

**TECHNICAL MEMORANDUM
FIRST QUARTERLY GROUNDWATER SAMPLING OCTOBER 2001
OPERABLE UNIT 7**



**DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA**



DEFENSE LOGISTICS AGENCY

PREPARED FOR



**U.S. ARMY ENGINEERING AND
SUPPORT CENTER HUNTSVILLE**

PREPARED BY:



LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

CONTRACT No. DACA87-94-D-0016, T.O. 0032
PROJECT No. 12001-1-1632

January 2002



January 22, 2002

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**Subject: Technical Memorandum
First Quarterly Groundwater Sampling – October 2001
Operable Unit 7 – Fire Training Area Groundwater
Defense Supply Center Richmond
Contract No. DACA87-94-D-0016
Task Order 0032**

Dear Mr. Shirley:

Law Engineering and Environmental Services, Inc., (LAW) is pleased to submit this Technical Memorandum of the First Quarterly Groundwater Sampling conducted at Operable Unit 7 (Fire Training Area [FTA] Groundwater) of the Defense Supply Center Richmond (DSCR) located in Richmond, Virginia. Groundwater sampling activities were conducted in October 2001.

The purpose of this Technical Memorandum is to describe the field sampling activities, summarize the laboratory analytical data, and discuss the results. As agreed upon during the DSCR Planning Team Meeting held on December 18, 2001 in Richmond, Virginia, this Technical Memorandum is being provided only for information purposes and no review comments are expected.

LAW 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,

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

A handwritten signature in cursive script, reading 'Angela L. McMath'.

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

A handwritten signature in cursive script, reading 'Tushar E. Talele'.

Tushar E. Talele, P.E.
Project Principal

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OPERABLE UNIT 7
DEFENSE SUPPLY CENTER RICHMOND

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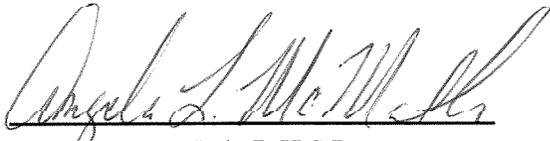
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PREFACE

Law Engineering and Environmental Services, Inc., (LAW) has prepared this Quarterly Groundwater Sampling Technical Memorandum under Contract DACA87-94-D-0016, Task Order 0032, to the United States Army Engineering and Support Center, Huntsville (CEHNC). This Technical Memorandum documents the groundwater sampling activities conducted during October 2001 for Operable Unit 7 at the Defense Supply Center Richmond (DSCR), located in Chesterfield County, Virginia.

Ms. Angela L. McMath is the Project Manager for DSCR. Mr. Jim Delano is the Project Coordinator for Task Order 0032. Ms. Erica McCray is the primary author of this document. Mr. Tushar Talele is the Project Principal.

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



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



Tushar E. Talele, P.E.
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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
CCBs	continuing calibration blanks
CEHNC	United States Army Engineering and Support Center Huntsville
CEMRD	Corps of Engineers Missouri River Division
CCV	continuing calibration verification
CO ₂	carbon dioxide
DO	dissolved oxygen
DQE	Data Quality Evaluation
DQOs	Data Quality Objectives
DSCR	Defense Supply Center Richmond
Fe ⁺²	ferrous iron
FOS	fuel oil storage
FTA	Fire Training Area
ICV	initial calibration verification
LAW	Law Engineering and Environmental Services, Inc.
LCS	laboratory control sample
µg/L	micrograms per liter
MDL	method detection limit
µg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL/min	milliliter per minute
MNA	monitored natural attenuation
msl	mean sea level
MS/MSD	matrix spike/matrix spike duplicate
mV	millivolts
nM	nanomolar
ORP	oxidation-reduction potential
OU	Operable Unit
PCE	perchloroethylene (tetrachloroethylene)
QA	quality assurance
QC	quality control

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

%R	percent recovery
SDG	sample delivery group
SMF	sporadic marginal failure
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SC	Specific Conductivity
STL	Severn Trent Laboratories
TCE	trichloroethylene
TOC	total organic carbon
USACE	United States Army Corps of Engineers
USAEHA	United States Army Environmental Hygiene Agency
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
VOCs	volatile organic compounds
TPP	Technical Project Planning
%	percent difference
PQL	practical quantitation limits

EXECUTIVE SUMMARY

Law Engineering and Environmental Services, Inc. (LAW) has prepared this First Quarterly Groundwater Sampling Technical Memorandum under Contract No. DACA87-94-D-0016, Task Order 32 to the United States Army Engineering and Support Center Huntsville (CEHNC). This report documents the activities conducted and presents the results of the groundwater sampling of Operable Unit (OU) 7 at the Defense Supply Center Richmond (DSCR), Virginia.

OU 7 consists of the groundwater underlying the Fire Training Area (FTA). The FTA (designated OU 4) is located near the southern boundary of the DSCR. The southern boundary is formed by Kingsland Creek, which is located about 600 feet from the FTA. OU 7 consists of the contaminated groundwater located just east of the location of a former aboveground fuel oil storage (FOS) tank and extends approximately 1,000 feet to the east of the tank. Previously, the surface area of the site was 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 in order to evaluate the nature, magnitude and extent of ground-water contamination.

Field activities for the first quarterly sampling event were performed in October 2001 in general accordance with procedures outlined in the "Final Sampling and Analysis Plan for Expanded Site Investigation" (LAW, 1992) and the Quarterly Groundwater Sampling Plan for DSCR (LAW, 2001). To facilitate the ongoing quarterly groundwater sampling, dedicated pumps were installed.

Results of water level measurements indicate that groundwater in the upper aquifer generally flows to the southeast, groundwater flow in the lower aquifer generally flows to the east. These results are consistent with previous observations.

Results of the sampling activities in the upper and lower aquifers indicate that detected levels of volatile organic compounds are consistent with previously detected concentrations and continue to generally exhibit a decreasing trend. Furthermore, results of analyses of natural attenuation parameters indicate that conditions in both the upper and lower aquifers are generally favorable for reductive dechlorination.

1.0 INTRODUCTION

1.0.0.1 Law Engineering and Environmental Services, Inc. (LAW) conducted the First Quarterly Groundwater Sampling activities during October 2001 at the Defense Supply Center Richmond (DSCR) located in Chesterfield County, Virginia. Groundwater monitoring wells located at Operable Units (OUs) 6, 7, 8 and the Post Exchange Gasoline Station were sampled as part of the Quarterly Groundwater Sampling Plan (LAW, 2001). This Technical Memorandum addresses groundwater sampling activities conducted at OU 7. LAW has conducted these sampling activities under Contract No. DACA87-94-D-0016, Task Order 32 to the United States Army Engineering and Support Center Huntsville (CEHNC).

1.1 PURPOSE AND OBJECTIVES

1.1.0.1 This technical memorandum has been prepared to document results of groundwater sampling conducted at OU 7 in October 2001. The quarterly sampling is being performed to monitor the nature and extent of the groundwater contaminant plume and to collect additional data to support monitored natural attenuation (MNA) as a component of the final remedy for the site. Additionally, previously collected metals data require further evaluation to assess whether detected concentrations represent a potential risk to human health. The metals data collected as part of this sampling event will be used to support a future risk evaluation.

1.1.0.2 The objectives of the groundwater sampling at OU 7 are as follows:

- Collect analytical data to support the MNA program as a component of an effective remedy.
- Monitor the current nature and extent of the groundwater contaminant plume.
- Collect groundwater elevation data for the preparation of potentiometric surface maps.

1.2 REPORT ORGANIZATION

1.2.0.1 This Technical Memorandum is organized as follows: Section 1.0 describes the purpose and objectives, history and the environmental impact of the DSCR facility; Section 2.0 describes the field activities conducted during groundwater sampling; Section 3.0 describes laboratory analytical results of the groundwater sampling activities; Section 4.0 provides a summary of the document; and Section 5.0 lists the references cited. Tables, Figures, and Appendices immediately follow Section 5.0.

1.3 SITE DESCRIPTION

1.3.0.1 OU 7 consists of the groundwater beneath and downgradient of the Fire Training Area (FTA). The FTA (which is designated OU 4) is located near the southern boundary of the DSCR (Figure 1-1). The southern boundary is formed by Kingsland Creek, which is located approximately 600 feet from the FTA. OU 7 consists of the contaminated groundwater east of the location of a former aboveground fuel oil storage (FOS) tank and extends approximately 1,000 feet to the east of the tank. Previously, the surface area of the site was used for fire training exercises where obsolete and unserviceable waste chemicals were burned from the mid 1960s until the late 1970s. 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. Petroleum oils, lubricating oils, solvents, pesticides, and herbicides may have been used for ignition. Several sampling and analysis programs have been performed at the FTA in order to evaluate the nature, magnitude and extent of ground-water contamination. A conceptual model of potential exposure pathways is provided as Figure 1-2.

1.4 PREVIOUS INVESTIGATIONS

1.4.0.1 Previous studies of OU 7 have identified three plumes of groundwater contamination, consisting of volatile organic compounds (VOCs) in the upper aquifer, which extend from the FTA to the southeast. The three plumes are considered to be associated with fire training activities at each of the three burn pits. The highest concentrations of trichloroethylene (TCE) were detected in well MWFOS-3, which is located near Pit 3 and the former FOS tank. TCE concentrations in MWFOS-3 ranged from 12,000 to 280,000 micrograms per liter ($\mu\text{g/L}$) (LAW, 1996a).

1.4.0.2 Contamination of the lower aquifer by chlorinated VOCs was detected in the vicinity of Kingsland Creek (bedrock well DMW 22E) at concentrations as high as approximately 3,000 $\mu\text{g/L}$ in December 1992 and October 1993 (LAW, 1996a). A confining unit exists between the upper and lower aquifers at OU 7. A breach in the confining unit is suspected to be the source of the lower aquifer contamination. The breach is suspected to be associated with the improper installation of wells DMW-33B and DMW-22E.

1.4.0.3 The wells suspected to have caused a breach in the confining layer were abandoned in May 1994 because they were installed without double casing, posing a potential pathway for contaminant migration from the upper to lower aquifer (ES, 1994). In 1995, groundwater samples from a nearby bedrock well (MWFTA-20) contained chlorinated solvents at significantly lower levels than those documented prior to well abandonment in 1992 and 1993. A total organic concentration of 10.1 $\mu\text{g/L}$ was reported, two orders

of magnitude lower than the 1992 and 1993 concentrations. The abandonment of wells DMW-22E and DMW-33B appears to have mitigated the conduit for contamination migrating to the lower aquifer at the FTA (LAW, 1996b).

1.4.0.4 Eighteen upper aquifer wells were sampled for VOCs in October 1997. Well MWFOS-1 was additionally sampled for total and dissolved metals. Maximum concentrations of tetrachloroethylene (PCE) and 1,1,1-trichloroethane (2,200 and 1,500 µg/L, respectively) were detected in well AEHA-DG-10, downgradient of Pit 1. The maximum concentration of cis-1, 2-dichloroethene (2,300 µg/L) was detected in DMW-33A, near Kingsland Creek. A TCE concentration of 4,500 µg/L was also detected in DMW-33A. The maximum detected concentration of TCE (298,900 µg/L) was detected in MWFOS-3 near Pit 3 during resampling which occurred November 1997. In November 1997, four grab groundwater samples were collected from the upper portion of the aquifer using hydropunch-sampling equipment to better delineate the extent of VOC contamination in the upper aquifer. The highest detected concentration was 510 µg/L of TCE at HPFTA-4, while the results for other samples (designated HPFTA-5 and HPFTA-6) were collected in December 1998 to further delineate the extent of the contamination plume(s) south of Kingsland Creek.

1.4.0.5 Four lower aquifer monitoring wells were sampled in October 1997 for VOCs and natural attenuation parameters. The sampling results indicated an increase in lower aquifer total VOC concentrations reaching 34.6 µg/L at location MWFTA-20. While low concentrations of aromatic hydrocarbons (benzene, naphthalene, and xylenes) were detected, the primary constituents detected included TCE, PCE, cis-1,2-dichloroethene, 1,1-dichloroethene, and 1,1-dichloroethane.

1.4.0.6 The Final Focused Feasibility Study for OU 7 recommended dual phase extraction to address the high-concentration portions of each of the three upper aquifer plumes. To support this recommendation, a dual phase extraction pilot test was performed in 1996 within the plume adjacent to Pit 3 (the location of the highest concentrations of VOCs in groundwater at the FTA) to evaluate the potential feasibility of this technology and obtain site-specific design parameters for a potential dual phase extraction system. The pilot test results supported the recommendation of dual phase extraction as part of the overall remediation plan to address chlorinated solvent contamination of the upper aquifer at OU 7 (LAW, 1997).

1.4.0.7 Concerns were raised, however, regarding the installation and operation of a dual phase extraction system at the plume south of Kingsland Creek, including: (1) the potential for impacting flow and water levels in Kingsland Creek during pumping operations in the off-base area, (2) whether treated

groundwater would meet state discharge limits for metals for Kingsland Creek, and (3) the logistics and potential costs of transporting water to an on-base treatment system from off-base private property.

1.4.0.8 In late 1998, a pilot test of the density-driven convection *in situ* remedial technology was performed (LAW, 1999a). This technology was considered because of its potential advantage over other technologies by treating groundwater contaminants *in situ*, thereby potentially mitigating the concerns with dual phase extraction noted above. Based on the results of the density-driven convection pilot test, a letter addendum was prepared recommending that this technology be evaluated in detail in a feasibility study for OU 7 (LAW, 1999b). This technology will be considered to treat the off base VOC contamination. Monitored natural attenuation is being evaluated as part of the investigation proposed in this document as a component of the potential remedy for treating residual contamination of groundwater that may remain above remedial action goals.

2.0 FIELD ACTIVITIES

2.0.0.1 Field activities consisting of static water level measurements, visual inspection of wells, installation of dedicated pumps, measurement of field parameters, and the collection of groundwater samples for laboratory analysis were conducted during October 2001. These activities were performed in general accordance with procedures outlined in the “Final Sampling and Analysis Plan for Expanded Site Investigation” (LAW, 1992) and the Quarterly Groundwater Sampling Plan (LAW, 2001). A total of 14 existing wells screened in the upper aquifer and 11 existing wells screened in the lower aquifer were proposed for this investigation.

2.1 WATER LEVEL ELEVATIONS

2.1.0.1 Depths to static water levels in the proposed groundwater monitoring wells were measured from September 17 through 18, 2001. An electronic water level meter was used to measure the depths to water and the total depths of each well. The top of casing was used as the reference level for each well, to determine direction of groundwater flow in both aquifers. Resource International, Inc., surveyed the top of well casing elevations during 1997 with reference to the National Geodetic Vertical Datum 1929. Results of the measurements are presented in Section 3.0.

2.2 MONITORING WELL EVALUATION

2.2.0.1 Prior to specific sampling activities, monitoring wells were visually inspected to evaluate their overall condition and identify obstructions and accumulations of sediment potentially affecting the performance of the wells.

2.3 DEDICATED PUMPS INSTALLATION

2.3.0.1 To facilitate the ongoing quarterly groundwater sampling, dedicated bladder pumps were installed in the wells to be sampled. In order to install the bladder pump, depth to groundwater and total well depth were measured and the water column thickness calculated. After calculating the water column thickness and determining if the water column was appropriate to install a bladder pump, a bladder pump was installed to approximately 2 feet from the bottom of the well. The bladder pumps were installed with well caps that allow the fast connection of an air source and flow cell for well purging, inline water quality monitoring and groundwater collection.

2.4 MONITORING WELL SAMPLING

2.4.0.1 The monitoring wells were sampled using low flow sampling methods for the collection of groundwater samples submitted for analysis. The purpose of low flow sampling is to collect samples representative of the formation in which the well is screened, while equilibrating draw down and water extraction rates to minimize exposing the screened interval to atmospheric conditions. Wells were purged to achieve stabilization prior to sampling. Stabilization parameters monitored during purging and sampling were pH, oxidation-reduction potential (ORP), specific conductivity (SC), dissolved oxygen (DO), and groundwater drawdown. Stabilization was achieved after three successive readings were within ± 0.1 for pH, ± 10 millivolts (mV) for ORP, $\pm 3\%$ for SC, $\pm 10\%$ for DO and drawdown was equilibrated with groundwater recharge rate. After stabilization of the monitoring well, samples were collected with minimal turbulence and agitation in properly cleaned and preserved sampling containers. Groundwater samples were collected through dedicated discharge tubing. All samples were analyzed for VOCs, MNA parameters, and total and dissolved metals. The MNA parameters were nitrate, sulfate, sulfide, methane, ethane, ethane, carbon dioxide, hydrogen, alkalinity, chloride and total organic carbon (TOC). Samples to be analyzed for VOCs, methane, ethane and ethene were collected at a flow rate of approximately 100 milliliters per minute (mL/min) and the remaining samples were collected at a higher flow rate of approximately 200 to 300 mL/min. Samples for VOC analysis were collected with no head space in the sample containers. Groundwater obtained for dissolved metals was filtered using an inline 0.45 micrometer cellulose filter cartridge. Furthermore, hydrogen samples were obtained using the bubble strip method as outlined in the Sampling Plan. Field Sampling Reports are provided in Appendix A of this technical memorandum.

2.4.0.2 Following collection, samples were immediately placed on ice in an insulated container to initiate cooling of the samples to the target of 4 degrees Celsius ($^{\circ}\text{C}$). After completing the sampling process at each well, samples were delivered to the field office, where samples were sorted and chain of custody documentation was completed by the Sample Coordinator. Samples were then packaged for shipment to the fixed based laboratory via Federal Express Priority Overnight delivery. Upon arrival at the laboratory, cooler temperatures were generally within prescribed limits ($4^{\circ}\text{C} \pm 2^{\circ}\text{C}$).

2.4.0.3 During the October 2001 sampling event, one monitoring well designated for sampling in the Sampling Plan was not sampled. MWFTA-8 was proposed to be sampled as a lower aquifer well; however, this well is screened in the upper aquifer. Therefore, the well was not sampled as upper aquifer data were already planned for collection in that area.

2.4.0.4 In summary, a total of 14 upper aquifer wells (Table 2-1) and 10 lower aquifer wells (Table 2-2) was sampled during the field investigation.

2.5 ANALYTICAL PROGRAM

2.5.0.1 This section describes the analytical methods and quality control program utilized for the sampling of OU 7 at DSCR. The analytical methods are described in the Sampling Plan (LAW, 2001).

2.5.1 Field Analytical Parameters

2.5.1.1 The field analytical parameters were collected using a Horiba U-22 water quality meter. This instrument uses an in-line flow-through cell to monitor the groundwater geochemistry. The instruments were calibrated daily in general accordance with manufacturer's recommendations. The following field parameters were measured: ORP, SC, pH, temperature, DO and ferrous iron (using a Hach Test Kit). DO was measured using two methods: 1) a flow-through C866 DO meter, and 2) Hach Test Kit. DO measurements using the meter ranged from 0.36 to 4.38 milligrams per liter (mg/L) in the upper aquifer and 0 to 6.97 mg/L in the lower aquifer with an average of 0.41 mg/L and 2.54 mg/L, respectively. The DO concentrations measured with the Hach Test Kit ranged from 0 to 4 mg/L in the upper aquifer and 2 to 7 mg/L for the lower aquifer, with an average of 2.21 mg/L and 3.9 mg/L, respectively. The DO meter and Hach Test Kit measurements were determined to be statistically unequal. Since data obtained using the DO meter are less subjective than those obtained from the test kit, all DO measurements discussed in subsequent sections are those obtained using the meter.

2.5.2 Chemical Analysis

2.5.2.1 A total of 14 upper aquifer wells and 10 lower aquifer wells were sampled at OU 7 for fixed based laboratory chemical analyses for VOCs, metals, and MNA parameters (see Appendix B). Laboratory analyses were performed by Severn Trent Laboratories (STL) of North Canton, Ohio. Field duplicate samples were sent to the United States Army Corps of Engineers (USACE) Missouri River Division (CERMD) laboratory for quality assurance (QA) analyses.

2.5.3 Field Quality Control

2.5.3.1 The field control program for the collection of samples included specific procedures for sampling of the monitoring wells as described in the Sampling Plan (LAW, 2001). Field quality control samples were collected to evaluate collection technique. These samples included duplicate samples and trip

blanks. Documentation of the sampling was performed in the field to ensure that the sample collection, labeling, chain-of-custody, and request for analysis were in agreement. Custody seals were placed on each cooler before shipping by common carrier.

2.5.3.2 Sample bottles were provided by the laboratory and met the United States Environmental Protection Agency (USEPA) cleaning requirements for environmentally clean containers. Each sample was preserved according to the SAP requirements and immediately placed in a cooler containing ice. The ice was placed in resealable plastic bags to prevent water leakage. Sample labels were pre-printed and placed immediately on the container prior to placement in the cooler.

2.5.4 Laboratory Quality Control

2.5.4.1 The laboratory quality control (QC) program including sample handling, laboratory control and reporting, is documented in the SAP (LAW, 1992). Sample handling includes documentation of sample receipt, placement in storage, lab personnel using the sample, and disposal. The laboratory control consists of instrument calibration and maintenance, laboratory control samples (LCS), method blanks, and matrix spikes. Reporting of the laboratory control data was planned prior to the collection of the data, allowing the laboratory to place the appropriate information into the data package so that the data quality evaluation (DQE) could be performed.

2.5.5 Data Quality Evaluation

2.5.5.1 DQE was performed by LAW, referencing the USACE Shell Document for Analytical Chemistry Requirements (USACE, 1998a). In general, the Shell document prescribes limits for the mainstream methods commonly used in site evaluation, specifically USEPA SW-846 Methods. Although the Shell document does not prescribe criteria for most of the MNA parameters, a standardized approach to DQE was adopted following generic DQE as outlined in the USEPA Region III Modifications to the Organic National Functional Guidelines and USEPA Region III Modifications to the Inorganic National Functional Guidelines (USACE, 1994). Results of the DQE are provided in Appendix B.

2.5.6 Data Quality Objectives

2.5.6.1 The Data Quality Objective (DQO) process is defined by the USEPA as a seven-step iterative planning approach used to prepare plans for environmental data collection activities (USEPA, 2000). The DQO process clearly defines the problem, what the decisions criteria for answering the problem are, and how the decision criteria will be addressed. The USEPA DQO process is similar to the four-phase

USACE Technical Project Planning process, which includes a project identification phase, determining data needs phase, data collection options phase, and program finalization phase (USACE, 1998b). The seven steps in the USEPA DQO process are:

1. State the problem – summarize the contamination problem that will require new environmental data and identify the resources available to resolve the problem.
2. Identify the decision – identify the decision that requires new environmental data to address the contamination problem.
3. Identify inputs – identify the information that will be required to support the decision and specify which inputs require new environmental measurements.
4. Define boundaries – define the spatial and temporal boundaries that the data must represent to support the decision.
5. Develop a decision rule – develop a logical “if...then..” statement that defines the conditions that would cause the decision maker to choose among alternative actions.
6. Specify limits on decision errors – specify the decision maker’s tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data.
7. Optimize the design – identify a resource-effective sampling and analysis design for generating data that are expected to satisfy the DQOs.

2.5.6.2 LAW has applied the DQO process to this First Quarterly Groundwater Sampling activity.

3.0 DISCUSSION OF RESULTS

3.0.0.1 This section provides a discussion of the results of the field activities discussed in Section 2.0.

3.1 GROUNDWATER ELEVATION DATA

3.1.0.1 Groundwater elevations ranged from 5.29 to 20.39 feet from 23.43 to 36.37 feet above mean sea level (msl) in the upper aquifer and lower aquifer, respectively. The water level measurements were converted to relative water table elevation by subtracting the water level measurements from the referenced measuring point elevations. Groundwater elevation data are provided in Table 3-1 and are illustrated in Figures 3-1 and 3-2 for the upper and lower aquifer, respectively. The water table elevations were contoured to provide the apparent direction of groundwater flow in the representative aquifers.

3.2 FIELD ANALYTICAL PARAMETERS

3.2.0.1 The following section presents a discussion of the parameters measured during the sampling of the wells. The field analytical parameters were collected using a Horiba U-22 water quality meter. This instrument uses an in-line flow-through cell to monitor the groundwater geochemistry. The instruments were calibrated daily in general accordance with manufacturer's recommendations. Parameters measured using field instruments are listed in Tables 3-2 and 3-3 for the upper and lower aquifers, respectively.

3.2.0.2 The DO concentrations in the upper aquifer were lower than those of the lower aquifer. The average DO concentration in the upper aquifer was approximately 0.41 mg/L, while the average DO concentration in the lower aquifer was 2.76 mg/L. The range of DO concentrations in the upper aquifer was from 0 to 4.38 mg/L. The range of DO concentrations measured in the lower aquifer was from 0.36 to 6.97 mg/L. A summary of the field parameters is presented on Tables 3-2 and 3-3 for the upper and lower aquifers, respectively.

3.2.0.3 The measured values of ORP varied greatly and most often did not correlate with the measurements of DO. The ORP ranged from -165 mV to 389 mV across both upper and lower aquifers. Generally, the upper aquifer was characterized by higher ORP measurements than the lower aquifer. The range of ORP measurements for the upper aquifer was from approximately -73 to 389 mV; and ORP measurements for the lower aquifer were from approximately -165 to 155 mV. Since ORP measurements show limited correlation with DO measurements and follow no discernable pattern, DO measurements are considered within the data set to be a more realistic indicator parameter for MNA.

3.2.0.4 The presence of ferrous iron (Fe^{+2}) potentially indicates the existence of reducing conditions in the subsurface environment. Fe^{+2} was detected at higher levels in the upper aquifer than the lower aquifer. Fe^{+2} concentrations ranged from 0 to 4.6 mg/L in the upper aquifer and 0 to 1.0 mg/L in the lower aquifer. The average ferrous iron concentration in the upper aquifer was approximately 2.2 mg/L and 0.1 mg/L in the lower aquifer.

3.2.0.5 The range of pH values measured in the upper aquifer was from 3.9 to 6.59, while that measured in the lower aquifer was from 5.24 to 13.0. Temperature of the groundwater ranged from 15.87°C to 23.49°C in the upper aquifer, while temperature measurements in the lower aquifer were from 13.14°C to 21.46°C.

3.3 LABORATORY ANALYTICAL PARAMETERS

3.3.0.1 This section provides results of laboratory analyses for groundwater samples collected from OU 7. The analytical methods were selected to complement the analytical needs for this area with consideration given to detection limits, inherent method accuracy and precision, and the compounds to be identified. In general, USEPA SW-846 methodologies were used to facilitate data evaluation by USACE standards as outlined in the USACE Shell Document (USACE, 1998a). Data Summary Tables are included in Appendix B, along with a summary of the DQE.

3.3.1 Upper Aquifer Detection Summary

3.3.1.1 Samples were collected at OU 7 during October 2001 and analyzed for VOCs, metals, and MNA parameters.

3.3.1.2 As part of the field program, 2 duplicate samples were collected for VOC analysis from the upper aquifer wells. The duplicates (OU 7 Dup 1 and 2) correlate closely with their respective parent samples (AEHADG-10 and DMW-25A, respectively). Relative percent difference (RPD) ranged from 0 to 13 percent, with typical limits less than 30 percent being acceptable.

3.3.1.3 A total of 2 samples were sent to the CEMRD lab as QA splits. Data from the QA split samples were not available for review; therefore, comparison to site data was not performed.

3.3.1.4 Positive detections for the upper aquifer are provided in Table 3-4. Groundwater samples collected from 4 of the 14 upper aquifer monitoring wells sampled did not contain VOCs above detection limits. These wells included DMW-26A, MWFOS-1, MWFTA-5, and MWFTA-7.

3.3.2 VOCS

3.3.2.1 Results of VOC analyses in the upper aquifer wells indicate the presence of chlorinated solvent constituents in addition to their degradation products. The primary constituents present across the upper aquifer wells in order of highest to lowest concentrations are as follows: cis-1,2-dichloroethene (190,000 µg/L in MWFTA-23); 1,1,1-trichloroethane (7,300 µg/L in AEHADG-10); vinyl chloride (VC) (5,400 JQ µg/L in MWFTA-23); acetone (3,600 JQ µg/L in MWFTA-23); PCE (3,300 µg/L in AEHADG-10); TCE (14,000 µg/L in AEHADG-10); 1,2-dichlorobenzene (1,300 JQ µg/L in MWFTA-23); 1,1-dichloroethene (1,100 µg/L in AEHADG-10); naphthalene (340 JQ µg/L in AEHADG-10); 1,1-dichloroethane (170 µg/L in DMW-33A); carbon tetrachloride (130 JQ µg/L in AEHADG-10); and trans-1,2-dichloroethene (39 JQ µg/L in DMW-33A).

