EPA/ROD/R04-99/064
1999

EPA Superfund
Record of Decision:

CHERRY POINT MARINE CORPS AIR STATION
EPA ID: NC1170027261
OU 02
HAVELOCK, NC
09/29/1999

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

SEP 29 1999

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

4WD-FFB

Commanding General
MGEN Thomas A. Braaten
Marine Corps Air Station
Cherry Point, North Carolina 28533-0006

SUBJ: Record of Decision - Operable Unit 2
MCAS Cherry Point NPL Site
Cherry Point, North Carolina

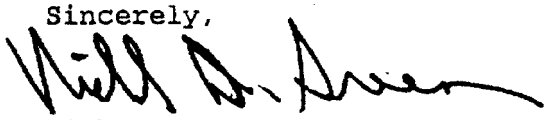
Dear General Braaten:

The U.S. Environmental Protection Agency (EPA) Region 4 has reviewed the above subject decision document and concurs with the selected remedy for the Remedial Action at Operable Unit 2. This remedy is supported by the previously completed Remedial Investigation, Feasibility Study and Baseline Risk Assessment Reports.

The selected remedy consists of: institutional controls to restrict groundwater use, prohibit intrusive activities, and restrict use to industrial activities within the landfill boundary, fencing with signage, in-situ soil vapor extraction technology to treat soil hot spots to be protective of groundwater, monitored natural attenuation of groundwater, and monitoring of groundwater, surface water and sediments. This remedial action is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action and is cost effective.

EPA appreciates the coordination efforts of the Environmental Affairs Department and Atlantic Division, Naval Facilities Engineering Command and the level of effort that was put forth in the documents leading to this decision. EPA looks forward to continuing the exemplary working relationship as we move toward final cleanup of the NPL site.

Sincerely,



Richard D. Green
Director
Waste Management Division

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy
Bill Powers, EAD MCAS Cherry Point
Lance Laughmiller, LANTDIV
Linda Raynor, NCDENR

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Sincerely,

Richard D. Green
Director
Waste Management Division

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy
Bill Powers, EAD MCAS Cherry Point
Lance Laughmiller, LANTDIV
Linda Raynor, NCDENR

bcc: Allison Abernathy, FFRRO/OSWE

Bassett Bozeman 9/27/99 Johnston 9-27-99 Green

NORTH CAROLINA DEPARTMENT OF
ENVIRONMENT AND NATURAL RESOURCES

DIVISION OF WASTE MANAGEMENT

May 24, 1999

Commanding General, MGen. Thomas A. Braaten
Marine Corps Air Station - Cherry Point
Attention: Mr. William Powers
Environmental Affairs Department (L.N.)
Marine Corps Air Station, PSC Code 8006
Cherry Point, NC 28533-0006

Subject: **Record of Decision for Operable Unit 2**
(Document dated March 1999)
MCAS-Cherry Point- North Carolina

Dear General Braaten:

The NC Superfund Section has completed its review of the Record of Decision (ROD) for Operable Unit 2 and concurs with the selected remedy. The remedy selected for groundwater is a combination of natural attenuation and institutional controls, and for soil and remaining landfill waste, the remedy is a combination of soil vapor extraction and institutional controls.

This concurrence is based on the information presented in the ROD (dated March 1999), the Remedial Investigation Report for OU-2 (dated April 1997) and the Feasibility Study Report (dated July 1997). Should the State receive new or additional information that significantly affects this concurrence, it may be modified or withdrawn with appropriate written notice to the Navy, Air Station and EPA Region IV.

Our concurrence with this Record of Decision in no way binds the State to concur in future decisions or commits the State to participate, financially or otherwise, in the cleanup of the site. The State reserves the right to review, comment, and make independent assessments of all future work relating to the site.

If you have any questions regarding this concurrence, or any other matter concerning Operable Unit 2, please call either Ms. Linda F. Raynor at (919) 733-2801, extension 340, or myself at (919) 733-2801, extension 291.

Sincerely,

Grover Nicholson
Federal Remediation Branch
NC Superfund Section

Encl (5)

- Institutional Controls, which include land use restrictions, groundwater/aquifer use restrictions, and site access restrictions as specified and outlined in the attached Land Use Control Implementation Plan (LUCIP).

Statutory Determinations

The selected remedy is protective of human health and the environment complies with federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result In hazardous substances remaining on site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

T. A. BRAATEN
Major General, U.S. Marine Corps
Commanding General
Marine Corps Air Station, Cherry Point

28 AUGUST 1999
Date

Record Of Decision

for

Operable Unit 2

Marine Corps Air Station
Cherry Point, North Carolina

Atlantic Division
Naval Facilities Engineering Command
Contract Number N62472-90-D-1298
Contract Task Order 0239

March 1999

TETRA TEC NUS, INC.

119504/P

RECORD OF DECISION
FOR
OPERABLE UNIT 2

MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Atlantic Division
Environmental Restoration Branch, Code 1823
Naval Facilities Engineering Command
1510 Gilbert Street
Norfolk, Virginia 23511-2699

Submitted by:
Tetra Tech NUS, Inc.
600 Clark Avenue, Suite 3
King of Prussia, Pennsylvania 19406-1433

CONTRACT NUMBER N62472-90-D-1298
CONTRACT TASK ORDER 0239

MARCH 1999

TABLE OF CONTENTS

SECTION **PAGE**

LIST OF ACRONYMS AND ABBREVIATIONS vi

DECLARATION ix

DECISION SUMMARY

1.0 SITE NAME, LOCATION, AND DESCRIPTION 1-1
0.1 SITE 10 - OLD SANITARY LANDFILL 1-7
1.2 SITE 44A - FORMER SLUDGE APPLICATION 1-7
1.3 SITE 46 - POLISHING PONDS NO. 1 AND 2 1-7
1.4 SITE 76 - VEHICLE MAINTENANCE AREA (HOBBY SHOP) 1-7

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES 2-1
2.1 SITE HISTORY 2-1
2.2 PREVIOUS INVESTIGATIONS AND ENFORCEMENT ACTIVITIES 2-1

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION 3-1

4.0 SCOPE AND ROLE OF OPERABLE UNIT 2 4-1

5.0 SITE CHARACTERISTICS 5-1

6.0 NATURE AND EXTENT OF CONTAMINATION 6-1
6.1 SOIL 6-1
6.1.1 Surface Soil 6-1
6.1.2 Subsurface Soil 6-4
6.1.3 Migration of Soil Contaminants to Groundwater 6-9
6.2 GROUNDWATER AND SURFACE WATER 6-9
6.2.1 Surficial Aquifer 6-9
6.2.2 Yorktown Aquifer 6-23
6.2.3 Surface Water 6-25
6.3 SEDIMENT AND SEEPS 6-29
6.3.1 Sediment 6-29
6.3.2 Leachate Seeps 6-29
6.3.3 Polishing Pond Sediment 6-35

7.0 CONTAMINANT FATE AND TRANSPORT 7-1

8.0 SUMMARY OF SITE RISKS 8-1
8.1 BASELINE HUMAN HEALTH RISK ASSESSMENT 8-1
8.1.1 Chemicals of Potential Concern 8-1
8.1.2 Exposure Assessment 8-2
8.1.3 Toxicity Assessment 8-6
8.1.4 Risk Characterization 8-14
8.1.5 Risk Uncertainty 8-25
8.1.6 Human Health Risk Summary 8-26
8.2 ECOLOGICAL RISK ASSESSMENT 8-27

TABLE OF CONTENTS (Continued)

SECTION **PAGE**

9.0 DESCRIPTION OF ALTERNATIVES 9-1
9.1 GROUNDWATER ALTERNATIVES 9-2
9.1.1 Groundwater Alternative I - No Action 9-2
9.1.2 Groundwater Alternative 2 - Natural Attenuation and Institutional Controls 9-2
9.1.3 Groundwater Alternative 3 - Groundwater Extraction; Treatment and Discharge to Slocum Creek or Pretreatment and Discharge to Sewage Treatment Plant(STP); Institutional Controls 9-4
9.1.4 Groundwater Alternative 4 - Air Sparging/Soil Vapor Extraction; Institutional Controls 9-5
9.2 SOIL ALTERNATIVES 9-5
9.2.1 Soil Alternative 1 - No Action 9-5
9.2.2 Soil Alternative 2 - Institutional Controls 9-6
9.2.3 Soil Alternative 3 - Soil Vapor Extraction; Institutional Controls 9-6
9.2.4 Soil Alternative 4 - Excavation, Consolidation, and Containment; Institutional Controls 9-7
9.2.5 Soil Alternative 5 - Excavation, Treatment and Onsite Disposal; Institutional Controls 9-7
9.2.6 Soil Alternative 6 - Excavation and Offsite Disposal; Institutional Controls 9-8
9.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) 9-8

10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES 10-1
10.1 THRESHOLD CRITERIA 10-3
10.1.1 Overall Protection of Human Health and the Environment 10-3
10.1.2 Compliance with ARARs 10-10
10.2 PRIMARY BALANCING CRITERIA 10-11
10.2.1 Long-Term Effectiveness and Permanence 10-11
10.2.2 Reduction of Toxicity, Mobility, or Volume Through Treatment 10-12
10.2.3 Short-Term Effectiveness 10-12
10.2.4 Implementability 10-13
10.2.5 Cost 10-13
10.3 MODIFYING CRITERIA 10-15
10.3.1 USEPA/State Acceptance 10-15
10.3.2 Community Acceptance 10-15

11.0 SELECTED REMEDY 11-1
11.1 REMEDY SELECTION 11-1
11.2 ESTIMATED COSTS 11-5

12.0 STATUTORY DETERMINATIONS 12-1
12.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT 12-1
12.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS 12-1
12.2.1 Contaminant-Specific ARARs 12-2
12.2.2 Location-Specific ARARs 12-2
12.2.3 Action-Specific ARARs 12-2
12.2.4 Other Guidance Considered 12-2
12.3 COST-EFFECTIVENESS 12-2

TABLE OF CONTENTS (Continued)

SECTION **PAGE**

12.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT PRACTICABLE 12-2
12.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT 12-3

13.0 DOCUMENTATION OF SIGNIFICANT CHANGES 13-1

14.0 RESPONSIVENESS SUMMARY 14-1
14.1 BACKGROUND ON COMMUNITY INVOLVEMENT 14-1
14.2 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND NAVY RESPONSES 14-1

REFERENCES R-1

APPENDICES

A GLOSSARY
B LAND USE CONTROL IMPLEMENTATION PLAN (LUCIP)
C TRANSCRIPT OF PUBLIC MEETING

TABLES

NUMBER		PAGE
6-1	Summary of Analytical Results - Surface Soil and Dry Leachate Seep Soil (0 to 2 Feet)	6-2
6-2	Subsurface Soil Analytical Results (>2 Feet)	6-5
6-3	Remedial Goal Options for Soil - Protection of Groundwater	6-10
6-4	Summary of Analytical Results - Surficial Aquifer (1994 and 1996)	6-17
6-5	Summary of Analytical Results - Yorktown Aquifer (1994)	6-24
6-6	Summary of Analytical Results - Turkey Gut Surface Water (1994)	6-26
6-7	Summary of Analytical Results - Slocum Creek Surface Water (1994)	6-28
6-8	Summary of Analytical Results - Turkey Gut Sediment	6-30
6-9	Summary of Analytical Results - Slocum Creek Sediment	6-32
6-10	Summary of Analytical Results - Leachate Seep Water (1995)	6-33
6-11	Summary of Analytical Results - Polishing Pond Sediment/Soil	6-36
8-1	Media-Specific Chemicals of Potential Concern (COPCs)	8-3
8-2	Exposure Concentrations for Chemicals of Potential Concern (COPCs)	8-7
8-3	Exposure Assumptions - Current Land Use Receptors	8-10
8-4	Exposure Assumptions - Future Land Use Receptors	8-12
8-5	Dose-Response Parameters for Chemicals of Potential Concern	8-15
8-6	Summary of Cumulative Risks	8-24
8-7	Remedial Goal Options for Groundwater - Future Resident (6-Year)	8-28
8-8	Remedial Goal Options for Groundwater - Future Resident (30-Year)	8-29
8-9	Remedial Goal Options for Soil - Future Resident (6-Year)	8-30
8-10	Remedial Goal Options for Soil - Future Resident (30-Year)	8-31
8-11	Remedial Goal Options for Soil - Future Full-Time Employee	8-32
8-12	Groundwater COCs that Exceed MCLs or State Groundwater Standards	8-33
8-13	Remedial Options for Soil - Protection of Groundwater	8-34
9-1	Remedial Action Objectives	9-3
9-2	Potential Contaminant-Specific ARARs	9-10
9-3	Potential Location-Specific ARARs	9-11
9-4	Potential Action-Specific ARARs	9-12
10-1	Glossary of Evaluation Criteria	10-2
10-2	Summary of Evaluation of Groundwater Alternatives	10-4
10-3	Summary of Evaluation of Soil Alternatives	10-6
10-4	Cost Comparison of Alternatives	10-14
11-1	Groundwater Performance Standards	11-3
11-2	Soil Performance Standards	11-4

FIGURES

NUMBER		PAGE
1-1	Location Map	1-2
1-2	General Air Station Map	1-3
1-3	Operable Unit 2 - General Site Location Map	1-5
6-1	Organic Constituents in Soil Exceeding RGOs	6-13
6-2	Inorganic Constituents in Soil Exceeding RGOs	6-15
6-3	Contaminants in Surficial Aquifer Exceeding State Standards	6-21
8-1	Conceptual Site Model	8-5

LIST OF ACRONYMS AND ABBREVIATIONS

A	Applicable
ARAR	Applicable or Relevant and Appropriate Requirement
B&R Environmental	Brown and Root Environmental
BEHP	Bis(2-ethylhexyl)phthalate
BGS	Below Ground Surface
BMP	Base Master Plan
BTEX	Benzene, Toluene, Ethylbenzene, Xyiene
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CDI	Chronic Daily Intake
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
CNS	Central Nervous System
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CSF	Cancer Slope Factor
CY	Cubic Yards
DCE	Dichloroethene
DERA	Defense Environmental Restoration Account
DL	Detection Limit
DON	Department of the Navy
ER-M	Effects Range-Medium
FS	Feasibility Study
GI	Gastrointestinal
GIS	Geographic Information System
HI	Hazard Index
HNUS	Halliburton NUS Environmental Corporation
HpCDD	Heptachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzo-p-furan
HQ	Hazard Quotient
HRS	Hazard Ranking System
HSWA	Hazardous and Solid Waste Amendments
IAS	Initial Assessment Study
ILCR	Incremental Lifetime Cancer Risk

IRP	Installation Restoration Program
kg	Kilogram
L	Liter
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Plan
MCAS	Marine Corps Air Station
MCL	Maximum Contaminant Level
mg	Milligram
MSL	Mean Sea Level
NA	Not Applicable or Not Analyzed
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environmental and Natural Resources
NCP	National Contingency Plan
ND	Not Detected
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NS	No Standard
O&M	Operation and Maintenance
OCDD	Octachlorodibenzo-p-dioxin
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocabon
PCB	Polychlorinated Biphenyi
PCE	Tetrachloroethene
POL	Petroleum, Oil, and Lubricants
PRAP	Proposed Remedial Action Plan
R&A	Relevant and Appropriate
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RFI	RCRA Facility Investigation
RFA	RCRA Facility Assessment
RfD	Reference Dose
RGO	Remedial Goal Option
RI	Remedial Investigation

ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SMP	Site Management plan
STP	Sewage Treatment Plant
SVE	Soil Vapor Extraction
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TBC	To Be Considered
TCA	1,1,1-Trichloroethane
TCDD	Tetrachlorodibenzo-p-dioxin
TCE	Trichloroethene
TCL	Target Compound List
TDM	Technical Direction Memorandum
TEF	Toxicity Equivalence Factor
TRC	Technical Review Committee
TSDF	Treatment, Storage, and Disposal Facility
UCL	Upper Confidence Level
UF	Uncertainty Factor
ig	Microgram
USC	United States Code
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
USMC	United States Marine Corps
VOC	Volatile Organic Compound

DECLARATION

Site Name and Location

Operable Unit 2 (Site 10 - Old Sanitary Landfill, Site 44A - Former Sludge Application Area, Site 46 - Polishing Ponds No. 1 and No. 2, and Site 76 - Vehicle Maintenance Area [Hobby Shop])
Marine Corp Air Station
Cherry Point, North Carolina

Statement of Basis and Purpose

This decision document presents the selected remedy for Operable Unit 2 (OU2) at the Marine Corp Air Station (MCAS), Cherry Point, North Carolina. The remedy was chosen in accordance with the federal Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for OU2. Although this remedy is considered the final Record of Decision (ROD) under CERCLA, under the federal Resource Conservation and Recovery Act (RCRA) this remedy is considered an Interim Measure. Currently, the North Carolina Hazardous Waste Section, which administers the RCRA program, has no regulations or guidance in place to allow for any cleanup levels in lieu of residential levels.

The Department of the Navy (DON) and the Marine Corps have obtained concurrence from the State of North Carolina Department of Environment and Natural Resources (NCDENR) and the United States Environmental Protection Agency (USEPA) Region IV on the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this operable unit, if not addressed by implementing the response action selected in this ROD, may present a potential threat to public health, welfare, or the environment.

Description of Selected Remedy

Operable Unit 2 is one of 15 operable units at MCAS Cherry Point. Separate investigations and assessments are being conducted for these other sites at MCAS Cherry Point in accordance with. CERCLA. Therefore, this ROD applies only to OU2. This remedy calls for the design and implementation

of response measures that will protect human health and the environment. This remedy addresses sources of contamination as well as soil and groundwater contamination, which are the principal threats posed by the site.

The selected remedy for groundwater is natural attenuation and institutional controls. The selected remedy for soil and waste is soil vapor extraction and institutional controls.

The major components of the site-wide remedy are:

- Monitored natural attenuation will be the selected remedy for the groundwater contamination. The goals of this remediation are twofold: first to remediate the current levels of contamination in the groundwater, and second to contain any future releases from the debris remaining in the landfill.

- In-situ soil treatment by soil vapor extraction at known major soil "hot spots" (secondary source areas) that are contaminated with organics and at any such areas identified during the Remedial Design. This includes monitoring of air emissions and soil to evaluate the effectiveness of treatment.

  Long-term monitoring - MCAS Cherry Point shall conduct long-term monitoring to evaluate the effectiveness of the natural attenuation process. Long-term monitoring will also serve to insure that there are no further releases from the landfill debris still buried at the site, or other contaminated media that will cause unacceptable risks to human health and the environment. A monitoring plan, which shall be prepared and carried out in accordance with appropriate federal and State regulations and guidance and with the concurrence of USEPA and NCDENR, will be created to detail the frequency, media type, analysis, and locations of the long-term monitoring samples. The plan shall require, at a minimum, collection and analysis of groundwater samples and of surface water and sediment samples from Slocum Creek and Turkey Gut. Based on the results of the monitoring, USEPA or NCDENR may require additional sampling and analysis, and/or remedial actions. Changes to the monitoring plan (including changes to sample frequency, media samples, sample locations, analyses performed, and installation or abandonment of monitoring wells) may be required by USEPA or NCDENR, or proposed by MCAS Cherry Point, based on review of results from the regular monitoring program or other circumstances. Changes to the monitoring plan shall be submitted to USEPA and NCDENR for concurrence as non-significant changes to the ROD. Monitoring may be discontinued upon demonstration that continued attainment of remedial goals has been achieved. Discontinuation of the monitoring program shall be submitted for USEPA and NCDENR concurrence as a non-significant change to the ROD.

- Institutional Controls, which Include land use restrictions, groundwater/aquifer use restrictions, and site access restrictions as specified and outlined In the attached Land Use Control Implementation Plan (LUCIP).

Statutory Determinations

The selected remedy is protective of human health and the environment, compiles with federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satislies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element

Because this remedy will result In hazardous substances remaining on site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

T. A. BRAATEN
Major General, U.S. Marine Corps
Commanding General
Marine Corps Air Station, Cherry Point

28 AUGUST 1999

Date

DECISION SUMMARY

1.0 SITE NAME, LOCATION, AND DESCRIPTION

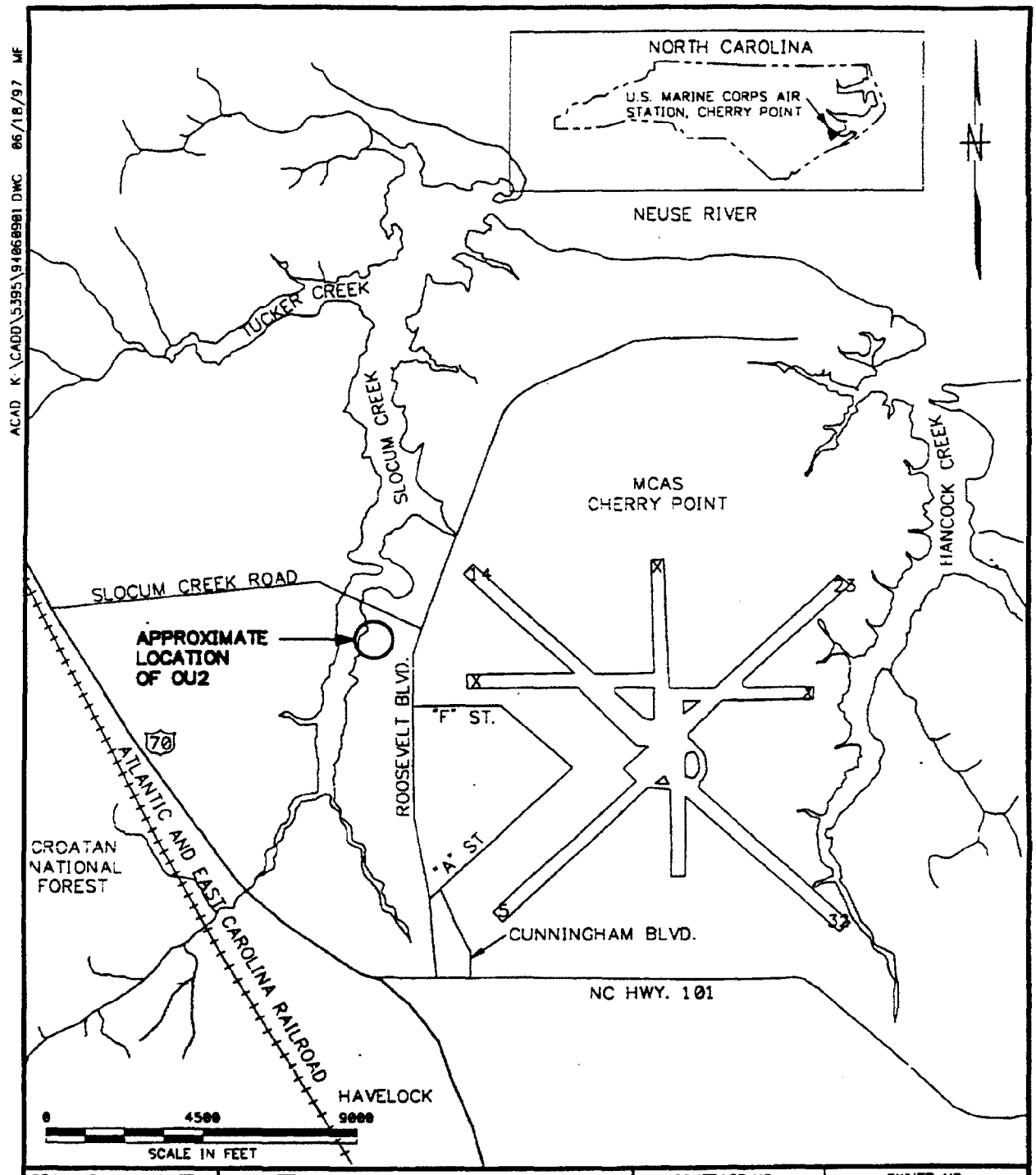
Marine Corps Air Station (MCAS) Cherry Point is part of a military installation located in southeastern Craven County, North Carolina just north of the town of Havelock. The Air Station covers approximately 11,485 acres. Its boundaries are the Neuse River to the north, Hancock Creek to the east, North Carolina Highway 101 to the south, and an irregular boundary line approximately three-quarters of a mile west of Slocum Creek. The entire facility is situated on a peninsula north of Core and Bogue Sounds and south of the Neuse River. The general location of the Air Station is shown on Figure 1-1.

The study area, Operable Unit 2 (OU2), is one of 15 operable units located within MCAS Cherry Point. An “operable unit,” as defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), is a discrete action that comprises an incremental step toward comprehensively addressing site problems. With respect to MCAS Cherry Point, operable units were developed to combine one or more individual sites where Installation Restoration Program (IRP) activities are or will be implemented.

Operable Unit 2 is located in the west-central portion of the Air Station, as shown on Figure 1-2. It is bounded by the MCAS Cherry Point Sewage Treatment Plant (STP) to the north, Roosevelt Boulevard to the east, a residential area to the south, and Slocum Creek to the west (Figure 1-3). Operable Unit 2, the subject of this ROD, consists of four sites:

- Site 10 - Old Sanitary Landfill (primary component of OU2)
- Site 44A - Former Sludge Application Area
- Site 46 - Polishing Ponds No. 1 and No. 2
- Site 76 - Vehicle Maintenance Area (Hobby Shop)

These sites have been grouped into one operable unit because of their proximity to each other (i.e., Site 44A - Former Sludge Application Area overlies portions of the Site 10 landfill and Site 46 - Polishing Ponds No. 1 and 2 and Site 76 - Vehicle Maintenance Area (Hobby Shop) are located adjacent to the landfill). In addition, Site 44A and Site 46 both contain the same types of suggested contamination derived from sewage treatment.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NORTH CAROLINA
U.S. MARINE CORPS AIR STATION, CHERRY POINT
N
NEUSE RIVER
TUCKER CREEK
SLOCUM CREEK
MCAS
CHERRY POINT
HANCOCK CREEK
SLOCUM CREEK ROAD
APPROXIMATE LOCATION OF OU2
ROOSEVELT BLVD.
"F" ST.
"A" ST
70
ATLANTIC AND EAST CAROLINA RAILROAD
CROATAN NATIONAL FOREST
CUNNINGHAM BLVD.
NC HWY. 101
HAVELOCK
0
4500
9000
SCALE IN FEET
DRAWN BY HJP DATE 4/9/97
Brown & Root Environmental
CONTRACT NO. 5395
OWNER NO. 0211
CHECKED BY DATE
APPROVED BY DATE
COST/SCHED-AREA
APPROVED BY DATE
SCALE AS NOTED
LOCATION MAP
MCAS CHERRY POINT, NORTH CAROLINA
DRAWING NO. FIGURE 1-1
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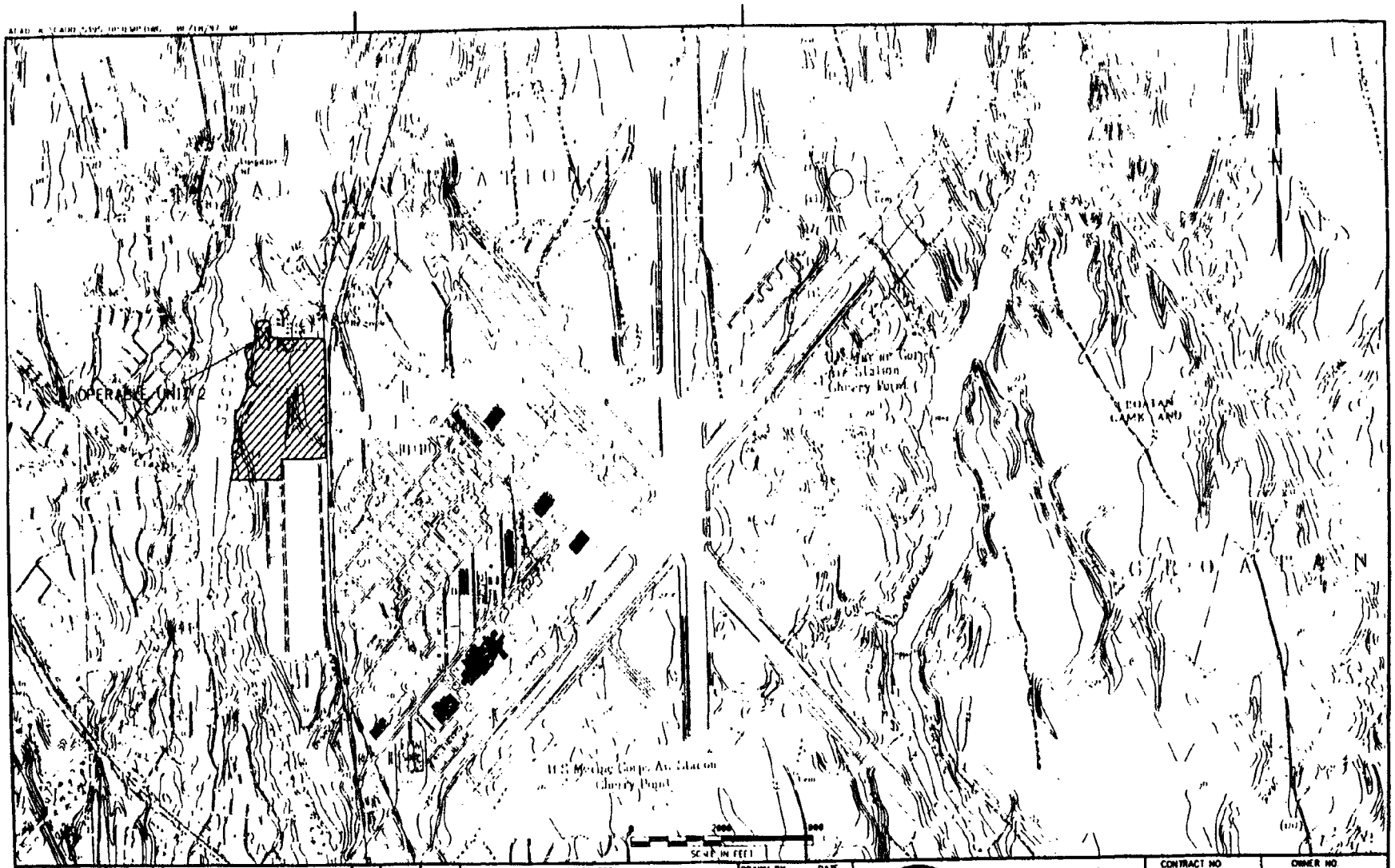


NO	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

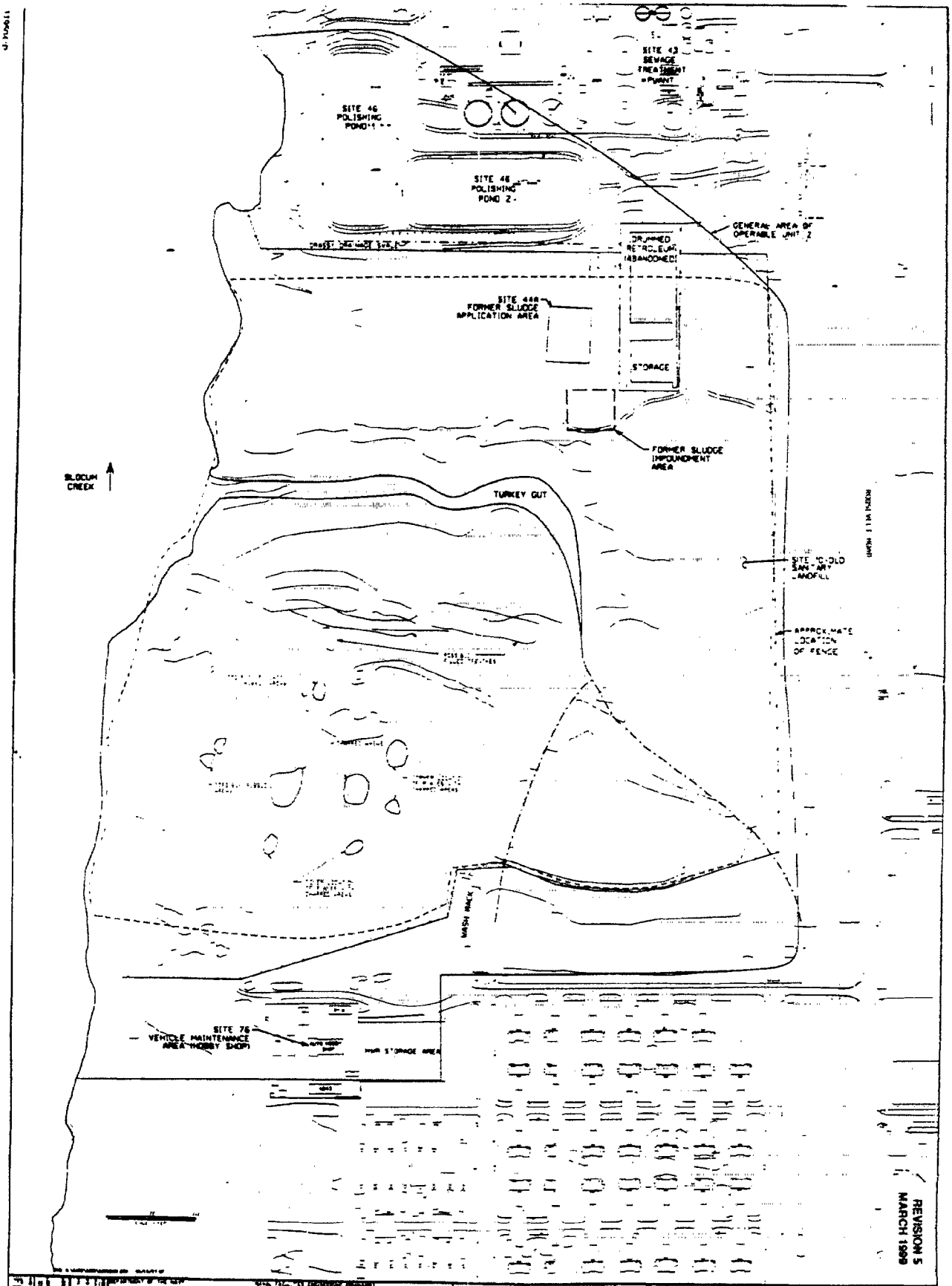
DRAWN BY HJP 4/16/9/ DATE
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

Brown & Root Environmental

OPERABLE UNIT 2
GENERAL AIR STATION MAP
MCAS CHERRY POINT, NORTH CAROLINA

CONTRACT NO 5395 | OWNER NO 0211
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO FIGURE 1-2 | REV 0

FIGIN CADD NO. SOUTH_04.DGN - REV 0 - 02/11/97


SITE 43
SEWAGE
TREATMENT
PLANT
SITE 46
POLISHING
POND 1
SITE 46
POLISHING
POND 2
GENERAL AREA OF
OPERABLE UNIT 2
DRUMMED
PETROLEUM
(ABANDONED)
SITE 44A
FORMER SLUDGE
APPLICATION AREA
STORAGE
FORMER SLUDGE
IMPOUNDMENT
AREA
SLOCUM
CREEK
TURKEY GUT
SITE 10-OLD
SANITARY
LANDFILL
APPROXIMATE
LOCATION
OF FENCE
MARSH BRANCH
SITE 76
VEHICLE MAINTENANCE
AREA (HOBBY SHOP)
MAP STORAGE AREA
REVISION 5
MARCH 1999
ATLANTIC DIVISION
OU2
GENERAL SITE LOCATION MAP
FIGURE 1-3
REVISIONS

1.1 SITE 10 - OLD SANITARY LANDFILL

Site 10 is located west of Roosevelt Boulevard and south of Site 43 - Sewage Treatment Plant, on the east side of Slocum Creek. The site consists of a sanitary landfill approximately 40 acres in size. Former sludge impoundments that were closed in the mid-1980s are also located at this site. The sludge impoundment area is included as a hazardous waste management unit in the Air Station's RCRA Part B permit. A fenced, lined area formerly used for storage of drums of petroleum products is also located at Site 10. The area is no longer used for drum storage.

1.2 SITE 44A - FORMER SLUDGE APPLICATION

Site 44 consists of one of two areas in which sludge from the sewage treatment plant was applied. Liquid sludge was removed from the digesters for land application every 30 days. Sludge was applied at Sites 10 and 21. Site 44A is located on Site 10 (OU2), and Site 44B is located on Site 21 (OU13). Site 44B is not discussed further, as it is not an OU2 site. The sludge contained organic material and other constituents that would not be digested during the sewage treatment process. Site 44A is also included as a hazardous waste management unit in the Air Station's RCRA Part B permit.

1.3 SITE 46 - POLISHING PONDS NO. 1 AND 2

This site consists of two inactive unlined ponds that served as aeration basins for wastewater from the Sewage Treatment Plant (STP). The ponds are approximately 12 feet deep. The STP was recently upgraded and does not require the use of the ponds for aeration. The ponds may be used for future stormwater management. Concurrence will be obtained from the USEPA and NCDENR prior to any changes to the current use of these inactive ponds. Site 46 is also included in the Air Station's RCRA Part B permit.

1.4 SITE 76 - VEHICLE MAINTENANCE AREA (HOBBY SHOP)

Site 76 consists of a building and parking lot where personal vehicles are repaired. General auto maintenance and auto body repair are typical work activities conducted at this facility.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Air Station was commissioned in 1942 to maintain and support facilities, services, and materiel of a Marine Aircraft Wing and other units as designated by the Commandant of the Marine Corps.

The following subsections describe the history (i.e., the past land usages and waste disposal practices) of Sites 10, 44A, 46, and 76 and summarize the previous site investigations/enforcement activities.

2.1 SITE HISTORY

Site 10, the Old Sanitary Landfill, served as the primary disposal site at the Air Station from 1955 until the early to mid-1980s. Contaminated material and petroleum, oil, and lubricants (POLs) were landspread, burned, stored in unlined pits, and buried at the landfill. The southern portion of Site 10 was used for firetraining exercises. Former sludge impoundments were located at the Site 10 landfill. These impoundments were closed in the mid-1980s and were used for disposal of metal filings, plating sludges, paints, organic solvents, oil and grease, and miscellaneous chemicals. Closure of the impoundments consisted of sludge excavation, backfilling of the excavations, and capping. The former petroleum storage area is currently inactive and no longer used to store drums of petroleum products.

Site 44A was used for landspreading of digested sludge from the sewage treatment plant. Sludge removed between September and November 1987 was applied at Sites 44A and 44B. Site 44B is part of another operable unit (OU13).

The Site 46 ponds, which are unlined, were used for aeration of sewage treatment plant wastewater. They are no longer in use. A Closure Plan was submitted to the state for this site in December 1988. USEPA Region IV is amenable to waiving the closure requirements and allowing the ponds to be addressed under the NCDENR solid waste management unit (SWMU) authority. Concurrence will be obtained from USEPA and NCDENR prior to any change in use of these ponds.

Site 76 is currently used for maintenance of personal vehicles by Air Station personnel. It is the only site at OU2 that is active.

2.2 PREVIOUS INVESTIGATIONS AND ENFORCEMENT ACTIVITIES

The OU2 sites (10, 44A, 46, and 76) were identified in the Initial Assessment of Sites (IAS) prepared by a Navy contractor. These sites were also included in a multi-task RCRA Section 3008(h) Administrative

Order on Consent signed by the Navy and the USEPA in December 1989. MCAS Cherry Point was placed on the National Priorities List (NPL), which was established under CERCLA, in December 1994. As a result, IR investigations are being conducted to meet the requirements of both CERCLA and RCRA.

The nature and extent of contamination at OU2 has been under investigation since 1981. The work was conducted using a phased approach that was based on the availability of funding and the prioritization of sites in terms of potential environmental impacts. The work was conducted under several environmental programs according to regulatory requirements in effect at the time. Information pertaining to these investigations is contained in the following documents:

- Report on Hydrogeology, Contaminants Detected, and Corrective Action/Recommendations for the Former Sludge Impoundments, January 1987 (NUS Corporation): Provides an evaluation of data collected during closure of these impoundments.
- Remedial Investigation Interim Report, October 1988 (NUS Corporation): Provides the results of groundwater, surface water, sediment, and leachate seep sampling and analysis conducted at Site 10 under the IR Program.
- Water Resources Investigations Report 89-615, 1990 (U.S. Geological Survey [USGS]): Provides the results of groundwater sampling and analysis conducted by the USGS.
- Water Resources Investigations Report 89-4200, 1990 (USGS): Provides additional results of groundwater sampling and analysis conducted by the USGS.
- RCRA Facility Investigations Report (RFI) - Units 5, 10, 16, and 17, May 1991 (NUS Corporation): Provides results of additional investigations conducted at Site 10 following signing of the RCRA Consent Order, including soil, surface water, sediment, and groundwater sampling and analysis.
- Evaluation and Recommendations - Unit 10 Former Sludge Impoundment Area, December 1991 (Halliburton NUS Corporation): Provides the results of soil sampling conducted before and after closure of the former sludge impoundment area at Site 10.
- RCRA Facility Investigation and Corrective Measures Study Final Technical Direction Memorandum (TDM) for Units 10 and 16, November 1992 (Halliburton NUS Corporation): Provides the results of additional soil sampling conducted at Site 10 to address data gaps identified upon completion of the RFI.

- RCRA Facilities Investigation (RFI) - 21 Units, June 1993 (Halliburton NUS Corporation): Provides the results of soil sampling and analysis at Site 44A (formerly Site 45) conducted following signing of the RCRA Consent Order.

- Phase II Technical Direction Memorandum, June 1994 (Halliburton NUS Corporation): Provides the results of additional soil sampling conducted to address data gaps identified upon completion of the TDM.

- Remedial Investigation (RI) Report, April 1997 (Brown & Root Environmental): Presents the results of soil, groundwater, surface water, and sediment sampling conducted in 1994; soil and leachate seep data collected in 1995; and surface water, soil, and groundwater data collected in 1996. Summarizes previous data collected from past investigations.

