



Naval Facilities Engineering Systems Command Mid-Atlantic
Norfolk, Virginia

Final

**Installation Restoration Program and
Military Munitions Response Program
Site Management Plan
Fiscal Year 2023**

Marine Corps Base Camp Lejeune and Marine Corps Air Station New River
North Carolina

September 2022



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Prepared for NAVFAC Mid-Atlantic
by CH2M HILL, Inc.
Virginia Beach, Virginia
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8-98	MMRP Site UXO-14, ASR #2.199, and #2.200
8-99	MMRP Site UXO-15, ASR #2.19
8-100	MMRP Site UXO-16, ASR #2.212
8-101	MMRP Site UXO-17, ASR #2.212
8-102	MMRP Site UXO-18, ASR #2.44
8-103	MMRP Site UXO-20, ASR #2.32 and #2.87
8-104	MMRP Site UXO-21, ASR #2.204
8-105	MMRP Site UXO-23, ASR #2.82
8-106	MMRP Site UXO-25
8-107	MMRP Site UXO-26, ASR #2.79a and #2.79c
8-108	MMRP Site UXO-27, ASR #2.212
9-1	AOPC 9
9-2	AOPC 10
9-3	AOPC 11

Schedules

3-1	MMRP Site UXO-31
5-1	IRP Site 111
5-2	MMRP Site UXO-28
5-3	MMRP Site UXO-29, ASR #2.1, #2.167, and #2.29
5-4	MMRP Site UXO-30, ASR #2.44, #2.134, and #2.98
6-1	IRP Site 96
7-1	IRP Site 88

8-1	IRP Site 2
8-2	IRP Site 3
8-3	IRP Site 6
8-4	IRP Site 35
8-5	IRP Site 36
8-6	IRP Site 49
8-7	IRP Site 69
8-8	IRP Site 73
8-9	IRP Site 78
8-10	IRP Site 82
8-11	IRP Site 86
8-12	IRP Site 89
8-13	IRP Site 93
8-14	IRP Site 9

Acronyms and Abbreviations

3R	Recognize, Retreat, Report
°F	degree(s) Fahrenheit
ABC	Atomic, Biological, and Chemical
AFFF	aqueous film-forming foam
AM	Action Memorandum
AOC	area of concern
AOPC	area of potential concern
ASR	Archival Search Report
AS	Air Sparging
AST	aboveground storage tank
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CAIS	chemical agent identification set
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	constituent of concern
COPC	constituent of potential concern
CSI	Confirmatory Site Investigation
CSM	conceptual site model
CVOC	chlorinated volatile organic compound
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDT	dichlorodiphenyltrichloroethane
DGM	digital geophysical mapping
DMM	discarded military munitions
DNAPL	dense nonaqueous phase liquid
DoD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
EE/CA	Engineering Evaluation/Cost Analysis
EIA	Expanded Investigation Area
EOD	Explosive Ordnance Disposal
EPH	extractable petroleum hydrocarbon
ERA	ecological risk assessment
ERD	enhanced reductive dechlorination
ESD	Explanation of Significant Difference
ESI	Expanded Site Investigation or Expanded Site Inspection
ESS	Explosives Safety Submission
EVO	emulsified vegetable oil
FARP	Forward Arming and Refueling Point
FFA	Federal Facilities Agreement
FS	Feasibility Study
FY	fiscal year
FYR	Five-Year Review
GIS	geographic information system
GWTP	groundwater treatment plant

HAPSITE	Hazardous Air Pollutants on Site
HDD	horizontal directionally drilled
HHRA	human health risk assessment
HHRS	human health risk screening
HPCA	Hadnot Point Construction Area
HPIA	Hadnot Point Industrial Area
IAS	Initial Assessment Study
IRA	Interim 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
LCH	lower Castle Hayne
LGAC	liquid-phase granular activated carbon
LTM	long-term monitoring
LUC	land use control
LUCIP	Land Use Control Implementation Plan
LUST	leaking underground storage tank
MC	munitions constituent
MCAS	Marine Corps Air Station
MCH	middle Castle Hayne
MCB	Marine Corps Base
MDAS	material documented as safe
MEC	munitions and explosives of concern
MILCON	military construction
MIP	membrane interface probe
mm	millimeter(s)
MMRP	Military Munitions Response Program
MNA	monitored natural attenuation
MPPEH	material potentially presenting an explosive hazard
MRS	munitions response site
MTBE	methyl tert-butyl ether
N/A	not applicable
NACIP	Navy Assessment and Control of Installation Pollutants
NADD	No Action Decision Document
NAE	Natural Attenuation Evaluation
NAIP	natural attenuation indication parameter
NAVFAC	Naval Facilities Engineering Systems Command
Navy	Department of the Navy
NCDEQ	North Carolina Department of Environmental Quality
NCGWQS	North Carolina Groundwater Quality Standard
NFA	no further action
NIRIS	Naval Installation Restoration Information Solution
NTCRA	Non-time-critical Removal Action
NWCRC	North Wallace Creek Regimental Complex

O&G	oil and grease
O&M	operations and maintenance
ORC	oxygen-releasing compounds
OU	operable unit
OWS	oil-water separator
PA	preliminary assessment
PAH	polycyclic aromatic hydrocarbon
PCA	tetrachloroethane
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PFAS	per- and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
POL	petroleum, oil, and lubricants
PRAP	Proposed Remedial Action Plan
PRB	permeable reactive barrier
PSW	public supply well
RA	remedial action
RACR	Remedial Action Completion Report
RAO	remedial action objective
RC	response complete
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RFI	Resource Conservation and Recovery Act Facility Investigation
RI	Remedial Investigation
RIP	remedy-in-place
ROD	Record of Decision
SBGR	subgrade biogeochemical reactor
SC	site closeout
SDZ	surface danger zone
SEAR	surfactant enhanced aquifer remediation
SI	Site Investigation or Site Inspection
SMP	Site Management Plan
SRI	Supplemental Remedial Investigation
SSI	Supplemental Site Investigation
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SVS	sewer ventilation system
SWMU	solid waste management unit
TAU	twin agent unit
TCE	trichloroethene
TCRA	Time-critical Removal Action
TDS	total dissolved solids
TNT	trinitrotoluene
TPH	total petroleum hydrocarbons
TSS	total suspended solids
UCH	upper Castle Hayne
USEPA	United States Environmental Protection Agency
USMC	United States Marine Corps

UST	underground storage tank
UU/UE	unlimited use and unrestricted exposure
UXO	unexploded ordnance
VC	vinyl chloride
VI	vapor intrusion
VIMS	vapor intrusion mitigation system
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbon
XRF	X-ray fluorescence
yd ³	cubic yard(s)
ZVI	zero-valent iron

Introduction

This document presents the fiscal year (FY) 2023 Installation Restoration Program (IRP) and Military Munitions Response Program (MMRP) Site Management Plan (SMP) for Marine Corps Base (MCB) Camp Lejeune and Marine Corps Air Station (MCAS) New River, North Carolina. This IRP and MMRP SMP presents planned environmental activities to be conducted during FY 2023 and provides projections for long-term progress in accordance with the Department of the Navy (Navy) IRP and MMRP. This document has been prepared by CH2M HILL, Inc. for Naval Facilities Engineering Systems Command (NAVFAC) Mid-Atlantic Division and MCB Camp Lejeune. The IRP and MMRP SMP is submitted to representatives of the United States Environmental Protection Agency (USEPA) Region 4; the North Carolina Department of Environmental Quality (NCDEQ), formerly known as the North Carolina Department of Environment and Natural Resources; and members of the Restoration Advisory Board. This document is available on the public Administrative Record.

1.1 IRP and MMRP SMP Purpose

The FY 2023 IRP and MMRP SMP is a forward-looking management tool and one of the primary documents identified in the Federal Facilities Agreement (FFA) (MCB Camp Lejeune, 1991). This IRP and MMRP SMP includes proposed deadlines for completion of deliverables, as specified in the FFA, to be submitted during FY 2023. The prioritization of activities and the conceptual schedules were developed by the MCB Camp Lejeune Partnering Team, which includes representatives from NAVFAC, MCB Camp Lejeune, USEPA, and NCDEQ. The IRP and MMRP 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. This IRP and MMRP SMP updates and supersedes the FY 2022 IRP and MMRP SMP (CH2M, 2021).

1.2 IRP and MMRP SMP Report Organization

The FY 2023 IRP and MMRP SMP is organized as follows:

- **Section 1**—Provides the IRP and MMRP SMP purpose and report organization.
- **Section 2**—Presents the Base description and environmental history, and the CERCLA process for conducting site investigations and actions. Provides a Basewide summary of the IRP and MMRP. 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 2023. 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 Underground Storage Tank (UST) Program.
- **Section 11**—Provides references to other reports and documents cited in this IRP and MMRP SMP.

Base Description and Environmental History

2.1 Base Description

A brief description of MCB Camp Lejeune and MCAS New River (also referred to as the Base) (**Figure 2-1**) and setting is provided as follows.

Commissioned: 1941

Mission: Maintain combat-ready warfighters for expeditionary deployment. Training operations and capabilities include 80 live fire ranges, 34 gun positions, 50 tactical landing zones, 3 military operations in urban terrain complexes, and 11 miles of beach capable of supporting amphibious operations.

Population: The Base and surrounding community is home to an active duty, dependent, retiree, and civilian population of approximately 170,000 people.

Environmental and Geographical Setting: MCB Camp Lejeune and MCAS New River cover more than 156,000 acres located along the Atlantic Ocean within the coastal plain of southeastern North Carolina, within Onslow County, adjacent to the City of Jacksonville. The Base consists of a diverse environmental setting with elevations ranging from sea level to 70 feet above mean sea level. Much of the topography is traversed by swales, wetlands, streams, and creeks that drain into the New River that bisects the Base and includes upland forests, wetlands, water, and urban/developed land.

Community Setting: The Base enjoys a close relationship with neighboring civilian communities. The Base and Onslow County work together to ensure quality living for both military and civilians throughout the area. Most of the land surrounding the facility is used for agriculture. Estuaries along the coast support commercial and recreational fishing and residential resort areas located adjacent to the Base along the Atlantic Ocean.

Weather: Short, mild winters and long, hot summers generally characterize climatic conditions. Average annual net precipitation is approximately 54 inches. Ambient air temperatures generally range from 20 to 60 degrees Fahrenheit (°F) in the winter months and 75°F to 95°F during the summer months (National Oceanic and Atmospheric Administration, 2013). Winds are generally south-southwesterly in the summer and north-northwesterly in the winter.

Geology/Hydrogeology: Within MCB Camp Lejeune and MCAS New River, approximately 1,500 feet of a sedimentary sequence mantles the crystalline bedrock and includes seven aquifers and their associated confining units, including the surficial, Castle Hayne, Beaufort, Peedee, Black Creek, and Upper and Lower Cape Fear aquifers.

Water Usage: Potable water is provided to the Base and surrounding area by water supply wells that pump groundwater from the deeper Castle Hayne aquifer. There are currently active water supply wells on Base that rely 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. 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.



Figure 2-1. Base Location Map

2.2 Environmental Restoration Program History

2.2.1 Installation Restoration Program History

Historical operations, storage, and disposal practices at the Base have resulted in environmental impacts to soil and groundwater. The Base 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 the NACIP program. 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 legislation. The IRP, which was implemented to follow the requirements of the Superfund Amendments and Reauthorization Act, replaced the NACIP Program. MCB Camp Lejeune was placed on the CERCLA National Priorities List on October 4, 1989 (54 *Federal Register* 41015, October 4, 1989). Following that listing, an FFA between USEPA Region 4, the North Carolina Department of Environment, Health, and Natural Resources (now NCDEQ), 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 Camp Lejeune 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 Camp Lejeune in accordance with CERCLA, the National Oil and Hazardous Substances Pollution Contingency Plan, 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 IRP and MMRP SMP includes the sites currently under investigation following the CERCLA process and the proposed deadlines for completion of deliverables, as specified in the FFA.

Five-Year Reviews (FYRs) were completed in 1999 (Baker, 1999), 2005 (Baker, 2005), 2010 (CH2M, 2010), 2015 (CH2M, 2015), and 2020 (CH2M, 2020). In 2020, 20 operable units (OUs) were identified at the Base for review: OUs 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 19, 20, 21, 23, 24, and 25. All ongoing remedial actions (RAs) were determined to be protective of human health and the environment. The recommendations from the 2020 FYR are currently being implemented, and the milestones and statuses are provided in **Table 2-1**. The next FYR is scheduled for 2025.

As part of the requirements established under CERCLA, an Administrative Record file has been established for the IRP at MCB Camp Lejeune. The Administrative Record is a compilation of all documents that the Navy has used to select an RA 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 RAs taken at a site. A copy of the MCB Camp Lejeune 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/Dy5T>. Access to the website is available at the Onslow County Library.

The sixth update to the Community Involvement Plan, which provides information on community participation, was completed in 2020 (CH2M, 2020) (previous versions in 1990, FY 1994, FY 2006, FY 2011, and FY 2015). The Community Involvement Plan will be updated again in 2025 or when a major change occurs in the Environmental Restoration Program.

2.2.1.1 Vapor Intrusion

MCB Camp Lejeune initiated a Basewide vapor intrusion (VI) evaluation in 2007 to identify buildings where VI might be occurring and to evaluate potential risks posed to building occupants from VI related to groundwater impacts (AGVIQ/CH2M, 2009; CH2M, 2011; CH2M, 2015). The phased VI evaluation identified VI as a pathway of concern at Site 88 (Building 3B), and a vapor intrusion mitigation system (VIMS) was installed in 2012. Although VI was not a significant pathway of concern, there was a potential for the VI pathway to become significant at Site 78 (Building 902) and 88 (Buildings 3, 37, and 43) in the future. Based on the results of the evaluation, the Base elected to install VIMS in Building 902 (Site 78) and Buildings 3, 37, and 43 (Site 88) in 2012, as a precautionary measure. Additional VI evaluations at Site 88 identified human health risks associated with a wastewater/sanitary sewer line as a potential VI preferential pathway to Building HP57, and a sewer ventilation system (SVS) was installed in October 2016. Analytical results from the last 5 to 8 years (13 to 18 rounds) of performance monitoring demonstrated operation of the VIMS/SVS is effectively mitigating the VI pathway. For that reason, the semiannual indoor/outdoor air and exhaust sampling was discontinued in March 2021. Moving forward, indoor air/outdoor air and exhaust sampling will be conducted every 5 years; however, weekly and quarterly system performance monitoring will continue, except at Buildings 3 and 3B which were demolished in June 2022. Subslab soil gas sampling at Buildings 37, 43, and HP57 was conducted in December 2021 (after remedial implementation at Site 88). There were no detections above the USEPA Non-residential and Residential VISLs for subslab soil gas samples. A rebound study at Site 88 (Buildings 37 and 43) is planned to evaluate whether the VIMS can be decommissioned at these buildings. The VIMS at Site 78 (Building 902) and SVS at Site 88 (Building HP57) will continue to be monitored weekly and quarterly during the rebound study.

A Basewide VI monitoring evaluation is conducted every 5 years to evaluate the potential for future VI pathways. The Basewide VI evaluation sampling in 2021 was conducted at Building G480 (Site 35), Buildings 1601 and 1603 (Site 78), Buildings AS515 and AS545 (Site 86), and Building 626 (Site 82). No further VI evaluation was recommended for all buildings except for Building 1601 (Site 78). Additional VI data collection was recommended for Building 1601 every 5 years (CH2M, 2022).

2.2.1.2 Per- and Polyfluoroalkyl Substances

A Basewide preliminary assessment (PA) report was completed in 2019 to identify potential sources of per- and polyfluoroalkyl substances (PFAS) at MCB Camp Lejeune and MCAS New River (CH2M, 2019). An archive search, interviews, and site reconnaissance were conducted to identify potential and confirmed PFAS release areas. A total of 52 areas were identified for further evaluation of the presence of PFAS in environmental media and a Basewide Site Inspection (SI) was completed in FY 2022 which also included seven sites that were evaluated for PFAS in 2017 (CH2M, 2022). Of the 59 potential PFAS release areas included in the SI, no further action (NFA) was recommended at 7 areas, Phase 2 SI activities were recommended for 8 areas and Remedial Investigation (RI) activities were recommended for 44 areas (**Table 2-2**). Work plans for the follow-on activities are planned for submittal in FY 2023 and FY 2024.

Additionally, based on the results of the Basewide PFAS SI, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) concentrations in surficial aquifer groundwater at the Camp Davis Forward Arming and Refueling Point (FARP) Activities South, 1 of the 44 sites recommended for RI activities, exceeded the 2016 USEPA lifetime drinking water health advisory of 70 parts per trillion. Because off-Base drinking water wells could be located within 1 mile downgradient of the site based on inferred groundwater flow direction, public outreach efforts were initiated to identify drinking water wells within 1 mile of Camp Davis FARP Activities South. Based on the public outreach efforts through June 2021, 12 off-Base drinking water wells screened in the Castle Hayne aquifer were identified within 1 mile of Camp Davis FARP Activities South. Samples were collected from these drinking water wells in March, April, June, and September 2021. Results were below the 2016 USEPA lifetime drinking water health advisory for PFOS and/or PFOA. Subsequently, the Camp Davis FARP Activities South site was identified as Site 111 (OU 34) and is included in this SMP (**Section 5.1.1**).

PFAS guidance and regulations are rapidly evolving. The Navy will continue to evaluate regulatory changes and further evaluation of PFAS sites and/or data based on regulatory changes will be conducted as needed.

2.2.2 Munitions Response History

The Department of Defense (DoD) established the MMRP, which was shortened to Munitions Response Program by the Navy, under the Defense Environmental Restoration Program in September 2001. The purpose is to address military munitions and explosives of concern (MEC) (unexploded ordnance [UXO] and waste military munitions) and munitions constituents (MCs) (chemical residues of munitions) at locations that are not operational ranges. A requirement was established obligating the identification, characterization, and tracking of data on military munitions and military munitions responses at these locations. By September 2002, locations requiring a military munitions response were inventoried. DoD is required by Congress to set priorities for investigating all munitions response sites (MRSs). The site prioritization is based on overall conditions at these locations and the potential risk posed to human health and the environment through evaluation of available data.

The Navy has set priorities for 32 MRSs at MCB Camp Lejeune and MCAS New River. The results of this scoring will be used to sequence priorities for site remediation with other Navy/Marine Corps MRSs based on relative risks and other factors, such as future land use, cultural and economic factors, and ecological impacts. The Navy and Marine Corps work with the MCB Camp Lejeune Partnering Team to follow the CERCLA process to address MMRP sites identified at the Base.

2.3 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 RAs to protect human health and the environment. The major elements of the CERCLA process are presented on **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. The Base has developed a Community Involvement Plan and established a Restoration Advisory Board comprising members of the community, local environmental group members, and state and federal officials, who meet quarterly to maintain community involvement with environmental restoration activities at the Base.

2.3.1 Preliminary Assessment/Site Investigation or Site Inspection

The IRP begins with concerns about a site, area, or potential contaminant source. The PA/Site Investigation or SI phase of the CERCLA process evaluates potential sites to determine whether they should be eliminated from further consideration (that is, 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 RI/Feasibility Study (FS).

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

2.3.1.2 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 whether contaminants are present at a site and a screening risk assessment to determine whether they have been released at levels posing an unacceptable risk to human health or 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 the Base, the PA and SI have been completed concurrently as a PA/SI. After completion of the PA/SI, an Expanded Site Investigation/Inspection (ESI) may be conducted to confirm whether site-specific contamination or hazards are present prior to moving forward with NFA, transferring to another regulatory program, or implementing an RI.

2.3.2 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 influence 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.

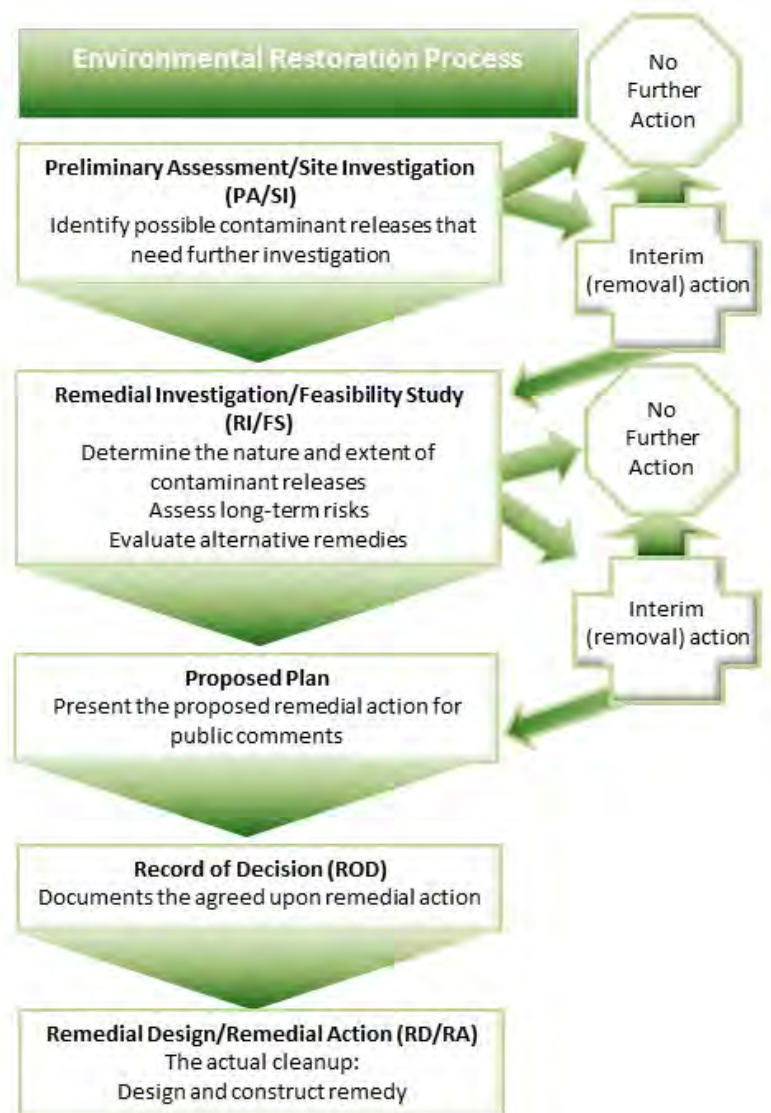


Figure 2-2. CERCLA Process

2.3.2.1 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.

2.3.2.2 Feasibility Study

The FS is the mechanism for the development, screening, and detailed evaluation of alternative RAs. 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 RA alternative that mitigates the threats.

2.3.3 Treatability Study

Treatability studies involve testing and evaluating a treatment technology to assess its effectiveness 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 (RD) 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 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.

2.3.4 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 are classified as either Time-critical Removal Actions (TCRAs) or Non-time-critical Removal Actions (NCRAs).

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 fieldwork 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 NCRAs. For a NCRA, 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 RA 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 RA 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 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 National Oil and Hazardous Substances Pollution Contingency Plan's nine criteria were not addressed as part of the EE/CA or AM, a focused FS would be needed, followed by a ROD.

2.3.5 Proposed 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 Plan (or sometimes referred to as a Proposed Remedial Action Plan [PRAP]) and ROD.

2.3.5.1 Proposed Plan

A Proposed Plan presents the remedial alternatives developed in the FS and recommends a preferred remedial method. The public has an opportunity to comment on the Proposed Plan 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.

2.3.5.2 Record of Decision

At the end of the Proposed Plan 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, NCDEQ, 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.

2.3.6 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.

2.3.6.1 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 and specifications, and RA Work Plans.

2.3.6.2 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 RA. The start date is important because it triggers the beginning of the FYR cycle if one is required. The RA phase involves two main components: RA construction and RA operation.

Interim Remedial Actions (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, IRAs 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 receptor 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.

2.3.7 Remedy-in-Place and Response Complete

2.3.7.1 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. 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.

2.3.7.2 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 SC.

Once all RIPs and RCs have been documented for every site at the facility and the terms of the FFA have been met, SC and National Priorities List deletion will be requested.

2.3.7.3 Five-Year Reviews

FYRs are generally required by CERCLA or program policy when hazardous substances remain on a site above levels that permit unlimited use and unrestricted exposure (UU/UE). FYRs 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.

2.4 Current IRP and MMRP Site Status

A total of 102 sites have been identified under the Base IRP and MMRP (**Figures 2-3 and 2-4**). Of the 70 sites identified in the IRP, 31 are considered currently active (under investigation, remediation, or long-term monitoring [LTM], or have land use controls [LUCs] implemented) (**Figure 2-5**), and 39 sites have been formally closed with NFA (**Figure 2-6**). Of the 32 (there are two UXO-01 sites considered in this count) sites identified in the MMRP, 8 are considered currently active (**Figure 2-7**), and 24¹ have been closed with NFA (**Figure 2-8**). A total of 30 OUs² have been identified under the IRP and MMRP to group sites based on geographic location or similar disposal histories (**Table 2-3**). **Table 2-4** provides a Basewide summary of the IRP and MMRP sites and previous investigations. **Table 2-5** lists the current status of each site and provides a list of primary documents and anticipated submittal dates for the remainder of FY 2023 through 2025.

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: Proposed Plan/ROD**, **Section 7: RD/RA**, and **Section 8: RIP/RC**). **Section 9** includes three additional sites (area of potential concern [AOPC] 9, AOPC 10, and AOPC 11) that have not been assigned IRP or MMRP site designations but are being investigated following the CERCLA process (**Figure 2-9**). **Section 10** includes two sites that have been transferred from the IRP to the Base UST Program for further action (**Figure 2-10**). Sites that have been transferred to the RCRA Program are documented separately in the RCRA SMP (CH2M, 2019).

¹ UXO-26, the B-3 Gas Chamber, consists of three Archival Search Report (ASR) areas: ASR #2.79a, 2.79b, and 2.79c. ASR #2.79a and 2.79c have been closed with NFA, and ASR #2.79b was reopened as an operational range.

² OU boundaries are generally defined during the PA/SI or RI phase of the CERCLA process for initial investigation. For sites with LUCs, the LUC boundaries become the site boundaries when instituted; however, OU boundaries are shown on figures, where applicable, for historical reference.

Table 2-1. Summary of Five-Year Review Recommendations and Milestones

IRP & MMRP Site Management Plan FY 2023

MCB Camp Lejeune and MCAS New River

Recommendation	Site	Milestone	Current Status
Complete the Site 78 FS Amendment to reevaluate alternatives to address VOCs in groundwater.	78	December 31, 2020	Delayed as the groundwater extraction and treatment systems were turned off in 2020 and a rebound study was conducted in 2021. This study supports the draft FS Amendment which is planned for submittal in FY 2023.
Reinstate groundwater LTM for 4,4'-DDD and 4,4'-DDT and an aquifer use control boundary 500 feet from groundwater containing 4,4'-DDD and 4,4'-DDT.	2	December 31, 2023	The Memorandum to Site File was finalized in FY 2020 to document reinstitution of LTM and an aquifer use control. The LUCs were updated in FY 2022 and LTM will begin in FY 2023.
Refine the extent of PFAS in site media at Site 9 and evaluate whether there is a potentially unacceptable risk to human health and/or a potential complete exposure pathway to drinking water receptors.	9	December 31, 2025	A report documenting additional VOC investigation will be submitted in FY 2023. Based on results of the Basewide PFAS PA/SI, a RI is planned for FY 2024.
Refine the extent of PCE in site media at Site 9 and evaluate potential risks to human health and the environment and potential future actions if necessary.			
Refine the extent of PFAS in site media at Site 54 and evaluate whether there is a potentially unacceptable risk to human health and/or a potential complete exposure pathway to drinking water receptors.	54	December 31, 2025	Based on results of the Basewide PFAS PA/SI, a RI is planned for FY 2024.
Determine if radionuclides are present in groundwater above background.	82	December 31, 2025	The sampling was completed in FY 2022 and the draft report will be submitted in FY 2023.
Complete the SRI and conduct an FS Amendment to reevaluate alternatives to address new contaminant sources and VOCs in groundwater.	82	December 31, 2025	A third update technical memorandum for the SRI was submitted in FY 2021, and air sparge pilot study is being conducted through FY 2023, and a groundwater alternative treatment technology evaluation is planned in FY 2023.
Refine the extent of PFAS in site media near Buildings AS502, AS508, AS3900, AS3905 and the MV-22B Osprey crash and evaluate whether there is a potentially unacceptable risk to human health and/or a potential complete exposure pathway to drinking water receptors.	86	December 31, 2025	Based on results of the Basewide PFAS PA/SI, a RI is planned for FY 2024.
Complete the supplemental investigation and re-evaluate the remedial strategy.	89	December 31, 2025	The supplemental investigation field activities to refine delineation was completed in FY 2022 and the draft report will be submitted in FY 2023, followed by re-evaluation of the remedial strategy.

Notes:

DDD - dichlorodiphenyldichloroethane

DDT - dichlorodiphenyltrichloroethane

FS - Feasibility Study

FY - fiscal year

LTM - long-term monitoring

LUCs - land use controls

PA/SI - Preliminary Assessment/Site Inspection

PCE - tetrachloroethene

PFAS - per- and polyfluoroalkyl substances

SRI - Supplemental Remedial Investigation

VOC - volatile organic compound

Table 2-2. Summary of Basewide PFAS SI Sites and Findings

IRP & MMRP Site Management Plan FY 2023

MCB Camp Lejeune and MCAS New River

Site Name		Soil Exceedance	GW Exceedance	Potential Risk ³
No Further Action Recommendation - Soil and groundwater samples do not contain concentrations of PFOA, PFOS, or PFBS above the SL and the HHRS did not identify unacceptable risk				
TLZ Phoenix ¹		NS	No	No
Camp Davis FARP Activities North		No	No	No
Site 69 – Former Rifle Range Chemical Dump		NS	No	No
Excavator Fire adjacent to the Hathcock Range		No	No	No
Former Building TT38 Tarawa Terrace Fire Station		No	No	No
Lyman Road FARP Activities		No	No	No
Site 65 – Former Engineer Area Dump		No	No	No
Phase 2 SI Recommendation - Soil and/or groundwater samples do contain concentrations of PFOA, PFOS, or PFBS above SLs, which indicates a release may have occurred, but the HHRS results do not indicate a potential unacceptable risk or there is uncertainty related to the CSM				
Building SR43 Sandy Run Fire Station (Station #9)		No	Yes	No
Site 89 – Former DRMO at Camp Geiger		NS	Yes	No
Aircraft Wreckage Storage Area		NS	Yes	No
Site 41 - Camp Geiger Dump Near Former Trailer Park		NS	No	No
Former Hadnot Point WWTP and Sludge Drying Beds		No	Yes	No
Site 6 and 82 – Former DRMO Lots 201 and 203		No	Yes	No
Site 24 – Former Industrial Area Fly Ash Dump		No	Yes	No
AV-8B Harrier Crash off Lyman Road		NS	Yes	Yes
RI Recommendation - Soil and/or groundwater samples contain concentrations of PFOA, PFOS, or PFBS above SLs and the HHRS identified unacceptable risk				
IRP Site 111, Camp Davis FARP Activities South		No	Yes	Yes
Building RR6 Former Rifle Range Battalion Warehouse Fire Station		No	Yes	Yes
Building RR155 Stone Bay MARSOC Fire Station (Station #10)		No	Yes	Yes
MV-22B Osprey Fire #7		NS	Yes	Yes
Building AS4100 MAG Aircraft Maintenance Hangar		No	Yes	
Former Charlie Island		No	Yes	
Building AS4109 New Maintenance Hangar		No	Yes	
Echo Island		No	Yes	
MCAS NR Crash Crew Staging Area #4		No	Yes	
MCAS NR Crash Crew Staging Area #1		Yes	Yes	
MCAS NR Crash Crew Staging Area #3				
CH 53E Super Stallion Fire #1				
MCAS NR Crash Crew Staging Area #2		Yes	No	
MCAS NR Crash Crew Staging Area #5		No	Yes	
Current Crash Crew Fire Training Area		No	Yes	
Building AS849 Crash Crew Materiel Storage Area		No	Yes	
Crash Crew Fire Rescue Area		No	Yes	
Building AS890 Maintenance Hangar Area		No	Yes	
Site 54 - Former Crash Crew Fire Training Burn Pit ¹		NS	Yes	
Site 86 ²	Building AS502 Fire Station (Station #1)	NS	Yes	
	Building AS508 MV22 Trainer Hangar	NS	Yes	
	Building AS3900 Corrosion Control Facility	NS	Yes	
	Building AS3905 Maintenance Hangar	NS	Yes	

Table 2-2. Summary of Basewide PFAS SI Sites and Findings

IRP & MMRP Site Management Plan FY 2023

MCB Camp Lejeune and MCAS New River

Site Name	Soil Exceedance	GW Exceedance	Potential Risk ³
MWSS-272 Motor Transport Area	No	Yes	Yes
Building AS118 Motor Transport Maintenance Facility	No	Yes	Yes
Former Camp Geiger WWTP and Sludge Drying Beds	Yes	Yes	Yes
Building TC701 Camp Geiger Fire Station (Station #6)	No	Yes	Yes
Former Agan Street WWTP and Sludge Drying Beds	No	Yes	Yes
Crash Crew P-19 Refueling Route	NS	Yes	Yes
Building M303 Montford Point Barracks Fire Station (Station #8)	No	Yes	Yes
Building STP467 Contaminated Soil/ OWS Sludge Drying Bed	No	Yes	Yes
Site 9 - Piney Green Road Fire Fighting Training Pit ¹	NS	Yes	Yes
Building LCH4022 Midway Park Fire Station (Station #2)	Yes	Yes	Yes
Building 2600 Paradise Point Fire Station (Station #4)	No	Yes	Yes
Building 18 Hadnot Point Fire Station (Station #3)	No	Yes	Yes
Building 1400 Dogwood Street Fire Station	Yes	Yes	Yes
Building FC294 French Creek Fire Station (Station #5)	No	Yes	Yes
Toyota Tacoma Fire	NS	Yes	Yes
Building A66 HMMWV Fire	No	Yes	Yes
Building BB8 Courthouse Bay Fire Station (Station #7)	No	Yes	Yes
Former Courthouse Bay WWTP and Sludge Drying Beds	No	Yes	Yes
TLZ Bluebird FARP	No	Yes	Yes
RI Recommendation - Areas that are adjacent to an area recommended for an RI, where there is uncertainty related to potential impacts from the adjacent area			
Site 43 – Former Agan Street Dump	NS	Yes	No
Agan Street Foam Deployment	No	Yes	No

Notes

NS-Not Sampled

¹ Investigated in 2017

² Site 86 was investigated in 2017 and included 4 of the individual potential PFAS release areas identified in the PA.

³ Based on an HQ of 0.1

Table 2-3. Summary of Sites By Operable Unit

IRP & MMRP Site Management Plan FY 2023

MCB Camp Lejeune and MCAS New River

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	
	UXO-22	UXO-22—Sites 6 and 82	
3	48	MCAS Mercury Dump	Unique waste source (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	Unique waste source (pesticides).
6	36	Camp Geiger Dump Area Near Sewage Treatment Plant	Geographic location of sites. Similar characteristics of material disposed (POL, waste oils, solvents) and contaminants detected (metals, VOCs, O&G).
	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, metals).
	28	Hadnot Point Burn Dump	
	30	Sneads Ferry Road Fuel Tank Sludge Area	
8	16	Former Montford Point Burn Dump	Isolated site with unique waste source.
9	65	Engineer Area Dump	Isolated site with unique waste source.
10	35	Camp Geiger Fuel Farm	Former fuel farm with suspected chlorinated solvent disposal.
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	Suspected waste (dry cleaning solvent).
16	89	Former DRMO	Geographic location of sites and adjacent surface water body. Similar waste characteristics (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	Active PCX Service Station transferred to the IRP. Petroleum releases addressed under UST Program and chlorinated solvents addressed under IRP OU 1.
19	84	Building 45	Isolated site with PCBs.
20	86	Tank Area AS419-AS421 at MCAS	Site 86 was originally included under OU 6 but separated based on VOC concentrations.
21	73	Courthouse Bay Liquids Disposal Area	Isolated site with suspected waste disposal (POL, solvents).

Table 2-3. Summary of Sites By Operable Unit

IRP & MMRP Site Management Plan FY 2023

MCB Camp Lejeune and MCAS New River

OU	Site No.	Site Description	Primary Reason for OU Selection
22	96	Building 1817 UST	Transferred to IRP from RCRA based on chlorinated VOC plume identified.
23	49	MCAS Suspected Minor Dump	Isolated site with chlorinated VOCs in groundwater.
24	UXO-06	Fortified Beach Assault Area (ASR #2.65)	Isolated site with potential MEC.
25	UXO-19	M-4, Rifle Grenade Range (ASR #2.104) K-22 Practice Hand Grenade Course (ASR #2.111) M115 Hand Grenade Range (ASR #2.168) (Camp Devil Dog Historical Ranges)	Isolated site with potential MEC.
26	UXO-24	Camp Geiger Area	Geographic location of sites.
	Site 37	Camp Geiger Area Surface Dump	
30	UXO-28	Wallace Creek Phase I Munitions Response Site	Isolated site with potential MEC.
31	UXO-29	New River Runway Expansion Area (ASR #2.1, #2.167, and #2.29)	Isolated site with potential MEC.
33	UXO-30	Portions of B-6 (ASR #2.44), B-12 (ASR #2.134), and ABC Ranges (ASR #2.198)	Isolated site with potential MEC.
34	Site 111	Camp Davis Forward Arming and Refueling Point Activities South	Isolated site with unique waste source.

Notes:

ASR -	Archival Search Report
DRMO -	Defense Reutilization and Marketing Office
IRP -	Installation Restoration Program
O&G -	oil and grease
OU -	Operable Unit
MCAS -	Marine Corps Air Station
MEC-	munitions and explosives of concern
MMRP -	Military Munitions Response Program
PCBs -	polychlorinated biphenyls
POL -	petroleum, oil, lubricants
RCRA -	Resource Conservation and Recovery Act
UST -	underground storage tank
VOCs -	volatile organic compounds

Table 2-4. Summary of Environmental Studies, Investigations, and Actions Completed
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River

Site No.	OU	Historic Site Use	Preliminary Studies		Preliminary Investigations	PA	SI	RI	FS	Pilot Study / Treatability Study	Additional Investigations	Removal Actions	PRAP/ Proposed Plan	Signed Interim ROD	IROD Action/ RD/RA	Signed ROD Date/ Post-ROD Documents	ROD Action/ RD/RA	RACR	NFA Date ¹
			IAS (1983)	Confirmation Study (1984-1987)															
INSTALLATION RESTORATION PROGRAM SITES																			
PA Site	--	- HPIA Bldgs 1120, 1409, and 1512	--	--	--	- PA/SI (2006)		--	--	--	--	--	--	--	--	--	--	--	- February 2006 ²
PA Site	--	- MCAS New River Bldgs SAS113, AS116, and AS119	--	--	--	- PA/SI (2006) - ESI (2010)		--	--	--	--	--	--	--	--	--	--	--	- March 26, 2010 ²
PA Site	--	- Montford Point Bldgs M119 and M315	--	--	--	- PA/SI (2006) - ESI (2010)		--	--	--	--	--	--	--	--	--	--	--	- March 26, 2010 ²
1	7	- Artillery units disposing liquid wastes on ground surface (1940s)	X	X	- Soil Assessment (1991) - GW Study (1993) - Project Plans (1993)	--	--	- RI (1995)	- FS (1995)	--	- RI Data Review (2013)	--	- PRAP (1995)	--	--	- October 9, 1996	- LTM (1996-2001) - LUCs (2001, 2002)	- RACR (2002) - RACR (2015)	- October 9, 1996 - April 15, 2015
2	5	- Bldg. 712 used for storing, handling, and dispensing pesticides (1945-1958)	X	X	- Initial Assessment Study (1983) - Confirmation Study (1990) - Geophysical Invest. (1992-1994) - Limited GW Sampling (1992) - Project Plans (1993)	--	--	- RI (1994)	- FS (1994)	--	- Update Closeout Report TM (2011) - LSA PSW-647 (2017) - Completion Report, Groundwater Investigation (2017) - Groundwater Investigation (2018)	- TCRA (1995)	- PRAP (1994)	--	--	- September 15, 1994 - Memo to Site File (2020)	- LTM (1995-2007, 2023) - LUCs (2001, 2002, 2008, 2021)		--
3	12	- Creosote plant (1951-1952)	X	--	- Initial Assessment Study (1983) - Project Plans (1994)	--	- SI (1991)	- RI (1996)	- FS (1996)	-ORC (2015-2019)	--	- NTCRA (2000)	- PRAP (1996)	--	--	- May 15, 1997 - Amended July 28, 1999	- Soil removal & off-site disposal (2000) - LTM (1997-present) - LUCs (2001)	- RACR (2001)	--
4	--	- Surface disposal of construction debris including asphalt, old bricks, and cement (Unknown)	X	--	- Confirmatory Site Assessment (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- August 11, 2011
6	2	- Lot 201 stored pesticides & transformers containing PCBs. Lot 203 served as a waste disposal area (1940s-1980s)	X	X	- Confirmation Study (1990) - Lot 203 soil gas survey (1989) - Project Plans (1992)	--	--	- RI (1993) - Supplemental RI (2015 - present)	- FS (1993)	- Biosparging (2017-2019)	- Chlorobenzene Investigation (2010-2012) - Vapor Intrusion Evaluation (2009, 2011, and 2015) - Supplemental Investigation (2015) - FY 2012 VI 5-Year Review (2015) - TM SRI Status Update (2017, 2020, 2021) - Soil LUC Refinement Invetigation (2022)	- TCRA (1994) - TCRA (1995-1996) - TCRA (2011)	- PRAP (1993)	--	--	- September 24, 1993 - ESD (2017)	- Excavation & off-site disposal (1994) - LTM (1996-present) - LUCs (2001, 2002, 2019)	- Closeout Report, Soil (1997)	--
7	11	- Tarawa Terrace dump used during construction of Base housing (Closed 1972)	X	--	- Project Plans (1994)	--	- SI (1991)	- RI (1996)	--	--	--	--	- PRAP (1996)	--	--	-January 20, 1998	- NFA	--	- January 20, 1998
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	- Initial Assessment Study (1983) - Confirmation Study (1990) - Project Plans (1992)	--	--	- RI (1993)	- FS (1993)	--	- PFAS SI (2018) - SI for VOCs in Groundwater (2021-2022)	- RA (2000)	- PRAP (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 (1998) - GW Investigation (2001)	--	- SI (2001)	--	--	--	--	--	--	--	--	--	- NFA - LUCs implemented for conservativeness (2012)	--	- April 5, 2005 ³
12	--	- Explosive ordnance disposal by burning or detonating (early 1960s)	X	--	- Project Plans (1995) - Pre-RI Screening Study (1998)	--	--	--	--	--	--	--	--	--	--	--	--	--	- August 18, 1997

Table 2-4. Summary of Environmental Studies, Investigations, and Actions Completed

IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River

Site No.	OU	Historic Site Use	Preliminary Studies		Preliminary Investigations	PA	SI	RI	FS	Pilot Study / Treatability Study	Additional Investigations	Removal Actions	PRAP/ Proposed Plan	Signed Interim ROD	IROD Action/ RD/RA	Signed ROD Date/ Post-ROD Documents	ROD Action/ RD/RA	RACR	NFA Date ¹
			IAS (1983)	Confirmation Study (1984-1987)															
13	--	- Surface disposal of construction debris including clippings, branches, and asphalt (1944)	X	--	- LSA (2008)	--	--	--	--	--	--	--	--	--	--	--	--	--	- November 3, 2011
15	--	- Burn landfill area for disposal of sewage treatment sludge, litter, metal, asphalt, sand, etc. (1948-1958)	--	--	--	- PA/SI (2011) - ESI (2012)		--	--	--	- SWMU 46 CSI, RFI, and IM (1997- 2007)	--	--	--	--	--	- NFA - LUCs implemented for conservativeness (2012)	--	- March 26, 2012
16	8	- Burn dump for trash from surrounding housing area and disposal of small amounts of waste oil (suspected 1958-1972)	X	--	- Project Plans (1994)	--	--	- RI (1996)	--	--	--	--	- PRAP (1996)	--	--	- September 30, 1996 - ESD (2012)	- LUCs (2001, 2002, 2014)	--	--
18	--	- Disposal of construction materials and debris (1976-1978)	X	--	- Confirmatory Site Assessment (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- June 14, 2011
19	--	- Naval Research Lab used radionuclides for metabolic studies on animals (1947-1976)	X	--	- Radiological Survey (2007)	--	- Focused SI (2008) - ESI (2010)		--	--	--	--	--	--	--	--	--	--	- July 29, 2010
20	--	- Incineration of burnable wastes associated with Naval Research Lab (1956-1960)	X	--	- Radiological Survey (2007)	--	- Focused SI (2008) - ESI (2010)		--	--	- Radiological Investigation (2009)	--	--	--	--	--	--	--	- July 29, 2010
21	1	- Pit in northern portion of site used as drainage receptor for oil from transformers (1950-1951). Pesticide mixing and wash-down area for equipment used for pesticide application (1958-1977)	X	X	- Project Plans (1993)	--	--	- RI (1994)	- FS (1994)	--	--	- RA (1995)	- PRAP (1994)	--	--	- September 15, 1994 - ESD (1995)	- Excavation & off-site treatment (1995) - LUCs (2001, 2002)	--	--
23	--	- Storage of insecticides and herbicides (1958-1977)	X	--	- Confirmatory Site Assessment (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- August 11, 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 (1993)	--	--	- RI (1994)	- FS (1994)	--	--	--	- PRAP (1994)	--	--	- September 15, 1994	- LTM (1996-1997)	- RACR (2016)	- September 15, 1994
25	--	- Base incinerator burning trash and classified materials (1940-1960)	X	--	--	--	- Focused SI (2008) - ESI (2010)		--	--	--	--	--	--	--	--	--	--	- July 29, 2010
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	- GW Study (1993) - Project Plans (1993)	--	--	- RI (1995)	- FS (1995)	--	- Additional Delineation (2001)	--	- PRAP (1995)	--	--	- October 9, 1996	- LTM (1996-2001) - LUCs (2001, 2014)	- RACR (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	- GW Study (1993) - Project Plans (1993)	--	--	- RI (1995)	--	--	--	--	- PRAP (1995)	--	--	-May 1996	- NFA	--	- May 1996

Table 2-4. Summary of Environmental Studies, Investigations, and Actions Completed

IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River

Site No.	OU	Historic Site Use	Preliminary Studies		Preliminary Investigations	PA	SI	RI	FS	Pilot Study / Treatability Study	Additional Investigations	Removal Actions	PRAP/ Proposed Plan	Signed Interim ROD	IROD Action/ RD/RA	Signed ROD Date/ Post-ROD Documents	ROD Action/ RD/RA	RACR	NFA Date ¹
			IAS (1983)	Confirmation Study (1984-1987)															
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 (1993)	--	--	- IRA RI for Soil (1994) - Comprehensive RI (1995) - Supplemental RI (2009)	- IRA FS for Soil (1994) - IRA FS for Surficial GW (1995) - FS (2009)	- Air Sparge Trench (1996) - Modified Fenton's/Permanganate (2003-2006) - ERD and Bioaugmentation Work Plan (2018-present) - Air Sparging Work Plan (2019)	- GW Investigations (1997-2007) - NAE (1998-2003) - LTM (1999-2004) - Hot Spot Characterization (2002-2003) - Technology Evaluation (2003) - Vapor Intrusion Evaluation (2009, 2011, and 2015) - FY 2012 VI 5-Year Review (2015)	- RA (1995-1997) - NTCRA (2007)	- PRAP for Soil (1994) - PRAP for GW (1995) - Final PRAP (2009)	- September 15, 1994 (Soil) - September 22, 1995 (Surficial GW)	- Soil removal and disposal (1995-1997) - In situ air sparging (1998)	- November, 2009 - ESD (2017)	- In situ air sparging (2010-2013) - LUCs (2010, 2019) - MNA (2011-present)	- IRACR (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 (1994)	--	--	- RI (1996)	- FS (1998) - Revised FS (2002)	- ERD (2015 - 2016)	- Additional GW Sampling (2000)	- TCRA (1997) - NTCRA (2003)	- PRAP (2002)	--	--	- July 6, 2005 - ESD (2017)	- MNA (1998-present) - LUCs (2005, 2019)	- IRACR (2003) - IRACR (2007)	--
37	26	- Surface disposal of wastes including motor parts, garbage, and wood (1950-1951)	X	--	- Confirmatory Site Assessment (2011)	- PA/SI (2014) - Draft ESI (2017)		- RI/FS (2019)		--	--	--	- Proposed Plan (2019)	--	--	--	--	--	- September 30, 2019
38	--	- Surface disposal of construction debris and branches (Unknown)	X	--	- Confirmatory Site Assessment (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- August 11, 2011
40	--	- Disposal of auto parts and metal (1969-unknown)	X	--	--	- PA/SI (2009)		--	--	--	--	--	--	--	--	--	--	--	- January 27, 2009
41	4	- Open burn dump containing construction debris, POL wastes, mirex, solvents, batteries, ordnance, and chemical training agents. (1946-1970)	X	X	- Project Plans (1993)	--	--	- RI/FS (1995)		--	--	--	- PRAP (1995)	--	--	- January 16, 1996	- LTM (1997-2005) - LUCs (2001, 2002)	- RACR (2006)	--
42	--	- Surface disposal of debris including trees, tree stumps, and boards (1950-1960)	X	--	- Confirmatory Site Assessment (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- August 11, 2011
43	6	- Dump receiving inert material (i.e., construction debris and trash) and sludge from a former sewage disposal facility. (Unknown)	X	--	- Project Plans (1994)	--	- SI (1991)	- RI (1996)	- FS (2002)	--	--	- IRA (1995, 2003)	- PRAP (2002)	--	--	- July 6, 2005	- LUCs (2005)	- IRACR (2007)	--
44	6	- Active dump site receiving debris, cloth, lumber, and paint cans (1950s)	X	--	- Project Plans (December 2, 1994)	--	- SI (1991)	- RI (1996)	- FS (2002)	--	--	--	- PRAP (2002)	--	--	- July 6, 2005	- LUCs (2005)	- IRACR (2007)	--
46	--	- Disposal of construction and demolition debris (1958-1962)	X	--	- Confirmatory Site Assessment (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- June 14, 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 (1993)	--	--	- RI (1993)	--	--	--	--	- PRAP (1993)	--	--	- September 10, 1993	- NFA	--	- September 10, 1993
49	23	- Disposal of paint cans (Unknown)	X	--	--	- PA/SI (2011)		- RI/FS (2012)		- Air Sparging (2018-2020) - Expanded Air Sparging (planned in 2021)	--	--	- PRAP (2013)	--	--	- April 24, 2014	- MNA (2014-present) - LUCs (2014)	- IRACR (2014)	--
51	--	- Empty container disposal, including paint cans and hydraulic fluid (1967-1968)	X	--	- Confirmatory Site Assessment (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- June 14, 2011

Table 2-4. Summary of Environmental Studies, Investigations, and Actions Completed

IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River

Site No.	OU	Historic Site Use	Preliminary Studies		Preliminary Investigations	PA	SI	RI	FS	Pilot Study / Treatability Study	Additional Investigations	Removal Actions	PRAP/ Proposed Plan	Signed Interim ROD	IROD Action/ RD/RA	Signed ROD Date/ Post-ROD Documents	ROD Action/ RD/RA	RACR	NFA Date ¹
			IAS (1983)	Confirmation Study (1984-1987)															
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 (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- August 11, 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 (1994)	--	--	- RI (1996)	- FS (2002)	--	- Post-RI Monitoring (1998-2002) PFAS SI (2018)	- IRA (2000)	- PRAP (2002)	--	--	- July 6, 2005	- LUCs (2005)	- IRACR (2007)	--
55	--	- Disposal area for barrels, tires, trash, metal planking, and telephone poles (1950s-1960s)	X	--	- Confirmatory Site Assessment (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- August 11, 2011
61	--	- Disposal area for wastes generated during bivouac exercises (Unknown)	X	--	- Confirmatory Site Assessment (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- August 11, 2011
62	--	- Disposal area for wastes generated during bivouac exercises (Unknown)	X	--	- Confirmatory Site Assessment (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- August 11, 2011
63	13	- Waste disposal generated during training exercises (Unknown)	X	--	- Project Plans (1995)	--	- SI (1994)	- RI (1996)	--	--	--	--	- PRAP (1996)	--	--	- April 15, 1997 - ESD (2012)	- LUCs (2001, 2002, 2014)	--	--
65	9	- Battery acid and POL disposal, burning construction debris (1958-1972)	X	--	- Project Plans (1995)	--	- SI (1994)	- RI (1997)	--	--	- Post-RI Sampling (2001)	--	- PRAP (2001)	--	--	- September 28, 2001	-Non-Asbestos Removal Completion Report (2015) - LUCs implemented for conservativeness (2015)	--	- September 28, 2001
66	--	- Vehicle maintenance area during training exercises (Unknown)	X	--	- Confirmatory Site Assessment (2011)	--	--	--	--	--	--	--	--	--	--	--	--	--	- August 11, 2011
67	--	- TNT disposal by burning in 2-3 foot deep pits (1951)	X	--	- Confirmatory Site Assessment (2010)	--	--	--	--	--	--	--	--	--	--	--	--	--	- November 15, 2010
68	--	- Garbage, building debris, waste treatment sludge disposal. (1942-1972).	X	--	- Project Plans (1995) - Pre-RI Screening Study (1998)	--	--	--	--	--	--	--	--	--	--	--	- NFA - LUCs implemented for conservativeness, (2001, 2002)	--	- May 1, 2001 ⁴
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 (1993)	--	- ESI (2012)	- RI (1997)	- FS (2012)	- In-well Aeration (1996-1998)	- Radiological Survey (2007) - Supplemental Investigation (2011)	--	- PRAP (1998) - PRAP (2012)	- June 29, 2000	- MNA (1998-2005) - LUCs (2001, 2002)	- June 25, 2013	- Soil Cap (2014) - MNA and LTM (2015-present) - LUCs (2001,2002,2015)	- RACR (2015)	--
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 (1995)	--	--	- RI (1997) - Amended RI (2006) - Supplemental RI (2009)	- FS (1998) - FS (2009)	- Hydrogen Sparging (2003-2006) - Air/ozone Sparging (2007-2008) -Biostimulation (2017-2020) -Bio-barrier (2019-2020)	- GW modeling (1998) - LTM (2000-2005) - NAE (2002) - Technology Evaluation (2003) - Vapor Intrusion Evaluation (2009, 2011, and 2015) - FY 2012 VI 5-Year Review (2015)	--	- PRAP (2009)	--	--	- November 2009 - ESD (2017)	- In situ air sparging (2010-2012) - ERD injections (2011, 2013) - MNA (2010-present) - LUCs (2010, 2019)	- IRACR (2011)	--

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IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River

Site No.	OU	Historic Site Use	Preliminary Studies		Preliminary Investigations	PA	SI	RI	FS	Pilot Study / Treatability Study	Additional Investigations	Removal Actions	PRAP/ Proposed Plan	Signed Interim ROD	IROD Action/ RD/RA	Signed ROD Date/ Post-ROD Documents	ROD Action/ RD/RA	RACR	NFA Date ¹
			IAS (1983)	Confirmation Study (1984-1987)															
74	4	- Grease, pesticide, chemical training agents disposal (Early 1950s to early 1960s)	X	X	- Project Plans (1993)	--	--	- RI/FS (1995)		--	- Confirmatory Sampling (2012) - Henderson Pond/Hickory Pond Investigation Report (2013)	--	- PRAP (1995)	--	--	- January 16, 1996	- LTM (1997-1998) - LUCs (2001, 2002)	- RACR (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 (1995) - Pre-RI Screening Study (1995)	--	--	--	--	--	--	--	--	--	--	--	--	--	- August 18, 1997
76	--	- Approximately 25-75 buried drums likely containing tear gas, chloroform, carbon tetrachloride, benzene, and chloropicrin. (1949)	X	--	- Project Plans (1995) - Pre-RI Screening Study (1998)	--	--	--	--	--	- Additional GW Sampling (1999)	--	--	--	--	--	--	--	- July 26, 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 (1993)	--	--	- IRA RI (1992) - RI (1994)	- IRA FS (1992) - FS (1994) - FS Amendment Investigation (2018) - FS Amendment (2022)	- ORC/HRC (2003-2005) - ERD (2012-2015) - Air Sparging (2017-2019) - Enhanced Pump and Treat (2018-2019) -Rebound Study (2020-2021)	- NAE (2002) - Vapor Intrusion Evaluation (2009, 2011, and 2015) - Historical Metals Evaluation (2013) - Supplemental GW Investigation (2014) - FY 2012 VI 5-Year Review (2015) -GW Treatment Plant Evaluation (2017-2018) -Building 902 VIMS Investigation (2018-present)	- Soil excavation (1994-1995)	- IRA PRAP (1992) - PRAP (1994)	- September 23, 1992	- GW Pump & Treat	- September 15, 1994 - ESD (2017)	- GW Pump & Treat (1994-present) - LTM (1995-present) - LUCs (2001, 2002, & 2015)	-Closeout Report, Soil (1996)	--
80	11	- Golf course maintenance, pesticides (Unknown to present)	--	--	- Project Plans (1994)	--	- SI (1991)	- RI (1996)	--	--	--	- TCRA (1996)	- PRAP (1997)	--	--	- January 20, 1998 - ESD (2012)	- NFA - LUCs (2007, 2012)	--	- January 20, 1998
82	2	- Storage, disposal, and handling of potentially hazardous waste and material. (prior to late 1980s).	--	--	- Project Plans (1992)	--	- SI (1991)	- RI (1993)	- FS (1993)	- ERD (2007) - SBGR (2019-2020) - AS (2021-2022)	- Vapor Intrusion Evaluation (2009, 2011, and 2015) - Potential Source Investigation (2011) - Supplemental Investigation (2012-2015) -FY 2012 VI 5-Year Review (2015) - Treatment Plant Evaluation (2016) - TM SRI Status Update (2017, 2020, 2021) -Soil LUC Investigation (2021) -SI for Radionuclides (2021-2022)	- Soil Excavation (1994-1995)	- PRAP (1993)	--	--	- September 24, 1993 - ESD (2017)	- Soil Excavation (1994-1995) - SVE System (1996) - GW Pump & treat (1996-present) - LTM (1996-present) - LUCs (2001, 2002, 2019)	- Closeout Report, Soil (1997)	--
84	19	- Electrical powerhouse, transformers containing PCBs (possible buried), PCB dielectric oil (Unknown) Bldg 45 maintenance facility (1965-early 1990s)	--	--	- Pre-RI Screening Study (1995) - Bldg 45 Removal (1999) - UST Removal (1999) - Project Plans (2001)	--	--	- RI (2002)	- FS (2002) - Amended FS (2008)	--	- Supplemental Investigation (2006)	- Phase I NTCRA (2002) - Phase II NTCRA (2005) - Phase III NTCRA (2007)	- PRAP (2002) - PRAP (2008)	--	--	- January 31, 2009	- Soil Removal (2002-2007) - LUCs (2010)	--	--

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			IAS (1983)	Confirmation Study (1984-1987)															
85	--	- Battery disposal (1950s)	--	--	- Project Plans (1995) - Pre-RI Screening Study (1998)	- PA/SI (2011)		--	--	--	- EE/CA (1999) - LTM (2001-2002) - ESI (2011)	- NTCRA (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 (1990) - AST Removal (1992) - UST Assessment (1992) - Project Plans (1994)	--	--	- RI (1996) - Amended RI (2003) - Expanded SRI (2011)	- FS (1998) - FS (2013)	- Air Sparge (2005-2006) - ISCO and ERD (2011-2013)	- LTM (1998-2005) - PFAS SI (2018)	--	- PRAP (2014)	--	--	- October 29, 2014	- LUCs (2015) - MNA (2015-present)	- RACR (2015)	--
87	--	- Hospital waste materials including hypodermic needles and chlorine-based white powder (1986)	--	--	- Project Plans (1995) - Pre-RI Screening Study (1998)	--	--	--	--	--	--	--	--	--	--	--	--	--	- June 26, 2001
88	15	- Base Dry Cleaners (1940s-2004) - Varsol stored in USTs (1940s-1970s) - PCE stored in ASTs (1970-1980s)	--	--	- Project Plans (1997)	--	--	- Focused RI (1998) - RI (2008) - SWMU 615 RFI (2014-2016)	- FS (2017)	- SEAR (1999) - RABITT (2001) - ISCO and ERD (2011) - Building HP57 Sewer Ventilation (2016 - 2018) - Zones 1 and 3 Study (2018-present)	- DNAPL Investigation (1998-1999) - LTM (1999-2002) - Supplemental SI (2002-2003) - MIP Investigation (2004) - Vapor Intrusion Evaluation (2009, 2011, and 2015) - FY 2012 VI 5-Year Review Work Plan (2015-Present) - Bldg HP57 Vapor Intrusion Investigation (2015)	- NTCRA (2005)	- Proposed Plan (2018)	--	--	- May 28, 2019	- Zone 1 – ERD via vertical injection wells and VIMS (2019-present) - Zone 2 – ISCO via horizontal injection wells and VIMS (2020-present) - Zone 3 – Biobarrier via vertical injection wells (2019-present) - Sitewide – MNA after active treatment and LUCs (2020)	--	--
89	16	- Base Motor Pool (until 1988) - DRMO storing scrap and surplus metals, electronic equipment, vehicles, rubber tires, and fuel bladders (1988-2000)	--	--	- UST STC-868 Investigation (1994) - Project Plans (1997)	--	--	- RI (1998) - Comprehensive RI (2008) - BERA Addendum (2008)	- FS (2012)	- ERH (2003-2005) - Air Sparge, PRB, ZVI, ERD (2006-2008)	- LTM (1999-2003) - Supplemental Site Investigation (2001) - Vapor Intrusion Evaluation (2009, 2011, and 2015) - FY 2012 VI 5-Year Review (2015) - Supplemental Investigation (2017-present)	- TCRA (2000) - Source Area NTCRA (2007-2009) - Western Wetland NTCRA (2009)	- PRAP (2012)	--	--	- December 6, 2012	- Horizontal well air sparging (2013-present) - PRB (2013 - present) - Aerators (2014-present) - MNA (2014 - present) - LUCs (2013)	- IRACR (2014)	--
90	17	- Three heating oil USTs, toluene (Unknown)	--	--	- UST Removal (1993) - Project Plans (1996)	--	--	- Focused RI (2001)	--	--	--	--	- PRAP (2001)	--	--	- September 30, 2001	- NFA	--	- September 30, 2001
91	17	- Two waste oil USTs (unknown-1992)	--	--	- UST Removal (1992) - Project Plans (1996)	--	--	- Focused RI (2001)	--	--	- Post-RI Monitoring (2000-2001) - Supplemental GW Report (2001)	--	- PRAP (2001)	--	--	- September 30, 2002	- NFA	--	- September 30, 2002
92	17	- Gasoline UST (1980-1994)	--	--	- UST Removal (1994) - Project Plans (1996)	--	--	- Focused RI (2001)	--	--	- Post-RI Monitoring (2000-2001)	--	- PRAP (2001)	--	--	- September 30, 2003	- NFA	--	- September 30, 2003

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			IAS (1983)	Confirmation Study (1984-1987)															
93	16	- Heating oil UST (unknown to 1993)	--	--	- UST Investigation (1995) - Geotechnical Investigation (1995-1996) - Project Plans (1997)	--	--	- RI (1998)	- FS (2005)	- SBGR (2015 - present)	- NAE (2001) - Additional Plume Characterization (2002) - LTM (1999-2005) - Supplemental Site Investigation (2005) - Human Health Screening (2013) - Vapor Intrusion Evaluation (2009 and 2015) - FY 2012 VI 5-Year Review (2015)	--	- PRAP (2006)	--	--	- October 2, 2006	- Permanganate injection (2006-2008) - LTM (2008-present) - LUCs (2009, 2014)	- 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 (2000-2001) - Project Plans (2004)	--	--	- RI (2003-2005)	--	--	--	--	- PRAP (2006)	--	--	- August 28, 2006	- NFA	--	- August 28, 2006
95	--	- Livestock dipping vats (1906-1961)	--	--	- Initial Assessment (2004)	--	- SI (2007)	--	--	--	--	- NTCRA (2010)	--	--	--	--	--	--	- August 24, 2010
96	--	- Former 300-gallon waste oil UST	--	--	- UST removal and investigations (1997) - Confirmatory Sampling Investigation (2005)	--	--	- RFI (2005) - Amended RFI (2006) - RI (2017)	- CMS (2007) - Pre-FS Vapor Intrusion Investigation and Groundwater Study (2020) - FS (2021)	- SVE and ERD (2018-2019)	- Additional GW Delineation (2009) - Vapor Intrusion Evaluation (2009, 2011, and 2015) - FY 2012 VI 5-Year Review (2015)	--	- Proposed Plan (2021)	--	--	- Final ROD pending signature 2022	--	--	--
110	--	- Water Towers (LCH-4004, S-5, S-830, S-2323, and SBA-108)	--	--	--	- ESI (2020)	--	--	--	--	--	--	--	--	--	--	--	--	- October 1, 2020
111	34	- Camp Davis Forward Arming and Refueling Point Activities South	--	--	--	- Basewide PFAS PA (2019)	- Basewide PFAS SI (2022)	-RI Work Plan (2022)	--	--	--	--	--	--	--	--	--	--	--
MILITARY MUNITIONS RESPONSE PROGRAM SITES																			
UXO-01	--	- Former Live Hand Grenade Course (1945-1946)	--	--	--	- PA/SI (2009) - ESI (2012)	--	--	--	--	--	--	--	--	--	--	--	--	- November 30, 2011
UXO-01	--	- D-6 50-foot Indoor Rifle and Pistol Range (before 1954)	--	--	--	- PA/SI (2009)	--	--	--	--	--	- NTCRA (2013)	--	--	--	--	--	--	- May 9, 2013
UXO-02	--	- Explosive range (1973-2002)	--	--	--	- PA/SI (2012)	--	--	--	--	--	--	--	--	--	--	--	--	- May 31, 2012
UXO-03	--	- Practice hand grenade course (1953-1959)	--	--	--	- Focused SI (2006) - ESI (2011) - PA/SI (2011)	--	--	--	--	--	--	--	--	--	--	--	--	- November 15, 2011
UXO-04	--	- Bulldozer uncovered a live WWII MK-II high-explosive hand grenade during excavation (between 1974 and 1976)	--	--	--	- ESI (2009)	--	--	--	--	--	--	--	--	--	--	--	--	- January 27, 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)	--	--	- LSA (2000)	- Focused PA/SI (2007) - PA/SI (2009)	--	--	--	--	--	--	--	--	--	--	--	--	- June 16, 2009
UXO-06	24	- Range using small arms, 3.5-in practice rockets, rifle grenades, hand grenades (1953-1977)	--	--	--	- Focused PA/SI (2007) - Focused SIs (2006-2012) - PA/SI (2012)	- RI (2015)	--	- FS (2016)	--	--	--	- Proposed Plan (2017)	--	--	April 30, 2018	- Surface MEC Clearance and LUCs (2018-2019)	- RACR (2020)	--
UXO-07	--	- Practice hand grenade course (1953)	--	--	--	- PA/SI (2011) - ESI (2011)	--	--	--	--	--	--	--	--	--	--	--	--	- December 6, 2011
UXO-08	--	- Bazooka range (1970s-1990s). Gas chamber using tear gas (1953-1961).	--	--	--	- Focused PA/SI (2010) - PA/SI (2011)	--	--	--	--	--	--	--	--	--	--	--	--	- November 28, 2011

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			IAS (1983)	Confirmation Study (1984-1987)															
UXO-09	--	- Triangulation range using service munitions and automatic rifles (~1953)	--	--	--	- PA/SI (2009)		--	--	--	--	--	--	--	--	--	--	--	- June 23, 2009
UXO-10	--	- Range using flame throwers and small arms blank ammunition (1970-1977)	--	--	--	- PA/SI (2011) - ESI (2012)		--	--	--	--	--	--	--	--	--	--	--	- March 12, 2012
UXO-11	--	- Practice hand grenade course (1953)	--	--	--	- PA/SI (2011) - ESI (2012)		--	--	--	--	--	--	--	--	--	--	--	- December 7, 2011
UXO-12	--	- Small arms range, including .33 caliber weapons (1945-1946)	--	--	--	- PA/SI (2011)		--	--	--	--	--	--	--	--	--	--	--	- March 10, 2011
UXO-13	--	- Maneuver training area used to train troops in non-live fire operations (Unknown)	--	--	--	--		--	--	--	--	--	--	--	--	--	--	--	- March 24, 2004 ⁵
UXO-14	--	- Indoor pistol range using small caliber weapons (1950-1996), and gas chamber using tear gas (1950-1954)	--	--	--	- PA/SI (2011) - ESI (2012)		--	--	--	--	- NTCRA (2013)	--	--	--	--	--	--	- September 4, 2013
UXO-15	--	- 1000-inch small arms range used for service and target practice (1945-1946)	--	--	--	- PA/SI (2010)		--	--	--	--	--	--	--	--	--	--	--	- February 9, 2010
UXO-16	--	- Gun position training ground for 8-inch Howitzers, 4.2 inch mortars, 175 mm guns, and 120 mm mortars. (Unknown)	--	--	--	- Focused PA/SI (2009)		--	--	--	--	--	--	--	--	--	--	--	- May 27, 2009
UXO-17	--	- Firing Position used for military training (1950-1985)	--	--	--	- PA/SI (2012)		--	--	--	--	--	--	--	--	--	--	--	- February 16, 2012
UXO-18	--	- Small arms ranges (1950-1961)	--	--	--	- PA/SI (2011)		--	--	--	--	--	--	--	--	--	--	--	- March 10, 2011
UXO-19	25	M-4, Rifle Grenade Range (ASR #2.104), K-22 Practice Hand Grenade Course (ASR #2.111), and M-115 Hand Grenade Range (ASR #2.168) (Camp Devil Dog Historical Ranges)- (1950s-1970s)	--	--	--	- PA/SI (2010)		- RI/FS (2014)		--	--	--	- Proposed Plan (2015)	--	--	- December 9, 2015	- LUCs (2016)	-RACR (2018)	--
UXO-20	--	- 1,000-inch and A-1, 50-foot .22 caliber ranges (1940s-1950s)	--	--		- Focused PA/SI (2011)		--	--	--	--	--	--	--	--	--	--	--	- March 22, 2011
UXO-21	--	- Gas Chamber (2nd Marine Division) (1970s)	--	--	--	- ESI (2012) - Phase II ESI (2014)		--	--	--	- MILCON Intrusive Investigation (2013)	--	--	--	--	--	--	--	- July 15, 2014
UXO-22	--	- Possible disposal trenches (unknown)	--	--	--	- PA/SI (2013) - ESI (2016)		--	--	--	- FY 2012 VI 5-Year Review (CH2M, 2015)	--	--	--	--	- ESD (2017)	- LUCs (2019)	--	--
UXO-23	--	- D-9 skeet range (1953-2011)	--	--	--	- Focused SI (2008) - Focused PA/SI (2010) - Wallace Creek Expanded Site Inspection (2010) - ESI (2018)		- Remedial Investigation (2013-2016)	--	--	- Environmental Update (2011) - Wallace Creek Confirmation Sampling (2012)	- NTCRA (2012-2016)	--	--	--	--	--	--	- March 23, 2018
UXO-24	26	- Ammunition Burial Site (2010)	--	--	--	- PA/SI (2014) - Draft ESI (2017)		- RI/FS (2019)		--	--	--	-Proposed Plan (2019)	--	--	- September 30, 2019	- LUCs (2019)	-RACR (2020)	--
UXO-25	--	- Impact Area “M” range (1941 - 1945) and M-16, Outdoor Classroom range (unknown)	--	--	--	- PA/SI (2013)		--	--	--	--	--	--	--	--	--	--	--	- February 12, 2013
UXO-26	--	- B-3 Gas Chamber (1953-1958)	--	--	--	- PA/SI (2009) - ESI (2012)		--	--	--	--	--	--	--	--	--	--	--	- September 11, 2012
UXO-27	--	- Gun Position Owl	--	--	--	- PA/SI (2015)		--	--	--	--	--	--	--	--	--	- NFA ⁴	--	- October 3, 2016

Table 2-4. Summary of Environmental Studies, Investigations, and Actions Completed

IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River

Site No.	OU	Historic Site Use	Preliminary Studies		Preliminary Investigations	PA	SI	RI	FS	Pilot Study / Treatability Study	Additional Investigations	Removal Actions	PRAP/ Proposed Plan	Signed Interim ROD	IROD Action/ RD/RA	Signed ROD Date/ Post-ROD Documents	ROD Action/ RD/RA	RACR	NFA Date ¹
			IAS (1983)	Confirmation Study (1984-1987)															
UXO-28	30	- Wallace Creek Phase I Munitions Response Site	--	--	--	- PA/SI (2016)		- RI Work Plan (2017) - RI Work Plan Addendum (2019) - RI (2022)	--	--	--	--	--	--	--	--	--	--	--
UXO-29	31	- New River Runway Expansion Area	--	--	- MILCON Investigation (2014)	- PA/SI (2019)		- RI (2021)	--	--	--	--	--	--	--	--	--	--	--
UXO-30	33	- Portions of B-6 (ASR #2.44), B-12 (ASR #2.134), and ABC Ranges (ASR #2.198)	--	--	- Environmental Investigation Report B-12 Baffled Pistol Range Proposed BEQ (2008)	- PA/SI (2020)		- RI/FS (2022)		--	--	--	--	--	--	--	--	--	--
UXO-31	--	- Off-Base Surface Danger Zones	--	--	--	- PA/SI (2006) - ESI (2013)		--	--	--	- EE/CA (2015)	--	--	--	--	--	--	--	--

¹ NFA date is the date EPA concurred with the NFA

² NFA date is the date of the final PA/SI Report

³ NFA date is the date the team concurred to NFA during the April 5, 2005 partnering meeting

⁴ NFA date is the date the NADD was signed

⁵ NFA date is the administrative closed date

"--" indicates the specified report not completed for the site.

