# ANNUAL GROUNDWATER MONITORING REPORT

# Hazardous Waste Management Units 5, 7, 10 and 16 CALENDAR YEAR 2009

# RADFORD ARMY AMMUNITION PLANT RADFORD, VIRGINIA

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# TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	HWMU-5	1
1.2	HWMU-7	
1.3	HWMU-10	
1.4	HWMU-16	
2.0	HWMU-5 ANNUAL GROUNDWATER MONITORING REPORT	3
2.1	WASTE MANAGEMENT UNIT INFORMATION	3
2.2	GROUNDWATER MONITORING PLAN	
2.3	GROUNDWATER MOVEMENT	
2.4	GROUNDWATER ANALYTICAL DATA EVALUATION	4
2.	.4.1 Comparison to Groundwater Protection Standards	4
2.	.4.2 Comparison to Background Concentrations	5
2.	.4.3 Annual Monitoring for Constituents Listed in Appendix IX of 40 CFR Part 264	5
2.5	RECOMMENDATIONS	6
3.0	HWMU-7 ANNUAL GROUNDWATER MONITORING REPORT	7
3.1	WASTE MANAGEMENT UNIT INFORMATION	7
3.2	GROUNDWATER MONITORING PLAN.	
3.3	GROUNDWATER MOVEMENT	
3.4	GROUNDWATER ANALYTICAL DATA EVALUATION	8
3.	.4.1 Comparison to Groundwater Protection Standards	8
3.	.4.2 Comparison to Background Concentrations	
3.	.4.3 Annual Monitoring for Constituents Listed in Appendix IX of 40 CFR Part 264	
3.5	RECOMMENDATIONS	10
4.0	HWMU-10 ANNUAL GROUNDWATER MONITORING REPORT	12
4.1	WASTE MANAGEMENT UNIT INFORMATION	12
4.2	GROUNDWATER MONITORING PLAN	12
4.3	GROUNDWATER MOVEMENT	12
4.4	GROUNDWATER ANALYTICAL DATA EVALUATION	13
4.	.4.1 Comparison to Groundwater Protection Standards	13
4.	.4.2 Comparison to Background Concentrations	
	.4.3 Annual Monitoring for Constituents Listed in Appendix IX of 40 CFR Part 264	
4.5	RECOMMENDATIONS	
5.0	HWMU-16 ANNUAL GROUNDWATER MONITORING REPORT	15
5.1	WASTE MANAGEMENT UNIT INFORMATION	15
5.2	GROUNDWATER MONITORING PLAN.	
5.3	GROUNDWATER MOVEMENT	15
5.4	GROUNDWATER ANALYTICAL DATA EVALUATION	
5.	.4.1 Comparison to Groundwater Protection Standards	
5.	.4.2 Comparison to Background Concentrations	17
	.4.3 Annual Monitoring for Constituents Listed in Appendix IX of 40 CFR Part 264	
5.5	RECOMMENDATIONS	
SIGN	ATURE/CERTIFICATION	19

i

#### LIST OF TABLES

Table 1	HWMU-5 Groundwater Elevations - 2009
Table 2	HWMU-7 Groundwater Elevations - 2009
Table 3	HWMU-10 Groundwater Elevations - 2009
Table 4	HWMU-16 Groundwater Elevations - 2009

#### LIST OF APPENDICES

Appendix A HWMU-	WMU-5
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- Appendix A-1 HWMU-5 Potentiometric Surface Maps (Second and Fourth Quarters 2009)
- Appendix A-2 HWMU-5 Year 2009 Laboratory Analytical Results Point of Compliance Wells
- Appendix A-3 HWMU-5 Year 2009 Laboratory Analytical Results Plume Monitoring Wells
- Appendix A-4 Established Background Values and Computations for HWMU-5

#### Appendix B HWMU-7

- Appendix B-1 HWMU-7 Potentiometric Surface Maps (Second and Fourth Quarters 2009)
- Appendix B-2 HWMU-7 Year 2009 Laboratory Analytical Results Point of Compliance Wells
- Appendix B-3 HWMU-7 Year 2009 Laboratory Analytical Results Plume Monitoring Wells
- Appendix B-4 Established Background Values and Computations for HWMU-7

# Appendix C HWMU-10

- Appendix C-1 HWMU-10 Potentiometric Surface Maps (Second and Fourth Quarters 2009)
- Appendix C-2 HWMU-10 Year 2009 Laboratory Analytical Results

#### Appendix D HWMU-16

- Appendix D-1 HWMU-16 Potentiometric Surface Maps (Second and Fourth Quarters 2009)
- Appendix D-2 HWMU-16 Year 2009 Laboratory Analytical Results Point of Compliance Wells
- Appendix D-3 HWMU-16 Year 2009 Laboratory Analytical Results Plume Monitoring Wells
- Appendix D-4 Established Background Values and Computations for HWMU-16
- Appendix E Laboratory Analytical Results Year 2009 (CD-ROM)
- Appendix F Field Notes (CD-ROM)

#### 1.0 INTRODUCTION

This document presents the Annual Groundwater Monitoring Report for calendar year 2009 for Hazardous Waste Management Units (HWMUs) 5, 7, 10, and 16 located at the Radford Army Ammunition Plant (Radford AAP) in Radford, Virginia. The Annual Groundwater Monitoring Report was compiled in accordance with the requirements specified in the Final Hazardous Waste Post-Closure Care Permit dated October 4, 2002, for HWMUs 5, 7, 10, and 16.

The Annual Groundwater Monitoring Report presents the following set of information for each Unit: basic information and unit identification, a description of the groundwater monitoring plan, a discussion of groundwater movement, potentiometric surface maps, a table of groundwater elevations, and detailed statistical evaluations of the analytical data.

Please note that the sampling frequency for HWMUs 5, 7, 10, and 16 was changed from quarterly to semiannual in the VDEQ-approved Class 1 Permit Modification dated June 14, 2007. Therefore, this Annual Groundwater Monitoring Report evaluates the analytical data from Second Quarter 2009 and Fourth Quarter 2009 for each Unit.

#### 1.1 HWMU-5

HWMU-5 is a closed lined neutralization pond. The Unit received certification for closure in 1989. As stated in Permit Condition I.K.1 of the Final Post-Closure Care Permit, the Compliance Period during which the Groundwater Protection Standard applies to HWMU-5 is 19 years, beginning on the effective date of the original Post-Closure Care Permit for HWMU-5 (October 28, 2001) and continuing until October 28, 2020. This report is the eighth complete Annual Groundwater Monitoring Report submitted to the Virginia Department of Environmental Quality (VDEQ) for this Unit during the Compliance Period.

#### 1.2 HWMU-7

HWMU-7 is a closed unlined holding and neutralization basin. The Unit received certification for closure in 1990. As stated in Permit Condition I.K.2, the Compliance Period during which the Groundwater Protection Standard applies to HWMU-7 is 18 years, beginning on the effective date of the original Post-Closure Care Permit for HWMU-7 (October 30, 1999) and continuing until October 30, 2017. This report is the tenth complete Annual Groundwater Monitoring Report submitted to the VDEQ for this Unit during the Compliance Period.

#### 1.3 HWMU-10

HWMU-10 is a closed equalization basin for the biological treatment system. The Unit received certification for closure in 1998. As stated in Permit Condition I.K.3, the Compliance Period during which the Groundwater Protection Standard applies to HWMU-10 is 18 years, beginning on the effective date of the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Management Units 5, 7, 10, and 16 (October 4, 2002) and continuing until October 4, 2020. This report is the eighth Annual Groundwater Monitoring Report submitted to the VDEQ for this Unit during the Compliance Period.

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#### 1.4 HWMU-16

HWMU-16 is a closed hazardous waste landfill. The Unit received certification for closure in 1993. As stated in Permit Condition I.K.4, the Compliance Period during which the Groundwater Protection Standard applies to HWMU-16 is 13 years, beginning on the effective date of the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Management Units 5, 7, 10, and 16 (October 4, 2002) and continuing until October 4, 2015. This report is the eighth Annual Groundwater Monitoring Report submitted to the VDEQ for this Unit during the Compliance Period.

#### 2.0 HWMU-5 ANNUAL GROUNDWATER MONITORING REPORT

#### 2.1 Waste Management Unit Information

Unit Name: Hazardous Waste Management Unit 5 (HWMU-5)
Owner/Operator: United States Army/Alliant Techsystems Inc.

**Unit Location:** Radford AAP Main Plant Area, Radford, Virginia

Class: Hazardous Waste Management Unit Type: Closed Lined Neutralization Pond

#### 2.2 Groundwater Monitoring Plan

#### **Monitoring Network:**

Upgradient Well: 5W8B

Point of Compliance Wells: 5W5B, 5W7B, 5WC21, 5WC22, 5WC23 Plume Monitoring Wells: 5SW5, S5W7, 5W9A, 5W10A, 5W11A Observation Wells: 5WCA, S5W6, S5W8, 5WC11, 5WC22

**Monitoring Status:** Compliance Monitoring Program

#### **CY 2009 Monitoring Events:**

Second Quarter 2009: April 20-21, 2009 Fourth Quarter 2009: October 26-27, 2009

#### 2.3 Groundwater Movement

The monitoring wells at HWMU-5 are screened entirely within either weathered carbonate bedrock residuum or alluvium or across the weathered residuum/carbonate bedrock interface. The static water level measurements gathered during the 2009 semiannual monitoring events are summarized in **Table 1**. Groundwater fluctuations ranged from 0.34 to 3.77 feet during the 2009 groundwater monitoring events. As shown on the HWMU-5 Potentiometric Surface Maps (**Appendix A-1**), groundwater movement beneath the site is generally to the northeast.

Darcian flow conditions were assumed for the alluvium, residuum, and carbonate bedrock beneath HWMU-5. As a result, the groundwater velocities were calculated by multiplying the hydraulic conductivity (determined from previously conducted slug tests) by the average hydraulic gradient across the site and dividing by an assumed effective porosity for the aquifer. The average hydraulic gradient was determined by superimposing three evenly spaced flow line vectors over the potentiometric surface map, measuring their lengths, calculating the head differential over the distances measured, and dividing the head differential by the length of the flow line vectors. The three calculated gradients were then averaged to a single value. Using this method, the average groundwater hydraulic gradient across the site based on Fourth Quarter 2009 groundwater elevations was calculated to be 0.025 ft/ft. Historical slug test data for the site

yielded an average hydraulic conductivity of 5.25 x 10<sup>-5</sup> ft/second. This value is consistent with literature values for carbonate rock and for clayey, silty sand and gravel alluvium and residuum (Domenico and Schwartz, 1990).

The estimated groundwater velocity across the site was calculated to be approximately 0.28 ft/day or 102 ft/year based on the following:

- Average hydraulic conductivity of 5.25 x 10<sup>-5</sup> ft/second.
- Average hydraulic gradient of 0.025 ft/ft.
- Assumed effective porosity of 0.40, based on a representative range of porosities for carbonate rock, weathered residuum, and clayey, silty sand and gravel alluvium (Domenico and Schwartz, 1990).

The actual groundwater flow velocities in the carbonate bedrock may vary as much as one to two orders of magnitude from the velocity presented above depending on water level conditions and the distribution of solution features.

#### 2.4 Groundwater Analytical Data Evaluation

The groundwater samples collected from the compliance monitoring network during the 2009 semiannual monitoring events were analyzed for the constituents listed in Appendix E to Attachment 2 of the Final Post-Closure Care Permit, plus chromium, diethyl ether, 2-nitroaniline, 4-nitroaniline, and nitrobenzene (which were added to the constituent list for HWMU-5 following Fourth Quarter 2003) and dichlorodifluoromethane (which was added to the constituent list following Third Quarter 2006). In addition, groundwater samples were collected from the upgradient well and the point of compliance wells for the annual monitoring for the constituents listed in Appendix IX of 40 CFR Part 264. The laboratory analytical results for the 2009 monitoring events are included in **Appendix A-2** (point of compliance wells) and in Appendix A-3 (plume monitoring wells). The laboratory analytical results for the 2009 monitoring events are included on CD-ROM in Appendix E. The analytical data were validated in accordance with SW-846, USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. Data validation reports are included in Appendix E. Copies of field notes recorded during sample collection are included on CD-ROM in Appendix F.

# 2.4.1 Comparison to Groundwater Protection Standards

As specified in Permit Condition V.J.1.i, the 2009 groundwater analytical data for the upgradient well and the point of compliance wells were compared to the Groundwater Protection Standards (GPSs) for HWMU-5 listed in Appendix G of Permit Attachment 2. In accordance with Permit Condition V.I.2, Radford AAP performed a simple empirical comparison of the upgradient well and the point of compliance well data to GPSs (**Appendix A-2**).

As shown in **Appendix A-2**, no inorganic constituents were detected at concentrations greater than their respective GPSs.

As also shown in **Appendix A-2**, trichloroethene (TCE) was detected in point of compliance well 5W5B at a concentration less than the established GPS for TCE of 5  $\mu$ g/l during Second Quarter 2009. During Fourth Quarter 2009, TCE was detected in point of compliance well 5W5B at a concentration of 7  $\mu$ g/l, which is greater than the GPS but within the range of historical detections. No other organic constituents were detected at concentrations greater than their GPSs during the 2009 semiannual monitoring events.

Historically, TCE has been detected in point of compliance well 5W5B at concentrations greater than the GPS of 5  $\mu$ g/l. As a result, Radford AAP developed a corrective action program to address TCE at the Unit. The corrective action program was approved by the VDEQ in correspondence dated November 5, 2009, and incorporated into the Post Closure Care Permit for HWMUs 5, 7, 10, and 16. Beginning in Second Quarter 2010, groundwater monitoring at HWMU-5 will be conducted in accordance with the corrective action program presented in the Post Closure Care Permit.

#### 2.4.2 Comparison to Background Concentrations

As specified in Permit Condition V.O, the 2009 groundwater analytical data for the plume monitoring wells were compared to the background concentrations for HWMU-5 listed in Appendix F of Permit Attachment 2. In accordance with Permit Condition V.I.2, Radford AAP performed a simple empirical comparison of the plume monitoring well data to the background concentrations (**Appendix A-3**).

As shown in **Appendix A-3**, no constituent concentrations detected in the plume monitoring wells exceeded their respective background concentrations during the 2009 monitoring events.

In accordance with the requirements of Permit Condition V.K.3, the established background values and the computations used to determine the background values are included in **Appendix A-4**. The background values and associated computations are taken from the Groundwater Quality Assessment Report for HWMU-5 dated August 1999.

#### 2.4.3 Annual Monitoring for Constituents Listed in Appendix IX of 40 CFR Part 264

During Second Quarter 2009, the groundwater samples collected from the upgradient well and the point of compliance wells were analyzed for the constituents listed in Appendix IX to 40 CFR Part 264 in accordance with Permit Condition V.J.1.e. Upon receipt of the Second Quarter 2009 analytical data, Radford AAP notified the VDEQ of the initial detection of three additional Appendix IX constituents (bromodichloromethane, 4,4'-DDD, and endosulfan II) that were not listed in Appendix E of Permit Attachment 2 (Unit 5 – Groundwater Compliance Monitoring (Quarterly) Constituent List). In accordance with Permit Condition V.J.1.e.(1), Radford AAP resampled the subject wells (well 5W7B for bromodichloromethane; wells 5W5B, 5W7B, 5WC21, 5WC22, and 5WC23 for 4,4'-DDD; and wells 5WC21, 5WC22, and 5WC23 for endosulfan II) in order to confirm or refute the additional Appendix IX constituent detections. Bromodichloromethane, 4,4'-DDD, and endosulfan II were not confirmed in the subject wells at concentrations above their respective detection limits. As a result, bromodichloromethane, 4,4'-

DDD, and endosulfan II will not be added to the Groundwater Monitoring List for the Unit. Therefore, no changes to the Groundwater Monitoring List for the Unit are required.

#### 2.5 Recommendations

Based on an evaluation of the groundwater analytical data and additional information for HWMU-5, no inorganic constituents and no organic constituents other than TCE were detected at concentrations greater than their respective GPSs during calendar year 2009. TCE was detected in point of compliance well 5W5B at a concentration of 7 µg/l during Fourth Quarter 2009, which is greater than the established GPS for TCE of 5 µg/l but within the range of historical detections. Radford AAP developed a corrective action program to address TCE at the Unit. The corrective action program was approved by the VDEQ in correspondence dated November 5, 2009, and incorporated into the Post Closure Care Permit for HWMUs 5, 7, 10, and 16. Beginning in Second Quarter 2010, groundwater monitoring at HWMU-5 will be conducted in accordance with the corrective action program presented in the Post Closure Care Permit.

Appendix IX constituents bromodichloromethane, 4,4'-DDD, and endosulfan II were initially detected in point of compliance wells 5W5B, 5W7B, 5WC21, 5WC22, and/or 5WC23 during Second Quarter 2009. In accordance with Permit Condition V.J.1.e.(1), Radford AAP resampled the subject wells (well 5W7B for bromodichloromethane; wells 5W5B, 5W7B, 5WC21, 5WC22, and 5WC23 for 4,4'-DDD; and wells 5WC21, 5WC22, and 5WC23 for endosulfan II) in order to confirm or refute the additional Appendix IX constituent detections. Bromodichloromethane, 4,4'-DDD, and endosulfan II were not confirmed in the subject wells at concentrations above their respective detection limits. As a result, bromodichloromethane, 4,4'-DDD, and endosulfan II will not be added to the Groundwater Monitoring List for the Unit. No additional Appendix IX constituents were detected during Second Quarter 2009; therefore, no changes to the Groundwater Monitoring List for the Unit are required.

#### 3.0 HWMU-7 ANNUAL GROUNDWATER MONITORING REPORT

#### 3.1 Waste Management Unit Information

**Unit Name:** Hazardous Waste Management Unit 7 (HWMU-7) **Owner/Operator:** United States Army/Alliant Techsystems Inc.

**Unit Location:** Radford AAP Main Plant Area, Radford, Virginia

Class: Hazardous Waste Management Unit

Type: Closed Unlined Holding and Neutralization Basin

#### 3.2 Groundwater Monitoring Plan

#### **Monitoring Network:**

Upgradient Well: 7W12B

Point of Compliance Wells: 7WCA, 7MW6, 7W11B

Plume Monitoring Wells: 7W9C, 7W10B, 7W10C, 7W13

Observation Wells: 7MW5, 7W9B, 7W11

**Monitoring Status:** Compliance Monitoring Program

#### **CY 2009 Monitoring Events:**

Second Quarter 2009: April 13-14, 2009 Fourth Quarter 2009: October 19-20, 2009

#### 3.3 Groundwater Movement

The monitoring wells at HWMU-7 are screened entirely within alluvium, weathered carbonate bedrock residuum, or carbonate bedrock or across the interfaces between two of the listed strata. The static water level measurements gathered during the 2009 semiannual monitoring events are summarized in **Table 2**. Groundwater fluctuations ranged from 0.04 to 2.65 feet annually. As shown on the HWMU-7 Potentiometric Surface Maps (**Appendix B-1**), groundwater movement beneath the site is generally to the west towards the New River and to the northeast and southwest toward the unnamed intermittent drainages that flow into the New River north and south of the site.

Darcian flow conditions were assumed for the alluvium, residuum, and carbonate bedrock beneath HWMU-7. As a result, the groundwater velocities were calculated by multiplying the hydraulic conductivity (determined from previously conducted slug tests) by the average hydraulic gradient across the site, and dividing by an assumed effective porosity for the aquifer materials. The average hydraulic gradient was determined by superimposing three evenly spaced flow line vectors over the potentiometric surface map, measuring their lengths, calculating the head differential over the distances measured, and dividing the head differential by the length of the flow line vectors. The three calculated gradients were then averaged to a single value. Using this method, the average groundwater hydraulic gradient across the site

based on the Fourth Quarter 2009 groundwater elevations was calculated to be 0.008 ft/ft. Historical slug test data for the site yielded an average hydraulic conductivity of 5.1 x 10<sup>-6</sup> ft/second. This value is consistent with literature values for carbonate rock and for clayey, silty sand and gravel alluvium and residuum (Domenico and Schwartz, 1990).

The estimated groundwater velocity across the site was calculated to be approximately  $8.81 \times 10^{-3}$  ft/day or 3.2 ft/year, based on the following:

- Average hydraulic conductivity of 5.1 x 10<sup>-6</sup> ft/second.
- Average hydraulic gradient of 0.008 ft/ft.
- Assumed effective porosity of 0.40, based on a representative range of porosities for carbonate rock, weathered residuum, and clayey, silty sand and gravel alluvium (Domenico and Schwartz, 1990).

The actual groundwater flow velocities in the carbonate bedrock may vary as much as one to two orders of magnitude from the velocity presented above depending on water level conditions and the distribution of solution features.

#### 3.4 Groundwater Analytical Data Evaluation

The groundwater samples collected from the compliance monitoring network during the 2009 semiannual monitoring events were analyzed for the constituents listed in Appendix E to Attachment 3 of the Final Post-Closure Care Permit, plus copper (which was added to the constituent list for HWMU-7 following Third Quarter 2003) and zinc (which was added to the constituent list for HWMU-7 following Second Quarter 2004). In addition, groundwater samples were collected from the upgradient well and the point of compliance wells for the annual monitoring for the constituents listed in Appendix IX of 40 CFR Part 264. The laboratory analytical results for the 2009 monitoring events are included in **Appendix B-2** (point of compliance wells) and in **Appendix B-3** (plume monitoring wells). The laboratory analytical results for the 2009 monitoring events also are included in electronic format in **Appendix E**. The analytical data were validated in accordance with SW-846, *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. Data validation reports are included in **Appendix E**. Copies of field notes recorded during sample collection are included on CD-ROM in **Appendix F**.

# 3.4.1 Comparison to Groundwater Protection Standards

As specified in Permit Condition V.J.2.i, the 2009 groundwater analytical data for the upgradient well and the point of compliance wells were compared to the GPSs for HWMU-7 listed in Appendix G of Permit Attachment 3. In accordance with Permit Condition V.I.2, Radford AAP performed a simple empirical comparison of the upgradient well and the point of compliance well data to the GPSs (**Appendix B-2**).

As shown in **Appendix B-2**, no constituents were detected at concentrations greater than their respective GPSs.

#### 3.4.2 Comparison to Background Concentrations

As specified in Permit Condition V.O, the 2009 groundwater analytical data for the plume monitoring wells were compared to the background concentrations for HWMU-7. The original background concentrations as presented in the Groundwater Quality Assessment Report for HWMU-7 dated August 1998 are listed in Appendix F of Permit Attachment 3. However, in correspondence dated October 31, 2007, the VDEQ indicated that Radford AAP should statistically recalculate the background concentration values for HWMU-7 as part of the clean closure evaluation for the Unit. In December 2007, Draper Aden Associates recalculated background values for all plume monitoring well constituents at HWMU-7. For the calendar year 2009 semiannual monitoring events, Radford AAP performed a simple empirical comparison of the plume monitoring well data to the site-specific background concentrations presented in Appendix F of Permit Attachment 3, as well as the December 2007 revised background values presented in the pending Class 3 Permit Modification for HWMUs 5, 7, 10, and 16 (Appendix B-3).

As shown in **Appendix B-3**, total barium concentrations detected in plume monitoring well 7W10B during both 2009 semiannual monitoring events were greater than the Permitspecified background concentration of 64  $\mu$ g/l as well as the December 2007 revised background concentration of 41  $\mu$ g/l. Additionally, the total barium concentrations detected in plume monitoring well 7W10C during both 2009 semiannual monitoring events were greater than the December 2007 revised background concentration of 41  $\mu$ g/l, but less than the Permit-specified background concentration of 64  $\mu$ g/l. However, all of the total barium concentrations detected in wells 7W10B and 7W10C were more than an order of magnitude below the USEPA MCL for barium of 2,000  $\mu$ g/l. Higher total barium concentrations in downgradient plume monitoring wells relative to background at HWMU-7 may be the result of natural variations in trace element distribution in groundwater. In addition, these concentrations are consistent with previous barium concentrations detected these wells.

As also shown in **Appendix B-3**, total cobalt concentrations detected in plume monitoring well 7W13 during both 2009 semiannual monitoring events were greater than the December 2007 revised background concentration of 5  $\mu$ g/l, but less than the Permit-specified background concentration of 17  $\mu$ g/l. A higher total cobalt concentration in downgradient plume monitoring well 7W13 relative to background at HWMU-7 may be the result of natural variations in trace element distribution in groundwater. In addition, the total cobalt concentrations detected in well 7W13 are consistent with previous cobalt concentrations detected in this well.

No other constituent concentrations detected in the plume monitoring wells were greater than their respective background concentrations.

In accordance with the requirements of Permit Condition V.K.3, the established background values and the computations used to determine the background values are included in **Appendix B-4**. This includes both the background values and computations associated with Appendix F of Permit Attachment 3 (excerpted from the Groundwater Quality Assessment

Report for HWMU-7 dated August 1998), as well as the December 2007 revised background values presented in the pending Class 3 Permit Modification for HWMUs 5, 7, 10, and 16.

## 3.4.3 Annual Monitoring for Constituents Listed in Appendix IX of 40 CFR Part 264

During Second Quarter 2009, the groundwater samples collected from the upgradient well and the point of compliance wells were analyzed for the constituents listed in Appendix IX to 40 CFR Part 264 in accordance with Permit Condition V.J.2.e. Upon receipt of the Second Quarter 2009 analytical data, Radford AAP notified the VDEQ of the detection of two additional Appendix IX constituents (chloroform and diethyl ether) that were not listed in Appendix E of Permit Attachment 3 (Unit 7 – Groundwater Compliance Monitoring (Quarterly) Constituent List). Chloroform was detected in upgradient well 7W12B and in point of compliance wells 7WCA and 7W11B. However, Radford AAP did not verify the chloroform concentrations detected in wells 7W12B, 7WCA, and 7W11B based on the June 14, 2007 concurrence by the VDEQ with the Alternate Source Demonstration (ASD) for chloroform at HWMU-7 submitted on January 31, 2007, which identified an upgradient off-site source for chloroform in groundwater. Therefore, chloroform will not be added to the Groundwater Monitoring List for the Unit.

In accordance with Permit Condition V.J.2.e.(1), Radford AAP resampled point of compliance well 7MW6 for diethyl ether in order to confirm or refute the additional Appendix IX constituent detection. Diethyl ether was not confirmed in the subject well at a concentration above its detection limit. As a result, diethyl ether will not be added to the Groundwater Monitoring List for the Unit.

No additional Appendix IX constituents were detected during Second Quarter 2009. Therefore, no changes to the Groundwater Monitoring List for the Unit are required.

#### 3.5 Recommendations

Based on an evaluation of the groundwater analytical data and additional information for HWMU-7, no constituents were detected at concentrations greater than their respective GPSs during calendar year 2009. Therefore, no further action is recommended at this time.

The Appendix IX constituent chloroform was detected in upgradient well 7W12B and in point of compliance wells 7WCA and 7W11B during Second Quarter 2009. Chloroform will not be added to the Compliance Monitoring Constituent List for HWMU-7 based on the June 14, 2007 concurrence by the VDEQ with the ASD for chloroform at HWMU-7 submitted on January 31, 2007. The Appendix IX constituent diethyl ether was initially detected in point of compliance well 7MW6 during Second Quarter 2009. In accordance with Permit Condition V.J.2.e.(1), Radford AAP resampled point of compliance well 7MW6 for diethyl ether in order to confirm or refute the additional Appendix IX constituent detection. Diethyl ether was not confirmed in the subject well at a concentration above its detection limit. As a result, diethyl ether will not be added to the Groundwater Monitoring List for the Unit. No additional Appendix IX constituents were detected during Second Quarter 2009; therefore, no changes to the Groundwater Monitoring List for the Unit are required.

An evaluation of the plume monitoring well data indicates that the concentrations of total barium in plume monitoring wells 7W10B and 7W10C were greater than the site-specific background concentration. As stated previously, higher total barium concentrations in downgradient plume monitoring wells relative to background at HWMU-7 may be the result of natural variations in trace element distribution in groundwater. In addition, these concentrations are consistent with previous barium concentrations detected these wells. Therefore, no further action regarding the total barium concentrations detected in plume monitoring wells 7W10B and 7W10C is recommended at this time.

An evaluation of the plume monitoring well data indicates that the concentrations of total cobalt in plume monitoring well 7W13 were greater than the site-specific background concentration. As stated previously, a higher total cobalt concentration in downgradient plume monitoring well 7W13 relative to background at HWMU-7 may be the result of natural variations in trace element distribution in groundwater. In addition, the total cobalt concentrations detected in well 7W13 are consistent with previous cobalt concentrations detected in this well. Therefore, no further action regarding the total cobalt concentrations detected in plume monitoring well 7W13 is recommended at this time.

In correspondence to the VDEQ dated August 9, 2007, Radford AAP submitted a Class 3 permit modification for the Post-Closure Care Permit for HWMUs 5, 7, 10, and 16. The permit modification included an amended closure plan for HMWU-7. Upon incorporation of the Class 3 permit modification into the Permit, Radford AAP will finalize the closure report for HWMU-7. The closure report will include a clean closure evaluation for soil and groundwater at the Unit. Upon VDEQ approval of the closure report, HWMU-7 will be clean closed.

#### 4.0 HWMU-10 ANNUAL GROUNDWATER MONITORING REPORT

#### **4.1** Waste Management Unit Information

**Unit Name:** Hazardous Waste Management Unit 10 (HWMU-10)

**Owner/Operator:** United States Army/Alliant Techsystems Inc.

**Unit Location:** Radford AAP Main Plant Area, Radford, Virginia

Class: Hazardous Waste Management Unit

**Type:** Closed Equalization Basin for the Biological Treatment System

#### 4.2 Groundwater Monitoring Plan

#### **Monitoring Network:**

Upgradient Well: 10D4

Point of Compliance Wells: 10MW1, 10DDH2R, 10D3, 10D3D

Plume Monitoring Wells: none Observation Wells: none

**Monitoring Status:** Compliance Monitoring Program

#### **CY 2009 Monitoring Events:**

Second Quarter 2009: April 15, 2009 Fourth Quarter 2009: October 21, 2009

#### 4.3 Groundwater Movement

The monitoring wells at HWMU-10 are screened either across the alluvium/limestone bedrock interface or entirely within bedrock. The static water level measurements gathered during the 2009 semiannual monitoring events are summarized in **Table 3**. Groundwater fluctuations ranged from 0.01 to 0.82 feet annually. As shown on the HWMU-10 Potentiometric Surface Maps (**Appendix C-1**), groundwater movement beneath the site is generally to the north towards the New River.

Darcian flow conditions were assumed for the alluvium and limestone bedrock beneath HWMU-10. As a result, the groundwater velocities were calculated by multiplying the hydraulic conductivity (determined from previously conducted slug tests) by the average hydraulic gradient across the site and dividing by an assumed effective porosity for the aquifer materials. The average hydraulic gradient was determined by superimposing three evenly spaced flow line vectors over the potentiometric surface map, measuring their lengths, calculating the head differential over the distances measured, and dividing the head differential by the length of the flow line vectors. The three calculated gradients were then averaged to a single value. Using this method, the average groundwater hydraulic gradient across the site based on Fourth Quarter 2009 groundwater elevations was calculated to be 0.014 ft/ft. Historical slug test data for the site yielded an average hydraulic conductivity of 4.9 x 10<sup>-4</sup> ft/second. This value is consistent with

literature values for limestone and for clayey, silty sand and gravel alluvium (Domenico and Schwartz, 1990).

The estimated groundwater velocity across the site was calculated to be approximately 1.48 ft/day or 540 ft/year, based on the following:

- Average hydraulic conductivity of 4.9 x 10<sup>-4</sup> ft/second.
- Average hydraulic gradient of 0.014 ft/ft.
- Assumed effective porosity of 0.40, based on a representative range of porosities for limestone and for clayey, silty sand and gravel alluvium (Domenico and Schwartz, 1990).

The actual groundwater flow velocities in the carbonate bedrock may vary as much as one to two orders of magnitude from the velocity presented above depending on water level conditions and the distribution of solution features.

#### 4.4 Groundwater Analytical Data Evaluation

The groundwater samples collected from the compliance monitoring network during the 2009 semiannual monitoring events were analyzed for the constituents listed in Appendix E to Attachment 4 of the Final Post-Closure Care Permit, plus cobalt and vanadium (which were added to the constituent list for HWMU-10 following Second Quarter 2004) and acetone and 2-propanol (which were added to the constituent list for HMWU-10 following Second Quarter 2005). In addition, groundwater samples were collected from the upgradient well and the point of compliance wells for the annual monitoring for the constituents listed in Appendix IX of 40 CFR Part 264. The laboratory analytical results for the 2009 monitoring events are included in **Appendix C-2**. The laboratory analytical results for the 2009 monitoring events also are included in electronic format in **Appendix E**. The analytical data were validated in accordance with SW-846, *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. Data validation reports are included in **Appendix E**. Copies of field notes recorded during sample collection are included on CD-ROM in **Appendix F**.

#### 4.4.1 Comparison to Groundwater Protection Standards

As specified in Permit Condition V.J.3.i, the 2009 groundwater analytical data for the upgradient well and the point of compliance wells were compared to GPSs for HWMU-10 listed in Appendix G of Permit Attachment 4. In accordance with Permit Condition V.I.2, Radford AAP performed a simple empirical comparison of the upgradient well and the point of compliance well data to the GPSs (**Appendix C-2**). As shown in **Appendix C-2**, none of the constituent concentrations detected in the upgradient well and in the point of compliance wells were greater than their respective GPSs.

#### **4.4.2** Comparison to Background Concentrations

Only the analytical data from plume monitoring wells are compared to background concentrations. However, the compliance monitoring network at HWMU-10 is composed entirely of point of compliance wells. Therefore, the analytical data from HWMU-10 is not compared to background concentrations.

#### 4.4.3 Annual Monitoring for Constituents Listed in Appendix IX of 40 CFR Part 264

During Second Quarter 2009, the groundwater samples collected from the upgradient well and the point of compliance wells were analyzed for the constituents listed in Appendix IX to 40 CFR Part 264 in accordance with Permit Condition V.J.3.e. Upon receipt of the Second Quarter 2009 analytical data, Radford AAP notified the VDEQ of the detection of one additional Appendix IX constituent (diethyl ether) that was not listed in Appendix E of Permit Attachment 4 (Unit 10 – Groundwater Compliance Monitoring (Quarterly) Constituent List). In accordance with Permit Condition V.J.3.e.(1), Radford AAP resampled point of compliance well 10DDH2R for diethyl ether in order to confirm or refute the additional Appendix IX constituent detection. Diethyl ether was not confirmed in the subject well at a concentration above its detection limit. As a result, diethyl ether will not be added to the Groundwater Monitoring List for the Unit.

No additional Appendix IX constituents were detected during Second Quarter 2009. Therefore, no changes to the Groundwater Monitoring List for the Unit are required.

#### 4.5 Recommendations

Based on an evaluation of the groundwater analytical data and additional information for HWMU-10, no constituents were detected at concentrations greater than their respective GPSs during calendar year 2009. Therefore, no further action is recommended at this time.

The Appendix IX constituents chlordane and diethyl ether were initially detected in compliance well 10DDH2R during Second Quarter 2009. In accordance with Permit Condition V.J.3.e.(1), Radford AAP resampled the subject well for the detected constituent in order to confirm or refute the detection of the additional Appendix IX constituents. Diethyl ether was not confirmed in the subject well at a concentration above its detection limit. As a result, diethyl ether will not be added to the Groundwater Monitoring List for the Unit. No additional Appendix IX constituents were detected during Second Quarter 2009; therefore, no changes to the Groundwater Monitoring List for the Unit are required.

#### 5.0 HWMU-16 ANNUAL GROUNDWATER MONITORING REPORT

#### **5.1** Waste Management Unit Information

**Unit Name:** Hazardous Waste Management Unit 16 (HWMU-16)

Owner/Operator: United States Army/Alliant Techsystems Inc.

**Unit Location:** Radford AAP Main Plant Area, Radford, Virginia

Class: Hazardous Waste Management Unit Type: Closed Hazardous Waste Landfill

#### 5.2 Groundwater Monitoring Plan

#### **Monitoring Network:**

Upgradient Well: 16C1

Point of Compliance Wells: 16WC1A, 16WC1B, 16MW8, 16MW9

Plume Monitoring Wells: 16-1, 16-2, 16-3, 16-5, 16WC2B, 16SPRING

Observation Wells: 16WC2A, 16C3, 16CDH3

**Monitoring Status:** Compliance Monitoring Program

#### **CY 2009 Monitoring Events:**

Second Quarter 2009: April 6-8, 2009 Fourth Quarter 2009: October 6-8, 2009

#### 5.3 Groundwater Movement

The monitoring wells at HWMU-16 are screened entirely within either carbonate bedrock or weathered carbonate bedrock residuum, or across the residuum/bedrock interface. The static water level measurements gathered during the 2009 semiannual monitoring events are summarized in **Table 4**. Groundwater fluctuations ranged from 0.08 to 2.43 feet annually. As shown on the HWMU-16 Potentiometric Surface Maps (**Appendix D-1**), groundwater movement beneath the site is generally to the northeast.

Darcian flow conditions were assumed for the weathered residuum and carbonate bedrock beneath HWMU-16. As a result, the groundwater velocities were calculated by multiplying the hydraulic conductivity (determined from previously conducted slug tests) by the average hydraulic gradient across the site and dividing by an assumed effective porosity for the aquifer materials. The average hydraulic gradient was determined by superimposing three evenly spaced flow line vectors over the potentiometric surface map, measuring their lengths, calculating the head differential over the distances measured, and dividing the head differential by the length of the flow line vectors. The three calculated gradients were then averaged to a single value. Using this method, the average groundwater hydraulic gradient across the site based on Fourth Quarter 2009 groundwater elevations was calculated to be 0.089 ft/ft. Historical slug test data for the site yielded an average hydraulic conductivity of 7.87 x 10<sup>-5</sup> ft/second. This

value is consistent with literature values for carbonate rock and for clay and silt residuum (Domenico and Schwartz, 1990).

The estimated groundwater velocity across the site was calculated to be approximately 1.51 ft/day or 551 ft/year based on the following:

- Average hydraulic conductivity of 7.87 x 10<sup>-5</sup> ft/second.
- Average hydraulic gradient of 0.089 ft/ft.
- Assumed effective porosity of 0.40, based on a representative range of porosities for carbonate rock and clay and silt residuum (Domenico and Schwartz, 1990).

The actual groundwater flow velocities in the carbonate bedrock may vary as much as one to two orders of magnitude from the velocity presented above depending on water level conditions and the distribution of solution features.

#### 5.4 Groundwater Analytical Data Evaluation

The groundwater samples collected from the compliance monitoring network during the 2009 semiannual monitoring events were analyzed for the constituents listed in Appendix E to Attachment 5 of the Final Post-Closure Care Permit, plus chloroethane, diethyl ether, dimethyl ether, and methylene chloride (which were added to the constituent list for HWMU-16 following Third Quarter 2003), and 1,1,2-trichloro-1,2,2-trifluoroethane (which was added to the constituent list for HWMU-16 following Second Quarter 2004). In addition, groundwater samples were collected from the upgradient well and the point of compliance wells for the annual monitoring for the constituents listed in Appendix IX of 40 CFR Part 264. The laboratory analytical results for the 2009 monitoring events are included in Appendix D-2 (point of compliance wells) and in **Appendix D-3** (plume monitoring wells). The laboratory analytical results for the 2009 monitoring events also are included in electronic format in Appendix E. The analytical data were validated in accordance with SW-846, USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. Data validation reports are included in Appendix E. Copies of field notes recorded during sample collection are included on CD-ROM in Appendix F.

Please note that plume monitoring well 16-1 was dry during Second Quarter 2009; therefore, no groundwater samples were collected from plume monitoring well 16-1 during that event.

#### **5.4.1** Comparison to Groundwater Protection Standards

As specified in Permit Condition V.J.4.i, the 2009 groundwater analytical data for the upgradient well and the point of compliance wells were compared to GPSs for HWMU-16 listed in Appendix G of Permit Attachment 5. In accordance with Permit Condition V.I.2, Radford AAP performed a simple empirical comparison of the upgradient well and the point of compliance well data to the GPSs (**Appendix D-2**).

As shown in **Appendix D-2**, no constituents were detected at concentrations greater than their respective GPSs.

#### **5.4.2** Comparison to Background Concentrations

As specified in Permit Condition V.O, the 2009 groundwater analytical data for the plume monitoring wells were compared to the background concentrations for HWMU-16 listed in Appendix F of Permit Attachment 5. In accordance with Permit Condition V.I.2, Radford AAP performed a simple empirical comparison of the plume monitoring well data to the background concentrations (**Appendix D-3**).

As shown in **Appendix D-3**, total barium concentrations detected in upgradient well 16C1 and in plume monitoring wells 16-2, 16-3, and 16-5 and in spring sampling location 16SPRING during both 2009 semiannual monitoring events were greater than the background concentration of 175.4 µg/l. In addition, the total barium concentration detected in plume monitoring well 16-1 during Fourth Quarter 2009 was greater than the background concentration of 175.4 µg/l. However, all of the total barium concentrations detected in the plume monitoring wells were well below the USEPA MCL for barium of 2,000 µg/l. Furthermore, higher barium concentrations in downgradient plume monitoring wells relative to background may be the result of natural variations in trace element distribution in groundwater. As illustrated in the boring logs for the compliance network monitoring wells (Appendix H of Permit Attachment 5), upgradient well 16C1 is screened in limestone while downgradient plume monitoring wells 16-1, 16-2, 16-3, and 16-5 are screened in shale and fault breccia. Such differing lithologic formations would be expected to contain very different trace element distributions.

No other constituent concentrations detected in the plume monitoring wells were greater than their respective background concentrations. In accordance with the requirements of Permit Condition V.K.3, the established background values and the computations used to determine the background values are included in **Appendix D-4**. The background values and associated computations are taken from the Groundwater Quality Assessment Report for HWMU-16 dated August 1999.

#### 5.4.3 Annual Monitoring for Constituents Listed in Appendix IX of 40 CFR Part 264

During Second Quarter 2009, the groundwater samples collected from the upgradient well and the point of compliance wells were analyzed for the constituents listed in Appendix IX to 40 CFR Part 264 in accordance with Permit Condition V.J.4.e. Upon receipt of the Second Quarter 2009 analytical data, Radford AAP notified the VDEQ of the initial detection of four additional Appendix IX constituents (acetone, benzene, 1,1-dichloroethene, and tetrahydrofuran) that were not listed in Appendix E of Permit Attachment 5 (Unit 16 – Groundwater Compliance Monitoring (Quarterly) Constituent List). Benzene, 1,1-dichloroethene, and tetrahydrofuran were only detected in upgradient well 16C1. However, as 16C1 is the background well for HWMU-16, the benzene, 1,1-dichloroethene, and tetrahydrofuran concentrations detected in the well appear to be derived from a source upgradient of the Unit. As a result, benzene, 1,1-dichloroethene, and tetrahydrofuran will not be added to the Groundwater Monitoring List for the Unit.

Acetone was initially detected in point of compliance well 16MW8. In accordance with Permit Condition V.J.4.e.(1), Radford AAP resampled point of compliance well 16MW8 for acetone in order to confirm or refute the additional Appendix IX constituent detection. Acetone was not confirmed in the subject well at a concentration above its detection limit. As a result, acetone will not be added to the Groundwater Monitoring List for the Unit.

No additional Appendix IX constituents were detected during Second Quarter 2009. Therefore, no changes to the Groundwater Monitoring List for the Unit are required.

#### 5.5 Recommendations

Based on an evaluation of the groundwater analytical data and additional information for HWMU-16, no constituents were detected at concentrations greater than their respective GPSs during calendar year 2009. Therefore, no further action is recommended at this time.

The Appendix IX constituents benzene, 1,1-dichloroethene, and tetrahydrofuran were initially detected in upgradient well 16C1 during Second Quarter 2009. However, as 16C1 is the background well for HWMU-16, the benzene, 1,1-dichloroethene, and tetrahydrofuran concentrations detected in the well appear to be derived from a source upgradient of the Unit. As a result, benzene, 1,1-dichloroethene, and tetrahydrofuran will not be added to the Groundwater Monitoring List for the Unit. The Appendix IX constituent acetone was initially detected in point of compliance well 16MW8 during Second Quarter 2009. In accordance with Permit Condition V.J.4.e.(1), Radford AAP resampled point of compliance well 16MW8 for acetone in order to confirm or refute the additional Appendix IX constituent detection. Acetone was not confirmed in the subject well at a concentration above its detection limit. As a result, acetone will not be added to the Groundwater Monitoring List for the Unit. No additional Appendix IX constituents were detected during Second Quarter 2009; therefore, no changes to the Groundwater Monitoring List for the Unit are required.

The evaluation of the plume monitoring well data indicated that the concentrations of total barium upgradient well 16C1 and in plume monitoring wells 16-1, 16-2, 16-3, 16-5, and 16SPRING were greater than the site-specific background concentration. As stated previously, higher total barium concentrations in downgradient plume monitoring wells relative to background are likely due to natural variations in trace element distribution in groundwater. Upgradient well 16C1 is screened in limestone while downgradient plume monitoring wells 16-1, 16-2, 16-3, and 16-5 are screened in shale and fault breccia. Such differing lithologic formations would be expected to contain very different trace element distributions. Therefore, no further action regarding the 2009 total barium concentrations detected in plume monitoring wells 16-1, 16-2, 16-3, and 16-5 and in spring sampling location 16SPRING is recommended at this time.

#### SIGNATURE/CERTIFICATION

Preparea by:		
Name:	Ross G. Miller, Senior Project Geologist	
Signature:	For Simo	
Company:	Draper Aden Associates	
Address:	2206 South Main Street	
City/State/Zip:	Blacksburg, Virginia 24060-6600	

# Virginia Professional Certification:

I certify that I have prepared or supervised preparation of the attached report, that it has been prepared in accordance with industry standards and practices, and that the information contained herein is truthful and accurate to the best of my knowledge.

Name:	l Program Manager	
	3	
Signature:		
Virginia Professional Certifi	cation Type and Number:	PG 832
Company:	Draper Aden Associates	
Address:	2206 South Main Street	
City/State/Zip:	Blacksburg, Virginia 24060-6600	

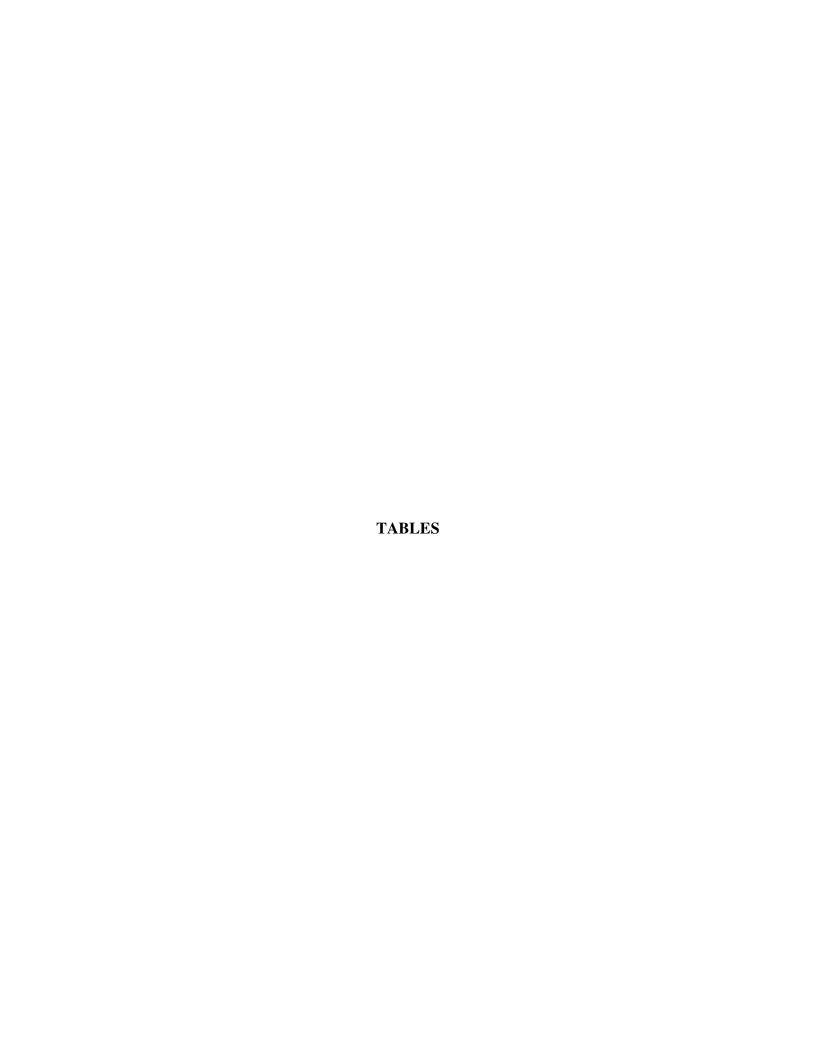


TABLE 1 HWMU-5 GROUNDWATER ELEVATIONS - 2009 RADFORD ARMY AMMUNITION PLANT RADFORD, VIRGINIA

MONITORING	ELEVATION	SECOND QU	JARTER 2009	609 FOURTH QUARTER:	
WELL ID	TOP OF WELL	DTW	GW ELEV	DTW	GW ELEV
5W8B	1789.58	16.17	1773.41	16.90	1772.68
5W5B	1775.13	9.93	1765.20	11.02	1764.11
5W7B	1774.78	9.84	1764.94	10.44	1764.34
5WC21	1774.43	9.95	1764.48	10.80	1763.63
5WC22	1774.45	9.96	1764.49	10.88	1763.57
5WC23	1773.84	9.37	1764.47	10.37	1763.47
S5W5	1772.31	8.52	1763.79	9.74	1762.57
S5W7	1776.08	11.87	1764.21	12.13	1763.95
5W9A	1762.20	2.50	1759.70	3.86	1758.34
5W10A	1771.40	14.37	1757.03	16.28	1755.12
5W11A	1766.20	10.93	1755.27	14.70	1751.50
5WC11	1788.92	17.16	1771.76	18.84	1770.08
5WC12	1788.96	16.97	1771.99	18.07	1770.89
5WCA	1779.05	14.51	1764.54	14.91	1764.14
S5W6	1771.43	7.28	1764.15	8.86	1762.57
S5W8	1783.68	13.11	1770.57	13.45	1770.23

#### **NOTES:**

DTW: Depth to water from top of casing. GW ELEV: Groundwater elevation.

All elevations in feet above mean sea level.

TABLE 2 HWMU-7 GROUNDWATER ELEVATIONS - 2009 RADFORD ARMY AMMUNITION PLANT RADFORD, VIRGINIA

MONITORING	ELEVATION	SECOND QUARTER 2009		FOURTH QU	JARTER 2009
WELL ID	TOP OF WELL	DTW	GW ELEV	DTW	GW ELEV
7W12B	1717.31	24.60	1692.71	24.84	1692.47
7WCA	1715.40	24.67	1690.73	24.71	1690.69
7MW6	1715.30	25.61	1689.69	26.41	1688.89
7W11B	1715.90	24.78	1691.12	25.15	1690.75
7W9C	1704.45	13.94	1690.51	14.52	1689.93
7W10B	1706.65	15.09	1691.56	15.57	1691.08
7W10C	1709.30	18.94	1690.36	21.59	1687.71
7W13	1705.42	18.33	1687.09	19.28	1686.14
7W9B	1712.49	22.40	1690.09	22.68	1689.81
7MW5	1716.20	24.72	1691.48	24.95	1691.25
7W11	1714.82	23.77	1691.05	24.42	1690.40

#### **NOTES:**

DTW: Depth to water from top of casing. GW ELEV: Groundwater elevation.

All elevations in feet above mean sea level.

TABLE 3 HWMU-10

# GROUNDWATER ELEVATIONS - 2009 RADFORD ARMY AMMUNITION PLANT RADFORD, VIRGINIA

MONITORING	ELEVATION	SECOND QU	ARTER 2009	FOURTH QUARTER 200		
WELL ID	TOP OF WELL	DTW	GW ELEV	DTW	GW ELEV	
10D4	1714.38	22.72	1691.66	22.73	1691.65	
10DDH2R	1704.38	19.40	1684.98	19.78	1684.60	
10D3	1702.95	17.64	1685.31	18.28	1684.67	
10D3D	1702.64	17.61	1685.03	18.43	1684.21	
10MW1	1703.62	17.97	1685.65	18.24	1685.38	

#### **NOTES:**

DTW: Depth to water from top of casing. GW ELEV: Groundwater elevation.

All elevations in feet above mean sea level.

TABLE 4 HWMU-16 GROUNDWATER ELEVATIONS - 2009 RADFORD ARMY AMMUNITION PLANT RADFORD, VIRGINIA

MONITORING	ELEVATION	SECOND QU	JARTER 2009	FOURTH QU	JARTER 2009
WELL ID	TOP OF WELL	DTW	GW ELEV	DTW	GW ELEV
16C1	1840.14	51.19	1788.95	48.76	1791.38
16MW8	1815.82	72.85	1742.97	73.96	1741.86
16MW9	1808.88	64.05	1744.83	66.31	1742.57
16WC1A	1812.61	67.39	1745.22	69.21	1743.40
16WC1B	1812.95	67.61	1745.34	69.53	1743.42
16-1	1815.82	DRY	DRY	43.99	1771.83
16-2	1810.99	55.72	1755.27	55.76	1755.23
16-3	1824.77	58.35	1766.42	56.77	1768.00
16-5	1742.60	4.75	1737.85	4.67	1737.93
16WC2B	1818.71	55.20	1763.51	53.53	1765.18
16WC2A	1820.05	DRY	DRY	DRY	DRY
16C3	1822.22	DRY	DRY	68.25	1753.97
16CDH3	1825.60	DRY	DRY	DRY	DRY
SPRING	na	na	na	na	na

#### **NOTES:**

DTW: Depth to water from top of casing. GW ELEV: Groundwater elevation. All elevations in feet above mean sea level.

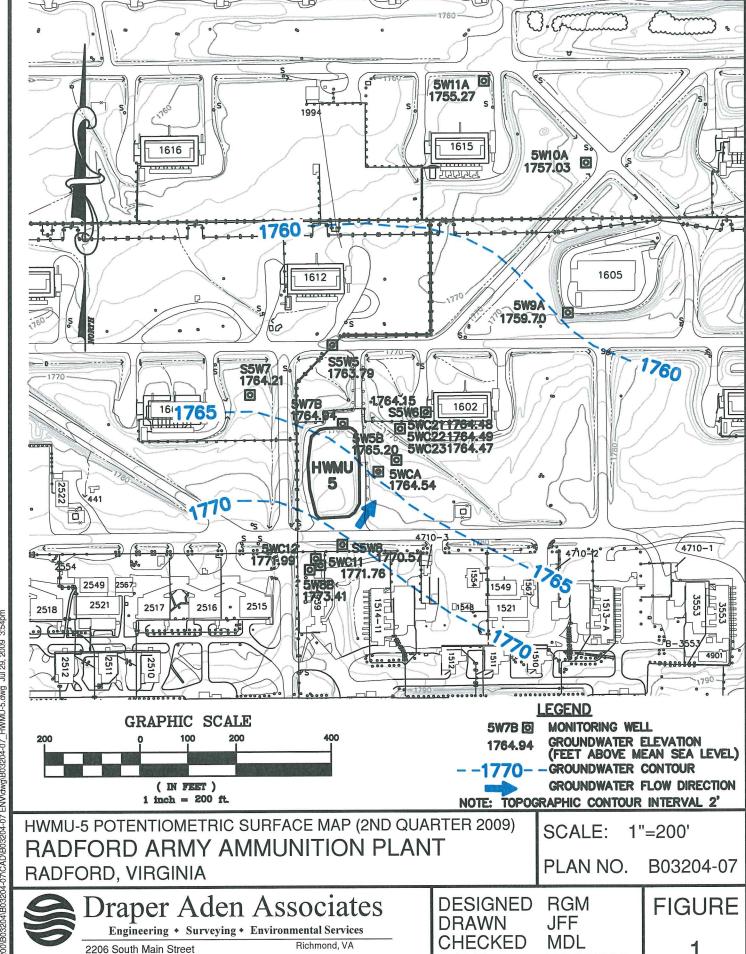
na: Not applicable.

APPENDIX A

HWMU-5

# **APPENDIX A-1**

HWMU-5 POTENTIOMETRIC SURFACE MAPS SECOND QUARTER 2009 FOURTH QUARTER 2009



Charlottesville, VA

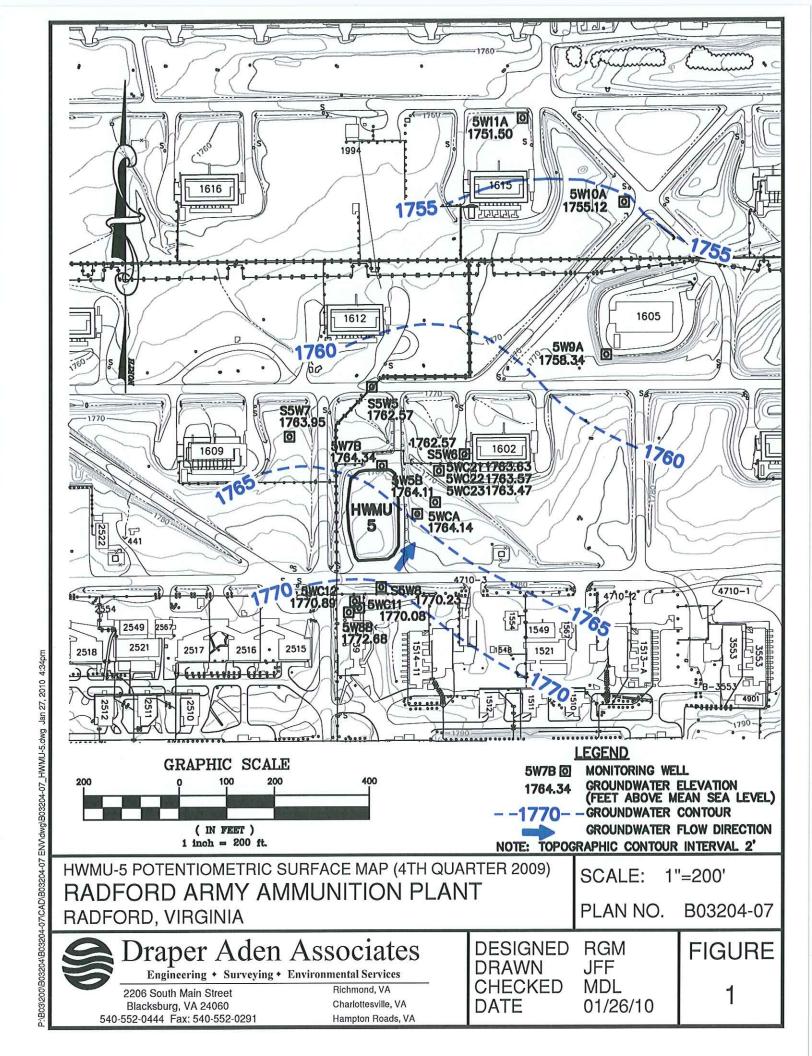
Hampton Roads, VA

7/29/2009

DATE

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Blacksburg, VA 24060 540-552-0444 Fax: 540-552-0291



# APPENDIX A-2

HWMU-5 2009 LABORATORY ANALYTICAL RESULTS POINT OF COMPLIANCE WELLS

# Target Analyte Monitoring Results - HWMU-5 Point of Compliance Wells

# Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

All Results in ug/L.

Analyte/Quarter	51V8B Q	5W5B Q	51V7B Q	5WC21 Q	5WC22 Q	5WC23 Q	QL	GPS	Methe
Antimony						CAS # 7440-36-0		*****	
Second Quarter 2009	U	U	UN	ı u	U	U	1	: 6	6020
Fourth Quarter 2009	U	U	U	U	U	U	1	6	6020
Arsenic		·				CAS # 7440-38-2		·	
Second Quarter 2009	U	U	υ	U		U	10	50	6020
Fourth Quarter 2009	U	U	U	U	U	U	10	50	6020
Barium						CAS # 7440-39-3			
Second Quarter 2009	85.8	16.1	30.1	13.9	26	20.1	10	2000	6020
Fourth Quarter 2009	104	43.2	37.2	15.9	31.6	25.3	10	2000	6020
Beryllium			01.12	10.0	31.3	CAS # 7440-41-7			0020
Second Quarter 2009	0.24 J	υ U	0.52 J	1.9	U	U	1	4	6020
Fourth Quarter 2009	U.24 3	U	U.52 3	3.1 J	U	U	1	4	6020
	O	O .		3.1 0		CAS # 7440-43-9			0020
Cadmium	U	1.1		0.47.1			4	. 5	6000
Second Quarter 2009		U	U	0.47 J	0.25 J	U	1	5	6020
Fourth Quarter 2009	U 		U	U	U	U 7440 47.2	1		6020
Chromium						CAS # 7440-47-3		100	
Second Quarter 2009	U	U	1.8 J		U	U	5	100	6020
Fourth Quarter 2009	U	U	U	10.7 J	U	U	5	100	6020
Cobalt						CAS # 7440-48-4			
Second Quarter 2009	U	U	6.8	50.7	3.7 J	1.9 J	5	313	6020
Fourth Quarter 2009	U	U	U	77.9	6	U	5	313	6020
Copper						C4S # 7440-50-8			
Second Quarter 2009	U	U	3.6 J	4.3 J	U	U	5	1300	6020
Fourth Quarter 2009	U	U	U	7.1	U	U :	5	1300	6020
Lead						CAS # 7439-92-1			
Second Quarter 2009	U	0.25 J	1.3	U	U	U	1	15	6020
Fourth Quarter 2009	U	U	1.3	U	U	U	1	15	6020
Mercury						CAS # 7439-97-6			
Second Quarter 2009	U	U	U	U	U	U	2	2	7470A
Fourth Quarter 2009	U	U	υ	U	U	U	2	2	7470A
Nickel						CAS # 7440-02-0		:	
Second Quarter 2009	U	U	6.4 J	27.9	5.4 J	3.4 J	10	313	6020
Fourth Quarter 2009	U	U	υ	40.1	U	U	10	313	6020
Selenium						CAS # 7782-49-2		i	
Second Quarter 2009	U	6.1 J	U	U	U	U	10	50	6020
Fourth Quarter 2009	U	· U	U	U	U	U	10	50	6020
Silver			·			CAS # 7440-22-4		<u> </u>	
Second Quarter 2009	υ	U	U N	ı U i	U	U	2	78.25	6020
Fourth Quarter 2009	U	U	: U	· U	U	U	2	78.25	6020
						CAS # 7440-28-0		<u> </u>	
Thallium						U U		2	6000
Second Quarter 2009	U	υ	U	U	U		1	2	6020
Fourth Quarter 2009	U	U	U	U	U	U 7440 04 5	1		6020
Tin						CAS # 7440-31-5			
Second Quarter 2009	UJ	U J	U J	UJ	UJ	UJ	5	-	6020
Vanadium	.,					CAS # 7440-62-2			
Second Quarter 2009	U	U	U	. U	U	U	10	109.55	6020
Fourth Quarter 2009	U	U	U	U	U	U	10	109.55	6020
Zinc						CAS # 7440-66-6			
Second Quarter 2009	3.7 J	3.2 J	18.6	30.3	U	U	10	4695	6020
		U				i .			



# Target Analyte Monitoring Results - HWMU-5 Point of Compliance Wells

# Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

All Results in ug/L.

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	51VC21 Q	511'C22 Q	5WC23 Q	QL	GPS	Method
Sulfide						CAS # 18496-25	-8		
Second Quarter 2009	U	U	U	U	U	U	1000	-	9034
Cyanide						CAS# 57-12-5			
Second Quarter 2009	U .	U	U	U	U	U	20	-	9012A
Total Recoverable Pheno	lics					CAS # C-020			
Second Quarter 2009	U	U	U	U	U	U	60		9065
Acenaphthene						C4S# 83-32-9			
Second Quarter 2009	U J	U J	UJ	UJ	UJ	UJ	5	· -	8270C
Acenaphthylene						CAS # 208-96-8			
Second Quarter 2009	U J .	UJ	UJ	U J	Uj	UJ	5	-	8270C
Acetone						CAS # 67-64-1			!
Second Quarter 2009	U	26	U	U	U	U	10	223.57	8260B
Fourth Quarter 2009	U	U	U	U	U	U	10	223.57	8260B
Acetonitrile						CAS # 75-05-8			l
Second Quarter 2009	U	U	U	U	U	U	20		8260B
Acetophenone						C4S # 98-86-2			1
Second Quarter 2009	U	U	U	U	U	U .	5	_	8270C
2-Acetylaminofluorene	-					CAS # 53-96-3			
Second Quarter 2009	U	U .	U.	U	U	U	5		8270C
Acrolein				Ü		CAS # 107-02-8			02700
Second Quarter 2009	UJ	UJ	U J	U J	U J	U J	25		8260B
	0 3			0 3	U J	CAS # 107-13-1	25		0200B
Acrylonitrile									1
Second Quarter 2009	U	U	U 		U	U	5	····	8260B
Aldrin						CAS # 309-00-2			1
Second Quarter 2009	U	U	. U	U	U	U	0,05		8081A
Allyl chloride						CAS # 107-05-1			
Second Quarter 2009	U	U	U 	U	U	U	0.5	-	8260B
4-Aminobiphenyl						CAS# 92-67-1			
Second Quarter 2009	U	U	U	U	U	U	5	<u>i</u> .	8270C
Aniline						C4S# 62-53-3			
Second Quarter 2009	. U	U	U	U	U	U	5	-	8270C
Anthracene						CAS # 120-12-7			
Second Quarter 2009	U	υ	U	U	U	U	5	-	8270C
Aramite						CAS# 140-57-8			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
Benzene	·					CAS # 71-43-2		1	
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
Benzo[a]anthracene	<del></del>		·			CAS # 56-55-3		<del></del>	L
Second Quarter 2009	U	U	υ	U	U	U	5		8270C
Benzo[b]fluoranthene						CAS # 205-99-2			1
Second Quarter 2009	U	U	U	. U	U	U	5		8270C
Benzo[k]fluoranthene	······································					CAS # 207-08-9		<u> </u>	.l
Second Quarter 2009	UJ	U J	υJ	UJ	U J	U J	5		8270C
						CAS# 191-24-2		<u>:</u>	L
Benzo[ghi]perylene Second Quarter 2009	υ	U	U		U	U U	5		8270C
						CAS # 50-32-8		<u> </u>	1 52,00
Benzo(a)pyrene			11				<i>-</i>		90700
Second Quarter 2009	U	U	U	U 	U	U 106 50 3	5	<u> </u>	8270C
1,4-Benzenediamine						CAS # 106-50-3			1 2-2-
Second Quarter 2009	UJ	U J	UJ	UJ	UJ	UJ	50		8270C



# Target Analyte Monitoring Results - HWMU-5 Point of Compliance Wells

# Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

All Results in ug/L.

An Resuns in ug/L.  Analyte/Quarter	51V8B O	5W5B Q	5W7B Q	-5WC21 Q	5H'C22 Q	5WC23 Q	QL	GPS	Method
Benzyl alcohol	311 OB Q	3430 Q	311713 2	3// C21 Q	3// C22 Q	CAS # 100-51-6	QL.	015	memon
Second Quarter 2009	· U	U	υ	U	U	U	5	1 2	8270C
alpha-BHC						C4S # 319-84-6		<u>:</u>	02700
Second Quarter 2009	U	U	U	U	U	U	0.05		8081A
beta-BHC						CAS # 319-85-7			
Second Quarter 2009		u i	. U	U	U	U	0.05		8081A
delta-BHC	O	O	. 0	O	O	CAS # 319-86-8	0.00		0001A
Second Quarter 2009	U .	U	U	U		U U	0.05		8081A
				O		CAS # 58-89-9	0.03		0001A
gamma-BHC Second Quarter 2009	U	U	U	U	U	U	0.05		8081A
		O		U	U	CAS # 111-91-1	0.03		000 IA
bis(2-Chloroethoxy)methar			u	U	U	U			8270C
Second Quarter 2009	Ü	U	:	U	U	CAS # 111-44-4	5		02/00
bis(2-Chloroethyl)ether						y	-		00700
Second Quarter 2009	U J	U J	U J	U J	Ú J	U J CAS # 108-60-1	5		8270C
bis(2-Chloro-1-methylethyl							-		00700
Second Quarter 2009	· U	U	U	U	U	U	5		8270C
bis(2-Ethylhexyl)phthalate	.:					CAS# 117-81-7			
Second Quarter 2009	U	U	U	U	U	U	6	. 10	8270C
Fourth Quarter 2009	U	U	U 	U	U	U 100.06.1	6	10	8270C
Bromobenzene						CAS# 108-86-1			
Second Quarter 2009	U	U	U	U	Ų.	U 74.07.5	0.5	-	8260B
Bromochloromethane						CAS # 74-97-5		i	
Second Quarter 2009	U	U	. U	U	U	U 75 67 4	0.5		8260B
Bromodichloromethane						CAS # 75-27-4			
Second Quarter 2009	U	U	U	U :	U	U 75.25.2	1	1	8260B
Bromoform						C4S # 75-25-2	1 2 2	. 1	
Second Quarter 2009	U	U	U	U	U	U	0.5		8260B
4-Bromophenyl phenyl eth						CAS # 101-55-3			
Second Quarter 2009	U	U	U	U	U	U	5	i - 1	8270C
2-Butanone						C4S # 78-93-3		7-22-22	
Second Quarter 2009	U	U	U	U	U	U	10	691.08	8260B
Fourth Quarter 2009	U	· U	U	U	U	U	10	691,08	8260B
n-Butyl alcohol						CAS# 71-36-3			
Second Quarter 2009	U	U	U	U	U	U	50		8260B
tert-Butyl alcohol						CAS # 75-65-0			
Second Quarter 2009	U	U	U	. U	U	U	10	-	8260B
n-Butylbenzene						CAS# 104-51-8			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
sec-Butylbenzene						CAS # 135-98-8			
Second Quarter 2009	U	U	υ	U	U	U	0.5	-	8260B
tert-Butylbenzene						CAS # 98-06-6			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
Butyl benzyl phthalate						CAS # 85-68-7			
Second Quarter 2009	υ	U	U	υ	U	U	5	-	8270C
Carbon disulfide						CAS # 75-15-0			
Second Quarter 2009	U	U	U	U	U	υ	0,5	-	8260B
Carbon tetrachloride						CAS # 56-23-5			
Second Quarter 2009									



# Radford Army Ammunition Plant, Radford, Virginia

 $Upgradient\ well = 5W8B$ 

Analyte/Quarter	51V8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	QL	GPS	Method
Chlordane						CAS# 57-74-9			
Second Quarter 2009	U	U	U	U	U	U	0.86		8081A
o-Chloroaniline						C4S # 106-47-8			
Second Quarter 2009	UJ	U J	υJ	U J	UJ	UJ	5	-	8270C
Chlorobenzene						CAS# 108-90-7			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
Chlorobenzilate						CAS# 510-15-6			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
o-Chloro-m-cresol						CAS# 59-50-7			
Second Quarter 2009	. U :	U	U	U	υ	U	5	-	8270C
Chloroethane						CAS# 75-00-3			
Second Quarter 2009	U	U	υ	U	U	U	1	*	8260B
2-Chloroethyl vinyl ether						C4S# 110-75-8			'
Second Quarter 2009	U J	UJ	UJ	UJ	UJ	UJ	0.5	-	8260B
Chloroform						CAS# 67-66-3			<u> </u>
Second Quarter 2009	U	0.2 J	15	0.8 J	0.5 J	0.5 J	1	80	8260B
Fourth Quarter 2009	U .	U	U	U	U	U	1	80	8260B
Chloromethane						CAS # 74-87-3			
Second Quarter 2009	U	U	U	U	U	U	1	- "	8260B
-Chloronaphthalene						CAS# 91-58-7			
Second Quarter 2009	. U J	U J	UJ	. U J	UJ	UJ	5	-	8270C
-Chlorophenol						C4S # 95-57-8			
Second Quarter 2009	U	U	U	U	 U	U	5		8270C
-Chlorophenyl phenyl et	her					CAS# 7005-72-3			
Second Quarter 2009	UJ	U J	U J	U J	UJ	UJ	5	-	8270C
Chloroprene						C4S # 126-99-8			l
Second Quarter 2009	U	U	U	U	U	U	0.5		8260B
-Chlorotoluene						CAS # 95-49-8			
Second Quarter 2009	U	U	U	U	Ü	U	0.5		8260B
-Chlorotoluene						C4S # 106-43-4	0.0		0.000
Second Quarter 2009	U	U	U	U	U	U U	0.5		8260B
						CAS# 218-01-9	0.0		02000
Chrysene Second Quarter 2009	UJ	U J	UJ	UJ	U J	U J	5		8270C
		0 3			, O	CAS # 110-82-7			02/00
Syclohexane	U	U	. U	υ	U	U	0.5		8260B
Second Quarter 2009			U	U		CAS # 94-75-7	0.5	<u> </u>	02006
2,4-Dichlorophenoxyacet									D4E4A
Second Quarter 2009	U	U	U	U	U	U 70 54 0	5		8151A
,4'-DDD						CAS# 72-54-8			i
Second Quarter 2009	U	U	U	U	U	U	0.1		8081A
I,4'-DDE						CAS # 72-55-9			
Second Quarter 2009	U	U	U	U	U	U	0.1	. <del>.</del>	8081A
,4'-DDT						CAS# 50-29-3			
Second Quarter 2009	U	U	U	U	U	U :	0.1	· -	8081A
Piallate						CAS# 2303-16-4			
Second Quarter 2009	UJ	ΟĴ	υJ	UJ	U J	UJ	5	-	8270C
Dibenz(a,h)anthracene						CAS# 53-70-3			
Second Quarter 2009	U	υ	· U	U	U	υ	5	-	8270C
Dibenzofuran						CAS# 132-64-9			F
Second Quarter 2009	UJ	υJ	UJ	UJ	UJ	UJ	5	-	8270C



# Radford Army Ammunition Plant, Radford, Virginia

 $Upgradient\ well = 5W8B$ 

5W8B	Q 5W5B	$Q \mid 5W7B \mid Q$	5WC21 Q	5WC22 Q	5WC23 Q	QL	GPS	Method
	υ	U	U			0.5	-	8260B
					i			
U	U	U	U			0.5		8260B
					1			
U	U	U	U			0.5	-	8260B
					<del></del>			
U	U	U	U	U	U	5	-	8270C
					CAS # 95-50-1			
U	U	U	U	U	U	0.5	=	8260B
					CAS # 541-73-1			
U	U	U	U	U	U	0.5	-	8260B
					C.45 # 106-46-7			
U	U	U	U	U	U	0.5	-	8260B
					CAS# 91-94-1			
U	U	U	U	U	U	5	-	8270C
					CAS# 110-57-6			
UJ	UJ	U J	UJ	UJ	UJ	5	-	8260B
					CAS # 75-71-8			
U	U	U	0.2 J	0.4 J	0.3 J	1	125.2	8260B
U	U	<u>;</u> U	U	· U	U	1	125.2	8260B
					CAS # 75-34-3			
U	U	U	U	U	U	1	-	8260B
		<u>i.</u>			CAS# 107-06-2			!
U	U	U	U	U	U	1	5	8260B
U	i U	U	U	U	U	1	5	8260B
					CAS # 75-35-4			1
U	υ	U	U	υ	U	0.5	-	8260B
					C4S# 156-59-2			i
U	. U	U	U	U	U	0.5	-	8260B
				:	CAS # 156-60-5			l
U	U	U	U	U	U	0.5	····-	8260B
					CAS # 120-83-2			ł
U	υ	U	U	U	U	5		8270C
					CAS # 87-65-0			
U	: U	U	. U		per exercise and a	5	-	8270C
								L
	U U		U		T	0.5		8260B
	: 11	l u				0.5	-	8260B
				:	L	0.0		L
		11	11			n s		8260B
				: :	L	0.0		02000
11						0.5		92600
U	U		U		<u></u>		·	8260B
					CAS# 10001-01-0			
U	U	U	U	U	U CAS# 10061-02-6	0.5		8260B
	U ne U U U U U U U U U U U U U U U U U U	U U  ne  U U  U U  U U  U U  U U  U U  U	U U U U  ne  U U U U U	U U U U U  O U U U U  U U U U U  U U U U	U U U U U U U U U U U U U U U U U U U	CAS# 124-48-1   U	CAS# 124-48-1   U	CLS # 124-48-1



# Radford Army Ammunition Plant, Radford, Virginia

 $Upgradient\ well = 5W8B$ 

Analyte/Quarter	51V8B Q	5W5B Q	5W7B Q	5WC21 Q	5H'C22 Q	5WC23 Q	QL	GPS	Method
Dieldrin						CAS # 60-57-1			
Second Quarter 2009	U	U	U	U	U	U	0.1	-	8081A
Diethyl ether						C4S # 60-29-7			
Second Quarter 2009	U	U	UJ	1.1 J	3.8 J	2.7 J	12.5	-	8260B
Fourth Quarter 2009	U	U	U	U	U	U	12	,	8260B
Diethyl phthalate						CAS# 84-66-2			
Second Quarter 2009	U	Ü	U	U	U	U	10	12,520	8270C
Fourth Quarter 2009	U	U	U	U	U	U	10	12,520	8270C
O,O-Diethyl O-2-pyraziny	/l					CAS# 297-97-2			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
Dimethoate						CAS # 60-51-5			
Second Quarter 2009	U J	U J	UJ	UJ	UJ	UJ	5		8270C
Dimethyl ether						CAS# 115-10-6			
Second Quarter 2009	U	U	U	U	U	U	12.5	-	8260B
p-(Dimethylamino)azobe	nzene					CAS # 60-11-7			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
7,12-Dimethylbenz[a]ant	hracene					CAS # 57-97-6			
Second Quarter 2009	U	U	U	U	U	U	5		8270C
3,3'-Dimethylbenzidine						CAS# 119-93-7			
Second Quarter 2009	. U	U	U	U	U		5		8270C
a,a-Dimethylphenethylar	nine					CAS # 122-09-8			
Second Quarter 2009	U J	U J	UJ	. U J	UJ	UJ	50		8270C
2,4-Dimethylphenol					· · ·	CAS # 105-67-9			
Second Quarter 2009	u u U	U		Ü	U	U	5		8270C
						CAS # 131-11-3			1.
Dimethyl phthalate Second Quarter 2009	 U	Ü	U	, U	U	U	5		8270C
						CAS # 99-65-0			02.00
m-Dinitrobenzene Second Quarter 2009	 U	 U	U	υ . υ	U	U	5	_	8270C
						CAS# 534-52-1	•		02,100
4,6-Dinitro-o-cresol	U J	U J	υ J	UJ	UJ	U J	10		8270C
Second Quarter 2009				0 3	0 1	CAS # 51-28-5			02/00
2,4-Dinitrophenol				υJ	Uj	1	10		92700
Second Quarter 2009	UJ	U J	UJ		UJ	U J	10	·	8270C
2,4-Dinitrotoluene						(AS# 121-14-2		31,3	00700
Second Quarter 2009	. 0	U	U	U	U	, ·	10	31.3	8270C
Fourth Quarter 2009	U	U	. U	U	U	CAS # 606-20-2	10	31,3	8270C
2,6-Dinitrotoluene									
Second Quarter 2009	Ü	U	U	U	U	U	10	15.65	8270C
Fourth Quarter 2009	U	U	U	U	U	U 98.95.7	10	15.65	8270C
Dinoseb				.,		CAS # 88-85-7			
Second Quarter 2009	UJ	U J	UJ	UJ	υJ	U J	2.5	<u> </u>	8151A
Di-n-octyl phthalate						CAS# 117-84-0			,
Second Quarter 2009	U	U	U	U	υ	U	5	-	8270C
1,4-Dioxane						CAS # 123-91-1			,
Second Quarter 2009	U	U	U	U	υ	U	100	. <del>.</del>	8260B
Diphenylamine						CAS# 122-39-4			
Second Quarter 2009	U	U	U	U	υ	U	10		8270C
Disulfoton	* * ** ****					CAS# 298-04-4			
Second Quarter 2009	U	U	U	U	υ	U	5		8270C



