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ANNUAL GROUNDWATER REPORT – OCTOBER 2002

OPERABLE UNIT 7

FIRE TRAINING AREA GROUNDWATER

DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

DEFENSE LOGISTICS AGENCY

PREPARED FOR

U.S. ARMY ENGINEERING AND
SUPPORT CENTER HUNTSVILLE

PREPARED BY

MACTEC ENGINEERING AND CONSULTING, INC.
CONTRACT No DACA87-02-D-0007, T.O. 0001
PROJECT No 12001-2-0701

AUGUST 2003

MACTEC

August 6, 2003

Ms. Edna Sheridan
Contracting Officer
U S. Army Engineering and Support Center – Huntsville
4820 University Square
Huntsville, AL 35816-1822

Subject: Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Contract No. DACA87-02-D-0007
Task Order 0001

Dear Ms Sheridan

MACTEC Engineering and Consulting, Inc. (f/k/a Law Engineering and Environmental Services, Inc.) is pleased to submit the Annual Groundwater Report for Operable Unit 7 (Fire Training Area Groundwater) of the Defense Supply Center Richmond (DSCR) in Chesterfield County, Virginia. The report includes data for groundwater sampling activities conducted during October 2002. Please note that 2002 funding issues delayed production of this document

The purpose of this report is to document the groundwater sampling activities conducted at the DSCR during October 2002. In addition, the Annual Report summarizes October 2001, March/April 2002, July 2002, and October 2002 sample results to evaluate trends and to assess the current nature and extent of contamination. This document includes isoconcentration plume maps for the primary contaminants for the upper and lower WBUs and time-series graphs for comparison to historical data.

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MACTEC appreciates the opportunity to assist you on this important project. If you have any questions regarding this submittal, please do not hesitate to call us at 770-421-3400.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.

Robin S. Futch

Robin S Futch, P.G
Project Manager

Angela L McMath

Angela L McMath, R H S P
Program Manager

James R. Wallace

James R Wallace, Sc D., P.E.
Program Principal By CSK with permission

MACTEC Engineering and Consulting, Inc
3200 Town Point Drive NW, Suite 100 • Kennesaw, GA 30144
770-421-3553 • Fax 770-421-3486

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ANNUAL GROUNDWATER REPORT – OCTOBER 2002
OPERABLE UNIT 7
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

Commander
U S. Army Engineering and Support Center – Huntsville
ATTN. CEHNC-PM-ED (T. E. Shirley)
4820 University Square
Huntsville, AL 35816-1822
(1 copy, 2 electronic)

Defense Supply Center Richmond
ATTN· DSCR-SD, Building 80 (S Edlavitch)
8000 Jefferson Davis Highway
Richmond, VA 23297-5000
(4 copies, 1 electronic)

U S Army Engineering and Support Center – Huntsville
ATTN: Ms Edna Sheridan, Contracting Officer
4820 University Square
Huntsville, AL 35816-1822
(1 copy)

U.S. Environmental Protection Agency, Reg III
ATTN Jack Potosnak (3HS13)
1650 Arch Street
Philadelphia, PA 19103-2029
(3 copies)

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(1 copy)

Public Affairs Office
Defense Supply Center Richmond
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8000 Jefferson Davis Highway
Richmond, VA 23297-5427
(1 copy)

Commander
U.S. Army Corps of Engineers
Missouri River Division
ATTN· CEERD-ED-EA
12565 West Center Road
Omaha, NE 68144
(1 copy)

Commander
U.S Army Corps of Engineers
Missouri River Division
ATTN: CEERD-ED-GL
12565 West Center Road
Omaha, NE 68144
(1 copy)

Commonwealth of Virginia
Virginia Dept. of Environmental Quality
Division of Waste Operations
ATTN. Eric Salopek
629 E. Main Street, P O Box 10009
Richmond, VA 23240-0009
(3 copies)

Mr. John Fellinger
TechLaw, Inc.
6 Meghans Way
Pennsville, NJ 08070
(1 copy)

Commander
U S Army Corps of Engineers–Norfolk District
ATTN: CENAO-PM-M (Al Opstal)
803 Front Street
Norfolk, VA 23510-1096
(1 copy)

Ms Kinzie Gordon
Lead Scientist/Regulatory Specialist
Mitretek Systems
3150 Fairview Park Drive South
Falls Church, VA 22042-4519
(1 copy)

Total 20 copies / 2 electronic copies

PREFACE

MACTEC Engineering and Consulting, Inc. (f/k/a Law Engineering and Environmental Services, Inc) has prepared this Annual Groundwater Report – October 2002 for Operable Unit 7 under Contract DACA87-02-D-0007, Task Order 0001, to the U.S. Army Engineering and Support Center, Huntsville (CEHNC). This Annual Report documents the groundwater sampling and analysis activities conducted at the Defense Supply Center Richmond (DSCR) in Chesterfield County, Virginia during October 2002. In addition, the Annual Report provides a compilation of the October 2001, March/April 2002, July 2002, and October 2002 analytical results in order to evaluate trends and to assess the current nature and extent.

Ms. Angela McMath is the Program Manager for DSCR. Ms Robin Futch is the Project Manager for Task Order 0001 Ms Taura Nichols is the primary author of this document. Dr. James Wallace is the Program Principal.

The efforts of Mr. T.E. Shirley (Project Manager) from CEHNC and Mr. Steve Edlavitch from DSCR are greatly appreciated.

Robin S. Futch

Robin S. Futch, P G.
Project Manager

James R. Wallace

James R Wallace, Sc.D , P E.
Program Principal By CSK with permission

Angela L McMath, R.H S P.
Program Manager

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LIST OF ACRONYMS AND ABBREVIATIONS

ACLs	alternate concentration limits
bgs	below ground surface
BTOP	below top of pump
CEERD	United States Army Engineer Research and Development Center
CEHNC	United States Army Engineering and Support Center Huntsville
CO_2	carbon dioxide
COPs	chemicals of potential concern
CSL	Chemical Systems Laboratory
CSM	Conceptual Site Model
D&M	Dames and Moore
DCA	dichloroethane
DCE	dichloroethene
DGSC	Defense General Supply Center
DLA	Defense Logistics Agency
DO	dissolved oxygen
DPE	dual phase extraction
DPT	Direct Push Technology
DQE	data quality evaluation
DQO	data quality objective
DSCR	Defense Supply Center Richmond
ES	Engineering Science
ESI	expanded site investigation
°F	degrees Fahrenheit
Fe^{2+}	ferrous iron
FFA	Federal Facilities Agreement
ft/ft	feet per foot
ft/day	feet per day
ft/yr	feet per year
ft^2/day	square feet per day
ft^3/yr	cubic feet per year
FTA	Fire Training Area
FOS	fuel oil storage

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

FS	Feasibility Study
in/yr	inches per year
J	Estimated; based on QC data
JB	Estimated, possibly biased high or false positive based on blank contamination
JH	Estimated, possibly biased high based upon QC data
JQ	Estimated, value is between reporting limit and detection limit
LAW	Law Engineering and Environmental Services, Inc.
MACTEC	MACTEC Engineering and Consulting, Inc
MCL	maximum contaminant levels
µg/L	micrograms per liter
MNA	monitored natural attenuation
msl	mean sea level
NCDC	National Climatic Data Center
NGVD	National Geodetic Vertical Datum
NM	not measured
NS	not sampled
NTU	nephelometric turbidity unit
NWI	National Wetlands Inventory
ORP	oxidation reduction potential
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbons
PCE	tetrachloroethene
pH	negative log of the hydrogen ion concentration
PX	Post Exchange
QA	Quality Assurance
RAB	Restoration Advisory Board
RAOs	remedial action objectives
RI	Remedial Investigation
RPAs	Resource Protection Areas
SCE	Soils Conservation Service
TCA	trichloroethane

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

TCE	trichloroethene
TDS	total dissolved solids
TOC	total organic carbon
UJ	Undetected, reported detection limit is imprecise
USAEHA	United States Army Environmental Hygiene Agency
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VC	vinyl chloride
VOCs	volatile organic compounds
WBU	water bearing unit
WP	Work Plan

TAB

Executive Summary

EXECUTIVE SUMMARY

MACTEC Engineering and Consulting, Inc (f/k/a Law Engineering and Environmental Services, Inc [LAW]), has prepared the Operable Unit 7 Annual Groundwater Report – October 2002 under Contract No DACA87-02-D-0007, Task Order 0001, to the United States Army Engineering and Support Center Huntsville (CEHNC). This annual groundwater report summarizes the September/October 2001, March/April 2002, July 2002, and the October 2002 sampling and analytical results for Operable Unit (OU) 7 of the Defense Supply Center Richmond (DSCR) located in Chesterfield County, Virginia

OU 7 includes contaminated groundwater within and downgradient of the Fire Training Area (FTA) near the southern boundary of the DSCR Soils associated with the FTA are OU 4 Kingsland Creek forms the southern boundary of DSCR approximately 600-feet south of the FTA. Previously, the FTAs were used for fire training exercises where obsolete and unserviceable waste chemicals were burned from the mid-1960s until the late-1970s Several sampling and analysis programs have been performed at the FTA to evaluate the nature, magnitude, and extent of groundwater contamination

Field activities for the fourth quarterly sampling event were performed in October 2002 in general accordance with procedures outlined in the "Final Sampling and Analysis Plan Revision 1" (LAW, 1992) and the "Final Quarterly Groundwater Sampling Plan for DSCR" (LAW, 2002a)

Twenty-seven monitoring wells were sampled at OU 7 during the fourth quarterly groundwater sampling event in October 2002. The groundwater samples were analyzed for volatile organic compounds (VOCs), metals, and monitored natural attenuation (MNA) parameters Analytical results indicated that concentrations of VOCs were consistent with previously detected concentrations and continue to exhibit a decreasing trend in the upper and lower water bearing units (WBUs) and the fractured bedrock

Chlorinated solvent constituents were detected both in the upper and lower WBU monitoring wells at OU 7. During the October 2002 sampling event, the constituents of primary concern, tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (DCE), trans-1,2-DCE, vinyl chloride (VC), 1,1,1-trichloroethane (TCA), 1,1-dichloroethane (DCA), and 1,1-DCE, were detected within the upper WBU.

Results from the October 2002 sampling event for the upper WBU were compared to historical OU 7 data These comparisons indicate that concentrations of PCE, TCE, *trans*-1,2-DCE, 1,1,1-TCA, 1,1-DCE, and 1,1-DCA were within the range of, and generally lower than, previously recorded concentrations The reduction of the parent products (PCE, TCE, 1,1,1-TCA) and the presence of daughter products (*cis*,1-2-DCE, *trans*-1,2-DCE, 1,1-DCA, VC) provides evidence that natural degradation is occurring at OU 7

Mann–Kendall trend evaluations were performed for each well to assess the significance of trends observed The results from the Mann-Kendall evaluations indicated a statistically significant decreasing trend for PCE within the upper WBU In addition, selected wells within the upper WBU possessed statistically decreasing trends for TCE, *cis*-1,2-DCE, *trans*-1,2-DCE, VC, 1,1,1-TCA, 1,1-DCA, and 1,1-DCE The results from the Mann-Kendall statistics, in conjunction with the time series graphs plotted for selected wells, indicate an overall reduction of contamination within the upper WBU.

For the lower WBU, the detected constituents of primary concern include PCE, TCE, cis-1,2-DCE, and VC. The constituents *trans*-1,2-DCE, 1,1,1-TCA, 1,1-DCE, and 1,1-DCA were not detected during the October 2002 sampling event The results from this sampling event were compared to historical OU 7 data These comparisons indicated that concentrations of PCE, TCE, 1,1,1-TCA, 1,1-DCE, and 1,1-DCA were within the range of the historical data

Mann–Kendall trend evaluations were performed for each well within the lower WBU to assess the significance of trends observed The results from the Mann-Kendall evaluation do not indicate statistically significant (increasing or decreasing) trends for VOCs in the lower WBU

Only one well (MWFTA-20) located in the fractured bedrock is currently sampled as part of the quarterly monitoring program. The primary constituents detected during the October 2002 sampling event for MWFTA-20 include TCE, cis-1,2-DCE, VC, 1,1-DCA, and 1,1-DCE. The results from the October 2002 sampling event for the fractured bedrock were compared to historical OU 7 data. These comparisons indicated that concentrations of PCE, TCE, *cis*-1,2-DCE, 1,1,1-TCA, 1,1-DCE, and 1,1-DCA in October 2002 were within the range of, and generally less than, the historical data Historically, *trans*-1,2-DCE has been detected twice in MWFTA-20 at low concentrations (<5-micrograms per liter [μg/L]); however, it was not detected in this well during the October 2002 sampling event

Comparisons of average concentrations for 1992 and 2002 also indicated a reduction in PCE, TCE, 1,1,1-TCA, 1,1-DCE, 1,1-DCA and an increasing concentration of VC in the fractured bedrock However, the results from the Mann-Kendall trend evaluation performed for MWFTA-20 do not indicate a statistically significant (decreasing or increasing) trend for the selected VOCs within this well

TAB

Section 1.0

1.0 INTRODUCTION

1.0.0.1 MACTEC Engineering and Consulting, Inc (MACTEC) (f/k/a Law Engineering and Environmental Services, Inc. [LAW]), conducted the fourth quarterly groundwater sampling activities during October 2002 at the Defense Supply Center Richmond (DSCR) (Figure 1-1) in Chesterfield County, Virginia, as part of a quarterly groundwater monitoring program currently ongoing at DSCR. Groundwater monitoring wells at Operable Units (OUs) 6, 7, 8, and the Post Exchange (PX) Gasoline Station were sampled in accordance with the procedures outlined in the "Final Sampling and Analysis Plan Revision 1" (LAW, 1992) and the "Final Quarterly Groundwater Sampling Plan for DSCR" (LAW, 2002a). This Annual Groundwater Report summarizes the September/October 2001, March/April 2002, July 2002, and October 2002 sampling and analysis results. MACTEC prepared this report under Contract No DACA87-02-D-0007, Task Order 0001, to the United States Army Engineering and Support Center Huntsville (CEHNC)

1.1 PURPOSE AND OBJECTIVES

1.1.0.1 Groundwater samples were collected in October 2001, March/April 2002, July 2002, and October 2002 as part of a quarterly groundwater monitoring program currently ongoing at DSCR. This Annual Groundwater Report has been prepared to document the results of groundwater elevation measurements and groundwater sampling and analysis activities conducted at OU 7 in October 2002 and to summarize the previous year's (October 2001, March/April 2002, July 2002) groundwater sampling activities Due to funding issues, groundwater samples were not collected during the first quarter of 2002.

1.1.0.2 The purpose of the monitoring program at OU 7 is to monitor the groundwater contaminant plume(s) and to collect additional data to document natural attenuation as a potential component of the final remedy and exit strategy for the site A list of the groundwater monitoring wells sampled at OU 7 during these sampling events is included as Table 1-1, monitoring well locations are depicted on the OU 7 site map (Figure 1-2)

1.1.0.3 The objectives of the groundwater sampling program at OU 7 include the following

- Collect analytical data to document MNA as a component of an effective remedy and exit strategy

- Continue to monitor the current nature and extent of the groundwater contaminant plume(s).
- Collect groundwater elevation data to monitor groundwater flow

1.2 BACKGROUND

1.2.0.1 DSCR, one of three supply centers of the Defense Logistics Agency (DLA), is located at 8000 Jefferson Davis Highway, 11 miles south of Richmond, Virginia, in Chesterfield County (Figure 1-1) DSCR was originally constructed in 1941 as two separate facilities. the Richmond General Depot and Richmond Holding and Reconsignment Point From 1962 to 1995, the facility was designated as the Defense General Supply Center (DGSC) In 1995 the name was changed to the Defense Supply Center Richmond DSCR is the lead center for aviation within the DLA A summary of the environmental restoration program milestones for DSCR is provided in Table 1-2.

1.2.1 Site Description – OU 7

1.2.1.1 The Fire Training Area (FTA) is located near the southern boundary of DSCR and is shown on Figure 1-1. The contaminated soils located at the FTA are designated as OU 4 and have been identified as three separate sources located in the northern portion of the FTA The groundwater, located beneath and downgradient from these identified sources, is designated as OU 7 OU 4 was previously used for fire training exercises where obsolete and unserviceable waste chemicals were burned from the mid-1960s until the late-1970s (LAW, 1994)

1.2.1.2 Three separate unlined pits were used for fire training purposes. Flammable liquid chemicals and petroleum products were dumped into the pits, ignited, and then extinguished during the training. Oils, solvents, pesticides, and herbicides may have been used for fuel. (LAW, 1996a)

1.2.1.3 Pit 1, which was used from the mid-1970s to 1979, was located in the eastern portion of OU 7. Pit 2, located in the central portion of OU 7 and west of Pit 1, was used from the late-1960s until it was replaced by Pit 1 in the 1970s. Pit 3, a suspected pit used for fire training activities, is present in 1969 aerial photographs and was located in the western portion of OU 7 Based on aerial photographs, the fuel oil storage (FOS) tank, used to store fuel oil, was partially constructed over Pit 3 in 1975 In 1978, the FOS tank released approximately 10,600 gallons of No 4 fuel oil to the surface as a result of a cracked valve Heavy rain at the time of the spill caused the oil to overflow its containment berm and flow across the site, ultimately discharging to Kingsland Creek This area, southwest of the FTA, has been designated as OU 13 (a/k/a Polycyclic Aromatic Hydrocarbon [PAH] Area) (LAW, 1996a).

1.2.2 Previous Environmental Studies

1.2.2.1 Previous environmental studies conducted at OU 7 identified groundwater contaminant plumes primarily consisting of volatile organic compounds (VOCs) in the upper and lower water bearing units (WBUs) The plumes extend from the FTA to the southeast. These plumes, consisting of parent compounds, tetrachloroethene (PCE), trichloroethene (TCE), and 1,1,1-trichloroethane (TCA), are considered to be associated with fire training activities at each of the three burn pits In addition, VOC contamination has been identified within the fractured bedrock at the FTA, but due to the limited number of wells screened within the fractured bedrock, an evaluation of plume locations and boundaries in this medium cannot be made

1.2.2.2 Multiple organizations have conducted studies at OU 7. These agencies include the Chemical Systems Laboratory (CSL) at the United States Army Toxic and Hazardous Materials Agency, the United States Army Environmental Hygiene Agency (USAEHA), Dames and Moore (D&M), Parsons Engineering-Science, Inc., LAW, and, currently, MACTEC. The studies previously conducted at OU 7 and the related findings are summarized in Table 1-3

1.2.2.3 From 2000 to 2001, LAW conducted sampling events to verify the presence or absence of persistent sources. During this time, direct push technology (DPT) sampling techniques were used to aid in providing a profile of the groundwater conditions in the upper WBU In 2002, these data were evaluated to aid in the evaluation of the nature and extent as presented in the Summary of Findings Report (MACTEC, 2003a) During this evaluation, three separate plumes were identified downgradient from Pits 1, 2, and, 3, and/or the former FOS tank in the upper WBU at OU 7. Each plume exhibited different VOC parent/daughter product distributions Due to the current placement of monitoring wells within OU 7, only the plumes downgradient from the Pit 1 and the Pit 3 area continue to be evaluated

1.2.3 Scheduled Environmental Activities

1.2.3.1 As part of the DSCR Draft Supplemental Feasibility Study (FS) Work Plan (WP) (MACTEC, 2003b), additional field activities are scheduled for OU 7 The proposed field activities include the collection of soil and groundwater to refine the facility-wide and OU 7-specific conceptual site model (CSM) and developing realistic remedial action objectives (RAOs) The primary objectives for OU 7 presented in the WP include.

1 Evaluate subsurface conditions to determine if features of the bedrock surface potentially affect the distribution and migration of contaminants.

2 Characterize source area(s) to determine appropriate remedial action for the prevention of continued leaching to groundwater

3 Characterize plume boundaries to evaluate and define potential off-site migration pathways for contaminated groundwater

4 Characterize the hydraulic interaction between groundwater and surface water in Kingsland Creek.

5. Clarify pre-remedy geochemical conditions in soil and groundwater in OU 7 that are significant in remedy screening, selection, design, and implementation

1.2.3.2 Currently, activities are scheduled to be conducted at OU 7 during the latter part of 2003. In addition, groundwater at OU 7 continues to be evaluated under the ongoing quarterly monitoring program.

1.3 REPORT ORGANIZATION

1.3.0.1 The OU 7 Annual Groundwater Report is organized as follows Section 1.0 describes the purpose and objectives of the Annual Report, presents the facility site description, and summarizes the historical investigations at OU 7, Section 2 0 provides a summary of the CSM including the hydrological, geological, hydrogeological, and geochemical conditions at OU 7; Section 3 0 provides a summary of the groundwater monitoring program including a summary of results for the October 2002 sampling activities, Section 4.0 provides a summary of the nature and extent of groundwater contamination at OU 7, Section 5 0 provides a summary of the conclusions; and Section 6 0 provides the references. Tables, figures, and appendices immediately follow Section 6 0

TAB

Section 2.0

2.0 CONCEPTUAL SITE MODEL

2.0.0.1 The CSM presented in this section considers a broad range of physical, chemical, temporal, and spatial variables that affect the distribution and fate of contaminants. At a minimum, an adequate hydrogeologic CSM should provide a description of the regional and local climate and geology of the area as well as site-specific information to facilitate an understanding of the overall project goals. These goals include: 1) identification of additional data requirements; 2) obtaining the additional data needed, 3) use of the data to generate a model suitable to support remedy evaluation and establishment of specific performance requirements for restoration planning activities. Site-specific information that supports the CSM also includes

- Identification of principal hydrogeologic units
- The hydraulic properties of the different hydrogeologic units
- The evaluations and configurations of the potentiometric and lithologic/bedrock surfaces(s)
- Surface drainage configurations and hydrologic boundaries
- Surface water and groundwater interactions
- Sources of contaminants
- Direction(s) and rate(s) of contaminant migration
- Biogeochemical processes affecting contaminant fate

2.0.0.2 Available data collected during previous site characterization investigations, treatability studies, and recent monitoring events were compiled and evaluated to develop the current CSM Published literature regarding the physiography, climate, geology, and hydrology of east-central Virginia was also reviewed for the purpose of developing this CSM The historical databases compiled by the United States Geological Survey (USGS) and data from a number of consulting engineering firms and contractors were incorporated into the CSM The current CSM reflects available environmental investigations and remedy-performance data available for DSCR

2.1 FOCUS OF THE CSM

2.1.0.1 The CSM presented herein focuses on the mechanisms of deposition, fate, and transport of site-related constituents of concern in the environment at and near OU 7 Development of the CSM was based on descriptions of the soil, groundwater, surface water, and atmospheric systems at the site, and the relationships among these systems, both spatially and temporally. The systems described in the CSM provide an understanding of the local processes that control the behavior of constituents of concern in the environment and will facilitate the selection of efficient and effective remedial methods to protect human health and the environment

2.1.0.2 The CSM serves as the basis for the performance "model" which will be used for the remedial alternatives evaluation and selection process. The CSM will also be used to support an analysis of exposure pathways that will be conducted to define remedial decision criteria and endpoints.

2.2 REGIONAL ENVIRONMENTAL SETTING

2.2.0.1 The regional characteristics of the environmental setting in the vicinity of DSCR that are directly relevant to the CSM and additional data requirements are discussed in the subsection.

2.2.1 Regional Physiography, Geology and Hydrogeology

2.2.1.1 DSCR is located in Chesterfield County, Virginia, approximately two miles east of the Fall Line in the Atlantic Coastal Plain Physiographic Province (Powell *et al*, 1990) DSCR lies in the western margin of the coastal plain, termed the "Fall Zone" (McFarland, 1997), which separates the Atlantic Coastal Plain Physiographic Province from the Piedmont Physiographic Province west of the Fall Line (McFarland, 1997) The Fall Line is a geomorphic and hydrologic feature marking the boundary between the resistant crystalline rocks of the Piedmont to the west and the generally unconsolidated sediments of the coastal plain to the east (Appendix A, Figures A-1, A-2, and A-3). The Atlantic Coastal Plain Physiographic Province, east of DSCR, is characterized by level to gently rolling terrain, broad stream valleys, and extensive wetlands overlying an eastward-thickening wedge of unconsolidated sediments. The Piedmont Physiographic Province, west of the DSCR, is characterized by rolling terrain underlain by igneous and metamorphic rock on which have developed residual soils that range from 0- to 100-feet in thickness, the Piedmont also includes fault-bound structural basins that contain sedimentary and igneous rock (Mills *et al*, 1987) In addition, Quaternary alluvial deposits are localized in stream valleys.

2.2.1.2 The Fall Zone comprises a belt several miles in width encompassing the complex margin between the elevated Piedmont and the lower-lying, more level coastal plain The topography of the Fall

Zone is dominated by the valleys of the major rivers, which are incised into coastal plain sediments. The coastal plain to the east of the Fall Zone is an undulating lowland ranging in width from fewer than 20 miles to more than 100 miles and lying between the Appalachian Mountain system to the west and the shores of the Atlantic Ocean to the east (Walker and Coleman, 1987). Land surface elevations of the coastal plain in the vicinity of DSCR range from approximately 50- to 100-feet, referenced to the National Geodetic Vertical Datum (NGVD) of 1929 (equivalent to mean sea level [msl]) The Piedmont rises to elevations of several hundred feet NGVD within approximately ten miles to the west and northwest of DSCR.

2.2.1.3 The bedrock in the Piedmont of east-central Virginia is the Petersburg Granite At the Fall Line, the surface of the bedrock dips eastward beneath a thickening wedge of largely unconsolidated sediments of the coastal plain (Appendix A, Figures A-1 through A-3). These sediments originated from erosion of the Petersburg Granite, having been reworked through successive erosional and depositional periods brought about by a series of marine transgressions and regressions resulting from changes in sea level (Meng and Harsh, 1988) The thickness of sediments in central Virginia ranges from zero at the Fall Line to more than 6,000-feet along the Atlantic coast (McFarland, 1997).

2.2.1.4 These eastward-dipping stratified sediments are largely undeformed and were deposited in fluvial, deltaic, and marine depositional environments At the base of the sequence lies a thick series of fluvial and deltaic deposits of Cretaceous age medium to coarse-grained quartz sand with gravel, silt, and clay These deposits are regionally assigned to the Potomac formation (Meng and Harsh, 1988) This formation is overlain by a much thinner sequence of marine Tertiary deposits, classified as the Aquia and Calvert Formations (from oldest to youngest). Above these formations is found a veneer of flat-lying surficial Tertiary and Quaternary deposits of the Yorktown and Eastover Formations (Figures A-1 and A-2)

2.2.1.5 Meng and Harsh (1988) classified the sequence of sediments in the coastal plain into a hydrogeologic framework of WBUs, or "aquifers", and confining units (Figure A-2) Permeable sediments, in the zone of saturation, are generally WBUs, while significantly less-permeable sediments that restrict groundwater movement are considered confining units The term "aquifer" is often reserved for WBUs from which "usable" quantities of groundwater can be withdrawn.

2.2.1.6 Within Chesterfield County, the principal aquifers, from uppermost to deepest, (Appendix A, Figures A-2 and A-3) are reported to be the Yorktown-Eastover aquifer and the Aquia aquifer (separated by the Calvert confining unit), both Tertiary marine strata, and the middle Potomac aquifer, a mostly Cretaceous age fluvial and deltaic deposit (Powell *et al.*, 1990). However, McFarland (1999) suggested that the western limits of the Yorktown-Eastover, the Aquia, and the upper and lower Potomac aquifers may be some distance to the east of DSCR, so these units may not be present in the vicinity of DSCR and Chesterfield County, as interpreted by Powell *et al* (1990). Additionally, groundwater in the Piedmont, located in the western part of Chesterfield County, is largely present in bedrock fractures and in pores in weathered bedrock ("saprolite") overlying Petersburg Granite bedrock. Groundwater also occurs in saprolite and bedrock fractures beneath the coastal plain sedimentary deposits at DSCR.

2.2.1.7 Due to the present uncertainty about the classification of the aquifers in the vicinity of DSCR and the heterogeneous nature of the sediments that comprise these aquifers, making their cataloging in the field difficult if not impracticable, they have been grouped into two distinct WBUs These WBUs are the upper WBU, previously classified as the Yorktown-Eastover aquifer, and the lower WBU, previously classified as the Aquia and the Potomac aquifers These WBUs are separated by a largely clay confining layer, previously classified as the Calvert confining unit (Appendix A, Figure A-2).

2.2.2 Surface Water and Wetlands

2.2.2.1 Streams in the vicinity of DSCR are tributaries to the James River, which ultimately discharges to the Chesapeake Bay Streams within the vicinity of DSCR include a tributary to Falling Creek located along the western property boundary in the northern portion of DSCR, No Name Creek originating on DSCR property and flowing to the east of the facility, and Kingsland Creek located along the southern property boundary (Figure 2-1)

2.2.2.2 Corridors of environmentally sensitive lands that lie along or near the banks of streams, rivers, and other waterways that ultimately discharge into the Chesapeake Bay have been designated as resource protection areas (RPAs) under Virginia's Chesapeake Bay Preservation Act of 1988 In response to the Act, Chesterfield County enacted the Chesapeake Bay Preservation Ordinance in 1990 to protect environmentally sensitive lands known as Chesapeake Bay Preservation Areas. RPAs are the most sensitive of these areas in Chesterfield County and include wetlands adjacent to perennial streams plus 100-feet buffer zones on the landward sides of such wetlands This Act affords special protection to these RPAs and prohibits certain types of activities (e g., excavation, filling, and grading) within these zones Potential wetlands, defined on the basis of plant communities and hydrologic conditions and listed in the National Wetlands Inventory (NWI), are associated with every stream in the vicinity of DSCR (Appendix A, Figure A-4)

2.2.3 Climate

2.2.3.1 East-central Virginia lies within the modified continental climatic zone, which is characterized by pronounced seasonal variability in temperature and precipitation (National Climatic Data Center [NCDC], 2000). The region usually experiences warm summers and relatively mild winters, with a mean annual temperature in the range of 55 degrees Fahrenheit (°F) to 60°F Average monthly temperatures in the vicinity of Richmond range from 78°F in July to the 36°F in January. Prolonged periods of extreme cold or extreme warm weather are unusual

2.2.3.2 The amount of precipitation in the area is variable with the greatest amounts generally occurring in July and August. Mean annual precipitation for the 64-year period of record at the Richmond Airport is approximately 43.2 inches (NCDC, 2000)

2.2.3.3 The mean annual pan evaporation rate for the region is approximately 40 inches, and the greatest rates of evaporation occur in July and August The prevailing wind direction in the vicinity of DSCR is southeasterly. Wind speeds generally are moderate, except during intense summer storms when localized high-speed gusts may occur.

2.2.4 Recharge/Discharge Relationships

2.2.4.1 Groundwater in the Coastal Plain and Fall Zone is recharged primarily by infiltration of precipitation and percolation to the groundwater table (McFarland, 1999) Most precipitation in naturally vegetated landscapes of the Coastal Plain and Fall Zone infiltrates the ground surface, although occasionally the infiltration capacity of the soil is exceeded and surface runoff is produced (McFarland, 1997) Part of the water that infiltrates the ground surface is returned to the atmosphere by evapotranspiration, the remainder either moves as interflow through the vadose zone to discharge directly into a surface water body, percolates through the vadose zone to the water table to recharge the uppermost, unconfined WBU, or is stored in the vadose zone as soil moisture

2.2.4.2 The recharge zone for the Costal Plain aquifers is located in the Fall Zone Groundwater in the confined aquifers moves eastward toward the ocean or locally toward discharge zones along major rivers where these major rivers have cut to the depths of the confined aquifers Where the confined aquifer is in hydraulic communication with such a river, the confined groundwater may discharge into the river, or be recharged by the river, depending on the potentiometric surface of the aquifer relative to the river stage If the potentiometric surface of the aquifer is above the river stage, the aquifer will discharge into the river, and the river is termed a gaining river in this reach. When the potentiometric surface of the aquifer is below the river stage, the river will discharge into the aquifer, or recharge the aquifer, and over this reach, the river is termed a losing river. These hydraulic interactions between groundwater systems and surface water bodies are more pronounced in the Fall Zone due to the shallow nature of the WBUs and the resulting incision of stream channels into the WBUs and confining units (McFarland, 1999).

2.2.4.3 Calculation of volumetric rates of groundwater movement indicate that approximately 10-inches per year (in/yr) of the total precipitation delivered to the ground surface arrives at the surficial WBU as recharge to groundwater in much of the Fall Zone (McFarland, 1999) Of that recharge, more than 9 in/yr discharges locally to rivers and streams, and less than 1 in/yr provides recharge to the regional confined groundwater system.

2.2.4.4 Knowledge of the volumetric rate of groundwater movement is integral to the development of an understanding of the mechanisms of chemical release and transport in the subsurface Although regional calculations are adequate for initial consideration of potential remedial design options, it will be important to define the local water budget to guide final remedy selection and implementation. Calculation of the local volumetric rates of groundwater movement is required to develop the final remedy. Currently, an evaluation of site-specific infiltration characteristics is being proposed as part of the Supplemental FS field effort

2.3 LOCAL ENVIRONMENTAL SETTING

2.3.0.1 This subsection describes local characteristics of the environmental setting at the DSCR facility that combined with the regional characteristics, further refine the CSM and identifies additional data requirements

2.3.1 Surface Water Hydrology

2.3.1.1 The land surface at DSCR has been extensively altered by historical grading and filling operations and is essentially flat, with a slight downward grade from the west to northeast and southeast. Elevations range from about 140-feet above msl along the western boundary of DSCR to about 100-feet msl in the southeastern part of the facility

2.3.1.2 Surface drainage generally is toward the James River, east of the facility. The southern one-third of the installation, on which OU 7 is located, drains toward Kingsland Creek, which forms the southern boundary of DSCR The surface run-off collected from the PX Gasoline Station, southwest warehouses, and OU 7 areas are collected and directed to the DSCR storm-sewer system and finally into Kingsland Creek. The delineated watershed areas at DSCR are illustrated in Figure 2-1.

2.3.2 Storm Water Drainage

2.3.2.1 DSCR is served by an extensive storm-sewer system, consisting of catch basins, storm drains, outfalls, and subsurface conveyance piping at depths ranging from approximately 3-feet to 14-feet below ground service (bgs) In the southern part of the facility within the FTA (OU 4), storm water run-off is directed into surface drainage ditches via storm-sewer lines that transect the FTA, and it is then discharged to Kingsland Creek south of the FTA The location of the storm sewer lines are shown on Figure 2-2. Kingsland Creek forms the southern boundary of DSCR and discharges into the James River approximately one mile east of the facility

2.3.3 Soils – OU 7

2.3.3.1 Soils on the facility proper are classified as "Made Land," defined as areas where soil material consists of anthropogenic fill or where soil has been removed or reworked. Fill material apparently has been placed over extensive areas in the southern part of DSCR bordering Kingsland Creek, in the central eastern part of the facility near the NGA, and in areas bordering No Name Creek. Based on aerial photography prior to DSCR construction and a 1943 topographic map (which was based upon a survey conducted in 1938), these filled areas were topographically low areas at the time the facility was constructed The ground surface elevation changes at DSCR from 1938 to 1994 are presented in Figure 2-3.

2.3.3.2 The native soils generally are silty to sandy loams, with some clay and occasional gravels, which formed by weathering of coastal plain sediments or by weathering of granite and gneiss of the Piedmont. The surface layer generally is a sandy to clayey loam, ranging in color from gray and pale brown to yellowish red The subsoil and substratum are sandy clay with some gravel and generally are strongly to extremely acidic (USDA, 1978).

2.3.4 Direct Recharge of Precipitation to Groundwater

2.3.4.1 Possible sources of recharge to groundwater at OU 7 include recharge from precipitation, recharge from other sources (e g , storm sewers or sanitary sewers) at DSCR, and movement of groundwater into OU 7 from recharge areas or other sources upgradient of DSCR Since direct recharge from precipitation is probably the primary source of groundwater at OU 7, water levels measured in monitoring wells in OU 7 should be related to the amount of precipitation occurring at the site, with periods of increased precipitation corresponding with periods of rising groundwater levels and periods of decreased precipitation corresponding with periods of declining groundwater levels. Additional data are needed to quantify the amount of direct recharge to groundwater occurring at DSCR and fully characterize ongoing chemical release mechanisms. This information is important for the establishment of remedial endpoints and decision criteria for soil OUs as well as to identify specific criteria for remedial components designed to interrupt soil-to-groundwater chemical mobilization processes.

2.3.4.2 As mentioned above, storm sewers may also supply recharge to the groundwater table in the upper WBU The full impact of these submerged water-bearing structures on groundwater flow has not been well established. Additionally, the potential for these engineered structures to act as preferential contaminant migration pathways (e.g., facilitating subsurface transport, introducing additional chemical mass to the groundwater system) needs to be clarified to provide the basis for selection of an appropriate remedy

2.3.5 Hydrologic Budget for DSCR

2.3.5.1 A hydrologic budget study has not been completed for OU 7 However, as part of earlier efforts to characterize groundwater conditions at DSCR, the USGS estimated the vertical movement of groundwater downward from the upper WBU at the Area 50 landfill, through the confining layer into the lower WBU beneath the landfill, and calculated that approximately 2 95 million gallons of water per year (equivalent to 394,000-cubic feet per year [ft^3/yr]) moved into the lower WBU through the landfill. The USGS also estimated the horizontal movement of groundwater through the lower WBU beneath the Area 50 landfill and calculated that approximately 15 million gallons of water per year (equivalent to 2 million ft^3/yr) moved through the lower WBU and out of the vicinity of the landfill (Powell *et al*, 1990). While this information is useful, it represents only a partial hydrologic budget for a small part of DSCR and is not site-specific for OU 7. Therefore, additional evaluation of the hydrologic budget in the vicinity of OU 7 would be useful for a more localized assessment

2.3.5.2 A complete hydrologic budget for DSCR must consider the sources of water moving into (inflow) and out of (outflow) of the facility. Surface water run-off into the southwest corner of the Open Storage Area (OU 1), precipitation onto the land surface, imported water (municipal water from Chesterfield County delivered to the installation via a water main), and movement of groundwater onto DSCR from upgradient areas are the primary sources of water moving onto the installation. Surface runoff (into No Name Creek, Kingsland Creek, and into storm drains), evapotranspiration, point- and non-point source discharge of groundwater to storm drains, and movement of groundwater to downgradient areas past the eastern facility boundary are the primary means by which water moves off the installation. These sources of groundwater recharge and discharge, as well as the general groundwater flow regime, are presented as a graphical interpretation of the CSM for OU 7 in Figure 2-4.

2.3.6 Local Hydrogeology

2.3.6.1 To characterize the subsurface conditions at OU 7, geologic logs of boreholes from previous investigations were reviewed. To understand the subsurface deposits at OU 7, four hydrostratigraphic cross-sections were constructed based on the information contained in the geological logs and are presented and discussed in this section The locations of the hydrostratigraphic cross-section transects through OU 7 are illustrated on Figure 2-5 The hydrogeologic cross-sections are provided in Figures 2-6, 2-7, 2-8, and 2-9.

2.3.6.2 In general, it appears that the subsurface stratigraphy at DSCR has been interpreted inconsistently through the varying drilling programs that have been conducted. Nonetheless, the subsurface stratigraphy at DSCR can be divided into three distinctive hydrogeological zones, an upper WBU, a confining layer, and a lower WBU.

2.3.6.3 The upper WBU at OU 7, as described on the hydrostratigraphic cross-sections, consists of 25- to 35-feet of interlayered unconsolidated deposits of clays, silts, sands, and gravels As previously discussed, some of these materials are of anthropogenic origin and the contacts with the native soils are not clear Visual observations of outcrops in the OU 7 area tend to indicate that most of the north-east quadrant consists of fill material from the ground surface to almost 10-feet bgs. As described in subsequent sections of this CSM, the depth to groundwater at OU 7 ranges from 5-feet bgs to 20-feet bgs. This suggests that, in select areas, the fill within the OU 7 area may be in direct contact with the water table Based on visual observations, the fill materials at OU 7 consist mostly of loose sand, gravel, and construction debris (e.g concrete slabs, woods, etc) Percolation in this type of fill material tends to be higher than in the native soils Subsequently, chemicals of potential concern (COPs) are expected to migrate faster, both vertically and horizontally, in such deposits. This is important in terms of understanding migratory pathways for chemicals, as well as identifying remedial components appropriate for addressing groundwater protection needs

2.3.6.4 As shown on the cross sections, a persistent layer of coarse sand and gravel is present in the base of the upper WBU Although the sand and gravel content vary across OU 7, this layer is the most conductive layer in the upper WBU. A similar conductive layer was identified in the upper portion of the upper WBU (Figure 2-7) This layer is located in the north central portion of OU 7 and extends from approximately 9-feet bgs to a depth of approximately 12-feet bgs and appears to dip to the south. The origin of this layer (anthropogenic or native) could not be determined from the boring logs; however, it appears to be located at the base of potential fill material These two coarse-grained layers are potential preferential pathways for the migration of chemicals in the upper WBU.

2.3.6.5 The cross-sections indicate that a prevalent fine-grained low permeability layer composed of clay with varied content of silts and sands is present in the subsurface across the OU 7 area. This unit ranges in thickness from four feet in the vicinity of MW112-2- to 15-feet in the vicinity of MWFTA-29B. This stratigraphic unit most likely corresponds with the Calvert Formation (Powell *et al.*, 1990). For purposes of this CSM this stratigraphic unit will be considered the confining layer A preliminary review of the boring logs for the boreholes installed at OU 7 indicates the confining layer is not present in all locations The presence and/or absence of this fine-grained confining unit is important in terms of understanding the nature and degree of hydrogeochemical communication between the upper and lower WBUs and the vertical transport of chemicals into the lower WBU; therefore, a more detailed review of the boring logs was conducted The review indicated that the confining layer probably is not absent but appears to be absent due to logging inconsistencies Such inconsistencies include, but are not limited to, soil samples collected at irregular intervals, borings terminated before intercepting the confining layer, and failure to identify the actual confining layer.

2.3.6.6 This confining layer is underlain by a medium to coarse-grained layer of sands and gravels with thin, discontinuous clay interbedding. This unit ranges in thickness from 10-feet in thickness at MWFTA-20 to more than 15-feet thick at MWFTA-17. These deposits have been interpreted as the Potomac Formation, as described for the Fall Zone region (Powell *et al*, 1990). However, due to uncertainty about the age of near-surface sediments at DSCR, the deposits underlying the relatively continuous fine-grained stratum will be referred to as the "lower WBU"

2.3.6.7 The unconsolidated sediments comprising the lower WBU overlie granitic bedrock (i.e, Petersburg Granite). Saprolite grades vertically downward to the upper surface of the bedrock (Powell *et al.,* 1990) The saprolite varies in thickness, but in some areas may exceed 30-feet in thickness (e g., in the vicinity of monitoring well cluster DMW-10A/B/E). Competent bedrock, described as granite, has been encountered at depths ranging from 53- to 69-feet bgs at OU 7. A limited number of borings have been advanced to competent bedrock at OU 7. The limited information that is available suggests a general north-to-south slope of the bedrock surface The degree to which the bedrock surface may control or influence the migration of chemical contamination is unknown.

2.3.7 Hydrostratigraphy

2.3.7.1 Groundwater is first encountered during drilling at relatively shallow depths, generally less than 12-feet bgs at OU 7 Groundwater may be encountered in the silts and clays of the upper WBU although it occurs more commonly in the coarse-grained (sand and gravel) intervals of the upper WBU under unconfined (i e., water-table) conditions The heterogeneous nature of deposits comprising the upper WBU suggests that movement of groundwater in the saturated zone within the upper WBU occurs primarily in the coarse-grained materials. This is an important observation, both in terms of understanding the basis for geochemical conditions observed in the upper WBU and for identifying potential mechanisms to control or influence groundwater movement and control the migration of chemicals

2.3.7.2 Boreholes advanced into the lower WBU at OU 7 always encounter groundwater Two saturated zones have been identified in the lower WBU. The first zone is located beneath the base of the confining layer and the second zone occurs in the saprolite-bedrock interphase. Groundwater elevations in monitoring wells constructed in the lower WBU are usually within the confining layer or at its basal contact with the lower unit. This indicates that the relatively continuous fine-grained stratum of the confining layer at OU 7 probably functions as a confining or semi-confining layer

2.3.7.3 Visual examination of the soil samples collected within the confining layer indicate that the confining layer was dry. This further supports the interpretation that the fine grained stratum may act as confining or semi-confining layer

2.3.7.4 In summary, the primary hydrogeologic units at OU 7, stratigraphically from highest to lowest, are referred to in the current CSM as the "upper WBU," the "confining layer," and the "lower WBU." The confining layer separates the upper and lower WBU. The upper WBU consists of fill materials and native soils with varied content of sand and gravel. The lower WBU consists of native material with varying content of sand and gravel, in-place weathered bedrock (saprolite), and fractured bedrock.

2.3.7.5 Although the groundwater potentiometric surface in the upper portion of the granitic bedrock and the overlying saprolite appears to be different from the one at the upper portion of the lower WBU, the number of monitoring wells installed into the bedrock unit is not sufficient to form the basis for conclusions regarding the hydrologic characteristics of this material.

2.3.8 Monitoring Well Screened Interval

2.3.8.1 Fifty one monitoring wells are installed at OU 7, 38 are screened in the upper WBU, nine are screened in the upper portion of the lower WBU, and four are installed in the inter-phase of the lower WBU and bedrock A summary of the monitoring wells and the associated construction details are presented in Table 2-1 In general, monitoring wells installed in the upper WBU were completed as Type II (single cased) monitoring wells and lower WBU monitoring wells were completed as Type III (double cased) monitoring wells with the outer casing terminated within the confining layer However, there are some exceptions with lower WBU wells completed as Type II These wells are currently under evaluation for future abandonment

2.3.9 Groundwater Elevations, Gradients, and Flow Directions

2.3.9.1 The groundwater table in the upper WBU at OU 7 typically is encountered at depths ranging from about 5- to 20-feet bgs. The potentiometric surface of groundwater in the lower WBU is encountered at depths ranging from about 18- to 27-feet bgs The saturated thickness of the upper WBU ranges from greater than 35-feet in the vicinity of monitoring well MWFOS-1/MW112-3 near the northern boundary of OU 7 (Figure 1-2) to less than 25-feet at some locations along Kingsland Creek The entire lower WBU is saturated under confining conditions The saturated thickness of the lower WBU ranges from 10 to 40-feet in thickness. According to boring logs, bedrock appears to dip to the east southeast at OU 7.

2.3.9.2 Water-level measurements obtained at OU 7 in October 2001, April 2002, and July 2002 for the upper WBU and lower WBU have been plotted and contoured on a site map (Appendix A, Figures A-5 through A-10) Water level measurements collected at OU 7 in October 2002 for the upper and lower WBUs have been plotted and contoured on a site map (Figures 2-10 and 2-11, respectively). Table 2-2 summarizes historical OU 7 water level elevations. The potentiometric maps indicate that the water table in the upper WBU generally slopes from northwest to southeast across OU 7 in the direction of Kingsland Creek, although local variation on the rates and direction of groundwater movement has been observed in the configuration of the water table in the vicinity of Kingsland Creek.

2.3.9.3 The hydraulic gradient for the upper WBU was calculated using October 2002 groundwater elevation data Based on that groundwater elevation data, two areas of distinctive hydraulic gradient were calculated. A gentle hydraulic gradient was calculated in the north-west portion of OU 7 with a hydraulic gradient of approximate 0 004-feet per foot (ft/ft) (when calculated between monitoring wells MWFOS-1 and DMW-26A) and an area of steeper hydraulic gradient on the south-east portion of OU 7 with an approximate hydraulic gradient of 0 022 ft/ft (when calculated between monitoring wells DMW-19A and DMW-22A). From these hydraulic gradient calculations, it appears that the hydraulic gradient becomes steeper as it approaches Kingsland Creek This change in hydraulic gradient may be related to changes in subsurface conditions such as changes in hydraulic conductivity (due to clay content, etc) Although there is a gradient difference between the north-west and the south-east area at OU 7, the predominant groundwater flow direction remains towards the south-east.

2.3.9.4 The direction of groundwater movement in the upper WBU, as indicated by the configuration of the potentiometric surface in OU 7, is towards Kingsland Creek (Figure 2-10). Kingsland Creek appears to be hydraulically connected to the upper WBU and, therefore, directly influences the groundwater flow direction in this unit The configuration of the water table near the creek also indicates that Kingsland Creek is usually a gaining stream

2.3.9.5 Compared to the upper WBU at OU 7, fewer groundwater potentiometric elevation measurements are available for the lower WBU (Table 2-2). Based on the October 2002 groundwater elevation data, the groundwater flow direction in the lower WBU is generally toward the east (Figure 2-11). The groundwater flow direction and hydraulic gradient were determined after separating the monitoring wells screened in the upper portion of the lower WBU from the monitoring wells screened in the lower portion of the lower WBU and plotting the resulting groundwater potentiometric surfaces on a site map. After plotting the potentiometric surface of the upper portion of the lower WBU, it was apparent that groundwater in this unit flows in an easterly direction and in the lower portion of the lower WBU groundwater flow appears to flow in a southeast direction Figure 2-10 presents the potentiometric surface contour map for the upper portion of the lower WBU for the October 2002 sampling event. A potentiometric surface map for the monitoring wells screened in the lower portion of the lower WBU (MWFTA-28B and MWFTA-29B) was not produced because the number of monitoring wells installed was not sufficient for reliable conclusions to be drawn regarding the actual groundwater conditions.

2.3.9.6 The hydraulic gradient between MWFTA-4 and PWFTA-2 was calculated to be approximately 0 009 ft/ft toward the east. Kingsland Creek is hydraulically separated from the lower WBU and, therefore, does not directly influence the groundwater flow direction in this unit.

2.3.9.7 A number of groundwater monitoring wells at OU 7 have been completed as monitoring well pairs, with one member of the pair completed in the upper WBU and the other member installed nearby and completed in the lower WBU (e g , PWFTA-1 and PWFTA-2) Comparison of groundwater elevations measured at the same time in members of monitoring well pairs or clusters can provide insight into the functioning of the hydrologic system and the degree of communication locally between the upper and lower WBUs

2.3.9.8 Comparison of groundwater levels measured in members of monitoring well pairs during the same measurement event indicated that groundwater levels in the upper WBU invariably are higher than groundwater levels in the lower unit at the same location. Figure 2-12 present the comparisons of monitoring wells DMW-22A, MWFTA-20, and PWFTA-2 The downward orientation of the vertical hydraulic gradients indicates that if there are areas where the upper and lower WBUs are in hydraulic communication (e g., in areas where the confining layer has been breached or is absent), groundwater would move from the upper WBU into the lower WBU. Such conditions could influence the fate and transport of constituents that may need to be addressed by remedy planning activities

2.3.9.9 The magnitude of vertical hydraulic gradients is spatially variable at OU 7 Downward gradients (greater than 1 ft/ft) were observed at all the monitoring wells pairs (e g DMW-29A and DMW-29B and PWFTA-1 and PWFTA-2)

2.3.9.10 As previously mentioned, three groundwater monitoring wells were installed in the lower portion of the lower WBU Two of the monitoring wells were installed in the saprolite-bedrock interface (MWFTA-28B and MWFTA-29B) and the third one in the fractured bedrock (MWFTA-20) In order to evaluate the vertical hydraulic gradients between groundwater levels in the lower WBU and bedrock, groundwater levels measured in the bedrock monitoring well (MWFTA-20) should be compared to groundwater levels measured in a monitoring well installed at the base of the lower WBU (MWFTA-28B or MWFTA-29B). However, these monitoring wells are not close enough to MWFTA-20 to calculate a vertical gradient between the lower WBU and the bedrock. Nevertheless, if we compare a monitoring well located in the upper portion of the lower WBU and adjacent to bedrock monitoring well (PWFTA-2) with the bedrock monitoring well (MWFTA-20) the calculated vertical hydraulic gradients between the bedrock and the lower WBU is directed vertically downward indicating that at these locations, groundwater moves from the lower WBU and into the bedrock. Because of the few monitoring wells completed in bedrock at the base of the lower WBU, it is uncertain whether the vertical gradient at MWFTA-2 represents a general relationship between the lower WBU and the bedrock

2.3.10 Hydraulic Conductivity and Velocity of Groundwater Movement

2.3.10.1 The hydraulic properties of the subsurface materials in the upper and lower WBUs at DSCR have been evaluated at OU 7 on several occasions by conducting pumping tests (Engineering Science [ES], 1993) and positive and negative displacement (slug) test (D&M, 1989a and 1989b; LAW, 1996a). In 1993, ES conducted a pumping test of the upper and lower WBUs at OU 7 during the Remedial Investigation (RI) activities (ES, 1993) Evaluation of the test data produced estimates of transmissivity (i e , the capacity of the WBUs at OU 7 to transmit water) and storativity (i.e., the capacity of the WBU to store water) Data from previous aquifer testing evaluations are provided in Appendix A

2.3.10.2 Based on the information presented in the RI (ES, 1993), the minimum and maximum transmissivity calculated for the upper WBU during the pumping portion of the test ranged between 20 76-square feet per day (ft^2/day) (PWFTA-1) and 538.56 ft^2/day (MWFTA-3) and, during the recovery portion, transmissivity values ranging between 10.59 ft^2/day (PWFTA-1) and 1,010 7 ft^2/day (MWFTA-3) were calculated

2.3.10.3 The recovery data of the pumping test performed in the lower WBU yielded a transmissivity value of approximate 0 20 ft^2/day. Because the conditions of the aquifer test at other areas within OU 7 have been questioned, the ranges presented for the transmissivity values are considered approximate (ES, 1993).

2.3.10.4 Hydraulic conductivity was calculated based on the calculated transmissivity divided by the saturated thickness (as measured by the length of saturated screened interval). The hydraulic conductivity values varied from 1.31-feet per day (ft/day) to 46.35 ft/day during the pumping portion of the pumping test and from 0 67 ft/day to 86.98 ft/day during the recovery portion of the pumping test in the upper WBU Calculated hydraulic conductivity values for the lower WBU ranged from 0.03 ft/day to 0.01 ft/day (ES, 1993).

2.3.10.5 The hydraulic conductivity values resulting from the slug test conducted in the upper WBU generally are in good agreement with the lower values of the range of values for hydraulic conductivity estimated from the results of the pumping tests at OU 7 These values range from approximately 0.4 ft/day (MWFTA-1) to approximately 6.6 ft/day (MWFTA-7). Hydraulic conductivity values calculated for the lower WBU are in good agreement with the range of values estimated from the results of the pumping test These slug test values ranged from approximately 0 009 ft/day to 0.87 ft/day. Values for hydraulic conductivity of the confining layer, determined from the results of laboratory permeability tests, were much lower, ranging from 0.0003 ft/day to 0 005 ft/day

2.3.10.6 The velocity of groundwater movement through a saturated medium (i.e , the particle velocity, or average linear velocity that a molecule of groundwater would attain) can be estimated using a modification of Darcy's Law (Freeze and Cherry, 1979). As previously mentioned, two areas of distinctive hydraulic gradient were observed at OU 7, therefore, it is expected that groundwater moves at a different linear velocity in each area According to the water levels obtained during October 2002, the groundwater gradient on the gentle hydraulic gradient area in the northwest portion of the site was 0 004 ft/ft and the steeper hydraulic gradient near Kingsland Creek was 0 03 ft/ft for the upper WBU at OU 7 (Section 2 5 9). The hydraulic conductivity of materials in the upper WBU at OU 7 ranged from approximately 0.4 to 6 6 ft/day. Using these values and an approximate value of 0.25 for effective porosity (Wolff, 1982), the average linear velocity of groundwater movement in the gentle hydraulic gradient area is estimated to range from about 0.0064 ft/day to about 0.106 ft/day (equivalent to a range of about 2 3- to 38 7-feet per year [ft/yr]) and for the steeper hydraulic gradient area the average linear velocity ranged from 0 048 to 0 79 ft/day (equivalent to a range of about 17.5 to 288 ft/yr). The average linear velocity of groundwater movement in the lower WBU at OU 7 generally is lower than the range of groundwater velocities in the upper unit, ranging from about 0 000011 ft/day to about 0.0002 ft/day (equivalent to a range of about 0.004 to 0 066 ft/yr)

2.4 GROUNDWATER GEOCHEMICAL CONDITIONS

2.4.0.1 The cations calcium, magnesium, sodium, and potassium and the anions carbonate, bicarbonate, chloride, sulfate, and nitrate can be naturally-occurring constituents dissolved in groundwater and are known as "major" inorganic constituents (Hem, 1989) Natural groundwater has specific compositional characteristics related to the mineralogy of the WBU(s) and the conditions that control the dissolution of the minerals as groundwater moves through it. Evaluation of the major constituent geochemistry of groundwater can provide information regarding the origin and evolution of the constituents and can be used to compare the characteristics of waters in different locations and/or in differing hydrogeological environments (Hounslow, 1995).

2.4.0.2 Analytical results for major inorganic constituents can be compared and interpreted using point-value plots or graphical methods The standard style of trilinear plots was described first and used by Piper Fetter (1994) describes the process of plotting an analysis on the Piper diagrams in this manner·

> "A trilinear diagram can show the percentage composition of three ions. By grouping Na^+ and K^+ together, the major cations can be displayed on one trilinear diagram Likewise, if CO_3^{2-} and HCO_3^- are grouped, there are also three groups of major anions . . Analyses are plotted on the basis of the percent of each cation or (anion)
>
> Each apex of the triangle represents a 100% concentration of one of the three constituents If a sample has two constituent groups present, then the point representing each would be plotted on the line between the apexes for these two groups If all three constituent groups are present, the analyses would fall in the interior of the field The diamond-shaped field between the two triangles is used to represent the composition of water with respect to both cations and anions

The cation point is projected onto the diamond-shaped field parallel to the side of the triangle labeled magnesium, and the anion point is similarly projected parallel to the side of the triangle labeled sulfate The intersection of the two lines is plotted as a point on the diamond shaped field."

2.4.0.3 In addition to the data points being plotted on the diagram, a circle whose radius reflects the total dissolved solids (TDS) (as estimated from the concentration of the major cations and anions) is plotted and centered on the respective data points.

2.4.0.4 Piper diagrams are useful for distinguishing water of different histories, and can be used to identify trends in evolution of water chemistry. Groundwater samples obtained from a distinct water type will typically share similar geochemistry and, therefore, will plot in a cluster on a trilinear diagram Mixing of water from two different water types will plot as a straight line joining the clusters of data on different areas of a diagram Piper diagrams for the upper and lower WBU groundwater at OU 7 are as shown in Figures 2-13 and 2-14, respectively.

2.4.0.5 **Upper WBU** – Wells in the upper WBU of the OU7 tend to have water of the mixed cation/chloride to the mixed cation/sulfate water types. Exceptions to this include DMW-25A, which has a unique sodium/bicarbonate water type, and MWFTA-1, which has a magnesium/chloride-sulfate type. In addition, wells across Kingsland Creek (MWFTA-5 and MWFTA-10) tend to have no predominant cation or anion

2.4.0.6 Wells in the southern interior of OU7 tend to have higher total cation and anion concentrations (higher TDS concentration). DMW-26A, DMW-25A, MWFTA-3, DMW-22A, DMW-33A, and MWFTA-1 all have greater TDS than the wells closer to the periphery of OU7. An exception to this trend is MWFOS-1, which has an intermediate TDS. Groundwater samples taken from these wells have a negative log of the hydrogen ion concentration (pH) from 3.43 (MWFTA-7) to 6 71 (DMW-26A) with a median of 5.28.

2.4.0.7 Wells downgradient of the pits (as interpreted from the estimated potentiometric surface) appear to have a much higher TDS In addition, DMW-25A and DMW-26A and to a lesser extent MWFTA-3 and DMW-22A have sodium as a major cation and chloride to bicarbonate as major anions. The origin of the high TDS and distinct water types appears to be further upgradient from DWM-26A.

2.4.0.8 The group of wells DMW-33A, DMW-22A, and MWFTA-3 on the north and south banks of Kingsland Creek appear to form a related series MWFTA-3, the furthest upstream well, is a sodium/chloride water type. DMW-22A, the next downstream well, is a mixed cation/chloride with sodium and (magnesium + calcium) in almost equal amounts DMW-33A, the furthest downstream well, is a (magnesium + calcium)/chloride water type. This series may represent successive mixings or possibly an ion exchange series interacting with clays associated with the creek

2.4.0.9 **Lower WBU** – Wells in the lower WBU of OU 7 tend to have water of the calcium-magnesium/bicarbonate-carbonate water type. MWFTA-28B is an exception, being of the magnesium/bicarbonate-chloride water type MWFTA-14 is the other exception, being of the sodium/bicarbonate water type.

2.4.0.10 Wells in the lower WBU are strongly differentiated by pH. Groundwater collected from these wells have a pH from 7.09 to 12 44 with a median of 10 89. There appear to be two distinct groups of wells with high pHs In the western group are wells MWFTA-16 and MWFTA-17, while the eastern group is comprised of wells MWFTA-29B, MWFTA-19, and, to a lesser extent, MWFTA-14 (pH = 9.08). The two remaining wells between the two groupings have pHs of 7.09 and 7.34. Since the form of the major inorganic carbon anions (carbonate and bicarbonate) are controlled by pH, the anion water type for wells predominated by carbon anions are carbonate for the high pH wells and bicarbonate for the lower pH wells. The higher pH wells appear to align with the flow direction (west to east), as interpreted from the estimated potentiometric surface of the lower WBU. The lower pH wells appear to align with a parallel flow path, with some possible mixing occurring in MWFTA-14. The cause of this high pH zone is not currently known, but the origin may be further upgradient from MWFTA-16

2.4.0.11 A review of existing stratigraphic detail within the upper and lower WBUs compared to water types of the groundwater within the screened intervals shows no apparent patterns. From the distinctly different water types and different levels of TDS and pH, it does not appear that mixing of water from the upper WBU and lower WBU is occurring

TAB

Section 3.0

3.0 SUMMARY OF THE GROUNDWATER MONITORING PROGRAM

3.0.0.1 Groundwater samples were collected in October 2001, March/April 2002, July 2002, and October 2002 as part of the quarterly groundwater monitoring program currently ongoing at DSCR The results of the October 2001, March/April 2002, and July 2002 sampling results for OU 7 are presented in the October 2001 Technical Memorandum (LAW, 2002b), March/April 2002 Technical Memorandum (MACTEC, 2003c), and July 2002 Technical Memorandum (MACTEC, 2003d), respectively The results for the October 2002 sampling event are presented as part of this Annual Groundwater Report in relation to the results from the previous events. These groundwater sampling activities were performed in general accordance with procedures outlined in the "Sampling Analysis Plan Revision 1" (LAW, 1992) and the "Final Quarterly Groundwater Sampling Plan" (LAW, 2002a)

3.0.0.2 Nineteen groundwater monitoring wells screened in the upper WBU, seven groundwater monitoring wells screened in the lower WBU, and one groundwater monitoring well screened within the fractured bedrock were selected for sampling during the October 2002 sampling event. In order to further refine the data collection effort, modifications were made and documented to the original monitoring well network initiated for the groundwater monitoring program in 2001. Changes were coordinated and approved by CEHNC. Table 1-1 provides a list of the wells sampled for the October 2001, March/April 2002, July 2002, and October 2002 sampling events and provides a summary for the well network modifications made in 2001 and 2002. Five of the nineteen wells in the upper WBU currently sampled were not included in the original sampling program. These wells were added to the quarterly monitoring program to enhance the representativeness of data collected from the monitoring well network at OU 7. For the lower WBU, two wells (DMW-29B and PWFTA-2) were removed from the original sampling program because the monitoring wells were suspected of being improperly installed.

3.0.0.3 Groundwater samples from each well sampled were analyzed for field parameters (temperature, turbidity, oxidation reduction potential [ORP], dissolved oxygen [DO], pH, ferrous iron [Fe^{2+}], and specific conductance), total and dissolved metals, total and dissolved mercury, total and dissolved thallium, and total VOCs. In addition, the groundwater samples were analyzed for natural attenuation parameters (hydrogen, carbon dioxide [CO_2], methane, ethane, ethene, chloride, sulfate, total sulfide, nitrate, total alkalinity, and total organic carbon [TOC]) A summary of the analyses performed for each of the sampling events is presented in Appendix B, Table B-1 Laboratory analyses were performed by Severn Trent Laboratories of North Canton, Ohio Field duplicate samples were sent to the United States

Army Engineer Research and Development Center (CEERD) laboratory for quality assurance (QA), and dissolved hydrogen gas samples were analyzed by Microseeps, Inc

3.0.0.4 Summary tables for the upper WBU, lower WBU, and the fractured bedrock are presented in Tables 3-1 and 3-2 for select chlorinated VOCs (PCE, TCE, *cis*-1,2-dichloroethene [DCE], *trans*-1,2-DCE, vinyl chloride [VC], 1,1,1-TCA, 1,1-dichloroethane [DCA], and 1,1-DCE) and Tables 3-3 and 3-4 for select metals (aluminum, arsenic [upper WBU, only], iron, and manganese). A summary of the Data Quality Completeness of the October 2001 through October 2002 sampling events, the Data Quality Evaluation (DQE) of the October 2002 sampling event; a summary of analytical results for the October 2001 through October 2002 sampling events; and a summary of qualified data for the October 2001 through October 2002 sampling events are provided in Appendix B, Appendix C, Appendix D, and Appendix E, respectively. This section presents sampling results for selected chlorinated VOCs, selected metals, and natural attenuation geochemical parameters for the October 2001, March/April 2002, July 2002, and October 2002 sampling events

3.1 OCTOBER 2002 GROUNDWATER ELEVATION DATA

3.1.0.1 Groundwater elevations were collected from selected wells at OU 7 during the October 2001, April/March 2002, July 2002, and October 2002 sampling events. The groundwater elevation data are summarized in Table 2-2

3.1.0.2 Water level measurements collected during October 2002 indicated that the elevation of potentiometric surface in the upper WBU at OU 7 ranged from 93.86-feet msl in AEHA-DG9 to 77.20-feet msl in MWFTA-7. The potentiometric surface of the upper WBU and the direction of groundwater flow for the October 2002 sampling event are shown in Figure 2-10. North of Kingsland Creek, the water level elevations indicate that groundwater in the upper WBU generally flows to the southeast

3.1.0.3 Water level measurements collected during October 2002 indicated that the elevation of potentiometric surface in the lower WBU at OU 7 ranged from 76 17-feet msl in MWFTA-16 to 53.60-feet msl in MWFTA-29B The potentiometric surface of the lower WBU and the direction of groundwater flow for the October 2002 sampling event are shown in Figure 2-11 Water level elevations indicate that groundwater in the lower WBU generally flows to the east

3.2 OCTOBER 2002 FIELD ANALYTICAL PARAMETERS

3.2.0.1 Field analytical data (pH, DO, ORP, turbidity, temperature, and specific conductance) were collected from each well to verify stabilization of groundwater field parameters prior to sample collection Fe^{2+} was measured in the field after stabilization was achieved. Stabilization of these field parameters is required by CEHNC and the United States Environmental Protection Agency (USEPA) and procedures are documented in the Sampling Analysis Plan (LAW, 1992) and the "Final Quarterly Groundwater Sampling Plan" (LAW, 2002a). A review of the field notes indicated that stabilization was achieved for each of the wells sampled at OU 7 during the October 2002 sampling event except for MWFTA-1. Due to sampling equipment problems, MWFTA-1 was sampled at an elevated turbidity (218 nephelometric turbidity units [NTUs]) However, all other field parameters for this well stabilized prior to sampling The final measured results for each field parameter and Fe^{2+} for each are included in Appendix C, Tables C-1 through C-3 for the upper WBU, lower WBU, and fractured bedrock, respectively Field sampling reports for the October 2002 sampling event are provided in Appendix F.

3.3 SUMMARY OF ANALYTICAL RESULTS

3.3.0.1 The primary VOCs detected at OU 7 include PCE, TCE, *cis*-1,2-DCE, *trans*-1,2-DCE, VC, 1,1,1-TCA, 1,1-DCA, and 1,1-DCE The concentrations of these VOCs for the last four sampling events are summarized in Tables 3-1 and 3-2 for the upper and lower WBUs, respectively. Isoconcentration maps for the upper and lower WBUs are provided in Figures 3-1 through 3-10, respectively. Background concentrations or alternate concentration limits (ACLs) have not been established for DSCR; therefore, for the purposes of data presentation only, the selected chlorinated VOC concentrations were referenced to their respective maximum contaminant levels (MCLs) as provided by the National Primary Drinking Water Regulations (USEPA, 2002) Detailed discussions of the results for each of the VOCs are provided in Section 4.0.

3.3.0.2 The isoconcentration figures graphically present the data summarized in Table 3-1 for the upper WBU (Figure 3-1 through 3-7 for PCE, TCE, *cis*-1,2-DCE, VC, 1,1,1-TCA, 1,1-DCA, and 1,1-DCE, respectively) and Table 3-2 for the lower WBU (Figure 3-8 through 3-10 for TCE, *cis*-1,2-DCE, and VC, respectively). These figures show the areal extent of each of the select chlorinated VOC plumes.

3.3.0.3 For the upper WBU, two VOC plumes are apparent One plume is located downgradient from Pit 1 and is centered on AEHA-DG10 (except *cis*-1,2-DCE and 1,1-DCA, which are centered on DMW-33A) for each of the quarters (October 2001 through October 2002). The VOC concentrations detected at AEHA-DG10 are generally an order of magnitude greater than surrounding wells.

3.3.0.4 The other plume is located downgradient from the former FOS tank/Pit 3 and is centered on MWFTA-23 and MWFOS-3. Concentrations of TCE, *cis*-1,2-DCE, and VC detected in MWFTA-23 and MWFOS-3 are generally an order of magnitude greater than surrounding wells. These two wells may represent a continuing source area for these constituents.

3.3.0.5 For the lower WBU, Figures 3-8, 3-9, and 3-10 show that the VOC contamination is generally centered in the vicinity of MWFTA-16. This well is located downgradient from the plume associated with the former FOS tank/Pit 3 in the upper WBU. VOCs were not detected within monitoring well MWFTA-16 during the initial sampling event in October 1993. However, VOCs were detected during the October 2000 sampling event (the second sampling event for this well). The VOCs within this well are presumed to result from either improperly installed monitoring wells upgradient of MWFTA-16 and/or naturally occurring fractures within the confining layer.

3.3.0.6 Table 3-2 presents the selected chlorinated VOC results for the fractured bedrock TCE, *cis*-1,2-DCE, VC, 1,1-DCA, and 1,1-DCE were detected above their corresponding MCL. The areal extent of contamination within the bedrock is currently unknown as MWFTA-20 is the only well sampled as part of the quarterly monitoring program

3.3.0.7 In addition to the isoconcentration figures, pie graphs for the October 2002 sampling event showing the distribution of the primary VOCs at each well shown were placed on the cross-sections (Figures 2-6 and 2-9) to provide an indication of the vertical distribution of contamination The size of the pie GRAPH shown on the figures corresponds to the total concentration of the primary VOCs As shown on Figure 2-6 and 2-9, the concentrations of the primary VOCs are higher in the upper WBU than in the lower WBU along the length of the cross-sections shown

3.3.0.8 Background concentrations or ACLs for metals have not been established for DSCR, therefore, for the purposes of data presentation only, the total metals data were referenced to their corresponding primary or secondary MCL (when available) Aluminum, arsenic, iron, and manganese were detected above the reference concentrations for each of the four sampling events for the upper WBU and aluminum, iron, and manganese were detected above the reference concentration for the lower WBUs. These results are summarized in Tables 3-3 and 3-4 for the upper and lower WBUs, respectively. The summarized results for each of the metals detected are presented in Appendix C, Table C-1, C-2, and C-3. Discussions of the results for total aluminum, arsenic, iron, and manganese are provided in Section 4.0.

3.3.0.9 Figures showing the results of the total metal results for aluminum, arsenic, iron, and manganese for both the upper and lower WBUs are provided in Figures 3-11 and 3-12, respectively. The metal posting figures indicate that arsenic, iron, and manganese are widespread within OU 7, with maximum concentrations corresponding to locations with elevated VOC contamination However, a correlation could not be made with aluminum as maximum concentrations were detected within background wells or wells without elevated VOC concentrations.

3.4 MONITORED NATURAL ATTENUATION PARAMETERS

3.4.0.1 As part of the goals of the groundwater monitoring program to collect analytical data to support the MNA program as a component of the final remedy for OU 7 and to assess the sustainability of degradation of VOCs within the subsurface, key MNA parameters were evaluated in both the upper and lower WBUs. To accomplish this goal, nineteen monitoring wells in the upper WBU and seven monitoring wells in the lower WBU were analyzed for geochemical and biochemical indicator parameters of natural attenuation (MNA parameters) for the October 2001 through October 2002 sampling events. Results for selected MNA parameters (DO, nitrate, sulfate, CO_2, hydrogen, alkalinity, TOC, ORP, pH, Fe^{2+}, and sulfide) are presented on Figure 3-13 and Figure 3-14 for the upper and lower WBU, respectively. Each of the MNA parameters measured, including the other parameters (ethene, ethane, methane, temperature, and chloride) not shown on the figures, are presented in Appendix C, Tables C-1, C-2, and C-3 Each parameter presented on Figure 3-13 and Figure 3-14 was selected to provide an indication of the sustainability of natural attenuation at OU 7 Appendix G presents a discussion of the relevance of the MNA parameters presented on Figures 3-13 and 3-14 and a brief summary of the results of the October 2002 sampling event for each of the parameters shown on the figures Table G-1 presents an interpretation of the ranges for each parameter and the range used to assign a color to a parameter result.

3.4.0.2 The primary constituents of potential concern at OU 7 are the chlorinated VOCs, PCE, TCE, and associated daughter products, *cis*-1,2-DCE and VC Reductive dechlorination is the primary breakdown pathway for these VOCs. After DO is consumed within the groundwater, anaerobic microorganisms typically use additional electron acceptors (as available) in the following order of preference. nitrate, ferric iron oxyhydroxide, sulfate, and finally CO_2. Rates for reductive dechlorination increase as oxidation-reduction conditions decrease. However, rates are limited to the availability of electron donors (typically a carbon source) and electron acceptors. The MNA parameters evaluated, along with the presence of *cis*-1,2-DCE and VC, provide an important line of evidence for the occurrence and continuation of natural attenuation.

TAB

Section 4.0

4.0 NATURE AND EXTENT OF CONTAMINATION AND TREND EVALUATION

4.0.0.1 A quarterly groundwater monitoring program was initiated to evaluate groundwater contaminant concentration trends and to evaluate MNA as a potential component of the final remedy for OU 7. Four quarters of data have been collected and are presented in this Annual Groundwater Report to evaluate the current nature and extent of the contamination at OU 7. In order to evaluate the data, a statistical trend evaluation was performed using the Mann-Kendall statistical trend analysis on historical data (1982 [when possible]) through 2002 for the purpose of evaluating selected VOC trends in groundwater. In addition, time series graphs were prepared for historical data for the purpose of providing a visual aid in determining VOC trends. The following sections provide a summary of the potential sources of contamination, summarizes the statistical trend analyses, and provides an assessment of the current nature and extent of groundwater contamination at OU 7.

4.1 POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION

4.1.0.1 Figure 1-2 shows the locations of the three fire training pits documented as previously utilized at OU 7 These three pits are considered to be the primary source areas for the upper WBU groundwater contamination at OU 7 However, it is possible that other areas at OU 7 may be potential sources that have not yet been defined completely VOCs are the primary constituents of concern; PCE, TCE, and 1,1,1-TCA and associated daughter products (*cis*-1,2-DCE, *trans*-1,2-DCE, VC , 1,1-DCA, and 1,1-DCE) account for the majority of the VOC contamination in the upper WBU. The distribution and concentrations of the VOCs originating from each of these pits is variable Based on the current well network at OU 7, two plumes located within the upper WBU and downgradient from two of the pits (Pit 1 and Pit 3) can be described However, historic DPT data, combined with data from the monitoring well network, indicate there are three distinguishable plumes with some co-mingling downgradient

4.1.0.2 Figure 1-2 show the locations of the existing lower WBU wells The source(s) for the contamination within the lower WBU are currently unknown The VOCs located within the lower WBU are suspected to be either from the natural migration of groundwater from the upper WBU to the lower WBU via fractures within the confining layer or due to improperly installed wells, which may have caused conduits through the confining layer.

4.1.0.3 In addition to VOC contamination, elevated levels of aluminum, arsenic, iron, and manganese have been detected in the upper WBU. In the lower WBU, elevated levels of aluminum, iron, and manganese have been detected The elevated concentrations of metals within the upper and lower WBU are generally located in areas that have elevated VOC concentrations, suggesting the inorganics have been mobilized by changes in geochemical processes associated with the chemicals that were burned within the pits

4.2 STATISTICAL TREND ANALYSIS

4.2.0.1 Time series graphs were prepared and a statistical evaluation, utilizing the Mann-Kendall statistical trend analysis, was performed on the historic data that has been collected at OU 7. The Mann-Kendall statistics and the times series graphs were used to identify and evaluate the temporal trends for each identified plume. The results of these trends were then used to support one of the first lines of evidence of MNA, mass loss. Results from the Mann-Kendall statistical trend analysis and the time series graphs were evaluated utilizing potentiometric surface and isoconcentration contour maps to identify and explain trends for wells located within and downgradient of identified source areas This evaluation provides an assessment of the current and historical groundwater conditions at OU 7 for the purpose of supporting conclusions about the extent of contamination and the effectiveness of MNA as a component of the final remedial strategy for OU 7 groundwater. Appendix H provides a detailed discussion of the Mann-Kendall trend test.

4.2.1 Trend analysis approach

4.2.1.1 The Mann-Kendall statistical analysis was performed and time series graphs were prepared for select monitoring wells: upper WBU wells AEHA-DG10, DMW-20A, DMW-22A, DMW-25A, DMW-27A, DMW-33A, MWFOS-3, MWFTA-23, and MWFTA-3 (Figures 4-1 through 4-10, respectively); lower WBU wells MWFTA-16, MWFTA-18, and MWFTA-19 (Figures 4-11 through 4-13, respectively); and one fractured bedrock well, MWFTA-20 (Figure 4-14). Time series graphs are provided for existing data (not all wells evaluated within this assessment were installed in 1982) and the evaluations for each well started where data was available

4.2.1.2 The trend evaluation focuses on VOCs, primarily PCE, TCE, *cis*-1,2-DCE, *trans*-1,2-DCE, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, and VC, the constituents of concern within the groundwater at OU 7 In addition, although other VOC contaminants have been detected in the groundwater at OU 7, they are not prevalent within the groundwater at OU 7. The contaminants evaluated within this assessment can be considered indicators for the presence (or absence) of these VOCs and this detailed evaluation focuses on wells located within or downgradient from identified plumes

4.2.2 Trend Analysis Evaluation

4.2.2.1 Table 4-1 provides a summary of the Mann-Kendall test results for the wells previously listed This integrated approach was used since statistically significant trends can be masked with small concentration changes within the plume and because the data may not reflect actual trends when interpreting the overall plume extent. Trends determined by the Mann-Kendall test and not supported by the time series graphs are identified on Table 4-1. In addition, the time series graphs may not reflect an actual trend due to either variable data or because available data are too limited to qualify the trend Consequently, the Mann-Kendall test, which was performed for all data for each individual well, does not take into account large increases of contaminants moving through the well during migration of the plume Evaluation of the time series graphs provides evidence of increasing or decreasing trends that the Mann-Kendall statistics did not support due to the reporting of low concentrations during the initial sampling events or due to elevated reporting limits

4.2.2.2 A summary of the Mann-Kendall analyses performed for each well sampled is provided in Table 4-1 and a more detailed discussion of the isoconcentration plume trends for the selected wells is provided in the following sections. Tables 4-2 and 4-3 provides a summary of the Mann-Kendall test results and provides a description of the VOC trends within select monitoring wells for the upper and lower WBUs. Wells selected for evaluation are located within the identified plumes or located on plume boundaries and have trends that may indicate plume migration or attenuation. The evaluation for each well was based on the Mann-Kendall test results, the time series graphs, the groundwater flow directions, and plume locations

4.3 EXTENT OF VOC CONTAMINATION

4.3.0.1 Tables 3-1 and 3-2 provide a summary of results for selected VOCs for the October 2001, March/April 2002, July 2002, and October 2002 groundwater for the upper and lower WBUs (including the fractured bedrock), respectively The temporal trends for the plumes located downgradient from Pit 1 and Pit 3 were evaluated utilizing the Mann-Kendall statistics and time series plots. The spatial trends for the plumes located downgradient from Pit 1 and Pit 3 were evaluated utilizing the isoconcentration figures (Figures 3-1 through 3-10). The following sections provide a separate discussion for the temporal and spatial trends for each source area (Pit 1 and Pit 3) currently evaluated. As previously stated, due to the currently monitoring well network, the plume located downgradient from Pit 2 cannot be evaluated.

4.3.0.2 The plumes, consisting of parent compounds PCE, TCE, and 1,1,1-TCA, are associated with fire training activities at each of the three burn pits. PCE, TCE, and 1,1,1-TCA are the primary constituents of concern downgradient from Pit 1 while PCE and TCE are the primary VOCs downgradient from Pit 3. This conclusion is based upon the presence of the parent compounds and their associated daughter products downgradient from these source areas. In general, the presence of *cis*-1,2-DCE, *trans*, 1,2-DCE, and VC, daughter products of PCE and TCE, and 1,1-DCA, daughter product of 1,1,1-TCA, is considered to be due to biological degradation However, the presence of 1,1-DCE is an indicator that abiotic degradation may be occurring.

4.3.0.3 The October 2002 VOC data have been compared to the October 2001, March/April 2002, and July 2002 to evaluate short term trends of the PCE, TCE, 1,1,1-TCA, and related daughter products. Isoconcentration figures for the individual constituent plumes are provided in Figures 3-1 through 3-7 for the upper WBU and Figures 3-8 through 3-10 for the lower WBU Currently, site-specific groundwater background concentrations or ACLs have not been established for the site, therefore, for presentation purposes the concentrations presented on the plume maps are referenced to the corresponding MCLs (USEPA, 2002)

4.3.0.4 A discussion of the overall nature and extent, both temporally and spatially, of the plumes located downgradient from Pit 1 and Pit 3 is provided in following subsections For ease of reading, the nature and extent evaluation of the upper and lower WBUs and the fractured bedrock for each source area are separated within the subsections provided below.

4.3.1 Plume Evaluation – Pit 1

4.3.1.1 **VOCs** – Elevated VOC concentrations detected downgradient from Pit 1 include PCE, TCE, *cis*-1,2-DCE, VC, 1,1,1-TCA, 1,1-DCA, and 1,1-DCE. The monitoring wells with elevated VOC concentrations located downgradient from Pit 1 include AEHA-DG10 and DMW-33A. Wells on the plume boundary include DMW-22A, MWFTA-3, DMW-25A, and DMW-35A (It should be noted that due to the current monitoring well network, DMW-25A and MWFTA-3, although suspected to be downgradient of the source area from Pit 2, are identified on the plume maps as associated with the current VOC plumes located downgradient from Pit 1)

4.3.1.2 PCE – The areal extent of the elevated (>1,000-micrograms per liter [µg/L]) PCE concentrations for the four quarters has fluctuated from each sampling event with the maximum concentrations detected at AEHA-DG10. The areal extent of the PCE concentrations (5 to 100 µg/L) appears to have remained relatively constant. However, currently, there are no monitoring wells located downgradient and to the east of DMW-33A. Because of this, the areal extent of PCE cannot be evaluated in this area.

4.3.1.3 The Mann-Kendall trend analysis performed indicates a statistically significant decreasing PCE trend for three (AEHA-DG10, DMW-22A, and DMW-25A) of the four wells located within or on the boundary of the plume. An exception is the increasing trend reported for MWFTA-3. The upward trend observed within this well may be due to the migration of PCE downgradient from Pit 2, the co-mingling of the PCE plume downgradient from Pit 1 and Pit 2, and/or the expansion of the Pit 1 PCE plume. Without additional data from wells upgradient from MWFTA-3 and downgradient from DMW-25A, the cause of this increasing PCE trend cannot be fully assessed. The Mann-Kendall results for all other wells indicates that no significant trends are apparent

4.3.1.4 TCE – Elevated concentration of TCE are also centered on AEHA-DG10. The isoconcentration figure illustrates that TCE detected at concentrations greater than 10,000 µg/L have decreased and are no longer apparent The areal extent for the overall TCE concentrations (5 to 100 µg/L) appears to have remained relatively constant

4.3.1.5 The Mann-Kendall trend analysis results indicate a statistically significant decreasing TCE trend for three (AEHA-DG10, DMW-22A, and DMW-25A) wells located within or on the boundary of the plume All other wells downgradient from Pit 1 did not exhibit a statistically significant trend.

4.3.1.6 ***cis*-1,2-DCE** – The isoconcentration figure illustrates that the areal extent of the *cis*-1,2-DCE concentrations located downgradient from Pit 1 has exhibited fluctuations. The maximum concentrations of *cis*-1,2-DCE are centered on DMW-33A Currently, monitoring wells are not located downgradient and to the east of DMW-33A Because of this, the areal extent of the *cis*-1,2-DCE concentrations cannot be evaluated. However, the areal extent for the *cis*-1,2-DCE concentrations (5 to 100 µg/L) throughout the plume has remained somewhat unchanged

4.3.1.7 The Mann-Kendall trend analysis indicates a statistically significant decreasing trend for one boundary well (DMW-22A) and no statistically significant trend for all other wells evaluated within the plume

4.3.1.8 **VC** – Elevated concentrations of VC are centered on DMW-33A Elevated reporting limits were reported for VC for the July 2002 (<170 µg/L) and October 2002 (<130 µg/L) sampling events and, therefore, a current assessment of VC within DMW-33A cannot be completed. Consequently, a VC plume centered on DMW-33A is not presented in the isoconcentration figure. Elevated reporting limits for monitoring well AEHA-DG10 have also been provided; therefore, an evaluation of the presence of VC upgradient from DMW-33A cannot be made

4.3.1.9 **1,1,1-TCA** – An evaluation of the 1,1,1-TCA isoconcentration figure indicates the areal extent of the elevated (>1,000 µg/L) 1,1,1-TCA concentrations for the four quarters have fluctuated with each sampling event with the maximum concentrations centered around AEHA-DG10. However, the areal extent of the 1,1,1-TCA concentrations (200 to 1000 µg/L) appears to have remained relatively constant.

4.3.1.10 The Mann-Kendall trend analysis indicates a statistically significant decreasing trend for one boundary well (DMW-22A) and no trend for all other wells evaluated within the plume

4.3.1.11 **1,1,1-DCA** – An evaluation of the 1,1-DCA isoconcentration figure indicates that the areal extent of the elevated (>1,000 µg/L) 1,1-DCA concentrations for the four quarters have decreased from the October 2001 to October 2002 sampling events with the maximum 1,1-DCA concentrations centered around DMW-33A. However, the areal extent of 1,1-DCA concentrations (10 to 100 µg/L) has remained somewhat unchanged

4.3.1.12 The Mann-Kendall trend analysis indicates a statistically significant decreasing trend for one boundary well (DMW-22A) and no trend for all other wells evaluated within the plume

4.3.1.13 1,1,1-DCE – An evaluation of the 1,1-DCE isoconcentration figure indicates the areal extent of the elevated (>1,000 µg/L) 1,1-DCE concentrations for the four quarters have decreased from each sampling event with the maximum 1,1-DCE concentrations centered around AEHA-DG10. However, the areal extent of the 1,1-DCE concentrations (7 to 100 µg/L) has remained unchanged

4.3.1.14 The Mann-Kendall trend analysis indicates a statistically significant decreasing trend for one boundary well (DMW-22A) and no trend for all other wells evaluated within the plume.

4.3.1.15 Summary – The predominant VOCs detected within the upper WBU at OU 7 include PCE, TCE, 1,1,1-TCA and associated daughter products (*cis*-1,2-DCE, VC, 1,1-DCA, and 1,1-DCE) as discussed in earlier sections. As of October 2002, the plume downgradient from Pit 1 is comprised of approximately 41% TCE, 18% PCE, 21% *cis*-1,2-DCE, 15% 1,1,1-TCA, 1% 1,1-DCA, 3% 1,1-DCE, and 1% VC (calculations were conducted without taking into account the reporting limits and therefore, VC may be biased low by approximately 3% with TCE biased high 2% and PCE biased high 1%).

4.3.1.16 The vertical VOC distribution for the VOCs downgradient from Pit 1 is shown in Figure 2-8. Monitoring wells AEHA-DG10 and DMW-33A contain similar VOC distributions, with DMW-33A containing more daughter products. This indicates parent VOC compounds are degrading as they migrate through the poorly graded sand and gravel layer. Monitoring well DMW-35A, located upgradient from AEHA-DG10 and nearer to Pit 1, does not exhibit the same elevated concentrations as AEHA-DG10. This is due to the more porous gravel layers extending above a silty sand layer from Pit 1 to AEHA-DG10 The migration of the contaminants from Pit 1 are more likely to travel through this gravel layer TO AEHA-DG10 than downward through the silty sand layer to DMW-33A

4.3.2 Plume Evaluation – Pit 3

4.3.2.1 VOCs – Elevated VOC concentrations detected downgradient from Pit 3 include TCE, *cis*-1,2-DCE, *trans*-1,2-DCE, and VC. The monitoring wells with elevated VOC concentrations located downgradient from Pit 1 include MWFTA-23 and MWFOS-3. Due to elevated reporting limits within both of these wells, the areal extent of PCE, 1,1,1-TCA, 1,1-DCA, and 1,1-DCE cannot be evaluated.

4.3.2.2 TCE – Maximum TCE concentrations, located downgradient from the former FOS tank or Pit 3, are centered on MWFOS-3 For the area downgradient from the FOS tank, a plume is not apparent on the October 2001 map This is due to elevated reporting limits in MWFOS-3 and MWFTA-23, a monitoring well located downgradient from MWFOS-3. However, evaluation of the plume from April 2002 to October 2002 indicates that this plume has remained somewhat unchanged

4.3.2.3 In addition, the variability of TCE concentrations between MWFTA-23 and MWFOS-3 is likely due to the location of the screened intervals within the upper WBU for each well. MWFTA-23, which includes a 30-foot screen, is screened across the entire upper WBU in this area. MWFOS-3 was installed with a 10 foot screen, located at the upper part of the upper WBU.

4.3.2.4 The Mann-Kendall trend analysis performed does not detect a statistically significant trend at MWFTA-23 or MWFOS-3.

4.3.2.5 ***cis*-1,2-DCE –** Maximum concentrations of *cis*-1,2-DCE are centered on MWFTA-23 with elevated concentrations detected in MWFOS-3. The presence of the *cis*-1,2-DCE within MWFTA-23 and MWFOS-3 is likely due to the natural attenuation of PCE and TCE within each of this wells. In addition, *cis*-1,2-DCE has not been detected in DMW-27A, a monitoring well located downgradient from MWFTA-23, indicating that this plume is not readily migrating.

4.3.2.6 The Mann-Kendall trend analysis performed does not detect a statistically significant trend for either of these wells located within the plume downgradient from Pit 3.

4.3.2.7 ***trans*-1,2-DCE –** *trans*-1,2-DCE is currently detected above reporting limits and the corresponding MCL of 100 µg/L in one well, located downgradient from the former FOS tank/Pit 3. An evaluation of the *trans*-1,2-DCE concentrations within MWFTA-23 cannot be performed due to elevated reporting limits within this well.

4.3.2.8 Due to the elevated reporting limits, a historical evaluation of the *trans*-1,2-DCE concentrations within MWFOS-3 or MWFTA-23 cannot be conducted.

4.3.2.9 **VC –** Elevated concentrations of VC are centered on MWFTA-23 with elevated concentrations also being detected in MWFOS-3. The areal extent of the plume boundary located downgradient from the former FOS tank has remained unchanged, indicating that this plume is not readily migrating. The relatively flat groundwater gradient in this area of OU 7 may be a factor that contributes to this condition

4.3.2.10 The Mann-Kendall trend analysis performed for VC does not detect a statistically significant trend for either of these wells located within the plume downgradient from Pit 3.

4.3.2.11 Summary – As of October 2002, the plume downgradient from the former FOS tank/Pit 3 is comprised of approximately 85% *cis*-1,2-DCE, 10% TCE, 4% VC, with 1% for all other constituents combined. However, calculations were conducted without taking into account the reporting limits and therefore, PCE, 1,1,1-TCA, 1,1-DCA, 1,1-DCE may be biased low by 2 percent and *trans*-1,2-DCE may be biased low by 1 percent with TCE biased high by 9 percent.

4.3.2.12 The vertical VOC distribution for the VOCs downgradient from Pit 3 is shown in Figure 2-6. Monitoring wells MWFOS-3 and MWFTA-23 do not contain similar VOC distributions as seen in monitoring wells AEHA-DG10 and DMW-33A. MWFTA-23 contains more VOC daughter products and MWFOS-3 contains more VOC parent products The variation of VOC distributions between these two wells, located so closely together, is likely due to the screen interval within each well. MWFTA-23 is screened throughout most of the upper WBU and MWFOS-3 is screened within the top portion of the upper WBU. The likely pathway for the contaminants is downward through the sand and gravel layer. Monitoring wells located downgradient from these two wells do not have VOC concentrations above reporting limits. This is likely due to these wells being screened within a less porous silty sand layer.

4.3.3 Other VOCs – Upper WBU

4.3.3.1 Additional VOCs detected at the site, as listed in Table F-1 (Appendix F) and reported in the groundwater samples collected during the October 2001, March/April 2002, July 2002, and October 2002 were 1,2,4-trimethylbenzene, 1,2-dichlorobenzene, 1,3,5-trimethylbenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, acetone, benzene, carbon tetrachloride, chloroform, chloromethane, isopropylbenzene, methylene chloride, and naphthalene.

4.3.4 VOCs Lower WBU

4.3.4.1 Elevated VOC concentrations have been detected downgradient at one monitoring well, MWFTA-16, located downgradient from Pit 3 Due to elevated reporting limits within this well, the areal extent of PCE and TCE cannot be evaluated The constituents *trans*-1,2-DCE, 1,1,1-TCA, 1,1-DCA, and 1,1-DCE have been historically, and are currently, not detected within the lower WBU

4.3.4.2 **TCE** – In addition to VOCs being detected at MWFTA-16, historically TCE has been detected in monitoring well PWFTA-2, a well that is currently not sampled as part of the groundwater monitoring program PWFTA-2 was removed from the monitoring program because the installation diagrams indicated that the outer casing may have been improperly installed through the confining layer causing potential leakage of upper WBU contaminants into the lower WBU Figure 3-8 is the TCE isoconcentration figure for the lower WBU. The plume located on this map represents the TCE contamination at PWFTA-2 for the October 2001 and April 2002 sampling events.

4.3.4.3 ***cis*-1,2-DCE** – Elevated concentrations of *cis*-1,2-DCE have been detected at MWFTA-16. Since the October 2001 sampling event, the *cis*-1,2-DCE concentrations have fluctuated slightly, but remained generally consistent. The areal extent for this plume boundary (70 to 100 µg/L) has remained somewhat unchanged indicating the plume is not readily migrating downgradient The source of the contamination within the lower WBU is currently not known but may have been caused by improperly installed wells or fractures within the confining layer, which is approximately four feet thick in this area.

4.3.4.4 The Mann-Kendall analysis did not indicate a statistically significant trend for MWFTA-16; however, one statistically significant decreasing trend was calculated by the Mann-Kendall test for monitoring well MWFTA-19 However, the concentrations detected within this well are low (<2.1 µg/L), and the trend analysis is not considered to be significant for this evaluation.

4.3.4.5 **VC** – Elevated VC concentrations have been detected at MWFTA-16 The isoconcentration figure illustrates that the areal extent of the plume located downgradient from the former FOS tank has exhibited slight increases of VC concentrations. In addition, the areal extent for this plume boundary (2 to 100 µg/L) has remained somewhat unchanged MWFTA-17, a monitoring well located downgradient from MWFTA-16, historically has not had, and currently does not have, detectable VC concentrations.

4.3.4.6 The Mann-Kendall analysis performed did not indicate a statistically significant VC trend for MWFTA-16 However, an evaluation of the time series graphs do indicate an increasing trend because VC has increased since the initial sampling event in October 1993 when a result of <2 µg/L was reported in this well.

4.3.5 Other VOCs – Lower WBU

4.3.5.1 Additional VOCs detected at the site, as listed in Table F-2 (Appendix F) and reported in the groundwater samples collected during the October 2001, March/April 2002, July 2002, and October 2002, were 1,2-dichlorobenzene, 2-butanone, 2-hexanone, acetone, benzene, chlorobenzene, chloroethane, chloroform, chloromethane, p-isopropyltoluene, methylene chloride, toluene, and naphthalene.

4.3.6 Summary of VOCs – Lower WBU

4.3.6.1 VOC contamination within the lower WBU at OU 7 is primarily located around MWFTA-16. This well is located downgradient from the plume associated with the former FOS tank/Pit 3 in the upper WBU VOCs were not detected within monitoring well MWFTA-16 during the initial sampling event in October 1993. However, VOCs were detected during the October 2000 sampling event (the second sampling event for this well) The contamination at this well is presumed to be caused by either improperly installed monitoring wells upgradient of MWFTA-16 and/or naturally occurring fractures within the confining layer. The areal extent of the VOC plume at MWFTA-16 is not readily expanding or migrating downgradient. In addition, VOCs have not been detected at MWFTA-17, a monitoring well located immediately downgradient from MWFTA-16. MWFTA-16 and MWFTA-17 will continued to be monitored as part of the monitoring program to evaluate the potential for migration within the lower WBU.

4.3.6.2 The VOC distribution pies for wells located downgradient from Pit 1 is shown on Figure 2-6 As shown in the figure, the confining layer within this area is approximately 4-feet in thickness MWFTA-16 is located downgradient from MWFTA-23, a monitoring well located in the upper WBU with elevated VOC concentrations A potential source of contamination within the lower WBU downgradient from Pit 3 is possibly due the migration of contamination through fractures within the confining layer.

4.3.7 VOCs Fractured Bedrock

4.3.7.1 MWFTA-20 is currently the only well existing in the fractured bedrock sampled as part of the quarterly monitoring program and Figure 4-14 represents the time series graph. PCE, *trans*-1,2-DCE, and

1,1,1-TCA are currently not detected above reporting limits The non-detection of these constituents is consistent with historical data.

4.3.7.2 TCE, *cis*,-1,2-DCE, 1,1-DCA, and 1,1-DCE at MWFTA-20 are currently detected above the corresponding reporting limits for the October 2001 through October 2002 sampling events. Mann-Kendall analysis does not indicate a statistically significant trend for the contaminants evaluated. However, an evaluation of the time series graph indicates increasing concentrations of VC. The concentration of VC has increased from <2 µg/L in October 1993 to 12 µg/L in October 2002 An areal evaluation of the plume cannot be determined for MWFTA-20 because reference points are not available The source of the contamination within the fractured bedrock is currently not detected but concentrations may have resulted from improperly installed wells in the vicinity and/or upgradient or natural fractures within the saprolite

4.4 METALS

4.4.0.1 Upper WBU – Total and dissolved metals were measured during the October 2001, March/April 2002, July 2002, and October 2002 sampling events. Summary tables for metals detected in the upper WBU for each event are provided in Table 3-3. Currently, background metal concentrations or ACLs have not been established for DSCR and the results from the metals analysis were compared to primary or secondary MCLs. The metals exceeding these standards in the upper WBU include aluminum, arsenic, iron, and manganese and are presented in Figure 3-11

4.4.0.2 Aluminum – The maximum aluminum concentrations detected during the October 2001 and October 2002 sampling events were detected in monitoring wells DMW-13A (ranging from 794 µg/L to 1550 µg/L), a monitoring well located upgradient from Pit 1, and MWFTA-7 (ranging from 730 µg/L to 1340 J [estimated, based on QC data]), a monitoring well located on the eastern boundary of OU 7. DMW-13A and MWFTA-7 are not within an area of known VOC contamination and are upgradient and side gradient to the identified VOC plumes Site-wide background concentrations have not been established; however, these wells have higher concentrations of aluminum than in known areas of contamination. Based on the locations of these elevated aluminum concentrations and without a site-wide background concentration, an evaluation of the significance of the elevated aluminum concentrations cannot be made

4.4.0.3 **Arsenic** – The maximum arsenic concentrations detected during the October 2001 through October 2002 sampling events were detected in monitoring well MWFTA-23, located downgradient from the former FOS tank/Pit 3, with concentrations ranging from 49 3 µg/L to 96 6 µg/L. The areal extent of the arsenic concentrations at MWFTA-23 and in surrounding wells is similar to the areal extent of the chlorinated solvent plume located in this area; this suggests that arsenic may have been mobilized by changes in geochemical processes associated with chemicals used in Pit 3 for fire training exercises.

4.4.0.4 Elevated arsenic concentrations are also located at monitoring well AEHA-DG10, located downgradient from Pit 1, with concentrations ranging from 27.9 µg/L to 81 µg/L In addition, the areal extent of the arsenic concentrations within surrounding wells is similar to that of the chlorinated solvent plume downgradient from Pit 1. However, the areal extent of the elevated arsenic concentrations does not include DMW-33A. Arsenic concentrations decrease south of DMW-22A, suggesting that arsenic is migrating at a slower rate than the chlorinated solvents located within this area.

4.4.0.5 Elevated arsenic concentrations were also detected in MWFTA-1, a monitoring well located within OU 13 but originally installed to evaluate the groundwater downgradient from OU 7. The location of the elevated arsenic concentrations within this area suggests that the elevated arsenic concentrations are associated with the arsenic located upgradient and within OU 7 An arsenic source located within OU 13 has not been presently identified and arsenic concentrations from soil samples taken in OU 13 were generally low. Elevated arsenic concentrations found within the soil at OU 13 were found in surface soils and not subsurface soil An evaluation of the MNA parameters within this well indicates reducing conditions. Because monitoring wells are currently not located immediately upgradient from MWFTA-1, a determination of the extent of these elevated arsenic concentrations within this area cannot be made.

4.4.0.6 **Iron** – The maximum iron concentrations detected during the October 2001 through October 2002 sampling events were detected at monitoring well MWFTA-23, located downgradient from the former FOS tank/Pit 3, with concentrations ranging from 21,800 µg/L to 64,000 µg/L. Iron concentrations detected in monitoring well MWFOS-3 were similar to the iron concentrations detected within DMW-13A, a monitoring well located upgradient from Pit 1, but higher than the iron concentrations detected within MWFOS-1, located upgradient from the former FOS tank/Pit 3 The areal extent of the iron concentrations located within wells surrounding MWFTA-23 is somewhat similar to the areal extent of the chlorinated solvent plume.

4.4.0.7 Elevated iron concentrations were also detected at AEHA-DG10, located downgradient from Pit 1, with concentrations ranging from 17,700 µg/L to 33,700 µg/L. The iron concentrations detected in monitoring wells located downgradient from AEHA-DG10 were an order of magnitude lower than the concentrations detected at AEHA-DG10 but similar to the concentrations detected at wells located upgradient from Pit 1, indicating that the areal extent of the iron concentrations is more localized around AEHA-DG10.

4.4.0.8 Manganese – The maximum manganese concentrations detected during the October 2001 through October 2002 sampling events were detected at monitoring well AEHA-DG10, located downgradient from Pit 1, with concentrations ranging from 658 µg/L to 1,080 µg/L. The concentration of manganese at wells located downgradient from AEHA-DG10 is similar to the concentrations within wells located upgradient from Pit 1, indicating the areal extent of the elevated manganese concentrations is localized around AEHA-DG10.

4.4.0.9 Elevated manganese concentrations were also detected in monitoring well MWFTA-23 located downgradient from the former FOS tank/Pit 3, with concentrations ranging from 153 µg/L to 519 µg/L. The concentration of manganese at wells located downgradient from MWFTA-23 is similar to the concentrations in wells located upgradient from the former FOS tank/Pit 3, indicating the areal extent of elevated manganese concentrations is localized around MWFTA-23.

4.4.0.10 Summary – With the exception of aluminum, the location of elevated metals concentrations detected at the upper WBU appear to correlate with the VOC contamination downgradient from Pit 1 and the former FOS tank/Pit 3. This observation is consistent with a modification of the existing redox conditions in areas affected by VOCs If previously existing oxidizing conditions in the soils and WBU media were to be converted to reducing conditions (as would be expected from the degradation of fuel constituents), immobile metals might be mobilized. In particular, the dark reddish iron and black manganese oxyhydroxide coating on mineral grains that naturally color the sediments could be chemically reduced to their more-soluble, lower valence state. Since arsenic is reported to be strongly absorbed to these same oxyhydroxides, the dissolution of these coatings could also liberate adsorbed arsenic However, without site-wide background concentrations, the extent of the arsenic contamination is unknown

4.4.0.11 Lower WBU – Summary tables for metals detected in the lower WBU for each event are provided in Table 3-4 Currently, background metal concentrations have not been established for the lower WBU at DSCR and the results from the metals analysis were compared to primary or secondary MCLs The metals exceeding the primary and secondary MCL standards in the lower WBU include aluminum, iron, and manganese and, are presented in Figure 3-12. In addition, few wells are available in the lower WBU at OU 7 and, consequently, a complete evaluation of the current conditions within the lower WBU cannot be performed.

4.4.0.12 The maximum concentrations of aluminum were detected in MWFTA-17 with concentrations ranging from 4,520 µg/L to 5,380 µg/L The maximum concentrations of iron were detected in MWFTA-28B, a monitoring well located south of Kingsland Creek, with concentration ranging from 2,270 µg/L to 3,130 µg/L MWFTA-16, which has elevated VOC concentrations, contains low level iron concentrations The maximum manganese concentrations were detected in MWFTA-16, with concentrations ranging from 12 4 JQ (estimated; value is between the detection limit and reporting limit) µg/L to 324 µg/L With the exception of manganese, elevated metals concentrations within the lower WBU do not appear to correlate with VOC contamination within the lower WBU

4.4.0.13 Fractured Bedrock – Summary tables for metals detected in MWFTA-20, the one monitoring well currently located within the fractured bedrock, is provided in Table 3-4. Currently, background metal concentrations have not been established for the fractured bedrock at DSCR and the results from the metals analysis were compared to primary or secondary MCLs. The metals exceeding the primary and secondary MCL standards in the fractured bedrock include aluminum, iron, and manganese. In addition, few wells screened within the fractured bedrock are present at OU 7 and consequently, a complete evaluation of the current conditions within the fractured bedrock cannot be performed

TAB

Section 5.0

5.0 CONCLUSIONS

5.0.0.1 In October 2002, MACTEC conducted a groundwater sampling event for OU 7 at DSCR. The following sections present conclusions developed as a result of the analysis of the groundwater monitoring data.

5.0.0.2 **Upper WBU** – Groundwater in the upper WBU of OU 7 has been impacted by various VOCs from past site activities Two separate plumes, containing VOCs (parent and daughter products), have been delineated based on the results of this quarterly sampling event. The plumes, located downgradient from Pit 1 and Pit 3 or the former FOS tank, appear to be moving in the direction of groundwater flow towards Kingsland Creek Additionally, previous direct push data depict a third plume, this plume is downgradient of Pit 2. The current well network is not positioned to effectively monitor the plume from Pit 2.

5.0.0.3 Concentrations of VOCs appear to have decreased as a result of degradation and the analytical data suggest that reductive dechlorination is occurring. The predominant VOCs detected within the upper WBU at OU 7 include PCE, TCE, 1,1,1-TCA and associated daughter products (*cis*-1,2-DCE, *trans*-1,2-DCE, VC, 1,1-DCA, and 1,1-DCE) as discussed in earlier sections. TCE made up the majority of contamination within the Pit 1 contaminant plume and *cis*-1,2-DCE made up the majority of contamination within the former FOS tank/Pit 3 contamination plume. In addition, the plume located downgradient from Pit 1 also contains 1,1,1-TCA and associated daughter products. The presence of PCE/TCE daughter products (*cis*-1,2-DCE, *trans*-1,2-DCE, and VC) and 1,1,1-TCA daughter products (1,1-DCA) provides direct evidence that natural degradation is occurring.

5.0.0.4 The geochemical indicators for natural attenuation measured within the upper and lower WBU and the fractured bedrock at OU 7 generally indicate conditions that are favorable for sustaining natural attenuation and supporting MNA as a final remedial alternative However, the low availability of dissolved TOC in the groundwater may be limiting reaction rates

5.0.0.5 In general, a natural progression of degradation products can be seen downgradient within the Pit 1 plume, with elevated concentrations of parent VOC compounds detected within AEHA-DG10 and elevated concentrations of daughter products detected within DMW-33A. However, VOC concentrations located downgradient from DMW-33A needs to be assessed to ascertain potential migratory pathways

5.0.0.6 Downgradient from Pit 3, *cis*-1,2-DCE makes up the majority of the contamination (within MWFTA-23 and MWFOS-3); this provides direct evidence that natural degradation is occurring. In addition, an evaluation of wells located downgradient from MWFTA-23 and MWFOS-3 does not indicate that the VOC plume is migrating.

5.0.0.7 Elevated arsenic, iron, and manganese concentrations have also been detected within the upper WBU at OU 7 These elevated inorganic concentrations are detected within wells containing elevated VOC concentrations suggesting the inorganics may be mobilized by changes in geochemical processes associated with the chemicals that were used within the pits.

5.0.0.8 **Lower WBU** – For the lower WBU, 1,1,1-TCA, 1,1-DCA, and 1,1-DCE have not been detected. PCE, TCE, *cis*-1,2-DCE, and VC have historically been detected sporadically and at low levels (<10 µg). VOC contamination within the lower WBU at OU 7 is primarily located within MWFTA-16. This well is located downgradient from the contamination plume associated with the former FOS tank/Pit 3 in the upper WBU However, the areal extent of the VOC plume at MWFTA-16 does not appear to be readily expanding or migrating downgradient In addition, VOCs have not been detected within MWFTA-17, a monitoring well located immediately downgradient from MWFTA-16. MWFTA-16 and MWFTA-17 will continue to be monitored as part of the monitoring program to evaluate the potential for migration within the lower WBU.

5.0.0.9 In addition, the VOCs detected within PWFTA-2, a monitoring well no longer sampled as part of the monitoring program due to suspected improper installation, were detected at low levels (>10 µg/L). The VOC concentrations within this area are currently not under evaluation due to the current well network for the lower WBU

5.0.0.10 **Fractured Bedrock** – TCE, *cis*,-1,2-DCE, 1,1-DCA, and 1,1-DCE within MWFTA-20 are currently detected above their corresponding reporting limits for the October 2001 through October 2002 sampling events Mann-Kendall analysis does not indicate a statistically significant trend for the contaminants evaluated. However, an evaluation of the time series graph indicates an increase concentration for VC The concentration of VC has increased from <2 µg/L in October 1993 to 12 µg/L in October 2002. An areal evaluation of the plume cannot be determined for MWFTA-20 since other fractured bedrock wells have not been installed. The source of the contamination within the fractured bedrock is currently not known, this contamination may result from improperly installed wells

TAB

Section 6.0

6.0 REFERENCES

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TAB

Tables

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TABLE 1-1

HISTORICAL MONITORING WELLS SAMPLED
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Screened WBU	Oct-01 Monitoring Wells Sampled	Mar/Apr-02 Monitoring Wells Sampled	July-02 Monitoring Wells Sampled	Oct-02 Monitoring Wells Sampled
Upper	AEHADG-10	AEHADG-10	AEHADG-10	AEHADG-10
Upper	DMW-13A	DMW-13A	DMW-13A	DMW-13A
Upper	NS	NS	DMW-20A (a)	DMW-20A
Upper	DMW-22A	DMW-22A	DMW-22A	DMW-22A
Upper	DMW-25A	DMW-25A	DMW-25A	DMW-25A
Upper	DMW-26A	DMW-26A	DMW-26A	DMW-26A
Upper	DMW-27A	DMW-27A	DMW-27A	DMW-27A
Upper	DMW-33A	DMW-33A	DMW-33A	DMW-33A
Upper	DMW-35A	DMW-35A	DMW-35A	DMW-35A
Upper	MWFOS-1	MWFOS-1	MWFOS-1	MWFOS-1
Upper	NS	NS	MWFOS-3 (b)	MWFOS-3
Upper	MWFTA-1	MWFTA-1	MWFTA-1	MWFTA-1
Upper	MWFTA-3	MWFTA-3	MWFTA-3	MWFTA-3
Upper	MWFTA-5	MWFTA-5	MWFTA-5	MWFTA-5
Upper	MWFTA-7	MWFTA-7	MWFTA-7	MWFTA-7
Upper	NS	NS	MWFTA-9 (c)	MWFTA-9
Upper	NS	NS	MWFTA-10 (c)	MWFTA-10
Upper	MWFTA-23	MWFTA-23	MWFTA-23	MWFTA-23
Upper	NS	NS	MW112-2 (d)	MW112-2
Lower	DMW-29B	DMW-29B	DMW-29B (e) - NS	NS
Lower	MWFTA-14	MWFTA-14	MWFTA-14	MWFTA-14
Lower	MWFTA-16	MWFTA-16	MWFTA-16	MWFTA-16
Lower	MWFTA-17	MWFTA-17	MWFTA-17	MWFTA-17
Lower	MWFTA-18	MWFTA-18	MWFTA-18	MWFTA-18
Lower	MWFTA-19	MWFTA-19	MWFTA-19	MWFTA-19
Lower	MWFTA-28B	MWFTA-28B	MWFTA-28B	MWFTA-28B
Lower	MWFTA-29B	MWFTA-29B	MWFTA-29B	MWFTA-29B
Lower	PWFTA-2	PWFTA-2	PWFTA-2 (f) - NS	NS
Bedrock	MWFTA-20	MWFTA-20	MWFTA-20	MWFTA-20

Notes:

(a) Added well DMW-20A to assess contamination prior to boundary well, MWFTA-7 per LAW memo dated June 27, 2002

(b) Added well MWFOS-3 to monitor high concentrations and determine the potential presence of persistent sources per LAW meeting on July 24, 2002

(c) Added wells MWFTA-9 and MWFTA-10 due to VDEQ recommendation dated July 17, 2002

(d) Added Bldg 112 well, MW112-2, to provide additional characterization to background conditions per LAW meeting on June 24 2002

(e) Deleted well DMW- 29B because single cased well in lower WBU - may be conduit for lower WBU contamination from upper WBU - per LAW meeting on June 24, 2002 and memo dated June 27, 2002

(f) Deleted well PWFTA-2 because installation diagrams indicate that the outer casing may be improperly installed through the confining layer causing potential "leakage" of upper WBU contaminants into the lower WBU per LAW meeting on June 24 2002 and memo dated June 27, 2002

NS Not Sampled

PREPARED/DATE EMS 4/14/03
CHECKED/DATE CMB 4/16/03

TABLE 1-2

ENVIRONMENTAL PROGRAM MILESTONES
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Environmental Program Milestones, DSCR
1941	Installation placed in active service as two separate facilities (Richmond General Depot and Richmond Holding and Reconsignment Point)
1962	Department of Defense consolidates missions of the 2 facilities, renames the facility DGSC and later DSCR.
1987	DSCR added to the National Priorities List
1990	FFA identified DSCR as a federal facility requiring investigation
1996	Final Focused FS completed, DPE recommended as preferred remedy for VOCs in groundwater
1996	Small-scale groundwater/vapor DPE system tested at OU 7.
1998	Small-scale density-driven convection system tested at OU 7
2001	Quarterly groundwater sampling initiated at OU 7 to evaluate MNA as a viable remedy
2002	Restoration Advisory Board (RAB) formed and first meeting held

Notes:
DGSC Defense General Supply Center
DSCR Defense Supply Center Richmond
DPE dual-phase extraction
FFA federal facility agreement
FS feasibility study
OU operable units
VOCs volatile organic compounds

PREPARED/DATE EMS 4/14/03
CHECKED/DATE MET 6/25/03

20701 06

TABLE 1-3

HISTORICAL INVESTIGATION SUMMARY
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Year	Activity/Action
1960s-1979	• Flammable liquid waste chemicals and petroleum products are disposed of in three unlined pits, ignited, and then extinguished in conjunction with fire training activities • Pit 1, which was in use from the mid-1970s to 1979, was located in the eastern portion of what is now OU 7 This pit, located near a storm sewer line (running north-south), was circular with a 50 foot diameter and approximately 3 feet deep • Pit 2, rectangular in shape with 20' X 40' dimensions, was used from the late 1960s until it was replaced by Pit 1 in the mid-1970s (1973-1975) Large flow stains are visually evident in A 1973 aerial photograph Aerial photography indicates the pit was filled with soil in 1975 • Pit 3 is present in 1969 aerial photographs The use of this pit for fire training activity cannot be confirmed In 1971, Pit 3 is not identifiable in aerial photography. • A berm surrounding a fuel oil storage tank was constructed in 1975, partially covering the Pit 3 area In November 1978, the FOS tank released approximately 10,600 gallons of No 4 fuel oil to the surface as a result of a cracked valve Heavy rain at the time of the spill caused the oil to overflow its containment berm and discharge into Kingsland Creek (LAW, 1994).
1981	Chemical Systems Laboratory (CSL) conducted an Installation Assessment of DSCR to evaluate the existence of toxic and hazardous materials in the subsurface environment at DSCR. The report identified the fire training area as a potential source of contamination The report recommended further assessment of the FTA to determine the extent of subsurface contaminant migration and the establishment of a surface water monitoring program (CSL, 1981)
1982	• In March 1982, United States Army Environmental Hygiene Agency (USAEHA) continued the study of Pit 1 and reported the pit to have a 1" layer of liquid petroleum products mixed with fire extinguishing material floating on the water. In addition, the bottom of the pit was reported to contain 1 to 4 inches of petroleum-based sludge • The USAEHA installed four monitoring wells, one upgradient (DG-8) and three downgradient (DG-9, 10, and 11), in the area around Pit 1 to determine the groundwater quality at the site. Elevated levels of chlorinated solvents were detected down gradient of Pit 1 At this time, USAEHA recommended continued water quality assessment at Kingsland Creek • In September 1982, the USAEHA initiated a geohydrologic study that included a Surface Water Monitoring Program. Two locations along Kingsland Creek, SP01 located upstream and SP02 located downstream of the FTA, were selected as sampling locations for the evaluation of the impact of the FTA on surface water quality (USAEHA, 1982).
1983	Pit 1 was filled with soil leaving the petroleum layer and sludge in place (D&M, 1989b)

TABLE 1-3

HISTORICAL INVESTIGATION SUMMARY
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Year	Activity/Action
1985	• D&M initiated a Phase II Program following DSCR's placement on the proposed National Priority List As part of this effort, D&M installed monitoring well DMW-13A to replace DG-8 as a background well for the FTA In addition to the boring for DMW-13A, D&M advanced three soil borings (DMW-62, 63 and 64) and collected 9 soil samples • To evaluate the horizontal surface soil contamination, D&M collected three shallow surface samples (DMA-1 through DMA-3) to confirm the flow stain and wet areas previously identified in aerial photographs • USAEHA collected sediment samples from the locations SP01 and SP02 (D&M, 1989b)
1986	• A Phase I Soil Gas Sampling Program was initiated by D&M in October 1986 and the results were used to aid in the determination of monitoring well locations to more accurately define the extent of groundwater contamination The results of the Phase I investigation identified a potential for additional contamination sources located west of Pit 1 • An aerial photographic interpretation investigation was conducted to more accurately define the areas of concern Used in this investigation were aerial photographs taken in 1959, 1965, 1969, 1971, 1972, 1973, 1975, and 1982 An interpretation of the photographs is provided in the D&M Remedial Investigation Report (D&M, 1989b) • A Phase II Soil Gas Sampling Program was initiated in November 1986 to delineate areas identified in the Phase I investigation and in the aerial photographs • To confirm the extent of groundwater contamination identified in the Soil Gas Sampling program, D&M installed seven monitoring wells (DMW-19A through DMW-22A and DMW-25A through DMW-27A) downgradient from the previously identified fire training pits. • D&M advanced four soil borings (DMS-74 through DMS-77), in addition to the seven borings advanced during the monitoring well installation activity • Six additional surface soil samples (DMA-9 through DMA-13 and DMH-1) were collected to assess flow stains and wet areas identified in aerial photographs (D&M, 1989b)
1987	• A quarterly monitoring program was initiated as part of DSCR's RCRA Part B permit, which was in place at that time This monitoring program included collection of four rounds of samples from nine surface water locations and 28 monitoring wells. The first round was conducted in the January 1987 field-sampling program, while rounds 2, 3, and 4 were conducted in April and July 1987 and November 1988, respectively (D&M, 1989b) • Surface water sampling of the sewer outfall at Kingsland Creek was initiated. Samples were collected at location SWD-1 to evaluate the contamination potential and possible migratory pathway of the storm sewer, which traverses the FTA

TABLE 1-3

HISTORICAL INVESTIGATION SUMMARY
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Year	Activity/Action
1988	• During the fall of 1988, D&M conducted a supplemental investigation in the FTA to address data gaps identified in the Draft RI report. During this time six additional wells (DMW-22E, DMW-29A, DMW-29B, DMW-33A, DMW-33B, and DMW-35A) were installed to evaluate contamination in the upper and lower water bearing unit and in the bedrock Soil samples were collected from each of the monitoring well soil borings for chemical analysis In addition, two additional borings (DMS-106 and DMS-107) were advanced to assess the continuity, structures, and thickness of the clayey layer that separates the upper and lower water bearing units (D&M, 1989) • An aquatic survey was performed and surface water and sediment samples were collected from three stations (SP13, 14 and SP16) during the study (D&M, 1989b)
1992	• As part of the pre-remedial program, LAW conducted an expanded site investigation (ESI) of the Fuel Oil Storage (FOS) area The purpose of the ESI was to provide additional support of the HRS scoring, support scoping of the RI, and aid in developing the RI workplan Five soil samples (SUFOS-1 through SUFOS-5) and four groundwater monitoring wells (MWFOS-1 through MWFOS-4) were installed in the FOS area (LAW, 1994). • A remedial investigation addendum was initiated at the FTA by LAW to determine the nature and extent of contamination This effort was conducted in two phases, the first phase being conducted from September through December 1992 by LAW and Engineering Science (ES) and the second phase being conducted from August through October 1993 by ES • In October, LAW installed 10 monitoring wells (MWFTA-1 through MWFTA-10) as five well clusters. During the installation, soil samples (SBFTA-1, SBFTA-3, SBFTA-5, SBFTA-7, and SBFTA-9) were collected from five of the borings advanced for the monitoring well installation (LAW, 1996a) • ES advanced seventeen soil borings and collected 37 samples for analysis (ES, 1993)
1993	• ES installed ten monitoring wells (MWFTA-11 through MWFTA-20) and collected 22 hydropunch samples (HPFTA-1 through HPFTA-22) as part of the Phase II RI In addition, two pumping wells (PWFTA-1 and PWFTA-2) were installed for the purpose of performing pump tests (ES, 1993)
1994	• In May, ES abandoned two lower water bearing unit monitoring wells (DMW-22E and DMW-33B) to reduce the possibility of cross contamination between the upper and lower water bearing units (ES, 1994)

TABLE 1-3

HISTORICAL INVESTIGATION SUMMARY
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Year	Activity/Action
1995	• In September 1995, LAW initiated a supplemental remedial investigation The objectives of this field program were to – Install well (MWFTA-21) to evaluate the presence of VOCs in the bedrock – Evaluate drainage pathways from the FTA to determine if surface runoff from the site may have transported contaminated soil into the nearby wooded area through the storm sewer system and drainage features Nine soil samples (SSFTA21 through SSFTA30) were collected from outfall locations – Sample MWFTA-20 and MWFOS-3 to confirm the presence of DNAPL – Collect 4 sediment samples and analyze for dioxins – Assess the FTA surface water drainage. A smoke test was performed on the western storm sewer line (LAW, 1996b)
1996	To support the recommendation proposed in the Final Focused Feasibility Study, LAW initiated a DPE pilot study south of the former FOS area. Contaminant mass removals by vapor extraction were observed during the SVE and Dual Phase Test Therefore, DPE was considered a good candidate (LAW, 1996c)
1998	LAW initiated a DDC pilot test to determine the effectiveness of source removal offsite and south of Kingsland Creek One DDC pilot test well and nine nested piezometers were installed The DDC performed well by reducing dissolved VOC concentrations (LAW, 1999).
2000	From September 2000 to September 2001, LAW conducted a four-phase sampling event to provide data to evaluate the extent of VOC contamination, determine groundwater flow direction, and evaluate monitored natural attenuation (MNA) as a potential remedy to address residual contamination in the upper water bearing unit The first phase of field activities included sampling of approximately 41 monitoring wells In addition, groundwater samples were collected in the FOS area to verify the presence or absence of DNAPL DPT sampling techniques were used to aid in providing a comprehensive profile of the groundwater conditions in the upper water bearing unit (LAW, 2002a)
2001	• In September 2001, LAW initiated a quarterly sampling program for the purpose of monitoring the nature and extent of the groundwater contaminant plume and to collect additional data to support monitored natural attenuation as a component of the final remedy for the site • In August and September 2001, the second phase of the field activities included the installation and sampling of monitoring well MWFTA-29B In addition, six wells that were not accessible in September 2000 were sampled • The third phase of field activities occurred in July and August 2001, at which time LAW conducted DPT groundwater sampling During this event, approximately 53 DPT borings were advanced and 134 groundwater samples were collected. • In August and September 2001, the fourth phase of the field activities conducted by LAW included the installation and sampling of monitoring well MWFTA-28B (LAW, 2002a)

TABLE 1-3

HISTORICAL INVESTIGATION SUMMARY
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Year	Activity/Action
	• In October 2001, LAW initiated a quarterly sampling program for the purpose of monitoring the nature and extent of the groundwater contaminant plume, to collect additional data to support MNA as a component of the final remedy for the site, and to collect groundwater data for the preparation of the potentiometric surface maps (LAW 2002a)
2002	• Restoration Advisory Board (RAB) formed and first meeting held in January 2002. • Quarterly sampling continued in March, July and October to collect chemical data regarding nature and extent of contamination and to collect data to support monitored natural attenuation as a component of the final remedy
2003	Quarterly sampling continued in January and April to collect chemical data regarding nature and extent of contamination and to collect data to support monitored natural attenuation as a component of the final remedy. Quarterly sampling will continue through the end of the year

PREPARED/DATE: <u>TLN 9/30/02</u>
CHECKED/DATE: <u>RSF 6/27/03</u>

TABLE 2-1

SUMMARY OF MONITORING WELL CONSTRUCTION DETAILS
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Well ID	Date of Installation	Easting	Northing	Ground Surface Elevation	Top of Casing Elevation	Total Depth of Boring	Total Depth of Well	Well Type/Type III Outer Casing Depth	Depth to Top of Confining Layer	Depth to Bottom of Confining Layer	Depth to Top of Saprolite	Depth to Top of Bedrock	Depth to Top of Well Screen	Thickness of Confining Unit	Well Screen Length	Well Casing Diameter	Well Material	Screened Aquifer	Screened Geological Formation	Well Function	Consulting Company / Government Agency	Soil Boring Log Available	Well Construction Details Available
				(feet MSL)		(feet below ground surface)								(feet)	(feet)	(inches)							
AEHA DG8	3/13/1982	NA	NA	105.40	107.70	20.0	19.5	Type II					9.50		10.00	2	PVC	Upper	Eastover	Monitoring	USAEHA	Yes	Yes
AEHA DG9	3/14/1982	11789063.96	3674799.65	101.60	104.20	18.6	18.3	Type II					5.30		13.00	2	PVC	Upper	Eastover	Monitoring	USAEHA	Yes	Yes
AEHA DG10	3/14/1982	11789139.77	3674795.47	95.72	98.13	16.5	16.5	Type II					6.50		10.00	2	PVC	Upper	Eastover	Monitoring	USAEHA	Yes	Yes
AEHA DG11	3/15/1982	11789062.78	3674887.63	101.70	103.40	17.0	16.1	Type II					6.10		10.00	2	PVC	Upper	Eastover	Monitoring	USAEHA	Yes	Yes
DMW-13A	5/21/1985	11788957.94	3675013.19	99.51	101.43	24.0	22.0	Type II					14.50		5.00	4	Teflon/PVC	Upper	Eastover	Monitoring	Dames & Moore	Yes	Yes
DMW-19A	11/19/1986	11789055.48	3674740.28	95.45	97.40	21.0	21.0	Type II					4.50		15.00	4	Teflon/PVC	Upper	Eastover	Monitoring	Dames & Moore	Yes	Yes
DMW 20A	11/14/1986	11789336.34	3674854.64	95.01	97.59	21.0	21.0	Type II					5.40		15.00	4	Teflon/PVC	Upper	Eastover	Monitoring	Dames & Moore	Yes	Yes
DMW 21A	11/18/1986	11789267.47	3674600.52	84.71	87.53	16.3	16.3	Type II					11.30		5.00	4	Teflon/PVC	Upper	Eastover	Monitoring	Dames & Moore	Yes	Yes
DMW 22A	11/26/1986	11789281.04	3674607.42	84.94	87.15	35.0	34.8	Type II					29.80		5.00	4	Teflon/PVC	Upper	Eastover	Monitoring	Dames & Moore	Yes	Yes
DMW 22I	11/2/1988	NA	NA	84.70	86.57	70.0	70.0	Type II	19.5	22	29.5	55	65.00	2.5	5.00	2	Stainless Steel	Bedrock	Petersburg	Abandoned	Dames & Moore	Yes	Yes
DMW 25A	12/12/1986	11788885.37	3674673.29	96.31	97.87	21.0	19.3	Type II					4.30		15.00	4	Teflon/PVC	Upper	Eastover	Monitoring	Dames & Moore	Yes	Yes
DMW 26A	12/10/1986	11788624.15	3674722.15	96.27	98.73	21.0	20.2	Type II					5.20		15.00	4	Teflon/PVC	Upper	Eastover	Monitoring	Dames & Moore	Yes	Yes
DMW 27A	12/8/1986	11788435.24	3674821.49	98.65	101.24	21.0	19.7	Type II					4.70		15.00	4	Teflon/PVC	Upper	Eastover	Monitoring	Dames & Moore	Yes	Yes
DMW 29A	11/7/1988	11789153.58	3674797.25	95.68	97.65	30.0	28.0	Type II					23.00		5.00	4	Teflon/PVC	Upper	Eastover	Monitoring	Dames & Moore	Yes	Yes
DMW 29B	11/7/1988	11789167.93	3674800.60	95.73	97.74	48.0	48.0	30.0	27.5	32			43.00	4.5	5.00	2	Teflon/PVC	Lower	Potomac	Monitoring	Dames & Moore	Yes	Yes
DMW 33A	5/18/1988	11789481.21	3674605.40	82.50	85.09	15.0	15.0	Type II					5.00		10.00	4	PVC	Upper	Eastover	Monitoring	Dames & Moore	Yes	Yes
DMW 33B	6/2/1988	NA	NA	82.20	84.53	46.5	40.5	Type II	23.0	28.5	40	45	30.00	5.5	10.00	4	Teflon/PVC	Bedrock	Petersburg	Abandoned	Dames & Moore	Yes	Yes
DMW 35A	11/8/1988	11789078.30	3674908.98	97.28	100.51	34.0	32.5	Type II	32.5				27.50		5.00	4	PVC	Upper	Eastover	Monitoring	Dames & Moore	Yes	Yes
MWIOS 1	9/30/1992	11788226.22	3675108.99	109.37	112.26	26.0	23.5	Type II	8.0	16			18.50	8.0	5.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWIOS 2	10/1/1992	11788575.97	3674887.33	99.78	101.45	17.0	17.0	Type II					7.24		9.70	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWIOS 3	9/30/1992	11788389.55	3674881.76	100.88	103.19	18.0	17.0	Type II					7.24		9.70	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWIOS-4	10/1/1992	11788474.67	3674961.97	101.98	103.60	19.5	18.0	Type II					8.24		9.70	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 1	10/3/1992	11788760.72	3674309.84	89.21	91.32	15.0	14.1	Type II					9.10		5.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 2A	5/5/1993	11788770.27	3674334.07	89.49	92.83	43.7	38.5	22.0	35.0	NA			NA		4.87	2	PVC	Lower	Potomac	Monitoring	Law Engineering	Yes	No
MWTA 3	10/2/1992	11789105.58	3674526.04	84.53	86.71	17.0	14.3	Type II	15.0				9.30		5.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 4	10/15/1992	11789106.14	3674537.68	84.35	86.28	35.1	35.1	19.8	13.0	25.0			30.11	12.0	5.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 5	10/14/1992	11789646.75	3674494.15	83.28	85.47	13.5	12.9	Type II	11.0				7.90		5.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 6	10/15/1992	11789637.63	3674509.61	83.06	85.18	38.0	24.0	15.0	13.0	32.0			19.00	19.0	5.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 7	10/2/1992	11789837.72	3674821.78	83.96	86.72	15.0	14.1	Type II					9.10		5.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 8	10/16/1992	11789843.31	3674811.43	83.45	85.06	37.0	33.1	23.0	32.0				28.10		5.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 9	10/14/1992	11789607.98	3674159.91	83.76	85.90	15.5	14.5	Type II					9.50		5.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 10	10/17/1992	11789600.28	3674175.44	83.45	86.29	25.1	25.1	15.5	17.0	23			20.11	6.0	5.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 21	8/23/1995	11789710.04	3674752.23	81.67	81.53	87.0	72.0	31.0	28.0	36.0	44.0	61.0	57.00	8.0	15.00	2	PVC	Bedrock	Petersburg	Monitoring	Law Engineering	Yes	Yes
MWTA 22	8/30/1996	11788395.79	3674881.14	100.75	103.20	35.0	35.0	Type II	34.0				5.30		28.00	4	PVC	Upper	Eastover	Pilot Test	Law Engineering	Yes	Yes
MWTA 23	8/31/1996	11788396.74	3674872.72	100.30	102.77	35.0	35.0	Type II	33.6				5.30		29.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA-24	8/29/1996	11788400.25	3674880.93	100.64	103.06	35.0	35.0	Type II	34.0				5.30		29.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 25	8/28/1996	11788402.74	3674858.20	100.06	102.07	33.0	33.0	Type II	34.0				5.30		27.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 26	8/27/1996	11788435.69	3674881.83	100.31	102.66	35.0	35.0	Type II	34.0				5.30		29.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA-27	8/29/1996	11788417.34	3674826.28	98.84	101.00	33.0	33.0	Type II	33.0				5.30		27.00	2	PVC	Upper	Eastover	Monitoring	Law Engineering	Yes	Yes
MWTA 28B	8/22/2001	11789525.73	3674399.19	82.74	85.16	69.0	69.0	25.5	22.5	38.0	38.0	61.0	59.00	15.5	10.00	2	PVC	Saprolite/bedrock	Potomac	Monitoring	Law Engineering	Yes	Yes
MWTA 29B	3/28/2001	11789667.29	3674743.04	81.38	81.59	69.5	69.5	30.0	27.0	34.0	49.0	69.0	59.50	7.0	10.00	2	PVC	Saprolite/bedrock	Potomac	Monitoring	Law Engineering	Yes	Yes
PWTA 1	9/2/1993	11789256.67	3674618.17	84.54	86.89	20.0	20.0						5.00		15.00	2	PVC	Upper	Eastover	Monitoring	Eng. Science, Inc.	Yes	Yes
PWTA 2	9/22/1993	11769274.32	3674636.03	83.38	86.04	41.0	40.0	25.0	23.0	29.0	34.0		25.00	6.0	15.00	2	PVC	Lower	Eastover	Monitoring	Eng. Science, Inc.	Yes	Yes
MWTA-11	9/1/1993	11788393.23	3674767.64	97.88	101.10	31.0	29.0		29.0				24.00		5.00	2	PVC	Upper	Eastover	Monitoring	Eng. Science, Inc.	Yes	Yes
MWTA-12	9/1/1993	11788835.40	3674360.82	89.76	92.08	20.5	18.5		18.5				3.50		15.00	2	PVC	Upper	Eastover	Monitoring	Eng. Science, Inc.	Yes	Yes
MWTA 13	9/10/1993	11789568.18	3674557.36	NA	84.57	40.0	40.0	25.5	24.0	33.0			35.00	9.0	5.00	2	PVC	Lower	Potomac	Monitoring	Eng. Science, Inc.	Yes	Yes
MWTA44	9/11/1993	11789421.18	3674505.36	NA	85.06	40.0	40.0	24.5	24.0	28.0	38.0		35.00	4.0	5.00	2	PVC	Lower	Potomac	Monitoring	Eng. Science, Inc.	Yes	Yes
MWTA-15	9/13/1993	11789272.18	3674460.36	NA	85.77	40.0	40.0	25.0	23.0	28.0	38.0		35.00	5.0	5.00	2	PVC	Lower	Potomac	Monitoring	Eng. Science, Inc.	Yes	Yes

TABLE 2-1

SUMMARY OF MONITORING WELL CONSTRUCTION DETAILS
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Well ID	Date of Installation	Easting	Northing	Ground Surface Elevation	Top of Casing Elevation	Total Depth of Boring	Total Depth of Well	Well Type/Type III Outer Casing Depth	Depth to Top of Confining Layer	Depth to Bottom of Confining Layer	Depth to Top of Saprolite	Depth to Top of Bedrock	Depth to Top of Well Screen	Thickness of Confining Unit	Well Screen Length	Well Casing Diameter	Well Material	Screened Aquifer	Screened Geological Formation	Well Function	Consulting Company / Government Agency	Soil Boring Log Available	Well Construction Details Available
				(feet MSL)		(feet below ground surface)								(feet)	(feet)	(inches)							
MW11A 16	9/21/1993	11788397.96	3674856.55	100.13	103.16	50.0	50.0	33.5	32.0	36.0			45.00	4.0	5.00	2	PVC	Lower	Potomac	Monitoring	Eng. Science Inc	Yes	Yes
MW11A 17	9/20/1993	11788590.97	3674828.97	97.63	100.15	50.0	50.0	32.5	29.5	35.0			45.00	5.5	5.00	2	PVC	Lower	Potomac	Monitoring	Eng. Science Inc	Yes	Yes
MW11A 18	9/18/1993	11788897.78	3674632.81	95.47	97.59	49.0	49.0	32.5	25.0	37.0	44.0		44.00	12.0	5.00	2	PVC	Lower	Potomac	Monitoring	Eng. Science Inc	Yes	Yes
MW11A 19	9/19/1993	11789485.12	3674703.72	82.21	84.45	40.0	40.0	24.0	18.0	27.0	35.0		35.00	9.0	5.00	2	PVC	Lower	Potomac	Monitoring	Eng. Science Inc	Yes	Yes
MW11A 20	9/24/1993	11789308.57	3674619.34	84.05	87.04	76.0	75.0	25.0	23.0	29.0	40.0	51.0	70.00	6.0	5.00	2	PVC	Bedrock	Petersburg	Monitoring	Eng. Science Inc	Yes	Yes
DIX	12/11/1998	NA	NA	NA	84.85	25.0	23.5	Type II	23.0				18.17		5.56	4	PVC	Upper	Eastover	Pilot Test	Wasatch Environmental	Yes	Yes
PZ 1	12/11/1998	11789465.35	3674599.52	82.03	84.09	24.0	22.1	Piezometer	23.0				19.00		1.00	2	PVC	Upper	Eastover	Pilot Test	Wasatch Environmental	Yes	Yes
PZ 2	12/11/1998	11789465.35	3674599.52	82.03	84.01	24.0	14.4	Piezometer	23.0				11.00		1.00	1	PVC	Upper	Eastover	Pilot Test	Wasatch Environmental	Yes	Yes
PZ 3	12/11/1998	11789465.35	3674599.52	82.03	84.10	24.0	7.6	Piezometer	23.0				5.00		1.00	2	PVC	Upper	Eastover	Pilot Test	Wasatch Environmental	Yes	Yes
PZ 4	12/15/1998	11789470.19	3674599.74	82.25	84.61	21.0	21.0	Piezometer					19.50		1.00	2	PVC	Upper	Eastover	Pilot Test	Wasatch Environmental	Yes	Yes
PZ 5	12/15/1998	11789470.19	3674599.74	82.25	84.59	21.0	13.0	Piezometer					11.50		1.00	1	PVC	Upper	Eastover	Pilot Test	Wasatch Environmental	Yes	Yes
PZ 6	12/16/1998	11789470.19	3674599.74	82.25	84.56	9.5	6.5	Piezometer					5.50		1.00	2	PVC	Upper	Eastover	Pilot Test	Wasatch Environmental	Yes	Yes
PZ 7	12/9/1998	11789474.29	3674603.74	82.23	84.57	21.0	21.0	Piezometer	23.0				19.50		1.00	2	PVC	Upper	Eastover	Pilot Test	Wasatch Environmental	Yes	Yes
PZ 8	12/9/1998	11789474.29	3674603.74	82.23	84.56	23.0	14.0	Piezometer	23.0				12.00		1.00	1	PVC	Upper	Eastover	Pilot Test	Wasatch Environmental	Yes	Yes
PZ 9	12/9/1998	11789474.29	3674603.74	82.23	84.53	21.0	7.0	Piezometer	23.0				6.00		1.00	2	PVC	Upper	Eastover	Pilot Test	Wasatch Environmental	Yes	Yes

Notes:
feet MSL — feet below mean sea level
NA — Not available
(shaded) — Not applicable
UHA — Army Environmental Hygiene Agency
USGS — United States Geological Survey