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

AST = aboveground storage tank

BEQ = Bachelor Enlisted Quarters

BERA = baseline ecological risk assessment

Bldg. = building

CSI = Confirmatory Site Investigation

CMS = Corrective Measures Study

CWM = chemical warfare materiel

DNAPL = dense non-aqueous phase liquid

DRMO = Defense Reutilization and Marketing Office

EE/CA = Engineering Evaluation/Cost Analysis

ERD = enhanced reductive dechlorination

ERH = electrical resistance heating

ESD = Explanation of Significant Difference

ESI = Expanded Site Investigation

FS = feasibility study

GW = groundwater

HPIA = Hadnot Point Industrial Area

HRC = Hydrogen Release Compound

IAS = Initial Assessment Study

IM = interim measure

IRA = Interim Remedial Action

IRACR = Interim Remedial Action Completion Report

IROD = Interim Record of Decision

ISCO = *in situ* chemical oxidation

JP = jet propulsion

LSA = Limited Site Assessment

LTM = long-term monitoring

LUCs = land use controls

MCAS = Marine Corps Air Station

MILCON = Military Construction

MIP = membrane interface probe

MNA = monitored natural attenuation

Mk = Mark

mm = millimeter

NAE = natural attenuation evaluation

NFA = No Further Action

NTCRA = Non-time-critical Removal Action

ORC = Oxygen Release Compound

OWS = oil-water separator

PA = preliminary assessment

PCB = polychlorinated biphenyl

PCE = tetrachloroethene

PFAS = per- and polyfluoroalkyl substances

POL = petroleum, oil, and lubricants

PRAP = Proposed Remedial Action Plan

RA = Remedial Action

RABITT = Reductive Anaerobic Bioremediation *In Situ* Treatment Technology

RACR = Remedial Action Completion Report

RD = Remedial Design

RFI = Resource Conservation and Recovery Act Facility Investigation

RI = Remedial Investigation

ROD = Record of Decision

SBGR = subgrade biogeochemical reactor

SEAR = surfactant enhanced aquifer remediation

SI = Site Inspection

SRI = Supplemental Remedial Investigation

SVE = soil vapor extraction

SWMU = solid waste management unit

TCRA = Time-critical Removal Action

TNT = trinitrotoluene

UST = underground storage tank

UXO = unexploded ordnance

WWII = World War II

Table 2-5. Sites and Status for FY 2023 through FY 2025

IRP & MMRP Site Management Plan FY 2023

MCB Camp Lejeune and MCAS New River

Site No.	OU	Site Description	Current Site Status	FY 2023 Reports		FY 2024 Reports		FY 2025 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	NFA	--	--	--	--	--	--
2	5	Former Nursery/Day Care Center	RIP (LUC)	--	--	FY 2023 LTM Report	May 2024	--	--
3	12	Old Creosote Plant	RIP (LTM and LUC)	--	--	FY 2023 LTM Report	May 2024	--	--
4	--	Sawmill Road Construction Debris Dump	NFA	--	--	--	--	--	--
6	2	Storage Lots 201 and 203	RIP (LTM and LUC)	FY 2021 LTM Report	October 2022	FY 2022 LTM Report	October 2023	FY 2023 LTM Report	October 2024
				LUC Refinement Report	December 2022				
7	11	Tarawa Terrace Dump	NFA	--	--	--	--	--	--
9	2	Fire Fighting Training Pit at Piney Green Road	NFA	SI Report	January 2023	--	--	--	--
10	--	Original Base Dump	RIP (LUC)	--	--	--	--	--	--
12	--	Explosive Ordnance Disposal	NFA	--	--	--	--	--	--
13	--	Golf Course Construction Debris Dump	NFA	--	--	--	--	--	--
15	--	Montford Point Burn Landfill Area	RIP (LUC)	--	--	--	--	--	--
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 (MNA and LUC)	Brinson Creek Technical Memorandum	November 2022	Brinson Creek Technical Memorandum	April 2024	FY 2024 LTM Report	January 2025
				FY 2022 LTM Report	April 2023	FY 2023 LTM Report	December 2023		
36	6	Camp Geiger Dump Area Near Sewage Treatment Plant	RIP (MNA and LUC)	--	--	FY 2023 LTM Report	May 2024	--	--
37	--	Camp Geiger Area Surface Dump	NFA	--	--	--	--	--	--
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	23	MCAS Suspected Minor Dump	RIP (MNA and LUC)	--	--	FY 2023 LTM Report	March 2024	--	--
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	--	--	--	--	--	--

Table 2-5. Sites and Status for FY 2023 through FY 2025

IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River

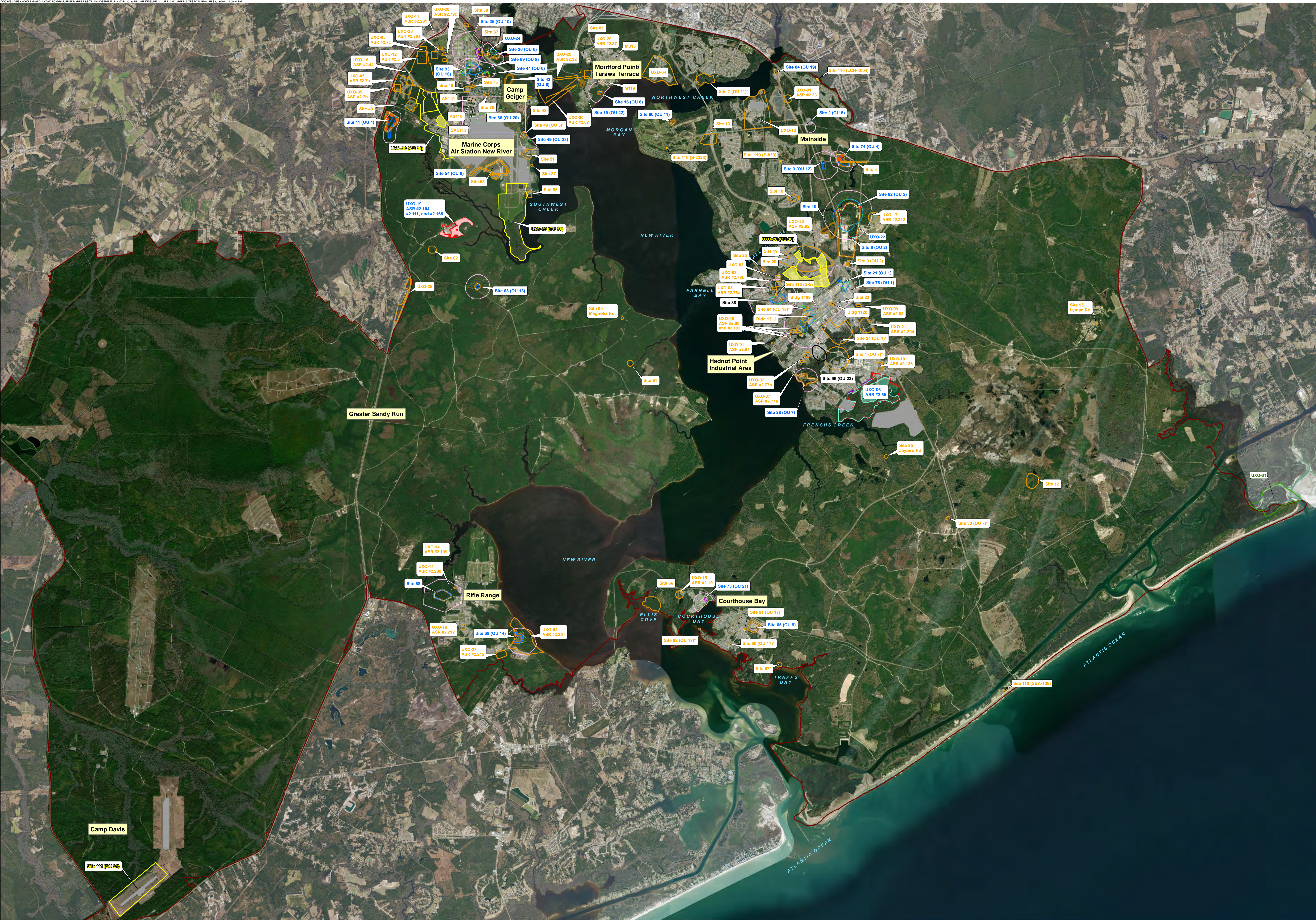
Site No.	OU	Site Description	Current Site Status	FY 2023 Reports		FY 2024 Reports		FY 2025 Reports	
				Document	Anticipated Submittal Date	Document	Anticipated Submittal Date	Document	Anticipated Submittal Date
62	--	Race Course Area Dump	NFA	--	--	--	--	--	--
63	13	Verona Loop Dump	RIP (LUC)	--	--	--	--	--	--
65	9	Engineer Area Dump	RIP (LUC)	--	--	--	--	--	--
66	--	AMTRAC Landing Site and Storage Area	NFA	--	--	--	--	--	--
67	--	Engineer's TNT Burn Site	NFA	--	--	--	--	--	--
68	--	Rifle Range Dump	RIP (LUC)	--	--	--	--	--	--
69	14	Rifle Range Chemical Dump	RIP (MNA, LTM, and LUC)	--	--	FY 2023 LTM Report	December 2023	--	--
73	21	Courthouse Bay Liquids Disposal Area	RIP (MNA and LUC)	FY 2022 LTM Report	August 2023	FY 2023 LTM Report	December 2023	FY 2024 LTM Report	February 2025
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 (Groundwater Treatment, LTM, and LUC)	FS Amendment	January 2023	ROD Amendment	October 2024	FY 2023 LTM Report	October 2024
				Proposed Plan	June 2023				
				FY 2022 LTM Report	August 2023				
80	11	Paradise Point Golf Course Maintenance Area	RIP (LUC)	--	--	--	--	--	--
82	2	Piney Green Road VOC Area	RIP (Groundwater Treatment, LTM, and LUC)	LUC Refinement Report	January 2023	Potential FS Amendment	September 2024	FY 2023 LTM Report	October 2024
				SI Report	February 2023			Potential Proposed Plan	April 2025
				FY 2022 LTM Report	July 2023				
84	19	Building 45	RIP (LUC)	--	--	--	--	--	--
85	--	Camp Johnson Battery Dump	NFA	--	--	--	--	--	--
86	20	Tank Area AS419-AS421 at MCAS	RIP (MNA, LUC)	FY 2022 LTM Report	March 2023	FY 2023 LTM Report	May 2024	FY 2024 LTM Report	June 2025
87	--	MCAS Officers' Housing Area	NFA	--	--	--	--	--	--
88	15	Base Dry Cleaners	RD/RA	Zone 2 Phase 1 Injection Report	November 2022	IRACR	March 2023	FY 2023 LTM Report	October 2024
						FY 2022 LTM Report	October 2023		
89	16	Former DRMO	RIP (AS, PRB, Aerator, MNA, and LUC)	SI Report	January 2023	FY 2023 LTM Report	June 2024	FY 2024 LTM Report	August 2025
				FY 2022 LTM Report	April 2023				
90	17	Building BB-9	NFA	--	--	--	--	--	--
91	17	Building BB-51	NFA	--	--	--	--	--	--
92	17	Building BB-246	NFA	--	--	--	--	--	--
93	16	Building TC-942	RIP (LTM and LUC)	FY 2022 LTM Report	March 2023	FY 2023 LTM Report	April 2024	FY 2024 LTM Report	July 2025
94	18	PCX Service Station	NFA	--	--	--	--	--	--
95	--	Dipping Vat Sites	NFA	--	--	--	--	--	--
96	22	Building 1817 UST	PP/ROD	RD	February 2023	--	--	--	--
110	--	Former Water Towers (LCH-4004, S-5, S-830, S-2323, and SBA-108)	NFA	--	--	--	--	--	--
111	34	Camp Davis Forward Arming and Refueling Point Activities South	RI/FS	--	--	RI Report	March 2024	FS Report	December 2024
MILITARY MUNITIONS RESPONSE PROGRAM SITES									
UXO-01	--	Former Live Hand Grenade Course (ASR #2.23)	NFA	--	--	--	--	--	--
UXO-01	--	D-6, 50-ft Indoor Rifle and Pistol Range (ASR #2.64)	NFA	--	--	--	--	--	--
UXO-02	--	Unnamed Explosive Range (ASR #2.201)	NFA	--	--	--	--	--	--
UXO-03	--	Practice Hand Grenade Course (ASR #2.78a and 2.78b)	NFA	--	--	--	--	--	--
UXO-04	--	Knox Trailer Park	NFA	--	--	--	--	--	--
UXO-05	--	Miniature Anti-Tank Range (ASR #2.7a, 2.7b, and 2.7c)	NFA	--	--	--	--	--	--
UXO-06	24	Fortified Beach Assault Area (ASR #2.65)	RIP (LUC)	--	--	--	--	--	--
UXO-07	--	Practice Hand Grenade Course (ASR #2.77a and 2.77b)	NFA	--	--	--	--	--	--
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)	NFA	--	--	--	--	--	--
UXO-09	--	F-9, Triangulation Range (ASR #2.83)	NFA	--	--	--	--	--	--

Table 2-5. Sites and Status for FY 2023 through FY 2025

IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River

Site No.	OU	Site Description	Current Site Status	FY 2023 Reports		FY 2024 Reports		FY 2025 Reports	
				Document	Anticipated Submittal Date	Document	Anticipated Submittal Date	Document	Anticipated Submittal Date
UXO-10	--	D-11A, Flame Tank and Flame Thrower Range (ASR #2.136)	NFA	--	--	--	--	--	--
UXO-11	--	B-5, Practice Hand Grenade Course (ASR #2.81)	NFA	--	--	--	--	--	--
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)	NFA	--	--	--	--	--	--
UXO-15	--	1000-inch Range (ASR #2.19)	NFA	--	--	--	--	--	--
UXO-16	--	Former Gun Positions 41A and 41B (ASR #2.212)	NFA	--	--	--	--	--	--
UXO-17	--	Firing Position #2 (ASR #2.212)	NFA	--	--	--	--	--	--
UXO-18	--	B-6, 50-foot Small Arms Range (ASR #2.44)	NFA	--	--	--	--	--	--
UXO-19	25	M-4, Rifle Grenade Range (ASR #2.104), K-22 Practice Hand Grenade Course (ASR #2.111), and M-115 Hand Grenade Range (ASR #2.168) (Camp Devil Dog Historical Ranges)	RIP (LUC)	--	--	--	--	--	--
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 (2nd Marine Division) (ASR #2.204)	NFA	--	--	--	--	--	--
UXO-22	2	Sites 6 & 82 (OU 2)	RIP (LUC)	--	--	--	--	--	--
UXO-23	--	D-9 Skeet Range (ASR #2.82)	NFA	--	--	--	--	--	--
UXO-24	26	Camp Geiger Area	RIP (LUC)	--	--	--	--	--	--
UXO-25	--	Verona Loop	NFA	--	--	--	--	--	--
UXO-26	--	B-3, Gas Chamber (ASR #2.79a and 2.79c)	NFA	--	--	--	--	--	--
UXO-27	--	Gun Position Owl (ASR #2.212)	NFA	--	--	--	--	--	--
UXO-28	30	Wallace Creek Phase I Munitions Response Site	RI/FS	FS	May 2023	Proposed Plan	October 2023	--	--
						ROD	December 2023	--	--
						RD	July 2024	--	--
UXO-29	31	New River Runway Expansion Area (ASR #2.1, 2.167, and 2.29)	RI/FS	FS	April 2023	ROD	December 2023	--	--
				Proposed Plan	September 2023	RD	August 2024	--	--
UXO-30	33	Portions of B-6 (ASR #2.44), B-12 (ASR #2.134), and ABC Ranges (ASR #2.198)	RI/FS	RI/FS	October 2022	RD	March 2024	--	--
				Proposed Plan	April 2023				
				ROD	June 2023				
UXO-31	--	Off-Base Surface Danger Zones	PA/SI	PA	January 2023	SI	July 2024	--	--

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



Legend

IRP/MMRP Site Status:

- Installation Boundary
- Proposed Plan/ROD Sites
- RDRA Sites
- PA/SI Sites
- ESI Sites
- RIFS Sites
- Expanded Investigation Area

IRP Sites with LUCs:

- Aquifer Use Control Boundary
- Non-Industrial Use Control Boundary
- Intrusive Activities Control Boundary (Soil)
- Intrusive Activities Control Boundary (Groundwater)
- Industrial/Non-Industrial Use Control Boundary (Vapor Intrusion)

- Access Control Boundary
- Industrial/Non-Industrial Use Control Boundary (Soil Vapor Intrusion)
- Industrial/Non-Industrial Use Control Boundary (MEC/MPPEH)
- Intrusive Activities Control Boundary (MEC/MPPEH)
- Explosives Safety Education
- Intrusive Activities Control in Undeveloped Areas (MEC/MPPEH)

Note:

Proposed LUC boundaries are dashed.

* Response Complete Site, where a remedy was implemented and cleanup levels were met.

0

3,000

6,000

9,000

12,000

15,000

18,000

Feet

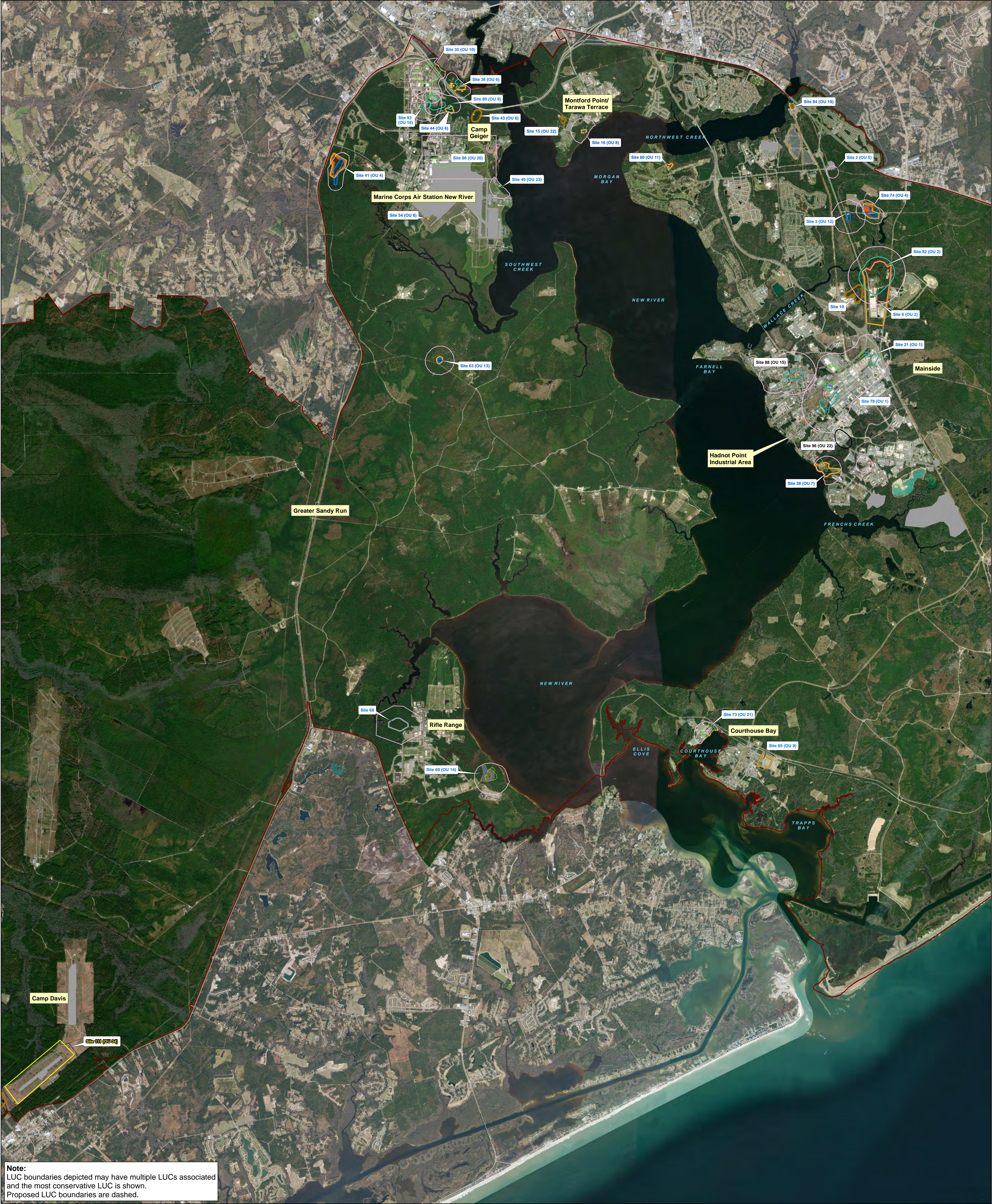
1 inch = 3,000 feet

Imagery Source: ©2017 Esri

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Figure 2-3
IRP and MMRP Sites
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River
North Carolina

ch2m



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

Legend

IRP Site Status:

- PA/SI Sites
- R/V/S Sites
- Proposed Plan/ROD Sites
- RIP Sites

RIP Sites with LUCs:

- Aquifer Use Control Boundary
- Non-Industrial Use Control Boundary; Non-Industrial Use Control Boundary (Soil)
- Intrusive Activities Control Boundary (Soil)
- Intrusive Activities Control Boundary (Groundwater)

- Industrial/Non-Industrial Use Control Boundary (Vapor Intrusion)
- Access Control Boundary
- Industrial/Non-Industrial Use Control Boundary (Soil Vapor Intrusion)
- Industrial/Non-Industrial Use Control Boundary (MEC/MPPEH)
- Intrusive Activities Control Boundary (MEC/MPPEH)
- Installation Boundary

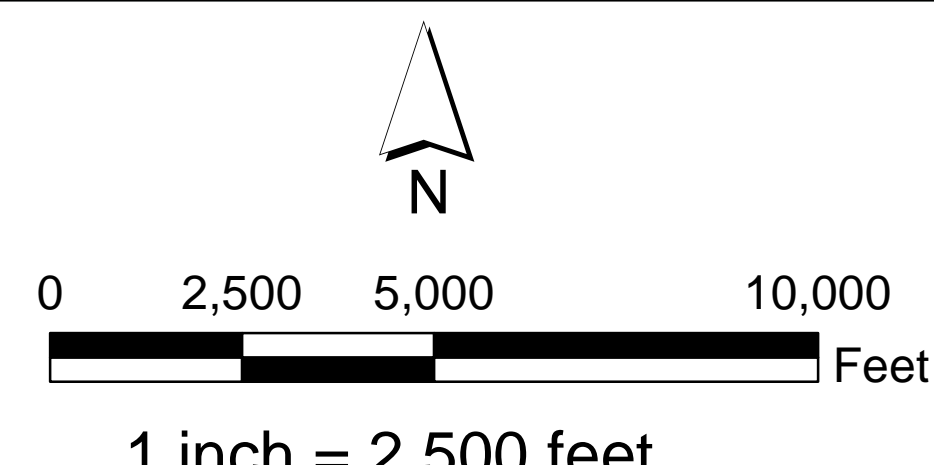


Figure 2-5
Active IRP Sites
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River
North Carolina



Legend
RC/NFA Site
Installation Boundary

Note:
* Response Complete Site; where a remedy was implemented and cleanup levels were met.

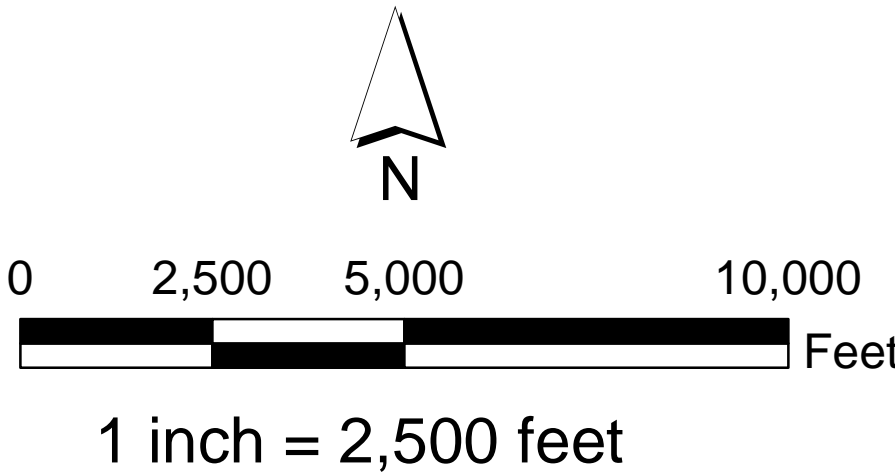
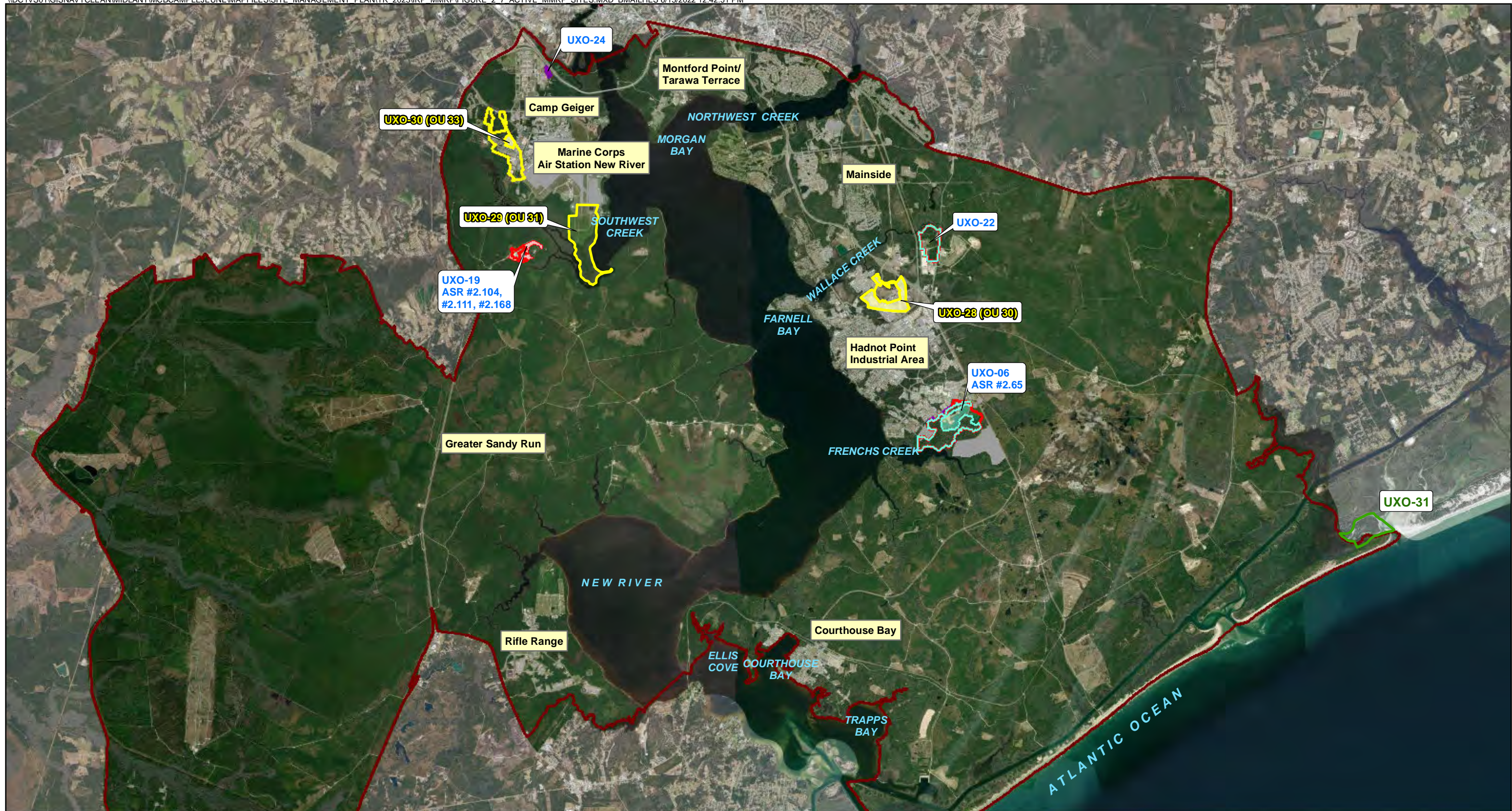


Figure 2-6
Closed IRP Sites
IRP & MMRP Site Management Plan FY 2022
MCB Camp Lejeune and MCAS New River
North Carolina
ch2m.



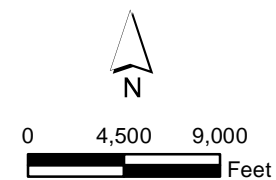
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MMRP Site Status:

- PA/SI Sites
- ESI Sites
- RI/FS Sites
- Proposed Plan/ROD Sites
- RD/RA Sites
- Expanded Investigation Area
- Installation Boundary

MMRP Sites with LUCs:

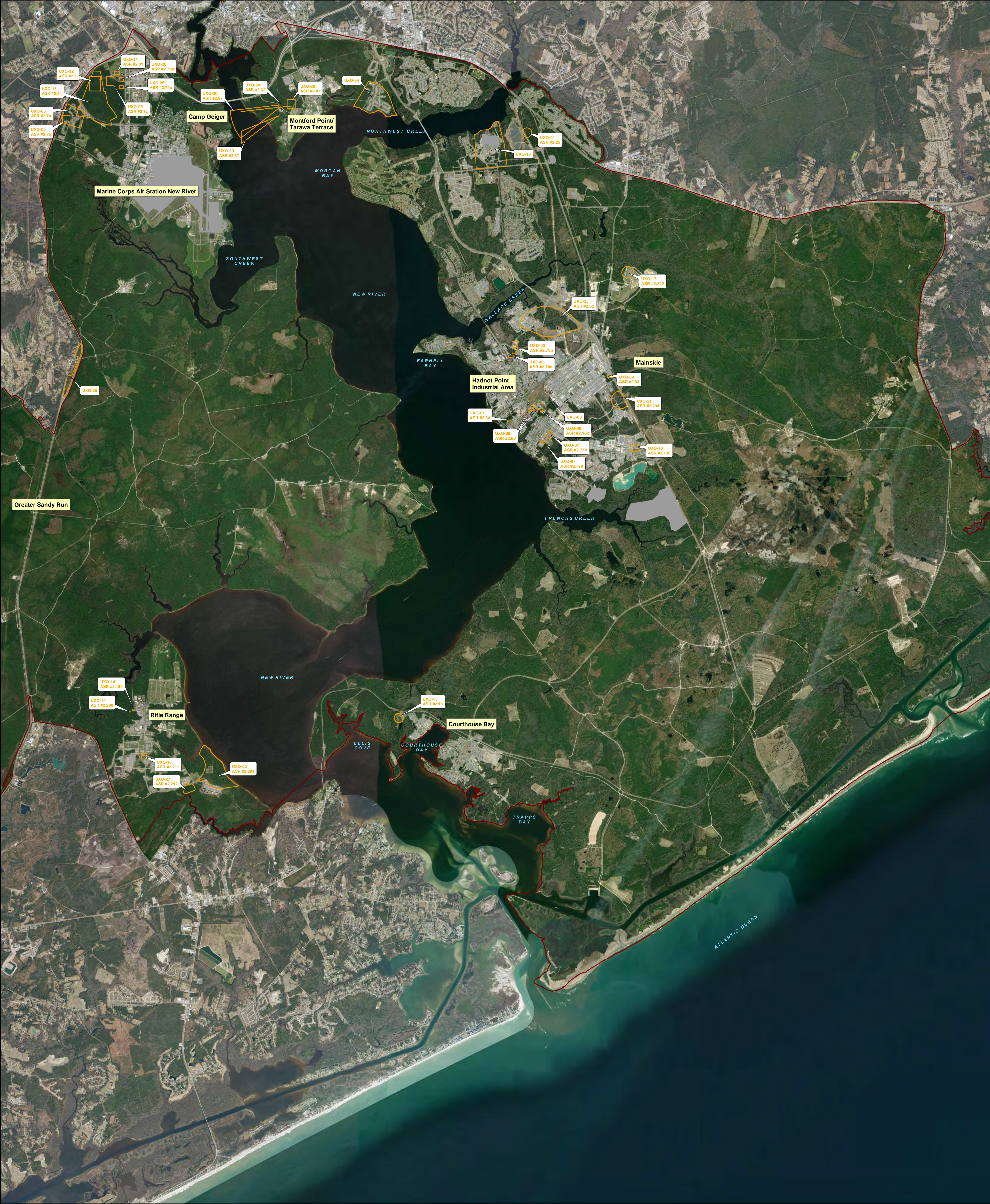
- Industrial/Non-Industrial Use Control Boundary (MEC/MPPEH)
- Intrusive Activities Control Boundary (MEC/MPPEH)
- Explosives Safety Education Program
- Intrusive Activities Control in Undeveloped Areas (MEC/MPPEH)



1 inch = 9,000 feet

Imagery Source: ©2020 Esri

Figure 2-7
Active MMRP Sites
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River
North Carolina



Legend
NFA Sites
Installation Boundary

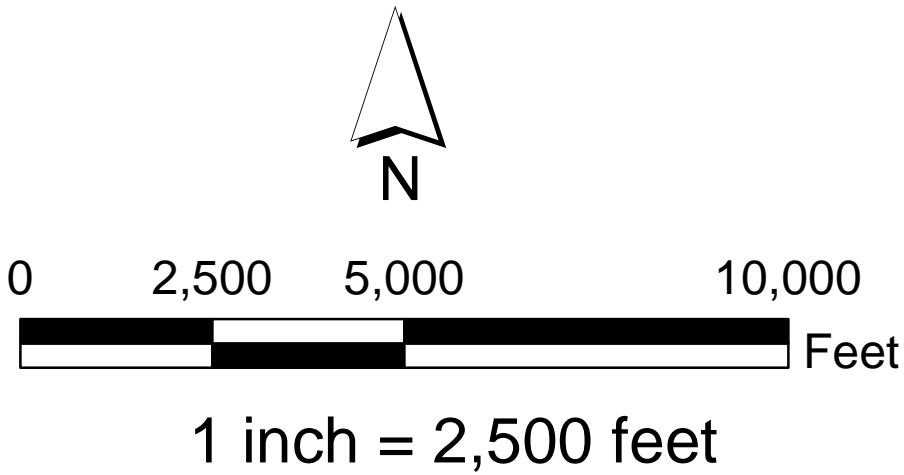
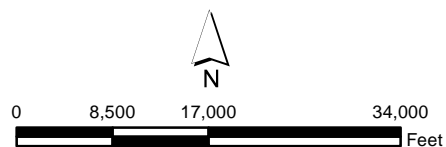


Figure 2-8
Closed MMRP Sites
IRP & MMRP Site Management Plan FY 2022
MCB Camp Lejeune and MCAS New River
North Carolina
ch2m.



Legend

- Site Boundaries
- Installation Boundary



1 inch = 17,000 feet

Imagery Source: ©2021 Esri

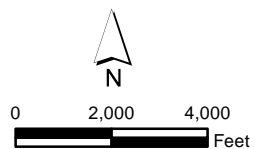
Figure 2-9
Additional Sites
IRP & MMRP Site Management Plan FY 2022
MCB Camp Lejeune and MCAS New River
North Carolina

ch2m



Legend

- Site Boundaries
- Installation Boundary



1 inch = 4,000 feet

Imagery Source: ©2017 Esri

Figure 2-10
Transferred IRP Sites
IRP & MMRP Site Management Plan FY 2022
MCB Camp Lejeune and MCAS New River
North Carolina

ch2m

Descriptions of PA/SI Sites

The following subsections discuss the site history, summary of previous investigations, and future activities of the one MMRP site that is in the PA/SI phase of the CERCLA process. There are currently no IRP sites in the PA/SI phase.

3.1 IRP PA/SI Sites

There are currently no IRP sites in the PA/SI phase.

3.2 MMRP PA/SI Sites

3.2.1 UXO-31 – Off-Base Surface Danger Zones

Four historical off-Base surface danger zones (SDZs) were identified based on historical range maps and documents reviewed by the Base. The former SDZs were of various configurations from the 1940s to 2007, and include the following: Rocket Range Number 1 (Archival Search Report [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. The SDZs are safety buffers adjacent to the southeastern boundary of MCB Camp Lejeune (**Figure 3-1**), encroaching on off-Base property consisting of private, state-administered, and state-owned parcels. In 2014, UXO warning signs were installed along the banks of the waterways within and around the perimeter of UXO-31 to provide notification of potential UXO hazards. Based on investigation activities conducted by the United States Marine Corps (USMC) from 2009 to 2015, the off-Base SDZs MRS was reduced from 1,632 acres to approximately 175 acres based on where MEC was found. The off-Base SDZs MRS were added to the MMRP as Site UXO-31 in 2022 and a PA/SI is planned to evaluate changes to the site since the initial investigations.



Figure 3-1. MMRP Site UXO-31

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

Table 3-1. Previous Investigations Summary, MMRP UXO-31 – Off-Base Surface Danger Zones

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Off-Base SDZ Preliminary Assessment/Site Investigation (CH2M, 2011)	007358	2009-2011	In 2009, a PA/SI was initiated by the USMC to identify potential historical activities that may have affected environmental media from MEC and/or MC, assess geophysical anomalies that represent the potential presence and density of MEC, and evaluate potential risks to human health and the environment relating to historical range activities. Community notification and involvement activities included contacting the land owners regarding the SDZs and for access approval, issuing a fact sheet, and holding a public meeting. Field activities included an aerial geophysical survey; digital geophysical mapping (DGM) on dry land areas; soil, groundwater, sediment, and surface water/pore water sampling for explosives residues and metals analysis. No unacceptable risks to human or ecological receptors were identified during the risk screenings. More than 5,000 anomalies were identified based on the geophysical surveys. An intrusive investigation was conducted on the 200 acres of Bear Island. One MEC item (aircraft flare) was found on the ground surface and several munitions-related items were found during the intrusive anomaly investigation on Bear Island.
Expanded Site Investigation (CH2M, 2014)	005918	2013-2014	An ESI was conducted in FY 2013 to further investigate the nature of geophysical anomalies in areas outside of Bear Island. MEC items were only found within the southwestern portion of the site, near the former Browns Island target area. Only material potentially presenting an explosive hazard (MPPEH) and/or cultural debris were found within the remaining areas of the off-Base SDZs. The probability of contact with MEC is low, primarily because the MEC items found were located within areas that were difficult to access due to marshy conditions. The ESI recommended amending the Explosives Safety Submission (ESS) and reducing the current size of the off-Base SDZs to include only the southwestern portion of the site where MEC was found and preparation of an EE/CA to evaluate future actions that may be used to mitigate potential munitions in the reduced area.
Engineering Evaluation/Cost Analysis (CH2M, 2015)	007357	2015	An EE/CA evaluated alternatives to reduce the explosive safety risk by reducing the potential exposure to MEC and MPPEH that may be present within the off-Base SDZs. The EE/CA recommended an investigation of the previously identified geophysical anomaly sources within the MRS water channels and an investigation of the MRS terrestrial anomalies that either were not investigated during the ESI or the source was not identified because of their depth or presence below shallow water. The off-Base SDZs MRS was reduced to approximately 175 acres in size based on the area where MEC was found, and this area was added to the MMRP as Site UXO-31.
Warning Sign Installation (CH2M, 2015)	007581	2014-2015	UXO warning signs are posted to notify the public of the potential dangers when accessing these locations.

NIRIS = Naval Installation Restoration Information Solution

3.2.1.1 Future Activities

A PA is being prepared and will be submitted in FY 2023, followed by a SI (**Schedule 3-1**). UXO warning signs will be inspected annually and will continue to be maintained by MCB Camp Lejeune.

Schedule 3-1
MMRP Site UXO-31
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River

ID	Task Name	Duration	Start	Finish	2023												2024																			
					May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug				
1	PA	233 days	Mon 6/6/22	Tue 1/24/23																																
2	Draft PA	100 days	Mon 6/6/22	Tue 9/13/22																																
3	Review Period (Navy/Base)	50 days	Wed 9/14/22	Wed 11/2/22																																
4	Response to Comments	14 days	Thu 11/3/22	Wed 11/16/22																																
5	Review Period (USEPA/NCDEQ)	50 days	Thu 11/17/22	Thu 1/5/23																																
6	Response to Comments	14 days	Fri 1/6/23	Thu 1/19/23																																
7	Final PA	5 days	Fri 1/20/23	Tue 1/24/23																																
8	SI	493 days	Wed 9/7/22	Sat 7/27/24																																
9	Draft SAP	90 days	Wed 9/7/22	Mon 12/5/22																																
10	Review Period (Navy/Base)	60 days	Tue 12/6/22	Fri 2/3/23																																
11	Response to Comments	14 days	Sat 2/4/23	Fri 2/17/23																																
12	Review Period (USEPA/NCDEQ)	60 days	Sat 2/18/23	Tue 4/18/23																																
13	Response to Comments	14 days	Wed 4/19/23	Tue 5/2/23																																
14	Final SAP	14 days	Wed 5/3/23	Tue 5/16/23																																
15	Field Activities and Data Evaluation	150 days	Wed 5/17/23	Fri 10/13/23																																
16	Draft SI	150 days	Sat 10/14/23	Mon 3/11/24																																
17	Review Period (Navy/Base)	50 days	Tue 3/12/24	Tue 4/30/24																																
18	Response to Comments	14 days	Wed 5/1/24	Tue 5/14/24																																
19	Review Period (USEPA/NCDEQ)	50 days	Wed 5/15/24	Wed 7/3/24																																
20	Response to Comments	14 days	Thu 7/4/24	Wed 7/17/24																																
21	Final SI	10 days	Thu 7/18/24	Sat 7/27/24																																

Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

SECTION 4

Descriptions of ESI Sites

There are currently no IRP or MMRP sites in the ESI phase.

Descriptions of RI/FS Sites

The following subsections discuss the site history, previous investigations, and future activities of the one IRP site and three 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 approximate extent of investigation activities.

5.1 IRP RI/FS Sites

5.1.1 Site 111 (OU 34)—Camp Davis FARP Activities South

Site 111, the Camp Davis FARP Activities South covers approximately 350 acres in the Camp Davis area of the Base (**Figure 5-1**). The Camp Davis FARP Activities South area consists of locations along the south runway where Marines staged P-19s (such as aircraft rescue and fire fighting vehicles) and mobile fire extinguishing systems known as twin agent units (TAUs) for emergency response support during FARP operations. FARP activities have been documented in this area between 2013 and 2015; however, flight operations have been conducted at Camp Davis since 1943 and it is likely that emergency response support would have been staged during historical flight operations.



Figure 5-1. IRP Site 111, OU 34

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

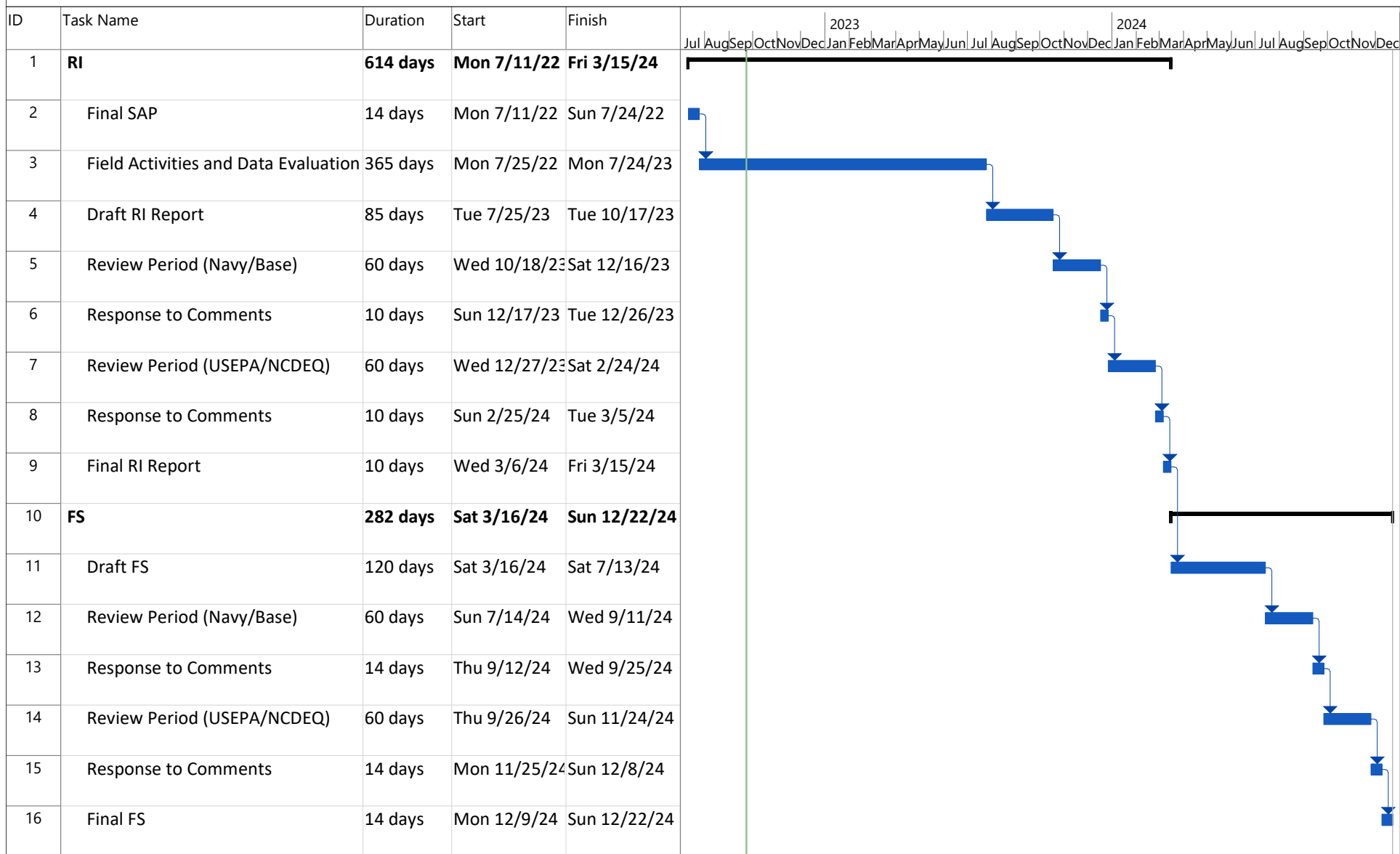
Table 5-1. Previous Investigations Summary, IRP Site 111

Previous Investigation/Action	NIRIS Document Number	Date	Activities
PFAS Preliminary Assessment (CH2M, 2019)	008263	2019	The PA was conducted to identify and catalog potential PFAS releases Basewide and if a release was confirmed, evaluate whether additional investigation is warranted. Interviews were conducted with relevant site personnel based on review of existing information and a site reconnaissance was conducted. P-19s and TAUs are currently and were historically staged onsite for FARP activities. No documentation or institutional knowledge of aqueous film-forming foam (AFFF) or other PFAS-containing materials being released was identified during the PA. However, due to the presence of P-19s and TAUs containing AFFF, an AFFF release potentially may have occurred and further investigation was recommended.
PFAS Site Inspection (CH2M, 2022)	008778	2021-2022	An SI was conducted to identify the presence or absence of PFAS in groundwater and soil resulting from historical site activities. Eight surficial aquifer groundwater samples were collected from permanent monitoring wells, and seven surface soil samples and seven subsurface soil samples were collected. Each sample was analyzed for PFAS. Concentrations of PFOS and PFOA were detected in groundwater and exceeded the residential scenario risk-based screening levels. The human health risk screening (HHRS) identified potential unacceptable risks associated with exposure to PFOA and PFOS in groundwater. Based on these results, an RI was recommended to delineate the nature and extent of PFAS impacts and further evaluate potential human health risks from exposure to PFAS.
Post Site Inspection Sampling (CH2M, 2021)	Pending Upload	2021	Based on preliminary results of the SI, expedited investigations were conducted to assess potential impacts to off-Base receptors and further investigate the hydrogeologic properties of the upper Castle Hayne (UCH) and lower Castle Hayne (LCH) aquifers. Prior to the investigation, public outreach efforts were initiated to identify drinking water wells within 1 mile of Site 111. Based on the public outreach efforts, 12 off-Base drinking water wells screened in the Castle Hayne aquifer have been identified within 1 mile of Camp Davis FARP Activities South. Samples were collected from these drinking water wells in 2021 and results were below the 2016 USEPA lifetime drinking water health advisory for PFOS and/or PFOA, current at the time of the investigation. Additional monitoring wells were installed in the surficial, UCH, and LCH aquifers and the new and existing monitoring wells were sampled for PFAS analysis. PFAS concentrations in the surficial aquifer were similar to previously collected data and there were no exceedances of the screening levels in the newly installed wells in all aquifer zones. A full presentation of the groundwater investigation and results will be incorporated into the RI.
Draft Remedial Investigation Work Plan (CH2M, 2022)	Pending Final	2021-2022	An RI is being planned to define the nature and extent of PFAS. Field activities will include monitoring well installation and two rounds of groundwater, soil, surface water, and sediment sampling for PFAS analysis to assess seasonal variability.

5.1.1.1 Future Activities

RI activities were initiated in FY 2022 and are pending completion based on current MILCON activities. An FS will be prepared following completion of the RI. (**Schedule 5-1**).

Schedule 5-1
IRP Site 111
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

5.2 MMRP RI/FS Sites

5.2.1 UXO-28 (OU 30)—Wallace Creek Phase I Munitions Response Site

Site UXO-28 covers approximately 81 acres and is located west of Holcomb Boulevard and north of Parachute Tower Road on the Mainside area of the Base (**Figure 5-2**). Site UXO-28 was identified in 2013 based on the discovery of munitions-related items during a NTCRA within the former theoretical shot-fall zone of Site UXO-23, the former D-9 Skeet Range. Site UXO-28 encompasses the theoretical shot-fall zone of UXO-23; the cleared areas observed in historical aerial photography, indicating a higher potential for past use as historical training areas; the Tactical Landing Zone Sparrow that was historically used for troop training from 1954 to the early 2000s; and the North Wallace Creek Regimental Complex (NWCRC). The NWCRC is included because fill containing debris and MPPEH from the excavation and construction activities within the NWCRC was reportedly placed by a military construction (MILCON) contractor in the area of the former theoretical shot-fall zone, sometime between 2013 and 2015. Because the open areas of the site (where the fill containing MPPEH was reportedly placed) are considered recreational and public areas, signs were installed in 2016 for notification of the potential for UXO hazards. In addition, Recognize, Retreat, Report (3R), Explosives Safety Education Program informational flyers were distributed to building occupants working and living within the newly constructed buildings. Additional warning signs were installed along the running trails within UXO-28 in May 2018.

Recent research conducted by MCB Camp Lejeune discovered that a historical maneuver training area overlapped Site UXO-28 and extended outside of the Site UXO-28 boundary. MEC, specifically discarded military munitions (DMM), has been discovered in proximity to foxholes identified within and around the site boundary, indicating that the foxholes were likely used as defensive firing positions during maneuver training operations associated with Tactical Landing Zone Sparrow. Therefore, a 144-acre Expanded Investigation Area (EIA) was identified (**Figure 5-2**).

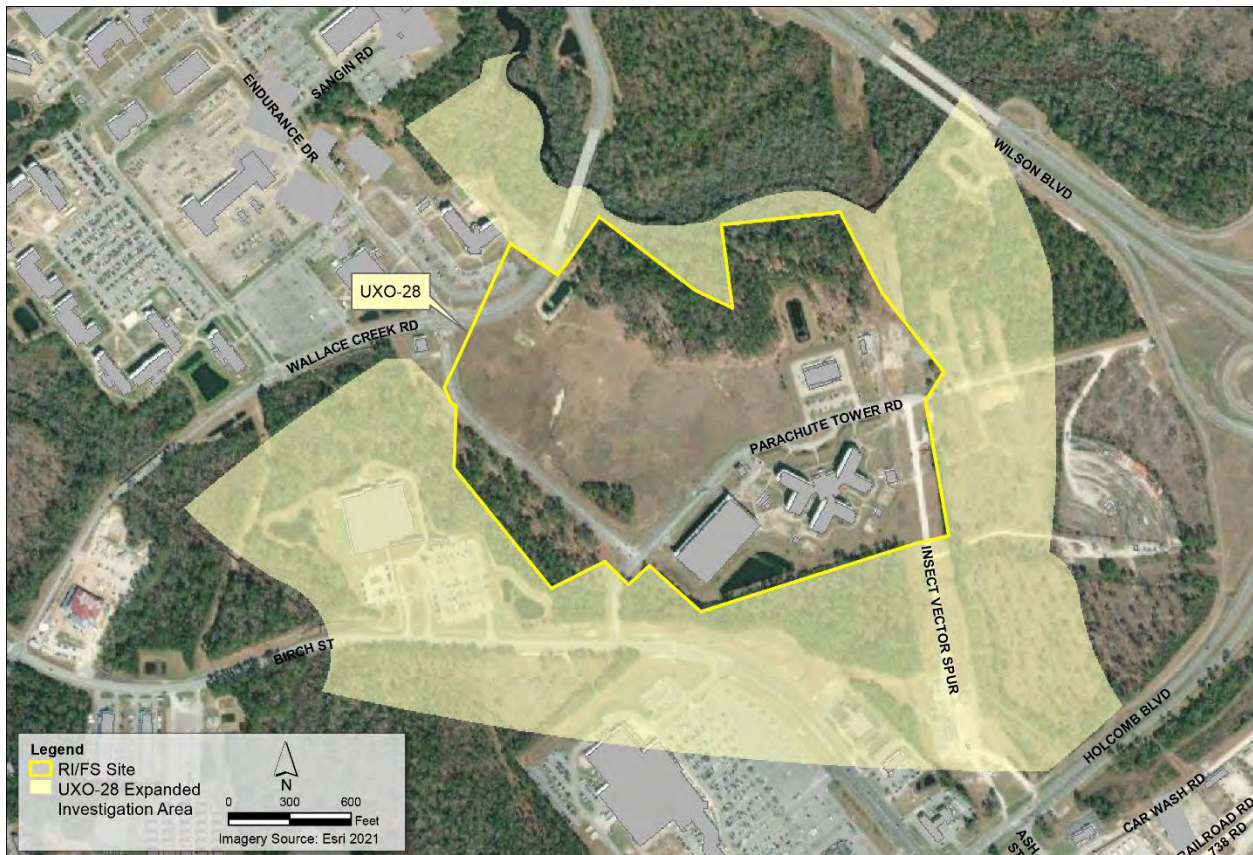


Figure 5-2. MMRP Site UXO-28, OU 30

Previous investigations are listed in **Table 5-2**.

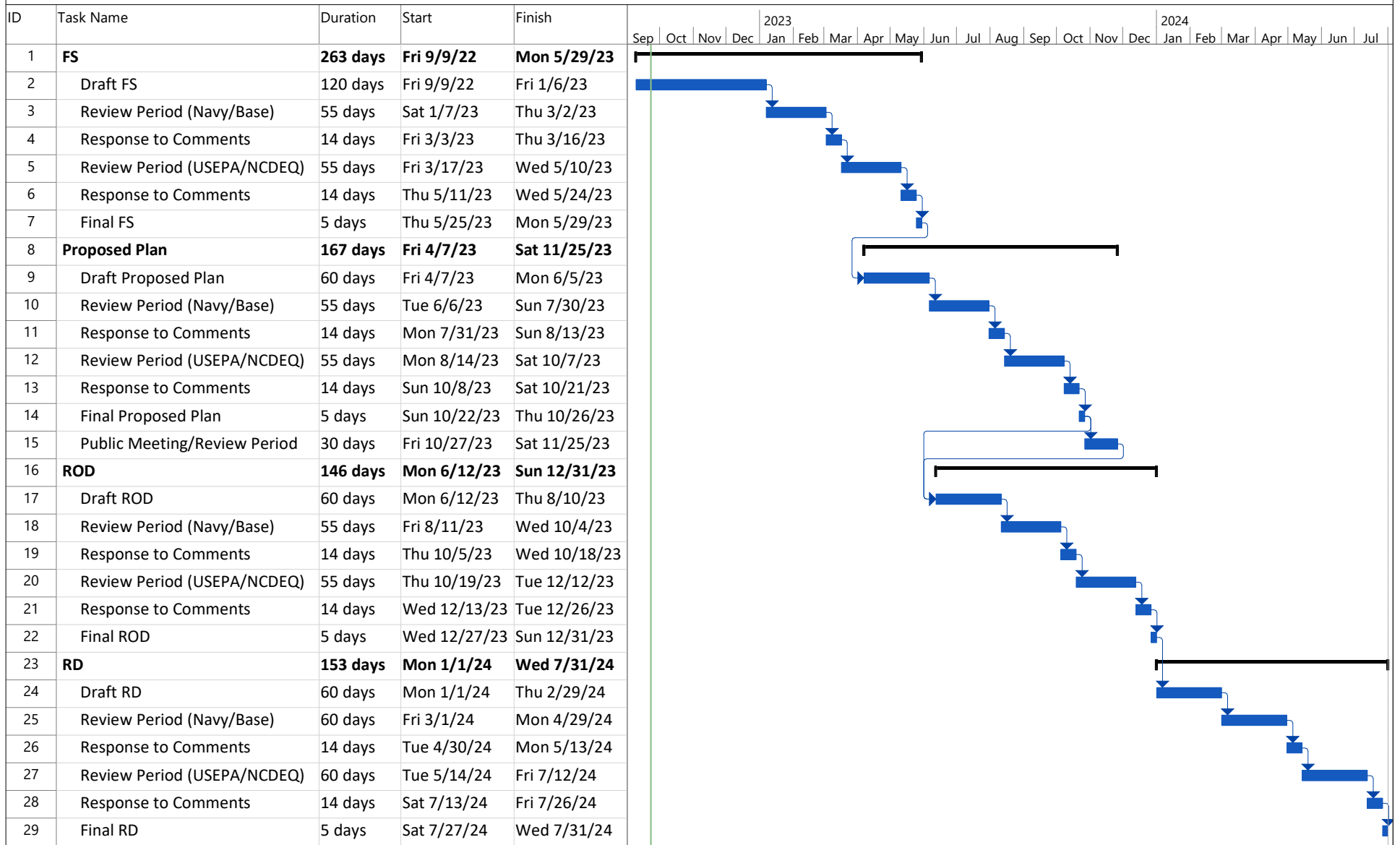
Table 5-2. Previous Investigations Summary, MMRP Site UXO-28

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Munitions Response Investigation North Wallace Creek Regimental Complex	N/A	2015	A munitions response action was conducted at the NWCRC MRS to remove MEC and MPPEH from the ground surface, if present, and to characterize MEC and MPPEH in the subsurface. No MEC was found; however, one MPPEH item was found at a depth of approximately 2 feet below ground surface (bgs). The MPPEH item was expended and later classified as material documented as safe (MDAS).
Preliminary Assessment/Site Investigation (CH2M, 2016)	008271	2016	The PA/SI was completed to document that sufficient data had been collected, during previous UXO-23 investigations, to meet the objectives of a PA/SI. The PA/SI evaluated the available MC data in surface soil, subsurface soil, groundwater, surface water, and sediment. Arsenic and lead have been detected at concentrations exceeding background and regulatory screening criteria. However, arsenic does not pose an unacceptable risk to human health or ecological receptors and lead in soil was addressed during the UXO-23 NTCRA and was further evaluated in groundwater as part of the UXO-23 ESI. It was recommended that an RI be conducted at UXO-28 and focus on explosives residues and perchlorate.
Remedial Investigation (CH2M, 2022)	007925	2019-2021	<p>The RI was conducted to assess the nature and extent of MEC/MPPEH and to identify and evaluate the potential hazards/risks to human health and the environment resulting from historical site activities. Field activities included DGM, intrusive investigation of DGM anomalies, mag-and-dig investigations of foxholes, and soil and groundwater sampling for MC analysis. During research conducted by MCB Camp Lejeune, a historical maneuver training area overlapping and extending past the boundary of UXO-28 was identified. The area was investigated and included in this RI as the EIA.</p> <p>A total of 177 MEC/MPPEH items were identified, and the majority were found just below the ground surface. Approximately 90 percent of these items consisted of or were derived from illumination flares, grenades (hand or rifle), 3.5-inch inert training rockets, or 60- or 81-millimeter (mm) mortars. These findings, along with the identification of potential fighting positions, support the conclusion that Site UXO-28 and the EIA were likely used as maneuver training areas.</p> <p>Based on the results of the explosive hazards evaluation, the current land use scenario hazard level associated with MEC/MPPEH potentially remaining is considered to be low, with the exception of the EIA, which showed a moderate explosive hazards level for the current and future land use scenarios.</p> <p>There were no unacceptable risks to human or ecological receptors from exposure to MCs in soil and groundwater.</p> <p>Based on the RI results, NFA was recommended for the area where the UXO-23 NTCRA was conducted, and an FS was recommended for the remainder of the site.</p>

5.2.1.1 Future Activities

In preparation for the FS, a MEC/MPPEH surface clearance will be conducted in FY 2022 for portions of the site, followed by the FS, Proposed Plan, ROD, and RD (**Schedule 5-2**).

Schedule 5-2
MMRP Site UXO-28
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

5.2.2 UXO-29 (OU 31)—New River Runway Expansion Area (ASR #2.1, #2.167, and #2.29)

Site UXO-29 covers approximately 286 acres and is located at the southern end of the runway at MCAS New River (**Figure 5-3**). The site encompasses portions of three historical terrestrial ranges. Former Infantry Weapons Demonstration Course, B17 (ASR #2.29), was active from 1946 to 1947 and reportedly used 75-, 105-, and 155 mm projectiles. Former Artillery Training Area (ASR #2.1) was active from 1941 to 1943 and reportedly used small arms, rockets, and projectiles. Former hand grenade range (practice demonstrator), M113 (ASR #2.167), was active from 1970 to 1977 and was reportedly used for hand grenade training. The site was identified during initial MILCON activities for the runway expansion based on discovery of 2.36-inch practice bazooka rounds. The site consists of mowed areas with paved and unpaved roads in the northern part of the site, and undeveloped wooded areas and wetlands in the southern part of the site. In 2016, because munition items were found to the north and outside the original site boundary during MILCON support work conducted in 2013, additional historical records review was conducted, and a potential firing point to the north was identified; therefore, the site boundary was extended north to Perimeter Road. Because portions of the site are considered recreational areas, signs were installed for notification of the potential for UXO hazards, and the Base closed the playground, primitive campground, and hunting areas, and restricted access to the running path.



Figure 5-3. MMRP Site UXO-29 (OU 31), ASR #2.1, #2.167, and #2.29

Previous investigations are listed in **Table 5-3**.

Table 5-3. Previous Investigations Summary, MMRP Site UXO-29, ASR #2.1, #2.167, and #2.29

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Munitions Response Investigation (CH2M, 2014)	006112	2013-2014	In 2013, a focused munitions response investigation was conducted in the 10-acre MCAS New River Expansion area to reduce the potential for encountering MEC and MPPEH during future MILCON activities. Field activities consisted of 100 percent DGM and intrusive investigations and post-detonation soil sampling. Eight MEC (including high-explosive and white phosphorus rounds) and more than 250 MPPEH items were identified and removed. Post-detonation soil sampling results did not indicate any unacceptable human health or ecological risks due to exposure to soil within the area of the controlled detonation. Because DGM and the intrusive investigation were conducted over 100 percent of the MRS and all identified anomalies were removed to the maximum depth of detection, the explosives safety quantity distance arcs were removed, and MILCON was approved to proceed. The discovery of MEC and MPPEH within and north of the footprint of Site UXO-29 indicates that additional MEC and MPPEH may exist and additional investigation was recommended.
Preliminary Assessment/Site Investigation (CH2M, 2019)	007806	2016-2019	<p>A PA/SI was conducted to further evaluate the presence and character of MEC/MPPEH outside the MILCON area and identify whether there is MC contamination sitewide, evaluate potential environmental impacts from MC resulting from historical site activities, assess the potential hazards/risks to human health and the environment, and evaluate whether additional investigations are required. Field activities included site-wide surface soil sampling for explosives residues, perchlorate, and metals analysis, surface clearance within the recreational areas (northeastern portion of Site UXO-29), DGM and intrusive anomaly investigation, and "mag and dig" over approximately 3 percent of the combined northern tree-cleared area and Recreation Areas. No site-related unacceptable human health or ecological risks were identified due to exposure to MC in surface soil.</p> <p>A total of 776 DGM anomalies were intrusively investigated. MEC items were not found, but 64 MPPEH items were identified from the combined surface clearance and intrusive investigation ranging from ground surface to 1 foot bgs. MPPEH items were derived from signal flares, smoke grenades, practice hand grenades, projectiles (60- and 81- mm), and 2.36-inch rockets, and were inspected and subsequently classified as MDAS.</p> <p>The majority of the MEC/MPPEH items found to-date at Site UXO--29 were identified in the northeastern portion of the site, within an approximate 52-acre area that, based on historical aerial photographs and the amount of items found, may be a former range target area. This area was subsequently designated as an AOC due to the potential presence of additional MEC/MPPEH and the presence of a high density of metallic anomalies representing potential disposal/burial areas that may be associated with former firing positions. The AOC encompasses a portion of the northern mowed area of the site and a portion of the recreation area. An explosive hazards evaluation was conducted and identified a high potential explosive risk within this AOC. Based on the findings, an RI was recommended.</p>

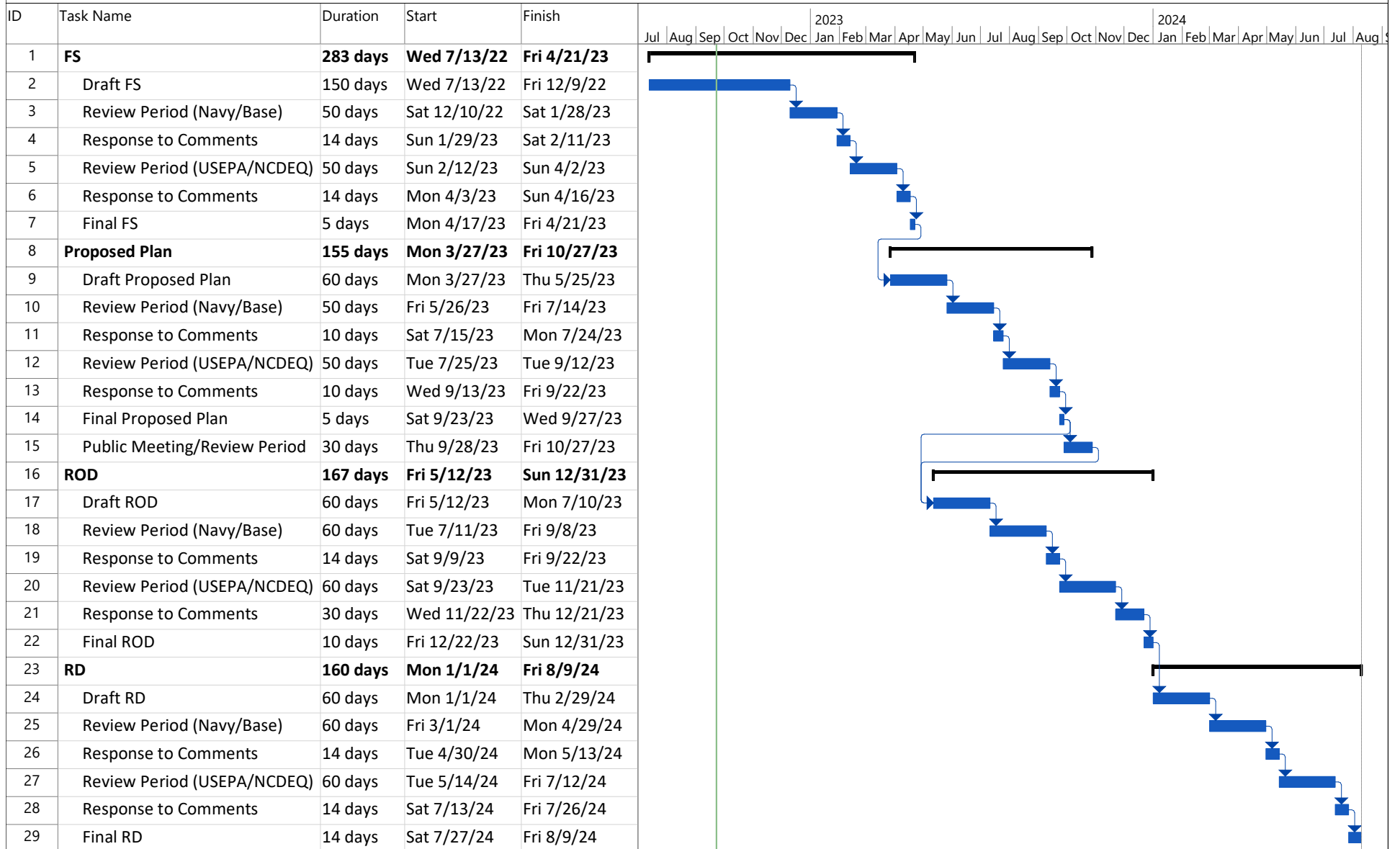
Table 5-3. Previous Investigations Summary, MMRP Site UXO-29, ASR #2.1, #2.167, and #2.29

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation (CH2M, 2021)	008638	2018-2021	<p>The RI was conducted to characterize the nature and extent of MEC/MPPEH, evaluate potential explosive hazards, and establish if potential risks to human health and/or the environment are present. Field activities included DGM, intrusive investigation of DGM anomalies, and/or mag-and-dig investigations to further characterize the nature and extent of MEC/MPPEH.</p> <p>There were 157 MEC and 1,315 MPPEH items identified and the majority were found just below the ground surface. Approximately 82 percent of the items identified consisted of 2.36-inch rockets, rocket components, or rocket fragments located within the eastern portion of the site, indicating that the southeastern portion of the site was likely used as a rocket range target area. There were no unacceptable risks to human or ecological receptors from exposure to MCs in soil and groundwater.</p> <p>The site was divided into 10 distinct areas for the explosive hazards evaluation based on variations of current and potential future land use, munitions findings, and site access conditions. The explosive hazards were low for six of the areas, moderate for three of the areas, and high for one area. A FS was recommended to develop RAOs and evaluate remedial alternatives to address the potential explosive hazards.</p>

5.2.2.1 Future Activities

In preparation for the FS, a MEC/MPPEH surface clearance will be conducted in FY 2022 for portions of the site, followed by a FS, Proposed Plan, ROD, and RD (**Schedule 5-3**).

Schedule 5-3
MMRP Site UXO-29
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

5.2.3 UXO-30 (OU 33)— Portions of B-6 (ASR #2.44), B-12 (ASR #2.134), and ABC Ranges (ASR #2.198)

Site UXO-30 covers approximately 240 acres and is located in the northwestern portion of MCAS New River (**Figure 5-4**). The site consists of the overlapping portions of the following ranges:

- **B-6.** 50-foot Small Arms Range (ASR #2.44) identified for use with .22 caliber rifles and pistols, and .32, .38, and .45 caliber pistols
- **B-12.** Baffled Range (ASR #2.134) identified for firing .22 caliber rifles and pistols, service pistols and shotguns, and .38, .45, and 9-mm weapons
- **B-14.** Atomic, Biological, and Chemical (ABC) Warfare Area (ASR #2.198), assumed to have used chemical warfare training materials such as riot control grenades and chemical agent identification sets (CAIS).

The Range Identification and Preliminary Range Assessment Report (USACE, 2001) stated that the former B-14, ABC Warfare Area was identified as an ABC training area in a list of training facilities in Annex Z-1 to Base Order 11102.1B, dated May 5, 1960. It is assumed that chemical warfare training materials such as riot control grenades and CAIS were used in this area. The selected former range training areas have been approved for closure under the MMRP due to reported use of live fire in B-6 and B-12 ranges and former active use of the B-14 ABC Warfare Area.

A potential former Base training area located adjacent to and southeast of the B-14 ABC Warfare Area was identified through 1956 and 1962 historical aerial photographs, which showed vegetation-cleared areas and an associated access road during this period. Recently constructed buildings and associated parking lots now occupy the western portion of this area. The remaining portion of the area, approximately 18 acres, was identified as the B-14 EIA (**Figure 5-4**).

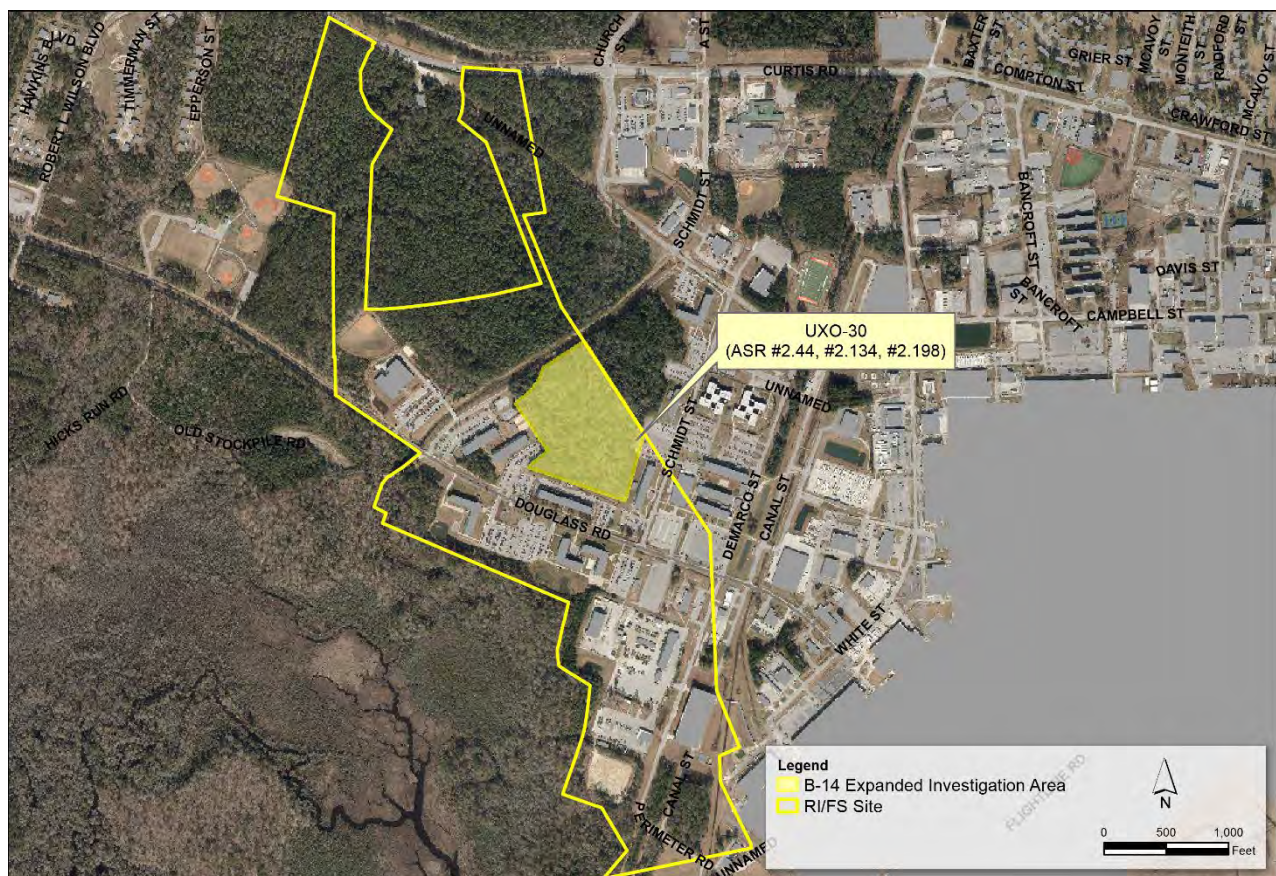


Figure 5-4. MMRP Site UXO-30 (OU 33), ASR #2.44, #2.134, and #2.98

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

Table 5-4. Previous Investigations Summary, MMRP Site UXO-30, ASR #2.44, #2.134, and #2.198

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Environmental Investigation Report B-12 Baffled Pistol Range (ASR #2.134) Proposed Bachelor Enlisted Quarters (CH2M, 2008)	007373	2008	An environmental investigation was conducted within the portion of the former B-12 Baffled Pistol Range (ASR #2.134) proposed for construction, which site boundaries overlap with B-14, ABC Warfare Area (ASR 2.198) and B-6, 50-Foot Small Arms Range (ASR #2.44). Field activities included sampling of surface soil, subsurface soil, groundwater, sediment, and surface water. Each sample was analyzed for metals and perchlorate. The human health and ecological risk screening results indicated there were no unacceptable risks to current or future receptors.
Preliminary Assessment/Site Inspection Report, Proposed Fitness Center (P-714) MILCON Area (CH2M, 2011)	004685	2011	A PA/SI was conducted at the proposed Fitness Center (P-714) MILCON area that was located within the boundary of B-6, 50-foot small arms range (ASR #2.44) and the B-12, Baffled Pistol Range (ASR #2.134). At the time of the PA/SI, the adjacent B-14, ABC Warfare Area (ASR #2.198) was still active and was not investigated. The PA/SI was conducted to evaluate the potential presence and nature of impacts to environmental media resulting from historical use of small arms munitions at the site, and to evaluate whether additional investigation and/or remediation activities are necessary prior to construction activities. Field activities included the collection and analysis of surface and subsurface soil, groundwater, sediment, and surface water samples. The samples were analyzed for perchlorate and select metals (arsenic, antimony, copper, lead, and zinc). The human health and ecological risk screening results indicated there were no unacceptable risks to current or future receptors. Therefore, no further environmental evaluation was recommended and MILCON activities for the investigated portion of the Fitness Center were recommended to proceed as planned.
Preliminary Assessment/Site Inspection (CH2M, 2020)	008452	2018-2020	<p>A PA/SI was conducted to evaluate the presence and characterization of MEC and MPPEH potentially present within the undeveloped areas of the site, identify and evaluate potential environmental impacts of MC potentially resulting from historical site activities, assess the potential hazards and risks to human health and the environment, and evaluate whether additional investigations are required. Field activities included DGM, an intrusive anomaly investigation, and soil sampling.</p> <p>No MEC/MPPEH or chemical warfare training materials were identified within the former B-14 ABC Warfare Area and there was no indication that this portion of the site had been previously used for training activities. Findings within the B-14 EIA indicate that this portion of Site UXO-30 may have been used for training or maneuver activities during the 1950s and 1960s instead of the originally designated B-14 ABC Warfare Area. Nine MPPEH items were found within the western portion of the B-14 EIA. The explosive hazards evaluation for the EIA indicated a low potential explosive hazards level. However, because only approximately 15 percent of the EIA was investigated, additional MEC/MPPEH may be present.</p> <p>The human health and ecological risk evaluations concluded that there are no unacceptable risks to human and ecological receptors from exposure to MC in surface soil.</p> <p>No further action was recommended for the B-6 range, B-12 range, and B-14 ABC Warfare Area. Additional investigation was recommended in the B-14 EIA to further evaluate the presence and character of MEC/MPPEH.</p>

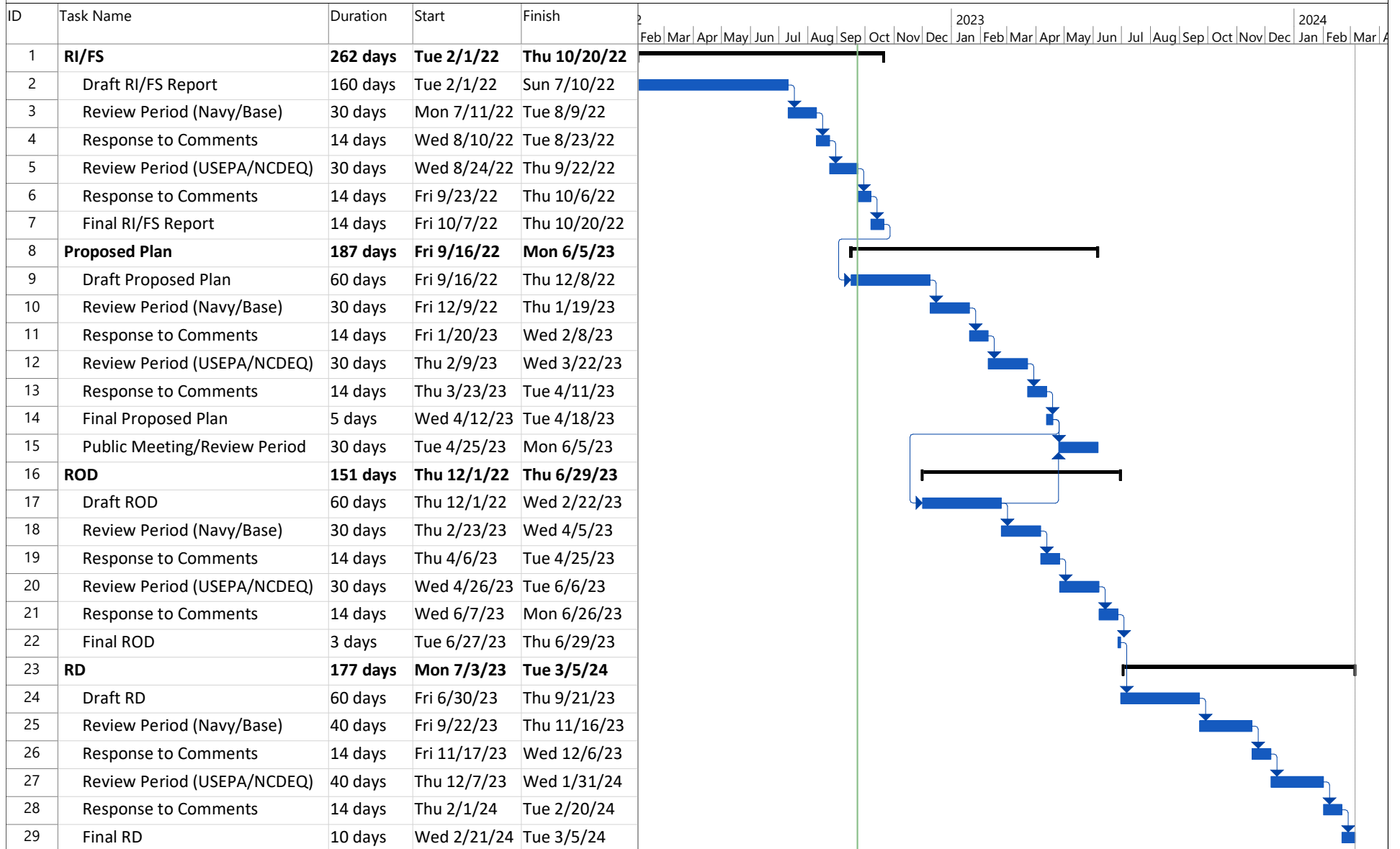
Table 5-4. Previous Investigations Summary, MMRP Site UXO-30, ASR #2.44, #2.134, and #2.198

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Draft Remedial Investigation/Feasibility Study (CH2M, 2022)	Pending Final	2021-2022	Based on the results of the PA/SI, there was sufficient information to complete the RI and an RI/FS was prepared for the B-14 EIA. The RI summarizes the PA/SI findings for the B-14 EIA, and the FS identifies the RAO and evaluates remedial alternatives to address the potential explosives hazards. The remedial alternatives evaluated include no action, LUCs, surface MEC/MPPEH removal and LUCs, and surface and subsurface MEC/MPPEH removal.

