closed with NFA.
Removal Action (2000)	2000	A new POL Fire Training Pit was completed in 2000. The new training facility employed a petroleum source for burning operations and the pit was lined with high-temperature concrete. During the installation of the new facility, POL-contaminated soil was excavated and removed from the site.

8.2.7 Site 10 (Pre-RI)—Original Base Dump

Site 10, the Original Base Dump, is located on the Mainside of the Base (**Figure 8-37**). Site 10 was approximately 5 to 10 acres in size during full operation of the landfill and was reportedly used for construction debris and as a burn dump during construction of the Base, prior to 1950.

FIGURE 8-37
IRP Site 10



Previous investigations are listed in **Table 8-51.**

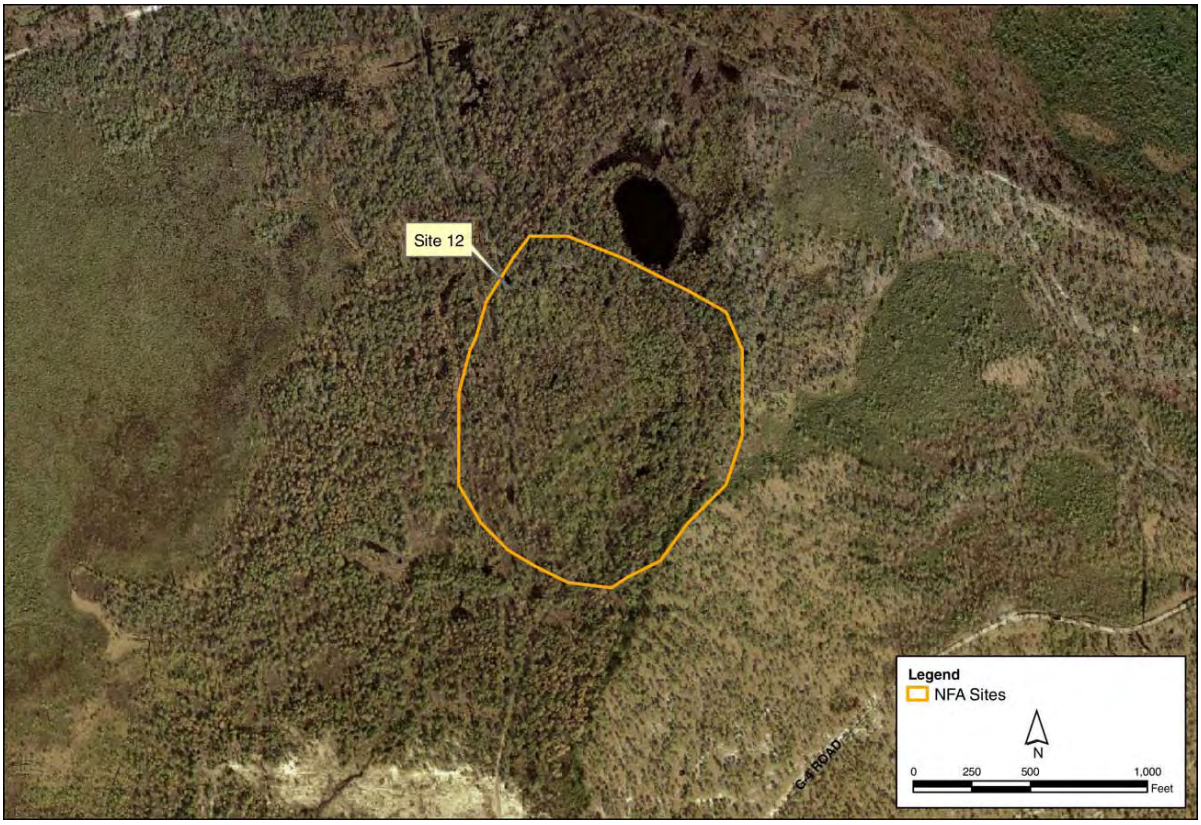
TABLE 8-51
Previous Investigations Summary, IRP Site 10

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. During investigation it was determined that the site did not require further investigation. However, the site was added to the IRP in 1994 when it was reported that two marines developed skin rashes after contacting a heavy oily material that may have been at the site.
Site Investigation (Baker, 2001)	1998 - 2001	An SI was conducted to verify the presence or absence of contamination. Field activities included a site survey and soil, groundwater, surface water, and sediment sampling. No unacceptable risks to human health were identified. The ERA identified minimal potential risks from metals in surface water. Based on the findings, the Final SI recommended NFA.
No Action Decision Document (CH2M HILL, Baker, 2005)	2005	A Final NFA Decision Document (DD) was completed May 12, 2005.

8.2.8 Site 12 (Pre-RI)—EOD Detonation Area

Site 12, the EOD Detonation Area, covers approximately 8 to 10 acres, located on the Mainside of the Base (**Figure 8-38**). Since the early 1960s, Site 12 has operated as an EOD detonation area. Ordnance is disposed by burning or detonating when it is found to be inert, unserviceable, or defective. Materials disposed at Site 12 include ordnance, colored smokes, and white phosphorous. Any undestroyed residues are typically less than 1 pound. Because Site 12 is an active range, it now falls under the Navy's Active Range Program.

FIGURE 8-38
IRP Site 12



Previous investigations are listed in **Table 8-52**.

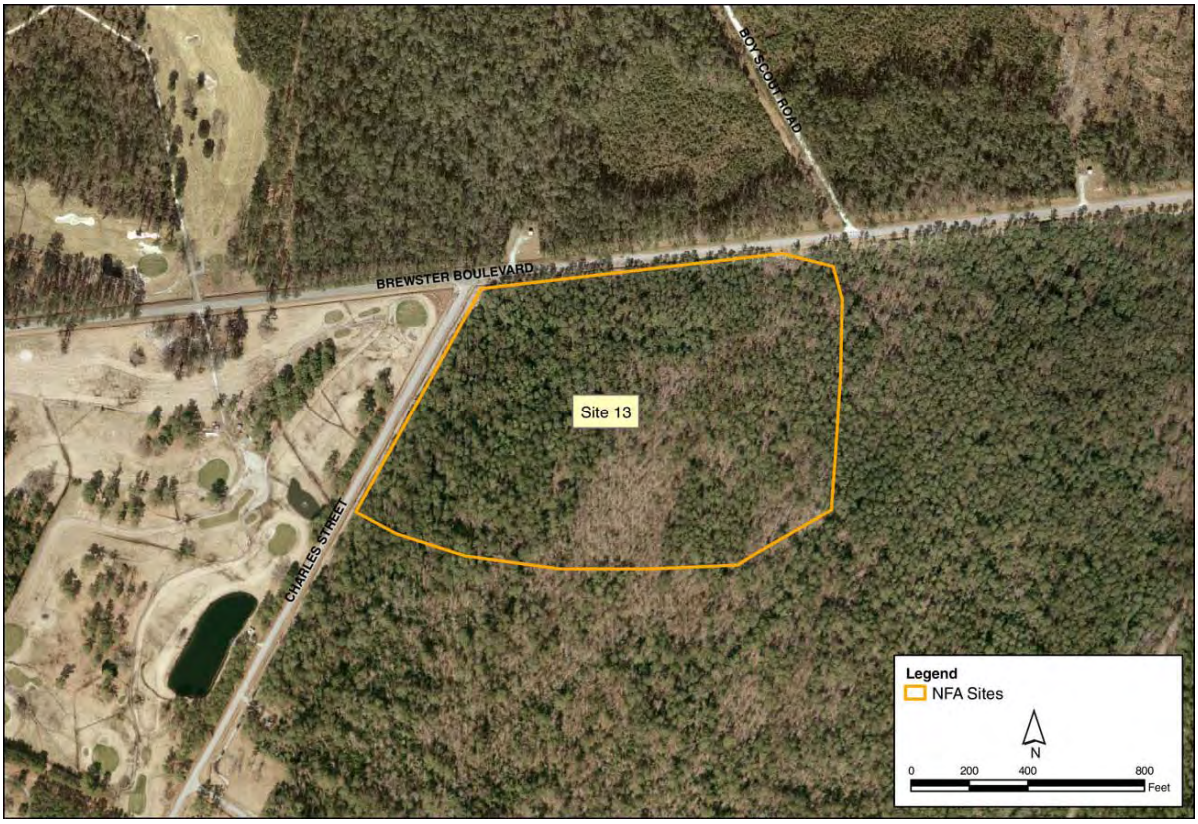
TABLE 8-52
Previous Investigations Summary, IRP Site 12

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The quantity of any waste reportedly disposed of at the site was insignificant and did not warrant further investigation. However, during a disposal exercise in 1992, an explosive crater (approximately 8 feet deep) uncovered an oily sheen and a suspected petroleum odor was noted.
Pre-Remedial Investigation Screening Study (1998)	1995 - 1998	An RI was initiated to assess the nature and extent of contamination. During the Pre-RI field investigation, EOD personnel stated that disposal of small arms ammunition was carried out by piling up the rounds, sometimes inside a crater from a past disposal, dousing the pile with diesel fuel, and exploding the pile with a small explosive. EOD personnel also stated that the range had been used for a brief time as a target range for aircraft to drop "dummy" bombs onto. Soil and groundwater samples were collected and analytical results indicated that soil and groundwater had not been impacted by site activities. As a result, the Pre-RI recommended site closeout.
No Action Decision Document (2001)	2001	The Final NFA DD was completed May 8, 2001.

8.2.9 Site 13—Golf Course Construction Dump Site

Site 13, the Golf Course Construction Dump Site, encompasses approximately 10 acres in the Paradise Point area of the Base (**Figure 8-39**). In 1944, Site 13 was reportedly used for surface disposal of construction debris including clippings, branches, and asphalt associated with golf course construction.

FIGURE 8-39
IRP Site 13



Previous investigations are listed in **Table 8-53.**

TABLE 8-53
Previous Investigations Summary, IRP Site 13

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at the site, and the IAS concluded that NFA was necessary.
Limited Site Assessment (Osage, 2008)	2008	An LSA was conducted to substantiate the NFA status. Representative soil and groundwater samples were collected from across the site and analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. The soil and groundwater analytical results indicated no compounds were detected above regulatory screening levels and the site was closed with NFA.

8.2.10 Site 18—Watkins Village (E) Site

Site 18, Watkins Village (E) Site, includes approximately 1 acre in the Paradise Point area of the Base (**Figure 8-40**). From 1976 to 1978, construction materials and debris were reportedly buried at Site 18.

FIGURE 8-40
IRP Site 18

Previous investigations are listed in **Table 8-54**.

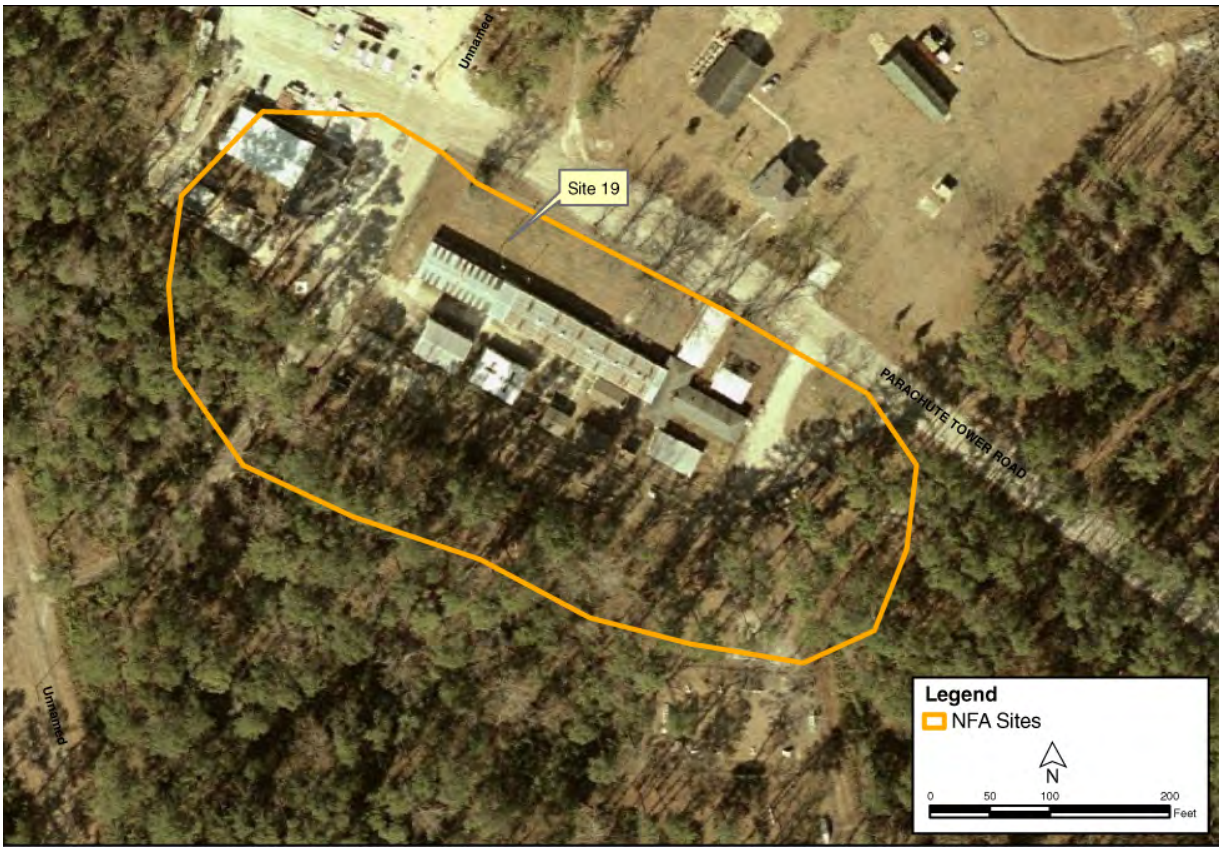
TABLE 8-54
Previous Investigations Summary, IRP Site 18

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at Site 18, and no further assessment was recommended.
Confirmatory Site Assessment (Osage, 2011)	2009-2011	To verify the presence or absence of contamination, a Confirmatory Site Assessment is underway due to its history as a dump. Soil and groundwater sampling for VOCs, SVOCs, herbicides, pesticides/PCBs, and metals was completed. Based on the preliminary results, no human health or ecological risks were identified and the site was closed with NFA.

8.2.11 Site 19—Naval Research Laboratory Dump

Site 19, the Naval Research Laboratory Dump, is approximately 4 acres located on the Mainside of the Base. From 1947 to 1976, the Naval Research Laboratory was located in the area of the Pest Control Shop (Building PT-37) (**Figure 8-41**). Activities at the laboratory included using radionuclides (Iodine 131) for metabolic studies on small animals. From 1956 to 1960, approximately 100 dogs were disposed of in a small area near Building PT-37. Because Iodine 131 has a half-life of only 8 days, potential for residual radiological contamination was considered to be negligible. In November 1980, Strontium-90 beta buttons were found while grading a parking lot near Building PT-37. The area was surveyed, and contaminated items were recovered. Soil samples were obtained and the site was cleaned of radioactive substances. Five 55-gallon drums of soil and animal residues were collected along with 499 beta buttons and appropriately disposed offsite.

FIGURE 8-41
IRP Site 19



Previous investigations are listed in **Table 8-55**.

TABLE 8-55
Previous Investigations Summary, IRP Site 19

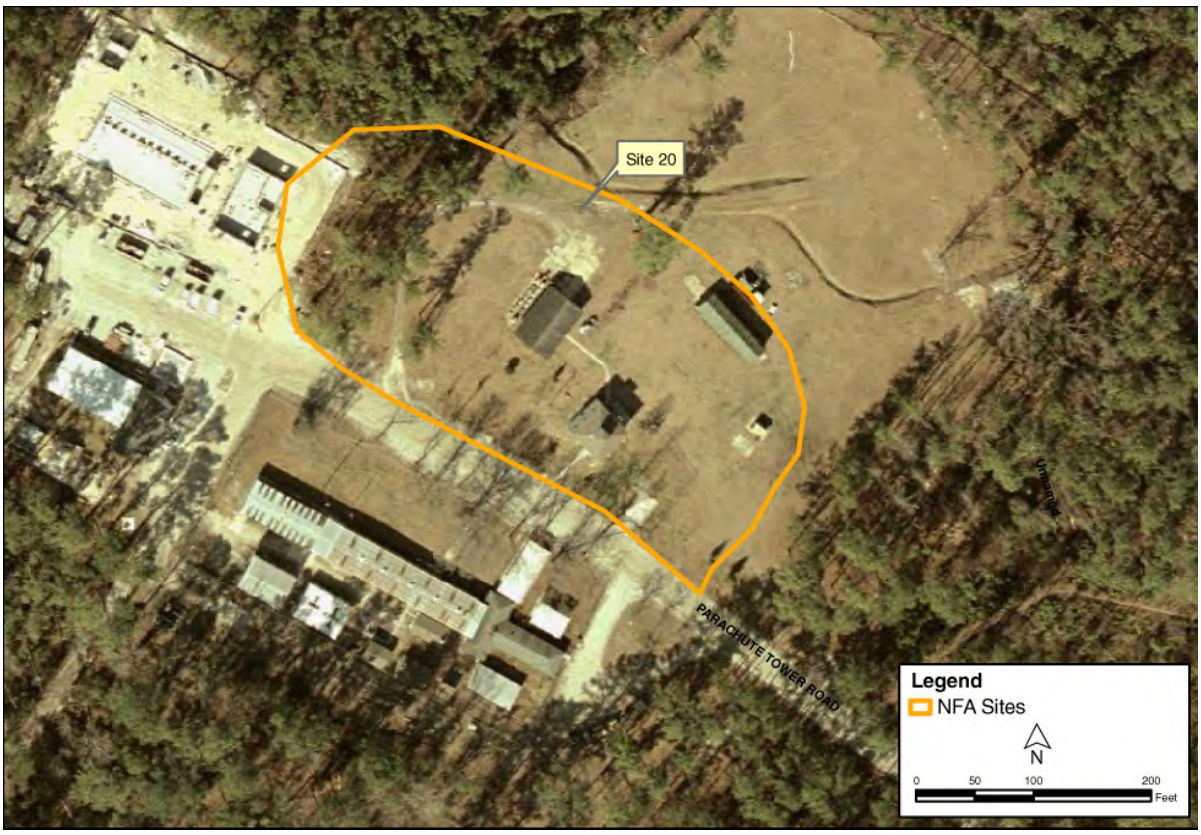
Previous Investigation/Action	Date	Activities
Report of Radiological Affairs Technical Assistance Visit (NEESA, 1981)	1981	Based on the discovery of beta buttons (self-illuminating markers containing strontium-90 used on Naval vessels to light pathways and entrances) an evaluation of former burial pits was conducted. Approximately 500 Beta buttons, animal carcasses, and 160 pounds of soil contaminated with strontium-90 were removed. The contaminated material was stored in Building PT-26 until it was transported to the Nuclear Regulatory Commission for disposal. The former burial area was radiologically surveyed in-situ for beta contamination and soil samples were collected from the burial site and sent to Naval Energy and Environmental Support Activity (NEESA) for isotope analysis. Results

Previous Investigation/Action	Date	Activities
		confirmed that the contamination was removed and that the site was available for unrestricted use.
IAS (Water and Air Research, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Based on historical documentation, Site 19 was identified as a potential hazard to human health and the environment based on past use as a dump and radiological site use. Based on the results of the 1981 radiological investigation and the small quantity of waste reportedly buried, Site 19 was not recommended for further investigation.
Focused SI (CH2M HILL, 2008)	2007	The Focused SI was initiated to evaluate the presence or absence of chemical impacts to human health and the environment in support of future military construction (MILCON) activities. Surface soil, subsurface soil, and groundwater samples were collected and analyzed for VOCs, SVOCs, Pesticides/PCBs and metals. Metals, VOCs, SVOCs, and pesticides/PCBs were detected in soil and groundwater at levels exceeding screening criteria. An HHRA was recommended to confirm that no unacceptable risk is present.
Radiological Survey (NAVSEADET, 2007)	2007 - 2008	RASO collected surface and subsurface soil samples from the former burial pit area. Laboratory analysis for strontium-90 did not detect radioactivity above natural background levels in any of the soil samples.
Wallace Creek Expanded SI (CH2M HILL, 2010)	2009 - 2010	An HHRS and an ERS were performed on the data that was collected during the Focused SI in 2007, and no unacceptable risks to human health or ecological risk receptors were identified. Therefore, the site was closed with NFA.

