

FINAL

FIVE-YEAR REVIEW REPORT

MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA

CONTRACT TASK ORDER 0228

NOVEMBER 2002

This report documents completion of the 5-Year Review of MCAS Cherry Point, specifically Operable Units 1, 2, and 3, and a status summary of additional sites, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR).

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Final
Five-Year Review Report
Marine Corps Air Station
Cherry Point, North Carolina

Contract Task Order—228

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Executive Summary

Department of the Navy conducted this Five-Year Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Review for the Marine Corps Air Station (MCAS) in Cherry Point, North Carolina, in accordance with the U.S. Environmental Protection Agency's (USEPA's) *Comprehensive Five-Year Review Guidance*, dated June 2001. The document addresses remedies and remedial actions (RAs) that have been implemented within all operable units (OUs) for which there is a USEPA Record of Decision (ROD) or action memorandum in place. A total of 15 OUs have been identified at MCAS Cherry Point, of which RODs exist for only three: OU1, OU2, and OU3.

The objective of this Five-Year Review is to evaluate current remedies at OU1, OU2, and OU3 and to determine whether the remedies are protective of human health and the environment in accordance with the requirements set forth in the ROD. The principal method used to evaluate the protectiveness of the remedies was a thorough review of various reports and documents pertaining to site activities and findings. The methods, findings, and conclusions from the document reviews are presented in this Five-Year Review report. In addition, the Five-Year Review report identifies any issues that may be preventing a particular remedy from functioning as designed or as appropriate, which could endanger the protection of human health and the environment. The overall evaluation of the effectiveness of each remedy is presented as a protectiveness statement that was developed for each OU and associated sites with RAs. The protectiveness statements for OU1, OU2, and OU3 are listed below.

OU1

Naval Aviation Depot Central Hot Spot Area

The current pump and treatment system operation at the NADEP central hot spot area was found to be protective of human health and the environment. However, the air stripping tower problems should be looked at and resolved in a preventive manner to make the pump and treatment remedy system more effective and in order to ensure long-term protectiveness. Evaluation of the VOC mass removed versus extracted groundwater volumes should also be conducted through the next several reporting periods to determine whether the pump and treatment system is reaching its asymptotic stage, and whether alternative technologies should be considered.

Site 16

The current operation of the air sparge/soil vapor extraction system at Site 16 was found to be protective of human health and the environment. The air sparge/soil vapor extraction system is operating as designed and VOC mass continues to be removed from groundwater at significant rates. However, the rust and sediment or excessive condensate accumulation in the air-water separator should be looked at to increase system operating time and improve future performance.

OU2

Site 10

The overall remedy at OU2 was found to be protective of human health and the environment based on the information evaluated. However, some issues should be evaluated and addressed. With respect to the operation of the soil vapor extraction system, it appears to be most effective at soil hot spots 1 and 3, where VOCs continue to be removed from soil at significant rates. However, the soil vapor extraction system does not appear to be effective at soil hot spots 2 and 4, as the system is removing little to no VOCs from the soil while exceedances still exist throughout these treatment areas. It is suggested that new technologies or modifications to the system configuration be considered and evaluated to accelerate or improve soil treatment and maintain the RAOs at hot spots 2 and 4. In addition, based on the confirmatory soil sampling results, it is suspected that previously unidentified soil "hot spots" may exist and that the current soil vapor extraction system layout may need to be modified to optimize contaminant removal. It is recommended that further investigation be performed and/or additional technologies be evaluated to aid remedial progress, as necessary.

The land use controls associated with the OU2 remedy have been effective in protecting human health and the environment.

The protectiveness of the MNA remedy for groundwater is expected to be protective given current information and conditions and will be verified through long-term monitoring.

OU3

Site 7

The air sparge remedy was found to be protective in the short term because it has been effective in reducing benzene concentrations within the hot spot area, based on the evaluation of data. As a result of this effectiveness, a portion of the system was to be shut down after 1 year due to its achievement of performance standards. However, areas of benzene contamination in soil have been identified outside of the air sparge system area of influence. It is recommended that the planned expansion of the current system be completed to ensure that the RAOs for Site 7 are achieved..

The land use controls associated with the OU3 remedy have been effective in protecting human health and the environment.

The protectiveness of the MNA remedy for groundwater is expected to be protective given current information and conditions and will be verified through long-term monitoring.

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Acronyms List

ADV	Automatic drain valves
ARAR	Applicable or Relevant and Appropriate Requirement
AS	Air sparge
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action Navy
COPC	Chemical of potential concern
DCE	Dichloroethene
FID	Flame ionization detector
IRP	Installation Restoration Program
IWTP	Industrial Wastewater Treatment Plant
LANTDIV	Atlantic Division
LTRA	Long term remedial action
LUCAP	Land use control assurance plan
LUCIP	Land use control implementation plan
MCAS	Marine Corps Air Station
MCL	Maximum contaminant level
MNA	Monitored natural attenuation
NADEP	Naval Aviation Depot
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and maintenance
OU	Operable unit
PLC	Programmable logic controller
PRAP	Proposed Remedial Action Plan
RA	Remedial action
RAR	Remedial Action Report
RAOs	Remedial action objectives
RCRA	Resource Conservation and Recovery Act
RD	Remedial design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SVE	Soil vapor extraction
TCE	Trichloroethene
USEPA	U. S. Environmental Protection Agency
UST	Underground storage tank
VC	Vinyl chloride
VOCs	Volatile organic compounds
WP	Work Plan

1. Introduction

The Department of Navy conducted a Five-Year Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Review under the Atlantic Division (LANTDIV) Comprehensive Long-term Environmental Action Navy (CLEAN) II Program, Contract No. N62470-95-D-6007, Contract Task Order 0228. The Five-Year Review was prepared for the Marine Corps Air Station (MCAS) in Cherry Point, North Carolina, in accordance with the *Comprehensive Five-Year Review Guidance* (USEPA, 2001). This document addresses remedies and remedial actions (RAs) that have been implemented within all operable units (OUs) for which there is a U. S. Environmental Protection Agency (USEPA) Record of Decision (ROD) or action memorandum in place. A total of 15 OUs have been identified at MCAS Cherry Point, of which RODs exist for only three OUs: OU1, OU2, and OU3.

The objective of this Five-Year Review is to evaluate current remedies at OU1, OU2, and OU3 at MCAS Cherry Point and to determine whether the remedies are protective of human health and the environment in accordance with the requirements outlined in the ROD for each OU. The principal method used to evaluate the protectiveness of the remedies was a thorough review of reports and documents pertaining to site activities and findings. The methods, findings, and conclusions from the document reviews are presented in this Five-Year Review report. In addition, the Five-Year Review report identifies any issues that may be preventing a particular remedy from functioning as designed or as appropriate, which could endanger the protection of human health and the environment.

The Department of the Navy is preparing this Five-Year Review report pursuant to CERCLA 121 and the National Contingency Plan (NCP). CERCLA 121 states: that a site is subject to a Five-Year Review if the remedy being implemented has come to its fifth year of operation. The Department of the Navy prepared this Five-Year Review report pursuant to CERCLA 121 and the NCP. CERCLA 121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The U.S. EPA interpreted this requirement further in the NCP; 40 CFR 300.430 (f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the first Five-Year Review for MCAS Cherry Point. The triggering action for this statutory review is the initiation of the RA at OU1, NADEP Central Hot Spot Area, in March 1997. The Five-Year Review is required because hazardous contaminants remain at the

NADEP Central Hot Spot Area above levels that allow for unlimited use and unrestricted exposure.

2. Background

In support of the Five-Year Review, the presentation of background information for MCAS Cherry Point is necessary to identify for each OU the potential threats posed to the public and the environment at the time of the ROD. This allows for the remedy performances to be compared with the site conditions that the remedies were intended to address. Information presented in this section includes a discussion on site OUs, site physical characteristics, a brief land use description, a listing of chronological events, and OU site characteristics.

2.1 Site Operable Units

MCAS Cherry Point has 15 OUs identified, of which only three OUs have remedies and RODs in place (TT, 1999). Those OUs without remedies and RODs in place will not be discussed further in this document in accordance with the requirements set in the *Comprehensive Five-Year Review Guidance* (USEPA, 2001). Figure 2-1 presents the locations of all OUs within the Air Station. Table 2-1 presents an overview of all the OUs at MCAS Cherry Point and documents their current status.

The OUs for which Five-Year Reviews are presented in this report include OU1, the NADEP central hot spot area, and Site 16; OU2, Sites 10, 44A, 46, and 76; and OU3, Sites 6 and 7. OU1 is in the southwestern portion of the Air Station, and OU2 and OU3 are both in the west-central portion of the Air Station on the east bank of Slocum Creek. Figures 2-2, 2-3, and 2-4 show the locations of sites in OU1, OU2, and OU3, respectively.

2.2 Physical Characteristics and Land Use

MCAS Cherry Point was commissioned in 1942 to maintain and support facilities, services, and material of a Marine Aircraft Wing as designated by the Commandant of the Marine Corps (TT, 1999 and CH2M HILL, 1999a and 2000). It is located in the southeastern portion of Craven County, North Carolina. It covers approximately 11,485 acres on a peninsula north of Core and Bogue Sounds and south of the Neuse River. It is bounded on the east by Hancock Creek, on the south by North Carolina Highway 101, on the west by an irregular boundary line approximately 0.75 mile west of Slocum Creek, and on the north by the Neuse River (Figure 2-1).

MCAS Cherry Point is located in an environmentally sensitive area surrounded by natural surface water bodies, such as Slocum Creek, Luke Row's Gut, and Sandy Branch (TT, 1999). Several aquifers underlie MCAS Cherry Point, including the surficial aquifer, Yorktown Aquifer, Pungo River Aquifer, and Castle Hayne Aquifer. All groundwater at MCAS Cherry Point, including the surficial aquifer, is designated as Class GA water by the State of North Carolina. Such water is considered an existing or potential source of drinking water. Slocum Creek and Sandy Branch are Class C fresh water bodies suitable for fish and wildlife, propagation, secondary recreation, and other uses except primary recreation, and as a source

of water supply as designated by the State of North Carolina. Table 2-2 shows a summary of environmentally sensitive areas.

Environmental impacts that have occurred as a result of past practices at MCAS Cherry Point have been identified through remedial investigations (RIs). A summary of these environmental impacts relative to their location within each site and OU is summarized in Table 2-2.

2.3 Site Chronology

Historical land use and practices at MCAS Cherry Point resulted in the contamination of the environment in certain areas. OU1, OU2, and OU3 were identified as priorities for investigation and remediation. The following list for these three OUs presents the significant events that have occurred at MCAS Cherry Point prior to the implementation of the RAs.

2.3.1 OU1 (1975—December 31, 2001)

1975	Use of Site 15 area and ditch behind NADEP discontinued (B & R, 1996).
1985-1995	NADEP central hot spot area was identified as one of the four hot spot groundwater areas (B & R, 1996).
1992-1993	Site 40 remediated and closed under North Carolina authority (B & R, 1996).
December 1994	MCAS Cherry Point placed on the National Priorities List (NPL) (CH2M HILL, 1999a and 2000).
1996	Demolition of Plating Shop Sites 51 and 52 began (B & R, 1996).
February 1996	Focused RI/Feasibility Study (RI/FS) Report became available.
June 1996	Interim Proposed RA Plan (PRAP) for NADEP hot spot area groundwater released (B & R, 1996).
August 1996	Interim ROD for groundwater remediation in the NADEP central hot spot area issued.
1997	Time critical removal action conducted at OU1 (TT, 1999 and OHM, 2000n).
March 1997	Extraction well drilling at NADEP Central Hot Spot Area started.
April 1997	Basis of Design Report available for OU1 Site 16 (B & R, 1997a).
August 1997	Several design modifications noted for the Site 16 (B & R, 1997b).
September 1997	Delivery order issued to install air sparge (AS) and soil vapor extraction (SVE) equipment at Site 16 (OHM, 2000n).
December 1997	Sampling and Analysis Plan (SAP) prepared by OHM (OHM, 1997d).

December 1997	Work Plan (WP) for construction and operation of AS system prepared by OHM.
March 1998	AS and SVE wells installed (OHM, 2000n).
April, 1998, October 1998, and March 1999	Baseline groundwater sampling for the NADEP central hot spot area conducted (B & R, 1996).
August 1998	SAP prepared by OHM.
September 1998	AS/SVE system at Site 16 started (OHM, 2000n).
October 1998	Baseline sampling at Site 16 (OHM, 2000n).
October 1998	Final inspection of the AS/SVE system at Site 16 (OHM, 2000n).
December 1998	Initial groundwater extraction system for the NADEP central hot spot area started (B & R, 1996).
January 1999	Operation and Maintenance (O&M) Plan prepared by OHM.
November 1999	Responsibility of the Industrial Wastewater Treatment Plant (IWTP) was transferred from OHM to the Air Station (Site interview with Mr. Taylor Sword).
2000	RI activities began by Tetra Tech.
April 2000	Draft Long Term Remedial Action WP (LTRAP) prepared by OHM (OHM, 2000d).
March 2001	Condensate from Site 16 AS/SVE system was allowed to directly discharge to ground (Consensus item # 0301-01-D).
May 2001	Annual O&M Status Report for IWTP prepared by OHM.
November 2001	Draft RI report was submitted by Tetra Tech.

2.3.2 OU2 (1980—January 31, 2002)

Mid-1980	Closure of the former sludge impoundments (CH2M HILL, 1999a).
1981	OU2 Site Investigation initiated (CH2M HILL, 1999a).
December 1988	Closure plan for Site 46 submitted to the State (CH2M HILL, 1999a).
December 1989	OU2 sites (10, 44A, 46, and 76) included in a multi-task Resource Conservation and Recovery Act (RCRA) Section 3008(h) Administrative Order (CH2M HILL, 1999a).
December 1994	MCAS Cherry Point placed on the NPL (CH2M HILL, 1999a and 2000).
April 1997	RI Report Prepared (CH2M HILL, 1999a).
April 1997	SVE selected by Brown & Root Engineering as the best available technology for soil remediation (OHM, 1999d).

April 1997	Basis of Design Report for SVE.
April 1997	14 SVE wells installed at hot spot 3 at Site 10 (B & R, 1997).
June 1997	Several modifications to technical specifications made to the SVE system (OHM, 1997a).
July 1997	RI/FS Report and PRAP documents for OU3 released to the public (CH2M HILL, 1999a).
July - August 1997	Public comment period held (CH2M HILL, 1999a).
September 1997	Site Specific Health and Safety Plan prepared by OHM.
November 1997	WP prepared by OHM (OHM, 1997c).
November 1997	SAP prepared by OHM (OHM, 1997d).
December 1997	SVE wells installed at hot spots 1 and 2 (OHM, April 23, 1998 and 1999e).
December 1997	Baseline soil sampling performed (OHM, 1999e).
February 1998	SVE system started up (OHM, 1999e).
June 1998	O&M Plan for the SVE system prepared by OHM (OHM, 1998).
March 1999	Final ROD document prepared by CH2M HILL (CH2M HILL, 1999a).
May 1999	Final Remedial Design (RD) WP prepared by CH2M HILL for Long-Term Groundwater Monitoring (CH2M HILL, 1999b).
May 1999	Long Term Monitoring RA Plan (LTRA) prepared (OHM, 1999d).
May 1999	RA Report (RAR) prepared (OHM, 1999e).
July 1999	Surface water and sediments collected from Slocum Creek and Turkey Gut by Tetra Tech (CH2M HILL, 2001a).
August 1999	Soil samples were collected by CH2M HILL (CH2M HILL, 2001a). CH2M HILL installed 19 monitoring wells in OU2. (CH2M HILL, 2001a).
September-October 1999	Baseline groundwater sampling conducted by CH2M HILL. (CH2M HILL, 2001a).
December 2000	Annual O&M Status Report prepared (OHM, 2000p).
September 2001	RD/RAR for OU2 Groundwater approved.
October 2001	Final RD/RAR for OU2 Groundwater prepared (CH2M HILL, 2001a).
January 2002	Annual O&M Status Report prepared (OHM, 2002b).
2.3.3	OU3 (1984—October 30,2001)
1984	OU3 site investigation initiated (CH2M HILL, 2000).

December 1989	Sites 6 and 7 included in a multi-task RCRA Section 3008(h) Administrative Order (CH2M HILL, 2000).
December 1994	MCAS Cherry Point placed on the NPL (CH2M HILL, 2000).
August 1996	RI/FS Report and PRAP documents for OU3 released (CH2M HILL, 2000).
1997	Site 6 Closure (CH2M HILL, 2000).
September 1998	Proposal for the SVE soil hot spot treatment for Site 7 prepared by OHM.
January 1999	Decision made to substitute AS for SVE system as technology to address soil contamination at Site 7. (OHM, 1999b).
January 1999	WP for construction and operation of the AS system.
January 1999	SAP prepared (OHM, 1999c).
May 1999	Final RD WP prepared by CH2M HILL for long-term monitoring (CH2M HILL, 1999b).
July 1999	Surface water and sediments collected at Slocum Creek and Luke Rowe's Gut by Tetra Tech (CH2M HILL, 2001b).
August 1999	CH2M HILL installed seven monitoring wells for long-term groundwater monitoring (CH2M HILL, 2001b).
October 1999	Baseline groundwater sampling conducted at OU3 by CH2M HILL (CH2M HILL, 2001b).
January 2000	Baseline groundwater and soil sampling related to the AS system performed (OHM, 2000i).
January 2000	41 AS wells installed (OHM, 2000j).
March 13, 2000	AS system start-up (OHM, 2000f, g, h).
March 15, 2000	Final inspection of the AS system (OHM, 2000j).
May 2000	O&M Plan prepared by OHM (OHM, 2000e).
June 2000	2-methylnaphthalene was no longer a chemical of potential concern (COPC) due to a revised State groundwater standard (OHM, 2000i; CH2M HILL, 2000).
June 2000	LTRA prepared by OHM.
August 2000	RAR prepared by OHM.
August 2000	Final ROD Report prepared by CH2M HILL (CH2M HILL, 2000).
February 2001	Confirmatory soil sampling performed with the installation of 12 4-foot-deep borings (OHM, 2001d).
March 2001	12 AS wells turned off.