3.3.2.2 TCE concentrations ranged from less than the reporting limit (1 µg/L) to 14,000 µg/L. PCE concentrations ranged from less than the reporting limit (1µg/L) to 3,300 µg/L. Cis-1,2-dichloroethene concentrations ranged from less than the detection limit (0.5 µg/L) to 190,000 µg/L. VC concentrations ranged from less than the detection limit (2 µg/L) to 5,400 JQ µg/L.

3.3.3 MNA Parameters

3.3.3.1 The upper aquifer wells were sampled and analyzed, as stated in Section 2.4, for TOC, chloride, nitrate, sulfate, alkalinity, sulfide, carbon dioxide, ethane, ethane, methane, total and dissolved hydrogen in order to facilitate a review of the viability of MNA. The results of the analyses are included in Table 3-4 and are discussed below. These samples were collected to provide the necessary data for evaluation of MNA.

- TOC was measured in each of the 14 sampled wells with results ranging from less than the detection limit (1 mg/L) to 36 mg/L in MWFTA-1. The average concentration in the upgradient wells was 1.50 mg/L.
- Chloride was measured in each of the 14 sampled wells, and results ranged from 4.5 mg/L in MWFTA-5 to 258 mg/L DMW-26A. The average concentration in the upgradient wells was 44.6 mg/L.
- Nitrate was measured in each of the 14 sampled wells, and results ranged from less than the reporting limit (0.1 mg/L) to 1 mg/L in DMW-13A. The average concentration in the upgradient wells was 0.12 mg/L.
- Sulfate was measured in each of the 14 sampled wells, and results ranged from less than the reporting limit (1.0 mg/L) to 59.3 mg/L in MWFOS-1. The average concentration in the upgradient wells was 13.76 mg/L.

- Total alkalinity was measured in each of the 14 sampled wells, and results ranged from less than the reporting limit (5.0 mg/L) to 280 mg/L in MWFTA-1. The average concentration in the upgradient wells was 36.43 mg/L.
- Total Sulfide was measured in each of the 14 sampled wells, and results ranged from less than the reporting limit (1.0 mg/L) to 6.3 mg/L in MWFTA-5. The average concentration in the upgradient wells was slightly above the reporting limit.
- Carbon dioxide was measured in each of the 14 sampled wells, and results ranged from 22 J mg/L in MWFO-1 to 510 J mg/L in MWFTA-1. The average concentration in the upgradient wells was 148.07 mg/L.
- Ethene, ethane and methane were measured in each of the 14 sampled wells. Ethane was detected ranging from concentrations less than the reporting limit of 0.002 mg/L to 0.00048 mg/L in MWAFTA-23. Ethene was detected ranging from less than the reporting limit (0.001 mg/L) to 0.039 mg/L in MWAFTA-23. Methane was detected at concentrations ranging from 0.00085 JB (estimated; possibly biased high or false positive based on blank contamination in MWFTA-7) to 5.4 mg/L in DMW-26A.
- Hydrogen was measured in each of the 14 sampled wells. Concentrations measured ranged from 1.6 nanomolar (nM) (1 nanomolar is equivalent to 10^{-9} moles per liter) in DMW-13A and MWFTA-1 to 13 nM in MWFTA-23.

3.3.4 Metals

3.3.4.1 Samples for analyses for total and dissolved metals were collected from the upper aquifer wells. Dissolved metals concentrations are tabulated in Table 3-4; and total metals are discussed below. These data are consistent with previous data.

- The maximum concentrations of total aluminum, arsenic, and barium detected were 1360 J $\mu\text{g/L}$ (MWFTA-7), 96.6 $\mu\text{g/L}$ (MWFTA-23) and 607 $\mu\text{g/L}$ (MWFTA-23), respectively. Total beryllium and total cadmium were also detected; however, the maximum concentrations were qualified as possibly biased high or false positive based upon blank contamination (see Appendix B).
- The maximum concentrations of total calcium, cobalt, iron, and lead detected were 34,200 $\mu\text{g/L}$ (MWFTA-1), 30.4 $\mu\text{g/L}$ (AEHADG-10), 64,000 $\mu\text{g/L}$ (MWFTA-23), and 6.2 $\mu\text{g/L}$ (DMW-13A), respectively. The maximum concentrations of total magnesium and manganese detected were 51,900 $\mu\text{g/L}$ (MWFTA-1) and 1,080 $\mu\text{g/L}$ (AEHADG-10), respectively.
- The maximum concentrations of total nickel, potassium, sodium, and zinc detected were 43.1 $\mu\text{g/L}$ (AEHADG-10), 10,100 $\mu\text{g/L}$ (MWFTA-1), 145,000 $\mu\text{g/L}$ (DMW-26A), and 152 $\mu\text{g/L}$ (MWFTA-23), respectively. Total molybdenum and total vanadium were also detected; however, the maximum detected concentrations were qualified as possibly biased high or false positive based on blank contamination (see Appendix B).

3.3.5 Lower Aquifer Detection Summary

3.3.5.1 Samples were collected from the lower aquifer at OU 7 during the October 2001 sampling event and analyzed for VOCs, metals, and MNA parameters.

3.3.5.2 As part of the field program, 1 duplicate sample was collected for VOC analysis from the lower aquifer wells. The duplicate (OU 7 Dup 1) correlates closely with the parent sample (MWFTA-2). RPD ranged from 0 to 13 percent, with typical limits less than 30 percent being acceptable.

3.3.5.3 One sample was submitted to the CEMRD lab as a QA split. Data from the QA split samples were not available for review; therefore, comparison to site data was not performed.

3.3.5.4 Positive detections for OU 7 lower aquifer wells are shown in Table 3-5.

3.3.6 VOCs

3.3.6.1 Results of VOC analyses in the lower aquifer wells indicate the presence of chlorinated solvent constituents in addition to their degradation products. The primary constituents present across the 10 lower aquifer wells in order of highest to lowest concentrations are as follows: cis-1,2-dichloroethene (1,200 µg/L in MWFTA-16); VC (270 µg/L in MWFTA-16); acetone (46 JQ µg/L in MWFTA-16); 1,1-dichloroethane (20 µg/L in MWFTA-20); 1,1-dichloroethene (9.3 µg/L in MWFTA-20); 1,2-dichlorobenzene (6.3 JQ µg/L in MWFTA-16); TCE (7.4 µg/L in MWFTA-20); 2-butanone (2 JQ µg/L in MWFTA-28B); 2-hexanone (1.7 JL µg/L in MWFTA-29B); toluene (1.1 JQ µg/L in MWFTA-20); naphthalene (0.82 JQ µg/L in MWFTA-17, MWFTA-29B, and PWFTA-2); PCE (0.76 JQ µg/L in MWFTA-19); benzene (0.27 JQ µg/L in MWFTA-29B); p-isopropyltoluene (0.23 JQ µg/L in PWFTA-2); 1,4-dichlorobenzene (0.21 JQ µg/L in PWFTA-2); trans-1,2-dichloroethene (0.18 JQ µg/L in PWFTA-2).

3.3.6.2 Chloroform and methylene chloride were also detected at maximum concentrations of 0.76 JB µg/L and 0.52 JB µg/L, respectively. However, the concentrations were qualified as possibly biased high or false positive based on blank contamination (see Appendix B).

3.3.6.3 TCE concentrations ranged from less than the reporting limit (1 µg/L) to 7.4 µg/L. PCE concentrations ranged from less than the reporting limit (1 µg/L) to 0.76 JQ µg/L. VC concentrations ranged from less than the detection limit (2 µg/L) to 270 µg/L.

3.3.7 MNA Parameters

3.3.7.1 The lower aquifer wells were sampled and analyzed, as stated in Section 2.4, for TOC, chloride, nitrate, sulfate, alkalinity, sulfide, carbon dioxide, ethane, ethane, methane, total and dissolved hydrogen in order to facilitate a review of the viability of MNA. The results of the analyses are included in Table 3-5 and are discussed below.

- TOC was measured in each of the 10 sampled wells with results ranging from less than the detection limit (1 mg/L) to 22 mg/L in MWFTA-28B. The average concentration in the upgradient wells was 17.41 mg/L.
- Chloride was measured in each of the 10 sampled wells, and results ranged from 1.5 mg/L in MWFTA-29B to 58.6 mg/L MWFTA-28B. The average concentration in the upgradient wells was 12.3 mg/L.
- Sulfate was measured in each of the 10 sampled wells, and results ranged from 0.94 JQ mg/L in MWFTA-18 to 29.6 mg/L in MWFTA-14. The average concentration in the upgradient wells was 8.60 mg/L.
- Total alkalinity was measured in each of the 10 sampled wells, and results ranged from 24 mg/L in DMW-29B to 480 mg/L in MWFTA-16. The average concentration in the upgradient wells was 190.6 mg/L.
- Total Sulfide was measured in each of the 10 sampled wells, and results ranged from less than the reporting limit (1.0 mg/L) to 2.2 mg/L in MWFTA-29B. The average concentration in the upgradient wells was slightly less than the reporting limit.
- Carbon dioxide was measured in each of the 10 sampled wells, and results ranged less than the reporting limit (0.001 mg/L) to 45 J mg/L in DMW-29B. The average concentration in the upgradient wells was 5.53 mg/L.
- Ethene, ethane and methane were measured in each of the 10 sampled wells. Ethane was detected ranging from concentrations less than the reporting limit of 0.002 mg/L to 0.0015 mg/L in MWAFTA-16. Ethene was detected ranging from less than the reporting limit (0.001 mg/L) to 0.011 mg/L in MWAFT-16. Methane was detected at concentrations ranging from (0.0014 JB; estimated; possibly biased high or false positive based on blank contamination) in DMW-29B to 0.28 mg/L in MWFTA-18.
- Hydrogen was measured in 9 of the 10 sampled wells. Concentrations measured ranged from 2.7 nM (1 nanomolar is equivalent to 10^{-9} moles per liter) in DMW-29B to 52 nM in MWFTA-29B.

3.3.8 Metals

3.3.8.1 Total and dissolved metals were collected from the lower aquifer wells (see Table 3-5). Dissolved metals concentrations are tabulated in Table 3-5; and total metals are discussed below. These data are consistent with previous data.

- The maximum concentrations of total aluminum, barium, calcium, and chromium detected were 5,250 µg/L (MWFTA-17), 250 µg/L (MWFTA-29B), 119,000 µg/L (MWFTA-17), and 42.1 µg/L (MWFTA-29B), respectively. The maximum concentrations of total iron, magnesium, and manganese detected were 3,130 µg/L (MWFTA-28B), 23,800 µg/L (MWFTA-28B), and 175 µg/L (MWFTA-28B), respectively.
- The maximum concentrations of total nickel, potassium, sodium, vanadium, and zinc detected were 9.7 JQ µg/L (MWFTA-29B), 188,000 µg/L (MWFTA-16), 73,700 µg/L (MWFTA-29B), 5.2 JQ µg/L (MWFTA-17), and 392 µg/L (MWFTA-28B), respectively.
- Total beryllium, total cobalt, total copper, and total molybdenum were also detected; however, the maximum concentrations were qualified as possibly biased high or false positive based on blank contamination (see Appendix B).

3.3.9 Results Summary

3.3.9.1 Upper Aquifer – The DO concentrations measured in groundwater from wells within the upper aquifer of OU 7 indicate that anaerobic conditions generally exist throughout the plume. Higher DO levels at specific wells suggest that aerobic zones may exist locally in the vicinity of these wells and that reductive dechlorination may be inhibited in these areas.

3.3.9.2 The concentrations of Fe^{+2} detected in monitoring wells in the vicinity of MWFTA-23 indicate that conditions are favorable for reductive dechlorination. No ferrous iron was detected in wells MWFTA-7 and DMW25A.

3.3.9.3 Dissolved hydrogen concentrations were generally greater than 1 nM in groundwater from the upper aquifer wells sampled, further suggesting favorable conditions for reductive dechlorination.

3.3.9.4 Chloride is naturally occurring and is typically difficult to use as an indicator of reductive dechlorination. However, comparing relative concentrations can be an indication of degradation of chlorinated compounds. Trends in chloride levels are inconclusive.

3.3.9.5 Sulfide is produced by the metabolic reduction of sulfate. Therefore, if subsurface sulfate is depleted, sulfide concentrations should be detected. Generally, if sulfide concentrations are above of 1 mg/L, reductive dechlorination is possible. Sulfide concentrations exceeded 1 mg/L in several wells, suggesting favorable conditions for reductive dechlorination. However, no trends were noted for these levels across the site.

3.3.9.6 Total alkalinity was measured in groundwater from wells within the upper aquifer of OU 7. Total alkalinity is a measure of groundwater's ability to buffer changes in pH, which may be caused by the addition of biologically generated acids. Alkalinity within the plume was reported as being generally between <5 mg/L and 280 mg/L, with the highest measurement being in groundwater collected from the suspected initial source area in the proximity of MWFTA-1. No trends were noted for alkalinity.

3.3.9.7 Lower Aquifer – The DO measured in groundwater samples from wells screened in the lower aquifer indicates that anaerobic conditions generally exist throughout the plume. However, higher DO levels measured in specific monitoring wells (MWFTA-16, MWFTA-17, MWFTA-19, MWFTA-20, and MWFTA-2) suggest that reductive dechlorination may be inhibited in these areas.

3.3.9.8 The results of ORP measurements in the lower aquifer wells are inconclusive since they did not correlate with the respective DO concentrations. Ferrous iron was not detected in groundwater from the lower aquifer wells sampled, indicating that iron reduction has likely not occurred.

3.3.9.9 Dissolved hydrogen concentrations were generally above 1 nM in the lower aquifer groundwater, suggesting that favorable conditions exist for reductive dechlorination.

3.3.9.10 Chloride concentrations above background levels generally indicate degradation of chlorinated constituents. However, chloride concentrations in the plume within the lower aquifer were not significantly greater than those detected in upgradient wells. This suggests that degradation of chlorinated constituents has likely not occurred significantly in the lower aquifer.

3.3.9.11 Sulfide levels were generally less than the laboratory detection limit and are inclusive.

3.3.9.12 Alkalinity in the chlorinated constituent plume within the lower aquifer was generally lower than that in upgradient wells (average of approximately 30 mg/L as CaCO₃). This indicates that there has been apparent carbon dioxide (CO₂) production above indigenous concentrations.

4.0 SUMMARY

4.0.0.1 LAW conducted a groundwater sampling and analysis event in October 2001 for OU 7 at DSCR. This sampling event was conducted to obtain hydrogeological and geochemical data to further define the chlorinated solvent plume existing within OU 7 and to evaluate whether conditions are conducive to MNA.

4.0.0.2 Groundwater in the upper aquifer generally flows to the southeast, following the natural topography of the site. Groundwater in the lower aquifer generally flows to the east.

4.0.0.3 A comparison of current and historical data shows that chlorinated VOCs (i.e., PCE, TCE, and their breakdown products) in the upper and lower aquifer appear to have decreased in previous events and are now decreasing or are consistent with previous results. Total and dissolved metals are also consistent with previous investigations. Based on these evaluations, hydrogeochemical conditions in the upper aquifer and lower aquifer appear to be generally conducive to reductive dechlorination.

5.0 REFERENCES

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TABLES

TABLE 2-1

UPPER AQUIFER WELLS SAMPLED
Technical Memorandum
First Quarterly Groundwater Sampling – October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

AEHADG-10	DMW-26A	MWFOS-1	MWFTA-7
DMW-13A	DMW-27A	MWFTA-1	MWFTA-23
DMW-22A	DMW-33A	MWFTA-3	
DMW-25A	DMW-35A	MWFTA-5	

PREPARED/DATE: EMM 12-4-01
CHECKED/DATE: AWE 12-5-01

TABLE 2-2

LOWER AQUIFER WELLS SAMPLED
Technical Memorandum
First Quarterly Groundwater Sampling – October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

DMW-29B	MWFTA-18	MWFTA-29B
MWFTA-14	MWFTA-19	PWFTA-2
MWFTA-16	MWFTA-20	
MWFTA-17	MWFTA-28B	

PREPARED/DATE: EMM 12-4-01
CHECKED/DATE: AWE 12-5-01

TABLE 3-1

HYDROGEOLOGIC RESULTS
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Well ID	Aquifer	Date Measured	Elevation Top of Casing (msl)	Water Level Elevation (ft)	Depth to Water from TOC (ft)
DMW-29B	Lower	9/17/2001	97.74	61.37	36.37
MWFTA-14	Lower	9/18/2001	85.06	61.63	23.43
MWFTA-16	Lower	9/17/2001	103.16	75.17	27.99
MWFTA-17	Lower	9/17/2001	100.15	73.93	26.22
MWFTA-18	Lower	9/17/2001	97.59	68.83	28.76
MWFTA-19	Lower	9/17/2001	84.45	58.93	25.52
MWFTA-20	Lower	9/17/2001	87.04	60.34	26.70
MWFTA-28B	Lower	9/18/2001	85.16	56.96	28.20
MWFTA-29B	Lower	9/17/2001	81.59	58.07	23.52
PWFTA-2	Lower	9/17/2001	86.04	61.55	24.49
AEHADG-10	Upper	9/17/2001	98.13	84.56	13.57
DMW-13A	Upper	9/17/2001	101.43	89.38	12.05
DMW-22A	Upper	9/17/2001	87.15	80.21	6.94
DMW-25A	Upper	9/17/2001	97.87	86.92	10.95
DMW-26A	Upper	9/17/2001	98.73	90.10	8.63
DMW-27A	Upper	9/17/2001	101.24	90.44	10.80
DMW-33A	Upper	9/18/2001	85.09	78.31	6.78
DMW-35A	Upper	9/17/2001	100.51	86.70	13.81
MWFOS-1	Upper	9/17/2001	112.26	91.87	20.39
MWFTA-1	Upper	9/17/2001	91.32	82.87	8.45
MWFTA-3	Upper	9/17/2001	86.71	81.42	5.29
MWFTA-5	Upper	9/17/2001	85.47	77.19	8.28
MWFTA-7	Upper	9/17/2001	86.72	76.44	10.28
MWFTA-23	Upper	9/17/2001	102.77	90.57	12.20

TOC Top of Casing
ft feet
msl mean sea level

PREPARED/DATE: EMM 12-4-01
CHECKED/DATE: AWE 12-5-01

TABLE 3-2

RESULTS OF FIELD ANALYSES - UPPER AQUIFER
 Technical Memorandum
 First Quarterly Groundwater Sampling - October 2001
 Operable Unit 7
 Defense Supply Center Richmond
 Richmond, Virginia

Sample ID:	AEHADG-10	DMW-13A	DMW-22A	DMW-25A	DMW-26A	DMW-27A	DMW-33A
Sample Date:	10/5/2001	10/5/2001	10/5/2001	10/5/2001	10/4/2001	10/5/2001	10/8/2001
FIELD MEASUREMENTS							
Oxidation Reduction Potential (mV)	38	308	-73	160	-18	8	74
Ferrous Iron (mg/L)	3.6	2.3	3.7	0	3.8	2.2	3.5
Specific Conductance (µmhos/cm)	0.278	0.162	0.43	0.103	0.822	0.089	0.235
pH (Standard pH Units)	5.57	3.9	5.95	5.16	5.61	4.35	5.06
Temperature (°C)	20.4	21.9	16.37	18.9	23.49	22.5	17.67
Dissolved Oxygen (mg/L)	0	0.11	0	0	0	0	4.38

°C degrees Celsius
 mg/L milligrams per liter
 mV millivolts
 µmhos/cm micromhos per centimeter

TABLE 3-2

RESULTS OF FIELD ANALYSES - UPPER AQUIFER
 Technical Memorandum
 First Quarterly Groundwater Sampling - October 2001
 Operable Unit 7
 Defense Supply Center Richmond
 Richmond, Virginia

Sample ID:	DMW-35A	MWFOS-1	MWFTA-1	MWFTA-3	MWFTA-5	MWFTA-7	MWFTA-23
Sample Date:	10/5/2001	10/9/2001	10/4/2001	10/4/2001	10/8/2001	10/1/2001	10/9/2001
FIELD MEASUREMENTS							
Oxidation Reduction Potential (mV)	153	57	-23	49	69	389	75
Ferrous Iron (mg/L)	1	0.5	3.6	1.4	0.6	0	4.6
Specific Conductance (µmhos/cm)	0.073	0.145	0.673	0.121	0.085	0.16	0.466
pH (Standard pH Units)	5.22	6.13	6.59	6.11	5.48	4.08	4.67
Temperature (°C)	18.98	21.53	19.6	19.4	15.87	18.69	20.1
Dissolved Oxygen (mg/L)	0	0.44	0	0	0	0.82	0

°C degrees Celsius
 mg/L milligrams per liter
 mV millivolts
 µmhos/cm micromhos per centimeter

PREPARED/DATE: EMM 12-4-01
 CHECKED/DATE: AWE 12-5-01

TABLE 3-3
RESULTS OF FIELD ANALYSES - LOWER AQUIFER
 Technical Memorandum
 First Quarterly Groundwater Sampling - October 2001
 Operable Unit 7
 Defense Supply Center Richmond
 Richmond, Virginia

Sample ID:	MWFTA-14	MWFTA-16	MWFTA-17	MWFTA-18	MWFTA-19	MWFTA-20	MWFTA-28B	MWFTA-29B	DMW-29B	PWFTA-2
Sample Date:	10/9/2001	10/9/2001	10/2/2001	10/1/2001	10/1/2001	10/1/2001	10/8/2001	10/1/2001	10/10/2001	10/1/2001
FIELD MEASUREMENTS										
Oxidation Reduction Potential (mV)	12	-165	-105	-86	-3	-48	-124	-113	155	-36
Ferrous Iron (mg/L)	0	0	0	1	0	0	0	0	0	0
Specific Conductance (µmhos/cm)	0.439	4.93	1.75	0.125	0.609	0.157	0.543	2.4	0.061	0.99
pH (Standard pH Units)	9.82	11.13	11.93	6.89	10.91	10.4	7.01	13.0	5.24	11.01
Temperature (°C)	15.62	21.46	19.59	17.97	16.5	17.7	14.58	16.9	13.14	15.2
Dissolved Oxygen (mg/L)	1.09	3.35	6.97	0.36	6.33	3.18	0.57	0.41	0.42	2.67

°C degees Celsius
 mg/L milligrams per liter
 mV millivolts
 µmhos/cm micromhos per centimeter

PREPARED/DATE: EMM 12-4-01
 CHECKED/DATE: AWE 12-5-01

TABLE 3-4

POSITIVE RESULTS TABLE FOR GROUNDWATER - UPPER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date:	Practical (a) Quantitation Limit	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
<u>FIXED BASE LABORATORY ANALYSIS</u>									
<u>Anions - MCAWW 300.3A mg/L</u>									
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
<u>Dissolved Gases - RSK SOP-175 mg/L</u>									
Carbon dioxide	0.001	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
<u>Dissolved Hydrogen by Microseeps AM20GA nM/L</u>									
Hydrogen	0.03	8.3	10	1.6	8.9	9.5	8.2	8.1	7.7
<u>Mercury - SW846 7470A (Dissolved) µg/L</u>									
Mercury		Not detected							
<u>Mercury - SW846 7470A (Total) µg/L</u>									
Mercury		Not detected							
<u>Metals - SW846 6010B (Dissolved) µg/L</u>									
Aluminum	200	<200	<200	1190	<200	<200	<200	137 JQ	331
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
Cobalt	30	29.9 JQ	27.9 JQ	5.2 JQ	<30	12.2 JQ	11.1 JQ	<30	<30
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
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

TABLE 3-4

POSITIVE RESULTS TABLE FOR GROUNDWATER - UPPER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Practical (a)	Sample	Duplicate	Sample	Sample	Sample	Duplicate	Sample	Sample
Sample ID:	Quantitation	AEHADG-10	AEHADG-10	DMW-13A	DMW-22A	DMW-25A	DMW-25A	DMW-26A	DMW-27A
Sample Date:	Limit	10/5/2001	10/5/2001	10/5/2001	10/5/2001	10/5/2001	10/5/2001	10/4/2001	10/5/2001
<u>FIXED BASE LABORATORY ANALYSIS</u>									
<u>Metals - SW846 6010B (Total) µg/L</u>									
Aluminum	200	<200	272	1120	<200	64.5 JQ	<200	196 JQ	325
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
Cobalt	30	30.4	29.4 JQ	5.7 JQ	<30	12.1 JQ	11.9 JQ	<30	1.3 JB
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
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
<u>Thallium - SW846 7841 (Dissolved) µg/L</u>									
Thallium	2	2.1 JB	<2	2.4 JB	1.9 JB	<2	<2	1.9 JB	2.2 JB
<u>Thallium - SW846 7841 (Total) µg/L</u>									
Thallium	2	2.2 JB	<2	2 JB	2.1 JB	<2	<2	2 JB	<2
<u>Total Alkalinity - MCAWW 310.1 mg/L</u>									
Total Alkalinity	5	16	17	<5	55	23	22	33	3 JB
<u>Total Organic Carbon - SW846 9060 mg/L</u>									
Total Organic Carbon	1	1 JB	1 JB	0.6 JB	3	0.8 JB	0.6 JB	17	12
<u>Total Sulfide - MCAWW 376.1 mg/L</u>									
Total Sulfide	1	3.9 J	<1 J	<1	1.2 J	<1	<1	1.1	NA

TABLE 3-4

POSITIVE RESULTS TABLE FOR GROUNDWATER - UPPER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Practical (a)	Sample	Duplicate	Sample	Sample	Sample	Duplicate	Sample	Sample
Sample ID:	Quantitation	AEHADG-10	AEHADG-10	DMW-13A	DMW-22A	DMW-25A	DMW-25A	DMW-26A	DMW-27A
Sample Date:	Limit	10/5/2001	10/5/2001	10/5/2001	10/5/2001	10/5/2001	10/5/2001	10/4/2001	10/5/2001
<u>FIXED BASE LABORATORY ANALYSIS</u>									
<u>Volatile Organic Compounds - SW846 8260B µg/L</u>									
1,1,1-Trichloroethane	1	7300	7300	<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
1,2-Dichlorobenzene	1	130 JQ	150 JQ	<1	0.62 JQ	<1	<1	<5	<1
Acetone	10	<4200	<4200	<10	<10	<10	<10	<50	0.85 JB
Carbon tetrachloride	1	120 JQ	130 JQ	<1	<1	<1	<1	<5	<1
Chloroform	1	130 JB	140 JB	0.36 JB	<1	<1	<1	<5	<1
cis-1,2-Dichloroethene	0.5	880	870	<0.5	6.2	8.8	8.8	<2.5	<0.5
Methylene chloride	1	<420	<420	<1	<1	<1	<1	<5	<1
Naphthalene	1	340 JQ	<420	<1	<1	<1	<1	<5	<1
Tetrachloroethene	1	3300	3300	<1	2.4	19	19	<5	<1
trans-1,2-Dichloroethene	0.5	<210	<210	<0.5	<0.5	<0.5	<0.5	<2.5	<0.5
Trichloroethene	1	14000	14000	<1	10	5.6	5.4	<5	<1
Vinyl chloride	2	<830	<830	<2	0.32 JQ	0.6 JQ	0.6 JQ	<10	7.7

J Estimated.

JB Estimated; possibly biased high or falsepositive based on blank contamination.

JH Estimated; possibly biased high based on QC data.

JL Estimated; possibly biased low based on QC data.

JQ Estimated; Value is between reporting limit and detection limit.

NA Not Analyzed.

R Rejected.

UJ Undetected; Reported Detection Limit is imprecise.

UL Undetected; Data biased low - Reported

Detection Limit is higher than indicated.