The first remediation activity at OU2 was the closure of the former sludge impoundments at Site 10 in the mid-I980s. The soil vapor extraction system was installed in the major “hot spots" in 1997.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Throughout the site's-history, the community has been an active participant in activities in accordance with CERCLA Sections 113(k)(2)(B)(i-v) and 117. In 1988, a Technical Review Committee (TRC) was formed to review recommendations for and monitor progress of the investigation and remediation efforts at MCAS Cherry Point. The TRC was made up of representatives of the Navy, USEPA, U.S. Fish and Wildlife Service, U.S. Geological Survey, U.S. Forest Service, National Oceanographic and Atmospheric Administration, NCDENR, the Craven County Fire Marshal, and the U.S. Marine Corps. In June 1995, a Restoration Advisory Board (RAB) was established as a forum for communications between the community and decision-makers. The RAS absorbed the TRC and added members from the community. The RAS members work together to monitor progress of the investigations and to review remediation activities and recommendations at MCAS Cherry Point. RAB meetings are held regularly.

The RI/FS and PRAP documents for Operable Unit 2 at MCAS Cherry Point were released to the public in July 1997. These documents were made available to the public in both the Administrative Record and the information repositories maintained at the Havelock Public Library and MCAS Cherry Point Library. The notice of the availability of these two documents was published in the Havelock News on July 16, 1997; the Windsock on July 17, 1997; the Carteret County News-Times on July 20, 1997; and the Sun Journal on July 21, 1997. A public comment period was held from July 23, 1997 to August 22, 1997. In addition, a public meeting was held on July 29, 1997. At this meeting, representatives from the Navy, MCAS Cherry Point, USEPA, and NCDENR answered questions about problems at the site and the remedial alternatives under consideration. A response to the comments received during the public comment period is included in the Responsiveness Summary, which is part of this Record of Decision (Section 14). This decision document presents the selected remedial action for OU2, MCAS Cherry Point, North Carolina, chosen in accordance with CERCLA, as amended by SARA, and the National Contingency Plan. The decision for OU2 is based on the Administrative Record.

4.0 SCOPE AND ROLE OF OPERABLE UNIT 2

Fifteen operable units-have been defined at MCAS Cherry Point based on contaminant similarity, source similarity, and/or physical proximity of the contaminated sites. The sites that comprise OU2 were combined because of physical proximity to the landfill (Site 10), similar contaminants associated with these sites, and the contaminated groundwater that is beneath or near all of the sites. One operable unit, OU12, has been deferred to the State of North Carolina's underground storage tank program. The remaining operable units at the Air Station are being investigated as part of a comprehensive Air Station investigation. The timing and coordination of these investigations have been addressed in the MCAS Cherry Point Site Management Plan (SMP).

This selected remedy is the first and final remedial action for OU2. The function of this remedy is to reduce risks to human health and the environment associated with exposure to buried wastes and contaminated groundwater and soil.

The potential exposure to contaminated soil and groundwater under a future residential exposure scenario at OU2 constitutes the principal risks to human health. Buried wastes and areas of contaminated soil ("hot spots") are also sources of groundwater contamination. The selected remedy identified in this Decision Summary for contaminated groundwater and soil/waste materials at OU2 will eliminate or minimize future risks to human health and the environment.

The major components of the remedy are:

- Monitored natural attenuation of groundwater.
- An active soil treatment system that includes soil vapor extraction at major "hot spots" (secondary source areas.
- Institutional controls.
- Groundwater, surface water, and sediment monitoring program to ensure that natural attenuation will be effective and to confirm that contaminants are not migrating into the environment. The monitoring program will continue until a five-year review concludes that the alternative has achieved continued attainment of the performance standards (see Table 11-1) and remains protective of human health and the environment.

This remedy addresses the first and final cleanup action planned for OU2, where surficial aquifer groundwater contains elevated concentrations of contaminants. Although this water-bearing zone is affected, the contamination is not affecting the public drinking water supply. The purpose of this proposed action is to prevent current and future potential exposure to buried wastes and contaminated soil and groundwater and to reduce the migration of. contaminants.

This is the only ROD contemplated for OU2. Separate investigations and assessments are being conducted for the other sites at MCAS Cherry Point in accordance with GERCLA. Therefore, this ROD applies only to OU2.

5.0 SITE CHARACTERISTICS

This section of the ROD presents an overview of the physical characteristics of OU2.

MCAS Cherry Point is located in the Coastal Plain of North Carolina. Ground surface elevations at OU2 range from 22 to 30 feet at the highest points of Sites 46 and 10, respectively, to approximately 1.5 feet at the banks of Slocum Creek.

Operable Unit 2 is bounded on the west by Slocum Creek, which flows northward past the site. Turkey Gut is a perennial stream that flows through the central portion of Site 10 into Slocum Creek. Turkey Gut separates the northern and southern areas of Site 10. Turkey Gut is a freshwater body, whereas Slocum Creek is a tidal saltwater body. The soils at the site are generally poorly drained and acidic. They are also subject to ponding and seasonal high water tables. Low-lying areas along the streams are subject to flooding.

The knowledge of the stratigraphy at OU2 is derived from published U.S. Geological Survey (USGS) documents and the onsite boring logs. The surficial material at OU2 consists of both fill (sand, silt, and clay mixed with refuse consisting of domestic trash, wood, plastic, rubber, glass, asphalt, concrete, and metal fragments) and natural materials. As much as 26 feet of fill material was noted at Site 10.

Generally, the fill material is thickest at the center of the landfill area and thins gradually to the west and abruptly to the east. Natural material at OU2 consists of orange, yellow, and brown silty sand, with trace to some amounts of clay present in localized areas. The natural material, which contains the surficial aquifer, ranges from at least 25 feet thick at Site 46 to a maximum of 52 feet in the southwest portion of OU2.

The surficial aquifer is the uppermost aquifer of the study area and is exposed at the ground surface and in streambeds throughout the Air Station. This aquifer consists of unconsolidated and interfingering beds of fine sand, sift, clay, shell, and peat beds, as well as scattered deposits of coarser-grained material believed to represent relic beach ridges and alluvium. Groundwater beneath the site was encountered in the surficial aquifer at approximately 7 to 22 feet below ground surface (BGS), and water level elevations ranged from approximately 2.6 to 22 feet mean sea level (MSL) in April 1996.

The groundwater in the surficial aquifer flows toward and discharges into either Slocum Creek or Turkey Gut. Polishing Ponds No. 1 and No. 2 (Site 46) are unlined and act as a recharge zone for the surficial aquifer. There are two distinct areas of water table mounding. A large mounding effect at the southeast

corner of OU2 is due to a topographic high. A small mounding effect in the central area is observed in wells that are located near trenches that act as recharge zones.

Underlying the surficial aquifer is the Yorktown confining unit. It consists of an olive green to grayish green, dense, fine sand with varying amounts of shell fragments, clay, and silt. Six borings were extended through this confining unit to install monitoring wells in the Yorktown aquifer. The confining unit has an average thickness of 19 feet, as measured in these six locations. The Yorktown confining layer is continuous throughout OU2.

The Yorktown aquifer is described as a gray silty sand with varying amounts of shell fragments. The groundwater within the Yorktown Aquifer beneath OU2 flows westward and discharges into Slocum Creek. The potentiometric surface (April 1996) of the Yorktown aquifer ranges from approximately 6 to 9.5 feet MSL. Generally, the vertical hydraulic gradients between the surficial and Yorktown aquifers are upward in areas near Slocum Creek and downward in the central and eastern portion of the site.

A dark green, clayey silt and clayey sand was encountered in six of the Lower Yorktown wells at depths ranging from 69 to 100 feet. These materials signify the presence of the underlying Pungo River confining unit. The thickness of this confining unit was not determined because the unit was not penetrated during the drilling activities.

Potable water used at the Air Station and in the adjacent town of Havelock comes from the Castle Hayne aquifers. This unit lies at depths of approximately 195 feet or more below ground surface, below the Pungo River aquifer and the Castle Hayne confining unit. All groundwaters at the Air Station are classified as GA waters by the state of North Carolina. Such groundwater is considered to be an existing or potential source of drinking water.

The Air Station has an active fish and wildlife management program designed to protect all native wildlife species and their habitat, make fish and wildlife resources available on a continuing basis, and enhance fish and wildlife resources. Numerous game and nongame species exist at the Air Station. In addition, the Air Station has management programs for endangered and threatened species known to exist at or migrate through the area. These include the bald eagle, American alligator, red-cockaded woodpecker, and loggerhead turtle. Slocum Creek and its tributaries are designated as a critical environmental area that is considered to be essential to the conservation and management of rare species (both state and Federal).

6.0 NATURE AND EXTENT OF CONTAMINATION

Soil, groundwater, surface water, sediment and leachate seep samples were collected and analyzed for a variety of parameters, in order to determine the nature and extent of contamination.

6.1 SOIL

6.1.1 Surface Soil

Until 1995, five soil samples had been collected at this site from depths of less than 2 feet. Three of these samples were analyzed for target compound list (TCL) volatile and semivolatile organics and target analyte list (TAL) metals. Two of the samples were only analyzed for RCRA List 2 metals. In 1995, thirteen additional surface soil and leachate seep samples were collected and analyzed for the full TCL/TAL, including cyanide. In 1996, two surface samples were collected and analyzed for the full TCL/TAL including cyanide, and two surface soil samples were collected and analyzed for dioxins. Table 6-1 summarizes the surface soil sampling results.

Only a few volatile organic compounds were detected. These include single detections of 1,2-dichloroethene (20 micrograms per kilogram [µg/kg]), methylene chloride (12 µg/kg), and chloroform (9 µg/kg), the first two of which were found at the same location. Xylenes were detected in seven samples at concentrations of 1 to 11 µg/kg, and toluene was found in three samples at concentrations of 11 to 42 µg/kg.

One surface soil sample contained several polynuclear aromatic hydrocarbons (PAHs) at concentrations ranging from 140 µg/kg for indeno(1,2,3-cd)pyrene to 360 µg/kg for pyrene. This sample also contained the highest concentrations of the DDT isomers (33 to 43 µg/kg). Several other pesticides were also detected in surface soils, including chlordanes (1.9 to 29 µg/kg), dieldrin (3.8 to 20 µg/kg), endosulfan 1 (1.8 to 7.6 µg/kg), endrin aldehyde (3.0 to 27 µg/kg), and heptachlor (2 µg/kg). The maximum concentrations of pesticides were found in various samples throughout the site. Polychlorinated biphenyls (PCBs) were detected in only three surface soil samples at concentrations ranging from 28 µg/kg (Aroclor-1254) to 630 µg/kg (Aroclor-1260).

Dioxins were detected in two surface soil samples. The congeners detected include octachlorodibenzo-p-dioxin (OCDD) and total heptachlorodibenzo-p-dioxin (HpCDD). These are the least toxic of the dioxins. Dioxins are evaluated using Toxicity Equivalence Factors (TEFs) relative to the toxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). TCDD equivalent concentrations ranged from 0.0001 to 0.001 µg/kg.

TABLE 6-1

**SUMMARY OF ANALYTICAL RESULTS – SURFACE SOIL AND DRY LEACHATE SEEP SOIL (0 TO 2 FEET) – OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2**

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections	Background Concentration[1]
Volatile Organics (µg/kg)				
Toluene	3/18	21.7	11 - 42	6.1
Xylenes	7/18	3.7	1 - 11	6.9
1,2-Dichloroethene (total)	1/18	20	20	ND[2]
Methylene chloride	1/18	12	12	4[3]
Chloroform	1/18	9	9	5[3]
Semivolatile Organics (µg/kg)				
2,4-Dinitrophenol	1/15	850	850	ND
4-Nitrophenol	1/15	850	850	ND
Di-n-octylphthalate	2/15	128.5	67-190	ND
Benzo(a)anthracene	1/15	160	160	ND
Benzo(b)fluoranthene	1/15	170	170	ND
Benzo(k)fluoranthene	1/15	160	160	ND
Benzo(g,h,i)perylene	1/15	250	250	ND
Benzo(a)pyrene	1/15	240	240	ND
Chrysene	1/15	220	220	ND
Fluoranthene	1/15	270	270	ND
Indeno(1,2,3-cd)pyrene	1/15	140	140	ND
Pyrene	1/15	360	360	ND
Pesticides/PCBs/Dioxins/Furans (µg/kg)				
alpha-Chlordane	7/15	8.9	1.9 - 27	1.20
gamma-Chlordane	2/15	20.5	12 - 29	1.09
4,4'-DDD	2/15	23.4	3.8 - 43	2.36
4,4'-DDE	6/15	22.9	4.2 - 69	0.625[3]
4,4'-DDT	7/15	14.4	4.7 - 35	0.56[3]
Dieldrin	4/14	10.7	3.8 - 20	1.1[3]
Endosulfan I	2/15	4.7	1.8 - 7.6	0.43[3]
Endrin aldehyde	6/14	10.7	3.0 - 27	ND
Heptachlor	1/15	2.0	2.0	0.045(
Aroclor-1254	2/15	29.5	28-31	ND
Aroclor-1260	1/15	630	630	ND
OCDD	2/2	0.58	0.141-1.012	NA[4]
Total HpCDD	1/2	0.026	0.026	NA[4]

TABLE 6-1

**SUMMARY OF ANALYTICAL RESULTS – SURFACE SOIL AND DRY LEACHATE SEEP SOIL (0 TO 2 FEET) – OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2**

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections	Background Concentration[1]
Inorganics (mg/kg)				
Aluminum	18/18	4,541	1190 - 13,000	9,268
Antimony	4/18	2.3	1.1 - 3.6	ND
Arsenic	20/20	2.4	0.68 - 17.1	4.54
Barium	20/20	24.7	3.3 - 103	14.4
Beryllium	1/20	0.28	0.28	0.26
Cadmium	8/20	2.0	0.29 - 6.4	0.65
Calcium	17/18	20,416	210 - 209,000	693
Chromium	20/20	14.0	2.2 - 51.2	12.8
Cobalt	13/20	0.73	0.22 - 1.6	1.63
Copper	18/20	11.0	1.1 - 50.8	3.08
Iron	18/18	8,552	1,520 - 54,700	4,959
Lead	17/20	29.3	3.8 - 76.5	7.92
Magnesium	14/18	678	236 - 2,180	383
Manganese	18/18	37.3	3.7 - 211	14.1
Mercury	10/18	0.30	0.06 - 1.0	0.11
Nickel	15/20	2.2	0.35 - 5.4	4.29
Potassium	12/18	578	189 - 1140	390
Selenium	6/20	0.98	0.30 - 3.1	0.38
Silver	2/20	2.1	0.43 - 3.7	0.46
Sodium	8/18	124	40.3 - 424	59.2
Thallium	3/20	2.6	0.47 - 6.7	0.48[3]
Vanadium	19/20	9.7	3.2 - 24.2	15.5
Zinc	19/20	43.1	4.8 - 209	10.6

1 Upper 95% Confidence Limit (UCL) concentration.
2 ND – Not detected.
3 95% UCL exceeded the maximum background concentration; therefore, maximum is reported.
4 NA – Not analyzed.

Metals of interest in the surface soil samples were cadmium, chromium, manganese, and thallium, which were detected at maximum concentrations of 6.4 mg/kg, 51.2 mg/kg, 211 mg/kg, and 6.7 mg/kg, respectively. No single sample location contained an overwhelming majority of the detected maximums. The maximum values were detected at a number of sample locations.

6.1.2 Subsurface Soil

Past soil sampling programs were based on soil-gas and geophysical surveys, aerial photographs, and knowledge of existing groundwater contamination. When anomalous areas or areas of groundwater contamination were identified, soil borings and test pits were installed to collect subsurface soil samples. Table 6-2 summarizes the subsurface soil sampling results.

The analytical results for subsurface soil show that volatile organic compounds were not detected frequently, but were detected at notable concentrations in a limited number of samples. In addition, only a limited number of samples were analyzed for sernivolatile organic compounds and pesticides/PCBs. Fuel-type constituents, including benzene, toluene, ethylbenzene, and xylenes (BTEX), were identified in a number of subsurface soil samples. The vast majority of samples analyzed for BTEX did not contain these compounds at detectable levels. The primary detections were scattered throughout the site, with the highest concentrations reported in the areas used for fire training exercises in the southern portion of the landfill. The highest concentrations of BTEX (primarily, toluene, ethylbenzene, and xylenes, with lower concentrations of benzene) ranged from 155,280 to 617,000 Fg/kg. The sample with the lower concentration was collected near the water table. All other sample intervals were above the water table.

Other areas with BTEX contamination were in the area of the former sludge impoundments (1,900 to 7,500 µg/kg); one boring south of Turkey Gut (4,830 µg/kg); and in the east-central portion of the site (2,174 to 10,993 µg/kg). All of the samples in these areas were collected from above the water table. The presence of these constituents in soil appears to suggest potential source area(s) for BTEX in groundwater.

Another group of compounds potentially relating to observed groundwater contamination are chlorinated solvents such as tetrachloroethene (PCE), trichloroethene (TCE), dichloroethenes (DCE), vinyl chloride, and 1,1,1-trichloroethane (TCA). While not widespread, their presence also appears to correlate with observed areas of these compounds in the surficial aquifer. There are a few areas with chlorinated solvents in the soil, such as south of Turkey Gut (DCE at 6 to 4,700 µg/kg and vinyl chloride at 490 µg/kg), the area of the former sludge impoundments (PCE at 4,800 µg/kg, TCE at 800 to 880 µg/kg, and TCA at 2,500 µg/kg) and in the east-central portion of the site (PCE at 38 µg/kg). All samples in, these areas were collected above the water table.

TABLE 6-2

SUBSURFACE SOIL ANALYTICAL RESULTS (> 2 FEET)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 3

Analyte	Concentration Range	Frequency of Detection	Background Concentration[1]
Volatile Organics (µg/kg)			
Acetone	4 - 5,300	24/111	100[2]
2-Butanone	11 - 16,000	15/111	5[2]
4-Methyl-2-pentanone	10 - 1,000	5/111	ND[3]
2-Hexanone	7 - 510	7/111	ND
Benzene	4 - 280	7/115	ND
Toluene	5 - 67,000	20/115	6.1
Ethylbenzene	7 - 140,000	19/115	4[2]
Xylenes (total)	5 - 450,000	32/111	6.9
Chlorobenzene	14 - 520	7/115	ND
Styrene	5	1/111	ND
1,1,1-Trichloroethane	3 - 2,500	15/115	ND
1,1-Dichloroethane	9 - 69	4/115	ND
1,2-Dichloroethane	13	1/115	ND
Chloroethane	14	1/115	ND
Tetrachloroethene	38 - 4,800	2/111	ND
Trichloroethene	5 - 880	7/115	ND
1,2-Dichloroethene (total)	5 - 4,700	6/111	ND
Vinyl chloride	13 - 490	2/115	ND
Chloroform	470 - 2,590	4/115	5[2]
Methylene chloride	4 - 190,000	16/115	4[2]
Trichlorofluoromethane	4.9 - 24	4/4	ND
trans-1,3-Dichloropropene	98	1/115	ND
Carbon disulfide	6 - 44	7/111	ND
Semivolatile Organics (µg/kg)			
Phenol	43 - 12,000	4/20	ND
2,4-Dimethylphenol	52 - 4,100	5/20	ND
4-Methylphenol	590 - 27,000	2/16	ND
1,2-Dichlorobenzene	430 - 2,000	2/20	ND
Bis(2-ethylhexyl)phthalate	49 - 11,000	9/20	75[2]
Di-n-butylphthalate	110 - 360	5/20	261
Diethylphthalate	55 - 160	2/20	ND
Butylbenzylphthalate	140 - 2,300	2/20	ND
Anthracene	1,000	1/20	ND
Fluoranthene	1,100	1/20	ND
Fluorene	420 - 20,000	4/20	ND

TABLE 6-2

SUBSURFACE SOIL ANALYTICAL RESULTS (> 2 FEET)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 3

Analyte	Concentration Range	Frequency of Detection	Background Concentration[1]
2-Methylnaphthalene	140 - 230,000	8/16	ND
Naphthalene	100 - 39,000	9/20	ND
Phenanthrene	200 - 90,000	6/20	ND
Pyrene	190	1/20	ND
Dibenzofuran	4,300 - 11,000	2/16	ND
Pesticides/PCBs/Dioxins/Furans (µg/kg)			
Aldrin	3.6	1/14	ND
delta-BHC	4.6	1/14	ND
alpha-Chlordane	3.9 - 630	3/9	1.20
gamma-Chlordane	1.2 - 2.8	3/10	1.09
4,4'-DDD	1.4 - 3.5	4/11	2.36
4,4'-DDE	2.5 - 30	2/13	0.625[2]
4,4'-DDT	120 - 130	2/13	0.56[2]
Dieldrin	7.2 - 53	4/14	1.10[2]
Endosulfan I	2.2	1/14	0.43[2]
Endosulfan II	32 - 47	2/12	0.64[2]
Endosulfan sulfate	36 - 67	2/14	ND
Endrin	15 - 21	2/14	ND
Heptachlor epoxide	7.7 - 18	2/12	ND
1,2,3,4,6,7,8-HpCDD	0.0404	1/1	NA[4]
1,2,3,4,6,7,8-HpCDF	0.0061	1/2	NA
OCDD	0.210-0.651	2/2	NA
Total HpCDD	0.0404	1/2	NA
Total HpCDF	0.0075	1/2	NA
Inorganics (mg/kg)			
Aluminum	467 - 18,500	32/32	9,268
Antimony	3.9 - 66.3	15/111	ND
Arsenic	0.12 - 13.7	113/118	4.54
Barium	1.0 - 705	38/40	14.4
Beryllium	0.02 - 3.7	38/117	0.26
Cadmium	0.14 - 119.5	26/127	0.65
Calcium	49.7 - 105,000	32/32	693
Chromium	1.1 - 122	120/127	12.8
Cobalt	0.50 - 16.7	14/34	1.63
Copper	0.24 - 2,370	76/127	3.08
Iron	717 - 62,600	32/32	4,959

TABLE 6-2

SUBSURFACE SOIL ANALYTICAL RESULTS (> 2 FEET)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 3 OF 3

Analyte	Concentration Range	Frequency of Detection	Background Concentration[(1)]
Lead	0.82 -1,650	118/127	7.92
Magnesium	25.3 - 3,440	32/32	383
Manganese	2.7 - 1,170	32/32	14.1
Mercury	0.04 - 4.1	12/115	0.11
Nickel	1.0 - 176	54/127	4.29
Potassium	54.6 - 2,040	22/32	390
Selenium	0.02 - 1.5	38/117	0.38
Silver	0.09 - 90.0	11/125	0.46
Sodium	30.6 - 2,250	19/32	59.2
Thallium	0.12 - 7.4	6/117	0.48[(2)]
Vanadium	4.0 - 27.2	27/34	15.5
Zinc	0.58 - 2,650	113/127	10.6

1 Upper 95% Confidence Limit (UCL) concentration.
2 95% UCL exceeded the maximum background concentration; therefore, maximum is reported.
3 ND - Not detected.
4 NA - Not analyzed.

Other compounds of note in the subsurface soil include several phenols found in the area of the former sludge impoundments. These compounds and the maximum concentrations included phenol (12,000 µg/kg), 2,4-dimethylphenol (4,100 µg/kg), and 4-methylphenol (27,000 µg/kg). All samples in this area were collected above the water table. In addition, several of the more soluble PAHs were detected in the area formerly used for fire-training exercises in the southern portion of the landfill. The highest concentrations were reported for fluorene (20,000 µg/kg), phenanthrene (90,000 µg/kg), naphthalene (39,000 µg/kg), and 2-methylnaphthalene (230,000 µg/kg). The depth interval was at the water table.

Fourteen samples were collected and analyzed for pesticides, which produced infrequent detections. Dieldrin was one of the most commonly detected pesticides and was found at a maximum concentration of 53 µg/kg in the former sludge impoundment area. Other pesticides of note were chlordanes (630 µg/kg maximum) and 4,4'-DDD (3.5 µg/kg maximum). The maximum concentrations of these pesticides were detected in the southern portion of the landfill. Many of the maximum concentrations of these and other pesticides were found at depths greater than 10 feet. This may indicate soil mixing or application of pesticides for insect control when various areas were receiving waste material.

Dioxins and furans were detected in two subsurface soil samples. Congeners detected include OCDD, HpCDD, and heptachlordibenzo-p-furan (HpCDF). These are the least toxic of the dioxins and furans. TCDD equivalent concentrations ranged from 0.0003 to 0.0011 µg/kg.

Ketones were detected in several samples. Acetone was detected at concentrations up to 5,300 µg/kg (southern portion of landfill), and 2-butanone was detected up to 16,000 µg/kg (east-central portion of site).

A number of metals were detected in the subsurface soil samples. Many metals were detected in 90 percent or more of the samples, with the following metals detected less frequently: antimony (14 percent), mercury (10 percent), beryllium (32 percent), cadmium (20 percent), cobalt (41 percent), copper (60 percent), nickel (43 percent), selenium (32 percent), silver (9 percent), thallium (5 percent), and vanadium (79 percent). Metals that were detected in at least 90 percent of the samples include aluminum, arsenic, barium, calcium, chromium, iron, lead, magnesium, manganese, potassium, sodium, and zinc. Several of the metals, including arsenic, vanadium, and zinc, were detected at concentrations that are not significantly different from the background concentration range. The metals whose maximum detected concentrations exceeded the background results the greatest were antimony, barium, cadmium, copper, lead, manganese, and silver. These were not widespread or common contaminants in subsurface soil at Operable Unit 2, although there are a limited number of locations with high

concentrations. Copper, lead, and zinc were those metals which were detected most frequently at concentrations greater than background and which appeared to be the most widespread.

6.1.3 Migration of Soil Contaminants to Groundwater

Remedial Goal Options (RGOs) based on potential movement of contaminants from soil to groundwater were developed as part of the RI according to Method ll Category S-3 contained in the North Carolina Risk Analysis Framework guidance. Method ll uses a transport model to calculate soil target concentrations that would not likely exceed the groundwater target concentrations. The groundwater target concentrations were either state Class GA groundwater standards or risk-based concentrations, for chemicals with no numerical groundwater standard. Soil RGOs were developed for any chemical ever detected in groundwater that exceeded the state groundwater standard plus products of potential chemical transformations. Table 6-3 provides the Category S-3 soil RGOs along with the maximum soil concentrations detected for each chemical. The following chemicals exceeded RGOs based on protection of groundwater: benzene, 2-butanone, chlorobenzene, chloroform, 1,2-dichloroethane, cis-and trans-1,2-dichloroethene, trans-1,3-dichloropropane, ethylbenzene, methylene chloride, tetrachloroethene, toluene, 1,1,1-trichloroethane, trichloroethene, vinyl chloride, 2,4-dimethylphenol, 2-methylnaphthalene, 4-methylphenol, naphthalene, dieldrin, heptachlor epoxide, cadmium, iron, lead, manganese, nickel, and silver. Figures 6-1 and 6-2 show the locations that exceed these RGOs for organics and inorganics, respectively. Results for iron are not shown because the calculated RGO was lower than the background concentration range.

6.2 GROUNDWATER AND SURFACE WATER

6.2.1 Surficial Aquifer

Table 6-4 summarizes the most recent surficial aquifer groundwater sampling results. Figure 6-3 shows the locations where state groundwater standards were exceeded. The most commonly detected contaminants in the surficial aquifer were monocyclic aromatic fuel constituents (BTEX), halogenated aliphatics (chlorinated solvents and breakdown products such as tetrachloroethene (PCE), trichloroethene (TCE), dichloroethene (DCE), vinyl chloride, 1,1,1-trichloroethane (TCA), dichloroethanes (DCA), and chloroethane), and chlorinated monocyclic aromatics (chlorobenzene and dichlorobenzenes). Several items are of note in discussing the nature and extent of contamination in the surficial aquifer. First, there is widespread contamination of groundwater with organic chemicals. Those listed above are the most prevalent based on past and recent data. Second, the maximum detected concentrations of many compounds have declined over the years.

TABLE 6-3

REMEDIAL GOAL OPTIONS FOR SOIL - PROTECTION OF GROUNDWATER
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Chemical	S- 3 Target Concentration	Maximum Soil Concentration
Volatiles (µg/kg)		
Benzene*[1]	5.6	280
Bromodichloromethane	2.9	ND [2]
2-Butanone*	687	16,000
Carbon tetrachloride	2.9	ND
Chlorobenzene*	432	520
Chloroethane	13,848	14
Chloroform*	0.96	2,590
Chloromethane	6.7	ND
Dibromochloromethane	0.69	ND
1,1-Dichloroethane	3,521	69
1,2-Dichloroethane*	1.7	13
1,1-Dichloroethene	49.2	ND
cis-1,2-Dichloroethene*	350	4,700 (total)[3]
trans-1,2-Dichloroethene*	400	4,700 (total)[3]
1,2-Dichloropropane	2.8	ND
cis-1,3-Dichloropropene	1.2	ND
trans-1,3-Dichloropropene*	1.2	98
Ethylbenzene*	343	140,000
2-Hexanone	760	510
Methylene chloride*	21.9	190,000
4-Methyl-2-pentanone	2,500	1,000
1,1,2,2-Tetrachloroethane	0.31	ND
Tetrachloroethene*	5.9	4,800
Toluene*	8,111	67,000
1,1,1-Trichloroethane*	1,484	2,500
1,1,2-Trichloroethane	0.96	ND
Trichloroethene*	20.7	880
Vinyl chloride*	0.09	490
Semivolatiles (µg/kg)		
Bis(2-chloroethyl)ether	0.04	ND
Bis(2-ethylhexyl)phthalate	906,000	11,000
2,4-Dimethylphenol*	1,194	4,100
2-Methylnaphthalene*	3,235	230,000
2-Methylphenol	2,097	ND
4-Methylphenol*	205	27,000
Naphthalene*	925	39,000

TABLE 6-3

REMEDIAL GOAL OPTIONS FOR SOIL - PROTECTION OF GROUNDWATER
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2

Chemical	S-3 Target Concentration	Maximum Soil Concentration
Nitrobenzene	3.6	ND
2-Nitrobenzene	2,346	ND
Pesticides (µg/kg)		
Aldrin	203	3.6
alpha-BHC	0.31	ND
beta-BHC	1.1	ND
4,4'-DDD	5,601	43
4,4'-DDE	17,881	69
4,4'-DDT	10,521	130
Dieldrin*	1.8	53
Endosulfan I	2,059	7.6
Endosulfan II	2,059	47
Endrin aldehyde	348	27
Heptachlor	226	2.0
Heptachlor epoxide*	6.7	18
Metals (µg/kg)		
Arsenic	26.2	17.1
Cadmium*	2.7	119.5
Chromium	21,000(+3) 27.2(+6)	122 (total)
Iron*	151	62,600
Lead*	270	1,650
Manganese*	65.2	1,170
Nickel*	56.4	176
Silver*	0.22	90

1 Asterisk indicates exceedance of target concentration.
2 Not detected.
3 Samples were analyzed for total 1,2-dichloroethene.

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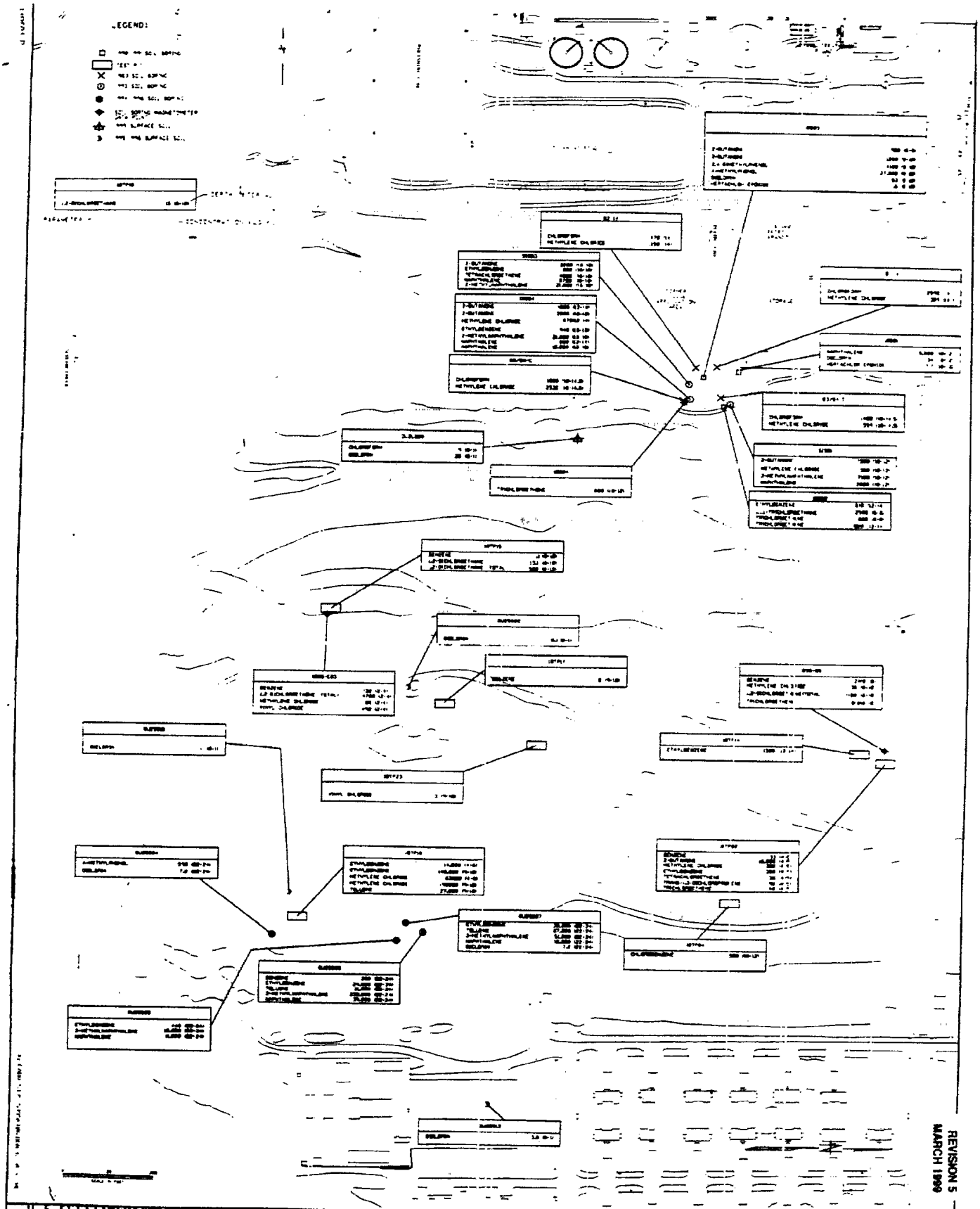

FIGURE 6-

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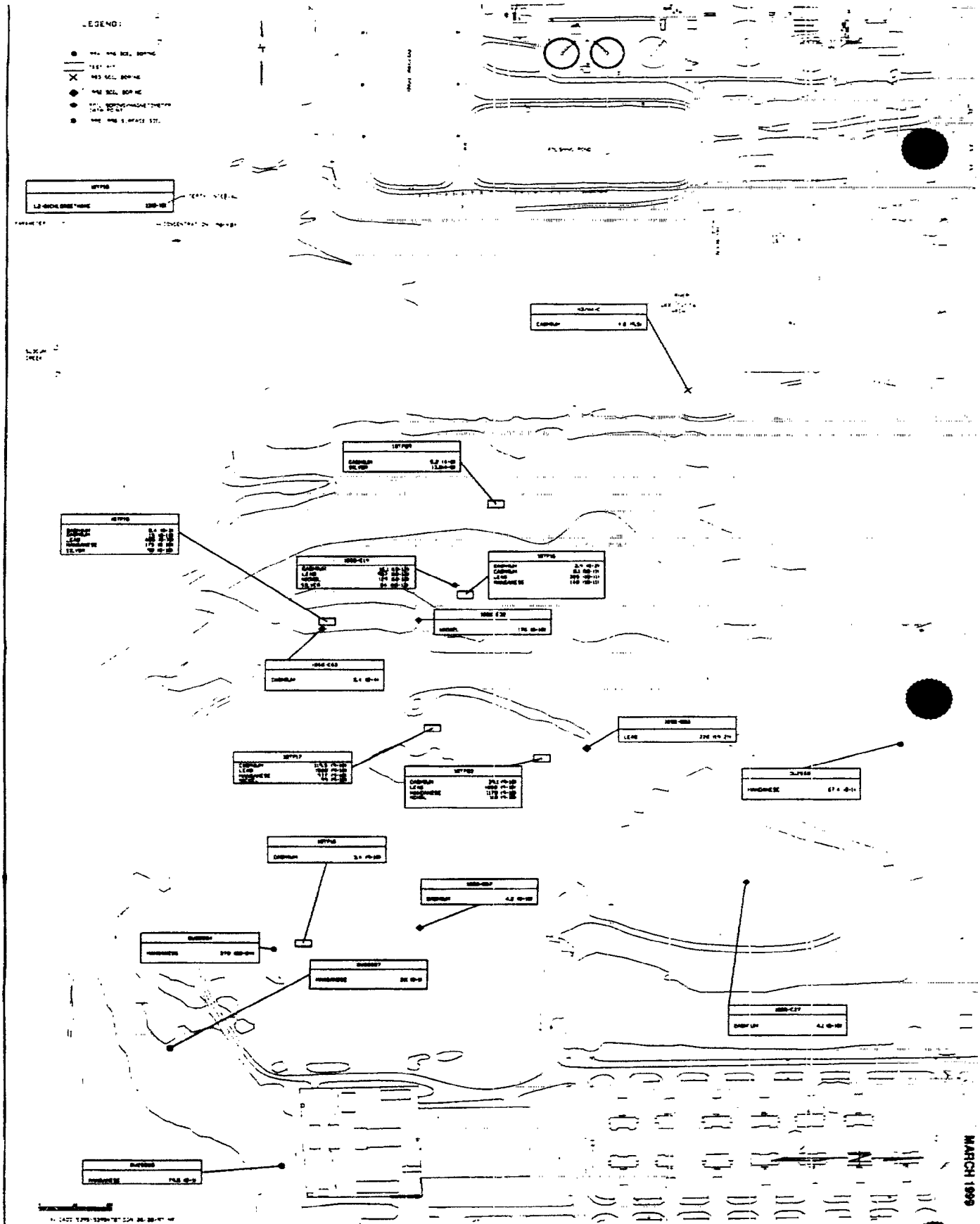

FIGURE 6-2

MARCH 1999

TABLE 6-4

SUMMARY OF ANALYTICAL RESULTS - SURFICIAL AQUIFER (1994 AND 1996)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 3

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections	Background Range	No Class GA Standard[4]
Volatile Organics (µg/L)					
Acetone	3/9	19.0	7 - 32	NA	700
2-Butanone	2/17	76.0	69 - 83	NA	170
2-Hexanone*[5]	1/46	1	1	NA	>DL[6]
4-Methyl-2-pentanone*	5/46	17.0	3 - 64	NA	> DL
Benzene*	21/46	19.6	2 - 230	NA	1
Toluene	7/46	41.6	2 - 110	NA	1.000
Ethylbenzene*	7/46	13.0	1 - 38	NA	29
Xylenes	11/46	49.9	2 - 180	NA	530
Chlorobenzene*	22/46	42.3	1 - 180	NA	50
1,2-Dichlorobenzene[1]	15/76	8.5	0.75 - 28	NA	620
1,3-Dichlorobenzene[1]	2/79	2	2	NA	620
1,4-Dichlorobenzene[1]	26/79	10.7	2.5 - 40	NA	75
1,1,1-Trichloroethane	2/46	4	3 - 5	NA	200
1,1-Dichloroethane	18/46	27.6	1 - 79	NA	700
1,2-Dichloroethane*	3/46	3.7	2 - 5	NA	0.38
Chloroethane	12/46	27.3	1 - 90	NA	2,800
Tetrachloroethene*	6/46	7.4	1 - 21	N A	0.7
Trichloroethene*	11/46	11.3	1 - 40	NA	2.8
1,1-Dichloroethene	1/46	2	2	NA	7
cis-1,2-Dichloroethene*	16/46	29.2	1 - 140	NA	70
trans-1,2-Dichloroethene	6/46	1.8	0.75 - 3	NA	70
Vinyl chloride*	16/46	8.3	1 - 26	NA	0.015
Methylene chloride	3/45	1.5	1 - 2	NA	5
1,2-Dichloropropane*	5/46	1.2	1 - 2	NA	0.56
Chloroform*	2/46	2	1 - 3	NA	0.19
Semivolatile Organics (µg/L)					
Phenol	4/33	8.	3 - 16	NA	300
2-Methylphenol*	2/33	8.5	6 - 11	NA	> DL
4-Methylphenol*	5/33	32.7	3 - 65	NA	> DL
2,4-Dimethylphenol*	4/33	77.3	4 - 280	NA	> DL
Bis(2-ethylhexyl)phthalate*	3/33	33.0	4 - 66	NA	3
Diethylphthalate	9/33	18.2	4 - 53	NA	5.000
2-Methylnaphthalene*	4/33	8.3	4 - 18	NA	> DL
Naphthalene*	8/33	14.6	3 - 41	NA	21

TABLE 6-4

SUMMARY OF ANALYTICAL RESULTS - SURFICIAL AQUIFER (1994 AND 1996)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 3

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections	Background Range	No Class GA Standard[4]
Nitrobenzene*	1/33	5	5	NA	> DL
Bis(2-chloroethyl)ether*	1/33	3	3	NA	> DL
Pesticides/PCBs (µg/L)					
Aldrin*	1/32	0.0034	0.0034	NA	>DL
alpha-BHC*	2/30	0.0094	0.0089 - 0.0098	NA	>DL
gamma-BHC (Lindane)	2/28	0.024	0.0089 - 0.041	NA	0.2
alpha-Chlordane	5/30	0.0009	0.0054 - 0.014	NA	0.027
gamma-Chlordane	1/31	0.0085	0.0085	NA	0.027
4,4'-DDE*	1/30	0.0092	0.0092	NA	> DL
4,4'-DDT*	1/31	0.017	0.017	NA	>DL
Endosulfan I*	1/32	0.0090	0.0090	NA	> DL
Endosulfan II*	3/26	0.021	0.0033 - 0.056	NA	>DL
Endrin	3/32	0.013	0.00071 - 0.020	NA	2
Endrin aldehyde*	5/29	0.22	0.01 - 0.97	NA	>DL
Heptachlor	1/31	0.0055	0.0055	NA	0.008
Heptachlor epoxide*	2/30	0.012	0.0033 - 0.024	NA	0.004
Inorganics (µg/L)					
Aluminum	29/46	347	15.0 - 4,840	ND[8]-2,500	NS[7]
Arsenic*	27/46	42.6	3.9 - 126	ND-3.3	50
Barium	44/46	78.5	16.0 - 306	3.9-43.7	2,000
Cadmium*	2/46	5.6	5.2 - 6.0	ND	5
Calcium	45/45	32,502	1,170 - 93,850	ND-2,305	NS
Cobalt	10/46	32.5	8.6 - 81.0	ND	NS
Copper	2/46	6.2	1.7 - 10.6	ND	1,000
Iron*	43/46	34,774	69.9 - 100,500	ND-4,370	300
Lead	9/46	2.8	0.75 - 7.3	ND-5.0	15
Magnesium	46/46	8,116	1,080 - 34,900	709-2,295	NS
Manganese*	46/46	400	5.4 - 3,270	5.3-35.8	50
Nickel	2/46	18.6	15.3 - 22.0	ND	100
Potassium	46/46	7,526	923 - 36,900	ND-1,315	NS
Sodium	46/46	27,452	1,070 - 95,900	2,130-7,560	NS
Vanadium	4/46	6.0	1.8 - 9.0	ND	NS
Zinc	14/46	22.8	6.0 - 90.5	ND-14.0	2,100
Cyanide	1/46	28.0	28.0	NA	154
pH (units)*	37/37	5.95[2]	3.22 - 7.28	NA	6.5 - 8.5

TABLE6-4

SUMMARY OF ANALYTICAL RESULTS - SURFICIAL AQUIFER (1994 AND 1996)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 3 OF 3

1 Measured in both volatile and semivolatile fraction.
2 Geometric average.
3 NA - Not analyzed.
4 15A NCAC 2L.0200.
5 Asterisk next to analyte indicates exceedance of state standard.
6 > DL - Greater than detection limit. Any detection is considered an exceedance of the standard.
7 NS - No standard.
8 ND - Not detected.