April 2001	Final Annual O&M status report prepared by OHM (OHM, 2001d).
September 2001	RD/RAR approved.
October 2001	Final RD/RAR prepared for groundwater (CH2M HILL, 2001b).

2.4 Site Characterization

Site investigations and RIs were conducted at MCAS Cherry Point. The findings of these investigations revealed contamination in soil and/or groundwater that warranted RAs at OU1, OU2, and OU3. Investigation findings for each OU are presented below.

2.4.1 OU1

Findings from OU1 investigations are summarized below:

- The investigation results revealed the NADEP central hot spot (groundwater) as one of the four hot spot areas at OU1 where VOC concentrations have the greatest potential to endanger public health and the environment (B & R, 1996).
- The groundwater contamination that resulted from the activities at the following sites triggered the interim RA for the NADEP central hot spot area (B & R, 1996):
 - Site 15: Area and ditch behind NADEP.
 - Site 40: NADEP former drum storage area.
 - Site 42: IWTP.
 - Site 47: Industrial sewer system.
 - Site 51: Building 137 plating shop.
 - Site 52: Building 133 plating shop and drainage ditch.
 - Tank farms and underground storage tank (UST) sites located within OU1.
- The most prevalent analytes detected at NADEP include benzene, trichloroethene (TCE), vinyl chloride (VC), and 1,2 dichloroethene (1,2 DCE) (B & R, 1996).
- Free product is present on the groundwater surface near Building 133 in the NADEP central hot spot area (B & R, 1996).
- Shallow aquifer at Site 16 has been impacted by chlorinated volatile organic compounds (VOCs) from upgradient sources (OHM, 1997c).
- Groundwater in the surficial aquifer generally flows to the west towards Slocum Creek (OHM, 1997c).

2.4.2 OU2

Findings from OU2 investigations are summarized below (CH2M HILL, 1999a).

- Contaminant concentrations in groundwater that exceed State groundwater standards were primarily VOCs (i.e., benzene, trichloroethene, and vinyl chloride).
- The majority of the unacceptable risks for human health are from ingesting groundwater from the surficial aquifer, namely VOCs and metals.

- Unacceptable risks to human health from exposure to soil contaminants were identified for future residents.
- Four hot spot soil areas were identified based on the protection of groundwater regulatory standards.
- Municipal waste, industrial waste, and construction debris were encountered during test pit excavation and soil boring activities.
- Site groundwater eventually discharges to Turkey Gut and Slocum Creek, where investigation results identified COPC concentrations of VOCs (i.e., benzene, vinyl chloride, and other VOCs) that exceeded State surface water standards.

2.4.3 OU3

OU3 investigation findings are summarized below (CH2M HILL, 2000 and OHM, 1999b).

- The elevated chemical concentrations of VOCs, PAHs, and metals detected in both surface and subsurface soil reflect the same conditions observed in groundwater, which exceed the State groundwater standards.
- The only unacceptable risk exists for both future resident and construction worker scenarios from ingestion of groundwater and exposure to contaminated soil.
- In consensus with the State of North Carolina, it was determined that the area within Site 7 contained soil contamination consisting of fuel-related compounds requiring RA.
- Benzene and 2-methylnaphthalene are two COPCs identified in the soil that need RA to protect groundwater from secondary source contamination. 2-methylnaphthalene was later removed from the list of COPCs because it no longer exceeded a revised State groundwater standard.
- A 2-methylnaphthalene plume is contained within the benzene plume in the northwestern part of the plume at Site 7.

Since these sites are located in areas that might immediately threaten human health or the environment with the existing conditions, it is important to identify the locations of the sources and the pathways of the releases and contaminant migration. The investigation results and historical land use, the identified COPCs, and the human health and ecological risk summary are presented in Table 2-3.

2.5 Initial Response Actions

Several pre-ROD response actions were taken by MCAS Cherry Point to limit continued contaminant migration at the possible source areas within OU1, OU2, and OU3. Those response actions include:

- Efforts taken at OU1 (B & R, 1996):
 - Modifying current operations at the NADEP area to limit the use of chlorinated solvents.
 - Closing or discontinuing use of Sites 15, 40, 51, and 52.

- Conducting or planning remedial activities for Sites 40, 47, 51, and 52.
- Repairing leaking underground industrial pipelines at the NADEP central hot spot area.
- Removing leaking USTs.
- A time-critical action performed to remove debris piles containing asbestos, steel condensate tanks, and soil containing petroleum hydrocarbons at Site 16.
- OU2: Closure of the sludge impoundments within Site 10 in mid-1980s and Site 46 polishing ponds in December 1988 (CH2M HILL, 1999a).
- OU3: Closure of the former fly ash ponds within Site 6 in 1997 that included the removal of the lime-alum sludge, stabilization of the remaining material, re-grading the area, and the planting of trees (CH2M HILL, 2000).

TABLE 2-1
Operable Unit Overview
MCAS Cherry Point

OU	Site	Site Status	Site Remedial Action	Discussed in Five-Year Review?	Reference
1	14 – Motor transportation	No further action required.	N/A	No	TT, 1999
	15 – Area and ditch behind NADEP	Requires further investigation.	N/A	No	TT, 1999
	16 – Landfill at Sandy Branch	Groundwater is undergoing remediation. Soil will be investigated.	AS and SVE for groundwater	Yes	TT, 1999
	18 – Facilities maintenance compound	RCRA facility investigation was required, but the Site Management Plan indicated uncertainty as to whether or not samples were collected.	N/A	No	TT, 1999
	42 – IWTP	Groundwater is undergoing remediation in the area surrounding the plant. Groundwater and soil beneath the facility will need further investigations.	Groundwater pump and treat	Yes	B & R, 1996
	47 – Industrial area sewer system	Phase I and II reports submitted. Site still under investigation.	N/A	No	TT, 1999
	51 – Building 137 plating shop	No further action required. Shop was removed.	N/A	No	TT, 1999
	52 – Building 133 plating shop and ditch	No further action required. Shop was removed.	N/A	No	TT, 1999
	83 – Building 96 former pesticide mixing area	SAR completed. Building evacuated.	N/A	No	TT, 1999
	92 – Stripper barn	Identified as hot spot. Treatability study for the enhanced bioremediation is currently conducting at the site.	N/A	No	TT, 1999
2	98 – Groundwater near building 4032	Chlorinated VOC was detected.	N/A	No	TT, 1999
	10 – Old sanitary landfill	Soil is undergoing remediation. Long-term groundwater monitoring to commence in 2002.	SVE for soil, MNA for groundwater, land use controls.	Yes	CH2M HILL, 1999a
	44A – Former sludge application area	RCRA site closure.	N/A	No	TT, 1999
	46 – Polishing ponds 1 and 2	RCRA closure.	N/A	No	TT, 1999

TABLE 2-1
Operable Unit Overview
MCAS Cherry Point

OU	Site	Site Status	Site Remedial Action	Discussed in Five-Year Review?	Reference
	76 – Vehicle maintenance area	Site is active.	N/A	No	CH2M HILL, 1999a
3	6 – Fly ash ponds	Long-term groundwater monitoring to commence in 2002.	Ponds were filled in, area graded, and trees planted.	No	TT, 1999
	7 – Old incinerator and adjacent area	Soil is undergoing remediation. Long-term groundwater monitoring to commence in 2002.	AS for soil, MNA for groundwater, land use controls.	Yes	CH2M HILL, 2000
4	4 – Borrow pit/landfill north of runway 14	RI report completed. FS is being performed.	N/A	No	TT, 1999
5	1 – Borrow pit/landfill	RI is underway.	N/A	No	TT, 1999
	2 – Borrow pit/dump site	RI is underway.	N/A	No	TT, 1999
6	12 – Crash crew training area	RI report completed. FS is being performed.	N/A	No	TT, 1999
7	55 – Third LAAM tank	Not listed in RCRA permit. RI/FS planned to begin in fiscal year 2005.	N/A	No	TT, 1999
13	19 – Borrow pit/landfill	RI report completed. FS is being performed.	N/A	No	TT, 1999
	21 – Borrow pit/landfill	RI report completed. FS is being performed.	N/A	No	TT, 1999
	44B – Former sludge application area	RI report completed. FS is being performed.	N/A	No	TT, 1999
14	90 – Building 130 VOC contaminated groundwater	Not listed in RCRA permit. Investigation of abandoned aviation fuel pipeline indicated chlorinated solvents and fuel compounds. RI is underway.	N/A	No	TT, 1999
15	82 – Slocum Creek Adjacent to OU2 and OU3	Not listed in RCRA Permit. Ecological Risk Assessment screening level is to be conducted.	N/A	No	TT, 1999
N/A	Site 85 – Hobby shop disposal area	Not listed in RCRA permit. Removal action completed. Site screening process underway.	N/A	No	TT, 1999

TABLE 2-1
Operable Unit Overview
MCAS Cherry Point

OU	Site	Site Status	Site Remedial Action	Discussed in Five-Year Review?	Reference
N/A	Site 99 – Old hospital area	Not listed in RCRA permit. Identified in 1999 due to elevated FID readings, debris, and garbage detected in 1998 soil borings. SWMU Assessment Report completed in 2002. No further action recommended.	N/A	No	TT, 1999
Points of Environmental Interest					
OU1	Building 133 magnesium and alodine treatment	No further action required, removed from Site Management Plan	N/A	No	USEPA 2001b
	Building 137 cleaning vat	No further action required, removed from Site Management Plan	N/A	No	USEPA 2001b
	Building 137 lead foundry	No further action required, removed from Site Management Plan	N/A	No	USEPA 2001b
	Building 245 sump	No further action required, removed from Site Management Plan	N/A	No	USEPA 2001b
	Building 4173 condensate catch bucket	Air station routed the condensate to the industrial sewer system, removed the stained soil, and collected a confirmatory soil sample.	N/A	No	TT, 1999
	Building 4525 hazardous waste accumulation area	No further action required, removed from Site Management Plan	N/A	No	USEPA 2001b
	Ditch next to coal storage yard	No further action required, removed from Site Management Plan	N/A	No	USEPA 2001b
	Radioactive waste storage area 1	This area currently under evaluation.	N/A	No	TT, 1999
	Radioactive storage area 2	This area currently under evaluation.	N/A	No	TT, 1999
OU 6	Site 35A – high-power engine run-up area and test cells	Soil, groundwater, surface water, and sediment were investigated by CH2M HILL in 1999. POEI Evaluation Report submitted in 2001.	N/A	No	TT, 1999

Notes: In OU1, NADEP refers to an area that has groundwater impacts resulting from activities at Sites 15, 40, 42 (IIWTP), 47, 51, 52, and tank farms and USTs located within OU1 (B&R, 1996).

TABLE 2-2
Operable Unit Physical Setting
MCAS Cherry Point

Physical Setting			Within a Populated Area?
OU	Site	Site and Source Locations	Located in an Environmentally Sensitive Area?
1	16 – Sandy Branch Landfill	Located in the western boundary of OU1 (Figure 2-2). Chlorinated VOCs in groundwater are migrating from upgradient sources through OU1 (TT, 1999).	No
	NADEP central hot spot area	Located in the central region of OU1 (Figure 2-2). Sources are believed to result from the activities summarized in Table 2-3 (B & R, 1996).	No
2	10 – Old sanitary landfill	Site 10 is the primary area of OU2 (Figure 2-3). The fire training area in the southern portion of Site 10, landfilling activities, and the former sludge disposal impoundments are potentially responsible for the soil and groundwater contamination in OU2 (CH2M HILL, 1999a).	No
	44A – Former sludge application area	Site 44A is located south of Site 46, in the northern part of OU2 (Figure 2-3).	No
	46 – Polishing ponds	Site 46 is located in the northwest corner of OU2 (Figure 2-3).	No
	76 – Vehicle maintenance area	Site 76 is located in the south side of OU2 (Figure 2-3).	No
3	6 – Fly ash ponds	Site 6 is located in the northeast part of OU3 (Figure 2-4). The three unlined ponds constituted Site 6, which were used for alum/lime sludge disposal believed to be the source of the contamination (CH2M HILL, 2000).	No
	7 – Old incinerator and adjacent area	Site 7 is located in the south part of OU3 (Figure 2-4). The western portion of Site 7 was used for incinerator fly ash disposal and open burning, which is believed to be the possible source of the contamination (CH2M HILL, 2000).	No

TABLE 2-3
Operable Unit Investigation Summaries
MCAS Cherry Point

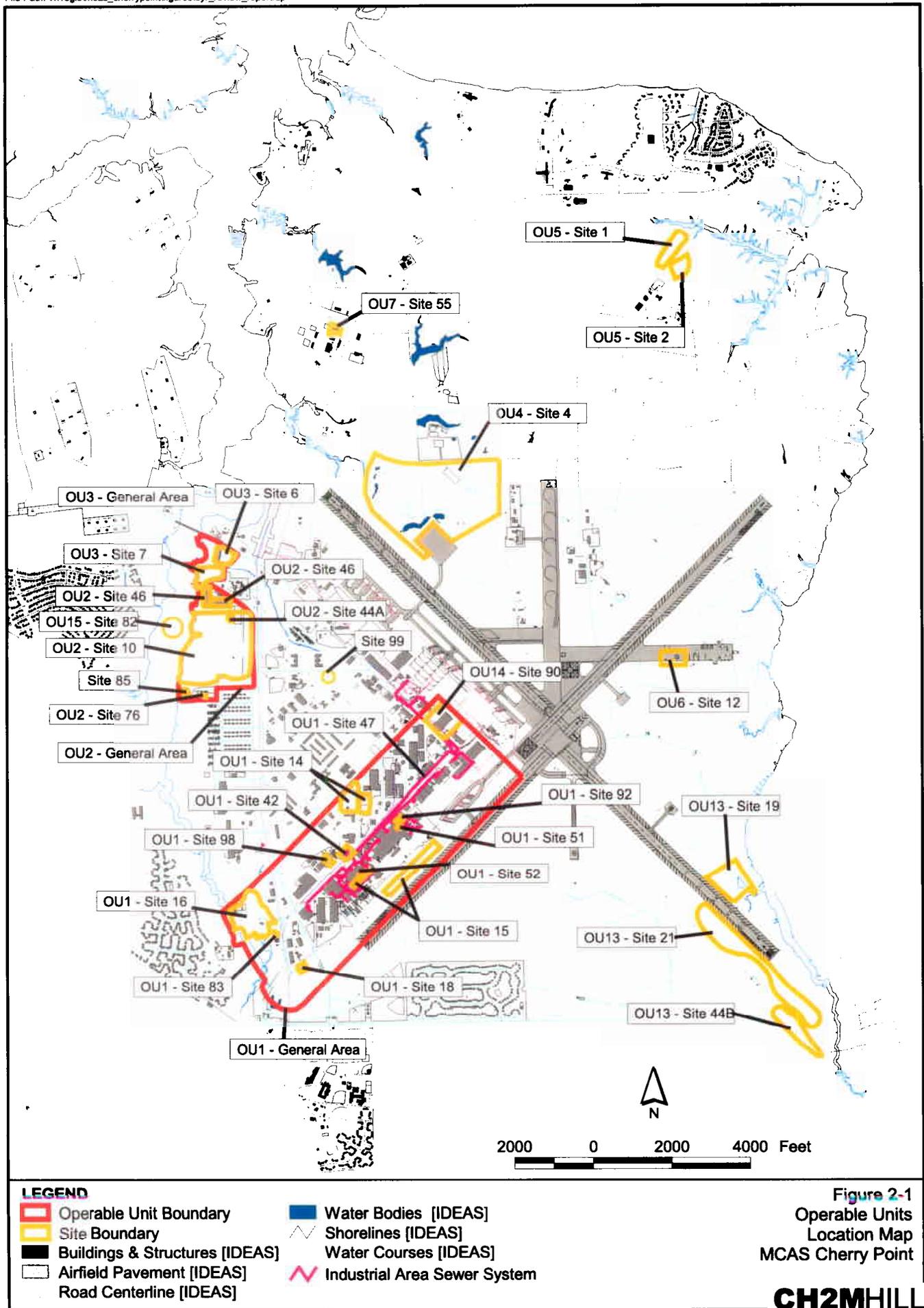
OU	COPC Categories					Human Health and Ecological Risk Summary ^a	
	Historical Land Use ^a	Current/Future Land and Groundwater Use	Soil	Groundwater	Surface Water		Sediments
1	<p>Site 15 – Wastes (incl. petroleum, oil and lubricants, solvents, metals) stored from 1940s to 1975</p> <p>Site 40 – Hazardous wastes (incl. spent solvent, paint stripping solutions) stored from 1979 to 1986</p> <p>Site 42 – IWTP</p> <p>Site 47 – Industrial sewer system connecting industrial areas of the MCAS with the IWTP</p> <p>Sites 51 and 52 – Plating operations (incl. acid rinses, cadmium plating) from 1942 to 1990</p> <p>Tank farms and USTs to store petroleum products (incl. lubricants, jet fuel)</p>	<p>OU1 encompasses the majority of Air Station industrial activities. All industrial activities, including IWTP and sewer system, remain active.</p> <p>Site 16 is currently used to store construction materials and automobiles.</p>	N/A	<p>CVOCs, petroleum VOCs, SVOCs, metals (IWTP)</p> <p>CVOCs (Site 16)</p>	N/A	N/A	<p>Risks exist primarily related to the potential migration from the hot spot area to Yorktown Aquifer, and potentially the underlying aquifer.</p>
2	<p>Site 16 – Disposal site (incl. tanks, drums containing petroleum products) from 1946-1948 (OHM, 1997c)</p> <p>Site 10 – Fire training, petroleum storage, sludge (incl. solvents, plating sludges), impoundments, unlined landfill for petroleum, oil and lubricants</p> <p>Site 44A – Sludge application from sewage treatment plant</p> <p>Site 46 – Sewage treatment plant polishing ponds</p> <p>Site 76 – Vehicle maintenance (CH2M HILL, 1999a)</p>	<p>Site 76 is the only active site within OU2.</p> <p>Development of aquifer for groundwater use or any well, except monitoring wells, installation is restricted (CH2M HILL, 1999a).</p>	<p>0 to 2 feet: PAHs, PCB, metals</p> <p>0 to 10 feet: metals</p>	<p>GW: Chlorinated and petroleum VOCs, PAHs, pesticides, aldehydes</p> <p>Leachate seep: petroleum and chlorinated VOCs, pesticides, metals</p>	<p>Turkey Gut: SVOCs, pesticides, metal</p> <p>Stocum Creek: petroleum pesticides</p>	<p>Turkey Gut: metals</p> <p>Stocum Creek: metals</p>	<p>Unacceptable risks exist for future site residents in surface soil and surficial aquifer.</p> <p>No critical habitats or endangered species affected by site contamination.</p> <p>No significant risks exist for ecological receptors.</p>