# Radford Army Ammunition Plant, Radford, Virginia

 $Upgradient\ well = 5W8B$ 

Analyte/Quarter	51V8B Q	5W5B Q	5W7B Q	5WC21 Q	5H'C22 Q	5WC23 Q	QL	GPS	Method
Endosulfan I						CAS # 959-98-8			
Second Quarter 2009	U	U	U	U	U	U	0.05	-	8081A
Endosulfan II						C4S# 33213-65-9	)		
Second Quarter 2009	U	U	U	U	U	U	0.1	-	8081A
Endosulfan sulfate						CAS# 1031-07-8			
Second Quarter 2009	U	U	U	U	U	U	0.1		8081A
Endrin						C4S# 72-20-8			
Second Quarter 2009	UJ	UJ	υJ	UJ	UJ	UJ	0.1		8081A
Ethyl acetate						CAS# 141-78-6			
Second Quarter 2009	U	U	U	U	U	U	5	-	8260B
Endrin aldehyde						CAS # 7421-93-4			
Second Quarter 2009	U	υ	U	U	U	U	0.1	-	8081A
Ethanol						CAS# 64-17-5			
Second Quarter 2009	U	υ	U	U	U	U	250	-	8260B
Ethylbenzene						CAS# 100-41-4			<u></u>
Second Quarter 2009	U	U	U	U	U	υ	1	-	8260B
Ethyl methacrylate						C4S# 97-63-2			
Second Quarter 2009	U	U	U	U	U	U	0.5		8260B
Ethyl methanesulfonate						CAS # 62-50-0			ı
Second Quarter 2009	U	U	U	U	U	U	5	· -	8270C
Ethylene oxide						CAS# 75-21-8			I
Second Quarter 2009	UJ	U J	UJ	U J	UJ	UJ	20		8260B
Famphur						C4S # 52-85-7			1
Second Quarter 2009	. U .	U	U	U	· U	U	5	: · - · ·	8270C
Fluoranthene				. ,		CAS # 206-44-0			l
Second Quarter 2009	U	U	U	U	U	U	 5		8270C
Fluorene						 C4S			J
Second Quarter 2009	UJ.	U J	U J	U J	UJ	U J	5	· -	8270C
Heptachlor						 CAS		.i	L
Second Quarter 2009	: · · · · · · · · · · · · · · · · · · ·	U	 U	U	U	U	0.05	-	8081A
Heptachlor epoxide	· · · · · · · · · · · · · · · · · · ·					CAS# 1024-57-3			L
Second Quarter 2009	U	 U	u	. U	U	U	0.05	-	8081A
Hexachlorobenzene						CAS # 118-74-1			I
Second Quarter 2009	υ	υ υ υ υ	U	U J	Uj	UJ	5	-	8270C
Hexachlorobutadiene						CAS # 87-68-3			
Second Quarter 2009	U	υ	Ü	U	U	U	0.5	-	8260B
Hexachlorocyclopentadie	<u></u>					CAS # 77-47-4			
Second Quarter 2009	UJ	U J	UJ	U	U	U	5	Ţ -	8270C
Hexachloroethane						CAS# 67-72-1		<u> </u>	02.00
Second Quarter 2009	υ	U	υ υ	υ	U	U	0.5		8260B
	i					CAS # 70-30-4	0.0	1	CZCOD
Hexachlorophene	UJ		U J	UJ		UJ	500		8270C
Second Quarter 2009	: U J :					CAS # 1888-71-7	550	<u> </u>	
Hexachloropropene				· 11 1		U J	E		92700
Second Quarter 2009	U	U		UJ	UJ	CAS # 591-78-6	5	· -	8270C
2-Hexanone					·				1 00000
Second Quarter 2009	U	U	U	U	U	U 102 20 5	5		8260B
Indeno[1,2,3-cd]pyrene						C4S# 193-39-5			



# Radford Army Ammunition Plant, Radford, Virginia

 $Upgradient\ well = 5W8B$ 

Analyte/Quarter	5W8B Q	) 5W5B Q	51V7B Q	5WC21 Q	511'C22 Q	5WC23 Q CAS# 78-83-1	QL	GPS	Method
Isobutyl alcohol Second Quarter 2009	U	: U	U	U	U	U	25	-	8260B
Isodrin						C4S# 465-73-6			
Second Quarter 2009	U	υ	U	U	U	U :	5		8270C
sophorone						CAS # 78-59-1			
Second Quarter 2009	U	J. O	U	U	U	U	5	-	8270C
sopropylbenzene						CAS# 98-82-8			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
Isopropylether						CAS # 108-20-3			ı
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
4-Isopropyltoluene						CAS # 99-87-6			
Second Quarter 2009	Ü	U	U	U	U	U	0.5	-	8260B
Isosafrole						C4S# 120-58-1			
Second Quarter 2009	U	U	U	U	U	U .	5		8270C
Kepone						CAS # 143-50-0			l
Second Quarter 2009	UJ	U J	U J	U J	и и и И ј	UJ	5	-	8270C
Methacrylonitrile						 C4S# 126-98-7			
Second Quarter 2009	u. i. U	U	U	· u	U	U	5	-	8260B
Methapyrilene						CAS # 91-80-5			
Second Quarter 2009	U J	UJ	U J	U	U	U	5		8270C
Methoxychlor						C4S# 72-43-5			
Second Quarter 2009		U	U	U	U	U	0.5	-	8081A
Bromomethane			Ū			CAS # 74-83-9			
Second Quarter 2009	u u u U	U	U		Ü	U	0.5		8260B
3-Methylcholanthrene					·	CAS# 56-49-5		<u> </u>	
Second Quarter 2009	U		U	. U		U	. 5		8270C
odomethane	Ü				Ü	CAS # 74-88-4			02.00
Second Quarter 2009	U		U	U	u u U	U	0.5		8260B
	O					CAS # 80-62-6		<u>:</u>	OZOOB
Methyl methacrylate Second Quarter 2009	U	U	, U	 U	U	U U	0.5		8260B
			:			CAS # 66-27-3	0.5		0200B
Methyl methane sulfonate						U :	5		8270C
Second Quarter 2009	U	U	U	υ	υ	CAS # 91-57-6		i	82700
2-Methylnaphthalene									00700
Second Quarter 2009	U	U	· U	U	<u> </u>	U 200 00 0		: -	8270C
Methyl parathion			<del>, , , , , , , , , , , , , , , , , , , </del>			CAS # 298-00-0	<u>-</u>		
Second Quarter 2009	U J	n 1	UJ	UJ	UJ	UJ	5	-	8270C
4-Methyl-2-pentanone						CAS # 108-10-1			
Second Quarter 2009	U	U	U	U L	U	U	5	-	8260B
2-Methylphenol			,			CAS # 95-48-7			
Second Quarter 2009	U	U	υ	U	U	υ	5		8270C
3 & 4-Methylphenol						CAS # m 108-39-4	₽ p 10€	-44-	
Second Quarter 2009	U	U	U	U	U	U	10	-	8270C
Methyl tert-butyl ether						CAS # 1634-04-4			
Second Quarter 2009	U	υ	U	υ	U	U	0.5	-	8260B
Dibromomethane						CAS# 74-95-3			
Second Quarter 2009	U	U	U	U	υ	U	0.5	-	8260B
Methylene chloride	-					CAS # 75-09-2			
Second Quarter 2009	U	υ	U	U	υ	U	1	5	8260B
Fourth Quarter 2009	U	U	U	U	U	U	1	5	8260B
						time some		parametri	



# Radford Army Ammunition Plant, Radford, Virginia

 $Upgradient\ well = 5W8B$ 

Analyte/Quarter	5W8B Q	2 5W5B	Q 5IV7B	Q	5WC21 Q	5WC22 Q	5WC23 Q	QL	GPS	Method
Naphthalene							CAS # 91-20-3			
Second Quarter 2009	U	U	U		U	U	U	0.5		8260B
1,4-Naphthoquinone							C4S # 130-15-4			
Second Quarter 2009	U	U	U		U	U	U	5	-	8270C
1-Naphthylamine							CAS # 134-32-7			
Second Quarter 2009	U	U	U		U	U	U	5	: <u>-</u>	8270C
2-Naphthylamine							C4S# 91-59-8			
Second Quarter 2009	UJ	U J	U	J	υJ	UJ	UJ	5	-	8270C
o-Nitroaniline							CAS # 88-74-4			
Second Quarter 2009	U	U	U		U	U	U	10	-	8270C
Fourth Quarter 2009	U	U	U		U	U	U	10	-	8270C
m-Nitroaniline							CAS # 99-09-2			
Second Quarter 2009	U	· U	U		U	U	U :	10		8270C
p-Nitroaniline							CAS # 100-01-6			l
Second Quarter 2009	U	· U	 U		U	U	U	20	20	8270C
Fourth Quarter 2009	U	U	· U		U	U	U	20	20	8270C
Nitrobenzene							CAS # 98-95-3			J
Second Quarter 2009	U	U	U		U.	U	U	10	10	8270C
Fourth Quarter 2009	U	U	· U		- U	U	U	10	10	8270C
o-Nitrophenol							CAS # 88-75-5			1
Second Quarter 2009	U	u u	. U		U	U .	U	5	_	8270C
	J		1			Ü	CAS # 100-02-7	•		J
p-Nitrophenol Second Quarter 2009	· U	υ	U		U	U	U	10		8270C
			, 0				C4S # 56-57-5			02/00
4-Nitroquinoline-1-oxide										I 00700
Second Quarter 2009	UJ	: U J	U	J .	U J	U J	UJ	5	-	8270C
N-Nitrosodi-n-butylamine							CAS# 924-16-3			i
Second Quarter 2009	U	· U	U		U	U	U	5		8270C
N-Nitrosodiethylamine							CAS # 55-18-5			
Second Quarter 2009	U	U	U		U	U	U	5	-	8270C
N-Nitrosodimethylamine							CAS # 62-75-9			
Second Quarter 2009	U	U	υ		U	U	U	5		8270C
N-Nitrosodiphenylamine							CAS # 86-30-6			
Second Quarter 2009	U	U	U		U :	U	U	5	-	8270C
N-Nitrosodipropylamine							CAS # 621-64-7			
Second Quarter 2009	υ	U	U		U	Ü	U	5	-	8270C
N-Nitrosomethylethylamine	} }		and the second second				CAS # 10595-95-6	3		
Second Quarter 2009	U	U	υ		U .	U	U	5	-	8270C
N-Nitrosomorpholine							CAS # 59-89-2			
Second Quarter 2009	υJ	UJ	U	J	υJ	UJ	UJ	5	-	8270C
N-Nitrosopiperidine			. <u></u>				CAS # 100-75-4			1
Second Quarter 2009	U	U	υ		U	U	U	5	-	8270C
N-Nitrosopyrrolidine							CAS # 930-55-2			l
Second Quarter 2009	UJ	UJ	U	J	U J	 U ј	UJ	5	-	8270C
5-Nitroso-o-toluidine							CAS # 99-55-8			1
		U	υ		U		U	5		82700
Second Quarter 2009	U					U	.1	J	-	8270C
Parathion							CAS # 56-38-2			00700
Second Quarter 2009	U	U	U		U	U	U	5	-	8270C
Oantaablasabaanaaa							CAS # 608-93-5			
Pentachlorobenzene Second Quarter 2009	U	U	· U		U J	UJ	UJ	5		8270C



# Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	51V8B Q	5W5B	Q 5IV7B Q	5WC21 Q	5H'C22 Q	5WC23 Q	QL	GPS	Method
Pentachloroethane	2				1 , 22	CAS # 76-01-7	×	1	1
Second Quarter 2009		U			 U	U	0.5		8260B
Pentachloronitrobenzene						C4S # 82-68-8			1
Second Quarter 2009	U	U					5	_	8270C
						CAS # 87-86-5			02700
Pentachlorophenol Second Quarter 2009	 U	. U	υ	υ	U	U	10		8270C
		. 0		U		CAS # 62-44-2	10		02/00
Phenacetin Second Quarter 2009	U	U	U	 U		U	5		8270C
		U	Ü			C4S # 85-01-8	3		62700
Phenanthrene Second Quarter 2009	U	U	U	U	U	U	5		8270C
				U		CAS # 108-95-2			02/00
Phenol			U	U	U	U	5		92700
Second Quarter 2009	U	U			U	C4S # 298-02-2			8270C
Phorate			1.5	11		U U	5		00700
Second Quarter 2009	U	U	U	U	U	1	5	-	8270C
2-Picoline						CAS # 109-06-8	-		00700
Second Quarter 2009		U	U	· U	U	U 22050 50	5	-	8270C
Pronamide						C4S # 23950-58-			
Second Quarter 2009	U	U	U	. U	U	U 71 00 0	5	· · ·	8270C
1-Propanol						CAS # 71-23-8			
Second Quarter 2009	U J	U	U J	UJ	U J	UJ	1000	-	8260B
2-Propanol						CAS # 67-63-0			T
Second Quarter 2009	U	U	U	U	U	U	100	· -	8260B
Propionitrile						CAS # 107-12-0			
Second Quarter 2009	U	U	U	U	U	U	10	· -	8260B
n-Propylbenzene						CAS # 103-65-1			
Second Quarter 2009	U	U	U	U	U	U	0.5		8260B
Pyrene						C4S # 129-00-0			·
Second Quarter 2009	UJ	U.	UJ	UJ	Uj	U J	5	-	8270C
Pyridine						CAS # 110-86-1			,
Second Quarter 2009	U	U	U	U	U	U	5	i - i	8270C
Safrole						CAS # 94-59-7			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
Silvex						CAS # 93-72-1			
Second Quarter 2009	U	U	U	U	U	U	2.5	-	8151A
Styrene						CAS # 100-42-5			
Second Quarter 2009	U	U	υ	U	U	U	0.5	-	8260B
Sulfotep						CAS # 3689-24-5			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
2,4,5-Trichlorophenoxyace	tic acid					CAS # 93-76-5			
Second Quarter 2009	U	U	U	U	U	U	2.5		8151A
1,2,4,5-Tetrachlorobenzene	9					C4S# 95-94-3			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
1,1,1,2-Tetrachloroethane						CAS # 630-20-6			
Second Quarter 2009	U	U	U	U	U	U	0.5	· -	8260B
1,1,2,2-Tetrachloroethane			:	<u></u>		CAS # 79-34-5			1
Second Quarter 2009	U	U	U	U	U	Ü	0.5		8260B
Tetrachloroethene						CAS # 127-18-4			<u> </u>
Second Quarter 2009	U	U	Ü	U	U	U	1	5	8260B
						I		1	



# Radford Army Ammunition Plant, Radford, Virginia

 $Upgradient\ well = 5W8B$ 

Analyte/Quarter	51V8B Q	5W5B Q	5IV7B Q	5WC21 Q	5H'C22 Q	5WC23 Q	QL	GPS	Method
Tetrahydrofuran						CAS# 109-99-9			
Second Quarter 2009	U	U	U	U	U	U	5	-	8260B
2,3,4,6-Tetrachlorophenol						C4S # 58-90-2			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
Toluene						CAS # 108-88-3			
Second Quarter 2009	U	U	U	U	U	U	1	1000	8260B
Fourth Quarter 2009	U	U	U	U	U	U	1	1000	8260B
o-Toluidine						CAS # 95-53-4			
Second Quarter 2009	UJ	U J	U J	UJ	UJ	UJ	5	-	8270C
Toxaphene						CAS# 8001-35-2			
Second Quarter 2009	U	U	U	U	U	U	2.5	-	8081A
1,2,3-Trichlorobenzene						CAS# 87-61-6			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
1,2,4-Trichlorobenzene						CAS # 120-82-1			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
1,1,1-Trichloroethane						C4S# 71-55-6			
Second Quarter 2009	U	U	U	U	U	U	1	-	8260B
1,1,2-Trichloroethane						CAS # 79-00-5			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
Trichloroethene						CAS # 79-01-6			
Second Quarter 2009	U	1.3	U	0.8 J	2.5	2.5	1	5	8260B
Fourth Quarter 2009	U	7	U	1.9	3.3	3.3	1	5	8260B
Trichlorofluoromethane						CAS # 75-69-4			
Second Quarter 2009	U	U	U	U	U	U	1	-	8260B
2,4,5-Trichlorophenol						CAS # 95-95-4			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
2,4,6-Trichlorophenol						CAS# 88-06-2			L
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
1,2,3-Trichloropropane						CAS# 96-18-4			ı
Second Quarter 2009	U	U	U	U	U	U	1	-	8260B
1,1,2-Trichloro-1,2,2-Trifluo	roethane					CAS # 76-13-1			i
Second Quarter 2009	U	U	, U	· U	U	U	1	+	8260B
O,O,O-Triethyl phosphorot	hioate					CAS# 126-68-1			·
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
1,2,4-Trimethylbenzene						CAS# 95-63-6			I
Second Quarter 2009	U	U	U	· U	υ	U	0.5	-	8260B
1,3,5-Trimethylbenzene	····		<u></u>	and the statement and a	and the second second second second second	CAS # 108-67-8		. 4	L
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
sym-Trinitrobenzene						CAS # 99-35-4			
Second Quarter 2009	UJ	U J	υJ	UJ	UJ	UJ	5	-	8270C
Vinyl acetate						CAS # 108-05-4			
Second Quarter 2009	U	U	υ	U	υ	U	0.5	-	8260B
Vinyl chloride						CAS # 75-01-4			
Second Quarter 2009	U	υ	υ	U	υ	U	0.5	-	8260B
Xylenes (Total)						CAS # 1330-20-7			
Second Quarter 2009	U	U	υ	U	υ	U	3	10,000	8260B
Fourth Quarter 2009	U	υ	υ	U	U	U	3	10,000	8260B
	-	-			-		-		



### Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

All Results in ug/L.

Analyte/Quarter 5W8B Q 5W5B Q 5W7B Q 5WC21 Q 5WC22 Q 5WC23 Q QL GPS Method

### **Definitions:**

The following definitions apply to results reported for Appendix IX monitoring events. All Appendix IX monitoring results for compliance wells are reported to the detection limit.

Appendix IX Monitoring Events: Fourth Quarter 2003, Second Quarter 2004, Second Quarter 2005,
Third Quarter 2006, Second Quarter 2007, Second Quarter 2008,
Second Quarter 2009

OL Denotes permit required quantitation limit.

U denotes not detected at or above the detection limit or QL.

UA denotes not detected at or above the adjusted detection limit or adjusted QL.

J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above the detection limit and detection limit and QL are estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted detection limit and and adjusted detection limit and QL are estimated.

UN Denotes analyte concentration is less than the quantitation limit and/or five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.

R Denotes result rejected.

O Denotes data validation qualifier. X Denotes mass spectral confirmation not obtained-result suspect.

Background Denotes background concentrations listed in Appendix F to Attachment 2 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), where applicable.

CAS# Denotes Chemical Abstract Services registration number.

**GPS** Denotes Groundwater Protection Standards listed in Appendix G to Attachment 2 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002).

NS denotes not sampled. NA denotes not analyzed.

"-" denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

# The following definitions apply to results reported for non-Appendix IX monitoring events. All non-Appendix IX monitoring results for compliance wells are reported to at or above the quantitation limit.

QL Denotes permit required quantitation limit.

U Denotes analyte not detected at or above QL.

UA Denotes analyte not detected at or above adjusted sample QL.

J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.

R Denotes result rejected.

Q Denotes data validation qualifier.

**Background** Denotes background concentrations listed in Appendix F to Attachment 2 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), where applicable. **CAS#** Denotes Chemical Abstract Services registration number.

**GPS** Denotes Groundwater Protection Standards listed in Appendix G to Attachment 2 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002).

Verification events:

Verification event 12/12/03 and 6/22/2004, 3/23/05, 08/03/2005, and 9/26/2006 (original results reported). 07/17/2008. Verification results reported except where noted.

Verification event 6/10/2009 for 4,4'-DDD for 5W5B, 5W7B, 5WC21, 5WC22, 5WC23; Endosulfan II for 5WC21, 5WC22, 5WC23; bromodichloromethane in 5W7B; and trichloroethane in 5W5B. 4,4'-DDD, Endosulfan II, and bromodichloromethane not detected in verification event. Trichloroethene confirmed in 5W5B.



# Comprehensive Data Validation Report

# Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Draper Aden Associates

Monitoring Event: Second Quarter 2009 Facility: HWMU-5

		Validation Notes	
0	!	(ng/L)	
Validated	Result	Sample ID (ug/L) Q (ug/L) Q (ug/L)	
Laboratory Validated	Result	(ng/L) Q	
		Sample ID	
		Analyte	Method: 6020

Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC

Baríum	5WC21	13.9	13.9	10	No action taken.	
	SWDUP	14.3	14.3	10	No action taken.	No action taken. Blind field duplicate for 5WC21.
Beryllium	5WC21	1.9	1.9	-	No action taken.	
	SWDUP	2	2	-	No action taken.	No action taken. Blind field duplicate for 5WC21.
Chromium	5WC21	5.6	5.6	5	No action taken.	
	SWDUP	5.5	5.5	5	No action taken.	No action taken. Blind field duplicate for 5WC21.
Cobalt	5WC21	50.7	50.7	5	No action taken.	
	SWDUP	49.8	49.8	'n	No action taken.	No action taken. Blind field duplicate for SWC21.
Nickel	5WC21	27.9	27.9	10	No action taken.	
	SWDUP	28.6	28.6	10	No action taken.	No action taken. Blind field duplicate for 5WC21.
Zinc	5WC21	30.3	30.3	10	No action taken.	
	SWDUP	33.5	33.5	10	No action taken.	No action taken. Blind field duplicate for 5WC21.

Definitions:

Data Validation Qualifiers:
QL Denotes permit quantitation limit. Q Denotes data qualifier.
J Denotes analyte reported at or above quantitation limit and associated result is estimated.

# Comprehensive Data Validation Report

# Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Draper Aden Associates

Monitoring Event: Fourth Quarter 2009 Facility: HWMU-5

	Validation Notes	
OL	(ng/L)	
Validated Result	(ug/L) Q	
aboratory Result	Ø	
7	Sample ID (ug/L)	Method: 6020
	Analyte	Method: 6020

Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC

Barium	5WC21	15.9	15.9		10	No action taken. Blind field duplicate 5WDUP, RPD <10.
	SWDUP	15.9	15.9		10	No action taken. Blind field duplicate result for 5WC21. RPD <10.
Beryllium	5WC21	3.1	3.1	J		Blind field duplicate 5WDUP, RPD < 10. MSD and PDS recovered high (126%/155%).
	SWDUP	3.1	3.1	ī	_	Blind field duplicate result for 5WC21. RPD <10. MSD and PDS recovered high (126%/155%).
Chromium	5WC21	10.7	10.7	J	5	Blind field duplicate 5WDUP, RPD>10 (22). Result estimated.
	SWDUP	13.4	13.4	J	5	Blind field duplicate result for 5WC21. RPD > 10 (22). Result estimated.
Cobalt	5WC21	77.9	6.77		5	No action taken. Blind field duplicate 5WDUP, RPD <10.
	SWDUP	42	79		5	No action taken. Blind field duplicate result for 5WC21. RPD <10.
Copper	5WC21	7.1	7.1		5	No action taken. Blind field duplicate 5WDUP, RPD <10.
	SWDUP	7.6	7.6		5	No action taken. Blind field duplicate result for 5WC21. RPD <10.
Nickel	5WC21	40.1	40.1		10	No action taken. Blind field duplicate 5WDUP, RPD <10.
	SWDUP	41	41		10	No action taken. Blind field duplicate result for 5WC21. RPD <10.
Zinc	5WC21	48.3	48.3		10	No action taken. Blind field duplicate 5WDUP, RPD <10.
	SWDUP	50.5	50.5		10	No action taken. Blind field duplicate result for 5WC21. RPD <10.
Method: 8260B						

# Laboratory: Lancaster Laboratories, Lancaster, PA

No action taken. Blind field duplicate result for 5WC21 (5WDUP) was 1.9 ug/l. RPD <10. No action taken. Blind field duplicate result for 5WC21. RPD <10. 1.9 1.9 1.9 SWDUP Trichloroethene

# Definitions:

Data Validation Qualifiers:
QL Denotes permit quantitation limit. Q Denotes data qualifier.
J Denotes analyte reported at or above quantitation limit and associated result is estimated.

# APPENDIX A-3

HWMU-5 2009 LABORATORY ANALYTICAL RESULTS PLUME MONITORING WELLS

# Target Analyte Monitoring Results At Or Above Permit Quantitation Limit HWMU-5 Plume Monitoring Wells

# Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 5W8B

Analyte/Quarter/CAS#	51V8B Q	51V9A Q	51V10.4 Q	5W11.4 Q	S5W5 Q	S5W7 Q	QL	Background	Method
Antimony						C4S #	7440-	36-0	4000000000000000000000000000000000
Second Quarter 2009	U	υ	U	U	U A	U	1	3	6020
Fourth Quarter 2009	U	U	U	U	U	U	1	3	6020
Arsenic	+ + '					CAS#	7440-	38-2	
Second Quarter 2009	U	U	U	U	U	U	10	1	6020
Fourth Quarter 2009	U	U	U	U	U	U	10	1	6020
Barium	,					CAS#	7440-	39-3	
Second Quarter 2009	85.8	51.9	43.5	91.1	27.5	76.1	10	172.87	6020
Fourth Quarter 2009	104	62.5	54.9	131	32.4	107	10	172.87	6020
Beryllium						CAS#	7440-	41-7	
Second Quarter 2009	0.24 J	U	U	U	U	U	1	0.7	6020
Fourth Quarter 2009	υ	U	U	U	U	U ,	1	0.7	6020
Cadmium						C4S#	7440-	43-9	
Second Quarter 2009	U	U	U	υ	U	U	1	1.45	6020
Fourth Quarter 2009	U	U	U	U	U	U	1	1.45	6020
Chromium						CAS#	7440-	47-3	
Second Quarter 2009	U	U	U	U	U	U	5	5	6020
Fourth Quarter 2009	U	U	U	U	U	U	5	5	6020
Cobalt						CAS#	7440-	48-4	
Second Quarter 2009	U	U	U	U	U	U	5	7	6020
Fourth Quarter 2009	U	U	U	U	U	5.7	5	7	6020
Copper						CAS#	7440-	50-8	
Second Quarter 2009	U	U	U	U	U	U	5	18	6020
Fourth Quarter 2009	U	U	U	U	U	U	5	18	6020
Lead	1					CAS#	7439-9	92-1	
Second Quarter 2009	U	U	U	U	U	U	1	10	6020
Fourth Quarter 2009	U	U	U	U	U	U	1	10	6020
Mercury						CAS #	7439-9	97-6	
Second Quarter 2009	υ	U	υ	U	U	U	2	0.9	7470A
Fourth Quarter 2009	U	U	U	U	U	U	2	0.9	7470A
Nickel	1					CAS#	7440-0	02-0	
Second Quarter 2009	U	U	U	U	U	U	10	106	6020
Fourth Quarter 2009	U	U	U	U	U	U	10	106	6020
Selenium						C.4S #			
Second Quarter 2009		U	U	U	U	U	10	1	6020
Fourth Quarter 2009	U	υ	U	υ	U	U	10	1	6020
Silver	!					CAS#			
Second Quarter 2009	U	U	U	U	U	υ	2	2.3	6020
Fourth Quarter 2009	U	U	U	υ	U	υ	2	2.3	6020
Thallium						CAS#			
Second Quarter 2009	U	U	Ü	U	U	U	1	2	6020
Fourth Quarter 2009	U	U	U	U	U	U	1	2	6020
Vanadium	1 .					CAS#			
	U	U	U	U	υ	U	10	17	6020
Second Quarter 2009	U	U	U	U	U	U	10	17	6020
Fourth Quarter 2009	1 5		-	<del>-</del>	<del>-</del>	CAS#			
Zinc	3.7 J	U	U	 U	U	U	10	75	6020
Second Quarter 2009	J., J	U	U	U	υ	14.3	10	75	6020
Fourth Quarter 2009									
Acetone	T G					CAS#			92600
Second Quarter 2009	U	U	U	U	U	U	10	89	8260B
Fourth Quarter 2009	U	U	U	U	U	U	10	89	8260B



# Target Analyte Monitoring Results At Or Above Permit Quantitation Limit HWMU-5 Plume Monitoring Wells

# Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

 $Upgradient\ well = 5W8B$ 

Analyte/Quarter/CAS #	51V8B Q	51V9A Q	51V10A Q	51V11.4 Q	S5W5 Q	S5W7 Q	QL	Background	Method
bis(2-Ethylhexyl)phthalate					- :	C.4S #	117-81	1-7	
Second Quarter 2009	U	U	U	Ų	U	U	6	10	8270C
Fourth Quarter 2009	U	U	U	U	U	U	6	10	8270C
2-Butanone						CAS #	78-93-	3	
Second Quarter 2009	U	U	U	U	U	U	10	21.3	8260B
Fourth Quarter 2009	U	U	U	U	U	U	10	21.3	8260B
Chloroform						CAS#	67-66-	3	
Second Quarter 2009	υ	U	U	U	U	U	1	0.5	8260B
Fourth Quarter 2009	U	U	U	U	U	U	1	0.5	8260B
Dichlorodifluoromethane						CAS#	75-71-	8	
Second Quarter 2009	U	U	U	U	U	U	1	1	8260B
Fourth Quarter 2009	U	U	U	U	U	U	1	1	8260B
1,2-Dichloroethane	'					C4S#	107-06	3-2	
Second Quarter 2009	U	U	U	U	U	U	1	0.1	8260B
Fourth Quarter 2009	U	U	U	U	U	U	1	0.1	8260B
Diethyl ether						CAS#	60-29-	7	
Second Quarter 2009	U	U	U	U	U	U	12.5	12	8260B
Fourth Quarter 2009	U	U	U	U	U	U	12	12	8260B
Diethyl phthalate						CAS#	84-66-2	2	
Second Quarter 2009	U	U	U	U	U	U	10	5	8270C
Fourth Quarter 2009	U	U	U	U	U	U	10	5	8270C
2,4-Dinitrotoluene						CAS #	121-14	-2	
Second Quarter 2009	U	 U	U	U	U	U	10	0.18	8270C
Fourth Quarter 2009	υ	U	U	U	U	U.	10	0.18	8270C
2,6-Dinitrotoluene						CAS#	606-20	<u>+2</u>	
Second Quarter 2009	U	U	U	U	U	U	10	80.0	8270C
Fourth Quarter 2009	U	U	U	υ	U	U	10	0.08	8270C
Methylene chloride						CAS#	75-09-2	2	
Second Quarter 2009	U	U		U	U	U	1	0.7	8260B
Fourth Quarter 2009	U	U	U	U	U	U	1	0.7	8260B
							88-74-4		
o-Nitroaniline	U	U	 U	U	U	U	10	20	8270C
Second Quarter 2009	U	U	U	U	U	U	10	20	8270C
Fourth Quarter 2009	1 0		Ü				100-01		02100
p-Nitroaniline	U	U	U	U	U	U CAS #	20	20	8270C
Second Quarter 2009	U	U	U	U	U	U	20	20	8270C
Fourth Quarter 2009							98-95-3		02700
Nitrobenzene	U	U	U	U	U	U CAS#	10	10	8270C
Second Quarter 2009	1	U			U	U			
Fourth Quarter 2009	U			U			10	10	8270C
Toluene	1 ,,						108-88		00000
Second Quarter 2009	υ	U	U	U	U	U	1	0.1	8260B
Fourth Quarter 2009	U	U	U	U	υ	U	1	0.1	8260B
Trichloroethene	1						79-01-6		
Second Quarter 2009	U	U	U	U	U	U	1	0.8	8260B
Fourth Quarter 2009	υ	U	U	U , a .	U	U	1	0.8	8260B
Xylenes (Total)							1330-2		
Second Quarter 2009	U	U	U	U	U	U	3	0.1	8260B
Fourth Quarter 2009	U	U	U	U	U	U	3	0.1	8260B



# Target Analyte Monitoring Results At Or Above Permit Quantitation Limit HWMU-5 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

 $Upgradient\ well = 5W8B$ 

Analyte/Quarter/CAS #

51V8B Q 5W9A Q 5W10A Q

5W11.4 Q

S5W5 Q

S5W7 Q QL Background Method

### Definitions:

All plume monitoring well results reported to at or above the permit quantitation limit except for the upgradient well during the Appendix IX monitoring event.

During the Appendix IX monitoring event, results for the upgradient well are reported to the detection limit.

Q Denotes data validation qualifier.

QL Denotes permit required quantitation limit.

U Denotes analyte not detected at or above QL.

UA Denotes analyte not detected at or above adjusted sample QL.

J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated.

When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.

UN Denotes analyte concentration is less than the quantitation limit and five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.

R Denotes result rejected.

Background Denotes background concentrations listed in Appendix F to Attachment 2 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002).

CAS# Denotes Chemical Abstract Services registration number.

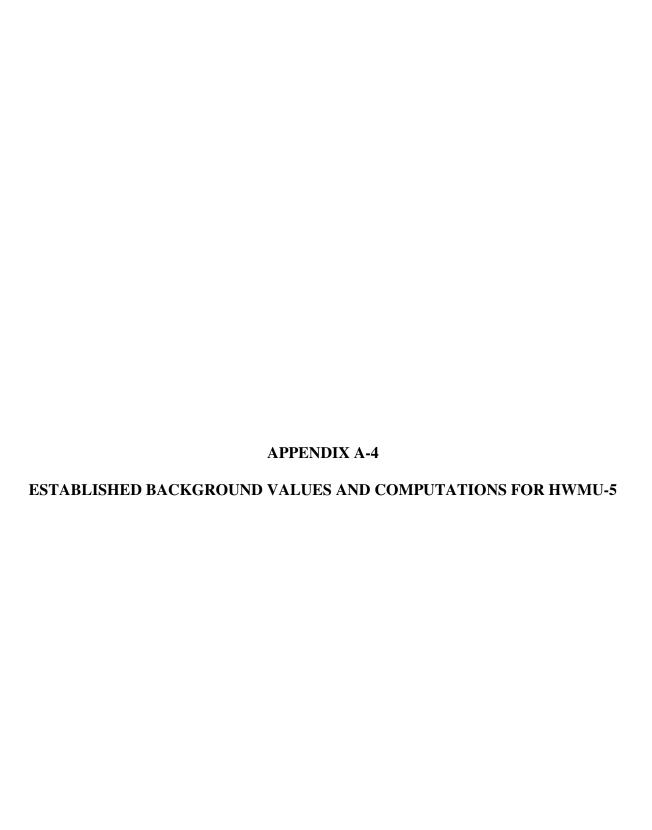
GPS Denotes groundwater protection standard.

NS denotes not sampled.

NA denotes not analyzed. "-" denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

Appendix IX Monitoring Events: Fourth Quarter 2003, Second Quarter 2004, Second Quarter 2005, Third Quarter 2006, Second Quarter 2007, Second Quarter 2008, Second Quarter 2009.





flow line vectors over the Potentiometric Surface Map, measuring their lengths, calculating the head differential over the distances measured, and dividing the head differential by the length of the flow line vectors. The three calculated gradients were then averaged to a single value. Using this method, the average groundwater hydraulic gradient across the site based on First Quarter 1999 groundwater elevations was calculated to be 0.017 ft/ft. Historical slug test data for the site yielded an average hydraulic conductivity of 5.25 x 10<sup>-5</sup> ft/second. This value is consistent with literature values for karst carbonate rock and for clayey, silty sand and gravel alluvium and residuum (Domenico and Schwartz, 1990).

The estimated groundwater velocity across the site was calculated to be approximately 0.193 ft/day or 70.4 ft/year, based on the following:

- an average hydraulic conductivity of 5.25 x 10<sup>-5</sup> ft/second;
- an average hydraulic gradient of 0.017 ft/ft; and
- an assumed effective porosity of 0.40, based on a representative range of porosities for karst carbonate rock, weathered residuum, and clayey, silty sand and gravel alluvium (Domenico and Schwartz, 1990).

The actual groundwater flow velocities in the carbonate bedrock may vary as much as one to two orders of magnitude from the velocity presented above, depending on water level conditions and the distribution of karst conduits.

## 3.3 HWMU-5 GROUNDWATER MONITORING ANALYTE LIST

The groundwater monitoring analyte list for HWMU-5 is presented in Table 1 (Appendix B). The list represents the subset of the constituents listed in Appendix VIII of 40 CFR Part 261 that previously have been detected in the groundwater and/or that are reasonably expected to be in or derived from waste contained in HWMU-5. As discussed in Section 3.5.2 below, 11 inorganic constituents, three volatile organic constituents, and two explosive/propellant constituents have been detected in the groundwater monitoring network for HWMU-5 at statistically significant concentrations above the Unit's calculated background concentrations.

The concentration limits established for the hazardous constituents also are listed in **Table 1**. The concentration limits represent either background concentrations calculated for the constituents in this GWQAR, Maximum Concentrations of Constituents for Ground-water Protection listed in Table 1 of 40 CFR 264.94, USEPA Drinking Water Standard Maximum Contaminant Levels (MCLs), or alternate concentration limits (ACLs) established by the VDEQ (July 1998).

As Alliant discussed with the VDEQ in the past, the reliability of previous laboratory analytical data - particularly dissolved metals data - appeared to be questionable in some cases. In an April 9, 1996 letter to C. Jake (Alliant), the VDEQ agreed that only total metals concentrations in groundwater would be measured, as described in a USEPA Region III guidance on groundwater sampling in karst terrain. Therefore, all references to metals concentrations in this GWQAR refer to total metals concentrations.

## 3.4 HWMU-5 GROUNDWATER BACKGROUND CONCENTRATIONS

Background concentrations were calculated for each constituent in the groundwater monitoring program using the analytical data from First Quarter 1996 through First Quarter 1999 for upgradient well 5W8B. The background concentration calculations were based on site wide 95% confidence, 95% coverage upper prediction intervals. The calculated background

concentrations are listed in Table 2 (Appendix B). The background concentrations were used to construct the outermost closing contours on the Isoconcentration Maps (Appendix A).

### 3.5 HWMU-5 STATISTICAL ANALYSIS

Statistical evaluations for HWMU-5 are performed annually and submitted to the VDEQ in accordance with the annual reporting requirements specified in 40 CFR 265.94. As part of this GWQAR, statistical evaluations were performed on First Quarter 1999 analytical data in accordance with the procedures and guidance provided in the following documents:

- Title 40 of the Code of Federal Regulations, 40 CFR 264.97 and 264.98;
- VDEQ Guidance for statistical analysis titled "Data Analysis Plan," undated;
- Interim Final Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, USEPA, April 1989;
- Addendum to Interim Final Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, USEPA, July 1992; and
- Statistical Methods for Groundwater Monitoring, Gibbons, R.D., 1994.

Statistical threshold values were computed for the 40 constituents for which HWMU-5 is currently monitored based on the concentrations of those constituents in upgradient (background) well 5W8B. All data starting with First Quarter 1996 to First Quarter 1999 were used for this purpose. The 1996 through 1999 monitoring data have been submitted previously to the VDEQ by Alliant in quarterly monitoring reports; therefore, the data are not listed in this GWQAR. Statistical comparisons were performed for the First Quarter 1999 data set. Comparison statistical analyses were performed for all constituents which were detected in any downgradient well during that event.

# 3.5.1 Background Data and Statistical Comparisons

Statistical analyses were performed using the analytical results from upgradient well 5W8B as background data. Based on the percentage of non-detects and the distribution of the background data, methods of statistical comparisons varied. Background average, standard deviation and other descriptive statistical data were computed for all constituents and are presented in Appendix C.

The constituents listed below were 100% non-detected in the background data. The background threshold levels (BTLs) for these constituents were established as equal to their detection limits (DL). Detections of these constituents in the downgradient wells during First Quarter 1999 were compared to these BTLs.

Backgro	Background Threshold Level (BTL) = Detection Limit (DL)								
Parameter	Sample Size	% Non-Detects	DL (μg/l)	BTL (μg/l)					
Antimony	13	100	3	3					
Arsenic .	13	100	1	1					
Selenium	13	100	1	1					
Benzene	13	100	0.1	0.1					
Chloromethane	13	100	0.3	0.3					
1,2-Dichloroethane	13	100	0.1	0.1					
Tetrachloroethene	13	100	0.1	0.1					
Toluene	13	100	0.1	0.1					
trans-1,2-Dichloroethene	13	100	0.1	0.1					

Background Threshold Level (BTL) = Detection Limit (DL)									
Parameter	Sample Size	% Non-Detects	DL (μg/l)	BTL (μg/l)					
1,1,2-Trichloroethane	13	100	0.5	0.5					
Trichlorofluoromethene	13	100	0.5	0.5					
Vinyl chloride	13	100	0.1	0.1					
Xylenes (total)	13	100	0.1	0.1					
Bis (2-ethylhexyl) phthalate	13	100	10	10					
Di-n-butyl phthalate	9	100	5	. 5					
Diethyl phthalate	13	100	5	5					
Diphenylamine	13	100	10	10					
2,6-Dinitrotoluene	13	100	0.08	0.08					

Non-parametric prediction intervals were computed for all of the constituents for which the data from background well 5W8B satisfied one of the following two criteria, per VDEQ regulations and guidance as well as USEPA guidance:

- Percentage of non-detects was greater than or equal to 50 and less than 100; or
- Percentage of non-detects was less than 50, but data was not normally distributed in original or log-transformed mode.

The background threshold levels for these constituents were set as equal to their upper prediction limits (UPLs). The background and relevant statistical data for these constituents are summarized below. The confidence level and false positive rate were calculated based on the number of background data points available and number of future comparisons. For all constituents, the confidence level was determined to be equal to 0.920, and the false positive rate was equal to 0.080. Since the upper control limit of a non-parametric interval cannot be adjusted for multiple comparisons and inadequate number of background data, the number of resampling events required was adjusted to account for the high error rates inherent in those situations. The number of confirmation resamples required for all constituents is 2. The background and relevant statistical data for these constituents are summarized below. Associated statistical computations are presented in Appendix C.

BTL = Upper Prediction Li	mit of Non-parame	tric Prediction In	terval w/false p	positive rate=0.067
Parameter	Sample Size	% Non-Detects	DL (μg/l)	BTL (µg/l)
Beryllium	13	54	0.2	0.7
Cobalt	13	46	1	7
Copper	13	54	1	18
Lead	13	69	1	10
Mercury	13	85	0.2	0.9
Nickel	13	69	15	106
Silver	13	85	0.2	2.3
Thallium	13	85	1	2
Vanadium	13	62	4	17
Zinc	13	38	5	75
Acetone	13	92	10.0	89
Chloroform	13	77	0.3	0.5
Methylene chloride	13	92	0.7	0.7
Methylethyl ketone	13	92	1.1	21.3
Trichloroethene	13	85	0.1	0.8
2,4-Dinitrotoluene	13	92	0.08	0.18
Total Organic Carbon	13	69	1,000	253,000
Total Organic Halides	13	46	5	13.4

The following constituents exhibited normally distributed background data with less than 25% non-detects. One sided parametric prediction intervals were computed on the background data for all of these constituents. The UPLs for these constituents were set as their respective BTLs, with one exception. For pH, a two-sided parametric prediction interval was computed; therefore, the BTL for pH consisted of a range between the lower prediction limit (LPL) and the upper prediction limit. The background concentration calculations were based on a site wide 95% confidence, 95% coverage upper prediction intervals. When adjusted for multiple comparisons of the background data, the minimum required false positive rate was below 1% (0.01). A 99% confidence level (0.01 false positive rate) was used for all individual comparisons, which with the most conservative assumptions provided a site-wide false positive rate of >0.05 for all constituents. The background and relevant statistical data for these constituents are summarized below. The prediction interval computations for these constituents are presented in Appendix C.

BTL = UPL of one-sided Prediction Interval (exception pH) w/site-wide false positive rate>0.05 (individual comparisons false positive rate=0.01) BTL for pH = LPL – UPL of two-sided Prediction Interval											
DL BTL											
Parameter	Sample Size	% Non-Detects	(μ <b>g/l</b> )	(μg/l)							
Barium	13	0	2	172.87							
Cadmium	13	23	0.1	1.45							
Specific Conductivity	Specific Conductivity 8 0 1 μS/cm 450 μS/cm										
pН	8	0	0.1 pH units	2.79 - 7.47 pH units							

# 3.5.2 Results of Statistical Comparisons

The following table lists the constituents which were detected during the First Quarter 1999 event at concentrations exceeding their respective background threshold levels (BTLs), and the downgradient wells in which they were detected.

Parameter	Monitoring Well(s)
Arsenic	S5W5
Beryllium	5W7B, 5WC21, S5W5
Cadmium	5WC21
Cobalt	5W5B, 5W7B, 5WC21, 5WC22, S5W7, 5W11A
Copper	5W7B, 5WC21
Lead	5W7B, S5W5
Nickel	5WC21
Selenium	5W5B
Silver	5W5B
Vanadium	5W5B, 5W7B, S5W5
Zinc	5W7B, 5WC21, 5W11A
Chloroform	5WC21
Trichloroethene	5W5B, 5WC21, 5WC22, 5WC23, 5W10A
Xylenes (total)	5W5B
2,4-Dinitrotoluene	5W5B, 5W7B, 5WC21, 5WC22, 5WC23
2,6-Dinitrotoluene	5W5B, 5W7B, 5WC21, 5WC22, 5WC23, 5W9A
Specific Conductivity	5W5B, 5W7B, 5WC21, 5WC22, 5WC23, S5W7, 5W9A, 5W11A
рH	5WC23, 5W10A, 5W11A

# TABLE 2 HWMU-5 CALCULATED BACKGROUND VALUES

	Background Concentration
Constituent	(μg/l unless otherwise noted)
Antimony	3
Arsenic	1
Barium	172.87
Beryllium	0.7
Cadmium	1.45
Cobalt	7
Copper	18
Lead	10
Mercury	0.9
Nickel	106
Selenium	1
Silver	2.3
Thallium	2
Vanadium	17
Zinc	75
Acetone	89
Benzene	0.1
Chloroform	0.5
Chloromethane	0.3
1,2-Dichloroethane	0.1
Methylene chloride	0.7
Methylethylketone	21.3
Tetrachloroethene	0.1
Toluene	0.1
trans-1,2-Dichloroethene	0.1
1,1,2-Trichloroethane	0.5
Trichloroethene	0.8
Trichlorofluoromethane	0.5
Vinyl chloride	0.1
Xylenes (total)	0.1
Bis (2-ethylhexyl) phthalate	10
Di-n-butylphthalate	5
Diethyl phthalate	5
Diphenylamine	10
2,4-Dinitrotoluene	0.18
2,6-Dinitrotoluene	0.08
Total Organic Carbon	253,000
Total Organic Halides	13.4
Specific Conductivity	450 μS/cm
pH	2.79 to 7.47 pH units

### Appendix IX Constituents Detected Since Permit Issuance HWMUs 5, 7, 10, and 16 Radford Army Ammunition Plant

Unit	Quarter Initially Detected	Constituent	Background Calculated or QL?	Background (ug/L)	GPS Required? (261 Appendix VIII)	Proposed GPS (ug/L)	Source
		Chromium	QL	5	yes	100	USEPA MCL
		Diethyl Ether	QL	12	no	NA	NA
HMWU-5	Fourth Quarter 2003	2-Nitroaniline	QL	20	no	NA	NA
HIVIVV U-3		4-Nitroaniline	QL	20	yes	20	Background/QL
		Nitrobenzene	QL	10	yes	10	Background/QL
	Third Quarter 2006	Dichlorodifluoromethane	QL	1	yes	125.2	VDEQ ACL
HWMU-7	Third Quarter 2003	Copper	Calculated	49	no	NA	NA
HVVIVIU-7	Second Quarter 2004	Zinc	Calculated	217	no	NA	NA
	First Quarter 2003	Cobalt	QL	5	no	NA	NA
HWMU-10	Second Quarter 2003	Vanadium	QL	10	no	NA	NA
	Second Quarter 2005	Acetone	QL	10	no	NA	NA
	Second Quarter 2005	2-Propanol	QL	50	no	NA	NA
		Chloroethane	Calculated	20.7	yes	20.7	Background/QL
	Second Quarter 2003	Diethyl Ether	Calculated	75.5	no	NA	NA
HWMU-16		Dimethyl Ether	Calculated	17.0	no	NA	NA
	Third Quarter 2003	Methylene Chloride	Calculated	13.95	no*	NA	NA
	Second Quarter 2004	1,1,2-Trichloro-1,2,2-trifluoroethane	Calculated	1.2	no*	NA	NA

- HWMU-5: The additional Appendix IX constituents detected in the downgradient point of compliance wells were not detected above their respective Quantitation Limits (QLs) in the upgradient well. As a result, background concentrations for those constituents were set as equal to their respective QLs. In accordance with the Permit (Condition V.J.1.g.), GPS are proposed for those additional Appendix IX constituents that are listed in Appendix VIII of 40 CFR Part 261 (chromium, 4-nitroaniline, nitrobenzene, and dichlorodifluoromethane). No GPS are proposed for the additional Appendix IX constituents that are not listed in Appendix VIII of 40 CFR Part 261 (diethyl ether and 2-nitroaniline).
- HWMU-7: Background concentrations for the additional Appendix IX constituents detected in the downgradient point of compliance wells (copper and zinc) were previously calculated and submitted to the VDEQ in the August 1998 *Groundwater Quality Assessment Report for HWMU-7* prepared by ERM, Inc. In accordance with the Permit (Condition V.J.2.g.), no GPS are proposed for the additional Appendix IX constituents (copper and zinc), as they are not listed in Appendix VIII of 40 CFR Part 261.
- HWMU-10: The additional Appendix IX constituents detected in the downgradient point of compliance wells were not detected above their respective Quantitation Limits (QLs) in the upgradient well. As a result, background concentrations for those constituents were set as equal to their respective QLs. In accordance with the Permit (Condition V.J.3.g.), no GPS are proposed for the additional Appendix IX constituents (cobalt, vanadium, acetone, and 2-propanol), as they are not listed in Appendix VIII of 40 CFR Part 261.
- HWMU-16: Background concentrations for additional Appendix IX constituents chloroethane, diethyl ether, dimethyl ether, and methylene chloride were calculated using data collected from upgradient well 16C1 during the period from Third Quarter 2003 through Third Quarter 2004. The background concentration for additional Appendix IX constituent 1,1,2-trichloro-1,2,2-trifluoroethane was calculated using data collected from upgradient well 16C1 during the period from Second Quarter 2004 through Third Quarter 2006. In accordance with the Permit (Condition V.J.4.g.), GPS are proposed for additional Appendix IX constituents that are listed in Appendix VIII of 40 CFR Part 261 (chloroethane). No GPS are proposed for the additional Appendix IX constituents that are not listed in Appendix VIII of 40 CFR Part 261 (diethyl ether and dimethyl ether).

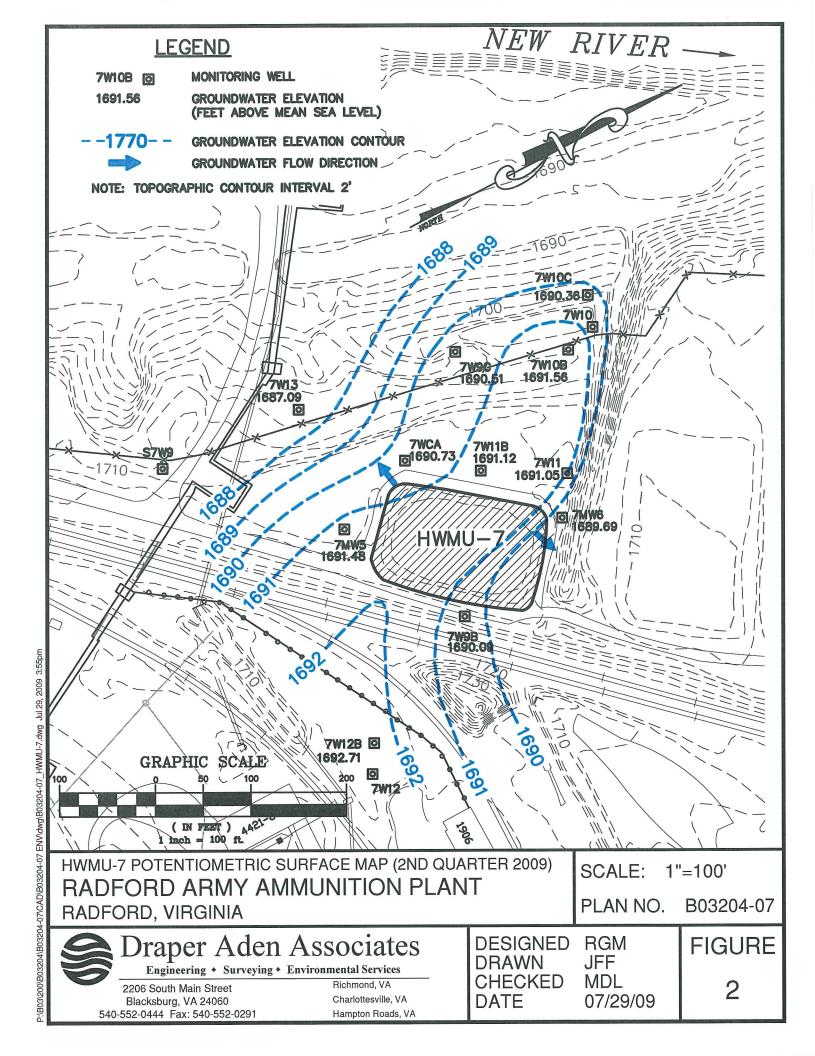
  \*Methylene chloride and 1,1,2-trichloro-1,2,2-trifluoroethane should not be added to the Groundwater Monitoring List for HWMU-16, as these constituents were only detected in the upgradient well for the Unit, and not in the downgradient point of compliance wells.

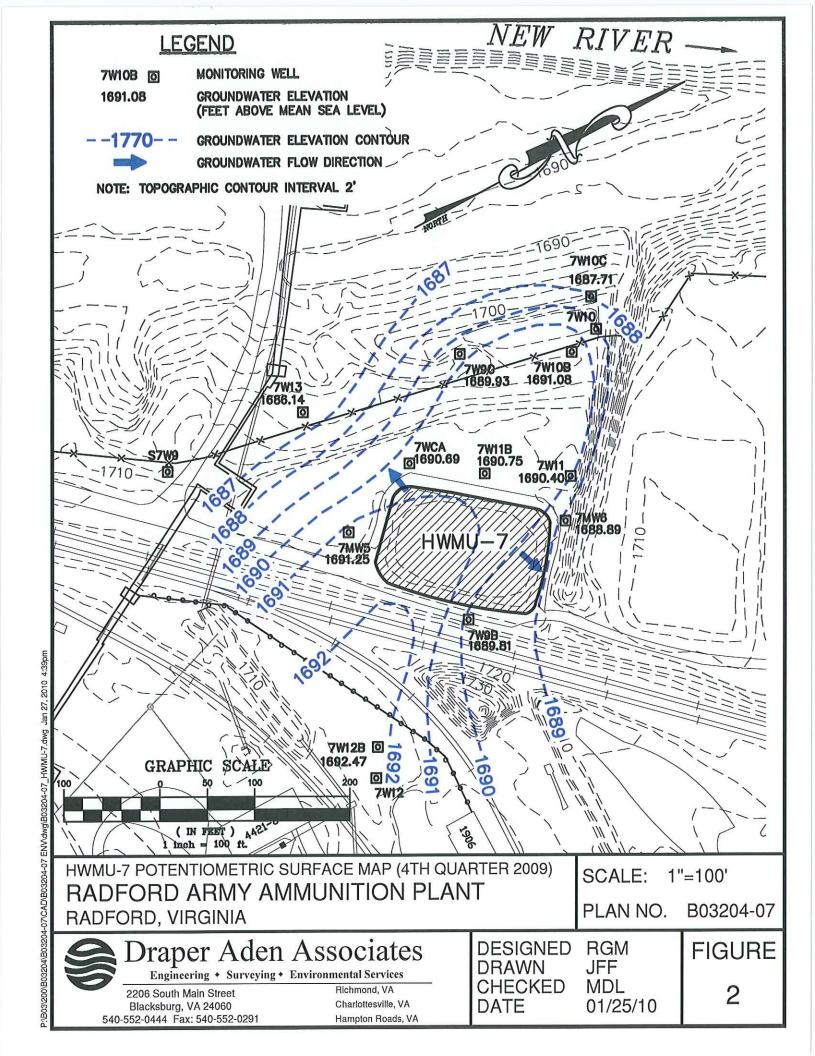
APPENDIX B

HWMU-7

# **APPENDIX B-1**

HWMU-7 POTENTIOMETRIC SURFACE MAPS SECOND QUARTER 2009 FOURTH QUARTER 2009





# APPENDIX B-2

HWMU-7 2009 LABORATORY ANALYTICAL RESULTS POINT OF COMPLIANCE WELLS

Upgradient well = 7W12B

Analtye/Quarter	7W12B Q	7MW6 Q	7IVCA Q	7W11B Q	QL	GPS	Background	Method
Antimony						C	AS#	7440-36-0
Second Quarter 2009	U	U	U	UN	1	6	1	6020
Fourth Quarter 2009	U	U	U	U	1	6	1	6020
Arsenic		I			ı	ć	! 'AS #	7440-38-2
Second Quarter 2009	U	U	U	U	10	10	10	6020
Fourth Quarter 2009	υ	υ	U	U	10	10	10	6020
Barium		l				•	'AS #	7440-39-3
Second Quarter 2009	33.1	19.2	29.7	41.3	10	2000	41	6020
Fourth Quarter 2009	36	17.8	29.3	58.1	10	2000	41	6020
Beryllium						6	  48 #	7440-41-7
Second Quarter 2009	U	U	U	U	1	1		6020
Cadmium	1			J			 'A <b>S</b> #	7440-43-9
			U	U		1	1	6020
Second Quarter 2009 Fourth Quarter 2009	υ	U	U	U	1	5	1	6020
	U	U	U	U	1	5	ĺ .	
Chromium	1	1					AS#	7440-47-3
Second Quarter 2009	7.8	U	U	1.2 J	5	100	9.9	6020
Fourth Quarter 2009	7.5	U	U	U	5	100	9.9	6020
Cobalt		. "					'AS #	7440-48-4
Second Quarter 2009	U	U	5.7	1.4 J	5	156.65	5	6020
Fourth Quarter 2009	U	U	U	U	5	156.65	5	6020
Copper						C	AS#	7440-50-8
Second Quarter 2009	1 J	U	U	1.3 J	5	1300	5	6020
Fourth Quarter 2009	υ	U	UJ	U	5	1300	5	6020
Lead	<del>-</del>					С	.4S#	7439-92-1
Second Quarter 2009	υ	UJ	U	U	1	15	1	6020
Fourth Quarter 2009	υ	U	UJ	U	1	15	1	6020
Mercury	I	1				C	AS#	7439-97-6
Second Quarter 2009	U	U	U	U	2	2	2	7470A
Fourth Quarter 2009	U	υ	U	U	2	2	2	7470A
Nickel		I!				C	AS#	7440-02-0
Second Quarter 2009	U	3.1 J	14.6	2.1 J	10	313	10	6020
Fourth Quarter 2009	U	U	12.5	υ	10	313	10	6020
Selenium							AS #	7782-49-2
Second Quarter 2009	U	U	U	U	10	50	10	6020
Fourth Quarter 2009	U	U	U	U	10	50	10	6020
						1	l	7440-22-4
Silver		i .,					AS#	
Second Quarter 2009	U	U	U	U	2	78.25	2	6020
Fourth Quarter 2009	U	U	U	υ	2	78.25	2	6020
Thallium	1-2						AS #	7440-28-0
Second Quarter 2009	U	UJ	υ	U	1	2	1	6020
Fourth Quarter 2009	U	U	U	U	1	2	1	6020
Tin			MARIO MICIONI I PROGRESSIO I NESSO - N			C	4S #	7440-31-5
Second Quarter 2009	U	U	υ	U	5	- "		6020
Vanadium						C	AS#	7440-62-2
Second Quarter 2009	U	U	U	U	10			6020

Upgradient well = 7W12B

Analtye/Quarter	7W12B Q	7MIV6 Q	7WCA Q	71V11B Q	QL	GPS	Buckground	Method
Zinc						C	C4 <i>S</i> #	7440-66-6
Second Quarter 2009	4.8 J	7.1 J	5.2 J	3.7 J	10	4695	10.9	6020
Fourth Quarter 2009	U	U	UJ	U	10	4695	10.9	6020
Cyanide		!				! C	 [AS #	57-12-5
Second Quarter 2009	U	U	U	U	20	200	20	9012A
Fourth Quarter 2009	: U	U	U	U	20	200	20	9012A
Sulfide		ł T			20	1.		18496-25-8
Second Quarter 2009	Ü	U	U	U	1000	ı	1	9034
	÷ -		U	0	1000		740#	C-020
Total Recoverable Pheno		1 . 1		1.			'AS #	
Second Quarter 2009	U	U	U	U	60	-		9065
Acenaphthene					,	C	'AS#	83-32-9
Second Quarter 2009	υJ	UJ	UJ	UJ	5	-		8270C
Acenaphthylene						C	AS#	208-96-8
Second Quarter 2009	, U J	UJ	UJ	UJ	5	-		8270C
Acetone						C	AS #	67-64-1
Second Quarter 2009	U	U	U	U	5	-		8260B
Acetonitrile						C	AS#	75-05-8
Second Quarter 2009	U	U	U	U	20	-		8260B
Acetophenone		I		)	1	C	'. 'AS #	98-86-2
Second Quarter 2009	U	U	U	U	5	-		8270C
2-Acetylaminofluorene		I			I	·	1	53-96-3
Second Quarter 2009	U	U	 ປ	U	5	-		8270C
Acrolein				l	J		'	107-02-8
Second Quarter 2009	UJ	U J	U J	UJ	25	<u>.                            </u>		8260B
			0 0		25		   AS #	107-13-1
Acrylonitrile							A3 #	
Second Quarter 2009	U	U		U	5			8260B
Aldrin		in 1 m				C	'AS #	309-00-2
Second Quarter 2009	U	U	U 	U	0.05	-		8081
Allyl chloride		,			p	С	AS#	107-05-1
Second Quarter 2009	U	U	U	U	0.5	-		8260B
4-Aminobiphenyl						C	AS#	92-67-1
Second Quarter 2009	U	U	U	U	5	-		8270C
Aniline		·		*		C	AS #	62-53-3
Second Quarter 2009	U	U	U	U	5	•		8270C
Anthracene	<i>i</i>	t		l	F	C	AS #	120-12-7
Second Quarter 2009	U	U	U	U	5	-		8270C
Aramite	1	ı		L	t	<i>C</i>	'AS#	140-57-8
Second Quarter 2009	U	U	U	U	5			8270C
Benzene							'AS#	71-43-2
Second Quarter 2009	U	U	U	U	0.5			8260B
	,			L	0.0		115#	56-55-3
Benzo[a]anthracene	i 11	į - <sub>11</sub>	11			C.	'AS #	
Second Quarter 2009	U	U	U	U	5		46.4	8270C
Benzo[b]fluoranthene						C	AS #	205-99-2
Second Quarter 2009	U	U	U	U	5		<u></u>	8270C
Benzo[k]fluoranthene					·	C	AS #	207-08-9
Second Quarter 2009	υJ	UJ	U J	υJ	5	-		8270C

 $Upgradient\ well = 7W12B$ 

Analtye/Quarter	7W12B Q	7MIV6 Q	TWCA Q	THILD Q.	QL	GPS	Background	Method
Benzo[ghi]perylene						(	CAS#	191-24-2
Second Quarter 2009	U	U	U	U	5	-		82700
Benzo(a)pyrene						(	CAS#	50-32-8
Second Quarter 2009	U	U	U	υ	5	-		8270C
1,4-Benzenediamine	1						AS#	106-50-3
Second Quarter 2009	UJ	UJ	U J	UJ	50	-		8270C
Benzyl alcohol	L	, ,					AS#	100-51-6
Second Quarter 2009	U	U	U	U	5	-		8270C
alpha-BHC	!					· .	' 'AS#	319-84-6
Second Quarter 2009	U	U	U .	U	0.05	-	T	8081
beta-BHC				l I		· · · · · · · · · · · · · · · · · · ·	L CAS #	319-85-7
Second Quarter 2009	U	U	U	U	0.05	_	<u> </u>	8081
delta-BHC		· i				(	  AS #	319-86-8
Second Quarter 2009	Ü	U	U	U	0.05	_	I	8081
gamma-BHC	i				0.00		AS#	58-89-9
Second Quarter 2009	U	U	U		0.05		1	8081
bis(2-Chloroethoxy)metha			Ü		. 0.03	l <sup>-</sup>	\ 'AS #	111-91-1
Second Quarter 2009	ille   U	U !	U	l u	-		7.5 #	8270C
	0	0		0	5		210#	111-44-4
bis(2-Chloroethyl)ether	1	l 11 1 1					'AS# Т	8270C
Second Quarter 2009	UJ	UJ	υJ	UJ	5	-	2.467.0	
bis(2-Chloro-1-methylethy	<del></del>					(	IAS#	108-60-1
Second Quarter 2009	UJ	UJ	U J	UJ	5			8270C
bis(2-Ethylhexyl)phthalate							AS#	117-81-7
Second Quarter 2009	U	U	U	U	5	6	6	8270C
Fourth Quarter 2009	U	U	U	U	6	6	6	8270C
Bromobenzene						C	`AS #	108-86-1
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Bromochloromethane						C	24S #	74-97-5
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Bromodichloromethane						C	AS#	75-27-4
Second Quarter 2009	U	U	U	U	1	-		8260B
Bromoform						C	AS#	75-25-2
Second Quarter 2009	U	U	U	U	0.5	-		8260B
4-Bromophenyl phenyl etl	ner					C	AS#	101-55-3
Second Quarter 2009	U	U	U	U	5	-		8270C
n-Butyl alcohol	L	l				C	'AS #	71-36-3
Second Quarter 2009	U	U	U	υ	50	-		8260B
tert-Butyl alcohol		l				C	'AS #	75-65-0
Second Quarter 2009	U	U	U	U	10			8260B
n-Butylbenzene	J	·		L		C	'	104-51-8
Second Quarter 2009	U	U	υ	U	0,5	-		8260B
sec-Butylbenzene	L			<u> </u>		· · · · · · · · · · · · · · · · · · ·	 AS#	135-98-8
Second Quarter 2009	υ		U	U	0.5	-		8260B
tert-Butylbenzene	L	<u> </u>	-		0.0		 'AS #	98-06-6
							AREA TO	

Upgradient well = 7W12B

Analtye/Quarter	7W12B (	2 7MW6	Q 711	C4 Q	7W11B	Q	QL	GPS	Buckground	Method
Butyl benzyl phthalate						-0.00		(	C4S #	85-68-7
Second Quarter 2009	U	υ	U		U		5	3130	10	8270C
Fourth Quarter 2009	U	U	υ		U		10	3130	10	8270C
Carbon disulfide			i			!		(	AS#	75-15-0
Second Quarter 2009	U	U	U		: U	I	0.5			8260B
	1								C4S #	56-23-5
Carbon tetrachloride Second Quarter 2009	U	U	U		U		. 1			8260B
	0		0		0		'	1	24S#	57-74-9
Chlordane	1 11	i			1 11	1		,		
Second Quarter 2009	U	U	U		U		0.86	l	1	8081
p-Chloroaniline		1							CAS#	106-47-8
Second Quarter 2009	UJ	UJ	U	J	U	J	5	-	<u> </u>	8270C
Chlorobenzene								(	AS#	108-90-7
Second Quarter 2009	U	U	U		U		0.5	-	<u> </u>	8260B
Chlorobenzilate									AS#	510-15-6
Second Quarter 2009	UJ	UJ	U	J	U	J	5	-		8270C
p-Chloro-m-cresol			1					(	CAS#	59-50-7
Second Quarter 2009	U	U	U		U		5	-	]	8270C
Chloroethane		.* .						(	.4S#	75-00-3
Second Quarter 2009	U	U	U		U	- I	1	-		8260B
Chloroform	1	· ·	1		1	- 1		(	:	67-66-3
Second Quarter 2009	1.7	υ	0.9	) J	1.1	1	1		1	8260B
	1	-			1	J		L	 CAS #	110-75-8
2-Chloroethyl vinyl ether Second Quarter 2009	UJ	UJ	l u	J	U	J	ο τ	·	715 #	8260B
		0 3	U	J	0	J	0.5	L	2.40.4	91-58-7
2-Chloronaphthalene	7				1	. 1			CAS#	
Second Quarter 2009	l n l	UJ	U	J	U	J	5	<u> </u>		8270C
2-Chlorophenol			,			- 1		(	CAS #	95-57-8
Second Quarter 2009	U	U	U		U		5	L		8270C
4-Chlorophenyl phenyl et	her				- <u></u>				CAS#	7005-72-3
Second Quarter 2009	UJ	UJ	U	J	U	J	5	-		8270C
Chloroprene								(	CAS#	126-99-8
Second Quarter 2009	U	U	υ		U		0.5	-		8260B
2-Chlorotoluene								(	CAS#	95-49-8
Second Quarter 2009	U	U	υ		U	····	0.5	-		8260B
4-Chlorotoluene						I		(	AS#	106-43-4
Second Quarter 2009	U	U	U		U	······	0.5	-		8260B
Chrysene			1		I	1			LAS#	218-01-9
Second Quarter 2009	UJ	U J	lυ	J	U	J	5		1	8270C
Cyclohexane	1				.1			(	CAS#	110-82-7
Second Quarter 2009	U	U	υ		U		0.5	Ī .	1	8260B
	.1	.   3	0		i		0.0	L	CAS#	94-75-7
2,4-Dichlorophenoxyacet		11			11	T		<b>_</b>	π	
Second Quarter 2009	υ	_ U	U		U		5	L	740#	8151A
4,4'-DDD		11112						(	CAS#	72-54-8
Second Quarter 2009	U	U	U		U		0.1		1	8081
4,4'-DDE									CAS#	72-55-9
Second Quarter 2009	υ	U	U		U	ſ	0.1	-		8081
4,4'-DDT								(	AS#	50-29-3

 $Upgradient\ well = 7W12B$ 

Analtye/Quarter	7W12B Q	7MIV6 Q	7WCA Q	71V11B Q	QL	GPS	Background	Method
Diallate						(	C.4 <i>S</i> #	2303-16-4
Second Quarter 2009	UJ	UJ	U J	U J	5			8270C
Dibenz(a,h)anthracene	I		-		-			53-70-3
Second Quarter 2009	U	U	U	U	r	:	_ <b></b>	8270C
		U	U	U	5	-	1	
Dibenzofuran							CAS#	132-64-9
Second Quarter 2009	ΠJ	UJ	U J	ΠΊ	5	-		8270C
Dibromochloromethane						(	CAS#	124-48-1
Second Quarter 2009	U	U	U	U	0.5	-		8260B
1,2-Dibromo-3-chloropro	oane					(	CAS #	96-12-8
Second Quarter 2009	U	U	U	U	0.5			8260B
1,2-Dibromoethane		<u></u>				(	CAS#	106-93-4
Second Quarter 2009	U	U	U	U	0.5			8260B
Di-n-butyl phthalate				1		! (	1 24 <b>S</b> #	84-74-2
Second Quarter 2009	U	U	U	U	5		1	8270C
	.1 :		Ü	9	J	, ,	746#	95-50-1
1,2-Dichlorobenzene	1					i (	CAS#	
Second Quarter 2009	U	U	U	U	0.5	-		8260B
1,3-Dichlorobenzene							CAS#	541-73-1
Second Quarter 2009	U	U	U	U	0.5	-		8260B
1,4-Dichlorobenzene						(	CAS#	106-46-7
Second Quarter 2009	U	υ	U	U	0.5	-		8260B
3,3'-Dichlorobenzidine		L		'		(	AS#	91-94-1
Second Quarter 2009	U	U	U	U	5	-		8270C
trans-1,4-Dichloro-2-bute	ne			!			1.4S#	110-57-6
Second Quarter 2009	U	U	U	U	5	-	1	8260B
		l			3		CAS#	75-71-8
Dichlorodifluoromethane							.A3 #	
Second Quarter 2009	U	U	U	U	1	-		8260B
1,1-Dichloroethane							CAS#	75-34-3
Second Quarter 2009	U	U	U	U	1	-		8260B
1,2-Dichloroethane						(	AS#	107-06-2
Second Quarter 2009	U	U	U	υ	1	-		8260B
1,1-Dichloroethene						(	CAS#	75-35-4
Second Quarter 2009	U	U	U	U	0.5	-	T	8260B
cis-1,2-Dichloroethene		L				(	CAS#	156-59-2
Second Quarter 2009	U	U	υ	υ	0,5	-		8260B
trans-1,2-Dichloroethene		l	!	!				156-60-5
Second Quarter 2009	U	υ	U	U	0.5			8260B
					0.3		7.40.4	1
2,4-Dichlorophenol	1					(	CAS#	120-83-2
Second Quarter 2009	U	U	U	υ	5	•	<u> </u>	8270C
2,6-Dichlorophenol		,		4.		(	AS#	87-65-0
Second Quarter 2009	U	U	U	U	5	-		8270C
1,2-Dichloropropane						(	CAS#	78-87-5
Second Quarter 2009	U	υ	U	υ	0.5	-		8260B
1,3-Dichloropropane	1					(	CAS#	142-28-9
Second Quarter 2009	U	U	U	υ	0.5			8260B
	. l. <u> </u>	L			-,-	l	CAS#	594-20-7
2,2-Dichloropropane								

Upgradient well = 7W12B

Analtye/Quarter	7W12B Q	7MIV6 Q	7WCA Q	711/11	g Q	QL	GPS	Background	Method
1,1-Dichloropropene								CAS #	563-58-6
Second Quarter 2009	U	U	U	U		0.5	-		8260B
cis-1,3-Dichloropropene	L							CAS #	10061-01-5
Second Quarter 2009	U	υ	U	U		0.5	-	į	8260B
trans-1,3-Dichloropropene	•					!		CAS#	10061-02-6
Second Quarter 2009	U	U	U	U		0.5	-		8260B
Dieldrin								CAS#	60-57-1
Second Quarter 2009	U	U	U	υ		0.1	-		8081
Diethyl ether	1							CAS#	60-29-7
Second Quarter 2009	U	U	U	U		12.5	-		8260B
Diethyl phthalate	L			i		<u> </u>		C.4S #	84-66-2
Second Quarter 2009	U	U	U	U		5	-		8270C
O,O-Diethyl O-2-pyrazinyl	I	i		i				CAS #	297-97-2
Second Quarter 2009	U	U	U	U		5	-		8270C
Dimethoate	1	I						CAS#	60-51-5
Second Quarter 2009	υJ	UJ	U J	U	J	5		i	8270C
Dimethyl ether	1	1			-	۱ . '		CAS#	115-10-6
Second Quarter 2009	U	υ	U	U		12.5	_		8260B
o-(Dimethylamino)azoben	zene	l!		[				: CAS#	60-11-7
Second Quarter 2009	U	U	 U	U		5		i	8270C
7,12-Dimethylbenz[a]anthr	acene			<u> </u>		l		 C.4S #	57-97-6
Second Quarter 2009	υ	U	U	U		5			8270C
3,3'-Dimethylbenzidine	l	l		l				C.4S#	119-93-7
Second Quarter 2009	U	[ U	U	U		5	_		8270C
a,a-Dimethylphenethylami	l	L		ļ				CAS#	122-09-8
Second Quarter 2009	   U.J	UJ	U J	U	J	50			8270C
2,4-Dimethylphenol	L	l		I				CAS#	105-67-9
Second Quarter 2009	U	U	U	U		5		(71.5 "	8270C
Dimethyl phthalate	L	l. 7 1		l				 CAS #	131-11-3
Second Quarter 2009	U	U	U	U		5			8270C
m-Dinitrobenzene		l . ĭ		l		9	_	CAS#	99-65-0
Second Quarter 2009	U	U	 U	U U		5		1	8270C
	l	l 1		l		5		CAS#	534-52-1
4,6-Dinitro-o-cresol Second Quarter 2009	UJ	UJ	UJ	U	J	10		C/13 #	8270C
2,4-Dinitrophenol								CAS#	51-28-5
Second Quarter 2009	UJ	UJ	UJ	U	J	10		10	8270C
Fourth Quarter 2009	UJ	UJ	U J	U	J	10	31.3	10	8270C
2,4-Dinitrotoluene		3 3				10	31.3	CAS#	121-14-2
Second Quarter 2009	U	U	1.6 J	U		5	31.3	10	8270C
Fourth Quarter 2009	U	υ	1.6 J	U		10	31.3	10	8270C
,				J		10			606-20-2
2,6-Dinitrotoluene Second Quarter 2009	U	υ	U	U	į			LAIS#	8270C
Fourth Quarter 2009	U	υ	U	U		5	15.65	10	8270C 8270C
	l			l		10	15.65		88-85-7
Dinoseb	1 11						'	CAS # :	
Second Quarter 2009	L U	υ	U	U	!	2.5	-		8151A
Di-n-octyl phthalate							,	CAS#	117-84-0

Upgradient well = 7W12B

Analtye/Quarter	7W12B Q	2 7MIV6 Q	7IVCA Q	7W11B Q	QL.	GPS	Background	Method
1,4-Dioxane						(	C.4S #	123-91-1
Second Quarter 2009	U	U	U	U	100	-		8260B
Diphenylamine	Ε	I	Į.	1	1.	. (	C.4S #	122-39-4
Second Quarter 2009	U	U	U	U	5	-		8270C
Disulfoton	1		!		į	•	IAS#	298-04-4
Second Quarter 2009	U	U	U	U	5	-	!	8270C
Endosulfan I	1				i	(	: :://////////////////////////////////	959-98-8
Second Quarter 2009	U	U	U	U	0,05	_	-	8081
Endosulfan II	1	I			1	•	: CAS #	33213-65-9
Second Quarter 2009	U	U	U	U	0.1			8081
Endosulfan sulfate				1	0.1		 	1031-07-8
Second Quarter 2009	U	U	U	U	0.1			8081
	0				0.1	- ,	: ::::::::::::::::::::::::::::::::::::	72-20-8
Endrin Second Quarter 2009	U	U	U	U	0.4	(	AND TO	8081
				0	0.1		~ 4 C #	141-78-6
Ethyl acetate	1 11 1	1		1 12 2	i -	(	CAS#	
Second Quarter 2009	UJ	UJ	U J	n 1	5			8260B
Endrin aldehyde	-, · · · · · · · · · · ·	,		· · · · · ·	1		CAS#	7421-93-4
Second Quarter 2009	U	υ	· U	U	0.1			8081
Ethanol						(	CAS#	64-17-5
Second Quarter 2009	U	U	U	U	250			8260B
Ethylbenzene							C.4S #	100-41-4
Second Quarter 2009	U	U	U	U	1	-		8260B
Ethyl methacrylate						(	CAS#	97-63-2
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Ethyl methanesulfonate						(	AS#	62-50-0
Second Quarter 2009	U	υ	U	U	5	-		8270C
Ethylene oxide						(	CAS#	75-21-8
Second Quarter 2009	UJ	U J	UJ	UJ	20	-		8260B
Famphur						(	AS#	52-85-7
Second Quarter 2009	U	υ	U	U	5	-	1	8270C
Fluoranthene			l		السامات المساسات	(	CAS#	206-44-0
Second Quarter 2009	U	U	U	U	5	-		8270C
Fluorene				. L			C <b>AS</b> #	86-73-7
Second Quarter 2009	UJ	UJ	υJ	UJ	5			8270C
Heptachlor							]	76-44-8
Second Quarter 2009	U	U	υ	U	0.05		-	8081
Heptachlor epoxide				<u> </u>			CAS#	1024-57-3
Second Quarter 2009	U	U	υ	υ	0.05			8081
Hexachlorobenzene	_L				1		MS#	118-74-1
Second Quarter 2009	U	υ	υ	U				8270C
					5	· · · · · · · · · · · · · · · · · · ·	746#	87-68-3
Hexachlorobutadiene	T.			1	T - 2 3	(	CAS#	
Second Quarter 2009	U	U	U	υ	0.5		1.0.0	8260B
Hexachlorocyclopentadie					1 .		CAS #	77-47-4
Second Quarter 2009	U	U	U	U	5	-	<u> </u>	8270C
Hexachloroethane	.,			.,			CAS#	67-72-1
Second Quarter 2009	U	U	U	U	0.5	-		8260B

 $Upgradient\ well = 7W12B$ 

Analtye/Quarter	7W12B Q	7MIV6 Q	7IVCA Q	7W11B Q	QL	GPS	Background	Method
Hexachlorophene	A CONTRACTOR OF THE PROPERTY O					-	C.4S #	70-30-4
Second Quarter 2009	U	U	U	U	500	-		8270C
Hexachloropropene	•					1	CAS#	1888-71-7
Second Quarter 2009	U	υ	U	U	5	-		8270C
2-Hexanone		!		!	L	1	CAS#	591-78-6
Second Quarter 2009	U	u	U	U	5	_		8260B
Indeno[1,2,3-cd]pyrene				I	J	l (	CAS#	193-39-5
Second Quarter 2009	U	U I	U.		5	_	-	8270C
Isobutyl alcohol	i	BAAA1		1				78-83-1
Second Quarter 2009	U	U	 υ	U	25			8260B
Isodrin	.	l.				١		465-73-6
Second Quarter 2009	U	U	υ	U	5		CALD IT	8270C
	. 0	0	U			-	 CAS #	78-59-1
Isophorone	1 1						LAG#	8270C
Second Quarter 2009	U	U	U 	U	5	-		
Isopropylbenzene				40.00			CAS#	98-82-8
Second Quarter 2009	U	U		U	0.5	-		8260B
Isopropylether		1			i	,	CAS#	108-20-3
Second Quarter 2009	U	U	U	U	0.5	-		8260B
4-Isopropyltoluene							CAS#	99-87-6
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Isosafrole						(	CAS#	120-58-1
Second Quarter 2009	U	U	U	υ	5	-		8270C
Kepone							C.4S #	143-50-0
Second Quarter 2009	U	U	U	U	5	-		8270C
Methacrylonitrile	'						CAS#	126-98-7
Second Quarter 2009	U	U	U	U	5	-		8260B
Methapyrilene					1	(	CAS#	91-80-5
Second Quarter 2009	U	U	U	U	5	-		8270C
Methoxychlor	L				l		CAS#	72-43-5
Second Quarter 2009	U	U	U	U	0.5	-		8081
Bromomethane					<u> </u>		CAS#	74-83-9
Second Quarter 2009	U	U	U	U	0.5	_	T	8260B
Chloromethane	!				L		l. CAS #	74-87-3
Second Quarter 2009	U	υ	U	U	1			8260B
3-Methylcholanthrene	"				J'			56-49-5
Second Quarter 2009	U	U	U	U	5	<u>`</u>		8270C
				0			CAC#	78-93-3
2-Butanone	i			1 11			CAS#	
Second Quarter 2009	U	U	υ	U	5	-		8260B
lodomethane					i		CAS#	74-88-4
Second Quarter 2009	υ	U	υ	U	0.5	<u> </u>		8260B
Methyl methacrylate							CAS #	80-62-6
Second Quarter 2009	υ	U	U	U	0.5	-		8260B
Methyl methane sulfonat	e					(	C.4S #	66-27-3
Second Quarter 2009	U	U	υ	U	5	-		8270C
2-Methylnaphthalene					* · · · · · · · · · · · · · · · · · · ·		CAS#	91-57-6
Second Quarter 2009	U	U	U	U	5		1	8270C

Upgradient well = 7W12B

Analtye/Quarter	7W12B Q	7MIV6 Q	7WCA Q	7W11B Q	QL	GPS	Background	Method
Methyl parathion						(	C.4S #	298-00-0
Second Quarter 2009	UJ	UJ	U J	UJ	5	-		8270C
4-Methyl-2-pentanone	1			1	l		CAS #	108-10-1
Second Quarter 2009	U	· U	U	U	5		1	8260B
2-Methylphenol		ļ		J	l	(		95-48-7
Second Quarter 2009	U	: U	U	U	5		i	8270C
	1	: - 1.		l T		·	CAS# 08-39-4	
3 & 4-Methylphenol Second Quarter 2009	υ	U	U	U	10		[	8270C
	l o	. 0	O		10	١	0.48.4	1634-04-4
Methyl tert-butyl ether				f		i ,	CAS# 	
Second Quarter 2009	U	U	U	U	0.5	<u> </u>		8260B
Dibromomethane					·		CAS#	74-95-3
Second Quarter 2009	U	U	. U	U	0.5	-		8260B
Methylene chloride							C.4S #	75-09-2
Second Quarter 2009	U	U	U	U	1	-		8260B
Naphthalene						(	CAS#	91-20-3
Second Quarter 2009	U	U	U	U	0.5	-		8260B
1,4-Naphthoquinone							CAS#	130-15-4
Second Quarter 2009	U	U	U	U	5	-		8270C
1-Naphthylamine	!			l		•	AS#	134-32-7
Second Quarter 2009	U	U	U	U	5			8270C
2-Naphthylamine	<u> </u>				!		 CAS #	91-59-8
Second Quarter 2009	UJ	UJ	UJ	UJ	5			8270C
o-Nitroaniline	1. "				]	١	] C <b>AS</b> #	88-74-4
Second Quarter 2009	U		U	U	10	1		8270C
			U		10	J	0.40.2	99-09-2
m-Nitroaniline	1					· · · · · · · · · · · · · · · · · · ·	C <b>AS</b> #	
Second Quarter 2009	U	U	U	U	10	-		8270C
p-Nitroaniline				I		(	CAS#	100-01-6
Second Quarter 2009	U	U	U	υ	10	-	<u></u>	8270C
Nitrobenzene				y			CAS#	98-95-3
Second Quarter 2009	U	U	U	U	5	-		8270C
o-Nitrophenol						(	CAS#	88-75-5
Second Quarter 2009	υ	U	U	U	5	-		8270C
p-Nitrophenol	1	·				(	CAS#	100-02-7
Second Quarter 2009	UJ	UJ	UJ	UJ	10	50	20	8270C
Fourth Quarter 2009	U	υ	U	U	10	50	20	8270C
4-Nitroguinoline-1-oxide		1		L	i			56-57-5
Second Quarter 2009	UJ	UJ	U J	UJ	5	T -		8270C
N-Nitrosodi-n-butylamine		.!			1		CAS#	924-16-3
Second Quarter 2009	U	υ	U	U	5	<u>`</u>		8270C
	.]. "					l	C40#	55-18-5
N-Nitrosodiethylamine					I		CAS#	
Second Quarter 2009	U	U	U	U	5	l		8270C
N-Nitrosodimethylamine				F			CAS#	62-75-9
Second Quarter 2009	UJ	U J	U J	U J	5			8270C
N-Nitrosodiphenylamine						(	CAS#	86-30-6
Second Quarter 2009	υ	U	U	U	5	-		8270C
N-Nitrosodipropylamine						(	CAS#	621-64-7
Second Quarter 2009	UJ	. U J	UJ	UJ	5	-	i	8270C

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	7W12B Q	7M1V6 Q	7WCA Q	7WIIB Q	QL	GPS Background	Method
N-Nitrosomethylethylami	ne					C.4S #	10595-95-6
Second Quarter 2009	U	U	U	U	5	-	8270C
N-Nitrosomorpholine				:		CAS#	59-89-2
Second Quarter 2009	UJ	UJ	U J	UJ	5	- 1	8270C
N-Nitrosopiperidine						CAS#	100-75-4
Second Quarter 2009	U	υ	U	U	5		8270C
		0	0			C 10 #	930-55-2
N-Nitrosopyrrolidine		i				CAS#	8270C
Second Quarter 2009	UJ	UJ	U J	UJ	5	-	
5-Nitroso-o-toluidine						CAS#	99-55-8
Second Quarter 2009	U	U	U	U	5	-	8270C
Parathion						CAS#	56-38-2
Second Quarter 2009	U	U	U	U	5	-	8270C
Pentachlorobenzene						CAS#	608-93-5
Second Quarter 2009	U	U	U	U	5	-	8270C
Pentachloroethane				. ,!	1	CAS#	76-01-7
Second Quarter 2009	U	U	U	U	0.5		8260B
Pentachloronitrobenzene		1				CAS#	82-68-8
Second Quarter 2009	; U	U	U	υ	5	1	8270C
	0	0	Ü	0	5	0.00	87-86-5
Pentachlorophenol		1 3				CAS#	
Second Quarter 2009	U	<u> </u>	U	U	10	-	8270C
Phenacetin	.,					C.4S #	62-44-2
Second Quarter 2009	U	U	U	U	5	-	8270C
Phenanthrene						C.4S #	85-01-8
Second Quarter 2009	U	U	U	U	5	-	8270C
Phenol		1 1		l	!	CAS#	108-95-2
Second Quarter 2009	U	Ü	υ	U	5	-	8270C
Phorate		<u> </u>				CAS#	298-02-2
Second Quarter 2009	U	U	U	U	5		8270C
	1	1				CAS#	109-06-8
2-Picoline	1	T 1				C/IS#	
Second Quarter 2009	U	U	U	U	5	- 1	8270C
Pronamide	.,	,				CAS#	23950-58-5
Second Quarter 2009	U	U	U	U	5	-	8270C
1-Propanol						CAS#	71-23-8
Second Quarter 2009	UJ	UJ	UJ	υJ	1000	-	8260B
2-Propanol		.! !		<u></u>		CAS#	67-63-0
Second Quarter 2009	υ	U	U	U	100	-	8260B
Propionitrile		L		1		CAS#	107-12-0
Second Quarter 2009	U	U	U	U	10	<b>→</b>	8260B
		1		I	10	CAS#	103-65-1
n-Propylbenzene	1	L or i		[		C/13 #	
Second Quarter 2009	U	U	U	U	0.5	-	8260B
Pyrene				·		CAS#	129-00-0
Second Quarter 2009	ΝJ	UJ	U J	UJ	5	-	8270C
Pyridine						CAS#	110-86-1
Second Quarter 2009	UJ	UJ	UJ	UJ	5	-	8270C
Safrole	. fac i			1		CAS#	94-59-7

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	7W12B Q	7MIV6 Q	7WCA Q	7W11B Q	QL	GPS	Background	Method
Silvex						(	C4S#	93-72-1
Second Quarter 2009	U	U	U	U	2.5	-		8151A
Styrene				!		(	CAS #	100-42-5
Second Quarter 2009	U	U	U	U	0.5			8260B
Sulfotep	1			£	:	:	CAS #	3689-24-5
Second Quarter 2009	U	U	U	υ	5			8270C
	1					! •	 [AS #	93-76-5
2,4,5-Trichlorophenoxyac Second Quarter 2009	U U	U	U	U	2.5		.7.5 #	8151A
	1	0	U	0	2.5	l	2.46.4	
1,2,4,5-Tetrachlorobenzer		1 1		1	1		CAS # 	95-94-3
Second Quarter 2009	U	U	U	U	5	-		8270C
1,1,1,2-Tetrachloroethane	)						CAS#	630-20-6
Second Quarter 2009	U	U	U	υ	0.5			8260B
1,1,2,2-Tetrachloroethane						(	CAS#	79-34-5
Second Quarter 2009	U	U	U	υ	0.5	-		8260B
Tetrachloroethene						. (	AS#	127-18-4
Second Quarter 2009	U	U	U	U	1	-		8260B
Tetrahydrofuran	f	1		1	,		CAS#	109-99-9
Second Quarter 2009	U	U	U	U	5		<u> </u>	8260B
	1	- 1	-	1 -	1.		AS#	58-90-2
2,3,4,6-Tetrachloropheno Second Quarter 2009		U	U	U		i .		8270C
	U				5	-	2.46.4	108-88-3
Toluene	· · · · · · · · · · · · · · · · · · ·	T T		-T			CAS#	
Second Quarter 2009	U	U	U	U	1	-		8260B
o-Toluidine						(	AS#	95-53-4
Second Quarter 2009	UJ	υJ	U J	UJ	5	-		8270C
Toxaphene						(	AS#	8001-35-2
Second Quarter 2009	U	U	U	U	2.5	-		8081
1,2,3-Trichlorobenzene						(	AS#	87-61-6
Second Quarter 2009	U	U	U	U	0.5	-		8260B
1,2,4-Trichlorobenzene		.1		!	1	(	AS#	120-82-1
Second Quarter 2009	U	U	U	U	0.5	-		8260B
1,1,1-Trichloroethane	1			l		·	CAS#	71-55-6
Second Quarter 2009	U	υ	U	U	1 1			8260B
1,1,2-Trichloroethane	.1			_L	l. '		   CAS #	79-00-5
Second Quarter 2009	U	U	U	Τυ		l		8260B
		'		1	0.5		746#	
Trichloroethene	T .,	1 1		1	1		CAS#	79-01-6
Second Quarter 2009	U	U	U	U	1	-		8260B
Trichlorofluoromethane	1						CAS#	75-69-4
Second Quarter 2009	U	υ	U	U	1	-		8260B
2,4,5-Trichlorophenol						(	AS#	95-95-4
Second Quarter 2009	U	U	Ü	U	5	-		8270C
2,4,6-Trichlorophenol	4				,		CAS#	88-06-2
Second Quarter 2009	U	υ	U	U	5	-		8270C
1,2,3-Trichloropropane		1					Z4S #	96-18-4
Second Quarter 2009	U	U	U	U	1		<u> </u>	8260B
1,1,2-Trichloro-1,2,2-Triflu		l		.1			 CAS #	76-13-1

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	7W12B Q	7MIV6 Q	7WCA Q	7W11B	Q	QL	GPS	Background	Method
O,O,O-Triethyl phospho	orothioate				************		X230024470 C2207430	C.4S #	126-68-1
Second Quarter 2009	U	U	U	U		5	-		8270C
1,2,4-Trimethylbenzene				1				CAS#	95-63-6
Second Quarter 2009	U	U	U	U		0.5	-		8260B
1,3,5-Trimethylbenzene	, !	' ,						CAS#	108-67-8
Second Quarter 2009	U	U	U	U		0.5	-		8260B
sym-Trinitrobenzene				1				CAS#	99-35-4
Second Quarter 2009	UJ	UJ	UJ	U	J	5	-		8270C
Vinyl acetate								CAS#	108-05-4
Second Quarter 2009	U	U	U	U	- 1	0.5	-		8260B
Vinyl chloride		<u></u>			1			CAS#	75-01-4
Second Quarter 2009	U	U	U	υ		0.5	-		8260B
Xylenes (Total)		*						C.4S #	1330-20-7
Second Quarter 2009	U	U	U	U		3		1	8260B

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	7W12B Q	7MIV6 Q	7WCA Q	71V11B Q	QL	GPS	Buckground	Method

### Definitions:

The following definitions apply to results reported for Appendix IX monitoring events.