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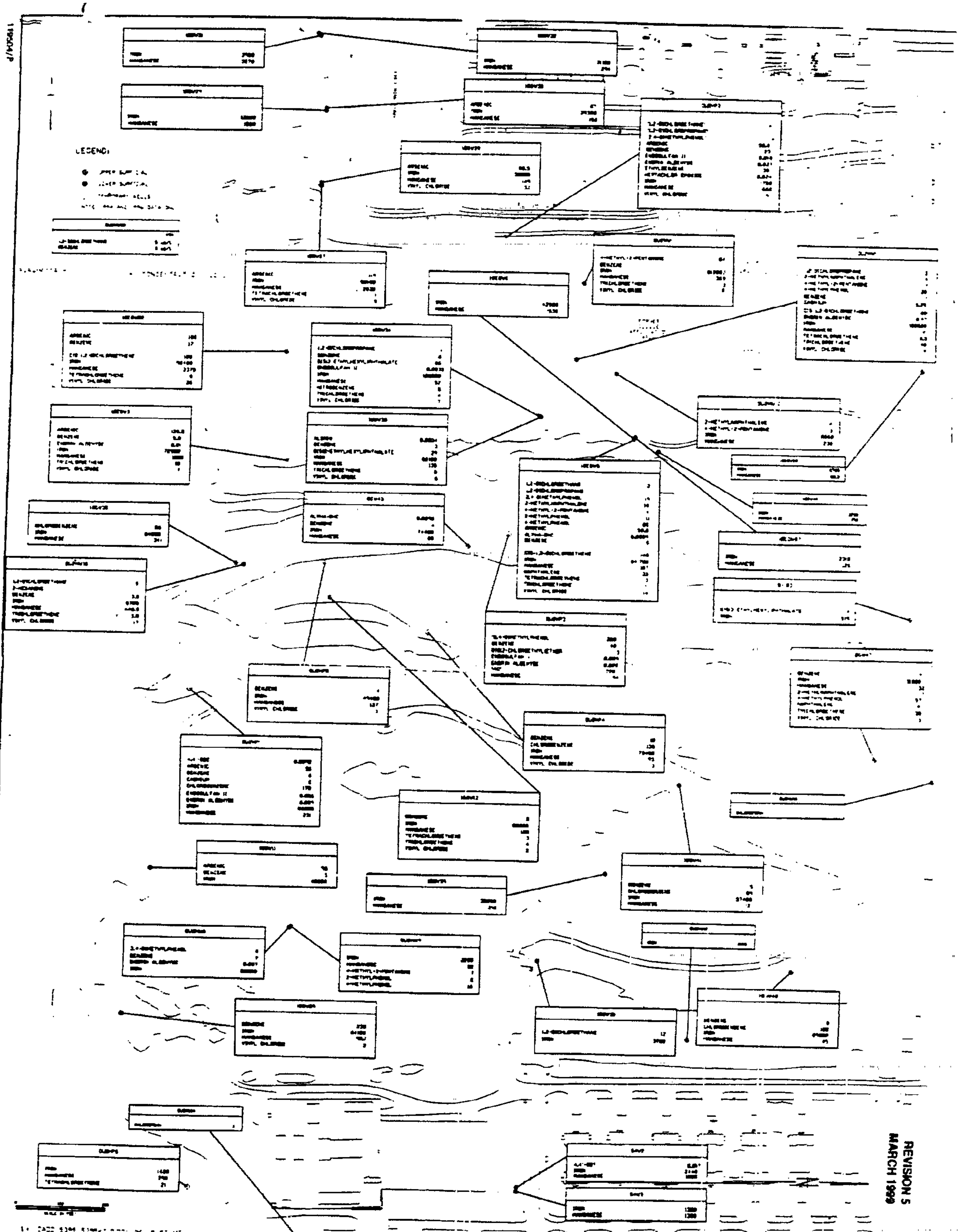

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CONTAMINANTS IN SURFICIAL AQUIFER EXCEEDING STATE STANDARDS

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FIGURE 6-3

6-21

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Third, although no distinct plumes are visible based on the most recent sampling event, several areas of overall contamination can be outlined as general areas of concern. These areas of concern are those in which certain contaminants exceed state and/or Federal groundwater or drinking water standards.

Benzene, TCE, and vinyl chloride were the compounds that exceeded the state groundwater quality standards most often. Chlorobenzene, chloroethane, 1,1-dichloroethane, and cis-1,2-dichloroethenewere also detected frequently. The concentration of benzene over much of OU2 exceeds the state standard of 1 microgram/liter (µg/L). Within this area of general benzene contamination, three areas of solvent contamination were identified. One area is located west (downgradient) of the former sludge impoundments and extends to the south side of Turkey Gut. Another area is centered on the eastern edge of the landfill, and a third area is located in the southwest portion of OU2. This area may be associated with the fire training areas and potential use of solvents there or in the adjacent vehicle maintenance area (Site 76).

Several areas have chlorobenzene concentrations exceeding the state standard of 50 µg/L. These areas are as follows: (1) coincident with the solvent contamination area south of Turkey Gut; (2) an area in the upstream area of Turkey Gut; and (3) the areas surrounding sample OU2HP1, which is located southwest of Turkey Gut.

Metals are not significant groundwater contaminants at this site. During the most recent sampling event, only four metals (arsenic, cadmium, iron, and manganese) were found that exceeded state standards (50 µg/L, 5 µg/L, 50 µg/L, and 300 µg/L, respectively). Cobalt and vanadium were detected in several wells; however, they were not detected in background samples. Many detections of calcium, magnesium, and potassium also exceeded background concentrations.

There is no significant difference in the analytical results for wells screened in the upper and lower portions of the surficial aquifer. These results, therefore, do not indicate a great potential for nonaqueous-phase liquids at this site.

6.2.2 Yorktown Aquifer

Table 6-5 summarizes the most recent Yorktown aquifer groundwater sampling results. The analytical results for the Yorktown aquifer indicate that metals are not significant contaminants except for iron and manganese. Iron exceeded the state groundwater standard in most wells, and manganese exceeded the standard in more than 50 percent of the wells. Organic compounds were detected in low concentrations during the most recent (1994) sampling round. These include chloroform (1 and 2 µg/L), methylene chloride (3 µg/l), and bis(2-ethylhexyl)phthalate (BEHP) (25 µg/l), which are common laboratory

TABLE 6-5

SUMMARY OF ANALYTICAL RESULTS - YORKTOWN AQUIFER (1994)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	NC Groundwater Standard[1]	Frequency of Detection	Average of Positive Detections	Range of Positive Detections
Volatile Organics (µg/L)				
Chloroform*[2]	0.19	2/10	1.5	1 - 2
Methylene chloroide	5	1/10	3	3
Semivolatile Organics (µg/L)				
Bis(2-ethylhexyl)phthalate*	3	1/8	25	25
Inorganics (µg/L)				
Aluminum	NS[3]	6/10	198	25.0 - 936
Barium	2,000	10/10	18.1	2.0 - 44.0
Calcium	NS	10/10	61,930	49,500 - 68,600
Iron*	300	9/10	827	279 - 2,010
Lead	15	2/10	1.2	1.2
Magnesium	NS	10/10	1,700	783 - 2,380
Manganese*	50	10/10	50.9	12.0 - 90.0
Potassium	NS	10/10	2,238	858 - 7,510
Sodium	NS	10/10	10,409	1,280 - 32,000
Zinc	2,100	1/10	10.0	10.0
pH (units)*	6.5 - 8.5	10/10	7.42[4]	6.99 - 8.59

1 15A NCAC 2L.0200.
2 Asterisk indicates exceedance of state standard.
3 NS - No standard.
4 Geometric average.

contaminants, while BEHP is a commonly used plasticizer. However, none of these compounds were found in QA/QC blanks at levels that would affect the data. Chloroform and BEHP exceeded the state standards.

The concentrations of all metals found in the Yorktown aquifer during the most recent sampling event were below drinking water standards or state groundwater standards, except for iron and manganese. The standards for iron and manganese are based on aesthetic concerns.

6.2.3 Surface Water

Tables 6-6 and 6-7 summarize the most recent surface water sampling results for Turkey Gut and Slocum Creek, respectively. The analytical results for samples collected from Turkey Gut and Slocum Creek in 1994 indicate that the suite of compounds detected is similar to the types and classes of compounds detected in onsite groundwater. However, the surface water concentrations were generally lower than those detected in groundwater. In Turkey Gut, a sample that was located just upstream of an identifiable leachate seep (in 1985) contained benzene, chlorobenzene,1,4-dichlorobenzene, 1,1-dichloroethane, chloroethane, cis-1,2-dichloroethene, and vinyl chloride. Most detections were 1 to 3 µg/L, although chlorobenzene was detected at a concentration of 10 µg/L in this sample. This was the only Turkey Gut sample that contained detectable concentrations of volatile organic compounds. In Slocum Creek, chloroform was consistently detected at a concentration of 1 µg/l. Cis-1,2-dichloroethene which was consistently found on site, was detected in Slocum Creek. Therefore, it can be assumed that contaminated groundwater is discharging to Slocum Creek. The sample in which cis-1,2-dichloroethene was detected is at the downgradient end of a contaminant plume emanating from the former sludge impoundment area at Site 10 that was closed in the mid- 1 980s.

Pesticides were detected in several surface water samples, although their presence may be related to suspended sediment material in the samples rather than actually dissolving in the surface waters. Pesticides were detected at low concentrations in a number of groundwater samples, although no plume or significant soil-source area could be identified that could result in the presence of these pesticides in Turkey Gut or Slocum Creek. The source of these pesticides is most likely the prior or current application of these materials throughout the watershed, followed by runoff.

It is notable that manganese, which was a prevalent groundwater contaminant at concentrations that exceeded state groundwater standards, was also found in Turkey Gut. This is an additional indication of discharge of shallow groundwater to Turkey Gut. Manganese was also detected in Slocum Creek.

TABLE 6-6

SUMMARY OF ANALYTICAL RESULTS - TURKEY GUT SURFACE WATER (1994)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections	NC Class C Standard/ Criteria[4]
Volatile Organics (µg/L)				
Benzene	1/4	1	1	71.4
Chlorobenzene	1/4	10	10	21,000
1,4-Dichlorobenzene[1]	1/8	2	2	2,600
1,1-Dichloroethane	1/4	2	2	19.8
Chloroethane	1/4	3	3	860
cis-1,2-Dichloroethene	1/4	1	1	7.0
Vinyl chloride	1/4	1	1	525
Semivolatile Organics (µg/L)				
Bis(2-ethylhexyl)phthalate*	2/4	5	4 - 6	5.9
Pesticides/PCBs (µg/L)				
gamma-BHC (Lindane)	2/4	0.0049	0.0016 - 0.0081	0.01
4,4'-DDD*	1/4	0.028	0.028	0.00084
Heptachlor epoxide*	1/4	0.0019	0.0019	0.00011
Inorganics (µg/L)				
Aluminum*	3/4	380	29.0 - 1,010	87
Arsenic	1/4	2.95	2.95	50
Barium	4/4	57.1	40.5 - 90.0	1,400
Calcium*	4/4	63,750	21,400 - 135,000	7,300
Iron*	4/4	4,391	1,435 - 11,600	1,000
Lead	1/4	7.5	7.5	25
Magnesium*	4/4	102,719	3,125 - 393,000	200
Manganese*	4/4	268	80.5 - 458	100
Potassium*	4/4	33,176	1,840 - 123,000	30,000
Sodium*	4/4	766,645	3,170 - 3,030,000	400,000
Zinc	1/4	17.0	17.0	50
pH (units)	4/4	6.52[2]	6.01 - 6.95	6 - 9
Inorganics - Filtered (µg/l)				
Antimony	1/4	11.5	11.5	4,300
Barium	4/4	54.5	39.0 - 86.0	1,400

TABLE 6-6

SUMMARY OF ANALYTICAL RESULTS - TURKEY GUT SURFACE WATER (1994)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINE
PAGE 2 OF 2

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections	NC Class C Standard/ Criteria (4)
Calcium*	4/4	64,550	22,100 - 139,000	7,300
Copper*	2/4	16.1	7.25 - 25.0	7
Iron*	3/4	2,526	727 - 5,580	1,000
Magnesium*	4/4	101,246	3,115 - 387,000	200
Manganese*	4/4	232	71.5 - 447	100
Potassium*	4/4	31,430	1,890 - 116,000	30,000
Sodium*	4/4	796,685	3,200 - 3,150,000	400,000
Zinc	1/4	12.0	12.0	50

1 Measured in both volatile and semivolatile fractions.
2 Geometric average.
3 NA - Not applicable.
4 NCDENR, 1997. Asterisk next to analyte indicates exceedance of standard.

TABLE 6-7

SUMMARY OF ANALYTICAL RESULTS - SLOCUM CREEK SURFACE WATER (1994)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections	NC Class C Standard/Criteria [3]
Volatile Organics (µg/L)				
Acetone	1/1	3	3	500
cis-1,2-dichloroethene	2/3	1.5	1 - 2	NS[4]
Chloroform	3/3	1	1	470
Pesticides/PCBs (µg/L)				
4,4[1]-DDD*	3/3	0.033	0.027 - 0.039	0.00084
Inorganics (µg/L)				
Barium	3/3	51.0	37.0 - 60.0	1,400
Calcium	3/3	134,000	132,000 - 135,000	NS
Copper*	1/3	28.0	28.0	3
Iron	2/3	132	106 - 158	NS
Magnesium	3/3	396,000	379,000 - 407,000	NS
Manganese*	3/3	383	350 - 432	100
Potassium	3/3	120,333	116,000 - 123,000	NS
Sodium	3/3	3,073,333	2,950-000 - 3,150,000	NS
pH (units)	3/3	7.47[1]	7.55 - 7.87	6 - 9
Inorganics - Filtered (µg/L)				
Antimony	1/3	7.4	7.4	4,300
Barium	3/3	32.0	28.0 - 37.0	1,400
Calcium	3/3	140,333	138,000 - 144,000	NS
Copper*	3/3	27.7	23.0 - 37.0	3
Magnesium	3/3	401,667	395,000 - 414,000	NS
Manganese	2/3	6.0	6.0	100
Potassium	3/3	119,000	116,000 - 124,000	NS
Sodium	3/3	3,140,000	3,090,000 - 3,210,000	NS
Zinc	1/3	7.0	7.0	86

1 Geometric average.
2 NA - Not applicable.
3 NCDENR, 1997. Asterisk next to analyte indicates exceedance of standard.
4 NS - No standard.

There is no general pattern or trend in contaminant distribution in either Turkey Gut or Slocum Creek.

6.3 SEDIMENT AND SEEPS

6.3.1 Sediment

Tables 6-8 and 6-9 summarize sediment sampling results for Turkey Gut and Slocum Creek, respectively. Sediment analytical results indicate that pesticides and metals are the most frequently detected analytes. A wide variety of pesticides was found in Turkey Gut. In Turkey Gut, the pesticides were found generally in an upstream sample or in a sample collected from near the mouth of Turkey Gut. Some, but not all, of the identified compounds were detected in surface soil samples. Some, but not all, of the pesticides detected in Slocum Creek were also detected in surface soil samples. It is not known whether the site is contributing to the presence of pesticides or whether such presence is a result of current or past use of pesticides at the Air Station.

The concentrations of metals in sediment in Slocum Creek and Turkey Gut do not appear to indicate the presence of a major onsite source area. Many of the metals are found at concentrations Within approximately two times the background soil concentrations. Although this comparison is not totally valid (i.e., soils are not the same as sediments), the fact still has credence in identifying whether onsite soils may be contributing to the observed sediment contamination. The maximum concentrations of individual metals were found at various Turkey Gut sample locations. Maximum concentrations in Slocum Creek were generally detected in the most downstream location. No upgradient or upslope areas could be Identified as potential sources of these metals in Slocum Creek.

6.3.2 Leachate Seeps

The earliest leachate seep water and sediment samples were collected and analyzed in 1985 and 1987. Additional leachate, seep samples were collected in 1995. Samples were collected of surface water (ifpresent) or sediment (if no surface water present) from near the four locations sampled between 1985 and 1987, along with a water sample from a new location. One of the water samples was from a leachate seep/spring at the toe of the Site 10 landfill, and two were from areas of ponded surface water.

Table 6-10 summarizes the most recent leachate seep sampling results. Based on the 1995 results, the actual leachate seep contained several volatile organic compounds (2 µg/L of benzene, 5 µg/L of chloroethane, and 3 µg/L of vinyl chloride) that were also detected in the surficial aquifer, although at higher concentrations. One of the areas of ponded water contained the only other detections of organic chemicals (xylenes at 2 µg/L and several pesticides ranging from 0.0625 µg/L to 0.17 µg/L.

TABLE 6-8

SUMMARY OF ANALYTICAL RESULTS - TURKEY GUT SEDIMENT
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections
Volatile Organics (µg/kg)			
2-Butanone	3/10	191	9.25 - 540
Ethylbenzene	1/10	11	11
Xylenes (total)	2/10	24	5 - 43
1,1-Dichloroethane	1/10	19	19
Chloroethane	1/10	75	75
Carbon disulfide	1/8	20	20
Semivolatile Organics (µg/kg)			
Di-n-butylphthalate	4/6	494	350 - 640
Pesticides/PCBs (µg/kg)			
alpha-Chlordane	4/4	6.67	0.36 - 25
gamma-Chlordane	4/4	3.1	0.34 - 8.8
4,4[1]-DDD	3/5	1.48	0.45 - 3.4
4,4[1]-DDE	3/5	0.87	0.42 - 1.4
4,4[1]-DDT	1/6	0.20	0.20
Dieldrin	3/6	7.9	0.52- 22
Endosulfan II	1/6	0.24	0.24
Endrin aldehyde	1/6	0.40	0.40
Endrin ketone	1/4	1.2	1.2
Heptachlor	2/6	0.14	0.13 - 0.15
Heptachlor epoxide	1/6	16	16
Inorganics (mg/kg)			
Aluminum	8/8	7230	1,630 - 11,100
Antimony	2/9	15.0	10.0 - 20.0
Arsenic	7/9	3.3	1.2 - 7.2
Barium	8/8	30.7	12.6 - 92.1
Beryllium	1/9	0.20	0.20
Cadmium	2/9	2.5	1.4 - 3.6
Calcium	8/8	4208	348 - 12,000
Chromium	9/9	11.1	2.0 - 24.6
Cobalt	1/7	2.3	2.3
Copper	6/9	4.0	2.0 - 6.6
Iron	8/8	8480	1,930 - 18,200
Lead	8/10	22.5	6.55 - 52.5
Magnesium	8/8	494	155 - 930
Manganese	8/8	45.1	6.4 - 182

TABLE 6-8

SUMMARY OF ANALYTICAL RESULTS - TURKEY GUT SEDIMENT
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections
Mercury	2/9	0.14	0.10 - 0.17
Nickel	2/10	9.5	4.3 - 14.7
Potassium	7/7	400	123 - 679
Selenium	1/9	0.70	0.70
Sodium	6/8	304	40.7 - 1,090
Vanadium	8/8	15.9	4.8 - 26.7
Zinc	10/10	23.5	2.0 - 73.1

TABLE 6

SUMMARY OF ANALYTICAL RESULTS - SLOCUM CREEK SEDIMENT
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections
Volatile Organics (µg/kg)			
2-Butanone	1/7	13	13
Chlorobenzene	1/7	61	61
Chloromethane	1/7	16	16
Semivolatile Organics (µg/kg)			
Bis(2-ethylhexyl)phthalate	1/5	430	430
Di-n-butylphthalate	3/5	430	190 - 800
Pesticides/PCBs (µg/kg)			
alpha-Chlordane	1/3	1.5	1.5
4,4[1]-DDD	1/4	2.7	2.7
4,4[1]-DDE	1/5	2.8	2.8
Inorganics (mg/kg)			
Aluminum	5/5	2,289	382 - 8,760
Antimony	1/7	10.6	10.6
Arsenic	5/7	8.1	0.30 - 32.7
Barium	5/5	10.6	1.1 - 35.8
Calcium	5/5	1,732	136 - 6,540
Chromium	3/7	21.7	1.7 - 57.5
Cobalt	1/5	3.4	3.4
Copper	2/7	10.9	3.9 - 17.9
Iron	5/5	11,122	932 - 32,600
Lead	4/7	13.5	1.2 - 37.7
Magnesium	4/5	1,036	93.7 - 2,650
Manganese	5/5	111	3.3 - 394
Mercury	1/7	0.60	0.60
Nickel	1/7	3.0	3.0
Potassium	3/5	444	93.6 - 956
Selenium	1/7	0.89	0.89
Sodium	5/5	3,006	155- 8,250
Vanadium	2/5	3.5	1.7 - 5.2
Zinc	6/7	26.1	1.0 - 113

TABLE 6-10

SUMMARY OF ANALYTICAL RESULTS - LEACHATE SEEP WATER (1995)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections
Volatile Organics (µg/kg)			
Benzene	1/3	2	2
Xylenes	1/3	2	2
Chloroethane	1/3	5	5
Vinyl chloride	1/3	3	3
Semivolatile Organics (µg/kg)			
Butylbenzylphthalate	1/3	10	10
Pesticides/PCBs (µg/kg)			
Aldrin	1/3	0.0625	0.0625
gamma-BHC	1/3	0.0725	0.0725
4,4[1]-DDT	1/3	0.17	0.17
Dieldrin	1/3	0.155	0.155
Endrin	1/3	0.165	0.165
Heptachlor	1/3	0.0775	0.0775
Inorganics (µg/kg)			
Aluminum	3/3	721.8	360.5 - 1,310
Antimony	1/3	9.4	9.4
Arsenic	3/3	2.8	2.2 - 3.9
Barium	3/3	31.2	5.2 - 76.8
Cadmium	3/3	9.4	0.8 - 24.2
Calcium	3/3	16,185	3,705 - 36,500
Chromium	3/3	3.8	0.85 - 5.6
Cobalt	1/3	6.5	6.5
Copper	2/3	36.0	9.3 - 62.6
Iron	3/3	13,991	558 - 40,400
Lead	1/3	24.1	24.1
Magnesium	3/3	1,401.7	681 - 2,580
Manganese	3/3	212.3	62.5 - 494
Nickel	3/3	33.3	0.85 - 97.9
Potassium	3/3	3,033.3	1,860 - 4,470
Selenium	2/3	2.45	2.3 - 2.6
Sodium	3/3	2,926.7	1,240 - 5,640
Thallium	1/3	1.95	1.95

TABLE 6-10

SUMMARY OF ANALYTICAL RESULTS - LEACHATE SEEP WATER (1995)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections
Vanadium	3/3	3.5	2.15 - 6.0
Zinc	3/3	299.2	26.3 - 813
pH	3/3	6.11(1)	6.09 - 6.15

1 Geometric average.
2 NA - Not applicable.

Based on the 1995 results, the leachate seep contained the highest concentrations of all metals (except thallium). In several cases, the concentrations of metals in this sample exceeded the maximum detections in the surficial aquifer. These metals included antimony, cadmium, chromium, copper, lead, nickel, selenium, and zinc. For all other metals, the concentrations in groundwater exceed the leachate water concentrations. Many of the metals (cadmium, iron, and manganese) were present at concentrations that exceeded State groundwater standards and/or Federal drinking water standards. The low flow rate of this seep makes it unlikely that leachate water would migrate to groundwater and cause an exceedance of a groundwater standard. In addition, this leachate seep may be an area of groundwater discharge.

The sediment samples collected in 1995 from previously identified (but visibly dry at the time of sampling) leachate seep locations were similar in concentration to surface soil samples. The analytical results are included with surface soil (Table 6-1). Only a few organic compounds were detected (monocyclic aromatics, trihalomethanes, phthalate esters, and pesticides) at low concentrations. The organic compounds detected at the highest concentrations were 2,4-dinitrophenol (850µg/kg), 4-nitrophenol (850 µg/kg), 4,4'-DDE (69µg/kg), di-n-octylphthalate (67 µg/kg), and toluene (42 µg/kg). The concentrations of all other organics ranged from 7.6 µg/kg (endosulfan I) to 25 µg/kg (alpha-chlordane).

The concentrations of metals in these two leachate seep sediment samples were also similar to those reported for surface soil. However, some metals were found at higher concentrations while others were found at lower concentrations. Some of the more notable metals detections include arsenic (17.1 mg/kg), lead (76.5 mg/kg), and zinc (80.8 mg/kg).

6.3.3 Polishing Pond Sediment

Table 6-11 summarizes the polishing pond sampling results. Eight sediment and soil samples were collected from the polishing ponds in 1994. The uppermost samples were collected from the pond sediment, and the deeper samples were collected from the underlying natural soil material. The data indicate that the sediments in the ponds contain a number of organic chemicals, whereas the underlying soils are fairly free of organic contamination. For example, pond sediment contains ketones, monocyclic aromatics, phthalate esters, PAHs, and pesticides at concentrations ranging from 0.063 µg/kg (gamma-BHC) to 13,000 µg/kg [bis(2-ethylhexyl)phthalate]. The underlying natural soil material contains chloroform (4 µg/kg), bis(2-ethylhexyl)phthalate (130 µg/kg), di-n-butylphthalate (255 µg/kg), alph-achlordane (0.1 µg/kg), and heptachlor (up to 0.14 µg/kg). In general, the pond sediments contain higher concentrations of metals than the underlying soils.

TABLE 6-11

SUMMARY OF ANALYTICAL RESULTS - POLISHING POND SEDIMENT/SOIL
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 3

Analyte	Sediments[1]			Soil[2]		
	Concentration Range	Average of Positive Detections	Frequency of Detection	Concentration Range	Average of Positive Detections	Frequency of Detection
Volatile Organics (µg/kg)						
Acetone	1,300	1,300	1/4	ND(3)	--	--
2-Butanone	11 - 80	34.3	3/4	ND	--	--
Toluene	26	26	1/4	ND	--	--
Ethylbenzene	42	42	1/4	ND	--	--
Xylenes	44	44	1/4	ND	--	--
Chloroform	ND	--	--	4	4	1/4
Carbon disulfide	31	31	1/4	ND	--	--
Simivolatile Organics (µg/kg)						
Bis(2-ethylhexyl)phthalate	120 - 13,00	3,590	4/4	130	130	1/4
Di-n-butylphthalate	180 - 350	250	4/4	200 - 290	255	4/4
Phenol	260	260	1/4	ND	--	--
Fluoranthene	150	250	1/4	ND	--	--
2-Methylnaphthalene	130	130	1/4	ND	--	--
Pesticides/PCBs (µg/kg)						
Aldrin	0.28 - 3.8	2.0	2/4	ND	--	--
gamma-BHC (Lindane)	0.063 - 1.2	0.63	2/4	ND	--	--
alpha–Chlordane	0.66 - 15	7.8	2/4	0.10	0.10	1/4
gamma-Chlordane	2.6	2.6	1/3	ND	--	--
4,4'-DDD	13	13	1/2	ND	--	--
4,4'-DDE	0.19 - 16	5.5	3/3	ND	--	--
Dieldrin	0.53 - 9.4	5.0	2/4	ND	--	--
Endosulfan I	5.1	5.1	1/4	ND	--	--

TABLE 6-11

SUMMARY OF ANALYTICAL RESULTS - POLISHING POND SEDIMENT/SOIL
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 3

Analyte	Sediments[1]			Soil[2]		
	Concentration Range	Average of Positive Detections	Frequency of Detection	Concentration Range	Average of Positive Detections	Frequency of Detection
Heptachlor	0.11	0.11	1/3	0.068 - 0.14	0.099	3/3
Methoxychlor	0.44	0.44	1/3	ND	--	–
Inorganics (mg/kg						
Aluminum	5,300 - 9.810	8,040	4/4	2,920 - 4/410	3,580	4/4
Arsenic	2.3 - 3.3	2.8	2/4	1.3 - 2.3	1.9	4/4
Barium	10.2 - 25.6	15.8	4/4	5.0 - 7.2	5.75	4/4
Beryllium	0.34	0.34	1/4	ND	--	--
Cadmium	1.7 – 4.1	2.9	2/4	ND	--	--
Calcium	319 - 1,180	636	4/4	73.2 - 295	185	4/4
Chromium	14.0 - 78.5	32.4	4/4	3.8 - 11.7	7.55	4/4
Copper	2.3 - 17.4	6.7	4/4	1.2 - 1.6	1.47	3/4
Iron	3,340 - 14,500	8,312	4/4	2,690 - 6,720	4,368	4/4
Lead	3.2 - 7.1	5.0	4/4	1.9 - 3.7	2.4	4/4
Magnesium	264 - 514	417.4	4/4	148 - 220	184	4/4
Manganese	9.5 - 20.4	14.2	4/4	4.3 - 10.2	6.5	4/4
Mercury	0.12 - 0.85	0.485	2/4	ND	--	--
Nickel	10.3	10.3	1/4	ND	--	--
Potassium	428 - 616	453	4/4	244 - 262	235.5	4/4
Selenium	0.18 - 0.26	0.22	2/4	ND	--	--
Silver	0.97 - 4.1	2.54	2/4	ND	--	--
Vanadium	14.8 - 36.8	23.3	4/4	8.5 - 13.0	9.9	4/4
Zinc	7.08 - 55.3	27.9	3/1	ND	--	--
Cyanide	1.8	1.8	1/4	ND	--	--

TABLE 6-11

SUMMARY OF ANALYTICAL RESULTS - POLISHING POND SEDIMENT/SOIL
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 3 OF 3

1 Includes samples OU2SD08-1012, OU2SD09-1012, OU2SD10-1012, OU2SD10-1012-D, and OU2SD11-1012. Duplicate sample results are averaged and counted as one sample.
2 Includes samples OU2SD08-1214, OU2SD09-1214, OU2SD10-1214, and OU2SD11-1214.
3 ND – Not Detected.

7.0 CONTAMINANT FATE AND TRANSPORT

The primary contaminants of Operable Unit No. 2 are volatile organic compounds in soil and shallow groundwater (surficial aquifer). Volatile organic chemicals are typically considered to be fairly soluble and have a low capacity for retention to soil organic carbon. Therefore, they are the organic compounds most likely to be detected in groundwater. These types of chemicals may migrate through the soil column to groundwater as infiltrating precipitation solubilizes them. Some portion of these chemicals is retained by the unsaturated soil, but most will continue migration downward until they reach the water table. At that time, migration is primarily lateral with the hydraulic gradient at a rate determined by the aquifer seepage velocity and chemical retardation. Again, some portion of the chemical may be retained by the saturated soil.

Several of these compounds have specific gravities less than that of water (e.g., benzene, xylenes). These compounds are typically found in fuels, and if a large enough spill occurs (including using gasoline, etc. as a fuel), these compounds may move through the soil column as a bulk liquid until they reach the water table. There, instead of going into solution, the majority of the release may remain as a discrete fuel layer on the water-table surface, with some of the material being dissolved at the water/fuel interface. No floating fuel product was observed in any of the monitoring wells at OU2. The water table over much of the study area is less than 15 feet deep.

Pesticides were widely used at the Air Station. Many of the compound detected are no longer licensed for general sale and use in the United States. Therefore, it is assumed that much of what was detected in the soil and sediments is representative of past application for insect control. Pesticides as a class of compounds are not considered to be very mobile in the environment. These chemicals, upon application or disposal, tend to remain affixed to soil particles. Migration of pesticides occurs primarily by wind or water erosion. Concentrations of pesticides are generally below 50 µg/kg, with a few exceptions such as detections of DDT and DDD in subsurface soils.

8.0 SUMMARY OF SITE RISKS

8.1 BASELINE HUMAN HEALTH RISK ASSESSMENT

The baseline risk assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by remedial action. It serves as the baseline indicating what risks could exist if no action were taken at OU2. This section of the ROD reports the results of the baseline risk assessment conducted for OU2.

8.1.1 Chemicals of Potential Concern

A human health risk assessment was conducted for Operable Unit 2 using the following current USEPA risk assessment guidance and Region IV supplements:

- Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part A) (USEPA, December 1989).
- Exposure Factors Handbook (USEPA, May 1989).
- Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (USEPA, March 25,1991).
- Baseline Risk Assessment Guidance (USEPA Region IV, April 4, 1991).
- Dermal Exposure Assessment: Principles and Applications, Interim Repot (USEPA, January 1992).
- Supplement to RAGS: Calculating the Concentration Term (USEPA, May 1992).
- Supplement to RAGS: Region IV Bulletins (1-5) - Human Health Risk Assessment (USEPA Region IV, November 1995).

The first step in the risk assessment was to develop a list or group of chemicals referred to as chemicals of potential concern (COPCs) for each medium sampled. Contaminant concentrations were then compared to risk-based screening concentrations, background concentrations, and groundwater and surface water standards. The risk-based concentrations were calculated to correspond to an individual chemical incremental lifetime cancer risk of 1E-6 (1×10^{-6}, or a one-in-one-million risk) and a Hazard Index of 0.1 for specified, routine exposure. Residential exposure levels were used for soil and sediment.

Risk-based concentrations for residential use of groundwater were used for screening groundwater and surface water contaminants.

Any COPC that is carded through the risk assessment process and has an incremental lifetime cancer risk (ILCR) greater than 1E-6 or HI greater than 0.1 for any of the exposure scenarios is referred to as a chemical of concern (COC). Contaminants that exceed a groundwater or surface water standard are also retained as COCs.

Essential elements may be screened out of a risk assessment if it is shown that concentrations detected are not associated with adverse health effects or do not exceed as groundwater or surface water standard. Therefore, the following nutrients were eliminated: calcium, magnesium, potassium, and sodium.

COPCs were developed for surface soil (less than 2 feet deep), all soils to a depth of 10 feet (the maximum assumed depth of intrusive activities [e.g., excavation, utility lines]), groundwater, stream surface water and sediment, leachate seeps, and Site 46 polishing pond sediment. Table 8-1 identifies the COPCs for OU2.

8.1.2 Exposure Assessment

Whether a chemical is actually a concern to human health depends upon the likelihood of exposure (i.e., whether the exposure pathway is currently complete or could be complete in the future). A complete exposure pathway (a sequence of events leading to contact with a chemical) is defined by the following four elements:

- Source and mechanism of release.
- Transport medium (e.g., surface water, air) and mechanism of migration through the medium.
- Presence or potential presence of receptor at the exposure point.
- Route of exposure (ingestion, inhalation, dermal absorption).

If all four elements are present, the pathway is considered complete.

A conceptual site model was developed for OU2 to define potential receptors and the routes by which they are likely to be exposed. Figure 8-1 represents the conceptual site model used to evaluate potential receptors for Operable Unit 2. Identified receptors under current land use conditions included maintenance workers, trespassers, and recreational users of Slocum Creek. In addition, potential future

TABLE 8-1

MEDIA-SPECIFIC CHEMICALS OF POTENTIAL CONCERN (COPCs)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Surface soil (0 to 2 Feet)	All Soil (0 to 10 Feet)	Groundwater	Leachate Seeps	Surface Water	Sediment	Polishing Pound Sediment
Benzo(a) anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chrysene Indo(1,2,3-cd)pyrene Aroclor-1260 Aluminum Antimony Arsenic Beryllium Cadmium Chromium Iron Manganese Thallium	Arsenic Cadmium Lead	**Surficial Aquifer:** 1,1-Dichloroethene 1,2-Dichloroethane 1,2-Dichloropropane 2-Butanone 2-Hexanone 4-methyl-2-pentanone Benzene Chlorobenzene Chloroform Chloroethane cis-1,2-Dichloroethene Ethylbenzene Tetrachloroethene Toluene Trichloroethene Vinyl chloride 1,2-Dichlorobenzene 1,4-Dichlorobenzene 2-Methylnaphthalene 2-Methylphenol 4-Methylphenol 2,4-Dimethylphenol Bis(2-chloroethyl)ether Bis(2-ethylhexyl)phthalate Naphthalene Nitrobenzene 4,4'-DDE 4,4'-DDT Aldrin	Benzene Chloroethane Vinyl chloride 4,4'-DDT Aldrin gamma-BHC Dieldrin Heptachlor Antimony Arsenic Cadmium Iron Lead Manganese Nickel Thallium	**Turkey Gut:** Bis(2-ethylhexyl)phthalate 4,4'-DDD Heptachlor epoxide Arsenic **Slocum Creek:** 4,4'-DDD	**Turkey Gut:** Aluminum Antimony Arsenic Beryllium Iron Manganese **Slocum Creek:** Aluminum Antimony Arsenic Chromium Iron Manganese	None

TABLE 8-1

MEDIA-SPECIFIC CHEMICALS OF POTENTIAL CONCERN (COPCs)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2

Surface soil (0 to 2 Feet)	All Soil (0 to 10 Feet)	Groundwater	Leachate Seeps	Surface Water	Sediment	Polishing Pound Sediment
		Surficial Aquifer: (Continued) alpha-BHC gamma-BHC Endosulfan I Endosulfan II Endrin Aldehyde Heptachlor heptachlor epoxide Aluminum Arsenic Barium Cadmium Iron Manganese **Yorktown Aquifer:** Chloroform Bis(2-ehtylhexyl)phthalate Iron Manganese				

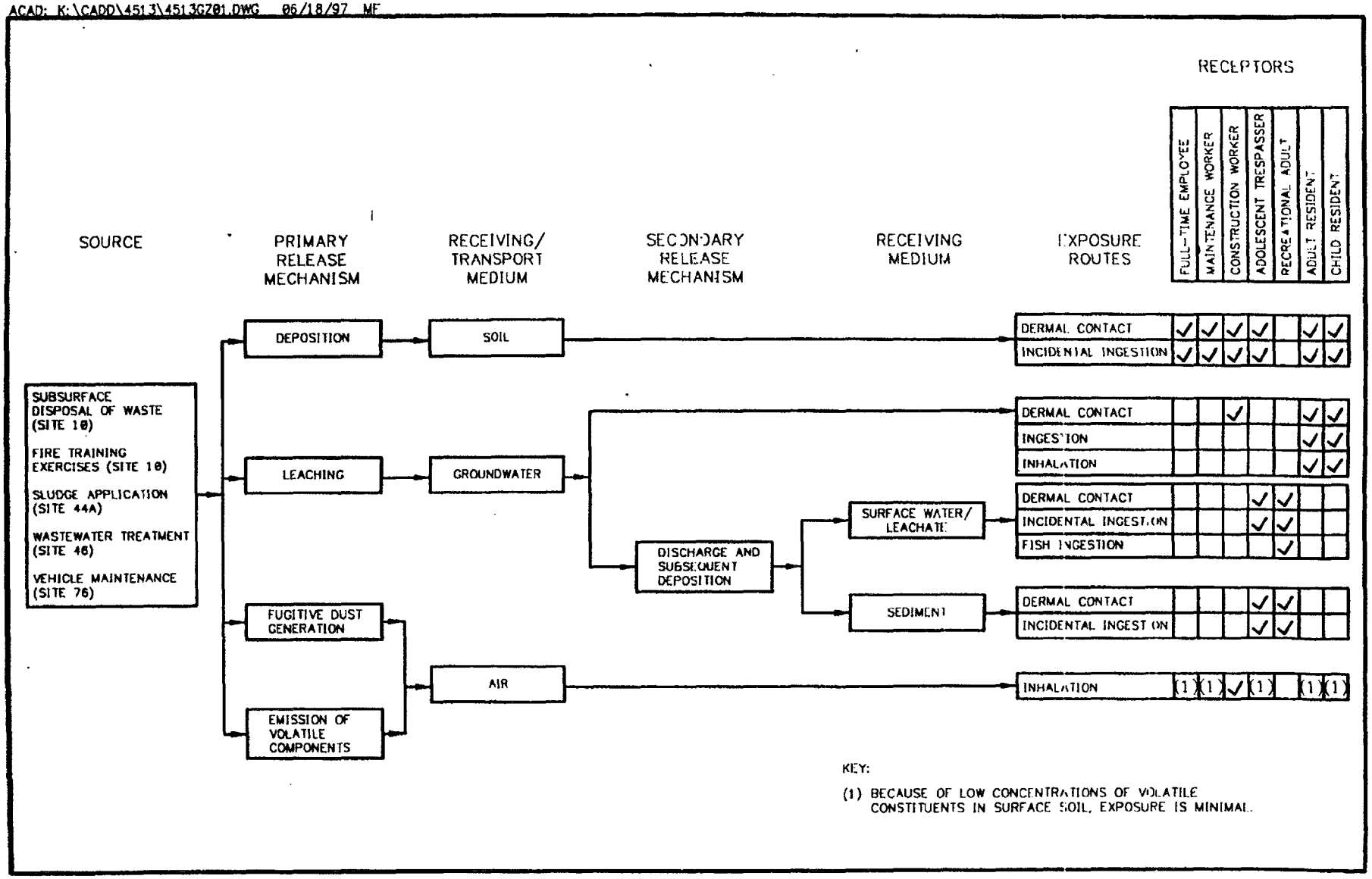

FIGURE 8-1

CONCEPTUAL SITE MODEL
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

land use conditions were also considered for residents, full-time employees, and construction workers. Maintenance workers and full-time employees were assumed to be exposed only to surface soil via direct contact during routine onsite activities. Trespassers were assumed to come into direct contact with surface soil, surface water, leachate seeps, and sediment. Recreational users were assumed to be exposed to surface water and sediment via direct contact. In addition, ingestion of fish was also considered. Under future land use conditions, construction workers represent potential receptors who could be exposed via direct contact to soils to a depth of perhaps 10 feet. Additional exposure routes considered for construction workers are direct contact with groundwater in the bottom of an excavation and inhalation of fugitive dust generated when the soil is disturbed. Future potential residents are assumed to be exposed to surface soil and groundwater via direct contact.