TABLE 2-3
Operable Unit Investigation Summaries
MCAS Cherry Point

OU	Historical Land Use ^a	Current/Future Land and Groundwater Use	COPC Categories				Human Health and Ecological Risk Summary ^a
			Soil	Groundwater	Surface Water	Sediments	
3	<p>Site 6 – Lime/alum sludge, and fly ash and cinder disposal ponds</p> <p>Site 7 – Fly ash disposal, open burning of waste (incl. petroleum oil and lubricants), and incinerator (CH2M HILL, 2000)</p>	<p>OU3 is now vacant, unused land.</p> <p>OU3 is restricted for future industrial development only.</p> <p>No plans to develop the aquifer for future water supply (CH2M HILL, 2000).</p>	<p>0-1 foot: pesticide, PAHs, metals</p> <p>0 to 10 feet: petroleum VOCs, PAHs, metals, furan</p>	<p>Petroleum and chlorinated VOCs, pesticide, metals SVOCs, insecticide</p>	<p>Chlorinated VOCs, SVOCs, metals</p>	<p>Metals^b</p>	<p>Unacceptable risks exist for future residents in surface soil and surficial aquifer.</p> <p>Unacceptable risks exist for future construction workers in surface soil.</p> <p>No significant risks exist for ecological receptors.</p>

^a B & R, 1996; CH2M HILL, 1999a and 2000

^b Located in Luke Rowe's Gut and Slocum Creek



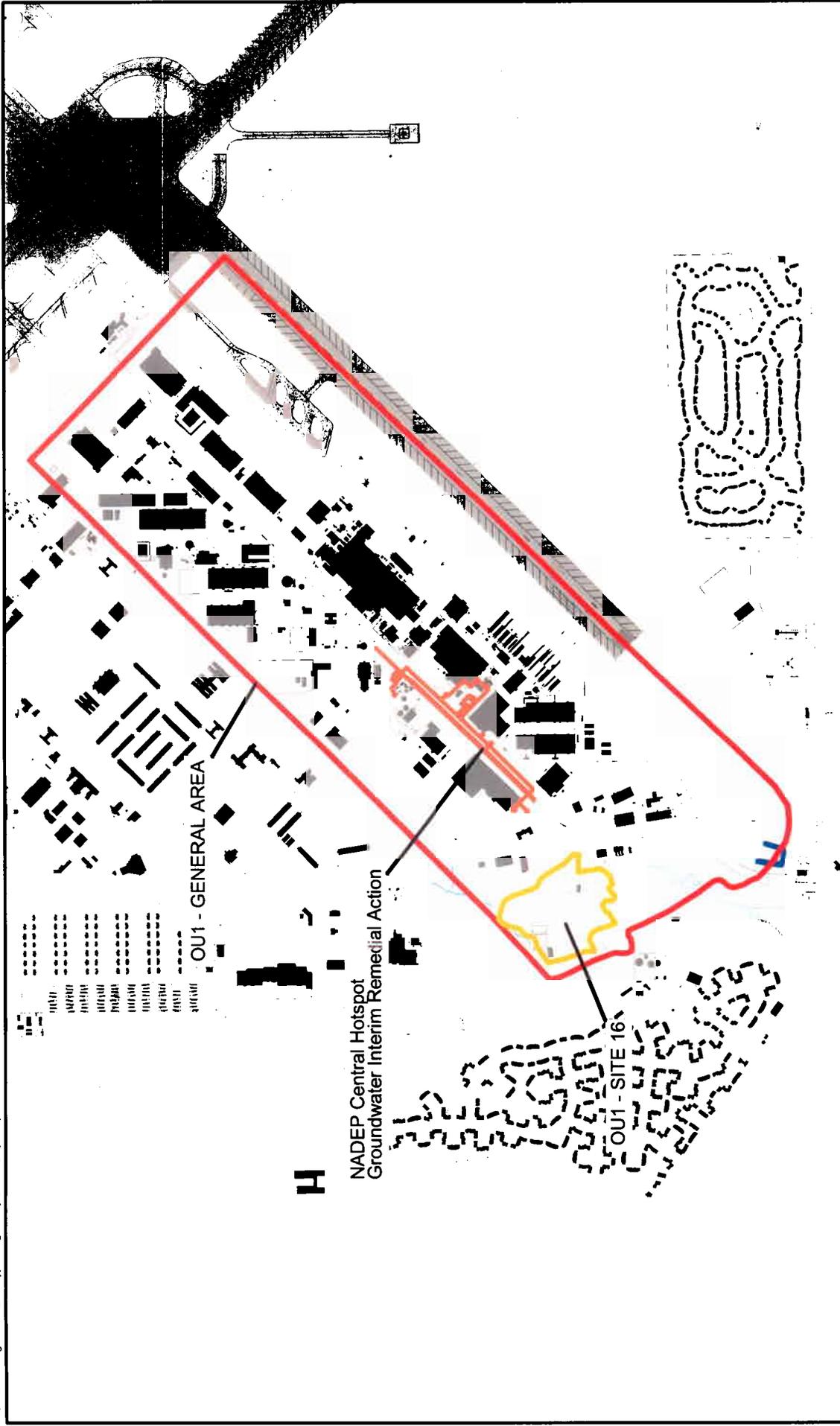
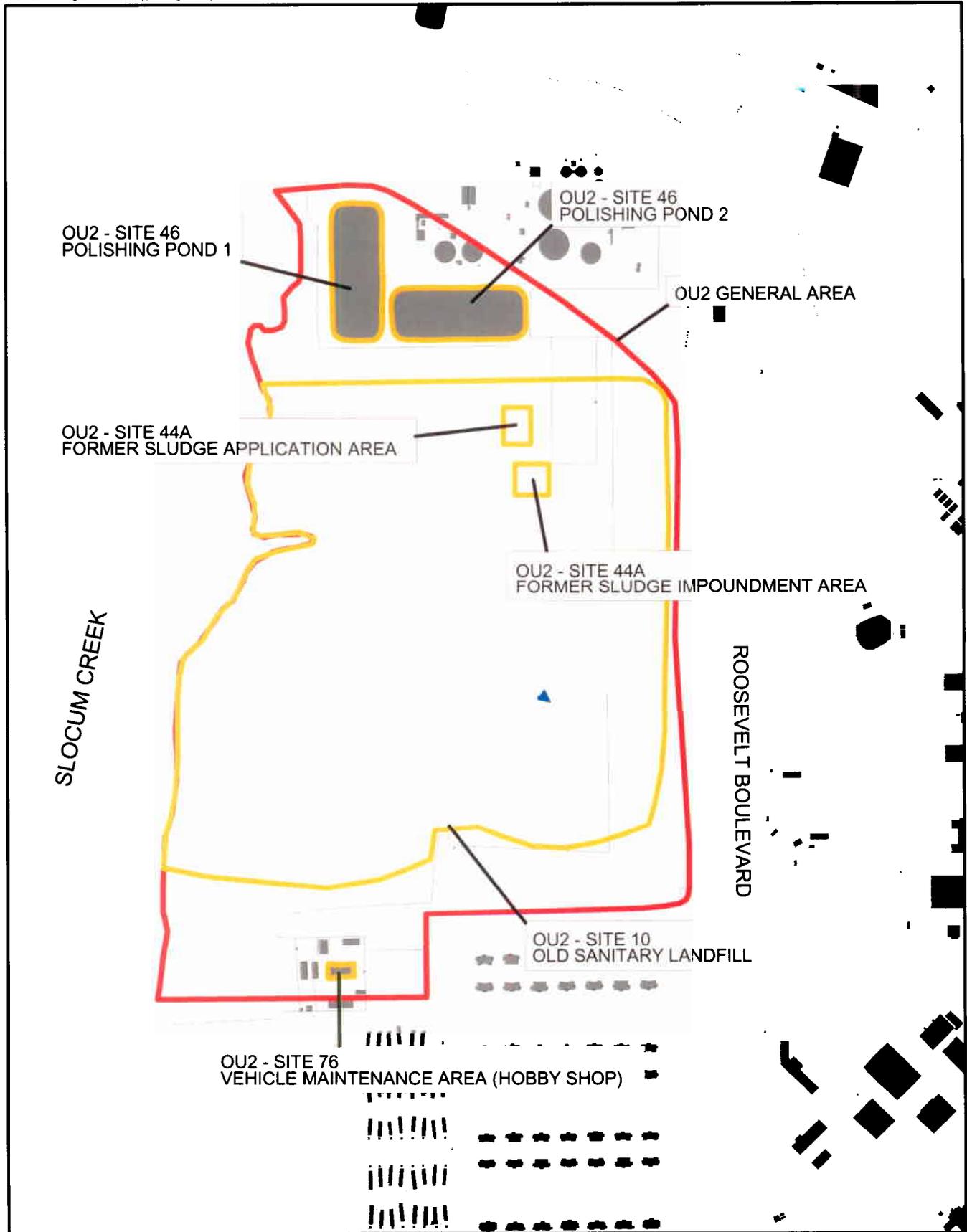


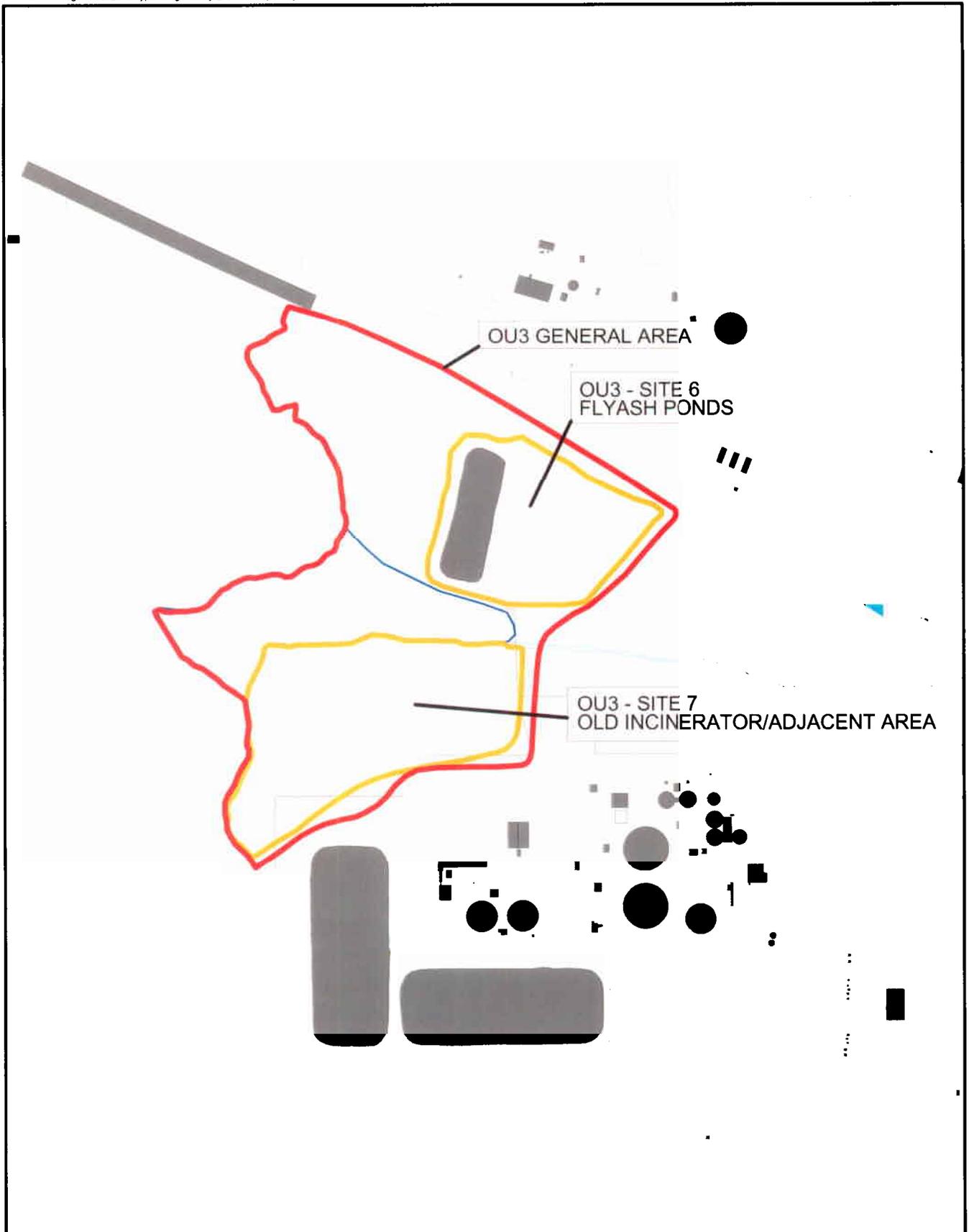
Figure 2-2
Operable Unit 1
Location Map
MCAS Cherry Point



LEGEND

- Buildings & Structures [IDEAS]
- Road Centerline [IDEAS]
- Water Bodies [IDEAS]
- Shorelines [IDEAS]
- Water Courses [IDEAS]
- Operable Unit Boundary
- Site Boundary

Figure 2-3
Operable Unit 2
Location Map
MCAS Cherry Point



LEGEND

- Buildings & Structures [IDEAS]
- Road Centerline [IDEAS]
- Water Bodies [IDEAS]
- Shorelines [IDEAS]
- Water Courses [IDEAS]

- Operable Unit Boundary
- Site Boundary
- Wetlands



200 0 200 400 Feet

Figure 2-4
Operable Unit 3
Location Map
MCAS Cherry Point

3. Remedial Actions

The remedies for OU1, OU2, and OU3 were selected to reduce unacceptable risks to human health and the environment. Specifically, remedies adopted at OU2 and OU3 involve controlling secondary source(s) in the soil, thereby protecting groundwater quality. For OU1, the overall site-wide groundwater remedy has not yet been determined. The ultimate remedy will be selected during the current RI/FS process (B & R, 1996, and OHM, 2000a). Interim groundwater remedies are currently being implemented to control the plume migration at various locations at OU1 (NADEP central hot spot area and at Site 16). The active remedies at the three OUs include:

- OU1: Groundwater pump and treat in the NADEP central hot spot area, and AS/ SVE for Site 16.
- OU2: SVE for Site 10.
- OU3: AS for Site 7.

It should be noted that for OU2 and OU3, monitored natural attenuation (MNA) was selected as the remedy to address groundwater contamination. The RD/RA reports for OU2 and OU3 were approved in September 2001 and long-term monitoring associated with the MNA remedy is scheduled to begin in 2002. Since the monitoring component of the groundwater remedy has not started, it will not be discussed further in this report. In addition to the active and passive remedies indicated above, institutional controls have also been implemented as part of the remedies at OU2 and OU3. The remainder of this report will focus on the active remedies in place at the various OUs. A discussion of the rationale, implementation, and O&M for RAs at each OU is presented in this section.

3.1 Description of Remedial Actions

3.1.1 OU1

Groundwater contamination in the NADEP central hot spot area has apparently migrated to the underlying Yorktown Aquifer. Although the surficial aquifer and underlying Yorktown Aquifer are not current water sources for MCAS Cherry Point and surrounding communities, the deeper underlying Pungo River and Castle Hayne Aquifers are the drinking water sources for MCAS Cherry Point and surrounding communities, and could eventually be impacted (B & R, 1996). Thus, the interim groundwater RA (pump and treat) was primarily implemented to reduce the levels of VOCs in groundwater in order to protect the surface water where groundwater would eventually discharge. A secondary objective was to reduce groundwater contaminant concentrations to attain maximum contaminant levels (MCLs) and State groundwater standards. Table 3-1 presents a summary of the current site status, the RAs, and remedial action objectives (RAOs) for each OU.

VOC concentrations exceeding Federal or State standards were also detected in the surficial aquifer at Site 16. This contamination is believed to have originated from the NADEP area.

AS and SVE were implemented at Site 16 to contain the VOC plume migrating from the upgradient NADEP area and to prevent the discharge of groundwater to surface water (OHM, 2000a).