5.2.3.1 Future Activities

The draft RI/FS for the B-14 EIA was submitted in FY 2022, followed by a Proposed Plan, ROD, and RD (Schedule 5-4).

Schedule 5-4
MMRP Site UXO-30
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

Descriptions of Proposed Plan and ROD Sites

The following subsections discuss the site history, previous investigations, and future activities of the one IRP site in the Proposed Plan/ROD phase of the CERCLA process. There are currently no MMRP sites in the Proposed Plan/ROD phase.

6.1 IRP Proposed Plan/ROD Sites

6.1.1 Site 96 (OU 22)—Building 1817 UST

Site 96, previously Solid Waste Management Unit (SWMU) 360, encompasses approximately 14 acres in the Mainside Hadnot Point Industrial Area (HPIA), between Connector Road and McHugh Boulevard (**Figure 6-1**). Site 96 is the site of a former 300-gallon waste oil UST positioned near Building 1817. The former UST was located in the eastern portion of the compound, which is currently used as a temporary staging area for batteries, refrigeration units, and other used equipment prior to disposal or reutilization.



Figure 6-1. IRP Site 96, OU 22

Previous investigations are listed in **Table 6-1**.

Table 6-1. Previous Investigations Summary, IRP Site 96

Previous Investigation/Action	NIRIS Document Number	Date	Activities
UST Removal and Investigations (Catlin, 1997)	Not applicable (N/A)	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 Confirmatory Site Investigation (CSI) under the Resource Conservation and Recovery Act (RCRA) program.
Confirmatory Site Investigation (Baker, 2005)	N/A	2002-2005	The CSI included soil and groundwater sampling for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, and RCRA metals analyses. The CSI identified VOCs, SVOCs, and pesticides in groundwater that exceeded screening criteria.
Resource Conservation and Recovery Act Facility Investigation (Baker and CH2M, 2005) Amended Resource Conservation and Recovery Act Facility Investigation (CH2M, 2006)	003860 003974	2005-2006	The RCRA Facility Investigation (RFI) included soil and groundwater sampling for VOCs, pesticides, and RCRA metals analysis. A chlorinated volatile organic compound (CVOC) plume was identified in groundwater. Potential unacceptable human health risks to future residents were identified from exposure to tetrachloroethene (PCE), trichloroethene (TCE), and heptachlor epoxide in groundwater.
Corrective Measures Study (CH2M, 2007)	006322	2007	A Corrective Measures Study was conducted to develop remedial goal options for the site and to evaluate management options for groundwater at SWMU 360. The corrective measures evaluated were enhanced reductive dechlorination (ERD), air sparging (AS), and in situ chemical oxidation (ISCO).
Additional Groundwater Delineation (Osage, 2009)	N/A	2007-2009	Groundwater samples were collected and analyzed for PCE and its daughter products to delineate the downgradient and vertical extent of the CVOC plume. As a result of the sampling, the vertical extent of contamination was delineated; however, the plume extended horizontally more than 1,800 feet southeast from the source area and was not fully delineated to North Carolina Groundwater Quality Standards (NCGWQS). Because the contamination was not associated with the former UST, the SWMU was transferred to the IRP to complete the delineation under an RI/FS.
Basewide Vapor Intrusion Evaluation (AGVIQ/CH2M, 2009; CH2M, 2011, 2015)	002772 through 002777 004694 through 004698	2007-2015	Site 96 was included in the phased Basewide VI evaluation, conducted from 2007-2011, to determine whether complete or significant exposure pathways exist for VI into buildings. Groundwater, soil gas, and/or air samples were collected from Buildings 1817, 1819, 1827, 1828, and 1855. Although significant VI impacts were not expected, additional sampling was recommended at Buildings 1827 and 1828 to assess temporal and spatial variability. Based on results of the phased investigations and monitoring reports, NFA was recommended. Collection of additional VI data during LTM or every 5 years was recommended for Building 1828.

Table 6-1. Previous Investigations Summary, IRP Site 96

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation (CH2M, 2017)	007200	2015-2017	An RI was conducted to identify the potential source of contamination, define the nature and extent of contamination, and evaluate the potential human health and ecological risks. Field activities included monitoring well installation, and soil, groundwater, surface water, and pore water sampling. Soil samples were analyzed for VOCs, SVOCs, polychlorinated biphenyls (PCBs), and metals. Groundwater samples were analyzed for VOCs, SVOCs, metals, methane, and natural attenuation indication parameters (NAIPs). Both surface water and sediment were analyzed for VOCs. VOCs were detected in soil and groundwater at concentrations exceeding regulatory screening criteria. The source of VOCs was contaminated soil from a former 300-gallon waste oil UST adjacent to Building 1817. Based on the risk assessment, there was a potential unacceptable risk to future residential receptors from exposure to PCE, TCE, and cis-1,2- dichloroethene (DCE) in surficial aquifer groundwater if used as a potable water source. Indoor air data indicated there was a potential unacceptable risk to future industrial workers and hypothetical future residents from exposure to PCE and TCE in indoor air (VI from surficial aquifer groundwater) within 100 feet of the groundwater plume if 1) current building conditions change or 2) if future buildings are constructed. No unacceptable risks to ecological receptors were identified based on exposure to surface water and pore water in Cogdels Creek. Following the treatability study and in support of the FS, site-wide groundwater sampling of the existing monitoring well network for VOCs analysis was recommended to further evaluate seasonal variability, natural attenuation, and potential risks to human health and the environment.
Treatability Study Work Plan (CH2M, 2018)	007575	2018-2019	A treatability study was conducted to assess the effectiveness of soil vapor extraction (SVE) in removing select VOCs near the location of the former Building 1817 UST (source area) vadose zone and to evaluate the effectiveness of ERD in reducing concentrations of VOCs in source area groundwater. Baseline treatability study field activities were initiated in March 2018 and performance monitoring was conducted through May 2019. The results were presented in the FS.
Pre-Feasibility Study Vapor Intrusion and Groundwater Investigation (CH2M, 2020)	008313	2018-2020	VI and groundwater investigations were conducted to assess the extent of soil gas impacts from PCE and TCE related to groundwater underlying Building 1828, evaluate current indoor air concentrations of PCE and TCE within Building 1828, evaluate the current concentrations of VOCs in groundwater, and reevaluate human health risks in preparation for evaluating remedial alternatives in the FS. Field activities included soil gas, exterior soil gas, indoor air, and outdoor air sampling for PCE and TCE analysis, and site-wide groundwater sampling for VOC analysis. At Building 1828, indoor air concentrations remained below screening levels and the human health risk assessment (HHRA) indicated risks to industrial workers within acceptable levels. The HHRA identified potential unacceptable risks to future residents from exposure to PCE and TCE in indoor air in Building 1828 associated with VI from subslab soil gas. Since the RI, the PCE and TCE concentrations in the surficial aquifer have decreased by multiple orders of magnitude in the vicinity of the former UST and the downgradient PCE plume has diminished in size due to the Treatability Study (CH2M, 2018). In the UCH aquifer, there are limited PCE, TCE, and vinyl chloride (VC) concentrations in downgradient areas, similar to that observed during the RI. The updated HHRA identified potential unacceptable risk to future residential receptors from exposure to TCE and VC in UCH aquifer groundwater if used as a potable water supply, and from exposure to VC in surficial aquifer groundwater based on cumulative exposure pathways. An FS was recommended to evaluate remedial alternatives to address potential future risks.

Table 6-1. Previous Investigations Summary, IRP Site 96

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Feasibility Study (CH2M, 2021)	008552	2020-2021	The FS was prepared to identify the RAOs and target treatment areas, and to evaluate the remedial alternatives that would satisfy the RAOs. The following remedial alternatives were evaluated: <ol style="list-style-type: none"> 1. No action 2. Monitored natural attenuation (MNA) and LUCs 3. ERD, SVE, and LUCs 4. AS, Soil Removal, and LUCs
Proposed Plan (CH2M, 2021)	008699	2021	A Proposed Plan was issued to solicit public input on the preferred alternative (MNA and LUCs) and a public meeting was held. No questions or inquiries were received, and the preferred alternative was selected as the remedy. The ROD is planned for signature in FY 2022. The CSM is shown on Figure 6-2 .
Record of Decision (CH2M, 2022)	Pending Upload		

6.1.1.2 Future Activities

The RD will be prepared in FY 2023 followed by implementation of LTM and LUCs (**Schedule 6-1**).

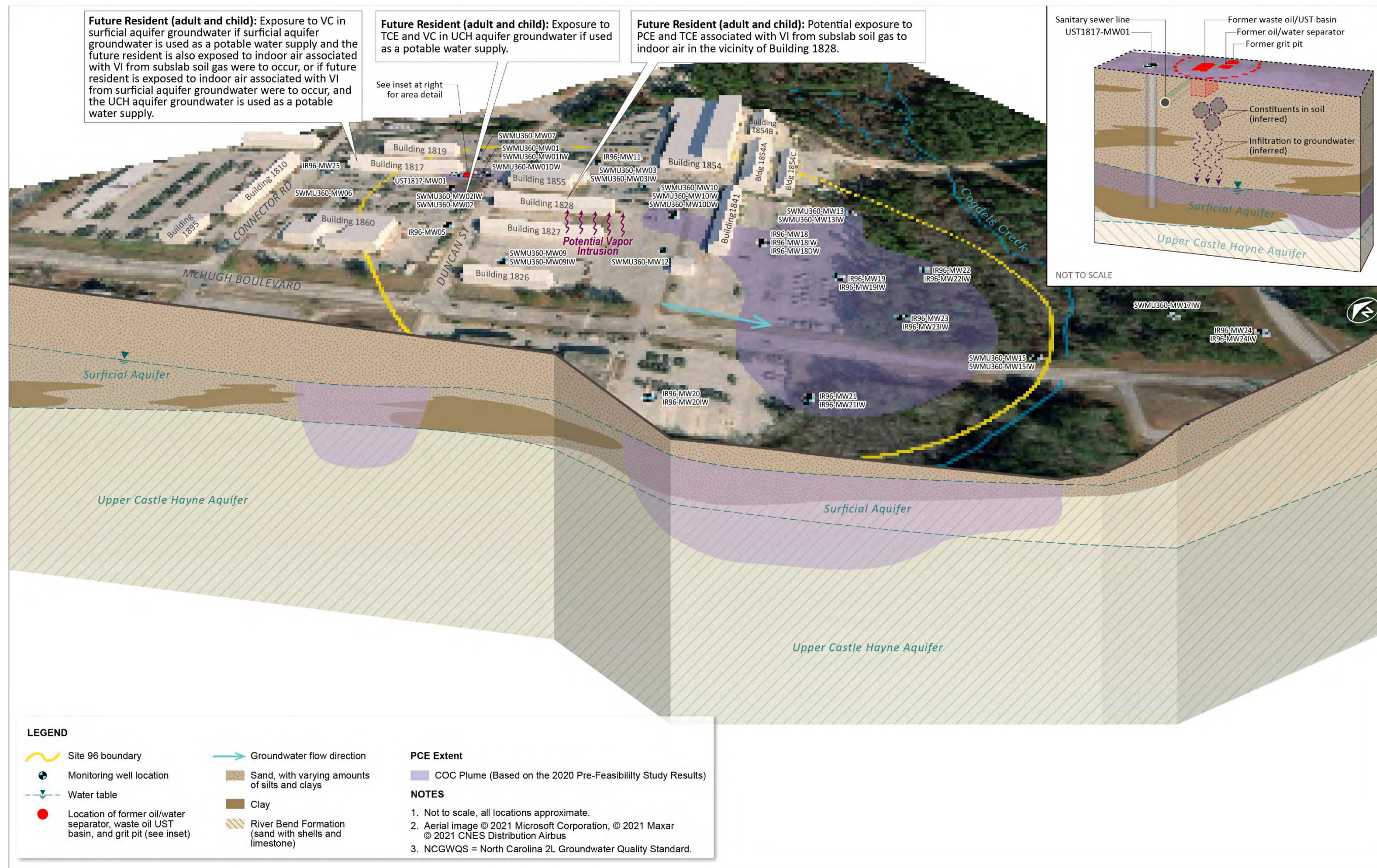


Figure 6-2. IRP Site 96 Conceptual Site Model

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Schedule 6-1
IRP Site 96
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River

ID	Task Name	Duration	Start	Finish	Aug	Sep	Oct	Nov	Dec	2023 Jan	Feb
1	RD	131 days	Mon 8/29/22	Mon 2/27/23							
2	Draft RD	60 days	Mon 8/29/22	Thu 10/27/22							
3	Review Period (Navy/Base)	45 days	Fri 10/28/22	Sun 12/11/22							
4	Response to Comments	14 days	Mon 12/12/22	Sun 12/25/22							
5	Review Period (USEPA/NCDEQ)	45 days	Mon 12/26/22	Wed 2/8/23							
6	Response to Comments	14 days	Thu 2/9/23	Wed 2/22/23							
7	Final RD	5 days	Thu 2/23/23	Mon 2/27/23							

Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

6.2 MMRP Proposed Plan/ROD Sites

There are currently no MMRP sites in the Proposed Plan/ROD phase.

Descriptions of RD and RA Sites

The following subsections discuss the site history, previous investigations, and future activities of the one IRP site in the RD and RA phase of the CERCLA process. There are currently no MMRP sites in the RD/RA phase.

7.1 IRP RD/RA Sites

7.1.1 Site 88 (OU 15)—Base Dry Cleaners

Site 88, the former Base Dry Cleaning Facility Building 25, encompasses approximately 41 acres in the HPIA of MCB Camp Lejeune (**Figure 7-1**). Building 25 began operating as a dry cleaning facility in the 1940s. Five 750-gallon USTs were installed on the northern side of the building to store dry cleaning fluids. Initially, Varsol was used in dry cleaning operations. Because of flammability concerns, Varsol use was discontinued in the 1970s and it was replaced with PCE. The PCE was stored in one 150-gallon aboveground storage tank (AST) adjacent to the northern wall of Building 25, in the same vicinity as the USTs. PCE was reportedly stored in the AST from the 1970s until 1995. Spent PCE was reportedly disposed of in floor drains during this time. 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.

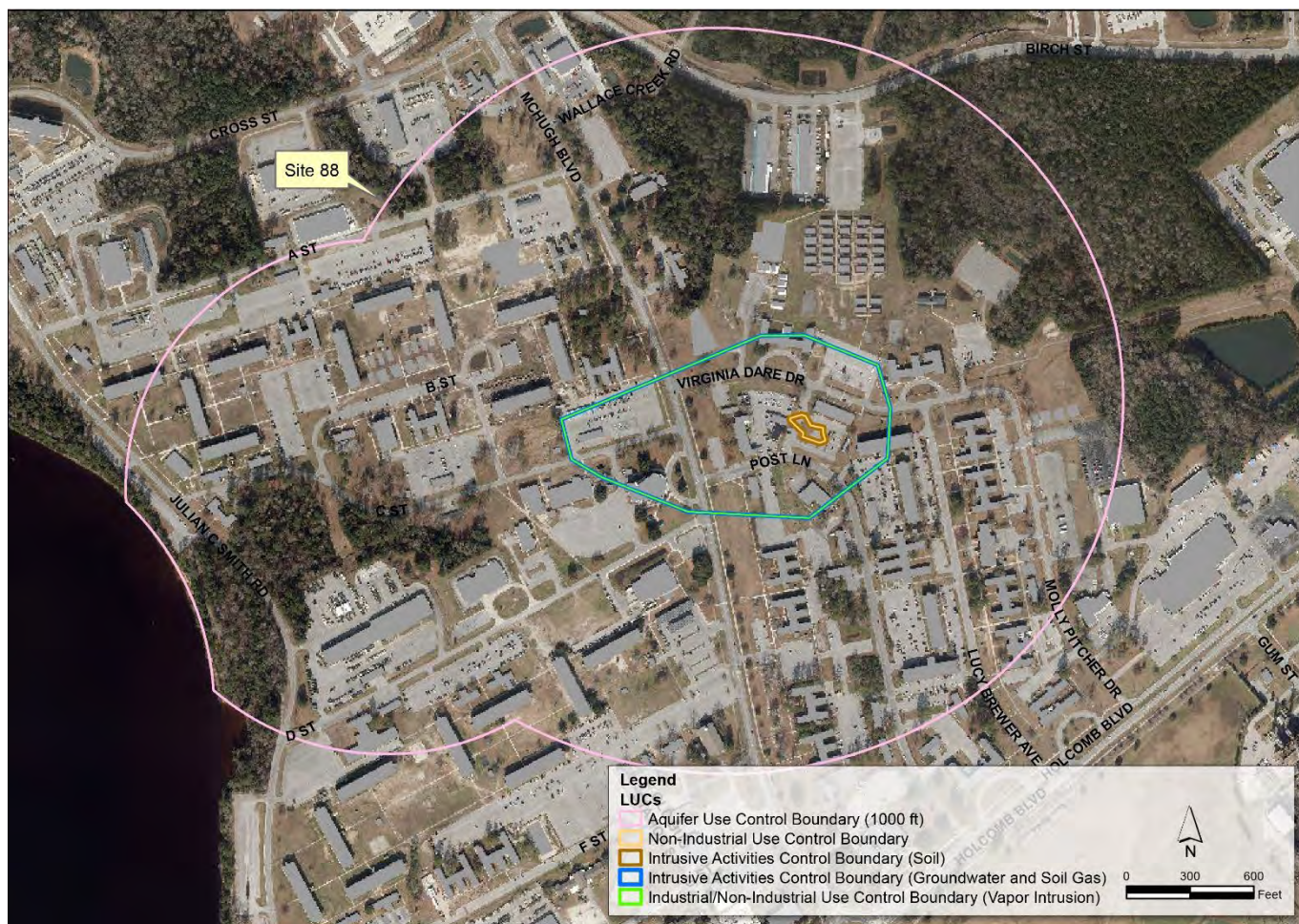


Figure 7-1. IRP Site 88, OU 15

Previous investigations are listed in **Table 7-1**, and the LUC summary is presented in **Table 7-2**.

Table 7-1. Previous Investigations Summary, IRP Site 88

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Remedial Investigation (Baker, 1998)	002020	1996-1998	During removal of the USTs and AST, CVOCs and metals were detected in soil samples, and CVOCs, total petroleum hydrocarbons (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 VOCs, 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 UCH aquifer groundwater, and Building 25 was confirmed as the source area, suggesting the presence of a dense nonaqueous phase liquid (DNAPL).
Dense Non-aqueous Phase Liquid Recovery (Duke Engineering and Services, 1999)	002324	1998-1999	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 to 20 feet bgs, directly beneath Building 25 and in an area adjacent to the northern 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 (Baker, 2001)	003343 ^a	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 (Battelle Memorial Institute, 2001)	004778	2000-2001	Reductive Anaerobic Bioremediation In Situ Treatment Technology 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.
Draft Supplemental Site Investigation (CH2M, 2002)	006290	2002	The Supplemental Site Investigation (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 northwestern migration of contaminants. Further, the vertical distribution of VOCs suggested that although appreciable volumes of DNAPL were 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.

Table 7-1. Previous Investigations Summary, IRP Site 88

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Membrane Interface Probe Investigation (CH2M, 2004; AGVIQ/CH2M, 2006)	004000 003954	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.
Engineering Evaluation/Cost Analysis (CH2M, 2004) Non-time-critical Removal Action (AGVIQ/CH2M, 2006)	004000 003954	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 contaminated 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 downgradient areas.
Remedial Investigation (CH2M, 2008)	004120 004121	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.
Treatability Study and Technical Memorandum, Summary of In Situ Chemical Oxidation, ERD, and Bio-barrier Pilot Studies (CH2M, 2011)	N/A	2010-2011	To evaluate effectiveness of remedial technologies to treat the VOC plume, a pilot study was conducted using ERD and ISCO for contaminant mass reduction and ERD as a bio-barrier to prevent further downgradient contaminant migration. For mass reduction, ISCO was demonstrated to be most effective based on a VOC reduction of 87 percent, whereas for ERD, an appropriate dose would be cost-prohibitive. The ERD bio-barrier achieved up to 97 percent PCE reduction and was effective. The results of the pilot study were used for the development of remedial alternatives in the FS.
Basewide Vapor Intrusion Evaluation (AGVIQ/CH2M, 2009, CH2M, 2011, 2015)	002772 through 002777 004694 through 004698	2007-2015	Site 88 was included in the phased Basewide VI evaluation, conducted from 2007-2011, to determine whether complete or significant exposure pathways exist for VI into buildings. VI was identified as a pathway of concern at Building 3B and a VIMS was installed in 2012. VIMS were installed in three additional buildings (Buildings 3, 37, and 43) in 2012 as a precautionary measure. VIMS O&M was initiated in 2012 and is ongoing. Additional sampling was conducted at Building HP57 and Building 37A (identified based on exceedances of groundwater in the vicinity) in 2013. Based on the results, NFA was recommended for Building 37A and follow-up monitoring was recommended at Building HP57.

Table 7-1. Previous Investigations Summary, IRP Site 88

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Building HP57 Additional Vapor Intrusion Investigation (CH2M, 2015)	006562	2014-2015	<p>An additional VI investigation was conducted at Building HP57 based on the temporal variability of TCE concentrations and the potential for preferential transport of vapors through underground utilities. Field activities included subslab soil gas, indoor air, and outdoor air sampling. PCE, TCE, and chloroform were detected in indoor air; however, the concentrations found in the subslab were not high enough to result in VI at levels above indoor air screening levels. Therefore, a Hazardous Air Pollutants on Site (HAPSITE) investigation was conducted to identify the source of the indoor air detections.</p> <p>An uncapped sewer pipe was identified as a potential vapor entry point and the pipe was plugged. Additional indoor air samples were collected from Buildings 58, 59, and HP55, which are connected to the same sewer line. Samples were also collected, using the HAPSITE, from sewer connections within Building 37, which currently has VIMS. VOCs were detected within some of the buildings suggesting the sewer line may act as a potential pathway for vapor to enter the buildings. The p-traps were inspected and repaired if necessary to prevent vapors from entering spaces through the sewer line by maintaining a water barrier. Additional HAPSITE monitoring and indoor air sampling was conducted. Results indicate that PCE was detected, but not at a concentration exceeding the VI screening level. TCE was not detected above the method detection limit.</p> <p>A pilot study was planned to evaluate the effectiveness of venting the sewer line.</p>
SWMU 615 Resource Conservation and Recovery Act Facility Investigation (CH2M, 2016)	006881	2014-2016	<p>An RFI was initiated in 2014 to evaluate the significance, nature, and extent of environmental contamination that may have resulted from historical site activities. Field activities included collection of soil and groundwater samples for VOCs. The results of the soil samples collected indicate that VOCs were not present in subsurface soil at concentrations above regulatory criteria. Two VOCs, PCE and TCE, were present in surficial aquifer groundwater, localized to the southeastern corner of SWMU 615, at concentrations slightly exceeding the NCGWQS. Because the VOCs identified in the surficial aquifer groundwater at SWMU 615 are located in the vicinity of the VOC groundwater plumes at IRP Site 88, it was recommended that the NCGWQS exceedances of PCE and TCE be addressed as part of the FS for Site 88 that was conducted in FY 2016 through FY 2017. In January 2016, NCDEQ accepted the recommendations for SWMU 615 to be transferred to the IRP (NCDEQ, 2016). Based on the post-excavation confirmatory soil sampling and groundwater data, a VI investigation was conducted to evaluate the potential for a VI pathway to Building 133. The results of subslab soil gas and subslab soil sampling indicated that PCE was not present at concentrations above the North Carolina Soil Screening Levels and it was determined there was not a significant VI pathway.</p>

Table 7-1. Previous Investigations Summary, IRP Site 88

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Vapor Intrusion Mitigation System Monitoring (CH2M, 2021)	008478 ^b	2012-2021	<p>VIMS were installed in four buildings (3, 3B, 37, and 43) at Site 88 in 2012. Performance monitoring began in 2012 and is conducted quarterly to evaluate if the VIMS at Site 88 are operating to effectively mitigate the VI pathway.</p> <p>Based on damage from Hurricane Florence (September 2018), Building 3 and the eastern portion of Building 3B were vacated and both buildings were demolished in June 2022.</p> <p>In addition, monitoring activities for the SVS at Building HP57 were conducted in conjunction with VIMS performance monitoring activities starting in December 2018.</p> <p>The VIMS and SVS are operating effectively to mitigate the VI pathway. Performance monitoring events currently include monitoring the system operating parameters (flow rate, riser vacuum, short-term differential pressure) quarterly. In December 2021, after remedy implementation, subslab soil gas sampling was conducted for building-specific VOCs analysis at Buildings 37, 43, and HP-57. Based on results, a rebound study is planned at Buildings 37 and 43 in FY 2023 to evaluate whether the VIMS can be decommissioned based on seasonal results. The VIMS at these Buildings will be shut down and sampling will be conducted in December 2023 and June 2023. Subslab soil gas samples will be collected for VIMS monitoring at Building HP57 every 5 years.</p>
Feasibility Study (CH2M, 2017)	007285	2016-2017	<p>The FS was prepared based on additional investigations and pilot studies conducted at the site, to identify the RAOs and target treatment zones, and to evaluate the remedial alternatives that would satisfy the RAOs. The following remedial alternatives were evaluated for each zone:</p> <ul style="list-style-type: none"> • Zone 1 Alternatives <ol style="list-style-type: none"> 1. No action 2. AS with SVE, MNA, LUCs, and VIMS 3. ISCO, MNA, LUCs, and VIMS 4. ERD, MNA, LUCs, and VIMS • Zone 2 Alternatives <ol style="list-style-type: none"> 1. No action 2. AS, MNA, LUCs, and VIMS 3. ISCO, MNA, LUCs, and VIMS • Zone 3 Alternatives <ol style="list-style-type: none"> 1. No action 2. MNA and LUCs 3. Biobarrier, MNA and LUCs
Building HP57 Sewer Ventilation Pilot Study Technical Memorandum (CH2M, 2018)	008131	2016-2018	<p>A pilot study was initiated at Building HP57 to assess whether ventilation of the sewer line could reduce PCE and TCE concentrations within the sewer line between the source area and Building HP57, thus reducing the concentrations in Building HP57 plumbing and indoor air. Overall, the data collected support the conclusion that the permanent sewer ventilation system can mitigate sewer VI at Building HP57.</p>

Table 7-1. Previous Investigations Summary, IRP Site 88

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Draft Zones 1 and 3 Treatability Study (CH2M, 2022)	008811	2018-2019	<p>The FS identified ERD as a potential component for remedial alternatives within Zones 1 and 3. ERD has been applied as source area treatment in Zone 1 and to mitigate offsite VOC migration in Zone 3.</p> <p>The Zone 1 objective is to evaluate the effectiveness of ERD substrate for treatment of VOCs in groundwater. The approach included the installation of surficial and UCH aquifer vertical injection wells, emulsified vegetable oil (EVO) injections, bioaugmentation, and performance monitoring of groundwater and soil gas. Performance monitoring results for Zone 1 indicated that in the surficial and UCH aquifers, within the influence of the ERD injections, constituent of concern (COC) concentrations were generally stable to decreasing and conditions were generally favorable for reductive dechlorination. Outside the influence of the ERD injections, little effect on COCs and conditions were observed.</p> <p>The Zone 3 objective was to evaluate effectiveness of ERD substrate oriented as a biobarrier for treatment of VOCs in downgradient groundwater. The approach included the installation of UCH aquifer vertical injection wells, EVO injections, bioaugmentation, and groundwater performance monitoring.</p> <p>Performance monitoring results for Zone 3 indicated that the biobarrier is effectively treating contaminated groundwater, particularly along the middle portion. Within the biobarrier, concentrations of PCE were below laboratory detection limits while daughter product concentrations were greater than upgradient of the biobarrier, indicating ERD is occurring. Conditions upgradient, within, and downgradient are reducing and generally favorable for reductive dechlorination.</p>
Proposed Plan (CH2M, 2018)	007644	2018-2019	<p>A Proposed Plan was issued to solicit public input on the preferred alternative for addressing groundwater contamination:</p> <p>Zone 1 – ERD via vertical injection wells and VIMS</p> <p>Zone 2 – ISCO via horizontal injection wells and VIMS</p> <p>Zone 3 – Biobarrier via vertical injection wells</p> <p>Sitewide – MNA after active treatment and LUCs</p> <p>The ROD was prepared to document the preferred alternative as the selected remedy and was signed on May 23, 2019.</p>
Record of Decision (CH2M, 2019)	007835		
Remedial Design (CH2M, 2020)	008140	2020	<p>The RD presents the design of remedy as specified by the ROD, including plans for performance monitoring during active treatment and MNA thereafter, LUCs (Table 7-2), and VIMS operation and monitoring. Initial Zones 1 and 3 treatability study results were presented in the RD as these results were used to develop plans for the design. Figure 7-2 is the CSM.</p>
Zone 2 Injections (AGVIQ, 2022, Paragon, 2022)	008826	2020-2022	<p>Horizontal injection wells and vertical extraction wells were installed at Zone 2 and upgradient and central permanganate injections were completed in April 2022. Downgradient injections and recirculation were completed in May 2022.</p>
	Pending Final		

Table 7-1. Previous Investigations Summary, IRP Site 88

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Long-Term Monitoring (CH2M, 2022)	008741	2020-present	LTM, consisting of performance monitoring until active treatment is complete for groundwater, and VI monitoring for the VIMS and SVS was initiated in 2020. The LTM includes semiannual performance monitoring for Zone 1 (three surficial and five UCH aquifer monitoring wells sampled for VOCs, NAIPs, and microbial analysis), Zone 2 (two UCH, four middle Castle Hayne [MCH], and three LCH aquifer monitoring wells sampled for VOCs), and Zone 3 (13 UCH aquifer monitoring wells for VOCs, and eight UCH monitoring wells for NAIPs and microbial analysis). VI monitoring (subslab soil gas) for Buildings 37, 43, and HP-57 will be conducted every five years.

^a Only the final monitoring report NIRIS number is shown.

^b Only the most recent VIMS monitoring report/checklist NIRIS number is shown.

Table 7-2. Land Use Control Summary, IRP Site 88

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	287.0	September 1, 2020
Intrusive Activities and Non-Industrial Use Control Boundary (Soil)	0.243	September 1, 2020
Industrial/Non-Industrial Use Control Boundary (VI)	21.7	September 1, 2020
Intrusive Activities Control Boundary (Groundwater and Soil Gas)	21.7	September 1, 2020

7.1.1.2 Future Activities

An Interim RACR will be prepared in FY 2023 (**Schedule 7-1**). The third round of EVO injections is planned for Zones 1 and 3 in FY 2023 and a second round of injections is planned in Zone 2 in FY 2024. Engineering controls to prevent communication with the stormwater sewer and alternate injection approaches to reduce stress to the aquifer will be evaluated prior to the third round of injections at Zone 1. LTM consisting of groundwater performance monitoring semiannually and VI monitoring every five years for the VIMS and SVS will continue. A VI rebound study will be conducted in FY 2023 in which the VIMS will be turned off at Buildings 37 and 43 and subslab soil gas and indoor/outdoor air samples will be collected semiannually. LUC inspections will be conducted quarterly.

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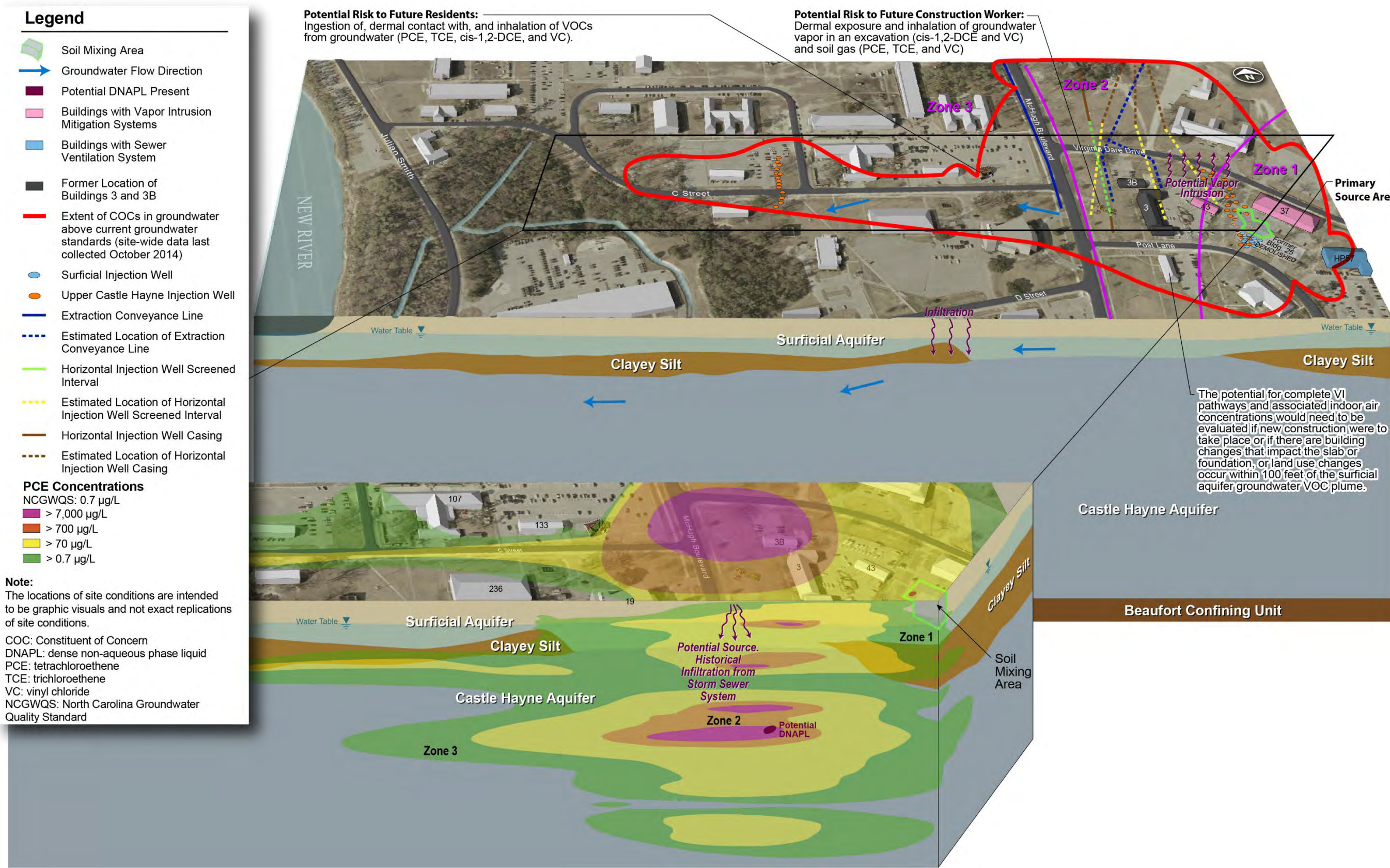
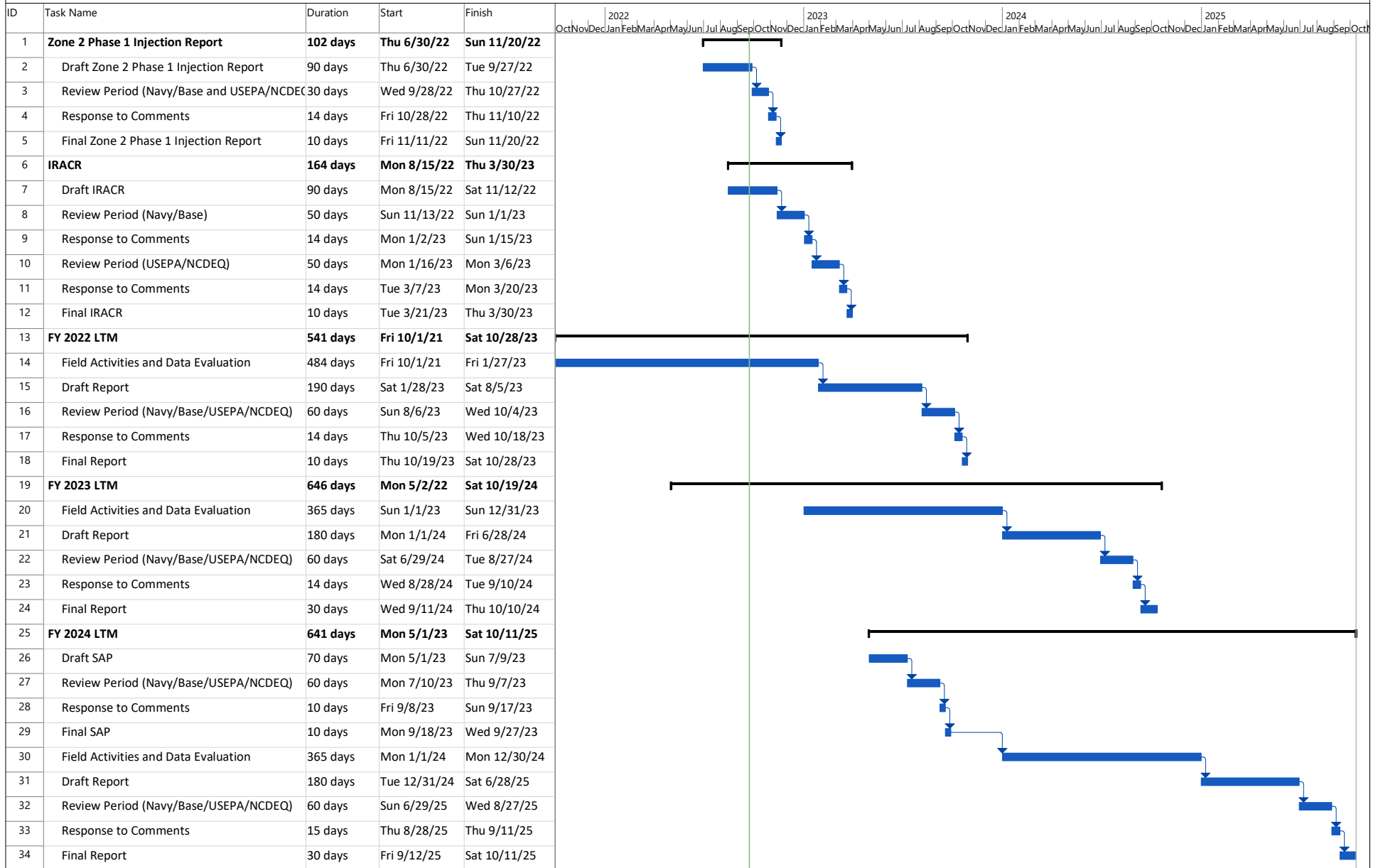


Figure 7-2. IRP Site 88 Conceptual Site Model

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Schedule 7-1
IRP Site 88
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

7.2 MMRP RD/RA Sites

There are currently no MMRP sites in the RD/RA phase.

Descriptions of RIP and RC Sites

The following subsections discuss the site history for the IRP and MMRP sites that are in the RIP and RC phase of the CERCLA process.

8.1 IRP RIP Sites

8.1.1 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 northeastern portion of the Base (**Figure 8-1**). From 1945 to 1958, an onsite building was used for storing, handling, and dispensing pesticides. Chemicals known to have been used at Site 2 include chlordane, 4,4'-dichlorodiphenyltrichloroethane (DDT), diazinon, and 4,4'-dichlorodiphenyldichloroethane (DDD). Chemicals known to have been stored 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.



Figure 8-1. IRP Site 2, OU 5

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 2

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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)	N/A	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.
Geophysical Investigation (Baker, 1994)	001273	1991-1992	A surface geophysical investigation was performed to establish the source of groundwater contamination. No anomalies that could serve as sources (that is, tanks or drums) of groundwater contamination were identified. However, an atypical subsurface feature was detected. The data from this anomaly were not sufficiently conclusive to ascertain whether it was a tank, large-diameter utility line, or other buried structure. Results of this investigation are discussed in the RI (Baker, 1994).
Remedial Investigation (Baker, 1994) Feasibility Study (Baker, 1994)	001273 001251	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)	001560 through 001562	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 (Baker, 1994) Record of Decision (Baker, 1994)	001253 000230	1994	A PRAP was issued to solicit public input on the preferred alternative (LTM and LUCs) and a public meeting was held. The ROD was signed in September 1994 and the selected remedy was LTM for groundwater and LUCs.
Remedy-in-Place and Long-Term Monitoring Closeout Report (CH2M, 2008)	004190	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 screening criteria for four consecutive events, LTM was discontinued, and an SC report was submitted. LUCs were implemented in 2001 and updated in 2002 and 2008.

Table 8-1. Previous Investigations Summary, IRP Site 2

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Update to the Operable Unit No. 5–Site 2 Closeout Report Technical Memorandum (CH2M, 2011)	004760	2011	This technical memorandum provided an update to the Closeout Report for Operable Unit 5, Site 2 (CH2M, 2008) to incorporate the Notice of Non-Significant Changes. The screening criteria in groundwater were achieved, and no risk to human health and the environment from exposure to groundwater remained at Site 2. Therefore, the LUCs restricting groundwater intrusive activities and aquifer use were removed. LUCs remain in place to prohibit non-industrial use. The current CSM is shown on Figure 8-2 .
MCB Camp Lejeune IRP Partnering Team Meeting Minutes (CH2M, 2016)	007264	2016	Based on the 2015 FYR (CH2M, 2015), removal of a non-industrial use LUC for soil was recommended because confirmation soil and sediment data did not exceed residential regional screening levels; however, during detailed data evaluation and review historical groundwater data exceeding current standards was identified. Therefore, in 2016, historical soil and groundwater data were reviewed and compared against current standards and reassessed for risk based on current land use. Potential risk associated with soil concentrations was determined to be within an acceptable range for residential receptors and the Partnering Team agreed to remove non-industrial LUCs for soil. Potential unacceptable risks were identified associated with potable use of groundwater based on historical pesticide concentrations. As a result, the Partnering Team agreed to install three shallow monitoring wells directly downgradient from the previous pesticide exceedances in groundwater and analyze for DDD and DDT.
Limited Site Assessment Public Supply Well 647 (Davenport and Catlin, 2017)	N/A	2017	During a September 2016 investigation, four monitoring wells were installed, and groundwater samples were collected from the newly installed wells near PSW-647 (a public supply well [PSW] that is currently offline) after oil was discovered in PSW-647 when Camp Lejeune Utility Department attempted to replace the well's pump. No contaminants were detected in the soil or groundwater. Based on the results, the PSW-647 well will continue to be monitored and will be cleaned so that no free-phase product remains in the well. Sampling was recommended after the well was cleaned. A semi-annual monitoring report will be prepared to document results and provide appropriate recommendations.
Completion Report, Operable Unit No. 5–Site 2 Groundwater Investigation (Meadows, 2017)	007359	2017	Three monitoring wells were installed directly downgradient from the previous pesticide exceedances in groundwater and groundwater samples from the newly installed wells were analyzed for pesticide (DDD and DDT) analysis. Based on the results, pesticide concentrations exceeded the NCGWQS in groundwater collected from the southernmost well (IR02-MW13) and the field duplicate.
Groundwater Sampling (Meadows, 2018)	008141	2018	In FY 2018, one round of groundwater sampling for pesticide (DDD and DDT) analysis from IR02-MW13 and nearby PSW-647, which is currently offline, was conducted. Pesticides were not detected in samples from PSW-647; however, DDD concentrations in the sample from IR02-MW13 exceeded the NCGWQS. Reinstitution of LTM sampling every 5 years beginning in 2023 and an aquifer use control LUC were recommended.

Table 8-1. Previous Investigations Summary, IRP Site 2

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Memorandum to Site File: Non-Significant Changes to the Remedy (CH2M, 2020)	008345	2019-2020	Based on the groundwater investigation results, LTM of groundwater for 4,4'-DDD and 4,4'-DDT will be conducted every 5 years and an aquifer use LUC will be reinstated. The HHRA review concluded that there were no unacceptable risks to future residents from exposure to soil or sediment. Therefore, the non-industrial use control LUC will be removed. A Memorandum to Site File was issued documenting the non-significant change to the remedy.
Land Use Control Implementation Plan Update (CH2M, 2021)	008729	2021	A Land Use Control Implementation Plan (LUCIP) was prepared to document changes to LUCs. Based on the comprehensive data and human health risk assessment review and the groundwater sampling conducted in 2018, the non-industrial use control LUC was removed and the aquifer use control LUC was reinstated. An updated Notice of Contaminated Site was filed with Onslow County real property records in October 2021.

Table 8-2. Land Use Control Summary, IRP Site 2

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (500 feet)	18.03	October 8, 2021

8.1.1.1 Future Activities

Groundwater LTM will be reinstituted in FY 2023 (**Schedule 8-1**) and LUC inspections will be conducted quarterly.

Potential Risk to Future Residents:
Ingestion or dermal contact with pesticides (4,4'-DDD and 4,4'-DDT) in groundwater, if used as a potable water supply.



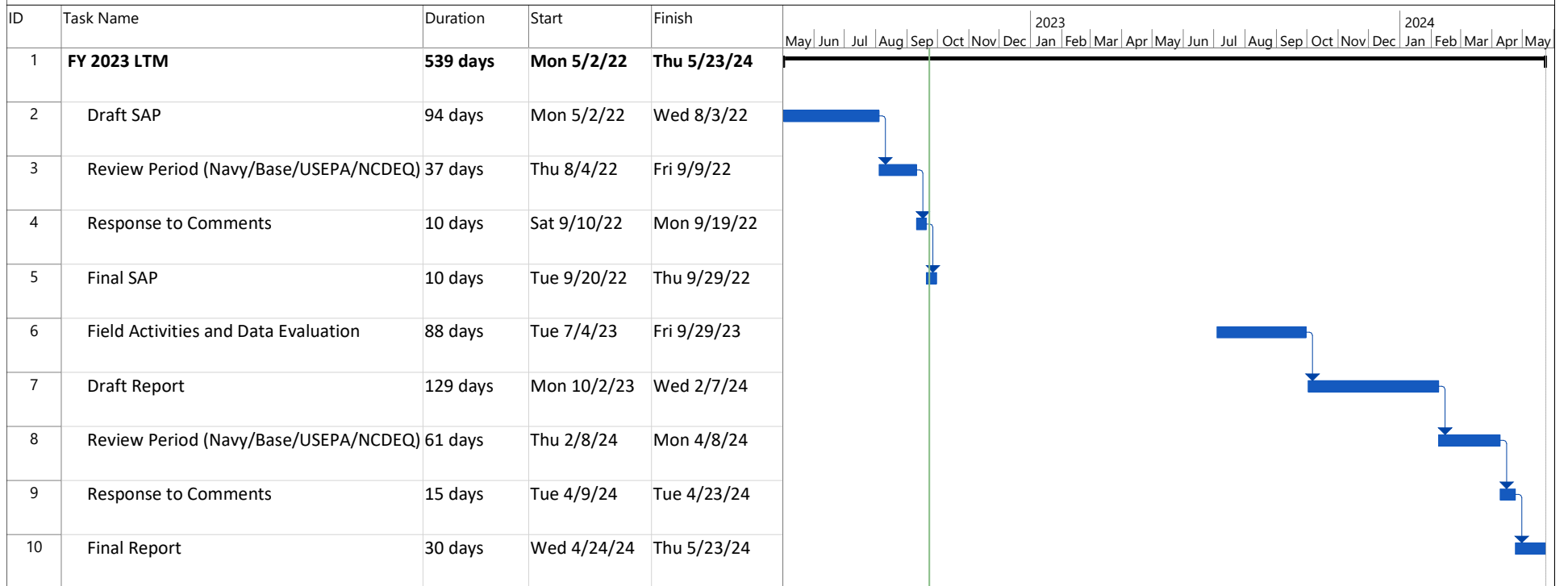
LEGEND

- Aquifer Use Control Boundary (500ft)
- Excavation Area
- Monitoring Well - LTM
- Monitoring Well - not in LTM
- Groundwater Table
- Estimated Direction of Groundwater Flow

Figure 8-2. IRP Site 2, Conceptual Site Model

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Schedule 8-1
IRP Site 2
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Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

8.1.2 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 Base 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, OU 12

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 3

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	01511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at Site 3, and it was concluded that no further assessment was necessary. However, USEPA requested an additional investigation to determine whether hazardous waste contamination existed.
Site Inspection (Halliburton/NUS, 1992)	000331	1991-1992	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 8-3. Previous Investigations Summary, IRP Site 3

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation/ Feasibility Study (Baker, 1996)	001699 001700 001721	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. Polycyclic aromatic hydrocarbons (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 conducted to screen remedial alternatives for addressing soil and groundwater contamination.
Proposed Remedial Action Plan (Baker, 1996) Record of Decision (Baker, 1997; 1999)	002132 001753 004099	1996-1999	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 ROD was 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 July 1999, 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 Non-time Critical Removal Action (OHM, 2001)	006359	1997	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 were removed to achieve industrial cleanup levels. Groundwater LTM for VOCs and SVOCs was initiated in 1997. LUCs were implemented in 2001 and updated in 2002.
Long-term Monitoring (CH2M, 2021)	008759 ^a	1997-present	LTM was initiated in 1997 and included annual groundwater sampling of three surficial and one UCH aquifer monitoring wells for VOCs and SVOCs. Over time, the monitoring well network and analyte list were optimized as cleanup levels were met for four consecutive sampling events. In FY 2017, after four rounds of sampling without an exceedance of cleanup levels, the surficial aquifer wells were removed from LTM. Monitoring well IR03-MW02IW is the only monitoring well in the UCH aquifer left to be monitored for benzo(a)anthracene and benzo(b)fluoranthene. Based on the results of FY 2019 and FY 2020 LTM, decreasing the sampling frequency to every five years was recommended with the next sampling event in 2023 in preparation for the 2025 FYR.
Pilot Study (CH2M, 2015 and 2017)	007410 007361	2015-2019	A pilot study was conducted to evaluate the effectiveness of enhanced aerobic biodegradation using an oxygen-releasing compounds (ORC) reagent to accelerate the natural attenuation process and reduce the time to achieve site closure. Field activities included ORC injections in the surficial aquifer, the installation of ORC socks in the UCH aquifer, and performance monitoring. The results indicated that ORC had not reached the affected UCH aquifer monitoring well. A continuation of the pilot study was conducted in August 2018 to enhance/increase the distribution of ORC by extracting groundwater from monitoring well IR03-MW02IW to create a gradient toward the monitoring well. Post-extraction monitoring was conducted through 2019. Although groundwater conditions near IR03-MW02IW were conducive to aerobic degradation after the pilot study was initiated, geochemistry parameters collected during LTM in FY 2019 and FY 2020 indicated conditions were generally unfavorable for aerobic degradation.

^a Only the most recent LTM report NIRIS number is shown.

Table 8-4. Land Use Control Summary, IRP Site 3

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	85.21	February 15, 2002
Non-Industrial Use Control Boundary (Soil)	0.14	
Intrusive Activities Control Boundary (Groundwater)	4.09	

8.1.2.1 Future Activities

Groundwater LTM will continue (**Schedule 8-2**) and LUC inspections will be conducted quarterly.

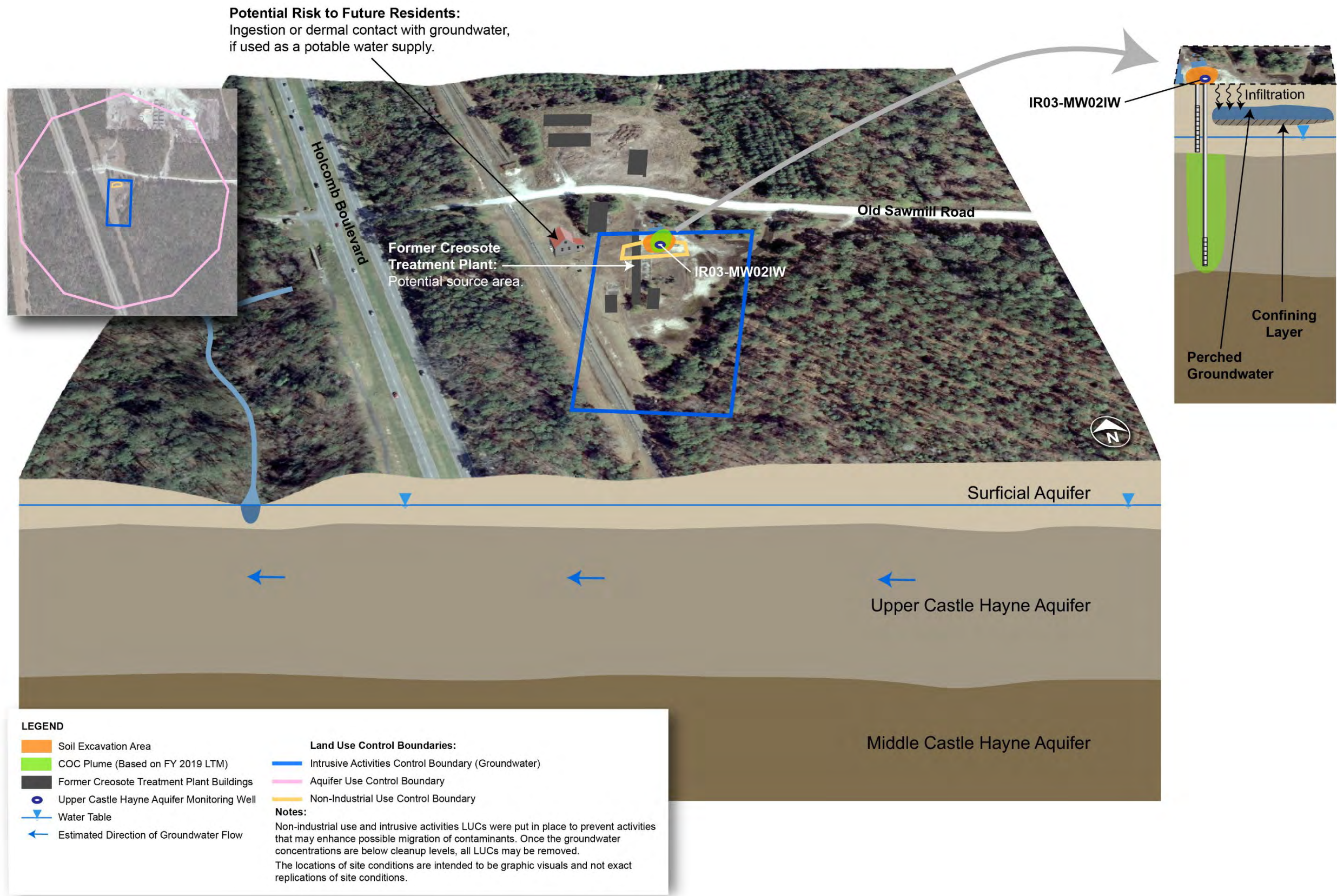
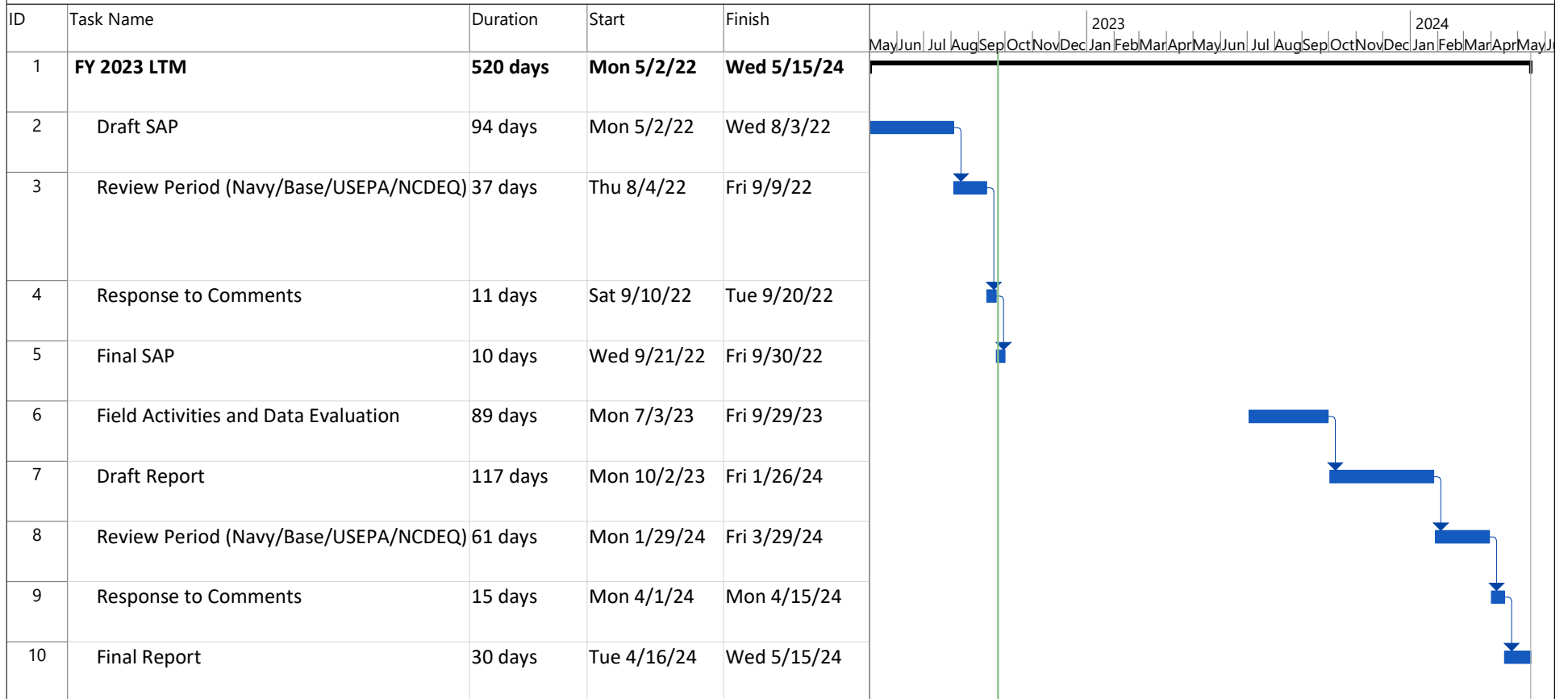


Figure 8-4. IRP Site 3 Conceptual Site Model

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Schedule 8-2
IRP Site 3
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MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

8.1.3 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 North Carolina Highway 24 (**Figure 8-5**). OU 2 consists of four sites (Sites 6, 9, and 82, and UXO-22) that are grouped together because of their proximity to one another. Site 6 comprises approximately 160 acres located between Site 82 to the north, Piney Green Road to the east, and Holcomb Boulevard to the west. Site 6 includes Lots 201, 202, and 203, which are open, gravel storage lots. 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. Lot 202 has been used to store a variety of shipping containers and other surplus equipment. Most of Lot 203 remains an open field; 21 acres were temporarily used by the Defense Reutilization and Marketing Office (DRMO) for metal staging operations between 2001 and 2012.

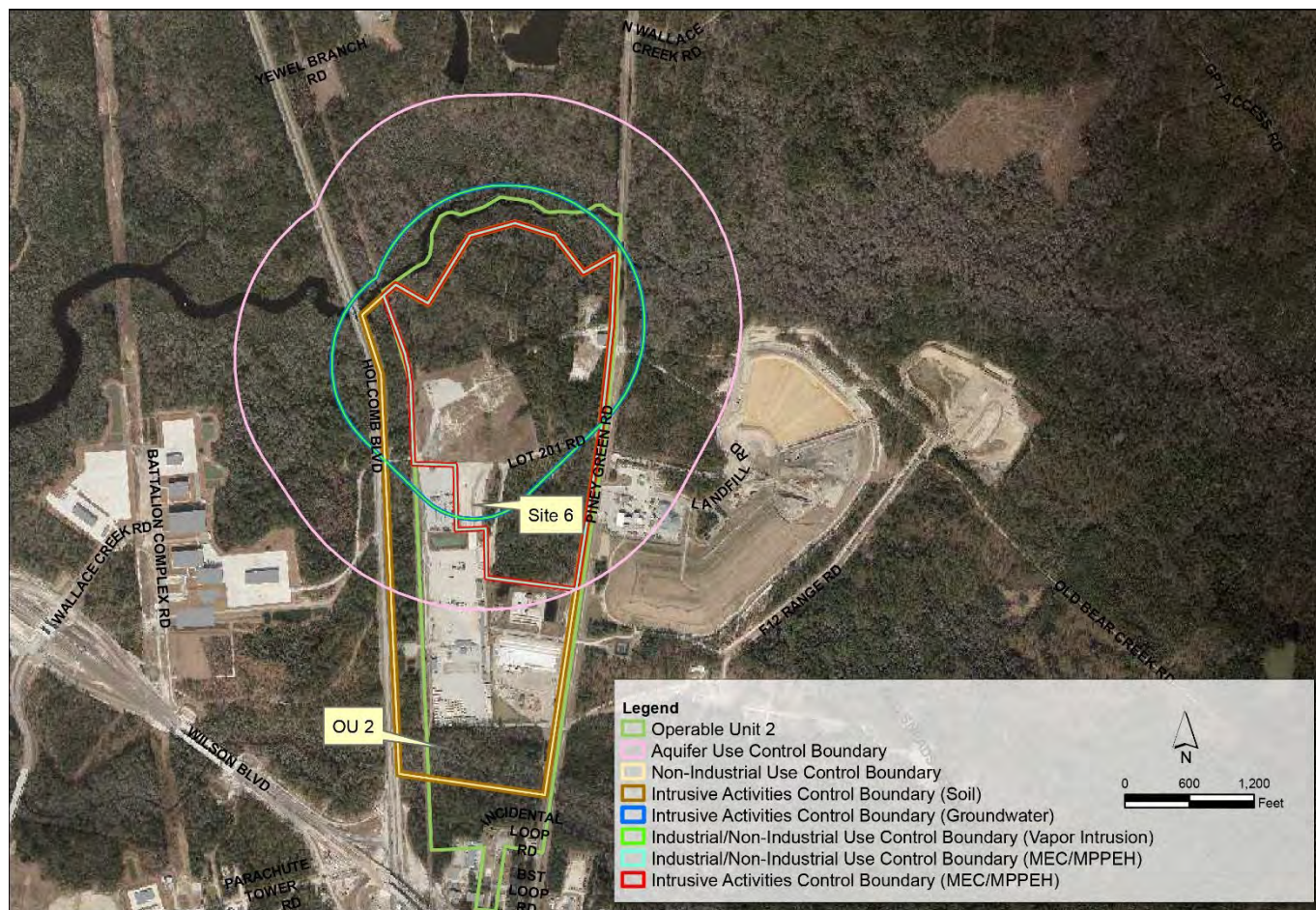


Figure 8-5. IRP Site 6, OU 2

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 6

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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.

Table 8-5. Previous Investigations Summary, IRP Site 6

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Site Assessment (ESE, 1992)	000273	1984-1992	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 samples collected from shallow monitoring wells revealed low levels of VOCs and benzene.
Soil Gas Survey (MCB Camp Lejeune, 1989)	000305	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.
Remedial Investigation/ Feasibility Study (Baker, 1993)	001483	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. The FS identified AOCs based on the RI risk assessment and an evaluation of the COC concentrations exceeding the remediation goals.
Proposed Remedial Action Plan and Record of Decision (Baker, 1993)	001249	1993	A PRAP was developed to solicit public input on the preferred alternative (soil removal, groundwater extraction and treatment, LTM, and LUCs) and a public meeting was held. The ROD was signed in September 1993 and the selected remedy was soil removal, LTM for groundwater, and LUCs.
Remedy-in-Place Closeout Report (OHM, 1997)	001523 002288 through 002295	1994-1997	The selected remedy identified in the ROD was conducted as a TCRA in 1994, during which 20 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 and metals were initiated in 1996. LUCs were implemented in 2001 and updated in 2002. The current CSM is shown on Figure 8-6 .
Long-term Monitoring (CH2M, 2021)	Pending Upload ^a	1996-present	LTM was initiated in 1996 and included annual groundwater sampling for VOCs and metals from seven surficial, one UCH, and one lower Castle Hayne (LCH) aquifer monitoring wells. LTM was discontinued in 2012 based on ongoing investigations and reinstated in 2014 with an expanded network to encompass the current extent of contamination. The LTM program currently includes annual groundwater sampling from 10 UCH and five LCH aquifer monitoring wells for VOCs analysis.
Chlorobenzene Summary Report (CH2M, 2010)	002877	2008-2010	To identify the potential source of chlorobenzene contamination and delineate the extent in groundwater, an SSI was conducted. During vegetation clearing activities, MPPEH were discovered and an ESS was submitted to remove and dispose of the MPPEH. 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; test pitting, and additional groundwater delineation was recommended.

Table 8-5. Previous Investigations Summary, IRP Site 6

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Basewide Vapor Intrusion Evaluation (AGVIQ/CH2M, 2009)	002772 through 002777	2007-2009	A Basewide VI Study was conducted to determine whether complete or significant exposure pathways exist for VI into buildings. At OU 2, no buildings were identified within 100 feet of a monitoring well containing VOC concentrations above NCGWQS.
Chlorobenzene Test Pitting Investigation (CH2M, 2012)	004742	2010-2012	As a follow-up to the recommendations of the Chlorobenzene Summary Report, test pitting to investigate the large geophysical anomalies and soil sampling were conducted. Twelve test pit excavations were completed and cultural debris, MPPEH, drums, buckets, communication batteries, communication wires, and scrap metal were uncovered. At Test Pit 10, two drums were uncovered, resulting in elevated breathing zone measurements, and the soil results indicated chlorobenzene concentrations at 70,000,000 micrograms per kilogram. Additional monitoring wells were also installed and sitewide groundwater samples were collected to further investigate the extent of chlorobenzene in groundwater. Recommendations were to complete the delineation of chlorobenzene in groundwater, assess the distribution of chlorobenzene in vadose zone soil, and update LUCs, as necessary.
Action Memorandum (CH2M, 2011) Time-critical Removal Action (CH2M, 2011)	003413 004184	2011	An AM documented the decision for a TCRA to address the buried drums and chlorobenzene-contaminated soil discovered during test pitting activities. The TCRA was conducted in May 2011. Approximately 42 yd ³ of soil and debris were removed. Confirmation samples were collected in the excavated area, and analytical results indicated that concentrations of chlorobenzene were still present in soil above industrial screening levels. The site was restored with clean backfill, and further investigation of chlorobenzene in soil via passive soil gas and soil sampling and an evaluation of the current RIP was recommended.
Lot 202 Environmental Condition of Property for Property Real Estate DRMO Area (CH2M, 2014)	005908	2014	An Environmental Condition of Property was performed for Lot 202 to assess the lot's environmental condition in support a potential interagency transfer of the property. The study found that there were no known or documented instances where hazardous or petroleum substances were stored, disposed, or released on Lot 202. However, facility personnel suggested that buried debris may be present beneath Lot 202. A DGM survey and test pitting were conducted, and buried metallic and wooden debris was identified within the northern portion of Lot 202. Soil and groundwater samples were collected within Lot 202, and the concentrations do not pose an unacceptable human health risk. Evaluation of chlorobenzene concentrations reported in well IR06-MW80 (adjacent to and east of Lot 202) show that exposure to the groundwater from this well would result in unacceptable human health risks. Contamination from this well has the potential to migrate beneath the northern portion of Lot 202. This Environmental Condition of Property concluded that the property is suitable for transfer for the use as a controlled area storage yard, as long as the LUCs are maintained.

Table 8-5. Previous Investigations Summary, IRP Site 6

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Supplemental Investigation (CH2M, 2015)	006573	2012-2015	<p>In 2012 and 2013, a supplemental investigation was conducted to evaluate the potential for additional VOC source material in soil and groundwater. Field activities included hydrogeologic testing and soil, groundwater, and passive soil gas sampling for VOCs. VOCs were detected at concentrations exceeding screening criteria in soil and groundwater samples.</p> <p>Based on the results, additional horizontal and vertical delineation, groundwater modeling, and a pilot study for chlorobenzene and chlorinated ethenes in groundwater were recommended.</p>
Supplemental Remedial Investigation Status Update (CH2M, 2017)	007244	2015-2017	<p>A status update for the Supplemental RI (SRI) was conducted in phases to characterize potential source areas and delineate VOCs, chlorobenzene and chlorinated ethenes, in site media. Field activities included monitoring well installation and soil, groundwater, surface water, and sediment sampling. Efforts to delineate the extent of VOCs in groundwater at Site 6 were successful and results of the phased investigation indicated that residual chlorobenzene contamination remains in soil and groundwater in the TCRA area.</p> <p>Results of the sediment and surface water sampling indicated contaminated groundwater may be discharging into Wallace Creek, and continued LTM of VOC concentrations in sediment and surface water from the creek was recommended.</p>
Supplemental Remedial Investigation Status Update 2 (CH2M, 2020)	008374	2016-2020	<p>SRI activities were conducted to identify and characterize previously undiscovered source areas and characterize source areas identified during the previous SRI; assess the nature and extent of COCs in soil, groundwater, sediment, and surface water; improve the understanding of groundwater flow and groundwater contaminant migration; and evaluate the recovery well network performance and optimization.</p> <p>Field activities included monitoring well installation and site-wide groundwater sampling, passive soil gas sampling, surface clearance, a DGM survey, test pit excavations, MIP and soil sampling and, recovery well installation, testing and groundwater sampling.</p> <p>Based on the results, identification and/or refinement of four source areas was completed and the nature and extent of VOCs in groundwater was further refined.</p>
Explanation of Significant Difference (CH2M, 2017)	007229	2017	<p>The Explanation of Significant Difference (ESD) updated the RAOs for OU 2 to include VI, to add an industrial/non-industrial use control for VI, intrusive controls due to MEC/MPPEH associated with UXO-22, and to update the groundwater LUCs based on current extent of groundwater contamination.</p>
Land Use Control Implementation Plan Update (CH2M, 2019)	008082	2019	<p>A Land Use Control Implementation Plan (LUCIP) was prepared to document updates to current LUCs for OU 2. The aquifer use control and the intrusive activities control for groundwater boundaries were updated to reflect the current extent of COCs. An intrusive activities control boundary for MEC/MPPEH, an industrial/non-industrial use control boundary for MEC/MPPEH, and an industrial/non-industrial use control boundary for VI were added.</p> <p>The intrusive activities control and non-industrial use control boundaries for soil remain unchanged.</p>

Table 8-5. Previous Investigations Summary, IRP Site 6

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Supplemental Remedial Investigation Status Update 3 (CH2M, 2021)	Pending Upload	2019-2021	<p>SRI activities were conducted to address the uncertainty of potential unacceptable risk to human and/or ecological receptors from exposure to soil by evaluating whether contaminants identified in the ROD as well as discovered during source removal and supplemental investigations since the ROD were present in AOC soil samples at concentrations resulting in unacceptable risk. Field activities included soil sampling for PAHs, pesticides, and metals. The results of the AOC soil investigation indicate that there are no unacceptable risks to human health or the environment, eliminating the uncertainties regarding the former soil removal.</p> <p>The nature and extent of groundwater impacts at Site 6 was defined from the former chlorobenzene source area northwest towards Wallace Creek. The chlorobenzene contamination in the surficial aquifer (and associated soil source area) was remediated through the biosparging study conducted during the SRI. Residual chlorinated VOC impacts originating from the former source area persist in the UCH aquifer within approximately 1 order-of-magnitude of the NCGWQS. VOC concentrations in this area are decreasing.</p> <p>Biosparging proved effective at remediating chlorobenzene below the North Carolina Preliminary Soil Remediation Goal Protection of Groundwater in the soil and below the laboratory detection limits in groundwater in the surficial aquifer. The lithology at Site 6 is conducive for adequate air injection to stimulate aerobic biodegradation, with an approximate radius of influence of aeration of 50 feet from biosparge wells.</p>
Soil LUC Refinement Work Plan (CH2M, 2021)	008797	2021	A soil investigation was conducted to determine whether LUC refinement at Sites 6 and 82 is feasible. Field activities were conducted in 2021 and included performing DGM and ground penetrating radar followed by soil sampling for VOCs, SVOCs, pesticides, PCBs, and metals. A report is being prepared for submittal in FY 2022.