8.2.12 Site 20—Naval Research Lab Incinerator

Site 20, the Naval Research Lab Incinerator, encompasses approximately 3 acres located on the Mainside of the Base (**Figure 8-42**). From 1947 to 1976, the Naval Research Laboratory was located in the area of the Pest Control Shop (Building PT-37). Activities at the laboratory included using radionuclides (Iodine 131) for metabolic studies on small animals. From 1956 to 1960, Site 20 was used for the incineration of burnable wastes.

FIGURE 8-42
IRP Site 20



Previous investigations are listed in **Table 8-56**.

TABLE 8-56
Previous Investigations Summary, IRP Site 20

Previous Investigation/ Action	Date	Activities
IAS (Water and Air Research, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Site 20 was identified as a potential hazard to human health and the environment based on past use as an incinerator and the potential for radiological contamination from past activities at the Laboratory. Due to the small quantity of waste reportedly burned, NFA was recommended.
Radiological Survey (NAVSEADET, 2007)	2007	RASO collected samples from the concrete pad for analysis of Strontium-90. No radioactivity was detected above natural background levels. No unacceptable risks were expected to future site workers.

Previous Investigation/ Action	Date	Activities
Focused SI (CH2M HILL, 2008)	2007 - 2008	The Focused SI was initiated to evaluate the presence or absence of impacts to human health and the environment to support future MILCON activities. Surface soil, subsurface soil, and groundwater samples were collected and analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. Metals, VOCs, SVOCs, and pesticides/PCBs were detected in soil and groundwater at levels exceeding screening criteria. As a result, confirmatory sampling for TCE and an HHRA were recommended.
Radiological Investigation (Aleut World Solutions, LLC, 2009)	2008 - 2009	The Navy requested a more detailed radiological investigation to be performed. Radiological surveying and surface and subsurface soil samples were collected within the footprint of the former incinerator for analysis of Sr-90 and Ra-226. Two soil samples were reported slightly above natural background levels for Sr-90; however, no radioactivity was detected above background for Ra-226. Based upon the results, no unacceptable risks were expected to future site workers.
Wallace Creek Expanded SI (CH2M HILL, 2010)	2009 - 2010	An HHRS and an ERS were performed on the data that was collected during the Focused SI in 2007, and no unacceptable risks to human health or ecological receptors were identified. Confirmatory sampling was also conducted, and TCE was not detected. Therefore, the site was closed with NFA.

8.2.13 Site 23—Roads and Grounds Building 1105

Site 23, the Roads and Grounds Building 1105, is located in the HPIA, within the boundaries of IRP Site 78, covering less than a half of an acre (**Figure 8-42**). In 1958, the Pest Control Shop, moved its activities from Building 712 (IRP Site 2) to Building 1105 at Site 23. From 1958 until 1977, Building 1105 was used for storage of insecticides and herbicides, while mixing of the chemicals was performed at Lot 140 (IRP Site 21). Storage and handling procedures at Building 1105 were reportedly adequate to prevent any large spills and to ensure a current safe working environment. Chemicals reportedly stored in Building 1105 included chlorinated hydrocarbons such as DDT and chlordane as well as diazinon, malathion, lindane, mirex, 2,4-D, dalapon, and dursban. Building 1105 currently houses the Roads and Grounds Department.

FIGURE 8-43
IRP Site 23

Previous investigations are listed in **Table 8-57.**

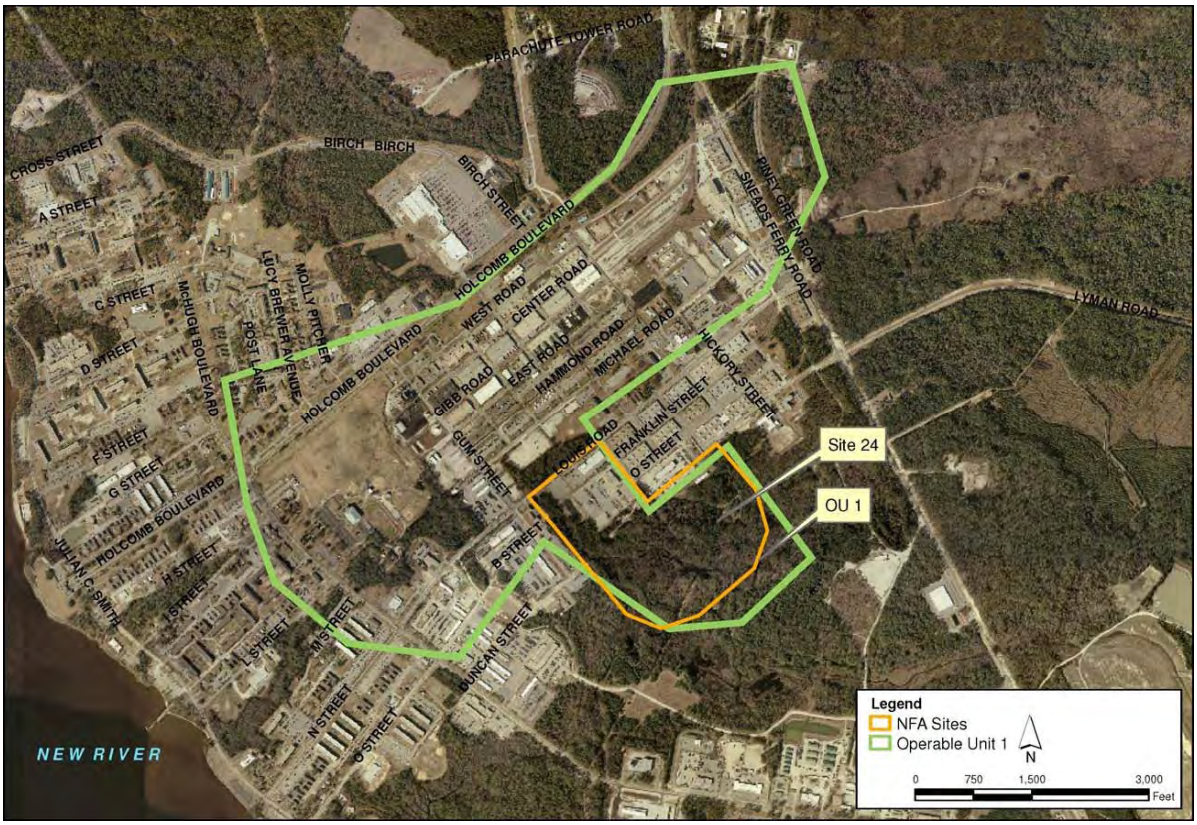
TABLE 8-57
Previous Investigations Summary, IRP Site 23

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Although the site had been listed as a potential hazardous waste site, no spills or disposal of materials had been reported and no further assessment was recommended.
Confirmatory Site Assessment (CH2M HILL, 2011)	2009 - 2011	To verify the presence or absence of contamination, a Confirmatory Site Assessment is underway to determine impacts of previous pesticide and herbicide storage. Field activities included collection of soil samples for SVOCs, VOCs, pesticides, herbicides, and metals. No pesticides or herbicides were detected above screening criteria; however, VOCs were detected in groundwater and potential human health risks were identified attributable to Site 78; therefore, the site was closed with NFA.

8.2.14 Site 24 (OU 1)—Industrial Area Fly Ash Dump

Site 24, the Industrial Area Fly Ash Dump, encompasses approximately 100 acres within OU 1 approximately 1 mile east of the New River and 2 miles south of State Route 24. OU 1 consists of three sites (Sites 21, 24, and 78) that have been grouped together into one OU because of their proximity to one another (**Figure 8-44**). Site 24 was used for the disposal of fly ash, cinders, solvents, used paint stripping compounds, sewage sludge, and water treatment sludge from the late 1940s to 1980s. Sludge from the wastewater treatment plant (WWTP) and sewage treatment plant (STP) were reportedly disposed at this site since the late 1940s. Construction debris was reportedly disposed at the site in the 1960s. During 1972 to 1979, fly ash cinders and used cleaning solvents were dumped on the ground surface. An estimated 31,500 tons of fly ash was disposed at the site and an estimated 45,000 gallons of stripping compounds was disposed over a 7-year period.

FIGURE 8-44
IRP Site 24, Operable Unit 1



Previous investigations are listed in **Table 8-58.**

TABLE 8-58
Previous Investigations Summary, IRP Site 24

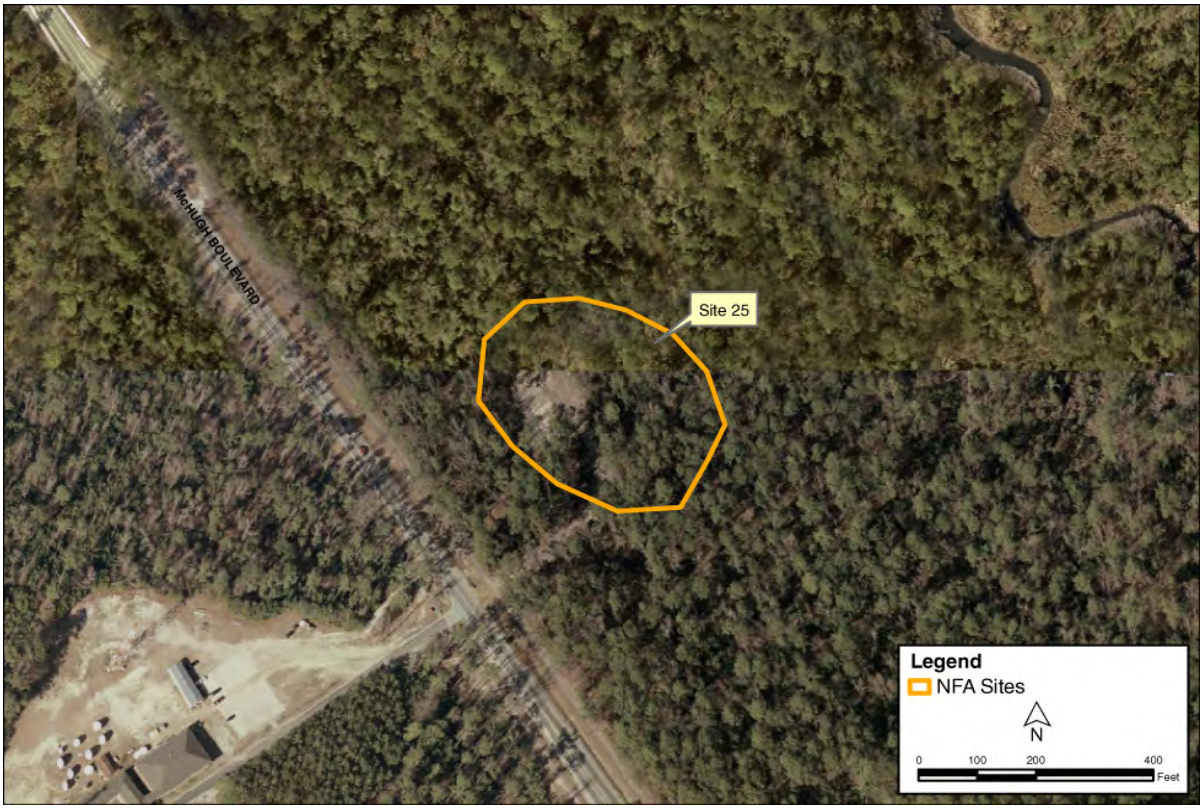
Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Research indicated that past site operations may have impacted groundwater and surface water and recommended an additional investigation.

Previous Investigation/Action	Date	Activities
Confirmation Study (1987)	1984 - 1987	The Confirmation Study included groundwater, surface water, and sediment investigations. Analytical results identified the presence of metals in groundwater, surface water, and sediment. However, the detected concentrations in surface water and sediment did not exceed regulatory standards.
RI/FS (Baker, 1994)	1994	RI field activities included a site survey, groundwater, soil, sediment, and surface water sampling. Analytical results identified pesticides and metals in soil and groundwater. Potential unacceptable human health risks were identified due to pesticides in groundwater. No unacceptable ecological risks were identified. An FS was developed to screen remedial alternatives for addressing groundwater contamination.
PRAP and ROD (Baker, 1994)	1994	The PRAP was submitted for public review and comment in July 1994. The Final ROD was signed in September 1994. The selected remedial alternative was LTM for groundwater.
LTM	1996 - 1997	LTM was implemented in 1996 and discontinued in 1997 after evaluating the analytical results collected over four consecutive quarters that indicated no pesticides or metals concentrations in groundwater exceeded the cleanup levels. In 2001, the LTM Report documented the completion of LTM.

8.2.15 Site 25—Base Incinerator

Site 25 encompasses approximately 3 acres on the Mainside of the Base. From 1940 to 1960, Site 25 operated as the Base Incinerator, burning trash and classified materials (**Figure 8-45**). Potential materials present at the site include burned trash, ashes, and melted glass.

FIGURE 8-45
IRP Site 25



Previous investigations are listed in **Table 8-59**.

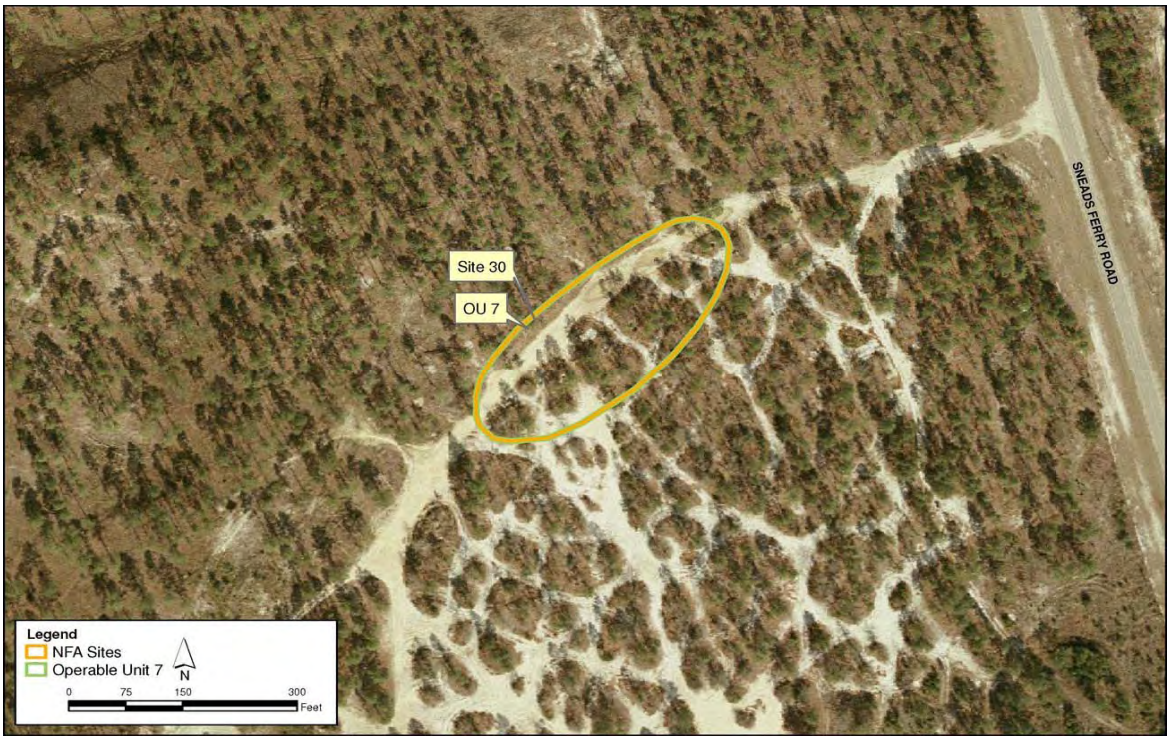
TABLE 8-59
Previous Investigations Summary, IRP Site 25

Previous Investigation/Action	Date	Activities
IAS (Water and Air Research, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Site 25 was identified based on past use as an incinerator. However, historical records indicated that non hazardous materials were disposed of (i.e. trash and glass) and NFA was recommended.
Focused SI (CH2M HILL, 2008)	2007 - 2008	To evaluate the presence or absence of chemical impacts to human health and the environment in order to support future MILCON activities, soil and groundwater samples were collected and analyzed for VOCs, SVOCs, Pesticides/PCBs, and metals. Arsenic was detected in surface soil samples above screening levels, and an HHRA was recommended.
Wallace Creek Expanded SI (CH2M HILL, 2009)	2009 - 2010	An HHRS and an ERS were performed on the data that was collected during the Focused SI in 2007, and no unacceptable risks to human health or ecological receptors were identified. Therefore, the site was closed with NFA.

8.2.16 Site 30 (OU 7)—Sneads Ferry Road Fuel Tank Sludge Area

Site 30, the Sneads Ferry Road Fuel Tank Sludge Area, is located within OU 7 on the Mainside of the Base and covers one acre (**Figure 8-46**). OU 7 consists of three sites (Sites 1, 28, and 30) that have been grouped together into one OU because of their unique characteristics of suspected waste (POL) and geographic location. Site 30 was reportedly used by a private contractor in 1970 to clean out two 12,000-gallon emptied fuel storage tanks when the contents of the tanks were converted from leaded gasoline to unleaded gasoline. Sludge and/or washout was reportedly drained from the tanks and disposed of along a tank trail which intersects Sneads Ferry Road. The composition of the waste is unknown, but it may have contained cleansing compounds and possibly diluted tetraethyl lead. An estimated minimum of 600 gallons was reportedly disposed.

FIGURE 8-46
IRP Site 30, Operable Unit 7



Previous investigations are listed in **Table 8-60.**

TABLE 8-60
Previous Investigations Summary, IRP Site 30

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The IAS concluded that sludge deposits could potentially impact groundwater and recommended an additional investigation to determine the boundaries of the impacted area and verify the presence of hazardous wastes.
Confirmation Study (1987)	1984 - 1987	Confirmation Study field activities included groundwater, surface water, and sediment investigations. Analytical results identified O&G in the disposal area and in stream bed sediments as well as lead in groundwater.
Remedial Investigation (Baker, 1994)	1994	To further characterize the nature and extent of contamination an RI was conducted. Field activities consisted of a site survey and soil, groundwater, surface water, and sediment sampling. No unacceptable human health or ecological risks were identified at Site 30.
PRAP (1995) and ROD (Baker, 1996)	1995 - 1996	The PRAP was submitted for public review and comment in July 1995. The Final ROD was signed in May 1996 and due to the absence of contamination the site was closed with NFA.

8.2.17 Site 38—Camp Geiger Construction Dump

Site 38, the Camp Geiger Area Surface Dump, encompasses approximately 4 acres in the Camp Geiger area of the Base (**Figure 8-47**). The dates of operation are unknown, but Site 38 was reportedly used for surface disposal of construction debris and branches. During the IAS, evidence of dumping activities was observed.

FIGURE 8-47
IRP Site 38

Previous investigations are listed in **Table 8-61**.

TABLE 8-61
Previous Investigations Summary, IRP Site 38

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at Site 38, and concluded that no further assessment was necessary.
Confirmatory Site Assessment (CH2M HILL, 2011)	2010-2011	To verify the presence or absence of contamination due to the site's history as a dump, confirmatory sampling was conducted. Soil and groundwater samples were collected and analyzed for VOCs, SVOCs, and metals. No unacceptable risks to human health or the environment were identified and the site was closed with NFA.