All Appendix IX monitoring results for compliance wells are reported to the detection limit.

QL Denotes permit required quantitation limit.

U denotes not detected at or above the detection limit.

UA denotes not detected at or above the adjusted detection limit.

J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above the detection limit and detection limit and QL are estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted detection limit and adjusted detection

(i.e., "UAJ"), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.

UN Denotes analyte concentration is less than the quantitation limit and/or five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.

R Denotes result rejected.

Q Denotes data validation qualifier.

**Background** Denotes background concentrations listed in the pending Class 3 Permit Modification for the Post-Closure Care Permit for HWMUs 5, 7, 10 and 16.

CAS# Denotes Chemical Abstract Services registration number.

GPS Denotes groundwater protection standard.

# The following definitions apply to results reported for non-Appendix IX monitoring events. All non-Appendix IX monitoring results for compliance wells are reported to at or above the quantitation limit.

QL Denotes permit required quantitation limit.

U Denotes analyte not detected at or above QL.

UA Denotes analyte not detected at or above adjusted sample QL.

J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.

R Denotes result rejected.

Q Denotes data validation qualifier.

**Background** Denotes background concentrations listed in the pending Class 3 Permit Modification for the Post-Closure Care Permit for HWMUs 5, 7, 10 and 16.

CAS# Denotes Chemical Abstract Services registration number.

GPS Denotes groundwater protection standard.

### Notes:

### -Appendix IX Groundwater Monitoring Events:

Third Quarter 2003, Second Quarter 2004, Second Quarter 2005, Third Quarter 2006, Second Quarter 2007, Second Quarter 2009

All Appendix IX results evaluated and reported to detection limit.

-9/29/2003: Verification sampling event for 7MW6, 7W11B, 7W12B, 7WCA (copper and zinc).

Verification results reported in this table for copper and zinc.

-6/21-22/2004: Verification sampling event for 7MW6, 7W11B, 7W12B, 7WCA.

Verification results reported in this table for chloroform (7W12B).

-3/23/2005: Verification sampling event for 7MW6. Verification results reported in this table for bis(2-ethylhexyl)phthalate).

-7/26/2005: Verification sampling event for 7MW6, 7W11B, 7W12B, 7WCA (ethyl acetate), 7W11B (beta-BHC), and 7MW6 (alpha-BHC). All Verification results reported as not detected. Verification results reported.

-Sept 2006: Verification sampling event for 7W12B and 7W11B 3Q2006 for chloroform. Initial results reported in this table for chloroform (7W11B, -July 17, 2008: Verification sampling event for 7W13 arsenic and cobalt. 7W9C cobalt

June 11, 2009, Verification sampling event for 7MW6 Diethyl ether. Analyte not detected. Verification results reported.



# Comprehensive Data Validation Report

# Sample/Blind Field Duplicate Results Greater Than the Ouantitation Limit

Comprehensive Data Validation Report	e Data Vali	idation R	eport		<b>M</b>	Draper Aden Associates
Sample/Blind l	ield Dupli	cate Resu	Ilts Greater	r Than tl	Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit	ug + Suveying → Ervironmental Services
Facility: HWMU-7	TU-7	Monit	oring Even	it: Secon	Monitoring Event: Second Quarter 2009	
	L	Laboratory Result	Validated Result	g.		
Analyte	Sample ID	Sample ID (ug/L) Q (ug/L)	(ug/L) Q	Q (ug/L)	Validation Notes	
Method: 6020 Laboratory: CompuChem, a Division of Liberty Analytical, Cary,	em, a Division of	Liberty Analyi	tical, Cary, NC			
Barium	7WCA	29.7	29.7	10	No action taken.	

No action taken. Field duplicate for 7WCA.

No action taken.

10 10

> 30.3 5.7 5.6

30.3

7WDUP

5.7 5.6

7WCA

Cobalt

No action taken. Field duplicate for 7WCA.

No action taken.

10

14.6

14.6 14.8

7WCA

Nickel

7WDUP

5 2

10

14.8

7WDUP

Method: 8260B

Chloroform

No action taken.

No action taken. Field duplicate for 7WCA.

Laboratory: Lancaster Laboratories, Lancaster, PA

Result < permit QL 1 ug/l. Duplicate for 7WCA. Duplicate 0.9 ug/l. Result < permit QL 1 ug/1. 6.0 6.0 6.0 6.0 7WDUP 7WCA

Definitions: QL Denotes permit quantitation limit. Q Denotes data qualifier. J Denotes analyte reported at or above QL limit and associated result is estimated

# Comprehensive Data Validation Report

# Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Draper Aden Associates

Facility: HWMU-7

Monitoring Event: Fourth Quarter 2009

	ڐ	aboratory Validated Result Result	Validated Result	Q.	
Analyte	Sample ID	(ug/L) Q	Sample ID (ug/L) Q (ug/L) Q (ug/L)	(ng/L)	Validation Notes
Method: 6020					
Laboratory: Com	Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC	Liberty Analy	tical, Cary, NC		

	No action taken. Blind field duplicate 7WDUP, RPD < 10.	Blind field duplicate result for 7WCA. RPD <10.	No action taken. Blind field duplicate 7WDUP, RPD <10.	Blind field duplicate result for 7WCA. RPD <10.
	10	10	10	10
	29.3	28.6	12.5	13
famous famous	29.3	28.6	12.5	13
	7WCA	7WDUP	7WCA	7WDUP

Barium

Nickel

Definitions: QL Denotes permit quantitation limit. Q Denotes data qualifier. J Denotes analyte reported at or above QL limit and associated result is estimated.

### APPENDIX B-3

HWMU-7 2009 LABORATORY ANALYTICAL RESULTS PLUME MONITORING WELLS

# Target Analyte Monitoring Results At or Above Permit Quantitation Limit HWMU 7 Plume Monitoring Wells

### Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

 $Upgradient\ well = 7W12B$ 

Analyte/Quarter	7W12B Q	7W9C Q	711/10B Q	71V10C Q	71V13 Q	QL	Background	GPS	Method	CAS#
Antimony				************************************						
Second Quarter 2009	U	UN	U	U	U	1	1	6	6020	7440-36-6
Fourth Quarter 2009	U ·	U	U	U	U	1	1	6	6020	7440-36-0
Arsenic		• •		'					!	'
Second Quarter 2009	U	U	U	U	U	10	10	10	6020	7440-38-
Fourth Quarter 2009	U	U	U	U	U :	10	10	10	6020	7440-38-
Barium				!					1	
Second Quarter 2009	33.1	22.8	65.7	49.8	12.7	10	41 :	2000	6020	7440-39-
Fourth Quarter 2009	36	22.8	79,7	59.6	16.5	10	41	2000	6020	7440-39-
Cadmium				!					l	L
Second Quarter 2009	U	U	U	U	U	1	1	5	6020	7440-43-
Fourth Quarter 2009	U	U	U	U	U	1	1	5	6020	7440-43-
					J					1
Chromium	7.8	U	U	U	U .	5	9,9	100	6020	7440-47-
Second Quarter 2009		U	U	U	U	5	9.9	100	6020	7440-47-
Fourth Quarter 2009	7.5			U	:		9.9	100	3020	/ 770-4/-
Cobalt					0.0	5	5	156.05	6020	7440-48-
Second Quarter 2009	U	U	U	U	8.2			156.65		
Fourth Quarter 2009	U .	U	U	U	10.7	5	5	156.65	6020	7440-48-
Copper									1	r
Second Quarter 2009	1 J	U :	U	U	U	5	5	1300	6020	7440-50-
Fourth Quarter 2009	. U		U	U	U	5	5	1300	6020	7440-50-
Lead									,	
Second Quarter 2009	U	UJ	U	U	UJ	1	1	15	6020	7439-92-
Fourth Quarter 2009	U ;	U	U	U	U ]	1	1	15	6020	7439-92-
Mercury										
Second Quarter 2009	U	U	U	U	U	2	2	2	7470A	7439-97-6
Fourth Quarter 2009	U	U	U	υ	U	2	. 2	2	7470A	7439-97-0
Nickel										
Second Quarter 2009	U	U	U	U	U	10	10	313	6020	7440-02-0
Fourth Quarter 2009	U	U	U	U	U	10	10	313	6020	7440-02-0
Selenium			L							
Second Quarter 2009	U	U	U	U	U	10	10	50	6020	7782-49-2
Fourth Quarter 2009	U	υ	U	U	U	10	10	50	6020	7782-49-2
Silver		i			İ				I	
Second Quarter 2009	υ	U	U	U	U	2	2	78.25	6020	7440-22-4
Fourth Quarter 2009	U	U	υ	υ	U	2	2	78.25	6020	7440-22-4
Thallium	l						!		.l	
Second Quarter 2009	U	UJ	υ	U	υJ	1	1	2	6020	7440-28-0
Fourth Quarter 2009	U	U	υ	υ	U	1	1	2	6020	7440-28-0
									]	
Zinc	401						40.0	4605	6020	7440.66.0
Second Quarter 2009	4.8 J	U	U	U	U	10	10.9	4695	6020	7440-66-6
Fourth Quarter 2009	U	U	U	U	U	10	10.9	4695	6020	7440-66-6
Cyanide									T	
Second Quarter 2009	U	U 	U J	U	U	20	20	200	9012A	57-12-5
Fourth Quarter 2009	U	U	U	U	U	20	20	200	9012A	57-12-5
bis(2-Ethylhexyl)pht							<u></u>		· · · · · · · · · · · · · · · · · · ·	
Second Quarter 2009	U	U	υJ	U	U	5	6	6	8270C	117-81-7
Fourth Quarter 2009	U	U	U	U	U	6	6	6	8270C	117-81-7
Butyl benzyl phthala	ate									
Second Quarter 2009	U	υ	υJ	U	U	5	10	3130	8270C	85-68-7
Fourth Quarter 2009	U	U	U	υ	U	10	10	3130	8270C	85-68-7

# Target Analyte Monitoring Results At or Above Permit Quantitation Limit HWMU 7 Plume Monitoring Wells

### Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 7W12B

Analyte/Quarter	7H'12B Q	7W9C Q	7H'10B Q	7W10€ Q	7W13 Q	QL	Background	GPS	Method	CAS#
2,4-Dinitrophenol										***************************************
Second Quarter 2009	UJ	UJ	UJ	UJ	UJ	10	10	31.3	8270C	51-28-5
Fourth Quarter 2009	ΠΊ	UJ	υJ	UJ	υJ	10	10	31.3	8270C	51-28-5
2,4-Dinitrotoluene				,					.d l	
Second Quarter 2009	U	U	UJ	U	U	5	10	31.3	8270C	121-14-2
Fourth Quarter 2009	U	U	U	U	U	10	10	31.3	8270C	121-14-2
2,6-Dinitrotoluene									I	
Second Quarter 2009	U	U	UJ	U	U	5	10	15.65	8270C	606-20-2
Fourth Quarter 2009	U	U	· U	U	U	10	10	15.65	8270C	606-20-2
p-Nitrophenol									.l	
Second Quarter 2009	υJ	U	UJ	U	U	10	20	50	8270C	100-02-7
Fourth Quarter 2009	U	U	U	U	U	10	20	50	8270C	100-02-7

### Definitions:

All plume monitoring well results reported to at or above the permit quantitation limit except for the upgradient well during the Appendix IX monitoring Event. During this event, results for the upgradient well are reported to the detection limit.

- Q Denotes data validation qualifier.
- QL Denotes permit required quantitation limit.
- U Denotes analyte not detected at or above QL.
- UA Denotes analyte not detected at or above adjusted sample QL.
- J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
- UN Denotes analyte concentration is less than the quantiation limit and five times the blank concentration.

  Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.
- R Denotes result rejected.
- **Background** Denotes background concentrations listed in the pending Class 3 Permit Modification for the Post-Closure Care Permit for HWMUs 5, 7, 10 and 16.

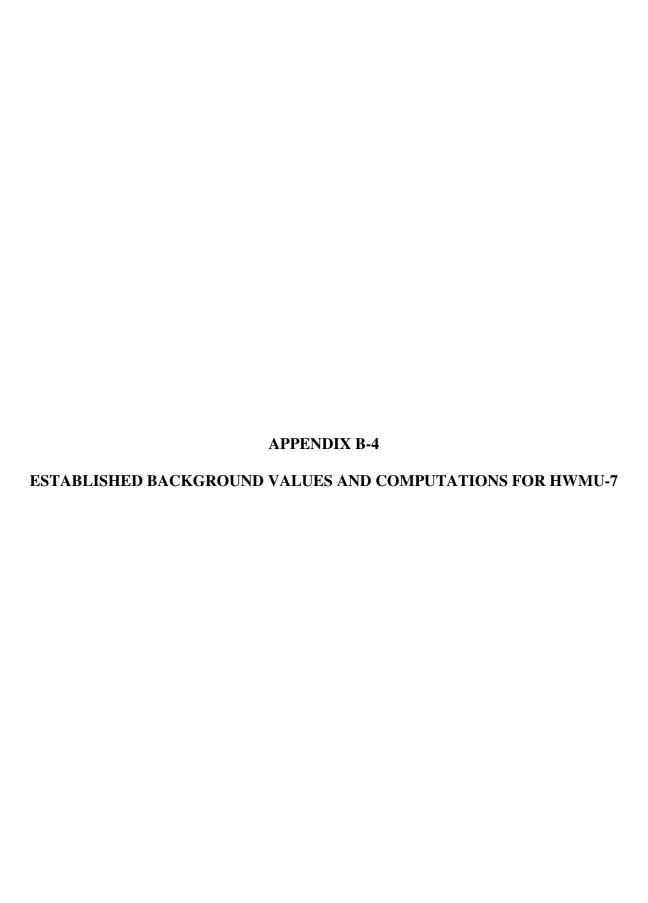
7W13 cobalt-original result reported. 7W9C cobalt- Verification result reported.

CAS# Denotes Chemical Abstract Services registration number. GPS Denotes groundwater protection standard.

Notes

- -January 2005: Verification sampling event for 7M W13 4Q2004 arsenic. Verification results reported in this table for arsenic (7W13).
- -March 2006: Verification sampling event for 7MW13 1Q2006 arsenic. Verification results reported in this table for arsenic (7W13).
- -July 2006: Verification sampling event for 7MW13 2Q2006 arsenic. Verification results reported in this table for arsenic (7W13).
- -Sept 2006: Verification sampling event for 7W12B 3Q2006 chloroform. Initial results reported in this table for chloroform (7W12B). July 17, 2007: Verification sampling event for 7W13 arsenic-verification event result reported, highest of four quadruplicate results,
- -Dec 17, 2008: Verification sampling event for 7W13. cobalt-Original result reported.





April 1995 letter from the DEQ to J. Redder, Hercules, Inc. (now Alliant TechSystems, Inc.). The lists incorporate requirements outlined in the Virginia Hazardous Waste Management Regulations (VR 672-10-1) Sections 9.5.C and 9.5.D. These include the Indicator Parameters, Ground Water Quality Parameters, EPA Interim Primary Drinking Water Standards, Known Hazardous Waste Constituents, and Detected VHWMR Appendix 10.6 Constituents. A demonstration was made to the DEQ that several hazardous waste constituents had not been detected for six consecutive quarters. As a result, these constituents have not been analyzed for on a regular basis. These are highlighted in the **Table 3-1**.

Additional parameters have not been detected in any of the wells. During the meeting between Alliant and DEQ on 21 May 1996, DEQ suggested that the recommendations to temporarily cease sampling additional constituents that had not been detected in six or more consecutive sampling events made in the GWQAP addendum submitted 3 November 1995 would better be addressed in the post closure permitting process. Therefore, those additional constituents will not be addressed in this report.

### 3.4 UNIT 7 GROUND WATER BACKGROUND VALUES

As requested in the DEQ's 23 July letter, background values were calculated for each parameter .

As discussed with DEQ, Alliant believes the analytical data to be questionable in some cases. DEQ has agreed in a 9 April 1996 letter to C. Jake (Alliant) that only total metals will be measured, as described in an EPA Region III guidance on ground water sampling in karst terrain. Another case of questionable data involves an increase in Total Organic Carbon (TOC) concentrations by a factor of 10. As such, the TOC concentrations from 1995 through 1997 were used to calculate the background values. Table 3-2 presents the *Historical Maximum Values*, which were used to develop the isocontour maps.

As requested in the DEQ's 23 July 1998 letter, using the data from well 7W12B, background values were calculated for each parameter in the ground water monitoring program. However, as a result of the 21 May 1996 meeting and subsequent telephone conversations, these background values are being submitted in accordance with the regulations and shown on the isocontour maps but were not utilized for purposes of this report.

Additionally, calculations of background values based on the 95% confidence, 95% coverage upper tolerance limit require that data distributions be normal or lognormal. Some of the data do not fulfill this requirement

### 3.5 UNIT 7 STATISTICAL ANALYSIS

Statistical evaluations for Unit 7 are performed annually and submitted as part of the Annual Reporting requirements found in the VHWMR Section 9.5. As a result of the 21 May 1996 meeting between Alliant and DEQ, Alliant has established background ground water concentrations for the upgradient well, 7W12B utilizing the Virginia DEQ "Guidance on Statistical Methods for Ground Water Data Analysis at a Solid Waste or Hazardous Waste Site, Version 2.0, 1995". In response to Mr. Glenn von Gonten's letter dated 23 July, 1998, Alliant has revised the background concentrations to include sample data collected in 1997. These values can be found in Table 3-3. Methods used for background concentration computation and statsistical analysis are described below.

The following parameters were 100% Non-Detected in 20 or more sampling events. The downgradient well data points were compared to the laboratory PQLs in a nonparametric statistical manner or to the applicable MCL or VGWPS (if one exists). Background values were then estimated by using the laboratory PQL for that constituent.

11

Parameter	PQL (ppb)	Sample Size	% Non- Detect	MCL or VGWPS (ppb)
2,4-DNT	0.2	22	100	None
2,6-DNT	0.1	22	100	None
2,4 Dinitrophenol	11	11	100	None
Benzyl Alcohol	8	8	100	None
Cyanide	20	20	100	5
Bis(2- ethyl hexyl) phthalate	9	9	100	None
2 - Nitrophenol	9	9	100	None
4 - Nitrophenol	9	9	100	None
Acetone	100	14	100	None
Antimony	30	14	100	None
Vanadium-	40	20	100	None

The following parameter has log-normally distributed data with between 15 and 50 percent Non-Detect values. As such, Cohen's Method was used as an adjustment for the mean and standard deviation, as recommended in the DEQ guidance. Results of the background analysis are summarized in Table 3-4

Parameter	Sample	% Non-
·	Size	Detect
Lead	23	34

The following parameters have data with greater than 50% Non-Detects, a minimum sample size of twenty (20). The data were non-normally distributed as indicated using a data distribution statistical method. According to Mr. Glenn von Gonten, DEQ in a 30 July 1996 telephone conversation, the maximum value detected will be used for plume delineation purposes for those constituents with greater than 50% non-detected values. An isocontour map for Total Organic Halides could not

be created because only one sampling point maximum concentration exceeded the background value.

Parameter	Sample Size	% Non- Detect
Arsenic	23	91.3
Cadmium	23	60.9
Chromium	23	56.5
Cobalt	20	65.5
Mercury	23	82.6
Nickel	20	85
Selenium	23	82.6
Thallium	20	70
Total Organic Halides	48	62.5

The following parameters do not have greater than four (4) sampling events and therefore could not be included in this (plume) evaluation:

- 2,4-D
- Gross Beta
- Radium
- Sulfate

The following parameters have between 15 and 50 percent Non-Detect values, and do not have normal or log-normal data distributions. Thus, Cohen's Method could not be used. Per the DEQ's 23 July letter, background concentrations were computed by calculating an upper tolerance limit based on 95% coverage, at a 95% confidence level. It should be noted that upper tolerance limits are not typically used unless the data are normally or log-normally distributed. Background concentration analysis data is summarized in Table 3-4.

ParameterSample Size% Non-DetectsTotal Organic Carbon36.27.2%Silver2347.8%

The remaining parameters have less than 15% Non-Detect values and no data manipulation was required. Computation data for barium, copper, specific conductivity, and zinc are summarized in Table 3-4

Parameter	Sample Size	% Non- Detect
Copper	20	0
PH	92	0
Barium	23	13
Specific Conductivity	92	0
Zinc	20	0

Table 3-3 Unit 7 Background Values

	·	
Parameter	Units	Background Value
2,4-DNT	Ppb	0.2
2,6-DNT	Ppb	0.1
Acetone	Ppb	100
Antimony	Ppb	30
Arsenic	Ppb	2.0
Barium	Ppb	64
Cadmium	Ppb	0.4
Chromium	Ppb	34
Cobalt	Ppb	17
Copper	Ppb	49
Cyanide	Ppb	5
Lead	Ppb	14
Mercury	Ppb	0.350
Nickel	Ppb	63
PH	SU	7
Selenium	Ppb	20
Silver	Ppb	2.13
Specific Conductivity	Umhos/sec	1,025
Thallium	Ppb	4
Total Organic Halides	ppb	21
Total Organic Carbon	Ppb	3930
Vanadium	Ppb	40
Zinc	Ppb	217

## STATISTICAL SUMMARY OF BACKGROUND WATER QUALITY DATA

Date	Barium	Copper	Silver	Zinc	Lead	TOC	
3/31/92	1.00		0.10		0.50	100	SpCor
6/30/92	1.00		0.10		0.50		730.00
9/30/92	1.00		0.10		0.50		706.00
12/31/92	35.00	50.00	0.30	253.00	19.00		370.00
3/31/93	27.00	16.00	0.40	17.00	0.50		798.00
6/30/93	31.00	10.00	0.10	126.00	0.50		722.00
9/30/93	38.00	6.00	0.30	81.00	4.00		715.00
12/31/93	40.00	7.00	0.10	144.00	0.50		895.00
3/31/94	27.00	10.00	0.30	29.00	2.00		918.00
6/30/94	35.00	3.00	0.70	26.00	5.00		723.00
9/30/94	59.00	2.00	0.50	26.00	12.00		750.00
12/31/94	44.00	2.00	3.10	55.00	3.00		891.00
3/30/95	40.00	10.00	0.10	10.20	1.00		880.00
6/29/95	36.00	9.30	0.10	20.00	1.40	žs.	822.00
9/30/95	30.00	2.00	0.10	11.00	0.50	4050 80	740.00
12/31/95	37.00	10.00	1.90	49.00	6.00	1250.00	610.00
3/31/96	31.00	8.00	0.10	55.00	2.00	875.00	840.00
6/30/96	26.00	3.00	0.10	1.00	0.50	500.00	652.00
9/30/96	35.00	14.00	0.10	24.00	4.00	2000.00	608.00
12/31/96	32.00	3.00	0.30	113.00	6.00	500.00	758.00
3/31/97	40.00	16.00	0.40	105.00	6.00	2000.00	768.00
6/30/97	32.00	55.00	0.30	135.00	3.00	1000.00	750.00
9/30/97	43.00	29.00	1.20	45.00	3.00	3000.00 500.00	720.00 850.00
Number of Samples	23.00	20.00	00.00				
Mean	31.35	20.00	23.00	20.00	23.00	9.00	23.00
Standard Deviation	13.91	13.27	0.47	66.26	3.54	1291.67	748.52
Shapiro-Wilk W	0.84	14.92	0.71	63.06	4.38	870.52	119.05
Normal Distribution	No.	0.70	0.57	0.84	0.70	0.87	0.89
K	2.33	No	No	No	No	Yes	Yes
· UTL	2.33 63.74	2.40	2.33	2.40	2.33	3.03	2.33
٠.٠	03.74	49.01	2.13	217.35	13.74	3930.23	1025.79

Notes:

K = Tolerance factor for one-sided normal tolerance interval with probability level of 95% and 95% coverage.

ULT = Upper Tolerance Limit.

### Appendix IX Constituents Detected Since Permit Issuance HWMUs 5, 7, 10, and 16 Radford Army Ammunition Plant

Unit	Quarter Initially Detected	Constituent	Background Calculated or QL?	Background (ug/L)	GPS Required? (261 Appendix VIII)	Proposed GPS (ug/L)	Source
		Chromium	QL	5	yes	100	USEPA MCL
		Diethyl Ether	QL	12	no	NA	NA
HMWU-5	Fourth Quarter 2003	2-Nitroaniline	QL	20	no	NA	NA
HIVIVV U-3		4-Nitroaniline	QL	20	yes	20	Background/QL
		Nitrobenzene	QL	10	yes	10	Background/QL
	Third Quarter 2006	Dichlorodifluoromethane	QL	1	yes	125.2	VDEQ ACL
HWMU-7	Third Quarter 2003	Copper	Calculated	49	no	NA	NA
HVVIVIU-7	Second Quarter 2004	Zinc	Calculated	217	no	NA	NA
	First Quarter 2003	Cobalt	QL	5	no	NA	NA
HWMU-10	Second Quarter 2003	Vanadium	QL	10	no	NA	NA
	Second Quarter 2005	Acetone	QL	10	no	NA	NA
	Second Quarter 2005	2-Propanol	QL	50	no	NA	NA
		Chloroethane	Calculated	20.7	yes	20.7	Background/QL
	Second Quarter 2003	Diethyl Ether	Calculated	75.5	no	NA	NA
HWMU-16		Dimethyl Ether	Calculated	17.0	no	NA	NA
	Third Quarter 2003	Methylene Chloride	Calculated	13.95	no*	NA	NA
	Second Quarter 2004	1,1,2-Trichloro-1,2,2-trifluoroethane	Calculated	1.2	no*	NA	NA

- HWMU-5: The additional Appendix IX constituents detected in the downgradient point of compliance wells were not detected above their respective Quantitation Limits (QLs) in the upgradient well. As a result, background concentrations for those constituents were set as equal to their respective QLs. In accordance with the Permit (Condition V.J.1.g.), GPS are proposed for those additional Appendix IX constituents that are listed in Appendix VIII of 40 CFR Part 261 (chromium, 4-nitroaniline, nitrobenzene, and dichlorodifluoromethane). No GPS are proposed for the additional Appendix IX constituents that are not listed in Appendix VIII of 40 CFR Part 261 (diethyl ether and 2-nitroaniline).
- HWMU-7: Background concentrations for the additional Appendix IX constituents detected in the downgradient point of compliance wells (copper and zinc) were previously calculated and submitted to the VDEQ in the August 1998 *Groundwater Quality Assessment Report for HWMU-7* prepared by ERM, Inc. In accordance with the Permit (Condition V.J.2.g.), no GPS are proposed for the additional Appendix IX constituents (copper and zinc), as they are not listed in Appendix VIII of 40 CFR Part 261.
- HWMU-10: The additional Appendix IX constituents detected in the downgradient point of compliance wells were not detected above their respective Quantitation Limits (QLs) in the upgradient well. As a result, background concentrations for those constituents were set as equal to their respective QLs. In accordance with the Permit (Condition V.J.3.g.), no GPS are proposed for the additional Appendix IX constituents (cobalt, vanadium, acetone, and 2-propanol), as they are not listed in Appendix VIII of 40 CFR Part 261.
- HWMU-16: Background concentrations for additional Appendix IX constituents chloroethane, diethyl ether, dimethyl ether, and methylene chloride were calculated using data collected from upgradient well 16C1 during the period from Third Quarter 2003 through Third Quarter 2004. The background concentration for additional Appendix IX constituent 1,1,2-trichloro-1,2,2-trifluoroethane was calculated using data collected from upgradient well 16C1 during the period from Second Quarter 2004 through Third Quarter 2006. In accordance with the Permit (Condition V.J.4.g.), GPS are proposed for additional Appendix IX constituents that are listed in Appendix VIII of 40 CFR Part 261 (chloroethane). No GPS are proposed for the additional Appendix IX constituents that are not listed in Appendix VIII of 40 CFR Part 261 (diethyl ether and dimethyl ether).

  \*Methylene chloride and 1,1,2-trichloro-1,2,2-trifluoroethane should not be added to the Groundwater Monitoring List for HWMU-16, as these constituents were only detected in the upgradient well for the Unit, and not in the downgradient point of compliance wells.

# CONSTITUENT BACKGROUND VALUES FOR THE COMPLIANCE GROUNDWATER MONITORING PROGRAM

### HWMU-7 RADFORD ARMY AMMUNITION PLANT RADFORD, VIRGINIA

### **Prepared for:**

Alliant Techsystems Inc.
Radford Army Ammunition Plant
Route 114
Radford, Virginia 24141-0100

### Prepared by:

Draper Aden Associates 2206 South Main Street Blacksburg, Virginia 24060 (540) 552-0444

February 2008 DAA Job No. B03204-122

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## RADFORD ARMY AMMUNITION PLANT – HWMU-7 CALCULATION OF CONSTITUENT BACKGROUND VALUES

Draper Aden Associates recalculated background values for the plume monitoring well constituents of the groundwater monitoring program for Hazardous Waste Management Unit No. 7 (HWMU-7) located at the Radford Army Ammunition Plant (Radford AAP) in Radford, Virginia. Background values were calculated for all plume monitoring well constituents.

The background values for HWMU-7 plume monitoring well constituents were calculated using the analytical data for upgradient well 7W12B using data from Second Quarter 2003 through Second Quarter 2007 (available most recent data with one exception-cyanide includes 4th Quarter 2007 data). Inter-well upper prediction limits (UPL) were calculated on the background data for the target parameters in accordance with the facility permit and VHWMR (40 CFR 264.97(h)). Where applicable, the background value calculations were based on site-wide 95% confidence, 95% coverage upper prediction intervals. The calculated background values for all target constituents are listed on **Table 1**.

### **Background Data and Background Value Calculations**

The constituents listed below were 100% non-detected (<LOQ) in the background well. The background values for these constituents were established as equal to their quantitation limits (QL).

Background Value = Quantitation Limit (QL)					
Constituent	Sample Size	% Non-Detects	QL (µg/l)	Background Value (µg/l)	
Antimony	17	100	1	1	
Arsenic	17	100	10	10	
Cadmium	17	100	1	1	
Cobalt	17	100	5	5	
Copper	16	100	5	5	
Lead	17	100	1	1	
Mercury	17	100	2	2	
Nickel	17	100	10	10	
Selenium	17	100	10	10	
Silver	17	100	2	2	
Thallium	17	100	1	1	
Cyanide	18	100	20	20	
Bis(2-ethylhexyl)phthalate	17	100	6	6	
Butyl benzyl phthalate	17	100	10	10	
2,4-Dinitrophenol	17	100	10	10	
2,4-Dinitrotoluene	17	100	10	10	
2,6-Dinitrotoluene	17	100	10	10	
p-Nitrophenol	17	100	10	10	

Non-parametric prediction intervals were computed for the constituents for which the data from upgradient well 7W-12B satisfied one of the following two criteria, per VDEQ regulations and guidance as well as USEPA guidance:

- Percentage of non-detects was greater than or equal to 50 and less than 100; or
- Percentage of non-detects was less than 50, but data was not normally distributed in original or log-transformed mode.

Only one result for zinc was reported above its LOQ. The reported result (10.9  $\mu$ g/l) is the NUPL for zinc. The non-parametric prediction limit computation for chromium is presented in **Appendix A**.

Background Value = UPL of Non-parametric Prediction Interval (NUPL)					
			QL	NUPL	Background Value
Parameter	Sample Size	% Non-Detects	(µg/l)	(µg/l)	(μg/l)
Chromium	17	12	5	9.9	9.9
Zinc	14	93	10	10.9	10.9

The following constituent (barium) exhibited normally distributed background data with less than 0% non-detects. One sided parametric prediction interval was computed on the background data for barium. The background value for barium was set as equal to its UPL. The background concentration calculations were based on a site wide 95% confidence, 95% coverage upper prediction intervals. The background and relevant statistical data for barium is summarized below. The prediction interval computation is presented in **Appendix A**.

	Background Value = UPL of one-sided Prediction Interval						
QL UPL Background Value							
Parameter	Sample Size	% Non-Detects	(µg/l)	$(\mu g/l)$	(μg/l)		
Barium	17	17 0 10 41.0 41.0					

### TABLE 1

### HWMU-7 CALCULATED BACKGROUND VALUES

Constituent	Background Value (µg/l unless otherwise noted)
Antimony	1
Arsenic	10
Barium	41.0
Cadmium	1
Chromium	9.9
Cobalt	5
Copper	5
Lead	1
Mercury	2
Nickel	10
Selenium	10
Silver	2
Thallium	1
Zinc	10.9
Cyanide	20
Bis(2-ethylhexyl)phthalate	6
Butyl benzyl phthalate	10
2,4-Dinitrophenol	10
2,4-Dinitrotoluene	10
2,6-Dinitrotoluene	10
p-Nitrophenol	10

### APPENDIX A

HWMU-7
BACKGROUND VALUE CALCULATIONS
STATISTICAL COMPUTATIONS FOR BARIUM AND CHROMIUM

### RAAP-HWMU-7 - Background Calculation - December 2007

17-Dec-07

Y2K Correction dates are as shown in table below.

Actual Event	Date Used in Stat Software
2003-Qtr2	8/1/1999
2003-Qtr3	8/2/1999
2003-Qtr4	8/3/1999
2004-Qtr1	8/4/1999
2004-Qtr2	8/5/1999
2004-Qtr3	8/6/1999
2004-Qtr4	8/7/1999
2005-Qtr1	8/8/1999
2005-Qtr2	8/9/1999
2005-Qtr3	8/10/1999
2005-Qtr4	8/11/1999
2006-Qtr1	8/12/1999
2006-Qtr2	8/13/1999
2006-Qtr3	8/14/1999
2006-Qtr4	8/15/1999
2007-Qtr1	8/16/1999
2007-Qtr2	8/17/1999

### Notes:

1) Background data was computed for all target constituents using the 2Q 2003 - 2Q 2007 data for background well 7W12B. Background data was 100% <LOQ for all target parameters except barium, chromium and zinc. Zinc had only one reported result > LOQ.

Statistical computations using GRITS/STAT V5.0 performed only for barium and chromium, as applicable.

 $P.^{\circ}B03|200|B03204|B03204-122|WORK|HWMU-7\ Closure\ Rpt-Recalculation\ of\ Background\ [HWMU-7\ StatDate\ correction\ December\ 2007\ background\ recalc.xls]Sheet1$ 

Normality Tests

Report Printed: 12-17-2007 16:02

Facility: RAAPHWMU7 Haz. Waste Unit 7 - RAAP

Address:

City:Radford ST:VA Zip:24141

County: MONTGOMERY

Contact:

Phone: ( ) -

Permit Type:Detection

Constituent:Ba Barium, total

CAS Number: 7440-39-3

MCL: 0.000 ppb

ACL: 0.000 ppb

Detect Limit: 2.000 ppb

Start Date:Aug 01 1999 End Date:Aug 17 1999

Normality Test on Observations for wells listed below:

Well:7W12B Position:Upgradient Observations:17

 Scale
 Minimum
 Maximum
 Mean
 Std Dev

 Original:
 32.800
 39.800
 36.253
 1.875

 Log:
 3.490
 3.684
 3.589
 0.052

Pooled Statistics

Observations: 17

Statistic Original Log Scale Scale 36.253 Mean: 3.589 Std Dev: 1.875 0.052 Skewness: -0.019 -0.150 Kurtosis: -0.236 -0.251 Minimum: 32.800 3.490 Maximum: 39.800 3.684 CV: 0.052 0.014

Shapiro-Wilk Statistics

Test 5% Critical 1% Critical Scale Statistic Value Value Original: 0.9602 0.8920 0.8510

Log: 0.9592

0.8920

0.8510

\* Indicates statistically significant evidence of non-normality.  $\ensuremath{\mathsf{GRIT}}/\ensuremath{\mathsf{STAT}}$  Version 5.0

### Parametric Prediction Interval Report Printed December 17,2007

Page 1

```
Facility: Haz. Waste Unit 7 - RAAP
Parameter: Barium, total (CAS Number: 7440-39-3)
```

### ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

```
Observations (n): 17 Shapiro-Wilk (W): 0.9602 Critical W, \alpha=0.01: 0.8510 Mean: 36.253 ppb Std Dev: 1.875 ppb DF: 16 Conf. Level (1-\alpha): 0.9500 Future Samples (k): 4 t 1 - \alpha 2.4729 Kappa: 2.5446 UL: 41.024 ppb LL: -\infty
```

Normality Tests

Report Printed: 12-17-2007 16:05

Facility: RAAPHWMU7 Haz. Waste Unit 7 - RAAP

Address:

City:Radford ST:VA Zip:24141

County: MONTGOMERY

Contact:

Phone:() -

Permit Type:Detection

Constituent:Cr Chromium, total

CAS Number: 7440-47-3

MCL: 0.000 ppb ACL: 0.000 ppb

ACL: 0.000 ppb Detect Limit: 1.000 ppb

Start Date: Aug 01 1999 End Date: Aug 17 1999

Normality Test on Observations for wells listed below:

Well:7W12B Position:Upgradient Observations:17

 Scale
 Minimum
 Maximum
 Mean
 Std Dev

 Original:
 0.500
 9.900
 6.612
 2.648

 Log:
 -0.693
 2.293
 1.672
 0.909

Pooled Statistics

Observations: 17

Statistic Original Log Scale Scale 6.612 Mean: 1.672 Std Dev: 2.648 0.909 Skewness: -1.317\* -2.191\* Kurtosis: 1.110 3.139 Minimum: 0.500 -0.693 Maximum: 9.900 2.293 CV: 0.401 0.543

Shapiro-Wilk Statistics

Test 5% Critical 1% Critical Scale Statistic Value Value Original: 0.8293\* 0.8920 0.8510

Log: 0.5707\*

0.8920 0.8510

\* Indicates statistically significant evidence of non-normality.  $\ensuremath{\mathsf{GRIT}}/\ensuremath{\mathsf{STAT}}$  Version 5.0

### Nonparametric Prediction Interval

Report Printed December 17,2007

Facility:Haz. Waste Unit 7 - RAAP

Parameter: Chromium, total (CAS Number: 7440-47-3)

### ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n): 17

Conf. Level  $(1-\alpha)$ : 94.440% N/A

UL: 9.900 ppb

LL: 0.000

Report Produced by GRITS/STAT 5.01

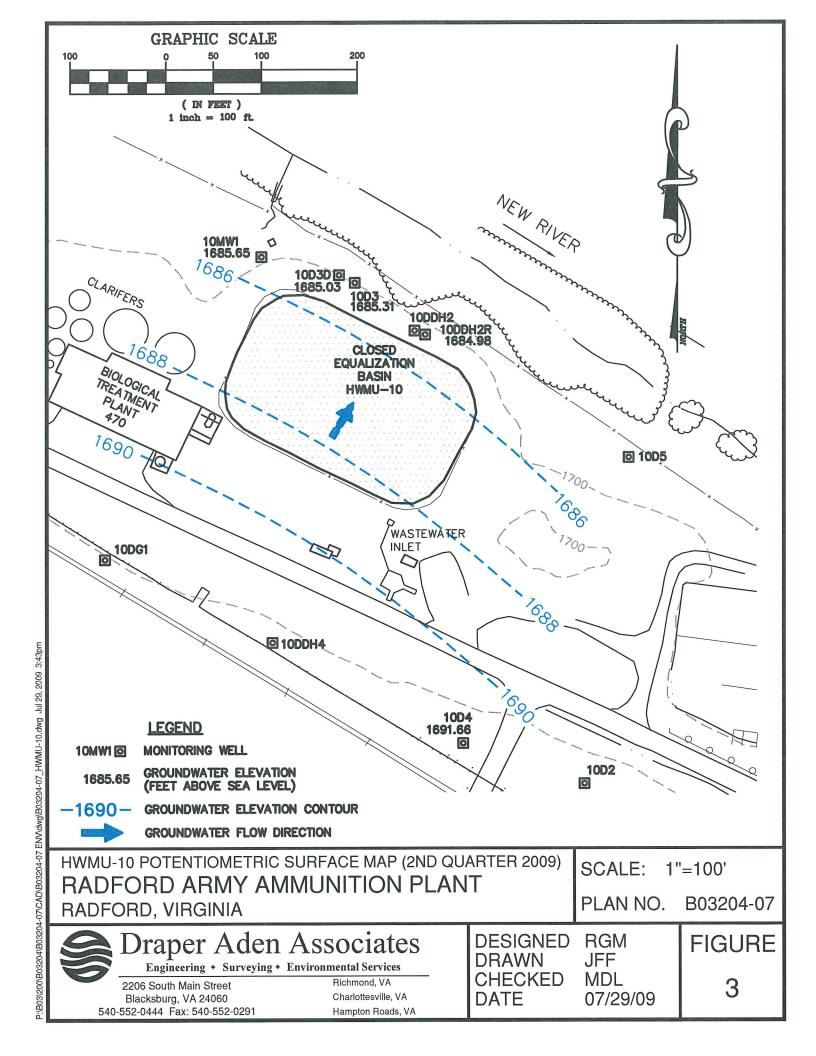
Page 1

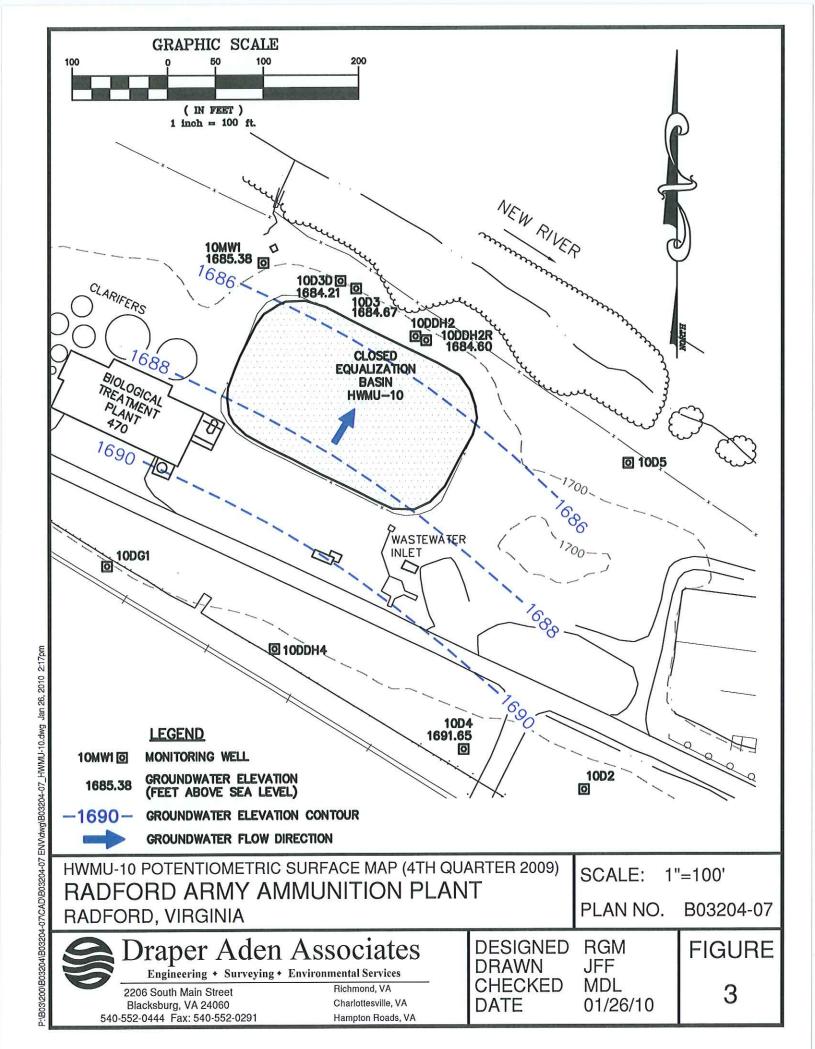
APPENDIX C

**HWMU-10** 

### **APPENDIX C-1**

HWMU-10 POTENTIOMETRIC SURFACE MAPS SECOND QUARTER 2009 FOURTH QUARTER 2009





### APPENDIX C-2

HWMU-10 2009 LABORATORY ANALYTICAL RESULTS POINT OF COMPLIANCE WELLS

#### Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 10D4

Analyte/Quarter	10D4 Q	10D3 Q	10D3D Q	10DDH2R Q	10MW1 Q	QL	GPS	Method
Antimony				C4S f	₹ 7440-36-0			
Second Quarter 2009	U	UJ	UJ	U	U	1	· -	6020
Arsenic				CAS i	7440-38-2			
Second Quarter 2009	Ú	U	U	U	U	10	50	6020
Fourth Quarter 2009	U	U	U	U	U	10	50	6020
Barium					7440-39-3			
Second Quarter 2009	107	118 J	50.4 J	42.8	81.8	10	2000	6020
Fourth Quarter 2009	121	105	50.4	67.3	88.5	10	2000	6020
Beryllium		700	00.1		7440-41-7	10	2000	0020
Second Quarter 2009	U	U	· U	U	U			6020
			. 0		7440-43-9			
Cadmium	Ü.				U			
Second Quarter 2009		U	U	U	7440-47-3			6020
Chromium						_	400	
Second Quarter 2009	3.6 J	2.3 J	U	U	1.9 J	: 5	100	6020
Fourth Quarter 2009	U	U	U	U	U	5	100	6020
Cobalt					7440-48-4			
Second Quarter 2009	U	U	U	U	U	5	-	6020
Fourth Quarter 2009	U	U	U	U	U	5		6020
Copper				CAS #	7440-50-8			
Second Quarter 2009	1.3 J	U	U	U	U	5	1300	6020
Fourth Quarter 2009	U	U	U	U	U	5	1300	6020
Lead				CAS #	7439-92-1			
Second Quarter 2009	0.92 J	U	U	U	U	1	15	6020
Fourth Quarter 2009	U	U	U	U	U	1	15	6020
Mercury				CAS#	7439-97-6	THE PERSON NAMED IN COLUMN TWO		
Second Quarter 2009	U	U	U	U	U	2	2	7470A
Fourth Quarter 2009	U	U	. U	U	U	2	2	7470A
Nickel				CAS #	7440-02-0			
Second Quarter 2009	U	U	U	U	U	10	313	6020
Fourth Quarter 2009	U	U	U	U	U	10	313	6020
Selenium				C.4S #	7782-49-2	·······		
Second Quarter 2009	U	U	U	U	U	10	50	6020
Fourth Quarter 2009	U	U	U	U	U	10	50	6020
Silver				CAS#	7440-22-4			
Second Quarter 2009	: U	U	U	U	U	2	78.25	6020
Fourth Quarter 2009	U	U	U	U	U	2	78.25	6020
Thallium			<u></u>	CAS#	7440-28-0	<u> </u>		
Second Quarter 2009	U	U	U	U	U	1		6020
Tin	· · · · · · · · · · · · · · · · · · ·	·····			7440-31-5	l		
Second Quarter 2009	υJ	UJ	U J	UJ	UJ	5		6020
Vanadium		<b>5</b> 0			7440-62-2	· · · · · · · · · · · · · · · · · · ·	<u>:</u>	
Second Quarter 2009	1.6 J	U	U	U	U	10	1	6020
	U .0 J	U	U	U	U	10	-	6020
Fourth Quarter 2009					7440-66-6	10	:	6020
Zinc	741		. 67 1		r		4000	
Second Quarter 2009	7.4 J	U	5.7 J	U	U	10	4695	6020
Fourth Quarter 2009	U	U	U	U	U	10	4695	6020
Sulfide					18496-25-8			~~~
Second Quarter 2009	U	U	U	U	U	1000	-	9034

#### Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 10D4

Analyte/Quarter	10D4 Q	10D3 Q	10D3D Q	10DDH2R Q	10MW1 Q	QL	GPS	Method
Cyanide				C4S #	57-12-5			
Second Quarter 2009	U	U	U	U	U	20	200	9012A
Fourth Quarter 2009	U	· U	U	U	U	20	200	9012A
Total Recoverable Pher	nolics			CAS #	PHENOLICS			
Second Quarter 2009	U	U	· U	U	U	60	-	9065
Acenaphthene				CAS#	83-32-9			
Second Quarter 2009	UJ	UJ	UJ	UJ	UJ	5	-	8270C
Acenaphthylene				C:1S #	208-96-8			
Second Quarter 2009	UJ	u J	U J	UJ	UJ	5		8270C
Acetone				CAS #	67-64-1			
Second Quarter 2009	· U	U	5700	U	U	5		8260B
Fourth Quarter 2009	Ü	U	12000	U	U	10	-	8260B
Acetonitrile				C.1S #	75-05-8			
Second Quarter 2009	U	. U	U	Ú	U	20	-	8260B
Acetophenone	'			C.4S #	98-86-2			
Second Quarter 2009	U	U	U	U	U	5		8270C
2-Acetylaminofluorene				CAS #	53-96-3			
Second Quarter 2009	U	U	· U	U	U	5	_	8270C
Acrolein					107-02-8			
Second Quarter 2009	UJ	UJ	U J	U J	UJ	25	<u> </u>	8260B
Acrylonitrile					107-13-1			
Second Quarter 2009	U	U	U	U	U	5		8260B
Aldrin					309-00-2			02000
Second Quarter 2009	U	U	U	U	U	0.05		8081A
Allyl chloride	:				107-05-1	0.00		
Second Quarter 2009	U	U U	U	U	U	0.5		8260B
I-Aminobiphenyl					92-67-1	0.0		02000
Second Quarter 2009	U	U	U	U	U	5		8270C
Aniline					62-53-3		<u></u>	02100
Second Quarter 2009	U	U	U	U	U	5		8270C
	. 0				120-12-7			02700
Anthracene Second Quarter 2009	: 11	U	. 11					92700
	U	U	U	U C15#	140-57-8	5	- !	8270C
Aramite						e		00700
Second Quarter 2009	U	U	U	U C45#	71-43-2	5	<u></u>	8270C
Benzene	1 11					0.5	<del> </del>	00000
Second Quarter 2009	U	U	U	U	56-55-3	0.5	in the second	8260B
Benzo[a]anthracene						· · · · <u>-</u> · · · ·		
Second Quarter 2009	U	U	U	U	U	5	· _	8270C
Benzo[b]fluoranthene					205-99-2		1 1 1 1 1 1 1 1 1 1 1	
Second Quarter 2009	U	U	U	U	U	5	- !	8270C
Benzo[k]fluoranthene	1				207-08-9		4	
Second Quarter 2009	UJ	UJ	UJ	UJ	UJ	5	-	8270C
Benzo[ghi]perylene	:				191-24-2			
Second Quarter 2009	U	U	U	U	U	5	<u> </u>	8270C
Benzo(a)pyrene				CAS#	50-32-8		·	
Second Quarter 2009	U	U	U	U	U	5	<u>-</u>	8270C
,4-Benzenediamine				C.45 #	106-50-3			
Second Quarter 2009	UJ	UJ	UJ	U J	U J	50	- I	8270C

#### Radford Army Ammunition Plant, Radford, Virginia

 $Upgradient \ well = 10D4$ 

Analyte/Quarter	10D4 Q	10D3	Q	0D3D	Q	10DDH2R Q	10MW1	Q	QL	GPS	Method
Benzyl alcohol					************	C4S	# 100-51-6				
Second Quarter 2009	U	. U		U		U	U		5	-	8270C
alpha-BHC						CAS	# 319-84-6				
Second Quarter 2009	U	U		U		U	U		0.05	-	8081A
beta-BHC						CAS :	# 319-85-7				
Second Quarter 2009	U	U		U		U	U		0.05	-	8081A
delta-BHC						CAS	# 319-86-8				
Second Quarter 2009	U	U		U		U	U		0.05	~	8081A
gamma-BHC						CAS	# 58-89-9				
Second Quarter 2009	U	U		U		U	U		0.05	-	8081A
bis(2-Chloroethoxy)met	hane					CAS i	# 111-91-1				
Second Quarter 2009	U	U		U		U	U		5	**	8270C
bis(2-Chloroethyl)ether						C45 i	¢ 111-44-4				
Second Quarter 2009	UJ	U	J	U.	J	U J	υ.	j	5	-	8270C
bis(2-Chloro-1-methylet	hyl)ether					CAS 1	# 108-60-1				
Second Quarter 2009	U	U		U		U	U		5	-	8270C
bis(2-Ethylhexyl)phthala	ate					CAS i	# 117-81-7				
Second Quarter 2009	U	U		U		U	U		5	-	8270C
Bromobenzene						CAS t	# 108-86-1				
Second Quarter 2009	U	U		U		U	U		0.5	-	8260B
Bromochloromethane						CAS #	<sup>#</sup> 74-97-5				
Second Quarter 2009	U	U		Ü		U	U		0.5	-	8260B
Bromodichloromethane						C4S t	75-27-4				
Second Quarter 2009	U	U		U		U	U		1	80	8260B
Fourth Quarter 2009	U	U		U		U	U		1 -	80	8260B
Bromoform						CAS #	75-25-2				
Second Quarter 2009	U	U		U		U	U		0.5	-	8260B
4-Bromophenyl phenyl	ether					C.4S #	¥ 101-55-3				
Second Quarter 2009	U	U	:	U		U	U		5	-	8270C
2-Butanone						C4S #	<sup>‡</sup> 78-93-3				
Second Quarter 2009	· U	U		U	ŧ	U	U		5	691.08	8260B
Fourth Quarter 2009	U	U		U		U	U		10	691.08	8260B
n-Butyl alcohol						CAS ŧ	71-36-3				
Second Quarter 2009	U	U		U		U	U		50	-	8260B
tert-Butyl alcohol						CAS #	¥ 75-65-0				
Second Quarter 2009	U	U		U		U	U		10	· · · · · · · · · · · · · · · · · · ·	8260B
n-Butylbenzene						CAS #	104-51-8				
Second Quarter 2009	U	U		U		U	U		0.5	-	8260B
sec-Butylbenzene						CAS #	135-98-8				
Second Quarter 2009	U	U		U	- 1	U	υ		0.5	-	8260B
tert-Butylbenzene				TOTAL STREET,	riser had to a recovery	CAS #	∮ 98-06-6			and to the and at a series of the	
Second Quarter 2009	U	U		U	1	U	U		0.5	-	8260B
Butyl benzyl phthalate						CAS #	# 85-68-7				
Second Quarter 2009	U	U		U		U	U		5	-	8270C
Carbon disulfide						CAS #	‡ 75-15-0				
Second Quarter 2009	U	U		U		U	U		0.5	-	8260B
Carbon tetrachloride						C.4S #	≢ 56-23-5				
Second Quarter 2009	U	U		U	- 1	U	U		1 :	-	8260B



#### Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 10D4

Analyte/Quarter	10D4 Q	10D3 Q	10D3D	Q 10DDH2R	Q 10MW1	Q = QL	<sub>i</sub> GPS	Method
Chlordane				C.4	S # 57-74-9			
Second Quarter 2009	U	U	U	i U	U	0.86		8081A
p-Chloroaniline				CA	S# 106-47-8			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Chlorobenzene				CA	S # 108-90-7			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Chlorobenzilate				CA	S# 510-15-6			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
p-Chloro-m-cresol				Ci	S# 59-50-7			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Chloroethane				C.4	S # 75-00-3			
Second Quarter 2009	U	U	U	U	U	1	-	8260B
Chloroform				C.4	S # 67-66-3			
Second Quarter 2009	22	4.9	2	U	5.3	1	80	8260B
Fourth Quarter 2009	40	16	5.1	U	9.7	1	80	8260B
2-Chloroethyl vinyl ether				CA	S# 110-75-8			
Second Quarter 2009	UJ	U J	UJ	J U J	U .	0.5	-	8260B
2-Chloronaphthalene					S # 91-58-7			
Second Quarter 2009	UJ	U J	U J	U .	U.	) 5	_	8270C
2-Chlorophenol					S# 95-57-8			
Second Quarter 2009	U	u	U	U	U	5	_	8270C
4-Chlorophenyl phenyl e	-				S # 7005-72-3			
Second Quarter 2009	UJ	U J	UJ	J U J	ı Ü ,	J 5	_	8270C
Chloroprene					S# 126-99-8			02100
Second Quarter 2009	U	U	U	U	U	0.5		8260B
2-Chlorotoluene	·				S# 95-49-8	0.0		
Second Quarter 2009	U	U		U	U	0.5		8260B
4-Chlorotoluene					S # 106-43-4	0.0		02000
Second Quarter 2009	Ü	U	U	U	U	0.5		8260B
					S # 218-01-9	0.5		02000
Chrysene Second Quarter 2009	UJ	U J	UJ		1	J 5		8270C
		<u> </u>			S# 110-82-7	,	· -	
Cyclohexane Second Quarter 2009	U	U	U	U	U	0.5		8260B
					S # 94-75-7	0.5	· · · · ·	02006
2,4-Dichlorophenoxyacet Second Quarter 2009		U	U	U	U U			91514
	U		U	<u>i</u>	S # 72-54-8	5	_i	8151A
4,4'-DDD								0004.8
Second Quarter 2009	U -	U	U	U	U	0.1	-	8081A
4,4'-DDE			······································		S # 72-55-9			
Second Quarter 2009	U	U	U	U	U 50.00.0	0.1	-	8081A
4,4'-DDT					S # 50-29-3			
Second Quarter 2009	U	U	U	U	U	0.1		8081A
Diallate					S # 17708-57-			
Second Quarter 2009	υJ	UJ	UJ			J 5	· <u>-</u>	8270C
Dibenz(a,h)anthracene					s # 53-70-3			
Second Quarter 2009	U	U	U	. U	U	5		8270C
Dibenzofuran				CA	S # 132-64-9			
Second Quarter 2009	UJ	UJ	UJ			J 5	. i	8270C
Dibromochloromethane				C4	S # 124-48-1			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B



#### Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 10D4

Analyte/Quarter	10D4 Q	10D3 Q	10D3D <u>Q</u>	10DDH2R Q	10MW1 Q	QL	GPS	Method
1,2-Dibromo-3-chloropro	pane			C4S #	96-12-8			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,2-Dibromoethane				CAS #	106-93-4			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Di-n-butyl phthalate				CAS #	84-74-2			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
1,2-Dichlorobenzene				CAS #	95-50-1			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,3-Dichlorobenzene				CAS #	541-73-1			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,4-Dichlorobenzene				CAS#	106-46-7			
Second Quarter 2009	U	U	U	U	U	0.5		8260B
3,3'-Dichlorobenzidine				C4S #	91-94-1			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
trans-1,4-Dichloro-2-bute	ne			CAS #	110-57-6			
Second Quarter 2009	UJ	UJ	U J	UJ	UJ	5	- 	8260B
Dichlorodifluoromethane	•			CAS#	75-71-8			
Second Quarter 2009	U	U	. U	U	U	1	-	8260B
1,1-Dichloroethane				CAS#	75-34-3			
Second Quarter 2009	U	U	U	U	U	1	-	8260B
1,2-Dichloroethane				CAS#	107-06-2			
Second Quarter 2009	U	U	U	<u> </u>	U	1	-	8260B
1,1-Dichloroethene					75-35-4			
Second Quarter 2009	U	U	U	. U	U	0.5	=	8260B
cis-1,2-Dichloroethene					156-59-2			
Second Quarter 2009	U	U	U	U	U	0.5	<del>-</del> 	8260B
trans-1,2-Dichloroethene				,	156-60-5			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
2,4-Dichlorophenol					120-83-2			00700
Second Quarter 2009	U	U	U	U	87-65-0	5		8270C
2,6-Dichlorophenol Second Quarter 2009					T	- ·		82700
***************************************	U	U	U	U C45#	78-87-5	5		8270C
1,2-Dichloropropane Second Quarter 2009	U	. U		U	U U	0.5		8260B
1,3-Dichloropropane					142-28-9	0.5	- · · · · · · · · · · · · · · · · · · ·	02000
Second Quarter 2009	U	U	U	U	U	0.5		8260B
					594-20-7	0.5	<del>-</del>	8200B
2,2-Dichloropropane Second Quarter 2009	U	U	U	: U	U	0.5		8260B
1,1-Dichloropropene					563-58-6		-	02000
Second Quarter 2009	U	U	U	U	U	0.5		8260B
cis-1,3-Dichloropropene					10061-01-5	i		0200B
Second Quarter 2009	U	U	U	U	U	0.5		8260B
trans-1,3-Dichloropropen	e			C4S #	10061-02-6			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Dieldrin				CAS#	60-57-1			900 100 1 100 to 1 1 100 May 100 100 to 1 100 May 100 100 to 1 100 May
Second Quarter 2009	U	U	U	U	U	0.1	_	8081A
Diethyl ether				CAS#	60-29-7			
Second Quarter 2009	U	U	U	U	U	12.5	-	8260B



#### Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 10D4

Analyte/Quarter	10D4 Q	10D3 Q	10D3D Q	10DDH2R	Q 10MW1 Q	QL	GPS	Method
Diethyl phthalate				C.÷	IS# 84-66-2			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
O,O-Diethyl O-2-pyrazin	ıyl			CA	IS # 297-97-2			
Second Quarter 2009	U	U	U	U	U	5	*	8270C
Dimethoate				CA	S# 60-51-5			
Second Quarter 2009	UJ	UJ	UJ	U.	JUJ	5	-	8270C
Dimethyl ether				CA	S # 115-10-6			
Second Quarter 2009	U	U	U	U	U	12.5	-	8260B
p-(Dimethylamino)azob	enzene			C.	S# 60-11-7			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
7,12-Dimethylbenz[a]an	thracene			C.4	S # 57-97-6			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
3,3'-Dimethylbenzidine				C.4	S # 119-93-7			
Second Quarter 2009	U	U	U	U	U	5		8270C
a,a-Dimethylphenethyla	mine			CA	S # 122-09-8			
Second Quarter 2009	UJ	U J	UJ	U .	J U J	50	-	8270C
2,4-Dimethylphenol				CA	S # 105-67-9			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Dimethyl phthalate				CA	S# 131-11-3			
Second Quarter 2009	U	U	U	U	U	5	*	8270C
n-Dinitrobenzene				Ca	S # 99-65-0			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
I,6-Dinitro-o-cresol				C.4	S # 534-52-1			
Second Quarter 2009	UJ	UJ	UJ	U .	l U J	10		8270C
2,4-Dinitrophenol	L'			CA	S # 51-28-5			
Second Quarter 2009	UJ	UJ	UJ	U	ı U J	10	-	8270C
2,4-Dinitrotoluene				CA	S# 121-14-2			
Second Quarter 2009	U	U	U	U	U	5	31.3	8270C
Fourth Quarter 2009	U	U	U	U	U	10	31.3	8270C
2,6-Dinitrotoluene				CA	S # 606-20-2			
Second Quarter 2009	U	U	U	U	U	5	15.65	8270C
Fourth Quarter 2009	U	U	U	U	U	10	15.65	8270C
Dinoseb				CA	S# 88-85-7			
Second Quarter 2009	U	U	U	U	U	2.5	•	8151A
Di-n-octyl phthalate				C.4	S # 117-84-0			
Second Quarter 2009	U	U	U	U	U	5 :	-	8270C
,4-Dioxane				CA	S # 123-91-1			
Second Quarter 2009	U	U	U	U	U	100	-	8260B
Diphenylamine				CA	S # 122-39-4			
Second Quarter 2009	U	U	U	U	U	5	i	8270C
Disulfoton	<u> </u>	***************************************		CA	S# 298-04-4			
Second Quarter 2009	U	U	U	U	U	5 .	-	8270C
Endosulfan I					S# 959-98-8			
Second Quarter 2009	U	U	U	U	U	0.05	······································	8081A
Endosulfan II					S # 33213-65-9			
Second Quarter 2009	U	U	U	U	U	0.1	- · · · · · · · · · · · · · · · · · · ·	8081A
Endosulfan sulfate					S # 1031-07-8	J. 1		
Second Quarter 2009	U	U	. U	U	U	0.1		8081A



#### Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 10D4

Analyte/Quarter	10D4 Q	10D3 Q	10D3D Q	10DDH:	2R Q	10MW1 Q	QL	GPS	Method
Endrin					CAS#	72-20-8			
Second Quarter 2009	U	U	U	U		U	0.1		8081A
Ethyl acetate					CAS#	141-78-6			
Second Quarter 2009	UJ	UJ	UJ	U	J	UJ	5	-	8260B
Endrin aldehyde					CAS#	7421-93-4			
Second Quarter 2009	U	U	U	U		U	0.1	-	8081A
Ethanol					CAS#	64-17-5			
Second Quarter 2009	U	U	U	U		U	250		8260B
Ethylbenzene					CAS#	100-41-4			
Second Quarter 2009	U	U	U	U		U	1		8260B
Ethyl methacrylate					CAS#	97-63-2			
Second Quarter 2009	U	U	U	U		U	0.5	-	8260B
Ethyl methanesulfonate					C4S #	62-50-0			
Second Quarter 2009	. U	U	U	U		U	5	-	8270C
Ethylene oxide					CAS#	75-21-8			
Second Quarter 2009	UJ	UJ	UJ	U	J	UJ	20	-	8260B
Famphur					CAS#	52-85-7			
Second Quarter 2009	. U J	UJ	UJ	U	J	UJ	5	-	8270C
Fluoranthene					CAS#	206-44-0			
Second Quarter 2009	U	U	U	U		U	5	_ :	8270C
Fluorene					C4S#	86-73-7			
Second Quarter 2009	UJ	UJ	UJ	U	J	UJ	5	-	8270C
Heptachlor					C4S #	76-44-8			
Second Quarter 2009	U	U	U	U		U	0.05		8081A
Heptachlor epoxide					CAS #	1024-57-3			
Second Quarter 2009	U	U	U	U		U	0.05	_ :	8081A
Hexachlorobenzene	Ī				CAS#	118-74-1			
Second Quarter 2009	U	U	 U	U		U	5	_	8270C
Hexachlorobutadiene	<u> </u>				CAS#	87-68-3			
Second Quarter 2009	U	U	U	U		U	0.5	_	8260B
Hexachlorocyclopentad					CAS#	77-47-4			
Second Quarter 2009	U	U	U .	U		U	5	_	8270C
Hexachloroethane	! 0	<u>.</u>	· . ·		CAS #	67-72-1		<u>-</u>	
Second Quarter 2009	U	U	U	U		U	0.5		8260B
Hexachlorophene			:		CAS #	70-30-4	0.0	i	02000
Second Quarter 2009	UJ	UJ	· U J	U	J	UJ	500		8270C
Hexachloropropene		0 0		Ų		1888-71-7			02,00
Second Quarter 2009	: U	U	Ü	U		U	5		8270C
					CAS#	591-78-6		i	02700
2-Hexanone Second Quarter 2009	U	U	. U	U		U	5		8260B
		U			C 15 #	193-39-5	3	-	02000
Indeno[1,2,3-cd]pyrene Second Quarter 2009	: 11	U	. U	u. U		U U	5		8270C
	. U	. U	. 0		C15#	78-83-1	3		02700
Isobutyl alcohol	11			1.1	CAO #		ne .		9,2600
Second Quarter 2009	U	U	U	U .	C1C #	U 465-73-6	25	- :	8260B
Isodrin					CAS#				00700
Second Quarter 2009	U	U	U	U .		U 70.50.4	5 :		8270C
Isophorone					CAS#	78-59-1			



#### Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 10D4

Analyte/Quarter	10D4 Q	10D3 Q	10D3D Q	10DDH2R Q	10MW1 Q	QL	GPS	Methoa
Isopropylbenzene				CAS#	98-82-8			
Second Quarter 2009	U	U	U	U	U	0.5		8260B
Isopropylether				CAS#	108-20-3			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
4-Isopropyltoluene				CAS#	99-87-6			
Second Quarter 2009	U	U	U	U	U	0.5	<del>-</del> :	8260B
Isosafrole				CAS#	120-58-1			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Kepone				CAS#	143-50-0			
Second Quarter 2009	U	Ü	U	U	U	5	- 1	8270C
Methacrylonitrile				CAS#	126-98-7			
Second Quarter 2009	U	U	U	U	U	5	-	8260B
Methapyrilene				CAS #	91-80-5			
Second Quarter 2009	UJ	UJ	UJ	n 1	UJ	5		8270C
Methoxychlor				CAS#	72-43-5			
Second Quarter 2009	U	U	U	U	U	0.5	<del>-</del> :	8081A
Bromomethane				CAS #	74-83-9			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Chloromethane				CAS#	74-87-3			
Second Quarter 2009	U	U	U	U	U	1	-	8260B
3-Methylcholanthrene				CAS#	56-49-5			
Second Quarter 2009	U	U	U	U	U	5		8270C
lodomethane	·			C4S #	74-88-4			
Second Quarter 2009	U	U	. U	U	U	0.5	- 1	8260B
Methyl methacrylate	<u></u>			CAS#	80-62-6			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Methyl methane sulfona	ite		.1	CAS#	66-27-3		i	
Second Quarter 2009	U	U	U	U	U	5	- !	8270C
2-Methylnaphthalene				CAS#	91-57-6			
Second Quarter 2009	U	U	U	U	U	5	- :	8270C
Methyl parathion				CAS#	298-00-0			na ere ere ere ere ere ere
Second Quarter 2009	UJ	UJ	UJ	UJ	UJ	5	- 1	8270C
4-Methyl-2-pentanone				CAS#	108-10-1			
Second Quarter 2009	U	U	U	U	U	5 .	-	8260B
2-Methylphenol	· · · · · · · · · · · · · · · · · · ·		<u></u>	CAS #	95-48-7			
Second Quarter 2009	U	U	U	U	U	5	_	8270C
3 & 4-Methylphenol	<u></u>			CAS#	m 108-39-4	p 106-44-		
Second Quarter 2009	U	U	U	U	U	10	-	8270C
Methyl tert-butyl ether	:		·	CAS#	1634-04-4			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Dibromomethane	.;			CAS#	74-95-3			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Methylene chloride	. 1		<u> </u>	C.45 #	75-09-2			
Second Quarter 2009	υ	U	U	U	U U	1 .	-	8260B
Naphthalene			·		91-20-3			
Second Quarter 2009	U	U	: U	U	U	0.5	-	8260B
1,4-Naphthoquinone			-		130-15-4			22000
Second Quarter 2009	U	U						



#### Radford Army Ammunition Plant, Radford, Virginia

 $Upgradient\ well = 10D4$ 

GPS Method	GPS	QL	10MW1 Q	10DDH2R Q	DQ	10D3L	Q	10D3	D4 Q	10D-	Analyte/Quarter
			134-32-7	C.4S #		***************************************					1-Naphthylamine
- 8270C	<del>-</del>	5	U	U		U		U	U	U	Second Quarter 2009
			91-59-8	CAS#							2-Naphthylamine
- 8270C	-	5	UJ	UJ	J	U	J	U	U J	U	Second Quarter 2009
			88-74-4	CAS#							o-Nitroaniline
- 8270C	-	10	U	U		U		U	U	U	Second Quarter 2009
			99-09-2	CAS#							m-Nitroaniline
- 8270C	-	10	U	U		U		U	U	U	Second Quarter 2009
			100-01-6	CAS#							p-Nitroaniline
- 8270C	-	10	U	U		U		U	U	U	Second Quarter 2009
			98-95-3	CAS#							Nitrobenzene
- 8270C	- "	5	U	U		U		U	U	· U	Second Quarter 2009
			88-75-5	C.4S #							o-Nitrophenol
- 8270C	-	5	U	U		U		U	U	U	Second Quarter 2009
			100-02-7	CAS#							p-Nitrophenol
- 8270C	-	10	U	U		U		U	U	U	Second Quarter 2009
			56-57-5	CAS#						•	4-Nitroquinoline-1-oxide
- 8270C	-	5	UJ	UJ	J	U	J	U	U J	U	Second Quarter 2009
			924-16-3	CAS#						е	N-Nitrosodi-n-butylamine
- 8270C	~	5	U	U		U		U	U	U	Second Quarter 2009
			55-18-5	CAS#							N-Nitrosodiethylamine
- 8270C	-	5	U	U		U		U	U .	U	Second Quarter 2009
and the second and an experience of the			62-75-9	CAS#							N-Nitrosodimethylamine
- 8270C	-	5	U	U		U		U	U .	. U	Second Quarter 2009
			86-30-6	CAS#						:	N-Nitrosodiphenylamine
- 8270C	-	5	U	U		U		U	U	: U	Second Quarter 2009
			621-64-7	CAS#							N-Nitrosodipropylamine
- 8270C	-	5	U	U		U		U	U	IJ	Second Quarter 2009
			10595-95-6	CAS#						ine	N-Nitrosomethylethylami
- 8270C	-	5	U	U		U		U	U	U	Second Quarter 2009
			59-89-2	CAS#							N-Nitrosomorpholine
- 8270C		5	UJ	UJ	J	U	J	U	U J	U	Second Quarter 2009
			100-75-4	CAS#							N-Nitrosopiperidine
- 8270C	•	5	U	U		U		U	U	U	Second Quarter 2009
			930-55-2	CAS#							N-Nitrosopyrrolidine
- 8270C	· · · · · · · · · · · · · · · · · · ·	5	UJ	UJ	J	U	J	U	U J	: U	Second Quarter 2009
			99-55-8	CAS#		i					5-Nitroso-o-toluidine
- 8270C		5	U	U		U		U	υ	U	Second Quarter 2009
			56-38-2	CAS#						alia na comunica	Parathion
- 8270C	-	5	U	U		U		U	U	U	Second Quarter 2009
			608-93-5	CAS#	4		!				Pentachlorobenzene
- 8270C	· · · · · · · · · · · · · · · · · · ·	5	U	U		U		U	U	U	Second Quarter 2009
			76-01-7	C.4S #							Pentachloroethane
- 8260B		0.5	U	U		Ų		U	U	U	Second Quarter 2009
<u></u>			82-68-8	CAS#		Larrana and a recommenda				е	Pentachloronitrobenzene
- 8270C		5	U	U	:	U		U	U	. U	Second Quarter 2009
			87-86-5	CAS#							
-	: -	10	87-86-5 U	CAS#		U		U	Ū	U	Pentachlorophenol Second Quarter 2009

#### Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 10D4

Analyte/Quarter	10D4 Q	10D3 Q	10D3D Q	) 10DDH2R	Q_10MW1	Q QL	GPS	Method
Phenacetin				C.4.	S # 62-44-2			
Second Quarter 2009	U	U	U	U	U	5		8270C
Phenanthrene				CA	S # 85-01-8			
Second Quarter 2009	U	U	U	U	U	5	- -	8270C
Phenol				CA	s # 108-95-2			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Phorate				CA.	s # 298-02-2			
Second Quarter 2009	U	U	U	U	U	5	_	8270C
2-Picoline				CA.	s # 109-06-8			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Pronamide				C.4.	s # 23950-58-	-5		
Second Quarter 2009	U	U	: · · · · · ·	U	U	5	-	8270C
1-Propanol			<del>-</del>		S # 71-23-8			
Second Quarter 2009	UJ	UJ	UJ		UJ	1000		8260B
2-Propanol	0 0	0 0			s # 67-63-0			-
Second Quarter 2009	U	 U	2200	U	U	100	 -	8260B
Fourth Quarter 2009	ΟJ	UJ	20000	: U J			- -	8260B
	0 0		20000		s # 107-12-0		-	02005
Propionitrile Second Quarter 2009	U	U	U	 U	U	10		8260B
	U				S # 103-65-1		-	02000
n-Propylbenzene								00000
Second Quarter 2009	U	U	. U	U	S # 129-00-0	0.5		8260B
Pyrene								00700
Second Quarter 2009	Ų J	U J	UJ	UJ		5		8270C
Pyridine					S # 110-86-1			
Second Quarter 2009	U	U	U	U again	U	. 1.	- -	8270C
Safrole					\$# 94-59-7			
Second Quarter 2009	U	U	U	U	U	5	· -	8270C
Silvex				C.4.	S # 93-72-1			
Second Quarter 2009	U	U	U	U	U	2.5	· -	8151A
Styrene				CA	\$ # 100-42-5			
Second Quarter 2009	U	U	U	U	U	0.5	. <del>-</del>	8260B
Sulfotep				CA	s # 3689-24-5			
Second Quarter 2009	U	U	U	U	U	5		8270C
2,4,5-Trichlorophenoxya	acetic acid			CA.	s# 93-76-5			
Second Quarter 2009	U	U	U	U	U	2.5	; -	8151A
1,2,4,5-Tetrachlorobenz	ene			CA.	S# 95-94-3			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
1,1,1,2-Tetrachloroethar	ne			CA.	s # 630-20-6			
Second Quarter 2009	U	U	U	U	U	0.5	=	8260B
1,1,2,2-Tetrachloroethar	ne		:	CA	5 # 79-34-5			
Second Quarter 2009	U	U	U	U	U	0.5		8260B
Tetrachloroethene				CA.	S # 127-18-4			
Second Quarter 2009	U	U	U	U	U	1	: •	8260B
Tetrahydrofuran					s # 109-99-9		· i	
Second Quarter 2009	U .	U	U	U	J U	5		8260B
					s # 58-90-2	· · · · · · · · · · · · · · · · · · ·		02005
2,3,4,6-Tetrachlorophen		1 I	U	U			:	8270C
Second Quarter 2009	. U		. i		S # 108-88-3	5	<u> </u>	02/00
Toluene				CA.	J # 100-00-3			



#### Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 10D4

Analyte/Quarter	10D4 Q	10D3 Q	-10D3D Q	10DDH2R Q	10MW1 Q	QL	GPS	Method
o-Toluidine				C4S	# 95-53-4			
Second Quarter 2009	UJ	U J	U J	UJ	UJ	5	-	8270C
Toxaphene				CAS	# 8001-35-2			
Second Quarter 2009	U	U	U	U	U	2.5	_	8081A
1,2,3-Trichlorobenzene				CAS	# 87-61-6			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,2,4-Trichlorobenzene				CAS	# 120-82-1			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,1,1-Trichloroethane				CAS	# 71-55-6			
Second Quarter 2009	U	U	U	U	U	1	-	8260B
1,1,2-Trichloroethane				CAS	# 79-00-5			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Trichloroethene				CAS	# 79-01-6			
Second Quarter 2009	U	U	U	U	U	1	5	8260B
Fourth Quarter 2009	U	U	U	U	U	1	5	8260B
Trichlorofluoromethane				CAS	# 75-69-4			
Second Quarter 2009	U	U	U	U	U	1	-	8260B
2,4,5-Trichlorophenol				C.4S	# 95-95-4			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
2,4,6-Trichlorophenol				CAS	# 88-06-2			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
1,2,3-Trichloropropane				CAS	# 96-18-4			
Second Quarter 2009	U	U	U	U	U .	1 .	-	8260B
1,1,2-Trichloro-1,2,2-Trifl	luoroethar	ne		CAS	# 76-13-1			
Second Quarter 2009	U	U	U	U	U	1	-	8260B
O,O,O-Triethyl phosphor	othioate			CAS	# 126-68-1			
Second Quarter 2009	U	U	U	U	U	5	-	8270C
1,2,4-Trimethylbenzene				C.4S	# 95-63-6			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,3,5-Trimethylbenzene				C.4S	# 108-67-8			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
sym-Trinitrobenzene				CAS	# 99-35-4			
Second Quarter 2009	UJ	UJ	UJ	UJ	UJ	5	=	8270C
Vinyl acetate				CAS	# 108-05-4			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Vinyl chloride				CAS	# 75-01-4			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Xylenes (Total)				CAS	# 1330-20-7			
Second Quarter 2009	U	U	U	U	U	3	10000	8260B
Fourth Quarter 2009	U	U	U	U	U	3	10000	8260B

#### Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 10D4

All Results in ug/L.