^a Only the most recent LTM report NIRIS number is shown.

Table 8-6. Land Use Control Summary, OU 2

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	394.04	April 16, 2019
Non-Industrial Use Control Boundary (Soil)	206.75	February 15, 2002
Intrusive Activities Control Boundary (Soil)	206.75	
Intrusive Activities Control Boundary (Groundwater)	147.90	April 16, 2019
Industrial/Non-Industrial Use Control Boundary (VI)	147.90	
Intrusive Activities Control Boundary (MEC/MPPEH)	112.12	
Industrial/Non-Industrial Use Control Boundary (MEC/MPPEH)	112.12	

8.1.3.1 Future Activities

The soil LUC refinement report will be completed in FY 2023, followed by a Memorandum to Site File to refine the LUCs (**Schedule 8-3**). Groundwater LTM will continue and LUC inspections will be conducted quarterly.

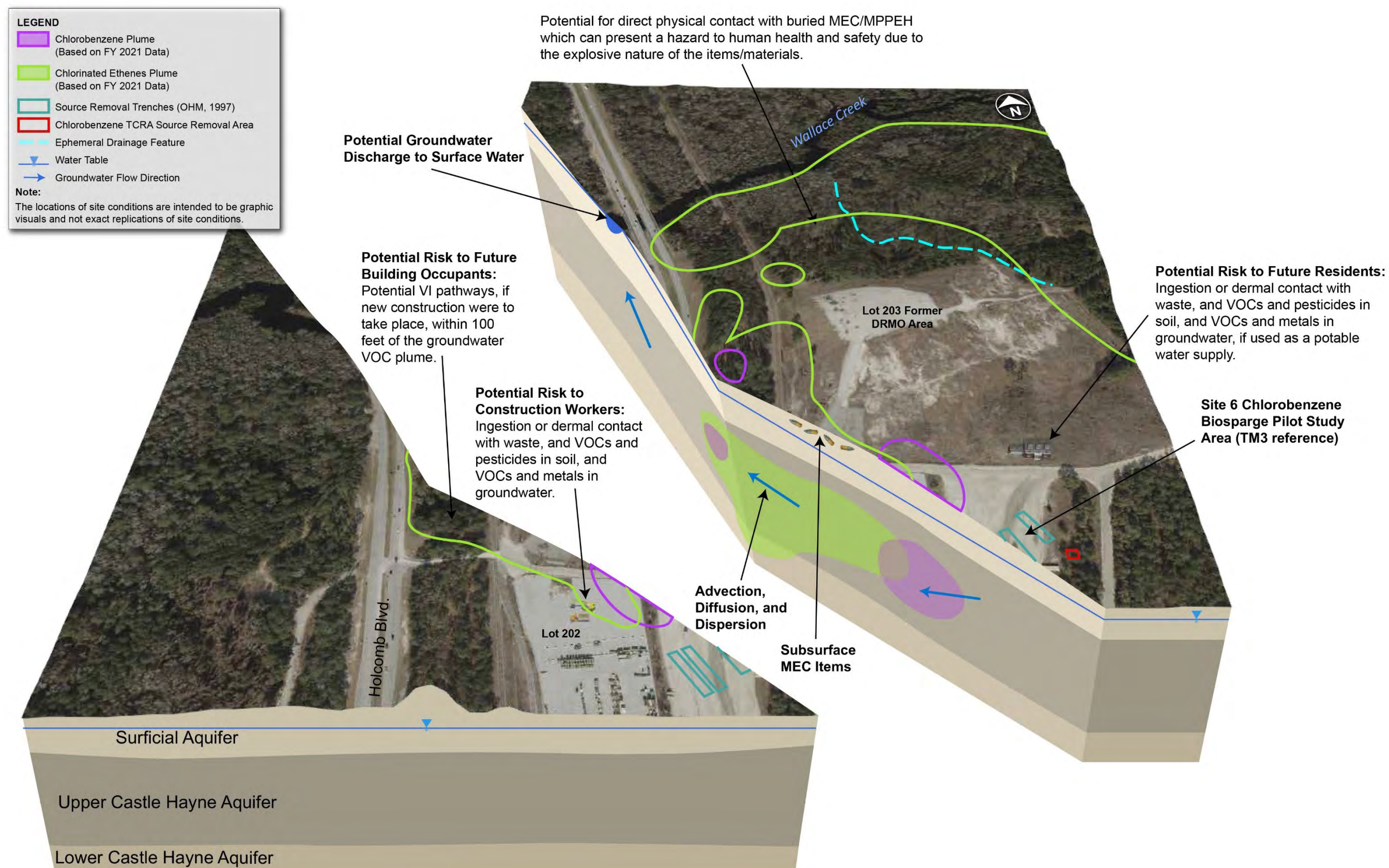
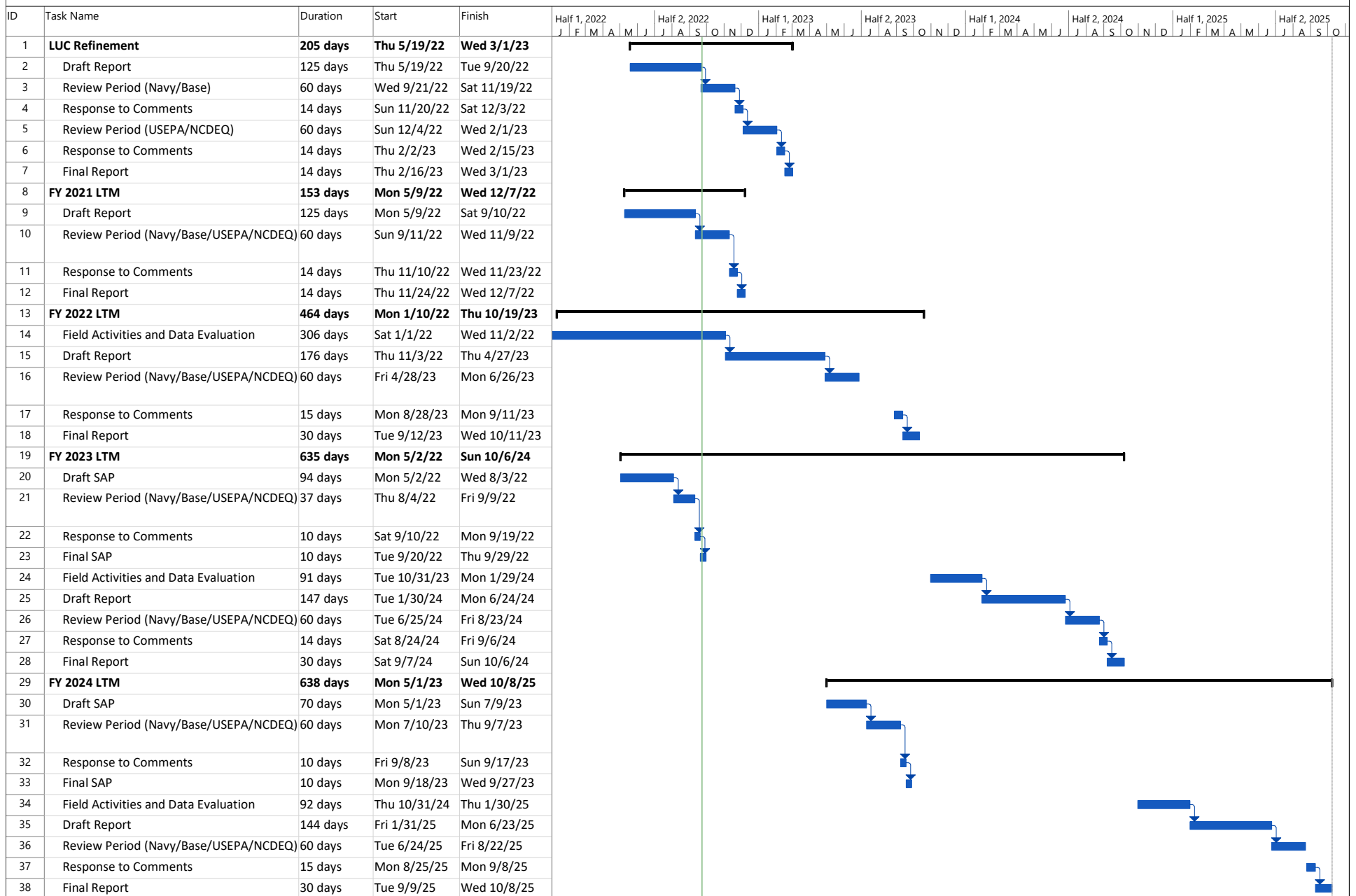


Figure 8-6. IRP Site 6 Conceptual Site Model

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Schedule 8-3
IRP Site 6
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

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

Site 10, the Original Base Dump, is located on the Mainside of the Base (**Figure 8-7**). Site 10 was estimated to be 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.

In 2012, the Base implemented soil LUCs for conservativeness based on the site’s history as a dump. MILCON for three administrative buildings adjacent to Site 10 was completed in 2016. As a precautionary measure, the Base installed VIMS within the buildings.



Figure 8-7. IRP Site 10

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 10

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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.

Table 8-7. Previous Investigations Summary, IRP Site 10

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Site Investigation (Baker, 2001)	003266	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 Ecological Risk Assessment (ERA) identified minimal potential risks from metals in surface water. Based on the findings, the Final SI recommended NFA.
No Action Decision Document (Baker and CH2M, 2005)	003730	2005	A No Action Decision Document (NADD) was finalized in 2005 to document NFA.

Table 8-8. Land Use Control Summary, IRP Site 10

LUC Boundary	Estimated Area (Acres)
Intrusive Activities Control Boundary (Soil)	25.2

8.1.4.1 Future Activities

LUC inspections will be conducted quarterly.

8.1.5 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 8-8**). Surface wastes in this area were investigated under the RCRA program as SWMU 46. Upon removal of surface wastes, Site 15 was transferred to the IRP on December 28, 2007. The site covers approximately 24 acres and the waste disposal area is 2 acres.

In 2012, the Base added soil LUCs for conservativeness, based on the site’s history as a dump.



Figure 8-8. IRP Site 15

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 15

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Confirmatory Site Investigation (Baker, 2001; 2002)	003746 003747 003753 003754	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.

Table 8-9. Previous Investigations Summary, IRP Site 15

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Resource Conservation and Recovery Act Facility Investigation (Baker and CH2M, 2005)	003858	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, 2006)	007338	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 Measure (Shaw, 2007)	007372	2007	Removal of three mounds and a surface soil area to a depth of 1 foot bgs was conducted. A total of 1,039 tons of soil and debris was removed and confirmation soil sampling indicated pesticide and metal concentrations below screening criteria.
Preliminary Assessment/Site Investigation (CH2M, 2011)	002787	2009-2011	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 test pits for waste delineation. Buried waste was not encountered in the test pits, with the exception of small inert pipes and metal. Potentially unacceptable human health risks were identified based on chromium in groundwater at one location. Potentially unacceptable ecological risks were identified for one surface soil and three subsurface soil areas based on pesticides, PCBs, and metals. Additional sampling and risk assessment were recommended.
Expanded Site Investigation (CH2M, 2012)	004971	2011-2012	An ESI was conducted to further assess the nature and extent of contaminants and evaluate potential risks to human health and the environment. Field activities included soil and groundwater sampling for VOCs, SVOCs, pesticides/PCBs, and metals. Exposure to surface and subsurface soil would not result in unacceptable risks to human health. Although potentially unacceptable risks were identified due to future residential exposure to SVOCs (primarily benzo(a)pyrene) in groundwater; benzo(a)pyrene was detected in only 1 of 8 samples, was not detected in the duplicate sample, and the concentration was below the maximum contaminant level. No significant ecological risks were identified from exposure to surface soil. For subsurface soil, potential risks to lower- and upper-trophic-level receptors could occur if the lead and pesticides in subsurface soil is exposed. However, given the lack of deep-dwelling earthworms, limited burrowing activity, unlikelihood for excavation in the waste disposal area, and the relatively small area exposed by occasional tree falls, exposure to subsurface soils is unlikely. Based on these conclusions, NFA was recommended.
No Action Decision Document (CH2M, 2013)	005587	2013	An NADD was finalized in 2013 to document NFA.

Table 8-10. Land Use Control Summary, IRP Site 15

LUC Boundary	Estimated Area (Acres)
Intrusive Activities Control Boundary (Soil)	3.3

8.1.5.1 Future Activities

LUC inspections will be conducted quarterly.

8.1.6 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 8-9**). 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 yd³, and mitigation was completed. Currently, Site 16 is vacant.



Figure 8-9. IRP Site 16, OU 8

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 16

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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.

Table 8-11. Previous Investigations Summary, IRP Site 16

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation/ Feasibility Study (Baker, 1996)	001695 001696	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) was below the recommended screening criteria for PCBs of 10 to 25 parts per million for industrial areas. No unacceptable ecological risks were identified for terrestrial or aquatic receptors.
Proposed Remedial Action Plan and Record of Decision (Baker, 1996)	003028 001726	1996	A PRAP was issued to solicit public input on the preferred alternative (no RA) 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 RAs were required in the ROD.
Remedy-in-Place	--	2001-2002	Although the ROD did not require RA, for conservativeness, LUCs (Non-Industrial Use Control Boundary [soil], Intrusive Activities Control Boundary [groundwater], and Aquifer Use Control Boundary [1,000 feet]) were implemented by the Base in 2001 and updated in 2002 due to the site's past use as a dump.
Explanation of Significant Difference (CH2M, 2012)	005162	2012	An ESD was submitted in 2012 to document the LUCs as the remedy, including the addition of an intrusive activities control boundary for soil to prevent exposure to waste in place.
Land Use Control Implementation Plan (CH2M, 2014)	006372	2013-2014	One LUC (Intrusive Activities Control Boundary [soil]) was added in the 2014 LUCIP Update and a new Notice of Contaminated Site was filed with Onslow County real property records.

Table 8-12. Land Use Control Summary, IRP Site 16

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	63.26	August 14, 2014
Non-Industrial Use Control Boundary (Soil)	2.12	
Intrusive Activities Control Boundary (Soil)	2.12	
Intrusive Activities Control Boundary (Groundwater)	0.17	

8.1.6.1 Future Activities

LUC inspections will be conducted quarterly.

8.1.7 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 North Carolina Highway 24 (**Figure 8-10**). 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.

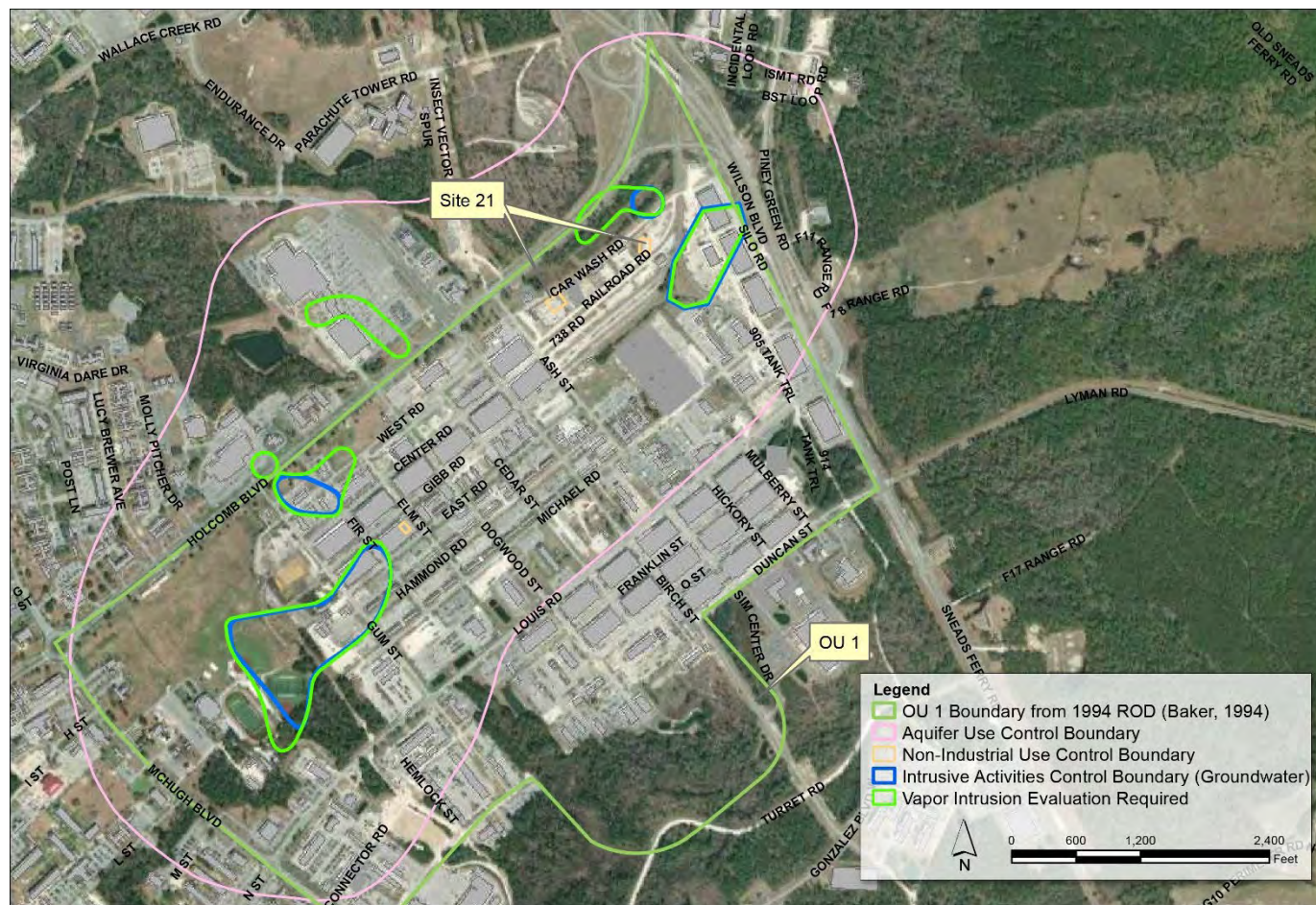


Figure 8-10. IRP Site 21, OU 1

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 21

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. Research indicated that past site operations may have affected soil, groundwater, and surface water and recommended an additional investigation.
Confirmation Study (ESE, 1990)	00214	1984-1990	The Confirmation Study included soil and groundwater investigations. Analytical results confirmed the presence of pesticides/PCBs in soils.
Remedial Investigation/ Feasibility Study (Baker, 1994)	001271 000522 004388	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 conducted to develop and screen remedial alternatives for addressing soil contamination at three separate areas on the site.
Proposed Remedial Action Plan (Baker, 1994) Record of Decision (Baker, 1994)	001254 000366	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 ROD was signed in September 1994.
Explanation of Significant Difference (Baker, 1995)	001555	1995	Before implementing the soil remedy, an ESD was issued to revise the screening criteria for PCBs to the federal PCB action level for industrial sites due to the industrial nature of site activities.
Remedy-in-Place (OHM, 1996; Baker, 2000; CH2M, 2016)	002341 002342 004625 006854	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, a 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. The survey plat was updated to show all of the current OU 1 LUCs in 2015. The Site 21 LUC boundary remains unchanged.

Table 8-14. Land Use Control Summary, IRP Site 21

LUC Boundary	Area (Acres)	Onslow County Registration Date
Non-Industrial Use Control Boundary (Soil)	0.70	December 8, 2015

8.1.7.1 Future Activities

LUC inspections will be conducted quarterly.

8.1.8 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 (petroleum, oil, and lubricants [POL]; oil and grease (O&G); and metals) and geographic location (**Figure 8-11**). 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 8-11. IRP Site 28, OU 7

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 28

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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.

Table 8-15. Previous Investigations Summary, IRP Site 28

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Confirmation Study (ESE, 1990)	000214	1984-1988	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. In addition, VOCs and O&G were detected in groundwater samples.
Remedial Investigation/ Feasibility Study (Baker, 1995)	001498 through 001500	1994-1995	An RI was conducted to further characterize the nature and extent of contamination. 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.
Proposed Remedial Action Plan (Baker, 1995) Record of Decision (Baker, 1995)	001495 001784	1995-1996	A PRAP was issued to solicit public input on the preferred alternative (LTM and LUCs) and a public meeting was held. The ROD was signed in October 1996 and documented the selected remedy as LTM for groundwater and LUCs.
Long-term Monitoring Closeout Report (CH2M, 2002)	003205	1996-2002	Semiannual groundwater, surface water, and sediment LTM was initiated in 1996 and included sampling of seven monitoring wells and three surface water and sediment locations for metals analysis. In 1998, quarterly groundwater, surface water, and sediment sampling was initiated to evaluate the seasonal fluctuations of lead. In 2001, Site 28 was recommended for removal from LTM and site closure after multiple rounds of data indicated that lead concentrations fluctuated seasonally. The seasonal fluctuations were based on naturally occurring organic matter and changes in groundwater elevation over time. Based on these results, a Closeout Report was prepared to document the completion of LTM.
Meeting Summary (CH2M, 2013)	007348	2013	Based on recommendations from the FYR, existing site data were reviewed by the MCB Camp Lejeune Partnering Team and the consensus was reached to update the LUCIP to: <ul style="list-style-type: none"> Remove the groundwater intrusive activities LUCs as recommended in the FYR. Maintain the aquifer use LUC to prevent drinking water well installation within the extent of waste remaining in place. Maintain and extend the non-industrial use LUC to encompass the former burn dump boundaries and Orde Pond, where waste was reportedly encountered during utilities installation in 2012. Add soil intrusive activities LUCs to prevent exposure to the waste remaining in-place as recommended in the FYR.

Table 8-15. Previous Investigations Summary, IRP Site 28

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Land Use Control Implementation Plan (CH2M, 2014)	006387	2014	Based on LTM results for groundwater, screening criteria have been achieved. A LUCIP was prepared to document the extension of the non-industrial LUC boundary to encompass all former dump boundaries and the adjacent pond, and the removal of LUCs restricting groundwater intrusive activities. In addition, because waste remains in place, LUCs to restrict soil intrusive activities are required within the extent of waste to prevent exposure. An updated Notice of Contaminated Site was filed with Onslow County real property records in October 2014.

Table 8-16. Land Use Control Summary, IRP Site 28

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	79.57	October 15, 2014
Non-Industrial Use Control Boundary (Waste)	25.73	
Intrusive Activities Control Boundary (Waste)	25.73	

8.1.8.1 Future Activities

LUC inspections will be conducted quarterly.

8.1.9 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 northwestern portion of the Base and covers approximately 178 acres (**Figure 8-12**). 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 U.S. Highway 17 Bypass. During the active life of the fuel farm, several releases of fuel occurred. A vehicle maintenance garage (former Building TC474) and weapons cleaning area were also present at Site 35.

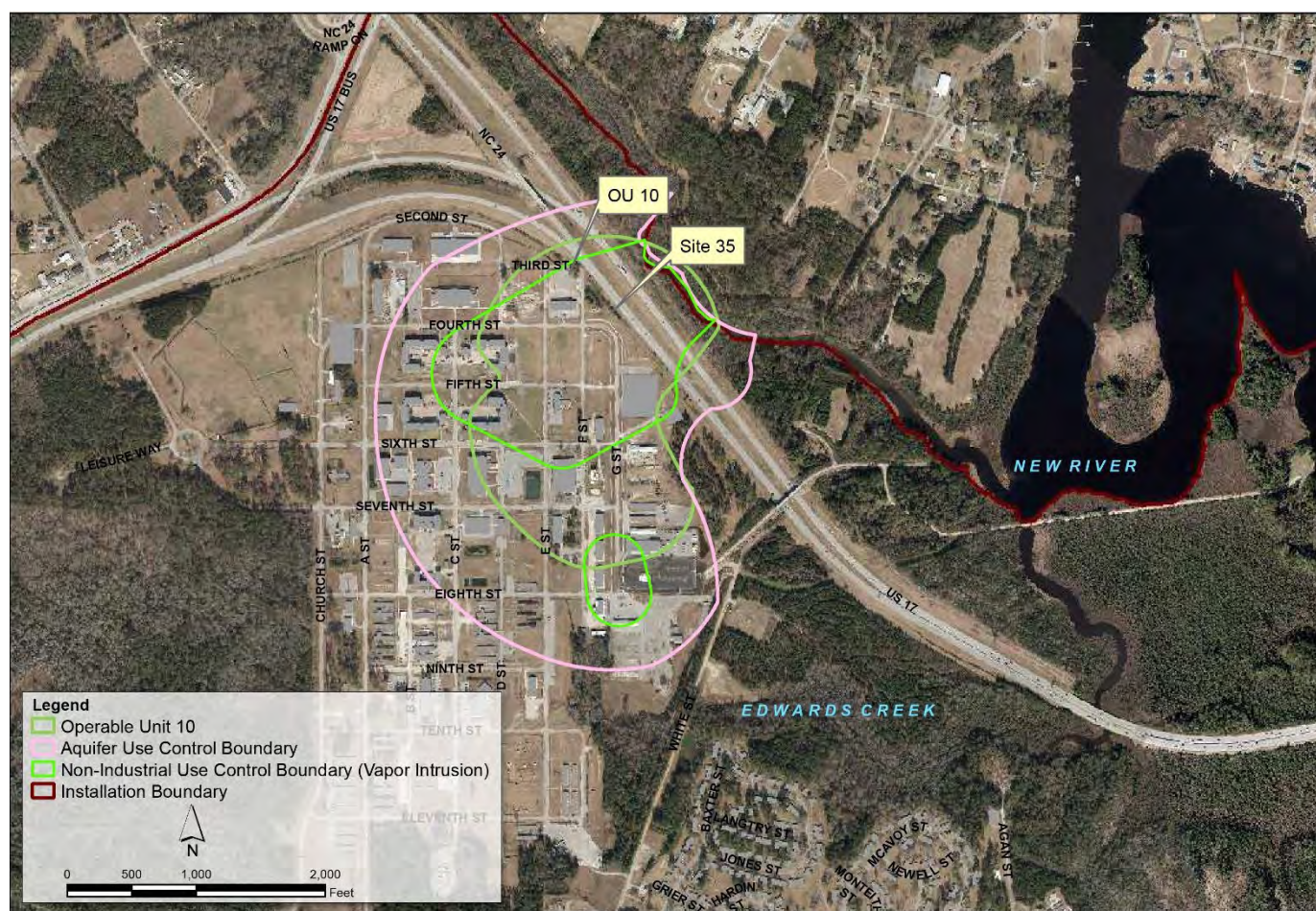


Figure 8-12. IRP Site 35, OU 10

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 35

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. Due to potential for petroleum hydrocarbon impacts from historical site activities and recorded spills, the site was recommended for further investigation.
Confirmation Study (ESE, 1990)	000214	1985-1990	Soil, groundwater, sediment, and surface water samples were collected to delineate contamination. Results indicated that all media were potentially affected by previous site activities.

Table 8-17. Previous Investigations Summary, IRP Site 35

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Feasibility Study (NUS Corporation, 1990)	N/A	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 screening criteria.
Comprehensive Site Assessment (Law, 1992)	001985	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 (Baker, 1994)	001507	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.
Soil Interim Record of Decision (Baker, 1994)	001520	1994	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.
Remedial Investigation (Baker, 1995)	001539 through 001542	1994-1995	A soil gas survey, and soil, groundwater, surface water, and sediment sampling were 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 Feasibility Study (Baker, 1995)	001538	1995	The Interim FS addressed groundwater impacts and identified RAs 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.
Groundwater Interim Record of Decision (Baker, 1995)	001546	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 AS was the selected remedy for shallow groundwater, and the 100-foot trench was installed in 1998.
Draft Supplemental Groundwater Investigation (Baker, 1996)	000157 000161 000162	1995-1996	Soil, groundwater, surface water, and sediment samples were collected to fill data gaps from the RI and support the AS 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)	001586	1996	A pilot study was conducted for in situ AS in the shallow aquifer. Groundwater, soil, and sediment sampling results indicated that AS had limited effectiveness for VOC removal, and no further investigation was recommended.

Table 8-17. Previous Investigations Summary, IRP Site 35

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Closeout Report (OHM, 1997)	002281 through 002287	1995-1997	In response to the IROD, a removal action for petroleum hydrocarbon soil was initiated. From 1995 to 1997, approximately 15,700 tons of petroleum hydrocarbon contaminated soil were removed from the former fuel farm area. Confirmatory sampling was conducted and revealed concentrations below screening criteria. The site was restored, and a closeout report was completed in 1997.
Long-term Monitoring (CH2M, 2004)	003634 ^a	1999-2005	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 an SRI was initiated.
Natural Attenuation Evaluation (CH2M, Baker, and CDM, 2003)	003739	1998-2003	Seasonal changes, plume stability, and presence of natural degradation were evaluated to determine whether 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 to be stalled in some locations.
Hot Spot Characterization (Baker, 2003)	004093	2002-2003	Characterization was completed to delineate any continuing contaminant sources. Field activities included soil and groundwater sampling for VOCs, SVOCs, volatile petroleum hydrocarbon, extractable petroleum hydrocarbon, and total organic carbon. Based on the analytical results, one shallow hot spot was co-mingled with petroleum hydrocarbons, and a deeper, larger hot spot was identified.
Technical Evaluation (CH2M, 2003)	007158	2003	A Technical Evaluation was conducted to develop and evaluate RA alternatives for groundwater. ISCO via modified Fenton's reagent followed by potassium permanganate was recommended for TCE removal. In situ AS with vertical wells was recommended for the petroleum hydrocarbon contamination.
Pilot Study (CH2M, 2006)	003898	2003-2006	The pilot study evaluated the effectiveness of ISCO for the remediation of TCE-contaminated 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. In addition to the almost immediate reductions in contaminant concentrations typical for the modified Fenton's chemistry, contaminant concentrations continued to reduce over time following the pilot study within the treatment area, as well as upgradient and downgradient of the treatment area. Trends indicated the reduction of parent compounds with subsequent increases in daughter products, consistent with the patterns of biodegradation. Contaminant reductions across the site were attributed to the combined effects of the modified Fenton's injections, as well as permanganate injected in the area, natural attenuation, biodegradation, and physical attenuation processes.
Supplemental Remedial Investigation (CH2M, 2009)	004390	2005-2009	Soil, groundwater, surface water, and sediment samples were collected to delineate extent of contamination. VOCs exceeded criteria and presented unacceptable risks in groundwater.

Table 8-17. Previous Investigations Summary, IRP Site 35

Previous Investigation/Action	NIRIS Document Number	Date	Activities
EE/CA (AQVIQ/CH2M, 2007) Non-time-critical Removal Action (AGVIQ/CH2M, 2008)	003991 004237	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. 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, 2009)	004392	2009	Remedial alternatives to address CVOC-contaminated groundwater were assessed including, no action, MNA, ERD with bioaugmentation, ISCO, and in situ AS.
Proposed Remedial Action Plan (CH2M, 2009) Record of Decision (CH2M, 2009)	006324 002743	2009	A PRAP was issued in April 2009 to solicit public input on the preferred alternative (in situ AS 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 ROD was signed in November 2009. The CSM is shown on Figure 8-13 .
Remedy-in-Place and Interim Remedial Action Completion Report (Shaw, 2011)	004659	2010-2011	The RD was completed for in situ AS using a horizontal well, LTM and MNA, and LUCs. The horizontal well was installed to address VOCs in groundwater; AS was initiated in 2010 and discontinued in 2013 based on the downward trending concentrations of VOCs in the source area wells. LUCs were also finalized to prohibit aquifer use until screening criteria 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.
Basewide Vapor Intrusion Evaluation (AGVIQ/CH2M, 2009, CH2M, 2011, 2015, and 2022)	002772 through 002777 004694 through 004698 008559 Pending Final	2007-present	<p>Site 35 was included in the phased Basewide VI evaluation, conducted from 2007-2011, to determine whether complete or significant exposure pathways exist for VI into buildings. Groundwater, soil gas, and/or air samples were collected from Buildings G480, G521, G530, G531, G532, and G533. VI was not identified as a significant pathway of concern for any of the buildings located in the vicinity of Site 35. However, additional sampling was recommended to further characterize temporal variability at Building G533 and based on the 2013 results, NFA was recommended.</p> <p>During the desktop evaluation for the 2020 VI five-year update, Buildings G480, G532, and G533 were identified for collection of additional VI data based on increasing groundwater VOC trends within 100 feet.</p> <p>During the VI five-year update in 2020/2021, Buildings G480, G532, and G533 were identified for collection of additional VI data based on increasing groundwater VOC trends within 100 feet. Subslab soil gas, indoor air, and outdoor air samples were collected from Building G480 and analyzed for naphthalene. Analytical results and evaluation of the data suggest that the VI pathway is not currently complete and is not expected to become complete and significant in the future. Therefore, no further investigation of the VI pathway is recommended for Building G480. Buildings G532 and G533 were unoccupied and were undergoing significant remodeling, and therefore samples were not collected. However, as part of the ongoing Site 35 air sparging pilot study, subslab soil gas points were installed in Building G533 and were sampled. TCE concentrations exceeded screening criteria in one duplicate sample. Building G533 is located closest to the air sparge well and will continue to be monitored during the pilot study.</p>

Table 8-17. Previous Investigations Summary, IRP Site 35

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Long-term Monitoring (CH2M, 2022)	Pending Final	2011-present	<p>LTM was re-initiated in 2011 and consists of MNA and air sparging performance monitoring. In 2011, LTM included annual groundwater sampling for VOCs from 14 surficial, 18 UCH, and five MCH aquifer monitoring wells. After the AS system was turned off, the LTM network was optimized and in FY 2017 the monitoring well network was updated. The current LTM program consists of annual groundwater sampling from 8 surficial, 9 UCH, and 2 MCH aquifer monitoring wells; every 5 years from 4 surficial, 10 UCH, and 2 MCH aquifer monitoring wells for VOCs; and every 5 years for NAIPs to evaluate subsurface conditions for MNA of VOCs.</p> <p>Surficial aquifer groundwater near Brinson Creek is monitored for exceedances of 10 times the North Carolina Surface Water Quality Standards as an indicator for potential impacts to the creek. Sporadic VC exceedances have occurred at one monitoring well. Additional investigation of Brinson Creek is being conducted to determine whether groundwater is affecting surface water.</p>
Explanation of Significant Difference (CH2M, 2017)	007229	2017	The ESD was submitted in 2017 to update the RAOs for OU 10 to include an industrial/non-industrial use control boundary for VI.
Bioremediation Treatability Study (CH2M, 2021)	008604	2018-2020	A treatability study was conducted to refine the current nature and extent of groundwater VOC exceedances in the UCH aquifer in the southern portion of the site, followed by conducting ERD and bioaugmentation injections, including a methane inhibitor (red yeast rice extract) at half the injection locations, and groundwater performance monitoring to evaluate the effectiveness of enhancing natural attenuation. Injections took place in 2019 and three quarters of performance monitoring were conducted. VOC, geochemical, and microbial results indicate poor delivery of ERD substrate to the target wells due to a preferential pathway that allowed for the migration of ERD substrate to the north of the treatability study area. TCE and VC are the only VOCs in the southern plume which exceed the current groundwater standards.
Land Use Control Implementation Plan Update (CH2M, 2019)	008083	2019	The LUCIP Update included the implementation of a new LUC to evaluate VI pathways based on future changes in building and/or land use, within 100 feet of the current groundwater plumes in the surficial and Castle Hayne aquifers. The aquifer use control boundary remains unchanged.
Air Sparging Treatability Study (CH2M, 2022)	Pending Final	2019-present	A treatability study is being conducted to evaluate the effectiveness of restarting the existing air sparge well to further reduce concentrations of residual VC in the surficial and UCH aquifers. The air sparge well was turned on in September 2020. Performance monitoring is being conducted consisting of groundwater and soil gas samples. Results will be presented in a future LTM report.

Table 8-17. Previous Investigations Summary, IRP Site 35

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Brinson Creek Investigation Technical Memorandum (Paragon, 2022)	Pending Final	2021-2022	An investigation was conducted to evaluate whether the groundwater-to-surface water migration pathway is complete for Site 35 groundwater into Brinson Creek and if additional remedial action is warranted. Field activities included 2 rounds of pore water, sediment, and surface water sampling for VOC analysis. VC was detected at concentrations exceeding screening criteria in porewater at one location indicating a complete groundwater-to-surface water pathway. Detections in sediment and surface water did not exceed screening criteria. Human health and ecological risk assessments and additional monitoring of porewater, sediment, and surface water along Brinson Creek were recommended to further refine the extent of groundwater discharge.

^a Only the final monitoring report NIRIS number is shown.

^b Only the most recent LTM report NIRIS number is shown.

Table 8-18. Land Use Control Summary, IRP Site 35

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary	178.6	August 16, 2010
Industrial/Non-Industrial Control Boundary (VI)	61.6	April 16, 2019

8.1.9.1 Future Activities

The AS treatability study and Brinson Creek investigation will be conducted through FY 2023 (**Schedule 8-4**). LTM consisting of MNA and AS performance monitoring for groundwater will continue and LUC inspections will be conducted quarterly.

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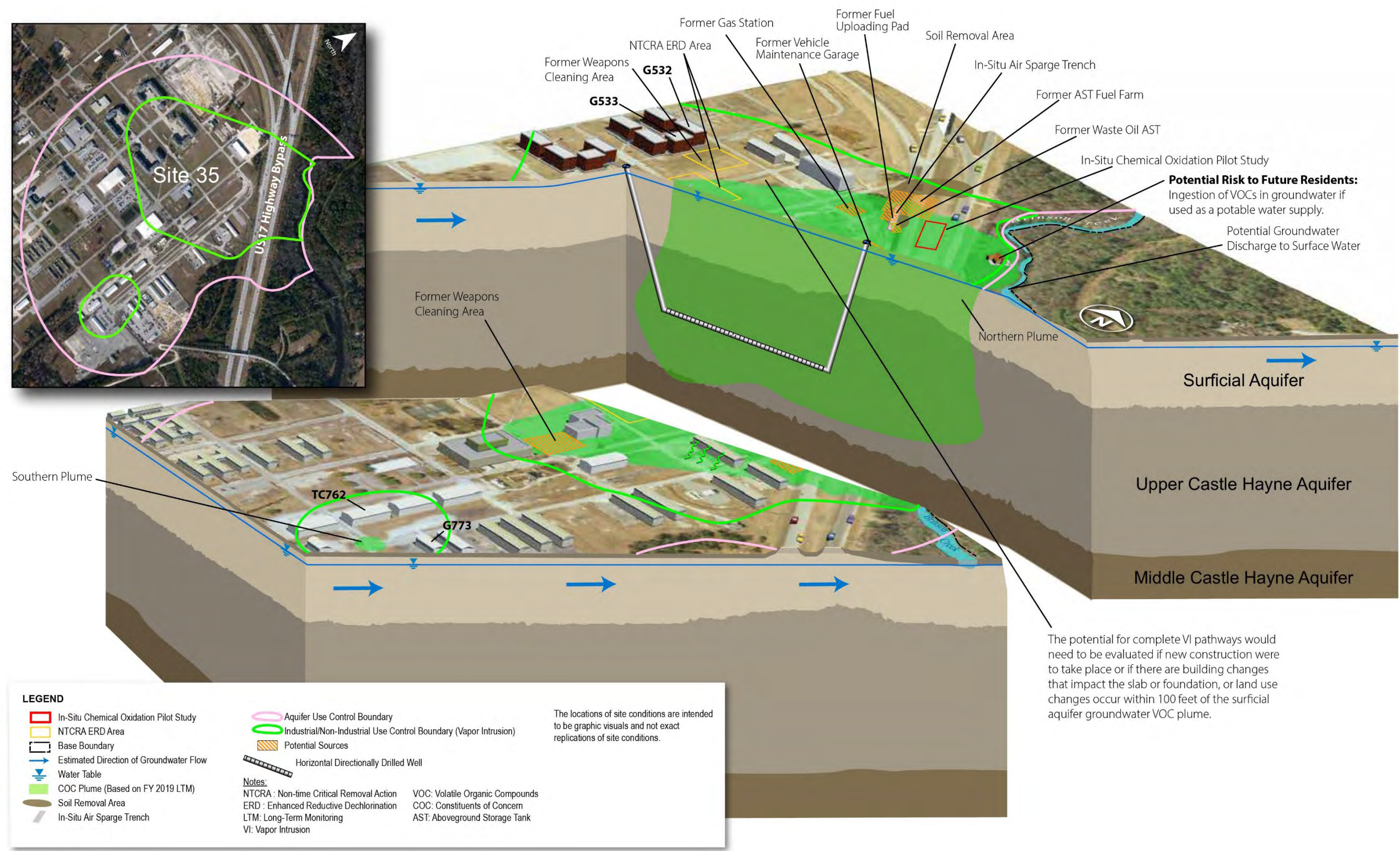
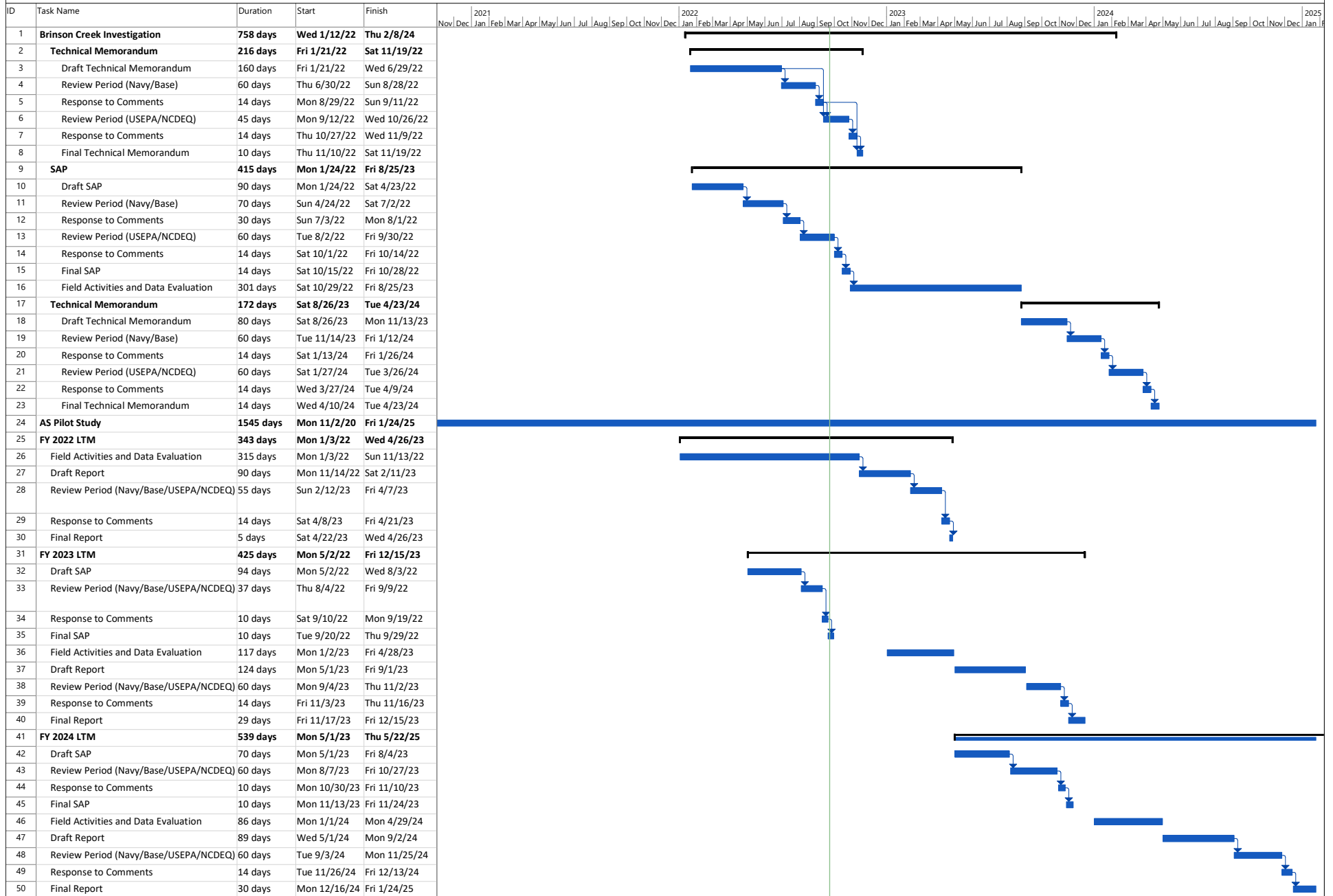


Figure 8-13. IRP Site 35 Conceptual Site Model

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Schedule 8-4
IRP Site 35
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

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

Site 36, the Camp Geiger Dump Area, encompasses approximately 65 acres within OU 6 in the northwestern portion of the Base (**Figure 8-14**). OU 6 covers four sites (Sites 36, 43, 44, and 54) that have been grouped together into one OU because of the similar characteristics of material disposed, contaminants detected, 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.

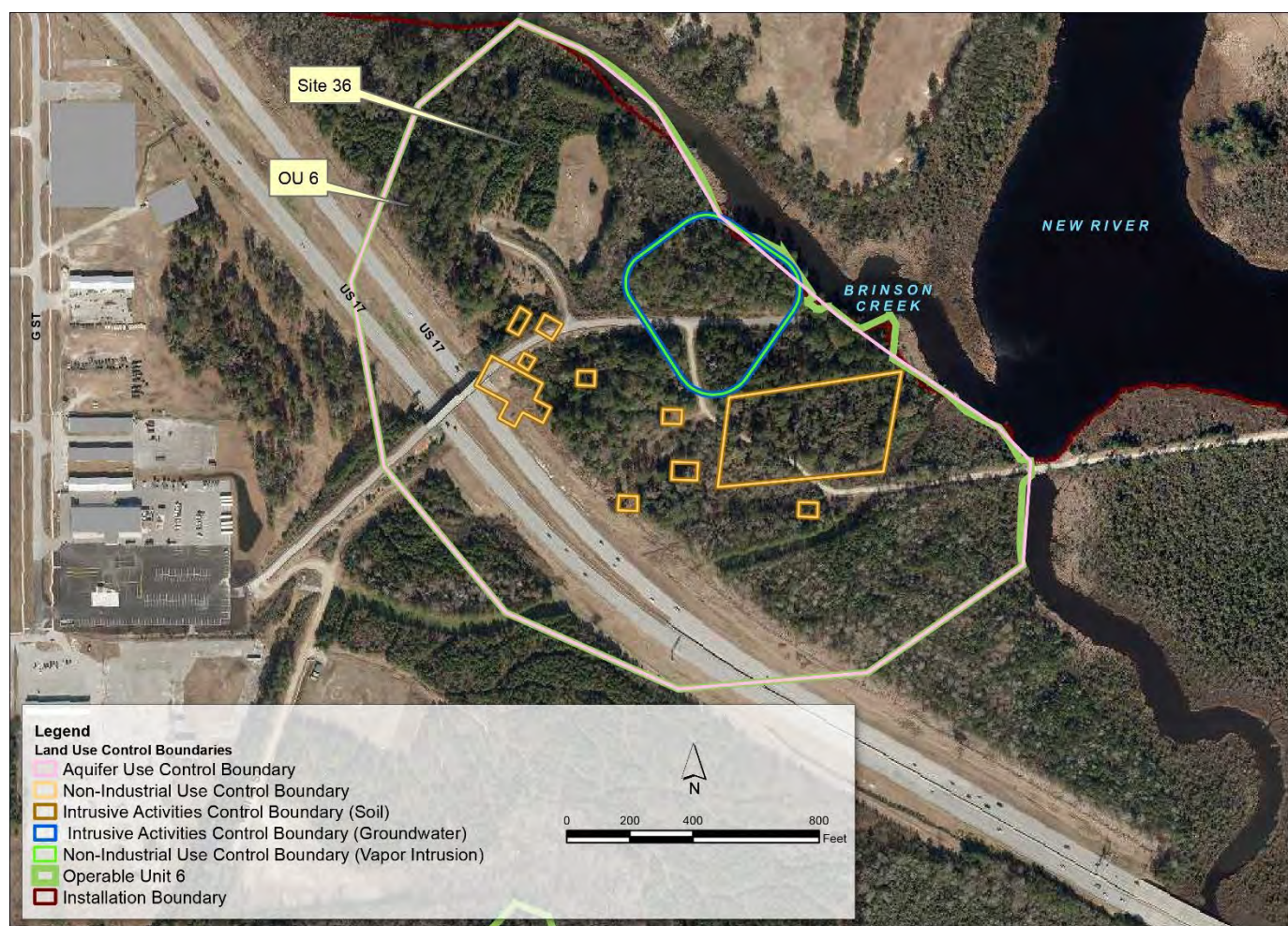


Figure 8-14. IRP Site 36, OU 6

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 36

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. A Confirmation Study was recommended due to the indication that hazardous substances were disposed of.
Confirmation Study (ESE, 1990)	000214	1984-1990	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.

Table 8-19. Previous Investigations Summary, IRP Site 36

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation (Baker, 1996)	001710 through 001717	1994-1996	To further characterize the nature and extent of contamination, a 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, PAHs, pesticides, and PCBs in soil and VOCs in groundwater. Minimal potential ecological risks were identified for aquatic receptors at Site 36.
Time-critical Removal Action (Baker, 1997)	N/A	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.
Long-term Monitoring (CH2M, 2019)	008129 ^a	1998-present	LTM was initiated in 1998 and consists of MNA for groundwater which included quarterly groundwater sampling and surface water sampling. In FY 2014, surface water sampling was discontinued but contingent on whether concentrations of VOCs in surficial aquifer groundwater are greater than 10 times the North Carolina Surface Water Quality Standards, and then sampling will resume. Groundwater monitoring for site-specific VOCs and NAIPs was reduced to every 5 years beginning in FY 2019. The LTM program currently includes groundwater sampling from three surficial, six UCH, and one MCH aquifer monitoring wells, and contingent surface water sampling at four locations for VOCs and NAIPs every 5 years.
Feasibility Study (Baker and CH2M, 2002)	003025	1998-2002	Based on the results of the RI and FS 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.
Interim Remedial Action (Shaw, 2003)	N/A	2003	An EE/CA was presented at a public meeting for completing an interim response removal action. Excavation and offsite 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.
Proposed Remedial Action Plan (Baker, 2002) Record of Decision (CH2M, Baker, and CDM, 2005)	002978 003644	2002-2005	A PRAP was issued to solicit public input on the preferred alternative (excavation and offsite disposal and LUCs for soil and MNA and LUCs for groundwater) and a public meeting was held. The ROD was signed in July 2005 and documented the selected remedy as soil excavation, MNA, and LUCs.
Remedial Design (Baker and CH2M, 2005) Interim Remedial Action Completion Report (CH2M, 2007)	003829 004144	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. The CSM is shown on Figure 8-15 .

Table 8-19. Previous Investigations Summary, IRP Site 36

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Pilot Study (CH2M, 2017)	007429	2015-2016	A pilot study was conducted in 2015 and 2016 to evaluate the effectiveness of ERD using an EVO-based Slow Release Substrate to accelerate the natural attenuation process and reduce the time to achieve site closure. To further enhance biodegradation, each injection was bioaugmented. Field activities included injections and performance monitoring. Results indicated the pilot study injections successfully stimulated biodegradation and reduced COC concentrations. However, distribution of substrate may have been limited by preferential pathways which the volume of injectant in this small scale may have been unable to overcome.
Explanation of Significant Difference (CH2M, 2017)	007229	2017	The ESD was submitted in 2017 to update the RAOs for OU 6 to include an industrial/non-industrial use control boundary for VI.
Land Use Control Implementation Plan Update (CH2M, 2019)	008080	2018-2019	The LUCIP Update detailed modifications to existing LUCs. The intrusive activities control boundary for groundwater was updated to be within 100 feet of the current extent of VOC exceedances in the surficial and Castle Hayne aquifers. A LUC to evaluate VI pathways based on future changes in land use, including newly constructed buildings, within 100 feet of the current groundwater plumes in the surficial and Castle Hayne aquifers was also implemented.

^a Only the most recent LTM report NIRIS number is shown.

Table 8-20. Land Use Control Summary, IRP Site 36

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	64.8	February 8, 2007
Non-Industrial Use Control Boundary (Soil)	4.8	
Intrusive Activities Control Boundary (Soil)	4.8	
Intrusive Activities Control Boundary (Groundwater)	4.73	April 16, 2019
Industrial/Non-Industrial Use Control Boundary (VI)	4.73	

8.1.10.1 Future Activities

LTM consisting of MNA for groundwater will continue (**Schedule 8-5**) and LUC inspections will be conducted quarterly.

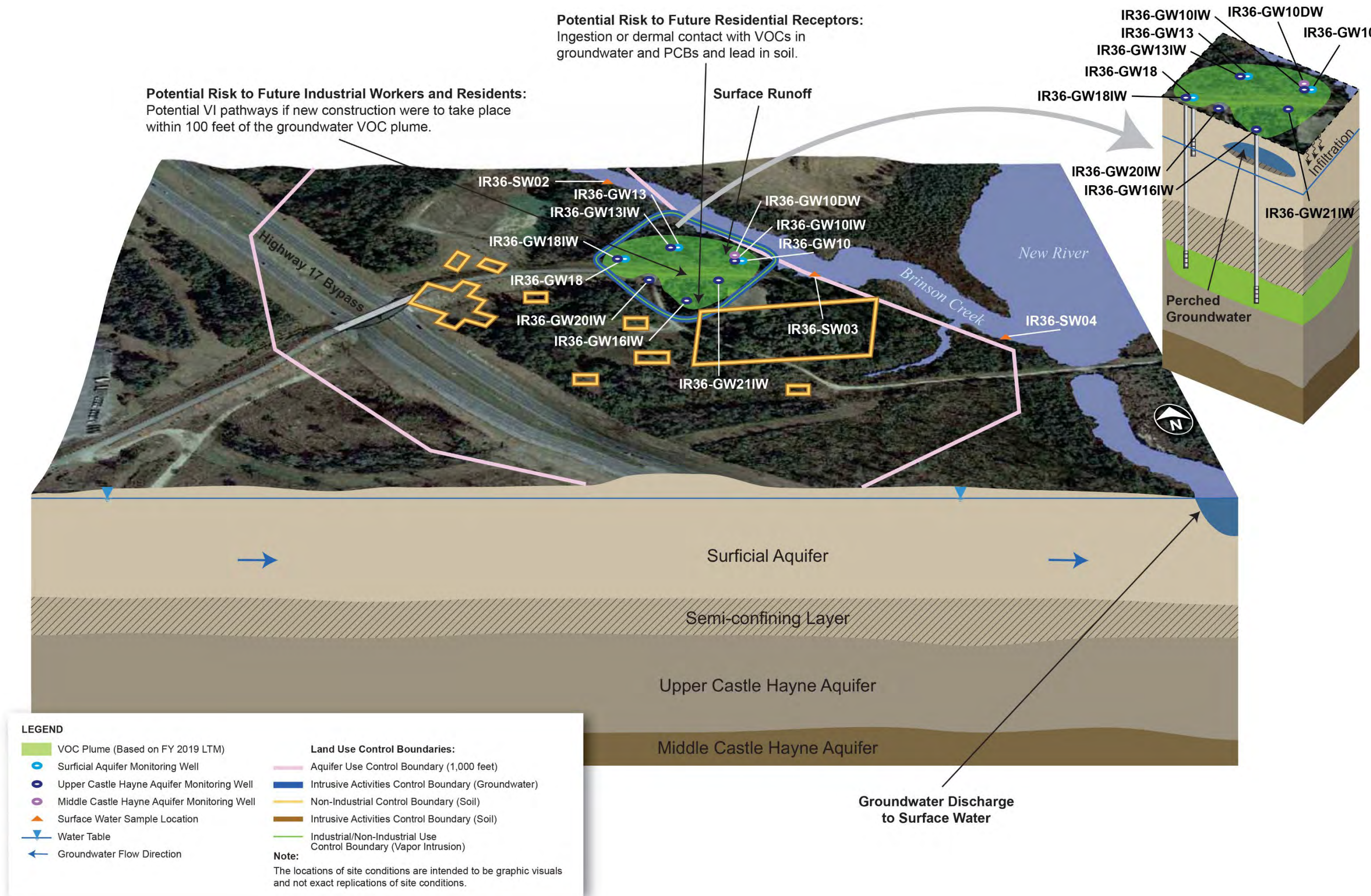
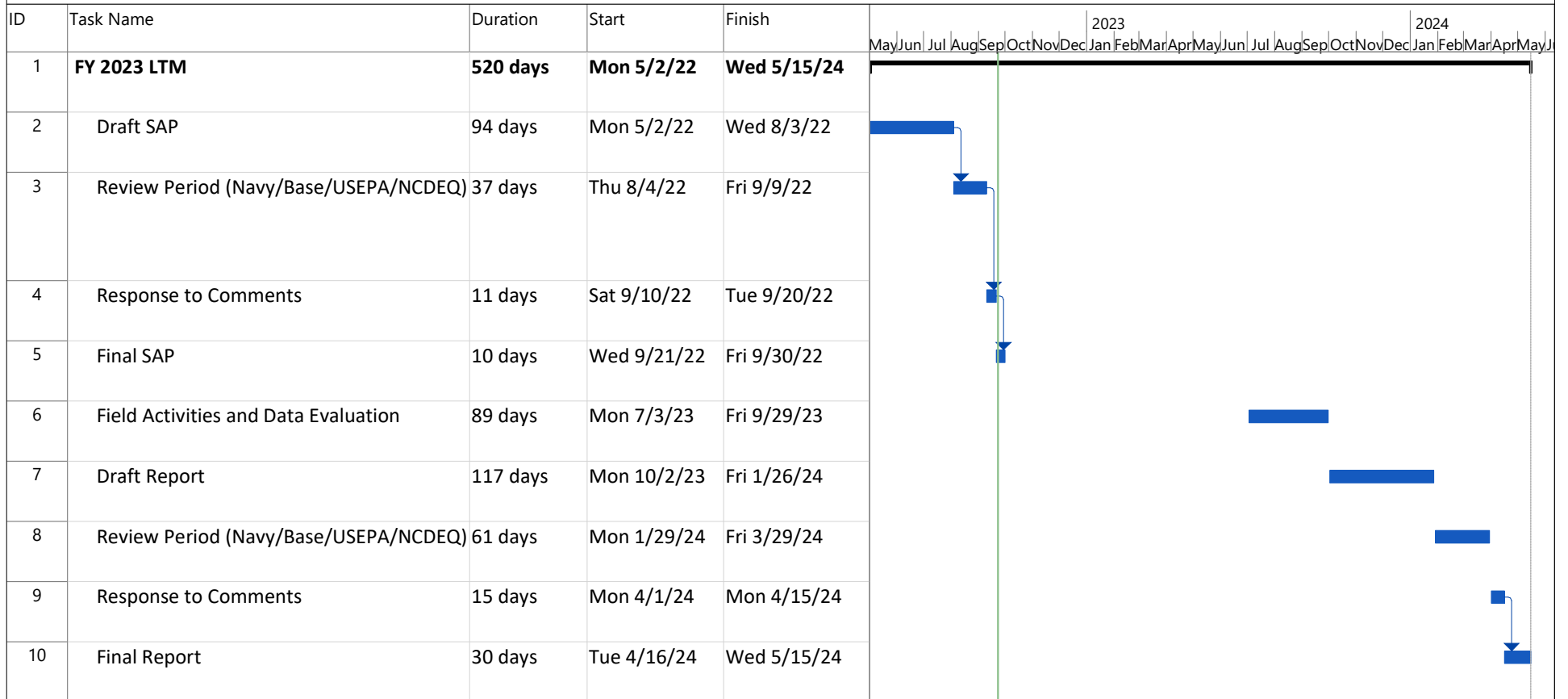


Figure 8-15. IRP Site 36 Conceptual Site Model

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Schedule 8-5
IRP Site 36
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

8.1.11 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 8-16**). OU 4 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), were reportedly disposed of at Site 41. The debris was reportedly burned and graded over with soil. The dump area contains an estimated 110,000 yd³ 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.

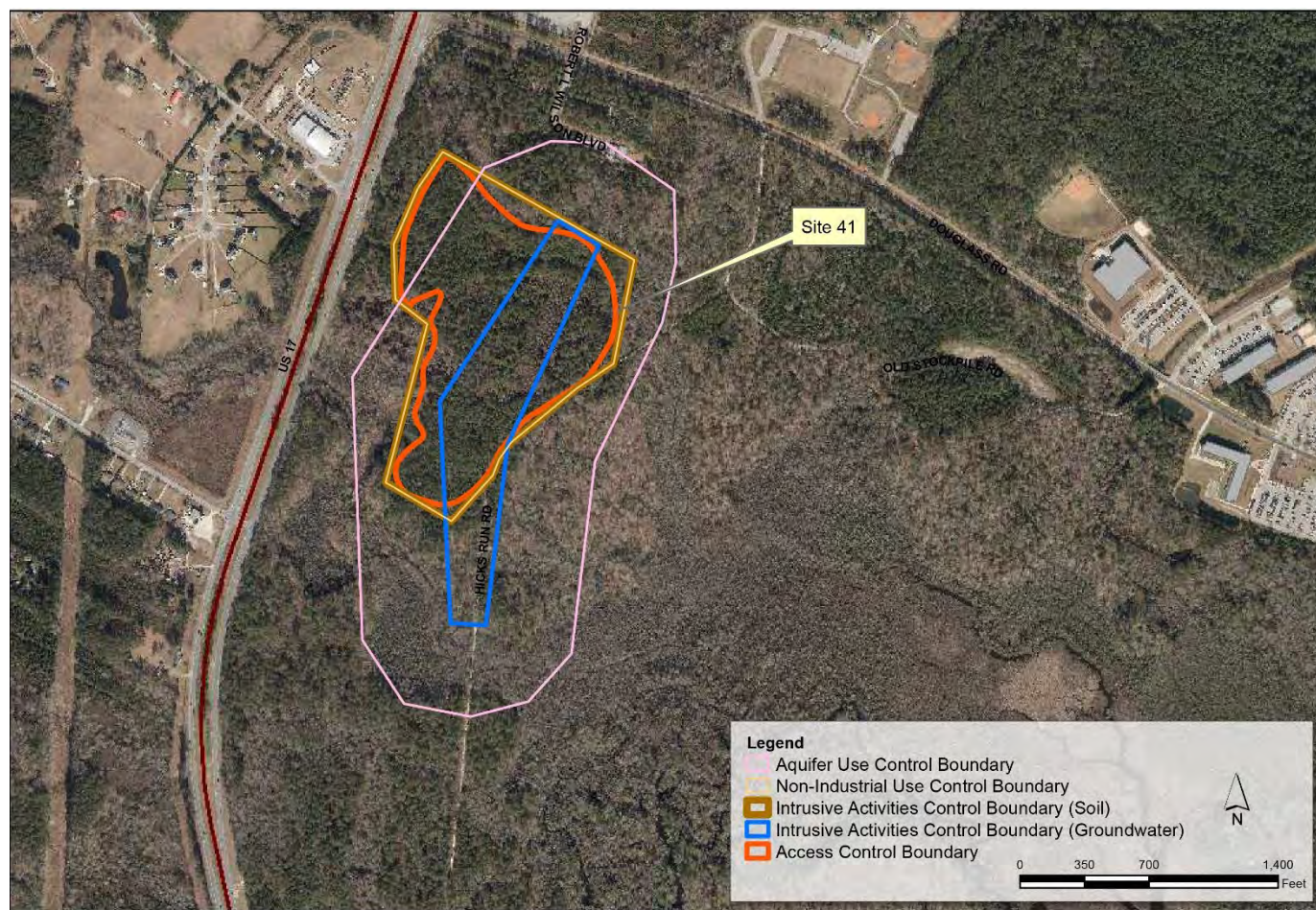


Figure 8-16. IRP Site 41, OU 4

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 41

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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 (ESE, 1990)	000214	1984-1990	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.

Table 8-21. Previous Investigations Summary, IRP Site 41

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation/Feasibility Study (Baker, 1995)	001524 through 001526	1993-1995	To further characterize the nature and extent of contamination, a 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 conducted to develop and screen remedial alternatives for addressing soil, groundwater, and surface water contamination.
Proposed Remedial Action Plan (Baker, 1995) Record of Decision (Baker, 1995)	001529 001734	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 ROD was signed in January 1996 and documented LTM for groundwater and seep surface water (including groundwater, surface water, and sediment sampling), and LUCs as the selected remedy.
Remedy-in-Place and Remedial Action Completion Report (CH2M, 2006)	003953	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, total dissolved solids (TDS), and total suspended solids (TSS). In 2005, the groundwater screening criteria 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 8-22. Land Use Control Summary, IRP Site 41

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (500 feet)	86.44	February 15, 2002
Non-Industrial Use Control Boundary (Soil)	36.63	
Intrusive Activities Control Boundary (Soil)	36.63	
Intrusive Activities Control Boundary (Groundwater)	16.47	
Access Control Boundary	30	--

8.1.11.1 Future Activities

LUC inspections will be conducted quarterly.

8.1.12 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 8-17**). 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, contaminants detected, and geographic location. An abandoned sewage treatment plant is adjacent to the site. The Agan Street Dump reportedly received inert material such as construction debris and trash. Sludge from the former sewage treatment plant was also reportedly dumped onto the ground surface of Site 43; however, it is not clear when disposal operations took place.



Figure 8-17. IRP Site 43, OU 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 43

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. The IAS concluded that waste quantities at the site, regardless of their nature, were minor; therefore, a Confirmation Study was not recommended. However, USEPA requested an additional investigation to determine whether hazardous waste contamination existed.

Table 8-23. Previous Investigations Summary, IRP Site 43

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Site Inspection (Baker, 1994)	002312	1991-1994	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.
Remedial Investigation (Baker, 1996) Feasibility Study (Baker and CH2M, 2002)	001710 through 001717 003025	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 OU 6 FS.
Interim Remedial Actions (OHM, 1995)	001728	1995, 2003	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 were removed for recycling and 1,477 tons of soil were excavated.
Proposed Remedial Action Plan (Baker, 2002) Record of Decision (CH2M, Baker, and CDM, 2005)	002978 003644	2002-2005	The preferred alternative, excavation and offsite 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. Excavation and offsite 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 Interim Remedial Action Completion Report (CH2M, 2007)	004144	2005-2007	Soil LUCs were implemented in 2005, and an IRACR was completed to document the RIP.

Table 8-24. Land Use Control Summary, IRP Site 43

LUC Boundary	Area (Acres)	Onslow County Registration Date
Non-Industrial Use Control Boundary (Soil)	0.14	February 8, 2007
Intrusive Activities Control Boundary (Soil)	13.2	

8.1.12.1 Future Activities

LUC inspections will be conducted quarterly.

8.1.13 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 8-18**). 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, contaminants detected, material disposed of, 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.

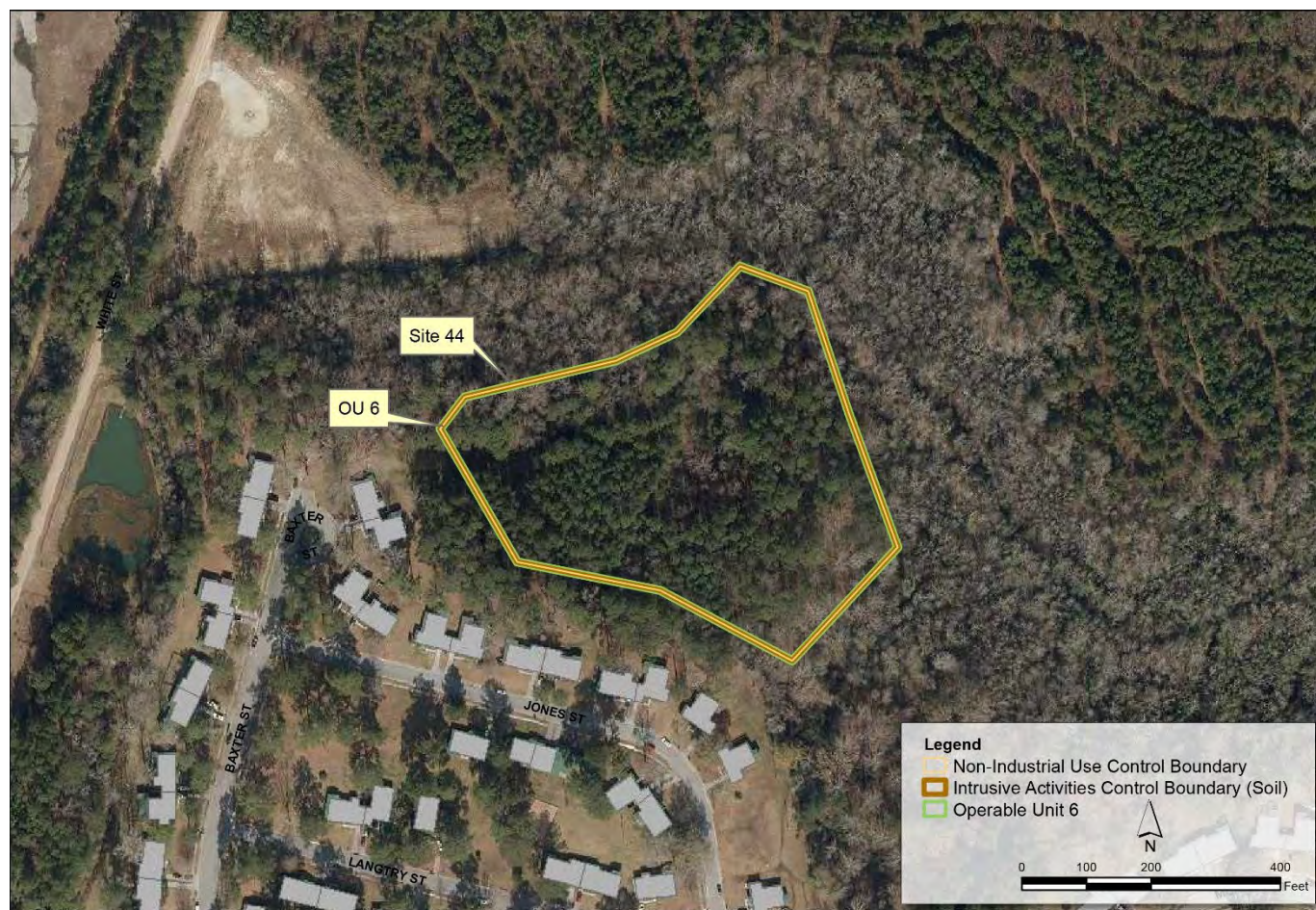


Figure 8-18. IRP Site 44, OU 6

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 44

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. Due to the negligible quantity of inert material reportedly disposed at Site 44, a Confirmation Study was not recommended. However, the USEPA later requested an additional investigation to determine whether hazardous waste contamination existed.
Site Inspection (Baker, 1994)	002314	1991-1994	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.

Table 8-25. Previous Investigations Summary, IRP Site 44

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation (Baker, 1996) Feasibility Study (Baker and CH2M, 2002)	001710 through 001717 003025	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.
Proposed Remedial Action Plan (Baker, 2002) Record of Decision (CH2M, Baker, and CDM, 2005)	002978 003644	2002-2005	Although no action was recommended during the FS, for conservativeness, the Base 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 Interim Remedial Action Completion Report (CH2M, 2007)	004144	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 8-26. Land Use Control Summary, IRP Site 44

LUC Boundary	Area (Acres)	Onslow County Registration Date
Intrusive Activities Control Boundary (Soil)	5.6	February 8, 2007
Non-Industrial Use Control Boundary	5.6	

8.1.13.1 Future Activities

LUC inspections will be conducted quarterly.

8.1.14 Site 49 (OU 23) — MCAS Suspected Minor Dump

Site 49, the MCAS Suspected Minor Dump, encompasses approximately 1 acre and is located within MCAS New River, in the northwestern portion of the Base (**Figure 8-19**). The dates of operation are unknown, but Site 49 is suspected of having been used for the disposal of paint and potentially hazardous substances. A building located approximately 50 feet from the northeastern boundary of the site is currently used for the storage of miscellaneous industrial materials and paint supplies. A drainage pipe exits the building and ends in the northeastern 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 8-19. IRP Site 49, OU 23

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 49

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. The quantity of waste disposed of was determined to be insignificant and did not warrant further investigation.

Table 8-27. Previous Investigations Summary, IRP Site 49

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2011)	004681	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.
Remedial Investigation/ Feasibility Study (CH2M, 2012)	005498	2011-2012	Field activities were conducted to assess the nature and extent of contamination and potential human health and environmental impacts. Field activities included soil, groundwater, pore water, surface water, and sediment sampling for VOC analysis. VOC concentrations exceeded screening criteria in one soil sample, one groundwater sample, one surface water sample, and one pore water sample. Potential unacceptable human health risks were identified due to exposure to VOCs in groundwater and RAOs were developed. The remedial alternatives evaluated were no action, MNA and LUCs, enhanced in situ bioremediation with LUCs and LTM, and AS with LUCs and LTM.
Proposed Remedial Action Plan (CH2M, 2013) Record of Decision (CH2M, 2014)	005540 005897	2013-2014	A PRAP was issued to solicit public input on the preferred alternative (MNA and LUCs) and a public meeting was held. No written comments were received. The ROD was signed on April 24, 2014.
Remedial Design (CH2M, 2014) Interim Remedial Action Completion Report (CH2M, 2014)	006467 006405	2014	The RD provides the implementation actions, monitoring framework, and site closure milestones for the selected remedy for Site 49, which includes: <ul style="list-style-type: none"> • MNA to monitor groundwater and pore water and track changes in COC concentrations • LUCs to prevent aquifer use and protect any future potential receptors from VI MNA RA activities began in June 2014 and are ongoing. The CSM for IRP Site 49 is shown on Figure 8--20 .
Long-term Monitoring (CH2M, 2021)	008759 ^a	2014-present	LTM was initiated in 2014 and consists of MNA for groundwater and pore water. In 2014, LTM consisted of biennial groundwater sampling of four surficial aquifer monitoring wells and one UCH aquifer monitoring well, and two pore water sampling locations for VOCs analysis. In FY 2016, the frequency of pore water sampling increased from biennially to quarterly for two quarters to evaluate trends and seasonal variability. Concentrations returned to 2014 levels and sampling frequency returned to biennially. Based on the results over time, COCs and monitoring wells have been removed from the LTM program because concentrations were not detected above cleanup levels for four consecutive monitoring events. The LTM protocol currently consists of sampling every five years at one surficial aquifer monitoring well and one pore water location for TCE, cis-1,2-DCE, and VC.

Table 8-27. Previous Investigations Summary, IRP Site 49

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Air Sparging Pilot Study (CH2M, 2021)	008595	2018-present	A pilot study was conducted to evaluate the effectiveness of injecting air into the UCH aquifer to reduce VOC concentrations in the surficial aquifer. Performance monitoring showed decreases of TCE and VC in groundwater. Based on the results, the technical memorandum recommended decreasing the frequency of LTM sampling to every 5 years and evaluating the feasibility of expanding the AS system; however, PFAS was detected at Site 49 during the Basewide PFAS PA/SI and the expansion is on hold until the nature and extent of PFAS is defined.

^a Only the most recent LTM report NIRIS number is shown.

Table 8-28. Land Use Control Summary, IRP Site 49

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	37.58	September 8, 2014
Industrial/Non-Industrial Use Control Boundary (VI)	0.46	

8.1.14.1 Future Activities

LTM consisting of MNA for groundwater will continue (**Schedule 8-6**) and LUC inspections will be conducted quarterly.