The remedial components at the NADEP central hot spot area and Site 16 include the following:

- A groundwater extraction system covering three areas: Building 4224/Building 133 area; IWTP area; and Building 159 area.
- A groundwater treatment system at the IWTP that includes the following components:
 - Equalization tank.
 - Iron oxidation.
 - Flash mixing/flocculation/clarification.
 - Pressure sand filtration.
 - Air stripping.
 - Discharge of treated effluent to the MCAS Cherry Point wastewater treatment plant.
 - Off-gas emission controlled by catalytic oxidation.
 - Solids handling.
- The monitoring program in the NADEP central hot spot area includes:
 - Sampling effluent air at equalization tank vent and stripping tower vent.
 - Sampling groundwater semi-annually.
 - Measuring monitoring well water levels and dissolved oxygen; vacuum pressure at each extraction well; and organic vapors to balance, optimize, and evaluate the performance of the system.
- At Site 16, the RA consists of a AS/SVE groundwater remedial system, which includes 40 air injection and 44 SVE wells, operating in two treatment segments, or compounds.
- The performance monitoring of the AS/SVE system at Site 16 includes:
 - Measuring air influent between and after carbon cells, and at well heads.
 - Taking readings of the following: vacuum at well heads and monitoring wells, pressure at air injection wells, water levels in monitoring and air injection wells, and dissolved oxygen levels in wells.
 - Sampling of air discharge from the stack.
 - Sampling groundwater quarterly.

3.1.2 OU2

The RAs for OU2 address soil and groundwater conditions at various areas of concern within OU2. The areas needing remediation were determined by the presence of contaminated soil above risk-based levels, contaminated soil above State protection of groundwater standards, and contaminated groundwater above regulatory criteria (i.e., MCLs and State groundwater standards). Refer to Table 2-3 for a summary of the areas and

their contaminants of concern. The major components of the remedy for OU2 are (CH2M HILL, 1999a):

- MNA of groundwater (long-term monitoring to be implemented in 2002).
- SVE at four soil hot spot areas within Site 10 containing volatile organic compounds.
- Institutional controls implemented in conjunction with other remedies to eliminate exposure to contaminants (e.g., limiting land use to industrial only, prohibiting intrusive activities and aquifer use). The objective of these remedy components is to reduce risks to human health and the environment associated with exposure to buried wastes, contaminated groundwater, and contaminated soil (CH2M HILL, 1999a).

The following performance monitoring programs have been instituted to assess the progress of natural attenuation and soil treatment, and to confirm that onsite contaminants are not migrating offsite and negatively impacting the environment:

- Sampling of groundwater in the surficial aquifer and Yorktown Aquifer.
- Sampling of air emissions from the SVE system in the soil treatment areas.
- Sampling of surface water and sediment in Slocum Creek and Turkey Gut.

3.1.3 OU3

The RAs for OU3 were instituted because of benzene concentrations in groundwater and soil contaminant concentrations of VOCs, PAHs, metals, and pesticides that could potentially be a source of groundwater contamination. Each soil contaminant that exceeded a standard was compared to groundwater standard exceedances in order to determine if the soils had the potential to be a secondary source of contamination. Calculations were then made to determine soil concentrations that would be protective of groundwater. As a result, the Navy, acting under CERCLA authority, has implemented a RA at OU3 Site 7 for soil with concentrations exceeding groundwater protection standards (OHM, 2000h).

The RA originally proposed by B & R for soil contamination at OU3 Site 7 was SVE (CH2M HILL, 2000). After further evaluation, it was determined that SVE would likely be problematic at the site due to the very shallow water table. Therefore, the originally proposed SVE remedy was replaced with an AS remedy (OHM, 1999a, b).

The major components of the selected remedy for OU3 include (CH2M HILL, 2000):

- MNA for groundwater (long-term monitoring to be implemented in 2002).
- In-situ treatment using AS within an area of soil contamination at Site 7 (COPC is benzene).

Institutional controls implemented in conjunction with the other remedies in eliminating exposure to contaminants and to protect human health and the environment (limiting land use to vacant land). Fencing was implemented to control site access. The following performance monitoring programs were instituted to assess the progress of natural attenuation and soil treatment, and to confirm that onsite contaminants are not migrating offsite and negatively impacting the environment (OHM, 2000h):

- Sampling of groundwater in the surficial aquifer and Yorktown Aquifer.

- Sampling of soil in the AS area at Site 7 to monitor the progress of remediation.
- Sampling surface water and sediments in Slocum Creek and Luke Rowe's Gut.

3.2 Remedy Implementation

As discussed in later subsections, the remedial systems at OU1, OU2, and OU3 are generally functioning as designed. A summary of the remedies implemented at each OU in terms of the design and startup dates, system configuration, contaminant mass removal, and system operating time are presented in Table 3-2.

3.3 Remedy Operation and Maintenance

This section presents a discussion of the general system O&M involved in each remedy implementation at OU1, OU2, and OU3. A summary of the time when systems were inactive and when routine and non-routine maintenance were performed is presented in Table 3-3. Summaries of major O&M activities performed to date at each OU are presented in Table 3-4. These activities represent major items only; dates not noted represent times when the system operated as designed.

3.3.1 OU1

The groundwater extraction and treatment system for the NADEP central hot spot area has been operating as designed (OHM, 2000b, g, k, o; OHM, 2001a, f, h, k; OHM, 2002a). However, the air stripping tower treatment unit at the IWTP experienced several major system shutdowns due to the accumulation of biomass on the packing material during the annual reporting period of 2000 (OHM, 2000b, g, k, o). During 2001, major shutdowns of the system were involved with the equipment failure and faulty pressure regulator of the programmable logic controller (PLC) (OHM, 2001a, f, h, k). Since system startup in December 1998 through December 30, 2001, the pump and treat system has removed a total of 686 lbs. of VOC mass from the groundwater (OHM, 2002a).

The routine O&M activities for the NADEP central hot spot pump and treat system are listed in Table 3-3.

The AS/SVE system at Site 16 was in operation for approximately 77 percent of the time, from October 1, 1999, through September 30, 2001. During 2000, system shutdowns were mainly attributed to high condensate accumulation in the air-water separator or in the storage tank or the sediment accumulation in the separator. For 2001, the system shutdowns were primarily caused by corrosion inside the air-water separator. This resulted in the flaking of particulate matter inside the unit and caused blockages in the discharge pump, resulting in accumulation of condensate in the air-water separator. The AS/SVE system has removed a total of 2,093 lbs. of VOC mass since its startup in February 1997 through September 30, 2001. (OHM, 2000c, l, m; OHM, 2001c, e, g, l, m).

The routine O&M activities associated with the AS/SVE system are listed in Table 3-3.

3.3.2 OU2

The SVE system has been operating as designed (OHM, 2000p). From October 1, 1999, through September 30, 2001, the SVE system was in operation an average of 80 percent of the time. During the annual reporting periods of 2000 and 2001, system shutdowns were due to high condensate accumulation in the air-water separator or equipment failure. Approximately 3,000,000 lbs. of organic contaminant mass (including methane) were removed from OU2 soil since the system startup in December 1997 through September 30, 2001, with the largest amount contributed by hot spot 1. (OHM, 2000p; OHM, 2002b).

The routine O&M activities associated with the SVE system are listed in Table 3-3.

3.3.3 OU3

The AS system has been operating as designed. The system has been in operation about 90 percent of the time since its startup in March 2000. (OHM, 2001d, i, j) The system shutdowns have primarily corresponded with the determination of biodegradation activities within the treatment zone and with groundwater sampling events.

Specific O&M requirements for the OU3 AS remediation system are listed in Table 3-3.

TABLE 3-1
Operable Unit Remedial Action Summary
MCAS Cherry Point

OU	Site	Site Status (Active/ Inactive)	Remedial Actions	Remedial Action Objectives	Documents Detailing RA and RAOs
1	16	Active (OHM, 1997c)	AS and SVE.	Remove VOCs from soil and groundwater to protect Slocum Creek from contaminated groundwater migration from NADEP central hot spot and localized contamination onsite.	O &M, 1999; WP, 1997; LTRA, 2000; and SAP, 1997.
	NADEP central hotspot area	Sites 15 and 42 are active. Sites 51 and 52 are inactive and used for storage. (TT, 1999)	Groundwater pump and treat.	Protection of human receptors from adverse health effects that may result from dermal contact, ingestion, and inhalation for contaminants in the groundwater in the surficial aquifer beneath OU1. Mitigation of contamination migration from OU1 into the environment. Overall protection of the environment and human health.	LTRA, 2000; Interim ROD, 1996; and SAP, 1998.
2	10	Petroleum storage area is inactive Sludge impoundments closed (CH2M HILL, 1999a)	MNA of groundwater. SVE at the identified four hot spot soil areas containing organics. Institutional controls to limit possible exposure to contaminants.	Pretreatment of extracted groundwater to achieve optimum efficiency and economy when discharging flows through the existing IWTP. Protect groundwater from leachable organics at areas identified in the ROD. Remediate groundwater to achieve the performance standards listed in the ROD.	WP, 1997; SAP, 1997; O&M Plan, 1998; ROD, 1999; LTRA, 1999; and RAR, 1999.
44A		Currently inactive (CH2M HILL, 1999a)	MNA of groundwater. Institutional controls to limit possible exposure to contaminants.	Remediate groundwater to achieve the performance standards listed in the ROD.	WP, 1997; SAP, 1997; O&M Plan, 1998; ROD, 1999; LTRA, 1999; and RAR, 1999.
46		RCRA site closure. (CH2M HILL, 1999a)	MNA of groundwater. Institutional controls to limit possible exposure to contaminants.	Remediate groundwater to achieve the performance standards listed in the ROD.	WP, 1997; SAP, 1997; O&M Plan, 1998; ROD, 1999; LTRA, 1999; and RAR, 1999.

TABLE 3-1
 Operable Unit Remedial Action Summary
 MCAS Cherry Point

OU	Site	Site Status (Active/Inactive)	Remedial Actions	Remedial Action Objectives	Documents Detailing RA and RAOs
76		Active (CH2M HILL, 1999a)	MNA of groundwater. Institutional controls to limit possible exposure to contaminants.	Remediate groundwater to achieve the performance standards listed in the ROD.	WP, 1997; SAP, 1997; O&M Plan, 1998; ROD, 1999; LTRA, 1999; and RAR, 1999.
3	6	RCRA site closure (CH2M HILL, 2000)	Institutional controls limiting land use to industrial use only and prohibiting the use of groundwater for any purpose other than monitoring activities.	Protect future residents from exposure to contaminated groundwater.	WP, 1999; SAP, 1999; O&M Plan, 2000; ROD, 2000; LTRA, 2000; and RAR, 2000.
	7	Currently inactive (CH2M HILL, 2000)	MNA of groundwater. AS for soil benzene contamination. Institutional controls limiting land use to vacant land and prohibiting the use of groundwater for any purpose other than monitoring activities. Fence all of Site 7.	Protect future residents from exposure to contaminated soil and waste/fill material. Protect future construction workers from exposure to waste/fill material and contaminated soil. Protect future residents from exposure to contaminated groundwater.	WP, 1999; SAP, 1999; O&M Plan, 2000; ROD, 2000; LTRA, 2000; and RAR, 2000.

TABLE 3-2
 Remedial Action Summary
 MCAS Cherry Point

OU and Remedy	System Startup Date	Design Specifications Changes	Current System Configuration	VOC Mass Removal	Operating Time
1 - Pump and treat	12/1998	None.	10 groundwater extraction wells and an air stripping unit at NADEP hot spot area.	686 lbs. since system startup through 12/30/2001 (OHM, 2002a).	Not documented.
1 - AS and SVE	9/1998	None.	40 AS wells and 44 SVE wells at Site 16 (OHM, 2001c).	2093 lbs. since system startup through 9/30/2001 (OHM, 2001m).	System was able to achieve 77 percent of operating time from 10/1/1999 to 9/30/2001 (OHM, 2000c, l, m; OHM, 2001c, e, g, i, m).
2 - SVE	2/1998	After 5 ½ weeks of operation, carbon abatement system was discontinued due to the low effluent concentrations (OHM, 1999d).	HS1: 9, 16-foot SVE wells. HS2: 9, 18-foot SVE wells. HS3: 14, 18-foot SVE wells. HS4: 4, 18-foot SVE wells.	3,091,813 lbs. since system startup through 9/30/2001 (includes methane) (OHM, 2002b).	System has been able to achieve 80 percent of operating time from 10/1/1999 to 9/30/2001 (OHM, 2000p; OHM, 2002b).
3 - AS	3/2000	41 AS wells were installed instead of 31. Transformer size changed (OHM, 2000l). The following wells were not turned on after February 6, 2001, soil sampling event: 7AS05 through 7AS07, 7AS09, 7AS15, 7AS32, and 7AS39 through 7AS45 (OHM, 2001d).	41 AS wells (OHM, 2001d).	Not documented.	System was in operation 90 percent of the available time since startup to 9/30/2001 (OHM, 2001d, i, j).

TABLE 3-3
 Summary of Remedy Operations ^a
 MCAS Cherry Point

OU	Remedy	Non-operation Time	Reasons	Routine O&M	Non-routine O&M
1	Pump and treat	Week of 10/15/1999	Air stripper tower support structure cracked.	Weekly: Document and discuss data variances or exceedances; record flow rate and cumulative pumped volumes at each wellhead.	2/13/2000: Level switch on the sump pump was faulty. 2/15/2000: Installation of the de-mister began.
		Week of 10/22/1999	Air stripping tower packing removed; support structure and grating repaired.	Monthly: Gauge liquid levels in extraction well; balance extraction well flow.	3/16/2000: Hose connection was repaired on EW-15.
		1/21/2000	Freezing temperature.	Semi-annual: Collect groundwater samples from extraction wells.	5/27 through 7/19/2000: Grating repaired, packing material replaced, blower repaired, and de-mister and trays replaced due to the internal failure of air stripper.
		1/28/2000	Freezing temperature.		6/8/2000: Packing material was sampled for characterization and disposal.
		4/14 through 4/16/2000	Heavy rainfall.		10/10/2000: Packing material was transported for offsite disposal as a listed waste.
		5/27 through 7/19/2000	Air stripper failure due to biofouling on the packing material.		11/3/2000: Cleaning the equalization tank, AS lines, and air stripper tower.
		8/17 through 8/19/2000	Heavy rainfall.		6/8/2001: Reconnected PLC control wiring for 51EW10.
		5/29 through 6/1/2001	Inspection of the IWTP.		8/9 through 10/19/2001: Repaired PLC control panel and pressure regulators.
		8/9 through 10/19/2001	Pressure regulators of the PLC failed.		12/10/2001: Ordered a new motor for extraction well 15EX10.
		12/3 through 12/8/2001	IWTP sampling.		
		11/3 through 3/26/2001	Air stripping tower cleaning due to fouling.		
AS/SVE ^{ab}		8/27 through 9/7/1999	Hurricane.	Daily: Check AS/SVE wells and piping for leaks and other problems.	11/5/1999: Replaced the bleed air valve switch on the compressor at Compound 2.
		1/14 through 1/31/2000 and 2/1 through 2/7/2000	Freezing temperature.	Weekly: Record pressure readings at SVE wellheads; inspect AS/SVE equipment and record operating status; measure vapor flow rates and effluent concentrations using flame ionization detector (FID).	1/11/2000: The piping header was found separated and needed repair.
		2/9 and 2/15/2000	High water level alarm in the air-water separator.		1/19/2000: Cleaned the air-water separator.
		3/2 through 3/3/2000	Monitoring well gauging.		2/4/2000: Drained condensate from the lines due to freezing weather conditions.
		3/20, 3/22, 3/27, and 3/29/2000	High water level alarm in the air-water separator.	Monthly: Gauge liquid levels in monitoring wells; balance air flow from AS/SVE as appropriate.	5/15/2000: Compound 1 wells E-7, E-8, and E-9 have no vacuum. Troubleshooting indicated a possible break in the PVC underground.
		4/3/2000	High water level alarm in tank at Compound 2.	Quarterly: Collect groundwater samples from monitoring wells.	5/18/2000: Excavated SVE piping between the header and SVE well E-7.
		4/13 through 4/14/2000	Heavy rainfall.		6/5/2000: Replaced the stainless steel float.
		4/19 through 4/24/2002	Heavy rainfall.		

TABLE 3-3
 Summary of Remedial Operations ^a
 MCAS Cherry Point

OU	Remedy	Non-operation Time	Reasons	Routine O&M	Non-routine O&M
		4/24 through 4/26/2000	Compound 2 with faulty coil and timer.		
		7/7/2000	Alarm alerts at Compound 2.		6/16/2000: Replaced the flow meter at the storage tank at Compound 2.
		8/11 and 8/26/2000	High water level alarm in air-water separator.		8/10 through 9/1/2000: Daily checks on the ADVs to ensure that water is not injected into the cooling and lubricating oil.
		10/20/2000	Repair a broken line in Compound 1.		
		12/4 through 12/8/2000	Freezing temperature.		10/2/2000: A break was found in the line for Compound 1. System was shutdown, break repaired and restarted.
		1/5/2001	High water level in storage tank.		2/5/2001: Replaced hour meter on Compound 2.
		2/22/2001	Faulty circuit breaker in Compound 2.		2/22/2001: The circuit breaker at Compound 2 broke.
		3/5 through 3/6/2001	Freezing temperature.		4/30/2001: The condensation system on Compound 2 was found shutdown due to a faulty circuit breaker.
		3/12 through 3/22/2001	Groundwater sampling at the site.		5/2/2001: Replaced the circuit breaker for condensation on the compressor at Compound 2
		4/4, 4/9, and 4/11/2001	High water level in air-water separator in Compound 2.		5/17/2001: The compressor controller was replaced
					6/4/2001: The condensate from the air-water separator was piped for direct discharge to the surface at the site.
					6/22/2001: Ordered an hour meter for the SVE blower on Compound 2.
					9/1/2001: Based shutdown due to military recall.
					10/16/2001: Fixed electrical problems on Compound 1.
		4/18 through 4/19/2001	High water level in storage tank in Compound 1.		
		5/21 and 5/23/2001	High water level in storage tank in Compound 2.		
		6/8/2001	Groundwater sampling at the site.		