(a) Quantitation limits are ideal. Sample quantitation limits may vary due to sample volume/weight extracted and dilutions.

mg/L milligram per liter

nM/L nanamolars per liter

µg/L microgram per liter

TABLE 3-4

POSITIVE RESULTS TABLE FOR GROUNDWATER - UPPER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Sample ID: Sample Date:	Practical (a) Quantitation Limit	Sample DMW-33A 10/8/2001	Sample DMW-35A 10/5/2001	Sample MWFO5-1 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
<u>FIXED BASE LABORATORY ANALYSIS</u>										
<u>Anions - MCAWW 300.3A mg/L</u>										
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
<u>Dissolved Gases - RSK SOP-175 mg/L</u>										
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
<u>Dissolved Hydrogen by Microseeps AM20GA nM/L</u>										
Hydrogen		0.03	9.1	8.9	8.8	1.6	7.4	7.8	8.8	13
<u>Mercury - SW846 7470A (Dissolved) µg/L</u>										
Mercury										Not detected
<u>Mercury - SW846 7470A (Total) µg/L</u>										
Mercury										Not detected
<u>Metals - SW846 6010B (Dissolved) µg/L</u>										
Aluminum		200	<200	<200	<200	163 JQ	54 JQ	<200	1340 J	178 JQ
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
Cobalt		30	<30	<30	<30	2.2 JB	<30	<30	5.6 JQ	11.3 JQ
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
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

TABLE 3-4

POSITIVE RESULTS TABLE FOR GROUNDWATER - UPPER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Practical (a)	Sample							
Sample ID:	Quantitation	DMW-33A	DMW-35A	MWFOS-1	MWFTA-1	MWFTA-3	MWFTA-5	MWFTA-7	MWFTA-23
Sample Date:	Limit	10/8/2001	10/5/2001	10/9/2001	10/4/2001	10/4/2001	10/8/2001	10/1/2001	10/9/2001
<u>FIXED BASE LABORATORY ANALYSIS</u>									
<u>Metals - SW846 6010B (Total) µg/L</u>									
Aluminum	200	<200	<200	<200	329 JH	478	<200	1360 J	656
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
Cobalt	30	<30	<30	<30	2 JB	<30	<30	5.3 JQ	12.1 JQ
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
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
<u>Thallium - SW846 7841 (Dissolved) µg/L</u>									
Thallium	2	<2	<2	<2	2 JB	1.8 JB	<2	<2	<2
<u>Thallium - SW846 7841 (Total) µg/L</u>									
Thallium	2	<2	<2	<2	2.1 JB	2.4 JB	<2	<2	2.1 JB
<u>Total Alkalinity - MCAWW 310.1 mg/L</u>									
Total Alkalinity	5	15	10 JB	19	280	21	24	1.6 JB	23
<u>Total Organic Carbon - SW846 9060 mg/L</u>									
Total Organic Carbon	1	2 JB	<1	0.6 JB	36	3	0.7 JB	1	48
<u>Total Sulfide - MCAWW 376.1 mg/L</u>									
Total Sulfide	1	2.8	1.1	<1	<1	<1	6.3	<1	2.3

TABLE 3-4

POSITIVE RESULTS TABLE FOR GROUNDWATER - UPPER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date:	Practical (a) Quantitation Limit	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
<u>FIXED BASE LABORATORY ANALYSIS</u>									
<u>Volatile Organic Compounds - SW846 8260B µg/L</u>									
1,1,1-Trichloroethane	1	1200	<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
1,2-Dichlorobenzene	1	29 JQ	<1	<1	<5	<1	<1	<1	1300 JQ
Acetone	10	<1000	<10	<10	<50 UL	<10	<10	<10	3600 JQ
Carbon tetrachloride	1	<100	<1	<1	<5	<1	<1	<1	<5000
Chloroform	1	27 JB	<1	<1	<5	<1	<1	<1	<5000
cis-1,2-Dichloroethene	0.5	2900	1.7	<0.5	<2.5	12	<0.5	<0.5	190000
Methylene chloride	1	<100	<1	<1	3.9 JB	<1	<1	<1	<5000
Naphthalene	1	<100	<1	<1	4.6	<1	<1	<1	<5000
Tetrachloroethene	1	430	9.7	<1	<5	3	<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
Trichloroethene	1	3500	3	<1	<5	8.4	<1	<1	<5000
Vinyl chloride	2	33 JQ	<2	<2	<10	0.56 JQ	<2	<2	5400 JQ

J Estimated.

JB Estimated; possibly biased high or falsepositive based on blank contamination.

JH Estimated; possibly biased high based on QC data.

JL Estimated; possibly biased low based on QC data.

JQ Estimated; Value is between reporting limit and detection limit.

NA Not Analyzed.

R Rejected.

UJ Undetected; Reported Detection Limit is imprecise.

UL Undetected; Data biased low - Reported

Detection Limit is higher than indicated.

(a) Quantitation limits are ideal. Sample quantitation limits may vary due to sample volume/weight extr:

mg/L milligram per liter

nM/L nanamolars per liter

µg/L microgram per liter

PREPARED/DATE: MAB 12-19-01
 CHECKED/DATE: JAH 12-20-01

TABLE 3-5
POSITIVE RESULTS TABLE FOR GROUNDWATER - LOWER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Sample ID: Sample Date:	Practical (a) Quantitation Limit	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	Sample MWFTA-19 10/2/2001	Sample MWFTA-20 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
<u>FIXED BASE LABORATORY ANALYSIS</u>													
<u>Anions - MCAWW 300.3A mg/L</u>													
Chloride		1	9.3	16.5	7.6	5.9	3.8	6	3.5	58.6	1.5	8.6	8.6
Sulfate		1	5	29.6	7.4	7.2	0.94 JQ	6.2	4.8	14	5.1	5.8	5.6
<u>Dissolved Gases - RSK SOP-175 mg/L</u>													
Carbon dioxide		0.001	45 J	0.11 JB	<0.17 UJ	<0.17 J	7.1 J	<0.17 J	0.089 JB	3.2 J	<0.17 UJ	<0.17 UJ	0.14 JB
Ethane		0.002	<0.002	<0.002	0.0015 JQ	<0.002	0.001 JQ	<0.002	<0.002	<0.002	0.00043 JQ	<0.002	<0.002
Ethene		0.001	<0.001	<0.001	0.011	<0.001	0.005	<0.001	0.0054	<0.001	0.00088 JQ	0.002	0.0022
Methane		0.001	0.0014 JB	0.0036	0.022	0.073	0.28	0.0034	0.013	0.0021	0.017	0.16	0.17
<u>Dissolved Hydrogen by Microseeps AM20GA nM/L</u>													
Hydrogen		0.03	2.7	7.2	26	19	6.8	13	6.1	NA	52	46	51
<u>Mercury - SW846 7470A (Dissolved) ug/L</u>													
Mercury		Not detected											
<u>Mercury - SW846 7470A (Total) ug/L</u>													
Mercury		Not detected											
<u>Metals - SW846 6010B (Dissolved) ug/L</u>													
Aluminum		200	<200	<200	<200	5340	109 JB	659	<200	<200	453 JB	1200	1220
Antimony		5	<5	<5	<5	<5	3 JQ	<5	2.8 JQ	<5	<5	<5	<5
Barium		200	31.4 JQ	35 JQ	721	156 JQ	29.3 JQ	55.2 JQ	72 JQ	75.3 JQ	239	45.9 JQ	45.7 JQ
Beryllium		10	<10	<10	<10	<10	<10	<10	<10	<10	0.76 JB	<10	<10
Cadmium		2	<2	<2	<2	<2	<2	0.3 JB	<2	<2	<2	<2	<2
Calcium		5000	5390	5390	109000	119000	9530	45600	16800	22400	109000	58000	57300
Chromium		10	<10	<10	1.5 JB	<10	<10	<10	<10	<10	1.9 JB	<10	<10
Copper		10	<10	<10	<10	<10	<10	<10	<10	<10	4.3 JB	<10	<10
Iron		200	215	<200	<200	<200	2400	<200	<200	425	<200	<200	<200
Magnesium		5000	4040 JQ	5150	125 JQ	<5000	6550	37.5 JB	2210 JQ	22400	30.1 JB	<5000	<5000
Manganese		20	72.9	2.7 JB	2 JB	1.2 JB	107	<20	25.9	101	1.2 JB	<20	1.8 JB
Molybdenum		40	<40	7.5 JB	<40	<40	<40	<40	<40	<40	9.1 JB	<40	<40
Nickel		100	<100	<100	<100	2.4 JB	2.9 JB	<100	<100	<100	5.8 JB	<100	2.3 JB
Potassium		5000	5090	56600	186000	26800	7180	10400	10300	27900	91200	35100	36500
Sodium		5000	4590 JQ	52200	59300	11500	7670	5640	11600	42200	72400	12300	12600
Vanadium		50	<50	<50	1.6 JB	6 JQ	<50	2.4 JB	1.2 JB	<50	3.1 JQ	2 JB	2.3 JB
Zinc		20	30.4 J	<20	50.8 J	<20	<20	<20	<20	47.2	<20	<20	<20
<u>Metals - SW846 6010B (Total) ug/L</u>													
Aluminum		200	<200	995	70.4 JQ	5250	257 JB	673	301 JB	279	1960 JH	1900 J	1280 J
Barium		200	36.2 JQ	51.8 JQ	738	145 JQ	38.6 JQ	54.5 JQ	79.5 JQ	89.3 JQ	250	43.2 JQ	43.8 JQ
Beryllium		10	0.81 JB	<10	<10	<10	<10	<10	<10	<10	0.99 JB	<10	<10
Calcium		5000	5330	8670	111000	119000	9620	45400	17100	26500	110000	54600	54700
Chromium		10	<10	1.6 JQ	<10	<10	<10	<10	<10	<10	42.1	<10	<10

TABLE 3-5
POSITIVE RESULTS TABLE FOR GROUNDWATER - LOWER AQUIFER
 Technical Memorandum
 First Quarterly Groundwater Sampling - October 2001
 Operable Unit 7
 Defense Supply Center Richmond
 Richmond, Virginia

	Sample ID: Sample Date:	Practical (a) Quantitation Limit	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	Sample MWFTA-19 10/2/2001	Sample MWFTA-20 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
Cobalt		30	<30	1.4 JB	<30	<30	<30	<30	<30	<30	2.2 JB	<30	<30
Copper		10	<10	<10	<10	<10	<10	<10	<10	<10	12 JB	4.2 JB	<10
Iron		200	2080	905	<200	<200	2910	<200	520	3130	1970 JH	<200	<200
Magnesium		5000	4280 JQ	8480	1930 JQ	<5000	6670	44.8 JB	4950 JQ	23800	935 JQ	57.9 JB	62.7 JB
Manganese		20	78.5	19.2 JQ	12.4 JQ	<20	111	<20	139	175	71.3	1.4 JB	1.2 JB
Molybdenum		40	<40	8.6 JB	<40	<40	<40	<40	<40	<40	7.3 JQ	<40	<40
Nickel		100	<100	3.3 JQ	<100	<100	2.5 JB	<100	<100	<100	9.7 JQ	6 JB	2.6 JB
Potassium		5000	5250	57300	188000	24900	7190	10200	9980	25800	89300	37300	37000
Sodium		5000	4790 JQ	55900	58500	11000	7490	5560	11400	41700	73700	12900	12900
Vanadium		50	<50	1.2 JB	1.6 JB	5.2 JQ	<50	2.2 JB	1.2 JB	1.1 JB	3.8 JQ	2.3 JB	2.5 JB
Zinc		20	14.2 JQ	23.4	24.8 J	<20	<20	<20	<20	392	30.5	<20	<20
pH EPA 150.1 units													
pH (liquid)			6.8	9.1	11.8	11.7	7.3	10.9	9.6	8.9	11.8	11.3	NA
Thallium - SW846 7841 (Dissolved) µg/L													
Thallium		2	<2	<2	2.2 J	<2	<2	<2	<2	<2	<2 UL	<2	<2
Thallium - SW846 7841 (Total) µg/L													
Thallium			Not detected										
Total Alkalinity - MCAWW 310.1 mg/L													
Total Alkalinity		5	24	150	480	270	60	110	72	160	440 J	140	120
Total Organic Carbon - SW846 9060 mg/L													
Total Organic Carbon		1	0.5 JB	2 JB	2 JB	2	2	<1	<1	22	5	<1	<1
Total Sulfide - MCAWW 376.1 mg/L													
Total Sulfide		1	1.5	<1	1.9	<1	<1	<1	<1	1.2	2.2	1.2	1.2
Volatile Organic Compounds - SW846 8260B µg/L													
1,1-Dichloroethane		1	<1	<1	<50	<1	<1	<1	20	<1	<1	4	4.1
1,1-Dichloroethene		1	<1 UJ	<1 UJ	<50 UJ	<1	<1	<1	9.3	<1 UJ	<1	2.1	2.2
1,2-Dichlorobenzene		1	<1	<1	6.3 JQ	<1	<1	<1	<5	<1	<1	1.5	1.5
1,4-Dichlorobenzene		1	<1	<1	<50	<1	<1	<1	<5	<1	<1	0.21 JQ	0.2 JQ
2-Butanone		10	<10	<10	<500	<10	<10	<10	<50	2 JQ	1.8 JQ	<10	<10
2-Hexanone		10	<10	<10	<500	<10 UL	<10 UL	<10 UL	<50 UL	<10	1.7 JL	<10 UL	<10 UL
Acetone		10	<10	<10	46 JQ	6.7 JQ	0.6 JQ	0.78 JQ	<50	7.3 JB	15	2.7 JQ	2.8 JQ
Benzene		1	<1	<1	<50	<1	<1	<1	<5	<1	0.27 JQ	<1	<1
Chloroform		1	<1	<1	<50	<1	<1	<1	0.76 JB	0.28 JB	<1	<1	<1
cis-1,2-Dichloroethene		0.5	0.25 JQ	<0.5	1200	<0.5	2.5	1.6	150	<0.5	<0.5	5.3	5.5
Methylene chloride		1	<1	<1	<50	<1	<1	0.44 JQ	<5	0.52 JB	<1	<1	<1
Naphthalene		1	<1	0.24 JQ	<50	0.82 JQ	<1	<1	<5	0.74 JQ	0.82 JQ	0.82 JQ	0.82 JQ
p-Isopropyltoluene		1	<1	<1	<50	<1	<1	<1	<5	<1	<1	0.2 JQ	0.23 JQ

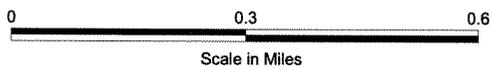
TABLE 3-5
POSITIVE RESULTS TABLE FOR GROUNDWATER - LOWER AQUIFER
 Technical Memorandum
 First Quarterly Groundwater Sampling - October 2001
 Operable Unit 7
 Defense Supply Center Richmond
 Richmond, Virginia

	Sample ID: Sample Date:	Practical (a) Quantitation Limit	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	Sample MWFTA-19 10/2/2001	Sample MWFTA-20 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	0.32 JQ	<1	<50	<1	<1	0.76 JQ	<5	<1	<1	0.4 JQ	0.4 JQ
Toluene		1	0.34 JQ	0.47 JQ	<50	0.3 JQ	0.63 JQ	0.24 JQ	1.1 JQ	0.84 JQ	0.95 JQ	0.31 JQ	0.28 JQ
trans-1,2-Dichloroethene		0.5	<0.5	<0.5	<25	<0.5	<0.5	<0.5	<2.5	<0.5	<0.5	0.16 JQ	0.18 JQ
Trichloroethene		1	0.21 JQ	<1	<50	<1	<1	0.44 JQ	7.4	<1	<1	5.4	5.5
Vinyl chloride		2	<2	<2	270	<2	<2	<2	8.4 JQ	<2	<2	0.41 JQ	0.5 JQ

J Estimated.
 JB Estimated; possibly biased high or falsepositive based on blank contamination.
 JH Estimated; possibly biased high based on QC data.
 JL Estimated; possibly biased low based on QC data.
 JQ Estimated; Value is between reporting limit and detection limit.
 NA Not Analyzed.
 R Rejected.
 UJ Undetected; Reported Detection Limit is imprecise.
 UL Undetected; Data biased low - Reported
 Detection Limit is higher than indicated.
 (a) Quantitation limits are ideal. Sample quantitation limits may vary due to sample volume/weight extracted and dilutions.
 mg/L milligram per liter
 nM/L nanamolars per liter
 µg/L microgram per liter

PREPARED/DATE: MAB 12-19-01
 CHECKED/DATE: JAH 12-20-01

FIGURES



U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE

DEFENSE SUPPLY CENTER RICHMOND
RICHMOND, VIRGINIA

TECHNICAL MEMORANDUM
FIRST QUARTERLY GROUNDWATER SAMPLING - OCTOBER 2001
**DEFENSE SUPPLY CENTER RICHMOND
AND SURROUNDING AREA**
OU 7 FIRE TRAINING AREA

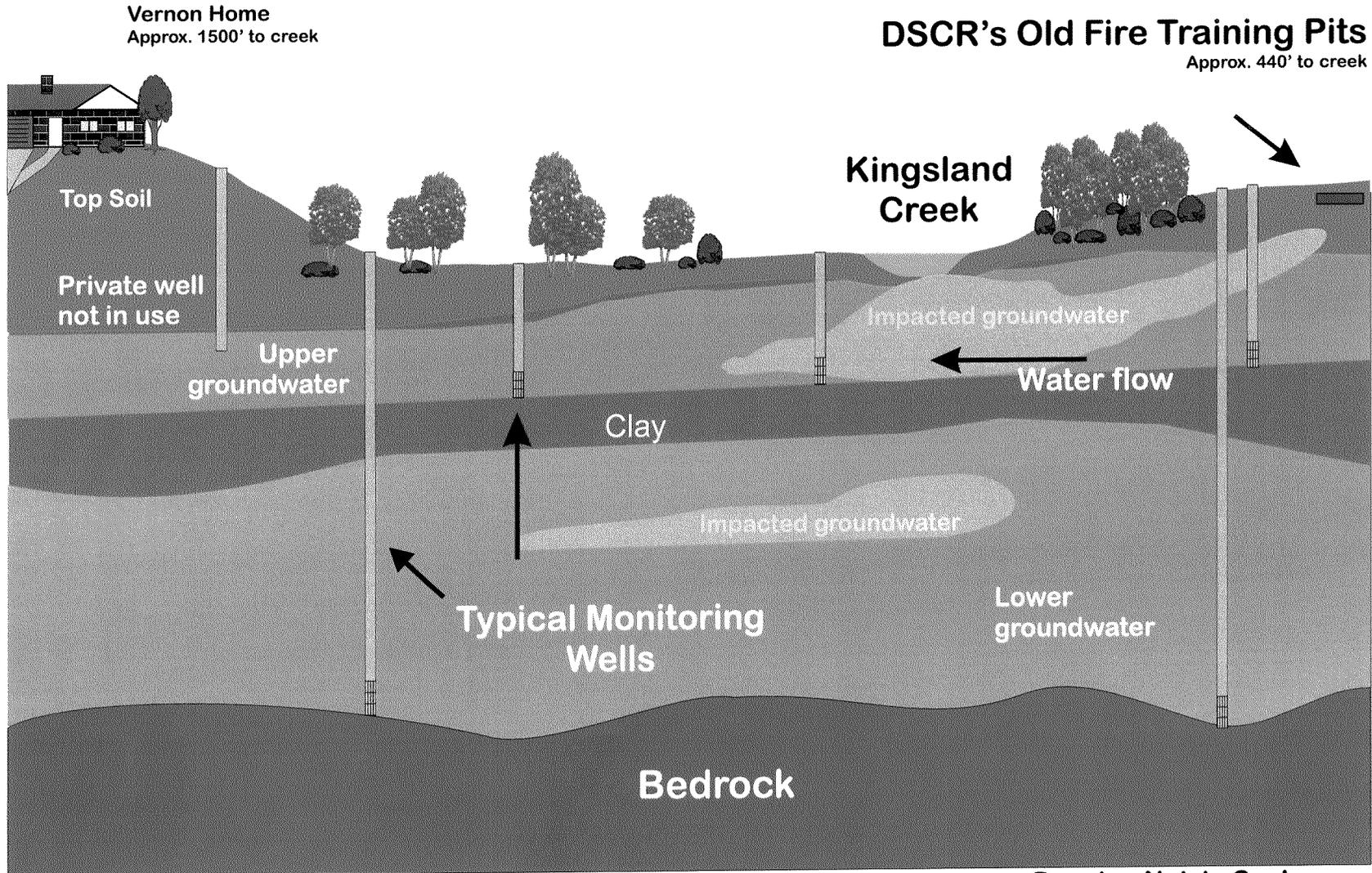
PREPARED BY/DATE:
CLC 1-18-02
CHECKED BY/DATE:
EMM 1-18-03
PROJECT NO.
12001-1-1632

FIGURE
NUMBER:
1-1

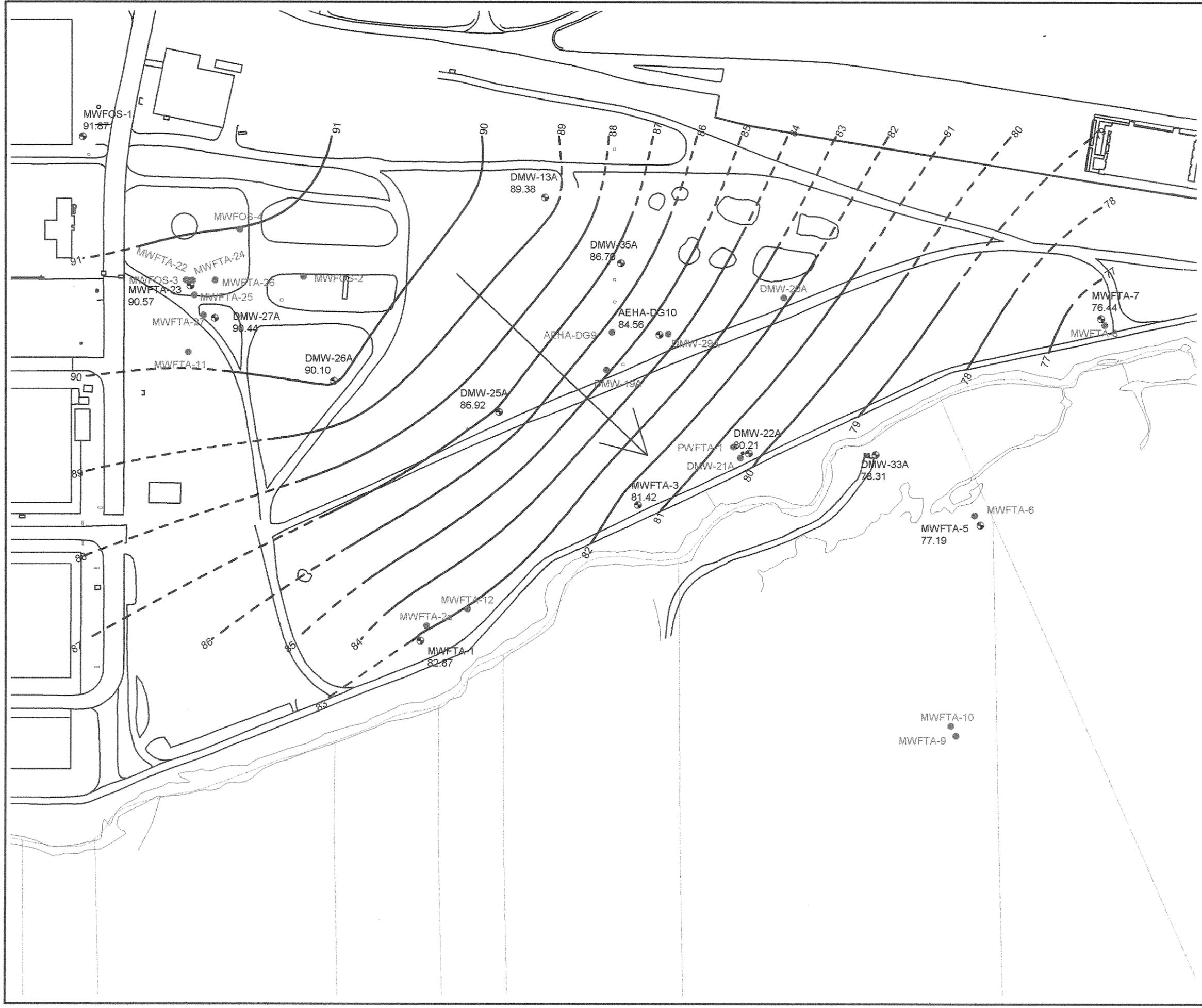
PLOT DATE:
01/18/02
FILE DATE:
01/18/02
FILE NAME:
dscr_sites.apr

FIGURE 1-2

FIRE TRAINING AREA GROUNDWATER CONCEPTUAL SITE MODEL
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond

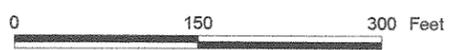


Drawing Not to Scale

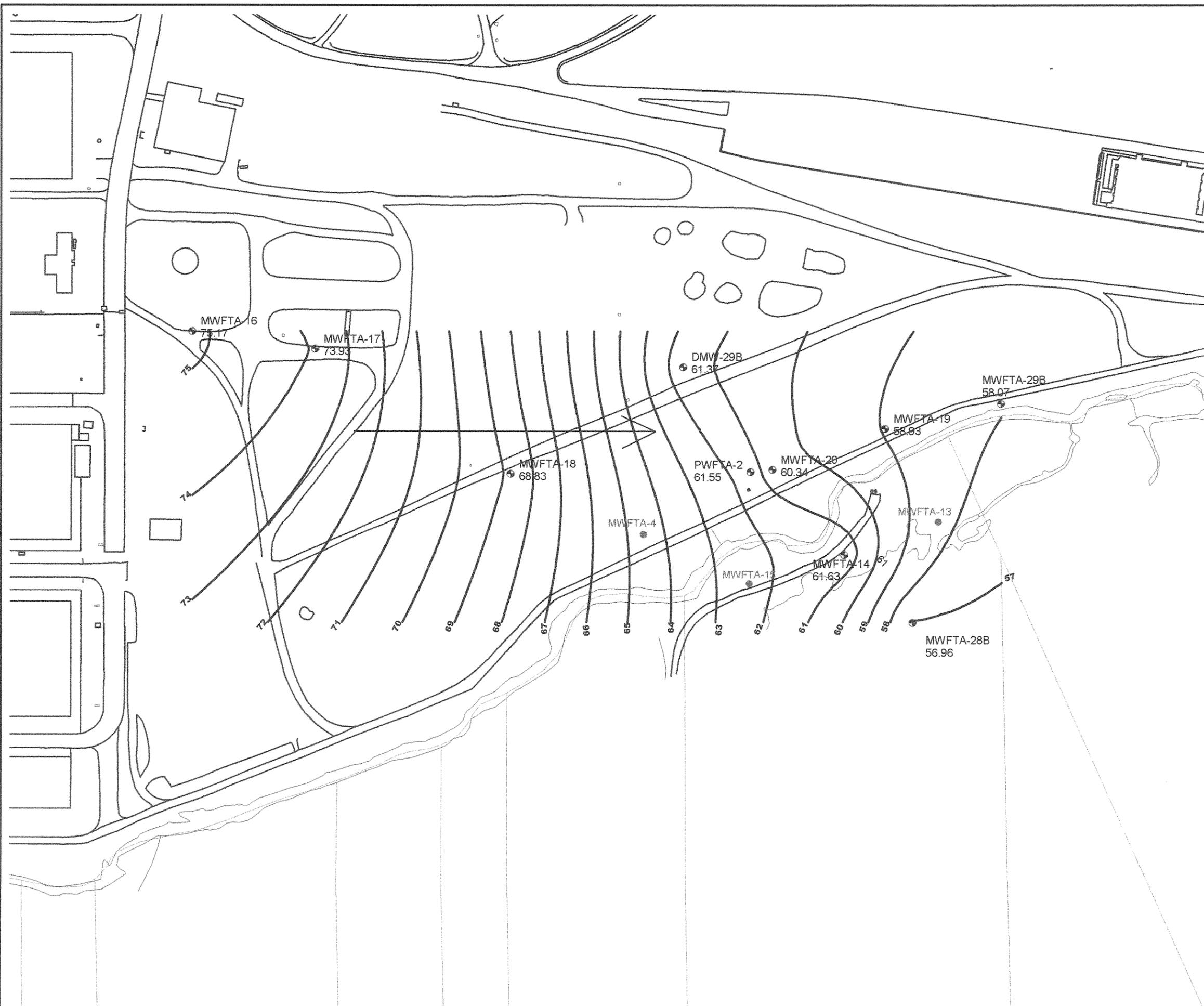


- LEGEND:**
- DMW-35A 86.79 ● MONITORING WELL LOCATION, ID AND STATIC WATER LEVEL ELEVATION
 - MWFTA-6 ● MONITORING WELL LOCATION (NOT SAMPLED)
 - BASE MAP
 - ▭ CITY PROPERTY PARCEL
 - POTENTIOMETRIC CONTOUR (FT.)
 - - - EXTRAPOLATED POTENTIOMETRIC CONTOUR (FT.)
 - GROUNDWATER FLOW DIRECTION

- Notes:**
1. Static water levels were measured during September 17 & 18, 2001.
 2. Static water level elevations are in feet with reference to the mean sea level.