8.2.18 Site 40—Camp Geiger Area Borrow Pit

Site 40, the Camp Geiger Area Borrow Pit, encompasses approximately 22 acres (**Figure 8-48**). Starting in 1969, Site 40 was reportedly used for disposal of auto parts and metal. The former borrow pit dump was reported to have covered an area of approximately 4 to 5 acres within Site 40.

FIGURE 8-48
IRP Site 40

Previous investigations are listed in **Table 8-62.**

TABLE 8-62
Previous Investigations Summary, IRP Site 40

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Site 40 was identified as being a waste disposal site for automobile parts and scrap metal. Site 40 was recommended for NFA because there was insufficient evidence that hazardous substances were associated with the site.
Preliminary Assessment/Site Inspection (CH2M HILL, 2009)	2008 - 2009	A PA/SI was conducted to characterize potential contamination at Site 40 based on potential MILCON projects in the vicinity. Field activities included soil, groundwater, surface water, and sediment sampling and test pitting to delineate the former dump area. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. No wastes were encountered and no risks to human health or the environment were identified. The site was closed with NFA.
No Further Action Decision Document (2010)	2010	The Final NFA DD was completed August 12, 2010, which stated that all investigations or activities for the IRP for Site 40 are complete.

8.2.19 Site 42—Building 705 BOQ Dump

Site 42, the Building 705 Bachelor Officers Quarters (BOQ) Dump, encompasses several acres located in the MCAS New River portion of the Base (**Figure 8-49**). From 1950 to 1960, Site 42 was reportedly used for surface disposal of debris including trees, tree stumps, and boards.

FIGURE 8-49
IRP Site 42

Previous investigations are listed in **Table 8-63**.

TABLE 8-63
Previous Investigations Summary, IRP Site 42

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at Site 42 and no further assessment was recommended.
Confirmatory Site Assessment (CH2M HILL, 2011)	2009-2011	To verify the presence or absence of contamination due to the site's history as a dump, confirmatory sampling was conducted in FY 2009. Soil and groundwater samples were collected and analyzed for VOCs, SVOCs, and metals. Based on the results, no unacceptable human health or ecological risks were identified and the site was closed with NFA.

8.2.20 Site 46—MCAS Main Gate Dump

Site 46, the MCAS Main Gate Dump, encompasses less than 1 acre in MCAS New River, in the northwest portion of the Base (**Figure 8-50**). From 1958 to 1962, Site 46 was reportedly used for disposal of construction and demolition debris.

FIGURE 8-50
IRP Site 46

Previous investigations are listed in **Table 8-64.**

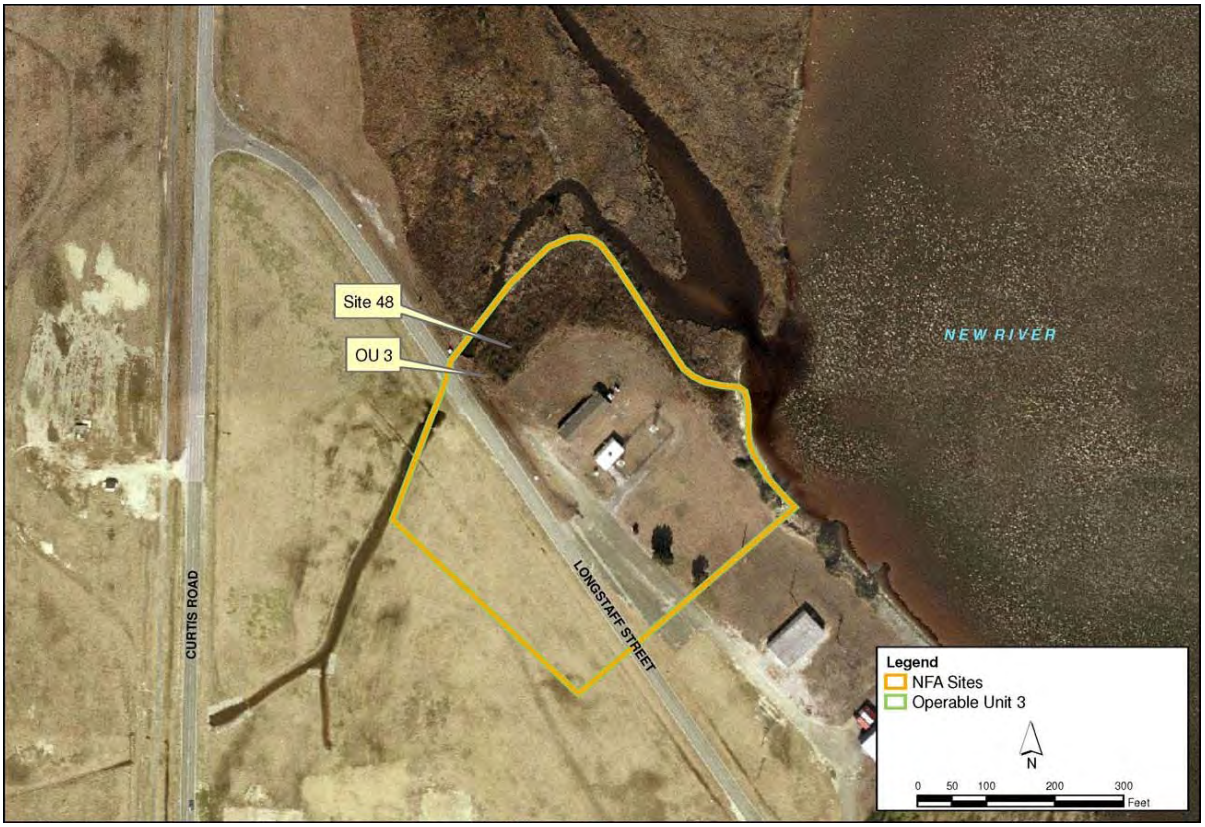
TABLE 8-64
Previous Investigations Summary, IRP Site 46

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at Site 46 and no further assessment was recommended.
Confirmatory Site Assessment (Osage, 2011)	2009-2011	To verify the presence or absence of contamination due to the site's history as a dump, confirmatory sampling was conducted. Soil and groundwater samples were collected and analyzed for VOCs, SVOCs, herbicides, pesticides, and metals. No unacceptable risks to human health or the environment were identified and the site was closed with NFA.

8.2.21 Site 48 (OU 3)—MCAS Mercury Dump

Site 48, the MCAS Mercury Dump, encompasses approximately 4 acres within MCAS New River, in the northwest portion of the Base. Building AS-804 was constructed in 1955 and was used as the Administration Office and Photographic Lab from 1955 to 1990 (**Figure 8-51**). From 1956 to 1966, mercury was drained from radar units and disposed in small quantities behind the building. It was reported that approximately 1 gallon of mercury per year over a 10-year period was disposed in this manner. Building AS-804 is currently used as a classroom training facility.

FIGURE 8-51
IRP Site 48, Operable Unit 3



Previous investigations are listed in **Table 8-65.**

TABLE 8-65
Previous Investigations Summary, IRP Site 48

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. An estimated 1,000 pounds of mercury was possibly dispersed over approximately 20,000 ft^2 adjacent to the New River. It was concluded that mercury disposal practices could potentially impact the New River and recommended a Confirmation Study to verify the presence of mercury.
Confirmation Study (1987)	1984 - 1987	A Confirmation Study was conducted to verify the presence of mercury. Field activities included soil and sediment investigations. Low levels of mercury were identified in both media, and further characterization was recommended.
Supplemental Characterization (1991)	1991	A Supplemental Characterization Investigation was conducted based on results of the confirmation study. Field activities included surface water and sediment sampling. Mercury was not detected in any samples collected during the investigation. The risk evaluation identified several metals (not mercury) as contaminants of potential concern (COPCs).

Previous Investigation/Action	Date	Activities
Remedial Investigation (1992)	1992	To further characterize the nature and extent of contamination an RI was conducted. Field activities included a geophysical investigation and soil, groundwater, surface water, and sediment sampling. The geophysical investigation did not identify any objects associated with mercury disposal, and analytical results did not identify mercury in any media sampled. Pesticides and metals were detected in surface soil samples. Low levels of organics and metals were detected in groundwater and surface water samples, and pesticides, PAHs, and metals were detected in sediment samples. No potential unacceptable human health or ecological risks were identified.
PRAP and ROD (Baker, 1993)	1993	A PRAP was issued to solicit public input on the preferred alternative (no action) and a public meeting was held. The Final ROD was issued and signed in September 1993. Because no remedial actions were required in the ROD, the site was closed with NFA.

8.2.22 Site 51—MCAS Football Field

Site 51, the MCAS Football Field, encompasses approximately 20 to 30 acres in MCAS New River, in the northwest portion of the Base. Site 51 was reportedly the site of empty container disposal between approximately 1967 and 1968 (**Figure 8-52**). Paint cans and hydraulic fluid cans were reportedly disposed.

FIGURE 8-52
IRP Site 51

Previous investigations are listed in **Table 8-66**.

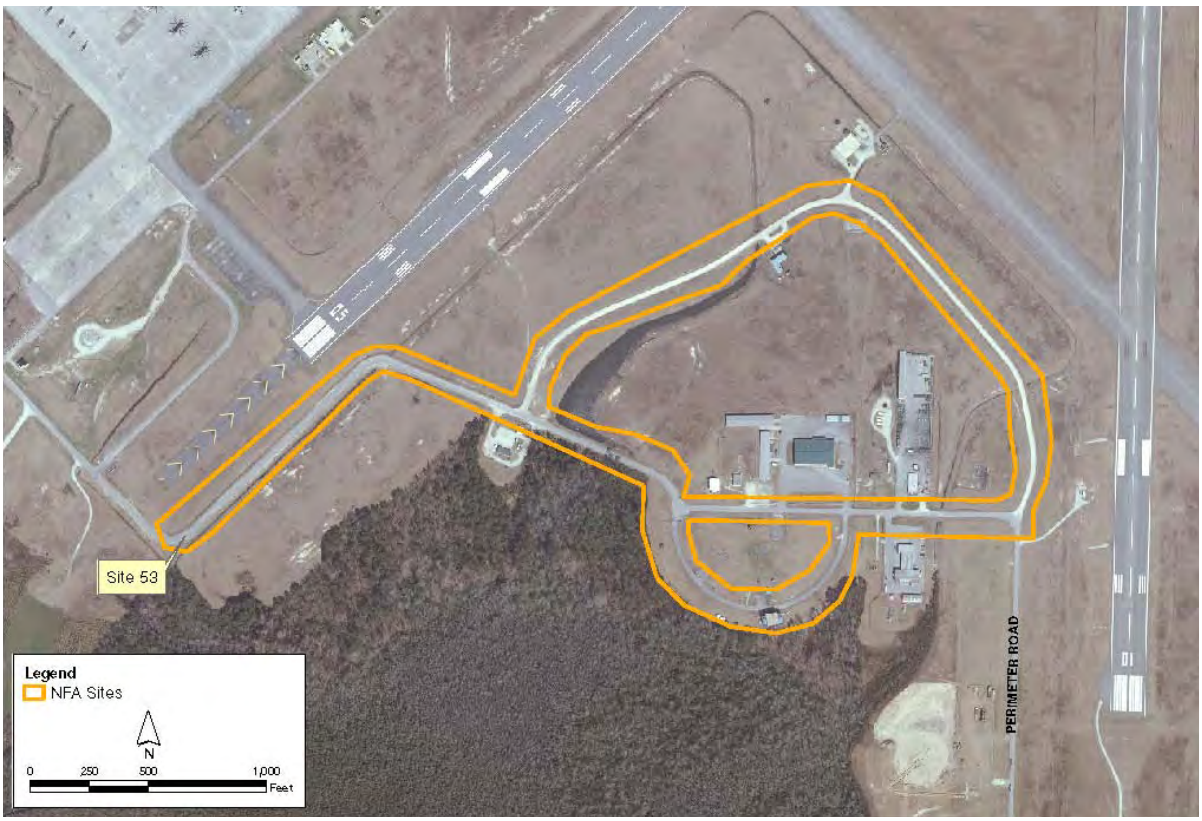
TABLE 8-66
Previous Investigations Summary, IRP Site 51

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The quantity of any waste reportedly disposed of at IRP Site 51 was determined to be insignificant and did not warrant further investigation.
Confirmatory Site Assessment (Osage, 2011)	2009-2011	To verify the presence or absence of waste, confirmatory sampling was conducted. Soil and groundwater samples were collected and analyzed for SVOCs, VOCs, pesticides/PCBs, and metals. No unacceptable risks were identified to human health or the environment and the site was closed with NFA.

8.2.23 Site 53—MCAS Warehouse Building 3525 Area

IRP Site 53, the MCAS Warehouse Building 3525 Area, encompasses approximately 3 miles of roadway in MCAS New River, in the northwest portion of the Base (**Figure 8-53**). From 1970 to 1975, liquid wastes were sprayed on the unimproved dirt roads in the vicinity of IRP Site 53 to control dust. The liquid waste mixture reportedly contained crankcase waste oil, jet propulsion (JP) fuels, and paint thinners.

FIGURE 8-53
IRP Site 53



Previous investigations are listed in **Table 8-67**.

TABLE 8-67
Previous Investigations Summary, IRP Site 53

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The quantity of any waste reportedly disposed of at IRP Site 53 was determined to be insignificant and did not warrant further investigation.
Confirmatory Site Assessment (CH2M HILL, 2011)	2009-2011	To verify the presence or absence of waste, confirmatory sampling was conducted. Soil and groundwater samples were collected and analyzed for SVOCs, VOCs, PCBs, and metals. Potential human health risks were identified from arsenic groundwater at one temporary well location. A permanent monitoring well was installed, a groundwater sample was collected to confirm the results, and arsenic was not detected. Therefore, the site was closed with NFA.

8.2.24 Site 55—Air Station East Perimeter Dump

IRP Site 55, the Air Station East Perimeter Dump, encompasses several acres in MCAS New River, in the northwest portion of the Base (**Figure 8-54**). From the 1950s to the 1960s, IRP Site 55 was reportedly used as a disposal area for barrels, tires, trash, metal planking, and telephone poles. The area is currently used as a marina and recreation area by the Air Station.

FIGURE 8-54
IRP Site 55

Previous investigations are listed in **Table 8-68.**

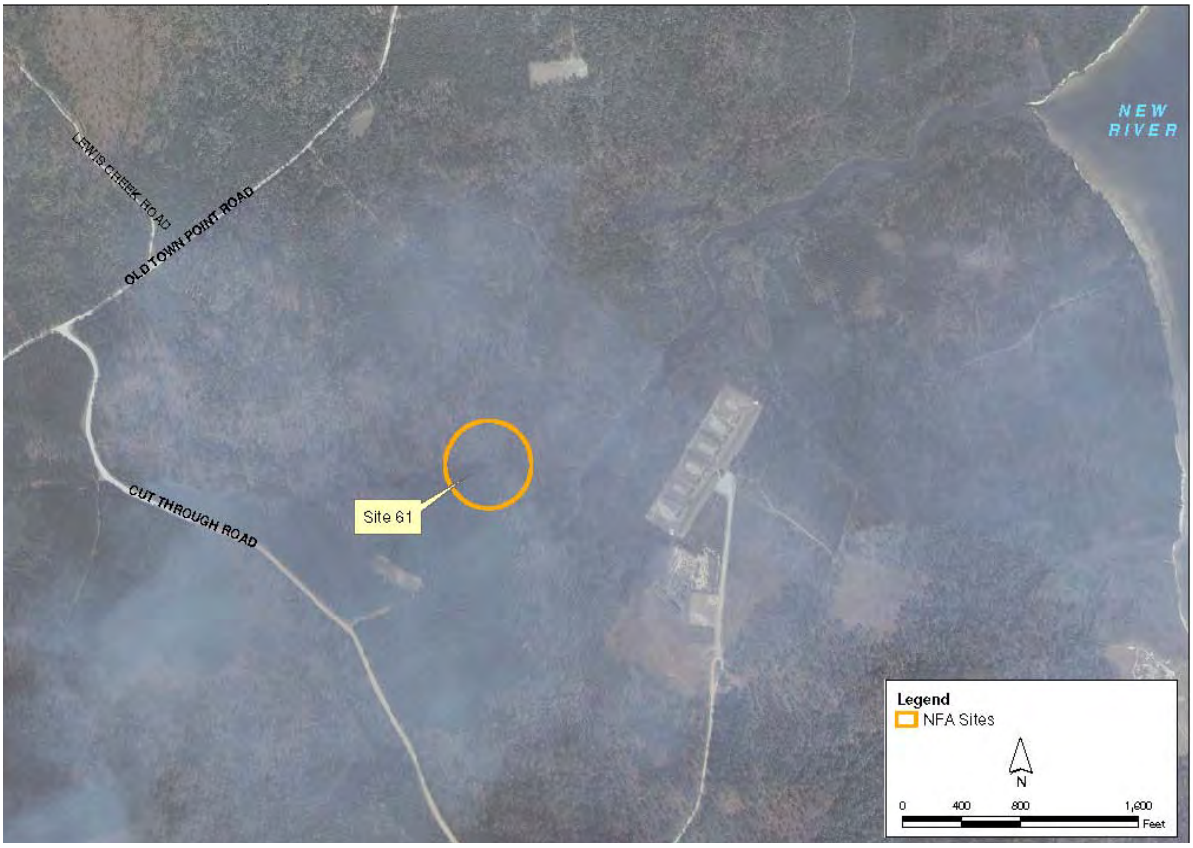
TABLE 8-68
Previous Investigations Summary, IRP Site 55

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at IRP Site 55, and no further assessment was recommended.
Confirmatory Site Assessment (CH2M HILL, 2011)	2009-2011	To verify the presence or absence of contamination due to the site's history as a dump, confirmatory sampling was conducted. Groundwater and soil samples were collected and analyzed for SVOCs, VOCs, pesticides/PCBs, herbicides, and metals and no unacceptable risks to human health or the environment were identified. The site was closed with NFA.

8.2.25 Site 61—Rhodes Point Road Dump

IRP Site 61, the Rhodes Point Road Dump, encompasses approximately 8 to 10 acres, located nearly 5 miles south of the MCAS New River operations area (**Figure 8-55**). The exact dates of operation are unknown; however, it was reported that IRP Site 61 has been used as a disposal area for wastes generated during bivouac exercises. The site is currently used for war games, so site access/use is restricted.

FIGURE 8-55
IRP Site 61



Previous investigations are listed in **Table 8-69**.