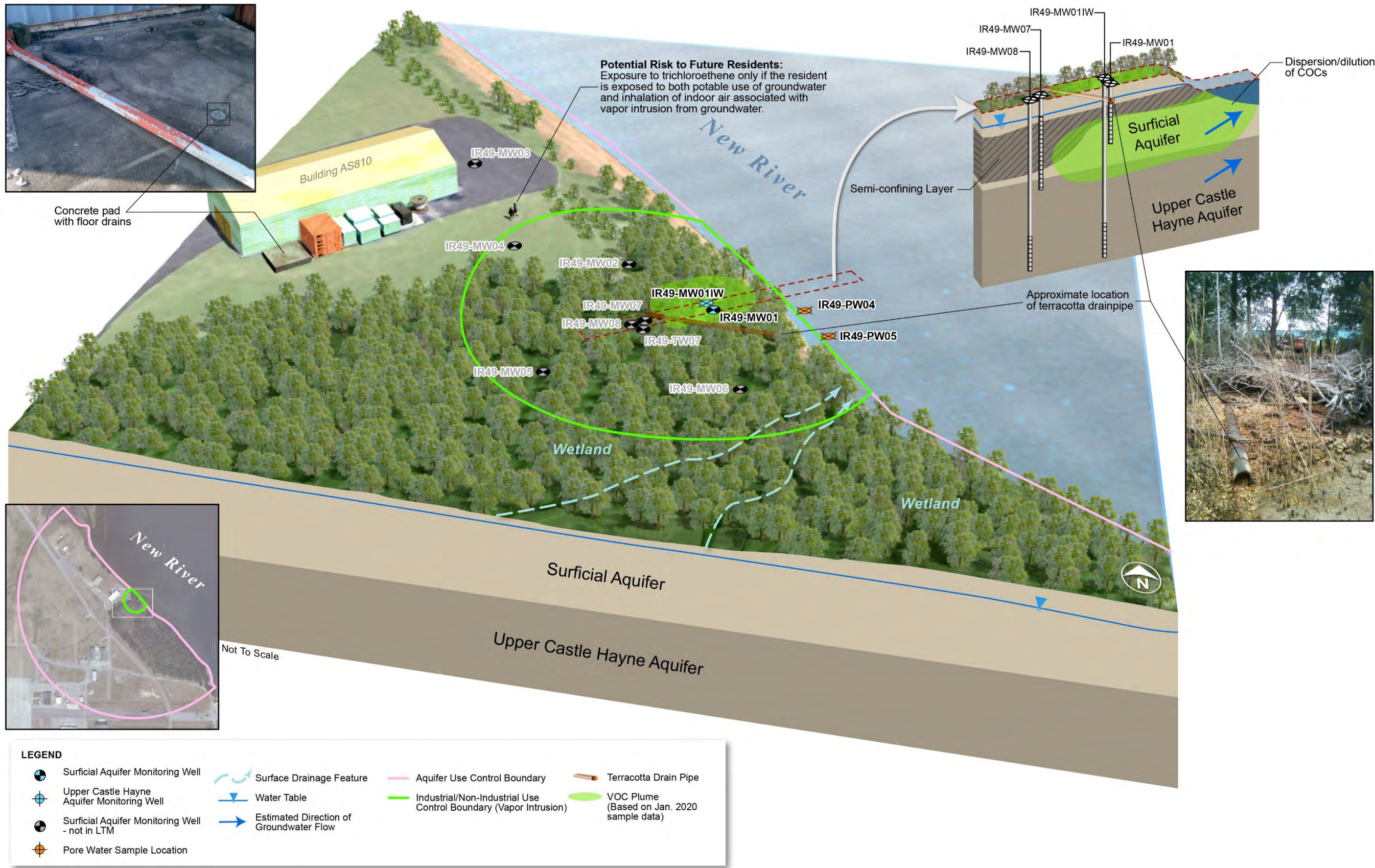
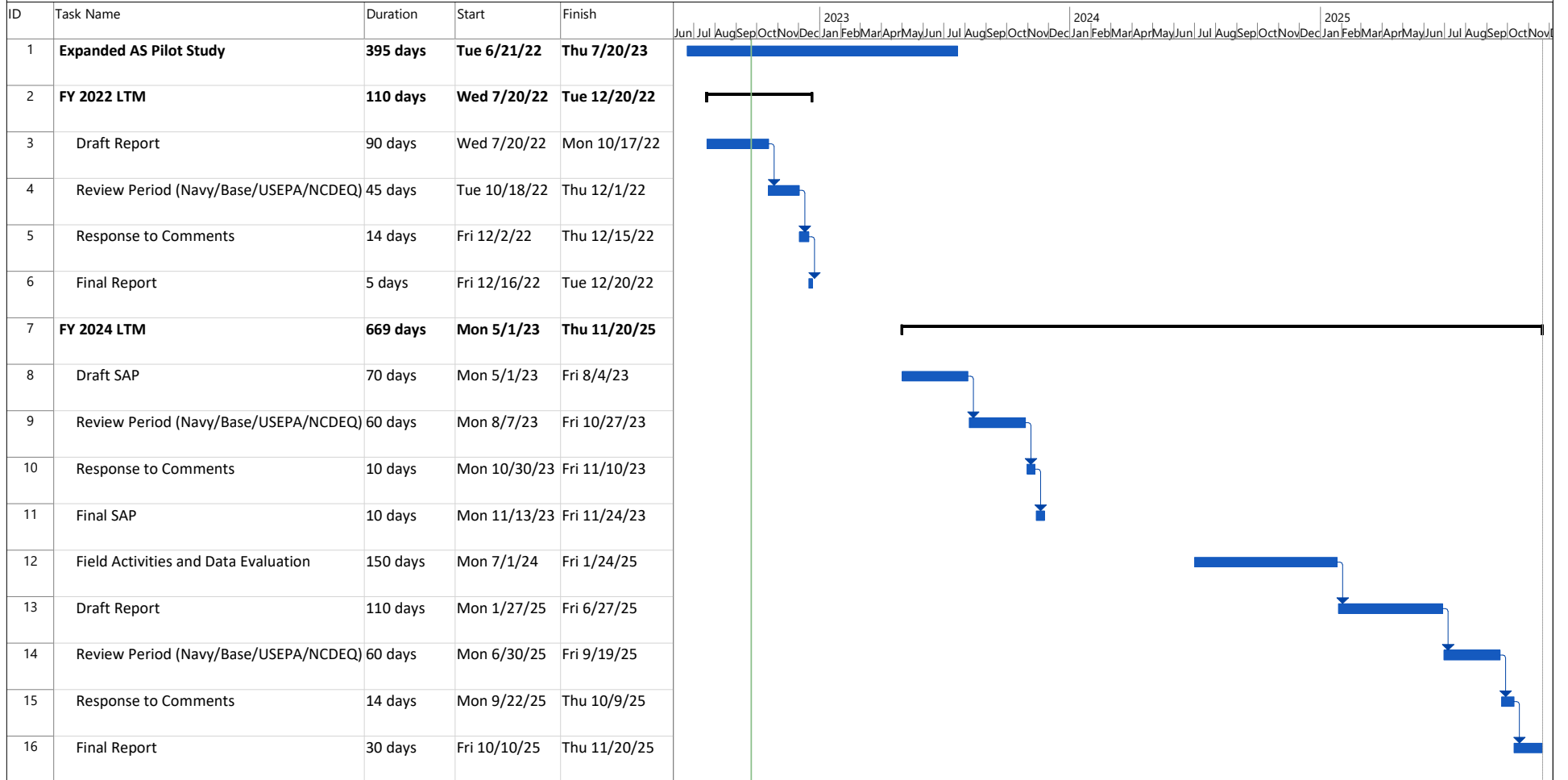


Figure 8-20. IRP Site 49 Conceptual Site Model

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Schedule 8-6
IRP Site 49
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

8.1.15 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 southwestern end of Runway 5-23 within the MCAS New River operations area (**Figure 8-21**). 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, contaminants detected, 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 jet propulsion (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. In 2015, most of Site 54 (including the burn pit) was paved with concrete and is currently used for MCAS New River operations.

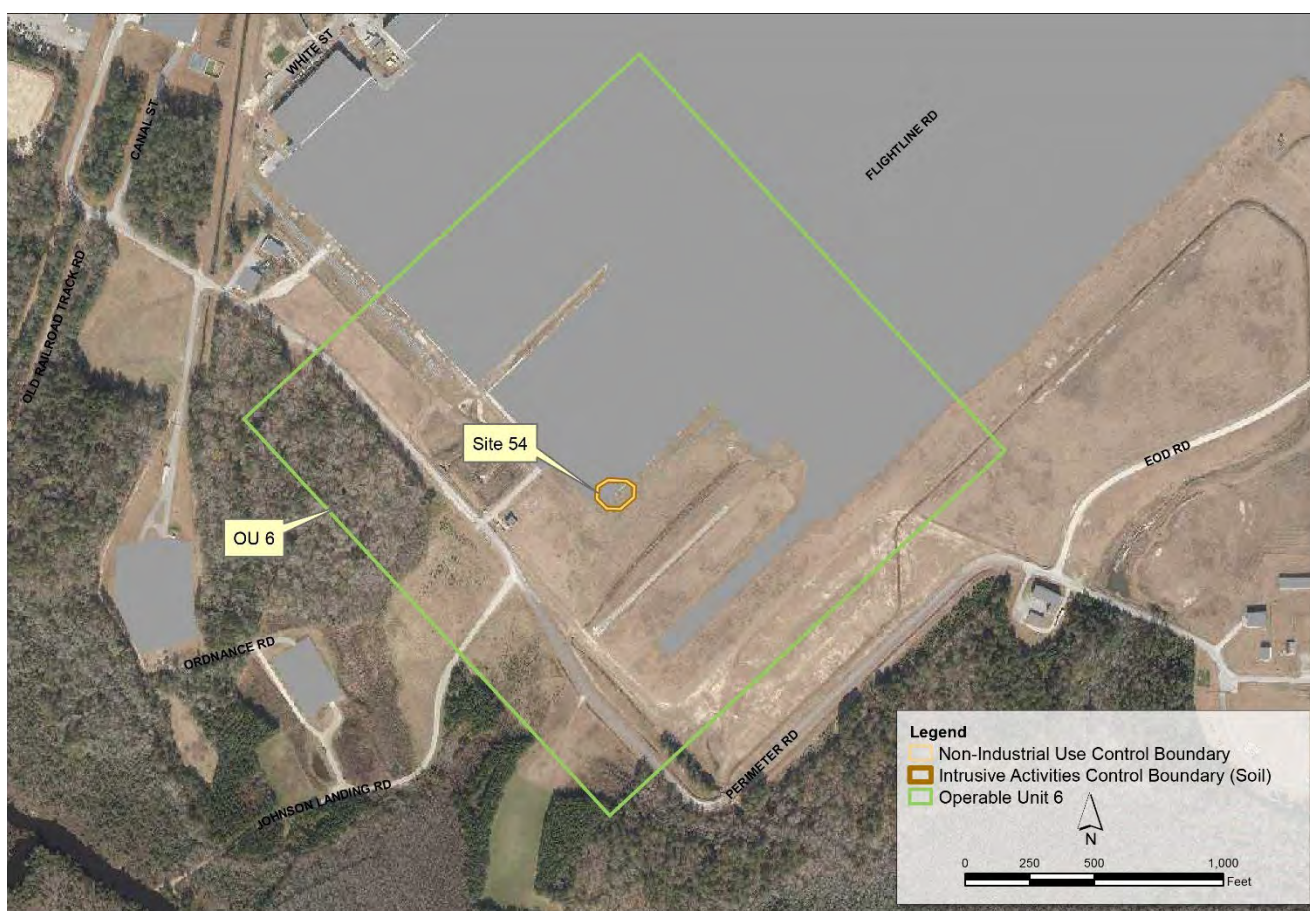


Figure 8-21. IRP Site 54, OU 6

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 54

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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.

Table 8-29. Previous Investigations Summary, IRP Site 54

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Confirmation Study (ESE, 1990)	000214	1984-1990	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.
Remedial Investigation (Baker, 1996)	001710 through 001717	1995	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 (Baker, 2002)	003307 ^a	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.
Interim Remedial Action	N/A	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 feet long by 96.5 feet wide and extended 9 feet bgs to the depth of groundwater. Construction activities also included installation of a new concrete-lined fire training area and two propane tanks.
Feasibility Study (Baker and CH2M, 2002)	003025	2002	Based on the results of the IRA and post-RI groundwater monitoring, it was determined that lead, SVOCs, and VOCs no longer affected the groundwater; therefore, no action was identified during the FS.
Proposed Remedial Action Plan (Baker, 2002) Record of Decision (CH2M, Baker, and CDM, 2005)	002978 003644	2002-2005	Although no action was recommended during the FS, for conservativeness, the Base 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 Interim Remedial Action Completion Report (CH2M, 2007)	004144	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).
Site Inspection for Per-and Polyfluorinated Alkyl Substances (CH2M, 2018)	007757	2017-2018	An SI was conducted to identify the presence or absence of PFAS in groundwater resulting from historical site activities. Four surficial monitoring wells were installed and groundwater samples were collected for PFAS analysis. Concentrations of perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) were detected in groundwater and exceeded the 2016 USEPA lifetime drinking water health advisory with the highest concentrations detected just downgradient of the former Crash Crew Fire Training Burn Pit. The elevated concentrations of PFOS and PFOA in the groundwater indicate historical fire training activities have resulted in a release of PFAS to the groundwater in the surficial aquifer. Additional investigations were recommended to evaluate the nature and extent of PFAS contamination.

^a Only the final monitoring report NIRIS number is shown.

Table 8-30. Land Use Control Summary, IRP Site 54

LUC Boundary	Estimated Area (Acres)	Onslow County Registration Date
Non-Industrial Use Control Boundary (Soil)	0.29	February 8, 2007
Intrusive Activities Control Boundary (Soil)	0.29	

8.1.15.1 Future Activities

An RI will be planned based on prioritization of findings and investigations from the Basewide PFAS PA/SI. LUC inspections will be conducted quarterly.

8.1.16 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 8-22**). 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.

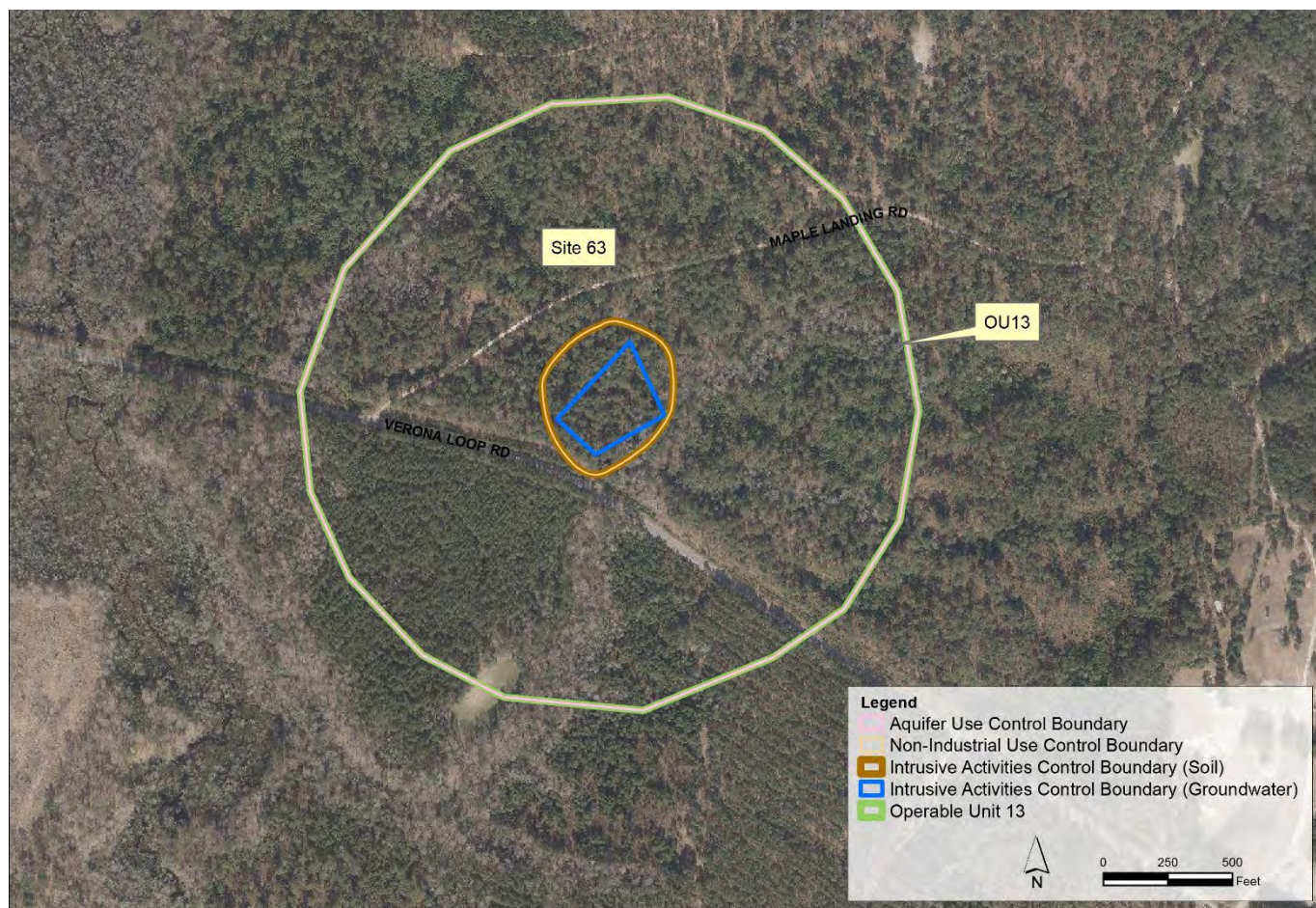


Figure 8-22. IRP Site 63, OU 13

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 63

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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, USEPA requested an additional investigation to determine whether hazardous waste contamination existed.
Site Investigation (Baker, 1994)	002311	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.

Table 8-31. Previous Investigations Summary, IRP Site 63

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation (Baker, 1996)	001708 001709	1995-1996	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.
Proposed Remedial Action Plan (Baker, 1996) Record of Decision (Baker, 1997)	001704 001754	1996-1997	A PRAP was issued to solicit public input on the preferred alternative (no action) and a public meeting was held. The ROD was signed in April 1997.
Remedy-in-Place	--	2001-2002	Although the ROD did not require RA, for conservativeness the Base implemented LUCs in 2001 and updated them in 2002.
Explanation of Significant Difference (CH2M, 2012)	005162	2012	An ESD was submitted in 2012 to document the LUCs as the remedy including the addition of a non-industrial use control boundary and an intrusive activities control boundary for soil to prevent exposure to waste in place.
Land Use Control Implementation Plan Update (CH2M, 2014)	006366	2013-2014	LUCs were updated in the 2014 LUCIP Update and a new Notice of Contaminated Site was filed with Onslow County real property records in August 2014.

Table 8-32. Land Use Control Summary, IRP Site 63

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	110.28	August 14, 2014
Non-Industrial Use Control Boundary (Soil)	5.16	
Intrusive Activities Control Boundary (Soil)	5.16	
Intrusive Activities Control Boundary (Groundwater)	2.05	

8.1.16.1 Future Activities

LUC inspections will be conducted quarterly.

8.1.17 Site 65 (OU 9)—Engineer Area Dump

Site 65, the Engineer Area Dump, is located in the Courthouse Bay area of MCB Camp Lejeune and initially covered approximately 2 acres (**Figure 8-23**). 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. In 2013, during MILCON activities within Site 65, buried waste including asbestos-containing material and oversized debris, and lead-contaminated soil were encountered and disposed of offsite.

In 2015, the Base implemented soil LUCs for conservativeness based on the site's history as a dump and the identification of asbestos-containing material in the buried waste.



Figure 8-23. IRP Site 65, OU 9

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 65

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at the site, and no further assessment was recommended. However, USEPA requested an additional investigation to determine whether hazardous waste contamination existed.

Table 8-33. Previous Investigations Summary, IRP Site 65

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Site Investigation (Baker, 1994)	002313	1991-1994	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.
Remedial Investigation (Baker, 1997)	000145 000146	1995-1997	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)	003073	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 whether surrounding media had been affected by potential releases. Analytical results indicated there were no effects caused by the containers.
Proposed Remedial Action Plan (Baker, 2001)	N/A	2001	A PRAP was issued to solicit public input on the preferred alternative (no action) and a public meeting was held. The ROD was signed in September 2001. The ROD for Site 65 stipulated that no additional RA or monitoring was required.
Record of Decision (Baker, 2001)	003019		
Land Use Control Implementation Plan (Osage, 2014)	007702	2014	Based on the presence of debris and soil with potential non-friable asbestos still remaining at Site 65, the Base implemented LUCs to prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and recreational areas and to prohibit intrusive activities without proper controls, specifically for management of potential asbestos-containing material.
Non-Friable Asbestos and Non-Asbestos Debris Removal Technical Memorandum Completion Report (Osage, 2015)	006448	2015	In support of MILCON activities, screening and removal of non-asbestos and non-friable asbestos debris were conducted. Based on the soil and debris screening, more than 200 tons of metallic debris were decontaminated and recycled, and more than 400 tons of non-friable asbestos debris and other debris were disposed of.

Table 8-34. Land Use Control Summary, IRP Site 65

LUC Boundary	Area (Acres)
Intrusive Activities Control Boundary (Soil)	18.91
Non-Industrial Use Control Boundary (Soil)	18.91

8.1.17.1 Future Activities

LUC inspections will be conducted quarterly.

8.1.18 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 8-24). 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 yd³. The amount of solvents disposed at Site 68 was estimated to be between 1,000 and 2,000 gallons.



Figure 8-24. IRP Site 68

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 68

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. Organic compounds were identified in PSWs, 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)	00214	1984-1990	Monitoring wells were installed and groundwater samples were collected for VOCs analysis from the monitoring wells and PSWs in 1984 and again in 1986. No constituents of potential concern (COPCs) were detected in groundwater samples collected from these wells.

Table 8-35. Previous Investigations Summary, IRP Site 68

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Pre-Remedial Investigation Screening Study (Baker, 1998)	002635 002636	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 RA was recommended.
No Action Decision Document (CH2M, 2001)	003011	2001	An NADD was finalized in 2001 to document NFA.
Remedy-in-Place	--	2001-present	Although no RA 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 8-36. Land Use Control Summary, IRP Site 68

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	202.8	February 8, 2007
Intrusive Activities Control Boundary (Soil)	26.9	
Intrusive Activities Control Boundary (Groundwater)	26.9	
Non-Industrial Use Control Boundary (Soil)	26.9	

8.1.18.1 Future Activities

LUC inspections will be conducted quarterly.

8.1.19 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 Camp Lejeune (**Figure 8-25**). 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 (tear gas) or other training agents (chemical agents). Site 69 is located within Site UXO-02 (**Section 8.4.3**), which was used as an explosive range from 1973 to 2002 and was addressed under the MMRP.



Figure 8-25. IRP Site 69, OU 14

Previous investigations are listed in **Table 8-37**, and the LUC summary is provided in **Table 8-38**.

Table 8-37. Previous Investigations Summary, IRP Site 69

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Radiation Survey and Soil Sampling (NEESA, 1981)	007167	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)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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.

Table 8-37. Previous Investigations Summary, IRP Site 69

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Site Summary Report (ESE, 1990) Site Assessment Report (ESE, 1992)	000214 000273	1984-1992	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 in one sediment sample.
Remedial Investigation (Baker, 1997)	001761 through 001763	1995-1997	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 affected by the former disposal operations.
In-Well Aeration Pilot Study (Baker, 1998)	001792	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)	002527	1998	The PRAP identified 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)	003005	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 was a part of ongoing investigations and studies in which the LTM requirements were 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	N/A	2005	Due to a request by Onslow County Commissioners, NCDEQ—Department of Water Quality and the Base performed split surface water and sediment sampling in surface waters adjacent to Site 69. NCDEQ recommended no further sampling and no advisory to be issued.
Radiation Survey (New World Technology, Inc., 2007)	007278	2007	A radiation survey was conducted and radioactivity was not detected at higher than average natural concentrations, which confirmed the 1980 to 1981 findings.

Table 8-37. Previous Investigations Summary, IRP Site 69

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Supplemental Investigation (CH2M, 2011)	004729	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 toward 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 CSM is shown on Figure 8-26 .
UXO-02 Expanded Site Investigation (CH2M, 2012)	005470	2011-2012	An ESI was conducted at UXO-02, including Site 69, to further investigate potential unacceptable risks identified during the UXO-02 PA/SI and Site 69 Supplemental Investigation. Field activities included an intrusive anomaly investigation, monitoring well installation, and soil, groundwater, surface water, and sediment sampling for pesticides, metals, and/or explosives residues analyses. No unacceptable human health or ecological risks were identified from potential exposure to soil, surface water, sediment, or metals in surficial aquifer groundwater. NFA was recommended for the portion of UXO-02 located outside of the Site 69 perimeter fence. The remaining environmental impacts to be further assessed were associated with potential risks from exposure to waste and the VOC groundwater plume associated with Site 69.
Feasibility Study (CH2M, 2012)	004788	2011-2012	Remedial alternatives were evaluated to address the waste disposal area and COCs in groundwater. The alternatives evaluated for the waste disposal area were no action, LUCs, capping with LUCs, and removal. The alternatives evaluated for groundwater were no action; MNA with LUCs; permeable reactive barrier (PRB) with MNA and LUCs; ERD with bioaugmentation, MNA, and LUCs; and ISCO with MNA and LUCs.
Proposed Remedial Action Plan (CH2M, 2012) Record of Decision (CH2M, 2013)	005165 005661	2012-2013	A PRAP was issued to solicit public input on the preferred alternative (capping with LUCs for waste and MNA and LUCs for groundwater) and a public meeting was held. General comments for informational purposes were addressed during the public meeting and no written comments were received. The ROD was signed on June 25, 2013.
Remedial Design (CH2M, 2013) Remedial Action Completion Report (Tetra Tech, 2015)	006321 006828	2013-2015	The RD presents the design of remedy as specified by the ROD, including capping, plans for MNA and LTM, and a LUCIP. Construction of the soil cap was completed in 2014.
Long-term Monitoring (CH2M, 2022)	008820 ^a	2015-present	LTM was reinstated in 2015 and consists of MNA for VOCs and LTM for pesticides, PCBs, metals, and chemical agent in groundwater to monitor plume stability and confirm that there were no releases from the waste disposal area or potential impacts to surface water. LTM consists of groundwater sampling of 9 surficial, 12 UCH, and 6 MCH aquifer monitoring wells for VOCs every 5 years. A subset of these wells are sampled for NAIPs, pesticides, PCBs, metals, and chemical agent.

^a Only the final monitoring report NIRIS number is shown.

Table 8-38. Land Use Control Summary, IRP Site 69

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	126.31	September 1, 2015
Intrusive Activities Control Boundary (Soil, Groundwater, and MEC)	14.2	
Industrial/Non-Industrial Use Control Boundary (VI)	16.33	
Access Control Boundary	14.2	

8.1.19.1 Future Activities

LTM consisting of MNA and LTM for groundwater will continue (**Schedule 8-7**) and LUC inspections will be conducted quarterly.

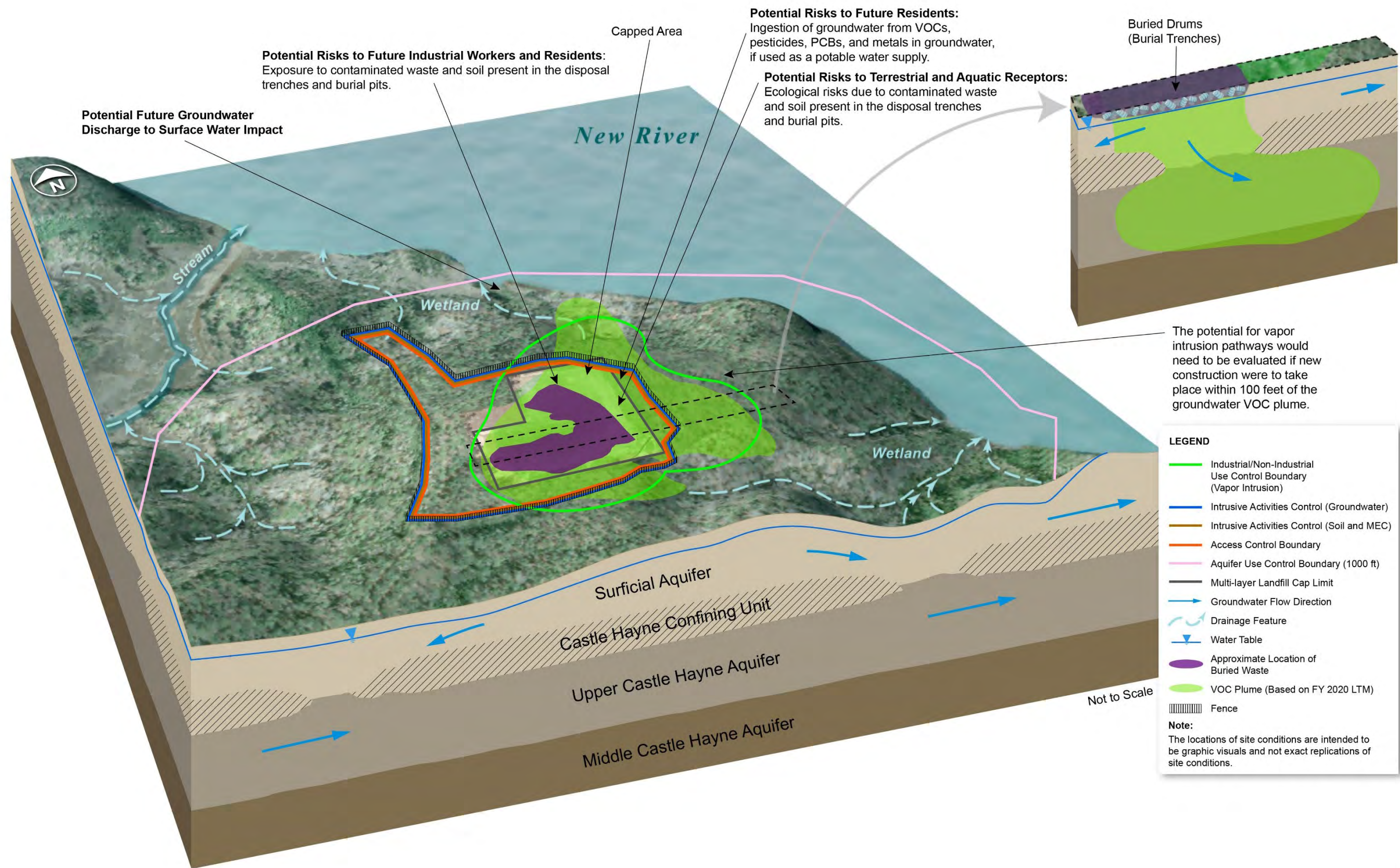
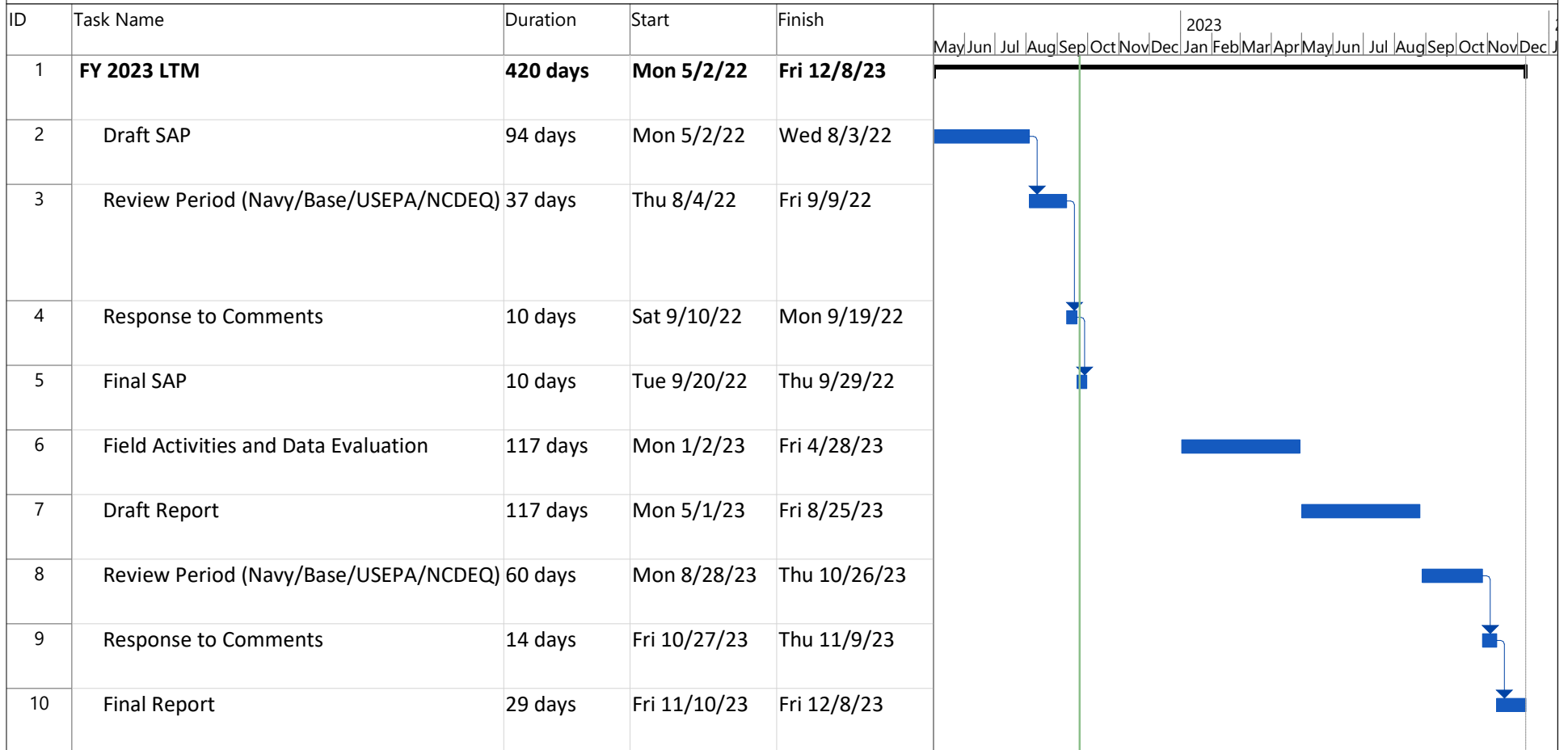


Figure 8-26. IRP Site 69 Conceptual Site Model

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Schedule 8-7
IRP Site 69
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

8.1.20 Site 73 (OU 21)—Courthouse Bay Liquids Disposal Area

Site 73, the Courthouse Bay Liquids Disposal Area, covers approximately 47 acres located along the northwestern shore of Courthouse Bay (**Figure 8-27**). The Amphibious Vehicle Maintenance Facility was constructed in 1946 and remains active. 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 former Building A3. Between 1983 and 1989, Building A3 was demolished and a new building was constructed. Based on the nature of maintenance activities conducted and CVOs 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.



Figure 8-27. IRP Site 73, OU 21

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 73

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. A review of historical records, aerial photographs, and field inspections found that an estimated 400,000 gallons of waste oil were discharged directly onto the ground surface. Approximately 20,000 gallons of waste battery acid were also reportedly disposed of in the area. Therefore, Site 73 was recommended for additional study.

Table 8-39. Previous Investigations Summary, IRP Site 73

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Confirmation Study (ESE, 1990)	000214	1985-1990	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 affected by VOCs and metals.
UST Investigations (Baker, 1992 and 1994)	007191 007192	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	N/A	1994	A soil gas survey and groundwater screening program were conducted. The analytical results identified nine AOCs at Site 73, segregated by potential sources of contamination.
Remedial Investigation (Baker, 1997)	001766 through 001768	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 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.
Feasibility Study (Baker, 1998)	004612	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 AOC had not changed in shape or size but was not fully delineated. The Supplemental Groundwater Investigation 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 contaminated groundwater.
Groundwater Modeling Report (Baker, 1998)	004605	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, 2005)	003783 ^a	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 (Baker and CH2M, 2002)	003267	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-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.

Table 8-39. Previous Investigations Summary, IRP Site 73

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Technology Evaluation and Pilot Study Project Plans (CH2M, Baker, and CDM, 2003)	003260	2003	Potential remedial options were evaluated for treatment of intermediate groundwater with TCE concentrations above 1,000 micrograms per liter ("hot spot" area). Five treatment technologies (ISCO using permanganate, abiotic reduction using colloidal iron injection, ERD promoted by hydrogen release compound, 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 horizontal directionally drilled (HDD) well was recommended.
Hydrogen Sparging Pilot Study (MicroPact, Baker, 2006)	002732	2003-2006	A 900-foot-long horizontal well with 400 feet of screened area was installed to a depth of 85 feet bgs in the "hot spot" area. Approximately 40 hydrogen injections were completed in 2004 and 2005. The average TCE concentration decreased by approximately 35 percent, and the average total VOC concentration decreased by approximately 8 percent.
Phase 2 Pilot Study (AGVIQ/CH2M, 2008)	004324	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 percent, with ERD and sparging being the primary treatment mechanisms.
Supplemental Remedial Investigation (CH2M, 2009)	004391	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) within the Castle Hayne aquifer. 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-contaminated soil was delineated in the area corresponding with historical 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, 2009)	004389	2009	Potential remedial alternatives were identified to address CVOCs in groundwater and petroleum hydrocarbon-contaminated 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) AS with downgradient ERD injections.
Proposed Remedial Action Plan (CH2M, 2009) Record of Decision (CH2M, 2009)	006325 002742	2009	A PRAP was issued in April 2009 to solicit public input on the preferred alternative (in situ AS 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 ROD was signed in November 2009. The CSM is shown on Figure 8-28 .

Table 8-39. Previous Investigations Summary, IRP Site 73

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedy-in-Place Interim Remedial Action Completion Report (Shaw, 2011) Interim Remedial Action Activities Summary (Osage, 2014)	004660 006442	2009- 2014	The RD was prepared for in situ AS by the horizontal well, downgradient ERD injections, LTM and MNA, and LUCs. In FY 2010, the horizontal well was initiated for AS to treat the highest VOC concentrations in groundwater, and LUCs were finalized to prohibit aquifer use and exposure to soil until screening criteria 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 2011 and an IRACR was submitted. The AS system was discontinued in 2012 when RAOs within the zone of influence were met, the ERD bio-barrier was in-place, and the potential for AS to impact VI at adjacent buildings existed. A second round of ERD injections was completed in December 2013 and an Interim Remedial Action Activities Summary was submitted (Osage, 2014).
Basewide Vapor Intrusion Evaluation (AGVIQ/CH2M, 2009, CH2M, 2011, and 2015)	002772 through 002777 004694 through 004698 008559	2007- present	Site 73 was included in the phased Basewide VI evaluation, conducted from 2007-2011, to determine whether complete or significant exposure pathways exist for VI into buildings. VI was not identified as a significant pathway of concern for any of the buildings located in the vicinity of Site 73. However, during operation of the AS system, subslab soil gas concentrations increased and additional sampling was conducted to confirm that the concentrations decreased since the system was shut down in 2012. Based on the 2013 sampling results, NFA was recommended for Building A47 unless the AS system is turned back on.
Long-term Monitoring (CH2M, 2022)	Pending Final	2010- present	LTM was initiated in 2010 and consists of LTM for groundwater for performance monitoring of the AS system and biobarrier, and MNA for groundwater outside of the active treatment areas and sitewide after active treatment is complete. In 2010, LTM consisted of collecting groundwater samples from seven surficial, 14 UCH, and three MCH aquifer monitoring wells for VOCs. After the AS system was turned off, the LTM network was expanded to include the former AS performance monitoring wells and included 10 surficial, 23 UCH, and four MCH aquifer monitoring wells. Monitoring of the MCH aquifer was discontinued after FY 2015 because VOCs were not detected above laboratory detection limits. The LTM program currently includes annual sampling for VOCs at 8 surficial and 21 UCH aquifer wells, and sampling for NAIPs every 5 years to evaluate subsurface conditions for biodegradation and reductive dechlorination of VOCs. Free product monitoring and recovery (using an oil-absorbent sock) is being conducted monthly at one monitoring well.
Explanation of Significant Difference (CH2M, 2017)	007229	2017	The ESD was submitted in 2017 to update the RAOs for OU 21 to include an industrial/non-industrial use control boundary for VI.
Biostimulation and Bioaugmentation Pilot Study (CH2M, 2021)	008692	2017- 2020	A pilot study was conducted to evaluate the effectiveness of biostimulation and bioaugmentation by deploying in situ microcosms (Bio-Traps) or a combination of the two to facilitate degradation of residual VC in the UCH aquifer, and reduce the time to site closure. Bio-Traps were deployed and collected in 2017 to initially evaluate the effectiveness of potential substrates. Results indicated the highest microbial and functional gene concentrations and low methane concentrations in the bioaugmentation unit; therefore, bioaugmentation was selected as the preferred approach for the pilot study. Injection wells were installed in November 2018 and the bioaugmentation injections were conducted in 2019, followed by performance monitoring through 2020. The results of the pilot study will be presented in the next LTM report.

Table 8-39. Previous Investigations Summary, IRP Site 73

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Bio-barrier Reinjection Treatability Study (Paragon and Meadows, 2021)	Pending Upload	2019-2020	In FY 2017, performance monitoring results indicated that the bio-barrier substrate had depleted, and a reinjection event was recommended. The second substrate and bioaugmentation reinjection event was initiated in 2019 as a treatability study to evaluate the effectiveness of redeveloping injection wells and recirculating groundwater to replenish the bio-barrier with EVO, ERD, and decrease downgradient COC concentrations. The study targeted the southwest-most injection wells where VC concentrations were highest. Well development and injections were conducted 2019-2020 followed by performance monitoring.
Land Use Control Implementation Plan Update (CH2M, 2019)	008081	2018-2019	The LUCIP Update detailed modifications to existing LUCs. A LUC to evaluate future buildings and land use for potential VI pathways, prior to construction or modifications to existing buildings, within the extent of groundwater or soil contamination remaining-in-place above concentrations allowing for UU/UE was implemented. In addition, the LUC boundary for intrusive activities control boundary for soil on the existing plat was corrected to a non-industrial use control boundary in accordance with the ROD.
Air Sparging Pilot Study (CH2M, 2021)	Pending Upload	2021-present	A pilot study is planned to restart the existing air sparge well to evaluate the effectiveness of pulsing the AS system and injecting warmed air to further reduce concentrations of residual VOCs in the surficial and UCH aquifers. Performance monitoring will be conducted consisting of groundwater and soil gas samples. Results will be presented in a future LTM report.

^a Only the final monitoring report NIRIS number is shown.

^b Only the most recent LTM report NIRIS number is shown.

Table 8-40. Land Use Control Summary, IRP Site 73

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control (1,000 feet)	47.06	August 16, 2010
Non-Industrial Use Control Boundary (Soil)	0.81	April 16, 2019
Industrial/Non-Industrial Control Boundary (Groundwater VI)	15.83	
Industrial/Non-Industrial Use Control Boundary (Soil VI)	0.81	

8.1.20.1 Future Activities

The air sparging pilot study is planned for FY 2022 and results will be presented in future LTM reports (**Schedule 8-8**). LTM consisting of groundwater performance monitoring of the AS system and biobarrier, and MNA for groundwater outside of active treatment areas will continue and LUC inspections will be conducted quarterly.

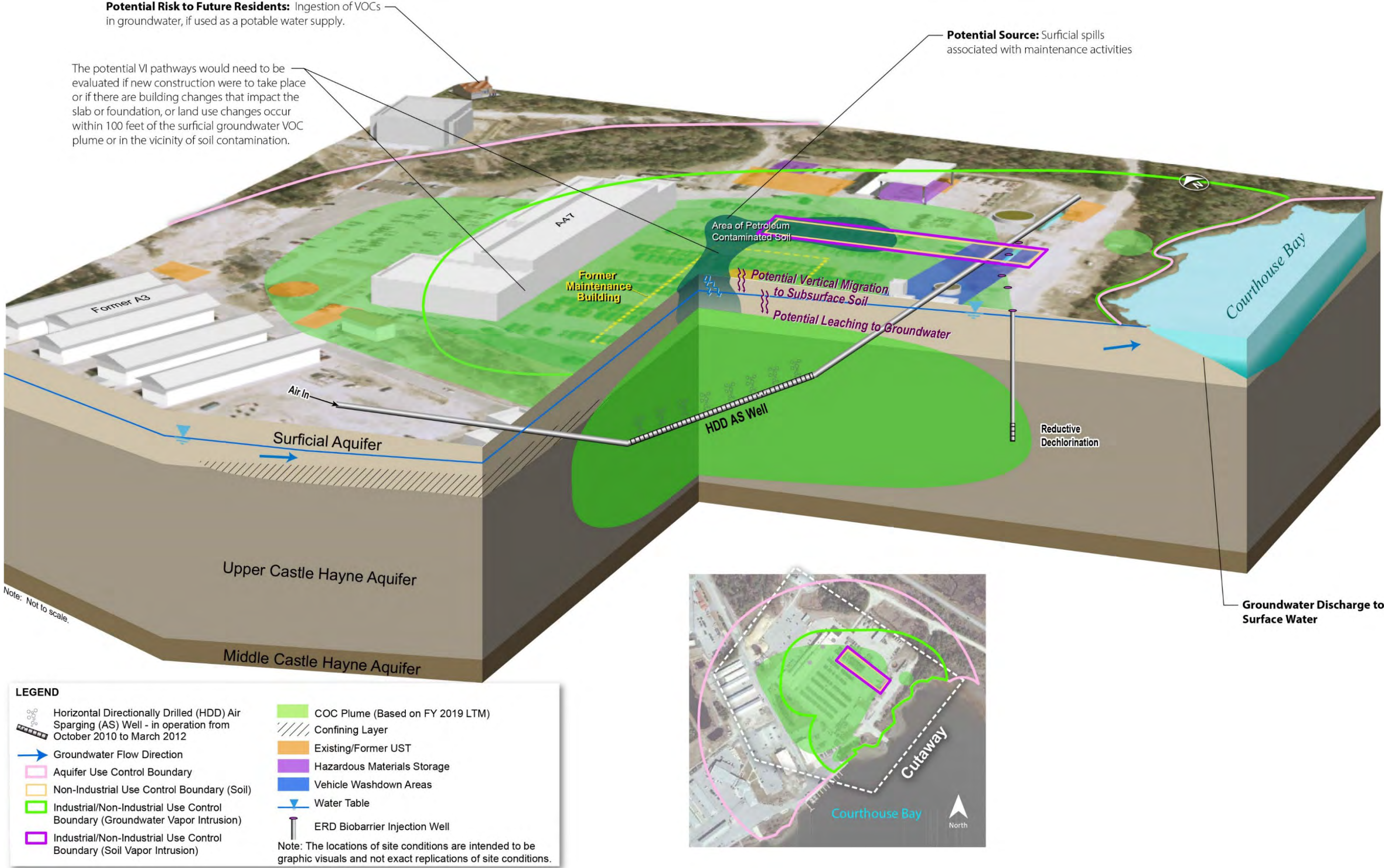
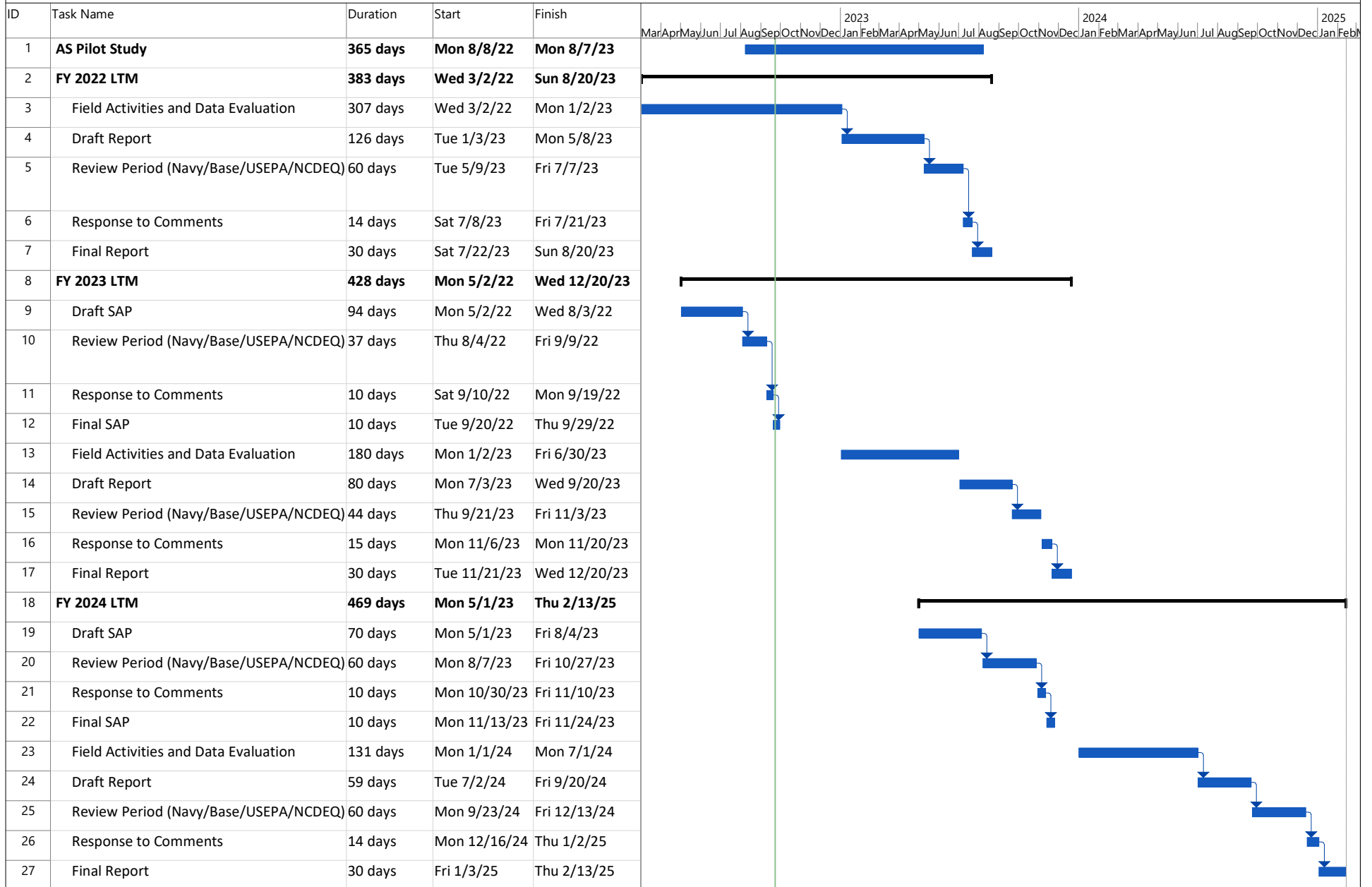


Figure 8-28. IRP Site 73 Conceptual Site Model

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Schedule 8-8
IRP Site 73
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

8.1.21 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 OU 4 (**Figure 8-29**). 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 technical memorandum reports chemical training agents in the form of test kits were reportedly disposed of at Site 74. A former Pest Control Area was also reportedly located in the southeastern portion of the site.



Figure 8-29. IRP Site 74, OU 4

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 74

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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 (ESE, 1990)	000214	1984-1990	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.

Table 8-41. Previous Investigations Summary, IRP Site 74

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation/ Feasibility Study (Baker, 1995)	001524 through 001526	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 training agents (chemical agents) 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 conducted to develop and screen remedial alternatives for addressing soil, groundwater, and surface water contamination.
Proposed Remedial Action Plan (Baker, 1995) Record of Decision (Baker, 1995)	001529 001734	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 ROD was signed in January 1996.
Remedy-in-Place Remedial Action Completion Report (CH2M, 2006)	003953	1997-2011	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 screening criteria 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 and additional fencing was installed in 2011 along both sides of the access road leading to Henderson Pond.
Confirmatory Sampling (CH2M, 2012)	006298	2012	Soil samples were collected from beneath the access road area through Site 74 leading to the proposed Henderson Pond and Hickory Pond recreational area to evaluate potential risks to human health and the environment. The samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. The HHRS indicated that exposure to soil by the most likely potential receptors, construction workers, was not expected to result in any unacceptable risks. Future residential (and potentially recreational) exposure to SVOCs and pesticides in soil may result in unacceptable risk to human health. In addition, ecological exposure to pesticides/PCBs in soil may pose a potential risk. However, any exposures other than by construction workers are unlikely because the soil is beneath 0.5 to 1 foot of gravel and LUCs are in place to prevent intrusive activities and residential development.
Henderson Pond/Hickory Pond Investigation Report (CH2M, 2013)	006348	2012-2013	In 2012, an additional investigation was conducted based on potential risk to human and ecological receptors identified during the confirmatory sampling (Phase 1). Surface/subsurface soil, sediment, surface water, and fish tissue samples were collected and analyzed for metals, PCBs, pesticides, SVOCs, and/or VOCs. Based on risk assessments conducted using these data, direct exposure to soil within the proposed recreational improvement areas and sediment and surface water in Henderson and Hickory Ponds do not result in unacceptable risks to human health and the environment. Carcinogenic risks associated with ingestion of fish from either Henderson or Hickory Pond by adults, children, and lifetime anglers are within acceptable USEPA levels. However, ingestion of fish from Henderson or Hickory Pond, based on reasonable maximum exposure assumptions, would result in non-carcinogenic hazards above acceptable USEPA levels for adults and children. The hazard is associated with non-dioxin like PCBs for Henderson Pond and mercury for Hickory Pond. Anglers are notified of potential risk from consumption of fish, consistent with advisories already in place for North Carolina, through flyers posted at the Game Wardens Office and signage along the ponds.

Table 8-42. Land Use Control Summary, IRP Site 74

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (500 feet)	71.27	February 15, 2002
Non-Industrial Use Control Boundary (Soil)	23.81	
Intrusive Activities Control Boundary (Soil)	23.81	
Intrusive Activities Control Boundary (Groundwater)	13.93	--
Access Control Boundary	20.5	

8.1.21.1 Future Activities

LUC inspections will be conducted quarterly.

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

Site 78, the HPIA, covers approximately 800 acres and is located within OU 1, 1 mile east of the New River and 2 miles south of North Carolina Highway 24 (**Figure 8-30**). 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 Camp Lejeune. The HPIA consists of maintenance shops, warehouses, painting shops, printing shops, auto body shops, and other small industrial facilities. Because of 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 8-30. IRP Site 78, OU 1

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 78

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. The IAS recommended additional investigations based on historical operations in HPIA.

Table 8-43. Previous Investigations Summary, IRP Site 78

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Interim Remedial Investigation (ESE, 1992)	001516	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 OU 1 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 IROD was signed on September 23, 1992.
Interim Feasibility Study (Baker, 1992)	001517		
Interim Proposed Remedial Action Plan	000414		
Interim Record of Decision for Surficial Aquifer (Baker, 1992)	001504		
	N/A		
	001161		
Remedial Investigation/ Feasibility Study (Baker, 1994)	001271	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 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.
Proposed Remedial Action Plan (Baker, 1994)	000522		
Record of Decision (Baker, 1994)	004388		
	001254		
	000366		
Explanation of Significant Difference (Baker, 1995)	001555	1995	An ESD was issued to revise the screening criteria 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, 1998)	001943	1998	A Notice of Non-significant Changes was submitted that identified ROD changes including removal of heptachlor epoxide, metals, TSS, TDS, and O&G from the LTM program.
	001944		
Optimization Study	N/A	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; however, additional delineation, NAE, and pilot studies were planned.
Natural Attenuation Evaluation (CH2M, Baker, and CDM, 2002)	006289	2001-2002	Based on the findings of the LTM sampling, an NAE was conducted to further delineate the contaminant plume and to determine whether natural attenuation of CVOCs was occurring. Field activities included groundwater sampling for VOCs. The NAE concluded that there was evidence for natural attenuation processes occurring at the site.

Table 8-43. Previous Investigations Summary, IRP Site 78

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Oxygen Release Compound and Hydrogen Release Compound Pilot Studies/Pilot Study Report (Baker and CH2M, 2005)	003801	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 included injection of ORC into groundwater at locations with VC concentrations higher than 1,000 milligrams per liter. The pilot study performed at Site 78 South included the injection of hydrogen release compound, into groundwater at locations with TCE concentrations greater than 1,000 milligrams per liter. The final Pilot Study report reported that the concentration of VC 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.
Remedy-in-Place Closeout Report (OHM, 1996)	002341 002342	1994-present	The soil excavation to remove pesticide and PCB-contaminated soils began operation in 1994 and was expanded in 1995. The groundwater extraction and treatment systems at Site 78 North and South have been in operation since 1994 and O&M is ongoing. Groundwater LTM for VOCs and metals was initiated in 1994. 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 8-31 .
Long-term Monitoring (CH2M, 2021)	008621 ^a	1994-present	LTM was initiated in 1994 and consists of LTM for performance monitoring and VI performance monitoring for the VIMS at Building 902. In 1994, LTM included annual groundwater sampling for VOCs and metals from 21 surficial, 2 UCH, and 2 MCH aquifer monitoring wells; and 8 supply wells for VOCs, metals, and total suspended and dissolved solids. The LTM network has been updated and optimized to encompass the extent of contamination and reduce redundancies, and currently includes 20 surficial, 22 UCH, 17 MCH, and 4 LCH aquifer monitoring wells; 2 surficial aquifer recovery wells; and 9 UCH aquifer recovery wells. The supply wells are currently inactive and/or abandoned. Groundwater samples are collected annually and are analyzed for VOCs. The groundwater extraction and treatment system was shut down in March 2020 to facilitate MILCON Performance monitoring for VOCs, NAIPs, microbial, and compound specific isotope analysis is planned as part of LTM 6- and/or 12- months following the planned year-long shutdown. The findings will be used to assess the viability of MNA as one of the remedial alternatives considered in the FS Amendment.
Hadnot Point Industrial Area Evaluation (CH2M, 2010)	006343	2009-2010	An extensive groundwater investigation was conducted across the HPIA to assess the current CVOC 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 (Rhêa, 2011)	002935	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.

Table 8-43. Previous Investigations Summary, IRP Site 78

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Hadnot Point Construction Area Risk Evaluation Update (CH2M, 2012)	006347	2012	During a MILCON PA/SI for the Hadnot Point Construction Area (HPCA) (CH2M, 2010) located within the HPIA of Site 78, potentially unacceptable risks were identified based on future residential exposure to PAHs and metals in surface soil and ecological exposure to metals in surface water and sediment located in a drainage feature. Additional risk evaluation was recommended, and an ecological site survey was conducted. The evaluation concluded that concentrations of PAHs and metals detected in surface soil appear to be ubiquitous in nature and are present across the HPCA with no identified source; the potential human health risks were based on a reasonable maximum exposure, assuming direct contact with the highest concentrations, whereas the central tendency exposure, based on more realistic exposure duration, soil ingestion rates, and average concentrations, were within USEPA's acceptable ranges. Overall, risks to ecological receptors from exposure to surface soil, sediment, and surface water at the HPCA are considered low and significant impacts to receptor populations are unlikely. Based on these conclusions, NFA was recommended in the HPCA.
Historical Metals Evaluation (CH2M, 2013)	005740	2012-2013	In 2012, an evaluation of metals in groundwater was conducted based on recommendations of the FYR. Groundwater samples were collected from monitoring wells in the LTM program and analyzed for total metals. Ten COPCs were identified in the surficial aquifer and one COPC was identified in the Castle Hayne aquifer. The report recommended the following: (1) collect additional groundwater samples for target analyte list metals analysis every 3 years as part of the LTM program; (2) redevelop IR78-RW09 and resample using techniques that minimize turbidity; and (3) further assess fate and transport in areas where previous activities may have affected geochemical properties.
Basewide Vapor Intrusion Evaluation (AGVIQ/CH2M, 2009, CH2M, 2011, 2015, and 2022)	002772 through 002777 004694 through 004698 008559 Pending Final	2007-present	<p>Site 78 was included in the phased Basewide VI evaluation, conducted from 2007-2011, to determine whether complete or significant exposure pathways exist for VI into buildings. Groundwater, soil gas, and/or air samples were collected from Buildings 901, 902, 903, 1502, 160, 1603, 1606, and 1707. A VIMS was installed at Building 902 as a precautionary measure and system startup was conducted in 2012. VIMS O&M was initiated in 2012 and is ongoing. Although VI was not identified as a significant pathway of concern, additional sampling was recommended at Buildings 901, 1601, and 1606 to further evaluate the VI pathway and/or assess temporal variability. Based on the 2013 monitoring results, NFA was recommended at Buildings 901 and 1606.</p> <p>During the VI five-year update in 2020/2021, Buildings 1601 and 1603 were identified for collection of additional VI data based on subslab soil gas concentrations at Building 1601 and utility lines intersecting (within 100 feet) source area groundwater concentrations of benzene at Building 1603. Subslab soil gas, indoor air, and outdoor air samples were collected from Building 1601 and analyzed for TCE. Analytical results and evaluation of the data indicate the potential for a complete VI pathway cannot be ruled out; however, the pathway is not currently significant. Continued monitoring of the VI pathway was recommended for Building 1601. Subslab soil gas, indoor air, and outdoor air samples were also collected at Building 1603 in and analyzed for benzene. Analytical results and evaluation of the data suggest that the VI pathway is not currently complete and would not be expected to become complete and significant in the future, and therefore, no further investigation of the VI pathway is recommended for Building 1603.</p>

Table 8-43. Previous Investigations Summary, IRP Site 78

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Supplemental Groundwater Investigation (CH2M, 2014)	005873	2011-2014	In 2011, a supplemental groundwater investigation was initiated to investigate if the LTM program and LUCs remain protective in the short term and support the future evaluation of alternative treatment technologies for long-term protectiveness. The investigation included monitoring well installation, groundwater sampling, a passive soil gas survey, and a MIP investigation. The results of the investigation indicated that the groundwater COC plumes are deeper and more widespread than conditions at the time of the ROD. As a result, recommendations for changes were made for the LTM program and LUC boundaries.
Treatability Study (CH2M, 2015)	006849	2012-2015	A treatability study was implemented to evaluate the effectiveness of ERD with bioaugmentation for reducing CVOC mass and obtain information of design parameters for site-wide implementation as a potential alternative to accelerate site closure. Based on analysis of the geochemical, microbial, and CVOC results, ERD with bioaugmentation was determined to be an effective technology for treating Site 78 South groundwater.
Vapor Intrusion Mitigation System Monitoring (CH2M, 2021)	Pending Final ^b	2012-present	A VIMS was installed at Building 902 in 2012. Performance monitoring began in 2012 and is conducted quarterly to evaluate if the VIMS at Site 78 are operating to effectively mitigate the VI pathway. Performance monitoring events currently include monitoring the system operating parameters (flow rate, riser vacuum, short-term differential pressure) quarterly. After December 2020, based on previous results, subslab soil gas sampling will be conducted every 5 years as part of LTM.
Building 902 VIMS Investigation (CH2M, 2021)	Pending Final	2018-present	During monitoring in FY 2017, system operating parameters indicated that the high-water table observed at Site 78 was affecting the VIMS operations and an investigation to evaluate on-going water entrainment in the VIMS and potential system modifications is ongoing. Field activities include soil gas sampling, pressure field extension testing, piezometer installation, water level data collection, and flux monitoring with a HAPSITE. Air dilution valves were recommended at several of the nodes in the southern portion of the building to minimize water entrainment, and an additional suction node was recommended in the northern portion of the building to increase the VIMS radius of influence.
Land Use Control Implementation Plan Update (CH2M, 2016)	006854	2015	Based on results of the Groundwater Delineation Report, Site 78 LUCs were updated to encompass the current extent of VOC exceedances in groundwater and to evaluate future buildings and land use for potential VI pathways. A LUCIP was prepared to document the updated LUCs. An updated Notice of Contaminated Site was filed with Onslow County real property records in December 2015.
Explanation of Significant Difference (CH2M, 2017)	007229	2017	The ESD was submitted in 2017 to update the RAOs for OU 1 to include VI, add an industrial/non-industrial use control for VI, and incorporate VIMS into the remedy.

Table 8-43. Previous Investigations Summary, IRP Site 78

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Feasibility Study Amendment Investigation Summary Technical Memorandum (CH2M, 2018)	007596	2017-2018	<p>The 2015 FYR recommended refining the CSM and continuing the evaluation of alternate treatment technologies. The FS Amendment Investigation work plan outlined potential alternative groundwater treatment technologies for three areas (Northwest Woods, Buildings 901/902/903, and Buildings 1601/1603) and data needs for the Hadnot Point Fuel Farm to further refine the extent of COCs in groundwater.</p> <p>Field activities included monitoring and recovery well installation, soil and groundwater sampling, a bench-scale study, and aquifer testing. Soil samples were analyzed for grain size, fraction of organic carbon, and magnetic susceptibility. Groundwater samples were analyzed for site-specific VOCs.</p> <p>The report recommended re-evaluating the path forward for the site following results of the air sparging pilot study at the Northwest Woods area, the recovery well test at Buildings 901/902/903, and changes to the LTM program.</p>
Alternative Remedy Evaluation Work Plan (CH2M, 2017)	007276	2017-2019	<p>AS was one of the alternative technologies evaluated for the Northwest Woods area to further support evaluation of the technology in the FS Amendment. The objective of this study was to evaluate the effectiveness of AS at depths up to 125 feet bgs. In addition, vertical and lateral extent of COCs in groundwater were refined and concentration trends and natural attenuation of COCs in each aquifer unit were evaluated as part of this AS treatability pilot study.</p> <p>Field activities included monitoring and injection well installation, and groundwater sampling for VOC analysis. The AS system was started in November 2017 and ran continuously for 12 months. Quarterly monitoring was conducted through November 2018 and a rebound test was conducted in February 2019. Results will be presented in the FS Amendment.</p>
Groundwater Treatment Plant Evaluation Summary Report (CH2M, 2018)	007578	2017-2018	<p>An evaluation was conducted to assess the potential for operational enhancements to accommodate higher hydraulic and contaminant mass loading by assessing the capacity, reliability, operability, flexibility, and capability of the groundwater treatment plants (GWTPs), assessing the ability of the GWTPs to treat additional groundwater with higher concentrations of site COCs, and identify potential equipment and/or operational enhancements to accommodate higher flow rates and mass loading, including rough order-of-magnitude cost estimates.</p> <p>Results indicate that the GWTPs are currently underused based on the influent from the current recovery well network. Each GWTP was designed to accommodate up to 80 gallons per minute; however, the average groundwater flow to each plant is currently 3.5 gallons per minute, due to the shallow placement of pump intakes. Implementation of an enhanced groundwater extraction and treatment alternative would include the operation of new and existing recovery wells at optimized flow rates to maximize contaminant mass removal. This enhancement would result in higher hydraulic and mass loading to the GWTP system.</p> <p>If enhanced groundwater extraction and treatment is selected as the preferred alternative technology, recommendations to mitigate the impacts include re-instating the addition of flocculants, replacing existing blowers with appropriately sized blowers, implementing anti-scalant chemical injections upstream of the air stripper, and replacing existing piping with larger diameter piping.</p>

Table 8-43. Previous Investigations Summary, IRP Site 78

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Enhanced Pump and Treat Pilot Test at Buildings 901/902/903 (CH2M, 2019)	008279	2018-2019	A recovery well test was conducted in the Building 901/902/903 area to evaluate the effectiveness of pumping to reduce VOC concentrations. A pump was installed and operated for approximately 12 days. Groundwater samples were collected from the pump test well and 5 performance monitoring wells for VOC analysis prior to the pilot test initiation (baseline) and 1 day and 1 week following initiation. Performance results did not differ significantly from baseline sampling results and were consistent with long-term site monitoring results. In addition, performance results indicated that although a capture zone could be sustained, continued pumping was not expected to accelerate cleanup. Thus, the recovery well test was permanently discontinued.
Draft Feasibility Study Amendment (CH2M, 2022)	Pending Final	2022	<p>An FS Amendment was prepared to update RAOs and evaluate remedial alternatives to mitigate current unacceptable risk to human health or the environment from exposure to COCs.</p> <p>Three target treatment areas were identified and included (1) Buildings 901, 902, and 903, (2) Northwest Woods, and (3) Buildings 1601 and 1603.</p> <p>The remedial alternatives developed for Buildings 901, 902, and 903 were:</p> <ul style="list-style-type: none"> • No Change to Remedy in Place • Air Sparging, LTM/MNA, LUCs, and VIMS • Enhanced Pump and Treat, LTM/MNA, LUCs, and VIMS • MNA, LUCs, and VIMS <p>The remedial alternatives developed for the Northwest Woods area were:</p> <ul style="list-style-type: none"> • No Change to Remedy in Place • Air Sparging, LTM/MNA, and LUCs • Enhanced Pump and Treat, LTM/MNA, and LUCs • Enhanced Reductive Dechlorination, LTM/MNA, and LUCs • MNA and LUCs <p>The remedial alternatives developed for Buildings 1601 and 1603 were:</p> <ul style="list-style-type: none"> • No Change to Remedy in Place • Air Sparging, LTM/MNA, LUCs, and VIMS • Enhanced Pump and Treat, LTM/MNA, and LUCs • Enhanced Reductive Dechlorination, LTM/MNA, and LUCs • MNA and LUCs

^a Only the most recent LTM report NIRIS number is shown.

^b Only the most recent VIMS monitoring report/checklist NIRIS number is shown.

Table 8-44. Land Use Control Summary, IRP Site 78

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	754	December 8, 2015
Non-Industrial Use Control Boundary (Soil)	0.70	
Intrusive Activities Control Boundary (Groundwater)	38.4	
Industrial/Non-Industrial Use Control (VI)	54.14	

8.1.22.1 Future Activities

The FS Amendment will be submitted in FY 2022, followed by a Proposed Plan and ROD Amendment (**Schedule 8-9**). LTM consisting of groundwater performance monitoring and VI performance monitoring of the VIMS at Building 902 will continue and LUC inspections will be conducted quarterly.

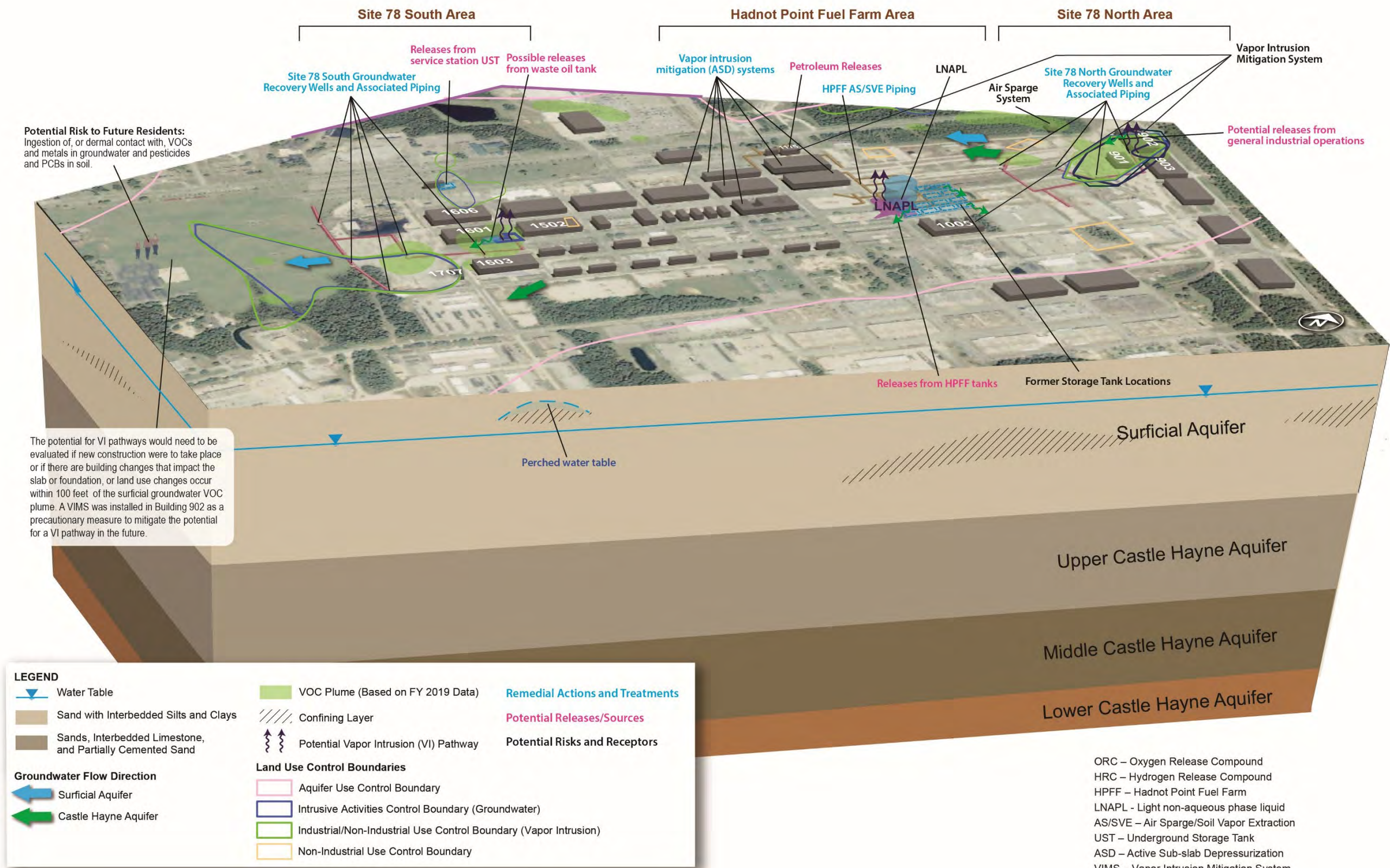
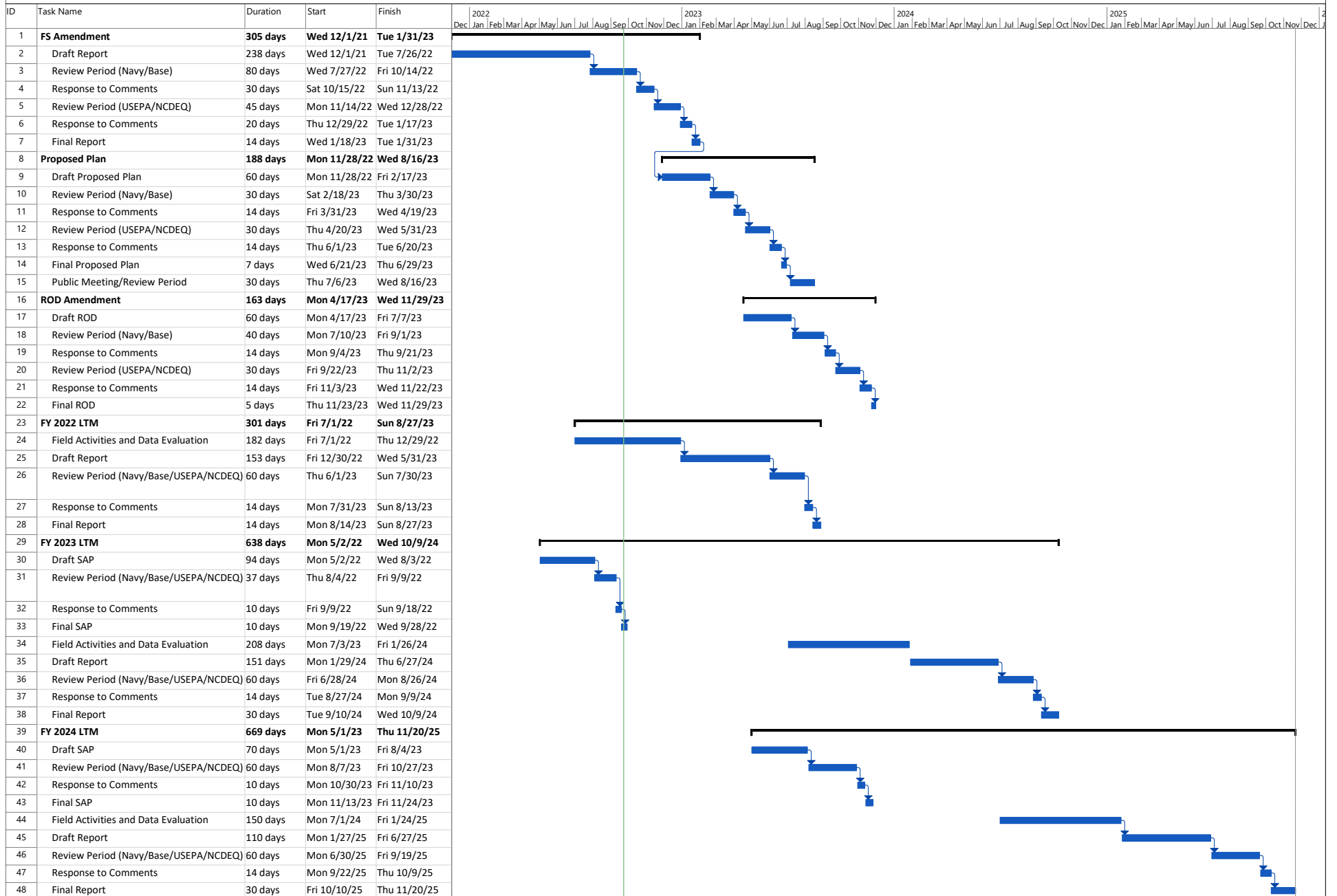


Figure 8-31. IRP Site 78 Conceptual Site Model

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Schedule 8-9
IRP Site 78
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

8.1.23 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 8-32**). 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 or 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 8-32. IRP Site 80, OU 11

Previous investigations are listed in **Table 8-45**, and the LUC summary is presented in **Table 8-46**.