Analyte/Quarter 10D4 Q 10D3 Q 10D3D Q 10DDH2R Q 10MW1 Q QL GPS Method

#### Definitions:

- QL Denotes permit required quantitation limit.
- U Denotes analyte not detected at or above QL.
- UA Denotes analyte not detected at or above adjusted sample QL.
- J Denotes associated result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
- UN Denotes analyte concentration is less than the quantiation limit and five times the blank concentration.

  Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when results are reported to at or above the detection limit.
- R Denotes result rejected.
- Q Denotes data validation qualifier.

CAS# Denotes Chemical Abstract Services registration number.

GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 4 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002). For cobalt, vanadium, acetone and 2-propanol, these analytes are not listed in Appendix VIII to 40 CFR Part 261; therefore, GPSs will not be established for these constituents.

NS denotes not sampled.

NA denotes not analyzed.

"-" denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

#### Appendix IX Monitoring Events:

First Quarter 2003, Second Quarter 2004, Second Quarter 2005,

Third Quarter 2006, Second Quarter 2007, Second Quarter 2008, Second Quarter 2009

For Appendix IX monitoring, compliance well results reported/evaluated to detection limit.

Verification events: 12/12/03, 06/17/04, 7/25/2005.

6/17/04. Verification event. Acetone: 10D3D was not detected during verification event. Verification event result reported.

7/25/05. Verification event. All wells: ethyl acetate. 10D3D: alpha-BHC, acetone and 2-propanol. All verification results: Not detected except for acetone and 2-propanol. Verification results presented in table.

7/17/2008. Verification event. 10MW1. Technical chlordane, diethyl phthalate. Verification results reported-all not detected. 6/11/2009 – Verification event, 10DDH2R, Diethyl ether, Verification results reported in table-all not detected.



## Comprehensive Data Validation Report

# Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Draper Aden Associates

Facility: HWMU-10

Monitoring Event: Second Quarter 2009

		Laboratory Validated Result Result	Validated Result	ar	
Analyte	Sample ID	Sample ID (ug/L) Q (ug/L) Q	(ug/L) Q	(ng/L)	Validation Notes
Method: 6020					1   1   1   1   1   1   1   1   1   1
Laboratory: CompuChem, a Division of Liberty Analtyical, Cary, NC	, a Division of	<sup>c</sup> Liberty Analty	vical, Cary, NC		
Barium	10D3	118	118 J	10	Internal standard In115 recovered low (68%).
	10DUP	102	102	10	No action taken. Blind field duplicate for 10D3. RPD 14
Method: 8260B					
Laboratory: Lancaster Laboratories, Lancaster, PA	tboratories, La	ncaster, PA			
Chloroform	10D3	4.9	4.9	0.5	No action taken. Blind field duplicate result 4.7 ug/l.
	TODITE	4.7	4.7	0.5	No action taken. Field duplicate for 10D3.

QL Denotes permit quantitation limit.
Q Denotes data qualifier.
J Denotes analyte reported at or above QL and associated result is estimated.



# Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Monitoring Event: Fourth Quarter 2009 Facility: HWMU-10

	41	41::00		7	
		uesu	Result	身	
Analyte	Sample ID	0 ( [/pii)	Sample ID ( I/oii) O ( I/oii) O ( I/oii)	( [/011)	Validation Notes

Method: 6020

Laboratory: CompuChem, a Division of Liberty Analtyical, Cary, NC

10 No action taken. RPD < 10. Blind field duplicate for this well is 10DUP.	10 No action taken. Blind field duplicate for 10D3. RPD < 10.	
105	601	
105	109	
10D3	10DUP	Standard Commence of the State of State
rium		

Method: 8260B

Laboratory: Lancaster Laboratories, Lancaster, PA

No action taken. Blind field duplicate for this well is 10DUP. RPD <10.	No action taken. Blind field duplicate for 10D3.
1	
16	17
16	17
10D3	10DUP
Chloroform	

QL Denotes permit quantitation limit.

Obenotes data qualifier.

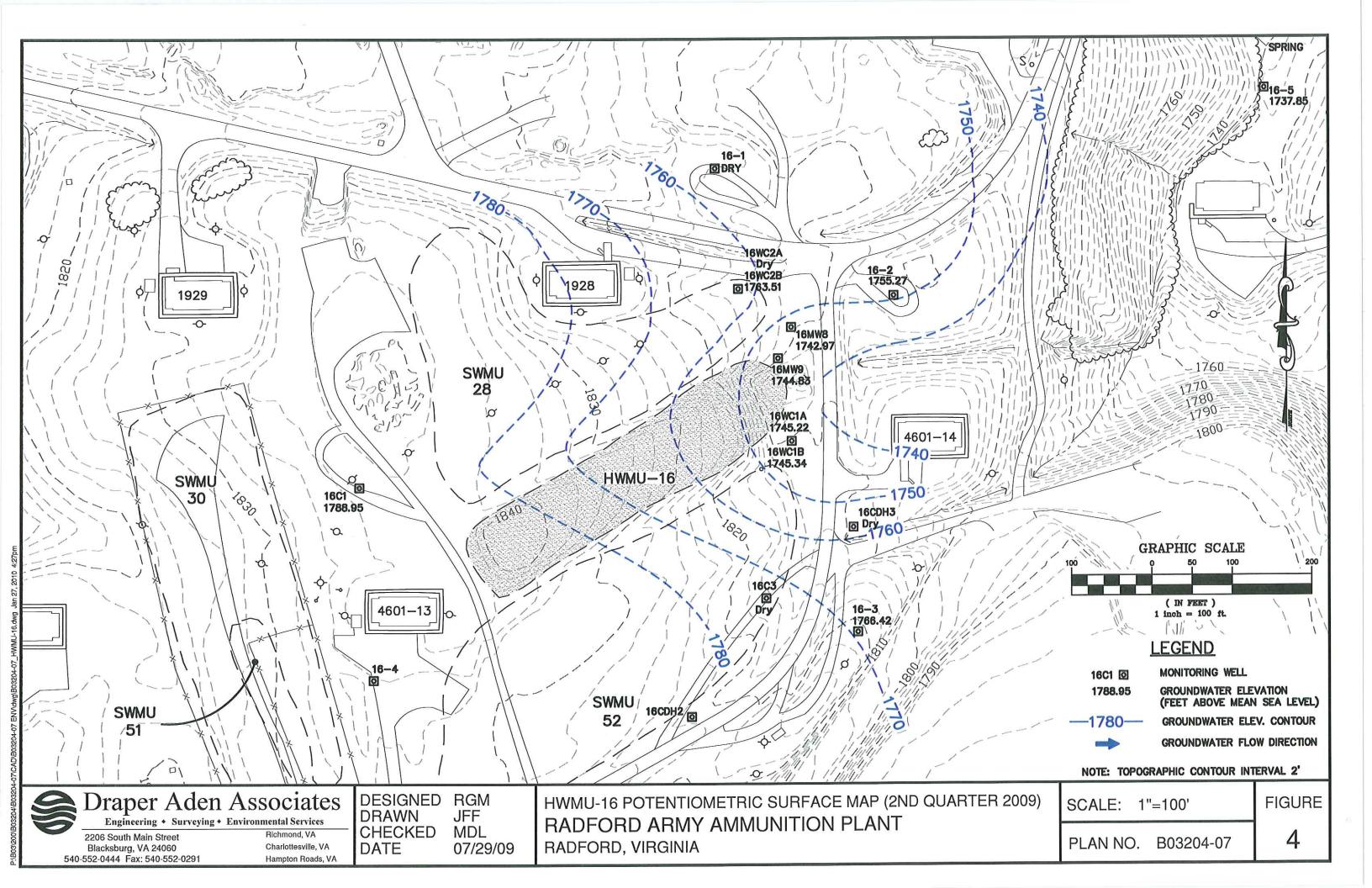
J Denotes analyte reported at or above QL and associated result is estimated.

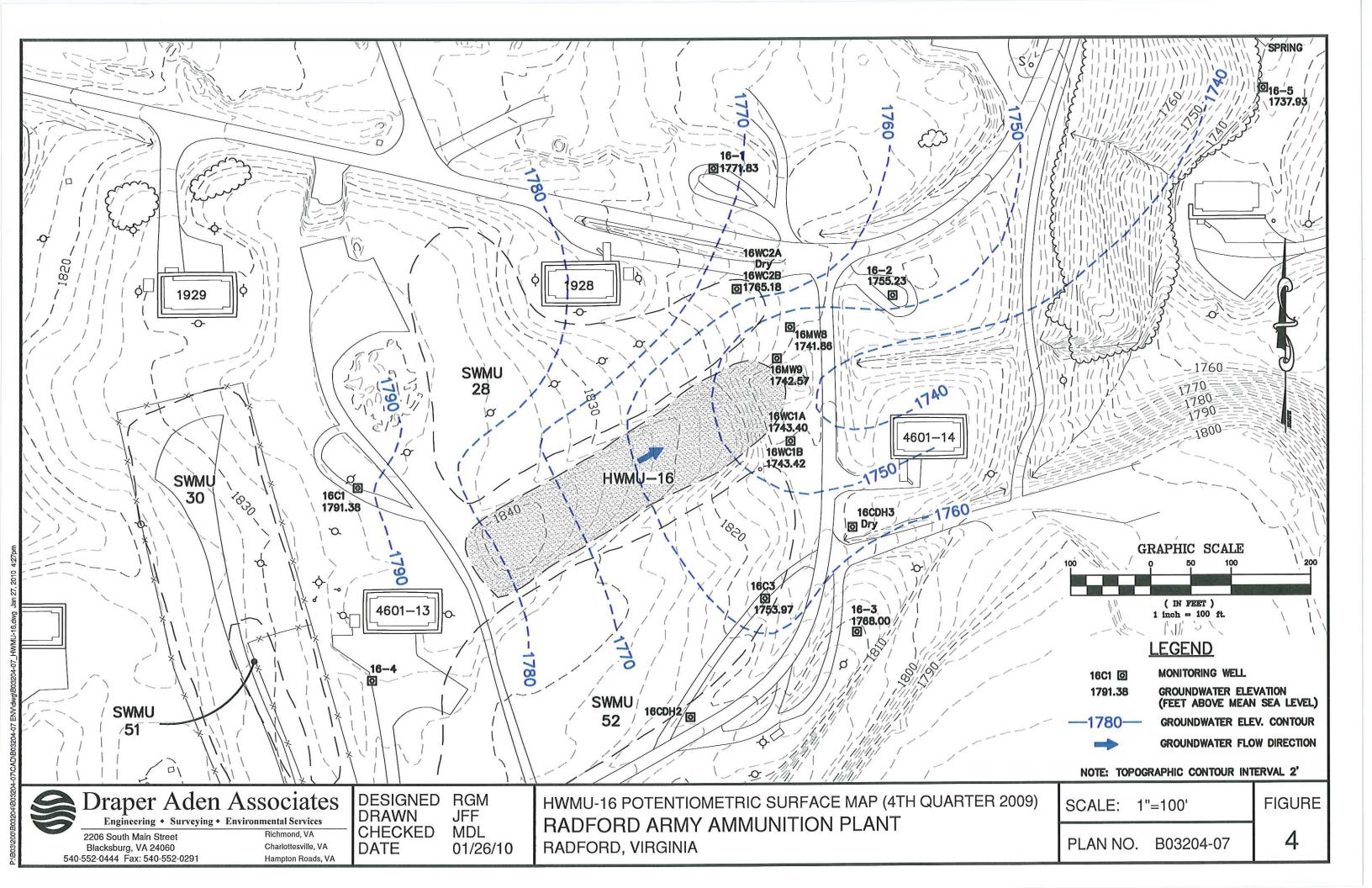
APPENDIX D

**HWMU-16** 

#### **APPENDIX D-1**

HWMU-16 POTENTIOMETRIC SURFACE MAPS SECOND QUARTER 2009 FOURTH QUARTER 2009





#### APPENDIX D-2

HWMU-16 2009 LABORATORY ANALYTICAL RESULTS POINT OF COMPLIANCE WELLS

*Upgradient well = 16C1* 

Analtye/Ouarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	GPS	Method
Antimony					CAS#	7440-36-0		
Second Quarter 2009	U	U	U	U	U	1	6	6020
Fourth Quarter 2009	U	U	U	U	U	1	6	6020
Arsenic					CAS#	7440-38-2		
Second Quarter 2009	U	U	U	U	U	10	50	6020
Fourth Quarter 2009	U	UJ	UJ	U	U J	10	50	6020
Barium					CAS#	7440-39-3		
Second Quarter 2009	196	84.5	349	217	207	10	2000	6020
Fourth Quarter 2009	191	95.7	492	199	175	10	2000	6020
Beryllium					CAS#	7440-41-7		
Second Quarter 2009	U	0.25 J	U	U	U CAS#	1	4	6020
Fourth Quarter 2009	U	U	U	U	U	1	4	6020
	0	U	U	U			4	0020
Cadmium	U	0.00 1	U	U	CAS#		-	
Second Quarter 2009		0.23 J				1	5	6020
Fourth Quarter 2009	UJ	UJ	UJ	U	U J	1	5	6020
Chromium					CAS#	7440-47-3		
Second Quarter 2009	U	U	U	U	1.2 J	5	100	6020
Fourth Quarter 2009	U	UJ	UJ	U	U J	5	100	6020
Cobalt					CAS#	7440-48-4		
Second Quarter 2009	U	1.7 J	2.3 J	9.6	U	5	313	6020
Fourth Quarter 2009	U	UJ	U J	8.8	U J	5	313	6020
Copper					CAS#	7440-50-8		
Second Quarter 2009	U	7.9	U	U	U	5	1300	6020
Fourth Quarter 2009	U	13.6 J	U J	U	U J	5	1300	6020
Lead	-		-		CAS#	7439-92-1		
Second Quarter 2009	U	0.91 J	U	U	U CAS#	1	15	6020
Fourth Quarter 2009	UJ	4	UJ	U	U J	1	15	6020
	UJ	-	J J				13	0020
Mercury Second Quarter 2000	U	U	U	U	CAS#		2	7470
Second Quarter 2009					1.4 J	2		7470
Fourth Quarter 2009	U	U	U	U	U	2	2	7470
Nickel					CAS#	7440-02-0		
Second Quarter 2009	U	4.6 J	8.3 J	5.4 J	6.2 J	10	313	6020
Fourth Quarter 2009	U	UJ	UJ	U	U J	10	313	6020
Selenium					CAS#	7782-49-2		
Second Quarter 2009	U	U	U	U	U	10	50	6020
Fourth Quarter 2009	U	UJ	UJ	U	U J	10	50	6020
Silver					CAS#	7440-22-4		
Second Quarter 2009	U	1.1 J	U	U	U	2	78.25	6020
Fourth Quarter 2009	UJ	2.1 J	UJ	U	U J	2	78.25	6020
Thallium					CAS#	7440-28-0		
Second Quarter 2009	U	U	U	U	U CAS#	1	-	6020
Tin	-	-			CAS#			
Second Quarter 2009	U	U	U	U	U CAS#	5	_	6020
						7440-62-2		
Vanadium Second Quarter 2009	U	U	U	U	CAS#	10	109.55	6020
	U	UJ	U J	U	U J	10	109.55	
Fourth Quarter 2009	U	U J	U J	U			109.55	6020
Zinc	11 1	05.0 '	11 1	0.4	CAS #	7440-66-6	4005	222
Second Quarter 2009	U J	25.3 J	UJ	6.1 J	13.1 J	10	4695	6020
Fourth Quarter 2009	U	44.2 J	UJ	U	18.2 J	10	4695	6020
Sulfide			-		CAS#	18496-25-8	-	
Second Quarter 2009	UJ	U	U	U	U	1000	-	9034
Cyanide					CAS#	57-12-5		
Second Quarter 2009	U	U	U	U	U	20	-	9012
Acenaphthene					CAS#	83-32-9		



Upgradient well = 16C1

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B		GPS	Method
Acenaphthylene					CAS#	208-96-8		
Second Quarter 2009	UJ	UJ	UJ	U J	U J	5	-	8270C
Acetone					CAS#	67-64-1		
Second Quarter 2009	U	UN	U	U	U	10	223.57	8260B
Acetonitrile					CAS#	75-05-8		
Second Quarter 2009	U	U	U	U	U	20	_	8260B
								02000
Acetophenone						98-86-2		20722
Second Quarter 2009	U	U	U	U	U	5	-	8270C
2-Acetylaminofluorene					CAS#	53-96-3		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Acrolein					CAS#	107-02-8		
Second Quarter 2009	U J	UJ	UJ	U J	U J	25	_	8260E
						107-13-1		
Acrylonitrile					CAS#			00000
Second Quarter 2009	U	U	U	U	U	5	-	8260B
Aldrin					CAS#	309-00-2		
Second Quarter 2009	U	U	U	U	U	0.05	-	8081A
Allyl chloride					CAS#	107-05-1		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
1-Aminobiphenyl Second Quarter 2009	U	U	U	U	CAS#	92-67-1 5		82700
	U	U	U	U			-	82/00
Aniline					CAS#			
Second Quarter 2009	U	U	U	U	U	5	-	82700
Anthracene					CAS#	120-12-7		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Aramite					CAC#	140-57-8		
Second Quarter 2009	U	U	U	U	CAS#	5	_	82700
Second Quarter 2009	U	<u> </u>	U				-	02/00
Benzene						71-43-2		
Second Quarter 2009	0.2 J	U	U	U	U	0.5	-	8260E
Benzo[a]anthracene					CAS#	56-55-3		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Benzo[b]fluoranthene					CAS#	205-99-2		
Second Quarter 2009	U	U	U	U	U U	5		82700
	-		-					02700
Benzo[k]fluoranthene					CAS#	207-08-9		
Second Quarter 2009	U J	UJ	UJ	U J	U J	5	-	82700
Benzo[ghi]perylene					CAS#	191-24-2		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Ronzo(a)nyrono					CAS#	50-32-8		
Benzo(a)pyrene Second Quarter 2009	U	U	U	U	U U	5		82700
	-		-					02700
I,4-Benzenediamine					CAS#	106-50-3		
Second Quarter 2009	U J	UJ	UJ	U J	U J	50	-	8270C
Benzyl alcohol					CAS#	100-51-6		
Second Quarter 2009	U	U	U	U	U	5	-	82700
alpha-BHC					CAS#	319-84-6		
Second Quarter 2009	U	U	U	U	U U	0.05	_	8081 <i>A</i>
								00017
peta-BHC						319-85-7		
Second Quarter 2009	U	U	U	U	U	0.05		8081 <i>A</i>
delta-BHC					CAS#	319-86-8	-	
Second Quarter 2009	U	U	U	U	U	0.05	-	8081 <i>A</i>
gamma-BHC					CAS#	58-89-9		
Second Quarter 2009	U	U	U	U	U CAS#	0.05	_	8081 <i>A</i>
								00017
ois(2-Chloroethoxy)methane			.,		CAS#	111-91-1		
Second Quarter 2009	U	U	U	U	U	5	-	82700
ois(2-Chloroethyl)ether					CAS#	111-44-4		
Second Quarter 2009	U J	UJ	UJ	U J	U J	5	-	82700
ois(2-Chloro-1-methylethyl)ethe	r				CAS#	108-60-1		
Second Quarter 2009	U J	UJ	U J	U J	U J	5		82700
SSSSIII QUALTE 2003	0 0	0 0	0 0	0 0	0 0	J	-	02/00



Upgradient well = 16C1

Analtye/Ouarter	16C1	16MW8	16MW9	16WC1A	16WC1B		GPS	Method
ois(2-Ethylhexyl)phthalate						117-81-7		
Second Quarter 2009	U	U	U	U	U	5	10	82700
3romobenzene					CAS#	108-86-1		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
Bromochloromethane					CAS#	74-97-5		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
Bromodichloromethane					CAS#	75-27-4		
Second Quarter 2009	U	U	U	U	U	1	-	8260E
Bromoform					CAS#	75-25-2		
Second Quarter 2009	U	U	U	U	U U	0.5	-	8260E
4-Bromophenyl phenyl ether					CAS#	101-55-3		
Second Quarter 2009	U	U	U	U	U	5	_	82700
						78-93-3		
2-Butanone Second Quarter 2009	U	U	U	U	U CAS#	10	691.08	8260E
Fourth Quarter 2009	U	U	U	U	U	10	691.08	8260E
n-Butyl alcohol						71-36-3		
Second Quarter 2009	U	U	U	U	U	50	-	8260E
ert-Butyl alcohol					CAS#	75-65-0		
Second Quarter 2009	U	U	U	U	U	10	-	8260E
n-Butylbenzene					CAS#	104-51-8		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
sec-Butylbenzene					CAS#	135-98-8		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
ert-Butylbenzene					CAS#	98-06-6		
Second Quarter 2009	U	U	U	U	U U	0.5	-	8260
Butyl benzyl phthalate					CAS#	85-68-7		
Second Quarter 2009	U	U	U	U	U	5	_	82700
					CAE#			
Carbon disulfide Second Quarter 2009	U	U	U	U	CAS#	0.5		8260E
		0	0					02001
Carbon tetrachloride Second Quarter 2009	U	U	U	U	U CAS#	<i>56-23-5</i>	5	0000
								8260E
Fourth Quarter 2009	U	U	U	U	U	1	5	8260E
Chlordane						57-74-9		
Second Quarter 2009	U	U	U	U	U	0.86	-	8081
o-Chloroaniline					CAS#	106-47-8		
Second Quarter 2009	UJ	UJ	UJ	UJ	U J	5	-	82700
Chlorobenzene					CAS#	108-90-7		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
Chlorobenzilate					CAS#	510-15-6		
Second Quarter 2009	U	U	U	U	U	5	_	82700
			-					
o-Chloro-m-cresol Second Quarter 2009	U	U	U	U	CAS#	5		82700
	U	U	U	U				02/00
Chloroethane	0.7	11	0.0 1	0.0 1	CAS#	75-00-3		200
Second Quarter 2009	3.7	U	0.9 J	0.3 J	U	1	-	8260E
Fourth Quarter 2009	4.4	U	1.7	U	U	1		8260E
Chloroform					CAS#	67-66-3		
Second Quarter 2009	U	U	U	U	U	1	80	8260E
2-Chloroethyl vinyl ether					CAS#	110-75-8		
Second Quarter 2009	U J	U J	U J	UJ	U J	0.5	-	8260E
2-Chloronaphthalene					CAS#	91-58-7		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	82700
2-Chlorophenol						95-57-8		
Second Quarter 2009	U	U	U	U	U CAS#	5	_	82700
								02,00
1-Chlorophenyl phenyl ether Second Quarter 2009	U J	U J	U J	U J	CAS#	7005-72-3 5	_	90700
	O J	U J	U J	U J			-	82700
Chloroprene					CAS#	126-99-8		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E



Upgradient well = 16C1

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	GPS	Method
2-Chlorotoluene					CAS#	95-49-8		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
4-Chlorotoluene					CAS#	106-43-4		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Chrysene					CAS#	218-01-9		
Second Quarter 2009	U J	U J	UJ	U J	U J	5	_	8270C
								02700
Cyclohexane	- 11			- 11	CAS#	0.5		00000
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
2,4-Dichlorophenoxyacetic acid						94-75-7		
Second Quarter 2009	U	U	U	U	U	5	-	8151A
4,4'-DDD					CAS#	72-54-8		
Second Quarter 2009	U	U	U	U	U J	0.1	-	8081A
4,4'-DDE					CAS#	72-55-9		
Second Quarter 2009	U	U	U	U	U U	0.1		8081A
								0001A
4,4'-DDT					CAS#	50-29-3		
Second Quarter 2009	U	UN	U	U	U	0.1	-	8081A
Diallate	-				CAS#	2303-16-4		-
Second Quarter 2009	UJ	UJ	UJ	U J	U J	5	-	8270C
Dibenz(a,h)anthracene					CAS#	53-70-3		
Second Quarter 2009	U	U	U	U	U U	5	-	8270C
D'I						132-64-9		
Dibenzofuran	11 1		11 1	11 1	CAS#			8270C
Second Quarter 2009	UJ	U J	UJ	U J	U J	5		82700
Dibromochloromethane					CAS#	124-48-1		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,2-Dibromo-3-chloropropane					CAS#	96-12-8		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,2-Dibromoethane					CAS#	106-93-4		
Second Quarter 2009	U	U	U	U	U	0.5		8260B
			<u> </u>					02000
Di-n-butyl phthalate						84-74-2		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
1,2-Dichlorobenzene					CAS#	95-50-1		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,3-Dichlorobenzene					CAS#	541-73-1		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
					C1.C #	106-46-7		
1,4-Dichlorobenzene Second Quarter 2009	U	U	U	U	CAS#	0.5	_	8260B
	U	U	U	U	U		-	820UB
3,3'-Dichlorobenzidine					CAS#	91-94-1		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
trans-1,4-Dichloro-2-butene					CAS#	110-57-6		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8260B
Dichlorodifluoromethane					CAS#	75-71-8		
Second Quarter 2009	0.7 J	0.3 J	U	0.1 J	U CAS#	1	46.5	8260B
Fourth Quarter 2009	U	U	U	U	U	1	46.5	8260B
1,1-Dichloroethane					CAS#	75-34-3		
Second Quarter 2009	7.6	0.1 J	3.4	1	0.2 J	1	296.08	8260B
Fourth Quarter 2009	8.2	U	5.9	U	U	1	296.08	8260B
1,2-Dichloroethane					CAS#	107-06-2		
Second Quarter 2009	U	U	U	U	U CAS#	1	5	8260B
	-		0	-			3	0200D
1,1-Dichloroethene					CAS#	75-35-4		
Second Quarter 2009	0.3 J	U	U	U	U	0.5	-	8260B
trans-1,2-Dichloroethene					CAS#	156-60-5		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
2,4-Dichlorophenol					CAS#	120-83-2		
Second Quarter 2009	U	U	U	U	U CAS#	5	_	8270C
	-	<u> </u>		-				32700
2,6-Dichlorophenol					CAS#			
Second Quarter 2009	U	U	U	U	U	5	-	8270C



Upgradient well = 16C1

Analtye/Ouarter	16C1	16MW8	16MW9	16WC1A	16WC1B		GPS	Method
,2-Dichloropropane						78-87-5		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
,3-Dichloropropane					CAS#	142-28-9		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
						594-20-7		
2,2-Dichloropropane	- 11				CAS#			0000
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
,1-Dichloropropene					CAS#	563-58-6		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
sis-1,3-Dichloropropene					CAS#	10061-01-5		
Second Quarter 2009	U	U	U	U	U U	0.5	-	8260
						10061-02-6		
rans-1,3-Dichloropropene					CAS#			00001
Second Quarter 2009	U	U	U	U	U	0.5		82601
Dieldrin					CAS#	60-57-1		
Second Quarter 2009	U	U	U	U	U	0.1	-	8081
Diethyl ether					CAS#	60-29-7		
Second Quarter 2009	22	1.2 J	5.9 J	1.5 J	U U	12.5		82601
							-	
Fourth Quarter 2009	24	U	15	U	U	12.5	-	8260
iethyl phthalate					CAS#	84-66-2		
Second Quarter 2009	U	U	U	U	U	5	12,520	8270
0.00					G. G. W.	297-97-2		
0,O-Diethyl O-2-pyrazinyl					CAS#			2072
Second Quarter 2009	U	U	U	U	U	5	-	8270
Dimethoate					CAS#	60-51-5		
Second Quarter 2009	U J	UJ	UJ	U J	U J	5	-	8270
Dimethyl ether					CAS#	115-10-6		
Second Quarter 2009	6.3 J	0.1 J	3 J	0.9 J	0.3 J	12.5	_	9260
							-	8260
Fourth Quarter 2009	U	U	U	U	U	12.5	-	8260
o-(Dimethylamino)azobenzene					CAS#	60-11-7		
Second Quarter 2009	U	U	U	U	U	5	-	8270
140 B' II II II II II					G. G. W.	F7.07.0		
',12-Dimethylbenz[a]anthracen						57-97-6		0070
Second Quarter 2009	U	U	U	U	U	5	-	8270
3,3'-Dimethylbenzidine					CAS#	119-93-7		
Second Quarter 2009	UJ	UJ	UJ	UJ	U J	5	-	8270
,a-Dimethylphenethylamine					CAS#	122-09-8		
Second Quarter 2009	U J	UJ	UJ	U J	U J	50	_	8270
								0270
2,4-Dimethylphenol					CAS#	105-67-9		
Second Quarter 2009	U	U	U	U	U	5	-	8270
Dimethyl phthalate					CAS#	131-11-3		
Second Quarter 2009	U	U	U	U	U	5	-	8270
n-Dinitrobenzene						99-65-0		
Second Quarter 2009	U	U	U	U	U	5	-	8270
I,6-Dinitro-o-cresol					CAS#	534-52-1		
Second Quarter 2009	U J	UJ	UJ	UJ	U J	10	-	8270
2,4-Dinitrophenol					CAS#	51-28-5		
Second Quarter 2009	U J	U J	UJ	U J	U J	10	-	8270
2,4-Dinitrotoluene					CAS#	121-14-2		
Second Quarter 2009	U	U	U	U	U	10	31.3	8270
Fourth Quarter 2009	U	U	U	U	U	10	31.3	8270
							01.0	0270
,6-Dinitrotoluene					CAS#	606-20-2		
Second Quarter 2009	U	U	U	U	U	10	15.65	8270
Fourth Quarter 2009	U	U	U	U	U	10	15.65	8270
	-	-	-	-			****	
Dinoseb						88-85-7		
Second Quarter 2009	U	U	U	U	U	2.5	-	8151
Di-n-octyl phthalate					CAS#	117-84-0		
Second Quarter 2009	U	U	U	U	U	5	-	8270
,4-Dioxane					CAS#	123-91-1		2000
Second Quarter 2009	U	U	U	U	U	100	-	82601



Upgradient well = 16C1

Diphenylamine Second Quarter 2009  Disulfoton Second Quarter 2009  Endosulfan I Second Quarter 2009  Endosulfan II Second Quarter 2009  Endosulfan sulfate Second Quarter 2009  Endrin Second Quarter 2009  Ethyl acetate Second Quarter 2009  Endrin aldehyde Second Quarter 2009  Ethanol Second Quarter 2009  Ethyl benzene Second Quarter 2009	0 J U J U J U J U J U J U J U J U J U J	0 J U J U J U J U J U J U J U J U J U J	U U J U U	U J U	CAS# U  CAS#	5 298-04-4 5 959-98-8 0.05 33213-65-9 0.1 1031-07-8	-	8270C 8270C 8081A 8081A
Disulfoton Second Quarter 2009  Endosulfan I Second Quarter 2009  Endosulfan II Second Quarter 2009  Endosulfan sulfate Second Quarter 2009  Endrin Second Quarter 2009  Ethyl acetate Second Quarter 2009  Endrin aldehyde Second Quarter 2009  Ethanol Second Quarter 2009  Ethanol Second Quarter 2009	n n n n n n n n n n n n n n n n n n n	n n n n n n n n n n n n n n n n n n n	n n 1	n 1	CAS# U CAS# U J CAS# U J CAS# U U U U U U U U U U U U U U U U U U U	298-04-4 5 959-98-8 0.05 33213-65-9 0.1 1031-07-8 0.1	-	8270C 8081A 8081A
Second Quarter 2009  Endosulfan I Second Quarter 2009  Endosulfan II Second Quarter 2009  Endosulfan sulfate Second Quarter 2009  Endrin Second Quarter 2009  Ethyl acetate Second Quarter 2009  Endrin aldehyde Second Quarter 2009  Ethanol Second Quarter 2009  Ethanol Second Quarter 2009	n 1 n 1	n n n n n n n n n n n n n n n n n n n	U J	U J	U CAS# U J CAS# U J CAS# U J	5 959-98-8 0.05 33213-65-9 0.1 1031-07-8 0.1		8081A 8081A
Endosulfan I Second Quarter 2009 Endosulfan II Second Quarter 2009 Endosulfan sulfate Second Quarter 2009 Endrin Second Quarter 2009 Ethyl acetate Second Quarter 2009 Endrin aldehyde Second Quarter 2009 Ethanol Second Quarter 2009	n 1 n 1	n n n n n n n n n n n n n n n n n n n	U J	U J	CAS # U J  CAS # U J  CAS # U U	959-98-8 0.05 33213-65-9 0.1 1031-07-8 0.1		8081A 8081A
Second Quarter 2009  Endosulfan II Second Quarter 2009  Endosulfan sulfate Second Quarter 2009  Endrin Second Quarter 2009  Ethyl acetate Second Quarter 2009  Endrin aldehyde Second Quarter 2009  Ethanol Second Quarter 2009  Ethanol Second Quarter 2009  Ethylbenzene	n n n	n n	n n	U J	U J  CAS # U J  CAS # U	0.05 33213-65-9 0.1 1031-07-8 0.1		8081 <i>A</i>
Endosulfan II Second Quarter 2009 Endosulfan sulfate Second Quarter 2009 Endrin Second Quarter 2009 Ethyl acetate Second Quarter 2009 Endrin aldehyde Second Quarter 2009 Ethanol Second Quarter 2009 Ethylbenzene	n n n	n n	n n	U J	CAS # U J  CAS # U	33213-65-9 0.1 1031-07-8 0.1		8081 <i>A</i>
Second Quarter 2009  Endosulfan sulfate Second Quarter 2009  Endrin Second Quarter 2009  Ethyl acetate Second Quarter 2009  Endrin aldehyde Second Quarter 2009  Ethanol Second Quarter 2009  Ethylbenzene	0 0	U J	U	U	U J  CAS#  U	0.1 1031-07-8 0.1	-	
Endosulfan sulfate Second Quarter 2009 Endrin Second Quarter 2009 Ethyl acetate Second Quarter 2009 Endrin aldehyde Second Quarter 2009 Ethanol Second Quarter 2009 Ethylbenzene	0 0	U J	U	U	CAS#	1031-07-8 0.1	-	
Second Quarter 2009  Endrin Second Quarter 2009  Ethyl acetate Second Quarter 2009  Endrin aldehyde Second Quarter 2009  Ethanol Second Quarter 2009  Ethylbenzene	U J	U U J	U		U	0.1	-	8081A
Endrin Second Quarter 2009 Ethyl acetate Second Quarter 2009 Endrin aldehyde Second Quarter 2009 Ethanol Second Quarter 2009 Ethylbenzene	U J	U U J	U				-	8081A
Second Quarter 2009  Ethyl acetate Second Quarter 2009  Endrin aldehyde Second Quarter 2009  Ethanol Second Quarter 2009  Ethylbenzene	n n n	U J		U	CAS#	72-20 8		
Ethyl acetate Second Quarter 2009 Endrin aldehyde Second Quarter 2009 Ethanol Second Quarter 2009 Ethylbenzene	n n n	U J		U		14-40-0		
Second Quarter 2009  Endrin aldehyde Second Quarter 2009  Ethanol Second Quarter 2009  Ethylbenzene	U				U	0.1	-	8081A
Second Quarter 2009  Endrin aldehyde Second Quarter 2009  Ethanol Second Quarter 2009  Ethylbenzene	U				CAS#	141-78-6		
Endrin aldehyde Second Quarter 2009 Ethanol Second Quarter 2009 Ethylbenzene			UJ	U J	U J	100		8260B
Second Quarter 2009  Ethanol Second Quarter 2009  Ethylbenzene					CAS#	7421-93-4		
Ethanol Second Quarter 2009 Ethylbenzene		U	U	U	U	0.1	-	8081A
Second Quarter 2009  Ethylbenzene				-				
Ethylbenzene	UJ	U J	UJ	U J	CAS#	100		8260B
	0 0	0 0	0 0	0 0				02000
Second Quarter 2009	- 11				CAS#	100-41-4	70	2222
	U	U	U	U	U	1	70	8260B
Fourth Quarter 2009	U	U	U	U	U	1	70	8260B
Ethyl methacrylate	-		-		CAS#	97-63-2		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Ethyl methanesulfonate					CAS#	62-50-0		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Ethylene oxide					CAS#	75-21-8		
Second Quarter 2009	UJ	U J	UJ	U J	U J	100	-	8260B
Famphur					CAS#	52-85-7		
Second Quarter 2009	U	U	U	U	U	5	_	8270C
Fluoranthene					CAS#	206-44-0		
Second Quarter 2009	U	U	U	U	U	5	_	8270C
						86-73-7		
Fluorene Second Quarter 2009	U J	U J	UJ	U J	CAS#	5		8270C
	0 0	0 0	0 0	0 0				02700
Heptachlor					CAS#	76-44-8		00014
Second Quarter 2009	U	U	U	U	U	0.05	-	8081A
Heptachlor epoxide					CAS#	1024-57-3		
Second Quarter 2009	U	U	U	U	U	0.05	-	8081A
Hexachlorobenzene					CAS#	118-74-1		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Hexachlorobutadiene					CAS#	87-68-3		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Hexachlorocyclopentadiene					CAS#	77-47-4		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Hexachloroethane					CAS#	67-72-1		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Hexachlorophene					CAS#			
Second Quarter 2009	U J	UJ	UJ	U J	U J	500		8270C
						1888-71-7		
Hexachloropropene Second Quarter 2009	U	U	U	U	U CAS#	5		8270C
	U	U	U	J				02700
2-Hexanone	- 11				CAS#			2005
Second Quarter 2009	U	U	U	U	U	5	-	8260B
Indeno[1,2,3-cd]pyrene					CAS#	193-39-5		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Isobutyl alcohol					CAS#			
Second Quarter 2009	U	U	U	U	U	25	-	8260B
					0.0"	465 70 C		
Isodrin					CAS#	465-73-6		



Upgradient well = 16C1

Analtye/Ouarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	GPS	Method
sophorone					CAS#	78-59-1		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Isopropylbenzene					CAS#	98-82-8		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
loonronulathar					CAS#	108-20-3		
Second Quarter 2009	U	U	U	U	U CAS#	0.5	_	8260E
								0200L
4-Isopropyltoluene					CAS#			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
Isosafrole					CAS#	120-58-1		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Kepone					CAS#	143-50-0		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Mathaemdenituila					C15.#	126-98-7		
Methacrylonitrile	U	U	U	U	CAS#	5		8260
Second Quarter 2009	U	U	U	U	U		-	82001
Methapyrilene					CAS#	91-80-5		
Second Quarter 2009	UJ	UJ	UJ	UJ	U J	5	-	82700
Methoxychlor					CAS#	72-43-5		
Second Quarter 2009	U	U	U	U	U	0.5	-	8081
Bromomethane					CAS#	74-83-9		
Second Quarter 2009	U	U	U	U	U CAS#	0.5	_	8260
								02001
Chloromethane						74-87-3		
Second Quarter 2009	U	U	U	U	U	1	2.11	82601
Fourth Quarter 2009	UJ	UJ	UJ	UJ	U J	1	2.11	82601
3-Methylcholanthrene					CAS#	56-49-5		
Second Quarter 2009	U	U	U	U	U.	5	_	82700
odomethane	U	U	U	U	CAS#	74-88-4		00001
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
Methyl methacrylate					CAS#	80-62-6		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
Methyl methane sulfonate					CAS#	66-27-3		
Second Quarter 2009	U	U	U	U	U	5	-	82700
2-Methylnaphthalene					CAS#	91-57-6		
Second Quarter 2009	U	U	U	U	U U	5		82700
								02700
Methyl parathion					CAS#	298-00-0		
Second Quarter 2009	UJ	UJ	UJ	U J	U J	5	-	82700
I-Methyl-2-pentanone					CAS#	108-10-1		
Second Quarter 2009	U	U	U	U	U	5	-	8260
2-Methylphenol					CAS#	95-48-7		
Second Quarter 2009	U	U	U	U	U	5	-	82700
							- 100 11	
8 & 4-Methylphenol						m 108-39-4	p 106-44-	2070
Second Quarter 2009	U	U	U	U	U	10	-	82700
Methyl tert-butyl ether					CAS#	1634-04-4		
Second Quarter 2009	U	U	U	U	U	0.5	-	82601
Dibromomethane					CAS#	74-95-3		
Second Quarter 2009	U	U	U	U	U	0.5	-	82601
						75-09-2		
Methylene chloride Second Quarter 2009	5.1	U	U	U	CAS#	1		82601
							-	
Fourth Quarter 2009	5.9	U	U	U	U	1	-	82601
Naphthalene					CAS#	91-20-3		
Second Quarter 2009	U	U	U	U	U	0.5	-	82601
.4-Naphthoguinone					CAS#	130-15-4		
Second Quarter 2009	U	U	U	U	U U	5		8270
	J	<u> </u>	J	-			-	02100
-Naphthylamine					CAS#	134-32-7		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Nonbthulamina			-		0.0.0.0	01 50 0		-
2-Naphthylamine					CAS#	91-59-8		

Upgradient well = 16C1

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B		GPS	Method
o-Nitroaniline			-			88-74-4	-	-
Second Quarter 2009	U	U	U	U	U	10	-	82700
m-Nitroaniline					CAS#	99-09-2		-
Second Quarter 2009	U	U	U	U	U	10	-	82700
p-Nitroaniline					CAS#	100-01-6		
Second Quarter 2009	U	U	U	U	U	10	-	82700
Nitrobenzene					CAS#	98-95-3		
Second Quarter 2009	U	U	U	U	U U	5	-	82700
o-Nitrophenol					CAS#	88-75-5		
Second Quarter 2009	U	U	U	U	U U	5	_	82700
								02700
p-Nitrophenol	- 11		U	- 11	CAS#	100-02-7		00700
Second Quarter 2009	U	U	U	U	U	10	-	82700
4-Nitroquinoline-1-oxide					CAS#	56-57-5		
Second Quarter 2009	UJ	U J	UJ	U J	U J	5	-	82700
N-Nitrosodi-n-butylamine					CAS#	924-16-3		
Second Quarter 2009	U	U	U	U	U	5	-	82700
N-Nitrosodiethylamine					CAS#	55-18-5		
Second Quarter 2009	U	U	U	U	U U	5	-	82700
						62-75-9		
N-Nitrosodimethylamine Second Quarter 2009	U	U	U	U	U CAS#	5		82700
								02700
N-Nitrosodiphenylamine				11		86-30-6		
Second Quarter 2009	U	U	U	U	U	5	-	82700
N-Nitrosodipropylamine					CAS#	621-64-7		
Second Quarter 2009	U	U	U	U	U	5	-	82700
N-Nitrosomethylethylamine					CAS#	10595-95-6		
Second Quarter 2009	U	U	U	U	U	5	-	82700
N-Nitrosomorpholine					CAS#	59-89-2		
Second Quarter 2009	U J	UJ	UJ	U J	U J	5	_	82700
						100-75-4		02,00
N-Nitrosopiperidine Second Quarter 2009	U	U	U	U	CAS#	100-75-4 5		82700
	U	0	U	<u> </u>			-	02/00
N-Nitrosopyrrolidine					CAS#	930-55-2		
Second Quarter 2009	UJ	UJ	UJ	U J	U J	5	-	82700
5-Nitroso-o-toluidine					CAS#	99-55-8		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Parathion					CAS#	56-38-2		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Pentachlorobenzene					CAS#	608-93-5		
Second Quarter 2009	U	U	U	U	U CAS#	5	_	82700
								02,00
Pentachloroethane					CAS#	76-01-7		00005
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
Pentachloronitrobenzene Pentachloronitrobenzene						82-68-8		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Pentachlorophenol					CAS#	87-86-5		
Second Quarter 2009	U	U	U	U	U	10	=	82700
Phenacetin					CAS#	62-44-2		
Second Quarter 2009	U	U	U	U	U U	5	-	82700
					a.a."			
Phenanthrene Second Quarter 2009	U	U	U	U	CAS#	5	_	82700
	U	U	U	U				82700
Phenol						108-95-2		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Total Recoverable Phenolics					CAS#	C-020		
Second Quarter 2009	U J	U	U	U	U	60	=	9065
Phorate					CAS#	298-02-2		
Second Quarter 2009	U	U	U	U	U U	5	-	82700
	-	-	-	-				
2-Picoline				- 11	CAS#	931-19-1		00700
Second Quarter 2009	U	U	U	U	U	5	-	82700

Upgradient well = 16C1

Analtye/Ouarter	16C1	16MW8	16MW9	16WC1A	16WC1B		GPS	Method
Pronamide					CAS#	23950-58-5		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
I-Propanol					CAS#	71-23-8		
Second Quarter 2009	UJ	U J	U J	U J	U J	100	_	8260B
2-Propanol			11 1		CAS#	67-63-0		0000
Second Quarter 2009	UJ	UJ	UJ	U J	U J	100		8260B
Propionitrile					CAS#	107-12-0		
Second Quarter 2009	U	U	U	U	U	10	-	8260B
n-Propylbenzene					CAS#	103-65-1		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
Durana					CAC#	129-00-0		
Pyrene Second Quarter 2009	UJ	U J	UJ	UJ	CAS#	5		82700
	0 0	0 0	0 0	0 0				02700
Pyridine						110-86-1		
Second Quarter 2009	U	U	U	U	U	5	-	82700
Safrole					CAS#	94-59-7		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Silvex					CAC#	93-72-1		
Second Quarter 2009	U	U	U	U	U CAS#	2.5	_	8151 <i>A</i>
	-		J	<u> </u>			-	01018
Styrene					CAS#	100-42-5		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
Sulfotep					CAS#	3689-24-5		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
2,4,5-Trichlorophenoxyacetic	anid				CAS#	93-76-5		
Second Quarter 2009	U	U	U	U	U U	2.5	-	8151 <i>A</i>
	U		U	<u> </u>				01317
1,2,4,5-Tetrachlorobenzene					CAS#	95-94-3		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
1,1,1,2-Tetrachloroethane					CAS#	630-20-6		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
1,1,2,2-Tetrachloroethane					CAS#	79-34-5		
Second Quarter 2009	U	U	U	U	U U	0.5	_	8260E
								02002
Tetrachloroethene						127-18-4		
Second Quarter 2009	0.3 J	U	U	U	U	1	5	8260E
Fourth Quarter 2009	U	U	U	U	U	1	5	8260E
Tetrahydrofuran					CAS#	109-99-9		
Second Quarter 2009	14	U	U	U	U U	1	-	8260E
	• •							
2,3,4,6-Tetrachlorophenol					CAS#			20726
Second Quarter 2009	U	U	U	U	U	5	-	82700
Toluene					CAS#	108-88-3		
Second Quarter 2009	U	U	U	U	U	1	1000	8260E
Fourth Quarter 2009	U	U	U	U	U	1	1000	8260E
					C+C #	95-53-4		
o-Toluidine			11 1		CAS#			00706
Second Quarter 2009	UJ	UJ	UJ	U J	U J	5	-	82700
T <u>oxaphene</u>					CAS#	8001-35-2		
Second Quarter 2009	U	U	U	U	U	2.5	-	8081 <i>A</i>
1,2,3-Trichlorobenzene					CAS#	87-61-6		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
1,2,4-Trichlorobenzene					010."	120-82-1		
Second Quarter 2009	U	U	U	U	CAS#	0.5	-	00605
	U	U	U	U			-	8260E
1,1,1-Trichloroethane						71-55-6		
Second Quarter 2009	0.7	U	U	U	U	1	200	8260E
Fourth Quarter 2009	1.1	U	U	U	U	1	200	8260E
1,1,2-Trichloroethane	11	11	U	11	CAS#			0000
Second Quarter 2009	U	U	U	U	U	0.5	-	8260E
Trichloroethene					CAS#	79-01-6		
Second Quarter 2009	0.2 J	U	U	U	U	0.5	5	8260E
Fourth Quarter 2009	U	U	U	U	U	1	5	8260E
		-	-	-	-		-	

*Upgradient well = 16C1* 

Trichlorofluoromethane Second Quarter 2009 Fourth Quarter 2009  2,4,5-Trichlorophenol Second Quarter 2009  2,4,6-Trichlorophenol Second Quarter 2009  1,2,3-Trichloropropane Second Quarter 2009  1,1,2-Trichloro-1,2,2-Trifluoroe	0.6 J U	U U	U U	U U	CAS# 5	1	469.5 469.5	8260B 8260B
Fourth Quarter 2009  2,4,5-Trichlorophenol Second Quarter 2009  2,4,6-Trichlorophenol Second Quarter 2009  1,2,3-Trichloropropane Second Quarter 2009	U	U	U	U	U CAS# S	1		
2,4,5-Trichlorophenol Second Quarter 2009 2,4,6-Trichlorophenol Second Quarter 2009 1,2,3-Trichloropropane Second Quarter 2009	U	U	<u> </u>		CAS#		469.5	8260B
Second Quarter 2009  2,4,6-Trichlorophenol Second Quarter 2009  1,2,3-Trichloropropane Second Quarter 2009			U	U		35-95-4		
2,4,6-Trichlorophenol Second Quarter 2009 1,2,3-Trichloropropane Second Quarter 2009			U	U				
Second Quarter 2009  1,2,3-Trichloropropane Second Quarter 2009	U	П			U	5	-	8270C
1,2,3-Trichloropropane Second Quarter 2009	U	TH.			CAS# 8	38-06-2		
Second Quarter 2009		U	U	U	U	5	-	8270C
					CAS#			
1.1.2-Trichloro-1.2.2-Trifluoroe	U	U	U	U	U	0.5	-	8260B
	ethane				CAS#	76-13-1		
Second Quarter 2009	U	U	U	U	U	1	-	8260B
Fourth Quarter 2009	U	U	U	U	U	1	-	8260B
O,O,O-Triethyl phosphorothio	ate				CAS#	126-68-1		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
1,2,4-Trimethylbenzene					CAS#	95-63-6		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,3,5-Trimethylbenzene					CAS#	108-67-8		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
sym-Trinitrobenzene					CAS#	99-35-4		
Second Quarter 2009	UJ	UJ	UJ	U J	U J	5	-	8270C
Vinyl acetate					CAS#	108-05-4		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Vinyl chloride					CAS#	75-01-4		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Xylenes (Total)					CAS#	1330-20-7		
Second Quarter 2009	U	U	U	U	U	3	10000	8260B
Fourth Quarter 2009		U	U	U	U	3		

Upgradient well = 16C1 All Results in ug/L.

16MW9 16WC1A 16WC1B

#### **Definitions:**

Analtye/Quarter

The following definitions apply to results reported for Appendix IX monitoring events.

All Appendix IX monitoring results for compliance wells are reported to the detection limit.

16MW8

Appendix IX Monitoring Events: 3Q2003, 2Q-2004, 2Q-2005, 3Q2006, 2Q2007, 2Q2008, 2Q2009

QL Denotes permit required quantitation limit.

U denotes not detected at or above the detection limit.

UA denotes not detected at or above the adjusted detection limit.

CAS# Denotes Chemical Abstract Services registration number.

16C1

J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above the detection limit and detection limit and QL are estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.

UN Denotes analyte concentration is less than the quantitation limit and/or five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.

R Denotes result rejected.

Q Denotes data validation qualifier. X Denotes mass spectral confirmation not obtained-result suspect.

Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), where applicable.

**GPS** Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002).

NS denotes not sampled. NA denotes not analyzed.

"-" denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

## The following definitions apply to results reported for non-Appendix IX monitoring events. All non-Appendix IX monitoring results for compliance wells are reported at or above the quantitation limit.

QL Denotes permit required quantitation limit.

U Denotes analyte not detected at or above QL.

UA Denotes analyte not detected at or above adjusted sample QL.

J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.

R Denotes result rejected.

O Denotes data validation qualifier.

**Background** Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), where applicable.

CAS# Denotes Chemical Abstract Services registration number.

**GPS** Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002).

#### NOTE:

Fourth Quarter 2008:

Due to laboratory error all HWMU 16 samples were analyzed using Method 8260B 5 ml purge instead of a 25 ml purge which resulted in a higher QL. For these samples, all results were evaluated to the detection limit, which is comparable to the permit QL. Results below the laboratory QL but at or above the permit QL are reported and qualified as estimated. Second Quarter 2009:

Verification event 6/11/2009 - 16MW8 for acetone. Verification result reported as not detected.



GPS

Method

# Comprehensive Data Validation Report

# Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Draper Aden Associates

Monitoring Event: Second Quarter 2009 Facility: HWMU-16

	_	Laboratory Validated Result Result	Validated Result	σΓ	
Analyte	Sample ID	Sample ID (ug/L) Q	(ug/L) Q	(ng/L)	Validation Notes
Method: 6020					
Laboratory: CompuChem, a Division of Liberty Analtyical, C	m, a Division of	Liberty Anall	yical, Cary, NC	a contribution	The state of the s
Barium	16WC1A	217	217	10	No action taken.
	16WDUP	215	215	10	No action taken. Blind field duplicate for 16WC1A.
Cobalt	16WC1A	9.6	9.6	5	No action taken.
	16WDUP	10.9	10.9	5	No action taken. Blind field duplicate for 16WC1A.
Method: 8260B					
Laboratory: Lancaster Laboratories, Lancaster, PA	aboratories, La	ncaster, PA			
1,1-Dichloroethane	16WC1A	-	_		No action taken.
	16WDUP		-		No action taken. Blind field duplicate for 16WC1A.

Definitions:

Data Validation Qualifiers:

QL Denotes permit quantitation limit. Q Denotes data qualifier. J Denotes analyte reported at orabove quantitation limit and associated result is estimated.

# Comprehensive Data Validation Report

# Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Draper Aden Associates

Facility: HWMU-16

Monitoring Event: Fourth Quarter 2009

	_	>	Validated	5	
		Result	Result	3	
Analyte	Sample ID	(ug/L) Q	ID (ug/L) Q (ug/L) Q (ug/L)	(ng/L)	Validation Notes
Method: 6020					

Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC

Barium	16WC1A	199	199		10	No action taken. Blind field duplicate 16WDUP, RPD <10.
	16WDUP	207	207		10	No action taken. Blind field sample duplicate for 16WC1A. RPD <10.
Cobalt	16WC1A	8.8	8.8		5	No action taken. Blind field duplicate 16WDUP, RPD <10.
	16WDUP	8.4	8.4	_	5	Blind field sample duplicate for 16WC1A. RPD <10. Internal standard relative intensity was low
The state of the s					THE CONTRACTOR OF THE CONTRACT	(65%). Result estimated.

0₩

## Definitions:

Data Validation Qualifiers:
QL Denotes permit quantitation limit. Q Denotes data qualifier.
J Denotes analyte reported at or above quantitation limit and associated result is estimated.

#### APPENDIX D-3

HWMU-16 2009 LABORATORY ANALYTICAL RESULTS PLUME MONITORING WELLS

### Target Analyte Monitoring Results At Or Above Permit Quantitation Limit HWMU-16 Plume Monitoring Wells

#### Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

*Upgradient well = 16C1* 

Analtye/Quarter	16C1 Q	16-1 Q	16-2 Q	16-3 Q	16-5 Q	16WC2B Q	16SPRING Q	QL	Background	Method
Antimony						CAS #7440	0-36-0			
Second Quarter 2009	U	-	U A	U	U	U	U	1	3	6020
Fourth Quarter 2009	U	U	U	U	U	U	U	1	3	6020
Arsenic						CAS #7440	)-38-2			
Second Quarter 2009	U	-	U	U	U	U	U	10	1	6020
Fourth Quarter 2009	U	U	U	U	U	UJ	U	10	1	6020
Barium		1			1	CAS #7440	)-39-3			
Second Quarter 2009	196	-	277	646	170	119	283	10	175.4	6020
Fourth Quarter 2009	191	227	318	782	193	128	236	10	175.4	6020
Beryllium						CAS #7440	)-41-7			
Second Quarter 2009	U	-	U	U	U	U	U	1	0.7	6020
Fourth Quarter 2009	U	U	U	U	U	U	U	1	0.7	6020
Cadmium		1			1	CAS #7440	)-43-9			
Second Quarter 2009	U	-	U	U	U	U	U	1	0.2	6020
Fourth Quarter 2009	U J	U	U	U	U	U	U	1	0.2	6020
Chromium	1	1	1	1	1	CAS #7440	)-47-3	1		
Second Quarter 2009	U	-	U	U	U	U	U	5	6.2	6020
Fourth Quarter 2009	U	U	U	U	U	UJ	U	5	6.2	6020
Cobalt						CAS #7440	)-48-4			
Second Quarter 2009	U	-	U	U	U	U	U	5	5	6020
Fourth Quarter 2009	U	U	U	U	U	UJ	U	5	5	6020
Copper						CAS #7440	)-50-8			
Second Quarter 2009	U	-	U	U	U	U	U	5	13	6020
Fourth Quarter 2009	U	U	U	U	U	U J	U	5	13	6020
Lead						CAS #7439	9-92-1			
Second Quarter 2009	U	-	U	U	U	U	U	1	10	6020
Fourth Quarter 2009	U J	U	U	U	U	U	U	1	10	6020
Mercury	1	"	1		"	CAS #7439	9-97-6			
Second Quarter 2009	U	-	U	U	U	U	U	2	0.2	7470A
Fourth Quarter 2009	U	U	U	U	U	U	U	2	0.2	7470A
Nickel	1	"	1		"	CAS #7440	0-02-0			
Second Quarter 2009	U	-	U	U	U	U	U	10	16	6020
Fourth Quarter 2009	U	U	U	U	U	UJ	U	10	16	6020
Selenium						CAS #7782	2-49-2			
Second Quarter 2009	U	-	U	U	U	U	U	10	1	6020
Fourth Quarter 2009	U	U	U	U	U	UJ	U	10	1	6020
Silver						CAS #7440	)-22-4			
Second Quarter 2009	U	-	U	U	U	U	U	2	0.5	6020
Fourth Quarter 2009	U J	U	U	U	U	U	U	2	0.5	6020
Vanadium						CAS #7440	)-62-2			
Second Quarter 2009	U	-	U	U	U	U	U	10	151	6020
Fourth Quarter 2009	U	U	U	U	U	UJ	U	10	151	6020
Zinc						CAS #7440	)-66-6			
Second Quarter 2009	U J	-	U J	UJ	U J	UJ	UJ	10	51	6020
Fourth Quarter 2009	U	U	U	U	U	U J	U	10	51	6020
2-Butanone			•	•	•	CAS #78-9	3-3			
Second Quarter 2009	U	-	U J	UJ	U J	UJ	U J	10	1.1	8260B
Fourth Quarter 2009	U	U	U	U	U	U	U	10	1.1	8260B

### Target Analyte Monitoring Results At Or Above Permit Quantitation Limit HWMU-16 Plume Monitoring Wells

#### Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

*Upgradient well = 16C1* 

Analtye/Quarter	16C1 Q	16-1 Q	16-2 Q	16-3 Q	16-5 Q	16WC2B Q	16SPRING Q	QL	Background	Method
Carbon tetrachlorid		~	~	~	~	CAS #56-2	~			
Second Quarter 2009	U	-	U	U	U	U	U	1	0.2	8260B
Fourth Quarter 2009	U	U	U	U	U	U	U	1	0.2	8260B
Chloroethane						CAS #75-0	0-3			
Second Quarter 2009	3.7	_	U	U	U	U	U	1	20.7	8260B
Fourth Quarter 2009	4.4	U	U	U	U	U	U	1	20.7	8260B
Dichlorodifluorome	thane					CAS # 75-7	1-8			
Second Quarter 2009	0.7 J	-	U	U	U	U	U	1	46.5	8260B
Fourth Quarter 2009	U	U	U	U	U	U	U	1	46.5	8260B
1,1-Dichloroethane						CAS #75-3	4-3			
Second Quarter 2009	7.6	-	U	U	U	U	U	1	9.5	8260B
Fourth Quarter 2009	8.2	U	U	U	U	U	U	1	9.5	8260B
Diethyl ether						CAS #60-2	9-7			
Second Quarter 2009	22	-	U	U	U	U	U	12.5	75.5	8260B
Fourth Quarter 2009	24	U	U	U	U	U	U	12.5	75.5	8260B
Dimethyl ether	I .		1	l	<u> </u>	CAS #115-	10-6			
Second Quarter 2009	6.3 J	-	U	U	U	U	U	12.5	17.0	8260B
Fourth Quarter 2009	U	U	U	U	U	U	U	12.5	17.0	8260B
2,4-Dinitrotoluene						CAS # 121-	14-2			
Second Quarter 2009	U	-	U	U	U	U	U	10	0.1	8270C
Fourth Quarter 2009	U	U	U	U	U	U	U	10	0.1	8270C
2,6-Dinitrotoluene						CAS #606-	20-2			
Second Quarter 2009	U	-	U	U	U	U	U	10	0.11	8270C
Fourth Quarter 2009	U	U	U	U	U	U	U	10	0.11	8270C
Ethylbenzene		1				CAS # 100-	41-4			
Second Quarter 2009	U	-	U	U	U	U	U	1	0.1	8260B
Fourth Quarter 2009	U	U	U	U	U	U	U	1	0.1	8260B
Chloromethane						CAS #74-8	7-3			
Second Quarter 2009	U	-	U	U	U	U	U	1	0.3	8260B
Fourth Quarter 2009	U J	UJ	U J	U J	U J	UJ	U J	1	0.3	8260B
Methylene chloride						CAS #75-0	9-2			
Second Quarter 2009	5.1	-	U	U	U	U	U	1	13.95	8260B
Fourth Quarter 2009	5.9	U	U	U	U	U	U	1	13.95	8260B
Tetrachloroethene						CAS # 127-	18-4			
Second Quarter 2009	0.3 J	-	U	U	U	U	U	1	0.7	8260B
Fourth Quarter 2009	U	U	U	U	U	U	U	1	0.7	8260B
Toluene						CAS #108-	88-3			
Second Quarter 2009	U	-	U	U	U	U	U	1	0.1	8260B
Fourth Quarter 2009	U	U	U	U	U	U	U	1	0.1	8260B
1,1,1-Trichloroethan	ie					CAS #71-5	5-6			
Second Quarter 2009	0.7	-	U	U	U	U	U	1	9.2	8260B
Fourth Quarter 2009	1.1	U	U	U	U	U	U	1	9.2	8260B
Trichloroethene	II.	1	1	ı	II.	CAS #79-0	1-6	I	1	
Second Quarter 2009	0.2 J	-	U	U	U	U	U	0.5	0.1	8260B
Fourth Quarter 2009	U	U	U	U	U	U	U	1	0.1	8260B
Trichlorofluorometh	ane	1	1	l	I	CAS #75-6	9-4		1	
Second Quarter 2009	0.6 J	-	U	U	U	U	U	1	11.3	8260B
Fourth Quarter 2009	U	U	U	U	U	U	U	1	11.3	8260B



### Target Analyte Monitoring Results At Or Above Permit Quantitation Limit HWMU-16 Plume Monitoring Wells

#### Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

 $Upgradient \ well = 16C1$ 

Analtye/Quarter	16C1 Q	16-1 Q	16-2 Q	16-3 Q	16-5 Q	16WC2B Q	16SPRING Q	QL	Background	Method
1,1,2-Trichloro-1,2,2	-Trifluoro	ethane				CAS #76-1	3-1			
Second Quarter 2009	U	-	U	U	U	U	U	1	1.2	8260B
Fourth Quarter 2009	U	U	U	U	U	U	U	1	1.2	8260B
Xylenes (Total) CAS #1330-20-7										
Second Quarter 2009	U	-	U	U	U	U	U	3	0.2	8260B
Fourth Quarter 2009	U	U	U	U	U	U	U	3	0.2	8260B

#### **Definitions:**

All plume monitoring well results reported to at or above the permit quantitation limit except for the upgradient well during the Appendix IX monitoring Event. During this event, results for the upgradient well are reported to the detection limit.

- Q Denotes data validation qualifier.
- QL Denotes permit required quantitation limit.
- U Denotes analyte not detected at or above QL.
- UA Denotes analyte not detected at or above adjusted sample QL.
- J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
- UN Denotes analyte concentration is less than the quantiation limit and five times the blank concentration.

  Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.
- R Denotes result rejected.

**Background** Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002).

**CAS#** Denotes Chemical Abstract Services registration number.

**GPS** Denotes groundwater protection standard.

NS denotes not sampled. NA denotes not analyzed. "-"denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

#### Notes:

4Q2004. No data for 16-1 8270C-semivolatiles. Well dry-insufficient sample volume.

4Q2006 - No data for 16-1; well dry.

4Q2008- No data for 16-1; well dry.

2Q2009- No data for 16-1; well dry.

#### NOTE:

Fourth Quarter 2008

Due to laboratory error all HWMU 16 samples were analyzed using Method 8260B 5 ml purge instead of a 25 ml purge which resulted in a higher QL. For these samples, all results were evaluated to the detection limit, which is comparable to the permit QL. Results below the laboratory QL but at or above the permit QL are reported and qualified as estimated.



	APPENDIX D-4		
ESTABLISHED BACKGROUND	VALUES AND C	OMPUTATIONS FOR	R HWMU-16

- It was not understood why the majority of fluorescein detections were considered false positive detections. The basis of this observation is unclear considering a lack of background and laboratory confirmation results.
- It was not apparent why certain samples were selected for laboratory confirmation and others were not. There was no apparent consistency in the selection of samples for laboratory confirmation.
- Samples were submitted for confirmation laboratory analyses three months or more
  following the collection of the samples in the field. No information was provided
  regarding the custody and/or storage of the samples. The samples were submitted to the
  analytical laboratory with incomplete chain-of-custody (COC), and the COC
  documentation was not completed by the laboratory.

In summary, the data from the study do not provide the basis for meaningful interpretation. Any attempt to formulate conclusions from the data as presented regarding the presence of preferred or predominant groundwater flow patterns is not warranted or recommended.

# 3.3 HWMU-16 GROUNDWATER MONITORING ANALYTE LIST

The groundwater monitoring analyte list for HWMU-16 is presented in Table 1 (Appendix B). The list represents the subset of the constituents listed in Appendix III of 40 CFR Part 261 that previously have been detected in the groundwater and/or that are reasonably expected to be in or derived from waste contained in HWMU-16. As discussed in Section 3.5.2 below, 12 inorganic constituents and two explosive/propellant constituents have been detected in the groundwater monitoring network for HWMU-16 at statistically significant concentrations above the Unit's calculated background concentrations. The inorganic constituents may be derived from the aquifer formation materials; however, the two explosive/propellant constituents (2,4-Dinitrotoluene and 2,6-Dinitrotoluene) are byproducts of wastes derived from explosives. Therefore, the two explosive/propellant constituents detected could only be from HWMU-16.

The concentration limits established for the hazardous constituents also are listed in Table 1. The concentration limits represent either background concentrations calculated for the constituents in this GWQAR, Maximum Concentrations of Constituents for Ground-water Protection listed in Table 1 of 40 CFR 264.94, USEPA Drinking Water Standard Maximum Contaminant Levels (MCLs), or alternate concentration limits (ACLs) established by the VDEQ (July 1998). Certain organic constituents on the list do not have USEPA MCLs or VDEQ ACLs; they also do not have calculated background concentrations because they have not been detected in the Unit's upgradient well. Therefore, the concentration limits for these constituents are equal to their respective method detection limits.

As Alliant discussed with the VDEQ in the past, the reliability of previous laboratory analytical data - particularly dissolved metals data - appeared to be questionable in some cases. In an April 9, 1996 letter to C. Jake (Alliant), the VDEQ agreed that only total metals concentrations in groundwater would be measured, as described in a USEPA Region III guidance on groundwater sampling in karst terrain. Therefore, all references to metals concentrations in this GWQAR refer to total metals concentrations.

# 3.4 HWMU-16 GROUNDWATER BACKGROUND CONCENTRATIONS

Background concentrations were calculated for each constituent in the groundwater monitoring program using the analytical data from 1996 through 1998 for upgradient well 16C1.

The background concentration calculations were based on site wide 95% confidence, 95% coverage upper prediction intervals. The calculated background concentrations are listed in Table 2 (Appendix B). The background concentrations were used to construct the outermost closing contours on the Isoconcentration Maps (Appendix A).

# 3.5 HWMU-16 STATISTICAL ANALYSIS

Statistical evaluations for HWMU-16 are performed annually and submitted to the VDEQ in accordance with the annual reporting requirements specified in 40 CFR 265.94. As part of this GWQAR, statistical evaluations were performed on Fourth Quarter 1998 analytical data in accordance with the procedures and guidance provided in the following documents:

- Title 40 of the Code of Federal Regulations, 40 CFR 264.97 and 264.98;
- VDEQ Guidance for statistical analysis titled "Data Analysis Plan," undated;
- Interim Final Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, USEPA, April 1989;
- Addendum to Interim Final Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, USEPA, July 1992; and
- Statistical Methods for Groundwater Monitoring, Gibbons, R.D., 1994.

Statistical threshold values were computed for the 54 constituents for which HWMU-16 is currently monitored based on the concentrations of those constituents in upgradient (background) well 16C1. All data starting with First Quarter 1996 to Fourth Quarter 1998 were used for this purpose. The 1996 through 1998 monitoring data have been submitted previously to the VDEQ by Alliant in quarterly monitoring reports; therefore, the data are not listed in this GWQAR. Statistical comparisons were performed for the Fourth Quarter 1998 data set. Comparison statistical analyses were performed for all constituents which were detected in any downgradient well during that event.

# 3.5.1 Background Data and Statistical Comparisons

Statistical analyses were performed using the analytical results from upgradient well 16C1 data as background data. Based on the percentage of non-detects and the distribution of the background data, methods of statistical comparisons varied. Background average, standard deviation and other descriptive statistical data were computed for all constituents and are presented in Appendix C.

The constituents listed below were 100% non-detected in the background data. The background threshold levels (BTLs) for these constituents were established as equal to their detection limits (DL). Detections of these constituents in the downgradient wells during Fourth Quarter 1998 were compared to these BTLs.

Backgro	und Threshold Leve	el (BTL) = Detecti	on Limit (DL)						
Parameter Sample Size % Non-Detects (µg/l) BTL (µg/l)									
Antimony	12	100	3	3					
Arsenic	12	100	1	1					
Bromoform	12	100	0.3	0.3					
Carbon tetrachloride	12	100	0.2	0.2					
Chlorobenzene	12	100	0.1	0.1					
Chloromethane	12	100	0.3	0.3					
Cyanide	12	100	10	10					

Background Threshold Level (BTL) = Detection Limit (DL)								
	DL BTL							
Parameter	Sample Size	% Non-Detects	(μ <b>g/l</b> )	(μg/l)				
Di-n-butyl phthalate	12	100	5	5				
1,2-Dichloroethane	12	100	0.1	0.1				
trans-1,2-Dichloroethene	12	100	0.1	0.1				
1,4-Dichlorobenzene	12	100	0.1	0.1				
Ethylbenzene	12	100	0.1	0.1				
Mercury	12	100	0.2	0.2				
Methyl ethyl ketone	12	100	1.1	1.1				
Selenium	12	100	1	1				
1,1,2,2-Tetrachloroethane	12	100	0.3	0.3				
1,1,2-Trichloroethane	12	100	0.5	0.5				
Trichloroethene	12	100	0.1	0.1				
Toluene	12	100	0.1	0.1				
2378-TCDF	12	100	0.0485 ppt	0.0485 ppt				
12378-PECDF	12	100	0.0439 ppt	0.0439 ppt				
23478-PECDF	12	100	0.0417 ppt	0.0417 ppt				
123478-HXCDF	12	100	0.0390 ppt	0.0390 ppt				
123678-HXCDF	12	100	0.0377 ppt	0.0377 ppt				
234678-HXCDF	12	100	0.0428 ppt	0.0428 ppt				
123789-HXCDF	12	100	0.0415 ppt	0.0415 ppt				
1234678-HPCDF	12	100	0.0615 ppt	0.0615 ppt				
1234789-HPCDF	12	100	0.0709 ppt	0.0709 ppt				
OCDF	12	100	0.1307 ppt	0.1307 ppt				

Non-parametric prediction intervals were computed for all of the constituents for which the data from background well 16C1 satisfied one of the following two criteria, per VDEQ regulations and guidance as well as USEPA guidance:

- Percentage of non-detects was greater than or equal to 50 and less than 100; or
- Percentage of non-detects was less than 50, but data was not normally distributed in original or log-transformed mode.

The background threshold levels for these constituents were set as equal to their upper prediction limits (UPLs). The background and relevant statistical data for these constituents are summarized below. The confidence level and false positive rate were calculated based on the number of background data points available and number of future comparisons. For all constituents, the confidence level was determined to be equal to 0.933, and the false positive rate was equal to 0.067. Since the upper control limit of a non-parametric interval cannot be adjusted for multiple comparisons and inadequate number of background data, the number of resampling events required was adjusted to account for the high error rates inherent in those situations. The number of confirmation resamples required for all constituents is 2. The background and relevant statistical data for these constituents are summarized below. Associated statistical computations are presented in Appendix C.