PREPARED/DATE JPV 5/21/03
CHECKED/DATE RSI 6/19/03

TABLE 2-2

HISTORICAL WATER LEVEL ELEVATIONS MEASURED
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Well ID	Screened WBU	Measuring Point Elevation (in feet msl)	Oct-01 Water Level Elevations (in feet msl)	Mar/Apr-02 Water Level Elevations (in feet msl)	July-02 Water Level Elevations (in feet msl)	Oct-02 Water Level Elevations (in feet msl)
AEHA DG9	Upper	104.20	NM	NM	89.00	93.86
AEHA DG10	Upper	98.13	84.56	86.38	BTOP	86.98
DMW-13A	Upper	101.43	89.83	96.74	88.74	91.88
DMW-19A	Upper	97.40	NM	NM	85.24	88.44
DMW-20A	Upper	97.59	NM	NM	81.58	83.78
DMW-21A	Upper	87.53	NM	NM	80.13	83.11
DMW-22A	Upper	87.15	80.21	82.16	79.93	82.7
DMW-25A	Upper	97.87	86.92	88.82	86.42	95.21
DMW-26A	Upper	98.73	90.10	90.12	89.15	90.60
DMW 27A	Upper	101.24	90.44	90.94	89.85	91.18
DMW-29A	Upper	97.65	NM	NM	83.84	86.77
DMW-33A	Upper	85.09	78.31	79.39	78.06	79.61
DMW-35A	Upper	100.51	86.70	88.72	86.26	88.46
MWFOS 1	Upper	112.26	91.87	92.70	NM	92.93
MWFOS 2	Upper	101.20	NM	NM	89.66	91.64
MWFOS-3	Upper	$\boxed{103.19}$	NM	NM	88.08	91.57
MWFOS 4	Upper	103.60	NM	NM	90.46	92.35
MWFTA-1	Upper	91.32	82.87	84.24	82.61	82.92
MWFTA-3	Upper	86.83	81.54	83.18	81.33	83.87
MWFTA 5	Upper	85.47	77.19	80.32	76.62	79.37
MWFTA 6	Upper	85.18	NM	NM	76.70	NM
MWFTA 7	Upper	86.72	76.44	77.37	75.97	77.20
MWFTA-8	Upper	85.16	NM	NM	75.07	NM
MWFTA 9	Upper	85.90	NM	NM	78.12	82.60
MWFTA-10	Upper	86.29	NM	NM	78.84	81.84
MWFTA-11	Upper	101.10	NM	NM	89.37	90.43
MWFTA-12	Upper	92.08	NM	NM	82.89	84.59
MWFTA 22	Upper	103.20	NM	NM	90.10	91.60
MWFTA 23	Upper	102.77	90.57	91.28	90.03	91.51
MWFTA 24	Upper	103.06	NM	NM	90.05	91.57
MWFTA-25	Upper	102.07	NM	NM	89.98	91.42
MWFTA 26	Upper	102.66	NM	NM	90.03	91.62
MWFTA 27	Upper	101.00	NM	NM	89.81	91.14
PWFTA-1	Upper	86.89	NM	NM	80.38	83.76
DMW 29B	Lower	97.74	61.37	66.76	66.10	64.49
MWFTA 2A	Lower	92.90	NM	80.88	80.21	NM
MWFTA-4	Lower	86.37	NM	69.83	67.53	66.92
MWFTA 13	Lower	84.57	NM	NM	65.95	NM
MWFTA 14	Lower	85.06	61.63	66.24	66.5	65.06
MWFTA 15	Lower	85.77	NM	NM	68.37	NM
MWFTA 16	Lower	103.16	75.17	78.37	78.74	76.17
MWFTA 17	Lower	100.15	73.93	77.27	77.84	75.50
MWFTA 18	Lower	97.59	68.83	73.12	72.34	71.09
MWFTA 19	Lower	84.45	58.93	64.13	64.69	63.00
MWFTA 28B	Lower	$\boxed{85.16}$	56.96	63.20	62.46	58.54
MWFTA 29B	Lower	81.59	58.07	55.01	63.82	53.60
PWFTA 2	Lower	86.04	61.55	66.44	66.40	65.14
MWFTA 20	Bedrock	87.04	60.34	65.43	65.30	64.01

Notes

*	Due to funding limitations the First Quarterly Sampling Event for 2002 was not initiated
msl	mean sea level
BTOP	below top of pump
NM	not measured
WBU	water bearing unit
$\boxed{}$	Well needs to be resurveyed to obtain accurate top of casing; groundwater elevation for this well not used for potentiometric maps

PREPARED/DATE EMS 4/10/03
CHECKED/DATE RSE 6/26/03

TABLE 3-1

GROUNDWATER SAMPLING RESULTS FOR SELECT VOCs
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

(Units = µg/L)	OCT-01	MAR/APR-02	JULY-02	OCT-02
		Tetrachloroethene		
AEHADG-10	3300	1200	2800	1900
DMW-13A	< 1	< 1	< 1	< 1
DMW-20A	NS	NS	< 1 3	< 1
DMW-22A	2 4	4 3	3 2	1 9
DMW-25A	19	5	13	1 4
DMW-26A	< 5	< 1	< 1	< 1
DMW-27A	< 1	< 1	< 1	< 1
DMW-33A	430	140	360	450
DMW-35A	9 7	15	7 8	6 1
MW112-2	NS	NS	< 1	< 1
MWFOS-1	< 1	< 1	< 1	< 1
MWFOS-3	NS	NS	< 330	< 330
MWFTA-1	< 5	< 1	< 1	< 1
MWFTA-10	NS	NS	< 1	< 1
MWFTA-23	< 5000	< 1200	< 5000	< 1200
MWFTA-3	3	< 3 3	37	9
MWFTA-5	< 1	< 1	< 1	< 1
MWFTA-7	< 1	< 1	< 1	< 1
MWFTA-9	NS	NS	< 1	< 1
		Trichloroethene		
AEHADG-10	14000	9000	5200	2800
DMW-13A	< 1	< 1	< 1	< 1
DMW-20A	NS	NS	1 3	2 5
DMW-22A	10	20	12	10
DMW-25A	5 6	0 74 JQ	4	< 1
DMW-26A	< 5	< 1	< 1	0 81 JQ
DMW-27A	< 1	< 1	< 1	< 1
DMW-33A	3500	780	2000	2500
DMW-35A	3	33	3 1	2
MW112-2	NS	NS	< 1	< 1
MWFOS-1	< 1	< 1	< 1	< 1
MWFOS-3	NS	NS	8400	7600
MWFTA-1	< 5	< 1	< 1	< 1
MWFTA-10	NS	NS	< 1	< 1
MWFTA-23	< 5000	240 JQ	2500 JQ	< 1200
MWFTA-3	8 4	1 6 JQ	22	9 1
MWFTA-5	< 1	< 1	< 1	< 1
MWFTA-7	< 1	< 1	< 1	< 1
MWFTA-9	NS	NS	< 1	< 1

TABLE 3-1

GROUNDWATER SAMPLING RESULTS FOR SELECT VOCs
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

(Units = µg/L)	OCT-01	MAR/APR-02	JULY-02	OCT-02
		cis-1,2-Dichloroethene		
AEHADG-10	880	1000	780	690
DMW-13A	< 0 5	< 0 5	< 0 5	< 0 5
DMW-20A	NS	NS	40	21
DMW-22A	6 2	6 7	3 5	2
DMW-25A	8 8	1 2	6	< 0 5
DMW-26A	< 2 5	< 0 5	< 0 5	0 38 JQ
DMW-27A	< 0 5	< 0 5	< 0 5	< 0 5
DMW-33A	2900	690	1800	1900
DMW-35A	1 7	9 1	0 55	< 0 5
MW112-2	NS	NS	< 0 5	< 0 5
MWFOS-1	< 0 5	< 0 5	< 0 5	< 0 5
MWFOS-3	NS	NS	11000	9800
MWFTA-1	< 2 5	0 64	0 43 JQ	0 61
MWFTA-10	NS	NS	< 0 5	< 0 5
MWFTA-23	190000	34000	140000	52000
MWFTA-3	12	100	38 J	56
MWFTA-5	< 0 5	< 0 5	< 0 5	< 0 5
MWFTA-7	< 0 5	< 0 5	< 0 5	< 0 5
MWFTA-9	NS	NS	< 0 5	< 0 5
		trans-1,2-Dichloroethene		
AEHADG-10	< 210	< 170	< 83	< 62
DMW-13A	< 0 5	< 0 5	< 0 5	< 0 5
DMW-20A	NS	NS	< 0 66	< 0 5
DMW-22A	< 0 5	< 0 5	< 0 5	< 0 5
DMW-25A	< 0 5	< 0 5	< 0 5	< 0 5
DMW-26A	< 2 5	< 0 5	< 0 5	< 0 5
DMW-27A	< 0 5	< 0 5	< 0 5	< 0 5
DMW-33A	39 JQ	7 3 JQ	< 42	< 33
DMW-35A	< 0 5	< 0 5	< 0 5	< 0 5
MW112-2	NS	NS	< 0 5	< 0 5
MWFOS-1	< 0 5	< 0 5	< 0 5	< 0 5
MWFOS-3	NS	NS	160 JQ	140 JQ
MWFTA-1	< 2 5	< 0 5	< 0 5	< 0 5
MWFTA-10	NS	NS	< 0 5	< 0 5
MWFTA-23	< 2500	< 620	< 2500	< 620
MWFTA-3	0 22 JQ	4 4	1 3 J	2 6
MWFTA-5	< 0 5	< 0 5	< 0 5	< 0 5
MWFTA-7	< 0 5	< 0 5	< 0 5	< 0 5
MWFTA-9	NS	NS	< 0 5	< 0 5

TABLE 3-1

GROUNDWATER SAMPLING RESULTS FOR SELECT VOCs
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

(Units = µg/L)	OCT-01	MAR/APR-02	JULY-02	OCT-02
			Vinyl Chloride	
AEHADG-10	< 830	< 670	< 330	< 250
DMW-13A	< 2	< 2	< 2	< 2
DMW-20A	NS	NS	< 2 7	< 2
DMW-22A	0 32 JQ	< 2	< 2	< 2
DMW-25A	0 6 JQ	< 2	< 2	< 2
DMW-26A	< 10	< 2	< 2	< 2
DMW-27A	7 7	< 2	4 3	< 2
DMW-33A	33 JQ	7 7 JQ	< 170	< 130
DMW-35A	< 2	< 2	< 2	< 2
MW112-2	NS	NS	< 2	< 2
MWFOS-1	< 2	< 2	< 2	< 2
MWFOS-3	NS	NS	380 JQ	360 JQ
MWFTA-1	< 10	< 2	< 2	< 2
MWFTA-10	NS	NS	< 2	< 2
MWFTA-23	5400 JQ	2600	4000 JQ	2500
MWFTA-3	0 56 JQ	14	3 1 J	4 1
MWFTA-5	< 2	< 2	< 2	< 2
MWFTA-7	< 2	< 2	< 2	< 2
MWFTA-9	NS	NS	< 2	< 2
			1,1,1-Trichloroethane	
AEHADG-10	7300	5800	3000	1200
DMW-13A	< 1	< 1	< 1	< 1
DMW-20A	NS	NS	< 1 3	< 1
DMW-22A	< 1	< 1	< 1	< 1
DMW-25A	< 1	< 1	< 1	< 1
DMW-26A	< 5	< 1	< 1	< 1
DMW-27A	< 1	< 1	< 1	< 1
DMW-33A	1200	160	660	680
DMW-35A	< 1	0 89 JQ	< 1	< 1
MW112-2	NS	NS	< 1	< 1
MWFOS-1	< 1	< 1	< 1	< 1
MWFOS-3	NS	NS	< 330	< 330
MWFTA-1	< 5	< 1	< 1	< 1
MWFTA-10	NS	NS	< 1	< 1
MWFTA-23	< 5000	< 1200	< 5000	< 1200
MWFTA-3	< 1	< 3 3	< 1 1	< 2
MWFTA-5	< 1	< 1	< 1	< 1
MWFTA-7	< 1	< 1	< 1	< 1
MWFTA-9	NS	NS	< 1	< 1

TABLE 3-1

GROUNDWATER SAMPLING RESULTS FOR SELECT VOCs
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

(Units = µg/L)	OCT-01	MAR/APR-02	JULY-02	OCT-02
	1,1-Dichloroethane			
AEHADG-10	86 JQ	98 JQ	68 JQ	< 120
DMW-13A	< 1	< 1	< 1	< 1
DMW-20A	NS	NS	< 1 3	< 1
DMW-22A	0 7 JQ	0 88 JQ	0 5 JQ	0 48 JQ
DMW-25A	< 1	< 1	< 1	< 1
DMW-26A	< 5	< 1	< 1	< 1
DMW-27A	< 1	< 1	< 1	< 1
DMW-33A	170	51	100	110
DMW-35A	< 1	0 43 JQ	< 1	< 1
MW112-2	NS	NS	< 1	< 1
MWFOS-1	< 1	< 1	< 1	< 1
MWFOS-3	NS	NS	< 330	< 330
MWFTA-1	< 5	0 78 JQ	1	0 79 JQ
MWFTA-10	NS	NS	< 1	< 1
MWFTA-23	< 5000	< 1200	< 5000	< 1200
MWFTA-3	0 27 JQ	1 3 JQ	0 62 JQ	0 62 JQ
MWFTA-5	< 1	< 1	< 1	< 1
MWFTA-7	< 1	< 1	< 1	< 1
MWFTA-9	NS	NS	< 1	< 1
	1,1-Dichloroethene			
AEHADG-10	1100	570	270	140 J
DMW-13A	< 1	< 1	< 1	< 1
DMW-20A	NS	NS	< 1 3	< 1
DMW-22A	0 66 JQ	1 3	0 74 JQ	0 61 JQ
DMW-25A	< 1	< 1	< 1	< 1
DMW-26A	< 5	< 1	< 1	< 1
DMW-27A	< 1	< 1	< 1	< 1
DMW-33A	450 J	62	230	280
DMW-35A	< 1 UJ	1 6	< 1	< 1
MW112-2	NS	NS	< 1	< 1
MWFOS-1	< 1 UJ	< 1	< 1	< 1
MWFOS-3	NS	NS	< 330	< 330
MWFTA-1	< 5	< 1	< 1	< 1
MWFTA-10	NS	NS	< 1	< 1
MWFTA-23	< 5000 UJ	< 1200	< 5000	< 1200
MWFTA-3	0 45 JQ	< 3 3	1 2 J	0 69 JQ
MWFTA-5	< 1 UJ	< 1	< 1	< 1
MWFTA-7	< 1	< 1	< 1	< 1
MWFTA-9	NS	NS	< 1	< 1

Notes:

J Estimated, based on QC data
JQ Estimated, value is between reporting limit and detection limit
µg/L micrograms per liter
NS not sampled
UJ undetected reported detection limit is imprecise

PREPARED/DATE FLN 5/19/03
CHECKED/DATE JAH 5/19/03

TABLE 3-2

GROUNDWATER SAMPLING RESULTS FOR SELECT VOCs
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	OCT-01	MAR/APR-02	JULY-02	OCT-02
(Units = µg/L)				
		Tetrachloroethene		
MWFTA-14	< 1	< 1	< 1	< 1
MWFTA-16	< 50	< 33	< 50	< 56
MWFTA-17	< 1	< 1	< 1	< 1
MWFTA-18	< 1	< 1	< 1	< 1
MWFTA-19	0 76 JQ	1	1 1	1 2
MWFTA-28B	< 1	< 1	< 1	< 1
MWFTA-29B	< 1	< 1	< 1	< 1
PWFTA-2	0.4 JQ	0 25 JQ	NS	NS
MWFTA-20*	< 5	< 3 3	< 3 3	< 4
		Trichloroethene		
MWFTA-14	< 1	< 1	< 1	< 1
MWFTA-16	< 50	< 33	< 50	< 56
MWFTA-17	< 1	< 1	< 1	< 1
MWFTA-18	< 1	< 1	< 1	< 1
MWFTA-19	0 44 JQ	0 65 JQ	0 6 JQ	0 54 JQ
MWFTA-28B	< 1	< 1	< 1	< 1
MWFTA-29B	< 1	< 1	< 1 UJ	< 1
PWFTA-2	5 5	6 6	NS	NS
MWFTA-20*	7 4	7 8	7 4	5 1
		cis-1,2-Dichloroethene		
MWFTA-14	< 0 5	< 0 5	< 0 5	< 0 5
MWFTA-16	1200	1100	1100	1500
MWFTA-17	< 0 5	< 0.5	< 0 5	< 0 5
MWFTA-18	2 5	2.3	2 2	2
MWFTA-19	1 6	1 5	1 2	1 1
MWFTA-28B	< 0 5	< 0 5	< 0 5	< 0 5
MWFTA-29B	< 0 5	< 0 5	< 0 5	< 0 5
PWFTA-2	5 5	4 6	NS	NS
MWFTA-20*	150	130	150	100

TABLE 3-2

GROUNDWATER SAMPLING RESULTS FOR SELECT VOCs
LOWER WATER BEARING UNIT
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	OCT-01		MAR/APR-02		JULY-02	OCT-02
(Units = μg/L)						
	trans-1,2-Dichloroethene					
MWFTA-14	< 0 5		< 0 5		< 0 5	< 0 5
MWFTA-16	< 25		< 17		< 25	< 28
MWFTA-17	< 0 5		< 0 5		< 0 5	< 0 5
MWFTA-18	< 0 5		< 0 5		< 0 5	< 0 5
MWFTA-19	< 0 5		< 0 5		< 0 5	< 0 5
MWFTA-28B	< 0 5		< 0 5		< 0 5	< 0 5
MWFTA-29B	< 0 5		< 0 5		< 0 5	< 0 5
PWFTA-2	0 18	JQ	0 19	JQ	NS	NS
MWFTA-20*	< 2 5		3		< 2 5	< 2
	Vinyl Chloride					
MWFTA-14	< 2		< 2		< 2	< 2
MWFTA-16	270		310		430	920
MWFTA-17	< 2		< 2		< 2	< 2
MWFTA-18	< 2		< 2		< 2	< 2
MWFTA-19	< 2		< 2		< 2	< 2
MWFTA-28B	< 2		< 2		< 2	< 2
MWFTA-29B	< 2		< 2		< 2	< 2
PWFTA-2	0 5	JQ	0 44	JQ	NS	NS
MWFTA-20*	8 4	JQ	12		9 2	12
	1,1,1-Trichloroethane					
MWFTA-14	< 1		< 1		< 1	< 1
MWFTA-16	< 50		< 33		< 50	< 56
MWFTA-17	< 1		< 1		< 1	< 1
MWFTA-18	< 1		< 1		< 1	< 1
MWFTA-19	< 1		< 1		< 1	< 1
MWFTA-28B	< 1		< 1		< 1	< 1
MWFTA-29B	< 1		< 1		< 1	< 1
PWFTA-2	< 1		< 1		NS	NS
MWFTA-20*	< 5		0 53	JQ	< 5	< 4

TABLE 3-2

GROUNDWATER SAMPLING RESULTS FOR SELECT VOCs
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	OCT-01		MAR/APR-02	JULY-02	OCT-02
(Units = µg/L)					
MWFTA-14	**1,1-Dichloroethane**				
MWFTA-16	< 1		< 1	< 1	< 1
MWFTA-17	< 50		< 33	< 50	< 56
MWFTA-18	< 1		< 1	< 1	< 1
MWFTA-19	< 1		< 1	< 1	< 1
MWFTA-28B	< 1		< 1	< 1	< 1
MWFTA-29B	< 1		< 1	< 1	< 1
PWFTA-2	< 1		< 1	< 1	< 1
MWFTA-20*	4 1		4 3	NS	NS
	20		22	19	16
	1,1-Dichloroethene				
MWFTA-14	< 1	UJ	< 1	< 1	< 1
MWFTA-16	< 50	UJ	< 33	< 50	< 56
MWFTA-17	< 1		< 1	< 1	< 1
MWFTA-18	< 1		< 1	< 1	< 1
MWFTA-19	< 1		< 1	< 1	< 1
MWFTA-28B	< 1	UJ	< 1	< 1	< 1
MWFTA-29B	< 1		< 1	< 1	< 1
PWFTA-2	2 2		2 4	NS	NS
MWFTA-20*	9 3		6 1	11	7 6

Notes:

*	fractured bedrock well
JQ	Estimated, value is between reporting limit and detection limit
µg/L	micrograms per liter
NS	not sampled
UJ	undetected, Reported Detection Limit is imprecise

PREPARED/DATE TLN 5/19/03
CHECKED/DATE IAH 5/19/03

TABLE 3-3

GROUNDWATER SAMPLING RESULTS FOR SELECT TOTAL METALS
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Oct-01	Mar/Apr-02	Jul-02	Oct-02
(Units = µg/L)				
	Aluminum			
AEHADG-10	272	85 3 JB	107 JQ	74 2 JQ
DMW-13A	1120	1520	1490	831
DMW-20A	NS	NS	239	145 JQ
DMW-22A	< 200	< 200	60 1 JQ	78 7 JQ
DMW-25A	64 5 JQ	600	57 8 JQ	925
DMW-26A	196 JQ	140 JB	378	443
DMW-27A	325	390	619	435
DMW-33A	< 200	32 3 JQ	81 JQ	91 2 JQ
DMW-35A	< 200	< 200 UJ	81 JQ	< 200 UJ
MW112-2	NS	NS	218	62 5 JQ
MWFOS-1	< 200	< 200 UJ	69 3 JQ	< 200 UJ
MWFOS-3	NS	NS	155 JQ	94 3 JQ
MWFTA-1	329 JH	309 JH	266	310
MWFTA-10	NS	NS	576	< 200
MWFTA-23	656	213	297	174 JQ
MWFTA-3	478	277	268	246
MWFTA-5	< 200	31 9 JQ	66 5 JQ	< 200
MWFTA-7	1360 J	857	790	757
MWFTA-9	NS	NS	125 JQ	60 1 JQ
	Arsenic			
AEHADG-10	81	27 9	47 6	39 6
DMW-13A	< 5	< 5	< 5	< 5
DMW-20A	NS	NS	< 5	< 5
DMW-22A	20 1	4 8 JQ	16 4	14 4
DMW-25A	< 5	< 5	< 5	2 8 JQ
DMW-26A	< 5	< 5	6 9	2 6 JQ
DMW-27A	< 5	< 5	< 5	< 5
DMW-33A	< 5	< 5	< 5	< 5
DMW-35A	< 5	< 5	< 5	< 5
MW112-2	NS	NS	< 5	< 5
MWFOS-1	< 5	< 5	< 5	< 5
MWFOS-3	NS	NS	26 7	27 4
MWFTA-1	42 5	39 9	35 3	35 7
MWFTA-10	NS	NS	2 4 JQ	3 2 JB
MWFTA-23	96 6	49 3	94 3	77 2
MWFTA-3	5 1	18	6 8 J	15 1
MWFTA-5	< 5	< 5	< 5	< 5
MWFTA-7	< 5	< 5	< 5	< 5
MWFTA-9	NS	NS	< 5	< 5

TABLE 3-3

GROUNDWATER SAMPLING RESULTS FOR SELECT TOTAL METALS
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Oct-01	Mar/Apr-02	Jul-02	Oct-02
(Units = µg/L)				
		Iron		
AEHADG-10	33500	33700	23400	17700
DMW-13A	3380	3720	4090	2200
DMW-20A	NS	NS	2960 JQ	639
DMW-22A	5420	328	1910	4070
DMW-25A	364	500	45 3 JQ	731
DMW-26A	12800	7830	18800	12500
DMW-27A	2990	3240	1960	4020
DMW-33A	6870	1060	5360	5240
DMW-35A	1610	177 JQ	1220	1460
MW112-2	NS	NS	1810	1030
MWFOS-1	702	542	770	473
MWFOS-3	NS	NS	3880	3850
MWFTA-1	9920	9600	6780	7450
MWFTA-10	NS	NS	580	352
MWFTA-23	64000	24300	37000	21800
MWFTA-3	1840	4200	1970	3290
MWFTA-5	1070	901	732	518
MWFTA-7	< 200	< 200	< 200	< 200
MWFTA-9	NS	NS	345	226
		Manganese		
AEHADG-10	1080	1560	997 J	658
DMW-13A	200	196	228	170
DMW-20A	NS	NS	307	297
DMW-22A	192	43 7	122	117
DMW-25A	467	8 1 JQ	183	11 4 JQ
DMW-26A	107	172	103	70
DMW-27A	16 1 JQ	26 1	10 9 JQ	20 3
DMW-33A	139	63 5	153	146
DMW-35A	48 4	50 2	49 5	49 5
MW112-2	NS	NS	61 3	62 3
MWFOS-1	60 8	46 1	49 1	44
MWFOS-3	NS	NS	65 4	65 5
MWFTA-1	807	912	510	531
MWFTA-10	NS	NS	80 4	62 7
MWFTA-23	519	152	428	198
MWFTA-3	43 7	106	52 6	78 4
MWFTA-5	46 8	47 2	48 7	50 5
MWFTA-7	40 5	24 2	67 8	38 4
MWFTA-9	NS	NS	27 1	26 1

Notes:

J Estimated based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JQ Estimated Value is between reporting limit and detection limit
µg/L micrograms per liter
NS not sampled

PREPARED/DATE TLN 5/19/03
CHECKED/DATE JAH 5/19/03

TABLE 3-4

GROUNDWATER SAMPLING RESULTS FOR SELECT TOTAL METALS
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	OCT-01	MAR/APR-0.	JULY-02	OCT-02
(Units = µg/L)		Aluminum		
MWFTA-14	995	51 2 JQ	75 JQ	< 200
MWFTA-16	70 4 JQ	62 6 JB	80 4 JQ	479
MWFTA-17	5250	5580	4520	4820
MWFTA-18	257 JB	107 JQ	< 200 UJ	< 200 UJ
MWFTA-19	673	691	878	837
MWFTA-28B	279	33 7 JQ	177 JQ	< 200
MWFTA-29B	1960 JH	1110 JH	1600 JH	1200 JH
PWFTA-2	1900 J	1030	NS	NS
MWFTA-20*	301 JB	200	77 9 JQ	< 200 UJ
		Iron		
MWFTA-14	905	< 200	259	< 200
MWFTA-16	< 200	< 200	82 4 JQ	581
MWFTA-17	< 200	< 200	< 200	< 200
MWFTA-18	2910	1970	2430	1690
MWFTA-19	< 200	200	< 200	< 200
MWFTA-28B	3130	2270	2590	2330
MWFTA-29B	1970 JH	508	604 JH	600
PWFTA-2	< 200	< 200	NS	NS
MWFTA-20*	520	190 JQ	299 J	281
		Manganese		
MWFTA-14	19 2 JQ	1 7 JQ	36 7	3 3 JQ
MWFTA-16	12 4 JQ	21 6	49 9	324
MWFTA-17	< 20	< 20	< 20	< 20
MWFTA-18	111	84	105	77 3
MWFTA-19	< 20	< 20	< 20	1 3 JB
MWFTA-28B	175	222	237	209
MWFTA-29B	71 3	15 3	12 4 JQ	15 7 JQ
PWFTA-2	1 4 JB	< 20	NS	NS
MWFTA-20*	139	71 3	152 J	96 1

Notes:

- * fractured bedrock well
- J Estimated, based on QC data
- JB Estimated, possibly biased high or false positive based on blank contamination
- JH Estimated, possibly biased high based upon QC data
- JQ Estimated, Value is between reporting limit and detection limit
- µg/L micrograms per liter
- NS not sampled

PREPARED/DATE TLN 5/19/03
CHECKED/DATE JAH 5/19/03

TABLE 4-1

MANN-KENDALL TREND EVALUATION RESULTS
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

					Number of Samples Less Than 10	Number of Samples Greater Than or Equal to 10	
WBU	Location/Constituent	n	# of NDs	S	MK Probability	Z(calculated)	Result/Note
Upper	**AEHA-DG10**						
	PCE	9	0	-22	0.024		Decreasing
	TCE	9	0	-24	0.01386		Decreasing
	cis-1,2-DCE	6	0	-1	1		No Trend
	trans-1,2-DCE	7	6				2
	VC	7	6				2
	1,1,1-TCA	9	0	-10	0.358		No Trend
	1,1-DCA	9	2	-10	0.358		No Trend
	1,1-DCE	9	0[c]	-20	0.044		No Trend
Upper	**DMW-13A**						
	PCE	10	10				1
	TCE	10	10				1
	cis-1,2-DCE	5	5				1
	trans-1,2-DCE	9	9				1
	VC	10	10				1
	1,1,1-TCA	10	10				1
	1,1-DCA	10	10				1
	1,1-DCE	10	10				1
Upper	**DMW-20A**						
	PCE	9	3	-22	0.024		Decreasing
	TCE	9	0	-15	0.06		No Trend[b]
	cis-1,2-DCE	4	0	-2	0.75		No Trend
	trans-1,2-DCE	8	3	-18	0.032		No Trend
	VC	9	9				1
	1,1,1-TCA	9	8				1
	1,1-DCA	9	5	-22	0.024		Decreasing
	1,1-DCE	9	8				1
Upper	**DMW-22A**						
	PCE	12	0	-50		-3.3601	Decreasing
	TCE	12	0	-47		-3.1618	Decreasing
	cis-1,2-DCE	7	0	-17	0.0108		Decreasing
	trans-1,2-DCE	11	6	-43		-3.3591	Decreasing
	VC	12	8	-38		-2.6474	Decreasing
	1,1,1-TCA	12	5	-46		-3.2143	Decreasing
	1,1-DCA	12	0	-62		-4.1829	Decreasing
	1,1-DCE	12	0	-57		-3.8491	Decreasing
Upper	**DMW-25A**						
	PCE	11	0	-39		-2.9583	Decreasing
	TCE	11	1	-35		-2.6469	Decreasing
	cis-1,2-DCE	6	1	-9	0.136		No Trend
	trans-1,2-DCE	11	6	-25		-1.9706	No Trend
	VC	12	10	-34		-2.4111	Decreasing
	1,1,1-TCA	12	9	-28		-1.9727	No Trend
	1,1-DCA	11	7	-20		-1.5797	No Trend
	1,1-DCE	11	5	-23		-1.8064	No Trend

TABLE 4-1

MANN-KENDALL TREND EVALUATION RESULTS
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

					Number of Samples Less Than 10	Number of Samples Greater Than or Equal to 10	
WBU	Location/Constituent	n	# of NDs	S	MK Probability	Z(calculated)	Result/Note
Upper	DMW-26A						
	PCE	10	9				1
	TCE	10	9				1
	cis-1 2-DCE	5	3				1
	trans 1,2-DCE	9	8				1
	VC	10	10				1
	1 1 1-TCA	10	10				1
	1,1-DCA	10	10				1
	1 1-DCE	10	10				1
Upper	DMW-27A						
	PCE	10	9				1
	TCE	10	10				1
	cis-1,2-DCE	5	5				1
	trans-1 2-DCE	9	8				1
	VC	10	6	-21	0 072		No Trend
	1 1 1-TCA	10	10				1
	1 1-DCA	10	10				1
	1 1-DCE	10	10				1
Upper	DMW-33A						
	PCE	9	0	-15	0 06		No Trend[b]
	TCE	9	0	-14	0 18		No Trend
	cis-1,2-DCE	7	0	1	1		No Trend
	trans-1 2-DCE	8	4	14	0 108		No Trend
	VC	9	4	16	0 12		No Trend
	1 1 1-TCA	9	0	-2	0 92		No Trend
	1 1-DCA	9	0	-14	0 18		No Trend
	1 1-DCE	9	0	-4	0 762		No Trend
Upper	DMW-35A						
	PCE	8	0	-16	0 062		No Trend
	TCE	8	0	2	0 904		No Trend
	cis-1 2-DCE	6	1	3	0 72		No Trend
	trans-1,2-DCE	7	7				1
	VC	8	8				1
	1 1 1-TCA	8	6				1
	1 1-DCA	8	7				1
	1 1-DCE	8	6	5	0 36		No Trend[b]
Upper	MWFOS-1						1
	PCE	7	7				1
	TCE	7	6				1
	cis-1 2-DCE	6	5				1
	trans-1 2-DCE	7	7				1
	VC	7	7				1
	1 1 1-TCA	7	7				1
	1 1-DCA	7	7				1
	1 1-DCE	7	7				1
Upper	MWFOS-3						
	PCE	7	5				2
	TCE	7	0	-9	0 238		No Trend
	cis-1 2-DCE	6	0	-1	1		No Trend
	trans 1 2-DCE	7	4				2
	VC	7	2	1	1		No Trend
	1 1 1-TCA	7	7				2
	1 1-DCA	7	7				2
	1 1-DCE	7	7				2

TABLE 4-1

MANN-KENDALL TREND EVALUATION RESULTS
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

					Number of Samples Less Than 10	Number of Samples Greater Than or Equal to 10	
WBU	Location/Constituent	n	# of NDs	S	MK Probability	Z(calculated)	Result/Note
Upper	MWFTA-1						
	PCE	7	7				1
	TCE	7	7				1
	cis-1,2-DCE	5	1	-6	0 234		No Trend
	trans-1 2-DCE	7	7				1
	VC	7	7				1
	1,1,1-TCA	7	7				1
	1 1-DCA	7	3				1
	1 1-DCE	7	7				1
Upper	MWFTA-3						
	PCE	7	4	16	0 0054		Increasing[b]
	TCE	7	0	9	0 238		No Trend
	cis-1 2-DCE	6	0	9	0 136		No Trend
	trans-1 2-DCE	7	0	11	0 136		No Trend
	VC	7	1	5	0 562		No Trend
	1 1 1-TCA	7	7				1
	1,1-DCA	7	1	7	0 191		No Trend[b]
	1,1-DCE	7	3	3	0 772		No Trend
Upper	MWFTA-5						
	PCE	7	7				1
	TCE	7	7				1
	cis-1,2-DCE	6	6				1
	trans-1 2-DCE	7	7				1
	VC	7	7				1
	1 1 1-TCA	7	7				1
	1 1-DCA	7	7				1
	1 1-DCE	7	7				1
Upper	MWFTA-7						
	PCE	7	7				1
	TCE	7	7				1
	cis-1 2-DCE	6	6				1
	trans-1 2-DCE	7	7				1
	VC	7	7				1
	1,1 1-TCA	7	7				1
	1 1-DCA	7	7				1
	1 1-DCE	7	7				1
Upper	MWFTA-9						
	PCE	4	4				1
	TCE	4	4				1
	cis-1 2-DCE	3	3				1
	trans-1 2-DCE	4	4				1
	VC	4	4				1
	1 1 1-TCA	4	4				1
	1,1-DCA	4	4				1
	1 1-DCE	4	4				1
Upper	MWFTA-10						
	PCE	4	4				1
	TCE	4	4				1
	cis-1 2-DCE	3	3				1
	trans-1 2-DCE	4	4				1
	VC	4	4				1
	1 1 1-TCA	4	4				1
	1 1-DCA	4	4				1
	1 1-DCE	4	4				1

TABLE 4-1

MANN-KENDALL TREND EVALUATION RESULTS
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

					Number of Samples Less Than 10	Number of Samples Greater Than or Equal to 10	
WBU	Location/Constituent	n	# of NDs	S	MK Probability	Z(calculated)	Result/Note
Upper	MWFTA-23						
	PCE	5	5	-6	0 234		No Trend
	TCE	5	3				2
	cis-1,2-DCE	5	0	-6	0 234		No Trend
	trans-1 2-DCE	5	5				2
	VC	5	1	-8	0 084		No Trend
	1,1 1-TCA	5	5				2
	1,1-DCA	5	5				2
	1,1-DCE	5	5				2
Lower	MWFTA-14						
	PCE	6	6				1
	TCE	6	5				1
	cis-1 2-DCE	6	5				1
	trans-1 2-DCE	6	6				1
	VC	6	6				1
	1,1 1-TCA	6	6				1
	1 1-DCA	6	6				1
	1 1-DCE	6	6				1
Lower	MWFTA-16						
	PCE	7	7				2
	TCE	7	7				2
	cis-1 2-DCE	7	0	2	0 386		No Trend
	trans-1 2-DCE	7	6				2
	VC	7	1	15	0 03		No Trend
	1,1 1-TCA	7	7				2
	1 1-DCA	7	7				2
	1 1-DCE	7	7				2
Lower	MWFTA-17						
	PCE	6	6				1
	TCE	6	6				1
	cis-1,2-DCE	6	5				1
	trans-1 2-DCE	6	6				1
	VC	6	6				1
	1 1 1-TCA	6	6				1
	1 1-DCA	6	6				1
	1 1-DCE	6	6				1
Lower	MWFTA-18						
	PCE	6	5				1
	TCE	6	5				1
	cis-1,2-DCE	6	0	-5	0 47		No Trend
	trans-1 2-DCE	6	6				1
	VC	6	5				1
	1,1 1-TCA	6	6				1
	1 1-DCA	6	5				1
	1 1-DCE	6	6				1
Lower	MWFTA-19						
	PCE	6	0	-3	0 36		No Trend
	TCE	6	0				1
	cis-1 2-DCE	6	0	-13	0 0166		Decreasing[4]
	trans-1 2-DCE	6	6				1
	VC	6	6				1
	1 1 1-TCA	6	6				1
	1 1-DCA	6	5				1
	1 1-DCE	6	6				1

TABLE 4-1

MANN-KENDALL TREND EVALUATION RESULTS
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

					Number of Samples Less Than 10	Number of Samples Greater Than or Equal to 10	
WBU	Location/Constituent	n	# of NDs	S	MK Probability	Z(calculated)	Result/Note
Lower	MWFTA-28B						
	PCE	5	5				1
	TCE	5	5				1
	cis-1 2-DCE	5	5				1
	trans-1 2-DCE	5	5				1
	VC	5	5				1
	1,1,1-TCA	5	5				1
	1 1-DCA	5	5				1
	1 1-DCE	5	5				1
Lower	MWFTA-29B						
	PCE	5	5				1
	TCE	5	5				1
	cis-1,2-DCE	5	5				1
	trans-1,2-DCE	5	5				1
	VC	5	5				1
	1 1 1-TCA	5	5				1
	1,1-DCA	5	5				1
	1,1-DCE	5	5				1
Bedrock	MWFTA-20						
	PCE	7	5	1	1		No Trend
	TCE	7	0	-11	0 136		No Trend
	cis-1,2-DCE	7	0	-2	0 386		No Trend
	trans-1 2-DCE	7	5	9	0 238		No Trend
	VC	7	2	15	0 03		No Trend
	1,1 1-TCA	7	5	-9	0 238		No Trend
	1 1-DCA	7	0	-5	0 562		No Trend
	1 1-DCE	7	0	-5	0 562		No Trend

Notes

n indicates the total number of samples

S calculated Mann-Kendall (MK) statistic, Indicates the strength and the direction of the trend A positive value indicates an increasing trend and a negative value indicates a decreasing trend

MK Probability indicates the probability that a trend truly exists A lower MK probability value indicates a higher probability that a trend exists and MK probability less than 0 05 (95% confidence level) area assumed to be significant It MK probability < 0 05 then the direction of trend is determined from S

z(calculated) measure of likelihood of trend If abs(Z(calculated)) > 1 9774 (95% confidence level of a two-tailed distribution) existence of a trend accepted

a Trend does not appear to be supported after evaluation of the time series graphs or the concentrations of the constituents are low and the apparent trend is not significant for this evaluation

b Mann-Kendall statistics evaluation performed using the one-tailed normal distribution test due to out of range data reported for the two-tailed distribution test

1 Results below the reporting limits

2 Elevated reporting limits trend can not be evaluated

PREPARED/DATE ILN 06/22/2003
CHECKED/DATE CMB 06/24/2003

TABLE 4-2

Mann-Kendall Trend and Monitoring Well Evaluation
Upper Water Bearing Unit
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Monitoring Well	Analyte	Trend	Location Relative to Identified VOC Plume	Trend Explanations
Pit 1 Trend Summary				
DMW-13A	PCE	NA	UG	• Located upgradient from Pit 1
	TCE	NA	UG	• Background well for OU 7
	cis-1,2-DCE	NA	UG	• Historically and currently does not have VOCs detected above reporting limits
	trans-1,2-DCE	NA	UG	
	VC	NA	UG	
	1,1,1-TCA	NA	UG	
	1,1-DCA	NA	UG	
	1,1-DCE	NA	UG	
DMW-35A	PCE	NT	PB	• Currently located on the boundary of the elevated PCE, TCE and cis-1,2-DCE areas of contamination and outside the boundary of the other areas of elevated VOC contamination Located downgradient from Pit 1 and upgradient from monitoring well AEHA-DG10
	TCE	NT	PB	• The PCE concentrations within this well have decreased from 16 µg/L in November 1988 to 6 1 µg/L in October 2002 but have fluctuated up and down so no trend is discernable
	cis-1,2-DCE	NT	PB	• The TCE concentrations within this well decreased from 4 J µg/L in November 1988, with a peak concentration of 33 µg/L in April 2002, to 2 µg/L in October 2002
	trans-1,2-DCE	NA	NA	• Screened at the bottom of the upper WBU within a silty sand layer
	VC	NA	NA	• Historically has had low levels (>40 µg/L) of VOCs (when compared to AEHA-DG10) This is likely due to the migration of contaminants through a more porous sand and gravel layer located above DMW-33A and extending to AEHA-DG10
	1,1,1-TCA	NA	NA	
	1,1-DCA	NA	NA	
	1,1-DCE	NA	NA	

TABLE 4-2

Mann-Kendall Trend and Monitoring Well Evaluation
Upper Water Bearing Unit
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Monitoring Well	Analyte	Trend	Location Relative to Identified VOC Plume	Trend Explanations
AEHA-DG10	PCE	D	P	• Currently located near the center of the PCE, TCE, *cis*-1,2-DCE, and 1,1,1-TCA areas of contamination and within the 1,1-DCA and 1,1-DCE areas of contamination
	TCE	D	P	• A thorough evaluation of potential VC and *trans*-1,2-DCE plumes at AEHA-DG10 cannot be conducted as elevated reporting limits for VC and *trans*-1,2-DCE have historically been reported for this well.
	cis-1,2-DCE	NT	P	• The PCE concentrations within this well have decreased from 11,000 µg/L in March 1982, with a peak concentration of 12,000 µg/L in July 1982, to 1,900 µg/L in October 2002
	trans-1,2-DCE	NA	NA	• The TCE concentrations within this well have decreased from 59,000 µg/L in March 1982 to 2,800 µg/L in October 2002 The PCE and TCE concentrations located downgradient from AEHA-DG 10 does not indicate TCE is readily migrating
	VC	NA	NA	• The *cis*-1,2-DCE concentrations within this well have increased from 400 µg/L in October 1987 to 690 µg/L in October 2002 However, the results have decreased since the peak concentration of 1,000 µg/L was detected in April 2002
	1,1,1-TCA	NT	P	• The 1,1,1-TCA concentrations within this well have increased from 1,000 µg/L in March 1982 to 1200 µg/L in October 2002 However, the results have decreased since the peak concentration of 40,000 µg/L was detected in July 1982
	1,1-DCA	NT	P-NP	• The 1,1-DCA and 1,1-DCE concentrations within this well have fluctuated but have generally decreased since elevated concentrations (>10,000) were historically detected
	1,1-DCE	NT	P	• Decreasing concentrations of these constituents within this well is attributed to natural attenuation

TABLE 4-2

Mann-Kendall Trend and Monitoring Well Evaluation
Upper Water Bearing Unit
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Monitoring Well	Analyte	Trend	Location Relative to Identified VOC Plume	Trend Explanations
DMW-33A	PCE TCE *cis*-1,2-DCE *trans*-1,2-DCE VC 1,1,1-TCA 1,1-DCA 1,1-DCE	NT NT NT NT NT NT NT NT	P P P P P P P P	• Currently located within the PCE, TCE, *cis*-1,2-DCE, 1,1,1-TCA, 1,1-DCA, and 1,1-DCE areas of contamination • A thorough evaluation of potential VC and *trans*-1,2-DCE plumes at DMW-33A cannot be conducted as elevated reporting limits for VC and *trans*-1,2-DCE have historically been reported for this well • The PCE concentrations within this well have decreased from 1,500 µg/L in November 1988 to 450 µg/L in October 2002 • The TCE concentrations within this well have decreased from 3,400 µg/L in November 1988 to 2,500 µg/L, with a peak concentration of 5,600 µg/L in November 1992, in October 2002 The PCE and TCE concentrations located downgradient from AEHA-DG10 does not indicate this plume is readily migrating • The *cis*-1,2-DCE concentrations within this well have decreased from 2,300 µg/L in October 1997 to 1,900 µg/L in October 2002 • The 1,1,1-TCA concentrations within this well have increased from 560 µg/L in November 1988 to 680 µg/L in October 2002 However, the results have decreased since the peak concentration of 1200 µg/L was detected in October 2001 • The 1,1-DCA and 1,1-DCE concentrations within this well have fluctuated but have generally decreased since elevated concentrations (>500 µg/L) were historically detected • Decreasing concentrations of these constituents within this well is attributed to natural attenuation

TABLE 4-2

Mann-Kendall Trend and Monitoring Well Evaluation
Upper Water Bearing Unit
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Monitoring Well	Analyte	Trend	Location Relative to Identified VOC Plume	Trend Explanations
DMW-22A	PCE TCE *cis*-1,2-DCE *trans*-1,2-DCE VC 1,1,1-TCA 1,1-DCA 1,1-DCE	D D D D D D D D	NP PB NP NA NP PB NP NP	• Currently located outside or near the boundaries of the PCE, *cis*-1,2-DCE, VC, 1,1-DCA, and 1,1-DCE areas of contamination and downgradient from the center of the TCE, and 1,1,1-TCA areas of contamination • An isoconcentration figure was not prepared for *trans*-1,2-DCE as this constituent has been detected above reporting limits within a few wells during recent sampling events • The PCE concentrations have decreased from 560 µg/L in January 1987 to 1 9 µg/L in October 2002 • The *cis*-1,2-DCE has decreased from 330 µg/L in October 1993 to 2 µg/L in October 2002 • The *trans*-1,2-DCE concentrations have decreased from 650 µg/L in January 1987 (with a maximum concentration of 1,100 µg/L in April 1987) to <0 5 µg/L within the last four sampling events • The VC concentrations, which increased from <10 µg/L in January 1987 to 30 µg/L in November 1992, has decreased to <2 µg/L in October 2002 • The 1,1-DCA concentrations have decreased from 280 µg/L in January 1987 to 0 48 JQ µg/L in October 2002. • The 1,1-DCE concentrations have decreased from 280 µg/L in January 1987 to 0 61 JQ µg/L in October 2002 • The TCE concentrations have decreased from 2,900 µg/L in January 1987 to 10 µg/L in October 2002 • The 1,1,1-TCA concentrations have decreased from 48 J µg/L (with a maximum concentration of 170 µg/L in April 1987) in January 1987 to <1 µg/L in October 2002 In addition, 1,1,1-TCA has not been detected above the reporting limits since the October 2000 sampling event • DMW-22A is located on the outer perimeter of most of the VOC areas of concern An overall reduction of these VOCs within this monitoring well indicates that the areal boundary of each of the VOC concentrations is decreasing

TABLE 4-2

Mann-Kendall Trend and Monitoring Well Evaluation
Upper Water Bearing Unit
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Monitoring Well	Analyte	Trend	Location Relative to Identified VOC Plume	Trend Explanations
DMW-20A	PCE TCE *cis*-1,2-DCE *trans*-1,2-DCE VC 1,1,1-TCA 1,1-DCA 1,1-DCE	D NT NT NT NA NA D NA	NP NP NP NP NP NP NP NP	• Located northeast of monitoring well AEHA-DG10 and currently located northeast of the VOC plumes • The PCE concentrations have decreased from 3 4 J µg/L in January 1987 to <1 µg/L in October 2002 The maximum concentration of PCE within this well occurred in April 1987 with a concentration of 5 3 µg/L, slightly above the MCL • The 1,1-DCA concentrations have decreased from <5 µg/L in January 1987 to <1 µg/L in October 2002 • The TCE concentrations fluctuated from 4 7 µg/L in January of 1987 to a slight decrease of 2 5 µg/L in October 2002 No statistically significant trend was determined • Historically and currently, *cis*-1,2-DCE, *trans*-1,2-DCE, 1,1,1-TCA, and 1,1-DCE were not detected above their respective MCLs
DMW-25A	PCE TCE *cis*-1,2-DCE *trans*-1,2-DCE VC 1,1,1-TCA 1,1-DCA 1,1-DCE	D D NT NT D NT NT NT	P P NP NA NP NP NP NP	• Located west of monitoring well AEHA-DG10 and downgradient from Pit 2 within the PCE and TCE plumes • PCE concentrations have decreased from 370 µg/L in January 1987, with a peak concentrations of 1300 µg/L in November 1992, to 1 4 µg/L in October 2002 • VC concentrations have decreased from <10 in October 1984, with a detectable concentration of 8 2 µg/L in November 1992, to <2 µg/L in October 2002 • TCE concentrations have decreased from 220 µg/L in January 1987, with a peak concentrations of 420 µg/L in November 1992, to <1 µg/L in October 2002 • Currently, *cis*-1,2-DCE, *trans*,1-2-DCE, 1,1,1-TCA, 1,1-DCE, and 1,1-DCA do not have detectable concentrations above reporting limits

TABLE 4-2

Mann-Kendall Trend and Monitoring Well Evaluation
Upper Water Bearing Unit
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Monitoring Well	Analyte	Trend	Location Relative to Identified VOC Plume	Trend Explanations
MWFTA-3	PCE	I	PB	• Located down gradient from Pit 2, but due to the current well network is assumed to be connected to the individual VOC plumes downgradient from Pit 1 • The PCE concentrations have increased from <1 μg/L in November 1992 to 9 μg/L (with a maximum concentration of 37 μg/L in July 2002) in October 2002. • The constituents, 1,1,1-TCA, 1,1-DCE, and 1,1-DCA have historically not been detected above reporting limits or MCLs within this well • TCE, *cis*-1,2-DCE, *trans*-1,2-DCE, and VC have fluctuated since the initial sampling events, with current concentrations for each of these constituents higher than historical concentrations An evaluation of the time series graph for this well, indicates an overall upward trend for the VOCs detected in this well • This may be caused from the migration of the plume downgradient from Pit 2, the joining of the plumes downgradient from Pit 1 and Pit 2, or from expansion of the plume downgradient from Pit 1. Without, additional data from wells updgradient from MWFTA-3, the cause of this trend within this well cannot be fully assessed
	TCE	NT	P	
	cis-1,2-DCE	NT	NP	
	trans-1,2-DCE	NT	NP	
	VC	NT	P	
	1,1,1-TCA	NA	NP	
	1,1-DCA	NT	NP	
	1,1-DCE	NT	NP	

TABLE 4-2

Mann-Kendall Trend and Monitoring Well Evaluation
Upper Water Bearing Unit
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Monitoring Well	Analyte	Trend	Location Relative to Identified VOC Plume	Trend Explanations
Pit 3 Trend Summary				
MWFOS-3	PCE TCE *cis*-1,2-DCE *trans*-1,2-DCE VC 1,1,1-TCA 1,1-DCA 1,1-DCE	NA NT NT NA NT NA NA NA	NA P P NA P NA NA NA	• Currently located near the center of the TCE, *cis*-1,2-DCE, and VC plume downgradient from Pit 3 • A thorough evaluation of potential PCE, *trans*-1,2-DCE, 1,1,1-TCA, 1,1-DCA, and 1,1-DCE areas of contamination at MWFOS-3 cannot be conducted as elevated reporting limits for these constituents have historically and are currently reported for this well • The TCE concentrations within this well have decreased from 300,000 µg/L in November 1992 to 7600 µg/L in October 2002 • The *cis*-1,2-DCE concentrations within this well have increased from 23000 µg/L in September 1995 to 9800 µg/L in October 2002 • The VC concentrations within this well have increased from 200 µg/L in November 1992 to 360 JQ µg/L in October 2002
MWFTA-23	PCE TCE *cis*-1,2-DCE *trans*-1 2-DCE VC 1 1 1-TCA 1,1-DCA 1,1-DCE	NT NA NT NA NT NA NA NA	NA P P NA P NA NA NA	• Currently located near the center of the TCE, *cis*-1,2-DCE, and VC plume downgradient from Pit 3 • A thorough evaluation of potential PCE, *trans*-1,2-DCE, 1,1,1-TCA, 1,1-DCA, and 1,1-DCE plumes at MWFTA-23 cannot be conducted as elevated reporting limits for these constituents have historically and are currently reported for this well • A maximum concentration of TCE 2500 JQ µg/L was detected within this well in July 2002 However, due to elevated concentrations of *cis*-1,2-DCE, elevated reporting limits for TCE were also reported within this well during the October 2002 sampling event However, elevated levels of TCE are suspected to be present within this well • The *cis*-1,2-DCE concentrations within this well have decreased from 240,000 µg/L in October 2000 to 52,000 µg/L in October 2002 • The VC concentrations within this well have decreased from 5400 JQ µg/L in October 2002 to 2500 JQ µg/L in October 2002

TABLE 4-2

Mann-Kendall Trend and Monitoring Well Evaluation
Upper Water Bearing Unit
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Monitoring Well	Analyte	Trend	Location Relative to Identified VOC Plume	Trend Explanations
DMW-27A	PCE	NA	NP	• DMW-27A is located downgradient from MWFTA-23 and Pit 3, indicating the VOC contamination is not readily migrating • VC is the only constituent historically detected within DMW-27A • A maximum VC concentration of 7 7 µg/L was detected in October 2001 and decreased to <2 µg/L in October 2002.
	TCE	NA	NP	
	cis-1,2-DCE	NA	NP	
	trans-1,2-DCE	NA	NP	
	VC	NT	NP	
	1,1,1-TCA	NA	NP	
	1,1-DCA	NA	NP	
	1,1-DCE	NA	NP	

Notes:

P in plume
NP not in plume
PB located on plume boundary
UG upgradient from plume
NA not applicable
I increasing trend
D decreasing trend
NT no trend
µg/L micrograms per liter
MCL maximum contaminant level (MCL for PCE and TCE is 5 µg/L, MCL for *cis*-1,2-DCE is 70 µg/L; MCL for *trans*-1,2-DCE is 100 µg/L, MCL for 1,1,1-TCA is 200 µg/L, MCL for 1,1-DCE is 7 µg/L, and no MCL is published for 1,1-DCA)

PREPARED/DATE TLN 6/30/03
CHECKED/DATE JAH 6/30/03

704 105

Table 4-3

Mann-Kendall Trend and Monitoring Well Evaluation
Lower Water Bearing Unit
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Monitoring Well	Analyte	Mann-Kendall Trend	Location Relative to Identified VOC Plume	Trend Explanations
MWFTA-16	PCE	NA	NA	• Located within the lower WBU downgradient from MWFTA-23 (a monitoring well with elevated VOC concentrations within the upper WBU) and south of Pit 3
	TCE	NA	NA	• Suspected source of contamination is migration of contaminants through fractures within confining layer, which is 4 feet within this area of OU 7
	cis-1,2-DCE	NT	P	• *cis*-1,2-DCE concentrations have increased from 2 4 J µg/L in October 1993 to 1500 µg/L in October 2002. However, the concentrations have remained consistent since a concentration of 1400 µg/L was detected in October 2000
	trans-1,2-DCE	NA	NA	• VC concentrations have increased from <2 µg/L in October 1993 to 920 µg/L in October 2002 However, the concentrations have fluctuated since a concentration of 260 µg/L was detected in October 2000
	VC	NT	P	• All other constituents can not be evaluated due to elevated reporting limits
	1,1,1-TCA	NA	NA	
	1,1-DCA	NA	NA	
	1,1-DCE	NA	NA	
MWFTA-17	PCE	NA	NP	• Currently located downgradient from MWFTA-16
	TCE	NA	NP	• Elevated concentrations of the VOCs have not been detected within this well
	cis-1,2-DCE	NA	NP	
	trans-1,2-DCE	NA	NP	
	VC	NA	NP	
	1,1,1-TCA	NA	NP	
	1,1-DCA	NA	NP	
	1 1-DCE	NA	NP	
MWFTA-18	PCE	NA	NP	• Located southeast of MWFTA-17
	TCE	NA	NP	• Concentrations from each of the constituents has not been detected above reporting limits or their respective MCL
	cis-1,2-DCE	NA	NP	
	trans-1,2-DCE	NA	NP	
	VC	NA	NP	
	1,1,1-TCA	NA	NP	
	1,1-DCA	NA	NP	
	1,1-DCE	NA	NP	

Table 4-3

Mann-Kendall Trend and Monitoring Well Evaluation
Lower Water Bearing Unit
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Monitoring Well	Analyte	Mann-Kendall Trend	Location Relative to Identified VOC Plume	Trend Explanations
MWFTA-19	PCE	NT	NP	• Located downgradient from Pit 1
	TCE	NA	NP	• Concentrations within this well have generally not been detected above reporting limits or their respective MCLs
	cis-1,2-DCE	D	NP	• *cis*-1,2-DCE, has a decreasing trend, however the concentrations are below the MCL and have only slightly decreased from of 2 µg/L in October 1993 to 1 1 µg/L in October 2002
	trans-1,2-DCE	NA	NP	• TCE has decreased from 5.9 µg/L detected in October 1993 to 0 54 JQ µg/L in October 2002
	VC	NA	NP	
	1,1,1-TCA	NA	NP	
	1,1-DCA	NA	NP	
	1,1-DCE	NA	NP	

Notes:

P — in plume
NP — not in plume
NA — not applicable
D — decreasing trend
NT — no trend
µg/L — micrograms per liter
MCL — maximum contaminant level (MCL for PCE and TCE is 5 µg/L, MCL for *cis*-1,2-DCE is 70 µg/L, MCL for *trans*-1,2-DCE is 100 µg/L; MCL for 1,1,1-TCA is 200 µg/L, MCL for 1,1-DCE is 7 µg/L, and no MCL is published for 1,1-DCA)

PREPARED/DATE TLN 6/30/03
CHECKED/DATE JAH 6/30/03

TAB

Figures

FIGURES

704 110

0 Feet

Source of aerials: University of Virginia Library, Geospatial and Statistical Data Center
Photo numbers 37007d45, 46, 47, 48, 56, and 57.

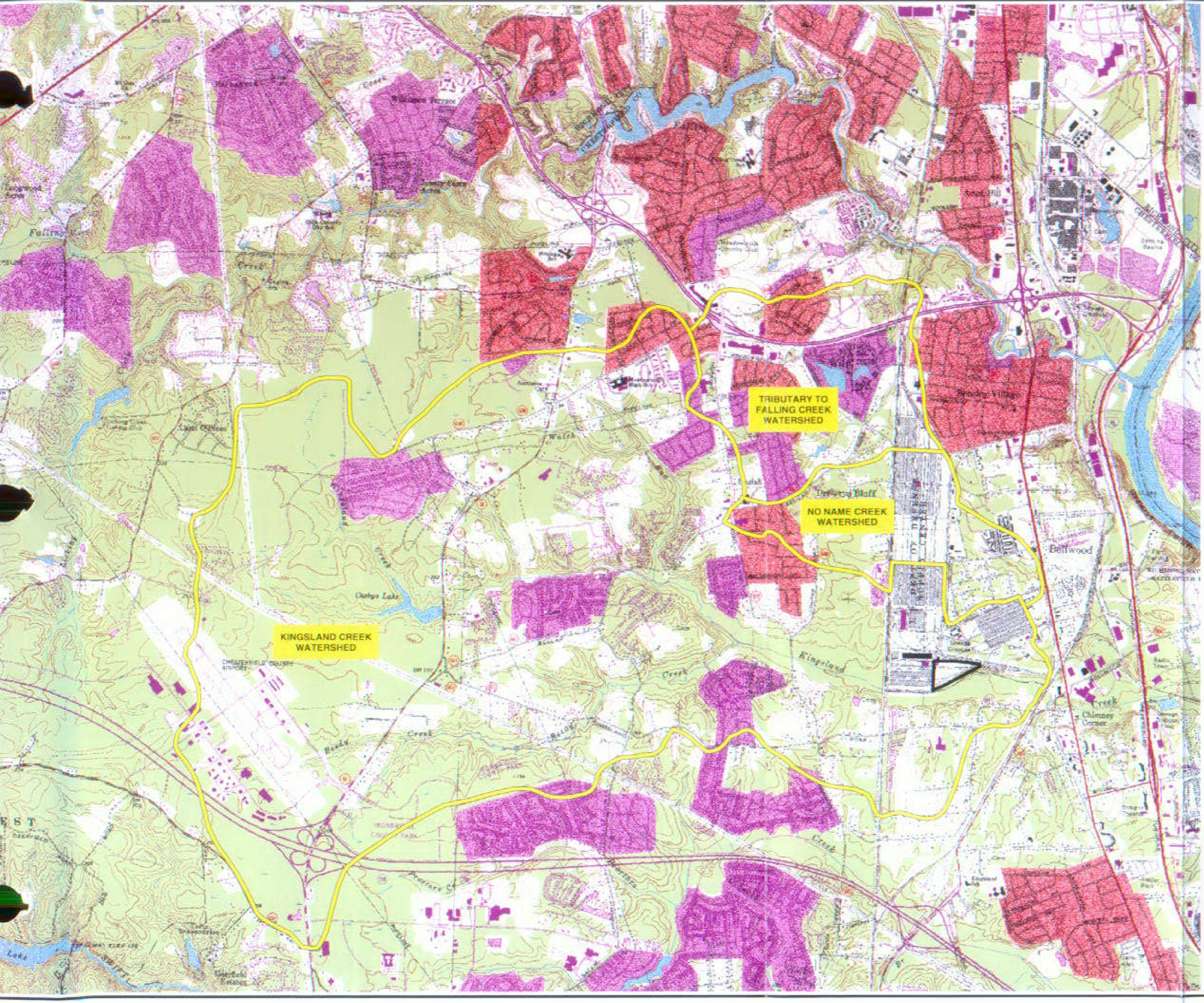
U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE			
DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA			
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 **DEFENSE SUPPLY CENTER RICHMOND AND SURROUNDING AREA** OU 7 - FIRE TRAINING AREA GROUNDWATER			
PREPARED BY: KAC 7/3/03	FIGURE NUMBER:	FILE DATE:	05/16/03
CHECKED BY: TLN 7/3/03	1-1	PLOT DATE:	06/26/03
PROJECT NO: 12001-2-0703		FILE NAME:	aerial_ou7.mxd

LEGEND:
- MONITORING WELL - UPPER WBU
- MONITORING WELL - LOWER WBU
- MONITORING WELL - BEDROCK
- DECOMMISSIONED MONITORING WELL
- DIRECT PUSH LOCATION
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
2. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS.

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7
SITE MAP AND MONITORING WELL LOCATIONS
OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	7/3/03	FIGURE NUMBER:	FILE DATE: 5/22/03
CHECKED BY: TLN	7/3/03	1-2	PLOT DATE: 7/3/03
PROJECT NO: 12001-2-0703			FILE NAME: ou7_site.mxd



LEGEND:
WATERSHED DELINEATION
OPERABLE UNIT 7

APPROXIMATE WATERSHED AREAS:
KINGSLAND CREEK - 6,790 ACRES
NO NAME CREEK - 620 ACRES
TRIBUTARY TO FALLING CREEK - 920 ACRES

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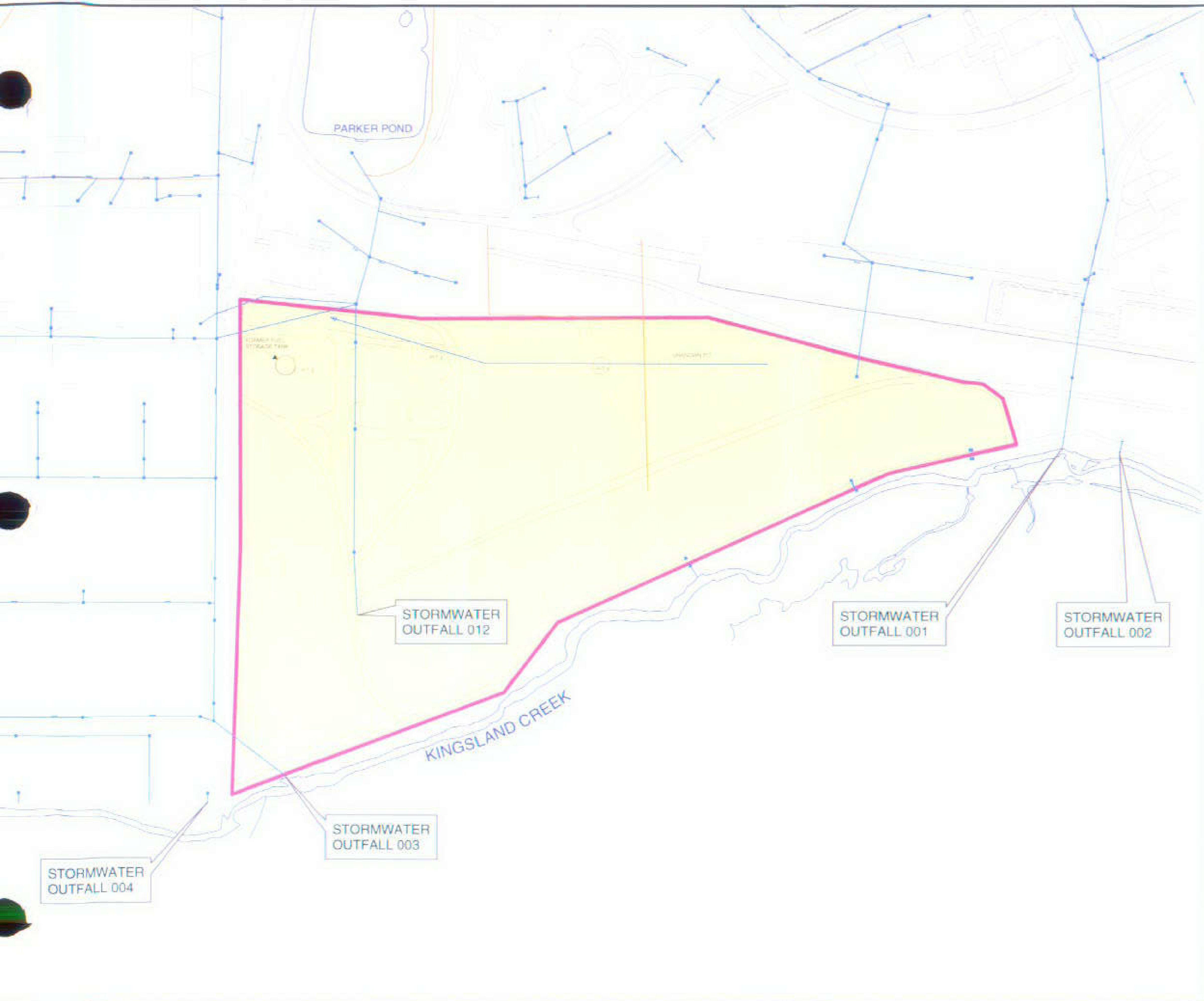
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT - OCTOBER 20002 - OPERABLE UNIT 7

REGIONAL TOPOGRAPHIC AND WATERSHED DELINEATION MAP

OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: CLC	7/8/03	FIGURE NUMBER:	FILE DATE:	6/26/03
CHECKED BY: TLN	7/8/03	2-1	PLOT DATE:	7/8/03
PROJECT NO: 12001-2-0703			FILE NAME:	watersheds.mxd



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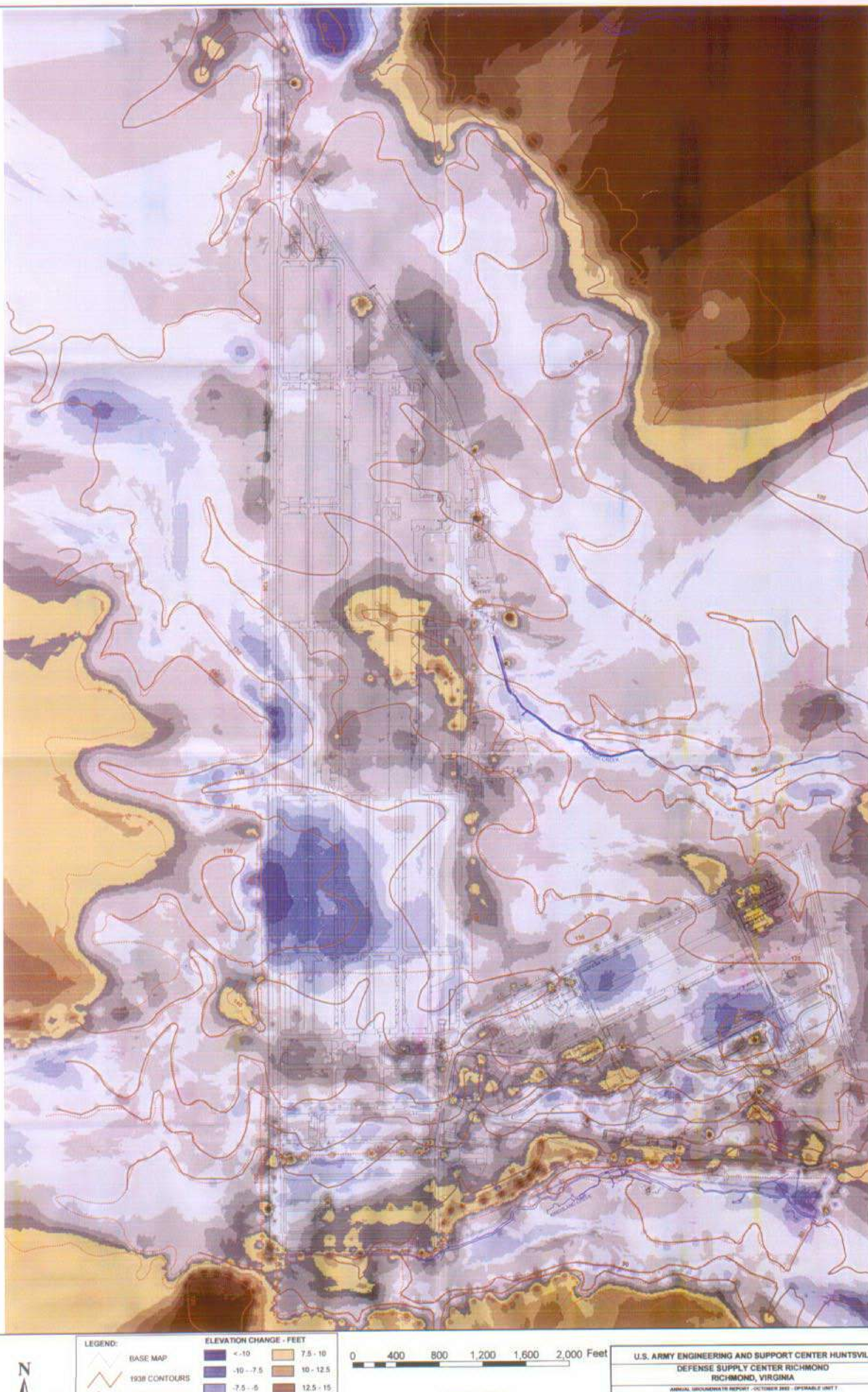
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7

STORMWATER DRAINAGE MAP

OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: CLC	7/8/03	FIGURE NUMBER:	FILE DATE:	7/8/03
CHECKED BY: TLN	7/8/03	2-2	PLOT DATE:	7/8/03
PROJECT NO: 12001-2-0703			FILE NAME:	stormwater.mxd



N
W E
S

LEGEND:

BASE MAP
1938 CONTOURS
1994 CONTOURS
120 ELEVATIONS (FEET MEAN SEA LEVEL)

NOTE:
THE 1943 TOPOGRAPHIC MAP IS BASED UPON ELEVATION DATA SURVEYED IN 1938.

ELEVATION CHANGE - FEET

< -10	7.5 - 10
-10 - -7.5	10 - 12.5
-7.5 - -5	12.5 - 15
-5 - -2.5	15 - 17.5
-2.5 - 0	17.5 - 20
0 - 2.5	
2.5 - 5	
5 - 7.5	

0 400 800 1,200 1,600 2,000 Feet

1" = 400'

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GROUND SURFACE ELEVATION CHANGES
1938 - 1994

OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: CLC	7/22/03	FIGURE NUMBER: 2-3	FILE DATE: 05/01/03
CHECKED BY: JMD	7/22/03		PLOT DATE: 7/22/03
PROJECT NO: 12001-2-0703			FILE NAME: CUTFILL-OU7

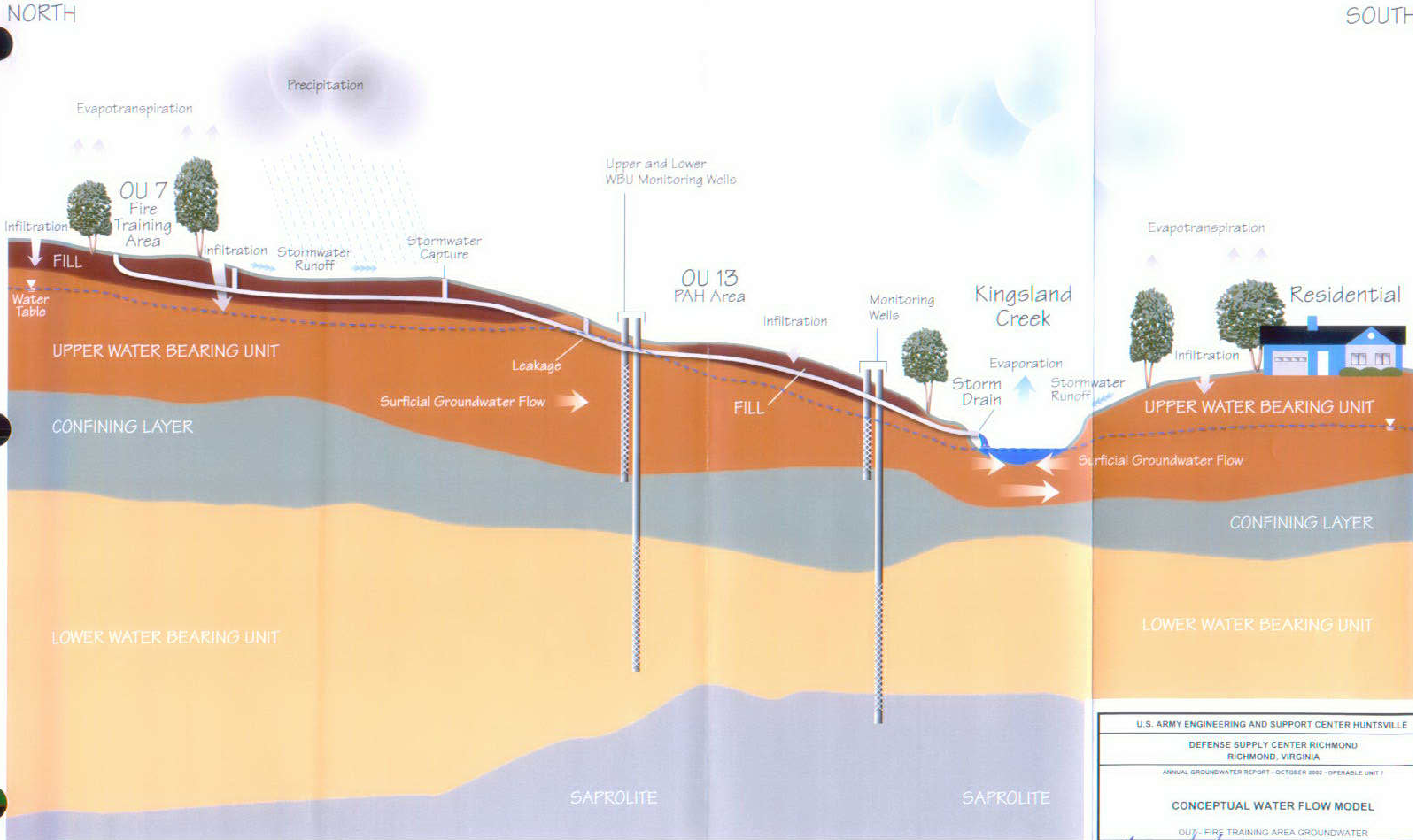

FIGURE NOT TO SCALE

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DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

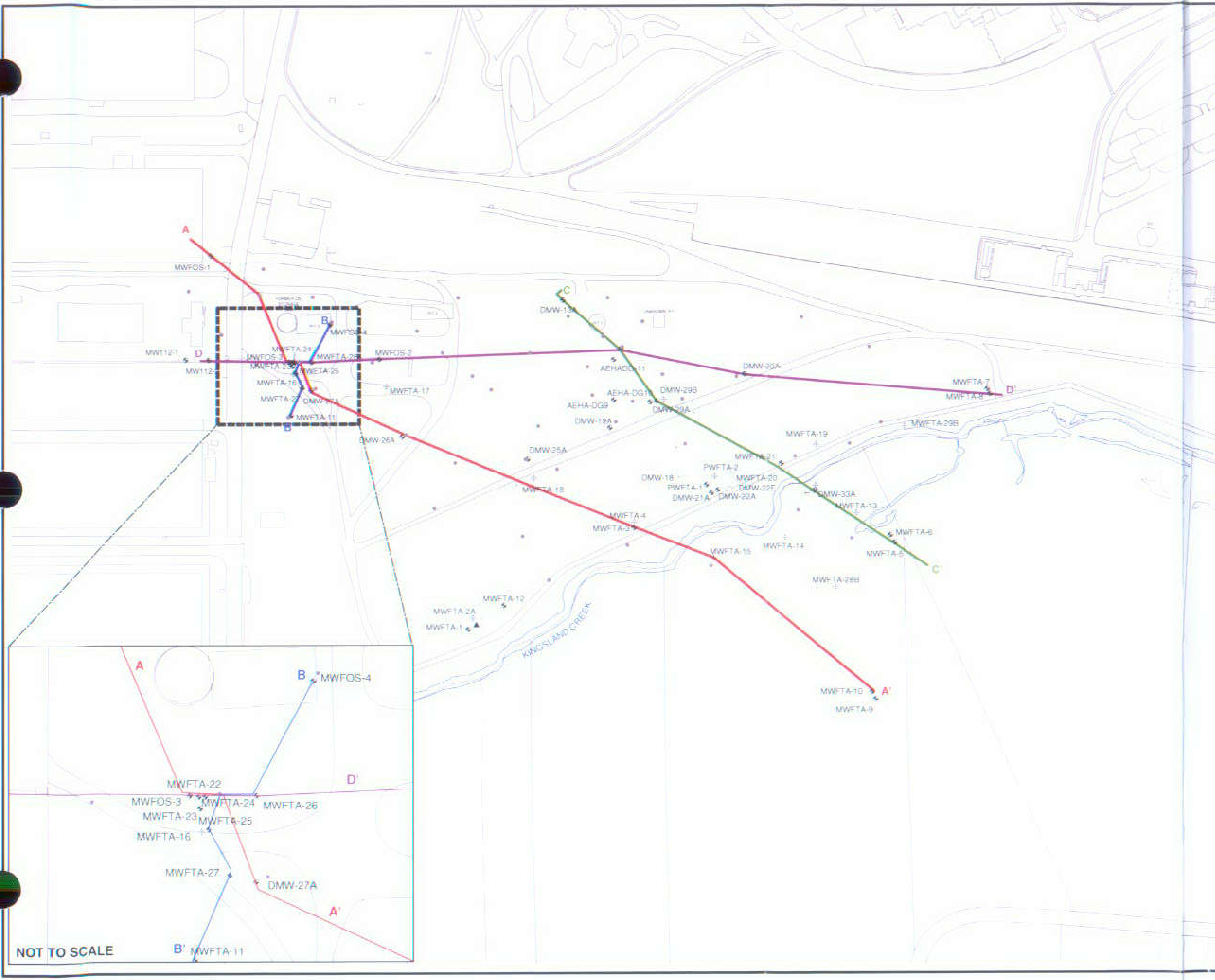
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7

CONCEPTUAL WATER FLOW MODEL

OU7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY/DATE: 5/29/03	FIGURE NUMBER:	FILE DATE
CHECKED/DATE: 5/29/03	2-4	PLOT DATE
PROJECT NO.		FILE NAME

704 116



LEGEND:
- MONITORING WELL - UPPER WBU
- MONITORING WELL - LOWER WBU
- MONITORING WELL - BEDROCK
- DECOMMISSIONED WELL
- DIRECT PUSH TECHNOLOGY
- KINGSLAND CREEK
- DSCR BASE MAP
- CROSS SECTION TRACE A
- CROSS SECTION TRACE B
- CROSS SECTION TRACE C
- CROSS SECTION TRACE D

NOTES:
1. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
2. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS.

0 200 400 Feet

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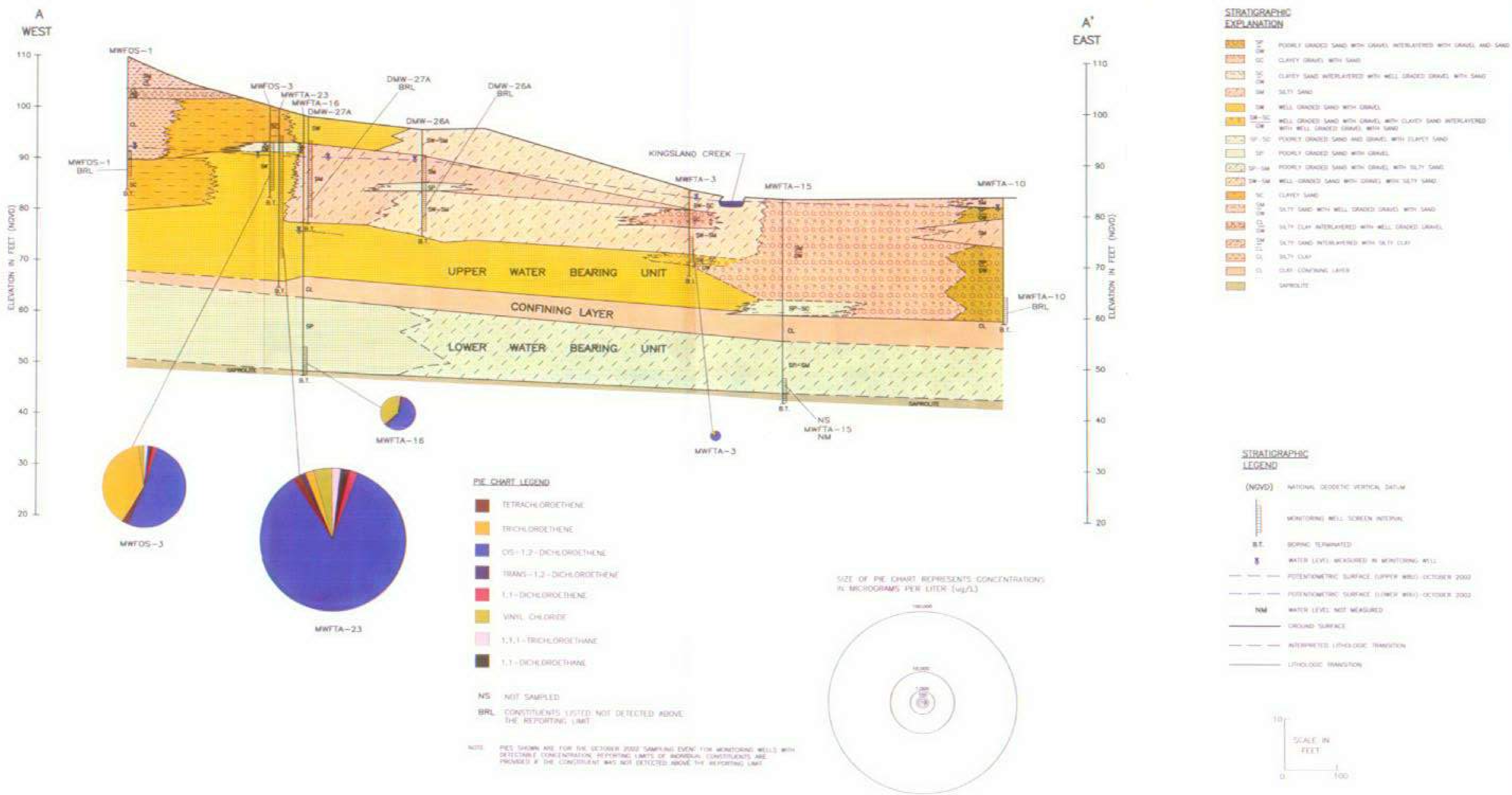
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7

CROSS SECTION TRACE -
SITE STRATIGRAPHY

OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	7/23/03	FIGURE NUMBER:	FILE DATE:	7/11/03
CHECKED BY: TLN	7/23/03	2-5	PLOT DATE:	7/23/03
PROJECT NO:	12001-2-0703		FILE NAME:	crosssection.mxd



DESIGNED	M. VAZQUEZ
DRAWN	R. ALEXANDER
CHECKED	T. NICHOLS
IN CHARGE	R. FUTCH
DATE	08/01/2003

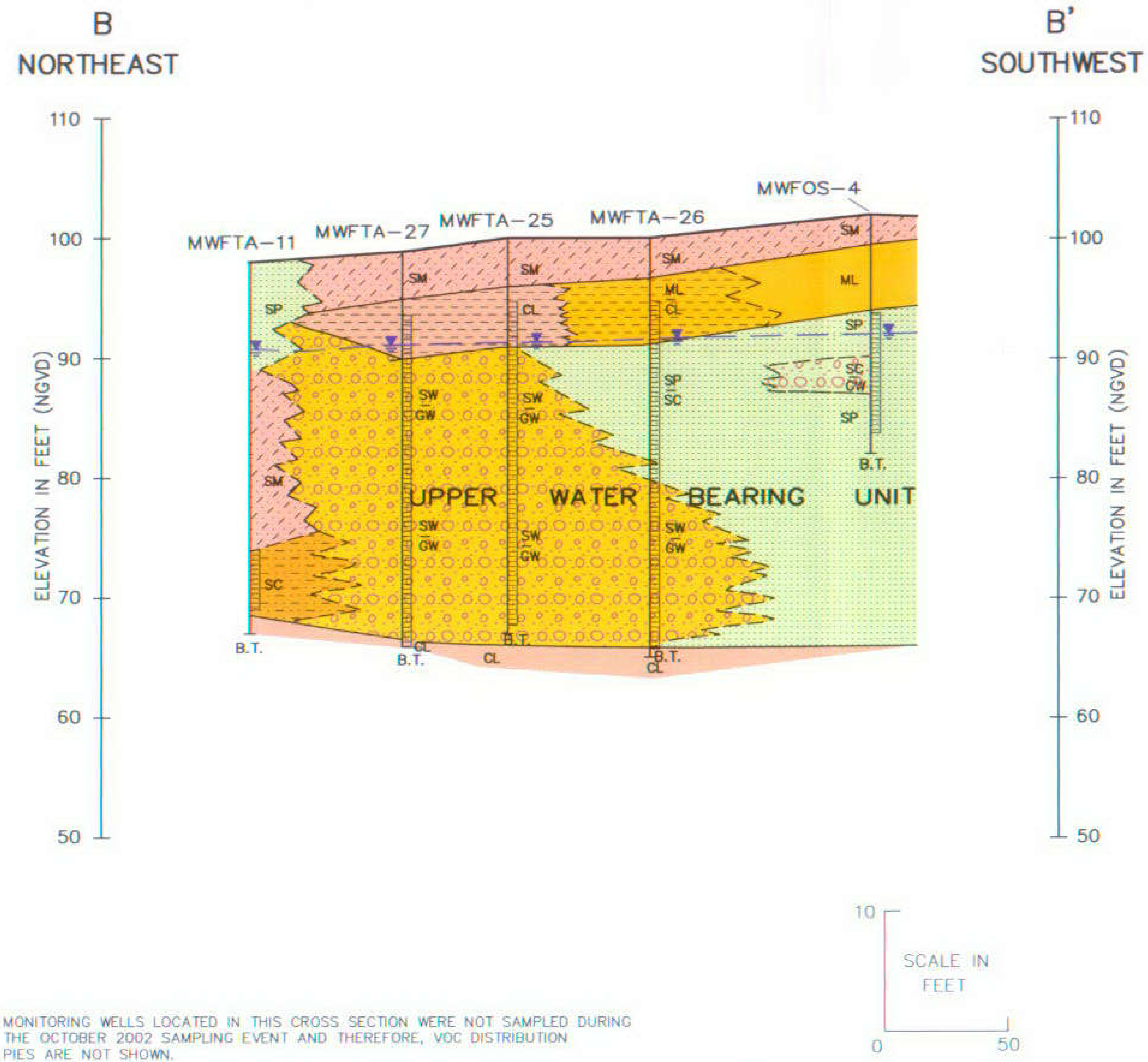
US ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER–RICHMOND
RICHMOND, VIRGINIA

MACTEC Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

ANNUAL GROUNDWATER REPORT–OCTOBER 2002–OPERABLE UNIT 7

HYDROSTRATIGRAPHIC
CROSS SECTION A–A'
OU7–FIRE TRAINING AREA GROUNDWATER

SCALE: AS SHOWN
CONTRACT: 12001-2-0701-2
DWG NO: FIG. 2-6



STRATIGRAPHIC EXPLANATION

- SW/GW — WELL GRADED SAND WITH GRAVEL INTERLAYERED WITH WELL GRAVEL WITH SAND
- SC/GW — CLAYEY SAND INTERLAYERED WITH WELL GRADED GRAVEL WITH SAND
- SP — POORLY GRADED SAND WITH GRAVEL
- SM — SILTY SAND
- SC — CLAYEY SAND
- CL — CLAY-CONFINING LAYER
- CL — SILTY CLAY
- ML — SANDY SILT
- ML/CL — SANDY SILT INTERLAYERED WITH SILTY CLAY

STRATIGRAPHIC LEGEND

- (NGVD) — NATIONAL GEODETIC VERTICAL DATUM
- MONITORING WELL SCREEN INTERVAL
- B.T. — BORING TERMINATED
- WATER LEVEL MEASURED IN MONITORING WELL
- POTENTIOMETRIC SURFACE (UPPER WBU)—OCTOBER 2002
- GROUND SURFACE
- INTERPRETED LITHOLOGIC TRANSITION
- LITHOLOGIC TRANSITION

NOTE: MONITORING WELLS LOCATED IN THIS CROSS SECTION WERE NOT SAMPLED DURING THE OCTOBER 2002 SAMPLING EVENT AND THEREFORE, VOC DISTRIBUTION PIES ARE NOT SHOWN.

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT-OCTOBER 2002-OPERABLE UNIT 7

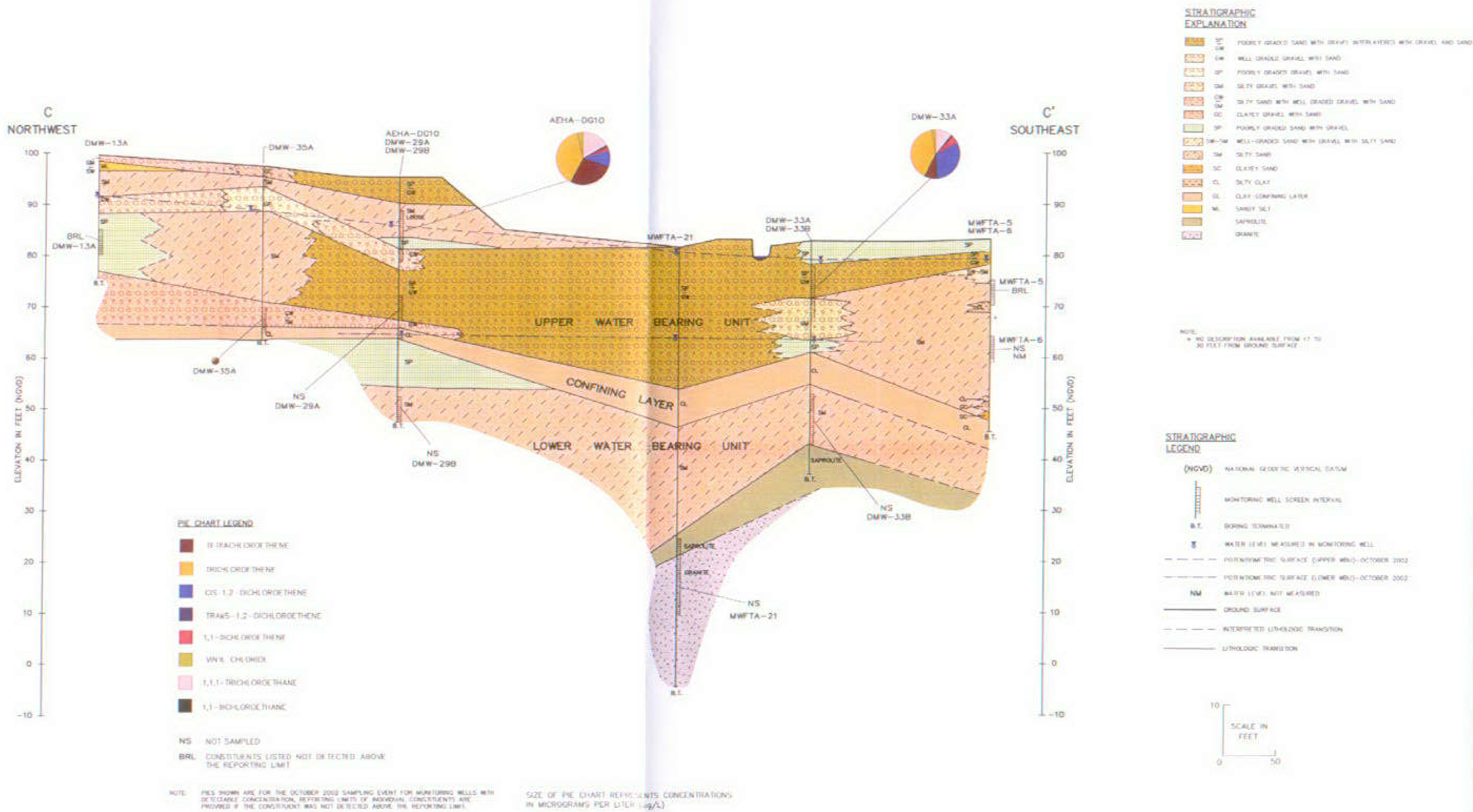
HYDROSTRATIGRAPHIC CROSS SECTION B-B'

OU7-FIRE TRAINING AREA GROUNDWATER

PREPARED BY: MAV 7/30/03	FIGURE NUMBER:	FILE DATE: 06.DEC.02	
CHECKED BY: RSF 7/30/03	2-7	PLOT DATE: 19.DEC.02	
PROJECT NO: 12000-1-1632		FILE NAME: OPER-UNIT-7T	

J:\DSCR\XSECT SUMMARY\OPER-UN-XSEC-BB2.dwg - Model 08/04/2003 8:12p Expand

701 119



US ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER-RICHMOND
RICHMOND, VIRGINIA

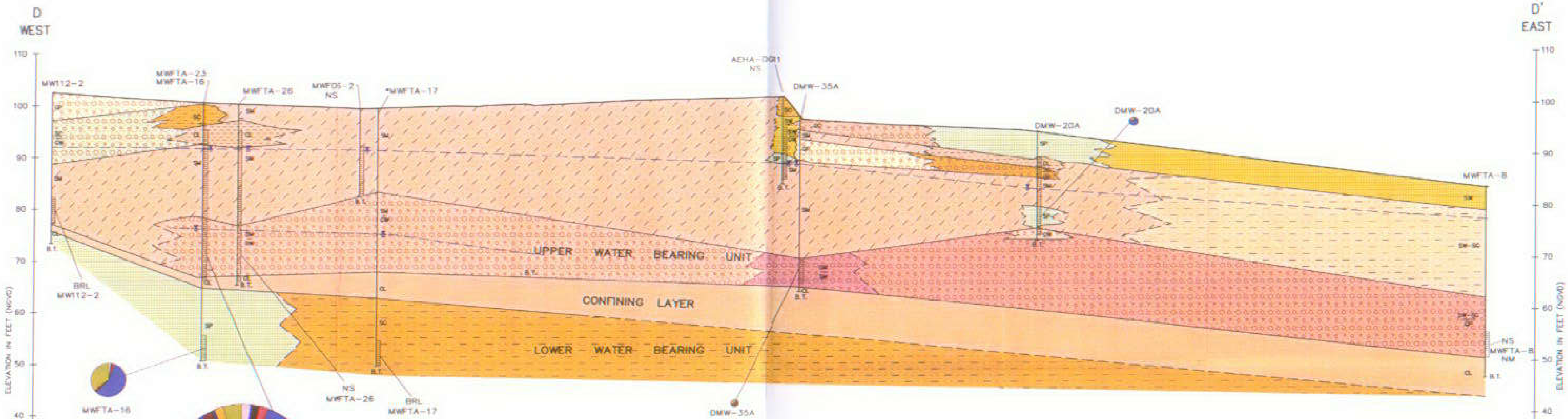
MACTEC Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

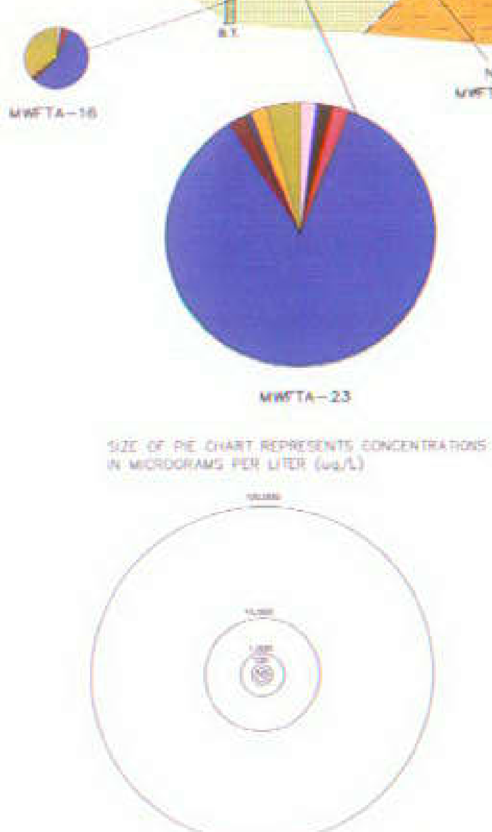
ANNUAL GROUNDWATER REPORT-OCTOBER 2002-OPERABLE UNIT 7

HYDROSTRATIGRAPHIC
CROSS SECTION C-C'
OU7-FIRE TRAINING AREA GROUNDWATER

DESIGNED	M. VAZQUEZ
DRAWN	R. ALEXANDER
CHECKED	T. NICHOLS
IN CHARGE	R. FUTCH
DATE	08/01/2003

SCALE	AS SHOWN
CONTRACT	12001-2-0701-2
DWG NO	FIG. 2-8





SIZE OF PIE CHART REPRESENTS CONCENTRATIONS IN MICROGRAMS PER LITER (ug/L)

PIE CHART LEGEND

- TETRACHLOROETHENE
- TRICHLOROETHENE
- CIS-1,2-DICHLOROETHENE
- TRANS-1,2-DICHLOROETHENE
- 1,1-DICHLOROETHENE
- VINYL CHLORIDE
- 1,1,1-TRICHLOROETHANE
- 1,1-DICHLOROETHANE

NS NOT SAMPLED

BRL CONSTITUENTS LISTED NOT DETECTED ABOVE THE REPORTING LIMIT

NOTE: PIES SHOWN ARE FOR THE OCTOBER 2002 SAMPLING EVENT FOR MONITORING WELLS WITH DETECTABLE CONCENTRATION. REPORTING LIMITS OF INDIVIDUAL CONSTITUENTS ARE PROVIDED IF THE CONSTITUENT WAS NOT DETECTED ABOVE THE REPORTING LIMIT.

STRATIGRAPHIC EXPLANATION

GC	CLAYEY GRAVEL WITH SAND
GW	WELL GRADED GRAVEL WITH SAND
SC	CLAYEY SAND
SC/GP	CLAYEY SAND WITH POORLY GRADED GRAVEL
SC/GW	CLAYEY SAND INTERLAYERED WITH WELL GRADED GRAVEL WITH SAND
SW/GW	WELL GRADED SAND WITH GRAVEL INTERLAYERED WITH WELL GRAVEL WITH SAND
GM/SM	SILTY GRAVEL WITH SAND INTERLAYERED WITH SILTY SAND
GP	POORLY GRADED GRAVEL WITH SAND
SM/GW	SILTY SAND WITH WELL GRADED GRAVEL WITH SAND
SW	WELL GRADED SAND WITH GRAVEL
SP	POORLY GRADED SAND WITH GRAVEL
SW-SC	WELL-GRADED SAND WITH CLAYEY SAND AND GRAVEL
SM	SILTY SAND
CL	SILTY CLAY
CL	CLAY-CONFINING LAYER
SW-SC/GP	WELL-GRADED SAND WITH CLAYEY SAND AND GRAVEL, INTERLAYERED WITH POORLY GRADED GRAVEL WITH SAND

STRATIGRAPHIC LEGEND

(NGVD)	NATIONAL GEODETIC VERTICAL DATUM
	MONITORING WELL SCREEN INTERVAL
B.T.	BORING TERMINATED
	WATER LEVEL MEASURED IN MONITORING WELL
	POTENTIOMETRIC SURFACE (UPPER WBU)-OCTOBER 2002
	POTENTIOMETRIC SURFACE (LOWER WBU)-OCTOBER 2002
NM	WATER LEVEL NOT MEASURED
	GROUND SURFACE
	INTERPRETED LITHOLOGIC TRANSITION
	LITHOLOGIC TRANSITION
*MWFTA-17	OFF-SET BORING INFORMATION WAS PROJECTED INTO THE CROSS SECTION

10 SCALE IN FEET 0 60

DESIGNED	M. VAZQUEZ
DRAWN	R. ALEXANDER
CHECKED	T. NICHOLS
IN CHARGE	R. FUTCH
DATE	08/01/2003

US ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER–RICHMOND
RICHMOND, VIRGINIA

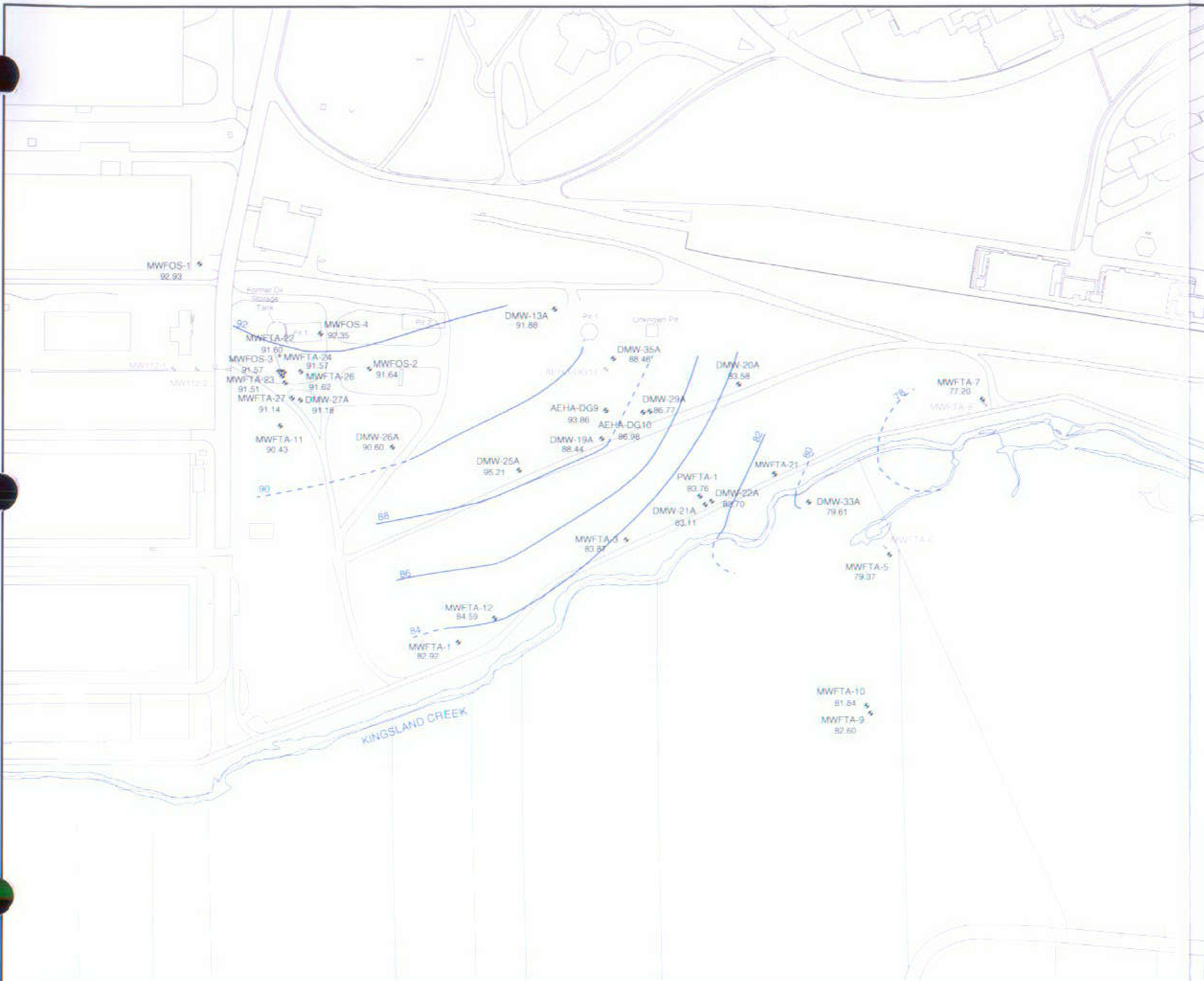
MACTEC Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

ANNUAL GROUNDWATER REPORT–OCTOBER 2002–OPERABLE UNIT 7

HYDROSTRATIGRAPHIC CROSS SECTION D–D'

OU7–FIRE TRAINING AREA GROUNDWATER

SCALE: AS SHOWN
CONTRACT: 12001-2-0701-2
DWG NO: FIG. 2-9



LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- POTENTIOMETRIC CONTOUR (FEET)
- EXTRAPOLATED POTENTIOMETRIC CONTOUR (FEET)
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
2. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS.
3. *WELL NEEDS TO BE RESURVEYED TO OBTAIN AN ACCURATE TOC; GROUNDWATER ELEVATION FOR THIS WELL IS NOT USED FOR POTENTIOMETRIC CONTOURING.

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7
POTENTIOMETRIC SURFACE MAP -
UPPER WATER BEARING UNIT - OCTOBER 2002
OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	7/23/03	FIGURE NUMBER:	FILE DATE: 5/22/03
CHECKED BY: JDM	7/23/03	2-10	PLOT DATE: 7/23/03
PROJECT NO: 12001-2-0703			FILE NAME: ou7u_pot_10-02.mxd

LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- POTENTIOMETRIC CONTOUR (FEET)
- EXTRAPOLATED POTENTIOMETRIC CONTOUR (FEET)
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
2. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS.
3. *WELL NEEDS TO BE RESURVEYED TO OBTAIN AN ACCURATE TOC; GROUNDWATER ELEVATION FOR THIS WELL IS NOT USED FOR POTENTIOMETRIC CONTOURING.

0 200 400 Feet

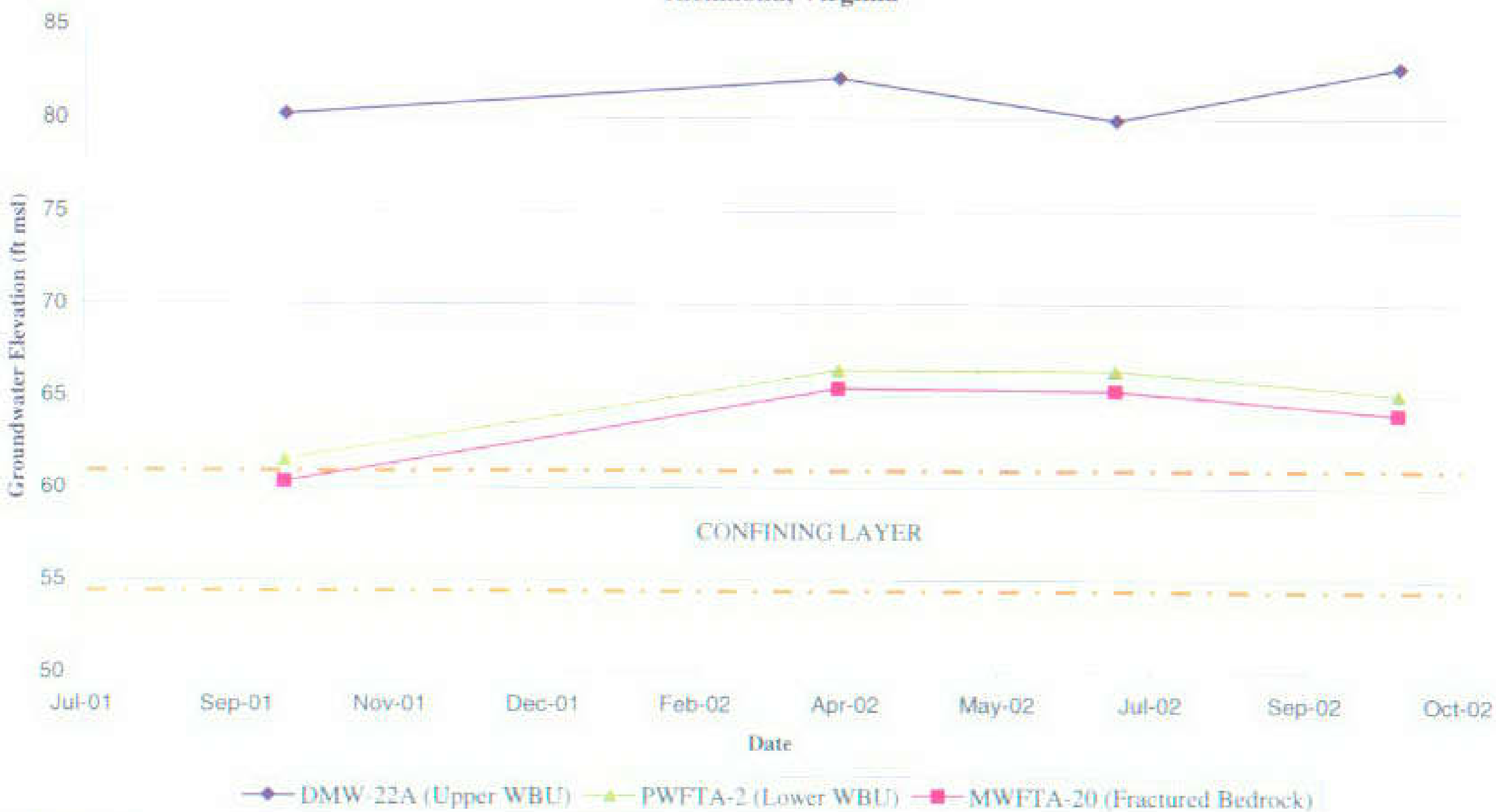
U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7
POTENTIOMETRIC SURFACE MAP -
LOWER WATER BEARING UNIT - OCTOBER 2002
OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	7/23/03	FIGURE NUMBER:	FILE DATE: 5/22/03
CHECKED BY: JDM	7/23/03	2-11	PLOT DATE: 7/23/03
PROJECT NO: 12001-2-0703			FILE NAME: ou7l_pot_10-02.mxd

FIGURE 2-12

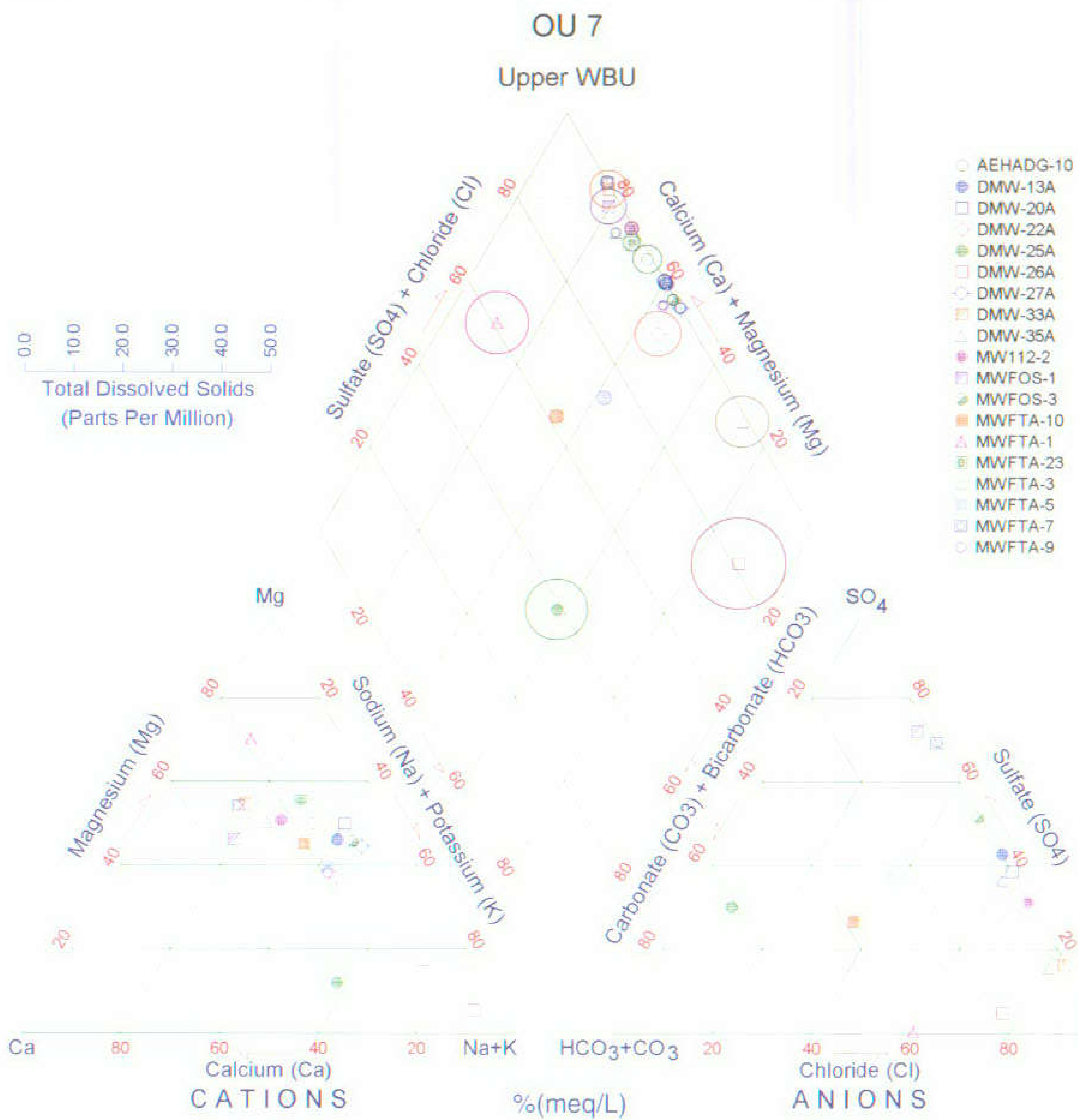
UPPER AND LOWER WBU GROUNDWATER ELEVATION COMPARISON
DMW-22A, PWFTA-2 and MWFTA-20 CLUSTER WELLS
ANNUAL GROUNDWATER REPORT OCTOBER 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



Note:
WBU - water bearing unit
ft - feet
msl - mean sea level

PREPARED/DATE: MAV 5/30/03
CHECKED/DATE: TLN 7/30/03

704 123



Notes:

•%(meq/L) - Percent of total milliequivalents per liter

•WBU – Water bearing unit

•The total dissolved solids (TDS) concentration is estimated from the concentrations of the 4 cations and the 4 anions shown on the figure. The diameter of the circle is scaled by the concentration of TDS reported in milligrams per liter (parts per million) and may be compared to the scale bar to the left of the figure.

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE

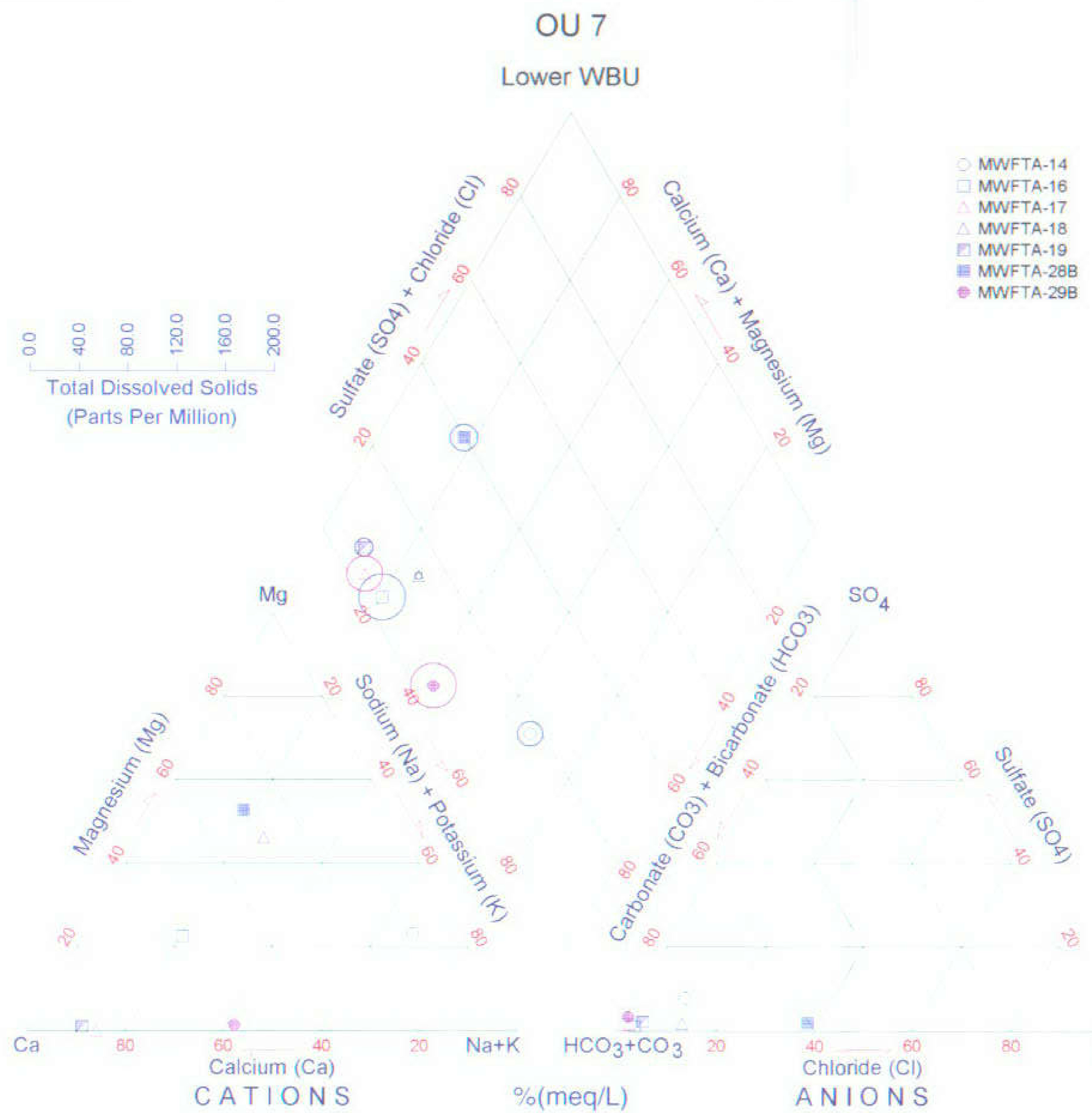
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT – OCTOBER 2002 – OPERABLE UNIT 7

PIPER DIAGRAM
UPPER WATER BEARING UNIT

OU 7 – FIRE TRAINING AREA GROUNDWATER

Prepared By	MET 06/30/03	FIGURE NUMBER	File Date	06/24/03
Checked By	NTG 06/30/03	2-13	Plot Date	06/30/03
Project No.	12001-2-0301.6000.6011		File Name	OU 7 Piper.ppt



Notes:

- %(meq/L) - Percent of total milliequivalents per liter
- WBU – Water bearing unit
- The total dissolved solids (TDS) concentration is estimated from the concentrations of the 4 cations and the 4 anions shown on the figure. The diameter of the circle is scaled by the concentration of TDS reported in milligrams per liter (parts per million) and may be compared to the scale bar to the left of the figure.

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE

DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

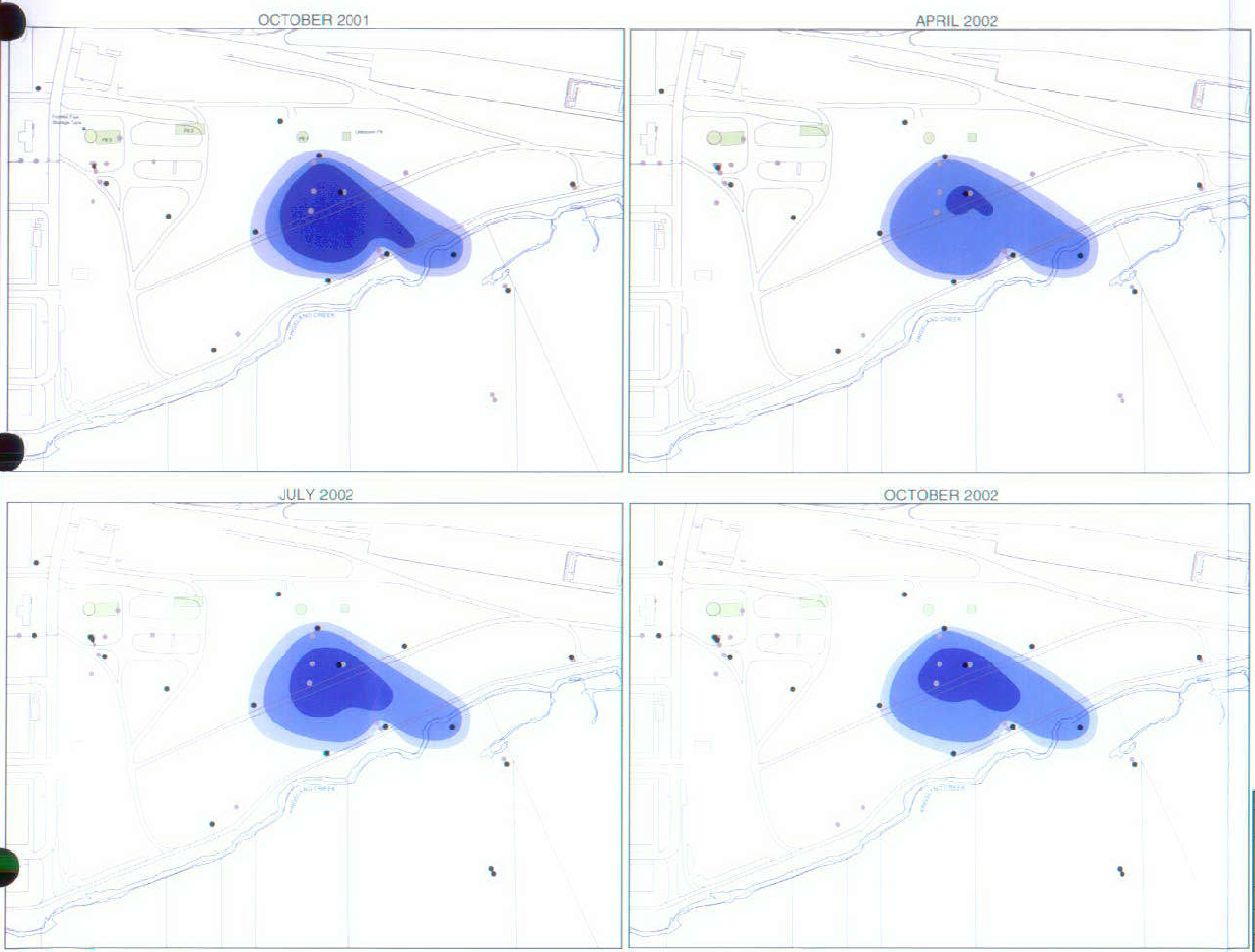
ANNUAL GROUNDWATER REPORT – OCTOBER 2002 – OPERABLE UNIT 7

PIPER DIAGRAM
LOWER WATER BEARING UNIT

OU 7 – FIRE TRAINING AREA GROUNDWATER

Prepared By	MET 06/30/03	FIGURE NUMBER	File Date	06/24/03
Checked By	NTG 06/30/03	2-14	Plot Date	06/30/03
Project No	12001 2 0701 6000 6011		File Name	OU 7 Piper ppt

TETRACHLOROETHENE



N
W E
S

LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. BACKGROUND AND ALTERNATE CONCENTRATION LIMITS (ACLs) HAVE NOT BEEN ESTABLISHED FOR DSCR; THEREFORE THE VOC CONCENTRATIONS HAVE BEEN COMPARED TO MAXIMUM CONTAMINANT LEVELS (USEPA, 2002).
2. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
3. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS. (SHADED GREEN)

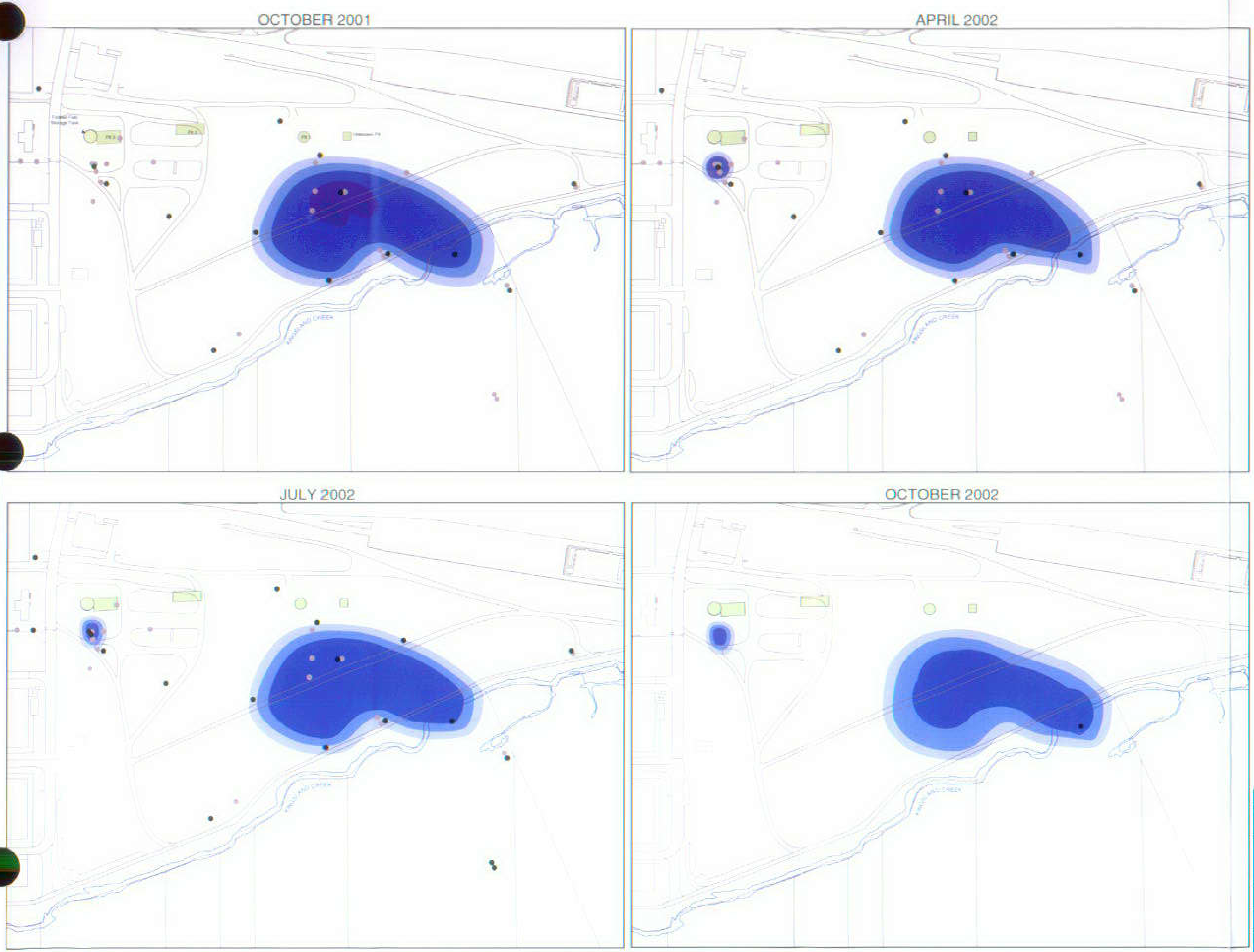
CONCENTRATIONS IN MICROGRAMS PER LITER

5 100 1,000 10,000

0 300 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE		
DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7 TETRACHLOROETHENE ISOCONCENTRATION CONTOURS UPPER WATER BEARING UNIT - 2001-2002 OU 7 - FIRE TRAINING AREA GROUNDWATER		
PREPARED BY: KAC 7/23/03	FIGURE NUMBER:	FILE DATE: 6/04/03
CHECKED BY: TLN 7/23/03	3-1	PLOT DATE: 7/23/03
PROJECT NO: 12001-2-0703		FILE NAME: pce_upper.mxd

TRICHLOROETHENE



LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. BACKGROUND AND ALTERNATE CONCENTRATION LIMITS (ACLs) HAVE NOT BEEN ESTABLISHED FOR DSCR; THEREFORE THE VOC CONCENTRATIONS HAVE BEEN COMPARED TO MAXIMUM CONTAMINANT LEVELS (USEPA, 2002).
2. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
3. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS (SHADED GREEN).
4. THE PLUME LOCATED DOWNGRADIANT FROM PIT 3 CANNOT BE EVALUATED DURING THE OCTOBER 2001 SAMPLING EVENT DUE TO ELEVATED REPORTING LIMITS; HOWEVER A PLUME IS SUSPECTED TO EXIST.