Two scenarios that were not considered to be applicable to OU2 are inhalation of volatile emissions or fugitive dust under current land use conditions. Volatile emissions are considered to be minimal, as only low concentrations of volatile organic compounds were detected in the surface soil. Fugitive dust is not considered because the site is currently well vegetated.

Exposure concentrations are based on a statistical development of the upper 95 percent confidence limit on the data set. There are many instances where, with isolated detections of high concentrations among many lower concentrations, the Upper Confidence Level (UCL) can exceed the maximum detected concentrations. In these cases, the maximum detection is used as the exposure concentration. Since this was the case for many COPCs in most media at OU2, the risk assessment is considered to be extremely conservative. Exposure concentrations used to calculate human health risks are summarized in Table 8-2. Parameters used to estimate potential exposures for current and future land use receptors are summarized in Tables 8-3 and 8-4, respectively.

8.1.3 Toxicity Assessment

A cancer slope factor (CSF) and a reference dose (RfD) are applied to estimate risk of cancer from an exposure and the potential for noncarcinogenic effects to occur from exposure.

CSFs have been developed by USEPAs Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic COPCs. CSFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term “upper bound” reflects the conservative estimate of risks calculated from the CSF. Use of this approach makes underestimations of the actual cancer risk highly unlikely. CSFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human

TABLE 8-2

EXPOSURE CONCENTRATIONS FOR CHEMICALS OF POTENTIAL CONCERN (COPCs) [(1)]
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 3

Chemical	Surface Soil (0 to 2 feet) (mg/kg)	All Soil (0 to 10 feet) (mg/kg)	Groundwater (mg/L)		Surface Water (mg/L)			Sediment (mg/kg)	
			Surficial Aquifer	Yorktown Aquifer	Slocum Creek [1]	Turkey Gut	Leachate Seeps	Slocum Creek	Turkey Gut
1,1-Dichloroethene	- -[(2)]	- -	0.00077	- -	- -	- -	- -	- -	- -
1,2-Dichloroethane	- -	- -	0.00097	- -	- -	- -	- -	- -	- -
1,2-Dichloroproprane	- -	- -	0.00083	- -	- -	- -	- -	- -	- -
Butanone	- -	- -	0.020	- -	- -	- -	- -		
2-Hexanone	- -	- -	0.001	- -	- -	- -	- -		
4-Methyl-2-pentanone	- -	- -	0.005	- -	- -	- -	- -		
Benzene	- -	- -	0.012	- -	- -	- -	0.002[(3)]	- -	- -
Chlorobenzene	- -	- -	0.072	- -	- -	- -	- -	- -	- -
Chloroethane	- -	- -	0.0087	- -	- -	- -	0.005[(3)]		
Chloroform	- -	- -	0.00087	0.002[(3)]	- -	- -	- -	- -	- -
cis-1,2-Dichloroethene	- -	- -	0.015	- -	- -	- -	- -	- -	- -
Ethylbenzene	- -	- -	0.0024	- -	- -	- -	- -	- -	- -
Methylene chloride	- -	- -	- -	- -	- -	- -	- -	- -	- -
Tetrachloroethene	- -	- -	0.0015	- -	- -	- -	- -	- -	- -
Toluene	- -	- -	0.0055	- -	- -	- -	- -	- -	- -
Trichloroethene	- -	- -	0.0035	- -	- -	- -	0.003[(3)]	- -	- -
Vinyl chloride	- -	- -	0.0048	- -	- -	- -	- -	- -	- -
1,2-Dichlorobenzene	- -	- -	0.0029	- -	- -	- -	- -	- -	- -
1,4-Dichlorobenzene	- -	- -	0.0082	- -	- -	- -	- -	- -	- -
2,4-Dimethylphenol	- -	- -	0.010	- -	- -	- -	- -	- -	- -
2-Methylnapthalene	- -	- -	0.0057	- -	- -	- -	- -	- -	- -
2-Methylphenol	- -	- -	0.0054	- -	- -	- -	- -	- -	- -
4-Methylphenol	- -	- -	0.0010	- -	- -	- -	- -	- -	- -

TABLE 8-2

EXPOSURE CONCENTRATIONS FOR CHEMICALS OF POTENTIAL CONCERN (COPCs)
OPERATBLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 3

Chemical	Surface Soil (0 to 2 feet) (mg/kg)	All Soil (0 to 10 feet) (mg/kg)	Groundwater (mg/L)		Surface Water (mg/L)			Sediment (mg/kg)	
			Surficial Aquifer	Yorktown Aquifer	Slocum Creek	Turkey Gut	Leachate Seeps	Slocum Creek	Turkey Gut
Benzo(a)anthracene	0.160(3)	- -	- -	- -	- -	- -	- -	- -	- -
Benzo(a)pyrene	0.240(3)	- -	- -	- -	- -	- -	- -	- -	- -
Benzo(b)fluoranthene	0.170(3)	- -	- -	- -	- -	- -	- -	- -	- -
Benzo(k)fluoranthene	0.160(3)	- -	- -	- -	- -	- -	- -		
Bis(2-chloroethyl)ether	- -	- -	0.003(3)	- -	- -	- -	- -		
Bis(2-ethylhexyl)phthalate	- -	- -	0.011	0.0188	- -	0.006(3)	- -		
Chrysene	0.220(3)	- -	- -	- -	- -	- -			- -
Indenol(1,23-cd)pyrene	0.140(3)	- -	- -	- -	- -	- -			- -
Napthalene	- -	-	0.0081	- -	- -	- -	- -		
Nitrobenzene	- -	- -	0.005(3)	- -	- -	- -	- -	- -	- -
4,4'-DDD	- -	- -	- -	- -	0.000039(3)	0.00028(3)	- -	- -	- -
4,4'-DDE	- -	- -	0.000055	- -	- -	- -	- -	- -	- -
4,4'-DDT	- -	- -	0.00001(3)	- -	- -	- -	0.00017(3)	- -	- -
Aldrin	- -	- -	0.0000034(3)	- -	- -	- -	0.0000625(3)	- -	- -
a-BHC	- -	- -	0.0000098(3)	- -	- -	- -	- -	- -	- -
Y-BHC	- -	- -	0.000027	- -	- -	- -	0.0000725(3)	- -	- -
Dieldrin	- -	- -	- -	- -	- -	- -	0.000155(3)	- -	- -
Endosulfan II	- -	- -	0.00005(3)	- -	- -	- -	- -	- -	- -
Endosulfan I	- -	- -	0.000009(3)	- -	- -	- -	- -	- -	- -
Endrin Aldehyde	- -	- -	0.000079	- -	- -	- -	- -	- -	- -
Heptachlor	- -	- -	0.0000055(3)	- -	- -	- -	0.0000775(3)	- -	- -
Heptachlor epoxide	- -	- -	0.00002(3)	- -	- -	0.0000019(3)	- -	- -	- -
Aroclor-1260	0.0778	- -	- -	- -	- -	- -	- -	- -	- -

TABLE 8-2

EXPOSURE CONCENTRATIONS FOR CHEMICALS OF POTENTIAL CONCERN (COPCs)[1]
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 3 OF 3

Chemical	Surface Soil (0 to 2 feet) (mg/kg)	All Soil (0 to 10 feet) (mg/kg)	Groundwater (mg/L)		Surface Water (mg/L)			Sediment (mg/kg)	
			Surficial Aquifer	Yorktown Aquifer	Slocum Creek	Turkey Gut	Leachate Seeps	Slocum Creek	Turkey Gut
Aluminum	6,470	- -	0.275	- -	- -	- -	- -	8,760[3]	11,100[3]
Antimony	3.6	- -	- -	- -	- -	- -	0.0094[3]	10.6[3]	20.0[3]
Arsenic	17.1[3]	2.96	0.0967	- -	- -	0.00295[3]	0.0039[3]	32.7[3]	7.2[3]
Barium	- -	- -	0.0975	- -	- -	- -	- -	- -	- -
Berylium	0.15	- -	- -	- -	- -	- -	- -	- -	0.2[3]
Cadmium	2.2	1.35	0.00269	- -	- -	- -	0.0242[3]	- -	- -
Chromium	24.1	- -	- -	- -	- -	- -	- -	57.5[3]	- -
Copper	- -	- -	- -	- -	- -	- -	- -	- -	- -
Iron	14,300	- -	100.5[3]	1.8	- -	- -	40.4[3]	32,600[3]	18,200[3]
Lead	- -	35.7	- -	- -	- -	- -	0.0241[3]	- -	- -
Manganese	78.6	- -	0.760	0.063	- -	- -	0.494[3]	394[3]	182[3]
Mercury	- -	- -	- -	- -	- -	- -	- -	- -	- -
Nickel	- -	- -	- - - -	- -	- -	- -	0.0979[3]	- -	- -
Silver	- -	- -	- -	- -	- -	- -	- -	- -	- -
Thallium	0.99	- -	- -	- -	- -	- -	0.00195[3]	- -	- -

1 95 Percent upper confidence limit, unless otherwise noted
2 - - - Not a COPC for this medium
2 Maximum concentration

TABLE 8-3

**EXPOSURE ASSUMPTIONS - CURRENT LAND USE RECEPTORS
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2**

Pathway Parameters	Maintenance Worker	Adolescent Trespasser	Adult Recreational User	Units
Dermal Contact with Soil/Sediment				
Skin Surface Area	3,160	4,570/4,140[1]	5,170	cm^2
Adherence Factor	1.0	1.0	1.0	mg/cm^2
Absorption Factor	CSV[2]	CSV	CSV	unitless
Exposure Frequency	12	12	45	days/year
Exposure Duration	25	10	30	years
Body Weight	70	45	70	kg
Averaging Time - Noncancer	9,125	3,650	10,950	days
Averaging Time - Cancer	25,550	25,550	25,550	days
Incidental Ingestion of Soil Sediment				
Ingestion Rate	200	100	100	mg/day
Exposure Frequency	12	12	45	days/year
Exposure Duration	25	10	30	years
Body Weight	70	45	70	years
Averaging Time - Noncancer	9,125	3,650	10,950	days
Averaging Time - Cancer	25,550	25,550	25,550	days
Dermal Contact with Surface Water/Leachate				
Skin Surface Area	NA[4]	4,570/1,540[3]	19,400	cm^2
Permeability Constant	NA	CSV	CSV	cm/hour
Exposure Time	NA	1	1	hours/day
Exposure Frequency	NA	12	45	days/year
Exposure Duration	NA	10	30	years
Body Weight	NA	45	70	kg
Averaging Time - Noncancer	NA	3,650	10,950	days
Averaging Time - Cancer	NA	25,550	25,550	days
Incidental Ingestion of Surface Water/Leachate				
Ingestion Rate	NA	0.05/0.005[3]	0.05	liters/day
Exposure Time	NA	1	1	hours/day
Exposure Frequency	NA	12	45	days/year
Exposure Duration	NA	10	30	years
Averaging Time - Noncancer	NA	3,650	10,950	days
Averaging Time - Cancer	NA	25,550	25,550	days

TABLE 8-3

**EXPOSURE ASSUMPTIONS - CURRENT LAND USE RECEPTORS
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2**

Pathway Parameters	Maintenance Worker	Adolescent Trespasser	Adult Recreational User	Units
Ingestion of Fish				
Bioconcentration factor	NA	NA	CSV	liters/kg
Fraction Ingested from Contaminated Source	NA	NA	0.1	unitless
Ingestion Rate	NA	NA	0.284	kg/meal
Exposure Frequency	NA	NA	48	meals/year
Exposure Duration	NA	NA	30	years
Body Weight	NA	NA	70	kg
Averaging Time - Noncancer	NA	NA	10,950	days
Averaging Time - Cancer	NA	NA	25,550	days

1 soil/sediment
2 CSV - chemical specific value
3 surface water/leachate
4 NA - Not applicable

TABLE 8-4

**EXPOSURE ASSUMPTION - FUTURE LAND USE RECEPTORS
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2**

Pathway Parameters	Adult Resident	Child Resident	Full-Time Employee	Construction Worker	Units
Inhalation of Fugitive Dust					
Inhalation Rate	NA(1)	NA	NA	4.8	m^3/hour
Absorption Factor	NA	NA	NA	0.125 - lungs 0.625 - gut	unitless
Exposure Time	NA	NA	NA	8	hours/day
Exposure Frequency	NA	NA	NA	180	days/year
Exposure Duration	NA	NA	NA	1	year
Body Weight	NA	NA	NA	70	kg
Averaging Time - Noncancer	NA	NA	NA	365	days
Averaging Time - Cancer	NA	NA	NA	25,550	days
Dermal Contact with Soil					
Skin Surface Area	5,230	3,910	3,160	4,300	cm^2
Adherence factor	1.0	1.0	1.0	1.0	mg/cm^2
Absorption Factor	0.01/0.001(2)	0.01/0.001(2)	0.01/0.001(2)	0.01/0.001(2)	unitless
Exposure Frequency	350	350	250	180	days/year
Exposure Duration	6/24(3)	6	25	1	years
Body Weight	70	15	70	70	kg
Averaging Time - Noncancer	2,190/8,760	2,190	9,125	365	days
Averaging Time - Cancer	25,550	25,550	25,550	25,550	days
Incidental Ingestion of Soil					
Ingestion Rate	200	200	50	480	mg/day
Exposure Frequency	350	350	250	180	days/year
Exposure Duration	6/24	6	25	1	years
Body Weight	70	15	70	70	kg
Averaging Time - Noncancer	2,190/8,760	2,190	9,125	365	days
Averaging Time - Cancer	25,550	25,550	25,550	25,550	days
Dermal Contact with Groundwater					
Skin Surface Area	19,400	7,280	NA	4,300	cm^2
Permeability Constant	CSV(4)	CSV	NA	CSV	cm/hour
Exposure Time	12	12	NA	240	minutes/day
Exposure Frequency	350	350	NA	180	days/year
Exposure Duration	6/24	6	NA	1	years
Body Weight	70	15	NA	70	kg
Averaging Time - Noncancer	2,190/8,760	2,190	NA	365	days
Averaging Time - Cancer	25,550	25,550	NA	25,550	days

TABLE 8-4

**EXPOSURE ASSUMPTIONS - FUTURE LAND USE RECEPTORS
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2**

Pathway Parameters	Adult Resident	Child Resident	Full-Time Employee	Constructi on Worker	Units
Ingestion of Groundwater					
Ingestion Rate	2	1	NA	NA	liters/day
Exposure Frequency	350	350	NA	NA	days/year
Exposure Duration	6/24	6	NA	NA	years
Body Weight	70	15	NA	NA	kg
Averaging Time - Noncancer	2,190/8,760	2,190	NA	NA	days
Averaging Time - Cancer	25,550	25,550	NA	NA	days
Inhalation of Volatiles in Groundwater					
Inhalation Rate	10	10	NA	NA	liters/minute
Shower Duration	12	12	NA	NA	minutes
Total Time in Bathroom	20	20	NA	NA	minutes
Air Exchange Rate	0.0083	0.0083	NA	NA	per minute
Exposure Frequency	350	350	NA	NA	showers/yea r
Exposure Duration	6/24	6	NA	NA	years
Body Weight	70	15	NA	NA	kg
Averaging Time - Noncancer	2,190/8,760	2,190	NA	NA	days
Averaging Time - Cancer	25,550	25,550	NA	NA	days

1 NA - not applicable
2 organics/inorganics
3 adult evaluated for exposure durations of 6 and 24 years
4 CSV - chemical-specific value

extrapolation and uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans).

Based on data collected from human studies, USEPA has developed weight of evidence classifications. Group A includes human carcinogens. Group B includes probable human carcinogens. B1 indicates that limited data are available. B2 indicates sufficient evidence in animals and inadequate or no evidence in humans. Group C includes possible human carcinogens. Chemical in Group D are not classifiable as to human carcinogenicity. Group E indicates evidence of noncarcinogenicity for humans.

The increased cancer risk is expressed by terms such as 1E-6. To state that a chemical exposure causes a 1E-6 added upper limit risk of cancer means that if one million people are exposed, one additional incident of cancer is expected to occur. The calculations and assumptions yield an upper limit estimate that assures that no more than one case is expected and, in fact, there may be no additional cases of cancer. USEPA policy has established that an upper limit cancer risk falling below or within the range of 1E-6 to 1E-4 is acceptable.

RfDs have been developed by USEPA for indicating the potential for adverse health effects from exposure to a COPC exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure for humans, including sensitive individuals. Estimated intakes of COPCs from environmental media (e.g., the amount of a COPC ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). If the estimated exposure to a chemical, expressed as mg/kg-day, is less than the RfD, exposure is not expected to cause any noncarcinogenic effects, even if exposure is continued for a lifetime. In other words, if the estimated dose divided by the RfD is less than 1.0, there is no concern for adverse noncarcinogenic effects.

Dose-response parameters (CSFs, RfDs, absorption factors, and weight of evidence) used in the risk assessment are summarized in Table 8-5.

8.1.4 Risk Characterization

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN [1]
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 7

Chemical	Chronic/Subchronic RfD (mg/kg/day)[2]			CSF (kg-day/mg)[3]			GI[4] Absorption Factor	Weight of Evidence
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal		
Volatile Organics								
1,1-Dichloroethene		7E-3 (UF=1000;liver)	9E-3	1.75E-1 (kidney)	6E-1 (adrenal tumors)	7.5E-1	0.80[5]	C
1,2-Dichloroethane		2.86E-3[9] (UF=3000;CNS, GI tract, liver, kidney)	2.3E-3	9.1E-2	9.1E-2 (hemangiosarcoma)	1.1E-1	0.80[5]	B2
1,2-Dichloropropane	1.14E-3 (UF=300;nasal hyperplasia)				6.8E-2[16] (liver)	8.5E-2	0.80[5]	B2
2-Butanone	2.86E-1 (UF-1000;birth wt)	6E-1 (UF=3000; birth wt)	4.8E-1				0.80[5]	
2-Hexanone	2.29E-2[27]	8.E-2[27]	6.4E-2				0.80[5]	
4-Methyl-2-pentanone	2.29E-1, 2.29E-2[16] (UF=100/1000; liver, kidney)	8-E-1,8E-2[16] (UF=300/3000;liver, kidney)	6.4E-2				0.80[5]	
Benzene	1.71E-3[9] (UF=1000; hematopoietic system	3E-4[24]	3E-4	2.9E-2 (leukemia, neoplasia)	2.9E-2 (leukemia, neoplasia)	2.9E2	1.0[8]	A
Chlorobenzene	5.71E-3(16) (UF=10,000; liver, kidney)	2.E-2 (UF=1000; liver)	6.2E-3				0.31[10]	D
Chloroethane	2.86E+0 (UF=300; fetus)	4.E-1[9]	3.2E-1				0.80[5]	

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN [1]
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 7

Chemical	Chronic/Subchronic RfD (mg/kg/day)[2]			CSF (kg-day/mg)[3]			GI[4] Absorption Factor	Weight of Evidence
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal		
Chloroform		1E-2 (UF-1000; liver)	1E-2	8.05E-2 (liver)	6.1E-3 (kidney)	6.1E-3	1.0[11]	B2
cis-1,2-Dichloroethene		1.E-2[16] (UF=3000; blood)	8E-3				0.80[5]	D
Ethylbenzene	2.86E-1 (UF=300; development)	1E-1 (UF=1000; liver, kidney)	8E-2				0.80[5]	
Methylene chloride	8.57E-1[16] (UF=100: liver)	6E-2 (UF=100; liver)	6E-2	1.64E-3 (liver; respiratory)	7.5E-3 (liver; respiratory)	7.5E-3	1.0[12]	B2
Tetrachloroethene		1E-2 (UF=1000; liver)	1E-2	2.03E-3[9] (liver)	5.2E-2[9] (liver)	5.2E-2	1.0[13]	B2/C
Toluene	1.14-1 (UF=300; CNS; nasal mucosa)	2E-1 (UF=1000; liver kidney)	1.6E-1				0.80[5]	D
Trichloroethene		6E-3[9]	6E-3	6.0E-3[9] liver	1.1E-2[26] (liver)	1.1E-2	1.0[14]	
Vinyl chloride				3.0E-1[16] (liver)	1.9E+0[16] (lung, liver)	2.38E+ 0	0.80[5]	A
Semivolatile Organics								
1,2-Dichlorobenzene	4E-2[16] (UF=1000; whole body)	9E-2 (UF=1000)	9E-2				1.0[6]	D
1,4-Dichlorobenzene	2.29E-1 (UF=100; liver)				2.4E-2[16] (liver)	2.4E-2	1.0[7]	B2

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN[1]
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 3 OF 7

Chemical	Chronic/Subchronic RfD (mg/kg/day)[2]			CSF (kg-day/mg)[3]			GI[4] Absorption Factor	Weight of Evidence
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal		
2.4-Dimethylphenol		2E-2 (UF=3000;lethargy, blood)	1E-2				0.50[5]	
2-Methylnaphthalene		4E-2[27]	2E-2				0.50	
2-Methylphenol		5E-2 (UF=1000; body wt, neurotoxicity	2.5E-2				0.50[5]	
4-Methylphenol		5E-3[16] (UF=1000; CNS, respiratory)	2.5E-3				0.50[5]	C
Benzo(a)anthracene				3.1E-1[29]	7.3E-1[29] (liver)	3.65E-1	0.50[5]	B2
Benzo(a)pyrene				3.1E+0[25] (respiratory tract)	7.3E+0 (forestomach, liver, esophagus)	3.65E+0	0.50[5]	B2
Benzo(b)fluoranthene				3.1E-1[29]	7.3E-1[29] (liver)	3.65E-1	0.50[5]	B2
Benzo(k)fluoranthene				3.1E-2[29]	7.3E-1[29] (liver)	3.65E-2	0.50[5]	B2
Bis(2-chloroethyl)ether				1.16E+0 (hepatoma)	1.1E+0 (hepatoma)	2.2E+0	0.50[5]	B2
Bis(2-ethylhexyl)phthalate		2E-2 (UF=1000; liver)	1.1E-2		1.4E-2 (liver)	2.55E-2	0.55[15]	B2
Chrysene				3.1E-3[29]	7.3E-3[29]	3.65E-3	0.50[5]	B2
Indeno(1,2,3-cd)pyrene				3.1E-1[29]	7.3E-1[29]	3.65E-1	0.50[5]	B2
Napthalene		4E-2[26]	2E-2				0.50[5]	D

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN[1]
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 4 OF 7

Chemical	Chronic/Subchronic RfD (mg/kg/day)[2]			CSF (kg-day/mg)[3]			GI[4] Absorption Factor	Weight of Evidence
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal		
Nitrobenzene	5.71E-4[16] (UF-10,000; blood, liver, kidney)	5E-4 (UF=10000; blood, liver, kidney)	2.5E-4				0.50[5]	D
Pesticides/PCBs								
4,4'-DDD					2.4E-1 (liver)	2.5E-1	0.80[30]	B2
4,4'-DDE					3.4E-1 (liver)	4.2E-1	0.80[30]	B2
4,4'-DDT		5E-4 (UF=100; liver)	4E-4	3.4E-1 (liver)	3.4E-1 (liver)	4.2E-1	0.80[30]	B2
Aldrin		3E-5 (UF=1000; liver)	1.5E-5	1.71E+1 (liver)	1.7E+1 (liver)	3.4E+1	0.50[5]	B2
alpha-BHC				6.3E+0 (liver, kidney)	6.3E+0 (liver, kidney)	1.3E+1	0.50[5]	
gamma-BHC		3E-4 (UF=1000; liver, kidney)	1.5E-4		1.3E+0[16] (liver)	2.6E+0	0.50[5]	B2/C
Dieldrin		5E-5 (UF=100; liver)	2.5E-5	1.61E+1 (liver)	1.6E+1 (liver)	3.2E+1	0.50[5]	B2
Endosulfan I		6E-3[27] (UF=100; body wt)	3E-3				0.50[5]	
Endosulfan II		6E-3[27] (UF=100; body wt)	3E-3				0.50[5]	
Endrin aldehyde		3E-4[27]	1.5E-4				0.50[5]	

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN [1]
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 5 OF 7

Chemical	Chronic/Subchronic RfD (mg/kg/day)[2]			CSF (kg-day/mg)[3]			GI[4] Absorption Factor	Weight of Evidence
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal		
Heptachlor		5E-4 (UF=300; liver)	2.5E-4	4.55E+0 (liver)	4.5E+0 (liver)	9.0E+0	0.50[5]	B2
Heptachlor epoxide		1.3E-5 (UF=1000; liver)	6.5E-6	9.1E+0 (liver)	9.1E+0 (liver)	1.82E+1	0.50[5]	B2
Aroclor-1260					7.7E+0 (liver)	1.5E+1	0.50[5]	B2
Inorganics								
Aluminum		1E+0[9]	2E-1				0.20[5]	
Antimony		4E-4 (UF=1000; whole body, blood)	8E-5				0.20[5]	
Arsenic		3E-4 (UF=3; skin)	2.85E-4	1.51+1 (lung)	1.5E+0 (skin)	1.6E+0	0.95[17]	A
Barium	1.43E-4[16] (UF=1000; fetus)	7E-2 (UF=3; cardiovascular system)	1.4E-2				0.20[5]	
Beryllium		5E-3 (UF=100)	5E-5	8.4E+0 (lung; osteosarcomas)	4.3E+0 (lung; osteosarcomas)	4.3E+2	0.01[18]	B2
Cadmium		5E-4 (UF=10; kidney)	1.5E-5	6.3E+0 (lung; trachea)			0.03[19]	B1
Chromium VI		5E-3 (UF=500)	5E-5	4.2E+1 (lung)			0.01[20]	A
Copper		4E-2(9) (gastrointestinal system)	2.4E-2				0.60[21]	

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN[1]
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 6 OF 7

Chemical	Chronic/Subchronic RfD (mg/kg/day)[2]			CSF (kg-day/mg)[3]			GI[4] Absorption Factor	Weight of Evidence
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal		
Iron		3E-1[9]	6E-2				0.20[5]	
Lead								B2
Manganese	1.43E-5 (UF=1000; CNS)	2.4E-2 (UF=3; CNS)	4.6E-3				0.20[5]	D
Mercury	8.57E-5(16) (UF=30; CNS)	3E-4[16] (UF=1000; kidney)	6E-5				0.20[5]	D
Nickel		2E-2 (UF=300; body weight)	8E-4				0.40[23]	
Silver		5E-3 (UF=3; argyria)	1E-3				0.20[5]	
Thallium		7E-5[22,26] (UF=3000; liver blood, hair)	1.4E-5				0.20[5]	D

1 All values from USEPA, May 1996 (IRIS) unless otherwise noted
2 RfD - Reference Dose
3 CSF - Cancer Slope Factor
4 GI - Gastrointestinal
5 USEPA Region IV default value (November 1995)
6 Assumed equal to 1,4-dichlorobenzene
7 ATSDR, October 1991a
8 ATSDR, October 1991b
9 ECAO provisional value
10 ATSDR, October 1989a
11 ATSDR, October 1991c
12 ATSDR, October 1991d
13 ATSDR, October 1991e
14 ATSDR, January 1988

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN[1]
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 7 OF 7

15 ATSDR, October 1991f
16 HEAST FY - 1995 (USEPA, May 1995)
17 ATSDR, October 1991g
18 ATSDR, October 1991h
19 ATSDR, October 1991i
20 ATSDR, October 1991j
21 ATSDR, October 1989b
22 Thallic oxide; HEAST FY - 1990 (USEPA, January 1990)
24 USEPA Region IV provisional value identified in comments received on RI report. Uncertainty factor and target organs not available.
25 Provisional values listed in USEPA Region IV, November 1995.
26 Withdrawn from IRIS
27 Surrogate value provided.
28 Other USEPA document referenced in USEPA Region III, May 1996.
29 Based on USEPA Region IV Toxicity Equivalence Factors (TEFs; USEPA Region IV, November 1995).
30 ATSDR 1992.

$$Risk = CDI \times CSF$$

Where:

Risk = a unitless probability (e.g., 2E-6) of an individual developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
CSF = cancer slope factor, expressed as $(mg/kg\text{-}day)^{-1}$

These risks are probabilities that are generally expressed in scientific notation (e.g., 1E-6). An excess lifetime cancer risk of 1E-6 indicates that, as a reasonable maximum estimate, an individualhas a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at OU2.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose derived for a similar exposure period. The ratio of exposure to toxicity is called a Hazard Quotient (HQ). By adding the HQs for all COPCs that affect the same target organ (e.g, liver) within a medium or across all media to which a given population may be reasonably exposed, the Hazard Index (HI) can be generated.

The HQ is calculated as follows:

$$\text{Non-cancer HQ} = CDI/RfD$$

Where:

CDI = chronic daily intake
RfD = reference dose

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

To evaluate cancer risks, a risk level lower than 1E-6 is considered a minimal or *de minimis* risk. The risk range of 1E-6 to 1E-4 is an acceptable risk range and would not be expected to require a response action. A risk level greater than 1E-4 would be evaluated further, and remedial action to decrease the estimated risk is considered.

An HI of less than unity (1.0) indicates the exposures are not expected to cause adverse health effects. An HI greater than 1.0 requires further evaluation. For example, although HQs of the several chemicals present are added and exceed 1.0, further evaluation may show that their toxicities are not additive because each chemical affects different target organs. When total effects are evaluated on an effect and target organ basis, the HI of the separate chemicals may be at acceptable concentrations.

Carcinogenic risks and noncarcinogenic hazards were evaluated for potential exposures to media-specific COPCs in surface soil, subsurface soil, surface water, sediment, leachate seeps, and groundwater (both surficial aquifer and Yorktown aquifer). Receptor populations that may potentiallybe exposed are maintenance workers, construction workers, adolescent trespassers, adult recreational users, full-time employees, and adult and child residents who could, theoretically,use groundwater for a household water source. Risks and hazards estimated for the identified receptors at OU2 are provided in Table 8-6.

The risks shown in Table 8-6 indicate that even under the conservative assumptions made during the risk assessment (e.g., frequent use of the maximum detected contaminant concentration as the exposure concentration), risks are within the target risk range except for the adult resident (Hazard Index and cancer risk) and child resident (Hazard Index and cancer risk).

The majority of the cancer risk to future residents is from ingestion of shallow groundwater (surficial aquifer) containing arsenic and vinyl chloride. For noncarcinogenic risks, individual exposure routes with HIs greater than 1 were ingestion of soil containing arsenic by a child resident and ingestion of groundwater containing arsenic and iron by adults and children. The exposure scenario for soil was based on the maximum detected concentration of arsenic; therefore, the HI is an extremely conservative value.

For the sake of completeness, a 30-year residential exposure scenario was also evaluated. This scenario is highly unlikely to occur as long as the property remains in military use (i.e., a 30-year residence is extremely conservative). Incremental cancer risks associated with exposure to soil for this receptor assume 6 years of exposure as a small child and an additional 24 years of exposure as an older child and adult. The incremental cancer risk for the adult receptor under this exposure scenario is 2.5E-3 (which exceeds the USEPA target risk range). Arsenic and vinyl chloride are the major risk drivers for groundwater, and arsenic drives the soil risks.

TABLE 8-6

SUMMARY OF CUMULATIVE RISKS
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Receptor	Exposure Pathway	Cancer Risk	Hazard Index
Maintenance Worker	Direct contact with surface soil	1.0E-6	0.016
Construction Worker	Direct contact with soil and groundwater; inhalation of fugitive dust.	7.6E-7	0.61
Adolescent Trespasser	Direct contact with surface soil and leachate seeps.	3.9E-7	0.020
	Direct contact with Slocum Creek water and sediment.	2.8E-7	0.016
	Direct contact with Turkey Gut water and sediment.	1.3E-7	0.0081
Adult Recreational User	Direct contact with Slocum Creek water and sediment; ingestion of fish.	4.0E-5	0.044
Full-Time Employee	Direct contact with surface soil.	6.4E-6	0.10
Adult Resident (6 year)	Direct contact with groundwater (surficial aquifer) and surface soil.	3.8E-4(1)	22*
	Direct contact with groundwater (Yorktown aquifer) and surface soil.	4.9E-6	0.55
Child/Adult Resident (30 year)(2)	Direct contact with groundwater (surficial aquifer) and surface soil.	2.5E-3*	51*/22*
	Direct contact with groundwater (surficial aquifer) and surface soil.	5.6E-5	2.8*/0.55
Child Resident	Direct contact with groundwater (surficial aquifer) and surface soil.	9.24E-4*	51*
	Direct contact with groundwater (Yorktown aquifer) and surface soil.	3.6E-5	2.8*

1 An asterisk indicates an “acceptable” risk.
2 includes 6 years as child and 24 years as adult. The 30-yr child/adult cancer risk was obtained by adding the 6-yr. Child cancer risk and the 24-yr. adult cancer risk. His are not additive. This first HI value is for a 6-yr. child, and the second value is for a 24-yr. adult.

In addition to the future potential exposure to the surficial aquifer, potential potable use of the Yorktown aquifer and exposure to surface soil was also considered. Both aquifers would not be used as a source of potable water at the same time. The only noncarcinogenic risk is from ingestion of soil containing arsenic by a child resident.

8.1.5 Risk Uncertainty

The intent of this section is to identify important uncertainties and limitations associated with the baseline human health risk assessment. Exposure scenarios based on USEPA guidance use conservative assumptions, which means actual risk will not be greater than that estimated and may be lower. For this reason, estimated cancer risks based on USEPA guidance, such as those presented in this document, may not represent actual risks to the population.

Because of data set limitations, the 95th percentile may exceed the maximum concentration reported in some evaluations. This may occur when there are a large number of nondetects and the detection limits are unusually high due because of interferences in the analyses. In these cases, consistent with USEPA Region IV guidance, the maximum reported values were used as exposure point concentrations to estimate human exposures. Although the use of maximum values is generally recognized as an appropriate screening approach, it should be recognized that this procedure may overestimate actual exposure.

This is also the case for use of detection limits as nondetect values when a chemical has been reported as not detected in most of the samples collected and analyzed. Since some nondetects may be zero, assuming that a concentration equal to half the detection limit is present instead of zero may overestimate actual chemical concentrations on site. This is particularly true if interfering chemicals affect the analyses, and the nondetect value is elevated.

Environmental sampling and analysis can contain significant errors and artifacts. At OU2, data used in the risk assessment are believed to adequately and accurately represent current conditions.

When long-term health effects are evaluated, it is assumed that chemical concentrations are constant for the exposure period being evaluated. This may not be accurate since reported chemical concentrations are changing because of various degradation processes (e.g., dilution by uncontaminated water, sorption, dispersion of contaminated groundwater, volatilization, biodegradation, chemical degradation, photodegradation). Use of steady-state conditions will likely overestimate exposure.

Exposures to vapors at the site, fugitive dust (except for future construction workers), dermal contact with groundwater from household uses other than bathing (e.g., laundry, washing dishes), and other possible

exposuresto site media were not evaluated. Although these and other exposures could occur, the magnitudesof these exposures are expected to be much lower than the exposures evaluated and would not quantitatively affect the total health impact from the site.

Since groundwater from the surficial and Yorktown aquifers in the surrounding area is not used for drinking water or other household water needs, exposures related to drinking and bathing are theoretical and relate to potential future exposures. This is unlikely because the Air Station has a separate potable water distribution system.

In hazard and risk evaluations, risks or hazards presented by several chemicals reported for the same exposure have been added to provide a sum of estimated total risk or hazard for that particular exposure. This is a conservative assumption and is scientifically accurate only in those instances where health effects of individual chemicals are directed at the same effect and same target organ. Effects may be additive, synergistic, or antagonistic. Since a large number of chemicals have no similarity as to their noncarcinogenic action or target of their action, this approach may overestimate risk.

Risks calculated from slope factors are derived using a linearized multistage procedure; therefore, they are likely to be conservative upper-bound estimates. Actual risks may be much lower.

Toxicity information is not available for all COPCs. Because RfDs, CSFs, and other toxicity criteria are not available for all identified chemicals, it is impossible to qualitatively or quantitatively assess the risks associated with exposure to some substances. Some compounds were not selected as COPCs based on screening values for similar compounds. There is not toxicity information for lead.

Some uncertainty is associated with the evaluation of carcinogenic effects from oral exposure to arsenic, and there is no published oral CSF. The uncertainties associated with the ingestion of arsenic are high, such that estimated risks may be overestimated by as much as an order of magnitude.

8.1.6 Human Health Risk Summary

Risk and hazards associated with exposure to all environmental media (and combinations) were within the USEPA generallyacceptable ranges for the current maintenance worker, adolescent trespasser, and adult recreational user and the future construction worker and full-time employee.

For the unlikely hypothetical future site resident, exposure media were shown to exceed acceptableresidential goals. These media include surface soil and surficial aquifer groundwater.

For future residents, several chemicals have individual cancer risks greater than 1E-6 and/or an HI greater than 0.1, making them chemicals of concern for groundwater. These analytes are as follows: benzene, chlorobenzene, 1,1-dichlorothene, vinyl chloride, bis(2-chloroethyl)ether, 1,4-dichlorobenzene, 4-methylphenol, nitrobenzene, heptachlor epoxide, arsenic, cadmium, iron, and manganese.

Exposure to surface soil at OU2 results in unacceptable risks (HIs) only for future child residents. There are however, several chemicals that contributed individual ICRs greater than 1E-6 or HIs greater than 0.1 for residential or full-time employee exposures, making them chemicals of concern for soil. These chemicals are as follows: benzo(a)pyrene, antimony, arsenic, beryllium, chromium, iron, and thallium.

USEPA Region IV requires, as part of the risk assessment, an estimation of Remedial Goal Options (RGOs) for three risk range levels for any receptor for which an individual chemical has an ICR greater than 1E-6 or an HI greater than 0.1.

Tables 8-7 and 8-8 present RGOs forgroundwater for the 6-year resident and 30-year resident exposures, respectively. These tables also contain MCLs and state groundwater standards.

Tables 8-9, 8-10, and 8-11 present RGOs for surface soil for the 6-year resident, 30-year resident, and full-time employee exposures.

In addition to the COCs based on risk (i.e., protection of human health), many groundwater analytes exceed state standards and/or MCLs and several soil analytes exceed concentrations based on protection of groundwater, also making them COCs. Table 8-12 presents the chemicals that exceed state groundwater standards and/or MCLs. Table 8-13 presents soil contaminants that exceed RGOs based on protection of groundwater.

Actual or threatened releases of hazardous substances from OU2, if not addressed by implementing the remedy selected in this ROD, may present a potential threat to public health, welfare, or the environment.