BTL = Upper Prediction Limit of Non-parametric Prediction Interval w/false positive rate=0.067						
Parameter	Sample Size	% Non-Detects	DL (μg/l)	BTL (μg/l)		
Beryllium	12	75	0.2	0.7		
Cadmium	12	75	· 0.1	0.2		
Cobalt	12	75	1	5		
Copper	12	50	1	13		
1,1-Dichloroethane	12	0	0.2	9.5		
2,4-Dinitrotoluene	12	92	0.08	0.10		

BTL = Upper Prediction Limit of Non-parametric Prediction Interval w/false positive rate=0.067						
Parameter	Sample Size	% Non-Detects	DL (μg/l)	. BTL (μg/l)		
2,6-Dinitrotoluene	12	75	0.08	0.11		
Lead	12	42	, 1	10		
Nickel	12	92	- 15	16		
Silver	12	75	0.2	0.5		
Thallium	12	67	· 1	6		
TOC	12	75	1000	7000		
1,1,1-Trichloroethane	12	17	. 0.3	9.2		
Vanadium	12	83	4	151		
Vinyl Chloride	12	92	0.1	0.1		
Xylene (total)	12	92	0.1	0.2		
Zinc	12	50	5	51		

Chromium exhibited normally distributed data (excluding non-detects) with between 25% and 50% non-detects in the background well. The mean and standard deviation of the background data for chromium were adjusted using Cohen's Maximum Likelihood Estimator Method (1959, 1961). A one-sided parametric prediction interval was then computed for chromium based on the adjusted mean and standard deviation. The Upper Prediction Limit was set as the BTL for chromium. The background and relevant statistical data for chromium are summarized below. Cohen's adjustment computations and prediction interval computations are presented in Appendix C.

BTL = Upper Prediction Limit of Prediction Interval w/false positive rate=0.05									
Original Mean = 3.54, Original SD = 1.933 Adjusted Mean = 3.642. Adjusted SD = 1.95									
Auju	Steu Mean - J.	142. Aujusteu SD	- 1.7J						
			DL	BTL					
Parameter Sample Size % Non-Detects (μg/l) (μg/l)									
Chromium									

The following constituents exhibited normally distributed background data with less than 25% non-detects. One sided parametric prediction intervals were computed on the background data for all of these constituents. The UPLs for these constituents were set as their respective BTLs, with one exception. For pH, a two-sided parametric prediction interval was computed; therefore, the BTL for pH consisted of a range between the lower prediction limit (LPL) and the upper prediction limit. The background concentration calculations were based on a site wide 95% confidence, 95% coverage upper prediction intervals. When adjusted for multiple comparisons of the background data, the minimum required false positive rate was below 1% (0.01). A 99% confidence level (0.01 false positive rate) was used for all individual comparisons, which with the most conservative assumptions provided a site-wide false positive rate of >0.05 for all constituents. The background and relevant statistical data for these constituents are summarized below. The prediction interval computations for these constituents are presented in Appendix C.

BTL = UPL of one-sided Prediction Interval (exception pH) w/site-wide false positive rate>0.05 (individual comparisons false positive rate=0.01) BTL for pH = LPL – UPL of two-sided Prediction Interval								
Parameter Sample Size % Non-Detects (µg/l) BTL (µg/l)								
Barium	12	0	2	175.4				
Dichlorodifluoromethane	12	8	0.3	46.5				
Tetrachloroethene 12 17 0.1 0.7								
TOX	12	17	5	42.2				

BTL = UPL of one-sided Prediction Interval (exception pH) w/site-wide false positive rate>0.05 (individual comparisons false positive rate=0.01) BTL for pH = LPL – UPL of two-sided Prediction Interval								
Parameter Sample Size % Non-Detects (μg/l) (μg/l) Trichlorofluoromethane 12 0 0.5 11.3								
Specific Conductivity 8 0 1 μS/cm 672 μS/cm								
pН	8	0	0.1 pH units	5.7 to 7.9 pH units				

### 3.5.2 Results of Statistical Comparisons

The following table lists the constituents which were detected during the Fourth Quarter 1998 event at concentrations exceeding their respective background threshold levels (BTLs), and the downgradient wells in which they were detected.

Parameter	Monitoring Well(s)
Arsenic	16-5, 16WC2B
Barium	16-2, 16-3, 16-5, 16WC1A, 16WC1B, 16WC2B, 16SPRING
Beryllium	16WC1B, 16WC2B
Cadmium	16WC1B
Chromium	16-3, 16-5, 16WC1B, 16WC2B
Cobalt	16-5, 16WC1B, 16WC2B
Copper	16-5, 16WC1B, 16WC2B
Lead	16WC1B
Mercury	16WC1B
Nickel	16-5, 16WC1A, 16WC2B
Selenium	16-5, 16WC1B, 16WC2B
Zinc	16WC1B
2,4-Dinitrotoluene	16-3, 16-5, 16WC1B, 16WC2B, 16SPRING
2,6-Dinitrotoluene	16WC1A, 16WC1B

Any HWMU-16 target constituents not listed above were not detected in the downgradient monitoring wells at concentrations exceeding their respective BTLs.

#### 3.6 HWMU-16 PLUME DELINEATIONS

In accordance with VDEQ instructions presented during the May 19, 1999 meeting between Alliant and the VDEQ, Isoconcentration Maps were produced to depict constituent plumes in the groundwater beneath the site (Appendix A). In order to evaluate the shape and position of constituent plumes over time, historical Isoconcentration Maps were developed using the historical maximum concentrations for the constituents monitored at the site for the time periods of 1992 through 1995 and 1996 through 1998. The historical maximum concentrations for these time periods are listed in Tables 3 and 4, respectively (Appendix B).

Groundwater analytical data collected prior to 1992 were not included in the evaluation of historical maximum concentrations. The data collected prior to 1992 are considered unreliable due to "order-of-magnitude" variations in parameter concentrations from quarter to quarter, as well as a general lack of laboratory QA/QC. Additionally, the groundwater monitoring analyte lists prior to 1992 did not include many of the parameters on the current groundwater monitoring analyte list for HWMU-16.

# TABLE 2 HWMU-16 Calculated Background Values

Constituent	Background Concentration
	(μg/l unless otherwise noted)
Antimony	3
Arsenic	1
Barium	175.4
Beryllium	0.7
Cadmium	0.2
Chromium	6.2
Cobalt	5
Copper	13
Lead	. 10
Mercury	0.2
Nickel	16
Selenium	1
Silver	0.5.
Thallium	6 '
Vanadium	151
Zinc	51
Bromoform	0.3
Carbon Tetrachloride	0.2
Chlorobenzene	0.1
Chloromethane	0.3
1,4-Dichlorobenzene	0.1
Dichlorodifluoromethane	46.5
1,1-Dichloroethane	9.5
1,2-Dichloroethane	0.1
trans-1,2-Dichloroethene	0.1
Ethylbenzene	0.1
Methyl Ethyl Ketone	1.1
1,1,2,2-Tetrachloroethane	0.3 ,
Tetrachloroethene	0.7
Toluene	0.1
1,1,1-Trichloroethane	9.2
1,1,2-Trichloroethane	0.5
Trichloroethene	0.1
Trichlorofluoromethane	11.3
Vinyl Chloride	0.1
Xylenes (total)	0.2

TABLE 2 HWMU-16 Calculated Background Values

Constituent	Background Concentration (μg/l unless otherwise noted)
Di-n-butylphthalate	5
2,4-Dinitrotoluene	0.10
2,6-Dinitrotoluene	0.11
2378-TCDF	0.0485 ppt
12378-PECDF	0.0439 ppt
23478-PECDF	0.0417 ppt
123478-HXCDF	0.0390 ppt
123678-HXCDF	0.0377 ppt
234678-HXCDF	0.0428 ppt
123789-HXCDF	0.0415 ppt
1234678-HPCDF	0.0615 ppt
1234789-HPCDF	0.0709 ppt
OCDF	0.1307.ppt
Cyanide	10 3
Total Organic Carbon (x4)	7000
Total Organic Halides (x4)	42.2
Specific Conductivity	672 μS/cm
pН	5.7 to 7.9 pH units

#### Appendix IX Constituents Detected Since Permit Issuance HWMUs 5, 7, 10, and 16 Radford Army Ammunition Plant

Unit	Quarter Initially Detected	Constituent	Background Calculated or QL?	Background (ug/L)	GPS Required? (261 Appendix VIII)	Proposed GPS (ug/L)	Source
		Chromium	QL	5	yes	100	USEPA MCL
		Diethyl Ether	QL	12	no	NA	NA
HMWU-5	Fourth Quarter 2003	2-Nitroaniline	QL	20	no	NA	NA
HIVIVV U-3		4-Nitroaniline	QL	20	yes	20	Background/QL
		Nitrobenzene	QL	10	yes	10	Background/QL
	Third Quarter 2006	Dichlorodifluoromethane	QL	1	yes	125.2	VDEQ ACL
HWMU-7	Third Quarter 2003	Copper	Calculated	49	no	NA	NA
HVVIVIU-7	Second Quarter 2004	Zinc	Calculated	217	no	NA	NA
	First Quarter 2003	Cobalt	QL	5	no	NA	NA
HWMU-10	Second Quarter 2003	Vanadium	QL	10	no	NA	NA
	Second Quarter 2005	Acetone	QL	10	no	NA	NA
	Second Quarter 2005	2-Propanol	QL	50	no	NA	NA
		Chloroethane	Calculated	20.7	yes	20.7	Background/QL
	Second Quarter 2003	Diethyl Ether	Calculated	75.5	no	NA	USEPA MCL  NA  NA  Background/QL  Background/QL  VDEQ ACL  NA  NA  NA  NA  NA  NA
HWMU-16		Dimethyl Ether	Calculated	17.0	no	NA	NA
	Third Quarter 2003	Methylene Chloride	Calculated	13.95	no*	NA	NA
	Second Quarter 2004	1,1,2-Trichloro-1,2,2-trifluoroethane	Calculated	1.2	no*	NA	NA

- HWMU-5: The additional Appendix IX constituents detected in the downgradient point of compliance wells were not detected above their respective Quantitation Limits (QLs) in the upgradient well. As a result, background concentrations for those constituents were set as equal to their respective QLs. In accordance with the Permit (Condition V.J.1.g.), GPS are proposed for those additional Appendix IX constituents that are listed in Appendix VIII of 40 CFR Part 261 (chromium, 4-nitroaniline, nitrobenzene, and dichlorodifluoromethane). No GPS are proposed for the additional Appendix IX constituents that are not listed in Appendix VIII of 40 CFR Part 261 (diethyl ether and 2-nitroaniline).
- HWMU-7: Background concentrations for the additional Appendix IX constituents detected in the downgradient point of compliance wells (copper and zinc) were previously calculated and submitted to the VDEQ in the August 1998 *Groundwater Quality Assessment Report for HWMU-7* prepared by ERM, Inc. In accordance with the Permit (Condition V.J.2.g.), no GPS are proposed for the additional Appendix IX constituents (copper and zinc), as they are not listed in Appendix VIII of 40 CFR Part 261.
- HWMU-10: The additional Appendix IX constituents detected in the downgradient point of compliance wells were not detected above their respective Quantitation Limits (QLs) in the upgradient well. As a result, background concentrations for those constituents were set as equal to their respective QLs. In accordance with the Permit (Condition V.J.3.g.), no GPS are proposed for the additional Appendix IX constituents (cobalt, vanadium, acetone, and 2-propanol), as they are not listed in Appendix VIII of 40 CFR Part 261.
- HWMU-16: Background concentrations for additional Appendix IX constituents chloroethane, diethyl ether, dimethyl ether, and methylene chloride were calculated using data collected from upgradient well 16C1 during the period from Third Quarter 2003 through Third Quarter 2004. The background concentration for additional Appendix IX constituent 1,1,2-trichloro-1,2,2-trifluoroethane was calculated using data collected from upgradient well 16C1 during the period from Second Quarter 2004 through Third Quarter 2006. In accordance with the Permit (Condition V.J.4.g.), GPS are proposed for additional Appendix IX constituents that are listed in Appendix VIII of 40 CFR Part 261 (chloroethane). No GPS are proposed for the additional Appendix IX constituents that are not listed in Appendix VIII of 40 CFR Part 261 (diethyl ether and dimethyl ether).

  \*Methylene chloride and 1,1,2-trichloro-1,2,2-trifluoroethane should not be added to the Groundwater Monitoring List for HWMU-16, as these constituents were only detected in the upgradient well for the Unit, and not in the downgradient point of compliance wells.

# Statistical Computations – RAAP HWMU-16 – 1,1,2-Trichloro-1,2,2-Trifluoroethane

In accordance with the facility permit and VHWMR, statistical background concentration is being established for 1,1,1-Trichloro-1,2,2-Trifluoroethane. Inter-well upper prediction limits (UPL) were calculated on the background data for this target parameter in accordance with the facility permit and VHWMR (40 CFR 264.97(h)). Background data for this target parameter consisted of all data for the background well 16C1 collected from 2<sup>nd</sup> quarter 2004 through 3<sup>rd</sup> quarter 2006.

### Discussion of Tests for Normality

The power of a statistical tool to account for false positive and false negative results, while accurately detecting true statistical variations for a facility under scrutiny depends on numerous factors, one of which is the distribution of the data. A great number of statistical tools are based on the assumption that data are normally distributed. Hence the distribution of the sample population for parameters evaluated under this statistical analysis is first determined. Sample populations are tested for normal distribution using several normality tests. "Groundwater Information Tracking System with Statistical Analysis Capability" (GRITS/STAT) v5.0 was the software used to run these statistical tests. GRITS/STAT is an analytical software package provided by the USEPA. The distributions of the data sets were verified in the original mode as well as in log-transformed mode. The normality of the data set was evaluated using the Shapiro-Wilk test for normality.

# Discussion of Prediction Interval Tests

Normality tests are performed prior to running parametric tests (tests that require that the data be normal). Results of the normality tests show that the background data for 1,1,2-Trichloro-1,2,2-Trifluoroethane is non-normally distributed. Non-parametric UPL (NUPL) was constructed on the background data for this parameter. The confidence levels of NUPLs are typically approximate and estimated to be around 91%.

#### Summary of UPL

Parameter	Background Data Distribution	Type of UPL	Multiple Comparisons/year	UPL (μg/l)
1,1,2-Trichloro-1,2,2-	Non-Normal	NUPL	N/A	1.2
Trifluoroethane				

#### Statistical Computations – RAAP HWMU-16

In accordance with the facility permit and VHWMR, statistical background concentrations are being established for the four new target parameters chloroethane, diethyl ether, dimethyl ether and methylene chloride. These four target parameters were added to the facility monitoring program during the 3<sup>rd</sup> quarter 2003 monitoring event. Inter-well upper prediction limits (UPL) were calculated on the background data for the target parameters in accordance with the facility permit and VHWMR (40 CFR 264.97(h)). Background data for these target parameters consisted of all data for the background well 16C1 collected from 3<sup>rd</sup> quarter 2003 through 3<sup>rd</sup> quarter 2004.

#### Discussion of Tests for Normality

The power of a statistical tool to account for false positive and false negative results, while accurately detecting true statistical variations for a facility under scrutiny depends on numerous factors, one of which is the distribution of the data. A great number of statistical tools are based on the assumption that data are normally distributed. Hence the distribution of the sample population for parameters evaluated under this statistical analysis is first determined. Sample populations were tested for normal distribution using several normality tests. "Groundwater Information Tracking System with Statistical Analysis Capability" (GRITS/STAT) v5.0 was the software used to run these statistical tests. GRITS/STAT is an analytical software package provided by the USEPA. The distributions of the data sets were verified in the original mode as well as in log-transformed mode. The normality of the data sets was evaluated using the Shapiro-Wilk test for normality.

#### Discussion of Prediction Interval Tests

Normality tests are performed prior to running parametric tests (tests that require that the data be normal). A 99% confidence parametric inter-well UPL was computed for each of the four target parameters that showed normally distributed background data. Results of the normality tests show that the background data for chloroethane, diethyl ether and methylene chloride are normally distributed, and the background data for dimethyl ether is non-normally distributed. Non-parametric UPL (NUPL) was constructed on the background data for dimethyl ether, and parametric UPLs (PUPL) were constructed on the background data for chloroethane, diethyl ether and methylene chloride. No adjustments to the error rates were made to the NUPLs for multiple comparisons. Adjustment for 10 comparisons per year (considering 10 compliance monitoring wells at the facility and 4 quarters of data for each year, and considering historic detects, 10 is considered a representative number for multiple comparisons per year) was made to the PUPLs. The confidence levels of NUPLs are well less than 95%. Any statistically significant increase (SSI) must be confirmed by verification sampling.

# Summary of UPLs

Parameter	Background	Type	Multiple	UPL (μg/l)
	Data Distribution	of UPL	Comparisons/year	
Chloroethane	Normal	PUPL	10	20.7
Diethyl ether	Normal	NUPL	10	75.5
Dimethyl ether	Non-normal	PUPL	N/A	17.0
Methylene Chloride	Normal	PUPL	10	13.95

#### RAAP-HWMU-16 - Statistical Analysis - Notes

1) Y2K Correction dates are as shown in table below.

Actual Event	Date Used in Stat Software	
2000-Qtr1	12/13/1999	
2000-Qtr2	12/14/1999	
2000-Qtr3	12/15/1999	
2000-Qtr4	12/16/1999	
2001-Qtr1	12/17/1999	
2003-Qtr3	12/18/1999	
2003-Qtr4	12/19/1999	
2004-Qtr1	12/20/1999	
2004-Qtr2	12/21/1999	
2004-Qtr3	12/22/1999	

#### Interwell Tests:

2) Background data for target parameters chloroethane, diethyl ether, dimethyl ether and methylene chloride were evaluated using Shapiro-Wilk test. Background data showed normal distribution for chloroethane, diethyl ether and methylene chloride. Parametric interwell 99% confidence upper prediction limits were computed for parameters with normally distributed background data. Dimethyl ether background data was non-normally distributed. Therefore non-parametric Upper Prediction Limit (UPL) was computed for dimethyl ether.

3) No adjustments for multiple comparisons could be made for non-parametric UPLs. Adjustments were made to the parametric UPLs for 10 future comparisons per year to account for multiple compliance monitoring wells and quarterly event data. Any Statistically significant increase (SSI) must be confirmed by verification sampling.

E:\Ross Work\Radford AAP Archives\HWMU-16\[HWMU16StatDate correction.xls]Sheet1

## Normality Tests

Report Printed: 02-02-2005 13:49

Facility: RAAPHWMU16 Haz. Waste Unit 16 - RAAP

Address:

City:Radford

ST:VA Zip:24141

County: PULASKI

Contact:

Phone:() -

Permit Type:Detection

Constituent: ClEthane Chloroethane

CAS Number: 75-00-3

MCL:

0.000 ppb

ACL:

0.000 ppb

Detect Limit:

2.000 ppb

Start Date: Mar 31 1996 End Date:Dec 22 1999

Normality Test on Observations for wells listed below:

Well:16C1

Position: Upgradient Observations: 5

Scale Original: Minimum 1.000

Maximum 6.400

Mean 4.340

Std Dev

Log:

0.000

1.856

1.303

2.078 0.749

**Pooled Statistics** 

Observations:

5

Statistic

Log Original Scale Scale

Mean: Std Dev: 4.340 2.078 1.303 0.749

Skewness: Kurtosis:

-0.810

-1.296\* -0.011

Minimum: Maximum: -0.5551.000

0.000

CV:

6.400 0.479

1.856 0.575

Shapiro-Wilk Statistics

Test 5% Critical 1% Critical Scale Statistic

Value

Value

Original:

0.9037

0.7620

0.6860

Log: 0.7615\* 0.7620 0.6860

\* Indicates statistically significant evidence of non-normality. GRIT/STAT Version 5.0

Facility:Haz. Waste Unit 16 - RAAP Parameter:Chloroethane(CAS Number:75-00-3)

## ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

```
Observations (n):
   Shapiro-Wilk
                        (W):
                                   0.9037
 Critical W,\alpha=0.01:
                                   0.6860
                       Mean: 4.340 ppb
                                 2.078 ppb
                  Std Dev:
                          DF:
                                 0000 0.99
 Conf. Level (1-\alpha):
                                       10
Future Samples (k):
            t - 1 - \alpha - :
\left[ \begin{array}{c} - \\ k \end{array} \right]
                                    7.1732
                                    7.8579
                     Kappa:
                          UL: 20.669 ppb
                          LL: -∞
```

# Normality Tests

Report Printed: 02-02-2005 13:49

Facility: RAAPHWMU16 Haz. Waste Unit 16 - RAAP

Address:

City:Radford

ST:VA Zip:24141

County: PULASKI

Contact:

Phone:() -

Permit Type: Detection

Constituent: DEthEth Diethyl ether

CAS Number:

MCL:

0.000 ppb

ACL:

0.000 ppb

**Detect Limit:** 

24.000 ppb

Start Date: Mar 31 1996 End Date: Dec 22 1999

Normality Test on Observations for wells listed below:

Well:16C1

Position: Upgradient Observations: 5

Scale Original: Minimum 12.000

Maximum 30.000

Mean 21.200

Std Dev 6.907

Log:

2.485

3.401

3.007

0.355

**Pooled Statistics** 

Observations:

5

Statistic Original Scale

3.007 21.200 Mean: Std Dev: 6.907 0.355 -0.122-0.491Skewness: -1.140-1.024**Kurtosis:** 

Minimum:

12.000

2.485

Maximum:

30.000

3.401

CV:

0.326

0.118

Log Scale

Shapiro-Wilk Statistics

Test 5% Critical 1% Critical

Scale Statistic Original:

0.9768

Value 0.7620 Value 0.6860 Log: 0.9507 0.7620 0.6860

\* Indicates statistically significant evidence of non-normality. GRIT/STAT Version 5.0

## Parametric Prediction Interval Report Printed February 2,2005

Page 1

Facility:Haz. Waste Unit 16 - RAAP Parameter:Diethyl ether(CAS Number:- -)

## ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

```
Observations (n):
                 (W):
  Shapiro-Wilk
                           0.9768
 Critical W,\alpha = 0.01:
                           0.6860
                  Mean: 21.200 ppb
                          6.907 ppb
              Std Dev:
                     DF:
                          0.99
 Conf. Level (1-\alpha):
                              10
Future Samples (k):
          t - 1 - \alpha - 1
                            7.1732
                 Kappa:
                            7.8579
                     UL: 75.470 ppb
                     LL: -∞
```

# Normality Tests

Report Printed: 02-02-2005 13:53

Facility: RAAPHWMU16 Haz. Waste Unit 16 - RAAP

Address:

City:Radford ST:VA Zip:24141

County: PULASKI

Contact:

Phone:() -

Permit Type: Detection

Constituent: DMethEth Dimethyl ether

CAS Number: - -

MCL: 0.000 ppb ACL: 0.000 ppb Detect Limit: 24.000 ppb

Start Date:Mar 31 1996 End Date:Dec 22 1999

Normality Test on Observations for wells listed below:

Well:16C1 Position: Upgradient Observations:5

 Scale
 Minimum
 Maximum
 Mean
 Std Dev

 Original:
 12.000
 17.000
 13.000
 2.236

 Log:
 2.485
 2.833
 2.555
 0.156

**Pooled Statistics** 

Observations: 5

Original Statistic Log Scale Scale 2.555 13.000 Mean: 2.236 0.156 Std Dev: 1.500\* Skewness: 1.500\* 0.250 0.250**Kurtosis:** Minimum: 12.000 2.485 2.833 17.000 Maximum: 0.061 CV: 0.172

Shapiro-Wilk Statistics

Test 5% Critical 1% Critical Scale Statistic Value Value Original: 0.5521\* 0.7620 0.6860 Log: 0.5521\* 0.7620 0.6860

\* Indicates statistically significant evidence of non-normality. GRIT/STAT Version 5.0

# Nonparametric Prediction Interval Report Printed February 2,2005

Facility:Haz. Waste Unit 16 - RAAP Parameter:Dimethyl ether(CAS Number:- -)

# ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n):

5

Conf. Level  $(1-\alpha)$ :

33.330%

UL: 17.000 ppb LL: 0.000

Report Produced by GRITS/STAT 5.01

Page 1

## Normality Tests

Report Printed: 02-02-2005 13:54

Facility: RAAPHWMU16 Haz. Waste Unit 16 - RAAP

Address:

City:Radford

ST:VA Zip:24141

County:PULASKI

Contact:

Phone:() -

Permit Type: Detection

Dichloromethane (Methylene chloride) Constituent: MeCl

CAS Number: 75-09-2

MCL:

0.000 ppb

ACL:

0.000 ppb

Detect Limit:

2.000 ppb

Start Date: Mar 31 1996 End Date:Dec 22 1999

Normality Test on Observations for wells listed below:

Well:16C1 Position: Upgradient Observations: 5

Scale Original: Minimum 4.100

Maximum 6.800

Mean 5.800 1.037

Std Dev

Log:

1.411

1.917 1.743 0.197

**Pooled Statistics** 

Observations:

5

Statistic	Original	Log
	Scale	Scale
Mean:	5.800	1.743
Std Dev:	1.037	0.197
Skewness:	-0.925	-1.088*
Kurtosis:	-0.436	-0.263
Minimum:	4.100	1.411
Maximum:	6.800	1.917
CV:	0.179	0.113

Shapiro-Wilk Statistics

Test 5% Critical 1% Critical

Scale Statistic

Original: 0.8964

Value 0.7620 Value 0.6860 Log: 0.8519 0.7620 0.6860

 $\mbox{*}$  Indicates statistically significant evidence of non-normality. GRIT/STAT Version 5.0

### **Parametric Prediction Interval** Report Printed February 2,2005

Page 1

Facility:Haz. Waste Unit 16 - RAAP Parameter:Dichloromethane (Methylene chloride(CAS Number:75-09-2)

# ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

```
Observations (n):
                     (W):
  Shapiro-Wilk
                              0.8964
 Critical W,\alpha=0.01:
                              0.6860
                    Mean: 5.800 ppb
                             1.037 ppb
                Std Dev:
                       DF:
                            0.95000.99
 Conf. Level (1-\alpha):
Future Samples (k):
                                  10
           t<sub>-1</sub> - α<sub>-1</sub>:
                                7.1732
                   Kappa:
                                7.8579
                       UL: 13.947 ppb
                       LL: -∞
```

# Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1

All Results in ug/L.

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	GPS	Method
Chloroethane						75-00-3		
Third Quarter 2003	6.4	U	4.8	U	U	1	20.7	8260B
Fourth Quarter 2003	5.7	U	2.6	1.1	U	1	20.7	8260B
First Quarter 2004	υJ	UJ	UJ	U J	UJ	1	20.7	8260B
Second Quarter 2004	4.4	U	2.4	0.63 J	U	1	20.7	8260B
Third Quarter 2004	4.2	U	2	U	U	1	20.7	8260B
Fourth Quarter 2004	4.9	U	2.5	U	U	1	20.7	8260B
First Quarter 2005	7.6 J	UJ	3.7 J	U J	U J	1	20.7	8260B
Second Quarter 2005	υJ	U	υJ	U	U	1	20.7	8260B
Third Quarter 2005	4.7 J	UJ	U	UJ	υJ	1	20.7	8260B
Fourth Quarter 2005	4.6 J	U	2.6 J	U	ប	1	20.7	8260B
First Quarter 2006	5.3	U	U	U	U	1	20.7	8260B
Second Quarter 2006	5 J	U	2 J	U	U	1	20.7	8260B
Third Quarter 2006	5	U	0.7 J	0.7 J	U	1	20.7	8260B
Fourth Quarter 2006	5.8	U	1	U	υ	1	20.7	8260B
First Quarter 2007	6.1	U	1	U	U	1	20.7	8260B
Second Quarter 2007	5.2	U	1.4	U	U	1	20.7	8260B
Diethyl ether					CAS#	60-29-7		
Third Quarter 2003	12 J	U	12 J	U	U	12	-	8260B
Fourth Quarter 2003	30	U	14	U	U	12	-	8260B
First Quarter 2004	24	U	U	U	U	12	-	8260B
Second Quarter 2004	23 J	U J	13 J	UJ	UJ	12	-	8260B
Third Quarter 2004	17	U	U	U	U	12	-	8260B
Fourth Quarter 2004	24	υJ	U	U	UJ	12	-	8260B
First Quarter 2005	29	U	14	U	U	12	-	8260B
Second Quarter 2005	20	UJ	9.2	UJ	UJ	12	-	8260B
Third Quarter 2005	30	U	15	U	U	12	-	8260B
Fourth Quarter 2005	25	U	18	U	Ü	12	-	8260B
First Quarter 2006	19	U	U	U	U	12	-	8260B
Second Quarter 2006	17	U	U	U	Ũ	12.5	-	8260B
Third Quarter 2006	33	1.5 J	4.3 J	4.6 J	U	12.5	-	8260B
Fourth Quarter 2006	20	U	U	U	U	12.5	-	8260B
First Quarter 2007	21	U	U	U	U	12.5		8260B
Second Quarter 2007	17 J	1.5 J	5.7 J	2.1 J	fi fi	12.5	-	8260B
Dimethyl ether					CAS#	115-10-6		
Third Quarter 2003	6.6 J	U	9.9 J	U	U	12	-	8260B
Fourth Quarter 2003	U	U	U	U	U	12	-	8260B
First Quarter 2004	17 J	Uj	13 J	UJ	n 1	12	-	8260B
Second Quarter 2004	υJ	υJ	6.6 J	υJ	υJ	12	-	8260B
Third Quarter 2004	UJ	U J	UJ	UJ	U J	12	-	8260B
Fourth Quarter 2004	16 J	UJ	12 J	U	υJ	12	-	8260B
First Quarter 2005	26	U	25	U	U	12	-	8260B
Second Quarter 2005	15	U	14	U	U	12	-	8260B
Third Quarter 2005	13	U	U	U	U	12	-	8260B
Fourth Quarter 2005	U	U	U	U	U	12	-	8260B
First Quarter 2006	U	. U	U	U	U	12	-	8260B
Second Quarter 2006	U	U	υ	U	U	12.5	-	8260B
Third Quarter 2006	11 J	UJ	3.2 J	2.8 J	υJ	12.5	-	8260B
Fourth Quarter 2006	U	U	U	U	U	12.5	-	8260B
First Quarter 2007	U	υ	U	U	U	12.5	-	8260B
Second Quarter 2007	11 J	U	7 J	2.6 J	1.2 J	12.5	-	8260B

# Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1

All Results in ug/L.

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL.	GPS	Method
Methylene chloride					CAS#			
Third Quarter 2003	4.1	U	U	U	U	1	13.95	8260B
Fourth Quarter 2003	6.8	U	U	U	U	1	13.95	8260B
First Quarter 2004	6.4	U	U	U	U	1	13.95	8260B
Second Quarter 2004	5.7	U	U	U	U	1	13.95	8260B
Third Quarter 2004	6	U A	U A	U A	U A	1	13.95	8260B
Fourth Quarter 2004	6.4	U	U	U	U	1	13.95	8260B
First Quarter 2005	6.8 J	U	υ	U	U	1	13.95	8260B
Second Quarter 2005	6.3	U	U	U	U	1	13.95	8260B
Third Quarter 2005	6.2	U	U	U	U	1	13.95	8260B
Fourth Quarter 2005	4.7	U	U	U	U	1	13.95	8260B
First Quarter 2006	4.9	U	U	U	U	1	13.95	8260B
Second Quarter 2006	7	U	U	U	U	1	13.95	8260B
Third Quarter 2006	UN	UN	UN	UN	UN	1	13.95	8260B
Fourth Quarter 2006	U A	U	U	U A	U	1	13.95	8260B
First Quarter 2007	6.3	υ	U	υ	U	1	13.95	8260B
Second Quarter 2007	3.4	U	U	U	U	1	13.95	8260B
1,1,2-Trichloro-1,2,2-Trifluc	roethane				CAS # 7	6-13-1		
Third Quarter 2003	U	U	U	U	U	1	-	8260B
Second Quarter 2004	1.2	UJ	υJ	U J	UJ	1	-	8260B
Third Quarter 2004	U	υ	U	U	U	1	-	8260B
Fourth Quarter 2004	U	U	U	U	U	1	-	8260B
First Quarter 2005	1	U	U	U	U	1	*	8260B
Second Quarter 2005	U	U	U	U	U	1	-	8260B
Third Quarter 2005	U	U	υ	U	U	1	•	8260B
Fourth Quarter 2005	U	U	U	U	U	1	-	8260B
First Quarter 2006	U	U	U	U	U	1	-	8260B
Second Quarter 2006	U	U	U	U	U	1	-	8260B
Third Quarter 2006	U	U	U	U	U	1	-	8260B
Fourth Quarter 2006	U	U	U	U	U	1	-	8260B
First Quarter 2007	U	υ	U	U	U	1	-	8260B
Second Quarter 2007	U	U	U	U	U	1	-	8260B

# Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1

All Results in ug/L.

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	GPS	Method

Definitions: QL Denotes permit required quantitation limit. U Denotes analyte not detected at or above QL UA Denotes analyte not detected at or above adjusted sample QL. J Denotes associated result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated. UN Denotes analyte concentration is less than the quantiation limit and five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when results are reported to at or above the project detection limit. R Denotes result rejected. Q Denotes data validation qualifier. CAS# Denotes Chemical Abstract Services registration number. X Denotes mass spectral confirmation not obtained-result suspect.

GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002).

NS denotes not sampled. NA denotes not analyzed. "-" denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

#### Notes

#### -Appendix IX Groundwater Monitoring Events:

Third Quarter 2003, Second Quarter 2004, Second Quarter 2005, Third Quarter 2006, Second Quarter 2007
For Appendix IX monitoring events, all results evaluated to detection limit. See laboratory data deliverable for detection limit.

-9/30/2003: Verification sampling event for 16C1 (heptachlor) and 16C1B (Endrin). Verification results: all results reported not detected to detection limit. Original results 0.067 µg/l and 0.39 µg/l, respectively. Confirmation results reported in this table. -9/30/2003: Verification sampling event for 16C1 (chloroethane, ethyl ether, methyl ether, methylene chloride) and 16MW9 (chloroethane, ethyl ether, methyl ether, methyl ether, methyl ether). Verification results: all results confirmed original analysis. Original results reported in this table.

-June 21, 2004: Verification event for 8260B 16C1 (1,1-dichloroethene and 1,1,2-trichloro-1,2,2-trifluoroethane).

Verification results: all not detected except 1,1,2-trichloro-1,2,2-trifluoroethane added to quarterly analyte list beginning 3Q 2004.

Due to laboratory error, Appendix IX results for semivolatiles (Method 8270C) will be presented in 3Q 2004. Verification event results for 16WC1B and 16C1 (8081A) — all verification results were not confirmed.

07/27-28/2005. Verification event for 16WC1B (Mercury Method 7470A.) Not detected in verification sample.

Also, verification event for 16C1, 16WC1B-8081A. and 16C1, 16MW9, 16WC1A-ethanol. All verification results not detected. Verification results used.

06/19/2007. Verification event for 16WC1B and 16MW9 thallium Not detected in verification sample. Verification results used.

# APPENDIX E

# LABORATORY ANALYTICAL RESULTS – YEAR 2009 (CD-ROM)

APPENDIX F

FIELD NOTES (CD-ROM



Data Validation Summary
Second Quarter 2009 Groundwater Monitoring Event

Annual Monitoring under 40 CFR 264 Appendix IX
Post Closure Care Permit Hazardous Waste Management Units 5, 7, 10 and 16
Radford Facility Army Ammunition Plant, Radford, Virginia
EPA ID# VA1210020730

Draper Aden Associates performed data validation of the analytical results for the Second Quarter 2009 semiannual groundwater monitoring event at Hazardous Waste Management Units (HWMUs) 5, 7, 10, and 16 located at the Radford Facility Army Ammunition Plant (RFAAP) in Radford, Virginia. The monitoring event also served as annual monitoring under 40 CFR 264 Appendix IX. The following information summarizes the data validation review.

### Sample Collection/Analytical Services

Draper Aden Associates of Blacksburg, Virginia collected all groundwater samples during April 6-21, 2009. Select samples for select analyses were re-sampled by Draper Aden Associates on June 10-11, 2009 to confirm or refute initial detections of new newly identified Appendix IX target analytes. See attached data validation reports for affected sample locations and analyses.

Samples were submitted for laboratory analysis via courier to CompuChem, a Division of Liberty Analytical, of Cary, North Carolina, or Lancaster Laboratories, Lancaster, Pennsylvania. Select analyses were previously performed by ProChem Analytical, Inc., of Elliston, Virginia. However, ProChem Analytical, Inc. ceased operations for environmental analysis is July 2008.

#### Receipt of Monitoring Event Data

On behalf of Alliant Techsystems Inc., each laboratory submitted results to Draper Aden Associates in a final certificate of analysis which included analytical results as well as relevant documentation to verify and validate the results. The final certificate of analysis for the event was received on June 4, 2009.

#### Verification Events

Verification sampling was required and conducted on June 10 and 11, 2009 to confirm or refute detections of concern reported for the Second Quarter 2009 monitoring event. Results of the verification event are reported in the permit required semiannual groundwater monitoring report. No new Appendix IX target analytes were detected in Second Quarter 2009.

### Summary of Monitoring Event Data by Analytical Method

Certificates of analysis were received from each laboratory in the following sample delivery groups (SDGs):

Summary of Required Analytical Methods and SDGs

Analytical Method		Hazardous Waste N	Management Unit	
	HWMU 5	HWMU 7	HWMU 10	HWMU 16
8260B Volatiles	SDG RAD14	SDG RAD13	SDG RAD12,	SDG RAD09
			RAD17	
8270C Semivolatiles	SDG 904138/0904139	SDG 0904096/0904097	SDG 904109	SDG 0904069
8081A Pesticides	SDG 0904138	SDG 0904096	SDG 904109	SDG 0904069
8151A Herbicides	SDG 0904138	SDG 0904096	SDG 904109	SDG 0904069
6020 Inorganics	SDG	SDG:	SDG 904109	SDG 0904069
	904138/0904139	0904096/0904097		
9014 Cyanide	SDG 0904138	SDG: 0904096/0904097	SDG 904109	SDG 0904069
9034 Sulfide	SDG 0904138	SDG: 0904096	SDG 904109	SDG 0904069
9065 Phenolics	SDG 0904138	SDG: 0904096	SDG 904109	SDG 904109
7470A Mercury	SDG 904138/0904139	SDG: 0904096/0904097	SDG 904109	SDG 0904069

Each final certificate of analysis was complete in its presentation and the data were of acceptable quality. Chains of custody and permit required target analytes are provided in each SDG.

## Data Analysis and Validation

All samples were analyzed by SW-846 Method requirements (Test Methods for Evaluating Solid Wastes - Physical and Chemical Methods, USEPA SW-846, 3rd edition - Final Update I, II/IIA and III). All data were evaluated in general accordance with:

- Test Methods for Evaluating Solid Wastes Physical and Chemical Methods, USEPA SW-846, 3rd edition Final Update I, II/IIA and III)
- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, October 1999 and USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008, where applicable).
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004

Draper Aden Associates of Blacksburg, Virginia performed a comprehensive data validation, including recalculation of 10% of the data, except where noted. For each HWMU, data validation reports and a summary table of data validation results are provided as an attachment (Appendix A – data validation summary tables, Appendix B – data validation reports [CD ROM]).

## Reporting of Results

Compliance well results were reported to at or above the detection limit for the target analytes (constituents) listed in Appendix IX to 40 CFR Part 264 as presented in Appendix I of Attachment 1 of the Final Post-Closure Care Permit. Detection limits were based on latest laboratory method detection limit. Plume well results were reported to at or above the permit quantitation limit for the constituents listed in the semiannual compliance monitoring lists.

***********
<u>a.</u>
Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services

This Report has been prepared by:

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8. A.D

Date:

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**Appendix IX Monitoring Event Monitoring Event: Second Quarter 2009** 

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
Method: 6020		
Laboratory: CompuChem, a Division of Lil	perty Analytical, Cary, NC	指于1995年6月19日1日1996年19月1日1日1日1日1日1日1日1日1日1日1日1日1日1日1日1日1日1日1
Antimony	l	0.4
Arsenic	10	2
Barium	10	1
Beryllium	1	0.2
Cadmium	1	0.2
Chromium	5	1
Cobalt	5	1
Copper	5	1
Lead	1	0.2
Nickel	10	2
Selenium	10	3
Silver	2	0.2
Thallium	1	0.2
Tin	5	1
Vanadium	10	1
Zinc		3
Method: 7470A		
Laboratory: CompuChem, a Division of Li	berty Analytical, Cary, NC	
Moreury	2	0.2
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin	berty Analytical, Cary, NC 0.05	
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC	berty Analytical, Cary, NC  0.05  0.05	0.005 0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC	berty Analytical, Cary, NC  0.05  0.05  0.05  0.05	
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC	berty Analytical, Cary, NC  0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC	berty Analytical, Cary, NC  0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane	berty Analytical, Cary, NC  0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.	0.005 0.005 0.005 0.005 0.005 0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005 0.005 0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE	berty Analytical, Cary, NC  0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.	0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.86 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan I	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan I Endosulfan II	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate Endrin	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.36 0.1 0.1 0.1 0.1 0.1	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.005 0.01 0.005 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.86 0.1 0.1 0.1 0.1 0.1 0.1	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate Endrin	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.86 0.1 0.1 0.1 0.1 0.1 0.1 0.10.1	0.005 0.005 0.005 0.005 0.005 0.86 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Heptachlor	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.10 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.05 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Line Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor Heptachlor Hetachlor	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.10 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.	0.005 0.005 0.005 0.005 0.005 0.86 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan I Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor epoxide	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.10 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.05 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Linal Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor Heptachlor Toxaphene Method: 8151A	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.06 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.05 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor Heptachlor Toxaphene Method: 8151A	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.06 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.005 0.005 0.005 0.005 0.005 0.866 0.01 0.01 0.01 0.01 0.005 0.01 0.01 0.01 0.01 0.01 0.01 0.01 1.001 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor epoxide Methoxychlor Toxaphene Method: 8151A  Laboratory: CompuChem, a Division of L.	berty Analytical, Cary, NC  0.05 0.05 0.05 0.05 0.05 0.86 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.5 0.1 0.1 0.1 0.1 0.5 0.5 0.5 0.5 0.5 0.5 0.5	0.005 0.005 0.005 0.005 0.005 0.866 0.01 0.01 0.01 0.01 0.005 0.01 0.01 0.01 0.01 0.01 0.01 1.001 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan Sulfate Endrin Endrin aldehyde Heptachlor Heptachlor epoxide Methoxychlor Toxaphene Method: 8151A  Laboratory: CompuChem, a Division of Lo	berty Analytical, Cary, NC  0.05 0.05 0.05 0.05 0.05 0.086 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.15 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.005 0.005 0.005 0.005 0.005 0.866 0.01 0.01 0.01 0.01 0.005 0.01 0.01 0.01 0.01 0.01 0.01 0.01 1.001 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

Tuesday, August 04, 2009



# **Appendix IX Monitoring Event**

Monitoring Event: Second Quarter 2009

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
Aethod: 8260B		
aboratory: Lancaster Laboratories, Lanca	ster, PA	
Acetone	10	3
Acetonitrile	20	7
Acrolein	25	5
Acrylonitrile	5	1
Allyl chloride	0.5	0.1
Benzene	0.5	0.1
Bromobenzene	0.5	0.1
Bromochloromethane	0.5	0.1
Bromodichloromethane	1	0.1
Bromoform	0.5	0.1
2-Butanone	10	1
n-Butyl alcohol	50	20
tert-Butyl alcohol	10	4
n-Butylbenzene	0.5	0.1
sec-Butylbenzene	0.5	0.1
tert-Butylbenzene	0.5	0.1
Carbon disulfide	0.5	0.4
Carbon tetrachloride	1	0.1
Chlorobenzene	0.5	0.1
Chloroethane	1	0.1
2-Chloroethyl vinyl ether	0.5	. 0.1
Chloroform	1	0.1
Chloromethane	1	0.2
Chloroprene	0.5	0.1
2-Chlorotoluene	0.5	0.1
4-Chlorotoluene	0.5	0.1
Cyclohexane	0.5	0.1
Dibromochloromethane	0.5	0.1
1,2-Dibromo-3-chloropropane	0.5	0.2
1,2-Dibromoethane	0.5	0.1
1,2-Dichlorobenzene	0.5	0.1
1,3-Dichlorobenzene	0.5	0.1
1,4-Dichlorobenzene	0.5	0.1
trans-1,4-Dichloro-2-butene	5	1
Dichlorodifluoromethane	1	0.1
1,1-Dichloroethane	1	0.1
1,2-Dichloroethane	1	0.1
1,1-Dichloroethene	0.5	0.1
cis-1,2-Dichloroethene	0.5	0.1
trans-1,2-Dichloroethene	0.5	0.1
1,2-Dichloropropane	0.5	0.1
1,3-Dichloropropane	0.5	0.1
2,2-Dichloropropane	0.5	0.1
1,1-Dichloropropene	0.5	0.1
cis-1,3-Dichloropropene	0.5	0.1
trans-1,3-Dichloropropene	0.5	0.1
	12.5	1.1
Diethyl ether	12.5	0.1
Dimethyl ether	100	20
1,4-Dioxane	5	1
Ethyl acetate	250	50
Ethanol Ethanol	1	0.1
Ethylbenzene	ı	



Appendix IX Monitoring Event

**Monitoring Event: Second Quarter 2009** 

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)	
Method: 8260B			
Laboratory: Lancaster Laboratories, Lancast	er, PA	第二次表別的目標的問題によっているとのようなないのはないのからます。 ここしょうかい こくしゃ	
Ethyl methacrylate	0.5	0.1	
Ethylene oxide	20	5	
Hexachlorobutadiene	0.5	0.1	
Hexachloroethane	0.5	0.1	
2-Hexanone	5	1	
Isobutyl alcohol	25	10	
Isopropylbenzene	0.5	0.1	
Isopropylether	0.5	0.1	
4-Isopropyltoluene	0.5	0.1	
Methacrylonitrile	5	1	
Bromomethane	0.5	0.1	
Iodomethane	0.5	0.1	
Methyl methacrylate	0.5	0.1	
4-Methyl-2-pentanone	5	1	
Methyl tert-butyl ether	0.5	0.1	
Dibromomethane	0.5	0.1	
Methylene chloride	1	0.2	
Naphthalene	0.5	0.1	
Pentachloroethane	0.5	0.2	
1-Propanol	1000	5	
2-Propanol	100	50	
Propionitrile	10	2	
n-Propylbenzene	0.5	0.1	
Styrene	0.5	0.1	
1,1,1,2-Tetrachloroethane	0.5	0.1	
1,1,2,2-Tetrachloroethane	0.5	0.1	
Tetrachloroethene	i	0.1	
Tetrahydrofuran	5	2	
Toluene	1	0.1	
1,2,3-Trichlorobenzene	0.5	0.1	
1,2,4-Trichlorobenzene	0.5	0.1	
1,1,1-Trichloroethane	1	0.1	
1,1,2-Trichloroethane	0.5	0.1	
Trichloroethene	1	0.1	
Trichlorofluoromethane	1	0.1	
1,2,3-Trichloropropane	1	0.3	
1,1,2-Trichloro-1,2,2-Trifluoroethane	1	0.2	
1,2,4-Trimethylbenzene	0.5	0.1	
1,3,5-Trimethylbenzene	0.5	0.1	
Vinyl acetate	0.5	0.2	
Vinyl chloride	0.5	0.1	
	3	1	
Xylenes (Total)	-		

Page 3 of 6 Tuesday, August 04, 2009



**Appendix IX Monitoring Event Monitoring Event: Second Quarter 2009** 

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
Aethod: 8270C		
aboratory: CompuChem, a Division of Li	berty Analytical, Cary, NC	The state of the s
Acenaphthene	5	1
Acenaphthylene	5	1
Acetophenone	5	1
2-Acetylaminofluorene	5	1
4-Aminobiphenyl	5	1
Aniline	5	1
Anthracene	5	1
Aramite	5	1
Benzo[a]anthracene	5	1
Benzo[b]fluoranthene	5	1
Benzo[k]fluoranthene	5	1
Benzo[ghi]perylene	5	1
Benzo(a)pyrene	5	1
1,4-Benzenediamine	50	10
Benzyl alcohol	5	1
bis(2-Chloroethoxy)methane	5	1
bis(2-Chloroethyl)ether	5	1
bis(2-Chloro-1-methylethyl)ether	5	1
bis(2-Ethylhexyl)phthalate	6	1
4-Bromophenyl phenyl ether	5	1
Butyl benzyl phthalate	5	1
p-Chloroaniline	5	1
Chlorobenzilate	5	1
p-Chloro-m-cresol	5	1
2-Chloronaphthalene	5	1
2-Chlorophenol	5	1
4-Chlorophenyl phenyl ether	5	1
Chrysene	5	1
Diallate	5	1
Dibenz(a,h)anthracene	5	1
Dibenzofuran	5	1
Di-n-butyl phthalate	5	1
3,3'-Dichlorobenzidine	5	1
2,4-Dichlorophenol	5	1
2,6-Dichlorophenol	5	1
Diethyl phthalate	10	1
O,O-Diethyl O-2-pyrazinyl	5	1
Dimethoate	5	1
p-(Dimethylamino)azobenzene	5	1
7,12-Dimethylbenz[a]anthracene	5	1
3,3'-Dimethylbenzidine	5	4
a,a-Dimethylphenethylamine	50	10
	5	1
2,4-Dimethylphenol Dimethyl phthalate	5	1
m-Dinitrobenzene	5	1
	10	2
4,6-Dinitro-o-cresol	10	2
2,4-Dinitrophenol	10	1
2,4-Dinitrotoluene	10	1
2,6-Dinitrotoluene	5	1
Di-n-octyl phthalate	10	1
Diphenylamine	5	1
Disulfoton	<i>y</i>	

Tuesday, August 04, 2009

# **Summary of Quantitation Limits and Detection Limits**



**Appendix IX Monitoring Event Monitoring Event: Second Quarter 2009** 

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
lethod: 8270C		
aboratory: CompuChem, a Division of	Liberty Analytical, Cary, NC	
Ethyl methanesulfonate	5	1
Famphur	5	5
Fluoranthene	5	1
Fluorene	5	1
Hexachlorobenzene	5	1
Hexachlorocyclopentadiene	5	1
Hexachlorophene	500	88
Hexachloropropene	5	1
Indeno[1,2,3-cd]pyrene	5	1
Isodrin	5	1
	5	1
Isophorone	5	1
Isosafrole	5	5
Kepone	5	5
Methapyrilene	5	1
3-Methylcholanthrene	5	1
Methyl methane sulfonate	5	1
2-Methylnaphthalene		1
Methyl parathion	5	1
2-Methylphenol	5	*
3 & 4-Methylphenol	10	2
1,4-Naphthoquinone	5	1
1-Naphthylamine	5	1
2-Naphthylamine	5	1
o-Nitroaniline	10	1
m-Nitroaniline	10	2
p-Nitroaniline	20	1
Nitrobenzene	10	1
o-Nitrophenol	5	1
p-Nitrophenol	10	2
4-Nitroquinoline-1-oxide	5	1
	5	1
N-Nitrosodi-n-butylamine	5	1
N-Nitrosodiethylamine	5	1
N-Nitrosodimethylamine	5	1
N-Nitrosodiphenylamine		1
N-Nitrosodipropylamine	5	1
N-Nitrosomethylethylamine	5	1
N-Nitrosomorpholine	5	1
N-Nitrosopiperidine	5	1
N-Nitrosopyrrolidine	5	1
5-Nitroso-o-toluidine	5	1
Parathion	5	1
Pentachlorobenzene	5	1
Pentachloronitrobenzene	5	1
Pentachlorophenol	10	2
Phenacetin	5	1
Phenanthrene	5	1
	5	1
Phenol	5	1
Phorate	5	1
2-Picoline	5	1
Pronamide	5	1
Pyrene		1
Pyridine	5	A

Tuesday, August 04, 2009

# **Summary of Quantitation Limits and Detection Limits**



# Appendix IX Monitoring Event

**Monitoring Event: Second Quarter 2009** 

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
Method: 8270C		
Laboratory: CompuChem, a Division of Li	berty Analytical, Cary, NC	
Safrole	5	1
Sulfotep	5	1
1,2,4,5-Tetrachlorobenzene	5	1
2,3,4,6-Tetrachlorophenol	5	1
o-Toluidine	5	1
2,4,5-Trichlorophenol	5	1
2,4,6-Trichlorophenol	5	1
O.O.O-Triethyl phosphorothioate	5	1
sym-Trinitrobenzene	5	
Method: 9012A		
Laboratory: CompuChem, a Division of Li	berty Analytical, Cary, NC	
Cyanide	20	3.5
Method: 9034		
Laboratory: CompuChem, a Division of La	berty Analytical, Cary, NC	
Sulfide	1000	660
Method: 9065		
Laboratory: CompuChem, a Division of La	iberty Analytical, Cary, NC	
Total Recoverable Phenolics	60	18

Tuesday, August 04, 2009



# Data Validation Summary Fourth Quarter 2009 Semiannual Groundwater Monitoring Event

# Post Closure Care Permit Hazardous Waste Management Units 5, 7, 10 and 16 Radford Facility Army Ammunition Plant, Radford, Virginia EPA ID# VA1210020730

Draper Aden Associates performed data validation of the analytical results for the Fourth Quarter 2009 semiannual groundwater monitoring event at Hazardous Waste Management Units (HWMUs) 5, 7, 10, and 16 located at the Radford Facility Army Ammunition Plant (RFAAP) in Radford, Virginia. The following information and attached tables summarize the data validation results.

#### Sample Collection/Analytical Services

Draper Aden Associates, of Blacksburg, Virginia, collected all groundwater samples during October 6-27, 2009. The chain of custody and the permit required target analyte list for each HWMU is provided as an attachment. Samples were collected from all required locations.

Samples were submitted for laboratory analysis via courier to CompuChem, a Division of Liberty Analytical, of Cary, North Carolina, or Lancaster Laboratories, Lancaster, Pennsylvania. A summary table of the required analyses and identification of the analyzing laboratory is provided below.

#### Receipt of Monitoring Event Data

On behalf of Alliant Techsystems Inc., each laboratory submitted results to Draper Aden Associates in a final certificate of analysis which included analytical results as well as relevant documentation to verify and validate the results. The final certificate of analysis for the event was received on December 19, 2009.

#### Summary of Monitoring Event Data by Analytical Method

Certificates of analysis were received from each laboratory in the following sample delivery groups (SDGs):

Summary of Required Analytical Methods and SDGs

	Haza				
Analytical Method	HWMU 5	HWMU 7	HWMU 10	HWMU 16	Laboratory
8260B Volatiles	SDG RAD25	NA	SDG RAD24	SDG RAD22	Lancaster
8270C Semivolatiles	SDG 0910223	SDG 0910166	SDG 0910176	SDG 0910073	CompuChem
8081A Pesticides	NA	NA	NA	NA	NA
8151A Herbicides	NA	NA	NA	NA	NA
6020 Inorganics	SDG 0910223	SDG 0910166/0912007	SDG 0910176	SDG 0910073	CompuChem
9012/9010B Cyanide	NA	SDG 0910166	SDG 0910176 SDG 1001150	NA	CompuChem
9034 Sulfide	NA	NA	NA	NA	NA
9065 Phenolics	NA	NA	NA	NA	NA
7470A Mercury	SDG 0910223	SDG 0910166	SDG 0910176	SDG 0910073	CompuChem

NA - Denotes analysis not applicable/analysis not required.

Each final certificate of analysis was complete in its presentation and the data were of acceptable quality. Chains of custody and permit required target analytes are provided in each SDG.

#### Data Analysis and Validation

Samples were analyzed by SW-846 Method requirements (Test Methods for Evaluating Solid Wastes - Physical and Chemical Methods, USEPA SW-846, 3rd edition - Final Update I, II/IIA and III). Data, except where noted below, were evaluated in general accordance with:

- USEPA Region III Modifications To The Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses, April 1993.
- USEPA Region III Modifications To The National Functional Guidelines for Organic Data Review, September 1994.
- USEPA Region III Innovative Approaches for Validation of Organic and Inorganic Data Standard Operating Procedures M-1 and IM-1, June 1995, modified, and the analytical method.

Draper Aden Associates of Blacksburg, Virginia, performed data validation as detailed in the attached data validation reports. For each HWMU, data validation reports and a summary table of data validation results are provided as an attachment.

Review was limited to the following items, where applicable:

- Data package completeness
- Chain of custody
- Holding time/preservation
- Initial and continuing calibrations
- Blanks
- Interference check sample (inorganics)
- Surrogates
- Matrix spike/matrix spike duplicate/(MS/MSD) samples
- Laboratory control samples (LCS)
- Internal standards
- Field duplicate
- Laboratory duplicate (inorganics)

- Serial dilution (inorganics)
- Target analyte identification and quantitation
- Other as noted

#### Reporting of Results

For this event, compliance well and plume well results were reported to at or above the permit quantitation limit (QL).

Each final certificate of analysis was complete in its presentation and the data were of acceptable quality. A summary of the data evaluation by analytical method is provided below.

The chain of custody documentation was complete, except where noted below. The laboratory received the samples on ice and in good condition, with custody seals intact. Technical holding time and preservation criteria were met. The data set demonstrated the laboratory's ability to achieve the permit QL, unless noted below.

#### SW-846 Method 8260B/5030B-Volatile Organic Analytes- 25 ml purge volume, unless noted

Calibration, blank, surrogate, MS/MSD, LCS, internal standards, sample/field sample duplicate results, and target analyte identification and quantitation were met, except where noted below. The MS/MSD samples were analyzed on project samples as noted on the chain of custody. A trip blank was analyzed for each day of sample collection. A blind field duplicate was collected and analyzed for the required target analytes. No target analytes were detected in the sample/field duplicate sample unless noted below. Deviations from specific QA/QC criteria that were identified during the data review process are summarized below.

#### HWMU 5

- Sample/Field Sample Duplicate results- 5WC21/5WDUP- This applied to trichloroethene only (1.9/1.9 µg/l). The RPD criteria were met and no data qualification was required.
- Toluene was reported in the trip blank for each of the two days of sample collection. Toluene results were attributed to vendor vial contamination (see attached correspondence from Lancaster Laboratories). Toluene was not detected at or above the permit QL in any project sample.
- The certificate of analysis was revised to reflect the correct QL.

#### HWMU 10

- Sample/Field Sample Duplicate results 10D3/10DUP This applied to chloroform only (16/17 µg/l). The RPD criteria were met and no data qualification was required.
- 2-Propanol recovered low in the LCS. 2-Propanol sample results for all monitoring locations, except for 10D3D, were validated and qualified "UJ" to note an estimated QL due to the low LCS recovery. 2-Propanol reported above the QL in 10D3D was not influenced by the low LCS recovery.
- 2-Propanol was analyzed via Method 8260B using a 5 ml purge volume and no data qualification was required.
- The following samples required an additional analysis in dilution to report the final result: 10D4 (chloroform), 10D3D (acetone), and 10D3D (2-propanol). For these target analytes, the result from the undiluted initial analysis exceeded the instrument calibration range requiring the dilution. Final results were reported within the instrument calibration range and dilution factors were correctly applied.

#### HWMU 16

- Final results were revised to report the correct QL.
- Toluene was reported below the permit QL in the trip blank for each of the three days of sample collection. These results for toluene were attributed to vendor vial contamination (see attached correspondence).
- Chloromethane recovered low in the LCS. Chloromethane was not detected in any sample at or above the QL and results for chloromethane were qualified "UJ" to note that the QL is estimated due to this QC deficiency.
- Sample 16C1 was analyzed in dilution to obtain the final result for diethyl ether.
- The permit required QL is 12.5  $\mu$ g/l for both diethyl ether and dimethyl ether. The laboratory reported the QL for each analyte as 13  $\mu$ g/l due to rounding. Draper Aden Associates revised the QL to 12.5  $\mu$ g/l and no revision was requested.

#### SW-846 Method 8270C/3510C- Semivolatile Organic Analytes

Calibration, blank, surrogate, MS/MSD, LCS, internal standards, sample/field sample duplicate results, and target analyte identification and quantitation were met, except where noted below. The MS/MSD samples were analyzed on project samples as noted on the chain of custody. No target analytes were detected in the sample/field duplicate sample. Deviations from specific QA/QC criteria that were identified during the data review process are summarized below.

#### HWMU 5

- The final reported result for bis(2-ethylhexyl) phthalate for sample 5WC21 was reported from the field duplicate result as not detected at or above the permit QL. The field duplicate result was used to refute the 5WC21 result for this analyte, 23 µg/l. Laboratory blank contamination is suspected.
- The laboratory incorrectly reported a QL of 20 μg/l instead of 10 μg/l for 2-nitroaniline (o-nitroaniline). The low calibration point of the curve for this analyte supports a QL of 10 μg/l. Draper Aden Associates corrected these QL values and no revision was requested.
- The laboratory reported a QL of 10  $\mu$ g/l for bis-2(ethylhexylphthalate). The low calibration point of the initial calibration curve and the MDL study supports a QL of 6  $\mu$ g/l, the USEPA MCL. The final QL for this target was reported at 6  $\mu$ g/l. A revision to the certificate of analysis was not requested.
- The tune amount (50 ng) was not noted in the certificate of analysis. The tune amount has been 50 ng historically and no data qualification was required.

#### HWMU 7

- The initial calibration standard RSD exceeded 15% for 2,4-dinitrophenol and all results for this target analyte was qualified as estimated.
- The laboratory incorrectly reported a QL of 20  $\mu$ g/l instead of 10  $\mu$ g/l for 2,4-dinitrophenol and 4-nitrophenol. The low calibration point of the curve for each analyte supports a QL of 10  $\mu$ g/l. The laboratory revised the final results to reflect the correct QL.
- The laboratory reported a QL of 10  $\mu$ g/l for bis-2(ethylhexylphthalate). The low calibration point of the initial calibration curve and the MDL study supports a QL of 6

 $\mu$ g/l, the USEPA MCL. The final QL for this target was reported at 6  $\mu$ g/l. A revision to the certificate of analysis was not requested.

- The LCS/MS/MSD recovery for p-nitrophenol was less than 45% (32/35%R). The reported recoveries for p-nitrophenol were within the laboratory specified quality control limits (10-100%) and no data qualification was required.
- The tune amount (50 ng) was not noted in the certificate of analysis. The tune amount has been 50 ng historically and no data qualification was required.

#### HWMU 10

• The tune amount (50 ng) was not noted in the certificate of analysis. The tune amount has been 50 ng historically and no data qualification was required.

#### HWMU 16

- The Chain of Custody was amended by the laboratory to note that the samples were received at the correct temperature. This information was provided as a revision.
- The extraction log was omitted from the certificate of analysis and provided as a revision.
- The tune amount (50 ng) was not noted in the certificate of analysis. The tune amount has been 50 ng historically and no data qualification was required.

#### SW-846 Method 6020/3005A-Inorganics-total

Calibration, blank, interference check sample, MS/MSD/DUP, LCS, internal standards, serial dilution, sample/field sample duplicate results, and target analyte identification and quantitation were met, except where noted below. MS/MSD analyses were performed on project samples as noted on the chain of custody. Deviations from specific QA/QC criteria that were identified during the data review process are summarized below. The field duplicate/sample results exhibited acceptable precision, where applicable, except where noted.

#### HWMU 5

- Sample/Blind Field Sample Duplicate results 5WC21/5WDUP- This applied to barium (15.9/15.9 μg/l), beryllium (3.1/3.1 μg/l), chromium (10.7/13.4 μg/l), cobalt (77.9/79.0 μg/l), copper (7.1/7.6 μg/l), nickel (40.1/41.0 μg/l), and zinc (48.3/50.5 μg/l). The RPD between chromium results was >20 and qualified as estimated. The remaining RPD criteria were met and no other data qualification was required.
- The MSD for beryllium recovered at 126%, just above the upper control limit of 125%. The MS recovered within control limits but the post-digestion spike for beryllium recovered high. Detected results for beryllium (5WC21/DUP) were qualified as estimated.

#### HWMU 7

- Sample/Blind Field Sample Duplicate results 7WCA/7WDUP- This applied to barium (29.3/28.6 μg/l) and nickel (12.5/13.0 μg/l). The RPD criteria were met and no data qualification required.
- The final reported results for copper, lead and zinc for sample 7WCA were obtained from the field duplicate (7WDUP) results. The field duplicate was used to verify that copper, lead, and zinc were not detected at or above the permit QL. Results for these analytes were qualified as estimated due to the discrepancy between sample and field duplicate results.

• The reported result for arsenic in sample 7W13 was inconsistent with historical results. The laboratory was requested to re-digest and reanalyze sample 7W13 for arsenic only. The laboratory could not reanalyze the sample by Method 6020 due to instrument failure and the sample was reanalyzed by Method 6010B. The permit specified QL of 10 μg/l for arsenic was achieved by Method 6010B. The final arsenic result for 7W13 was reported as not detected at or above the permit QL.

#### HWMU 10

• Sample/Blind Field Sample Duplicate results - 10D3/10DUP - This applied to barium only (105/109 µg/l). The RPD criteria were met and no data qualification was required.

#### HWMU 16

- Sample/Blind Field Sample Duplicate results 16C1A/16WDUP This applied to barium (199/207 μg/l) and cobalt only (8.8/8.4μg/l). The RPD criteria were met and no data qualification was required.
- One or more of the internal standards Sc45, In115, and Bi209 recovered low in samples 16C1, 16MW8, 16MW9, 16WDUP, 16WC1B, and 16WC2B and the reported results for analytes associated with these internal standards were qualified estimated as follows: 16C1 (silver, cadmium, lead)
  - 16MW8 (vanadium, chromium, cobalt, nickel, copper, zinc, arsenic, selenium, silver, cadmium)
  - 16MW9, 16WDUP, 16WC1B (vanadium, chromium, cobalt, nickel, copper, zinc, arsenic, selenium, silver, cadmium, lead)
  - 16WC2B (vanadium, chromium, cobalt, nickel, copper, zinc, arsenic, selenium)
- Final results were revised to report the correct QL for mercury, noted below. Results for Method 6020 were not revised.

#### SW-846 Method 7470A-Mercury-total

HWMUs 5, 7, 10, 16

Calibration, blank, MS/MSD, LCS, sample/field sample duplicate results were within control limits except where noted below. MS/MSD analyses were performed on project samples as noted on the chain of custody. Mercury was not detected in the sample/blind field duplicate sample.

Sample results were reviewed for transcription errors from the instrument data to the laboratory report and no errors were noted. Deviations from specific QA/QC criteria that were identified during the data review process are summarized below.

#### HWMU 16

• Final results were revised to report the correct QL.

#### SW-846 Method 9012A/9010B- Cyanide

HWMUs 7, 10

Calibration, blank, MS/MSD, LCS, sample/field sample duplicate results were met, except where noted below. The MS/MSD samples were analyzed on project samples as noted on the chain of custody. Cyanide was not detected in the sample/field duplicate sample. Sample results were reviewed for transcription errors from the instrument data to the laboratory report and no errors were noted. Cyanide was not detected at or above the permit QL in any sample. No deviations from specific QA/QC criteria were identified during the data review process.

#### HWMU10

• The post-preservation pH of sample 10D4 collected 10/21/2009 was 9 SU and not >12 SU as required per Method 9012A. The sample was recollected for cyanide on 10/27/2009 and the pH criterion was met. However, the laboratory inadvertently did not analyze the sample. Draper Aden Associates re-sampled monitoring well 10D4 on January 25, 2010 for cyanide. The result was received via email on January 27, 2010. Cyanide was not detected at or above the permit QL.

#### DATA VALIDATION REVIEW ITEMS-SAMPLE PAPERWORK

#### A. QC DELIVERABLES PACKAGE – SAMPLE PAPERWORK:

1.	Was the chain of custody included in the data deliverable package?	☑ YES □ NO
2.	Was custody transfer between different parties dated and signed?	🗹 YES 🗆 NO
2.	Did the chain of custody document sampler signature, sample locations,	
	date and time of sampling and analyses requested?	☑ YES □ NO
3.	Were the sample results included for all sample locations?	🗹 YES 🗆 NO
4.	Did the laboratory report all required target analytes?	☑ YES □ NO

End of page

#### A. QC DELIVERABLES PACKAGE:

- ☑ Project specific target analytes reported at or above required permit QL
   MDL study performed for all target analytes and supports required QL-not reviewed
- ☑ Passed single blind performance evaluation sample within 12 months
- ☑ Electronic data file reviewed

#### B. TECHNICAL HOLDING TIME AND PRESERVATION REVIEW CRITERIA:

- ☑ 14-day sample holding time
- ☑ Samples received at ≤6°C, zero headspace
- ☑ Preparation Method 5030C, 25 ml purge volume

#### C. GC/MS INSTRUMENT PERFORMANCE CHECK REVIEW CRITERIA:

☑ Instrument performance check solution was analyzed at the beginning of each 12-hour period of standard and/or sample analysis

#### D. INITIAL GC/MS CALIBRATION REVIEW CRITERIA:

- ☐ Target analytes included in the ICAL
- ☑ ICAL consisted of 5 calibration standards (or more, as needed)
- ☑ Lowest concentration calibration standard at or below the associated MCL, regulatory compliance, action limit, or required QL
- ☑ No calibration standards were removed from curve that would negatively impact the data integrity
- $\square$  Each target analyte %RSD  $\leq 15\%$

#### E. CALIBRATION VERIFICATION REVIEW CRITERIA:

- ☑ Calibration verification standard analyzed at the beginning of each 12-hour period following the instrument performance check analysis and prior to the method blank and sample analysis
- ☑ % Difference/Drift of target analytes within ± 25.0%

#### F. BLANK REVIEW CRITERIA:

- ☑ Method/extraction blank analyzed on each GC/MS system used for sample analysis
- ☑ Trip Blank-one per day of collection.

#### G. SURROGATE REVIEW CRITERIA:

- The following surrogates (or others as allowed) were used and within the specified range
  - dibromofluoromethane (80-120%), 4-bromofluorobenzene (80-120%)
  - toluene-d<sub>8</sub> (80-120%), 1,2-dichloroethane-d<sub>4</sub> (80-120%)

# H. MATRIX SPIKE / MATRIX SPIKE DUPLICATE (MS/MSD) / LABORATORY CONTROL SAMPLE (LCS) REVIEW CRITERIA:

- ☑ MS/MSD and LCS analyzed; MS/MSD and LCS within range
- ☑ Project specific analytes -%R 75-130%, RPD <10
- ✓ Independent source

#### I. INTERNAL STANDARDS REVIEW CRITERIA:

- ☑ The following internal standards (or others as allowed) were used -fluorobenzene or 1,4-difluorobenzene, chlorobenzene-d<sub>5</sub>, 1,4-dichlorobenzene-d<sub>4</sub>
- $\square$  Internal standard areas within  $\pm$  50% of last calibration verification
- ☑ Internal standard retention times within ± 30 seconds of last calibration verification

#### J. TARGET ANALYTE IDENTIFICATION REVIEW CRITERIA:

- ☑ Results were consistent with historical data. New detections evaluated as follows:
- ☑ RRTs of the reported analytes within ± 0.06 RRT units of the standard RRT
- ☑ Sample spectra versus laboratory standard spectra criteria were evaluated:
  - -Characteristic ions maximized in the same scan or within one scan of each other
  - -Characteristic ions present in the standard spectra were present in the sample spectra for analytes detected above the QL
  - -Relative intensities of the ions between the standard and sample spectra were within ±30%.

#### DATA EVALUATION FOR SW-846 METHOD 8260B (GC/MS) VOLATILE ORGANICS (Con't.)

#### K. TARGET ANALYTE QUANTITATION REVIEW CRITERIA:

- Results are consistent with historical data. New detections evaluated as follows:
  - If analyte %RSD was 15% or less, use average relative response factor for quantitation.
  - If analyte %RSD was greater than 15%, use first or higher order regression fit of five calibration points (6 calibration points for 2<sup>nd</sup> order)
- ☐ Results that exceed the initial calibration range were reanalyzed at a higher dilution
- Analyte concentrations recorded on the sample quantitation reports were accurately transferred to the sample summary sheets (laboratory report)

#### L. REPORTING:

- ☑ Detected analytes or results requiring validation are presented on the attached data validation report
- ☑ Results reported at or above permit QL
- ☑ Results reported within instrument calibration range
- ☑ Sample/blind field duplicate RPD <20, where applicable

#### A. QC DELIVERABLES PACKAGE:

- ☐ Passed single blind performance evaluation sample within 12 months (not evaluated)
- ☑ Electronic data file reviewed

#### B. TECHNICAL HOLDING TIME AND PRESERVATION REVIEW CRITERIA:

- ☑ Holding time: 7-day sample collection to extraction / 40-day extraction to analysis
- $\square$  Samples received at  $\leq 6^{\circ}$ C)
- ☑ Extraction Method 3510C used

#### C. GC/MS INSTRUMENT PERFORMANCE CHECK REVIEW CRITERIA:

☑ Instrument performance check solution analyzed at the beginning of each 12-hour period of standard and/or sample analysis

#### D. INITIAL GC/MS CALIBRATION REVIEW CRITERIA:

- ☑ Target analytes included in the ICAL
- ☑ ICAL consisted of a minimum of 5 calibration standards (or more, as needed)
- ☑ Lowest concentration calibration standard at or below the associated MCL, regulatory compliance, action limit, or permit QL
- ☑ No calibration standards were removed that would negatively impact the data integrity
- $\square$  Each target analyte %RSD  $\leq 15\%$
- ☑ Correlation coefficient or coefficient of determination >0.99 for target analytes with ≥15 % RSD

#### E. CALIBRATION VERIFICATION REVIEW CRITERIA:

- ☑ Calibration verification standard analyzed at the beginning of each 12-hour period following the instrument performance check analysis and prior to the method blank and sample analysis
- ☑ Analytes have % Difference/Drift within ± 25.0%

#### F. BLANK REVIEW CRITERIA:

☑ Method/extraction blank analyzed on each GC/MS system used for sample analysis

#### G. SURROGATE REVIEW CRITERIA:

- ☑ The following surrogates (or others, as allowed ) were used and within the specified range
  - phenol d<sub>6</sub> Or d<sub>6</sub> (10%-94%), 2-fluorophenol (45-110%), 2,4,6-tribromophenol (10%-123%),
  - nitrobenzene  $d_8$  (35-110%), 2-fluorobiphenyl (43%-116%), terphenyl  $d_{14}$  (49-120%)

# H. MATRIX SPIKE / MATRIX SPIKE DUPLICATE (MS/MSD) / LABORATORY CONTROL SAMPLE (LCS) REVIEW CRITERIA:

- ☑ MS/MSD and LCS analyzed with all target analytes
- ☑ MS/MSD and LCS recovered at or above 45%, RPD <20

#### I. INTERNAL STANDARDS REVIEW CRITERIA:

- ☑ The following internal standards were used (or others as allowed)
  - -1,4-Dichlorobenzene-d<sub>4</sub>, Naphthalene-d<sub>8</sub>, Acenapththene-d<sub>10</sub>, Phenanthrene-d<sub>10</sub>, Chrysene-d<sub>12</sub>, Perylene-d<sub>12</sub>
- $\square$  Internal standard areas within  $\pm$  50% of last calibration verification
- ☑ Internal standard retention times within ± 30 seconds of last calibration verification

#### J. TARGET ANALYTE IDENTIFICATION REVIEW CRITERIA:

- Results were consistent with historical data. New detections evaluated as follows:
- ☑ RRTs of the reported analytes within ± 0.06 RRT units of the standard RRT
- ☑ Sample spectra versus laboratory standard spectra criteria were evaluated:
- Characteristic ions maximized in the same scan or within one scan of each other
  - Characteristic ions present in the standard spectra were present in the sample spectra for analytes detected above the permit QL
  - Relative intensities of the ions between the standard and sample spectra were within ±30%.

#### DATA EVALUATION FOR SW-846 METHOD 8270C (GC/MS) SEMIVOLATILE ORGANICS (Con't.)

#### K. TARGET ANALYTE QUANTITATION REVIEW CRITERIA:

- ✓ Results were consistent with historical data. New detections evaluated as follows:

   If analyte %RSD was 15% or less, use average relative response factor for quantitation.
   If analyte %RSD was greater than 15%, use first or higher order regression fit of five calibration points (6 calibration points for 2<sup>nd</sup> order).
- Results that exceed the initial calibration range were reanalyzed at a higher dilution.
- Analyte concentrations recorded on the sample quantitation reports were accurately transferred to the sample summary sheets (laboratory report).

#### L. REPORTING:

- Detected analytes or results requiring validation are presented on the attached data validation report
- ☑ Results reported to at or above the permit QL
- Results reviewed to detection limit and no target analytes were detected at or above DL or QL

#### A. QC DELIVERABLES PACKAGE: $\square$ Sample results included for all sample locations Target analyte QLs reported at permit required QL $\overline{\mathbf{A}}$ Sample digestion method: 3005A $\square$ Electronic data file reviewed $\square$ В. TECHNICAL HOLDING TIMES / PRESERVATION REVIEW CRITERIA: $\square$ 6 month holding time, pH<2 with Nitric Acid (HNO3) C. INSTRUMENT CALIBRATION/TUNE CRITERIA: M Target analytes, 1 calibration blank and at least 1 standard $\overline{\mathbf{A}}$ Instrument tuned prior to analysis (%RSD <5%) D. **INSTRUMENT CALIBRATION CRITERIA:** $\checkmark$ 10 sample frequency Use of calibration blank and check standard $\checkmark$ $\square$ Recovery within 90-110% Е. **BLANK CRITERIA:** Trip Blank (check only if analyzed) N/A N/A Equipment Blank $\checkmark$ Method/Other Lab Blanks (check only if analyzed) Interference free $\overline{\Delta}$ CCB 10 sample frequency INTERFERENCE CHECK SAMPLES (ICS) CRITERIA: F. $\overline{\mathbf{A}}$ At beginning of batch or every 12 hours (80-120%) G. MATRIX SPIKE DUPLICATE (MSD) CRITERIA: ք One MSD or sample duplicate per batch of 20 samples RPD ≤ 20 between MS and MSD results or sample and duplicate results $\checkmark$ Control limit is $\pm$ OL when sample values are less than 5 times QL (100X DL) ☑ Η. MATRIX SPIKE (MS) CRITERIA: 75-125% recovery, all analytes $\square$ $\square$ All analytes, spiked prior to digestion One matrix spike per analytical batch $\checkmark$ No more than 20 samples per analytical batch V I. BLIND FIELD SAMPLE DUPLICATE CRITERIA:

☑ 10% Difference

#### J. SAMPLE RESULTS CRITERIA:

Results reported within instrument linear range

#### K. LABORATORY CONTROL SAMPLE (LCS) CRITERIA:

All target analytes, 1 LCS per 20 samples, (80-120% Recovery)

#### L. INTERNAL STANDARDS (IS) CRITERIA:

☑ IS (Li, Sc, In, Tb, Bi) intensities (70-125% RI, see section 9.3, 6020A)

#### M. SERIAL DILUTION CRITERIA:

- ☑ Similar matrix
- If concentration 50 times IDL, %Difference must be within 10%

#### N. QUANTIATION LIMIT STANDARD (CDRL STANDARD) CRITERIA:

- ☑ Target analytes
- ☑ 85-115% recovery
- ☑ Standard analyzed at the QL

#### O. REPORTING:

- Detected analytes or results requiring validation are presented on the attached data validation report
- N/A MDL study reviewed (not reviewed 4Q2009)
- ☑ Results reported to at or above the permit QL

# A. QC DELIVERABLES PACKAGE: ☑ Mercury QL reported at permit required QL ☑ Electronic data file reviewed B. TECHNICAL HOLDING TIME / PRESERVATION REVIEW CRITERIA: ☑ 28 day holding time, Adjust pH <2 w/ HNO<sub>3</sub>

#### C. INSTRUMENT CALIBRATION CRITERIA:

- ✓ 1 calibration blank and at least 5 standards
   ✓ ICAL standards within 5% of true value
- ✓ Instrument calibrated for every analytical sequence, r>0.995
- ☑ ICAL standard analyzed at the permit QL
- ☑ QL standard analyzed at or less than the permit required QL (70-130%R)
- ☑ QL standard analyzed at beginning of run, following ICV/ICB

#### D. INITIAL / CONTINUING CALIBRATION VERIFICATION CRITERIA:

☐ 10 sample frequency for CCV; recovery within 80-120%

#### E. BLANK CRITERIA:

- N/A Trip Blank (check only if analyzed)
- N/A Equipment Blank (check only if analyzed)
- Method/other laboratory blanks (check only if analyzed), Interference free

#### F. MATRIX SPIKE DUPLICATE (MSD) CRITERIA:

- ☑ One MSD or sample duplicate per batch of 20 samples
- $\square$  RPD  $\leq$  20 between MS and MSD results or sample and duplicate results
- $\square$  Control limit is  $\pm$  QL when sample values are less than 5 times QL (100X DL)

#### H. MATRIX SPIKE (MS) CRITERIA:

- ☑ 75-125% recovery
- MS spiked prior to digestion, One MS per analytical batch of 20 samples

#### H. FIELD SAMPLE DUPLICATE CRITERIA:

☐ Target analyte: mercury, %Difference <10%

#### I. LABORATORY CONTROL SAMPLE (LCS) CRITERIA:

Recovery within 80-120% range. Independent source from calibration standards.

#### J. SAMPLE RESULTS CRITERIA:

☑ Results reported within instrument calibration range

#### K. REPORTING:

Detected analytes at or above the permit QL. When applicable, results requiring validation are presented on the attached data validation report.