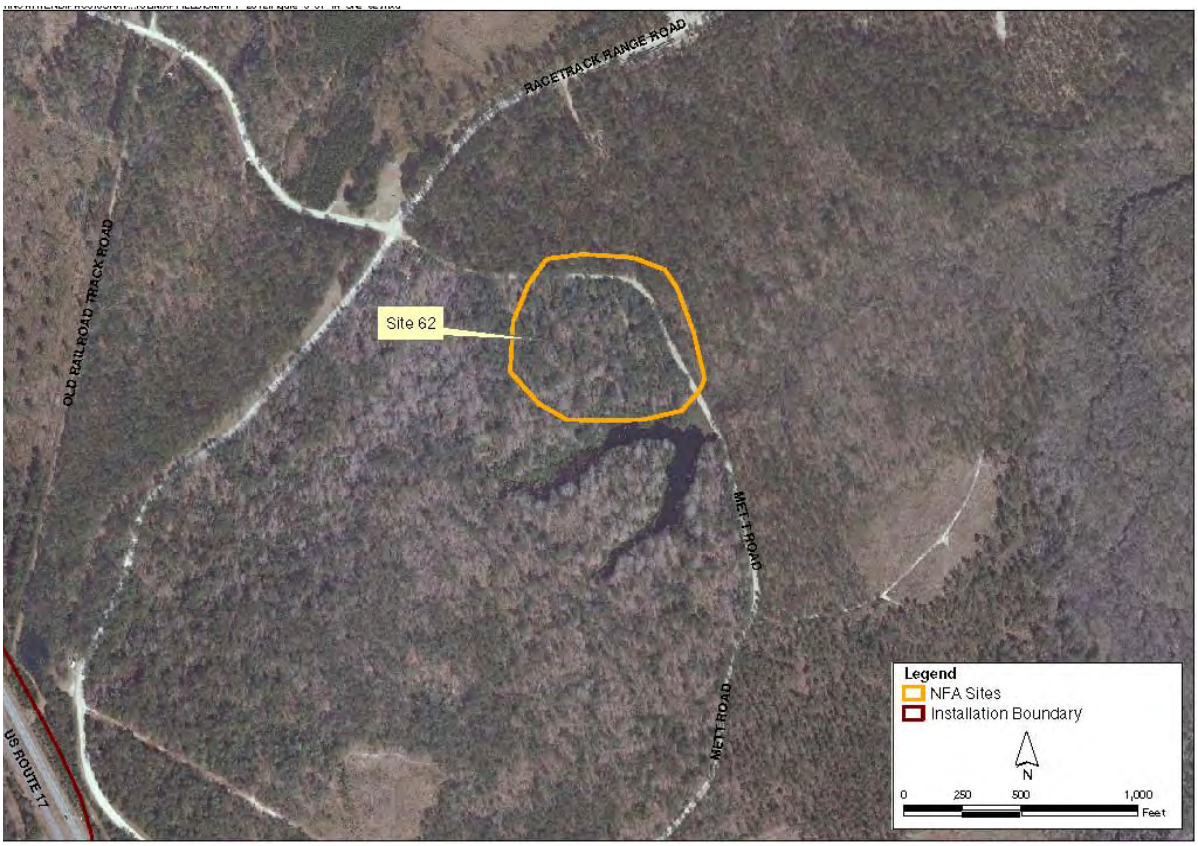
TABLE 8-69
Previous Investigations Summary, IRP Site 61

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at IRP Site 61, and no further assessment was recommended.
Confirmatory Site Assessment (CH2M HILL, 2011)	2009-2011	To verify the presence or absence of waste, confirmatory sampling was conducted. Soil and groundwater samples were collected and analyzed for SVOCs, VOCs, PCBs, and metals. Potential human health risks were identified from arsenic groundwater at one temporary well location. A permanent monitoring well was installed, a groundwater sample was collected to confirm the results, and arsenic was detected below regulatory criteria and background. Therefore, the site was closed with NFA.

8.2.26 Site 62—Race Course Area Dump

IRP Site 62, the Race Course Area Dump, encompasses approximately 1 to 2 acres, nearly 2 miles south of the MCAS New River operations area (**Figure 8-56**). The exact dates of operation are unknown; however, it was reported that IRP Site 62 has been used as a disposal area for wastes generated during bivouac exercises. The site is currently used for war games, so site access/use is restricted.

FIGURE 8-56
IRP Site 62



Previous investigations are listed in **Table 8-70**.

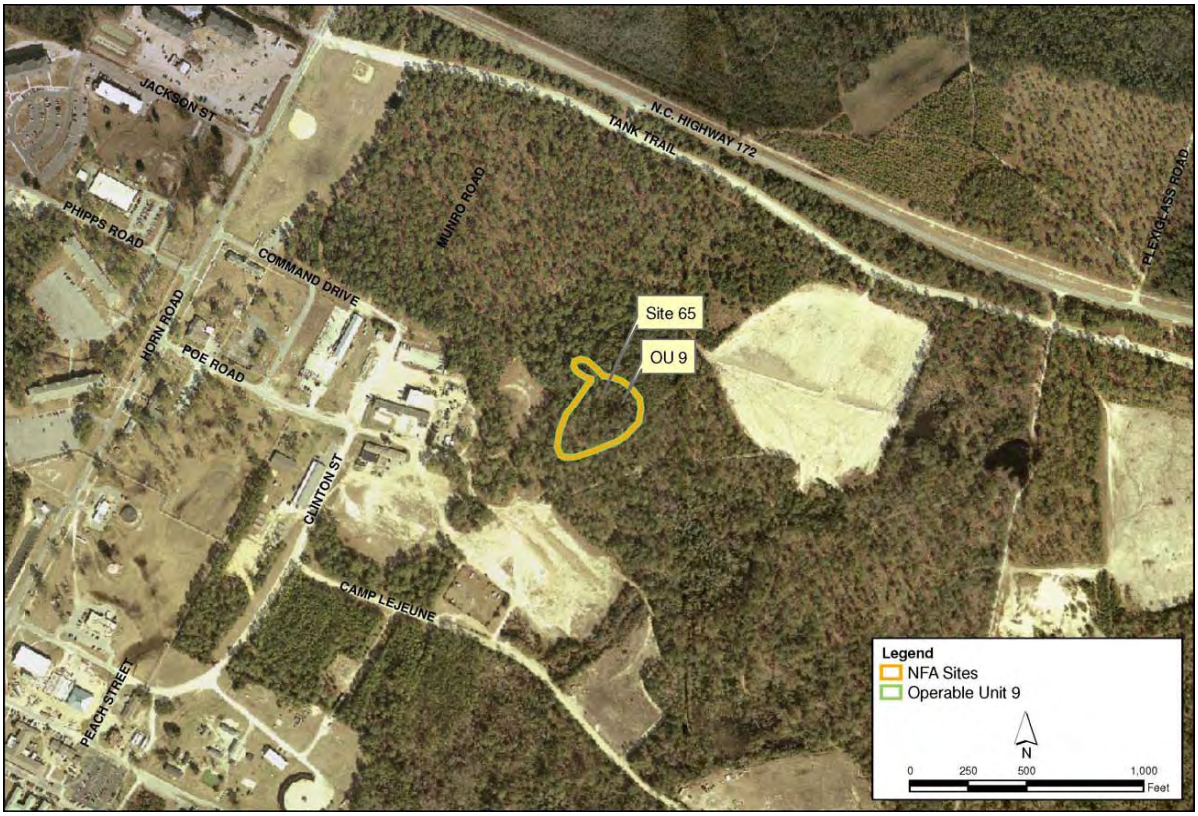
TABLE 8-70
Previous Investigations Summary, IRP Site 62

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at IRP Site 62, and no further assessment was recommended.
Confirmatory Site Assessment (CH2M HILL, 2011)	2009-2011	To verify the presence or absence of contamination due to the site's history as a dump, confirmatory sampling was completed. Soil and groundwater samples were analyzed for VOCs, SVOCs, and metals. No unacceptable risks to human health or the environment were identified. The site was closed with NFA.

8.2.27 Site 65 (OU 9)—Engineer Area Dump

Site 65, the Engineer Area Dump, is located in the Courthouse Bay area of MCB CamLej and covers approximately 5 acres (**Figure 8-57**). Two separate disposal areas have been reported at Site 65, a battery acid disposal area and a liquid disposal area. The liquids that have been disposed are reported to have been POL types. In addition, the dump was used to burn construction debris. The dump was in operation from at least 1958 until 1972.

FIGURE 8-57
IRP Site 65, Operable Unit 9



Previous investigations are listed in **Table 8-71.**

TABLE 8-71
Previous Investigations Summary, IRP Site 65

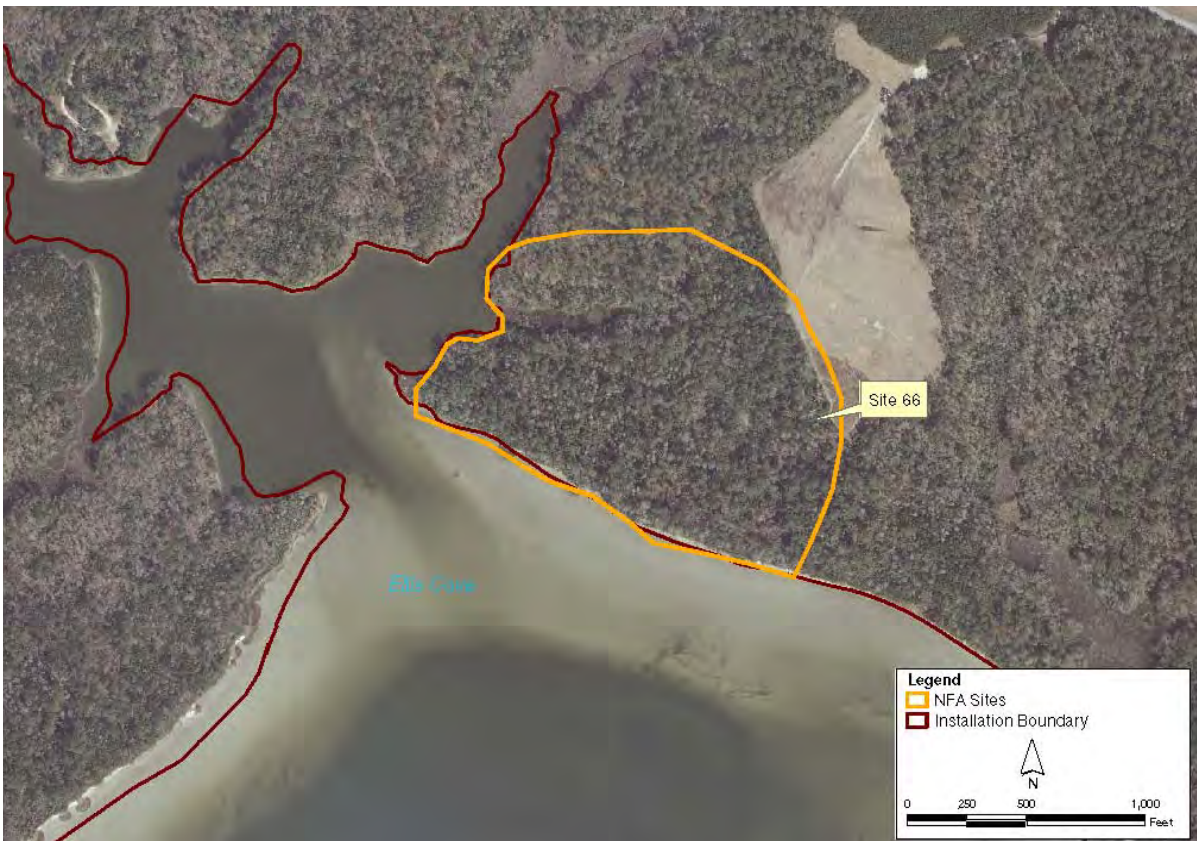
Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. No hazardous wastes were reportedly disposed of at the site, and no further assessment was recommended. However, the USEPA requested an additional investigation to determine whether hazardous waste contamination existed.
Site Inspection (Baker,1991)	1991	An SI was conducted to verify the presence or absence of contamination. Field activities included soil, groundwater, surface water, and sediment sampling. Fill materials were encountered in site soils, confirming that waste material was disposed of at the site. Pesticides and metals were detected in groundwater and sediment samples. Based on these findings, the SI recommended further evaluation.

Previous Investigation/Action	Date	Activities
Remedial Investigation (Baker,1995)	1995	An RI was conducted to evaluate the nature and extent of contamination and potential risks to human health and the environment. Field activities included soil, groundwater, surface water, and sediment sampling, and ecological investigations. Findings from the RI indicated that there were no releases of hazardous substances from the waste disposal areas and no unacceptable human health or ecological risks were identified.
Post-Remedial Investigation Monitoring (Baker, 2001)	2001	Several discarded containers were discovered near the site in 2001. The containers were heavily corroded and no materials were observed in the containers. Groundwater, soil, surface water, and sediment were collected to determine if surrounding media had been impacted by potential releases. Analytical results indicated there were no effects caused by the containers.
PRAP and ROD (Baker, 2001)	2002	A PRAP was issued to solicit public input on the preferred alternative (no action) and a public meeting was held. The Final ROD was issued and signed in September 2001. The ROD for Site 65 stipulated that no additional remedial action or monitoring was required.

8.2.28 Site 66—AMTRAC Landing Site and Storage Area

IRP Site 66, the Amphibious Tractors (AMTRAC) Landing Site and Storage area, encompasses approximately 1 square mile in the Courthouse Bay area of the Base (**Figure 8-58**). Beginning in the 1950s, IRP Site 66 was utilized for vehicle maintenance during training activities. Exact operations are unknown; however, it is likely that vehicle maintenance operations resulted in release of POL, and battery acid.

FIGURE 8-58
IRP Site 66



Previous investigations are listed in **Table 8-72.**

TABLE 8-72
Previous Investigations Summary, IRP Site 66

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. Although spills of POL had likely occurred at IRP Site 66, the quantity was insignificant and did not warrant further investigation.
Confirmatory Site Assessment (CH2M HILL, 2011)	2009-2011	To verify the presence or absence of contamination, confirmatory sampling was conducted. Groundwater, soil, sediment, and surface water samples were collected and analyzed for SVOCs, VOCs, and metals. Potential ecological risks were identified from metals in surface water. Confirmation surface water sampling was conducted and the metals were not detected. Therefore, the site was closed with NFA.

8.2.29 Site 67—Engineer's TNT Burn Site

IRP Site 67, Engineer's Trinitrotoluene (TNT) Burn Site, is located in the Courthouse Bay area of the Base (**Figure 8-59**). In 1951, IRP Site 67 was reportedly used for TNT disposal. Deep pits (2- to 3-feet deep) were dug and unwanted TNT was opened and burned. Complete consumption of all TNT was reported during these procedures.

FIGURE 8-59
IRP Site 67

Previous investigations are listed in **Table 8-73.**

TABLE 8-73
Previous Investigations Summary, IRP Site 67

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The quantity of any waste reportedly disposed of at IRP Site 67 was insignificant and did not warrant further investigation.
Confirmatory Site Assessment (CH2M HILL, 2010)	2009-2010	To verify the presence or absence of contamination due to the site's history, confirmatory sampling was completed in FY 2010. Soil and Groundwater samples were analyzed for TNT and breakdown products. 2-Amino-4,6-DNT was detected in groundwater at one temporary well location. The concentration was below regulatory screening criteria; therefore, the site was closed with NFA.

8.2.30 Site 75 (Pre-RI)—MCAS Basketball Court Site

Site 75, the MCAS Basketball Court Site, is located in the MCAS New River operations area (**Figure 8-60**). Site 75 was reportedly a drum burial area that was used in the early 1950s. The excavation area was an oval-shaped pit approximately 90 feet long by 70 feet wide and was sufficiently deep to have encountered the water table. An estimated 75 to 100 55-gallon drums were placed in this pit. The drums reportedly contained a chloroacetophenone tear gas solution used for training. Additional organic chemicals, such as chloroform, carbon tetrachloride, benzene, and chloropicrin, may have been present in the solution.

FIGURE 8-60
IRP Site 75

Previous investigations are listed in **Table 8-74.**

TABLE 8-74
Previous Investigations Summary, IRP Site 75

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The IAS concluded that degradation of buried drums could result in the release of suspected materials into the groundwater, potentially impacting water supply wells within the area. Based on these findings, the IAS recommended additional investigation.
Pre-Remedial Investigation Screening Study (Baker, 1995)	1995	A Pre-RI screening study was conducted to determine whether contamination was present at the site. Field activities included a geophysical investigation and soil and groundwater sampling. The geophysical survey did not detect any major subsurface anomalies that could have been the suspected drums. SVOCs, pesticides, and metals were detected in soil samples and metals were detected in groundwater samples. No potential, unacceptable ecological risks were identified, and the Pre-RI recommended NFA.
No Further Action Decision Document (CH2M HILL, 2001)	2001	The Final NFA DD was completed May 8, 2001.

8.2.31 Site 76 (Pre-RI)—MCAS Curtis Road Site

Site 76, the MCAS Curtis Road Site, is located in the MCAS New River operations area and covers less than one acre (**Figure 8-61**). There are several base housing units to the immediate north of the Site 76 study area. The site was reportedly used as a drum disposal area on two occasions in 1949. The estimated area of the disposal unit is a quarter-acre, and approximately 25 to 75 55-gallon drums were allegedly disposed at this site. The drums reportedly contained a chloroacetophenone tear gas solution used for training similar to that allegedly buried at Site 75. Additional organic chemicals, such as chloroform, carbon tetrachloride, benzene, and chloropicrin, may have been present in the solution.

FIGURE 8-61
IRP Site 76

Previous investigations are listed in **Table 8-75.**

TABLE 8-75
Previous Investigations Summary, IRP Site 76

Previous Investigation/Action	Date	Activities
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCB CamLej. The IAS concluded that degradation of buried drums could potentially result in the release of suspected materials into groundwater. Based on these findings, the IAS recommended an additional investigation.
Pre-Remedial Investigation Screening Study (Baker, 1998)	1995 - 1998	A Pre-RI screening study was conducted to determine whether contamination was present at the site. Field activities included a geophysical investigation, soil, and groundwater sampling. The geophysical survey did not detect any major subsurface anomalies that could have been the suspected drums. VOCs, SVOCs, and pesticides were detected in soil samples. Metals were detected in groundwater samples. No unacceptable human health risks were identified due to the presence of metals in groundwater. As a result, the Pre-RI recommended NFA.
Additional Groundwater Sampling (Baker, 1999)	1999	In response to an agency comment and because metals were previously detected above screening criteria, groundwater was resampled in October 1999. Only aluminum and iron were detected above screening criteria and no unacceptable human health risks were identified.
No Further Action Decision Document (CH2M HILL, 2001)	2001	The Final NFA DD was completed May 8, 2001.

8.2.32 Site 85—Former Camp Johnson Battery Dump

Site 85 covers approximately 5 acres of heavily vegetated land (**Figure** 8-62) in the Camp Johnson area of the MCB CamLej. During the 1950s Site 85 was used for battery disposal. The site was discovered in 1992 when decomposed batteries used in military communication equipment during the Korean War ear were unearthed as a roadway was being widened. Discarded charcoal canisters from air purifying respirators and battery packs were also discovered throughout the site.

FIGURE 8-62
IRP Site 85

Previous investigations are listed in **Table 8-76.**

TABLE 8-76
Previous Investigations Summary, IRP Site 85

Previous Investigation/Action	Date	Activities
Pre-RI Screening Study (Baker, 1998)	1995 - 1998	A Pre-RI was initiated to assess the nature and extent of contamination. Field activities included a site survey, installation of temporary monitoring wells, and soil and groundwater sampling. Metals were detected in soil and groundwater samples collected near battery piles and a Baseline Risk Assessment identified potential risks to human receptors. The Pre-RI recommended an EE/CA for the battery piles and associated soil.
Engineering Evaluation/Cost Analysis (Baker, 1999)	1999	An EE/CA was prepared to evaluate remedial alternatives for metals in soil and groundwater at Site 85. The three alternatives were institutional controls, excavation and on-Base disposal, and treatment (ex-*Situ* soil washing). A public notice was issued and public meeting was held in October 1998. The recommended alternative in the EE/CA included removal of soil and batteries through a NTCRA, followed by re-evaluation of groundwater.
Action Memorandum (Baker, 1999)	1999	An Action Memo was completed to propose excavation with on-Base disposal as the NTCRA to address metals in soil and the battery piles.

Previous Investigation/Action	Date	Activities
Non-Time Critical Removal Action (OHM, 2000)	2000	The NTCRA was conducted and 158 tons of soil and debris were removed from the site. Confirmation soil sampling was conducted.
Long Term Monitoring (Baker, 2002)	2001-2002	Groundwater LTM was initiated in July 2001 and included sampling of five monitoring wells on a quarterly basis for metals analysis. In July 2002, the concentrations of metals were below the cleanup levels for at least four consecutive quarters and LTM was discontinued at Site 85.
No Further Action Decision Document (Baker, 2005)	2005	Based on results of previous investigations at Site 85, no further remedial action was recommended. USEPA and NCDENR concurred with NFA status.
Preliminary Assessment/Site Inspection (CH2M HILL, 2010)	2009-2010	To characterize potential environmental impacts associated with the past use of Site 85, a PA/SI was initiated. Soil and groundwater samples were collected for metals. Several metals were detected in soil and groundwater at concentrations exceeding screening criteria. Potential unacceptable risks were identified in groundwater due to exposure to chromium and unacceptable risks for ecological were identified due to exposure to select metals in soil. Further assessment of soil and groundwater was recommended.
Expanded Site Inspection (CH2M HILL, 2011)	2010-2011	To assess the nature and extent of metals in soil at Site 85, an ESI was initiated. Field activities included composite surface soil, discrete surface soil, and groundwater sampling. Samples were analyzed for select metals. No unacceptable human health or ecological risks were identified during risk assessments. Based on the results of the PA/SI and ESI, the NFA decision was confirmed.