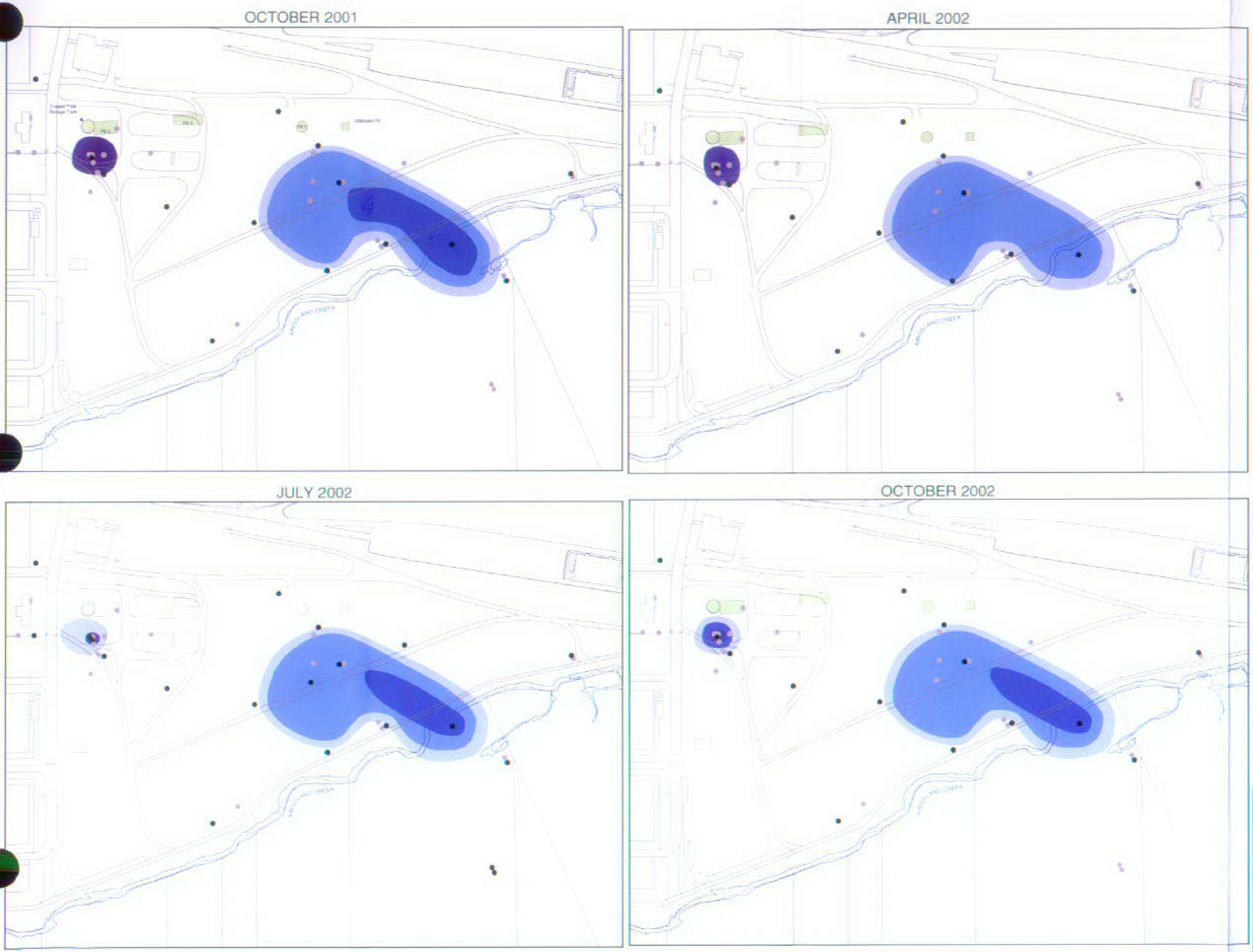
CONCENTRATIONS IN MICROGRAMS PER LITER

5 100 1,000 10,000 100,000

0 300 600 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7 TRICHLOROETHENE ISOCONCENTRATION CONTOURS UPPER WATER BEARING UNIT - 2001 - 2002 OU 7 - FIRE TRAINING AREA GROUNDWATER		
PREPARED BY: KAC 7/23/03	FIGURE NUMBER:	FILE DATE: 5/19/03
CHECKED BY: TLN 7/23/03	3-2	PLOT DATE: 7/23/03
PROJECT NO: 12001-2-0703		FILE NAME: tce_upper.mxd

CIS-1,2-DICHLOROETHENE



N
W E
S

LEGEND:

- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:

1. BACKGROUND AND ALTERNATE CONCENTRATION LIMITS (ACLs) HAVE NOT BEEN ESTABLISHED FOR DSCR; THEREFORE THE VOC CONCENTRATIONS HAVE BEEN COMPARED TO MAXIMUM CONTAMINANT LEVELS (USEPA, 2002).
2. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
3. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS, RESPECTIVELY. (SHADED GREEN)

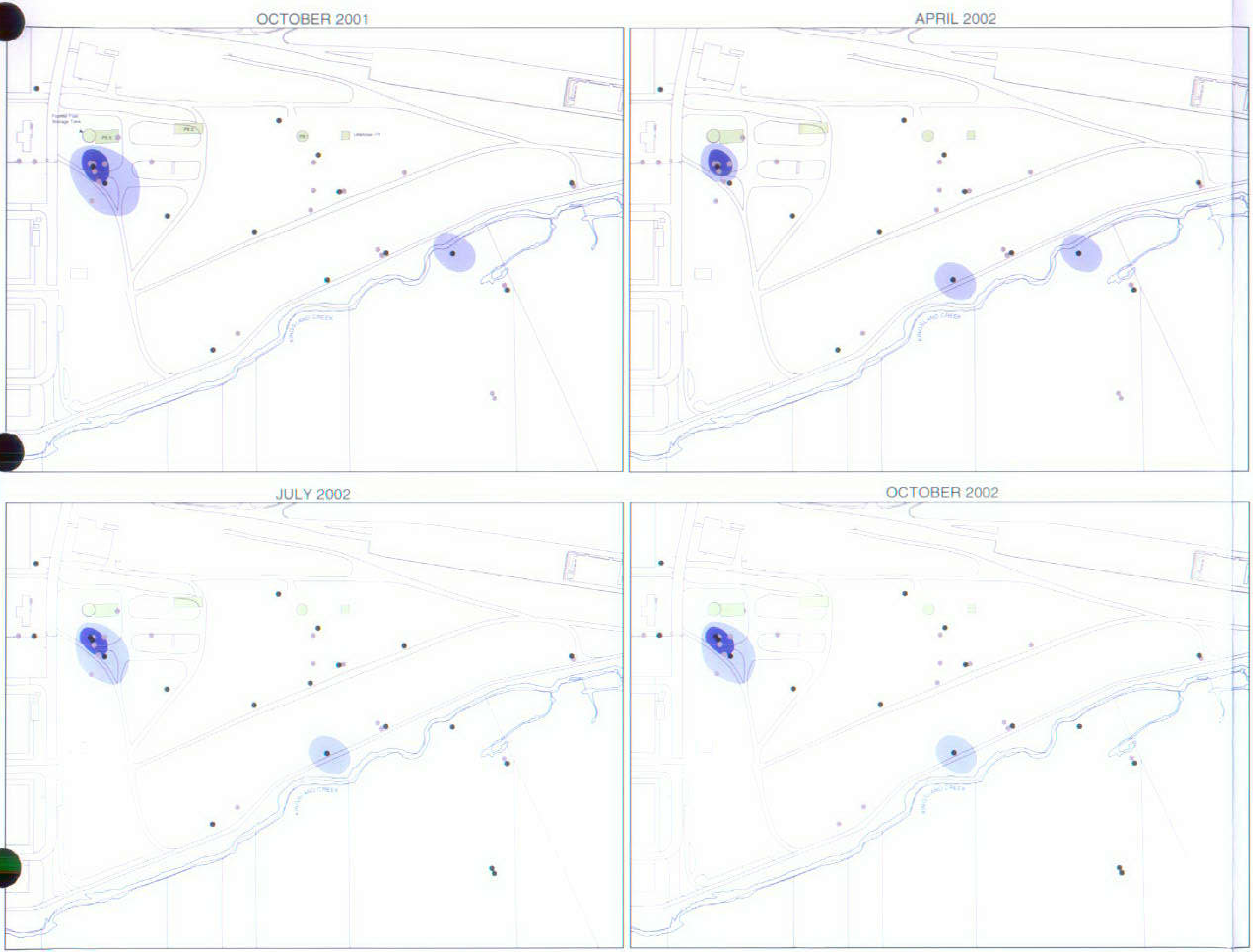
CONCENTRATIONS IN MICROGRAMS PER LITER

70 100 1,000 10,000 100,000 1,000,000

0 300 600 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE		
DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7 CIS-1,2-DICHLOROETHENE ISOCONCENTRATION CONTOURS UPPER WATER BEARING UNIT - 2001 - 2002 OU 7 - FIRE TRAINING AREA GROUNDWATER		
PREPARED BY: KAC 7/23/03	FIGURE NUMBER:	FILE DATE: 5/8/03
CHECKED BY: TLN 7/23/03	3-3	PLOT DATE: 7/23/03
PROJECT NO: 12001-2-0703		FILE NAME: cis_upper.mxd

VINYL CHLORIDE



N
W E
S

LEGEND:
- ● MONITORING WELL - SAMPLED
- ● MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. BACKGROUND AND ALTERNATE CONCENTRATION LIMITS (ACLs) HAVE NOT BEEN ESTABLISHED FOR DSCR; THEREFORE THE VOC CONCENTRATIONS HAVE BEEN COMPARED TO MAXIMUM CONTAMINANT LEVELS (USEPA, 2002).
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3. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS. (SHADED GREEN)

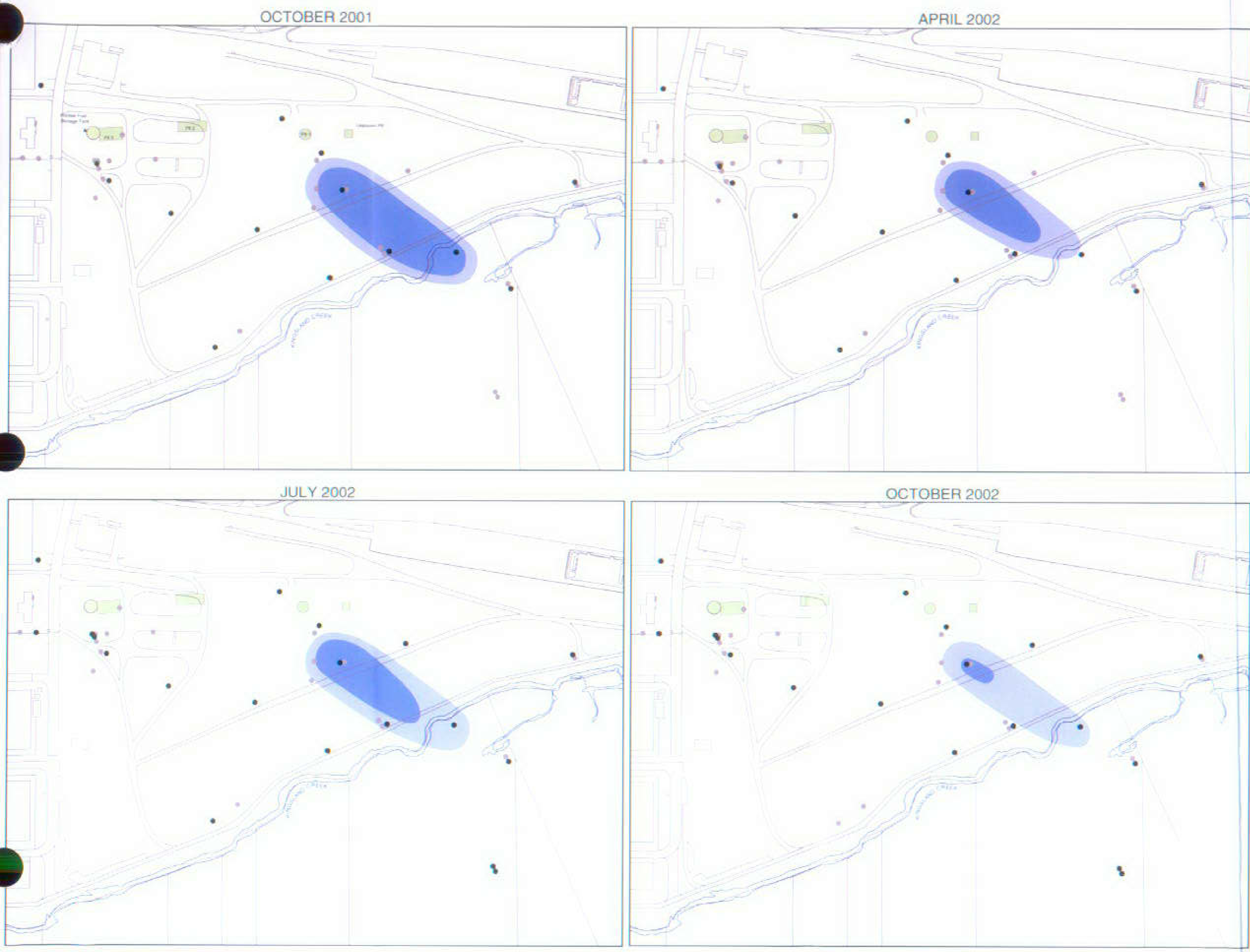
CONCENTRATIONS IN MICROGRAMS PER LITER

2 100 1,000 10,000

0 300 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA			
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7 VINYL CHLORIDE ISOCONCENTRATION CONTOURS UPPER WATER BEARING UNIT - 2001 - 2002 OU 7 - FIRE TRAINING AREA GROUNDWATER			
PREPARED BY: KAC	7/23/03	FIGURE NUMBER:	FILE DATE: 5/15/03
CHECKED BY: TLN	7/23/03	3-4	PLOT DATE: 7/23/03
PROJECT NO: 12001-2-0703			FILE NAME: vc_upper.mxd

1,1,1-TRICHLOROETHANE



LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. BACKGROUND AND ALTERNATE CONCENTRATION LIMITS (ACLs) HAVE NOT BEEN ESTABLISHED FOR DSCR; THEREFORE THE VOC CONCENTRATIONS HAVE BEEN COMPARED TO MAXIMUM CONTAMINANT LEVELS (USEPA, 2002).
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3. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS. (SHADED GREEN)

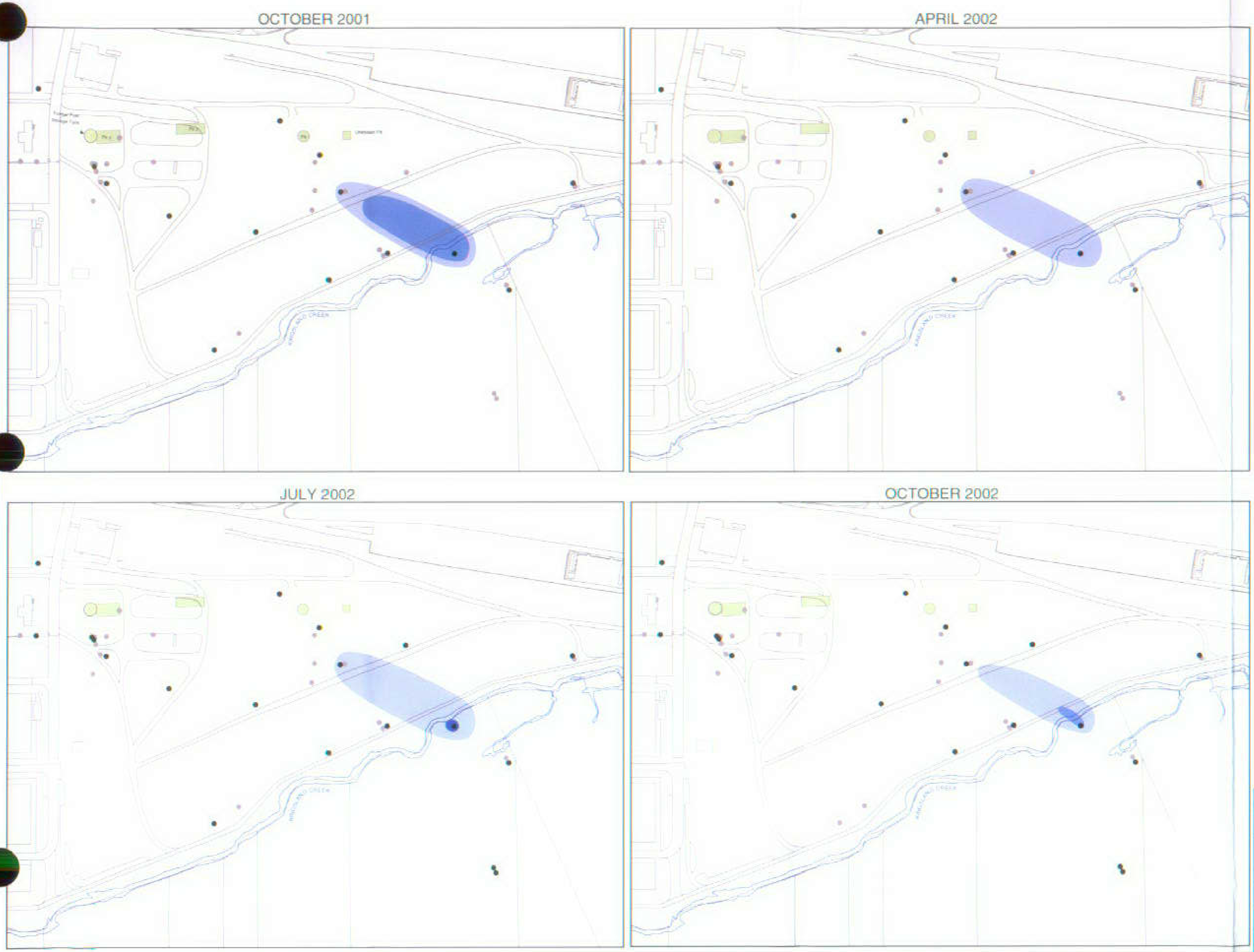
CONCENTRATIONS IN MICROGRAMS PER LITER

200 1,000 10,000

0 300 600 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE		
DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7 1,1,1-TRICHLOROETHANE ISOCONCENTRATION CONTOURS UPPER WATER BEARING UNIT - 2001 - 2002 OU 7 - FIRE TRAINING AREA GROUNDWATER		
PREPARED BY: KAC 7/23/03	FIGURE NUMBER:	FILE DATE: 6/11/03
CHECKED BY: TLN 7/23/03	3-5	PLOT DATE: 7/23/03
PROJECT NO: 12001-2-0703		FILE NAME: 1,1,1-tca_upper.mxd

1,1-DICHLOROETHANE



N
W E
S

LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. BACKGROUND AND ALTERNATE CONCENTRATION LIMITS (ACLs) HAVE NOT BEEN ESTABLISHED FOR DSCR; THEREFORE THE VOC CONCENTRATIONS HAVE BEEN COMPARED TO MAXIMUM CONTAMINANT LEVELS (USEPA, 2002).
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3. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS. (SHADED GREEN)

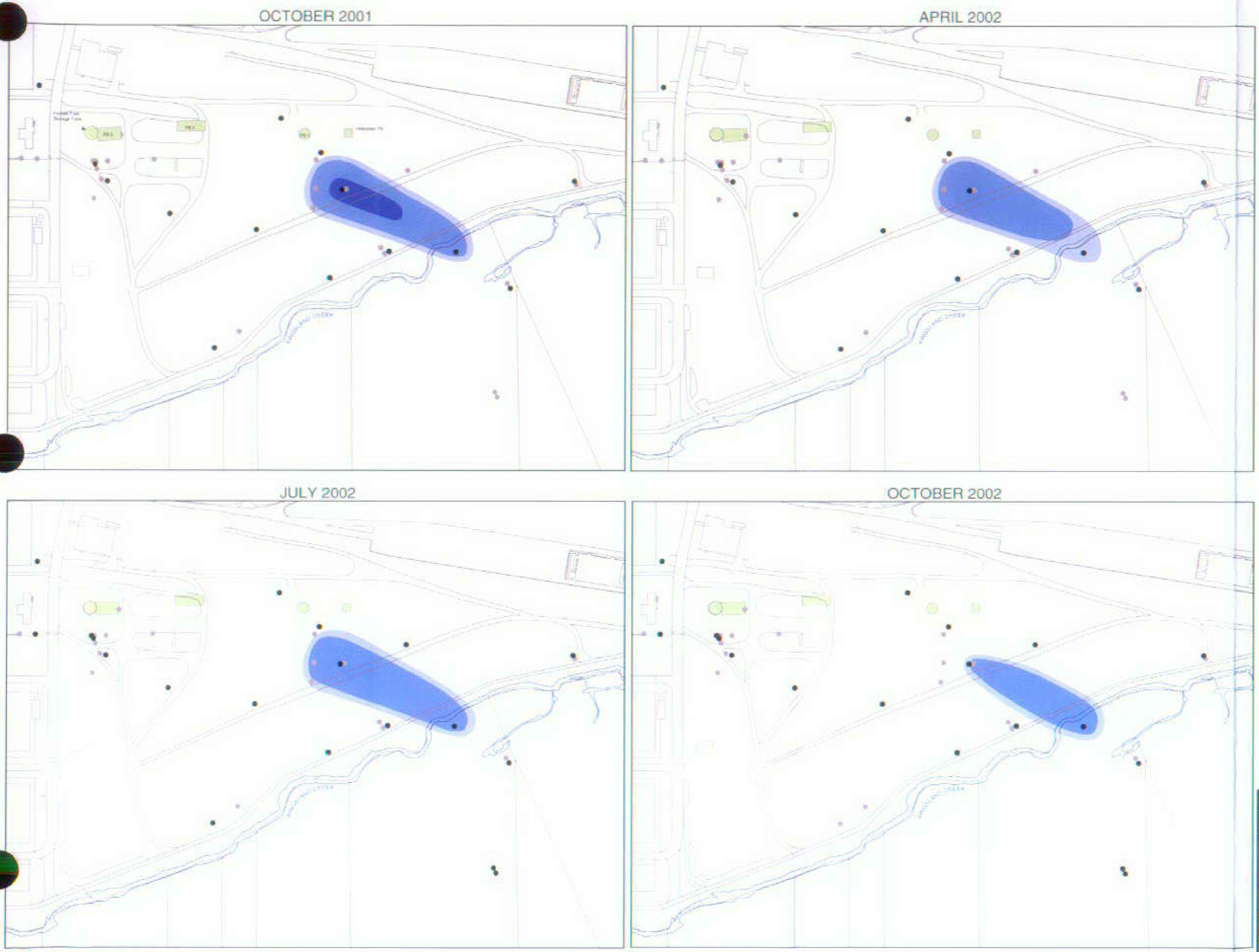
CONCENTRATIONS IN MICROGRAMS PER LITER

10 100 1,000

0 300 600 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7 1,1-DICHLOROETHANE ISOCONCENTRATION CONTOURS UPPER WATER BEARING UNIT - 2001 - 2002 OU 7 - FIRE TRAINING AREA GROUNDWATER		
PREPARED BY: KAC 7/23/03	FIGURE NUMBER:	FILE DATE: 6/11/03
CHECKED BY: TLN 7/23/03	3-6	PLOT DATE: 7/23/03
PROJECT NO: 12001-2-0703		FILE NAME: 1,1-dca_upper.mxd

1,1-DICHLOROETHENE



LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. BACKGROUND AND ALTERNATE CONCENTRATION LIMITS (ACLs) HAVE NOT BEEN ESTABLISHED FOR DSCR; THEREFORE THE VOC CONCENTRATIONS HAVE BEEN COMPARED TO MAXIMUM CONTAMINANT LEVELS (USEPA, 2002).
2. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
3. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS. (SHADED GREEN)

CONCENTRATIONS IN MICROGRAMS PER LITER

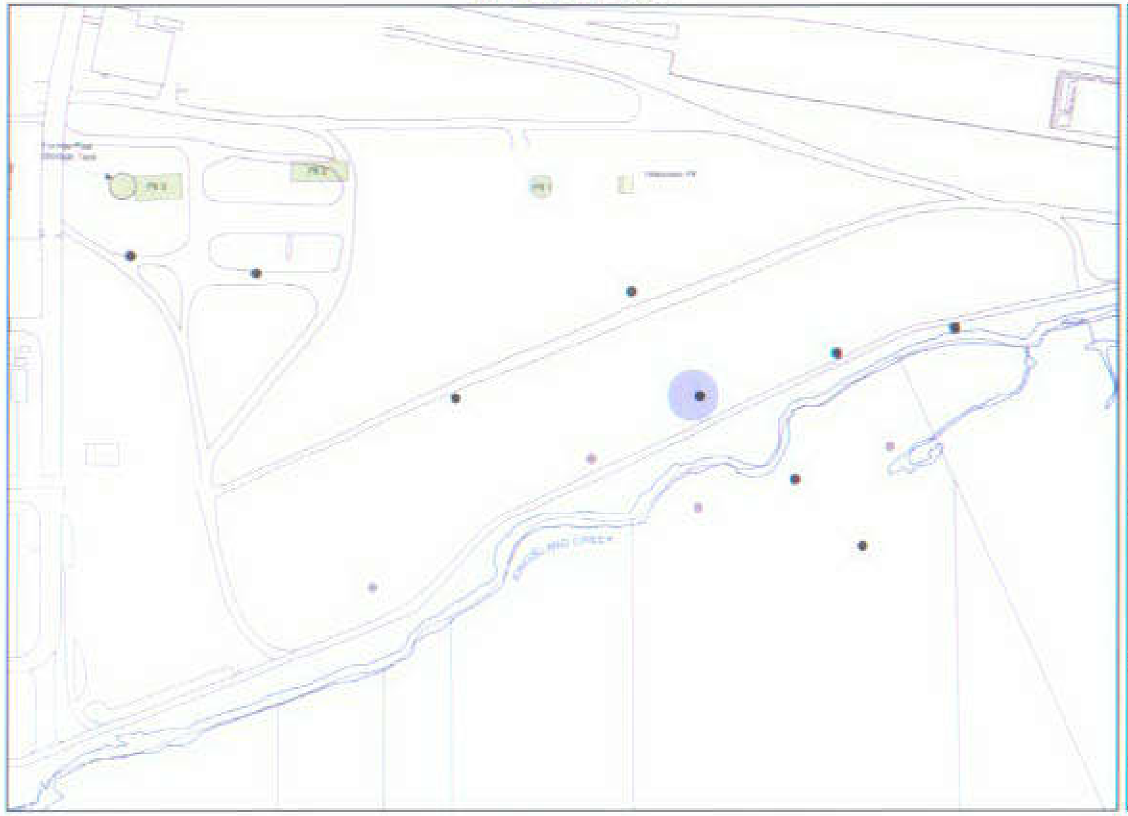
7 100 1,000 10,000

0 300 600 Feet

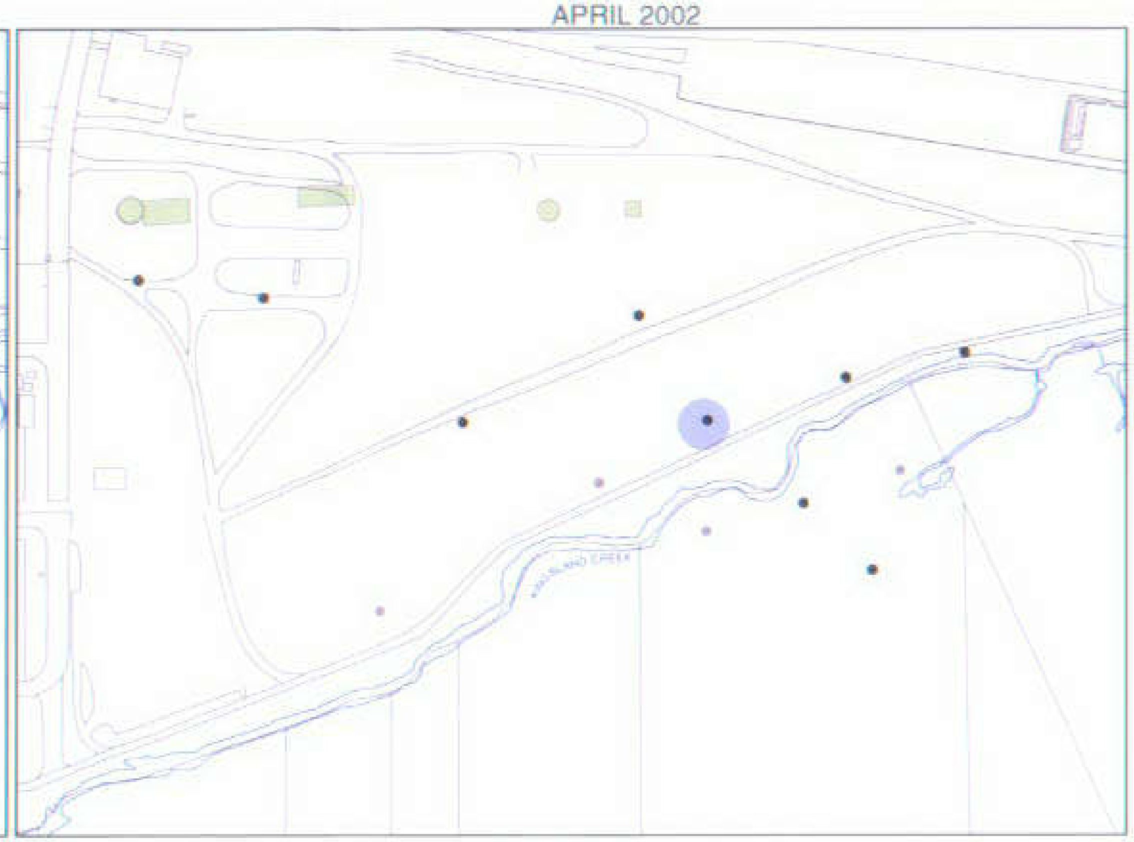
U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE		
DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7 1,1-DICHLOROETHENE ISOCONCENTRATION CONTOURS UPPER WATER BEARING UNIT - 2001 - 2002 OU 7 - FIRE TRAINING AREA GROUNDWATER		
PREPARED BY: KAC 7/23/03	FIGURE NUMBER:	FILE DATE: 6/11/03
CHECKED BY: TLN 7/23/03	3-7	PLOT DATE: 7/23/03
PROJECT NO: 12001-2-0703		FILE NAME: 1,1-dce_upper.mxd

TRICHLOROETHENE

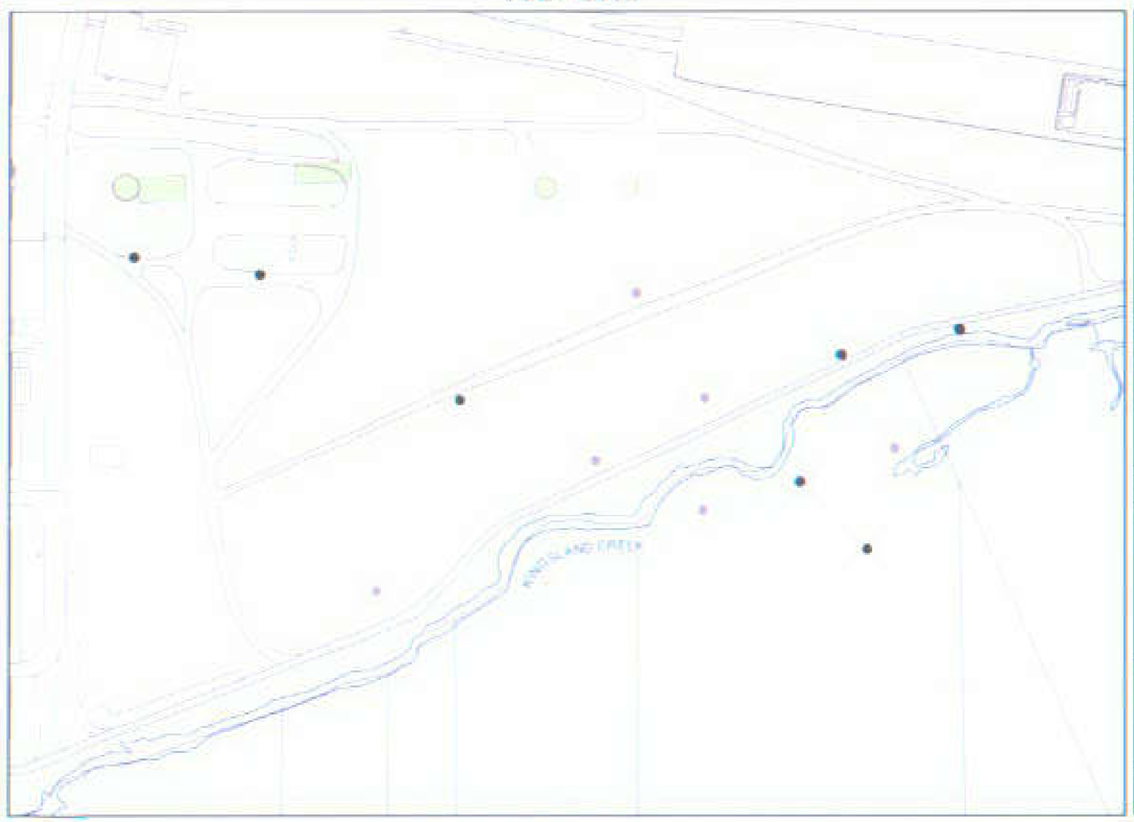
OCTOBER 2001



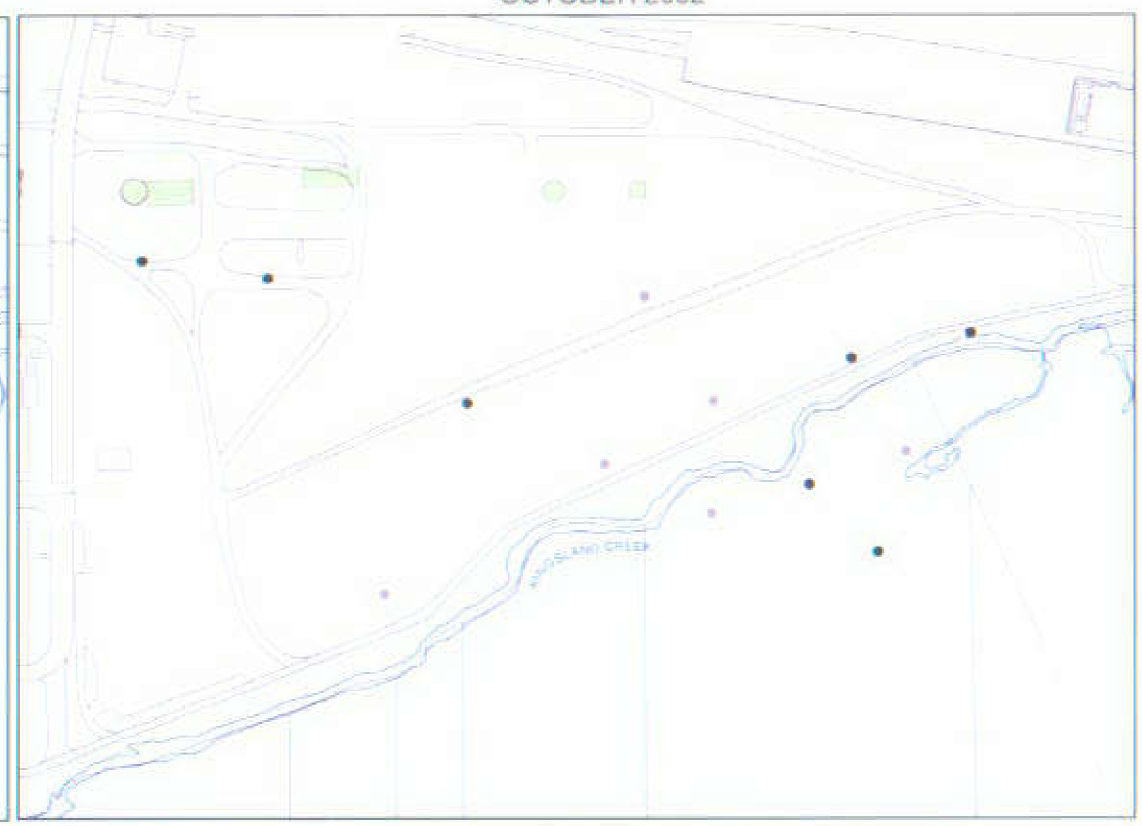
APRIL 2002



JULY 2002



OCTOBER 2002



N
W E
S

LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. BACKGROUND AND ALTERNATE CONCENTRATION LIMITS (ACLs) HAVE NOT BEEN ESTABLISHED FOR DSCR; THEREFORE THE VOC CONCENTRATIONS HAVE BEEN COMPARED TO MAXIMUM CONTAMINANT LEVELS (USEPA, 2002).
2. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
3. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS. (SHADED GREEN)
4. THE MONITORING WELL PWFAA-2 WAS REMOVED FROM THE MONITORING PROGRAM; THEREFORE THE TCE PLUME CANNOT BE EVALUATED FOR THE JULY AND OCTOBER 2002 SAMPLING EVENTS.

CONCENTRATIONS IN MICROGRAMS PER LITER

5 100

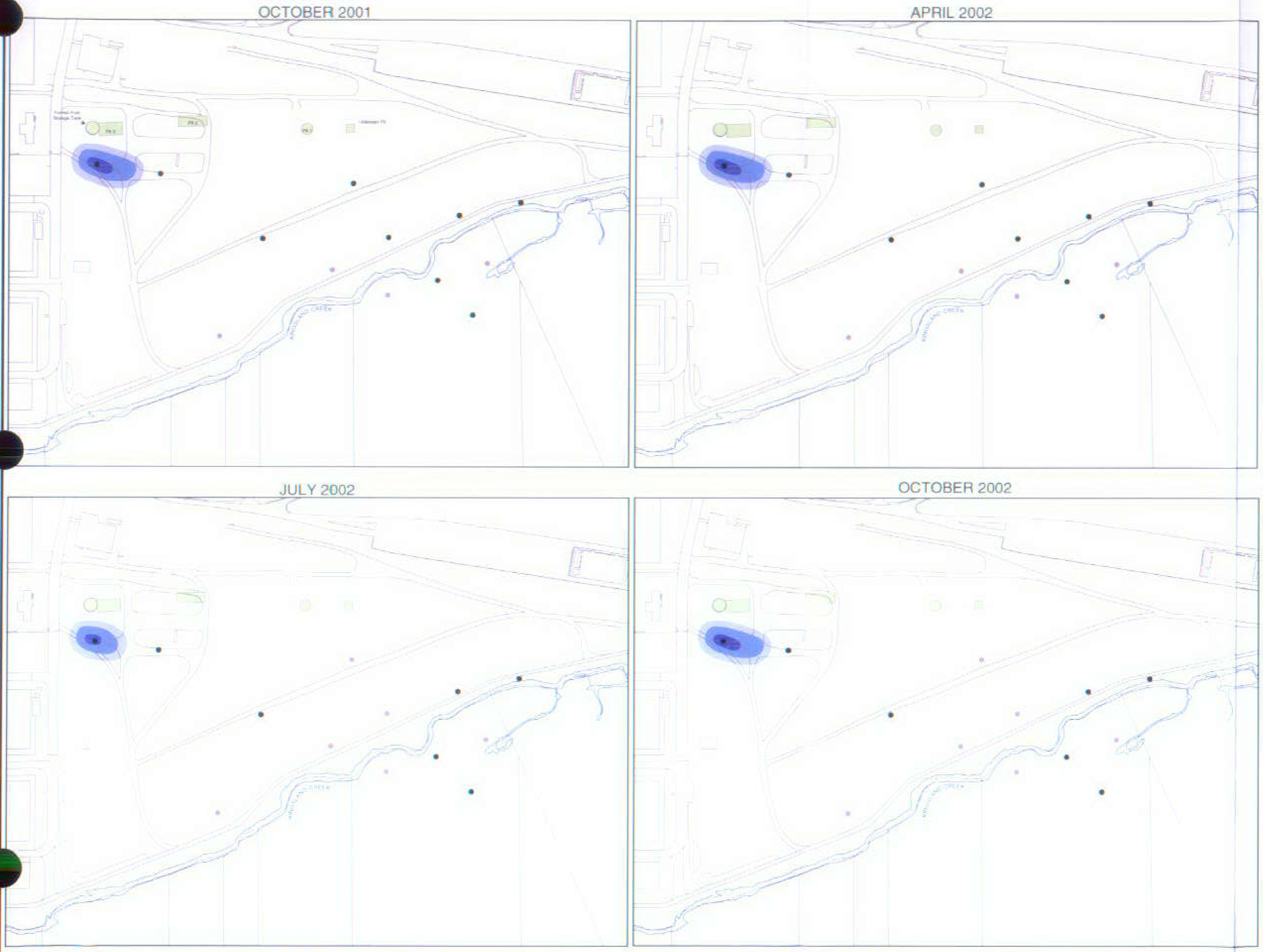
0 300 600 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7
TRICHLOROETHENE ISOCONCENTRATION CONTOURS
LOWER WATER BEARING UNIT - 2001 - 2002
OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC 7/23/03	FIGURE NUMBER:	FILE DATE: 5/19/03
CHECKED BY: TLN 7/23/03	3-8	PLOT DATE: 7/23/03
PROJECT NO: 12001-2-0703		FILE NAME: tce_lower_bu.mxd

CIS-1,2-DICHLOROETHENE



LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. BACKGROUND AND ALTERNATE CONCENTRATION LIMITS (ACLs) HAVE NOT BEEN ESTABLISHED FOR DSCR; THEREFORE THE VOC CONCENTRATIONS HAVE BEEN COMPARED TO MAXIMUM CONTAMINANT LEVELS (USEPA, 2002).
2. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
3. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS. (SHADED GREEN)

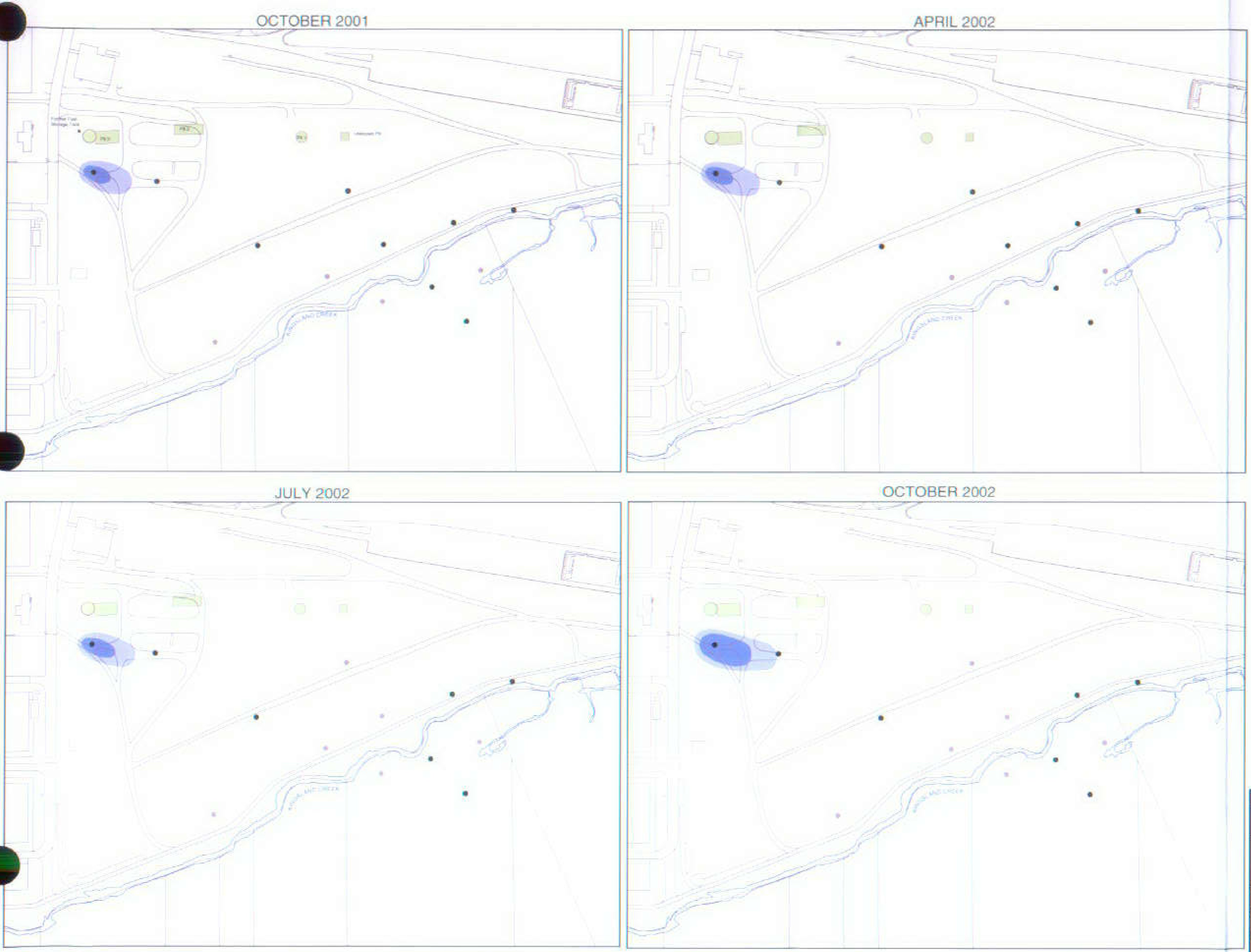
CONCENTRATIONS IN MICROGRAMS PER LITER

70 | 100 | 1,000 | 10,000

0 | 300 | 600 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7 CIS-1,2-DICHLOROETHENE ISOCONCENTRATION CONTOURS LOWER WATER BEARING UNIT - 2001 - 2002 OU 7 - FIRE TRAINING AREA GROUNDWATER		
PREPARED BY: KAC 7/23/03	FIGURE NUMBER:	FILE DATE: 5/08/03
CHECKED BY: TLN 7/23/03	3-9	PLOT DATE: 7/23/03
PROJECT NO: 12001-2-0703		FILE NAME: cis_lower.mxd

VINYL CHLORIDE



LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. BACKGROUND AND ALTERNATE CONCENTRATION LIMITS (ACLs) HAVE NOT BEEN ESTABLISHED FOR DSCR; THEREFORE THE VOC CONCENTRATIONS HAVE BEEN COMPARED TO MAXIMUM CONTAMINANT LEVELS (USEPA, 2002).
2. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
3. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969 AERIAL PHOTOGRAPHS (SHADED GREEN).

CONCENTRATIONS IN MICROGRAMS PER LITER

2 100 1,000

0 300 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7
VINYL CHLORIDE ISOCONCENTRATION CONTOURS
LOWER WATER BEARING UNIT - 2001 - 2002
OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	7/23/03	FIGURE NUMBER:	FILE DATE:	5/08/03
CHECKED BY: TLN	7/23/03	3-10	PLOT DATE:	7/23/03
PROJECT NO: 12001-1-0703			FILE NAME:	vc_lower.mxd

LEGEND:
- MONITORING WELL - SAMPLED FOR TOTAL METALS
- MONITORING WELL - NOT SAMPLED FOR TOTAL METALS
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
2. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969, RESPECTIVELY, AERIAL PHOTOGRAPHS.
3. DEFINITION OF QUALIFICATION FLAGS:
   JB = ESTIMATED; POSSIBLY BIASED HIGH OR FALSE POSITIVE BASED ON BLANK CONTAMINATION
   JQ = ESTIMATED; VALUE IS BETWEEN REPORTING LIMIT AND DETECTION LIMIT
   UJ = UNDETECTED; REPORTED DETECTION LIMIT IS IMPRECISE
   J = ESTIMATED; BASED ON QC DATA
4. DEFINITION OF ABBREVIATED ANALYTES AND REPORTING UNITS:
   NS - WELL NOT SAMPLED
   < - RESULT IS BELOW THE CONSTITUENT REPORTING LIMIT
   Al - TOTAL ALUMINUM
   As - TOTAL ARSENIC
   Fe - TOTAL IRON
   Mn - TOTAL MANGANESE
5. METALS RESULTS PROVIDED ARE FROM THE OCTOBER 2002 SAMPLE EVENT.

ALL UNITS ARE IN ug/L

0 100 200 300 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7

SELECTED TOTAL METALS IN MONITORING WELLS - UPPER WATER BEARING UNIT

OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	6/30/03	FIGURE NUMBER: 3-11	FILE DATE: 6/17/03
CHECKED BY: TLN	6/30/03		PLOT DATE: 6/30/03
PROJECT NO: 12001-2-0703			FILE NAME: metals_up_OU7.mxd

LEGEND:

- MONITORING WELL - SAMPLED FOR TOTAL METALS
- MONITORING WELL - NOT SAMPLED FOR TOTAL METALS
- KINGSLAND CREEK
- BASE MAP

NOTES:

1. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
2. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969, RESPECTIVELY, AERIAL PHOTOGRAPHS.
3. DEFINITION OF QUALIFICATION FLAGS:
   JB = ESTIMATED; POSSIBLY BIASED HIGH OR FALSE POSITIVE BASED ON BLANK CONTAMINATION
   JQ = ESTIMATED; VALUE IS BETWEEN REPORTING LIMIT AND DETECTION LIMIT
   JH = ESTIMATED; POSSIBLY BIASED HIGH BASED ON QC DATA
4. DEFINITION OF ABBREVIATED ANALYTES AND REPORTING UNITS:
   < - RESULT IS BELOW THE SAMPLE REPORTING LIMIT
   Al - TOTAL ALUMINUM
   Fe - TOTAL IRON
   Mn - TOTAL MANGANESE
5. METALS RESULTS PROVIDED ARE FROM THE OCTOBER 2002 SAMPLING EVENT.

ALL UNITS ARE IN ug/L

0 100 200 300 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE

DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7

SELECTED TOTAL METALS IN MONITORING WELLS - LOWER WATER BEARING UNIT

OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	6/30/03	FIGURE NUMBER:	FILE DATE:	6/19/03
CHECKED BY: TLN	6/30/03	3-12	PLOT DATE:	6/30/03
PROJECT NO: 12001-2-0703			FILE NAME:	metals_lo_OU7.mxd

N
W E
S

LEGEND:
- MONITORING WELL - SAMPLED, MNA EVALUATED
- MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
2. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969, RESPECTIVELY, AERIAL PHOTOGRAPHS.
3. DEFINITION OF QUALIFICATION FLAGS:
   JB = ESTIMATED; POSSIBLY BIASED HIGH OR FALSE POSITIVE BASED ON BLANK CONTAMINATION
   JQ = ESTIMATED; VALUE IS BETWEEN REPORTING LIMIT AND DETECTION LIMIT
   JH = ESTIMATED; POSSIBLY BIASED HIGH BASED ON QC DATA
   J = ESTIMATED; BASED ON QC DATA
4. DEFINITION OF POSTING SYMBOLS AND COLORS:
   12 - SUPPORTING MNA
   12 - FAVORABLE FOR MNA
   12 - NOT SUPPORTING MNA
   MNA - MONITORED NATURAL ATTENUATION
   NS - WELL NOT SAMPLED
   NA - PARAMETER RESULTS NOT AVAILABLE
   < - RESULT IS BELOW THE SAMPLE REPORTING LIMIT
5. DEFINITION OF ABBREVIATED ANALYTES AND REPORTING UNITS:
   DO - DISSOLVED OXYGEN
   NO_3 - NITRATE - NITROGEN (mg/L as N)
   SO_4 - SULFATE
   CO_2 - CARBON DIOXIDE
   H_2 - DISSOLVED HYDROGEN
   TOC - TOTAL ORGANIC CARBON
   ALK - TOTAL ALKALINITY (mg/L as $CaCO_3$)
   ORP - OXYGEN REDUCTION POTENTIAL
   pH - NEGATIVE LOG OF THE HYDROGEN ION CONCENTRATION
   Fe^{2+} - FERROUS IRON (mg/L)
   mg/L - MILLIGRAMS PER LITER
   mV - MILLIVOLTS
   nM - NAMOMOLES PER LITER

ALL UNITS ARE IN mg/L EXCEPT ORP WHICH IS IN mV AND HYDROGEN WHICH IS IN nM.

0 100 200 300 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE		
DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7 SELECTED MONITORED NATURAL ATTENUATION PARAMETERS - UPPER WATER BEARING UNIT - OCTOBER 2001 - 2002 OU 7 - FIRE TRAINING AREA GROUNDWATER		
PREPARED BY: KAC 7/23/03	FIGURE NUMBER:	FILE DATE: 6/12/03
CHECKED BY: TLN 7/23/03	3-13	PLOT DATE: 7/31/03
PROJECT NO: 12001-1-1632		FILE NAME: MNA_up_OU7.mxd

704 139

N W E S

LEGEND:

- MONITORING WELL - SAMPLED, MNA EVALUATED
- MONITORING WELL - NOT SAMPLED
- KINGSLAND CREEK
- BASE MAP

NOTES:

1. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
2. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969, RESPECTIVELY, AERIAL PHOTOGRAPHS.
3. DEFINITION OF QUALIFICATION FLAGS:
   - JB = ESTIMATED; POSSIBLY BIASED HIGH OR FALSE POSITIVE BASED ON BLANK CONTAMINATION
   - JQ = ESTIMATED; VALUE IS BETWEEN REPORTING LIMIT AND DETECTION LIMIT
   - JH = ESTIMATED; POSSIBLY BIASED HIGH BASED ON QC DATA
   - J = ESTIMATED; BASED ON QC DATA
   - JL = ESTIMATE; POSSIBLY BIASED LOW BASED ON QC DATA
4. DEFINITION OF POSTING SYMBOLS AND COLORS:
   - 12 - SUPPORTING MNA
   - 12 - FAVORABLE FOR MNA
   - 12 - NOT SUPPORTING MNA

   MNA - MONITORED NATURAL ATTENUATION
   NS - WELL NOT SAMPLED
   NA - PARAMETER RESULTS NOT AVAILABLE
   < - RESULT IS BELOW THE SAMPLE REPORTING LIMIT
5. DEFINITION OF ABBREVIATED ANALYTES AND REPORTING UNITS:
   - DO - DISSOLVED OXYGEN
   - NO_3 - NITRATE - NITROGEN (mg/L as N)
   - SO_4 - SULFATE
   - CO_2 - CARBON DIOXIDE
   - H_2 - DISSOLVED HYDROGEN
   - TOC - TOTAL ORGANIC CARBON
   - ALK - TOTAL ALKALINITY (mg/L as $CaCO_3$)
   - ORP - OXYGEN REDUCTION POTENTIAL
   - pH - NEGATIVE LOG OF THE HYDROGEN ION CONCENTRATION
   - Fe^{2+} - FERROUS IRON (mg/L)

   mg/L - MILLIGRAMS PER LITER
   mV - MILLIVOLTS
   nM - NANOMOLES PER LITER

ALL UNITS ARE IN mg/L EXCEPT ORP WHICH IS IN mV AND HYDROGEN WHICH IS IN nM.

0 100 200 300 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE

DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7 PARAMETERS

SELECTED MONITORED NATURAL ATTENUATION PARAMETERS - LOWER WATER BEARING UNIT - OCTOBER 2001-2002

OU 7 - FIRE TRAINING AREA GROUNDWATER

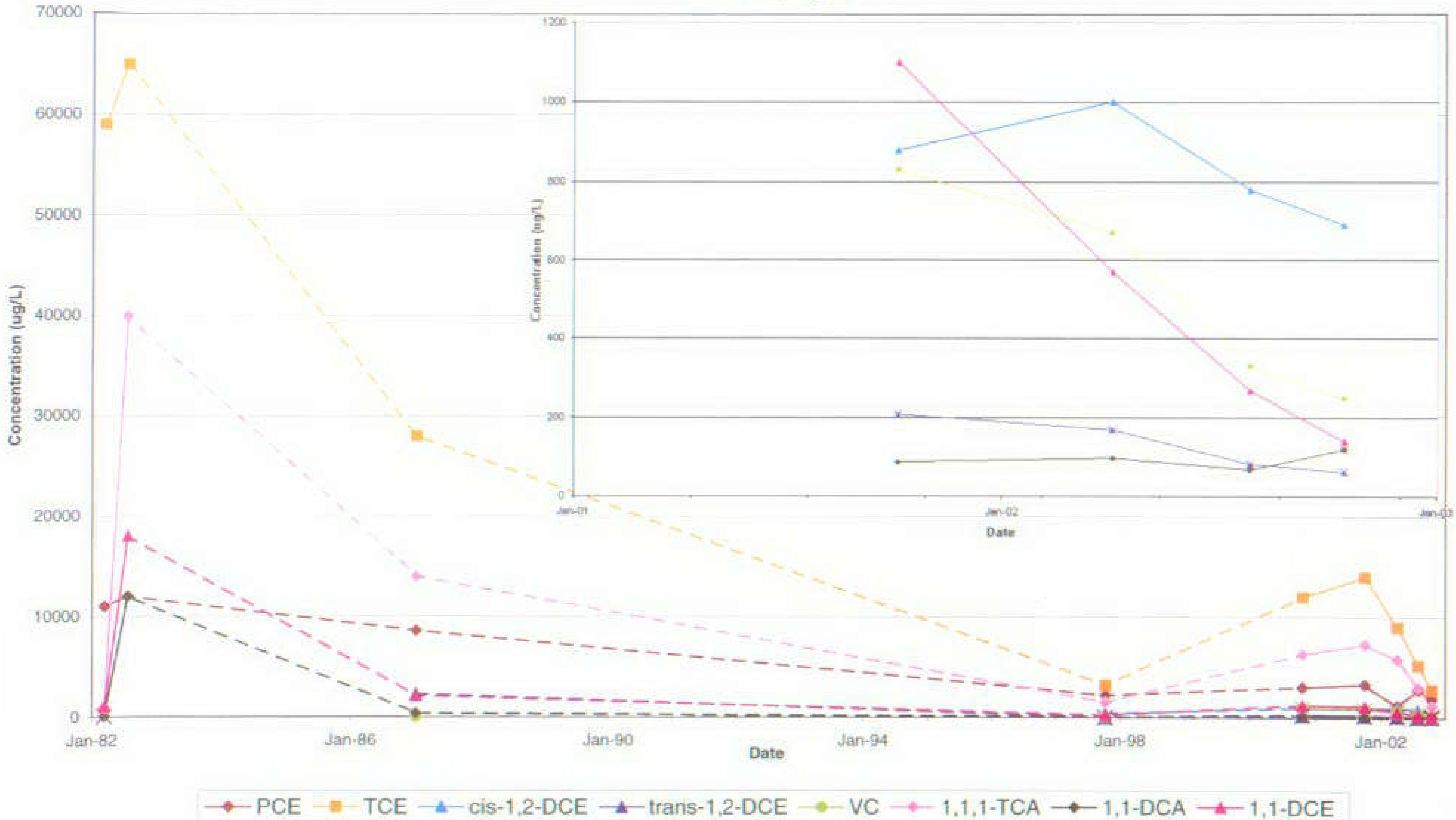
PREPARED BY: KAC	7/22/03	FIGURE NUMBER:	FILE DATE:	6/17/03
CHECKED BY: TLN	7/22/03	3-14	PLOT DATE:	7/31/03
PROJECT NO: 12001-2-0703			FILE NAME:	MNA_lo_OU7.mxd

FIGURES

FIGURE 4-1

AEHA-DG10 TIME SERIES GRAPH
OPERABLE UNIT 7 - UPPER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

FIGURE 4-2

DMW-20A TIME SERIES GRAPH
OPERABLE UNIT 7 - UPPER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

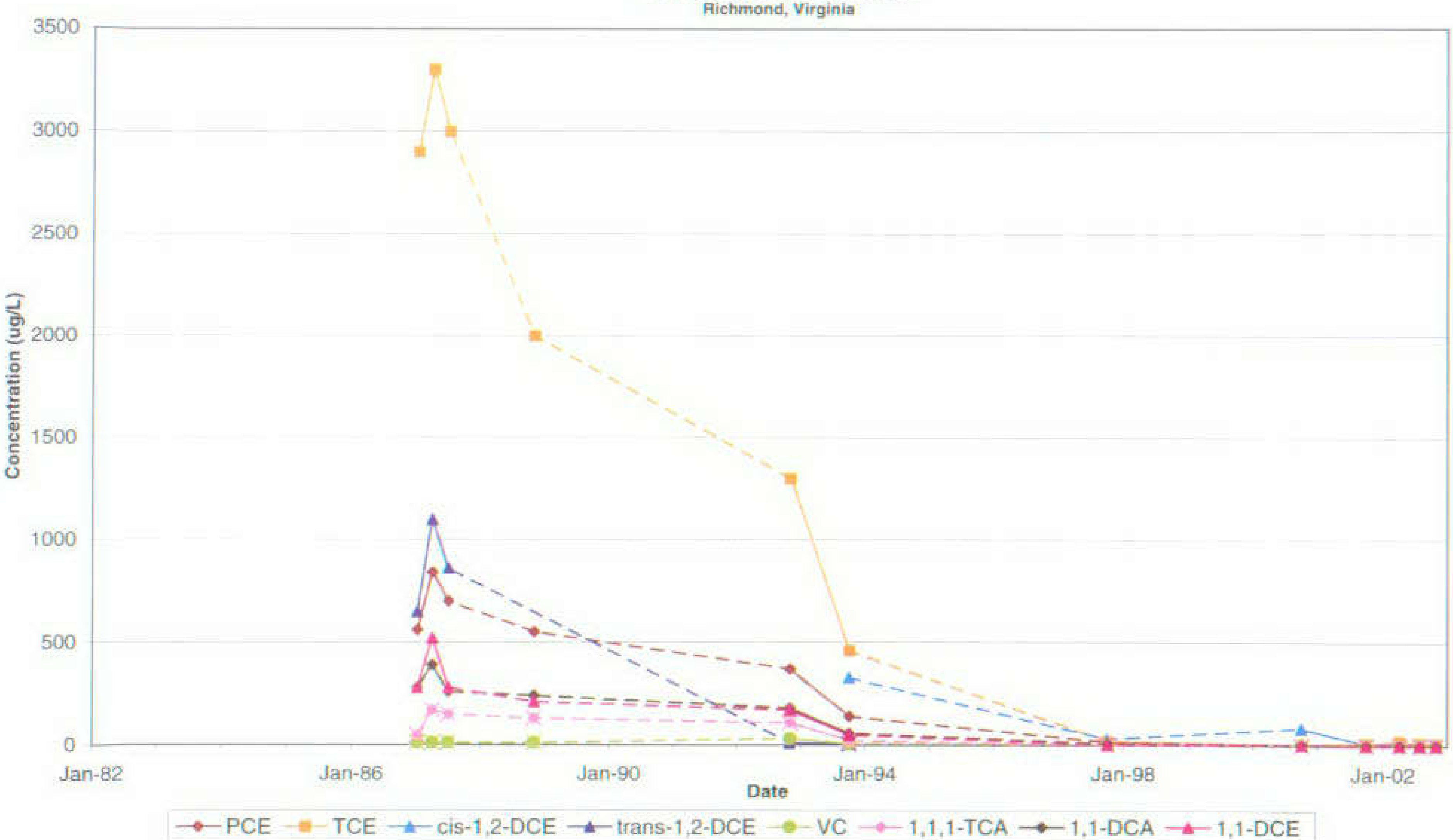
Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

704 142

FIGURE 4-3

DMW-22A TIME SERIES GRAPH
OPERABLE UNIT 7 - UPPER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

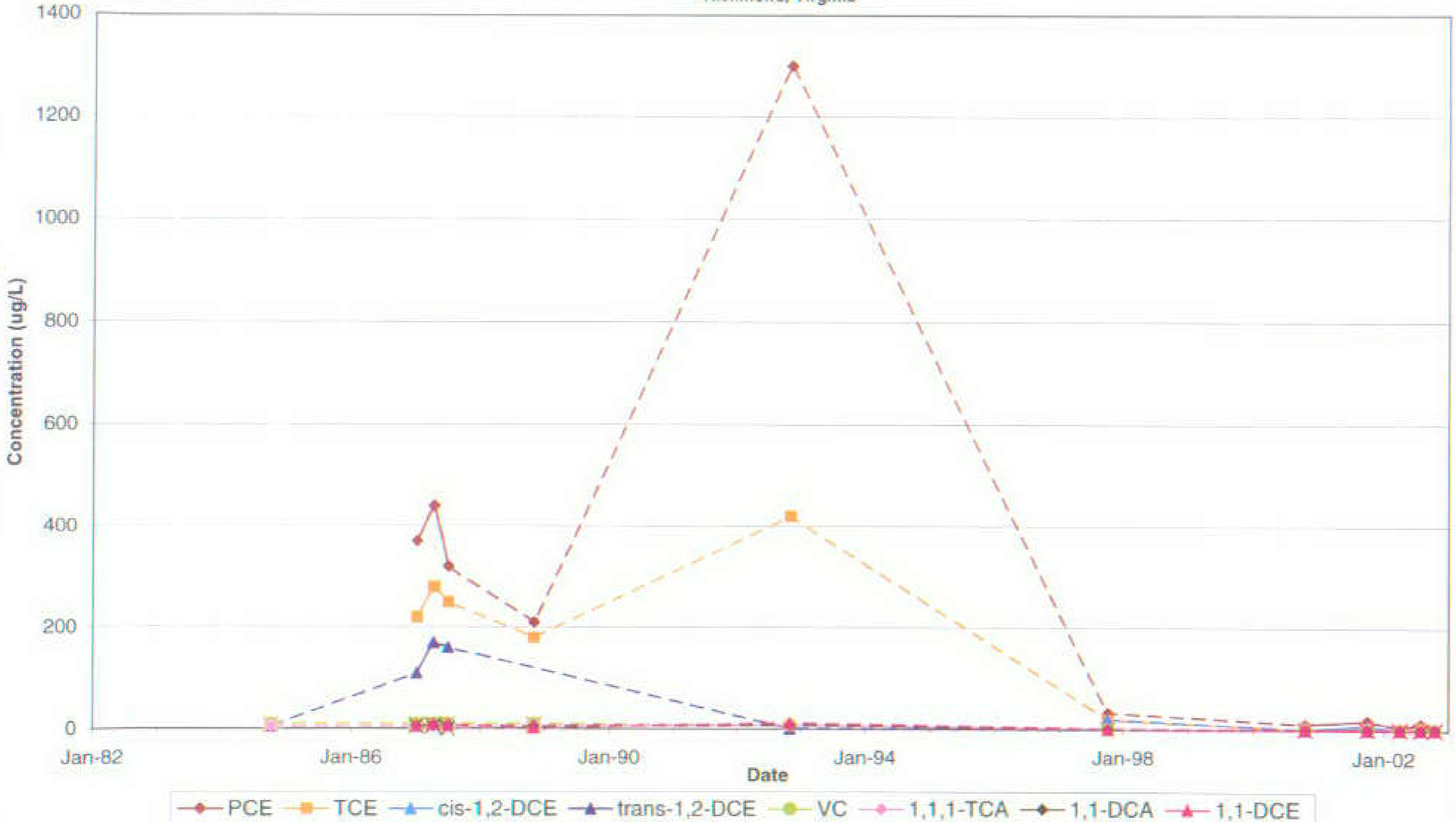
Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

704 143

FIGURE 4-4

DMW-25A TIME SERIES GRAPH
OPERABLE UNIT 7 - UPPER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



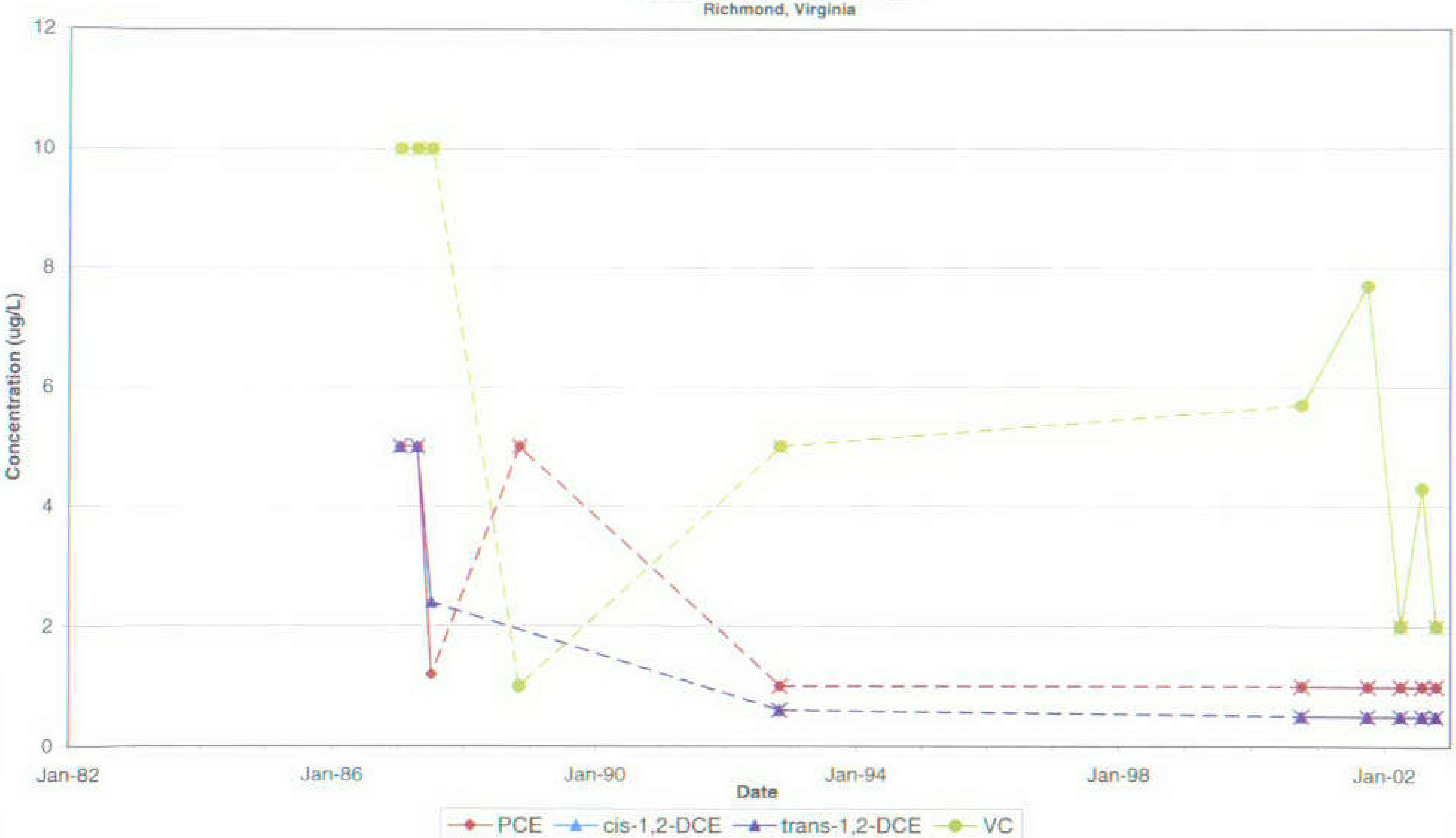
- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

FIGURE 4-5

DMW-27A TIME SERIES GRAPH
OPERABLE UNIT 7 - UPPER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

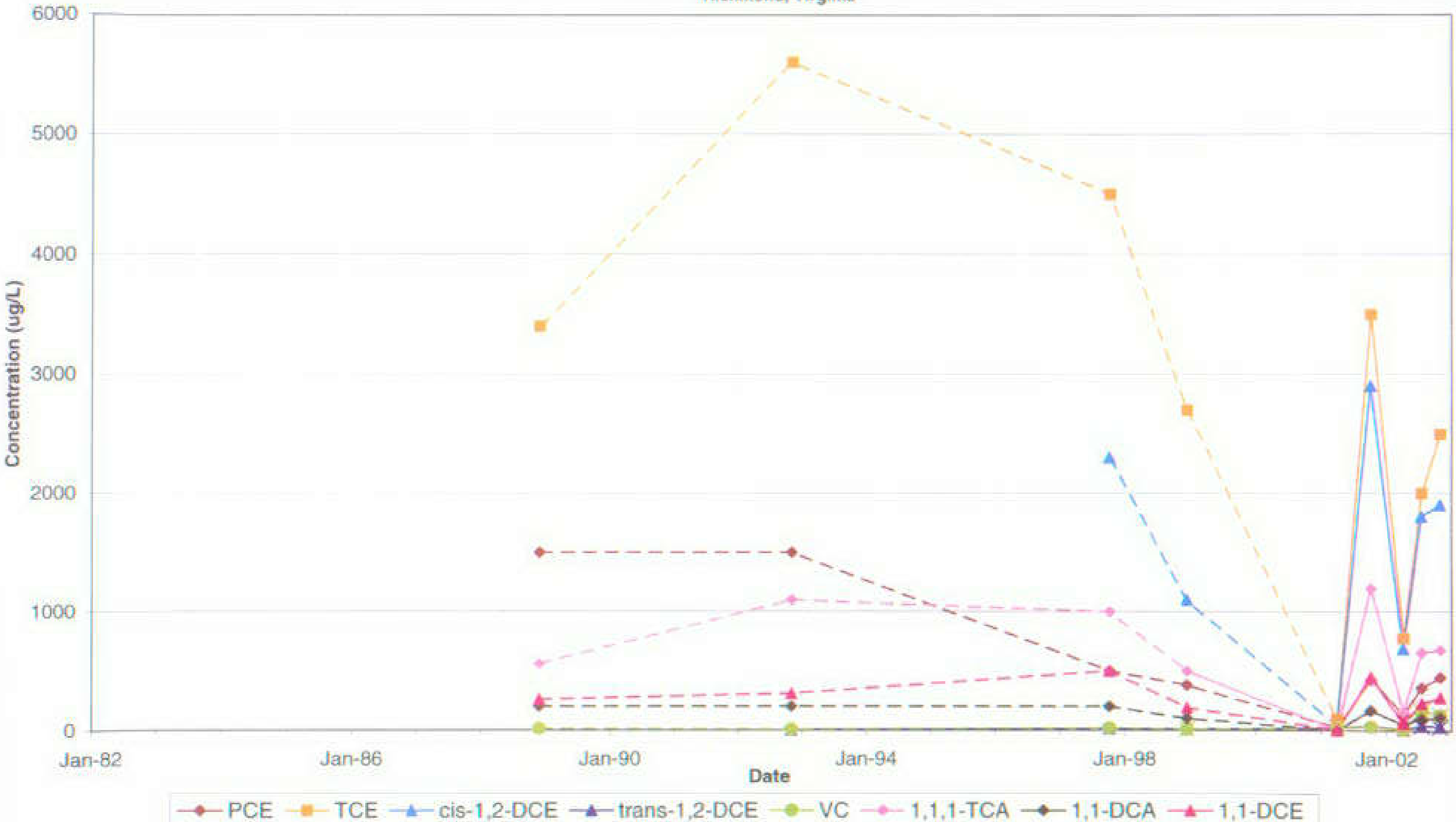
Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

704 145

FIGURE 4-6

DMW-33A TIME SERIES GRAPH
OPERABLE UNIT 7 - UPPER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

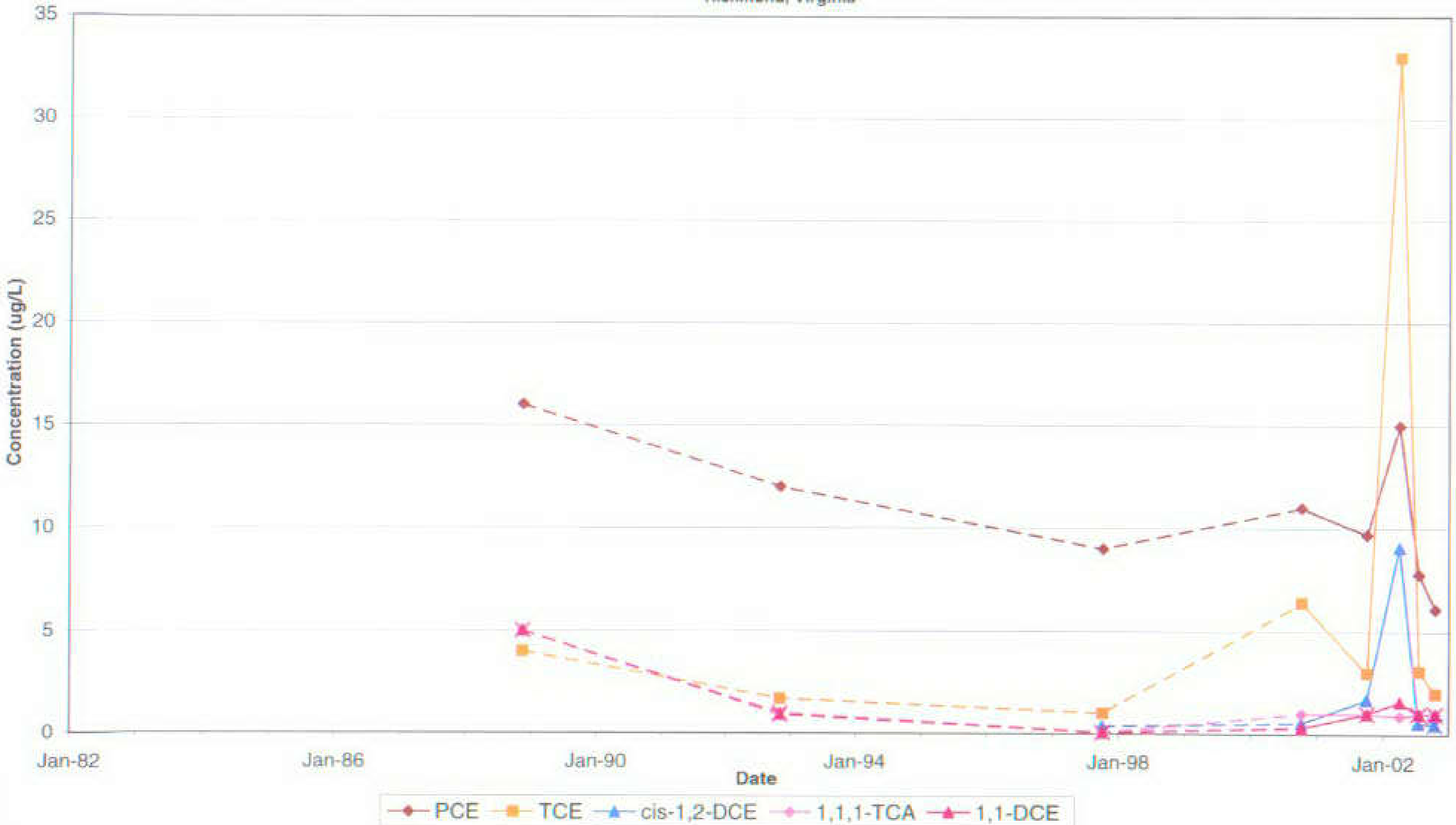
Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

704 146

FIGURE 4-7

DMW-35A TIME SERIES GRAPH
OPERABLE UNIT 7 - UPPER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

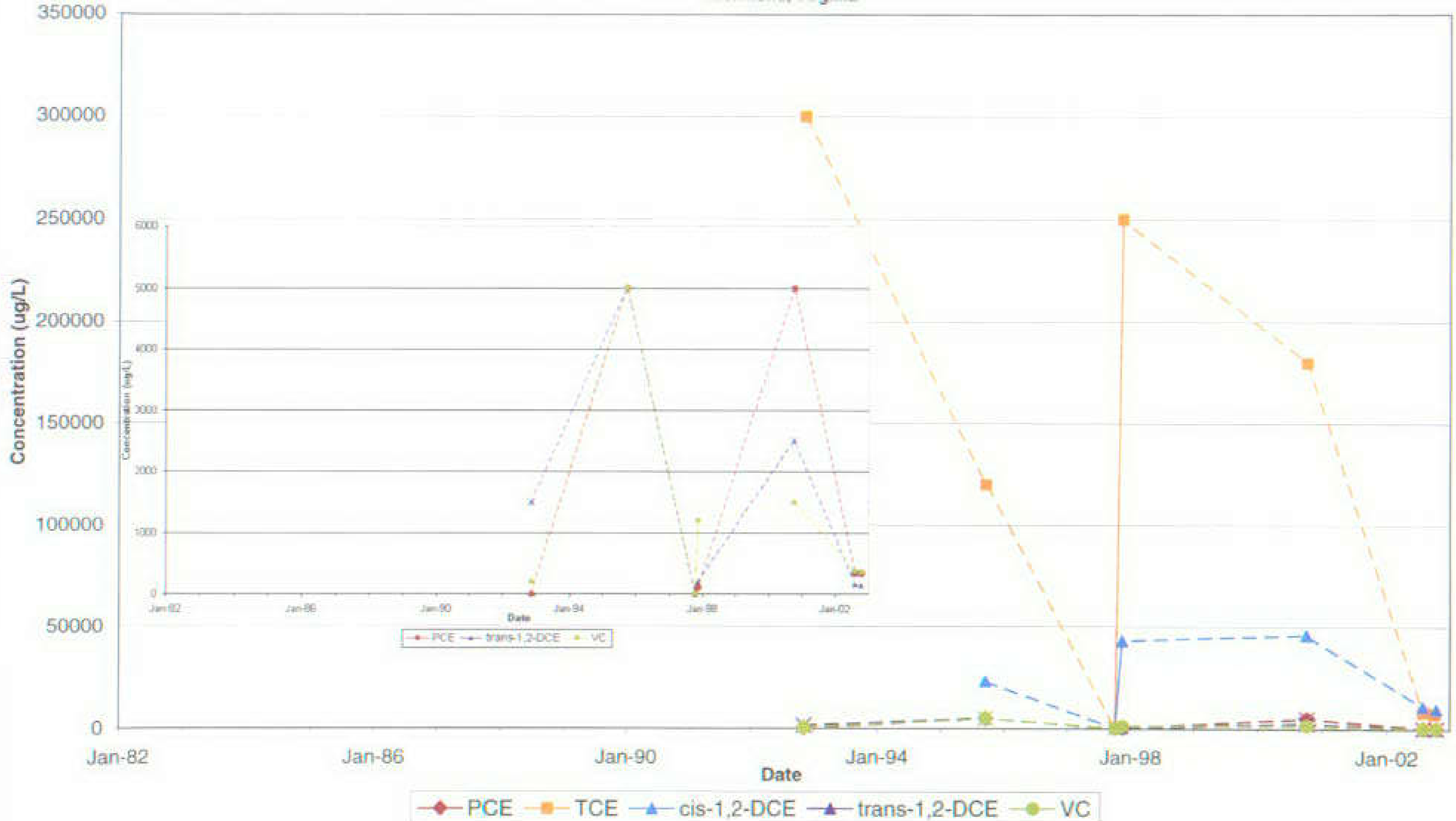
Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

704 147

FIGURE 4-8

MWFOS-3 TIME SERIES GRAPH
OPERABLE UNIT 7 - UPPER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

FIGURE 4-9

MWFTA-3 TIME SERIES GRAPH
OPERABLE UNIT 7 - UPPER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

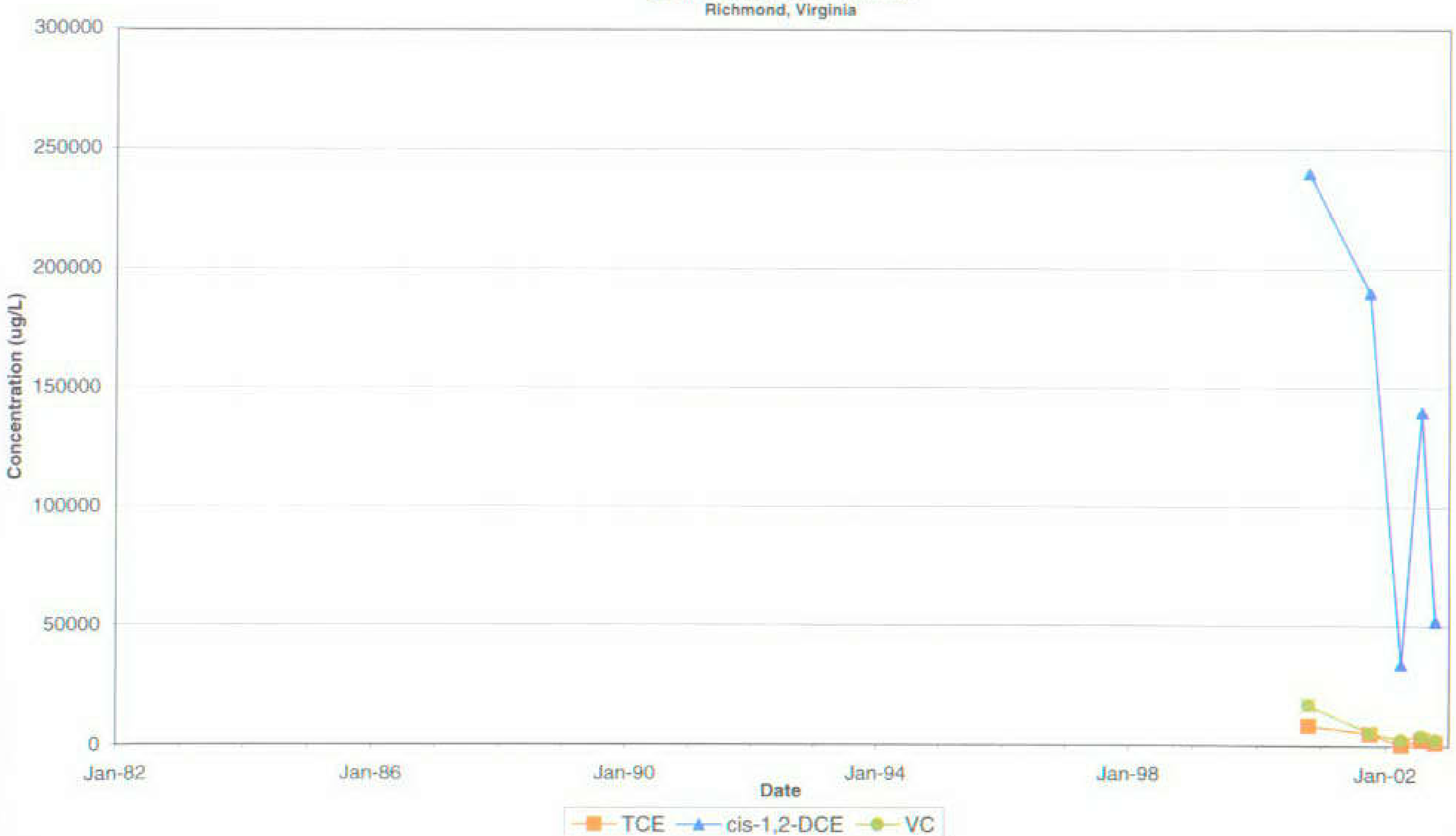
- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

704 149

FIGURE 4-10

MWFTA-23 TIME SERIES GRAPH
OPERABLE UNIT 7 - UPPER WBU
Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

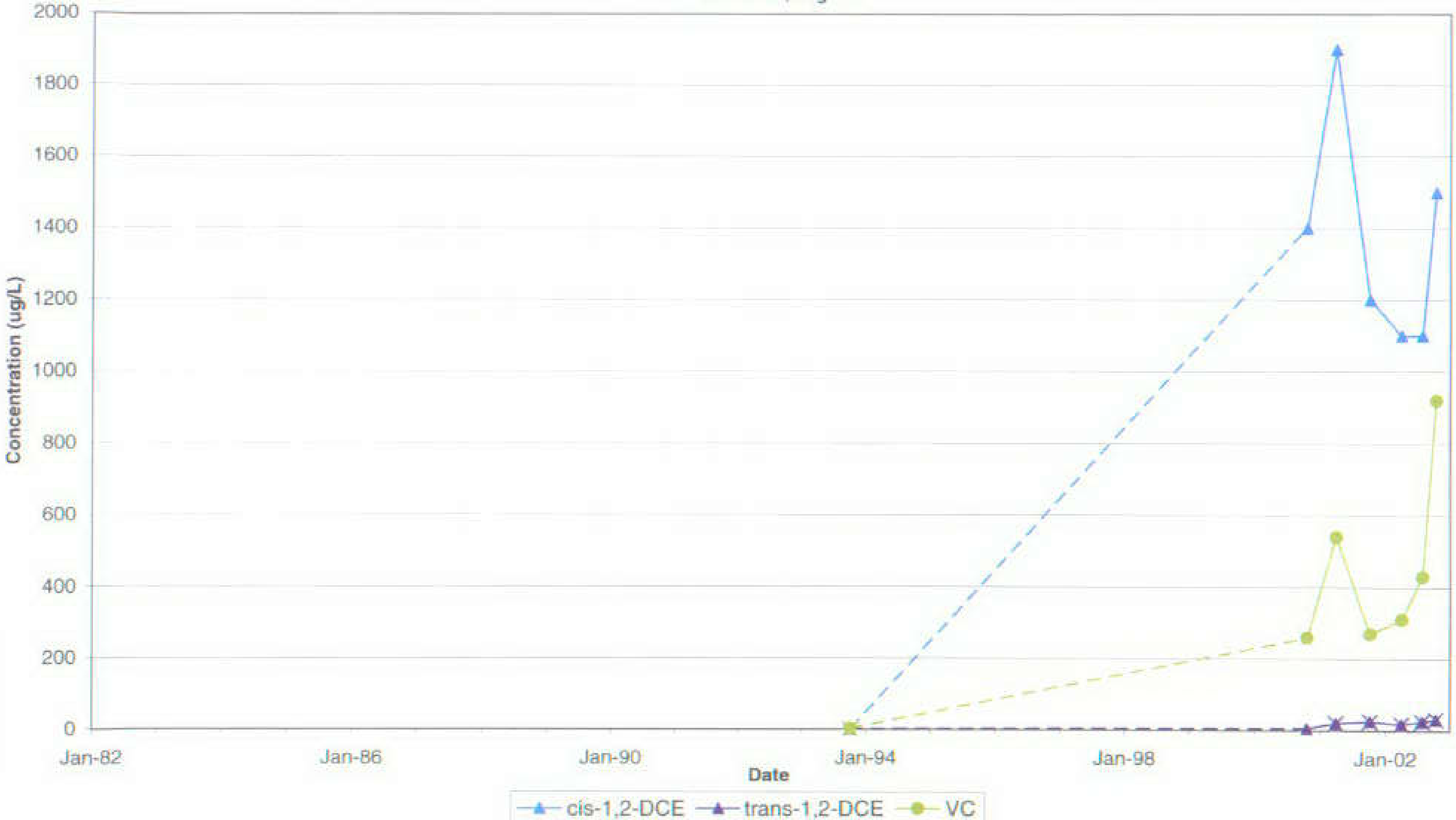
Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

704 150

FIGURE 4-11

MWFTA-16 TIME SERIES GRAPH
OPERABLE UNIT 7 -LOWER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

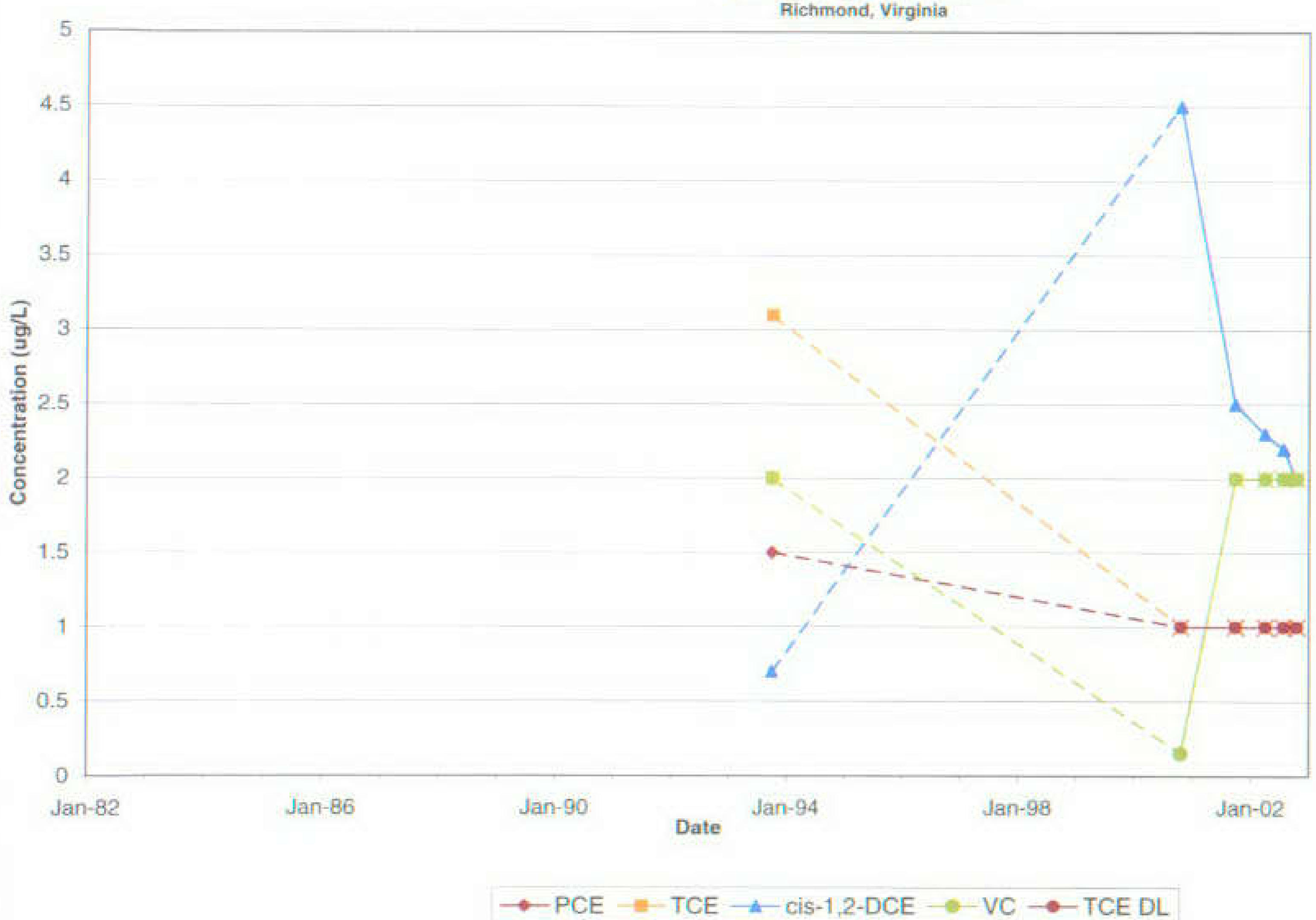
Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

704 151

FIGURE 4-12

MWFTA-18 TIME SERIES GRAPH
OPERABLE UNIT 7 - LOWER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



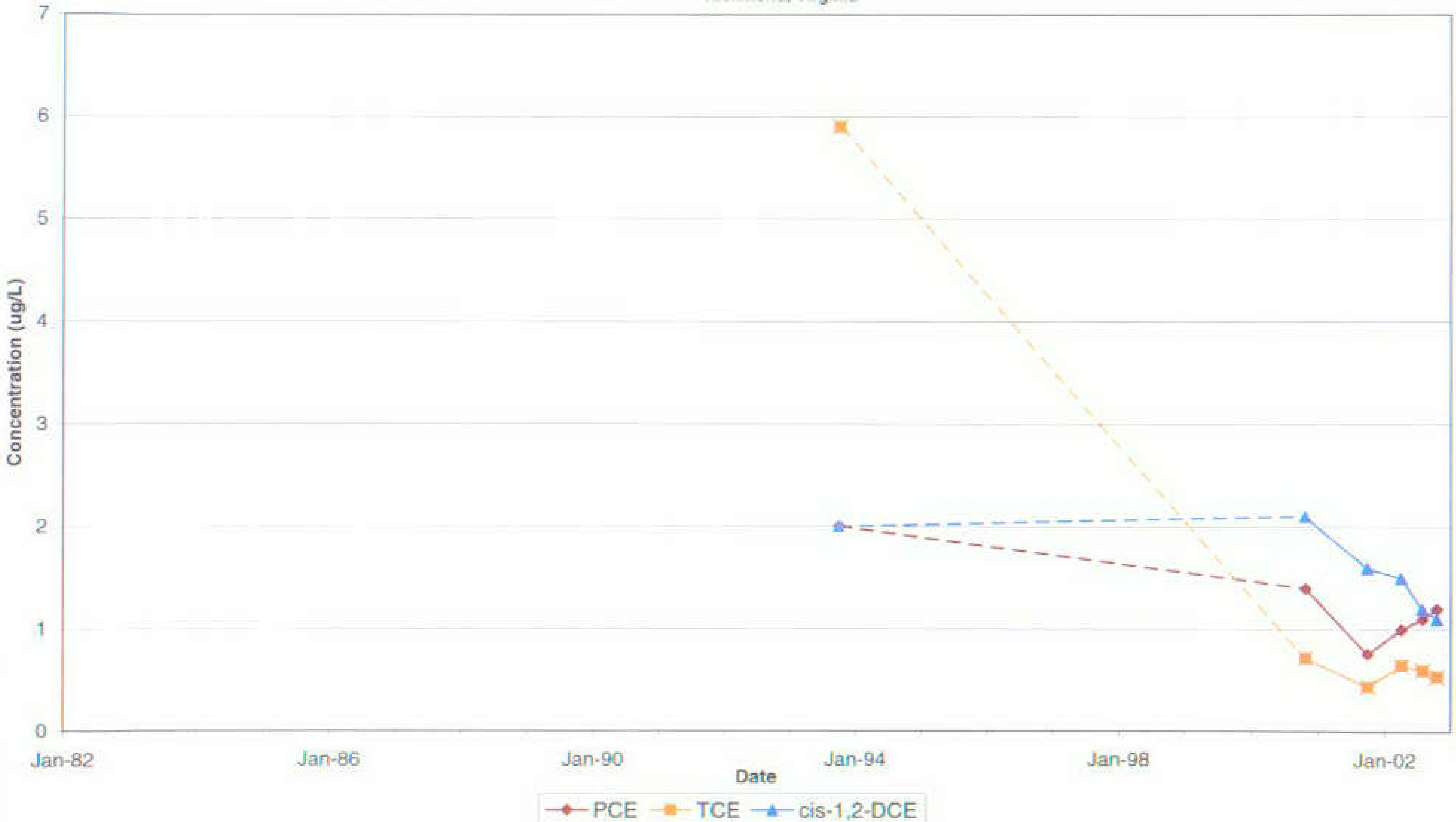
- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

FIGURE 4-13

MWFTA-19 TIME SERIES GRAPH
OPERABLE UNIT 7 - LOWER WBU

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



- - - indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

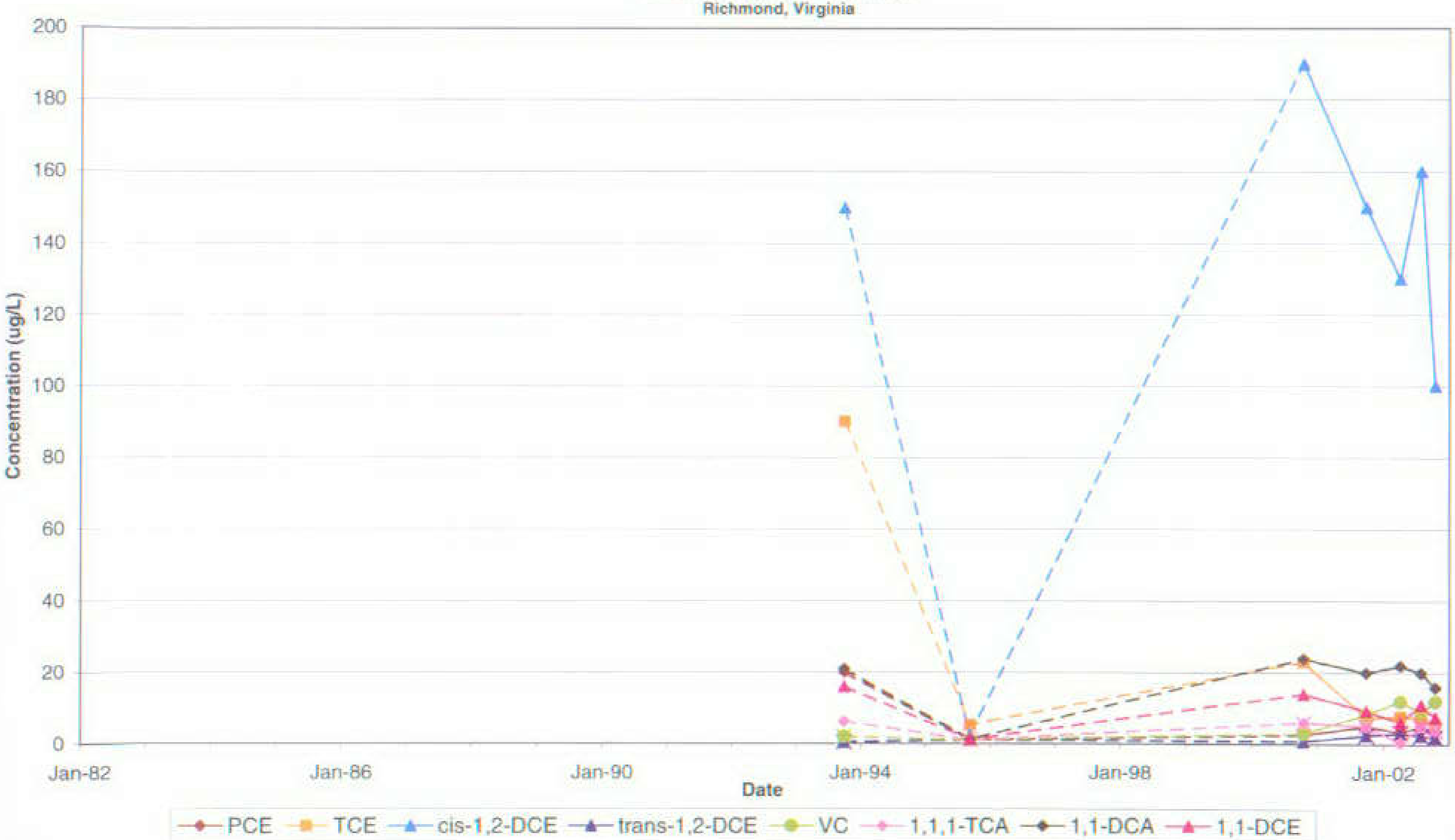
Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

704 153

FIGURE 4-14

MWFTA-20 TIME SERIES GRAPH
OPERABLE UNIT 7 - FRACTURED BEDROCK

Annual Groundwater Report - October 2002 - Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia



--- indicates data that is discontinuous for more than one year
x - indicates data plotted at the sample reporting limit

Prepared By: TLN 06/22/2003
Checked By: CMB 06/23/2003

704 154

TAB

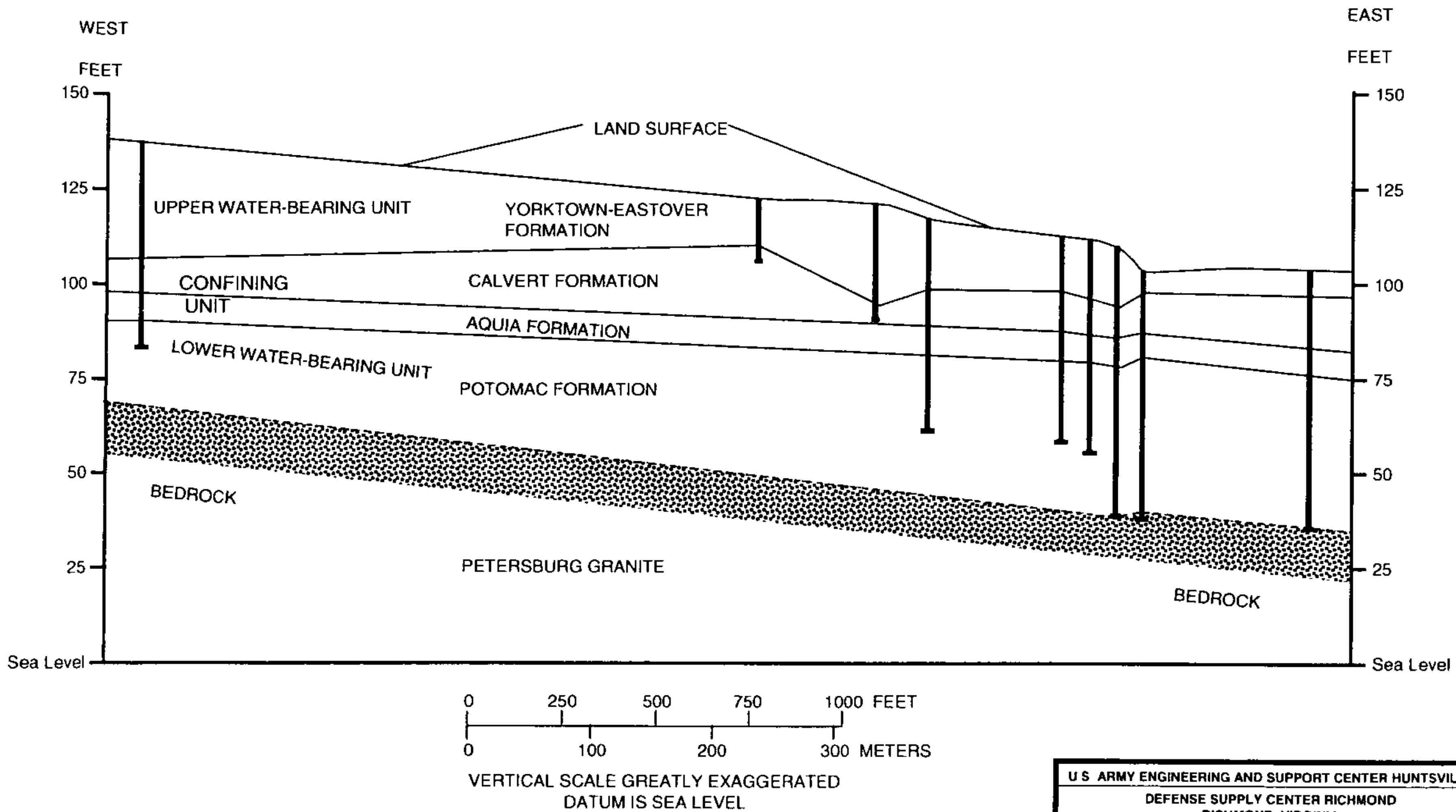
Appendix A

APPENDIX A: HYDROLOGIC DATA

TAB

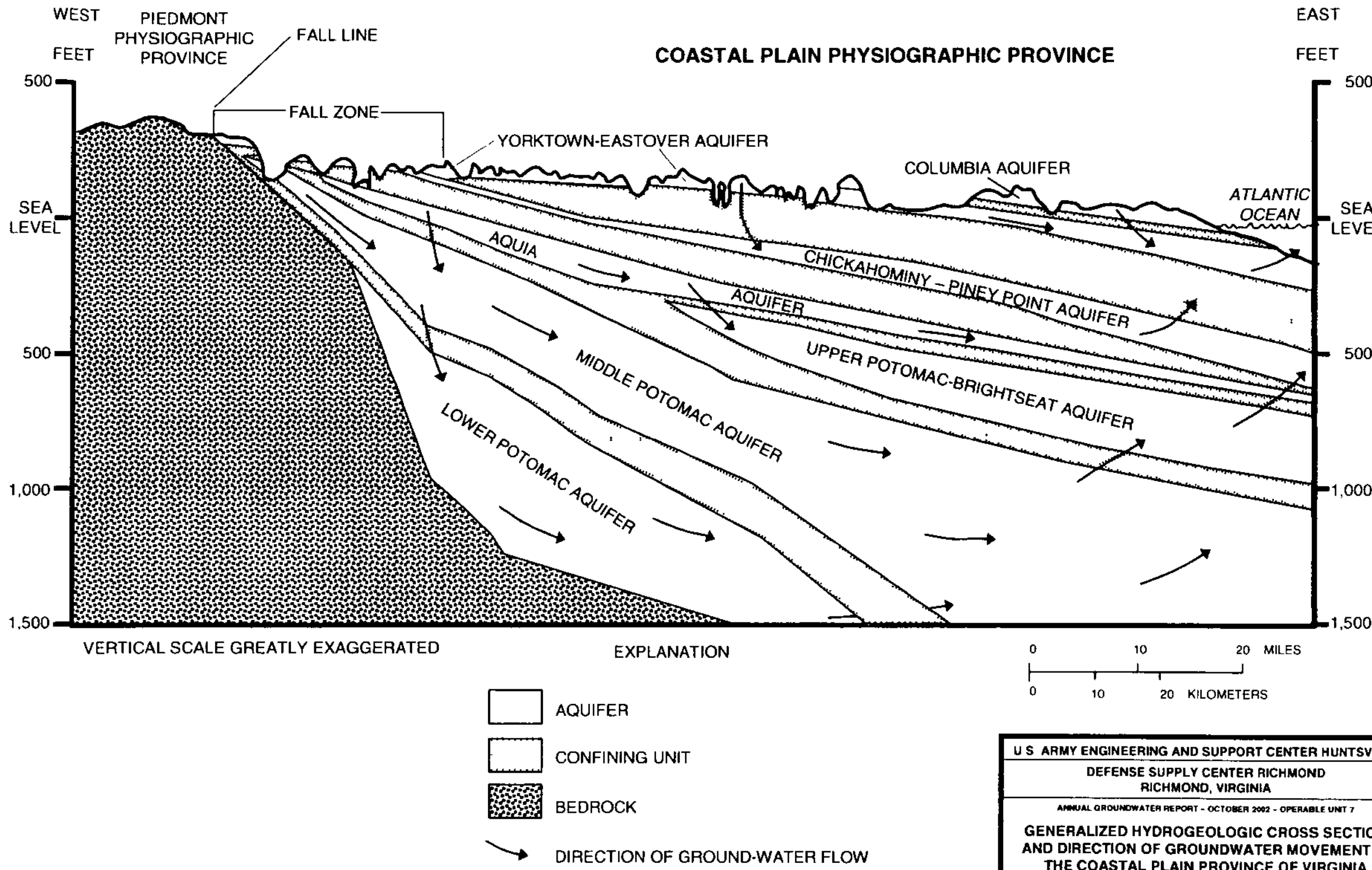
APPENDIX A FIGURES

APPENDIX A FIGURES



Source Powell *et al*, 1990

U S ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE		
DEFENSE SUPPLY CENTER RICHMOND, RICHMOND, VIRGINIA		
ANNUAL GROUNDWATER REPORT – OCTOBER 2002 – OPERABLE UNIT 7		
USGS 1990 INTERPRETATION OF GENERALIZED STRATIGRAPHY IN THE VICINITY OF DSCR		
OU 7 – FIRE TRAINING AREA GROUNDWATER		
Prepared By MET 07/30/03	FIGURE NUMBER	File Date 06/11/03
Checked By JDM 07/3-/03	A-1	Plot Date 06/30/03
Project No 12001 2 0701 6000 6009		File Name Regional Cross Section Figures.ppt



Source McFarland, 1997

U S ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE

DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7

GENERALIZED HYDROGEOLOGIC CROSS SECTION AND DIRECTION OF GROUNDWATER MOVEMENT IN THE COASTAL PLAIN PROVINCE OF VIRGINIA

OU 7 - FIRE TRAINING AREA GROUNDWATER

Prepared By MET 07/30/03	FIGURE NUMBER	File Date 06/11/03
Checked By JDM 07/30/03	A-2	Plot Date 06/30/03
Project No 12001 2 0701 6000 6009		File Name Regional Cross Section Figures.ppt

PERIOD	EPOCH	STRATIGRAPHIC FORMATION	HYDROGEOLOGIC UNITS	LITHOLOGY	LITHOLOGIC DESCRIPTIONS FOR DSCR
	RECENT	Recent Deposits/Fill Material	Unsaturated (Vadose) Zone		Clay, sand, silt, and gravel overlain by topsoil May contain fill material in some areas
TERTIRY	MIOCENE	Eastover Formation	Upper Water Bearing Unit		Interlayered beds of sand, silt, and clay with occasional gravel, rust or orange to yellowish brown and gray Contains a basal sand, and gravel layer
TERTIRY	MIOCENE	Calvert Formation	Confining Unit		Clay or silt and fine sand with clay Contains a basal sand and gravel unit Basal stratum contains sharks teeth and wood fragments.
TERTIRY	PALEOCENE	Aquia Formation	Confining Unit/Aquifer		Sand, fine to medium, fining upward, dark green Sometimes difficult to differentiate Calvert and Aquia Formations
CRETACEOUS	MIDDLE	Potomac Formation& Other Units	Lower Aquifer		Grayish green sand, medium to very coarse, interbedded with clay layers varying in thickness, occasional gravels
TRIASSIC, JURASSIC(?), PALEOZOIC AND PRECAMBRIAN		Petersburg Granite	Bedrock		Saprolite (weathered bedrock) biotite, amphibole, feldspar, and quartz mineral pieces in a clayey sand matrix May not be present throughout area
					Granite to granodiorite, and granitic gneiss

LEGEND

- IGNEOUS/METAMORPHIC ROCKS
- TRIASSIC ROCKS
- GRAVEL AND SAND
- FINE, MEDIUM, OR COARSE SAND
- CLAYEY SAND
- SANDY CLAY
- CLAY

Source Powell *et al*, 1990

U S ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE

DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7

1988 INTERPRETATION OF GENERALIZED STRATIGRAPHIC COLUMN IN THE VICINITY OF DSCR

OU 7 - FIRE TRAINING AREA GROUNDWATER

Prepared By MET 07/30/03	FIGURE NUMBER	File Date 06/11/03	
Checked By JDM 07/30/03	A-3	Plot Date 06/30/03	
Project No 12001 2-0701 6000 6009		File Name Regional Cross Section Figures ppt	

704 162

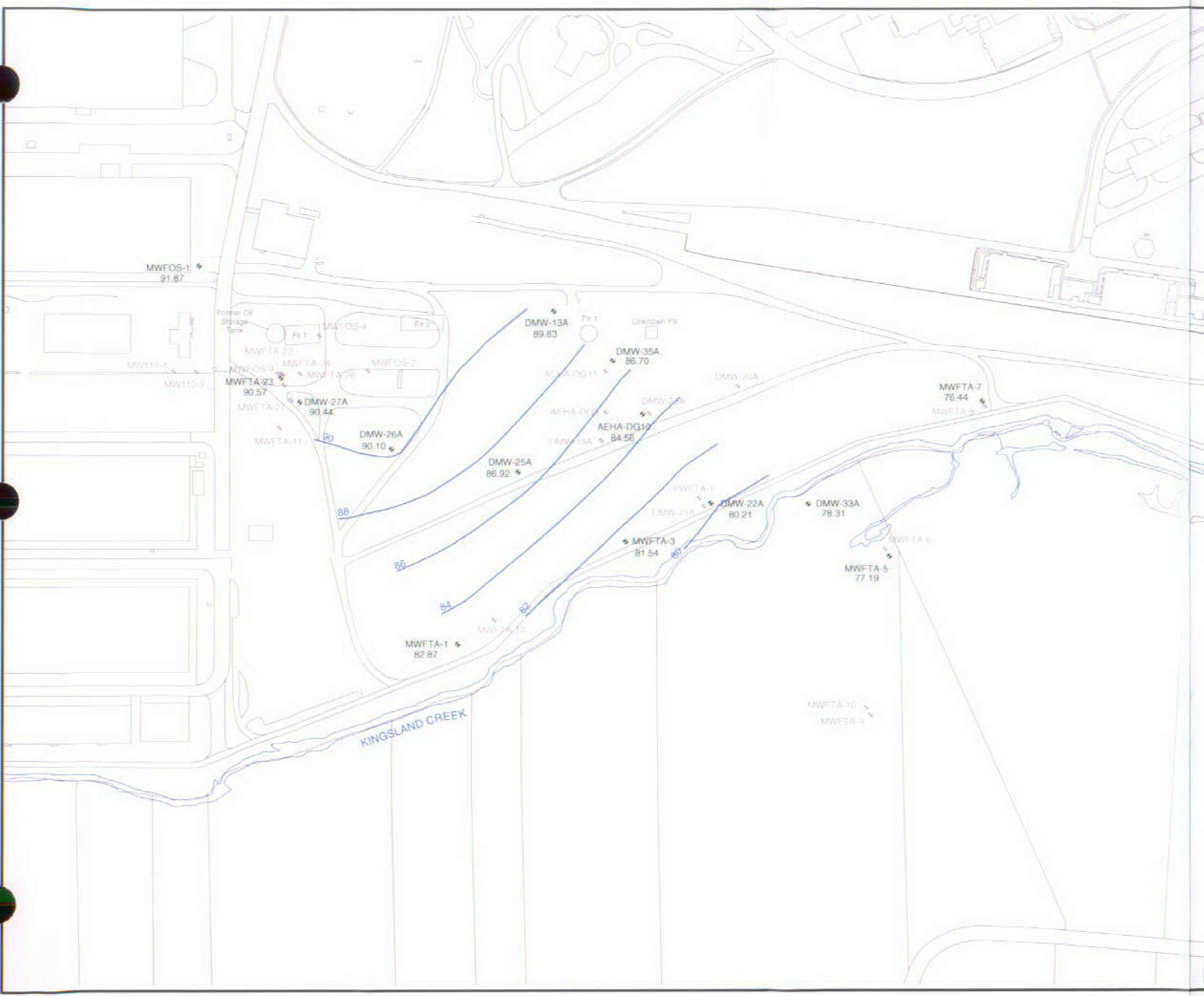
LEGEND:

- STREAMS
- DSCR BOUNDARY
- WETLAND LISTED IN NATIONAL WETLANDS INVENTORY (NWI)

N
W E
S

0 1,800 3,600 5,400

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE		
DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
ANNUAL GROUNDWATER REPORT - OCTOBER 2002 - OPERABLE UNIT 7 WETLANDS IN THE VICINITY OF DSCR OU 7 - FIRE TRAINING AREA GROUNDWATER		
PREPARED BY: CLC 7/7/03	FIGURE NUMBER:	FILE DATE: 05/14/03
CHECKED BY: JDM 7/7/03	A-1	PLOT DATE: 7/7/03



LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- POTENTIOMETRIC CONTOUR (FEET)
- EXTRAPOLATED POTENTIOMETRIC CONTOUR (FEET)
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
2. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969, RESPECTIVELY, AERIAL PHOTOGRAPHS.

0 200 400 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA
ANNUAL GROUNDWATER REPORT - OCTOBER 2002
POTENTIOMETRIC SURFACE MAP -
UPPER WATER BEARING UNIT - OCTOBER 2001
OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	7/11/03	FIGURE NUMBER:	FILE DATE: 5/22/03
CHECKED BY: TLN	7/11/03	A-5	PLOT DATE: 7/11/03
PROJECT NO: 12001-1-1632			FILE NAME: ou7u_pot_10-01.mxd

LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- POTENTIOMETRIC CONTOUR (FEET)
- EXTRAPOLATED POTENTIOMETRIC CONTOUR (FEET)
- KINGSLAND CREEK
- BASE MAP

NOTES:
1. WELL LOCATIONS BASED ON SURVEY PERFORMED BY RESOURCE INTERNATIONAL, INC., 1997, 2001.
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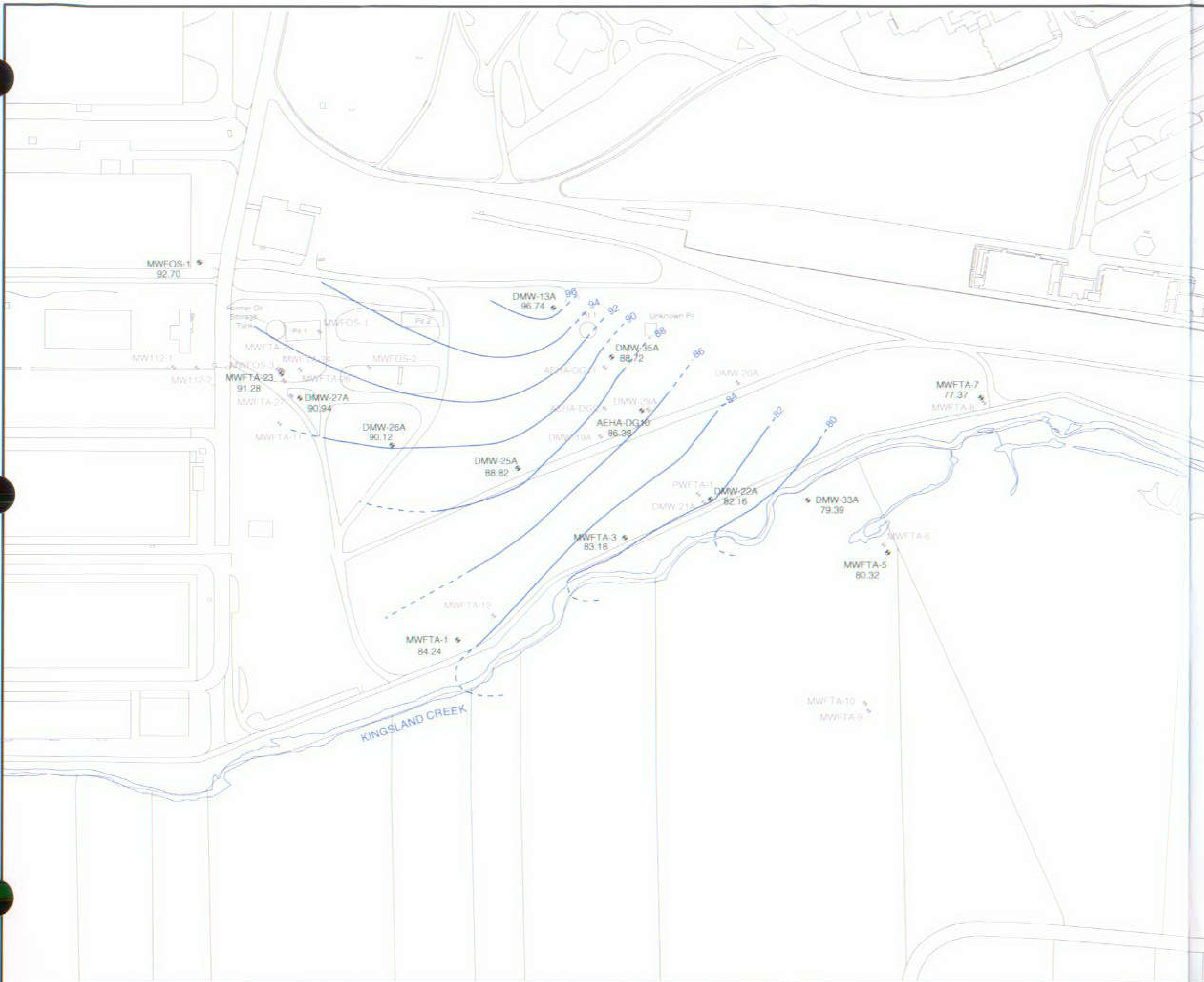
0 200 400 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA
ANNUAL GROUNDWATER REPORT - OCTOBER 2002
POTENTIOMETRIC SURFACE MAP -
LOWER WATER BEARING UNIT - OCTOBER 2001
OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	7/11/03	FIGURE NUMBER:	FILE DATE: 5/22/03
CHECKED BY: TLN	7/11/03	A-6	PLOT DATE: 7/11/03
PROJECT NO: 12001-1-1632			FILE NAME: ou7l_pot_10-01.mxd



LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- POTENTIOMETRIC CONTOUR (FEET)
- EXTRAPOLATED POTENTIOMETRIC CONTOUR (FEET)
- KINGSLAND CREEK
- BASE MAP

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0 200 400 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA
ANNUAL GROUNDWATER REPORT - OCTOBER 2002
POTENTIOMETRIC SURFACE MAP -
UPPER WATER BEARING UNIT - APRIL 2002
OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	7/10/03	FIGURE NUMBER:	FILE DATE:	5/22/03
CHECKED BY: TLN	7/11/03	A-7	PLOT DATE:	7/10/03
PROJECT NO: 12001-1-1632			FILE NAME:	ou7u_pot_04-02.mxd

LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- POTENTIOMETRIC CONTOUR (FEET)
- EXTRAPOLATED POTENTIOMETRIC CONTOUR (FEET)
- KINGSLAND CREEK
- BASE MAP

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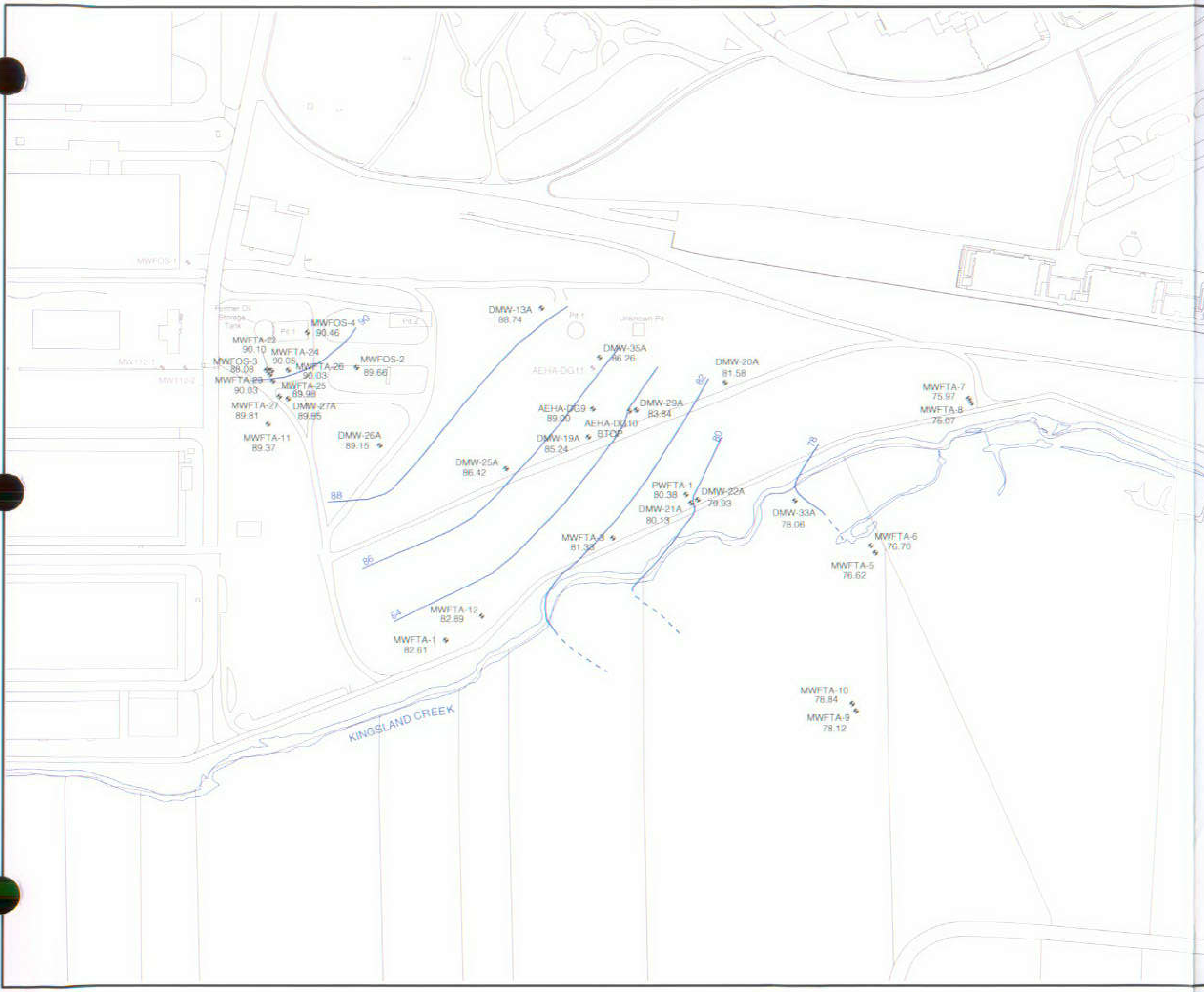
0 200 400 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA
ANNUAL GROUNDWATER REPORT - OCTOBER 2002
POTENTIOMETRIC SURFACE MAP -
LOWER WATER BEARING UNIT - APRIL 2002
OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	7/10/03	FIGURE NUMBER:	FILE DATE: 5/22/03
CHECKED BY: TLN	7/11/03	A-8	PLOT DATE: 7/10/03
PROJECT NO: 12001-1-1632			FILE NAME: ou7l_pot_04-02.mxd



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W E
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LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- POTENTIOMETRIC CONTOUR (FEET)
- EXTRAPOLATED POTENTIOMETRIC CONTOUR (FEET)
- KINGSLAND CREEK
- BASE MAP

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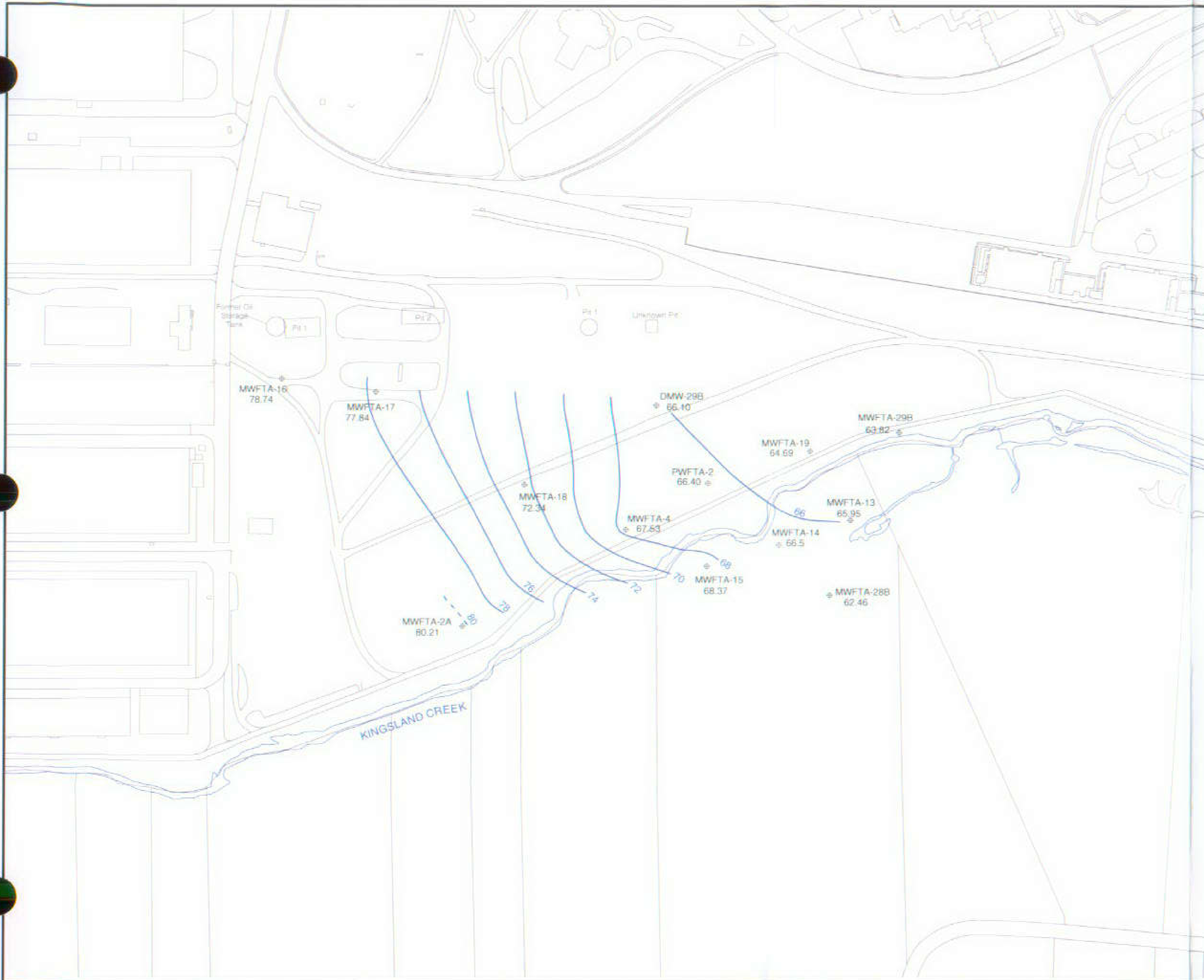
2. THE UNKNOWN PIT, PIT 1, PIT 2, AND PIT 3 ARE APPROXIMATE LOCATIONS AND WERE DIGITIZED FROM THE 1965, 1975, 1972, AND 1969, RESPECTIVELY, AERIAL PHOTOGRAPHS.
3. BTOP = BELOW TOP OF PUMP

0 200 400 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT - OCTOBER 2002
POTENTIOMETRIC SURFACE MAP -
UPPER WATER BEARING UNIT - JULY 2002
OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	7/10/03	FIGURE NUMBER:	FILE DATE: 5/22/03
CHECKED BY: TLN	7/11/03	A-9	PLOT DATE: 7/10/03
PROJECT NO: 12001-1-1632			FILE NAME: ou7u_pot_07-02.mxd



LEGEND:
- MONITORING WELL - SAMPLED
- MONITORING WELL - NOT SAMPLED
- POTENTIOMETRIC CONTOUR (FEET)
- EXTRAPOLATED POTENTIOMETRIC CONTOUR (FEET)
- KINGSLAND CREEK
- BASE MAP

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0 200 400 Feet

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE

DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

ANNUAL GROUNDWATER REPORT - OCTOBER 2002

POTENTIOMETRIC SURFACE MAP -
LOWER WATER BEARING UNIT - JULY 2002

OU 7 - FIRE TRAINING AREA GROUNDWATER

PREPARED BY: KAC	7/10/03	FIGURE NUMBER:	FILE DATE:	5/22/03
CHECKED BY: TLN	7/11/03	**A-10**	PLOT DATE:	7/10/03
PROJECT NO: 12001-1-1632			FILE NAME:	ou7l_pot_07-02.mxd

TAB

APPENDIX A TABLE

APPENDIX A TABLE

TABLE A-1

VALUES OF HYDRAULIC PARAMETERS
ESTIMATED FROM RESULTS OF AQUIFER TESTS
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Hydrogeologic Unit	Range in OU 6	Range in OU 7	Range in OU 8
	Transmissivity (ft²/day[a])		
Upper Water-Bearing	10 – 165 (1)	10 (2)	80 – 500 (3),(4)
Confining Layer	NA[b]	NA	0 035 (3)
Lower Water-Bearing	68 – 115 (1)	0 3 – 25 (2)	110 – 275 (3)
	Average Thickness of Unit (ft[c])		
Upper Water-Bearing	12 (1),(3),(5)	16 (2),(6),(7)	15 (3),(4)
Confining Layer	15 (1),(3),(5)	6 – 10 (2),(6),(7)	18 (4)
Lower Water-Bearing	30 (1),(3),(5)	30 (2),(6),(7)	15 – 40 (3),(4)
	Estimated Horizontal Hydraulic Conductivity (ft/day[d])		
Upper Water-Bearing	0 8 – 14 (1)	0 22 – 6 (7),(8)	6 (3),(4)
Confining Layer	NA	NA	0 005 (3)
Lower Water-Bearing	2 3 – 3 8 (8)	0 0005 – 0 97 (7),(8)	7 3 – 18.3 (3)
	Estimated Vertical Hydraulic Conductivity (ft/day)		
Upper Water-Bearing	NA	0 025 – 0 6 (7),(9)	NA
Confining Layer	NA	NA	0 00027 – 0 028 (3)
Lower Water-Bearing	NA	0 00005 – 0 097 (7),(9)	0 73 – 1 83 (3)
	Storage Coefficient ( )		
Upper Water-Bearing	0 0025 – 0 013 (1)	NA	0 01 – 0 40 (3),(4)
Confining Layer	NA	NA	0 00000002 (3)
Lower Water-Bearing	0 0009 – 0 071 (1)	0 0046 (2)	0 00002 – 0 00003 (3)
	Horizontal Hydraulic Gradient (ft/ft[e])		
Upper Water-Bearing		0 004 – 0 03	
Confining Layer		NA	
Lower Water-Bearing		0 009	

[a] ft²/day – square feet per day
[b] NA – parameter is not available
[c] ft – feet
[d] ft/day – feet per day

TABLE A-1

VALUES OF HYDRAULIC PARAMETERS ESTIMATED FROM RESULTS OF AQUIFER TESTS
Annual Groundwater Report – October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Transmissivity (ft^2/day[a])		
Hydrogeologic Unit	**Range in OU 6**	**Range in OU 7**	**Range in OU 8**
		Vertical Hydraulic Gradient (ft/ft[c])	
Upper Water-Bearing / Lower Water-Bearing		0 03 - 2 6	
Confining Layer /Lower Water-Bearing		NA	
Lower Water-Bearing / Bedrock		NA	
		Groundwater Velocity (ft/day[c])	
Upper Water-Bearing		0 0064 - 0.79	
Confining Layer		NA	
Lower Water-Bearing		$1\ 1 \times 10^{-5}$ - 1.8×10^{-4}	

Notes:

Sources of Information
(1) Law (2000)
(2) ES (1994)
(3) Powell et al (1990)
(4) Law (1996a)
(5) Dames & Moore, Inc (1989a).
(6) Dames & Moore, Inc (1989b)
(7) Law (2002).
(8) Hydraulic conductivity estimated as the quotient of transmissivity divided by saturated thickness of transmissive unit
(9) Vertical hydraulic conductivity in each water-bearing unit assumed (LAW, 2002) to be one-tenth the value of horizontal hydraulic conductivity in that unit

PREPARED/DATE MAV 07/31/03
CHECKED/DATE TLN 07/31/03

[c] ft/ft – feet per feet

TAB

APPENDIX A - PUMPING TEST RESULTS

APPENDIX A
PUMPING TEST RESULTS
SOURCE: ENGINEERING SCIENCE – 1993 – REMEDIAL INVESTIGATION FIELD WORK – FIRE TRAINING AREA

FIGURE D.4

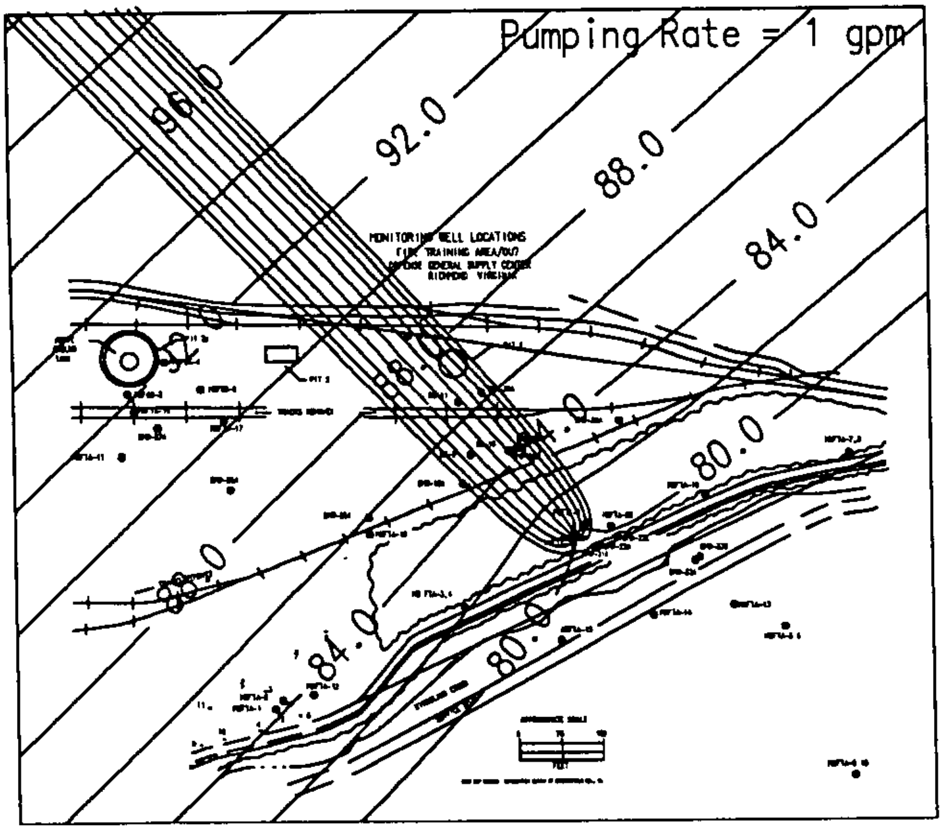

Pumping Rate = 1 gpm
96.0
92.0
88.0
84.0
80.0
84.0
80.0
MONITORING WELL LOCATIONS

FIGURE D.5

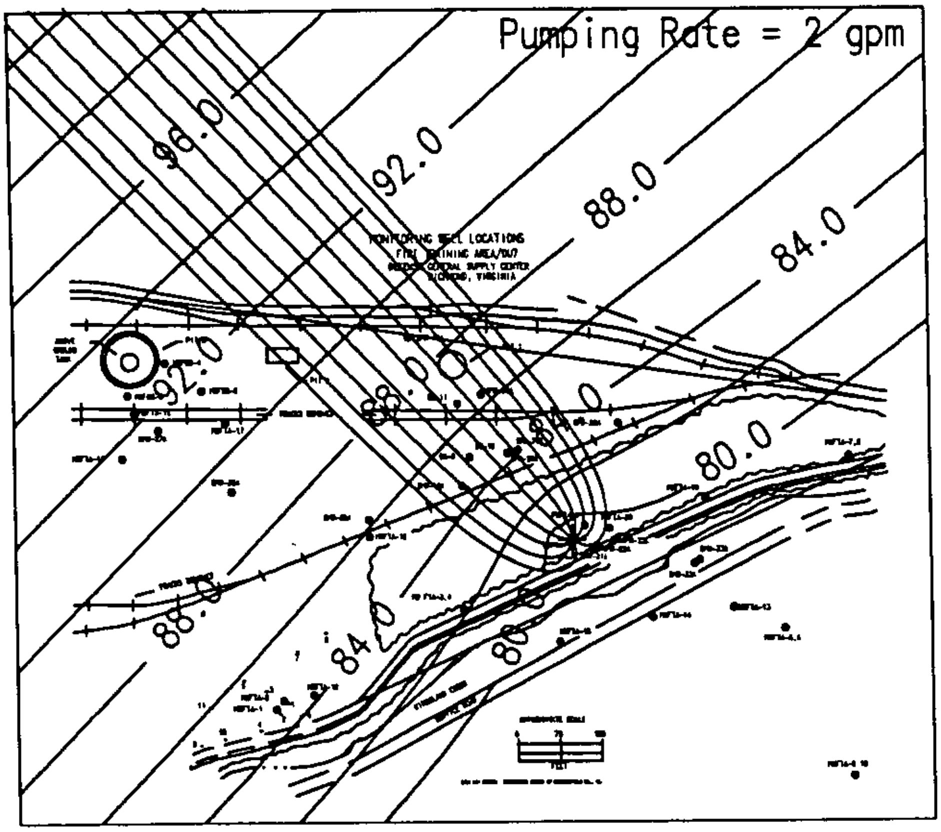
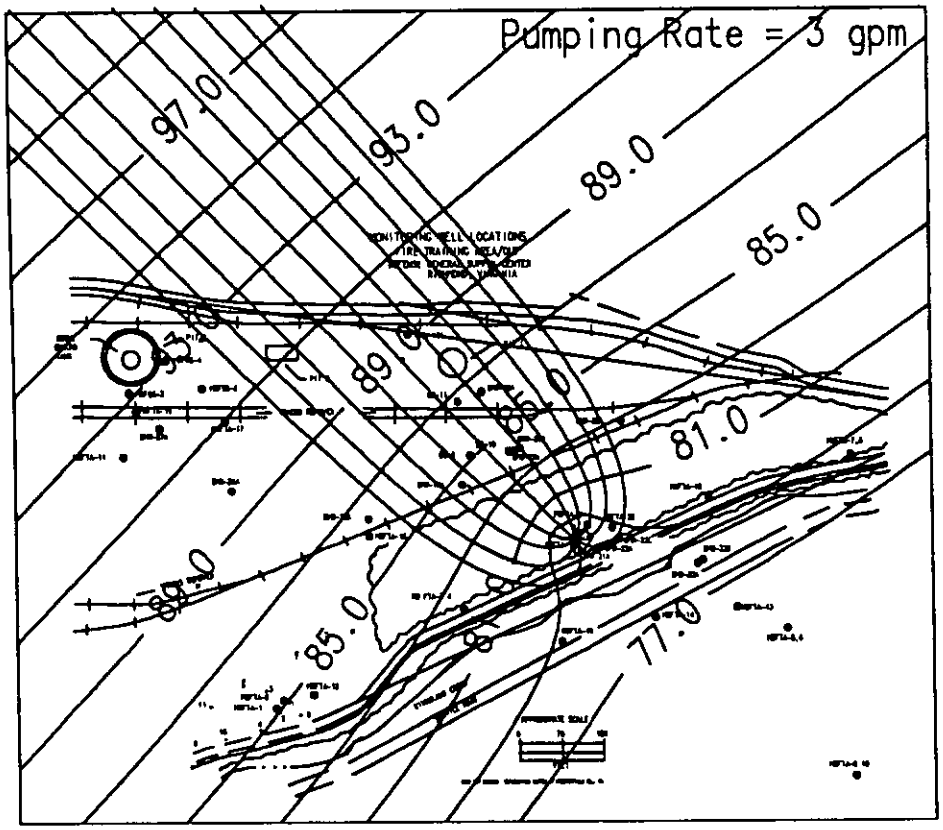
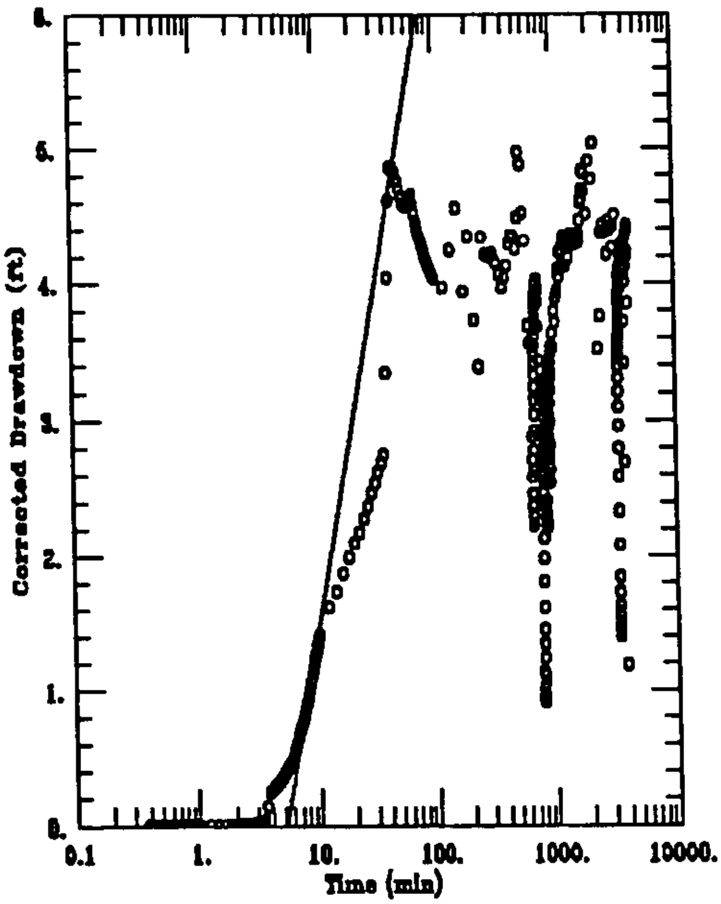


FIGURE D.6



Engineering-Science, Inc.	Client: DGSC
Project No.: FB570.07	Location: FTA (OU7)

PWFTA-1 (Pumping)



DATA SET:
pw1p.
11/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
12-Oct-93..15-Oct-93

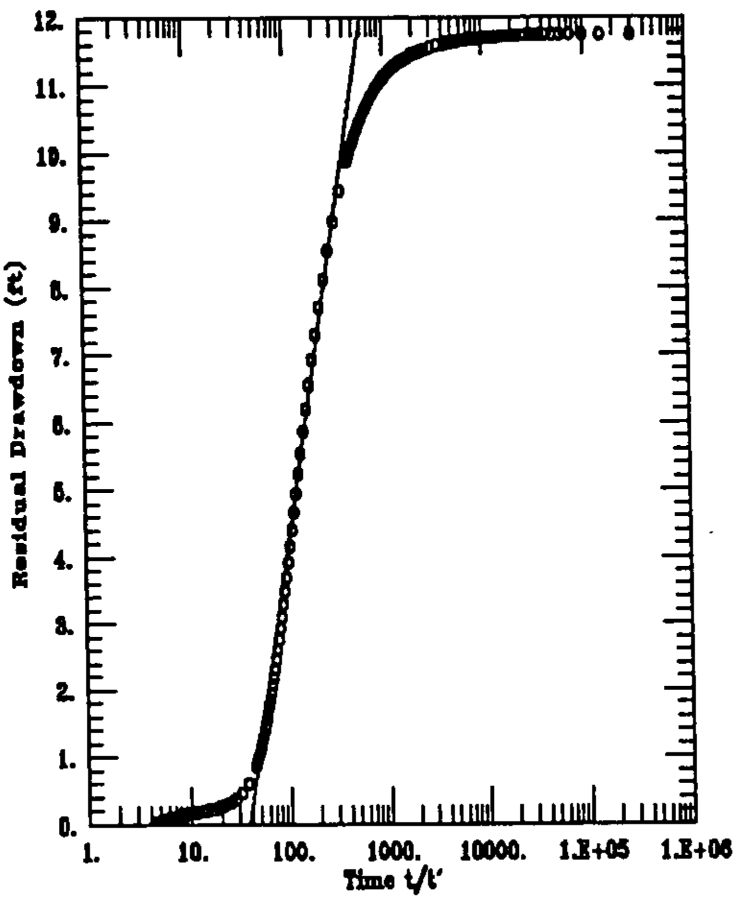
TEST WELL:
PWFTA-1

ESTIMATED PARAMETERS:
T = 0.01442 ft^2/min

TEST DATA:
Q = 0.4011 ft^3/min
r = 0.1 ft
rc = 0.33 ft
rw = 0.83 ft

Engineering-Science, Inc.	Client: DGSC
Project No.: FB570.07	Location: FTA (OU7)

PWFTA-1 (Recovery)



DATA SET:
pw1r.
11/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Theis Recovery

TEST DATE:
15-Oct-93

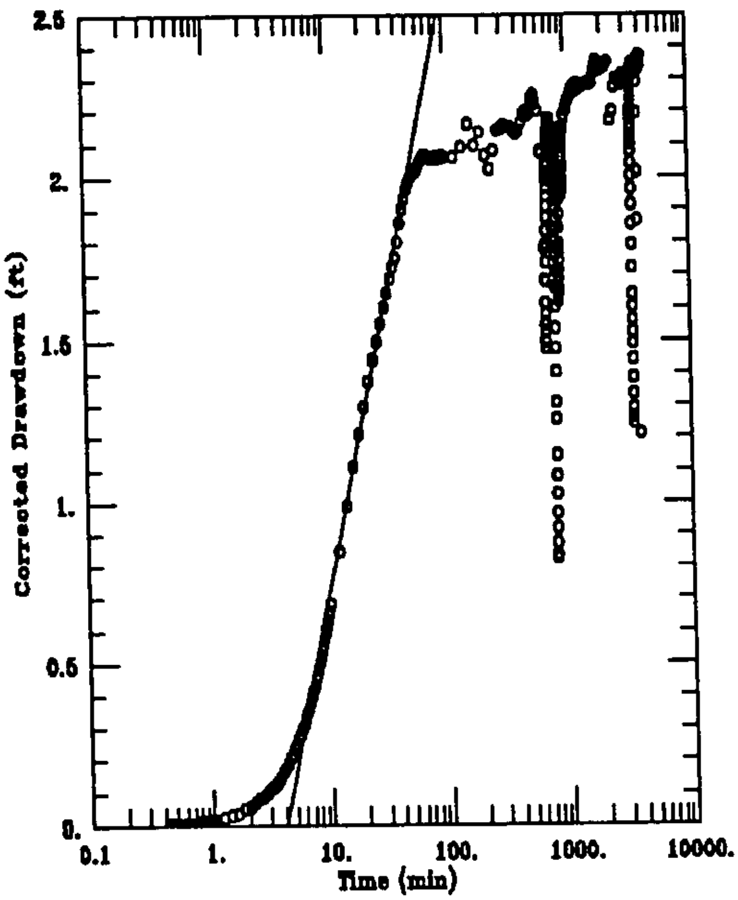
TEST WELL:
PWFTA-1

ESTIMATED PARAMETERS:
T = 0.007357 ft^2/min
S' = 38.1

TEST DATA:
Q = 0.4011 ft^3/min
t pumping = 4320. min
rc = 0.33 ft
rw = 0.83 ft

Engineering-Science, Inc.	Client: DGSC
Project No.: FB570.07	Location: FTA (OU7)

DWM-21A (Pumping)



DATA SET:
21ap.
11/14/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Cooper-Jacob

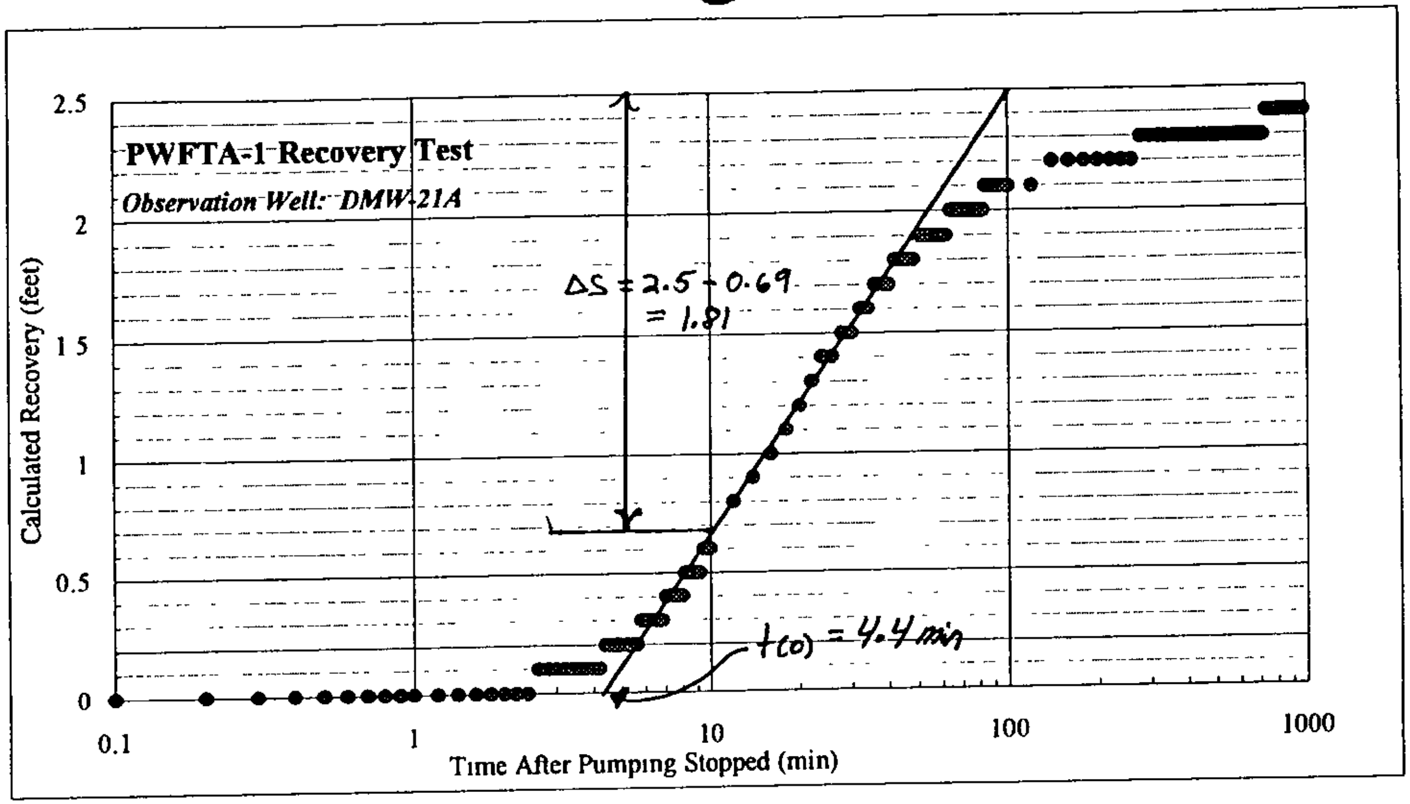
TEST DATE:
12-Oct-93...15-Oct-93

TEST WELL:
PWFTA-1

OBS. WELL:
DWM-21A

ESTIMATED PARAMETERS:
T = 0.04002 ft^2/min
S = 0.0007009

TEST DATA:
Q = 0.4011 ft^3/min
r = 22.6 ft
rc = 0.33 ft
rw = 0.83 ft
b = 12.67 ft



$\Delta S = 1.81$ ft
$Q = 3.0$ gpm

$T = \frac{264\,Q}{\Delta S} = \frac{(264)(3)}{1.81} = 439.2$ gpd/ft

$T = 439.2$ gpd/ft $\times$ 1.34E-1 $= 58.8\ ft^2/day$

$r = 22.6$ ft
$t(0) = 4.4$ min
$= 0.00306$ days

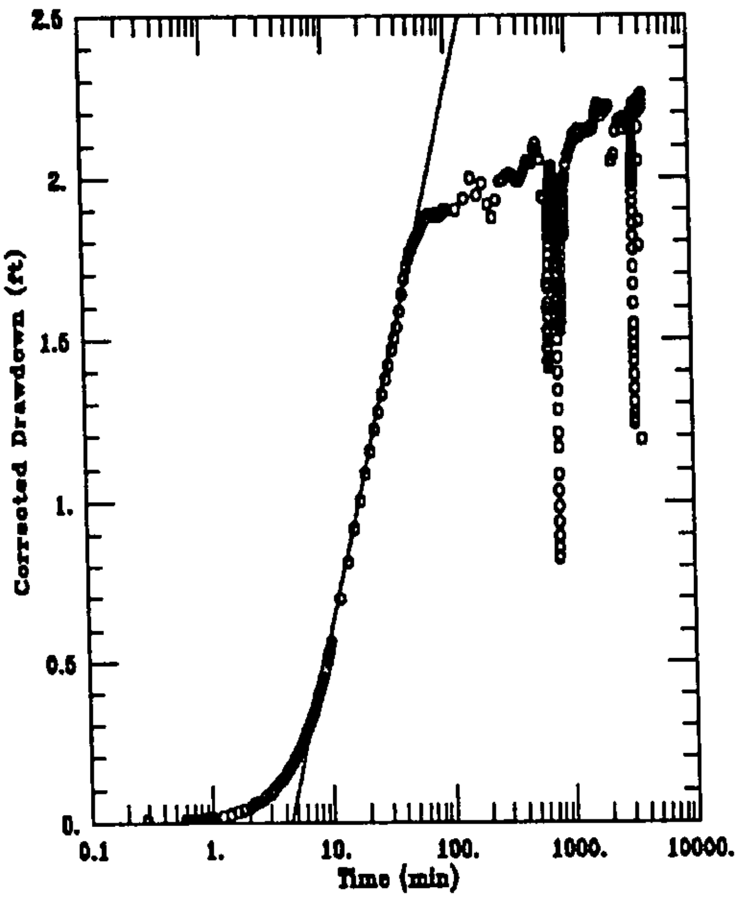
$S = \frac{(0.3)\,T\,t(0)}{r^2}$

$= \frac{(0.3)(439.2)(0.00306)}{(22.6)^2}$

$S = 0.00079$

Engineering-Science, Inc.	Client: DGSC
Project No.: FB570.07	Location: FTA (OU7)

DWM-22A (Pumping)



DATA SET:
22ap.
11/16/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Cooper-Jacob

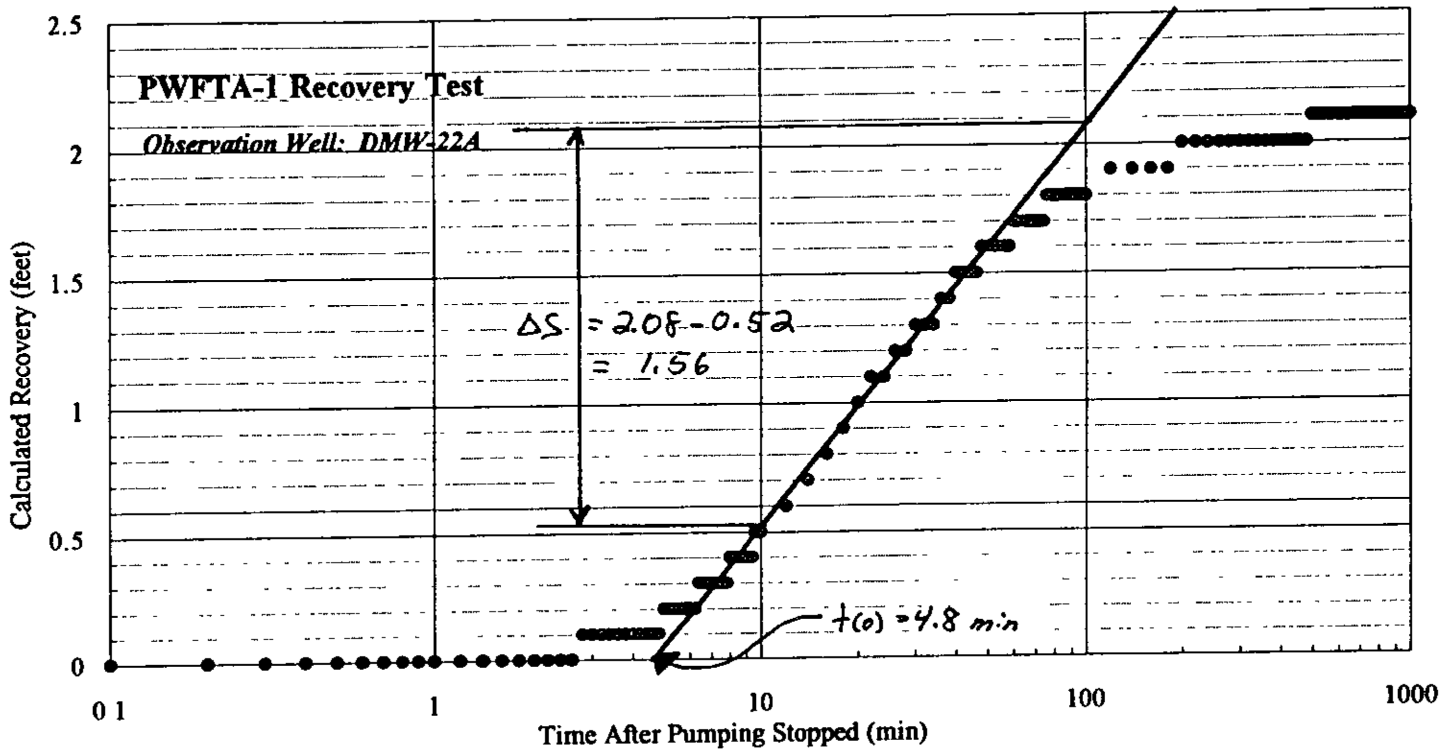
TEST DATE:
12-Oct-93...15-Oct-93

TEST WELL:
PWFTA-1

OBS. WELL:
DWM-22A

ESTIMATED PARAMETERS:
T = 0.04375 ft^2/min
S = 0.0003677

TEST DATA:
Q = 0.4011 ft^3/min
r = 34.3 ft
rc = 0.33 ft
rw = 0.83 ft
b = 28.02 ft



$\Delta S = 1.56$ ft

$Q = 3.0$ gpm

$T = \frac{264 Q}{\Delta S} = \frac{(264)(3)}{1.56} = 507.7$ gpd/ft

$T = 507.7$ gpd/ft $\times 1.34E-1 = 68.0$ ft^2/day

$r = 34.3$ ft

$t_{(0)} = 4.8$ min

$= 0.00333$ days

$S = \frac{(0.3)\, T\, t_{(0)}}{r^2}$

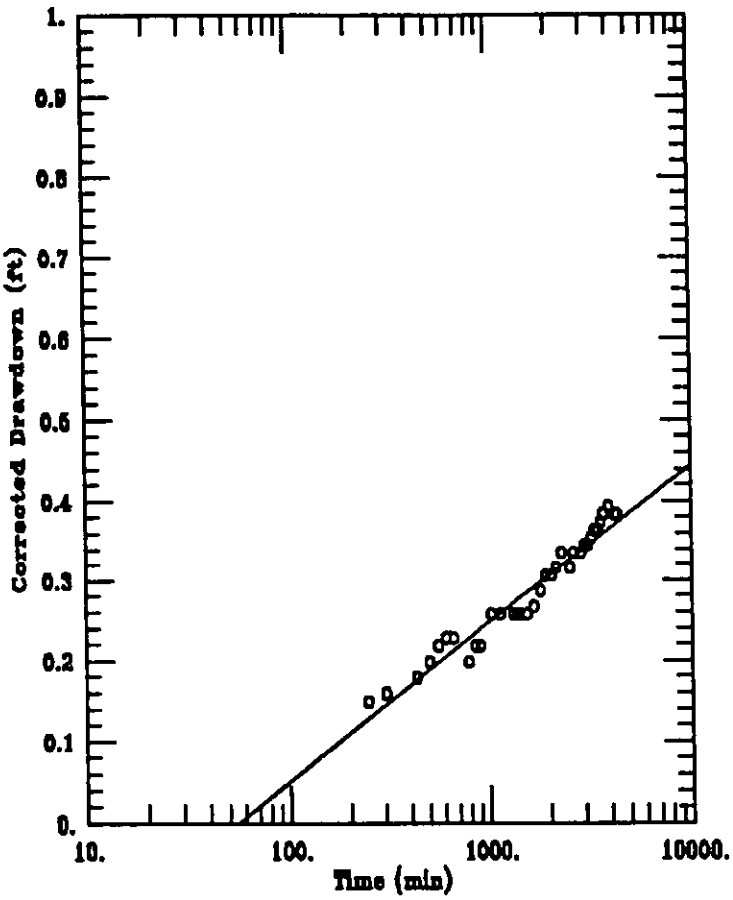
$= \frac{(0.3)(507.7)(0.00333)}{(34.3)^2}$

$= 0.00043$

jdt\dgsc\22arec xlc

Engineering-Science, Inc.	Client: **DGSC**
Project No.: **FB570.07**	Location: **FTA (OU7)**

MWFTA-3 (Pumping Test)

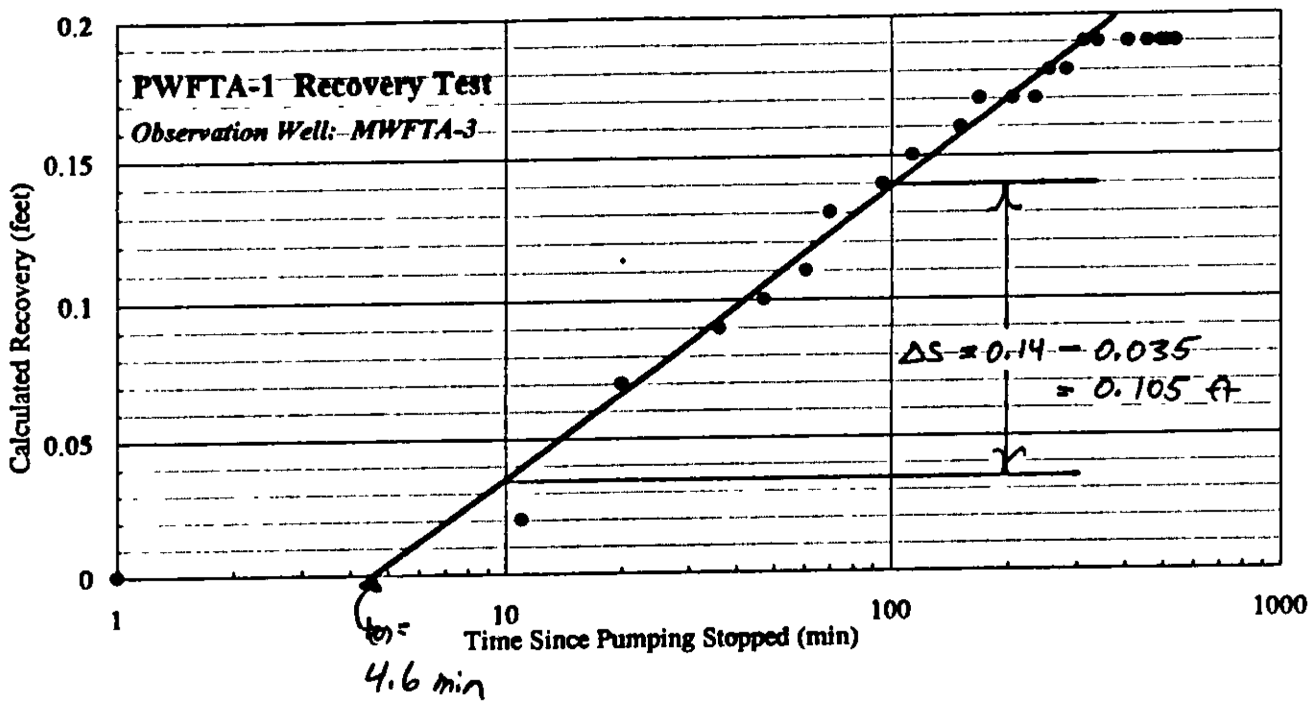


DATA SET:
mwfta3.
11/18/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Cooper-Jacob
TEST DATE:
12-Oct-93...15-Oct-93
TEST WELL:
PWFTA-1
OBS. WELL:
MWFTA-3

ESTIMATED PARAMETERS:
T = 0.374 ft^2/min
S = 0.0008526

TEST DATA:
Q = 0.4011 ft^3/min
r = 232. ft
rc = 0.33 ft
rw = 0.667 ft
b = 11.62 ft



$\Delta s = 0.105$ feet

$Q = 3.0$ gpm

$T = \frac{264\,Q}{\Delta s} = \frac{(264)(3)}{0.105} = 7{,}543$ gpd/ft

$T = 7543$ gpd/ft $\times$ 1.34E-1 $= 1{,}010.7$ ft²/day

$r = 232$ ft

$t_{(0)} = 4.6$ min
$= 0.0032$ days

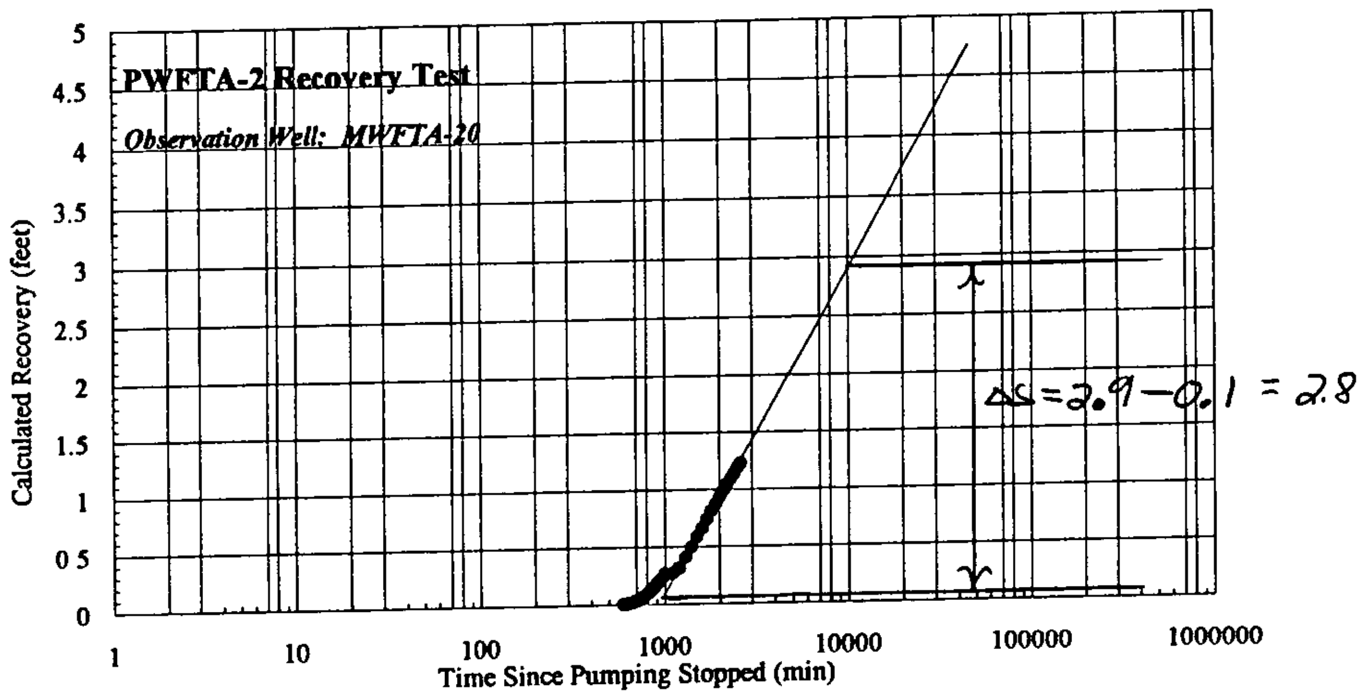
$S = \frac{0.3\, T\, t_{(0)}}{r^2}$

$= \frac{(0.3)(7{,}543)(0.0032)}{(232)^2}$

$S = 0.00013$

704 185

jdf\dgoc\mwfta3r.xlc



$\Delta S = 2.8$ ft

$Q = 0.25$ gpm

$T = \frac{264(Q)}{\Delta S} = \frac{(264)(0.25)}{2.8} = 23.57$ gpd/ft

$T = 23.57 \times 1.34E\text{-}1 = 3.16$ ft^2/day

$r = 31$ feet.