#### INORGANIC DATA EVALUATION FOR CYANIDE BY SW-846 METHOD 9012/9010B

Α.	QC DELIVERABLES PACKAGE:
	<ul> <li>☑ Passed single blind performance evaluation sample within 12 months (not evaluated)</li> <li>☑ Electronic data file reviewed</li> </ul>
В.	TECHNICAL HOLDING TIME / PRESERVATION CRITERIA:
	<ul> <li>✓ 14 day holding time</li> <li>✓ Cool ≤6° C</li> <li>✓ Adjust pH &gt;12 w/ NaOH</li> </ul>
С.	INSTRUMENT CALIBRATION CRITERIA:
	<ul> <li>✓ 1 calibration blank and at least 3 standards, correlation coefficient &gt;0.995</li> <li>✓ Standard at or below QL</li> </ul>
D.	INITIAL / CONTINUING CALIBRATION VALIDATION CRITERIA:
	<ul> <li>☑ 10 sample frequency</li> <li>☑ Use of check standard with every batch of samples</li> <li>☑ Recovery within 85-115% range (± 15%)</li> </ul>
<b>E.</b>	BLANK CRITERIA:
	<ul> <li>✓ Interference free</li> <li>✓ Verification Blank analysis analyzed every 10 samples</li> </ul>
F.	MATRIX SPIKE DUPLICATE (MSD) CRITERIA:
	<ul> <li>✓ One MSD or ample duplicate per batch of 20 samples</li> <li>✓ RPD ≤ 20 between MS and MSD results or sample and duplicate results</li> <li>✓ Control limit is ± QL when sample values are less than 5 times QL (100X DL)</li> </ul>
G.	MATRIX SPIKE (MS) CRITERIA:
	<ul> <li>         ✓ 75-125% recovery</li> <li>Spiked prior to distillation</li> <li>One MS required per analytical batch. No more than 20 samples per batch</li> </ul>
н.	SAMPLE RESULTS CRITERIA:
	☑ Results reported within instrument calibration range
I.	REPORTING:
	Detected analytes at or above the permit QL. When applicable, results requiring validation are presented on the attached data validation report.

#### LIMITATIONS:

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Conclusions presented are based upon a review of available information, the results of our field studies, and/or professional judgment. To the best of our knowledge, information provided by others is true and accurate, unless otherwise noted.

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1-26.2010

Date:

1-28-2010

Date:

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www.daa.com

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acct#11200 ap#1168612 sample#5820380-95

HWMU5
Radford Army Ammunition Plant
2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

**ANALYTICAL METHOD: 8260B/5030B** 

TYPE METHOD: GCMS CLASS: VOLATILE

No.	ANALYTE	CAS RN	Required QL (μg/l)
1.	Acetone	67-64-1	10
2.	Chloroform (trichloromethane)	67 <b>-</b> 66-3	1
3.	2-butanone (methyl ethyl ketone - MEK)	<b>78-93-3</b>	10
4,	1,2-dichloroethane	107-06-2	1
5.	Methylene chloride	75-09-2	1
6.	Toluene (methyl benzene)	108-88-3	. 1
7.	Trichloroethene	79-01 <b>-</b> 6	1
8.	Xylenes (total)	1330-20-7	3
9.	Diethyl ether	60-29-7	12
10.	Dichlorodifluoromethane	<b>75-71-8</b>	1

Note: #9 added on Jan 2004 due To 4Q2003 detection. JCF 0104 Note#10 (dichlorodifluoromethane) add 4Q 2006 due to detection 3Q 2006. JCF 10/06

#### Reviewed:

Revised and updated 1/15/2004 JCF.
Revised and updated 10/1/06.
Reviewed 4 Q 2006 -9/30/2009 10:52 AM
10/9/2007 JCF -- 2007 switched to semiannual monitoring 2/4 Q.





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Preserved and shipped on Ice: a 7 Syranson Currier Currier 99<u>9</u> 200 100 <u>10-800160</u> 2009 2nd Semiemous! Monitoring B03204-07 Box 4: Sample Type G Grab C Composite RAAP, Rectord, Virginia #2 Relinquished #2 Received by (Signature) 8 Соптрату Received by Isb In Good Condition Yes No Custody Soal triand Yes No Temperature upon errived Received on Ice Yes No 60/80/00 CG Clear 10 28/09 Box 5: Sample Container Type <u>۱</u> Box 3: Filtered/Unfiltered ( .mpuchem Environmantal, 501 Madison Avenue. Cary, NG 27513/Cathy Dover, Manager/1-800-839-5987 Unfillered F Fillend G Amber Gla Location Event: DAAJN: LabJN: P Plestic NeOH ZnAc ; Other (Specify) | None Janet C. Frezior 2206 South Mein Street Bleckeburg, Vrginie 24060 (540) 552-0444 (540) 552-0251 ENGE (KM) DENG SIANU 42 57 (Menet-ynamen) A0505/A0747

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மை 2-1L AG #1 Relinquished by (Signeture): Company Nume: 1 - 500 ML P 60/20/01 pag Time: 0900 (listoT ç CP/MS 6020/3006A (Metals-Box 2: Preser A HCL B HNC<sub>3</sub> C H<sub>2</sub>SO<sub>4</sub> Consultant: Atm: Address: Phone: Fex: Trip Blank Equipment Blank Product Box 4 - Sample Type

Box 3 - Filtered Infiltand

Required by N d Sample

Box 2 - Preservative

Box 5 - Sample Container Type

Residual Chlorific Present 3 ₹ 3 8 8 ₹ © |₹ Š ₹ 8 8 Slaughter Clients Special Instructions: level 4 with pedd. 1305 055/ 1600 9 ટ્ર omil **-** w **-** 0 00000 0/0/0 Date: 2008 Describe problems, if any SW Surfece Water GW Groundwater SWC21 SWDUP SWC22 Leechate Sample ID SW8B SW8B 5WC23 5W8A 6W10A SEWE **EW11A** Sempler Name \$8 Signature: Sempler Nem Print Attn: Address: Sampler Phone: Fex: Fex:

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# **HWMU5** Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event



**ANALYTICAL METHOD: SEE BELOW** 

TYPE METHOD: SEE BELOW

CLASS: TOTAL

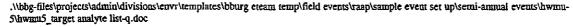
#### Method SW 846-6020 (ICP/MS)

No.	ANALYTE	CAS RN	Required Per	rmit Quantitation limit (µg/l)
1.	Antimony	7440-36-0	1	
2.	Arsenic	7440-38-2	10	
3.	Barium	7440-39-3	10	
4.	Beryllium	7440-41-7	1	
4. 5.	Cadmium	7440-43-9	1	
6.	Chromium	7440-47-3	5	
7.	Cobalt	7440-48-4	5 5	
8.	Copper	7440-50-8	5	
9.	Lead	7440-92-1	1	
10.	Nickel	7440-02-0	10	./
11.	Selenium	7782-49-2	10	JUZA NE
12.	Silver	7440-22-4	2	(1)
13.	Thallium	7440-28-0	1	0.5
14.	Vanadium	7440-62 <b>-2</b>	10	)
15.	Zinc	7440-66-6	10	
Method :	SW 7470A/CVAA			
16.	Mercury	7439-97-6	2	

. Note: # 6 added on Jan 2004 due To 4Q2003 detection.

#### Reviewed:

Revised and updated 1/15/2004 JCF. Revised and updated 10/1/06. Reviewed 4 Q 2006 -9/30/2009 10:52 AM 10/9/2007 JCF - 2007 switched to semiannual monitoring 2/4 Q.



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#### **HWMU5**

### Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

**ANALYTICAL METHOD: 8270C** 

TYPE METHOD: GCMS
CLASS: SEMIVOLATILE

No.	ANALYTE	CAS RN	Required Permit Quantitation limit (µg/l)
1,	Bis(2-ethylhexyl)phthalate	117-81-7	10
2.	Diethylphthlate	84-66-2	10
3.	2,4-dinitrotoluene	121-14-2	10
4.	2,6-dinitrotoluene	606-20-2	10
5.	2-Nitroaniline (o-Nitroaniline)	88-74-4	10
6.	4-Nitroaniline (p-Nitroaniline)	100-01-6	20
7.	Nitrobenzene "	98-95-3	10

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Note: #5-7 added on Jan 2004 due To 4Q2003 detection. JCF 0104

#### Reviewed:

Revised and updated 1/15/2004 JCF.
Revised and updated 10/1/06.
Reviewed 4 Q 2006 -9/30/2009 10:52 AM
10/9/2007 JCF - 2007 switched to semiannual monitoring 2/4 Q.

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RECORD	300-833-5097	::	d/Unfillered  6 Container Type  V VOA  CG Clear Glass			Time: DBDO STEEPER NO
CUSTODY	Manager/1-8	Sample Site: Location: Event: DAA JN: Lab JN:	Box 3: Filtered F Filtered U Unfiltered Box 5: Sample P Plastic AG Amber Glass			Received A
CHAIN OF CUSTODY RECORD	27513/Cathy Dover, Manager/1-800-833-5097	Draper Aden Associates Janet C. Frazler 2206 South Main Street Blecksburg, Virginia 24060 (540) 552-0444 (540) 552-0291	E NaOH F ZnAc G Other (Specity) H None	0 10 212 Er Er A -300 P	50/06/ (chanted) AS 108	X X X X Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z
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# Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

**ANALYTICAL METHOD: SEE BELOW** 

TYPE METHOD: SEE BELOW

CLASS: TOTAL

# Method SW 846-6020 (ICP/MS)

No.	ANALYTE	CAS RN	Required PERMIT QL (µg/l)
1.	Antimony	7440-36-0	1
2.	Arsenic	7440-38-2	10
3.	Barium	7440-39-3	10
4.	Cadmium	7440-43-9	1
5.	Chromium	7440-47-3	5
6.	Copper	7440-50-8	5
7.	Cobalt	7440-48-4	5
8.	Lead	7440-92-1	1
9.	Nickel	7440-02-0	10
10.	Selenium	7782-49-2	10
11.	Silver	7440-22-4	2
12.	Thallium	7440-28-0	1
13.	Zinc	7440-66-6	10
	•		
14.	Mercury	7439-97-6	2

Copper added to list 11/03 JCF

zinc added to list 2Q 2004 JCF

this list updated 10/04 (4thQ 2004) JCF no changes 1Q207. JCF 10/2007

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Review 09 2005 JCF



#### **HWMU7**

## Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

ANALYTICAL METHOD: 9012/9010A

TYPE METHOD: CLO
CLASS: CYANIDE

No. ANALYTE CAS RN Required PERMIT QL (μg/l)

1 Cyanide 57-12-5 20

JCF 10/2007

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Review 09 2005 JCF



#### HWMU7

# Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

**ANALYTICAL METHOD: 8270C** 

TYPE METHOD: GCMS
CLASS: SEMIVOLATILE

No.	ANALYTE	CAS RN	Required PERMIT QL (µg/l)
1. 2. 3. 4. 5.	Bis(2-ethylhexyl)phthalate Butylbenzyl phthlate 2,4-Dinitrophenol 2,4-dinitrotoluene 2,6-dinitrotoluene p-nitrophenol, 4-nitrophenol	117-81-7 85-68-7 51-28-5 121-14-2 606-20-2 100-02-7	10 10 10 10 10 10

JCF 10/2007

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Review 09 2005 JCF



Jo# 1167595

Sample Stonage Time Requested: ŝŝ 30 DYS ORG/6 MTHS INORG ST (S) analyze 1 th-10 blank for each day of sampling. Justing ٥ 2 S) Š. Date Dista LOS Report results at or greater than QL.
 Level 1 with EDD. Project Specific (PS) QC: Sample Collection for Project Complete? Tiggi Date GENERAL NOTES Bill: Comment 68-419618G Carrier: Tracking Number: Copy to Consultant: Oc. tobe : Zoog 2009 Znd Seniannual Monitoring B03204-07 Box 4: Sample Type G Grab C Composite RAAP, Radford, Virginia Japon Date/0/3/199 by (Signeture): #2 Received by (Signature): CHAIN OF CUSTODY RECORD STAIDLE FWWC10  $\mathcal{C}$ 25 New Holland Pire, Lancaster, PA: 17505-2425/Barb Wayand, Manager/ (717):656-2300 Company CG Clear Glass Name: £ Box 6: Sample Container Type < VO Time: / 700 Yes Box 3: Filtered/Unfiltered Received on Ice U Unfiltered F Filtered Sample Site Location: Event: DAA JN: Lab JN: P Plastic R Temperature upon arrival G Other (Specify) H None 2206 South Main Street Blacksburg, Virginia 24060 (540) 552-0444 Draper Aden Associates E NaOH F ZnAc Janel C. Frazier (540) 552-0291 10/12/09 £ #1 Relinquished by (Signature): torpic algans #1 Received Company Negre: Custody Seal Intect Yes send, usc Date: 10 31 09 Box 2: Preservative A HCL B HNO<sub>3</sub> Date: 10/21/09 이그덩 Ine: 0800 B0809/80978 C H<sub>2</sub>SO<sub>4</sub> Attm: Address: ę Phone: Fax: Lancasier Laboratories 24 욷 ₹ 3 Equipment Blank ₹ G 8 8 **≋** Box 1: Matrix Received by lab in Good Condition Yes Box 5 - Sample Container Type Box 3 - Filtered/Unfiltered Required pH of Sample BRI Slaughter Clients Special Instructions: level 1 with edd. Product 1355 1355 130 Box 2 - Preservative 005/ Other 00 ⊢ш 0000 18/01 10/01 0/2 20ct#11300 Describe problems, if any SW Surface Water GW Groundwater L Leachate S Soll Laboratory Irip Blank 1003 Sample ID 10MW1 100UP 10D3D 10D4 Sampler-Herge Sampler Nam Signature:/ Attn: Address: Sampler Phone: Fax: Fax: (Print):

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by (Signature)

Сопрапу

Name:

Time: 0300

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Sampler

(Print):

acct#11200 ap#1167595 Sample#5813614-22

# HWMU10 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

1 2 L

**ANALYTICAL METHOD: 8260B/5030B** 

TYPE METHOD: GCMS CLASS: VOLATILE

No.	ANALYTE	CAS RN	Required QL (μg/l)
1.	Bromodichloromethane	75 <b>-27-4</b>	1
2.	Chloroform (trichloromethane)	67-66-3	. 1
3.	2-butanone (methyl ethyl ketone - MEK)	78 <b>-</b> 93-3	10
3.	Trichloroethene	79-01-6	1
4.	Xylenes (total)	1330-20-7	3
5.	Acetone	67-64-1	10
6.	Isopropanol / 2-Propanol	67-63-0	50

Noete 5 and 6 added 3Q2005. JCF

Reviewed 09/2005 10/2007 jcf

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	Project Specific (PS) QC: Sample Collection for Project Complete?  Camber: N.C. Countries: Project Complete Tracking Number:	Invoice Copy to Consultant: Bill: Doct Zower Preserved and shipped on Ios: Zresa Ino	GENERAL NOTES. Report results at or greater than QL. Level 4 with EDD.		2x15 deliveratore regured.	172 Will resumpte for OU - MOVIOR	103	へものだけなった。	\$0	Olo		Residual Chlorina Present?	No No			Date: Sample Storage Time: Time  Time Requested:  Time Date: DAS ORGE  Time: UCD  Time: UCD
	RAAP, Radford, Virginia HVMIU10 2009 2nd Semiamusi Monitoring B03204-07	red Box 4: Sample Type G Grab V VOA V VOG Composite	+ 4			0410116				7		Re	Yes		3,1°C	22 Relibraciahed 22 (Signature): Company Name: 22 Received 22 (Signature): Company Name:
CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097	Sample Sile: Location: Event DAA JN: Lab JN:	Box 3: Filtered   Filtered     Filtered     Unfiltered     Unfiltered   Box 5: Bample Container Type   Plastic     V VOA Amber Glass   CG Clear Container Co			Ç										Raceived on Ica V Yes	Tune/// S  Tune/// S  Tune/// S  Tune:
513/Cathy Dover, Mar	Draper Aden Aseoclates Janet C. Frazier 2206 South Main Street Blacksburg, Virginia 24060 (540) 552-0444 (540) 552-0791	E NeOH F ZnAG G Other (Specify) H None	0 172	1.400 mb.P.	OKJUR 19/10/98 OKJUR 19/10/98 OKJUR 19/10/98 OKJUR 19/10/98	x (-2) X0 9	21< 27 ×	77 ×		× <2.>12					Temperature upon arrival	Miller Conti
enue, Cary, NC 275	Oraper Aden Janet C. 2206 South Backsburg, V. (540) 55 (540) 55			MP 2-1LA	A0127 (Mercury-Total)		×	×		×					Yes No Temp	tr Rainquished  by (Signature) <sup>(f)</sup> Company Name  Company  Pr (Signature)  Company  Name
al, 501 Madison Av	Consultant: Attn: Address: Phone: Fax:	Box 2: Preservative A HCL B HNO <sub>3</sub> C H <sub>2</sub> SO <sub>4</sub> D NB <sub>2</sub> S <sub>2</sub> O <sub>5</sub>	o ⊃ Ç a	1-500 ml P	Vumber of Bottles CP/MS 6020/3005A (Metals-	_	4 X		*	X 4					Custody Seal Inlact	Time: 0800 Date: (6/21/09
Shem Environment	Oraper Aden Associaties 0 0 0 0 0	1 Trip Blank E. Equipment Blank P. Product O. Other	Box 4 . Sample Type Box 3 - FitteredUnfliered Required DH of Sample	Box 5 - Sample Container Type	emíT xfuleM : F xo8	1500 GW	10 0 GW	NS VHE	<u> </u>	1/30 GW				vel 4 with ¢dd.	m_1 Yes No	Slawahter Storms Emeri Emeri
Laboratory: CompuC	Client: Oraper Ader Attn: Address: C Phone: C Fox: C Fax: C	Box 1: Mahrix SW Surface Weler GW Groundwater L Leschale S Soil	Box 4 - S: Box 3 - Fitte	Box 5 - Sample	ormen Giding Giden	10D4 10/31		10D3	10DUP	16/01 deast				Clients Special Instructions: level 4 with 644	Received by lab in Good Condillon. L	Sampler Name State State State State Stampler Sampler Sampler Sampler Sampler Stanpler Stanpl

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W 10-4.0	2010 Or all	Project Specific (PS) QC: Sample Collection for Project Campleto?  Carrier: MC COURIEN SCRULE Tracefing Minister.			2 2 1	Frescrived and Shipped on ice: Syste Inc		an CL.	14.5. 24.6. 24.6. 5.5.6.	resampling reguind	PH 10 instead of 2H 12. UE 1021-05					11-collisted Date 128/09 Sample Storage Time Requested to 10/28/09 WITHE INORG COUNTIEST 1/20/28/09 WITHE INORG TIMES A 1505 10.28:09
		RAAP, Radford, Virginia HWAAU10 intual Moniloring Re-sample B03204-07		Box 4: Sample Type G Grab	C Composite		1 Report			HTMS YOUR X	lab @ pH 10 Ins					
	26097	RAAP, Radiord, Virginia HVMAU10 2009 2nd Semiannual Moniloring Re-sample B03204-07				CG Clear Glass									es No	30 Company Connection of the Company C
ODY RECOR	ger/1-800-833-E	Sample Site: Location: Event: 2009 2 DAA.JN;		Box 3: Fithered/Unfittered F Fillered U Unlittered	Box 5: Sample Container Type	AG Amber Glass					16-07				eived on Ice	Time, 08.30  Time, 08.30  Time, 08.30  Time, 9.30  Time, 9.30
	y, NC 27513/Cathy Dover, Manager/1-800-833-5097	Draper Aden Associates S. Janet C. Frazier 2206 South Brin Street Blacksbrur, Virginia 24060 (540) 552-0444 E. (540) 552-0431 D.			G Other (Specify) BA	AG					241012				No Temperature upon arrival 490 Received on Ice 77es	Custoner Delivery V (1) 10.38.09
	1 Avenue, Car		5 2	2					4	ispnide	>12				Yes	#1 Relinquished Dv. (Signe).uge). Company Marne. #1 Recaived Dv. (Signe).uge Company Name.
	Compuchern Environmental, 501 Madison Avenue, Cary,	Consultant: Attn: Address: Phone:	Box 2: Preservative	A HCL B HNO,	C H₂SO. D Na₂S₂O₃	9	⊐ °	1/3	450 m 54	aelitica to Tedmila 014 (Cyanide)					Custody Seal Intact	Date: 10/97/09  Date: 10/97/09  Time: 0730
	wronmenta			Trip Blank Equipment Blank	т.		red		J.V.De	xhisM :1 xod	AS GW			4	N	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	npucnem Er	Uraper Aden Associate 0 0 0 0 0 0 0 0 0 0 0		T Trip Blank E Equipmen	O Other	Box 4 - Sample Type	Box 3 - Filtered/Unfiltered Required off Sample	Box 2 - Preservative	Box 5 - Sample Container Type	Date: 2009	37 1635			level 4 with ed	dition Yes	ment of the standard of the st
	ratory:	Gient: Crapk Address: Phone: Fax:	Box 1: Watrix	SW Surface Water GW Groundwater	S Soil	Box	Box 3	Box	Box 5 . Si	Sample D Sample Samp Sample Sample Sa	1004 16 3-			Clients Special Instructions: level 4 with edd.	Received by lab in Good Condition Ves. Describe problems, if any:	Sampler Name Sampler Sampler Name Name Sampler

# HWMU10 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

ANALYTICAL METHOD: SEE BELOW

TYPE METHOD: SEE BELOW

CLASS: TOTAL

#### Method SW 846-6020 (ICP/MS)

No.	ANALYTE	CAS RN	Required QL (μg/l)
1.	Arsenic	7440-38-2	10
2.	Barium	7440-39-3	10
3.	Cobalt	7440-48-4	5
4.	Chromium	7440-47-3	5
5.	Copper	7440-50-8	5
6.	Lead	7440-92-1	1
7.	Nickel	7440-02-0	10
8.	Selenium	7782-49-2	10
9.	Silver	7440-22 <del>-4</del>	2
10.	Vanadium		10
11.	Zinc	7440-66-6	10
Method SW	7470A		
12.	Mercury	7439-97-6	2

Not: Cobalt and vanadium added 2 Q 2004. JCF 7/14/2004 10/2007 jcf

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#### HWMU10

## Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

ANALYTICAL METHOD: 8270C/3520C

TYPE METHOD: GCMS
CLASS: SEMIVOLATILE

No.	ANALYTE	CAS RN	Requir	ed QL (µg/l)
1.	2,4-dinitrotoluene	121-14-2	10	/
2.	2,6-dinitrotoluene	606-20-2	10	

10/2007 jcf

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### HWMU10 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

**ANALYTICAL METHOD: 9012A** 

TYPE METHOD: <u>CLO</u> CLASS: <u>CYANIDE</u>

No. ANALYTE CAS RN Required QL ( $\mu g/l$ )

1 Cyanide 57-12-5 26

10/2007 jcf

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CHAIN OF CUSTODY RECORD SCANOL 5803043-59

UNIX ĺ ظُوٰ The proof of the second of the second of the second of the second of the second of the second of the second of Time Requested; Sample Storage 30 DYS ORG/6 MTHS INORG 7. Project required LOQ's attached. Please report 5. 1 Trip Blank to be analyzed per day of sample (2) (2) 10 (3) را ģ å The state of the s opsilos 1/22-11 System 1 Date: (0]9105 D B 950 4. Report results at or greater than QL. Report results at or greater than QL Project Specific (PS) or Batch (B) QC: Sample Collection for Project Complete? For Samples Collected 10/7/09 For Samples Collected 10/7/09 For Samples Collected 10/6/09 See attached target analyte list. Time: Date: 2. Level 1 deliverables required. SENERAL NOTES Preserved and shipped on ice: these LOQ's, not lab LOQ's. Copy to Consultant: Carrier: Tracking Number: Ö 1. DAA EDD required. 蓋 collection. 180 2009 - 2nd Semiannual Monitoring Event Box 4: Sample RAAP, Radford, Virginia C Composite Company 11 Type G Grab #2 Relinquished by (Signature): HWMU16 803204-07 by (Signatura): #2 Received Laboratory. Lancasier Laboratones, 2425 New Holland Rike: Eabrasier, PA\*17605-2425/ Barb Wyant, Manager/ (717) 856-2300\* Company CG Clear Glass Received on los Yes No Box 5: Sample Container Type V V0A Date: 10 A Of Box 3: Filtersd/Unfiltersd F Filtered Time: // 20() Date: U Unfiltered NG Amber Glass Sample Site Location: DAA JN: Lab JN: P Plastic Event Received by tab in Good Condition Yes No Custody Seal Intact Yes No Temperature upon arrival G Other (Specify) 2206 South Main Street Blacksburg, Virginia 24060 (540) 552-0444 Drapar Aden Associates MaoH ZnAc Janet C. Frazier Clients Special Instructions: Lavel 1 with edd. See attached target analyte list. See Genral Notes block Company DAA #1 Relinquished by (Signature): by (Signature) Name: #1 Receive Company Name: \* 3-40ml V 90/9/010g eBind Time: 0730 Date: 10/0/09 925 ٧ lm 62 - 80602/8085 D Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> C HSO B HNO3 Consultant A HCL Attn: Address: Phone: Fax: 47 GW F Equipment Blank 5 8 3 ₹ Š 8 Š ₹ ₹ 3 8 8 8 Box 6 - Sample Container Type Take Slaughter Trip Blank Box 3 - Filtered/Unfiltered Product Required pH of Sample 635 Box 4 - Sample Type 120 Box 2 - Preservative 0461 Offner S 000000 10/6 9 2 2 3 3 3 3 3 3 3 8/01 1017 101 600Z :B3P() 10 (0) Describe problems, if any: SW Surface Weter GW Groundwater WISHELY. L \_Leachate 16SPRING Trip Blank2 Trip Blank3 Trip Brank1 18WC1B 18WDUP 16MNW8 16MW9 16WC2B 16-2 2 16-1 6.3 Soil Sampler Name Address: Signature Sampler I Phone: Fex: Fax: Sampler Samoler (Print): (Print):

acct\*11200 ap\* 1165741 Sample\*5802043-59

## HWMU16 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

**ANALYTICAL METHOD: 8260B/5030B** 

TYPE METHOD: GCMS CLASS: VOLATILE

No.	ANALYTE	CAS RN	Required LOQ (µg/l)	
1.	—Carbon tetrachloride	56-23-5	1	
2.	- chloromethane; (Methyl chloride)	74-87-3	1	
3,	-2-butanone (methyl ethyl ketone - MEK)	78-93-3	10	
4.	1,1-dichloroethane	75-34-3	1	
5.	→Dichlorodifluoromethane ✓	75-71-8	1	
6.	Ethylbenzene /	100-41-4	1	
7.	►Tetrachloroethene ✓	127-18-4	1	
8,	✓ Toluene (methyl benzene) ✓	108-88-3	1	
9.	1,1,1-trichloroethane (methyl chloroform)	71-55-6	1	O
10.		79-01-6	1	$\mathcal{L}$
11.	✓ Trichlorofluoromethane (CFC-11) ✓	75-69-4	1	
12.	—Xylenes (total) ✓	1330-20-7	3	5
13	←Chloroethane ✓	75-00-3	1	_ /
14	→ Diethyl ether ✓	60-29-7	12.5	`
15	Dimethyl ether ~	115-10-6	12.5	_
16	Methylene chloride	75-09-2	1	5
17	1.1,2-Trichloro-1,2,2-Trifluoroethane   ✓	76-13-1	1	$\supset$

13-16 added 10/03. JCF Revised 10/31/03 JCF

17 added 0704. Revised 7/28/2004 10/2008 JCF

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rge volume.

Laboratory:	CompuChem Environmental, 501 Madison Avenue,	vironment	al, 501 Ma	idison Ave	anue, car	y, NC Z/5	13/Catny Do	ver, manage	Cary, NC 2/513/Carny Dover, Manage//1-50U-633-509/	/600			
Client: Attn: Address:	000		Consultant: Attn: Address:			Draper Aden Janet C. 2206 South B	Draper Aden Associates Janet C. Frazier 2206 South Main Street Blocket an Windin 24000		Sample Site: Location:	RA	RAAP, Radford, Virginia HWMU16	Project Spécific (PS) of Batch (B) QC: Sample Collection for Project Complete?	8) QC: [2] vis Diso omplete? [2] vis Diso
Phone: Fax: Fax:	) ၁၀ <b>ဇ</b> ဝ		Phone: Fax:			(540) 5 (540) 5	52-0444 52-0291		Event: DAA JN: Lab JN:	2009 - 2nd §	2009 - 2nd Semiannual Monitoring Eva 803204-07	Tracking Number.	(4)
Box 1: Metrix SW Surface Water GW Groundwater	<u>⊢</u> ш	Trip Blank Eculoment Glank	Box 2: Preservative A HCL B HNO,	servative			E NBOH F ZnAc	NOS.	Box 3: Filtered/Unfiltered F Filtered U Unfiltered	Utered	Box 4: Sample Type G Grab	Involce Copy to Consultant	24 C
L Leachste S Soil			C H <sub>2</sub> SO <sub>4</sub>	20.				1 11.	Box 5: Sample Container Type P Plestic V VOA	tainer Type V VOA	C Composite	Bill: Down Edmatant Preserved and shipped on ice:	
	Box 4 - Sample Type			9	G			r en	Sept Office	O CO	GENERAL NOTES:	33	
¥	Box 3 - Filtered/Unfiltered	2		7	٦							tong by the distribution belowers and	extended to the second of the
	Required pH of Sample	•		2 "	. =					-		1. EKIS EDD & DAA EDD required	quired.
Box	Box 6 - Sample Container Type	Type		500 ml P	2-11-A							<ol><li>Level 4 deliverables required.</li></ol>	uired.
Residual C	Residual Chloring Present?	אני		-alate	(seibs)	,					• 1	3. See attached target analyte list.	llyte list.
Yes	>  운			M) Aad	( lovime	§∙Hd		<del></del>			Ž ,	Ford (Source) attach de	sct) attached.
	ate: 2099	AritaM : I xoG	settod to redme	(SOO) (1830)	25) 2026812075 (AL)	Metal 1							Jus. 9/29/20
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Received by lab In Good Condition	d Condition Y Yes.	S S	Custody Seel Inlact	il Inlact	Yes	No Tempera	sature upon emiv	/al Rec	than upon arrival Received on foe	\$ .	(a)	Ves No	(John) Om
Describe problems, if any:	ny:		_			k	2/2	7.0.7.0	7.8.5	16 14	Sheet toc.	SQUIII S BESVE IK	2011-10
Sampler Mary Le	Slawel	18/	Pale/0/6/09	60/9	#1 Relinquished by (Signeture);		Se Cr	Sman	10/5/05 Date: 04/5/05		#2 Relinquished by (Signeture):	٥	Date: Semple Storage
Sempler Signatur A	a Style	B	Time 0730		Company . Name:	DAB			Time: [630		Company Name:	T	Time:
Sample/Name (Print): Sampler	Se Ener		Date: [Q	1विवाठ <sup>द</sup>	#1 Received by (Signature) Company	1	# Transin	high	10/8/04 4 35 11	_	by (Signisture) Company	- Core	Date. 10/8/00 MTHS INDRG
O Signature:	200 VZ		Time: C 50		Name: A		つなど、スク		Tiffe;		Name:	L	局が、人人してい

# HWMU16 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

**ANALYTICAL METHOD: SEE BELOW** 

TYPE METHOD: SEE BELOW

CLASS: TOTAL

#### Method SW 846-6020 (ICP/MS)

No.	ANALYTE	CAS RN	Required LOQ (µg/l)
1.	Antimony	7440-36-0	1
2.	Arsenic	7440-38-2	10
3.	Barium	7440-39-3	10
4.	Bervillum	7440-41-7	1
5.	Cadmium	7440-43-9	1
6.	Chromium	7440-47-3	5
7.	Cobait	7440-48-4	5
8.	Copper	7440-50-8	5
9.	Lead	7440-92-1	1
10.	Nickel	7440-02-0	10
11.	Selenium	7782-49-2	10
12.	Silver	7440-22-4	2
13.	Vanadium	7440-62-2	10
14.	Zinc	7440-66-6	10

#### Method SW 7470A/CVAA

15 Mercury 7439-97-6 2

10/2007 JCF



#### HWMU16 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

**ANALYTICAL METHOD: 8270C** 

TYPE METHOD: GCMS
CLASS: SEMIVOLATILE

No.	ANALYTE	CAS RN	Required LOQ (μg/l)
1.	2,4-dinitrotoluene	121-14-2	10
2.	2,6-dinitrotoluene	606-20-2	10

10/2007 JCF



APPENDIX F

FIELD NOTES

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- 4 . ! .	-		DAS	100E			
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(1135)	12.90	6,46	924	7,27	199. 7		
		Sample -	Time (112	(5)			
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and A		·					
FALL3							
	68.66			Begin F	Purge (115	5)	
Post Proge OTh	- 68.94	4		Initial	Purze - Cl	eur	
Time	Temp(0)	Cond(us)	00 mg/2	PH	ORP(mJ)	Prack	Desc
(1200)	12.90	952	7.34	6.83	200.0	0.34min	cleur
(1205)	13.50	987	6.51	6.79	198.2	16	Clear
(1210)	13.45	1026	6.00	6.68	200.2	<sup>1</sup> 7	51 cloudy
(1215)	12.97	1092.	4.74	6.53	204.7	l/	51 cloudy
(1228)	12.72	1159	3,26	6.41	203.2	¥£	51 claudy
(1225)	12.85	1184	2.44	6.37	196.9	и	31 cloudy
(1230)	13,00	1185	2,44	6,38	193.3	1	cleur
(1235)	13.27	1203	2.21	6.38	186.8	4	Clear
(1240)	13.31	1200	1.96	6.37	183, 3	ч	Clear
(1245)	13.47	1205	1.89	6.36	181.6	h	Clear
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			L.			70	
1							
		1					
			62				

4/6/00			Bo?	AP BZ=4-07 DAS/TQE			FBH8
WELL	. 7		1	713 IOC			
DTW	- 26.86			Benja	Pureye (13	323)	
	5W-26.95	s i			Pareze - (		
	Temp(ci)		Dong		ORP(mu)		Desi
(1325)	12.09	627	7.35	6.04	197.9	0.34min	- Committee of the Comm
(1330)	11.74	566	6.89	6.02	204.7	-1	clew
(1335)	11 86		6.51	6.04	206.0	4	clear
(1340)	11,91	556	6,40	6.05	206,4	٤٠	clew
(1345)	11.88			6.06	207.0	u	clear
(1350)					2073		clear
(1355)	11.66	571	6.32	6.07	207.7	11	Clear-
(1355)	Recidings	Step			GC - L T		Ceeo
(1410)	11.89	579	6.40	6.13	204.1		
		Sample Ti	m (14)	(0)			
16-3 DTW:	59.35			Benin	Purge (14	33)	
Bost Purge DT	W-65.16			Initia	D	9	
Time	Temp(e)	Coodlus)	Don	9/c pH	ORPLA	nU) Purza	ch Desc
(1935)	12.34	223	8.88	7.56	1505	- 0.3	Inin clear
(1440)	12.28	222	7.87	7.64	150.2	ą	Clew
(1445)	12.32	222	7,46	7,70	149,	7 11	Clear
(1450)	12.37	219	7.18	7.75	148.	3 4	Clear
(1455)	12.48	317	6.9	7 7.7	8 147.	<b>)</b> •(	Clear
(1500)	12.64	216	6.70	7.81	145.	2 "	Clear
(1505)	i275	216	6,4	1 7,8	1 144.	j iç	cleur
(1510)	12.59	216	6.48	2 7.85			clear
(1515)	12.47	215	6.40	7.4	2 144.	7	
(1515)	Reading	s Stable	2				Jake a
(1535)	12.69	214	6.7	1 7,8	33 144.	4 1	0MP613-01
		Sample T					6
					M (6) 83	260, (2)	1804, (2) 9270
			(á		,		

417/09	RAA	104-07 17QE	FB#8	4/7/00	1		RAAP	- 2			F6#8
0 1 11	0,45	ITOE		1			B03204 DAS/TG	XE			
General Not				16-2							
- weather: O	vercust 305	·		DTW.	55.72			Begin 8	Pureye (10	06)	
- PRE: EYE PR	okction, Nitr	le Gloves		Post Purage	DTW-55.	80	J	nitial	Purge -	clear	
- Calibrations	: YSI 1,50 M	NDS		Time	Temples	Conl(us)	00 001	PH	ORPINU	Purzek	Desc
PH: 4.00:	4.00 7.00	6.99 10.00	16.00	(1010)	10.19	642		6.58	200.8	0,34	
Conductiv	ily reads 14	14 us in 1413,	us std	(1015)	9,93	646	7.04	6.57	200.5	44	cleur
D0% = 1		,		(1020)	9,59	645	6.60	6.56	201.2	4,	Clevr
- Dedicated	tubing and	well skirts us	ed @ each	(1025)	9.65	640	6.23	6.53	202.4	C e	Clear
well and	disposed of	after each use		(1038)	10.12	631	6.08	6.54	202.1	e 8	Ckar
* All equips	nent decored 1	between each we	11	(1035)	10.24	630	5.80	6.57	199.9	"	ckar
- Purged wa	ater contained	and disposed	of at	(1040)	10.34	632	5.71 (	1.56	200.3	41	dear
dedicated	location ons	ife	4	(1045)	10.45	631	5.67	1.58	199.8	41	Ckur
		ed and transpor	ted on	(1050)	10.51	633	5.67 6	.57	200.0	٤.	cleur
ice in	coolers			(1050)	Reading	Stuble					
				,1	0	Sample	Time (10	55)	V.		
	Water Lev	el Table - Unit		1			Collecto				
well	DIM	PostPurge DTW	Notes	(1100)	10.66	620	5.84	6.60	19517	Post R	nge Reading
16-1	DRY	9		1							9
16-2	\$5.72	55.80		16WC	2 <u>B</u>						
16-3	58.35	65.16		DTW	- 55,20		F	Begin F	Purge (1/2	1)	
16-5	4,75	6.75		Post Purge!	DTW - 58.	.95	· I	nitial	Persye - C	leur	
16WC2B	55.20	58.95		Time	Temp(c)	Cord Cus	) DO 009/	PH	ORP(n	1 U) Purzy	L Desc
16MW8	72.85	75.34	, v .	(1125)	10.82	288	8.00	7.48	156.9	23	Inin cher
16 WCIB	67.61	68.04		(1130)	10.62	289	7.03	7.40			clear
1660CIA	67.39	69.42		(1135)	10,57	288	4.00	7,42	1416.5	u	clear
16.1169	64.05	64.75		(1140)	10.99	287	1.78	7,51	101,4	41	Clear
16 CI	51,19	51.21	,	(1145)	11,00	287	1,72	7,53	86.9	01	Clear
1/ 200/2	-0.1/			(1150)	11.04	286	1.37	7,53	83.0	11	Clear
16 CDH3	DRY			(1155)	11.06	286	1.35	7.54		0.4	Clear
1663	DRY				11.07	286	1.30	7,54	75,4	11	Clair
ILWC2A	DRY				Readings						
1/ \			0.000		10.97	286	1.62	7.57			Clear
16-1 = DTW.		ples Collected (	(0945)	Sample	Time (12)	05) S	amples Coll	ecled; (a)	)2266, (1)7	m, (2)	8270
	(\$	<b>9</b> 23)	8	1			63		,		

4/7/09	Ì		RAA	1P 204-07 HAR	Partie and the Atlanta	NI BUNGON BULLING HTS	FB#8	١(١٦):	9		RAA	P 170E			FB#8
11 6			DAS	HOR							DAS	ITAE			
16-5	2 1170		D	~ 0	1100			16C1				0	2 //		
210	W-4,75		Be	gin Purge	(1230) - clear				81.19			Begin	Purage (140	77)	
Tostruged	DTW-6.75	( 1/ )	Initio	11 runge	- Clear	0 11	17		00-51.8		6 00	Initial	Purge - C/ed ORP(mV)	45	
(1235)	Temp(°)	Condlars	DOM9/2			rungekigi	w Desc	Time	Tempted		00	YL PH	ORP(mV)		
(1240)	10.86	438 444	2.75	7.16	113.5	0.3 min		(1410)	10.31	551	6.76	6.84	/53, 9	0.37	min Clear
(1245)	10.92	447	2.16	7:11	118.0	11	Clear	(1415)	11.61	695	4.32	6.56	181. 3		Clear
(1250)	11,26	447	2.74	7,10	120.3	11	Clear		10,76	704	3.48	6.48	188.9	41	clear
(1255	11,44	.448	2,82	7,13	123.4	11	Clear	(1425)	10.64	702	3.09	6.44	187.1	11	Clear
(1300	) 11,11	450	2,91	7.11	129.4	1)	Clear	(1435)	10.81	703	2.68	6.46	175,0	- 84	Clear
(1305)	\$10,99	449	2.91			7.7		(1440)	11, 12	705	2.67	6.46	167.2	84	cleur
(1305	1			7,10	131.7		Clear		11.27	707	2.47	6.45	160.3	11	clear
	) 11.27	450		TAH	140.2		Clear	(1450)			2.27	6.45	156.8	t/	ckeer
(1320		ple Time	(1310)	1,01	170,2		Clean		11.40	707 708	2.26	6.45	152,9	h	clear
	Samala	s Collect	(1010)	(0 (1)	TMA (2)	7770		(1455)	11,44		2.22	6.46	150.0	٥(	cker
	Jampie	3 Collect	ka:(3) 841	60, (1)	(2) 8	2/0		(1530)		712	2,51	6.49	141.7		
								(100)		Sample			777, 7		
Sorie	m 16									Sample	CI	(11/2)	4000 000	TN. F.	2) 0, 0,
Time	Temple Temple	Condlus	) Dong	nH.	ORP(mu)	)			12/82	20 Lis C	- Collect	115 15:0	8260, (1) rotul	01.	(0)000
(1343	3) 11.29	403	10.09	7.00	66.3				Cerroa	, Cir Cy	anize,	11 Jul Jia	e, (1.10ku)	rreno	1,628001
(1)	) 11121	403	10.01	7100	46.3			1							
	San	aple Tim	0 1345												
	Samole	s Collec	62/370	260 (1)	TM (2)	חרבי									
	Jampie	Conec	100.00700		(47)	a 10		j.							
								f							
*,								f.							
			a	9							(8)				

4/8/09	Marie Continue of the Marie Inc. 101	RAAP	Trestanti sterili su It	he Ushikum may ar ma	FB#8	11/01/	0,			AAP			
1,010	Bo	3204-07			PV#8	4/8/0	1		B	3204-0	7		FB#8
General Notes		PAS/TORE				1/1/1			C	DAS/70/E			
- Weather 1 Sun	ny 508	2.00				16W		26		Dose	0 (110		
- PPE: Eye Prote	stein Notale Col	NISEC				Post Pung	W-67.	942			Purge (113		
- Calibrations:	YSI (50 MDS	00-2				Tibe	TrupE	(-1/-)	DO MIL		Purge - c	O v	N
PH: 4.00 = 4	1.00 , 7.00 : 7.	00 10	2.00 = 10.	ov		(1140)	11,74	Condus	8.98	7.27		. 8	
Conductivity	reads 1413	141 16	141341	Sold.		(1145)	11.98	582	6.24	6.90	234.7	0.3 /min	
00% = 100		70.3	1.5)0.0			(1150)	12.14	620	3.86	6.74	223.5	1	clear
· adicated to		ell shis	te 118	d at e	e c b	(1155)	12.22	644	2.88	6.77	209.4	1( , , ,	clear
well and dis	sprised of ast	er each	1111			(1200)	12.10	647	2.75	6.77	205.3	11	deur
- All equipment	decored bet	ween ea	ch well		2	(1205)	12,00	652	2,66	6.75	202.8	u	Clear
- Parased want	- contained	and di	sposed a	of at		(1210)	12.17	650	2,52	6.74	182.0	4	clear
dedicated Docat	tion onsite		·			(1215)	12.29	650	2.36	6.74	117,6	ų	clear
- Samples coll	ected, stored	and t	12msport	ed on	100	(1220)	12.36	653	2.21	6.75	83.0	e <sub>l</sub>	cleer
in coolers			`			(1225)	12.51	656	2,19	6,76	70.7	15	clear
•						(1230)	12.62	6,56	2.17	6,76	67.2	V <sub>t</sub>	clear
16WCIB						(1235)	12.71	458	2.16	6.74	61.9	11	dear
DTW-67,61	,	Begin	Purage (1	000)		(1235)		5 Stube		6.67			- Cert
Post Pargy DTW - 68.1		Initial	Purye-	Clear	* ,	(1350)	13,01	652	2.21	6.67	58.1		
Time Temple	Cond(us) DO M3h	PH	DRP(mU)	Puzik	Desc			Samo	le Time	(1240)	)		
(1005). 12.30	333 5.20	5.76		0.3 /mir	cleur		5.4	Samole	5 Collecto	1: (9)	8240.13	TM, (2	18151
(1010) 12.29	317 4.51	5.72	1941.6	13	Clear		1 8270,	(3)CN,	(3) Sul R	De (3)	Total Phen	01 (6)	3081
(1012) 13.18	301 4.14	5,62	200.2	l(	clear								
(1025) 12.43	293 3.86	5.61	208.0	11	clear	1661	DUP						
11>	271 3.52	5.57	244.7	10	clen	1		Sample	Time (1:	300)			
(1030) 12.61	268 3.28	5,62	263.9	11	Clev	v i					260, (1) Tr		
1	266 3.20		269.5		Clew						, (1) Total	Phenolile	1)8081
(1040) 12.44	270 3.10	5.63	266,5	n	cleur	Dupl	cate w	rell was	sample	ed at /	6651A		
4	270 2.98	5.59	269.0	IC.	clew						t.		
	270 2.94	5.60	267,1	10	Clear	-					į į		
(1050) Readings	2011 304	5.75	274 G										
	294 3.04		274,9										
	Simple Time (1	000/	n 11	in) dial	(1) 4072	<b>*</b>							
1500	Samples Collecte		rotal Ph							80			
(1) (1)	MAI SMITHOU (	וווו עם	ioine ph	1001 (3)	0001					39)	No.		

4/8/09			RAS	P	THE MAN AND LEAST SELECTION AND	FB#S		
			803	15/TQE				
16MW	<u>L</u>							
DTW -	64.05			Benin f	virge (clea	(N		
Post Purge OT	W-64.75			Initia	Purze - 1	407		
Time	Temp(c)	Cond(us)	DO 7/2	PH	ORA(nV)		Desc	
(1410)	13.10	676	8.03	6,76	114.6	0.34min		
(1415)	13.45	690	6.48	6.57	104.4	. 4	Char	
(1420)	13.47	731	3,30	6.43	75.1	دا	Clear	
(1425)	13.45	751	2.19	6.41	66.1	14	Cleev	
(1430)	13.41	740	2.03	6.37	73.9	( (	Clear	
(1435)	13,59	688	2.13	6.34	84,1	11	clear	
(1440)	13.46	668	2,17	6.32	90,7	h	Clear	
(1445)	13.17	630	2.26	6.28	97.5	vA	Clear	
(1450)	13.01	613	2,20	6,24	98.7	N	Cleur	
(1455)	12,91	606	2.12	6,24	98:1	h	Clew	
(1500)	12.87	603	2.09	6,24	97.9	V	clew	
(1500)	Readings	Stuble						
(1521)	13,10	597	2.31	6.29	87.1			
		Sem		(1505)				
		Samo	les Coll	ecture : (3	38260,	(STM (2)	3/5(	
					e, (1) TOTO			
						1,20.0.1	G. 7 00 00	
16 MWS	3							
	72.85			Benia F	my (153	4)		
Post Purge D	TW-75.3	9		Initial	Pura - 3	1 Cloud		
Line	Temp(a)	Carol(us)	DO may	PH	ERP(mU)	Punch	Desi	
(1535)	13.55	104	6.42	5.39	230,7		SC. Clardy	
(1540)	13.13	91	2,45	5.05	187.7	0.3	Clary	
(1545)	12,97	89	2,08	5.03	183.0	L <sub>L</sub>	cloudy	
(1550)	13.14	89	1.94	5.07	165,3	11	daely	
(1555)	13.27	91	1,82	5,15	146,1			
(1600)	13,31	90	1.80	5.12	149.2	il	SI Cloudy Clear	
(1605)	13.28	87	1.84	5.09	155.6	Vl	clew	
(1605)	Readings		- 4				0400	
	2	36	(g	0				

4/8/09 B AAP B03204-07 BASTAE FB#8 16MW8 cont Time Temp(e) Cond(us) DOMS/L PH ORPIMU (1634) 12.91 84 2.01 4.99 165.1 Sample Time (1610) Samples Collected: (3) 8260, (1) TM, (2) 8151 (2) 8270, (1) CN, (1) Suificle, (1) Total Phenoi, (1) 8081 Note: well was purged dry during sample collection

4/13/09 R	1AAP	FB#8	4/13/09			RAAP B03204- DAS 17	07			FB#18
	ASITGE		ł			DAS /	702			
	evel Table-Unit 7		7WIOC							
WELL DTW	C. C.	les		1-18,94			Begin P.	urge (140	3)	
7W12B 24,60	24.62		Post Purge	DTW-21	0.67	I	nitial 1	Parge-Cle	par	
7w9C 13.94	16.86		Time -	Femple)	Condlus	Do rug/2	oH	ORP(MU)	Purgek	Desc_
7W108 15.09	15.66		(1405)	12.71	806	2.05	7,06	92,5	0,3 /min	Clear
TWIOC 18,94	20.67		(1410)	13.26	797	1,91	7.06	93.1	11	Clear
TW13 18,33	20.19		(1415)	13.46	794	1,97	7.06	96.8	å t	Clear
7MW6 25.61	29.97		(1420)	13.33	796	1.97	7.05	100,9	7.0	Clear
7W11B 24.78	25.04			13,14	796	1.89	7.04	104,2	11	Clear
7.WCA 24.67	24.55		(1430)	13.13	795	1.90	7.03	105.3	i e	Clear
7W9B 22,40	SWL ONLY		(1435)	13.04	794	1.92	7.03	107.1	0.0	Clear
7WII 23.77			(1435)	Readings	5 table					
7MW5 24.72	11		(1452)		786	1.88	7.04	94.1	8 4	Clear
		. 1		Sam	ple Time	(1440)				
7W13	s			Samples	Collectedi	(1) TM (1)	(a)	8270		
DTW-18.33	Begin Purge (1253)	//				,				-
Post Purge DTW-20,19	Begin Purge (1253) Initial Purge - Clear		7W9C							
Time Temple (ondlus) D	orge pt orp(aw) Purg	ek Desc		5-13,94	!	d	BeginPu	rge (151:	3)	
		Imin Clear	Post Rurge			Ti	itial Pu	inge-Clea		
(1300) 13.32 1286 4	.86 7,23 17,1 11	Clear	Time		Cond(us)	DOM9/L	PH	DRP(mu)	Rugek	Desc
(1305) 13,49 1310 4	1.00 7,21 -3,0 11	Clear		12.40	1141	2.43	6.83	115.2	0,32/m	n Clear
(1310) 13.40 1327 3	3.71 7.22 -13.7	Clear	7 4	12.31	1167		6.77	125.4	11	Clear
(1315) 13.22 1333 3	2.70 -7.23 -5.8 "	Clear		12.25	1185		6.74	128.1	e	Clear
(1320) 13.25 1331 3	2.72 7.25 -2.0 17	Clear	1	1226	1190			124.2	i i	Clear
(1325) 13.18 1335 3	1.71 7.25 2.6 "	Clear			1198		6.73	109.0	ll	Clear
(1330) 13.07 1334 3	1.70 7.26 5.0 11	Clear	(1540)					106.5	i	Clear
(1330) Readings Stable			(1545)					100.6	i (	Clear
Sample Time (	1335)	11 11 11 11	)	Readings						
Samples Collected: (1	)TM (1)CN (2) 8270	ta .		12.39		2,06-	6.76	90.3	PostPura	e Reading
					re Time (					7
(1344) 12.98 1345 3	.85 7,27 10.0 Post1	Purge Reading	So	moles (	'ollected:	(1) TM. (1	)cn, (2)	18270		
					82				3	,
	(00)		1	*	10	(Ie				

4/14/09	No. T. L. of Philipper(Mail.)		RAI BO320 DAS	98-07	Money Moral L. C. J. C. N. D. Hite		FB#8	4/14/0	9		B	RAAP 03204-07 DASTTQE			FB#8
7W12B			DAS	ITQE				700.10	<i>f</i> .			DASTTOE			
	-24.60		1	Rain Dum	e(1127)			7mw		/ 1		D. *	0 /1-	201)	
Post Parge DT	w-2462		To	itial Pun	ge-Clear			Post Pura	J-25.			Degn	Purge(13	1000	
	4.3	Cond(us)	DO mg/L	ott	ORP(MV)	Rumak	Desc	Time	Tambo	(cond(us)	DOMIL	p H	ORP(MU)		Desc
(1130)	12.98	684	8.30	6.98	182.3	0.3 /min		(1345)		1535	2.53	7,31	-19.9	0.34/min	
(1135)	12.90	484	7,54	6.95	186.6	li	Clear	(1350)	12.21	1601	2.26	7,20	-62.4	O13 July	Clear
(1140)		482	7,10	6.93	190.7	11	Clear				2,17	7.13	-78.6	/1	Clear
(1145)	12.68	681	6.90	6.93	192.9	11	Clear		12.46	1664	2.17	7.11	-84.6	11	Clear
(1150)		680	6.73	6.92	194,5	11	Clear		12.53	1677	2.29	7.11	-91.5	11	Clear
(1155)		677	6.61	6.91	196.7	11	Clear		12.53	1679	2.25	7.08	-93.7	11	Clear
		677	4.58	6.91	197.3	1.1	Clear	1	12.64	1678	2,26	7,08	-96.5	i I	0,000
4 4		677	6.54	6.91	197.0	11	Clear			ngs Stal					
	Readings						-	(1434)	12,90	1565	2.37	7,24	-88.1	Post Pu	rge Reading
(1226)	11.95	669	6.63	6.90	194,2 H	Post Purge	Reading		Samo	le Time	(1420)				Je ken ng
	Sample		- L		,	J			Sample	es Collec	kdi (3)8.	360.(1)7	TM (2)82	70. (i)cn	1,(2)8151
5	Samples Co	llected:	3)8260 (1	) TM, (a)	8270, (1	)CN, (2)	18151				(1)5	ulfide (	1)9065	(2)8081	, , , , , , ,
			(1) Sulfid	e (1) 900	5.(2)80	81						,			
				,	1			1 7W116	3_						
7W10B									0-24,	78		Begin	Purge (14	48)	
	-15.09			Begin Pun	ge (1244	) .		Post Pur	re DTW -	25.04	k	Initia	Purge-C	lear	
Post Purge D	TW-15.66	0	Ini	tial Pur	ge-Clear			Time	Temp(6)	(Condlus)	Dom9/L	- oH	_ORP(MU)		DesC
Jime	Temp(6)	Condlus)	Dongh	pH.	ORP(MU)	Purojek	Desc		12,69	883	6.14	6.44	41.4	0.34/min	Clear
(1245)	1170	934	4.67	6.78	192.1	0.34mi	in Clear	(1455)	12.68	835	5.21	6.42	53,7	11	Clear
(1250)	11.67	929	3.55	6.73	192.5	31	Clear	(1500)	12.51	772	4,02	6,39	58.9	12	Clear
(1255)	11.60	920	3.18	6.72	190.4	h	Clear	(1505)	12.45	748	3.45	6,38	60.7	/1	Clear
(1300)	11.63	916	3.10	6.71	187,7	11	Clear	(1510)	12.44	728	3.28	6.37	61.1	11	Clear
(1305)		915	2.98	6:71	184.7	11	Clear	(1515) /	12.44	708	3.04	6,36	48.3	11	Clear
	11.56	916	2.93	6.71	181,5	11	Clear	(1520)/		702	2.89	6.37	36.5	11	Clear
	)11.57	917	2,99	6.71	178.6	11	Clear.	(1525)		705	2.84	6,37	32.1		Clear
(1315)	Readings	Stabl	e						12.49	708	2.82	6,37	29.2	1)	Clear
(1332)	)11.72	915	3.75	6.73	173.8	ost Purge	Reading			ings Sto	ble			0 10	
	Sample			4 2	f		3	(1618)	12.80	745	2.93	6,43	38.3	Post Ruge	Reading
Sam	ples Collec	ted:(1)	TM,	(9)89	170,(1)	N								0	U
			(10	4)								(105)			4. 3

4/14/09		The section of the section of the	RAAP	The second of the second	See all the second second	in or a committee of the	FB#8
111101		Ŧ	303204-0 DAS/TAL	7			
7WIIB (	(Cont.)		01707				
	Sample	le Time	(1535	5)			
	Samples Samples	Collecke	1: (9)824	0, (3) TM	(6)8270	, (6) 819	51
	η.		(3)CN,	(3) Sulfid	e,(3)900	5, (4) 80	81
			,		,		
TWCA						•	
	-24.67			Begin Pur	ge (1632	2)	
Post Purge		55	In	ifia Pui	rge - Clea	ar	
	Temple)		DOMIL	ptt	ORP(MU)	Purgek	Desc
	12.73	853	4.08	6.68	82.4	0,34min	Clear
(1640)		854	3,20	6.67	83.4	11	Clear
(1645)		861	2,93	6.65	87.3	11	Clear
(1656)		867	2.90	6.65	92.1	11	Clear
(1455)	12.98	873	2.84	6.65	96,6	11	Clear
(1700)	13.01	877	2.86	6.65	101,3	11	Clear
(1705)	13,00	881	2.79	4.65	103,0	11	Clear
1	Readings	Stable					
	13,04	894	2.87	6.69	105,21	Post Purge	Reading
		Time (i	-				J
4	Samples (	ollected	(3)8260	(i) TM	(2)8270	, (2)815	)
			(1) CN,	(1) Sulfie	de,(1)906	5,(2)808	71
			,		,	,	
TWD	uP.						
	Samo	le Tim	e (1725				
	Samples	Collecta	1:(3)824	0,(1)Th	1,(2)827	0, (2) 815	7
			(1)CN	(1)5a1fid	e, (1)906	5,(2)808	1
					,		1
*	Duplica	le well	Sampl	ed at	TWCA	, KO	3
					MAR	1013	
				2.0	Jample .	teel	
-					. Would		
6 N						٠	
			(1	06)			

4/15/09	Bo:	AAP 3204-07 45/70E			FB#8
General Notes					
Weather-1	Overcast, 40's				
PPE- Eve P	rotection, Nitr	ile gloves			
Calibration	5-45I 650 n	ADS .			
04-4,00	= 4.00 , 7.00	= 7.00 ,10.0	00-91	98	
Conductivis	y reads 1413	us in 1413	3455	td	
Do % = 1					
· Dedicated tubi	ing and well sk	irts used at	! each	well	
· All equipment	Verned between	n each we	11		
· Purge water cor	tained and disper	sed of at N	edicate	d location	onsite
· All samples colle	acted stored an	d tonnsports	ed in a	solers on	ice
- All Samples Corre	CRG, 510.00 (1)	0 11011101011			
Static	Water Level	Table - L	Init	10	
WELL	DTW	Post Parge D	ITW	Notes	
10 DDHAR	19,40	19,46			
10 D3	17,64	17.82			
10D3D	17,61	17.69			
IOMWI	17.97	18.12			
10 D4	22.72				
IOMWI					
Dru - 17.97		Begin Pur	ge (10	24)	
Post Purge DTW - 18	3.12	Initial Pure	je - Cle	ear	
Time Tymo(2)	Coodlus Dougle	pH OR	P(mu)	Purgek	Desc
Post Purge DTW - 18 Time Temp(E) (1024) 13.46 (1030) 13.23	944 9.66	7,22 19	58.3	0.3 min	Clear
(1030) 13.23	623 8.05	7.16 1	78.4	)(	Clear
(1035) 13 17	595 792	716 15	229	11	Clear

DTW-17,9			13eqin	runge CIO	247		
Post Purge DTW - 1	8.12	I	nitial F	lurge - Cla	ear		
Time Temp(2)	Cond (us)	Doroll	pH	ORP(MU)		Desc	
(1024) 13.46	944	9.66	7,22	158.3	0,3 4 min	Clear	
(1030) 13.23	623	8.05	7.16	178.4	)(	Clear	
(1035) 13,17	585	7.82	7.16	182.9	71	Clear	
(1040) 13.10	538	7,36	7.15	192.7	11	Clear	
(1045) 12.94	508	7,10	7.14	198,8	11	Clear	
(1050) 12.93	487	6.92	7,14	200.9	11	Clear	
(1055) 12.87	476	6.88	7,14	202.5	8.0	Clear	
(1055) Readings	Stable						
(1114)13.02	447	6.77	7.13	202.0	Post Purge	Reading	
()			(107)		U	)	

4/15/09	RAAP	FB#8	4/15/09	RAAP	F6#8
	RAAP BO3ZO4-01 DASTAE			BO3204-07 DAS/TQE	
10MWI (Cont.)			1003		
	Time(1100)		D7W-17.64	Begin Purge (13	
Samples Col.	lected: (3)8240, (1)TM, (2)8151, (2)88	270	Post Purge DTW - 17.82	Initial Purge-CI	
	(1)CN, (1) Sulfide, (1)9065, (3	1)8081			Purgek_DesC
			(1310) 12.66 60		0.34 nain Clear
10030			(1315) 12.43 60		" Clear
DTW-17.61	Begin Purge (1128)		(1320) 12,43 58		Clear
Post Purge DTW - 17, 6	9 Initial Punge-Clear	u u	(1325) 12,45 57		Clear
Time Temp(8) Con		K Desc	(1330) 12,32 56		Clear
		min Clear	(1335) 12.35 56		Clear
(1135) 13,70 6	35 1,93 7,04 -213.4 11	Clear	(1340) 12.48 56		Clear
	61 2,10 7,05 -214,5	Clear	(1345) 12,34 56.		" Clear
(1145) 13,47 6	67 2,46 7,03 -212,1 "	Clear	3   1   1   1   1   1   1   1   1   1	table - Purge water had a re	Hen odor.
(1150) 13,35 6	71 2.72 7.02 -208.8 11	Clear	Sample	Time (1350)	
(1155) 13,10 6	75 3,20 7,03 -198,6	Clear	Samples Colle	ckd: (3)8260, (1)TM, (2)815	1,(2)8270
	79 3,20 7.02 -195.2 "	Clear		(1) cN, (1) Sulfide, (1)90	
(1205) 12,64 6	83 3.26 7.01 -191.3	Clear	(1433) 12.64 569	3,86 6.98 28.3	Post Purge Reading
(1205) Readings.	Stable				
(1258) 12.92 6	77 - 3.58 7108 - 180.4 Post P	urge Radine	IODDHAR		
Sample ?	Time (1210)	0	DTW-19.40		445)
Samples Collec	fed: (9)8260, (3) TM, (6)8151, (6)8270	,(3)CN	Post Purge Drw-19.4	W Initial Purge-	Clear
	(3) Sulfide, (3) 9065, (6)8081		Time Temple Co	nd(us) Dougle pH ORP(us	W) Purgek DesC
	,			42 2.55 6.96 40.1	0.39 min Clear
IODUP		. "		.44 1.72 7.00 22.8	Clear
Sample "	Time (1405)		(1455) 11.83 6	29 2.03 7.01 12.3	11 Clear
Samples (	Collected: (3) 8260, (1) TM, (2) 8151, (2	1)8270	(1500) i1.62 6	27 2.18 7.02 9.6	" Clear
/	(1)CN, (1)Sulfide, (1)9065		- (1505) 11.64 6.	24 2.29 7,02 8.4	" Clear
	, ,		(1510) 11.64 6	22 2.38 7,02 5.9	Clear
* Duplicate	well sampled at 1003			22 2.41 7.02 3.8	"Clear
1			(1515) Readings 5	Stable	2 1.0
			(1530) 11.77 5	93 2.51 6.78 8.6	Post Parge Reading
			Sample	Tima (1520)	
			Samples Collected	(3)8260, (1) TM, (2)8151, (2)8270	,(1)CN(1)Sulfide,(1)9065
	(08)		·	(109) (2)8081	

			ota savata il con il teleboro	and the state of t	Thillens in not talk?	
4/15/09		RAA	P			FB#8
	E	BO3204-	O7 PE			
					14 21	
10D4						
DTW-22.72			Begin Pu	me (154:	3)	
Post Purge DTW -22.71	4			urge - Cl		
	and lus	DO MIL		ORP(NW)	PungeK	Tosc
	308	6.84			8.34 mm	Clear
	309	4.98	6.62	56.7	1/	Clear
7	305	4,20	6.56	61.8	7)	Clear
1.	295	3.96	6.54	58.8	11	Clear
				57.1	11	Clear
	292	3.84	4.53	54.3	11	Clear
X 1	291	3.80	6.53	34,3		Clear
(1610) Readings		ole	/ 10	101	2 1 0	0 1'
	290	4,21	6.60	59.61	ost Kurge	Keading
Samp	le lin	ve (161:	5)	-1 / 10	7- (-)	2:-21
Samples Co	Nected!	(3)8240	0, (2)81	51,(2)8	210, (a)	8081
		(I) TM,	(1) CN,	(1) Selfi	de,(1)9	065
				100	9	
			2017	10-13		
			SKIL	de		
			1	wy		
				)		
						-
						*
		(1	(0)			•

4/16/09	RAAP	FB#18
	B03204-07 DAS/TOE	
General Notes		
Weather	- Sanny, 50-60's	
PRE-Eye	- Sunny, 50-60's Protection, Nitrile gloves	
	Maintenance Log - Unit 433	
WELL	Notes .	
	Replaced water level port plug	
74MW5		
74mw4	Replaced water level port plug	
74 MW 1	Replaced Water level port plug	10001001
74MW3	Repaired well head sample tubing, Replaced was	Port Plub
741446	Kepaired Well head Sample tubing, Replaced Wo	ater level plage
14/11/10 1	- Could not replace plug due to suspended	Dot tware
	based conductivity meter.	
WELL	Maintenance Log - Unit-10	
WELL	Notes	
IODDHAR	Replaced water level port plus	7
10D3	Replaced Water love port plu	, .a
10D3D	Replaced water here port plu	g
IOMWI	Replaced water level port plu	8
1004	Replaced water level port plu Replaced water level port plu Replaced water level port plu	g
		9
- Annie Francisch and Francisch		

112/20/09	BAAP		FB#8
1100101	803204-07 DASITAE	i l	
General Notes			
Wanthor-			
PPE- Eye Protection	on, Nitrile gloves, t	lard Hats	
Calibrations	in, Nitrile glaves, to - YSI 650 MD	5	
-11- 4M=4	00 7.00 = 7.01	10,00 = 10,2	00
Conductivity	reads 1414 us	in 1413 us	std.
DO % = 100	23		

Dedicated taking and well skirts used at each well

All equipment decored between each well

Runge water contained and disposed of at dedicated location onsite

All samples collected, stored and transported in coolers on ice.

Static	Water Lei	el Table - Unit - 5.	
WELL	Drw	Post Purge DTW	Notes
S5W7	11.87	11.87	
S5W5	8,52	9.07	
5W9A	2,50	2.51	
5WIOA	14.37	14,55	
5WIIA	10.93	12.04	
5W8B	16.17	16.53	
5W7B	9,24	9.91	
5W5B	9,93	11,06	6
5WCal	9.95	10.01	
5WC22	9.96	10.02	
5wc23	9.37	9,51	
		SWL ONLY	,
5WCA	14,51	1)	
S5W6	7.28	11	
S5W8	13.11	21	
5WCII	17.16	11	
5wc12	16.97	(1	
	. , , ,		

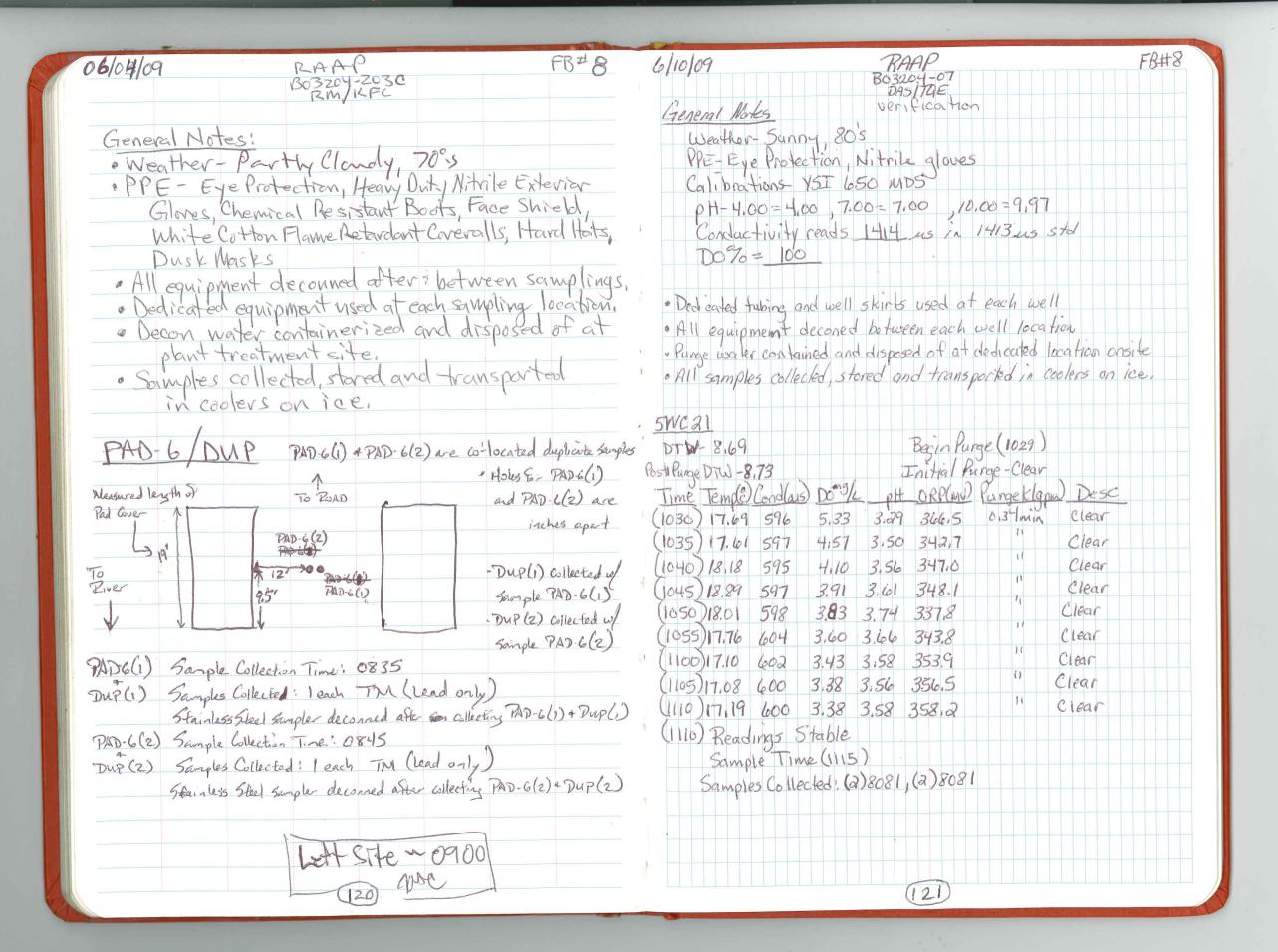
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A CHARLES AND A SHEET AND A SHEET ASSESSMENT	and the best produced and the best parties at	Series I saw Mark Study		Color and the Color and the Residence (
4/20/09	RA	MAP		F8#8
	1503 Dx	201-07 15/1QE		
5WBB				
DTW-16.17		Regin P	urge (0951)	
Post Purge Drw-12	0.53	1.1	urge-Clean	y I I I I I I I I I I I I I I I I I I I
Time Temp(8)	Condlus Do 19/L		RP(MU) Pura	
(0955) 13.18	161 7.91	4,62 0	and the same of th	Imin Clear
(1000) 13.71	114 6,30	4,40 0		Clear
(1005) 13.62	98 5,98	. 4.37 6		
(1010) 13,48	88 5.69	4,33 à	1	Clear
(1015) 13,52	83 5,49	4,32 0	1	
(1020) 13,43		4,33	A	Clear
(1020) Readings				
(1044) /324	64 5.04	4,33	281,8 Bot	Purge Reading
Sample	Time (1025)			
Samples	Collected: (3)820	60 (a)815.	1, (2) 8270, (	2)8081
	(1)900	5 (1) CN,	(1) TM, (1)	Sulfide
5WSB				
DTW-9,93		Begin F	Purge (1114)	
Post Parge Drw-	11.06	In Fig 1	Purge-Clear	
Time Temple	(c) Cond(us) Da	19/2 pt	ORP(MU)	Purgek Desc
(1115) 11.36	380 6.4	The same of the sa		5,3 min Clear
(1120) 11,27	336 6.4		234,4	11 Clear
(1125) 11,20	301 6.4.		230,8	" Cleav
(1130) 11.12	276 6.40	5.71	228,4	11 Clear
(1135) 11,10	274 6,40		225,1	11 Clear
(1140) 11,19	272 6.45			11 Clear
(1145) 11,15	273 6.41	5,75	224.8	" Clear
(1145) Readings	Slabb			
(1209) 11,14	287 6,20	5.65	221, 2 Ps.	st Rusge Reading
Sampl	e Time (1150)	)		J , J
Samples C	ollected; (3)82	60, (a)815	1,(2)8270	(2)8081
	(1)90	65, (1)CN,	(i) TM, (i	)Sulfide
		(113)		

	And the second s	coil a	11/20/00	RAAP	FBH8
4/20/08	RAAP BO3204-07 DAS/70E	FB#8	4/20/09	RAAP B03204-07 DAS/TQE	
	DAS/TOE		<u> </u>	DA5/1QE	
5W78	A /		C		
DTW-9,84	Begin Purge (122)	7)	S5W7	P - D	(1523)
Post Purge DTW-9,91	Initial Purge - Cla	av	Drw-11.87	Begin Punge Initial Punge	(1323)
Time Temple Condlas	DOM9/L pH ORP(MU)	Pugek Desc	Post Purge DTW-11.87	Initial lung	Purgek Desc
(1230) 11,28 206	6.33 3.58 348.5	013 min Clear	Time Temple (and Cus)		
(1235) 11.51 212	5.79 3.51 401.8	11 Clear	(1525) 14:08 325	1.83 6.78 190.2	
(1240) 11,52 215	5.75 3.52 423.4	" Clear	(1536) 14.19 330	1.74 6.79 189.0	Clear
(1245) 11.45 214	5.78 3.55 428.3	11 Clear	(1535) 14.27 333	1.77 6.78 185.2	() () ()
(1250) 11.45 210	5.78 3.57 433.8	" Clear	(1540) 14,27 335	1.82 6.77 181.5	(1)
(1255) 11.48 207	5,79 3,58 434,3	" Clear	(1545) 14,30 336	1.88 6.77 176.2	Clear
(1300) 11,55 205	5.79 3.58 440.1	Clear	(1550) 14,47 336	1.93 6.77 173.6	11 01
(1300) Readings Stable			(1555)14.58 337	1,97 6,78 171.1	11 Clear
(1358) 12,05 216	5.73 3.45 3435.2	Post Purge Reading	(1555) Readings Stal	ole	
Sample Tim	0 (1305) DS 4/20/0	9	(1613) 14.46 340	1.98 6.79 165,2	Post Runge Reading
Sample 11m	1:(9)8240, (6)8151, (6)8270	(6)8081	Sande Tin	ne (1600)	
Samples Collected	(3)9065, (3)CN, (3)TM, (3)	Sulfide	Samples Collecte	ed:(2)8276,(3)8260,(1	774
	(3)4063, (3)CN, (3)1141, (0)	2017100			
67115			1		
55W5 DTW-2.52	Begin Purge (141	2)			
M I	Initial Purge · Cla				
Post Purge DTW - 9,07	Initial rurge cre	Pungek Dosc			
	Company of the Compan				
(146) 12,34 292	3.57 6.04 284.7	0.3 min Clear			
(1420) 12,21 256	2.55 5.98 272.7	Clear			
(1425) 12,27 253	2.03 5.98 261,6	Cital			
(1430) 12,29 253	1.90 5.99 257.4	Clear			
(1435) 12.34 257	1.64 5.98 247.3	Clear			
(1440) 12.35 261	1.57 6.00 239.7	11 Clear			
(1445)12.36 265	1,53 5,99 235,4	Clear			
(1450)12.39 269	1.56 6.00 231.9	Clear			7
(1450) Readings S	table				
(1504) 12.58 276	1.67 6.00 226.1	Post Parge Reading			
Sample	Time (1455)	9			
Samples Caller	Time (1455) ed:(3)82100 (2)8270, (1) Th	1			
J. pes Svee				(115)	

4/21/09 RAAP	FB#8	4/21/09 RAAP FB#8 B03204-07 DAS/TQE	
DASTRE			_
General Notes		5wc23	-
- Weather: Overcas +, 40's		DTW-9.96 Begin Purge (1059)	-
- PPE: Eye Protection, Natrile Gloves, Hard Hats		Post Punge DTW-10.02 Initial Punge-Clear	-
Calibrations - YSI 650 MDS		Time Temple Condlas DONG/L DH ORP(NN) Pringek Dosc	-
0H-4.00= 7.00= 10.00=		(1100) 12.78 803 4.12 6.38 295.1 0.34min Clear (1105) 12.71 810 2.92 6.36 278.7 11 Clear	-
Conductivity reads us in 1413 us 5:4d  Do 90 = 100			- 1
D 76 - 700		(1110) 12,56 812 2.62 6.39 261.5 1 Clear	-
5wc21		(1115) 12.63 813 2.55 6.40 248.3 ( Clear	- 1
DTW-9.95 Bagin Purge (0914)		(1120) 12.78 817 2.53 6.41 235.8 11 Clear (1125) 13.22 817 2.55 6.44 223.0 11 Clear	
Post Purge DTW-10.01 Begin Purge (0914) Post Purge DTW-10.01 Initial Purge-Clear			
Time Temple Condlus Domg/L pH ORP(WW) Pungek	Desc	(1135) 12,98 820 2.48 6.44 210,9 "Clear (1135) 12,93 819 2.45 6.43 206.5 "Clear	
(0914) 13.09 593 8.73 3.31 317.9 0.34 min	n Clear	(1140) 12.84 819 2.42 6.43 203.7 " Clear	
(0915) 13.11 593 8.50 3,29 321.3	Clear	(1140) Readings Stable	-
(0920) 13,11 576 7,00 3,30 371.9 "	Clear	(1201)12.71 816 2.57 6.48 186.5 Post Purge Reading	
(0925) 12.97 583 6.54 3,29 385.5 "	Clear	Sample Time (1145)	
(0930) 13.00 578 6.08 3.29 397.3 "	Clear	Samples Collected: (4)8260,(2)8151,(2)8270,(2)8081	
(0935) 13.08 573 5.45 3.30 408.8 "	Clear	(DCN, (DTM, (1) 9065, (1) Balfide	
(0940) 13,97 569 5,00 3,29 418,6 "	Clear		
(0945) 12.89 566 4.75 3.28 422.1	Clear	5wc23	
(0950) 12.81 563 4.42 3.29 428.9	Clear	Post Purge Drw-9.51  Post Purge Drw-9.51  To. tral Purge - Clear	1
(0955) 12.97 559 4.15 3.30 431.2 "	Clear	Post Purge Drw-9,51 In. Fral Purge - Clear	
(1000) 13.05 558 3.95 3.31 430.6	Clear	Post Purge Drw-9,51 In. Fral Purge - Clear Time Temple Condlus Do Myle pH CRP(MW) Purck Desc	
(1005) 12.89 556 3.91 3.31 434.1 "	Clear	(1215) 12.03 830 5.27 6.83 143.2 0.3 min Clear	
(1005) Readings Stable		(1220) 12,29 830 3,25 6.48 169.6 " Clear	
(1043) 12.81 552 3.96 3.34 425.8 Post Purg	e Reading	(1225) 12.21 828 2.73 6.43 168.4 " Clear	_
Sample Time (1010)		(1230) 12.19 824 2.62 644 166,3 " Clear	
Samples Collected, (4)8260, (2)8151, (2)8270, (2)8081,	(1) TM	(1235) 12,10 824 2.62 6.46 160.1 " Clear	
(1) cN, (1) 9065, (1) Sulfide		(1240) 12,17 823 2.61 6.47 156.5 " Clear	_
		(1245) 12.32 821 2.57 6.47 150.8 " Clear	_ 7
5WDUP	***	(1250) 12.43 224 2.57 6.49 148.7 " Clear	_
Sample Time (1025)	(1) 501	(1250) Readings Stable	_
Samples Collected: (4)8260, (2)8151, (2)8270, (2)8081, (1)TM + Collected at 5wc21 (16) (1)9065, (1) 5014	VII)CN	(1313) 12.76 821 2.58 6.52 153.9 Post Purge Reading	
# Collected at 5wc21 (116) (1)9065, (1) 5alt	100		