8.2.33 Site 87 (Pre-RI)—MCAS Officers' Housing Area

Site 87, the MCAS Officers' Housing Area site (formerly Site A), is located on the west bank of the New River and covers less than one acre (**Figure 8-63**). The area was identified in 1986 when waste was identified eroding out of a cut bank along the New River near an officers' housing area. The materials were tentatively identified as hospital wastes. Various hospital waste materials were noted, including hypodermic needles and vials of white powder that were believed to contain a chlorine-based substance. No information was available regarding the volume of the waste or the mode of disposal and it is unclear how the materials got into the river bank.

FIGURE 8-63
IRP Site 87

Previous investigations are listed in **Table 8-77.**

TABLE 8-77
Previous Investigations Summary, IRP Site 87

Previous Investigation/Action	Date	Activities
Pre-RI Screening Study (Baker, 1998)	1995 - 1998	A Pre-RI was initiated to assess the nature and extent of contamination. Field activities included a site survey, exploratory test pits, and soil, groundwater, surface water, and sediment sampling. No potential unacceptable human health or ecological risks were identified. As a result, the Pre-RI recommended NFA.
Confirmatory Groundwater Sampling (Baker, 1999)	1999	One groundwater sample collected during the Pre-RI detected PCP above the screening criteria and the location was sampled again in 1999. No PCP was detected.
NFA DD (CH2M HILL, 2001)	2001	The Final NFA DD was completed May 8, 2001.

8.2.34 Site 90 (OU 17)—Building BB-9

Site 90, Building BB-9, encompasses approximately 6 acres within OU 17, in the southeast portion of the Base in the Courthouse Bay Complex (**Figure 8-64**). OU 17 consists of three sites (Sites 90, 91, and 92) that have been grouped together based on the unique characteristic of suspected waste. All three sites were formerly part of the UST program, but were transferred to the IRP because petroleum related contamination was not identified. Site 90 is a former UST basin where three 1,000-gallon steel USTs, containing heating oil, were previously located between a dry cleaning distribution facility and a heating plant. The USTs were removed in March 1993. Dry-cleaning processes were performed at this location for an unknown period of time, but were subsequently discontinued. During the years that dry cleaning operations were conducted at this location, a 250-gallon AST was located onsite.

FIGURE 8-64
IRP Site 90, Operable Unit 17

Previous investigations are listed in **Table 8-78.**

TABLE 8-78
Previous Investigations Summary, IRP Site 90

Previous Investigation/Action	Date	Activities
Focused RI (Baker, 1999)	1997 - 1999	A Focused RI was conducted to assess the nature and extent of contamination at OU17. Field activities included a site survey and soil and groundwater sampling. Analytical results identified the presence of toluene in soil samples and PCE and chloroform were detected in groundwater. Potential unacceptable human health risks were identified due to the presence of PCE in groundwater. Additional groundwater sampling was conducted in 1999 and 2000. Only TCE was detected above screening criteria at one location and there is no evidence of a large scale PCE impact of the area and NFA was recommended.
PRAP and ROD (Baker,2001)	2001	A Final PRAP was issued in July 2001 to solicit public input on the preferred alternative (no remedial actions) and a public meeting was held. The Final ROD was issued and signed on September 30, 2001.

8.2.35 Site 91 (OU 17)—Building BB-51

Site 91, Building BB-51, encompasses approximately 8 acres within OU 17, in the southeast portion of the Base in the Courthouse Bay Complex (**Figure 8-65**). OU 17 consists of three sites (Sites 90, 91, and 92) that have been grouped together based on the unique characteristic of suspected waste. All three sites were formerly part of the UST program, but were transferred to the IRP because petroleum related contamination was not identified. Site 91 is currently used by the Marine Corps School of Engineering to train personnel. The site is a former UST basin where two 300-gallon steel USTs, used to store waste oil, were previously located northeast of Building BB-51. The USTs were removed in August 1992. At the time of the UST closure, TPH contamination was detected in the soil samples.

FIGURE 8-65
IRP Site 91, Operable Unit 17

Previous investigations are listed in **Table 8-79.**

TABLE 8-79
Previous Investigations Summary, IRP Site 91

Previous Investigation/Action	Date	Activities
Focused RI (Baker, 1997)	1997	A Focused RI was conducted to assess the nature and extent of contamination at OU17. Field activities included a site survey and soil and groundwater sampling. Potential risks to human health were identified from chloroform, arsenic, iron, and manganese in groundwater. Chloroform and iron were determined not to be site related.
Supplemental Groundwater Investigation (Baker, 1999)	1999	Additional groundwater sampling was conducted in 1999 to confirm the presence of VOCs or SVOCs. Post-RI monitoring was recommended.
Post RI Groundwater Monitoring (Baker, 2001)	2000 - 2001	Post-RI groundwater monitoring was initiated in July 2000, and included quarterly groundwater sampling for VOCs, SVOCs, iron, and arsenic. The results indicated that the constituents detected were naturally occurring and not site related.
PRAP and ROD (Baker, 2001)	2001	A Final PRAP was issued in July 2001 to solicit public input on the preferred alternative (no remedial actions) and a public meeting was held. The Final ROD was issued and signed in September.

8.2.36 Site 92 (OU 17)—Building BB-246

Site 92, formerly Building BB-246, is located within OU 17, in the southeast portion of the Base in the Courthouse Bay Complex and covers approximately 1 acre (**Figure 8-66**). OU 17 consists of three sites (Sites 90, 91, and 92) that have been grouped together based on the unique characteristic of suspected waste. All three sites were formerly part of the UST program, but were transferred to the IRP because petroleum related contamination was not identified. Site 92 is a former UST basin where one 1,000-gallon steel UST, containing gasoline, were previously located. The UST was installed in 1980, deactivated in 1989, and removed in January 1994. A subsequent SI identified the presence of chlorinated hydrocarbons in the groundwater.

FIGURE 8-66
IRP Site 92, Operable Unit 17

Previous investigations are listed in **Table 8-80.**

TABLE 8-80
Previous Investigations Summary, IRP Site 92

Previous Investigation/Action	Date	Activities
Focused RI (Baker, 1997)	1997	A Focused RI was conducted to assess the nature and extent of contamination at OU17. Field activities at Site 92 included a site survey and soil and groundwater sampling. Potential human health risks were identified from acetone, arsenic, and iron in soil and chloroform in groundwater. However, the concentrations were either comparable with background or reflective of the sample decontamination process.
Post-RI Groundwater Monitoring (Baker, 2001)	2000 - 2001	Based on the findings of the Focused RI, Post-RI groundwater monitoring was conducted quarterly for VOCs, SVOCs, iron, arsenic, and manganese. The results indicated that the constituents detected were naturally occurring and not site related.
PRAP and ROD (Baker, 2001)	2001	A Final PRAP was issued in July 2001 to solicit public input on the preferred alternative (no remedial actions) and a public meeting was held. The Final ROD was issued and signed in September 2001.

8.2.37 Site 94 (OU 18)—PCX Service Station

Site 94, the PCX Service Station (Building 1613), covers approximately 1 acre and is located within the HPIA on the Mainside of the Base within the western portion of Site 78 (OU 1) (**Figure 8-67**). Building 1613 is an active facility, providing refueling services for private vehicles, and consists of a single-story brick structure flanked by three concrete pump islands on two sides. Historical records indicate that two 10,000-gallon and two 30,000-gallon USTs storing various grades of gasoline were installed northeast of Building 1613 during the 1950s. The USTs and associated petroleum-contaminated soil were removed in January 1995. During subsequent phases of investigation, free phase hydrocarbons and chlorinated organic contaminants were detected in groundwater. Soil and groundwater contamination resulting from the petroleum releases at the site is currently being remediated under NCDENR's UST program.

FIGURE 8-67
IRP Site 94, Operable Unit 18

Previous investigations are listed in **Table 8-81.**

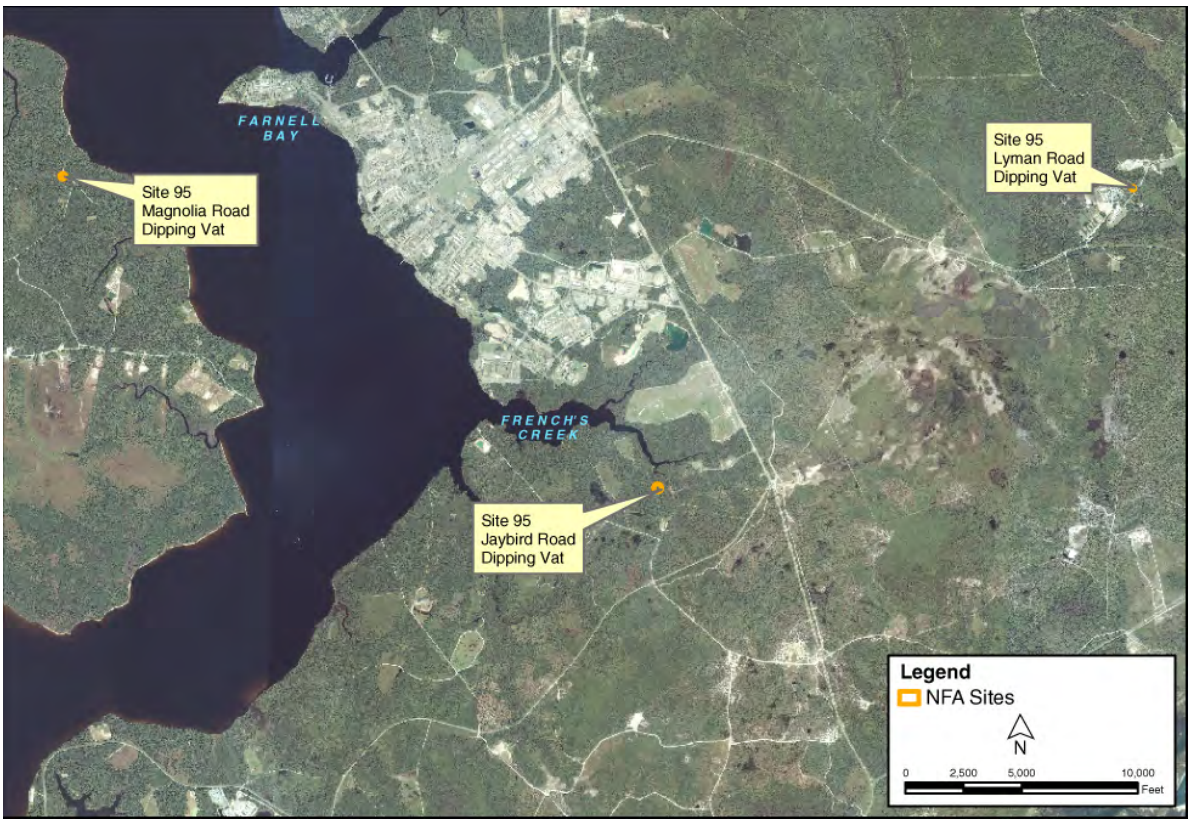
TABLE 8-81
Previous Investigations Summary, IRP Site 94

Previous Investigation/Action	Date	Activities
Groundwater Investigation (OHM, 2000)	2000	An Investigation was conducted to evaluate groundwater conditions. Analytical results identified VOCs (primarily BTEX and methyl tert-butyl ethylene [MTBE]) and PAHs at concentrations exceeding NCGWQS. A December 1, 2000 letter from the Base to NCDENR requested the transfer of the PCX Service Station to the IRP, which resulted in the subsequent CERCLA investigation activities.
RI Baseline Groundwater Sampling (CH2M HILL, 2003)	2003	To obtain the most current groundwater quality data, a baseline groundwater sampling event was conducted. Samples were analyzed for VOCs and several VOCs exceeded screening criteria.
Remedial Investigation (CH2M HILL, 2005)	2004 - 2005	An RI was conducted to further evaluate contamination near Site 94. Field activities included soil and groundwater sampling for SVOC and VOC analysis. Potential unacceptable human health risks were identified due to VOCs in groundwater. No potential unacceptable ecological risks were identified. The Final RI concluded that groundwater contamination was determined to be from an upgradient source and will be addressed as part of Site 78.
PRAP and ROD (CH2M HILL, 2006)	2006	The PRAP was issued to solicit public input on the preferred alternative (no remedial actions) and a public meeting was held. The ROD for OU 18 was issued for NFA and signed in August 2006.

8.2.38 Site 95—Dipping Vat Sites

IRP Site 95, the Dipping Vat sites, consists of three separate areas, which are identified by their locations (Jaybird Road, Magnolia Road, and Lyman Road) (**Figure 8-68**). The IRP Site 95 dipping vats were in operation from approximately 1900 through 1960 and were used to submerge livestock in a pesticide solution consisting of arsenic and synthetic pesticides, such as DDT and toxaphene. The dipping vats were discovered during an archaeological review of MCB CamLej. The dipping vats were approximately 25 to 30 feet long, 4 to 5 feet deep, and 2.5 to 3.5 feet wide, each able to hold approximately 1,500 to 2,000 gallons of dipping solution. A drip pad, approximately 12-feet by 15-feet, was constructed at the exit of each vat. Holding pens, approximately 50-feet by 50-feet, were also associated with the dipping vats.

FIGURE 8-68
IRP Site 95



Previous investigations are listed in **Table 8-82**.

TABLE 8-82
Previous Investigations Summary, IRP Site 95

Previous Investigation/Action	Date	Activities
Initial Assessment (Baker, 2004)	2004	Vats were initially identified during an archaeological investigation of the Base. Following their discovery, an initial assessment was performed on two of the three dipping vat sites (Jaybird Road and Magnolia Road), which included soil sampling for pesticides and metals. Arsenic exceeded screening criteria, and additional assessment was recommended. The third site (Lyman Road) was identified after the initial investigation.

Previous Investigation/Action	Date	Activities
Site Investigation (CH2M HILL, 2007)	2006 - 2007	Based on results from the Initial Assessment an SI field investigation was conducted. Field activities included soil and groundwater sampling for VOCs, SVOCs, pesticides/PCBs, and metals. An HHRS was completed and did not identify any unacceptable risks to human health at the Jaybird Road and Lyman Road Sites; therefore, NFA was recommended at these two locations. Potential risks to human health and the environment were identified from arsenic in soil at the Magnolia Road location and a removal action was recommended.
Engineering Evaluation/ Cost Analysis (RHEA, 2010)	2010	An EE/CA was prepared to evaluate alternatives for the NTCRA at the Magnolia Road site. The three alternatives were no action, excavation and off-site disposal, and *In-Situ* phytoremediation. A public notice was issued and public meeting was held in February 2010 to present the EE/CA. No written questions or comments were received.
Action Memorandum (CH2M HILL, 2010)	2010	An Action Memo was completed to propose excavation with off-site disposal as the NTCRA to address the arsenic contaminated soil.
Non-Time Critical Removal Action (RHEA, 2010)	2010	The NTCRA was conducted and a second vault was identified and removed from beneath the original dipping vat at the depth of the water table. Confirmation soil sampling was conducted to confirm arsenic concentrations below the cleanup level. A permanent monitoring well was installed to conduct groundwater sampling for arsenic. Arsenic concentrations in soil and groundwater were below NC standards and/or background and the site was closed with NFA.

8.3 MMRP RC Sites

8.3.1 UXO-04—Knox Trailer Park

Site UXO-04, Knox Trailer Park, encompasses approximately 134 acres in the northern portion of the Base (**Figure 8-69**). The Knox Trailer Park area began as a Civilian Conservation Corps Camp in 1941, responsible for eliminating the source of endemic malaria by draining all surrounding wetlands. This was accomplished by ditching, using dynamite, and spraying diesel oil on water surfaces as a larvicide. Additionally, a dog-training school was located in the southernmost area of the site from 1942 to 1946. The dogs were subjected to overhead rifle and machine gun fire and explosions of charges of dynamite and TNT to simulate battlefield conditions. It has also been reported that the research facilities at Camp Knox conducted testing on body armor during WW II through the early 1950s. The research was likely performed indoors, and the amount of ammunition expended for testing purposes is expected to be minimal. From the early 1950s until 2006, the area has been used for residential housing. Sometime between 1974 and 1976, an EOD technician responded to the discovery of UXO in the Knox Trailer Park area. A bulldozer operator uncovered a live WW II MK-II high-explosive hand grenade while conducting excavation activities. A visual inspection of the Knox Trailer Park was conducted in November 2002 by the Base's EOD team, and no UXO was discovered.

FIGURE 8-69
MMRP Site UXO-04

Previous investigations are listed in **Table 8-83.**

TABLE 8-83
Previous Investigations Summary, MMRP Site UXO-04

Previous Investigation/Action	Date	Activities
Expanded Site Investigation (CH2M HILL, 2009)	2005 - 2009	A phased field investigation was conducted to identify the presence and nature of MC contamination and evaluate the number and density of anomalies that represent potential subsurface MEC. Field activities included a geophysical survey, intrusive investigation, soil, groundwater, sediment and surface water sampling. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, explosives, perchlorate, and metals. No munitions-related material that would indicate historical site use as an active range was found, and the sources of all other geophysical anomalies were found to be scrap-metal. No potential unacceptable human health or ecological risks were identified. As a result, the site was recommended for NFA and removal from the MMRP. The Expanded Site Inspection Report was submitted in 2009 documenting the NFA decision.
No Further Action Decision Document (2010)	2010	The Final NFA DD was signed by the Base Commanding Officer on August 12, 2010, which stated that all investigations and actions for the MMRP Site UXO-04are complete. NFA concurrence letters on the ESI from the EPA and State were included in the NFA DD.

8.3.2 UXO-05—Mini Anti-Tank Range (ASR #2.7a, #2.7b, and #2.7c)

Site UXO-05 consists of three areas that cover approximately 70 acres. Two areas (ASR #2.7a and #2.7b) overlap and are located at the main entrance of the New River Air Station, just south of the intersection of Curtis Road and US Highway 17 (**Figure 8-70**). The other area of Site UXO-05 (ASR #2.7c) is located north of ASR #2.7a and #2.7b in the Camp Geiger area. Site UXO-05 was used as the Miniature Anti-Tank Range between 1942 and 1944. Small arms (.22 caliber rifles) were fired at a moving target car located on a transverse track.

A 500-gallon UST was located at the former Building CG1, Base Game Warden and Archery Club Office located in the southern portion of ASR #2.7a. The tank (UST-CG1-1) was installed in 1985 and reportedly contained used oil until it was removed in February 1994.

The northern area of Site UXO-05 (ASR #2.7c) overlaps a portion of MMRP Site UXO-01 (Section 3.2.3), the Former B-3 Gas Chamber (ASR #2.79b), which is currently undergoing further site investigation due to the potential for subsurface MEC based on geophysical anomalies identified during initial PA/SI activities.