$t(0) = 900$ min

$= 0.625$ days

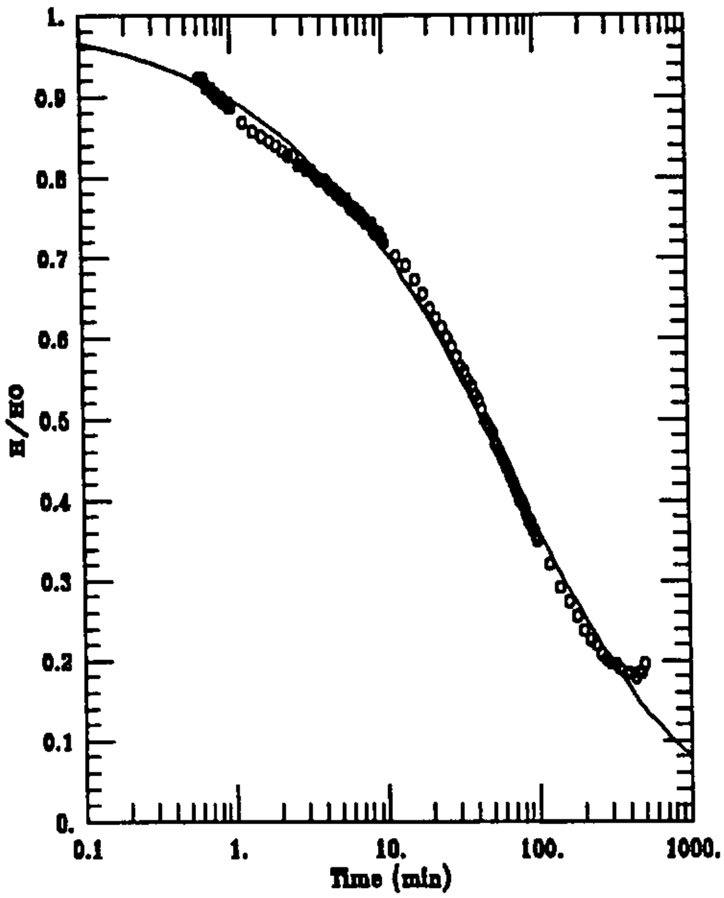
$S = \frac{(0.3)\ T\ t(0)}{r^2}$

$= \frac{(0.3)(23.57)(0.625)}{(31)^2}$

$S = 0.00460$

Engineering-Science, Inc.	Client: DGSC
Project No.: FB570.07	Location: FTA (OU7)

PWFTA-2 (Injection)



DATA SET:
pw2sin.
11/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
21-Oct-93

TEST WELL:
PWFTA-2

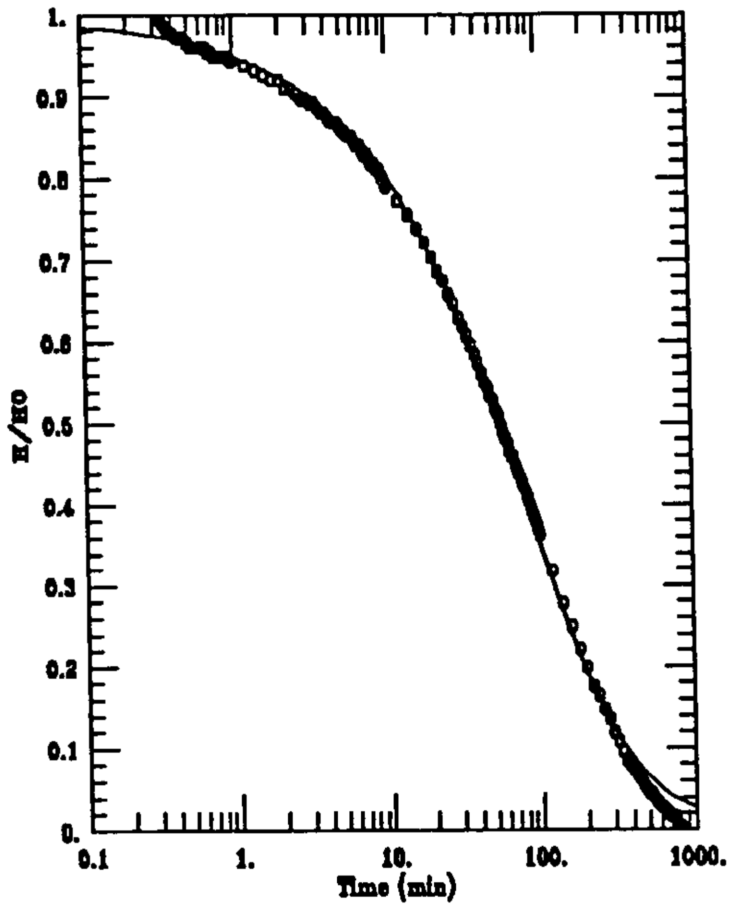
OBS. WELL:

ESTIMATED PARAMETERS:
T = 0.0002854 ft^2/min
S = 0.1452

TEST DATA:
HO = 1.68 ft
rc = 0.33 ft
rw = 0.83 ft

Engineering-Science, Inc.	Client: DGSC
Project No.: FB570.07	Location: FTA (OU7)

PWFTA-2 (Withrdawal)



DATA SET:
pw2eout.
11/18/93

AQUIFER TYPE:
Confined
SOLUTION METHOD:
Cooper et al.
TEST DATE:
25-Oct-93
TEST WELL:
PWFTA-2
OBS. WELL:

ESTIMATED PARAMETERS:
T = 0.00131 ft^2/min
S = 0.004477

TEST DATA:
HO = 1.76 ft
rc = 0.33 ft
rw = 0.83 ft

TAB

APPENDIX A

APPENDIX A
MONITORING WELL DATA SUMMARY AND SLUG TEST RESULTS
SOURCE: LAW ENGINEERING AND ENVIRONMENTAL SERVICES – 1994 – DRAFT FINAL REMEDIAL INVESTIGATION REPORT – FIRE TRAINING AREA

TABLE 3-1

MONITORING WELL DATA SUMMARY
Fire Training Area
Defense General Supply Center, Richmond, Virginia

Well No.	Elevation (ft. msl)		Depth of Well (GSL)	Screened Interval			Aquifer/ Formation Details	K-Test Result (ft/min)		Static Water Level Elevation (feet msl)		
	TOC	GSL		Length of Screen	Top of Screen Elevation	Base of Screen Elevation		Slug-In	Slug-Out	Oct 92	Dec 92	Oct 93
MWFTA-1	91.41	89.45	14.0	4.9	80.35	75.45	Upper Aquifer. Fine- coarse sand	2.989×10^{-4}	2.768×10^{-4}	82.77	83.11	82.94
MWFTA-2*	91.15	89.10	32.0	4.9	62.00	57.10	Lower Aquifer. Fine-coarse sand with gravel and clay	6.356×10^{-6}	1.174×10^{-5}	83.40	82.83	NA
MWFTA-2A	92.90	89.79	38.5	5.0	56.29	51.29		NT		NA	NA	NA
MWFTA-3	86.83	84.82	14.2	4.9	75.52	70.62	Upper Aquifer. Clayey, silty sand	3.269×10^{-4}	4.049×10^{-4}	81.98	82.89	82.23
MWFTA-4	86.37	84.58	35.0	4.9	54.48	49.58	Lower Aquifer. Fine-very coarse sand with clay	1.118×10^{-4}	1.576×10^{-4}	75.32	75.26	74.83
MWFTA-5	85.47	83.28	12.9	5.0	75.38	70.38	Upper Aquifer. Clayey sand and silt	1.023×10^{-3}	1.590×10^{-3}	77.82	80.85	77.45
MWFTA-6	85.18	83.06	24.0	5.0	64.06	59.06	Upper Aquifer. Fine to coarse micaceous sand	2.470×10^{-3}	1.022×10^{-3}	77.98	80.84	77.62
MWFTA-7	86.84	84.29	14.0	4.9	75.19	70.29	Upper Aquifer. Silty, clayey sand with gravel	4.587×10^{-3}	3.790×10^{-3}	77.00	77.26	76.77
MWFTA-8 *	85.16	83.80	33.0	4.9	55.70	50.80	Lower Aquifer. Fine to very coarse sand with gravel	5.662×10^{-3}	3.171×10^{-3}	77.06	77.26	76.73
MWFTA-9	85.90	83.76	14.5	5.0	74.26	69.26	Upper Aquifer. Silty sand with gravel	7.494×10^{-4}	6.149×10^{-4}	80.45	83.65	80.12
MWFTA-10	86.29	83.45	25.0	4.9	63.35	58.45	Lower Aquifer. Fine to very coarse clayey sand with gravel	5.158×10^{-4}	6.054×10^{-4}	80.39	83.34	79.81
MWFTA-11	101.22	NA	29.00	5.00	74.62	69.62	Upper Aquifer. Very clayey sand	NT	NT	NT	NT	90.13
MWFTA-12	92.12	NA	18.50	15.00	86.52	71.52	Upper Aquifer. Silty sand, some clay	NT	NT	NT	NT	82.83
MWFTA-13	84.57	NA	40.00	5.00	46.84	41.84	Lower Aquifer. Clayey to silty sand	NT	NT	NT	NT	64.28

TABLE 3-1

MONITORING WELL DATA SUMMARY
Fire Training Area
Defense General Supply Center, Richmond, Virginia

Well No.	Elevation (ft. msl)		Depth of Well (GSL)	Screened Interval			Aquifer/ Formation Details	K-Test Result (ft/min)		Static Water Level Elevation (feet msl)		
	TOC	GSL		Length of Screen	Top of Screen Elevation	Base of Screen Elevation		Slug-In	Slug-Out	Oct 92	Dec 92	Oct 93
MWFTA-14	85.06	NA	40.00	5.00	49.17	44.17	Lower Aquifer. Silty to clayey sand	NT	NT	NT	NT	67.21
MWFTA-15	85.77	NA	40.00	5.00	47.98	42.98	Lower Aquifer. Silty to clayey sand with gravel	NT	NT	NT	NT	72.89
MWFTA-16	103.25	NA	50.00	5.00	55.25	50.25	Lower Aquifer. Silty to clayey sand with gravel	NT	NT	NT	NT	84.39
MWFTA-17	100.15	NA	50.00	5.00	53.15	48.15	Lower Aquifer. Silty to clayey sand	NT	NT	NT	NT	83.12
MWFTA-18	97.67	NA	49.00	5.00	51.07	46.07	Lower Aquifer. Silty to clayey sand	NT	NT	NT	NT	78.68
MWFTA-19	84.47	NA	40.00	5.00	46.97	41.97	Lower Aquifer. Silty to slightly clayey sand with gravel grading to saprolite	NT	NT	NT	NT	67.67
MWFTA-20	87.08	NA	75.00	5.00	14.03	9.03	Lower Aquifer. Granitic bedrock	NT	NT	NT	NT	70.36
PWFTA-1	87.06	NA	20.00	15.00	80.66	65.66	Upper Aquifer. Silty sand. Sand and gravel	NT	NT	NT	NT	81.50
PWFTA-2	86.07	NA	40.00	15.00	58.07	43.07	Lower Aquifer. Silty to clayey sand grading to saprolite	2.08×10^{-5}	2.08×10^{-5}	NT	NT	71.46

TOC = Top of Casing
GSL = Ground Surface Level
* = MW FTA-2 abandoned and re-installed due to presence of grout in the well
NA = Not Available
NT = Not Tested
NB = Date for wells MWFTA-11 through MWFTA-20, FWFTA-1 and PWFTA-2 obtained from Engineering Science, Inc.

PREPARED BY/DATE: ______
CHECKED BY/DATE: ______
APPROVED BY/DATE: ______

TABLE D-1

SUMMARY OF AQUIFER TEST RESULTS
FIRE TRAINING AREA (OU7)
DEFENSE GENERAL SUPPLY CENTER
Richmond, Virginia

TEST	Well ID	Transmissivity (T) (feet ^2/day)	Saturated Thickness (b) (feet)	Hydraulic Conductivitiy (K) (feet/day)	Storativity (dimensionless)	Method	Comments
Unconfined Test Well PWFTA-1							
	PWFTA-1	20.76	15.84	1 31	NA	Cooper-Jacob	Pumping
		10.59	15.84	0.67	NA	Theis Recovery	Recovery
	DMW-21A	57.63	12.67	4 55	0 00070	Cooper-Jacob	Pumping
		58 80	12 67	4 64	0.00079	Driscoll	Recovery
	DMW-22A	63.00	28.02	2.25	0.00037	Cooper-Jacob	Pumping
		68.00	28.02	2.43	0.00043	Driscoll	Recovery
	MWFTA-3	538.56	11 62	46 35	0 00085	Cooper-Jacob	Pumping
		1010.70	11 62	86.98	0 00013	Driscoll	Recovery
Confined Test Well PWFTA-2							
	PWFTA-2	0.20	15.00	0.01	NA	Theis Recovery	Recovery
		0.41	15.00	0.03	0.14520	Cooper et al.	Slug Test (Injection)
		1.89	15.00	0 13	0 00448	Cooper et al.	Slug Test (Withdrawal)
	MWFTA-20	0.63	28.39	0.02	NA	Theis Recovery	Recovery
		23.57	28.39	0.83	0.00460	Driscoll	Recovery

Printed. 11/24/93

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SOURCE:

REMEDIAL INVESTIGATION
FIRE TRAINING AREA

DAMES & MOORE

MAY 1989

TABLE 3-4

Results of Slug Testing
Fire Training Area

Well	Aquifer	Aquifer Interval	Screen Depth (feet)	Screen Elevation (feet MSL)	Hydraulic Conductivity (cm/sec)	Remarks
DMW-13A	Upper	Top	14.5-19.5	85.1-80.1	2.09×10^{-3}	Test 1
					2.21×10^{-3}	Test 2
DMW-22A	Upper	Bottom	24.8-29.8	60.2-55.2	1.26×10^{-3}	Confining Unit Absent
DMW-22E	Bedrock	Top	65.0-70.0	19.7-14.7	4.47×10^{-6}	Slightly Fractured Rock
DMW-25A	Upper	Top	4.3-19.3	91.9-76.9	2.43×10^{-4}	Test 1
					2.30×10^{-4}	Test 2
DMW-29A	Upper	Bottom	23.0-28.0	72.8-67.8	1.50×10^{-3}	Test 1
					1.88×10^{-3}	Test 2
DMW-33B	Lower	Entire	30.0-40.0	52.2-42.2	5.68×10^{-6}	Thin Saturated Zone

Well #	r (cm)	r2 (cm2)	L (cm)	L*2	L/r	ln(L/r)	r2/(L*2)	G*H	H1	H2	t1	t2	ln(H1/H2)	(t2-t1)	K (I*N/O)	HYDRAULIC CONDUCTIVITY (K)
13A (1)	5.08	25.806	152.4	304.8	30.00	3.401	0.0847	0.2880	0.441	0.18756	78	196	0.85495	118	0.00208642	2.09E-03
13A (2)	5.08	25.806	152.4	304.8	30.00	3.401	0.0847	0.2880	0.68689	0.23873	40	178	1.05684	138	0.00220534	2.21E-03
22A	5.08	25.806	152.4	304.8	30.00	3.401	0.0847	0.2880	0.66035	0.33743	80	234	0.67141	154	0.00125549	1.26E-03
22E	2.54	6.452	152.4	304.8	60.00	4.094	0.0212	0.0867	0.78214	0.70569	4005	6000	0.10286	1995	0.00000447	4.47E-06
25A (1)	5.08	25.806	321.3	642.6	63.25	4.147	0.0402	0.1665	0.47737	0.23039	500	1000	0.72852	500	0.00024266	2.43E-04 m/sec
25A (2)	5.08	25.806	321.3	642.6	63.25	4.147	0.0402	0.1665	0.89965	0.83963	50	100	0.06904	50	0.00022998	2.30E-04
29A (1)	5.08	25.806	152.4	304.8	30.00	3.401	0.0847	0.2880	0.39902	0.2251	134	244	0.57247	110	0.00149866	1.50E-03
29A (2)	5.08	25.806	152.4	304.8	30.00	3.401	0.0847	0.2880	0.75199	0.65987	40	60	0.13068	20	0.00188159	1.88E-03
33B	5.08	25.806	304.8	609.6	60.00	4.094	0.0423	0.1733	0.89805	0.84108	2000	4000	0.06554	2000	0.00000568	5.68E-06

TAB

Appendix B

APPENDIX B
SUMMARY DATA QUALITY COMPLETENESS

APPENDIX B
DATA QUALITY COMPLETENESS SUMMARY – SEPTEMBER/OCTOBER 2001, APRIL 2002, JULY 2002, AND OCTOBER 2002

B.0.0.0.1 Overall percent completeness for the data collection efforts and data quality objective (DQO) attainment for the groundwater collection efforts at Operable Unit (OU) 7 conducted in September/October 2001, April 2002, July 2002, and October 2002 ranged from 99 5 to 96.9 percent (%). A discussion of compound and/or method completeness compared to project objectives, as well as effects of field conditions on project objectives, is presented below. Table B-1 presents a summary of the analyses performed for each sampling event

B.1.1 Analytical Completeness

B.1.1.0.1 An analytical completeness goal of 90% was proposed for this project As previously stated, the overall analytical completeness was achieved , however, some constituents did not meet the 90 % goal. The following compounds exhibited percent completeness less than 90.

Compound -Specific Percent Completeness

Sept/Oct. 2001		**April 2002**		**July 2002**		**October 2002**	
Volatile Compounds		Volatile Compounds		Volatile Compounds		Volatile Compounds	
Carbon disulfide	83%	Acetone	0%	Acetone	24.3%	Acetone	80 95%
		2-Butanone	52%	2-Butanone	73.0%	2-Butanone	83 33%
		2-Hexanone	58%	2-Hexanone	24 3%	2-Hexanone	83 33%
				Dissolved Gases			
				Ethane	74 3%		
				Ethene	74 3%		

B.1.1.0.2 The effect of data completeness below 90% for these compounds based on the project objectives is negligible. Carbon disulfide was not detected in the samples. Acetone, 2-butanone, and 2-hexanone are common laboratory contaminants Acetone was detected in some samples as well as in associated method blanks and therefore, its presence in the samples is suspect 2-Butanone and 2-hexanone were either not detected or below the practical quantitation limit (PQL) in all the samples In addition, the data generated for carbon dioxide, 2-butanone and 2-hexanone does not adversely impact the overall risk assessment for the site due to the lack of positive results in excess of a risk-based concentration level Carbon disulfide, acetone, 2-butanone, and 2-hexanone are not constituents of potential concern (COPC) for OU 7. Ethane and ethene results, in addition to several other parameters, are used to evaluate the water system's ability for natural attenuation Because an evaluation of natural attenuation processes depends on several parameters, the completeness of ethane and ethene results below 90% does not adversely impact the project objectives.

B.1.1.0.3 Thirteen groundwater samples from the lower water bearing unit (WBU) were collected in the September/October 2001 field event and assayed for pH to confirm high pH (greater than 10) measurements collected in the field during the sampling effort. The pH measurements collected in the field were confirmed by the laboratory analyses. Values of pH greater than 10 pH units are not typically found in natural groundwater and may affect microbial activity and the valence state in which certain metals may exist in the aquifer system. The basic pH values are not considered to significantly impact the project DQOs because the data shows that natural attenuation is occurring within the lower WBU at OU 7.

B.1.1.0.4 Two groundwater samples (MWFTA-16 and MWFTA-20) were collected during the July and October 2002 field events, both preserved and unpreserved for volatile organic compounds (VOCs), in order to analyze the effects of the effervescence that occurs when the lower WBU samples are preserved with hydrochloric acid (HCl) Results were compared and found to be well within VOC limits for duplicate analyses Although the results in the unpreserved samples were equal to or slightly greater than the results for the preserved samples, there is no clear indication whether or not VOCs were lost during the bubble formation in samples preserved with HCl. One more set of data is needed to accurately assess the preservation of lower WBU samples. Project DQOs are not affected.

B.1.2 Field Sampling Completeness

B.1.2.0.1 A total of 14 upper WBU, 10 lower WBU, and 1 bedrock well was proposed to be sampled during the quarterly events to provide data to support a monitored natural attenuation (MNA) program as a component of an effective remedy at each site (LAW, 2001). However, during the collection of samples from and evaluation of monitoring wells at OU 7, changes to the quarterly events were implemented These changes are presented below as follows

- Deleted monitoring well MWFTA-8 since monitoring well MWFTA-7 is screened within the same WBU and represents the same location as MWFTA-8
- Added well, DMW-20A, to obtain chemical/delineate contamination prior to boundary well, MWFTA-7 per LAW memo dated June 27, 2002

- Added well, MWFOS-3, to monitor high concentrations and determine the presence of dense non-aqueous phase liquid (DNAPL) per LAW meeting on July 24, 2002

- Added wells, MWFTA-9 and MWFTA-10, due to Virginia Department of Environmental Quality (VDEQ) recommendation dated July 17, 2002

- Added Bldg. 112 well, MW112-2, to provide additional characterization to background conditions per LAW meeting on June 24, 2002.

- Deleted well, DMW- 29B, because single cased well in lower WBU - may be conduit for lower WBU contamination from upper WBU - per LAW meeting on June 24, 2002 and memo dated June 27, 2002.

- Deleted well, PWFTA-2, because installation diagrams infer that the outer casing may be improperly installed through the confining layer causing potential "leakage" of upper WBU contaminants into the lower WBU per LAW meeting on June 24, 2002 and memo dated June 27, 2002.

B.1.2.0.2 Therefore, for added wells, DMW-20A, MWFTA-9, MWFTA-10, MW112-2, and MWFOS-3, only two quarters of analytical data have been collected In addition, the analytical data collected from deleted wells, DMW-29B and PWFTA-2, may not be representative of conditions within the lower WBU due to improper well construction and the analytical data should be considered estimated. Water levels were collected on each of the added wells, with the exception of MW112-2, during each quarterly sampling event and complete potentiometric surface maps for the upper and lower WBUs could be defined for each quarter. However, there are not sufficient bedrock wells to determine either water quality conditions or the potentiometric surface within fractured bedrock at OU 7. See Table A2-1 for details.

B.1.2.0.3 In some instances, field parameters or analytical parameters were not collected/not analyzed due to inclement weather, insufficient volume of water, improper preservation, or sampling error. Ferrous iron was not collected during one of 4 quarters in groundwater samples collected from monitoring wells, MWFTA-19 (April 2002), MWFTA-28B (April 2002), MWFOS-3 (April 2002), and DMW-20A (July 2002). Ferrous iron was not collected from monitoring wells MWFTA-19 (April 2002), MWFOS-3 (April 2002), and DMW-20A (July 2002) due to sampling oversight and from MWFTA-28B (April 2002) due to insufficient volume of water Sulfide was not analyzed for the groundwater sample collected from monitoring well DMW-27A in October 2001 due to improper preservation Both ferrous iron and sulfide results, in addition to several other parameters, are used to evaluate the water system's ability for natural attenuation Because an evaluation of natural attenuation processes depends on several parameters, the absence of one quarter of data do not adversely impact the project objectives

TAB

APPENDIX B TABLE

APPENDIX B TABLE

TABLE B-1

SUMMARY OF ANALYSES PERFORMED
QUARTERLY EVENTS
October 2001 through October 2002
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

ANALYTICAL PARAMETER AND METHOD NUMBER	First Quarter October 2001			Second Quarter April 2002			Third Quarter July 2002			Fourth Quarter October 2002		
	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock
FIELD PARAMETER												
Dissolved Oxygen - E360.1 mg/L	X	X	X	X	X	X	X	X	X	X	X	X
Dissolved Oxygen												
Ferrous Iron - A3500D mg/L	X	X	X	X	X	X	X	X	X	X	X	X
Ferrous Iron												
Oxidation Reduction Potential - A2580A mV	X	X	X	X	X	X	X	X	X	X	X	X
Oxidation Reduction Potential												
pH - E150.1 pH Units	X	X	X	X	X	X	X	X	X	X	X	X
pH												
Specific Conductance - E120.1 mS/cm	X	X	X	X	X	X	X	X	X	X	X	X
Specific Conductance												
Temperature - E170.1 deg C	X	X	X	X	X	X	X	X	X	X	X	X
Temperature												
Turbidity - E180.1 NTU	X	X	X	X	X	X	X	X	X	X	X	X
Turbidity												
FIXED BASE LABORATORY ANALYSIS												
Anions - MCAWW 300.0A mg/L	X	X	X	X	X	X	X	X	X	X	X	X
Chloride												
Nitrate as N												
Sulfate												
Dissolved Gases - RSK SOP-175 mg/L	X	X	X	X	X	X	X	X	X	X	X	X
Carbon dioxide												
Ethane												
Ethene												
Methane												
Hydrogen by Microseeps - AM20GAX nM	X	X	X	X	X	X	X	X	X	X	X	X
Hydrogen												
pH - E150.1 pH Units		X [(a)]	X [(a)]									
pH												
Total Alkalinity - MCAWW 310.1 mg/L	X	X	X	X	X	X	X	X	X	X	X	X
Total Alkalinity												
Total Organic Carbon - SW846 9060 mg/L	X	X	X	X	X	X	X	X	X	X	X	X
Total Organic Carbon												
Total Sulfide - MCAWW 376.1 mg/L	X	X	X	X	X	X	X	X	X	X	X	X
Total Sulfide												
Mercury - SW846 7470A (Total and Dissolved) µg/L	X	X	X	X	X	X	X	X	X	X	X	X
Mercury												

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TABLE B-1

SUMMARY OF ANALYSES PERFORMED
QUARTERLY EVENTS
October 2001 through October 2002
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

ANALYTICAL PARAMETER AND METHOD NUMBER	First Quarter October 2001			Second Quarter April 2002			Third Quarter July 2002			Fourth Quarter October 2002		
	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock
Metals - SW846 6010B (Total and Dissolved) µg/L	X	X	X	X	X	X	X	X	X	X	X	X
Aluminum												
Antimony												
Arsenic												
Barium												
Beryllium												
Cadmium												
Calcium												
Chromium												
Cobalt												
Copper												
Iron												
Lead												
Magnesium												
Manganese												
Molybdenum												
Nickel												
Potassium												
Selenium												
Silver												
Sodium												
Vanadium												
Zinc												
Thallium - SW846 7841 (Total and Dissolved) µg/L	X	X	X	X	X	X	X	X	X	X	X	X
Thallium												
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L				X [b]			X [b]			X [b]		
PCB-1016												
PCB-1221												
PCB-1232												
PCB-1242												
PCB-1248												
PCB-1254												
PCB-1260												
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C SIM µg/L				X [b]			X [b]			X [b]		
Acenaphthene												
Acenaphthylene												
Anthracene												
Benzo(a)anthracene												
Benzo(a)pyrene												
Benzo(b)fluoranthene												
Benzo(ghi)perylene												
Benzo(k)fluoranthene												
Carbazole												
Chrysene												
Dibenz(a,h)anthracene												
Fluoranthene												
Fluorene												
Indeno(1,2,3-cd)pyrene												
Naphthalene												
Phenanthrene												
Pyrene												

TABLE B-1

SUMMARY OF ANALYSES PERFORMED
QUARTERLY EVENTS
October 2001 through October 2002
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

ANALYTICAL PARAMETER AND METHOD NUMBER	First Quarter October 2001			Second Quarter April 2002			Third Quarter July 2002			Fourth Quarter October 2002		
	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock
Volatile Organic Compounds - SW846 8260B µg/L	X	X	X	X	X	X	X	X	X	X	X	X
1,1,1,2-Tetrachloroethane												
1,1,1-Trichloroethane												
1,1,2,2-Tetrachloroethane												
1,1,2-Trichloroethane												
1,1-Dichloroethane												
1,1-Dichloroethene												
1,1-Dichloropropene												
1,2,3-Trichlorobenzene												
1,2,3-Trichloropropane												
1,2,4-Trichlorobenzene												
1,2,4-Trimethylbenzene												
1,2-Dibromo-3-chloropropane												
1,2-Dibromoethane												
1,2-Dichlorobenzene												
1,2-Dichloroethane												
1,2-Dichloropropane												
1,3,5-Trimethylbenzene												
1,3-Dichlorobenzene												
1,3-Dichloropropane												
1,4-Dichlorobenzene												
2,2-Dichloropropane												
2-Butanone												
2-Chlorotoluene												
2-Hexanone												
4-Chlorotoluene												
4-Methyl-2-pentanone												
Acetone												
Benzene												
Bromobenzene												
Bromochloromethane												
Bromodichloromethane												
Bromoform												
Bromomethane												
Carbon disulfide												
Carbon tetrachloride												
Chlorobenzene												
Chloroethane												
Chloroform												
Chloromethane												
cis-1,2-Dichloroethene												
cis-1,3-Dichloropropene												
Dibromochloromethane												
Dibromomethane												
Dichlorodifluoromethane												
Ethylbenzene												
Hexachlorobutadiene												
Isopropylbenzene												
m-Xylene & p-Xylene												
Methylene chloride												
n-Butylbenzene												
n-Propylbenzene												
Naphthalene												
o-Xylene												

TABLE B-1

SUMMARY OF ANALYSES PERFORMED
QUARTERLY EVENTS
October 2001 through October 2002
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

ANALYTICAL PARAMETER AND METHOD NUMBER	First Quarter October 2001			Second Quarter April 2002			Third Quarter July 2002			Fourth Quarter October 2002		
	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock	Upper WBU	Lower WBU	Fractured Bedrock
Volatile Organic Compounds - SW846 8260B µg/L (continued)												
p-Isopropyltoluene												
sec-Butylbenzene												
Styrene												
tert-Butylbenzene												
Tetrachloroethene												
Toluene												
trans-1,2-Dichloroethene												
trans-1,3-Dichloropropene												
Trichloroethene												
Trichlorofluoromethane												
Vinyl chloride												
Xylenes (total)												
Volatile Organic Compounds UNPRES - SW846 8260B µg/L								X [c]	X [c]		X [c]	X [c]
See analyte list above												

Notes

(a) pH was collected and measured at the laboratory on lower WBU and bedrock well locations to confirm field results
(b) PCBs and PAHs were collected and analyzed on samples from monitoring wells MWITA-1 and MWITA-3 only to monitor constituents of concern for OU 13
(c) Both acid preserved and unpreserved VOC samples were collected from monitoring wells MWITA-16 and MWITA-20 in order to analyze the effects of the effervescence that occurs when the lower water bearing unit samples are preserved with HCl

VOC Volatile Organic Compound
WBU Water Bearing Unit
deg C degrees Celsius
mg/l milligram per liter
mS/cm milliSiemens per centimeter
mV millivolt
nM nanomoles
NTU nephelometric turbidity unit
pH negative log of the hydrogen ion concentration
µg/l microgram per liter

PREPARED/DATE JAH 5/29/03
CHECKED/DATE JAV 5/23/03

704 207

TAB

Appendix C

APPENDIX C
OCTOBER 2002 DATA QUALITY EVALUATION

APPENDIX C

DATA QUALITY EVALUATION AND DATA SUMMARY

TABLE OF CONTENTS

LIST OF ACRONYMS

CCB	continuing calibration blank
CCV	continuing calibration verification
DQE	data quality evaluation
DQO	data quality objectives
DSCR	Defense Supply Center Richmond
HCl	hydrochloric acid
ICB	initial calibration blank
ICV	initial calibration verification
LAW	Law Engineering and Environmental Services, Inc.
LCS	laboratory control sample
MACTEC	MACTEC Engineering and Consulting, Inc.
MDL	method detection limit
mg/L	milligram per liter
MNA	Monitored Natural Attenuation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
QA	Quality Assurance
QC	Quality Control
RPD	relative percent difference
RL	reporting limit
SAP	Sampling and Analysis Plan
SDG	sample delivery group
SIM	selective ion monitoring
SMF	sporadic marginal failure
STL	Severn Trent Laboratories, Inc
TOC	Total Organic Carbon
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WBU	water bearing unit
µg/L	micrograms per liter
%D	percent difference
%R	percent recovery

APPENDIX C - DATA QUALITY EVALUATION AND DATA SUMMARY TABLES

C.0 INTRODUCTION

C.0.0.0.1 The following sections present the analytical laboratory used, the data quality objectives (DQOs) for the project, results of the analyses of the quality control (QC) samples, tabular summaries of the analytical data obtained, and a discussion of the quality of the analytical data for Operable Unit (OU) 7 (Fire Training Area Groundwater) at the Defense Supply Center Richmond (DSCR) This data quality evaluation (DQE) case narrative summarizes the data quality from the October 2002 quarterly groundwater sampling event at OU 7.

C.0.0.0.2 The data validation was performed in general accordance with the Final Sampling and Analysis Plan (SAP) (Law Engineering and Environmental Services, Inc. [LAW], 1992), United States Army Corps of Engineers (USACE) Shell for Analytical Chemistry Requirements (USACE, App. I, February 2001), United States Environmental Protection Agency (USEPA) and Region III National Functional Guidelines for Organic and Inorganic Data Review (USEPA, June 2001, October 1999, and February 1994, respectively), and the appropriate analytical method requirements as presented in Test Methods for Evaluating Solid Waste, USEPA SW-846, Update III and subsequent revisions (USEPA, 1996).

C.1 ANALYTICAL LABORATORY

C.1.0.0.1 Groundwater samples collected from monitoring wells in October 2002 were analyzed by Severn Trent Laboratories, Inc., (STL) of North Canton, Ohio, for volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), anions (chloride, nitrate, and sulfate), alkalinity, sulfide, total and dissolved metals, and total organic carbon (TOC). Samples were also sent to STL of Santa Ana, California for analysis of dissolved gases (carbon dioxide, methane, ethane, and ethene) In addition, Microseeps of Pittsburgh, Pennsylvania analyzed select samples for dissolved hydrogen

C.1.0.0.2 All samples collected were analyzed using USEPA SW-846 methods VOCs were analyzed by Method 8260B, PAHs by selective ion monitoring (SIM) Method 8270C, PCBs by Method 8082, anions by Method 300 0A, alkalinity by 310 1, sulfide by 376 1, dissolved gases by Method RSK-175, total and dissolved metals by Methods 6010B, 7470A, and 7841, and TOC by Method 9060. Dissolved hydrogen was analyzed by Microseeps Method AM20GAX

C.2 DATA QUALITY OBJECTIVES

C.2.0.0.1 Project-specific DQOs are described in Section 8 0 and presented on Figure 8-2 of the Quarterly Groundwater Sampling Plan for OU 7 (LAW, 2002). Once the environmental data have been collected and analyzed, the consultants assess the laboratory data for its usability as prescribed by project goals. The criteria that measure the usability of environmental data as it relates to project objectives are data accuracy, precision, and completeness. Evaluation of these criteria ultimately reveals the representativeness and bias, if any, present in the sampling and analytical processes These criteria are explained in detail in Section 7 1.1 of the Final SAP (LAW, 1992)

C.3 DATA QUALITY EVALUATION PROCEDURES

C.3.0.0.1 The procedures used by MACTEC Engineering and Consulting, Inc. (MACTEC) for data evaluation and validation are described in the DQE standard operating procedures (LAW, 2001/2002). The primary DQE was performed by MACTEC's staff or project chemist The DQE narrative and qualified (flagged) data tables were reviewed by a senior chemist.

C.3.0.0.2 The laboratory data, field QC data, and field notes provide the information to evaluate the analytical data for accuracy, precision, completeness, and representativeness with respect to the project-specific DQOs. The data are first evaluated based on field notes taken during collection of the samples to assess sampling conditions and sampling procedures or determine if changes to the planned procedures were necessary. Secondly, each sample shipment sent to the laboratory is assessed for adherence to method prescribed holding times, proper chain-of-custody documentation, correct usage of sample containers, and sample integrity upon receipt by the laboratory

C.3.0.0.3 The laboratory's internal QC procedures for calibration, method validation, and performance evaluation include appraisal of method prescribed tune (for gas chromatograph/mass spectrometer) and calibration criteria, method blank analyses, laboratory control sample (LCS) analysis, matrix spike (MS)/matrix spike duplicate (MSD) analyses, and assessment of surrogate and internal standard recovery where applicable MACTEC's evaluation of the laboratory data focuses on exceptions to the planned QC activities, problems encountered, and the effectiveness of the methodologies used within the laboratory The data are then evaluated overall with respect to the project DQOs, providing the completeness The following sections present the evaluation procedures used for the analytical data with respect to the project-specific DQOs

C.3.1 EVALUATION OF FIELD DATA QUALITY

C.3.1.0.1 QC and quality assurance (QA) samples were collected to assess the quality and representativeness of the field sampling activities and the accuracy of analytical results from the primary laboratory. Field QC and QA samples are required by the USACE protocols (USACE, 2001) and were specified for collection in the Quarterly Groundwater Sampling Plan for OU 7 (LAW, 2002) The QC and QA samples collected and their use were presented in Appendix C (Data Quality Evaluation and Data Summary) of the OU 7 Quarterly Groundwater Sampling Technical Memorandum (MACTEC, 2003).

C.3.2 EVALUATION OF LABORATORY DATA QUALITY

C.3.2.0.1 Laboratory data are evaluated to assess adherence to method prescribed calibration and/or continuing calibration criteria, method blank analysis results, analyte recoveries from LCS, MS/MSD recoveries and relative percent differences (RPDs), surrogate recoveries and ultimately, completeness. Except for completeness, these criteria are used to evaluate the accuracy and precision of the data generated by the laboratory Furthermore, the USACE specified control limits for the major USEPA SW-846 methodologies are presented in the Shell document (USACE, Appendix I, February 2001) and data were evaluated based on those limits The analytical methods and the associated limits used for analysis of the environmental samples collected during the October 2002 sampling event was included in the Shell document

C.3.2.0.2 In general, control limits not addressed by the USACE in the Shell document default to laboratory generated limits. Laboratory-established control limits are based on the mean percent recovery plus or minus three standard deviations of the mean using a minimum population of 20 recovery values. Specific laboratory QC elements considered in the calculation of precision, accuracy, representativeness, and completeness are presented in Appendix C (Data Quality Evaluation and Data Summary) of the OU 7 Quarterly Groundwater Sampling Technical Memorandum (MACTEC, 2003)

C.4 DATA QUALITY EVALUATION

C.4.0.0.1 The comprehensive analytical results for samples associated with this site are summarized in this Appendix as Tables C-1 through C-4 Analytical results are quantitated at the reporting limit (RL) but evaluated down to the method detection limit (MDL) The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the value is above zero. The RL is defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions as defined by SW-846. Data points reported at concentrations above the MDL, but less than the RL are considered estimated quantitative values and are qualified as "JQ" RLs are adjusted by the sample weight/volume extracted and analyzed, moisture content (soils and sediments only), and/or dilution, and therefore may be different for each sample.

C.4.0.0.2 The following sections provide summary discussions of data quality for the October 2002 sampling event for OU 7 at DSCR. Each section highlights the main points of data quality indicators and identifies data points that require qualification Data qualification flags and their descriptions are presented in the footnotes of Tables C-1 through C-4

C.4.0.0.3 DQE forms were generated and used by MACTEC to document the evaluated data components. These forms are arranged so that parameters affecting all samples are reviewed first, such as proper execution of chain-of-custody, temperature of the samples upon receipt at the lab, appropriate sample containers/preservatives, etc These original forms and the respectively flagged data tables are filed with each sample delivery group (SDG) after senior review.

C.4.1 GROUNDWATER – OCTOBER 2002

C.4.1.0.1 A total of 27 groundwater and 5 duplicate samples (two for preservation technique) were collected at OU 7 in October of 2002. Monitoring well sample locations were selected to obtain information to determine if natural attenuation of chlorinated solvents was occurring and were assayed for VOCs, total and dissolved metals, and monitored natural attenuation (MNA) parameters dissolved gases (including hydrogen), anions, TOC, alkalinity, and sulfide. In addition, two upper water bearing unit (WBU) groundwater samples (MWFTA-1 and MWFTA-3) and one duplicate sample (OU7DUP-2) were assayed for PAHs and PCBs

C.4.1.0.2 The correct sample containers and preservatives were used for the analytical methods specified on the chains-of-custody. Lower WBU samples were collected without hydrochloric acid (HCl) preservation due to the effervescing of the samples upon their addition to the preserved sample vial. Two of the samples (MWFTA-16 and MWFTA-20) were also collected with HCl preservation to assess the effects of the preservation technique on VOC concentration The chains-of-custody were executed properly and all hold times were met. Additionally, the correct methods were employed for both extraction/digestion and analysis as outlined in the work plan The appropriate units, detection limits, and compounds were reported by the laboratory per the July 2002 subcontract agreement between MACTEC and STL – North Canton

C.4.1.1 Groundwater – Upper WBU

C.4.1.1.1 Nineteen groundwater and two duplicate samples were collected from the upper WBU at OU 7 in October of 2002. Each of the monitoring well sample locations from the upper WBU were assayed for VOCs, total and dissolved metals, and MNA parameters. Two of the locations (MWFTA-1 and MWFTA-3) were additionally sampled and analyzed for PAHs and PCBs

C.4.1.1.2 Volatile Organic Compounds (SW8260B) – The initial calibration tunes passed the QC requirements outlined in the Shell document and the method. VOCs were calibrated using either the average relative response factor and/or quadratic curve and were within specified limits In the initial calibration verification (ICV) performed on 10/21/02, dichlorodifluoromethane exceeded the plus or minus 20 percent criteria The results were qualified as estimated and flagged (UJ) in the following samples:

DMW-22A	DMW-26A	DMW-27A	DMW-33A	MWFOS-1
MWFOS-3	MWFTA-3	MWFTA-5	MWFTA-9	MWFTA-10
OU7DUP-2	TB-101502-1	TB-101702-2	TB-102902-1	

C.4.1.1.3 The continuing calibration verification (CCV) standards associated with the OU 7 groundwater samples were analyzed as appropriate and some compounds exceeded limits specified by the USACE or the method Qualifications were made based on percent difference (%D) observed in the CCVs analyzed on the dates indicated below. Qualifications were assigned for high and low biased (J for detects and UJ for non-detects) exceedances in the CCV, unless overridden by qualifications for other QC exceedances If the %D observed for a compound exceeded plus or minus 40% or the compound exceeding %D criteria in the CCV also exceeded percent recovery (%R) criteria in the LCS, the associated results were qualified as unusable (flagged R)

CCV Date	Affected Compounds	Associated Samples		
10/22/02	Acetone	DMW-26A	DMW-27A	MWFOS-1
	Bromoform	MWFTA-3	OU7DUP-2	TB-101502-2
	Dichlorodifluoromethane			
	Hexachlorobutadiene			
	Trichlorofluoromethane			
	2-Hexanone			
	2-Butanone			
10/24/02	Acetone	AEHADG-10	OU7DUP-1	
	Carbon disulfide			
	Dichlorodifluoromethane			

CCV Date	Affected Compounds	Associated Samples		
10/30/02	Acetone Dichlorodifluoromethane Hexachlorobutadiene Naphthalene n-Butylbenzene 1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 2-Butanone 2-Hexanone	TB-101702-2		
11/01/02	1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene Hexachlorobutadiene Naphthalene n-Butylbenzene sec-Butylbenzene Acetone (unusable) 2-Butanone (unusable) 2-Hexanone (unusable)	DMW-33A MWFTA-10	MWFTA-5 TB-102902-1	MWFTA-9
11/06/02	1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 2-Butanone 2-Hexanone Hexachlorobutadiene Naphthalene n-Butylbenzene Acetone (unusable)	DMW-22A		

C.4.1.1.4 The batch specific preparation blanks did not have analytes of interest greater than the RL The following method blanks contained the indicated compounds at concentrations above the MDL but below the RL. The associated OU 7 samples with concentrations less than or equal to ten times the blank concentration were accordingly qualified as estimated with possible method blank contamination and flagged "JB", unless overridden by qualifications for other QC exceedences.

Blank Date	Compound	Concentration	Flagged Samples
10/22/02	Acetone	1 2 microgram per liter (µg/L)	DMW-26A
10/30/02	Acetone	1 4 µg/L	No flag – results non-detect
11/01/02	Methylene Chloride	0 35 µg/L	TB-102902-1

C.4.1.1.5 Batch specific LCSs were also analyzed and recoveries were acceptable, with the following exceptions Qualifications were assigned for either high biased (JH for positive results and UJ for non-detects) or low biased (JL for positives or UL for non-detects) exceedances in the LCS, unless overridden by qualifications for other QC exceedances. If the %R observed for a compound exceeded plus or minus 40% or the compound exceeding %R criteria in the LCS also exceeded %D criteria in the CCV, the associated results were qualified as unusable (flagged R). No qualification was necessary for LCS/LCSD failures that met sporadic marginal failure (SMF) criteria

LCS/LCSD	Affected Compounds	Associated Samples	
11/01/02	Acetone (unusable)	DMW-33A	MWFTA-5
	2-Butanone (unusable)	MWFTA-9	MWFTA-10
	2-Hexanone (unusable)	TB-102902-1	
	4-Methyl-2-pentanone (low)		

C.4.1.1.6 MS/MSDs were specified and performed on groundwater sample MWFTA-1. Acetone and 2-butanone recoveries were below QC limits, but no flags were necessary because the failures were within SMF limits.

C.4.1.1.7 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and MWFTA-3/OU7DUP-2) were collected and analyzed for VOCs RPD between the parent sample and the duplicate sample is outside of specified limits (<30%) for 1,1-dichloroethene in AEHADG-10/OU7DUP-1 Both the parent and the duplicate sample were qualified as estimated and flagged "J" The surrogates and internal standards added to the samples by the laboratory were recovered within specified limits.

C.4.1.1.8 The trip blanks associated with the OU 7 samples were analyzed, but were not reported to contain VOCs above the RL However, the trip blanks contained methylene chloride, but the associated samples were either non-detect, greater than five times the blank value, or already flagged "JB" for method blank contamination. No further flagging was necessary. An equipment blank (OU6EQB-1: SDG #A2K070276) was collected to assess possible contamination from using non-dedicated sampling equipment. Acetone, methylene chloride, and toluene were found in the equipment blank No flags were necessary because the associated results were non-detect or greater than five times the blank value in the associated samples

C.4.1.1.9 The following samples were diluted to place the VOC results within the range of the calibration curve, which resulted in elevated RLs.

Sample	Dilution Factor	Sample	Dilution Factor	Sample	Dilution Factor
AEHADG-10	125x	DMW-33A	66 67x	MWFOS-3	333 33x
MWFTA-3	2x	MWFTA-23(1)	1250x	MWFTA-23(2)	1666 67x
OU7DUP-1	125x	OU7DUP-2	2x		

C.4.1.1.10 Additionally, the following data points were reported at concentrations above the MDL, but less than the RL and were qualified as estimated and flagged as "JQ"

Sample ID	Affected Compounds
AEHADG-10	Naphthalene, 1,1-Dichloroethene
DMW-20A	Chloromethane
DMW-22A	1,1-Dichloroethane, 1,1-Dichloroethene, 1,2-Dichlorobenzene
DMW-25A	Acetone
DMW-26A	cis-1,2-Dichloroethene, Trichloroethene
DMW-33A	Methyene chloride
DMW-35A	Acetone
MWFOS-3	Methylene chloride, trans-1,2-Dichloroethene, Vinyl chloride
MWFTA-1	1,1-Dichloroethane, Acetone
MWFTA-3	1,1-Dichloroethane, 1,1-Dichloroethene
MWFTA-7	Acetone
MWFTA-23(2)	Vinyl chloride
OU7DUP-1	Naphthalene
OU7DUP-2	1,1-Dichloroethene

C.4.1.1.11 Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier.

C.4.1.1.12 Dissolved Gases (RSK-175) – The initial and continuing calibrations for each instrument used for the analysis of dissolved gases met acceptable criteria. Some of the laboratory batch preparation blanks (Method Blanks) contained methane or carbon dioxide. The methane result in sample MWFTA-5 was qualified as estimated with possible method blank contamination and flagged "JB". Batch LCSs for dissolved gases were within acceptable limits, and MS/MSD spikes were not performed for dissolved gases.

C.4.1.1.13 The trip blanks were analyzed and contained carbon dioxide and/or methane. Methane in samples DMW-35A, DMW-13A, DMW-20A, and DMW-25A was less than five times the blank value and qualified as estimated with possible method blank contamination and flagged "JB".

C.4.1.1.14 An equipment blank (OU6DQB-1) was collected and analyzed with SDG # A2K070276 to assess possible contamination from non-dedicated sampling equipment. Although carbon dioxide was detected in the equipment blank, the result was flagged "JB" for method blank contamination No flagging of the data for equipment blank contamination is necessary.

C.4.1.1.15 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and MWFTA-3/OU7DUP-2) were collected and analyzed for dissolved gases. RPD between the parent sample and the duplicate sample is within specified limits (<20%)

C.4.1.1.16 Results were evaluated and reported down to the MDL Flagging of dissolved gas results less than the RL but greater than the MDL (JQ) was necessary for ethane in MWFTA-23 and methane in TB-101602-1. Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier.

C.4.1.1.17 Polynuclear Aromatic Hydrocarbons (PAHs by SW8270C SIM) – Analysis for PAHs by method 8270C SIM was performed for samples MWFTA-1, MWFTA-3 and OU7DUP-2 The initial and continuing calibration for each instrument used for the analysis of PAHs met acceptable criteria The laboratory batch preparation blanks (method blanks) did not contain PAHs

C.4.1.1.18 The batch LCSs for PAHs were within QC limits MS/MSD recoveries in spiked sample MWFTA-1 were within specified limits

C.4.1.1.19 One field duplicate pair (MWFTA-3/OU7DUP-2) was collected and analyzed for PAHs RPD between the parent sample and the duplicate sample was not calculated because there were no positive results for PAHs. The recovery of surrogate terphenyl–d14 was above the QC limit in sample OU7DUP-2. No qualification was necessary, since the rest of the surrogates were within the QC limits, and there were no positive results for PAHs

C.4.1.1.20 Results were evaluated and reported down to the MDL Flagging of PAH results less than the RL but greater than the MDL was required acenaphthene, anthracene, and fluorene for sample MWFTA-1. Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier.

C.4.1.1.21 Polychlorinated Biphenyls (PCBs by SW8082) – Analysis for PCBs by method SW8082 was performed for samples MWFTA-1, MWFTA-3 and OU7DUP-2 The initial and continuing calibration for each instrument used for the analysis of PCBs met acceptable criteria. The alternate source ICV was also with QC limits The laboratory batch preparation blanks (method blanks) did not contain PCBs

C.4.1.1.22 The batch LCSs for PCBs were within QC limits. MS/MSD recoveries for spiked sample MWFTA-1 were within QC limits.

C.4.1.1.23 One field duplicate pair (MWFTA-3/OU7DUP-2) was collected and analyzed for PCBs RPD between the parent sample and the duplicate sample was not calculated because there were no positive results for PCBs. One surrogate (decachlorobiphenyl) recovered below the QC limit in sample MWFTA-1, but no flags were necessary because the other surrogate (tetrachloro-meta-xylene) recovered within the QC limit

C.4.1.1.24 Results were evaluated and reported down to the MDL Flagging of PCB results less than the RL but greater than the MDL was not required

C.4.1.1.25 Total and Dissolved Metals (SW6010B) – The initial calibration for each instrument used for the analysis of dissolved and total metals met USACE criteria The alternate source ICVs were within 10 percent of their true value. The low-level calibration checks performed for metals analyses exceeded QC criteria as indicated below. The associated non-detect results were qualified as estimated and flagged "UL" for low jrecoveries and "UJ" for high recoveries.

Date	Metal	Flag	Associated Samples
10/23/02	Aluminum	UJ	AEHADG-10 (dissolved), DMW-35A (both), MWFOS-1 (both), OU7DUP-1 (dissolved)
	Zinc	UL	DMW-20A (both), DMW-25A (both), DMW-26A (both), DMW-27A (both), DMW-35A (both), MW112-2 (both), MWFOS-1 (both), MWFOS-3 (both), MWFTA-1 (both)
11/12/02	Antimony	UJ	DMW-22A (both), DMW-33A (both), MWFTA-5 (both), MWFTA-9 (both), MWFTA-10 (both)

C.4.1.1.26 The CCVs were within 10 percent of their true value The laboratory batch preparation blanks (Method Blanks) contained arsenic, calcium, copper, manganese, and/or potassium above the detection limit The associated results less than five times the blank value were qualified as estimated and flagged "JB". Therefore, the total copper results, for DMW-22A and DMW-33A, and the dissolved copper result for MWFTA-10 were qualified as estimated and flagged "JB"

C.4.1.1.27 The batch LCSs for dissolved and total metals were within USACE prescribed limits (80-120%R) The MS/MSD recoveries for total and dissolved metals in MWFTA-1 and total metals in MWFOS-3 and MWFTA-9 were within QC limits

C.4.1.1.28 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and MWFTA-3/OU7DUP-2) were collected and analyzed for metals. The RPD between the parent and the duplicate sample results was outside of control limits for total and dissolved vanadium in AEHADG-10/OU7DUP-1 and the results were qualified as estimated and flagged "J" unless overridden by other QC criteria. There were no dissolved results that exceeded the total results by more than the QC limit.

C.4.1.1.29 A serial dilution to assess new matrices was performed on samples MWFTA-1, MWFTA-9, and MWFOS-3 Recoveries were within 10 percent of their original value with the exception of total potassium in MWFOS-3, and potassium and manganese in MWFTA-9. The associated results that were greater than 50 times the MDL (potassium in samples MWFOS-3 and MWFTA-9) were qualified as estimated and flagged "J", unless overridden by other QC criteria.

C.4.1.1.30 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG # A2K070276) to assess potential contamination from non-dedicated sampling equipment Sample OU6EQB-1 contained reportable levels of total and/or dissolved arsenic, barium, cadmium, calcium, cobalt, iron, manganese, and zinc The following results were less than five times the equipment blank value and qualified as estimated and flagged "JB".

Metal	Affected Samples
Arsenic	MWFTA-10 (total)
Cobalt	MWFOS-3 (both), MW112-2 (both), MWFTA-9 (both), MWFTA-10 (dissolved)
Iron	MWFTA-9 (dissolved), MWFTA-10 (dissolved)

C.4.1.1.31 Results were evaluated and reported down to the MDL Flagging of total and dissolved metals results less than the RL but greater than the MDL (JQ) is described below.

Sample ID	Affected Metals
AEHADG-10	Aluminum (total), Barium (both), Beryllium (both), Calcium (both), Cobalt (both), Nickel (both), Potassium (both), Vanadium (both)
DMW-13A	Barium (both), Beryllium (both), Cadmium (both), Calcium (both), Cobalt (both), Lead (total), Magnesium (both), Nickel (both), Potassium (both)
DMW-20A	Aluminum (both), Barium (both), Beryllium (both), Calcium (both), Magnesium (both), Nickel (both), Potassium (both)
DMW-22A	Aluminum (both), Barium (both)
DMW-25A	Arsenic (total), Barium (both), Cobalt (both), Chromium (both), Copper (both), Magnesium (both), Manganese (both), Molybdenum (total), Nickel (both), Vanadium (both)
DMW-26A	Arsenic (both), Barium (both), Calcium (both), Magnesium (both), Vanadium (both)

Sample ID	Affected Metals
DMW-27A	Barium (both), Beryllium (both), Calcium (both), Cobalt (both), Magnesium (both), Potassium (both), Vanadium (both)
DMW-33A	Aluminum (both), Barium (both), Beryllium (both), Zinc (total)
DMW-35A	Barium (both), Beryllium (both), Calcium (both), Magnesium (both), Nickel (both), Potassium (both), Sodium (both)
MW112-2	Aluminum (both), Barium (both), Beryllium (both), Calcium (both), Magnesium (both), Nickel (both), Sodium (both)
MWFOS-1	Barium (both), Beryllium (total), Molybdenum (both)
MWFOS-3	Aluminum (both), Barium (both), Calcium (both), Copper (both), Magnesium (both), Nickel (total), Potassium (both)
MWFTA-1	Beryllium (both), Cobalt (both), Vanadium (both)
MWFTA-3	Aluminum (dissolved), Barium (both), Beryllium (both), Calcium (both), Cobalt (both), Magnesium (both), Vanadium (both)
MWFTA-5	Aluminum (dissolved), Barium (both), Calcium (both), Magnesium (both) Potassium (both)
MWFTA-7	Barium (both), Beryllium (both), Cadmium (total), Calcium (both), Cobalt (both), Chromium (dissolved), Copper (total) Lead (both), Magnesium (both), Potassium (both), Sodium (both)
MWFTA-9	Aluminum (both), Barium (both), Calcium (both), Magnesium (both), Molybdenum (dissolved), Potassium (both)
MWFTA-10	Barium (both), Calcium (total), Magnesium (both), Potassium (both)
MWFTA-23	Aluminum (both), Beryllium (both), Calcium (both), Cobalt (both), Magnesium (both), Nickel (both), Potassium (both), Sodium (both), Vanadium (both)
OU7DUP-1	Aluminum (total), Barium (both), Beryllium (both), Calcium (both), Cobalt (both), Nickel (both), Potassium (both), Vanadium (both)
OU7DUP-2	Barium (both), Beryllium (both), Calcium (dissolved), Cobalt (dissolved), Magnesium (both), Vanadium (dissolved)

C.4.1.1.32 Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier.

C.4.1.1.33 Total and Dissolved Mercury (7470A) - The initial and continuing calibration for each instrument used for the analysis of total and dissolved mercury met acceptable criteria The low-level check standard recovered above QC limits for mercury after the analysis on 10/25/02 Associated total and dissolved results in sample MWFTA-1 were qualified as estimated and flagged "UJ" The laboratory batch preparation blanks (Method Blanks) did not contain mercury

C.4.1.1.34 Batch LCSs for mercury were within acceptable limits The MS/MSD recoveries for total mercury in sample MWFTA-9 were within QC limits. Recoveries of total and dissolved mercury in spiked sample MWFTA-1 and total mercury in MWFOS-3 were outside of the QC limit. The associated results were qualified as estimated and flagged "UL".

C.4.1.1.35 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG # A2K070276) to assess possible contamination from using non-dedicated sampling equipment. Mercury was non-detect in the equipment blank

C.4.1.1.36 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and MWFTA-3/OU7DUP-2) were collected and analyzed. The RPDs between the parent and the duplicate sample results were not calculated since the results were non-detect. A serial dilution was performed to assess new matrices in samples MWFTA-1, MWFTA-9, and MWFOS-3 and recoveries were within 10 percent of their original value. Results were evaluated and reported down to the MDL Flagging of total and dissolved metals results less than the RL but greater than the MDL (JQ) was not necessary.

C.4.1.1.37 Total and Dissolved Thallium (SW7841) - The initial and continuing calibration for each instrument used for the analysis of total and dissolved thallium met acceptable criteria. The low level check analyzed after the analysis of the project samples was outside of acceptable QC limits on 10/29/02 and 10/30/02 The associated non-detect total and dissolved results for MWFTA-3, MWFTA-7, and OU7DUP-2, and the dissolved result for OU7DUP-1 were qualified as estimated and flagged "UJ" Several non-detect total and dissolved results associated with the low level check analyzed on 10/29/02 were subsequently qualified as estimated and flagged "UJ", but were overridden by "UL" flags for low post digestion spike recoveries (see section **C.4.1.7.4.** below).

C.4.1.1.38 The laboratory batch preparation blanks (Method Blanks) were non-detect for thallium. Batch LCSs for thallium were within acceptable limits. The MS/MSD recoveries for total thallium in samples MWFOS-3 and MWFTA-9 and total and dissolved thallium in sample MWFTA-1 were within QC limits

C.4.1.1.39 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and MWFTA-3/OU7DUP-2) were collected and analyzed RPD between the parent sample and the duplicate sample could not be calculated because thallium was not detected in these samples.

C.4.1.1.40 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG # A2K070276) to assess possible contamination from using non-dedicated sampling equipment Thallium was non-detect in the equipment blank

B.4.1.1.41 A post digestion spike was performed on the samples analyzed by graphite furnace to confirm matrix effects. Recoveries were low for AEHADG-10 (both), DMW-26A, (both), DMW-20A (both), MWFTA-1 (both), MWFTA-3 (both), MWFTA-7 (total), OU7DUP-1 (total), and OU7DUP-2 (both) and results were subsequently qualified as estimated for possible matrix effects and flagged "UL". A serial dilution was performed to assess new matrices in samples MWFTA-1 and MWFTA-9 and recoveries were within 10 percent of their original value. Results were evaluated and reported down to the MDL. Flagging of thallium results less than the RL but greater than the MDL (JQ) was not necessary

C.4.1.1.42 Anions (300.0A) – The initial and continuing calibration for each instrument used for the analysis of chloride, nitrate, and sulfate met acceptable criteria. The laboratory batch preparation blanks (Method Blanks) analyzed on 10/17/02 contained nitrate at 0.11 milligrams per liter (mg/L) The associated result in sample MW112-2 was qualified as estimated with possible method blank contamination and flagged "JB" Subsequent initial calibration blanks (ICBs)/continuing calibration blanks (CCBs) contained chloride, nitrate, and/or sulfate The nitrate results were qualified as estimated and flagged "JB" for MW112-2 and "JH" for DMW-13A. Batch LCSs for anions were within acceptable limits The MS/MSD recoveries of chloride in MWFTA-1 were outside of acceptable limits for chloride. The associated result was qualified as estimated and flagged "J"

C.4.1.1.43 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and MWFTA-3/OU7DUP-2) were collected and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (<20%).

C.4.1.1.44 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG #A2K070276) to assess possible contamination from using non-dedicated sampling equipment. The equipment blank contained chloride at 2 2 mg/L and sulfate at 15.9 mg/L The chloride and sulfate results in samples MWFTA-9, MWFTA-10, and MWFOS-3 and the sulfate result in sample MW112-2 may be qualified as estimated and flagged "JB" for possible equipment blank contamination. However, review of previous quarterly data and comparison to other groundwater samples indicate that these results are representative Therefore, no qualification of the data due to equipment blank contamination was necessary

C.4.1.1.45 Results were evaluated and reported down to the MDL Flagging of anion results less than the RL but greater than the MDL (JQ) is described below

Sample ID	Affected Analytes	Sample ID	Affected Analytes
DMW-26A	Nitrate	MWFTA-1	Sulfate
DMW-27A	Nitrate	MWFTA-7	Nitrate
DMW-33A	Nitrate		

C.4.1.1.46 Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier.

C.4.1.1.47 Total Organic Carbon (9060) – The initial and continuing calibration for each instrument used for the analysis of TOC met acceptable criteria The laboratory batch preparation blanks (Method Blanks) did not contain TOC Subsequent ICBs/CCBs contained TOC, and the results less than five times the associated blank value (AEHADG-10, DMW-13A, DMW-20A, DMW-33A, MWFOS-1, and OU7DUP-1) were qualified as estimated with possible high bias and flagged "JH". Batch LCSs for TOC were within acceptable limits. The MS/MSDs recoveries of spiked sample MWFTA-1 were within acceptable QC limits.

C.4.1.1.48 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and MWFTA-3/OU7DUP-2) were collected and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (<20%).

C.4.1.1.49 The trip blanks associated with the OU 7 samples did not contain TOC An equipment blank (OU6EQB-1) was collected and analyzed (SDG# A2K070276) to assess possible contamination from non-dedicated sampling equipment, and TOC was detected at 3 mg/L MWFOS-3 contained less than five times the equipment blank value and was qualified as estimated with possible high bias and flagged "JH" Sample DMW-20A was qualified as estimated and flagged "JB" since the result was less than the equipment blank value

C.4.1.1.50 Results were evaluated and reported down to the MDL Flagging of TOC results less than the RL but greater than the MDL was not necessary

C.4.1.1.51 Alkalinity (310.1) – The titration standardization performed for the analysis of alkalinity met acceptable criteria, as did the initial calibration and calibration check The laboratory batch preparation blanks (Method Blanks) contained alkalinity The associated results less than five times the method blank value (AEHADG-10, DMW-33A, DMW-35A, MWFTA-9, MWFOS-1, MWFOS-3, MW112-2, and OU7DUP-1) were qualified as estimated with possible high bias and flagged "JH" Associated results less than the blank value (DMW-27A and DMW-20A) were qualified as estimated with possible method blank contamination and flagged "JB"

C.4.1.1.52 Batch LCSs for alkalinity were within acceptable limits The MS/MSD recoveries for sample MWFTA-1 were within QC limits.

C.4.1.1.53 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and MWFTA-3/OU7DUP-2) were collected and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (<20%)

C.4.1.1.54 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG #A2K070276) to assess possible contamination from using non-dedicated sampling equipment. The equipment blank was non-detect for alkalinity Results were evaluated and reported down to the MDL. Flagging of alkalinity results less than the RL but greater than the MDL was not necessary

C.4.1.1.55 Sulfide (376.1) – The titration standardization performed for the analysis of sulfide met acceptable criteria. The laboratory batch preparation blanks (Method Blanks) contained sulfide at 0.49 and 0 65 mg/L. Associated results less than five times the blank value (DMW-20A, DMW-25A, MWFOS-3, and MWFTA-1) were qualified as estimated with possible high bias and flagged "JH". Associated results less than the blank value (DMW-13A and OU7DUP-1) were qualified as estimated with possible method blank contamination and flagged "JB".

C.4.1.1.56 Batch LCSs for sulfide were within acceptable limits The MS/MSD recoveries for spiked sample MWFTA-1 were within acceptable laboratory limits

C.4.1.1.57 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and MWFTA-3/OU7DUP-2) were collected and analyzed. RPD between the parent sample and the duplicate sample was not calculated because the results were either below the RL or non-detect.

C.4.1.1.58 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG #A2K070276) to assess possible contamination from using non-dedicated sampling equipment The equipment blank contained sulfide at 0 32 mg/L, therefore, the associated results for samples DMW-20A, MWFTA-9 and

MWFTA-10 may be estimated due to possible equipment blank contamination and flagged "JH" However, review of previous quarterly data and comparison to other groundwater samples indicate that the sulfide results reported for these samples are representative. Therefore, no qualification of the data due to equipment blank contamination was necessary

C.4.1.1.59 Results were evaluated and reported down to the MDL. Flagging of sulfide results less than the RL but greater than the MDL (JQ) was necessary for samples DMW-22A, DMW-33A, MWFTA-3, MWFTA-5, MWFTA-9, MWFTA-10, and OU7DUP-2. Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier

C.4.1.1.60 Dissolved Hydrogen (AM20GA) – Initial and continuing calibration standards and instrument/method blanks were within method-stated control limits LCS results were also within laboratory-established limits. MS/MSD samples were not required for hydrogen analysis

C.4.1.1.61 Two field duplicate pairs (AEHADG-10/OU7DUP-1, MWFTA-3/OU7DUP-2) were collected from the upper WBU and analyzed. RPD between the parent and duplicate samples were within QC limits Results were evaluated and reported down to the MDL. Flagging of hydrogen results less than the RL but greater than the MDL was not necessary

C.4.1.2 Groundwater – Lower WBU And Fractured Bedrock Wells

C.4.1.2.1 Seven groundwater and two duplicate samples were collected from the lower WBU at OU 7 in October of 2002. In addition, bedrock well MWFTA-20 and a duplicate sample were collected at OU 7 in October of 2002 Each of the monitoring well sample locations were assayed for VOCs, total and dissolved metals, and MNA parameters Samples MWFTA-16P and MWFTA-20P were collected preserved with HCl and were analyzed for VOCs only to investigate the effects of HCl preservation on the VOC concentrations in samples from the lower WBU.

C.4.1.2.2 Volatile Organic Compounds (SW8260B) – The initial calibration tunes passed the QC requirements outlined in the Shell document and the method. VOCs were calibrated using either the average relative response factor and/or quadratic curve and were within specified limits. In the ICV performed on 10/21/02, dichlorodifluoromethane exceeded the plus or minus 20 percent criteria The results were qualified as estimated and flagged (UJ) in the following samples

MWFTA-14	MWFTA-16	MWFTA-16P	MWFTA-17	MWFTA-19	MWFTA-20
MWFTA-20P	MWFTA-28B	MWFTA-29B	OU7DUP-3	TB-101502-1	TB-101702-2
TB-102902-1					

C.4.1.2.3 The CCV standards associated with the OU 7 groundwater samples were analyzed as appropriate and some compounds exceeded limits specified by the USACE or the method. Qualifications were made based on %D observed in the CCVs analyzed on the dates indicated below Qualifications were assigned for high and low biased (J for detects and UJ for non-detects) exceedances in the CCV, unless overridden by qualifications for other QC exceedances If the %D observed for a compound exceeded plus or minus 40% or the compound exceeding %D criteria in the CCV also exceeded %R criteria in the LCS, the associated results were qualified as unusable (flagged R).

CCV Date	Affected Compounds	Associated Samples
10/22/02	Acetone Bromoform Dichlorodifluoromethane Hexachlorobutadiene Trichlorofluoromethane 2-Hexanone 2-Butanone	MWFTA-16, MWFTA-16P, MWFTA-17 MWFTA-19, MWFTA-20, MWFTA-20P MWFTA-29B, OU7DUP-3, TB-101502-2
10/24/02	Acetone Carbon disulfide Dichlorodifluoromethane	MWFTA-23
10/30/02	Acetone Dichlorodifluoromethane Hexachlorobutadiene Naphthalene n-Butylbenzene 1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 2-Butanone 2-Hexanone	TB-101702-2
11/01/02	1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene Hexachlorobutadiene Naphthalene n-Butylbenzene sec-Butylbenzene Acetone (unusable) 2-Butanone (unusable) 2-Hexanone (unusable)	MWFTA-14, MWFTA-28B, TB-102902-1

C.4.1.2.4 The batch specific preparation blanks did not have analytes of interest greater than the RL The following method blanks contained the indicated compounds at concentrations above the MDL but below the RL The associated OU 7 samples with concentrations less than or equal to ten times the blank concentration were accordingly qualified as estimated with possible method blank contamination and flagged "JB", unless overridden by qualifications for other QC exceedences.

Blank Date	Compound	Concentration	Flagged Samples
10/22/02	Acetone	1.2 µg/L	MWFTA-17
10/30/02	Acetone	1.4 µg/L	No flag – results non-detect
11/01/02	Methylene Chloride	0 35 µg/L	TB-102902-1

C.4.1.2.5 Batch specific LCSs were also analyzed and recoveries were acceptable, with the following exceptions Qualifications were assigned for either high biased (JH for positive results and UJ for non-detects) or low biased (JL for positives or UL for non-detects) exceedances in the LCS, unless overridden by qualifications for other QC exceedances. If the %R observed for a compound exceeded plus or minus 40% or the compound exceeding %R criteria in the LCS also exceeded %D criteria in the CCV, the associated results were qualified as unusable (flagged R) No qualification was necessary for LCS/LCSD failures that met SMF criteria.

LCS/LCSD	Affected Compounds	Associated Samples
11/01/02	Acetone (unusable) 2-Butanone (unusable) 2-Hexanone (unusable) 4-Methyl-2-pentanone (low)	MWFTA-14, MWFTA-28B, TB-102902-1

C.4.1.2.6 MS/MSDs were specified and performed on groundwater sample MWFTA-29B Trichloroethene and 1,1,2,2-tetrachloroethane recoveries were above and below QC limits respectively The trichloroethene result did not require qualification, since the sample result was non-detect The 1,1,2,2-tetrachloroethane result was qualified as estimated and flagged "UL" for sample MWFTA-29B

C.4.1.2.7 One field duplicate pair (MWFTA-20/OU7DUP-3) was collected and analyzed RPD between the parent sample and the duplicate sample is within specified limits (<30%) In addition, unpreserved aliquots of samples MWFTA-16 (MWFTA-16P) and MWFTA-20 (MWFTA-20P) were collected to evaluate the effects of preservative on the lower WBU water The RPD between the preserved and unpreserved samples were within QC criteria The surrogates and internal standards added to the samples by the laboratory were recovered within specified limits

C.4.1.2.8 The trip blanks associated with the OU 7 samples were analyzed, but were not reported to contain VOCs above the RL However; the trip blanks contained methylene chloride, but the associated samples were either non-detect, greater than five times the blank value, or already flagged "JB" for method blank contamination. No further flagging was necessary An equipment blank (OU6EQB-1: SDG #A2K070276) was collected to assess possible contamination from using non-dedicated sampling equipment. Acetone, methylene chloride, and toluene were found in the equipment blank No flags were necessary because the associated results were non-detect or greater than five times the blank value in the associated samples

C.4.1.2.8 The following samples were diluted to place the VOC results within the range of the calibration curve, which resulted in elevated RLs.

Sample	Dilution Factor	Sample	Dilution Factor	Sample	Dilution Factor
MWFTA-16	55 56x	MWFTA-16P	62 5x	MWFTA-20	4x
MWFTA-20P	4x	OU7DUP-3	4x		

C.4.1.2.9 Additionally, the following data points were reported at concentrations above the MDL, but less than the RL and were qualified as estimated and flagged as "JQ"

Sample ID	Affected Compounds
MWFTA-17	Acetone
MWFTA-19	Trichloroethene
MWFTA-28B	Naphthalene

C.4.1.2.10 Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier

C.4.1.2.11 Dissolved Gases (RSK-175) – The initial and continuing calibrations for each instrument used for the analysis of dissolved gases met acceptable criteria. Some of the laboratory batch preparation blanks (Method Blanks) contained methane or carbon dioxide. The carbon dioxide result in samples MWFTA-20 and OU7DUP-3 were qualified as estimated with possible method blank contamination and flagged "JB" The methane result in sample MWFTA-14 was also qualified as estimated with possible method blank contamination and flagged "JB" Batch LCSs for dissolved gases were within acceptable limits, and MS/MSD spikes were not performed for dissolved gases.

C.4.1.2.12 One field duplicate pair (MWFTA-20/OU7DUP-3) was collected and analyzed for dissolved gases RPD between the parent sample and the duplicate sample is within specified limits (<20%)

C.4.1.2.13 The trip blanks were analyzed and contained carbon dioxide and/or methane The carbon dioxide result for sample MWFTA-14 was less than five times the blank value and was qualified as estimated with possible method blank contamination and flagged "JB".

C.4.1.2.14 An equipment blank (OU6EQB-1) was collected and analyzed (SDG # A2K070276) to assess possible contamination from non-dedicated sampling equipment Although carbon dioxide was detected in the equipment blank, the result was flagged "JB" for method blank contamination No flagging of the data for equipment blank contamination is necessary

C.4.1.2.15 Results were evaluated and reported down to the MDL. Flagging of dissolved gas results less than the RL but greater than the MDL (JQ) was necessary for ethane in MWFTA-29B and methane in TB-101602-1. Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier.

C.4.1.2.16 Total and Dissolved Metals (SW6010B) – The initial calibration for each instrument used for the analysis of dissolved and total metals met USACE criteria The alternate source ICVs were within 10 percent of their true value The low-level calibration checks performed for metals analyses exceeded QC criteria as indicated below The associated non-detect results were qualified as estimated and flagged "UL" for low recoveries and "UJ" for high recoveries

Date	Metal	Flag	Associated Samples
10/23/02	Aluminum	UJ	MWFTA-18 (both)
10/23/02	Zinc	UL	MWFTA-16 (both), MWFTA-17 (both), MWFTA-18 (dissolved)
10/30/02	Aluminum	UJ	MWFTA-20 (both), OU7DUP-3 (both)
11/12/02	Antimony	UJ	MWFTA-14 (total), MWFTA-28B (both)

C.4.1.2.17 The CCVs were within 10 percent of their true value The laboratory batch preparation blanks (Method Blanks) contained arsenic, calcium, copper, manganese, and/or potassium above the detection limit The associated results less than five times the blank value were qualified as estimated and flagged "JB".

Metal	Associated Samples
Arsenic	MWFTA-19 (both), MWFTA-20 (total), MWFTA-29B (total)
Copper	MWFTA-14 (both)
Manganese	MWFTA-19 (total)

C.4.1.2.18 The batch LCSs for dissolved and total metals were within USACE prescribed limits (80-120%R). The MS/MSD recoveries for MWFTA-29B were outside of QC limits for total aluminum. The associated result for sample MWFTA-29B was qualified as estimated and flagged "JH".

C.4.1.2.19 One field duplicate pair (MWFTA-20/OU7DUP-3) was collected and analyzed for metals The RPD between the parent and the duplicate sample results was within QC limits. The dissolved potassium and sodium results for sample MWFTA-16 and the dissolved arsenic result for sample MWFTA-14 exceeded the total results by more than the QC limit, and were qualified as estimated and flagged "J" ("UL" for total arsenic in MWFTA-14)

C.4.1.2.20 A post digestion spike was performed on sample MWFTA-29B (total) to confirm matrix effects and recoveries were within USACE limits A serial dilution to assess new matrices was performed on sample MWFTA-29B. Recoveries were within 10 percent of their original value with the exception of aluminum and iron. However, the associated results were less than 50 times the MDL, and no qualification was necessary

C.4.1.2.21 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG # A2K070276) to assess potential contamination from non-dedicated sampling equipment. Sample OU6EQB-1 contained reportable levels of total and/or dissolved arsenic, barium, cadmium, calcium, cobalt, iron, manganese, and zinc. There were no results less than five times the blank values.

C.4.1.2.22 Results were evaluated and reported down to the MDL Flagging of total and dissolved metals results less than the RL but greater than the MDL (JQ) is described below

Sample ID	Affected Metals
MWFTA-14	Barium (both), Magnesium (both), Molybdenum (both)
MWFTA-16	Aluminum (dissolved), Arsenic (dissolved), Copper (total), Magnesium (dissolved), Vanadium (both)
MWFTA-17	Barium (both), Vanadium (both)
MWFTA-18	Barium (both), Magnesium (dissolved), Nickel (total), Zinc (total)
MWFTA-19	Barium (both), Magnesium (total), Vanadium (both)
MWFTA-20	Barium (both), Iron (dissolved), Magnesium (both), Vanadium (dissolved)
MWFTA-28B	Barium (both)
MWFTA-29B	Barium (both), Chromium (total), Copper (total), Magnesium (total), Manganese (total), Molybdenum (both), Nickel (both), Vanadium (both)
OU7DUP-3	Barium (both), Iron (total), Magnesium (both)

C.4.1.2.23 Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier.

C.4.1.2.24 Total and Dissolved Mercury (7470A) - The initial and continuing calibration for each instrument used for the analysis of total and dissolved mercury met acceptable criteria. The low-level check standard recovered above QC limits for mercury after the analysis on 10/25/02. There were no associated lower WBU samples. The laboratory batch preparation blanks (Method Blanks) did not contain mercury.

C.4.1.2.25 Batch LCSs for mercury were within acceptable limits The MS/MSD recoveries for total and dissolved mercury in spiked sample MWFTA-29B were within QC limits

C.4.1.2.26 One field duplicate pair (MWFTA-20/OU7DUP-3) was collected and analyzed. The RPDs between the parent and the duplicate sample results were not calculated since the results were non-detect. A serial dilution was performed to assess new matrices in sample MWFTA-29B and recoveries were within 10 percent of their original value .

C.4.1.2.27 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG # A2K070276) to assess possible contamination from using non-dedicated sampling equipment Mercury was non-detect in the equipment blank. Results were evaluated and reported down to the MDL. Flagging of total and dissolved metals results less than the RL but greater than the MDL was not necessary.

C.4.1.2.28 Total and Dissolved Thallium (SW7841) - The initial and continuing calibration for each instrument used for the analysis of total and dissolved thallium met acceptable criteria. The low level check analyzed after the analysis of the project samples was outside of acceptable QC limits on 10/29/02 and 10/30/02. The associated non-detect total and dissolved results (MWFTA-19, MWFTA-20, MWFTA-29B, and OU7DUP-3) were qualified as estimated and flagged "UJ" Several non-detect total and dissolved results associated with the low-level check analyzed on 10/29/02 were subsequently qualified as estimated and flagged "UJ", but were overridden by "UL" flags for low post digestion spike recoveries (see section **C.4.2.5.4.** below)

C.4.1.2.29 The laboratory batch preparation blanks (Method Blanks) were non-detect for thallium Batch LCSs for thallium were within acceptable limits The MS/MSD recoveries for total thallium in sample MWFTA-29B were below QC limits, therefore the total thallium result for MWFTA-29B was qualified as estimated and flagged "UL"

C.4.1.2.30 One field duplicate pair (MWFTA-20/OU7DUP-3) was collected and analyzed RPD between the parent sample and the duplicate sample could not be calculated because thallium was not detected in these samples.

C.4.1.2.31 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG # A2K070276) to assess possible contamination from using non-dedicated sampling equipment. Thallium was non-detect in the equipment blank

C.4.1.2.32 A post digestion spike was performed on the samples analyzed by graphite furnace to confirm matrix effects. Recoveries were low for MWFTA-14 (dissolved), MWFTA-16 (dissolved), MWFTA-19 (both), and MWFTA-20 (dissolved) and results were subsequently qualified as estimated for possible matrix effects and flagged "UL". A serial dilution was performed to assess new matrices in sample MWFTA-19 and recoveries were within 10 percent of their original value. Results were evaluated and reported down to the MDL. Flagging of thallium results less than the RL but greater than the MDL (JQ) was not necessary

C.4.1.2.33 Anions (300.0A) – The initial and continuing calibration for each instrument used for the analysis of chloride, nitrate, and sulfate met acceptable criteria The laboratory batch preparation blanks (Method Blanks) analyzed on 10/17/02 contained nitrate at 0.11 mg/L There were no associated lower WBU results less than five times the blank value. Subsequent ICBs/CCBs contained chloride, nitrate, and/or sulfate. There were no associated lower WBU sample results less than five times the blank value. Batch LCSs for anions were within acceptable limits The MS/MSD recoveries for the spiked sample MWFTA-29B were within QC limits

C.4.1.2.34 One field duplicate pair (MWFTA-20/OU7DUP-3) was collected and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (<20%).

C.4.1.2.35 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG #A2K070276) to assess possible contamination from using non-dedicated sampling equipment The equipment blank contained chloride at 2 2 mg/L and sulfate at 15 9 mg/L However, there were no lower WBU samples less than five times the blank value

C.4.1.2.36 Results were evaluated and reported down to the MDL Flagging of anion results less than the RL but greater than the MDL (JQ) was necessary for nitrate in sample MWFTA-14 Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier

C.4.1.2.37 Total Organic Carbon (9060) – The initial and continuing calibration for each instrument used for the analysis of TOC met acceptable criteria. The laboratory batch preparation blanks (Method Blanks) did not contain TOC Subsequent ICBs/CCBs contained TOC, and the results less than five times the associated blank value (MWFTA-16 and MWFTA-19) were qualified as estimated with possible high bias and flagged "JH". Batch LCSs for TOC were within acceptable limits The MS/MSDs recoveries of spiked sample MWFTA-29B were within acceptable QC limits.

C.4.1.2.38 One field duplicate pair (MWFTA-20/OU7DUP-3) was collected and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (<20%).

C.4.1.2.39 The trip blanks associated with the OU 7 samples did not contain TOC. An equipment blank (OU6EQB-1) was collected and analyzed (SDG# A2K070276) to assess possible contamination from non-dedicated sampling equipment, and TOC was detected at 3 mg/L. There were no associated lower WBU samples less than five times the blank value, therefore, no qualification was necessary

C.4.1.2.40 Results were evaluated and reported down to the MDL. Flagging of TOC results less than the RL but greater than the MDL was necessary for sample MWFTA-14. Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier

C.4.1.2.41 Alkalinity (310.1) – The titration standardization performed for the analysis of alkalinity met acceptable criteria, as did the initial calibration and calibration check. The laboratory batch preparation blanks (Method Blanks) contained alkalinity There were no associated results less than five times the method blank value.

C.4.1.2.42 Batch LCSs for alkalinity were within acceptable limits The MS/MSD recoveries for sample MWFTA-29B were below QC limits, and the result for MWFTA-29B was qualified as estimated and flagged "JL"

C.4.1.2.43 One field duplicate pair (MWFTA-20A/OU7DUP-3) was collected and analyzed RPD between the parent sample and the duplicate sample is within specified limits (<20%).

C.4.1.2.44 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG #A2K070276) to assess possible contamination from using non-dedicated sampling equipment. The equipment blank was non-detect for alkalinity Results were evaluated and reported down to the MDL. Flagging of alkalinity results less than the RL but greater than the MDL was not necessary.

C.4.1.2.45 Sulfide (376.1) – The titration standardization performed for the analysis of sulfide met acceptable criteria. The laboratory batch preparation blanks (Method Blanks) contained sulfide at 0 49 and 0 65 mg/L. Associated results less than five times the blank value (MWFTA-18) were qualified as estimated with possible high bias and flagged "JH". Associated results less than the blank value (MWFTA-16, and MWFTA-17) were qualified as estimated with possible method blank contamination and flagged "JB"

C.4.1.2.46 Batch LCSs for sulfide were within acceptable limits The MS/MSD recoveries for spiked sample MWFTA-29B were within acceptable laboratory limits.

C.4.1.2.47 One field duplicate pair (MWFTA-20/OU7DUP-3) was collected and analyzed. RPD between the parent sample and the duplicate sample was not calculated because the results were either below the RL or non-detect.

C.4.1.2.48 An equipment blank sample (OU6EQB-1) was collected and analyzed (SDG #A2K070276) to assess possible contamination from using non-dedicated sampling equipment The equipment blank contained sulfide at 0 32 mg/L, however, there were no associated results less than five times the blank value.

C.4.1.2.49 Results were evaluated and reported down to the MDL Flagging of sulfide results less than the RL but greater than the MDL (JQ) was necessary for samples MWFTA-20, MWFTA-29B, and OU7DUP-3 Any value reported below the RL but above the MDL that was previously flagged "J" is subsequently overridden by the "JQ" qualifier

C.4.1.2.50 Dissolved Hydrogen (AM20GA) – Initial and continuing calibration standards and instrument/method blanks were within method-stated control limits LCS results were also within laboratory-established limits. MS/MSD samples were not required for hydrogen analysis Holding times were met for the samples submitted to Microseeps for analysis.

C.4.1.2.51 One field duplicate pair (MWFTA-20/OU7DUP-3) was collected from the lower WBU and analyzed. RPD between the parent and duplicate samples were within QC limits.

C.5 DATA QUALITY EVALUATION SUMMARY

C.5.0.0.1 Except as previously noted, the data quality indicators were within the USACE prescribed QC limits and requires only the qualifications described. Overall percent completeness for the data collection efforts and DQO attainment is 99 5 A discussion of compound and/or method completeness compared to project objectives, as well as affects of field conditions on project objectives, is presented below

C.5.0.0.2 The following compounds exhibited percent completeness less than 90

Compound	% Complete	Compound	% Complete	Compound	% Complete
Acetone	80 95%	2-Hexanone	83 33%	2-Butanone	83 33%

C.5.0.0.3 The affect of data completeness below 90% for these compounds based on the project objectives is negligible Acetone, 2-butanone, and 2-hexanone are common laboratory contaminants Acetone was detected in some samples as well as in associated method blanks and therefore, its presence in the samples is suspect 2-Butanone, and 2-hexanone were not detected in the samples In addition, the data generated for 2-butanone and 2-hexanone does not adversely impact the overall risk assessment for the site due to the lack of positive results in excess of a risk-based concentration level. Acetone, 2-butanone, and 2-hexanone are not constituents of concern for OU7

C.5.0.0.4 Two samples in this SDG (MWFTA-16 and MWFTA-20) were collected both preserved and unpreserved for VOCs in order to analyze the effects of the effervescence that occurs when the lower WBU samples are preserved with HCl. Results were compared and found to be well within VOC limits for duplicate analyses The RPD between the samples and the preserved samples were less than 14.3% Although the results in the unpreserved samples were equal to or slightly greater than the results for the preserved samples, there is no clear indication whether or not VOCs are lost during the bubble formation in samples preserved with HCl. More data is needed to accurately assess the preservation of lower WBU samples Project DQOs are not affected

C.6 REFERENCES

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PREPARED/DATE: JAH 5/23/03

CHECKED/DATE JAV 5/23/03

TAB

APPENDIX C TABLES

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TABLE C-1

DATA SUMMARY TABLE FOR GROUNDWATER
UPPER WATER BEARING UNIT - OCTOBER 2002
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Sample ID: Sample Date:	Reporting (a) Limit	Sample AEHADG-10 10/16/2002	Duplicate AEHADG-10 10/16/2002	Sample DMW-13A 10/16/2002	Sample DMW-20A 10/16/2002	Sample DMW-22A 10/30/2002	Sample DMW-25A 10/16/2002	Sample DMW-26A 10/15/2002
FIELD PARAMETER:								
Dissolved Oxygen - E360.1 mg/L								
Dissolved Oxygen	0 1	0 8	0 8	0 8	1	0 4	2 5	0 1
Ferrous Iron - A3500D mg/L								
Ferrous Iron	0 1	<0 1	<0 1	3 5	<0 1	2	<0 1	1
Oxidation Reduction Potential - A2580A mV								
Oxidation Reduction Potential	--	-31	-31	299	405	-80	157	-68
pH - E150.1 pH Units								
pH	--	5 16	5 16	3 74	3 85	5 87	6 63	6 71
Specific Conductance - E120.1 mS/cm								
Specific Conductance	0 001	0 318	0 318	0 137	0 124	0 274	0 291	0 709
Temperature - E170 1 deg C								
Temperature	0 1	20 5	20 5	21 6	19 4	15 8	18 7	21
Turbidity - E180.1 NTU								
Turbidity	1	15	15	<1	47	<1	19	11
FIXED BASE LABORATORY ANALYSIS:								
Anions - MCAWW 300.3A mg/L								
Chloride	1	45	44 9	15 2	16 5	45	6 3	118
Nitrate as N	0 1	<0 1	<0 1	1 4 JB	0 17	<0 1	1	0 02 JQ
Sulfate	1	19 7	18 6	20 8	19	33 6	39 4	13 9
Dissolved Gases - RSK SOP-175 mg/L								
Carbon dioxide	0 001	120	120	110	160	85	24	180
Ethane	0 002	<0 002	<0 002	<0 002	<0 002	<0 002	<0 002	<0 002
Ethene	0 001	0 014	0 013	<0 001	<0 001	<0 001	<0 001	<0 001
Methane	0 001	0 18	0 19	0 0023 JB	0 0011 JB	0 075	0 0016 JB	2 4
Hydrogen by Microseeps - AM20GAX nM								
Hydrogen	0 03	2 2	2 6	2 4	2 7	4 2	5	2 9
Mercury - SW846 7470A (Dissolved) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1

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Mercury - SW846 7470A (Total) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L								
Aluminum	200	<200 UJ	<200 UJ	794	109 JQ	85 6 JQ	623	260
Antimony	5	<5	<5	<5	<5	<5 UJ	<5	<5
Arsenic	5	37 9	38 6	<5	<5	15	<5	3 1 JQ
Barium	200	108 JQ	109 JQ	98 2 JQ	70 7 JQ	66 7 JQ	51 9 JQ	57 5 JQ
Beryllium	10	1 9 JQ	2 JQ	1 4 JQ	0 91 JQ	<10	<10	<10
Cadmium	2	<2	<2	0 43 JQ	<2	<2	<2	<2
Calcium	5000	4750 JQ	4740 JQ	1740 JQ	1460 JQ	9710	18500	4430 JQ
Chromium	10	<10	<10	<10	<10	<10	2 2 JQ	<10
Cobalt	30	25 8 JQ	25 7 JQ	4 JQ	5 JB	<30	2 JQ	<30
Copper	10	<10	<10	<10	<10	<10	8 5 JQ	<10
Iron	200	17300	17400	2130	43 7 JB	4140	579	12400
Lead	3	<3	<3	3 1	<3	<3	<3	<3
Magnesium	5000	5370	5420	2130 JQ	2670 JQ	7380	2690 JQ	1580 JQ
Manganese	20	650	654	162	295	119	8 2 JQ	69 6
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	37 5 JQ	37 6 JQ	3 3 JQ	4 9 JQ	<100	4 4 JQ	<100
Potassium	5000	4530 JQ	4600 JQ	2220 JQ	2980 JQ	5840	14500	9180
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	11600	11700	6090	6670	29900	42000	90600
Vanadium	50	1 1 JQ	0 75 JQ	<50	<50	<50	1 4 JQ	3 8 JQ
Zinc	20	28 8	27 4	20 4	<20 UL	<20	<20 UL	<20 UL
Metals - SW846 6010B (Total) µg/L								
Aluminum	200	63 4 JQ	74 2 JQ	831	145 JQ	78 7 JQ	925	443
Antimony	5	<5	<5	<5	<5	<5 UJ	<5	<5
Arsenic	5	39 6	39 5	<5	<5	14 4	2 8 JQ	2 6 JQ
Barium	200	107 JQ	110 JQ	102 JQ	70 5 JQ	64 9 JQ	52 3 JQ	58 5 JQ
Beryllium	10	1 9 JQ	1 9 JQ	1 2 JQ	0 97 JQ	<10	<10	<10
Cadmium	2	<2	<2	0 49 JQ	<2	<2	<2	<2
Calcium	5000	4670 JQ	4800 JQ	1710 JQ	1430 JQ	9450	18300	4440 JQ
Chromium	10	<10	<10	<10	<10	<10	2 6 JQ	<10
Cobalt	30	24 7 JQ	26 JQ	4 JQ	5 2 JB	<30	2 3 JQ	<30
Copper	10	<10	<10	<10	<10	1 9 JB	8 4 JQ	<10
Iron	200	17200	17700	2200	639	4070	731	12500
Lead	3	<3	<3	2 8 JQ	<3	<3	<3	<3

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Magnesium	5000	5300	5440	2200 JQ	2690 JQ	7170	2680 JQ	1610 JQ
Manganese	20	639	658	170	297	117	11 4 JQ	70
Molybdenum	40	<40	<40	<40	<40	<40	3 7 JQ	<40
Nickel	100	37 2 JQ	38 4 JQ	3 4 JQ	4 2 JQ	<100	3 7 JQ	<100
Potassium	5000	4480 JQ	4590 JQ	2230 JQ	2970 JQ	5670	14000	9400
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	11300	11800	6200	6710	29200	41300	90700
Vanadium	50	0 81 JQ	1 2 JQ	<50	<50	<50	1 9 JQ	4 2 JQ
Zinc	20	24 1	24 2	47 7	<20 UL	23	<20 UL	<20 UL
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L								
PCB-1016	1	NA	NA	NA	NA	NA	NA	NA
PCB-1221	1	NA	NA	NA	NA	NA	NA	NA
PCB-1232	1	NA	NA	NA	NA	NA	NA	NA
PCB-1242	1	NA	NA	NA	NA	NA	NA	NA
PCB-1248	1	NA	NA	NA	NA	NA	NA	NA
PCB-1254	1	NA	NA	NA	NA	NA	NA	NA
PCB-1260	1	NA	NA	NA	NA	NA	NA	NA
Surrogate - %								
Decachlorobiphenyl	--	NA	NA	NA	NA	NA	NA	NA
Tetrachloro-m-xylene	--	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organic Compounds - SW846 8270C SIM µg/L								
Acenaphthene	0 2	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	0 2	NA	NA	NA	NA	NA	NA	NA
Anthracene	0 2	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0 2	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0 2	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0 2	NA	NA	NA	NA	NA	NA	NA
Benzo(ghi)perylene	0 2	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0 2	NA	NA	NA	NA	NA	NA	NA
Chrysene	0 2	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	0 2	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	0 2	NA	NA	NA	NA	NA	NA	NA
Fluorene	0 2	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0 2	NA	NA	NA	NA	NA	NA	NA
Naphthalene	0 2	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0 2	NA	NA	NA	NA	NA	NA	NA
Pyrene	0 2	NA	NA	NA	NA	NA	NA	NA

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Surrogate - %								
2 4,6-Tribromophenol	--	NA	NA	NA	NA	NA	NA	NA
2-Fluorobiphenyl	--	NA	NA	NA	NA	NA	NA	NA
2-Fluorophenol	--	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene-d5	--	NA	NA	NA	NA	NA	NA	NA
Phenol-d5	--	NA	NA	NA	NA	NA	NA	NA
Terphenyl-d14	--	NA	NA	NA	NA	NA	NA	NA
Thallium - SW846 7841 (Dissolved) µg/L								
Thallium	2	<2 UL	<2 UJ	<2	<2 UL	<2	<2	<2 UL
Thallium - SW846 7841 (Total) µg/L								
Thallium	2	<2 UL	<2 UL	<2	<2 UL	<2	<2	<2 UL
Total Alkalinity - MCAWW 310.1 mg/L								
Total Alkalinity	5	13 JH	13 JH	<5	1 4 JB	31	97	61
Total Organic Carbon - SW846 9060 mg/L								
Total Organic Carbon	1	1 JH	1 JH	1 JH	1 JB	2	11	16
Total Sulfide - MCAWW 376 1 mg/L								
Total Sulfide	1	<1	0 33 JB	0 49 JB	1 1 JH	0 32 JQ	0 81 JH	6 9
Volatile Organic Compounds - SW846 8260B µg/L								
1,1 1,2-Tetrachloroethane	1	<120	<120	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	1	1100	1200	<1	<1	<1	<1	<1
1,1 2,2-Tetrachloroethane	1	<120	<120	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	1	<120	<120	<1	<1	<1	<1	<1
1,1-Dichloroethane	1	<120	<120	<1	<1	0 48 JQ	<1	<1
1,1-Dichloroethene	1	98 JQ	140 J	<1	<1	0 61 JQ	<1	<1
1,1-Dichloropropene	1	<120	<120	<1	<1	<1	<1	<1
1,2,3-Trichlorobenzene	1	<120	<120	<1	<1	<1 UJ	<1	<1
1,2,3-Trichloropropane	1	<120	<120	<1	<1	<1	<1	<1
1 2 4-Trichlorobenzene	1	<120	<120	<1	<1	<1 UJ	<1	<1
1 2 4-Trimethylbenzene	1	<120	<120	<1	<1	<1	<1	<1
1,2-Dibromo-3-chloropropane	2	<250	<250	<2	<2	<2	<2	<2
1,2-Dibromoethane	1	<120	<120	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	1	140	140	<1	<1	0 44 JQ	<1	<1
1,2-Dichloroethane	1	<120	<120	<1	<1	<1	<1	<1
1,2-Dichloropropane	1	<120	<120	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	1	<120	<120	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	1	<120	<120	<1	<1	<1	<1	<1
1,3-Dichloropropane	1	<120	<120	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	1	<120	<120	<1	<1	<1	<1	<1

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2,2-Dichloropropane	1	<120	<120	<1	<1	<1	<1	<1
2-Butanone	10	<1200	<1200	<10	<10	<10 UJ	<10	<10 UJ
2-Chlorotoluene	1	<120	<120	<1	<1	<1	<1	<1
2-Hexanone	10	<1200	<1200	<10	<10	<10 UJ	<10	<10 UJ
4-Chlorotoluene	1	<120	<120	<1	<1	<1	<1	<1
4-Methyl-2-pentanone	10	<1200	<1200	<10	<10	<10	<10	<10
Acetone	10	<1200 UJ	<1200 UJ	<10	<10	<10 R	2 5 JQ	1 6 JB
Benzene	1	<120	<120	<1	<1	<1	<1	<1
Bromobenzene	1	<120	<120	<1	<1	<1	<1	<1
Bromochloromethane	1	<120	<120	<1	<1	<1	<1	<1
Bromodichloromethane	1	<120	<120	<1	<1	<1	<1	<1
Bromoform	1	<120	<120	<1	<1	<1	<1	<1 UJ
Bromomethane	2	<250	<250	<2	<2	<2	<2	<2
Carbon disulfide	1	<120 UJ	<120 UJ	<1	<1	<1	<1	<1
Carbon tetrachloride	1	<120	<120	<1	<1	<1	<1	<1
Chlorobenzene	1	<120	<120	<1	<1	<1	<1	<1
Chloroethane	2	<250	<250	<2	<2	<2	<2	<2
Chloroform	1	<120	<120	<1	<1	<1	<1	<1
Chloromethane	2	<250	<250	<2	0 52 JQ	<2	<2	<2
cis-1,2-Dichloroethene	0 5	650	690	<0 5	21	2	<0 5	0 38 JQ
cis-1 3-Dichloropropene	1	<120	<120	<1	<1	<1	<1	<1
Dibromochloromethane	1	<120	<120	<1	<1	<1	<1	<1
Dibromomethane	1	<120	<120	<1	<1	<1	<1	<1
Dichlorodifluoromethane	2	<250 UJ	<250 UJ	<2	<2	<2 UJ	<2	<2 UJ
Ethylbenzene	1	<120	<120	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	<120	<120	<1	<1	<1 UJ	<1	<1 UJ
Isopropylbenzene	1	<120	<120	<1	<1	<1	<1	<1
m-Xylene & p-Xylene	1	<120	<120	<1	<1	<1	<1	<1
Methylene chloride	1	<120	<120	<1	<1	<1	<1	<1
n-Butylbenzene	1	<120	<120	<1	<1	<1 UJ	<1	<1
n-Propylbenzene	1	<120	<120	<1	<1	<1	<1	<1
Naphthalene	1	54 JQ	58 JQ	<1	<1	<1 UJ	<1	<1
o-Xylene	0 5	<62	<62	<0 5	<0 5	<0 5	<0 5	<0 5
p-Isopropyltoluene	1	<120	<120	<1	<1	<1	<1	<1
sec-Butylbenzene	1	<120	<120	<1	<1	<1	<1	<1
Styrene	1	<120	<120	<1	<1	<1	<1	<1

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Sample ID· Sample Date	Reporting (a) Limit	Sample AEHADG-10 10/16/2002	Duplicate AEHADG-10 10/16/2002	Sample DMW-13A 10/16/2002	Sample DMW-20A 10/16/2002	Sample DMW-22A 10/30/2002	Sample DMW-25A 10/16/2002	Sample DMW-26A 10/15/2002
tert-Butylbenzene	1	<120	<120	<1	<1	<1	<1	<1
Tetrachloroethene	1	1700	1900	<1	<1	1 9	1 4	<1
Toluene	1	<120	<120	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	0 5	<62	<62	<0 5	<0 5	<0 5	<0 5	<0 5
trans-1,3-Dichloropropene	1	<120	<120	<1	<1	<1	<1	<1
Trichloroethene	1	2500	2800	<1	2 5	10	<1	0 81 JQ
Trichlorofluoromethane	2	<250	<250	<2	<2	<2	<2	<2 UJ
Vinyl chloride	2	<250	<250	<2	<2	<2	<2	<2
Xylenes (total)	1	<120	<120	<1	<1	<1	<1	<1
Surrogate - %								
1 2-Dichloroethane-d4	--	85	88	87	88	90	86	92
4-Bromofluorobenzene	--	92	90	89	91	79	91	90
Dibromofluoromethane	--	92	93	91	92	99	90	99
Toluene-d8	--	91	90	91	90	88	91	94

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DATA SUMMARY TABLE FOR GROUNDWATER
UPPER WATER BEARING UNIT - OCTOBER 2002
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample DMW-27A 10/15/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/16/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/15/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/16/2002
FIELD PARAMETER:								
Dissolved Oxygen - E360.1 mg/L								
Dissolved Oxygen	0 1	1 1	0 6	0 7	1	0 6	0 8	2 2
Ferrous Iron - A3500D mg/L								
Ferrous Iron	0 1	0 5	2 4	<0 1	3	<0 1	<0 1	2
Oxidation Reduction Potential - A2580A mV								
Oxidation Reduction Potential	--	-63	-43	147	224	101	230	-158
pH - E150.1 pH Units								
pH	--	3 99	5 15	5 29	4 92	5 56	4 8	5 67
Specific Conductance - E120.1 mS/cm								
Specific Conductance	0 001	0 123	0 314	0 073	0 119	0 240	0 107	0 557
Temperature - E170.1 deg C								
Temperature	0 1	22 3	18 6	19 7	19 9	20	20 4	20 5
Turbidity - E180.1 NTU								
Turbidity	1	<1	42	<1	26	36	11	218
FIXED BASE LABORATORY ANALYSIS:								
Anions - MCAWW 300.3A mg/L								
Chloride	1	20 1	53 7	11 7	16 4	12	9 2	34 8 J
Nitrate as N	0 1	0 01 JQ	0 02 JQ	<0 1	0 06 JB	<0 1	<0 1	<0 1
Sulfate	1	1 4	19 5	4 2	13 8	62 9	18 1	0 53 JQ
Dissolved Gases - RSK SOP-175 mg/L								
Carbon dioxide	0 001	220	99	61	70	42	200	450
Ethane	0 002	<0 002	<0 002	<0 002	<0 002	<0 002	<0 002	<0 002
Ethene	0 001	<0 001	0 0017	<0 001	<0 001	<0 001	0 01	<0 001
Methane	0 001	2 9	0 015	0 002 JB	<0 001	0 012	1 2	4 8
Hydrogen by Microseeps - AM20GAX nM								
Hydrogen	0 03	2 4	19	2 5	3	2 9	5 6	2 3
Mercury - SW846 7470A (Dissolved) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1 UL

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DATA SUMMARY TABLE FOR GROUNDWATER
UPPER WATER BEARING UNIT - OCTOBER 2002
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample DMW-27A 10/15/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/16/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/15/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/16/2002
Mercury - SW846 7470A (Total) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1 UL	<1 UL
Metals - SW846 6010B (Dissolved) µg/L								
Aluminum	200	430	59 9 JQ	<200 UJ	66 8 JQ	<200 UJ	91 4 JQ	250
Antimony	5	<5	<5 UJ	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5	29 2	35 9
Barium	200	138 JQ	88 1 JQ	29 5 JQ	31 8 JQ	13 6 JQ	139 JQ	217
Beryllium	10	0 9 JQ	0 87 JQ	0 65 JQ	2 5 JQ	<10	<10	0 71 JQ
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	957 JQ	13100	3160 JQ	3400 JQ	15600	1160 JQ	22200
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	0 76 JQ	<30	<30	3 6 JB	<30	1 7 JB	1 2 JQ
Copper	10	<10	<10	<10	<10	<10	3 4 JQ	<10
Iron	200	3950	5180	1360	994	445	3780	7540
Lead	3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	1750 JQ	9440	2350 JQ	2870 JQ	7770	1930 JQ	30900
Manganese	20	21 7	145	47 9	61 9	43 5	64 2	544
Molybdenum	40	<40	<40	<40	<40	18 7 JQ	<40	<40
Nickel	100	<100	<100	4 4 JQ	7 4 JQ	<100	<100	<100
Potassium	5000	2850 JQ	5540	3620 JQ	6110	6870	2080 JQ	8030
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	5550	9050	2930 JQ	3400 JQ	9740	5980	14200
Vanadium	50	1 4 JQ	<50	<50	<50	<50	<50	1 5 JQ
Zinc	20	<20 UL	<20	<20 UL	<20 UL	<20 UL	<20 UL	<20 UL
Metals - SW846 6010B (Total) µg/L								
Aluminum	200	435	91 2 JQ	<200 UJ	62 5 JQ	<200 UJ	94 3 JQ	310
Antimony	5	<5	<5 UJ	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5	27 4	35 7
Barium	200	140 JQ	87 6 JQ	30 9 JQ	32 1 JQ	13 6 JQ	142 JQ	215
Beryllium	10	0 86 JQ	1 JQ	0 71 JQ	2 5 JQ	0 64 JQ	<10	1 JQ
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	972 JQ	12900	3350 JQ	3410 JQ	15600	1220 JQ	21900
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	0 81 JQ	<30	<30	3 5 JB	<30	1 3 JB	0 98 JQ
Copper	10	<10	2 4 JB	<10	<10	<10	3 5 JQ	<10
Iron	200	4020	5240	1460	1030	473	3850	7450
Lead	3	<3	<3	<3	<3	<3	<3	<3

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DATA SUMMARY TABLE FOR GROUNDWATER
UPPER WATER BEARING UNIT - OCTOBER 2002
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Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample DMW-27A 10/15/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/16/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/15/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/16/2002
Magnesium	5000	1780 JQ	9360	2430 JQ	2870 JQ	7770	1960 JQ	30300
Manganese	20	20 3	146	49 5	62 3	44	65 5	531
Molybdenum	40	<40	<40	<40	<40	18 5 JQ	<40	<40
Nickel	100	<100	<100	4 6 JQ	6 JQ	<100	3 5 JQ	<100
Potassium	5000	2890 JQ	5520	3770 JQ	6110	6740	2090 JQ	7960
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	5640	8850	2910 JQ	3360 JQ	9490	6040	14200
Vanadium	50	1 4 JQ	<50	<50	<50	<50	<50	1 4 JQ
Zinc	20	<20 UL	18 2 JQ	<20 UL	<20 UL	<20 UL	<20 UL	<20 UL
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L								
PCB-1016	1	NA	NA	NA	NA	NA	NA	<1
PCB-1221	1	NA	NA	NA	NA	NA	NA	<1
PCB-1232	1	NA	NA	NA	NA	NA	NA	<1
PCB-1242	1	NA	NA	NA	NA	NA	NA	<1
PCB-1248	1	NA	NA	NA	NA	NA	NA	<1
PCB-1254	1	NA	NA	NA	NA	NA	NA	<1
PCB-1260	1	NA	NA	NA	NA	NA	NA	<1
Surrogate - %								
Decachlorobiphenyl	--	NA	NA	NA	NA	NA	NA	39
Tetrachloro-m-xylene	--	NA	NA	NA	NA	NA	NA	95
Semi-Volatile Organic Compounds - SW846 8270C SIM µg/L								
Acenaphthene	0 2	NA	NA	NA	NA	NA	NA	0 083 JQ
Acenaphthylene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Anthracene	0 2	NA	NA	NA	NA	NA	NA	0 046 JQ
Benzo(a)anthracene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Benzo(a)pyrene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Benzo(b)fluoranthene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Benzo(ghi)perylene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Benzo(k)fluoranthene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Chrysene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Dibenz(a h)anthracene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Fluoranthene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Fluorene	0 2	NA	NA	NA	NA	NA	NA	0 049 JQ
Indeno(1,2,3-cd)pyrene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Naphthalene	0 2	NA	NA	NA	NA	NA	NA	2 3
Phenanthrene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Pyrene	0 2	NA	NA	NA	NA	NA	NA	<0 2

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DATA SUMMARY TABLE FOR GROUNDWATER
UPPER WATER BEARING UNIT - OCTOBER 2002
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Sample ID: / Sample Date:	Reporting (a) Limit	Sample DMW-27A 10/15/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/16/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/15/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/16/2002
Surrogate - %								
2 4 6-Tribromophenol	--	NA	NA	NA	NA	NA	NA	105
2-Fluorobiphenyl	--	NA	NA	NA	NA	NA	NA	64
2-Fluorophenol	--	NA	NA	NA	NA	NA	NA	78
Nitrobenzene-d5	--	NA	NA	NA	NA	NA	NA	68
Phenol-d5	--	NA	NA	NA	NA	NA	NA	70
Terphenyl-d14	--	NA	NA	NA	NA	NA	NA	48
Thallium - SW846 7841 (Dissolved) µg/L								
Thallium	2	<2	<2	<2	<2	<2	<2	<2 UL
Thallium - SW846 7841 (Total) µg/L								
Thallium	2	<2	<2	<2	<2	<2	<2	<2 UL
Total Alkalinity - MCAWW 310 1 mg/L								
Total Alkalinity	5	3 6 JB	9 5 JH	11 JH	4 9 JH	13 JH	6 2 JH	190
Total Organic Carbon - SW846 9060 mg/L								
Total Organic Carbon	1	10	1 JH	<1	<1	1 JH	4 JH	30
Total Sulfide - MCAWW 376.1 mg/L								
Total Sulfide	1	<1	0 48 JQ	<1	<1	<1	2 7 JH	1 4 JH
Volatile Organic Compounds - SW846 8260B µg/L								
1,1,1,2-Tetrachloroethane	1	<1	<67	<1	<1	<1	<330	<1
1,1,1-Trichloroethane	1	<1	680	<1	<1	<1	<330	<1
1,1,2,2-Tetrachloroethane	1	<1	<67	<1	<1	<1	<330	<1
1,1 2-Trichloroethane	1	<1	<67	<1	<1	<1	<330	<1
1 1-Dichloroethane	1	<1	110	<1	<1	<1	<330	0 79 JQ
1,1-Dichloroethene	1	<1	280	<1	<1	<1	<330	<1
1,1-Dichloropropene	1	<1	<67	<1	<1	<1	<330	<1
1 2,3-Trichlorobenzene	1	<1	<67 UJ	<1	<1	<1	<330	<1
1,2,3-Trichloropropane	1	<1	<67	<1	<1	<1	<330	<1
1,2 4-Trichlorobenzene	1	<1	<67 UJ	<1	<1	<1	<330	<1
1,2 4-Trimethylbenzene	1	<1	<67	<1	<1	<1	<330	<1
1,2-Dibromo-3-chloropropane	2	<2	<130	<2	<2	<2	<670	<2
1 2-Dibromoethane	1	<1	<67	<1	<1	<1	<330	<1
1 2-Dichlorobenzene	1	<1	<67	<1	<1	<1	<330	<1
1,2-Dichloroethane	1	<1	<67	<1	<1	<1	<330	<1
1,2-Dichloropropane	1	<1	<67	<1	<1	<1	<330	<1
1,3,5-Trimethylbenzene	1	<1	<67	<1	<1	<1	<330	<1
1,3-Dichlorobenzene	1	<1	<67	<1	<1	<1	<330	<1
1,3-Dichloropropane	1	<1	<67	<1	<1	<1	<330	<1
1,4-Dichlorobenzene	1	<1	<67	<1	<1	<1	<330	<1

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DATA SUMMARY TABLE FOR GROUNDWATER
UPPER WATER BEARING UNIT - OCTOBER 2002
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Sample ID: / Sample Date:	Reporting (a) Limit	Sample DMW-27A 10/15/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/16/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/15/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/16/2002
2 2-Dichloropropane	1	<1	<67	<1	<1	<1	<330	<1
2-Butanone	10	<10 UJ	<670 R	<10	<10	<10 UJ	<3300	<10
2-Chlorotoluene	1	<1	<67	<1	<1	<1	<330	<1
2-Hexanone	10	<10 UJ	<670 R	<10	<10	<10 UJ	<3300	<10
4-Chlorotoluene	1	<1	<67	<1	<1	<1	<330	<1
4-Methyl-2-pentanone	10	<10	<670 UL	<10	<10	<10	<3300	<10
Acetone	10	<10 UJ	<670 R	1 1 JQ	<10	<10 UJ	<3300	1 8 JQ
Benzene	1	<1	<67	<1	<1	<1	<330	<1
Bromobenzene	1	<1	<67	<1	<1	<1	<330	<1
Bromochloromethane	1	<1	<67	<1	<1	<1	<330	<1
Bromodichloromethane	1	<1	<67	<1	<1	<1	<330	<1
Bromoform	1	<1 UJ	<67	<1	<1	<1 UJ	<330	<1
Bromomethane	2	<2	<130	<2	<2	<2	<670	<2
Carbon disulfide	1	<1	<67	<1	<1	<1	<330	<1
Carbon tetrachloride	1	<1	<67	<1	<1	<1	<330	<1
Chlorobenzene	1	<1	<67	<1	<1	<1	<330	<1
Chloroethane	2	<2	<130	<2	<2	<2	<670	<2
Chloroform	1	<1	<67	<1	<1	<1	<330	<1
Chloromethane	2	<2	<130	<2	<2	<2	<670	<2
cis-1,2-Dichloroethene	0 5	<0 5	1900	<0 5	<0 5	<0 5	9800	0 61
cis-1 3-Dichloropropene	1	<1	<67	<1	<1	<1	<330	<1
Dibromochloromethane	1	<1	<67	<1	<1	<1	<330	<1
Dibromomethane	1	<1	<67	<1	<1	<1	<330	<1
Dichlorodifluoromethane	2	<2 UJ	<130 UJ	<2	<2	<2 UJ	<670	<2
Ethylbenzene	1	<1	<67	<1	<1	<1	<330	<1
Hexachlorobutadiene	1	<1 UJ	<67 UJ	<1	<1	<1 UJ	<330	<1
Isopropylbenzene	1	<1	<67	<1	<1	<1	<330	<1
m-Xylene & p-Xylene	1	<1	<67	<1	<1	<1	<330	<1
Methylene chloride	1	<1	29 JQ	<1	<1	<1	310 JQ	<1
n-Butylbenzene	1	<1	<67 UJ	<1	<1	<1	<330	<1
n-Propylbenzene	1	<1	<67	<1	<1	<1	<330	<1
Naphthalene	1	<1	<67 UJ	<1	<1	<1	<330	3 6
o-Xylene	0 5	<0 5	<33	<0 5	<0 5	<0 5	<170	<0 5
p-Isopropyltoluene	1	<1	<67	<1	<1	<1	<330	<1
sec-Butylbenzene	1	<1	<67 UJ	<1	<1	<1	<330	<1
Styrene	1	<1	<67	<1	<1	<1	<330	<1

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DATA SUMMARY TABLE FOR GROUNDWATER
UPPER WATER BEARING UNIT - OCTOBER 2002
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Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample DMW-27A 10/15/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/16/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/15/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/16/2002
tert-Butylbenzene	1	<1	<67	<1	<1	<1	<330	<1
Tetrachloroethene	1	<1	450	6 1	<1	<1	<330	<1
Toluene	1	<1	<67	<1	<1	<1	<330	<1
trans-1 2-Dichloroethene	0 5	<0 5	<33	<0 5	<0 5	<0 5	140 JQ	<0 5
trans-1,3-Dichloropropene	1	<1	<67	<1	<1	<1	<330	<1
Trichloroethene	1	<1	2500	2	<1	<1	7600	<1
Trichlorofluoromethane	2	<2 UJ	<130	<2	<2	<2 UJ	<670	<2
Vinyl chloride	2	<2	<130	<2	<2	<2	360 JQ	<2
Xylenes (total)	1	<1	<67	<1	<1	<1	<330	<1
Surrogate - %								
1 2-Dichloroethane-d4	--	94	91	86	87	95	87	87
4-Bromofluorobenzene	--	90	85	90	90	90	91	90
Dibromofluoromethane	--	101	101	92	91	100	93	90
Toluene-d8	--	94	94	91	91	94	91	91

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DATA SUMMARY TABLE FOR GROUNDWATER
UPPER WATER BEARING UNIT - OCTOBER 2002
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Sample ID: Sample Date.	Reporting (a) Limit	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 10/29/2002	Sample MWFTA-23 10/15/2002
FIELD PARAMETER:								
Dissolved Oxygen - E360.1 mg/L								
Dissolved Oxygen	0 1	0 8	0 8	1	0 6	1	<0 1	4 9
Ferrous Iron - A3500D mg/L								
Ferrous Iron	0 1	2	2	3 4	2	3 2	3	0 5
Oxidation Reduction Potential - A2580A mV								
Oxidation Reduction Potential	--	-28	-28	111	405	191	63	-76
pH - E150.1 pH Units								
pH	--	5 26	5 26	6 37	3 43	5 31	5 94	5 1
Specific Conductance - E120 1 mS/cm								
Specific Conductance	0 001	0 432	0 432	0 115	0 114	0 064	0 116	0 249
Temperature - E170.1 deg C								
Temperature	0 1	18 8	18 8	15 9	19 8	16 3	15 1	19 8
Turbidity - E180 1 NTU								
Turbidity	1	5	5	10	<1	3	10	48
FIXED BASE LABORATORY ANALYSIS:								
Anions - MCAWW 300 3A mg/L								
Chloride	1	74 7	73 5	7 4	7 2	7 8	4 6	36 4
Nitrate as N	0 1	<0 1	<0 1	<0 1	0 06 JQ	<0 1	<0 1	<0 1
Sulfate	1	27 8	25 2	13 7	29 8	8 5	6 4	1 8
Dissolved Gases - RSK SOP-175 mg/L								
Carbon dioxide	0 001	96	93	39	68	49	38	210
Ethane	0 002	<0 002	<0 002	<0 002	<0 002	<0 002	<0 002	0 00089 JQ
Ethene	0 001	<0 001	<0 001	<0 001	<0 001	<0 001	<0 001	0 036
Methane	0 001	0 14	0 14	0 0011 JB	0 0034	0 0021	0 004	1 4
Hydrogen by Microseeps - AM20GAX nM								
Hydrogen	0 03	3 1	2 7	5	2 5	3 7	4 5	19
Mercury - SW846 7470A (Dissolved) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1

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DATA SUMMARY TABLE FOR GROUNDWATER
UPPER WATER BEARING UNIT - OCTOBER 2002
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Sample ID. / Sample Date:	Reporting (a) Limit	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 10/29/2002	Sample MWFTA-23 10/15/2002
Mercury - SW846 7470A (Total) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L								
Aluminum	200	187 JQ	228	113 JQ	730	59 JQ	<200	129 JQ
Antimony	5	<5	<5	<5 UJ	<5	<5 UJ	<5 UJ	<5
Arsenic	5	15.8	16	<5	<5	<5	<5	75.5
Barium	200	65.4 JQ	67.1 JQ	25.5 JQ	80.5 JQ	18.9 JQ	6.3 JQ	251
Beryllium	10	0.62 JQ	0.71 JQ	<10	1.9 JQ	<10	<10	1.2 JQ
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	4750 JQ	4830 JQ	3350 JQ	3680 JQ	2180 JQ	4060 JQ	2520 JQ
Chromium	10	<10	<10	<10	1.7 JQ	<10	<10	<10
Cobalt	30	1.2 JQ	0.84 JQ	<30	4.4 JQ	1.3 JB	0.74 JB	5 JQ
Copper	10	<10	<10	<10	<10	<10	1.8 JB	<10
Iron	200	3070	3130	384	<200	179 JB	329 JB	21300
Lead	3	<3	<3	<3	1.8 JQ	<3	<3	<3
Magnesium	5000	3070 JQ	3120 JQ	2620 JQ	2560 JQ	1630 JQ	3240 JQ	3260 JQ
Manganese	20	73.9	76.2	51.2	39.3	26.2	61.1	196
Molybdenum	40	<40	<40	<40	<40	2.5 JQ	<40	<40
Nickel	100	<100	<100	<100	<100	<100	<100	4.9 JQ
Potassium	5000	5440	5480	4300 JQ	2920 JQ	2580 JQ	3520 JQ	3580 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	43300	43600	8340	1760 JQ	5790	7780	4800 JQ
Vanadium	50	0.8 JQ	0.74 JQ	<50	<50	<50	<50	1 JQ
Zinc	20	<20	<20	30.9	<20	<20	<20	25.1
Metals - SW846 6010B (Total) µg/L								
Aluminum	200	216	246	<200	757	60.1 JQ	<200	174 JQ
Antimony	5	<5	<5	<5 UJ	<5	<5 UJ	<5 UJ	<5
Arsenic	5	13.8	15.1	<5	<5	<5	3.2 JB	77.2
Barium	200	69.6 JQ	70.1 JQ	27 JQ	81 JQ	18.3 JQ	7.1 JQ	256
Beryllium	10	0.6 JQ	0.73 JQ	<10	1.8 JQ	<10	<10	1.3 JQ
Cadmium	2	<2	<2	<2	0.32 JQ	<2	<2	<2
Calcium	5000	4990 JQ	5010	3230 JQ	3730 JQ	2130 JQ	4060 JQ	2590 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	0.78 JQ	<30	<30	4.4 JQ	0.93 JB	<30	5.6 JQ
Copper	10	<10	<10	<10	1.9 JQ	<10	<10	<10
Iron	200	3280	3290	518	<200	226	352	21800
Lead	3	<3	<3	<3	1.8 JQ	<3	<3	<3