TABLE 3-3
Summary of Remedy Operations ^a
MCAS Cherry Point

OU	Remedy	Non-operation Time	Reasons	Routine O&M	Non-routine O&M
		7/9 through 7/11/2001	Accumulation of rust particulate and sediment in air-water separator in Compound 1.		
		7/10-7/13/2001	Accumulation of rust particulate and sediment in air-water separator in Compound 2.		
		7/23/2001	Parts failure.		
		9/11/2001	Base lockdown called for by military.		
		9/24/2001	Groundwater sampling at the site.		
		9/24 through 10/16/2001	Part failure at Compound 1.		
2	SVE	10/29 through 11/12/1999	Hurricane.	Daily: Check SVE wells and piping for leaks and other problems; quick visual inspection of system operation.	11/6/1999: Additional drain valves installed to compensate for additional rainwater entering the system.
		12/10 through 12/17/1999	High level switch controlling the transfer pump at the knockout tank was faulty.	Weekly: Record vacuum readings at SVE wellheads and monitoring wells; record pressure readings at SVE wellheads; inspect SVE equipment and record operating status; measure vapor flow rate and effluent vapor concentration using a FID.	11/12/1999: Additional drain valves were installed in the low points on the headers.
		12/24/1999 through 1/1/2000	To avoid Y2K computer issues.		1/26/2000: Stack line was separated and repaired.
		1/10 through 1/13/2000	High water in vapor/liquid separator.	Monthly: Gauge liquid levels in surrounding wells.	2/9/2000: A break in the header pipe near hot spot 4 was repaired.
		1/17/2000	Freezing temperature.		4/11/2000: Heat sensor, level switch knockout, control transformers in PLC was replaced.
		1/27 through -1/31/2000	Freezing temperature.		5/17/2000: Replaced vacuum gauge and connection assembly on well 1 at hot spot 1.
		2/1 through 2/7/2000	High water in vapor/liquid separator.		6/7/2000: An hour meter was installed to monitor the system operating time.
		2/9/2000	Header pipe near hot spot 4 broken.		6/28 through 7/8/2000: Drive belts were replaced and bearings were greased.
		2/28 through 3/3/2000	To install confirmation soil borings.		10/2/2000: Checked all SVE well lines. Repaired the 2-inch line connected to SVE-10.
		3/6, 3/20, and 3/28 through 4/11/2000	System operating intermittently due to a faulty heat sensor.		10/20/2000: Repaired the main line to hot spot 1.
		4/14/2000	Heavy rainfall.		12/1/2000: Repaired two SVE lines found separated at hot spot 2.
					2/1/2001: Replaced PLC.
					2/13/2001: Replaced electric starter coil on the blower motor.
					2/26/2001: Repaired a pinched wire.
					5/15/2001: Rewired hour meter.
					6/6/2001: Ordered a ring seal for the leaking blower.
					6/11/2001: The ring seal was replaced on the blower.
					9/14/2001: Cleaned the dirty level sensors.

TABLE 3-3
Summary of Remedy Operations ^a
MCAS Cherry Point

OU	Remedy	Non-operation Time	Reasons	Routine O&M	Non-routine O&M
		5/22/2000	Heavy rainfall.		
		6/28 through 7/8/20/00	Due to unidentifiable noise from the system.		
		7/24/2000	High level alarm in effluent tank.		
		8/7 through 8/25/2000	System operated intermittently due to high level alarm in the air-water separator.		
		10/20/2000	Main line to hot spot 1 broken.		
		12/4 through 12/7/2000	Freezing temperature.		
		12/14/2000	Faulty high level switch in air-water separator.		
		12/20/2000 through 2/1/2001	PLC failure.		
		2/13 through 2/26/2001	Wire shortage.		
		6/18/2001	Excessive condensate accumulation in the air-water separator.		
		6/26/2001	Loss of power from Base.		
		7/2 and 8/27/2001	Excessive condensate accumulation in the air-water separator.		
3	AS	5/22/2000	Heavy rainfall.	Biweekly: Measurements of VOC concentrations in soil chambers with a FID.	No non-routine maintenance occurred.
		1/18/2001	Faulty power surge.	Beginning 4th quarter 2000 O&M, bi-weekly inspections became monthly. (OHM, 2001b)	
		4/25/2001	Allow vadose zone to return static conditions.		
		6/12 through 6/20/2001	Groundwater sampling at the site.		
		9/21 through 9/26/2001	Groundwater sampling at the site.		

^a OHM, 2000b, c, e, g, h, j, k, l, m, o, p; OHM, 2001a, b, c, d, e, f, g, h, i, j, k, l, m; OHM, 2002a, b.

^b Site 16 AS/SVE system includes Compounds 1 and 2. Where not indicated, shutdowns apply to both Compounds 1 and 2.

TABLE 3-4
Operation and Maintenance Activities
MCAS Cherry Point

Date	O&M Activities and Operating Problems Encountered *
OU1	NADEP Central Hot Spot Area—Pump and Treat, 12/7/1998 through 12/31/2001 (OHM, 2000b, g, k, o; OHM, 2001a, f, h, k; OHM, 2002a)
12/7/1998	Pump and treat system at NADEP central hot spot area started.
10/15/1999	Carbon vessels disinfected, and air stripper tower was cleaned and tested for throughput of joint waste stream.
Week of 10/15/1999	Cracks observed in supporting structure and grating of the air stripping tower. Joint testing was postponed until the cracks were repaired.
10/22/1999	Carbon units were flushed with caustic disinfectants.
Week of 10/22/1999	Support structure and grating was repaired, the tower packing replaced, and the de-mister screen at the top of the tower replaced. The sight glass was repaired on the float switches.
10/25/1999	Two carbon units flushed with disinfectants.
10/29/1999	Carbon filters flushed, well flow rates collected. Wash stone was used to raise well vaults.
11/1/1999	The waste streams were mixed.
11/5/1999	Mixing the waste streams in coordination with station personnel.
11/6/1999	The seal on the equalization tank transfer pump was found to be leaking.
11/15/1999	Mixing the waste streams in coordination with station personnel.
1/21/2000	System shut down due to freezing weather conditions.
1/28/2000	System shut down due to freezing weather conditions.
2/13/2000	Containment berm was found nearly filled with water. Drain valve on storage tank was open. Valve was shut and water was pumped into the storage tank. Level switch controlling the sump pump was found to be faulty. IWTP personnel were notified of the problem.
2/15/2000	Installation of de-mister began.
3/16/2000	Water was flowing out of an extraction well vault on Harrison Street.
3/17/2000	Extraction well 15 (EX-15) was shut down and a hose connection was repaired.
4/7/2000	EX-11 flow meter found not working and needs to be replaced.
4/14/2000	System shut down due to heavy rains.
4/16/2000	System restarted.

TABLE 3-4
Operation and Maintenance Activities
MCAS Cherry Point

Date	O&M Activities and Operating Problems Encountered *
4/19/2000	Flow meter batteries replaced in EX-11.
5/2/2000	The base to the flow meter of EX-11 was found cracked and replaced.
5/14/2000	EX-12 and EX-14 were found non-operational due to low water levels in the well.
5/18/2000	EX-12 and EX-14 were found non-operational due to low water levels in the well.
5/27 through 7/19/2000	System shut down due to biofouling on the air stripper packing material. The supporting grating failed under the weight of the biomass on packing material. The grating was repaired, packing material replaced, blower repaired, and de-mister and trays were replaced.
6/8/2000	A sample was collected from air stripping packing material for characterization and disposal. It was determined the material to be a D006-listed waste.
7/19/2000	System restarted.
7/24/2000	System was re-piped to treat the flow from IWTP.
7/25/2000	Antifoam agent was injected to fix the foam problems inside the air stripper.
8/10/2000	Deposit of iron is raising pressure in the AS lines in equalization tank. OHM will monitor the maintenance.
8/17/2000	System shut down due to heavy rains.
8/19/2000	System restarted.
8/26/2000	Flow louver on blower B-2 was found closed. The blower was replaced and louver was adjusted to "open".
10/10/2000	Air stripper tower packing material was transported to a Navy-approved landfill in Belleville, Michigan.
10/29/2000	Batteries in the flow meters for extraction wells 51EW13, 51EW17, and 51EW18 were replaced.
10/31/2000	All extraction wells were gauged.
11/3/2000	IWTP was shut off for the cleaning of the equalization tank, AS lines, and air stripper tower. All groundwater extraction wells were also shut off. The air stripper was dealing with biofouling problem again.
3/26/2001	Air stripper was cleaned. IWTP and groundwater extraction systems were restarted.
5/5/2001	The batteries in the flow meter for extraction wells 51EW10, 51EW12, and 51EW13 were replaced.
5/29/2001	System and extraction wells was shut down by MCAS personnel for inspection of the IWTP.

TABLE 3-4
Operation and Maintenance Activities
MCAS Cherry Point

Date	O&M Activities and Operating Problems Encountered *
6/1/2001	MCAS personnel attempted to restart the system but did not succeed. PLC control panel was then reset to power up the system. Extraction well 51EW10 will not run in auto mode. This pump was left in the Hand position to operate.
6/8/2001	PLC was inspected by the manufacturer and was found with no problem. The control wiring for 51EW10 was found not hooked up and was reconnected to operate in auto mode.
6/10/2001	The flow meter for extraction well 51EW19 was replaced.
8/9/2001	System and extraction wells were shut down by MCAS IWTP personnel for repair of the PLC equipment.
10/17/2001	The PLC was repaired and system restarted; however, pressure regulators were found to be faulty. The system was shut down.
10/19/2001	The pressure regulators were replaced by MCAS IWTP personnel and system restarted.
11/8/2001	The batteries in the flow meters for extraction well 15EX10, 15EX13, 15EX14, 15EX16 and 15EX19 were replaced.
	The batteries in the flow meter for extraction well 15EX11 were replaced. The pump in extraction well 15EX10 was found shut down. The fuse was replaced and pump restarted.
12/3/2001	The system was shut down for sampling by MCAS IWTP personnel.
12/10/2001	The pump motor extraction well 15EX10 was found to be faulty. A new motor was ordered.
Site 16 AS/SVE, 9/18/1998 through 10/16/2001 (OHM, 2000c, h, l, m, n; OHM, 2001c, e, g, l, m)	
9/18/1998	AS/SVE system at Site 16 started.
6/13/1999	System shut down for well gauging. System restarted.
8/13/1999	System shut down for sampling. System restarted.
8/27/1999	System shut down due to hurricane.
9/7/1999	System restarted.
10/22/1999	Both vapor extraction systems (i.e., Compounds 1 and 2) were shut down because water had been entrained into the system knock out tank.
10/29/1999	Air stack sampling and well gauging data collection were conducted. Both Compounds 1 and 2 were shut down briefly to change the oil lubrication system on the blowers.
11/ 5/1999	Maintenance personnel replaced the bleed air valve switch on the compressor at Compound 2.

TABLE 3-4
Operation and Maintenance Activities
MCAS Cherry Point

Date	O&M Activities and Operating Problems Encountered *
12/3/1999	Air stack sampling using a Summa canister was conducted and well gauging data were collected and recorded.
1/11/2000	The piping header was separated and needed repair.
1/12/2000	The header pipes to some of the SVE wells were found cracked.
1/14/2000	System was shut down due to freezing temperature.
1/19/2000	The air-water separator was cleaned.
1/31/2000	System restarted.
2/1/2000	Compound 1 was down due to freezing temperature. Compound 2 was shut down.
2/4/2000	The system was shut down and condensate was drained from the lines due to freezing temperature.
2/7/2000	System restarted.
2/9/2000	System was found shut down due to high level alarms in the air-water separators. The condensate was pumped to the storage tank and the system was restarted.
2/15/2000	System was found shut down due to high level alarms in the air-water separators. The condensate was pumped to the storage tank and the system was restarted.
3/2/2000	System was shut down for the monthly gauging of the monitoring wells.
3/3/2000	System restarted.
3/20/2000	Compound 2 was down due to a high level alarm in the air-water separator. The tank was purged and the compound was restarted.
3/22/2000	Compound 2 was down due to a high level alarm in the air-water separator. The tank was purged and the compound was restarted.
3/27/2000	Compound 2 was down due to a high level alarm in the air-water separator. The tank was purged and the compound was restarted.
3/29/2000	Compound 2 was down due to a high level alarm in the air-water separator. The tank was purged and the compound was restarted.
4/3/2000	System was found shut down due to a high liquid level in the tank at Compound 2.
4/13/2000	System was shut down due to heavy rainfall.
4/14/2000	System restarted. Increased AS on all wells. Effluent venting at stack increased slightly from 0.0 to 1.6 and 3.6 ppm for Compounds 1 and 2, respectively.

TABLE 3-4
 Operation and Maintenance Activities
 MCAS Cherry Point

Date	O&M Activities and Operating Problems Encountered *
4/19/2000	System was shut down due to heavy rainfall.
4/24/2000	Restarted Compound 1. Attempt to restart Compound 2 failed due to electrical difficulties.
4/26/2000	Faulty coil and timer were replaced at Compound 2. System restarted.
5/11/2000	Pressure regulators in AS wells I-31, I-40, I-39, I-29, I-28, I-27, I-15, I-14, I-3, and I-4 and vacuum gauges in SVE wells E-34, E-44, E-42, E-32, E-40, E-17, E-15, E-16, and E-14 were not functioning. Replacements ordered. Water is being transferred to oil collection buckets on the oil-water separator.
5/15/2000	Replaced pressure regulators for wells I-40, I-39, and I-27 and vacuum gauge for SVE well E-16. A possible break in the PVC underground after the header was found to cause no vacuum at Compound 1 wells E-7, E-8, and E-9.
5/18/2000	The SVE piping between the header and SVE well E-7 was excavated as large quantities of silt, small pebbles, and dirt were accumulating in the air-water separator.
5/22/2000	Reduced vacuum on the system from 5 inches to 2 inches Hg due to heavy rains. The system was returned to normal operating conditions the next day.
5/31/2000	Sensor error message flashing on the compressor computer screen.
6/2/2000	Sensor error still flashing on compressor computer screen.
6/5/2000	Replaced the differential pressure that caused the sensor error message. Compound 1 down for high level alarm in the separator. Cleaned out knockout of sand, silt, and debris. Compound 1 restarted. Pumped 1,400 gallons of water in the Compound 2 tank. Replaced the stainless steel float found in the air compressor.
6/12/2000	Installed new parts into auto condensate blow off valve.
6/16/2000	Replaced the flow meter to the storage tank at Compound 2.
6/20/2000	Disconnected and removed both flow meters to the storage tanks at Compounds 1 and 2.
7/7/2000	Compound 2 was found shut down. Cleared all alarms and restarted the system.
8/8/2000	Checked automatic drain valves (ADV) on both compressors. Drained the tanks on both compressors to remove excess water.
8/11/2000	Compound 1 was found shut down due to a high level alarm in the air-water separator. The separator was cleaned of silt and clay and the system was restarted.
8/25/2000	Compound 1 was found shut down due to high level in the air-water separator. The separator transfer pump was cleaned of sediment. The system was restarted.

TABLE 3-4
Operation and Maintenance Activities
MCAS Cherry Point

Date	O&M Activities and Operating Problems Encountered *
8/26/2000	Compound 1 was found down due to high level in the air-water separator. Tank was pumped down and the system was restarted.
8/10 through 9/1/2000	Daily checks of the ADVs were conducted to ensure that water is not injected into the cooling and lubricating oil.
10/12/2000	The air-water separator for Compound 1 was cleaned of sand.
10/16/2000	The air-water separator for Compound 1 was cleaned of sand.
10/20/2000	A break was found in the line for Compound 1. System was shut down, break repaired, and system restarted.
12/4/2000	System was shut down and condensate was drained from the SVE lines due to freezing temperatures.
12/8/2000	The system was restarted.
1/5/2001	The system was found shut down due to a high level in the storage tank. A vacuum truck was used to remove and transport 2,000 gallons of condensate to the IWTP for treatment and disposal.
2/5/2001	The hour meter was replaced on Compound 2.
2/22/2001	Compound 2 was found shut down due to a faulty circuit breaker.
3/5/2001	The system was shut down due to freezing temperatures. The condensate was drained from all lines.
3/6/2001	System restarted.
3/12/2001	System shut down for groundwater sampling.
3/22/2001	System restarted.
4/4/2001	Compound 2 was found shut down due to a high water level in the air-water separator. An accumulation of rust particulate and fine-grained sediment was found in the separator. The separator was cleaned and system was restarted.
4/10/2001	Compound 2 was found shut down due to a high water level in the air-water separator. An accumulation of rust particulate and fine-grained sediment was found in the separator. The separator was cleaned and system was started.
4/11/2001	The air-water separator was cleaned of particulate matter on six occasions during adjustment of the system operating parameter. Compound 2 was found shut down due to a high water level in the air-water separator. An accumulation of rust particulate and fine-grained sediment was found in the separator. The separator was cleaned and system was restarted.