8.2 ECOLOGICAL RISK ASSESSMENT

There are no critical habitats or endangered species or habitats that are affected by site contamination. Several wetland areas were identified at OU2 during a field survey conducted in April 1995. The

TABLE 8-7

REMEDIAL GOAL OPTIONS FOR GROUNDWATER - FUTURE RESIDENT (6-YEAR)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Cancer Risk (µg/L)			RGOs for Target Hazard Quotient (µg/L)			NC Class GA Standards (µg/L)	Federal MCL (µg/L)
	1E-6	1E-5	1E-4	0.1	1	10		
Benzene	3.8	38	380	4.4	44	440	1.0	5.0
Chlorobenzene	NA(2)	NA	NA	26	260	2,600	50	100
1,1 -Dichloroethene	0.25	2.5	25	-(1)	-	-	7.0	7.0
Vinyl chloride	0.086	0.86	8.6	NA	NA	NA	0.015	2.0
Bis(2-chloroethyl)ether	0.16	1.6	16	NA	NA	NA	DL(5)	NS(3)
1,4-Dichlorobenzene	6.9	69	690	3,400	34,000	340,000	75	75
4-Methylphenol	NA	NA	NA	7.6	76	760	DL	NS
Nitrobenzene	NA	NA	NA	0.77	7.7	77	DL	NS
Heptachlor epoxide	0.019	0.19	1.9	-	-	-	0.004	0.2
Arsenic	0.1	1.0	10	0.47	4.7	47	50	50
Cadmium	NA	NA	NA	0.74	7.4	74	5.0	5.0
Iron	NA	N A	NA	460	4,600	46,000	300	300(4)
Manganese	NA	NA	NA	7.8	78	780	50	50(4)

1 Concentration of contaminan at site results in a Hazard Index less than 0.1.

2 NA - Not applicable. No cancer slope factor or Reference Dose for this chemical.

3 NS - No standard.

4 Secondary MCL.

5 DL - Detection Limit. Any detection is considered an exceedance of state standard.

TABLE 8-8

REMEDIAL GOAL OPTIONS FOR GROUNDWATER - FUTURE RESIDENT (30-YEAR)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Cancer Risk (µg/L)			RGOs for Target Hazard Quotient (µg/L)			NC Class GA Standards (µg/L)	Federal MCL (µg/L)
	1E-6	1E-5	1E-4	0.1	1	10		
Benzene	1.6	16	160	3.6	36	360	1.0	5.0
Chlorobenzene	NA(2)	NA	NA	18	180	1,800	50	100
1,1-Dichloroethene	0.097	0.97	9.7	-(1)	-	-	7.0	7.0
Vinyl chloride	0.032	0.32	3.2	NA	NA	NA	0.015	2.0
Bis(2-chloroethyl)ether	0.059	0.59	5.9	NA	NA	NA	DL(5)	NS(3)
1,4-Dichlorobenzene	2.5	25	250	610	6,100	61,000	75	75
4-Methylphenol	NA	NA	NA	5.3	53	530	DL	NS
Nitrobenzene	NA	NA	NA	0.54	5.4	54	DL	NS
Heptachlor epoxide	0.0069	0.069	0.69	0.014	0.14	1.4	0.004	0.2
Arsenic	0.038	0.38	3.8	0.33	3.3	33	50	50
Cadmium	NA	NA	NA	0.52	5.2	52	5.0	5.0
Iron	NA	NA	NA	330	3,300	33,000	300	300(4)
Manganese	NA	NA	NA	5.4	54	540	50	50(4)

1 Concentration of contaminant at site results in a Hazard Index less than 0.1.

2 NA - Not applicable. No cancer slope factor or Reference Dose for this chemical.

3 NS - No standard.

4 Secondary MCL.

5 DL - Detection Limit. Any detection is considered an exceedance of state standard.

TABLE 8-9

REMEDIAL GOAL OPTIONS FOR SOIL - FUTURE RESIDENT (6-YEAR)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Cancer Risk (mg/kg)			RGOs for Target Hazard Quotient (mg/kg)		
	1E-6	1E-5	1E-4	0.1	1	10
Benzo(a)pyrene	0.12	1.2	12	NA(1)	NA	NA
Antimony	NA	NA	NA	2.9	29	290
Arsenic	0.51	5.1	51	2.3	23	230
Beryllium	0.072	0.72	7.2	13.3	133	1,330
Chromium (IV)	NA	NA	NA	13.3	133	1,330
Iron	NA	NA	NA	2,140	21,400	214,000
Thallium	NA	NA	NA	0.5	5.0	50

1 NA - Not applicable. No cancer slope factor or Reference Dose for this chemical.

TABLE 8-10

REMEDIAL GOAL OPTIONS FOR SOIL - FUTURE RESIDENT (30-YEAR)
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Cancer Risk (mg/kg)			RGOs for Target Hazard Quotient (mg/kg)		
	1E-6	**1E-5**	**1E-4**	**0.1**	**1**	**10**
Benzo(a)pyrene	0.088	0.88	8.8	NA(1)	NA	NA
Antimony	NA	NA	NA	2.5	25	250
Arsenic	0.35	3.5	35	2.1	21	210
Beryllium	0.038	0.38	3.8	11	110	1,100
Chromium (VI)	NA	NA	NA	12	120	1,200
Iron	NA	NA	NA	1,900	19,000	190,000
Thallium	NA	NA	NA	0.45	4.5	45

1 NA - Not applicable. No cancer slope factor or Reference Dose for this chemical.

TABLE 8-11

REMEDIAL GOAL OPTIONS FOR SOIL - FUTURE FULL-TIME EMPLOYEE
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Cancer Risk (mg/kg)			RGOs for Target Hazard Quotient (mg/kg)		
	1E-6	1E-5	1E-4	0.1	1	10
Benzo(a)pyrene	-(1)	-	-	NA(2)	NA	NA
Antimony	NA	NA	NA	-	-	-
Arsenic	1.2	12	120	-	-	-
Beryllium	0.18	1.8	18	140	1,400	14,000
Chromium (VI)	NA	NA	NA	140	1,400	14,000
Iron	NA	NA	NA	46,600	466,000	4,660,000
Thalliurn	NA	NA	NA	-	-	-

1 Concentration of contaminant at site results in a cancer risk less than 1E-6 or Hazard Index less than 0.1.

2 NA - Not applicable. No cancer slope factor or Reference Dose for this chemical.

TABLE 8-12

GROUNDWATER COCs THAT EXCEED MCLs OR STATE GROUNDWATER STANDARDS
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Chemical of Concern	NC Class GA Standard (µg/L)	Federal MCL (µg/L)
Benzene	1	5
Chlorobenzene	50	100
Chloroform	0.19	100
1,2-Dichloroethane	0.38	5
cis-1,2-Dichloroethene	70	70
1,2-Dichloropropane	0.56	5
Ethylbenzene	29	700
2-Hexanone	DL(1)	NS(2)
4-Methyl-2-pentanone	DL	NS
Tetrachloroethene	0.7	5
Trichloroethene	2.8	5
Vinyl chloride	0.015	2
Bis(2-chloroethyl)ether	DL	NS
Bis(2-ethylhexyl)phthalate	3	6
2,4-Dimethylphenol	DL	NS
2-Methylnaphthalene	DL	NS
2-Methylphenol	DL	NS
4-Methylphenol	DL	NS
Naphthalene	21	NS
Nitrobenzene	DL	NS
Aldrin	DL	NS
alpha-BHC	DL	NS
4,4'-DDE	DL	NS
4,4'-DDT	DL	NS
Endosulfan I	DL	NS
Endosulfan II	DL	NS
Endrin aldehyde	DL	NS
Heptachlor epoxide	0.004	0.2
Arsenic	50	50
Cadmium	5	5
Iron	300	300(3)
Manganese	50	50(3)

1 DL - Detection limit. Any detection is considered an exceedance of state standard.

2 NS - No standard.

3 Secondary MCL.

TABLE 8-13

REMEDIAL OPTIONS FOR SOIL - PROTECTION OF GROUNDWATER
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Chemical of Concern	NC S-3 Target Concentration
Organics (µg/kg)	
Benzene	5.6
2-Butanone	687
Chlorobenzene	432
Chloroform	0.96
1,2-Dichloroethane	1.7
cis-1,2-Dichloroethene	350
trans- 1,2-Dichloroethene	400
trans-1.3-Dichloropropene	1.2
Ethylbenzene	343
Methylene chloride	21.9
Tetrachloroethene	5.9
Toluene	8,111
1,1,1-Trichloroethane	1,484
Trichloroethene	20.7
Vinyl chloride	0.09
2,4-Dimethylphenol	1,194
2-Methylnaphthalene	3,235
4-Methylphenol	205
Naphthalene	925
Dieldrin	1.8
Heptachlor epoxide	6.7
Metals (mg/kg)	
Cadmium	2.7
Iron	151
Lead	270
Manganese	65.2
Nickel	56.4
Silver	0.22

wetlands are adjacent to Slocum Creek and Turkey Gut and are classified as Coastal Plain Small Stream Swamp areas..

The maximum surface water and sediment exposure point concentrations and estimated dose received by receptors were compared to benchmark values that are protective of ecological receptors. The maximum and mean (i.e., average of positive detections) soil exposure point concentrationsand estimate dose received by receptors were also compared to benchmark values that are protective of ecological receptors. Contaminants exceeding these values were regarded as ecological COPCs, and their toxicological properties were summarized. The relative potential risks that each of these COPCs might pose to ecological receptors inhabiting the area near OU2 were then evaluated in the form of Hazard Quotients.

Only a few COPCs were identified in Turkey Gut surface waters, and their HQs were relatively low. The organic COPCs were only detected at one location. The inorganic COPCs were also detected above benchmark values in the most upstream sample. Potential risks to aquatic receptors from surface water contamination alone are expected to be minimal. In Turkey Gut sediments, only a few COPCs were identified, and related HQswere relatively low. Most of the benchmark values were only exceeded at onelocation. The concentrations at these locations were below or close to ER-M levels. The pesticide COPCs identified may be a concern because of theirtendency to persist and bioaccumulate. However, these pesticides are no longer in use and were not COPCs in OU2 site soil. In addition, pesticides were Also detected in background soil samples collected at the Air Station (not only at OU2). Some of the detections do not appear to be solely related to activities at OU2.

Only two COPCs (4,4'-DDD and copper) were identified in Slocum Creek surface water. The COPCs were detected at similar concentrations in all samples collected from Slocum Creek, including the location upstream of OU2. Therefore, these detections do not appear to be solely related to activities at OU2, and OU2 may not be only contributor of these COPCs. Only a few COPCs were identified in Slocum Creek sediment, and the concentrations that exceeded benchmark values were only detected at one location. The exceedances of benchmarks are considered to be isolated occurrences and are not believed to be a significant concernSlocum Creek has been designated as a separate operable unit that will be evaluated at a later date.

Based on maximum contaminant concentrations, the benchmark values for the soil COPCs were only exceeded at six sample locations, suggesting a lack of widespread contamination. In addition, some of the benchmark values were based on human health or agricultural scenarios. Based on average concentrations and ecologically-based benchmarks, Aroclor-1260 was the only COPC. This chemical was only detected in one surface soil sample. As a result, risks to terrestrial receptors from contamination in OU2 soils appear to be insignificant.

The results of the ecological assessment indicate that some contaminants are present in concentrations that result in HQs indicative of potential risk. However, risks impled by these exceedances are mitigated by several factors.

- Only a few COPCs were identified at OU2.

- HQs for surface water, sediment, and soil COPCs based on comparisons with benchmark toxicity values were relative low.

- Detections of any of the COPCs were isolated or may not be entirely site related. Exceedances of benchmark toxicity values in Slocum Creek and Turkey Gut were limited to single locations or exceedances occurred at locations upstream of OU2. Based on maximum concentrations, soil benchmark toxicity values were only exceeded at six widely spaced locations. Based on average concentrations, the benchmark values were only exceeded at one location.

- Most of the contaminants posing potential risk from exposure to Turkey Gut sediment were also detected in background soil samples collected at the Air Station (not only at OU2).

- Risk numbers generated from the food chain models were based on scattered detections of chemicals. The models conservatively assumed that the receptors would be exposed to the detections their entire life. In addition, the risk values were mainly driven by uncertainty in toxicity data, rather than actual risk.

9.0 DESCRIPTION OF ALTERNATIVES

The OU2 FS presents-the results of the detailed analysis of four potential remedial action alternatives for groundwater and six potential remedial action alternatives for soil. These alternatives have been developed to provide a range of remedial actions for the site. This section of the ROD summarizes the alternatives that are described in the FS.

The following alternatives have been developed for groundwater at OU2.

- Groundwater Alternative 1 - No Action.
- Groundwater Alternative 2 - Natural Attenuation and Institutional Controls.
- Groundwater Alternative 3 - Groundwater Extraction; Treatment and Discharge to Slocum Creek or Pretreatment and Discharge to Sewage Treatment Plant (STP); Institutional Controls.
- Groundwater Alternative 4 - Air Sparging/Soil Vapor Extraction; Institutional Controls.

The following alternatives have been developed for soil and buried waste at OU2:

- Soil Alternative 1 - No Action
- Soil Alternative 2 - Institutional Controls
- Soil Alternative 3 - Soil Vapor Extraction; Institutional Controls
- Soil Alternative 4 - Excavation, Consolidation, and Containment; Institutional Controls
- Soil Alternative 5 - Excavation, Treatment, and Onsite Disposal; Institutional Controls
- Soil Alternative 6 - Excavation and Offsite Disposal; Institutional Controls

The remedial action alternatives for soil and groundwater were developed to address contaminated groundwater and soil and various areas of concerns (or soil hot spots) within OU2. The areas of concern were identified by comparing media-specific contaminant concentrations detected at OU2 to media-specific remediation goals developed in the FS. The areas of concern and soil hot spots for OU2 include:

- Contaminated soil above risk-based levels
- Contaminated soil above performance standards based on protection of groundwater (i.e., S-3 target concentration RGOs)

- Contaminated groundwater above performance standards (i.e., MCLs and state groundwater standards)

Figures 6-1 and 6-2 showed the locations where organic and inorganic constituents, respectively, in soil exceed RGOs based on protection of groundwater. Figure 6-3 showed the surficial aquifer well locations where contaminant concentrations exceed MCLs or state groundwater standards. These standards are exceeded in most of the surficial aquifer beneath OU2. Only three locations had contaminant concentrations that resulted in an HI above 1.0 for the future hypothetical residential scenario; however, these are not presented on a separate map because future residential use of OU2 is extremely unlikely. Table 9-1 summarizes the remedial objectives for soil and groundwater. A concise description of how each alternative will address contamination at OU2 as well as estimated cost follows.

9.1 GROUNDWATER ALTERNATIVES

9.1.1 Groundwater Alternative 1 - No Action

The No Action Alternative is required under CERCLA to establish a baseline for comparison. Under this alternative, no actions will be performed to contain, remove, or treat groundwater contaminated above performance standards. There are no capital or annual operation and maintenance (O&M) costs associated with this alternative.

9.1.2 Groundwater Alternative 2 - Natural Attenuation and Institutional Controls

Under Groundwater Alternative 2, Institutional controls will be imposed to eliminate or reduce pathways of exposure to contaminants at OU2. In addition a monitoring program will be developed to confirm the effectiveness of natural attenuation.

Natural attenuation refers to inherent processes that affect the rate of migration and concentration of chemicals in groundwater. The most important processes are biodegradation, advection, hydrodynamic dispersion, dilution from recharge, sorption, and volatilization.

The institutional controls would involve groundwater and aquifer use restrictions. All groundwater beneath OU2 would be restricted from any use, other than monitoring purposes. No wells would be installed, except for monitoring wells constructed pursuant to 15A NCAC 2C.0108 as determined by NCDENR.

TABLE 9-1

REMEDIAL ACTION OBJECTIVES
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Objective	Location	Estimated Volume	Rationale
Protect groundwater from leachable organics	Are 1 (locations B1, B2, B3/B4, B5/B6, 10B01, 10B02, 10B03, 10B04, 10SISB1, 10SISB3, and 10SISB4)	6,200 CY	Organic compounds above performance standards.
	Area 2 (locations 10SB-E63 and 10TP15)	260 CY	Organic compounds above performance standards.
	Area 3A (location 10TP18)	560 CY	Organic compounds above performance standards.
	Area 3B (locations OU2SB05, OU2SB07, and OU2SB08)	370 CY	Organic compounds above performance standards.
	Area 4 (locations 10SB-B5, 10TP02, and 10TP14	370 CY	Organic compounds above performance standards.
	Other areas (isolated locations - see Figure 6-1)	930 CY	Organic compounds above performance standards.
Protect groundwater from leachable inorganics	Isolated areas (see Figure 6-2)	2,700 CY	Metals above performance standards.
Groundwater (surficial aquifer)	Entire site	220 Million Gallons	Organics and metals above performance standards.

Monitoring would consist of sampling of groundwater and surface water and sediment in Slocum Creek and Turkey Gut. The objectives of monitoring would be to determine the effectiveness of the remedy and to confirm that contaminants are not migrating off site.

The estimated net present worth of this alternative is $729,000 over 30 years, with no capital cost and an annual operation and maintenance (O&M) cost of $43,800 per year.

9.1.3 Groundwater Alternative 3 - Groundwater Extraction; Treatment and Discharge to Slocum Creek or Pretreatment and Discharge to Sewage Treatment Plant (STP); Institutional Controls

9.1.3.1 Groundwater Alternative 3A - Groundwater Extraction; Treatment and Discharge to Slocum Creek; Institutional Controls

Groundwater Alternative 3A will involve the same institutional controls and media monitoring as discussed in Groundwater Alternative 2. In addition, a groundwater extraction and treatment system would be installed to contain the contaminants in the surficial aquifer by restricting lateral and vertical migration of the groundwater.

The groundwater extraction system would consist of wells installed in the surficial aquifer near the boundaries of Slocum Creek and Turkey Gut. Groundwater extraction would continue until the performance standards for each of the contaminants of concern are achieved.

The treatment of contaminated groundwater will involve physical and chemical treatment. The groundwater would be treated to levels that attain state surface water standards for Slocum Creek or NPDES discharge limits that would be established. The treated groundwater would be discharged directly to Slocum Creek.

The estimated time to implement this alternative is one to two years. Modeling studies have indicated that it would take approximately 60 years to attain most performance standards. The estimated net present worth of this alternative is $10.5 million over 30 years, with a capital cost of $4.3 million and an annual O&M cost of $395,000 per year.

9.1.3.2 Alternative 3B - Groundwater Extraction; Pretreatment and Discharge to STP; Institutional Controls

Groundwater Alternative 3B is similar to Groundwater Alternative 3A except that extracted groundwater would be pretreated and discharged to the STP instead of Slocum Creek. Pretreatment of extracted

groundwater would be less rigorous but would include physical and chemical treatment. The groundwater would be pretreated to levels that meet STP influent requirements, which are the same as the STP effluent discharge limits. The pretreated groundwater would be discharged to the STP.

The estimated time to implement this alternative is one to two years. Modeling studies have indicated that it would take approximately 60 years to attain most performance standards. The estimated net present worth of this alternative is $5.3 million over 30 years, with a capital cost of $2.2 million and an annual O&M cost of $198,000 per year.

9.1.4 Groundwater Alternative 4 - Air Sparging/Soil Vapor Extraction: Institutional Controls

Groundwater Alternative 4 would involve the same institutional controls and media monitoring as discussed in Groundwater Alternative 2. In addition, an in-situ groundwater treatment system would be installed to remove volatile organic compounds (VOCs) from the surficial aquifer.

Groundwater contaminated with VOCs would be treated in-situ using air sparging/soil vapor extraction (AS/SVE) technologies. The AS/SVE system would consist of a series of injection wells screened near the bottom of the aquifer and a series of extraction wells screened in the vadose zone above the water table. Extracted air, which would contain the VOCs removed from the groundwater, would be treated, if necessary, prior to discharge to the atmosphere.

The estimated time to implement this alternative is less than one year. Modeling studies have indicated that it would take approximately 11 years to attain performance standards for VOCs. It would take approximately 60 years to attain performance standards for most other contaminants. The estimated net present worth of this alternative is $4.5 million over 30 years, with a capital cost of $2.1 million and an annual O&M cost of $248,000 per year.

9.2 SOIL ALTERNATIVES

9.2.1 Soil Alternative 1 - No Action

The No Action Alternative is required under CERCLA to establish a baseline for comparison. Under this alternative, no actions would be taken to contain, remove, or treat soil contaminated above performance standards. There are no capital or annual O&M costs associated with this alternative.

9.2.2 Soil Alternative 2 - Institutional Controls

Under Soil Alternative 2, institutional controls would be imposed to eliminate or reduce pathways of exposure to soil contaminants and buried waste at OU2. In addition, a monitoring program would be implemented.

The institutional controls would involve land use restrictions and designation of the area as a restricted or limited use industrial area. The land use at OU2 would be restricted to industrial uses only. Prohibited land uses include, but would not be limited to, residences, schools, playgrounds, day cares, and retirement centers. No intrusive activities (e.g., excavation of ground surface or insertion of objects into the ground surface, except for monitoring purposes) would be allowed, unless prior approval has been obtained from USEPA and NCDENR. Site access would be restricted to authorized personnel only. Site access controls would include the installation of a fence around the polishing ponds, repair and replacement of existing fencing around the OU2 landfill, and the placement of warning signs along the fence, Slocum Creek, and Turkey Gut to warn all unauthorized persons to stay out.

Monitoring would consist of sampling of groundwater and surface water and sediment in Slocum Creek and Turkey Gut. The objectives of monitoring would be to confirm that contaminants are not migrating to groundwater or surface water.

The estimated net present worth of this alternative is $800,000 over 30 years, with a capital cost of $70,900 and an annual O&M cost of $43,800 per year.

9.2.3 Soil Alternative 3 - Soil Vapor Extraction; Institutional Controls

Soil Alternative 3 would involve the same institutional controls and media monitoring as discussed in Soil Alternative 2. In addition, soil containing VOCs at concentrations greater than the performance standards and that constitute a secondary source area would be treated in-situ using soil vapor extraction (SVE).

The SVE systems at the secondary source areas would use wells screened in the vadose zone for capture and extraction of VOCs from the soil. Extracted air, contaminated with VOCs, would be treated using an aboveground off-gas treatment system, if required. Air monitoring and soil sampling would be implemented to evaluate the effectiveness of treatment.

The estimated time to implement this alternative is less than one year. The estimated net present worth of this alternative is $1.5 million over 30 years, with a capital cost of $720,000 and an annual O&M cost of $91,400 per year.

9.2.4 Soil Alternative 4 - Excavation, Consolidation, and Containment; Institutional Controls

Soil Alternative 4 includes the same institutional controls and media monitoring as Soil Alternative 2. In addition, soil contaminated at levels higher than performance standards would be excavated, consolidated, and capped using a multilayer cap to reduce the migration of soil contaminants due to infiltration, surface water runoff, and wind erosion.

Soil with concentrations higher than the performance standards for various organic and inorganic contaminants would be excavated and placed in a consolidation area. To minimize excavation and transportation requirements, the consolidation area would be the largest single area of contaminated soil. This area is located approximately 150 feet south of the former sludge application area (Site 44A) in the vicinity of the former sludge impoundments.

The consolidation area would be covered with a multi-layer cap to contain the contaminated soil to minimize infiltration and erosion. The consolidation area would be closed as a landfill in accordance with the requirements of RCRA Subtitle C and 15A NCAC 13A. The cap would cover an area of approximately 0.5 acre.

The estimated time to implement this alternative is less than one year. The estimated net present worth of this alternative is $1.9 million over 30 years, with a capital cost of $1.2 million and an annual O&M cost of $43,800 per year.

9.2.5 Soil Alternative 5 - Excavation, Treatment and Onsite Disposal; Institutional Controls

Soil Alternative 5 includes the same institutional controls and media monitoring as Soil Alternative 2. In addition, soil contaminated at levels higher than the performance standards would be excavated and treated, based on the contaminants of concern, to immobilize and/or remove contaminants. Metals contamination in the soil would be immobilized using chemical fixation/solidification technologies that bind the chemical to a solid matrix which is resistant to leaching. Soil contaminated with volatile organics would be treated using thermal desorption technologies. These technologies use indirect or direct heating of the soil to thermally desorb or volatilize organic contaminants. Off-gas from the process would be treated through a secondary treatment system if needed.

Soil that exceeds performance standards for volatile organic contaminants and soil that exceeds performance standards for inorganic and nonvolatile organic contaminants would require excavation and treatment. The soil that contains inorganics and nonvolatile organics would be treated using a cement-based solidification process. The solidified soil would be placed in a consolidation area and capped. The

cap design is the same as for Soil Alternatives 4. Soil that contains volatile organics would be treated using low-temperature thermal desorption. The thermally treated soil would be used as general backfill.

The estimated time to implement this alternative is one year. The estimated net present worth of this alternative is $5.4 million over 30 years, with a capital cost of $4.7 million and an annual O&M cost of $43,800 per year.

9.2.6 Soil Alternative 6 - Excavation and Offsite Disposal; Institutional Controls

Soil Alternative 6 includes the same institutional controls and media monitoring as Soil Alternative 2. In addition, soil contaminated at levels higher than the performance standards would be excavated and disposed off site.

Soil contaminated at levels higher than the performance standards would be excavated and hauled to an offsite landfill. Based on previous testing, the contaminated soil would not be classified as a RCRA hazardous waste. Clean fill would be placed and compacted in the excavated areas. Topsoil would be placed on top of the compacted fill, and the areas would be revegetated.

The estimated time to implement this alternative is one year. The estimated net present worth of this alternative is $3.5 million over 30 years, with a capital cost of $2.8 million and an annual O&M cost of $43,800 per year.

9.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

The remedial action for OU2, under CERCLA Section 121(d), must comply with Federal and state environmental laws that are either applicable or relevant and appropriate. Applicable requirements are those standards, criteria, or limitations promulgated under Federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those that, while not applicable, still address problems or situations sufficiently similar to those encountered on site that their use is well-suited to a particular site. To-be-considered (TBC) criteria are nonpromulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary level of cleanup to protect health or the environment. While TBCs do not have the status of ARARs, the approach to determining whether a remedial action is protective of human health and the environment involves considering TBCs along with ARARs.

The affected groundwater in the aquifers beneath OU2 has been classified by North Carolina and USEPA and Class GA and Class 2A, a potential source of drinking water, respectively. It is the policy of North

Carolina and USEPA that groundwater resources be protected and restored to their beneficial uses. North Carolina groundwater classification is defined in 15A NCAC 2L. A complete definition of the USEPA groundwater classification is provided in the Guidelines for Groundwater Classification under the EPA Groundwater Protection Strategy, Final Draft, December 1986.

The site has sources of groundwater contamination that must be addressed in order to utilize Monitored Natural Attenuation as the selected remedy for groundwater. Four hot spots have been identified as potential sources of groundwater contamination. The site itself is a landfill; therefore, all possible sources cannot be identified. However, the natural attenuation monitoring plan will serve as a control for any other potential releases from the site. If other sources are identified during the course of the monitored natural attenuation, they will be addressed in a manner that satisfies the State ARAR, 15A NCAC 2L.0106(f)(3) and (f)(4).

Contaminant-specific ARARs are health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. Examples of chemical-specific ARARs include the MCLs specified under the Safe Drinking Water Act and North Carolina groundwater standards. Since there are usually numerous chemicals of concern for any remedial site, various numerical quantity requirements can be ARARs. Table 9-2 lists potential contaminant-specific ARARs for OU2.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in specific locations. Examples of location-specific ARARs include state and Federal requirements to protect floodplains, critical habitats, and wetlands and solid and hazardous waste facility siting criteria. Table 9-3 summarizes the potential location-specific ARARs for OU2.

Action-specific ARARs are technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy. Since there are usually several alternative actions for any remedial site, very different requirements can be ARARs. Table 9-4 lists potential action-specific ARARs and TBCs for OU2.

TABLE 9-2

POTENTIAL CONTAMINANT-SPECIFIC ARARs
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Citation	Description	Category
Safe Drinking Water Act		
40 CFR 141 - National Primary Drinking Water Standards	Establishes MCLs which are health-based standards for public water systems.	R&A
	Establishes MCLGs set at levels of no known or anticipated adverse health effects.	R&A
Clean Water Act		
40 CFR 131 - Ambient Water Quality Standards	Suggested ambient standards for the protection of human health and aquatic life.	R&A
Clean Air Act		
40 CFR 50 - National Primary and Secondary Ambient Air Quality Standards	Establishes standards for ambient air quality to protect public health.	R&A
Resource Conservation and Recovery Act		
40 CFR 264, Subpart F - Releases from Solid Waste Management Units	Establishes groundwater protection standards.	A
State of North Carolina Regulations		
15A NCAC 2D .0400 - Ambient Air Quality Standards	Establishes standards for ambient air quality to protect human health.	R&A
15A NCAC 2B - Surface Water Classifications and Standards	Establishes water quality standards for all waters of the state	A
15A NCAC 2L - Groundwater Quality Standards	Establishes minimum water quality standards for groundwater.	A
15A NCAC 18 - Water Quality Standards	Establishes MCLs for drinking water.	R&A
(Draft) North Carolina Risk Analysis Framework	Establishes cleanup levels for in soil and groundwater.	TBC

A - Applicable
R&A- Relevant and appropriate
TBC- To-Be-Considered Criteria

TABLE 9-3

POTENTIAL LOCATION-SPECIFIC ARARs
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Citation	Description	Category
Executive Order 11990 Wetlands Protection Policy	Requires Federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to enhance their natural and beneficial values. Wetlands are located along Slocum Creek and Turkey Gut.	TBC
Endangered Species Act (16 USC 1531/40 CFR 502)	Requires Federal agencies to ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat.	R&A
Fish and Wildlife Coordination Act (16 USC 661)	Requires Federal agencies to consult with appropriate state agency for the modification of any body of water.	R&A
Fish and Wildlife Improvement Act (16 USC 742a) and Fish and Wildlife Conservation Act (16 USC 2901)	Provide for consideration of the impacts on wetlands and protected habitats. Wetlands are located along Slocum Creek and Turkey Gut.	R&A
EPA Groundwater Protection Strategy	This policy is to protect groundwater for its highest usage.	TBC
North Carolina Coastal Area Management Act (15A NCAC 7)	Provides guidelines for areas of environmental concern, including estuarine waters and estuarine shorelines.	R&A

R&A - Relevant and Appropriate
TBC - To-be-considered Criteria

TABLE 9-4

POTENTIAL ACTION-SPECIFIC ARARs
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Citation	Description	Category
Resource Conservation and Recovery Act		
40 CFR 261 - Identification and Listing of Hazardous Wastes	Characterization of hazardous wastes.	A
40 CFR 262 - Standards Applicable to Generators of Hazardous Waste	General requirements managing hazardous wastes and manifest requirements.	A
40 CFR 263 - Standards Applicable to Transporters of Hazardous Waste	Requirements for offsite transportation of hazardous waste.	A
40 CFR 264 - Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	Establishes minimum national standards that define acceptable management of hazardous waste.	A
40 CFR 268 - Land Disposal Restrictions	Certain classes of hazardous waste are restricted from land disposal without acceptable treatment.	A
Clean Water Act		
40 CFR 122 - National Pollutant Discharge Elimination System	Governs point source discharges to surface water.	R&A
Other Federal Acts and Requirements		
49 CFR 107 and 171-179 - Department of Transportation Rules for Hazardous Materials Transport	Regulates the offsite transportation of hazardous materials (including hazardous and solid waste).	A
29 CFR 1910,1926, and 1904 - Occupational Safety and Health Administration	Regulates occupational safety and health requirements for workers engaged in remedial activities.	A
State and North Carolina Regulations		
15A NCAC 13A -Solid Waste Management Regulations	Establishes standards for management of solid (nonhazardous) waste.	A
15A NCAC 13B - Hazardous Waste Management Regulations	Establishes standard for management of hazardous waste.	A
15A NCAC 213 and 2H - Water Pollution Control Regulations	Regulates wastewater discharged to surface water.	A
15A NCAC 2H - Stormwater Runoff Disposal	Regulates pollutants associated with stormwater runoff.	A
15A NCAC 4 - Erosion and Sedimentation Control	Establishes standards to control damage from land disturbing activities.	A

TABLE 9-4

POTENTIAL ACTION-SPECIFIC ARARs
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2

Citation	Description	Category
15A NCAC 2C - Well Construction Standards	Establishes criteria for design and installation of monitoring wells.	A
15A NCAC 2L.0106 - Corrective Action for Groundwater	Requirements for corrective action when groundwater has been degraded.	A
NCGS 130A - 310.8 - Recordation of Inactive Hazardous Substance or Waste Disposal Site	Requirements for filing notice of site with County Register of Deeds Office	A

A - Applicable
R&A - Relevant and appropriate
TBC - To-be-considered criteria

10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section of the ROD provides the basis for determining which alternative provides the best balance with respect to the statutory balancing criteria in CERCLA Section 121 (42 USC 9621) and in the NCP (40 CFR 300.430). The major objective of the FS was to develop, screen, and evaluate alternatives for remediation of groundwater and soil at OU2. A variety of technologies and alternatives were identified as candidates to remediate the contamination at OU2. These were screened based on their feasibility with respect to the contaminants present and site characteristics. After the initial screening, the remaining alternatives/technologies were combined into potential remedial alternative and evaluated in detail. The remedial alternative was selected from the screening process using the following nine evaluation criteria:

- Overall protection of human health and the environment.
- Compliance with applicable and/or relevant Federal or state public health or environmental standards.
- Long-term effectiveness and permanence.
- Reduction of toxicity, mobility, or volume through treatment.
- Short-term effectiveness
- Implementability
- Cost
- USEPA/State acceptance
- Community acceptance

A glossary of the evaluation criteria is provided in Table 10-1.

The NCP categorizes the nine criteria into three groups:

- Threshold Criteria - Overall protection of human health and the environment and compliance with ARARs (or invoking a waiver) are threshold criteria that must be satisfied in order for an alternative to be eligible for selection.

- Primary Balancing Criteria - Long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost are primary balancing factors used to weigh major trade-offs among alternative hazardous waste management strategies.

- Modifying Criteria - USEPA/State and community acceptance are modifying criteria that are formally taken into account after public comments are received on the proposed plan and incorporated in the ROD.

TABLE 10-1
GLOSSARY OF EVALUATION CRITERIA

- **Overall Protection of Human Health and Environment** - Addresses whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with ARARs - Addresses whether or not an alternative will meet all of the applicable or relevant and appropriate requirements (ARARs), other criteria to be considered (TBCs), or other Federal and state environmental statutes and/or provide grounds for invoking a waiver.

- **Long-term Effectiveness and Permanence** - Refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

- Reduction of Toxicity, Mobility, or Volume through Treatment - Addresses the anticipated performance of the treatment options that may be employed in an alternative.

- **Short-term Effectiveness** - Refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

- **Implementability** - Addresses the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the chosen solution.

- Cost - Includes capital and operation and maintenance costs. For comparative purposes, provides present-worth values.

- **USEPA/State Acceptance** - Evaluates the technical and administrative issues and concerns that the USEPA and the State of North Carolina have regarding each of the alternatives. This criterion is addressed in the ROD once comments on the RI/FS report and the Proposed Plan have been received.

- **Community Acceptance** - Evaluates the issues and concerns the public may have regarding each of the alternatives. This criterion is addressed in the ROD once comments on the RI/FS report and Proposed Plan have been received.

The selected alternative must meet the threshold criteria and comply with all ARARs or be granted a waiver for compliance with ARARs. Any alternative that does not satisfy both of these requirements is not eligible for selection. The Primary Balancing Criteria are the technical criteria upon which the detailed analysis of alternatives is primarily based. The final two criteria, known as Modifying Criteria, assess the acceptance of the alternative. The following analysis summarizes the evaluation of alternatives for remediating groundwater and soil at OU2 under each criterion. Each groundwater alternative and each soil alternative is compared for achievement of a specific criterion.

Tables 10-2 and 10-3 present summaries of the detailed analysis for groundwater and soil, respectively.

10.1 THRESHOLD CRITERIA

All alternatives considered for selection must comply with the threshold criteria of overall protection of human health and the environment and compliance with ARARs.

10.1.1 Overall Protection of Human Health and the Environment

This criterion evaluates, overall, the degree of protectiveness afforded to human health and the environment. It assess the overall adequacy of each alternative. For all alternatives, the waste buried in the landfill would remain and may act as a continuing source of contamination that could not feasibly be removed.

10.1.1.1 Groundwater Alternatives

Groundwater concentrations exceed state standards and pose an unacceptable risk to human health from ingestion under a hypothetical future residential exposure scenario.

Groundwater Alternative 1 does not reduce potential risks to human health and the environment; therefore, this alternative is not protective and will no longer be considered in the discussion.

Groundwater Alternatives 2, 3, and 4 would employ institutional controls, with monitoring, to reduce the unacceptable risks to human health from ingestion of groundwater. The sampling and analysis program would confirm that contaminants are not migrating from the site, and institutional controls would restrict land use and groundwater use and limit she access.

Groundwater Alternative 2 relies on natural attenuation processes to reduce organic and inorganic contaminant concentrations that exceed state groundwater standards and pose an unacceptable risk to

TABLE 10-2

SUMMARY OF EVALUATION OF GROUNDWATER ALTERNATIVES
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Evaluation Criteria	Groundwater Alternative 1: No Action	Groundwater Alternative 2: Natural Attenuation, institutional Controls, and Monitoring
Threshold Criteria		
Overall Protection of Human Health and Environment	No reduction in potential risks except through natural attenuation of the groundwater.	Natural attenuation, institutional controls, and monitoring will reduce potential risks to human health and the environment under realistic exposure scenarios.
Compliance with ARARs Chemical-Specific ARARs	No active effort to reduce contaminant levels to below federal or state ARARs.	Would comply with state groundwater regulations.
Location-Specific ARARs	Not applicable.	Not applicable.
Action-Specific ARARs	Not applicable.	Not applicable.
Primary Balancing Criteria		
Long-Term Effectiveness and Permanence	Allows risk to remain uncontrolled.	Monitoring and use restrictions provide adequate and reliable controls.
Reduction of Toxicity, Mobility, or Volume through Treatment	No Treatment.	No Treatment.
Short-Term Effectiveness	Not applicable, no short term impacts/concerns at site.	Minor risks to workers involved in monitoring of groundwater, surface water, and sediment. No impacts to community upon implementation of institutional controls. Less than one year to implement.
Implementability	Nothing to implement. No monitoring to show effectiveness.	Enforcement of institutional controls at military site is proven to be effective and reliable. Monitoring will demonstrate effectiveness.
Costs: Capital O&M- NPW	 $0 $0 $0	 $0 $43,800 $729,000
Modifying Criteria		
ESEPA/State Acceptance	Not acceptable to USEPA and NCDENR.	Acceptable to USEPA and NCDENR.

TABLE 10-2

SUMMARY OF EVALUATION OF GROUNDWATER ALTERNATIVES
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2

Evaluation Criteria	Groundwater Alternative 3: Groundwater Extraction; Treatment and Discharge to Slocum Creek or Pretreatment and Discharge to STP; Institutional Controls	Groundwater Alternative 4: Air Sparging/Soil Vapor Extraction; Institutional Controls
Threshold Criteria		
Overall Protection of Human Health and Environment	Institutional controls and monitoring provide some protection of human health and the environment. Groundwater containment using extraction wells provides some additional protection.	Institutional controls and monitoring provide some protection of human health and the environment. Groundwater treatment using AS/SVE provides some additional protection.
Compliance with ARARs Chemical-Specific ARARs	Would comply with state groundwater regulations.	Would comply with state groundwater regulations.
Location-Specific ARARs	Can be designed to attain ARARs that apply.	Can be designed to attain ARARs that apply.
Action-Specific ARARs	Can be designed to attain ARARs that apply.	Can be designed to attain ARARs that apply.
Primary Balancing Criteria		
Long-Term Effectiveness and Permanence	Removal of contaminated groundwater will reduce site hazards to potential land users. Institutional controls will further limit risks.	In-situ treatment of contaminated groundwater will reduce site hazards to potential land users. Institutional controls will further limit risks.
Reduction of Toxicity, Mobility, or Volume through Treatment	The Volume and toxicity of contaminated groundwater would be reduced through active remediation. Residuals created that require disposal.	Active remediation will reduce the volume and toxicity of contaminated groundwater. Residuals generated that require disposal.
Short-Term Effectiveness	Proper system management will limit short term hazards associated with contaminated media treatment. Groundwater RGOs achieved in about 60 years. One to two years to implement.	Proper system management will limit short term hazards associated with contaminated media treatment. Groundwater RGOs achieved in about 60 years. Two to three years to implement.
Implementability	Alternative consists of common treatment practices, which are readily available/implementable. Monitoring will demonstrate effectiveness.	Alternative consists of common treatment practices, which are readily available/implementable. Monitoring will demonstrate effectiveness.
Costs: Capital O&M NPW	<u>Slocum Creek</u> <u>STP</u> $4,340,000 $2,181,000 $395,000 $198,000 $10,466,000 $5,278,000	 $2,089,000 $248,000 $4,514,000
Modifying Criteria		
ESEPA/State Acceptance	Acceptable to USEPA and NCDENR.	Acceptable to USEPA and NCDENR.

TABLE 10-3

SUMMARY OF EVALUATION OF SOIL ALTERNATIVES
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 4

Evaluation Criteria	Soil Alternative 1: No Action	Soil Alternative 2: Institutional Controls and	Soil Alternative 3: Soil Vapor Extraction; Institutional Controls
Threshold Criteria			
Overall Protection of Human health and the environment	No reduction in potential risks.	Institutional controls and monitoring will prevent unacceptable risks to human health by eliminating exposure to contaminants.	Institutional controls and monitoring will prevent unacceptable risks to human health by eliminating exposure to contaminants. Treatment of major secondary source areas will provide protection of groundwater and surface water.
Compliance with ARARs Chemical-Specific ARARs	No active effort to reduce contaminant levels to attain ARARs.	No active effort to reduce contaminant levels to attain ARARs.	Would only comply with S-3 target concentrations for volatile organics.
Location-Specific ARARs	Not applicable.	Not applicable.	Can be designed to attain ARARs that apply.
Action-Specific ARARs	Not applicable.	Not applicable.	Can be designed to attain ARARs that apply.
Primary Balancing Criteria			
Long- Term Effectiveness and Performance	Allows risks to remain uncontrolled.	Monitoring and use restrictions provide adequate and reliable controls.	Removal of volatile organics from secondary source areas will reduce risks to the environment. Monitoring and use restrictions provide adequate and reliable controls.
Reduction of Toxicity, Mobility, and volume Through Treatment	No Treatment.	No Treatment.	Toxicity reduced by removal of volatile organics from major secondary sources areas. No reduction of mobility or volume. Residuals created that require disposal.

TABLE 10-3

SUMMARY OF EVALUATION OF SOIL ALTERNATIVES
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 4

Evaluation Criteria	Soil Alternative 1: No Action	Soil Alternative 2: Institutional controls and Monitoring	Soil Alternative 3: Soil Vapor Extraction; Institutional Control
Short-Term Effectiveness	Not applicable. No short-term impacts or concerns.	Minor risks to workers involved in installation of fencing and warning signs and monitoring of groundwater, surface water, and sediment. No impacts to community or environment. Less than one year to implement.	Proper system management will limit short-term hazards associated with contaminated media treatment. Minor risks to workers involved in installation of fencing and warning signs and monitoring of groundwater, surface water, and sediment. No impacts to community or environment. Potential risks from air emissions can be adequately controlled. SVE systems are expected to operate for one to two years.
Implementability	Nothing to implement. No monitoring to show effectiveness.	Alternative is readily implementable.	Alternative consists of common treatment practices, which are readily available and implementable. Treatability study may be necessary.
Costs:			
Capital	$0	$70,900	$720,000
O&M	$0	$43,800	$91,400
NPW	$0	$800,000	$1,538,000
Modifying Criteria			
USEPA/State Acceptance	Not acceptable to USEPA or NCDENR.	Not acceptable to USEPA and NCDENR.	Acceptable to USEPA and NCDENR.