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DATA SUMMARY TABLE FOR GROUNDWATER
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Sample ID: Sample Date	Reporting (a) Limit	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 10/29/2002	Sample MWFTA-23 10/15/2002
Magnesium	5000	3210 JQ	3240 JQ	2570 JQ	2540 JQ	1570 JQ	3250 JQ	3280 JQ
Manganese	20	77 9	78 4	50 5	38 4	26 1	62 7	198
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	<100	<100	<100	<100	<100	6 8 JQ
Potassium	5000	5470	5610	4180 JQ	2970 JQ	2490 JQ	3510 JQ	3510 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	46000	45700	8240	1750 JQ	5400	7670	4870 JQ
Vanadium	50	0 92 JQ	<50	<50	<50	<50	<50	1 3 JQ
Zinc	20	<20	<20	<20	21	<20	<20	55
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L								
PCB-1016	1	<1	<1	NA	NA	NA	NA	NA
PCB-1221	1	<1	<1	NA	NA	NA	NA	NA
PCB-1232	1	<1	<1	NA	NA	NA	NA	NA
PCB-1242	1	<1	<1	NA	NA	NA	NA	NA
PCB-1248	1	<1	<1	NA	NA	NA	NA	NA
PCB-1254	1	<1	<1	NA	NA	NA	NA	NA
PCB-1260	1	<1	<1	NA	NA	NA	NA	NA
Surrogate - %								
Decachlorobiphenyl	--	61	60	NA	NA	NA	NA	NA
Tetrachloro-m-xylene	--	111	110	NA	NA	NA	NA	NA
Semi-Volatile Organic Compounds - SW846 8270C SIM µg/L								
Acenaphthene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Acenaphthylene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Anthracene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Benzo(a)anthracene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Benzo(a)pyrene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Benzo(ghi)perylene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Chrysene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Dibenz(a h)anthracene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Fluoranthene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Fluorene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Indeno(1 2,3-cd)pyrene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Naphthalene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Phenanthrene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Pyrene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA

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Surrogate - %								
2 4,6-Tribromophenol	--	83	90	NA	NA	NA	NA	NA
2-Fluorobiphenyl	--	55	64	NA	NA	NA	NA	NA
2-Fluorophenol	--	58	69	NA	NA	NA	NA	NA
Nitrobenzene-d5	--	49	57	NA	NA	NA	NA	NA
Phenol-d5	--	49	64	NA	NA	NA	NA	NA
Terphenyl-d14	--	59	310	NA	NA	NA	NA	NA
Thallium - SW846 7841 (Dissolved) µg/L								
Thallium	2	<2 UL	<2 UL	<2	<2 UJ	<2	<2	<2
Thallium - SW846 7841 (Total) µg/L								
Thallium	2	<2 UL	<2 UL	<2	<2 UL	<2	<2	<2
Total Alkalinity - MCAWW 310 1 mg/L								
Total Alkalinity	5	20	22	15	<5	7 4 JH	26	23
Total Organic Carbon - SW846 9060 mg/L								
Total Organic Carbon	1	8	8	<1	2	<1	<1	11
Total Sulfide - MCAWW 376 1 mg/L								
Total Sulfide	1	0 78 JQ	0 78 JQ	0 48 JQ	<1	0 96 JQ	0 8 JQ	<1
Volatile Organic Compounds - SW846 8260B µg/L								
1,1,1 2-Tetrachloroethane	1	<2	<2	<1	<1	<1	<1	<1200
1,1,1-Trichloroethane	1	<2	<2	<1	<1	<1	<1	<1200
1,1,2 2-Tetrachloroethane	1	<2	<2	<1	<1	<1	<1	<1200
1 1 2-Trichloroethane	1	<2	<2	<1	<1	<1	<1	<1200
1,1-Dichloroethane	1	0 6 JQ	<2	<1	<1	<1	<1	<1200
1,1-Dichloroethene	1	0 69 JQ	0 64 JQ	<1	<1	<1	<1	<1200
1,1-Dichloropropene	1	<2	<2	<1	<1	<1	<1	<1200
1,2,3-Trichlorobenzene	1	<2	<2	<1 UJ	<1	<1 UJ	<1 UJ	<1200
1,2,3-Trichloropropane	1	<2	<2	<1	<1	<1	<1	<1200
1,2,4-Trichlorobenzene	1	<2	<2	<1 UJ	<1	<1 UJ	<1 UJ	<1200
1 2 4-Trimethylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
1,2-Dibromo-3-chloropropane	2	<4	<4	<2	<2	<2	<2	<2500
1,2-Dibromoethane	1	<2	<2	<1	<1	<1	<1	<1200
1,2-Dichlorobenzene	1	<2	<2	<1	<1	<1	<1	<1200
1,2-Dichloroethane	1	<2	<2	<1	<1	<1	<1	<1200
1,2-Dichloropropane	1	<2	<2	<1	<1	<1	<1	<1200
1,3,5-Trimethylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
1,3-Dichlorobenzene	1	<2	<2	<1	<1	<1	<1	<1200
1,3-Dichloropropane	1	<2	<2	<1	<1	<1	<1	<1200
1,4-Dichlorobenzene	1	<2	<2	<1	<1	<1	<1	<1200

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2 2-Dichloropropane	1	<2	<2	<1	<1	<1	<1	<1200
2-Butanone	10	<20 UJ	<20 UJ	<10 R	<10 UJ	<10 R	<10 R	<12000
2-Chlorotoluene	1	<2	<2	<1	<1	<1	<1	<1200
2-Hexanone	10	<20 UJ	<20 UJ	<10 R	<10 UJ	<10 R	<10 R	<12000
4-Chlorotoluene	1	<2	<2	<1	<1	<1	<1	<1200
4-Methyl-2-pentanone	10	<20	<20	<10 UL	<10	<10 UL	<10 UL	<12000
Acetone	10	<20 UJ	<20 UJ	<10 R	1 2 JQ	<10 R	<10 R	<12000
Benzene	1	<2	<2	<1	<1	<1	<1	<1200
Bromobenzene	1	<2	<2	<1	<1	<1	<1	<1200
Bromochloromethane	1	<2	<2	<1	<1	<1	<1	<1200
Bromodichloromethane	1	<2	<2	<1	<1	<1	<1	<1200
Bromoform	1	<2 UJ	<2 UJ	<1	<1 UJ	<1	<1	<1200
Bromomethane	2	<4	<4	<2	<2	<2	<2	<2500
Carbon disulfide	1	<2	<2	<1	<1	<1	<1	<1200
Carbon tetrachloride	1	<2	<2	<1	<1	<1	<1	<1200
Chlorobenzene	1	<2	<2	<1	<1	<1	<1	<1200
Chloroethane	2	<4	<4	<2	<2	<2	<2	<2500
Chloroform	1	<2	<2	<1	<1	<1	<1	<1200
Chloromethane	2	<4	<4	<2	<2	<2	<2	<2500
cis 1,2-Dichloroethene	0 5	56	54	<0 5	<0 5	<0 5	<0 5	52000
cis-1 3-Dichloropropene	1	<2	<2	<1	<1	<1	<1	<1200
Dibromochloromethane	1	<2	<2	<1	<1	<1	<1	<1200
Dibromomethane	1	<2	<2	<1	<1	<1	<1	<1200
Dichlorodifluoromethane	2	<4 UJ	<4 UJ	<2 UJ	<2 UJ	<2 UJ	<2 UJ	<2500
Ethylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
Hexachlorobutadiene	1	<2 UJ	<2 UJ	<1 UJ	<1 UJ	<1	<1 UJ	<1200
Isopropylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
m-Xylene & p-Xylene	1	<2	<2	<1	<1	<1	<1	<1200
Methylene chloride	1	<2	<2	<1	<1	<1	<1	1300
n-Butylbenzene	1	<2	<2	<1 UJ	<1	<1 UJ	<1 UJ	<1200
n-Propylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
Naphthalene	1	<2	<2	<1 UJ	<1	<1 UJ	<1 UJ	<1200
o-Xylene	0 5	<1	<1	<0 5	<0 5	<0 5	<0 5	<620
p-Isopropyltoluene	1	<2	<2	<1	<1	<1	<1	<1200
sec-Butylbenzene	1	<2	<2	<1 UJ	<1	<1 UJ	<1 UJ	<1200
Styrene	1	<2	<2	<1	<1	<1	<1	<1200

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DATA SUMMARY TABLE FOR GROUNDWATER
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Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 10/29/2002	Sample MWFTA-23 10/15/2002
tert-Butylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
Tetrachloroethene	1	9	8 6	<1	<1	<1	<1	<1200
Toluene	1	<2	<2	<1	<1	<1	<1	<1200
trans-1,2-Dichloroethene	0 5	2 5	2 6	<0 5	<0 5	<0 5	<0 5	<620
trans-1,3-Dichloropropene	1	<2	<2	<1	<1	<1	<1	<1200
Trichloroethene	1	9 1	8 5	<1	<1	<1	<1	<1200
Trichlorofluoromethane	2	<4 UJ	<4 UJ	<2	<2 UJ	<2	<2	<2500
Vinyl chloride	2	4 1	4	<2	<2	<2	<2	2500
Xylenes (total)	1	<2	<2	<1	<1	<1	<1	<1200
Surrogate - %								
1,2-Dichloroethane-d4	--	91	92	91	93	93	93	86
4-Bromofluorobenzene	--	89	91	80	90	83	81	88
Dibromofluoromethane	--	97	98	98	98	101	100	92
Toluene-d8	--	94	94	90	93	92	91	89

Notes:

C	Celsius
J	Estimated, based on QC data
JB	Estimated, possibly biased high or false positive based on blank contamination
JH	Estimated, possibly biased high based upon QC data
JQ	Estimated, Value is between reporting limit and detection limit
mV	millivolt
mg/L	milligrams per liter
mS/cm	milliSeimens per centimeter
µg/L	micrograms per liter
NA	Not Analyzed
nM	nanoMoles
NTU	nephelometric turbidity unit
pH	negative log of thehydrogen ion concentration
R	unusable
UJ	undetected, Reported Detection Limit is imprecise
UL	Undetected, Data biased low - Reported Detection Limit is higher than indicated
(a)	Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/sample weight extracted and/or sample dilutions

PREPARED/DATE JAH 5/29/03
CHECKED/DATE JAV 5/29/03

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DATA SUMMARY TABLE FOR GROUNDWATER
LOWER WATER BEARING UNIT - OCTOBER 2002
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Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-14 10/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/15/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/17/2002
FIELD PARAMETER:								
Dissolved Oxygen - E360.1 mg/L								
Dissolved Oxygen	0 1	2 4	5 8	4	7 1	7	1 5	1 7
Ferrous Iron - A3500D mg/L								
Ferrous Iron	0 1	<0 1	<0 1	<0 1	3	<0 1	0 5	1
Oxidation Reduction Potential - A2580A mV								
Oxidation Reduction Potential	--	195	-149	-64	-89	-19	-93	-82
pH - E150.1 pH Units								
pH	--	9 08	12 23	12 33	7 34	10 89	7 09	12 44
Specific Conductance - E120.1 mS/cm								
Specific Conductance	0 001	0 495	1 92	1 44	0 156	0 725	0 697	1 9
Temperature - E170.1 deg C								
Temperature	0 1	14	18 1	18 6	17	16 1	12 4	18 7
Turbidity - E180 1 NTU								
Turbidity	1	8	14	3	8	7	21	19
FIXED BASE LABORATORY ANALYSIS:								
Anions - MCAWW 300.3A mg/L								
Chloride	1	13 9	11 6	5 6	4 7	6 4	58 2	2 1
Nitrate as N	0 1	0 01 JQ	<0 1	<0 1	<0 1	<0 1	<0 1	<0 1
Sulfate	1	20 2	7 1	10 8	1 2	6 3	5 6	30 4
Dissolved Gases - RSK SOP-175 mg/L								
Carbon dioxide	0 001	0 22 JB	<0 17	<0 17	15	<0 17	18	<0 17
Ethane	0 002	<0 002	0 0055	<0 002	<0 002	<0 002	<0 002	0 00039 JQ
Ethene	0 001	<0 001	0 049	<0 001	<0 001	<0 001	<0 001	0 0013
Methane	0 001	0 0007 JB	0 12	0 13	0 043	0 0028	0 41	0 034
Hydrogen by Microseeps - AM20GAX nM								
Hydrogen	0 03	3 8	27	4 1	2 6	16	4 6	2 6
Mercury - SW846 7470A (Dissolved) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L								
Aluminum	200	<200	85 4 JQ	4430	<200 UJ	616	<200	266

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Antimony	5	44 2 J	<5	<5	<5	<5	<5 UJ	<5
Arsenic	5	<5	2 5 JQ	<5	<5	3 2 JB	<5	<5
Barium	200	40 9 JQ	329	117 JQ	30 8 JQ	63 1 JQ	137 JQ	138 JQ
Beryllium	10	<10	<10	<10	<10	<10	<10	<10
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	7580	55500	92400	8400	52700	35300	70900
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	<30	<30	<30	<30	<30
Copper	10	2 3 JB	<10	<10	<10	<10	<10	<10
Iron	200	<200	<200	<200	1470	<200	2210	<200
Lead	3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	6470	326 JQ	<5000	4920 JQ	<5000	23300	<5000
Manganese	20	2 9 JQ	<20	<20	71 9	<20	204	<20
Molybdenum	40	8 6 JQ	<40	<40	<40	<40	<40	6 8 JQ
Nickel	100	<100	<100	<100	<100	<100	<100	3 JQ
Potassium	5000	46500	92500 J	21300	5590	9870	12500	57400
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	49700	37600 J	12600	7740	5370	23500	49000
Vanadium	50	<50	3 2 JQ	7 2 JQ	<50	2 8 JQ	<50	1 4 JQ
Zinc	20	<20	<20 UL	<20 UL	<20 UL	<20	<20	<20
Metals - SW846 6010B (Total) µg/L								
Aluminum	200	<200	479	4820	<200 UJ	837	<200	1200 JH
Antimony	5	<5 UJ	<5	<5	<5	<5	<5 UJ	<5
Arsenic	5	<5	<5	<5	<5	2 1 JB	<5	2 2 JB
Barium	200	39 7 JQ	557	127 JQ	34 5 JQ	67 2 JQ	141 JQ	136 JQ
Beryllium	10	<10	<10	<10	<10	<10	<10	<10
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	7250	111000	101000	8800	57800	36300	68000
Chromium	10	<10	<10	<10	<10	<10	<10	3 3 JQ
Cobalt	30	<30	<30	<30	<30	<30	<30	<30
Copper	10	2 JB	2 3 JQ	<10	<10	<10	<10	1 9 JQ
Iron	200	<200	581	<200	1690	<200	2330	600
Lead	3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	6350	16100	<5000	5180	230 JQ	23800	599 JQ
Manganese	20	3 3 JQ	324	<20	77 3	1 3 JB	209	15 7 JQ
Molybdenum	40	7 5 JQ	<40	<40	<40	<40	<40	7 1 JQ
Nickel	100	<100	<100	<100	3 2 JQ	<100	<100	3 8 JQ

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Potassium	5000	46600	78900 J	23200	5820	10200	12800	54400
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	49300	24700 J	13500	8110	5520	24100	46200
Vanadium	50	<50	0 87 JQ	7 1 JQ	<50	2 5 JQ	<50	1 4 JQ
Zinc	20	<20	<20 UL	<20 UL	19 5 JQ	<20	<20	<20
Thallium - SW846 7841 (Dissolved) µg/L								
Thallium	2	<2 UL	<2 UL	<2	<2	<2 UL	<2	<2 UJ
Thallium - SW846 7841 (Total) µg/L								
Thallium	2	<2	<2	<2	<2	<2 UL	<2	<2 UL
Total Alkalinity - MCAWW 310.1 mg/L								
Total Alkalinity	5	160	270	250	53	120	160	340 JL
Total Organic Carbon - SW846 9060 mg/L								
Total Organic Carbon	1	0 8 JQ	1 JH	2	2	0 7 JH	2	3
Total Sulfide - MCAWW 376.1 mg/L								
Total Sulfide	1	1 4	0 49 JB	0 49 JB	0 81 JH	<1	<1	0 62 JQ
Volatile Organic Compounds - SW846 8260B µg/L								
1,1,1,2-Tetrachloroethane	1	<1	<56	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	1	<1	<56	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	1	<1	<56	<1	<1	<1	<1	<1 UL
1,1,2-Trichloroethane	1	<1	<56	<1	<1	<1	<1	<1
1,1-Dichloroethane	1	<1	<56	<1	<1	<1	<1	<1
1,1-Dichloroethene	1	<1	<56	<1	<1	<1	<1	<1
1,1-Dichloropropene	1	<1	<56	<1	<1	<1	<1	<1
1,2,3-Trichlorobenzene	1	<1 UJ	<56	<1	<1	<1	<1 UJ	<1
1,2,3-Trichloropropane	1	<1	<56	<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene	1	<1 UJ	<56	<1	<1	<1	<1 UJ	<1
1,2,4-Trimethylbenzene	1	<1	<56	<1	<1	<1	<1	<1
1,2-Dibromo-3-chloropropane	2	<2	<110	<2	<2	<2	<2	<2
1,2-Dibromoethane	1	<1	<56	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	1	<1	<56	<1	<1	<1	<1	<1
1,2-Dichloroethane	1	<1	<56	<1	<1	<1	<1	<1
1,2-Dichloropropane	1	<1	<56	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	1	<1	<56	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	1	<1	<56	<1	<1	<1	<1	<1
1,3-Dichloropropane	1	<1	<56	<1	<1	<1	<1	<1

TABLE C-2

DATA SUMMARY TABLE FOR GROUNDWATER
LOWER WATER BEARING UNIT - OCTOBER 2002
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-14 10/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/15/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/17/2002
1,4-Dichlorobenzene	1	<1	<56	<1	<1	<1	<1	<1
2,2-Dichloropropane	1	<1	<56	<1	<1	<1	<1	<1
2-Butanone	10	<10 R	<560 UJ	<10 UJ	<10	<10 UJ	<10 R	<10 UJ
2-Chlorotoluene	1	<1	<56	<1	<1	<1	<1	<1
2-Hexanone	10	<10 R	<560 UJ	<10 UJ	<10	<10 UJ	<10 R	<10 UJ
4-Chlorotoluene	1	<1	<56	<1	<1	<1	<1	<1
4-Methyl-2-pentanone	10	<10 UL	<560	<10	<10	<10	<10 UL	<10
Acetone	10	<10 R	<560 UJ	1 1 JB	<10	<10 UJ	<10 R	<10 UJ
Benzene	1	<1	<56	<1	<1	<1	<1	<1
Bromobenzene	1	<1	<56	<1	<1	<1	<1	<1
Bromochloromethane	1	<1	<56	<1	<1	<1	<1	<1
Bromodichloromethane	1	<1	<56	<1	<1	<1	<1	<1
Bromoform	1	<1	<56 UJ	<1 UJ	<1	<1 UJ	<1	<1 UJ
Bromomethane	2	<2	<110	<2	<2	<2	<2	<2
Carbon disulfide	1	<1	<56	<1	<1	<1	<1	<1
Carbon tetrachloride	1	<1	<56	<1	<1	<1	<1	<1
Chlorobenzene	1	<1	<56	<1	<1	<1	<1	<1
Chloroethane	2	<2	<110	<2	<2	<2	<2	<2
Chloroform	1	<1	<56	<1	<1	<1	<1	<1
Chloromethane	2	<2	<110	<2	<2	<2	<2	<2
cis-1,2-Dichloroethene	0 5	<0 5	1500	<0 5	2	1 1	<0 5	<0 5
cis-1,3-Dichloropropene	1	<1	<56	<1	<1	<1	<1	<1
Dibromochloromethane	1	<1	<56	<1	<1	<1	<1	<1
Dibromomethane	1	<1	<56	<1	<1	<1	<1	<1
Dichlorodifluoromethane	2	<2 UJ	<110 UJ	<2 UJ	<2	<2 UJ	<2 UJ	<2 UJ
Ethylbenzene	1	<1	<56	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	<1 UJ	<56 UJ	<1 UJ	<1	<1 UJ	<1 UJ	<1 UJ
Isopropylbenzene	1	<1	<56	<1	<1	<1	<1	<1
m-Xylene & p-Xylene	1	<1	<56	<1	<1	<1	<1	<1
Methylene chloride	1	<1	<56	<1	<1	<1	<1	<1
n-Butylbenzene	1	<1 UJ	<56	<1	<1	<1	<1 UJ	<1
n-Propylbenzene	1	<1	<56	<1	<1	<1	<1	<1
Naphthalene	1	<1 UJ	<56	<1	<1	<1	0 43 JQ	<1
o-Xylene	0 5	<0 5	<28	<0 5	<0 5	<0 5	<0 5	<0 5
p-Isopropyltoluene	1	<1	<56	<1	<1	<1	<1	<1
sec-Butylbenzene	1	<1 UJ	<56	<1	<1	<1	<1 UJ	<1
Styrene	1	<1	<56	<1	<1	<1	<1	<1
tert-Butylbenzene	1	<1	<56	<1	<1	<1	<1	<1

TABLE C-2

DATA SUMMARY TABLE FOR GROUNDWATER
LOWER WATER BEARING UNIT - OCTOBER 2002
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-14 10/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/15/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/17/2002
Tetrachloroethene	1	<1	<56	<1	<1	1 2	<1	<1
Toluene	1	<1	<56	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	0 5	<0 5	<28	<0 5	<0 5	<0 5	<0 5	<0 5
trans-1,3-Dichloropropene	1	<1	<56	<1	<1	<1	<1	<1
Trichloroethene	1	<1	<56	<1	<1	0 54 JQ	<1	<1
Trichlorofluoromethane	2	<2	<110 UJ	<2 UJ	<2	<2 UJ	<2	<2 UJ
Vinyl chloride	2	<2	920	<2	<2	<2	<2	<2
Xylenes (total)	1	<1	<56	<1	<1	<1	<1	<1
Surrogate - %								
1,2-Dichloroethane-d4	--	93	91	90	86	94	95	91
4-Bromofluorobenzene	--	83	90	88	90	90	84	89
Dibromofluoromethane	--	101	96	82	92	93	103	77
Toluene-d8	--	92	95	92	93	95	92	92
Volatile Organic Compounds - SW846 8260B, UNPRES µg/L								
1,1,1,2-Tetrachloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,1 1-Trichloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,1-Dichloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,1-Dichloroethene	1	NA	<62	NA	NA	NA	NA	NA
1,1-Dichloropropene	1	NA	<62	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
1,2 3-Trichloropropane	1	NA	<62	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	1	NA	<62	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	2	NA	<120	NA	NA	NA	NA	NA
1 2-Dibromoethane	1	NA	<62	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
1,2-Dichloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,2-Dichloropropane	1	NA	<62	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	1	NA	<62	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
1,3-Dichloropropane	1	NA	<62	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
2,2-Dichloropropane	1	NA	<62	NA	NA	NA	NA	NA
2-Butanone	10	NA	<620 UJ	NA	NA	NA	NA	NA
2-Chlorotoluene	1	NA	<62	NA	NA	NA	NA	NA
2-Hexanone	10	NA	<620 UJ	NA	NA	NA	NA	NA

TABLE C-2

DATA SUMMARY TABLE FOR GROUNDWATER
LOWER WATER BEARING UNIT - OCTOBER 2002
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Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-14 10/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/15/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/17/2002
4-Chlorotoluene	1	NA	<62	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	10	NA	<620	NA	NA	NA	NA	NA
Acetone	10	NA	<620 UJ	NA	NA	NA	NA	NA
Benzene	1	NA	<62	NA	NA	NA	NA	NA
Bromobenzene	1	NA	<62	NA	NA	NA	NA	NA
Bromochloromethane	1	NA	<62	NA	NA	NA	NA	NA
Bromodichloromethane	1	NA	<62	NA	NA	NA	NA	NA
Bromoform	1	NA	<62 UJ	NA	NA	NA	NA	NA
Bromomethane	2	NA	<120	NA	NA	NA	NA	NA
Carbon disulfide	1	NA	<62	NA	NA	NA	NA	NA
Carbon tetrachloride	1	NA	<62	NA	NA	NA	NA	NA
Chlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
Chloroethane	2	NA	<120	NA	NA	NA	NA	NA
Chloroform	1	NA	<62	NA	NA	NA	NA	NA
Chloromethane	2	NA	<120	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	0 5	NA	1400	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	1	NA	<62	NA	NA	NA	NA	NA
Dibromochloromethane	1	NA	<62	NA	NA	NA	NA	NA
Dibromomethane	1	NA	<62	NA	NA	NA	NA	NA
Dichlorodifluoromethane	2	NA	<120 UJ	NA	NA	NA	NA	NA
Ethylbenzene	1	NA	<62	NA	NA	NA	NA	NA
Hexachlorobutadiene	1	NA	<62 UJ	NA	NA	NA	NA	NA
Isopropylbenzene	1	NA	<62	NA	NA	NA	NA	NA
m-Xylene & p-Xylene	1	NA	<62	NA	NA	NA	NA	NA
Methylene chloride	1	NA	<62	NA	NA	NA	NA	NA
n-Butylbenzene	1	NA	<62	NA	NA	NA	NA	NA
n-Propylbenzene	1	NA	<62	NA	NA	NA	NA	NA
Naphthalene	1	NA	<62	NA	NA	NA	NA	NA
o-Xylene	0 5	NA	<31	NA	NA	NA	NA	NA
p-Isopropyltoluene	1	NA	<62	NA	NA	NA	NA	NA
sec-Butylbenzene	1	NA	<62	NA	NA	NA	NA	NA
Styrene	1	NA	<62	NA	NA	NA	NA	NA
tert-Butylbenzene	1	NA	<62	NA	NA	NA	NA	NA
Tetrachloroethene	1	NA	<62	NA	NA	NA	NA	NA
Toluene	1	NA	<62	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	0 5	NA	<31	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	1	NA	<62	NA	NA	NA	NA	NA
Trichloroethene	1	NA	<62	NA	NA	NA	NA	NA

TABLE C-2

DATA SUMMARY TABLE FOR GROUNDWATER
LOWER WATER BEARING UNIT - OCTOBER 2002
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-14 10/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/15/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/17/2002
Trichlorofluoromethane	2	NA	<120 UJ	NA	NA	NA	NA	NA
Vinyl chloride	2	NA	920	NA	NA	NA	NA	NA
Xylenes (total)	1	NA	<62	NA	NA	NA	NA	NA
Surrogate - %								
1,2-Dichloroethane-d4	--	NA	94	NA	NA	NA	NA	NA
4-Bromofluorobenzene	--	NA	91	NA	NA	NA	NA	NA
Dibromofluoromethane	--	NA	100	NA	NA	NA	NA	NA
Toluene-d8	--	NA	95	NA	NA	NA	NA	NA

Notes:

C Celsius
J Estimated, based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JH Estimated, possibly biased high based upon QC data
JL Estimated, possibly biased low based upon QC data
JQ Estimated, Value is between reporting limit and detection limit
mV millivolt
mg/L milligrams per liter
mS/cm milliSeimens per centimeter
µg/L micrograms per liter
NA Not Analyzed
nM nanoMoles
NTU nephelometric turbidity unit
pH negative log of thehydrogen ion concentration
R unusable
UJ undetected, Reported Detection Limit is imprecise
UL Undetected, Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/sample weight extracted and/or sample dilutions

PREPARED/DATE JAH 5/29/03
CHECKED/DATE JAV 5/29/03

704 266

TABLE C-3

DATA SUMMARY TABLE FOR GROUNDWATER
FRACTURED BEDROCK - OCTOBER 2002
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
FIELD PARAMETER:			
Dissolved Oxygen - E360 1 mg/L			
Dissolved Oxygen	0 1	3 5	3 5
Ferrous Iron - A3500D mg/L			
Ferrous Iron	0 1	4	4
Oxidation Reduction Potential - A2580A mV			
Oxidation Reduction Potential	--	15	15
pH - E150.1 pH Units			
pH	--	9 41	9 41
Specific Conductance - E120.1 mS/cm			
Specific Conductance	0 001	0 215	0 215
Temperature - E170.1 deg C			
Temperature	0 1	18	18
Turbidity - E180.1 NTU			
Turbidity	1	10	10
FIXED BASE LABORATORY ANALYSIS:			
Anions - MCAWW 300.3A mg/L			
Chloride	1	3 7	3 8
Nitrate as N	0 1	<0 1	<0 1
Sulfate	1	4 4	4 5
Dissolved Gases - RSK SOP-175 mg/L			
Carbon dioxide	0 001	0 12 JB	0 13 JB
Ethane	0 002	<0 002	<0 002
Ethene	0 001	0 01	0 011
Methane	0 001	0 027	0 031
Hydrogen by Microseeps - AM20GAX nM			
Hydrogen	0 03	2 7	2 8
Mercury - SW846 7470A (Dissolved) ug/L			
Mercury	1	<1	<1
Mercury - SW846 7470A (Total) ug/L			
Mercury	1	<1	<1
Metals - SW846 6010B (Dissolved) ug/L			
Aluminum	200	<200 UJ	<200 UJ
Antimony	5	<5	<5
Arsenic	5	<5	<5
Barium	200	68 2 JQ	65 3 JQ
Beryllium	10	<10	<10
Cadmium	2	<2	<2
Calcium	5000	14900	14300
Chromium	10	<10	<10
Cobalt	30	<30	<30
Copper	10	<10	<10
Iron	200	193 JQ	97 1 JQ
Lead	3	<3	<3
Magnesium	5000	4780 JQ	4640 JQ
Manganese	20	97 5	91 7

TABLE C-3

DATA SUMMARY TABLE FOR GROUNDWATER
FRACTURED BEDROCK - OCTOBER 2002
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
Molybdenum	40	<40	<40
Nickel	100	<100	<100
Potassium	5000	7040	6870
Selenium	5	<5	<5
Silver	10	<10	<10
Sodium	5000	10500	10100
Vanadium	50	0 69 JQ	<50
Zinc	20	<20	<20
Metals - SW846 6010B (Total) ug/L			
Aluminum	200	<200 UJ	<200 UJ
Antimony	5	<5	<5
Arsenic	5	2 2 JB	<5
Barium	200	65 8 JQ	68 2 JQ
Beryllium	10	<10	<10
Cadmium	2	<2	<2
Calcium	5000	14200	15100
Chromium	10	<10	<10
Cobalt	30	<30	<30
Copper	10	<10	<10
Iron	200	281	259
Lead	3	<3	<3
Magnesium	5000	4540 JQ	4400 JQ
Manganese	20	96 1	91 8
Molybdenum	40	<40	<40
Nickel	100	<100	<100
Potassium	5000	6830	7180
Selenium	5	<5	<5
Silver	10	<10	<10
Sodium	5000	10200	10400
Vanadium	50	<50	<50
Zinc	20	<20	<20
Thallium - SW846 7841 (Dissolved) ug/L			
Thallium	2	<2 UL	<2 UJ
Thallium - SW846 7841 (Total) ug/L			
Thallium	2	<2 UJ	<2 UJ
Total Alkalinity - MCAWW 310.1 mg/L			
Total Alkalinity	5	74	74
Total Organic Carbon - SW846 9060 mg/L			
Total Organic Carbon	1	<1	<1
Total Sulfide - MCAWW 376.1 mg/L			
Total Sulfide	1	0 46 JQ	0 3 JQ
Volatile Organic Compounds - SW846 8260B ug/L			
1,1,1,2-Tetrachloroethane	1	<4	<4
1,1,1-Trichloroethane	1	<4	<4
1,1,2,2-Tetrachloroethane	1	<4	<4
1,1,2-Trichloroethane	1	<4	<4
1,1-Dichloroethane	1	15	16
1,1-Dichloroethene	1	7 5	7 6
1 1-Dichloropropene	1	<4	<4
1 2,3-Trichlorobenzene	1	<4	<4
1 2 3-Trichloropropane	1	<4	<4

TABLE C-3

DATA SUMMARY TABLE FOR GROUNDWATER
FRACTURED BEDROCK - OCTOBER 2002
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
1,2,4-Trichlorobenzene	1	<4	<4
1,2,4-Trimethylbenzene	1	<4	<4
1,2-Dibromo-3-chloropropane	2	<8	<8
1,2-Dibromoethane	1	<4	<4
1,2-Dichlorobenzene	1	<4	<4
1,2-Dichloroethane	1	<4	<4
1,2-Dichloropropane	1	<4	<4
1,3,5-Trimethylbenzene	1	<4	<4
1,3-Dichlorobenzene	1	<4	<4
1,3-Dichloropropane	1	<4	<4
1,4-Dichlorobenzene	1	<4	<4
2,2-Dichloropropane	1	<4	<4
2-Butanone	10	<40 UJ	<40 UJ
2-Chlorotoluene	1	<4	<4
2-Hexanone	10	<40 UJ	<40 UJ
4-Chlorotoluene	1	<4	<4
4-Methyl-2-pentanone	10	<40	<40
Acetone	10	<40 UJ	<40 UJ
Benzene	1	<4	<4
Bromobenzene	1	<4	<4
Bromochloromethane	1	<4	<4
Bromodichloromethane	1	<4	<4
Bromoform	1	<4 UJ	<4 UJ
Bromomethane	2	<8	<8
Carbon disulfide	1	<4	<4
Carbon tetrachloride	1	<4	<4
Chlorobenzene	1	<4	<4
Chloroethane	2	<8	<8
Chloroform	1	<4	<4
Chloromethane	2	<8	<8
cis-1,2-Dichloroethene	0 5	92	100
cis-1,3-Dichloropropene	1	<4	<4
Dibromochloromethane	1	<4	<4
Dibromomethane	1	<4	<4
Dichlorodifluoromethane	2	<8 UJ	<8 UJ
Ethylbenzene	1	<4	<4
Hexachlorobutadiene	1	<4 UJ	<4 UJ
Isopropylbenzene	1	<4	<4
m-Xylene & p-Xylene	1	<4	<4
Methylene chloride	1	<4	<4
n-Butylbenzene	1	<4	<4
n-Propylbenzene	1	<4	<4
Naphthalene	1	<4	<4
o-Xylene	0 5	<2	<2
p-Isopropyltoluene	1	<4	<4
sec-Butylbenzene	1	<4	<4
Styrene	1	<4	<4
tert-Butylbenzene	1	<4	<4
Tetrachloroethene	1	<4	<4
Toluene	1	<4	<4
trans-1,2-Dichloroethene	0 5	<2	<2
trans-1,3-Dichloropropene	1	<4	<4
Trichloroethene	1	4 8	5 1
Trichlorofluoromethane	2	<8 UJ	<8 UJ
Vinyl chloride	2	12	12
Xylenes (total)	1	<4	<4

Surrogate - %

TABLE C-3

DATA SUMMARY TABLE FOR GROUNDWATER
FRACTURED BEDROCK - OCTOBER 2002
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Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
1,2-Dichloroethane-d4	--	91	94
4-Bromofluorobenzene	--	88	90
Dibromofluoromethane	--	97	99
Toluene-d8	--	92	96
Volatile Organic Compounds - SW846 8260B, UNPRES ug/L			
1,1,1,2-Tetrachloroethane	1	<4	NA
1,1,1-Trichloroethane	1	<4	NA
1,1,2,2-Tetrachloroethane	1	<4	NA
1,1,2-Trichloroethane	1	<4	NA
1,1-Dichloroethane	1	13	NA
1,1-Dichloroethene	1	6 6	NA
1,1-Dichloropropene	1	<4	NA
1,2,3-Trichlorobenzene	1	<4	NA
1,2,3-Trichloropropane	1	<4	NA
1,2,4-Trichlorobenzene	1	<4	NA
1,2,4-Trimethylbenzene	1	<4	NA
1,2-Dibromo-3-chloropropane	2	<8	NA
1,2-Dibromoethane	1	<4	NA
1,2-Dichlorobenzene	1	<4	NA
1,2-Dichloroethane	1	<4	NA
1,2-Dichloropropane	1	<4	NA
1,3,5-Trimethylbenzene	1	<4	NA
1,3-Dichlorobenzene	1	<4	NA
1,3-Dichloropropane	1	<4	NA
1,4-Dichlorobenzene	1	<4	NA
2,2-Dichloropropane	1	<4	NA
2-Butanone	10	<40 UJ	NA
2-Chlorotoluene	1	<4	NA
2-Hexanone	10	<40 UJ	NA
4-Chlorotoluene	1	<4	NA
4-Methyl-2-pentanone	10	<40	NA
Acetone	10	<40 UJ	NA
Benzene	1	<4	NA
Bromobenzene	1	<4	NA
Bromochloromethane	1	<4	NA
Bromodichloromethane	1	<4	NA
Bromoform	1	<4 UJ	NA
Bromomethane	2	<8	NA
Carbon disulfide	1	<4	NA
Carbon tetrachloride	1	<4	NA
Chlorobenzene	1	<4	NA
Chloroethane	2	<8	NA
Chloroform	1	<4	NA
Chloromethane	2	<8	NA
cis-1,2-Dichloroethene	0 5	87	NA
cis-1,3-Dichloropropene	1	<4	NA
Dibromochloromethane	1	<4	NA
Dibromomethane	1	<4	NA
Dichlorodifluoromethane	2	<8 UJ	NA
Ethylbenzene	1	<4	NA
Hexachlorobutadiene	1	<4 UJ	NA
Isopropylbenzene	1	<4	NA
m-Xylene & p-Xylene	1	<4	NA
Methylene chloride	1	<4	NA
n-Butylbenzene	1	<4	NA
n-Propylbenzene	1	<4	NA
Naphthalene	1	<4	NA

TABLE C-3

DATA SUMMARY TABLE FOR GROUNDWATER
FRACTURED BEDROCK - OCTOBER 2002
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
o-Xylene	0 5	<2	NA
p-Isopropyltoluene	1	<4	NA
sec-Butylbenzene	1	<4	NA
Styrene	1	<4	NA
tert-Butylbenzene	1	<4	NA
Tetrachloroethene	1	<4	NA
Toluene	1	<4	NA
trans-1,2-Dichloroethene	0 5	<2	NA
trans-1,3-Dichloropropene	1	<4	NA
Trichloroethene	1	4 2	NA
Trichlorofluoromethane	2	<8 UJ	NA
Vinyl chloride	2	11	NA
Xylenes (total)	1	<4	NA
Surrogate - %			
1,2-Dichloroethane-d4	--	91	NA
4-Bromofluorobenzene	--	87	NA
Dibromofluoromethane	--	94	NA
Toluene-d8	--	90	NA

Notes.

C Celsius
JB Estimated, possibly biased high or false positive based on blank contamination
JQ Estimated, Value is between reporting limit and detection limit
mV millivolt
mg/L milligrams per liter
mS/cm milliSeimens per centimeter
µg/L micrograms per liter
NA Not Analyzed
nM nanoMoles
NTU nephelometric turbidity unit
pH negative log of thehydrogen ion concentration
UJ undetected, Reported Detection Limit is imprecise
UL Undetected, Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/sample weight extracted and/or sample dilutions

PREPARED/DATE JAH 5/18/03
CHECKED/DATE JAV 5/18/03

TABLE C-4

DATA SUMMARY TABLE FOR GROUNDWATER CONTROL SAMPLES
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting (a) Limit	Trip Blank TB-101502-2 10/15/2002	Trip Blank TB-101602-1 10/16/2002	Trip Blank TB-101702-2 10/17/2002	Trip Blank TB-102902-1 10/29/2002
Dissolved Gases - RSK SOP-175 mg/L					
Carbon dioxide	0 001	0 2	0 63	1 1	0 89
Ethane	0 002	<0 002	<0 002	<0 002	<0 002
Ethene	0 001	<0 001	<0 001	<0 001	<0 001
Methane	0 001	<0 001	0 00069 JQ	<0 001	<0 001
Total Organic Carbon - SW846 9060 mg/L					
Total Organic Carbon	1	<1	<1	<1	<1
Volatile Organic Compounds - SW846 8260B ug/L					
1,1,1,2-Tetrachloroethane	1	<1	<1	<1	<1
1,1,1-Trichloroethane	1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	1	<1	<1	<1	<1
1,1,2-Trichloroethane	1	<1	<1	<1	<1
1,1-Dichloroethane	1	<1	<1	<1	<1
1,1-Dichloroethene	1	<1	<1	<1	<1
1,1-Dichloropropene	1	<1	<1	<1	<1
1,2,3-Trichlorobenzene	1	<1	<1	<1 UJ	<1 UJ
1,2,3-Trichloropropane	1	<1	<1	<1	<1
1,2,4-Trichlorobenzene	1	<1	<1	<1 UJ	<1 UJ
1,2,4-Trimethylbenzene	1	<1	<1	<1	<1
1,2-Dibromo-3-chloropropane	2	<2	<2	<2	<2
1,2-Dibromoethane	1	<1	<1	<1	<1
1,2-Dichlorobenzene	1	<1	<1	<1	<1
1,2-Dichloroethane	1	<1	<1	<1	<1
1,2-Dichloropropane	1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	1	<1	<1	<1	<1
1,3-Dichlorobenzene	1	<1	<1	<1	<1
1,3-Dichloropropane	1	<1	<1	<1	<1
1,4-Dichlorobenzene	1	<1	<1	<1	<1
2,2-Dichloropropane	1	<1	<1	<1	<1
2-Butanone	10	<10 UJ	<10	<10 UJ	<10 R
2-Chlorotoluene	1	<1	<1	<1	<1
2-Hexanone	10	<10 UJ	<10	<10 UJ	<10 R
4-Chlorotoluene	1	<1	<1	<1	<1
4-Methyl-2-pentanone	10	<10	<10	<10	<10 UL
Acetone	10	<10 UJ	<10	<10 UJ	<10 R
Benzene	1	<1	<1	<1	<1
Bromobenzene	1	<1	<1	<1	<1
Bromochloromethane	1	<1	<1	<1	<1
Bromodichloromethane	1	<1	<1	<1	<1
Bromoform	1	<1 UJ	<1	<1	<1
Bromomethane	2	<2	<2	<2	<2
Carbon disulfide	1	<1	<1	<1	<1
Carbon tetrachloride	1	<1	<1	<1	<1
Chlorobenzene	1	<1	<1	<1	<1
Chloroethane	2	<2	<2	<2	<2
Chloroform	1	<1	<1	<1	<1
Chloromethane	2	<2	<2	<2	<2
cis-1 2-Dichloroethene	0 5	<0 5	<0 5	<0 5	<0 5
cis-1,3-Dichloropropene	1	<1	<1	<1	<1
Dibromochloromethane	1	<1	<1	<1	<1
Dibromomethane	1	<1	<1	<1	<1
Dichlorodifluoromethane	2	<2 UJ	<2	<2 UJ	<2 UJ
Ethylbenzene	1	<1	<1	<1	<1
Hexachlorobutadiene	1	<1 UJ	<1	<1 UJ	<1
Isopropylbenzene	1	<1	<1	<1	<1
m-Xylene & p-Xylene	1	<1	<1	<1	<1
Methylene chloride	1	3 1	3 3	3 1	2 6 JB
n-Butylbenzene	1	<1	<1	<1 UJ	<1 UJ

TABLE C-4

DATA SUMMARY TABLE FOR GROUNDWATER
CONTROL SAMPLES
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting (a) Limit	Trip Blank TB-101502-2 10/15/2002	Trip Blank TB-101602-1 10/16/2002	Trip Blank TB-101702-2 10/17/2002	Trip Blank TB-102902-1 10/29/2002
n-Propylbenzene	1	<1	<1	<1	<1
Naphthalene	1	<1	<1	<1 UJ	<1 UJ
o-Xylene	0 5	<0 5	<0 5	<0 5	<0 5
p-Isopropyltoluene	1	<1	<1	<1	<1
sec-Butylbenzene	1	<1	<1	<1	<1 UJ
Styrene	1	<1	<1	<1	<1
tert-Butylbenzene	1	<1	<1	<1	<1
Tetrachloroethene	1	<1	<1	<1	<1
Toluene	1	<1	<1	<1	<1
trans-1,2-Dichloroethene	0 5	<0 5	<0 5	<0 5	<0 5
trans-1,3-Dichloropropene	1	<1	<1	<1	<1
Trichloroethene	1	<1	<1	<1	<1
Trichlorofluoromethane	2	<2 UJ	<2	<2	<2
Vinyl chloride	2	<2	<2	<2	<2
Xylenes (total)	1	<1	<1	<1	<1
Surrogate - %					
1,2-Dichloroethane-d4	--	94	85	96	89
4-Bromofluorobenzene	--	88	88	83	82
Dibromofluoromethane	--	99	95	105	100
Toluene-d8	--	93	92	93	92

Notes:

P	monitoring well is located within the plume
NP	monitoring well is not located within the plume
PG	monitoring well is located on the plume boundary
NA	not applicable
I	Mann-Kendall results indicate a statistically significant increasing trend
D	Mann-Kendall results indicate a statistically significant decreasing trend
µg/L	micrograms per liter
MCL	maximum contaminant level (MCL for PCE and TCE is 5 µg/L, MCL for *cis*-1,2-DCE is 70 µg/L, MCL for *trans*-1,2-DCE is 100 µg/L, MCL for 1,1,1-TCA is 200 µg/L; MCL for 1,1-DCE is 7 µg/L, and no MCL is published for 1,1-DCA)

PREPARED/DATE JAH 5/18/03
CHECKED/DATE JAV 5/18/03

TAB

Appendix D

APPENDIX D
SUMMARY OF CONSTITUENTS DETECTED FOR THE OCTOBER 2001 THROUGH OCTOBER 2002 SAMPLING EVENTS

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID. / Sample Date	Reporting Limit (a)	Sample AEHADG-10 10/5/2001	Duplicate AEHADG-10 10/5/2001	Sample AEHADG-10 4/5/2002	Duplicate AEHADG-10 4/5/2002	Sample AEHADG-10 7/30/2002	Duplicate AEHADG-10 7/30/2002	Sample AEHADG-10 10/16/2002	Duplicate AEHADG-10 10/16/2002
FIELD PARAMETER									
Dissolved Oxygen - E360 1 mg/L									
Dissolved Oxygen	0 1	<0 1	<0 1	1 3	1 3	1 2	1 2	0 8	0 8
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0 1	3 6	3 6	6 2	6 2	<0 1	<0 1	<0 1	<0 1
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	38	38	43	43	9	9	-31	-31
pH - E150 1 pH Units									
pH	--	5 57	5 57	5 6	5 6	5 37	5 37	5 16	5 16
Specific Conductance - E120 1 mS/cm									
Specific Conductance	0 001	0 278	0 278	0 344	0 344	0 221	0 221	0 318	0 318
Temperature - E170 1 deg C									
Temperature	0 1	20 4	20 4	12 7	12 7	21 3	21 3	20 5	20 5
Turbidity - E180 1 NTU									
Turbidity	1	26	26	3	3	<1	<1	15	15
FIXED BASE LABORATORY ANALYSIS:									
Anions - MCAWW 300 0A mg/L									
Chloride	1	75 2	73 8	119	120	65 8	65 5	45	44 9
Nitrate	0 1	<0 1	<0 1	<0 1	<0 1	<0 1	<0 1	<0 1	<0 1
Sulfate	1	20 1	20 4	18 3	18 6	20 8	20 2	19 7	18 6
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0 001	94 J	100 J	92	86	100	110	120	120
Ethane	0 002	<0 002	<0 002	<0 002	<0 002	<0 002	<0 002	<0 002	<0 002
Ethene	0 001	0 005	0 0049	0 0063	0 0054	0 01	0 011	0 014	0 013
Methane	0 001	0 023	0 023	0 035	0 03	0 045	0 05	0 18	0 19
Dissolved Hydrogen by Microseeps AM20GAX nM									
Hydrogen	0 03	8 3	10	1 4	1 2	1 8	2	2 2	2 6
Total Alkalinity - MCAWW 310 1 mg/L									
Total Alkalinity	5	16	17	13 JH	11 JH	15	15	13 JH	13 JH
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	1 JB	1 JB	0 9 JQ	1	1	1	1 JH	1 JH
Total Sulfide - MCAWW 376 1 mg/L									
Total Sulfide	1	3 9 J	<1 J	<1	<1	<1	0 65 JQ	<1	0 33 JB

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TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date.	Reporting Limit (a)	Sample AEHADG-10 10/5/2001	Duplicate AEHADG-10 10/5/2001	Sample AEHADG-10 4/5/2002	Duplicate AEHADG-10 4/5/2002	Sample AEHADG-10 7/30/2002	Duplicate AEHADG-10 7/30/2002	Sample AEHADG-10 10/16/2002	Duplicate AEHADG-10 10/16/2002
Mercury - SW846 7470A (Dissolved) µg/L									
Not Detected	1	<1	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L									
Mercury	1	<1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L									
Aluminum	200	<200	<200	52.1 JB	66.5 JB	69.9 JQ	74.5 JQ	<200 UJ	<200 UJ
Arsenic	5	65	63.7	29.5	30.2	46.6	44.2	37.9	38.6
Barium	200	132 JQ	125 JQ	191 JQ	193 JQ	142 JQ	137 JQ	108 JQ	109 JQ
Beryllium	10	0.9 JB	0.92 JB	1.4 JQ	1.4 JQ	1.5 JQ	1.5 JQ	1.9 JQ	2 JQ
Cadmium	2	<2	0.43 JB	<2	<2	<2	<2	<2	<2
Calcium	5000	5720	5800	10200	10400	5830	5720	4750 JQ	4740 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	29.9 JQ	27.9 JQ	46.3	45.7	32.2	31.5	25.8 JQ	25.7 JQ
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10
Iron	200	27200	26100	33300	33500	23600	23000	17300	17400
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	7880	7500	11100	11100	7370	7190	5370	5420
Manganese	20	1080	985	1550	1540	997 J	969	650	654
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	42.4 JQ	38.5 JQ	55.3 JQ	55.1 JQ	41.7 JQ	40.2 JQ	37.5 JQ	37.6 JQ
Potassium	5000	6410	6230	4610 JQ	4620 JQ	5280	5170	4530 JQ	4600 JQ
Sodium	5000	15000	14400	20000	19800	16400	16000	11600	11700
Vanadium	50	<50	<50	0.86 JQ	<50	<50	0.68 JQ	1.1 JQ	0.75 JQ
Zinc	20	25.1	24	94.4 J	49.3 J	35.6	37.7	28.8	27.4
Metals - SW846 6010B (Total) µg/L									
Aluminum	200	<200	272	85.3 JB	74.4 JB	97.3 JQ	107 JQ	63.4 JQ	74.2 JQ
Arsenic	5	71.5	81	27.8	27.9	45.9	47.6	39.6	39.5
Barium	200	134 JQ	130 JQ	185 JQ	194 JQ	135 JQ	141 JQ	107 JQ	110 JQ
Beryllium	10	1 JB	1.3 JB	1.4 JQ	1.4 JQ	1.4 JQ	1.6 JQ	1.9 JQ	1.9 JQ
Cadmium	2	<2	0.59 JB	<2	<2	<2	<2	<2	<2
Calcium	5000	5730	5920	10700	10500	5600	5790	4670 JQ	4800 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	30.4	29.4 JQ	43.3	47	31	31.7	24.7 JQ	26 JQ
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10
Iron	200	30500	33500	31700	33700	23100	23400	17200	17700
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	7890	7650	10600	11200	7080	7280	5300	5440
Manganese	20	1080	1010	1420	1560	951 J	977 J	639	658
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	43.1 JQ	40.6 JQ	54.8 JQ	54.8 JQ	39.2 JQ	42.6 JQ	37.2 JQ	38.4 JQ
Potassium	5000	6430	6300	4630 JQ	4640 JQ	5050	5360	4480 JQ	4590 JQ
Sodium	5000	15100	14400	18900	19800	15700	16200	11300	11800
Vanadium	50	1.4 JB	1.6 JB	<50	<50	<50	<50	0.81 JQ	1.2 JQ
Zinc	20	25.2	27.4	49.7 J	51.6	36.1 J	54 J	24.1	24.2
Thallium - SW846 7841 (Dissolved) µg/L									
Thallium	2	2.1 JB	<2	<2 UL	<2 UL	<2 UJ	<2 UJ	<2 UL	<2 UJ
Thallium - SW846 7841 (Total) µg/L									
Thallium	2	2.2 JB	<2	<2 UL	<2 UL	<2 UJ	<2 UJ	<2 UL	<2 UL

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID. / Sample Date	Reporting Limit (a)	Sample AEHADG-10 10/5/2001	Duplicate AEHADG-10 10/5/2001	Sample AEHADG-10 4/5/2002	Duplicate AEHADG-10 4/5/2002	Sample AEHADG-10 7/30/2002	Duplicate AEHADG-10 7/30/2002	Sample AEHADG-10 10/16/2002	Duplicate AEHADG-10 10/16/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L									
Not Detected		NA	NA	NA	NA	NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C µg/L									
Acenaphthene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L									
1,1,1-Trichloroethane	1	7300	7300	5800	4500	2800	3000	1100	1200
1,1 Dichloroethane	1	86 JQ	83 JQ	98 JQ	74 JQ	61 JQ	68 JQ	<120	<120
1,1-Dichloroethene	1	1100	1100	570	510	270	270	98 JQ	140 J
1,2,4-Trimethylbenzene	1	<420	<420	<330	<330	<170	<170	<120	<120
1,2 Dichlorobenzene	1	130 JQ	150 JQ	77 JQ	74 JQ	140 JQ	150 JQ	140	140
1,3,5-Trimethylbenzene	1	<420	<420	<330	<330	<170	<170	<120	<120
1,3 Dichlorobenzene	1	<420	<420	51 JQ	<330	<170	<170	<120	<120
1,4 Dichlorobenzene	1	<420	<420	<330	<330	<170	<170	<120	<120
Acetone	10	<4200	<4200	<3300 R	840 R	<1700 R	<1700 R	<1200 UJ	<1200 UJ
Benzene	1	<420	<420	<330	<330	<170	<170	<120	<120
Carbon tetrachloride	1	120 JQ	130 JQ	59 JQ	63 JQ	<170 UJ	<170 UJ	<120	<120
Chloroform	1	130 JB	140 JB	89 JQ	65 JQ	<170	65 JQ	<120	<120
Chloromethane	2	<830	<830	<670	<670	<330 UJ	<330 UJ	<250	<250
cis 1,2-Dichloroethene	0.5	880	870	1000	990	780	780	650	690
Isopropylbenzene	1	<420	<420	<330	<330	<170	<170	<120	<120
Methylene chloride	1	<420	<420	110 JQ	<330	130 JB	110 JB	<120	<120
Naphthalene	1	340 JQ	<420	<330 UJ	<330	<170	<170	54 JQ	58 JQ
Tetrachloroethene	1	3300	3300	1200	1200	2800	2700	1700	1900
trans-1,2 Dichloroethene	0.5	<210	<210	<170	<170	<83	<83	<62	<62
Trichloroethene	1	14000	14000	9000	8600	5100	5200	2500	2800
Vinyl chloride	2	<830	<830	<670	<670	<330	<330	<250	<250

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TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID. Sample Date:	Reporting Limit (a)	Sample DMW-13A 10/5/2001	Sample DMW-13A 4/7/2002	Sample DMW-13A 7/17/2002	Sample DMW-13A 10/16/2002	Sample DMW-20A Oct 2001	Sample DMW-20A Apr 2002	Sample DMW-20A 7/30/2002	Sample DMW-20A 10/16/2002
FIELD PARAMETER									
Dissolved Oxygen - E360 1 mg/L									
Dissolved Oxygen	0 1	0 1	1 8	0 8	0 8	NS	NS	0 9	1
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0 1	2 3	2 6	1 3	3 5	NS	NS	NA	<0 1
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	308	335	319	299	NS	NS	349	405
pH - E150 1 pH Units									
pH	--	3 9	4 02	3 61	3 74	NS	NS	3 95	3 85
Specific Conductance - E120 1 mS/cm									
Specific Conductance	0 001	0 162	0 144	0 138	0 137	NS	NS	0 085	0 124
Temperature - E170 1 deg C									
Temperature	0 1	21 9	16 2	24	21 6	NS	NS	22 5	19 4
Turbidity - E180 1 NTU									
Turbidity	1	1	<1	3	<1	NS	NS	14	47
FIXED BASE LABORATORY ANALYSIS.									
Anions - MCAWW 300 0A mg/L									
Chloride	1	20 8	21 3	25 4 JH	15 2	NS	NS	16 6	16 5
Nitrate	0 1	1	1 1	0 51	1 4 JB	NS	NS	0 12	0 17
Sulfate	1	21 7	23 5	19 7 JH	20 8	NS	NS	10 9	19
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0 001	110 J	110	130	110	NS	NS	120	160
Ethane	0 002	<0 002	<0 002	<0 002 R	<0 002	NS	NS	<0 002	<0 002
Ethene	0 001	<0 001	<0 001	<0 001 R	<0 001	NS	NS	<0 001	<0 001
Methane	0 001	0 0013 JB	0 002	0 0011	0 0023 JB	NS	NS	0 0013	0 0011 JB
Dissolved Hydrogen by Microseeps AM20GAX nM									
Hydrogen	0 03	1 6	1 3	2 4	2 4	NS	NS	2 2	2 7
Total Alkalinity - MCAWW 310 1 mg/L									
Total Alkalinity	5	<5	<5	<5	<5	NS	NS	2 1 JB	1 4 JB
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	0 6 JB	0 6 JQ	<1	1 JH	NS	NS	<1	1 JB
Total Sulfide - MCAWW 376 1 mg/L									
Total Sulfide	1	<1	<1	<1	0 49 JB	NS	NS	0 97 JQ	1 1 JH

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TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-13A 10/5/2001	Sample DMW-13A 4/7/2002	Sample DMW-13A 7/17/2002	Sample DMW-13A 10/16/2002	Sample DMW-20A Oct. 2001	Sample DMW-20A Apr 2002	Sample DMW-20A 7/30/2002	Sample DMW-20A 10/16/2002
Mercury - SW846 7470A (Dissolved) µg/L									
Not Detected	1	<1	<1 UJ	<1	<1	NS	NS	<1	<1
Mercury - SW846 7470A (Total) µg/L									
Mercury	1	<1	<1 UJ	<1	<1	NS	NS	<1	<1
Metals - SW846 6010B (Dissolved) µg/L									
Aluminum	200	1190	1360	1550	794	NS	NS	121 JQ	109 JQ
Arsenic	5	<5	<5	<5	<5	NS	NS	<5	<5
Barium	200	109 JQ	111 JQ	123 JQ	98 2 JQ	NS	NS	98 7 JQ	70 7 JQ
Beryllium	10	1 1 JB	0 87 JQ	1 2 JQ	1 4 JQ	NS	NS	0 63 JQ	0 91 JQ
Cadmium	2	0 88 JB	0 73 JB	1 JQ	0 43 JQ	NS	NS	<2	<2
Calcium	5000	2110 JQ	2330 JQ	2820 JQ	1740 JQ	NS	NS	1650 JQ	1460 JQ
Chromium	10	<10	<10	<10	<10	NS	NS	<10	<10
Cobalt	30	5 2 JQ	4 6 JQ	5 9 JQ	4 JQ	NS	NS	5 8 JQ	5 JB
Copper	10	<10	<10	3 2 JB	<10	NS	NS	<10	<10
Iron	200	3680	3090	4190	2130	NS	NS	794	43 7 JB
Lead	3	6	4 7	5 6	3 1	NS	NS	<3	<3
Magnesium	5000	2510 JQ	2460 JQ	2650 JQ	2130 JQ	NS	NS	2860 JQ	2670 JQ
Manganese	20	195	185	221	162	NS	NS	304	295
Molybdenum	40	<40	<40	<40	<40	NS	NS	<40	<40
Nickel	100	2 9 JQ	<100	<100	3 3 JQ	NS	NS	5 1 JQ	4 9 JQ
Potassium	5000	2960 JQ	1980 JQ	2020 JQ	2220 JQ	NS	NS	2800 JQ	2980 JQ
Sodium	5000	6550	6410	7270	6090	NS	NS	6430	6670
Vanadium	50	<50	<50	<50	<50	NS	NS	<50	<50
Zinc	20	41 5	36 6	57 1	20 4	NS	NS	14 4 JQ	<20 UL
Metals - SW846 6010B (Total) µg/L									
Aluminum	200	1120	1520	1490	831	NS	NS	239	145 JQ
Arsenic	5	<5	<5	<5	<5	NS	NS	<5	<5
Barium	200	115 JQ	115 JQ	126 JQ	102 JQ	NS	NS	88 9 JQ	70 5 JQ
Beryllium	10	1 1 JB	0 97 JQ	1 3 JQ	1 2 JQ	NS	NS	<10	0 97 JQ
Cadmium	2	1 1 JB	0 89 JB	0 91 JQ	0 49 JQ	NS	NS	<2	<2
Calcium	5000	2290 JQ	2570 JQ	2440 JQ	1710 JQ	NS	NS	1550 JQ	1430 JQ
Chromium	10	<10	<10	<10	<10	NS	NS	<10	<10
Cobalt	30	5 7 JQ	5 2 JQ	5 7 JQ	4 JQ	NS	NS	5 7 JQ	5 2 JB
Copper	10	<10	<10	3 4 JB	<10	NS	NS	<10	<10
Iron	200	3380	3720	4090	2200	NS	NS	2960 JQ	639
Lead	3	6 2	4 3	4 9	2 8 JQ	NS	NS	<3	<3
Magnesium	5000	2700 JQ	2540 JQ	2780 JQ	2200 JQ	NS	NS	2790	2690 JQ
Manganese	20	200	196	228	170	NS	NS	307	297
Molybdenum	40	<40	<40	<40	<40	NS	NS	<40	<40
Nickel	100	2 8 JQ	3 7 JQ	<100	3 4 JQ	NS	NS	4 7 JQ	4 2 JQ
Potassium	5000	3070 JQ	1890 JQ	1930 JQ	2230 JQ	NS	NS	2750 JQ	2970 JQ
Sodium	5000	6620	6980	6750	6200	NS	NS	6210	6710
Vanadium	50	<50	0 87 JQ	<50	<50	NS	NS	<50	<50
Zinc	20	44 2	47 4	50 6	47 7	NS	NS	19 8 JQ	<20 UL
Thallium - SW846 7841 (Dissolved) µg/L									
Thallium	2	2 4 JB	<2 UL	<2 UL	<2	NS	NS	<2	<2 UL
Thallium - SW846 7841 (Total) µg/L									
Thallium	2	2 JB	<2 UL	<2 UL	<2	NS	NS	<2	<2 UL

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-13A 10/5/2001	Sample DMW-13A 4/7/2002	Sample DMW-13A 7/17/2002	Sample DMW-13A 10/16/2002	Sample DMW-20A Oct 2001	Sample DMW-20A Apr 2002	Sample DMW-20A 7/30/2002	Sample DMW-20A 10/16/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L									
Not Detected		NA	NA	NA	NA	NS	NS	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C µg/L									
Acenaphthene	0 2	NA	NA	NA	NA	NS	NS	NA	NA
Anthracene	0 2	NA	NA	NA	NA	NS	NS	NA	NA
Fluorene	0 2	NA	NA	NA	NA	NS	NS	NA	NA
Naphthalene	0 2	NA	NA	NA	NA	NS	NS	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L									
1 1 1-Trichloroethane	1	<1	<1	<1	<1	NS	NS	<1 3	<1
1 1 Dichloroethane	1	<1	<1	<1	<1	NS	NS	<1 3	<1
1 1-Dichloroethene	1	<1	<1	<1	<1	NS	NS	<1 3	<1
1 2 4-Trimethylbenzene	1	<1	<1	<1	<1	NS	NS	<1 3	<1
1 2-Dichlorobenzene	1	<1	<1	<1	<1	NS	NS	<1 3	<1
1,3,5-Trimethylbenzene	1	<1	<1	<1	<1	NS	NS	<1 3	<1
1 3-Dichlorobenzene	1	<1	<1	<1	<1	NS	NS	<1 3	<1
1,4-Dichlorobenzene	1	<1	<1	<1	<1	NS	NS	<1 3	<1
Acetone	10	<10	1 7 R	<10 UJ	<10	NS	NS	1 8 R	<10
Benzene	1	<1	<1	<1	<1	NS	NS	<1 3	<1
Carbon tetrachloride	1	<1	<1	<1	<1	NS	NS	<1 3 UJ	<1
Chloroform	1	0 36 JB	<1	<1	<1	NS	NS	<1 3	<1
Chloromethane	2	<2	<2	<2 UJ	<2	NS	NS	<2 7 UJ	0 52 JQ
cis-1 2-Dichloroethene	0 5	<0 5	<0 5	<0 5	<0 5	NS	NS	40	21
Isopropylbenzene	1	<1	<1	<1	<1	NS	NS	<1 3	<1
Methylene chloride	1	<1	<1	<1	<1	NS	NS	<1 3	<1
Naphthalene	1	<1	<1	<1 UJ	<1	NS	NS	<1 3 UJ	<1
Tetrachloroethene	1	<1	<1	<1	<1	NS	NS	<1 3	<1
trans-1 2 Dichloroethene	0 5	<0 5	<0 5	<0 5	<0 5	NS	NS	<0 66	<0 5
Trichloroethene	1	<1	<1	<1	<1	NS	NS	1 3	2 5
Vinyl chloride	2	<2	<2	<2	<2	NS	NS	<2 7	<2

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TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID. Sample Date	Reporting Limit (a)	Sample DMW-22A 10/5/2001	Sample DMW-22A 4/7/2002	Sample DMW-22A 7/30/2002	Sample DMW-22A 10/30/2002	Sample DMW-25A 10/5/2001	Duplicate DMW-25A 10/5/2001	Sample DMW-25A 4/5/2002	Sample DMW-25A 7/29/2002	Sample DMW-25A 10/16/2002
FIELD PARAMETER										
Dissolved Oxygen - E360.1 mg/L										
Dissolved Oxygen	0.1	<0.1	2.2	1.3	0.4	<0.1	<0.1	3	0.6	2.5
Ferrous Iron - A3500D mg/L										
Ferrous Iron	0.1	3.7	0.35	<0.1	2	<0.1	<0.1	<0.1	<0.1	<0.1
Oxidation Reduction Potential - A2580A mV										
Oxidation Reduction Potential	--	-73	86	-14	-80	160	160	231	310	157
pH - E150.1 pH Units										
pH	--	5.95	6.4	6.82	5.87	5.16	5.16	5.9	4.92	6.63
Specific Conductance - E120.1 mS/cm										
Specific Conductance	0.001	0.43	0.267	0.23	0.274	0.103	0.103	0.185	0.125	0.291
Temperature - E170.1 deg C										
Temperature	0.1	16.4	10.4	19.4	15.8	18.9	18.9	15.9	23.1	18.7
Turbidity - E180.1 NTU										
Turbidity	1	<1	<1	8	<1	8	8	16	4	19
FIXED BASE LABORATORY ANALYSIS										
Anions - MCAWW 300.0A mg/L										
Chloride	1	80.9	63.1	41.3	45	11.7	12.9	6	12.4	6.3
Nitrate	0.1	<0.1	0.54	<0.1	<0.1	<0.1	<0.1	1.5	0.17	1
Sulfate	1	13.7	14.6	10.8	33.6	7.4	7.1	36.1	18.7	39.4
Dissolved Gases - RSK SOP-175 mg/L										
Carbon dioxide	0.001	73 J	39	70	85	130 J	140 J	68	100	24
Ethane	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ethene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methane	0.001	0.22	0.01	0.021	0.075	0.013	0.012	0.00059 JQ	0.0022	0.0016 JB
Dissolved Hydrogen by Microseeps AM20GAX nM										
Hydrogen	0.03	8.9	0.96	2.7	4.2	9.5	8.2	1.5	2	5
Total Alkalinity - MCAWW 310.1 mg/L										
Total Alkalinity	5	55	31	44	31	23	22	45	27	97
Total Organic Carbon - SW846 9060 mg/L										
Total Organic Carbon	1	3	2	2	2	0.8 JB	0.6 JB	4	2	11
Total Sulfide - MCAWW 376.1 mg/L										
Total Sulfide	1	1.2 J	<1	0.65 JQ	0.32 JQ	<1	<1	<1	<1	0.81 JH

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date	Reporting Limit (a)	Sample DMW-22A 10/5/2001	Sample DMW-22A 4/7/2002	Sample DMW-22A 7/30/2002	Sample DMW-22A 10/30/2002	Sample DMW-25A 10/5/2001	Duplicate DMW-25A 10/5/2001	Sample DMW-25A 4/5/2002	Sample DMW-25A 7/29/2002	Sample DMW-25A 10/16/2002
Mercury - SW846 7470A (Dissolved) µg/L										
Not Detected	1	<1	<1 UJ	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L										
Mercury	1	<1	<1 UJ	<1	<1	<1	<1	0 094 JQ	<1	<1
Metals - SW846 6010B (Dissolved) µg/L										
Aluminum	200	<200	<200	<200 UJ	85 6 JQ	<200	<200	<200 UJ	<200 UJ	623
Arsenic	5	19 7	<5	14 6	15	<5	<5	<5	<5	<5
Barium	200	93 8 JQ	81 6 JQ	49 5 JQ	66 7 JQ	71 9 JQ	55 3 JQ	51 3 JQ	48 1 JQ	51 9 JQ
Beryllium	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium	2	<2	<2	<2	<2	<2	0 35 JB	0 35 JB	<2	<2
Calcium	5000	14700	13000	7990	9710	2930 JQ	2470 JQ	14800	4520 JQ	18500
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10	2 2 JQ
Cobalt	30	<30	<30	<30	<30	12 2 JQ	11 1 JQ	<30	2 1 JQ	2 JQ
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10	8 5 JQ
Iron	200	5130	311	1770	4140	210	175 JQ	<200	<200	579
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	11900	8740	5730	7380	2330 JQ	1810 JQ	3010 JQ	1530 JQ	2690 JQ
Manganese	20	185	37 3	117	119	490	440	5 5 JB	157	8 2 JQ
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	4 9 JQ	<100	<100	3 8 JQ	3 2 JQ	<100	<100	4 4 JQ
Potassium	5000	8910	6080	4780 JQ	5840	4440 JQ	3960 JQ	4480 JQ	3110 JQ	14500
Sodium	5000	32700	26400	28700	29900	19900	16300	21300	19000	42000
Vanadium	50	1 3 JB	<50	1 9 JQ	<50	<50	<50	<50	<50	1 4 JQ
Zinc	20	<20	<20	<20	<20	<20	12 8 JB	12 6 JQ	14 7 JQ	<20 UL
Metals - SW846 6010B (Total) µg/L										
Aluminum	200	<200	<200	60 1 JQ	78 7 JQ	64 5 JQ	<200	600	57 8 JQ	925
Arsenic	5	20 1	4 8 JQ	16 4	14 4	<5	<5	<5	<5	2 8 JQ
Barium	200	96 JQ	86 1 JQ	51 JQ	64 9 JQ	58 1 JQ	55 7 JQ	52 7 JQ	51 5 JQ	52 3 JQ
Beryllium	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium	2	<2	0 37 JB	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	15300	14400	8060	9450	2560 JQ	2460 JQ	15100	4740 JQ	18300
Chromium	10	<10	<10	<10	<10	<10	<10	1 7 JB	<10	2 6 JQ
Cobalt	30	<30	<30	<30	<30	12 1 JQ	11 9 JQ	<30	2 4 JQ	2 3 JQ
Copper	10	<10	<10	<10	1 9 JB	<10	<10	<10	<10	8 4 JQ
Iron	200	5420	328	1910	4070	364	333	500	45 3 JQ	731
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	12300	9630	5890	7170	1880 JQ	1810 JQ	3060 JQ	1650 JQ	2680 JQ
Manganese	20	192	43 7	122	117	467	455	8 1 JQ	183	11 1 JQ
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40	3 7 JQ
Nickel	100	<100	7 2 JQ	<100	<100	3 JQ	2 8 JQ	2 4 JB	4 5 JQ	3 7 JQ
Potassium	5000	9000	6690	4850 JQ	5670	4130 JQ	4040 JQ	4470 JQ	3250 JQ	14000
Sodium	5000	33400	28800	29200	29200	16600	16200	21600	19900	41300
Vanadium	50	1 8 JB	0 94 JQ	1 8 JQ	<50	<50	<50	<50	<50	1 9 JQ
Zinc	20	<20	17 9 JQ	<20	23	<20	<20	14 9 JQ	<20	<20 UI
Thallium - SW846 7841 (Dissolved) µg/L										
Thallium	2	1 9 JB	<2 UL	<2 UJ	<2	<2	<2	<2 UL	<2	<2
Thallium - SW846 7841 (Total) µg/L										
Thallium	2	2 1 JB	<2 UL	<2 UJ	<2	<2	<2	<2 UL	<2	<2

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date:	Reporting Limit (a)	Sample DMW-22A 10/5/2001	Sample DMW-22A 4/7/2002	Sample DMW-22A 7/30/2002	Sample DMW-22A 10/30/2002	Sample DMW-25A 10/5/2001	Duplicate DMW-25A 10/5/2001	Sample DMW-25A 4/5/2002	Sample DMW-25A 7/29/2002	Sample DMW-25A 10/16/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L										
Not Detected		NA	NA	NA	NA	NA	NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C µg/L										
Acenaphthene	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L										
1,1,1-Trichloroethane	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	1	0.7 JQ	0.88 JQ	0.5 JQ	0.48 JQ	<1	<1	<1	<1	<1
1,1-Dichloroethene	1	0.66 JQ	1.3	0.74 JQ	0.61 JQ	<1	<1	<1	<1	<1
1,2,4-Trimethylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	1	0.62 JQ	0.19 JQ	<1	0.44 JQ	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acetone	10	<10	17 R	<10 R	<10 R	<10	<10	<10 R	<10 R	2.5 JQ
Benzene	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	1	<1	<1	<1 UJ	<1	<1	<1	<1	<1 UJ	<1
Chloroform	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloromethane	2	<2	<2	<2 UJ	<2	<2	<2	<2	<2 UJ	<2
cis-1,2-Dichloroethene	0.5	6.2	6.7	3.5	2	8.8	8.8	1.2	6	<0.5
Isopropylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methylene chloride	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	1	<1	<1	<1	<1 UJ	<1	<1	<1 UJ	<1	<1
Tetrachloroethene	1	2.4	4.3	3.2	1.9	19	19	5	13	1.4
trans-1,2-Dichloroethene	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	1	10	20	12	10	5.6	5.4	0.74 JQ	4	<1
Vinyl chloride	2	0.32 JQ	<2	<2	<2	0.6 JQ	0.6 JQ	<2	<2	<2

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date.	Reporting Limit (a)	Sample DMW-26A 10/4/2001	Sample DMW-26A 4/5/2002	Sample DMW-26A 7/31/2002	Sample DMW-26A 10/15/2002	Sample DMW-27A 10/5/2001	Sample DMW-27A 4/4/2002	Sample DMW-27A 7/30/2002	Sample DMW-27A 10/15/2002
FIELD PARAMETER:									
Dissolved Oxygen - E360 1 mg/L									
Dissolved Oxygen	0 1	<0 1	0 4	1 36	0 1	<0 1	1 8	0 8	1 1
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0 1	3 8	3 2	<0 1	1	2 2	2	<0 1	0 5
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	-18	169	-18	-68	8	386	-31	-63
pH - E150 1 pH Units									
pH	--	5 61	4 71	5 86	6 71	4 35	4 26	4 2	3 99
Specific Conductance - E120 1 mS/cm									
Specific Conductance	0 001	0 822	0 827	0 76	0 709	0 089	0 088	0 098	0 123
Temperature - E170 1 deg C									
Temperature	0 1	23 5	16 6	33 9	21	22 5	16 2	27	22 3
Turbidity - E180 1 NTU									
Turbidity	1	<1	17	6	11	2	30	<1	<1
FIXED BASE LABORATORY ANALYSIS									
Anions - MCAWW 300 0A mg/L									
Chloride	1	258	210	224	118	17 1	20 4	16 5	20 1
Nitrate	0 1	<0 1	0 29	<0 1	0 02 JQ	<0 1	<0 1	<0 1	0 01 JQ
Sulfate	1	<1	53 3	2 7	13 9	2	2 5	3 1	1 4
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0 001	170 J	120	150	180	240 J	90	200	220
Ethane	0 002	<0 002	<0 002	<0 004	<0 002	0 00038	<0 002	<0 004	<0 002
Ethene	0 001	<0 001	<0 001	<0 002	<0 001	0 0031	<0 001	<0 002	<0 001
Methane	0 001	5 4	1 8	0 29	2 4	3 7	3 6	0 26	2 9
Dissolved Hydrogen by Microseeps AM20GAX nM									
Hydrogen	0 03	8 1	1	3 6	2 9	7 7	10	2 2	2 4
Total Alkalinity - MCAWW 310 1 mg/L									
Total Alkalinity	5	33	<5	43	61	3 JB	2 1 JB	1 8 JB	3 6 JB
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	17	4	15	16	12	8	13	10
Total Sulfide - MCAWW 376 1 mg/L									
Total Sulfide	1	1 1	<1	0 97 JQ	6 9	NA	<1	0 32 JQ	<1

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-26A 10/4/2001	Sample DMW-26A 4/5/2002	Sample DMW-26A 7/31/2002	Sample DMW-26A 10/15/2002	Sample DMW-27A 10/5/2001	Sample DMW-27A 4/4/2002	Sample DMW-27A 7/30/2002	Sample DMW-27A 10/15/2002
Mercury - SW846 7470A (Dissolved) µg/L									
Not Detected	1	<1	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L									
Mercury	1	<1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L									
Aluminum	200	137 JQ	89.9 JB	292	260	331	398	609	430
Arsenic	5	<5	<5	6.3	3.1 JQ	<5	<5	<5	<5
Barium	200	66.2 JQ	107 JQ	69.6 JQ	57.5 JQ	112 JQ	163 JQ	107 JQ	138 JQ
Beryllium	10	<10	<10	<10	<10	0.6 JB	0.71 JQ	0.71 JQ	0.9 JQ
Cadmium	2	0.37 JB	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	4830 JQ	5690	3940 JQ	4430 JQ	611 JQ	1290 JQ	591 JQ	957 JQ
Chromium	10	<10	<10	3.7 JQ	<10	<10	<10	3.2 JQ	<10
Cobalt	30	<30	6.2 JQ	1.3 JB	<30	<30	<30	0.95 JQ	0.76 JQ
Copper	10	<10	<10	2.8 JQ	<10	<10	<10	<10	<10
Iron	200	13600	5890	17400	12400	3110	2700	1880	3950
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	2190 JQ	3800 JQ	2050 JQ	1580 JQ	1570 JQ	2050 JQ	1430 JQ	1750 JQ
Manganese	20	116	165	98.6	69.6	16.7 JQ	27	10.8 JQ	21.7
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	6.8 JB	<100	<100	<100	2.3 JQ	5.1 JQ	<100
Potassium	5000	5450	4510 JQ	4300 JQ	9180	3440 JQ	2540 JQ	2670 JQ	2850 JQ
Sodium	5000	151000	120000	129000	90600	4640 JQ	5620	4740 JQ	5550
Vanadium	50	2.1 JB	<50	4.4 JB	3.8 JQ	2.1 JB	<50	0.83 JQ	1.4 JQ
Zinc	20	<20	26.1	<20	<20 UL	<20	12.3 JQ	<20	<20 UL
Metals - SW846 6010B (Total) µg/L									
Aluminum	200	196 JQ	140 JB	378	443	325	390	619	435
Arsenic	5	<5	<5	6.9	2.6 JQ	<5	<5	<5	<5
Barium	200	62.2 JQ	112 JQ	73.4 JQ	58.5 JQ	108 JQ	158 JQ	110 JQ	140 JQ
Beryllium	10	<10	<10	<10	<10	0.69 JB	0.72 JQ	0.68 JQ	0.86 JQ
Cadmium	2	0.31 JB	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	4400 JQ	5970	4050 JQ	4440 JQ	614 JQ	1270 JQ	484 JQ	972 JQ
Chromium	10	<10	<10	2 JQ	<10	<10	<10	5.8 JQ	<10
Cobalt	30	<30	6.6 JQ	1.1 JB	<30	1.3 JB	1.6 JQ	1.2 JQ	0.81 JQ
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10
Iron	200	12800	7830	18800	12500	2990	3240	1960	4020
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	2050 JQ	3970 JQ	2120 JQ	1610 JQ	1510 JQ	2000 JQ	1460 JQ	1780 JQ
Manganese	20	107	172	103	70	16.1 JQ	26.1	10.9 JQ	20.3
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	5.3 JB	<100	<100	<100	2.4 JQ	4.4 JQ	<100
Potassium	5000	5210	4670 JQ	4430 JQ	9400	3310 JQ	2470 JQ	2700 JQ	2890 JQ
Sodium	5000	145000	125000	135000	90700	4410 JQ	5490	4800 JQ	5640
Vanadium	50	2.1 JB	<50	4.8 JQ	4.2 JQ	2.4 JB	<50	1 JQ	1.4 JQ
Zinc	20	<20	25.6	<20	<20 UL	<20	<20	<20	<20 UL
Thallium - SW846 7841 (Dissolved) µg/L									
Thallium	2	1.9 JB	<2 UL	<2 UL	<2 UL	2.2 JB	<2 UL	<2 UJ	<2
Thallium - SW846 7841 (Total) µg/L									
Thallium	2	2 JB	<2 UL	<2 UJ	<2 UL	<2	<2 UL	<2 UJ	<2

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date	Reporting Limit (a)	Sample DMW-26A 10/4/2001	Sample DMW-26A 4/5/2002	Sample DMW-26A 7/31/2002	Sample DMW-26A 10/15/2002	Sample DMW-27A 10/5/2001	Sample DMW-27A 4/4/2002	Sample DMW-27A 7/30/2002	Sample DMW-27A 10/15/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L									
Not Detected		NA	NA	NA	NA	NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C µg/L									
Acenaphthene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L									
1,1,1-Trichloroethane	1	<5	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	1	<5	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	1	<5	<1	<1	<1	<1	<1	<1	<1
1,2,4-Trimethylbenzene	1	<5	<1	<1	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	1	<5	<1	<1	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	1	<5	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	1	<5	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	1	<5	<1	<1	<1	<1	<1	<1	<1
Acetone	10	<50	<10 R	1.1 R	1.6 JB	0.85 JB	<10 R	3.3 R	<10 UJ
Benzene	1	<5	<1	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	1	<5	<1	<1 UJ	<1	<1	<1	<1 UJ	<1
Chloroform	1	<5	<1	<1	<1	<1	<1	<1	<1
Chloromethane	2	<10	<2	<2 UJ	<2	<2	<2	<2 UJ	<2
cis-1,2-Dichloroethene	0.5	<2.5	<0.5	<0.5	0.38 JQ	<0.5	<0.5	<0.5	<0.5
Isopropylbenzene	1	<5	<1	<1	<1	<1	<1	<1	<1
Methylene chloride	1	<5	<1	<1	<1	<1	<1	<1	<1
Naphthalene	1	<5	<1 UJ	<1 UJ	<1	<1	<1	<1	<1
Tetrachloroethene	1	<5	<1	<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	1	<5	<1	<1	0.81 JQ	<1	<1	<1	<1
Vinyl chloride	2	<10	<2	<2	<2	7.7	<2	4.3	<2

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SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID. / Sample Date	Reporting Limit (a)	Sample DMW-33A 10/8/2001	Sample DMW-33A 4/8/2002	Sample DMW-33A 7/17/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/5/2001	Sample DMW-35A 4/5/2002	Sample DMW-35A 7/17/2002	Sample DMW-35A 10/16/2002
FIELD PARAMETER									
Dissolved Oxygen - E360.1 mg/L									
Dissolved Oxygen	0.1	4.4	1.1	1.4	0.6	<0.1	6.2	0.8	0.7
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0.1	3.5	1	0.5	2.4	1	0.1	1	<0.1
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	-	74	74	-101	-43	153	298	196	147
pH - F150.1 pH Units									
pH	--	5.06	5.2	5.2	5.15	5.22	5.3	5.34	5.29
Specific Conductance - E120.1 mS/cm									
Specific Conductance	0.001	0.235	0.116	0.202	0.314	0.073	0.074	0.06	0.073
Temperature - E170.1 deg C									
Temperature	0.1	17.7	19.8	19.7	18.6	19	14.2	20.5	19.7
Turbidity - E180.1 NTU									
Turbidity	1	17	53	2	42	19	<1	28	<1
FIXED BASE LABORATORY ANALYSIS.									
Anions - MCAWW 300.0A mg/L									
Chloride	1	45.3	10.5	50.4	53.7	11.4	11.6	11.2 JH	11.7
Nitrate	0.1	<0.1	<0.1	<0.1	0.02 JQ	<0.1	<0.1	0.028 JQ	<0.1
Sulfate	1	21.6	21.4	16.3 JH	19.5	4.1	4.7	4.8 JH	4.2
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0.001	110 J	71	81	99	78 J	53	72	61
Ethane	0.002	<0.002	<0.002	<0.002 R	<0.002	<0.002	<0.002	<0.002 R	<0.002
Ethene	0.001	<0.001	<0.001	0.00038 R	0.0017	<0.001	<0.001	<0.001 R	<0.001
Methane	0.001	0.024	0.15	0.03	0.015	0.0012 JB	0.00063 JQ	<0.001	0.002 JB
Dissolved Hydrogen by Microseeps AM20GAX nM									
Hydrogen	0.03	9.1	0.77	1.4	19	8.9	1.5	2.8	2.5
Total Alkalinity - MCAWW 310.1 mg/L									
Total Alkalinity	5	15	10 JH	13 JH	9.5 JH	10 JB	9 J	11 JH	11 JH
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	2 JB	2	1	1 JH	<1	<1	<1	<1
Total Sulfide - MCAWW 376.1 mg/L									
Total Sulfide	1	2.8	<1	<1	0.48 JQ	1.1	<1	<1	<1

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting Limit (a)	Sample DMW-33A 10/8/2001	Sample DMW-33A 4/8/2002	Sample DMW-33A 7/17/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/5/2001	Sample DMW-35A 4/5/2002	Sample DMW-35A 7/17/2002	Sample DMW-35A 10/16/2002
Mercury - SW846 7470A (Dissolved) µg/L									
Not Detected	1	<1	<1 UJ	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L									
Mercury	1	<1	<1 UJ	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L									
Aluminum	200	<200	<200	82 3 JQ	59 9 JQ	<200	<200 UJ	63 JQ	<200 UJ
Arsenic	5	<5	<5	<5	<5	<5	<5	<5	<5
Barium	200	79 2 JQ	34 7 JQ	93 5 JQ	88 1 JQ	27 3 JQ	30 3 JQ	30 7 JQ	29 5 JQ
Beryllium	10	0 85 JB	<10	1 4 JQ	0 87 JQ	<10	<10	<10	0 65 JQ
Cadmium	2	<2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	12500	5470	14300	13100	2800 JQ	3400 JQ	3400 JQ	3160 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	0 89 JB	<30	<30	<30	1 4 JB	<30
Copper	10	<10	<10	<10 UL	<10	<10	<10	1 7 JB	<10
Iron	200	5070	1180	5770	5180	1330	131 JQ	1210	1360
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	9490	3950 JQ	10300	9440	2240 JQ	2370 JQ	2460 JQ	2350 JQ
Manganese	20	137	57 7	163	145	44	46 8	51 2	47 9
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	<100	<100	<100	<100	6 5 JB	<100	4 4 JQ
Potassium	5000	6200	3090 JQ	4780 JQ	5540	4240 JQ	3370 JQ	3300 JQ	3620 JQ
Sodium	5000	7010	5210	8170	9050	2160 JQ	2930 JQ	2380 JQ	2930 JQ
Vanadium	50	<50	<50	0 81 JQ	<50	<50	<50	<50	<50
Zinc	20	15 2 JQ	<20	<20	<20	<20	<20	<20	<20 UL
Metals - SW846 6010B (Total) µg/L									
Aluminum	200	<200	32 3 JQ	81 JQ	91 2 JQ	<200	<200 UJ	81 JQ	<200 UJ
Arsenic	5	<5	<5	<5	<5	<5	<5	<5	<5
Barium	200	82 4 JQ	37 2 JQ	86 9 JQ	87 6 JQ	30 7 JQ	32 8 JQ	30 1 JQ	30 9 JQ
Beryllium	10	1 1 JB	<10	1 3 JQ	1 JQ	<10	<10	<10	0 71 JQ
Cadmium	2	<2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	12900	6050	13100	12900	3180 JQ	3500 JQ	3310 JQ	3350 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	0 77 JB	<30	<30	<30	1 8 JB	<30
Copper	10	<10	<10	<10 UL	2 4 JB	<10	<10	2 2 JB	<10
Iron	200	6870	1060	5360	5240	1610	177 JQ	1220	1460
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	9610	4270 JQ	9540	9360	2490 JQ	2510 JQ	2410 JQ	2430 JQ
Manganese	20	139	63 5	153	146	48 4	50 2	49 5	49 5
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	<100	<100	<100	2 7 JQ	5 2 JB	3 1 JQ	4 6 JQ
Potassium	5000	6250	3300 JQ	4590 JQ	5520	4590 JQ	3550 JQ	3210 JQ	3770 JQ
Sodium	5000	7130	5860	7940	8850	2510 JQ	2960 JQ	2400 JQ	2910 JQ
Vanadium	50	1 JB	<50	0 7 JQ	<50	<50	<50	<50	<50
Zinc	20	27	22 6	<20	18 2 JQ	<20	<20	<20	<20 UL
Thallium - SW846 7841 (Dissolved) µg/L									
Thallium	2	<2	<2 UL	<2 UL	<2	<2	<2 UL	<2	<2
Thallium - SW846 7841 (Total) µg/L									
Thallium	2	<2	<2 UL	<2 UL	<2	<2	<2 UL	<2 UL	<2

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SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-33A 10/8/2001	Sample DMW-33A 4/8/2002	Sample DMW-33A 7/17/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/5/2001	Sample DMW-35A 4/5/2002	Sample DMW-35A 7/17/2002	Sample DMW-35A 10/16/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L									
Not Detected		NA	NA	NA	NA	NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C µg/L									
Acenaphthene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L									
1,1,1-Trichloroethane	1	1200	160	660	680	<1	0.89 JQ	<1	<1
1,1-Dichloroethane	1	170	51	100	110	<1	0.43 JQ	<1	<1
1,1-Dichloroethene	1	450 J	62	230	280	<1	1.6	<1	<1
1,2,4-Trimethylbenzene	1	<100	<20	<83	<67	<1	<1	<1	<1
1,2-Dichlorobenzene	1	29 JQ	2.7 JQ	<83	<67	<1	<1	<1	<1
1,3,5-Trimethylbenzene	1	<100	<20	<83	<67	<1	<1	<1	<1
1,3-Dichlorobenzene	1	<100	<20	<83	<67	<1	<1	<1	<1
1,4-Dichlorobenzene	1	<100	4.2 JQ	<83	<67	<1	<1	<1	<1
Acetone	10	<1000	<200 R	<830 UJ	<670 R	<10	<10 R	14 J	11 JQ
Benzene	1	<100	<20	<83	<67	<1	<1	<1	<1
Carbon tetrachloride	1	<100	<20	<83	<67	<1	<1	<1	<1
Chloroform	1	27 JB	5.9 JQ	<83	<67	<1	<1	<1	<1
Chloromethane	2	<200	<40	<170 UJ	<130	<2	<2	<2 UJ	<2
cis-1,2-Dichloroethene	0.5	2900	690	1800	1900	1.7	9.1	0.55	<0.5
Isopropylbenzene	1	<100	<20	<83	<67	<1	<1	<1	<1
Methylene chloride	1	<100	<20	34 JB	29 JQ	<1	<1	<1	<1
Naphthalene	1	<100	<20 UJ	<83 UJ	<67 UJ	<1	<1 UJ	<1 UJ	<1
Tetrachloroethene	1	430	140	360	450	9.7	15	7.8	6.1
trans-1,2-Dichloroethene	0.5	39 JQ	7.3 JQ	<42	<33	<0.5	<0.5	<0.5	<0.5
Trichloroethene	1	3500	780	2000	2500	3	33	3.1	2
Vinyl chloride	2	33 JQ	7.7 JQ	<170	<130	<2	<2	<2	<2

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MW112-2 Oct 2001	Sample MW112-2 Apr 2002	Sample MW112-2 7/31/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/9/2001	Sample MWFOS-1 4/5/2002	Sample MWFOS-1 7/29/2002	Sample MWFOS-1 10/15/2002
FIELD PARAMETER									
Dissolved Oxygen - E360 1 mg/L									
Dissolved Oxygen	0 1	NS	NS	2 5	1	0 4	0 4	1 26	0 6
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0 1	NS	NS	<0 1	3	0 5	0 4	0	<0 1
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	NS	NS	228	224	57	-15	161	101
pH - E150 1 pH Units									
pH	--	NS	NS	4 56	4 92	6 13	6 38	5 87	5 56
Specific Conductance - E120 1 mS/cm									
Specific Conductance	0 001	NS	NS	0 104	0 119	0 145	0 347	0 171	0 240
Temperature - E170 1 deg C									
Temperature	0 1	NS	NS	24 8	19 9	21 5	19 2	20 8	20
Turbidity - E180 1 NTU									
Turbidity	1	NS	NS	8	26	<1	<1	10 9	36
FIXED BASE LABORATORY ANALYSIS.									
Anions - MCAWW 300 0A mg/L									
Chloride	1	NS	NS	13 9	16 4	13	16 8	15 1	12
Nitrate	0 1	NS	NS	0 15	0 06 JB	<0 1	<0 1	<0 1	<0 1
Sulfate	1	NS	NS	9 1	13 8	59 3	114	61 6	62 9
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0 001	NS	NS	69	70	22 J	9 1	32	42
Ethane	0 002	NS	NS	<0 002	<0 002	<0 002	<0 002	<0 002	<0 002
Ethene	0 001	NS	NS	<0 001	<0 001	<0 001	<0 001	<0 001	<0 001
Methane	0 001	NS	NS	0 00039	<0 001	0 0038	0 00092 JQ	<0 001	0 012
Dissolved Hydrogen by Microseeps AM20GAX nM									
Hydrogen	0 03	NS	NS	6 6	3	8 8	1 3	2 3	2 9
Total Alkalinity - MCAWW 310 1 mg/L									
Total Alkalinity	5	NS	NS	4 3 JH	4 9 JH	19	19 JH	13	13 JH
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	NS	NS	<1	<1	0 6 JB	0 6 JQ	<1	1 JH
Total Sulfide - MCAWW 376 1 mg/L									
Total Sulfide	1	NS	NS	0 65 JQ	<1	<1	<1	<1	<1

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date.	Reporting Limit (a)	Sample MW112-2 Oct 2001	Sample MW112-2 Apr. 2002	Sample MW112-2 7/31/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/9/2001	Sample MWFOS-1 4/5/2002	Sample MWFOS-1 7/29/2002	Sample MWFOS-1 10/15/2002
Mercury - SW846 7470A (Dissolved) µg/L									
Not Detected	1	NS	NS	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L									
Mercury	1	NS	NS	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L									
Aluminum	200	NS	NS	81 1 JQ	66 8 JQ	<200	<200 UJ	166 JQ	<200 UJ
Arsenic	5	NS	NS	<5	<5	<5	<5	<5	<5
Barium	200	NS	NS	30 6 JQ	31 8 JQ	13 7 JQ	25 9 JQ	15 4 JQ	13 6 JQ
Beryllium	10	NS	NS	1 8 JB	2 5 JQ	<10	<10	<10	<10
Cadmium	2	NS	NS	<2	<2	<2	<2	<2	<2
Calcium	5000	NS	NS	3460 JQ	3400 JQ	18600	34200	16500	15600
Chromium	10	NS	NS	<10	<10	<10	<10	<10	<10
Cobalt	30	NS	NS	4 JB	3 6 JB	<30	<30	<30	<30
Copper	10	NS	NS	<10	<10	<10	<10	<10	<10
Iron	200	NS	NS	879	994	649	517	675	445
Lead	3	NS	NS	<3	<3	<3	<3	<3	<3
Magnesium	5000	NS	NS	2830 JQ	2870 JQ	6670	10200	8320	7770
Manganese	20	NS	NS	59 2	61 9	56 8	47	49 5	43 5
Molybdenum	40	NS	NS	<40	<40	3 7 JB	14 7 JQ	15 4 JQ	18 7 JQ
Nickel	100	NS	NS	5 9 JQ	7 4 JQ	<100	<100	<100	<100
Potassium	5000	NS	NS	5890	6110	8220	8810	6840	6870
Sodium	5000	NS	NS	3400 JQ	3400 JQ	7030	11600	9240	9740
Vanadium	50	NS	NS	<50	<50	<50	<50	<50	<50
Zinc	20	NS	NS	<20	<20 UL	38 6 J	<20	21 9	<20 UL
Metals - SW846 6010B (Total) µg/L									
Aluminum	200	NS	NS	218	62 5 JQ	<200	<200 UJ	69 3 JQ	<200 UJ
Arsenic	5	NS	NS	<5	<5	<5	<5	<5	<5
Barium	200	NS	NS	31 9 JQ	32 1 JQ	13 7 JQ	24 8 JQ	15 8 JQ	13 6 JQ
Beryllium	10	NS	NS	1 8 JB	2 5 JQ	<10	<10	<10	0 64 JQ
Cadmium	2	NS	NS	0 29 JB	<2	<2	<2	<2	<2
Calcium	5000	NS	NS	3430 JQ	3410 JQ	19800	32500	16300	15600
Chromium	10	NS	NS	<10	<10	<10	<10	<10	<10
Cobalt	30	NS	NS	4 3 JB	3 5 JB	<30	<30	<30	<30
Copper	10	NS	NS	<10	<10	<10	<10	<10	<10
Iron	200	NS	NS	1810	1030	702	542	770	473
Lead	3	NS	NS	<3	<3	<3	<3	<3	<3
Magnesium	5000	NS	NS	2900 JQ	2870 JQ	7170	9710	8240	7770
Manganese	20	NS	NS	61 3	62 3	60 8	46 1	49 1	44
Molybdenum	40	NS	NS	<40	<40	3 9 JB	14 5 JQ	15 1 JQ	18 5 JQ
Nickel	100	NS	NS	6 3 JQ	6 JQ	<100	2 7 JB	<100	<100
Potassium	5000	NS	NS	6000	6110	8830	8350	6780	6740
Sodium	5000	NS	NS	3440 JQ	3360 JQ	7670	11000	9190	9490
Vanadium	50	NS	NS	<50	<50	<50	<50	<50	<50
Zinc	20	NS	NS	<20	<20 UL	<20 UJ	<20	<20	<20 UL
Thallium - SW846 7841 (Dissolved) µg/L									
Thallium	2	NS	NS	<2 UJ	<2	<2	<2 UL	<2	<2
Thallium - SW846 7841 (Total) µg/L									
Thallium	2	NS	NS	<2 UJ	<2	<2	<2 UL	<2	<2

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date	Reporting Limit (a)	Sample MW112-2 Oct 2001	Sample MW112-2 Apr. 2002	Sample MW112-2 7/31/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/9/2001	Sample MWFOS-1 4/5/2002	Sample MWFOS-1 7/29/2002	Sample MWFOS-1 10/15/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L									
Not Detected		NS	NS	NA	NA	NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C µg/L									
Acenaphthene	0 2	NS	NS	NA	NA	NA	NA	NA	NA
Anthracene	0 2	NS	NS	NA	NA	NA	NA	NA	NA
Fluorene	0 2	NS	NS	NA	NA	NA	NA	NA	NA
Naphthalene	0 2	NS	NS	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L									
1,1,1 Trichloroethane	1	NS	NS	<1	<1	<1	<1	<1	<1
1 1-Dichloroethane	1	NS	NS	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	1	NS	NS	<1	<1	<1 UJ	<1	<1	<1
1,2 4-Trimethylbenzene	1	NS	NS	<1	<1	<1	<1	<1	<1
1 2-Dichlorobenzene	1	NS	NS	<1	<1	<1	<1	<1	<1
1,3 5-Trimethylbenzene	1	NS	NS	<1	<1	<1	<1	<1	<1
1 3-Dichlorobenzene	1	NS	NS	<1	<1	<1	<1	<1	<1
1,4 Dichlorobenzene	1	NS	NS	<1	<1	<1	<1	<1	<1
Acetone	10	NS	NS	<10 R	<10	<10	<10 R	<10 R	<10 UJ
Benzene	1	NS	NS	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	1	NS	NS	<1 UJ	<1	<1	<1	<1 UJ	<1
Chloroform	1	NS	NS	<1	<1	<1	<1	<1	<1
Chloromethane	2	NS	NS	<2 UJ	<2	<2	<2	<2 UJ	<2
cis-1,2 Dichloroethene	0 5	NS	NS	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5
Isopropylbenzene	1	NS	NS	<1	<1	<1	<1	<1	<1
Methylene chloride	1	NS	NS	<1	<1	<1	<1	<1	<1
Naphthalene	1	NS	NS	<1 UJ	<1	<1	<1 UJ	<1	<1
Tetrachloroethene	1	NS	NS	<1	<1	<1	<1	<1	<1
trans-1 2 Dichloroethene	0 5	NS	NS	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5
Trichloroethene	1	NS	NS	<1	<1	<1	<1	<1	<1
Vinyl chloride	2	NS	NS	<2	<2	<2	<2	<2	<2

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date.	Reporting Limit (a)	Sample MWFOS-3 Oct 2001	Sample MWFOS-3 Apr 2002	Sample MWFOS-3 7/31/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/4/2001	Sample MWFTA-1 4/4/2002	Sample MWFTA-1 7/30/2002	Sample MWFTA-1 10/16/2002
FIELD PARAMETER									
Dissolved Oxygen - E360.1 mg/L									
Dissolved Oxygen	0 1	NS	NS	1 8	0 8	<0 1	1 2	0 47	2 2
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0 1	NS	NS	NA	<0 1	3 6	2 6	<0 1	2
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	NS	NS	280	230	-23	-23	-147	-158
pH - E150 1 pH Units									
pH	--	NS	NS	4 72	4 8	6 59	5 81	5 67	5 67
Specific Conductance - E120 1 mS/cm									
Specific Conductance	0 001	NS	NS	0 077	0 107	0 673	0 686	0 444	0 557
Temperature - E170 1 deg C									
Temperature	0 1	NS	NS	25 3	20 4	19 6	14 8	22 6	20 5
Turbidity - E180 1 NTU									
Turbidity	1	NS	NS	17	11	1	8	3	218
FIXED BASE LABORATORY ANALYSIS.									
Anions - MCAWW 300 0A mg/L									
Chloride	1	NS	NS	9 5	9 2	30 4	34 3	33 1	34 8 J
Nitrate	0 1	NS	NS	<0 1	<0 1	<0 1	0 02 JQ	<0 1	<0 1
Sulfate	1	NS	NS	11 2	18 1	1 2	0 54 JQ	0 56 JQ	0 53 JQ
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0 001	NS	NS	190	200	510 J	280	440	450
Ethane	0 002	NS	NS	<0 002	<0 002	<0 002	<0 002	<0 01	<0 002
Ethene	0 001	NS	NS	0 0035	0 01	<0 001	<0 001	<0 005	<0 001
Methane	0 001	NS	NS	0 29	1 2	4 4	5 2	0 51	4 8
Dissolved Hydrogen by Microseeps AM20GAX nM									
Hydrogen	0 03	NS	NS	2 9	5 6	1 6	11	2 6	2 3
Total Alkalinity - MCAWW 310 1 mg/L									
Total Alkalinity	5	NS	NS	7 2 JH	6 2 JH	280	270	190	190
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	NS	NS	3	4 JH	36	37	27	30
Total Sulfide - MCAWW 376 1 mg/L									
Total Sulfide	1	NS	NS	<1	2 7 JH	<1	<1	0 32 JQ	1 4 JH

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SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID· Sample Date	Reporting Limit (a)	Sample MWFOS-3 Oct. 2001	Sample MWFOS-3 Apr 2002	Sample MWFOS-3 7/31/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/4/2001	Sample MWFTA-1 4/4/2002	Sample MWFTA-1 7/30/2002	Sample MWFTA-1 10/16/2002
Mercury - SW846 7470A (Dissolved) µg/L									
Not Detected	1	NS	NS	<1	<1	<1 UL	<1 UL	<1 UL	<1 UL
Mercury - SW846 7470A (Total) µg/L									
Mercury	1	NS	NS	<1	<1 UL	<1 UL	0 11 JB	<1 UL	<1 UL
Metals - SW846 6010B (Dissolved) µg/L									
Aluminum	200	NS	NS	178 JQ	91 4 JQ	163 JQ	219	246	250
Arsenic	5	NS	NS	24 4	29 2	42 7	36 8	36 8	35 9
Barium	200	NS	NS	140 JQ	139 JQ	289	223	232	217
Beryllium	10	NS	NS	<10	<10	0 87 JB	<10	<10	0 71 JQ
Cadmium	2	NS	NS	<2	<2	0 42 JB	<2	<2	<2
Calcium	5000	NS	NS	1320 JQ	1160 JQ	35200	34200	20500	22200
Chromium	10	NS	NS	<10	<10	<10	1 6 JQ	<10	<10
Cobalt	30	NS	NS	2 JB	1 7 JB	2 2 JB	2 JQ	1 6 JQ	1 2 JQ
Copper	10	NS	NS	2 4 JQ	3 4 JQ	<10	<10	<10	<10
Iron	200	NS	NS	3920	3780	10200	9010	6670	7540
Lead	3	NS	NS	5 5	<3	<3	<3	<3	<3
Magnesium	5000	NS	NS	1960 JQ	1930 JQ	52700	52000	28500	30900
Manganese	20	NS	NS	65 1	64 2	822	871	510	544
Molybdenum	40	NS	NS	<40	<40	<40	<40	<40	<40
Nickel	100	NS	NS	<100	<100	<100	<100	<100	<100
Potassium	5000	NS	NS	2010 JQ	2080 JQ	10400	6970	7430	8030
Sodium	5000	NS	NS	6100	5980	15600	13500	14500	14200
Vanadium	50	NS	NS	<50	<50	1 6 JB	1 2 JQ	1 JQ	1 5 JQ
Zinc	20	NS	NS	32 3	<20 UL	30 8 J	<20	<20	<20 UL
Metals - SW846 6010B (Total) µg/L									
Aluminum	200	NS	NS	155 JQ	94 3 JQ	329 JH	309 JH	266	310
Arsenic	5	NS	NS	26 7	27 4	42 5	39 9	35 3	35 7
Barium	200	NS	NS	137 JQ	142 JQ	281	239	237	215
Beryllium	10	NS	NS	<10	<10	<10	<10	<10	1 JQ
Cadmium	2	NS	NS	<2	<2	0 37 JB	<2	<2	<2
Calcium	5000	NS	NS	1180 JQ	1220 JQ	34200	36000	20500	21900
Chromium	10	NS	NS	<10	<10	<10	<10	<10	<10
Cobalt	30	NS	NS	1 9 JB	1 3 JB	2 JB	1 5 JQ	1 5 JQ	0 98 JQ
Copper	10	NS	NS	25 2	3 5 JQ	<10	<10	<10	<10
Iron	200	NS	NS	3880	3850	9920	9600	6780	7450
Lead	3	NS	NS	8 4	<3	<3	<3	<3	<3
Magnesium	5000	NS	NS	1910 JQ	1960 JQ	51900	54300	28300	30300
Manganese	20	NS	NS	65 4	65 5	807	912	510	531
Molybdenum	40	NS	NS	<40	<40	<40	<40	<40	<40
Nickel	100	NS	NS	<100	3 5 JQ	<100	<100	<100	<100
Potassium	5000	NS	NS	2000 JQ	2090 JQ	10100	7510	7500	7960
Sodium	5000	NS	NS	6240	6040	15000	14600	14500	14200
Vanadium	50	NS	NS	<50	<50	2 1 JB	1 4 JQ	1 2 JQ	1 4 JQ
Zinc	20	NS	NS	90 2	<20 UL	<20 UJ	<20	<20	<20 UL
Thallium - SW846 7841 (Dissolved) µg/L									
Thallium	2	NS	NS	<2 UJ	<2	2 JB	<2 UL	<2	<2 UL
Thallium - SW846 7841 (Total) µg/L									
Thallium -	2	NS	NS	<2 UJ	<2	2 1 JB	<2 UL	<2	<2 UL

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date	Reporting Limit (a)	Sample MWFOS-3 Oct 2001	Sample MWFOS-3 Apr. 2002	Sample MWFOS-3 7/31/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/4/2001	Sample MWFTA-1 4/4/2002	Sample MWFTA-1 7/30/2002	Sample MWFTA-1 10/16/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L									
Not Detected .		NS	NS	NA	NA	NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C µg/L									
Acenaphthene	0.2	NS	NS	NA	NA	NA	0.073 JQ	0.066 R	0.083 JQ
Anthracene	0.2	NS	NS	NA	NA	NA	<0.2	0.057 R	0.046 JQ
Fluorene	0.2	NS	NS	NA	NA	NA	<0.2	0.041 R	0.049 JQ
Naphthalene	0.2	NS	NS	NA	NA	NA	2.5	2 R	2.3
Volatile Organic Compounds - SW846 8260B µg/L									
1,1,1-Trichloroethane	1	NS	NS	<330	<330	<5	<1	<1	<1
1,1-Dichloroethane	1	NS	NS	<330	<330	<5	0.78 JQ	1	0.79 JQ
1,1 Dichloroethene	1	NS	NS	<330	<330	<5	<1	<1	<1
1,2,4-Trimethylbenzene	1	NS	NS	<330	<330	<5	0.13 JQ	<1	<1
1,2 Dichlorobenzene	1	NS	NS	<330	<330	<5	<1	<1	<1
1,3,5 Trimethylbenzene	1	NS	NS	<330	<330	<5	0.17 JQ	<1	<1
1,3 Dichlorobenzene	1	NS	NS	<330	<330	<5	<1	<1	<1
1,4 Dichlorobenzene	1	NS	NS	<330	<330	<5	<1	<1	<1
Acetone	10	NS	NS	<3300 R	<3300	<50 UL	<10 R	2 R	1.8 JQ
Benzene	1	NS	NS	<330	<330	<5	0.18 JQ	<1	<1
Carbon tetrachloride	1	NS	NS	<330 UJ	<330	<5	<1	<1 UJ	<1
Chloroform	1	NS	NS	<330	<330	<5	<1	<1	<1
Chloromethane	2	NS	NS	<670 UJ	<670	<10	<2	<2 UL	<2
cis-1,2-Dichloroethene	0.5	NS	NS	11000	9800	<2.5	0.64	0.43 JQ	0.61
Isopropylbenzene	1	NS	NS	<330	<330	<5	1.1	<1	<1
Methylene chloride	1	NS	NS	150 JQ	310 JQ	3.9 JB	<1	<1	<1
Naphthalene	1	NS	NS	<330 UJ	<330	4.6	3.6	3.2 J	3.6
Tetrachloroethene	1	NS	NS	<330	<330	<5	<1	<1	<1
trans 1,2-Dichloroethene	0.5	NS	NS	160 JQ	140 JQ	<2.5	<0.5	<0.5	<0.5
Trichloroethene	1	NS	NS	8400	7600	<5	<1	<1	<1
Vinyl chloride	2	NS	NS	380 JQ	360 JQ	<10	<2	<2	<2

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-3 10/4/2001	Sample MWFTA-3 4/4/2002	Duplicate MWFTA-3 4/4/2002	Sample MWFTA-3 7/30/2002	Duplicate MWFTA-3 7/30/2002	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002
FIELD PARAMETER								
Dissolved Oxygen - E360.1 mg/L								
Dissolved Oxygen	0.1	<0.1	0.7	0.7	1	1	0.8	0.8
Ferrous Iron - A3500D mg/L								
Ferrous Iron	0.1	1.4	<0.1	<0.1	<0.1	<0.1	2	2
Oxidation Reduction Potential - A2580A mV								
Oxidation Reduction Potential	--	49	96	-96	42	42	-28	-28
pH - E150.1 pH Units								
pH	--	6.11	5.6	5.6	5.54	5.54	5.26	5.26
Specific Conductance - E120.1 mS/cm								
Specific Conductance	0.001	0.121	0.394	0.394	0.15	0.15	0.432	0.432
Temperature - E170.1 deg C								
Temperature	0.1	19.4	12.3	12.3	19	19	18.8	18.8
Turbidity - E180.1 NTU								
Turbidity	1	2	14	14	3	3	5	5
FIXED BASE LABORATORY ANALYSIS								
Anions - MCAWW 300.0A mg/L								
Chloride	1	17.8	103	104	31.7	33.9 JH	74.7	73.5
Nitrate	0.1	<0.1	0.02 JQ	0.02 JQ	<0.1	<0.1	<0.1	<0.1
Sulfate	1	5.3	31.3	31.3	9.7	10	27.8	25.2
Dissolved Gases - RSK SOP-175 mg/L								
Carbon dioxide	0.001	93 J	14 J	38 J	100	110	96	93
Ethane	0.002	<0.002	0.00046 JQ	0.00059 JQ	<0.002	<0.002	<0.002	<0.002
Ethene	0.001	<0.001	0.0014	0.0014	<0.001	<0.001	<0.001	<0.001
Methane	0.001	0.061	0.37	0.42	0.036 J	0.026 J	0.14	0.14
Dissolved Hydrogen by Microseeps AM20GAX nM								
Hydrogen	0.03	7.4	17	14	2.3	2.2	3.1	2.7
Total Alkalinity - MCAWW 310.1 mg/L								
Total Alkalinity	5	21	15 JH	16 JH	28	33	20	22
Total Organic Carbon - SW846 9060 mg/L								
Total Organic Carbon	1	3	10	10	4	4	8	8
Total Sulfide - MCAWW 376.1 mg/L								
Total Sulfide	1	<1	<1	<1	0.32 JQ	0.32 JQ	0.78 JQ	0.78 JQ

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TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting Limit (a)	Sample MWFTA-3 10/4/2001	Sample MWFTA-3 4/4/2002	Duplicate MWFTA-3 4/4/2002	Sample MWFTA-3 7/30/2002	Duplicate MWFTA-3 7/30/2002	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002
Mercury - SW846 7470A (Dissolved) µg/L								
Not Detected	1	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L								
Aluminum	200	54 JQ	204	202	154 JQ	241 J	187 JQ	228
Arsenic	5	4 2 JQ	12 9	12 2	5 4	6 3	15 8	16
Barium	200	34 8 JQ	76 JQ	77 6 JQ	37 2 JQ	38 9 JQ	65 4 JQ	67 1 JQ
Beryllium	10	<10	<10	<10	<10	<10	0 62 JQ	0 71 JQ
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	2520 JQ	5710	5780	2860 JQ	3080 JQ	4750 JQ	4830 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	<30	<30	<30	1 2 JQ	0 84 JQ
Copper	10	<10	<10	<10	<10	<10	<10	<10
Iron	200	1570	3590	3650	1640	1660	3070	3130
Lead	3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	1950 JQ	3580 JQ	3650 JQ	2020 JQ	2080 JQ	3070 JQ	3120 JQ
Manganese	20	39 8	89 2	90 6	44 3	46 5	73 9	76 2
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	<100	4 5 JQ	<100	<100	<100	<100
Potassium	5000	5320	4020 JQ	4130 JQ	4290 JQ	4540 JQ	5440	5480
Sodium	5000	13900	51500	52500	20600	22000	43300	43600
Vanadium	50	1 1 JB	<50	<50	<50	<50	0 8 JQ	0 74 JQ
Zinc	20	<20	<20	<20	<20	<20	<20	<20
Metals - SW846 6010B (Total) µg/L								
Aluminum	200	478	260	277	268	209	216	246
Arsenic	5	5 1	17 5	18	6 8 J	5 2 J	13 8	15 1
Barium	200	39 8 JQ	86 4 JQ	92 2 JQ	44 5 JQ	40 6 JQ	69 6 JQ	70 1 JQ
Beryllium	10	<10	<10	<10	<10	<10	0 6 JQ	0 73 JQ
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	2780 JQ	6430	6800	3390 JQ	3040 JQ	4990 JQ	5010
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	<30	<30	0 89 JQ	0 78 JQ	<30
Copper	10	<10	<10	<10	1 8 JQ	<10	<10	<10
Iron	200	1840	4040	4200	1970	1760	3280	3290
Lead	3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	2190 JQ	3970 JQ	4230 JQ	2330 JQ	2120 JQ	3210 JQ	3240 JQ
Manganese	20	43 7	101	106	52 6	47 7	77 9	78 4
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	3 1 JQ	3 8 JQ	<100	<100	<100	<100
Potassium	5000	5720	4150 JQ	4310 JQ	4740 JQ	4530 JQ	5470	5610
Sodium	5000	14400	58600	62000	26100	22900	46000	45700
Vanadium	50	1 5 JB	<50	1 1 JQ	<50	<50	0 92 JQ	<50
Zinc	20	<20	<20	<20	<20	<20	<20	<20
Thallium - SW846 7841 (Dissolved) µg/L								
Thallium	2	1 8 JB	<2 UL	<2 UL	<2 UJ	<2 UJ	<2 UL	<2 UL
Thallium - SW846 7841 (Total) µg/L								
Thallium	2	2 4 JB	<2 UL	<2 UL	<2 UJ	<2 UJ	<2 UL	<2 UL

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date	Reporting Limit (a)	Sample MWFTA-3 10/4/2001	Sample MWFTA-3 4/4/2002	Duplicate MWFTA-3 4/4/2002	Sample MWFTA-3 7/30/2002	Duplicate MWFTA-3 7/30/2002	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L								
Not Detected		NA	NA	NA	NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C µg/L								
Acenaphthene	0.2	NA	<0.2	<0.2	<0.2 R	<0.2 R	<0.2	<0.2
Anthracene	0.2	NA	<0.2	<0.2	<0.2 R	<0.2 R	<0.2	<0.2
Fluorene	0.2	NA	<0.2	<0.2	<0.2 R	<0.2 R	<0.2	<0.2
Naphthalene	0.2	NA	<0.2	<0.2	<0.2 R	<0.2 R	<0.2	<0.2
Volatile Organic Compounds - SW846 8260B µg/L								
1,1,1-Trichloroethane	1	<1	<3.3	<3.3	<1	<1.4	<2	<2
1,1-Dichloroethane	1	0.27 JQ	1.3 JQ	1.1 JQ	0.62 JQ	<1.4	0.6 JQ	<2
1,1-Dichloroethene	1	0.45 JQ	<3.3	<3.3	1.2 J	0.79 JQ	0.69 JQ	0.64 JQ
1,2,4-Trimethylbenzene	1	<1	<3.3	<3.3	<1	<1.4	<2	<2
1,2-Dichlorobenzene	1	<1	<3.3	<3.3	<1	<1.4	<2	<2
1,3,5-Trimethylbenzene	1	<1	<3.3	<3.3	<1	<1.4	<2	<2
1,3-Dichlorobenzene	1	<1	<3.3	<3.3	<1	<1.4	<2	<2
1,4-Dichlorobenzene	1	<1	<3.3	<3.3	<1	<1.4	<2	<2
Acetone	10	<10	<33 R	<33 R	<10 R	3.9 R	<20 UJ	<20 UJ
Benzene	1	<1	<3.3	<3.3	<1	<1.4	<2	<2
Carbon tetrachloride	1	<1	<3.3	<3.3	<1 UJ	<1.4 UJ	<2	<2
Chloroform	1	<1	<3.3	<3.3	<1	<1.4	<2	<2
Chloromethane	2	<2	<6.7 UJ	<6.7 UJ	<2 UJ	<2.9 UJ	<4	<4
cis-1,2-Dichloroethene	0.5	12	100	94	38 J	28 J	56	54
Isopropylbenzene	1	<1	<3.3	<3.3	<1	<1.4	<2	<2
Methylene chloride	1	<1	<3.3	<3.3	<1	0.87 JB	<2	<2
Naphthalene	1	<1	<3.3	<3.3	<1	<1.4	<2	<2
Tetrachloroethene	1	3	<3.3	<3.3	37	31	9	8.6
trans-1,2-Dichloroethene	0.5	0.22 JQ	4.4	4.2	1.3 J	0.76 J	2.5	2.6
Trichloroethene	1	8.4	1.6 JQ	1.1 JQ	22	18	9.1	8.5
Vinyl chloride	2	0.56 JQ	14	13	3.1 J	2 JQ	4.1	4

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID. Sample Date	Reporting Limit (a)	Sample MWFTA-5 10/8/2001	Sample MWFTA-5 4/8/2002	Sample MWFTA-5 7/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/1/2001	Sample MWFTA-7 4/7/2002	Sample MWFTA-7 7/29/2002	Sample MWFTA-7 10/17/2002
FIELD PARAMETER:									
Dissolved Oxygen - E360 1 mg/L									
Dissolved Oxygen	0 1	<0 1	0 5	0 9	1	0 8	3 7	2 7	0 6
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0 1	0 6	0 7	0 5	3 4	<0 1	<0 1	<0 1	2
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	69	115	79	111	389	438	411	405
pH - E150 1 pH Units									
pH	--	5 48	5 13	6 08	6 37	4 08	3 8	5 41	3 43
Specific Conductance - F120 1 mS/cm									
Specific Conductance	0 001	0 085	0 065	0 074	0 115	0 16	0 091	0 1	0 114
Temperature - F170 1 deg C									
Temperature	0 1	15 9	11 9	16 9	15 9	18 7	11 2	21 1	19 8
Turbidity - F180 1 NTU									
Turbidity	1	12	36	3	10	11	<1	18	<1
FIXED BASE LABORATORY ANALYSIS:									
Anions - MCAWW 300 0A mg/L									
Chloride	1	4 5	4 8	4 6 JB	7 4	10 2	5	7 2	7 2
Nitrate	0 1	<0 1	<0 1	<0 1	<0 1	0 71	0 08 JQ	0 02 JQ	0 06 JQ
Sulfate	1	6	7	6 3 JH	13 7	29 2	29 8	19 9	29 8
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0 001	40 J	39	40	39	97 J	64	50	68
Ethane	0 002	<0 002	<0 002	<0 002 R	<0 002	<0 002	<0 002	<0 002	<0 002
Ethene	0 001	<0 001	<0 001	<0 001 R	<0 001	<0 001	<0 001	<0 001	<0 001
Methane	0 001	0 0018	0 0029	0 00071 JQ	0 0011 JB	0 00085 JB	0 001	<0 001	0 0034
Dissolved Hydrogen by Microseeps AM20GAX nM									
Hydrogen	0 03	7 8	0 98	1 2	5	8 8	5 6	2 1	2 5
Total Alkalinity - MCAWW 310 1 mg/L									
Total Alkalinity	5	24	20 JH	24	15	16 JB	26 JB	<5	<5
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	0 7 JB	0 4 JQ	<1	<1	1	2	1	2
Total Sulfide - MCAWW 376 1 mg/L									
Total Sulfide	1	6 3	<1	<1	0 48 JQ	<1	<1	<1	<1

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TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date.	Reporting Limit (a)	Sample MWFTA-5 10/8/2001	Sample MWFTA-5 4/8/2002	Sample MWFTA-5 7/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/1/2001	Sample MWFTA-7 4/7/2002	Sample MWFTA-7 7/29/2002	Sample MWFTA-7 10/17/2002
Mercury - SW846 7470A (Dissolved) µg/L									
Not Detected	1	<1	<1 UJ	<1	<1	<1	<1 UJ	<1	<1
Mercury - SW846 7470A (Total) µg/L									
Mercury	1	<1	<1 UJ	<1	<1	<1	0 14 JB	<1	<1
Metals - SW846 6010B (Dissolved) µg/L									
Aluminum	200	<200	<200	90 JQ	113 JQ	1340 J	841	765	730
Arsenic	5	<5	<5	<5	<5	<5	<5	<5	<5
Barium	200	20 5 JQ	19 7 JQ	20 5 JQ	25 5 JQ	62 7 JQ	71 4 JQ	66 7 JQ	80 5 JQ
Beryllium	10	0 57 JB	<10	<10	<10	2 5 JB	1 6 JQ	1 7 JQ	1 9 JQ
Cadmium	2	<2	<2	<2	<2	<2	0 38 JB	<2	<2
Calcium	5000	3460 JQ	3310 JQ	3330 JQ	3350 JQ	5990	5160	2350 JQ	3680 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10	1 7 JQ
Cobalt	30	<30	<30	0 96 JB	<30	5 6 JQ	3 9 JQ	5 6 JQ	4 4 JQ
Copper	10	<10	<10	2 JB	<10	<10	<10	<10	<10
Iron	200	730	695	658	384	<200	<200	<200	<200
Lead	3	<3	<3	<3	<3	<3	<3	<3	1 8 JQ
Magnesium	5000	2770 JQ	2600 JQ	2670 JQ	2620 JQ	3270 JQ	2110 JQ	3660 JQ	2560 JQ
Manganese	20	46	44 2	48 8	51 2	41 1	23 9	66 8	39 3
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	<100	<100	<100	4 5 JB	3 JQ	4 2 JQ	<100
Potassium	5000	4650 JQ	3640 JQ	3390 JQ	4300 JQ	2190 JQ	2690 JQ	1610 JQ	2920 JQ
Sodium	5000	6010	6440	5840	8340	2630 JQ	1590 JQ	2200 JQ	1760 JQ
Vanadium	50	<50	<50	<50	<50	<50	<50	<50	<50
Zinc	20	<20	<20	<20	30 9	<20	<20	<20	<20
Metals - SW846 6010B (Total) µg/L									
Aluminum	200	<200	31 9 JQ	66 5 JQ	<200	1360 J	857	790	757
Arsenic	5	<5	<5	<5	<5	<5	<5	<5	<5
Barium	200	25 9 JQ	23 6 JQ	21 6 JQ	27 JQ	63 JQ	73 3 JQ	67 1 JQ	81 JQ
Beryllium	10	<10	0 68 JQ	<10	<10	2 5 JB	1 8 JQ	1 8 JQ	1 8 JQ
Cadmium	2	<2	0 39 JB	<2	<2	<2	<2	<2	0 32 JQ
Calcium	5000	3650 JQ	3390 JQ	3300 JQ	3230 JQ	5930	5220	2200 JQ	3730 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	0 8 JB	<30	5 3 JQ	4 3 JQ	5 4 JQ	4 4 JQ
Copper	10	<10	<10	<10 UL	<10	<10	<10	<10	1 9 JQ
Iron	200	1070	901	732	518	<200	<200	<200	<200
Lead	3	<3	<3	<3	<3	<3	<3	<3	1 8 JQ
Magnesium	5000	2870 JQ	2750 JQ	2660 JQ	2570 JQ	3280 JQ	2150 JQ	3680 JQ	2540 JQ
Manganese	20	46 8	47 2	48 7	50 5	40 5	24 2	67 8	38 4
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	<100	<100	<100	4 4 JB	3 4 JQ	3 5 JQ	<100
Potassium	5000	4810 JQ	3770 JQ	3400 JQ	4180 JQ	2230 JQ	2730 JQ	1550 JQ	2970 JQ
Sodium	5000	6310	6460	5770	8240	2590 JQ	1540 JQ	2120 JQ	1750 JQ
Vanadium	50	<50	<50	<50	<50	<50	<50	<50	<50
Zinc	20	16 JQ	<20	<20	<20	<20	18 7 JQ	<20	21
Thallium - SW846 7841 (Dissolved) µg/L									
Thallium	2	<2	<2 UL	<2	<2	<2	<2 UL	<2	<2 UJ
Thallium - SW846 7841 (Total) µg/L									
Thallium	2	<2	<2 UL	<2 UL	<2	<2	<2 UL	<2	<2 UL

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-5 10/8/2001	Sample MWFTA-5 4/8/2002	Sample MWFTA-5 7/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/1/2001	Sample MWFTA-7 4/7/2002	Sample MWFTA-7 7/29/2002	Sample MWFTA-7 10/17/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L									
Not Detected		NA	NA	NA	NA	NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C µg/L									
Acenaphthene	0 2	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	0 2	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	0 2	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	0 2	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L									
1 1 1-Trichloroethane	1	<1	<1	<1	<1	<1	<1	<1	<1
1 1-Dichloroethane	1	<1	<1	<1	<1	<1	<1	<1	<1
1 1 Dichloroethene	1	<1 UJ	<1	<1	<1	<1	<1	<1	<1
1,2,4-Trimethylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
1 3 5-Trimethylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
1 3-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
1 4 Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Acetone	10	<10	1 8 R	<10 UJ	<10 R	<10	2 1 R	<10 R	1 2 JQ
Benzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	1	<1	<1	<1	<1	<1	<1	<1 UJ	<1
Chloroform	1	<1	<1	<1	<1	<1	<1	<1	<1
Chloromethane	2	<2	<2	<2 UJ	<2	<2 JL	<2	<2 UJ	<2
cis-1,2-Dichloroethene	0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5
Isopropylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Methylene chloride	1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	1	<1	<1	<1 UJ	<1 UJ	<1	<1	<1	<1
Tetrachloroethene	1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1 2 Dichloroethene	0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5
Trichloroethene	1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl chloride	2	<2	<2	<2	<2	<2	<2	<2	<2

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-9 Oct 2001	Sample MWFTA-9 Apr 2002	Sample MWFTA-9 7/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 Oct 2001	Sample MWFTA-10 Apr. 2002	Sample MWFTA-10 7/17/2002	Sample MWFTA-10 10/29/2002
FIELD PARAMETER									
Dissolved Oxygen - E360.1 mg/L									
Dissolved Oxygen	0.1	NS	NS	0.38	1	NS	NS	2.6	<0.1
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0.1	NS	NS	<0.1	3.2	NS	NS	<0.1	3
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	NS	NS	189	191	NS	NS	313	63
pH - E150.1 pH Units									
pH	--	NS	NS	5.26	5.31	NS	NS	5.7	5.94
Specific Conductance - E120.1 mS/cm									
Specific Conductance	0.001	NS	NS	0.068	0.064	NS	NS	0.094	0.116
Temperature - E170.1 deg C									
Temperature	0.1	NS	NS	18.2	16.3	NS	NS	18.2	15.1
Turbidity - E180.1 NTU									
Turbidity	1	NS	NS	7	3	NS	NS	3	10
FIXED BASE LABORATORY ANALYSIS:									
Anions - MCAWW 300.0A mg/L									
Chloride	1	NS	NS	6.3 JB	7.8	NS	NS	4.3 JB	4.6
Nitrate	0.1	NS	NS	<0.1	<0.1	NS	NS	<0.1	<0.1
Sulfate	1	NS	NS	8 JH	8.5	NS	NS	6.2 JH	6.4
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0.001	NS	NS	54	49	NS	NS	34	38
Ethane	0.002	NS	NS	<0.002 R	<0.002	NS	NS	<0.002 R	<0.002
Ethene	0.001	NS	NS	<0.001 R	<0.001	NS	NS	<0.001 R	<0.001
Methane	0.001	NS	NS	<0.001	0.0021	NS	NS	0.00064 JQ	0.004
Dissolved Hydrogen by Microseeps AM20GAX nM									
Hydrogen	0.03	NS	NS	1.3	3.7	NS	NS	15	4.5
Total Alkalinity - MCAWW 310.1 mg/L									
Total Alkalinity	5	NS	NS	11 JH	7.4 JH	NS	NS	34	26
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	NS	NS	1	<1	NS	NS	<1	<1
Total Sulfide - MCAWW 376.1 mg/L									
Total Sulfide	1	NS	NS	<1	0.96 JQ	NS	NS	<1	0.8 JQ

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TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting Limit (a)	Sample MWFTA-9 Oct 2001	Sample MWFTA-9 Apr 2002	Sample MWFTA-9 7/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 Oct 2001	Sample MWFTA-10 Apr 2002	Sample MWFTA-10 7/17/2002	Sample MWFTA-10 10/29/2002
Mercury - SW846 7470A (Dissolved) µg/L									
Not Detected	1	NS	NS	<1	<1	NS	NS	<1	<1
Mercury - SW846 7470A (Total) µg/L									
Mercury	1	NS	NS	<1	<1	NS	NS	<1	<1
Metals - SW846 6010B (Dissolved) µg/L									
Aluminum	200	NS	NS	108 JQ	59 JQ	NS	NS	78 1 JQ	<200
Arsenic	5	NS	NS	<5	<5	NS	NS	<5	<5
Barium	200	NS	NS	14 6 JQ	18 9 JQ	NS	NS	6 3 JQ	6 3 JQ
Beryllium	10	NS	NS	<10	<10	NS	NS	<10	<10
Cadmium	2	NS	NS	<2	<2	NS	NS	<2	<2
Calcium	5000	NS	NS	2120 JQ	2180 JQ	NS	NS	4340 JQ	4060 JQ
Chromium	10	NS	NS	<10	<10	NS	NS	<10	<10
Cobalt	30	NS	NS	1 8 JB	1 3 JB	NS	NS	1 1 JB	0 74 JB
Copper	10	NS	NS	5 2 JB	<10	NS	NS	<10 UL	1 8 JB
Iron	200	NS	NS	114 JQ	179 JB	NS	NS	209	329 JB
Lead	3	NS	NS	<3	<3	NS	NS	<3	<3
Magnesium	5000	NS	NS	1560 JQ	1630 JQ	NS	NS	3420 JQ	3240 JQ
Manganese	20	NS	NS	26 1	26 2	NS	NS	70 5	61 1
Molybdenum	40	NS	NS	<40	2 5 JQ	NS	NS	<40	<40
Nickel	100	NS	NS	<100	<100	NS	NS	<100	<100
Potassium	5000	NS	NS	2120 JQ	2580 JQ	NS	NS	3050 JQ	3520 JQ
Sodium	5000	NS	NS	4630 JQ	5790	NS	NS	6050	7780
Vanadium	50	NS	NS	<50	<50	NS	NS	<50	<50
Zinc	20	NS	NS	23 1	<20	NS	NS	<20	<20
Metals - SW846 6010B (Total) µg/L									
Aluminum	200	NS	NS	125 JQ	60 1 JQ	NS	NS	576	<200
Arsenic	5	NS	NS	<5	<5	NS	NS	2 4 JQ	3 2 JB
Barium	200	NS	NS	16 8 JQ	18 3 JQ	NS	NS	8 2 JQ	7 1 JQ
Beryllium	10	NS	NS	<10	<10	NS	NS	<10	<10
Cadmium	2	NS	NS	<2	<2	NS	NS	<2	<2
Calcium	5000	NS	NS	2060 JQ	2130 JQ	NS	NS	4420 JQ	4060 JQ
Chromium	10	NS	NS	<10	<10	NS	NS	<10	<10
Cobalt	30	NS	NS	2 3 JB	0 93 JB	NS	NS	1 5 JB	<30
Copper	10	NS	NS	8 1 JB	<10	NS	NS	<10 UL	<10
Iron	200	NS	NS	345	226	NS	NS	580	352
Lead	3	NS	NS	2 7 JQ	<3	NS	NS	<3	<3
Magnesium	5000	NS	NS	1580 JQ	1570 JQ	NS	NS	3620 JQ	3250 JQ
Manganese	20	NS	NS	27 1	26 1	NS	NS	80 4	62 7
Molybdenum	40	NS	NS	<40	<40	NS	NS	<40	<40
Nickel	100	NS	NS	<100	<100	NS	NS	<100	<100
Potassium	5000	NS	NS	2150 JQ	2490 JQ	NS	NS	3080 JQ	3510 JQ
Sodium	5000	NS	NS	4620 JQ	5400	NS	NS	6270	7670
Vanadium	50	NS	NS	<50	<50	NS	NS	<50	<50
Zinc	20	NS	NS	31 5	<20	NS	NS	15 3 JQ	<20
Thallium - SW846 7841 (Dissolved) µg/L									
Thallium	2	NS	NS	<2 UL	<2	NS	NS	<2 UL	<2
Thallium - SW846 7841 (Total) µg/L									
Thallium	2	NS	NS	<2	<2	NS	NS	<2 UL	<2

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-9 Oct 2001	Sample MWFTA-9 Apr 2002	Sample MWFTA-9 7/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 Oct 2001	Sample MWFTA-10 Apr 2002	Sample MWFTA-10 7/17/2002	Sample MWFTA-10 10/29/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L									
Not Detected		NS	NS	NA	NA	NS	NS	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C µg/L									
Acenaphthene	0 2	NS	NS	NA	NA	NS	NS	NA	NA
Anthracene	0 2	NS	NS	NA	NA	NS	NS	NA	NA
Fluorene	0 2	NS	NS	NA	NA	NS	NS	NA	NA
Naphthalene	0 2	NS	NS	NA	NA	NS	NS	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L									
1,1,1-Trichloroethane	1	NS	NS	<1	<1	NS	NS	<1	<1
1 1-Dichloroethane	1	NS	NS	<1	<1	NS	NS	<1	<1
1,1 Dichloroethene	1	NS	NS	<1	<1	NS	NS	<1	<1
1 2 4-Trimethylbenzene	1	NS	NS	<1	<1	NS	NS	<1	<1
1 2-Dichlorobenzene	1	NS	NS	<1	<1	NS	NS	<1	<1
1,3,5-Trimethylbenzene	1	NS	NS	<1	<1	NS	NS	<1	<1
1 3 Dichlorobenzene	1	NS	NS	<1	<1	NS	NS	<1	<1
1 4 Dichlorobenzene	1	NS	NS	<1	<1	NS	NS	<1	<1
Acetone	10	NS	NS	<10 UJ	<10 R	NS	NS	<10 UJ	<10 R
Benzene	1	NS	NS	<1	<1	NS	NS	<1	<1
Carbon tetrachloride	1	NS	NS	<1	<1	NS	NS	<1	<1
Chloroform	1	NS	NS	<1	<1	NS	NS	<1	<1
Chloromethane	2	NS	NS	<2 UJ	<2	NS	NS	<2 UJ	<2
cis-1 2-Dichloroethene	0 5	NS	NS	<0 5	<0 5	NS	NS	<0 5	<0 5
Isopropylbenzene	1	NS	NS	<1	<1	NS	NS	<1	<1
Methylene chloride	1	NS	NS	<1	<1	NS	NS	<1	<1
Naphthalene	1	NS	NS	<1 UJ	<1 UJ	NS	NS	<1 UJ	<1 UJ
Tetrachloroethene	1	NS	NS	<1	<1	NS	NS	<1	<1
trans 1 2-Dichloroethene	0 5	NS	NS	<0 5	<0 5	NS	NS	<0 5	<0 5
Trichloroethene	1	NS	NS	<1	<1	NS	NS	<1	<1
Vinyl chloride	2	NS	NS	<2	<2	NS	NS	<2	<2

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TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date.	Reporting Limit (a)	Sample MWFTA-23 10/9/2001	Sample MWFTA-23 4/5/2002	Sample MWFTA-23 7/31/2002	Sample MWFTA-23 10/15/2002
FIELD PARAMETER					
Dissolved Oxygen - E360 1 mg/L					
Dissolved Oxygen	0 1	<0 1	0 5	1	4 9
Ferrous Iron - A3500D mg/L					
Ferrous Iron	0 1	4 6	3 4	<0 1	0 5
Oxidation Reduction Potential - A2580A mV					
Oxidation Reduction Potential	--	75	-73	7	-76
pH - E150 1 pH Units					
pH	--	4 67	5 33	4 96	5 1
Specific Conductance - E120 1 mS/cm					
Specific Conductance	0 001	0 466	0 152	0 211	0 249
Temperature - E170 1 deg C					
Temperature	0 1	20 1	15 9	19 3	19 8
Turbidity - E180 1 NTU					
Turbidity	1	107	7	171	48
FIXED BASE LABORATORY ANALYSIS					
Anions - MCAWW 300 0A mg/L					
Chloride	1	108	33 6	70 6	36 4
Nitrate	0 1	<0 1	0 02 JQ	<0 1	<0 1
Sulfate	1	0 71 JQ	2 3	0 18 JQ	1 8
Dissolved Gases - RSK SOP-175 mg/L					
Carbon dioxide	0 001	290 J	150	260	210
Ethane	0 002	0 00048 JQ	0 00061 JQ	<0 004	0 00089 JQ
Ethene	0 001	0 039	0 028	0 0072	0 036
Methane	0 001	1 9	0 84	0 22	1 4
Dissolved Hydrogen by Microseeps AM20GAX nM					
Hydrogen	0 03	13	1 9	14	19
Total Alkalinity - MCAWW 310 1 mg/L					
Total Alkalinity	5	23	22	23	23
Total Organic Carbon - SW846 9060 mg/L					
Total Organic Carbon	1	48	8	23	11
Total Sulfide - MCAWW 376 1 mg/L					
Total Sulfide	1	2 3	<1	<1	<1

TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-23 10/9/2001	Sample MWFTA-23 4/5/2002	Sample MWFTA-23 7/31/2002	Sample MWFTA-23 10/15/2002
Mercury - SW846 7470A (Dissolved) µg/L					
Not Detected	1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L					
Mercury	1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L					
Aluminum	200	178 JQ	64 6 JB	245	129 JQ
Arsenic	5	92 8	48 6	91 7	75 5
Barium	200	582	194 JQ	492	251
Beryllium	10	1 9 JB	<10	1 6 JB	1 2 JQ
Cadmium	2	<2	<2	0 3 JB	<2
Calcium	5000	5820	2680 JQ	4950 JQ	2520 JQ
Chromium	10	<10	<10	<10	<10
Cobalt	30	11 3 JQ	4 5 JQ	10 7 JQ	5 JQ
Copper	10	<10	<10	<10	<10
Iron	200	61300	23600	36900	21300
Lead	3	<3	<3	<3	<3
Magnesium	5000	8160	3080 JQ	6450	3260 JQ
Manganese	20	499	151	423	196
Molybdenum	40	<40	<40	<40	<40
Nickel	100	10 5 JQ	6 5 JB	10 7 JQ	4 9 JQ
Potassium	5000	6270	3710 JQ	4210 JQ	3580 JQ
Sodium	5000	7740	4440 JQ	6960	4800 JQ
Vanadium	50	1 6 JB	1 2 JQ	1 9 JB	1 JQ
Zinc	20	124	18 9 JQ	118	25 1
Metals - SW846 6010B (Total) µg/L					
Aluminum	200	656	213	297	174 JQ
Arsenic	5	96 6	49 3	94 3	77 2
Barium	200	607	196 JQ	502	256
Beryllium	10	2 1 JB	0 57 JQ	1 6 JB	1 3 JQ
Cadmium	2	<2	<2	<2	<2
Calcium	5000	6610	2690 JQ	4940 JQ	2590 JQ
Chromium	10	<10	<10	<10	<10
Cobalt	30	12 1 JQ	4 8 JQ	10 6 JQ	5 6 JQ
Copper	10	<10	<10	<10	<10
Iron	200	64000	24300	37000	21800
Lead	3	<3	<3	<3	<3
Magnesium	5000	8560	3080 JQ	6510	3280 JQ
Manganese	20	519	152	428	198
Molybdenum	40	<40	<40	<40	<40
Nickel	100	10 4 JQ	3 1 JB	10 6 JQ	6 8 JQ
Potassium	5000	6570	3640 JQ	4220 JQ	3510 JQ
Sodium	5000	7960	4550 JQ	7070	4870 JQ
Vanadium	50	2 3 JB	1 4 JQ	1 6 JB	1 3 JQ
Zinc	20	152	24 8	112	55
Thallium - SW846 7841 (Dissolved) µg/L					
Thallium	2	<2	<2 UL	<2 UJ	<2
Thallium - SW846 7841 (Total) µg/L					
Thallium	2	2 1 JB	<2 UL	<2 UJ	<2