TABLE 3-4
Operation and Maintenance Activities
MCAS Cherry Point

Date	O&M Activities and Operating Problems Encountered *
4/19/2001	Compound 1 was found shut down due to a high water level in the storage tank. A vacuum truck was used to transport 2,000 gallons of water from the site to the IWTP for treatment and disposal. The system was shut down for freezing temperatures.
4/30/2001	Compound 1 restarted.
5/2/2001	The condensation system on Compound 2 was found shut down due to a faulty circuit breaker.
5/21/2001	The circuit breaker for condensation on the compressor was replaced. The compressor would not restart due to controller failure. The controller was replaced on May 17, 2001. During this time, the SVE was in operation for Compound 1.
5/23/2001	Compound 2 was found shut down due to a high water level in the storage tank. A vacuum tank was used to transport 1,800 gallons of water to the IWTP for treatment and disposal.
6/4/2001	Compound 2 was found shut down due to a high water level in the storage tank. The tank was emptied using a vacuum truck. The water was discharged at the site.
6/8/2001	The condensate collected by the air-water separator was piped for direct discharge to the surface at the site.
6/12/2001	The system was shut down for the quarterly groundwater sampling at the site.
6/22/2001	System restarted.
7/9/2001	The hour meter for the SVE blower on Compound 2 failed. A new unit was ordered and operational data is being tracked manually.
7/11/2001	Compound 1 was down due to an accumulation of rust particulate and fine-grained sediment in the air-water separator. The separator was cleaned.
7/10/2001	Compound 1 restarted.
7/13/2001	Compound 2 was down due to an accumulation of rust particulate and fine-grained sediment in the air-water separator. The separator was cleaned.
7/23/2001	Compound 2 restarted.
9/24/2001	Compound 2 was found to have shut down. Reset breaker and cleaned connection on auto bleeder. System restarted correctly. The system was shut down for the quarterly groundwater sampling at the site. Compound 1 will not power back up after manual shutdown. Contacted electrical contractor.
9/25/2001	Compound 2 system restarted.

TABLE 3-4
Operation and Maintenance Activities
MCAS Cherry Point

Date	O&M Activities and Operating Problems Encountered *
9/1 1/2001	Base lockdown called for by military. Upon shutting system down system, instrumentation indicated a false "high vacuum" alarm due to an electrical voltage spike or lightning strike near by.
10/16/2001	Compound 1 restarted.
OU2—SVE, 2/3/1999 through 9/30/2001 (OHM, 2000I, p; OHM, 2002b)	
2/3/1998	SVE system started.
10/4/1999	1,800 gallons of condensate was transferred to IWTP.
10/22/1999	System lines were checked with no problems noticed. A bleed air valve was installed.
10/25/1999	The knock out tank was emptied three times. Well gauge ID tags were installed on the headers.
10/29/1999	System was non-operational due to a hurricane.
11/12/1999	System restarted.
11/5/1999	More rainwater in system than normal relating to the recent precipitation events.
11/6/1999	Drain valves were installed in the low points on headers to compensate for additional rainwater entering the system.
11/12/1999	Additional drain valves were installed as a field engineering upgrade.
12/10/1999	System was non-operational due to a faulty high level switch in the moisture knockout tank.
12/17/1999	System restarted.
12/24/1999	System shut down due to Y2K issues.
1/1/2000	System restarted.
1/10/2000	System was found shut down due to high water in vapor/liquid separator.
1/13/2000	Water was pumped and system restarted.
1/17/2000	Shut down system due to freezing weather conditions
1/24/2000	900 gallons of condensate were transferred to IWTP. No liquid transfers were performed since due to the adjustment of the vacuum applied to each hot spot.

TABLE 3-4
 Operation and Maintenance Activities
 MCAS Cherry Point

Date	O&M Activities and Operating Problems Encountered *
1/26/2000	Stack line was separated and the line was repaired.
1/27/2000	Shut down system due to freezing weather conditions.
1/31/2000	System restarted.
2/1/2000	System found shut down due to high water level in separator. Pipes and separator were drained due to freezing weather conditions.
2/7/2000	System restarted.
2/9/2000	Header pipe near hot spot 4 was found broken and repaired. System restarted.
2/28/2000	System was shut down for installation of confirmatory soil borings.
3/3/2000	System restarted.
3/6/2000	System was found shut down due to high temperature exhaust alarm. All filters were replaced and system restarted.
3/20/2000	System was found shut down due to high temperature exhaust alarm.
3/28/2000	System was found shut down due to high temperature exhaust alarm.
3/29/2000	System was found shut down due to high temperature exhaust alarm.
3/31/2000	System was found shut down due to high temperature exhaust alarm.
4/3/2000	System was found shut down due to high temperature exhaust alarm.
4/4/2000	System was found shut down due to high temperature exhaust alarm. Diagnosis of why high temperature exhaust alarm commenced.
4/11/2000	New heat sensor was installed to fix the high temperature problem. System restarted. New level switch in vapor/liquid separator and two control transformers in PLC were also installed.
4/14/2000	System shut down due to heavy rainfall and the system extracting a large amount of water. SVE temporarily shut off and adjustments made.
4/17/2000	Adjustments made corrected the problem of system extracting large amount of water.
5/9/2000	System checked. System is not removing water.
5/17/2000	Replace vacuum gauge and connection assembly on well 1 at hot spot 1 to correct the system for not removing any water.

TABLE 3-4
Operation and Maintenance Activities
MCAS Cherry Point

Date	O&M Activities and Operating Problems Encountered *
2/1/2001	PLC was repaired and system restarted.
2/13/2001	The system was found shut down due to a pinched wire that was shorting intermittently.
2/26/2001	The system was restarted.
3/18/2001	The motor bearings were greased on the blower and the filters were changed.
3/20/2001	The oil was replaced in the blower in the gearbox. A small quantity of metal shavings was observed in the used oil. The blower was operated for 2 days and the oil was checked for metal shavings. No metals shavings were found. The blower has not given any indication of a pending problem (i.e., excessive vibration or unusual noises).
5/15/2001	The hour meter was rewired. The unit was not operating properly.
6/6/2001	Oil leak found on the blower. Problem diagnosed to be a bad ring seal. Parts were ordered.
6/11/2001	The ring seal was replaced on the blower.
6/18/2001	System was found shut down upon arrival due to a high level alarm on the air-water separator as a result of large amount of condensate accumulation. The condensate was transferred to the onsite storage tank. The system was restarted.
6/26/2001	System was found shut down upon arrival probably due to a loss of power from the base. The system was restarted.
7/2/2001	System was found shut down upon arrival due to a high level alarm on the air-water separator. The condensate was transferred to the onsite storage tank. The system was restarted.
8/27/2001	System was found shut down upon arrival due to a high level alarm on the air-water separator. The condensate was transferred to the onsite storage tank. The system was restarted.
9/14/2001	System shut down due to dirty level sensors. The system was restarted after the repair.
OU3- AS, 3/16/2000 to 9/30/2001 (OHM, 2001b, d, i, j)	
3/16/2000	System started.
4/17/2000	Hour meter installed to measure the run-time of the blower.
5/12/2000	Began to measure oxygen in the sample chamber to monitor aerobic biodegradation.
5/15/2000	Measured temperature of the drive shaft bearing, drive shaft, and gearbox on the blower.

TABLE 3-4
Operation and Maintenance Activities
MCAS Cherry Point

Date	O&M Activities and Operating Problems Encountered *
5/22/2000	System shut down for several hours due to heavy rains.
11/2/2000	Water was purged from the sparge lines.
11/6/2000	Water was purged from the sparge lines.
11/14/2000	Water was purged from the sparge lines.
11/17/2000	Water was purged from the sparge lines.
1/18/2001	System was found shut down upon arrival to the site, which was believed to be a fault from a power surge. The system was restarted.
4/4/2001	The bearings on the blower were greased.
4/24/2001	The bearings on the blower were greased.
4/25/2001	System was shut down to allow the vadose zone to return to static conditions and allow preferential air pathways in the soil to close.
5/9/2001	The system was restarted.
5/14/2001	The drive belts on the blower were found broken. The belts were replaced and the system restarted.
6/12/2001	System was shut down for quarterly groundwater sampling.
6/20/2001	The system was restarted.
7/19/2001	The bearings on the blower were greased.
9/21/2001	System was shut down for quarterly groundwater sampling.
9/26/2001	The system was restarted.

4. Progress Since the Last Five-Year Review

This is the first Five-Year Review for MCAS Cherry Point.

5. Five-Year Review Process

5.1 Administrative Components

The CH2M HILL Five-Year Review team is led by Mr. Rodger Jackson, Navy Technical Representative (NTR) for the Installation Restoration Program (IRP) at MCAS Cherry Point and consists of the following team members – Mr. Rodger Jackson/NTR for LANTDIV, Mr. Jeff Christopher/IRP Lead for MCAS Cherry Point, Mr. George Lane/RPM for NCDENR, and Ms. Michelle Thornton/RPM for U.S. EPA. The review team established the review schedule that began in August 2001 and extends through May 2002. The Five-Year Review process includes the following elements:

- Community involvement.
- Document review.
- Data review.
- Site inspection.
- Local interviews.
- Five-Year Review Report development and review.

5.2 Community Involvement

Activities to involve the community in the Five-Year Review process were initiated with a notification published in four local newspapers that specified a Five-Year Review process was occurring at MCAS Cherry Point. When the Five-Year Review Report has been finalized, a notice will be sent to the *Sun Journal*, *Carteret County News Times*, *Havelock News*, and *Windsock* indicating the results of the review and that the report is available for public review.

5.3 Document Review

The Five-Year Review consisted of a review of many documents, including, but not limiting to, RODs, land use control implementation plans (LUCIPs), RA WPs, RARs, LTRAs, and quarterly and annual O&M status reports. These documents can be found at the MCAS Cherry Point Library located in Building 298 on the Air Station and at the Havelock-Craven County Library located at the corner of Lane and Miller Boulevards in Havelock, North Carolina. Data Review

To monitor the performance of the active remedies at each OU and to ensure that the RAOs specified in the RODs are attained to protect human health and the environment, various sampling and monitoring activities have been performed since the remedies were implemented. The results of a review of these data are summarized in Table 5-1.

5.4 Site Inspection and Interviews

The CH2M HILL MCAS Cherry Point Activity Manager, Mr. Doug Bitterman, conducted limited site inspections at MCAS Cherry Point on September 28, 2001, to assess the protectiveness of each remedy at OU1, OU2, and OU3.

At the time of the inspection, no significant issues were identified regarding the remedies at OU1, OU2, or OU3. It was observed that the IWTP was not operating because of mechanical problems, which prohibited treatment of the groundwater influent.

Interviews were conducted with various parties connected to MCAS Cherry Point. Mr. Dale McFarland, Supervisory Environmental Engineer, Restoration and Recycling Division, was interviewed on October 15, 2001. Mr. Taylor Sword, Senior Project Manager, IT Group Inc., was interviewed on October 23, 2001. Mr. Tom Sandy, the CH2M HILL Technical Consultant for the IWTP Evaluation Project, was interviewed on November 15, 2001.

Information generated from the interviews did not identify any concerns regarding the protectiveness of the various RAs at OU1, OU2, or OU3. Site inspection and interview information is presented in Appendix A.

TABLE 5-1
Data Review Details
MCAS Cherry Point

OU	Data Reviewed	Review Conclusion *	Potential Actions Required to Attain FAOs or to Optimize the Operation
1	Monitoring well gauging, air sampling, and cumulative mass removal data.	<p>Exceedances of performance standards still exist in groundwater in both the NADEP central hot spot area and Site 16.</p> <p>The AS/SVE at Site 16 continues to remove VOC mass from the site at increasing rates.</p> <p>The pump and treat system at the NADEP central hot spot area continues to remove VOC mass from groundwater. However, data has shown that the ratio of mass removed over the extracted groundwater volume has been decreased since the 1st quarter of 2001.</p>	<p>No actions required.</p> <p>Continue to monitor mass removal and groundwater extraction rates through the next several reporting periods. Plot mass removed versus extracted groundwater volume graphically to determine whether the pump and treat system is reaching its asymptotic stage and whether a more cost-effective alternative should be considered.</p>
2	Air sampling, well gauging, confirmatory soil sampling, and cumulative mass removal data.	<p>Air sampling results indicated the maximum operating values have not exceeded the discharge standards. VOC removal efficiencies continue to increase in hot spots 1 and 3. Minimal VOC mass is being removed from hot spot 2. Almost no VOC mass has been removed from hot spot 4 since the 4th quarter of 2000. Based on the confirmatory soil sampling results from 2/28 to 3/2/2000, VOC concentrations still exceed performance standards in locations throughout the four hot spot areas.</p> <p>Higher VOC concentrations were detected in some areas outside the SVE areas.</p> <p>At some hotspot locations, VOC soil concentrations are higher than previously measured during SVE installation and later soil borings.</p> <p>The increased soil VOC concentrations and differences in analytes detected may suggest:</p> <ul style="list-style-type: none"> • Contaminant distribution is not uniform. • The extent of contamination may be greater than previously thought. <p>Excessive cost involved in disposing of SVE system condensate.</p>	<p>No actions required.</p> <p>Further investigation should be conducted to refine the delineation of high VOC concentrations in soil.</p> <p>If sources are determined to be localized, a removal action should be considered to reduce the time and cost to remediate the soil.</p> <p>Other treatment technologies should be evaluated and used in conjunction with current SVE system to expedite the remediation of OU2 soil.</p> <p>The percentage of methane in the SVE off-gas should be measured to determine how much VOC removal is actually taking place. If the off-gas has a high percentage of methane, another monitoring technique is recommended so that the non-methane mass removal can be measured.</p> <p>Carefully review groundwater sampling data to delineate the possibility of soil hot spots not previously identified.</p> <p>Recommend sampling condensate to facilitate search for lower cost disposal alternative.</p>

TABLE 5-1
 Data Review Details
 MCAS Cherry Point

OU	Data Reviewed	Review Conclusion *	Potential Actions Required to Attain RAOs or to Optimize the Operation
3	Vadose zone monitoring, confirmatory soil sampling, and cumulative mass removal data.	The VOC concentrations, measured with a FID, are decreasing across the site. Confirmatory soil sampling results indicated an overall shrink in contaminant plume size (OHM, 2001d). Confirmatory soil sampling results also revealed an area with elevated benzene concentrations located outside the radius of influence of AS wells. 2-methylnaphthalene was removed as a COC due to revised State groundwater standards.	System to be expanded to cover the southwest area outside of the current radius of influence of the AS system. Continue monitoring oxygen levels versus VOC levels to ensure continuously sufficient microbial activities.

*(OHM, 2000p, 2001d, 2000h, h, i, j)

6. Five-Year Review Summary of Findings

This section presents a Five-Year Review summary of findings based on the document reviews pertaining to the RAs performed at OU1, OU2, and OU3.

6.1 OU1

The Five-Year Review identified several key findings, which are summarized below (OHM, 2000b, c, g, h, k, l, m, n o; OHM, 2001a, c, e, f, g, h, k, l, m; OHM, 2002a):

- The groundwater extraction system at NADEP central hot spot area has been operating as designed since November 30, 1998.
- The air stripping treatment component for the pump and treat system had two problems with biofouling for the period May 7, 2000 through November 3, 2000 that resulted in internal failure (cracks in the supporting structure and the grating of the air stripper, due to the weight of biomass material). The biofouling problem is currently being evaluated as part of a project to evaluate the waste stream influent to the air stripper.
- The 10 extraction wells in the NADEP central hot spot area have reduced the VOC concentrations in groundwater at least 50 percent based on the site interview conversation with Mr. Taylor Sword (Appendix A).
- The VOC mass removal rate has been decreasing since the 1st quarter of 2001.
- The Site 16 AS/SVE system has been operating as designed since November 1998.
- Accumulation of condensate and corrosion in the air-water separator has shut down the AS/SVE on many occasions.
- The AS/SVE system continues to remove VOC mass from groundwater in both Compounds 1 and 2 at increasing rates.

6.2 OU2

The Five-Year Review identified several key findings, which are summarized below (OHM, 2000l, p; OHM, 2002b):

- The SVE remedy Site 10 soil is operating as designed since March 1998.
- The mass removal calculations performed by OHM for the SVE system were based on in-line measurements. A cumulative total of approximately 3,000,000 lbs. of contaminants have been removed through the reporting period of September 30, 2001. The majority of the contaminant mass removed consisted of methane.
- VOC mass removal continues to increase at significant rates in hot spots 1 and 3 while little to no removal has been observed at hot spots 2 and 4.

- Confirmatory soil sampling in the hot spot areas revealed some areas with VOC concentrations greater than previously measured during the installation of SVE borings in 1997 along with new analytes detected at the SVE outlet.
- Air samples indicate the stack emissions have remained below the discharge standards; thus, the use of the carbon abatement system was discontinued.
- MNA plan to address groundwater conditions was approved in September 2001 and will be implemented in 2002.
- Land use controls put in place include restricting site use to industrial use only, prohibiting intrusive activities below the water table, and prohibiting groundwater use. These controls are functioning as planned in conjunction with the other remedy components in eliminating exposure to contaminants and in being protective of human health and the environment based on interviews with Mr. Dale McFarland and Mr. Taylor Sword. OU3

The Five-Year Review identified several key findings, which are summarized below (OHM, 2001b, d, i, j):

- The AS system remedy at Site 7 has demonstrated that it is effective at meeting the RAOs for the hot spot soil to be protective of groundwater quality.
- VOC concentrations measured in soil are decreasing across the site.
- As a result of the AS system's ability to achieve the remedial goal of 5.6 micrograms per kilogram for benzene in soil, 12 AS wells (7AS05 through 7AS07, 7AS09, 7AS15, 7AS32, and 7AS39 through 7AS45) have been turned off since March 31, 2001.
- Soil confirmatory sampling on February 6, 2001, identified areas southwest and northeast of the existing treatment zone that contained elevated benzene concentrations due to exclusion from the radius of influence of the AS system configuration. The addition of five additional AS wells has been recommended to provide additional coverage in these areas.
- MNA plan to address groundwater conditions was approved in September 2001 and will be implemented in 2002.
- Land use controls put in place include restricting site use to industrial use only or no use authorized, and prohibiting intrusive activities and groundwater use. Based on interviews with Mr. Dale McFarland and Mr. Taylor Sword, the land use controls are functioning as intended in conjunction with the other remedy components in eliminating exposure to contaminants and are protective of human health and the environment.