TABLE 10-3

**SUMMARY OF EVALUATION OF SOIL ALTERNATIVES
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 3 OF 4**

Evaluation Criteria	Soil Alternative 4: Excavation, Consolidation, and Containment; Institutional Controls	Soil Alternative 5: Excavation, Treatment, and Onsite Disposal; Institutional Controls	Soil Alternative 6: Excavation and Offsite Disposal; Institutional Controls
Threshold Criteria			
Overall Protection of Human health and the Environment	Institutional controls and monitoring will reduce potential risks to human health and the environment. Consolidation and containment of all secondary source areas will provide additional protection of groundwater and surface water.	Institutional controls and monitoring will reduce potential risks to human health and the environment. Removal of volatile organics from and stabilization and capping of all secondary source areas will provide additional protection of groundwater and surface water.	Institutional controls and monitoring will reduce potential risks to human health and the environment. Removal of all secondary source areas will provide additional protection of groundwater and surface water.
Compliance with ARARs Chemical-Specific ARARs Location-Specific ARARs Action-Specific ARARs	Would comply with S-3 target concentration for volatile organics and metals. Can be designed to attain ARARs that apply. Can be designed to attain ARARs that apply.	Would comply with S-3 target concentration for volatile organics and metals. Can be designed to attain ARARs that apply. Can be designed to attain ARARs that apply.	Would comply with S-3 target concentration for volatile organics and metals Can be designed to attain ARARs that apply. Can be designed to attain ARARs that apply.
Primary Balancing Criteria			
Long-Term Effectiveness and Permanence	Containment of contaminants from all secondary source area will reduce risks to the environment. Monitoring and use restrictions provide adequate and reliable controls.	Treatment of contaminants from all secondary source area will reduce risks to the environment. Monitoring and use restrictions provide adequate and reliable controls.	Removal of all secondary source areas will reduce risks to the environment. Monitoring and use restrictions provide adequate and reliable controls.
Reduction of Toxicity, Mobility, and Volume Through Treatment	Mobility reduced by containment of all contaminants from secondary source areas beneath a cap. No reduction of toxicity or volume.	Toxicity reduced by removal of volatile organics from all secondary source areas. Residuals created that require disposal. Mobility reduced by solidification of secondary source areas contaminated with non-volatile organics and metals. Volume would increase.	No treatment.

TABLE 10-3

SUMMARY OF EVALUATION OF SOIL ALTERNATIVES
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 4 OF 4

Evaluation Criteria	Soil Alternative 4: Excavation, Consolidation, and Containment; Institutional Controls	Soil alternative 5: Excavation, Treatment, and Onsite Disposal; Institutional Controls	Soil Alternative 6: Excavation and Offsite Disposal; Institutional Controls
Short-Term Effectiveness	Proper system management will limit short-term hazards associated with containment of contaminated media. Minor risks to workers involved in installation of fence and warning signs and monitoring of groundwater, surface water, and sediment. No impacts to community or environment. Less than one year to implement.	Proper system management will limit short-term hazards associated with contaminated media treatment. Minor risks to workers involved in installation of fence and warning signs and monitoring groundwater, surface water, and sediment. No impacts to community or environment. Less than one year to implement.	Proper system management will limit short-term hazards associated with handling of contaminated media. Minor risks to workers involved in installation of fence and warning signs and monitoring of groundwater, surface water, and sediment. No impacts to community or environment. Less than one year to implement.
Implementability	Alternative consists of common remediation practices, which are readily available and implementable.	Alternative consists of common treatment and remediation practices, which are readily available and implementable. Treatability study may be required.	Alternative consists of remediation practices, which are readily available and implementable.
Costs:			
Captial	$1,214,000	$4,713,000	$2,808,000
O&M	$43,800	$43,800	$43,800
NPW	$1,943,000	$5,442,000	$3,537,000
Modifying Criteria			
USEPA/State Acceptance	**Acceptable to USEPA and NCDENR.**	**Acceptable to USEPA and NCDENR.**	**Acceptable to USEPA and NCDENR.**

human health from ingestion. Groundwater Alternatives 3 and 4 involve active groundwater remediation systems that provide additional protection of the environment by preventing migration of contaminated groundwater to surface water, which could result in exceedances of state surface water standards. Groundwater Alternative 3 would remove organics and inorganics. Groundwater Alternative 4 would remove mainly volatile organics.

10.1.1.2 Soil Alternatives

Soil concentrations exceed levels based on protection of groundwater and pose an unacceptable risk to human health under a hypothetical future residential exposure scenario.

Soil Alternative 1 does not reduce potential risks to human health and the environment; therefore, it is not protective and will no longer be considered in this discussion. Soil Alternative 2 does not reduce potential risks to the environment because soil concentrations would exceed levels based on protection of groundwater, therefore, it is not protective and will no longer be considered in this discussion.

Soil Alternatives 3, 4, 5, and 6 would employ institutional controls, with monitoring, to reduce risks to human health from exposure to contaminated soil and buried waste material. The sampling and analysis program would confirm that contaminants are not migrating to the environment. Institutional controls would restrict land use and groundwater use and limit site access.

Soil Alternatives 3 and 5 involve soil treatment that protects the environment by removing soil contaminants that could migrate to groundwater and surface water and cause an exceedance of state standards. Soil Alternatives 4 and 5 involve containment of untreated or solidified contaminated soil which protects the environment by reducing the potential for migration of contaminants to groundwater and surface water. Soil Alternative 6 involves removal and offsite disposal of soil which protects the environment by eliminating the potential for migration to groundwater and surface water.

10.1.2 Compliance with ARARs

10.1.2.1 Groundwater Alternatives

Groundwater Alternatives 2, 3, and 4 will meet all of their respective ARARs. Groundwater ARARs include North Carolina groundwater standards and MCLs that establish chemical-specific limits on certain contaminants in groundwater and community water systems, respectively.

Groundwater Alternative 2 would eventually comply with ARARs through natural attenuation, otherwise a waiver of state groundwater standards is needed or the surficial aquifer could be reclassified from drinking

water (Class GA) to either restricted designation (Class RS) or water supplies for purposes other than drinking (Class GC).

Groundwater Alternative 3 would actively remove organics and inorganics. Groundwater Alternative 4 would remove mainly volatile organics; other contaminants would be removed by natural attenuation.

Groundwater Alternatives 2, 3, and 4 would be able to meet all of the location- and action-specific ARARs that apply to them.

For all groundwater alternatives, waste buried in the landfill would continue to be a potential source of groundwater contamination. The volume of buried waste is substantially greater than the volume of soil "hot spot" soil that would be addressed under one of the remedial alternatives for soil.

10.1.2.2 Soil Alternatives

Soil Alternatives 3, 4. 5, and 6 would meet all of their respective ARARs. Soil ARARs include North Carolina S-3 target concentrations (TBC criteria) that establish chemical-specific limits on contaminants based on protection of groundwater. Soil Alternatives 3, 4, 5, and 6 would be able to meet all location- and action-specific ARARs, as noted in Table 10-3.

10.2 PRIMARY BALANCING CRITERIA

10.2.1 Long-Term Effectiveness and Permanence

The main concerns under this criterion are the reliability of controls over the residual risks associated with contaminants that remain at the site and the permanence of the effectiveness of each alternative. Although residual risks associated with environmental media will be minimal under realistic exposure scenarios, untreated waste (landfill waste) will remain at the site under all alternatives. Until such time that no residual risk remains at the site, all alternatives will require five-year reviews to ensure that adequate protection of human health and the environment is maintained.

Groundwater Alternative 3 is the most effective, because all contaminants would be actively removed from the surficial aquifer. Groundwater Alternative 4 is less effective than Alternative 3, because only volatile organics would be actively removed. Groundwater Alternative 2 is the least effective, because contamination would not be actively removed. However, natural attenuation processes would effectively remove contaminants not removed by active remediation processes. Groundwater Alternatives 2, 3, and 4 provide continued monitoring, aquifer use restrictions, and land use restrictions which are all adequate and reliable controls. The monitoring programs are used to determine that the alternatives remain effective.

Soil Alternative 6 is the most effective, because all contaminants that exceed RGOs would be removed from the site and be disposed off site. Soil Alternative 5 is less effective than Alternative 6, because only organic compounds would be removed by treatment; however, the mobility of the remaining contaminants would be reduced using solidification and capping. Soil Alternative 3 is less effective than Alternative 5 because only volatile (and some semivolatile) organic compounds would be removed. Soil Alternative 4 is the least effective, because contaminants would be contained beneath a cap rather than being removed. Soil Alternatives 3, 4, 5, and 6 provide continued monitoring, fencing, and land use restrictions which are all adequate and reliable controls. The containment, treatment, and removal components of these alternatives are well-proven technologies that would provide adequate performance.

Barring remediation of contamination to unrestricted exposure levels, any private ownership of the land in the future would be controlled under a restrictive covenant.

10.2.2 Reduction of Toxicity, Mobility, or Volume Through Treatment

The criterion addresses the reduction in toxicity, reduction in mobility, or reduction of volume of contaminants provided through treatment processes.

Groundwater Alternative 2 does not involve active treatment processes to reduce toxicity, mobility, or volume.

Groundwater Alternatives 3 and 4 use active groundwater treatment to reduce toxicity, mobility, or volume. Alternative 3 uses physical/chemical treatment following groundwater extraction, and Alternative 4 uses in-situ AS/SVE. Both of these alternatives satisfy the CERCLA statutory preference for treatment.

Soil Alternatives 4 and 6 do not involve active treatment processes to reduce toxicity, mobility, or volume.

Soil Alternative 3 uses soil vapor extraction to remove volatile organics, thereby reducing toxicity and mobility. Soil Alternative 5 uses thermal desorption to remove volatile organics, thereby reducing toxicity and mobility. This alternative also uses solidification to reduce mobility, however, there would be an increase in volume. Both of these alternative satisfy the CERCLA statutory preference for treatment.

10.2.3 Short-Term- Effectiveness

The main concern for this criterion would be potential effects to the remedial workers, community, and environment during implementation of the remedial action. An additional concern is the time for each alternative to achieve the remedial action objectives.

No risks to the community or environment are anticipated for any of the groundwater or soil alternatives. Groundwater Alternatives 3 and 4 create some risks to workers during installation of extraction wells, treatment plants, and the AS/SVE system. Soil Alternatives 3, 4, 5, and 6 also create risks to workers during excavation, handling, consolidation, and treatment of contaminated soils. All potential risks to workers can be adequately controlled.

The institutional controls component of all alternatives could be implemented in less than one year.

The time in which Groundwater Alternatives 2, 3, and 4 will achieve the remedial action objectives for surficial aquifer groundwater is estimated to be 11 years for organics and 60 years for metals. The time to achieve the performance standards cannot be accurately estimated because the contribution from the primary source of contamination (buried waste) is unknown. Evaluation of future monitoring results may allow for an estimate of the effect of landfill material on groundwater remediation times.

The SVE systems for Soil Alternative 3 are expected to achieve the performance standards in one to two years. For Soil Alternatives 4, 5, and 6, the excavation, consolidation, capping, treatment, and offsite disposal activities could be implemented in less than one year.

10.2.4 Implementability

The major concerns in the category consist of the ease of implementation, including availability of equipment and services, the technical complexity of the processes, and the ease of obtaining permits or approvals.

Groundwater Alternatives 2, 3, and 4 use conventional, well-demonstrated, and commercially available technologies that are reliable and readily implementable. For Groundwater Alternative 3, it may be more difficult to implement the discharge to Slocum Creek option. The treatment system for discharge to Slocum Creek would be more complex than for discharge to the sewage treatment plant.

Soil Alternatives 3, 4, 5, and 6 also use conventional, well-demonstrated, and commercially available technologies that are reliable and readily implementable. Soil Alternatives 3 and 5 present certain additional concerns because treatability studies would probably be required. Soil Alternatives 3, 4, 5, and 6 require verification of soil contamination volumes.

10.2.5 Cost

Cost details are provided in the FS and are summarized in Table 10-4.

TABLE 10-4

COST COMPARISON FOR ALTERNATIVES
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Alternative	Direct and Indirect Cost	Annual O&M Costs	Total Net Present Worth
Groundwater			
Alternative 1	None	None	None
Alternative 2	None	$43,800	$729,000
Alternative 3	$4,340,000[1] $2,181,000[2]	$395,000[1] $198,000[2]	$10,466,000[1] 45,278,000[2]
Alternative 4	$2,089,000	$248,000	$4,514,000
Soil			
Alternative 1	None	None	None
Alternative 2	$70,900	$43,800	$800,000
Alternative 3	$720,000	$91,400	$1,538,000
Alternative 4	$1,214,000	$43,800	$1,953,000
Alternative 5	$4,713,000	$43,800	$5,442,000
Alternative 6	$2,808,000	$43,800	$3,537,000

1 Discharge to Slocum Creek.
2 Discharge to Sewage Treatment Plant.

For the groundwater alternatives, Alternative 2 (natural attenuation) has the lowest present worth cost and Alternative 3 (extraction, treatment, and discharge to Slocum Creek) has the highest. The STP discharge option for Alternative 3 and Alternative 4 (AS/SVE) have similar costs. Alternative 3 with discharge to Slocum Creek is significantly more expensive because of the treatment plant construction and operation costs. Groundwater Alternative 2 provides the best ratio of costs to benefit received through the permanent reduction of risks to human health and the environment.

For the soil alternatives, Alternatives 3 (SVE) and 4 (capping) have the lower present worth costs, and Alternative 5 (treatment and onsite disposal) and 6 (offsite disposal) have the highest. Alternatives 5 and 6 are more expensive because of the onsite treatment costs and the offsite transportation and disposal costs, respectively. Soil Alternative 3 provides the best ratio of costs to benefit received through the permanent reduction of risks to human health and the environment.

10.3 MODIFYING CRITERIA

10.3.1 USEPA/State Acceptance

The USEPA and State of North Carolina have concurred with the selection of Groundwater Alternative 2 and Soil Alternative 3 to remediate OU2.

10.3.2 Community Acceptance

Based on comments expressed at the July 29, 1997 public meeting and receipt of written comments during the comment period, it appears that the community generally agrees with the selected remedy. Specific responses to issues raised by the community can be found in Section 14, the Responsiveness Summary.

11.0 SELECTED REMEDY

11.1 REMEDY SELECTION

Based upon consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives, current and proposed exposure scenarios, and USEPA, state, and public comments, MCAS Cherry Point and the Navy have selected Groundwater Alternative 2 (Natural Attenuation and Institutional Controls) and Soil Alternative 3 (Soil Vapor Extraction and Institutional Controls) for remedial action at OU2. At the completion of this remedy, the risk associated with this site will be protective of human health and the environment.

The selected site-wide alternative for OU2 is consistent withthe requirements of Section 121 of CERCLA and the NCP. The selectedalternative will reduce the mobility, toxicity, and volume of contaminated soil on site. In addition, the selected site-wide alternative is protective of human health and the environment, will attain Federal and state ARARs (unless a waiver is justified), is cost-effective, and uses permanent solutions to the maximum extent practicable.

Based on the information available at this time, the selected alternatives represent the best balance among the criteria used to evaluate remedies.

The preferred site-wide remedy is anticipated to meet the following objectives:

- Prevent exposure to contaminated soil and buried waste.
- Restrict current and future land use at OU2.
- Prevent exposure to contaminated groundwater at OU2.
- Prevent future potential use of the groundwater at OU2.
- Allow for natural attenuation of the groundwater at OU2.
- Mitigate migration of contaminants from the soil (major secondary source areas) to the environment.

The only unacceptable risks to human health are for the future hypothetical residential exposure. The majority of the risks are due to ingestion of surficial aquifer groundwater and surface soil. All other potential risks to human health under the remaining current and future exposure scenarios are within the USEPA "acceptable" risk range. The future residential exposure pathway for groundwater is extremely unlikely because the surficial aquifer is not used as a source of drinking water, and the Air Station has a separate potable water supply system.

The major components of the site-wide remedy are:

- Monitored natural attenuation of groundwater contaminants will be the means of remediating the groundwater and bontaining any future releases from the debris remaining in the landfill. Long-term monitoring shall be utilized to confirm the effectiveness of the natural attenuation processes in attaining the performance standards in Table 11-1.

- In-situ treatment using soil vapor extraction at known major soil "hot spots" (secondary source areas) that are contaminated with organics and any such areas identified during the Remedial Design. This includes air monitoring and sampling of soil to ensure that the performance standards in Table 11-2 are met.

- Institutional controls will be implemented at the site to limit possible exposure to contaminants and to protect human health and the environment. The details of the institutional controls for this ROD are presented in the LUCIP, Appendix B.

The records on the presence of contamination at OU2 and the specific restrictions for site use listed above (including land use and groundwater use restrictions) will be recorded in the MCAS Cherry Point Base Master Plan. This will insure that at the time of any future landdevelopment, the Air Station will be able to take adequate measures to minimize adverse human health and environmental effects. The USEPA and NCDENR will be properly notified of proposed construction plans at OU2 prior to commencement of any construction activities. Barring remediation to unrestricted exposure levels, any private ownership of the land in the future would be controlled under a restrictive covenant.

The fencing and warning signs will be installed, replaced, and repaired, as necessary, to restrict access to OU2, thereby minimizing human exposure to landfilled wastes. The warning signs will be installed along the fence and the banks of Slocum Creek and Turkey Gut.

Monitoring will consist of the sampling of groundwater in the surficial and Yorktown aquifers to assess the progress of natural attenuation in meeting the groundwater performance standards (i.e., North Carolina groundwater standards) and to confirm that site contaminants are not migrating into the environment. Monitoring will also consist of the sampling of air emissions from the soil vapor extraction systems and soil in the secondary source areas to be treated. The soil sampling results will be compared to the soil performance standards (i.e., North Carolina S-3 target concentrations). Monitoring will also consist of sampling surface water and sediment in Slocum Creek and Turkey Gut to confirm that site contaminants are not migrating into the environment. The details of the monitoring will be contained in the long term monitoring plan that will be developed with Federal and State concurrence. The marine ecological risk assessment was separated from the RI and will be performed under a different operable unit. Monitoring

TABLE 11-1

GROUNDWATER PERFORMANCE STANDARDS
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Contaminant	Performance Standard[1] (µg/kg)
ORGANICS (µg/L)	
Benzene	1
Chlorobenzene	50
Chloroform	0.19
1,2-Dichloroethane	0.38
cis-1,2-Dichloroethene	70
1,2-Dichloropropane	0.56
Ethylbenzene	29
2-Hexanone	<DL[2]
4-Methyl-2-pentanone	<DL
Tetrachloroethene	0.7
Trichloroethene	2.8
Vinyl chloride	0.015
Bis(2-chloroethyl)ether	<DL
Bis(2-ethylhexyl)phthalate	3
2,4-Dimethylphenol	<DL
2-Methylnaphthalene	<DL
2-Methylnaphenol	<DL
4-Methylphenol	<DL
Naphthalene	21
Nitrobenzene	<DL
Aldrin	<DL
alpha-BHC	<DL
4,4'-DDE	<DL
4,4'-DDT	<DL
Endosulfan I	<DL
Endosuffan II	<DL
Endrin aldehyde	<DL
Heptachlor epoxide	0.004
METALS (µg/L)	
Arsenic	50
Cadmium	5
Iron	300
Manganese	50

1 North Carolina Class GA Groundwater Standard
2 Less than detection limit.

TABLE 11-2

SOIL PERFORMANCE STANDARDS
OPERABLE UNIT 2
MCAS CHERRY POINT, NORTH CAROLINA

Contaminant	Performance Standard[(1)] (µg/kg)
Benzene	5.6
2-Butanone	687
Chlorobenzene	432
Chloroform	0.96
1,2-Dichloroethane	1.7
cis-1,2-Dichloroethene	350
trans-1,2-Dichloroethene	400
trans-1,3-Dichloropropene	1.2
Ethylbenzene	343
Methylene chloride	21.9
Tetrachloroethene	5.9
Toluene	8,111
1,1,1-Trichloroethane	1,484
Trichloroethene	20.7
Vinyl chloride	0.09
2,4-Dimethylphenol	1,194
2-Methylnaphthalene	3,235
4-Methylphenol	205
Naphthalene	925
Dieldrin	1.8
Heptachlor expoxide	6.7

1 North Carolina S-3 Target Concentration for Protection of Groundwater

of surface water and sediment in Slocum Creek will be used to further evaluate conditions in Slocum Creek. A monitoring plan will be developed with Federal and State concurrence. Based on the results of the monitoring, additional sampling and analysis and/or remedial actions may be required.

11.2 ESTIMATED COSTS

The estimated net present worth of GroundwaterAlternative 2 is $729,000, with no capital cost, an annual O&M cost of $43,800 per year for 30 years, and a 5-year cost (for the site review) of $20,000. The annual costs are for groundwater, surface water, and sediment monitoring.

The estimated net present worth of Soil Alternative 3 is $1,538,000, with a capital cost of $720,000, an annual O&M cost of $47,600 per year for 2 years (SVE system), an annual O&M cost of $43,800 per year (monitoring), and a 5-year cost of $20,000.

It should be noted that the cost estimate was calculated for the FS and should not be considered a construction-quality cost estimate. An FS cost estimate should have an accuracy of +50 or -30 percent. The remedy could change somewhat as a result of the remedial design and construction process. Such changes, in general, reflect modifications resulting from the engineering design process. In addition, the monitoring program will be developed at the remedial design stage and could be revised during the 5-year reviews as a result of evaluation of the data collected.

It should also be noted that the cost estimate does not include the cost to remediate any additional secondary source areas that may be identified during the remedial design.

12.0 STATUTORY DETERMINATIONS

Under CERCLA Section 121, the Navy and MCAS Cherry Point must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy for OU2 meets the statutory requirements.

12.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy protects human health and the environmentby eliminating, reducing, and controlling risk through institutional controls, natural attenuation of groundwater, and in-situ soil treatment. The only "unacceptable" risks posed by OU2 are under a future hypothetical residential exposure scenario. The majority of the risk is from ingestion of contaminated groundwater from the shallow aquifer and surface soil. Land use restrictions, as detailed in the LUCIP, would prevent future residential use of the site and invasive construction activities, aquifer use restrictions would prevent the installation of wells (other than for monitoring) and use of contaminated groundwater, and fencing and warning signs would control unauthorized uses of the site. Soil treatment would remove secondary sources of groundwater contamination. Monitoring would provide a means of evaluating future releases of hazardous constituents from landfill materials to the environment, confirming there is no offsite migration of contaminants, and evaluating the effectiveness of natural attenuation and soil treatment. There are no short-term threats associated with the selected remedy that cannot be readily controlled. In addition, no cross-media impacts are expected from the remedy.

12.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Remedial actions performed under CERCLA must comply with all ARARs. All alternatives considered for OU2 were evaluated based on the degree to which they complied with these requirements. The selected remedy was found to meet identified ARARs, unless a waiver was justified, identified in Tables 9-2, 9-3, and 9-4. CERCLA Section 121(d)(4)(C) provides that an ARAR may be waived when compliance is technically impracticable from an engineering perspective. The following is a short narrative in support of attainment of pertinent ARARs.

12.2.1 Contaminant-Specific ARARs

North Carolina Class GA groundwater standards are the groundwater protection standards identified in this ROD as performance standards for remedial action.

12.2.2 Location-Specific ARARs

Performance standards are consistent with ARARs identified in Table 9-3.

12.2.3 Action-Specific ARARs

Performance and treatment standards are consistent with RCRA ARARs identified in Table 9-4, and these regulations will be incorporated into the design and implementation of this remedy.

12.2.4 Other Guidance Considered

Other guidance TBCs include health-based advisories and guidance and the Draft North Carolina Risk Analysis Framework. TBCs have been used in estimating incremental cancer risk numbers for remedial activities at the site and in determining RCRA applications to contaminated media. The state Risk Analysis Framework was used to develop the performance standards for remediation of secondary source areas.

12.3 COST-EFFECTIVENESS

The Navy and MCAS Cherry Point believe this remedy will control the risks to human health and the environment at an estimated net present worth of $2,300,000 over 30 years. Therefore, based on realistic exposure scenarios, the selected remedy provides an overall effectiveness proportionate to its costs, such that it represents a reasonable value for the money that will be spent.

12.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT PRACTICABLE

The Navy and MCAS Cherry Point, with USEPA and North Carolina concurrence, have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for final remediation of OU2. Of those alternatives that are protective of human health and the environment and comply with ARARs, the Navy and MCAS Cherry Point, with USEPA and North Carolina concurrence, have determined that this selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost, while also

considering the statutory preference for treatment as a principal element and considering USEPA/State and community acceptance.

The selected alternative would provide permanent, long-term remedies through provision and enforcement of institutional controls in the Air Station Base Master Plan to restrict entry, to prohibit invasive construction activities and installation of wells, and limit the area to nonresidential and/or industrial type uses; by implementing soil treatment; and monitoring the effectiveness of groundwater natural attenuation processes.

The selected remedy treats the principal threats posed by contaminated soil (secondary source areas), achieving significant reductions of volatile organics. This remedy provides the most cost-effective treatment and will cost less than offsite disposal. The selection of treatment of the contaminated soil is consistent with program expectations that indicate that highly toxic and mobile waste are a priority for treatment and often necessary to ensure the long-term effectiveness of a remedy.

12.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

By treating the secondary source area soils using soil vapor extraction, the selected remedy addresses one of the principal threats posed by the site through the use of treatment technologies. By utilizing treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

13.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for Operable Unit 2 was released for public comment on Wednesday, July 23, 1997. The Proposed Plan identified Groundwater Alternative 2 - Natural Attenuation and Institutional Controls and Soil Alternative 3 - Soil Vapor Extraction and Institutional Controls as the preferred alternative for remediation. The Navy and MCAS Cherry Point reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that the State of North Carolina has expressed some concerns regarding the exceedances of surface water standards and sediment screening criteria and about the reliability of the uptake modeling of contaminants through the ingestion of fish tissues by human. The Navy and Marine Corps have agreed to collect some fish tissue samples to evaluate the uptake modeling and assist in assessing the risk to human health through ingestion of fish tissue by humans.

The fish tissue sample collection was completed in October 1998, and the analytical results were received in January 1999. The evaluation of the analysis of the fish tissue samples shows no potential unacceptable risk to human health from fish tissue ingestion in Slocum Creek.

The Navy will compare the results of the fish tissue samples to the OU2 uptake model, which used surface water data to predict fish tissue concentrations, and will assess its use at other sites. The State of North Carolina and the Navy will evaluate this comparison and then make a determination as how to proceed with the evaluation of human health from fish tissue ingestion in future investigations and evaluate the use of this approach at other sites. The State of North Carolina currently recommends against the use of surface water data in uptake models to predict fish tissue concentration. The State advocates the collection of fish tissue samples when the surface water standards or sediment screening criteria are exceeded.

14.0 RESPONSIVENESS SUMMARY

14.1 BACKGROUND ON COMMUNITY INVOLVEMENT

Community relations activities to date are summarized below:

- Established information repositories.
- Established the Administrative Record for all of the sites at the Air Station.
- Released the Proposed Plan for public review in repositories.
- Released public notice announcing public comment and document availability of the Proposed Plan.
- Held public meeting on July 29, 1997 to solicit comments and provide information. The public meeting transcript is available in the repositories and is included in Appendix C.

14.2 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND NAVY RESPONSES

Following is a summary of the responses to comments received during the public comment period. All comments were received during the public meeting.

1. What was the source of metals at Site 44A?

   Response: The metals were most likely present in the wastewater that was treated at the sewage treatment plant. During treatment, the metals would have been removed from the wastewater and became part of the sludge. The sludge was then applied to the ground at Site 44A.

2. Will the selected remedy be reviewed every five years for effectiveness and to update technologies?

   Response: As required by the Superfund law, five year reviews are required when hazardous substances remain on site at concentrations above health-based levels. The results of the long-term monitoring will be reviewed at least every five years to confirm that the selected remedy remains effective and protective of human health and the environment. The feasibility of using new technologies could also be evaluated at that time.

3. How long will it take until the site is clean?

   Response: The active treatment component, soil vapor extraction, is expected to operate for two to three years. Natural attenuation of groundwater will take longer. Based on modeling, the organic compounds would be removed in 10 to 15 years, most of the metals would be removed in 60 years, and a few metals may not be removed for a very long time. It is difficult to estimate the exact time for natural remediation because of the landfill material present at the site. The site will never be totally clean because the landfill material will not be removed.

4. Is the waste that is present below the water table causing a significant contribution to any of the groundwater contamination?

   Response: There was little correlation between groundwater contaminant concentrations in the surficial aquifer and whether or not the waste was above or below the water table. There is no significant groundwater contamination in the Yorktown aquifer.

6. How many wells have been installed at OU2? Are they at different depths?

   Response: There are approximately 60 permanent monitoring wells installed in the surficial aquifer. Approximately 40 wells are screened in the upper portion of this aquifer, and the remainder are screened in the lower portion of this aquifer. There are sixteen wells installed in the Yorktown aquifer.

6. Will soil vapor extraction remove all of the contaminants, and will any breakdown products be produced?

   Response: This technology should not result in toxic breakdown products. Soil vapor extraction is effective for volatile organics. It could also stimulate some biological activity and reduce some of the less volatile organic compounds. It would not be effective for removal of metals. Volatile organics are the main contaminants of concern at OU2.

7. How often will the groundwater be tested?

   Response: The frequency of monitoring will be specified in a monitoring plan that will be developed during the Remedial Design, with the consensus of the Navy, MCAS Cherry Point, and the regulatory agencies. The initial monitoring program may be modified in the future based on a review of the results.

8. Has another Operable Unit been added to address contamination in Slocum Creek upstream of OU2 and OU3? Is groundwater discharging to surface water causing the contamination in Slocum Creek?

   Response: Because the source(s) of this contamination and the potential for adverse ecological effects on Slocum Creek are not known, it was decided to implement remedial actions at OU2 and OU3 to address the known sources of contamination. Additional studies will be conducted as part of Operable Unit 15 to define other potential contaminant sources and their impacts on Slocum Creek near OU2 and OU3. Although the concentrations of some chemicals in Slocum Creek are higher than state surface water standards, OU2 does not appear to be the source (or only source) of this. The main contaminants of concern in the groundwater at OU2 are volatile organics; however, the potential contaminants of concern in Slocum Creek are pesticides and metals. The monitoring plan to be developed during the Remedial Design will include sampling of Slocum Creek to confirm that OU2 groundwater is not causing problems in Slocum Creek.

9. Are the primary balancing criteria weighted equally during the evaluation of alternatives and selection of the remedy? Shouldn't long-term effectiveness and reduction of toxicity, mobility, and volume have the highest weighting so that eventually the fencing and warning signs can be removed?

   Response: All of the balancing criteria have an equal weighting. The purpose of the evaluation is to identify important trade-offs among the alternatives, and professional judgment is also used. Most of OU2 is a landfill; therefore, it would not be feasible, and would be very costly, to remove or treat all of the wastes. For this reason, the fences and warning signs will always be needed, and long-term monitoring will be required.

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APPENDICES

APPENDIX A
GLOSSARY

This glossary defines terms used in this Record of Decision (ROD) describing CERCLA activities. The definitions apply specifically to this ROD and may have other meanings when used in different circumstances.

Administrative Record: A file that contains all information used by the lead agency to make its decision in selecting a response under CERCLA. This file is to be available for public review and a copy is to be established at or near the site, usually at one of the information repositories. Also a duplicate is filed in a central location, such as a regional or state office.

Aquifer: An underground formation of materials such as sand, soil, or gravel that can store and supply groundwater to wells and springs. Most aquifers used in the United States are within a thousand feet of the earth's surface.

Baseline Risk Assessment: A study conducted as a supplement to a remedial investigation to determine the nature and extent of contamination at a Superfund site and the risks posed to public health and/or the environment.

Carcinogen: A substance that may cause cancer.

Cleanup: Actions taken to deal with a release or threatened release of hazardous substances that could affect public health and/or the environment. The noun "cleanup" is often used broadly to describe various response actions or phases of remedial responses such as Remedial Investigation/Feasibility Study.

Comment Period: A time during which the public can review and comment on various documents and actions taken, either by the Department of Defense installation or the USEPA. For example, a comment period is provided when USEPA proposes to add sites to the National Priorities List.

Community Relations: The Navy and MCAS Cherry Point program to inform and involve the public in the Superfund process and response to community concerns.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A Federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The act created a special tax that goes into a trust fund, commonly known as "Superfund," to investigate and clean up abandoned or uncontrolled hazardous waste sites. Under the program USEPA can either (1) pay for site cleanup when parties responsible for the contamination cannot be located or are unwilling or unable to perform the work or (2) take legal action to force parties responsible for site contamination to clean up the the site or reimburse the Federal government for the cost of the cleanup.

Defense Environmental Restoration Account (DERA): An account established by Congress to fund Department of Defense hazardous waste site cleanups, building demolition, and hazardous waste minimization. The account was established under the Superfund Amendments and Reauthorization Act.

Drinking Water Standards: Standards for the quality of drinking water that are set by both the USEPA and NCDEHNR.

Explanation of Differences: After adoption of a final remedial action plan, if any remedial or enforcement action is taken, or if any settlement or consent decree is entered into, and if the settlement or decree differs significantly from the final plan, the lead agency is required to publish an explanation of significant differences and why they were made.

Feasibility Study: See Remedial Investigation/Feasibility Study.

Groundwater: Water beneath the earth's surface that fills pores between materials such as sand, soil, or gravel. In aquifers, groundwater occurs in sufficient quantities that it can be used for drinking water, irrigation, and other purposes.

Hazard Ranking System (HRS): A scoring system used to evaluate relative risks to public health and the environment from releases or threatened releases of hazardous substances. USEPA and states use the HRS to calculate a site score, from 0 to 100, based on the actual or potential release or hazardous substances from a site through air, surface water, or groundwater to affect people. The score is the primary factor used to decide if a hazardous site should be placed on the NPL.

Hazardous Substances: Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.

Information Repository: A file containing information, technical reports, and reference documents regarding a Superfund site. Information repositories for Marine Corps Air Station Cherry Point are at the Havelock Public Library, 300 Miller Boulevard, Havelock, North Carolina and the MCAS Cherry Point Library, PSC Box 8019, Building 298, “E” Street, Cherry Point, North Carolina.

Maximum Contaminant Level (MCL): National standards for acceptable concentrations of contaminants in public drinking water systems. These are legally enforceable standards for suppliers of drinking water set by the USEPA under the Safe Drinking Water Act.

Monitoring Wells: Wells drilled at specific locations on or off a hazardous waste site where groundwater can be sampled at selected depths and studied to assess the groundwater flow direction and the types and amounts of contaminants present.

National Priorities List (NPL): The USEPAs list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial response using money from the trust fund. The list is based primarily on the score a site receives in the Hazard Ranking System. USEPA is required to update the NPL at least once a year.

Parts Per Billion (ppb)/Parts Per Million (ppm): Units commonly used to express low concentrations of contaminants. For example, one ounce of trichloroethene in a million ounces of water is 1 ppm. One ounce of trichloroethene in a billion ounces of water is 1 ppb. If one drop of trichloroethene is mixed in a competition-size swimming pool, the water will contain about 1 ppb of trichloroethene.

Preliminary Remediation Goals: Screening concentrations that are provided by the USEPA and NCDENR and are used in the assessment of the site for comparative purposes prior to remedial goals being set during the baseline risk assessment.

Proposed Plan: A public participation requirement of SARA in which the lead agency summarizes for the public the preferred cleanup strategy and the rationale for preference, the afternatives presented in the detailed analysis of the Feasibility Study, and presents any waivers to cleanup standards of CERCLA Section 121(d)(4) that may be proposed. This may be prepared either as a fact sheet or a separate document. In either case, it must actively solicit public review and comment on all alternatives under agency consideration.

Record of Decision (ROD): A public document that explains which cleanup altemative(s) will used at NPL sites. The Record of Decision is based on information and technical analysis generated during the Remedial Investigation/Feasibility Study and consideration of public comments and community concerns.

Remedial Action (RA): The actual construction or implementation phase that follows the remedial design of the selected cleanup alternative at a site on the NPL.

Remedial Investigation/Feasibility Study (RI/FS): Investigation and analytical studies usually performed at the same time in an interactive process and together referred to as the "RI/FS." They are intended to (1) gather the data necessary to determine the type and extent of contamination at a Superfund site, (2) establish criteria for cleanup up the site, (3) identify and screen cleanup alternatives for remedial action, and (4) analyze in detail the technology and costs of the alternatives.

Remedial Response: A long-term action that stops or substantially reduces a release or threatened release of hazardous substances that is serious, but does not pose an immediate threat to public health and/or the environment.

Removal Action: An immediate action performed quickly to address a release or threatened release of hazardous substances.

Resource Conservation and Recovery Act (RCRA): A Federal law that established a regulatory system to track hazardous wastes from the time of generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous wastes. RCRA is designed to prevent new uncontrolled hazardous waste sites.

Response Action: As defined by Section 101(25) of CERCLA, means remove, removal, remedy, or remedial action, including enforcement activities related hereto.

Responsiveness Summary: A summary of oral and written public comments received by the lead agency during a comment period on key documents and the response to these comments prepared by the lead agency. The responsiveness summary is a key part of the ROD, highlighting community concerns for decision-makers.

Secondary Drinking Water Standards: Secondary drinking water regulations are set by the USEPA and NCDEHNR. These guidelines are not designed to protect public health. Instead they are intended to protect "public welfare" by providing guidelines regarding the taste, odor, color, and other aesthetic aspects of drinking water that do not present a health risk.

Superfund: The trust fund established by CERCLA that can be drawn upon to plan and conduct cleanups of past hazardous waste disposal sites and current releases or threats of releases of non-petroleum products. Superfund is often divided into removal, remedial, and enforcement components.

Superfund Amendments and Reauthorization Act (SARA): The public law enacted on October 17, 1986, to reauthorize the funding provisions and to amend the authorities and requirements of CERCLA and associated laws. Section 120 of SARA requires that all Federal facilities "be subject to and comply with this act in the same manner and to the same extent as any non-government entity."

Surface Water: Bodies of water that are above ground, such as rivers, lakes, and streams.

Volatile Organic Compound (VOC): An organic (carbon-containing) compound that evaporates (volatilizes) readily at room temperature.

APPENDIX B

LAND USE CONTROL IMPLEMENTATION PLAN (LUCIP)
MCAS CHERRY POINT OU2

ATTACHMENT B

LAND USE CONTROL IMPLEMENTATION PLAN (LUCIP)
MCAS CHERRY POINT OU#2 (Sites 10, 44a, 46, & 76)

GENERAL

By separate Memorandum of Agreement, hereinafter referred to as the Land Use Control Assurance Plan (LUCAP), the U.S. Environmental Protection Agency (U.S. EPA); the North Carolina Department of Environment and Natural Resources (NCDENR); and the Department of the Navy (Navy) on behalf of U.S. Marine Corps Air Station, Cherry Point, agreed that the Navy and the United States Marine Corps (Marine Corps) shall follow certain procedures for implementing and maintaining site-specific land use controls. Those procedures are contained in the LUCAP, and, for Operable Unit No. 2 (OU#2), this Land Use Control Implementation Plan (LUCIP). The LUCAP is intended to ensure that all of the Department of the Navy's site-specific selected remedies with land use controls remain protective of human health and the environment. This LUCIP and its requirements are part of the selected remedy within the Final Record of Decision (ROD).

The parties to the LUCAP also agree that the efficacy/protectiveness of the land use controls within this Land Use Control Implementation Plan is contingent upon the Department of the Navys substantial good faith compliance with those procedures applicable to the selected remedy. Should such compliance not occur or should the LUCAP be terminated, the parties agree that the protectiveness of the selected remedy may be reconsidered by any party and additional remedial measures may be necessary to ensure the selected remedy remains protective of human health and the environment.

This document is the LUCIP for MCAS Cherry Point OU#2. OU#2 is comprised of the following sites: Site 10 - Old Sanitary Landfill, Site 44A - Former Sludge Application Area, Site 46 - Polishing Ponds No. 1 and No. 2, and Site 76 - Vehicle Maintenance Area (Hobby Shop). This LUCIP is an attachment to and a part of the ROD for these sites.

The Navy and the Marine Corps will, pursuant to the LUCAP, include the land use controls set forth in this LUCIP within the Installation's Geographic Information System (GIS) and the base master planning process. Pursuant to the LUCAP paragraph IV.a, the Installation will provide written notification to the State and U.S. EPA when the requirements of this paragraph have been met.

All proposed changes to this LUCIP will be submitted to the State and U.S. EPA for review and concurrence prior to implementation. Changes to this LUCIP will, if required under the National Contingency Plan, be reflected in changes to the selected remedy made through the appropriate process (e.g., Explanation of Significant Differences, ROD amendment).

The parties agree that the Navy's annual certification of land use control implementation is necessary for as long as the Navy retains ownership of the site. NCDENR maintains this annual certification is part of the selected remedy. The Navy and Marine Corps maintain this annual certification is a procedure to implement the selected remedy and is not a part of the selected remedy. Nevertheless, all parties agree that a written certification is desirable. Accordingly, pursuant to the LUCAP paragraph V.b., MCAS Cherry Point will provide that certification annually to U.S. EPA and NCDENR that the land use controls within the ROD remain implemented

SITE BOUNDARY IDENTIFICATION

The geographic boundary for these sites is identified in ROD Figure B-1. This boundary indicates the outermost border of all controlled portions of the site (i.e., no areas subject to land use controls lie outside this boundary).

The geographic boundary of the current soil contamination is identified in ROD Figure B-1. This boundary indicates the limits of soil contamination and the area of restricted land use, intrusive activities, and site access for soil.

The geographic boundaries of the current shallow and deep groundwater contamination are identified in ROD Figure B-2. These boundaries indicate the current limits of groundwater contamination.

SITE USE CONTROLS

The land use at OU2 would be restricted to industrial uses only. Prohibited land use includes, but would not be limited to, residences, schools, playgrounds, day cares, and retirement centers.