FIGURE 8-70
MMRP Site UXO-05, ASR #2.7a, #2.7b, and #2.7c

Previous investigations are listed in **Table 8-84.**

TABLE 8-84
Previous Investigations Summary, MMRP Site UXO-05

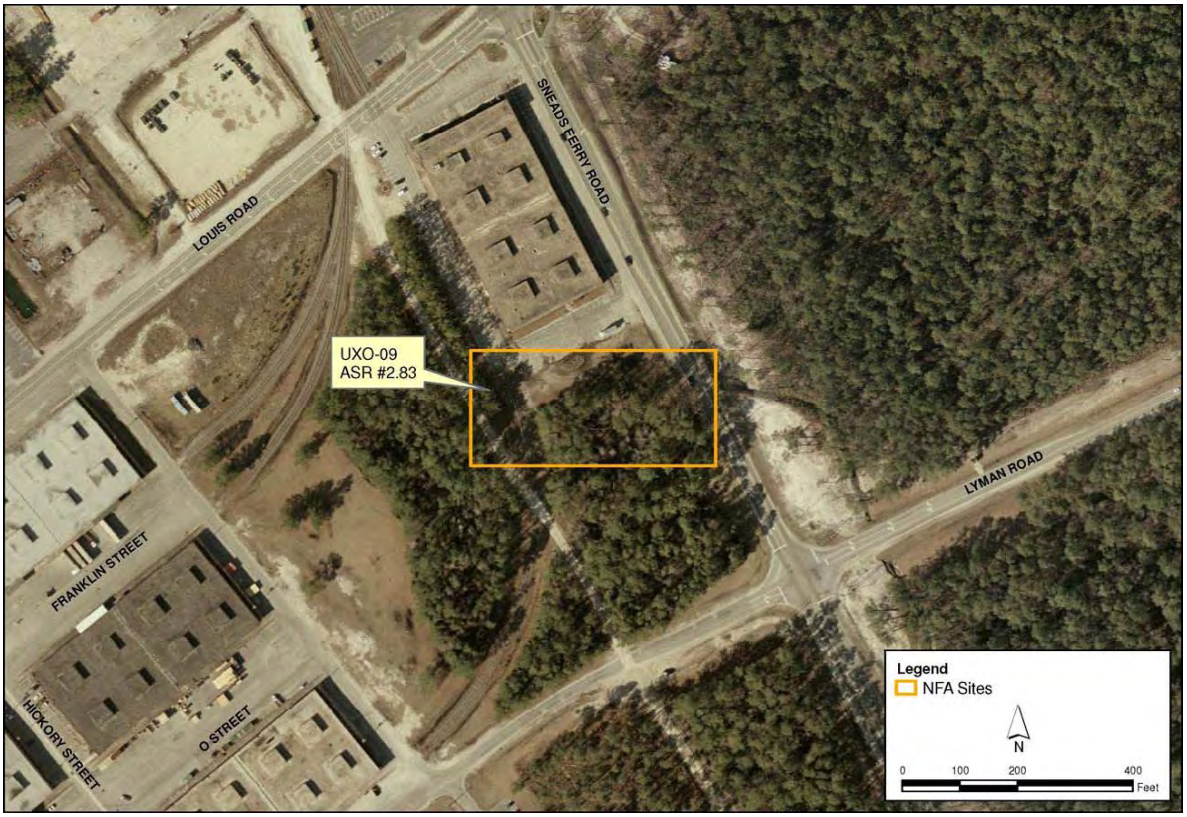
Previous Investigation/Action	Date	Activities
Limited Site Assessment Former UST CG1-1 (Law and Catlin, 2000)	2000	In February 1994, the 500-gallon used oil UST was removed from the vicinity of Building CG1. Post removal soil samples exceeded action levels for oil and grease; as a result, 4 shallow monitoring wells were installed within a 40 ft radius of the UST location and groundwater samples were collected and analyzed for volatile and extractable petroleum hydrocarbons (VPH, EPH), VOCs, SVOC, chromium, and lead. Benzene, p-isopropyl

Previous Investigation/Action	Date	Activities
		toluene, and bis(2-ethylhexyl)phthalate were detected at concentrations exceeding NCGWQS but below gross contaminant levels. Soil samples collected during well installation did not exceed NC SSLs. Based on these results, the site was issued NFA status by NCDENR in July 2000.
Onslow County Water and Sewer Authority Focused PA/SI (Arcadis, 2007)	2007	A focused PA/SI was conducted to evaluate the potential presence of MEC and impacted soil or groundwater within a proposed water line easement traversing ASR #2.7a of Site UXO-05. To characterize the subsurface conditions, DGM, soil sampling, and groundwater sampling was conducted. Samples were analyzed for VOCs, SVOCs, TPH-DRO, TPH-GRO, pesticides, PCBs, metals, TOC, TOH, perchlorate, and explosives residues. No unacceptable risks to construction workers were identified.
PA/SI (CH2M HILL, 2009)	2008 - 2009	A PA/SI was conducted at Site UXO-05 to assess the potential presence and nature of site-related impacts to human health and the environment. Field activities included surface and subsurface soil sampling, groundwater sampling, and surface water and sediment sampling. The samples were analyzed for explosives residue, perchlorate, SVOCs, and metals. No unacceptable risks to human health or the environment over that of background concentrations from exposure to site media were identified and NFA was recommended. The geophysical anomalies identified in the northern area of Site UXO-05 (ASR #2.7c) are attributed to Site UXO-01 and will be addressed as part of Site UXO-01.
No Further Action Decision Document (2009)	2009	The Final NFA DD was completed on October 5th, 2009, which stated that all investigations and actions for the MMRP Site UXO-09 are complete. Concurrence letters from the EPA and State were included in the NFA DD.

8.3.3 UXO-09—F-9, Triangulation Range (ASR #2.83)

Site UXO-09 encompasses approximately 3 acres in the HPIA (**Figure 8-71**). The F-9 Triangulation Range area was established in or prior to 1953. As reported in the ASR Report, interviews with base personnel indicate that the range was used for M-1 rifle target practice. Base personnel also indicated that the original range was most likely 100 feet wide and approximately 25 to 50 feet long, and may have contained a large dirt berm as a bullet stop. Based on interviews with base personnel, former munitions use was limited to small arms ammunition.

FIGURE 8-71
MMRP Site UXO-09, ASR #2.83



Previous investigations are listed in **Table 8-85.**

TABLE 8-85
Previous Investigations Summary, MMRP Site UXO-09

Previous Investigation/Action	Date	Activities
PA/SI (CH2M HILL, 2009)	2008 - 2009	A PA/SI was conducted to assess the potential presence and nature of site-related impacts to human health and the environment. Field activities included surface and subsurface soil sampling and groundwater sampling. The samples were analyzed for explosives residue, perchlorate, and total metals. No unacceptable risks to human health or the environment from exposure to site media were identified based on current and potential future land uses at Site UXO-09 and NFA was warranted.
No Further Action Decision Document (2010)	2010	The Final NFA DD was signed by the Base Commanding Officer on August 12, 2010, which stated that all investigations and actions for the MMRP Site UXO-09 are complete. NFA concurrence letters on the PA/SI from the EPA and State were included in the NFA DD.

8.3.4 UXO-12—1,000-inch Range (ASR #2.5)

Site UXO-12, the 1,000-inch Range, encompasses approximately 30 acres generally located west of Camp Geiger, in the northwest portion of the Base (**Figure 8-72**). The 1,000-inch range was established under Camp Training Order Number 7-1945, dated March 19, 1945, and was disestablished in March 1946 and no longer used for the firing of live ammunition. During operation of the site, munitions used included small caliber munitions (.30 caliber weapons firing). The site is being investigated as part of Site UXO-18 (Section 3.2.14) because it is located within the boundaries of the former B-6 small arms ranges.

FIGURE 8-72
MMRP Site UXO-12, ASR #2.5

Previous investigations are listed in **Table 8-86**.

TABLE 8-86
Previous Investigations Summary, MMRP Site UXO-12, ASR #2.5

Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL, 2011)	2009 - 2011	A field investigation was conducted to identify the presence or absence of contamination at the site. An XRF survey was conducted and surface water, sediment, and soil samples were collected and analyzed for select metals. No unacceptable human health or ecological risks were identified and the site was closed with NFA.
No Further Action Decision Document (2010)	2010	The Final NFA DD was submitted in August 2011, which stated that all investigations and actions for the MMRP Site UXO-12 are complete. NFA concurrence letters on the PA/SI from the EPA and State were included in the NFA DD.

8.3.5 UXO-13—Naval Regional Medical Center

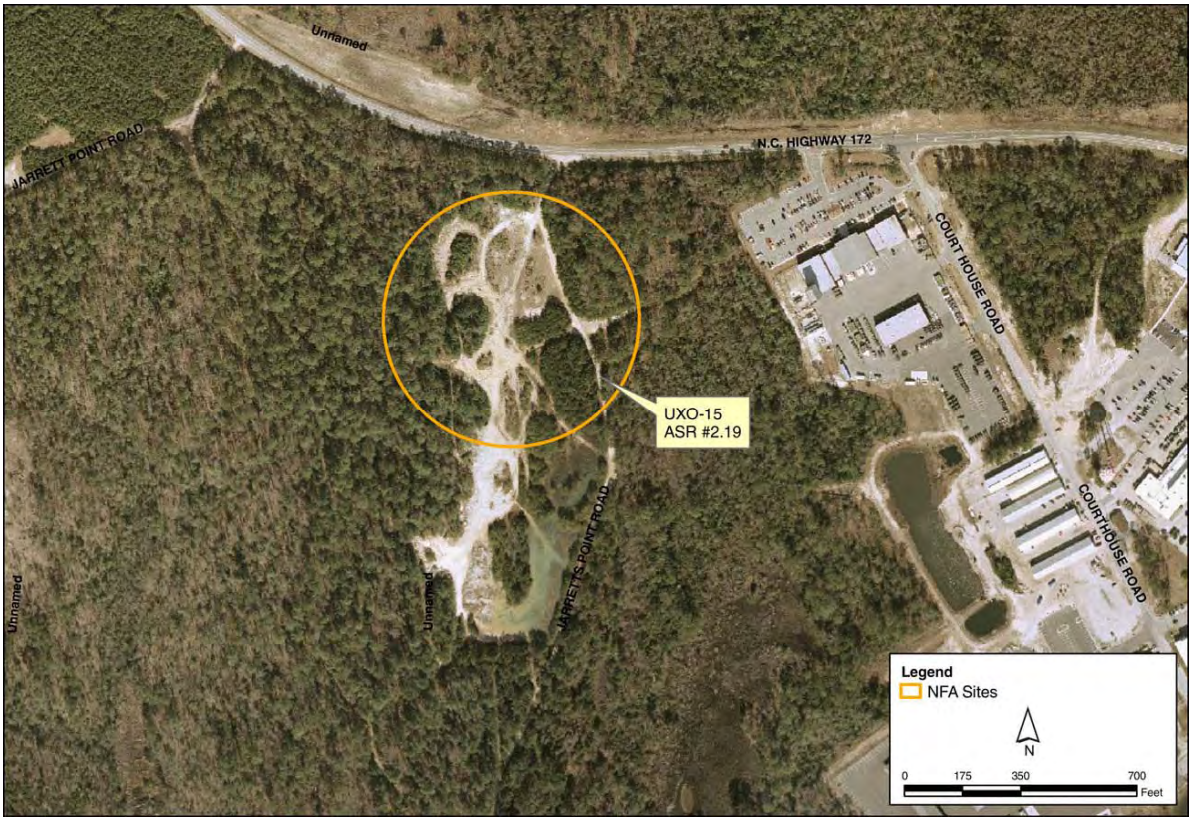
Site UXO-13, the Naval Regional Medical Center, encompasses approximately 176 acres located on the Mainside of the Base (**Figure 8-73**). No known historic live fire activities were conducted within this area; rather it was designated as a "Maneuver Training Area" used to train troops in non-live fire operations. UXO-13 was administratively closed on March 24, 2004 due to no known historic live-fire activities on this range.

FIGURE 8-73
MMRP Site UXO-13

8.3.6 UXO-15—1,000-inch Range (ASR #2.19)

The Former 1,000-inch Range (ASR #2.19) comprises approximately 9 acres and is located in the northern portion of the Courthouse Bay Amphibious Area where a MILCON project is proposed (**Figure 8-74**). Small arms, including M1 rifles and .30- and .45-caliber pistols were typically fired at the 1,000-inch ranges. The 1,000-inch Range was disestablished on March 19, 1946 and is no longer used for firing live ammunition. The Courthouse Bay Amphibious Area (including the Former 1,000-inch Range) is currently used by the Amphibian Assault Battalion to evaluate track vehicle performance as part of the Joint College Training Area.

FIGURE 8-74
MMRP Site UXO-15, ASR #2.19



Previous investigations are listed in **Table 8-87.**

TABLE 8-87
Previous Investigations Summary, MMRP Site UXO-15

Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL, 2010)	2008 - 2010	In support of proposed MILCON activities, a field investigation was conducted to identify the presence and nature of MC contamination. Field activities included soil sampling for metals and perchlorate. Arsenic and antimony were detected at levels exceeding screening criteria; however, no MC-related contamination was identified in soil. No potential unacceptable human health or ecological risks were identified and NFA was recommended.
No Further Action Decision Document (2010)	2010	The Final NFA DD was signed by the Base Commanding Officer on August 12, 2010, which stated that all investigations and actions for the MMRP Site UXO-15 are complete. Concurrence letters from the EPA and State were included in the NFA DD.

8.3.7 UXO-16—Gun Positions 41A and 41B (ASR #2.212)

Site UXO-16, also referred to as Former Gun Positions 41A and 41B, was first established during World War II (WW II) as a training ground and was also used during the Korean War-era as a training ground (**Figure 8-75**). Howitzers were reportedly positioned at Site UXO-16 and fired 105 mm and 155 mm munitions into the K-2 and G-10 Impact Areas; other munitions suspected to be used at Site UXO-16 include 4.2-inch, 81mm, 120mm, 175mm, 4.2-inch, and 8-inch munitions.

FIGURE 8-75
MMRP Site UXO-16, ASR #2.212

Previous investigations are listed in **Table 8-88.**

TABLE 8-88
Previous Investigations Summary, MMRP Site UXO-16

Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL, 2009)	2008 - 2009	In support of proposed MILCON activities, a field investigation was conducted to identify the presence and nature of MC contamination and evaluate the number and density of anomalies that represent potential subsurface MEC. Field activities included DGM and soil and groundwater sampling for explosives, perchlorate, and metals. A total of 895 geophysical anomalies potentially representing subsurface MEC were identified and intrusively investigated. All items were found to be MD or cultural debris (CD). No further MEC investigations were recommended; however, because it is not possible to provide 100 percent assurance that all MEC items were removed, training and on-call support during construction activities were recommended. No MC-related contamination was identified in site media. No unacceptable risks to human health or the environment were identified. NFA was recommended.
No Further Action Decision Document (2010)	2010	The Final NFA DD was signed by the Base Commanding Officer on August 12, 2010, which stated that all investigations and actions for the MMRP Site UXO-16 are complete. Concurrence letters from the EPA and State were included in the NFA DD.

8.3.8 UXO-18—B-6, 50-foot Small Arms Range (ASR #2.44)

Site UXO-18, covers approximately 176 acres and consists of several small ranges (**Figure 8-76**). The B-6 ranges were used between 1950 and 1961. Twenty-five target stations were reportedly used for .22 caliber (rifle and pistol) ammunition and 10 target stations were used for .32, .38, and .45 caliber (pistol) ammunition. The B-6 ranges, located north of Curtis Road and Hicks Run Road, were identified for closure. Site UXO-12 (Section 3.2.11) is located within the boundaries of the former B-6 small arms ranges and is being investigated as part of Site UXO-18.

FIGURE 8-76
MMRP Site UXO-18, ASR #2.44

Previous investigations are listed in **Table 8-89**.

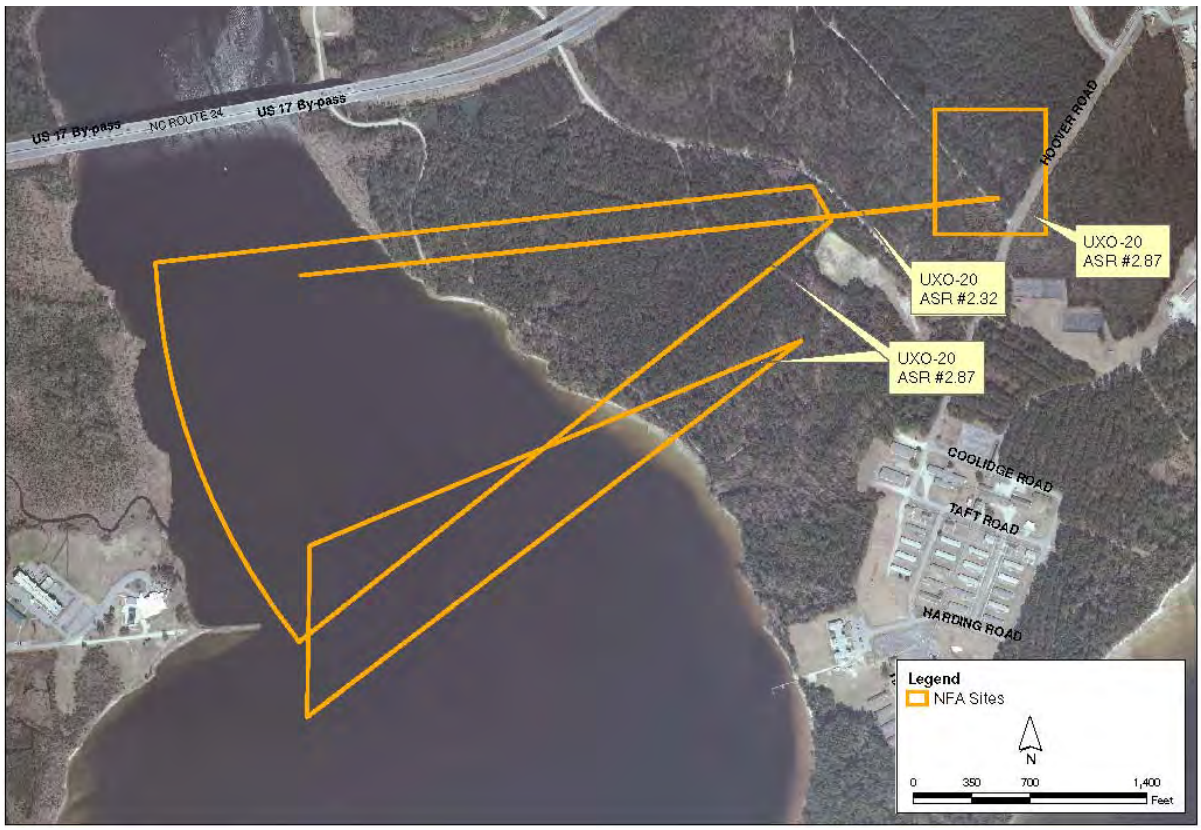
TABLE 8-89
Previous Investigations Summary, MMRP Site UXO-18, ASR #2.44

Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL, 2011)	2010 - 2011	A field investigation was conducted to identify the presence or absence of contamination at the site. An XRF survey was conducted and surface water, sediment, and soil samples were collected and analyzed for select metals. No unacceptable human health or ecological risks were identified and the site was closed with NFA.
No Further Action Decision Document (2010)	2010	The Final NFA DD was submitted in August 2011, which stated that all investigations and actions for the MMRP Site UXO-18 are complete. NFA concurrence letters on the PA/SI from the EPA and State were included in the NFA DD.

8.3.9 UXO-20—1,000-inch Range Montford point (ASR #2.32) A-1, 50-foot .22 Caliber Range (ASR #2.87)

Site UXO-20, includes two former small arms ranges in the Camp Johnson (Montford Point) area covering approximately 75 acres (**Figure 8-77**). The 1,000-inch Range (ASR #2.32) was used from the 1940s until the mid-1950s as a Familiarization Range for .30 caliber Browning automatic rifles. The A-1, 50-foot .22 Caliber Range (ASR #2.87) was used during the 1950s and is believed to have been inactive since 1957 and is adjacent to and overlapping the 100-inch range delineation.