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TABLE D-1

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
UPPER WATER-BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID. / Sample Date	Reporting Limit (a)	Sample MWFTA-23 10/9/2001	Sample MWFTA-23 4/5/2002	Sample MWFTA-23 7/31/2002	Sample MWFTA-23 10/15/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L					
Not Detected		NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) - SW846 8270C µg/L					
Acenaphthene	0 2	NA	NA	NA	NA
Anthracene	0 2	NA	NA	NA	NA
Fluorene	0 2	NA	NA	NA	NA
Naphthalene	0 2	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L					
1 1 1-Trichloroethane	1	<5000	<1200	<5000	<1200
1,1-Dichloroethane	1	<5000	<1200	<5000	<1200
1 1-Dichloroethene	1	<5000 UJ	<1200	<5000	<1200
1 2 4-Trimethylbenzene	1	<5000	<1200	<5000	<1200
1,2-Dichlorobenzene	1	1300 JQ	270 JQ	<5000	<1200
1,3 5-Trimethylbenzene	1	<5000	<1200	<5000	<1200
1 3-Dichlorobenzene	1	<5000	<1200	<5000	<1200
1 4-Dichlorobenzene	1	<5000	<1200	<5000	<1200
Acetone	10	3600 JQ	<12000 R	<50000 R	<12000
Benzene	1	<5000	<1200	<5000	<1200
Carbon tetrachloride	1	<5000	<1200	<5000 UJ	<1200
Chloroform	1	<5000	<1200	<5000	<1200
Chloromethane	2	<10000	<2500	<10000 UJ	<2500
cis-1 2-Dichloroethene	0 5	190000	34000	140000	52000
Isopropylbenzene	1	<5000	<1200	<5000	<1200
Methylene chloride	1	<5000	<1200	2100 JQ	1300
Naphthalene	1	<5000	<1200 UJ	<5000 UJ	<1200
Tetrachloroethene	1	<5000	<1200	<5000	<1200
trans-1 2-Dichloroethene	0 5	<2500	<620	<2500	<620
Trichloroethene	1	<5000	240 JQ	2500 JQ	<1200
Vinyl chloride	2	5400 JQ	2600	4000 JQ	2500

Notes

J Estimated based on QC data
JB Estimated possibly biased high or false positive based on blank contamination
JH Estimated, possibly biased high based upon QC data
JL Estimated, possibly biased low based upon QC data
JQ Estimated, Value is between reporting limit and detection limit
NA Not Analyzed
NS Not Sampled
R Unusable
UJ Undetected, Reported Detection Limit is imprecise
UL Undetected Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/sample weight extracted and/or sample dilutions

PREPARED/DATE JAH 5/23/03
CHECKED/DATE JAV 5/23/03

TABLE D-2

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date:	Reporting (a) Limit	Sample DMW-29B 10/10/2001	Sample DMW-29B 4/7/2002	Sample DMW-29B Jul 2002	Sample DMW-29B Oct 2002	Sample MWFTA-14 10/9/2001	Sample MWFTA-14 4/8/2002	Sample MWFTA-14 7/17/2002	Sample MWFTA-14 10/29/2002
FIELD PARAMETER									
Dissolved Oxygen - F360.1 mg/L									
Dissolved Oxygen	0.1	0.4	1.3	NS	NS	1.1	2.8	1.6	2.4
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0.1	<0.1	0.2	NS	NS	<0.1	<0.1	<0.1	<0.1
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	155	248	NS	NS	12	115	45	195
pH - F150.1 pH Units									
pH	--	5.24	5.68	NS	NS	9.82	10.71	10.03	9.08
Specific Conductance - E120.1 mS/cm									
Specific Conductance	0.001	0.061	0.093	NS	NS	0.439	0.382	0.312	0.495
Temperature - E170.1 deg C									
Temperature	0.1	13.1	17.7	NS	NS	15.6	12.9	18.4	14
Turbidity - E180.1 NTU									
Turbidity	1	13	6	NS	NS	4	<1	<1	8
FIXED BASE LABORATORY ANALYSIS:									
Anions - MCAWW 300.0A mg/L									
Chloride	1	9.3	9.4	NS	NS	16.5	12.5	15.3 JH	13.9
Nitrate as N	0.1	<0.1	<0.1	NS	NS	<0.1	<0.1	0.03 JQ	0.01 JQ
Sulfate	1	5	5.8	NS	NS	29.6	20.1	26.9	20.2
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0.001	45 J	39	NS	NS	0.11 JB	<0.17	0.15 JQ	0.22 JB
Ethane	0.002	<0.002	<0.002	NS	NS	<0.002	<0.002	<0.002 R	<0.002
Ethene	0.001	<0.001	<0.001	NS	NS	<0.001	<0.001	<0.001 R	<0.001
Methane	0.001	0.0014 JB	0.0043	NS	NS	0.0036	0.0019	<0.001	0.0007 JB
Hydrogen by Microseeps - AM20GAX nM									
Hydrogen	0.03	2.7	6.7	NS	NS	7.2	8.2	1.3	3.8
pH EPA 150.1 units									
pH (liquid)		6.8	NA	NS	NS	9.1	NA	NA	NA
Total Alkalinity - MCAWW 310.1 mg/L									
Total Alkalinity	5	24	22	NS	NS	150	160	190	160
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	0.5 JB	<1	NS	NS	2 JB	0.9 JQ	<1	0.8 JQ
Total Sulfide - MCAWW 376.1 mg/L									
Total Sulfide	1	1.5	<1	NS	NS	<1	<1	<1	1.4

TABLE D-2

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Sample ID. Sample Date:	Reporting (a) Limit	Sample DMW-29B 10/10/2001	Sample DMW-29B 4/7/2002	Sample DMW-29B Jul 2002	Sample DMW-29B Oct 2002	Sample MWFTA-14 10/9/2001	Sample MWFTA-14 4/8/2002	Sample MWFTA-14 7/17/2002	Sample MWFTA-14 10/29/2002
Mercury - SW846 7470A (Dissolved) µg/L										
	Not Detected	1	<1	<1 UJ	NS	NS	<1	<1 UJ	<1	<1
Mercury - SW846 7470A (Total) µg/L										
	Not Detected	1	<1	<1 UJ	NS	NS	<1	<1 UJ	<1	<1
Metals - SW846 6010B (Dissolved) µg/L										
Aluminum		200	<200	<200	NS	NS	<200	<200	77.5 JQ	<200
Antimony		5	<5	<5	NS	NS	<5	<5	<5	44.2 J
Arsenic		5	<5	<5	NS	NS	<5	<5	<5	<5
Barium		200	31.4 JQ	23.6 JQ	NS	NS	35 JQ	29.7 JQ	67.4 JQ	40.9 JQ
Beryllium		10	<10	<10	NS	NS	<10	<10	<10	<10
Cadmium		2	<2	0.35 JB	NS	NS	<2	<2	<2	<2
Calcium		5000	5390	4300 JQ	NS	NS	5390	5700	13800	7580
Chromium		10	<10	<10	NS	NS	<10	<10	<10	<10
Cobalt		30	<30	<30	NS	NS	<30	<30	0.86 JB	<30
Copper		10	<10	<10	NS	NS	<10	<10	<10 UL	2.3 JB
Iron		200	215	321	NS	NS	<200	<200	258	<200
Magnesium		5000	4040 JQ	3190 JQ	NS	NS	5150	4480 JQ	10800	6470
Manganese		20	72.9	48.5	NS	NS	2.7 JB	<20	45.5	2.9 JQ
Molybdenum		40	<40	<40	NS	NS	7.5 JB	7.1 JQ	7.5 JQ	8.6 JQ
Nickel		100	<100	<100	NS	NS	<100	<100	<100	<100
Potassium		5000	5090	4280 JQ	NS	NS	56600	69500	25400 J	46500
Sodium		5000	4590 JQ	5070	NS	NS	52200	51000	50900	49700
Vanadium		50	<50	<50	NS	NS	<50	<50	<50	<50
Zinc		20	30.4 J	<20	NS	NS	<20	<20	<20	<20
Metals - SW846 6010B (Total) µg/L										
Aluminum		200	<200	<200	NS	NS	995	51.2 JQ	75 JQ	<200
Arsenic		5	<5	<5	NS	NS	<5	<5	<5	<5
Barium		200	36.2 JQ	23.8 JQ	NS	NS	51.8 JQ	31.3 JQ	63.6 JQ	39.7 JQ
Beryllium		10	0.81 JB	<10	NS	NS	<10	<10	<10	<10
Cadmium		2	<2	0.35 JB	NS	NS	<2	<2	<2	<2
Calcium		5000	5330	4330 JQ	NS	NS	8670	5870	12600	7250
Chromium		10	<10	<10	NS	NS	1.6 JQ	<10	<10	<10
Cobalt		30	<30	<30	NS	NS	1.4 JB	<30	<30	<30
Copper		10	<10	<10	NS	NS	<10	<10	<10 UI	2 JB
Iron		200	2080	420	NS	NS	905	<200	259	<200
Magnesium		5000	4280 JQ	3210 JQ	NS	NS	8480	4800 JQ	10200	6350
Manganese		20	78.5	48.7	NS	NS	19.2 JQ	1.7 JQ	36.7	3.3 JQ
Molybdenum		40	<40	<40	NS	NS	8.6 JB	7.9 JQ	6.7 JQ	7.5 JQ
Nickel		100	<100	<100	NS	NS	3.3 JQ	<100	<100	<100
Potassium		5000	5250	4350 JQ	NS	NS	57300	71400	26700 J	46600
Sodium		5000	4790 JQ	5290	NS	NS	55900	52000	48400	49300
Vanadium		50	<50	<50	NS	NS	1.2 JB	<50	<50	<50
Zinc		20	14.2 JQ	<20	NS	NS	23.4	<20	<20	<20
Thallium - SW846 7841 (Dissolved) µg/L										
	Not Detected	2	<2	<2 UL	NS	NS	<2	<2 UI	<2	<2 UI
Thallium - SW846 7841 (Total) µg/L										
Thallium		2	<2	<2 UL	NS	NS	<2	<2 UL	<2 UI	<2

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TABLE D-2

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID / Sample Date:	Reporting (a) Limit	Sample DMW-29B 10/10/2001	Sample DMW-29B 4/7/2002	Sample DMW-29B Jul 2002	Sample DMW-29B Oct. 2002	Sample MWFTA-14 10/9/2001	Sample MWFTA-14 4/8/2002	Sample MWFTA-14 7/17/2002	Sample MWFTA-14 10/29/2002
Volatile Organic Compounds - SW846 8260B µg/L									
1,1,1-Trichloroethane	1	<1	<1	NS	NS	<1	<1	<1	<1
1 1-Dichloroethane	1	<1	<1	NS	NS	<1	<1	<1	<1
1 1-Dichloroethene	1	<1 UJ	<1	NS	NS	<1 UJ	<1	<1	<1
1 2-Dichlorobenzene	1	<1	<1	NS	NS	<1	<1	<1	<1
1 4-Dichlorobenzene	1	<1	<1	NS	NS	<1	<1	<1	<1
2 Butanone	10	<10	<10 R	NS	NS	<10	<10 R	<10	<10 R
2 Hexanone	10	<10	<10 R	NS	NS	<10	<10 R	<10	<10 R
Acetone	10	<10	2 1 R	NS	NS	<10	2 1 R	<10 UJ	<10 R
Benzene	1	<1	<1	NS	NS	<1	<1	<1	<1
Chlorobenzene	1	<1	<1	NS	NS	<1	<1	<1	<1
Chloroethane	2	<2	<2	NS	NS	<2	<2	<2	<2
Chloroform	1	<1	<1	NS	NS	<1	<1	<1	<1
Chloromethane	2	<2	<2	NS	NS	<2	<2	<2 UJ	<2
cis-1 2-Dichloroethene	0 5	0 25 JQ	<0 5	NS	NS	<0 5	<0 5	<0 5	<0 5
Methylene chloride	1	<1	<1	NS	NS	<1	<1	<1	<1
Naphthalene	1	<1	<1	NS	NS	0 24 JQ	<1	<1 UJ	<1 UJ
p-Isopropyltoluene	1	<1	<1	NS	NS	<1	<1	<1	<1
Tetrachloroethene	1	0 32 JQ	<1	NS	NS	<1	<1	<1	<1
Toluene	1	0 34 JQ	<1	NS	NS	0 47 JQ	<1	<1	<1
trans 1 2-Dichloroethene	0 5	<0 5	<0 5	NS	NS	<0 5	<0 5	<0 5	<0 5
Trichloroethene	1	0 21 JQ	0 19 JQ	NS	NS	<1	<1	<1	<1
Vinyl chloride	2	<2	<2	NS	NS	<2	<2	<2	<2
Volatile Organic Compounds - SW846 8260B, UNPRES µg/L									
1 1-Dichloroethane	1	NA	NS	NS	NS	NA	NA	NA	NA
1 1-Dichloroethene	1	NA	NS	NS	NS	NA	NA	NA	NA
Acetone	10	NA	NS	NS	NS	NA	NA	NA	NA
cis-1,2-Dichloroethene	0 5	NA	NS	NS	NS	NA	NA	NA	NA
Methylene chloride	1	NA	NS	NS	NS	NA	NA	NA	NA
Trichloroethene	1	NA	NS	NS	NS	NA	NA	NA	NA
Vinyl chloride	2	NA	NS	NS	NS	NA	NA	NA	NA

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SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting (a) Limit	Sample MWFTA-16 10/9/2001	Sample MWFTA-16 4/5/2002	Sample MWFTA-16 7/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/2/2001	Sample MWFTA-17 4/5/2002	Sample MWFTA-17 7/31/2002	Sample MWFTA-17 10/15/2002
FIELD PARAMETER									
Dissolved Oxygen - F360.1 mg/L									
Dissolved Oxygen	0.1	3.4	2.51	3.6	5.9	7	8.2	6.2	4
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	<0.1	<0.1
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	-165	-120	-121	-149	-105	-50	-45	-64
pH - E150.1 pH Units									
pH	--	11.13	12.5	12.33	12.23	11.93	11.94	12.33	12.33
Specific Conductance - E120.1 mS/cm									
Specific Conductance	0.001	4.93	5.96	4.73	1.92	1.75	1.73	1.73	1.44
Temperature - E170.1 deg C									
Temperature	0.1	21.5	15.4	26.8	18.1	19.6	16.8	31.6	18.6
Turbidity - E180.1 NTU									
Turbidity	1	46	15	2	14	3	1.9	1	3
FIXED BASE LABORATORY ANALYSIS:									
Anions - MCAWW 300.0A mg/L									
Chloride	1	7.6	6.4	8.7	11.6	5.9	6.3	5.8	5.6
Nitrate as N	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate	1	7.4	5.4	5.4	7.1	7.2	8.6	10	10.8
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0.001	<0.17 UJ	<0.17	<0.17	<0.17	<0.17 J	<0.17	<0.17	<0.17
Ethane	0.002	0.0015 JQ	0.0074	0.0029	0.0055	<0.002	<0.002	<0.002	<0.002
Ethene	0.001	0.011	0.08	0.029	0.049	<0.001	0.00045 JQ	<0.001	<0.001
Methane	0.001	0.022	0.097	0.039	0.12	0.073	0.12	0.049	0.13
Hydrogen by Microseeps - AM20GAX nM									
Hydrogen	0.03	26	36	83	27	19	9.7	4.9	4.1
pH EPA 150.1 units									
pH (liquid)		11.8	NA	NA	NA	11.7	NA	NA	NA
Total Alkalinity - MCAWW 310.1 mg/L									
Total Alkalinity	5	480	700	770	270	270	190	290	250
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	2 JB	1	2	1 JH	2	2	2	2
Total Sulfide - MCAWW 376.1 mg/L									
Total Sulfide	1	1.9	<1	<1	0.49 JB	<1	<1	0.32 JQ	0.49 JB

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SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

	Sample ID. Sample Date	Reporting (a) Limit	Sample MWFTA-16 10/9/2001	Sample MWFTA-16 4/5/2002	Sample MWFTA-16 7/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/2/2001	Sample MWFTA-17 4/5/2002	Sample MWFTA-17 7/31/2002	Sample MWFTA-17 10/15/2002
Mercury - SW846 7470A (Dissolved) µg/L	Not Detected	1	<1	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L	Not Detected	1	<1	0 1 JQ	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L										
Aluminum		200	<200	<200 UJ	<200	85 4 JQ	5340	5380	4520	4430
Antimony		5	<5	<5	<5 UJ	<5	<5	<5	<5	<5
Arsenic		5	<5	<5	<5	2 5 JQ	<5	<5	<5	<5
Barium		200	721	1190	988	329	156 JQ	129 JQ	134 JQ	117 JQ
Beryllium		10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium		2	<2	0 39 JQ	<2	<2	<2	<2	<2	<2
Calcium		5000	109000	182000	150000	55500	119000	107000	94100	92400
Chromium		10	1 5 JB	2 4 JB	1 5 JQ	<10	<10	<10	<10	<10
Cobalt		30	<30	<30	<30	<30	<30	<30	<30	<30
Copper		10	<10	<10	<10	<10	<10	<10	<10	<10
Iron		200	<200	<200	<200	<200	<200	<200	<200	<200
Magnesium		5000	125 JQ	73 1 JB	87 JQ	326 JQ	<5000	<5000	<5000	<5000
Manganese		20	2 JB	<20	<20	<20	1 2 JB	<20	<20	<20
Molybdenum		40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel		100	<100	<100	<100	<100	2 4 JB	<100	<100	<100
Potassium		5000	186000	186000	162000	92500 J	26800	19900	27000	21300
Sodium		5000	59300	46600	38600	37600 J	11500	11500	14700	12600
Vanadium		50	1 6 JB	<50	<50	3 2 JQ	6 JQ	6 1 JQ	7 2 JQ	7 2 JQ
Zinc		20	50 8 J	<20	14 1 JQ	<20 UI	<20	<20	16 9 JQ	<20 UI
Metals - SW846 6010B (Total) µg/L										
Aluminum		200	70 4 JQ	62 6 JB	80 4 JQ	479	5250	5580	4520	4820
Arsenic		5	<5	<5	<5	<5	<5	<5	<5	<5
Barium		200	738	1320	1090	557	145 JQ	133 JQ	133 JQ	127 JQ
Beryllium		10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium		2	<2	<2	<2	<2	<2	<2	<2	<2
Calcium		5000	111000	201000	165000	111000	119000	110000	93900	101000
Chromium		10	<10	1 7 JB	<10	<10	<10	<10	<10	<10
Cobalt		30	<30	<30	<30	<30	<30	<30	<30	<30
Copper		10	<10	<10	<10	2 3 JQ	<10	<10	<10	<10
Iron		200	<200	<200	82 4 JQ	581	<200	<200	<200	<200
Magnesium		5000	1930 JQ	1870 JQ	3220 JQ	16100	<5000	<5000	<5000	<5000
Manganese		20	12 4 JQ	21 6	49 9	324	<20	<20	<20	<20
Molybdenum		40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel		100	<100	<100	<100	<100	<100	<100	<100	<100
Potassium		5000	188000	205000	177000	78900 J	24900	20300	26700	23200
Sodium		5000	58500	50600	41500	24700 J	11000	11400	14400	13500
Vanadium		50	1 6 JB	<50	<50	0 87 JQ	5 2 JQ	6 JQ	7 JQ	7 1 JQ
Zinc		20	24 8 J	<20	15 6 JQ	<20 UI	<20	<20	<20	<20 UI
Thallium - SW846 7841 (Dissolved) µg/L	Not Detected	2	2 2 J	<2 UI	<2 UI	<2 UI	<2	<2 UI	<2 UJ	<2
Thallium - SW846 7841 (Total) µg/L										
Thallium		2	<2	<2 UI	<2 UL	<2	<2	<2 UI	<2 UJ	<2

TABLE D-2

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting (a) Limit	Sample MWFTA-16 10/9/2001	Sample MWFTA-16 4/5/2002	Sample MWFTA-16 7/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/2/2001	Sample MWFTA-17 4/5/2002	Sample MWFTA-17 7/31/2002	Sample MWFTA-17 10/15/2002
Volatile Organic Compounds - SW846 8260B µg/L									
1 1 1-Trichloroethane	1	<50	<33	<50	<56	<1	<1	<1	<1
1 1-Dichloroethane	1	<50	<33	<50	<56	<1	<1	<1	<1
1 1-Dichloroethene	1	<50 UJ	<33	<50	<56	<1	<1	<1	<1
1 2-Dichlorobenzene	1	6 3 JQ	<33	<50	<56	<1	<1	<1	<1
1 4-Dichlorobenzene	1	<50	<33	<50	<56	<1	<1	<1	<1
2-Butanone	10	<500	<330 UJ	<500 UJ	<560 UJ	<10	<10 R	<10 R	<10 UJ
2-Hexanone	10	<500	<330 UJ	<500 R	<560 UJ	<10 UJ	<10 R	<10 R	<10 UJ
Acetone	10	46 JQ	<330 R	<500 R	<560 UJ	6 7 JQ	2 6 R	4 7 R	1 1 JB
Benzene	1	<50	<33	<50	<56	<1	<1	<1	<1
Chlorobenzene	1	<50	4 9 JQ	<50	<56	<1	<1	<1	<1
Chloroethane	2	<100	<67	<100	<110	<2	<2	<2	<2
Chloroform	1	<50	<33	<50	<56	<1	<1	<1	<1
Chloromethane	2	<100	<67	<100 UJ	<110	<2 UJ	<2	<2 UJ	<2
cis-1 2-Dichloroethene	0 5	1200	1100	1100	1500	<0 5	<0 5	<0 5	<0 5
Methylene chloride	1	<50	12 JQ	32 JB	<56	<1	<1	<1	<1
Naphthalene	1	<50	<33 UJ	<50	<56	0 82 JQ	0 9 JB	<1 UJ	<1
p Isopropyltoluene	1	<50	<33	<50	<56	<1	<1	<1	<1
Tetrachloroethene	1	<50	<33	<50	<56	<1	<1	<1	<1
Toluene	1	<50	<33	<50	<56	0 3 JQ	0 38 JQ	<1	<1
trans-1 2-Dichloroethene	0 5	<25	<17	<25	<28	<0 5	<0 5	<0 5	<0 5
Trichloroethene	1	<50	<33	<50	<56	<1	<1	<1	<1
Vinyl chloride	2	270	310	430	920	<2	<2	<2	<2
Volatile Organic Compounds - SW846 8260B, UNPRES µg/L									
1 1-Dichloroethane	1	NA	NA	<50	<62	NA	NA	NA	NA
1 1-Dichloroethene	1	NA	NA	<50	<62	NA	NA	NA	NA
Acetone	10	NA	NA	61 R	<620 UJ	NA	NA	NA	NA
cis-1 2-Dichloroethene	0 5	NA	NA	1100	1400	NA	NA	NA	NA
Methylene chloride	1	NA	NA	33 JB	<62	NA	NA	NA	NA
Trichloroethene	1	NA	NA	<50	<62	NA	NA	NA	NA
Vinyl chloride	2	NA	NA	430	920	NA	NA	NA	NA

TABLE D-2

SUMMARY OF CONSIITUENTS DETECTFD IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID· Sample Date	Reporting (a) Limit	Sample MWFTA-18 10/2/2001	Sample MWFTA-18 4/4/2002	Sample MWFTA-18 7/29/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/2/2001	Sample MWFTA-19 4/7/2002	Sample MWFTA-19 7/30/2002	Sample MWFTA-19 10/17/2002
FIELD PARAMETER									
Dissolved Oxygen - F360 1 mg/L									
Dissolved Oxygen	0 1	0 4	0 8	1 3	7 1	6 3	NA	7 5	7
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0 1	1	0 6	<0 1	3	<0 1	NA	<0 1	<0 1
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	86	-80	-117	-89	-3	NA	16	-19
pH - E150 1 pH Units									
pH	--	6 89	6 86	6 95	7 34	10 91	NA	11 92	10 89
Specific Conductance - E120 1 mS/cm									
Specific Conductance	0 001	0 125	0 172	0 119	0 156	0 609	NA	0 528	0 725
Temperature - E170 1 deg C									
Temperature	0 1	18	17 9	19 8	17	16 5	NA	21 9	16 1
Turbidity - F180 1 NTU									
Turbidity	1	9	34	2	8	18	NA	14	7
FIXED BASE LABORATORY ANALYSIS·									
Anions - MCAWW 300 0A mg/L									
Chloride	1	3 8	4 3	4	4 7	6	6 6	6 4 JB	6 4
Nitrate as N	0 1	<0 1	<0 1	<0 1	<0 1	<0 1	<0 1	<0 1	<0 1
Sulfate	1	0 94 JQ	1	1 2	1 2	6 2	8 2	6 5	6 3
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0 001	7 1 J	19	13	15	<0 17 J	0 22 JB	<0 17	<0 17
Ethane	0 002	0 001 JQ	0 0011 JQ	<0 002	<0 002	<0 002	<0 002	<0 002	<0 002
Ethene	0 001	0 005	0 003	<0 001	<0 001	<0 001	<0 001	<0 001	<0 001
Methane	0 001	0 28	0 37	0 0077	0 043	0 0034	0 0019	0 00051 JB	0 0028
Hydrogen by Microseeps - AM20GAX nM									
Hydrogen	0 03	6 8	9 8	2	2 6	13	7	4	16
pH EPA 150 1 units									
pH (liquid)		7 3	NA	NA	NA	10 9	NA	NA	NA
Total Alkalinity - MCAWW 310 1 mg/L									
Total Alkalinity	5	60	68	67	53	110	130	150	120
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	2	2 JH	1	2	<1	0 4 JQ	<1	0 7 JH
Total Sulfide - MCAWW 376 1 mg/L									
Total Sulfide	1	<1	<1	<1	0 81 JH	<1	<1	<1	<1

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SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

	Sample ID. Sample Date	Reporting (a) Limit	Sample MWFTA-18 10/2/2001	Sample MWFTA-18 4/4/2002	Sample MWFTA-18 7/29/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/2/2001	Sample MWFTA-19 4/7/2002	Sample MWFTA-19 7/30/2002	Sample MWFTA-19 10/17/2002
Mercury - SW846 7470A (Dissolved) µg/L	Not Detected	1	<1	<1	<1	<1	<1	<1 UJ	<1	<1
Mercury - SW846 7470A (Total) µg/L	Not Detected	1	<1	0.091 JQ	<1	<1	<1	0.15 JB	<1	<1
Metals - SW846 6010B (Dissolved) µg/L										
Aluminum		200	109 JB	<200 UJ	<200 UJ	<200 UJ	659	716	901	616
Antimony		5	3 JQ	<5	<5	<5	<5	<5	<5	<5
Arsenic		5	<5	<5	<5	<5	<5	<5	<5	3.2 JB
Barium		200	29.3 JQ	31 JQ	28.9 JQ	30.8 JQ	55.2 JQ	72.5 JQ	64.4 JQ	63.1 JQ
Beryllium		10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium		2	<2	<2	<2	<2	0.3 JB	<2	<2	<2
Calcium		5000	9530	14800	11300	8400	45600	59600	55400	52700
Chromium		10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt		30	<30	<30	<30	<30	<30	<30	<30	<30
Copper		10	<10	<10	<10	<10	<10	<10	<10	<10
Iron		200	2400	932	2080	1470	<200	<200	<200	<200
Magnesium		5000	6550	5800	5290	4920 JQ	37.5 JB	<5000	<5000	<5000
Manganese		20	107	78.8	99.8	71.9	<20	<20	<20	<20
Molybdenum		40	<40	<40	<40	<40	<40	<40	2.5 JQ	<40
Nickel		100	2.9 JB	<100	<100	<100	<100	<100	<100	<100
Potassium		5000	7180	5330	5530	5590	10400	11000	10600	9870
Sodium		5000	7670	7370	7640	7740	5640	5370	5530	5370
Vanadium		50	<50	<50	<50	<50	2.4 JB	2.8 JQ	<50	2.8 JQ
Zinc		20	<20	<20	<20	<20 UI	<20	<20	<20	<20
Metals - SW846 6010B (Total) µg/L										
Aluminum		200	257 JB	107 JQ	<200 UJ	<200 UJ	673	691	878	837
Arsenic		5	<5	<5	<5	<5	<5	<5	<5	2.1 JB
Barium		200	38.6 JQ	50.7 JQ	34.5 JQ	34.5 JQ	54.5 JQ	76.5 JQ	63.4 JQ	67.2 JQ
Beryllium		10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium		2	<2	<2	<2	<2	<2	<2	<2	<2
Calcium		5000	9620	15600	11600	8800	45400	61800	54800	57800
Chromium		10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt		30	<30	<30	<30	<30	<30	<30	<30	<30
Copper		10	<10	<10	<10	<10	<10	<10	<10	<10
Iron		200	2910	1970	2430	1690	<200	<200	<200	<200
Magnesium		5000	6670	5950	5460	5180	44.8 JB	<5000	<5000	230 JQ
Manganese		20	111	84	105	77.3	<20	<20	<20	1.3 JB
Molybdenum		40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel		100	2.5 JB	3.4 JQ	<100	3.2 JQ	<100	<100	<100	<100
Potassium		5000	7190	5400	5670	5820	10200	12800	10400	10200
Sodium		5000	7490	7470	7910	8110	5560	6060	5180	5520
Vanadium		50	<50	<50	<50	<50	2.2 JB	3.3 JQ	<50	2.5 JQ
Zinc		20	<20	19.3 JQ	<20	19.5 JQ	<20	<20	<20	<20
Thallium - SW846 7841 (Dissolved) µg/L	Not Detected	2	<2	<2 UL	<2	<2	<2	<2 UI	<2 UJ	<2 UI
Thallium - SW846 7841 (Total) µg/L										
Thallium		2	<2	<2 UI	<2	<2	<2	<2 UJ	<2 UJ	<2 UI

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SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID: / Sample Date	Reporting (a) Limit	Sample MWFTA-18 10/2/2001	Sample MWFTA-18 4/4/2002	Sample MWFTA-18 7/29/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/2/2001	Sample MWFTA-19 4/7/2002	Sample MWFTA-19 7/30/2002	Sample MWFTA-19 10/17/2002
Volatile Organic Compounds - SW846 8260B µg/L									
1,1,1-Trichloroethane	1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
2 Butanone	10	<10	<10 UJ	<10 UJ	<10	<10	<10 R	<10 UJ	<10 UJ
2 Hexanone	10	<10 UL	<10 UJ	<10 R	<10	<10 UL	<10 R	<10 R	<10 UJ
Acetone	10	0.6 JQ	<10 R	<10 R	<10	0.78 JQ	24 R	<10 R	<10 UJ
Benzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	2	<2	0.46 JQ	<2	<2	<2	<2	<2	<2
Chloroform	1	<1	<1	<1	<1	<1	<1	<1	<1
Chloromethane	2	<2 UL	<2	<2 UJ	<2	<2 UL	<2	<2 UJ	<2
cis-1,2-Dichloroethene	0.5	2.5	2.3	2.2	2	1.6	1.5	1.2	1.1
Methylene chloride	1	<1	<1	<1	<1	0.44 JQ	<1	<1	<1
Naphthalene	1	<1	<1 UJ	<1	<1	<1	<1	<1	<1
p Isopropyltoluene	1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	1	<1	<1	<1	<1	0.76 JQ	1	1.1	1.2
Toluene	1	0.63 JQ	<1	<1	<1	0.24 JQ	<1	<1	<1
trans-1,2-Dichloroethene	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	1	<1	<1	<1	<1	0.44 JQ	0.65 JQ	0.6 JQ	0.54 JQ
Vinyl chloride	2	<2	<2	<2	<2	<2	<2	<2	<2
Volatile Organic Compounds - SW846 8260B, UNPRES µg/L									
1,1 Dichloroethane	1	NA	NA	NA	NA	NA	NA	NA	NA
1,1 Dichloroethene	1	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	10	NA	NA	NA	NA	NA	NA	NA	NA
cis 1,2-Dichloroethene	0.5	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	1	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	1	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	2	NA	NA	NA	NA	NA	NA	NA	NA

TABLE D-2

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATFR - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID: Sample Date	Reporting (a) Limit	Sample MWFTA-28B 10/8/2001	Sample MWFTA-28B 4/8/2002	Sample MWFTA-28B 7/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/1/2001	Sample MWFTA-29B 4/4/2002	Sample MWFTA-29B 7/30/2002	Sample MWFTA-29B 10/17/2002
FIELD PARAMETER									
Dissolved Oxygen - E360.1 mg/L									
Dissolved Oxygen	0.1	0.6	3.92	4.7	1.5	0.4	2	1.1	1.7
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0.1	<0.1	NA	0.5	0.5	<0.1	<0.1	<0.1	1
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	-124	-121	-140	-93	-113	-23	-176	-82
pH - F150.1 pH Units									
pH	--	7.01	7.37	7.49	7.09	13.0	13.88	13.03	12.44
Specific Conductance - E120.1 mS/cm									
Specific Conductance	0.001	0.543	0.502	0.492	0.697	2.4	2.47	1.87	1.9
Temperature - E170.1 deg C									
Temperature	0.1	14.6	14.1	22.9	12.4	16.9	12.7	25	18.7
Turbidity - E180.1 NTU									
Turbidity	1	15	10	<1	21	39	31	1	19
FIXED BASE LABORATORY ANALYSIS									
Anions - MCAWW 300.0A mg/L									
Chloride	1	58.6	58.9	55.8	58.2	1.5	1.4	1.9 JB	2.1
Nitrate as N	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.07 JQ	<0.1	<0.1
Sulfate	1	14	1.1	2 JB	5.6	5.1	3.4	18.2	30.4
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0.001	3.2 J	13	15	18	<0.17 UJ	<0.17	<0.17	<0.17
Ethane	0.002	<0.002	0.00045 JQ	<0.01 R	<0.002	0.00043 JQ	0.0007	<0.002	0.00039 JQ
Ethene	0.001	<0.001	<0.001	<0.005 R	<0.001	0.00088 JQ	0.0017	0.00057 JQ	0.0013
Methane	0.001	0.0021	0.99	0.48	0.41	0.017	0.033	0.012	0.034
Hydrogen by Microseeps - AM20GAX nM									
Hydrogen	0.03	NA	8	14	4.6	52	2	3.5	2.6
pH FPA 150.1 units									
pH (liquid)		8.9	NA	NA	NA	11.8	NA	NA	NA
Total Alkalinity - MCAWW 310.1 mg/L									
Total Alkalinity	5	160	160	230	160	440 J	190 J	370 JI	340 JI
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	22	6	2	2	5	4	3	3
Total Sulfide - MCAWW 376.1 mg/L									
Total Sulfide	1	1.2	<1	<1	<1	2.2	<1	<1	0.62 JQ

TABLE D-2

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

	Sample ID Sample Date	Reporting (a) Limit	Sample MWFTA-28B 10/8/2001	Sample MWFTA-28B 4/8/2002	Sample MWFTA-28B 7/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/1/2001	Sample MWFTA-29B 4/4/2002	Sample MWFTA-29B 7/30/2002	Sample MWFTA-29B 10/17/2002
Mercury - SW846 7470A (Dissolved) µg/L	Not Detected	1	<1	<1 UJ	<1	<1	<1	0 14 JQ	<1	<1
Mercury - SW846 7470A (Total) µg/L	Not Detected	1	<1	<1 UJ	<1	<1	<1	<1 UJ	<1	<1
Metals - SW846 6010B (Dissolved) µg/L										
Aluminum		200	<200	<200	116 JQ	<200	453 JB	322	340	266
Antimony		5	<5	<5	<5	<5 UJ	<5	<5	<5	<5
Arsenic		5	<5	<5	<5	<5	<5	<5	<5	<5
Barium		200	75 3 JQ	110 JQ	128 JQ	137 JQ	239	215	153 JQ	138 JQ
Beryllium		10	<10	<10	0 78 JQ	<10	0 76 JB	<10	<10	<10
Cadmium		2	<2	<2	<2	<2	<2	<2	0 41 JQ	<2
Calcium		5000	22400	34700	37100	35300	109000	101000	74800	70900
Chromium		10	<10	<10	<10	<10	1 9 JB	<10	<10	<10
Cobalt		30	<30	<30	<30	<30	<30	<30	<30	<30
Copper		10	<10	<10	<10 UI	<10	4 3 JB	<10	<10	<10
Iron		200	425	1850	2360	2210	<200	<200	<200	<200
Magnesium		5000	22400	24400	25700	23300	30 1 JB	39 5 JQ	53 JQ	<5000
Manganese		20	101	220	227	204	1 2 JB	<20	<20	<20
Molybdenum		40	<40	<40	<40	<40	9 1 JB	7 9 JQ	7 JQ	6 8 JQ
Nickel		100	<100	3 2 JQ	<100	<100	5 8 JB	4 5 JQ	4 1 JQ	3 JQ
Potassium		5000	27900	15900	13100 J	12500	91200	60500	65000	57400
Sodium		5000	42200	29000	24800	23500	72400	46800	53200	49000
Vanadium		50	<50	<50	0 77 JQ	<50	3 1 JQ	0 86 JQ	1 2 JQ	1 4 JQ
Zinc		20	47 2	14 4 JQ	<20	<20	<20	<20	<20	<20
Metals - SW846 6010B (Total) µg/L										
Aluminum		200	279	33 7 JQ	177 JQ	<200	1960 JH	1110 JH	1600 JH	1200 JH
Arsenic		5	<5	<5	<5	<5	<5	<5	<5	2 2 JB
Barium		200	89 3 JQ	111 JQ	136 JQ	141 JQ	250	212	163 JQ	136 JQ
Beryllium		10	<10	<10	0 85 JQ	<10	0 99 JB	<10	<10	<10
Cadmium		2	<2	0 28 JB	<2	<2	<2	<2	<2	<2
Calcium		5000	26500	34700	38700	36300	110000	99800	77800 JI	68000
Chromium		10	<10	<10	6 2 JQ	<10	42 1	4 3 JQ	<10	3 3 JQ
Cobalt		30	<30	<30	0 88 JB	<30	2 2 JB	<30	<30	<30
Copper		10	<10	<10	<10 UI	<10	12 JB	<10	<10	1 9 JQ
Iron		200	3130	2270	2590	2330	1970 JH	508	604 JH	600
Magnesium		5000	23800	24500	26400	23800	935 JQ	321 JQ	390 JQ	599 JQ
Manganese		20	175	222	237	209	71 3	15 3 JQ	12 4 JQ	15 7 JQ
Molybdenum		40	<40	<40	<40	<40	7 3 JQ	4 9 JQ	6 3 JQ	7 1 JQ
Nickel		100	<100	<100	<100	<100	9 7 JQ	7 8 JQ	4 JQ	3 8 JQ
Potassium		5000	25800	15800	13700 J	12800	89300	58200	67000	54400
Sodium		5000	41700	28900	25800	24100	73700	44700	54500	46200
Vanadium		50	1 1 JB	<50	<50	<50	3 8 JQ	1 3 JQ	1 1 JQ	1 4 JQ
Zinc		20	392	21 3	42 6	<20	30 5	96 9 JI	<20	<20
Thallium - SW846 7841 (Dissolved) µg/L	Not Detected	2	<2	<2 UL	<2 UI	<2	<2 UI	<2 UI	<2 UL	<2 UJ
Thallium - SW846 7841 (Total) µg/L										
Thallium		2	<2	<2 UL	1 7 JI	<2	<2 UI	<2 UI	<2 UI	<2 UI

TABLE D-2

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting (a) Limit	Sample MWFTA-28B 10/8/2001	Sample MWFTA-28B 4/8/2002	Sample MWFTA-28B 7/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/1/2001	Sample MWFTA-29B 4/4/2002	Sample MWFTA-29B 7/30/2002	Sample MWFTA-29B 10/17/2002
Volatile Organic Compounds - SW846 8260B µg/L									
1 1 1-Trichloroethane	1	<1	<1	<1	<1	<1	<1	<1	<1
1 1-Dichloroethane	1	<1	<1	<1	<1	<1	<1	<1	<1
1 1-Dichloroethene	1	<1 UJ	<1	<1	<1	<1	<1	<1	<1
1,2 Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
1 4-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
2 Butanone	10	2 JQ	0 79 R	<10	<10 R	1 8 JQ	1 9 JI	<10 UJ	<10 UJ
2 Hexanone	10	<10	<10 R	<10	<10 R	1 7 JL	<10 UI	<10 R	<10 UJ
Acetone	10	7 3 JB	4 7 R	2 6 J	<10 R	15	18 R	7 8 R	<10 UJ
Benzene	1	<1	<1	<1	<1	0 27 JQ	0 24 JQ	<1	<1
Chlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	2	<2	<2	<2	<2	<2	<2	<2	<2
Chloroform	1	0 28 JB	<1	<1	<1	<1	<1	<1	<1
Chloromethane	2	<2	<2	<2 UJ	<2	<2 JL	0 26 JQ	<2 UJ	<2
cis-1,2-Dichloroethene	0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5
Methylene chloride	1	0 52 JB	<1	<1	<1	<1	<1	<1	<1
Naphthalene	1	0 74 JQ	1 2 JB	<1 UJ	0 43 JQ	0 82 JQ	1 5	<1	<1
p Isopropyltoluene	1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	1	0 84 JQ	0 23 JQ	<1	<1	0 95 JQ	0 59 JQ	0 48 JQ	<1
trans-1 2-Dichloroethene	0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5	<0 5
Trichloroethene	1	<1	<1	<1	<1	<1	<1	<1 UJ	<1
Vinyl chloride	2	<2	<2	<2	<2	<2	<2	<2	<2
Volatile Organic Compounds - SW846 8260B, UNPRES µg/L									
1 1-Dichloroethane	1	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	1	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	10	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	0 5	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	1	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	1	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	2	NA	NA	NA	NA	NA	NA	NA	NA

TABLE D-2

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting (a) Limit	Sample PWFTA-2 10/1/2001	Sample PWFTA-2 4/4/2002	Duplicate PWFTA-2 4/4/2002	Sample PWFTA-2 Jul 2002	Sample PWFTA-2 Oct 2002
FIELD PARAMETER						
Dissolved Oxygen - E360 1 mg/L						
Dissolved Oxygen	0.1	2.7	5	5	NS	NS
Ferrous Iron - A3500D mg/L						
Ferrous Iron	0.1	<0.1	0.15	0.15	NS	NS
Oxidation Reduction Potential - A2580A mV						
Oxidation Reduction Potential	--	-36	-82	-82	NS	NS
pH - E150 1 pH Units						
pH	--	11.01	11.82	11.82	NS	NS
Specific Conductance - E120.1 mS/cm						
Specific Conductance	0.001	0.99	0.763	0.763	NS	NS
Temperature - E170 1 deg C						
Temperature	0.1	15.2	14.6	14.6	NS	NS
Turbidity - E180 1 NTU						
Turbidity	1	2	<1	<1	NS	NS
FIXED BASE LABORATORY ANALYSIS						
Anions - MCAWW 300 0A mg/L						
Chloride	1	8.6	8.9	8.7	NS	NS
Nitrate as N	0.1	<0.1	0.02 JQ	0.02 JQ	NS	NS
Sulfate	1	5.8	5.9	5.8	NS	NS
Dissolved Gases - RSK SOP-175 mg/L						
Carbon dioxide	0.001	<0.17 UJ	<0.17	<0.17	NS	NS
Ethane	0.002	<0.002	<0.002	<0.002	NS	NS
Ethene	0.001	0.002	0.0024	0.0027	NS	NS
Methane	0.001	0.16	0.23	0.25	NS	NS
Hydrogen by Microseeps - AM20GAX nM						
Hydrogen	0.03	46	170 J	110 J	NS	NS
pH EPA 150 1 units						
pH (liquid)		11.3	NA	NA	NS	NS
Total Alkalinity - MCAWW 310 1 mg/L						
Total Alkalinity	5	140	54 J	46	NS	NS
Total Organic Carbon - SW846 9060 mg/L						
Total Organic Carbon	1	<1	1 JH	1 JH	NS	NS
Total Sulfide - MCAWW 376 1 mg/L						
Total Sulfide	1	1.2	<1	<1	NS	NS

TABLE D-2

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

	Sample ID. / Sample Date:	Reporting (a) Limit	Sample PWFTA-2 10/1/2001	Sample PWFTA-2 4/4/2002	Duplicate PWFTA-2 4/4/2002	Sample PWFTA-2 Jul 2002	Sample PWFTA-2 Oct 2002
Mercury - SW846 7470A (Dissolved) µg/L							
	Not Detected	1	<1	0.14 JQ	<1	NS	NS
Mercury - SW846 7470A (Total) µg/L							
	Not Detected	1	<1	0.13 JQ	0.17 JQ	NS	NS
Metals - SW846 6010B (Dissolved) µg/L							
Aluminum		200	1200	1020	1020	NS	NS
Antimony		5	<5	<5	<5	NS	NS
Arsenic		5	<5	<5	<5	NS	NS
Barium		200	45.9 JQ	44.9 JQ	45.4 JQ	NS	NS
Beryllium		10	<10	<10	<10	NS	NS
Cadmium		2	<2	<2	<2	NS	NS
Calcium		5000	58000	52800	52900	NS	NS
Chromium		10	<10	<10	<10	NS	NS
Cobalt		30	<30	<30	<30	NS	NS
Copper		10	<10	<10	<10	NS	NS
Iron		200	<200	<200	<200	NS	NS
Magnesium		5000	<5000	<5000	<5000	NS	NS
Manganese		20	<20	<20	<20	NS	NS
Molybdenum		40	<40	<40	<40	NS	NS
Nickel		100	<100	<100	<100	NS	NS
Potassium		5000	35100	27100	27400	NS	NS
Sodium		5000	12300	10700	10600	NS	NS
Vanadium		50	2 JB	2.1 JQ	1.1 JQ	NS	NS
Zinc		20	<20	<20	<20	NS	NS
Metals - SW846 6010B (Total) µg/L							
Aluminum		200	1900 J	1030	972	NS	NS
Arsenic		5	<5	<5	<5	NS	NS
Barium		200	43.2 JQ	46.2 JQ	43.8 JQ	NS	NS
Beryllium		10	<10	<10	<10	NS	NS
Cadmium		2	<2	0.3 JQ	<2	NS	NS
Calcium		5000	54600	54800	51300	NS	NS
Chromium		10	<10	<10	<10	NS	NS
Cobalt		30	<30	<30	<30	NS	NS
Copper		10	4.2 JB	<10	<10	NS	NS
Iron		200	<200	<200	<200	NS	NS
Magnesium		5000	57.9 JB	<5000	<5000	NS	NS
Manganese		20	1.4 JB	<20	<20	NS	NS
Molybdenum		40	<40	<40	<40	NS	NS
Nickel		100	6 JB	<100	<100	NS	NS
Potassium		5000	37300	26700	25600	NS	NS
Sodium		5000	12900	10700	10100	NS	NS
Vanadium		50	2.3 JB	1.8 JQ	1.4 JQ	NS	NS
Zinc		20	<20	49.7 J	<20 UJ	NS	NS
Thallium - SW846 7841 (Dissolved) µg/L							
	Not Detected	2	<2	<2 UL	<2 UL	NS	NS
Thallium - SW846 7841 (Total) µg/L							
Thallium		2	<2	<2 UL	<2 UL	NS	NS

TABLE D-2

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting (a) Limit	Sample PWFTA-2 10/1/2001	Sample PWFTA-2 4/4/2002	Duplicate PWFTA-2 4/4/2002	Sample PWFTA-2 Jul 2002	Sample PWFTA-2 Oct. 2002
Volatile Organic Compounds - SW846 8260B µg/L						
1,1 1-Trichloroethane	1	<1	<1	<1	NS	NS
1 1-Dichloroethane	1	4	4 3	3 8	NS	NS
1 1-Dichloroethene	1	2 1	2 3	2 4	NS	NS
1 2-Dichlorobenzene	1	1 5	0 89	0 91 JQ	NS	NS
1,4-Dichlorobenzene	1	0 21 JQ	0 17	0 18 JQ	NS	NS
2-Butanone	10	<10	<10 UJ	<10 UJ	NS	NS
2-Hexanone	10	<10 UL	<10 UJ	<10 UJ	NS	NS
Acetone	10	2 7 JQ	2 3 R	1 6 R	NS	NS
Benzene	1	<1	<1	<1	NS	NS
Chlorobenzene	1	<1	<1	<1	NS	NS
Chloroethane	2	<2	<2	<2	NS	NS
Chloroform	1	<1	<1	<1	NS	NS
Chloromethane	2	<2 UJ	<2	<2	NS	NS
cis-1,2-Dichloroethene	0 5	5 3	4 6	4 4	NS	NS
Methylene chloride	1	<1	<1	<1	NS	NS
Naphthalene	1	0 82 JQ	1 4 J	<1	NS	NS
p-Isopropyltoluene	1	0 2 JQ	0 86 JQ	0 86 JQ	NS	NS
Tetrachloroethene	1	0 4 JQ	0 25 JQ	0 25 JQ	NS	NS
Toluene	1	0 31 JQ	0 24 JQ	0 2 JQ	NS	NS
trans-1,2-Dichloroethene	0 5	0 16 JQ	<0 5	0 19 JQ	NS	NS
Trichloroethene	1	5 4	6 3	6 6	NS	NS
Vinyl chloride	2	0 41 JQ	0 44 JQ	0 41 JQ	NS	NS
Volatile Organic Compounds - SW846 8260B, UNPRFS µg/L						
1 1-Dichloroethane	1	NA	NA	NA	NS	NS
1 1-Dichloroethene	1	NA	NA	NA	NS	NS
Acetone	10	NA	NA	NA	NS	NS
cis-1 2-Dichloroethene	0 5	NA	NA	NA	NS	NS
Methylene chloride	1	NA	NA	NA	NS	NS
Trichloroethene	1	NA	NA	NA	NS	NS
Vinyl chloride	2	NA	NA	NA	NS	NS

TABLE D-2

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting (a) Limit	Sample PWFTA-2 10/1/2001	Sample PWFTA-2 4/4/2002	Duplicate PWFTA-2 4/4/2002	Sample PWFTA-2 Jul 2002	Sample PWFTA-2 Oct 2002
Volatile Organic Compounds - SW846 8260B µg/L						
1,1,1 Trichloroethane	1	<1	<1	<1	NS	NS
1 1 Dichloroethane	1	4	4 3	3 8	NS	NS
1 1-Dichloroethene	1	2 1	2 3	2 4	NS	NS
1 2-Dichlorobenzene	1	1 5	0 89	0 91 JQ	NS	NS
1,4 Dichlorobenzene	1	0 21 JQ	0 17	0 18 JQ	NS	NS
2-Butanone	10	<10	<10 UJ	<10 UL	NS	NS
2-Hexanone	10	<10 UI	<10 UJ	<10 UI	NS	NS
Acetone	10	2 7 JQ	2 3 R	1 6 R	NS	NS
Benzene	1	<1	<1	<1	NS	NS
Chlorobenzene	1	<1	<1	<1	NS	NS
Chloroethane	2	<2	<2	<2	NS	NS
Chloroform	1	<1	<1	<1	NS	NS
Chloromethane	2	<2 UL	<2	<2	NS	NS
cis 1 2 Dichloroethene	0 5	5 3	4 6	4 4	NS	NS
Methylene chloride	1	<1	<1	<1	NS	NS
Naphthalene	1	0 82 JQ	1 4 J	<1	NS	NS
p-Isopropyltoluene	1	0 2 JQ	0 86 JQ	0 86 JQ	NS	NS
Tetrachloroethene	1	0 4 JQ	0 25 JQ	0 25 JQ	NS	NS
Toluene	1	0 31 JQ	0 24 JQ	0 2 JQ	NS	NS
trans-1,2 Dichloroethene	0 5	0 16 JQ	<0 5	0 19 JQ	NS	NS
Trichloroethene	1	5 4	6 3	6 6	NS	NS
Vinyl chloride	2	0 41 JQ	0 44 JQ	0 41 JQ	NS	NS
Volatile Organic Compounds - SW846 8260B, UNPRES µg/L						
1 1-Dichloroethane	1	NA	NA	NA	NS	NS
1,1-Dichloroethene	1	NA	NA	NA	NS	NS
Acetone	10	NA	NA	NA	NS	NS
cis-1,2-Dichloroethene	0 5	NA	NA	NA	NS	NS
Methylene chloride	1	NA	NA	NA	NS	NS
Trichloroethene	1	NA	NA	NA	NS	NS
Vinyl chloride	2	NA	NA	NA	NS	NS

Notes

J Estimated based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JH Estimated possibly biased high based upon QC data
JI Estimated possibly biased low based upon QC data
JQ Estimated, Value is between reporting limit and detection limit
NA Not Analyzed
NS Not Sampled
R Unusable
UJ Undetected, Reported Detection Limit is imprecise
UI Undetected, Data biased low Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/sample weight extracted and/or sample dilutions

PREPARED/DATE JAH 5/28/03
CHECKED/DATE JAV 5/28/03

TABLE D-3

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit [a]	Sample MWFTA-20 10/2/2001	Sample MWFTA-20 4/7/2002	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
FIELD PARAMETER							
Dissolved Oxygen - E360.1 mg/L							
Dissolved Oxygen	0.1	3.2	3.7	3.8	3.8	3.5	3.5
Ferrous Iron - A3500D mg/L							
Ferrous Iron	0.1	<0.1	<0.1	<0.1	<0.1	4	4
Oxidation Reduction Potential - A2580A mV							
Oxidation Reduction Potential	--	-48	104	-38	38	15	15
pH - E150.1 pH Units							
pH	--	10.4	10.64	8.77	8.77	9.41	9.41
Specific Conductance - E120.1 mS/cm							
Specific Conductance	0.001	0.157	0.147	0.156	0.156	0.215	0.215
Temperature - E170.1 deg C							
Temperature	0.1	17.7	15.6	23.2	23.2	18	18
Turbidity - E180.1 NTU							
Turbidity	1	4	<1	6	6	10	10
FIXED BASE LABORATORY ANALYSIS							
Anions - MCAWW 300.0A mg/L							
Chloride	1	3.5	3.4	4 JB	3.7 JB	3.7	3.8
Sulfate	1	4.8	4.9	4.5	4.5	4.4	4.5
Dissolved Gases - RSK SOP-175 mg/L							
Carbon dioxide	0.001	0.089 JB	0.32 JB	<0.17	<0.17	0.12 JB	0.13 JB
Ethane	0.002	<0.002	0.00032 JQ	<0.002	<0.002	<0.002	<0.002
Ethene	0.001	0.0054	0.0091	0.003	0.0032	0.01	0.011
Methane	0.001	0.013	0.023	0.0088	0.0098	0.027	0.031
Hydrogen by Microseeps - AM20GAX nM							
Hydrogen	0.03	6.1	8.1	2	2.2	2.7	2.8
pH EPA 150.1 units							
pH (liquid)		9.6	NA	NA	NA	NA	NA
Total Alkalinity - MCAWW 310.1 mg/L							
Total Alkalinity	5	72	68	81	79	74	74
Total Organic Carbon - SW846 9060 mg/L							
Total Organic Carbon	1	<1	0.5 JQ	<1	<1	<1	<1
Total Sulfide - MCAWW 376.1 mg/L							
Total Sulfide	1	<1	<1	0.97 JQ	<1	0.46 JQ	0.3 JQ

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TABLE D-3

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date	Reporting Limit [a]	Sample MWFTA-20 10/2/2001	Sample MWFTA-20 4/7/2002	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
Mercury - SW846 7470A (Dissolved) µg/L							
Not Detected	1	<1	<1 UJ	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L							
Not Detected	1	<1	<1 UJ	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L							
Aluminum	200	<200	<200	<200 UJ	90.5 JQ	<200 UJ	<200 UJ
Antimony	5	2.8 JQ	<5	<5	<5	<5	<5
Barium	200	72 JQ	74.9 JQ	66.1 JQ	67.8 JQ	68.2 JQ	65.3 JQ
Cadmium	2	<2	0.35 JB	<2	<2	<2	<2
Calcium	5000	16800	14600	10100	12400	14900	14300
Iron	200	<200	156 JQ	285 J	153 JQ	193 JQ	97.1 JQ
Magnesium	5000	2210 JQ	4380 JQ	6950	5690	4780 JQ	4640 JQ
Manganese	20	25.9	56.4	172 J	132 J	97.5	91.7
Potassium	5000	10300	8210	6410	6860	7040	6870
Sodium	5000	11600	11700	9900	10200	10500	10100
Vanadium	50	1.2 JB	<50	<50	<50	0.69 JQ	<50
Metals - SW846 6010B (Total) µg/L							
Aluminum	200	301 JB	<200	77.9 JQ	<200 UJ	<200 UJ	<200 UJ
Arsenic	5	<5	<5	<5	<5	2.2 JB	<5
Barium	200	79.5 JQ	79 JQ	68 JQ	77.5 JQ	65.8 JQ	68.2 JQ
Calcium	5000	17100	15100	11600 J	17900 J	14200	15100
Iron	200	520	190 JQ	299 J	144 JQ	281	259
Magnesium	5000	4950 JQ	4520 JQ	6100 J	2900 JQ	4540 JQ	4400 JQ
Manganese	20	139	71.3	152 J	65.8 J	96.1	91.8
Potassium	5000	9980	8370	6670	8060	6830	7180
Sodium	5000	11400	11700	10200	11500	10200	10400
Vanadium	50	1.2 JB	<50	<50	<50	<50	<50
Zinc	20	<20	<20	<20	20.8	<20	<20
Thallium - SW846 7841 (Dissolved) µg/L							
Not Detected	2	<2	<2 UI	<2 UJ	<2 UJ	<2 UI	<2 UJ
Thallium - SW846 7841 (Total) µg/L							
Thallium	2	<2	<2 UI	<2 UJ	<2 UJ	<2 UJ	<2 UJ

TABLE D-3

SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER - OCT 01, APR 02, JUL 02, AND OCT 02
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit [a]	Sample MWFTA-20 10/2/2001	Sample MWFTA-20 4/7/2002	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
Volatile Organic Compounds - SW846 8260B µg/L							
1,1,1-Trichloroethane	1	<5	0.53 JQ	<5	<3.3	<4	<4
1,1-Dichloroethane	1	20	22	19	19	15	16
1,1-Dichloroethene	1	9.3	6.1	11	9.3	7.5	7.6
Chloroform	1	0.76 JB	<3.3	<5	<3.3	<4	<4
cis-1,2-Dichloroethene	0.5	150	130	150	130	92	100
Methylene chloride	1	<5	<3.3	3.3 JB	1.1 JQ	<4	<4
Toluene	1	1.1 JQ	<3.3	<5	<3.3	<4	<4
trans-1,2-Dichloroethene	0.5	<2.5	3	<2.5	<1.7	<2	<2
Trichloroethene	1	7.4	7.8	7.4	5.8	4.8	5.1
Vinyl chloride	2	8.4 JQ	12	8.6 JQ	9.2	12	12
Volatile Organic Compounds - SW846 8260B, UNPRES µg/L							
1,1-Dichloroethane	1	NA	NA	20	NA	13	NA
1,1-Dichloroethene	1	NA	NA	11	NA	6.6	NA
cis-1,2-Dichloroethene	0.5	NA	NA	160	NA	87	NA
Methylene chloride	1	NA	NA	3.2 JB	NA	<4	NA
Trichloroethene	1	NA	NA	7.1	NA	4.2	NA
Vinyl chloride	2	NA	NA	8.6 JQ	NA	11	NA

Notes

- J Estimated, based on QC data
- JB Estimated, possibly biased high or false positive based on blank contamination
- JH Estimated, possibly biased high based upon QC data
- JL Estimated, possibly biased low based upon QC data
- JQ Estimated. Value is between reporting limit and detection limit
- NA Not Analyzed
- R Unusable
- UJ Undetected, Reported Detection Limit is imprecise
- UL Undetected. Data biased low - Reported Detection Limit is higher than indicated
- (a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method required sample volume extracted and analyzed. Sample reporting limits may vary due to sample volume/sample weight extracted and/or sample dilutions

PREPARED/DATE JAH 5-28-03
CHECKED/DATE JAV 5/28/03

TAB

Appendix E

APPENDIX E
SUMMARY OF QUALIFIED DATA FOR THE OCTOBER 2001 THROUGH OCTOBER 2002 SAMPLING EVENTS

TABLE E-1
SUMMARY OF QUALIFIED DATA
UPPER WATER BEARING UNIT
September/October 2001
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Sample ID Sample Date	Reporting Limit (a)	Sample AEHADG-10 10/5/2001	Duplicate AEHADG-10 10/5/2001	Sample DMW-13A 10/5/2001	Sample DMW-22A 10/5/2001	Sample DMW-25A 10/5/2001	Duplicate DMW-25A 10/5/2001	Sample DMW-26A 10/4/2001	Sample DMW-27A 10/5/2001
FIELD PARAMETER										
Dissolved Oxygen - E360.1 mg/L										
Dissolved Oxygen		0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ferrous Iron - A3500D mg/L										
Ferrous Iron		0.1	3.6	3.6	2.3	3.7	<0.1	<0.1	3.8	2.2
Oxidation Reduction Potential - A2580A mV										
Oxidation Reduction Potential		--	38	38	308	73	160	160	18	8
pH - E150.1 pH Units										
pH		-	5.57	5.57	3.9	5.95	5.16	5.16	5.61	4.35
Specific Conductance - E120.1 mS/cm										
Specific Conductance		0.001	0.278	0.278	0.162	0.43	0.103	0.103	0.822	0.089
Temperature - E170.1 deg C										
Temperature		0.1	20.4	20.4	21.9	16.4	18.9	18.9	23.5	22.5
Turbidity - E180.1 NTU										
Turbidity		1	26	26	1	<1	8	8	<1	2
FIXED BASE LABORATORY ANALYSIS										
Anions - MCAWW 300.3A mg/L										
Chloride		1	75.2	73.8	20.8	80.9	11.7	12.9	258	17.1
Nitrate		0.1	<0.1	<0.1	1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate		1	20.1	20.4	21.7	13.7	7.4	7.1	<1	2
Dissolved Gases - RSK SOP 175 mg/L										
Carbon dioxide		0.003	94 J	100 J	110 J	73 J	130 J	140 J	170 J	240 J
Ethane		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00038
Ethene		0.001	0.005	0.0049	<0.001	<0.001	<0.001	<0.001	<0.001	0.0031
Methane		0.001	0.023	0.023	0.0013 JB	0.22	0.013	0.012	5.4	3.7
Dissolved Hydrogen by Microseeps AM20GA nM/L										
Hydrogen		0.03	8.3	10	1.6	8.9	9.5	8.2	8.1	7.7
Total Alkalinity - MCAWW 310.1 mg/L										
Total Alkalinity		5	16	17	<5	55	23	22	33	3 JB
Total Organic Carbon - SW846 9060 mg/L										
Total Organic Carbon		1	1 JB	1 JB	0.6 JB	3	0.8 JB	0.6 JB	17	12
Total Sulfide - MCAWW 376.1 mg/L										
Total Sulfide		1	3.9 J	<1 J	<1	1.2 J	<1	<1	1.1	

TABLE E-1
SUMMARY OF QUALIFIED DATA
UPPER WATER BEARING UNIT
September/October 2001
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 10/5/2001	Duplicate AEHADG-10 10/5/2001	Sample DMW-13A 10/5/2001	Sample DMW-22A 10/5/2001	Sample DMW-25A 10/5/2001	Duplicate DMW-25A 10/5/2001	Sample DMW-26A 10/4/2001	Sample DMW-27A 10/5/2001
Mercury - SW846 7470A (Dissolved) µg/L									
Mercury	1	<1	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L									
Mercury	1	<1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L									
Aluminum	200	<200	<200	1190	<200	<200	<200	137 JQ	331
Antimony	5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	65	63 7	<5	19 7	<5	<5	<5	<5
Barium	200	132 JQ	125 JQ	109 JQ	93 8 JQ	71 9 JQ	55 3 JQ	66 2 JQ	112 JQ
Beryllium	10	0 9 JB	0 92 JB	1 1 JB	<10	<10	<10	<10	0 6 JB
Cadmium	2	<2	0 43 JB	0 88 JB	<2	<2	0 35 JB	0 37 JB	<2
Calcium	5000	5720	5800	2110 JQ	14700	2930 JQ	2470 JQ	4830 JQ	611 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	29 9 JQ	27 9 JQ	5 2 JQ	<30	12 2 JQ	11 1 JQ	<30	<30
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10
Iron	200	27200	26100	3680	5130	210	175 JQ	13600	3110
Lead	3	<3	<3	6	<3	<3	<3	<3	<3
Magnesium	5000	7880	7500	2510 JQ	11900	2330 JQ	1810 JQ	2190 JQ	1570 JQ
Manganese	20	1080	985	195	185	490	440	116	16 7 JQ
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	42 4 JQ	38 5 JQ	2 9 JQ	<100	3 8 JQ	3 2 JQ	<100	<100
Potassium	5000	6410	6230	2960 JQ	8910	4440 JQ	3960 JQ	5450	3440 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	15000	14400	6550	32700	19900	16300	151000	4640 JQ
Vanadium	50	<50	<50	<50	1 3 JB	<50	<50	2 1 JB	2 1 JB
Zinc	20	25 1	24	41 5	<20	<20	12 8 JB	<20	<20
Metals - SW846 6010B (Total) µg/L									
Aluminum	200	<200	272	1120	<200	64 5 JQ	<200	196 JQ	325
Antimony	5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	71 5	81	<5	20 1	<5	<5	<5	<5
Barium	200	134 JQ	130 JQ	115 JQ	96 JQ	58 1 JQ	55 7 JQ	62 2 JQ	108 JQ
Beryllium	10	1 JB	1 3 JB	1 1 JB	<10	<10	<10	<10	0 69 JB
Cadmium	2	<2	0 59 JB	1 1 JB	<2	<2	<2	0 31 JB	<2
Calcium	5000	5730	5920	2290 JQ	15300	2560 JQ	2460 JQ	4400 JQ	614 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	30 4	29 4 JQ	5 7 JQ	<30	12 1 JQ	11 9 JQ	<30	1 3 JB
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10
Iron	200	30500	33500	3380	5420	364	333	12800	2990
Lead	3	<3	<3	6 2	<3	<3	<3	<3	<3
Magnesium	5000	7890	7650	2700 JQ	12300	1880 JQ	1810 JQ	2050 JQ	1510 JQ
Manganese	20	1080	1010	200	192	467	455	107	16 1 JQ
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	43 1 JQ	40 6 JQ	2 8 JQ	<100	3 JQ	2 8 JQ	<100	<100
Potassium	5000	6430	6300	3070 JQ	9000	4130 JQ	4040 JQ	5210	3310 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	15100	14400	6620	33400	16600	16200	145000	4410 JQ
Vanadium	50	1 4 JB	1 6 JB	<50	1 8 JB	<50	<50	2 1 JB	2 4 JB
Zinc	20	25 2	27 4	44 2	<20	<20	<20	<20	<20
Thallium - SW846 7841 (Dissolved) µg/L									
Thallium	2	2 1 JB	<2	2 4 JB	1 9 JB	<2	<2	1 9 JB	2 2 JB
Thallium - SW846 7841 (Total) µg/L									
Thallium	2	2 2 JB	<2	2 JB	2 1 JB	<2	<2	2 JB	<2

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TABLE F-1
SUMMARY OF QUALIFIED DATA
UPPER WATER BEARING UNIT
September/October 2001
Annual Groundwater Report October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 10/5/2001	Duplicate AEHADG-10 10/5/2001	Sample DMW-13A 10/5/2001	Sample DMW-22A 10/5/2001	Sample DMW-25A 10/5/2001	Duplicate DMW-25A 10/5/2001	Sample DMW-26A 10/4/2001	Sample DMW-27A 10/5/2001
Volatile Organic Compounds - SW846 8260B µg/L									
1,1,1,2-Tetrachloroethane	1	<420	<420	<1	<1	<1	<1	<5	<1
1,1,1-Trichloroethane	1	7300	7300	<1	<1	<1	<1	<5	<1
1,1,2,2-Tetrachloroethane	1	<420 UJ	<420 UJ	<1 UJ	<1 UJ	<1 UJ	<1 UJ	<5 UJ	<1 UJ
1,1,2-Trichloroethane	1	<420	<420	<1	<1	<1	<1	<5	<1
1,1-Dichloroethane	1	86 JQ	83 JQ	<1	0.7 JQ	<1	<1	<5	<1
1,1-Dichloroethene	1	1100	1100	<1	0.66 JQ	<1	<1	<5	<1
1,1-Dichloropropene	1	<420	<420	<1	<1	<1	<1	<5	<1
1,2,3-Trichlorobenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
1,2,3-Trichloropropane	1	<420 UJ	<420 UJ	<1 UJ	<1 UJ	<1 UJ	<1 UJ	<5 UJ	<1 UJ
1,2,4-Trichlorobenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
1,2,4-Trimethylbenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
1,2-Dibromo-3-chloropropane	2	<830	<830	<2	<2	<2	<2	<10	<2
1,2-Dibromoethane	1	<420	<420	<1	<1	<1	<1	<5	<1
1,2-Dichlorobenzene	1	130 JQ	150 JQ	<1	0.62 JQ	<1	<1	<5	<1
1,2-Dichloroethane	1	<420	<420	<1	<1	<1	<1	<5	<1
1,2-Dichloropropane	1	<420	<420	<1	<1	<1	<1	<5	<1
1,3,5-Trimethylbenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
1,3-Dichlorobenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
1,3-Dichloropropane	1	<420	<420	<1	<1	<1	<1	<5	<1
1,4-Dichlorobenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
2,2-Dichloropropane	1	<420	<420	<1	<1	<1	<1	<5	<1
2-Butanone	10	<4200	<4200	<10	<10	<10	<10	<50	<10
2-Chlorotoluene	1	<420	<420	<1	<1	<1	<1	<5	<1
2-Hexanone	10	<4200 UL	<4200 UI	<10 UI	<10 UL	<10 UI	<10 UI	<50 UI	<10 UI
4-Chlorotoluene	1	<420	<420	<1	<1	<1	<1	<5	<1
4-Methyl-2-pentanone	10	<4200	<4200	<10	<10	<10	<10	<50	<10
Acetone	10	<4200	<4200	<10	<10	<10	<10	<50	0.85 JB
Benzene	1	<420	<420	<1	<1	<1	<1	<5	<1
Bromobenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
Bromochloromethane	1	<420	<420	<1	<1	<1	<1	<5	<1
Bromodichloromethane	1	<420	<420	<1	<1	<1	<1	<5	<1
Bromoform	1	<420	<420	<1	<1	<1	<1	<5	<1
Bromomethane	2	<830	<830	<2	<2	<2	<2	<10	<2
Carbon disulfide	1	<420	<420	<1	<1	<1	<1	<5	<1
Carbon tetrachloride	1	120 JQ	130 JQ	<1	<1	<1	<1	<5	<1
Chlorobenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
Chloroethane	2	<830	<830	<2	<2	<2	<2	<10	<2
Chloroform	1	130 JB	140 JB	0.36 JB	<1	<1	<1	<5	<1
Chloromethane	2	<830	<830	<2	<2	<2	<2	<10	<2
cis-1,2-Dichloroethene	0.5	880	870	<0.5	6.2	8.8	8.8	<2.5	<0.5
cis-1,3-Dichloropropene	1	<420	<420	<1	<1	<1	<1	<5	<1
Dibromochloromethane	1	<420	<420	<1	<1	<1	<1	<5	<1
Dibromomethane	1	<420	<420	<1	<1	<1	<1	<5	<1
Dichlorodifluoromethane	2	<830	<830	<2	<2	<2	<2	<10	<2
Ethylbenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
Hexachlorobutadiene	1	<420	<420	<1	<1	<1	<1	<5	<1
Isopropylbenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
m-Xylene & p-Xylene	1	<420	• <420	<1	<1	<1	<1	<5	<1
Methylene chloride	1	<420	<420	<1	<1	<1	<1	<5	<1

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TABLE E-1
SUMMARY OF QUALIFIED DATA
UPPER WATER BEARING UNIT
September/October 2001
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 10/5/2001	Duplicate AEHADG-10 10/5/2001	Sample DMW-13A 10/5/2001	Sample DMW-22A 10/5/2001	Sample DMW-25A 10/5/2001	Duplicate DMW-25A 10/5/2001	Sample DMW-26A 10/4/2001	Sample DMW-27A 10/5/2001
n-Butylbenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
n-Propylbenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
Naphthalene	1	340 JQ	<420	<1	<1	<1	<1	<5	<1
o-Xylene	0.5	<210	<210	<0.5	<0.5	<0.5	<0.5	<2.5	<0.5
p-Isopropyltoluene	1	<420	<420	<1	<1	<1	<1	<5	<1
sec-Butylbenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
Styrene	1	<420	<420	<1	<1	<1	<1	<5	<1
tert-Butylbenzene	1	<420	<420	<1	<1	<1	<1	<5	<1
Tetrachloroethene	1	3300	3300	<1	2.4	19	19	<5	<1
Toluene	1	<420	<420	<1	<1	<1	<1	<5	<1
trans-1,2-Dichloroethene	0.5	<210	<210	<0.5	<0.5	<0.5	<0.5	<2.5	<0.5
trans-1,3-Dichloropropene	1	<420	<420	<1	<1	<1	<1	<5	<1
Trichloroethene	1	14000	14000	<1	10	5.6	5.4	<5	<1
Trichlorofluoromethane	2	<830	<830	<2	<2	<2	<2	<10	<2
Vinyl chloride	2	<830	<830	<2	0.32 JQ	0.6 JQ	0.6 JQ	<10	7.7
Xylenes (total)	1	<420	<420	<1	<1	<1	<1	<5	<1
Surrogate									
1,2-Dichloroethane-d4	--	98	96	97	96	100	98	97	95
4-Bromofluorobenzene	--	83	84	90	88	85	86	88	86
Dibromofluoromethane	--	93	95	95	93	97	96	94	94
Toluene-d8	--	97	99	105	104	101	101	102	102

TABLE E-1
SUMMARY OF QUALIFIED DATA
UPPER WATER BEARING UNIT
September/October 2001
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-33A 10/8/2001	Sample DMW-35A 10/5/2001	Sample MWFOS-1 10/9/2001	Sample MWFTA-1 10/4/2001	Sample MWFTA-3 10/4/2001	Sample MWFTA-5 10/8/2001	Sample MWFTA-7 10/1/2001	Sample MWFTA-23 10/9/2001
FIELD PARAMETER									
Dissolved Oxygen - E360.1 mg/L									
Dissolved Oxygen	0.1	4.4	<0.1	0.4	<0.1	<0.1	<0.1	0.8	<0.1
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0.1	3.5	1	0.5	3.6	1.4	0.6	<0.1	4.6
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	-	74	153	57	23	49	69	389	75
pH - E150.1 pH Units									
pH	--	5.06	5.22	6.13	6.59	6.11	5.48	4.08	4.67
Specific Conductance - E120.1 mS/cm									
Specific Conductance	0.001	0.235	0.073	0.145	0.673	0.121	0.085	0.16	0.466
Temperature - E170.1 deg C									
Temperature	0.1	17.7	19	21.5	19.6	19.4	15.9	18.7	20.1
Turbidity - E180.1 NTU									
Turbidity	1	17	19	<1	1	2	12	11	107
FIXED BASE LABORATORY ANALYSIS									
Anions - MCAWW 300.3A mg/L									
Chloride	1	45.3	11.4	13	30.4	17.8	4.5	10.2	108
Nitrate	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.71	<0.1
Sulfate	1	21.6	4.1	59.3	1.2	5.3	6	29.2	0.71 JQ
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0.001	110 J	78 J	22 J	510 J	93 J	40 J	97 J	290 J
Ethane	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00048 JQ
Ethene	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.039
Methane	0.001	0.024	0.0012 JB	0.0038	4.4	0.061	0.0018	0.00085 JB	1.9
Dissolved Hydrogen by Microseeps AM20GA nM/L									
Hydrogen	0.03	9.1	8.9	8.8	1.6	7.4	7.8	8.8	13
Total Alkalinity - MCAWW 310.1 mg/L									
Total Alkalinity	5	15	10 JB	19	280	21	24	16 JB	23
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	2 JB	<1	0.6 JB	36	3	0.7 JB	1	48
Total Sulfide - MCAWW 376.1 mg/L									
Total Sulfide	1	2.8	1.1	<1	<1	<1	6.3	<1	2.3

TABLE E-1
SUMMARY OF QUALIFIED DATA
UPPER WATER BEARING UNIT
September/October 2001
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-33A 10/8/2001	Sample DMW-35A 10/5/2001	Sample MWFOS-1 10/9/2001	Sample MWFTA-1 10/4/2001	Sample MWFTA-3 10/4/2001	Sample MWFTA-5 10/8/2001	Sample MWFTA-7 10/1/2001	Sample MWFTA-23 10/9/2001
Mercury - SW846 7470A (Dissolved) µg/L									
Mercury	1	<1	<1	<1	<1 UL	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L									
Mercury	1	<1	<1	<1	<1 UJ	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L									
Aluminum	200	<200	<200	<200	163 JQ	54 JQ	<200	1340 J	178 JQ
Antimony	5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	42 7	4 2 JQ	<5	<5	92 8
Barium	200	79 2 JQ	27 3 JQ	13 7 JQ	289	34 8 JQ	20 5 JQ	62 7 JQ	582
Beryllium	10	0 85 JB	<10	<10	0 87 JB	<10	0 57 JB	2 5 JB	1 9 JB
Cadmium	2	<2	<2	<2	0 42 JB	<2	<2	<2	<2
Calcium	5000	12500	2800 JQ	18600	35200	2520 JQ	3460 JQ	5990	5820
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	<30	2 2 JB	<30	<30	5 6 JQ	11 3 JQ
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10
Iron	200	5070	1330	649	10200	1570	730	<200	61300
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	9490	2240 JQ	6670	52700	1950 JQ	2770 JQ	3270 JQ	8160
Manganese	20	137	44	56 8	822	39 8	46	41 1	499
Molybdenum	40	<40	<40	3 7 JB	<40	<40	<40	<40	<40
Nickel	100	<100	<100	<100	<100	<100	<100	4 5 JB	10 5 JQ
Potassium	5000	6200	4240 JQ	8220	10400	5320	4650 JQ	2190 JQ	6270
Selenium	5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	7010	2160 JQ	7030	15600	13900	6010	2630 JQ	7740
Vanadium	50	<50	<50	<50	1 6 JB	1 1 JB	<50	<50	1 6 JB
Zinc	20	15 2 JQ	<20	38 6 J	30 8 J	<20	<20	<20	124
Metals - SW846 6010B (Total) µg/L									
Aluminum	200	<200	<200	<200	329 JH	478	<200	1360 J	656
Antimony	5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	42 5	5 1	<5	<5	96 6
Barium	200	82 4 JQ	30 7 JQ	13 7 JQ	281	39 8 JQ	25 9 JQ	63 JQ	607
Beryllium	10	1 1 JB	<10	<10	<10	<10	<10	2 5 JB	2 1 JB
Cadmium	2	<2	<2	<2	0 37 JB	<2	<2	<2	<2
Calcium	5000	12900	3180 JQ	19800	34200	2780 JQ	3650 JQ	5930	6610
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	<30	2 JB	<30	<30	5 3 JQ	12 1 JQ
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10
Iron	200	6870	1610	702	9920	1840	1070	<200	64000
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	9610	2490 JQ	7170	51900	2190 JQ	2870 JQ	3280 JQ	8560
Manganese	20	139	48 4	60 8	807	43 7	46 8	40 5	519
Molybdenum	40	<40	<40	3 9 JB	<40	<40	<40	<40	<40
Nickel	100	<100	2 7 JQ	<100	<100	<100	<100	4 4 JB	10 4 JQ
Potassium	5000	6250	4590 JQ	8830	10100	5720	4810 JQ	2230 JQ	6570
Selenium	5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	7130	2510 JQ	7670	15000	14400	6310	2590 JQ	7960
Vanadium	50	1 JB	<50	<50	2 1 JB	1 5 JB	<50	<50	2 3 JB
Zinc	20	27	<20	<20 UJ	<20 UJ	<20	16 JQ	<20	152
Thallium - SW846 7841 (Dissolved) µg/L									
Thallium	2	<2	<2	<2	2 JB	1 8 JB	<2	<2	<2
Thallium - SW846 7841 (Total) µg/L									
Thallium	2	<2	<2	<2	2 1 JB	2 4 JB	<2	<2	2 1 JB

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TABLE E-1
SUMMARY OF QUALIFIED DATA
UPPER WATER BEARING UNIT
September/October 2001
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting Limit (a)	Sample DMW-33A 10/8/2001	Sample DMW-35A 10/5/2001	Sample MWFOS-1 10/9/2001	Sample MWFTA-1 10/4/2001	Sample MWFTA-3 10/4/2001	Sample MWFTA-5 10/8/2001	Sample MWFTA-7 10/1/2001	Sample MWFTA-23 10/9/2001
Volatile Organic Compounds - SW846 8260B µg/L									
1,1,1,2-Tetrachloroethane	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,1,1-Trichloroethane	1	1200	<1	<1	<5	<1	<1	<1	<5000
1,1,2,2-Tetrachloroethane	1	<100	<1 UJ	<1	<5 R	<1 UJ	<1	<1	<5000
1,1,2-Trichloroethane	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,1-Dichloroethane	1	170	<1	<1	<5	0.27 JQ	<1	<1	<5000
1,1-Dichloroethene	1	450 J	<1	<1 UJ	<5	0.45 JQ	<1 UJ	<1	<5000 UJ
1,1-Dichloropropene	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,2,3-Trichlorobenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,2,3-Trichloropropane	1	<100	<1 UJ	<1	<5	<1 UJ	<1	<1	<5000
1,2,4-Trichlorobenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,2,4-Trimethylbenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,2-Dibromo-3-chloropropane	2	<200	<2	<2	<10	<2	<2	<2	<10000
1,2-Dibromoethane	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,2-Dichlorobenzene	1	29 JQ	<1	<1	<5	<1	<1	<1	1300 JQ
1,2-Dichloroethane	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,2-Dichloropropane	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,3,5-Trimethylbenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,3-Dichlorobenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,3-Dichloropropane	1	<100	<1	<1	<5	<1	<1	<1	<5000
1,4-Dichlorobenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
2,2-Dichloropropane	1	<100	<1	<1	<5	<1	<1	<1	<5000
2-Butanone	10	<1000	<10	<10	<50	<10	<10	<10	<50000
2-Chlorotoluene	1	<100	<1	<1	<5	<1	<1	<1	<5000
2-Hexanone	10	<1000	<10 UJ	<10	<50 UJ	<10 UJ	<10	<10 UJ	<50000
4-Chlorotoluene	1	<100	<1	<1	<5	<1	<1	<1	<5000
4-Methyl-2-pentanone	10	<1000	<10	<10	<50	<10	<10	<10 UJ	<50000
Acetone	10	<1000	<10	<10	<50 UJ	<10	<10	<10	3600 JQ
Benzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
Bromobenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
Bromochloromethane	1	<100	<1	<1	<5	<1	<1	<1	<5000
Bromodichloromethane	1	<100	<1	<1	<5	<1	<1	<1	<5000
Bromoform	1	<100	<1	<1	<5	<1	<1	<1	<5000
Bromomethane	2	<200	<2	<2	<10	<2	<2	<2	<10000
Carbon disulfide	1	<100 R	<1	<1 R	<5	<1	<1 R	<1	<5000 R
Carbon tetrachloride	1	<100	<1	<1	<5	<1	<1	<1	<5000
Chlorobenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
Chloroethane	2	<200	<2	<2	<10	<2	<2	<2	<10000
Chloroform	1	27 JB	<1	<1	<5	<1	<1	<1	<5000
Chloromethane	2	<200	<2	<2	<10	<2	<2	<2 UJ	<10000
cis-1,2-Dichloroethene	0.5	2900	17	<0.5	<2.5	12	<0.5	<0.5	190000
cis-1,3-Dichloropropene	1	<100	<1	<1	<5	<1	<1	<1	<5000
Dibromochloromethane	1	<100	<1	<1	<5	<1	<1	<1	<5000
Dibromomethane	1	<100	<1	<1	<5	<1	<1	<1	<5000
Dichlorodifluoromethane	2	<200	<2	<2	<10	<2	<2	<2	<10000
Ethylbenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
Hexachlorobutadiene	1	<100	<1	<1	<5	<1	<1	<1	<5000
Isopropylbenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
m-Xylene & p-Xylene	1	<100	<1	<1	<5	<1	<1	<1	<5000
Methylene chloride	1	<100	<1	<1	3.9 JB	<1	<1	<1	<5000

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TABLE E-1
SUMMARY OF QUALIFIED DATA
UPPER WATER BEARING UNIT
September/October 2001
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-33A 10/8/2001	Sample DMW-35A 10/5/2001	Sample MWFOS-1 10/9/2001	Sample MWFTA-1 10/4/2001	Sample MWFTA-3 10/4/2001	Sample MWFTA-5 10/8/2001	Sample MWFTA-7 10/1/2001	Sample MWFTA-23 10/9/2001
n-Butylbenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
n-Propylbenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
Naphthalene	1	<100	<1	<1	4.6	<1	<1	<1	<5000
o-Xylene	0.5	<50	<0.5	<0.5	<2.5	<0.5	<0.5	<0.5	<2500
p-Isopropyltoluene	1	<100	<1	<1	<5	<1	<1	<1	<5000
sec-Butylbenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
Styrene	1	<100	<1	<1	<5	<1	<1	<1	<5000
tert-Butylbenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000
Tetrachloroethene	1	430	9.7	<1	<5	3	<1	<1	<5000
Toluene	1	<100	<1	<1	<5	<1	<1	<1	<5000
trans-1,2-Dichloroethene	0.5	39 JQ	<0.5	<0.5	<2.5	0.22 JQ	<0.5	<0.5	<2500
trans-1,3-Dichloropropene	1	<100	<1	<1	<5	<1	<1	<1	<5000
Trichloroethene	1	3500	3	<1	<5	8.4	<1	<1	<5000
Trichlorofluoromethane	2	<200	<2	<2	<10	<2	<2	<2 UJ	<10000
Vinyl chloride	2	33 JQ	<2	<2	<10	0.56 JQ	<2	<2	5400 JQ
Xylenes (total)	1	<100	<1	<1	<5	<1	<1	<1	<5000
Surrogate									
1,2-Dichloroethane-d4	--	93	96	88	94	96	90	93	91
4-Bromofluorobenzene	--	89	85	86	86	86	87	88	87
Dibromofluoromethane	--	96	94	92	94	94	92	92	93
Toluene-d8	--	98	100	96	102	102	95	96	97

Notes

J Estimated based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JH Estimated possibly biased high based upon QC data
JL Estimated possibly biased low based upon QC data
JQ Estimated Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected Reported Detection Limit is imprecise
UL Undetected, Data biased low Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE RMB 6/04/03
CHECKED/DATE JAH 6/05/03

TABLE E-2

SUMMARY OF QUALIFIED DATA - SEPTEMBER/OCTOBER 2001
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-29B 10/10/2001	Sample MWFTA-14 10/9/2001	Sample MWFTA-16 10/9/2001	Sample MWFTA-17 10/2/2001	Sample MWFTA-18 10/2/2001
FIELD PARAMETER						
Dissolved Oxygen - E360.1 mg/L						
Dissolved Oxygen	0.1	0.4	1.1	3.4	7	0.4
Ferrous Iron - A3500D mg/L						
Ferrous Iron	0.1	<0.1	<0.1	<0.1	<0.1	1
Oxidation Reduction Potential - A2580A mV						
Oxidation Reduction Potential	--	155	12	-165	105	-86
pH - E150.1 pH Units						
pH	--	5.24	9.82	11.13	11.93	6.89
Specific Conductance - E120.1 mS/cm						
Specific Conductance	0.001	0.061	0.439	4.93	1.75	0.125
Temperature - E170.1 deg C						
Temperature	0.1	13.1	15.6	21.5	19.6	18
Turbidity - E180.1 NTU						
Turbidity	1	13	4	46	3	9
FIXED BASE LABORATORY ANALYSIS						
Anions - MCAWW 300.3A mg/L						
Chloride	1	9.3	16.5	7.6	5.9	3.8
Nitrate	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate	1	5	29.6	7.4	7.2	0.94 JQ
Dissolved Gases - RSK SOP-175 mg/L						
Carbon dioxide	0.001	45 J	0.11 JB	<0.17 UJ	<0.17 J	7.1 J
Ethane	0.002	<0.002	<0.002	0.0015 JQ	<0.002	0.001 JQ
Ethene	0.001	<0.001	<0.001	0.011	<0.001	0.005
Methane	0.001	0.0014 JB	0.0036	0.022	0.073	0.28
Dissolved Hydrogen by Microseeps AM20GA nM/L						
Hydrogen	0.03	2.7	7.2	26	19	6.8
pH EPA 150.1 units						
pH (liquid)		6.8	9.1	11.8	11.7	7.3
Total Alkalinity - MCAWW 310.1 mg/L						
Total Alkalinity	5	24	150	480	270	60
Total Organic Carbon - SW846 9060 mg/L						
Total Organic Carbon	1	0.5 JB	2 JB	2 JB	2	2
Total Sulfide - MCAWW 376.1 mg/L						
Total Sulfide	1	1.5	<1	1.9	<1	<1

TABLE F-2

SUMMARY OF QUALIFIED DATA - SEPTEMBER/OCTOBER 2001
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-29B 10/10/2001	Sample MWFTA-14 10/9/2001	Sample MWFTA-16 10/9/2001	Sample MWFTA-17 10/2/2001	Sample MWFTA-18 10/2/2001
Mercury - SW846 7470A (Dissolved) µg/l						
Mercury	1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/l						
Mercury	1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/l						
Aluminum	200	<200	<200	<200	5340	109 JB
Antimony	5	<5	<5	<5	<5	3 JQ
Arsenic	5	<5	<5	<5	<5	<5
Barium	200	31.4 JQ	35 JQ	721	156 JQ	29.3 JQ
Beryllium	10	<10	<10	<10	<10	<10
Cadmium	2	<2	<2	<2	<2	<2
Calcium	5000	5390	5390	109000	119000	9530
Chromium	10	<10	<10	1.5 JB	<10	<10
Cobalt	30	<30	<30	<30	<30	<30
Copper	10	<10	<10	<10	<10	<10
Iron	200	215	<200	<200	<200	2400
Lead	3	<3	<3	<3	<3	<3
Magnesium	5000	4040 JQ	5150	125 JQ	<5000	6550
Manganese	20	72.9	2.7 JB	2 JB	1.2 JB	107
Molybdenum	40	<40	7.5 JB	<40	<40	<40
Nickel	100	<100	<100	<100	2.4 JB	2.9 JB
Potassium	5000	5090	56600	186000	26800	7180
Selenium	5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10
Sodium	5000	4590 JQ	52200	59300	11500	7670
Vanadium	50	<50	<50	1.6 JB	6 JQ	<50
Zinc	20	30.4 J	<20	50.8 J	<20	<20
Metals - SW846 6010B (Total) µg/L						
Aluminum	200	<200	995	70.4 JQ	5250	257 JB
Antimony	5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5
Barium	200	36.2 JQ	51.8 JQ	738	145 JQ	38.6 JQ
Beryllium	10	0.81 JB	<10	<10	<10	<10
Cadmium	2	<2	<2	<2	<2	<2
Calcium	5000	5330	8670	111000	119000	9620
Chromium	10	<10	1.6 JQ	<10	<10	<10
Cobalt	30	<30	1.4 JB	<30	<30	<30
Copper	10	<10	<10	<10	<10	<10
Iron	200	2080	905	<200	<200	2910
Lead	3	<3	<3	<3	<3	<3
Magnesium	5000	4280 JQ	8480	1930 JQ	<5000	6670
Manganese	20	78.5	19.2 JQ	12.4 JQ	<20	111
Molybdenum	40	<40	8.6 JB	<40	<40	<40
Nickel	100	<100	3.3 JQ	<100	<100	2.5 JB
Potassium	5000	5250	57300	188000	24900	7190
Selenium	5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10
Sodium	5000	4790 JQ	55900	58500	11000	7490
Vanadium	50	<50	1.2 JB	1.6 JB	5.2 JQ	<50
Zinc	20	14.2 JQ	23.4	24.8 J	<20	<20
Thallium - SW846 7841 (Dissolved) µg/L						
Thallium	2	<2	<2	2.2 J	<2	<2
Thallium - SW846 7841 (Total) µg/l						
Thallium	2	<2	<2	<2	<2	<2

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SUMMARY OF QUALIFIED DATA - SEPTEMBER/OCTOBER 2001
LOWER WATER BEARING UNIT
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Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-29B 10/10/2001	Sample MWFTA-14 10/9/2001	Sample MWFTA-16 10/9/2001	Sample MWFTA-17 10/2/2001	Sample MWFTA-18 10/2/2001
Volatile Organic Compounds - SW846 8260B µg/L						
1,1,1,2-Tetrachloroethane	1	<1	<1	<50	<1	<1
1,1,1-Trichloroethane	1	<1	<1	<50	<1	<1
1,1,2,2-Tetrachloroethane	1	<1	<1	<50	<1	<1
1,1,2-Trichloroethane	1	<1	<1	<50	<1	<1
1,1-Dichloroethane	1	<1	<1	<50	<1	<1
1,1-Dichloroethene	1	<1 UJ	<1 UJ	<50 UJ	<1	<1
1,1-Dichloropropene	1	<1	<1	<50	<1	<1
1,2,3-Trichlorobenzene	1	<1	<1	<50	<1	<1
1,2,3-Trichloropropane	1	<1	<1	<50	<1	<1
1,2,4-Trichlorobenzene	1	<1	<1	<50	<1	<1
1,2,4-Trimethylbenzene	1	<1	<1	<50	<1	<1
1,2-Dibromo-3-chloropropane	2	<2	<2	<100	<2	<2
1,2-Dibromoethane	1	<1	<1	<50	<1	<1
1,2-Dichlorobenzene	1	<1	<1	6.3 JQ	<1	<1
1,2-Dichloroethane	1	<1	<1	<50	<1	<1
1,2-Dichloropropane	1	<1	<1	<50	<1	<1
1,3,5-Trimethylbenzene	1	<1	<1	<50	<1	<1
1,3-Dichlorobenzene	1	<1	<1	<50	<1	<1
1,3-Dichloropropane	1	<1	<1	<50	<1	<1
1,4-Dichlorobenzene	1	<1	<1	<50	<1	<1
2,2-Dichloropropane	1	<1	<1	<50	<1	<1
2-Butanone	10	<10	<10	<500	<10	<10
2-Chlorotoluene	1	<1	<1	<50	<1	<1
2-Hexanone	10	<10	<10	<500	<10 UL	<10 UI
4-Chlorotoluene	1	<1	<1	<50	<1	<1
4-Methyl-2-pentanone	10	<10	<10	<500	<10 UI	<10 UI
Acetone	10	<10	<10	46 JQ	6.7 JQ	0.6 JQ
Benzene	1	<1	<1	<50	<1	<1
Bromobenzene	1	<1	<1	<50	<1	<1
Bromochloromethane	1	<1	<1	<50	<1	<1
Bromodichloromethane	1	<1	<1	<50	<1	<1
Bromoform	1	<1	<1	<50	<1	<1
Bromomethane	2	<2	<2	<100	<2	<2
Carbon disulfide	1	<1 R	<1 R	<50 R	<1	<1
Carbon tetrachloride	1	<1	<1	<50	<1	<1
Chlorobenzene	1	<1	<1	<50	<1	<1
Chloroethane	2	<2	<2	<100	<2	<2
Chloroform	1	<1	<1	<50	<1	<1
Chloromethane	2	<2	<2	<100	<2 UI	<2 UI
cis-1,2-Dichloroethene	0.5	0.25 JQ	<0.5	1200	<0.5	2.5
cis-1,3-Dichloropropene	1	<1	<1	<50	<1	<1
Dibromochloromethane	1	<1	<1	<50	<1	<1
Dibromomethane	1	<1	<1	<50	<1	<1
Dichlorodifluoromethane	2	<2	<2	<100	<2	<2
Ethylbenzene	1	<1	<1	<50	<1	<1
Hexachlorobutadiene	1	<1	<1	<50	<1	<1
Isopropylbenzene	1	<1	<1	<50	<1	<1
m-Xylene & p-Xylene	1	<1	<1	<50	<1	<1
Methylene chloride	1	<1	<1	<50	<1	<1
n-Butylbenzene	1	<1	<1	<50	<1	<1
n-Propylbenzene	1	<1	<1	<50	<1	<1
Naphthalene	1	<1	0.24 JQ	<50	0.82 JQ	<1
o-Xylene	0.5	<0.5	<0.5	<25	<0.5	<0.5
p-Isopropyltoluene	1	<1	<1	<50	<1	<1
sec-Butylbenzene	1	<1	<1	<50	<1	<1
Styrene	1	<1	<1	<50	<1	<1
tert-Butylbenzene	1	<1	<1	<50	<1	<1

TABLE F-2

SUMMARY OF QUALIFIED DATA - SEPTEMBER/OCTOBER 2001
LOWER WATER BEARING UNIT
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-29B 10/10/2001	Sample MWFTA-14 10/9/2001	Sample MWFTA-16 10/9/2001	Sample MWFTA-17 10/2/2001	Sample MWFTA-18 10/2/2001
Tetrachloroethene	1	0.32 JQ	<1	<50	<1	<1
Toluene	1	0.34 JQ	0.47 JQ	<50	0.3 JQ	0.63 JQ
trans-1,2-Dichloroethene	0.5	<0.5	<0.5	<25	<0.5	<0.5
trans-1,3-Dichloropropene	1	<1	<1	<50	<1	<1
Trichloroethene	1	0.21 JQ	<1	<50	<1	<1
Trichlorofluoromethane	2	<2	<2	<100	<2 UJ	<2 UJ
Vinyl chloride	2	<2	<2	270	<2	<2
Xylenes (total)	1	<1	<1	<50	<1	<1
Surrogate:						
1,2-Dichloroethane-d4	--	90	89	90	94	92
4-Bromofluorobenzene	--	85	85	87	89	89
Dibromofluoromethane	--	94	93	91	94	92
Toluene-d8	--	97	96	97	98	96

TABLE F-2

SUMMARY OF QUALIFIED DATA - SEPTEMBER/OCTOBER 2001
LOWER WATER BEARING UNIT
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Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 10/2/2001	Sample MWFTA-28B 10/8/2001	Sample MWFTA-29B 10/1/2001	Sample PWFTA-2 10/1/2001	Duplicate PWFTA-2 10/1/2001
FIELD PARAMETER						
Dissolved Oxygen - E360.1 mg/L						
Dissolved Oxygen	0.1	6.3	0.6	0.4	2.7	2.7
Ferrous Iron - A3500D mg/L						
Ferrous Iron	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Oxidation Reduction Potential - A2580A mV						
Oxidation Reduction Potential		-3	-124	-113	-36	36
pH - E150.1 pH Units						
pH	--	10.91	7.01	13.0	11.03	11.01
Specific Conductance - E120.1 mS/cm						
Specific Conductance	0.001	0.609	0.543	2.4	0.99	0.99
Temperature - E170.1 deg C						
Temperature	0.1	16.5	14.6	16.9	15.2	15.2
Turbidity - E180.1 NTU						
Turbidity	1	18	15	39	2	2
FIXED BASE LABORATORY ANALYSIS						
Anions - MCAWW 300.3A mg/L						
Chloride	1	6	58.6	1.5	8.6	8.6
Nitrate	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate	1	6.2	14	5.1	5.8	5.6
Dissolved Gases - RSK SOP-175 mg/L						
Carbon dioxide	0.001	<0.17 J	3.2 J	<0.17 UJ	<0.17 UJ	0.14 JB
Ethane	0.002	<0.002	<0.002	0.00043 JQ	<0.002	<0.002
Ethene	0.001	<0.001	<0.001	0.00088 JQ	0.002	0.0022
Methane	0.001	0.0034	0.0021	0.017	0.16	0.17
Dissolved Hydrogen by Microseeps AM20GA nM/L						
Hydrogen	0.03	13	NA	52	46	51
pH EPA 150.1 units						
pH (liquid)		10.9	8.9	11.8	11.3	NA
Total Alkalinity - MCAWW 310.1 mg/L						
Total Alkalinity	5	110	160	440 J	140	120
Total Organic Carbon - SW846 9060 mg/L						
Total Organic Carbon	1	<1	22	5	<1	<1
Total Sulfide - MCAWW 376.1 mg/L						
Total Sulfide	1	<1	1.2	2.2	1.2	1.2

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SUMMARY OF QUALIFIED DATA - SEPTEMBER/OCTOBER 2001
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Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 10/2/2001	Sample MWFTA-28B 10/8/2001	Sample MWFTA-29B 10/1/2001	Sample PWFTA-2 10/1/2001	Duplicate PWFTA-2 10/1/2001
Mercury - SW846 7470A (Dissolved) µg/l						
Mercury	1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/l						
Mercury	1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L						
Aluminum	200	659	<200	453 JB	1200	1220
Antimony	5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5
Barium	200	55 2 JQ	75 3 JQ	239	45 9 JQ	45 7 JQ
Beryllium	10	<10	<10	0 76 JB	<10	<10
Cadmium	2	0 3 JB	<2	<2	<2	<2
Calcium	5000	45600	22400	109000	58000	57300
Chromium	10	<10	<10	1 9 JB	<10	<10
Cobalt	30	<30	<30	<30	<30	<30
Copper	10	<10	<10	4 3 JB	<10	<10
Iron	200	<200	425	<200	<200	<200
Lead	3	<3	<3	<3	<3	<3
Magnesium	5000	37 5 JB	22400	30 1 JB	<5000	<5000
Manganese	20	<20	101	1 2 JB	<20	1 8 JB
Molybdenum	40	<40	<40	9 1 JB	<40	<40
Nickel	100	<100	<100	5 8 JB	<100	2 3 JB
Potassium	5000	10400	27900	91200	35100	36500
Selenium	5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10
Sodium	5000	5640	42200	72400	12300	12600
Vanadium	50	2 4 JB	<50	3 1 JQ	2 JB	2 3 JB
Zinc	20	<20	47 2	<20	<20	<20
Metals - SW846 6010B (Total) µg/l						
Aluminum	200	673	279	1960 JB	1900 J	1280 J
Antimony	5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5
Barium	200	54 5 JQ	89 3 JQ	250	43 2 JQ	43 8 JQ
Beryllium	10	<10	<10	0 99 JB	<10	<10
Cadmium	2	<2	<2	<2	<2	<2
Calcium	5000	45400	26500	110000	54600	54700
Chromium	10	<10	<10	42 1	<10	<10
Cobalt	30	<30	<30	2 2 JB	<30	<30
Copper	10	<10	<10	12 JB	4 2 JB	<10
Iron	200	<200	3130	1970 JB	<200	<200
Lead	3	<3	<3	<3	<3	<3
Magnesium	5000	44 8 JB	23800	935 JQ	57 9 JB	62 7 JB
Manganese	20	<20	175	71 3	1 4 JB	1 2 JB
Molybdenum	40	<40	<40	7 3 JQ	<40	<40
Nickel	100	<100	<100	9 7 JQ	6 JB	2 6 JB
Potassium	5000	10200	25800	89300	37300	37000
Selenium	5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10
Sodium	5000	5560	41700	73700	12900	12900
Vanadium	50	2 2 JB	1 1 JB	3 8 JQ	2 3 JB	2 5 JB
Zinc	20	<20	392	30 5	<20	<20
Thallium - SW846 7841 (Dissolved) µg/l						
Thallium	2	<2	<2	<2 UL	<2	<2
Thallium - SW846 7841 (Total) µg/l						
Thallium	2	<2	<2	<2 UL	<2	<2

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SUMMARY OF QUALIFIED DATA - SEPTEMBER/OCTOBER 2001
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Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 10/2/2001	Sample MWFTA-28B 10/8/2001	Sample MWFTA-29B 10/1/2001	Sample PWFTA-2 10/1/2001	Duplicate PWFTA-2 10/1/2001
Volatile Organic Compounds - SW846 8260B µg/l						
1 1 1 2-Tetrachloroethane	1	<1	<1	<1	<1	<1
1 1 1-Trichloroethane	1	<1	<1	<1	<1	<1
1 1 2 2 Tetrachloroethane	1	<1	<1	<1	<1	<1
1 1 2-Trichloroethane	1	<1	<1	<1	<1	<1
1 1 Dichloroethane	1	<1	<1	<1	4	4.1
1 1-Dichloroethene	1	<1	<1 UJ	<1	2.1	2.2
1 1 Dichloropropene	1	<1	<1	<1	<1	<1
1 2 3 Trichlorobenzene	1	<1	<1	<1	<1	<1
1 2 3-Trichloropropane	1	<1	<1	<1	<1	<1
1 2 4 Trichlorobenzene	1	<1	<1	<1	<1	<1
1 2 4-Trimethylbenzene	1	<1	<1	<1	<1	<1
1 2 Dibromo 3 chloropropane	2	<2	<2	<2	<2	<2
1 2 Dibromoethane	1	<1	<1	<1	<1	<1
1 2 Dichlorobenzene	1	<1	<1	<1	1.5	1.5
1 2-Dichloroethane	1	<1	<1	<1	<1	<1
1 2 Dichloropropane	1	<1	<1	<1	<1	<1
1 3 5-Trimethylbenzene	1	<1	<1	<1	<1	<1
1 3 Dichlorobenzene	1	<1	<1	<1	<1	<1
1,3 Dichloropropane	1	<1	<1	<1	<1	<1
1 4-Dichlorobenzene	1	<1	<1	<1	0.21 JQ	0.2 JQ
2 2-Dichloropropane	1	<1	<1	<1	<1	<1
2 Butanone	10	<10	2 JQ	1.8 JQ	<10	<10
2 Chlorotoluene	1	<1	<1	<1	<1	<1
2 Hexanone	10	<10 UI	<10	1.7 JI	<10 UL	<10 UI
4 Chlorotoluene	1	<1	<1	<1	<1	<1
4 Methyl-2 pentanone	10	<10 UI	<10	<10 UI	<10 UI	<10 UI
Acetone	10	0.78 JQ	7.3 JB	15	2.7 JQ	2.8 JQ
Benzene	1	<1	<1	0.27 JQ	<1	<1
Bromobenzene	1	<1	<1	<1	<1	<1
Bromochloromethane	1	<1	<1	<1	<1	<1
Bromodichloromethane	1	<1	<1	<1	<1	<1
Bromoform	1	<1	<1	<1	<1	<1
Bromomethane	2	<2	<2	<2	<2	<2
Carbon disulfide	1	<1	<1 R	<1	<1	<1
Carbon tetrachloride	1	<1	<1	<1	<1	<1
Chlorobenzene	1	<1	<1	<1	<1	<1
Chloroethane	2	<2	<2	<2	<2	<2
Chloroform	1	<1	0.28 JB	<1	<1	<1
Chloromethane	2	<2 UI	<2	<2 JI	<2 UI	<2 UL
cis-1 2 Dichloroethene	0.5	1.6	<0.5	<0.5	5.3	5.5
cis-1 3 Dichloropropene	1	<1	<1	<1	<1	<1
Dibromochloromethane	1	<1	<1	<1	<1	<1
Dibromomethane	1	<1	<1	<1	<1	<1
Dichlorodifluoromethane	2	<2	<2	<2	<2	<2
Ethylbenzene	1	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	<1	<1	<1	<1	<1
Isopropylbenzene	1	<1	<1	<1	<1	<1
m-Xylene & p Xylene	1	<1	<1	<1	<1	<1
Methylene chloride	1	0.44 JQ	0.52 JB	<1	<1	<1
n Butylbenzene	1	<1	<1	<1	<1	<1
n-Propylbenzene	1	<1	<1	<1	<1	<1
Naphthalene	1	<1	0.74 JQ	0.82 JQ	0.82 JQ	0.82 JQ
o-Xylene	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
p-Isopropyltoluene	1	<1	<1	<1	0.2 JQ	0.23 JQ
sec-Butylbenzene	1	<1	<1	<1	<1	<1
Styrene	1	<1	<1	<1	<1	<1
tert Butylbenzene	1	<1	<1	<1	<1	<1

TABLE F-2

SUMMARY OF QUALIFIED DATA - SEPTEMBER/OCTOBER 2001
LOWER WATER BEARING UNIT
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Operable Unit 7
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Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 10/2/2001	Sample MWFTA-28B 10/8/2001	Sample MWFTA-29B 10/1/2001	Sample PWFTA-2 10/1/2001	Duplicate PWFTA-2 10/1/2001
Tetrachloroethene	1	0.76 JQ	<1	<1	0.4 JQ	0.4 JQ
Toluene	1	0.24 JQ	0.84 JQ	0.95 JQ	0.31 JQ	0.28 JQ
trans-1,2-Dichloroethene	0.5	<0.5	<0.5	<0.5	0.16 JQ	0.18 JQ
trans-1,3-Dichloropropene	1	<1	<1	<1	<1	<1
Trichloroethene	1	0.44 JQ	<1	<1	5.4	5.5
Trichlorofluoromethane	2	<2 UJ	<2	<2 UJ	<2 UJ	<2 UJ
Vinyl chloride	2	<2	<2	<2	0.41 JQ	0.5 JQ
Xylenes (total)	1	<1	<1	<1	<1	<1
Surrogate						
1,2-Dichloroethane-d4	--	92	93	92	93	92
4-Bromofluorobenzene	-	87	88	91	89	87
Dibromofluoromethane	-	92	97	94	94	92
Toluene-d8	--	96	98	97	97	96

Notes

J Estimated based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JH Estimated, possibly biased high based upon QC data
JL Estimated, possibly biased low based upon QC data
JQ Estimated. Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected. Reported Detection Limit is imprecise
UL Undetected. Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed. Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE RMB 6/04/03
CHECKED/DATE JAH 6/05/03

TABLE E-3

SUMMARY OF QUALIFIED DATA - SEPTEMBER/OCTOBER 2001
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-20 10/2/2001
FIELD PARAMETER		
Dissolved Oxygen - E360.1 mg/L		
Dissolved Oxygen	0 1	3 2
Ferrous Iron - A3500D mg/L		
Ferrous Iron	0 1	<0 1
Oxidation Reduction Potential - A2580A mV		
Oxidation Reduction Potential	--	-48
pH - E150.1 pH Units		
pH	--	10 4
Specific Conductance - E120.1 mS/cm		
Specific Conductance	0 001	0 157
Temperature - E170.1 deg C		
Temperature	0 1	17 7
Turbidity - E180.1 NTU		
Turbidity	1	4
FIXED BASE LABORATORY ANALYSIS		
Anions - MCAWW 300.3A mg/L		
Chloride	1	3 5
Nitrate	0 1	<0 1
Sulfate	1	4 8
Dissolved Gases - RSK SOP-175 mg/L		
Carbon dioxide	0 001	0 089 JB
Ethane	0 002	<0 002
Ethene	0 001	0 0054
Methane	0 001	0 013
Dissolved Hydrogen by Microseeps AM20GA nM/L		
Hydrogen	0 03	6 1
pH EPA 150.1 units		
pH (liquid)		9 6
Total Alkalinity - MCAWW 310.1 mg/L		
Total Alkalinity	5	72
Total Organic Carbon - SW846 9060 mg/L		
Total Organic Carbon	1	<1
Total Sulfide - MCAWW 376.1 mg/L		
Total Sulfide	1	<1
Mercury - SW846 7470A (Dissolved) µg/L		
Mercury	1	<1
Mercury - SW846 7470A (Total) µg/L		
Mercury	1	<1
Metals - SW846 6010B (Dissolved) µg/L		
Aluminum	200	<200
Antimony	5	2 8 JQ
Arsenic	5	<5
Barium	200	72 JQ
Beryllium	10	<10
Cadmium	2	<2
Calcium	5000	16800
Chromium	10	<10
Cobalt	30	<30
Copper	10	<10
Iron	200	<200
Lead	3	<3
Magnesium	5000	2210 JQ
Manganese	20	25 9
Molybdenum	40	<40
Nickel	100	<100
Potassium	5000	10300
Selenium	5	<5
Silver	10	<10
Sodium	5000	11600
Vanadium	50	1 2 JB
Zinc	20	<20

TABLE E-3

SUMMARY OF QUALIFIED DATA - SEPTEMBER/OCTOBER 2001
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-20 10/2/2001
Metals - SW846 6010B (Total) ug/L		
Aluminum	200	301 JB
Antimony	5	<5
Arsenic	5	<5
Barium	200	79 5 JQ
Beryllium	10	<10
Cadmium	2	<2
Calcium	5000	17100
Chromium	10	<10
Cobalt	30	<30
Copper	10	<10
Iron	200	520
Lead	3	<3
Magnesium	5000	4950 JQ
Manganese	20	139
Molybdenum	40	<40
Nickel	100	<100
Potassium	5000	9980
Selenium	5	<5
Silver	10	<10
Sodium	5000	11400
Vanadium	50	1 2 JB
Zinc	20	<20
Thallium - SW846 7841 (Dissolved) ug/L		
Thallium	2	<2
Thallium - SW846 7841 (Total) ug/L		
Thallium	2	<2
Volatile Organic Compounds - SW846 8260B ug/L		
1,1,1,2-Tetrachloroethane	1	<5
1 1 1-Trichloroethane	1	<5
1,1 2,2-Tetrachloroethane	1	<5
1 1,2-Trichloroethane	1	<5
1 1-Dichloroethane	1	20
1,1-Dichloroethene	1	9 3
1 1-Dichloropropene	1	<5
1,2,3-Trichlorobenzene	1	<5
1 2 3-Trichloropropane	1	<5
1 2 4-Trichlorobenzene	1	<5
1,2,4 Trimethylbenzene	1	<5
1,2 Dibromo 3 chloropropane	2	<10
1,2 Dibromoethane	1	<5
1 2 Dichlorobenzene	1	<5
1 2-Dichloroethane	1	<5
1 2-Dichloropropane	1	<5
1,3,5-Trimethylbenzene	1	<5
1,3-Dichlorobenzene	1	<5
1 3 Dichloropropane	1	<5
1 4-Dichlorobenzene	1	<5
2 2-Dichloropropane	1	<5
2 Butanone	10	<50
2 Chlorotoluene	1	<5
2 Hexanone	10	<50 UL
4 Chlorotoluene	1	<5
4-Methyl 2-pentanone	10	<50 UI
Acetone	10	<50
Benzene	1	<5
Bromobenzene	1	<5
Bromochloromethane	1	<5
Bromodichloromethane	1	<5
Bromoform	1	<5
Bromomethane	2	<10
Carbon disulfide	1	<5
Carbon tetrachloride	1	<5
Chlorobenzene	1	<5
Chloroethane	2	<10
Chloroform	1	0 76 JB

TABLE E-3

SUMMARY OF QUALIFIED DATA - SEPTEMBER/OCTOBER 2001
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-20 10/2/2001
Chloromethane	2	<10 UL
cis-1,2-Dichloroethene	0 5	150
cis-1,3-Dichloropropene	1	<5
Dibromochloromethane	1	<5
Dibromomethane	1	<5
Dichlorodifluoromethane	2	<10
Ethylbenzene	1	<5
Hexachlorobutadiene	1	<5
Isopropylbenzene	1	<5
m Xylene & p-Xylene	1	<5
Methylene chloride	1	<5
n Butylbenzene	1	<5
n-Propylbenzene	1	<5
Naphthalene	1	<5
o-Xylene	0 5	<2 5
p Isopropyltoluene	1	<5
sec-Butylbenzene	1	<5
Styrene	1	<5
tert-Butylbenzene	1	<5
Tetrachloroethene	1	<5
Toluene	1	1 1 JQ
trans-1 2-Dichloroethene	0 5	<2 5
trans-1,3-Dichloropropene	1	<5
Trichloroethene	1	7 4
Trichlorofluoromethane	2	<10 UJ
Vinyl chloride	2	8 4 JQ
Xylenes (total)	1	<5
Surrogate,		
1,2-Dichloroethane-d4	--	93
4-Bromofluorobenzene	--	89
Dibromofluoromethane	--	94
Toluene-d8	--	98

Notes,

J Estimated, based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JH Estimated, possibly biased high based upon QC data
JL Estimated possibly biased low based upon QC data
JQ Estimated, Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected, Reported Detection Limit is imprecise.
UL Undetected, Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE RMB 6/04/03
CHECKED/DATE IAH 6/05/03

TABLE E-4

SUMMARY OF QUALIFIED DATA - APRIL 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 4/5/2002	Duplicate AEHADG-10 4/5/2002	Sample DMW-13A 4/7/2002	Sample DMW-22A 4/7/2002	Sample DMW-25A 4/5/2002	Sample DMW-26A 4/5/2002	Sample DMW-27A 4/4/2002	Sample DMW-33A 4/8/2002
FIELD PARAMETER									
Dissolved Oxygen - E360.1 mg/L									
Dissolved Oxygen	0.1	1.3	1.3	1.8	2.2	3	0.4	1.8	1.1
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0.1	6.2	6.2	2.6	0.4	<0.1	3.2	2	1
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	--	43	43	-335	86	231	169	386	74
pH - F150.1 pH Units									
pH	--	5.6	5.6	4.02	6.4	5.9	4.71	4.26	5.2
Specific Conductance - F120.1 mS/cm									
Specific Conductance	0.001	0.344	0.344	0.144	0.267	0.185	0.827	0.088	0.116
Temperature - F170.1 deg C									
Temperature	0.1	12.7	12.7	16.2	10.4	15.9	16.6	16.2	19.8
Turbidity - E180.1 NTU									
Turbidity	1	3	3	<1	<1	16	17	30	53
FIXED BASE LABORATORY ANALYSIS									
Anions - MCAWW 300.33 mg/L									
Chloride	1	119	120	21.3	63.1	6	210	20.4	10.5
Nitrate	0.1	<0.1	<0.1	1.1	0.54	1.5	0.29	<0.1	<0.1
Sulfate	1	18.3	18.6	23.5	14.6	36.1	53.3	2.5	21.4
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0.001	92	86	110	39	68	120	90	71
Ethane	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ethene	0.001	0.0063	0.0054	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methane	0.001	0.035	0.03	0.002	0.01	0.00059 JQ	1.8	3.6	0.15
Dissolved Hydrogen by Microseeps AM20GAX nM									
Hydrogen	0.03	1.4	1.2	1.3	0.96	1.5	1	10	0.77
Total Alkalinity - MCAWW 310.1 mg/L									
Total Alkalinity	5	13 JH	11 JH	<5	31	45	<5	2.1 JB	10 JH
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	0.9 JQ	1	0.6 JQ	2	4	4	8	2
Total Sulfide - MCAWW 376.1 mg/L									
Total Sulfide	1	<1	<1	<1	<1	<1	<1	<1	<1

TABLE E-4

SUMMARY OF QUALIFIED DATA - APRIL 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID- Sample Date	Reporting Limit (a)	Sample AEHADG-10 4/5/2002	Duplicate AEHADG-10 4/5/2002	Sample DMW-13A 4/7/2002	Sample DMW-22A 4/7/2002	Sample DMW-25A 4/5/2002	Sample DMW-26A 4/5/2002	Sample DMW-27A 4/4/2002	Sample DMW-33A 4/8/2002
Mercury - SW846 7470A (Dissolved) ug/L									
Mercury	1	<1	<1	<1 UJ	<1 UJ	<1	<1	<1	<1 UJ
Mercury - SW846 7470A (Total) ug/L									
Mercury	1	<1	<1	<1 UJ	<1 UJ	0.094 JQ	<1	<1	<1 UJ
Metals - SW846 6010B (Dissolved) ug/L									
Aluminum	200	52.1 JB	66.5 JB	1360	<200	<200 UJ	89.9 JB	398	<200
Antimony	5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	29.5	30.2	<5	<5	<5	<5	<5	<5
Barium	200	191 JQ	193 JQ	111 JQ	81.6 JQ	51.3 JQ	107 JQ	163 JQ	34.7 JQ
Beryllium	10	1.4 JQ	1.4 JQ	0.87 JQ	<10	<10	<10	0.71 JQ	<10
Cadmium	2	<2	<2	0.73 JB	<2	0.35 JB	<2	<2	<2
Calcium	5000	10200	10400	2330 JQ	13000	14800	5690	1290 JQ	5470
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	46.3	45.7	4.6 JQ	<30	<30	6.2 JQ	<30	<30
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10
Iron	200	33300	33500	3090	311	<200	5890	2700	1180
Lead	3	<3	<3	4.7	<3	<3	<3	<3	<3
Magnesium	5000	11100	11100	2460 JQ	8740	3010 JQ	3800 JQ	2050 JQ	3950 JQ
Manganese	20	1550	1540	185	37.3	5.5 JB	165	27	57.7
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	55.3 JQ	55.1 JQ	<100	4.9 JQ	<100	6.8 JB	2.3 JQ	<100
Potassium	5000	4610 JQ	4620 JQ	1980 JQ	6080	4480 JQ	4510 JQ	2540 JQ	3090 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	20000	19800	6410	26400	21300	120000	5620	5210
Vanadium	50	0.86 JQ	<50	<50	<50	<50	<50	<50	<50
Zinc	20	94.4 J	49.3 J	36.6	<20	12.6 JQ	26.1	12.3 JQ	<20
Metals - SW846 6010B (Total) ug/L									
Aluminum	200	85.3 JB	74.4 JB	1520	<200	600	140 JB	390	32.3 JQ
Antimony	5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	27.8	27.9	<5	4.8 JQ	<5	<5	<5	<5
Barium	200	185 JQ	194 JQ	115 JQ	86.3 JQ	52.7 JQ	112 JQ	158 JQ	37.2 JQ
Beryllium	10	1.4 JQ	1.4 JQ	0.97 JQ	<10	<10	<10	0.72 JQ	<10
Cadmium	2	<2	<2	0.89 JB	0.37 JB	<2	<2	<2	<2
Calcium	5000	10700	10500	2570 JQ	14400	15100	5970	1270 JQ	6050
Chromium	10	<10	<10	<10	<10	1.7 JB	<10	<10	<10
Cobalt	30	43.3	47	5.2 JQ	<30	<30	6.6 JQ	1.6 JQ	<30
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10
Iron	200	31700	33700	3720	328	500	7830	3240	1060
Lead	3	<3	<3	4.3	<3	<3	<3	<3	<3
Magnesium	5000	10600	11200	2540 JQ	9630	3060 JQ	3970 JQ	2000 JQ	4270 JQ
Manganese	20	1420	1560	196	43.7	8.1 JQ	172	26.1	63.5
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	54.8 JQ	54.8 JQ	3.7 JQ	7.2 JQ	2.4 JB	5.3 JB	2.4 JQ	<100
Potassium	5000	4630 JQ	4640 JQ	1890 JQ	6690	4470 JQ	4670 JQ	2470 JQ	3300 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	18900	19800	6980	28800	21600	125000	5490	5860
Vanadium	50	<50	<50	0.87 JQ	0.94 JQ	<50	<50	<50	<50
Zinc	20	49.7 J	51.6	47.4	17.9 JQ	14.9 JQ	25.6	<20	22.6
Thallium - SW846 7841 (Dissolved) ug/L									
Thallium	2	<2 UI	<2 UL	<2 UI	<2 UL	<2 UI	<2 UI	<2 UI	<2 UI
Thallium - SW846 7841 (Total) ug/L									
Thallium	2	<2 UI	<2 UI	<2 UI	<2 UI	<2 UI	<2 UL	<2 UI	<2 UI

TABLE E-4

SUMMARY OF QUALIFIED DATA - APRIL 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 4/5/2002	Duplicate AEHADG-10 4/5/2002	Sample DMW-13A 4/7/2002	Sample DMW-22A 4/7/2002	Sample DMW-25A 4/5/2002	Sample DMW-26A 4/5/2002	Sample DMW-27A 4/4/2002	Sample DMW-33A 4/8/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 ug/L									
PCB 1016	1	NA	NA	NA	NA	NA	NA	NA	NA
PCB 1221	1	NA	NA	NA	NA	NA	NA	NA	NA
PCB 1232	1	NA	NA	NA	NA	NA	NA	NA	NA
PCB 1242	1	NA	NA	NA	NA	NA	NA	NA	NA
PCB 1248	1	NA	NA	NA	NA	NA	NA	NA	NA
PCB 1254	1	NA	NA	NA	NA	NA	NA	NA	NA
PCB 1260	1	NA	NA	NA	NA	NA	NA	NA	NA
Surrogate - %									
Decachlorobiphenyl	--	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloro-m-xylene	--	NA	NA	NA	NA	NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) SW846 8270C ug/L									
Acenaphthene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(ghi)perylene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Surrogate - %									
2,4,6-Tribromophenol	--	NA	NA	NA	NA	NA	NA	NA	NA
2-Fluorobiphenyl	--	NA	NA	NA	NA	NA	NA	NA	NA
2-Fluorophenol	-	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene-d5	--	NA	NA	NA	NA	NA	NA	NA	NA
Phenol-d5	--	NA	NA	NA	NA	NA	NA	NA	NA
Terphenyl-d14	-	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B ug/L									
1,1,1,2-Tetrachloroethane	1	<330	<330	<1	<1	<1	<1	<1	<20
1,1,1-Trichloroethane	1	5800	4500	<1	<1	<1	<1	<1	160
1,1,2,2-Tetrachloroethane	1	<330	<330	<1	<1	<1	<1	<1	<20
1,1,2-Trichloroethane	1	<330	<330	<1	<1	<1	<1	<1	<20
1,1-Dichloroethane	1	98 JQ	74 JQ	<1	0.88 JQ	<1	<1	<1	51
1,1-Dichloroethene	1	570	510	<1	1.3	<1	<1	<1	62
1,1-Dichloropropene	1	<330	<330	<1	<1	<1	<1	<1	<20
1,2,3-Trichlorobenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
1,2,3-Trichloropropane	1	<330	<330	<1	<1	<1	<1	<1	<20
1,2,4-Trichlorobenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
1,2,4-Trimethylbenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
1,2-Dibromo-3-chloropropane	2	<670	<670	<2	<2	<2	<2	<2	<40
1,2-Dibromoethane	1	<330	<330	<1	<1	<1	<1	<1	<20
1,2-Dichlorobenzene	1	77 JQ	74 JQ	<1	0.19 JQ	<1	<1	<1	2.7 JQ

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TABLE E-4

SUMMARY OF QUALIFIED DATA - APRIL 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AFHADG-10 4/5/2002	Duplicate AEHADG-10 4/5/2002	Sample DMW-13A 4/7/2002	Sample DMW-22A 4/7/2002	Sample DMW-25A 4/5/2002	Sample DMW-26A 4/5/2002	Sample DMW-27A 4/4/2002	Sample DMW-33A 4/8/2002
1,2-Dichloroethane	1	<330	<330	<1	<1	<1	<1	<1	<20
1,2-Dichloropropane	1	<330	<330	<1	<1	<1	<1	<1	<20
1,3,5-Trimethylbenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
1,3-Dichlorobenzene	1	51 JQ	<330	<1	<1	<1	<1	<1	<20
1,3-Dichloropropane	1	<330	<330	<1	<1	<1	<1	<1	<20
1,4-Dichlorobenzene	1	<330	<330	<1	<1	<1	<1	<1	4.2 JQ
2,2-Dichloropropane	1	<330	<330	<1	<1	<1	<1	<1	<20
2-Butanone	10	<3300 UJ	<3300 R	<10 R	<10 R	<10 UJ	<10 UJ	<10 UJ	<200 UJ
2-Chlorotoluene	1	<330	<330	<1	<1	<1	<1	<1	<20
2-Hexanone	10	<3300 UJ	<3300 R	<10 R	<10 R	<10 UJ	<10 UJ	<10 UJ	<200 UJ
4-Chlorotoluene	1	<330	<330	<1	<1	<1	<1	<1	<20
4-Methyl-2-pentanone	10	<3300	<3300	<10	<10	<10	<10	<10	<200
Acetone	10	<3300 R	840 R	1.7 R	1.7 R	<10 R	<10 R	<10 R	<200 R
Benzene	1	<330	<330	<1	<1	<1	<1	<1	<20
Bromobenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
Bromochloromethane	1	<330	<330	<1	<1	<1	<1	<1	<20
Bromodichloromethane	1	<330	<330	<1	<1	<1	<1	<1	<20
Bromoform	1	<330	<330	<1	<1	<1	<1	<1	<20
Bromomethane	2	<670 UJ	<670	<2	<2	<2 UJ	<2 UJ	<2 UJ	<40 UJ
Carbon disulfide	1	<330	<330	<1	<1	<1	<1	<1	<20
Carbon tetrachloride	1	59 JQ	63 JQ	<1	<1	<1	<1	<1	<20
Chlorobenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
Chloroethane	2	<670	<670	<2	<2	<2	<2	<2	<40
Chloroform	1	89 JQ	65 JQ	<1	<1	<1	<1	<1	5.9 JQ
Chloromethane	2	<670	<670	<2	<2	<2	<2	<2	<40
cis-1,2-Dichloroethene	0.5	1000	990	<0.5	6.7	1.2	<0.5	<0.5	690
cis-1,3-Dichloropropene	1	<330	<330	<1	<1	<1	<1	<1	<20
Dibromochloromethane	1	<330	<330	<1	<1	<1	<1	<1	<20
Dibromomethane	1	<330	<330	<1	<1	<1	<1	<1	<20
Dichlorodifluoromethane	2	<670	<670	<2	<2	<2	<2	<2	<40
Ethylbenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
Hexachlorobutadiene	1	<330	<330	<1	<1	<1	<1	<1	<20
Isopropylbenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
m-Xylene & p-Xylene	1	110 JQ	<330	<1	<1	<1	<1	<1	<20
Methylene chloride	1	<330	<330	<1	<1	<1	<1	<1	<20
n-Butylbenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
n-Propylbenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
Naphthalene	1	<330 UJ	<330	<1	<1	<1 UJ	<1 UJ	<1	<20 UJ
o-Xylene	0.5	<170	<170	<0.5	<0.5	<0.5	<0.5	<0.5	<10
p-Isopropyltoluene	1	<330	<330	<1	<1	<1	<1	<1	<20
sec-Butylbenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
Styrene	1	<330	<330	<1	<1	<1	<1	<1	<20
tert-Butylbenzene	1	<330	<330	<1	<1	<1	<1	<1	<20
Tetrachloroethene	1	1200	1200	<1	4.3	5	<1	<1	140
Toluene	1	<330	<330	<1	<1	<1	<1	<1	<20
trans-1,2-Dichloroethene	0.5	<170	<170	<0.5	<0.5	<0.5	<0.5	<0.5	7.3 JQ
trans-1,3-Dichloropropene	1	<330	<330	<1	<1	<1	<1	<1	<20
Trichloroethene	1	9000	8600	<1	20	0.74 JQ	<1	<1	780
Trichlorofluoromethane	2	<670	<670	<2	<2	<2	<2	<2	<40
Vinyl chloride	2	<670	<670	<2	<2	<2	<2	<2	7.7 JQ
Xylenes (total)	1	<330	<330	<1	<1	<1	<1	<1	<20

TABLE E-4

SUMMARY OF QUALIFIED DATA - APRIL 2002
UPPER WATER BEARING UNIT
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 4/5/2002	Duplicate AEHADG-10 4/5/2002	Sample DMW-13A 4/7/2002	Sample DMW-22A 4/7/2002	Sample DMW-25A 4/5/2002	Sample DMW-26A 4/5/2002	Sample DMW-27A 4/4/2002	Sample DMW-33A 4/8/2002
Surrogate - %									
1,2-Dichloroethane-d4	--	127	99	99	97	125	126	103	127
4-Bromofluorobenzene	-	76	98	94	94	76	76	74	78
Dibromofluoromethane	-	120	104	104	101	117	116	100	118
Toluene-d8	--	99	103	100	100	92	91	93	97

TABLE E-4

SUMMARY OF QUALIFIED DATA - APRIL 2002
UPPER WATER BEARING UNIT
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-35A 4/5/2002	Sample MWFOS-1 4/5/2002	Sample MWFTA-1 4/4/2002	Sample MWFTA-3 4/4/2002	Duplicate MWFTA-3 4/4/2002	Sample MWFTA-5 4/8/2002	Sample MWFTA-7 4/7/2002	Sample MWFTA-23 4/5/2002
FIELD PARAMETER									
Dissolved Oxygen - E360 1 mg/L									
Dissolved Oxygen	0.1	6.2	0.4	1.2	0.7	0.7	0.5	3.7	0.5
Ferrous Iron - A3500D mg/L									
Ferrous Iron	0.1	0.1	0.4	2.6	<0.1	<0.1	0.7	<0.1	3.4
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential	-	298	15	-23	-96	96	115	438	73
pH - F150 1 pH Units									
pH	-	5.3	6.38	5.81	5.6	5.6	5.13	3.8	5.33
Specific Conductance - E120 1 mS/cm									
Specific Conductance	0.001	0.074	0.347	0.686	0.394	0.394	0.065	0.091	0.152
Temperature - E170 1 deg C									
Temperature	0.1	14.2	19.2	14.8	12.3	12.3	11.9	11.2	15.9
Turbidity - F180 1 NTU									
Turbidity	1	<1	<1	8	14	14	36	<1	7
FIXED BASE LABORATORY ANALYSIS									
Anions - MCAWW 300.3A mg/L									
Chloride	1	11.6	16.8	34.3	103	104	4.8	5	33.6
Nitrate	0.1	<0.1	<0.1	0.02 JQ	0.02 JQ	0.02 JQ	<0.1	0.08 JQ	0.02 JQ
Sulfate	1	4.7	114	0.54 JQ	31.3	31.3	7	29.8	2.3
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide	0.001	53	9.1	280	14 J	38 J	39	64	150
Ethane	0.002	<0.002	<0.002	<0.002	0.00046 JQ	0.00059 JQ	<0.002	<0.002	0.00061 JQ
Ethene	0.001	<0.001	<0.001	<0.001	0.0014	0.0014	<0.001	<0.001	0.028
Methane	0.001	0.00063 JQ	0.00092 JQ	5.2	0.37	0.42	0.0029	0.001	0.84
Dissolved Hydrogen by Microseeps AM20GAX nM									
Hydrogen	0.03	1.5	1.3	11	17	14	0.98	5.6	1.9
Total Alkalinity - MCAWW 310 1 mg/L									
Total Alkalinity	5	9 J	19 JH	270	15 JH	16 JH	20 JH	2.6 JB	22
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon	1	<1	0.6 JQ	37	10	10	0.4 JQ	2	8
Total Sulfide - MCAWW 376 1 mg/L									
Total Sulfide	1	<1	<1	<1	<1	<1	<1	<1	<1

TABLE E-4

SUMMARY OF QUALIFIED DATA - APRIL 2002
UPPER WATER BEARING UNIT
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID. / Sample Date	Reporting Limit (a)	Sample DMW-35A 4/5/2002	Sample MWFOS-1 4/5/2002	Sample MWFTA-1 4/4/2002	Sample MWFTA-3 4/4/2002	Duplicate MWFTA-3 4/4/2002	Sample MWFTA-5 4/8/2002	Sample MWFTA-7 4/7/2002	Sample MWFTA-23 4/5/2002
Mercury - SW846 7470A (Dissolved) ug/L									
Mercury	1	<1	<1	<1 UJ	<1	<1	<1 UJ	<1 UJ	<1
Mercury - SW846 7470A (Total) ug/L									
Mercury	1	<1	<1	0.11 JB	<1	<1	<1 UJ	0.14 JB	<1
Metals - SW846 6010B (Dissolved) ug/L									
Aluminum	200	<200 UJ	<200 UJ	219	204	202	<200	841	64.6 JB
Antimony	5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	36.8	12.9	12.2	<5	<5	48.6
Barium	200	30.3 JQ	25.9 JQ	223	76 JQ	77.6 JQ	19.7 JQ	71.4 JQ	194 JQ
Beryllium	10	<10	<10	<10	<10	<10	<10	1.6 JQ	<10
Cadmium	2	<2	<2	<2	<2	<2	<2	0.38 JB	<2
Calcium	5000	3400 JQ	34200	34200	5710	5780	3310 JQ	5160	2680 JQ
Chromium	10	<10	<10	1.6 JQ	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	2 JQ	<30	<30	<30	3.9 JQ	4.5 JQ
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10
Iron	200	131 JQ	517	9010	3590	3650	695	<200	23600
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	2370 JQ	10200	52000	3580 JQ	3650 JQ	2600 JQ	2110 JQ	3080 JQ
Manganese	20	46.8	47	871	89.2	90.6	44.2	23.9	151
Molybdenum	40	<40	14.7 JQ	<40	<40	<40	<40	<40	<40
Nickel	100	6.5 JB	<100	<100	<100	4.5 JQ	<100	3 JQ	6.5 JB
Potassium	5000	3370 JQ	8810	6970	4020 JQ	4130 JQ	3640 JQ	2690 JQ	3710 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	2930 JQ	11600	13500	51500	52500	6440	1590 JQ	4440 JQ
Vanadium	50	<50	<50	1.2 JQ	<50	<50	<50	<50	1.2 JQ
Zinc	20	<20	<20	<20	<20	<20	<20	<20	18.9 JQ
Metals - SW846 6010B (Total) ug/L									
Aluminum	200	<200 UJ	<200 UJ	309 JB	260	277	31.9 JQ	857	213
Antimony	5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	39.9	17.5	18	<5	<5	49.3
Barium	200	32.8 JQ	24.8 JQ	239	86.4 JQ	92.2 JQ	23.6 JQ	73.3 JQ	196 JQ
Beryllium	10	<10	<10	<10	<10	<10	0.68 JQ	1.8 JQ	0.57 JQ
Cadmium	2	<2	<2	<2	<2	<2	0.39 JB	<2	<2
Calcium	5000	3500 JQ	32500	36000	6430	6800	3390 JQ	5220	2690 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	1.5 JQ	<30	<30	<30	4.3 JQ	4.8 JQ
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10
Iron	200	177 JQ	542	9600	4040	4200	901	<200	24300
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	2510 JQ	9710	54300	3970 JQ	4230 JQ	2750 JQ	2150 JQ	3080 JQ
Manganese	20	50.2	46.1	912	101	106	47.2	24.2	152
Molybdenum	40	<40	14.5 JQ	<40	<40	<40	<40	<40	<40
Nickel	100	5.2 JB	2.7 JB	<100	3.1 JQ	3.8 JQ	<100	3.4 JQ	3.1 JB
Potassium	5000	3550 JQ	8350	7510	4150 JQ	4310 JQ	3770 JQ	2730 JQ	3640 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	2960 JQ	11000	14600	58600	62000	6460	1540 JQ	4550 JQ
Vanadium	50	<50	<50	1.4 JQ	<50	1.1 JQ	<50	<50	1.4 JQ
Zinc	20	<20	<20	<20	<20	<20	<20	18.7 JQ	24.8
Thallium - SW846 7841 (Dissolved) ug/L									
Thallium	2	<2 UI	<2 UI	<2 UI	<2 UL	<2 UI	<2 UI	<2 UI	<2 UI
Thallium - SW846 7841 (Total) ug/L									
Thallium	2	<2 UI	<2 UI	<2 UI	<2 UI	<2 UI	<2 UI	<2 UI	<2 UI

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TABLE F-4

SUMMARY OF QUALIFIED DATA - APRIL 2002
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Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-35A 4/5/2002	Sample MWFOS-1 4/5/2002	Sample MWFTA-1 4/4/2002	Sample MWFTA-3 4/4/2002	Duplicate MWFTA-3 4/4/2002	Sample MWFTA-5 4/8/2002	Sample MWFTA-7 4/7/2002	Sample MWFTA-23 4/5/2002
Polychlorinated Biphenyls (PCBs) SW846 8082 ug/L									
PCB 1016	1	NA	NA	<1	<1	<1	NA	NA	NA
PCB-1221	1	NA	NA	<1	<1	<1	NA	NA	NA
PCB 1232	1	NA	NA	<1	<1	<1	NA	NA	NA
PCB 1242	1	NA	NA	<1	<1	<1	NA	NA	NA
PCB 1248	1	NA	NA	<1	<1	<1	NA	NA	NA
PCB 1254	1	NA	NA	<1	<1	<1	NA	NA	NA
PCB 1260	1	NA	NA	<1	<1	<1	NA	NA	NA
Surrogate - %									
Decachlorobiphenyl	--	NA	NA	18	64	54	NA	NA	NA
Tetrachloro-m xylene	--	NA	NA	46	76	71	NA	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs) SW846 8270C ug/L									
Acenaphthene	0.2	NA	NA	0.073 JQ	<0.2	<0.2	NA	NA	NA
Acenaphthylene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Anthracene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Benzo(a)anthracene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Benzo(a)pyrene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Benzo(b)fluoranthene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Benzo(ghi)perylene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Benzo(k)fluoranthene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Carbazole	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Chrysene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Dibenz(a h)anthracene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Fluoranthene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Fluorene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Indeno(1 2 3 cd)pyrene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Naphthalene	0.2	NA	NA	2.5	<0.2	<0.2	NA	NA	NA
Phenanthrene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Pyrene	0.2	NA	NA	<0.2	<0.2	<0.2	NA	NA	NA
Surrogate - %									
2 4 6-Tribromophenol	--	NA	NA	120	151	99	NA	NA	NA
2 Fluorobiphenyl	--	NA	NA	72	114	73	NA	NA	NA
2 Fluorophenol	--	NA	NA	83	126	78	NA	NA	NA
Nitrobenzene-d5	--	NA	NA	94	132	85	NA	NA	NA
Phenol-d5	--	NA	NA	92	129	80	NA	NA	NA
Terphenyl d14		NA	NA	64	121	71	NA	NA	NA
Volatile Organic Compounds SW846 8260B ug/L									
1 1 1 2 Tetrachloroethane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1 1 1 Trichloroethane	1	0.89 JQ	<1	<1	<3.3	<3.3	<1	<1	<1200
1 1 2 2 Tetrachloroethane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1 1 2 Trichloroethane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1 1 Dichloroethane	1	0.43 JQ	<1	0.78 JQ	1.3 JQ	1.1 JQ	<1	<1	<1200
1 1-Dichloroethene	1	1.6	<1	<1	<3.3	<3.3	<1	<1	<1200
1 1-Dichloropropene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1 2 3 Trichlorobenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1 2 3 Trichloropropane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1 2 4 Trichlorobenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1 2 4 Trimethylbenzene	1	<1	<1	0.13 JQ	<3.3	<3.3	<1	<1	<1200
1 2-Dibromo-3-chloropropane	2	<2	<2	<2	<6.7	<6.7	<2	<2	<2500
1 2 Dibromoethane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1 2 Dichlorobenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	270 JQ