4/21/09	RAP	ap	FB‡	-8 4/21/09	RAAF 803204 DAS[7		FB#8
	B03201 DA5/7	70E				Q.C.	
5WC23(Cont)				5WIOA (	ont.)	.)	
Sample	Time (1255)			Time Tev	pp(E) Cond(us) DOM/L p	tt ORP(MV) Purgek	Desc
Samples C	Mected: (4)8260.(	(2)8270,(2)8151	1808(2)	(1519)14		50 116.4 0.34 min	Clear
	(1)TM,(1)	)cn, (i)9065, (i)	Sultide	50	mple Time (1510) mples Collected: (4)8260, (	2)2270 (:)7714	
				29	nples collected. (4) 8240, (	x/82/0,(1)114	
5W9A		20 0 m (1324)		5WILA			
Dtw-2.50	J	Bajin Parge (1334) Pal Parge - Clear	2.,	DTW-1	0,93 Rec	in Puroje (1534)	
Post Purge DTW-2.5		pit orp(MV	Purpe K Dos	2 2	-12.04 Tation	1 Purge-Clear	
(1335) 13.67	Cond(as) Dong/c 405 4.32	7.19 136.2	0.3 min Clea		p(E) Cond(us) Do mg/L pH		sc
(1340) 13.98	392 4,45	7,27 134,6	li clea	1		44 .	
(1345) 14.18	387 4:47	7.30 133.5	11 Clea			. 11	ar
(1350) 14,51	383 4.49	7.32 132.3	11 Clea		14 648 2.41 6.33		
(1355) 14.67	382 4.45	7.33 131.6	" Clea			3 113.4 " Cle	ar
(1400) 14,29	380 4.41	7.28 134.4	" Clea	7		//	
(1405) 13.84	380 4,39	7,27 133,9	11 Clea	43			
(1405) Reading	s Stable			(1605)14		108,6	
(1419) 14.16	377 4.46	7.32 126.1	Post Purge Readin	(1610)14		107,4 Clea	r
Samo	ble Time (1410)			(1610) Ka	adings Stable	100 ( 2 ( 0 )	1.
Samples	Collected (4) 8260	, (2)8270, (1)TI	М	(1626)14	41 626 2.55 6.35	100.6 Post Kurge Kea	ding
					Sample Time (1615)	(2)022 (1) The	
560A		0 ///		Ja	mples Collected: (4)8260,	(2)8910, (1) 119	
DTW-14.37		Begin Punge (1433		1			
Post Purge DTW-14.5		Hial Purge-Clear	Dark Die				
Time Temp(E)	Cond(us) Dorg/L 387 2.92	7.45 124.0	Purgek Des 0.3 / min Cle				
(1435) 14,87	384 2.79	7.47 123.8	1) Clea	1			
(1445) 14,76	381 2.76	7.45 124.2	11 Clea				
(1450)14,16	377 2.80	7.45 122.3	11 Clea				
(1455) 14,21	374 2.84	7.45 120.2	11 Clea				
(1500) 14.07	374 2,83	7,46 118,1	11 Clea				
(1505)14,30	374 2.90	7,47 114,2	11 Clear				
(1505) Reading	s Stable						
		18)			(119		



		Florid	Alinha	RAAP	F8#8
6/10/09	RAAP B03204-07	FB# 8	6/10/09	B03204-07 DAST TOPE	
	DAS ITAE.			verification	
5WC22			5W5B		
DTW - 815	Begin Parge (1141)	<i>c</i>	DTW-8.34	Begin Purge (1428)	
Post Purge DIW -2	2.59 Initial Purge-Clear Condlus Dong/L pt ORP(MU) Purg	Warn Dosc	Part Dame Dille 9 73	Initial Purae - Clear	
		34min Clear	Time Touck Cody	) DOM/L pH ORP(MV) Purgelelgp	W) Desc
(1145) 16,50 (1150) 16,49	895 2.76 6.07 199.7 0. 927 2.73 6.08 197.0	11 Clear	(1430) 14.46 587	6,59 5.33 162.4 0.34min	Clear
	955 2.81 6.12 191.8	1) Clear	(1435) 14.05 620	6,39 5,32 173.3	Clear
(1155) 14.63 (1200) 16.50	978 2.85 6.14 184.4	11 Clear	(1440)13,78 622	6.44 5.32 180.5	Clear
(1205) 16.43	982 2.89 6.15 182.7	Clear	(1445)13.82 629	6.52 5.37 183.9 "	Clear
(1210) 16.32	986 2.92 6.19 164,3	Clear	(1450)13.94 624	4.58 5.40 185.7 "	Clear
(1215)16.34	988 2.85 6.17 167.5	11 Clear	(1455)13,87 624	6,55 5.42 186.7	Clear
(1220)16.30	989 2.86 6.17 169.6	11 Clear		6.60 5.43 187.5	Clear
(1220) Readi			(1500) Readings 5	table .	
	Dample Time (1225)		Sample 7	Time (1505)	
Samo	les Collected: (2)8081, (2)8081		Samples Colleck	ed:(3)8260,(3)8260,(2)8081,(a)80	981
,	,				
5wc23			5W7B	P. D. (1827)	
DTW-7,9	14 Begin Purge (1306	)	DTW-8.68	Begin Parge (1537) Initial Purge-Clear	
Post Purge DTW-7.	95 Initial Purge-Clear		Post Purge DTW - 8.73	Initial ruige-cleur	N Dose
Time Temple		(gpm) Desc	Time Temple Conduct	8.00 3.34 377.8 0.34 min	Clear
(1310) 16,90	927 3.81 6.32 141.3 0.34		(1540) 15,22 264	8.00 3.34 377.8 0.39 min 7.90 3.27 406.5 11	Clear
(1315) 16.94		Clear	(1545) 14.64 263 (1550) 14.52 262	7.88 3,27 417.1	Clear
(1320) 16.67	1101 3.46 6.25 147.8	Clear	(1555)14,46 264	7.85 3.29 425.6	Clear
(1325)/6.61	1117 3.33 6.24 147.3	Clear Clear	(1600)14.35 267	7.87 3.32 433.3 ''	Clear
(1330)16.85	112 3.36 6.23 146.4	Clear	(1605)13.96 265	7.86 3.36 430.7	Clear
(1335)16.99	1117 3,31 6,23 147.4	Clear	(1610)13,90 265		Clear
(1340)14,97			(1610) Readings Sta		
(1345)17.03	116 3.35 6.22 148,1 inas Stable	de la man I	· Sample 7	Tme(1615)	
(1373) Nead	Sample Time (1350)		Samples Collec	ed: (3)8240, (3)8240, (2)8081, (2)80	81
2	ples Collected: (2)8081, (2)8081				
JOWN	spes concerts, wiscon jes over				
				(123)	
	(122)				

	Alulas TAAD	FB#18
6/11/09  RAAP-Verification  BO3204-6  DASTIGE	6/11/09 RAAP B03204-01 DAS/TGE	I DAG
DASTQE		
General Notes	16/400 6	
Weather - Overcast, 70's	DTW + 70.14 Begin Ruge (1151)	
PPE-Eye Protection, Nitrilo gloves	Post Purge Disi-70.65 Initial Purge-Clear	
Calibrations - YSI 450 MDS	Time Temple Condlus Dong/L pH ORP(MV) Purgek	phi vesc
pH-4.00=4.00,7.00=7.00,10.00=9.98	(1155) 1551 203 8.08 4.95 212.6 40.34/1	
Conductivity reads 1413 us in 1413 us std	(1200) 15.99 177 4.70 488 173.5	Clear
Do % = 100	(1205) 16.10 163 4.36 4.91 162.7	Clear
	(1210) 16.08 136 4.07 4.99 140.9	Clear
· Dedicated tubing and well skirts used at each well	(1215) 15,91 154 3.84 5.01 136.8	Clear
· All equipment decored between each well	(1220) 15.76 154 3.72 5.00 134.4	Clear
· Purge water disposed of at dedicated location ensite	(1220) Readings Stable	
· All samples collected, stored and transported in coolers on ice	Sample Time (1225)	
THE SAMPLES CONFERENCE STORED AND THE THAT THE THE TELEVISION TO	Samples Coilected (3) 8260, (3) 8260	
7mw6		
DTW-24.76 Begin Purge (1003)	IODDH2R	
Post Purge DTW-30.22 Initial Purge-Clear	DTW-17.62 Begin Purge (1249)	
Time Temple Condlus Dong DH ORPLAN Purgeklapan Desc	Post Purge DTW-17.68 Initial Purge-Clear	
	Time Temple Condlus DOBL AH ORPLAND Pungeklapu	) Desc
	(1256) 14.51 543 5.98 6.79 30.4 0.34 min	Clear
(	(1255) 14.39 611 3.15 6.28 21.5	Clear
	(1300) 14.07 636 2.80 6.90 20.1 "	Clear
(1020) 14.96 1894 4.13 6.88 - 106.4 " Clear	(1305) 13,87 625 2.98 6.76 39.7 "	Clear
(1025) 14,97 1845 3.95 6.92 -105.6 " Clear	(1310) 13.81 524 3.56 6.49 59.5 "	Clear
(1030) 14.91 1797 3.82 6.99 - 100.1 " Clear	(1315)13.81 434 4.37 6.34 76.7 "	Clear
(1035)14.91 1780 3.73 7.03 -102.9 " Clear	(1320)14.08 374 5.39 6.30 86.2 "	Clear
(1035) Readings Stable	(1325)13,99 368 5,56 6,28 89,5	Clear
Sample Time (1040)	(1330)14.00 363 5.66 6.27 91.8	Clear
Samples Collected: (3) 8260, (3) 8260	(1330) Readings Stable	
	Sample Time (1335)	
	Samples Collected: (3) 8260, (3) 8260	
	Damples Collected: (3)8260, (3)8260	welcher not
		KIILU
(124)	(123)	
		Markey - Price I's November of the National Action

10/6/09	RAI	4P 1-07	Bushesi a Lui Cen IRLA	TRibuted to the seas 2 ph	FB#8	10/7/09	3	RAAP 03204-07	F	8#8
	DA6/7	QE				C		DAS/TOE		
34 7						General Note				
14-3	· D	. 0 .	11004			Weather-		Inila almas		
Drw-56.77		egin run	ge (1554)			Calib li	ms - YSI 6	strile gloves		
Purge DTW-62.15	Jait1	al Purge	reolui)	D . L	Desc	Callbratio	0 = 400 7	00 = 7.00 10 0	2=10.00	
Time Tempé Condle		-		Purgek 0.34min		P 1 -4.00	ity con 1	00 = 7,00 , 10.00 113 us in 1413.	115 54	
(1555) 15.36 242			131.7	0.3 /min				119 115 11 1415.	us sia	
(1600) 15.27 240		7,54	129,5	11	Clear /	Do % =		skirts used at ea	ch well	
(1605) 14,74 232		7.72		11				tween each well	i we ii	
(1610) 14.30 229	6.40	7.78	123,9	11	Clear	e Purced water	s diegoged of	at dedicated loca	tion onsite	
(1615) 14,28 228	6,28	7.81		11	Clear	o All condes	a Marchal chan	I and tome as about	in coolect of	ico
(1620) 14.69 228	6.31	7.81	120.7	11	Clear	MII Samples	Collected) 5 1016	d and transported	IN CLOSE 15 CT	, 100
(1625) 15.10 228	6.36	7,87	118.8	1)	Clear	State	hope La	rel Table-Un	1+16	
(1430) 15.14 228	6.36	1101	110.0		Clear	WELL		0 (0 0 1	Notes	
(1630) Readings Sto	able	721	1219	D. LP	e Reading	16-1	DTW +3.99	47.49	101-5	
(1646) 14.72 225	11136	1 1101	10011	1051 larg	* rendering	16-2	55.76	55.79		
Sample Ti	me (1633)	(2) 0011	(2)0270	(2)-+NA		16-3	56.77	62.15		
Samples Collecte	9:(6)8260)	(218011	) (d) 8&10	,(2) 1101		16-5	4.67	9.74		
						16WC2B	53.53	57.75		
					•	16MW8	73.96	75.34		
						16WC1B	69.53	69.76		
						16WCIA	69.21	70.89		
						16MW9	66.31	66.78		
						1601	48.76			
							1-1-1-1		DTW-ONLY	
						16CDH3	DRY		if	
						1623	68.25		17	
						16WCAA	DRY		17	
						*				
	(7.	36						(37)		

1017/09	RAAP B03204-07 DAS/TQE	F8#8	10/7/09		RAAP B03204+07 D145/179E		FB#8
	DASTRE		11.10.00		DIAS / TQE		
16-1	7 0 /200		16WC2B	-2	Begin Parge	41154)	
DTW-43.99	Begin Purge (0939 149 Initial Purge - 51 Clo	1	Part O Trul	.53	Initial Purge-	Claur	
Post Purge DTW - 47	Initial Punge - 51 Clo	way	To strange DIW	C I( ) In Mig/	pt orp(mu)	Prock Desc	DTW
Time Temple L	Condais Do 1/2 pt ORP(an) Pu	rger Desc Drw			7.64 146.7	0,3 Truin Clear	54.60
1		Min Si. Clarde 45,45	(1155) 16.67 (1200) 15.74		7.48 149.7	" Clear	55.28
	541 7.08 6.92 205.1	11 Si. Cloudy 46.08	(1205) 15.57		7.58 117.3	" Clear	55.89
L Y		Clear 46,36	(1210)15.98		7.58 115.2	" Clear	56.01
	141 6.58 6.97 190.6	Clear 46.82 1	(1215) 16,20		7.58 //3.9	" Clear	56.14
7 0	128 6.47 6.94 188.4	Clear 46.96 Clear 47.13	(1220)16.57	274 1.46	7.63 102.8	" Clear	56.51
7 - 2	22 6.42 6.99 183.0	11	(1225)16.19		7.61 104.3	11 Clear	56.76 /
	18 6.46 7.01 180,2	" Clear 47.22	(1230)16,40		7.58 104,2	" Clear	56.92
(1010) Readings	Stable	10.000	(1235)14.57	31,751	1.59 100.3	" Clear	57,04
(1025)16,14 9	404 6.70 6.95 172.7 Pe	ost runge keadings	(1235) Readii		7000		
Sampl	e Time (1015)	24	(1251)458	272 114	7.45 109.8	Post Purge Read	ling
Samples	Collected: (3)8260, (2)8270, (1) TI	0	Saw	ple Time (1240			3
44.0			Sample	C. Upr Lod (3)83	360, (2)8270, (1)	tm	
16-2	Basi D. va (1638		Sample	) Collected ( 3)00	, , , , , , , , , , , , , , , , , , ,		х .
016-55.16	Bazin Punge (1039	200	16MW8				
Post Purge DTW-55	5.79 Initial Runge-Cle	ok Desc Mil	DTW-7:	396	Begin Purge	(1307)	
	ond(us) Dom/L pH ORP(MV) Run	Main Clear 55.77	Post Parge DIL	75.34	Initial Purge	e-Clear	
	0 1 10 1-2 5	Clear 55.77	Time Tomol	(c) (cod(us) Dong	L pH ORP(MU	) Pungek Dosc	DTW
		Clear 55.78	(1310) 16.46	111 247	5.34 232.1	0.34 min Clear	74.39
(1050) 15.20 3		' Clear 55.78	(1315) 16.70			Clear	74.59
7	583 4.16 6.61 169.2 "	" Clear 55,78	(1320) 16.69			11	74.67
	11.10	11 Clear 55.78	(1325)16.95		4,97 179.0	h Clear	74.74
(1105) 15, 10 5		11 Clear 55.79	(1330)17.37		5.00 174.3	" Clear	74.84
		11 Clear 55.78	(1335)17.62		5,02 170.0	Clear	74.93
(1115) 15.05 5	10	00,10	(1340)17.38		4.98 168.1	" Clear	75.17
(1115) Readings (1130) 4.90 5	1 - 1	st Pierce Reading	(1340) Ready	ngs Stable			
(130) Milo 3	ple Time (1120)		(1354)17.82	27 1.23	5.03 157.6	Post lurge k	lead ive
Jam	Collected: (3) 8260, (2) 8270, (	i) TM	50	mas la Timese (1	1345)		
Samples			San	ples Collected: (3)	8260 (39) (2)827	0,(i) TM	
	138				(157)		STREET OF THE PROPERTY OF

0.00	THE PARTY OF THE P	10/0/-0	2110	
10/7/09 RAAP B03204-07 DASITRE	F8#8	10/2/09	B03204-07 D45/19E	FB# 8
DAS 1 10 E			D45/10E	
16-5	5 5 6	General Notes		
DTW-4.67 Begin Purge (1423)		weather-Sun	14.705	
Post Purge Drw-9.74 Initial Purge-Clear		PPE-ENO Prot	ection, Nitribe glow	A & C
Time Temple Condlais) Domsk pH ORP(MW) Punge	K Dock Drul	Calibratins	YS1 650 MDS	765
Time temples conditions to the pit orrents large	in Clear 5.64		0,7.00 = 7.00	10.00 - 10.00
		9 1 1 10	2 1 413	10.00 - 10.00
(1430) 16,44 418 2.01 6,89 120,0 "	Clear 6.33	Conductivity	reads 1413 us in	1413 us 8ta
(1435) 16.92 431 1.77 6.88 118.8	Clear (0.91)	Do70 = 100	) \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
(1440) 17.07 432 1.75 6.89 118.4 "	Clear 7.11 V	· Dedicated tubing a	nd well skirts used	at each well
(1445) 17,20 437 1,78 6,89 117,7	Clear 7,28	· All equipment di	econed between each	h well
	Clear 7.48	· Punge wader dispose	ed of at dedicated	location orsite
(1455) 16.54 437 1.70 6.77 119.4	clear 8,13	· All samples collect	ed, stored and trans	ported on ice in coolers
(1455) Rondings Stable				
(1512)16.52 435 2.35 6.80 123.9 Post R	wee Reading	16MW9		
Sample Time (1500)	of receiving		Begin Purge (	093/2)
C 1 (1) (1) (2) (2) (2) (2) (2) (1) THA		Post Purge DTW-66.78	Initial Purge-	Clear
Samples Collected: (3)8260, (2)8270, (1) TM		The Toronto Carlo	) Days at adocu	I Purget Dosc DTW
			Dul DIT OKUM	, U <sub>0</sub>
12.0 *		7 2		0.3 min (lear 66.43
16Spring	/	(0945) 14.79 751	5.49 6.61 161.4	24
Time Temple Condlus Do" L pH ORAM	V	(0950) 15.47 834	3.32 6.53 91.7	2.0
(1530) 13.70 471 6.86 6.79 79.4		(0955/15.01 834	2.39 6.50 83.4	" Clear 66.59
		[1000] 15,18 828	2.34 6.47 80.3	" Clear 66.45"
Sample Time (1535)		(1005) 15,67 803	2.19 6.45 80.7	" Clear 66.51
Samples Collected: (3) 8260, (2) 8270, (1) TM		(1010) 16.05 759	2.26 6.38 79.2	" Clear 66.51
January Company of the State of			2.28 6.40 78.8	" Clear 66.51
			2.31 6.40 79.3	" Clear 66.52
		(1026) Readings Sta		7,041
			2.20 4.34 74.2	P. + D. P. 1°
			11000	Post Purge Reading
	×	Sample Ti		
1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	- 1	Jamples Collect	ed:(3)8260,(2)8270,(1)T	PM
(140)				

1018/09 F8#8 10	10/2/09 BAAP F-B# 8
DAS / 70E	10/2/09 RAAP F-6#8 B03204-07 DAS/70E
16WCIA	16WC1B(Cont.)
DTW-69.21 Begin Purge (1102)	Time Temple Condlus DOML pH ORPHIN Parget Desc DTW
Past Purge DIW-10,89 Initial runge-Clear	(1300) 16.09 334 2.06 5.69 154.1 0.37min Clear 69.67
Time Temple Condlass DOM/2 pt ORPLAN Purgek Desc DTW	(1305) 15.84 320 1.90 5.65 154.6 " Clear 69.67
(1103) 13.10 913	(1310) 15.68 290 1.52 5.62 153.7 " Clear 69.69
(1/10) 1313 301 6.00 4.15	(1315)15.52 285 1.44 5.62 152.9 " Clear 69.69
CIVS ISING	(1320) 15.41 281 1.42 5.62 151.4 Clear 69.70
	(1325) 15.63 279 1.37 5.63 149.8 " Clear 69.71
	(1325) Readings Stable
(1130)15.10 626 2181 6.12 4d.d Clear 69.10	(1341) 15.55 278 1.35 5.75 141.9 Post Purge Reading
(1135) 15.03 622 2.60 6.72 37,5 " Clear 69.72	Sample Time (1330)
(1146) 15.26 620 2,34 6.73 35.8 " Clear 69.70	Samples Collected: (3)8260, (2)8270, (1) TM
(1145) 15,64 619 dill 6113 36.6 Clew 69110	
(1.05)	1661
(1155) 15.81 620 2.05 6.77 30,1 " Clear 69.70	DTW-48.76 Begin Parge (1358)
(1135) 10001125 0010	Time Temple Cond(us) Domg/2 DH ORMAN Purgek Desc DTW
	1400) 1598 616 3.98 6.53 114,3 0.34 min Clear 48,77 (1405) 16.09 617 2.50 6.21 122.8 11 Clear 48.79
Jamples Correction. (1) only	
7	
16WDUP	1420)16,83 608 1.86 6.17 117.3 "Clear 48.79 (1425)16.34 605 1.68 6.16 115.5 "Clear 48.79
	(1430)16.10 602 1.63 6.14 115.0 " Clear 48.79
201111 162 00 1111	(1435)16.19 600 1.59 6.14 114.4 " Clear 48.79
	(1440)16.25 599 1.55 6.15 112.7 " Clear 48.79
	(1440) Readings Stable
21.03	(1455) 16/13 604 1.41 6.16 115.3 Post Parge Reading
Post Purge Dow - 69.76 Initial Purge - Clear Time Temple Condlas Dom/L p. H. ORPhin Purgek Desc DTW	Sample Time (1445)
	Samples Collected: (3) 8260, (2) 8270, (1) TM
(1245) 16.23 338 8.04 6.33 178.1 0.37 min Clear 64.65 (1250) 16.33 368 5.11 6.07 164.0 " Clear 69.66	
(1255) 16.25 383 3.23 5.86 152.1 " Clear 69.66	
(1300) 16.16 368 2.60 5.76 152.6 " Clear 69.67	
142	(143)

Clear 69.67 Clear 69.69 Clear 69.69 Clear 69.70

n Clear 48.79 / Clear 48.79 / Clear 48.79 Clear 48.79

10/19/09 RAAP B03204-0	F6#8	10/19/09 RAAP BOBDY-07	F8#8
13MW6 (Cont)  Sample Time (1030)  Samples Collected: (3)8260, (2)8270,  13MW7  DTW - 16,23  Post Purge DtW - 16,34  Time Temple Condas Dougle ptt (1055) 14,14 532 4,84 6,90 (1100) 14,19 601 2,72 6,84 (1105) 14,28 648 1,50 6,83 (1110) 14,47 667 1,25 6,83 (1115) 14,69 675 1,21 6,83	(1) TM, (1) 3140, (3) 8332/8330  In Purge (1052)  ( Rurge - Clear  ORP(W) Purgek Des C DTW  182.5 0.34min Clear 16.33  17-1.9 11 Clear 16.33	10/19/09  10/19/	DTW 24.86
(1125)14.94 671 1.17 6.79 (1125) Readings Stable (1140)14,62 668 1.23 6.77	159.3 11 Clear	Samples Collected. (2) 8270, (1) TM, (1) CN  7W9C  DTW-14.52  Post Purge DTW-16.77  Tritial Purge-Clear	
	el Table - Unit 7 Post Punge DTW Notes 24.86 16.77	Time Vemple Cond(w) Do" PH ORP(W) Purget Desc (1335) 13.41 1073 2.61 6.85 60.7 0.37 min Clear (1340) 13.38 1077 2.05 4.78 71.8 " Clear (1345) 13.70 1085 1.58 6.77 83,7 " Clear (1350) 13.80 1091 1.50 6.77 90.0 " Clear (1355) 14.03 1096 1.36 6.76 93.2 " Clear	15.61 15.72 15.81 15.90 \
7WIDC 21.59 7WIDC 21.59 7WID 19,28 7MW6 26.41 7WIB 25.15 7WCA 24.71 7W98 W250922.60 22	23.86 21.05 31.55 25.18 25.63	(1400) 14,29 1098 1.27 6.76 91.6 " Clear (1405) 14,42 1102 1.24 6.75 90.1 " Clear (1405) Readings Stable (1423) 14,63 1102 1.30 6.69 90.5 Post Pungel Sample Time (1410) Samples Collected: (2) 8270, (1) TM, (1) CN	16.14
7WII 24.42 7MW5 24.95	11	(HT)	

10/19/09 RAAP	FB#8	10/20/09 RA	AP F8#8
10/19/09 RAAP BO3204-07 DASTIGE	7 15 11 6	10 20 09 RAI 30320 DAS	1700
7W108		General Notes	
DTW-15.57 Begin Pange (1438)		Weather-Sunny, 60's	
Part Purce DTW - 1/200 Taitie Purge - Clear		PPE-Eye Protection, Nitri	le gloves, Cotton suits
Time Temple Cond(us) Dons/L PH ORP(MO) Parget Desc	DTW	Calibrations - YSI 650	
(1440) 1353 832 3.55 6.82 122.7 0.34min Clear	16.18	pH-4.00=4.00 ,7.00	=7.00 , 10.00 = 10.00
(1445) 13.44 828 2.84 6.75 128.0 " Clear		Conductivity reads 14	13 us in 1413 us Std
(1450) 13.31 815 2.40 6.74 128,3 " Clear	15.98	Do% = 100	
(1455) 13.37 813 2,22 6,76 126.5 " Clear	15.93	· Dedicated tubing and well skirts	used at each well
(1500) 13,29 811 2.09 6.77 125,9 " Clear	15.87 √	· All equipment deconed between	en each well
(1505) 13.44 808 1.96 6.77 125.0 " Clear	15.87	· Purge water disposed of at a	ledicales location onsite
(1510)13,57 806 1,95 6,77 124.6 "Clear	15.85	· All samples collected, stored and :	transported on ice in coolers
(1510) Readings Stable	J A		
(1528) 13.78 797 1.88 6.80 125,8 Post Purge Ro	eading	13mw4	2 . 0 . (277)
Sample Time (1515)		Post Purge DTW-16.90 In	Hal Purge -
Samples Collected: (2) 8270, (1) TM, (1) CN		Time Temp (E) Condiers) Dough	H apple Dunk Des Dall
7i noc			47 228.4 0,3 Ywin Clear 16.88
7W10C  DTW-21.59  Begin Purge (1546)			03 200.6 11 Clear
Post Purge DTW -22.86 Initial Purge - Clear		(0740) 13.40 545 2.36 7	. 43
Time Temple Condlus Dong/L pH ORP(MV) Purgek Des	C DTW		14 188.2 " Clear
(1541) 13.25 719 2.35 7.16 -52.0 0.34 min Clear	21.85		14 183.9 11 Clear 16,88
(1545) 13,22 719 1.60 7.07 -27,1 " Clear	The state of the s	(0755) 13.93 571 2.10 7,1	
	22.19	(0800)13,98 570 2,07 7,1	2 176.5 " Clear
	22.26	(0800) Readings Stable	
	22.53	(0839)14,10 320 3.15 6.7	11 170.6 Post Purge Roading
	22.61	Sample Time (0805)	
(1615) 12.83 720 0.80 7.04 26.0 "Clear	22.70	Samples Collected! (3) 2240, (2) 83	270, (1) mm, (1) 314.0, (3) 8332/8330
(1615) Readings Stable			
(1634)12.58 717 0.79 7.06 32.3 Post Purge K	eading	13WDUP (080)	
Sample Time (1620)		Sample Time (0820)	
Samples Collected: (3)8270, (1) TM, (1) CN		Samples Collected: (3)8260 (4)8270	(1) TM, (1) 514.0, (3) 8532/8530
		* Dup samples collected a + 1.	3/11ω7
[H8]		. (/-	19)
(TIO)			AREA STREET, THE PROPERTY OF T

10/20/09 RAAP	FB#8	10/20/09 RAAP PB#8
B03204-07 Das/TQE		B03204-07 DAS/TOE
13Mula.  Para Pina (1953)		7W13 DTW-19.28 Begin Purge (1123)
Post Purge DTW-2288 Initial Purge-Clear		Post Purge DTW-21.05 Initial Rurge-Clear
Post Purge DTW-2288 Initial Purge-Clear Time Temple) Condlaws) DOMG/L pt ORP(M) Purgek Desc.	DTW	Time Temp(2) Condlus DO 19/L pH ORP(MV) Pangek Desc DTW
(0855) 12.98 663 5.67 6.85 170.3 0.37min Clear	22,10	(1125) 13,89 1383 4,39 7,28 -6.6 0.34min Clear 20.62
(0900) 13.01 667 4.30 6.85 165.8 " Clear	22.28	(1130) 13.84 1398 2.01 7.23 -41.8 " Clear 20.84
(0905) 13,01 669 3.50 6.86 161,5 " Clear	22,38 √	(1135) 13.99 1398 1.62 7.21 -42.4 " Clear 21.06 V
(0910)12.87 671 3,29 6.86 159.8 " Clear	22,50	(1140) 14,23 /399 1.61 7,20 -36.0 " Clear 21.00
(0915) 12.63 672 3,16 6.86 157.2 " Clear	22.59	>1175)17131 7310 7160 -31.1 CICHI 211,00
(0920) 12.49 671 3.13 6.86 1567 " Clear	22.61	(1150)14,80 1398 1.65 7.21 -28.9 " Clear 20.90
(0925) 12,25 6/2 5/12 6.86 155.5 CIECU	22.64	(1155)14.93 1397 1.64 7.21 -30.0 "Clear 20.81 (1155) Readings Stable
(0925) Readings Stable	/ `	(1213) 14.64 1393 1.83 7.2 -19.7 Post Purge Reading
(0946)12,31 665 3.22 6,85 151.5 Post Purge Rea	ding	Sample Time (1200)
Sample Time (0930) Samples Collected (3)8260, (2)8270, (1)714, (1)314.0, (3)8335	1/8330	Samples Collected: (2)8270, (1) TM, (1) CN
Samples Collected (3704 40, (17141, (1751 110))	7000	J. 11, 125 Control (12, 12, 12)
13Mwl	,	7mw6_
DTW-21.52 Begin Purge (0959)	$\sqrt{}$	DTW-26.41 Begin Parge (+231)
Pat Para Dru - 21.73 Traffal Rivae - Clear		rostruge DIW-21133 Initial Burge-Clear
Time Temp (E) Condlaws) Dong/2 DH ORP(MU) Purgel Dosc	DTW	Time Temple Condlus DOM/2 pH ORP(M) Purget Desc DTW
(1000) 12.56 593 6.90 6.82 157.9 0.37min Clear	21.71	(1235) 14.43 1679 1.70 7.30 -23,2 0.37 min Clear 28.76 V
(1005) 12.56 645 5.41 6.80 152.2 " Clear	21.70	(1240)14.75 1715 1,23 7.15 -44.7 " Clear 29.66 (1245)15 17 1731 1.05 7.09 -55.1 " Class 29.66
(1010) 12,74 467 4,67 6,80 147.0 " Clear		(1245)15.10 1731 1.05 7.09 -55.1 " Clear 29.66 (1250)15.15 1732 0.95 7.08 -60.7 " Clear 29.89
(1015) 12.79 690 4.34 6.81 143.11 " Clear (1020) 12.90 706 4.20 6.81 139.18 " Clear	X1,66	(1255)15.34 1716 0.94 7.07 -64.8 " Clear 30.10
(1000) 101/10 100	2164	(1300)15,64 1700 0.95 7.08 -65.7 " Clear 30.45
(1025) 13.06 714 4.09 6.81 137.2 " Clear (1030) 13.18 719 3.99 6.81 135.6 " Clear	arie [	(1305)15.76 1688 0.95 7.10 -64.2 " Clear 30.77
(1035)13.27 722 3,90 618 132.6 "Clear		(1305) Readings Stable
(1035) Readings Stable		(1324)15.43 1656 0.98 7.07 -61.7 Post Purge Reading
(1057) 13,51 725 3.64 6.83 131,2 Post Purge Re	ading	Sample Time (1310)
SCAR 01- Trans (1040)	~	Samples Collected (2)8270, (1) TM, (1) CN
Samples Colleded: (3)8260, (2)8270, (1)TM, (1)314.0, (3)8332/8.	330	
		GED 7
(150)		(151)

PADD	P8#8	10/21/09	RAAP	FB#8
10/20/09  RAAP  803204-07  PAS/TOE	1040		B03204-07 DAS /TOE	
		General Notes		2
7W11B  Bagin Purge (1335)			Sunny 60's	
Post Purge DTW-25,18  Post Purge DTW-25,18  Initial Purge-Clear		PPE-EUR P	rotection, Nitrile gloves	
Time Temple Condaus Dough pt orplan) Pungek Desc	DTW	Calibration	25 - YSI 650 MDS	
(1335) 14,69 869 4,41 6.44 71,6 0,34 min Clear	25,17		= 4.00 , 7.00 = 7.00 , 10.0	00 = 9,99
(1340) 14,95 875 2,58 4.35 74.2 " Clear	25.16	Sonducti	vity reads 1413 us in 1413	3 us std
(1345) 15,26 886 2,05 6.37 74.9 " Chear	25.16	Do % = 10		
(1350) 15.43 891 1.86 6.38 74,3 11 Clear	25:15			
(1355) 1554 993 1,84 6,39 74,2 11 Clear	25,15	Static	Water Level Table - Un	nit 10
[1400 \15.70 893 1.84 6.39 74.5 " Clear	25.16	Control of the Contro	DTW Post Punge DT	The state of the s
(1405)15,59 895 1,80 6.40 74.6 "Clear		10DDH2R		
(1405) Randings Stable.		1003	12,28 18,34	The state of the s
(1435) 15,22 906 1.73 12,05 76.5 Post lunge Real Sample Time (1410)	ding	10 D3D	18.43 18.47	
Sample Time (1410)	)	10 MW 1	18.24 18.34	
Samples (allected: (6)8270, (3) TM, (3) CN		1004	22.73	
Sample				
7WCA		10MWL		
Dyu - 24.71 Begin Purge (1449)		DTW-18.2	4 Begin Purge (093	34)
Post Purge Dity -25.63 Initial Purge-Clear		Post Pringe DTW - 18	3.34 Initial Purge-Ci	ear
Time Temple Condas Dongle of ORKIN Parget Des	e DTW	Time Temp(2)	[ Cond(us) DOM/L DH ORP(MU)	Pangek Desc DTW
(1450) 14.42 970 2.47 6.77 75.7 0.39 min Clear	25.18	(0935) 14.32	442 9.01 7.18 219.2	0.34/min Clear 18.31
(1455) 14,39 966 1,65 6,70 791 " Clear		(0940) 14,03	424 8,17 7,37 225,6	11 Clear
(1500) 14.33 962 1.24 6.68 79.1 " Clear	25.40	(0945) /3,99		" Clear 18.30 ,
(1505) 14,37 961 1.06 6,69 78,8 11 Clear		(8950) 13.92	401 8,03 7,36 224.5	" Clear "
	1 25,41	(0955)/3,70	394 8,01 7,35 221.7	Clear
(1515)14.34 960 0.93 6.70 78.3 11 Clear		(1000)13.58	383 8.04 7.34 218, 6	"Clear
(1520)14.22 961 0.90 6.71 78.0 11 Clear		(1005)/3.70	376 7.89 7.31 217.7	" Clear 18.31
(1520) Readings Stable	,	(1005) Reading	s Stable	
(1550)14.15 969 1.10 6.75 75.4 Post Purge Rea	ding	(1027)14.17	361 7.63 7.33 210.3	Post Purge Reading
Sample Time (1525)		Sample	Time (1010)	
Samples Collected: (2)8270, (1) TM, (1) CN		Samples Co	(lected: (6) 8240, (2) 8270, (1) TM	, LI) CN
46	( ) 1			
ple Time (1540) Samples Collected: (2)8270, (1) TM, (	(1)CN			
Samples Collected at (52) TWCA	7.3		(153)	

10/21/09  RAAP  B03204-67  DAS/TOE	F8#8	10/21/09	RAAP B03204-07	FB#8
		0	DASTOE	
101)30		10DDH2R		
DTW-18,43 Begin Purge (1047)		D7W-19.78	Begin Ringe (1317) Initial Ringe - Clear	
Post Purge DTW-18.47 Initial Purge-Clear	Name of the last o	105+ Kinge DTW-19.83	Initial Purge-Clear	
Time Temple) Condlaw DONG/L pH ORP(M) Parget Desc [	2.16	Time Temple Conc	d(us) DOM9/2 pH ORP(UV) Purget	
(1050) 14.72 602 2.84 7.28 -163.9 0.34min Clear 13	8.45	(1325) 15,84 35 (1325) 15,49 51		
(1055) 14.80 598 1.33 7.19 -173.3 " Clear (1100) 15.03 590 2.02 7.15 -142.1 " Clear	1	(1325) 15.49 51 (1330) 15.50 523		lear is as
(1100) 15:03 590 2.02 7:15 -142.1 "Clear (1105) 15:11 585 2.38 7:13 -116.0 "Clear 18	45 \	(1335) 16.16 526		lear 19,82
(1110) 15,20 576 2.57 7.12 -104.6 " Clear	.75 V	(1340) 16.93 532		ear ear
(1115) 15.23 573 2.65 7.12 -100.9 "Clear		(1345) 17,22 533		
(1120)15,24 569 2,72 7,11 -96,7 " Clear 18	.45	(1350)17,47 533		
(1125)15,20 567 2.74 7.10 -94.3 "Clear	, 15	(1350) Readings Sta		
(1125) Readings Stable Purge water had Rotten Egg odo	F	(1408) 17,20 520	0 1.63 6.79 62,9 Post Purge	Peading
(1145)14.92 558 2,89 7,07 - 107.5 Post Ruge Reading		Sample Ti	me (1355)	
Sample Time (1130)			ed: (18)8260, (6)8270, (3) Ton, (3)	CN
Samples Collected: (4) 8260, (2) 8270, (1) TM, (1) CN				
		1004		
10D3		DTW-22.73	Begin Parge (1423)	
DTW-18.28 Begin Purge (1201)	4	Post Purge Reading - 22.	76 Initial Parge-Clear	
Post Purge DTW-18.34 Initial Purge-Clear	<u> </u>	Time Temple Cond		Desc Drw
Time Temple Condlaw Dong/L pH ORPhuw Parget Desc	DTW	(1425) 16.93 268	4.76 6.69 81.5 0.3 min (	lear 28.78
[1205] 15.62 494 4.10 6.99 27.3 0.34min Clear	18.34	(1430) 16.98 257	3,94 6.48 86.4 " C	lear
(1210) 16.16 467 3.98 6.96 40.9 (1 Clear	1	(1435) 17,05 251		lear 22.74
(1215) 15.81 452 3.72 6.92 53.5 " Clear		(1440) 17,13 250		lear
(1220) 15,56 446 3.60 6.86 61.7 11 Clear	V	(1445) 17.26 248	11	ear
(1235) 15.58 439 3.56 6.80 70.6 11 Clear		(1450)17.37 249	5.88 (6.75) 8011 (11	ear 22.75
(1230) 15.53 440 3.55 6.78 73.3 11 Clear		(1455) 17.51 248		ear
(1235) 15.45 440 3.53 6.76 78.3 " Clear		(1455) Readings Sta		0 1 5
(1235) Readings Stable		(1516)16.86 246	4.13 6.55 86,8 Post Parge 1	Reading
(1303) 451 3.40 6.75 85.2 Post Purge Roaling			ime (1500)	
Sample Time (1240)		samples Collect	red: (6) 8260, (2) 8270, (1) TM, (1)	C P/
Samples Collected: (6)8260, (2)8270, (1)TM, (1)CN	41 (2)(4)			
10 Dup Sample Time (1255) Samples Collected; (6)8260, (2)8270, (1)77 Dup collected at 10D3 (154)	~ (1)(~		(155)	
July contract to		A STATE OF THE RESIDENCE OF THE PERSON OF TH		

10/36/09 RAAP	FB#S	10/a6/09 RAAP FAITS
10/26/09 RAAP BO3204-07 DAS/74E	TOHS	10/26/09 RAAP FOCTS  BO3204+07 DASITUE
General Notes		55W7
Weather-Sunny		DTW-1213 Rain Dung (1222)
PPE-Eye Protection, Nitribe gloves		Post Parge DTW - 12:15 Initial Parge - Clear Time Temple Condaus Domale pH ORP(mo) Parack Desc DTW
Calibrations - XSI 650 MDS		Time Temple Condais Do 3/2 pH ORP(MO) Parack Desc Drw
Conductivity reads 1413 us in 1413 us Std	- 4	(1030) 16.19 431 7.87 6.46 142, 2 0.34min Clear 12.14
pt - 4.00 = 4.00 ,7.00 = 7.00 , 10.00 = 10.00		(1035) 16,17 437 4.11 6.57 132.4 " Clear
Do % = 100		(1040) 14.34 439 3.43 6.60 127.6 1' Clear
· Dodicaled tubing and well skirts used at each well		(1045) 14.49 441 3,35 6,64 132.9 " Clear 12.14
· All equipment deconed between each well		(1050)16.73 441 3.01 6.69 118.5 " Clear
· All purge water disposed of at dedicated location envite		(1055)16.61 442 2.86 6.71 115.4 " Clear
· All samples collected, stored and transported on iee in coolers		(1100)16.54 441 2.78 6.72 113.9 " Clear 12.15
		(1105)14.51 442 2.73 6,72 1/2.1 " Clear
Static Water Level Table - Unit 5		(1005) Readings Stable - Black particles in purge / Samok water
WELL DTW Past Purge DTW Notes		(1124)16.53 439 2.80 6.83 106.1 Post Purge Reading
S5W7 12:13 12:15		Sample Time (1110)
S5W5 9,74 10.06		Samples Collected: (3) 8260, (2) 8270, (1) TM
5W9A 3.86 3188		
SW10A 14,28 14,33		\$5w5
SW11A 14.70 15.11	-	DTW-9.74 Begin Pange (1137)
5W88 16,90 17.16		Vost Purge DIW-10.06 In High Purgo-Class
5W78 10.44 10.48		Time Temple Condlus DOM9/L DH ORP(MV) Purgek Desc DTW
5W5B 11.02 11.88		(1140) 11,18 345 6.67 6.19 119.6 0.37 min Clear 9.96
5wc21 10.80 10.87		(1145) 17.54 332 3.73 6.01 118.3 11 Clear
5WC22 10.88 10.91		(1150) 17,56 326 3.17 5.98 117.4 " elear
5wc 23 10.37 10.56		(1155)17.60 321 2.93 5.96 114.7 " Clear 9.90
SWL ONLY		(1200)17.61 317 2.74 5.95 113.0 " Clear V
5weA 14.91		(1205)17.51 317 2.59 5.94 110.6 " Clear 9.90
55W6 10127/018-86 8,86 11	<u>_</u>	(1210)17.50 315 2.53 5,94 110.3 " clear
55w8 13.45		(1215)17.47 314 2.49 5.93 109.7 11 Clear
5wc11 18,84 "		(1215) Readings Stable
5wc12 18.07 "		(1233)17,73 309 2,28 6,03 111.2 Post Purge Reading
		Sample Time (1220)
		Samples Collected: (3) 2260, (2) 2270, (1) TM
(56)		(157)

10/26/09	RAAP BO3204-07	FB#8	10/26/09	RAAP 803204-07 246/79E
SW9A	DAS/TQE			DA5   79E
Dtw-3.86	Begin Purge (1253)		5WIIA	2 \ 0
Post Pune DW - 3.88	Initial Purge-Clean		DTW-14.70	Begin Pur
Time Temple Co	nd (us) Domy/ pt office) Pur	gek Dosc Die	Post Parge DIW-13.	In Initial Pur
(1255) 16:15		Min Clear 3.88	Time Temple Co	
	89 4.90 7.32 134.9 1	1	/ \	660 4,83 6,51 -3 140 4,30 6,53
7	01 1113 1141 1411	Clear 3,88	(1200)	140 4.30 6.53 6 175 4.02 6.56 3
	81 4.40 101 193,0	11 Clear		01 3.76 4.58 50
(1315) 16.00 3°	1 4 1 1 1 1 1	Il Clear /	7	10 3.50 6.59 61
(1325) 15.94 39	10 1100 1100		/	3 3.38 6.58 63
(1325) Readings 5	,	Olov	/	4 3.30 6.58 65
(1342) 15,69 39		+ Runge Reading	(1555) Readings St	
Samolas	Collected: (3)8240, (2)8270, (1)	Tim	(1614)14.98 80	
Sample	2 Time (1330)			ime (1600)
			Samples Co	lleckd: (3)8240, (2)827
5WIDA				
Drw-16.28	Begin Purge (1414	)		
Post Purge DW - 16.3	3 Initial Purge-Clea			
lime lemple) (c	indus) DOPL OFF OKUMU FO	ingek Dese DTW	-	
7 4	100 100	34min Claur 14.31		
	99 2.20 1.71 100.3	" Clear		
	1 1 1 2 2 5	11 Clear	1	
(1436)15.38 3° (1435)15.38 3°		11 Clear 16,33		
(1440) 15.39 39	1 11	11 Chear 1		
(1445)/5,39 3		" Clear		
(1445) Reading	5 Stable	V	- FRANKA	
(1505)5.18 39	6 1.68 7.60 93.6 Pos	+ Punge Reading		
So	1. Two (1450)			
Samples	Collected: (3)8240, (2)8270	S(I)TM		

(158)

Purge (1517)
Purge - Clear

ORP(MU) Purge K DOSC DTW

-38,1 0.34 min Clear 15,22

9,9 " Clear

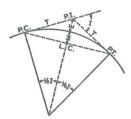
35.6 " Clear 56.7 61.5 Clear 15.01 11 Clear " Clear " Clear 3,4 7. 1 Post Purge Reading 270, (1) Tan

FB#8

(159)

Intralna	RAAP	FB#8				
10/27/09	303204-07 DAS/TOE					
P 1 11-1-0	U FIDE . Y. W					
General Notes						
weather-Overcast, Scattered Showers, 505						
PPE- Eve Protection, Nitrile gloves, hera hers						
Calibrations - 431 650 MDS						
2H - 4.00 = 4.00 , 7.00 = 7.00 , 10.00 = 4.11						
Conductivity reads 1413 us in 1413 us sic.						
7009 - 100						
· Dedicated tubing and well skirts used at fact wer						
111 22 1220	+ decaded between each we					
)     05 0	he resort at at applicate /occirion and	n ice				
· All samples co	Hected stored and transported in coolers o	1				
,						
1004	7 . 1 /100)	V				
DTW - 22.75	Begin Purge (1559)					
Post Purge DTW -	Initial Purge - Clear	DTV				
Time Temple (	Condlus Doms/ pH ORP(MU) Purget Des	2271				
(1600) 14.78	322 4,94 6,18 11711 000 111111 000					
	308 3,52 6.67 113.5 " Cle					
1	303 3.33 6.65 112.3 11 Chec					
(1615) 14.82	300 3,31 4,61	ar 22.78				
(1620)14.82	299 3.40 6.67 111.8	i /				
(1625)14.91	299 3.53 6.67 111.6 Cle					
(1630)14.93	299 3.54 6.67 111.5 " Clea	ır				
1110-100	ac Clabla	21 0				
111-41 15.01	298 3,69 6,61 112,6 Past Punge	Koading				
Si	2male Time. (1635)					
50000	les Collected: (1) CN	nompleted 2316				
Sample		MARLENOOP				
5WDUP	,	73iL				
5 WOOT (1270)						
Samples Collected: (3)8260, (2)8270, (1) TM						
⇒ P	ntinued in freld Book#9					
V Cor	licate sample collected at 5WC21					
* Dup	licare sample (160)					

### CURVE AND REDUCTION TABLES



#### CURVE FORMULAS

 $: R = \frac{50}{\sin D/2}$ 

2. Degree of Curve:  $D=100 \frac{I}{L}$ . Also,  $\sin D/2 = \frac{50}{R}$ 

:  $T=R \tan \frac{1}{2}I$ . Also,  $T=\frac{T \text{ for } 1^{\circ} \text{ curve}}{D} + C$ .

4. Length of Curve:  $L=100\frac{I}{D}$ 

1. Radius

5. Long Chord : L. C.=2R sin ½ I.
6. Middle Ordinate: M=R (1-cos ½ I)
7. External : E=\frac{R}{\cos \frac{1}{\sqrt{2}} \text{I}} - R. Also, E=T \text{tan \frac{1}{\sqrt{2}}} I.

### EXPLANATION AND USE OF TABLES

Given P.I. Sta. 83+40.7,  $I = 45^{\circ} 20'$  and  $D = 6^{\circ}30'$  find:

Stations - P. C. = P. I. - T.  $T = \frac{T \text{ for } 1^{\circ} \text{ Curve}}{D} + C.$  From Tables V and VI

T = \frac{2392.8}{6.5} + .197 = 368.32 = 3 + 68.32. Sta. P. C. = 83 + 40.7 - (3 + 68.32) = 79 + 72.38.

6.5 T. 181 - 300.32 = 3+03.32. Sta. P. C. = 83+40.7 - (3+68.32) = 79+72.38.

P. T. = P. C. + L, and L = 100 \( \frac{1}{D} = 100 \) \( \frac{45.33}{6.5} = 697.38 \) Therefore, P. T. = (79+72.38) \( + (6+97.38) = 86+69.76. \)

Offsets—Tangent offsets vary (approximately) directly with D and with the square of the distance. From Table III Tangent Offset for 100 feet = 5.669 feet. Distance = 80 - Sta. P. C. = 27.62. Hence offset = 5.66 \times \left( \frac{27.62}{100} \right)^3 = .432 \text{ ft. Also, square of any distance, divided by twice the radius equals (approximately) the distance from tangent Deflections—Deflection angle = \frac{1}{2} D \text{ for 100 ft., } \( \frac{1}{2} D \text{ for 50 ft., etc. For "X" ft. } = 3 \times \times 27.62 \times 6.5 = 53.86'. Also Deflection Angle = dfl. for 1 ft. from Table III \times X = 1.95 \)

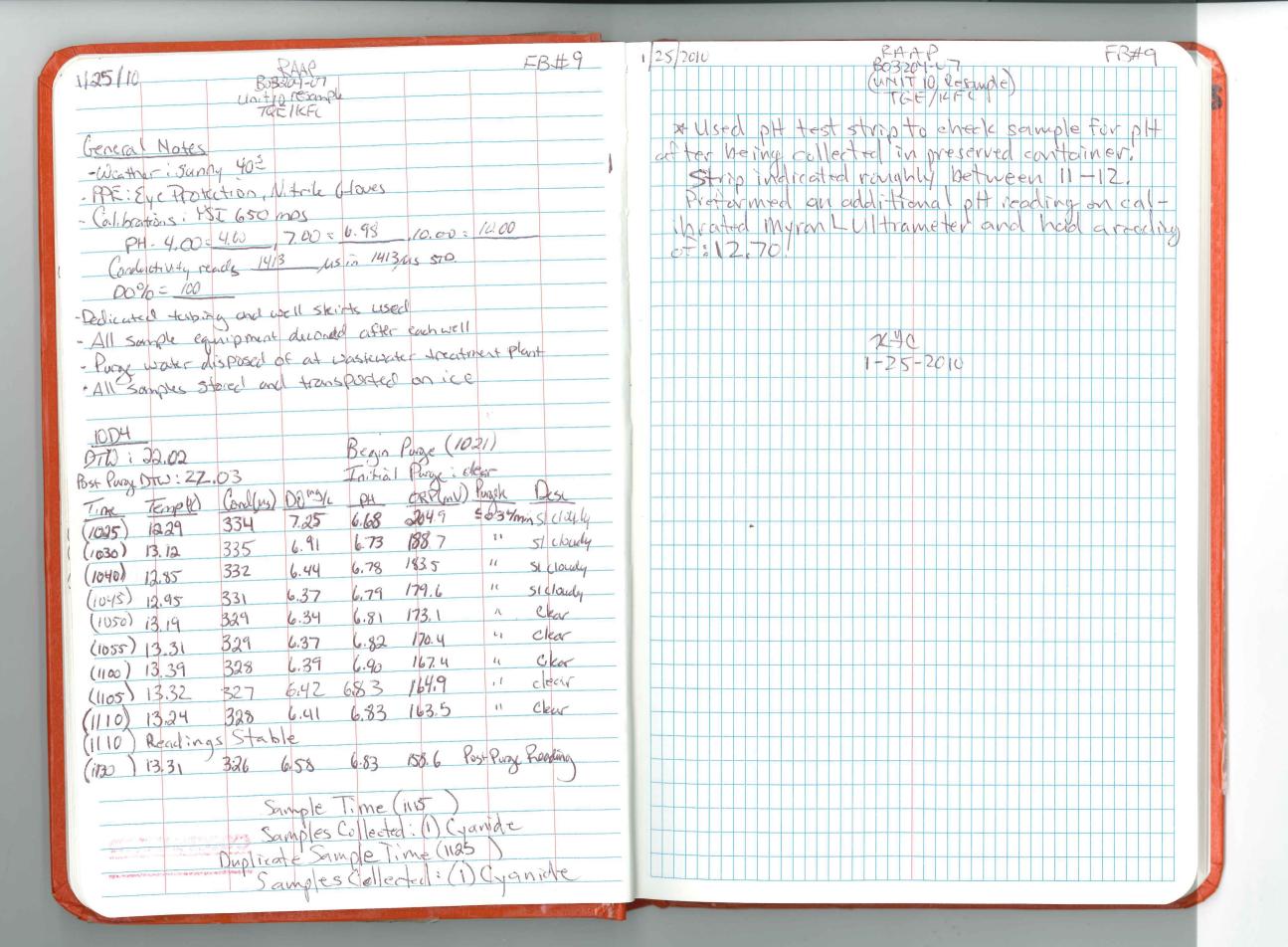
\times 27.62 = 53.86'. For Sta. 181 Deflection Angle = 53.86' + \frac{6\*30'}{2} = 4\*8.86'.

\text{Externals}—From Table V for 1° curve, with central angle of 45° 20' F = 479.6

Externals—From Table V for 1° curve, with central angle of 45° 20', E = 479.6. Therefore, for 6° 30′ curve,  $E = \frac{479.6}{6.5} + Correction from Table VI = 7.378 + .039 = 7.417.$ 

		10/27/09	BAAR	FB# 9
			BOB204-07	
		5W8B	470110	
	Projects (continued)	Drw-14.90	Begin Purge (0	834)
			Pila	Alson
	***************************************	Post Purge DTW - 1710	1 Dough 4 000/	NO at Discount
1		Time Tempe Cond		W) Ringer Des C DTU
	***************************************	(0835) 13.24 70		3 0.39mm Clear 17.45
	***************************************	(0840) 13.19 75	5 4.10 4.18 202.4	1 " Clear
		(0845) 13.22 75	5.85 4,20 200,	3 '' Clear
		(4850) 13.28 72	1 5.73 4.18 199.1	0 " Clear 17.11
Name	1	(0855) 13.32 73	5.68 4.19 197.	2 " Clear
	•	(0900) 13.34 74	5.64 4,20 196.0	clear /
Addr		(0905) 13,38 72	5.60 4.18 196:	3 " Clear 17,11
	•••••••••••••••••••••••••••••••••••••••	(0905) Readings Stab		
Phor	•••••••••••••••••••••••••••••••••••••••	(0922) 13,40 70	5.57 4.19 194.1	Post Purge Reading
	•••••••••••••••••••••••••••••••••••••••	Sample Time		
	•••••••••••••••••••••••••••••••••••••••			
		Samples Collect	led:(3)2240,(3)8270,(i)7M	
			2 0 (24)	2-2
		5W5B	Begin Kunge (09)	
	***************************************	DTW-11.02	Initial Ruge-CI	ear
	•••••••••••••••••••••••••••••••••••••••	Post Ruge DTW-11.88		
		Time Temple Condlus	DOUL DH ORP(mu)	Pungek Desc Dru
	,	(0940) 14.75 567	6,15 5,59 146,1	0.37min Clear 11.48
		(0945)14,60 600	3.25 5.38 163.7	1) Clear
		(0950) 14.66 612	3.66 5.35 160, 2	(1) Clear
		(0955)14,68 620	3,59 5,35 156.8	" Clear 11.63
E.		(1000)14.60 622	3.64 5.36 154.3	" Clear /
	***************************************		3.72 5.37 152.7	11 12 100
	***************************************	(1005)14.45 623 (1010)14.58 624	3.78 5.38 150.6	II Class
	***************************************		5118 5158 15016	Clfar
		7 2.1121	1016	0 4 0 0 73
Thic		(1029)14.81 639		Post Karge Kandung
This for	•••••••••••••••••••••••••••••••••••••••		Ime (1015)	
DT		Samples Co	Meched: (3)8260, (2)82	70, (1) Try
	·			

PAAP FBH9	10/27/09 RAAP
10/27/09 RAAP FBH9  BO3204-07  DAS LTDE	B03204-07 D45/70E
	5WC22
5W7B Drw-10.44 Begin Purge (1054)	Dtus-10.88 Bazin Aurge (1342)
Post Purge Drw -10.48 Initial Purge - Clear	Post Plage DTW-10,91 Initial Plage-Clear
Time Temple Condlus Dough pit ORPlant Purget Dosc Dru	Time Temple Condlus Dona/L pH CRP(MV) Pungek De
(1055) 17,13 209 7,15 4,01 195,0 0.34min Clear 10,48	(1345) 14.63 923 1.16 6.52 162.4 0.37 min Cle
(1100) 1201 190 1043 4,13 191.5 " Clear	(1350) 14.80 904 1.07 6.51 154.4 " Crea
(1105)1/286 174 6.23 405 192.0 Clear	(1355)14,77 892 1,10 G,52 143,7 " Clas
(1)10 16.91 156 6.07 4.08 195.4 " Clear 10.48	(1400)14,70 888 1.16 6.52 137,3 " Clear
(1115)16,87 154 6,02 4,09 194,9 11 Clear	(1405)14.57 886 1.20 6.52 130.9 " Clear
(1120)1681 158 599 4,07 196,9 " Clear	1410)14.47 883 1.30 6.52 123.2 " clear
(1125)16.70 152 5.96 4,02 200,1 " Clear	(1415)14.47 882 1.38 6.53 121.5 " Clean
(1125) Readings Stable	(1415) Readings Stable
(1158)17.16 140 5.59 3.94 203.5 Post Parge Reading	_ (1432)1425 9883 1.33 6.54 126.3 Post Parge Ro
Sample Time (1130)	Sample Time (1420)
Samples (allected: (9) 8240, (6) 8270, (3) TM	5amples Collected: (3) 8260, (2) 8270, (1) The
5WC21	5WC23  DTW-10,37  Begin Rurge (1445)
Drw-10.80 Bagin Purge (1227)	Post Pane BTW-10.56 Initial Parge-Clear
Post Punge DTW-10.87 Initial Punge-Clear Time Temple Condlus Domsk pit ORP(MV) Punge K Desc DTW.	- I g lead to the host to the lead to the
The second secon	
1000 1100 1100	(1450) 14.41 953 2.07 6.60 119.2 11 Clear
(7805) 14.13 5/13 8/14 8/14 8/14	(1455) 14.36 920 1.56 6.58 114.2 " Clear
1 1 01	(1500)14,33 904 1.59 6.58 111.0 11 Clear
(1245) 14,76 576 1,71 3,32 235,4 Clear 10,89 (1250) 14,82 576 1,64 3,32 237,5 " Clear	(1505)14,35 896 1.57 6.58 107.3 " Clear
(1255) 14.79 580 1.62 3.32 235.6 " Clear	(1510)14,31 895 1,52 6.58 105,3 " Clear
(1300) 14.82 582 1.55 3.32 234.8 " Clear 10.84	(1515)141,34 893 1.45 6.58 102,5 " Clear
(1300) Readings Stable	(1515) Readings Stable
(1331) 14,58 390 1.40 3.34 240.6 Post Purge Roading	(1534) 14.20 9 896 1.24 6.60 109.5 Post Purge Re
Sanala Time (1305)	Sample Time (1520)
Samples Collected: (3) 8260, (2) 8270, (1) TM	5amples Collected (3)8240, (2)8270, (1) TM
(2)	(3°)





Data Validation Summary
Second Quarter 2009 Groundwater Monitoring Event

Annual Monitoring under 40 CFR 264 Appendix IX
Post Closure Care Permit Hazardous Waste Management Units 5, 7, 10 and 16
Radford Facility Army Ammunition Plant, Radford, Virginia
EPA ID# VA1210020730

Draper Aden Associates performed data validation of the analytical results for the Second Quarter 2009 semiannual groundwater monitoring event at Hazardous Waste Management Units (HWMUs) 5, 7, 10, and 16 located at the Radford Facility Army Ammunition Plant (RFAAP) in Radford, Virginia. The monitoring event also served as annual monitoring under 40 CFR 264 Appendix IX. The following information summarizes the data validation review.

#### Sample Collection/Analytical Services

Draper Aden Associates of Blacksburg, Virginia collected all groundwater samples during April 6-21, 2009. Select samples for select analyses were re-sampled by Draper Aden Associates on June 10-11, 2009 to confirm or refute initial detections of new newly identified Appendix IX target analytes. See attached data validation reports for affected sample locations and analyses.

Samples were submitted for laboratory analysis via courier to CompuChem, a Division of Liberty Analytical, of Cary, North Carolina, or Lancaster Laboratories, Lancaster, Pennsylvania. Select analyses were previously performed by ProChem Analytical, Inc., of Elliston, Virginia. However, ProChem Analytical, Inc. ceased operations for environmental analysis is July 2008.

#### Receipt of Monitoring Event Data

On behalf of Alliant Techsystems Inc., each laboratory submitted results to Draper Aden Associates in a final certificate of analysis which included analytical results as well as relevant documentation to verify and validate the results. The final certificate of analysis for the event was received on June 4, 2009.

#### Verification Events

Verification sampling was required and conducted on June 10 and 11, 2009 to confirm or refute detections of concern reported for the Second Quarter 2009 monitoring event. Results of the verification event are reported in the permit required semiannual groundwater monitoring report. No new Appendix IX target analytes were detected in Second Quarter 2009.

#### Summary of Monitoring Event Data by Analytical Method

Certificates of analysis were received from each laboratory in the following sample delivery groups (SDGs):

Summary of Required Analytical Methods and SDGs

Analytical Method	Hazardous Waste Management Unit			
	HWMU 5	HWMU 7	HWMU 10	HWMU 16
8260B Volatiles	SDG RAD14	SDG RAD13	SDG RAD12,	SDG RAD09
			RAD17	
8270C Semivolatiles	SDG 904138/0904139	SDG 0904096/0904097	SDG 904109	SDG 0904069
8081A Pesticides	SDG 0904138	SDG 0904096	SDG 904109	SDG 0904069
8151A Herbicides	SDG 0904138	SDG 0904096	SDG 904109	SDG 0904069
6020 Inorganics	SDG	SDG:	SDG 904109	SDG 0904069
	904138/0904139	0904096/0904097		
9014 Cyanide	SDG 0904138	SDG: 0904096/0904097	SDG 904109	SDG 0904069
9034 Sulfide	SDG 0904138	SDG: 0904096	SDG 904109	SDG 0904069
9065 Phenolics	SDG 0904138	SDG: 0904096	SDG 904109	SDG 904109
7470A Mercury	SDG 904138/0904139	SDG: 0904096/0904097	SDG 904109	SDG 0904069

Each final certificate of analysis was complete in its presentation and the data were of acceptable quality. Chains of custody and permit required target analytes are provided in each SDG.

#### Data Analysis and Validation

All samples were analyzed by SW-846 Method requirements (Test Methods for Evaluating Solid Wastes - Physical and Chemical Methods, USEPA SW-846, 3rd edition - Final Update I, II/IIA and III). All data were evaluated in general accordance with:

- Test Methods for Evaluating Solid Wastes Physical and Chemical Methods, USEPA SW-846, 3rd edition Final Update I, II/IIA and III)
- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, October 1999 and USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008, where applicable).
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004

Draper Aden Associates of Blacksburg, Virginia performed a comprehensive data validation, including recalculation of 10% of the data, except where noted. For each HWMU, data validation reports and a summary table of data validation results are provided as an attachment (Appendix A – data validation summary tables, Appendix B – data validation reports [CD ROM]).

#### Reporting of Results

Compliance well results were reported to at or above the detection limit for the target analytes (constituents) listed in Appendix IX to 40 CFR Part 264 as presented in Appendix I of Attachment 1 of the Final Post-Closure Care Permit. Detection limits were based on latest laboratory method detection limit. Plume well results were reported to at or above the permit quantitation limit for the constituents listed in the semiannual compliance monitoring lists.

***********
SDraper Aden Associates
Engineering • Surveying • Environmental Services
Engineering • Surveying • Environmental Services

This Report has been prepared by:

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Date:

Date:

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**Appendix IX Monitoring Event Monitoring Event: Second Quarter 2009** 

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
Method: 6020		
Laboratory: CompuChem, a Division of Lil	perty Analytical, Cary, NC	THE TRACE OF CONTRACTOR OF THE TRACE OF THE
Antimony	1	0.4
Arsenic	10	2
Barium	10	1
Beryllium	1	0.2
Cadmium	1	0.2
Chromium	5	1
Cobalt	5	1
Copper	5	1
Lead	1	0.2
Nickel	10	2
Selenium	10	3
Silver	2	0.2
Thallium	1	0.2
Tin	5	Ĭ
Vanadium	10	1
Zinc		3
Method: 7470A		
Laboratory: CompuChem, a Division of Li	berty Analytical, Cary, NC	
Moreury	2	0.2
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin	berty Analytical, Cary, NC 0.05	
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC	berty Analytical, Cary, NC  0.05  0.05	0.005 0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC	berty Analytical, Cary, NC  0.05  0.05  0.05  0.05	0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC	berty Analytical, Cary, NC  0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC	berty Analytical, Cary, NC  0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane	berty Analytical, Cary, NC  0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.	0.005 0.005 0.005 0.005 0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005 0.005 0.005
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE	berty Analytical, Cary, NC  0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.	0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.86 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan I	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	0.005 0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.06 0.1 0.1 0.1 0.1 0.1	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.01 0.015
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate Endrin	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.86 0.1 0.1 0.1 0.1 0.1	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.005 0.01 0.005 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.86 0.1 0.1 0.1 0.1 0.1 0.1	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate Endrin	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.86 0.1 0.1 0.1 0.1 0.1 0.1 0.05	0.005 0.005 0.005 0.005 0.005 0.86 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan I Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor epoxide	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.10 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor Hetachlor Methoxychlor	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.10 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.	0.005 0.005 0.005 0.005 0.005 0.86 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan I Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor epoxide	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.10 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.05 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor Toxaphene	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.10 0.1 0.1 0.1 0.1 0.1 0.1 0.	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.05 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor Heptachlor Toxaphene Method: 8151A	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.10 0.1 0.1 0.1 0.1 0.1 0.1 0.	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.005 0.01 0.01 0.01 0.01 0.01 0.01 0.01 1.001 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor Heptachlor Toxaphene Method: 8151A  Laboratory: CompuChem, a Division of L	0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.06 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.005 0.005 0.005 0.005 0.005 0.866 0.01 0.01 0.01 0.01 0.005 0.01 0.01 0.01 0.01 0.01 0.01 1.001 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
Method: 8081A  Laboratory: CompuChem, a Division of Li  Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Chlordane 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endosulfan Sulfate Endrin Endrin aldehyde Heptachlor Heptachlor epoxide Methoxychlor Toxaphene Method: 8151A  Laboratory: CompuChem, a Division of L 2,4-Dichlorophenoxyacetic acid	berty Analytical, Cary, NC  0.05 0.05 0.05 0.05 0.05 0.086 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.15 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.005 0.005 0.005 0.005 0.005 0.86 0.01 0.01 0.01 0.01 0.005 0.01 0.01 0.01 0.01 0.01 0.01 0.01 1.001 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

Tuesday, August 04, 2009



# **Appendix IX Monitoring Event**

Monitoring Event: Second Quarter 2009

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)	
Method: 8260B			
aboratory: Lancaster Laboratories, Lanc	aster, PA	를 보고되는 것이 없는 것이 되었다. 그리고 있는데 기계에 전한 현실에 들어 보는 것이 되었다. 그는 사이에 보는 사이에 대한 경기 등에 되었다. 그 시간 그 시간 그 시간 그 시간 그 시간 그 시 	
Acetone	10	3	
Acetonitrile	20	7	
Acrolein	25	5	
Acrylonitrile	5	1	
Allyl chloride	0.5	0.1	
Benzene	0.5	0.1	
Bromobenzene	0.5	0.1	
Bromochloromethane	0.5	0.1	
Bromodichloromethane	1	0.1	
Bromoform	0.5	0.1	
2-Butanone	10	1	
n-Butyl alcohol	50	20	
tert-Butyl alcohol	10	4	
n-Butylbenzene	0.5	0.1	
sec-Butylbenzene	0.5	0.1	
tert-Butylbenzene	0.5	0.1	
Carbon disulfide	0.5	0.4	
Carbon distinde Carbon tetrachloride	1	0.1	
Chlorobenzene	0.5	0.1	
	1	0.1	
Chloroethane	0.5	0.1	
2-Chloroethyl vinyl ether	1	0.1	
Chloroform	1	0.2	
Chloromethane	0.5	0.1	
Chloroprene	0.5	0.1	
2-Chlorotoluene	0.5	0.1	
4-Chlorotoluene	0.5	0.1	
Cyclohexane	0.5	0.1	
Dibromochloromethane	0.5	0.2	
1,2-Dibromo-3-chloropropane	0.5	0.1	
1,2-Dibromoethane		0.1	
1,2-Dichlorobenzene	0.5	0.1	
1,3-Dichlorobenzene	0.5	0.1	
1,4-Dichlorobenzene	0.5	1	
trans-1,4-Dichloro-2-butene	5	0.1	
Dichlorodifluoromethane	1	0.1	
1,1-Dichloroethane	1	0.1	
1,2-Dichloroethane	1	0.1	
1,1-Dichloroethene	0.5		
cis-1,2-Dichloroethene	0.5	0.1	
trans-1,2-Dichloroethene	0.5	0.1	
1,2-Dichloropropane	0.5	0.1	
1,3-Dichloropropane	0.5	0.1	
2,2-Dichloropropane	0.5	0.1	
1,1-Dichloropropene	0.5	0.1	
cis-1,3-Dichloropropene	0.5	0.1	
trans-1,3-Dichloropropene	0.5	0.1	
Diethyl ether	12.5	1.1	
Dimethyl ether	12.5	0.1	
1,4-Dioxane	100	20	
Ethyl acetate	5	1	
Ethanol	250	50	
Ethylbenzene	1	0.1	



**Appendix IX Monitoring Event Monitoring Event: Second Quarter 2009** 

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
Method: 8260B		
Laboratory: Lancaster Laboratories, Lancaster	r, PA	######################################
Ethyl methacrylate	0.5	0.1
Ethylene oxide	20	5
Hexachlorobutadiene	0.5	0.1
Hexachloroethane	0.5	0.1
2-Hexanone	5	1
Isobutyl alcohol	25	10
Isopropylbenzene	0.5	0.1
Isopropylether	0.5	0.1
4-Isopropyltoluene	0.5	0.1
Methacrylonitrile	5	1
Bromomethane	0.5	0.1
Iodomethane	0.5	0.1
Methyl methacrylate	0.5	0.1
4-Methyl-2-pentanone	5	1
Methyl tert-butyl ether	0.5	0.1
Dibromomethane	0.5	0.1
Methylene chloride	1	0.2
Naphthalene	0.5	0.1
Pentachloroethane	0.5	0.2
1-Propanol	1000	5
2-Propanol	100	50
Propionitrile	10	2
n-Propylbenzene	0.5	0.1
Styrene	0.5	0.1
1,1,1,2-Tetrachloroethane	0.5	0.1
1,1,2,2-Tetrachloroethane	0.5	0.1
Tetrachloroethene	1	0.1
Tetrahydrofuran	5	2
Toluene	1	0.1
1,2,3-Trichlorobenzene	0.5	0.1
1,2,4-Trichlorobenzene	0.5	0.1
1,1,1-Trichloroethane	1	0.1
1,1,2-Trichloroethane	0.5	0.1
Trichloroethene	1	0.1
Trichlorofluoromethane	1	0.1
1,2,3-Trichloropropane	1	0.3
1,1,2-Trichloro-1,2,2-Trifluoroethane	1	0.2
1,2,4-Trimethylbenzene	0.5	0.1
1,3,5-Trimethylbenzene	0.5	0.1
Vinyl acetate	0.5	0.2
Vinyl chloride	0.5	0.1
Xylenes (Total)	3	1

Page 3 of 6 Tuesday, August 04, 2009



**Appendix IX Monitoring Event Monitoring Event: Second Quarter 2009** 

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)	
Aethod: 8270C			
aboratory: CompuChem, a Division of Libe	erty Analytical, Cary, NC	A STATE THE STATE OF THE STATE S	
Acenaphthene	5	1	
Acenaphthylene	5	1	
Acetophenone	5	1	
2-Acetylaminofluorene	5	1	
4-Aminobiphenyl	5	1	
Aniline	5	1	
Anthracene	5	1	
Aramite	5	1	
	5	1	
Benzo[a]anthracene	5	1	
Benzo[b]fluoranthene	5	1	
Benzo[k]fluoranthene	5	1	
Benzo[ghi]perylene	5	1	
Benzo(a)pyrene	50	10	
1,4-Benzenediamine	5	1	
Benzyl alcohol		1	
bis(2-Chloroethoxy)methane	5	1	
bis(2-Chloroethyl)ether	5	1	
bis(2-Chloro-1-methylethyl)ether	5	1	
bis(2-Ethylhexyl)phthalate	6		
4-Bromophenyl phenyl ether	5	1	
Butyl benzyl phthalate	5	1	
p-Chloroaniline	5	1	
Chlorobenzilate	5	1	
p-Chloro-m-cresol	5	1	
2-Chloronaphthalene	5	1	
2-Chlorophenol	5	1	
4-Chlorophenyl phenyl ether	5	1	
Chrysene	5	1	
Diallate	5	1	
Dibenz(a,h)anthracene	5	1	
Dibenzofuran	5	1	
Di-n-butyl phthalate	5	1	
3,3'-Dichlorobenzidine	5	1	
2,4-Dichlorophenol	5	1	
2,6-Dichlorophenol	5	1	
Diethyl phthalate	10	1	
	5	1	
O,O-Diethyl O-2-pyrazinyl	5	1	
Dimethoate	5	1	
p-(Dimethylamino)azobenzene	5	1	
7,12-Dimethylbenz[a]anthracene	5	4	
3,3'-Dimethylbenzidine	50	10	
a,a-Dimethylphenethylamine	5	1	
2,4-Dimethylphenol		1	
Dimethyl phthalate	5 5	1	
m-Dinitrobenzene		2	
4,6-Dinitro-o-cresol	10	2 2	
2,4-Dinitrophenol	10		
2,4-Dinitrotoluene	10	1	
2,6-Dinitrotoluene	10	1	
Di-n-octyl phthalate	5	1	
Diphenylamine	10	1	
Disulfoton	5	1	



**Appendix IX Monitoring Event Monitoring Event: Second Quarter 2009** 

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
lethod: 8270C		
aboratory: CompuChem, a Division of	Liberty Analytical, Cary, NC	
Ethyl methanesulfonate	5	1
Famphur	5	5
Fluoranthene	5	1
Fluorene	5	1
Hexachlorobenzene	5	1
Hexachlorocyclopentadiene	5	1
Hexachlorophene	500	88
Hexachloropropene	5	1
Indeno[1,2,3-cd]pyrene	5	1
Isodrin	5	1
	5	1
Isophorone	5	1
Isosafrole	5	5
Kepone	5	5
Methapyrilene	5	1
3-Methylcholanthrene	5	1
Methyl methane sulfonate	5	1
2-Methylnaphthalene		1
Methyl parathion	5	1
2-Methylphenol	5	*
3 & 4-Methylphenol	10	2
1,4-Naphthoquinone	5	1
1-Naphthylamine	5	1
2-Naphthylamine	5	1
o-Nitroaniline	10	1
m-Nitroaniline	10	2
p-Nitroaniline	20	1
Nitrobenzene	10	1
o-Nitrophenol	5	1
p-Nitrophenol	10	2
4-Nitroquinoline-1-oxide	5	1
	5	1
N-Nitrosodi-n-butylamine	5	1
N-Nitrosodiethylamine	5	1
N-Nitrosodimethylamine	5	1
N-Nitrosodiphenylamine		1
N-Nitrosodipropylamine	5	1
N-Nitrosomethylethylamine	5	1
N-Nitrosomorpholine	5	1
N-Nitrosopiperidine	5	1
N-Nitrosopyrrolidine	5	1
5-Nitroso-o-toluidine	5	1
Parathion	5	1
Pentachlorobenzene	5	1
Pentachloronitrobenzene	5	1
Pentachlorophenol	10	2
Phenacetin	5	1
Phenanthrene	5	1
	5	1
Phenol	5	1
Phorate	5	1
2-Picoline	5	1
Pronamide	5	1
Pyrene		1
Pyridine	5	A

Tuesday, August 04, 2009



# Appendix IX Monitoring Event

**Monitoring Event: Second Quarter 2009** 

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
Method: 8270C		
Laboratory: CompuChem, a Division of Li	berty Analytical, Cary, NC	
Safrole	5	1
Sulfotep	5	1
1,2,4,5-Tetrachlorobenzene	5	1
2,3,4,6-Tetrachlorophenol	5	1
o-Toluidine	5	1
2,4,5-Trichlorophenol	5	1
2,4,6-Trichlorophenol	5	1
O.O.O-Triethyl phosphorothioate	5	1
sym-Trinitrobenzene	5	
Method: 9012A		
Laboratory: CompuChem, a Division of Li	berty Analytical, Cary, NC	
Cyanide	20	3.5
Method: 9034		
Laboratory: CompuChem, a Division of La	berty Analytical, Cary, NC	
Sulfide	1000	660
Method: 9065		
Laboratory: CompuChem, a Division of La	iberty Analytical, Cary, NC	
Total Recoverable Phenolics	60	18

Tuesday, August 04, 2009



# Data Validation Summary Fourth Quarter 2009 Semiannual Groundwater Monitoring Event

# Post Closure Care Permit Hazardous Waste Management Units 5, 7, 10 and 16 Radford Facility Army Ammunition Plant, Radford, Virginia EPA ID# VA1210020730

Draper Aden Associates performed data validation of the analytical results for the Fourth Quarter 2009 semiannual groundwater monitoring event at Hazardous Waste Management Units (HWMUs) 5, 7, 10, and 16 located at the Radford Facility Army Ammunition Plant (RFAAP) in Radford, Virginia. The following information and attached tables summarize the data validation results.

#### Sample Collection/Analytical Services

Draper Aden Associates, of Blacksburg, Virginia, collected all groundwater samples during October 6-27, 2009. The chain of custody and the permit required target analyte list for each HWMU is provided as an attachment. Samples were collected from all required locations.

Samples were submitted for laboratory analysis via courier to CompuChem, a Division of Liberty Analytical, of Cary, North Carolina, or Lancaster Laboratories, Lancaster, Pennsylvania. A summary table of the required analyses and identification of the analyzing laboratory is provided below.

#### Receipt of Monitoring Event Data

On behalf of Alliant Techsystems Inc., each laboratory submitted results to Draper Aden Associates in a final certificate of analysis which included analytical results as well as relevant documentation to verify and validate the results. The final certificate of analysis for the event was received on December 19, 2009.

#### Summary of Monitoring Event Data by Analytical Method

Certificates of analysis were received from each laboratory in the following sample delivery groups (SDGs):

Summary of Required Analytical Methods and SDGs

	Hazardous Waste Management Unit (HWMU)				
Analytical Method	HWMU 5	HWMU 7	HWMU 10	HWMU 16	Laboratory
8260B Volatiles	SDG RAD25	NA	SDG RAD24	SDG RAD22	Lancaster
8270C Semivolatiles	SDG 0910223	SDG 0910166	SDG 0910176	SDG 0910073	CompuChem
8081A Pesticides	NA	NA	NA	NA	NA
8151A Herbicides	NA	NA	NA	NA	NA
6020 Inorganics	SDG 0910223	SDG 0910166/0912007	SDG 0910176	SDG 0910073	CompuChem
9012/9010B Cyanide	NA	SDG 0910166	SDG 0910176 SDG 1001150	NA	CompuChem
9034 Sulfide	NA	NA	NA	NA	NA
9065 Phenolics	NA	NA	NA	NA	NA
7470A Mercury	SDG 0910223	SDG 0910166	SDG 0910176	SDG 0910073	CompuChem

NA - Denotes analysis not applicable/analysis not required.

Each final certificate of analysis was complete in its presentation and the data were of acceptable quality. Chains of custody and permit required target analytes are provided in each SDG.

#### Data Analysis and Validation

Samples were analyzed by SW-846 Method requirements (Test Methods for Evaluating Solid Wastes - Physical and Chemical Methods, USEPA SW-846, 3rd edition - Final Update I, II/IIA and III). Data, except where noted below, were evaluated in general accordance with:

- USEPA Region III Modifications To The Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses, April 1993.
- USEPA Region III Modifications To The National Functional Guidelines for Organic Data Review, September 1994.
- USEPA Region III Innovative Approaches for Validation of Organic and Inorganic Data Standard Operating Procedures M-1 and IM-1, June 1995, modified, and the analytical method.

Draper Aden Associates of Blacksburg, Virginia, performed data validation as detailed in the attached data validation reports. For each HWMU, data validation reports and a summary table of data validation results are provided as an attachment.

Review was limited to the following items, where applicable:

- Data package completeness
- Chain of custody
- Holding time/preservation
- Initial and continuing calibrations
- Blanks
- Interference check sample (inorganics)
- Surrogates
- Matrix spike/matrix spike duplicate/(MS/MSD) samples
- Laboratory control samples (LCS)
- Internal standards
- Field duplicate
- Laboratory duplicate (inorganics)

- Serial dilution (inorganics)
- Target analyte identification and quantitation
- Other as noted

#### Reporting of Results

For this event, compliance well and plume well results were reported to at or above the permit quantitation limit (QL).

Each final certificate of analysis was complete in its presentation and the data were of acceptable quality. A summary of the data evaluation by analytical method is provided below.

The chain of custody documentation was complete, except where noted below. The laboratory received the samples on ice and in good condition, with custody seals intact. Technical holding time and preservation criteria were met. The data set demonstrated the laboratory's ability to achieve the permit QL, unless noted below.