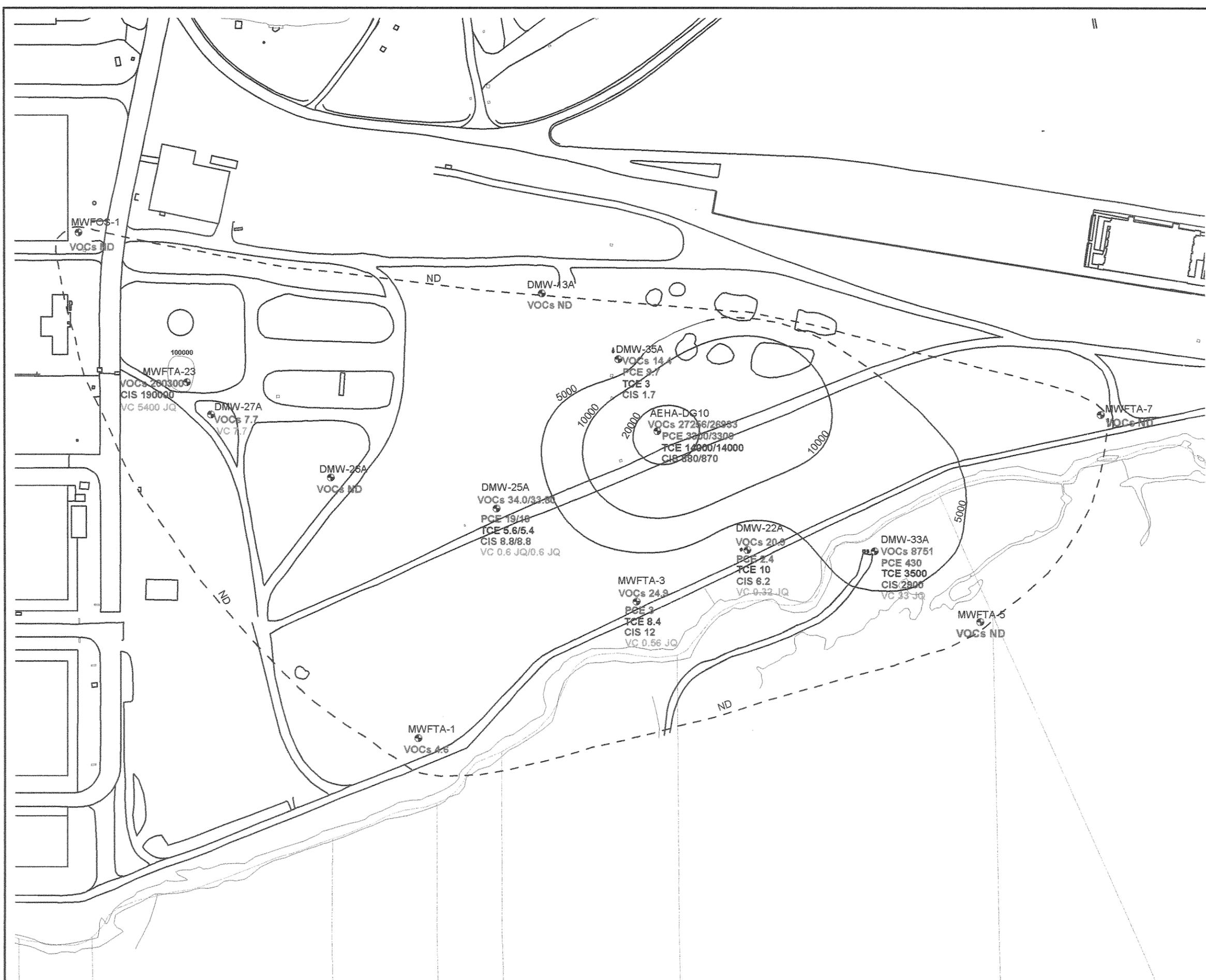
US ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE		
DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
TECHNICAL MEMORANDUM FIRST QUARTERLY GROUNDWATER SAMPLING - OCTOBER 2001		
POTENTIOMETRIC SURFACE MAP OF THE UPPER AQUIFER - SEPTEMBER 2001 OU 7 FIRE TRAINING AREA		
PREPARED BY: <i>CLC 1-22-02</i>	FIGURE NUMBER: 3-1	FILE DATE: 12/14/01
CHECKED BY: <i>GPP 1-22-02</i>		PLOT DATE: 1/22/02
PROJECT NO. 12001-1-1832		FILE NAME: techmemOU7.apr



- LEGEND:**
- DMV-29B 61.37 MONITORING WELL LOCATION, ID AND STATIC WATER LEVEL ELEVATION
 - MWFTA-13 MONITORING WELL LOCATION (NOT SAMPLED)
 - BASE MAP
 - CITY PROPERTY PARCEL
 - POTENTIOMETRIC CONTOUR (FT.)
 - GROUNDWATER FLOW DIRECTION
- Notes:**
1. Static water levels were measured during September 17 & 18, 2001.
 2. Static water level elevations are in feet with reference to the mean sea level.



US ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE		
DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
TECHNICAL MEMORANDUM FIRST QUARTERLY GROUNDWATER SAMPLING - OCTOBER 2001 POTENTIOMETRIC SURFACE MAP OF THE LOWER AQUIFER - SEPTEMBER 2001 OU 7 FIRE TRAINING AREA		
PREPARED BY: <i>ChC</i>	FIGURE NUMBER: 3-2	FILE DATE: 12/14/01
CHECKED BY: <i>GPP</i>		PLOT DATE: 1/16/02
PROJECT NO. 12001-1-1632		FILE NAME: techmem0117.apr



LEGEND:

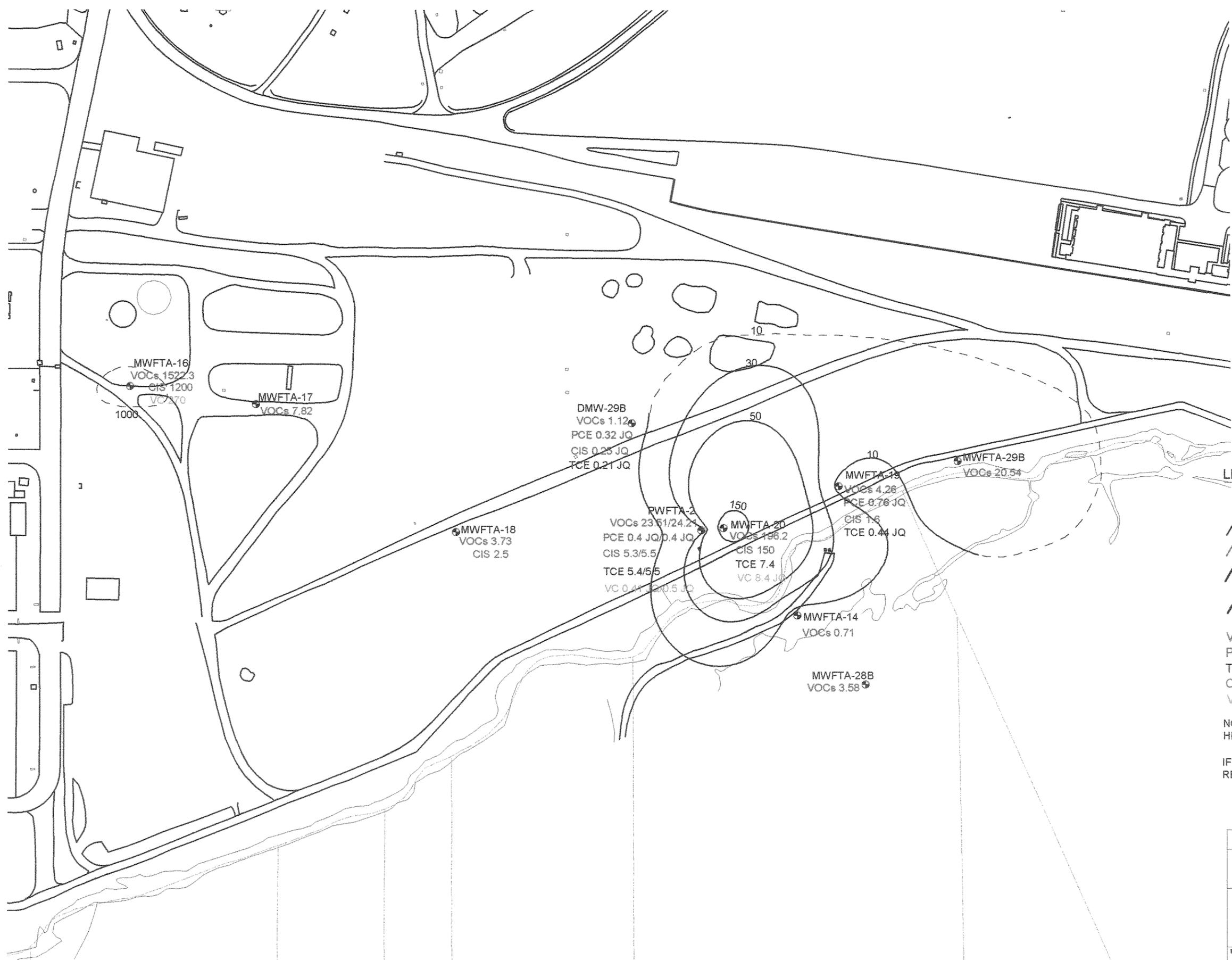
- MONITORING WELL LOCATION AND ID
 - BASE MAP
 - CITY PROPERTY PARCEL
 - TOTAL VOC CONCENTRATIONS IN GROUNDWATER (ug/L)
 - EXTRAPOLATED TOTAL VOC CONCENTRATIONS IN GROUNDWATER (ug/L)
- VOCs = Total Volatile Organic Compounds
 ND = No Detected Over Reporting Limit
 PCE =Tetrachloroethene (ug/L)
 TCE =Trichloroethene (ug/L)
 CIS = cis-1,2-Dichloroethene (ug/L)
 VC = Vinyl Chloride (ug/L)

NOTE: TOTAL VOC CONTOURS CALCULATED USING THE HIGHER VALUE BETWEEN SAMPLE AND DUPLICATE.

IF A DUPLICATE SAMPLE WAS COLLECTED, RESULTS ARE SHOWN AS ORIGINAL/DUPLICATE



US ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE		
DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
TECHNICAL MEMORANDUM FIRST QUARTERLY GROUNDWATER SAMPLING - OCTOBER 2001 VOLATILE ORGANIC COMPOUNDS IN THE UPPER AQUIFER - OCTOBER 2001 OU 7 FIRE TRAINING AREA		
PREPARED BY: <i>ELC 1-22-02</i>	FIGURE NUMBER: 3-3	FILE DATE: 1/08/02
CHECKED BY: <i>WNV 1-22-02</i>		PLOT DATE: 1/18/02
PROJECT NO. 12001-1-1632		FILE NAME: techmemOU7.apr



LEGEND:

- MONITORING WELL LOCATION AND ID
- ▭ BASE MAP
- ▭ CITY PROPERTY PARCEL
- ▭ TOTAL VOC CONCENTRATIONS IN GROUNDWATER (ug/L)
- ▭ EXTRAPOLATED TOTAL VOC CONCENTRATIONS IN GROUNDWATER (ug/L)

VOCs = Total Volatile Organic Compounds
 PCE = Tetrachloroethene (ug/L)
 TCE = Trichloroethene (ug/L)
 CIS = cis-1,2-Dichloroethene (ug/L)
 VC = Vinyl Chloride (ug/L)

NOTE: TOTAL VOC CONTOURS CALCULATED USING THE HIGHER VALUE BETWEEN SAMPLE AND DUPLICATE.

IF A DUPLICATE SAMPLE WAS COLLECTED, RESULTS ARE SHOWN AS ORIGINAL/DUPLICATE



US ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE		
DEFENSE SUPPLY CENTER RICHMOND RICHMOND, VIRGINIA		
TECHNICAL MEMORANDUM FIRST QUARTERLY GROUNDWATER SAMPLING - OCTOBER 2001 VOLATILE ORGANIC COMPOUNDS IN THE LOWER AQUIFER - OCTOBER 2001 OU 7 FIRE TRAINING AREA		
PREPARED BY: <i>CLC 1-23-02</i>	FIGURE NUMBER: 3-4	FILE DATE: 1/4/02
CHECKED BY: <i>WNV 1-22-02</i>		PLOT DATE: 1/17/02
PROJECT NO. 12001-1-1632		FILE NAME: techmemOU7.apr

APPENDIX A
FIELD SAMPLING REPORTS

Location DSCR - OU7 Identify Measuring Point (MP): TCC
 Site Name (eg. Top of Casing)

Well ID: MWFTA-5 Depth to Screen below MP: 10.80' of screen 15.80' of screen
 Field Sampling Personnel: LORETTA MARKHAM Top
CHARLETTE CLARK Bottom
 Pump Intake at (ft. below MP): 13.80
 Purging Device (Pump Type): PERISTALTIC BLADDER PUMP

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		Ferrous Iron mg/L	Redox Potential mV	Comments
										(high)	(low)			
10/2/01	1125	8.77		300		15.73	0.104	5.44	0.36				154	(cloudy (yellow tint))
10/3/01	1135	8.77		300		15.72	0.092	5.48	0.00				126	H ₂ O Cleared up some
10/8/01	1145	8.77		300		15.75	0.088	5.50	0.00				99	
10/8/01	1155	8.77		300		15.78	0.089	5.50	0.00				89	
10/8/01	1205	8.79		300		15.84	0.086	5.49	0.00				80	
10/8/01	1215	8.79		300		15.88	0.086	5.48	0.00				74	
10/8/01	1225	8.79		300		15.86	0.085	5.48	0.00				70	
10/8/01	1235	8.70		300		15.87	0.085	5.48	0.00				69	
	1740										3	0.60		

1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)
 USE FIELD SAMPLING REPORT FORM TO DOCUMENT SAMPLE COLLECTION

FIELD SAMPLING REPORT

JOB NO. 12001-1000
 JOB NAME DSCR MNA - OU 7
 DATE 10/08/01 TIME 16:15
 SAMPLING POINT DMW-33A
 (LOCATION)
 DEPTH _____

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

No odor

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: C. Clark, L. Markham SAMPLING OBSERVED BY: _____

DISCREPANCIES: _____

cation DSCR - OU 7 Site Name Identify Measuring Point (MP): Tox
 (eg. Top of Casing)

Well ID: DMW-33A Depth to Screen below MP: 7.44 of screen 17.44 of screen
 (Top Bottom)
 Field Sampling Personnel: L. Markham
C. Clark Pump Intake at (ft. below MP): 15.44
 Purging Device (Pump Type): BLADDER pump

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		Ferrous Iron mg/L	Redox Potential mV	Comments
										(high)	(low)			
1/8/01	1445	7.05		100		18.66	0.234	5.06	2.37				98	cloudy
1/8/01	1455	7.05		100		18.34	0.234	5.07	1.03				87	
1/8/01	1505	7.05		100		18.05	0.236	5.07	0.13				84	
1/8/01	1515	7.06		100		17.94	0.235	5.06	1.47				80	
1/8/01	1525	7.09		100		17.84	0.235	5.06	3.50				78	
1/8/01	1535	7.10		100		17.73	0.235	5.06	3.97				76	
1/8/01	1545	7.10		100		17.65	0.235	5.05	4.25				75	
1/8/01	1555	7.10		100		17.65	0.235	5.05	4.35				74	
1/8/01	1605	7.10		100		17.67	0.235	5.06	4.38				74	clean water
	1740										3	3.50		
<i>C. Clark</i>														

FIELD SAMPLING REPORT

JOB NO. 12001-1-1655
 JOB NAME DSCR MNA - OU 7
 DATE 10/8/01 TIME 1415
 SAMPLING POINT MWFTA-20B
 (LOCATION)
 DEPTH _____

SAMPLE INFORMATION

SAMPLE I.D. NO.: MWFTA-20B

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
0.8 gallons

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: Lance Greenhaw SAMPLING OBSERVED BY: [Signature]
 DISCREPANCIES: _____

Location DSCR - OU-7 Identify Measuring Point (MP): TOC
 Site Name (eg. Top of Casing)

Well ID: MWETA-28B Depth to Screen below MP: 61.32' of screen 71.32' of screen
 Field Sampling Personnel: Chris Williams Loane Greenham Top Bottom
 Pump Intake at (ft. below MP): 69.32
 Purging Device (Pump Type): BLADDER PUMP

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		Ferrous Iron mg/L	Redox Potential mV	Comments	
										(high)	(low)				
10/2/01	1140	28.79		60	.05	14.26	.852	7.14	1.29				-123	436	Turb.
	1150	30.10		60	.10	14.11	.695	6.81	.49				-114	270	
	1200	31.21		60	.15	14.09	.679	6.82	.29				-115	212	
	1210	32.12		60	.20	14.08	.663	6.98	.13				-120	151	
	1220	- Empty		Horiba Cell											
	1240	33.03		60	.3	14.26	.59	6.94	.89				-108	43.6	
	1250			60	.6	14.24	.588	6.87	.60				-109	32.7	
	1300			60	.7	14.29	.579	6.92					-116	26.8	
	1340			60	.8	14.52	.543	7.01	.57				-124	15	
	1415	Sample Time													
	1740										2	0			

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)
 USE FIELD SAMPLING REPORT FORM TO DOCUMENT SAMPLE COLLECTION

FIELD SAMPLING REPORT

JOB NAME DSCR MNA - OU 7
 DATE 10-9-01 TIME 1120
 SAMPLING POINT MWF05-1
 (LOCATION)
 DEPTH _____

SAMPLE INFORMATION SAMPLE I.D. NO.: MWF05-1

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	3	HCl to pH<2; Cool to 4°C	VOCs by SW8260B
VOA Vial	40 ml	3	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION WEATHER clear, cool AIR TEMPERATURE 45°

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, L. Barlow SAMPLING OBSERVED BY: _____
 DISCREPANCIES: _____

Location DSCR - OU7 - FTA
 Site Name

Identify Measuring Point (MP): TOC
 (eg. Top of Casing)

Well ID: MWFOS-1
 Field Sampling Personnel: Robert Forister
Lauren Barlow

Depth to Screen below MP: 21.69' of screen 26.59' of screen
 Top Bottom
 Pump Intake at (ft. below MP): 24.59'
 Purging Device (Pump Type): BLADDER PUMP

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		Ferrous Iron mg/L	Redox Potential mV	Comments	
										(high)	(low)			TURB	PID
0-9-01	0930		30 psi	250		18.08	0.148	6.20	2.64				92	9.8	1.3
	0940		20 psi	100		18.72	0.146	6.18	1.32				82	4	1.1
	950					19.50	0.146	6.19	1.10				76	0	
	1000					20.11	0.144	6.17	.80				72	0	
	1010					20.56	0.146	6.15	.65				69	0	
	1020					20.78	0.146	6.15	.63				65	0	
	1030					21.06	0.146	6.14	.48				61	0	
	1040					21.26	0.145	6.14	.44				59	0	
	1050					21.53	0.145	6.13	.44				57	0	
	1610										2	0.50			Sampled at 1120 Couldn't get a H2O level b/c water was below the pump

FIELD SAMPLING REPORT

JOB NO. 12001-1-1033
 JOB NAME DSCR MNA - OU 7
 DATE 10/9/01 TIME 0915
 SAMPLING POINT MWFTA-14
 (LOCATION)
 DEPTH _____

SAMPLE INFORMATION SAMPLE I.D. NO.: MWFTA-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	HCl to pH<2; Cool to 4°C	VOCs by SW8260B
VOA Vial	40 ml	3	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

purged 1 gallon

GENERAL INFORMATION WEATHER Clear, Sunny AIR TEMPERATURE 38° 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: Bill Ware SAMPLING OBSERVED BY: [Signature]
 DISCREPANCIES: _____

Location DSCR - 047 Identify Measuring Point (MP): FOC
 Site Name (eg. Top of Casing)

Well ID: MWFTA-14 Depth to Screen below MP: 38.92' of screen 40.92' of screen
 Field Sampling Personnel: Chris Williamson Top Bottom
Bill Vaire Pump Intake at (ft. below MP): 38.92'
 Purging Device (Pump Type): BLADDER PUMP

Date	Time	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		Ferrous Iron mg/L	Redox Potential mV	Comments
										(high)	(low)			
10/9/01	1510	23.57		90	.1	15.78	.572	11.02	6.78				25	999
	1520	23.58		90	.2	15.73	.479	10.01	5.70				15	999
	1530	23.61		90	.3	15.71	.472	9.98	5.69				9	999
	1540													
	1550	23.69		90	.5	15.70	.459	9.89	1.07				10	251
	1600	23.70		90	.6	15.71	.445	9.82	1.05				10	113
	1610	23.72		90	.7	15.64	.439	9.81	1.08				9	65
	1620	23.77		90	.8	15.65	.424	9.81	1.07				12	68
	1630	23.81		90	1.0	15.62	.439	9.82	1.09				12	4
10/9/01	1610									3	0.0			

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)
 USE FIELD SAMPLING REPORT FORM TO DOCUMENT SAMPLE COLLECTION

FIELD SAMPLING REPORT

JOB NO. 1200741033
 JOB NAME DSCR MNA - OU 7
 DATE 10/9/01 TIME 12:10
 SAMPLING POINT MWFTA-16
 (LOCATION)
 DEPTH _____

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	HCl to pH<2; Cool to 4°C	VOCs by SW8260B
VOA Vial	40 ml	3	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
Total purged - 5 gal @ end of sampling. No odor. Slightly orange color.

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION WEATHER Sunny AIR TEMPERATURE 65°

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: LG SAMPLING OBSERVED BY: KOA
 DISCREPANCIES: _____

Location DSCR - 047 Site Name Identify Measuring Point (MP): TOC
 (eg. Top of Casing)

Well ID: MWFTA-16 Depth to Screen below MP: 47.23' of screen 52.23' of screen
 Field Sampling Personnel: K. Adams Top Bottom
L. Greenhaw Pump Intake at (ft. below MP): 50.23'
 Purging Device (Pump Type): RED BLADDER PUMP

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		Ferrous Iron mg/L	Redox Potential mV	Turb NTU	Comments
										(high)	(low)				
10/9/01	1000	32.62		145		19.74	7.02	10.69	6.50				-123	-0.0	
	1010	33.78		145		19.91	6.72	10.80	3.85				-143	40.8	
	1020	34.55		90		20.15	6.51	10.93	3.64				-148	50.0	
	1030	35.20		90		20.54	6.34	10.96	3.60				-151	36.4	
	1048	36.38		45		19.88	5.89	10.86	3.60				-156	33.6	
	1058	36.40		45		20.52	5.75	10.97	3.49				-157	34.0	
	1108	36.41		45		20.88	5.68	11.05	3.48				-156	35.3	
	1132	36.40		45		21.20	5.22	11.04	3.68				-162	35.5	
	1142	36.60		45		21.41	5.06	11.11	3.45				-164	35.2	
	1152	36.62		45	~3.5 gal	21.46	4.93	11.13	3.35				-165	45.5	
	1610										7	0.0			

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)
 USE FIELD SAMPLING REPORT FORM TO DOCUMENT SAMPLE COLLECTION

FIELD SAMPLING REPORT

JOB NO. 12001-1-1033
 JOB NAME DSCR MNA - OU 7
 DATE 10/9/01 TIME 10:45
 SAMPLING POINT MWFTA-23
 (LOCATION)
 DEPTH _____

SAMPLE INFORMATION

SAMPLE I.D. NO.: MWFTA-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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

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: CHARLETTE CLARK
LORETTA MARCHAM SAMPLING OBSERVED BY: _____
 DISCREPANCIES: _____

Location DSCR - 007 12001-1-1633
 Site Name

Identify Measuring Point (MP): ToC
 (eg. Top of Casing)

Well ID: MWFTA-23
 Field Sampling Personnel: CHARLOTTE CLARK
LORETTA MACKHAM

Depth to Screen below MP: 7.98' of screen 36.98' of screen
 Top Bottom
 Pump Intake at (ft. below MP): 34.98'
 Purging Device (Pump Type): BLANDED Pump

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		Ferrous Iron mg/L	Redox Potential mV	Comments
										(high)	(low)			
2/9/01	0820	12.75		140		16.54	0.495	4.70	1.79				112	VERY ODOROUS, SULFUR
2/9/01	0830	12.75		140		16.50	0.506	4.64	11.15				103	SMELL, CLOUDY
2/9/01	0840	12.75		140		17.25	0.506	4.64	12.18				96	
2/9/01	0850	12.75		140		17.62	0.500	4.63	8.41				91	
2/9/01	0900	12.75		140		17.83	0.494	4.64	0.74				87	
2/9/01	0910	12.77		140		18.28	0.490	4.65	0.31				84	
2/9/01	0920	12.77		140		18.60	0.487	4.66	0.00				82	
2/9/01	0930	12.73		140		18.96	0.485	4.66	0.43				80	
2/9/01	0940	12.71		140		19.12	0.481	4.67	0.29				78	
2/9/01	0950	12.77		140		19.33	0.476	4.67	0.07				77	
2/9/01	1000	12.77		140		19.71	0.473	4.67	0.00				76	
2/9/01	1010	12.77		140		19.87	0.468	4.68	0.00				75	
2/9/01	1020	12.77		140		20.10	0.460	4.67	0.00				75	
	1610										0	4.6		

FIELD SAMPLING REPORT

JOB NO. 12001-F-1033
 JOB NAME DSCR MNA - OU 7
 DATE 10/10/01 TIME 820
 SAMPLING POINT DMW-29B
 (LOCATION)
 DEPTH _____

SAMPLE INFORMATION

SAMPLE I.D. NO.: DMW-29B

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
no odor, slight yellowish color

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION

WEATHER Clear, Cold AIR TEMPERATURE 40° 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: L. Barkow, R. Forister SAMPLING OBSERVED BY: _____

DISCREPANCIES: _____

Location DSCR - 007 - FTA Identify Measuring Point (MP): TOC
 Site Name (eg. Top of Casing)

Well ID: DMW 29B Depth to Screen below MP: ^{unknown} ~~57.38~~ of screen ^{50.40'} ~~69.38~~ of screen
 Field Sampling Personnel: Lauren Barlow Top Bottom
Robert Forister Pump Intake at (ft. below MP): ~~57.38~~ 48.40'
 Purging Device (Pump Type): BLADDER PUMP

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		Ferrous Iron mg/L	Redox Potential mV	Comments <i>Turbidity</i>
										(high)	(low)			
10-9-01	8:10	35.3	40 psi	300		14.59	0.063	5.40	1.11				136	155
	8:20	45.18	40 psi			14.46	0.062	5.35	0.40				156	25.0
	8:30		35 psi	175		13.49	0.062	5.24	0.30				172	15.0
	8:40					12.30	0.062	5.22	0.51				177	11.5
	8:50					13.14	0.061	5.24	0.42				155	12.8
	9:00													Well ran dry, left at 9:00 will return to sample after well recharges
														Returned to well at 1350, only recharged to 41.1', did not sample.
10-10-01														Returned to well on 10-10-01 and sampled at 820.
	1500										4	0		

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)
 USE FIELD SAMPLING REPORT FORM TO DOCUMENT SAMPLE COLLECTION

FIELD SAMPLING REPORT

JOB NAME DSCR MNA - OU 7
 DATE 10/1/01 TIME 1150
 SAMPLING POINT MWFTA - 7
 (LOCATION)
 DEPTH 10.35 ft BTOC

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
Approx 7 gal. purged. Clear for the most part.
Suspended sediment at first. No odor

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: K. Adams / T. Nidetzky SAMPLING OBSERVED BY: _____

DISCREPANCIES: _____

cation DSCR -

047

Site Name

Identify Measuring Point (MP): TOC
(eg. Top of Casing)

Well ID:

MWFJA-7

Depth to Screen below MP: 12.25' of screen 17.15' of screen
Top Bottom

Field Sampling Personnel:

K. ADAMS
T. NICHOLS

Pump Intake at (ft. below MP): 15.15'
Purging Device (Pump Type): BLADDER PUMP

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		Ferrous Iron mg/L	Redox Potential mV	TURBIDITY NTU	Comments
										(high)	(low)				
11/01	1020	10.35													
	1040	10.38		300		19.14	0.180	4.12	1.48				353	18.2	
	1050	10.38		300		18.87	0.168	4.09	0.89				372	5.4	
	1100			300		18.62	0.164	4.07	7.07				384	3.0	
	1110			300		18.55	0.163	4.04	1.10				389	1.8	
	1120			300		18.47	0.161	4.03	1.09				393	6.8	
	1130	10.38		300		18.54	0.160	4.05	0.90				384	8.0	
	1140	10.38		300		18.69	0.160	4.08	0.82				389	10.7	
	1700										3	0			

Ground Water Sampling Log

Project DCR Site OU-7 Well No. MWFTA-7 Date 10/1/01
 Well Depth ? Screen Length ? Well Diameter 2" Casing Type PVC
 Sampling Device GED Red. Bladder Sampling type Teflon-lined PE Water Level 10.35ft
 Measuring Point BtC Other Infor

Sampling Personnel K. Adams / T. Nichols

Time	pH	Temp	Cond.	Dis.O ₂	Turb.	[] Conc	ORP	PID	Notes
1140	4.12	19.14	0.180	1.48	18.2		353	0.0	
1150	4.09	18.87	0.168	0.89	5.4		372	0.0	
1100	4.07	18.62	0.164	7.07	3.0		384	0.0	
1110	4.04	18.55	0.163	1.10	1.8		389	0.0	4oriba top
1120	4.03	18.47	0.161	1.09	6.8		393	0.0	seal not
1130	4.05	18.54	0.160	0.90	8.0		384	0.0	tight. Air
1140	4.08	18.69	0.160	0.82	10.7		389	0.0	entering
									horiba...
									DO flux +
									Turb flux
									attributed
									to air.
									Miguel
									gave OK
									to sample
									based on
									readings.