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TABLE E-4

SUMMARY OF QUALIFIED DATA - APRIL 2002
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Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-35A 4/5/2002	Sample MWFOS-1 4/5/2002	Sample MWFTA-1 4/4/2002	Sample MWFTA-3 4/4/2002	Duplicate MWFTA-3 4/4/2002	Sample MWFTA-5 4/8/2002	Sample MWFTA-7 4/7/2002	Sample MWFTA-23 4/5/2002
1,2-Dichloroethane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1,2-Dichloropropane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1,3,5-Trimethylbenzene	1	<1	<1	0.17 JQ	<3.3	<3.3	<1	<1	<1200
1,3-Dichlorobenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1,3-Dichloropropane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
1,4-Dichlorobenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
2,2-Dichloropropane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
2-Butanone	10	<10 UJ	<10 UJ	<10 UJ	<33 R	<33 R	<10 R	<10 R	<12000 UJ
2-Chlorotoluene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
2-Hexanone	10	<10 UJ	<10 UJ	<10 UJ	<33 UJ	<33 UJ	<10 R	<10 R	<12000 UJ
4-Chlorotoluene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
4-Methyl-2-pentanone	10	<10	<10	<10	<33	<33	<10	<10	<12000
Acetone	10	<10 R	<10 R	<10 R	<33 R	<33 R	1.8 R	2.1 R	<12000 R
Benzene	1	<1	<1	0.18 JQ	<3.3	<3.3	<1	<1	<1200
Bromobenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Bromochloromethane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Bromodichloromethane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Bromoform	1	<1	<1	<1	<3.3	<3.3 UJ	<1	<1	<1200
Bromomethane	2	<2 UJ	<2 UJ	<2 UJ	<6.7 R	<6.7 R	<2	<2	<2500 UJ
Carbon disulfide	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Carbon tetrachloride	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Chlorobenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Chloroethane	2	<2	<2	<2	<6.7	<6.7	<2	<2	<2500
Chloroform	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Chloromethane	2	<2	<2	<2	<6.7 UJ	<6.7 UJ	<2	<2	<2500
cis-1,2-Dichloroethene	0.5	9.1	<0.5	0.64	100	94	<0.5	<0.5	34000
cis-1,3-Dichloropropene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Dibromochloromethane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Dibromomethane	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Dichlorodifluoromethane	2	<2	<2	<2	<6.7	<6.7	<2	<2	<2500
Ethylbenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Hexachlorobutadiene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Isopropylbenzene	1	<1	<1	1.1	<3.3	<3.3	<1	<1	<1200
m-Xylene & p-Xylene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Methylene chloride	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
n-Butylbenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
n-Propylbenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Naphthalene	1	<1 UJ	<1 UJ	3.6	<3.3	<3.3	<1	<1	<1200 UJ
o-Xylene	0.5	<0.5	<0.5	<0.5	<1.7	<1.7	<0.5	<0.5	<620
p-Isopropyltoluene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
sec-Butylbenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Styrene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
tert-Butylbenzene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Tetrachloroethene	1	15	<1	<1	<3.3	<3.3	<1	<1	<1200
Toluene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
trans-1,2-Dichloroethene	0.5	<0.5	<0.5	<0.5	4.4	4.2	<0.5	<0.5	<620
trans-1,3-Dichloropropene	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200
Trichloroethene	1	33	<1	<1	1.6 JQ	1.1 JQ	<1	<1	240 JQ
Trichlorofluoromethane	2	<2	<2	<2	<6.7	<6.7	<2	<2	<2500
Vinyl chloride	2	<2	<2	<2	14	13	<2	<2	2600
Xylenes (total)	1	<1	<1	<1	<3.3	<3.3	<1	<1	<1200

TABLE E-4

SUMMARY OF QUALIFIED DATA - APRIL 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting Limit (a)	Sample DMW-35A 4/5/2002	Sample MWFOS-1 4/5/2002	Sample MWFTA-1 4/4/2002	Sample MWFTA-3 4/4/2002	Duplicate MWFTA-3 4/4/2002	Sample MWFTA-5 4/8/2002	Sample MWFTA-7 4/7/2002	Sample MWFTA-23 4/5/2002
Surrogate - %									
1,2-Dichloroethane-d4	--	123	126	100	114	114	99	102	126
4-Bromofluorobenzene	--	76	79	77	74	75	98	96	82
Dibromofluoromethane	--	119	117	95	116	113	105	105	120
Toluene-d8	--	91	94	94	97	97	99	101	97

Notes

J Estimated: based on QC data
JB Estimated: possibly biased high or false positive based on blank contamination
JH Estimated: possibly biased high based upon QC data
JL Estimated: possibly biased low based upon QC data
JQ Estimated, Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected, Reported Detection Limit is imprecise
UL Undetected: Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method required sample volume extracted and analyzed. Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE: RMB 6/04/03
CHECKED/DATE: JAH 6/05/03

TABLE E-5

SUMMARY OF QUALIFIED DATA - APRIL 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-29B 4/7/2002	Sample MWFTA-14 4/8/2002	Sample MWFTA-16 4/5/2002	Sample MWFTA-17 4/5/2002	Sample MWFTA-18 4/4/2002
FIELD PARAMETER						
Dissolved Oxygen - E360.1 mg/L						
Dissolved Oxygen	0.1	1.3	2.8	2.5	8.2	0.8
Ferrous Iron - A3500D mg/L						
Ferrous Iron	0.1	0.2	<0.1	<0.1	NA	0.6
Oxidation Reduction Potential - A2580A mV						
Oxidation Reduction Potential	--	248	115	120	-50	-80
pH - E150.1 pH Units						
pH	--	5.68	10.71	12.5	11.94	6.86
Specific Conductance - E120.1 mS/cm						
Specific Conductance	0.001	0.093	0.382	5.96	1.73	0.172
Temperature - E170.1 deg C						
Temperature	0.1	17.7	12.9	15.4	16.8	17.9
Turbidity - E180.1 NTU						
Turbidity	1	6	<1	15	2	34
FIXED BASE LABORATORY ANALYSIS						
Anions - MCAWW 300.3A mg/L						
Chloride	1	9.4	12.5	6.4	6.3	4.3
Nitrate	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate	1	5.8	20.1	5.4	8.6	1
Dissolved Gases - RSK SOP-175 mg/L						
Carbon dioxide	0.001	39	<0.17	<0.17	<0.17	19
Ethane	0.002	<0.002	<0.002	0.0074	<0.002	0.0011 JQ
Ethene	0.001	<0.001	<0.001	0.08	0.00045 JQ	0.003
Methane	0.001	0.0043	0.0019	0.097	0.12	0.37
Dissolved Hydrogen by Microseeps AM20GAX nM						
Hydrogen	0.03	6.7	8.2	36	9.7	9.8
Total Alkalinity - MCAWW 310.1 mg/L						
Total Alkalinity	5	22	160	700	190	68
Total Organic Carbon - SW846 9060 mg/L						
Total Organic Carbon	1	<1	0.9 JQ	1	2	2 JH
Total Sulfide - MCAWW 376.1 mg/L						
Total Sulfide	1	<1	<1	<1	<1	<1

TABLE E 5

SUMMARY OF QUALIFIED DATA - APRIL 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-29B 4/7/2002	Sample MWFTA-14 4/8/2002	Sample MWFTA-16 4/5/2002	Sample MWFTA-17 4/5/2002	Sample MWFTA-18 4/4/2002
Mercury - SW846 7470A (Dissolved) ug/L						
Mercury	1	<1 UJ	<1 UJ	<1	<1	<1
Mercury - SW846 7470A (Total) ug/L						
Mercury	1	<1 UJ	<1 UJ	0.1 JQ	<1	0.091 JQ
Metals - SW846 6010B (Dissolved) ug/L						
Aluminum	200	<200	<200	<200 UJ	5380	<200 UJ
Antimony	5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5
Barium	200	23.6 JQ	29.7 JQ	1190	129 JQ	31 JQ
Beryllium	10	<10	<10	<10	<10	<10
Cadmium	2	0.35 JB	<2	0.39 JQ	<2	<2
Calcium	5000	4300 JQ	5700	182000	107000	14800
Chromium	10	<10	<10	2.4 JB	<10	<10
Cobalt	30	<30	<30	<30	<30	<30
Copper	10	<10	<10	<10	<10	<10
Iron	200	321	<200	<200	<200	932
Lead	3	<3	<3	<3	<3	<3
Magnesium	5000	3190 JQ	4480 JQ	731 JB	<5000	5800
Manganese	20	48.5	<20	<20	<20	78.8
Molybdenum	40	<40	7.1 JQ	<40	<40	<40
Nickel	100	<100	<100	<100	<100	<100
Potassium	5000	4280 JQ	69500	186000	19900	5330
Selenium	5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10
Sodium	5000	5070	51000	46600	11500	7370
Vanadium	50	<50	<50	<50	6.1 JQ	<50
Zinc	20	<20	<20	<20	<20	<20
Metals - SW846 6010B (Total) ug/L						
Aluminum	200	<200	51.2 JQ	62.6 JB	5580	107 JQ
Antimony	5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5
Barium	200	23.8 JQ	31.3 JQ	1320	133 JQ	50.7 JQ
Beryllium	10	<10	<10	<10	<10	<10
Cadmium	2	0.35 JB	<2	<2	<2	<2
Calcium	5000	4330 JQ	5870	201000	110000	15600
Chromium	10	<10	<10	1.7 JB	<10	<10
Cobalt	30	<30	<30	<30	<30	<30
Copper	10	<10	<10	<10	<10	<10
Iron	200	420	<200	<200	<200	1970
Lead	3	<3	<3	<3	<3	<3
Magnesium	5000	3210 JQ	4800 JQ	1870 JQ	<5000	5950
Manganese	20	48.7	1.7 JQ	21.6	<20	84
Molybdenum	40	<40	7.9 JQ	<40	<40	<40
Nickel	100	<100	<100	<100	<100	3.4 JQ
Potassium	5000	4350 JQ	71400	205000	20300	5400
Selenium	5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10
Sodium	5000	5290	52000	50600	11400	7470
Vanadium	50	<50	<50	<50	6 JQ	<50
Zinc	20	<20	<20	<20	<20	19.3 JQ
Thallium - SW846 7841 (Dissolved) ug/L						
Thallium	2	<2 UL	<2 UL	<2 UJ	<2 UJ	<2 UJ

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TABLE E-5

SUMMARY OF QUALIFIED DATA - APRIL 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-29B 4/7/2002	Sample MWFTA-14 4/8/2002	Sample MWFTA-16 4/5/2002	Sample MWFTA-17 4/5/2002	Sample MWFTA-18 4/4/2002
Thallium - SW846 7841 (Total) ug/L						
Thallium	2	<2 UJ	<2 UL	<2 UJ	<2 UJ	<2 UJ
Volatile Organic Compounds - SW846 8260B ug/L						
1,1,1,2-Tetrachloroethane	1	<1	<1	<33	<1	<1
1,1,1-Trichloroethane	1	<1	<1	<33	<1	<1
1,1,2,2-Tetrachloroethane	1	<1	<1	<33	<1	<1
1,1,2-Trichloroethane	1	<1	<1	<33	<1	<1
1,1-Dichloroethane	1	<1	<1	<33	<1	<1
1,1-Dichloroethene	1	<1	<1	<33	<1	<1
1,1-Dichloropropene	1	<1	<1	<33	<1	<1
1,2,3-Trichlorobenzene	1	<1	<1	<33	<1	<1
1,2,3-Trichloropropane	1	<1	<1	<33	<1	<1
1,2,4-Trichlorobenzene	1	<1	<1	<33	<1	<1
1,2,4-Trimethylbenzene	1	<1	<1	<33	<1	<1
1,2-Dibromo-3-chloropropane	2	<2	<2	<67	<2	<2
1,2-Dibromoethane	1	<1	<1	<33	<1	<1
1,2-Dichlorobenzene	1	<1	<1	<33	<1	<1
1,2-Dichloroethane	1	<1	<1	<33	<1	<1
1,2-Dichloropropane	1	<1	<1	<33	<1	<1
1,3,5-Trimethylbenzene	1	<1	<1	<33	<1	<1
1,3-Dichlorobenzene	1	<1	<1	<33	<1	<1
1,3-Dichloropropane	1	<1	<1	<33	<1	<1
1,4-Dichlorobenzene	1	<1	<1	<33	<1	<1
2,2-Dichloropropane	1	<1	<1	<33	<1	<1
2-Butanone	10	<10 R	<10 R	<330 UJ	<10 R	<10 UJ
2-Chlorotoluene	1	<1	<1	<33	<1	<1
2-Hexanone	10	<10 R	<10 R	<330 UJ	<10 R	<10 UJ
4-Chlorotoluene	1	<1	<1	<33	<1	<1
4-Methyl-2-pentanone	10	<10	<10	<330	<10	<10
Acetone	10	2.1 R	2.1 R	<330 R	2.6 R	<10 R
Benzene	1	<1	<1	<33	<1	<1
Bromobenzene	1	<1	<1	<33	<1	<1
Bromochloromethane	1	<1	<1	<33	<1	<1
Bromodichloromethane	1	<1	<1	<33	<1	<1
Bromoform	1	<1	<1	<33	<1	<1
Bromomethane	2	<2	<2	<67 UJ	<2	<2 UJ
Carbon disulfide	1	<1	<1	<33	<1	<1
Carbon tetrachloride	1	<1	<1	<33	<1	<1
Chlorobenzene	1	<1	<1	4.9 JQ	<1	<1
Chloroethane	2	<2	<2	<67	<2	0.46 JQ
Chloroform	1	<1	<1	<33	<1	<1
Chloromethane	2	<2	<2	<67	<2	<2
cis-1,2-Dichloroethene	0.5	<0.5	<0.5	1100	<0.5	2.3
cis-1,3-Dichloropropene	1	<1	<1	<33	<1	<1
Dibromochloromethane	1	<1	<1	<33	<1	<1
Dibromomethane	1	<1	<1	<33	<1	<1
Dichlorodifluoromethane	2	<2	<2	<67	<2	<2
Ethylbenzene	1	<1	<1	<33	<1	<1
Hexachlorobutadiene	1	<1	<1	<33	<1	<1
Isopropylbenzene	1	<1	<1	<33	<1	<1
m-Xylene & p-Xylene	1	<1	<1	<33	<1	<1
Methylene chloride	1	<1	<1	12 JQ	<1	<1
n-Butylbenzene	1	<1	<1	<33	<1	<1

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TABLE E-5

SUMMARY OF QUALIFIED DATA - APRIL 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting Limit (a)	Sample DMW-29B 4/7/2002	Sample MWFTA-14 4/8/2002	Sample MWFTA-16 4/5/2002	Sample MWFTA-17 4/5/2002	Sample MWFTA-18 4/4/2002
n-Propylbenzene	1	<1	<1	<33	<1	<1
Naphthalene	1	<1	<1	<33 UJ	0.9 JB	<1 UJ
o-Xylene	0.5	<0.5	<0.5	<17	<0.5	<0.5
p-Isopropyltoluene	1	<1	<1	<33	<1	<1
sec-Butylbenzene	1	<1	<1	<33	<1	<1
Styrene	1	<1	<1	<33	<1	<1
tert-Butylbenzene	1	<1	<1	<33	<1	<1
Tetrachloroethene	1	<1	<1	<33	<1	<1
Toluene	1	<1	<1	<33	0.38 JQ	<1
trans-1,2-Dichloroethene	0.5	<0.5	<0.5	<17	<0.5	<0.5
trans-1,3-Dichloropropene	1	<1	<1	<33	<1	<1
Trichloroethene	1	0.19 JQ	<1	<33	<1	<1
Trichlorofluoromethane	2	<2	<2	<67	<2	<2
Vinyl chloride	2	<2	<2	310	<2	<2
Xylenes (total)	1	<1	<1	<33	<1	<1
Surrogate - %						
1,2-Dichloroethane-d4	--	97	100	125	103	125
4-Bromofluorobenzene	--	92	97	75	96	78
Dibromofluoromethane	--	101	105	119	105	119
Toluene-d8	-	97	100	95	103	92

TABLE E-5

SUMMARY OF QUALIFIED DATA - APRIL 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 4/7/2002	Sample MWFTA-28B 4/8/2002	Sample MWFTA-29B 4/4/2002	Sample PWFTA-2 4/4/2002	Duplicate PWFTA-2 4/4/2002
FIELD PARAMETER						
Dissolved Oxygen - E360.1 mg/L						
Dissolved Oxygen	0.1	NA	3.9	2	5	5
Ferrous Iron - A3500D mg/L						
Ferrous Iron	0.1	NA	NA	<0.1	0.2	0.2
Oxidation Reduction Potential - A2580A mV						
Oxidation Reduction Potential	--	NA	-121	-23	-82	82
pH - E150.1 pH Units						
pH	-	NA	7.37	13.88	11.82	11.82
Specific Conductance - E120.1 mS/cm						
Specific Conductance	0.001	NA	0.502	2.47	0.763	0.763
Temperature - E170.1 deg C						
Temperature	0.1	NA	14.1	12.7	14.6	14.6
Turbidity - E180.1 NTU						
Turbidity	1	NA	10	31	<1	<1
FIXED BASE LABORATORY ANALYSIS						
Anions - MCAWW 300.3A mg/L						
Chloride	1	6.6	58.9	1.4	8.9	8.7
Nitrate	0.1	<0.1	<0.1	0.07 JQ	0.02 JQ	0.02 JQ
Sulfate	1	8.2	1.1	3.4	5.9	5.8
Dissolved Gases - RSK SOP-175 mg/L						
Carbon dioxide	0.001	0.22 JB	13	<0.17	<0.17	<0.17
Ethane	0.002	<0.002	0.00045 JQ	0.0007	<0.002	<0.002
Ethene	0.001	<0.001	<0.001	0.0017	0.0024	0.0027
Methane	0.001	0.0019	0.99	0.033	0.23	0.25
Dissolved Hydrogen by Microseeps AM20GAX nM						
Hydrogen	0.03	7	8	2	170 J	110 J
Total Alkalinity - MCAWW 310.1 mg/L						
Total Alkalinity	5	130	160	190 J	54 J	46
Total Organic Carbon - SW846 9060 mg/l						
Total Organic Carbon	1	0.4 JQ	6	4	1 JH	1 JH
Total Sulfide - MCAWW 376.1 mg/l						
Total Sulfide	1	<1	<1	<1	<1	<1

TABLE E-5

SUMMARY OF QUALIFIED DATA - APRIL 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 4/7/2002	Sample MWFTA-28B 4/8/2002	Sample MWFTA-29B 4/4/2002	Sample PWFTA-2 4/4/2002	Duplicate PWFTA-2 4/4/2002
Mercury - SW846 7470A (Dissolved) ug/L						
Mercury	1	<1 UJ	<1 UJ	0 14 JQ	0 14 JQ	<1
Mercury - SW846 7470A (Total) ug/L						
Mercury	1	0 15 JB	<1 UJ	<1 UJ	0 13 JQ	0 17 JQ
Metals - SW846 6010B (Dissolved) ug/L						
Aluminum	200	716	<200	322	1020	1020
Antimony	5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5
Barium	200	72 5 JQ	110 JQ	215	44 9 JQ	45 4 JQ
Beryllium	10	<10	<10	<10	<10	<10
Cadmium	2	<2	<2	<2	<2	<2
Calcium	5000	59600	34700	101000	52800	52900
Chromium	10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	<30	<30	<30
Copper	10	<10	<10	<10	<10	<10
Iron	200	<200	1850	<200	<200	<200
Lead	3	<3	<3	<3	<3	<3
Magnesium	5000	<5000	24400	39 5 JQ	<5000	<5000
Manganese	20	<20	220	<20	<20	<20
Molybdenum	40	<40	<40	7 9 JQ	<40	<40
Nickel	100	<100	3 2 JQ	4 5 JQ	<100	<100
Potassium	5000	11000	15900	60500	27100	27400
Selenium	5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10
Sodium	5000	5370	29000	46800	10700	10600
Vanadium	50	2 8 JQ	<50	0 86 JQ	2 1 JQ	1 1 JQ
Zinc	20	<20	14 4 JQ	<20	<20	<20
Metals - SW846 6010B (Total) ug/L						
Aluminum	200	691	33 7 JQ	1110 JH	1030	972
Antimony	5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5
Barium	200	76 5 JQ	111 JQ	212	46 2 JQ	43 8 JQ
Beryllium	10	<10	<10	<10	<10	<10
Cadmium	2	<2	0 28 JB	<2	0 3 JQ	<2
Calcium	5000	61800	34700	99800	54800	51300
Chromium	10	<10	<10	4 3 JQ	<10	<10
Cobalt	30	<30	<30	<30	<30	<30
Copper	10	<10	<10	<10	<10	<10
Iron	200	<200	2270	508	<200	<200
Lead	3	<3	<3	<3	<3	<3
Magnesium	5000	<5000	24500	321 JQ	<5000	<5000
Manganese	20	<20	222	15 3 JQ	<20	<20
Molybdenum	40	<40	<40	4 9 JQ	<40	<40
Nickel	100	<100	<100	7 8 JQ	<100	<100
Potassium	5000	12800	15800	58200	26700	25600
Selenium	5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10
Sodium	5000	6060	28900	44700	10700	10100
Vanadium	50	3 3 JQ	<50	1 3 JQ	1 8 JQ	1 4 JQ
Zinc	20	<20	21 3	96 9 JI	49 7 J	<20 UJ
Thallium - SW846 7841 (Dissolved) ug/L						
Thallium	2	<2 UI	<2 UI	<2 UL	<2 UL	<2 UI

TABLE E-5

SUMMARY OF QUALIFIED DATA - APRIL 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 4/7/2002	Sample MWFTA-28B 4/8/2002	Sample MWFTA-29B 4/4/2002	Sample PWFTA-2 4/4/2002	Duplicate PWFTA-2 4/4/2002
Thallium - SW846 7841 (Total) ug/L						
Thallium	2	<2 UJ	<2 UJ	<2 UL	<2 UJ	<2 UJ
Volatile Organic Compounds - SW846 8260B ug/L						
1 1 1 2 Tetrachloroethane	1	<1	<1	<1	<1	<1
1 1 1-Trichloroethane	1	<1	<1	<1	<1	<1
1 1 2 2-Tetrachloroethane	1	<1	<1	<1	<1	<1
1 1 2 Trichloroethane	1	<1	<1	<1	<1	<1
1 1-Dichloroethane	1	<1	<1	<1	4.3	3.8
1 1-Dichloroethene	1	<1	<1	<1	2.3	2.4
1 1 Dichloropropene	1	<1	<1	<1	<1	<1
1 2 3 Trichlorobenzene	1	<1	<1	<1	<1	<1
1 2 3 Trichloropropane	1	<1	<1	<1	<1	<1
1 2 4-Trichlorobenzene	1	<1	<1	<1	<1	<1
1 2 4 Trimethylbenzene	1	<1	<1	<1	<1	<1
1 2 Dibromo 3 chloropropane	2	<2	<2	<2	<2	<2
1 2-Dibromoethane	1	<1	<1	<1	<1	<1
1 2-Dichlorobenzene	1	<1	<1	<1	0.89	0.91 JQ
1 2-Dichloroethane	1	<1	<1	<1	<1	<1
1 2 Dichloropropane	1	<1	<1	<1	<1	<1
1 3 5 Trimethylbenzene	1	<1	<1	<1	<1	<1
1 3 Dichlorobenzene	1	<1	<1	<1	<1	<1
1 3 Dichloropropane	1	<1	<1	<1	<1	<1
1 4-Dichlorobenzene	1	<1	<1	<1	0.17	0.18 JQ
2 2 Dichloropropane	1	<1	<1	<1	<1	<1
2 Butanone	10	<10 R	0.79 R	1.9 JI	<10 UJ	<10 UL
2 Chlorotoluene	1	<1	<1	<1	<1	<1
2 Hexanone	10	<10 R	<10 R	<10 UI	<10 UJ	<10 UI
4 Chlorotoluene	1	<1	<1	<1	<1	<1
4-Methyl-2-pentanone	10	<10	<10	<10	<10	<10
Acetone	10	24 R	47 R	18 R	23 R	16 R
Benzene	1	<1	<1	0.24 JQ	<1	<1
Bromobenzene	1	<1	<1	<1	<1	<1
Bromochloromethane	1	<1	<1	<1	<1	<1
Bromodichloromethane	1	<1	<1	<1	<1	<1
Bromoform	1	<1	<1	<1	<1	<1
Bromomethane	2	<2	<2	<2	<2 UJ	<2 UJ
Carbon disulfide	1	<1	<1	<1	<1	<1
Carbon tetrachloride	1	<1	<1	<1	<1	<1
Chlorobenzene	1	<1	<1	<1	<1	<1
Chloroethane	2	<2	<2	<2	<2	<2
Chloroform	1	<1	<1	<1	<1	<1
Chloromethane	2	<2	<2	0.26 JQ	<2	<2
cis-1 2 Dichloroethene	0.5	1.5	<0.5	<0.5	4.6	4.4
cis 1 3 Dichloropropene	1	<1	<1	<1	<1	<1
Dibromochloromethane	1	<1	<1	<1	<1	<1
Dibromomethane	1	<1	<1	<1	<1	<1
Dichlorodifluoromethane	2	<2	<2	<2	<2	<2
Ethylbenzene	1	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	<1	<1	<1	<1	<1
Isopropylbenzene	1	<1	<1	<1	<1	<1
m-Xylene & p Xylene	1	<1	<1	<1	<1	<1
Methylene chloride	1	<1	<1	<1	<1	<1
n Butylbenzene	1	<1	<1	<1	<1	<1

TABLE E-5

SUMMARY OF QUALIFIED DATA - APRIL 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 4/7/2002	Sample MWFTA-28B 4/8/2002	Sample MWFTA-29B 4/4/2002	Sample PWFTA-2 4/4/2002	Duplicate PWFTA-2 4/4/2002
n-Propylbenzene	1	<1	<1	<1	<1	<1
Naphthalene	1	<1	1.2 JB	1.5	1.4 J	<1
o-Xylene	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
p-Isopropyltoluene	1	<1	<1	<1	0.86 JQ	0.86 JQ
sec Butylbenzene	1	<1	<1	<1	<1	<1
Styrene	1	<1	<1	<1	<1	<1
tert Butylbenzene	1	<1	<1	<1	<1	<1
Tetrachloroethene	1	1	<1	<1	0.25 JQ	0.25 JQ
Toluene	1	<1	0.23 JQ	0.59 JQ	0.24 JQ	0.2 JQ
trans-1,2-Dichloroethene	0.5	<0.5	<0.5	<0.5	<0.5	0.19 JQ
trans-1,3-Dichloropropene	1	<1	<1	<1	<1	<1
Trichloroethene	1	0.65 JQ	<1	<1	6.3	6.6
Trichlorofluoromethane	2	<2	<2	<2	<2	<2
Vinyl chloride	2	<2	<2	<2	0.44 JQ	0.41 JQ
Xylenes (total)	1	<1	<1	<1	<1	<1
Surrogate - %						
1,2-Dichloroethane-d4	--	100	102	105	124	104
4-Bromofluorobenzene	--	97	97	77	80	74
Dibromofluoromethane	--	103	104	95	118	103
Toluene-d8	--	100	101	94	95	93

Notes

J Estimated based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JH Estimated, possibly biased high based upon QC data
JL Estimated, possibly biased low based upon QC data
JQ Estimated. Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected. Reported Detection Limit is imprecise
UL Undetected. Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method required sample volume extracted and analyzed. Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE RMB 6/04/03
CHECKED/DATE JAH 6/05/03

TABLE E-6

SUMMARY OF QUALIFIED DATA - APRIL 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting Limit (a)	Sample MWFTA-20 4/7/2002
FIELD PARAMETER:		
Dissolved Oxygen - E360.1 mg/L		
Dissolved Oxygen	0 1	3 7
Ferrous Iron - A3500D mg/L		
Ferrous Iron	0 1	<0 1
Oxidation Reduction Potential - A2580A mV		
Oxidation Reduction Potential	--	104
pH - E150.1 pH Units		
pH	--	10 64
Specific Conductance - E120.1 mS/cm		
Specific Conductance	0 001	0 147
Temperature - E170.1 deg C		
Temperature	0 1	15 6
Turbidity - E180.1 NTU		
Turbidity	1	<1
FIXED BASE LABORATORY ANALYSIS:		
Anions - MCAWW 300.3A mg/L		
Chloride	1	3 4
Nitrate	0 1	<0 1
Sulfate	1	4 9
Dissolved Gases - RSK SOP-175 mg/L		
Carbon dioxide	0 001	0 32 JB
Ethane	0 002	0 00032 JQ
Ethene	0 001	0 0091
Methane	0 001	0 023
Dissolved Hydrogen by Microseeps AM20GAX nM		
Hydrogen	0 03	8 1
Total Alkalinity - MCAWW 310.1 mg/L		
Total Alkalinity	5	68
Total Organic Carbon - SW846 9060 mg/L		
Total Organic Carbon	1	0 5 JQ
Total Sulfide - MCAWW 376 1 mg/L		
Total Sulfide	1	<1

TABLE E-6

SUMMARY OF QUALIFIED DATA - APRIL 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date:	Reporting Limit (a)	Sample MWFTA-20 4/7/2002
Mercury - SW846 7470A (Dissolved) µg/L		
Mercury	1	<1 UJ
Mercury - SW846 7470A (Total) µg/L		
Mercury	1	<1 UJ
Metals - SW846 6010B (Dissolved) µg/L		
Aluminum	200	<200
Antimony	5	<5
Arsenic	5	<5
Barium	200	74 9 JQ
Beryllium	10	<10
Cadmium	2	0 35 JB
Calcium	5000	14600
Chromium	10	<10
Cobalt	30	<30
Copper	10	<10
Iron	200	156 JQ
Lead	3	<3
Magnesium	5000	4380 JQ
Manganese	20	56 4
Molybdenum	40	<40
Nickel	100	<100
Potassium	5000	8210
Selenium	5	<5
Silver	10	<10
Sodium	5000	11700
Vanadium	50	<50
Zinc	20	<20
Metals - SW846 6010B (Total) µg/L		
Aluminum	200	<200
Antimony	5	<5
Arsenic	5	<5
Barium	200	79 JQ
Beryllium	10	<10
Cadmium	2	<2
Calcium	5000	15100
Chromium	10	<10
Cobalt	30	<30
Copper	10	<10
Iron	200	190 JQ
Lead	3	<3
Magnesium	5000	4520 JQ
Manganese	20	71 3
Molybdenum	40	<40
Nickel	100	<100
Potassium	5000	8370
Selenium	5	<5
Silver	10	<10
Sodium	5000	11700
Vanadium	50	<50
Zinc	20	<20
Thallium - SW846 7841 (Dissolved) µg/L		
Thallium	2	<2 UL
Thallium - SW846 7841 (Total) µg/L		
Thallium	2	<2 UL

TABLE E-6

SUMMARY OF QUALIFIED DATA - APRIL 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting Limit (a)	Sample MWFTA-20 4/7/2002
Volatile Organic Compounds - SW846 8260B µg/L		
1,1,1,2-Tetrachloroethane	1	<3.3
1,1,1-Trichloroethane	1	0.53 JQ
1,1,2,2-Tetrachloroethane	1	<3.3
1,1,2-Trichloroethane	1	<3.3
1,1-Dichloroethane	1	22
1,1-Dichloroethene	1	6.1
1,1-Dichloropropene	1	<3.3
1,2,3-Trichlorobenzene	1	<3.3
1,2,3-Trichloropropane	1	<3.3
1,2,4-Trichlorobenzene	1	<3.3
1,2,4-Trimethylbenzene	1	<3.3
1,2-Dibromo-3-chloropropane	2	<6.7
1,2-Dibromoethane	1	<3.3
1,2-Dichlorobenzene	1	<3.3
1,2-Dichloroethane	1	<3.3
1,2-Dichloropropane	1	<3.3
1,3,5-Trimethylbenzene	1	<3.3
1,3-Dichlorobenzene	1	<3.3
1,3-Dichloropropane	1	<3.3
1,4-Dichlorobenzene	1	<3.3
2,2-Dichloropropane	1	<3.3
2-Butanone	10	<33 UJ
2-Chlorotoluene	1	<3.3
2-Hexanone	10	<33 UJ
4-Chlorotoluene	1	<3.3
4-Methyl-2-pentanone	10	<33
Acetone	10	<33 R
Benzene	1	<3.3
Bromobenzene	1	<3.3
Bromochloromethane	1	<3.3
Bromodichloromethane	1	<3.3
Bromoform	1	<3.3
Bromomethane	2	<6.7 UJ
Carbon disulfide	1	<3.3
Carbon tetrachloride	1	<3.3
Chlorobenzene	1	<3.3
Chloroethane	2	<6.7
Chloroform	1	<3.3
Chloromethane	2	<6.7
cis-1,2-Dichloroethene	0.5	130
cis-1,3-Dichloropropene	1	<3.3
Dibromochloromethane	1	<3.3
Dibromomethane	1	<3.3
Dichlorodifluoromethane	2	<6.7
Ethylbenzene	1	<3.3
Hexachlorobutadiene	1	<3.3
Isopropylbenzene	1	<3.3
m-Xylene & p-Xylene	1	<3.3
Methylene chloride	1	<3.3
n-Butylbenzene	1	<3.3
n-Propylbenzene	1	<3.3
Naphthalene	1	<3.3 UJ
o-Xylene	0.5	<1.7
p-Isopropyltoluene	1	<3.3

TABLE E-6

SUMMARY OF QUALIFIED DATA - APRIL 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: / Sample Date:	Reporting Limit (a)	Sample MWFTA-20 4/7/2002
sec-Butylbenzene	1	<3 3
Styrene	1	<3 3
tert-Butylbenzene	1	<3 3
Tetrachloroethene	1	<3 3
Toluene	1	<3 3
trans-1,2-Dichloroethene	0 5	3
trans-1,3-Dichloropropene	1	<3 3
Trichloroethene	1	7 8
Trichlorofluoromethane	2	<6 7
Vinyl chloride	2	12
Xylenes (total)	1	<3 3
Surrogate - %		
1,2-Dichloroethane-d4	--	125
4-Bromofluorobenzene	--	77
Dibromofluoromethane	--	122
Toluene-d8	--	95

Notes:
J Estimated, based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JH Estimated, possibly biased high based upon QC data
JL Estimated, possibly biased low based upon QC data
JQ Estimated, Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected, Reported Detection Limit is imprecise
UL Undetected, Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE RMB 6/04/03
CHECKED/DATE JAH 6/05/03

TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Sample ID Sample Date	Reporting Limit (a)	Sample AEHADG-10 7/30/2002	Duplicate AEHADG-10 7/30/2002	Sample DMW-13A 7/17/2002	Sample DMW-20A 7/30/2002	Sample DMW-22A 7/30/2002	Sample DMW-25A 7/29/2002	Sample DMW-26A 7/31/2002
FIELD PARAMETER									
Dissolved Oxygen - E360 1 mg/L									
Dissolved Oxygen		0 1	1 17	1 17	0 8	0 92	1 3	0 6	1 36
Ferrous Iron - A3500D mg/L									
Ferrous Iron		0 1	0	0	1 3	NA	0	0	0
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential		--	9	9	319	349	-14	310	-18
pH - E150 1 pH Units									
pH		-	5 37	5 37	3 61	3 95	6 82	4 92	5 86
Specific Conductance - E120 1 mS/cm									
Specific Conductance		0 001	0 221	0 221	0 138	0 085	0 23	0 125	0 76
Temperature - E170 1 deg C									
Temperature		0 1	21 29	21 29	23 99	22 48	19 4	23 12	33 9
Turbidity - E180 1 NTU									
Turbidity		1	0 9	0 9	2 7	13 5	7 9	3 9	6 5
FIXED BASE LABORATORY ANALYSIS									
Anions - MCAWW 300 3A mg/L									
Chloride		1	65 8	65 5	25 4 JH	16 6	41 3	12 4	224
Nitrate		0 1	<0 1	<0 1	0 51	0 12	<0 1	0 17	<0 1
Sulfate		1	20 8	26 2	19 7 JH	10 9	10 8	18 7	2 7
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide		0 001	100	110	130	120	70	100	150
Ethane		0 002	<0 002	<0 002	<0 002 R	<0 002	<0 002	<0 002	<0 004
Ethene		0 001	0 01	0 011	<0 001 R	<0 001	<0 001	<0 001	<0 002
Methane		0 001	0 045	0 05	0 0011	0 0013	0 021	0 0022	0 29
Hydrogen by Microseeps - AM20GAX nM									
Hydrogen		0 03	1 8	2	2 4	2 2	2 7	2	3 6
Total Alkalinity - MCAWW 310 1 mg/L									
Total Alkalinity		5	15	15	<5	2 1 JB	44	27	43
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon		1	1	1	<1	<1	2	2	15
Total Sulfide - MCAWW 376 1 mg/L									
Total Sulfide		1	<1	0 65 JQ	<1	0 97 JQ	0 65 JQ	<1	0 97 JQ

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TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 7/30/2002	Duplicate AEHADG-10 7/30/2002	Sample DMW-13A 7/17/2002	Sample DMW 20A 7/30/2002	Sample DMW-22A 7/30/2002	Sample DMW-25A 7/29/2002	Sample DMW-26A 7/31/2002
Mercury - SW846 7470A (Dissolved) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L								
Aluminum	200	69.9 JQ	74.5 JQ	1550	121 JQ	<200 UJ	<200 UJ	292
Antimony	5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	16.6	44.2	<5	<5	14.6	<5	6.3
Barium	200	142 JQ	137 JQ	123 JQ	98.7 JQ	49.5 JQ	48.1 JQ	69.6 JQ
Beryllium	10	1.5 JQ	1.5 JQ	1.2 JQ	0.63 JQ	<10	<10	<10
Cadmium	2	<2	<2	1 JQ	<2	<2	<2	<2
Calcium	5000	5830	5720	2820 JQ	1650 JQ	7990	4520 JQ	3940 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	3.7 JQ
Cobalt	30	32.2	31.5	5.9 JQ	5.8 JQ	<30	2.1 JQ	1.3 JB
Copper	10	<10	<10	3.2 JB	<10	<10	<10	2.8 JQ
Iron	200	23600	23000	4190	794	1770	<200	17400
Lead	3	<3	<3	5.6	<3	<3	<3	<3
Magnesium	5000	7370	7190	2650 JQ	2860 JQ	5730	1530 JQ	2050 JQ
Manganese	20	997 J	969	221	304	117	157	98.6
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	41.7 JQ	40.2 JQ	<100	5.1 JQ	<100	<100	<100
Potassium	5000	5280	5170	2020 JQ	2800 JQ	4780 JQ	3110 JQ	4300 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	16400	16000	7270	6430	28700	19000	129000
Vanadium	50	<50	0.68 JQ	<50	<50	1.9 JQ	<50	4.4 JB
Zinc	20	35.6	37.7	57.1	14.4 JQ	<20	14.7 JQ	<20
Metals - SW846 6010B (Total) µg/L								
Aluminum	200	97.3 JQ	107 JQ	1490	239	60.1 JQ	57.8 JQ	378
Antimony	5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	45.9	47.6	<5	<5	16.4	<5	6.9
Barium	200	135 JQ	141 JQ	126 JQ	88.9 JQ	51 JQ	51.5 JQ	73.4 JQ
Beryllium	10	1.4 JQ	1.6 JQ	1.3 JQ	<10	<10	<10	<10
Cadmium	2	<2	<2	0.91 JQ	<2	<2	<2	<2
Calcium	5000	5600	5790	2440 JQ	1550 JQ	8060	4740 JQ	4050 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	2 JQ
Cobalt	30	31	31.7	5.7 JQ	5.7 JQ	<30	2.4 JQ	1.1 JB
Copper	10	<10	<10	3.4 JB	<10	<10	<10	<10
Iron	200	23100	23400	4090	2960 JQ	1910	45.3 JQ	18800
Lead	3	<3	<3	4.9	<3	<3	<3	<3
Magnesium	5000	7080	7280	2780 JQ	2790	5890	1650 JQ	2120 JQ
Manganese	20	951 J	977	228	307	122	183	103
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	39.2 JQ	42.6 JQ	<100	4.7 JQ	<100	4.5 JQ	<100
Potassium	5000	5050	5360	1930 JQ	2750 JQ	4850 JQ	3250 JQ	4430 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	15700	16200	6750	6210	29200	19900	135000
Vanadium	50	<50	<50	<50	<50	1.8 JQ	<50	4.8 JQ
Zinc	20	36.1 J	54 J	50.6	19.8 JQ	<20	<20	<20
Thallium - SW846 7841 (Dissolved) µg/L								
Thallium	2	<2 UJ	<2 UJ	<2 UJ	<2	<2 UJ	<2	<2 UJ
Thallium - SW846 7841 (Total) µg/L								
Thallium	2	<2 UJ	<2 UJ	<2 UJ	<2	<2 UJ	<2	<2 UJ

TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 7/30/2002	Duplicate AEHADG-10 7/30/2002	Sample DMW-13A 7/17/2002	Sample DMW-20A 7/30/2002	Sample DMW-22A 7/30/2002	Sample DMW-25A 7/29/2002	Sample DMW-26A 7/31/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L								
PCB 1016	1	NA	NA	NA	NA	NA	NA	NA
PCB 1221	1	NA	NA	NA	NA	NA	NA	NA
PCB 1232	1	NA	NA	NA	NA	NA	NA	NA
PCB 1242	1	NA	NA	NA	NA	NA	NA	NA
PCB 1248	1	NA	NA	NA	NA	NA	NA	NA
PCB 1254	1	NA	NA	NA	NA	NA	NA	NA
PCB 1260	1	NA	NA	NA	NA	NA	NA	NA
Surrogate - %								
Decachlorobiphenyl	--	NA	NA	NA	NA	NA	NA	NA
Tetrachloro-m-xylene	-	NA	NA	NA	NA	NA	NA	NA
Semi Volatile Organic Compounds - SW846 8270C µg/L								
Acenaphthene	0.2	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	0.2	NA	NA	NA	NA	NA	NA	NA
Anthracene	0.2	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.2	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.2	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.2	NA	NA	NA	NA	NA	NA	NA
Benzo(ghi)perylene	0.2	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0.2	NA	NA	NA	NA	NA	NA	NA
Carbazole	0.2	NA	NA	NA	NA	NA	NA	NA
Chrysene	0.2	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	0.2	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	0.2	NA	NA	NA	NA	NA	NA	NA
Fluorene	0.2	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.2	NA	NA	NA	NA	NA	NA	NA
Naphthalene	0.2	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.2	NA	NA	NA	NA	NA	NA	NA
Pyrene	0.2	NA	NA	NA	NA	NA	NA	NA
Surrogate - %								
2,4,6-Tribromophenol	-	NA	NA	NA	NA	NA	NA	NA
2-Fluorobiphenyl	-	NA	NA	NA	NA	NA	NA	NA
2-Fluorophenol	--	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene-d5	--	NA	NA	NA	NA	NA	NA	NA
Phenol-d5	--	NA	NA	NA	NA	NA	NA	NA
Terphenyl-d14	-	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L								
1,1,1,2-Tetrachloroethane	1	<170	<170	<1	<1.3	<1	<1	<1
1,1,1-Trichloroethane	1	2800	3000	<1	<1.3	<1	<1	<1
1,1,2,2-Tetrachloroethane	1	<170	<170	<1	<1.3	<1	<1	<1
1,1,2-Trichloroethane	1	<170	<170	<1	<1.3	<1	<1	<1
1,1-Dichloroethane	1	61 JQ	68 JQ	<1	<1.3	0.5 JQ	<1	<1
1,1-Dichloroethene	1	270	270	<1	<1.3	0.74 JQ	<1	<1
1,1-Dichloropropene	1	<170	<170	<1	<1.3	<1	<1	<1
1,2,3-Trichlorobenzene	1	<170	<170	<1	<1.3	<1	<1	<1
1,2,3-Trichloropropane	1	<170	<170	<1	<1.3	<1	<1	<1
1,2,4-Trichlorobenzene	1	<170	<170	<1	<1.3	<1	<1	<1
1,2,4-Trimethylbenzene	1	<170	<170	<1	<1.3	<1	<1	<1
1,2-Dibromo-3-chloropropane	2	<330	<330	<2 UJ	<2.7	<2	<2	<2
1,2-Dibromoethane	1	<170	<170	<1	<1.3	<1	<1	<1
1,2-Dichlorobenzene	1	140 JQ	150 JQ	<1	<1.3	<1	<1	<1

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TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 7/30/2002	Duplicate AEHADG-10 7/30/2002	Sample DMW-13A 7/17/2002	Sample DMW-20A 7/30/2002	Sample DMW-22A 7/30/2002	Sample DMW-25A 7/29/2002	Sample DMW-26A 7/31/2002
1,2-Dichloroethane	1	<170 UJ	<170 UJ	<1	<1.3	<1 UJ	<1 UJ	<1
1,2-Dichloropropane	1	<170	<170	<1	<1.3	<1	<1	<1
1,3,5-Trimethylbenzene	1	<170	<170	<1	<1.3	<1	<1	<1
1,3-Dichlorobenzene	1	<170	<170	<1	<1.3	<1	<1	<1
1,3-Dichloropropane	1	<170	<170	<1	<1.3	<1	<1	<1
1,4-Dichlorobenzene	1	<170	<170	<1	<1.3	<1	<1	<1
2,2-Dichloropropane	1	<170	<170	<1	<1.3	<1	<1	<1
2-Butanone	10	<1700 UJ	<1700 UJ	<10	<13 R	<10 UJ	<10 UJ	<10 R
2-Chlorotoluene	1	<170	<170	<1	<1.3	<1	<1	<1
2-Hexanone	10	<1700 R	<1700 R	<10	<13 R	<10 R	<10 R	<10 R
4-Chlorotoluene	1	<170	<170	<1	<1.3	<1	<1	<1
4-Methyl-2-pentanone	10	<1700	<1700	<10	<13	<10	<10	<10
Acetone	10	<1700 R	<1700 R	<10 UJ	18 R	<10 R	<10 R	11 R
Benzene	1	<170	<170	<1	<1.3	<1	<1	<1
Bromobenzene	1	<170	<170	<1	<1.3	<1	<1	<1
Bromochloromethane	1	<170	<170	<1	<1.3	<1	<1	<1
Bromodichloromethane	1	<170	<170	<1	<1.3	<1	<1	<1
Bromoform	1	<170	<170	<1	<1.3	<1	<1	<1
Bromomethane	2	<330	<330	<2	<2.7	<2	<2	<2
Carbon disulfide	1	<170	<170	<1	<1.3	<1	<1	<1
Carbon tetrachloride	1	<170 UJ	<170 UJ	<1	<1.3 UJ	<1 UJ	<1 UJ	<1 UJ
Chlorobenzene	1	<170	<170	<1	<1.3	<1	<1	<1
Chloroethane	2	<330	<330	<2	<2.7	<2	<2	<2
Chloroform	1	<170	65 JQ	<1	<1.3	<1	<1	<1
Chloromethane	2	<330 UJ	<330 UJ	<2 UJ	<2.7 UJ	<2 UJ	<2 UJ	<2 UJ
cis-1,2-Dichloroethene	0.5	780	780	<0.5	40	3.5	6	<0.5
cis-1,3-Dichloropropene	1	<170	<170	<1	<1.3	<1	<1	<1
Dibromochloromethane	1	<170	<170	<1	<1.3	<1	<1	<1
Dibromomethane	1	<170	<170	<1	<1.3	<1	<1	<1
Dichlorodifluoromethane	2	<330 UJ	<330 UJ	<2	<2.7 UJ	<2 UJ	<2 UJ	<2 UJ
Ethylbenzene	1	<170	<170	<1	<1.3	<1	<1	<1
Hexachlorobutadiene	1	<170	<170	<1	<1.3	<1	<1	<1
Isopropylbenzene	1	<170	<170	<1	<1.3	<1	<1	<1
m-Xylene & p-Xylene	1	<170	<170	<1	<1.3	<1	<1	<1
Methylene chloride	1	130 JB	110 JB	<1	<1.3	<1	<1	<1
n-Butylbenzene	1	<170	<170	<1	<1.3	<1	<1	<1
n-Propylbenzene	1	<170	<170	<1	<1.3	<1	<1	<1
Naphthalene	1	<170	<170	<1 UJ	<1.3 UJ	<1	<1	<1 UJ
o-Xylene	0.5	<83	<83	<0.5	<0.66	<0.5	<0.5	<0.5
p-Isopropyltoluene	1	<170	<170	<1	<1.3	<1	<1	<1
sec-Butylbenzene	1	<170	<170	<1	<1.3	<1	<1	<1
Styrene	1	<170	<170	<1	<1.3	<1	<1	<1
tert-Butylbenzene	1	<170	<170	<1	<1.3	<1	<1	<1
Tetrachloroethene	1	2800	2700	<1	<1.3	3.2	13	<1
Toluene	1	<170	<170	<1	<1.3	<1	<1	<1
trans-1,2-Dichloroethene	0.5	<83	<83	<0.5	<0.66	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	1	<170	<170	<1	<1.3	<1	<1	<1
Trichloroethene	1	5100	5200	<1	13	12	4	<1
Trichlorofluoromethane	2	<330 UJ	<330 UJ	<2	<2.7 UJ	<2 UJ	<2 UJ	<2 UJ
Vinyl chloride	2	<330	<330	<2	<2.7	<2	<2	<2
Xylenes (total)	1	<170	<170	<1	<1.3	<1	<1	<1

TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
UPPER WATER BEARING UNIT
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Richmond, Virginia

Sample ID Sample Date	Reporting Limit (a)	Sample AEHADG-10 7/30/2002	Duplicate AEHADG-10 7/30/2002	Sample DMW-13A 7/17/2002	Sample DMW-20A 7/30/2002	Sample DMW-22A 7/30/2002	Sample DMW-25A 7/29/2002	Sample DMW-26A 7/31/2002
Surrogate %								
1,2-Dichloroethane-d4	--	108	111	106	108	106	109	109
4-Bromofluorobenzene	--	80	80	81	81	83	79	81
Dibromofluoromethane	--	107	107	102	105	102	105	107
Toluene-d8	-	91	93	91	91	92	90	90

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TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
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Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-27A 7/30/2002	Sample DMW-33A 7/17/2002	Sample DMW-35A 7/17/2002	Sample MW112-2 7/31/2002	Sample MWFOS-1 7/29/2002	Sample MWFOS-3 7/31/2002	Sample MWFTA-1 7/30/2002
FIELD PARAMETER								
Dissolved Oxygen - E360.1 mg/L								
Dissolved Oxygen	0.1	0.84	1.44	0.83	2.54	1.26	1.78	0.47
Ferrous Iron - A3500D mg/L								
Ferrous Iron	0.1	0	0.5	1.02	0	0	NA	0
Oxidation Reduction Potential - A2580A mV								
Oxidation Reduction Potential	--	-31	101	196	228	161	280	-147
pH - E150.1 pH Units								
pH	-	4.2	5.2	5.34	4.56	5.87	4.72	5.67
Specific Conductance - E120.1 mS/cm								
Specific Conductance	0.001	0.098	0.202	0.06	0.104	0.171	0.077	0.444
Temperature - E170.1 deg C								
Temperature	0.1	27	19.7	20.52	24.83	20.8	25.26	22.6
Turbidity - E180.1 NTU								
Turbidity	1	0	1.9	28.1	7.9	10.9	16.7	2.9
FIXED BASE LABORATORY ANALYSIS								
Anions - MCAWW 300.3A mg/L								
Chloride	1	16.5	50.4	11.2 JH	13.9	15.1	9.5	33.1
Nitrate	0.1	<0.1	<0.1	0.028 JQ	0.15	<0.1	<0.1	<0.1
Sulfate	1	3.1	16.3 JH	4.8 JH	9.1	61.6	11.2	0.56 JQ
Dissolved Gases - RSK SOP-175 mg/L								
Carbon dioxide	0.001	200	81	72	69	32	190	440
Ethane	0.002	<0.004	<0.002 R	<0.002 R	<0.002	<0.002	<0.002	<0.01
Ethene	0.003	<0.002	0.00038 R	<0.001 R	<0.003	<0.001	0.0035	<0.005
Methane	0.001	0.26	0.03	<0.001	0.00039	<0.001	0.29	0.51
Hydrogen by Microseeps - AM20GAX nM								
Hydrogen	0.03	2.2	1.4	2.8	6.6	2.3	2.9	2.6
Total Alkalinity - MCAWW 310.1 mg/L								
Total Alkalinity	5	1.8 JB	13 JH	11 JH	4.3 JH	13	7.2 JH	190
Total Organic Carbon - SW846 9060 mg/L								
Total Organic Carbon	1	13	1	<1	<1	<1	3	27
Total Sulfide - MCAWW 376.1 mg/L								
Total Sulfide	1	0.32 JQ	<1	<1	0.65 JQ	<1	<1	0.32 JQ

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Mercury - SW846 7470A (Dissolved) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1 UI
Mercury - SW846 7470A (Total) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1 UI
Metals - SW846 6010B (Dissolved) µg/L								
Aluminum	200	609	82 3 JQ	63 JQ	81 1 JQ	166 JQ	178 JQ	246
Antimony	5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5	24 4	36 8
Barium	200	107 JQ	93 5 JQ	30 7 JQ	30 6 JQ	15 4 JQ	140 JQ	232
Beryllium	10	0 71 JQ	1 4 JQ	<10	1 8 JB	<10	<10	<10
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	591 JQ	14300	3400 JQ	3460 JQ	16500	1320 JQ	20500
Chromium	10	3 2 JQ	<10	<10	<10	<10	<10	<10
Cobalt	30	0 95 JQ	0 89 JB	1 4 JB	4 JB	<30	2 JB	1 6 JQ
Copper	10	<10	<10 UI	1 7 JB	<10	<10	2 4 JQ	<10
Iron	200	1880	5770	1210	879	675	3920	6670
Lead	3	<3	<3	<3	<3	<3	5 5	<3
Magnesium	5000	1430 JQ	10300	2460 JQ	2830 JQ	8320	1960 JQ	28500
Manganese	20	10 8 JQ	163	51 2	59 2	49 5	65 1	510
Molybdenum	40	<40	<40	<40	<40	15 4 JQ	<40	<40
Nickel	100	5 1 JQ	<100	<100	5 9 JQ	<100	<100	<100
Potassium	5000	2670 JQ	4780 JQ	3300 JQ	5890	6840	2010 JQ	7430
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	4740 JQ	8170	2380 JQ	3400 JQ	9240	6100	14500
Vanadium	50	0 83 JQ	0 81 JQ	<50	<50	<50	<50	1 JQ
Zinc	20	<20	<20	<20	<20	21 9	32 3	<20
Metals - SW846 6010B (Total) µg/L								
Aluminum	200	619	81 JQ	81 JQ	218	69 3 JQ	155 JQ	266
Antimony	5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5	26 7	35 3
Barium	200	110 JQ	86 9 JQ	30 1 JQ	31 9 JQ	15 8 JQ	137 JQ	237
Beryllium	10	0 68 JQ	1 3 JQ	<10	1 8 JB	<10	<10	<10
Cadmium	2	<2	<2	<2	0 29 JB	<2	<2	<2
Calcium	5000	484 JQ	13100	3310 JQ	3430 JQ	16300	1180 JQ	20500
Chromium	10	5 8 JQ	<10	<10	<10	<10	<10	<10
Cobalt	30	1 2 JQ	0 77 JB	1 8 JB	4 3 JB	<30	1 9 JB	1 5 JQ
Copper	10	<10	<10 UI	2 2 JB	<10	<10	25 2	<10
Iron	200	1960	5360	1220	1810	770	3880	6780
Lead	3	<3	<3	<3	<3	<3	8 4	<3
Magnesium	5000	1460 JQ	9540	2410 JQ	2900 JQ	8240	1910 JQ	28300
Manganese	20	10 9 JQ	153	19 5	61 3	49 1	65 4	510
Molybdenum	40	<40	<40	<40	<40	15 1 JQ	<40	<40
Nickel	100	4 4 JQ	<100	3 1 JQ	6 3 JQ	<100	<100	<100
Potassium	5000	2700 JQ	4590 JQ	3210 JQ	6000	6780	2000 JQ	7500
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	4800 JQ	7940	2400 JQ	3440 JQ	9190	6240	14500
Vanadium	50	1 JQ	0 7 JQ	<50	<50	<50	<50	1 2 JQ
Zinc	20	<20	<20	<20	<20	<20	90 2	<20
Thallium - SW846 7841 (Dissolved) µg/L								
Thallium	2	<2 UJ	<2 UI	<2	<2 UJ	<2	<2 UJ	<2
Thallium - SW846 7841 (Total) µg/L								
Thallium	2	<2 UJ	<2 UI	<2 UI	<2 UJ	<2	<2 UJ	<2

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Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L								
PCB 1016	1	NA	NA	NA	NA	NA	NA	<1
PCB 1221	1	NA	NA	NA	NA	NA	NA	<1
PCB-1232	1	NA	NA	NA	NA	NA	NA	<1
PCB 1242	1	NA	NA	NA	NA	NA	NA	<1
PCB 1248	1	NA	NA	NA	NA	NA	NA	<1
PCB 1254	1	NA	NA	NA	NA	NA	NA	<1
PCB 1260	1	NA	NA	NA	NA	NA	NA	<1
Surrogate - %								
Decachlorobiphenyl	--	NA	NA	NA	NA	NA	NA	29
Tetrachloro-m-xylene	--	NA	NA	NA	NA	NA	NA	112
Semi Volatile Organic Compounds - SW846 8270C µg/L								
Acenaphthene	0 2	NA	NA	NA	NA	NA	NA	0 066 R
Acenaphthylene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Anthracene	0 2	NA	NA	NA	NA	NA	NA	0 057 R
Benzo(a)anthracene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Benzo(a)pyrene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Benzo(b)fluoranthene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Benzo(ghi)perylene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Benzo(k)fluoranthene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Carbazole	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Chrysene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Dibenz(a,h)anthracene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Fluoranthene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Fluorene	0 2	NA	NA	NA	NA	NA	NA	0 041 R
Indeno(1 2 3-cd)pyrene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Naphthalene	0 2	NA	NA	NA	NA	NA	NA	2 R
Phenanthrene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Pyrene	0 2	NA	NA	NA	NA	NA	NA	<0 2 R
Surrogate - %								
2 4 6-Tribromophenol	--	NA	NA	NA	NA	NA	NA	10
2-Fluorobiphenyl	-	NA	NA	NA	NA	NA	NA	6 3
2-Fluorophenol	--	NA	NA	NA	NA	NA	NA	4 6
Nitrobenzene-d5	--	NA	NA	NA	NA	NA	NA	8 9
Phenol-d5	--	NA	NA	NA	NA	NA	NA	6 8
Terphenyl-d14	--	NA	NA	NA	NA	NA	NA	8
Volatile Organic Compounds - SW846 8260B µg/L								
1 1 1 2-Tetrachloroethane	1	<1	<83	<1	<1	<1	<330	<1
1 1 1-Trichloroethane	1	<1	660	<1	<1	<1	<330	<1
1 1 2 2-Tetrachloroethane	1	<1	<83	<1	<1	<1	<330	<1
1 1 2-Trichloroethane	1	<1	<83	<1	<1	<1	<330	<1
1 1-Dichloroethane	1	<1	100	<1	<1	<1	<330	1
1 1-Dichloroethene	1	<1	230	<1	<1	<1	<330	<1
1 1-Dichloropropene	1	<1	<83	<1	<1	<1	<330	<1
1 2 3-Trichlorobenzene	1	<1	<83	<1	<1	<1	<330	<1
1 2 3-Trichloropropane	1	<1	<83	<1	<1	<1	<330	<1
1 2 4-Trichlorobenzene	1	<1	<83	<1	<1	<1	<330	<1
1 2 4-Trimethylbenzene	1	<1	<83	<1	<1	<1	<330	<1
1 2-Dibromo-3-chloropropane	2	<2	<170 UJ	<2 UJ	<2	<2	<670	<2
1 2-Dibromoethane	1	<1	<83	<1	<1	<1	<330	<1
1 2-Dichlorobenzene	1	<1	<83	<1	<1	<1	<330	<1

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Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-27A 7/30/2002	Sample DMW-33A 7/17/2002	Sample DMW-35A 7/17/2002	Sample MW112-2 7/31/2002	Sample MWFOS-1 7/29/2002	Sample MWFOS-3 7/31/2002	Sample MWFTA-1 7/30/2002
1,2-Dichloroethane	1	<1 UJ	<83	<1	<1	<1 UJ	<330	<1
1,2-Dichloropropane	1	<1	<83	<1	<1	<1	<330	<1
1,3,5-Trimethylbenzene	1	<1	<83	<1	<1	<1	<330	<1
1,3-Dichlorobenzene	1	<1	<83	<1	<1	<1	<330	<1
1,2,3-Trichloropropane	1	<1	<83	<1	<1	<1	<330	<1
1,4-Dichlorobenzene	1	<1	<83	<1	<1	<1	<330	<1
2,2-Dichloropropane	1	<1	<83	<1	<1	<1	<330	<1
2-Butanone	10	<10 UJ	<830	<10	<10 R	<10 UJ	<3300 R	<10 R
2-Chlorotoluene	1	<1	<83	<1	<1	<1	<330	<1
2-Hexanone	10	<10 R	<830	<10	<10 R	<10 R	<3300 R	<10 R
4-Chlorotoluene	1	<1	<83	<1	<1	<1	<330	<1
4-Methyl-2-pentanone	10	<10	<830	<10	<10	<10	<3300	<10
Acetone	10	13 R	<830 UJ	14 J	<10 R	<10 R	<3300 R	2 R
Benzene	1	<1	<83	<1	<1	<1	<330	<1
Bromobenzene	1	<1	<83	<1	<1	<1	<330	<1
Bromochloromethane	1	<1	<83	<1	<1	<1	<330	<1
Bromodichloromethane	1	<1	<83	<1	<1	<1	<330	<1
Bromoform	1	<1	<83	<1	<1	<1	<330	<1
Bromomethane	2	<2	<170	<2	<2	<2	<670	<2
Carbon disulfide	1	<1	<83	<1	<1	<1	<330	<1
Carbon tetrachloride	1	<1 UJ	<83	<1	<1 UJ	<1 UJ	<330 UJ	<1 UJ
Chlorobenzene	1	<1	<83	<1	<1	<1	<330	<1
Chloroethane	2	<2	<170	<2	<2	<2	<670	<2
Chloroform	1	<1	<83	<1	<1	<1	<330	<1
Chloromethane	2	<2 UJ	<170 UJ	<2 UJ	<2 UJ	<2 UJ	<670 UJ	<2 UJ
cis-1,2-Dichloroethene	0.5	<0.5	1800	0.55	<0.5	<0.5	11000	0.43 JQ
cis-1,3-Dichloropropene	1	<1	<83	<1	<1	<1	<330	<1
Dibromochloromethane	1	<1	<83	<1	<1	<1	<330	<1
Dibromomethane	1	<1	<83	<1	<1	<1	<330	<1
Dichlorodifluoromethane	2	<2 UJ	<170	<2	<2 UJ	<2 UJ	<670 UJ	<2 UJ
Ethylbenzene	1	<1	<83	<1	<1	<1	<330	<1
Hexachlorobutadiene	1	<1	<83	<1	<1	<1	<330	<1
Isopropylbenzene	1	<1	<83	<1	<1	<1	<330	<1
m-Xylene & p-Xylene	1	<1	<83	<1	<1	<1	<330	<1
Methylene chloride	1	<1	34 JB	<1	<1	<1	150 JQ	<1
n-Butylbenzene	1	<1	<83	<1	<1	<1	<330	<1
n-Propylbenzene	1	<1	<83	<1	<1	<1	<330	<1
Naphthalene	1	<1	<83 UJ	<1 UJ	<1 UJ	<1	<330 UJ	3.2 J
o-Xylene	0.5	<0.5	<42	<0.5	<0.5	<0.5	<170	<0.5
p-Isopropyltoluene	1	<1	<83	<1	<1	<1	<330	<1
sec-Butylbenzene	1	<1	<83	<1	<1	<1	<330	<1
Styrene	1	<1	<83	<1	<1	<1	<330	<1
tert-Butylbenzene	1	<1	<83	<1	<1	<1	<330	<1
Tetrachloroethene	1	<1	360	7.8	<1	<1	<330	<1
Toluene	1	<1	<83	<1	<1	<1	<330	<1
trans-1,2-Dichloroethene	0.5	<0.5	<42	<0.5	<0.5	<0.5	160 JQ	<0.5
trans-1,3-Dichloropropene	1	<1	<83	<1	<1	<1	<330	<1
Trichloroethene	1	<1	2000	3.1	<1	<1	8400	<1
Trichlorofluoromethane	2	<2 UJ	<170	<2	<2 UJ	<2 UJ	<670 UJ	<2 UJ
Vinyl chloride	2	4.3	<170	<2	<2	<2	380 JQ	<2
Xylenes (total)	1	<1	<83	<1	<1	<1	<330	<1

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TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting Limit (a)	Sample DMW-27A 7/30/2002	Sample DMW-33A 7/17/2002	Sample DMW-35A 7/17/2002	Sample MW112-2 7/31/2002	Sample MWFOS-1 7/29/2002	Sample MWFOS-3 7/31/2002	Sample MWFTA-1 7/30/2002
Surrogate - %								
1,2-Dichloroethane-d4	--	108	100	102	109	109	101	108
4-Bromofluorobenzene	--	82	82	81	82	80	82	83
Dibromofluoromethane	--	104	101	101	105	105	100	107
Toluene-d8	--	90	92	89	90	92	93	90

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TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-3 7/30/2002	Duplicate MWFTA-3 7/30/2002	Sample MWFTA-5 7/17/2002	Sample MWFTA-7 7/29/2002	Sample MWFTA-9 7/17/2002	Sample MWFTA-10 7/17/2002	Sample MWFTA-23 7/31/2002
FIELD PARAMETER								
Dissolved Oxygen - E360.1 mg/L								
Dissolved Oxygen	0.1	1	1	0.86	2.68	0.38	2.65	0.97
Ferrous Iron - A3500D mg/L								
Ferrous Iron	0.1	0	0	0.5	0	0	0	0
Oxidation Reduction Potential - A2580A mV								
Oxidation Reduction Potential	--	42	42	79	411	189	313	7
pH - E150.1 pH Units								
pH	--	5.54	5.54	6.08	5.41	5.26	5.7	4.96
Specific Conductance - E120.1 mS/cm								
Specific Conductance	0.001	0.15	0.15	0.074	0.1	0.068	0.094	0.211
Temperature - E170.1 deg C								
Temperature	0.1	19	19	16.9	21.1	18.2	18.15	19.26
Turbidity - E180.1 NTU								
Turbidity	1	2.9	2.9	3	17.6	6.8	3.4	171
FIXED BASE LABORATORY ANALYSIS								
Anions - MCAWW 300.3A mg/L								
Chloride	1	31.7	33.9 JH	4.6 JB	7.2	6.3 JB	4.3 JB	70.6
Nitrate	0.1	<0.1	<0.1	<0.1	0.02 JQ	<0.1	<0.1	<0.1
Sulfate	1	9.7	10	6.3 JH	19.9	8 JH	6.2 JH	0.18 JQ
Dissolved Gases - RSK SOP-175 mg/L								
Carbon dioxide	0.001	100	110	40	50	54	34	260
Ethane	0.002	<0.002	<0.002	<0.002 R	<0.002	<0.002 R	<0.002 R	<0.004
Ethene	0.001	<0.001	<0.001	<0.001 R	<0.001	<0.001 R	<0.001 R	0.0072
Methane	0.001	0.036 J	0.026 J	0.00071 JQ	<0.001	<0.001	0.00064 JQ	0.22
Hydrogen by Microseeps - AM20GAX nM								
Hydrogen	0.03	2.3	2.2	1.2	2.1	1.3	15	14
Total Alkalinity - MCAWW 310.1 mg/L								
Total Alkalinity	5	28	33	24	<5	11 JH	34	23
Total Organic Carbon - SW846 9060 mg/L								
Total Organic Carbon	1	4	4	<1	1	1	<1	23
Total Sulfide - MCAWW 376.1 mg/L								
Total Sulfide	1	0.32 JQ	0.32 JQ	<1	<1	<1	<1	<1

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TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-3 7/30/2002	Duplicate MWFTA-3 7/30/2002	Sample MWFTA-5 7/17/2002	Sample MWFTA-7 7/29/2002	Sample MWFTA-9 7/17/2002	Sample MWFTA-10 7/17/2002	Sample MWFTA-23 7/31/2002
Mercury - SW846 7470A (Dissolved) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L								
Aluminum	200	154 JQ	241 J	90 JQ	765	108 JQ	78.1 JQ	245
Antimony	5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	5.4	6.3	<5	<5	<5	<5	91.7
Barium	200	37.2 JQ	38.9 JQ	20.5 JQ	66.7 JQ	14.6 JQ	6.3 JQ	492
Beryllium	10	<10	<10	<10	1.7 JQ	<10	<10	1.6 JB
Cadmium	2	<2	<2	<2	<2	<2	<2	0.3 JB
Calcium	5000	2860 JQ	3080 JQ	3330 JQ	2350 JQ	2120 JQ	4340 JQ	4950 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	0.96 JB	5.6 JQ	1.8 JB	1.1 JB	10.7 JQ
Copper	10	<10	<10	2 JB	<10	5.2 JB	<10 UL	<10
Iron	200	1640	1660	658	<200	114 JQ	209	36900
Lead	3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	2020 JQ	2080 JQ	2670 JQ	3660 JQ	1560 JQ	3420 JQ	6450
Manganese	20	44.3	46.5	48.6	66.8	26.1	70.5	423
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	<100	<100	4.2 JQ	<100	<100	10.7 JQ
Potassium	5000	4290 JQ	4540 JQ	3390 JQ	1610 JQ	2120 JQ	3050 JQ	4210 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	20600	22000	5840	2200 JQ	4630 JQ	6050	6960
Vanadium	50	<50	<50	<50	<50	<50	<50	1.9 JB
Zinc	20	<20	<20	<20	<20	23.1	<20	118
Metals - SW846 6010B (Total) µg/L								
Aluminum	200	268	209	66.5 JQ	790	125 JQ	576	297
Antimony	5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	6.8 J	5.2 J	<5	<5	<5	2.4 JQ	94.3
Barium	200	44.5 JQ	40.6 JQ	21.6 JQ	67.1 JQ	16.8 JQ	8.2 JQ	502
Beryllium	10	<10	<10	<10	1.8 JQ	<10	<10	1.6 JB
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	3390 JQ	3040 JQ	3300 JQ	2200 JQ	2060 JQ	4420 JQ	4940 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	0.89 JQ	0.8 JB	5.4 JQ	2.3 JB	1.5 JB	10.6 JQ
Copper	10	1.8 JQ	<10	<10 UL	<10	8.1 JB	<10 UJ	<10
Iron	200	1970	1760	732	<200	345	580	37000
Lead	3	<3	<3	<3	<3	2.7 JQ	<3	<3
Magnesium	5000	2330 JQ	2120 JQ	2660 JQ	3680 JQ	1580 JQ	3620 JQ	6510
Manganese	20	52.6	47.7	48.7	67.8	27.1	80.4	428
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	<100	<100	3.5 JQ	<100	<100	10.6 JQ
Potassium	5000	4740 JQ	4530 JQ	3400 JQ	1550 JQ	2150 JQ	3080 JQ	4220 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	26100	22900	5770	2120 JQ	4620 JQ	6270	7070
Vanadium	50	<50	<50	<50	<50	<50	<50	1.6 JB
Zinc	20	<20	<20	<20	<20	31.5	15.3 JQ	112
Thallium - SW846 7841 (Dissolved) µg/L								
Thallium	2	<2 UJ	<2 UJ	<2	<2	<2 UJ	<2 UJ	<2 UJ
Thallium - SW846 7841 (Total) µg/L								
Thallium	2	<2 UJ	<2 UJ	<2 UJ	<2	<2	<2 UJ	<2 UJ

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TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID· Sample Date	Reporting Limit (a)	Sample MWFTA-3 7/30/2002	Duplicate MWFTA-3 7/30/2002	Sample MWFTA-5 7/17/2002	Sample MWFTA-7 7/29/2002	Sample MWFTA-9 7/17/2002	Sample MWFTA-10 7/17/2002	Sample MWFTA-23 7/31/2002
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L								
PCB-1016	1	<1	<1	NA	NA	NA	NA	NA
PCB-1221	1	<1	<1	NA	NA	NA	NA	NA
PCB 1232	1	<1	<1	NA	NA	NA	NA	NA
PCB 1242	1	<1	<1	NA	NA	NA	NA	NA
PCB 1248	1	<1	<1	NA	NA	NA	NA	NA
PCB 1254	1	<1	<1	NA	NA	NA	NA	NA
PCB 1260	1	<1	<1	NA	NA	NA	NA	NA
Surrogate - %								
Decachlorobiphenyl	--	47	42	NA	NA	NA	NA	NA
Tetrachloro m-xylene	--	78	99	NA	NA	NA	NA	NA
Semi-Volatile Organic Compounds - SW846 8270C µg/L								
Acenaphthene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Acenaphthylene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Anthracene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Benzo(ghi)perylene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Carbazole	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Chrysene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Dibenz(a h)anthracene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Fluoranthene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Fluorene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Indeno(1 2 3 cd)pyrene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Naphthalene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Phenanthrene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Pyrene	0.2	<0.2 R	<0.2 R	NA	NA	NA	NA	NA
Surrogate - %								
2 4 6 Tribromophenol	--	7.1	6.6	NA	NA	NA	NA	NA
2 Fluorobiphenyl	--	7	5.8	NA	NA	NA	NA	NA
2 Fluorophenol	--	7.9	6.7	NA	NA	NA	NA	NA
Nitrobenzene d5	--	6.8	5.9	NA	NA	NA	NA	NA
Phenol-d5	--	8.4	6.8	NA	NA	NA	NA	NA
Terphenyl d14	--	8.9	8.4	NA	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L								
1 1 1 2 Tetrachloroethane	1	<1	<1.4	<1	<1	<1	<1	<5000
1 1 1 Trichloroethane	1	<1	<1.4	<1	<1	<1	<1	<5000
1 1 2 2-Tetrachloroethane	1	<1	<1.4	<1	<1	<1	<1	<5000
1 1 2 Trichloroethane	1	<1	<1.4	<1	<1	<1	<1	<5000
1 1 Dichloroethane	1	0.62 JQ	<1.4	<1	<1	<1	<1	<5000
1 1-Dichloroethene	1	1.2 J	0.79 JQ	<1	<1	<1	<1	<5000
1 1 Dichloropropene	1	<1	<1.4	<1	<1	<1	<1	<5000
1 2 3 Trichlorobenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
1 2 3 Trichloropropane	1	<1	<1.4	<1	<1	<1	<1	<5000
1 2 4 Trichlorobenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
1 2 4 Trimethylbenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
1 2 Dibromo 3 chloropropane	2	<2	<2.9	<2 UJ	<2	<2 UJ	<2 UJ	<10000
1 2 Dibromoethane	1	<1	<1.4	<1	<1	<1	<1	<5000
1 2 Dichlorobenzene	1	<1	<1.4	<1	<1	<1	<1	<5000

TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-3 7/30/2002	Duplicate MWFTA-3 7/30/2002	Sample MWFTA-5 7/17/2002	Sample MWFTA-7 7/29/2002	Sample MWFTA-9 7/17/2002	Sample MWFTA 10 7/17/2002	Sample MWFTA-23 7/31/2002
1 2 Dichloroethane	1	<1 UJ	<1.4 UJ	<1	<1 UJ	<1	<1	<5000
1 2 Dichloropropane	1	<1	<1.4	<1	<1	<1	<1	<5000
1 3 5 Trimethylbenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
1 3 Dichlorobenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
1 3 Dichloropropane	1	<1	<1.4	<1	<1	<1	<1	<5000
1 4 Dichlorobenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
2 2-Dichloropropane	1	<1	<1.4	<1	<1	<1	<1	<5000
2-Butanone	10	<10 UJ	<14 UJ	<10	<10 UJ	<10	<10	<50000 R
2-Chlorotoluene	1	<1	<1.4	<1	<1	<1	<1	<5000
2-Hexanone	10	<10 R	<14 R	<10	<10 R	<10	<10	<50000 R
4-Chlorotoluene	1	<1	<1.4	<1	<1	<1	<1	<5000
4 Methyl 2 pentanone	10	<10	<14	<10	<10	<10	<10	<50000
Acetone	10	<10 R	3.9 R	<10 UJ	<10 R	<10 UJ	<10 UJ	<50000 R
Benzene	1	<1	<1.4	<1	<1	<1	<1	<5000
Bromobenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
Bromochloromethane	1	<1	<1.4	<1	<1	<1	<1	<5000
Bromodichloromethane	1	<1	<1.4	<1	<1	<1	<1	<5000
Bromoform	1	<1	<1.4	<1	<1	<1	<1	<5000
Bromomethane	2	<2	<2.9	<2	<2	<2	<2	<10000
Carbon disulfide	1	<1	<1.4	<1	<1	<1	<1	<5000
Carbon tetrachloride	1	<1 UJ	<1.4 UJ	<1	<1 UJ	<1	<1	<5000 UJ
Chlorobenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
Chloroethane	2	<2	<2.9	<2	<2	<2	<2	<10000
Chloroform	1	<1	<1.4	<1	<1	<1	<1	<5000
Chloromethane	2	<2 UJ	<2.9 UJ	<2 UJ	<2 UJ	<2 UJ	<2 UJ	<10000 UJ
cis-1 2-Dichloroethene	0.5	38 J	28 J	<0.5	<0.5	<0.5	<0.5	140000
cis-1 3 Dichloropropene	1	<1	<1.4	<1	<1	<1	<1	<5000
Dibromochloromethane	1	<1	<1.4	<1	<1	<1	<1	<5000
Dibromomethane	1	<1	<1.4	<1	<1	<1	<1	<5000
Dichlorodifluoromethane	2	<2 UJ	<2.9 UJ	<2	<2 UJ	<2	<2	<10000 UJ
Ethylbenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
Hexachlorobutadiene	1	<1	<1.4	<1	<1	<1	<1	<5000
Isopropylbenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
m Xylene & p Xylene	1	<1	<1.4	<1	<1	<1	<1	<5000
Methylene chloride	1	<1	0.87 JB	<1	<1	<1	<1	2100 JQ
n Butylbenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
n Propylbenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
Naphthalene	1	<1	<1.4	<1 UJ	<1	<1 UJ	<1 UJ	<5000 UJ
o Xylene	0.5	<0.5	<0.72	<0.5	<0.5	<0.5	<0.5	<2500
p Isopropyltoluene	1	<1	<1.4	<1	<1	<1	<1	<5000
sec-Butylbenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
Styrene	1	<1	<1.4	<1	<1	<1	<1	<5000
tert-Butylbenzene	1	<1	<1.4	<1	<1	<1	<1	<5000
Tetrachloroethene	1	37	31	<1	<1	<1	<1	<5000
Toluene	1	<1	<1.4	<1	<1	<1	<1	<5000
trans 1 2 Dichloroethene	0.5	1.3 J	0.76 J	<0.5	<0.5	<0.5	<0.5	<2500
trans 1 3 Dichloropropene	1	<1	<1.4	<1	<1	<1	<1	<5000
Trichloroethene	1	22	18	<1	<1	<1	<1	2500 JQ
Trichlorofluoromethane	2	<2 UJ	<2.9 UJ	<2	<2 UJ	<2	<2	<10000 UJ
Vinyl chloride	2	3.1 J	2 JQ	<2	<2	<2	<2	4000 JQ
Xylenes (total)	1	<1	<1.4	<1	<1	<1	<1	<5000

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TABLE E-7

SUMMARY OF QUALIFIED DATA - JULY 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date:	Reporting Limit (a)	Sample MWFTA-3 7/30/2002	Duplicate MWFTA-3 7/30/2002	Sample MWFTA-5 7/17/2002	Sample MWFTA-7 7/29/2002	Sample MWFTA-9 7/17/2002	Sample MWFTA-10 7/17/2002	Sample MWFTA-23 7/31/2002
Surrogate - %								
1,2-Dichloroethane d4	--	106	103	105	110	104	104	109
4-Bromofluorobenzene	--	79	80	82	80	80	79	78
Dibromofluoromethane	--	105	104	104	105	105	102	104
Toluene d8	--	91	90	92	92	91	90	91

Notes

J Estimated based on QC data
JB Estimated possibly biased high or false positive based on blank contamination
JH Estimated possibly biased high based upon QC data
JL Estimated possibly biased low based upon QC data
JQ Estimated Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected Reported Detection Limit is imprecise
UL Undetected, Data biased low Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE RMB 6/04/03
CHECKED/DATE JAH 6/05/03

TABLE E-8

SUMMARY OF QUALIFIED DATA - JULY 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting Limit (a)	Sample MWFTA-14 7/17/2002	Sample MWFTA-16 7/29/2002	Sample MWFTA-17 7/31/2002	Sample MWFTA-18 7/29/2002
FIELD PARAMETER					
Dissolved Oxygen - E360.1 mg/L					
Dissolved Oxygen	0.1	1.6	3.6	6.2	1.3
Ferrous Iron - A3500D mg/L					
Ferrous Iron	0.1	<0.1	<0.1	<0.1	<0.1
Oxidation Reduction Potential - A2580A mV					
Oxidation Reduction Potential	--	45	-121	-45	-117
pH - E150.1 pH Units					
pH	--	10.03	12.33	12.33	6.95
Specific Conductance - E120.1 mS/cm					
Specific Conductance	0.001	0.312	4.73	1.73	0.119
Temperature - E170.1 deg C					
Temperature	0.1	18.4	26.8	31.6	19.8
Turbidity - E180.1 NTU					
Turbidity	1	<1	2	1	2
FIXED BASE LABORATORY ANALYSIS					
Anions - MCAWW 300.3A mg/L					
Chloride	1	15.3 JH	8.7	5.8	4
Nitrate	0.1	0.03 JQ	<0.1	<0.1	<0.1
Sulfate	1	26.9	5.4	10	1.2
Dissolved Gases - RSK SOP-175 mg/L					
Carbon dioxide	0.001	0.15 JQ	<0.17	<0.17	13
Ethane	0.002	<0.002 R	0.0029	<0.002	<0.002
Ethene	0.001	<0.001 R	0.029	<0.001	<0.001
Methane	0.001	<0.001	0.039	0.049	0.0077
Hydrogen by Microseeps - AM20GAX nM					
Hydrogen	0.03	1.3	83	4.9	2
Total Alkalinity - MCAWW 310.1 mg/L					
Total Alkalinity	5	190	770	290	67
Total Organic Carbon - SW846 9060 mg/L					
Total Organic Carbon	1	<1	2	2	1
Total Sulfide - MCAWW 376.1 mg/L					
Total Sulfide	1	<1	<1	0.32 JQ	<1

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TABLE E-8

SUMMARY OF QUALIFIED DATA - JULY 2002
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-14 7/17/2002	Sample MWFTA-16 7/29/2002	Sample MWFTA-17 7/31/2002	Sample MWFTA-18 7/29/2002
Mercury - SW846 7470A (Dissolved) µg/L					
Mercury	1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L					
Mercury	1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L					
Aluminum	200	77 5 JQ	<200	4520	<200 UJ
Antimony	5	<5	<5 UJ	<5	<5
Arsenic	5	<5	<5	<5	<5
Barium	200	67 4 JQ	988	134 JQ	28 9 JQ
Beryllium	10	<10	<10	<10	<10
Cadmium	2	<2	<2	<2	<2
Calcium	5000	13800	150000	94100	11300
Chromium	10	<10	1 5 JQ	<10	<10
Cobalt	30	0 86 JB	<30	<30	<30
Copper	10	<10 UL	<10	<10	<10
Iron	200	258	<200	<200	2080
Lead	3	<3	<3	<3	<3
Magnesium	5000	10800	87 JQ	<5000	5290
Manganese	20	45 5	<20	<20	99 8
Molybdenum	40	7 5 JQ	<40	<40	<40
Nickel	100	<100	<100	<100	<100
Potassium	5000	25400 J	162000	27000	5530
Selenium	5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10
Sodium	5000	50900	38600	14700	7640
Vanadium	50	<50	<50	7 2 JQ	<50
Zinc	20	<20	14 1 JQ	16 9 JQ	<20
Metals - SW846 6010B (Total) µg/L					
Aluminum	200	75 JQ	80 4 JQ	4520	<200 UJ
Antimony	5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5
Barium	200	63 6 JQ	1090	133 JQ	34 5 JQ
Beryllium	10	<10	<10	<10	<10
Cadmium	2	<2	<2	<2	<2
Calcium	5000	12600	165000	93900	11600
Chromium	10	<10	<10	<10	<10
Cobalt	30	<30	<30	<30	<30
Copper	10	<10 UI	<10	<10	<10
Iron	200	259	82 4 JQ	<200	2430
Lead	3	<3	<3	<3	<3
Magnesium	5000	10200	3220 JQ	<5000	5460
Manganese	20	36 7	49 9	<20	105
Molybdenum	40	6 7 JQ	<40	<40	<40
Nickel	100	<100	<100	<100	<100
Potassium	5000	26700 J	177000	26700	5670
Selenium	5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10
Sodium	5000	48400	41500	14400	7910
Vanadium	50	<50	<50	7 JQ	<50
Zinc	20	<20	15 6 JQ	<20	<20
Thallium - SW846 7841 (Dissolved) µg/L					
Thallium	2	<2	<2 UL	<2 UJ	<2
Thallium - SW846 7841 (Total) µg/L					
Thallium	2	<2 UI	<2 UI	<2 UJ	<2

TABLE E-8

SUMMARY OF QUALIFIED DATA - JULY 2002
LOWER WATER BEARING UNIT
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Operable Unit 7
Defense Supply Center Richmond
Richmond Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-14 7/17/2002	Sample MWFTA-16 7/29/2002	Sample MWFTA-17 7/31/2002	Sample MWFTA-18 7/29/2002
Volatile Organic Compounds - SW846 8260B µg/L					
1 1 1 2 Tetrachloroethane	1	<1	<50	<1	<1
1 1 1-Trichloroethane	1	<1	<50	<1	<1
1 1 2 2 Tetrachloroethane	1	<1	<50	<1	<1
1 1 2 Trichloroethane	1	<1	<50	<1	<1
1 1-Dichloroethane	1	<1	<50	<1	<1
1 1-Dichloroethene	1	<1	<50	<1	<1
1 1-Dichloropropene	1	<1	<50	<1	<1
1 2 3 Trichlorobenzene	1	<1	<50	<1	<1
1 2 3 Trichloropropane	1	<1	<50	<1	<1
1 2,4 Trichlorobenzene	1	<1	<50	<1	<1
1,2 4 Trimethylbenzene	1	<1	<50	<1	<1
1 2 Dibromo 3 chloropropane	2	<2 UJ	<100	<2	<2
1 2-Dibromoethane	1	<1	<50	<1	<1
1 2-Dichlorobenzene	1	<1	<50	<1	<1
1 2-Dichloroethane	1	<1	<50 UJ	<1	<1 UJ
1 2 Dichloropropane	1	<1	<50	<1	<1
1 3 5 Trimethylbenzene	1	<1	<50	<1	<1
1,3 Dichlorobenzene	1	<1	<50	<1	<1
1 3 Dichloropropane	1	<1	<50	<1	<1
1 4 Dichlorobenzene	1	<1	<50	<1	<1
2 2 Dichloropropane	1	<1	<50	<1	<1
2-Butanone	10	<10	<500 UJ	<10 R	<10 UJ
2 Chlorotoluene	1	<1	<50	<1	<1
2 Hexanone	10	<10	<500 R	<10 R	<10 R
4 Chlorotoluene	1	<1	<50	<1	<1
4 Methyl 2-pentanone	10	<10	<500	<10	<10
Acetone	10	<10 UJ	<500 R	4 7 R	<10 R
Benzene	1	<1	<50	<1	<1
Bromobenzene	1	<1	<50	<1	<1
Bromochloromethane	1	<1	<50	<1	<1
Bromodichloromethane	1	<1	<50	<1	<1
Bromoform	1	<1	<50	<1	<1
Bromomethane	2	<2	<100	<2	<2
Carbon disulfide	1	<1	<50	<1	<1
Carbon tetrachloride	1	<1	<50 UJ	<1 UJ	<1 UJ
Chlorobenzene	1	<1	<50	<1	<1
Chloroethane	2	<2	<100	<2	<2
Chloroform	1	<1	<50	<1	<1
Chloromethane	2	<2 UJ	<100 UJ	<2 UJ	<2 UJ
cis 1 2 Dichloroethene	0 5	<0 5	1100	<0 5	2 2
cis-1,3 Dichloropropene	1	<1	<50	<1	<1
Dibromochloromethane	1	<1	<50	<1	<1
Dibromomethane	1	<1	<50	<1	<1
Dichlorodifluoromethane	2	<2	<100 UJ	<2 UJ	<2 UJ
Ethylbenzene	1	<1	<50	<1	<1
Hexachlorobutadiene	1	<1	<50	<1	<1
Isopropylbenzene	1	<1	<50	<1	<1
m-Xylene & p Xylene	1	<1	<50	<1	<1
Methylene chloride	1	<1	32 JB	<1	<1
n-Butylbenzene	1	<1	<50	<1	<1
n Propylbenzene	1	<1	<50	<1	<1
Naphthalene	1	<1 UJ	<50	<1 UJ	<1
o-Xylene	0 5	<0 5	<25	<0 5	<0 5
p-Isopropyltoluene	1	<1	<50	<1	<1
sec Butylbenzene	1	<1	<50	<1	<1

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SUMMARY OF QUALIFIED DATA - JULY 2002
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date.	Reporting Limit (a)	Sample MWFTA-14 7/17/2002	Sample MWFTA-16 7/29/2002	Sample MWFTA-17 7/31/2002	Sample MWFTA-18 7/29/2002
Styrene	1	<1	<50	<1	<1
tert Butylbenzene	1	<1	<50	<1	<1
Tetrachloroethene	1	<1	<50	<1	<1
Toluene	1	<1	<50	<1	<1
trans 1 2-Dichloroethene	0 5	<0 5	<25	<0 5	<0 5
trans 1,3 Dichloropropene	1	<1	<50	<1	<1
Trichloroethene	1	<1	<50	<1	<1
Trichlorofluoromethane	2	<2	<100 UJ	<2 UJ	<2 UJ
Vinyl chloride	2	<2	430	<2	<2
Xylenes (total)	1	<1	<50	<1	<1
Surrogate - %					
1 2 Dichloroethane-d4	--	105	108	111	107
4-Bromofluorobenzene	--	83	83	81	80
Dibromofluoromethane	--	101	104	94	105
Toluene d8	--	92	91	91	92
Volatile Organic Compounds - SW846 8260B, UNPRES µg/L					
1,1,1,2-Tetrachloroethane	1	NA	<50	NA	NA
1,1 1 Trichloroethane	1	NA	<50	NA	NA
1 1 2 2-Tetrachloroethane	1	NA	<50	NA	NA
1 1 2 Trichloroethane	1	NA	<50	NA	NA
1,1-Dichloroethane	1	NA	<50	NA	NA
1 1-Dichloroethene	1	NA	<50	NA	NA
1,1-Dichloropropene	1	NA	<50	NA	NA
1 2 3 Trichlorobenzene	1	NA	<50	NA	NA
1 2 3-Trichloropropane	1	NA	<50	NA	NA
1 2 4-Trichlorobenzene	1	NA	<50	NA	NA
1 2 4 Trimethylbenzene	1	NA	<50	NA	NA
1 2-Dibromo 3-chloropropane	2	NA	<100	NA	NA
1 2-Dibromoethane	1	NA	<50	NA	NA
1 2-Dichlorobenzene	1	NA	<50	NA	NA
1 2-Dichloroethane	1	NA	<50 UJ	NA	NA
1 2 Dichloropropane	1	NA	<50	NA	NA
1 3,5-Trimethylbenzene	1	NA	<50	NA	NA
1 3 Dichlorobenzene	1	NA	<50	NA	NA
1 3-Dichloropropane	1	NA	<50	NA	NA
1,4-Dichlorobenzene	1	NA	<50	NA	NA
2 2-Dichloropropane	1	NA	<50	NA	NA
2 Butanone	10	NA	<500 UJ	NA	NA
2-Chlorotoluene	1	NA	<50	NA	NA
2 Hexanone	10	NA	<500 R	NA	NA
4-Chlorotoluene	1	NA	<50	NA	NA
4-Methyl-2-pentanone	10	NA	<500	NA	NA
Acetone	10	NA	61 R	NA	NA
Benzene	1	NA	<50	NA	NA
Bromobenzene	1	NA	<50	NA	NA
Bromochloromethane	1	NA	<50	NA	NA
Bromodichloromethane	1	NA	<50	NA	NA
Bromoform	1	NA	<50	NA	NA
Bromomethane	2	NA	<100	NA	NA
Carbon disulfide	1	NA	<50	NA	NA
Carbon tetrachloride	1	NA	<50 UJ	NA	NA
Chlorobenzene	1	NA	<50	NA	NA
Chloroethane	2	NA	<100	NA	NA
Chloroform	1	NA	<50	NA	NA
Chloromethane	2	NA	<100 UJ	NA	NA

TABLE E-8

SUMMARY OF QUALIFIED DATA - JULY 2002
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-14 7/17/2002	Sample MWFTA-16 7/29/2002	Sample MWFTA-17 7/31/2002	Sample MWFTA-18 7/29/2002
cis-1 2 Dichloroethene	0 5	NA	1100	NA	NA
cis-1 3 Dichloropropene	1	NA	<50	NA	NA
Dibromochloromethane	1	NA	<50	NA	NA
Dibromomethane	1	NA	<50	NA	NA
Dichlorodifluoromethane	2	NA	<100 UJ	NA	NA
Ethylbenzene	1	NA	<50	NA	NA
Hexachlorobutadiene	1	NA	<50	NA	NA
Isopropylbenzene	1	NA	<50	NA	NA
m Xylene & p Xylene	1	NA	<50	NA	NA
Methylene chloride	1	NA	33 JB	NA	NA
n Butylbenzene	1	NA	<50	NA	NA
n Propylbenzene	1	NA	<50	NA	NA
Naphthalene	1	NA	<50	NA	NA
o-Xylene	0 5	NA	<25	NA	NA
p Isopropyltoluene	1	NA	<50	NA	NA
sec-Butylbenzene	1	NA	<50	NA	NA
Styrene	1	NA	<50	NA	NA
tert-Butylbenzene	1	NA	<50	NA	NA
Tetrachloroethene	1	NA	<50	NA	NA
Toluene	1	NA	<50	NA	NA
trans-1 2 Dichloroethene	0 5	NA	<25	NA	NA
trans 1 3 Dichloropropene	1	NA	<50	NA	NA
Trichloroethene	1	NA	<50	NA	NA
Trichlorofluoromethane	2	NA	<100 UJ	NA	NA
Vinyl chloride	2	NA	430	NA	NA
Xylenes (total)	1	NA	<50	NA	NA
Surrogate - %					
1 2-Dichloroethane-d4	--	NA	107	NA	NA
4 Bromofluorobenzene	--	NA	79	NA	NA
Dibromofluoromethane	-	NA	104	NA	NA
Toluene-d8	-	NA	91	NA	NA

TABLE E-8

SUMMARY OF QUALIFIED DATA - JULY 2002
LOWER WATER BEARING UNIT
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Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 7/30/2002	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002	Sample MWFTA-28B 7/17/2002	Sample MWFTA-29B 7/30/2002
FIELD PARAMETER						
Dissolved Oxygen - E360.1 mg/L						
Dissolved Oxygen	0.1	7.5	3.8	3.8	4.7	1.1
Ferrous Iron - A3500D mg/L						
Ferrous Iron	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Oxidation Reduction Potential - A2580A mV						
Oxidation Reduction Potential	--	16	-38	-38	-140	176
pH - E150.1 pH Units						
pH	--	11.92	8.77	8.77	7.49	13.03
Specific Conductance - E120.1 mS/cm						
Specific Conductance	0.001	0.528	0.156	0.156	0.492	1.87
Temperature - E170.1 deg C						
Temperature	0.1	21.9	23.2	23.2	22.9	25
Turbidity - E180.1 NTU						
Turbidity	1	14	6	6	<1	1
FIXED BASE LABORATORY ANALYSIS						
Anions - MCAWW 300.3A mg/L						
Chloride	1	6.4 JB	4 JB	3.7 JB	55.8	1.9 JB
Nitrate	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate	1	6.5	4.5	4.5	2 JB	18.2
Dissolved Gases - RSK SOP-175 mg/L						
Carbon dioxide	0.001	<0.17	<0.17	<0.17	15	<0.17
Ethane	0.002	<0.002	<0.002	<0.002	<0.01 R	<0.002
Ethene	0.001	<0.001	0.003	0.0032	<0.005 R	0.00057 JQ
Methane	0.001	0.00051 JB	0.0088	0.0098	0.48	0.012
Hydrogen by Microseeps - AM20GAX nM						
Hydrogen	0.03	4	2	2.2	14	3.5
Total Alkalinity - MCAWW 310.1 mg/L						
Total Alkalinity	5	150	81	79	230	370 JI
Total Organic Carbon - SW846 9060 mg/L						
Total Organic Carbon	1	<1	<1	<1	2	3
Total Sulfide - MCAWW 376.1 mg/L						
Total Sulfide	1	<1	0.97 JQ	<1	<1	<1

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SUMMARY OF QUALIFIED DATA - JULY 2002
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Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 7/30/2002	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002	Sample MWFTA-28B 7/17/2002	Sample MWFTA-29B 7/30/2002
Mercury - SW846 7470A (Dissolved) µg/L						
Mercury	1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L						
Mercury	1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L						
Aluminum	200	901	<200 UJ	90 5 JQ	116 JQ	340
Antimony	5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5
Barium	200	64 4 JQ	66 1 JQ	67 8 JQ	128 JQ	153 JQ
Beryllium	10	<10	<10	<10	0 78 JQ	<10
Cadmium	2	<2	<2	<2	<2	0 41 JQ
Calcium	5000	55400	10100	12400	37100	74800
Chromium	10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	<30	<30	<30
Copper	10	<10	<10	<10	<10 UL	<10
Iron	200	<200	285 J	153 JQ	2360	<200
Lead	3	<3	<3	<3	<3	<3
Magnesium	5000	<5000	6950	5690	25700	53 JQ
Manganese	20	<20	172 J	132 J	227	<20
Molybdenum	40	2 5 JQ	<40	<40	<40	7 JQ
Nickel	100	<100	<100	<100	<100	4 1 JQ
Potassium	5000	10600	6410	6860	13100 J	65000
Selenium	5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10
Sodium	5000	5530	9900	10200	24800	53200
Vanadium	50	<50	<50	<50	0 77 JQ	1 2 JQ
Zinc	20	<20	<20	<20	<20	<20
Metals - SW846 6010B (Total) µg/L						
Aluminum	200	878	77 9 JQ	<200 UJ	177 JQ	1600 JH
Antimony	5	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5
Barium	200	63 4 JQ	68 JQ	77 5 JQ	136 JQ	163 JQ
Beryllium	10	<10	<10	<10	0 85 JQ	<10
Cadmium	2	<2	<2	<2	<2	<2
Calcium	5000	54800	11600 J	17900 J	38700	77800 JI
Chromium	10	<10	<10	<10	6 2 JQ	<10
Cobalt	30	<30	<30	<30	0 88 JB	<30
Copper	10	<10	<10	<10	<10 UI	<10
Iron	200	<200	299 J	144 JQ	2590	604 JH
Lead	3	<3	<3	<3	<3	<3
Magnesium	5000	<5000	6100 J	2900 JQ	26400	390 JQ
Manganese	20	<20	152 J	65 8 J	237	12 4 JQ
Molybdenum	40	<40	<40	<40	<40	6 3 JQ
Nickel	100	<100	<100	<100	<100	4 JQ
Potassium	5000	10400	6670	8060	13700 J	67000
Selenium	5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10
Sodium	5000	5180	10200	11500	25800	54500
Vanadium	50	<50	<50	<50	<50	1 1 JQ
Zinc	20	<20	<20	20 8	42 6	<20
Thallium - SW846 7841 (Dissolved) µg/L						
Thallium	2	<2 UJ	<2 UJ	<2 UJ	<2 UI	<2 UI
Thallium - SW846 7841 (Total) µg/L						
Thallium	2	<2 UJ	<2 UJ	<2 UJ	1 7 JI	<2 UI

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SUMMARY OF QUALIFIED DATA - JULY 2002
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Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 7/30/2002	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002	Sample MWFTA-28B 7/17/2002	Sample MWFTA-29B 7/30/2002
Volatile Organic Compounds - SW846 8260B µg/L						
1 1 1 2-Tetrachloroethane	1	<1	<5	<3.3	<1	<1
1 1 1-Trichloroethane	1	<1	<5	<3.3	<1	<1
1 1 2 2 Tetrachloroethane	1	<1	<5	<3.3	<1	<1 UJ
1 1 2 Trichloroethane	1	<1	<5	<3.3	<1	<1
1,1 Dichloroethane	1	<1	19	19	<1	<1
1 1 Dichloroethene	1	<1	11	9.3	<1	<1
1 1-Dichloropropene	1	<1	<5	<3.3	<1	<1
1 2 3 Trichlorobenzene	1	<1	<5	<3.3	<1	<1
1 2 3 Trichloropropane	1	<1	<5	<3.3	<1	<1
1 2 4-Trichlorobenzene	1	<1	<5	<3.3	<1	<1
1 2 4-Trimethylbenzene	1	<1	<5	<3.3	<1	<1
1 2-Dibromo-3 chloropropane	2	<2	<10	<6.7	<2 UJ	<2
1 2 Dibromoethane	1	<1	<5	<3.3	<1	<1
1 2 Dichlorobenzene	1	<1	<5	<3.3	<1	<1
1 2 Dichloroethane	1	<1 UJ	<5 UJ	<3.3	<1	<1 UJ
1,2-Dichloropropane	1	<1	<5	<3.3	<1	<1
1 3 5 Trimethylbenzene	1	<1	<5	<3.3	<1	<1
1,3 Dichlorobenzene	1	<1	<5	<3.3	<1	<1
1 3 Dichloropropane	1	<1	<5	<3.3	<1	<1
1 4 Dichlorobenzene	1	<1	<5	<3.3	<1	<1
2 2 Dichloropropane	1	<1	<5	<3.3	<1	<1
2 Butanone	10	<10 UJ	<50 UJ	<33 R	<10	<10 UJ
2-Chlorotoluene	1	<1	<5	<3.3	<1	<1
2 Hexanone	10	<10 R	<50 R	<33 R	<10	<10 R
4 Chlorotoluene	1	<1	<5	<3.3	<1	<1
4 Methyl 2-pentanone	10	<10	<50	<33	<10	<10
Acetone	10	<10 R	<50 R	<33 R	2.6 J	7.8 R
Benzene	1	<1	<5	<3.3	<1	<1
Bromobenzene	1	<1	<5	<3.3	<1	<1
Bromochloromethane	1	<1	<5	<3.3	<1	<1
Bromodichloromethane	1	<1	<5	<3.3	<1	<1
Bromoform	1	<1	<5	<3.3	<1	<1
Bromomethane	2	<2	<10	<6.7	<2	<2
Carbon disulfide	1	<1	<5	<3.3	<1	<1
Carbon tetrachloride	1	<1 UJ	<5 UJ	<3.3 UJ	<1	<1 UJ
Chlorobenzene	1	<1	<5	<3.3	<1	<1
Chloroethane	2	<2	<10	<6.7	<2	<2
Chloroform	1	<1	<5	<3.3	<1	<1
Chloromethane	2	<2 UJ	<10 UJ	<6.7 UJ	<2 UJ	<2 UJ
cis-1 2-Dichloroethene	0.5	1.2	150	130	<0.5	<0.5
cis 1 3 Dichloropropene	1	<1	<5	<3.3	<1	<1
Dibromochloromethane	1	<1	<5	<3.3	<1	<1
Dibromomethane	1	<1	<5	<3.3	<1	<1
Dichlorodifluoromethane	2	<2 UJ	<10 UJ	<6.7 UJ	<2	<2 UJ
Ethylbenzene	1	<1	<5	<3.3	<1	<1
Hexachlorobutadiene	1	<1	<5	<3.3	<1	<1
Isopropylbenzene	1	<1	<5	<3.3	<1	<1
m-Xylene & p-Xylene	1	<1	<5	<3.3	<1	<1
Methylene chloride	1	<1	3.3 JB	1.1 JQ	<1	<1
n Butylbenzene	1	<1	<5	<3.3	<1	<1
n Propylbenzene	1	<1	<5	<3.3	<1	<1
Naphthalene	1	<1	<5	<3.3 UJ	<1 UJ	<1
o-Xylene	0.5	<0.5	<2.5	<1.7	<0.5	<0.5
p-Isopropyltoluene	1	<1	<5	<3.3	<1	<1
sec-Butylbenzene	1	<1	<5	<3.3	<1	<1

TABLE E-8

SUMMARY OF QUALIFIED DATA - JULY 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 7/30/2002	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002	Sample MWFTA-28B 7/17/2002	Sample MWFTA-29B 7/30/2002
Styrene	1	<1	<5	<3.3	<1	<1
tert-Butylbenzene	1	<1	<5	<3.3	<1	<1
Tetrachloroethene	1	1.1	<5	<3.3	<1	<1
Toluene	1	<1	<5	<3.3	<1	0.48 JQ
trans 1 2 Dichloroethene	0.5	<0.5	<2.5	<1.7	<0.5	<0.5
trans 1 3-Dichloropropene	1	<1	<5	<3.3	<1	<1
Trichloroethene	1	0.6 JQ	7.4	5.8	<1	<1 UJ
Trichlorofluoromethane	2	<2 UJ	<10 UJ	<6.7 UJ	<2	<2 UJ
Vinyl chloride	2	<2	8.6 JQ	9.2	<2	<2
Xylenes (total)	1	<1	<5	<3.3	<1	<1
Surrogate - %						
1 2 Dichloroethane-d4	--	109	107	108	108	106
4 Bromofluorobenzene	-	80	82	82	81	83
Dibromofluoromethane	-	100	99	105	103	89
Toluene-d8	--	90	91	93	91	92
Volatile Organic Compounds - SW846 8260B, UNPRES µg/L						
1 1 1 2 Tetrachloroethane	1	NA	<5	NA	NA	NA
1 1 1-Trichloroethane	1	NA	<5	NA	NA	NA
1 1 2 2 Tetrachloroethane	1	NA	<5	NA	NA	NA
1 1 2 Trichloroethane	1	NA	<5	NA	NA	NA
1 1 Dichloroethane	1	NA	20	NA	NA	NA
1 1 Dichloroethene	1	NA	11	NA	NA	NA
1 1 Dichloropropene	1	NA	<5	NA	NA	NA
1 2 3 Trichlorobenzene	1	NA	<5	NA	NA	NA
1 2 3 Trichloropropane	1	NA	<5	NA	NA	NA
1 2 4 Trichlorobenzene	1	NA	<5	NA	NA	NA
1 2 4 Trimethylbenzene	1	NA	<5	NA	NA	NA
1 2 Dibromo 3-chloropropane	2	NA	<10	NA	NA	NA
1 2-Dibromoethane	1	NA	<5	NA	NA	NA
1,2 Dichlorobenzene	1	NA	<5	NA	NA	NA
1 2-Dichloroethane	1	NA	<5 UJ	NA	NA	NA
1 2-Dichloropropane	1	NA	<5	NA	NA	NA
1 3,5-Trimethylbenzene	1	NA	<5	NA	NA	NA
1 3 Dichlorobenzene	1	NA	<5	NA	NA	NA
1 3 Dichloropropane	1	NA	<5	NA	NA	NA
1 4 Dichlorobenzene	1	NA	<5	NA	NA	NA
2 2 Dichloropropane	1	NA	<5	NA	NA	NA
2 Butanone	10	NA	<50 UJ	NA	NA	NA
2-Chlorotoluene	1	NA	<5	NA	NA	NA
2 Hexanone	10	NA	<50 R	NA	NA	NA
4 Chlorotoluene	1	NA	<5	NA	NA	NA
4 Methyl 2 pentanone	10	NA	<50	NA	NA	NA
Acetone	10	NA	<50 R	NA	NA	NA
Benzene	1	NA	<5	NA	NA	NA
Bromobenzene	1	NA	<5	NA	NA	NA
Bromochloromethane	1	NA	<5	NA	NA	NA
Bromodichloromethane	1	NA	<5	NA	NA	NA
Bromoform	1	NA	<5	NA	NA	NA
Bromomethane	2	NA	<10	NA	NA	NA
Carbon disulfide	1	NA	<5	NA	NA	NA
Carbon tetrachloride	1	NA	<5 UJ	NA	NA	NA
Chlorobenzene	1	NA	<5	NA	NA	NA
Chloroethane	2	NA	<10	NA	NA	NA
Chloroform	1	NA	<5	NA	NA	NA
Chloromethane	2	NA	<10 UJ	NA	NA	NA

TABLE E-8

SUMMARY OF QUALIFIED DATA - JULY 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-19 7/30/2002	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002	Sample MWFTA-28B 7/17/2002	Sample MWFTA-29B 7/30/2002
cis 1,2 Dichloroethene	0 5	NA	160	NA	NA	NA
cis 1 3 Dichloropropene	1	NA	<5	NA	NA	NA
Dibromochloromethane	1	NA	<5	NA	NA	NA
Dibromomethane	1	NA	<5	NA	NA	NA
Dichlorodifluoromethane	2	NA	<10 UJ	NA	NA	NA
Ethylbenzene	1	NA	<5	NA	NA	NA
Hexachlorobutadiene	1	NA	<5	NA	NA	NA
Isopropylbenzene	1	NA	<5	NA	NA	NA
m Xylene & p Xylene	1	NA	<5	NA	NA	NA
Methylene chloride	1	NA	3 2 JB	NA	NA	NA
n-Butylbenzene	1	NA	<5	NA	NA	NA
n Propylbenzene	1	NA	<5	NA	NA	NA
Naphthalene	1	NA	<5	NA	NA	NA
o-Xylene	0 5	NA	<2 5	NA	NA	NA
p Isopropyltoluene	1	NA	<5	NA	NA	NA
sec-Butylbenzene	1	NA	<5	NA	NA	NA
Styrene	1	NA	<5	NA	NA	NA
tert Butylbenzene	1	NA	<5	NA	NA	NA
Tetrachloroethene	1	NA	<5	NA	NA	NA
Toluene	1	NA	<5	NA	NA	NA
trans-1 2 Dichloroethene	0 5	NA	<2 5	NA	NA	NA
trans 1 3 Dichloropropene	1	NA	<5	NA	NA	NA
Trichloroethene	1	NA	7 1	NA	NA	NA
Trichlorofluoromethane	2	NA	<10 UJ	NA	NA	NA
Vinyl chloride	2	NA	8 6 JQ	NA	NA	NA
Xylenes (total)	1	NA	<5	NA	NA	NA
Surrogate - %						
1 2 Dichloroethane-d4	-	NA	106	NA	NA	NA
4 Bromofluorobenzene	--	NA	84	NA	NA	NA
Dibromofluoromethane	--	NA	105	NA	NA	NA
Toluene d8	--	NA	93	NA	NA	NA

Notes

J Estimated based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JH Estimated possibly biased high based upon QC data
JL Estimated possibly biased low based upon QC data
JQ Estimated, Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected Reported Detection Limit is imprecise
UL Undetected Data biased low Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE RMB 6/04/03
CHECKED/DATE JAH 6/05/03

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TABLE E-9

SUMMARY OF QUALIFIED DATA - JULY 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002
FIELD PARAMETER.			
Dissolved Oxygen - E360.1 mg/L			
Dissolved Oxygen	0 1	3 8	3 8
Ferrous Iron - A3500D mg/L			
Ferrous Iron	0 1	<0 1	<0 1
Oxidation Reduction Potential - A2580A mV			
Oxidation Reduction Potential	--	-38	-38
pH - E150.1 pH Units			
pH	--	8 77	8 77
Specific Conductance - E120.1 mS/cm			
Specific Conductance	0 001	0 156	0 156
Temperature - E170.1 deg C			
Temperature	0 1	23 2	23 2
Turbidity - E180.1 NTU			
Turbidity	1	6	6
FIXED BASE LABORATORY ANALYSIS:			
Anions - MCAWW 300 3A mg/L			
Chloride	1	4 JH	3 7 JB
Nitrate	0 1	<0 1	<0 1
Sulfate	1	4 5	4 5
Dissolved Gases - RSK SOP-175 mg/L			
Carbon dioxide	0 001	<0 17	<0 17
Ethane	0 002	<0 002	<0 002
Ethene	0 001	0 003	0 0032
Methane	0 001	0 0088	0 0098
Hydrogen by Microseeps - AM20GAX nM			
Hydrogen	0 03	2	2 2
Total Alkalinity - MCAWW 310.1 mg/L			
Total Alkalinity	5	81	79
Total Organic Carbon - SW846 9060 mg/L			
Total Organic Carbon	1	<1	<1
Total Sulfide - MCAWW 376.1 mg/L			
Total Sulfide	1	0 97 JQ	<1
Mercury - SW846 7470A (Dissolved) ug/L			
Mercury	1	<1	<1
Mercury - SW846 7470A (Total) ug/L			
Mercury	1	<1	<1
Metals - SW846 6010B (Dissolved) ug/L			
Aluminum	200	<200 UJ	90 5 JQ
Antimony	5	<5	<5
Arsenic	5	<5	<5
Barium	200	66 1 JQ	67 8 JQ
Beryllium	10	<10	<10
Cadmium	2	<2	<2
Calcium	5000	10100	12400
Chromium	10	<10	<10
Cobalt	30	<30	<30
Copper	10	<10	<10
Iron	200	285 J	153 JQ
Lead	3	<3	<3
Magnesium	5000	6950	5690
Manganese	20	172 J	132 J
Molybdenum	40	<40	<40
Nickel	100	<100	<100
Potassium	5000	6410	6860
Selenium	5	<5	<5
Silver	10	<10	<10
Sodium	5000	9900	10200
Vanadium	50	<50	<50
Zinc	20	<20	<20

TABLE E-9

SUMMARY OF QUALIFIED DATA - JULY 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002
Metals - SW846 6010B (Total) ug/L			
Aluminum	200	77 9 JQ	<200 UJ
Antimony	5	<5	<5
Arsenic	5	<5	<5
Barium	200	68 JQ	77 5 JQ
Beryllium	10	<10	<10
Cadmium	2	<2	<2
Calcium	5000	11600 J	17900 J
Chromium	10	<10	<10
Cobalt	30	<30	<30
Copper	10	<10	<10
Iron	200	299 J	144 JQ
Lead	3	<3	<3
Magnesium	5000	6100 J	2900 JQ
Manganese	20	152 J	65 8 J
Molybdenum	40	<40	<40
Nickel	100	<100	<100
Potassium	5000	6670	8060
Selenium	5	<5	<5
Silver	10	<10	<10
Sodium	5000	10200	11500
Vanadium	50	<50	<50
Zinc	20	<20	20 8
Thallium - SW846 7841 (Dissolved) ug/L			
Thallium	2	<2 UJ	<2 UJ
Thallium - SW846 7841 (Total) ug/L			
Thallium	2	<2 UJ	<2 UJ
Volatile Organic Compounds - SW846 8260B ug/L			
1 1 1,2-Tetrachloroethane	1	<5	<3 3
1 1,1-Trichloroethane	1	<5	<3 3
1,1 2 2-Tetrachloroethane	1	<5	<3 3
1,1,2-Trichloroethane	1	<5	<3 3
1,1 Dichloroethane	1	19	19
1,1 Dichloroethene	1	11	9 3
1,1 Dichloropropene	1	<5	<3 3
1,2 3-Trichlorobenzene	1	<5	<3 3
1 2,3-Trichloropropane	1	<5	<3 3
1,2,4-Trichlorobenzene	1	<5	<3 3
1,2,4-Trimethylbenzene	1	<5	<3 3
1 2-Dibromo 3-chloropropane	2	<10	<6 7
1 2-Dibromoethane	1	<5	<3 3
1 2-Dichlorobenzene	1	<5	<3 3
1 2 Dichloroethane	1	<5 UJ	<3 3
1 2-Dichloropropane	1	<5	<3 3
1 3 5-Trimethylbenzene	1	<5	<3 3
1,3 Dichlorobenzene	1	<5	<3 3
1,3 Dichloropropane	1	<5	<3 3
1 4 Dichlorobenzene	1	<5	<3 3
2,2 Dichloropropane	1	<5	<3 3
2 Butanone	10	<50 UJ	<33 R
2 Chlorotoluene	1	<5	<3 3
2 Hexanone	10	<50 R	<33 R
4-Chlorotoluene	1	<5	<3 3
4-Methyl-2 pentanone	10	<50	<33
Acetone	10	<50 R	<33 R
Benzene	1	<5	<3 3
Bromobenzene	1	<5	<3 3
Bromochloromethane	1	<5	<3 3
Bromodichloromethane	1	<5	<3 3
Bromoform	1	<5	<3 3
Bromomethane	2	<10	<6 7
Carbon disulfide	1	<5	<3 3
Carbon tetrachloride	1	<5 UJ	<3 3 UJ
Chlorobenzene	1	<5	<3 3
Chloroethane	2	<10	<6 7
Chloroform	1	<5	<3 3
Chloromethane	2	<10 UJ	<6 7 UJ
cis 1 2 Dichloroethene	0 5	150	130
cis-1 3 Dichloropropene	1	<5	<3 3
Dibromochloromethane	1	<5	<3 3
Dibromomethane	1	<5	<3 3
Dichlorodifluoromethane	2	<10 UJ	<6 7 UJ
Ethylbenzene	1	<5	<3 3
Hexachlorobutadiene	1	<5	<3 3
Isopropylbenzene	1	<5	<3 3

TABLE E-9

SUMMARY OF QUALIFIED DATA - JULY 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting Limit (a)	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002
m-Xylene & p-Xylene	1	<5	<3 3
Methylene chloride	1	3 3 JB	1 1 JQ
n Butylbenzene	1	<5	<3 3
n-Propylbenzene	1	<5	<3 3
Naphthalene	1	<5	<3 3 UJ
o-Xylene	0 5	<2 5	<1 7
p-Isopropyltoluene	1	<5	<3 3
sec-Butylbenzene	1	<5	<3 3
Styrene	1	<5	<3 3
tert-Butylbenzene	1	<5	<3 3
Tetrachloroethene	1	<5	<3 3
Toluene	1	<5	<3 3
trans-1,2-Dichloroethene	0 5	<2 5	<1 7
trans 1,3-Dichloropropene	1	<5	<3 3
Trichloroethene	1	7 4	5 8
Trichlorofluoromethane	2	<10 UJ	<6 7 UJ
Vinyl chloride	2	8 6 JQ	9 2
Xylenes (total)	1	<5	<3 3
Surrogate - %			
1,2-Dichloroethane-d4	--	107	108
4-Bromofluorobenzene	--	82	82
Dibromofluoromethane	--	99	105
Toluene-d8	--	91	93
<u>Volatile Organic Compounds - SW846 8260B, UNPRES ug/L</u>			
1,1,1,2-Tetrachloroethane	1	<5	NA
1,1,1-Trichloroethane	1	<5	NA
1,1 2 2-Tetrachloroethane	1	<5	NA
1,1,2-Trichloroethane	1	<5	NA
1,1-Dichloroethane	1	20	NA
1,1-Dichloroethene	1	11	NA
1,1-Dichloropropene	1	<5	NA
1 2 3-Trichlorobenzene	1	<5	NA
1 2,3-Trichloropropane	1	<5	NA
1,2 4-Trichlorobenzene	1	<5	NA
1 2 4-Trimethylbenzene	1	<5	NA
1,2-Dibromo-3 chloropropane	2	<10	NA
1 2-Dibromoethane	1	<5	NA
1 2-Dichlorobenzene	1	<5	NA
1 2-Dichloroethane	1	<5 UJ	NA
1,2 Dichloropropane	1	<5	NA
1,3,5-Trimethylbenzene	1	<5	NA
1 3 Dichlorobenzene	1	<5	NA
1,3 Dichloropropane	1	<5	NA
1,4 Dichlorobenzene	1	<5	NA
2 2-Dichloropropane	1	<5	NA
2 Butanone	10	<50 UJ	NA
2 Chlorotoluene	1	<5	NA
2 Hexanone	10	<50 R	NA
4 Chlorotoluene	1	<5	NA
4-Methyl-2-pentanone	10	<50	NA
Acetone	10	<50 R	NA
Benzene	1	<5	NA
Bromobenzene	1	<5	NA
Bromochloromethane	1	<5	NA
Bromodichloromethane	1	<5	NA
Bromoform	1	<5	NA
Bromomethane	2	<10	NA
Carbon disulfide	1	<5	NA
Carbon tetrachloride	1	<5 UJ	NA
Chlorobenzene	1	<5	NA
Chloroethane	2	<10	NA
Chloroform	1	<5	NA
Chloromethane	2	<10 UJ	NA
cis-1 2 Dichloroethene	0 5	160	NA
cis-1 3 Dichloropropene	1	<5	NA
Dibromochloromethane	1	<5	NA
Dibromomethane	1	<5	NA
Dichlorodifluoromethane	2	<10 UJ	NA
Ethylbenzene	1	<5	NA
Hexachlorobutadiene	1	<5	NA
Isopropylbenzene	1	<5	NA
m Xylene & p-Xylene	1	<5	NA
Methylene chloride	1	3 2 JB	NA
n Butylbenzene	1	<5	NA
n-Propylbenzene	1	<5	NA
Naphthalene	1	<5	NA

TABLE E-9

SUMMARY OF QUALIFIED DATA - JULY 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date:	Reporting Limit (a)	Sample MWFTA-20 7/30/2002	Duplicate MWFTA-20 7/30/2002
o-Xylene	0 5	<2 5	NA
p-Isopropyltoluene	1	<5	NA
sec-Butylbenzene	1	<5	NA
Styrene	1	<5	NA
tert-Butylbenzene	1	<5	NA
Tetrachloroethene	1	<5	NA
Toluene	1	<5	NA
trans-1 2-Dichloroethene	0 5	<2 5	NA
trans-1 3-Dichloropropene	1	<5	NA
Trichloroethene	1	7 1	NA
Trichlorofluoromethane	2	<10 UJ	NA
Vinyl chloride	2	8 6 JQ	NA
Xylenes (total)	1	<5	NA
Surrogate - %			
1,2 Dichloroethane d4	--	106	NA
4-Bromofluorobenzene	--	84	NA
Dibromofluoromethane	--	105	NA
Toluene d8	--	93	NA

Notes.