FIGURE 8-77
MMRP Site UXO-20, ASR #2.32 and #2.87



Previous investigations are listed in **Table 8-90.**

TABLE 8-90
Previous Investigations Summary, MMRP Site UXO-20, ASR #2.32 and #2.87

Previous Investigation/Action	Date	Activities
Preliminary Assessment/Site Inspection (CH2M HILL, 2011)	2009 - 2011	In support of potential MILCON activities within the Camp Johnson area, a field investigation was conducted in FY 2009. Groundwater and soil samples were collected and analyzed for select metals. Although arsenic was detected above screening levels throughout the range area, no unacceptable human health or ecological risks were identified in site media. Based on the results of the PA/SI, the site was closed with NFA.
No Further Action Decision Document (2010)	2010	The Final NFA DD was submitted in October 2011, which stated that all investigations and actions for the MMRP Site UXO-20 are complete. NFA concurrence letters on the PA/SI from the EPA and State were included in the NFA DD.

SECTION 9

Additional Site Investigations

The following sections discuss the site history, summary of previous investigations, and future activities of the six additional sites that have not been assigned IRP or MMRP site designations but are being investigated following the CERCLA process (**Figure 2-8**).

9.1 Off-Base Surface Danger Zones

Four historic off-Base surface danger zones (SDZs) were identified based on historic range maps and documents reviewed by the Base. The former SDZs (Rocket Range Number 1 (ASR #2.33), Direct Fire Artillery Range (G-7) (ASR #2.61), G-6 Artillery Range (ASR #2.62), and Impact Area N-1 (ASR #2.207) including Bomb Target-3 and Bomb Target-5) were of various configurations from the 1940s to 2007. SDZs are safety buffers and not impact areas. The SDZs are located adjacent to the southeastern boundary of MCB CamLej (**Figure 2-8**), and encompass approximately 1,632 acres encroaching on off-Base property. The off-Base property includes private, state-administered, and state-owned property owners.

A PA/SI was initiated in 2009 (CH2M HILL, 2009) to identify potential historical activities that may have impacted environmental media from MEC and/or munitions constituents, assess geophysical anomalies that represent the potential presence and density of MEC, and evaluate potential risks to human health or the environment relating to contamination from historical range activities. The land owners were contacted regarding the SDZs and for access approval, a fact sheet was issued, and a public meeting was held. An Aerial Geophysical Survey was conducted over the area and 2,019 target anomalies were identified and DGM was conducted on the dry land areas and approximately 3,165 anomalies were identified. Groundwater, soil, sediment, and surface water/pore water was sampled and analyzed for metals, explosives, and perchlorate. Base Range Control is planning a separate investigation to identify geophysical anomalies to acquire on Hammocks Beach in 2010-2011. The report of findings will be completed in 2011.

9.2 Proposed Fitness Center (P-714) MILCON Area

The MILCON area for the P-714 Fitness Center is located within MCAS New River, west of the intersection of Douglas Road and Schmidt Street (**Figure 2-8**). The site encompasses approximately 13 acres of predominantly wooded land within the B-6, 50-foot Small Arms Range (ASR #2.44) and B-12, Baffled Pistol Range (ASR #2.134). In preparation for the proposed MILCON project, a PA/SI was initiated in 2010 to identify historical activities that may have resulted in environmental contamination with MEC or MC, evaluate the presence and nature of MC contamination, and assess potential human health and ecological risks. Groundwater, soil, sediment, and surface water sampling was conducted for metals and perchlorate analysis in FY 2010. No unacceptable risks to human health and the environment were identified and the report was finalized in 2011.

9.3 Base Boundary Survey

A Base Boundary Survey was completed in FY 2010 to identify current and historical activities at the properties adjacent to MCB CamLej that may have resulted in environmental impacts to the Base and to evaluate potential on-Base impacts to soil and groundwater in the vicinity of identified off-Base areas of potential concern (AOPCs). After conducting a public database search and performing field reconnaissance, 12 AOPCs were identified. Environmental sampling was conducted at the AOPCs to evaluate the presence or absence of soil and/or groundwater contamination onto MCB CamLej. Based on the results, potential on-Base impacts to groundwater were identified at three of the AOPCs (**Figure 2-8**). The *Base Boundary Report for Potential Off-Base Contamination Encroachment, Marine Corps Base Camp Lejeune* (CH2M HILL, 2010) documents the results of the records review and field investigation and a summary of the three AOPCs identified are provided below. In 2010, the Base notified EPA and NCDENR of the results and additional delineation sampling was conducted in 2011 and is ongoing at AOPC 10. An addendum to the 2010 report is planned for submittal in 2012.

9.3.1 AOPC 9—Camp Knox Road and NC Highway 24

AOPC 9 is located near the intersection of Highway 24 and Bell Fork Road. AOPC 9 was chosen for intrusive sampling due to the presence of one operational gasoline retail station (utilizing USTs), two former UST sites, and one leaking underground storage tank (LUST) site (Chico's Tires). All of these sites are located directly across the US Highway 24/Lejeune Boulevard right-of-way, approximately 100 feet north of the Base boundary. The active gasoline station and the two former UST sites were not listed as release sites, but were reported to store gasoline, diesel fuel, and heating oil. The database search report indicated that a release from the Chico's Tires UST system occurred in 1998. According to the database search, a Limited Site Assessment received by NCDENR in 2001 concluded that the soil was not impacted above the maximum soil contaminant concentrations, but that petroleum contaminant concentrations exceeded the NCGWQS. The database report indicates that the Chico's Tires LUST incident received a NFA status through a Notice of Residual Petroleum.

Groundwater sampling for VOCs, SVOCs, and lead was conducted and MTBE, a gasoline additive commonly associated with petroleum releases, was detected above the NCGWQS in deep groundwater at one location.

9.3.2 AOPC 10—Tarawa Boulevard and NC Highway 24

AOPC 10 is located at the intersection of NC Highway 24 and Tarawa Boulevard. This area was chosen for intrusive investigation due to the presence of three active gasoline stations (UST sites), one LUST site (Silance Service Station), and two former dry cleaning facilities (Coastal Dry Cleaners and Three Hours Cleaners), located on the northern side of NC Highway 24. In 1993, one 4,000-gallon and two 5,000-gallon USTs containing gasoline were removed from the property, and petroleum hydrocarbon contamination was discovered. Following the tank Silance Service Station and an assessment of the release was initiated. In 2002, 1,122 tons of petroleum-impacted soil was excavated from the source area to accelerate natural attenuation. Benzene was detected in groundwater above the NCGWQS in 2003.

Groundwater sampling for VOCs, SVOCs, and lead was conducted and seven VOCs (PCE, TCE, 1,2-DCA, benzene, MTBE, chloromethane, bromodichloromethane) and/or one SVOC (naphthalene) were detected in groundwater at concentrations above the NCGWQS. The chlorinated volatile organic compounds (PCE, TCE, 1,2-DCA) detected are commonly associated with a release from a dry cleaner facility. The petroleum-related compounds (benzene, MTBE, naphthalene) detected are likely associated with a petroleum release, as documented in former UST reports submitted to NCDENR. The halogenated methanes (chloromethane, bromodichloromethane) are not typically associated with petroleum or dry cleaner releases, but are by-products of the disinfection of drinking water and also commonly occur as laboratory contaminants.

9.3.3 AOPC 11—Former Dogwood Variety Store

AOPC 11, located off of Highway 172 in Hubert, NC, was chosen for intrusive sampling due to the proximity to the Dogwood Variety Store LUST site, which is located on the eastern side of NC Highway 172 approximately 100 feet from the Base Boundary (**Figure 2-8**). Records from NCDENR indicate that a petroleum release was reported in December 1992 at the Dogwood Variety Store. The type of petroleum product released was not determined. The service station was closed around 1985 and three gasoline USTs and one diesel UST were removed from the site in December 1992. Laboratory analysis of a groundwater sample collected during the UST removal process reported BTEX concentrations exceeding NCGWQS. In June 2004, an additional site assessment was conducted and identified petroleum hydrocarbon-related compounds in groundwater at concentrations exceeding the NCGWQS. The management of this UST incident has been transferred to the NCDENR State Lead program.

Groundwater sampling for VOCs, SVOCs, and lead was conducted and five VOCs (benzene, ethylbenzene, xylenes, TCE, bromodichloromethane), three SVOC (naphthalene, 2-methylnaphthalene, bis(2-ethylhexyl)phthalate), and/or lead were detected in groundwater at concentrations above the MCLs/NCGWQS. During well installation, a petroleum odor and NAPL was identified. The petroleum-related compounds (benzene, ethylbenzene, xylenes, naphthalene) detected are likely associated with a historical petroleum release as documented in NCDENR UST records. Although lead was also detected above the MCL/NCGWQS and may be associated with a release, the temporary monitoring wells were not developed prior to sampling, resulting in high turbidity during sample collection. The sample turbidity may have contributed to the presence of lead.

Bromodichloromethane and bis(2-ethylhexyl)phthalate are not typically associated with petroleum releases, but commonly occur as laboratory contaminants.

9.3.4 SWMU 350—Former ASTs STT-61 through STT-66

The former AST facility, which consisted of Tanks STT-61 through STT-66, is located approximately 400 ft east of Iwo Jima Boulevard, a former entrance to the Tarawa Terrace housing development of MCB CamLej (**Figure 2-8**). SWMU 350 is currently a vacant one-half acre open grass field and a former railroad line and spur were located just south of the former ASTs. North of SWMU 350 and across NC State Highway 24 are several commercial businesses. Two documented LUST sites, including Circle K 8216 and a former Padgetts Toyota dealership, are located approximately 650 feet and 800 feet, respectively, northeast of SWMU 350.

The six ASTs (each with approximately 30,000 gallon capacity) at the facility were installed in 1942 and used for liquid propane storage until 1984. Rail cars would deliver and off-load liquid propane to the ASTs and the propane would subsequently be transferred from the tanks to delivery tanker trucks for service to MCB CamLej. In 1984, the AST piping system was modified and the facility was changed to waste oil storage. The six ASTs were removed in 1993, and the associated subsurface fuel lines for the tank system were left in-place.

Starting in 1990, environmental investigations conducted in the vicinity of the ASTs reported chlorinated and petroleum compounds in residual product collected from Tank STT-66, as well as in soil samples. Petroleum hydrocarbons and chlorinated VOCs were identified in groundwater located south and southwest of the SWMU. An interim measures soil removal was completed in 2006, consisting of the removal of fuel lines and impacted soils associated with the former AST system. Approximately 200 tons of soils were removed from the SWMU 350 trenches and disposed of as a non-hazardous waste material. In 2007, a Confirmatory Sampling Investigation (CSI) was conducted to further evaluate potentially impacted soil and groundwater at SWMU 350. Only arsenic and mercury were detected in soils at concentrations exceeding screening levels. In groundwater, benzene and naphthalene were detected at concentrations exceeding the NCGWQS. In July 2007, groundwater sampling was conducted around the Tarawa Terrace II Elementary School (Building TT-84), located downgradient from the site and there were no detections above the NCGWQS.

An RFI was initiated in 2009 to identify a potential source area for VOCs and to define the extent of groundwater impacts and is ongoing. The source of contamination at SWMU 350 was originally assumed to either be the former AST facility or an unknown source located west of the AST facility. Based upon the RFI field activities conducted to-date, a BTEX and chlorinated VOC plume was identified in the intermediate and deep groundwater zones in the area west and south of the former AST area and no exceedances of BTEX or chlorinated VOCs were reported in soil or shallow groundwater samples west of the former ASTs. The presence of the may be from an off-site, upgradient source located north and/or northwest of the former ASTs.

SECTION 10

Sites Transferred

This section discusses the site history for two sites which were transferred from the IRP to the UST program (**Figure 2-9**).

10.1 IRP Sites Transferred

10.1.1 Site 22—Industrial Area Tank Farm

Site 22, the Hadnot Point Fuel Farm, is located within the HPIA on the Mainside of the Base (**Figure 2-9**). All sampling events in and around Site 22 indicated that petroleum-related products from tanks were the only apparent source of contamination. Further, the tanks at Site 22 contain only jet fuel and the site is exempt from CERCLA under the petroleum exclusion. In a letter dated April 21, 1992, the Superfund Section of NCDENR suggested that all further remediation work at Site 22 would be appropriately performed under the UST program of the State of North Carolina.

Previous investigations are listed in **Table 10-1.**

TABLE 10-1
Previous Investigations Summary, Site 22

Previous Investigations/Actions	Date	Activities
Confirmation Study (1984)	1984 - 1988	A Confirmation Study was conducted to determine the presence or absence of contamination at the site. Field activities included groundwater sampling. The Confirmation Study confirmed the presence of VOCs related to fuels and/or solvents in groundwater and nearby water supply wells. As a result, four supply wells (HP-601, HP-602, HP-608, and HP-634) were immediately shut down. In addition, three groundwater plumes were identified in the shallow portion of the surficial aquifer, centered in the vicinity of Building 902, Site 22, and Building 1601.
HPFF Groundwater Study (O'Brien and Gere, 1990)	1990	A groundwater study was conducted at Site 22 as part of the MCB CamLej UST Program. The study concluded that fuel losses likely occurred predominantly through leaks in the transfer lines or valves. Analysis indicated that floating product had contributed significant levels of dissolved petroleum compounds including BTEX into the groundwater. Trace levels of non-petroleum VOCs including TCE and PCE were also detected within the fuel farm area. Based on the results of this study, a product recovery/groundwater treatment system was designed for the fuel farm and began operation in 1991.
Supplemental Characterization Study (1991)	1990 - 1991	A Supplemental Characterization Study was performed to further evaluate the extent of contamination in the shallow and deeper portions of the aquifer and to characterize the contamination within the shallow soils at suspected source locations. The study concluded that TCE was only present in soils associated with a UST at Building 902, which was reportedly used to store spent solvents. The results of the shallow groundwater sampling confirmed findings from previous investigations; and the results from the intermediate and deep monitoring wells identified BTEX downgradient of the fuel farm and at other areas of the site.

10.1.2 Site 45—Campbell Street Underground AVGAS Storage and Adjacent JP Fuel Farm

The Campbell Street Underground AVGAS Storage and Adjacent JP Fuel Farm (Site 45) is located at the intersection of Campbell and White Streets aboard MCAS New River (**Figure 2-9**). The Campbell Street Fuel Farm is an active fuel storage facility, with four 215,000-gallon steel above ground storage tanks that hold JP-5 jet fuel, which is pumped to the tarmac helicopter refueling station via an underground delivery line. Although Site 45

was initially identified for inclusion on the NPL, petroleum-related contamination is exempt from CERCLA and remediation work at Site 45 will be appropriately performed under the UST program of the State of North Carolina.

SECTION 11

References

AGVIQ/CH2M HILL Joint Venture 1 (JV1) 2006. Site 88 Building 25 Source Removal Non-Time Critical Removal Action Report, Operable Unit No. 15, Marine Corps Base, Camp Lejeune, North Carolina. August.

AGVIQ/CH2M HILL Joint Venture 2008. Phase 2 Pilot Study Report, Site 73, Operable Unit 21, Marine Corps Base, Camp Lejeune, North Carolina. October.

AH Environmental Consultants. 2002. *Wellhead Protection Plan-2002 Update, Marine Corps Base, Camp Lejeune.* August.

Aleut World Solutions, LLC. 2009. Radiological Investigation, Former Naval Medical Research Facility Laboratory, Marine Corps Base Camp Lejeune, Jacksonville, NC. September.

Arcadis. 2007. Focused Preliminary Assessment/Site Inspection, AOC#1, Proposed Water Line Easement Near MMRP Site UXO-05 (Mini Anti-tank Range), Marine Corps Base Camp Lejeune. August.

Baker Environmental, Inc. (Baker). 1992. Interim Record of Decision for Operable Unit No. 1, Site 78, Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1993. Record of Decision for Operable Unit No. 2 (Sites 6, 9, and 82), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1993. Record of Decision for Operable Unit No. 3, Site 48. Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1993. Remedial Investigation, Operable Unit 12, Site 3, Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1994. Site Inspection Report, Site 63, Verona Loop Dump, Marine Corps Base, MCB Camp Lejeune, North Carolina. January.

Baker. 1994. Feasibility Study Report, Operable Unit Number 5 – Site 2, Marine Corps Base Camp Lejeune, North Carolina. May.

Baker. 1994. Proposed Remedial Action Plan, Operable Unit No 5 (Site 2), Marine Corps Base, MCB Camp Lejeune, North Carolina. May.

Baker. 1994. Remedial Investigation Report, Operable Unit Number 5 (Site 2), Marine Corps Base Camp Lejeune, North Carolina. May.

Baker. 1994. Remedial Investigation Report, Operable Unit No. 1 (Sites 21, 24, and 78), Marine Corps Base Camp Lejeune, North Carolina. June.

Baker. 1994. Interim Remedial Action, Remedial Investigation, Operable Unit No. 10, Site 35 – Camp Geiger Fuel Farm, Marine Corps Base Camp Lejeune, North Carolina. July.

Baker. 1994. Record of Decision for Operable Unit No. 1 (Sites 21, 24, and 78), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1994. Record of Decision for Operable Unit No. 5 (Site 2), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1994. Soil Interim Record of Decision for Operable Unit No. 10 (Site 35), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1995. Remedial Investigation at Operable Unit No. 10 (Site 35, Camp Geiger Area Fuel Farm), Marine Corps Base Camp Lejeune, North Carolina. May.

Baker. 1995. Remedial Investigation Report, Operable Unit No. 7 (Sites 1, 28, and 30), Marine Corps Base Camp Lejeune, North Carolina. June.

Baker. 1995. Explanation of Significant Difference, Operable Unit No. 1. Marine Corps Base Camp Lejeune. October.

Baker. 1995. Remedial Investigation Report, Operable Unit No. 9 (OU 9) Site 65, Volume I of II, Marine Corps Base Camp Lejeune, North Carolina. November.

Baker. 1995. Remedial Investigation Report, Operable Unit No. 9 (OU 9) Site 65, Volume II of II, Marine Corps Base Camp Lejeune, North Carolina. November.

Baker. 1995. Record of Decision for Operable Unit No. 4 (Sites 41 and 74), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1995. Groundwater Interim Record of Decision for Operable Unit No. 10 (Site 35), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1995. Remedial Investigation/Feasibility Study, Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1995. Remedial Investigation Report Operable Unit No 4. (Sites 41 and 74), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1996. Remedial Investigation Report, Operable Unit No. 8 Site 16. Marine Corps Base Camp Lejeune, North Carolina. January.

Baker. 1996. Remedial Investigation Report, Operable Unit No. 11 Site 80. Marine Corps Base Camp Lejeune, North Carolina. April.

Baker. 1996. Remedial Investigation Report, Operable Unit No. 20 (Site 86), Marine Corps Base Camp Lejeune, North Carolina. August.

Baker. 1996. Remedial Investigation Report, Operable Unit No. 13 Site 63. Marine Corps Base Camp Lejeune, North Carolina. October.

Baker. 1996. Draft Supplemental Groundwater Investigation, Operable Unit No. 10 (Site 35, Camp Geiger Area Fuel Farm), Marine Corps Base Camp Lejeune, North Carolina. November.

Baker. 1996. In-situ Air Sparging Treatability Study Report Operable Unit No. 10 (Site 35). Marine Corps Base Camp Lejeune, North Carolina. November.

Baker. 1996. Record of Decision for Operable Unit No. 7 (Sites 1, 28, and 30), Marine Corps Base Camp Lejeune, North Carolina. Marine Corps Base, Camp Lejeune, North Carolina.

Baker. 1996h. Record of Decision for Operable Unit No. 8 (Site 16), Marine Corps Base Camp Lejeune, North Carolina.

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

Baker. 1997. Remedial Investigation Report, Site 73 Amphibious Vehicle Maintenance Facility, Marine Corps Base Camp Lejeune, North Carolina. November.

Baker. 1997. Record of Decision for Operable Unit No. 11 (Sites 7 and 80), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1997. Record of Decision for Operable Unit No. 13 (Site 65), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 1998. Phase I and II Treatability Report, Operable Unit No. 14 (Site 69), Marine Corps Base Camp Lejeune, North Carolina. January.