Type of Samples Collected

Information: 2 in = 617 ml/ft, 4 in = 2470 ml/ft: Vol_{cyl} = πr²h, Vol_{sphere} = 4/3πr³

FIELD SAMPLING REPORT

JOB NO. 12001-1-1055
 JOB NAME DSCR MNA - OU 7
 DATE 10/01/01 TIME 1230
 SAMPLING POINT PWFTA-2
 (LOCATION)
 DEPTH _____

SAMPLE INFORMATION SAMPLE I.D. NO.: PWFTA-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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME; SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME; SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION WEATHER Clear to P. Cloudy AIR TEMPERATURE ~ 65°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: R. Forister
 DISCREPANCIES: _____

FIELD SAMPLING REPORT

JOB NAME DSCR MNA - OU 7
 DATE 10/01/01 TIME 1230
 SAMPLING POINT PWFTA-2QA
 (LOCATION)
 DEPTH QA Split

SAMPLE INFORMATION SAMPLE I.D. NO.: PWFTA-2QA

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION

WEATHER Clear to P. Cloudy AIR TEMPERATURE 65°F
 SAMPLES SHIPPED TO: CEMRD - Omaha, NE
 SPECIAL HANDLING: FedEx
 MODE OF SHIPMENT: CAR/TRUCK BUS PLANE COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: C. Clark SAMPLING OBSERVED BY: P. Forister
 DISCREPANCIES: _____

FIELD SAMPLING REPORT

JOB NO. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/01/01 TIME 1200
 SAMPLING POINT OU7DUP-3
 (LOCATION)
 DEPTH Dup of PWFTA-2

SAMPLE INFORMATION

SAMPLE I.D. NO.: OU7DUP-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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION

WEATHER Clear + P. Cloudy AIR TEMPERATURE 65°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: R. Forster

DISCREPANCIES: _____

Location DSCR - 007 Identify Measuring Point (MP): T.O.C.
 Site Name _____ (eg. Top of Casing)

Well ID: PWFTA-2 Depth to Screen below MP: 27.09' of screen 42.09' of screen
 Field Sampling Personnel: ROBERT FORBSTER Top
CHARLETTE CLARK Bottom
 Pump Intake at (ft. below MP): 40.09'
 Purging Device (Pump Type): BLA0052 pump

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		Ferrous Iron mg/L	Redox Potential mV	Turb.	Comments
										(high)	(low)				
09/01/01	1055	24.80		300		14.82	1.01	10.91	4.44				118	45.1	1' drawdown, decrease flow
10/01/01	1105	25.18		200		14.89	1.00	10.96	2.91				82	5.7	
10/01/01	1115	25.73		200		14.73	1.00	11.02	2.66				28	4.0	
10/01/01	1125		5.5/2.5 4	120		14.82	1.00	11.03	2.63				-9	2.5	
10/01/01	1135	26.08	4	120		14.98	1.00	11.03	2.68				-27	2.4	pid 0.0 for all the above
10/01/01	1145		4	120		15.10	1.00	11.02	2.76				-33	2.4	
10/01/01	1155	26.05	4	120		15.20	0.99	11.01	2.67				-36	2.5	drawdown ceased
	1700										4	0			

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)
 USE FIELD SAMPLING REPORT FORM TO DOCUMENT SAMPLE COLLECTION

FIELD SAMPLING REPORT

JOB NO. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10-1-01 TIME 1300
 SAMPLING POINT MWFTA-29B
 (LOCATION)
 DEPTH _____

SAMPLE INFORMATION SAMPLE I.D. NO.: MWFTA-29B MS/MSD

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	<i>qst</i> 19	HCl to pH<2; Cool to 4°C	VOCs by SW8260B
VOA Vial	40 ml	<i>qst</i> 19	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	a 3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	<i>qst</i> 13	ZnAcetate & NaOH; Cool to 4°C	Sulfide by E376.1
Poly	250 ml	<i>qst</i> 13	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	<i>qst</i> 13	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 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION

WEATHER Clear AIR TEMPERATURE 70°

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: *[Signature]* SAMPLING OBSERVED BY: *[Signature]*

DISCREPANCIES: _____

Location DSCR - OU7 Identify Measuring Point (MP): TOC
 Site Name (eg. Top of Casing)

Well ID: MWFTA-25B Depth to Screen below MP: 59.38' of screen 69.38' of screen
 Field Sampling Personnel: Chris Willigerson Bill Wore Top Bottom
 Pump Intake at (ft. below MP): 67.38'
 Purging Device (Pump Type): BL200EA pump

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		Ferrous Iron mg/L	Redox Potential mV	Turb NTUs	Comments
										(high)	(low)				
7/0/1	1040	23.71		50	.07	17.7	2.92	12.98	4.39				-116	130	
	1050	24.64		↓	.13	17.1	2.59	12.98	2.75				-122	990	
	1100	25.56		↓	.20	16.8	2.56	13.00	1.54				-126	990	
	1110	26.75		↓	.26	16.6	2.55	13.04	0.69				-132	990	
	1120	28.01		↓	.30	16.4	2.53	13.06	0.40				-136	990	
	1130	29.24		45	.34	16.4	2.51	13.07	0.33				-137	960	
	1140	30.19		↓	.40	16.5	2.54	13.04	0.32				-128	19	
	1150	31.41		↓	.45	16.6	2.50	13.05	0.35				-127	23	
	1200	32.61		↓	.50	16.8	2.48	13.04	0.36				-125	24	
	1210	33.91		↓	.58	16.8	2.43	13.04	0.34				-120	38	
	1230	—		↓	.63	16.9	2.32	12.98	0.38				-93	23	
✓	1240	36.16		↓	.70	16.9	2.40	13.00	0.41				-113	39	
	1700										3	0			

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)
 USE FIELD SAMPLING REPORT FORM TO DOCUMENT SAMPLE COLLECTION

FIELD SAMPLING REPORT

JOB NO. 12001-1-1033
 JOB NAME DSCR MNA - OU 7
 DATE 10/2/01 TIME 0900
 SAMPLING POINT MWFTA-18
 (LOCATION)
 DEPTH to water: 28.85 FT. BTOK

SAMPLE INFORMATION SAMPLE I.D. NO.: MWFTA-18

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

Purged the well on 10/1/01 & Parameters stabilized.

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION WEATHER Clear ~ 70 °F 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: G. Puvvada/L. Markham SAMPLING OBSERVED BY: G. Puvvada

DISCREPANCIES: _____

FIELD SAMPLING REPORT

JOB No. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/2/01 TIME 0915
 SAMPLING POINT MWFTA-17
 (LOCATION)
 DEPTH initial 26.50' BTOC

SAMPLE INFORMATION

SAMPLE I.D. NO.: MWFTA-17

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

clear, purged @ 75ml/min + 65ml/min. Lots of drawdown purged on 10/1/01 and 10/2/01. Removed about 4 gallons.

GENERAL INFORMATION

WEATHER sunny & clear

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: KCA

SAMPLING OBSERVED BY: JLN

DISCREPANCIES: _____

Location DSCR - OU7 Identify Measuring Point (MP): TOC
 Site Name (eg. Top of Casing)

Well ID: MWF1A-17 Depth to Screen below MP: 46.85' of screen 51.85' of screen
 Field Sampling Personnel: K. ADAMS T. NICHOLS Top Bottom
 Pump Intake at (ft. below MP): 49.85'
 Purging Device (Pump Type): DLROBE Pump

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		Ferrous Iron mg/L	Redox Potential mV	TURBIDITY NTU	Comments
										(high)	(low)				
10/1/01	1450	25.88													
	1548	28.40		75											
	1551	29.28'		75		21.07	1.90	11.96	8.38				-106	7.0	
	1601	30.61		75		21.40	1.90	11.95	7.88				-104	8.4	
	1611	31.69'		75		20.61	1.88	11.97	7.96				-99	18.1	
	1629	33.45		80		19.74	1.88	12.01	9.63				-95	7.3	
	1639	34.42'		80		19.95	1.86	12.01	9.17				-95	11.8	
10/2/01	0825	28.97'		80		18.18	1.88	11.91	9.12				-61	5.0	
	0835	29.91'		80		18.13	1.84	11.93	8.18				-86	5.0	
	0845	30.66'		80		18.31	1.82	11.94	7.68				-98	5.0	
	0855	31.24'		80		18.53	1.78	11.94	7.35				-101	5.0	
	0905			80		18.93	1.76	11.94	7.16				-103	3.5	
	0915	33.30'		80		19.59	1.75	11.93	6.97				-105	2.6	
	1705										b	0			

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)
 USE FIELD SAMPLING REPORT FORM TO DOCUMENT SAMPLE COLLECTION

Ground Water Sampling Log

Project DSCR Site OU7 Well No. MWFTA-17 Date 10/1/01 - 10/2/01
 Well Depth _____ Screen Length _____ Well Diameter 2" Casing Type PVC
 Sampling Device QED Tubing type flex-lined PE Water Level 25.88' on 10/1/01
 Measuring Point BTOC Other Infor _____ 26.50' on 10/2/01

Sampling Personnel K. Adams / T. Nichols

Time	pH	Temp	Cond.	Dis.O ₂	Turb.	Li conc	ORP	PID	Notes
10/1 1551	11.96	22.07	1.90	8.38	7.0		-106	0.0	
1601	11.95	21.40	1.90	7.88	8.4		-104	0.0	
1611	11.97	20.61	1.88	7.96	18.1		-99	0.0	
1621	DID NOT READ - EMPTIED OUT HORIBA B/C of tiny bubbles.								
1629	12.01	19.74	1.88	9.63	7.3		-95	0.0	
1639	12.01	19.95	1.86	9.17	11.8		-95	0.0	
10/2/01 0825	11.91	18.18	1.88	9.12	5.0		-61	0.0	
0835	11.93	18.13	1.84	8.18	5.0		-86	0.0	
0845	11.94	18.31	1.82	7.68	5.0		-98	0.0	
0855	11.94	18.53	1.78	7.38	5.0		-101	0.0	
0905	11.94	18.93	1.76	7.16	3.5		-103	0.0	parameters stable
0915	11.93	19.59	1.75	6.97	2.6		-105	0.0	Begin sampling
10/2/01 1705	Hach Test								
	DO = 4								
	Fe = 0								

Type of Samples Collected _____

Information: 2 in = 617 ml/ft, 4 in = 2470 ml/ft; Vol_{cyt} = πr²h, Vol_{sphere} = 4/3πr³

FIELD SAMPLING REPORT

JOB No. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/4/01 TIME 1030
 SAMPLING POINT MWFTA-1
 (LOCATION)
 DEPTH _____

SAMPLE INFORMATION SAMPLE I.D. NO.: MWFTA-1 MS/MSD

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	<i>94</i> 39	HCl to pH<2; Cool to 4°C	VOCs by SW8260B
VOA Vial	40 ml	<i>94</i> 39	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	<i>94</i> 13	ZnAcetate & NaOH; Cool to 4°C	Sulfide by E376.1
Poly	250 ml	<i>94</i> 13	Cool to 4°C	Alkalinity by E310.1
Poly	250 ml	<i>94</i> 13	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 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

purged 3.75 gallons, odor of sulfur (rotten eggs)

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: *[Signature]* SAMPLING OBSERVED BY: *[Signature]*

DISCREPANCIES: _____

FIELD SAMPLING REPORT

JOB NO. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/4/01 TIME 1415
 SAMPLING POINT 047
 (LOCATION)
 DEPTH _____

SAMPLE INFORMATION

SAMPLE I.D. NO.: MWFTA-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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

purged 3.0 gallons

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: [Signature] SAMPLING OBSERVED BY: William Wau

DISCREPANCIES: _____

Location DSCR - OU7 Site Name Identify Measuring Point (MP): TOC
(eg. Top of Casing)

Well ID: MWFTA-3 Depth to Screen below MP: 11.38' of screen 16.28' of screen
 (Top Bottom)
 Field Sampling Personnel: Chris Williamson
Bill Ware Pump Intake at (ft. below MP): 14.28'
 Purging Device (Pump Type): BLADEL Pump

Date	Time 24 hr	Depth to Water Below MP ft	Pump Dial Setting (1)	Purge Rate mL/min	Cum. Volume Purged <i>gall liters</i>	Temp. deg. C	Spec Cond. umhos/cm	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L		Ferrous Iron mg/L	Redox Potential mV	Comments	
										(high)	(low)				
<u>2/4/14</u>	<u>1300</u>	<u>5.70</u>		<u>200</u>	<u>.75</u>	<u>19.4</u>	<u>0.126</u>	<u>6.60</u>	<u>2.11</u>				<u>52</u>	<u>41</u>	<u>Turbidity</u>
	<u>1310</u>	<u>5.70</u>		<u>200</u>	<u>1.0</u>	<u>18.8</u>	<u>0.118</u>	<u>6.31</u>	<u>0.71</u>				<u>53</u>	<u>9</u>	
	<u>1320</u>	<u>5.70</u>		<u>200</u>	<u>1.5</u>	<u>18.7</u>	<u>0.118</u>	<u>6.30</u>	<u>0.24</u>				<u>52</u>	<u>4</u>	
	<u>1330</u>	<u>5.70</u>		<u>200</u>	<u>2.0</u>	<u>18.9</u>	<u>0.120</u>	<u>6.14</u>	<u>0.00</u>				<u>52</u>	<u>4</u>	
	<u>1340</u>	<u>5.70</u>		<u>200</u>	<u>2.5</u>	<u>19.3</u>	<u>0.121</u>	<u>6.12</u>	<u>0.00</u>				<u>48</u>	<u>2</u>	
	<u>1350</u>	<u>5.70</u>		<u>200</u>	<u>3.0</u>	<u>19.4</u>	<u>0.121</u>	<u>6.11</u>	<u>0.00</u>				<u>49</u>	<u>2</u>	
	<u>1750</u>									<u>20</u>	<u>1.40</u>				

1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)
 USE FIELD SAMPLING REPORT FORM TO DOCUMENT SAMPLE COLLECTION

FIELD SAMPLING REPORT

JOB No. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/4/01 TIME 1420
 SAMPLING POINT DMW-26A
 (LOCATION)
 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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

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: KATHARINE ADAMS
LORETTA MARKHAM SAMPLING OBSERVED BY: _____

DISCREPANCIES: _____

Location DSCR - 00-7 Identify Measuring Point (MP): BTOC
 Site Name (eg. Top of Casing)

Well ID: DMW-26A Depth to Screen below MP: 7.91 of screen 22.91 of screen
 Field Sampling Personnel: R Adams Top, Bottom
L Markham Pump Intake at (ft. below MP): 20.91
 Purging Device (Pump Type): SED BLAODEE PUMP

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		Ferrous Iron mg/L	Redox Potential mV	Turns	Comments
										(high)	(low)				
10/4/01	1258	9.14		200		23.41	0.812	5.05	1.48				18	-3.2	
	1308	9.27		↓		22.34	0.812	5.62	0.16				6	-6.5	
	1318	9.50		↓		22.26	0.821	5.61	0.04				-2	+8.8'	
	1328	9.52		↓		22.28	0.822	5.61	0.00				-7	11.0	
	1338	9.60		↓		22.58	0.823	5.61	0.00				-11	-6.7	
	1348	9.60		150		22.68	0.823	5.61	0.00				-13	-4.5	
	1358	9.59		↓		23.11	0.823	5.61	0.00				-14	-8.0	
	1415	9.43		↓		23.49	0.822	5.61	0.00				-18	-7.5	
	1750									2		3.80			

FIELD SAMPLING REPORT

JOB No. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/5/01 TIME 1100
 SAMPLING POINT DMW-22A
 (LOCATION)
 DEPTH 6.74' BTDC

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

5 gallons, very strong sulfur smell, clear appearance

GENERAL INFORMATION

WEATHER 80° F Clear + sunny 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: TAMBA NICHOLS SAMPLING OBSERVED BY: KATHERINE ADAMS

DISCREPANCIES: _____

WELL PURGING - FIELD WATER QUALITY MEASUREMENTS FORM

Location DSCR - DMW-22A/047 Identify Measuring Point (MP): TOC
 Site Name (eg. Top of Casing)

Well ID: DMW-22A Depth to Screen below MP: 29.37' of screen 34.37' of screen
 Top Bottom

Field Sampling Personnel: J. MICHAELS Pump Intake at (ft. below MP): 32.37'
K. ADAMS Purging Device (Pump Type): ALPINE pump

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		Ferrous Iron mg/L	Redox Potential mV	Comments
										(high)	(low)			
														TURB ORP
10/5	0945	7.1		175		16.22	0.54	5.96	2.73					0.9 -73
	0955					16.34	0.72	5.97	0.44					0.3 -82
	1005	7.18				16.26	0.51	5.96	0					0.1 -81
	1015					16.25	0.47	5.95	0					0 -78
	1025	7.18				16.25	0.45	5.95	0.3					0.5 -76
	1035					16.29	0.44	5.95	0					0.6 -74
	1045	7.18				16.39	0.43	5.95	0					0.7 -73
	1535									2		3.70		

(1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)

FIELD SAMPLING REPORT

JOB NAME DSCR MNA - OU 7
 DATE 10/5/01 TIME 1100
 SAMPLING POINT AEHADG-10
 (LOCATION)
 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		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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
purged 3.0 gallons

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: *[Signature]* SAMPLING OBSERVED BY: *[Signature]*
 DISCREPANCIES: _____

FIELD SAMPLING REPORT

JOB NO. 120014-1035
 JOB NAME DSCR MNA - OU 7
 DATE 10/5/01 TIME 1200
1100
 SAMPLING POINT AEHADG-10QA
 (LOCATION)
 DEPTH QA Split

SAMPLE INFORMATION SAMPLE I.D. NO.: AEHADG-10QA

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
purged 3.0 gallons

GENERAL INFORMATION

WEATHER _____ AIR TEMPERATURE _____

SAMPLES SHIPPED TO: CEMRD - Omaha, NE
 SPECIAL HANDLING: FedEx
 MODE OF SHIPMENT: CAR/TRUCK BUS PLANE COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: [Signature] SAMPLING OBSERVED BY: William Van
 DISCREPANCIES: _____

FIELD SAMPLING REPORT

JOB NO. 12001-1-1033
 JOB NAME DSCR MNA - OU 7
 DATE 10/5/01 TIME 7:18²
 W.V. 17/80
 SAMPLING POINT OUTDUP-1
 (LOCATION)
 DEPTH Dup of AEHADA-10

SAMPLE INFORMATION SAMPLE I.D. NO.: OUTDUP-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	3	HCl to pH<2; Cool to 4°C	VOCs by SW8260B
VOA Vial	40 ml	3	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
purged 3.0 gallons

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: *Chitt* SAMPLING OBSERVED BY: *V. Davis*

DISCREPANCIES: _____

Location DSCR - OU 7 Identify Measuring Point (MP): TOC
 Site Name (eg. Top of Casing)

Well ID: AEHADG-10 Depth to Screen below MP: 8.57' of screen 18.57' of screen
 Field Sampling Personnel: Chris Williamson Top Bottom
Bill Lane Pump Intake at (ft. below MP): 16.57'
 Purging Device (Pump Type): Backflow Pump

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. umhos/cm	pH pH Units	DO Flow Cell mg/L	DO Hach Test Kit mg/L		Ferrous Iron mg/L	Redox Potential mV	Comments Turbidity
										(high)	(low)			
1/5/61	0830			100	.2	19.3	.222	5.39	.21				99	990
	0840			100	.3	19.5	.245	5.38	0.00				93	990
	0850			100	.4	19.5	.253	5.45	0.00				96	990
	0900	at top of pump		100	.5	19.5	.258	5.54	0.15				61	990
	0910		100	1.0	19.5	.266	5.54	0.00					57	590
	0920		100	1.25	19.6	.268	5.55	0.14					51	370
	0930		100	1.5	19.6	.268	5.55	0.00					50	118
	0940		100	1.75	19.7	.270	5.56	0.00					49	113
	0950		100	2.0	19.8	.270	5.56	0.00					48	117
	1000		100	2.25	19.8	.271	5.56	0.00					47	113
	1010		100	2.50	20.1	.271	5.56	0.14					43	34
	1020		100	2.75	20.2	.265	5.57	0.48					39	37
	1030		100	3.0	20.4	.278	5.57	0.00					38	26
	1535									1	3.60			

FIELD SAMPLING REPORT

JOB No. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/5/01 TIME 08 00
 SAMPLING POINT DMW-13A
 (LOCATION)
 DEPTH _____

SAMPLE INFORMATION

SAMPLE I.D. NO.: DMW-13A

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

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: K. Adams & T. Nickols SAMPLING OBSERVED BY: _____
 DISCREPANCIES: _____

Location DSCR - OU7
 Site Name

Identify Measuring Point (MP): 10C
 (eg. Top of Casing)

Well ID: DHW-13A
 Field Sampling Personnel: R. Adams
T. Nichols

Depth to Screen below MP: 16.86' of screen 21.86' of screen
 Top Bottom
 Pump Intake at (ft. below MP): 19.86'
 Purging Device (Pump Type): QED BLADDER PUMP

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		Ferrous Iron mg/L	Redox Potential mV	Turb. NTU	Comments
										(high)	(low)				
4/20/01	1455	12.50		200		23.5	0.149	3.86	0.92				297	2	
	1505	12.48				23.7	0.148	3.92	0.48				305	2	
	1515	12.49				23.7	0.147	3.95	0.39				307	0	
	1525	12.54				22.7	0.143	3.96	0.35				308	6	
	1535	12.55				22.5	0.147	3.97	0.23				309	9	
	1545	12.55				22.3	0.150	3.96	0.17				308	9	
	1555	12.55				22.2	0.155	3.94	0.12				308	13	
	1605	12.35				21.9	0.158	3.87	0.09				307	8	
	1615	12.55				22.0	0.160	3.90	0.13				307	0	
	1625					21.9	0.162	3.90	0.11				308	1	
	1535										2	2.30			

1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)
 USE FIELD SAMPLING REPORT FORM TO DOCUMENT SAMPLE COLLECTION

FIELD SAMPLING REPORT

JOB NO. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/25/01 TIME 1015
 SAMPLING POINT DMW-27A
 (LOCATION)
 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		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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
CLEAR, SMELL LIKE SULFUR

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

GENERAL INFORMATION WEATHER CLEAR AIR TEMPERATURE 55°F - 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: R. FORISTER SAMPLING OBSERVED BY: C. CLARKE
 DISCREPANCIES: _____

Location DSCR - 007 Identify Measuring Point (MP): TUR
 Site Name (eg. Top of Casing)

Well ID: DMW 27A Depth to Screen below MP: 8.03' of screen 23.03' of screen
 Field Sampling Personnel: ROBERT FORSTER Top CHARLETTE CLARK Bottom
 Pump Intake at (ft. below MP): 21.03'
 Purging Device (Pump Type): ROBERT PUMP

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		Ferrous Iron mg/L	Redox Potential mV	Comments	
										(high)	(low)			Turbidity (NTU)	P.D.
07/05	0800	11.31		2.60		20.27	0.112	4.06	2.12				166	28.7	0.0
	0810	11.41				20.63	0.096	3.82	0.29				133	11.3	
	0820	11.51				20.88	0.095	3.99	0.04				113	6.4	0.0
	0830	11.57				21.12	0.094	4.17	0.03				90	6.6	
	0840	11.59				21.39	0.092	4.24	0.01				73	4.8	0.0
	0850	11.61				21.59	0.091	4.30	0.08				58	4.8	
	0900	11.66				21.73	0.090	4.32	0.06				48	6.0	0.0
	0910	11.65				21.88	0.090	4.33	0.07				38	7.5	
	0920	11.65				22.07	0.089	4.35	0.00				29	7.9	0.0
	0930					22.15	0.089	4.35	0.6				22	8.1	
	0940	11.65				22.27	0.089	4.34	0.0				17	7.3	
	0950					22.39	0.089	4.35	0.0				12	1.4	0.0
	1000	11.65				22.50	0.089	4.35	0.0				8	1.8	
	1535										3	2.20			
			STABILIZED @ 1000												
			SAMPLE TIME 1015												

FIELD SAMPLING REPORT

JOB No. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/05/01 TIME 1330
 SAMPLING POINT DMW-35A
 (LOCATION)
 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		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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
SAMPLES CLEAR, NO ODOR

FIELD MEASUREMENTS

PARAMETER	EQUIPMENT I.D.	RESULTS (UNITS)	COMMENTS
SEE ATTACHED TABLE			

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)
CLEAR, NO ODOR

GENERAL INFORMATION

WEATHER SUNNY, HOT AIR TEMPERATURE ~ 79°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: Robert Forister SAMPLING OBSERVED BY: Charlette Clark

DISCREPANCIES: _____

Location DSCR - DU6 Site Name _____ Identify Measuring Point (MP): TOC
 (eg. Top of Casing)

Well ID: DMW-35A Depth to Screen below MP: 30.45' of screen 35.45' of screen
 Field Sampling Personnel: R. Forister Top, Bottom
C. Clark Pump Intake at (ft. below MP): 33.45'
 Purging Device (Pump Type): BLADDER PUMP

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		Ferrous Iron mg/L	Redox Potential mV	Turbid. (mm)	Comments
										(high)	(low)				
10-05-01	1150	14.22		300		20.35	0.076	5.01	5.64				198	778	
10-05-01	1200	14.21		300		19.25	0.072	5.22	0.65				173	71.9	
10-05-01	1210	14.24		300		19.10	0.074	5.21	0.0				161	27.1	
10-05-01	1220	14.24		300		19.03	0.070	5.21	0.0				159	22.9	
10-05-01	1230	14.25		300		19.00	0.070	5.20	0.0				156	22.8	
10-05-01	1240	14.24		300		18.99	0.070	5.21	0.0				154	18.8	
10-05-01	1250			300		18.98	0.071	5.21	0.0				153.0	16.9	
10-05-01	1300	14.20		300		18.98	0.073	5.22	0.0				153	19.4	
	1535										3	1.0			Called Sample time 1330

FIELD SAMPLING REPORT

JOB No. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/5/01 TIME 1100
 SAMPLING POINT DMW-25A
 (LOCATION)
 DEPTH _____

SAMPLE INFORMATION SAMPLE I.D. NO.: DMW-25A

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

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: George Powada
Lucretia Markham SAMPLING OBSERVED BY: _____

DISCREPANCIES: _____

FIELD SAMPLING REPORT

JOB No. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/5/01 TIME 1100
 SAMPLING POINT DMW-25A QA
 (LOCATION)
 DEPTH QA Split

SAMPLE INFORMATION SAMPLE I.D. NO.: DMW-25A QA

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

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: CEMRD - Omaha, NE
 SPECIAL HANDLING: FedEx
 MODE OF SHIPMENT: CAR/TRUCK BUS PLANE COMMERCIAL VEHICLE

QA/QC

SAMPLE COLLECTED BY: George Powada Loretta Mammian SAMPLING OBSERVED BY: _____
 DISCREPANCIES: _____

FIELD SAMPLING REPORT

JOB NO. 12001-1-1633
 JOB NAME DSCR MNA - OU 7
 DATE 10/5/01 TIME 1200
 SAMPLING POINT OU7Dup-2
 (LOCATION)
 DEPTH Dup of DMW-25A

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	H ₂ SO ₄ to pH<2; Cool to 4°C	TOC by SW9060
VOA Vial	40 ml	3	HCl to pH<2; Cool to 4°C	Methane, Ethane & Ethene by RSK175
VOA Vial	40 ml	2	Cool to 4°C	Carbon Dioxide by RSK175
Poly	500 ml	1	ZnAcetate & 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 ₂ by E300
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Total Metals by 6060B/7470A
Poly	1 Liter	1	HNO ₃ to pH<2; Cool to 4°C	Diss. Metals by 6060B/7470A
VOA Vial	20 ml	1	None	Hydrogen by AM19

COMMENTS: (WELL PURGING VOLUME: SAMPLE APPEARANCE; ODOR; COLOR, ETC.)