7. Technical Assessment

In order to evaluate whether the remedies in place at MCAS Cherry Point are operating properly and successfully, answers to three important questions were determined for each OU with a remedy in place:

1. Is the remedy functioning as designed?
2. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of selection still valid?
3. Has any other information come to light that could call into question the protectiveness of the remedy?

This section presents the technical assessment summaries for OU1, OU2, and OU3. Table 7-1 summarizes the most recent sampling results (if not otherwise indicated) for groundwater and soil along with the performance standards.

7.1 OU1—Performance Assessment

7.1.1 Is the Remedy Functioning as Designed?

The groundwater extraction system in the NADEP central hot spot area has generally been functioning as designed (OHM, 2000b, f, i, k). However, the air stripping tower has been experiencing operating difficulties due to biofouling (OHM, 2000b, g, k, o; OHM, 2001a, f, h, k; OHM, 2002a). The excessive biomass accumulating on the packing material has caused incidents that resulted in the internal failure of the treatment system (OHM, 2000b, g, k, o; OHM, 2001a, f, h, k; OHM, 2002a). This has resulted in the air stripping tower not functioning and has caused the groundwater extraction system to shut down. Treatment system malfunctions have a direct, adverse impact on the overall remedial goal.

The AS/SVE system at Site 16 has removed a cumulative total of approximately 2,000 lbs. of contaminants since system startup in September 1998 through September 2001. It operated 77 percent of the available time. The system has generally been operating as designed except that the accumulation of condensate and corrosion in the air-water separator have shut down the system many times (OHM, 2000c, h, l, m, n; OHM, 2001c, e, g, l, m).

7.1.2 Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of Selection Still Valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs are still valid based on the remedy evaluation from data in existing reports and from confirmation that the State and Federal standards for the COCs have not changed.

7.1.3 Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

It is a concern that the pump and treat system at the NADEP central hot spot area may have reached its asymptotic stage. Careful evaluation of future monitoring data and RAOs should be performed to determine whether a more cost-effective alternative should be considered. The effectiveness of the plume capture is also impacted during times of shutdown as a result of biofouling problems with the air-stripping tower.

The AS/SVE system at Site 16 is generally operating as designed. VOC mass removal continues to increase at significant rates in both Compounds 1 and 2. However, the system operation has been significantly impacted by the high level alarm in the air-water separator due to excessive condensate or rust and sediment accumulation.

7.1.4 Technical Assessment Summary

The groundwater extraction system in the NADEP central hot spot area has generally been operating as designed. However, the extraction system has shut down many times since the system startup due to both technically controllable (e.g., biofouling) and uncontrollable situations (e.g., hurricanes). While approximately half of the extraction wells continue to remove VOC mass at increasing rates, the overall VOC mass removal rate is decreasing. The results seem to indicate that the VOC removal via pump and treat is reaching a plateau and becoming less efficient. Alternative technologies should be considered if the trend continues.

The AS/SVE system at Site 16 has generally been operating as designed, except that the accumulation of condensate and corrosions in the air-water separator have shut down the system on many occasions. The treatment system continues to remove VOC mass from groundwater at significant rates.

7.2 OU2—Performance Assessment

7.2.1 Is the Remedy Functioning as Designed?

The SVE system at Site 10 is generally operating and functioning as designed. From October 1, 1999, through September 30, 2001, the system was in operation 80 percent of the time. During the total time that the system has been in operation, approximately 3,000,000 lbs. of VOCs have been removed, with the majority being methane. A review of the data indicates that substantially more contaminants are being removed from hot spot 1 than from the three remaining hot spots (OHM, 2000p; OHM, 2002b).

The times that the system was in shutdown were primarily due to mechanical failure from various parts and equipment and the high level alarm in the air-water separator (OHM, 2000p; OHM, 2002b; Appendix A). An evaluation of the shutdowns should be conducted to determine if consideration should be given to whether the frequently detected system problems warrant a system upgrade or optimization.

7.2.2 Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of Selection Still Valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs are still valid based on the remedy evaluation from data in existing reports and from confirmation that the State and Federal standards for the COPCs have not changed.

7.2.3 Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

There are areas where the VOC concentrations in soils have shown increases since the baseline assessment conducted in 1997 (based on confirmatory soil sampling in February/March 2000) (OHM, 2000p). Also, some analytes not previously detected have been observed at the SVE system outlet (OHM, 2000p). Therefore, it is suggested that localized hot spot areas not previously identified may exist that may require further investigation to delineate in order to make the remedy cost-effective in achieving RAOs. It is recommended that groundwater monitoring data from the forthcoming MNA long-term monitoring be evaluated with respect to the possible presence of additional hot spot areas. Also, the SVE system has been ineffective in hot spots 2 and 4 as little to no VOC mass is being removed.

7.2.4 Technical Assessment Summary

The SVE system at Site 10 has generally been operating as designed. The system has encountered various equipment malfunctions with limited shutdown periods. VOC mass removal continues to increase at significant rates in hot spots 1 and 3 while little to no removal has been observed at hot spots 2 and 4 (OHM, 2002b). The mass of VOCs removed to date also indicates that the majority of this mass is methane. The confirmatory soil data show that the VOC concentrations continue to exceed the performance standards set in the ROD, with some of the VOC concentrations greater than previously detected in the 1997 baseline sampling, along with the detections of new analytes from the SVE system (OHM, 2000p). These VOC exceedances have suggested that hot spot areas may potentially exist in places that were not previously identified and that the current SVE configuration may not be effective to address these areas. Further investigation should be considered to confirm the SVE treatment target areas, and dependent upon the results, alternative treatment technologies, installing additional wells, or changing locations of existing wells to optimize the SVE systems performance may need to be considered.

7.3 OU3—Performance Assessment

7.3.1 Is the Remedy Functioning as Designed?

The AS system at Site 7 was in operation at 90 percent of the time, between March 16, 2000, and September 30, 2001. The AS system is generally functioning as designed (OHM, 2001b, d, i, j).

7.3.2 Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of Selection Still Valid?

The exposure pathways, toxicity data, and exposure assumptions used in the risk assessment have remained valid since the AS treatment system started. However, the State groundwater standard for 2-methylnaphthalene was revised after the AS started, such that the concentrations at the site no longer exceeded the standard. As a result, the State regulator agreed at the June 29, 2000, partnering meeting to no longer consider 2-methylnaphthalene in Site 7 soil to be a secondary source for groundwater contamination (OHM, 2000i). Even though the presence of 2-methylnaphthalene was considered in the selection of AS as the best alternative technology for Site 7, the spatial extent of the other major COPCs, namely benzene, completely overlapped that of 2-methylnaphthalene. Thus, the removal of 2-methylnaphthalene as a COPC does not affect the area needing remediation or the RA scope for Site 7.

7.3.3 Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

It was noted that the extent of benzene contamination in soil at Site 7 extends beyond the radius of influence of the current AS system to the southwest and northeast, based on the February 2001 confirmatory soil sampling results (OHM, 2001d).

7.3.4 Technical Assessment Summary

The vadose zone monitoring has shown that the overall VOC concentrations in the soil gas chambers have decreased since the system started. This indicates that the AS remedy has been able to promote volatilization of the VOC plume. The comparison of the baseline sampling results in January 2000 with the results from confirmatory soil sampling on February 6, 2001, show that benzene concentrations are below the benzene North Carolina Department of Environment and Natural Resources Soil Cleanup Levels identified in the RAO in many locations.

TABLE 7-1
 Summary of Most Recent Soil and Groundwater Sampling Results
 MCAS Cherry Point

Chemical of Concern	Range of Confirmatory Soil Sampling Results (Detections Only) µg/kg	Soil Performance Standards µg/kg	Range of Confirmatory Groundwater Sampling Results (detections only) µg/L	Groundwater Performance Standards (MCL/NC Class GA Standard) µg/L
OU1—NADEP Central Hot Spot Area (8/29/2000, OHM, 2000o)				
Benzene	—	—	1.4-7	1
Chlorobenzene	—	—	4.8	N/A
1,1-Dichloroethane	—	—	1.2-101	700
1,2-Dichloroethane	—	—	2.2-2.5	0.38
1,1-Dichloroethylene	—	—	2.6-117	7
Cis-1,2-Dichloroethylene	—	—	88.1-2,390	70
Trans-1,2-Dichloroethylene	—	—	3.5-184	70
Trichloroethylene	—	—	22.9-4,040	2
Vinyl Chloride	—	—	2.8-146	1
OU1—Site 16 (3/20/2001, OHM, 2001e)				
Trans-1,2-Dichloromethane	—	—	13-280	70
Cis-1,2-Dichloroethylene	—	—	7-2000	70
1,2-Dichloroethane	—	—	6	0.38
Tetrachloroethylene	—	—	5	N/A
Trichloroethylene	—	—	5-1200	N/A
Vinyl Chloride	—	—	5-190	N/A
OU2—Site 10 (2/28 through 3/2/2001, OHM, 2000p)				
Hot Spot 1				
2-Butanone	9,000-9,300	687	—	—
Hot Spot 2 *				

HS2-SB7, HS2-SB10, HS2-SB11, and HS2-SB12 contain VOC concentrations exceeding performance standards.

TABLE 7-1
 Summary of Most Recent Soil and Groundwater Sampling Results
 MCAS Cherry Point

Chemical of Concern	Range of Confirmatory Soil Sampling Results (Detections Only) µg/kg	Soil Performance Standards µg/kg	Range of Confirmatory Groundwater Sampling Results (detections only) µg/L	Groundwater Performance Standards (MCL/NC Class GA Standard) µg/L
Hot Spot 3 *				
HS3-SB11 and HS3-SB12 contain VOC concentrations, including 2-butanone, chlorobenzene, ethylbenzene, methylene chloride, and toluene, exceeding performance standards.				
Hot Spot 4				
Benzene	11-55	5.6	—	—
OU3—Site 7 (Confirmatory Soil Sampling on 2/6/2001, OHM, 2001c; and Groundwater Sampling on 9/25/2001, OHM, 2001f)				
Benzene	3.3-1,160	5.6	11	1
Toluene	8.4-136	7,000	—	—
Ethylbenzene	5.6-151	240	—	—
Xylene	6.7-463	5000	—	—

* Specific range of VOC concentrations detected pending from OHM/IT.
 "—": Not sampled or not detected above laboratory reporting limits.
 N/A: Not available.

8. Issues

Issues with a remedy that prevents a RAO from being attained threaten the protection of human health and the environment. A discussion of identified issues for each OU, including a summary of the mechanical and weather-related problems noted during the review of documents, is presented in this section.

8.1 OU1

The major issue causing shutdowns of the pump and treat system at the NADEP central hot spot area is biofouling in the air stripper tower. This problem has resulted in several incidents of internal system failure, including cracks in the supporting structure and the grating of the air stripper. An evaluation of methods that could improve the influent water quality to the air stripper should be conducted in order to prevent the biomass accumulation and reduce frequent acid washing. This would increase the amount of time the system is on-line and improve the effectiveness of the remedy. CH2M HILL will be performing an evaluation of the system optimization.

In addition, the VOC mass removal from the extracted groundwater should be evaluated during the next several reporting periods to determine whether the pump and treat system has reached its asymptotic stage and whether ROAs can be achieved. The AS/SVE system at Site 16 has experienced several shutdowns due to parts failure, rust and sediment accumulation in the air-water separator, and excessive condensate accumulation in the separator. Reconditioning of the air-water separator should be conducted along with necessary modifications to system operations, i.e., lower vacuum pressure to minimize condensate accumulation during heavy rainfalls. This could increase operating time and performance for the AS/SVE system.

8.2 OU2

At Site 10, confirmatory soil sampling and VOC measurements from the SVE system off-gas have indicated that VOC concentrations remain elevated, with some locations having greater than previously detected VOC concentrations. It is suspected that unidentified hot spots may exist that would require further investigation to delineate (OHM, 2000p). In addition, alternative technologies or modifications to the current system configuration should be evaluated with respect to the treatment efficiencies at hot spots 2 and 4 as little to no VOC mass is being removed from soil. Optimization of the SVE system should also be evaluated, as the system has experienced several parts or equipment failures and the air-water separator has shut down the system on many occasions.

8.3 OU3

At Site 7, the overall concentrations of benzene in soil have decreased, and the extent of the benzene-contaminated soil area has decreased since the AS system started. However,

additional areas of benzene-contaminated soil outside of the system's area of influence have been identified to the southwest and northeast of the treatment area (OHM, 2001d). Unless these areas are added to the influence zone of the AS system by installing additional AS wells, the protectiveness of the RA at OU3 for human health and the environment may be threatened and the RAOs specified in the ROD may not be attained.

9. Recommendations and Follow-up Actions

This section presents recommendations to address the issues identified in Table 9.1.

9.1 OU1 Recommendations

9.1.1 NADEP Central Hot Spot Area Pump and Treat System

The remedy is generally functioning as designed and is achieving RAOs. Based on the information reviewed, no major recommendations were identified for this remedy. Minor recommendations include further evaluation of influent water quality to the air-stripping tower and careful monitoring of VOC mass removal rates versus groundwater pumping volumes during the next several reporting periods.

9.1.2 Site 16

The AS/SVE system has been operating as designed and is continuing to effectively remove VOC mass from groundwater. As a result, no major recommendations were identified for this remedy. A minor recommendation is that the air-water separator issues discussed in previous sections be looked at to further improve system performance.

9.2 OU2 Recommendations

9.2.1 Site 10

Additional investigation to identify previously undetected hot spots is recommended based on the confirmatory soil sampling and SVE system off-gas monitoring results. Depending on the investigation results, modification or re-consideration of the remedy may be warranted based on site conditions and in order to improve the cost-effectiveness of the remedy. The ineffectiveness of the SVE in removing VOC mass from hot spots 2 and 4 should also be evaluated to determine whether alternative technologies or modifications to the system configuration are warranted. In addition, the frequent equipment failure and air-water separator issues discussed previously should also be looked at to increase the system operating time. The start of the long-term monitoring associated with the MNA remedy for groundwater is also necessary to achieve the RAOs for this site.

9.3 OU3 Recommendations

9.3.1 Site 7

Since areas of benzene contamination in soil have been identified outside of the AS system area of influence, it is recommended that the planned expansion of the current system be completed to ensure that the RAOs for Site 7 are achieved. The start of the long-term monitoring associated with the MNA remedy for groundwater is also necessary to achieve the RAOs.

TABLE 9-1
Summary of Issues and Follow-Up Actions
MCAS Cherry Point

OU	Issues	Follow-Up Actions	Projected Schedule	Responsible Party	Affects Protectiveness (Y/N)	
					Current	Future
1	<p>Frequent biofouling in air stripping tower for the pump and treat system in the NADEP central hot spot area.</p> <p>Incremental VOC mass removal is decreasing in the NADEP central hot spot area.</p>	<p>More frequent acid washing should be performed, or adjustments in the pretreatment of the water entering air stripper should be evaluated to provide ultimate control of the problem.</p> <p>Evaluate the mass removal efficiencies through the next several reporting periods by plotting the mass removal data (Y-axis) versus extracted groundwater volume (X-axis). If the pump and treat system is reaching the asymptotic stage, consider whether other technologies are more cost-effective for addressing the groundwater plume at NADEP central hot spot area.</p>	<p>Currently being evaluated as part of the FSP/PRAP/ROD for OU1</p> <p>Currently being evaluated as part of the FSP/PRAP/ROD for OU1</p>	US Navy	N	Y
	<p>Accumulation of rust and sediments as well as excessive condensate in the air-water separator for AS/SVE in Site 16.</p>	<p>Recondition the air-water separator interior or make modifications to the system operation.</p>	<p>Currently being evaluated as part of the FSP/PRAP/ROD for OU1</p>	US Navy	Y	Y
2	<p>Excess condensate, especially during heavy rain.</p> <p>High VOC FID readings.</p> <p>VOC concentrations from soil borings showed elevated and greater concentrations than 1997 baseline sampling and new analytes found at SVE outlet.</p>	<p>Adjust vacuum pressure to reduce condensate.</p> <p>Sample condensate to determine a lower cost alternative for condensate management.</p> <p>Procedures have been performed to verify that the majority of VOC concentrations detected are methane. Use other methods, e.g., photo ionization detector, for more accurate monitoring purposes.</p> <p>Survey the site to locate potentially unidentified hot spots and evaluate groundwater sampling data and groundwater elevations to delineate possible additional contaminated soil areas.</p> <p>Evaluate other remedial technologies, if appropriate, based on the survey results.</p>	<p>Schedule uncertain. To be reviewed by Partnering Team in FY 2003</p> <p>Schedule uncertain. To be reviewed by Partnering Team in FY 2003</p> <p>Schedule uncertain. To be reviewed by Partnering Team in FY 2003</p>	US Navy	N	N

TABLE 9-1
Summary of Issues and Follow-Up Actions
MCAS Cherry Point

OU	Issues	Follow-Up Actions	Projected Schedule	Responsible Party	Affects Protectiveness (Y/N)	
					Current	Future
	Little to no VOC mass is being removed from hot spots 2 and 4.	Evaluate alternative technologies or modifications to the system configuration to improve the treatment efficiencies.	Schedule uncertain. To be reviewed by Partnering Team in FY 2003	US Navy	Y	Y
3	Areas with elevated benzene in soils have been identified outside the treatment system influence zone to the southwest and northeast.	Expand AS system configuration to include these areas.	System went on-line June 2002	US Navy	Y	Y

10. Protectiveness Statements

As part of the Five-Year Review for MCAS Cherry Point, a protectiveness statement must be developed for each OU and associated sites with RAs.