Baker. 1998. Groundwater Modeling Report, Operable Unit No. 9, Site 73 – Amphibious Vehicle Maintenance Facility, Marine Corps Base Camp Lejeune, North Carolina. April.

Baker. 1998. Focused Remedial Investigation Report for Operable Unit No. 15 (Site 88), Marine Corps Base Camp Lejeune, North Carolina. May.

Baker. 1998. Feasibility Study, Operable Unit No. 9, Site 73 – Amphibious Vehicle Maintenance Facility, Marine Corps Base Camp Lejeune, North Carolina. July.

Baker. 1998. Pre-Remedial Investigation Screening Study, Sites 12, 68, 75, 76, 84, 85, and 87 Marine Corps Base Camp Lejeune, North Carolina. November.

Baker. 1998. Focused Remedial Investigation Report for Operable Unit No. 16 (Sites 89 and 93), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 2000. Interim Record of Decision for Operable Unit No. 14 (Site 69), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 2000. Amended Record of Decision for Operable Unit No. 12 (Site 3), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 2000. Land Use Control Implementation Plan, OU No.1, Sites 21, 24 and 78), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 2001. Focused Remedial Investigation (4 Parts) Operable Unit 17 (OU17) Sites 90, 91, and 92 Including Appendices A-J.8, Marine Corps Base Camp Lejeune, North Carolina. April.

Baker. 2001. Site Investigation Report for Site 10 – Original Base Landfill, Marine Corps Base Camp Lejeune, North Carolina. July.

Baker. 2001. Record of Decision for Operable Unit No. 9 (Site 65), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 2001. Record of Decision for Operable Unit No. 17 (Sites 90, 91, and 92), Marine Corps Base Camp Lejeune, North Carolina.

Baker. 2001. Supplemental Investigation Site 89, Operable Unit 16, Marine Corps Base Camp Lejeune, North Carolina.

Baker. 2002. Site 93 Additional Plume Characterization Letter Report for Site 93, Marine Corps Base Camp Lejeune, North Carolina. March.

Baker. 2002. Remedial Investigation, Site 84, Operable Unit No. 19, Marine Corps Base Camp Lejeune, North Carolina. May.

Baker. 2002. Feasibility Study Operable Unit No. 6 (Sites 36, 43, 44, and 54). Marine Corps Base Camp Lejeune, North Carolina.

Baker. 2004. Suspected Dipping Vat Sampling and Suspected Asbestos Shingle/Transit Board Sampling. June.

Baker. 2005. Record of Decision for Operable Unit No. 6 (Sites 36, 43, 44, and 54), Marine Corps Base, Camp Lejeune, North Carolina. January.

Baker. 2005. Phase II SWMU Confirmatory Sampling Report, Marine Corps Base at Camp Lejeune, North Carolina. April.

Baker. 2005. Phase II SWMU Confirmatory Sampling Report, Marine Corps Base at Camp Lejeune, North Carolina. April.

Baker et al. 2003. Technology Evaluation, Operable Unit 21, Site 73, Marine Corps Base, Camp Lejeune, North Carolina. May.

Baker et al. 2003. Amended Remedial Investigation (RI) Operable Unit No. 20 (Site 86, Tank Area AS419-AS421). May.

Battelle Memorial Institute. 2001. Reductive Anaerobic Biological In-Situ Treatment Technology (RABITT) Treatability Test Report.

Cardinell, A. P., S. A. Berg, and O. B. Lloyd, Jr. 1993. *Hydrogeologic Framework of U.S. Marine Corps Base at Camp Lejeune, North Carolina.* Water Resources Investigations Report 93-4049. U.S. Geological Survey.

Catlin. 1997. Leaking Underground Storage Tank Well Installation and Monitoring, Limited Site Assessments, Marine Corps Base at Camp Lejeune, North Carolina. December.

CH2M HILL, Baker, and CDM. 2003. Natural Attenuation Evaluation Report, Operable Unit 10, Site 35, Former Camp Geiger Fuel Farm, Marine Corps Base Camp Lejeune, North Carolina. April.

CH2M HILL. 2001. No Action Decision Document, Site 12, Marine Corps Base Camp Lejeune, North Carolina. May.

CH2M HILL. 2001. No Action Decision Document, Site 75, Marine Corps Base Camp Lejeune, North Carolina. May.

CH2M HILL. 2001. No Action Decision Document, Site 76, Marine Corps Base Camp Lejeune, North Carolina. May.

CH2M HILL. 2001. No Action Decision Document, Site 87, Marine Corps Base Camp Lejeune, North Carolina. May.

CH2M HILL. 2002. Natural Attenuation Evaluation Report, Operable Unit No. 21 (Site 73), Amphibious Vehicle Maintenance Facility, Marine Corps Base Camp Lejeune, North Carolina. January.

CH2M HILL. 2002. Closeout Report. Operable Unit No. 7, Sites 1 & 28, Marine Corps Base Camp Lejeune, North Carolina. September.

CH2M HILL. 2002. Natural Attenuation Evaluation Report, Site 78 North, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2003. Technology Evaluation Operable Unit No. 10 (Site 35), Marine Corps Base Camp Lejeune, North Carolina. June.

CH2M HILL. 2003. Pilot Study Project Plans, Site 73 Operable Unit No. 21, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2005. No Action Decision Document, Site 10, Marine Corps Base Camp Lejeune, North Carolina. May.

CH2M HILL. 2005. Site 93 Feasibility Study, Marine Corps Base Camp Lejeune, North Carolina. November.

CH2M HILL. 2005. Remedial Investigation, Site 94, OU-18: PXS Service Station, Camp Lejeune, North Carolina.

CH2M HILL. 2005. Optimization of the Long-Term Monitoring Program, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2006. Preliminary Assessment/Site Inspection, Montford Point. Marine Corps Base Camp Lejeune, North Carolina. February.

CH2M HILL. 2006. Pilot Study Report, Site 35, Operable Unit No. 10. Marine Corps Base Camp Lejeune, North Carolina. March.

CH2M HILL. 2006. Closeout Report for Operable Unit No. 4, Sites 41 & 74, Marine Corps Base Camp Lejeune, North Carolina. July.

CH2M HILL. 2006. Record of Decision for Operable Unit No. 18, Site 94, Marine Corps Base Camp Lejeune, North Carolina. August.

CH2M HILL. 2006. Amended RCRA Facility Investigation Report SWMU 360, Marine Corps Base Camp Lejeune, North Carolina. September.

CH2M HILL. 2006. Pilot Study Report, Site 86, Operable Unit No. 20, Marine Corps Base Camp Lejeune.

CH2M HILL. 2006. Record of Decision for Operable Unit No. 16, Site 93, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2007. Corrective Measures Study SWMU 360, Marine Corps Base Camp Lejeune, North Carolina. October.

CH2M HILL. 2007. Site Investigation Report. Site 95, Historical Livestock Dipping Vats, Marine Corps Base Camp Lejeune.

CH2M HILL. 2007. Engineering Evaluation/Cost Analysis, Site 35, Operable Unit No. 10, Building G533, Marine Corps Base Camp Lejeune.

CH2M HILL. 2007. Interim Remedial Action Completion Report for Operable Unit No. 6, Sites 36, 43, 44 and 54, Marine Corps Base Camp Lejeune.

CH2M HILL. 2007. Land Use Control Implementation Plan for Operable Unit No. 11, Site 80. Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2008. *Focused Site Inspection Report: MILCON Environmental Support, Marine*

Corps Base Camp Lejeune, North Carolina. February.

CH2M HILL. 2008. Treatability Studies Report, Site 89, Operable Unit 16, Marine Corps Base Camp Lejeune, North Carolina. February.

CH2M HILL. 2008. Closeout Report Operable Unit No. 5 (Site 2), Marine Corps Base Camp Lejeune, North Carolina. September.

CH2M HILL. 2008. Pilot Study Report Operable Unit No. 2 (Site 82). Marine Corps Base Camp Lejeune, North Carolina. December.

CH2M HILL. 2008. Baseline Ecological Risk Assessment Addendum for the Western Wetland, Site 89 – Operable Unit 16, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2008. Comprehensive Remedial Investigation Site 89 – Operable Unit 16, Former Defense Reauthorization and Marketing Office (DRMO), Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2008. Focused Site Inspection MILCON Environmental Support, Northern Boundary Investigation Area of Site UXO-03, Former Practice Hand Grenade Range (ASR Site 2.78) Former Tear Gas Chamber 2nd Marine Division (ASR Site 2.204) Base Skeet Range IRP Sites 19 (Naval Research Lab Dump), 20 (Naval Research Lab Incinerator) and 25 (Former Base Incinerator). Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2008. Non-time-critical Removal Action, Site 35, Operable Unit No. 10. Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2008. Remedial Investigation, Site 88, Operable Unit 15, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2008. Site Management Plan Fiscal Year 2009, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina.

CH2M HILL. 2009. Supplemental Remedial Investigation, Site 35 – Operable Unit No. 10, Camp Geiger Area Fuel Farm. Marine Corps Base Camp Lejeune, North Carolina. March.

CH2M HILL. 2009. Supplemental Remedial Investigation, Site 73 – Operable Unit No. 21. Marine Corps Base Camp Lejeune, North Carolina. March.

CH2M HILL. 2009. Proposed Remedial Action Plan, Site 73: Operable Unit No. 21, Marine Corps Base Camp Lejeune, North Carolina. April.

CH2M HILL. 2009. Preliminary Assessment/Site Inspection Report, MMRP Site UXO-05, Former Miniature Anti-tank Range and Site UXO-01, Former B-3 Gas Chamber, Marine Corps Base Camp Lejeune, North Carolina. July.

CH2M HILL. 2009. Preliminary Assessment/Site Inspection Report MMRP Site UXO-09, Former F-9, Triangulation Range, Marine Corps Base Camp Lejeune, North Carolina. July.

CH2M HILL. 2009. Focused Site Inspection Work Plan Addendum for Site UXO-6 Base Borrow Pit Expansion, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina. ESS-106. August.

CH2M HILL. 2009. Preliminary Assessment/Site Inspection Report MMRP Site UXO-16, Former Gun Positions 41A and 41B, Marine Corps Base Camp Lejeune, North Carolina. August.

CH2M HILL. 2009. Draft Preliminary Assessment/Site Inspection Report, Site UXO-08, Former Lejeune Cantonment 2.36-inch Bazooka Range, Base CS Chamber, and NBC Training Trial (ASR# 2.182), and D-7 Gas Chamber (ASR#2.80), Marine Corps Base Camp Lejeune, Jacksonville, North Carolina. October.

CH2M HILL. 2009. Basewide Vapor Intrusion Evaluation Report. Marine Corps Base Camp Lejeune, North Carolina. November.

CH2M HILL. 2009. Record of Decision, Operable Unit 10, Site 35. Marine Corps Base Camp Lejeune, North Carolina. December.

CH2M HILL. 2009. Draft Preliminary Assessment/Site Inspection Report, MMRP Site UXO-03, Former D-3 Practice Hand Grenade Course, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2009. Preliminary Assessment/Site Inspection Report, MMRP Site UXO-01, Former Live Hand Grenade Course. Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2009. Draft Preliminary Assessment/Site Inspection Report, MMRP Site UXO-06, Former Fortified Beach Assault Area, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2009. Feasibility Study, Site 35, Operable Unit No. 10, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2009. Proposed Remedial Action Plan, Site 35: Operable Unit No. 10, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2009. Feasibility Study, Site 73, Operable Unit No. 21, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2009. Preliminary Assessment/Site Inspection Report, Site 40, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2009. Expanded Site Inspection Report, MMRP Site UXO-04, Knox Park, Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2009. Preliminary Assessment/Site Inspection Report, Former Gun Positions 41A and 41B. Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2009. Engineering Evaluation/Cost Assessment Western Wetland at Operable Unit 16 (Site 89) Former Defense Reutilization and Marketing Office. Marine Corps Base Camp Lejeune, North Carolina.

CH2M HILL. 2010. Preliminary Assessment/Site Inspection Report Former 1,000-inch Range (Amphibious Base Area) UXO-15, Marine Corps Base Camp Lejeune, North Carolina. February.

CH2M HILL. 2010. Action Memorandum Site 95 Magnolia Road Dipping Vat Site. Marine Corps Base Camp Lejeune, North Carolina. March.

CH2M HILL. 2010. Base Boundary Report for Potential Off-Base Contamination Encroachment, Marine Corps Base Camp Lejeune. April.

CH2M HILL. 2010. Expanded Site Inspection Report MCAS New River Buildings SAS113, AS116, and AS119 and Montford Point Buildings M119 and M315, Marine Corps Base Camp Lejeune, North Carolina. April.

CH2M HILL. 2010. Focused Preliminary Assessment/Site Inspection Report, Hadnot Point Construction Area, Post Office Intersection Area, and Fitness Center, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina. June.

CH2M HILL. 2010. Five-Year Review. Marine Corps Base Camp Lejeune, North Carolina. August.

CH2M HILL. 2010. Expanded Supplemental Remedial Investigation Site 86—Operable Unit No. 20, Marine Corps Base Camp Lejeune, North Carolina. September.

CH2M HILL. 2010. Expanded Site Inspection Report Wallace Creek MILCON Environmental Support Former Naval Research Lab Area (IRP Sites 19 and 20), IRP Site 25, and D-9 Skeet Range South Area. Marine Corps Base Camp Lejeune, North Carolina. October.

CH2M HILL. 2010. Focused Preliminary Assessment/Site Inspection Report Camp Devil Dog Construction Area and Military Munitions Response Program UXO-19, Marine Corps Base Camp Lejeune, North Carolina. October.

CH2M HILL. 2010. Draft Focused Preliminary Assessment/Site Inspection Camp Johnson MILCON Area and Military Munitions Response Program UXO-20, Marine Corps Base Camp Lejeune, North Carolina. November.

CH2M HILL. 2010. Draft Preliminary Assessment/Site Inspection Report Site UXO-12 New River 1,000-inch Range (ASR #2.5) and UXO-18 50-foot Small Bore Range (ASR #2.44), Marine Corps Base Camp Lejeune, North Carolina. November.

CH2M HILL. 2010. Confirmatory Sampling Report, Site 67 Engineer's TNT Burn Site, Marine Corps Base Camp Lejeune, North Carolina. November.

CH2M HILL. 2011. *Final Preliminary Site Assessment/Site Inspection Report, MMRP Site UXO-10, Former D-11A Flame Tank and Flame Thrower Range (ASR# 2.136), Marine Corps Base, Camp Lejeune, North Carolina.* July.

CH2M HILL. 2011. *Final Preliminary Site Assessment/Site Inspection Report, MMRP Site UXO-11, B-5 Practice Hand Grenade Course (ASR# 2.81), Marine Corps Base, Camp Lejeune, North Carolina.* June.

CH2M HILL. 2011. *Final Preliminary Site Assessment/Site Inspection Report, MMRP Site UXO-14, Former Indoor Pistol Range (ASR# 2.199) and Gas Chamber (ASR# 2.200)(Rifle Range Area), Marine Corps Base, Camp Lejeune, North Carolina.* April.

CH2M HILL. 2011. *Final Preliminary Site Assessment/Site Inspection Report MMRP Site UXO-07, Former D-6 Practice Hand Grenade Course (ASR# 2.77), Marine Corps Base, Camp Lejeune, North Carolina.* June.

Duke Engineering and Services. 1999. DNAPL Site Characterization using a Partitioning Interwell Tracer Test at Site 88, Marine Corps Base, Camp Lejeune, North Carolina. July.

Environmental Service and Engineering (ESE). 1990. Action Memorandum Site 95 Magnolia Road Dipping Vat Site. Marine Corps Base Camp Lejeune, North Carolina.

Harned, D. A., O. B. Lloyd, Jr., and M. W. Treece, Jr. 1989. *Assessment of Hydrologic and Hydrogeologic Data at Camp Lejeune Marine Corps Base, North Carolina.* Water Resources Investigations Report 89-4096. U.S. Geological Survey.

Heath, Ralph. 1989. *Basic Groundwater Hydrology*. Water Supply Paper 2220. U.S. Geological Survey.

MCB Camp Lejeune. 1991. Federal Facilities Agreement (FFA).

MicroPact et al. 2006. Pilot Study Report, Site 73, Operable Unit 21, Marine Corps Base, Camp Lejeune, North Carolina. May.

National Oceanic and Atmospheric Administration (NOAA). 2002. www.noaa.gov

Naval Energy and Environmental Support Activity (NEESA). 1981. Radiological Affairs Technical Assistance Visit to Insect Vector Control Center and Chemical Landfill Site. Marine Corps Base Camp Lejeune, North Carolina.

O'Brien and Gere. 1990. Product Recovery System Design, Hadnot Point Fuel Farm, Marine Corps Base Camp Lejeune, North Carolina. January.

O'Brien and Gere. 1992. Site Assessment Tanks AS419 – A421. New River, North Carolina. June.

OHM Remediation Corp. (OHM). 1995. Contractor's Closeout Report, Soil Remediation, Operable Unit 10 Site 35. Marine Corps Base Camp Lejeune, North Carolina.

OHM. 1995. Contractor's Closeout Report Time Critical Removal Action for Pesticide Contaminated Soil Operable Unit 5 Site 2, Marine Corps Base, MCB Camp Lejeune, North Carolina.

Osage. 2009. Technical Memorandum, SWMU 360 Groundwater Delineation. September

Rhēa Engineers and Consultants (Rhēa). 2006. Recommendations Report, Review, Recommendations, and Removal Report, Operable Unit No. 19 Site 84. Marine Corps Base Camp Lejeune, North Carolina. September.

Rhēa. 2007. Project Closeout Report: Review, Recommendations and Removal Action, Site 84, Operable Unit 19. Marine Corps Base Camp Lejeune, North Carolina. November.

Rhēa. 2008. Feasibility Study Amendment, Site 84, Operable Unit No. 19, Marine Corps Base Camp Lejeune, North Carolina.

Rhēa. 2008. Proposed Remedial Action Plan, Site 84, Operable Unit No. 19, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina.

Rhēa. 2010. Engineering Evaluation/Cost Analysis (EE/CA), Site 95, Marine Corps Base, Camp Lejeune, North Carolina. Rhēa Engineers & Consultants, Inc. January.

Rhēa, 2010. Non Time Critical Removal Action Summary, Site 95, Marine Corps Base, Camp Lejeune, North Carolina. August.

R. E. Wright Associates, Inc. 1994. One Well Site Check Plus Resample Two Existing Wells, Marine Corps Base, Camp Lejeune, North Carolina, UST STC-868. October

Shaw Environmental, Inc. (Shaw). 2003. Interim Removal Action Report Operable Unit No. 6, Sites 36 and 43, Marine Corps Base Camp Lejeune, North Carolina.

Shaw. 2007. Interim Remedial Measures Implementation Report, Solid Waste Management Unit 46, Marine Corps Base Camp Lejeune, North Carolina.

Tetra Tech. 2009. Site Inspection Report for D-6, 50-Foot Indoor Rifle and Pistol Range Former Building 451, Marine Corps Base Camp Lejeune, North Carolina. October.

Tetra Tech. 2010. Engineering Evaluation/Cost Analysis for Non-Time Critical Removal Action at D-6, 50-Foot Indoor Rifle and Pistol Range – UXO-01, Former Building 451, Marine Corps Base Camp Lejeune, North Carolina. October.

United States Army Corps of Engineers (USACE). 2001. Range Identification and Preliminary Assessment Report.

United States Marine Corps (USMC). 1997. Notice of Non-Significant Changes: OU 1 (Sites 24 and 78) and OU 5 (Site 2). July.

Water and Air Research Inc. (WAR). 1983. Initial Assessment Study for MCB Camp Lejeune, North Carolina.

Winner, M. D. and R. W. Coble. 1989. Hydrogeologic Framework of the North Carolina Coastal Plain Aquifer System.