Unless specifically excepted by both NCDENR and U.S. EPA, intrusive activities (e.g., excavation of soil or insertion of objects into the ground – except for monitoring purposes) are prohibited below the water table within the geographic boundary of the Site. See Figure B-1.

AQUIFER USE CONTROLS

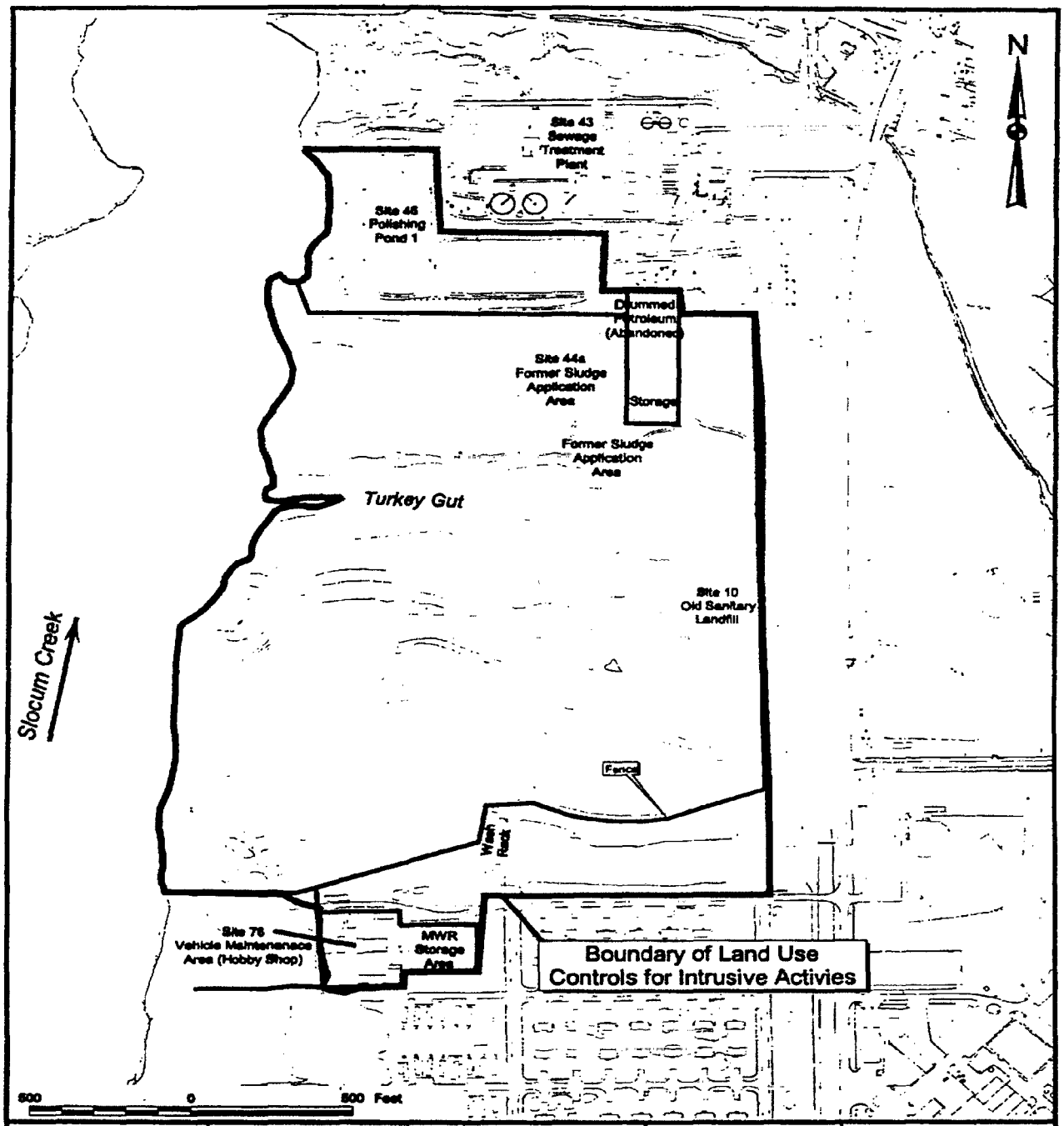
Except for monitoring purposes or as specifically excepted by NCDENR or U.S. EPA, all use of groundwater beneath OU#2 is prohibited. In addition, the installation of any well, other than those constructed for monitoring purposes, is prohibited except as authorized by North Carolina Administrative Code Title 15A, Chapter 2C as amended, Well Construction. See Figure B-2 (Boundary of Aquifer Use Controls).

SITE ACCESS CONTROLS

Site access is restricted to authorized personnel only. Site access controls will include the installation and maintaining of a fence around the polishing ponds, repair and replacement of existing fencing around the OU2 landfill, and the placement of warning signs along the fence, Slocum Creek, and Turkey Gut to warn all unauthorized persons to stay out. The signs shall contain the following warning– Restricted Area, For Entry, and shall contain a phone number for a point of contact.

NOTIFICATION

Following the procedures contained within the LUCAP, MCAS Cherry Point shall file a Notification of Inactive Hazardous Substance or Waste Disposal Site meeting the requirements of NCGS 130A-310.8.



DRAWN BY: MJJ	DATE: 12Feb99	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 6646 / OWNER NO.: —
CHECKED BY: —	DATE: —	OU2 Boundary of Land Use Controls for Intrusive Activities MCAS Cherry Point, North Carolina	APPROVED BY: — / DATE: —
COST/SCHEDULE-AREA			APPROVED BY: — / DATE: —
SCALE: AS NOTED		DRAWING NO.: Figure B-1	REV: 0

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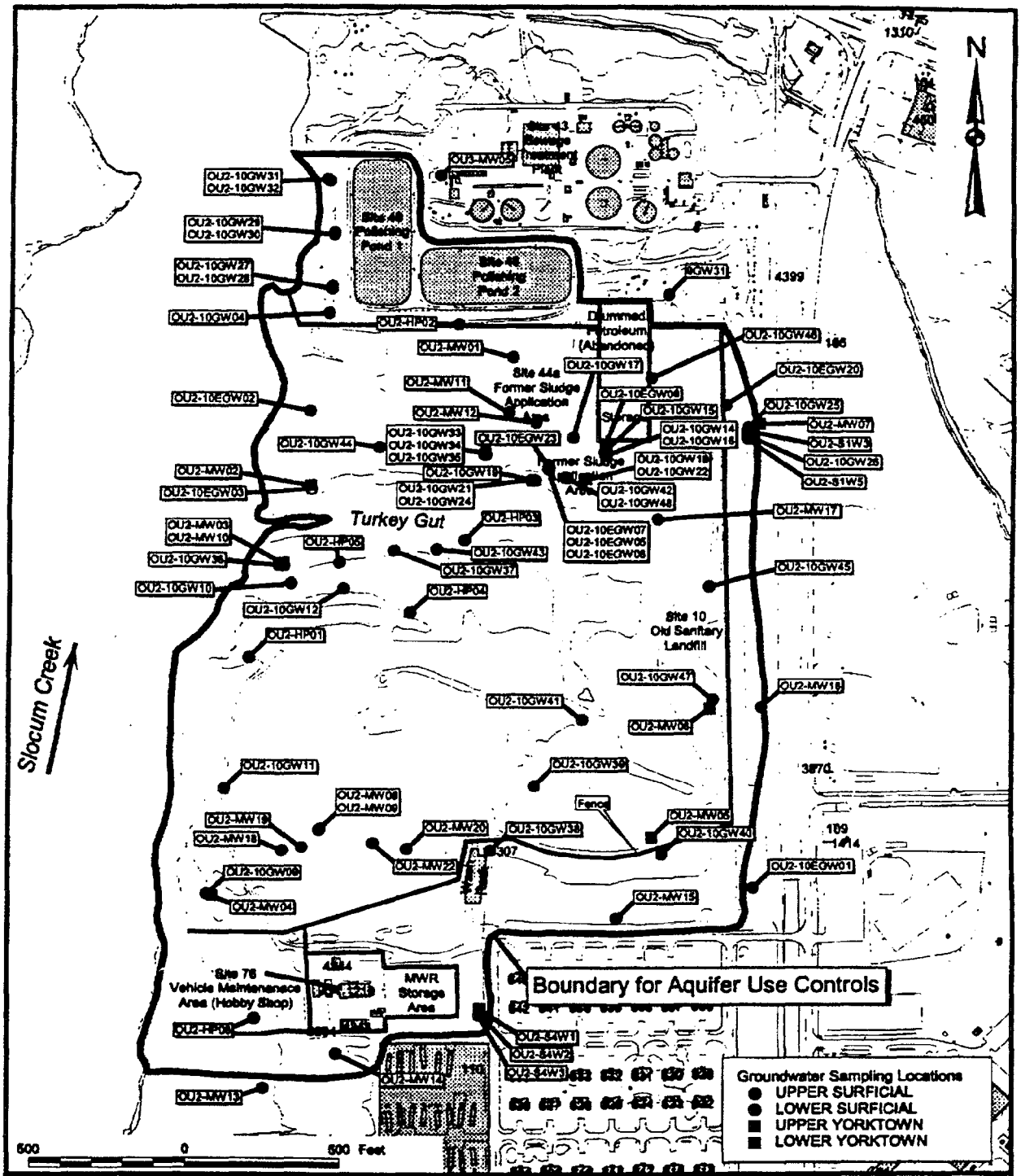

DRAWN BY: MJJ	DATE: 12/Feb/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 6648 / OWNER NO.
CHECKED BY: —	DATE: —	OU2 Boundary For Aquifer Use Controls MCAS Cherry Point, North Carolina	APPROVED BY: — / DATE: —
COST/SCHEDULE-AREA			APPROVED BY: — / DATE: —
SCALE: AS NOTED		DRAWING NO.: Figure B-2	REV: 0

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APPENDIX C

TRANSCRIPT OF PUBLIC MEETING

MCAS CHERRY POINT MEETING

HAVELOCK CITY AUDITORIUM

1 HATTERAS AVENUE

HAVELOCK, NORTH CAROLINA

TUESDAY, JULY 29, 1997

* *

CAPTAIN MATT MCLAUGHLIN
PUBLIC AFFAIRS OFFICER
U.S. MARINE CORPS

REPRESENTATIVES OF BROWN & ROOT ENVIRONMENTAL:

MR. MATTHEW COCHRAN
MR. KIM TURNBALL

REPRESENTATIVES OF THE U.S. NAVY:

MR. LANCE LAUGHMILLER

REPRESENTATIVES OF CHERRY POINT:

MS. RACHEL JOHNSON
MR. JOHN MEYERS

REPRESENTATIVES OF THE STATE OF NORTH CAROLINA:

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CAPTAIN MATT MCLAUGHLIN: WELL, I'D LIKE TO THANK EVERYBODY FOR COMING HERE THIS VERY WET CAROLINA EVENING. MY NAME IS CAPTAIN MATT MCLAUGHLIN; I'M THE PUBLIC AFFAIRS OFFICER FOR OUR NEIGHBOR, CHERRY POINT AIR STATION, HERE. WHAT WERE HERE TO DO THIS EVENING IS TO DISCUSS THE PROPOSED REMEDIAL ACTION PLAN THAT OUR FOLKS AT ENVIRONMENTAL AND OUR FRIENDS AT BROWN AND ROOT HAVE PUT TOGETHER FOR US THIS EVENING, SO THAT WE CAN BETTER UNDERSTAND AND BETTER STUDY OU2 AND HOW WE CAN CLEAN THIS UP FOR THE BETTERMENT OF THE COMMUNITY AND THE BETTERMENT OF OUR AIR STATION. CHERRY POINT IS IN A UNIQUE POSITION IN THE NORTH CAROLINA COMMUNITY HERE, AND WE STRIVE TO DO OUR VERY BEST TO MAKE SURE THAT WE ARE ENVIRONMENTALLY AWARE, AND WE DO OUR PART IN THE BIGGER PICTURE TO MAKE SURE THAT WE ARE THE LEADERS, ENVIRONMENTALLY. RECENTLY, LET'S SEE, OUR LAST ACCOMPLISHMENT THAT I CAN THINK OF DIDN'T HAPPEN VERY LONG AGO; IN FACT, WE HAD SOME KIDS OUT THERE HELPING US FROM ARTHUR EDWARDS ELEMENTARY, WITH A PROJECT AT OU3, OCCUPATIONAL UNIT THREE, WHERE WE PUT TOGETHER SOME LONG LEAF PINES. WE WERE TRYING TO GET THAT AREA BACK UP TO PAR.

THIS EVENING WE HAVE THE PLEASURE, BECAUSE I KNOW I'M NOT THE EXPERT ON THIS, TO HAVE WITH US MR. KIM TURNBALL FROM BROWN AND ROOT. BROWN AND ROOT IS THE RESTORATION, INSTALLATION RESTORATION PROGRAM CONTRACTOR, WHO IS HELPING OUT THE DEPARTMENT OF THE NAVY AND THE DEPARTMENT OF DEFENSE,

HELPING US CLEAN UP OUR WASTE SITES. WHAT HE'S GOING TO DO HERE THIS EVENING IS HE'S GOING TO LET YOU KNOW SEVERAL DIFFERENT COURSES OF ACTION THAT WE WOULD LIKE TO CONSIDER PURSUING TO CLEAN UP OU2. OPERATIONAL UNIT TWO IS ABOUT A SEVENTY-ACRE SITE WHICH COMPOSES FOUR SUB-SITES WITHIN IT. WHAT WE'D LIKE TO DO IS ADDRESS CLEANING UP THIS SITE FROM A GROUND/SOIL POINT OF VIEW AND FROM A WATER POINT OF VIEW AND, WELL, AND HE WILL ADDRESS TO YOU COURSES OF ACTION TO CLEAN UP BOTH OF THOSE TWO. WHAT WE WILL THEN DO IS WE WILL LET YOU KNOW WHAT WE FEEL THE BEST COURSE OF ACTION IS, AND THEN WE WILL SOLICIT PUBLIC COMMENT FROM YOU; AND THAT'S REALLY THE PURPOSE OF WHY WE'RE HERE THIS EVENING, TO GET THAT PUBLIC COMMENT, BECAUSE WE REALIZE WE'VE GOT A LOT OF FACTS AND FIGURES, AND WE THINK WE KNOW WHAT'S BEST; BUT REALLY, WHAT THIS WHOLE SUPERFUND CLEAN UP PROJECT IS ABOUT IS SOLICITING PUBLIC COMMENT FROM YOU TO MAKE SURE WE'VE GOT THE WHOLE PICTURE HERE. AT THE CONCLUSION OF MR. TURNBALL'S PRESENTATION, HE'LL ALLOW A PORTION OF TIME FOR QUESTIONS AND ANSWERS, AND I REALLY URGE YOU TO USE THIS TIME TO GET THOSE DEEP QUESTIONS OFF OF YOU. IF YOU'VE GOT REALLY IN DEPTH QUESTIONS, GET THEM OUT THERE AND LET'S GET THEM AIRED, AND LET'S MAKE SURE YOU GET SATISFACTION ON THOSE QUESTIONS. IF YOU HAVE ANY QUESTIONS OR COMMENTS THAT ARE NOT ABLE TO BE ADDRESSED THIS EVENING OR YOU DON'T WISH TO ADDRESS THEM THIS EVENING, THERE'S A WONDERFUL TUPPERWARE COMMENT BOX IN THE

BACK THAT WE'VE PROVIDED FOR YOU. FEEL FREE TO JOT DOWN THOSE QUESTIONS OR COMMENTS, AND WE WILL COLLECT THEM AND WE'LL GET THEM ANSWERED FOR YOU; WE'LL GET ANSWERS FOR YOU.

WHILE WE'RE DEALING WITH THIS WHOLE ISSUE HERE, SOME FOLKS, LIKE SOME OF YOU IN THE ROOM, ARE COMING INTO IT WITH A LOT OF INFORMATION; SOME FOLKS, LIKE ME, WHO ARE A LITTLE BIT NEWER TO IT, ARE STILL TRYING TO GAIN INFORMATION ON THE WHOLE ISSUE. IF, IN THE COURSE OF YOUR MEDITATION, YOUR THOUGHT, YOUR STUDY, YOUR QUESTIONS; GIVE US SOME MORE QUESTIONS; YOU WANT TO REVIEW SOME OF THE CORP'S MATERIAL, SOME OF THE SOURCE DOCUMENTS I WOULD CALL THEM, THESE DOCUMENTS RESIDE IN TWO PLACES. THEY RESIDE AT HAVELOCK PUBLIC LIBRARY FOR YOUR VIEW, AND THEY ALSO RESIDE IN THE CHERRY POINT PUBLIC LIBRARY; AND I WELCOME AND INVITE YOU TO GO AND VIEW THESE DOCUMENTS, READ THEM, AND GET INTIMATELY INVOLVED AND UP-TO-DATE ON WHAT'S GOING ON. I ALSO BELIEVE THAT THE RECORDS OF THIS MEETING WILL BE IN BOTH OF THOSE DEPOSITORIES SHORTLY AFTER THE MEETING CONCLUDES. LET'S SEE IF I HAVE HIT EVERYTHING ON MY LIST HERE. IF YOU HAVE ANY OTHER QUESTIONS AFTER YOU'VE REVIEWED THAT MATERIAL OUT THERE, OR SIMPLY AFTER THE MEETING, AND WE DON'T GET A CHANCE TO HIT THEM NOW, AND YOU DON'T GET A CHANCE TO PUT THEM IN THE COMMENT BOX, PLEASE FEEL FREE TO ADDRESS THEM TO MY OFFICE, THE PUBLIC AFFAIRS OFFICE AT CHERRY; THE ADDRESS IS ON THE SECOND PAGE OF THE LAMINATED HANDOUT THAT YOU HAVE,

AND WE'LL MAKE SURE WE GET THOSE OVER TO ENVIRONMENTAL, OVER TO BROWN AND ROOT, OVER TO WHO'S EVER ABLE TO BEST ANSWER THOSE QUESTIONS FOR YOU; AND WE'LL MAKE SURE WE GET THOSE ANSWERS FOR YOU.

FINALLY, AS I ALLUDED TO BEFORE, PART OF THIS PROCESS IS INFORMING THE PUBLIC AND MAKING SURE YOU HAVE THE ABILITY TO COMMENT ON THESE PROPOSED ACTIONS THAT WE WOULD LIKE TO TAKE. WE DON'T HAVE ALL THE ANSWERS, AND WE KNOW THAT YOU DO HAVE SOME OF THOSE ANSWERS; AND WE REALLY NEED, AND I'M ASKING, I'M SOLICITING FROM YOU, THOSE GOOD COMMENTS AND QUESTIONS; BECAUSE WE DON'T HAVE ANYTHING IN STONE RIGHT NOW. WE HAVE WHAT WE THINK IS THE BEST IDEA, AND WE WELCOME FROM YOU ANY INPUT THAT YOU MAY HAVE. MR. TURNBALL, THANK YOU.

MR. TURNBALL: THANK YOU. OPERABLE UNIT TWO IS ONE OF FIFTEEN OPERABLE UNITS AT THE AIR STATION. OPERABLE UNITS ARE USED TO ASSEMBLE SITES TOGETHER, OR SITES THAT ARE CLOSE TOGETHER, FOR INVESTIGATION PURPOSES. OPERABLE UNIT TWO IS LOCATED IN THIS PART OF THE AIR STATION [INDICATING ON VISUAL AID OF COVER MAP OF HANDOUT]. THE SEWAGE TREATMENT PLANT IS LOCATED JUST NORTH OF IT. THIS IS ROOSEVELT BOULEVARD, AND THIS IS SLOCUM CREEK GOING IN THIS DIRECTION THERE.

[INDICATING VISUAL AID ENTITLED, AERIAL VIEW.] THIS POSTER SHOWS A FEW MORE DETAILS OF THE SITES. SITE TEN IS THE OLD SANITARY LANDFILL. IT'S THE LARGEST PORTION OF

OPERABLE UNIT TWO, COVERING ABOUT FORTY ACRES. IT WAS USED AS THE PRIMARY DISPOSAL AREA FOR THE AIR STATION FROM THE MID 1950'S TO THE MID 1980'S. THERE IS ALSO A SMALL SLUDGE PILE ON TOP OF THE LANDFILL; THAT AREA WAS CLOSED DOWN IN THE EARLY 1980'S; THE SLUDGE WAS EXCAVATED AND THE AREA WAS BACK-FILLED. THERE IS ANOTHER SLUDGE APPLICATION AREA, SITE 44A, UP IN HERE. IT WAS USED FOR A TWO MONTH PERIOD IN 1987 TO DISPOSE OF SLUDGE FROM THE SEWAGE TREATMENT PLANT. RELATED TO THAT IS POLISHING PONDS ONE AND TWO, WHICH IS SITE 46; THESE WERE AERATION BASINS THAT WERE USED AS PART OF THE WASTE WATER TREATMENT PROCESS. THE LAST SITE IS SITE 76, DOWN IN HERE, THIS AREA IS WHERE AIR STATION PERSONNEL CAN WORK ON THEIR CARS OR SO BE IT.

[INDICATING VISUAL AID ENTITLED, SUPERFUND PROCESS.] THIS POSTER HERE SHOWS THE SUPERFUND PROCESS THAT'S LAID OUT IN THE SUPERFUND LAW. THERE ARE SPECIAL STEPS IN CLEANING UP A SITE. THE FIRST IS THE REMEDIAL INVESTIGATION TO FIND OUT WHAT PROBLEMS ARE THERE. THE SECOND STAGE IS THE FEASIBILITY STUDY ON WHAT CAN WE DO TO ADDRESS OR CLEAN UP THESE PROBLEMS. THE THIRD STEP IS THE PROPOSED REMEDIAL ACTION PLAN WHICH IS PART OF THIS PROCESS HERE, WHERE WE SOLICIT PUBLIC COMMENTS ON THE PREFERRED REMEDY. AFTER THE REMEDY HAS BEEN DECIDED UPON, THERE'S A DOCUMENT, CALLED A RECORD OF DECISION, THAT DOCUMENTS, LEGALLY, THE FINAL SELECTION OF THE REMEDIAL ALTERNATIVE SITE. THE FOLLOWING STEPS ARE THE

REMEDIAL DESIGN OF HOW TO IMPLEMENT THE REMEDY, THE REMEDIAL ACTION WHICH IS ACTUALLY IMPLEMENTING THAT REMEDY, AND IN SOME CASES THERE IS GOING TO BE LONG TERM OPERATION AND MAINTENANCE WHICH COULD INCLUDE LONG-TERM MONITORING. I'LL LEAVE THIS ONE UP HERE BECAUSE I'LL BE REFERRING BACK TO IT.

[INDICATING VISUAL AID ENTITLED, REMEDIAL INVESTIGATION.] THIS POSTER SHOW THE VARIOUS ENVIRONMENTAL MEDIA THAT WERE INVESTIGATED, INCLUDING SURFACE SOIL, SUBSURFACE SOIL, GROUNDWATER IN THE SUPERFICIAL OR SHALLOWEST AQUIFER AND ALSO GROUNDWATER IN THE YORKTOWN AQUIFER, WHICH IS DIRECTLY BENEATH THE SUPERFICIAL AQUIFER; AND THEY ARE SEPARATED BY A CLAY LAYER THAT IMPEDES THE FLOW FROM ONE AQUIFER TO THE LOWER AQUIFER. ALSO INVESTIGATED WERE TURKEY GUT, WHICH IS A STREAM THAT RUNS THROUGH THE MIDDLE OF SITE TEN, SURFACE WATER SEDIMENT SETTLES; AND SLOCUM CREEK WHICH FLOWS ALONG THE SITE IS BEING INVESTIGATED AS A SEPARATE COMPARABLE UNIT. IN THE SURFACE SOIL, THERE WAS MINIMAL CONTAMINATION; HOWEVER, THERE WERE A FEW AREAS THAT WOULD CAUSE AN UNACCEPTABLE RISK TO HUMAN HEALTH UNDER A FUTURE HYPOTHETICAL RESIDENTIAL SCENARIO, MEANING IF SOMEBODY LIVED THERE FOR A SIX YEAR PERIOD. THERE WAS ALSO SPORADIC, WIDESPREAD AREAS WHERE SOIL CONTAMINATION COULD CAUSE GROUNDWATER CONTAMINATION; AND THAT'S THROUGH AND ACTION OF PRECIPITATION RUNNING THROUGH THE SOIL AND PICKING UP CONTAMINANTS, AND THEN THEY WOULD END UP IN THE GROUNDWATER.

FOR SUBSURFACE SOIL, THERE WAS NO CONTAMINATION THAT PRESENTED AN UNACCEPTABLE RISK TO HUMAN HEALTH UNDER CURRENT LAND USE OR POTENTIAL FUTURE LAND USE. AGAIN, CONTAMINATION LEVELS WERE HIGHER THAN IN THE SURFACE SOIL, BUT AGAIN, WERE NOT LIFE THREATENING; THEY WERE IN LOW AREAS AND THEY WERE ALSO IN CONCENTRATIONS THAT COULD ADVERSELY AFFECT GROUNDWATER. THE GROUNDWATER BENEATH OPERABLE UNIT TWO WAS CONTAMINATED WITH MANY METALS AND ORGANIC COMPOUNDS. MOST OF THE AREA WITHIN THIS OUTLINE HERE IS CONTAMINATED AT CONCENTRATIONS THAT EXCEED STATE GROUNDWATER STANDARDS. FOR TURKEY GUT SURFACE WATER AND SEDIMENT, THERE WAS NO CONTAMINATION THAT PRESENTS AN UNACCEPTABLE RISK TO HUMAN HEALTH OR THE ENVIRONMENT.

[INDICATING VISUAL AID ENTITLED, BASEWIDE GEOLOGY.] THIS POSTER HIGHLIGHTS A LITTLE MORE, THE, WHEN I TALK ABOUT THE DIFFERENT AQUIFERS BENEATH THE SITE. THERE'S A SUPERFICIAL AQUIFER IN A CONFINING UNIT, AS I SAID, A CLAY LAYER, THAT IMPEDES FLOW DOWNWARD. THIS IS THE YORKTOWN AND PUNGO RIVER AQUIFER. DOWN HERE IS THE CASTLE HAYNE AQUIFER, AND THIS IS IMPORTANT BECAUSE THE AIR STATION DRAWS THEIR WATER SUPPLY FROM THIS AQUIFER.

SO THAT WAS A BRIEF SUMMARY OF REMEDIAL INVESTIGATION WHERE WE DETERMINE THE NATURE AND EXTENT OF CONTAMINATION, POTENTIAL RISKS OF HUMAN HEALTH AND THE ENVIRONMENT. THE NEXT STEP IS A FEASIBILITY STUDY WHERE WE DEVELOP OBJECTIVES

AND GOALS OF WHAT THE CLEAN UP SHOULD BE, DEVELOP ALTERNATIVES THAT CAN ADDRESS THOSE PROBLEMS, AND COMPARE THESE ALTERNATIVES; AND THAT IS ALL DOCUMENTED IN THE FEASIBILITY STUDY.

[INDICATING VISUAL AID ENTITLED, EVALUATION CRITERIA.] THESE ARE THE EVALUATION CRITERIA THAT ARE LAID OUT IN THE SUPERFUND LAW AND THE EPA GUIDANCE DOCUMENTS. THE FIRST CRITERIA, OVERALL PROTECTIVENESS OF HUMAN HEALTH AND THE ENVIRONMENT; AND COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS; THESE WOULD BE THINGS LIKE SURFACE WATER QUALITY STANDARDS AND STATE GROUNDWATER QUALITY STANDARDS. ANY ALTERNATIVE THAT IS SELECTED MUST MEET THESE TWO CRITERIA. THE FOLLOWING FIVE CRITERIA ARE BALANCING CRITERIA, SORT OF TO EVALUATE TRADE OFF BETWEEN DIFFERENT ALTERNATIVES. THESE CRITERIA ARE LONG TERM EFFECTIVENESS; REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT; SHORT-TERM EFFECTIVENESS; IMPLEMENTABILITY, WHICH IS SORT OF HOW EASY IT WOULD BE TO BUILD; AND COST. THERE ARE TWO OTHER CRITERIA THAT COULD MODIFY ALTERNATIVES PRESENTED TODAY, BEING EPA/STATE ACCEPTANCE WHICH IS INVOLVED IN THEIR REVIEW OF THE DOCUMENTS THAT ARE PRODUCED; AND COMMUNITY ACCEPTANCE WHICH IS ONE OF THE PURPOSES OF TODAY'S MEETING.

[INDICATING VISUAL AID ENTITLED, REMEDIAL ALTERNATIVES.] THIS POSTER HERE SHOWS THE ALTERNATIVES WE CONSIDERED FOR BOTH GROUNDWATER AND SOIL. THE FIRST

GROUNDWATER IS NO ACTION; AND THIS WOULD BE DOING NOTHING AT THE SITE; JUST WALKING AWAY WITH NO MONITORING OR NO CONTROLS OR ANYTHING OF THAT NATURE. THE NEXT ALTERNATIVE IS NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS. NATURAL ATTENUATION IS USING INHERENT PROCESSES IN NATURE THAT WOULD REDUCE CONTAMINANT CONCENTRATIONS. THERE WOULD ALSO BE MONITORING INVOLVED WITH THAT TO EVALUATE WHETHER IN FACT THOSE CONTAMINANT CONCENTRATIONS ARE DECREASING. ALONG WITH THAT IS INSTITUTIONAL CONTROLS, AND THEY COULD INCLUDE THINGS LIKE MONITORING OR FENCING OR RESTRICTIONS ON LAND USE OR USE OF GROUNDWATER BENEATH THE SITE. THE THIRD ALTERNATIVE IS CALLED GROUNDWATER EXTRACTION, WHICH IS REALLY JUST PUMPING GROUNDWATER TO THE SURFACE, TREATING IT TO REMOVE CHEMICAL CONTAMINANTS, DISCHARGING THE WATER EITHER TO SLOCUM CREEK OR TO THE SEWAGE TREATMENT PLANT AT THE AIR STATION. THE FOURTH ALTERNATIVE FOR GROUNDWATER IS CALLED AIR SPARGING AND SOIL VAPOR EXTRACTION. AIR SPARGING IS BASICALLY BLOWING AIR INTO THE GROUNDWATER; CONTAMINANTS CAN BE ATTACHED TO THAT AIR, AND THEN YOU WOULD PUMP OUT THE VAPOR AND CONTAMINANTS THAT WERE IN THE GROUNDWATER.

WE ALSO LOOKED AT SIX ALTERNATIVES FOR SOIL, AND THESE ARE THE SOIL HOT SPOTS THAT I ALLUDED TO BEFORE; THESE DO NOT INCLUDE THE WASTE THAT'S BURIED IN THE LANDFILL. THE FIRST ACTION, OR FIRST ALTERNATIVE, IS NO ACTION. THE SECOND ALTERNATIVE IS INSTITUTIONAL CONTROLS. THE THIRD ONE IS SOIL

VAPOR EXTRACTION, WHICH WAS SIMILAR TO THIS EXCEPT YOU'RE JUST APPLYING PRESSURE TO BASICALLY SUCK OUT CONTAMINANTS. THE FOURTH ALTERNATIVE WOULD BE EXCAVATION OR DIGGING UP THE MATERIAL, CONSOLIDATING IT IN ONE LOCATION ON TOP OF A LANDFILL, AND CONTAINMENT, WHICH WOULD BE COVERING IT WITH A CAP THAT WOULD IMPEDE RAINWATER FROM INFILTRATING THROUGH AND PUMPING CONTAMINANTS OUT OF THE SOIL. THE FIFTH ALTERNATIVE INVOLVES DIGGING UP THE WASTE, TREATING IT ON SITE TO REMOVE THE CONTAMINANTS, AND THEN DISPOSING OF THE TREATED MATERIAL ON TOP OF THE LANDFILL. THE LAST ALTERNATIVE IS EXCAVATION AND OFF-SITE DISPOSAL WHERE THE SOIL WOULD BE DUG UP AND HAULED AWAY TO A NONHAZARDOUS WASTE LANDFILL. BASED ON THE FIVE EVALUATION, OR THE EVALUATION CRITERIA HERE DOWN THROUGH COST, THE PREFERRED ALTERNATIVE FOR GROUNDWATER IS NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS; AND THE PREFERRED ALTERNATIVE FOR SOIL IS SOIL VAPOR EXTRACTION AND INSTITUTIONAL CONTROLS.

[INDICATES VISUAL AID ENTITLED, PREFERRED ALTERNATIVE.] THIS LEADS US TO THE NEXT STEP OF OUR PROCESS, THE PROPOSED REMEDIAL ACTION PLAN. THIS IS MORE DETAILS OF THE PREFERRED ALTERNATIVE THAT'S IDENTIFIED IN THAT PLAN. THE OBJECTIVES WOULD BE TO PREVENT POTENTIAL EXPOSURE TO CONTAMINATED SOIL AND FILL MATERIAL. THE SECOND OBJECTIVE WOULD BE PREVENT POTENTIAL EXPOSURE TO CONTAMINATED GROUNDWATER. THE THIRD WOULD BE PREVENT POTENTIAL USE OF

CONTAMINATED GROUNDWATER IN THE FUTURE. THE FOURTH OBJECTIVE WOULD BE RESTRICT CURRENT AND FUTURE USE OF THE SITES. THE LAST OBJECTIVE WOULD BE TO MINIMIZE THE IMPACT OF SOIL "HOT SPOTS" ON GROUNDWATER. THIS WOULD BE DONE THROUGH VARIOUS ACTIONS; THE FIRST BEING RECORDS OF THE CONTAMINATION WOULD BE MAINTAINED IN THE CHERRY POINT MASTER PLAN. THE MASTER PLAN IS THE DOCUMENT THAT SETS OUT RESTRICTIVE OR DESIGNATED LAND USES FOR VARIOUS AREAS OF THE AIR STATION. THE SECOND ITEM IS AN INSTITUTIONAL CONTROL USING THE MASTER PLAN THAT WOULD RESTRICT OR LIMIT USE OF GROUNDWATER AND LAND AT OU2. IT'S IMPORTANT TO NOTE HERE, TOO, THAT THE AIR STATION HAS IT'S OWN SEPARATE WATER SUPPLY; AND THE WELLS ARE NOT LOCATED ANYWHERE NEAR OU2. IN ADDITION, GROUNDWATER, SURFACE WATER, AND SEDIMENT WOULD BE MONITORED; ONE REASON FOR THIS IS TO DETERMINE IF THE CONTAMINATION IS REMAINING AT OU2 OR MIGRATING OFF INTO THE ENVIRONMENT; ANOTHER PURPOSE OF THIS WOULD BE TO CONFIRM THE EFFECTIVENESS OF NATURAL ATTENUATION AS A GROUNDWATER REMEDY. ANOTHER COMPONENT WOULD BE INSTALLATION, REPAIR AND REPLACING OF FENCING; THERE IS CURRENTLY A FENCE AROUND THE LANDFILL PORTION OF OU2; ADDITIONAL FENCING WOULD BE INSTALLED AND REPAIRED IN THE FUTURE AS NEEDED. WARNING SIGNS WOULD ALSO BE POSTED ON THE FENCE. AGAIN, THE LAST COMPONENT WOULD BE TREAT THE MAJOR SOIL "HOT SPOTS" WITH THIS SOIL VAPOR EXTRACTION; AGAIN, THAT WOULD BE TO MINIMIZE THE IMPACT OF SOIL ON FUTURE GROUNDWATER

CONTAMINATION.

AFTER ALL OF THE COMMENTS ARE RECEIVED, THEY ARE ADDRESSED IN A DOCUMENT CALLED THE RECORD OF DECISION, WHICH IS THE FINAL, LET ME SAY THIS IS THE LEGAL DOCUMENT THAT STATES WHAT HAS TO BE DONE AT OU2. THAT'S THE END OF MY PRESENTATION, IF ANYONE HAS ANY QUESTIONS.

MR. EUGENE SMITH: YOU HAD ON ONE OF YOUR EARLIER CHARTS, SECTION 44.

MR. TURNBALL: SITE 44A?

MR. SMITH: YES. YOU SAID THERE WAS SEWER SLUDGE AND YOU ALSO SAID METALS. WHY WOULD YOU HAVE METALS IN THE SEWER PLANT? THEY WOULDN'T BE PART OF ANY METALS THAT WERE ADDED THAT DID NOT GET THROUGH THE TREATMENT PLANT WOULD IT? DO YOU FOLLOW WHAT I'M SAYING?

MR. TURNBALL: THE SOURCE OF THE METALS OF THE SLUDGE?

MR. SMITH: YES, WHERE DID THE METALS COME FROM? DID THEY GET THROUGH THE TREATMENT PLANT?

MR. TURNBALL: THEY PROBABLY WENT THROUGH THE TREATMENT PLANT AND ENDED UP IN THE SLUDGE. THEY PROBABLY WERE REMOVED FROM THE WATER AND ENDED UP IN THE SLUDGE, WHICH IS WHAT WAS SPREAD IN THIS AREA.

MR. SMITH: I JUST THOUGHT IT WAS KIND OF STRANGE TO HAVE METALS END UP THROUGH THE TREATMENT CENTER, BUT THEN YOU DON'T KNOW WHAT WAS HERE AND WHAT WENT IN.

MR. TURNBALL: RIGHT, AND AGAIN, THIS WAS TEN YEARS AGO, SO IT'S DIFFICULT TO SPECULATE.

MR. LANCE LAUGHMILLER: THERE WAS A LOT OF METALS, OR FAIRLY A LOT, IN THAT AREA; YOU KNOW A LOT OF METALS THAT ARE CALLED CONTAMINANTS, THINGS LIKE IRON AND MANGANESE AND THINGS, WE'RE NOT TALKING . . .

MR. SMITH: TEN YEARS AGO I DON'T THINK WE WORRIED TOO MUCH ABOUT WHAT WE WERE DUMPING IN THE GROUND. YOU AND I JUST CARRIED STUFF OUT IN THE WOODS AND THREW THEM OFF THE BACK OF A PICK-UP TRUCK.

MR. LAUGHMILLER: NOT ME. TWENTY YEARS AGO MAYBE; MAYBE 1977.

MR. RICHARD POWERS: ISN'T IT MY UNDERSTANDING THAT EVERY FIVE YEARS THIS PLAN IS TO BE REVIEWED FOR EFFECTIVENESS AND TO UPDATE TECHNOLOGIES AND SO FORTH AND SO ON?

MR. TURNBALL: THAT IS CORRECT. WHAT WOULD HAPPEN WOULD BE THE RESULTS OF THE MONITORING WOULD BE REVIEWED AT LEAST EVERY FIVE YEARS TO DETERMINE THAT THE PREFERRED REMEDY REMAINS EFFECTIVE AND PROTECTIVE OF PEOPLE AND HEALTH AND THE ENVIRONMENT; AND THAT'S ALSO PART OF THE SUPERFUND LAW, THAT ANY TIME THERE'S ANY CONTAMINATION LEFT, YOU'RE REQUIRED TO DO THAT.

MR. POWERS: TO TAKE ADVANTAGE OF NEW TECHNOLOGIES OR ASSESS NEW TECHNOLOGIES?

MR. TURNBALL: THAT COULD BE ONE OF THE PURPOSES.

MR. SMITH: WHAT'S YOUR TIME FRAME BEING PROJECTED, WREN YOU CAN SAY THIS SITE IS CLEAN; WE CAN TURN THE ELECTRICITY OFF AND QUIT PUMPING IT WITH AIR? WHAT ARE WE TALKING ABOUT, FORTY YEARS? FIFTY YEARS?

MR. LAUGHMILLER: THE ACTIVE TREATMENT COMPONENT, WHICH IS THE SOIL VAPOR EXTRACTION; THAT'S EXPECTED TO LAST, ONCE IT'S OPERATIONAL AND FINE TUNED, FOR TWO OR THREE YEARS; PROBABLY EVEN LESS THAN THAT.

MR. SMITH: I FIGURED IT WOULD BE A LONGER TIME FRAME THAN THAT, JUST BY READING IT.

MR. LAUGHMILLER: NOW AGAIN, THE NATURAL ATTENUATION MAY TAKE LONGER, YOU KNOW, THROUGH SOME UNKNOWN. THE THING THAT'S DIFFICULT TO, I GUESS, QUANTIFY, OR SEE HOW BAD OF A PROBLEM WOULD BE, WOULD BE A LOT OF THE WASTE IN THE LANDFILL, WE REALLY DIDN'T GO IN AND SAMPLE THAT, AND SO IT'S--WE DID DO SOME MODELING AND WE SHOWED SOME OF THE ORGANIC COMPOUNDS COULDN'T FLUSH OUT IN A TEN OR FIFTEEN YEAR PERIOD. SOME OF THE METALS WOULD TAKE LONGER, AND THERE ARE SOME METALS THAT WOULD TAKE A VERY LONG TIME.

MS. PATRICIA MCCLELLAN: THE SURVEY FOR SOME OF THE LANDFILL AREAS ALLUDED THAT SOME OF THE SITES THE LAND WAS BELOW THE WATER TABLE; ARE THOSE THE REGIONS THAT PRODUCE THE CONTAMINATION, OR IS THE WASTE THAT YA'LL FOUND THERE IN THE CONCRETE AND STUFF?

MR. TURNBALL: WE LOOKED AT - MOST OF OUR SAMPLES WE TRY TO TAKE ABOVE THE WATER TABLE ANYWAY, SO WE, YOU KNOW, TO GET AN IDEA IF THERE'S GROUNDWATER IN THE SAMPLE. WE DID LOOK AT SOME OF THE DATA OF SOIL SAMPLES AND GROUNDWATER SAMPLES IN CLOSE PROXIMITY TO THOSE. WE REALLY COULDN'T GET MUCH CORRELATION.

MS. MCCLELLAN: SO YOU DON'T THINK THAT'S CONTRIBUTING SIGNIFICANTLY TO ANY OF THE GROUNDWATER CONTAMINATION?