J Estimated, based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JH Estimated, possibly biased high based upon QC data.
JL Estimated, possibly biased low based upon QC data.
JQ Estimated, Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected, Reported Detection Limit is imprecise
UL Undetected, Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE RMB 6/04/03
CHECKED/DATE JAH 6/05/03

TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 10/16/2002	Duplicate AEHADG-10 10/16/2002	Sample DMW-13A 10/16/2002	Sample DMW-20A 10/16/2002	Sample DMW-22A 10/30/2002	Sample DMW-25A 10/16/2002	Sample DMW-26A 10/15/2002
FIELD PARAMETER								
Dissolved Oxygen - E360 1 mg/L								
Dissolved Oxygen	0.1	0.8	0.8	0.8	1	0.4	2.5	0.1
Ferrous Iron - A3500D mg/L								
Ferrous Iron	0.1	<0.1	<0.1	3.5	<0.1	2	<0.1	1
Oxidation Reduction Potential - A2580A mV								
Oxidation Reduction Potential	--	-31	31	299	405	80	157	68
pH - F150 1 pH Units								
pH	--	5.16	5.16	3.74	3.85	5.87	6.63	6.71
Specific Conductance - E120 1 mS/cm								
Specific Conductance	0.001	0.318	0.318	0.137	0.124	0.274	0.291	0.709
Temperature - F170 1 deg C								
Temperature	0.1	20.5	20.5	21.6	19.4	15.8	18.7	21
Turbidity - F180 1 NTU								
Turbidity	1	15	15	<1	47	<1	19	11
FIXED BASE LABORATORY ANALYSIS								
Anions - MCAWW 300 0A mg/L								
Chloride	1	45	44.9	15.2	16.5	45	6.3	118
Nitrate as N	0.1	<0.1	<0.1	1.4 JB	0.17	<0.1	1	0.02 JQ
Sulfate	1	19.7	18.6	20.8	19	33.6	39.4	13.9
Dissolved Gases - RSK SOP-175 mg/L								
Carbon dioxide	0.001	120	120	110	160	85	24	180
Ethane	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ethene	0.001	0.014	0.013	<0.001	<0.001	<0.001	<0.001	<0.001
Methane	0.001	0.18	0.19	0.0023 JB	0.0011 JB	0.075	0.0016 JB	2.4
Hydrogen by Microseeps - AM20GAX nM								
Hydrogen	0.03	2.2	2.6	2.4	2.7	4.2	5	2.9
Total Alkalinity - MCAWW 310 1 mg/L								
Total Alkalinity	5	13 JH	13 JH	<5	14 JB	31	97	61
Total Organic Carbon - SW846 9060 mg/L								
Total Organic Carbon	1	1 JH	1 JH	1 JH	1 JB	2	11	16
Total Sulfide - MCAWW 376 1 mg/L								
Total Sulfide	1	<1	0.33 JB	0.49 JB	1.1 JH	0.32 JQ	0.81 JH	6.9

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TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 10/16/2002	Duplicate AEHADG-10 10/16/2002	Sample DMW-13A 10/16/2002	Sample DMW-20A 10/16/2002	Sample DMW-22A 10/30/2002	Sample DMW-25A 10/16/2002	Sample DMW-26A 10/15/2002
Mercury - SW846 7470A (Dissolved) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L								
Aluminum	200	<200 UJ	<200 UJ	794	109 JQ	85.6 JQ	623	260
Antimony	5	<5	<5	<5	<5	<5 UJ	<5	<5
Arsenic	5	37.9	38.6	<5	<5	15	<5	3.1 JQ
Barium	200	108 JQ	109 JQ	98.2 JQ	70.7 JQ	66.7 JQ	519 JQ	57.5 JQ
Beryllium	10	1.9 JQ	2 JQ	1.4 JQ	0.91 JQ	<10	<10	<10
Cadmium	2	<2	<2	0.43 JQ	<2	<2	<2	<2
Calcium	5000	4750 JQ	4710 JQ	1740 JQ	1460 JQ	9710	18500	4430 JQ
Chromium	10	<10	<10	<10	<10	<10	2.2 JQ	<10
Cobalt	30	25.8 JQ	25.7 JQ	4 JQ	5 JB	<30	2 JQ	<30
Copper	10	<10	<10	<10	<10	<10	8.5 JQ	<10
Iron	200	17300	17400	2130	43.7 JB	4140	579	12400
Lead	3	<3	<3	3.1	<3	<3	<3	<3
Magnesium	5000	5370	5420	2130 JQ	2670 JQ	7380	2690 JQ	1580 JQ
Manganese	20	650	654	162	295	119	8.2 JQ	69.6
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	37.5 JQ	37.6 JQ	3.3 JQ	4.9 JQ	<100	4.4 JQ	<100
Potassium	5000	4530 JQ	4600 JQ	2220 JQ	2980 JQ	5840	14500	9180
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	11600	11700	6090	6670	29900	42000	90600
Vanadium	50	1.1 JQ	0.75 JQ	<50	<50	<50	1.4 JQ	3.8 JQ
Zinc	20	28.8	27.4	20.4	<20 UI	<20	<20 UI	<20 UI
Metals - SW846 6010B (Total) µg/L								
Aluminum	200	63.4 JQ	74.2 JQ	831	145 JQ	78.7 JQ	925	443
Antimony	5	<5	<5	<5	<5	<5 UJ	<5	<5
Arsenic	5	39.6	39.5	<5	<5	14.4	2.8 JQ	2.6 JQ
Barium	200	107 JQ	110 JQ	102 JQ	70.5 JQ	64.9 JQ	52.3 JQ	58.5 JQ
Beryllium	10	1.9 JQ	1.9 JQ	1.2 JQ	0.97 JQ	<10	<10	<10
Cadmium	2	<2	<2	0.49 JQ	<2	<2	<2	<2
Calcium	5000	4670 JQ	4800 JQ	1710 JQ	1430 JQ	9450	18300	4440 JQ
Chromium	10	<10	<10	<10	<10	<10	2.6 JQ	<10
Cobalt	30	24.7 JQ	26 JQ	4 JQ	5.2 JB	<30	2.3 JQ	<30
Copper	10	<10	<10	<10	<10	1.9 JB	8.4 JQ	<10
Iron	200	17200	17700	2200	639	4070	731	12500
Lead	3	<3	<3	2.8 JQ	<3	<3	<3	<3
Magnesium	5000	5300	5440	2200 JQ	2690 JQ	7170	2680 JQ	1610 JQ
Manganese	20	639	658	170	297	117	11.4 JQ	70
Molybdenum	40	<40	<40	<40	<40	<40	3.7 JQ	<40
Nickel	100	37.2 JQ	38.4 JQ	3.4 JQ	4.2 JQ	<100	3.7 JQ	<100
Potassium	5000	4480 JQ	4590 JQ	2230 JQ	2970 JQ	5670	14000	9400
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	11300	11800	6200	6710	29200	41300	90700
Vanadium	50	0.81 JQ	1.2 JQ	<50	<50	<50	1.9 JQ	4.2 JQ
Zinc	20	24.1	24.2	47.7	<20 UI	23	<20 UI	<20 UI
Thallium - SW846 7841 (Dissolved) µg/L								
Thallium	2	<2 UI	<2 UJ	<2	<2 UI	<2	<2	<2 UI
Thallium - SW846 7841 (Total) µg/L								

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TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG 10 10/16/2002	Duplicate AEHADG-10 10/16/2002	Sample DMW-13A 10/16/2002	Sample DMW-20A 10/16/2002	Sample DMW-22A 10/30/2002	Sample DMW-25A 10/16/2002	Sample DMW-26A 10/15/2002
Thallium	2	<2 UI	<2 UI	<2	<2 UI	<2	<2	<2 UL
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L								
PCB 1016	1	NA	NA	NA	NA	NA	NA	NA
PCB-1221	1	NA	NA	NA	NA	NA	NA	NA
PCB 1232	1	NA	NA	NA	NA	NA	NA	NA
PCB-1242	1	NA	NA	NA	NA	NA	NA	NA
PCB 1248	1	NA	NA	NA	NA	NA	NA	NA
PCB-1254	1	NA	NA	NA	NA	NA	NA	NA
PCB-1260	1	NA	NA	NA	NA	NA	NA	NA
Surrogate - %								
Decachlorobiphenyl	--	NA	NA	NA	NA	NA	NA	NA
Tetrachloro-m-xylene	--	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organic Compounds - SW846 8270C SIM µg/L								
Acenaphthene	0 2	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	0 2	NA	NA	NA	NA	NA	NA	NA
Anthracene	0 2	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0 2	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0 2	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0 2	NA	NA	NA	NA	NA	NA	NA
Benzo(ghi)perylene	0 2	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0 2	NA	NA	NA	NA	NA	NA	NA
Carbazole	0 2	NA	NA	NA	NA	NA	NA	NA
Chrysene	0 2	NA	NA	NA	NA	NA	NA	NA
Dibenz(a h)anthracene	0 2	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	0 2	NA	NA	NA	NA	NA	NA	NA
Fluorene	0 2	NA	NA	NA	NA	NA	NA	NA
Indeno(1 2 3-cd)pyrene	0 2	NA	NA	NA	NA	NA	NA	NA
Naphthalene	0 2	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0 2	NA	NA	NA	NA	NA	NA	NA
Pyrene	0 2	NA	NA	NA	NA	NA	NA	NA
Surrogate - %								
2 4 6-Tribromophenol	--	NA	NA	NA	NA	NA	NA	NA
2-Fluorobiphenyl	-	NA	NA	NA	NA	NA	NA	NA
2-Fluorophenol	--	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene d5	-	NA	NA	NA	NA	NA	NA	NA
Phenol d5	-	NA	NA	NA	NA	NA	NA	NA
Terphenyl d14	-	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L								
1 1 1 2-Tetrachloroethane	1	<120	<120	<1	<1	<1	<1	<1
1 1,1-Trichloroethane	1	1100	1200	<1	<1	<1	<1	<1
1 1 2 2 Tetrachloroethane	1	<120	<120	<1	<1	<1	<1	<1
1 1 2 Trichloroethane	1	<120	<120	<1	<1	<1	<1	<1
1 1-Dichloroethane	1	<120	<120	<1	<1	0 48 JQ	<1	<1
1 1 Dichloroethene	1	98 JQ	140 J	<1	<1	0 61 JQ	<1	<1
1 1-Dichloropropene	1	<120	<120	<1	<1	<1	<1	<1
1 2 3 Trichlorobenzene	1	<120	<120	<1	<1	<1 UJ	<1	<1
1 2 3 Trichloropropane	1	<120	<120	<1	<1	<1	<1	<1
1 2 4-Trichlorobenzene	1	<120	<120	<1	<1	<1 UJ	<1	<1
1 2 4-Trimethylbenzene	1	<120	<120	<1	<1	<1	<1	<1
1 2-Dibromo 3-chloropropane	2	<250	<250	<2	<2	<2	<2	<2

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TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AEHADG-10 10/16/2002	Duplicate AEHADG-10 10/16/2002	Sample DMW-13A 10/16/2002	Sample DMW-20A 10/16/2002	Sample DMW-22A 10/30/2002	Sample DMW-25A 10/16/2002	Sample DMW-26A 10/15/2002
1 2-Dibromoethane	1	<120	<120	<1	<1	<1	<1	<1
1 2-Dichlorobenzene	1	140	140	<1	<1	0 44 JQ	<1	<1
1 2-Dichloroethane	1	<120	<120	<1	<1	<1	<1	<1
1 2 Dichloropropane	1	<120	<120	<1	<1	<1	<1	<1
1 3 5 Trimethylbenzene	1	<120	<120	<1	<1	<1	<1	<1
1 3 Dichlorobenzene	1	<120	<120	<1	<1	<1	<1	<1
1 3-Dichloropropane	1	<120	<120	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	1	<120	<120	<1	<1	<1	<1	<1
2 2-Dichloropropane	1	<120	<120	<1	<1	<1	<1	<1
2 Butanone	10	<1200	<1200	<10	<10	<10 UJ	<10	<10 UJ
2 Chlorotoluene	1	<120	<120	<1	<1	<1	<1	<1
2-Hexanone	10	<1200	<1200	<10	<10	<10 UJ	<10	<10 UJ
4-Chlorotoluene	1	<120	<120	<1	<1	<1	<1	<1
4 Methyl 2-pentanone	10	<1200	<1200	<10	<10	<10	<10	<10
Acetone	10	<1200 UJ	<1200 UJ	<10	<10	<10 R	2 5 JQ	1 6 JB
Benzene	1	<120	<120	<1	<1	<1	<1	<1
Bromobenzene	1	<120	<120	<1	<1	<1	<1	<1
Bromochloromethane	1	<120	<120	<1	<1	<1	<1	<1
Bromodichloromethane	1	<120	<120	<1	<1	<1	<1	<1
Bromoform	1	<120	<120	<1	<1	<1	<1	<1 UJ
Bromomethane	2	<250	<250	<2	<2	<2	<2	<2
Carbon disulfide	1	<120 UJ	<120 UJ	<1	<1	<1	<1	<1
Carbon tetrachloride	1	<120	<120	<1	<1	<1	<1	<1
Chlorobenzene	1	<120	<120	<1	<1	<1	<1	<1
Chloroethane	2	<250	<250	<2	<2	<2	<2	<2
Chloroform	1	<120	<120	<1	<1	<1	<1	<1
Chloromethane	2	<250	<250	<2	0 52 JQ	<2	<2	<2
cis 1 2-Dichloroethene	0 5	650	690	<0 5	21	2	<0 5	0 38 JQ
cis-1 3-Dichloropropene	1	<120	<120	<1	<1	<1	<1	<1
Dibromochloromethane	1	<120	<120	<1	<1	<1	<1	<1
Dibromomethane	1	<120	<120	<1	<1	<1	<1	<1
Dichlorodifluoromethane	2	<250 UJ	<250 UJ	<2	<2	<2 UJ	<2	<2 UJ
Ethylbenzene	1	<120	<120	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	<120	<120	<1	<1	<1 UJ	<1	<1 UJ
Isopropylbenzene	1	<120	<120	<1	<1	<1	<1	<1
m Xylene & p Xylene	1	<120	<120	<1	<1	<1	<1	<1
Methylene chloride	1	<120	<120	<1	<1	<1	<1	<1
n Butylbenzene	1	<120	<120	<1	<1	<1 UJ	<1	<1
n Propylbenzene	1	<120	<120	<1	<1	<1	<1	<1
Naphthalene	1	54 JQ	58 JQ	<1	<1	<1 UJ	<1	<1
o Xylene	0 5	<62	<62	<0 5	<0 5	<0 5	<0 5	<0 5
p-Isopropyltoluene	1	<120	<120	<1	<1	<1	<1	<1
sec Butylbenzene	1	<120	<120	<1	<1	<1	<1	<1
Styrene	1	<120	<120	<1	<1	<1	<1	<1
tert-Butylbenzene	1	<120	<120	<1	<1	<1	<1	<1
Tetrachloroethene	1	1700	1900	<1	<1	1 9	1 4	<1
Toluene	1	<120	<120	<1	<1	<1	<1	<1
trans 1 2 Dichloroethene	0 5	<62	<62	<0 5	<0 5	<0 5	<0 5	<0 5
trans 1 3 Dichloropropene	1	<120	<120	<1	<1	<1	<1	<1
Trichloroethene	1	2500	2800	<1	2 5	10	<1	0 81 JQ
Trichlorofluoromethane	2	<250	<250	<2	<2	<2	<2	<2 UJ
Vinyl chloride	2	<250	<250	<2	<2	<2	<2	<2
Xylenes (total)	1	<120	<120	<1	<1	<1	<1	<1

TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample AFHADG-10 10/16/2002	Duplicate AFHADG-10 10/16/2002	Sample DMW-13A 10/16/2002	Sample DMW-20A 10/16/2002	Sample DMW-22A 10/30/2002	Sample DMW-25A 10/16/2002	Sample DMW-26A 10/15/2002
Surrogate - %								
1 2 Dichloroethane d4	--	85	88	87	88	90	86	92
4 Bromofluorobenzene	--	92	90	89	91	79	91	90
Dibromofluoromethane	--	92	93	91	92	99	90	99
Toluene d8	-	91	90	91	90	88	91	94

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TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID. Sample Date:	Reporting Limit (a)	Sample DMW-27A 10/15/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/16/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/15/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/16/2002
FIELD PARAMETER								
Dissolved Oxygen - E360.1 mg/L								
Dissolved Oxygen	0.1	1.1	0.6	0.7	1	0.6	0.8	2.2
Ferrous Iron - A3500D mg/L								
Ferrous Iron	0.1	0.5	2.4	<0.1	3	<0.1	<0.1	2
Oxidation Reduction Potential - A2580A mV								
Oxidation Reduction Potential	--	63	-43	147	224	101	230	-158
pH - E150.1 pH Units								
pH	--	3.99	5.15	5.29	4.92	5.56	4.8	5.67
Specific Conductance - E120.1 mS/cm								
Specific Conductance	0.001	0.123	0.314	0.073	0.119	0.240	0.107	0.557
Temperature - E170.1 deg C								
Temperature	0.1	22.3	18.6	19.7	19.9	20	20.4	20.5
Turbidity - E180.1 NTU								
Turbidity	1	<1	42	<1	26	36	11	218
FIXED BASE LABORATORY ANALYSIS								
Anions - MCAWW 300.0A mg/L								
Chloride	1	20.1	53.7	11.7	16.4	12	9.2	34.8 J
Nitrate as N	0.1	0.01 JQ	0.02 JQ	<0.1	0.06 JB	<0.1	<0.1	<0.1
Sulfate	1	1.4	19.5	4.2	13.8	62.9	18.1	0.53 JQ
Dissolved Gases - RSK SOP-175 mg/L								
Carbon dioxide	0.001	220	99	61	70	42	200	450
Ethane	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ethene	0.001	<0.001	0.0017	<0.001	<0.001	<0.001	0.01	<0.001
Methane	0.001	2.9	0.015	0.002 JB	<0.001	0.012	1.2	4.8
Hydrogen by Microseeps - AM20GAX nM								
Hydrogen	0.03	2.4	19	2.5	3	2.9	5.6	2.3
Total Alkalinity - MCAWW 310.1 mg/L								
Total Alkalinity	5	3.6 JB	9.5 JH	11 JH	4.9 JH	13 JH	6.2 JH	190
Total Organic Carbon - SW846 9060 mg/L								
Total Organic Carbon	1	10	1 JH	<1	<1	1 JH	4 JH	30
Total Sulfide - MCAWW 376.1 mg/L								
Total Sulfide	1	<1	0.48 JQ	<1	<1	<1	2.7 JH	1.4 JH

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SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-27A 10/15/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/16/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/15/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/16/2002
Mercury - SW846 7470A (Dissolved) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1 UI
Mercury - SW846 7470A (Total) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1 UI	<1 UI
Metals - SW846 6010B (Dissolved) µg/L								
Aluminum	200	430	59 9 JQ	<200 UJ	66 8 JQ	<200 UJ	91 4 JQ	250
Antimony	5	<5	<5 UJ	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5	29 2	35 9
Barium	200	138 JQ	88 1 JQ	29 5 JQ	31 8 JQ	13 6 JQ	139 JQ	217
Beryllium	10	0 9 JQ	0 87 JQ	0 65 JQ	2 5 JQ	<10	<10	0 71 JQ
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	957 JQ	13100	3160 JQ	3400 JQ	15600	1160 JQ	22200
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	0 76 JQ	<30	<30	3 6 JB	<30	1 7 JB	1 2 JQ
Copper	10	<10	<10	<10	<10	<10	3 4 JQ	<10
Iron	200	3950	5180	1360	994	445	3780	7540
Lead	3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	1750 JQ	9440	2350 JQ	2870 JQ	7770	1930 JQ	30900
Manganese	20	21 7	145	47 9	61 9	43 5	64 2	544
Molybdenum	40	<40	<40	<40	<40	18 7 JQ	<40	<40
Nickel	100	<100	<100	4 4 JQ	7 4 JQ	<100	<100	<100
Potassium	5000	2850 JQ	5540	3620 JQ	6110	6870	2080 JQ	8030
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	5550	9050	2930 JQ	3400 JQ	9740	5980	14200
Vanadium	50	1 4 JQ	<50	<50	<50	<50	<50	1 5 JQ
Zinc	20	<20 UL	<20	<20 UL	<20 UI	<20 UI	<20 UI	<20 UI
Metals - SW846 6010B (Total) µg/L								
Aluminum	200	435	91 2 JQ	<200 UJ	62 5 JQ	<200 UJ	94 3 JQ	310
Antimony	5	<5	<5 UJ	<5	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5	27 4	35 7
Barium	200	140 JQ	87 6 JQ	30 9 JQ	32 1 JQ	13 6 JQ	142 JQ	215
Beryllium	10	0 86 JQ	1 JQ	0 71 JQ	2 5 JQ	0 64 JQ	<10	1 JQ
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	972 JQ	12900	3350 JQ	3410 JQ	15600	1220 JQ	21900
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	0 81 JQ	<30	<30	3 5 JB	<30	1 3 JB	0 98 JQ
Copper	10	<10	2 4 JB	<10	<10	<10	3 5 JQ	<10
Iron	200	4020	5240	1460	1030	473	3850	7450
Lead	3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	1780 JQ	9360	2430 JQ	2870 JQ	7770	1960 JQ	30300
Manganese	20	20 3	146	49 5	62 3	44	65 5	531
Molybdenum	40	<40	<40	<40	<40	18 5 JQ	<40	<40
Nickel	100	<100	<100	4 6 JQ	6 JQ	<100	3 5 JQ	<100
Potassium	5000	2890 JQ	5520	3770 JQ	6110	6740	2090 JQ	7960
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	5640	8850	2910 JQ	3360 JQ	9490	6040	14200
Vanadium	50	1 4 JQ	<50	<50	<50	<50	<50	1 4 JQ
Zinc	20	<20 UL	18 2 JQ	<20 UI	<20 UI	<20 UI	<20 UI	<20 UI
Thallium - SW846 7841 (Dissolved) µg/L								
Thallium	2	<2	<2	<2	<2	<2	<2	<2 UI
Thallium - SW846 7841 (Total) µg/L								

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TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-27A 10/15/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/16/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/15/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/16/2002
Thallium	2	<2	<2	<2	<2	<2	<2	<2 UJ
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L								
PCB 1016	1	NA	NA	NA	NA	NA	NA	<1
PCB 1221	1	NA	NA	NA	NA	NA	NA	<1
PCB-1232	1	NA	NA	NA	NA	NA	NA	<1
PCB-1242	1	NA	NA	NA	NA	NA	NA	<1
PCB-1248	1	NA	NA	NA	NA	NA	NA	<1
PCB 1254	1	NA	NA	NA	NA	NA	NA	<1
PCB 1260	1	NA	NA	NA	NA	NA	NA	<1
Surrogate - %								
Decachlorobiphenyl	--	NA	NA	NA	NA	NA	NA	39
Tetrachloro m xylene	--	NA	NA	NA	NA	NA	NA	95
Semi-Volatile Organic Compounds - SW846 8270C SIM µg/L								
Acenaphthene	0 2	NA	NA	NA	NA	NA	NA	0 083 JQ
Acenaphthylene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Anthracene	0 2	NA	NA	NA	NA	NA	NA	0 046 JQ
Benzo(a)anthracene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Benzo(a)pyrene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Benzo(b)fluoranthene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Benzo(ghi)perylene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Benzo(k)fluoranthene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Carbazole	0 2	NA	NA	NA	NA	NA	NA	<0 2
Chrysene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Dibenz(a h)anthracene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Fluoranthene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Fluorene	0 2	NA	NA	NA	NA	NA	NA	0 049 JQ
Indeno(1 2 3 cd)pyrene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Naphthalene	0 2	NA	NA	NA	NA	NA	NA	2 3
Phenanthrene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Pyrene	0 2	NA	NA	NA	NA	NA	NA	<0 2
Surrogate - %								
2 4 6 Tribromophenol	-	NA	NA	NA	NA	NA	NA	105
2 Fluorobiphenyl	-	NA	NA	NA	NA	NA	NA	64
2 Fluorophenol		NA	NA	NA	NA	NA	NA	78
Nitrobenzene d5	-	NA	NA	NA	NA	NA	NA	68
Phenol-d5	--	NA	NA	NA	NA	NA	NA	70
Terphenyl d14	--	NA	NA	NA	NA	NA	NA	48
Volatile Organic Compounds - SW846 8260B µg/L								
1 1 1 2-Tetrachloroethane	1	<1	<67	<1	<1	<1	<330	<1
1 1 1 Trichloroethane	1	<1	680	<1	<1	<1	<330	<1
1 1 2 2-Tetrachloroethane	1	<1	<67	<1	<1	<1	<330	<1
1 1 2-Trichloroethane	1	<1	<67	<1	<1	<1	<330	<1
1 1-Dichloroethane	1	<1	110	<1	<1	<1	<330	0 79 JQ
1 1-Dichloroethene	1	<1	280	<1	<1	<1	<330	<1
1 1-Dichloropropene	1	<1	<67	<1	<1	<1	<330	<1
1 2 3 Trichlorobenzene	1	<1	<67 UJ	<1	<1	<1	<330	<1
1 2 3 Trichloropropane	1	<1	<67	<1	<1	<1	<330	<1
1 2 4 Trichlorobenzene	1	<1	<67 UJ	<1	<1	<1	<330	<1
1 2 4 Trimethylbenzene	1	<1	<67	<1	<1	<1	<330	<1
1 2-Dibromo 3 chloropropane	2	<2	<130	<2	<2	<2	<670	<2

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TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
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Operable Unit 7
Defense Supply Center Richmond
Richmond Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample DMW-27A 10/15/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/16/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/15/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/16/2002
1 2 Dibromoethane	1	<1	<67	<1	<1	<1	<330	<1
1 2 Dichlorobenzene	1	<1	<67	<1	<1	<1	<330	<1
1 2 Dichloroethane	1	<1	<67	<1	<1	<1	<330	<1
1,2 Dichloropropane	1	<1	<67	<1	<1	<1	<330	<1
1 3 5-Trimethylbenzene	1	<1	<67	<1	<1	<1	<330	<1
1 3 Dichlorobenzene	1	<1	<67	<1	<1	<1	<330	<1
1 3 Dichloropropane	1	<1	<67	<1	<1	<1	<330	<1
1 4-Dichlorobenzene	1	<1	<67	<1	<1	<1	<330	<1
2 2-Dichloropropane	1	<1	<67	<1	<1	<1	<330	<1
2 Butanone	10	<10 UJ	<670 R	<10	<10	<10 UJ	<3300	<10
2 Chlorotoluene	1	<1	<67	<1	<1	<1	<330	<1
2-Hexanone	10	<10 UJ	<670 R	<10	<10	<10 UJ	<3300	<10
4-Chlorotoluene	1	<1	<67	<1	<1	<1	<330	<1
4 Methyl-2 pentanone	10	<10	<670 UJ	<10	<10	<10	<3300	<10
Acetone	10	<10 UJ	<670 R	1 1 JQ	<10	<10 UJ	<3300	1 8 JQ
Benzene	1	<1	<67	<1	<1	<1	<330	<1
Bromobenzene	1	<1	<67	<1	<1	<1	<330	<1
Bromochloromethane	1	<1	<67	<1	<1	<1	<330	<1
Bromodichloromethane	1	<1	<67	<1	<1	<1	<330	<1
Bromoform	1	<1 UJ	<67	<1	<1	<1 UJ	<330	<1
Bromomethane	2	<2	<130	<2	<2	<2	<670	<2
Carbon disulfide	1	<1	<67	<1	<1	<1	<330	<1
Carbon tetrachloride	1	<1	<67	<1	<1	<1	<330	<1
Chlorobenzene	1	<1	<67	<1	<1	<1	<330	<1
Chloroethane	2	<2	<130	<2	<2	<2	<670	<2
Chloroform	1	<1	<67	<1	<1	<1	<330	<1
Chloromethane	2	<2	<130	<2	<2	<2	<670	<2
cis 1 2-Dichloroethene	0 5	<0 5	1900	<0 5	<0 5	<0 5	9800	0 61
cis 1 3-Dichloropropene	1	<1	<67	<1	<1	<1	<330	<1
Dibromochloromethane	1	<1	<67	<1	<1	<1	<330	<1
Dibromomethane	1	<1	<67	<1	<1	<1	<330	<1
Dichlorodifluoromethane	2	<2 UJ	<130 UJ	<2	<2	<2 UJ	<670	<2
Ethylbenzene	1	<1	<67	<1	<1	<1	<330	<1
Hexachlorobutadiene	1	<1 UJ	<67 UJ	<1	<1	<1 UJ	<330	<1
Isopropylbenzene	1	<1	<67	<1	<1	<1	<330	<1
m Xylene & p Xylene	1	<1	<67	<1	<1	<1	<330	<1
Methylene chloride	1	<1	29 JQ	<1	<1	<1	310 JQ	<1
n Butylbenzene	1	<1	<67 UJ	<1	<1	<1	<330	<1
n-Propylbenzene	1	<1	<67	<1	<1	<1	<330	<1
Naphthalene	1	<1	<67 UJ	<1	<1	<1	<330	3 6
o-Xylene	0 5	<0 5	<33	<0 5	<0 5	<0 5	<170	<0 5
p Isopropyltoluene	1	<1	<67	<1	<1	<1	<330	<1
sec Butylbenzene	1	<1	<67 UJ	<1	<1	<1	<330	<1
Styrene	1	<1	<67	<1	<1	<1	<330	<1
tert Butylbenzene	1	<1	<67	<1	<1	<1	<330	<1
Tetrachloroethene	1	<1	450	6 1	<1	<1	<330	<1
Toluene	1	<1	<67	<1	<1	<1	<330	<1
trans-1 2 Dichloroethene	0 5	<0 5	<33	<0 5	<0 5	<0 5	140 JQ	<0 5
trans-1 3-Dichloropropene	1	<1	<67	<1	<1	<1	<330	<1
Trichloroethene	1	<1	2500	2	<1	<1	7600	<1
Trichlorofluoromethane	2	<2 UJ	<130	<2	<2	<2 UJ	<670	<2
Vinyl chloride	2	<2	<130	<2	<2	<2	360 JQ	<2
Xylenes (total)	1	<1	<67	<1	<1	<1	<330	<1

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TABLE F-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
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Operable Unit 7
Defense Supply Center Richmond
Richmond Virginia

Sample ID Sample Date	Reporting Limit (a)	Sample DMW-27A 10/15/2002	Sample DMW-33A 10/29/2002	Sample DMW-35A 10/16/2002	Sample MW112-2 10/16/2002	Sample MWFOS-1 10/15/2002	Sample MWFOS-3 10/15/2002	Sample MWFTA-1 10/16/2002
Surrogate - %								
1 2 Dichloroethane d4	--	94	91	86	87	95	87	87
4 Bromofluorobenzene	--	90	85	90	90	90	91	90
Dibromofluoromethane	--	101	101	92	91	100	93	90
Toluene-d8	--	94	94	91	91	94	91	91

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TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
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Richmond, Virginia

	Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 10/29/2002	Sample MWFTA-23 10/15/2002
FIELD PARAMETER:									
Dissolved Oxygen - E360.1 mg/L									
Dissolved Oxygen		0.1	0.8	0.8	1	0.6	1	<0.1	4.9
Ferrous Iron - A3500D mg/L									
Ferrous Iron		0.1	2	2	3.4	2	3.2	3	0.5
Oxidation Reduction Potential - A2580A mV									
Oxidation Reduction Potential		--	-28	28	111	405	191	63	76
pH - E150.1 pH Units									
pH		-	5.26	5.26	6.37	3.43	5.31	5.94	5.1
Specific Conductance - E120.1 mS/cm									
Specific Conductance		0.001	0.432	0.432	0.115	0.114	0.064	0.116	0.249
Temperature - E170.1 deg C									
Temperature		0.1	18.8	18.8	15.9	19.8	16.3	15.1	19.8
Turbidity - E180.1 NTU									
Turbidity		1	5	5	10	<1	3	10	48
FIXED BASE LABORATORY ANALYSIS									
Anions - MCAWW 300.0A mg/L									
Chloride		1	74.7	73.5	7.4	7.2	7.8	4.6	36.4
Nitrate as N		0.1	<0.1	<0.1	<0.1	0.06 JQ	<0.1	<0.1	<0.1
Sulfate		1	27.8	25.2	13.7	29.8	8.5	6.4	1.8
Dissolved Gases - RSK SOP-175 mg/L									
Carbon dioxide		0.001	96	93	39	68	49	38	210
Ethane		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00089 JQ
Ethene		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.036
Methane		0.001	0.14	0.14	0.0011 JB	0.0034	0.0021	0.004	1.4
Hydrogen by Microseeps - AM20GAX nM									
Hydrogen		0.03	3.1	2.7	5	2.5	3.7	4.5	19
Total Alkalinity - MCAWW 310.1 mg/L									
Total Alkalinity		5	20	22	15	<5	7.4 JH	26	23
Total Organic Carbon - SW846 9060 mg/L									
Total Organic Carbon		1	8	8	<1	2	<1	<1	11
Total Sulfide - MCAWW 376.1 mg/L									
Total Sulfide		1	0.78 JQ	0.78 JQ	0.48 JQ	<1	0.96 JQ	0.8 JQ	<1

TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
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Richmond, Virginia

Sample ID / Sample Date*	Reporting Limit (a)	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 10/29/2002	Sample MWFTA-23 10/15/2002
Mercury - SW846 7470A (Dissolved) ug/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) ug/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) ug/L								
Aluminum	200	187 JQ	228	113 JQ	730	59 JQ	<200	129 JQ
Antimony	5	<5	<5	<5 UJ	<5	<5 UJ	<5 UJ	<5
Arsenic	5	15.8	16	<5	<5	<5	<5	75.5
Barium	200	65.4 JQ	67.1 JQ	25.5 JQ	80.5 JQ	18.9 JQ	6.3 JQ	251
Beryllium	10	0.62 JQ	0.71 JQ	<10	1.9 JQ	<10	<10	1.2 JQ
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	4750 JQ	4830 JQ	3350 JQ	3680 JQ	2180 JQ	4060 JQ	2520 JQ
Chromium	10	<10	<10	<10	1.7 JQ	<10	<10	<10
Cobalt	30	1.2 JQ	0.84 JQ	<30	4.4 JQ	1.3 JB	0.74 JB	5 JQ
Copper	10	<10	<10	<10	<10	<10	1.8 JB	<10
Iron	200	3070	3130	384	<200	179 JB	329 JB	21300
Lead	3	<3	<3	<3	1.8 JQ	<3	<3	<3
Magnesium	5000	3070 JQ	3120 JQ	2620 JQ	2560 JQ	1630 JQ	3240 JQ	3260 JQ
Manganese	20	73.9	76.2	51.2	39.3	26.2	61.1	196
Molybdenum	40	<40	<40	<40	<40	2.5 JQ	<40	<40
Nickel	100	<100	<100	<100	<100	<100	<100	4.9 JQ
Potassium	5000	5440	5480	4300 JQ	2920 JQ	2580 JQ	3520 JQ	3580 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	43300	43600	8340	1760 JQ	5790	7780	4800 JQ
Vanadium	50	0.8 JQ	0.74 JQ	<50	<50	<50	<50	1 JQ
Zinc	20	<20	<20	30.9	<20	<20	<20	25.1
Metals - SW846 6010B (Total) ug/L								
Aluminum	200	216	246	<200	757	60.1 JQ	<200	174 JQ
Antimony	5	<5	<5	<5 UJ	<5	<5 UJ	<5 UJ	<5
Arsenic	5	13.8	15.1	<5	<5	<5	3.2 JB	77.2
Barium	200	69.6 JQ	70.1 JQ	27 JQ	81 JQ	18.3 JQ	7.1 JQ	256
Beryllium	10	0.6 JQ	0.73 JQ	<10	1.8 JQ	<10	<10	1.3 JQ
Cadmium	2	<2	<2	<2	0.32 JQ	<2	<2	<2
Calcium	5000	4990 JQ	5010	3230 JQ	3730 JQ	2130 JQ	4060 JQ	2590 JQ
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	0.78 JQ	<30	<30	4.4 JQ	0.93 JB	<30	5.6 JQ
Copper	10	<10	<10	<10	1.9 JQ	<10	<10	<10
Iron	200	3280	3290	518	<200	226	352	21800
Lead	3	<3	<3	<3	1.8 JQ	<3	<3	<3
Magnesium	5000	3210 JQ	3240 JQ	2570 JQ	2540 JQ	1570 JQ	3250 JQ	3280 JQ
Manganese	20	77.9	78.4	50.5	38.4	26.1	62.7	198
Molybdenum	40	<40	<40	<40	<40	<40	<40	<40
Nickel	100	<100	<100	<100	<100	<100	<100	6.8 JQ
Potassium	5000	5470	5610	4180 JQ	2970 JQ	2490 JQ	3510 JQ	3510 JQ
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	46000	45700	8240	1750 JQ	5400	7670	4870 JQ
Vanadium	50	0.92 JQ	<50	<50	<50	<50	<50	1.3 JQ
Zinc	20	<20	<20	<20	21	<20	<20	55
Thallium - SW846 7841 (Dissolved) ug/L								
Thallium	2	<2 UJ	<2 UL	<2	<2 UJ	<2	<3	<2
Thallium - SW846 7841 (Total) ug/L								

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TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
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Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 10/29/2002	Sample MWFTA-23 10/15/2002
Thallium	2	<2 UI	<2 UI	<2	<2 UI	<2	<2	<2
Polychlorinated Biphenyls (PCBs) - SW846 8082 µg/L								
PCB 1016	1	<1	<1	NA	NA	NA	NA	NA
PCB 1221	1	<1	<1	NA	NA	NA	NA	NA
PCB 1232	1	<1	<1	NA	NA	NA	NA	NA
PCB-1242	1	<1	<1	NA	NA	NA	NA	NA
PCB 1248	1	<1	<1	NA	NA	NA	NA	NA
PCB 1254	1	<1	<1	NA	NA	NA	NA	NA
PCB 1260	1	<1	<1	NA	NA	NA	NA	NA
Surrogate - %								
Decachlorobiphenyl	--	61	60	NA	NA	NA	NA	NA
Tetrachloro-m-xylene	--	111	110	NA	NA	NA	NA	NA
Semi-Volatile Organic Compounds - SW846 8270C SIM µg/L								
Acenaphthene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Acenaphthylene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Anthracene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Benzo(a)anthracene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Benzo(a)pyrene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Benzo(ghi)perylene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Carbazole	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Chrysene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Dibenz(a h)anthracene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Fluoranthene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Fluorene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Indeno(1 2 3 cd)pyrene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Naphthalene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Phenanthrene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Pyrene	0 2	<0 2	<0 2	NA	NA	NA	NA	NA
Surrogate - %								
2,4 6-Tribromophenol	-	83	90	NA	NA	NA	NA	NA
2 Fluorobiphenyl	--	55	64	NA	NA	NA	NA	NA
2 Fluorophenol	--	58	69	NA	NA	NA	NA	NA
Nitrobenzene d5	--	49	57	NA	NA	NA	NA	NA
Phenol d5	-	49	64	NA	NA	NA	NA	NA
Terphenyl-d14	--	59	310	NA	NA	NA	NA	NA
Volatile Organic Compounds - SW846 8260B µg/L								
1 1,1 2-Tetrachloroethane	1	<2	<2	<1	<1	<1	<1	<1200
1 1 1-Trichloroethane	1	<2	<2	<1	<1	<1	<1	<1200
1 1 2 2-Tetrachloroethane	1	<2	<2	<1	<1	<1	<1	<1200
1 1,2-Trichloroethane	1	<2	<2	<1	<1	<1	<1	<1200
1 1-Dichloroethane	1	0 6 JQ	<2	<1	<1	<1	<1	<1200
1 1-Dichloroethene	1	0 69 JQ	0 64 JQ	<1	<1	<1	<1	<1200
1 1-Dichloropropene	1	<2	<2	<1	<1	<1	<1	<1200
1 2 3-Trichlorobenzene	1	<2	<2	<1 UJ	<1	<1 UJ	<1 UJ	<1200
1,2 3-Trichloropropane	1	<2	<2	<1	<1	<1	<1	<1200
1 2 4 Trichlorobenzene	1	<2	<2	<1 UJ	<1	<1 UJ	<1 UJ	<1200
1 2 4 Trimethylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
1 2-Dibromo-3 chloropropane	2	<4	<4	<2	<2	<2	<2	<2500

TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 10/29/2002	Sample MWFTA-23 10/15/2002
1,2-Dibromoethane	1	<2	<2	<1	<1	<1	<1	<1200
1,2-Dichlorobenzene	1	<2	<2	<1	<1	<1	<1	<1200
1,2-Dichloroethane	1	<2	<2	<1	<1	<1	<1	<1200
1,2-Dichloropropane	1	<2	<2	<1	<1	<1	<1	<1200
1,3,5-Trimethylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
1,3-Dichlorobenzene	1	<2	<2	<1	<1	<1	<1	<1200
1,3-Dichloropropane	1	<2	<2	<1	<1	<1	<1	<1200
1,4-Dichlorobenzene	1	<2	<2	<1	<1	<1	<1	<1200
2,2-Dichloropropane	1	<2	<2	<1	<1	<1	<1	<1200
2-Butanone	10	<20 UJ	<20 UJ	<10 R	<10 UJ	<10 R	<10 R	<12000
2-Chlorotoluene	1	<2	<2	<1	<1	<1	<1	<1200
2-Hexanone	10	<20 UJ	<20 UJ	<10 R	<10 UJ	<10 R	<10 R	<12000
4-Chlorotoluene	1	<2	<2	<1	<1	<1	<1	<1200
4-Methyl-2-pentanone	10	<20	<20	<10 UJ	<10	<10 UJ	<10 UJ	<12000
Acetone	10	<20 UJ	<20 UJ	<10 R	1.2 JQ	<10 R	<10 R	<12000
Benzene	1	<2	<2	<1	<1	<1	<1	<1200
Bromobenzene	1	<2	<2	<1	<1	<1	<1	<1200
Bromochloromethane	1	<2	<2	<1	<1	<1	<1	<1200
Bromodichloromethane	1	<2	<2	<1	<1	<1	<1	<1200
Bromoform	1	<2 UJ	<2 UJ	<1	<1 UJ	<1	<1	<1200
Bromomethane	2	<4	<4	<2	<2	<2	<2	<2500
Carbon disulfide	1	<2	<2	<1	<1	<1	<1	<1200
Carbon tetrachloride	1	<2	<2	<1	<1	<1	<1	<1200
Chlorobenzene	1	<2	<2	<1	<1	<1	<1	<1200
Chloroethane	2	<4	<4	<2	<2	<2	<2	<2500
Chloroform	1	<2	<2	<1	<1	<1	<1	<1200
Chloromethane	2	<4	<4	<2	<2	<2	<2	<2500
cis-1,2-Dichloroethene	0.5	56	54	<0.5	<0.5	<0.5	<0.5	52000
cis-1,3-Dichloropropene	1	<2	<2	<1	<1	<1	<1	<1200
Dibromochloromethane	1	<2	<2	<1	<1	<1	<1	<1200
Dibromomethane	1	<2	<2	<1	<1	<1	<1	<1200
Dichlorodifluoromethane	2	<4 UJ	<4 UJ	<2 UJ	<2 UJ	<2 UJ	<2 UJ	<2500
Ethylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
Hexachlorobutadiene	1	<2 UJ	<2 UJ	<1 UJ	<1 UJ	<1	<1 UJ	<1200
Isopropylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
m-Xylene & p-Xylene	1	<2	<2	<1	<1	<1	<1	<1200
Methylene chloride	1	<2	<2	<1	<1	<1	<1	1300
n-Butylbenzene	1	<2	<2	<1 UJ	<1	<1 UJ	<1 UJ	<1200
n-Propylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
Naphthalene	1	<2	<2	<1 UJ	<1	<1 UJ	<1 UJ	<1200
o-Xylene	0.5	<1	<1	<0.5	<0.5	<0.5	<0.5	<620
p-Isopropyltoluene	1	<2	<2	<1	<1	<1	<1	<1200
sec-Butylbenzene	1	<2	<2	<1 UJ	<1	<1 UJ	<1 UJ	<1200
Styrene	1	<2	<2	<1	<1	<1	<1	<1200
tert-Butylbenzene	1	<2	<2	<1	<1	<1	<1	<1200
Tetrachloroethene	1	9	8.6	<1	<1	<1	<1	<1200
Toluene	1	<2	<2	<1	<1	<1	<1	<1200
trans-1,2-Dichloroethene	0.5	2.5	2.6	<0.5	<0.5	<0.5	<0.5	<620
trans-1,3-Dichloropropene	1	<2	<2	<1	<1	<1	<1	<1200
Trichloroethene	1	9.1	8.5	<1	<1	<1	<1	<1200
Trichlorofluoromethane	2	<4 UJ	<4 UJ	<2	<2 UJ	<2	<2	<2500
Vinyl chloride	2	4.1	4	<2	<2	<2	<2	2500
Xylenes (total)	1	<2	<2	<1	<1	<1	<1	<1200

TABLE E-10

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
UPPER WATER BEARING UNIT
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Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-3 10/17/2002	Duplicate MWFTA-3 10/17/2002	Sample MWFTA-5 10/29/2002	Sample MWFTA-7 10/17/2002	Sample MWFTA-9 10/29/2002	Sample MWFTA-10 10/29/2002	Sample MWFTA-23 10/15/2002
Surrogate - %								
1,2-Dichloroethane-d4	--	91	92	91	93	93	93	86
4-Bromofluorobenzene	--	89	91	80	90	83	81	88
Dibromofluoromethane	-	97	98	98	98	101	100	92
Toluene-d8	-	94	94	90	93	92	91	89

Notes
J Estimated, based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JH Estimated, possibly biased high based upon QC data
JL Estimated, possibly biased low based upon QC data
JQ Estimated. Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected, Reported Detection Limit is imprecise
UL Undetected, Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed. Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE RMB 6/04/03
CHECKED/DATE JAH 6/05/03

TABLE E-11

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-14 10/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/15/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/17/2002
FIELD PARAMETER								
Dissolved Oxygen - E360 1 mg/L								
Dissolved Oxygen	0 1	2 4	5 8	4	7 1	7	1 5	1 7
Ferrous Iron - A3500D mg/L								
Ferrous Iron	0 1	<0 1	<0 1	<0 1	3	<0 1	0 5	1
Oxidation Reduction Potential - A2580A mV								
Oxidation Reduction Potential	--	195	-149	-64	-89	-19	-93	-82
pH - E150 1 pH Units								
pH	-	9 08	12 23	12 33	7 34	10 89	7 09	12 44
Specific Conductance - E120 1 mS/cm								
Specific Conductance	0 001	0 495	1 92	1 44	0 156	0 725	0 697	1 9
Temperature - E170 1 deg C								
Temperature	0 1	14	18 1	18 6	17	16 1	12 4	18 7
Turbidity - E180 1 NTU								
Turbidity	1	8	14	3	8	7	21	19
FIXED BASE LABORATORY ANALYSIS								
Anions - MCAWW 300 0A mg/L								
Chloride	1	13 9	11 6	5 6	4 7	6 4	58 2	2 1
Nitrate as N	0 1	0 01 JQ	<0 1	<0 1	<0 1	<0 1	<0 1	<0 1
Sulfate	1	20 2	7 1	10 8	1 2	6 3	5 6	30 4
Dissolved Gases - RSK SOP-175 mg/L								
Carbon dioxide	0 001	0 22 JB	<0 17	<0 17	15	<0 17	18	<0 17
Ethane	0 002	<0 002	0 0055	<0 002	<0 002	<0 002	<0 002	0 00039 JQ
Ethene	0 001	<0 001	0 049	<0 001	<0 001	<0 001	<0 001	0 0013
Methane	0 001	0 0007 JB	0 12	0 13	0 043	0 0028	0 41	0 034
Hydrogen by Microseeps - AM20GAX nM								
Hydrogen	0 03	3 6	27	4 1	2 6	16	4 6	2 6
Total Alkalinity - MCAWW 310 1 mg/L								
Total Alkalinity	5	160	270	250	53	120	160	340 JI
Total Organic Carbon - SW846 9060 mg/L								
Total Organic Carbon	1	0 8 JQ	1 JH	2	2	0 7 JH	2	3
Total Sulfide - MCAWW 376 1 mg/L								
Total Sulfide	1	1 4	0 49 JB	0 49 JB	0 81 JH	<1	<1	0 62 JQ

TABLE E-11

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
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Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-14 10/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/15/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/17/2002
Mercury - SW846 7470A (Dissolved) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Mercury - SW846 7470A (Total) µg/L								
Mercury	1	<1	<1	<1	<1	<1	<1	<1
Metals - SW846 6010B (Dissolved) µg/L								
Aluminum	200	<200	85.4 JQ	4430	<200 UJ	616	<200	266
Antimony	5	44.2 J	<5	<5	<5	<5	<5 UJ	<5
Arsenic	5	<5	2.5 JQ	<5	<5	3.2 JB	<5	<5
Barium	200	40.9 JQ	329	117 JQ	30.8 JQ	63.1 JQ	137 JQ	138 JQ
Beryllium	10	<10	<10	<10	<10	<10	<10	<10
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	7580	55500	92400	8400	52700	35300	70900
Chromium	10	<10	<10	<10	<10	<10	<10	<10
Cobalt	30	<30	<30	<30	<30	<30	<30	<30
Copper	10	2.3 JB	<10	<10	<10	<10	<10	<10
Iron	200	<200	<200	<200	1470	<200	2210	<200
Lead	3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	6470	326 JQ	<5000	4920 JQ	<5000	23300	<5000
Manganese	20	2.9 JQ	<20	<20	71.9	<20	204	<20
Molybdenum	40	8.6 JQ	<40	<40	<40	<40	<40	6.8 JQ
Nickel	100	<100	<100	<100	<100	<100	<100	3 JQ
Potassium	5000	46500	92500 J	21300	5590	9870	12500	57400
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	49700	37600 J	12600	7740	5370	23500	49000
Vanadium	50	<50	3.2 JQ	7.2 JQ	<50	2.8 JQ	<50	1.4 JQ
Zinc	20	<20	<20 UI	<20 UL	<20 UI	<20	<20	<20
Metals - SW846 6010B (Total) µg/L								
Aluminum	200	<200	479	4820	<200 UJ	837	<200	1200 JB
Antimony	5	<5 UJ	<5	<5	<5	<5	<5 UJ	<5
Arsenic	5	<5	<5	<5	<5	2.1 JB	<5	2.2 JB
Barium	200	39.7 JQ	557	127 JQ	34.5 JQ	67.2 JQ	141 JQ	136 JQ
Beryllium	10	<10	<10	<10	<10	<10	<10	<10
Cadmium	2	<2	<2	<2	<2	<2	<2	<2
Calcium	5000	7250	111000	101000	8800	57800	36300	68000
Chromium	10	<10	<10	<10	<10	<10	<10	3.3 JQ
Cobalt	30	<30	<30	<30	<30	<30	<30	<30
Copper	10	2 JB	2.3 JQ	<10	<10	<10	<10	1.9 JQ
Iron	200	<200	581	<200	1690	<200	2330	600
Lead	3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	6350	16100	<5000	5180	230 JQ	23800	599 JQ
Manganese	20	3.3 JQ	324	<20	77.3	1.3 JB	209	15.7 JQ
Molybdenum	40	7.5 JQ	<40	<40	<40	<40	<40	7.1 JQ
Nickel	100	<100	<100	<100	3.2 JQ	<100	<100	3.8 JQ
Potassium	5000	46600	78900 J	23200	5820	10200	12800	54400
Selenium	5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	49300	24700 J	13500	8110	5520	24100	46200
Vanadium	50	<50	0.87 JQ	7.1 JQ	<50	2.5 JQ	<50	1.4 JQ
Zinc	20	<20	<20 UI	<20 UI	19.5 JQ	<20	<20	<20
Thallium - SW846 7841 (Dissolved) µg/L								
Thallium	2	<2 UI	<2 UL	<2	<2	<2 UI	<2	<2 UJ
Thallium - SW846 7841 (Total) µg/L								
Thallium	2	<2	<2	<2	<2	<2 UI	<2	<2 UI

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TABLE E-11

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
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Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-14 10/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/15/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/17/2002
Volatile Organic Compounds - SW846 8260B µg/L								
1,1,1,2-Tetrachloroethane	1	<1	<56	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	1	<1	<56	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	1	<1	<56	<1	<1	<1	<1	<1 UL
1,1,2-Trichloroethane	1	<1	<56	<1	<1	<1	<1	<1
1,1-Dichloroethane	1	<1	<56	<1	<1	<1	<1	<1
1,1-Dichloroethene	1	<1	<56	<1	<1	<1	<1	<1
1,1-Dichloropropene	1	<1	<56	<1	<1	<1	<1	<1
1,2,3-Trichlorobenzene	1	<1 UJ	<56	<1	<1	<1	<1 UJ	<1
1,2,3-Trichloropropane	1	<1	<56	<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene	1	<1 UJ	<56	<1	<1	<1	<1 UJ	<1
1,2,4-Trimethylbenzene	1	<1	<56	<1	<1	<1	<1	<1
1,2-Dibromo-3-chloropropane	2	<2	<110	<2	<2	<2	<2	<2
1,2-Dibromoethane	1	<1	<56	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	1	<1	<56	<1	<1	<1	<1	<1
1,2-Dichloroethane	1	<1	<56	<1	<1	<1	<1	<1
1,2-Dichloropropane	1	<1	<56	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	1	<1	<56	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	1	<1	<56	<1	<1	<1	<1	<1
1,3-Dichloropropane	1	<1	<56	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	1	<1	<56	<1	<1	<1	<1	<1
2,2-Dichloropropane	1	<1	<56	<1	<1	<1	<1	<1
2-Butanone	10	<10 R	<560 UJ	<10 UJ	<10	<10 UJ	<10 R	<10 UJ
2-Chlorotoluene	1	<1	<56	<1	<1	<1	<1	<1
2-Hexanone	10	<10 R	<560 UJ	<10 UJ	<10	<10 UJ	<10 R	<10 UJ
4-Chlorotoluene	1	<1	<56	<1	<1	<1	<1	<1
4-Methyl-2-pentanone	10	<10 UJ	<560	<10	<10	<10	<10 UJ	<10
Acetone	10	<10 R	<560 UJ	11 JB	<10	<10 UJ	<10 R	<10 UJ
Benzene	1	<1	<56	<1	<1	<1	<1	<1
Bromobenzene	1	<1	<56	<1	<1	<1	<1	<1
Bromochloromethane	1	<1	<56	<1	<1	<1	<1	<1
Bromodichloromethane	1	<1	<56	<1	<1	<1	<1	<1
Bromoform	1	<1	<56 UJ	<1 UJ	<1	<1 UJ	<1	<1 UJ
Bromomethane	2	<2	<110	<2	<2	<2	<2	<2
Carbon disulfide	1	<1	<56	<1	<1	<1	<1	<1
Carbon tetrachloride	1	<1	<56	<1	<1	<1	<1	<1
Chlorobenzene	1	<1	<56	<1	<1	<1	<1	<1
Chloroethane	2	<2	<110	<2	<2	<2	<2	<2
Chloroform	1	<1	<56	<1	<1	<1	<1	<1
Chloromethane	2	<2	<110	<2	<2	<2	<2	<2
cis-1,2-Dichloroethene	0.5	<0.5	1500	<0.5	2	1.1	<0.5	<0.5
cis-1,3-Dichloropropene	1	<1	<56	<1	<1	<1	<1	<1
Dibromochloromethane	1	<1	<56	<1	<1	<1	<1	<1
Dibromomethane	1	<1	<56	<1	<1	<1	<1	<1
Dichlorodifluoromethane	2	<2 UJ	<110 UJ	<2 UJ	<2	<2 UJ	<2 UJ	<2 UJ
Ethylbenzene	1	<1	<56	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	<1 UJ	<56 UJ	<1 UJ	<1	<1 UJ	<1 UJ	<1 UJ
Isopropylbenzene	1	<1	<56	<1	<1	<1	<1	<1
m-Xylene & p-Xylene	1	<1	<56	<1	<1	<1	<1	<1
Methylene chloride	1	<1	<56	<1	<1	<1	<1	<1
n-Butylbenzene	1	<1 UJ	<56	<1	<1	<1	<1 UJ	<1
n-Propylbenzene	1	<1	<56	<1	<1	<1	<1	<1
Naphthalene	1	<1 UJ	<56	<1	<1	<1	0.43 JQ	<1
o-Xylene	0.5	<0.5	<28	<0.5	<0.5	<0.5	<0.5	<0.5
p-Isopropyltoluene	1	<1	<56	<1	<1	<1	<1	<1
sec-Butylbenzene	1	<1 UJ	<56	<1	<1	<1	<1 UJ	<1

TABLE E-11

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
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Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-14 10/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/15/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/17/2002
Styrene	1	<1	<56	<1	<1	<1	<1	<1
tert-Butylbenzene	1	<1	<56	<1	<1	<1	<1	<1
Tetrachloroethene	1	<1	<56	<1	<1	1.2	<1	<1
Toluene	1	<1	<56	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	0.5	<0.5	<28	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	1	<1	<56	<1	<1	<1	<1	<1
Trichloroethene	1	<1	<56	<1	<1	0.54 JQ	<1	<1
Trichlorofluoromethane	2	<2	<110 UJ	<2 UJ	<2	<2 UJ	<2	<2 UJ
Vinyl chloride	2	<2	920	<2	<2	<2	<2	<2
Xylenes (total)	1	<1	<56	<1	<1	<1	<1	<1
Surrogate - %								
1,2-Dichloroethane-d4	--	93	91	90	86	94	95	91
4-Bromofluorobenzene	-	83	90	88	90	90	84	89
Dibromofluoromethane	-	101	96	82	92	93	103	77
Toluene-d8	--	92	95	92	93	95	92	92
Volatile Organic Compounds - SW846 8260B, UNPRES µg/L								
1,1,1,2-Tetrachloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,1-Dichloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,1-Dichloroethene	1	NA	<62	NA	NA	NA	NA	NA
1,1-Dichloropropene	1	NA	<62	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	1	NA	<62	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	1	NA	<62	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	2	NA	<120	NA	NA	NA	NA	NA
1,2-Dibromoethane	1	NA	<62	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
1,2-Dichloroethane	1	NA	<62	NA	NA	NA	NA	NA
1,2-Dichloropropane	1	NA	<62	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	1	NA	<62	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
1,3-Dichloropropane	1	NA	<62	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
2,2-Dichloropropane	1	NA	<62	NA	NA	NA	NA	NA
2-Butanone	10	NA	<620 UJ	NA	NA	NA	NA	NA
2-Chlorotoluene	1	NA	<62	NA	NA	NA	NA	NA
2-Hexanone	10	NA	<620 UJ	NA	NA	NA	NA	NA
4-Chlorotoluene	1	NA	<62	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	10	NA	<620	NA	NA	NA	NA	NA
Acetone	10	NA	<620 UJ	NA	NA	NA	NA	NA
Benzene	1	NA	<62	NA	NA	NA	NA	NA
Bromobenzene	1	NA	<62	NA	NA	NA	NA	NA
Bromochloromethane	1	NA	<62	NA	NA	NA	NA	NA
Bromodichloromethane	1	NA	<62	NA	NA	NA	NA	NA
Bromoform	1	NA	<62 UJ	NA	NA	NA	NA	NA
Bromomethane	2	NA	<120	NA	NA	NA	NA	NA
Carbon disulfide	1	NA	<62	NA	NA	NA	NA	NA
Carbon tetrachloride	1	NA	<62	NA	NA	NA	NA	NA
Chlorobenzene	1	NA	<62	NA	NA	NA	NA	NA
Chloroethane	2	NA	<120	NA	NA	NA	NA	NA
Chloroform	1	NA	<62	NA	NA	NA	NA	NA
Chloromethane	2	NA	<120	NA	NA	NA	NA	NA

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TABLE E-11

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
LOWER WATER BEARING UNIT
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-14 10/29/2002	Sample MWFTA-16 10/15/2002	Sample MWFTA-17 10/15/2002	Sample MWFTA-18 10/16/2002	Sample MWFTA-19 10/17/2002	Sample MWFTA-28B 10/29/2002	Sample MWFTA-29B 10/17/2002
cis 1 2 Dichloroethene	0 5	NA	1400	NA	NA	NA	NA	NA
cis 1,3-Dichloropropene	1	NA	<62	NA	NA	NA	NA	NA
Dibromochloromethane	1	NA	<62	NA	NA	NA	NA	NA
Dibromomethane	1	NA	<62	NA	NA	NA	NA	NA
Dichlorodifluoromethane	2	NA	<120 UJ	NA	NA	NA	NA	NA
Ethylbenzene	1	NA	<62	NA	NA	NA	NA	NA
Hexachlorobutadiene	1	NA	<62 UJ	NA	NA	NA	NA	NA
Isopropylbenzene	1	NA	<62	NA	NA	NA	NA	NA
m Xylene & p Xylene	1	NA	<62	NA	NA	NA	NA	NA
Methylene chloride	1	NA	<62	NA	NA	NA	NA	NA
n-Butylbenzene	1	NA	<62	NA	NA	NA	NA	NA
n Propylbenzene	1	NA	<62	NA	NA	NA	NA	NA
Naphthalene	1	NA	<62	NA	NA	NA	NA	NA
o Xylene	0 5	NA	<31	NA	NA	NA	NA	NA
p Isopropyltoluene	1	NA	<62	NA	NA	NA	NA	NA
sec Butylbenzene	1	NA	<62	NA	NA	NA	NA	NA
Styrene	1	NA	<62	NA	NA	NA	NA	NA
tert Butylbenzene	1	NA	<62	NA	NA	NA	NA	NA
Tetrachloroethene	1	NA	<62	NA	NA	NA	NA	NA
Toluene	1	NA	<62	NA	NA	NA	NA	NA
trans-1 2-Dichloroethene	0 5	NA	<31	NA	NA	NA	NA	NA
trans 1 3 Dichloropropene	1	NA	<62	NA	NA	NA	NA	NA
Trichloroethene	1	NA	<62	NA	NA	NA	NA	NA
Trichlorofluoromethane	2	NA	<120 UJ	NA	NA	NA	NA	NA
Vinyl chloride	2	NA	920	NA	NA	NA	NA	NA
Xylenes (total)	1	NA	<62	NA	NA	NA	NA	NA
Surrogate - %								
1 2 Dichloroethane d4	--	NA	94	NA	NA	NA	NA	NA
4-Bromofluorobenzene	--	NA	91	NA	NA	NA	NA	NA
Dibromofluoromethane	-	NA	100	NA	NA	NA	NA	NA
Toluene-d8	-	NA	95	NA	NA	NA	NA	NA

Notes

J Estimated based on QC data
JB Estimated possibly biased high or false positive based on blank contamination
JH Estimated possibly biased high based upon QC data
JL Estimated possibly biased low based upon QC data
JQ Estimated Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected Reported Detection Limit is imprecise
UL Undetected Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE RMB 6/04/03
CHECKED/DATE JAH 6/05/03

TABLE E-12

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
FIELD PARAMETER			
Dissolved Oxygen - E360.1 mg/L			
Dissolved Oxygen	0 1	3 5	3 5
Ferrous Iron - A3500D mg/L			
Ferrous Iron	0 1	4	4
Oxidation Reduction Potential - A2580A mV			
Oxidation Reduction Potential	--	15	15
pH - E150.1 pH Units			
pH	--	9 41	9 41
Specific Conductance - E120.1 mS/cm			
Specific Conductance	0 001	0 215	0 215
Temperature - E170.1 deg C			
Temperature	0 1	18	18
Turbidity - E180.1 NTU			
Turbidity	1	10	10
FIXED BASE LABORATORY ANALYSIS·			
Anions - MCAWW 300.0A mg/L			
Chloride	1	3 7	3 8
Nitrate as N	0 1	<0 1	<0 1
Sulfate	1	4 4	4 5
Dissolved Gases - RSK SOP-175 mg/L			
Carbon dioxide	0 001	0 12 JB	0 13 JB
Ethane	0 002	<0 002	<0 002
Ethene	0 001	0 01	0 011
Methane	0 001	0 027	0 031
Hydrogen by Microseeps - AM20GAX nM			
Hydrogen	0 03	2 7	2 8
Total Alkalinity - MCAWW 310.1 mg/L			
Total Alkalinity	5	74	74
Total Organic Carbon - SW846 9060 mg/L			
Total Organic Carbon	1	<1	<1
Total Sulfide - MCAWW 376.1 mg/L			
Total Sulfide	1	0 46 JQ	0 3 JQ
Mercury - SW846 7470A (Dissolved) ug/L			
Mercury	1	<1	<1
Mercury - SW846 7470A (Total) ug/L			
Mercury	1	<1	<1
Metals - SW846 6010B (Dissolved) ug/L			
Aluminum	200	<200 UJ	<200 UJ
Antimony	5	<5	<5
Arsenic	5	<5	<5
Barium	200	68 2 JQ	65 3 JQ
Beryllium	10	<10	<10
Cadmium	2	<2	<2
Calcium	5000	14900	14300
Chromium	10	<10	<10
Cobalt	30	<30	<30
Copper	10	<10	<10
Iron	200	193 JQ	97 1 JQ
Lead	3	<3	<3
Magnesium	5000	4780 JQ	4640 JQ
Manganese	20	97 5	91 7
Molybdenum	40	<40	<40
Nickel	100	<100	<100
Potassium	5000	7040	6870
Selenium	5	<5	<5
Silver	10	<10	<10
Sodium	5000	10500	10100
Vanadium	50	0 69 JQ	<50
Zinc	20	<20	<20

TABLE E-12

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting Limit (a)	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
Metals - SW846 6010B (Total) ug/L			
Aluminum	200	<200 UJ	<200 UJ
Antimony	5	<5	<5
Arsenic	5	2 2 JB	<5
Barium	200	65 8 JQ	68 2 JQ
Beryllium	10	<10	<10
Cadmium	2	<2	<2
Calcium	5000	14200	15100
Chromium	10	<10	<10
Cobalt	30	<30	<30
Copper	10	<10	<10
Iron	200	281	259
Lead	3	<3	<3
Magnesium	5000	4540 JQ	4400 JQ
Manganese	20	96 1	91 8
Molybdenum	40	<40	<40
Nickel	100	<100	<100
Potassium	5000	6830	7180
Selenium	5	<5	<5
Silver	10	<10	<10
Sodium	5000	10200	10400
Vanadium	50	<50	<50
Zinc	20	<20	<20
Thallium - SW846 7841 (Dissolved) ug/L			
Thallium	2	<2 UL	<2 UJ
Thallium - SW846 7841 (Total) ug/L			
Thallium	2	<2 UJ	<2 UJ
Volatile Organic Compounds - SW846 8260B ug/L			
1,1,1 2-Tetrachloroethane	1	<4	<4
1,1,1-Trichloroethane	1	<4	<4
1,1 2 2 Tetrachloroethane	1	<4	<4
1,1,2-Trichloroethane	1	<4	<4
1,1-Dichloroethane	1	15	16
1 1-Dichloroethene	1	7 5	7 6
1,1-Dichloropropene	1	<4	<4
1,2,3-Trichlorobenzene	1	<4	<4
1 2,3-Trichloropropane	1	<4	<4
1 2,4-Trichlorobenzene	1	<4	<4
1 2 4-Trimethylbenzene	1	<4	<4
1 2-Dibromo-3 chloropropane	2	<8	<8
1 2-Dibromoethane	1	<4	<4
1 2 Dichlorobenzene	1	<4	<4
1,2 Dichloroethane	1	<4	<4
1,2 Dichloropropane	1	<4	<4
1 3,5-Trimethylbenzene	1	<4	<4
1 3-Dichlorobenzene	1	<4	<4
1 3 Dichloropropane	1	<4	<4
1 4 Dichlorobenzene	1	<4	<4
2 2-Dichloropropane	1	<4	<4
2 Butanone	10	<40 UJ	<40 UJ
2 Chlorotoluene	1	<4	<4
2-Hexanone	10	<40 UJ	<40 UJ
4-Chlorotoluene	1	<4	<4
4 Methyl 2 pentanone	10	<40	<40
Acetone	10	<40 UJ	<40 UJ
Benzene	1	<4	<4
Bromobenzene	1	<4	<4
Bromochloromethane	1	<4	<4
Bromodichloromethane	1	<4	<4
Bromoform	1	<4 UJ	<4 UJ
Bromomethane	2	<8	<8
Carbon disulfide	1	<4	<4
Carbon tetrachloride	1	<4	<4
Chlorobenzene	1	<4	<4
Chloroethane	2	<8	<8
Chloroform	1	<4	<4
Chloromethane	2	<8	<8
cis 1 2-Dichloroethene	0 5	92	100
cis 1 3 Dichloropropene	1	<4	<4
Dibromochloromethane	1	<4	<4
Dibromomethane	1	<4	<4
Dichlorodifluoromethane	2	<8 UJ	<8 UJ
Ethylbenzene	1	<4	<4
Hexachlorobutadiene	1	<4 UJ	<4 UJ
Isopropylbenzene	1	<4	<4
m Xylene & p Xylene	1	<4	<4

TABLE E-12

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID Sample Date	Reporting Limit (a)	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
Methylene chloride	1	<4	<4
n-Butylbenzene	1	<4	<4
n-Propylbenzene	1	<4	<4
Naphthalene	1	<4	<4
o-Xylene	0 5	<2	<2
p-Isopropyltoluene	1	<4	<4
sec-Butylbenzene	1	<4	<4
Styrene	1	<4	<4
tert-Butylbenzene	1	<4	<4
Tetrachloroethene	1	<4	<4
Toluene	1	<4	<4
trans-1 2-Dichloroethene	0 5	<2	<2
trans-1,3-Dichloropropene	1	<4	<4
Trichloroethene	1	4 8	5 1
Trichlorofluoromethane	2	<8 UJ	<8 UJ
Vinyl chloride	2	12	12
Xylenes (total)	1	<4	<4
Surrogate - %			
1,2-Dichloroethane d4	--	91	94
4-Bromofluorobenzene	--	88	90
Dibromofluoromethane	--	97	99
Toluene-d8	--	92	96
Volatile Organic Compounds - SW846 8260B, UNPRES ug/L			
1,1,1,2-Tetrachloroethane	1	<4	NA
1,1,1-Trichloroethane	1	<4	NA
1 1,2,2-Tetrachloroethane	1	<4	NA
1 1 2-Trichloroethane	1	<4	NA
1,1-Dichloroethane	1	13	NA
1,1-Dichloroethene	1	6 6	NA
1 1-Dichloropropene	1	<4	NA
1 2 3-Trichlorobenzene	1	<4	NA
1,2 3-Trichloropropane	1	<4	NA
1,2 4-Trichlorobenzene	1	<4	NA
1 2,4-Trimethylbenzene	1	<4	NA
1,2-Dibromo 3-chloropropane	2	<8	NA
1,2-Dibromoethane	1	<4	NA
1,2-Dichlorobenzene	1	<4	NA
1 2-Dichloroethane	1	<4	NA
1 2-Dichloropropane	1	<4	NA
1,3 5-Trimethylbenzene	1	<4	NA
1,3-Dichlorobenzene	1	<4	NA
1 3-Dichloropropane	1	<4	NA
1 4-Dichlorobenzene	1	<4	NA
2 2-Dichloropropane	1	<4	NA
2-Butanone	10	<40 UJ	NA
2 Chlorotoluene	1	<4	NA
2-Hexanone	10	<40 UJ	NA
4-Chlorotoluene	1	<4	NA
4-Methyl-2-pentanone	10	<40	NA
Acetone	10	<40 UJ	NA
Benzene	1	<4	NA
Bromobenzene	1	<4	NA
Bromochloromethane	1	<4	NA
Bromodichloromethane	1	<4	NA
Bromoform	1	<4 UJ	NA
Bromomethane	2	<8	NA
Carbon disulfide	1	<4	NA
Carbon tetrachloride	1	<4	NA
Chlorobenzene	1	<4	NA
Chloroethane	2	<8	NA
Chloroform	1	<4	NA
Chloromethane	2	<8	NA
cis-1 2-Dichloroethene	0 5	87	NA
cis 1 3 Dichloropropene	1	<4	NA
Dibromochloromethane	1	<4	NA
Dibromomethane	1	<4	NA
Dichlorodifluoromethane	2	<8 UJ	NA
Ethylbenzene	1	<4	NA
Hexachlorobutadiene	1	<4 UJ	NA
Isopropylbenzene	1	<4	NA
m Xylene & p Xylene	1	<4	NA
Methylene chloride	1	<4	NA
n Butylbenzene	1	<4	NA
n Propylbenzene	1	<4	NA
Naphthalene	1	<4	NA
o Xylene	0 5	<2	NA
p Isopropyltoluene	1	<4	NA

TABLE E-12

SUMMARY OF QUALIFIED DATA - OCTOBER 2002
FRACTURED BEDROCK
Annual Groundwater Report - October 2002
Operable Unit 7
Defense Supply Cneter Richmond
Richmond, Virginia

Sample ID / Sample Date	Reporting Limit (a)	Sample MWFTA-20 10/17/2002	Duplicate MWFTA-20 10/17/2002
sec-Butylbenzene	1	<4	NA
Styrene	1	<4	NA
tert-Butylbenzene	1	<4	NA
Tetrachloroethene	1	<4	NA
Toluene	1	<4	NA
trans-1,2-Dichloroethene	0 5	<2	NA
trans-1 3-Dichloropropene	1	<4	NA
Trichloroethene	1	4 2	NA
Trichlorofluoromethane	2	<8 UJ	NA
Vinyl chloride	2	11	NA
Xylenes (total)	1	<4	NA
Surrogate - %			
1 2-Dichloroethane-d4	--	91	NA
4-Bromofluorobenzene	--	87	NA
Dibromofluoromethane	-	94	NA
Toluene-d8	-	90	NA

Notes.

J Estimated based on QC data
JB Estimated, possibly biased high or false positive based on blank contamination
JH Estimated, possibly biased high based upon QC data.
JL Estimated, possibly biased low based upon QC data
JQ Estimated, Value is between reporting limit and detection limit
NA Not Analyzed
R Unusable
UJ Undetected, Reported Detection Limit is imprecise.
UL Undetected, Data biased low - Reported Detection Limit is higher than indicated
(a) Reporting limits presented are the best that can be achieved under normal operating procedures with the method-required sample volume extracted and analyzed Sample reporting limits may vary due to sample volume/weight extracted and/or sample dilutions

PREPARED/DATE RMB 6/04/03
CHECKED/DATE JAH 6/05/03

TAB

Appendix F

APPENDIX F
OCTOBER 2002 FIELD SAMPLING REPORTS

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FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10/16/ TIME 1100
SAMPLING POINT. AE HADG - 10
DEPTH

SAMPLE INFORMATION SAMPLE I.D NO.: AEHADG-10

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot. Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis. Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS (WELL PURGING VOLUME· SAMPLE APPEARANCE; ODOR, COLOR, ETC)

2 GAL PURGED

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS. (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION WEATHER 50's RAIN AIR TEMPERATURE 50's

SAMPLES SHIPPED TO: STL-North Canton, Ohio / Microseeps – Pittsburg, PA

SPECIAL HANDLING· FedEx

MODE OF SHIPMENT ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: [signature] SAMPLING OBSERVED BY [signature]

DISCREPANCIES·

Best Available Copy

704 426

FIELD SAMPLING REPORT

JOB No 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10/16/03 TIME 1100
SAMPLING POINT: AEHADG-10
DEPTH

SAMPLE INFORMATION SAMPLE I.D NO.: AEHADG-10QA

MATERIAL. ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot. Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis. Metals by 6010B,7470A,7841

COMMENTS: (WELL PURGING VOLUME. SAMPLE APPEARANCE, ODOR; COLOR, ETC.)
2 GAL PURGED

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION WEATHER RAIN AIR TEMPERATURE 50's

SAMPLES SHIPPED TO CEMRD – Omaha, Nebraska
SPECIAL HANDLING: FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: [signature] SAMPLING OBSERVED BY [signature]
DISCREPANCIES

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10/11/02 TIME 1100
SAMPLING POINT AEHADG10
DEPTH

SAMPLE INFORMATION SAMPLE I.D. NO.: OU7DUP-1

MATERIAL ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME. SAMPLE APPEARANCE, ODOR, COLOR, ETC.)
1 GAL PURGED

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS (WELL PURGING VOLUME: SAMPLE APPEARANCE, ODOR, COLOR, ETC.)

GENERAL INFORMATION WEATHER RAIN AIR TEMPERATURE 50's

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: [signature] SAMPLING OBSERVED BY: [signature]
DISCREPANCIES

704 428

Location DSCR - OU7
Site Name

Well ID. AEHADG 10
Field Sampling Personnel: TONY ENGLUND
DAN VASS

Identify Measuring Point (MP):
(eg. Top of Casing)

Depth to Screen below MP: ____ Top of screen ____ Bottom of screen

Pump Intake at (ft. below MP):
Purging Device (Pump Type): BLADDER

Best Available Copy

Date	Time 24 hr	Depth to Water Below MP ft	Pump Dial Setting (1)	Purge Rate mL/min	Cum. Volume Purged GAL ~~liters~~	Temp deg. C	Spec Cond. mS/cm ~~umhos/cm~~	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron mg/L	Redox Potential mV	Comments TURB NTU
10/16/01	0930	11.80												BEGIN PURGING
	0945	11.80		100		20.12	0.320	4.81	1.55				86	95.3
	0955	11.80		100		20.66	0.325	4.91	1.73				35	42.9
	1005	11.80		100		20.41	0.324	5.05	1.02				1	26.9
	1015	11.80		100		2[illegible].41	0.320	5.13	0.90				-14	17.5
	1025	11.80		100		20.40	0.319	5.16	0.84				-26	15.5
	1035	11.80		100		[illegible].47	0.318	5.16	0.82	1		0	31	14.5
		P												PARAMETERS STABLE
	1100													COLLECT SAMPLE

FIELD SAMPLING REPORT

JOB No 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10/16/02 TIME 1100
SAMPLING POINT DMW-13A
DEPTH 10.81 ft.

SAMPLE INFORMATION SAMPLE I.D NO.: DMW-13A

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300 0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
No distinct color or odor observed

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION WEATHER Rain/overcast AIR TEMPERATURE 50°F

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: J Vecsey SAMPLING OBSERVED BY:
DISCREPANCIES

704 430

Location DSCR - CU 7
Site Name

Well ID: DMW-13A
Field Sampling Personnel. Sy Vecsey, Lobsen Barlow

Identify Measuring Point (MP): ______
(eg. Top of Casing)

Depth to Screen below MP: ______ Top of screen ______ Bottom of screen

Pump Intake at (ft. below MP): ______
Purging Device (Pump Type): ______

Best Available Copy

Date	Time 24 hr	Depth to Water Below MP ft	Pump Dial Setting (1)	Purge Rate mL/min	Cum. Volume Purged ~~liters~~	Temp. deg. C	Spec Cond. umhos/cm	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron mg/L	Redox Potential mV	Comments Tu. 6.
10/16	0945	11.02	22 psi	400		21.33	0.118	3.63	1.08				330	-0.6
	0955	11.00	19 psi	230		21.40	0.123	3.56	0.87				327	-1.4
	1005	10.98	19 psi	200		21.45	0.127	3.64	0.90				315	-1.3
	1015	10.95	19	"		21.55	0.131	3.66	0.87				308	-1.7
	1025	"	"	"		21.56	0.134	3.71	0.85				302	-1.7
	1035	"	"	"		21.63	0.137	3.74	0.82	4		3.50	299	-1.6
												Well	Stabilized -	Begin Sampling

704 431

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10-16-02 TIME 1300
SAMPLING POINT. DMW-20A
DEPTH

SAMPLE INFORMATION SAMPLE I D. NO.: DMW-20A

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376 1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS. (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
TOTAL PURGED 5.0 GALLON

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS. (WELL PURGING VOLUME· SAMPLE APPEARANCE; ODOR; COLOR, ETC)
SAMPLE SLIGHTLY CLOUDY, NO ODOR

GENERAL INFORMATION WEATHER OVERCAST, SHOWERS AIR TEMPERATURE 50'S

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING. FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: [signature] SAMPLING OBSERVED BY:
DISCREPANCIES

_____ of _____

704 432

WELL PURGING - FIELD WATER [illegible]

Location DSCR - 007 Site Name

Well ID: DMW-20A

Field Sampling Personnel: DAN VASS

Identify Measuring Point (MP): T. of CASING
(eg Top of Casing)

Depth to Screen below MP: _____ of screen (Top) _____ of screen (Bottom)

Pump Intake at (ft. below MP): _____

Purging Device (Pump Type): _____

Best Available Copy

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg. C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	TURB (NTU)	Comments
10-16	1005	14.72		100	0.5	19.3	0.129	3.50	1.29				498	25	
10-16	1015	14.62		100	0.75	19.3	0.128	3.52	1.30				460	1.4	
10-16	1025	14.60		–	1.00	19.3	0.122	3.70	1.39				444	3.0	PUMP LOST SUCTION
															PUMP DOWN - MAINTENANCE
10-16	1125	14.60		100	1.50	19.1	0.121	3.85	2.25				393	66.9	
10-16	1135	14.71		100	1.75	19.5	0.122	3.86	1.12				398	59.1	
10-16	1145	14.70		100	2.00	19.5	0.121	3.86	0.98				400	59.5	
10-16	1155	14.70		100	2.25	19.6	0.122	3.89	0.76				391	70.0	
10-16	1205	14.73		100	2.50	19.5	0.121	3.90	2.00				400	69.1	
10-16	1215	14.74		120	2.75	19.6	0.121	3.87	1.10				401	56.0	
10-16	1225	14.75		120	3.00	19.6	0.122	3.87	1.01				402	59.2	
10-16	1235	14.76		120	3.50	19.5	0.123	3.86	1.00				403	53.0	
10-16	1245	14.75		120	3.75	19.4	0.124	3.85	0.98	.3		0	405	47.0	

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10 30-02 TIME 1013
SAMPLING POINT DMW-22A
DEPTH 4.80

SAMPLE INFORMATION

SAMPLE I.D. NO.: DMW-22A

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis. Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
water mostly clear, smelled bad (rotten egg odor)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION

WEATHER rainy/cold AIR TEMPERATURE 45°F

SAMPLES SHIPPED TO: STL-North Canton, Ohio / Microseeps – Pittsburg, PA

SPECIAL HANDLING: FedEx

MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: J Vecsey SAMPLING OBSERVED BY: L Barlow

DISCREPANCIES:

Location OSC. 007 Site Name

Well ID. PMW-22A

Field Sampling Personnel: J Vecsey, L Barlow

Identify Measuring Point (MP). (eg. Top of Casing)

Depth to Screen below MP: ______ Top of screen ______ Bottom of screen

Pump Intake at (ft. below MP):

Purging Device (Pump Type):

Date	Time 24 hr	Depth to Water Below MP ft	Pump Dial Setting (1)	Purge Rate mL/min	Cum. Volume Purged ~~liters~~	Temp. deg. C	Spec Cond umhos/cm	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron mg/L	Redox Potential mV	Comments Turb
10/30/02	0805	4 45	20 psi	200		1574	0 285	561	1.56				81	0
	0815	4.70	"	"		1583	0.284	577	0 60				61	0
	0825	472	"	"		1597	0 286	583	0 52				40	0
	0835	4 74	"	"		1599	0 284	585	0 49				14	0
	0845	4 80	"	"		1598	0.282	5.86	0 47				-6	0
	0855	4 81	"	"		1601	0.281	585	0 45				-17	0
	0905	"	"	"		1595	0.280	587	0 46				-28	0
	0915	"	"	"		1592	0.279	587	0.43				-40	0
	0925	"	"	"		1589	0 277	5.86	0 44				-48	0
	0935	"	"	"		1580	0 276	586	0 42				-59	0
	0945	"	"	"		15.79	0 275	586	0 43				-69	0
	0955	"	"	"		1577	0 275	5.86	0 41				-77	0
	1005	"	"	"		1579	0 274	5.87	0 41				-80	0

Well not stabilized
Reached 2 hour time limit
Begin sampling

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10-16-02 TIME 1530
SAMPLING POINT. DMW-25A
DEPTH 1

SAMPLE INFORMATION

SAMPLE I.D. NO.: DMW-25A

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS?. ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR; COLOR, ETC)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION

WEATHER overcast, windy AIR TEMPERATURE 6c

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA

SPECIAL HANDLING FedEx

MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: L. Butler SAMPLING OBSERVED BY.

DISCREPANCIES:

704 436

WELL PURGING - FIELD WATER [illegible]

Location DSCR - OU7 (Site Name)

Well ID: DMW-25A

Field Sampling Personnel: Lauren Barker

Identify Measuring Point (MP): ______ (eg. Top of Casing)

Depth to Screen below MP: ______ Top of screen ______ Bottom of screen

Pump Intake at (ft below MP): ______

Purging Device (Pump Type): ______

Best Available Copy

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	Comments: Turb
10-16-02	1425	3.69	10psi	100		14.31	0.231	6.28	4.86				171	42.2
	1435	3.69				18.99	0.267	6.41	2.86				167	37.0
	1445	3.70				[illegible]	0.282	6.54	2.51				159	28.8
	1455	3.75				18.99	0.290	6.64	2.47				155	24.8
	1505	3.74				18.69	0.291	6.63	2.50	4		0	157	19.2

Well Stabilized

Sample time is 1530

FIELD SAMPLING REPORT

JOB No 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10/15 TIME 1315
SAMPLING POINT. DMW-26A
DEPTH

SAMPLE INFORMATION SAMPLE I.D. NO.: DMW-26A

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis. Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
Light brownish color water, no distinct odor

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION WEATHER Overcast AIR TEMPERATURE 50°F

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING: FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: Jay Vecsey SAMPLING OBSERVED BY:
DISCREPANCIES:

704 438

Location DSCh. ~~DMW-26A~~ OU 7
Site Name

Identify Measuring Point (MP): ___
(eg Top of Casing)

Well ID: DMW-26A
Field Sampling Personnel: Jay Vecsey, Lauren Barlow

Depth to Screen below MP: ___ of screen (Top) ___ of screen (Bottom)
Pump Intake at (ft. below MP): ___
Purging Device (Pump Type): ___

Best Available Copy

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	Comments: Turb
10/15	1105	8.76	19 psi	200		19.90	0.866	6.26	0.55				-40	87
	1115	8.81	19	200		20.18	0.851	6.39	0.29				-30	95
	1125	8.83	19	200		20.39	0.836	6.47	0.18				-43	74
	1135	8.85	19	200		20.45	0.827	6.51	0.15				-45	7.5
	1145	8.87	19	200		20.57	0.819	6.54	0.10				-48	77
	1155	8.91	19	200		20.62	0.809	6.57	0.10				-50	7.7
	1205	8.93	19	200		20.68	0.792	6.60	0.06				-52	79
	1215	8.97	19	200		20.72	0.774	6.62	0.06				55	83
	1225	8.99	19	200		20.74	0.753	6.64	0.06				-58	88
	1235	9.00	19	200		20.84	0.728	6.66	0.05				-63	9.4
	1245	9.01	19	200		20.74	0.718	6.69	0.00				-65	11
	1255	9.02	19	200		20.80	0.710	6.71	0.05				-67	9.8
	1305	9.04	19	200		20.97	0.709	6.71	0.05	1		1	-68	10.5

Well not stabilized
Reach 2hr max time limit
Sampling time 1315

FIELD SAMPLING REPORT

JOB No 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10-15-02 TIME 1320
SAMPLING POINT: DMW-27A
DEPTH

SAMPLE INFORMATION SAMPLE I.D NO.: DMW-27A

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376 1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis. Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS. (WELL PURGING VOLUME SAMPLE APPEARANCE; ODOR; COLOR, ETC)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS. (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION WEATHER AIR TEMPERATURE

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: Stephanie R Gaines SAMPLING OBSERVED BY:
DISCREPANCIES:

WELL PURGING ...

704 440

Location DSCR: U08 Site Name

Identify Measuring Point (MP): [illegible] (eg. Top of Casing)

Well ID: [redacted]

Field Sampling Personnel: Stephanie Gomez

Depth to Screen below MP: ____ Top of screen ____ Bottom of screen

Pump Intake at (ft below MP): ____

Purging Device (Pump Type): [illegible] bladder

Best Available Copy

Date	Time	Depth to Water Below MP	Pump Dial Setting (1)	Purge Rate	Cum. Volume Purged	Temp.	Spec Cond.	pH	DO Flow Cell	DO Hach Test Kit mg/L		Ferrous Iron	Redox Potential	Comments
	24 hr	ft		mL/min	~~liters~~	deg. C	umhos/cm	pH Units	mg/L	(high)	(low)	mg/L	mV	turb (NTU)
10/15/02	1040	10.75		240	< 1 gal	21.58	0.131	3.75	4.32				3	1.9
	1050	10.84		280	~ 1 gal	21.74	0.130	3.75	5.42				-18	0.7
	1100	10.89		220	~ 2 gal	21.82	0.129	3.75	6.70				-21	1.0
	1110	10.91		220	~ 2.5 gal	22.00	0.136	3.74	1.06				-32	0
	1120	10.93		220	~ 4 gal	22.22	0.149	3.77	1.05				-46	0
	1130	10.94		220	~ 4.5 gal	22.28	0.159	3.84	1.04				-48	0
	1140	10.94		220	~ 5 gal	22.32	0.124	3.80	1.18				-51	0
	1150	10.94		220	~ 5.5 gal	22.28	0.124	3.85	1.02				-47	0
	1200	10.94		220	~ 6.0 gal	22.28	0.164	3.80	1.07				-56	0
	1210	10.94		220	~ 6.5 gal	22.23	0.168	3.86	1.01				-51	0
	1220	10.94		220	~ 7.0 gal	22.23	0.137	3.87	1.10				-60	0
	1230	10.94		220	~ 7.5 gal	22.23	0.123	3.97	1.06				-58	0
	1240	10.94		220	~ 8.0 gal	22.28	0.123	4.06	1.11				-65	6
	1250	10.94		220	~ 8.5 gal	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]
			Stabilized	@	1250									
			sample	time	1320									
		H₂	sample	time	1440									

704 441

Location DSCR - OU7 - OFF SITE (VERNON PROPERTY)
Site Name

Identify Measuring Point (MP): ______
(eg. Top of Casing)

Well ID. DMW-33A
Field Sampling Personnel: R. FORISTER

Depth to Screen below MP: ______ of screen (Top) ______ of screen (Bottom)

Best Available Copy

Pump Intake at (ft. below MP): ______
Purging Device (Pump Type): ______

Initial DTW = 5.45'

Date	Time 24 hr	Depth to Water Below MP ft	Pump Dial Setting (1)	Purge Rate mL/min	Cum. Volume Purged ~~liters~~	Temp. deg. C	Spec Cond. umhos/cm	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron mg/L	Redox Potential mV	Comments TURBIDITY (NTU)
														TIME = 0800
10/29	initial	5.78		300	—									
	0805	5.90		300		18.55	0.331	4.96	2.90				152	11.5
	0815	6.07		300		18.55	0.324	4.89	1.03				97	17.4
	0825	6.17				18.65	0.321	4.95	0.72				40	22.0 (yet clear H2O)
	0835	6.16		300		18.52	0.320	4.94	0.61				17	32.0
	0845	6.14				18.55	0.319	5.00	0.60				4	44.8 (TURBIDITY GRADUALLY GOES UP YET TH[illegible] IS [illegible] COLOR CHANGE IN [illegible])
	0855	6.12		300		18.53	0.318	5.01	0.54				-12	76.4 (ERROR)
	0905	6.11				18.55	0.318	5.02	0.53				-19	100.0
	0915	6.11		300		18.53	0.318	5.12	0.59				-25	2.2 (????) (WORKS AGAIN?)
	0925					18.54	0.317	5.11	0.61				-31	0.4
	0935	6.11		300		18.53	0.316	5.12	0.63				-36	4.4
	0945	6.11		300		18.53	0.315	5.01	0.58				-36	18.1
	0955					18.55	0.314	5.16	0.65				-39	37.7
	1005			300		18.55	0.314	5.15	0.59	2		2.40	-43	92.2

~~2 HOUR LIMIT REACHED CALLED SITE MANAGER TO CONFIRM~~

SAMPLE TIME = 1030
H2 SAMPLE TIME = 1115

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10-29-02 TIME 1030
SAMPLING POINT:
DEPTH DMW-33A

SAMPLE INFORMATION SAMPLE I.D. NO.: DMW-33A

MATERIAL. ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST) ______

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST) ______

HAZARDOUS?. ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME SAMPLE APPEARANCE, ODOR, COLOR, ETC.)
BAD ODOR , CLEAR

GENERAL INFORMATION WEATHER RAIN AIR TEMPERATURE 46°F

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA

SPECIAL HANDLING: FedEx

MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: R FORSTER SAMPLING OBSERVED BY: ______

DISCREPANCIES: ______

704 443

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10-16-02 TIME 1045
SAMPLING POINT: DMW-35A
DEPTH

SAMPLE INFORMATION SAMPLE I.D. NO.: DMW-35A

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310 1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot. Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis. Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS. (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR, COLOR, ETC.)

GENERAL INFORMATION WEATHER Overcast, raining AIR TEMPERATURE 60°

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING: FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: L. Barlow SAMPLING OBSERVED BY:
DISCREPANCIES:

704 444

Location DSCh: 007
Site Name

Identify Measuring Point (MP). (eg. Top of Casing)

Well ID: DMW 35A

Field Sampling Personnel: Lauren Barlow

Depth to Screen below MP: ____ of screen (Top) ____ of screen (Bottom)

Pump Intake at (ft. below MP):

Purging Device (Pump Type):

Best Available Copy

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg. C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	Comments Turb
10-16-02	920	12.75	20 psi	200		19.60	0.081	5.17	5.13				161	10.6
	930	12.81	"	200		19.57	0.075	5.26	2.02				153	10.8
	940	12.81	"	200		19.50	0.075	5.26	1.14				152	3.9
	950	12.81	"	"		19.52	0.075	5.26	0.88				151	4.2
	1000	12.81	"	"		14.58	0.074	5.27	0.74				149	7.5
	1010	12.81	"	"		19.57	0.073	5.30	0.67				147	0
	1020	12.81	"	"		19.66	0.073	5.29	0.68	4		0	147	0
														Well Stabilized
														Sample time is 10:45

704 445

FIELD SAMPLING REPORT

JOB No 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10/16/02 TIME 1430
SAMPLING POINT. MW112-2
DEPTH

SAMPLE INFORMATION SAMPLE I.D. NO.: MW112-2

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot. Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE, ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
clear / no odor

GENERAL INFORMATION WEATHER rain/misty AIR TEMPERATURE 60F

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING. FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICL

QA/QC

SAMPLE COLLECTED BY. Stephen K Gunier SAMPLING OBSERVED BY:
DISCREPANCIES: Ø

704 446

Location DSC... - OU 7 Site Name

Identify Measuring Point (MP): (eg. Top of Casing) — of casing

Well ID. MW 112-2

Field Sampling Personnel: Robert Forister, Stephanie Garner

Depth to Screen below MP. ____ Top of screen ____ Bottom of screen

Pump Intake at (ft. below MP):

Purging Device (Pump Type): peristaltic pump

Best Available Copy

Date	Time	Depth to Water Below MP	Pump Dial Setting (1)	Purge Rate	Cum. Volume Purged	Temp.	Spec Cond.	pH	DO Flow Cell	DO Hach Test Kit mg/L		Ferrous Iron	Redox Potential	Comments
	24 hr	ft		mL/min	liters	deg C	umhos/cm	pH Units	mg/L	(high)	(low)	mg/L	mV	turb (NTU)
10/10/02	1300	14.60		280	<1 gal	19.66	0.149	5.13	2.15				209	41.1
	1310	14.60		280	~1 gal	19.94	0.131	5.00	1.39				220	15.2
	1320	14.60		280	~1.5 gal	19.92	0.125	4.94	1.25				223	12.8
	1330	14.60		280	~2 gal	19.94	0.122	4.92	1.10				224	15.1
	1340	14.60		280	~2.5 gal	19.82	0.120	4.90	1.06				225	18.9
	1350	14.60		280	~3 gal	19.94	0.119	4.92	1.01	2		3	224	25.6

stabilized @ 1350

sample time : 1430

H_2 sample time : 1500

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)

704 447

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10/15/02 TIME 1415
SAMPLING POINT MW FOS-1
DEPTH

SAMPLE INFORMATION SAMPLE I D NO.. MWFOS-1

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR, COLOR, ETC)
5 gals purged

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME SAMPLE APPEARANCE; ODOR, COLOR, ETC)
Water - Clear - No odor - No color

GENERAL INFORMATION WEATHER cool, breezy, overcast AIR TEMPERATURE ~60°F

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING. FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICL

QA/QC

SAMPLE COLLECTED BY C Clark D. Knaub SAMPLING OBSERVED BY:
DISCREPANCIES.

WELL PURGING - FIELD WATER

704 448

Best Available Copy

Location DSCR - UU7
Site Name

Well ID MW FOS - 1

Field Sampling Personnel: C. Clark, D Knaul

Identify Measuring Point (MP). (eg. Top of Casing)

Depth to Screen below MP: ____ of screen (Top) ____ of screen (Bottom)

Pump Intake at (ft. below MP):

Purging Device (Pump Type):

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg. C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	Comments: Turb (ntu)
10/15	12:44	20.4		200	—	20.2	.278	5.70	2.29				201	53.1
"	12:55	20.35		200	~.5 gal	20.1	.259	5.66	1.07				141	43.1
"	13:05	20.40		200	~.75 gal	20.0	0.250	5.63	0.76				123	40.2
"	13:16	20.40		200	~1.5 gal	20.0	0.246	5.60	0.68				114	40.0
"	13:26	20.40		200	~2.0 gal	19.9	0.243	5.58	0.64				110	38.0
"	13:36	20.40		200	~2.5 gal	20.0	0.241	5.57	0.61				107	37.7
"	13:46	20.35		200	~2.75 gal	20.1	0.240	5.58	0.58				105	37.1
"	1356	20.35		200	~3.00	20.0	0.240	5.56	0.57				103	36.5
"	1400	20.35		200	~3.35	20.0	0.240	5.56	0.56	0		0	101	35.8

ADJUSTED FLOW RATE FOR SAMPLING (100 ml/m)

5 gals purged, Sample time 141

C. Clark 10/15/02

FIELD SAMPLING REPORT	JOB No. 12001-2-0701 JOB NAME DSCR – MNA OU7 DATE 10/15/02 TIME 12:30 SAMPLING POINT: MWF05-3 DEPTH

SAMPLE INFORMATION SAMPLE I.D. NO.: MWF05-3

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS? ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376 1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot. Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis. Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

TOTAL PURGE 2.5 GAL,

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS. (WELL PURGING VOLUME. SAMPLE APPEARANCE, ODOR; COLOR, ETC.)

SAMPLE CLEAR, SLIGHT ODOR

GENERAL INFORMATION WEATHER CLOUDY AIR TEMPERATURE 50°-60°F

SAMPLES SHIPPED TO: STL-North Canton, Ohio / Microseeps – Pittsburg, PA

SPECIAL HANDLING: FedEx

MODE OF SHIPMENT ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY. [signature] SAMPLING OBSERVED BY.

DISCREPANCIES.

WELL PURGING - FIELD WATER QUALITY MEASUREMENTS

__ of __

704 450

Location DSCR - 007 Site Name

Well ID: MW FOS-3

Field Sampling Personnel: DAN VASS

Identify Measuring Point (MP). Top of ~~[illegible]~~ Casing
(eg Top of Casing)

Depth to Screen below MP: ______ Top of screen ______ Bottom of screen

Pump Intake at (ft. below MP): ______

Purging Device (Pump Type): ______

Best Available Copy

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp (deg C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	TURB (NTU)	Comments
10/15	1115	12.45		100	0	202	6.123	4.87	2 90				213	687	
10/15	1125	12.49		100	25	20.3	0.117	461	1.16				240	487	
10/15	1135	12.50		100	50	205	0.111	4.70	0 98				235	271	
10/15	1145	12.50		100	.75	204	0.108	478	0 84				233	105	
10/15	1155	12.51		100	1.00	203	0.108	479	0.83				233	11.0	
10/15	1205	12.51		100	1.25	204	0.107	4.80	0.80	3		0	230	108	

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10/29/02 TIME 0930
SAMPLING POINT: MWFTA-5
DEPTH

SAMPLE INFORMATION

SAMPLE I.D. NO: MWFTA-5

MATERIAL ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS (WELL PURGING VOLUME: SAMPLE APPEARANCE, ODOR; COLOR, ETC.)
clear, odorless

GENERAL INFORMATION

WEATHER overcast AIR TEMPERATURE 50°F

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA

SPECIAL HANDLING: FedEx

MODE OF SHIPMENT. ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY. S Garner Stephanie K. Garner SAMPLING OBSERVED BY:

DISCREPANCIES:

704 452

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Location DSCR - 007
Site Name

Well ID. MWFTA-5
Field Sampling Personnel S Garner

Identify Measuring Point (MP): Top of casing
(eg Top of Casing)

Depth to Screen below MP: ______ of screen (Top) ______ of screen (Bottom)

Pump Intake at (ft. below MP):
Purging Device (Pump Type): dedicated pump
Initial DTW 6.10'

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg. C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	Comments turb (NTU)
10/21/02	0750	6.35		240	<1 gal	16.06	0.141	5.70	3.25				155	48.8
	0800	6.36		240	<1 gal	16.12	0.123	6.06	1.81				130	22.5
	0810	6.36		200	~1 gal	16.06	0.122	6.17	1.33				123	11.7
	0820	6.36		200	~1 gal	16.00	0.120	6.27	1.14				117	12.5
	0830	6.36		200	~1.5 gal	15.99	0.117	6.32	1.06				112	12.0
	0840	6.36		200	~2 gal	15.95	0.116	6.36	1.04				112	10.2
	0850	6.36		200	~2.5 gal	15.92	0.115	6.37	1.01			3.4	111	10.1

Stabilized @ 0850
sample time: 0930
H_2 sample time: 1015

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10-17-02 TIME 1410
SAMPLING POINT: MWFTA-7
DEPTH

SAMPLE INFORMATION SAMPLE I.D. NO.: MWFTA-7

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME. SAMPLE APPEARANCE, ODOR, COLOR, ETC.)

GENERAL INFORMATION WEATHER Cloudy to Sunny AIR TEMPERATURE 62°

SAMPLES SHIPPED TO: STL-North Canton, Ohio / Microseeps – Pittsburg, PA

SPECIAL HANDLING FedEx

MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: L Furlow SAMPLING OBSERVED BY:

DISCREPANCIES.

WELL PURGING - FIELD WATER

Location DSCR - UC7
Site Name

Identify Measuring Point (MP): ______
(eg Top of Casing)

Well ID. MWFTA -7

Field Sampling Personnel: Lauren Barlow

Depth to Screen below MP- ______ of screen (Top) ______ of screen (Bottom)

Pump Intake at (ft. below MP): ______

Purging Device (Pump Type): dedicated pump

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704 454

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg C)	Spec Cond (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	Comments
10-17-02						21.34	0.118	3.83	5.14				338	Turb 6.8
~~1230~~	12:30	10.15	10 psi	160		20.79	0.113	3.50	2.90				379	5.1
~~1240~~	1240	10.18	"	"		20.58	0.114	3.39	1.44				390	4.7
~~1250~~	1250	10.18	"	"		20.58	0.114	3.40	0.92				395	0
~~1300~~	1300	10.18	"	"		20.76	0.114	3.41	0.83				395	5.1
~~1310~~	1310	10.18				20.19	0.114	3.37	0.70				400	6.9
	1320	10.18	"	"		20.10	0.114	3.43	0.63				400	7.3
	1330	10.18		"		19.93	0.114	3.44	0.60				403	0
	1340	10.21	"	"		19.80	0.114	3.43	0.57	0		2	405	0
	1350													Well Stabilized
														Sample time is 1410

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10-29-02 TIME 900
SAMPLING POINT: MWFTA-9
DEPTH 14 feet

SAMPLE INFORMATION

SAMPLE I.D. NO.: MWFTA-9

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300 0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis. Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS. (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
water clear, no odor

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR, COLOR, ETC)

GENERAL INFORMATION

WEATHER overcast, drizzle AIR TEMPERATURE 50°F

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICL

QA/QC

SAMPLE COLLECTED BY. J Vecsey SAMPLING OBSERVED BY: C Barlow
DISCREPANCIES:

WELL PURGING FIELD

_ of _

704 456

Location DSCR - OU7 (Site Name)

Identify Measuring Point (MP): ______
(eg Top of Casing)

Well ID: MWFTA-9

Depth to Screen below MP: ______ of screen (Top) ______ of screen (Bottom)

Field Sampling Personnel: J Vecsey, C Barlow

Pump Intake at (ft. below MP). ______
Purging Device (Pump Type) ______

Best Available Copy

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp (deg C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	Comments Turb
10/29/02	0835	4.25		200		16.14	0.103	4.55	2.35				249	11.1
	0845	4.03		"		16.35	0.090	5.17	0.78				207	3.8
	0855	4.10		"		16.57	0.076	5.20	0.87				197	1.8
	0905	4.13		"		16.35	0.069	5.54	~~1.08~~ 1.03				195	1.7
	0915	4.15		"		16.54	0.066	5.28	1.15				193	1.5
	0925	4.15		"		16.57	0.065	5.28	1.06				192	2.5
	0935	"		"		16.32	0.064	5.31	1.04	3		3.20	191	2.5
														Well stabilized Begin sampling

FIELD SAMPLING REPORT

JOB No 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10-29-02 TIME 250
SAMPLING POINT. MWFTA-10
DEPTH ______

SAMPLE INFORMATION SAMPLE I.D. NO.. MWFTA-10

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST) ______
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST) ______
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300 0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME. SAMPLE APPEARANCE, ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS. (WELL PURGING VOLUME SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION WEATHER overcast AIR TEMPERATURE 52°

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING: FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICL

QA/QC

SAMPLE COLLECTED BY. [illegible signature] SAMPLING OBSERVED BY: ______
DISCREPANCIES ______

Location DSCR - CCV
Site Name

Well ID. ...07-A-10
Field Sampling Personnel: [illegible]

Identify Measuring Point (MP):
(eg. Top of Casing)

Depth to Screen below MP: ______ of screen (Top) ______ of screen (Bottom)

Pump Intake at (ft. below MP):
Purging Device (Pump Type): peristaltic

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Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	Comments
														Turb
10-7-04	830	4.42	25%	120		15.21	0.127	5.77	0.44				97	12.7
	840	4.45	25%	120		15.21	0.122	5.83	0.11				82	10.8
	850	4.45	"	"		15.25	0.119	5.77	0.05				81	9.0
	900	4.45	"	"		15.14	0.117	5.81	0.01				76	9.2
	910	4.45	"	"		15.00	0.116	5.85	0.00				71	9.5
	920	"	"	"		15.18	0.116	5.90	0.00				67	11.0
	930					15.16	0.116	5.94	0.10	3		3	62	9.5

Well stabilized, reduced flow to 100 mL/min. Sample time is 930

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10-29-02 TIME 9:30
SAMPLING POINT MW FTA-14
(LOCATION)
DEPTH N/A

SAMPLE INFORMATION SAMPLE I.D. NO : MW FTA-14

MATERIAL. ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	**40 ml**	**3**	**Cool to 4°C ******	**VOCs by SW8260B**
VOA VIAL	**40 ml**	**3**	**Cool to 4°C**	**Methane, Ethane & Ethene by RSK175**
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	Zn Acetate & NaOH; Coo1 to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Dissolved Metals by 6010B/7470A/7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS· (WELL PURGING VOLUME: SAMPLE APPEARANCE, ODOR; COLOR, ETC.)

Lower aquifer well - VOCs and dissolved gasses collected w/o HCl - 7 Day Hold Time!!!

TOTAL PURGE 1.6 GALLON; SAMPLE CLEAR, NO ODOR

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS (WELL PURGING VOLUME SAMPLE APPEARANCE, ODOR, COLOR, ETC)

TOTAL PURGE 16 GALLON, SAMPLE CLEAR, NO ODOR

GENERAL INFORMATION WEATHER RAIN AIR TEMPERATURE 50's.

SAMPLES SHIPPED TO STL - North Canton, Ohio/Microseeps - Pittsburgh, PA
SPECIAL HANDLING· FedEx
MODE OF SHIPMENT. ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEH

QA/QC

SAMPLE COLLECTED BY Dan W[illegible] SAMPLING OBSERVED BY·
DISCREPANCIES

Location DSCR - OU 7
Site Name

Identify Measuring Point (MP). Top of Casing
(eg Top of Casing)

Well ID. MWFTA-14
Field Sampling Personnel: DAN VASS

Depth to Screen below MP: ____ of screen (Top) ____ of screen (Bottom)
Pump Intake at (ft. below MP): ____
Purging Device (Pump Type): ____

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Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg. C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	TURB	Comments
10 29	815	21.50		100	0 3	15.3	0.530	8.53	3.55				265	6.4	
10-29	825	22.05		80	0.6	14.8	0.513	8.68	3.13				238	6.8	
10 29	835	22.55		60	0.8	150	0 495	8.88	2.60				215	7.0	
10 29	845	23 20		30	1.0	14.3	0.500	8.92	2.50				207	7.6	
10-29	855	23.51		30	1.2	14 2	0497	8.99	2.47				199	7.6	
10-29	905	23.80		30	14	140	0.496	9.03	2.43				188	7 7	
10-29	915	24.02		30	1.6	140	0495	9.08	2.40			<0.1	195	7.6	

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10.15.02 TIME 1300
SAMPLING POINT (LOCATION) MWFTA-16
DEPTH N/A

SAMPLE INFORMATION

SAMPLE I.D. NO.: MWFTA-16

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	**40 ml**	**3**	**Cool to 4°C ******	**VOCs by SW8260B**
VOA VIAL	**40 ml**	**3**	**Cool to 4°C**	**Methane, Ethane & Ethene by RSK175**
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	Zn Acetate & NaOH, Coo1 to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310 1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2, Cool to 4°C	Dissolved Metals by 6010B/7470A/7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME· SAMPLE APPEARANCE; ODOR, COLOR, ETC.)

Lower aquifer well - VOCs and dissolved gasses collected w/o HCl - 7 Day Hold Time!!!

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
	SEE ATTACHED TABLE		

COMMENTS: (WELL PURGING VOLUME SAMPLE APPEARANCE, ODOR; COLOR, ETC)
FLAKEY CHUNKS OF WHITISH FLOC. CLEAR WATER, NO ODOR DETECTED.

GENERAL INFORMATION

WEATHER CLOUDY AIR TEMPERATURE ≈ 54° F

SAMPLES SHIPPED TO: STL - North Canton, Ohio/Microseeps - Pittsburgh, PA
SPECIAL HANDLING FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEH

QA/QC

SAMPLE COLLECTED BY R. FORISTER SAMPLING OBSERVED BY R. FORISTER
DISCREPANCIES

FIELD SAMPLING REPORT

JOB No 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10.15.02 TIME 1300
SAMPLING POINT: MWFTA-16
DEPTH

SAMPLE INFORMATION SAMPLE I.D NO. MWFTA-16P

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS? ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B

OMMENTS. (WELL PURGING VOLUME. SAMPLE APPEARANCE, ODOR, COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME· SAMPLE APPEARANCE; ODOR; COLOR, ETC)
FLAKEY CHUNKS OF WHITISH FLOC, IN CLEAR WATER WITH NO ODOR.

GENERAL INFORMATION WEATHER CLOUDY / BREEZY AIR TEMPERATURE ≈54°F

SAMPLES SHIPPED TO· STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING FedEx
MODE OF SHIPMENT ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY· E. FORISTER SAMPLING OBSERVED BY: E. FORISTER
DISCREPANCIES:

704 463

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Location DSCh: 007

Site Name: MWFTA ~~MWFOS~~-16

Well ID: MWFTA-16

Field Sampling Personnel: R. FORISTER

Identify Measuring Point (MP). (eg Top of Casing): C

Depth to Screen below MP. ? of screen (Top) ? of screen (Bottom)

Pump Intake at (ft. below MP): -

Purging Device (Pump Type): Dedicated Bladder

Date OCT 15 2002	Time 24 hr	Depth to Water Below MP ft	Pump Dial Setting (1)	Purge Rate mL/min	Cum. Volume Purged ~~liters~~	Temp. deg C	Spec Cond. umhos/cm	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron mg/L	Redox Potential mV	Comments TURBIDITY (ntu's)
10/15	1030	34.30		320	1	17.51	4.75	12.29	7.68				-79	244
10/15	1040			300	1.5	17.61	4.71	12.36	8.72				-98	17.0
	1050			220	2.0	17.55	4.51	12.39	8.41				-110	11.1
	1100	38.70'		220	2.3	17.88	4.31	12.40	8.05				-115	9.6
	1110			220	30	17.99	3.83	12.40	7.77				-122	9.6
	1120				3.5	18.18	3.35	12.31	7.44				-129	9.7
	1130			220	4.0	18.24	3.03	12.35	7.17				-133	10.5
	1140			220	4.5	18.21	2.88	12.34	6.95				-135	11.3
	1150				5.0	18.18	2.66	12.31	6.72				-138	11.1
	1200	43.33			5.5	18.12	2.52	12.30	6.47				-140	11.0
	1210				6.0	18.03	2.35	12.28	6.23				-143	13.7
	1220				65	18.02	2.16	12.26	6.64				-145	13.7
	1230					18.05	1.92	12.23	5.84	3		0	-149	14.1

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10-15-02 TIME 1145
SAMPLING POINT (LOCATION) MWFTA-17
DEPTH N/A

SAMPLE INFORMATION SAMPLE I D NO MWFTA-17

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	**40 ml**	**3**	**Cool to 4°C ******	**VOCs by SW8260B**
VOA VIAL	**40 ml**	**3**	**Cool to 4°C**	**Methane, Ethane & Ethene by RSK175**
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	Zn Acetate & NaOH, Coo1 to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310 1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2, Cool to 4°C	Dissolved Metals by 6010B/7470A/7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS. (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR, COLOR, ETC)

Lower aquifer well - VOCs and dissolved gasses collected w/o HCl - 7 Day Hold Time!!!

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I D.	RESULTS (UNITS)	COMMENTS
	SEE ATTACHED TABLE		

COMMENTS: (WELL PURGING VOLUME SAMPLE APPEARANCE, ODOR, COLOR, ETC)

Clear

GENERAL INFORMATION WEATHER Cloudy cool AIR TEMPERATURE 60°

SAMPLES SHIPPED TO STL - North Canton, Ohio/Microseeps - Pittsburgh, PA
SPECIAL HANDLING: FedEx
MODE OF SHIPMENT. ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY L Em[illegible] SAMPLING OBSERVED BY.
DISCREPANCIES

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Location DSCR - OU-7
Site Name

Identify Measuring Point (MP): (eg Top of Casing)

Well ID: MW57A-17

Field Sampling Personnel: Lauren Barlow, Jay Vorsey

Depth to Screen below MP ____ Top of screen ____ Bottom of screen

Pump Intake at (ft. below MP):

Purging Device (Pump Type):

Date	Time 24 hr	Depth to Water Below MP ft	Pump Dial Setting (1)	Purge Rate mL/min	Cum. Volume Purged ~~liters~~	Temp. deg C	Spec Cond umhos/cm	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron mg/L	Redox Potential mV	Comments Turb
10-15-02	1055	27.15	22psi	100		18.38	1.47	11.97	4.20				-44	3.5
	1105	27.50				18.04	1.46	12.31	4.02				-62	2.6
	1115	27.74				18.40	1.45	12.34	4.07				-63	3.3
	1125	28.04				18.66	1.44	12.34	4.02				-64	2.5
	1135	28.30				18.57	1.44	12.33	3.97	5		0	-64	2.5
														Well Stabilized
														Sample time 1145
														hydrogen sample time is 1225

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10/16/02 TIME 15:30
SAMPLING POINT (LOCATION) MWFTA-1B
DEPTH N/A

SAMPLE INFORMATION SAMPLE I D. NO: MWFTA-1B

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	**40 ml**	**3**	**Cool to 4°C ******	**VOCs by SW8260B**
VOA VIAL	**40 ml**	**3**	**Cool to 4°C**	**Methane, Ethane & Ethene by RSK175**
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	Zn Acetate & NaOH; Coo1 to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2, Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Dissolved Metals by 6010B/7470A/7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS (WELL PURGING VOLUME: SAMPLE APPEARANCE, ODOR, COLOR, ETC)

Lower aquifer well - VOCs and dissolved gasses collected w/o HCl - 7 Day Hold Time!!!

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I D	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS (WELL PURGING VOLUME. SAMPLE APPEARANCE, ODOR, COLOR, ETC)

GENERAL INFORMATION WEATHER ______ AIR TEMPERATURE ______

SAMPLES SHIPPED TO: STL - North Canton, Ohio/Microseeps - Pittsburgh, PA
SPECIAL HANDLING FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY Jay Pecsey SAMPLING OBSERVED BY ______
DISCREPANCIES ______

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Location DSCR - OU 7 (Site Name)

Well ID: MWFTA-18

Field Sampling Personnel: [illegible] Vecsey, Calvin Barton

Identify Measuring Point (MP): (eg Top of Casing)

Depth to Screen below MP: ______ Top of screen ______ Bottom of screen

Pump Intake at (ft. below MP):

Purging Device (Pump Type):

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	Comments
														Turb
10/16	1430	30.87	32 psi	200		16.57	0.160	6.99	8.41				-50	9.7
	1440	30.92	30	60		16.61	0.160	7.22	8.06				-70	9.1
	1450	31.03	"	"		16.77	0.158	7.32	7.70				-83	8.6
	1500	31.10	"	"		16.92	0.157	7.33	7.42				-87	8.7
	1510	31.15	"	"		16.98	0.156	7.34	7.08	3		3	-89	8.1
														Sample time 1530

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10.17.02 TIME 1150
SAMPLING POINT (LOCATION) MWFTA-19
DEPTH N/A

: kup well labeled - MW-19

2" well dedicated bladder pump

SAMPLE INFORMATION SAMPLE I.D. NO. MWFTA-19

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	**40 ml**	**3**	**Cool to 4°C ******	**VOCs by SW8260B**
VOA VIAL	**40 ml**	**3**	**Cool to 4°C**	**Methane, Ethane & Ethene by RSK175**
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	Zn Acetate & NaOH; Coo1 to 4°C	Sulfide by E376 1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Dissolved Metals by 6010B/7470A/7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR, COLOR, ETC)

Lower aquifer well - VOCs and dissolved gasses collected w/o HCl - 7 Day Hold Time!!!

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
	SEE ATTACHED TABLE		

COMMENTS (WELL PURGING VOLUME SAMPLE APPEARANCE, ODOR, COLOR, ETC)

Clear, no odor, pink tint

GENERAL INFORMATION WEATHER ______ AIR TEMPERATURE ______

SAMPLES SHIPPED TO STL - North Canton, Ohio/Microseeps - Pittsburgh, PA

SPECIAL HANDLING: FedEx

MODE OF SHIPMENT ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY R. Forister X [signature] SAMPLING OBSERVED BY S. Garner X [signature]

DISCREPANCIES

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Location DSC 007
Site Name

Well ID: MWFTA - 19
Field Sampling Personnel. R. FORISTER

Identify Measuring Point (MP): T. C.
(eg. Top of Casing)

Depth to Screen below MP. ____ of screen (Top) ____ of screen (Bottom)

Pump Intake at (ft. below MP):
Purging Device (Pump Type). Bladder (Dedicated)

Date	Time 24 hr	Depth to Water Below MP ft	Pump Dial Setting (1)	Purge Rate mL/min	Cum. Volume Purged gallons ~~liters~~	Temp. deg C	Spec Cond. umhos/cm	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron mg/L	Redox Potential mV		Comments
10.17.02	10 30	26.10'		255	< 1	15.47	0.732	10.89	7.33				-4	7.5	ADJUSTING FLOW RATE DUE TO DRAW DOWN
10 17 02	10 40	30.30'		255	1.5 g	15.54	0.726	10.87	7.12				-10	6.9	reduced FLOW RATE TO 150 ml @ 10
10 17 02	10 50	32.45'		150	2.25 g	15.78	0.724	10.87	7.09				-15	6.0	DRAW DOWN STILL HAPPENING THOUGH NOT AS BAD. WILL REDUCE FLOW A LIT.
10.17.02	11 00	34.25		140	2.5	15.90	0.724	10.89	7.09				-17	6.9	
10 17 02	1110	35.9		120	3.25	16.07	0.725	10.89	6.96	4		0	-19	0.6	
10.17.02			STABILIZED	@	1110										
10 17 02			SAMPLE	TIME	1150										

704 470

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10/17/02 TIME 1300
SAMPLING POINT (LOCATION) MWFTA-20
DEPTH N/A

SAMPLE INFORMATION SAMPLE I.D NO.. MWFTA-20

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST) ____
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST) ____
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	**40 ml**	**3**	**Cool to 4°C ******	**VOCs by SW8260B**
VOA VIAL	**40 ml**	**3**	**Cool to 4°C**	**Methane, Ethane & Ethene by RSK175**
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	Zn Acetate & NaOH, Coo1 to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2, Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Dissolved Metals by 6010B/7470A/7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME SAMPLE APPEARANCE; ODOR, COLOR, ETC.)
Lower aquifer well - VOCs and dissolved gasses collected w/o HCl - 7 Day Hold Time!!!

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME SAMPLE APPEARANCE, ODOR, COLOR, ETC.)

GENERAL INFORMATION WEATHER part sun AIR TEMPERATURE 60's

SAMPLES SHIPPED TO: STL - North Canton, Ohio/Microseeps - Pittsburgh, PA
SPECIAL HANDLING: FedEx
MODE OF SHIPMENT ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: Anthony W. England SAMPLING OBSERVED BY: Dan V[illegible]
DISCREPANCIES.

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10/17/02 TIME 1300
SAMPLING POINT: MWFTA-20
DEPTH

SAMPLE INFORMATION

SAMPLE I.D. NO.: MWFTA-20P

MATERIAL ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE. ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS? ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B

COMMENTS. (WELL PURGING VOLUME· SAMPLE APPEARANCE; ODOR, COLOR, ETC)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS· (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR, COLOR, ETC)

GENERAL INFORMATION

WEATHER Part sun AIR TEMPERATURE 60's

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA

SPECIAL HANDLING FedEx

MODE OF SHIPMENT ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY· [signature] SAMPLING OBSERVED BY· [signature]

DISCREPANCIES

704 472

FIELD SAMPLING REPORT

JOB No 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10/1/02 TIME 1300
SAMPLING POINT (LOCATION) MWFTA-20
DEPTH N/A

SAMPLE INFORMATION

SAMPLE I.D NO.: MWFTA-20QA

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	**40 ml**	**3**	**Cool to 4°C ******	**VOCs by SW8260B**
VOA VIAL	**40 ml**	**3**	**Cool to 4°C**	**Methane, Ethane & Ethene by RSK175**
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	Zn Acetate & NaOH, Coo1 to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Dissolved Metals by 6010B/7470A/7841

COMMENTS (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

Lower aquifer well - VOCs and dissolved gasses collected w/o HCl - 7 Day Hold Time!!!

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS. (WELL PURGING VOLUME SAMPLE APPEARANCE; ODOR, COLOR, ETC.)

GENERAL INFORMATION

WEATHER Part sun AIR TEMPERATURE 60's

SAMPLES SHIPPED TO: CEMRD – Omaha, Nebraska

SPECIAL HANDLING: FedEx

MODE OF SHIPMENT. ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: [signature] SAMPLING OBSERVED BY: [signature]

DISCREPANCIES:

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10/17/03 TIME 1300
SAMPLING POINT (LOCATION) MW FTA 20
DEPTH N/A

SAMPLE INFORMATION

SAMPLE I.D. NO.: OU7 DUP-3

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	**40 ml**	**3**	**Cool to 4°C ******	**VOCs by SW8260B**
VOA VIAL	**40 ml**	**3**	**Cool to 4°C**	**Methane, Ethane & Ethene by RSK175**
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	Zn Acetate & NaOH; Coo1 to 4°C	Sulfide by E376 1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2, Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Dissolved Metals by 6010B/7470A/7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

Lower aquifer well - VOCs and dissolved gasses collected w/o HCl - 7 Day Hold Time!!!

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS (WELL PURGING VOLUME SAMPLE APPEARANCE, ODOR, COLOR, ETC)

GENERAL INFORMATION

WEATHER PART SUN AIR TEMPERATURE 60's

SAMPLES SHIPPED TO: STL - North Canton, Ohio/Microseeps - Pittsburgh, PA
SPECIAL HANDLING FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEH

QA/QC

SAMPLE COLLECTED BY: Anthony W. Engel SAMPLING OBSERVED BY: [signature]
DISCREPANCIES:

WELL PURGING - FIELD WATER

1 of 1

Location DSCR - OU7 (Site Name)

Identify Measuring Point (MP): TOC
(eg Top of Casing)

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Well ID. MWFTA-20

Field Sampling Personnel: TONY ENGLUND, DAN VASS

Depth to Screen below MP: ____ of screen (Top) ____ of screen (Bottom)

Pump Intake at (ft. below MP): ____

Purging Device (Pump Type): BLADDER

Date	Time 24 hr	Depth to Water Below MP ft	Pump Dial Setting (1)	Purge Rate mL/min	Cum. Volume Purged GAL ~~liters~~	Temp. deg. C	Spec Cond. mS/cm ~~umhos/cm~~	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron mg/L	Redox Potential mV	Turbidity NTU	Comments
															BEGIN PURGING
10/17/02	1055	23.51				16.34	0.211	6.51	10.07				203	8.2	
	1105	24.50		100		16.03	0.216	6.71	4.58				34	10.6	
	1115	25.91		100		16.21	0.215	7.20	3.75				22	14.9	
	1125	26.22		50		16.55	0.214	8.20	3.54				30	12.6	
	1135	26.35		26		16.82	0.214	8.89	3.54				55	11.5	
	1150	26.45		26		17.15	0.215	9.30	3.44				22	11.2	
	1200	26.56		26		17.53	0.214	9.40	3.55				18	10.9	
	1210	26.64		26		17.96	0.215	9.41	3.51	2		4	15	10.1	PARAMETERS STABLE
	1220	26.69		26											COLLECT SAMPLE AT 1300
	1300														

704 475

FIELD SAMPLING REPORT

JOB No 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10/15/02 TIME 1315
SAMPLING POINT: MW FTA-23
DEPTH

SAMPLE INFORMATION SAMPLE I.D. NO.: MW FTA-23

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, ethane, ethene by RSK-175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2,Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	1	ZnAc & NaOH, Cool to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot. Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis. Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
4 GAL PURGED.

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR, COLOR, ETC.)

GENERAL INFORMATION WEATHER CLOUDY AIR TEMPERATURE 60's

SAMPLES SHIPPED TO STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING: FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: Anthy W. Engl SAMPLING OBSERVED BY:
DISCREPANCIES:

704 476

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Location DSCR - OW7 Site Name

Well ID: MWPTA-23

Field Sampling Personnel: TONY ENGLUND / DAN VASSER

Identify Measuring Point (MP): TOC
(eg. Top of Casing)

Depth to Screen below MP: ______ Top of screen ______ Bottom of screen

Pump Intake at (ft. below MP): ______

Purging Device (Pump Type): BLADDER

Date	Time	Depth to Water Below MP	Pump Dial Setting (1)	Purge Rate	Cum. Volume Purged	Temp.	Spec Cond.	pH	DO Flow Cell	DO Hach Test Kit mg/L		Ferrous Iron	Redox Potential	TURB	Comments
	24 hr	ft		mL/min	gal ~~liters~~	deg. C	mS/cm ~~umhos/cm~~	pH Units	mg/L	(high)	(low)	mg/L	mV	NTU	
														BEGIN PURGING	
10/15/02	1030	11.95		100											
	1040	11.98		100		19.46	0.335	4.72	3.92				40	57.9	
	1050	11.98		100		19.66	0.284	4.82	1.76				5	47.9	
	1105	11.98		100		19.74	0.256	4.93	1.32				-34	53.3	
	1115	11.98		100		19.44	0.250	4.98	3.17				-51	57.6	
	1125	11.98		100		19.97	0.246	4.98	5.06				-58	58.5	
	1140	11.98		100		19.45	0.242	5.02	5.70				-64	59.5	
	1150	11.98		100		19.95	0.239	5.02	5.45				-68	60.4	
	1200	11.98		50		19.56	0.239	5.05	5.91				-71	68.4	
	1215	11.98		50		19.46	0.243	5.13	6.14				-68	48.0	
	1225	11.98		50		19.79	0.243	5.01	5.45				-68 AVG ~~-75~~	45.6	
	1235	11.98		50		19.89	0.249	5.08	5.07				-75	47.3	
	1245	11.98		50	4.0	19.82	0.249	5.10	4.88	0		0.5	-76	48.3	
														COLLECT SAMPLE	
	1315	HAWC													

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)

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FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10/29/02 TIME 1100
SAMPLING POINT MWFTA-28B
(LOCATION)
DEPTH N/A

SAMPLE INFORMATION SAMPLE I.D NO.. MWFTA-28B

MATERIAL. ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	**40 ml**	**3**	**Cool to 4°C ******	**VOCs by SW8260B**
VOA VIAL	**40 ml**	**3**	**Cool to 4°C**	**Methane, Ethane & Ethene by RSK175**
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	Zn Acetate & NaOH; Coo1 to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Dissolved Metals by 6010B/7470A/7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME. SAMPLE APPEARANCE, ODOR; COLOR, ETC)

Lower aquifer well - VOCs and dissolved gasses collected w/o HCl - 7 Day Hold Time!!!

3.0 GAL PURGED

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME SAMPLE APPEARANCE; ODOR, COLOR, ETC.)

GENERAL INFORMATION WEATHER RAIN AIR TEMPERATURE 40°

SAMPLES SHIPPED TO: STL - North Canton, Ohio/Microseeps - Pittsburgh, PA

SPECIAL HANDLING: FedEx

MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHI

QA/QC

SAMPLE COLLECTED BY. [signature] SAMPLING OBSERVED BY [signature]

DISCREPANCIES:

704 478

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Location DSCR - OU 7 (Site Name)

Identify Measuring Point (MP): TOC
(eg Top of Casing)

Well ID. MW/FTA-24B

Depth to Screen below MP: ______ of screen (Top) ______ of screen (Bottom)

Field Sampling Personnel: TONY BALCHUND, DON VASS

Pump Intake at (ft. below MP): ______

Purging Device (Pump Type): BLADDER

Date	Time 24 hr	Depth to Water Below MP ft	Pump Dial Setting (1)	Purge Rate mL/min	Cum. Volume Purged gal ~~liters~~	Temp. deg C	Spec Cond. mS/cm ~~umhos/cm~~	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron mg/L	Redox Potential mV	TURBIDITY NTU	Comments
10/29/02	0800	24.20													BEGIN PURGING
	0810	25.70		100		14.48	0.768	6.36	3.16				-71	12.9	
	0820	26.15		30		13.46	0.761	6.54	1.66				-95	26.0	
	0830	26.41		30		13.17	0.745	6.74	1.39				-108	34.4	
	0840	26.80		30		12.87	0.736	6.45	1.23				-120	56.1	
	0850	27.00		30		12.73	0.724	7.01	1.15				-122	65.1	
	0900														
	0935	27.57		30		12.65	0.706	7.06	6.45				-90	20.2	
	0945	28.07		30		12.61	0.700	7.06	1.90				-92	19.8	
	0955	28.31		30		12.52	0.698	7.08	1.61				-93	19.5	
	1005	28.48		30		12.47	0.696	7.09	1.56				-93	20.0	
	1015	28.54		30		13.36	0.677	7.09	1.53	3		0.3	-93	21.0	PARAMETERS STABLE
	1100														COLLECT SAMPLE

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR – MNA OU7
DATE 10-17-02 TIME 1445
SAMPLING POINT: MWFTA-29B
DEPTH

SAMPLE INFORMATION SAMPLE I D NO.: MWFTA-29B

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	**40 ml**	**9**	**Cool to 4°C**	**VOCs by SW8260B**
VOA VIAL	**40 ml**	**3**	**Cool to 4°C**	**Methane, ethane, ethene by RSK-175**
VOA VIAL	40 ml	9	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	CO_2 by RSK-175
Poly	500 ml	3	ZnAc & NaOH, Cool to 4°C	Sulfide by E376 1
Poly	250 ml	3	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	3	Cool to 4°C	NO_3, SO_4, Cl by E300.0
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Tot Metals by 6010B,7470A,7841
Poly	1 L	1	HNO_3 to pH<2, Cool to 4°C	Dis Metals by 6010B,7470A,7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC)

Lower aquifer well - VOCs and dissolved gasses collected w/o HCl - 7 Day Hold Time!!!

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D	RESULTS (UNITS)	COMMENTS
N/A	N/A	N/A	N/A

COMMENTS: (WELL PURGING VOLUME SAMPLE APPEARANCE, ODOR, COLOR, ETC)

GENERAL INFORMATION WEATHER Cloudy AIR TEMPERATURE 60

SAMPLES SHIPPED TO: STL-North Canton, Ohio / Microseeps – Pittsburg, PA
SPECIAL HANDLING FedEx
MODE OF SHIPMENT ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: Jay Vecsey SAMPLING OBSERVED BY:
DISCREPANCIES:

WELL PURGING - FIELD WATER ... ___ of ___

704 480

Location DSCR - 007 (Site Name)

Identify Measuring Point (MP): ______
(eg. Top of Casing)

Well ID. MWFTA 29B

Depth to Screen below MP: ______ of screen (Top) ______ of screen (Bottom)

Field Sampling Personnel: J. Vecsey / C. Burling

Pump Intake at (ft. below MP): ______

Purging Device (Pump Type): ______

Best Available Copy

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	Comments: Turb	Comments
10/17	1230	21.65	30 psi	80		1782	1 79	12 11	2 53				-73	25.7	
~~10/17~~	1240	21 94	"	60		1805	1 77	12 04	2 17				-64	23 7	
	1250	22 20	"	60		18 48	1 77	12.07	2 55				-63	16 2	
	1300	22.45	"	"		18 52	1 80	12 26	2 63				-72	47 4	
	1310	22.65	"	"		18 70	1 82	12 36	2 59				-74	51 2	
	1320	22.80	"	"		18 71	1 85	12 40	2.41				-78	56.2	
	1330	23.16	"	"		18 81	1 87	12 42	2 09				-80	65 5	
	1340	23.40	"	"		18 71	1 90	12 42	1.83				-81	88.1	
	1350	23.55	"	"		18 63	1 90	12 43	1 76				-82	87 9	Well stabilized
	1400	24.81	"	"		18 63	1 90	12 44	1 66	↓		\	-82	87.4	
														18.8	- Turbidity okay.
	1415														Begin sampling.

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Best Available Copy

WELL PURGING - FIELD WATER QUALITY MEASUREMENTS FORM

Location DSCR - Ou 7 Site Name

Well ID: MW-F7A-1

Field Sampling Personnel: D. KNAUB, C. CLARK

Identify Measuring Point (MP): ______ (eg Top of Casing)

Depth to Screen below MP: ______ Top of screen ______ Bottom of screen

Pump Intake at (ft. below MP): ______

Purging Device (Pump Type): ______

Date 2002	Time 24 hr	Depth to Water Below MP ft	Pump Dial Setting (1)	Purge Rate mL/min	Cum. Volume Purged gal (~~liters~~)	Temp. deg C	Spec Cond. umhos/cm	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron mg/L	Redox Potential mV	Turb	Comments
10-16	0937	7.50		180	>.5 gal	20.2	0.517	5.66	4.94				-2.0	-5.4	Water has sulfur odor
10-16	0947	7.70		270		20.5	0.508	5.67	5.43				-12.0	24.5	and pale yellow color
10-16	0957	7.60		200		20.2	0.510	5.67	14.27				-15.0	69.3	ADJUSTED FLOW RATE
10-16	1007	7.60		200		20.3	0.500	5.66	17.32				-17.0	130	TO 200 ml/min
10-16	1017	7.60		200	4 gal	20.4	0.492	5.66	18.44				-19.0	146	
10-16	1027	7.65		200		20.4	0.480	5.67	18.65				-21.0	200	CHECKED AIRLINE, CLEARED
10-16	1037	7.65		200		20.0	0.550	5.56	1.29				-106	6.8	BUBBLES — CHANGED OUT
10-16	1047	7.67		200		20.2	0.546	5.60	1.82				-121	13.8	HORIBA EQUIPMENT
10-16	1057	7.50				20.3	0.546	5.65	2.28				-134	36.8	BATTERY ON CONTROLLER [illegible]
10-16	1108	7.70		~~20~~ 150		20.3	0.495	5.60	2.39				-134	200	CHANGED OUT CONTROLLER
10-16	1117	7.70		150	6.5	20.4	0.554	5.66	2.45				-144	130	AND ADJUSTED PURGE [illegible]
10-16	1127	7.70		150		20.4	0.551	5.60	2.50				-149	170	
10-16	1137	7.70		150		20.4	0.556	5.67	2.68				-150	160	
10-16	1147	7.70		150		20.5	0.557	5.67	2.23	2		2	-158	218	

7.5 [illegible] [illegible]
9 gals purged total

D Knaub 10/16/02

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10-16 TIME 1150
SAMPLING POINT (LOCATION) MWFTA-1
DEPTH N/A

SAMPLE INFORMATION

SAMPLE I.D NO.: MWFTA-1

MATERIAL. ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	40 ml	9	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA VIAL	40 ml	9	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Amber Glass	1 Liter	6	Cool to 4°C	PAHs by 8270 SIM
Amber Glass	1 Liter	6	Cool to 4°C	PCBs by 8082
Poly	500 ml	3	Zn Acetate & NaOH; Coo1 to 4°C	Sulfide by E376.1
Poly	250 ml	3	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	3	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2, Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Dissolved Metals by 6010B/7470A/7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS. (WELL PURGING VOLUME: SAMPLE APPEARANCE, ODOR; COLOR, ETC.)
9 gal purged before sampling. 11 gal total
P

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I D	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS (WELL PURGING VOLUME SAMPLE APPEARANCE, ODOR, COLOR, ETC.)
Pale yellow color - clear - strong sulfide odor

GENERAL INFORMATION WEATHER Cool - Rain, Light AIR TEMPERATURE ~55-60°F

SAMPLES SHIPPED TO: STL - North Canton, Ohio/Microseeps, Pittsburgh, PA

SPECIAL HANDLING: FedEx

MODE OF SHIPMENT. ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEH

QA/QC

SAMPLE COLLECTED BY D. Kraul SAMPLING OBSERVED BY: C. Clark

DISCREPANCIES.

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10/17/02 TIME 1330
SAMPLING POINT (LOCATION) MWFTA-3
DEPTH N/A

SAMPLE INFORMATION

SAMPLE I D. NO · [redacted] MWFTA-3

MATERIAL. ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?. ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER TYPE	CONTAINER VOLUME	NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Amber Glass	1 Liter	2	Cool to 4°C	PAHs by 8270 SIM
Amber Glass	1 Liter	2	Cool to 4°C	PCBs by 8082
Poly	500 ml	1	Zn Acetate & NaOH, Coo1 to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2, Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Dissolved Metals by 6010B/7470A/7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME· SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
Water clear, colorless – sulfide odor

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS. (WELL PURGING VOLUME. SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
3 GALS PURGED

GENERAL INFORMATION

WEATHER increasing clouds, cooling AIR TEMPERATURE ~~~55-60° F~~ ~65-70° F

SAMPLES SHIPPED TO STL - North Canton, Ohio/Microseeps, Pittsburgh, PA
SPECIAL HANDLING: FedEx
MODE OF SHIPMENT· ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: C Clark SAMPLING OBSERVED BY: D. Knaub
DISCREPANCIES·

JOB NO. 12001-2-0701

JOB NAME DSCR MNA – OU 7

DATE 10/17/02 TIME 13:30

SAMPLING POINT MWFTA-3
(LOCATION)

DEPTH N/A

FIELD SAMPLING REPORT

SAMPLE INFORMATION

SAMPLE I.D NO.: MWFTA-3QA

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)

TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)

HAZARDOUS?. ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Amber Glass	1 Liter	2	Cool to 4°C	PAHs by 8270 SIM
Amber Glass	1 Liter	2	Cool to 4°C	PCBs by 8082
Poly	500 ml	1	Zn Acetate & NaOH, Coo1 to 4°C	Sulfide by E376.1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2, Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2; Cool to 4°C	Dissolved Metals by 6010B/7470A/7841

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE, ODOR, COLOR, ETC.)

Water clear, colorless - sulfide odor

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS (WELL PURGING VOLUME SAMPLE APPEARANCE; ODOR, COLOR, ETC)

3 GALS PURGED

GENERAL INFORMATION

WEATHER Increasing clouds, cooling AIR TEMPERATURE ~ 65-70°F

SAMPLES SHIPPED TO: CEMRD – Omaha, Nebraska

SPECIAL HANDLING: FedEx

MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHI

QA/QC

SAMPLE COLLECTED BY: B. C. Clark SAMPLING OBSERVED BY: D Kraus

DISCREPANCIES:

FIELD SAMPLING REPORT

JOB No. 12001-2-0701
JOB NAME DSCR MNA – OU 7
DATE 10/17/02 TIME 1300
SAMPLING POINT (LOCATION) MWFTA-3
DEPTH N/A

SAMPLE INFORMATION

SAMPLE I.D. NO. OU7DUP-2

MATERIAL: ☒ WATER ☐ SOIL ☐ SLUDGE ☐ OTHER (LIST)
TYPE: ☒ GRAB ☐ COMPOSITE ☐ OTHER (LIST)
HAZARDOUS?: ☐ YES ☒ NO ☐ UNKNOWN

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	COMMENTS
TYPE	VOLUME			
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	VOCs by SW8260B
VOA VIAL	40 ml	3	HCl to pH<2, Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA VIAL	40 ml	3	H_2SO_4 to pH<2, Cool to 4°C	TOC by SW9060
VOA VIAL	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Amber Glass	1 Liter	2	Cool to 4°C	PAHs by 8270 SIM
Amber Glass	1 Liter	2	Cool to 4°C	PCBs by 8082
Poly	500 ml	1	Zn Acetate & NaOH, Coo1 to 4°C	Sulfide by E376 1
Poly	250 ml	1	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	1	Cool to 4°C	NO_3, SO_4, & Cl_2 by E300
Poly	1 Liter	1	HNO_3 to pH<2, Cool to 4°C	Total Metals by 6010B/7470A/7841
Poly	1 Liter	1	HNO_3 to pH<2, Cool to 4°C	Dissolved Metals by 6010B/7470A/7841
VOA VIAL	20 ml	1	None	Hydrogen by AM 20

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
Water Clear, colorless – sulfide odor

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS (WELL PURGING VOLUME SAMPLE APPEARANCE, ODOR, COLOR, ETC.)
3 GALS PURGED

GENERAL INFORMATION

WEATHER Increasing clouds, cooling AIR TEMPERATURE ~~~55-60°~~ ~65-70° F

SAMPLES SHIPPED TO: STL - North Canton, Ohio/Microseeps, Pittsburgh, PA
SPECIAL HANDLING FedEx
MODE OF SHIPMENT: ☐ CAR/TRUCK ☐ BUS ☒ PLANE ☐ COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY C. C[illegible] SAMPLING OBSERVED BY: D. Knaul
DISCREPANCIES

WELL PURGING - FIELD WATER

Best Available Copy

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10/17/02

Location DSCR - OU7 Site Name

Well ID: MWFTA-3

Field Sampling Personnel C Clark, D Knaub

Identify Measuring Point (MP). (eg Top of Casing) of Casing

Depth to Screen below MP. ____ of screen (Top) ____ of screen (Bottom)

Pump Intake at (ft. below MP):

Purging Device (Pump Type):

Date	Time (24 hr)	Depth to Water Below MP (ft)	Pump Dial Setting (1)	Purge Rate (mL/min)	Cum. Volume Purged (~~liters~~)	Temp. (deg C)	Spec Cond. (umhos/cm)	pH (pH Units)	DO Flow Cell (mg/L)	DO Hach Test Kit mg/L (high)	DO Hach Test Kit mg/L (low)	Ferrous Iron (mg/L)	Redox Potential (mV)	turb	Comments
10-17	1205	4.25		-	.15 gal	18.6	0.472	5.3	9.09				1	7.0	water clear, colorless
"	1215	4.35		150	.75	18.6	.516	5.26	0.81				-8	4.0	sulfide odor
"	1225	4.35		150	1.0	18.6	.500	5.29	0.72				-14	4.5	DRAWDOWN NOTED (CHECK
"	1235	4.15		100	1.25	18.7	.476	5.25	0.70				-18	4.1	TEAM IN AREA EXPERI
"	1245	4.10		100	1.75	18.8	.459	5.27	0.78				-21	3.5	EXCESSIVE DRAWDOWN,
"	1255	4.10		100	2.0	18.8	.446	5.26	0.76				-25	2.1	PURGED @ LOW RATE
"	1305	4.10		100	2.25	18.8	.440	5.26	0.77				-26	4.0	
"	1315	4.10		100	2.50	18.8	.432	5.26	0.77	0		2	-28	4.8	
															STABILIZATION ACHIEVED
															BEGAN SAMPLING
															-COULD NOT COMPLETE
															2 HYDROGEN SAMPL
															DUE TO TIME CON
														3 GALS PURGED TOTAL	
														FINAL DTW 4.5'	

C Clark 10/17/02

TAB

Appendix G

APPENDIX G
MONITORED NATURAL ATTENUATION PARAMETERS

APPENDIX G – MONITORED NATURAL ATTENUATION PARAMETERS

Dissolved Oxygen - DO is the most thermodynamically favored electron acceptor used by microbes for the biodegradation of organic carbon, whether natural or anthropogenic. Anaerobic bacteria which facilitate the reductive dechlorination of VOCs, generally cannot function at DO concentrations greater than 0.5 milligrams per liter (mg/L) and, hence, rates for biotic reductive dechlorination will be greatly reduced under these conditions. DO concentrations in the upper WBU for the October 2002 sampling event ranged from less than 0.1 mg/L (MWFTA-10) to 4.9 mg/L (MWFTA-3) with an average concentration of 0.99 mg/L. However, of 19 monitoring well sampled, only four monitoring wells had a DO concentration above 1 mg/L (MWFTA-1, MWFTA-23, MWFTA-25A, and DMW-27A).

DO concentrations in the lower WBU for the October 2002 sampling event ranged from 1.5 mg/L (MWFTA-28B) to 7.1 mg/L (MWFTA-18). Measured DO concentrations in the upper WBU are generally stable over the four sampling events for the wells measured in the upper WBU and are generally favorable for continued natural attenuation. Lower WBU monitoring wells measured over the four sampling events have DO concentrations that fluctuate and range from favorable to not-favorable for MNA Generally, DO concentrations are favorable for sustaining reductive dechlorination in the upper and range from favorable to not-favorable in the lower WBU at OU 7

The DO concentration detected in MWFTA-20 (fractured bedrock) for the October 2002 sampling event was 3 5 mg/L, which is consistent with historically detected DO concentrations This falls under the range of favorable to not-favorable for the fractured bedrock.

Nitrate – Nitrate may be used as an electron acceptor for anaerobic biodegradation of organic carbon via denitrification. In order for reductive dechlorination to continue at rates supporting of MNA, nitrate concentrations (measured as nitrate-nitrogen) in the contaminated portion of the aquifer should be less than 1.0 mg/L as N Nitrate concentrations in the upper WBU for the October 2002 were less than 1 mg/L except for DMW-13A which was 1.4 JB mg/L. The JB flag indicates that this data was qualified as estimated and biased high and for the purposes for this report is considered not detected Nitrate concentrations for the lower WBU during the October 2002, sampling event are less than 0 1 mg/L For the fractured bedrock, nitrate has not been detected above the reporting limit Results for nitrate in monitoring wells sampled in the upper and lower WBUs and the fractured bedrock (MWFTA-20 only) for the four sampling events indicate that nitrate concentrations will not compete with the reductive dechlorination pathway.

Sulfate - Sulfate may be used as an electron acceptor for anaerobic dechlorination of VOCs This process is termed "sulfate reduction" and results in the production of sulfide. Concentrations of sulfate greater than 20 mg/L may cause competitive exclusion of dechlorination. However, in many plumes with high concentrations of sulfate, reductive dechlorination still occurs. According to analytical test results for the October 2002 sampling event, sulfate concentrations ranged in the upper WBU from 0.53 JQ mg/L (MWFTA-1) to 62.9 mg/L (MWFOS-1) with an average concentration of 19.94 mg/L. For the lower WBU, sulfate concentrations measured during the October 2002 sampling event ranged from 1.2 mg/L in MWFTA-18 to 30.4 in MWFTA-29B. Sulfate concentrations for MWFTA-20 were 4.5 mg/L. Sulfate concentrations over the four sampling events indicate that conditions are generally favorable for continued natural attenuation in the upper and lower WBUs and the fractured bedrock.

Sulfate concentrations were generally higher in areas upgradient and side-gradient to the contaminant plumes in the upper WBU. Generally, sulfate concentrations decreased along the plume flow path indicating the sulfate reduction is occurring in groundwater of the upper WBU. This is illustrated with MWFOS-1, MWFOS-3, DMW-27A, and MWFTA-1. MWFOS-1 is the background well for the contamination associated with the former FOS tank/Pit 3 and had the highest sulfate concentrations. Along the flow path downgradient from the potential source areas, sulfate concentrations decrease to below the reporting limits for the March/April 2002, July 2002, and October 2002 sampling events.

Carbon Dioxide - Carbon dioxide is a by-product of complete mineralization of organic compounds and can also serve as an electron acceptor during methanogenesis. Carbon dioxide concentrations measured in the upper WBU during the October 2002 sampling event ranged from 24 mg/L (DMW-25A) to 450 mg/L in MWFTA-1. As with sulfate, carbon dioxide concentrations increased in wells downgradient from source areas. Increases of carbon dioxide in areas where breakdown of VOCs is occurring indicate that mineralization of organic compounds is occurring. For the lower WBU and fractured bedrock, carbon dioxide concentrations were less than 0.17 mg/L in each well measured except for MWFTA-18 (15 mg/L) and MWFTA-28B (18 mg/L).

Dissolve Hydrogen - Dissolved hydrogen was detected in groundwater samples from most wells sampled during recent groundwater sampling events. Dissolved hydrogen concentrations ranging from 1 to 11 nanomoles (nM) are indicative of oxidation-reduction conditions that are favorable for reductive dechlorination of VOCs. For the October 2002 sampling event, hydrogen concentrations range from 2.3 nM (MWFTA-1) to 19 nM (MWFTA-2 and DMW-33A) with an average concentration of 5 nM Hydrogen concentrations in lower WBU monitoring wells ranged from 2 6 nM (MWFTA-18 and

MWFTA-29B) to 27 nM (MWFTA-16) with an average concentration of 8.7 nM. Hydrogen concentrations in the fractured bedrock (MWFTA-20) were 2.8 nM. Hydrogen concentrations for wells measured in the upper and lower WBU and fractured bedrock are supportive of continuing MNA and are favorable for continuing reductive dechlorination.

Alkalinity - Microbial activity leads to increased alkalinity concentration. Increases in alkalinity result from the dissolution of rock, driven by the production of carbon dioxide produced by the metabolism of microorganisms Alkalinity is important in the maintenance of groundwater pH because it buffers the groundwater system against acids generated during aerobic and anaerobic biodegradation. Groundwater in the upper WBU at OU 7 has alkalinity concentrations that ranged from 1 JH mg/L as calcium carbonate ($CaCO_3$) (MWFOS-1) to 190 mg/L as $CaCO_3$ (MWFTA-1) with alkalinity concentrations in groundwater above 10 mg/L as $CaCO_3$ in 13 of the 19 monitoring well tested. In the lower WBU, alkalinity ranged from 53 mg/L as $CaCO_3$ (MWFTA-18) to 340 JL mg/L as $CaCO_3$ (MWFTA-29B). Alkalinity within the fractured bedrock (MWFTA-20) was 74 mg/L as $CaCO_3$.

Oxidation-Reduction Potential - The oxidation-reduction potential (ORP) of groundwater is a measure of electron activity and is an indicator of the relative tendency of a solution to accept or transfer electrons. Oxidation-reduction reactions in groundwater containing organic compounds (natural or anthropogenic) are usually biologically mediated; therefore, the ORP of a groundwater system depends upon and influences rates of biodegradation. Knowledge of the ORP of groundwater also is important because some biological processes operate only within a prescribed range of ORP conditions. ORP measurements can be used to estimate the location of the contaminant plume, especially in areas undergoing anaerobic biodegradation Results from the October 2002 sampling event for the upper WBU at OU 7 ranged between –158 (MWFTA-1) to 405 mV (MWFTA-7). For the lower WBU, ORP results ranged from -149 (MWFTA-16) to 195 mV (MWFTA-14) The ORP result for MWFTA-20 was 15 mV

pH - The pH of groundwater has an effect on the presence and activity of microbial populations in groundwater. This is especially true for methanogens Microbes capable of degrading VOCs and petroleum hydrocarbon compounds generally prefer pH values varying from 6 to 8. During the October 2002 sampling event, the upper WBU at OU 7 had pH results that ranged from 3.43 (MWFTA-7) to 6.63 (DMW-25A) For the same sampling event, the lower WBU had pH results that ranged from 7.09 (MWFTA-28B) to 12 44 (MWFTA-29B). The pH for MWFTA-20 was 9 41 Values for pH correlated well with carbon dioxide concentrations (increasing pH results in low carbon dioxide concentrations) in the lower WBU

Ferrous Iron - Ferric iron is used as an electron acceptor during anaerobic biodegradation of organic carbon During this process, iron (III) is reduced to iron (II), which may be soluble in water. Iron (II) concentrations can thus be used as an indicator of anaerobic degradation of chlorinated solvents. Native organic matter may also support reduction of iron (II). Care must be taken when interpreting iron (II) concentrations because they may be biased low by reprecipitation as iron sulfides or carbonates. Ferrous iron concentrations for the upper WBU during the October 2002, sampling event ranged from less than 0.1 mg/L (AEHADG-10, MWFOS-1, MWFOS-3, DMW-20A, DMW-25A, and DMW-35A) to 3.4 mg/L (MWFTA-5) with an average concentration of 2.1 mg/L. Nineteen monitoring wells were sampled, of which, groundwater in 13 of the monitoring wells had ferrous iron concentrations above the reporting limit (0.1 mg/L). Ferrous iron concentrations in the lower WBU for the October 2002, sampling event ranged from less than 0.1 mg/L (MWFTA-14, MWFTA-16, MWFTA-17, and MWFTA-19) to 3 0 mg/L (MWFTA-18) From the seven monitoring wells sampled, three (MWFTA-18; 3.0 mg/L, MWFTA-28B; 0.5 mg/L and MWFTA-29B; 1.0 mg/L) had ferrous iron concentrations above 0.1 mg/L. Ferrous iron concentrations for MWFTA-20 were 4 mg/L.

Sulfide - Sulfide may be an indicator of sulfate reduction. In addition, as previously stated, re-precipitation of iron sulfides may lead to anomalously low ferrous iron and sulfide concentrations. Sulfide concentrations in the upper WBU for the October 2002, sampling event ranged from less than 1 mg/L to approximately 6.9 mg/L (DMW-26A). Thirteen monitoring wells had detectable concentrations and four monitoring wells had sulfide concentrations above 1 mg/L For the lower WBU during the October 2002 sampling event, MWFTA-14 (1.4 mg/L) was the only well sampled with a sulfide concentration greater than 1 mg/L. Sulfide was detected in MWFTA-20 at 0.3 JQ mg/L.

Total Organic Carbon - Organic carbon is required as an electron donor and drives the biodegradation of organic contamination. Concentrations of TOC are generally low in both the upper and lower WBU and the fractured bedrock at OU 7 with the exception of MWFTA-1 in the upper WBU Low organic carbon concentrations limit the rates of biological degradation, however, the concentration of organic carbon associated with the soils was not quantified as part of the groundwater sampling activities Low organic carbon concentrations may be due to the utilization of dissolved organic matter in water from increased biological activity

TAB

APPENDIX G TABLE

APPENDIX G TABLE

TABLE G-1

MNA PARAMETERS AND COLOR INTERPRETATION
Annual Groundwater Report - October 2002
Operable Unit 6
Defense Supply Center Richmond
Richmond, Virginia

MNA Parameter	Concentration Threshold	Interpretation/Analysis	Color
DO*	<0.5 mg/L >5 mg/L	Reductive dechlorination is possible Reductive dechlorination is not possible	Green Blue
NO_3	<1 mg/L >1 mg/L	Reductive pathway is possible (nitrate does not compete) Nitrate competes with reductive pathway	Green Blue
SO_4	<20 mg/L	At higher concentrations, sulfate will compete with reductive pathway	Green
CO_2**	>2xbackground	Ultimate oxidative daughter product	Green
H	>1 nM <1 nM	Reductive pathway is possible, VC may accumulate VC is oxidized	Green Blue
ALK**	>2xbackground	Results from interaction between CO_2 and WBU minerals	Green
TOC	>20 mg/L	Carbon and energy source; drives dechlorination	Green
ORP*	<-110 mV >50 mV	Reductive pathway is likely Reductive dechlorination is not likely	Green Blue
pH	5 < pH < 9 5 > pH >9	Optimal range for reductive pathway to be possible Outside optimal range for reductive pathway	Green Blue
Fe^{+2}	>1 mg/L	Reductive pathway is possible	Green
Sulfide	>1 mg/L	Reductive pathway possible	Green
Chloride	>2xbackground	Daughter product of organic chlorine	NA
Temperature	>20 °C	Accelerates biochemical process	NA
Methane	<0 5 mg/L >0 5 mg/L	VC oxidizes Ultimate reductive daughter product, VC accumulates	NA

Notes:
MNA – Monitored Natural Attenuation
AVG Average
NA – Not applicable, constituent not included on MNA posting figures
*Ranges for the result are presented, if the result falls between the ranges a color of orange was assigned indicating that conditions are favorable for natural attenuation
**A background monitoring location for OU 7 is not available, therefore, concentrations detected at DMW-13A (an upgradient well) for the upper WBU and (a side gradient well) for the lower WBU was used
Green – Condition is supporting of natural attenuation
Blue – Condition is not supporting for natural attenuation
Adapted from ITRC, 1999 Natural Attenuation of Chlorinated Solvents in Groundwater Principals and Practices
DO – Dissolved Oxygen
NO_3 - Nitrate
SO_4 - Sulfate
CO_2 – Carbon dioxide
H – Dissolved hydrogen gas
ALK – Alkalinity
TOC – Total organic carbon
ORP – Oxidation reduction potential
pH – negative log of the hydrogen ion concentration
Fe^{+2} – Ferrous Iron

PREPARED/DATE MET 07/13/2003
CHECKED/DATE TLN 07/14/2003

TAB

Appendix H

APPENDIX H
MANN-KENDALL DATA EVALUATION

APPENDIX H – STATISTICAL METHODOLOGY
MANN-KENDALL TREND TEST

When analyzing a data set for trends, the method first described by H. B Mann in 1945 and later popularized by M. G. Kendall in 1975 has several advantages. First, it is a method that makes no assumptions about the distribution of the underlying population from which the samples were taken. Second, since it is a rank-order test, which depends only on the relative rankings of data and not their absolute values, it can accommodate censored data (data reported as "below detection limit" (BDL) with a specific detection limit). The Mann-Kendall test is commonly applied as a non-parametric test for zero-slope for a linear regression of the data set with time.

The basis of the Mann-Kendall test is a comparison of the number of increasing and decreasing differences among all the data points. Intuitively, if there is no trend in a data set, taking all possible differences between pairs of data points, one would expect approximately as many positive differences as there are negative (as many pairs would "go up" as "go down"). If there are significantly more "ups" than "downs" (or the opposite), one would have to conclude that the assumption of "no trend" is in error and, in fact, a trend does exist.

Just how many constitute a "significant difference" is dependent on how many data points are in the set, how much certainty of a trend is required (alpha), and how many of the data points have the same value ("ties") The result of the procedure is an S statistic that is compared to a table of probabilities of a value for S for a particular number of data points (n). One such table is table A-18 in Gilbert (1987). If the listed probability of the calculated S value exceeds the pre-determined (1- alpha/2 – two tailed distribution for increasing or decreasing trends) value, then the assumption of zero slope for the regression is accepted and "no trend" is assumed. If the listed probability of the calculated value is less than the pre-determined (1 - alpha) value, then the existence of a slope is indicated

To generate the calculated S value, the number of "down" pairs is subtracted from the number of "up" pairs. This gives the signed S value that can be compared to published tables. An alternate procedure can be used if there are at least $n>10$ data points (and preferably $n>40$, depending on the number of ties) which transforms the calculated S value into an approximate standard Z score (that is possibly adjusted for ties) and compared to readily available Z-score tables. This approximation method allows the test to be run for values of n for which no published tables exist. The exact S value comparison is preferred when table values are available and should always be used when $n < 10$.

FINAL PAGE

ADMINISTRATIVE RECORD

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