Table 8-45. Previous Investigations Summary, IRP Site 80

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Site Inspection (Halliburton/NUS, 1992)	000329	1991-1992	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.

Table 8-45. Previous Investigations Summary, IRP Site 80

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation (Baker, 1996)	001697 001698	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 consisted of a site survey and 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.
Time-critical Removal Action (OHM, 1996)	001742 through 001744	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 were excavated and transported offsite to a disposal facility.
Proposed Remedial Action Plan (Baker, 1996) Record of Decision (Baker, 1997)	001746 003498	1996-1997	A PRAP was issued in November 1996 to solicit public input on the preferred alternative (no RAs) and a public meeting was held. The ROD for OU 11 (Sites 7 and 80) was signed in January 1998.
Remedy-in-Place and Land Use Control Implementation Plan (CH2M, 2007)	003968	2007-present	Although the ROD did not require RA, 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.
Explanation of Significant Difference (CH2M, 2012)	005162	2012	An ESD was submitted in 2012 to document the LUCs as the remedy at Site 80.

Table 8-46. Land Use Control Summary, IRP Site 80

LUC Boundary	Area (Acres)	Onslow County Registration Date
Non-Industrial Use Control Boundary (Soil)	2.93	February 8, 2007
Intrusive Activities Control Boundary (Soil)	2.93	

8.1.23.1 Future Activities

LUC inspections will be conducted quarterly.

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

Site 82, the Piney Green Road VOC Area, is located within OU 2 (**Figure 8-33**). OU 2 consists of four sites (Sites 6, 9, and 82, and UXO-22) that are grouped together because of their proximity to one another. Site 82 comprises approximately 60 acres between Piney Green Road and Holcomb Boulevard, south of Wallace Creek and north of Site 6. Before the late 1980s, much of the site was reportedly used for storage, disposal, and handling of potentially hazardous waste and material. Before Site 82 was identified during the confirmatory sampling at Site 6, the eastern portion of Lot 203 was reportedly used for storage, disposal, and handling of potentially hazardous waste and material such as munition debris, wood, metal, batteries, communication wire, gas mask filters, drums, paint containers, grease containers, pesticides, and transformers containing PCBs, solvents, and waste oil.

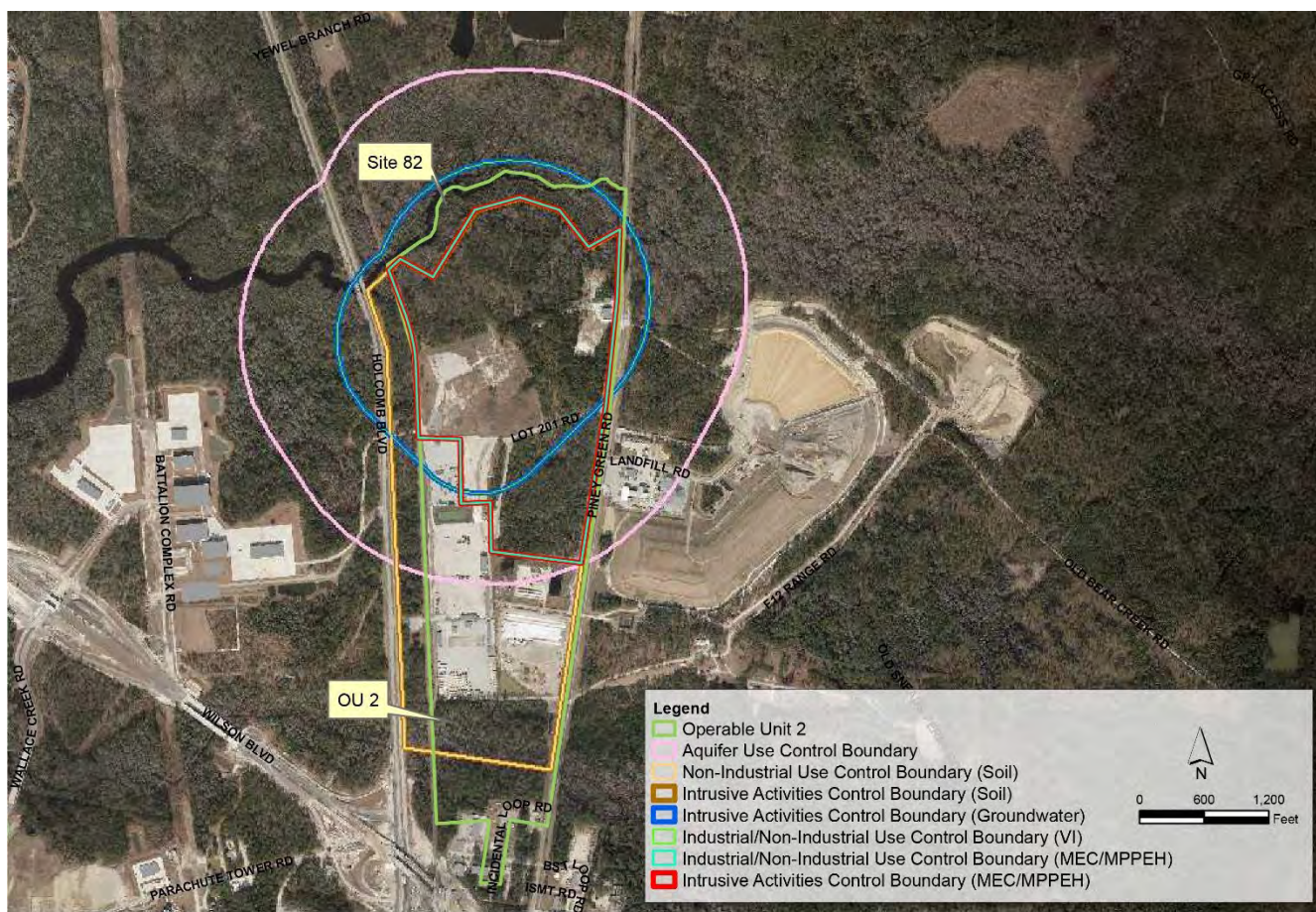


Figure 8-33. IRP Site 82, OU 2

Previous investigations are listed in **Table 8-47**, and the LUC summary is presented in **Table 8-48**.

Table 8-47. Previous Investigations Summary, IRP Site 82

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Site Investigation (Halliburton/NUS, 1992)	003165	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.

Table 8-47. Previous Investigations Summary, IRP Site 82

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation/ Feasibility Study (Baker, 1993) Proposed Remedial Action Plan (Baker, 1993) Record of Decision (Baker, 1993)	001483 001249 001248	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, and 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 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 FS also identified AOCs based on the RI risk assessment and an evaluation of the COC concentrations exceeding the remediation goals. 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, SVE to address vadose zone VOC contamination, and groundwater extraction and treatment to address VOCs, LTM, and LUCs. The ROD for OU 2 was signed in September 1993.
Remedy-in-Place Closeout Report (OHM, 1997)	001523 002288 through 002295	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 and O&M is ongoing. Groundwater and surface water LTM for VOCs and metals began in 1997. LUCs were implemented in 2001 and updated in 2002. The current CSM is shown on Figure 8-34 .
Long-term Monitoring (CH2M, 2021)	Pending Upload ^a	1996-present	LTM was initiated in 1996 and included annual groundwater sampling of seven surficial, six UCH, and seven LCH aquifer monitoring wells quarterly for VOCs, metals, TSS, and TDS analysis. Since 1999, three collocated surface water and sediment samples have been collected semiannually for VOC analysis. Metals, TDS, and TSS were discontinued in 1997, but metals were added back into the sampling protocol in 2015 based on an evaluation of metals in groundwater. Based on supplemental investigations, the LTM network was updated to reflect the current extent of contamination and currently includes 23 surficial, 15 UCH, and 8 LCH aquifer monitoring wells; 14 recovery wells; and 4 collocated surface water and sediment sample locations. Surface water and sediment samples are collected semiannually and are analyzed for VOCs and groundwater samples are collected annually and are analyzed for VOCs.
Groundwater Pilot Study (CH2M, 2008)	004236	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.

Table 8-47. Previous Investigations Summary, IRP Site 82

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Potential Source Investigation (Rhēa, 2011)	007239	2008-2011	The investigation was initiated to identify additional potential sources of CVOC contamination in groundwater at Site 82. During vegetation clearing activities, MPPEH was discovered and an ESS was submitted to remove and dispose of the MPPEH. An ESS Amendment was also submitted for OU 2. 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 tetrachloroethane (PCA) were detected at concentrations exceeding screening criteria.
Basewide Vapor Intrusion Evaluation (AGVIQ/CH2M, 2009, CH2M, 2011, 2015, and 2022)	002772 through 002777 004694 through 004698 008559 Pending Final	2007-present	A Basewide VI Study was conducted to determine whether complete or significant exposure pathways exist for VI into buildings. At OU 2, during the initial evaluations no buildings were identified within 100 feet of a monitoring well containing VOC concentrations above NCGWQS. During the VI five-year update in 2020/2021, Building 626, the groundwater extraction and treatment system, was identified for collection of additional VI data based on increasing groundwater VOC trends within 100 feet. Subslab soil gas, indoor air, and outdoor air samples were collected and analyzed for the site VOC COCs. TCE was detected in subslab soil gas and indoor air samples at concentrations exceeding screening criteria. A HAPSITE investigation was conducted to identify if there is VI occurring or if the detected concentrations of TCE were from an indoor source. The results and evaluation of the data suggest that the TCE concentrations in indoor air are related to the treatment process and not VI. Therefore, no further investigation of the VI pathway is recommended.
Supplemental Investigation (CH2M, 2015)	006573	2012-2015	In 2012 and 2013, a supplemental investigation was conducted to evaluate the potential for additional VOC source material in soil and groundwater. Field activities included hydrogeologic testing and collection of soil, groundwater, pore water, and passive soil gas samples for VOCs analysis. VOCs were detected at concentrations exceeding screening criteria in soil and groundwater samples, and an area of high VOC concentrations was identified. In 2012, an evaluation of metals in groundwater was conducted based on recommendations of the FYR. Groundwater samples were collected from the surficial aquifer and analyzed for target analyte list metals. Nine of the 22 detected metals exceeded the screening criteria and background threshold values. Based on the results of these activities, additional horizontal and vertical delineation, groundwater modeling, and optimization of the existing groundwater treatment system were recommended.
Supplemental Remedial Investigation Status Update (CH2M, 2017)	007244	2014-2017	Additional SRI activities were conducted to characterize potential source areas, assess the nature and extent of VOCs, evaluate the potential for co-mingling of contaminated groundwater originating from Sites 6 and 82, evaluate if contaminated groundwater is discharging into Wallace Creek, and investigate the ephemeral drainage feature as a potential source of surface water and sediment contamination. Field activities included a MIP investigation, monitoring well installation, and groundwater, surface water, sediment, and pore water sampling. The results indicated three VOC source areas, the groundwater VOC plumes were generally delineated, contaminants in the UCH aquifer have the potential to discharge into Wallace Creek, and the ephemeral drainage feature likely contributes in part to the COCs found in Wallace Creek, and there are potential unacceptable risks to human receptors from fish ingestion based on modeled fish tissue concentrations based on isolated detections in sediment and surface water from Wallace Creek.

Table 8-47. Previous Investigations Summary, IRP Site 82

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Supplemental Remedial Investigation Status Update 2 (CH2M, 2020)	008374	2016-2020	<p>SRI activities were conducted to identify and characterize previously undiscovered source areas and characterize source areas identified during the previous SRI; assess the nature and extent of COCs in soil, groundwater, sediment, and surface water; improve the understanding of groundwater flow and groundwater contaminant migration; evaluate the recovery well network performance and optimization, and prevent exposure to MEC/MPPEH that may exist on the ground surface within the wooded areas of Site 82.</p> <p>Field activities included monitoring well installation and site-wide groundwater sampling, passive soil gas sampling, surface clearance, a DGM survey, test pit excavations, MIP and soil sampling and, recovery well installation, testing and groundwater sampling.</p> <p>Based on the results, identification and/or refinement of four source areas was completed and the nature and extent of VOCs in groundwater was further refined.</p>
Treatment Plant Evaluation (CH2M, 2016)	007370	2016	<p>Evaluation of the GWTP was conducted in response to exceedances of 1,1,2,2-PCA in the effluent in which the original GWTP process was not designed to treat and the potential enhancements to the existing recovery well network. The GWTP evaluation activities included an initial data gap assessment, site visit, and collection of in-plant process samples. The evaluation determined that the GWTP effectiveness was limited by several factors and four alternatives were developed and evaluated to address and mitigate the various process concerns. Alternatives were assessed and selected by the Partnering Team in June 2016 (CH2M, 2016). Alternatives 1 and 2 were initiated to alleviate the current operational and performance issues, which included replacing the AS and liquid-phase granular activated carbon (LGAC) feed pumps and the backwash pump, reconfiguration of the LGAC vessels to a lead/lag configuration, addition of anti-scalant injections into the sand filter effluent, removal of obsolete metal treatment system components, and replacement of the existing air compressor. In addition to Alternatives 1 and 2, other GWTP upgrades were completed by Meadows in FY 2017, including: installation of two additional LGAC vessels, new sand filter, and shallow tray air stripper; additional aeration to storage tanks; reinstatement of flocculation; installation of anti-scalant injections; replacement of supernatant pumps; and various plumbing and electrical upgrades.</p>
Explanation of Significant Difference (CH2M, 2017)	007229	2017	<p>The ESD updated the RAOs for OU 2 to include VI, to add an industrial/non-industrial use control for VI, intrusive controls due to MEC/MPPEH associated with UXO-22, and to update the groundwater LUCs based on current extent of groundwater contamination.</p>
Land Use Control Implementation Plan Update (CH2M, 2019)	008082	2018-2019	<p>The LUCIP updated LUCs for OU 2. The aquifer use control and the intrusive activities control for groundwater boundaries were updated to reflect the current extent of COCs. An intrusive activities control boundary for MEC/MPPEH, an industrial/non-industrial use control boundary for MEC/MPPEH, and an industrial/non-industrial use control boundary for VI were added.</p> <p>The intrusive activities control and non-industrial use control boundaries for soil remains unchanged.</p>

Table 8-47. Previous Investigations Summary, IRP Site 82

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Supplemental Remedial Investigation Status Update 3 (CH2M, 2021)	Pending Upload	2019-2021	<p>SRI activities were conducted to address the uncertainty of potential unacceptable risk to human and/or ecological receptors from exposure to soil by evaluating whether contaminants identified in the ROD as well as discovered during source removal and supplemental investigations since the ROD were present in AOC soil samples at concentrations resulting in unacceptable risk and evaluation of alternative treatment technologies. Field activities included fish tissue sampling for pesticides, PCBs, and metals; effluent sampling for pesticides and PCBs; soil sampling for PAHs, pesticides, and metals; and expanded test pitting and subgrade biogeochemical reactor (SBGR) pilot study.</p> <p>The results of the AOC soil investigation indicate that there are no unacceptable risks to human health or the environment, eliminating the uncertainties regarding the former soil removal.</p> <p>Based on concentrations measured in Wallace Creek fish tissue samples and the most realistic exposure scenario, ingestion of catfish would result in unacceptable noncarcinogenic risks to recreational adult and child receptors due to PCBs. However, the presence of catfish appears limited and insufficient to yield the amount of fish used in the exposure scenarios. In addition, there were no pesticides or PCBs identified during the effluent sampling.</p> <p>SBGRs were installed in three source areas and after one year of operation, reducing conditions were established up to several hundred feet downgradient that resulted in one to three orders-of-magnitude decreases in chlorinated VOC concentrations. During test pit excavation for the SBGRs, general radioactive material in the form of commodities such as dials, gauges, and compasses were identified background during monitoring. The waste and soil were stockpiled, characterized, and appropriately disposed of.</p>
Soil LUC Refinement Work Plan (CH2M, 2021)	008797	2021	A soil investigation was conducted to determine whether LUC refinement at Sites 6 and 82 is feasible. Field activities were conducted in 2021 and included performing DGM and ground penetrating radar followed by soil sampling for VOCs, SVOCs, pesticides, PCBs, and metals. A report is being prepared for submittal in FY 2022.
Site Inspection for Radionuclides Work Plan (CH2M, 2021)	008787	2021	A groundwater investigation was conducted to determine whether a release of radionuclides to groundwater from these commodities has occurred. Field activities included collection of samples from the network of existing monitoring wells and the influent and effluent from the groundwater extraction and treatment plant for radionuclides analysis. Results will be presented in a report planned for submittal in FY 2022.
Air Sparging Pilot Study Work Plan (CH2M, 2021)	Pending Upload	2021	An AS pilot study is being conducted to assess whether it is a viable technology to treat the CVOCs at Site 82. The system was installed in January 2022 and performance monitoring is ongoing through January 2023.

^a Only the most recent LTM report NIRIS number is shown.

Table 8-48. Land Use Control Summary, OU 2

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	394.04	April 16, 2019
Non-Industrial Use Control Boundary (Soil)	206.75	February 15, 2002
Intrusive Activities Control Boundary (Soil)	206.75	
Intrusive Activities Control Boundary (Groundwater)	147.90	April 16, 2019
Industrial/Non-Industrial Use Control Boundary (VI)	147.90	
Intrusive Activities Control Boundary (MEC/MPPEH)	112.12	
Industrial/Non-Industrial Use Control Boundary (MEC/MPPEH)	112.12	

8.1.24.1 Future Activities

LTM, consisting of performance monitoring for the groundwater extraction and treatment includes groundwater, surface water, and sediment, is ongoing and LUC inspections will be conducted quarterly.

The SI for Radionuclides and the Soil LUC Refinement reports will be submitted in FY 2023. The AS pilot study is ongoing through FY 2023 (**Schedule 8-10**). Based on the AS pilot study, SBGR pilot study, and LTM results, the CSM will be updated and an FS Amendment considered to evaluate treatment alternatives for VOCs in groundwater. If an FS Amendment is prepared, a Proposed Plan and/or post-ROD change will follow.

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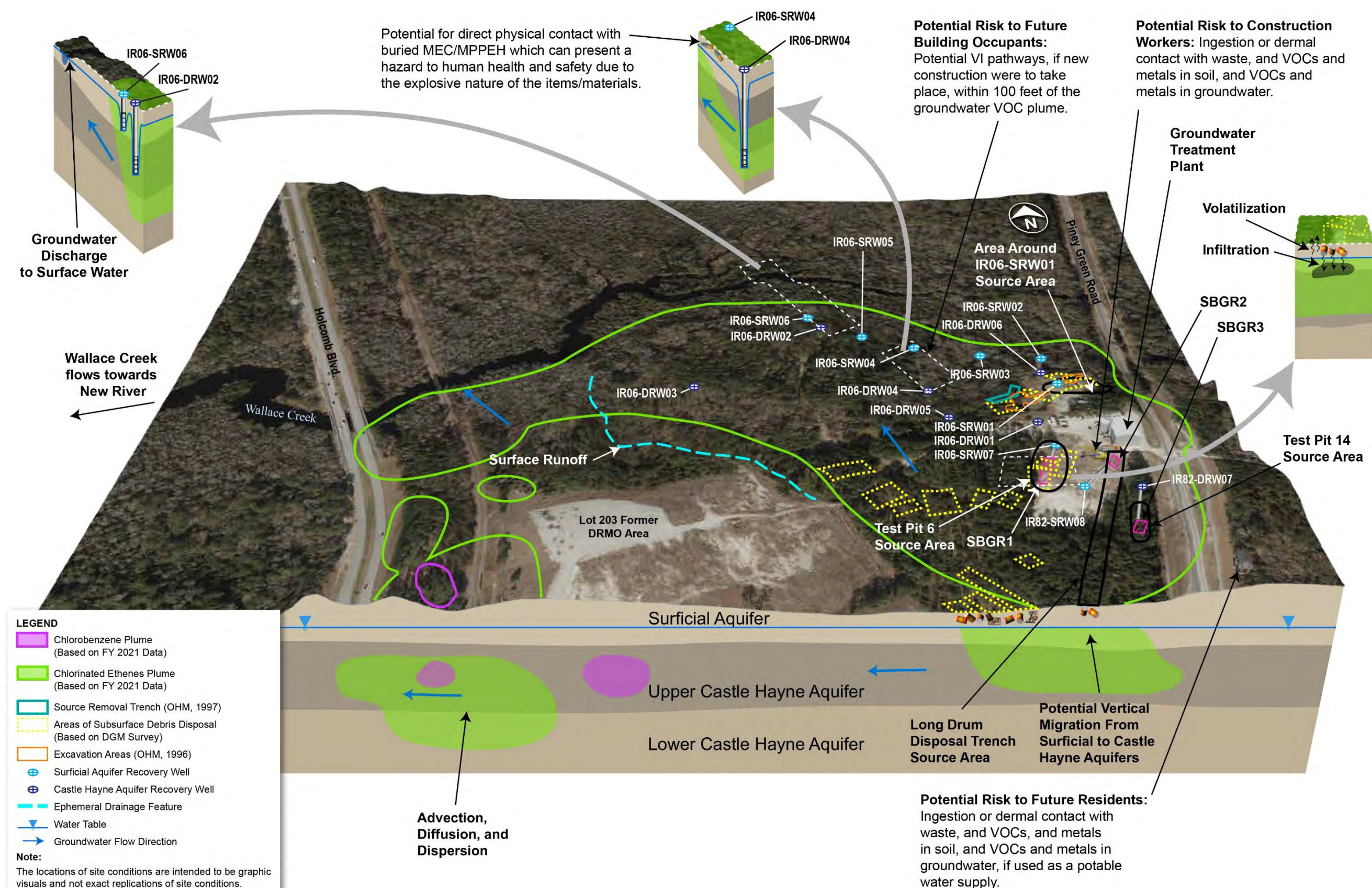


Figure 8-34. IRP Site 82 Conceptual Site Model

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Schedule 8-10 IRP Site 82 IRP & MMRP Site Management Plan FY 2023 MCB Camp Lejeune and MCAS New River				
ID	Task Name	Duration	Start	Finish
1	LUC Refinement	184 days	Thu 5/19/22	Tue 1/31/23
2	Draft Report	130 days	Thu 5/19/22	Sun 9/25/22
3	Review Period (Navy/Base)	45 days	Mon 9/26/22	Wed 11/9/22
4	Response to Comments	14 days	Thu 11/10/22	Wed 11/23/22
5	Review Period (USEPA/NCDEQ)	45 days	Thu 11/24/22	Sat 1/7/23
6	Response to Comments	14 days	Sun 1/8/23	Sat 1/21/23
7	Final Report	10 days	Sun 1/22/23	Tue 1/31/23
8	AS Pilot Study	261 days	Mon 1/10/22	Mon 1/9/23
9	Performance monitoring	365 days	Mon 1/10/22	Mon 1/9/23
10	SI for Radionuclides in Groundwater	237 days	Fri 4/1/22	Mon 2/27/23
11	Groundwater Sampling and Data Evaluation	145 days	Fri 4/1/22	Tue 8/23/22
12	Draft Report	60 days	Wed 8/24/22	Sat 10/22/22
13	Review Period (Navy/Base)	45 days	Sun 10/23/22	Tue 12/6/22
14	Response to Comments	14 days	Wed 12/7/22	Tue 12/20/22
15	Review Period (USEPA/NCDEQ)	45 days	Wed 12/21/22	Fri 2/3/23
16	Response to Comments	14 days	Sat 2/4/23	Fri 2/17/23
17	Final Report	10 days	Sat 2/18/23	Mon 2/27/23
18	Potential FS Amendment	138 days	Mon 3/18/24	Wed 9/25/24
19	Draft Report	90 days	Mon 3/18/24	Sat 6/15/24
20	Review Period (Navy/Base)	30 days	Sun 6/16/24	Mon 7/15/24
21	Response to Comments	14 days	Tue 7/16/24	Mon 7/29/24
22	Review Period (USEPA/NCDEQ)	30 days	Tue 7/30/24	Wed 8/28/24
23	Response to Comments	14 days	Thu 8/29/24	Wed 9/11/24
24	Final Report	14 days	Thu 9/12/24	Wed 9/25/24
25	Potential Proposed Plan	169 days	Thu 9/26/24	Tue 5/20/25
26	Draft Proposed Plan	45 days	Thu 9/26/24	Sat 11/9/24
27	Review Period (Navy/Base)	60 days	Sun 11/10/24	Wed 1/8/25
28	Response to Comments	14 days	Thu 1/9/25	Wed 1/22/25
29	Review Period (USEPA/NCDEQ)	60 days	Thu 1/23/25	Sun 3/23/25
30	Response to Comments	14 days	Mon 3/24/25	Sun 4/6/25
31	Final Proposed Plan	14 days	Mon 4/7/25	Sun 4/20/25
32	Public Meeting/Review Period	30 days	Mon 4/21/25	Tue 5/20/25
33	Potential Post-ROD Change	170 days	Wed 5/21/25	Tue 1/13/26
34	Draft Post-ROD Change	60 days	Wed 5/21/25	Sat 7/19/25
35	Review Period (Navy/Base)	60 days	Sun 7/20/25	Wed 9/17/25
36	Response to Comments	14 days	Thu 9/18/25	Wed 10/1/25
37	Review Period (USEPA/NCDEQ)	60 days	Thu 10/2/25	Sun 11/30/25
38	Response to Comments	30 days	Mon 12/1/25	Tue 12/30/25
39	Final Post-ROD Change	14 days	Wed 12/31/25	Tue 1/13/26
40	FY 2022 LTM	390 days	Mon 1/3/22	Sat 7/1/23
41	Field Activities and Data Evaluation	304 days	Mon 1/3/22	Wed 11/2/22
42	Draft Report	176 days	Thu 11/3/22	Thu 4/27/23
43	Review Period (Navy/Base/USEPA/NCDEQ)	60 days	Fri 4/28/23	Mon 6/26/23
44	Response to Comments	14 days	Fri 5/19/23	Thu 6/1/23
45	Final Report	30 days	Fri 6/2/23	Sat 7/1/23
46	FY 2023 LTM	635 days	Mon 5/2/22	Sun 10/6/24
47	Draft SAP	94 days	Mon 5/2/22	Wed 8/3/22
48	Review Period (Navy/Base/USEPA/NCDEQ)	37 days	Thu 8/4/22	Fri 9/9/22
49	Response to Comments	10 days	Fri 9/9/22	Sun 9/18/22
50	Final SAP	10 days	Mon 9/19/22	Wed 9/28/22
51	Field Activities and Data Evaluation	91 days	Tue 10/31/23	Mon 1/29/24
52	Draft Report	147 days	Tue 1/30/24	Mon 6/24/24
53	Review Period (Navy/Base/USEPA/NCDEQ)	60 days	Tue 6/25/24	Fri 8/23/24
54	Response to Comments	14 days	Sat 8/24/24	Fri 9/6/24
55	Final Report	30 days	Sat 9/7/24	Sun 10/6/24
56	FY 2024 LTM	665 days	Mon 5/1/23	Fri 11/14/25
57	Draft SAP	70 days	Mon 5/1/23	Fri 8/4/23
58	Review Period (Navy/Base/USEPA/NCDEQ)	60 days	Mon 8/7/23	Fri 10/27/23
59	Response to Comments	10 days	Mon 10/30/23	Fri 11/10/23
60	Final SAP	10 days	Mon 11/13/23	Fri 11/24/23
61	Field Activities and Data Evaluation	66 days	Thu 10/31/24	Thu 1/30/25
62	Draft Report	102 days	Fri 1/31/25	Mon 6/23/25
63	Review Period (Navy/Base/USEPA/NCDEQ)	60 days	Tue 6/24/25	Mon 9/15/25
64	Response to Comments	14 days	Tue 9/16/25	Fri 10/3/25
65	Final Report	30 days	Mon 10/6/25	Fri 11/14/25

Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

8.1.25 Site 84 (OU 19)—Building 45

Site 84, Building 45, covers approximately 5 acres just south of North Carolina Highway 24, 1 mile west of the Main Gate (**Figure 8-35**). The property was purchased by the federal government in 1941. 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 reported 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. In 2012, portions of the site were developed with a photovoltaic farm.



Figure 8-35. IRP Site 84, OU 19

Previous investigations are listed in **Table 8-49**, and the LUC summary is presented in **Table 8-50**.

Table 8-49. Previous Investigations Summary, IRP Site 84

Previous Investigation/Action	NIRIS Document Number	Date	Activities
UST Investigation	N/A	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.
Pre-Remedial Investigation Screening Study (Baker, 1998)	002635 002636	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 in soil collected from around the lagoon, and in surface water and sediment (above 1,000 parts per billion) 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	N/A	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 but rather from other unidentified source(s), based on the long industrial operation history at Building 45.
Building 45 Removal (Baker, 1999)	004629	1999	Concrete sampling and surface soil sampling were 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.
Remedial Investigation/ Feasibility Study (Baker, 2002)	003268-003269 003024	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 removing the Building 45 foundation materials. The Final FS was completed in June 2002, which developed and screened remedial alternatives for addressing soil contamination.
Proposed Remedial Action Plan (MCB Camp Lejeune, 2002) Engineering Evaluation/ Cost Analysis (Baker, 2002)	002979 006905	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 AM proposing removal actions was developed to address sediment and soil contamination.

Table 8-49. Previous Investigations Summary, IRP Site 84

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Phase I Non-time-critical Removal Action (CH2M, 2002)	003021	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. Approximately 4,857 tons of non-hazardous PCB-contaminated soil and 142 tons of petroleum-contaminated soil were removed from the site.
Phase II Non-time-critical Removal Action (TMS Envirocon and Baker, 2005)	003728	2002-2005	Excavation and offsite disposal of contaminated soil and lagoon sediments was completed. Approximately 12,000 tons of contaminated soil/sediment were removed from the site. However, remediation goals were not met because the Phase II NTCRA uncovered additional areas of contamination.
Supplemental Investigation and Recommendations Report (Rhēa, 2006)	003955	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 milligrams per kilogram and the pipes were left in place. A confirmation groundwater sample collected during the investigation indicated no exceedances of the NCGWQS.
Phase III Non-time-critical Removal Action and Construction Closeout Report (Rhēa, 2007)	004202	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-foot-thick vegetative soil cover was placed over the PCB-contaminated soil.
Amended Feasibility Study (Rhēa, 2008) Proposed Remedial Action Plan (Rhēa, 2008) Record of Decision (Rhēa, 2009)	004142 004141 004397	2008-2009	The Amended FS was conducted to evaluate remedial alternatives for addressing PCB soil contamination; 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. In addition, because the site is located within a utility corridor, the ROD indicated that once the utility corridor lease agreements are scheduled for renewal (2026), the affected utility companies will be notified of the contaminated area and given the option to either properly excavate and dispose of PCB-contaminated soil and PCB waste soil or relocate their utilities outside of the PCB AOC.
Remedy-in-Place Remedial Action Completion Report (Rhēa, 2010)	002845	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 milligrams per kilogram 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 milligram per kilogram.

Table 8-50. Land Use Control Summary, IRP Site 84

LUC Boundary	Area (Acres)	Onslow County Registration Date
Non-Industrial Use Control Boundary (Soil)	4.6	March 19, 2010
Intrusive Activities Control Boundary (Soil)	0.55	
Access Control Boundary	0.136	

8.1.25.1 Future Activities

LUC inspections will be conducted quarterly. The utility corridor lease agreements are scheduled for renewal in 2026. At the time of the renewal, the utility contractor will be notified of the PCB-contaminated soil in the vicinity of the current utility lines and given the option to complete the soil removal and disposal or relocate the utilities outside of the area of contaminated soil.

8.1.26 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 500 acres and consists of a VOC groundwater plume that underlies an area of approximately 78 acres (**Figure 8-36**). In 1954, three 25,000-gallon 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 and removed in 1992. Between 1968 and 2001, a helicopter wash pad used nozzles embedded in the tarmac to clean aircraft at Site 86 until abandonment in 2001. The site also includes SWMU 303, SWMU 318, UST AS-510, several hangars used for aircraft maintenance, and a gas station and garage. Investigations were initially conducted under the UST program, and the original site boundary encompassed only the AST area. Based on the presence of CVOC impacts, the site was transferred to the IRP and designated as Site 86. Over time, the site has expanded to encompass the potential sources previously listed.



Figure 8-36. IRP Site 86, OU 20

Previous investigations are listed in **Table 8-51**, and the LUC summary is provided in **Table 8-52**.

Table 8-51. Previous Investigations Summary, IRP Site 86

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Site Investigation (ESE, 1990)	N/A	1990	A Preliminary Site Investigation 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.

Table 8-51. Previous Investigations Summary, IRP Site 86

Previous Investigation/Action	NIRIS Document Number	Date	Activities
UST Assessment (O'Brien & Gere, 1992)	004603	1992	Soil and groundwater sampling were 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.
Remedial Investigation (Baker, 1996)	001719 001720	1995-1996	A soil and groundwater investigation were 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 (CH2M, Baker, and CDM, 2003)	003740	1997-2003	To delineate the vertical and horizontal extent of the VOC contamination and to collect additional data to determine the appropriate remedial alternative, post-RI fieldwork 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. The plumes were not fully delineated. The results of this investigation are discussed in the Amended RI.
Long-term Monitoring (Baker, 2005)	003727 ^a	1998-2005	Groundwater LTM was conducted for VOCs, NAIPs, and metals 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, Baker, and CDM, 2003)	003740	2001-2003	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/CH2M, 2006)	003942	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 TCE groundwater plume at the site. The report concluded that TCE concentrations were reduced by 99 percent in groundwater.
Expanded Supplemental Remedial Investigation (CH2M, 2011)	004731	2007-2011	The SRI 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. An FS was recommended to evaluate remedial alternatives.

Table 8-51. Previous Investigations Summary, IRP Site 86

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Basewide Vapor Intrusion Evaluation (AGVIQ/CH2M, 2009, CH2M, 2011, 2015, and 2022)	002772 through 002777 004694 through 004698 008559 Pending Final	2007-present	<p>Site 86 was included in the phased Basewide VI evaluation, conducted from 2007-2011, to determine whether complete or significant exposure pathways exist for VI into buildings. Groundwater, soil gas, and/or air samples were collected from Buildings AS502, AS510, AS515, and AS541. VI was not identified as a significant pathway of concern for any of the buildings located in the vicinity of Site 86.</p> <p>During the VI five-year update in 2020/2021, Buildings AS515 and AS545 were identified for collection of additional VI data based on increasing groundwater VOC trends within 100 feet. Subslab soil gas, indoor air, and outdoor air samples were collected from Building AS515 and VOC analytical results and evaluation of the data suggest that the VI pathway is not currently complete and would not be expected to become complete and significant in the future, and therefore, no further investigation of the VI pathway is recommended.</p>
Pilot Study (CH2M, 2013)	007369	2011-2013	To evaluate effectiveness of technologies to treat the VOC plume, a pilot study was conducted in two separate zones at Site 86. ERD with bioaugmentation was conducted in Zone 1 and ISCO using slow-release permanganate candles was conducted in Zone 2. Follow-up monitoring indicates that in Zone 1, the TCE mass was decreased by 93 percent and the VOC mass was reduced by 81 percent. In Zone 2, initial VOC concentrations were reduced by 81 percent and subsequent monitoring results were variable. The results of the pilot study were used for the development of remedial alternatives in the FS.
Feasibility Study (CH2M, 2013)	005808	2012-2013	Remedial alternatives were developed and evaluated to address VOCs in groundwater. The five alternatives were no action, MNA and LUCs, AS with MNA and LUCs, ISCO with MNA and LUCs, and ERD with MNA and LUCs.
Proposed Remedial Action Plan (CH2M, 2014) Record of Decision (CH2M, 2014)	005857 006431	2014	A PRAP was issued in January 2014 to solicit public input on the preferred alternative (MNA and LUCs) and a public meeting was held in February 2014. General comments were addressed during the public meeting and no written comments were received. The ROD was signed on October 29, 2014. The current CSM is shown on Figure 8-37 .
Remedial Design (CH2M, 2014) Remedial Action Completion Report (CH2M, 2015)	006428 007123	2014-2015	The RD presents the design of remedy as specified by the ROD, MNA and LUCs. A RACR was completed to document the RIP.
Long-term Monitoring (CH2M, 2022)	008805	2015-present	LTM was initiated in 2015 and consists of MNA for groundwater. In 2015, LTM includes annual groundwater sampling of 27 surficial, 30 UCH, and 1 MCH aquifer monitoring wells for VOCs every 5 years for NAIPs to monitor natural attenuation. The monitoring well network is reviewed and updated annually and currently consists of 3 surficial and 5 UCH aquifer downgradient monitoring wells sampled for VOCs annually and 19 surficial and 22 UCH aquifer monitoring wells sampled for VOCs and NAIPs every 5 years.

Table 8-51. Previous Investigations Summary, IRP Site 86

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Site Inspection for PFAS Investigation in Groundwater (CH2M, 2018)	007757	2017-2018	A SI was conducted to identify the presence or absence of PFAS in groundwater resulting from historical site activities in the vicinity of Building AS502, Building AS508, Building AS3900, and Building AS3905. Groundwater samples were collected from nine existing surficial aquifer monitoring wells and analyzed for PFAS. Concentrations of PFOS and PFOA were detected in groundwater and exceeded the 2016 USEPA lifetime drinking water health advisory with the highest concentrations detected near Building AS502. The elevated concentrations of PFOS and PFOA in the groundwater indicate historical aqueous film-forming foam releases have resulted in a release of PFAS to the groundwater in the surficial aquifer. Additional investigations were recommended to evaluate the nature and extent of PFAS contamination.

^a Only the most recent LTM report NIRIS number is shown.

Table 8-52. Land Use Control Summary, IRP Site 86

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	500.9	September 23, 2015
Industrial/Non-Industrial Use Control Boundary (VI)	96.4	

8.1.26.1 Future Activities

LTM consisting of MNA for groundwater will continue (**Schedule 8-11**), and LUC inspections will be conducted quarterly.

An RI will be planned based on prioritization of findings and investigations from the Basewide PFAS PA/SI.

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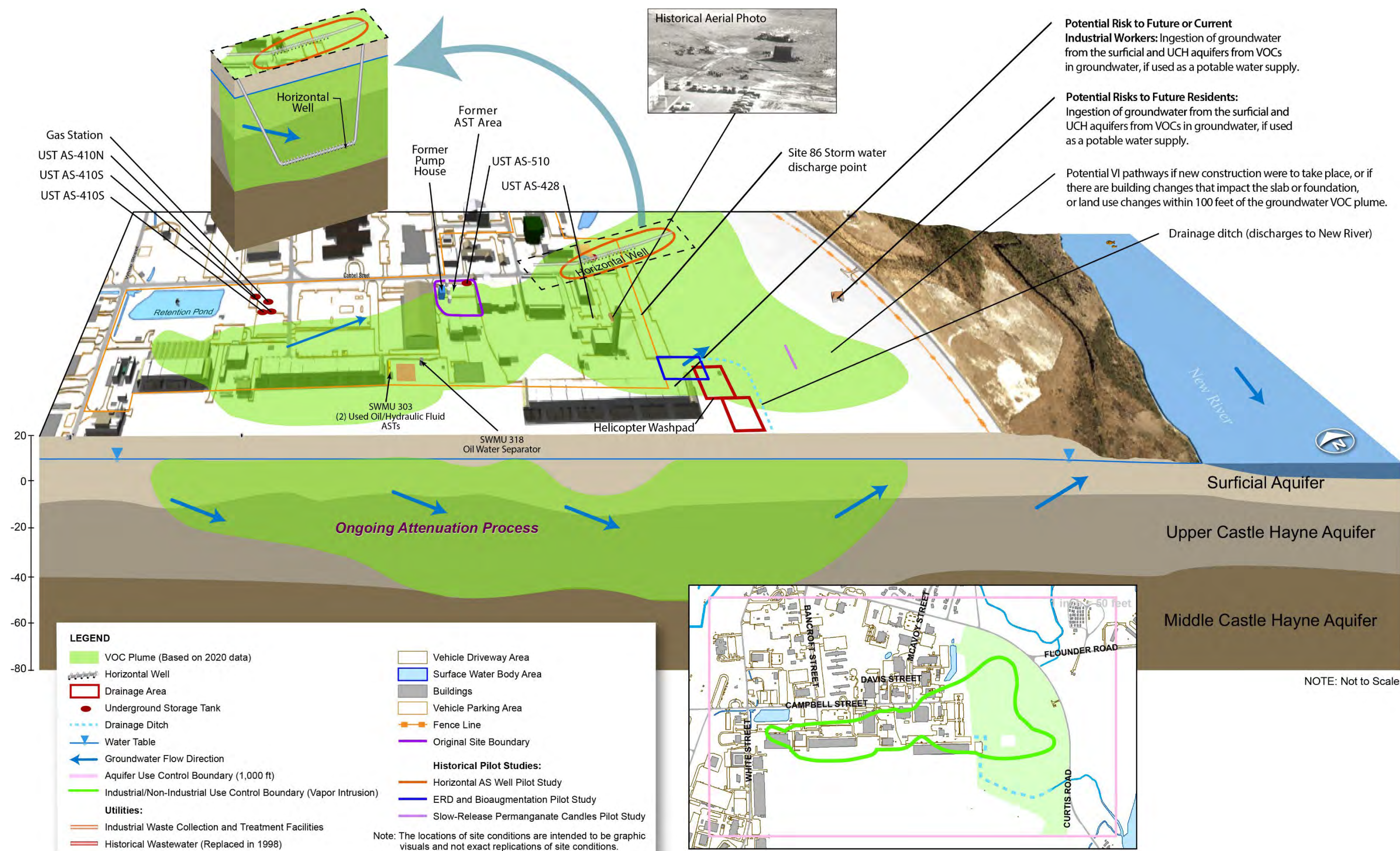
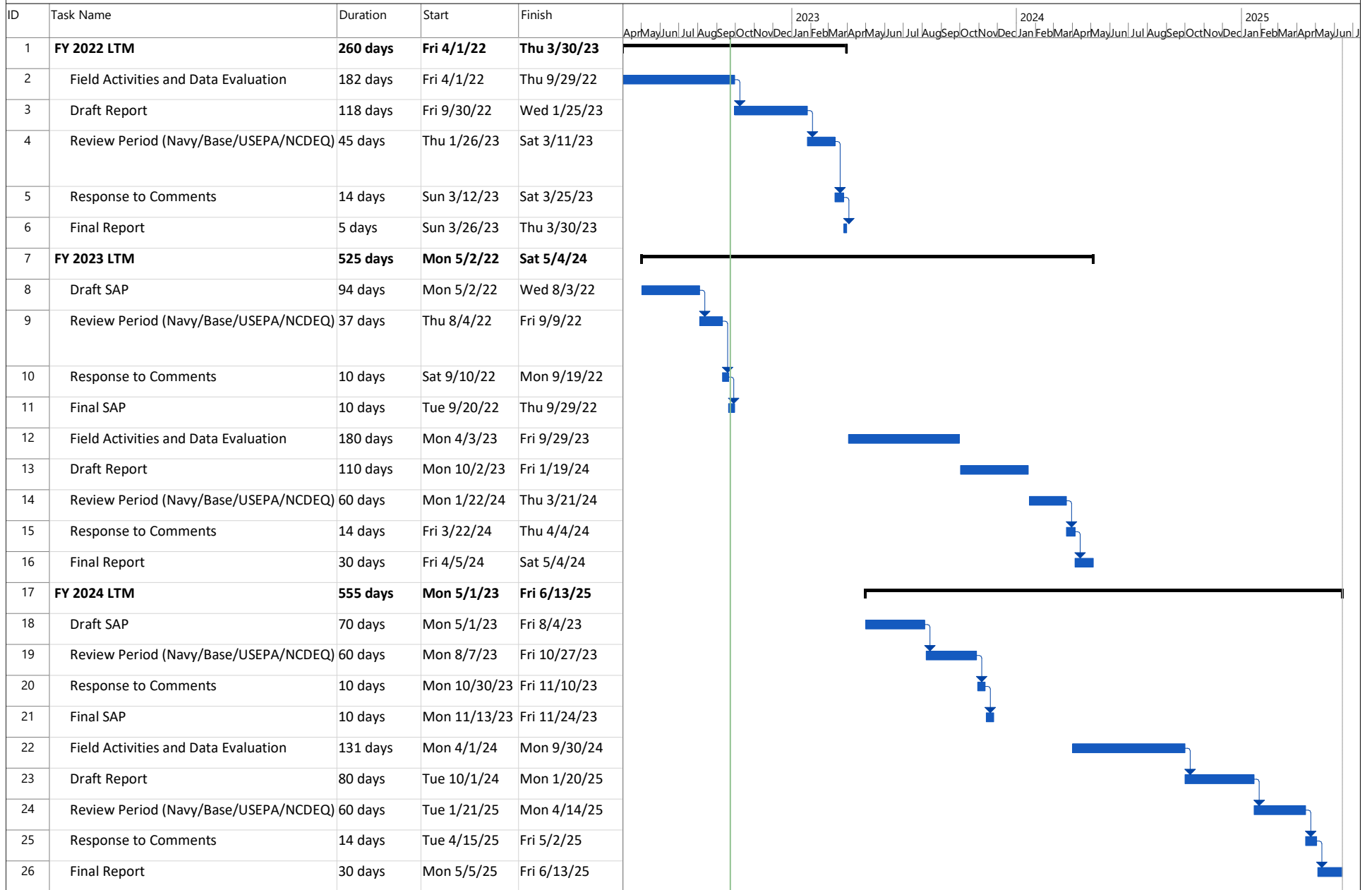


Figure 8-37. IRP Site 86 Conceptual Site Model

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Schedule 8-11
IRP Site 86
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

8.1.27 Site 89 (OU 16)—Former DRMO

Site 89, the former DRMO, covers approximately 50 acres within OU 16, which consists of two sites: Sites 89 and 93. The two sites have been grouped together because of their proximity to one another within Camp Geiger and unique characteristic of suspected waste (solvents) (**Figure 8-38**).

The Base motor pool operated on the site until 1988 and reportedly used solvents such as acetone, TCE, and 2-butanone (methyl-ethyl-ketone) for cleaning parts and equipment. A steel 550-gallon UST was used to store waste oil from 1983 until its removal in 1993. During removal, visible signs of contamination were observed, and the contaminated soil was removed until groundwater was encountered. Other structures historically located in the former UST area include Building STC-867, which was used to store hazardous soil, and a wash rack with an associated drain and OWS.

The DRMO was operated by the Defense Logistics Agency on the site until 2000. The area was used as a storage yard for items such as scrap and surplus metal, electronic equipment, vehicles, rubber tires, and fuel bladders. The former DRMO has been vacant since 2000. Currently, portions of Site 89 are used for storage and training.



Figure 8-38. IRP Site 89, OU 16

Previous investigations are listed in **Table 8-53**, and the LUC summary is presented in **Table 8-54**.

Table 8-53. Previous Investigations Summary, IRP Site 89

Previous Investigation/Action	NIRIS Document Number	Date	Activities
UST STC-868 Investigation (R.E. Wright, 1994)	000315	1994	A limited soil and groundwater investigation was conducted at UST STC-868 located within the Site 89 area. O&G 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.
Remedial Investigation (Baker, 1998)	002278 002279	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 CVOCs in groundwater and sediment.
Long-term Monitoring (Engineering and Environmental Consultants, Inc., 2005)	003778	1999-2005	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 SI.
Post-Remedial Investigation	N/A	1999	A post-RI was conducted 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 CVOCs contamination to the immediate and surrounding areas of the site. Soil sample results indicated that extremely high levels of CVOCs were affecting an extensive area within the southern portion of the site.
Low Temperature Thermal Desorption Time-critical Removal Action (CH2M, 2000)	003032	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 (CH2M, Baker, and CDM, 2001)	003956	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)	003806	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 (AGVIQ/CH2M, 2008)	004123	2006-2008	A treatability study was implemented to evaluate the performance and effectiveness of four RA, including AS using an HDD well; PRB, using mulch/compost as backfill; chemical reduction via ZVI injection through pneumatic fractures; and ERD using a combination of sodium lactate and EVO, with direct-push emplacement. While AS and ERD reduced contaminant mass for a similar cost per volume treated, AS 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 8-53. Previous Investigations Summary, IRP Site 89

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Comprehensive Remedial Investigation (CH2M, 2008)	004169	2006-2008	A Comprehensive RI was conducted to address previous data gaps. Field activities included an 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-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 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 performed to evaluate remedial alternatives.
Non-time-critical Removal Action (AGVIQ/CH2M, 2010)	002789	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 square feet at a depth of 25 feet, resulting in a total treated volume of 30,000 yd ³ . Follow-up monitoring has indicated significant reduction in VOC concentrations in the soil, groundwater, and adjacent creek.
Baseline Ecological Risk Assessment Addendum (CH2M, 2008)	004205	2008	Based on the results of the RI, additional sediment and surface soil samples were collected for PAHs and pesticides (DDD, dichlorodiphenyldichloroethene, and DDT) analysis. Results confirmed an isolated area of elevated sediment contaminant concentrations posing potential ecological risks. The Final Baseline ERA Addendum was completed to document the results and the identified isolated risk.
Engineering Evaluation/ Cost Analysis (CH2M, 2009) Non-time-critical Removal Action (CH2M, 2010)	002751 002841	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 screening criteria. Excavated soil was disposed of offsite.
Feasibility Study (CH2M, 2012)	004745	2011-2012	RAOs were developed to address VOC-contaminated groundwater in the source and downgradient areas and surface water. The remedial alternatives evaluated for the source area were no action, ERD, ISCO, and AS. Downgradient groundwater alternatives were no action, MNA, and PRB with MNA. Surface water alternatives were no action, PRB, and aerators.
Proposed Remedial Action Plan (CH2M, 2012) Record of Decision (CH2M, 2012)	004791 005526	2012	A PRAP was issued to solicit public input on the preferred alternative (including horizontal AS for source area groundwater, PRB for downgradient groundwater, and aerators for surface water). 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. The ROD was signed in December 2012.

Table 8-53. Previous Investigations Summary, IRP Site 89

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Design (CH2M, 2012)	005494	2012-2013	The RD presents the design of remedy as specified by the ROD, AS, PRBs, in-stream aeration, MNA, LTM, and LUCs. The current CSM is shown on Figure 8-39 .
Interim Remedial Action Completion Reports (Osage, 2014) (CH2M, 2014)	006408 006402	2013-2014	Remedial action activities began in March 2013. These activities included the installation of vertical and HDD AS wells in the source area, two PRBs in the downgradient area, and five in-creek aerators and baseline groundwater monitoring. The AS system was started in September 2013 and O&M reports are submitted monthly. LUCs were implemented and recorded with Onslow County in November 2013.
Basewide Vapor Intrusion Evaluation (AGVIQ/CH2M, 2009; CH2M, 2011, and CH2M, 2015)	002772 through 002777 004694 through 004698 008559	2007-2015	Site 89 was included in the phased Basewide VI evaluation, conducted from 2007-2011, to determine whether complete or significant exposure pathways exist for VI into buildings. Soil gas, and/or air samples were collected from Buildings TC860 and TC864. VI was not identified as a significant pathway of concern for any of the buildings located in the vicinity of Site 89. Additional sampling was recommended to further characterize temporal variability at Building TC864. Based on the 2013 results, the VI pathway was not currently significant when the AS system was not operating at Building TC864, but the subslab soil gas was recommended to be sampled as part of the performance monitoring and VI pathway to be considered during construction planning due to the TCE exceedance. However, in 2017 Buildings TC860 and TC864 were demolished.
Long-term Monitoring (CH2M, 2022)	Pending Final ^a	2014-present	<p>LTM was initiated in 2014 and consists of groundwater performance monitoring for AS and PRBs, MNA for groundwater outside of active treatment areas, and surface water performance monitoring for PRBs and aerators. In 2014, LTM included annual MNA sampling of 20 surficial, 12 UCH, and 4 MCH aquifer monitoring wells, and 5 surface water sample locations; quarterly AS performance sampling of 19 surficial, 15 UCH, and 1 MCH aquifer monitoring wells; quarterly PRB performance monitoring sampling of 20 surficial and 2 UCH aquifer monitoring well locations; and quarterly sampling of three surface water locations and two subslab soil gas locations within Building TC-864. The subslab soil gas monitoring has been discontinued since Building TC-864 was demolished in October 2017.</p> <p>The LTM program is reviewed and updated annually and currently consists of annual MNA sampling of 13 surficial aquifer, 19 UCH aquifer, and 6 MCH aquifer monitoring wells, and 5 surface water locations; annual AS performance sampling of 17 surficial and 16 UCH aquifer monitoring wells; annual PRB performance monitoring sampling of 20 surficial and 2 UCH aquifer monitoring well locations and semiannual PRB performance monitoring of 3 surface water locations.</p> <p>Groundwater samples are analyzed annually for VOCs and every 5 years for NAIPs to evaluate subsurface conditions for MNA of VOCs.</p>

Table 8-53. Previous Investigations Summary, IRP Site 89

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Supplemental Investigation (CH2M, 2020)	008338	2017-present	SIs were conducted between 2017 and 2022 to refine the CSM and define the nature and extent of CVOCs at concentrations indicative of DNAPL in the surficial and castle Hayne. The investigations included downhole probing, installation of groundwater monitoring wells, and collection of soil and groundwater samples for VOC analysis. Results indicate the remedy is not currently functioning as the groundwater COC plume is deeper and more widespread than conditions at the time of the ROD. The remedy will be further evaluated based on these results, and results of these investigations and recommendations will be presented in a technical memorandum.

^a Only the most recent LTM report NIRIS number is shown.

Table 8-54. Land Use Control Summary, IRP Site 89

LUC Boundary	Estimated Area	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	105.17 acres	November 28, 2013
Intrusive Activities Control Boundary (Groundwater)	29.06 acres	
Industrial/Non-Industrial Use Control Boundary (VI)	29.06 acres	
Access Control Boundary	1,600 feet of fence line	

8.1.27.1 Future Activities

LTM consisting of groundwater performance monitoring for AS and PRBs, MNA for groundwater and surface water outside of active treatment areas, and surface water performance monitoring for PRBs and aerators will continue and LUC inspections will be conducted quarterly.

The Supplemental Investigation Technical Memorandum will be submitted in FY 2023 (**Schedule 8-12**).

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<p>Schedule 8-12</p> <p>IRP Site 89</p> <p>IRP & MMRP Site Management Plan FY 2023</p> <p>MCB Camp Lejeune and MCAS New River</p>

ID	Task Name	Duration	Start	Finish																																																
1	Supplemental Investigation	225 days	Mon 3/21/22	Sun 1/29/23																																																
2	Draft Report	180 days	Mon 3/21/22	Fri 9/16/22																																																
3	Review Period (Navy/Base)	50 days	Sat 9/17/22	Sat 11/5/22																																																
4	Response to Comments	14 days	Sun 11/6/22	Sat 11/19/22																																																
5	Review Period (USEPA/NCDEQ)	50 days	Sun 11/20/22	Sun 1/8/23																																																
6	Response to Comments	14 days	Mon 1/9/23	Sun 1/22/23																																																
7	Final Report	7 days	Mon 1/23/23	Sun 1/29/23																																																
8	FY 2022 LTM	411 days	Fri 10/1/21	Sat 4/29/23																																																
9	Field Activities and Data Evaluation	363 days	Fri 10/1/21	Wed 9/28/22																																																
10	Draft Report	125 days	Thu 9/29/22	Tue 1/31/23																																																
11	Review Period (Navy/Base/USEPA/NCDEQ)	60 days	Wed 2/1/23	Sat 4/1/23																																																
12	Response to Comments	14 days	Sun 4/2/23	Sat 4/15/23																																																
13	Final Report	14 days	Sun 4/16/23	Sat 4/29/23																																																
14	FY 2023 LTM	565 days	Mon 5/2/22	Sun 6/30/24																																																
15	Draft SAP	94 days	Mon 5/2/22	Wed 8/3/22																																																
16	Review Period (Navy/Base/USEPA/NCDEQ)	37 days	Thu 8/4/22	Fri 9/9/22																																																
17	Response to Comments	10 days	Sat 9/10/22	Mon 9/19/22																																																
18	Final SAP	10 days	Tue 9/20/22	Thu 9/29/22																																																
19	Field Activities and Data Evaluation	393 days	Mon 10/3/22	Mon 10/30/23																																																
20	Draft Report	140 days	Tue 10/31/23	Mon 3/18/24																																																
21	Review Period (Navy/Base/USEPA/NCDEQ)	60 days	Tue 3/19/24	Fri 5/17/24																																																
22	Response to Comments	14 days	Sat 5/18/24	Fri 5/31/24																																																
23	Final Report	30 days	Sat 6/1/24	Sun 6/30/24																																																
24	FY 2024 LTM	596 days	Mon 5/1/23	Mon 8/11/25																																																
25	Draft SAP	70 days	Mon 5/1/23	Fri 8/4/23																																																
26	Review Period (Navy/Base/USEPA/NCDEQ)	60 days	Mon 8/7/23	Fri 10/27/23																																																
27	Response to Comments	10 days	Mon 10/30/23	Fri 11/10/23																																																
28	Final SAP	10 days	Mon 11/13/23	Fri 11/24/23																																																
29	Field Activities and Data Evaluation	284 days	Mon 10/2/23	Thu 10/31/24																																																
30	Draft Report	98 days	Fri 11/1/24	Tue 3/18/25																																																
31	Review Period (Navy/Base/USEPA/NCDEQ)	60 days	Wed 3/19/25	Tue 6/10/25																																																
32	Response to Comments	14 days	Wed 6/11/25	Mon 6/30/25																																																
33	Final Report	30 days	Tue 7/1/25	Mon 8/11/25																																																

Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

8.1.28 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 8-40**). 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 mostly industrial with the potential for residential use. Historical records indicate that a 550-gallon UST storing waste oil was previously located on Site 93, off the southwestern corner of Building TC-942. The UST was closed by removal in December 1993, and a Notice of Residual Petroleum is in place for lead in groundwater.



Figure 8-40. IRP Site 93, OU 16

Previous investigations are listed in **Table 8-55**, and the LUC summary is presented in **Table 8-56**.

Table 8-55. Previous Investigations Summary, IRP Site 93

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Geotechnical Investigation (R.E. Wright, 1996)	N/A	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 O&G and halogenated solvents. Groundwater samples were analyzed for VOCs, SVOCs and metals. O&G, naphthalene, and PCE were detected in soil samples. CVOCs, SVOCs, and metals were detected in groundwater samples.

Table 8-55. Previous Investigations Summary, IRP Site 93

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation (Baker, 1998)	002278 002279	1996-1998	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 CVOC contamination concentrated in the surficial aquifer within the 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.
Natural Attenuation Evaluation	N/A	2001	In 2001, a preliminary NAE was conducted to determine whether natural site conditions would encourage the natural attenuation process of degrading CVOCs. 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)	003694	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 (CH2M, 2005)	003817	2004-2005	An SSI was conducted to evaluate 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 to complete the horizontal and vertical delineation of the shallow groundwater contamination.
Feasibility Study (CH2M, 2005)	003817	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 VC).
Proposed Remedial Action Plan (CH2M, 2006) Record of Decision (CH2M, 2006)	003818 003952	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 Site 93 ROD was signed in October 2006.
Remedy-in-Place and Interim Remedial Action Completion Report (Shaw, 2009)	007365	2006-present	Phased ISCO injections were conducted from 2006 through 2008. After reviewing the baseline and follow-up data, it was determined that additional ISCO injections would not be cost effective and the quarterly monitoring of the groundwater would continue to verify achievement of the 90 percent reduction in COC concentrations through natural attenuation. 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. A CSM for IRP Site 93 is shown on Figure 8-41 .

Table 8-55. Previous Investigations Summary, IRP Site 93

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Long-Term Monitoring (CH2M, 2022)	Pending Final ^a	2008-present	LTM was initiated in 2008 and consists of MNA for groundwater and performance monitoring for SBGRs. Initially LTM consisted of quarterly sampling of 11 surficial, 5 UCH, and 1 MCH aquifer monitoring wells for VOCs, and every 5 years for NAIPs to evaluate MNA of VOCs. The LTM program is reviewed and updated annually and currently consists of annual sampling of 10 surficial aquifer monitoring wells for VOCs, and every 5 years for NAIPs to evaluate MNA of VOCs, semiannual sampling of 1 surficial monitoring well, 4 surficial extraction wells, and 3 surficial aquifer piezometer wells for VOCs and NAIPs to evaluate the effectiveness of SBGRs.
Meeting Minutes (CH2M, 2013)	005854	2013	MILCON was planned for utilities and soil borings in the western area of the intrusive activities (groundwater) LUC boundary at Site 93. Based on changes in CVOC concentrations over time (decreasing concentrations of PCE and TCE and increasing concentrations of breakdown products), construction worker risks were reevaluated using the maximum CVOC concentrations detected in groundwater collected during the FY 2013 LTM. No unacceptable human health risks were identified based on construction worker exposure to groundwater. Based on these results, the Partnering Team concurred that the proposed MILCON could proceed with no environmental controls related to the IRP site, unless evidence of previously unknown contamination was discovered.
Land Use Control Implementation Plan (CH2M, 2014)	006389	2013-2014	<p>The LUCIP details how the existing LUCs established in 2009 were modified based on the recommendations from the Basewide VI Evaluation and the results of the HHRS update. Based on those recommendations, the following LUC updates were registered with Onslow County in October 2014:</p> <ul style="list-style-type: none"> • Update the intrusive activities control boundary (groundwater) to be within 100 feet of the current groundwater plume. • Institute a LUC to evaluate VI pathways based on future changes in building and/or land use within 100 feet of the current groundwater plume. • Update the aquifer use control boundary to be within 1,000 feet of the current groundwater CVOC plume.
Basewide Vapor Intrusion Evaluation (AGVIQ/CH2M, 2009, and CH2M, 2015)	002772 through 002777 004694 through 004698	2007-2015	Site 93 was included in the phased Basewide VI evaluation, conducted from 2007-2011, to determine whether complete or significant exposure pathways exist for VI into buildings. Groundwater and soil gas samples were collected from Building G930. Building TC942 was unoccupied at the time; however, the building was later confirmed to be occupied. Therefore, subslab soil gas sampling was conducted in 2013 and a second round was recommended to evaluate temporal variability. The second round of two subslab soil gas probes were sampled in January 2015. There were no constituents detected in subslab soil gas at concentrations above the North Carolina Non-Residential Vapor Intrusion Screening Levels for subslab soil gas in either 2013 or 2015, and the analytical results indicated low temporal variability. Based on these results, the VI pathway is not currently complete and is unlikely to become complete and significant in the future. No additional sampling was recommended at Building TC942.

Table 8-55. Previous Investigations Summary, IRP Site 93

Previous Investigation/Action	NIRIS Document Number	Date	Activities
SBGR Pilot Study (CH2M, 2018 and CH2M, 2020)	007487 008325	2015-2021	<p>To reduce the time to site closure, a pilot study was initiated in 2015 to assess the effectiveness of using a SBGR to facilitate ERD of VOCs in the surficial aquifer. The SBGR began operation in December 2016, and results showed decreasing trends of parent products and increasing daughter products indicating that the SBGR had created conditions within its zone of influence conducive to reductive dechlorination.</p> <p>The SBGR was replenished with EVO and commercial dechlorinating bacteria in August 2018. Results indicated that VOC concentrations within the SBGR had decreased significantly except for VC, which remained at concentrations above its cleanup level. Based on these results, an expansion of the solar-powered SBGR and extraction well network was implemented in July 2020 and began operation in October 2020 to evaluate the potential to use ERD to further reduce VC concentrations in the surficial aquifer. Performance monitoring conducted in 2021 indicated that reductive dechlorination is occurring in the original and expanded SBGRs. Replenishment of the original SBGR with EVO was initiated in June 2022. Performance monitoring results will continue to be presented in LTM reports.</p>

^a Only the most recent LTM report NIRIS number is shown.

Table 8-56. Land Use Control Summary, IRP Site 93

LUC Boundary	Area (Acres)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	114.76	October 15, 2014
Intrusive Activities Control Boundary (Groundwater)	8.63	
Industrial/Non-Industrial Use Control Boundary (VI)	8.63	

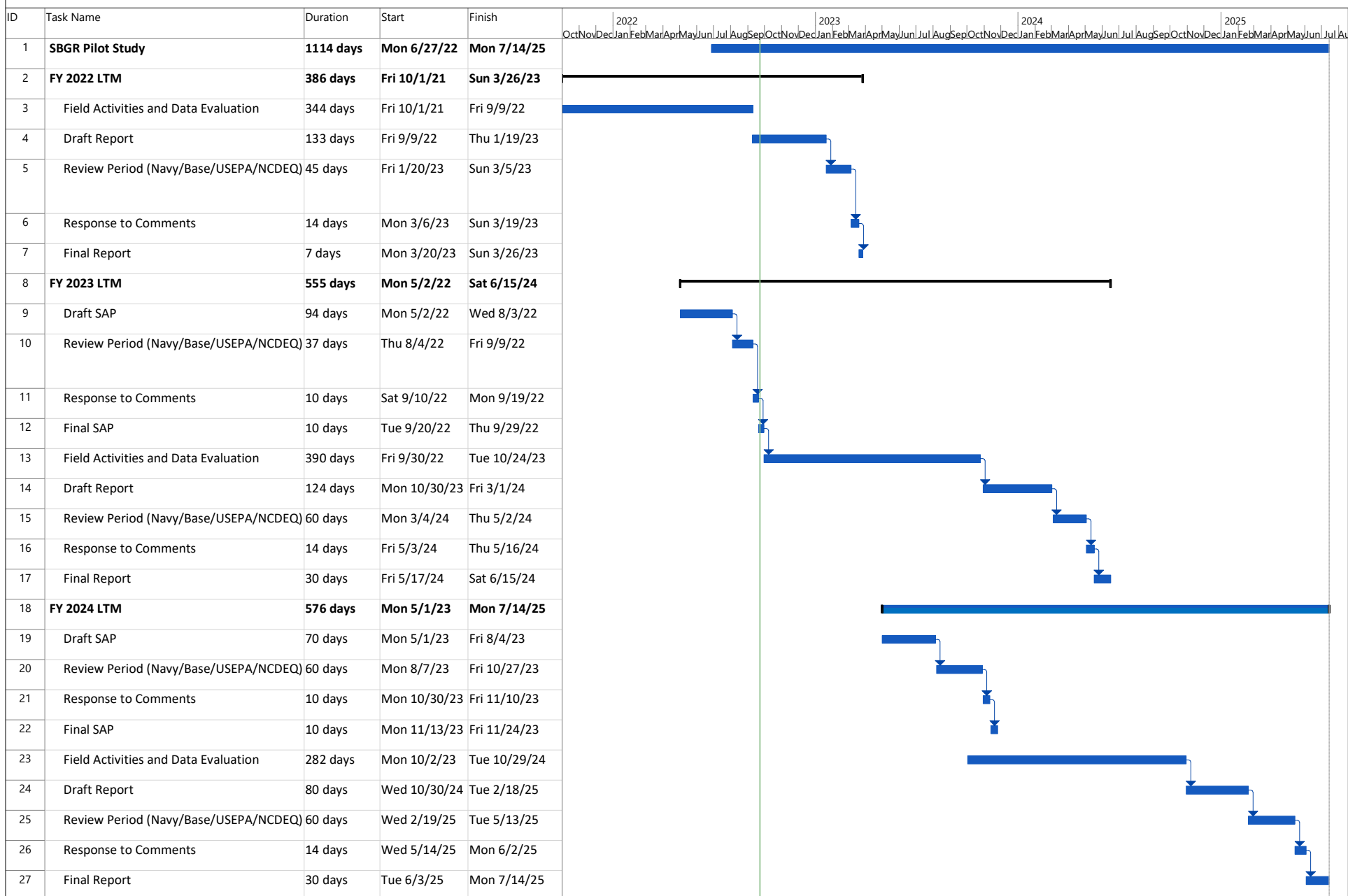
8.1.28.1 Future Activities

LTM consisting of MNA for groundwater and groundwater performance monitoring for SBGRs will continue (**Schedule 8-13**) and LUC inspections will be conducted quarterly.

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Schedule 8-13
IRP Site 93
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River



Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

8.2 MMRP RIP Sites

8.2.1 UXO-06 (OU 24)—Fortified Beach Assault Area (ASR #2.65)

Site UXO-06, the Fortified Beach Assault Area, encompasses approximately 366 acres on the Mainside of MCB Camp Lejeune, south of McHugh Boulevard and west of Sneads Ferry Road (**Figure 8-42**). This range was reportedly in use from 1953 until approximately 1977. The types of munitions used onsite include blank small arms, demolitions, flame throwers, 3.5-inch practice rockets, practice rifle grenades, and smoke and white phosphorus hand grenades. In addition, solvents and solutions were used at the site to clean equipment. The east-central portion of Site UXO-06 has been investigated and cleared and was most recently being used as a borrow pit to support construction projects across the Base. The borrow pit is currently closed (as of July 1, 2017) and in the reclamation process, as required by the State-approved Reclamation Plan.

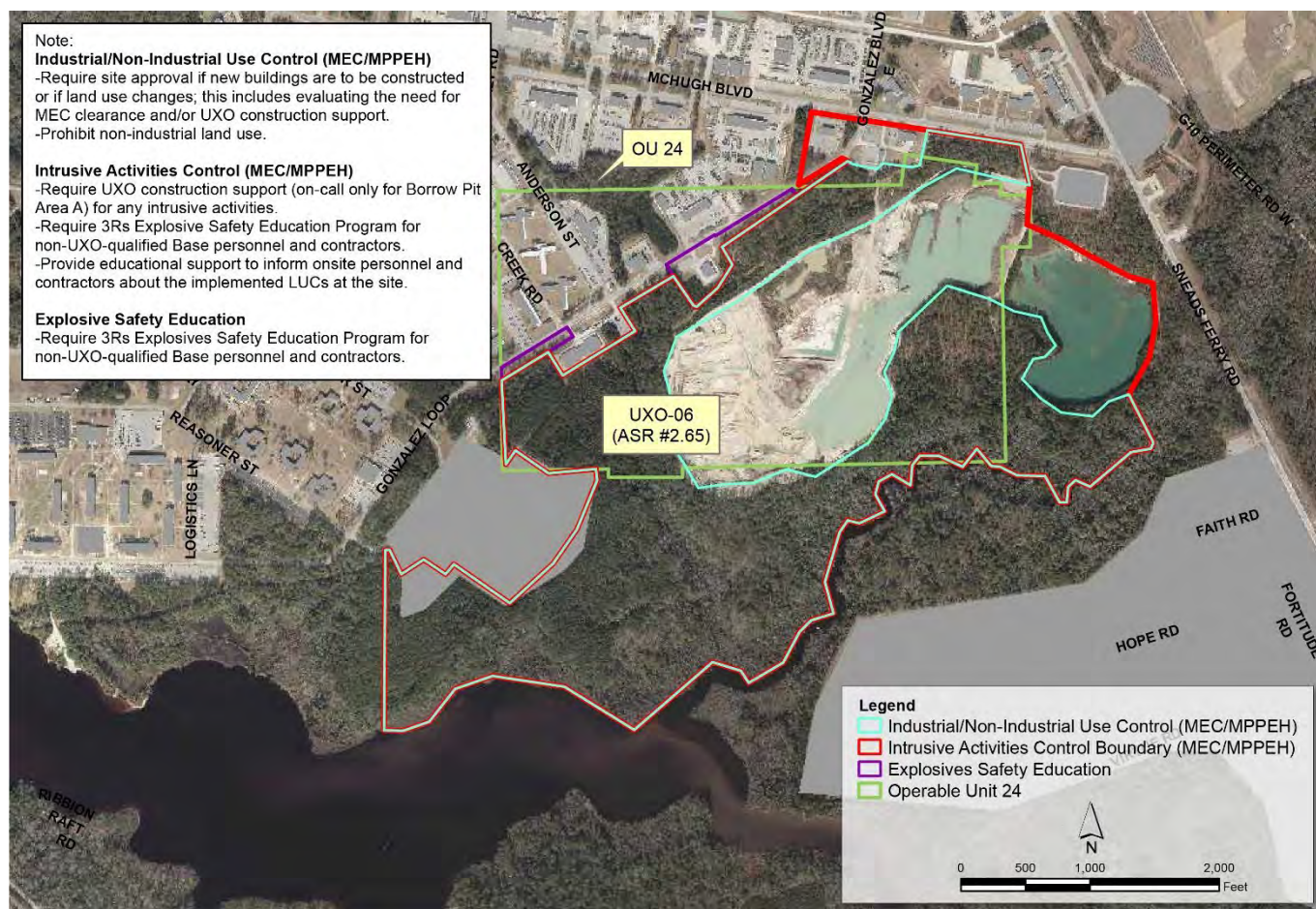


Figure 8-42. MMRP Site UXO-06 (OU 24), ASR #2.65

Previous investigations are listed in **Table 8-57**, and the LUC summary is presented in **Table 8-58**.

Table 8-57. Previous Investigations Summary, MMRP Site UXO-06, ASR #2.65

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Site Investigation MILCON Area (CH2M, 2007)	006698	2006-2007	In support of MILCON activities for an armory and extended parking area, soil and groundwater sampling, and 100 percent DGM were conducted in a 4-acre area at UXO-06. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, explosives residues, 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 percent assurance that all MEC items have been removed from the site, Explosives Safety Education Program was provided for protection of construction workers.
Focused Preliminary Assessment/Site Investigation (Arcadis, 2007)	006700	2007	To evaluate the presence of UXO and contaminated soil or groundwater within a proposed sewer line easement, the Onslow Water and Sewer Authority 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 residues, 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, except for two practice 3.5-inch rockets and one expended smoke rifle grenade, were construction/cultural debris.
Preliminary Assessment/Site Investigation (CH2M, 2012)	004746	2008-2012	A sitewide 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 percent DGM and intrusive anomaly investigation. The samples were analyzed for VOCs, SVOCs, pesticides, explosives residues, TPH, perchlorate, and metals and no unacceptable human health or ecological risks were identified from exposure to environmental media. MPPEH was found on the ground surface and in burial pits and there is potential for MEC/MPPEH to remain in the surface and subsurface at the site. An RI was recommended to further evaluate the potential for subsurface MEC in uninvestigated and undeveloped areas within the site and along the site boundaries.
Focused Site Inspections (CH2M, 2010, 2011, 2012)	005413 004411 005466	2010-2012	A Focused SI was conducted at the UXO-06 Borrow Pit Expansion Area in a phased approach. Field activities included 100 percent DGM and intrusive investigations. A total of 10,250 geophysical anomalies were investigated, 15 MEC items were identified and destroyed through controlled detonations, and more than 2,000 MPPEH items were identified. Based on the clearance activities, the borrow pit was recommended to be opened for excavation in January 2012. The intrusive investigation significantly reduced the risk of encountering subsurface MEC. However, because it is not possible to provide 100 percent assurance that all MEC items have been removed from the site, Explosives Safety Education Program was recommended for protection of site operators. On-call support from Base Explosive Ordnance Disposal (EOD) or a qualified UXO contractor for inspection and disposal of suspected MEC that may be unearthed was also recommended.