10.1 OU1

10.1.1 NADEP Central Hot Spot Area Pump and Treat System

The current pump and treatment system operation at the NADEP central hot spot area was found to be protective of human health and the environment. However, the air stripping tower problems should be looked at and resolved in a preventive manner to make the pump and treatment remedy system more effective and in order to ensure long-term protectiveness. Evaluation of the VOC mass removed versus extracted groundwater volumes should also be conducted through the next several reporting periods to determine whether the pump and treatment system is reaching its asymptotic stage, and whether alternative technologies should be considered.

10.1.2 Site 16

The AS/SVE system at Site 16 was found to be protective of human health and the environment. The AS/SVE system is operating as designed and VOC mass continues to be removed from groundwater at significant rates. However, the rust and sediment or excessive condensate accumulation in the air-water separator should be looked at to increase system operating time and improve future performance.

10.2 OU2

10.2.1 Site 10

The overall remedy at OU2 was found to be protective of human health and the environment based on the information evaluated. However, some issues should be evaluated and addressed. With respect to the operation of the SVE system, it appears to be most effective at soil hot spots 1 and 3, where VOCs continue to be removed from soil at significant rates. However, the SVE system does not appear to be effective at soil hot spots 2 and 4, as the system is removing little to no VOCs from the soil while exceedances still exist throughout these treatment areas. It is suggested that new technologies or modifications to the system configuration be considered and evaluated to accelerate or improve soil treatment and maintain the RAOs at hot spots 2 and 4. In addition, based on the confirmatory soil sampling results, it is suspected that previously unidentified soil "hot spots" may exist and that the current SVE system layout may need to be modified to optimize contaminant removal. It is recommended that further investigation be performed and/or additional technologies be evaluated to aid remedial progress, as necessary.

The land use controls associated with the OU2 remedy have been effective in protecting human health and the environment.

The protectiveness of the MNA remedy for groundwater is expected to be protective given current information and conditions and will be verified through long-term monitoring.

10.3 OU3

10.3.1 Site 7

The AS remedy was found to be protective in the short term because it has been effective in reducing benzene concentrations within the hot spot area, based on the evaluation of data. As a result of this effectiveness, a portion of the system was to be shut down after 1 year due to its achievement of performance standards. Since areas of benzene contamination in soil have been identified outside of the AS system area of influence, it is recommended that the planned expansion of the current system be completed to ensure that the RAOs for Site 7 are achieved. This will enable the remedy to maintain the RAOs set in the ROD and to protect human health and the environment from unacceptable risks.

The land use controls associated with the OU3 remedy have been effective in protecting human health and the environment.

The protectiveness of the MNA remedy for groundwater is expected to be protective given current information and conditions and will be verified through long-term monitoring.

11. Next Review

The completion of the next Five-Year Review for the MCAS Cherry Point OUs is required by 5 years from the signature date of this review.

12. References

- Brown & Root (B & R), 1996. *Interim Record of Decision for OU1*. August 1996.
- B & R, 1997a. *Remedial Investigation Report for OU2*. April 1997.
- B & R, 1997b. *Basis of Design Report for Air Sparging System at Site 10, OU2*. April 1997.
- CH2M HILL, 1999a. *Final Record of Decision for OU2*. March 1999.
- CH2M HILL, 1999b. *Final Remedial Design Work Plan, Baseline Round of Long-Term Monitoring For Operable Unit 2*. May 1999.
- CH2M HILL, 2000. *Final Record of Decision for OU3*. August 2000.
- CH2M HILL, 2001a. *Final Remedial Design/Remedial Action Report for OU2 Groundwater*. October 2001.
- CH2M HILL, 2001b. *Final Remedial Design/Remedial Action Report for OU3 Groundwater*. October 2001.
- OHM, 1997a. *Work Plan for Construction and Operation of Air Sparge System at Site 10, OU2*. November 1997.
- OHM, 1997b. *Sampling and Analysis Plan for OU2*. November 1997.
- OHM, 1997c. *Work Plan for Construction and Operation of Air Sparge/Vapor Extraction System at Site 16, OU1*. December 1997
- OHM, 1997d. *Sampling and Analysis Plan for Construction and Operation of Air Sparging and Vapor Extraction Remediation System at OU1, Site 16*. December, 1997
- OHM, 1998. *Operation and Maintenance Plan for Soil Vapor Extraction System at OU2*. June 1998.
- OHM, 1999a. *Sampling and Analysis Plan for OU3*. January 1999.
- OHM, 1999b. *Work Plan for Construction and Operation of Air Sparge System at OU3*. January 1999.
- OHM, 1999c. *Sampling and Analysis Plan for OU3*. January 1999.
- OHM, 1999d. *Long-Term Monitoring Remedial Action Plan for OU2*. May 1999.
- OHM, 1999e. *Remedial Action Report for OU2*. May 1999.
- OHM, 2000a. *Long-Term Remedial Action Plan for IWTP at OU1*. January 2000.
- OHM, 2000b. *Quarterly O&M Status Report for Fourth Quarter 1999, OU1 ITWP*. February 2000.

- OHM, 2000c. *Quarterly O&M Status Report for Fourth Quarter 1999, OU1 Site 16*. February 2000.
- OHM, 2000d. *Long-Term Remedial Action Plan for Site 16 at OU1*. April 2000.
- OHM, 2000e. *Quarterly O&M Status Report for First Quarter 2000, OU2*. May 2000.
- OHM, 2000f. *Operation and Maintenance Plan for OU3*. May 2000.
- OHM, 2000g. *Quarterly O&M Status Report for First Quarter 2000, OU1 ITWP*. May 2000.
- OHM, 2000h. *Quarterly O&M Status Report for First Quarter 2000, OU1 Site 16*. May 2000.
- OHM, 2000i. *Long-Term Monitoring Remedial Action Plan for OU3*. June 2000.
- OHM, 2000j. *Remedial Action Report for OU3*. August 2000.
- OHM, 2000k. *Quarterly O&M Status Report for Second Quarter 2000, OU1 ITWP*. August 2000.
- OHM, 2000l. *Quarterly O&M Status Report for Second Quarter 2000, OU1 Site 16*. August 2000.
- OHM, 2000m. *Quarterly O&M Status Report for Third Quarter 2000, OU1 Site 16*. October 2000.
- OHM, 2000n. *Remedial Action Report for OU1, Site 16*. November 2000.
- OHM, 2000o. *Quarterly O&M Status Report for Third Quarter 2000, OU1 ITWP*. November 2000.
- OHM, 2000p. *Annual Operation and Maintenance Status Report for OU2*. December 2000.
- OHM, 2001a. *Quarterly O&M Status Report for Fourth Quarter 2000, OU1 ITWP*. January 2001.
- OHM, 2001b. *Quarterly O&M Status Report for Fourth Quarter 2000, OU3*. January 2001.
- OHM, 2001c. *Annual O&M Status Report for January 1 through December 31 at OU1, Site 16*. February 2001.
- OHM, 2001d. *Annual Operation and Maintenance Status Report for OU3*. April 2001.
- OHM, 2001e. *Quarterly O&M Status Report for First Quarter 2001, OU1 Site 16*. May 2001.
- OHM, 2001f. *Annual Operation and Maintenance Status Report for OU1 ITWP*. May 2001.
- OHM, 2001g. *Quarterly O&M Status Report for Second Quarter 2001, OU1 Site 16*. July 2001.
- OHM, 2001h. *Quarterly O&M Status Report for Second Quarter 2001, OU1 ITWP*. July 2001.
- OHM, 2001i. *Quarterly O&M Status Report for Second Quarter 2001, OU3*. July 2001.
- OHM, 2001j. *Quarterly O&M Status Report for Third Quarter 2001, OU3*. October 2001.
- OHM, 2001k. *Quarterly O&M Status Report for Third Quarter 2001, OU1 ITWP*. October 2001.
- OHM, 2001l. *Quarterly O&M Status Report for Third Quarter 1999, OU1 Site 16*. October 2001.
- OHM, 2001m. *Quarterly O&M Status Report for Third Quarter 2001, OU1 Site 16*. November 2001.

OHM, 2002a. *Quarterly O&M Status Report for Fourth Quarter 2001, OU1 IWTP*. January 2001.

OHM, 2002b. *Annual Operation and Maintenance Status Report for OU2*. January 2001.

Tetra Tech NUS, INC (TT), 1999. *Site Management Plan for FY00*. December 1999.

USEPA, 2001a. *Comprehensive Five-Year Review Guidance*. EPA 540-R-01-007. June 2001.

USEPA, 2001b. *Draft Letter, Points of Environmental Interest (POEI's) at Marine Corps Air Station (MCAS), Cherry Point, North Carolina*. January 2001.

Appendix A

Site Inspection and Interview Checklist

Site Inspection and Interview Checklist

Purpose of the Checklist

The site inspection checklist provides a method for collecting pertinent site-specific information during the site inspection portion of the Five-Year Review. Information collected from the interviews is also incorporated and referenced, where appropriate. The checklist is a modification from what is presented in the guidance document (USEPA, 2001).

Five-Year Review Site Inspection and Interview Checklist

I. Site Information

Site Name:	MCAS Cherry Point
Date of Inspection:	September 28, 2001
Location/Region:	North Carolina/USEPA Region IV
Interviews (Dates):	Mr. Dale McFarland (October 15, 2001) IRP Lead for Cherry Point Supervisory Environmental Engineer Restoration and Recycling Division MCAS Cherry Point Environmental Affairs Department PSC Code 8006 Cherry Point, NC 28533-0006 252-466-4598
	Mr. Taylor Sword (October 23, 2001) Senior Project Manager OHM Remediation Services Corp./IT Group Inc. 5700 Thurston Avenue, Suite 116 Virginia Beach, VA 23455 757-318-5142
	Mr. Tom Sandy (November 15, 2001) Technical Consultant IWTP Evaluation Project CH2M HILL 4824 Parkway Plaza Boulevard, Suite 200 Charlotte, NC 28217-1968 704-329-0072

Remedies include: OU1 NADEP Central Hotspot Area: pump and treat.
 OU1 Site 16: AS and SVE.
 OU2: Land use controls, SVE for soil, MNA for
 groundwater.
 OU3: Land use controls, AS for Site 7 soil, MNA for
 groundwater.

Local regulatory authorities and response agencies:

Mr. George Lane
NC Dept. of Env. And Nat. Resources
Superfund Section
401 Oberlin Road, Suite 150
Raleigh, NC 27605
919-733-2801, x340

II. Interview – Mr. Dale McFarland

The following excerpts are from an interview with Mr. Dale McFarland on October 15, 2001:

Onsite documents and records verified

- O&M documents are readily available at the OHM/IT office trailer onsite at MCAS Cherry Point.
- Daily Access Logs are not maintained by Mr. McFarland, but are maintained by Mr. Sword during execution of activities at MCAS Cherry Point.

Access and Institutional Controls

- Fencing: Fencing is inspected quarterly by the onsite Environmental Engineering Restoration Program Manager (currently Mr. McFarland) in accordance with the Land Use Control Assurance Plan (LUCAP). The inspection logs are maintained onsite and submitted annually to the State agency.
- Other Access Restrictions: Signs and inspection of remedies via waterways are included in the quarterly inspection as noted above.
- Institutional Controls: Verification of compliance with institutional controls is included in the quarterly inspections as noted above. The annual reports are submitted to the State agency and USEPA. According to Mr. McFarland, the Institutional Controls are adequate, effective, and necessary in maintaining the remedies overall protectiveness.
- General: According to Mr. McFarland, there have been no public access issues with respect to vandalism/trespassing, and there have been no land use changes on or offsite.

Groundwater Remedies (Includes Pump and Treat, SVE, and Air Sparge)

- **Monitored Natural Attenuation:** Mr. McFarland indicated that monitoring wells are not regularly inspected; however, any observations from Mr. Sword's team during regular sampling events are communicated to him directly. This long-term monitoring plan associated with this remedy was not approved at the time of the interview, but has recently been approved and will be implemented in 2002¹.

III. Interview – Mr. Taylor Sword

The following excerpts are from an interview with Mr. Taylor Sword on October 23, 2001:

Onsite documents and records verified

- O&M documents are readily available at the OHM/IT office trailer onsite at MCAS Cherry Point.
- Site-Specific Health and Safety Plan is readily available at the OHM/IT office trailer on site at MCAS Cherry Point.
- O&M and OSHA Training Records are readily available at the OHM/IT office trailer onsite at MCAS Cherry Point.
- State and local permits related to the remedies are not required for MCAS Cherry Point.
- Daily Access Logs are not maintained by Mr. McFarland, but are maintained by Mr. Sword during execution of activities at MCAS Cherry Point.

O&M Cost

- **Records:** O&M cost records for systems built and maintained by OHM Remediation Services Corp./IT Group Inc. are reported and maintained on a monthly basis by Mr. Sword. These files are stored at OHM Remediation Services Corp./IT Group Inc. and with their Navy point of contact.
- **Unanticipated or unusually high O&M costs during review period:** According to Mr. Sword, routine maintenance of the remedies is incorporated into the O&M schedule and there have been no unusual costs associated with the remedies (except for costs outside of their control, such as lightning damage).

General Site Conditions

- **Roads:** According to Mr. Sword, all access to the remedy sites are via existing roads maintained by MCAS Cherry Point. He indicated that there have been no access issues during the time that the remedies have been in place.

Groundwater Remedies (Includes Pump and Treat, SVE, and Air Sparge)

¹ The Remedial Design/Remedial Action Reports for OU2 and OU3 Groundwater (October 2001) present the long-term monitoring plans for the monitored natural attenuation remedies. The plans specify that annual reports will be generated, which will include documentation on the field conditions of the monitoring wells.

- **General:** According to Mr. Sword, the remedy equipment is in good condition. He indicated that they maintain some spare parts (e.g., filters, pipefittings, belts) onsite for general and routine maintenance as indicated in the O&M schedule. He also indicated that equipment is not obsolete because they have anticipated upgrades in their schedule. General maintenance (including monthly thermal scans of bearings) is part of their schedule.
- **Remedy-Specific Summary According to Mr. Sword:**
 - OU1 IWTP: 10 Extraction wells and pumps are in good operating condition.
 - OU1 Site 16: AS system is in good operating condition.
 - OU2 Site 10: SVE is operating about 87 percent of the time.
 - OU3 Site 7: AS system in good operating condition.
- **Treatment Systems:** The groundwater treatment components of the IWTP have been maintained by MCAS Cherry Point personnel since November 1999 (prior to that time, they were maintained by IT Group, Inc., according to Mr. Sword).
- **Monitoring Data:** Mr. Sword indicated that reports are prepared and submitted quarterly and annually to the Navy and Marine Corps, and annually to the State.
- **Mr. Sword provided the following monitoring data summary for each of the remedies:**
 - **OU1 groundwater extraction wells:** The collected groundwater data indicate that half of the initial groundwater VOC concentrations have been remediated by the system since it has been in operation during the last 1.5 years.
 - **OU1 Site 16 AS/SVE:** The current system is not capturing a lot of VOCs, but there are not a lot of VOCs to capture, according the Mr. Sword. He indicates that the system is protective of Slocum Creek.
 - **OU2 Site 10 SVE:** The system is currently functioning well based on analytical data. He indicated that the VOC and methane data is being evaluated in order to determine which hot spots are contributors of the VOCs.
 - **OU3 Site 7 AS:** Overall, the data indicate high to low trend in concentrations of VOCs with time, and concurrently the oxygen levels show an increase in concentration. He noted that some of the contaminated soils appear to be outside the system's area of influence and they are currently taking steps to deal with this issue (i.e., submitted a proposal to install additional AS wells to increase the system's area of influence).
- **Monitored Natural Attenuation:** This long-term monitoring plan associated with this remedy was not approved at the time of the interview, but has recently been approved and will be implemented in 2002. Mr. Sword indicated that they inspect only those wells that are accessed during sampling activities. If Mr. Sword's team observes that any wells are damaged, they inform Mr. McFarland.

IV. Interview – Mr. Tom Sandy/CH2M HILL

The following excerpts are from an interview with Mr. Tom Sandy on November 15, 2001:

Groundwater Remedies (Includes Pump and Treat, SVE, and Air Sparge)

- In information obtained from Mr. Sandy with respect to the IWTP, the system is currently on-line after a shutdown for approximately 3 months due to a failed PLC. This shutdown resulted in the inability of the system to treat the contaminated groundwater from the extraction wells, because the air stripper is a required treatment for the groundwater.
- Mr. Sandy also noted issues associated with the air stripper component, which has been having problems related to biofouling. He is part of a CH2M HILL project team that will be evaluating the influent waste streams to the air stripper. Currently, the influent is composed of the industrial wastewater and groundwater from the extraction wells. Mr. Sandy indicated that the IWTP was originally designed to remove metals, but the current waste streams contain organics.
- Monitored Natural Attenuation: This long-term monitoring plan associated with this remedy was not approved at the time of the interview, but has recently been approved and will be implemented in 2002. However, with respect to the existing monitoring wells, Mr. McFarland indicated that they are not regularly inspected. Mr. Sword also indicated that they inspect only those wells that are accessed during sampling activities. If Mr. Sword's team observes that any wells are damaged, they inform Mr. McFarland.