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: George Povvada
Loretta Markham SAMPLING OBSERVED BY: _____

DISCREPANCIES: _____

Location DSCR - 00-7 Identify Measuring Point (MP): TOC
 Site Name (eg. Top of Casing)

Well ID: DMW-25A Depth to Screen below MP: 5.70' of screen 20.70' of screen
 Field Sampling Personnel: GERDGE PUWADIA Top
LORETTA MARLHAM Bottom
 Pump Intake at (ft. below MP): 18.70'
 Purging Device (Pump Type): SUPER PUMP

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		Ferrous Iron mg/L	Redox Potential mV	Turb NTU	Comments
										(high)	(low)				
01/5/0	0840	11.4		120		17.95	0.120	5.33	3.24				174	203.0	
	0850	11.98		80		17.91	0.112	5.30	1.04				166	95.7	
	0900	12.12				17.94	0.108	5.28	0.91				150	57.8	
✓	0910	12.31				18.06	0.107	5.26	4.97				144	36.0	
	0920	1				18.22	0.105	5.23	5.69				146	22.5	
	0930	12.68				18.32	0.104	5.21	5.65				148	20.0	
	0940					18.45	0.104	5.19	3.43				151	13.2	
	0950	12.95				18.55	0.103	5.18	0.00				154	10.8	
	1000	13.12				18.69	0.103	5.17	0.00				157	9.4	
	1010					18.90	0.103	5.16	0.00				160	8.5	
										4		0			
	1535														

1) Pump Dial Setting (eg. Hertz, cycles/min, etc.)
 USE FIELD SAMPLING REPORT FORM TO DOCUMENT SAMPLE COLLECTION

APPENDIX B
DATA QUALITY EVALUATION AND DATA SUMMARY

APPENDIX B - DATA QUALITY EVALUATION AND DATA SUMMARY TABLES

B.1 INTRODUCTION

B.1.0.1 The following sections present the analytical laboratory used, the data quality objectives 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 first quarter groundwater sampling event at OU 7.

B.1.0.2 The data validation was performed in general accordance with the Final Sampling and Analysis Plan (SAP) (LAW, 1992), United States Army Corps of Engineers (USACE) Shell for Analytical Chemistry Requirements (USACE, 1998a), United States Environmental Protection Agency (USEPA) Region III National Functional Guidelines for Organic and Inorganic Data Review (USEPA, 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 (USEPA, 1996).

B.2 ANALYTICAL LABORATORY

B.2.0.1 Groundwater samples collected from monitoring wells in October 2001 were analyzed by Severn Trent Laboratories, Inc. (STL) of North Canton, Ohio for volatile organic compounds (VOCs), anions (chloride, nitrate, and sulfate), alkalinity, sulfide, total and dissolved metals, and total organic carbon (TOC). Samples were also sent to STL of Santa Anna, California for analysis of dissolved gases (carbon dioxide, methane, ethane, and ethene). In addition, Microseeps of Pittsburgh, Pennsylvania analyzed select samples for dissolved hydrogen.

B.2.0.2 All samples collected were analyzed using USEPA SW-846 methods. VOCs were analyzed by Method 8260B, 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. Table 3-4 and 3-5 is a listing of the groundwater samples collected and analyzed to support the investigation at OU 7.

B.3 DATA QUALITY OBJECTIVES

B.3.0.1 Project-specific data quality objectives (DQOs) are described in Section 7.0 and presented on Figure 7-2 of the Quarterly Groundwater Sampling Plan For OU 7 (LAW, 2001). The DQO procedure is a strategic planning process involving the interested project parties (consultant specialists, clients, regulatory agencies, stakeholders, etc.) and was initially developed by the USEPA as a tool to ensure that the type, quantity, and quality of environmental data used in decision making is appropriate for the intended application. The USACE adopted the USEPA's DQO process in theory, and transformed the USEPA's seven step process into four phases (I through IV), subsequently published as Engineering Manual 200-1-2. Figure B-1 (included as an attachment to this appendix) of the USACE Technical Project Planning (TPP) Process (USACE, 1998b) is a chart outlining the alignment between the USEPA process and the USACE process. This procedure provides a systematic approach for defining the criteria that a data collection design should satisfy, including when and where to collect samples, the tolerable level of decision errors, and how many samples to collect. All of these criteria are evaluated in Phase I and II of the USACE DQO procedure by several technical professions which include engineering, scientific and legal disciplines. Overall, the collective goal of the TPP process is eventual site closeout. Once the environmental data have been collected and analyzed, the consultants assess the laboratory data for its usability as prescribed by project goals. Once the environmental data has been collected and analyzed, the consultants assess the laboratory data for its usability as prescribed by project goals. The criteria which 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 the following sections.

B.3.1 Accuracy

B.3.1.1 Accuracy is a measure of the closeness of an observed value to the "true" value, e.g., theoretical or reference value, or population mean. Accuracy includes a combination of random error and systematic error (bias) that result from sampling and analytical operations. To determine the accuracy of an analytical method, a sample spiking program is conducted, which determines bias in the laboratory procedures (via a laboratory control sample [LCS]) and bias inherent in the sample matrix (via a matrix spike/matrix spike duplicate [MS/MSD]). The percent recovery (%R) of the compounds spiked into a matrix is used to evaluate the accuracy of the environmental sampling process. The %R is defined as the observed concentration minus the sample concentration, divided by the true concentration of the spike added and multiplied by 100 to express percent.

$$\%R = \frac{X - T}{K} \times 100$$

where:

- X = Analytical result from the spiked sample
- T = Analytical result from the unspiked aliquot
- K = Known value of the spike
- %R = Percent Recovery

B.3.2 Precision

B.3.2.1 Precision is the distribution of a set of reported values about the mean, or the closeness of agreement between individual test results obtained under prescribed and similar conditions. To measure precision in environmental samples, duplicate field samples or MS/MSD samples are collected concurrently with the parent sample under the same field conditions. Precision determination can also be performed in the laboratory by the analysis of laboratory replicates, which are performed by analyzing the same sample twice. An added measure of precision is obtained by collecting quality assurance split samples, which is a field duplicate sample sent to the USACE Corps of Engineers Missouri River Division (CEMRD) laboratory for analysis. A split sample duplicate compares results from two different laboratories ultimately deriving a determination of relative percent difference (RPD) for each constituent present. Precision is best expressed in terms of RPD. The RPD for each compound or element is calculated using the following equation:

$$RPD = \frac{A - B}{(A + B)/2} \times 100$$

where:

- A = Replicate value 1
- B = Replicate value 2
- RPD = Relative Percent Difference

B.3.3 Completeness

B.3.3.1 Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct or normal conditions. The completeness goals established for the project DQOs were 90 percent for Level IV analytical data. Level IV analytical data are equivalent to the USACE Definitive Data Package. To calculate completeness, the amount of valid data obtained is divided by the amount of data planned to be obtained and the result is multiplied by 100 to convert to percent. The percent complete is then used to evaluate whether sufficient data were acquired from the sampling event.

B.3.4 Representativeness

B.3.4.1 Representativeness refers to the degree sample data accurately and precisely describe the population of samples at a sampling point or under certain environmental conditions. Samples that are not properly preserved or are analyzed beyond holding times may not be considered representative. Review of sampling procedures, laboratory preparation, analysis holding times, trip blank and field blank analysis help in providing this assessment.

B.4 DATA QUALITY EVALUATION PROCEDURES

B.4.0.1 The procedures used by Law Engineering and Environmental Services, Inc. (LAW) for data evaluation and validation are described in the DQE standard operating procedures (LAW, 2001). The primary data quality evaluation was performed by LAW's project chemist. The data quality evaluation narrative and qualified (flagged) data tables were reviewed by a senior chemist.

B.4.0.2 The laboratory, field quality control 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 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.

B.4.0.3 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, LCS analysis, MS/MSD analyses, and assessment of surrogate and internal standard recovery where applicable. LAW'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.

B.4.1 Evaluation of Field Data Quality

B.4.1.1 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, 1994) and were specified for collection in the Final MNA Sampling Plan for OU 7 Groundwater Investigation at DSCR (LAW, 2001).

B.4.1.2 Quality Control Samples - The QC samples were collected concurrently with the field samples to assess the accuracy and precision of sampling and analysis. The field QC samples collected consisted of field duplicates, MS/MSD, trip blanks, field blanks and rinsates as defined in the USACE protocols (USACE, 1994) and as designated in the Quarterly Groundwater Sampling Plan for OU 7 at DSCR. The QC samples were collected in the same type of sample containers concurrent with the sample and treated in the same manner as the parent samples. They were also analyzed by the laboratory concurrently with the field samples. QC samples are evaluated for reproducibility where applicable and the impact of blank contamination if present.

B.4.1.2.1 Field duplicates were collected to assess sampling precision. They consisted of replicate grab samples collected concurrently with the associated field samples. Although not collected at separate field locations, they were considered separate field samples for analytical purposes. Duplicate samples submitted to STL – North Canton were identified with unique sample codes to hide their identity from the laboratory, typically referred to as “blind duplicates”. Cross references to the sample's true identity are annotated in field books and daily reports maintained by field sampling personnel.

B.4.1.2.2 Field duplicate samples were collected to meet the frequency of approximately 10 percent established by the USACE. Poor precision is represented if during evaluation of laboratory data, RPDs exceed those as outlined below per analysis classification.

<u>MATRIX</u>	<u>RPD</u>	<u>ANALYSIS</u>
Water	>30%	VOCs
Water	>25%	Metals
Water	>20%	Anions, alkalinity, sulfide, dissolved gases, TOC

B.4.1.2.3 Field duplicate RPDs are calculated in a manner similar to that described for MS/MSDs for analytical values that are greater than or equal to the practical quantitation limits (PQL).

B.4.1.2.4 Trip blank samples were collected to assess whether cross-contamination of water samples collected for analysis of volatile organic parameters occurred during sampling and shipment to the laboratories. The trip blanks were placed in the sample shipping container with the aqueous field samples to be analyzed for VOCs. One trip blank was submitted in conjunction with the field samples for each sample shipment sent to the laboratory containing VOCs.

B.4.1.3 Quality Assurance Samples - The QA split samples were collected along with the field samples to assess sampling accuracy and the accuracy of the primary laboratory. The QA samples collected were field splits, field blank splits, rinsate splits and trip blanks, as defined in the USACE protocols (USACE, 1994). The QA samples were sent to the CEMRD Laboratory located in Omaha, Nebraska for analysis. The field splits were collected the same as the field duplicates described above and were collected at approximately the same frequency (10 percent). Trip blanks were also included in shipments of samples to be analyzed for VOCs by the CEMRD laboratory.

B.4.1.3.1 In order to facilitate the comparison of the field QC and QA data, the split samples sent to the CEMRD laboratory were assigned the same sample identification code as the field samples to which they were associated. A total of three QA splits were collected from OU 7. Two QA split samples, AEHADG-10QA and DMW-25AQA, were collected from the upper aquifer and analyzed for each parameter except hydrogen. One QA split sample, PWFTA-2QA, was collected from the lower aquifer and analyzed for each parameter except hydrogen. According to discussion with the CEMRD, the samples were received intact and in good condition. Data from the QA split samples were not available for review; therefore, comparison to site data was not performed.

B.4.2 Evaluation of Laboratory Data Quality

B.4.2.1 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 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, 1998a) 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 2001 sampling event were included in the Shell document.

B.4.2.2 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.

B.4.2.3 The *accuracy* of the laboratory data is assessed by consideration of:

- Recovery of spikes from field samples spiked with known amounts (MS and MSD)
- Recovery of surrogate spikes for most analyses by gas chromatography
- Recovery of analytes from LCS

B.4.2.4 To determine *precision*, duplicates and MS/MSDs were analyzed. The values reported for a spiked sample (MS) and a spiked duplicate (MSD) were used to calculate an RPD. At times, the laboratory may also analyze LCS duplicates and determine RPD. The control limits were those established by the USACE in the Shell document. Where the Shell document does not address a specific analytical method, the laboratory-established control limits are used. The laboratories internal control limits are based on a statistical population of at least 20 RPD values. They are calculated by determining the mean RPD plus three times the standard deviation for the upper limit and zero RPD as the lower limit.

B.4.2.5 To evaluate *completeness*, the number of valid data points obtained from the measurement systems are compared to the number that was expected to be obtained under correct or normal conditions. As noted previously, 90 percent of the Level IV OU 7 data were expected to be valid based upon the evaluation of the QC data.

B.4.2.6 Representativeness in the laboratory can be determined by making certain all sub-samples taken from a given sample represent the sample as a whole by premixing and homogenizing. However, overall representativeness is assessed by review of the precision obtained from field and laboratory duplicate samples.

B.5 DATA QUALITY EVALUATION

B.5.0.1 Summaries of analytes detected in the samples from the site for this investigation are presented in the report as Tables 3-4 and 3-5. The comprehensive analytical results for samples associated with this site are summarized in this Appendix as Tables B-1, B-2, and B-3.

B.5.0.2 The following sections provide summary discussions of data quality for the October 2001 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 are presented in Table B-4.

B.5.0.3 DQE forms were generated and used by LAW 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.

B.5.1 GROUNDWATER – OCTOBER 2001

B.5.1.0.1 A total of 24 groundwater and 3 duplicate samples were collected at OU 7 in October 2001. Monitoring well sample locations were selected to obtain information to determine whether natural attenuation of chlorinated solvents was occurring. Samples were analyzed for VOCs, total and dissolved metals, and monitored natural attenuation (MNA) parameters: dissolved gases (including hydrogen), anions, TOC, alkalinity, and sulfide.

B.5.1.0.2 The correct sample containers and preservatives were used for the analytical methods specified on the chain-of-custodies. The chain-of-custodies were executed properly and all hold times were met with the exception of carbon dioxide (see Section B.5.1.2). 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 2001 subcontract agreement between LAW and STL – North Canton.

B.5.1 GROUNDWATER – UPPER AQUIFER

B.5.1.0.1 Fourteen groundwater and two duplicate samples were collected from the upper aquifer at OU 7 in October 2001. Each of the monitoring well samples from the upper aquifer were assayed for VOCs, total and dissolved metals, and MNA parameters.

B.5.1.1 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 10/18/01, 1,1-dichloroethene and carbon disulfide exceeded the plus or minus 20 percent criteria. 1,1-Dichloroethene was flagged as estimated (J) because the ICV also served as the continuing calibration for samples analyzed immediately following the calibration. Carbon disulfide was flagged as rejected (R) because of ICV/continuing calibration verification (CCV) criteria and high LCS recovery as described below. In the ICV performed on 10/8/01, 2-Hexanone exceeded the plus or minus 20 percent criteria. However, no flags were required because recovery did not exceed the Sporadic Marginal Failure (SMF) limits of plus or minus 40 percent.

<u>ICV Date</u>	<u>Affected Compounds</u>	<u>Associated Samples</u>		
10/18/01	1,1-Dichloroethene Carbon Disulfide (rejected)	DMW-33A MWFTA-23	MWFOS-1 TB100801-2	MWFTA-5 TB-100901

B.5.1.1.1 The CCV standards associated with the OU 7 groundwater samples were analyzed as appropriate and several compounds were not within limits specified by the USACE or the method. Qualifications were made based on percent difference (%D) observed in the continuing calibration verifications analyzed on the dates indicated below. Qualifications were assigned for high and low biased (J for 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 percent or the compound exceeding %D criteria in the CCV also exceeded percent recovery (%R) criteria in the LCS, the associated results were rejected (flagged R).

<u>CCV Date</u>	<u>Affected Compounds</u>	<u>Associated Samples</u>	
10/10/01	Trichlorofluoromethane	MWFTA-7	TB-100101

<u>CCV Date</u>	<u>Affected Compounds</u>	<u>Associated Samples</u>	
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10/15/01	1,1,2,2-Tetrachloroethane 1,2,3-Trichloropropane	AEHADG-10 DMW-26A DMW-13A DMW-35A	OU7DUP-1 TB-100401-2 DMW-27A DMW-25A	MWFTA-3 DMW-22A TB-100501 OU7DUP-2
10/16/01	Acetone 1,1,2,2-Trichloroethane (rejected)	MWFTA-1	TB-100501-2	

B.5.1.1.2 The batch specific preparation blanks did not have analytes of interest greater than the PQL. The following preparation blanks contained the indicated compounds at concentrations above the method detection limit (MDL), but less than the PQL. The associated OU 7 samples with concentrations less than or equal to ten times these concentrations were accordingly qualified as estimated based on blank contamination and flagged as “JB”, unless overridden by qualifications for other QC exceedances.

<u>Blank Date</u>	<u>Compound</u>	<u>Concentration</u>	<u>Associated Samples</u>	
10/16/01	Methylene Chloride	0.61 µg/L	MWFTA-1	TB-100501-2

B.5.1.1.3 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 percent or the compound exceeding %R criteria in the LCS also exceeded %D criteria in the CCV, the associated results were rejected (flagged R).

<u>LCS Date</u>	<u>Affected Compounds</u>	<u>Associated Samples</u>		
10/18/01	Carbon disulfide (rejected)	DMW-33A MWFTA-23	MWFOS-1 TB-100801-2	MWFTA-5 TB-100901
10/10/01	Chloromethane (low) 4-Methyl-2-pentanone (low) 2-Hexanone(low)	MWFTA-7	TB-100101	
10/15/01	2-Hexanone (low)	AEHHA-10 DMW-26A DMW-13A DMW-35A	OU7DUP-1 TB-100401-2 DMW-27A DMW-25A	MWFTA-3 DMW-22A TB-100501 OU7DUP-2
10/16/01	2-Hexanone (low) 1,1,2,2-Trichloroethane (rejected)	MWFTA-1	TB-100501-2	

B.5.1.1.4 MS/MSDs were specified and performed on groundwater samples MWFTA-1 and MWFTA-29B. In addition, the laboratory performed a MS/MSD on sample MWFTA-16. The MS/MSD recovery criteria outlined in the Shell document were met with the following exceptions. Recoveries of 2-hexanone in

MWFTA-1 and MWFTA-29B, and acetone in MWFTA-1 were below limits, but results were previously qualified as estimated and flagged J. No further qualification was necessary.

B.5.1.1.5 Two field duplicate pairs (AEHADG-10/OU7DUP-1, DMW-25A/OU7DUP-2,) were collected from the upper aquifer and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (less than 30 percent). Furthermore, all surrogates and internal standards added to the samples by the laboratory were recovered within specified limits.

B.5.1.1.6 The trip blanks associated with the OU 7 samples were analyzed and reported to contain low levels of VOCs, as indicated below. The samples with concentrations less than or equal to five times these concentrations (ten times for acetone and methylene chloride) were accordingly qualified as estimated based on blank contamination and flagged as “JB”, unless overridden by qualifications for other QC exceedances. Associated samples that were non-detects required no qualification.

<u>Blank ID</u>	<u>Compound</u>	<u>Concentration</u>	<u>Action</u>
TB-100501	Acetone	0.78 µg/L	Associated results flagged JB
	Methylene Chloride	0.52 µg/L	No flag - associated results non-detect
	Bromodichloromethane	2.4 µg/L	No flag - associated results non-detect
	Chloroform	36 µg/L	Associated results flagged JB
	Dibromochloromethane	0.42 µg/L	No flag – associated results non-detect
TB-100501-2	Methylene Chloride	0.43 µg/L	Associated results previously flagged JB
	Bromodichloromethane	2.4 µg/L	Associated results flagged JB
	Chloroform	38 µg/L	Associated results flagged JB
	Dibromochloromethane	0.42 µg/L	No flag – associated results non-detect
TB-100801-2	Acetone	0.69 µg/L	Associated results flagged JB
	Bromodichloromethane	1.6 µg/L	No flag – associated results non-detect
	Bromoform	0.21 µg/L	No flag – associated results non-detect
	Dibromochloromethane	0.33 µg/L	No flag – associated results non-detect
	Chloroform	19 µg/L	Associated results flagged JB
	Methylene Chloride	0.40 µg/L	Associated results flagged JB
TB-100901	Acetone	1.4 µg/L	No flag – associated results non-detect or greater than 10x blank
	2-Butanone	0.73 µg/L	No flag – associated results non-detect

B.5.1.1.7 The following samples were diluted to place the VOC results within the range of the calibration curve, which resulted in elevated PQLs.

<u>Sample</u>	<u>Dilution</u>	<u>Sample</u>	<u>Dilution</u>	<u>Sample</u>	<u>Dilution</u>
	<u>Factor</u>		<u>Factor</u>		<u>Factor</u>
DMW-33A	100x	DMW-26A	5x	MWFTA-1	5x

MWFTA-20	5x	MWFTA-23	5000x	AEHADG-10	416.67x
OU7DUP-1	416.67				

B.5.1.1.8 Additionally, the following data points were reported at concentrations above the MDL, but less than the PQL and were qualified as estimated and flagged as “JQ”.

Sample ID	Affected Compounds
AEHADG-10	1,1-Dichloroethane, 1,2-Dichlorobenzene, Carbon tetrachloride, Naphthalene
OU7DUP-1	1,1-Dichloroethane, 1,2-Dichlorobenzene, Carbon tetrachloride
DMW-22A	1,1-Dichloroethane, 1,1-Dichloroethene, 1,2-Dichlorobenzene, Vinyl chloride
DMW-25A	Vinyl Chloride
OU7DUP-2	Vinyl chloride
DMW-33A	1,2-Dichlorobenzene, trans-1,2-Dichloroethene, Vinyl chloride
MWFTA-3	1,1-Dichloroethene, 1,1-Dichloroethane, trans-1,2-Dichloroethene, Vinyl chloride
MWFTA-23	1,2-Dichlorobenzene, Acetone, Vinyl chloride
TB-100501	Acetone, Dibromochloromethane, Methylene chloride
TB-100501-2	Dibromochloromethane
TB-100801-2	Acetone, Bromoform, Dibromochloromethane, Methylene chloride
TB-100901	2-Butanone, Acetone

B.5.1.2 Dissolved Gases (RSK-175) – The initial calibration for each instrument used for the analysis of dissolved gases met acceptable criteria. The continuing calibration standards were also within 25 percent of their true value. The laboratory batch preparation blanks (Method Blanks) did not contain dissolved gases with the following exceptions. Associated positive methane and carbon dioxide results less than 5 times the blank value were marked as estimated due to blank contamination and flagged “JB”.

Blank Date	Compound	Concentration	Associated Samples
10/18/01	Carbon Dioxide	0.14 µg/L	TB-100901
10/10/01	Carbon Dioxide	0.11 µg/L	TB-100101
	Methane	0.00089 µg/L	MWFTA-7 TB-100101
10/16/01	Methane	0.00057 µg/L	DMW-13A DMW-35A

B.5.1.2.1 Batch LCSs for dissolved gases were within acceptable limits. MS/MSD spikes were not performed for dissolved gases.

B.5.1.2.2 The trip blanks associated with the OU 7 samples were analyzed and reported to contain low levels of carbon dioxide and methane. The samples with concentrations less than or equal to five times these concentrations were accordingly qualified as estimated based on blank contamination and flagged as “JB”. However, methane and carbon dioxide results for samples collected on 10/8/01, 10/9/01, and 10/10/01 were already flagged “JB” due to positive method blank results (see above).

B.5.1.2.3 The analytical holding time of 7 days for carbon dioxide was exceeded for all OU7 samples. The associated positive results were flagged J and non-detects UJ if not overridden by other criteria.

B.5.1.2.4 Two field duplicate pairs (AEHADG-10/OU7DUP-1, DMW-25A/OU7DUP-2) were collected from the upper aquifer and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (less than 20 percent).

B.5.1.2.5 Results were evaluated and reported down to the MDL. Flagging of dissolved gasses results less than the PQL but greater than the MDL is outlined below.

<u>Analyte</u>	<u>Affected Samples</u>
Ethane	MWFTA-23
Methane	TB-100901
Carbon dioxide	TB-100201, TB-100801-2

B.5.1.3 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 midpoint calibration check standards were within 10 percent of their true value. The continuing calibration standards were also within 10 percent of their true value. The laboratory batch preparation blanks (Method Blanks) contained some metals above the detection limit. Samples containing these metals at less than 5 times the blank level were flagged as “JB” and are described below.

<u>Metal</u>	<u>Affected Samples</u>
Beryllium	MWFTA-7 (both)

The subsequent continuing calibration blanks (CCBs) were also less than the PQL, and results were flagged JB if the sample concentration was less than 5 times the blank concentration.

<u>Metal</u>	<u>Affected Samples</u>	
Beryllium	MWFTA-1 (diss.) AEHADG-10 (both) OU7DUP-1 (both) DMW-33A (both)	DMW-13A (both) DMW-27A (both) MWFTA-5 (diss.) MWFTA-23 (both)
Cadmium	DMW-13A (both) MWFTA-1 (both) OU7DUP-2 (diss.)	OU7DUP-1 (both) DMW-26A (both)
Cobalt	DMW-27A (total) MWFTA-14 (total)	MWFTA-1 (both)

Molybdenum	MWFOS-1 (both)	
Nickel	MWFTA-7 (both)	
Vanadium	AEHADG-10 (total)	DMW-22A (both)
	DMW-26A (both)	DMW-27A (both)
	DMW-33A (total)	MWFTA-1 (both)
	MWFTA-3 (both)	MWFTA-20 (both)
	MWFTA-23 (both)	OU7DUP-1 (total)
Zinc	OU7DUP-2 (diss.)	

B.5.1.3.1 The batch LCSs for dissolved and total metals were within USACE prescribed limits (80 to 120 %R). The MS/MSD recoveries for spiked sample MWFTA-1 were within USACE limits with the exception of total aluminum which recovered high. Results for total aluminum were flagged JH. The MS/MSD recoveries for spiked samples DMW-22A and MWFTA-5 were within USACE limits.

B.5.1.3.2 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and DMW-25A/OU7DUP-2) were collected from the upper aquifer and analyzed. The RPD between the parent and the duplicate sample results was within control limits.

B.5.1.3.3 The dissolved zinc result exceeded the total zinc result by more than 10 percent in samples MWFTA-1 and MWFOS-1 resulting in J flags for total and dissolved results.

B.5.1.3.4 A post digestion spike was performed on samples MWFTA-1 and AEHADG-10 to confirm matrix effects and were within USACE limits. A serial dilution was performed to assess new matrices in samples MWFTA-7, MWFTA-1, MWFTA-5, and DMW-22A and recoveries were within 10 percent of their original value with one exception. The relative percent difference between the diluted and undiluted results for aluminum in sample MWFTA-7 was greater than 10 percent and results were marked as estimated and flagged J.

B.5.1.3.5 Results were evaluated and reported down to the MDL. Flagging of total and dissolved metals results less than the PQL but greater than the MDL (JQ) is described below.

<u>Sample ID</u>	<u>Affected Metals</u>
AEHADG-10	Barium (total and dissolved), Nickel (total and dissolved)
OU7DUP-1	Barium (total and dissolved), Cobalt (total and dissolved), Nickel (total and dissolved)

DMW-13A	Barium (total and dissolved), Calcium (total and dissolved), Cobalt (total and dissolved), Magnesium (total and dissolved), Nickel (total and dissolved), Potassium (total and dissolved)
DMW-22A	Barium (total and dissolved)
DMW-25A	Aluminum (total), Barium (total and dissolved), Calcium (total and dissolved) Cobalt (total and dissolved), Magnesium (total and dissolved), Nickel (total and dissolved), Potassium (total and dissolved)
OU7DUP-2	Cadmium (dissolved), Barium (total and dissolved), Calcium (total and dissolved), Cobalt (total and dissolved), Iron (dissolved), Magnesium (total and dissolved), Nickel (total and dissolved), Potassium (total and dissolved)
DMW-26A	Aluminum (total and dissolved), Barium (total and dissolved), Calcium (total and dissolved), Magnesium (total and dissolved)
DMW-27A	Barium (total and dissolved), Calcium (total and dissolved), Magnesium (total and dissolved), Manganese (total and dissolved), Potassium (total and dissolved), Sodium (total and dissolved)
DMW-33A	Barium (total and dissolved), Zinc (dissolved)
DMW-35A	Barium (total and dissolved), Calcium (total and dissolved), Magnesium (total and dissolved), Nickel (total), Potassium (total and dissolved), Sodium (total and dissolved)
MWFTA-1	Aluminum (dissolved), Vanadium (total)
MWFTA-3	Aluminum (dissolved), Arsenic (dissolved), Barium (total and dissolved) Calcium (total and dissolved), Cobalt (dissolved), Magnesium (total and dissolved)
MWFTA-5	Barium (total and dissolved), Beryllium (dissolved), Calcium(total and dissolved) Magnesium (total and dissolved), Potassium (total and dissolved), Zinc (total)
MWFTA-7	Barium (total and dissolved), Cobalt (total and dissolved), Magnesium(total and dissolved), Potassium (total and dissolved), Sodium (total and dissolved)
MWFTA-23	Aluminum (dissolved), Cobalt (total and dissolved), Nickel (total and dissolved)
MWFOS-1	Barium (total and dissolved)

B.5.1.4 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 laboratory batch preparation blanks (Method Blanks) and subsequent CCBs were less than the PQL, but above the MDL in the following instances.