MR. TURNBALL: I DON'T KNOW. LIKE I SAID, IN A LOT OF THE AREAS WE DID NOT ACTUALLY TAKE SAMPLES OF THE WASTE OR BORE DOWN THROUGH THE WASTE. A LOT OF THE AREAS WERE ON THE EDGES OF THE LANDFILL WHERE THE WASTE WAS NOT, MAY NOT HAVE BEEN BURIED THAT DEEP.

MS. MCCLELLAN: WELL ACCORDING TO THIS, IT WASN'T AS DEEP.

MR. TURNBALL: WE DID GO HAVE, WE DID GO FIND SOME, YOU KNOW, THERE WERE SOME CONTAMINATED AREAS THAT WERE RIGHT ABOVE OR AT THE WATER TABLE. SOME OF THOSE AREAS ARE BEING ADDRESSED BY SOIL VAPOR EXTRACTION.

MS. MCCLELLAN: THIS SOIL VAPOR EXTRACTION, WILL THAT REMOVE ALL OF THE CONTAMINANTS; OR WILL IT CAUSE PRODUCTION OF, LIKE, SOME BREAK DOWN PRODUCTS OR SOMETHING?

MR. TURNBALL: IT SHOULD NOT CAUSE ANY BREAK DOWN PRODUCTS; IT WOULD REMOVE MOSTLY VOLATILE ORGANICS WHICH

EASILY EVAPORATE; IT COULD ALSO STIMULATE SOME BIOLOGICAL ACTIVITY AND REDUCE SOME OF THE LESS VOLATILE COMPOUNDS. IT WILL PROBABLY NOT BE EFFECTIVE FOR METALS; BUT THE BIGGEST PROBLEM WE SAW IN GROUNDWATER WAS FROM THE VOLATILE ORGANICS, AND ALSO IN THE SOIL.

MS. MCCLELLAN: HOW MANY MONITORING WELLS DO YOU HAVE AROUND THE AREA?

MR. TURNBALL: AT LEAST FIFTY.

MS. MCCLELLAN: AND THEY'RE AT DIFFERENT DEPTHS, RIGHT? SOME GO DOWN IN THE GROUNDWATER?

MR. TURNBALL: THERE ARE MONITORING WELLS FOR SCREENING IN THE SUPERFICIAL AQUIFER, BOTH IN THE UPPER PORTION OF IT AND THE LOWER PORTION OF IT; PLUS, IN THE YORKTOWN AQUIFER, THERE'S NOT AS MANY WELLS IN THE YORKTOWN AQUIFER; I BELIEVE THERE ARE FIFTEEN OR SIXTEEN; BUT MOST OF THE WELLS ARE IN THE SUPERFICIAL, SO WE BASICALLY SCREEN TWO LEVELS IN THE SUPERFICIAL AQUIFER AND ALSO MONITORING THE YORKTOWN AQUIFER.

MR. LAUGHMILLER: I HAVEN'T SEEN ANY SIGNIFICANT CONTAMINATION IN THE YORKTOWN AQUIFER. ALL THE CONTAMINATION HAS BEEN IN THE SUPERFICIAL AQUIFER RIGHT BELOW THE LANDFILL; SO THE IDEA IS, SINCE WE DON'T HAVE ANY REAL EVIDENCE THAT THE CONTAMINATION HAS MIGRATED DOWN IN ANY SIGNIFICANT WAY, THE NATURAL PROCESSES WILL REMOVE BOTH BY REMEDIATION AND ABSORPTION, A PORTION OF PROCESSES THAT WORK ON

CONTAMINATION, OR REMOVE THE CONTAMINATION, BEFORE IT HAS ANY IMPACT ON THE DRINKING WATER AQUIFER; AND THAT'S ONE OF THE MAIN REASONS FOR A MONITORING PROGRAM, TO CONFIRM THAT THAT'S ACTUALLY TAKING PLACE AND THAT IT'S BEING EFFECTIVE.

MRS. GRACE EVANS: HOW OFTEN DO YOU TEST? ONE OF THE COMMENTS WAS, I THINK HE SAID, TAKE THAT OUT; SO HOW OFTEN DO YOU ACTUALLY MONITOR?

MR. TURNBALL: THAT WILL BE DETERMINED DURING THE REMEDIAL DESIGN, THE EXACT MONITORING PROGRAM. WE MAY HAVE USED THE ANNUAL JUST FOR ALL DETERMINANTS FOR JUST A COMMON COST BASIS, BUT THIS WILL HAVE TO BE--THE EXACT MONITORING PROGRAM WILL HAVE TO BE HANDLED, A CONSENSUS BETWEEN THE NAVY AND THE AIR STATION AND REGULATORY AGENCIES.

MR. MATT COCHRAN: THE TYPICAL APPROACH TO THE MONITORING PROGRAM IS TO COLLECT A GREATER NUMBER OF SAMPLES IN THE EARLY STAGES OF MONITORING; FOR INSTANCE, YOU MAY TAKE SAMPLES OVER A QUARTERLY MONITORING PERIOD, THAT IS FOUR SAMPLES PER YEAR, AND EVALUATE THAT INFORMATION; AND THEN, AS YOU'RE SEEING TRENDS OVER TIME, YOU MAY DECREASE THE FREQUENCY THAT YOU COLLECT THOSE SAMPLES TO TWO TIMES A YEAR; AND TAILING IT OFF TO ONE TIME A YEAR, OR MAYBE ONCE EVERY SEVERAL YEARS ONCE YOU HAVE ESTABLISHED SOME SORT OF A BASE FIND TREND WITH YOUR INITIAL ROUNDS OF DATA.

MS. RACHEL JOHNSON: THE EXACT NUMBER OF WELLS TO SAMPLE AND WHAT TO SAMPLE FOR WILL BE DECIDED AS A CONSENSUS

DECISION BETWEEN THE STATE, NAVY EPA AND STATION PERSONNEL.

MR. TURNBALL: DID SOMEBODY HAVE A QUESTION OVER HERE?

MS. EVANS: YES, ON SOME OF THE ORIGINAL INFORMATION THAT WE WERE GIVEN, THIS WAS ON LINE TO BE DECIDED IN 1996, WE'RE ABOUT A YEAR BEYOND WHAT I ORIGINALLY READ ABOUT OU2; AND I WONDERED, SINCE THIS IS AN UNKNOWN QUANTITY OR AN UNKNOWN SOMETHING THAT SEEMS TO BE AFFECTING THIS SITE UPSTREAM, AND SO I GUESS ANOTHER OPERABLE UNIT HAS BEEN ADDED UP SLOCUM CREEK?

MR. LAUGHMILLER: LET ME ADDRESS THIS RIGHT NOW. ONE OF THE THINGS WE'VE GOT, WE'VE GOT A SMALL AMOUNT OF MAINLY METALS THAT WE'RE CONCERNED ABOUT THAT IS IN SLOCUM CREEK NEXT TO OPERABLE UNIT TWO AND OPERABLE UNIT THREE. IT'S HARD TO DETERMINE AT THIS POINT WHERE THAT'S COMING FROM; THERE'S A COUPLE--SOME OF THE CONTAMINANTS ARE SIMILAR TO THE ONES AT OPERABLE UNIT TWO; SOME ARE SIMILAR TO THE ONES IN THE OPERABLE UNIT THREE; SOME OF THEM ALSO, MAYBE, HAVE COME FROM OLD, NON-POINT SOURCE RUN-OFF SITES THAT WERE PERMEATED; SO WE'VE GOT SEVERAL DIFFERENT AVENUES OF WHERE THE CONTAMINATION MAY HAVE COME FROM; AND SOMETHING THAT'S GOING TO TAKE A MORE COORDINATED EFFORT, BECAUSE WHEN YOU START TALKING ABOUT ECOLOGICAL EFFECTS IN A SURFACE WATER BODY, IT'S NOT NEARLY AS AN EXACT SCIENCE AS WHAT WE'VE BEEN DEALING WITH. SO, FOR CONVENIENCE, AND TO GO AHEAD AND PUSH

OUR REMEDIES THROUGH, WE DECIDED TO SEPARATE THAT ASPECT AWAY FROM THOSE OPERABLE UNIT TWO AND OPERABLE UNIT THREE SO WE CAN FOCUS OUR CONCENTRATIONS ON GETTING WHAT WE KNOW AND WHAT WE UNDERSTAND TAKEN CARE OF. NOW WE'RE BEGINNING THE PROCESS OF COMING BACK AND PUTTING TOGETHER SOME OF THE ECOLOGICAL EFFECTS FROM THIS PARTICULAR AREA, SLOCUM CREEK, AND TRY TO DETERMINE WHAT IMPACT THEY HAVE.

MS. EVANS: WHAT I WAS TRYING TO MAKE OUT WAS WHETHER OR NOT IT WOULD BE A CONTINUANCE, IF IT IS COMING FROM BOTH STREAMS, WHICH IS APPARENTLY WHAT IS GOING TO BE LOOKED AT; THEN, KNOWING AS SURFACE WATER AND GROUNDWATER RUNS ALONG, WHETHER OR NOT THIS WOULDN'T KEEP, WHETHER WE SHOULD KNOW WHERE IT'S COMING FROM, SOME OF THESE. IN LOOKING AT THE THINGS, THE NUMBER OF ITEMS OR POLLUTANTS THAT WERE CHECKED, AND LOOKING AT SOME OF THE PERCENTAGES THAT WERE FOUND, AND ARE STILL GOING TO BE CHECKED FOR WITH CLEANUP GOALS; IT SEEMS THAT WE HAVE MORE PROBLEMS THAN CAN BE CLEANED UP BY USING TWO AND THREE TO CLEAN THEM. AND I WONDER IF SOME OF THE INFOR14ATION WAS CHECKING THE SEDIMENT BUT THEN CHECKING THE SOIL BENEATH IT; I KNOW THE SEDIMENT, AND I GUESS I THINK OF IT AS BEING LIGHTER THAN SOIL UNDERNEATH; WHAT IS THE DIFFERENCE THERE?

MR. TURNBALL: BETWEEN SEDIMENT AND SOIL?

MS. EVANS: YES, SEDIMENT AND SOIL, UNDERLYING SOIL?

MR. TURNBALL: OKAY, WHAT WE'RE TALKING ABOUT, SURFACE SOIL AND SUBSURFACE SOIL, THAT'S ON REGULAR LAND.

MS. JOHNSON: WHAT SHE'S REFERRING TO SPECIFICALLY IS IN THE PLAN AND IT'S FOUND ON PAGE FIVE.

MR. COCHRAN: GRACE, YOU ARE CORRECT THAT SLOCUM CREEK WOULD BECOME, OR A PORTION OF SLOCUM CREEK ADJACENT TO OU2 AND OU3 WILL BECOME A SEPARATE OPERABLE UNIT AND INVESTIGATED ON ITS OWN.

MS. EVANS: I JUST WONDERED IF UPSTREAM, WHETHER OR NOT YOU WOULD BE READY TO CLEAR THAT UP?

MR. TURNBALL: NO THAT'S REFERRING TO THESE POLISHING PONDS HERE; THAT SECTION OF THE DOCUMENT. WE TOOK SAMPLES OF THE SEDIMENT OR THE SLUDGE THAT WAS IN THE BOTTOM OF THOSE PONDS; WE ALSO WENT BENEATH THAT TO SEE IF THERE WERE ANY EFFECT OF CONTAMINANTS MOVING FROM THAT SLUDGE MATERIAL INTO THE NATURAL SOIL UNDERNEATH, AND THAT WHAT THAT WAS REFERRING TO THERE.

MS. EVANS: THE SEDIMENT AND SOIL?

MR. TURNBALL: IT WAS ACTUALLY THE SEDIMENT IN THE PONDS WHICH WOULD BE THE RESIDUAL MATERIAL THAT WOULD SETTLE OUT IN THOSE PONDS. THE SOIL THAT WOULD BE THERE IF THE PONDS WEREN'T THERE. SO THAT WASN'T REFERRING TO EITHER SLOCUM CREEK OR TURKEY GUT.

MS. EVANS: NO, NO, RIGHT; I UNDERSTAND THAT. IT'S JUST BECAUSE, AFTER WE HAD THAT VERY INTERESTING MEETING

LAST TIME DOWN IN MOREHEAD, AND LOOKING AT THE USGS INFORMATION ABOUT SHE GROUND CHANNELS, VALLEY OF CHANNELS, AND I THINK WHEN WE WERE--SOMEONE SAID, AFTER THAT MEETING, WE'D BETTER LOOK AT THE BENZINE; I DON'T THINK IT WAS AT THIS UNIT; IT WAS AT ANOTHER UNIT; BUT, IF THERE'S SOMETHING GOING ON THAT WE DON'T KNOW ABOUT, I JUST WONDER WHETHER THAT IS IT. WHAT I'M TRYING TO DO IS PROTECT SLOCUM CREEK. I WANT YOU TO EVEN ADD ANOTHER OPERABLE UNIT AND GET RID OF THAT ELBOW DOWN AT THE RIVER.

MR. COCHRAN: GRACE, WE ARE IN THE PROCESS NOW OF TAKING EXISTING DATA THAT HAS BEEN COLLECTED, AND THERE'S BEEN NUMEROUS STUDIES THAT HAVE BEEN DONE IN THE PAST, AND PUTTING THAT DATA TOGETHER AND SUMMARIZING THE DATA, SO THAT WE CAN PINPOINT WHAT HAS BEEN DONE IN THE PAST SO THAT WE CAN ASSESS THAT, AND DETERMINE WHAT WE NEED TO DO IN THE FUTURE. IN ASSOCIATION WITH OU2 AND 3.

MS. EVANS: IS THAT, DO YOU MEAN WHAT HAS GONE ON BEFORE OR WHAT--SAY LIKE THE EIGHT STUDY WHERE METALS WERE FOUND?

MR. TURNBALL: REALLY ASSESSING BOTH, WHAT HAVE BEEN CONTRIBUTORS, AND WHERE THOSE CONTRIBUTIONS ARE AT, WHERE THE CONTAMINANTS ARE AT.

MS. EVANS: I CAN'T FIND PICTURES OF CONTRIBUTORS UPSTREAM, SO IT WOULD SEEM THAT THAT WOULD BE THE GROUNDWATER COMING THROUGH; AND THAT IT’S COMING FROM SOMEWHERE, AND SO--

BECAUSE MAYBE THERE WAS SOMETHING UPSTREAM ON SLOCUM OR ON TURKEY AND IT'S COMING THROUGH IN THE GROUNDWATER. SHOULDN'T WE FIGURE THAT OUT BEFORE WE MAKE A DECISION?

MR. LAUGHMILLER: WHAT WE'VE DONE WITH THIS STUDY IS WE LOOKED AT THE CONTAMINANTS THAT ARE IN OU2. WE SAY, OKAY, WE'VE GOT SOME CONTAMINANTS IN THE SOIL; WE'VE GOT SOME CONTAMINANTS IN THE GROUNDWATER. WE HAVE TO--THE WAY WE TELL WHETHER OUR REMEDY IS EFFECTIVE, ARE ANY OF THESE CONTAMINANTS GOING TO LEACH DOWN THROUGH THE SOIL, OUT THROUGH THE GROUNDWATER AND INTO THE CREEK THAT WILL CAUSE ELEVATED LEVELS, LEVELS ABOVE STATE STANDARDS FOR SURFACE WATER. IF WE CAN'T INTERRUPT THAT, OR IF THAT'S HAPPENING, THEN WE HAVE TO REMEDY THAT, OR PREVENT THAT. RIGHT NOW, THE LEVELS OF CONTAMINATION THAT ARE COMING OUT INTO THE CREEK ARE BELOW THAT LEVEL; IT'S NOT A CORRELATED--IT'S NOT--WE HAVEN'T FOUND ANY CONTAMINANTS THAT ARE GOING DOWN THROUGH THIS MEDIA, COMING OUT OF OU2, THAT ARE CAUSING A DIRECT EFFECT THAT IS ABOVE THE LEVELS OF SLOCUM CREEK VOLATILES.

MS. LINDA RAYNOR: WE'RE EXPERIENCING--WE'RE CLEANING UP MOST OF THE VOLATILES AT OU2 AREAS. THE AQUATIC TOXICOLOGY PEOPLE WITH THE STATE ARE CONCERNED ABOUT METALS AND PESTICIDES IN SLOCUM CREEK, SO WE'VE BEEN TALKING ABOUT INVESTIGATING SLOCUM CREEK CONTINUALLY FOR THE PESTICIDES AND METALS, AND SO I'VE MET WITH THE AQUATIC TOXICOLOGY PEOPLE TO RELAY INFORMATION TO LINK THE MARINE CORPS AND CONTRACTORS OF

WHAT THEY KIND OF HAVE IN MIND AS FAR AS THE INVESTIGATION. SO, WHAT WILL HAPPEN NOW, THE MARINE CORPS AND THE CONTRACTORS WILL PREPARE A PROPOSAL OF WHERE THEY'RE GOING TO SAMPLE AND WHAT THEY'RE GOING TO SAMPLE. THEY'RE GOING TO HAVE TO SAMPLE FISH TISSUES AND THINGS LIKE THAT, AND THEN ALSO SUBMIT IT TO THE AQUATIC TOXICOLOGY PEOPLE, AND WHEN THEY WILL EVALUATE IT, AND SO THAT WILL BE STARTING THE INVESTIGATION OF SLOCUM CREEK. YOUR CONCERN, I GUESS, IS FOR THE CONTAMINANTS THAT ARE COMING UP GRADIENT FROM THESE SITES; AND THEY WILL HAVE TO BE ADDRESSED. WHEN WE FIND THE SOURCE, AND I THINK WE'VE KIND OF MADE SOME HEADWAY, THEN WE'LL HAVE TO ADDRESS THAT AND TAKE CARE OF IT. SO, YOU KNOW, WE'LL FIND OUT AS WE GO. BUT I THINK THE REASON OU2 AND 3--1 MEAN THOSE ARE THE ONES WE'RE CLEANING UP FIRST, AND THERE'S A WHOLE BUNCH OF OTHER PLACES TO CLEAN UP, AND WHEN WE FIND THAT MAYBE THE ONES UP GRADIENT IS A HIGHER PRIORITY, WE'LL TRY TO WORK THAT WAY AND FOCUS ON THAT; SO WE CAN ADDRESS THAT ALSO.

MS. EVANS: I GUESS THAT WILL SEEM TO TAKE CARE OF THE UPGRADING, IF WE THINK THIS IS NOT COMING FROM THAT, BEFORE WE TAKE CARE OF THIS, BECAUSE WOULDN’T IT JUST BE CUMULATIVE?

MS. RAYNOR: WELL, IN THE MEANTIME, WITH GETTING THIS LITTLE PIECE, THE SOIL LEVELS, THE CONTAMINATION IN THE SOILS ARE HIGHER THAN THE STATE ALLOWS ON THE GROUND SERVICE;

THAT'S WHY THEY'RE DOING THE SOIL VAPOR EXTRACTION, AND WE'RE GOING TO TRY NATURAL ATTENUATION, AND HOPEFULLY THAT WILL TAKE CARE OF THE PROBLEM. THAT'S WHY WE'RE GOING TO TAKE CARE OF THOSE AREAS THAT WERE INVESTIGATED; AND AS WE GO, WE'RE GOING TO ADD ON, AND IF THE UP GRADIENT SOURCES ARE A HIGHER PRIORITY, WE'LL CONCENTRATE ON THEM.

MR. POWERS: THAT'S CERTAINLY WHAT THE RAB IS FOR, IS TO HELP ASSIGN THOSE PRIORITIES.

MS. EVANS: WELL, I'M GOING TO ASK SOMETHING ELSE, TOO. IS, IN DECIDING UPON WHICH ALTERNATIVE YOU'RE GOING TO USE, IS EVERYTHING EQUAL; OR ARE YOU WEIGHING SOME OF THESE HIGHER? FOR ME, I WOULD THINK THE LONG-TERM EFFECTIVENESS AND PERMANENCE AND REDUCTION OF TOXICITY, MOBILITY, OR VOLUME; THOSE WOULD GET A HIGHER VALUE TO ME THAN SHORT-TERM EFFECTIVENESS, COST AND IMPLEMENTABILITY. THAT'S IMPORTANT, AND COST CERTAINLY IS IMPORTANT, BUT THE COSTS ARE SO INCREDIBLE ANYWAY; BUT, MY HIGHEST, FOR ME IT WOULD BE THE LONG-TERM EFFECTIVENESS; SO EVENTUALLY THESE FENCES CAN COME DOWN AND WARNING SIGNS WON'T HAVE TO BE DOTTING THE BASE, AND CERTAINLY THE REDUCTION OF TOXICITY AND MOBILITY ARE THE BIG ONES.

MR. LAUGHMILLER: THIS SITE IS KIND OF UNIQUE IN THE SENSE THAT THE MAIN PROBLEM WITH THE SITE IS THAT IT'S A FORTY ACRE LANDFILL, SO IT'S NEVER--WE'RE NEVER GOING TO WALK AWAY FROM IT; I MEAN, WE PUT GARBAGE OVER THERE FOR YEARS AND

YEARS AND YEARS, AND IT'S A LANDFILL, AND THAT'S WHERE THE LANDFILL EXISTS. AS FAR AS THE MONITORING, WE'RE PROBABLY ALWAYS GOING TO HAVE TO MONITOR TO SOME EXTENT, BECAUSE WE DON'T KNOW EXACTLY EVERYTHING THAT'S IN IT. I MEAN, THERE MAY BE ONE LITTLE DRUM OF SOMETHING IN THERE SOMEWHERE THAT TAKES FIFTY YEARS TO PUNCTURE; AND WE WON'T KNOW THAT UNTIL WE CATCH IT IN THE MONITORING, AND IT MAY NEVER HAPPEN; SO, IN THAT SENSE, THIS SITE IS A LITTLE UNIQUE AS FAR AS OUR OTHER SITES. WE'RE NEVER GOING TO DROP THE SIGNS DOWN AND WALK AWAY FROM THIS ONE, BECAUSE OF THE LANDFILL; BUT BY WORKING WITH THE STATE, AND COMING UP WITH AN ALTERNATIVE TO USE THE NATURAL PROCESSES FOR THE LEVELS OF CONTAMINATION THAT ARE CURRENTLY IN THERE, WE SAVED ABOUT FOUR MILLION DOLLARS THAT WE'VE BEEN ABLE TO PUT TOWARDS BRINGING SEVERAL OTHER OPERABLE UNITS UP ON LINE AND PUSHING THEM FORWARD, TOOK OUR BUDGET BASICALLY AND MOVED EVERYTHING TWO YEARS FORWARD; SO THAT WAS A GREAT ACCOMPLISHMENT BECAUSE OF THE STATE COMING UP WITH SOME CREATIVE ALTERNATIVES. THAT'S WHY WE BALANCE THE COSTS WITH SOME OF THE DIFFERENT THINGS.

MS. EVANS: I UNDERSTAND HOW TO DO THAT; I JUST WANT THE CANAL, BECAUSE IT'S THERE ON THE WATER; WE'VE GOT ENOUGH PROBLEMS WITH THE WATER AND WITH THE SAME METALS AND POLLUTION AND EVERYTHING ELSE COMING DOWNSTREAM FROM WEST, THAT I STILL DON'T WANT RIGHT HERE; IT'S GETTING TOO CLOSE TO HOME. BUT IT'S ALSO THE UNDERGROUND WATER, THE GROUNDWATER

THAT IS OF GREAT CONCERN, BECAUSE THAT'S MOVING; IT MIGHT COME OVER TO THE OTHER SIDE OF THE RIVER. I'M BEING A LITTLE FACETIOUS THERE, BUT IT'S JUST WE'RE ALWAYS INTERESTED TO KNOW WHETHER IT'S GOING TOWARDS HAVELOCK.

MS. RAYNOR: RICHARD AND I WENT AND SAMPLED THE CITY OF HAVELOCK WELL RECENTLY, IN MAY; WE SAMPLED IT FOR VOLATILES AND SEMI-VOLATILES AND NOTHING SHOWED.

MS. EVANS: UNDERGROUND.

MR. POWERS: NO, OF COURSE, THOSE WELLS WERE UNDERLYING THE WATER TABLE IN CASTLE HAYNE.

MS. RAYNOR: AND REMEMBER, LIKE CHARLES DANIELS WAS SAYING, THERE WAS A POSSIBILITY OF PUMPING . . .

MS. EVANS: AND IN FACT THE TWO WELLS--WHERE WERE THE TWO WELLS ON BASE THAT HAD TO BE CLOSED; WERE THEY . . .

MR. LAUGHMILLER: THERE ARE RIGHT DOWN ON THE SOUTHEAST, SOUTHWEST END, NOT FAR FROM THE MAIN GATE.

MR. POWERS: ONE WAS PRIMARILY FROM A GAS TANK LEAKING AT THE MWR GAS STATION.

MR. JOHN MYERS: YOU'RE CORRECT.

MR. POWERS: THAT WAS LITERALLY FROM HERE TO THE DOOR.

MR. SMITH: HAVE WE LEARNED ANYTHING, LESSONS FROM WHAT WE WERE DOING, AS YOU SAID, EVEN TWENTY YEARS AGO, TEN YEARS AGO; ARE WE DOING THINGS DIFFERENTLY ON THE AIR

STATION NOW?

MR. MYERS: YES SIR, QUITE A BIT, WE CERTAINLY ARE.

MR. SMITH: WE'RE NOT CREATING PROBLEMS FOR TODAY'S UNBORN GRANDCHILDREN WHO ARE NOW SUFFERING IN A SENSE?

MR. COCHRAN: I GUARANTEE THAT THE WASTE MANAGEMENT PROGRAM THAT THEY HAVE, THE WASTE MINIMIZATION THAT THEY HAVE AT CHERRY POINT, IS ON THE CUTTING EDGE.

MR. SMITH: YOU MEAN, THE TUSCARORA LANDFILL OR WHAT?

MR. COCHRAN: NO, AT THE AIR STATION; THEY HAVE A PROGRAM IN EFFECT FOR MINIMIZING WASTE; IN SOME CASES THERE ARE WASTE STREAMS THAT WERE USED, THAT WERE DEVELOPED TEN YEARS AGO THAT THEY NO LONGER GENERATE; THERE ARE WASTE TREATMENTS THAT THEY DON'T EVEN GENERATE ANYMORE, AND THEY HAVE A VERY AGGRESSIVE APPROACH OF INVENTORYING THEIR MATERIALS AND WASTE MINIMIZATION THAT REALLY KEEPS THINGS TO A MINIMUM.

MR. MYERS: AND AS YOU OPERATE, YOU'RE BOUND TO HAVE SPILLS ONCE IN A WHILE; THERE'S NONE OF THAT WHOLESALE SPILLING, BUT WHEN THERE IS A SPILL, THE AIR STATION HAS AN AGGRESSIVE PROGRAM OF RESPONSE AND CLEANING UP.

MR. LAUGHMILLER: AS OPPOSED TO WHAT WE USED TO HAVE.

MR. SMITH: WE NO LONGER TAKE A CONTAINER OF CONTAMINATED FUEL AND THROW IT IN THE BACK OF A PICK-UP TRUCK AND HAUL IT IN THE WOODS AND JUST DROP THE BARREL OUT? I THINK THAT WAS GOING ON TWENTY OR THIRTY YEARS AGO.

MR. MYERS: NO SIR.

MS. EVANS: YOU HAVE PEOPLE WHO STILL PARK THEIR CAR OVER A DITCH AND CHANGE THE OIL, RIGHT IN THE DITCH.

MR. SMITH: THAT'S PAMLICO COUNTY STYLE; WE DON'T DO THAT HERE.

MS. EVANS: COME ON OVER AND WATCH. THERE WAS ONE, IN TALKING ABOUT LEACHATE SEEPS, AND THAT'S SEDIMENT SAMPLES IN REGARD TO LEACHATE SEEPS, AND THAT GOES ON; ONE LOCATION HAD CONCENTRATION OF CHLOROFORM AND DIELDRIN THAT WERE HIGHER THAN CLEANUP GOALS BASED ON PROTECTION OF GROUNDWATER. I DON'T KNOW LEACHATE SEEPS?

MR. TURNBALL: THAT WOULD BE WHERE WATER HAD, RAINWATER HAD SEEPED THROUGH LANDFILL MATERIAL AND MAY HAVE COME OUT, YOU KNOW, JUST ON THE GROUND SURFACE AS A WET SPOT OR SOMETHING LIKE THAT; ORDINARILY A STAINED AREA ON THE GROUND. MOST OF THE GROUNDWATER DISCHARGES TO, WELL ALL OF THE SHALLOW GROUNDWATER DISCHARGES TO TURKEY GUT OR SLOCUM CREEK; BUT THERE MAY HAVE BEEN SOMETHING THAT CAUGHT, PREVENTED THAT GROUNDWATER FROM GOING ALL THE WAY DOWN. IT MIGHT HAVE COME OUT ON THE SURFACE. THE TERM, LEACHATE, IS KIND OF A TECHNICAL TERM FOR WATER THAT'S GONE THROUGH

GARBAGE AND PICKED UP ALL THE STUFF IN IT.

MS. EVANS: YES, WE HAVE A LOT OF TROUBLE WITH THE REGIONAL ONE, WHERE THAT WAS GOING TO GO. CHERRY POINT WAS GOING TO TAKE IT; HAVELOCK WAS GOING TO TAKE IT; NEWPORT WAS GOING TO TAKE IT, THE LEACHATE FROM THERE.

MR. TURNBALL: YES, THAT WAS NOT A--WE DID NOT FIND MANY OF THOSE AREAS, LEACHATE SEEPS, AT ALL. MOST OF THEM APPEARED TO BE JUST STAINS UPON THE GROUND.

MS. EVANS: I JUST WANTED TO GET THIS STRAIGHT IN MY HEAD, AS FAR AS THE WEIGHING OF THE CRITERIA. MY CRITERIA THAT WOULD WEIGH HEAVIEST FOR ME WOULD BE EFFECTIVENESS AND REDUCTION; IS THERE A WEIGHING OF THOSE, IS ONE WORTH TEN AND . . .

MR. TURNBALL: THE WEIGHING OF THAT WAS ALL DONE EQUALLY.

MS. EVANS: EVERYTHING WAS EQUAL? WAS COST AS EQUAL AS LONG TERM EFFECTIVENESS?

MR. TURNBALL: YES.

MR. LAUGHMILLER: IF YOU'LL LOOK ON PAGE ELEVEN, IT TALKS ABOUT THE PRIMARY BALANCING CRITERIA.

MS. EVANS: RIGHT.

MR. LAUGHMILLER: THIS LITTLE TABLE SHOWS THAT, THAT BASICALLY RANKED, THE ONES THAT ARE ONE, TWO, AND THREE, AND THESE ARE ALTERNATIVES TWO, THREE, AND FOUR. THE WAY WE TYPICALLY DO THESE THINGS IS, WE DO THIS AS A FIRST CUT TO

TRY TO SEE WHICH OF THEM OBVIOUSLY DON'T LOOK LIKE THEY'RE GOOD IDEAS; BUT IT'S KIND OF A NEGOTIATION. WE LOOK AT, YOU KNOW, IT'S NOT A BLACK AND WHITE; THIS ONE'S WORTH TEN POINTS; THIS IS WORTH THREE POINTS; AND WHATEVER FALLS, THAT'S WHAT WE DO. A LOT OF TIMES IT TAKES A PROFESSIONAL JUDGMENT TO SAY, OKAY, WELL THESE TWO ARE ABOUT THE SAME, WHICH ONE MAKES MORE SENSE. DO WE DO, WHEN WE ADDED IT UP, THIS ONE HAD ONE MORE POINT THAN THE OTHER ONE BUT IT COST TEN MILLION MORE DOLLARS. WELL, DOES IT REALLY MAKE SENSE TO DO THIS, OR SHOULD WE DO THIS, OR TWO ARE THE SAME AND COST THE SAME, AND ONE IS OF MORE INNOVATIVE TECHNOLOGY THAT MAY WORK A LITTLE FASTER; THERE'S A LOT OF THINGS THAT WE WORK TO BALANCE IT, AND THE NAVY, MARINE CORPS, STATE, AND EPA WORK TOGETHER TO LOOK AT THESE ALTERNATIVES AND SAY, WHICH ONE DO WE THINK IS THE BEST ALTERNATIVE; AND IT ISN'T ALWAYS A ONE TO ONE COMPARISON. USUALLY THESE THINGS FALL OUT.

MS. EVANS: IT LOOKS PRETTY GOOD TO ME ON THE SOIL ALTERNATIVE; BUT ON GROUNDWATER, WHEN IT CAME TO--OUT OF THE THREE ALTERNATIVES THERE, THAT REDUCTION OF TOXICITY, THAT HAD THE LEAST EFFECTIVENESS OF THE THREE ALTERNATIVES.

MR. POWERS: YES, THAT SHOWS A RANKING OF NUMBER THREE THERE, VERSUS THE ONE AND TWO COURSE. IF I MAY SAY, WORKING WITH THE STATE GROUNDWATER SECTION, AND THE DEPARTMENT AS A WHOLE, AND UNDERSTANDING OUR LEGISLATORS TO A GREAT POINT, THERE HAS BEEN MORE AND MORE OF A MOVE TO THE

NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS FOR, AS LANCE MENTIONED EARLIER, PARTICULARLY LARGE ASSIGNMENTS LIKE THIS, LIKE THESE LANDFILLS, LARGE SPRAY IRRIGATION FIELDS; AND IT IS FINE; IT IS APPROPRIATE; IT'S CERTAINLY BEING MONITORED AND EVALUATED FOR EFFECTIVENESS, AS YOU MENTIONED, PERIODICALLY; IN THIS CASE, EVERY FIVE YEARS, WHICH IS COMING UP IN A YEAR OR TWO. AND CERTAINLY AT THAT TIME, SAY, YOU KNOW, THE BASE WERE TO GET THOSE HORNETS HERE, AND ALL OF A SUDDEN THERE IS A HUGE DEMAND FOR LAND, YOU KNOW, THEN IT MIGHT BE MORE APPROPRIATE FOR THAT THREE TO BECOME A ONE, AND GO AHEAD AND DO PROACTIVE PUMPING AND STUFF. MORE AND MORE WE'RE GOING TO SEE THE NATURAL ATTENUATION/DEGRADATION PROCESSES, AS LONG AS THERE IS NOT IMMINENT THREAT TO OR REASONABLE THREAT TO HUMAN HEALTH AND SAFETY, AS BEING ACCEPTED FOR CLEANUP. IT'S JUST A WAY THAT'S ROLLING ACROSS THE NATION RIGHT NOW; THE BRANFIELDS INITIATIVE, THAT'S A PERFECT EXAMPLE.

MS. RAYNOR: THE AQUATIC TOXICOLOGY PEOPLE, THEY WERE CONCERNED SOME VOLATILES WERE GETTING INTO THE SURFACE WATER, BUT THEY WEREN'T REALLY THAT CONCERNED ABOUT THE VOLATILES; THEY WERE MORE CONCERNED ABOUT THE PESTICIDES. THAT'S WHY THAT ADDITIONAL OPERABLE UNITS IS GOING TO BE STUDIED.

MS. EVANS: WHEREVER THAT OPERABLE UNIT MAY BE.

MS. RAYNOR: WELL, IT'S GOING TO BE ON SLOCUM

CREEK.

MS. STEPHANIE MAXON: THERE HAVE BEEN A LOT OF ADDITIONAL STUDIES DONE, ON, YOU KNOW, THE PHYSICAL INFLUENCES, THE REDUCTION OF CONTAMINANTS. THERE HAVE BEEN A NUMBER OF STUDIES THAT HAVE TRIED TO DEFINE WHAT INFLUENCES THE MOBILITY, WHERE ANY CONTAMINANTS ARE COMING FROM; PUTTING THAT NEXT TO THE HISTORY OF WHAT HAS BEEN PRODUCED IN THOSE AREAS, YOU CAN GET A PRETTY GOOD IDEA OF WHERE THIS HAS COME FROM, WHERE IT IS NOW, AND AT WHAT LEVELS. THEY CAN EVEN TELL YOU WHAT VARIES, AND HOW MUCH A DANGER IT HAS BEEN. SO THERE HAVE BEEN ENOUGH STUDIES DONE THAT WE CAN FEEL SECURE ABOUT THEIR ATTENTION TO THE PROBLEM, IN MY OPINION.

MR. LAUGHMILLER: WE SHOULD PROBABLY INTRODUCE YOU; GRACE, DO YOU KNOW STEPHANIE?

MS. EVANS: NO.

MS. MAXON: I'M STEPHANIE MAXON, AN ENVIRONMENTALIST WITH DUKE. DUKE HAS VOLUNTEERED TO SPEND TIME AT CHERRY POINT LOOKING AT THE MATERIAL AND TRYING TO . . .

MS. EVANS: WILL YOU PUBLISH SOME OF THIS. THIS SOUNDS LIKE THINGS THAT WE OUGHT TO KNOW IN GENERAL.

MS. MAXON: THERE ARE A LOT OF STUDIES. IF YOU WOULD LIKE TO READ MY DATA, I WOULD BE GLAD TO GIVE IT TO YOU.

MS. EVANS: BECAUSE IT ISN'T JUST VALID JUST TO

HERE, IT'S VALID EVERYWHERE.

MS. JOHNSON: WHAT STEPHANIE IS WORKING ON IS LOOKING AT ALL THE STUDIES THAT HAVE BEEN DONE IN PAST, SPECIFICALLY AT THE SEDIMENT AT SLOCUM CREEK, AND WITH HER INPUT, NEGOTIATIONS WITH THE STATE AND EPA, THAT'S WHAT'S GOING TO--WE'RE GOING TO TAKE ALL THIS INPUT AND ALL THE DATA THAT'S BEEN COLLECTED IN THE PAST AND SIT DOWN AND LOOK AT SLOCUM CREEK AS A SEPARATE OPERABLE UNIT, OU15. SO, IN THAT SENSE, YOU WILL AS A PART OF, AS A RAB MEMBER, YOU WILL LOOK AT THAT AS PART OF OU15; SO YOU WILL BE INTIMATELY INVOLVED WITH ALL OF THE DECISIONS THAT COME OUT OF THOSE DISCUSSIONS.

MS. EVANS: COULD I PUT IN FOR GETTING RID OF THE ELBOW AT THE END? THEY JUST DID A CREEK IN WILMINGTON AND IT'S WORKED. IT'S WORKED DOWN THERE. IT'S AT SNYDER, AND IT HAS CLEANED UP THAT CREEK.

MS. RAYNOR: WHERE IS IT.

MS. EVANS: THEY GOT PERMISSION TO TAKE UP DOWN AT THE END WHERE THAT SLOCUM CREEK MEETS THE NEUSE RIVER. STUFF WASHED OUT AND DOWN FROM THE BASE AND CLOSED IT OFF SO THAT THERE IS A GOOD FLOW OUT.

CAPTAIN MCLAUGHLIN: FOLKS, WHAT OTHER QUESTIONS DO WE HAVE FOR MR. TURNBALL? WE SHOULD--I’M NOT SAYING THAT TO SPEED IT UP; I WAS JUST TRYING TO HONE IN OUR CONVERSATION TO WHAT WE ARE INTO RIGHT NOW.

MS. EVANS: WHEN WILL THIS DECISION BE MADE ON THIS? AS I SAID, I KNOW WE'RE A YEAR BEHIND THE ORIGINAL SCHEDULE.

MR. LAUGHMILLER: WE'RE TRYING TO HAVE THE DRY DOCUMENT COMPLETED BY THE END OF SEPTEMBER AND THE SIGNATURES FOR IT BEING LEGAL. WE'RE WORKING WITH THE STATE WITH SOME GENERAL LEGAL ISSUES FOR HOW TO IMPLEMENT INSTITUTIONAL CONTROLS, BUT WE SHOULD HAVE AN AGREE UPON DOCUMENT, AS FAR AS THE TECHNICAL ASPECT, AT THE END OF SEPTEMBER.

MS. EVANS: AND THEN WE'LL GO ON THEN TO?

MR. POWERS: BIGGER AND BETTER THINGS.

CAPTAIN MCLAUGHLIN: FOLKS, THANK YOU FOR COMING THIS EVENING. ONE SECOND BEFORE EVERYBODY GETS UP; I INVITE YOU ONE MORE TIME TO TAKE A LOOK AT THOSE DOCUMENTS, EITHER AT HAVELOCK PUBLIC LIBRARY, OR AT THE LIBRARY ON THE AIR STATION AND BECOME EVEN MORE FAMILIAR WITH THE PROBLEM. THE 22ND OF AUGUST IS THE LAST DATE THAT PUBLIC OPINION, COMMENTS, QUESTIONS, WE'LL BE ABLE TO ACT ON THOSE; AND I INVITE YOU TO MAIL THOSE QUESTIONS TO MY OFFICE, AND I'LL MAKE SURE WE GET THEM TO THE RIGHT FOLKS. THANK YOU, ONCE AGAIN, FOR COMING.

THE MEETING ADJOURNED AT 8:03 P.M.

* *

END OF DEPOSITION

STATE OF NORTH CAROLINA)

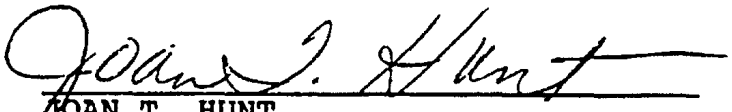
) C-E-R-T-I-F-I-C-A-T-I-0-N

COUNTY OF CARTERET)

I, JOAN T. HUNT, A COURT REPORTER AND NOTARY PUBLIC IN AND FOR THE AFORESAID COUNTY AND STATE, DO HEREBY CERTIFY THAT THE FOREGOING PAGES ARE AN ACCURATE TRANSCRIPT OF THE PUBLIC MEETING IN HAVELOCK, NORTH CAROLINA, ON JULY 29, 1997.

I FURTHER CERTIFY THAT I AM NOT FINANCIALLY INTERESTED IN THE OUTCOME OF THIS ACTION, A RELATIVE, EMPLOYEE, ATTORNEY OR COUNSEL OF ANY OF THE PARTIES, NOR A RELATIVE OR EMPLOYEE OF SUCH ATTORNEY OR COUNSEL.

WITNESS, MY HAND AND SEAL, THIS DATE: AUGUST 4, 1997.



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