Table 8-57. Previous Investigations Summary, MMRP Site UXO-06, ASR #2.65

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation (CH2M, 2015)	006483	2012-2015	An RI was conducted to further evaluate the nature and extent of subsurface MEC in uninvestigated and undeveloped areas within the site and in areas adjacent to UXO-06 boundaries. Field activities included DGM, an intrusive investigation, and post-detonation soil sampling. Approximately 3,300 anomalies and 190 MPPEH items were discovered. MPPEH was demilitarized onsite and classified as MDAS. Post-detonation soil sampling results did not indicate any unacceptable human health or ecological risks due to exposure to soil within the area of the controlled detonation. HHRAs and ERAs previously conducted at UXO-06 were reviewed and updated for the RI. There were no impacts to environmental media from MEC/MPPEH and no unacceptable risks to human or ecological receptors identified from exposure to MC in site media. Based on the results of the RI, an FS was recommended to develop remedial alternatives to address potential threats from any MEC that remains at the site.
Feasibility Study (CH2M, 2016)	007113	2016	Remedial alternatives were evaluated to address MEC and MPPEH that may be present. The alternatives evaluated were no action, LUCs, surface clearance and LUCs, surface and subsurface clearance through removal of discrete anomalies and LUCs, and surface and subsurface clearance through excavation and soil screening and LUCs.
Proposed Plan (CH2M, 2017) Record of Decision (CH2M, 2018)	007180 007589	2017-2018	A Proposed Plan was issued to solicit public input on the preferred alternative of surface MEC clearance and LUCs, and a public meeting was held. General comments for informational purposes were addressed during the public meeting and no written comments were received. A ROD was issued to document the selected remedy as surface MEC clearance and LUCs, and was signed April 30, 2018.
Remedial Design (CH2M, 2018)	007669	2018-2019	The RD presented the implementation actions for the selected remedy for controlling explosive hazards from MEC and MPPEH. The selected remedy consisted of a surface MEC clearance to reduce or prevent the potential for direct physical contact with MEC/MPPEH on the surface where it is most likely to be encountered and includes an instrument-aided visual inspection of the ground surface with removal of metallic objects; and LUCs to include installation of warning signs, implementation of educational programs, and administrative/legal controls.
Remedial Action Completion Report (CH2M, 2019)	008257	2019-2020	A RACR was prepared to document the completion of the surface MEC clearance, installation of 15 warning signs, and recordation of LUCs, all completed in 2019. The RACR was signed on February 27, 2020.

Table 8-58. Land Use Control Summary, MMRP Site UXO-06, ASR #2.65

LUC Boundary	Area (Acres)	Onslow County Registration Date
Intrusive Activities Control Boundary (MEC/MPPEH)	323.69	September 26, 2019
Industrial/Non-Industrial Use Control (MEC/MPPEH)	199.32	
Explosives Safety Education Program	5.38	

8.2.1.1 Future Activities

LUC inspections will be conducted quarterly.

8.2.2 UXO-19 (OU 25)—M-4, Rifle Grenade Range (ASR #2.104), K-22 Practice Hand Grenade Course (ASR #2.111), and M-115 Hand Grenade Range (ASR #2.168) (Camp Devil Dog Historical Ranges)

Site UXO-19, Camp Devil Dog Historical Ranges, is located within the Camp Devil Dog training area. The site initially covered approximately 80 acres; however, a 22-acre area in the eastern portion of the initial site boundary is currently active and used as a training facility. The current Site UXO-19 boundary, excluding the training facility, covers approximately 64 acres, as shown on **Figure 8-43**. There are eight overlapping ranges within UXO-19 boundaries, three of which were identified for closure under the MMRP. 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 phosphorus 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. Facilities included a bunker and foxhole. The M-115 Hand Grenade Range (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 8-43. MMRP Site UXO-19 (OU 25), ASR #2.104, #2.111, and #2.168

Previous investigations are listed in **Table 8-59**, and the LUC summary is presented in **Table 8-60**.

Table 8-59. Previous Investigations Summary, MMRP Site UXO-19, ASR #2.104, #2.111, and #2.168

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Preliminary Assessment/Site Investigation (CH2M, 2010)	002885	2010	In support of MILCON activities in the vicinity of the former grenade ranges, soil and groundwater sampling, 10 percent DGM of the former range area, 100 percent DGM of the MILCON footprint, and an intrusive MEC investigation were initiated in FY 2009. Samples were analyzed for explosives residues, 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 onsite, and other MEC items were discovered and removed.
Remedial Investigation/ Feasibility Study (CH2M, 2014)	005876	2011-2014	<p>Field activities were conducted in support of MILCON from 2011 to 2013 and included 100 percent DGM and intrusive in the undeveloped areas of the site. Approximately 47,000 geophysical anomalies and 24 saturated responses areas were identified for intrusive investigation. Approximately 450 MEC items were identified and destroyed through controlled detonations, and more than 50,000 MPPEH items were identified.</p> <p>Soil and/or groundwater samples were collected following controlled detonation and within a battery burn pit that was discovered on site. Soil results were above screening criteria in two of the detonation locations and within the burn pit. Soil investigation-derived waste was excavated from these locations; confirmation samples were collected; and no unacceptable human health risks remained.</p> <p>Based on the previous investigation activities, no unacceptable risks to human health or ecological receptors were expected from exposure to MC in site media. Potential hazards were associated with exposure to MEC present within developed areas during intrusive activities at any depth and within the undeveloped areas at depths greater than 2 feet bgs. To address these hazards, remedial alternatives evaluated included no action, LUCs, subsurface removal of MEC in undeveloped areas (via excavation, DGM, and intrusive investigation) and LUCs, and subsurface removal of MEC (via excavation and sifting) and LUCs.</p>
Proposed Plan (CH2M, 2015) Record of Decision (CH2M, 2015)	006423 006839	2015	A Proposed Plan was issued to solicit public input on the preferred alternative (LUCs) and a public meeting was held. General comments for informational purposes were addressed during the public meeting and no written comments were received. The ROD presented LUCs as the selected remedy and was signed on December 9, 2015.
Remedial Design (CH2M, 2016)	006878	2016	The RD presents the details of the LUCs to be protective of military personnel and site workers, including warning signs which were installed in October 2017 around the perimeter of the site to provide notification about potential munitions hazards, Explosives Safety Education Program, and digging restrictions in areas where munitions may be present below the ground surface.
Remedial Action Completion Report (CH2M, 2018)	007804	2018	A RACR was prepared to document the recordation of LUCs. The RACR was signed on October 5, 2018.

Table 8-60. Land Use Control Summary, MMRP Site UXO-19

LUC Boundary	Estimated Area (Acres)	Onslow County Registration Date
Intrusive Activities Control (MEC) in Developed/Inaccessible Areas	22	September 30, 2016
Intrusive Activities Control (MEC) in Undeveloped Areas	43	

8.2.2.1 Future Activities

LUC inspections will be conducted quarterly.

8.2.3 UXO-22 (OU 2)—Sites 6 and 82

Site UXO-22 covers approximately 112 acres between Holcomb Boulevard and Piney Green Road on the Mainside of the Base (**Figure 8-44**). OU 2 consists of four sites (Sites 6, 9, and 82, and UXO-22) that are grouped together because of their proximity to one another. UXO-22 encompasses portions of IRP Sites 6 and 82 where MEC and MPPEH have been previously found collocated with waste disposal areas. No former range activities are known to have occurred at the site. Current land uses at Site UXO-22 are industrial and commercial and consist of operation of the Base truck scales, equipment staging areas, parking lots, and a groundwater remediation system for Site 82.



Figure 8-44. MMRP Site UXO-22

Previous investigations are listed in **Table 8-61**, and the LUC summary is presented in **Table 8-62**.

Table 8-61. Previous Investigations Summary, MMRP Site UXO-22

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2013)	005724	2011-2013	<p>A field investigation was conducted to evaluate the presence and nature of MC contamination. Field activities included soil and groundwater sampling for explosives residues and metals. Explosives residues and metals were detected in exceedance of screening criteria in subsurface soil, sediment, and groundwater samples.</p> <p>Potential human health and ecological risks were identified from exposure to metals in soil, including surface soil in the ephemeral drainage. The metals exceedances are likely associated with the long-term use as a historical storage and waste disposal area rather than with the presence of MPPEH and MEC. Therefore, it was recommended that metals in soil be addressed as part of IRP Sites 6 and 82.</p> <p>Potential explosive hazards were identified based on the MEC and MPPEH found onsite during previous IRP investigations. An RI was recommended to further characterize the nature and extent of MEC. In addition, a MEC surface clearance was recommended to minimize explosive risks from unintentional detonations, especially in the wooded areas and in the former DRMO area.</p>
Expanded Site Investigation (CH2M, 2016)	007088	2013-2016	<p>An ESI was conducted to further investigate the presence and nature of MEC and MPPEH and to evaluate the extent of the battery disposal area identified during the PA/SI. Field activities included DGM, an intrusive investigation, test pitting and collection of soil samples from the battery disposal area within the ephemeral drainage, and surface clearing and soil sifting within a portion of the former DRMO. MEC and MPPEH items (which were all classified as MDAS upon proper inspection) were encountered on the surface and in the subsurface within the extent of the historical waste disposal areas with no apparent pattern of distribution. The potential for human contact with MEC/MPPEH was reduced by the surface clearance and soil sifting activities. The extent of batteries on the southern side of the ephemeral drainage was delineated, and the potential risk to receptors from metals was mitigated by removing exposed batteries and covering the test pit excavation area with clean fill. It was recommended that Site UXO-22 be managed as part of OU 2 and the LUCs for OU 2 be updated to include control of intrusive activities due to the potential of encountering MEC.</p>
Explanation of Significant Difference (CH2M, 2017)	007229	2017	<p>The ESD was submitted in 2017 to update the RAOs for OU 2 to include the addition of an industrial/non-industrial use control boundary and an intrusive activities control boundary to prevent potential explosive hazards resulting from MEC/MPPEH associated with MMRP Site UXO-22.</p>
Land Use Control Implementation Plan Update (CH2M, 2019)	008082	2019	<p>A LUCIP was prepared to document updates to current LUCs for OU 2. The aquifer use control and the intrusive activities control for groundwater boundaries will be updated to reflect the current extent of COCs. An intrusive activities control boundary for MEC/MPPEH, an industrial/non-industrial use control boundary for MEC/MPPEH, and an industrial/non-industrial use control boundary for VI will be added.</p> <p>The intrusive activities control and non-industrial use control boundaries for soil will remain unchanged.</p>

Table 8-62. Land Use Control Summary, MMRP Site UXO-22

LUC Boundary	Area (Acres)	Onslow County Registration Date
Intrusive Activities Control (MEC/MPPEH)	112.12	April 16, 2019
Industrial/Non-Industrial Use Control Boundary (MEC/MPPEH)	112.12	

8.2.3.1 Future Activities

Site UXO-22 will be managed as part of OU 2, and LUC inspections will be conducted quarterly.

8.2.4 UXO-24 (OU 26)—Camp Geiger Area

Site UXO-24 covers approximately 9 acres of mostly wooded land east of G Street in the Camp Geiger area of the Base (**Figure 8-45**). Prior to the 1950s, the site was completely wooded. Between 1950 and 1951, the site was used as a surface dump for items such as wood, tires, and scrap metal (Osage, 2011). During the late 1950s, the site was partially cleared for the construction of a carpenter shop, lumber rack, and paint shop in the northern portion of the site. Buried DMM were discovered at UXO-24 in 2010. A limited visual site inspection or site investigation conducted by Base EOD personnel found additional DMM and MPPEH in the area surveyed. Because Site UXO-24 also encompasses the majority of Site 37 (**Section 8.3.17**), the two sites were investigated simultaneously.



Figure 8-45. MMRP Site UXO-24

Previous investigations are listed in **Table 8-63**, and the LUC summary is presented in **Table 8-64**.

Table 8-63. Previous Investigations Summary, MMRP UXO-24

Previous Investigation/Action	NIRIS Document Number	Date	Activities
UXO-24 and Site 37 Preliminary Assessment/Site Investigation (CH2M, 2014)	006830	2013-2014	In 2013, a PA/SI was initiated to evaluate the nature and extent of potential MEC and MPPEH at UXO-24 and to evaluate the potential risk from pesticides and herbicides identified during the Site 37 Confirmatory Site Assessment (described in Section 8.3.17). At UXO-24, field activities included DGM and an intrusive investigation. Approximately 1,500 anomalies were identified during DGM, and intrusive investigation of 989 of the anomalies resulted in the discovery of 14 MEC items, consisting of 2 40-mm high explosive projectiles, 1 40-mm projectile, and 11 fuses. During the MEC investigation activities, buried waste was identified. The PA/SI recommended an ESI to delineate the nature and extent of the waste disposal area.

Table 8-63. Previous Investigations Summary, MMRP UXO-24

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Draft Expanded Site Investigation (CH2M, 2017)	N/A	2017	An ESI was conducted in 2017 to further investigate the nature and extent of the surface and buried debris and assess the potential environmental impacts and risks to human health and the environment from historical waste disposal activities. Field activities included a site walk, DGM, test pitting, and soil sampling. All samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. Surface and buried waste, including construction and demolition related debris, were identified across the site. There were no significant impacts to environmental media from the historical waste disposal activities and there were no unacceptable risks to human health or the environment identified from exposure to environmental media. No MEC or MPPEH was found during the ESI. NFA was recommended. However, because of uncertainties regarding the potential presence of MEC/MPPEH, following regulatory review of the draft ESI report, a LUC was recommended for Explosives Safety Education Program and a RI/FS was prepared.
Remedial Investigation/ Feasibility Study (CH2M, 2019)	007795	2018-2019	<p>The RI/FS was prepared to present the findings of the ESI, including the nature and extent of surface and buried debris, assimilate environmental data collected to date, evaluate the potential risks to human health and the environment, develop RAOs, and identify and evaluate remedial alternatives to mitigate potential unacceptable explosive hazards. The RI/FS concluded that the waste disposal area is widespread and diffuse across the site and waste extended from the surface to a maximum depth of 5 feet bgs. Although there were exceedances of screening criteria in surface and subsurface soil and historical groundwater, exceedances appeared isolated and unrelated to historical waste disposal and no unacceptable risks to human health or the environment were identified. Based on depth limitations of the PA/SI and because not all anomalies outside the 2-acre wooded area immediately adjacent to Building TC611 were 100 percent investigated, there is a potential level of uncertainty remaining regarding risk of encountering MEC/MPPEH.</p> <p>Three remedial alternatives were evaluated in the FS to meet the RAO for UXO-24, which is to reduce or prevent the potential for direct physical contact with MEC/MPPEH within the site boundary. The alternatives were as follows:</p> <ul style="list-style-type: none"> • No Action • LUCs • Surface and Subsurface MEC/MPPEH Removal
Proposed Plan (CH2M, 2019) Record of Decision (CH2M, 2019)	007791 008085	2019	A Proposed Plan was prepared to solicit public input on the preferred alternative (LUCs) and a public meeting was held. General comments for informational purposes were addressed during the public meeting. The ROD presented LUCs as the selected remedy and was signed on September 30, 2019.
Remedial Design (CH2M, 2019)	008321	2019	The RD presented the details of the LUCs, which consists of Explosives Safety Education training and administrative and legal control requirements to access the site.
Remedial Action Completion Report (CH2M, 2019)	008631	2019-2020	A RACR was prepared to document the recordation of LUCs. The RACR was signed on January 27, 2020.

Table 8-64. Land Use Control Summary, MMRP Site UXO-24

LUC Boundary	Area (Acres)	Onslow County Registration Date
Explosives Safety Education Program	4.06	September 26, 2019

8.2.4.1 Future Activities

LUC inspections will be conducted quarterly.

8.3 IRP RC Sites

8.3.1 Montford Point Buildings M119 and M315

The Montford Point PA site encompasses less than 0.5 acre and includes Buildings M119 and M315, located in the Montford Point portion of the Base (**Figure 8-46**). Building M119 was constructed in 1943 as a gun shed, most likely storing howitzers. Over the years, the building has been renovated and used as a classroom and vehicle repair shop. Several fuel oil tanks 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 indicate past dry cleaning operations. Rather, the building was used as a laundry pickup facility until the 1980s.



Figure 8-46. Montford Point (Buildings M119 and M315)

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

Table 8-65. Previous Investigations Summary, Montford Point (Buildings M119 and M315)

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2006)	006413	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.
Expanded Site Investigation (CH2M, 2010)	002795	2010	The ESI was conducted to confirm the results of the PA/SI and document the basis for recommendation of NFA where appropriate. Upon further review by the Partnering Team in 2009, it was concluded that the isolated detections of iron and lead in groundwater did not warrant additional investigation.
No Action Decision Document (CH2M, 2010)	007159	2010	An NADD was finalized in 2010 to document NFA.

8.3.2 MCAS New River Buildings SAS113, AS116, and AS119

The MCAS New River site encompasses less than 0.5 acre and includes Buildings SAS113, AS116, and AS119, located in the northwestern portion of the Base (**Figure 8-47**). Building SAS113 is 100 feet west of Bancroft Street 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 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.

Building AS119 is a single-story metal frame building located approximately 200 feet 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, several 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.



Figure 8-47. MCAS New River Buildings SAS113, AS116, and AS119

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

Table 8-66. Previous Investigations Summary, MCAS New River Buildings SAS113, AS116, and AS119

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2006)	006413	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, 2010)	002795	2009-2010	The ESI 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 ESI concluded that NFA was necessary. In 2009, the IRP Partnering Team concurred with this conclusion.
No Action Decision Document (CH2M, 2010)	007159	2010	An NADD was finalized in 2010 to document NFA.

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

The HPIA site encompasses less than 0.5 acre and includes Buildings 1120, 1409, and 1512, located in the HPIA. Building 1120 is between Hammond Road, Birch Street, and Ash Street (**Figure 8-48**). It was constructed as an automobile hobby shop in 1955, with additions to the building constructed in 1964 and 1969. Building 1120 has historically been used for auto body repair and painting.

Building 1409 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 1409 has been used as a classroom, Public Works storage, and furniture repair shop.

Building 1512 was historically located between Buildings 1504 and 1503 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 1512 is no longer present. The date of demolition is unknown.

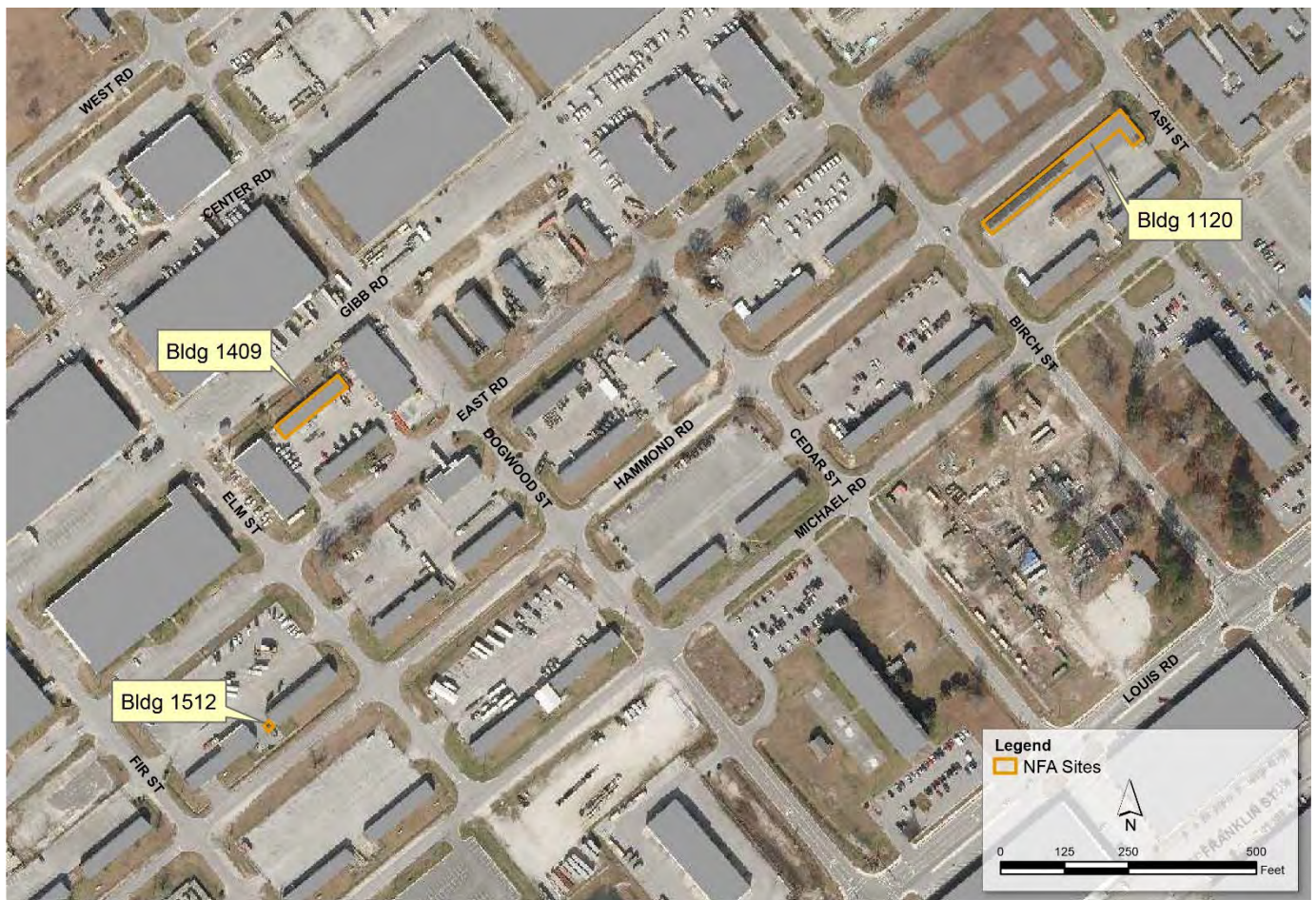


Figure 8-48. Hadnot Point Industrial Area (Buildings 1120, 1409, and 1512)

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

Table 8-67. Previous Investigations Summary, Hadnot Point Industrial Area (Buildings 1120, 1409, and 1512)

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2006)	006413	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 (CH2M, 2002).

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

Site 1, the French Creek Liquids Disposal Area, covers approximately 8 acres located within OU 7 on the Mainside of the Base (**Figure 8-49**). 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 (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 of 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 8-49. IRP Site 1, OU 7

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

Table 8-68. Previous Investigations Summary, IRP Site 1

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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.

Table 8-68. Previous Investigations Summary, IRP Site 1

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Confirmation Study (ESE, 1990)	000214	1984-1990	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 CVOCs, metals, and O&G.
Soil Assessment (Baker, 1991)	001510	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 (Baker, 1993)	001130	1993	To evaluate 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.
Remedial Investigation (Baker, 1995) Feasibility Study (Baker, 1995)	001498 through 001500 001497	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. COCs were evaluated during the FS and metals were eliminated as site-related COCs. The FS also evaluated remedial alternatives for VOCs in groundwater and RAOs were developed for the site.
Proposed Remedial Action Plan (Baker, 1995) Record of Decision (Baker, 1995)	001495 001784	1995-1996	A PRAP was issued to solicit public input on the preferred alternative (LTM and LUCs) and a public meeting was held. The ROD was signed in October 1996 and the selected remedy was LTM for groundwater and LUCs.
Remedy-in-Place Remedial Action Completion Report (CH2M, 2002)	N/A	1996-2002	Groundwater LTM was initiated in 1996 and included biannual sampling of eight monitoring wells (nine monitoring wells were initially specified in the work plan; however, one well was destroyed prior to the initiation of sampling) for VOCs analysis. Upon reevaluating the LTM Program in 1998, site-wide LTM was discontinued and quarterly confirmation sampling for VOC analysis was implemented at two wells. In April 2000, the concentrations of VOCs were below the screening criteria for at least four consecutive quarters, and discontinuation of confirmatory sampling was recommended in the October 2000 LTM Report (CH2M and Baker, 2000). Following approval from USEPA and NCDEQ in January 2001, a RACR was prepared to document the completion of confirmatory sampling. LUCs were implemented in 2000 and updated in 2002.
Meeting Summary (CH2M, 2013)	007348	2013	Based on recommendations from the FYR, existing site data were reviewed by the MCB Camp Lejeune Partnering Team and the consensus was reached to remove the LUCs and document the RC in a RACR because the only unacceptable risk identified at Site 1 was related to exposure to groundwater (1995 RI) and groundwater screening criteria were achieved during LTM.
Remedial Action Completion Report (CH2M, 2015)	007169	2015	A Notice of Record dated April 15, 2015 officially cancelled the LUCs.

8.3.5 Site 4—Sawmill Road Construction Debris Dump

Site 4, the Sawmill Road Construction Debris Dump, encompasses approximately 0.3 acre and is on the Mainside of the Base (**Figure 8-50**). 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 8-50. IRP Site 4

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

Table 8-69. Previous Investigations Summary, IRP Site 4

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at Site 4, and no further assessment was recommended.
Confirmatory Sampling Report (CH2M, 2011)	004700	2009-2011	To verify the presence or absence of contamination, a Confirmatory Site Assessment was conducted due to the site's 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.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.6 Site 7 (OU 11)—Tarawa Terrace Dump

Site 7, the Tarawa Terrace Dump, encompasses approximately 5 acres within OU 11. 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 8-51**). 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 of at this facility—only construction debris, water treatment plant filter media, and household trash.



Figure 8-51. IRP Site 7, OU 11

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

Table 8-70. Previous Investigations Summary, IRP Site 7

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. The quantity of any waste reportedly disposed of at the site was insignificant and did not warrant further investigation.
Site Inspection (Halliburton/NUS, 1992)	000330	1991-1992	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.

Table 8-70. Previous Investigations Summary, IRP Site 7

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation (Baker, 1996)	001701 through 001703	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 VOCs, SVOCs, pesticides/PCBs, and metals. No site-related contamination and no unacceptable risks to human health and the environment were identified.
Proposed Remedial Action Plan (PRAP, 1996) Record of Decision (Baker, 1997)	001746 003498	1996-1997	Based on the findings of the RI, a PRAP was issued in 1996 to solicit public input on the preferred alternative (no RA) and a public meeting was held. The ROD was signed on January 20, 1998, and the site was closed with NFA.

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

Site 9, the Fire Fighting Training Pit at Piney Green Road, encompasses 2.6 acres on the Mainside of the Base (**Figure 8-52**). OU 2 consists of four sites (Sites 6, 9, and 82, and UXO-22) that are grouped together because of their proximity to one another. The site has been used to conduct training exercises for extinguishing fires caused by flammable liquids from the early 1960s through the present. It was unlined until 1981, when it was lined with asphalt and outfitted with an OWS. Flammable liquids, including used oil, solvents, and fuels (unleaded), were used as accelerants during training exercises, and it is likely that fires were extinguished onsite using aqueous film-forming foam. The OWS located next to the fire training pit collects water used in the training exercises, as well as stormwater that enters the pit, and discharges water to the sanitary sewer. The product collected in the OWS is disposed of offsite.



Figure 8-52. IRP Site 9, OU 2

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

Table 8-71. Previous Investigations Summary, IRP Site 9

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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.

Table 8-71. Previous Investigations Summary, IRP Site 9

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Confirmation Study (ESE, 1990)	000214	1984-1990	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 (Baker, 1993)	001483	1992-1993	An RI was conducted to further investigate AOCs at OU 2. Field activities 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 at the Site and no potential sources of contamination were identified.
Proposed Remedial Action Plan (Baker, 1993) Record of Decision (Baker, 1993)	001249 001248	1993	A PRAP was issued in August 1993 to solicit public input on the preferred alternative (no RA) and a public meeting was held. The ROD for OU 2 was signed in September 1993 and the site was closed with NFA.
Removal Action	N/A	2000	A new 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.
Site Inspection for PFAS Investigation in Groundwater (CH2M, 2018)	007757	2017-2018	A SI was conducted to identify the presence or absence of PFAS in groundwater resulting from historical site activities. Three monitoring wells were installed in the surficial aquifer and groundwater samples were collected from the newly installed wells and one existing surficial aquifer monitoring well. Each sample was analyzed for PFAS. Concentrations of PFOS and PFOA were detected in groundwater and exceeded the 2016 USEPA lifetime drinking water health advisory, with the highest concentrations detected in the monitoring well nearest to and downgradient of the fire training pit. The elevated concentrations of PFOS and PFOA in the groundwater indicate historical fire training activities have resulted in a release of PFAS to the groundwater in the surficial aquifer. Additional investigations were recommended to evaluate the nature and extent of PFAS contamination.
Initial Site Assessment, Fire Training Pit 468 (Davenport and Catlin, 2018)	007636	2018	<p>During the PFAS investigation, soil cuttings containing a sheen, strong petroleum odor, and elevated photoionization detector readings were observed. An Initial Site Assessment was conducted to investigate the petroleum impacts in soil and presence in groundwater.</p> <p>Soil samples were collected for TPH-diesel range organics/ gasoline range organics analysis to verify presence, and subsequently identify the limits exceeding North Carolina Action Limit. A groundwater sample was collected and analyzed for VOCs, SVOCs, and volatile petroleum hydrocarbons (VPH)/ extractable petroleum hydrocarbons (EPH). PCE, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and VPH/EPH (C9-C22 aromatics) exceeded NCGWQS. At the request of NCDEQ and based on the groundwater exceedances, additional soil samples were collected and analyzed for VOCs, SVOCs, and VPH/EPH. PCE and C9-C22 aromatics exceeded soil screening levels.</p> <p>A removal action was conducted under the UST Program to remove petroleum-contaminated soil above the North Carolina Action Limit. The Initial Site Assessment concluded that the site qualifies as Low Risk with Industrial/Commercial land use under the UST program because petroleum contamination above the Maximum Contamination Concentrations had been removed and backfilled with clean soil. However, because chlorinated compounds were detected in groundwater at concentrations above the NCGWQS, the UST Program investigation site was recommended for transfer to the IRP.</p>

Table 8-71. Previous Investigations Summary, IRP Site 9

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Site Inspection Work Plan (CH2M, 2021)	008650		A groundwater investigation was conducted to evaluate and characterize the nature of VOCs identified in groundwater. Field activities included installation of three surficial aquifer monitoring wells and two UCH aquifer monitoring wells. Groundwater samples were collected from the new wells and three existing wells and analyzed for VOCs, SVOCs, and TPH. Results will be presented in the report in FY 2022.

8.3.7.1 Future Activities

The SI report to characterize VOCs in groundwater will be submitted in FY 2022 (**Schedule 8-14**). An RI will be planned based on prioritization of findings and investigations from the Basewide PFAS PA/SI.

Schedule 8-14
IRP Site 9
IRP & MMRP Site Management Plan FY 2023
MCB Camp Lejeune and MCAS New River

ID	Task Name	Duration	Start	Finish	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2023 Jan
1	SI	200 days	Mon 3/28/22	Sun 1/1/23											
2	Draft Report	195 days	Mon 3/28/22	Sat 10/8/22											
3	Review Period (Navy/Base)	30 days	Sun 10/9/22	Mon 11/7/22											
4	Response to Comments	14 days	Tue 11/8/22	Mon 11/21/22											
5	Review Period (USEPA/NCDEQ)	30 days	Tue 11/22/22	Wed 12/21/22											
6	Response to Comments	10 days	Tue 12/13/22	Thu 12/22/22											
7	Final Report	10 days	Fri 12/23/22	Sun 1/1/23											

Note: Project schedules are intended to be living documents and updated as needed based on site conditions, document review time frames, comment resolution time frames, etc.

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

Site 12, the EOD Detonation Area, covers approximately 8 to 10 acres on the Mainside of the Base (**Figure 8-53**). Since the early 1960s, Site 12 has operated as an EOD detonation area. Ordnance is disposed of by burning or detonating when it is found to be inert, unserviceable, or defective. Materials disposed of at Site 12 include ordnance, colored smokes, and white phosphorus. 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.

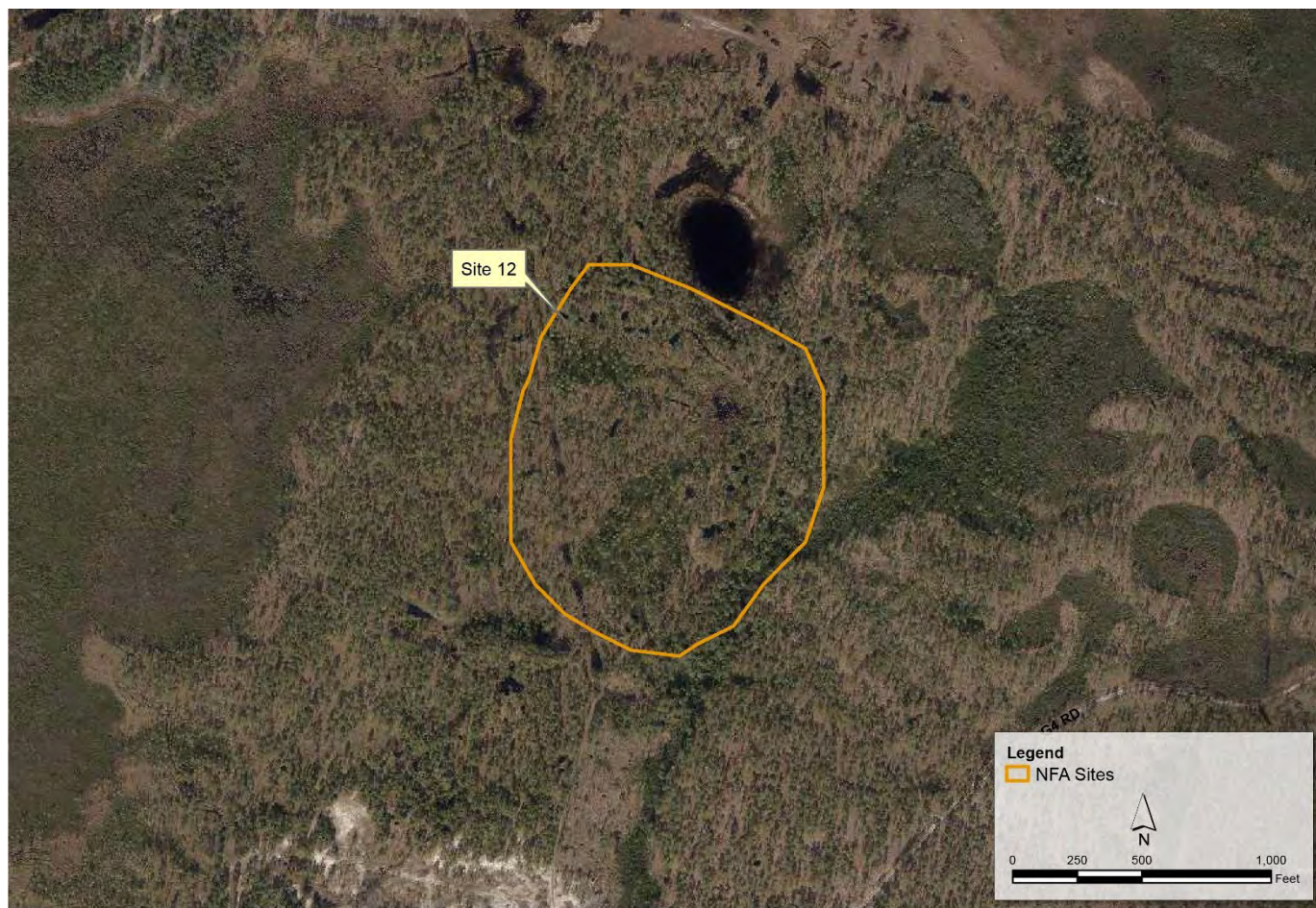


Figure 8-53. IRP Site 12

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

Table 8-72. Previous Investigations Summary, IRP Site 12

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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.

Table 8-72. Previous Investigations Summary, IRP Site 12

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Pre-Remedial Investigation Screening Study (Baker, 1998)	002635 002636	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 affected by site activities. As a result, the Pre-RI recommended SC.
No Action Decision Document (CH2M, 2001)	003016	2001	An NADD was finalized in 2001 to document NFA.

8.3.9 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 8-54**). In 1944, Site 13 was reportedly used for surface disposal of construction debris, including clippings, branches, and asphalt associated with golf course construction.



Figure 8-54. IRP Site 13

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

Table 8-73. Previous Investigations Summary, IRP Site 13

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at the site, and the IAS concluded that NFA was necessary.
Limited Site Assessment (Osage, 2008)	N/A	2008	A Limited Site Assessment 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.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.10 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 8-55**). From 1976 to 1978, construction materials and debris were reportedly buried at Site 18.



Figure 8-55. IRP Site 18

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

Table 8-74. Previous Investigations Summary, IRP Site 18

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at Site 18, and no further assessment was recommended.
Confirmatory Site Assessment (Osage, 2011)	007701	2009-2011	To verify the presence or absence of contamination, a Confirmatory Site Assessment was conducted due to the site's history as a dump. Field activities included soil and groundwater sampling for VOCs, SVOCs, herbicides, pesticides/PCBs, and metals. Metals were detected in soil at concentrations exceeding regulatory screening criteria and background; however, no human health or ecological risks were identified and the site was closed with NFA.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.11 Site 19—Naval Research Laboratory Dump

Site 19, the Naval Research Laboratory Dump, is located within the Former Naval Research Laboratory boundary, which encompasses approximately 4 acres on the Mainside of the Base. From 1947 to 1976, the Naval Research Laboratory was located in the area of the Pest Control Shop (**Figure 8-56**). 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. Because Iodine 131 has a half-life of only 8 days, the potential for residual radiological contamination was considered to be negligible. In November 1980, strontium-90 beta buttons (self-illuminating markers containing strontium-90 used on naval vessels to light pathways and entrances) were found while grading a parking lot. 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 were appropriately disposed of offsite.



Figure 8-56. IRP Site 19

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

Table 8-75. Previous Investigations Summary, IRP Site 19

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Report of Radiological Affairs Technical Assistance Visit (NEESA, 1981)	007138 007167	1981	Based on the discovery of beta buttons, 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 an onsite building 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 the Naval Energy and Environmental Support Activity for isotope analysis. Results confirmed that the contamination was removed and that the site was available for unrestricted use.
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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 Site Investigation (CH2M, 2008)	007279	2007-2008	The Focused SI was initiated to evaluate the presence or absence of chemical impacts to human health and the environment in support of 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. An HHRA was recommended to confirm that no unacceptable risk is present.
Radiological Survey (New World Technology, Inc., 2007)	007278	2007-2008	The Radiological Affairs Service Office 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 Site Inspection (AGVIQ/CH2M, 2010)	007280	2009-2010	An HHRS and an ecological risk screening were performed on the data 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.
No Action Decision Document (CH2M, 2011)	007170	2011	An NADD was finalized in 2011 to document NFA.

8.3.12 Site 20—Naval Research Lab Incinerator

Site 20, the Naval Research Lab Incinerator, is located within the Former Naval Research Laboratory boundary, which encompasses approximately 4 acres on the Mainside of the Base (**Figure 8-57**). From 1947 to 1976, the Naval Research Laboratory was located in the area of the Pest Control Shop. 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 8-57. IRP Site 20

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

Table 8-76. Previous Investigations Summary, IRP Site 20

Previous Investigation/ Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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 (New World Technology, Inc., 2007)	007278	2007	Radiological Affairs Service Office 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.

Table 8-76. Previous Investigations Summary, IRP Site 20

Previous Investigation/ Action	NIRIS Document Number	Date	Activities
Focused Site Investigation (CH2M, 2008)	007279	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)	007277	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 strontium-90 and Ra-226. Two soil samples were reported slightly above natural background levels for strontium-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 Site Inspection (AGVIQ/CH2M, 2010)	007280	2009-2010	An HHRS and an ecological risk screening were performed on the data 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.
No Action Decision Document (CH2M, 2011)	007170	2011	An NADD was finalized in 2011 to document NFA.

8.3.13 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 0.5 acre (**Figure 8-58**). In 1958, the Pest Control Shop moved its activities to Building 1105. 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-dichlorophenoxyacetic acid, 2,2-dichloropropionic acid, and dursban.



Figure 8-58. IRP Site 23

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

Table 8-77. Previous Investigations Summary, IRP Site 23

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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 Sampling Report (CH2M, 2011)	004700	2009-2011	To verify the presence or absence of contamination, a Confirmatory Site Assessment was conducted 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.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.14 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 8-59**). 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 and sewage treatment plant were reportedly disposed of at this site starting in the late 1940s. Construction debris was reportedly disposed of 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 were disposed of at the site, and an estimated 45,000 gallons of stripping compounds were disposed of over a 7-year period.



Figure 8-59. IRP Site 24, OU 1

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

Table 8-78. Previous Investigations Summary, IRP Site 24

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. Research indicated that past site operations may have affected groundwater and surface water and recommended an additional investigation.

Table 8-78. Previous Investigations Summary, IRP Site 24

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Confirmation Study (ESE, 1990)	000214	1984-1990	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.
Interim Remedial Action (Baker, 1992)	001504	1992	Based on the Confirmation Study results and recommendations, an additional investigation focusing on VOCs in the shallow aquifer beneath the HPIA was completed as part of an interim RI, IRA focused FS, and an IROD. A groundwater extraction and treatment system was installed at OU 1 to address VOCs in groundwater associated with Site 78.
Remedial Investigation/Feasibility Study (Baker, 1994)	001271 000522 004388	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. A HHRA was completed for soil at Site 24 and no unacceptable risks were identified. The HHRA for groundwater was evaluated for OU 1 rather than evaluating the sites individually. Potential unacceptable human health risks were identified for future potential residents from exposure to VOCs and metals in OU 1 groundwater. Heptachlor epoxide was also retained as a COC because it exceeded the NCGWQS at Site 24. No unacceptable ecological risks were identified.
Proposed Remedial Action Plan (Baker, 1994) Record of Decision (Baker, 1994)	001254 000366	1994	The PRAP was submitted for public review and comment in July 1994. The ROD was signed in September 1994. The selected remedy was LTM for groundwater.
Long-term Monitoring (Baker, 1998)	001977 ^a	1996-1997	Although the ROD specified semiannual groundwater sampling, quarterly sampling was implemented in 1996. At Site 24, the LTM protocol initially included groundwater sampling for VOCs, metals, TDS, and TSS at three monitoring wells: IR24-GW08, IR24-GW09, and IR24-GW10. It was recommended that future groundwater samples collected from Site 24 be submitted for pesticide analyses because the only COC identified in Site 24 groundwater in the RI was heptachlor epoxide.
Notice of Non-Significant Changes (USMC, 1997)	001898	1997	In July 1997, a Notice of Non-Significant Changes was issued to clarify that the COC at Site 24 is heptachlor epoxide. Although the ROD for OU 1 stipulated sampling for VOCs, metals, TDS, and TSS, heptachlor epoxide was the only COC identified in groundwater at Site 24 during the RI. As a result, pesticides were added to the sampling protocol at Site 24.
Long-term Monitoring (Baker and CH2M, 2000)	003516 ^a	1997-1998	Quarterly groundwater sampling continued and included groundwater sampling for VOCs, pesticides, metals, TDS, and TSS at three monitoring wells: IR24-GW08, IR24-GW09, and IR24-GW10. Analytical results collected over three consecutive quarters indicated no pesticides concentrations exceeded the screening criteria in groundwater. Based on these results, the March 1998 semiannual report recommended that Site 24 be eliminated from the OU 1 LTM program.
Notice of Non-Significant Change (USMC, 1998)	001943 001944	1998	The Notice of Non-Significant Changes documented the discontinuation of LTM at Site 24 as a result of three consecutive groundwater sampling rounds indicating pesticide levels were below the Federal and State action levels.
Remedial Action Completion Report (CH2M, 2016)	007154	2016	A RACR was prepared to document the completion of LTM. The RACR was signed in 2017.

^a Only the final monitoring report NIRIS number is shown.

8.3.15 Site 25—Base Incinerator

Site 25 encompasses approximately 0.5 acre on the Mainside of the Base. From 1940 to 1960, Site 25 operated as the Base Incinerator, where trash and classified materials were burned (**Figure 8-60**). Potential materials present at the site include burned trash, ashes, and melted glass.



Figure 8-60. IRP Site 25

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

Table 8-79. Previous Investigations Summary, IRP Site 25

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. Site 25 was identified based on past use as an incinerator. However, historical records indicated that nonhazardous materials were disposed of (trash and glass) and NFA was recommended.
Focused Site Investigation (CH2M, 2008)	007279	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.

Table 8-79. Previous Investigations Summary, IRP Site 25

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Wallace Creek Expanded Site Inspection (AGVIQ/CH2M, 2010)	007280	2009-2010	An HHRS and an ecological risk screening were performed on the data 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.
No Action Decision Document (CH2M, 2011)	007170	2011	An NADD was finalized in 2011 to document NFA.

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

Site 30, the Sneads Ferry Road Fuel Tank Sludge Area, is within OU 7 on the Mainside of the Base and covers approximately 1 acre (**Figure 8-61**). 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 that 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 of.



Figure 8-61. IRP Site 30, OU 7

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

Table 8-80. Previous Investigations Summary, IRP Site 30

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. The IAS concluded that sludge deposits could potentially impact groundwater and recommended an additional investigation to determine the boundaries of the affected area and verify the presence of hazardous wastes.

Table 8-80. Previous Investigations Summary, IRP Site 30

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Confirmation Study (ESE, 1990)	000214	1984-1990	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, 1995)	001498 through 001500	1994-1995	To further characterize the nature and extent of contamination, a 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.
Proposed Remedial Action Plan (Baker, 1995) Record of Decision (Baker, 1995)	001495 001784	1995-1996	The PRAP was submitted for public review and comment in July 1995. The ROD was signed in May 1996, and due to the absence of contamination the site was closed with NFA.

8.3.17 Site 37 (OU 26)—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 8-62**). Between 1950 and 1951, Site 37 was used for the surface disposal of wastes, including motor parts, garbage, and wood. During investigations at Site 37, buried debris was identified. U.S. Highway 17 Bypass runs through the northeastern portion of the site, and the rest of the site is primarily wooded. In 2010, buried munitions were discovered in the vicinity, and the area was identified as UXO-24 under the MMRP (**Section 8.2.4**).



Figure 8-62. IRP Site 37, OU 26

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

Table 8-81. Previous Investigations Summary, IRP Site 37

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at Site 37, and no further assessment was recommended.
Confirmatory Site Assessment (Osage, 2011)	007701	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 VOCs, SVOCs, pesticides and PCBs, herbicides, and metals. Potential unacceptable risks to the environment were identified due to exposure to pesticides and herbicides in soil and an additional investigation was recommended.

Table 8-81. Previous Investigations Summary, IRP Site 37

Previous Investigation/Action	NIRIS Document Number	Date	Activities
UXO-24 and Site 37 Preliminary Assessment/Site Investigation (CH2M, 2014)	006830	2013-2014	In 2013, a PA/SI was initiated to evaluate the nature and extent of potential MEC and MPPEH at UXO-24 (described in Section 8.2.4) and to evaluate the potential risk from pesticides and herbicides identified during the Site 37 Confirmatory Site Assessment. At Site 37, field activities included soil sampling for pesticide and herbicide analysis. Pesticides were detected at concentrations exceeding the screening criteria; however, no potential human health or environmental risks were identified due to exposure to soil. During the MEC investigation activities, buried debris was identified. The PA/SI recommended an ESI to delineate the nature and extent of the waste disposal area.
Draft Expanded Site Investigation (CH2M, 2017)	N/A	2017	An ESI was conducted in 2017 to further investigate the nature and extent of the surface and buried debris and assess the potential environmental impacts and risks to human health and the environment from historical waste disposal activities. Field activities included a site walk, DGM, test pitting, and soil sampling. All samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. Surface and buried waste, including construction- and demolition-related debris, were identified across the site. There were no significant impacts to environmental media from the historical waste disposal activities and there were no unacceptable risks to human health or the environment identified from exposure to environmental media. No MEC or MPPEH was found during the ESI. NFA was recommended. However, because of uncertainties regarding the potential presence of MEC/MPPEH, following regulatory review of the draft ESI report, a LUC for Explosives Safety Education Program was recommended for UXO-24 and a draft RI/FS was prepared.
Remedial Investigation/Feasibility Study (CH2M, 2019)	007795	2018-2019	The RI/FS was prepared to present the findings of the ESI, including the nature and extent of surface and buried debris, assimilate environmental data collected to date, evaluate the potential risks to human health and the environment, develop RAOs, and identify and evaluate remedial alternatives to mitigate potential unacceptable explosive hazards. The RI/FS concluded that the waste disposal area is widespread and diffuse across the site and waste extended from the surface to a maximum depth of 5 feet bgs. Although there were exceedances of screening criteria in surface and subsurface soil and historical groundwater, exceedances appeared isolated and unrelated to historical waste disposal and no unacceptable risks to human health or the environment were identified. Based on depth limitations of the PA/SI and because not all anomalies outside the 2-acre wooded area immediately adjacent to Building TC611 were 100 percent investigated, there is a potential level of uncertainty remaining regarding risk of encountering MEC/MPPEH. The RI recommended NFA for Site 37 and the FS presented alternatives to address the potential for direct physical contact with MEC/MPPEH as part of UXO-24.
Proposed Plan (CH2M, 2019)	007791	2019	A Proposed Plan was prepared to solicit public input on the preferred alternative (NFA) and a public meeting was held. General comments for informational purposes were addressed during the public meeting. The ROD was signed on September 30, 2019, and the site was closed with NFA.
Record of Decision (CH2M, 2019)	008085		

8.3.18 Site 38—Camp Geiger Construction Dump

Site 38, the Camp Geiger Area Surface Dump, encompasses approximately 3 acres in the Camp Geiger area of the Base (**Figure 8-63**). 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 8-63. IRP Site 38

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

Table 8-82. Previous Investigations Summary, IRP Site 38

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at Site 38, and concluded that no further assessment was necessary.
Confirmatory Sampling Report (CH2M, 2011)	004700	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.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.19 Site 40—Camp Geiger Area Borrow Pit

Site 40, the Camp Geiger Area Borrow Pit, encompasses approximately 22 acres (**Figure 8-64**). 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 4 to 5 acres within Site 40.



Figure 8-64. IRP Site 40

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

Table 8-83. Previous Investigations Summary, IRP Site 40

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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 Investigation (CH2M, 2009)	004327	2008-2009	A PA/SI was conducted to characterize potential contamination at Site 40 based on prospective 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 Action Decision Document (CH2M, 2010)	007171	2010	An NADD was finalized in 2010 to document NFA.

8.3.20 Site 42—Building 705 Bachelor Officers’ Quarters Dump

Site 42, the Building 705 Bachelor Officers’ Quarters Dump, encompasses 2.8 acres in the MCAS New River portion of the Base (**Figure 8-65**). From 1950 to 1960, Site 42 was reportedly used for surface disposal of debris, including trees, tree stumps, and boards.



Figure 8-65. IRP Site 42

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

Table 8-84. Previous Investigations Summary, IRP Site 42

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at Site 42 and no further assessment was recommended.
Confirmatory Sampling Report (CH2M, 2011)	004700	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.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.21 Site 46—MCAS Main Gate Dump

Site 46, the MCAS Main Gate Dump, encompasses less than 1 acre in MCAS New River, in the northwestern portion of the Base (**Figure 8-66**). From 1958 to 1962, Site 46 was reportedly used for disposal of construction and demolition debris.



Figure 8-66. IRP Site 46

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

Table 8-85. Previous Investigations Summary, IRP Site 46

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at Site 46 and no further assessment was recommended.
Confirmatory Site Assessment (Osage, 2011)	007701	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.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.22 Site 48 (OU 3)—MCAS Mercury Dump

Site 48, the MCAS Mercury Dump, encompasses approximately 5 acres within MCAS New River in the northwestern 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 8-67**). 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 of in this manner.



Figure 8-67. IRP Site 48, OU 3

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

Table 8-86. Previous Investigations Summary, IRP Site 48

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. An estimated 1,000 pounds of mercury were possibly dispersed over approximately 20,000 square feet adjacent to the New River. It was concluded that mercury disposal practices could potentially impact the New River and a Confirmation Study was recommended to verify the presence of mercury.
Confirmation Study (ESE, 1990)	000214	1984-1992	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.

Table 8-86. Previous Investigations Summary, IRP Site 48

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Supplemental Characterization (ESE, 1992)	007172	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 COPCs.
Remedial Investigation	N/A	1993	To further characterize the nature and extent of contamination, a 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.
Proposed Remedial Action Plan (Baker, 1993) Record of Decision (Baker, 1993)	001488 001514	1993	A PRAP was issued to solicit public input on the preferred alternative (no action) and a public meeting was held. The ROD was signed in September 1993. Because no RAs were required in the ROD, the site was closed with NFA.

8.3.23 Site 51—MCAS Football Field

Site 51, the MCAS Football Field, encompasses approximately 20 to 30 acres in MCAS New River in the northwestern portion of the Base. Site 51 was reportedly the site of empty container disposal between approximately 1967 and 1968 (**Figure 8-68**). Paint cans and hydraulic fluid cans were reportedly disposed of.



Figure 8-68. IRP Site 51

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

Table 8-87. Previous Investigations Summary, IRP Site 51

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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)	007701	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 human health or environmental risks were identified and the site was closed with NFA.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.24 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 northwestern portion of the Base (**Figure 8-69**). 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, JP fuels, and paint thinners.



Figure 8-69. IRP Site 53

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

Table 8-88. Previous Investigations Summary, IRP Site 53

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. The quantity of any waste reportedly disposed of at IRP Site 53 was determined to be insignificant and did not warrant further investigation.
Confirmatory Sampling Report (CH2M, 2011)	004700	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.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.25 Site 55—Air Station East Perimeter Dump

IRP Site 55, the Air Station East Perimeter Dump, encompasses approximately 6 acres in MCAS New River in the northwestern portion of the Base (**Figure 8-70**). 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 8-70. IRP Site 55

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

Table 8-89. Previous Investigations Summary, IRP Site 55

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at IRP Site 55, and no further assessment was recommended.
Confirmatory Sampling Report (CH2M, 2011)	004700	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. No debris was encountered during sampling activities. NFA for the Site was confirmed.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.26 Site 61—Rhodes Point Road Dump

IRP Site 61, the Rhodes Point Road Dump, encompasses approximately 8 to 10 acres and is located nearly 5 miles south of the MCAS New River operations area (**Figure 8-71**). 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 training activities.

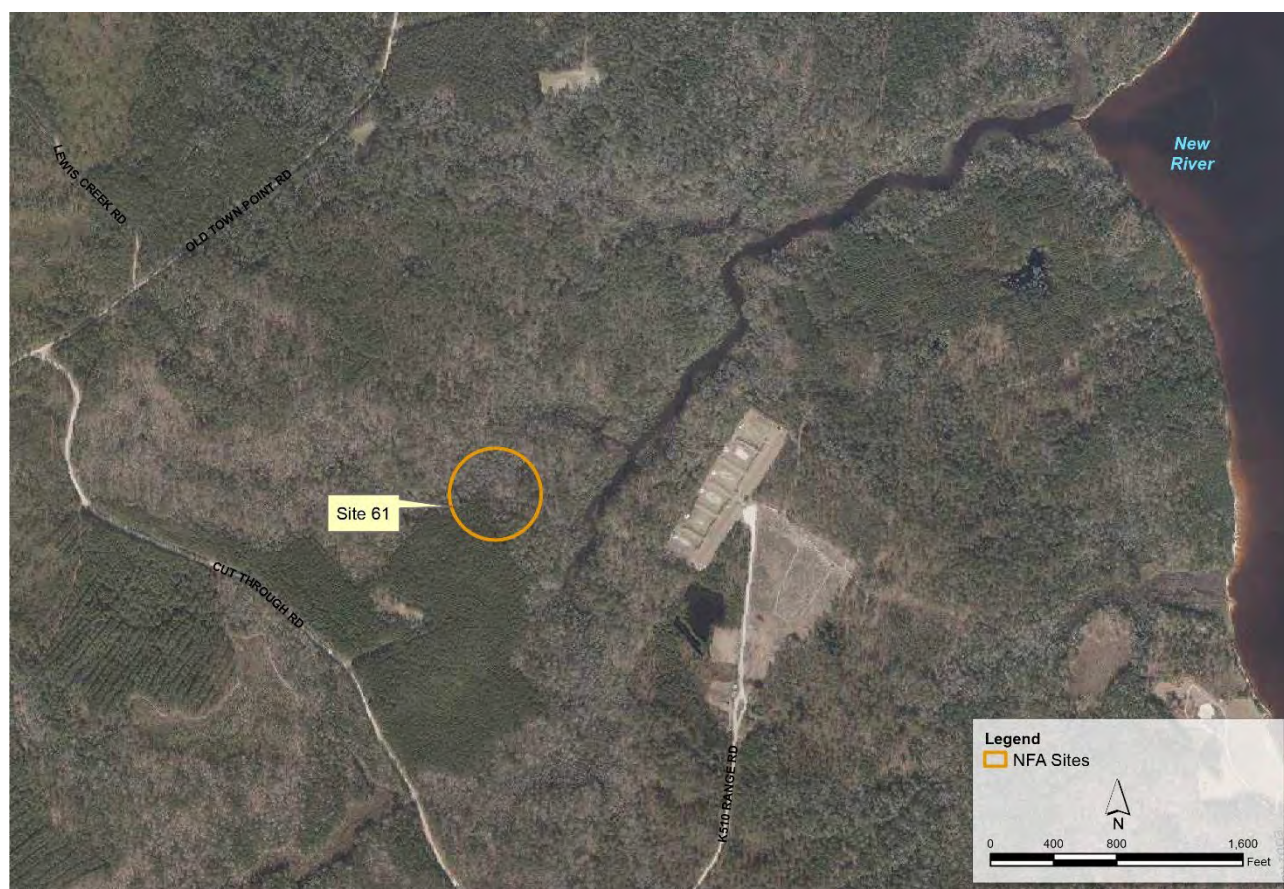


Figure 8-71. IRP Site 61

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

Table 8-90. Previous Investigations Summary, IRP Site 61

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at IRP Site 61, and no further assessment was recommended.
Confirmatory Sampling Report (CH2M, 2011)	004700	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.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.27 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 8-72**). 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.

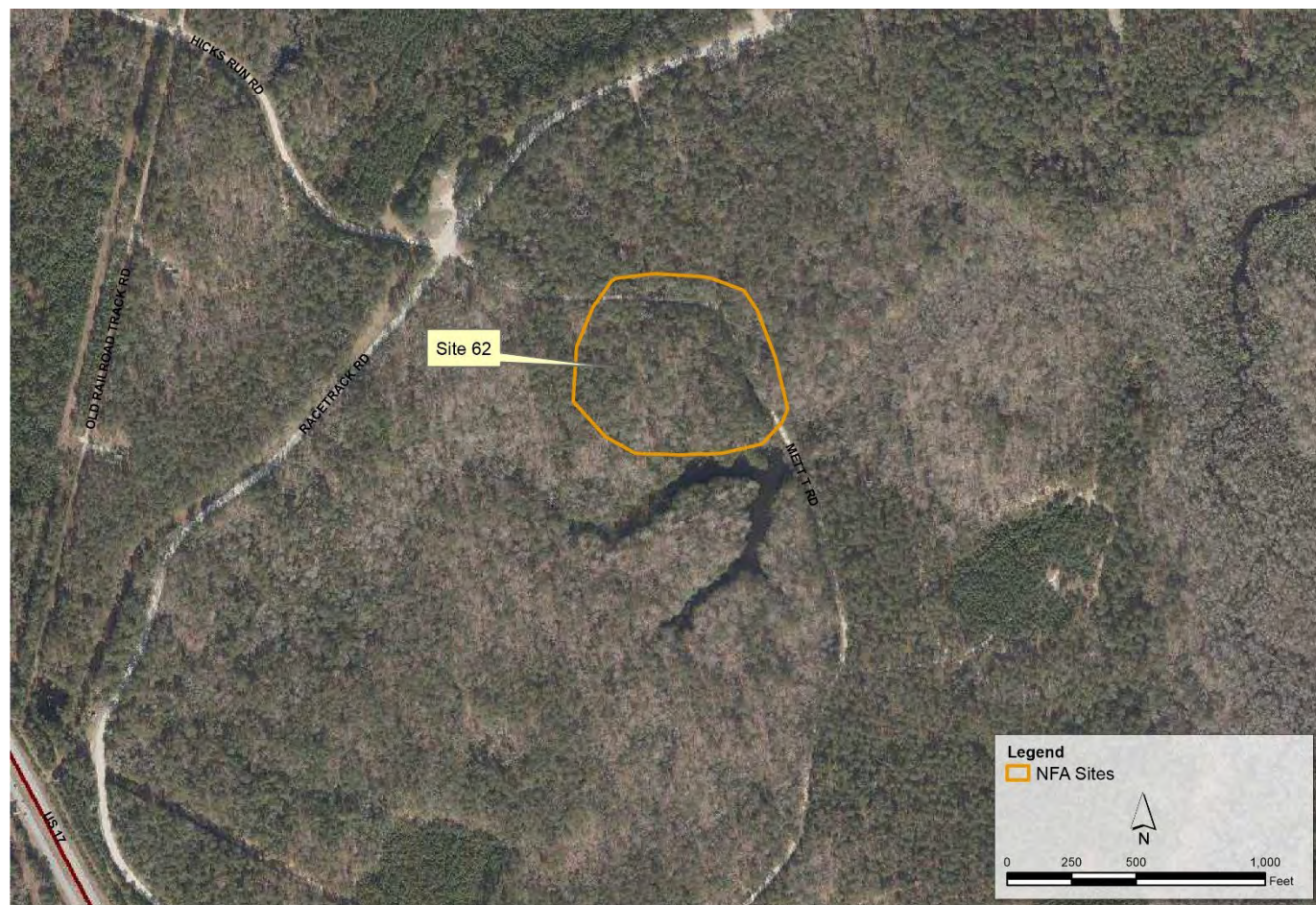


Figure 8-72. IRP Site 62

Previous investigations are listed in **Table 8-91**.

Table 8-91. Previous Investigations Summary, IRP Site 62

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. No hazardous wastes were reportedly disposed of at IRP Site 62, and no further assessment was recommended.
Confirmatory Sampling Report (CH2M, 2011)	004700	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.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.28 Site 66—Amphibious Tractors Landing Site and Storage Area

IRP Site 66, the Amphibious Tractors Landing Site and Storage Area, encompasses approximately 40 acres in the Courthouse Bay area of the Base (**Figure 8-73**). Beginning in the 1950s, IRP Site 66 was used 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 8-73. IRP Site 66

Previous investigations are listed in **Table 8-92**.

Table 8-92. Previous Investigations Summary, IRP Site 66

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. Although spills of POL had likely occurred at IRP Site 66, the quantity was insignificant and did not warrant further investigation.
Confirmatory Sampling Report (CH2M, 2011)	004700	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.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

8.3.29 Site 67—Engineer’s Trinitrotoluene Burn Site

IRP Site 67, Engineer’s Trinitrotoluene (TNT) Burn Site, encompasses approximately 7 acres in the Courthouse Bay area of the Base (**Figure 8-74**). 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 8-74. IRP Site 67

Previous investigations are listed in **Table 8-93**.

Table 8-93. Previous Investigations Summary, IRP Site 67

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. The quantity of any waste reportedly disposed of at IRP Site 67 was insignificant and did not warrant further investigation.
Confirmatory Site Assessment (CH2M, 2010)	002916	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-dinitrotoluene was detected in groundwater at one temporary well location. The concentration was below regulatory screening criteria; therefore, the site was closed with NFA.
No Action Decision Document (CH2M, 2012)	006353	2012	An NADD was finalized in 2012 to document NFA.

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

Site 75, the MCAS Basketball Court Site, encompasses approximately 1 acre in the MCAS New River operations area (**Figure 8-75**). 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 8-75. IRP Site 75

Previous investigations are listed in **Table 8-94**.

Table 8-94. Previous Investigations Summary, IRP Site 75

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. The IAS concluded that degradation of buried drums could result in the release of suspected materials into the groundwater, potentially affecting water supply wells within the area. Based on these findings, the IAS recommended additional investigation.
Pre-Remedial Investigation Screening Study (Baker, 1998)	002635 002636	1995- 1998	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 Action Decision Document (CH2M, 2001)	003013	2001	An NADD was finalized in 2001 to document NFA.

8.3.31 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 approximately 3 acres (**Figure 8-76**). 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 0.25 acre, and approximately 25 to 75 55-gallon drums were allegedly disposed of 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 8-76. IRP Site 76

Previous investigations are listed in **Table 8-95**.

Table 8-95. Previous Investigations Summary, IRP Site 76

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment Study (WAR, 1983)	001511	1983	The IAS was conducted to identify potential hazardous sites at the Base. 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.

Table 8-95. Previous Investigations Summary, IRP Site 76

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Pre-RI Screening Study (Baker, 1998)	002635 002636	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)	N/A	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 Action Decision Document (CH2M, 2001)	003384	2001	An NADD was finalized in 2001 to document NFA.

8.3.32 Site 85—Former Camp Johnson Battery Dump

Site 85 covers approximately 5 acres of heavily vegetated land (**Figure 8-77**) in the Camp Johnson area of MCB Camp Lejeune. 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 era 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 8-77. IRP Site 85

Previous investigations are listed in **Table 8-96**.

Table 8-96. Previous Investigations Summary, IRP Site 85

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Pre-Remedial Investigation Screening Study (Baker, 1998)	002635 002636	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 HHRA identified potential risks to human receptors. The Pre-RI recommended an EE/CA for the battery piles and associated soil.

Table 8-96. Previous Investigations Summary, IRP Site 85

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Engineering Evaluation/Cost Analysis (Baker, 1999)	004638	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)	004640	1999	An AM was completed to propose excavation with on-Base disposal as the NTCRA to address metals in soil and the battery piles.
Non-time-critical Removal Action (OHM, 2000)	002588	2000	The NTCRA was conducted and 158 tons of soil and debris were removed from 16 separate battery pile locations. Confirmation soil sampling was conducted.
Long-term Monitoring (Baker, 2002)	N/A	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 screening criteria for at least four consecutive quarters, and LTM was discontinued at Site 85.
No Action Decision Document (Baker and CH2M, 2005)	003729	2005	Based on results of previous investigations at Site 85, no further RA was recommended. USEPA and NCDEQ concurred with NFA status.
Preliminary Assessment/Site Inspection or Site Investigation (CH2M, 2011)	005391	2009-2011	To characterize potential environmental impacts associated with the past use of Site 85, a PA/SI was initiated. Field activities included test pitting and collection of soil and groundwater samples for metals analysis. Four test pits were excavated from 2 to 6 feet bgs; batteries were identified at the surface of each test pit, but were not observed deeper than 2 feet bgs. A battery sample was collected for metals analysis. Lead and mercury were detected at concentrations in exceedance of USEPA maximum toxicity values. The batteries and soil were placed in separate 55-gallon drums and removed from the site. 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 Investigation (CH2M, 2011)	004679	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.
No Action Decision Document (CH2M, 2012)	006297	2012	An NADD was finalized in 2012 to document NFA.

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

Site 87, the MCAS Officers' Housing Area site (formerly Site A), is located on the western bank of the New River and covers less than 1 acre (**Figure 8-78**). 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 8-78. IRP Site 87

Previous investigations are listed in **Table 8-97**.

Table 8-97. Previous Investigations Summary, IRP Site 87

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Confirmation Study (ESE, 1990)	000214	1984-1990	Monitoring wells were installed and groundwater samples were collected for VOCs analysis from the monitoring wells and PSWs in 1984 and again in 1986. No VOCs were detected in groundwater.
Pre-Remedial Investigation Screening Study (Baker, 1998)	002635 002636	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.

Table 8-97. Previous Investigations Summary, IRP Site 87

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Confirmatory Groundwater Sampling (CH2M, 2001)	003014	1999	One groundwater sample collected during the Pre-RI detected pentachlorophenol above the screening criteria and the location was sampled again in 1999. No pentachlorophenol was detected.
No Action Decision Document (CH2M, 2001)	003014	2001	An NADD was finalized in 2001 to document NFA.

8.3.34 Site 90 (OU 17)—Building BB-9

Site 90, Building BB-9, encompasses approximately 6 acres within OU 17, in the southeastern portion of the Base in the Courthouse Bay Complex (**Figure 8-79**). 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 8-79. IRP Site 90, OU 17

Previous investigations are listed in **Table 8-98**.

Table 8-98. Previous Investigations Summary, IRP Site 90

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Remedial Investigation (Baker, 2001)	003002	1997-2001	A Focused RI was conducted to assess the nature and extent of contamination at OU 17. 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; NFA was recommended.
Proposed Remedial Action Plan (Baker, 2001) Record of Decision (Baker, 2001)	N/A 003020	2001	A PRAP was issued in July 2001 to solicit public input on the preferred alternative (no RAs) and a public meeting was held. The ROD was signed on September 30, 2001 for NFA.

8.3.35 Site 91 (OU 17)—Building BB-51

Site 91, Building BB-51, encompasses approximately 8 acres within OU 17 in the southeastern portion of the Base in the Courthouse Bay Complex (**Figure 8-80**). 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. 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 8-80. IRP Site 91, OU 17

Previous investigations are listed in **Table 8-99**.

Table 8-99. Previous Investigations Summary, IRP Site 91

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Remedial Investigation (Baker, 2001)	003002	1997-2001	A Focused RI was conducted to assess the nature and extent of contamination at OU 17. 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.

Table 8-99. Previous Investigations Summary, IRP Site 91

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Supplemental Groundwater Investigation (Baker, 2001)	003002	1999-2001	Additional groundwater sampling was conducted in 1999 to confirm the presence of VOCs or SVOCs. Results were discussed in the 2001 Remedial Investigation. Post-RI monitoring was recommended.
Post-Remedial Investigation Groundwater Monitoring (Baker, 2001)	003351 through 003353	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.
Proposed Remedial Action Plan (Baker, 2001) Record of Decision (Baker, 2001)	N/A 003020	2001	A PRAP was issued in July 2001 to solicit public input on the preferred alternative (no RAs) and a public meeting was held. The ROD was signed in September 2001 for NFA.

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

Site 92, formerly Building BB-246, is located within OU 17 in the southeastern portion of the Base in the Courthouse Bay Complex and covers approximately 1 acre (**Figure 8-81**). 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 was 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 8-81. IRP Site 92, OU 17

Previous investigations are listed in **Table 8-100**.

Table 8-100. Previous Investigations Summary, IRP Site 92

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Remedial Investigation (Baker, 2001)	003002	1997-2001	A Focused RI was conducted to assess the nature and extent of contamination at OU 17. 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.

Table 8-100. Previous Investigations Summary, IRP Site 92

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Post-Remedial Investigation Groundwater Monitoring (Baker, 2001)	003351 through 003353	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.
Proposed Remedial Action Plan (Baker, 2001) Record of Decision (Baker, 2001)	N/A 003020	2001	A PRAP was issued in July 2001 to solicit public input on the preferred alternative (no RA) and a public meeting was held. The ROD was signed in September 2001 for NFA.

8.3.37 Site 94 (OU 18)—PCX Service Station

Site 94, the PCX Service Station, covers approximately 2 acres and is within the HPIA on the Mainside of the Base within the western portion of Site 78 (OU 1) (**Figure 8-82**). The PCX Service Station 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 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 NCDEQ's UST Program.



Figure 8-82. IRP Site 94, OU 18

Previous investigations are listed in **Table 8-101**.

Table 8-101. Previous Investigations Summary, IRP Site 94

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Groundwater Investigation (OHM, 2001)	007341	2000-2001	An investigation was conducted to evaluate groundwater conditions. Analytical results identified VOCs (primarily BTEX and methyl tert-butyl ether [MTBE]) and PAHs at concentrations exceeding NCGWQS. A December 1, 2000, letter from the Base to NCDEQ requested the transfer of the PCX Service Station to the IRP, which resulted in the subsequent CERCLA investigation activities.

Table 8-101. Previous Investigations Summary, IRP Site 94

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Remedial Investigation Baseline Groundwater Sampling (CH2M, 2005)	003802	2003	To obtain the most current groundwater quality data, baseline groundwater sampling was conducted. Samples were analyzed for VOCs and several VOCs exceeded screening criteria.
Remedial Investigation (CH2M, 2005)	003802	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 from an upgradient source and will be addressed as part of Site 78.
Proposed Remedial Action Plan (CH2M, 2006) Record of Decision (CH2M, 2006)	003816 003969	2006	The PRAP was issued to solicit public input on the preferred alternative (no RA) and a public meeting was held. The ROD for OU 18 was signed in August 2006 for NFA.

8.3.38 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), and encompass approximately 4 acres (**Figure 8-83**). 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 Camp Lejeune. 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 dipping vats.



Figure 8-83. IRP Site 95

Previous investigations are listed in **Table 8-102**.

Table 8-102. Previous Investigations Summary, IRP Site 95

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Initial Assessment (Baker, 2004)	004094	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.

Table 8-102. Previous Investigations Summary, IRP Site 95

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Site Investigation (CH2M, 2007)	004002	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 (Rhēa, 2010)	004650	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 offsite 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, 2010)	002816	2010	An AM was completed to propose excavation with offsite disposal as the NTCRA to address the arsenic contaminated soil.
Non-time-critical Removal Action (Rhēa, 2010)	002849	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 screening criteria. A permanent monitoring well was installed to conduct groundwater sampling for arsenic. Arsenic concentrations in soil and groundwater were below North Carolina standards and/or background and the site was closed with NFA.
No Action Decision Document (CH2M, 2011)	007339	2011	An NADD was finalized in 2011 to document NFA.

8.3.39 Site 110 — Former Water Towers — LCH-4004, S-5, S-830, S-2323, SBA-108

Site 110 includes five former water towers (LCH-4004, S-5, S-830, S-2323, and SBA-108) located in multiple areas of the Base (**Figure 8-84**). The water towers were in operation for varying date ranges from 1942 to 2015 in residential, recreational, industrial, and undeveloped areas of the Base. As a result of the historical use of lead-based paint on the exterior of water towers, lead was identified as a potential concern in soil during Base demolition and/or replacement of water towers. Fences were installed around the locations that are adjacent to housing areas.



Figure 8-84. Site 110 (Former Water Towers — LCH-4004, S-5, S-830, S-2323, SBA-108)

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

Table 8-103. Previous Investigations Summary, IRP Site 110 (Former Water Towers – LCH-4004, S-5, S-830, S-2323, SBA-108)

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (Osage, 2017)	007360	2017	A PA/SI was conducted to evaluate the extent of soil contamination that may have resulted from historical use of lead-based paint on the former water towers (S-2323, S-5, SBA-108, S-830, and LCH-4004) that constitute Site 110 and to determine whether additional investigation or remediation is warranted. Surface and subsurface soil samples were collected for lead analysis and a HHRS and ecological risk screening were conducted. Analytical results indicate the presence of lead and potential unacceptable human health and ecological risks were identified at all five former water towers. An ESI was recommended to further define the nature and extent of contamination, evaluate fate and transport mechanisms, and assess potential human health and ecological risks.
Expanded Site Investigation (CH2M, 2020)	008441	2018	An ESI was conducted to refine the lateral and/or vertical extent of lead in soils, evaluate the leachability of lead from soil to groundwater and to assess the potential human health and ecological risks if lead is present in groundwater. Field activities included surface and subsurface soil sampling, monitoring well installation, and groundwater sampling. Based on the results, there were no unacceptable risks to current or future human or ecological receptors based on exposure to lead in soil or groundwater. NFA was recommended.
Removal Action Technical Memorandum (Meadows, 2021)	Pending Upload	2021	Although NFA was recommended during the ESI, for conservativeness, the Base conducted additional soil excavation to reduce average lead concentrations in soil at all five former water tower locations. Approximately 300 tons of lead-impacted soil was collectively removed from the five locations.

8.4 MMRP RC Sites

8.4.1 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 8-85**). 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 firing live ammunition. During operation of the site, munitions used included fragmentation, offensive, and practice grenades. Based on the findings of previous investigations and the low probability of encountering MEC and/or MPPEH at UXO-01 (ASR #2.23), Explosives Safety Education Program is required for personnel conducting intrusive activities (USMC, 2015). Base Master Planning maintains the current site boundaries in GIS and all construction projects on-Base go through environmental review.



Figure 8-85. MMRP Site UXO-01, ASR #2.23

Previous investigations are listed in **Table 8-104**.