Blank	Compound	Flagged Samples
CCB	Thallium	MWFTA-1 (both) MWFTA-3 (both) DMW-26A (both) DMW-22A (both) DMW-13A (both) AEHADG-10 (both) MWFTA-23 (total) DMW-27A (diss.)

B.5.1.4.2 Batch LCSs for thallium were within acceptable limits. The MS/MSD recoveries for spiked samples DMW-22A, and MWFTA-5 were within acceptable limits. The analytical holding time of 6 months for thallium was met for the OU 7 samples.

B.5.1.4.3 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and DMW-25A/OU7DUP-2) were collected from the upper aquifer and analyzed. RPD between the parent sample and the duplicate sample could not be calculated because thallium was not detected in either sample.

B.5.1.4.4 A post digestion spike was performed on samples MWFTA-1 and AEHADG-10 to confirm matrix effects. Recovery was low for total and dissolved thallium in sample MWFTA-1 and high for total thallium in sample AEHADG-10. Results were previously flagged JB due to blank contamination and no further qualification was necessary. Results were evaluated and reported down to the MDL. Flagging of thallium results less than the PQL but greater than the MDL was not required.

B.5.1.5. 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 within QC limits for mercury. The laboratory batch preparation blanks (Method Blanks) and subsequent CCBs did not contain mercury.

B.5.1.5.1 Batch LCSs for mercury were within acceptable limits with one exception. The LCS recovery of mercury associated with samples collected on October 5 was below USACE limits (79 percent). However, the recovery was within the SMF limits of 60 to 140 percent. Therefore, no qualification to the affected sample data was applied. The MS/MSD recoveries for spiked sample MWFTA-1 were below QC limits. Mercury results were non-detect, and were flagged with a UL (non-detect with low bias). The MS/MSD recoveries for spiked samples DMW-22A, and MWFTA-5 were within USACE limits. The analytical holding time of 28 days for mercury was met for the OU7 samples.

B.5.1.5.2 Two field duplicate pairs (AEHADG-10/OU7DUP-1, DMW-25A/OU7DUP-2,) were collected from the upper aquifer and analyzed. RPD between the parent sample and the duplicate sample could not be calculated because mercury was not detected in either sample. Results were evaluated and reported down to the MDL. Flagging of mercury results less than the PQL but greater than the MDL was not required.

B.5.1.4 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) did not contain anions. No qualification was required. Batch LCSs for anions were within acceptable limits. The MS/MSD recoveries for the spiked sample MWFTA-1 were within acceptable limits.

B.5.1.4.1 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and DMW-25A/OU7DUP-2) were collected from the upper aquifer and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (less than 20 percent) for values above the PQL.

B.5.1.4.3 The sulfate results for MWFTA-23 were reported at concentrations above the MDL, but less than the PQL and were qualified as estimated and flagged as “JQ”. Sample DMW-26A required a two times dilution to place the chloride results within the analytical range of the instrument.

B.5.1.5 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) contained TOC below the PQL at 0.7 mg/L on 10/30/01 and 0.5 mg/L on 10/29/01. The TOC results for DMW-33A, MWFOS-1, MWFTA-5, TB-108001-2, TB-100901, AEHADG-10, DMW-13A, DMW-25A, OU7DUP-1, and OU7DUP-2 were qualified as estimated and flagged JB. Batch LCSs for TOC were within acceptable limits. The MS/MSD recoveries for the spiked samples MWFTA-1, and OU7DUP-1 were within acceptable limits. No qualification was necessary.

B.5.1.5.1 The trip blanks associated with the OU 7 samples collected on 10/8/01 and 10/9/01 were reported to contain low levels of TOC. The samples with concentrations less than or equal to five times these concentrations were accordingly qualified as estimated based on blank contamination and flagged as “JB”. However, those samples were previously flagged JB due to method blank contamination. The TOC results for sample MWFTA-23 were greater than five times the associated trip blank concentrations and required no qualification.

B.5.1.5.2 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and DMW-25A/OU7DUP-2) were collected from the upper aquifer and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (less than 20 percent). Results were evaluated and reported down to the MDL. Flagging of TOC results less than the PQL but greater than the MDL was not required.

B.5.1.6 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 below the PQL. Associated results greater than or equal to five

times the blank value required no qualification. Results for samples DMW-27A, DMW-35A and MWFTA-7 were less than five times the blank value and were flagged JB. Batch LCSs for alkalinity were within acceptable limits. The MS/MSD recoveries for spiked sample MWFTA-1 were within acceptable limits.

B.5.1.6.1 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and DMW-25A/OU7DUP-2) were collected from the upper aquifer and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (<20%). Results were evaluated and reported down to the MDL. Flagging of alkalinity results less than the PQL but greater than the MDL was not required.

B.5.1.7 Sulfide (376.1) – The titration standardization performed for the analysis of sulfide met acceptable criteria. The laboratory batch preparation blanks (Method Blanks) did not contain sulfide. Batch LCSs for sulfide were within acceptable limits. The MS/MSD recovery for spiked sample MWFTA-1 were within acceptable laboratory limits. Sulfide recovery in spiked sample DMW-22A was below QC limits and results were marked estimated and flagged J.

B.5.1.7.1 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and DMW-25A/OU7DUP-2) were collected from the upper aquifer and analyzed. RPD between OU7DUP-1 and AEHADG-10 was outside of QC limits (20 percent). Sulfide results for both samples were marked as estimated and flagged J. Results were evaluated and reported down to the MDL. Flagging of alkalinity results less than the PQL but greater than the MDL was not required.

B.5.1.8 Dissolved Hydrogen (AM20GA) - Initial and continuing calibration 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 Microseps for analysis.

B.5.1.8.1 Two field duplicate pairs (AEHADG-10/OU7DUP-1 and DMW-25A/OU7DUP-2) were collected from the upper aquifer and analyzed. RPD between the parent and duplicate samples were within QC limits. No qualification was necessary.

B.5.2 GROUNDWATER – LOWER AQUIFER

B.5.2.0.1 Ten groundwater samples and one duplicate sample were collected from the lower aquifer at OU 7 in October 2001. Each of the monitoring well samples from the lower aquifer was analyzed for VOCs,

total and dissolved metals, and MNA parameters. In addition, 13 samples were collected and analyzed for pH to confirm high pH (greater than 10) measurements collected in the field during the sampling effort.

B.5.2.1 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 10/18/01, 1,1-dichloroethene and carbon disulfide exceeded the plus or minus 20 percent criteria. 1,1-Dichloroethene was flagged as estimated (J) because the ICV also served as the continuing calibration for samples analyzed immediately following the calibration. Carbon disulfide was flagged as rejected (R) because of ICV/CC criteria and high LCS recovery as described below. In the ICV performed on 10/8/01, 2-Hexanone exceeded the plus or minus 20 percent criteria. However, no flags were required because recovery did not exceed the Sporadic Marginal Failure limits of plus or minus 40 percent.

<u>ICV Date</u>	<u>Affected Compounds</u>	<u>Associated Samples</u>		
10/18/01	1,1-Dichloroethene	DMW-29B	MWFTA-14	MWFTA-16
	Carbon Disulfide (rejected)	MWFTA-28B	TB100801-2	TB100901
		TB101001		

B.5.2.1.1 The continuing calibration standards associated with the OU 7 groundwater samples were analyzed as appropriate and several compounds were not within limits specified by the USACE or the method. Qualifications were made based on %D observed in the continuing calibration verifications analyzed on the dates indicated below. Qualifications were assigned for high and low biased (J for 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 percent or the compound exceeding %D criteria in the CCV also exceeded %R criteria in the LCS, the associated results were rejected (flagged R).

<u>CCV Date</u>	<u>Affected Compounds</u>	<u>Associated Samples</u>		
10/10/01	Trichlorofluoromethane	MWFTA-17	MWFTA-18	MWFTA-19
		MWFTA-20	MWFTA-29B	PWFTA-2
		OU7DUP-3	TB-100101	TB-100201

B.5.2.1.2 The batch specific preparation blanks did not have analytes of interest greater than the PQL. The following preparation blanks contained the indicated compounds at concentrations above the MDL, but less than the PQL. The associated OU 7 samples with concentrations less than or equal to ten times these concentrations were accordingly qualified as estimated based on blank contamination and flagged as “JB”, unless overridden by qualifications for other QC exceedances.

<u>Blank Date</u>	<u>Compound</u>	<u>Concentration</u>	<u>Associated Samples</u>
10/10/01	Chloroform	0.24 µg/L	MWFTA-20

B.5.2.1.3 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 percent or the compound exceeding %R criteria in the LCS also exceeded %D criteria in the CCV, the associated results were rejected (flagged R).

<u>LCS Date</u>	<u>Affected Compounds</u>	<u>Associated Samples</u>		
10/18/01	Carbon disulfide (rejected)	DMW-29B MWFTA-28B TB-101001	MWFTA-14 TB-100801-2	MWFTA-16 TB-100901
10/10/01	Chloromethane (low) 4-Methyl-2-pentanone (low) 2-Hexanone(low)	MWFTA-17 MWFTA-20 OU7DUP-3	MWFTA-18 MWFTA-29B TB-100101	MWFTA-19 PWFTA-2 TB-100201

B.5.2.1.4 MS/MSDs were specified and performed on groundwater samples MWFTA-1 and MWFTA-29B. In addition, the laboratory performed a MS/MSD on sample MWFTA-16. The MS/MSD recovery criteria outlined in the Shell document were met with the following exceptions. Recoveries of 2-hexanone in MWFTA-1 and MWFTA-29B, and acetone in MWFTA-1 were below limits, but results were previously qualified as estimated and flagged J. No further qualification was necessary.

B.5.2.1.5 One field duplicate pair (PWFTA-2/OU7DUP-3) was collected and analyzed from the lower aquifer. RPD between the parent sample and the duplicate sample is within specified limits (less than 30 percent). Furthermore, all surrogates and internal standards added to the samples by the laboratory were recovered within specified limits.

B.5.2.1.6 The trip blanks associated with the OU 7 lower aquifer samples were analyzed and reported to contain low levels of VOCs, as indicated below. The samples with concentrations less than or equal to five times these concentrations (ten times for acetone and methylene chloride) were accordingly qualified as estimated based on blank contamination and flagged as “JB”, unless overridden by qualifications for other QC exceedances. Associated samples that were non-detects required no qualification.

<u>Blank ID</u>	<u>Compound</u>	<u>Concentration</u>	<u>Action</u>
TB-100801-2	Acetone	0.69 µg/L	Associated results flagged JB

	Bromodichloromethane	1.6 µg/L	No flag – associated results non-detect
	Bromoform	0.21 µg/L	No flag – associated results non-detect
	Dibromochloromethane	0.33 µg/L	No flag – associated results non-detect
	Chloroform	19 µg/L	Associated results flagged JB
	Methylene Chloride	0.40 µg/L	Associated results flagged JB
TB-100901	Acetone	1.4 µg/L	No flag – associated results non-detect or greater than 10x blank
	2-Butanone	0.73 µg/L	No flag – associated results non-detect
TB-101001	Acetone	1.1 µg/L	No flag – associated results non-detect

B.5.2.1.7 The following samples were diluted to place the VOC results within the range of the calibration curve, which resulted in elevated PQLs.

Sample	Dilution Factor
MWFTA-20	5x
MWFTA-16	50x

B.5.2.1.8 Additionally, the following data points were reported at concentrations above the MDL, but less than the PQL and were qualified as estimated and flagged as “JQ”.

Sample ID	Affected Compounds
DMW-29B	cis-1,2-Dichloroethene, Tetrachloroethene, Toluene, Trichloroethene
MWFTA-14	Naphthalene, Toluene
MWFTA-16	1,2-Dichlorobenzene, Acetone
MWFTA-17	Acetone, Naphthalene, Toluene
MWFTA-18	Acetone, Toluene
MWFTA-19	Acetone, Methylene chloride, Tetrachloroethene, Toluene, Trichloroethene
MWFTA-20	Toluene, Vinyl chloride
MWFTA-28B	2-Butanone, Naphthalene, Toluene
MWFTA-29B	2-Butanone, Benzene, Naphthalene, Toluene
PWFTA-2	1,4-Dichlorobenzene, Acetone, Naphthalene, p-Isopropyltoluene, Tetrachloroethene, Toluene, trans-1,2-Dichloroethene, Vinyl chloride
OU7DUP-3	1,4-Dichlorobenzene, Acetone, Naphthalene, p-Isopropyltoluene, Tetrachloroethene, Toluene, trans-1,2-Dichloroethene, Vinyl chloride
TB-100801-2	Acetone, Bromoform, Dibromochloromethane, Methylene chloride
TB-100901	2-Butanone, Acetone
TB-101001	Acetone

B.5.2.2 Dissolved Gases (RSK-175) – The initial calibration for each instrument used for the analysis of dissolved gases met acceptable criteria. The continuing calibration standards were also within 25 percent of their true value. The laboratory batch preparation blanks (Method Blanks) did not contain dissolved gases with the following exceptions. Associated positive methane and carbon dioxide results less than 5 times the blank value were marked as estimated due to blank contamination and flagged “JB”.

<u>Blank Date</u>	<u>Compound</u>	<u>Concentration</u>	<u>Associated Samples</u>
10/18/01	Carbon Dioxide	0.14 µg/L	MWFTA-14 TB-100901
10/22/01	Methane	0.0006 µg/L	DMW-29B TB-101001
	Carbon Dioxide	0.13 µg/L	TB-101001
10/10/01	Carbon Dioxide	0.11 µg/L	TB-100101 OU7DUP-3
	Methane	0.00089 µg/L	No samples affected
10/11/01	Methane	0.00065 µg/L	TB-100201

B.5.2.2.1 Batch LCSs for dissolved gases were within acceptable limits. MS/MSD spikes were not performed for dissolved gases.

B.5.2.2.2 The trip blanks associated with the OU 7 samples were analyzed and reported to contain low levels of carbon dioxide and methane. The samples with concentrations less than or equal to five times these concentrations were accordingly qualified as estimated based on blank contamination and flagged as “JB”. However, methane and carbon dioxide results for samples collected on 10/8/01, 10/9/01, and 10/10/01 were already flagged “JB” due to positive method blank results (see above).

<u>Compound</u>	<u>Associated Samples</u>
Carbon Dioxide	MWFTA-20

B.5.2.2.3 The analytical holding time of 7 days for carbon dioxide was exceeded for all OU 7 samples. The associated positive results were flagged J and non-detects UJ if not overridden by other criteria.

B.5.2.2.4 One field duplicate pair (PWFTA-2/OU7DUP-3) was collected from the lower aquifer and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (less than 20 percent).

B.5.2.2.5 Results were evaluated and reported down to the MDL. Flagging of dissolved gasses results less than the PQL but greater than the MDL is outlined below.

<u>Analyte</u>	<u>Affected Samples</u>
Ethane	MWFTA-16 MWFTA-18 MWFTA-29B
Methane	TB-100901
Ethene	MWFTA-29B
Carbon dioxide	TB-100201, TB-100801-2

B.5.2.3 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 midpoint calibration check standards were within 10 percent of their true value. The continuing calibration standards were also within

10 percent of their true value. The laboratory batch preparation blanks (Method Blanks) contained some metals above the DL. Samples containing these metals at less than 5 times the blank level were flagged as “JB” and are described below.

<u>Metal</u>	<u>Affected Samples</u>
Aluminum	MWFTA-29B (diss.) MWFTA-18 (both)
Beryllium	MWFTA-29B (both)

The subsequent CCBs were also less than the PQL, and results were flagged JB if the sample concentration was less than 5 times the blank concentration.

<u>Metal</u>	<u>Affected Samples</u>
Aluminum	MWFTA-20 (total)
Beryllium	DMW-29B (total)
Cadmium	MWFTA-19 (diss.)
Chromium	MWFTA-29B (diss.) MWFTA-16 (diss.)
Cobalt	MWFTA-29B (total) MWFTA-14 (total)
Copper	PWFTA-2 (total) MWFTA-29B (both)
Magnesium	PWFTA-2 (total) MWFTA-29B (diss.) OU7DUP-3 (total) MWFTA-19 (both)
Manganese	PWFTA-2 (total) MWFTA-29B (diss.) OU7DUP-3 (both) MWFTA-17 (diss.) MWFTA-14 (diss.) MWFTA-16 (diss.)
Molybdenum	MWFTA-14 (both) MWFTA-29B (diss.)
Nickel	MWFTA-17 (diss.) MWFTA-18 (both) MWFTA-29B (diss.) OU7DUP-3 (both) PWFTA-2 (total)
Vanadium	OU7DUP-3 (both) MWFTA-19 (both) MWFTA-20 (both) MWFTA-28B (total) MWFTA-14 (total) MWFTA-16 (both) PWFTA-2 (both)

B.5.2.3.1 The batch LCSs for dissolved and total metals were within USACE prescribed limits (80 to 120 %R). The MS/MSD recoveries for spiked sample MWFTA-29B were within USACE limits (75 to 125 %R)

with the exception of total aluminum and total iron which recovered high. These results are flagged JH (estimated with high bias).

B.5.2.3.2 One field duplicate pair (PWFTA-2/OU7DUP-3) was collected from the lower aquifer and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (less than 25 percent), with the exception of the total aluminum results for PWFTA-2/OU7DUP-3. The associated results were qualified as estimated and flagged J.

B.4.2.3.3 The dissolved zinc result exceeded the total zinc result by more than 10 percent in samples DMW-29B, and MWFTA-16 resulting in J flags for total and dissolved results. A post digestion spike was performed on sample MWFTA-16 to confirm matrix effects and was within USACE control limits.

B.5.2.3.4 Results were evaluated and reported down to the MDL. Flagging of total and dissolved metals results less than the PQL but greater than the MDL (JQ) is described below.

Sample ID	Affected Metals
DMW-29B	Barium (total and dissolved), Magnesium (total and dissolved), Sodium (total and dissolved), Zinc (total)
MWFTA-14	Barium (total and dissolved), Chromium (total), Manganese (total), Nickel (total)
MWFTA-16	Aluminum (total), Magnesium (total and dissolved), Manganese (total)
MWFTA-17	Barium (both), Vanadium (both)
MWFTA-18	Antimony (dissolved), Barium (total and dissolved)
MWFTA-19	Cadmium (dissolved), Barium (total and dissolved)
MWFTA-20	Antimony (dissolved), Barium (total and dissolved), Magnesium (total and dissolved)
MWFTA-28B	Barium (total and dissolved)
MWFTA-29B	Molybdenum (total), Magnesium (total), Nickel (total), Vanadium (total and dissolved)
PWFTA-2	Barium (total and dissolved)
OU7DUP-3	Barium (total and dissolved)

B.5.2.4 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 laboratory batch preparation blanks (Method Blanks) and subsequent CCBs were less than the PQL, but above the MDL. No qualification was required because associated samples were non detect for thallium.

B.5.2.4.2 Batch LCSs for thallium were within acceptable limits. The recovery of total and dissolved thallium in MS/MSD sample MWFTA-29B was below limits and flagged as UL. The analytical holding time of 6 months for thallium was met for the OU7 samples.

B.5.1.4.3 One field duplicate pair (PWFTA-2/OU7DUP-3) was collected from the lower aquifer and analyzed. RPD between the parent sample and the duplicate sample could not be calculated because thallium was not detected in either sample.

B.5.1.4.4 A post digestion spike was performed on samples MWFTA-16 to confirm matrix effects. Recovery was low for dissolved thallium in MWFTA-16. Dissolved thallium in MWFTA-16 was flagged as estimated and marked J. Results were evaluated and reported down to the MDL. Flagging of thallium results less than the PQL but greater than the MDL was not required.

B.5.2.5. 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 within QC limits for mercury. The laboratory batch preparation blanks (Method Blanks) and subsequent CCBs did not contain mercury.

B.5.2.5.1 Batch LCSs for mercury were within acceptable limits with one exception. The LCS recovery of mercury associated with samples collected on October 5 was below USACE limits (79 percent). However, the recovery was within the SMF limits of 60 to 140 percent. Therefore, no qualification to the affected sample data was applied. The MS/MSD recoveries for spiked sample MWFTA-29B, were within USACE limits. The analytical holding time of 28 days for mercury was met for the OU7 samples.

B.5.2.5.2 One field duplicate pair (PWFTA-2/OU7DUP-3) was collected from the lower aquifer and analyzed. RPD between the parent sample and the duplicate sample could not be calculated because mercury was not detected in either sample. Results were evaluated and reported down to the MDL. Flagging of mercury results less than the PQL but greater than the MDL was not required.

B.5.2.4 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) did not contain anions. No qualification was required. Batch LCSs for anions were within acceptable limits. The MS/MSD recoveries for the spiked sample MWFTA-29B were within acceptable limits.

B.5.2.4.1 One field duplicate pair (PWFTA-2/OU7DUP-3) was collected from the lower aquifer and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (less than 20 percent) for values above the PQL.

B.5.2.4.3 The sulfate results for MWFTA-18 were reported at concentrations above the MDL, but less than the PQL and were qualified as estimated and flagged as “JQ”.

B.5.2.5 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) contained TOC below the PQL at 0.7 mg/L on 10/30/01 and 0.5 mg/L on 10/29/01. The TOC results for DMW-29B, MWFTA-14, MWFTA-16, TB-108001-2, and TB-100901 were qualified as estimated and flagged JB. Batch LCSs for TOC were within acceptable limits. The MS/MSD recoveries for the spiked sample MWFTA-29B were within acceptable limits. No qualification was necessary.

B.5.2.5.1 The trip blanks associated with the OU 7 samples collected on 10/8/01 and 10/9/01 were reported to contain low levels of TOC. The samples with concentrations less than or equal to five times these concentrations were accordingly qualified as estimated based on blank contamination and flagged as “JB.” However, those samples were previously flagged JB due to method blank contamination. The TOC results for sample MWFTA-28B were greater than five times the associated trip blank concentrations and required no qualification.

B.5.2.5.2 One field duplicate pair (PWFTA-2/OU7DUP-3) was collected from the lower aquifer and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (less than 20 percent). Results were evaluated and reported down to the MDL. Flagging of TOC results less than the PQL but greater than the MDL was not required.

B.5.2.6 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 below the PQL. Associated results greater than or equal to five times the blank value required no qualification. Batch LCSs for alkalinity were within acceptable limits. The MS/MSD recoveries for spiked sample MWFTA-18B were within acceptable limits. Recovery in sample MWFTA-29B was below QC limits, and results were marked estimated and flagged J.

B.5.2.6.1 One field duplicate pair (PWFTA-2/OU7DUP-3) was collected from the lower aquifer and analyzed. RPD between the parent sample and the duplicate sample is within specified limits (less than 20 percent). Results were evaluated and reported down to the MDL. Flagging of alkalinity results less than the PQL but greater than the MDL was not required.

B.5.2.7 Sulfide (376.1) – The titration standardization performed for the analysis of sulfide met acceptable criteria. The laboratory batch preparation blanks (Method Blanks) did not contain sulfide. Batch LCSs for sulfide were within acceptable limits. The MS/MSD recovery for spiked sample MWFTA-29B was within acceptable laboratory limits.

B.5.2.7.1 One field duplicate pair (PWFTA-2/OU7DUP-3) was collected from the lower aquifer and analyzed. Results were evaluated and reported down to the MDL. Flagging of alkalinity results less than the PQL but greater than the MDL was not required.

B.5.2.8 Dissolved Hydrogen (AM20GA) - Initial and continuing calibration and instrument/method blanks were assumed to be 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.

B.5.2.8.2 One field duplicate pair (PWFTA-2/OU7DUP-3) was collected and analyzed from the lower aquifer. RPD between the parent and duplicate samples were within QC limits. No qualification was necessary.

B.6.0 DATA QUALITY EVALUATION SUMMARY

B.6.0.1 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. 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.

B.6.0.2 The following compound exhibited percent completeness less than 90:

<u>Volatile Organic Compounds</u>	<u>% Complete</u>
Carbon disulfide	83

The effect of data completeness below 90 percent for this compound based on the project objectives is negligible. Carbon disulfide was not detected in the samples. In addition, the data generated for carbon disulfide do 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 is not constituent of potential concern (COPC) for OU 7.

B.6.0.3 Thirteen samples from the lower aquifer were collected 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 valance 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 show that natural attenuation is occurring within the lower aquifer at OU 7.

B.6.0.4 In addition, monitoring well MWFTA-8 was proposed to be sampled. However, since monitoring well MWFTA-7 is screened within the same aquifer and represents the same location as MWFTA-8, MWFTA-8 was not deemed necessary to sample. Therefore, project DQOs were not affected.

PREPARED/DATE: DWK 12-18-02

CHECKED/DATE: gph 1-22-02

TABLE B-1

DATA SUMMARY TABLE FOR GROUNDWATER - UPPER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond Virginia

	Sample ID: Sample Date:	Practical (a) Quantitation Limit	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
<u>FIXED BASE LABORATORY ANALYSIS</u>										
<u>Anions - MCAWW 300.3A mg/L</u>										
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
<u>Dissolved Gases - RSK SOP-175 mg/L</u>										
Carbon dioxide		0.001	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
<u>Dissolved Hydrogen by Microseeps AM20GA nM/L</u>										
Hydrogen		0.03	8.3	10	1.6	8.9	9.5	8.2	8.1	7.7
<u>Mercury - SW846 7470A (Dissolved) µg/L</u>										
Mercury		1	<1	<1	<1	<1	<1	<1	<1	<1
<u>Mercury - SW846 7470A (Total) µg/L</u>										
Mercury		1	<1	<1	<1	<1	<1	<1	<1	<1
<u>Metals - SW846 6010B (Dissolved) µg/L</u>										
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

TABLE B-1

DATA SUMMARY TABLE FOR GROUNDWATER - UPPER AQUIFER
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 First Quarterly Groundwater Sampling - October 2001
 Operable Unit 7
 Defense Supplu Center Richmond
 Richmond Virginia

	Sample ID: Sample Date:	Practical (a) Quantitation Limit	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
FIXED BASE LABORATORY ANALYSIS										
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
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	
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

TABLE B-1

DATA SUMMARY TABLE FOR GROUNDWATER - UPPER AQUIFER
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	Sample ID: Sample Date:	Practical (a) Quantitation Limit	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
<u>FIXED BASE LABORATORY ANALYSIS</u>										
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 UL	<10 UL	<10 UL	<10 UL	<10 UL	<50 UL	<10 UL
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
n-Butylbenzene		1	<420	<420	<1	<1	<1	<1	<5	<1

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DATA SUMMARY TABLE FOR GROUNDWATER - UPPER AQUIFER
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	Sample ID: Sample Date:	Practical (a) Quantitation Limit	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
<u>FIXED BASE LABORATORY ANALYSIS</u>										
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
<u>Surrogate:</u>										
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

J Estimated.

JB Estimated; possibly biased high or falsepositive based on blank contamination.

JH Estimated; possibly biased high based on QC data.

JL Estimated; possibly biased low based on QC data.

JQ Estimated; Value is between reporting limit and detection limit.

NA Not Analyzed.

R Rejected.

UJ Undetected; Reported Detection Limit is imprecise.

UL Undetected; Data biased low - Reported Detection Limit is higher than indicated.

(a) Quantitation limits are ideal. Sample quantitation limits may vary due to sample volume/weight extracted and dilutions.

mg/L milligram per liter

nM/L nanomolars per liter

µg/L microgram per liter

TABLE B-1
DATA SUMMARY TABLE FOR GROUNDWATER - UPPER AQUIFER
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Sample ID: Sample Date:	Practical (a) Quantitation Limit	Sample DMW-33A 10/8/2001	Sample DMW-35A 10/5/2001	Sample MWFO5-1 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
<u>FIXED BASE LABORATORY ANALYSIS</u>									
<u>Anions - MCAWW 300.3A mg/L</u>									
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
<u>Dissolved Gases - RSK SOP-175 mg/L</u>									
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
<u>Dissolved Hydrogen by Microseeps AM20GA nM/L</u>									
Hydrogen	0.03	9.1	8.9	8.8	1.6	7.4	7.8	8.8	13
<u>Mercury - SW846 7470A (Dissolved) µg/L</u>									
Mercury	1	<1	<1	<1	<1 UL	<1	<1	<1	<1
<u>Mercury - SW846 7470A (Total) µg/L</u>									
Mercury	1	<1	<1	<1	<1 UL	<1	<1	<1	<1
<u>Metals - SW846 6010B (Dissolved) µg/L</u>									
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

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	Sample ID: Sample Date:	Practical (a) Quantitation Limit	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
<u>FIXED BASE LABORATORY ANALYSIS</u>										
<u>Metals - SW846 6010B (Total) µg/L</u>										
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
<u>Thallium - SW846 7841 (Dissolved) µg/L</u>										
Thallium		2	<2	<2	<2	2 JB	1.8 JB	<2	<2	<2
<u>Thallium - SW846 7841 (Total) µg/L</u>										
Thallium		2	<2	<2	<2	2.1 JB	2.4 JB	<2	<2	2.1 JB
<u>Total Alkalinity - MCAWW 310.1 mg/L</u>										
Total Alkalinity		5	15	10 JB	19	280	21	24	1.6 JB	23
<u>Total Organic Carbon - SW846 9060 mg/L</u>										
Total Organic Carbon		1	2 JB	<1	0.6 JB	36	3	0.7 JB	1	48
<u>Total Sulfide - MCAWW 376.1 mg/L</u>										
Total Sulfide		1	2.8	1.1	<1	<1	<1	6.3	<1	2.3
<u>Volatile Organic Compounds - SW846 8260B µg/L</u>										
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

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DATA SUMMARY TABLE FOR GROUNDWATER - UPPER AQUIFER

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Operable Unit 7

Defense Supplu Center Richmond

Richmond Virginia

	Practical (a)	Sample							
Sample ID:	Quantitation	DMW-33A	DMW-35A	MWFOS-1	MWFTA-1	MWFTA-3	MWFTA-5	MWFTA-7	Sample
Sample Date:	Limit	10/8/2001	10/5/2001	10/9/2001	10/4/2001	10/4/2001	10/8/2001	10/1/2001	MWFTA-23
									10/9/2001
<u>FIXED BASE LABORATORY ANALYSIS</u>									
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 UL	<10	<50 UL	<10 UL	<10	<10 UL	<50000
4-Chlorotoluene	1	<100	<1	<1	<5	<1	<1	<1	<5000
4-Methyl-2-pentanone	10	<1000	<10	<10	<50	<10	<10	<10 UL	<50000
Acetone	10	<1000	<10	<10	<50 UL	<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 JL	<10000
cis-1,2-Dichloroethene	0.5	2900	1.7	<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
n-Butylbenzene	1	<100	<1	<1	<5	<1	<1	<1	<5000

TABLE B-1

DATA SUMMARY TABLE FOR GROUNDWATER - UPPER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supplu Center Richmond
Richmond Virginia

	Practical (a)	Sample							
Sample ID:	Quantitation	DMW-33A	DMW-35A	MWFOS-1	MWFTA-1	MWFTA-3	MWFTA-5	MWFTA-7	MWFTA-23
Sample Date:	Limit	10/8/2001	10/5/2001	10/9/2001	10/4/2001	10/4/2001	10/8/2001	10/1/2001	10/9/2001
<u>FIXED BASE LABORATORY ANALYSIS</u>									
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
<u>Surrogate:</u>									
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

J Estimated.

JB Estimated; possibly biased high or falsepositive based on blank contamination.

JH Estimated; possibly biased high based on QC data.

JL Estimated; possibly biased low based on QC data.

JQ Estimated; Value is between reporting limit and detection limit.

NA Not Analyzed.

R Rejected.

UJ Undetected; Reported Detection Limit is imprecise.

UL Undetected; Data biased low - Reported Detection Limit is higher than indicated.

(a) Quantitation limits are ideal. Sample quantitation limits may vary due to sample volume/weight ex

mg/L milligram per liter

nM/L nanamolars per liter

µg/L microgram per liter

PREPARED/DATE: MAB 12-19-01
 CHECKED/DATE: AM 12-20-01

TABLE B-2
DATA SUMMARY TABLE FOR GROUNDWATER - LOWER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date:	Practical (a) Quantitation Limit	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	Sample MWFTA-19 10/2/2001	Sample MWFTA-20 10/2/2001	Sample MWFTA-20B 10/8/2001	Sample MWFTA-29B 10/1/2001	Sample PWFTA-2 10/1/2001	Duplicate PWFTA-2 10/1/2001
<u>FIXED BASE LABORATORY ANALYSIS</u>												
<u>Anions - MCAWW 300.3A mg/L</u>												
Chloride	1	9.3	16.5	7.6	5.9	3.8	6	3.5	58.6	1.5	8.6	8.6
Nitrate	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate	1	5	29.6	7.4	7.2	0.94 JQ	6.2	4.8	14	5.1	5.8	5.6
<u>Dissolved Gases - RSK SOP-175 mg/L</u>												
Carbon dioxide	0.001	45 J	0.11 JB	<0.17 UJ	<0.17 J	7.1 J	<0.17 J	0.089 JB	3.2 J	<0.17 UJ	<0.17 UJ	0.14 JB
Ethane	0.002	<0.002	<0.002	0.0015 JQ	<0.002	0.001 JQ	<0.002	<0.002	<0.002	0.00043 JQ	<0.002	<0.002
Ethene	0.001	<0.001	<0.001	0.011	<0.001	0.005	<0.001	0.0054	<0.001	0.00088 JQ	0.002	0.0022
Methane	0.001	0.0014 JB	0.0036	0.022	0.073	0.28	0.0034	0.013	0.0021	0.017	0.16	0.17
<u>Dissolved Hydrogen by Microseeps AM20GA nM/L</u>												
Hydrogen	0.03	2.7	7.2	26	19	6.8	13	6.1	NA	52	46	51
<u>Mercury - SW846 7470A (Dissolved) µg/L</u>												
Mercury	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
<u>Mercury - SW846 7470A (Total) µg/L</u>												
Mercury	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
<u>Metals - SW846 6010B (Dissolved) µg/L</u>												
Aluminum	200	<200	<200	<200	5340	109 JB	659	<200	<200	453 JB	1200	1220
Antimony	5	<5	<5	<5	<5	3 JQ	<5	2.8 JQ	<5	<5	<5	<5
Arsenic	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Barium	200	31.4 JQ	35 JQ	721	156 JQ	29.3 JQ	55.2 JQ	72 JQ	75.3 JQ	239	45.9 JQ	45.7 JQ
Beryllium	10	<10	<10	<10	<10	<10	<10	<10	<10	0.76 JB	<10	<10
Cadmium	2	<2	<2	<2	<2	0.3 JB	<2	<2	<2	<2	<2	<2
Calcium	5000	5390	5390	109000	119000	9530	45600	16800	22400	109000	58000	57300
Chromium	10	<10	<10	1.5 JB	<10	<10	<10	<10	<10	1.9 JB	<10	<10
Cobalt	30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
Copper	10	<10	<10	<10	<10	<10	<10	<10	<10	4.3 JB	<10	<10
Iron	200	215	<200	<200	<200	2400	<200	<200	425	<200	<200	<200
Lead	3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium	5000	4040 JQ	5150	125 JQ	<5000	6550	37.5 JB	2210 JQ	22400	30.1 JB	<5000	<5000
Manganese	20	72.9	2.7 JB	2 JB	1.2 JB	107	<20	25.9	101	1.2 JB	<20	1.8 JB
Molybdenum	40	<40	7.5 JB	<40	<40	<40	<40	<40	<40	9.1 JB	<40	<40
Nickel	100	<100	<100	<100	2.4 JB	2.9 JB	<100	<100	<100	5.8 JB	<100	2.3 JB
Potassium	5000	5090	56600	186000	26800	7180	10400	10300	27900	91200	35100	36500
Selenium	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Sodium	5000	4590 JQ	52200	59300	11500	7670	5640	11600	42200	72400	12300	12600
Vanadium	50	<50	<50	1.6 JB	6 JQ	<50	2.4 JB	1.2 JB	<50	3.1 JQ	2 JB	2.3 JB
Zinc	20	30.4 J	<20	50.8 J	<20	<20	<20	<20	47.2	<20	<20	<20

TABLE B-2

DATA SUMMARY TABLE FOR GROUNDWATER - LOWER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Sample ID: Sample Date:	Practical (a) Quantitation Limit	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	Sample MWFTA-19 10/2/2001	Sample MWFTA-20 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
<u>FIXED BASE LABORATORY ANALYSIS</u>													
<u>Metals - SW846 6010B (Total) µg/L</u>													
Aluminum		200	<200	995	70.4 JQ	5250	257 JB	673	301 JB	279	1960 JH	1900 J	1280 J
Antimony		5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic		5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Barium		200	36.2 JQ	51.8 JQ	738	145 JQ	38.6 JQ	54.5 JQ	79.5 JQ	89.3 JQ	250	43.2 JQ	43.8 JQ
Beryllium		10	0.81 JB	<10	<10	<10	<10	<10	<10	<10	0.99 JB	<10	<10
Cadmium		2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Calcium		5000	5330	8670	111000	119000	9620	45400	17100	26500	110000	54600	54700
Chromium		10	<10	1.6 JQ	<10	<10	<10	<10	<10	<10	42.1	<10	<10
Cobalt		30	<30	1.4 JB	<30	<30	<30	<30	<30	<30	2.2 JB	<30	<30
Copper		10	<10	<10	<10	<10	<10	<10	<10	<10	12 JB	4.2 JB	<10
Iron		200	2080	905	<200	<200	2910	<200	520	3130	1970 JH	<200	<200
Lead		3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Magnesium		5000	4280 JQ	8480	1930 JQ	<5000	6670	44.8 JB	4950 JQ	23800	935 JQ	57.9 JB	62.7 JB
Manganese		20	78.5	19.2 JQ	12.4 JQ	<20	111	<20	139	175	71.3	1.4 JB	1.2 JB
Molybdenum		40	<40	8.6 JB	<40	<40	<40	<40	<40	<40	7.3 JQ	<40	<40
Nickel		100	<100	3.3 JQ	<100	<100	2.5 JB	<100	<100	<100	9.7 JQ	6 JB	2.6 JB
Potassium		5000	5250	57300	188000	249000	7190	10200	9980	25800	89300	37300	37000
Selenium		5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver		10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Sodium		5000	4790 JQ	55900	58500	11000	7490	5560	11400	41700	73700	12900	12900
Vanadium		50	<50	1.2 JB	1.6 JB	5.2 JQ	<50	2.2 JB	1.2 JB	1.1 JB	3.8 JQ	2.3 JB	2.5 JB
Zinc		20	14.2 JQ	23.4	24.8 J	<20	<20	<20	<20	392	30.5	<20	<20
<u>pH EPA 150.1 units</u>													
pH (liquid)			6.8	9.1	11.8	11.7	7.3	10.9	9.6	8.9	11.8	11.3	NA
<u>Thallium - SW846 7841 (Dissolved) µg/L</u>													
Thallium		2	<2	<2	2.2 J	<2	<2	<2	<2	<2	<2 UL	<2	<2
<u>Thallium - SW846 7841 (Total) µg/L</u>													
Thallium		2	<2	<2	<2	<2	<2	<2	<2	<2	<2 UL	<2	<2
<u>Total Alkalinity - MCAWW 310.1 mg/L</u>													
Total Alkalinity		5	24	150	480	270	60	110	72	160	440 J	140	120
<u>Total Organic Carbon - SW846 9060 mg/L</u>													
Total Organic Carbon		1	0.5 JB	2 JB	2 JB	2	2	<1	<1	22	5	<1	<1
<u>Total Sulfide - MCAWW 376.1 mg/L</u>													
Total Sulfide		1	1.5	<1	1.9	<1	<1	<1	<1	1.2	2.2	1.2	1.2
<u>Volatile Organic Compounds - SW846 8260B µg/L</u>													
1,1,1,2-Tetrachloroethane		1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,1,1-Trichloroethane		1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane		1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,1,2-Trichloroethane		1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,1-Dichloroethane		1	<1	<1	<50	<1	<1	<1	20	<1	<1	4	4.1
1,1-Dichloroethene		1	<1 UJ	<1 UJ	<50 UJ	<1	<1	<1	9.3	<1 UJ	<1	2.1	2.2
1,1-Dichloropropene		1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1

TABLE B-2

DATA SUMMARY TABLE FOR GROUNDWATER - LOWER AQUIFER
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date:	Practical (a) Quantitation Limit	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	Sample MWFTA-19 10/2/2001	Sample MWFTA-20 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
FIXED BASE LABORATORY ANALYSIS												
Volatile Organic Compounds - SW846 8260B µg/L (Cont.)												
1,2,3-Trichlorobenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,2,3-Trichloropropane	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,2,4-Trichlorobenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,2,4-Trimethylbenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,2-Dibromo-3-chloropropane	2	<2	<2	<100	<2	<2	<2	<10	<2	<2	<2	<2
1,2-Dibromoethane	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,2-Dichlorobenzene	1	<1	<1	6.3 JQ	<1	<1	<1	<5	<1	<1	1.5	1.5
1,2-Dichloroethane	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,2-Dichloropropane	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,3,5-Trimethylbenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,3-Dichlorobenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,3-Dichloropropane	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
1,4-Dichlorobenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	0.21 JQ	<1	0.2 JQ
2,2-Dichloropropane	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
2-Butanone	10	<10	<10	<500	<10	<10	<10	<50	2 JQ	1.8 JQ	<10	<10
2-Chlorotoluene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
2-Hexanone	10	<10	<10	<500	<10 UL	<10 UL	<10 UL	<50 UL	<10	1.7 JL	<10 UL	<10 UL
4-Chlorotoluene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
4-Methyl-2-pentanone	10	<10	<10	<500	<10 UL	<10 UL	<10 UL	<50 UL	<10	<10 UL	<10 UL	<10 UL
Acetone	10	<10	<10	46 JQ	6.7 JQ	0.6 JQ	0.78 JQ	<50	7.3 JB	15	2.7 JQ	2.8 JQ
Benzene	1	<1	<1	<50	<1	<1	<1	<5	<1	0.27 JQ	<1	<1
Bromobenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Bromochloromethane	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Bromodichloromethane	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Bromoform	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Bromomethane	2	<2	<2	<100	<2	<2	<2	<10	<2	<2	<2	<2
Carbon disulfide	1	<1 R	<1 R	<50 R	<1	<1	<1	<5	<1 R	<1	<1	<1
Carbon tetrachloride	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Chlorobenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Chloroethane	2	<2	<2	<100	<2	<2	<2	<10	<2	<2	<2	<2
Chloroform	1	<1	<1	<50	<1	<1	<1	0.76 JB	0.28 JB	<1	<1	<1
Chloromethane	2	<2	<2	<100	<2 UL	<2 UL	<2 UL	<10 UL	<2	<2 JL	<2 UL	<2 UL
cis-1,2-Dichloroethene	0.5	0.25 JQ	<0.5	1200	<0.5	2.5	1.6	150	<0.5	<0.5	5.3	5.5
cis-1,3-Dichloropropene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Dibromochloromethane	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Dibromomethane	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Dichlorodifluoromethane	2	<2	<2	<100	<2	<2	<2	<10	<2	<2	<2	<2
Ethylbenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Hexachlorobutadiene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Isopropylbenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
m-Xylene & p-Xylene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Methylene chloride	1	<1	<1	<50	<1	<1	0.44 JQ	<5	0.52 JB	<1	<1	<1
n-Butylbenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
n-Propylbenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Naphthalene	1	<1	0.24 JQ	<50	0.82 JQ	<1	<1	<5	0.74 JQ	0.82 JQ	0.82 JQ	0.82 JQ
o-Xylene	0.5	<0.5	<0.5	<25	<0.5	<0.5	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5
p-Isopropyltoluene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	0.2 JQ	0.23 JQ
sec-Butylbenzene	1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1

TABLE B-2
DATA SUMMARY TABLE FOR GROUNDWATER - LOWER AQUIFER
 Technical Memorandum
 First Quarterly Groundwater Sampling - October 2001
 Operable Unit 7
 Defense Supply Center Richmond
 Richmond, Virginia

	Sample ID: Sample Date:	Practical (a) Quantitation Limit	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	Sample MWFTA-19 10/2/2001	Sample MWFTA-20 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
FIXED BASE LABORATORY ANALYSIS													
Styrene		1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
tert-Butylbenzene		1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Tetrachloroethene		1	0.32 JQ	<1	<50	<1	<1	0.76 JQ	<5	<1	<1	0.4 JQ	0.4 JQ
Toluene		1	0.34 JQ	0.47 JQ	<50	0.3 JQ	0.63 JQ	0.24 JQ	1.1 JQ	0.84 JQ	0.95 JQ	0.31 JQ	0.28 JQ
trans-1,2-Dichloroethene		0.5	<0.5	<0.5	<25	<0.5	<0.5	<0.5	<2.5	<0.5	<0.5	0.16 JQ	0.18 JQ
trans-1,3-Dichloropropene		1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Trichloroethene		1	0.21 JQ	<1	<50	<1	<1	0.44 JQ	7.4	<1	<1	5.4	5.5
Trichlorofluoromethane		2	<2	<2	<100	<2 UJ	<2 UJ	<2 UJ	<10 UJ	<2	<2 UJ	<2 UJ	<2 UJ
Vinyl chloride		2	<2	<2	270	<2	<2	<2	8.4 JQ	<2	<2	0.41 JQ	0.5 JQ
Xylenes (total)		1	<1	<1	<50	<1	<1	<1	<5	<1	<1	<1	<1
Surrogate:													
1,2-Dichloroethane-d4		--	90	89	90	94	92	92	93	93	92	93	92
4-Bromofluorobenzene		--	85	85	87	89	89	87	89	88	91	89	87
Dibromofluoromethane		--	94	93	91	94	92	92	94	97	94	94	92
Toluene-d8		--	97	96	97	98	96	96	98	98	97	97	96

J Estimated.
 JB Estimated; possibly biased high or falsepositive based on blank contamination.
 JH Estimated; possibly biased high based on QC data.
 JL Estimated; possibly biased low based on QC data.
 JQ Estimated; Value is between reporting limit and detection limit.
 NA Not Analyzed.
 R Rejected.
 UJ Undetected; Reported Detection Limit is imprecise.
 UL Undetected; Data biased low - Reported
 Detection Limit is higher than indicated.
 (a) Quantitation limits are ideal. Sample quantitation limits may vary due to sample volume/weight extracted and dilutions.

mg/L milligram per liter
 nM/L nanomolars per liter
 µg/L microgram per liter

PREPARED/DATE: MAD 12-19-01
 CHECKED/DATE: JH 12-20-01

TABLE B-3

DATA SUMMARY TABLE FOR FIELD QUALITY CONTROL SAMPLES
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Sample ID: Sample Date:	Practical (a) Quantitation Limit	Trip Blank TB-100101 10/1/2001	Trip Blank TB-100201 10/2/2001	Trip Blank TB-100401-2 10/4/2001	Trip Blank TB-100501 10/5/2001	Trip Blank TB-100501-2 10/5/2001	Trip Blank TB-100801-2 10/8/2001	Trip Blank TB-100901 10/9/2001	Trip Blank TB-101001 10/10/2001
<u>Dissolved Gases - RSK SOP-175 mg/L</u>									
Carbon dioxide	0.001	0.072 JB	0.074 JQ	1.2 J	1.1 J	0.8 J	0.13 JQ	0.24 JB	0.082 JB
Ethane	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
Methane	0.001	0.00075 JB	0.00063 JB	0.0016	0.003	<0.001	<0.001	0.00099 JQ	0.00064 JB
<u>Total Organic Carbon - SW846 9060 mg/L</u>									
Total Organic Carbon	1	<1	<1	<1	<1	<1	0.7 JB	0.6 JB	<1
<u>Volatile Organic Compounds - SW846 8260B µg/L</u>									
1,1,1,2-Tetrachloroethane	1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	1	<1	<1	<1 UJ	<1 UJ	<1 R	<1	<1	<1
1,1,2-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 UJ	<1 UJ	<1 UJ
1,1-Dichloropropene	1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,3-Trichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,3-Trichloropropane	1	<1	<1	<1 UJ	<1 UJ	<1	<1	<1	<1
1,2,4-Trichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,4-Trimethylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dibromo-3-chloropropane	2	<2	<2	<2	<2	<2	<2	<2	<2
1,2-Dibromoethane	1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloropropane	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
1,3-Dichloropropane	1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
2,2-Dichloropropane	1	<1	<1	<1	<1	<1	<1	<1	<1
2-Butanone	10	<10	<10	<10	<10	<10	<10	0.73 JQ	<10
2-Chlorotoluene	1	<1	<1	<1	<1	<1	<1	<1	<1
2-Hexanone	10	<10 UL	<10 UL	<10 UL	<10 UL	<10 UL	<10	<10	<10

TABLE B-3

DATA SUMMARY TABLE FOR FIELD QUALITY CONTROL SAMPLES

Technical Memorandum

First Quarterly Groundwater Sampling - October 2001

Operable Unit 7

Defense Supply Center Richmond

Richmond, Virginia

Sample ID: Sample Date:	Practical (a) Quantitation Limit	Trip Blank TB-100101 10/1/2001	Trip Blank TB-100201 10/2/2001	Trip Blank TB-100401-2 10/4/2001	Trip Blank TB-100501 10/5/2001	Trip Blank TB-100501-2 10/5/2001	Trip Blank TB-100801-2 10/8/2001	Trip Blank TB-100901 10/9/2001	Trip Blank TB-101001 10/10/2001
<u>Volatile Organic Compounds - SW846 8260B µg/L (Cont.)</u>									
4-Chlorotoluene	1	<1	<1	<1	<1	<1	<1	<1	<1
4-Methyl-2-pentanone	10	<10 UL	<10 UL	<10	<10	<10	<10	<10	<10
Acetone	10	<10	<10	<10	0.78 JQ	<10 UL	0.69 JQ	1.4 JQ	1.1 JQ
Benzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Bromobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Bromochloromethane	1	<1	<1	<1	<1	<1	<1	<1	<1
Bromodichloromethane	1	<1	<1	<1	2.4	2.4	1.6	<1	<1
Bromoform	1	<1	<1	<1	<1	<1	0.21 JQ	<1	<1
Bromomethane	2	<2	<2	<2	<2	<2	<2	<2	<2
Carbon disulfide	1	<1	<1	<1	<1	<1	<1 R	<1 R	<1 R
Carbon tetrachloride	1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	2	<2	<2	<2	<2	<2	<2	<2	<2
Chloroform	1	<1	<1	<1	36	38	19	<1	<1
Chloromethane	2	<2 UL	<2 UL	<2	<2	<2	<2	<2	<2
cis-1,2-Dichloroethene	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene	1	<1	<1	<1	<1	<1	<1	<1	<1
Dibromochloromethane	1	<1	<1	<1	0.42 JQ	0.42 JQ	0.33 JQ	<1	<1
Dibromomethane	1	<1	<1	<1	<1	<1	<1	<1	<1
Dichlorodifluoromethane	2	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	<1	<1	<1	<1	<1	<1	<1	<1
Isopropylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
m-Xylene & p-Xylene	1	<1	<1	<1	<1	<1	<1	<1	<1
Methylene chloride	1	<1	<1	<1	0.52 JQ	0.43 JB	0.4 JQ	<1	<1
n-Butylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
n-Propylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	1	<1	<1	<1	<1	<1	<1	<1	<1
o-Xylene	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
p-Isopropyltoluene	1	<1	<1	<1	<1	<1	<1	<1	<1
sec-Butylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1
Styrene	1	<1	<1	<1	<1	<1	<1	<1	<1
tert-Butylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1

TABLE B-3

DATA SUMMARY TABLE FOR FIELD QUALITY CONTROL SAMPLES
Technical Memorandum
First Quarterly Groundwater Sampling - October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

	Sample ID:	Practical (a) Quantitation Limit	Trip Blank TB-100101 10/1/2001	Trip Blank TB-100201 10/2/2001	Trip Blank TB-100401-2 10/4/2001	Trip Blank TB-100501 10/5/2001	Trip Blank TB-100501-2 10/5/2001	Trip Blank TB-100801-2 10/8/2001	Trip Blank TB-100901 10/9/2001	Trip Blank TB-101001 10/10/2001
<u>Volatile Organic Compounds - SW846 8260B µg/L (Cont.)</u>										
Tetrachloroethene		1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene		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
trans-1,3-Dichloropropene		1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene		1	<1	<1	<1	<1	<1	<1	<1	<1
Trichlorofluoromethane		2	<2 UJ	<2 UJ	<2	<2	<2	<2	<2	<2
Vinyl chloride		2	<2	<2	<2	<2	<2	<2	<2	<2
Xylenes (total)		1	<1	<1	<1	<1	<1	<1	<1	<1
<u>Surrogate:</u>										
1,2-Dichloroethane-d4		--	92	93	95	96	97	91	88	92
4-Bromofluorobenzene		--	87	89	88	86	86	89	84	88
Dibromofluoromethane		--	93	92	95	95	96	95	92	96
Toluene-d8		--	96	98	103	101	103	98	97	101

J Estimated.

JB Estimated; possibly biased high or falsepositive based on blank contamination.

JH Estimated; possibly biased high based on QC data.

JL Estimated; possibly biased low based on QC data.

JQ Estimated; Value is between reporting limit and detection limit.

NA Not Analyzed.

R Rejected.

UJ Undetected; Reported Detection Limit is imprecise.

UL Undetected; Data biased low - Reported Detection Limit is higher than indicated.

(a) Quantitation limits are ideal. Sample quantitation limits may vary due to sample volume/weight extracted and dilutions.

mg/L milligram per liter

µg/L microgram per liter

PREPARED/DATE: MAB 12-19-01
 CHECKED/DATE: HW 12-20-01

TABLE B-4
DATA QUALIFIERS AND DESCRIPTION
Technical Memorandum
First Quarterly Groundwater Sampling-October 2001
Operable Unit 7
Defense Supply Center Richmond
Richmond, Virginia

Data Qualifier	Description
Data Usable With Qualification	
J	Estimated quantitation based upon QC data
JB	Estimated quantitation: possibly biased high or false positive based upon blank data
JH	Estimated quantitation: possibly biased high based upon QC data
JL	Estimated quantitation: possibly biased low based upon QC data
JQ	Estimated quantitation: result below the PQL
UJ	Undetected, reporting limit is inaccurate or imprecise
UL	Undetected, reporting limit is higher than indicated
Unusable Data	
R	Data rejected based upon QC data
Flagging Hierarchy	
R > JB > JH or JL > J or JQ	
JQ > J	
JH + JL = J	

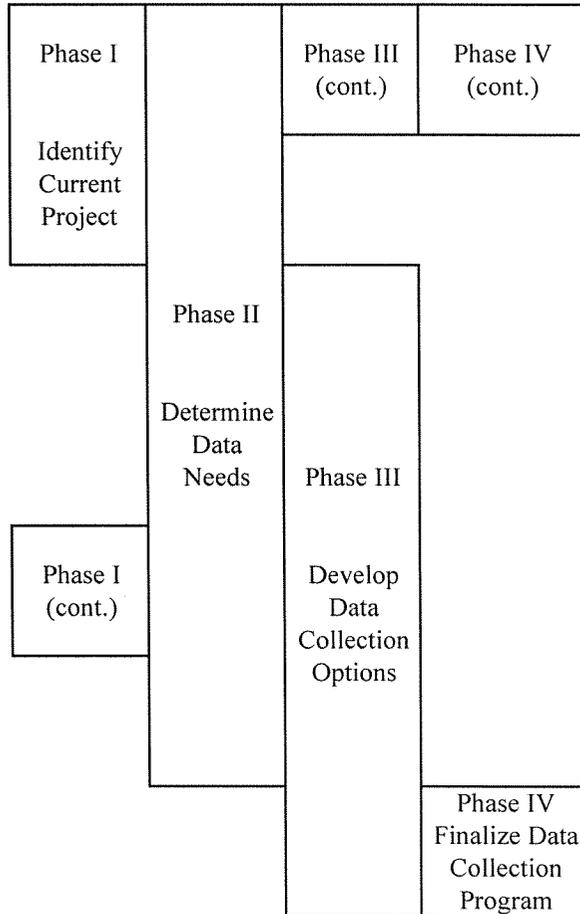
PREPARED/DATE: DWK 12-15-01
 CHECKED/DATE: DAH 12-19-01

**FIGURE B-1
ALIGNMENT BETWEEN EPA'S 7-STEP DQO PROCESS AND THE TPP PROCESS**

EPA's 7-Step DQO Process

Step 1 State the Problem
Step 2 Identify the Decision
Step 3 Identify Inputs to the Decision
Step 4 Define the Study Boundaries
Step 5 Develop a Decision Rule
Step 6 Specify Limits on Decision Errors
Step 7 Optimize the Design for Obtaining Data

Technical Project Planning (TPP) Process



Source: EM 200-1-2, 31 Aug 98

PREPARED BY/DATE: DWL 12-18-01
 CHECKED BY/DATE: JAH 12-19-01