Table 8-104. Previous Investigations Summary, MMRP Site UXO-01, ASR #2.23

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2009)	004386	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 percent DGM. Samples were analyzed for explosives residues, 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.
Expanded Site Investigation (CH2M, 2012)	004759	2011-2012	An ESI was conducted to further investigate the 249 geophysical anomalies identified during the PA/SI. An intrusive investigation was conducted, and no MEC or MPPEH was identified; NFA was recommended.
No Action Decision Document (CH2M, 2013)	005814	2013	An NADD was finalized in 2013 to document NFA.
ESS Determination Request (USMC, 2015)	006564	2015	Due to low probability of encountering MEC or MPPEH, the Base determined a UXO-qualified escort is not required to access the site. In addition, an ESS is not required to conduct future activities. Explosives Safety Education Program is required for all personnel accessing these locations.

8.4.2 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 1 acre and is identified as a former .22-caliber indoor range, which included 8 manually operated targets (**Figure 8-86**). The range was in use sometime before 1954, but exact dates are not known. The building was demolished in 1998.



Figure 8-86. MMRP Site UXO-01, ASR #2.64

Previous investigations are listed in **Table 8-105**.

Table 8-105. Previous Investigations Summary, MMRP Site UXO-01, ASR #2.64

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (Tetra Tech, 2009)	002767	2009	A field investigation was conducted to identify the presence or absence of contamination at the site. X-ray fluorescence (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 antimony, arsenic, and lead in soil was recommended.
Engineering Evaluation/Cost Analysis (Tetra Tech, 2010) Action Memorandum (Tetra Tech, 2011)	002875 004661	2010- 2011	An EE/CA was prepared to identify removal action alternatives to address the antimony, arsenic, and lead in 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 AM documented excavation and offsite disposal as the selected remedy.

Table 8-105. Previous Investigations Summary, MMRP Site UXO-01, ASR #2.64

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Non-time-critical Removal Action Construction Completion Report (Osage, 2013)	005652	2013	An NTCRA was initiated to address antimony, arsenic, and lead in soil. Pre-excavation soil sampling results indicated the lead concentrations would require that the soil be disposed of as hazardous waste. Therefore, soil within the excavation area was treated in place to render non-hazardous. Approximately 970 tons of soil, brush, and debris were excavated for offsite disposal. Post-excavation samples from the base of the excavation were collected and analyzed for antimony, arsenic, and lead. Antimony and lead were detected at concentrations in exceedance of the preliminary remediation goals at one location; therefore, the soil at this location was treated, excavated, and resampled; and the results were below the preliminary remediation goals. In addition, follow-up groundwater sampling was conducted for lead analysis, and lead was not detected. Based on the results of the NTCRA and groundwater sampling, NFA was recommended.
No Action Decision Document (Osage, 2014)	005881	2014	An NADD was finalized in 2014 to document NFA.

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

Site UXO-02, the Unnamed Explosive Range, encompasses approximately 127 acres along the western bank of the New River in the Rifle Range Area of the Base (**Figure 8-87**). UXO-02 encompasses IRP Site 69 (**Section 8.1.19**). UXO-02 was used as an explosive range from 1973 to 2002; however, the types of munitions employed at this range are unknown. Based on the findings of previous investigations and the low probability of encountering MEC and/or MPPEH at UXO-02, Explosives Safety Education Program is required for personnel conducting intrusive activities (USMC, 2015). Base Master Planning maintains the current site boundaries in GIS, and all construction projects on-Base go through environmental review.



Figure 8-87. MMRP Site UXO-02, ASR #2.201

Previous investigations are listed in **Table 8-106**.

Table 8-106. Previous Investigations Summary, MMRP Site UXO-02, ASR #2.201

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2012)	004768	2009-2012	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 (concurrently with Site 69 field activities [Section 8.1.19]). Soil, groundwater, surface water, and sediment samples were collected and analyzed for explosives residues, 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. Further investigation of groundwater and geophysical anomalies was recommended.

Table 8-106. Previous Investigations Summary, MMRP Site UXO-02, ASR #2.201

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Expanded Site Investigation (CH2M, 2012)	005470	2011-2012	An ESI was conducted at UXO-02, including Site 69, to further investigate potential unacceptable risks identified during the UXO-02 PA/SI and Site 69 supplemental investigation. Field activities included an intrusive anomaly investigation, monitoring well installation, and soil, groundwater, surface water, and sediment sampling for pesticides, metals, and/or explosives residues analyses. No unacceptable human health or ecological risks were identified from potential exposure to soil, surface water, sediment, or metals in the surficial aquifer groundwater. NFA was recommended for the portion of UXO-02 located outside of the Site 69 perimeter fence and an NADD was submitted in FY 2013. The remaining environmental impacts to be further assessed are associated with potential risks from exposure to waste and the VOC groundwater plume associated with Site 69.
No Action Decision Document (CH2M, 2013)	005814	2013	An NADD was finalized in 2013 to document NFA.
ESS Determination Request (USMC, 2015)	006564	2015	Due to low probability of encountering MEC or MPPEH, the Base determined a UXO-qualified escort is not required to access the site. In addition, an ESS is not required to conduct future activities. Explosives Safety Education Program is required for all personnel accessing these locations.

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

Site UXO-03, the former Practice Hand Grenade Course including the northern boundary area, covers approximately 12 acres of wooded and developed land (**Figure 8-88**). The site contains two former range areas (ASR #2.78a and #2.78b) along Birch Street, north of the Hadnot Point area. The northern boundary area was identified to be addressed as part of UXO-03, based on the uncertainty associated with historical range boundaries and planned MILCON. Site UXO-03 was used as the practice hand grenade range between 1953 and 1959. Although the specific types of munitions used at the site are unknown, the proximity to adjacent buildings and activities would substantiate the likely use of practice munitions. It was therefore concluded to be unlikely that pyrotechnics or high-explosive munitions were used at the site. Based on the findings of previous investigations and the low probability of encountering MEC and/or MPPEH at UXO-03, Explosives Safety Education Program is required for personnel conducting intrusive activities (USMC, 2015). Base Master Planning maintains the current site boundaries in GIS, and all construction projects on-Base go through environmental review.



Figure 8-88. MMRP Site UXO-03, ASR #2.78a and #2.78b

Previous investigations are listed in **Table 8-107**.

Table 8-107. Previous Investigations Summary, MMRP Site UXO-03, ASR #2.78a and #2.78b

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Site Investigation, Northern Boundary (CH2M, 2008)	007279	2008	A Focused SI was conducted within the northern boundary area to evaluate the potential for MEC and environmental impacts based on planned MILCON activities adjacent to the identified UXO-03 boundary. Soil and groundwater samples were collected and analyzed for explosives residues and metals. No exceedances of screening criteria and background were identified in soil or groundwater. A 10 percent DGM survey was also conducted and identified 189 geophysical anomalies representing potential subsurface MEC/MPPEH. A spent pyrotechnic signaling device was discovered on the ground surface during the investigation. Further investigation of the anomalies was recommended.
Expanded Site Investigation, Northern Boundary (CH2M, 2011)	002882	2009-2011	An ESI was conducted within the northern boundary area, including 100-percent DGM and intrusive anomaly investigation (except the wetland areas). 368 geophysical anomalies were identified and one MEC item and 19 MPPEH items were found during the intrusive investigation.
Preliminary Assessment/Site Investigation (CH2M, 2011)	004780	2007-2011	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 DGM and intrusive anomaly investigation over 11 percent of the accessible UXO-03 area; and surface and subsurface soil sampling, groundwater sampling, and surface water and sediment sampling in an unnamed drainage feature in the northern boundary area. The samples were analyzed for explosives residues and metals. There were no unacceptable risks to human health or the environment over that of background concentrations from exposure to site media based on current and potential future use. 68 geophysical anomalies were identified and three MPPEH items (a flare and small arms ammunition) were found during the intrusive investigation. Based on the results of northern boundary area investigations and the PA/SI, no munitions or MPPEH related to high explosives residues or hand grenades were found. The only munitions or MPPEH found within UXO-03 was a flare on the ground surface and flares have been found in other areas of the Base and are not necessarily related to the use of the site as a hand grenade range. Small arms ammunition was found but does not pose an excessive risk to those who may come into contact with it. Therefore, NFA was recommended. Prior to MILCON proceeding at the site, all site personnel conducting subsurface/intrusive activities were recommended to receive Explosives Safety Education Program.
No Action Decision Document (CH2M, 2012)	007176	2012	An NADD was finalized in 2012 to document NFA.

8.4.5 UXO-04—Knox Trailer Park

Site UXO-04, Knox Trailer Park, encompasses approximately 134 acres in the northern portion of the Base (**Figure 8-89**). The Knox Trailer Park area began as a Civilian Conservation Corps Camp in 1941, housing workers who were 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. In addition, 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 World War II through the early 1950s. The research was likely performed indoors, and the amount of ammunition expended for testing purposes is expected to have been 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 World War 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 8-89. MMRP Site UXO-04

Previous investigations are listed in **Table 8-108**.

Table 8-108. Previous Investigations Summary, MMRP Site UXO-04

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Expanded Site Investigation (CH2M, 2009)	004270	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 residues, 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 ESI report was submitted in 2009 documenting the NFA decision.
No Action Decision Document (CH2M, 2010)	007177	2010	An NADD was finalized in 2010 to document NFA.

8.4.6 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 MCAS New River, just south of the intersection of Curtis Road and U.S. Highway 17 (**Figure 8-90**). 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, 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-26 (**Section 8.4.23**), the Former B-3 Gas Chamber (ASR #2.79b), which was reopened as an operational range in 2014.



Figure 8-90. MMRP Site UXO-05, ASR #2.7a, #2.7b, and #2.7c

Previous investigations are listed in **Table 8-109**.

Table 8-109. Previous Investigations Summary, MMRP Site UXO-05

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Limited Site Assessment Former UST CG1-1 (Law and Catlin, 2000)	N/A	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 O&G; as a result, four shallow monitoring wells were installed within a 40-foot radius of the UST location and groundwater samples were collected and analyzed for volatile petroleum hydrocarbon and extractable petroleum hydrocarbon, VOCs, SVOC, chromium, and lead. Benzene, p-isopropyl 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 North Carolina Soil Screening Levels. Based on these results, the site was issued NFA status by NCDEQ in July 2000.
Onslow County Water and Sewer Authority Focused Preliminary Assessment/Site Investigation (Arcadis, 2007)	007344	2007	A focused PA/SI was conducted to evaluate the potential presence of MEC and contaminated 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-diesel-range organics, TPH-gasoline-range organics, pesticides, PCBs, metals, total organic carbon, total organic halogen, perchlorate, and explosives residues. No unacceptable risks to construction workers were identified.
Preliminary Assessment/Site Investigation (CH2M, 2009)	002767	2008-2009	<p>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 residues, 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.</p> <p>The geophysical anomalies identified in the northern area of Site UXO-05 (ASR #2.7c) were attributed to Site UXO-26 and were addressed during the Site UXO-26 ESI.</p>
No Action Decision Document (CH2M, 2009)	007334	2009	An NADD was finalized in 2009 to document NFA.

8.4.7 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 8-91**). 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. Based on the findings of previous investigations and the low probability of encountering MEC and/or MPPEH at UXO-07, Explosives Safety Education Program is required for personnel conducting intrusive activities (USMC, 2015). Base Master Planning maintains the current site boundaries in GIS, and all construction projects on-Base go through environmental review.

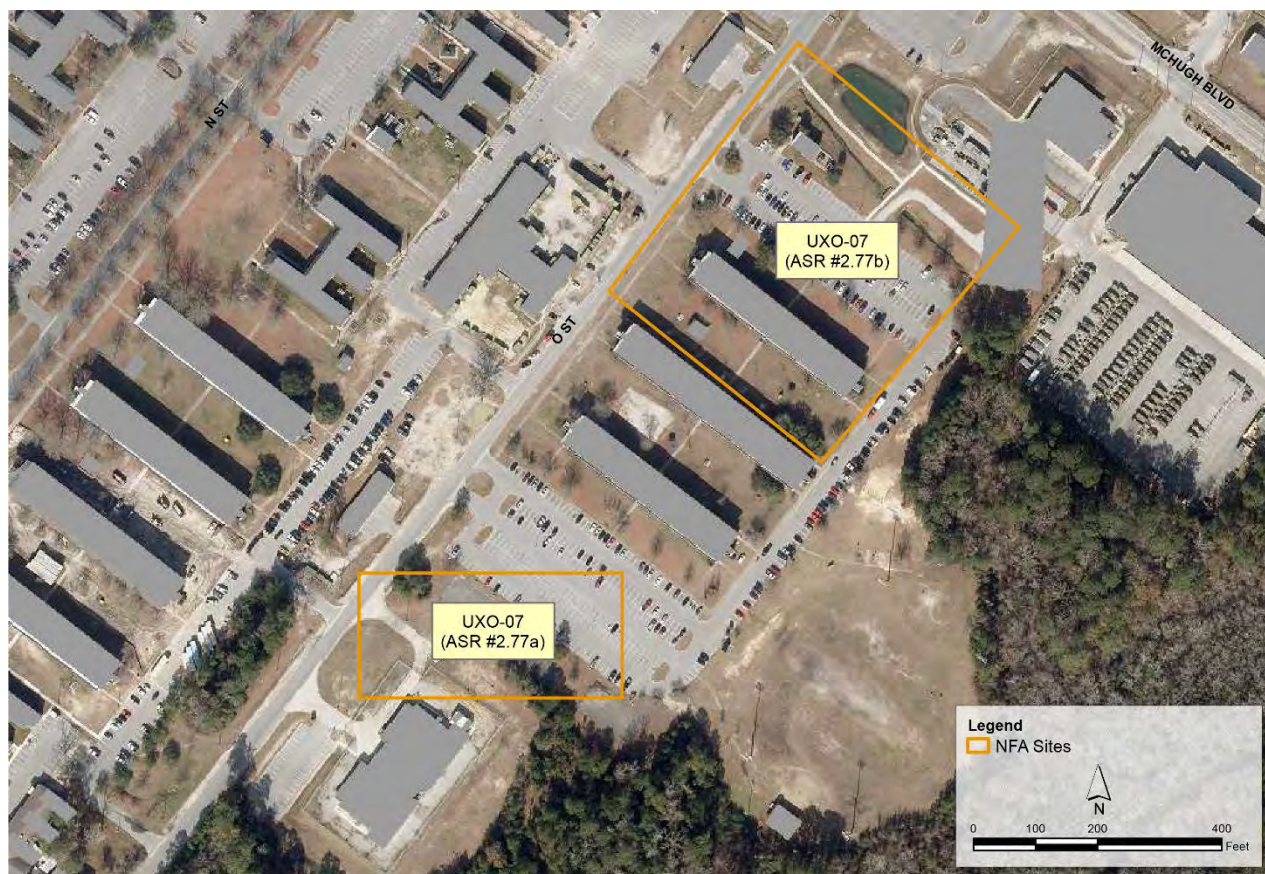


Figure 8-91. MMRP Site UXO-07, ASR #2.77a and #2.77b

Previous investigations are listed in **Table 8-110**.

Table 8-110. Previous Investigations Summary, MMRP Site UXO-07, ASR #2.77a and #2.77b

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2011)	004071	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 percent DGM. Samples were analyzed for SVOCs, explosives residues, 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 HHRS and ERS. 1,118 geophysical anomalies were present at the site, and an intrusive investigation was recommended.

Table 8-110. Previous Investigations Summary, MMRP Site UXO-07, ASR #2.77a and #2.77b

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Expanded Site Investigation (CH2M, 2011)	007178	2011	An ESI was conducted to address the PA/SI recommendations to intrusively investigate the sources of geophysical anomalies identified as representing potential subsurface MEC. No MEC items were found. The MPPEH items that were excavated were inspected, certified, and verified as MDAS. Based on the environmental and MEC investigation results, NFA was recommended at Site UXO-07.
No Action Decision Document (CH2M, 2013)	005814	2013	An NADD was finalized in 2013 to document NFA.
ESS Determination Request (USMC, 2015)	006564	2015	Due to low probability of encountering MEC or MPPEH, the Base determined a UXO-qualified escort is not required to access the site. In addition, an ESS is not required to conduct future activities. 3R Explosives Safety Education Program is required for all personnel accessing these locations.

8.4.8 UXO-08—2.36-inch Bazooka Range, Base Chemical Smoke Chamber, and Nuclear, Biological, and Chemical 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 8-92**). Areas within UXO-08 include the 2.36-inch Bazooka Range, the D-7 Gas Chamber, and the Base Chemical Smoke Chamber and Nuclear, Biological, and Chemical Training Trail. The Range Identification and PA 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 PA report indicate that the operation of the Base Chemical Smoke Chamber and Nuclear, Biological, and Chemical 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 MCB Camp Lejeune Cantonment 2.36-inch Bazooka Range. Retired Base 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 8-92. MMRP Site UXO-08, ASR #2.182 and #2.80

Previous investigations are listed in **Table 8-111**.

Table 8-111. Previous Investigations Summary, MMRP Site UXO-08, ASR #2.182 and ASR #2.80

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Preliminary Assessment/Site Investigation (CH2M, 2010)	002912	2009-2010	In support of MILCON activities for the HPCA, Post Office Intersection Area, and Fitness Center, soil, groundwater, surface water, and sediment sampling was conducted, along with 100 percent DGM. Samples were analyzed for VOCs, SVOCs, explosives residues, 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 HPCA, 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.
Preliminary Assessment/Site Investigation (CH2M, 2011)	004734	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 residues, metals, perchlorate, VOCs, SVOCs, and pesticides/PCBs, 100 percent DGM, and 10 percent intrusive investigation in MILCON areas. 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 FY 2015 FYR for Site 78. NFA was recommended at UXO-08.
No Action Decision Document (CH2M, 2013)	005814	2013	An NADD was finalized in 2013 to document NFA.

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

Site UXO-09 encompasses approximately 3 acres in the HPIA (**Figure 8-93**). The F-9 Triangulation Range area was established in or prior to 1953. As reported in the ASR report, Base personnel stated that the range was used for M-1 rifle target practice. Base personnel also stated 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 reportedly limited to small arms ammunition.



Figure 8-93. MMRP Site UXO-09, ASR #2.83

Previous investigations are listed in **Table 8-112**.

Table 8-112. Previous Investigations Summary, MMRP Site UXO-09

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2009)	002748	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 residues, 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 Action Decision Document (CH2M, 2010)	008255	2010	An NADD was finalized in 2010 to document NFA.

8.4.10 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 8-94**). UXO-10 was reportedly used as a range from 1970 to 1977. The types of munitions used at the range included flame throwers and small arms blank ammunition, which was reportedly used on tanks for demonstration purposes. Demolitions (C-4), white smoke grenades, white phosphorus hand grenades, flame thrower weapons, and blank ammunition for small arms were also used on the course. Based on the findings of previous investigations and the low probability of encountering MEC and/or MPPEH at UXO-10, 3R Explosives Safety Education Program is required for personnel conducting intrusive activities (USMC, 2015). Base Master Planning maintains the current site boundaries in GIS, and all construction projects on-Base go through environmental review.

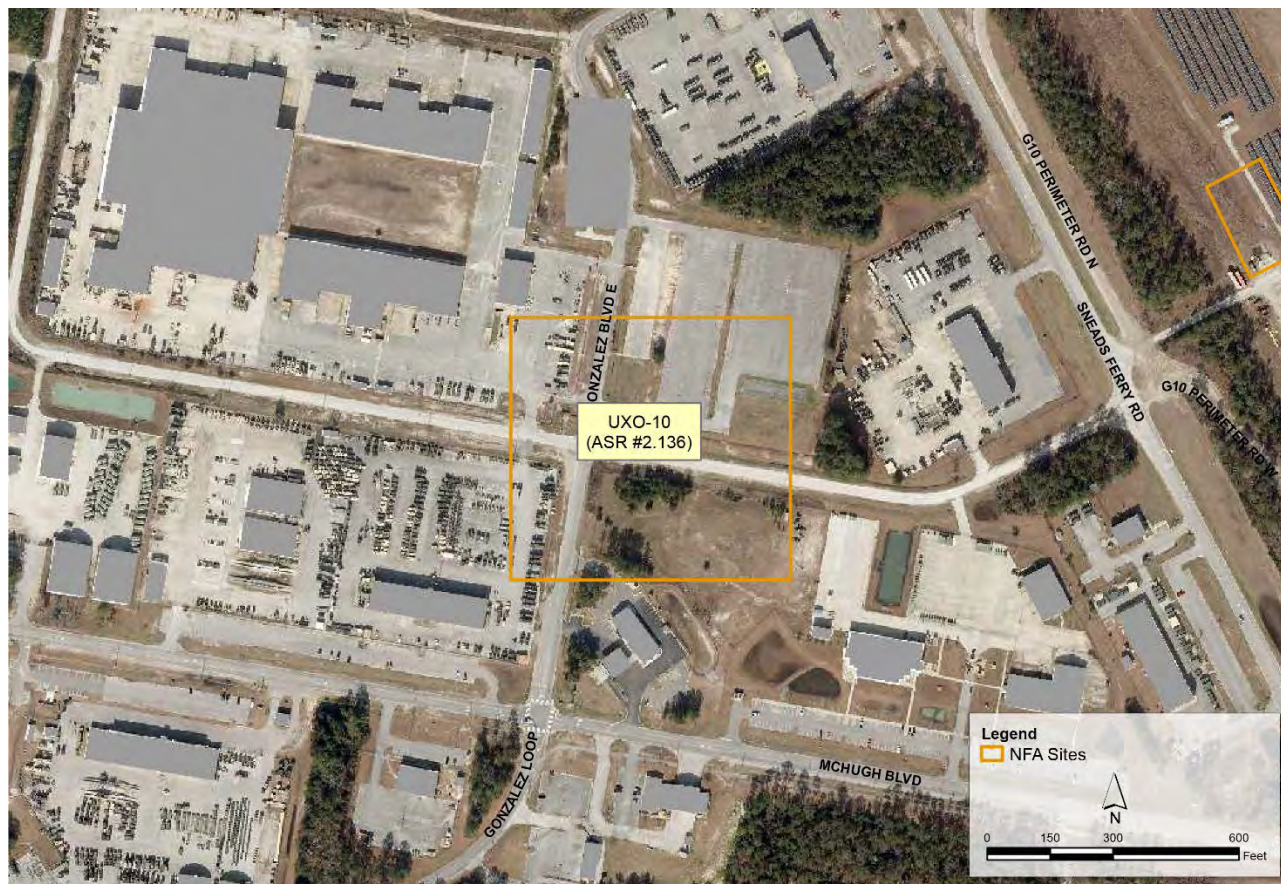


Figure 8-94. MMRP Site UXO-10, ASR #2.136

Previous investigations are listed in **Table 8-113**.

Table 8-113. Previous Investigations Summary, MMRP Site UXO-10, ASR #2.136

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2011)	004673	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 percent DGM. Samples were analyzed for VOCs, SVOCs, TPH, explosives residues, 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.

Table 8-113. Previous Investigations Summary, MMRP Site UXO-10, ASR #2.136

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Expanded Site Investigation (CH2M, 2012)	004771	2011-2012	An ESI was conducted to further investigate geophysical anomalies identified during the PA/SI. Field activities consisted of an intrusive investigation. Two MPPEH items were identified; however, no MEC or MPPEH containing explosive material were identified, and NFA was recommended.
No Action Decision Document (CH2M, 2013)	005814	2013	An NADD was finalized in 2013 to document NFA.
ESS Determination Request (USMC, 2015)	006564	2015	Due to low probability of encountering MEC or MPPEH, the Base determined a UXO-qualified escort is not required to access the site. In addition, an ESS is not required to conduct future activities. 3R Explosives Safety Education Program is required for all personnel accessing these locations.

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

Site UXO-11, the Practice Hand Grenade Course, encompasses approximately 2 acres in Camp Geiger in the northwestern portion of the Base (**Figure 8-95**). 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. Based on the findings of previous investigations and the low probability of encountering MEC and/or MPPEH at UXO-11, 3R Explosives Safety Education Program is required for personnel conducting intrusive activities (USMC, 2015). Base Master Planning maintains the current site boundaries in GIS, and all construction projects on-Base go through environmental review.



Figure 8-95. MMRP Site UXO-11, ASR #2.281

Previous investigations are listed in **Table 8-114**.

Table 8-114. Previous Investigations Summary, MMRP Site UXO-11, ASR #2.281

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2011)	004676	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 percent DGM. Samples were analyzed for explosives residues, metals, and perchlorate. Explosives residues 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.

Table 8-114. Previous Investigations Summary, MMRP Site UXO-11, ASR #2.281

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Expanded Site Investigation (CH2M, 2011)	007637	2011	An ESI was conducted to further evaluate the geophysical anomalies identified during the PA/SI. Additional investigation was also recommended to delineate the extent of identified impacts related to MC and to delineate chromium in surface and subsurface soil. Field activities included an intrusive investigation and soil sampling for chromium and explosives residues. An HHRS and ecological risk screening were conducted to evaluate data collected during the PA/SI and the ESI. No unacceptable human health or ecological risks were identified due to exposure to site media. No MEC items were identified during the intrusive investigation and six MPPEH items (including inert training hand grenades and small arms casings) were removed from the site for disposal. These results indicate that the potential for encountering unidentified subsurface MEC at Site UXO-11 is likely to be low. NFA was recommended.
No Action Decision Document (CH2M, 2013)	005814	2013	An NADD was finalized in 2013 to document NFA.
ESS Determination Request (USMC, 2015)	006564	2015	Due to low probability of encountering MEC or MPPEH, the Base determined a UXO-qualified escort is not required to access the site. In addition, an ESS is not required to conduct future activities. 3R Explosives Safety Education Program is required for all personnel accessing these locations.

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

Site UXO-12, the 1,000-inch Range, encompasses approximately 30 acres and is generally located west of Camp Geiger, in the northwestern portion of the Base (**Figure 8-96**). 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 firing live ammunition. During operation of the site, munitions used included small caliber munitions (.30-caliber weapons firing). The site was investigated as part of Site UXO-18 (**Section 8.4.18**) based on its location within the boundaries of the former B-6 small arms ranges.



Figure 8-96. MMRP Site UXO-12, ASR #2.5

Previous investigations are listed in **Table 8-115**.

Table 8-115. Previous Investigations Summary, MMRP Site UXO-12, ASR #2.5

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2011)	004683	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 Action Decision Document (CH2M, 2011)	007638	2011	An NADD was finalized in 2011 to document NFA.

8.4.13 UXO-13—Naval Regional Medical Center

Site UXO-13, the Naval Regional Medical Center, encompasses approximately 176 acres on the Mainside of the Base (**Figure 8-97**). No known historical 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 historical live-fire activities on this range.



Figure 8-97. MMRP Site UXO-13

8.4.14 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 less than 1 acre within the Rifle Range area of the Base (**Figure 8-98**). 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 8-98. MMRP Site UXO-14, ASR #2.199 and #2.200

Previous investigations are listed in **Table 8-116**.

Table 8-116. Previous Investigations Summary, MMRP Site UXO-14, ASR #2.199 and #2.200

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2011)	004687	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 percent 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.

Table 8-116. Previous Investigations Summary, MMRP Site UXO-14, ASR #2.199 and #2.200

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Expanded Site Investigation (CH2M, 2012)	004766	2011-2012	An ESI was conducted to evaluate potentially unacceptable human health risks previously identified in soil at the former Indoor Pistol range and assess the nature of geophysical anomalies in the former Gas Chamber area. Field activities included an intrusive investigation and surface and subsurface soil sampling for antimony, lead, and mercury. Potentially unacceptable human health and ecological risks were confirmed due to exposure to lead and antimony in soil at the Indoor Pistol Range. No MEC was identified during the intrusive investigation at the former Gas Chamber. No further investigation of the Gas Chamber and an interim action and/or an RI/FS to address antimony and lead in soil at the Indoor Pistol Range was recommended.
Engineering Evaluation/Cost Analysis (CH2M, 2012)	005164	2012	The EE/CA evaluated alternatives for a NTCRA to address potential unacceptable risks from antimony and lead in soil. The alternatives were no action, excavation and offsite disposal, and in situ soil stabilization with excavation and offsite disposal.
Action Memorandum (CH2M, 2013)	005588	2013	An AM was completed to propose in situ soil stabilization with excavation and offsite disposal as the NTCRA to address antimony and lead in soil.
Non-time-critical Removal Action (Osage, 2013)	N/A	2013	An NTCRA was initiated to address antimony and lead in soil. Pre-excavation soil sampling was conducted to define the lateral extent of contamination. Soil within the excavation area was treated in place to render the soil non-hazardous for offsite disposal. Approximately 333 tons of soil were excavated for offsite disposal. Post-excavation samples were collected from the base of the excavation and the results were below the screening criteria. Based on the results of the NTCRA, NFA was recommended in the closeout report.
No Action Decision Document (CH2M, 2014)	007642	2014	Based on recommendations from the ESI and completion of the NTCRA, a NADD was completed to document NFA for the site and was signed in August 2014.

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

The Former 1,000-inch Range (ASR #2.19) comprises approximately 9 acres in the northern portion of the Courthouse Bay Amphibious Area where a MILCON project was proposed (**Figure 8-99**). 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.



Figure 8-99. MMRP Site UXO-15, ASR #2.19

Previous investigations are listed in **Table 8-117**.

Table 8-117. Previous Investigations Summary, MMRP Site UXO-15, ASR #2.19

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2010)	002787	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 Action Decision Document (CH2M, 2010)	007639	2010	An NADD was finalized in 2010 to document NFA.

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

Site UXO-16, also referred to as Former Gun Positions 41A and 41B, encompasses approximately 4 acres in the Stone Bay area of the Base (**Figure 8-100**). UXO-16 was first established during World War II as a training ground and was also used during the Korean War-era as a training ground. 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 are 4.2-inch, 81-mm, 120-mm, 175-mm, 4.2-inch, and 8-inch munitions. Based on the findings of previous investigations and the low probability of encountering MEC and/or MPPEH at UXO-16, 3R Explosives Safety Education Program is required for personnel conducting intrusive activities (USMC, 2015). Base Master Planning maintains the current site boundaries in GIS and all construction projects on-Base go through environmental review.



Figure 8-100. MMRP Site UXO-16, ASR #2.212

Previous investigations are listed in **Table 8-118**.

Table 8-118. Previous Investigations Summary, MMRP Site UXO-16, ASR #2.212

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Preliminary Assessment/Site Investigation (CH2M, 2009)	002723	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 residues, perchlorate, and metals. A total of 895 geophysical anomalies potentially representing subsurface MEC were identified and intrusively investigated. All items were found to be cultural debris or MPPEH that was later determined to be MDAS. 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. However, prior to MILCON proceeding at the site, all site personnel conducting subsurface/intrusive activities were recommended to receive 3R Explosives Safety Education Program.
No Action Decision Document (CH2M, 2010)	007640	2010	An NADD was finalized in 2010 to document NFA.

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

Site UXO-17, Firing Position #2, encompasses approximately 16 acres on the Mainside of the Base (**Figure 8-101**). UXO-17 was a gun position used for military training, which fired into the G-10 impact area, used from the 1950s through at least 1985. Howitzer guns (105-mm and 155-mm) were used at this site. As a result of the type of training conducted at the site, DMM is unexpected, although ammunition packaging, range residue, barbed wire, and buried garbage may be present. Following the previous investigations presented in **Table 8-119**, the Base municipal solid waste landfill was expanded and covers a majority of the site (**Figure 8-101**). Based on the findings of previous investigations and the low probability of encountering MEC and/or MPPEH at UXO-17, 3R Explosives Safety Education Program is required for personnel conducting intrusive activities (USMC, 2015). Base Master Planning maintains the current site boundaries in GIS, and all construction projects on-Base go through environmental review.



Figure 8-101. MMRP Site UXO-17, ASR #2.212

Previous investigations are listed in **Table 8-119**.

Table 8-119. Previous Investigations Summary, MMRP Site UXO-17, ASR #2.212

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2012)	004748	2008-2012	<p>The PA/SI was completed in three phases. Phase I consisted of 100 percent DGM and intrusive investigation of a 4-acre area in the center of the site and environmental sampling of soil and groundwater. Phase II consisted of 9 percent DGM and intrusive investigation of the surrounding 12 acres and environmental sampling of soil and groundwater. Phase III consisted of groundwater sampling in the vicinity of a buried leaking drum discovered and removed during Phase I.</p> <p>Approximately 31.5 percent of Site UXO-17 was surveyed, yielding a total of 1,992 geophysical anomalies and 21 saturated response areas potentially representing subsurface MEC. Intrusive investigation resulted in the identification of 1 MEC item and 279 MPPEH items. The MEC item was determined to be DMM associated with the historical use as a firing position. Other MPPEH was consistent with the site's use for training. Other than DMM, the firing position and surrounding training area were not determined to be a source of MEC. Based on the estimated 263,500 pounds of other debris items (concrete, metal drums, and scrap metal) encountered, it is likely that portions of the site were used for disposal. The risk screening results indicated that exposure to soil, sediment, surface water, and groundwater would not result in unacceptable human health or ecological risks. Based on these results and because the site will be used as an above grade expansion area for the Base landfill, potentially covering any remaining subsurface debris, no further investigation was recommended. Prior to MILCON proceeding at the site, all site personnel conducting subsurface/intrusive activities were recommended to receive 3R Explosives Safety Education Program. On-call construction support was also recommended for inspection and disposal of suspected MEC/MPPEH that may be unearthed.</p>
No Action Decision Document (CH2M, 2013)	005814	2013	An NADD was finalized in 2013 to document NFA.

8.4.18 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 8-102**). 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 8.4.12**) is located within the boundaries of the former B-6 small arms ranges and was investigated as part of Site UXO-18.



Figure 8-102. MMRP Site UXO-18, ASR #2.44

Previous investigations are listed in **Table 8-120**.

Table 8-120. Previous Investigations Summary, MMRP Site UXO-18, ASR #2.44

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2011)	004683	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 Action Decision Document (CH2M, 2011)	007638	2011	An NADD was finalized in 2011 to document NFA.

8.4.19 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 8-103**). 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. The range is adjacent to and overlaps with the 1,000-inch Range delineation.

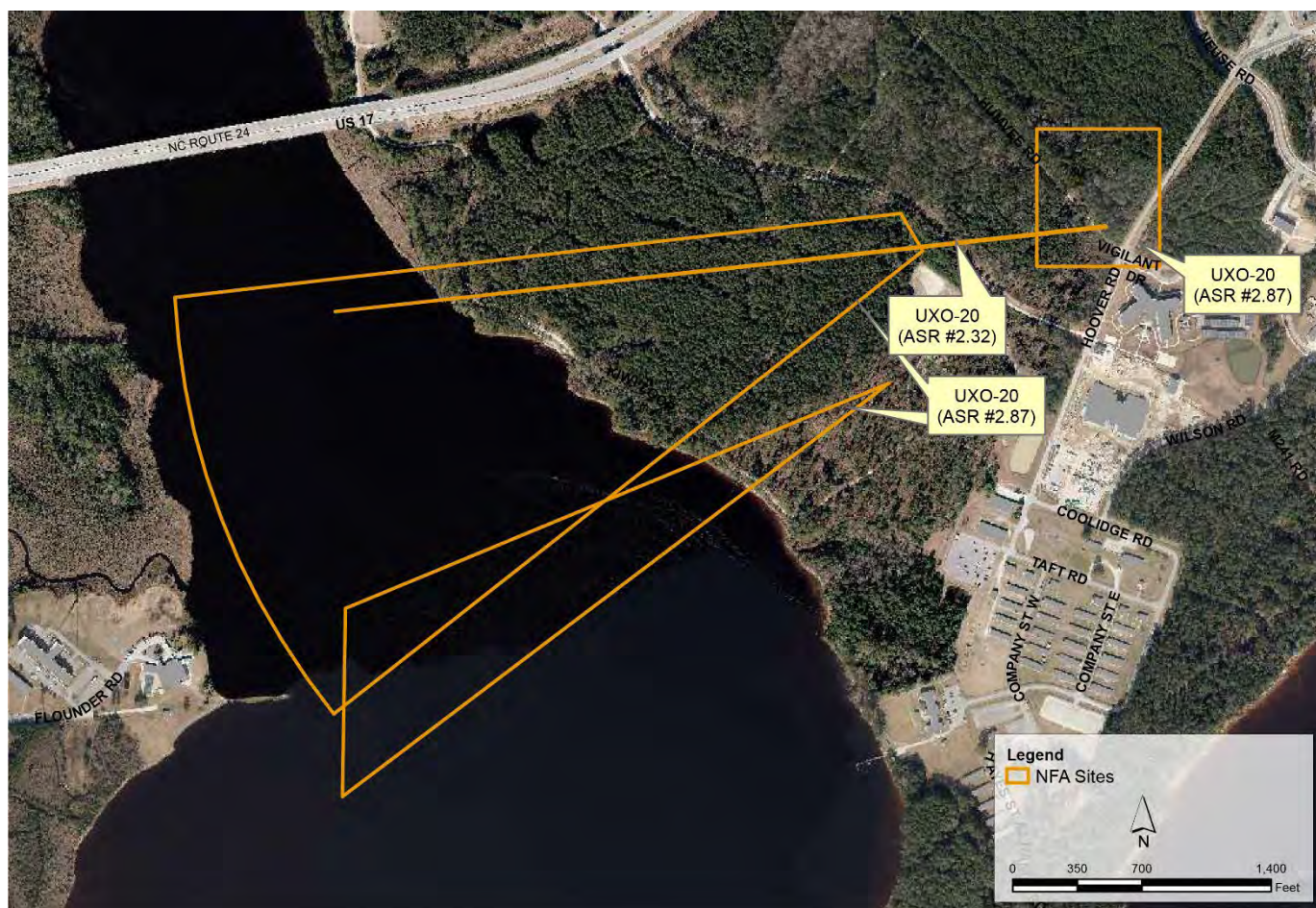


Figure 8-103. Site UXO-20, ASR #2.32 and #2.87

Previous investigations are listed in **Table 8-121**.

Table 8-121. Previous Investigations Summary, MMRP Site UXO-20, ASR #2.32 and #2.87

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Preliminary Assessment/Site Investigation (CH2M, 2011)	005391	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 Action Decision Document (CH2M, 2011)	007641	2011	An NADD was finalized in 2011 to document NFA.

8.4.20 UXO-21—Gas Chamber (2nd Marine Division) (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 8-104**). Based on the operational history of the site, chemical warfare training agents (tear gas) would have been used. The Preliminary Range Assessment/ASR (USACE, 2001) stated that CAIS and riot-control hand grenades may have been used at the site; however, this statement was a speculation based on areas surrounding other gas chambers often being used for other chemical training. There is no documentation or other historical indications that CAIS or riot-control hand grenades were used at the former D-Area Gas Chamber, and the PA/SI, (CH2M, 2011), Phase I ESI (CH2M, 2012), and the Phase II ESI (CH2M, 2014) found no evidence that these items are present at the site. Adjacent and overlapping ranges that may have affected Site UXO-21 include the Impact Area located east of Sneads Ferry Road, the F-6 Live Grenade Range (ASR #2.55), the F-13 Flame Thrower Range (ASR #2.139), the F-7 Flame Thrower Range (ASR #2.128), and the F-13 Field Firing Range (ASR #2.54). Based on the findings of previous investigations and the low probability of encountering MEC and/or MPPEH at UXO 21, 3R Explosives Safety Education Program is required for personnel conducting intrusive activities (USMC, 2015). Base Master Planning maintains the current site boundaries in GIS, and all construction projects on-Base go through environmental review.



Figure 8-104. MMRP Site UXO-21, ASR #2.204

Previous investigations are listed in **Table 8-122**.

Table 8-122. Previous Investigations Summary, MMRP Site UXO-21, ASR #2.204

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2011)	005839	2007-2011	<p>In support of MILCON activities, a PA/SI was conducted in a phased approach. In the interior 5-acre area of the site, soil and groundwater sampling and DGM were conducted as part of Phase I field activities. Samples were analyzed for VOCs, SVOCs, tear gas constituents, and metals. 569 geophysical anomalies representing potential subsurface MEC were identified during Phase I DGM. An intrusive investigation was conducted, and approximately 6 percent of the anomalies were determined to be MPPEH. MPPEH was inspected, identified as MDAS, and removed for offsite disposal.</p> <p>Phase II field activities included 10 percent DGM of the surrounding 9.5 acres and soil, groundwater, surface water, and sediment sampling for VOCs, SVOCs, explosives residues, perchlorate, and metals. 738 geophysical anomalies that represented potential subsurface MEC were identified during Phase I DGM.</p> <p>No unacceptable human health or ecological risks were identified from exposure to environmental media; however, further investigation of the geophysical anomalies identified during Phase II DGM was recommended.</p>
Expanded Site Investigation (CH2M, 2012)	004753	2011-2012	<p>An ESI was conducted to further assess the nature and extent of geophysical anomalies identified during Phase II of the PA/SI. Field activities included an intrusive investigation of the 1,307 geophysical anomalies identified during the PA/SI. One MEC item was discovered and destroyed through a controlled detonation, and more than 60 MPPEH items were identified. Additional DGM and an intrusive investigation were recommended to define the extent of MEC/MPPEH beyond the boundaries of Site UXO-21.</p>
MILCON Technical Memorandum (CH2M, 2013)	007362	2012-2013	<p>An intrusive investigation was conducted to identify and remove surface and subsurface MEC and MPPEH prior to initiation of MILCON activities.</p> <p>Fieldwork was conducted within the footprint of a planned expansion of Sneads Ferry Road including a planned utility corridor and a vehicle turn lane along Sneads Ferry Road, and within the tank trail area. Field activities consisted of an intrusive investigation and post detonation soil sampling. One MEC item and 55 MPPEH items were identified and removed. Based on the results of this investigation, the planned MILCON activities proceeded.</p>
Phase II Expanded Site Investigation (CH2M, 2014)	006277	2014	<p>Based on recommendations of the ESI, additional field activities were conducted in 2013 to define the extent of MEC/MPPEH in the MRS adjacent to UXO-21. Field activities included DGM and an intrusive investigation over approximately 7 percent of the MRS. The MEC items and MPPEH items recovered to date were inconsistent with items expected at a former gas chamber (such as expended tear gas canisters, riot control hand grenades, or war gas identification sets). The items found (for example, pyrotechnic, screening, and marking devices) are likely a result of general military training maneuvers and exercises at overlapping and adjacent ranges. The explosive hazard analysis indicated that the probability of contact with MEC and MPPEH and the risk from explosive hazards are both low.</p> <p>Based on the environmental sampling results of the PA/SI, the intrusive investigations completed to date, and the explosives hazard analysis, NFA was recommended. However, prior to MILCON proceeding at the site, all site personnel conducting subsurface/intrusive activities were recommended to receive 3R Explosives Safety Education Program.</p>
No Action Decision Document (CH2M, 2015)	006713	2014-2015	<p>An NADD was finalized in 2015 to document NFA.</p>

8.4.21 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 8-105**). The D-9 Skeet Range was used for recreational shooting from 1953 until it was closed in July 2011. The range was one of four live-fire ranges within a training area known as Area D. The weapons historically accommodated included 12-, 16-, 20-, 28-, and 410-gauge shotguns. Sizes of lead shot used on the range included 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 were fired each year. In addition, 3R Explosives Safety Education Program informational flyers were distributed to building occupants working and living within the newly constructed buildings.



Figure 8-105. MMRP Site UXO-23, ASR #2.82

Previous investigations are listed in **Table 8-123**.

Table 8-123. Previous Investigations Summary, MMRP Site UXO-23, ASR #2.82

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Site Inspection (CH2M, 2008)	007279	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 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 HHRA was recommended.

Table 8-123. Previous Investigations Summary, MMRP Site UXO-23, ASR #2.82

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Focused Preliminary Assessment/Site Investigation (CH2M, 2010)	002814	2008-2010	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 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 Site Inspection (AGVIQ/CH2M, 2010)	007280	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. A HHRS and an ecological risk screenings were performed on the data collected to-date. In the northern area, potential risks were identified for 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.
Environmental Update (CH2M, 2011)	004669	2011	Several MILCON projects were planned/initiated within and adjacent to the former theoretical shot-fall zone including construction of a road within the 11.5-acre graded area and building construction within the eastern portion of the removal area. Investigation activities were conducted to evaluate any environmental impacts within MILCON areas and to further delineate prior to the planned NTCRA. Additional soil sampling for lead and PAH analyses were conducted. Soil samples were also screened using an XRF analyzer. Lead concentrations exceeded screening criteria levels at three soil sample locations and the proposed NTCRA area was modified based on the results. The construction limits for the proposed building and road were outside of the NTCRA area; therefore, MILCON activities were recommended to proceed as planned.
Engineering Evaluation/Cost Analysis (CH2M, 2012)	004727	2010-2012	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.
Action Memorandum (CH2M, 2012)	004769	2012	An AM was completed to propose in situ stabilization followed by excavation and offsite disposal as the NTCRA to address lead and PAHs in soil.
Wallace Creek MILCON Sampling (CH2M, 2012)	007156	2012	In support of MILCON activities of buildings located northwest of the theoretical shot-fall zone, soil and groundwater sampling was conducted to evaluate whether environmental impacts related to historical activities could pose unacceptable risks to construction workers and future residents. The samples were analyzed for VOCs, SVOCs, pesticides/ PCBs, and metals. There were no unacceptable risks for human and ecological receptors at the proposed building locations. Therefore, MILCON activities were recommended to proceed as planned.

Table 8-123. Previous Investigations Summary, MMRP Site UXO-23, ASR #2.82

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Non-time-critical Removal Action (Osage, 2012 and 2013) (CH2M, 2014) (SEPI, 2016) (Meadows, 2016)	005824 through 005828 006107 N/A 007706 through 007710	2012-2016	The NTCRA was conducted in a phased approach to treat and remove lead and PAH contaminated soil in the former theoretical shot-fall zone. 109 final post-confirmation samples were collected during Phase I to confirm all contaminated soil was removed. Deeper contamination was found in the center of the NTCRA area and confirmation soil samples were collected to vertically delineate PAH and lead contaminated soil. Depths to soil with concentrations below the action levels ranged from 2 to 6.5 feet bgs. Soil removal was conducted to the depth of final post-confirmation samples during Phase I and to the depth of skeet and/or dark stained soil during Phases II and III. Approximately 74,157 tons of lead and PAH-contaminated soil were excavated with more than 54,000 tons treated with Enviroblend, rendering the soil as non-hazardous, prior to excavation. Approximately 72,695 tons of excavated soil were non-hazardous and 1,462 tons were hazardous. Site UXO-28 was established to address munitions related items that were identified during the NTCRA activities.
Expanded Site Investigation (CH2M, 2018)	007564	2012-2018	An ESI was conducted between 2012 and 2017 to confirm the results of the XRF screening conducted during previous investigations within Grid D10, conduct a site walk to evaluate the presence of potential dumping areas or unnatural disturbances (herein referred to as mounds) throughout the wooded areas of the site and to characterize the composition of the mounds and the soil surrounding the discarded containers discovered during the site walk, characterize potential PAH and/or lead impacts associated with the North Area and former theoretical shot fall-zone groundwater, Beaver Dam Creek surface water and sediment, and Bearhead Creek sediment, characterize potential impacts associated with the unknown black material observed in contact with the abandoned pipe, and evaluate potential risks to human health and the environment posed by any identified impacts. Field activities included collection of surface soil, subsurface soil, surface water, groundwater, and sediment samples, and investigation of soil surrounding discarded containers and mounds discovered during a site walk conducted throughout the UXO-23 wooded areas. Samples were analyzed for VOCs, SVOCs (PAHs), pesticides, chlorinated herbicides, PCBs, and/or metals. Based on results of the investigation, there were limited and isolated exceedances of regulatory screening criteria in surface and subsurface soil, groundwater, surface water, and sediment and no unacceptable risks to human health or the environment were identified from exposure to environmental media; therefore, NFA was recommended for UXO-23.
No Action Decision Document (CH2M, 2018)	007832	2018	The NADD was finalized in 2018 to document NFA.

8.4.22 UXO-25—Verona Loop

UXO-25 encompasses approximately 25 acres just south of MCAS New River (**Figure 8-106**) near the township of Verona, North Carolina. UXO-25 lies within portions of two former ranges, the Impact Area “M” range and the M-16, Outdoor Classroom range. The Impact Area “M” range was in use as a live fire range with maneuver exercises with the use of mortars, recoilless rifles, 2.36-inch rockets, and hand and rifle grenades from 1941 to approximately 1945. Historical information indicates that 0.30-caliber blanks may have been used, along with pyrotechnics at the M-16, Outdoor Classroom range. This area is no longer used for firing live ammunition. UXO-25 is relatively flat and heavily vegetated with trees and dense undergrowth. The area within UXO-25 is undeveloped, with a small residential area and church located adjacent to the central portion of the site where it is bisected by Verona Loop Road.

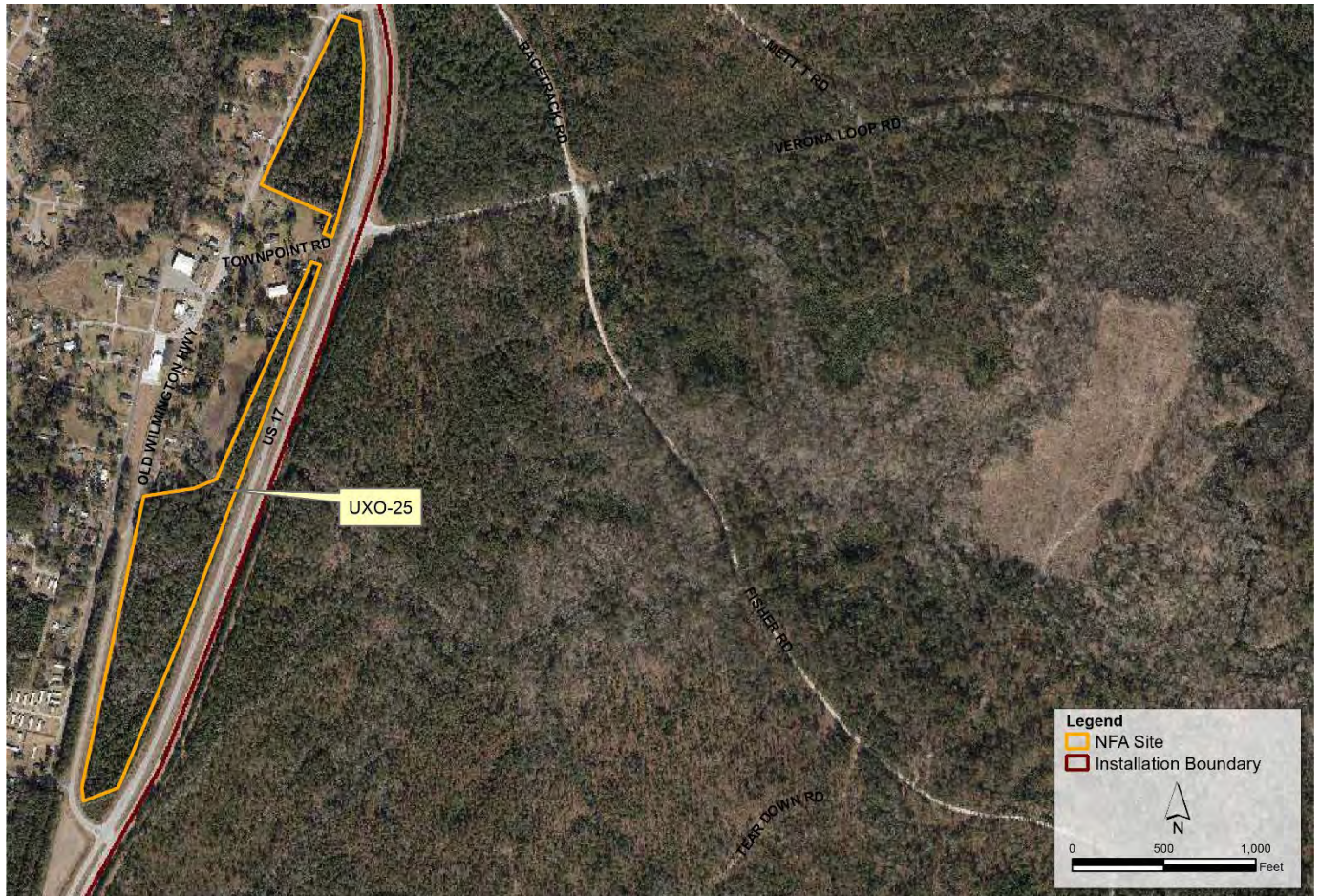


Figure 8-106. MMRP Site UXO-25

Previous investigations are listed in **Table 8-124**.

Table 8-124. Previous Investigations Summary, MMRP Site UXO-25

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (CH2M, 2013)	005590	2012-2013	A PA/SI was conducted to evaluate the presence of potential subsurface MEC and potential impacts to soil and groundwater. Field activities included 10 percent DGM, intrusive MEC investigations and surface soil, subsurface soil, and groundwater samples were collected and analyzed for explosives residues and metals. Metals were detected at concentrations above screening criteria in soil samples. However, an HHRS and ecological risk screening were conducted and no unacceptable risks were identified. The DGM investigation identified 361 potential targets but no MEC or MPPEH were identified during the intrusive investigation. Based on these results, NFA was recommended.
No Action Decision Document (CH2M, 2014)	005887	2014	An NADD was finalized in 2014 to document NFA.

8.4.23 UXO-26—B-3 Gas Chamber (ASR #2.79a and #2.79c)

Site UXO-26 (ASR #2.79a and ASR #2.79c, the Former B-3 Gas Chamber) covers approximately 14 acres located at the main entrance of the MCAS New River (**Figure 8-107**). The B-3 Gas Chamber facility was used between 1953 and 1958. As part of operational training activities, training agents (chemical agents), war gas identification sets, and riot control hand grenades may have been used. UXO-26 was entered in the MMRP as part of Site UXO-01, which included several sites; however, based on initial UXO-01 investigation results, separate MMRP site numbers (UXO-21 [ASR #2.204, Former Gas Chamber, 2nd Marine Division] and UXO-26) were designated. In addition, ASR #2.79b overlaps a portion of MMRP Site UXO-05 (see ASR #2.7c on **Figure 8-90**), which was reopened as an operational range in 2014.



Figure 8-107. MMRP Site UXO-26, ASR #2.79a and #2.79c

Previous investigations are listed in **Table 8-125**.

Table 8-125. Previous Investigations Summary, MMRP Site UXO-26, ASR #2.79a and #2.79c

Previous Investigations/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Investigation (UXO-05 and UXO-01) (CH2M, 2009)	002767	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 percent DGM. Samples were analyzed for SVOCs, including tear gas constituents, explosives residues, 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.

Table 8-125. Previous Investigations Summary, MMRP Site UXO-26, ASR #2.79a and #2.79c

Previous Investigations/Action	NIRIS Document Number	Date	Activities
Expanded Site Investigation (CH2M, 2012)	005483	2011-2012	The ESI field investigation was completed to assess, through intrusive investigation, the nature of the 353 geophysical anomalies identified during the PA/SI. No MPPEH was found during the intrusive investigation of areas ASR #2.79a or #2.79c. In the ASR #2.79b area, M6A3 2.36-inch rockets, rocket motors, and pieces of rockets were found indicating a potential target area. However, in 2012, Base Range Control identified the area encompassing ASR #2.79b to be reopened. Since the area was reopened, it falls under the responsibility and management of Range Control, and MEC clearance activities are planned to minimize explosive risks. If the area is not reopened, an RI is recommended under the MMRP for ASR #2.79b. In addition, it was recommended to maintain the existing warning signs and conduct a surface sweep for MEC/MPPEH to minimize explosive risks.
Range Reopening Activities (USMC, 2014)	007350	2014	In March 2014, the area encompassing ASR #2.79b was reopened as an operational range for use as a School of Infantry training area. Prior to reopening, UXO clearance activities were conducted by Range Control and resulted in recovery and disposal of 15,480 pounds of MPPEH and 6,800 pounds of range-related debris; demolition and disposal of three concrete targets; and identification, demolition, and disposal of 226 MEC items.
No Action Decision Document (CH2M, 2014)	007337	2014	An NADD was finalized in 2014 to document NFA.

8.4.24 UXO-27 – Gun Position Owl (ASR #2.212)

Site UXO-27 (ASR #2.212) covers approximately 14 acres in the southern portion of the Stone Bay Complex (**Figure 8-108**). The site is mostly covered by forest, and Everett Creek Road runs along the northern portion of the site. Gun Position Owl may have been used for indirect firing of 105-mm and 155-mm projectiles into the K-2 impact area. No other documentation has been identified to indicate that other military munitions have been used within Gun Position Owl. Based on the findings of previous investigations and the low probability of encountering MEC and/or MPPEH at UXO-27, 3R Explosives Safety Education Program is required for personnel conducting intrusive activities (USMC, 2015). Base Master Planning maintains the current site boundaries in GIS, and all construction projects on-Base go through environmental review.

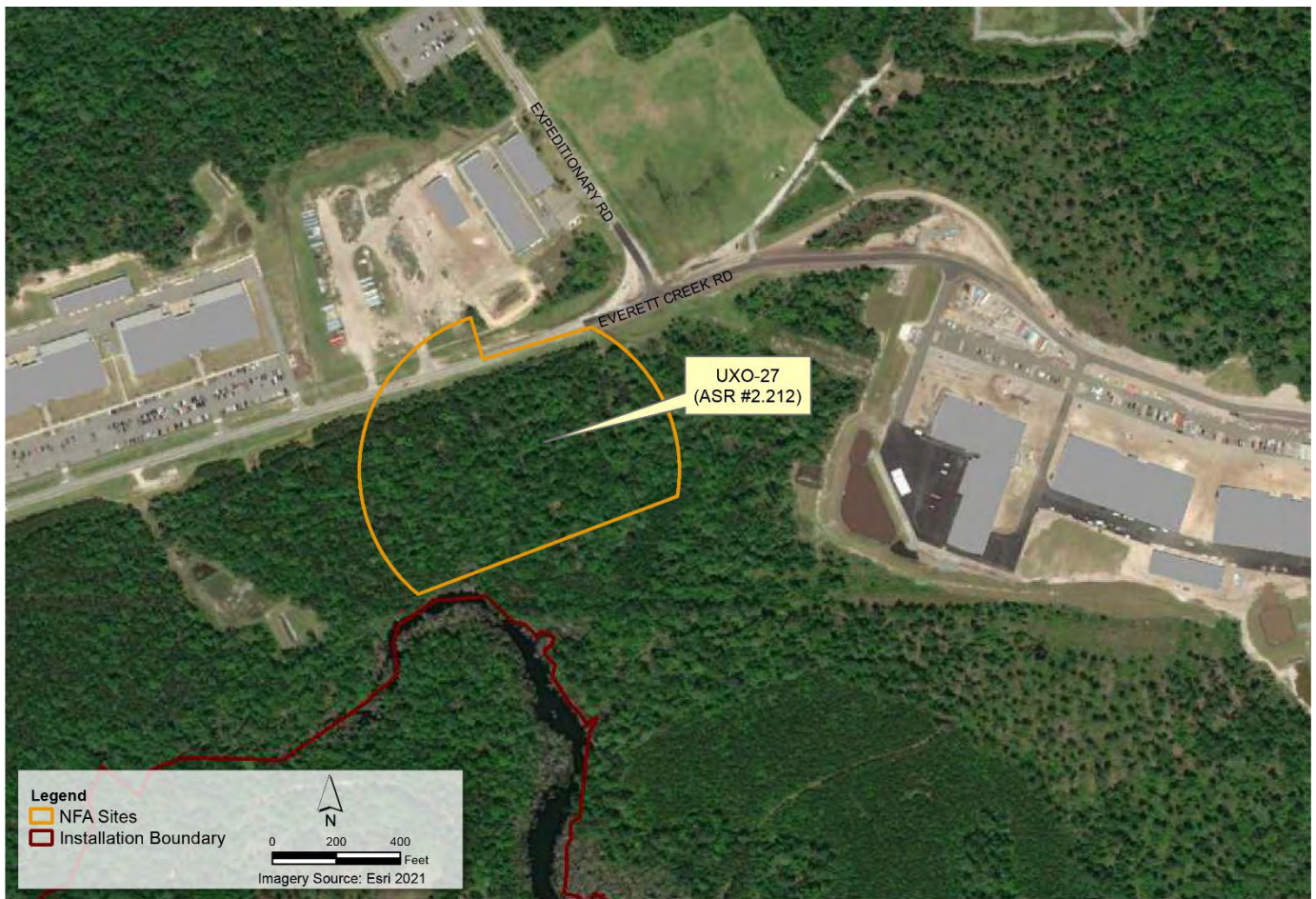


Figure 8-108. MMRP Site UXO-27, ASR #2.212

Previous investigations are listed in **Table 8-126**.

Table 8-126. Previous Investigations Summary, MMRP Site UXO-27, ASR #2.212

Previous Investigation/Action	NIRIS Document Number	Date	Activities
Preliminary Assessment/Site Inspection (CH2M, 2015)	007375	2013-2015	<p>In 2013, a PA/SI was initiated to evaluate the nature and extent of potential MEC, MPPEH, and MC at UXO-27. Field activities included DGM, an intrusive anomaly investigation, and soil and groundwater sampling for MC analysis. Approximately 700 anomalies were identified during DGM and more than 400 anomalies were intrusively investigated. No MEC and only MPPEH/ MDAS were identified.</p> <p>Only metals were detected above screening criteria in soil and groundwater. However, the results of the risk screening indicated that exposure would not result in unacceptable risks to human health or ecological receptors. Based on the results, NFA and closure under the MMRP was recommended for Site UXO-27. However, prior to MILCON proceeding at the site, all site personnel conducting subsurface/intrusive activities were recommended to receive 3R Explosives Safety Education Program.</p>
No Further Action Decision Document (CH2M, 2016)	007374	2016	A No Further Action Decision Document was finalized in FY 2016 to document NFA.

Additional Site Investigations

The following sections discuss the site history, previous investigations, and future activities of the additional sites that have not been assigned IRP or MMRP site designations but are being investigated following the CERCLA process.

9.1 Base Boundary Survey

A Base boundary survey was initiated in 2009 to identify current and historical activities at the properties adjacent to MCB Camp Lejeune 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 AOPCs. After conducting a public database search and 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 Camp Lejeune. Based on the results, potential on-Base impacts to groundwater were identified at three of the AOPCs (9, 10, and 11) (**Figure 2-9**). The *Base Boundary Report for Potential Off-Base Contamination Encroachment, Marine Corps Base Camp Lejeune* (CH2M, 2010) documents the results of the records review and field investigation. In 2010, the Base notified USEPA and NCDEQ of the results. Additional delineation sampling was conducted in 2011-2012 and was documented in the *Base Boundary Report Addendum for Potential Off-Base Contamination Encroachment* (CH2M, 2012). A summary of background information and future activities is provided below for each site.

In addition, a follow-up evaluation was initiated in FY 2022 to review and identify additional or new potential off-Base source areas that could impact soil and/or groundwater on-Base and a report is planned to summarize the results in FY 2022.

9.1.1 AOPC 9—Lejeune Boulevard and Camp Knox Road

AOPC 9 is located near the intersection of North Carolina Highway 24 and Bell Fork Road (**Figure 9-1**). Groundwater sampling for VOCs, SVOCs, and lead was conducted. MTBE, a gasoline additive commonly associated with petroleum releases, was detected at concentrations above the NCGWQS in deep groundwater. Potential off-Base sources include the former Chico's Tires leaking underground storage tank (LUST) site, FastFare 557 UST site, and Ronnie Henderson UST site. All of these sites are located directly across the North Carolina Highway 24/Lejeune Boulevard right-of-way, approximately 100 feet north of the Base boundary. NCDEQ issued NFA for the former Chico's Tires and Lejeune Exxon/Handy Mart 52 LUST sites, and there are no known releases associated with the FastFare 557 or Ronnie Henderson UST sites. Due to MILCON activities, several AOPC 9 groundwater monitoring wells were abandoned or destroyed, two of which were reinstalled in FY 2015. LTM was initiated in FY 2015 and is ongoing to monitor changes in MTBE concentrations in groundwater. In the 2016 report (CH2M, 2016), it was recommended that three additional samples be collected during different seasons on an annual basis from one monitoring well to evaluate potential seasonal variability of MTBE concentrations. The April 2018 MTBE concentration slightly increased compared to the February 2016 and July 2017 results to above the NCGWQS, but overall has decreased compared to the March 2015 result. The MTBE concentration remains lower than those observed in March 2015 (CH2M, 2019). Periodic groundwater monitoring is planned to evaluate trends.

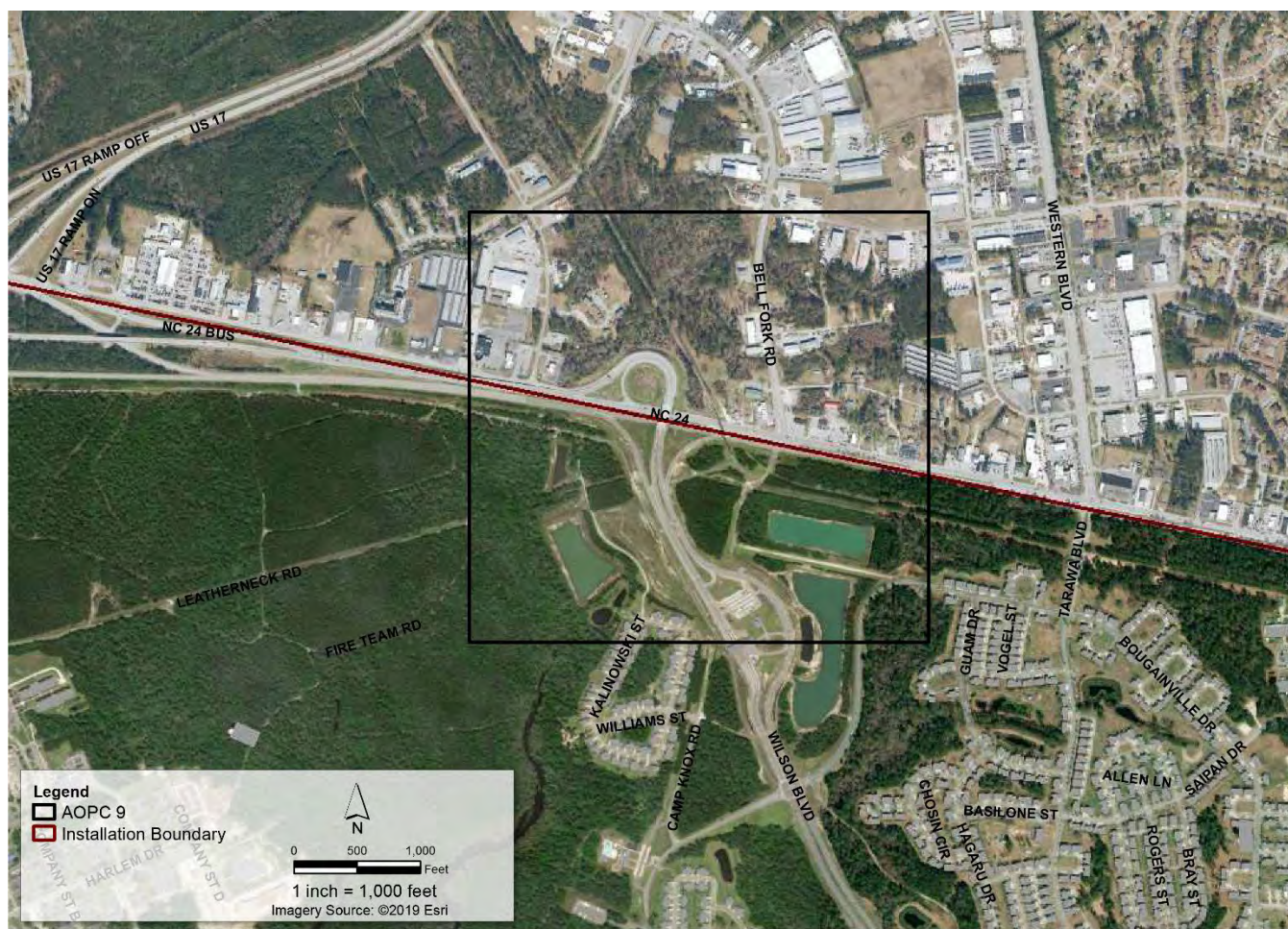


Figure 9-1. AOPC 9

9.1.2 AOPC 10—Lejeune Boulevard and Tarawa Boulevard

AOPC 10 is located at the intersection of North Carolina Highway 24 and Tarawa Boulevard (**Figure 9-2**). Groundwater sampling for VOCs, SVOCs, and lead was conducted. Petroleum-related compounds and CVOCs were identified in shallow and deep groundwater. Potential off-Base sources include petroleum contamination associated with the Silance Service Station LUST release and an unknown source of CVOCs. The Silance Service Station is classified as a low-risk site according to the NCDEQ UST Section and is part of the UST groundwater monitoring program. There are also active gasoline stations and former dry cleaning facilities located on the northern side of North Carolina Highway 24. The former dry cleaner is being investigated by NCDEQ under CERCLA as a potential source of VOC contamination in groundwater. LTM was initiated in FY 2014 and is ongoing to monitor changes in petroleum hydrocarbon and CVOC concentrations in groundwater. In the 2017 report (CH2M, 2018), it was recommended that the annual groundwater monitoring rotate dates of sample collection through spring and fall to evaluate seasonal variability in COC concentrations.

The first two seasonal groundwater samples were collected in July 2017 and April 2018. The draft 2018 report indicated that petroleum hydrocarbon distribution within the surficial aquifer was limited to the northern portion of the site adjacent to Lejeune Boulevard. Concentrations of BTEX and MTBE near the central portion of the petroleum hydrocarbon plume are generally decreasing. In February 2016, naphthalene concentrations increased in the central portion of the petroleum hydrocarbon plume and remained elevated in July 2017 and April 2018.

Within in the UCH aquifer, petroleum hydrocarbon concentrations exceeding screening criteria were naphthalene and MTBE adjacent to Lejeune Boulevard and near the intersection of the unnamed creek and Bougainville Drive. TCE concentrations remained localized to the northeastern portion of the site, and PCE concentrations exhibited a slight southwestwardly expansion. Although groundwater concentrations in samples collected from the UCH aquifer monitoring wells exceeded screening criteria, VOCs were not detected in the surficial aquifer; thus, the potential VI pathway to nearby residences is incomplete (CH2M, 2019). Periodic groundwater monitoring is planned to evaluate trends.



Figure 9-2. AOPC 10

9.1.3 AOPC 11—Former Dogwood Variety Store

AOPC 11 is located off Highway 172 in Hubert, North Carolina (**Figure 9-3**). Groundwater sampling for VOCs, SVOCs, and lead was conducted, and petroleum-related compounds have been identified in groundwater. The potential off-Base source is a petroleum release associated with the former Dogwood Variety Store LUST site that has been issued NFA by NCDEQ. LTM was initiated in FY 2014 and is ongoing to monitor changes in petroleum hydrocarbon concentrations in groundwater. In the 2017 report (CH2M, 2018), additional monitoring at four wells was recommended to evaluate the potential seasonal variability in COC concentrations and to determine distribution of naphthalene at the site.

The first two seasonal groundwater samples were collected in July 2017 and April 2018. Analytical results indicated that naphthalene has been the only constituent detected in groundwater samples above screening criteria since March 2011. Chloroform was detected in only one groundwater sample above the screening criteria, which is consistent with historical results (CH2M, 2019). Periodic groundwater monitoring is planned to evaluate trends.

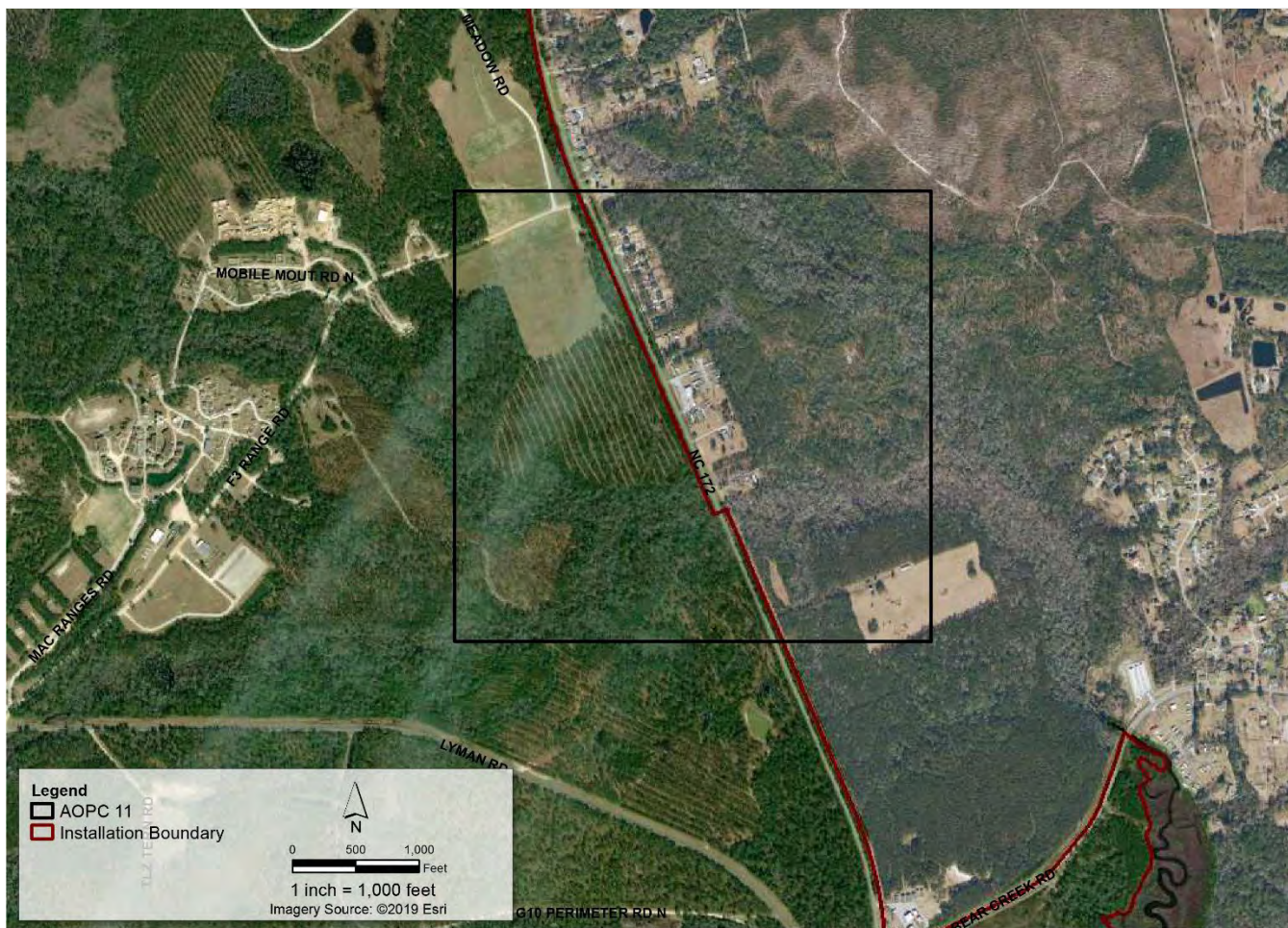


Figure 9-3. AOPC 11

Sites Transferred

This section discusses the site history for two sites that were transferred from the IRP to the UST Program (**Figure 2-10**). Additional information can be obtained from the NCDEQ UST Program.

10.1 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 2-10**). 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 NCDEQ 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, IRP Site 22

Previous Investigations/Actions	NIRIS Document Number	Date	Activities
Confirmation Study (ESE, 1990)	000214	1984-1987	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 that were immediately shut down. Three groundwater plumes were identified in the shallow portion of the surficial aquifer.
Hadnot Point Fuel Farm Groundwater Study (O'Brien and Gere, 1990)	000382	1990	A groundwater study was conducted at Site 22 as part of the MCB Camp Lejeune 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 (ESE, 1991)	N/A	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, 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.

10.2 Site 45—Campbell Street Fuel Farm

The Campbell Street Fuel Farm (Site 45) is located aboard MCAS New River (**Figure 2-10**). The Campbell Street Fuel Farm is an active fuel storage facility that supports vehicle refueling. Although Site 45 was initially identified for inclusion on the National Priorities List, 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.

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