#### SW-846 Method 8260B/5030B-Volatile Organic Analytes- 25 ml purge volume, unless noted

Calibration, blank, surrogate, MS/MSD, LCS, internal standards, sample/field sample duplicate results, and target analyte identification and quantitation were met, except where noted below. The MS/MSD samples were analyzed on project samples as noted on the chain of custody. A trip blank was analyzed for each day of sample collection. A blind field duplicate was collected and analyzed for the required target analytes. No target analytes were detected in the sample/field duplicate sample unless noted below. Deviations from specific QA/QC criteria that were identified during the data review process are summarized below.

#### HWMU 5

- Sample/Field Sample Duplicate results- 5WC21/5WDUP- This applied to trichloroethene only (1.9/1.9 µg/l). The RPD criteria were met and no data qualification was required.
- Toluene was reported in the trip blank for each of the two days of sample collection. Toluene results were attributed to vendor vial contamination (see attached correspondence from Lancaster Laboratories). Toluene was not detected at or above the permit QL in any project sample.
- The certificate of analysis was revised to reflect the correct QL.

#### HWMU 10

- Sample/Field Sample Duplicate results 10D3/10DUP This applied to chloroform only (16/17 µg/l). The RPD criteria were met and no data qualification was required.
- 2-Propanol recovered low in the LCS. 2-Propanol sample results for all monitoring locations, except for 10D3D, were validated and qualified "UJ" to note an estimated QL due to the low LCS recovery. 2-Propanol reported above the QL in 10D3D was not influenced by the low LCS recovery.
- 2-Propanol was analyzed via Method 8260B using a 5 ml purge volume and no data qualification was required.
- The following samples required an additional analysis in dilution to report the final result: 10D4 (chloroform), 10D3D (acetone), and 10D3D (2-propanol). For these target analytes, the result from the undiluted initial analysis exceeded the instrument calibration range requiring the dilution. Final results were reported within the instrument calibration range and dilution factors were correctly applied.

#### HWMU 16

- Final results were revised to report the correct QL.
- Toluene was reported below the permit QL in the trip blank for each of the three days of sample collection. These results for toluene were attributed to vendor vial contamination (see attached correspondence).
- Chloromethane recovered low in the LCS. Chloromethane was not detected in any sample at or above the QL and results for chloromethane were qualified "UJ" to note that the QL is estimated due to this QC deficiency.
- Sample 16C1 was analyzed in dilution to obtain the final result for diethyl ether.
- The permit required QL is 12.5  $\mu$ g/l for both diethyl ether and dimethyl ether. The laboratory reported the QL for each analyte as 13  $\mu$ g/l due to rounding. Draper Aden Associates revised the QL to 12.5  $\mu$ g/l and no revision was requested.

#### SW-846 Method 8270C/3510C- Semivolatile Organic Analytes

Calibration, blank, surrogate, MS/MSD, LCS, internal standards, sample/field sample duplicate results, and target analyte identification and quantitation were met, except where noted below. The MS/MSD samples were analyzed on project samples as noted on the chain of custody. No target analytes were detected in the sample/field duplicate sample. Deviations from specific QA/QC criteria that were identified during the data review process are summarized below.

#### HWMU 5

- The final reported result for bis(2-ethylhexyl) phthalate for sample 5WC21 was reported from the field duplicate result as not detected at or above the permit QL. The field duplicate result was used to refute the 5WC21 result for this analyte, 23 µg/l. Laboratory blank contamination is suspected.
- The laboratory incorrectly reported a QL of 20 μg/l instead of 10 μg/l for 2-nitroaniline (o-nitroaniline). The low calibration point of the curve for this analyte supports a QL of 10 μg/l. Draper Aden Associates corrected these QL values and no revision was requested.
- The laboratory reported a QL of 10  $\mu$ g/l for bis-2(ethylhexylphthalate). The low calibration point of the initial calibration curve and the MDL study supports a QL of 6  $\mu$ g/l, the USEPA MCL. The final QL for this target was reported at 6  $\mu$ g/l. A revision to the certificate of analysis was not requested.
- The tune amount (50 ng) was not noted in the certificate of analysis. The tune amount has been 50 ng historically and no data qualification was required.

#### HWMU 7

- The initial calibration standard RSD exceeded 15% for 2,4-dinitrophenol and all results for this target analyte was qualified as estimated.
- The laboratory incorrectly reported a QL of 20  $\mu$ g/l instead of 10  $\mu$ g/l for 2,4-dinitrophenol and 4-nitrophenol. The low calibration point of the curve for each analyte supports a QL of 10  $\mu$ g/l. The laboratory revised the final results to reflect the correct QL.
- The laboratory reported a QL of 10  $\mu$ g/l for bis-2(ethylhexylphthalate). The low calibration point of the initial calibration curve and the MDL study supports a QL of 6

 $\mu$ g/l, the USEPA MCL. The final QL for this target was reported at 6  $\mu$ g/l. A revision to the certificate of analysis was not requested.

- The LCS/MS/MSD recovery for p-nitrophenol was less than 45% (32/35%R). The reported recoveries for p-nitrophenol were within the laboratory specified quality control limits (10-100%) and no data qualification was required.
- The tune amount (50 ng) was not noted in the certificate of analysis. The tune amount has been 50 ng historically and no data qualification was required.

#### HWMU 10

• The tune amount (50 ng) was not noted in the certificate of analysis. The tune amount has been 50 ng historically and no data qualification was required.

#### HWMU 16

- The Chain of Custody was amended by the laboratory to note that the samples were received at the correct temperature. This information was provided as a revision.
- The extraction log was omitted from the certificate of analysis and provided as a revision.
- The tune amount (50 ng) was not noted in the certificate of analysis. The tune amount has been 50 ng historically and no data qualification was required.

#### SW-846 Method 6020/3005A-Inorganics-total

Calibration, blank, interference check sample, MS/MSD/DUP, LCS, internal standards, serial dilution, sample/field sample duplicate results, and target analyte identification and quantitation were met, except where noted below. MS/MSD analyses were performed on project samples as noted on the chain of custody. Deviations from specific QA/QC criteria that were identified during the data review process are summarized below. The field duplicate/sample results exhibited acceptable precision, where applicable, except where noted.

#### HWMU 5

- Sample/Blind Field Sample Duplicate results 5WC21/5WDUP- This applied to barium (15.9/15.9 μg/l), beryllium (3.1/3.1 μg/l), chromium (10.7/13.4 μg/l), cobalt (77.9/79.0 μg/l), copper (7.1/7.6 μg/l), nickel (40.1/41.0 μg/l), and zinc (48.3/50.5 μg/l). The RPD between chromium results was >20 and qualified as estimated. The remaining RPD criteria were met and no other data qualification was required.
- The MSD for beryllium recovered at 126%, just above the upper control limit of 125%. The MS recovered within control limits but the post-digestion spike for beryllium recovered high. Detected results for beryllium (5WC21/DUP) were qualified as estimated.

#### HWMU 7

- Sample/Blind Field Sample Duplicate results 7WCA/7WDUP- This applied to barium (29.3/28.6 μg/l) and nickel (12.5/13.0 μg/l). The RPD criteria were met and no data qualification required.
- The final reported results for copper, lead and zinc for sample 7WCA were obtained from the field duplicate (7WDUP) results. The field duplicate was used to verify that copper, lead, and zinc were not detected at or above the permit QL. Results for these analytes were qualified as estimated due to the discrepancy between sample and field duplicate results.

• The reported result for arsenic in sample 7W13 was inconsistent with historical results. The laboratory was requested to re-digest and reanalyze sample 7W13 for arsenic only. The laboratory could not reanalyze the sample by Method 6020 due to instrument failure and the sample was reanalyzed by Method 6010B. The permit specified QL of 10 μg/l for arsenic was achieved by Method 6010B. The final arsenic result for 7W13 was reported as not detected at or above the permit QL.

#### HWMU 10

• Sample/Blind Field Sample Duplicate results - 10D3/10DUP - This applied to barium only (105/109 µg/l). The RPD criteria were met and no data qualification was required.

#### HWMU 16

- Sample/Blind Field Sample Duplicate results 16C1A/16WDUP This applied to barium (199/207 μg/l) and cobalt only (8.8/8.4μg/l). The RPD criteria were met and no data qualification was required.
- One or more of the internal standards Sc45, In115, and Bi209 recovered low in samples 16C1, 16MW8, 16MW9, 16WDUP, 16WC1B, and 16WC2B and the reported results for analytes associated with these internal standards were qualified estimated as follows: 16C1 (silver, cadmium, lead)
  - 16MW8 (vanadium, chromium, cobalt, nickel, copper, zinc, arsenic, selenium, silver, cadmium)
  - 16MW9, 16WDUP, 16WC1B (vanadium, chromium, cobalt, nickel, copper, zinc, arsenic, selenium, silver, cadmium, lead)
  - 16WC2B (vanadium, chromium, cobalt, nickel, copper, zinc, arsenic, selenium)
- Final results were revised to report the correct QL for mercury, noted below. Results for Method 6020 were not revised.

#### SW-846 Method 7470A-Mercury-total

HWMUs 5, 7, 10, 16

Calibration, blank, MS/MSD, LCS, sample/field sample duplicate results were within control limits except where noted below. MS/MSD analyses were performed on project samples as noted on the chain of custody. Mercury was not detected in the sample/blind field duplicate sample.

Sample results were reviewed for transcription errors from the instrument data to the laboratory report and no errors were noted. Deviations from specific QA/QC criteria that were identified during the data review process are summarized below.

#### HWMU 16

• Final results were revised to report the correct QL.

#### SW-846 Method 9012A/9010B- Cyanide

HWMUs 7, 10

Calibration, blank, MS/MSD, LCS, sample/field sample duplicate results were met, except where noted below. The MS/MSD samples were analyzed on project samples as noted on the chain of custody. Cyanide was not detected in the sample/field duplicate sample. Sample results were reviewed for transcription errors from the instrument data to the laboratory report and no errors were noted. Cyanide was not detected at or above the permit QL in any sample. No deviations from specific QA/QC criteria were identified during the data review process.

#### HWMU10

• The post-preservation pH of sample 10D4 collected 10/21/2009 was 9 SU and not >12 SU as required per Method 9012A. The sample was recollected for cyanide on 10/27/2009 and the pH criterion was met. However, the laboratory inadvertently did not analyze the sample. Draper Aden Associates re-sampled monitoring well 10D4 on January 25, 2010 for cyanide. The result was received via email on January 27, 2010. Cyanide was not detected at or above the permit QL.

#### DATA VALIDATION REVIEW ITEMS-SAMPLE PAPERWORK

#### A. QC DELIVERABLES PACKAGE – SAMPLE PAPERWORK:

1.	Was the chain of custody included in the data deliverable package?	☑ YES □ NO
2.	Was custody transfer between different parties dated and signed?	🗹 YES 🗆 NO
2.	Did the chain of custody document sampler signature, sample locations,	
	date and time of sampling and analyses requested?	☑ YES □ NO
3.	Were the sample results included for all sample locations?	🗹 YES 🗆 NO
4.	Did the laboratory report all required target analytes?	☑ YES □ NO

End of page

#### A. QC DELIVERABLES PACKAGE:

- ☑ Project specific target analytes reported at or above required permit QL
   MDL study performed for all target analytes and supports required QL-not reviewed
- Passed single blind performance evaluation sample within 12 months
- ☑ Electronic data file reviewed

#### B. TECHNICAL HOLDING TIME AND PRESERVATION REVIEW CRITERIA:

- ☑ 14-day sample holding time
- ✓ Samples received at ≤6°C, zero headspace
- ☑ Preparation Method 5030C, 25 ml purge volume

#### C. GC/MS INSTRUMENT PERFORMANCE CHECK REVIEW CRITERIA:

☑ Instrument performance check solution was analyzed at the beginning of each 12-hour period of standard and/or sample analysis

#### D. INITIAL GC/MS CALIBRATION REVIEW CRITERIA:

- ☐ Target analytes included in the ICAL
- ☑ ICAL consisted of 5 calibration standards (or more, as needed)
- ☑ Lowest concentration calibration standard at or below the associated MCL, regulatory compliance, action limit, or required QL
- Mo calibration standards were removed from curve that would negatively impact the data integrity
- $\square$  Each target analyte %RSD  $\leq$  15%

#### E. CALIBRATION VERIFICATION REVIEW CRITERIA:

- ☑ Calibration verification standard analyzed at the beginning of each 12-hour period following the instrument performance check analysis and prior to the method blank and sample analysis
- ☑ % Difference/Drift of target analytes within ± 25.0%

#### F. BLANK REVIEW CRITERIA:

- ☑ Method/extraction blank analyzed on each GC/MS system used for sample analysis
- ☑ Trip Blank-one per day of collection.

#### G. SURROGATE REVIEW CRITERIA:

- The following surrogates (or others as allowed) were used and within the specified range
  - dibromofluoromethane (80-120%), 4-bromofluorobenzene (80-120%)
  - toluene-d<sub>8</sub> (80-120%), 1,2-dichloroethane-d<sub>4</sub> (80-120%)

# H. MATRIX SPIKE / MATRIX SPIKE DUPLICATE (MS/MSD) / LABORATORY CONTROL SAMPLE (LCS) REVIEW CRITERIA:

- ☑ MS/MSD and LCS analyzed; MS/MSD and LCS within range
- ☑ Project specific analytes -%R 75-130%, RPD <10
- ✓ Independent source

#### I. INTERNAL STANDARDS REVIEW CRITERIA:

- ☑ The following internal standards (or others as allowed) were used -fluorobenzene or 1,4-difluorobenzene, chlorobenzene-d<sub>5</sub>, 1,4-dichlorobenzene-d<sub>4</sub>
- $\square$  Internal standard areas within  $\pm$  50% of last calibration verification
- ☑ Internal standard retention times within ± 30 seconds of last calibration verification

#### J. TARGET ANALYTE IDENTIFICATION REVIEW CRITERIA:

- ☑ Results were consistent with historical data. New detections evaluated as follows:
- ☑ RRTs of the reported analytes within ± 0.06 RRT units of the standard RRT
- ☑ Sample spectra versus laboratory standard spectra criteria were evaluated:
  - -Characteristic ions maximized in the same scan or within one scan of each other
  - -Characteristic ions present in the standard spectra were present in the sample spectra for analytes detected above the QL
  - -Relative intensities of the ions between the standard and sample spectra were within ±30%.

#### DATA EVALUATION FOR SW-846 METHOD 8260B (GC/MS) VOLATILE ORGANICS (Con't.)

#### K. TARGET ANALYTE QUANTITATION REVIEW CRITERIA:

- Results are consistent with historical data. New detections evaluated as follows:
  - If analyte %RSD was 15% or less, use average relative response factor for quantitation.
  - If analyte %RSD was greater than 15%, use first or higher order regression fit of five calibration points (6 calibration points for 2<sup>nd</sup> order)
- ☑ Results that exceed the initial calibration range were reanalyzed at a higher dilution
- Analyte concentrations recorded on the sample quantitation reports were accurately transferred to the sample summary sheets (laboratory report)

#### L. REPORTING:

- ☑ Detected analytes or results requiring validation are presented on the attached data validation report
- ☑ Results reported at or above permit QL
- ☑ Results reported within instrument calibration range
- ☑ Sample/blind field duplicate RPD <20, where applicable

#### A. QC DELIVERABLES PACKAGE:

- ☐ Passed single blind performance evaluation sample within 12 months (not evaluated)
- ☑ Electronic data file reviewed

#### B. TECHNICAL HOLDING TIME AND PRESERVATION REVIEW CRITERIA:

- ☑ Holding time: 7-day sample collection to extraction / 40-day extraction to analysis
- $\square$  Samples received at  $\leq 6^{\circ}$ C)
- ☑ Extraction Method 3510C used

#### C. GC/MS INSTRUMENT PERFORMANCE CHECK REVIEW CRITERIA:

☑ Instrument performance check solution analyzed at the beginning of each 12-hour period of standard and/or sample analysis

#### D. INITIAL GC/MS CALIBRATION REVIEW CRITERIA:

- ☑ Target analytes included in the ICAL
- ☑ ICAL consisted of a minimum of 5 calibration standards (or more, as needed)
- ☑ Lowest concentration calibration standard at or below the associated MCL, regulatory compliance, action limit, or permit QL
- ☑ No calibration standards were removed that would negatively impact the data integrity
- $\square$  Each target analyte %RSD  $\leq 15\%$
- ☑ Correlation coefficient or coefficient of determination >0.99 for target analytes with ≥15 % RSD

#### E. CALIBRATION VERIFICATION REVIEW CRITERIA:

- ☑ Calibration verification standard analyzed at the beginning of each 12-hour period following the instrument performance check analysis and prior to the method blank and sample analysis
- ☑ Analytes have % Difference/Drift within ± 25.0%

#### F. BLANK REVIEW CRITERIA:

☑ Method/extraction blank analyzed on each GC/MS system used for sample analysis

#### G. SURROGATE REVIEW CRITERIA:

- ☑ The following surrogates (or others, as allowed ) were used and within the specified range
  - phenol d<sub>6</sub> Or d<sub>6</sub> (10%-94%), 2-fluorophenol (45-110%), 2,4,6-tribromophenol (10%-123%),
  - nitrobenzene  $d_8$  (35-110%), 2-fluorobiphenyl (43%-116%), terphenyl  $d_{14}$  (49-120%)

# H. MATRIX SPIKE / MATRIX SPIKE DUPLICATE (MS/MSD) / LABORATORY CONTROL SAMPLE (LCS) REVIEW CRITERIA:

- ☑ MS/MSD and LCS analyzed with all target analytes
- ☑ MS/MSD and LCS recovered at or above 45%, RPD <20

#### I. INTERNAL STANDARDS REVIEW CRITERIA:

- ☑ The following internal standards were used (or others as allowed)
  - -1,4-Dichlorobenzene-d<sub>4</sub>, Naphthalene-d<sub>8</sub>, Acenapththene-d<sub>10</sub>, Phenanthrene-d<sub>10</sub>, Chrysene-d<sub>12</sub>, Perylene-d<sub>12</sub>
- $\square$  Internal standard areas within  $\pm$  50% of last calibration verification
- $\square$  Internal standard retention times within  $\pm$  30 seconds of last calibration verification

#### J. TARGET ANALYTE IDENTIFICATION REVIEW CRITERIA:

- Results were consistent with historical data. New detections evaluated as follows:
- ☑ RRTs of the reported analytes within ± 0.06 RRT units of the standard RRT
- ☑ Sample spectra versus laboratory standard spectra criteria were evaluated:
- Characteristic ions maximized in the same scan or within one scan of each other
  - Characteristic ions present in the standard spectra were present in the sample spectra for analytes detected above the permit QL
  - Relative intensities of the ions between the standard and sample spectra were within ±30%.

#### DATA EVALUATION FOR SW-846 METHOD 8270C (GC/MS) SEMIVOLATILE ORGANICS (Con't.)

#### K. TARGET ANALYTE QUANTITATION REVIEW CRITERIA:

- ✓ Results were consistent with historical data. New detections evaluated as follows:

   If analyte %RSD was 15% or less, use average relative response factor for quantitation.
   If analyte %RSD was greater than 15%, use first or higher order regression fit of five calibration points (6 calibration points for 2<sup>nd</sup> order).
- Results that exceed the initial calibration range were reanalyzed at a higher dilution.
- Analyte concentrations recorded on the sample quantitation reports were accurately transferred to the sample summary sheets (laboratory report).

#### L. REPORTING:

- Detected analytes or results requiring validation are presented on the attached data validation report
- ☑ Results reported to at or above the permit QL
- Results reviewed to detection limit and no target analytes were detected at or above DL or QL

#### A. QC DELIVERABLES PACKAGE: $\square$ Sample results included for all sample locations Target analyte QLs reported at permit required QL $\overline{\mathbf{A}}$ Sample digestion method: 3005A $\square$ Electronic data file reviewed $\square$ В. TECHNICAL HOLDING TIMES / PRESERVATION REVIEW CRITERIA: $\square$ 6 month holding time, pH<2 with Nitric Acid (HNO3) C. INSTRUMENT CALIBRATION/TUNE CRITERIA: M Target analytes, 1 calibration blank and at least 1 standard $\overline{\mathbf{A}}$ Instrument tuned prior to analysis (%RSD <5%) D. **INSTRUMENT CALIBRATION CRITERIA:** $\checkmark$ 10 sample frequency Use of calibration blank and check standard $\checkmark$ $\square$ Recovery within 90-110% Е. **BLANK CRITERIA:** Trip Blank (check only if analyzed) N/A N/A Equipment Blank $\checkmark$ Method/Other Lab Blanks (check only if analyzed) Interference free $\overline{\Delta}$ CCB 10 sample frequency INTERFERENCE CHECK SAMPLES (ICS) CRITERIA: F. $\overline{\mathbf{A}}$ At beginning of batch or every 12 hours (80-120%) G. MATRIX SPIKE DUPLICATE (MSD) CRITERIA: $\overline{\mathbf{Q}}$ One MSD or sample duplicate per batch of 20 samples RPD ≤ 20 between MS and MSD results or sample and duplicate results $\checkmark$ Control limit is $\pm$ OL when sample values are less than 5 times QL (100X DL) ☑ Η. MATRIX SPIKE (MS) CRITERIA: 75-125% recovery, all analytes $\square$ $\square$ All analytes, spiked prior to digestion One matrix spike per analytical batch $\checkmark$ No more than 20 samples per analytical batch V I. BLIND FIELD SAMPLE DUPLICATE CRITERIA:

☑ 10% Difference

#### J. SAMPLE RESULTS CRITERIA:

Results reported within instrument linear range

#### K. LABORATORY CONTROL SAMPLE (LCS) CRITERIA:

All target analytes, 1 LCS per 20 samples, (80-120% Recovery)

#### L. INTERNAL STANDARDS (IS) CRITERIA:

☑ IS (Li, Sc, In, Tb, Bi) intensities (70-125% RI, see section 9.3, 6020A)

#### M. SERIAL DILUTION CRITERIA:

- ☑ Similar matrix
- If concentration 50 times IDL, %Difference must be within 10%

#### N. QUANTIATION LIMIT STANDARD (CDRL STANDARD) CRITERIA:

- ☑ Target analytes
- ☑ 85-115% recovery
- ☑ Standard analyzed at the QL

#### O. REPORTING:

- Detected analytes or results requiring validation are presented on the attached data validation report
- N/A MDL study reviewed (not reviewed 4Q2009)
- ☑ Results reported to at or above the permit QL

# A. QC DELIVERABLES PACKAGE: ☑ Mercury QL reported at permit required QL ☑ Electronic data file reviewed B. TECHNICAL HOLDING TIME / PRESERVATION REVIEW CRITERIA: ☑ 28 day holding time, Adjust pH <2 w/ HNO<sub>3</sub>

#### C. INSTRUMENT CALIBRATION CRITERIA:

- ✓ 1 calibration blank and at least 5 standards
   ✓ ICAL standards within 5% of true value
- ☑ Instrument calibrated for every analytical sequence, r>0.995
- ☑ ICAL standard analyzed at the permit QL
- QL standard analyzed at or less than the permit required QL (70-130%R)
- ☑ QL standard analyzed at beginning of run, following ICV/ICB

#### D. INITIAL / CONTINUING CALIBRATION VERIFICATION CRITERIA:

☐ 10 sample frequency for CCV; recovery within 80-120%

#### E. BLANK CRITERIA:

- N/A Trip Blank (check only if analyzed)
- N/A Equipment Blank (check only if analyzed)
- Method/other laboratory blanks (check only if analyzed), Interference free

#### F. MATRIX SPIKE DUPLICATE (MSD) CRITERIA:

- ☑ One MSD or sample duplicate per batch of 20 samples
- $\square$  RPD  $\leq$  20 between MS and MSD results or sample and duplicate results
- $\square$  Control limit is  $\pm$  QL when sample values are less than 5 times QL (100X DL)

#### H. MATRIX SPIKE (MS) CRITERIA:

- ☑ 75-125% recovery
- MS spiked prior to digestion, One MS per analytical batch of 20 samples

#### H. FIELD SAMPLE DUPLICATE CRITERIA:

☐ Target analyte: mercury, %Difference <10%

#### I. LABORATORY CONTROL SAMPLE (LCS) CRITERIA:

Recovery within 80-120% range. Independent source from calibration standards.

#### J. SAMPLE RESULTS CRITERIA:

☑ Results reported within instrument calibration range

#### K. REPORTING:

Detected analytes at or above the permit QL. When applicable, results requiring validation are presented on the attached data validation report.

#### INORGANIC DATA EVALUATION FOR CYANIDE BY SW-846 METHOD 9012/9010B

Α.	QC DELIVERABLES PACKAGE:			
	<ul> <li>☑ Passed single blind performance evaluation sample within 12 months (not evaluated)</li> <li>☑ Electronic data file reviewed</li> </ul>			
В.	TECHNICAL HOLDING TIME / PRESERVATION CRITERIA:			
	<ul> <li>✓ 14 day holding time</li> <li>✓ Cool ≤6° C</li> <li>✓ Adjust pH &gt;12 w/ NaOH</li> </ul>			
С.	INSTRUMENT CALIBRATION CRITERIA:			
	<ul> <li>✓ 1 calibration blank and at least 3 standards, correlation coefficient &gt;0.995</li> <li>✓ Standard at or below QL</li> </ul>			
D.	INITIAL / CONTINUING CALIBRATION VALIDATION CRITERIA:			
	<ul> <li>☑ 10 sample frequency</li> <li>☑ Use of check standard with every batch of samples</li> <li>☑ Recovery within 85-115% range (± 15%)</li> </ul>			
<b>E.</b>	BLANK CRITERIA:			
	<ul> <li>✓ Interference free</li> <li>✓ Verification Blank analysis analyzed every 10 samples</li> </ul>			
F.	MATRIX SPIKE DUPLICATE (MSD) CRITERIA:			
	<ul> <li>✓ One MSD or ample duplicate per batch of 20 samples</li> <li>✓ RPD ≤ 20 between MS and MSD results or sample and duplicate results</li> <li>✓ Control limit is ± QL when sample values are less than 5 times QL (100X DL)</li> </ul>			
G.	MATRIX SPIKE (MS) CRITERIA:			
	<ul> <li>              75-125% recovery     </li> <li>             Spiked prior to distillation</li> <li>             One MS required per analytical batch. No more than 20 samples per batch     </li> </ul>			
н.	SAMPLE RESULTS CRITERIA:			
	☑ Results reported within instrument calibration range			
I.	REPORTING:			
	Detected analytes at or above the permit QL. When applicable, results requiring validation are presented on the attached data validation report.			

#### LIMITATIONS:

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Conclusions presented are based upon a review of available information, the results of our field studies, and/or professional judgment. To the best of our knowledge, information provided by others is true and accurate, unless otherwise noted.

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Date:

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1-26.2010

This Report has been subjected to technical and quality review by:  $7 \left( - \frac{1}{28} - \frac{200}{200} \right)$ 

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Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

**ANALYTICAL METHOD: 8260B/5030B** 

TYPE METHOD: GCMS CLASS: VOLATILE

No.	ANALYTE	CAS RN	Required QL (µg/l)
1.	Acetone	67-64-1	10
2.	Chloroform (trichloromethane)	67 <b>-</b> 66-3	1
3.	2-butanone (methyl ethyl ketone - MEK)	<b>78-93-3</b>	10
4,	1,2-dichloroethane	107-06-2	1
5.	Methylene chloride	75-09-2	1
6.	Toluene (methyl benzene)	108-88-3	. 1
7.	Trichloroethene	79-01 <b>-</b> 6	1
8.	Xylenes (total)	1330-20-7	3
9.	Diethyl ether	60-29-7	12
10.	Dichlorodifluoromethane	75-71-8	1

Note: #9 added on Jan 2004 due To 4Q2003 detection. JCF 0104 Note#10 (dichlorodifluoromethane) add 4Q 2006 due to detection 3Q 2006. JCF 10/06

#### Reviewed:

Revised and updated 1/15/2004 JCF.
Revised and updated 10/1/06.
Reviewed 4 Q 2006 -9/30/2009 10:52 AM
10/9/2007 JCF -- 2007 switched to semiannual monitoring 2/4 Q.





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Required by N d Sample

Box 2 - Preservative

Box 5 - Sample Container Type

Residual Chlorific Present 3 ₹ 3 8 8 ₹ © |₹ Š ₹ 8 8 Slaughter Clients Special Instructions: level 4 with pedd. 1305 055/ 1600 9 ટ્ર omil - w a o 00000 0/0/0 Date: 2008 Describe problems, if any SW Surfece Water GW Groundwater SWC21 SWDUP SWC22 Leechate Sample ID SW8B SW8B 5WC23 5W8A 6W10A SEWE **EW11A** Sempler Name \$8 Signature: Sempler Nem Print Attn: Address: Sampler Phone: Fex: Fex:

500

CHAIN OF CUSTODY RECORD

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Sempler

# **HWMU5** Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event



**ANALYTICAL METHOD: SEE BELOW** 

TYPE METHOD: SEE BELOW

CLASS: TOTAL

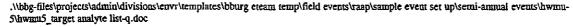
#### Method SW 846-6020 (ICP/MS)

No.	ANALYTE	CAS RN	Required Pe	ermit Quantitation limit (µg/l)
1.	Antimony	7440-36-0	1	
2.	Arsenic	7440-38-2	10	
3.	Barium	7440-39-3	10	
4.	Beryllium	7440-41-7	1	
4. 5.	Cadmium	7440-43-9	1	
6.	Chromium	7440-47-3	5	
7.	Cobalt	7440-48-4	5 5	
8.	Copper	7440-50-8	5	
9.	Lead	7440-92-1	1	
10.	Nickel	7440-02-0	10	./
11.	Selenium	7782-49-2	10	JUZA NR
12.	Silver	7440-22-4	2	مر روس ا
13.	Thallium	7440-28-0	1	0.5
14.	Vanadium	7440-62 <b>-2</b>	10	)
15.	Zinc	7440-66-6	10	
Method	SW 7470A/CVAA			
16.	Mercury	7439-97-6	2	

. Note: # 6 added on Jan 2004 due To 4Q2003 detection.

#### Reviewed:

Revised and updated 1/15/2004 JCF. Revised and updated 10/1/06. Reviewed 4 Q 2006 -9/30/2009 10:52 AM 10/9/2007 JCF - 2007 switched to semiannual monitoring 2/4 Q.



HWMU5, sub

#### **HWMU5**

### Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

**ANALYTICAL METHOD: 8270C** 

TYPE METHOD: GCMS
CLASS: SEMIVOLATILE

No.	ANALYTE	CAS RN	Required Permit Quantitation limit (µg/l)
1,	Bis(2-ethylhexyl)phthalate	117-81-7	10
2.	Diethylphthlate	84-66-2	10
3.	2,4-dinitrotoluene	121-14-2	10
4.	2,6-dinitrotoluene	606-20-2	10
5.	2-Nitroaniline (o-Nitroaniline)	88-74-4	10
6.	4-Nitroaniline (p-Nitroaniline)	100-01-6	20
7.	Nitrobenzene "	98-95-3	10

DY NOW

Note: #5-7 added on Jan 2004 due To 4Q2003 detection. JCF 0104

#### Reviewed:

Revised and updated 1/15/2004 JCF.
Revised and updated 10/1/06.
Reviewed 4 Q 2006 -9/30/2009 10:52 AM
10/9/2007 JCF - 2007 switched to semiannual monitoring 2/4 Q.

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0 F		<u></u>			<b>,</b>	T				Unit 1	7	т						1	1 1	 7					٠, ١
		Project Specific (PS) QC: Sample Collection for Project Complete?  Carrier: N C CON R V SEVIC		a f to Consultant	4	GENERAL NOTES:	Report results at or greater than Ol.	Report Level 4 with EDD.		Evis deliverable reguird.  Jul.  Residual Chlorine Present? 9.14.05	7.5		700	The second of the Address of the Second of t		90	Ļ	8				July 109 Sample Storage	0	CLLCL Det C. 11-0? WITHS INORG	(A. D.) (109
		RAAP, Redford, Virginia HWMU7 2009 2nd Semieanual Monitoring	BD3204-07	Box 4: Sample Type G Grab	C Composite	SG	1. Report			S. EVIS Residu	0-9010160	**	1	PACT FEMALES		)-	1	80-	7			#2 Relinquished	pany O	#2 Received by (Signature); Company Name:	
CHAIN OF CUSTODY RECORD	-800-833-5097	::		Box 3: Filtered/Unfiltered F Filtered U Unfiltered	e Contair	CG CIPE GIASS		1												19-2,00, 0,8°C	Received on Ice Yes No	Dat 10/21/09 #2 Ru	Timo: 2820 Company		1
	CompuChern Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097	Sample Site: 1.ocation: Event:	DAA JR: Lab JN:	!	ш. «	200			1/09				-							1		ST.		inter	defined in
CHAIN		Draper Aden Associales Janet C. Frazier 2206 South Main Street Bleckeburg, Virginia 24060 (540) 552-0444	(540) 552-0291 (540) 552-0291	E NaCH F ZnAc G Other (Spec H None		9	2	┿	┿┥	E E 10/0 P (obtine vo) ASTOR	77 ×		× ×		<u> </u>	x 1/2	×	× 22	× 40	-0,3	Temperature upon arrival	1 le Th	DAA C	X XX	
	ue, Cary, NC 2	Draper / James 2206 Sc Bleckebul				9		2 0	1. EO m P - 10 2-11. A	(IstoT-YnusieM.) A0147		>	< ×		8	×	×	$\frac{1}{1}$	×		Yes No Ten	#1 Relinquished	D	nature); ny	
	Madison Aven	lfant: sa:		Box 2: Proservative A HG B HNO <sub>3</sub>	C H <sub>2</sub> SO <sub>4</sub> D Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	9	2	27 a	1.560	-aisteM) A200010208 2M/401		,	×			×	×	× :	×		Custody Seal Inted	19/09	000		1
	mental, 501	Consultant: Attn: Address: Phone:	TEX.		0 0					Box 1: Matrix  Vumber of Bottles	GW 4	7	GW 4	Cr wu	GW 4	GW 4	GW 4	4	ew ew		No Custody	Ol:elec	Time: (	Date:	
	nem Environ	Associates			P Product O Other	rofe Type	d/Unfiltered	of Sample	ontainer Type	वसारी		L	020 045		13/0	all		(6.20)	44	1 with edd.	Yes	-hder	Cally.	3	
	СотриС	Dreper Aden Associates 0 0 0	00	<b>.</b>	<b>.</b>	Box 4 - Sample Type	Box 3 - Filtered/Unfiltered	Required pH of Sample Box 2 - Preservative	Box 6 - Sample Container Type	Date: 2009	61/0		0800	- X	06/0/	61/9	_	-	00/0	uctions: level	ood Condition	Slauci	18/10	بر نو	
	Laboratory:	Client: Attn: Address:	Fax:	2 3	L Leachate S Soil				Bo	C) elocation	7W12B	TANCA				7W9C	7W10B	7W10C	7W13	Clients Special Instructions: level 4 with edd	Received by lab in Good Condition Vectorial Describe problems, if eny:	Sampler/Jame	) \	A CO	1

# Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

**ANALYTICAL METHOD: SEE BELOW** 

TYPE METHOD: SEE BELOW

CLASS: TOTAL

# Method SW 846-6020 (ICP/MS)

No.	ANALYTE	CAS RN	Required PERMIT QL (µg/l)
1.	Antimony	7440-36-0	1
2.	Arsenic	7440-38-2	10
3.	Barium	7440-39-3	10
4.	Cadmium	7440-43-9	1
5.	Chromium	7440-47-3	5
6.	Copper	7440-50-8	5
7.	Cobalt	7440-48-4	5
8.	Lead	7440-92-1	1
9.	Nickel	7440-02-0	10
10.	Selenium	7782-49-2	10
11.	Silver	7440-22-4	2
12.	Thallium	7440-28-0	1
13.	Zinc	7440-66-6	10
	,		
14.	Mercury	7439-97-6	2

Copper added to list 11/03 JCF

zinc added to list 2Q 2004 JCF

this list updated 10/04 (4thQ 2004) JCF no changes 1Q207. JCF 10/2007

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Review 09 2005 JCF



#### **HWMU7**

# Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

ANALYTICAL METHOD: 9012/9010A

TYPE METHOD: CLO
CLASS: CYANIDE

No. ANALYTE CAS RN Required PERMIT QL (μg/l)

1 Cyanide 57-12-5 20

JCF 10/2007

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Review 09 2005 JCF



#### HWMU7

# Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

**ANALYTICAL METHOD: 8270C** 

TYPE METHOD: GCMS
CLASS: SEMIVOLATILE

No.	ANALYTE	CAS RN	Required PERMIT QL (µg/l)
1. 2. 3. 4. 5.	Bis(2-ethylhexyl)phthalate Butylbenzyl phthlate 2,4-Dinitrophenol 2,4-dinitrotoluene 2,6-dinitrotoluene p-nitrophenol, 4-nitrophenol	117-81-7 85-68-7 51-28-5 121-14-2 606-20-2 100-02-7	10 10 10 10 10 10

JCF 10/2007

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Review 09 2005 JCF



Jo# 1167595

Sample Stonage Time Requested: ŝŝ 30 DYS ORG/6 MTHS INORG ST (S) analyze 1 th-10 blank for each day of sampling. Justing ٥ 2 S) Š. Date Dista LOS Report results at or greater than QL.
 Level 1 with EDD. Project Specific (PS) QC: Sample Collection for Project Complete? Tiggi Date GENERAL NOTES Bill: Comment 68-419618G Carrier: Tracking Number: Copy to Consultant: Oc. tobe : Zoog 2009 Znd Seniannual Monitoring B03204-07 Box 4: Sample Type G Grab C Composite RAAP, Radford, Virginia Japon Date/0/3/199 by (Signeture): #2 Received by (Signature): CHAIN OF CUSTODY RECORD STAIDLE FWWC10  $\mathcal{C}$ 25 New Holland Pire, Lancaster, PA: 17505-2425/Barb Wayand, Manager/ (717):656-2300 Company CG Clear Glass Name: £ Box 6: Sample Container Type < VO Time: / 700 Yes Box 3: Filtered/Unfiltered Received on Ice U Unfiltered F Filtered Sample Site Location: Event: DAA JN: Lab JN: P Plastic B Temperature upon arrival G Other (Specify) H None 2206 South Main Street Blacksburg, Virginia 24060 (540) 552-0444 Draper Aden Associates E NaOH F ZnAc Janel C. Frazier (540) 552-0291 10/12/09 £ #1 Relinquished by (Signature): torpic algans #1 Received Company Negre: Custody Seal Intect Yes send, usc Date: 10 31 09 Box 2: Preservative A HCL B HNO<sub>3</sub> Date: 10/21/09 이그덩 Ine: 0800 B0809/80978 C H<sub>2</sub>SO<sub>4</sub> Attm: Address: ę Phone: Fax: Lancasier Laboratories 24 욷 ₹ 3 Equipment Blank ₹ G 8 8 **≋** Box 1: Matrix Received by lab in Good Condition Yes Box 5 - Sample Container Type Box 3 - Filtered/Unfiltered Required pH of Sample BRI Slaughter Clients Special Instructions: level 1 with edd. Product 1355 1355 130 Box 2 - Preservative 005/ Other 00 ⊢ш 0000 18/01 10/01 0/2 20ct#11300 Describe problems, if any SW Surface Water GW Groundwater L Leachate S Soll Laboratory Irip Blank 1003 Sample ID 10MW1 100UP 10D3D 10D4 Sampler-Herge Sampler Nam Signature:/ Attn: Address: Sampler Phone: Fax: Fax: (Print):

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Company

Date

by (Signature)

Сопрапу

Name:

Time: 0300

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Sampler

(Print):

acct#11200 ap#1167595 Sample#5813614-22

## HWMU10 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

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**ANALYTICAL METHOD: 8260B/5030B** 

TYPE METHOD: GCMS CLASS: VOLATILE

No.	ANALYTE	CAS RN	Required QL (μg/l)
1.	Bromodichloromethane	75 <b>-27-4</b>	1
2.	Chloroform (trichloromethane)	67-66-3	. 1
3.	2-butanone (methyl ethyl ketone - MEK)	78 <b>-</b> 93-3	10
3.	Trichloroethene	79-01-6	1
4.	Xylenes (total)	1330-20-7	3
5.	Acetone	67-64-1	10
6.	Isopropanol / 2-Propanol	67-63-0	50

Noete 5 and 6 added 3Q2005. JCF

Reviewed 09/2005 10/2007 jcf

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	Project Specific (PS) QC: Sample Collection for Project Complete?  Camber: N.C. Countries: Project Complete Tracking Number:	Invoice Copy to Consultant: Cipy to Consultant: Cipy to Consultant: Cipy to Consultant: Cipy to Copy t	GENERAL NOTES. Report results at or greater than QL. Level 4 with EDD.		2x15 deliveratore regured.	172 will resample for OU 1/01/10/2	1	へものだけなった。	\$0	000		Residual Chlorina Present?	No No			Date: Sample Storage Time Requested: Time Date: DAZAMTHS INORG
	RAAP, Radford, Virginia HVMIU10 2009 2nd Semiamusi Monitoring B03204-07	ed Box 4: Sample Type G Grab V VOA V VOG Clear Glass	+ 4			09/10/16				,		Re	Yes		3,1°C	Y2 Relibouished 22 Relibouished Company Namo: Y2 Received Y2 (Signature): Company Vame:
CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097	Sample Sile: Location: Event DAA JN: Lab JN:	Box 3: Filtered F Filtered U Unfiltered Box 5: Sample Container Type P Plastic V VOG C Cles			Ç										Raceived on los 1/789	Tune/// S  Tune/// S  Tune: // S
513/Cathy Dover, Mai	Draper Aden Aseoclates Janet C. Frazier 2206 South Main Street Blacksburg, Virginia 24060 (540) 552-0444 (540) 552-07291	E NaOH F ZnAc G Other (Specify) H None	D 172	E2/7 5-400 mJ-P	OPOLICE PHOS	× 1-2 1899	7/ 7/2 ×	77 ×		× <2 > 12					Temperature upon arrival	May Charles
enue, Cary, NC 278	Draper Add Janel C 2206 Sout Blacksburg, (540) £ (540) £			1-500 ml P 2-1L A	(Mercury-Total) A0125		×	×		×					Yes	tr Rainquished by (Signature) # Company Name: #1 Received by (Signature); Company Name:
al, 501 Madison Av	Gonsultant: Attn: Address: Phone: Fax:	Box 2: Preservative A HCL B HNO <sub>3</sub> C H <sub>2</sub> SO <sub>4</sub> D Na <sub>2</sub> S <sub>2</sub> O <sub>5</sub>	o ⊃ Ç a	1-50	values of Bottles CP/MS 6020/3005A (Metals-	_	4 X	4	*	Х					Custody Seal Inlact	Date:
Shem Environment	Oraper Aden Associates 0 0 0 0 0	7 Trip Blank E Equipment Blank P Product O Other	Box 4 . Sample Type Box 3 - FitteredUnfiltered Required DH of Sample	Box 5 - Sample Container Type	emít Máthix	1500 GW	10 0 GW	1240 GW	<u> </u>	1/30 GW				vel 4 with fdd.	M Yes No	Staughter Staughter Emer Emer
Laboratory: CompuC	Client: Oraper Ader Attn: Oraper Ader Address: C Phone: C Fex: C	Box 1: Matrix SW Surface Weler GW Groundwater L Leechale S Soil	Box 4. Sa Box 3. Fitter Required D	Box 2 - Fr Box 5 - Sample	onne i i i i i i i i i i	1004 /0/3/		10D3	10DUP	16/01 acast				Clients Special Instructions: level 4 with 644	Received by lab in Good Condillon. L	Sampler Name Ale Starbler Starbler Sampler Sampler Sampler Name Tyle En Sampler Sample

-			<b>&amp;</b> .		
)	277 E	2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	nital Nital	1624-01	Sample Storage Time Requested. 30 DVS ORG/6 MTHS INORG
	Project Specific (PS) QC: Sample Collection for Project Complete? Carrier: MC (COMP.) EX SE? Tracking Number:	Invoice Copy to Consultant: Bill: □Cur Closear Preserved and shipped on ice; □	ith EDD.	to instruct of 2H 12.	11-25 Arigh 128/09  DAA  Le Ge Swarnen, 10/28/09  C COUTIER
	RAAP, Radford, Virginia HVMAU10 niual Moniloring Re-sample B03204-07	Box 4: Sample Type G Grab C Composite	2. Level 4 v	10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11/01/11/21/3
	ğ	Fithered/Unfittered liered Sample Container Type V VOA Glass GG Char Glass			3
1.000	Sample S Location: Event: DAA JN:	Box 3: Filtered F Fillered U Unfiltered Box 5: Sample P Plastic AG Amber Glass		0-2/10	Recoived T
IN MC 27513/Cathy David	Draper Aden Associates         Consultant:         Draper Aden Associates         Sample Site:           0         Address:         2206 South Main Siteet         Location:           0         Address:         Blackstury, Urighies 24060         Location:           0         Fhore:         (540) 552-0291         Event:         2009 2nd Se           0         Fax:         (540) 552-0291         DAA JN:	E NaOH F ZAAC G Other (Specify) H None			shed LL Start 1.4% Received on toe 176s.  The DAA Trine, 0830  OAA Trine, 530  Coal Coal Coal Coal Coal Coal Coal Coal
venue. Ca	rend, Ca		(uppilde	2/4	any any sany sany sany sany sany sany sa
adison Av	A management	0 5 1 1 1	2 K (obinevo) Mt08	×	
tai, 501 M	Consultant: Address: Phone: Fax:	Box 2: Press A HCL B HNO <sub>3</sub> C H <sub>2</sub> SO <sub>4</sub> D Ne <sub>2</sub> S <sub>3</sub> C	Number of Bottles	-	Custody Seal Intac_Date: IO/27/09 Time: O730 Time: O730
ironment		Trip Blank Equipment Blank Product Other In Type	XhtsM:1 xoE	d dw	2
Shem En	Oraper Aden Associaries 0 0 0 0 0 0 0 0 0	T Trip Blank E Equipment P Product O Other O Other Eax 4 - Sample Type x 3 - Filtered/Unfiltered	Container	959	antition Yes
Comput	Draper Ade	r Frip Blank P Froduct P Froduct O Other  Box 4 - Sample Type Box 3 - FilteredUnrilitered Required by 4 Sample	Accounted pi of Sample Box 5 - Sample Container Type Dox 5 - Sampl	Leigh	
Laboratory:	Client: Address: Address: Phone: Fax:	Box III Mainza e Valere SW Surfaze e Valere GW Groundwelter L Leachate S Soil BR SW SW SW SW SW SW SW SW SW SW SW SW SW	Box	1004	Clients Special Instructions: level 4 with edd. Received by let in Good Condition Yes. Barnick Name Sampler Signeture: R. M. M. M. M. Sampler Signeture: R. M. M. M. M. Sampler Signeture: R. M. M. M. M. Sampler Signeture: R. M. M. M. M. M. Sampler Signeture: M. M. M. M. M. Sampler Signeture: M. M. M. M. M. M. Sampler Signeture: M. M. M. M. M. M. Sampler Signeture: M. M. M. M. M. M. M. M. Sampler Signeture: M. M. M. M. M. M. M. M. M. M. M. M. M.

# HWMU10 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

**ANALYTICAL METHOD: SEE BELOW** 

TYPE METHOD: SEE BELOW

CLASS: TOTAL

Method SW 846-6020 (ICP/MS)

No.	ANALYTE	CAS RN	Required QL (µg/l)
1.	Arsenic	7440-38-2	10
2.	Barium	7440-39-3	10
3. 4.	Cobalt Chromium	7440-48-4 7440-47-3	5 5
5.	Copper	7440-50-8	5
6.	Lead	7440 <b>-</b> 92-1	1
7.	Nickel	7440-02-0	10
8.	Selenium	7782-49-2	10
9.	Silver	7440-22 <del>-4</del>	2
10,	Vanadium		10
11.	Zinc	7440-66-6	10
Method SW	7470A		
12.	Mercury	7439-97-6	2

Not: Cobalt and vanadium added 2 Q 2004. JCF 7/14/2004 10/2007 jcf

<u>\*</u>

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#### HWMU10

### Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event

DAA JN: B03204-07

ANALYTICAL METHOD: 8270C/3520C

TYPE METHOD: GCMS
CLASS: SEMIVOLATILE

No.	ANALYTE	CAS RN	Requir	red QL (µg/l)
1.	2,4-dinitrotoluene	121-14-2	10	/
2.	2,6-dinitrotoluene	606-20-2	10	

10/2007 jcf

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#### HWMU10 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

**ANALYTICAL METHOD: 9012A** 

TYPE METHOD: <u>CLO</u> CLASS: <u>CYANIDE</u>

No. ANALYTE CAS RN Required QL ( $\mu g/l$ )

1 Cyanide 57-12-5 26

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acct#11200 Cup# 1165741

CHAIN OF CUSTODY RECORD SCANOL 5803043-59

UNIX ĺ ظُوٰ The proof of the second of the second of the second of the second of the second of the second of the second of Time Requested; Sample Storage 30 DYS ORG/6 MTHS INORG 7. Project required LOQ's attached. Please report 5. 1 Trip Blank to be analyzed per day of sample [5] [5] 知 知 ģ å The state of the s System 1 Date: (0]9105 D B 950 4. Report results at or greater than QL. Report results at or greater than QL Project Specific (PS) or Batch (B) QC: Sample Collection for Project Complete? For Samples Collected 10/7/09 For Samples Collected 10/7/09 For Samples Collected 10/6/09 See attached target analyte list. Time: Date: 2. Level 1 deliverables required. SENERAL NOTES Preserved and shipped on ice: these LOQ's, not lab LOQ's. Copy to Consultant: Carrier: Tracking Number: Ö 1. DAA EDD required. 蓋 collection. 180 2009 - 2nd Semiannual Monitoring Event Box 4: Sample RAAP, Radford, Virginia C Composite Company 11 Type G Grab #2 Relinquished by (Signature): HWMU16 803204-07 by (Signatura): #2 Received Laboratory. Lancasier Laboratones, 2425 New Holland Rike: Eabrasier, PA\*17605-2425/ Barb Wyant, Manager/ (717) 856-2300\* Company CG Clear Glass Received on los Yes No Box 5: Sample Container Type V V0 Date: 10 A Of Box 3: Filtersd/Unfiltersd F Filtersd Time: // 20() Date: U Unfiltered NG Amber Glass Sample Site Location: DAA JN: Lab JN: P Plastic Event Received by tab in Good Condition Yes No Custody Seal Intact Yes No Temperature upon arrival G Other (Specify) 2206 South Main Street Blacksburg, Virginia 24060 (540) 552-0444 Drapar Aden Associates MaoH ZnAc Janet C. Frazier Clients Special Instructions: Lavel 1 with edd. See attached target analyte list. See Genral Notes block Company DAA #1 Relinquished by (Signature): by (Signature) Name: #1 Receive Company Name: \* 3-40ml V 90/9/010g eBind Time: 0730 Date: 10/0/09 925 ٧ lm 62 - 80602/8085 D Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> C HSO B HNO3 Consultant A HCL Attn: Address: Phone: Fax: 47 GW F Equipment Blank 5 8 3 ₹ Š 8 Š ₹ ₹ 30 8 8 8 Box 6 - Sample Container Type Take Slaughter Trip Blank Box 3 - Filtered/Unfiltered Product Required pH of Sample 635 Box 4 - Sample Type 120 Box 2 - Preservative 0461 Offner S 000000 10/6 8/01 1017 101 600Z :B3P() 10 101 Describe problems, if any: SW Surface Weter GW Groundwater WISHELY. L \_Leachate 16SPRING Trip Blank2 Trip Blank3 Trip Brank1 18WC1B 18WDUP 16MNW8 16MW9 16WC2B 16-2 2 16-1 6.3 Soil Sampler Name Address: Signature Sampler I Phone: Fex: Fax: Sampler Samoler (Print): (Print):

apsha 112 1/2

acct\*11200 ap\* 1165741 Sample\*5802043-59

### HWMU16 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

**ANALYTICAL METHOD: 8260B/5030B** 

TYPE METHOD: GCMS CLASS: VOLATILE

No.	ANALYTE	CAS RN	Required LOQ (µg/l)	
1.	—Carbon tetrachloride	56-23-5	1	
2.	- chloromethane; (Methyl chloride)	74-87-3	1	
3,	-2-butanone (methyl ethyl ketone - MEK)	78-93-3	10	
4.	1,1-dichloroethane	75-34-3	1	
5.	→Dichlorodifluoromethane ✓	75-71-8	1	
6.	Ethylbenzene /	100-41-4	1	
7.	►Tetrachloroethene ✓	127-18-4	1	
8,	✓ Toluene (methyl benzene) ✓	108-88-3	1	
9.	1,1,1-trichloroethane (methyl chloroform)	71-55-6	1	O
10.		79-01-6	1	$\mathcal{L}$
11.	✓ Trichlorofluoromethane (CFC-11) ✓	75-69-4	1	
12.	—Xylenes (total) ✓	1330-20-7	3	5
13	←Chloroethane ✓	75-00-3	1	_ /
14	→ Diethyl ether ✓	60-29-7	12.5	`
15	Dimethyl ether ~	115-10-6	12.5	_
16	Methylene chloride	75-09-2	1	5
17	1.1,2-Trichloro-1,2,2-Trifluoroethane   ✓	76-13-1	1	$\supset$

13-16 added 10/03. JCF Revised 10/31/03 JCF

17 added 0704. Revised 7/28/2004 10/2008 JCF

of mapping

rge volume.

Laboratory:	CompuChem Environmental, 501 Madison Avenue,	vironment	al, 501 Ma	idison Ave	anue, car	y, NC Z/5	13/Catny Do	ver, manage	Cary, NC 2/513/Carny Dover, Manage//1-50U-633-509/	/600			
Client: Attn: Address:	000		Consultant: Attn: Address:			Draper Aden Janet C. 2206 South B	Draper Aden Associates Janet C. Frazier 2206 South Main Street Blocket an Windin 24000		Sample Site: Location:	RA	RAAP, Radford, Virginia HWMU16	Project Spécific (PS) of Batch (B) QC: Sample Collection for Project Complete?	8) QC: [2] vis Diso omplete? [2] vis Diso
Phone: Fax: Fax:	) ၁၀ <b>ဇ</b> ဝ		Phone: Fax:			(540) 5 (540) 5	52-0444 52-0291		Event: DAA JN: Lab JN:	2009 - 2nd §	2009 - 2nd Semiannual Monitoring Eva 803204-07	Tracking Number.	(4)
Box 1: Metrix SW Surface Water GW Groundwater	<u>⊢</u> ш	Trip Blank Eculoment Glank	Box 2: Preservative A HCL B HNO,	servative			E NBOH F ZnAc	NOS.	Box 3: Filtered/Unfiltered F Filtered U Unfiltered	Utered	Box 4: Sample Type G Grab	Involce Copy to Consultant	24 C
L Leachste S Soil			C H <sub>2</sub> SO <sub>4</sub>	20.				1 11.	Box 5: Sample Container Type P Plestic V VOA	tainer Type V VOA	C Composite	Bill: Down Edmatant Preserved and shipped on ice:	
	Box 4 - Sample Type			9	G			r en	Sept Gen	O CO	GENERAL NOTES:	33	
¥	Box 3 - Filtered/Unfiltered	2		7	٦							tong by the distribution belowers the	extended to the second of the
	Required pH of Sample	•		2 "	. =					-		1. EKIS EDD & DAA EDD required	quired.
Box	Box 6 - Sample Container Type	Type		500 ml P	2-11-A							<ol><li>Level 4 deliverables required.</li></ol>	uired.
Residual C	Residual Chloring Present?	אני		-alate	(seibs)	,					• 1	3. See attached target analyte list.	llyte list.
Yes	>  운			M) Aad	( lovime	§∙Hd		<del></del>			Ž ,	Ford (Source) attach de	sct) attached.
	ate: 2099	AritaM : I xoG	settod to redme	(SOO) (1830)	25) 2026812075 (AL)	Metal 1							Jus. 9/29/20
Sample IU	0	Ľ	W 65		8 ×	27		CO0160	Z-47	-			
	10/7 /345	_	m	×	Х	25			-03				
	5601 8/01	Ш	m	×	×	77			10				
16WGIA	ACC. 0/2/	<b>3</b>		×	×	8 0			2 W 2			IISEFORIQO	
1	-	1	6	×	×	\$	-		-00-				
16-1	1017 1015	ـــــ	60	×	, X	42			, D.				
16-2	1017 1130	MΘ	3	×	Х	<2			, (88 1				
16-3	10/6 1435	MS CW	m m	××	××	\$ \$ \$		_	5 C				
16WC2B		L	3	×	×	2×			-				
16SPRING	1535	œw.	6	×	×	42		+	2				
				100						1			
Received by lab In Good Condition	d Condition Y Yes.	S S	Custody Seel Inlact	il Inlact	Yes	No Tempera	sature upon emiv	/al Rec	than upon arrival Received on foe	\$ .	(a)	Ves No	(John) Om
Describe problems, if any:	ny:		_			k	2/2	7.0.7.0	7.8.5	16 14	Sheet toc.	SQUIII S BESVE IK	2011-10
Sampler Mary Le	Slawel	14,	Pale/0/6/09	60/9	#1 Relinquished by (Signeture);		Se Cr	Sman	10/5/05 Date: 04/5/05		#2 Relinquished by (Signeture):	٥	Date: Semple Storage
Sempler Signatur A	a Style	B	Time 0730		Company . Name:	DAB			Time: [630		Company Name:	T	Time:
Semple/Marre (Print): Sempler	Se Ener		Date: [Q	1विवाठ <sup>द</sup>	#1 Received by (Signature) Company	1	# Transin	high	10/8/04 4 35 11	_	by (Signisture) Company	- Core	Date. 10/8/00 MTHS INDRG
O Signature:	200 VZ		Time: C 50		Name: A		つなどはない		Tiffe;	7	Name:	L	局が、人人してい

# HWMU16 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

**ANALYTICAL METHOD: SEE BELOW** 

TYPE METHOD: SEE BELOW

CLASS: TOTAL

#### Method SW 846-6020 (ICP/MS)

No.	ANALYTE	CAS RN	Required LOQ (µg/l)
1.	Antimony	7440-36-0	1
2.	Arsenic	7440-38-2	10
3.	Barium	7440-39-3	10
4.	Bervillum	7440-41-7	1
5.	Cadmium	7440-43-9	1
6.	Chromium	7440-47-3	5
7.	Cobait	7440-48-4	5
8.	Copper	7440-50-8	5
9.	Lead	7440-92-1	1
10.	Nickel	7440-02-0	10
11.	Selenium	7782-49-2	10
12.	Silver	7440-22-4	2
13.	Vanadium	7440-62-2	10
14.	Zinc	7440-66-6	10

#### Method SW 7470A/CVAA

15 Mercury 7439-97-6 2

10/2007 JCF



#### HWMU16 Radford Army Ammunition Plant 2009 2<sup>nd</sup> Semiannual Monitoring Event DAA JN: B03204-07

**ANALYTICAL METHOD: 8270C** 

TYPE METHOD: GCMS
CLASS: SEMIVOLATILE

No.	ANALYTE	CAS RN	Required LOQ (μg/l)
1.	2,4-dinitrotoluene	121-14-2	10
2.	2,6-dinitrotoluene	606-20-2	10

10/2007 JCF



41610	q		RAA Bo32	104-01	Anno meneral disense de la	tic (Distinguished gra	FB#8
FALL:	7		DA	STOR			
,	The state of the s	011	0 .7			0	
Time	Temp(9)	PH	Conclus,	Doman	ORP(MU)	Porzek	Resc
(1120)	Keading	Struble	0.00				
(1135)	12.90	6,46		7,27	199. 7		
		Somple -	Time (110	15)		0	
	<	Domples	Collecto	D: (1)7P	1, (3) 8260	1, 12180	i (
FALL3							v
the same of the sa	68.66			B F	2 / 116	s )	
Post Proge DTh				To I	Purge (115)		
Time	Temp(0)	Cond (us)	90 mg/L	PH	Purze - (1	O. sh	0
(1200)	12.90	952	7.34	6.83	ORP(mJ)	Projek 0.34min	Desc
(1205)	13.50	987	6.51	6.79	198.2	11	
(1210)	13.45	1026	6.00	6.68	200.2	'n	Clear
(1215)	12.97	1092.	4.74	6.53	204.7	1/	51 cloudy
(1220)	12.72	1159	3,26	6.41	203.2	¥ſ	51 cloudy
(1225)	18.85	1184	2.44	6.37	196.9	и	51 cloudy
(1230)	13,00	1185	2,44	6,38	193.3	7	31 cloudy
(1235)	13.27	1203	2.99	6.38	186-8	ч	clear
(1240)	13.31	1200	1.96	6.37	183.3	ч	Clear
(1245)	13.47	1205	1.89	6.36	181.6	h	Clear
(1245)	Reading			0.00	10116		Clear
(1301)	13.70	1220	229	6.46	170.4	h	clear
		Sample			110,	-	Clear
		Simple	Callert	1: (1) -	rm, (3) &	20/0 /0	1201
	٤	monges	Corecto		(3)	dec, (d	) dell
4							
		à					
			61				

4/6/00	1		Bo?	JAP 3204-07			FB#8
WELL	. 7		-	DASTOR			
Constitution of the last	- 26.86			R	2 (13	22)	
					Pureye (13		
	NW-26.95		- mai	Initia	Perge - (	cer	
(1325)	Temp(c)		Domy	1000	ORP(my)		Desi
(1330)	0,70		7.35	6.04	197.9	0.34min	
(1335)	1111		6.89	6.02	204.7	41	clew
(1340)	11.00		0.51	6.04	206.0		clear
			6,40	6.05	206,4		clew
(1960)	11.38		,.37	6.06	207.0	u	clear
(1350)	11.81			6.07	2023	* \	clear
(1355)	11.66	571	.32	6.07	207.7	11	clear-
(1355)	Readings	Stube					
(1410 1	11.89	579 6	.40	6.13	204.1		
	4	Sample Ti	ne (140	00)			
		Samples Co	lected	1: (1) Tr	1, (3)82	60 (2)	Sou
16-3							
DTW:	58.35			Benin	Purge (14	33)	
Post Puge DT	W-65.16			Initia	Purge - C	Pres	
Time	1	Coallus)	000	19/L pH	ORPLA	aU) Pure	ch Desc
(10/35)	12.34	223	8.88		1505	0.3	This clear
(1440)	12.28	222	7.87			4	Cleir
(1445)	12.32	222	7,46			7 11	Clear
(1450)	12.37	219	7.18				Clear
(1455)	12.48	217	6.9				Clear
(1500)	12,64	216	6.70				Clear
(1505)	1275	216	6,4				cleur
(1510)	12.59	216	6.45				
(1515)	12.47	215	6.40				CIRCO
(1515)	Reading			100	1 , 14		
(1535)	12.69	214	6.7	1 7,8	13 144.	4 1	ompleted on
2-051	.07	Sample T				C	WWW.
					M (1) 21	1 0 (0)	) 80 4, (2) 9270
				3	(4)	460, Co	ש ברואויים

417/09	RAA	104-07 17QE	FB#8	4/7/00	1		RAAP	- 2			F6#8
0 1 11	0,45	ITOE		1			B03204 DAS/TG	XE			
General Not				16-2							
- weather: O	vercust 305	·		DTW.	55.72			Begin 8	Pureye (10	06)	
- PRE: EYE PR	okction, Nitr	le Gloves		Post Purage	DTW-55.	80	J	nitial	Purge -	clear	
- Calibrations	: YSI 1,50 M	NDS		Time	Temples	Conl(us)	00 001	PH	ORPINU	Purzek	Desc
PH: 4.00:	4.00 7.00	6.99 10.00	16.00	(1010)	10.19	642		6.58	200.8	0,34	
Conductiv	ily reads 14	14 us in 1413,	us std	(1015)	9,93	646	7.04	6.57	200.5	44	cleur
D0% = 1		,		(1020)	9,59	645	6.60	6.56	201.2	4,	Clevr
- Dedicated	tubing and	well skirts us	ed @ each	(1025)	9.65	640	6.23	6.53	202.4	C e	Clear
well and	disposed of	after each use		(1038)	10.12	631	6.08	6.54	202.1	e 8	Ckar
* All equips	nent decored 1	between each we	11	(1035)	10.24	630	5.80	6.57	199.9	"	ckar
- Purged wa	ater contained	and disposed	of at	(1040)	10.34	632	5.71 (	1.56	200.3	41	dear
dedicated	location ons	ife	4	(1045)	10.45	631	5.67	1.58	199.8	41	Ckur
		ed and transpor	ted on	(1050)	10.51	633	5.67 6	.57	200.0	٤.	cleur
ice in	coolers			(1050)	Reading	Stuble					
				,1	O	Sample	Time (10	55)	V.		
	Water Lev	el Table - Unit		1			Collecto				
well	DIM	PostPurge DTW	Notes	(1100)	10.66	620	5.84	6.60	19517	Post R	nge Reading
16-1	DRY	9		1							9
16-2	\$5.72	55.80		16WC	2 <u>B</u>						
16-3	58.35	65.16		DTW	- 55,20		F	Begin F	Purge (1/2	1)	
16-5	4,75	6.75		Post Purge!	DTW - 58.	.95	· I	nitial	Persye - C	lear	
16WC2B	55.20	58.95		Time	Temp(c)	Cord Cus	) DO 009/	PH	ORP(n	1 U) Purzy	L Desc
16MW8	72.85	75.34	, v .	(1125)	10.82	288	8.00	7.48	156.9	23	Inin cher
16 WCIB	67.61	68.04		(1130)	10.62	289	7.03	7.40			clear
1660CIA	67.39	69.42		(1135)	10,57	288	4.00	7,42	1416.5	u	clear
16.1169	64.05	64.75		(1140)	10.99	287	1.78	7,51	101,4	41	Clear
16 CI	51,19	51.21	,	(1145)	11,00	287	1,72	7,53	86.9	01	Clear
1/ 200/2	-0.1/			(1150)	11.04	286	1.37	7,53	83.0	11	Clear
16 CDH3	DRY			(1155)	11.06	286	1.35	7.54		0.4	Clear
1663	DRY				11.07	286	1.30	7,54	75,4	11	Clair
ILWC2A	DRY				Readings						
1/ \			0.000		10.97	286	1.62	7.57			Clear
16-1 = DTW.		ples Collected (	(0945)	Sample	Time (12)	05) S	amples Coll	ecled; (a)	)2266, (1)7	m, (2)	8270
	(\$	<b>9</b> 23)	8	1			63		,		

4/7/09	Ì		RAA	1P 204-07 HAR	Partie and the Atlanta	NI BUNGON BULLING HTS	FB#8	١(١٦):	9		RAA	P 170E			FB#8
11 6			DAS	HOR							DAS	ITAE			
16-5	2 1170		D	~ 0	1102			16C1				0	2 //		
210	W-4,75		Be	gin Purge	(1230) - clear				81.19			Begin	Purage (140	77)	
Tostruged	DTW-6.75	( 1/ )	Initio	11 runge	- Clear	0 11	17		00-51.8		6 00	Initial	Purge - C/ed ORP(mV)	45	
(1235)	Temp(°)	Condlars	DOM9/2			rungekigi	w Desc	Time	Tempted		00	YL PH	ORP(mV)		
(1240)	10.86	438 444	2.75	7.16	113.5	0.3 min		(1410)	10.31	551	6.76	6.84	/53, 9	0.37	min Clear
(1245)	10.92	447	2.16	7:11	118.0	11	Clear	(1415)	11.61	695	4.32	6.56	181. 3		Clear
(1250)	11,26	447	2.74	7,10	120.3	11	Clear		10,76	704	3.48	6.48	188.9	41	clear
(1255	11,44	.448	2,82	7,13	123.4	11	Clear	(1425)	10.64	702	3.09	6.44	187.1	11	Clear
(1300	) 11,11	450	2,91	7.11	129.4	1)	Clear	(1435)	10.81	703	2.68	6.46	175,0	- 84	Clear
(1305)	\$10.99	449	2.91			7.7		(1440)	11, 12	705	2.67	6.46	167.2	84	cleur
(1305	1			7,10	131.7		Clear		11.27	707	2.47	6.45	160.3	11	clear
	) 11.27	450		TAH	140.2		Clear	(1450)			2.27	6.45	156.8	t/	ckeer
(1320		ple Time	(1310)	1,01	170,2		Clean		11.40	707 708	2.26	6.45	152,9	h	clear
	Samala	s Collect	(1010)	(0 (1)	TMA (2)	7770		(1455)	11,44		2.22	6.46	150.0	٥(	cker
	Jampie	3 Collect	ka:(3) 891	60, (1)	(2) 8	2/0		(1530)		712	2,51	6.49	141.7		
								(100)		Sample			777, 7		
Sorie	m 16									Sample	CI	(11/2)	4000 000	TN. F.	2) 0, 0,
Time	Temple Temple	Condlus	) Dong	nH.	ORP(mu)	)			12/82	20 lis C	- Collect	115 15:0	8260, (1) rotul	01.	(0)000
(1343	3) 11.29	403	10.09	7.00	66.3				Cerroa	, Cir Cy	anize,	11 Jul Jia	e, (1.10ku	rreno	1,628001
(1)	) 11121	403	10.01	7100	46.3			1							
	San	aple Tim	0 1345												
	Samole	s Collec	62/370	260 (1)	TM (2)	חרבי									
	Jampie	Conec	100.00700	100,017	(47)	a 10		j.							
								f							
*,								f.							
			a	9							(8)				

4/8/09	Marie Continue of the Marie Inc. 101	RAAP	Trestanti sterili su It	he Ushikum may at ma	FB#8	11/01/	0,			AAP			
1,010	Bo	3204-07			PV#8	4/8/0	1		B	3204-0	7		FB#8
General Notes		PAS/TORE				1/1/1			C	DAS/70/E			
- Weather 1 Sun	ny 508	2.00				16W		26		Dose	0 (110		
- PPE: Eye Prote	stein Notale Col	NISEC				0.10	Post Purge Drw-69.42 Initial Purge - clear						
- Calibrations:	YSI (50 MDS	00-2				Tibe	TrupE	(-1/-)	DO MIL		purge - c	O v	N
PH: 4.00 = 4	1.00 , 7.00 : 7.	00 10	2.00 = 10.	ov		(1140)	11,74	Condus	8.98	7.27		. 8	
Conductivity	reads 1413	141 16	141341	Sold.		(1145)	11.98	582	6.24	6.90	234.7	0.3 /min	
00% = 100		70.3	1.5)0.0			(1150)	12.14	620	3.86	6.74	223.5	1	clear
· adicated to		ell shis	ts 118	d at e	e c b	(1155)	12.22	644	2.88	6.77	209.4	1( , , ,	clear
well and dis	sprised of ast	er each	1111			(1200)	12.10	647	2.75	6.77	205.3	11	deur
- All equipment	decored bet	ween ea	ch well		2	(1205)	12,00	652	2,66	6.75	202.8	u	Clear
- Parased want	- contained	and di	sposed a	of at		(1210)	12.17	650	2,52	6.74	182.0	4	clear
dedicated Docat	tion onsite		·			(1215)	12.29	650	2.36	6.74	117,6	ų	clear
- Samples coll	ected, stored	and t	12msport	ed on	100	(1220)	12.36	653	2.21	6.75	83.0	e <sub>l</sub>	cleer
in coolers			`			(1225)	12.51	656	2,19	6,76	70.7	15	clear
•						(1230)	12.62	6,56	2.17	6,76	67.2	V <sub>t</sub>	clear
16WCIB						(1235)	12.71	458	2.16	6.74	61.9	11	dear
DTW-67,61	,	Begin	Purage (1	000)		(1235)		5 Stube		6.67			- Cert
Post Pargy DTW - 68.1		Initial	Purye-	Clear	* ,	(1350)	13,01	652	2.21	6.67	58.1		
Time Temple	Cond(us) DO M3h	PH	DRP(mU)	Puzik	Desc			Samo	le Time	(1240)	)		
(1005). 12.30	333 5.20	5.76		0.3 /mir	cleur		5.4	Samole	5 Collecto	1: (9)	8240.13	TM, (2	18151
(1010) 12.29	317 4.51	5.72	1941.6	13	Clear		1 8270,	(3)CN,	(3) Sul R	De (3)	Total Phen	01 (6)	3081
(1012) 13.18	301 4.14	5,62	200.2	l(	clear								
(1025) 12.43	293 3.86	5.61	208.0	11	clear	1661	DUP						
11>	271 3.52	5.57	244.7	10	clen	1		Sample	Time (1:	300)			
(1030) 12.61	268 3.28	5,62	263.9	11	Clev	v i					260, (1) Tr		
1	266 3.20		269.5		Clew						, (1) Total	Phenolile	1)8081
(1040) 12.44	270 3.10	5.63	266,5	n	cleur	Dupl	cate w	rell was	sample	ed at /	6651A		
4	270 2.98	5.59	269.0	IC.	clew						t.		
	270 2.94	5.60	267,1	10	Clear	-					į į		
(1050) Readings	2011 304	5.75	274 G										
	294 3.04		274,9										
	Simple Time (1	000/	n 11	in) dial	(1) 4072	<b>*</b>							
1500	Samples Collecte		rotal Ph							80			
(1) (1)	MAI SMITHOU (	וווו עם	ioine ph	1001 (3)	0001					39)	No.		

4/8/09			RAS	P	THE PARTY OF LAND AND AND AND AND AND AND AND AND AND		FB#8
			803	15/TQE			
16MW	<u>L</u>						
DTW -	64.05			Benin f	virge (clea	(N	
Post Purge OT	W-64.75			Initia	Purze - 1	407	
Time	Temp(c)	Cond(us)	DO 7/2	PH	ORA(nV)		Desc
(1410)	13.10	676	8.03	6,76	114.6	0.34min	
(1415)	13.45	690	6.48	6.57	104.4	. 4	Char
(1420)	13.47	731	3,30	6.43	75.1	دا	Clear
(1425)	13.45	751	2.19	6.41	66.1	14	Cleev
(1430)	13.41	740	2.03	6.37	73.9	( (	Clear
(1435)	13,59	688	2.13	6.34	84,1	11	clear
(1440)	13.46	668	2,17	6.32	90,7	h	Clear
(1445)	13.17	630	2.26	6.28	97.5	vA	Clear
(1450)	13.01	613	2,20	6,24	98.7	N	Cleur
(1455)	12,91	606	2.12	6,24	98:1	h	Clew
(1500)	12.87	603	2.09	6,24	97.9	V	clew
(1500)	Readings	Stuble					
(1521)	13,10	597	2.31	6.29	87.1		
		Sem		(1505)			
		Samo	les Coll	ecture : (3	38260,	(STM (2)	) 3/5(
					e, (1) TOTO		
						1,20.0.1	G. 7 00 00
16 MWS	3						
	72.85			Benia F	my (153	4)	
Post Purge D	TW-75.3	9		Initial	Pura - 3	1 Cloud	
Line	Temp(a)	Carol(us)	DO may	PH	ERP(mU)	Punch	Desi
(1535)	13.55	104	6.42	5.39	230,7		SC. Clardy
(1540)	13.13	91	2,45	5.05	187.7	0.3	Clary
(1545)	12.97	89	2,08	5.03	183.0	L <sub>L</sub>	cloudy
(1550)	13.14	89	1.94	5.07	165,3	11	daely
(1555)	13.27	91	1,82	5,15	146,1		
(1600)	13,31	90	1.80	5.12	149.2	il	SI Cloudy Clear
(1605)	13.28	87	1.84	5.09	155.6	Vl	clew
(1605)	Readings		- 4				0400
	2	36	(g	0			

4/8/09 B AAP B03204-07 BASTAE FB#8 16MW8 cont Time Temp(e) Cond(us) DOMS/L PH ORPIMU (1634) 12.91 84 2.01 4.99 165.1 Sample Time (1610) Samples Collected: (3) 8260, (1) TM, (2) 8151 (2) 8270, (1) CN, (1) Suificle, (1) Total Phenoi, (1) 8081 Note: well was purged dry during sample collection

4/13/09 R	1AAP	FB#8	4/13/09			RAAP B03204- DAS 17	07			FB#18
	ASITGE					DAS /	702			
	evel Table-Unit 7		7WIOC							
WELL DTW	C. C.	les		1-18,94			Begin P.	urge (140	3)	
7W12B 24,60	24.62		Post Purge	DTW-21	0.67	I	nitial 1	Parge-Cle	par	
7w9C 13.94	16.86		Time -	Femple)	Condlus	Do rug/2	oH	ORP(MU)	Purgek	Desc_
7W108 15.09	15.66		(1405)	12.71	806	2.05	7,06	92,5	0,3 /min	Clear
TWIOC 18,94	20.67		(1410)	13.26	797	1,91	7.06	93.1	11	Clear
TW13 18,33	20.19		(1415)	13.46	794	1,97	7.06	96.8	å t	Clear
7MW6 25.61	29.97		(1420)	13.33	796	1.97	7.05	100,9	7.0	Clear
7W11B 24.78	25.04			13,14	796	1.89	7.04	104,2	11	Clear
7.WCA 24.67	24.55		(1430)	13.13	795	1.90	7.03	105.3	i e	Clear
7W9B 22,40	SWL ONLY		(1435)	13.04	794	1.92	7.03	107.1	0.0	Clear
7WII 23.77			(1435)	Readings	5 table					
7MW5 24.72	11		(1452)		786	1.88	7.04	94.1	8 4	Clear
		. 1		Sam	ple Time	(1440)				
7W13	s			Samples	Collectedi	(1) TM (1)	(a)	8270		
DTW-18.33	Begin Purge (1253)	//				,				-
Post Purge DTW-20,19	Begin Purge (1253) Initial Purge - Clear		7W9C							
Time Temple (ondlus) D	orge pt orp(aw) Purg	ek Desc		5-13,94	!	d	BeginPu	rge (151:	3)	
		Imin Clear	Post Rurge			Ti	itial Pu	inge-Clea		
(1300) 13.32 1286 4	.86 7,23 17,1 11	Clear	Time		Cond(us)	DOM9/L	PH	DRP(mu)	Rugek	Desc
(1305) 13,49 1310 4	1.00 7,21 -3,0 11	Clear		12.40	1141	2.43	6.83	115.2	0,32/m	n Clear
(1310) 13.40 1327 3	3.71 7.22 -13.7	Clear	7 4	12.31	1167		6.77	125.4	11	Clear
(1315) 13.22 1333 3	2.70 -7.23 -5.8 "	Clear		12.25	1185		6.74	128.1	e	Clear
(1320) 13.25 1331 3	2.72 7.25 -2.0 17	Clear	1	1226	1190			124.2	i i	Clear
(1325) 13.18 1335 3	1.71 7.25 2.6 "	Clear			1198		6.73	109.0	ll	Clear
(1330) 13.07 1334 3	1.70 7.26 5.0 11	Clear	(1540)					106.5	i	Clear
(1330) Readings Stable			(1545)					100.6	i (	Clear
Sample Time (	1335)	11 11 11 11	)	Readings						
Samples Collected: (1	)TM (1)CN (2) 8270	ta .		12.39		2,06-	6.76	90.3	PostPura	e Reading
					re Time (					7
(1344) 12.98 1345 3	.85 7,27 10.0 Post1	Purge Reading	So	moles (	'ollected:	(1) TM. (1	)cn, (2)	18270		
					82				3	,
	(00)		1	*	10	(Ie				

4/14/09	No. T. L. of Philipper(May)		RAI BO320 DAS	98-07	Money Morell & U.S. C. N.D. Hite		FB#8	4/14/0	9		B	RAAP 03204-07 DASTTQE			FB#8
7W12B			DAS	ITQE				700.10	<i>f</i> .			DASTTOE			
	-24.60		1	Rain Dum	e(1127)			7mw		/ 1		D. *	0 /1-	201)	
Post Parge DT	w-2462		To	itial Pun	ge-Clear			Post Pura	J-25.			Degn	Purge(13	1000	
	4.3	Cond(us)	DO mg/L	ott	ORP(MV)	Rumak	Desc	Time	Tambo	(cond(us)	DOMIL	p H	ORP(MU)		Desc
(1130)	12.98	684	8.30	6.98	182.3	0.3 /min		(1345)		1535	2.53	7,31	-19.9	0.34/min	
(1135)	12.90	484	7,54	6.95	186.6	li	Clear	(1350)	12.21	1601	2.26	7,20	-62.4	O13 July	Clear
(1140)		482	7,10	6.93	190.7	11	Clear				2,17	7.13	-78.6	/1	Clear
(1145)	12.68	681	6.90	6.93	192.9	11	Clear		12.46	1664	2.17	7.11	-84.6	11	Clear
(1150)		680	6.73	6.92	194.5	11	Clear		12.53	1677	2.29	7.11	-91.5	11	Clear
(1155)		677	6.61	6.91	196.7	11	Clear		12.53	1679	2.25	7.08	-93.7	11	Clear
		677	4.58	6.91	197.3	1.1	Clear	1	12.64	1678	2,26	7,08	-96.5	i I	0,000
4 4		677	4.54	6.91	197.0	11	Clear			ngs Stal					
	Readings						-	(1434)	12,90	1565	2.37	7,24	-88.1	Post Pu	rge Reading
(1226)	11.95	669	6.63	6.90	194,2 H	Post Purge	Reading		Samo	le Time	(1420)				Je ken ng
	Sample		- L		,	J			Sample	es Collec	kdi (3)8.	360.(1)7	TM (2)82	70. (i)cn	1,(2)8151
5	Samples Co	llected:	3)8260 (1	) TM, (a)	8270, (1	)CN, (2)	18151				(1)5	ulfide (	1)9065	(2)8081	, , , , , , ,
			(1) Sulfid	e (1) 900	5.(2)80	81									
				,	1			1 7W116	3_						
7W10B									0-24,	78		Begin	Purge (14	48)	
	-15.09			Begin Pun	ge (1244	) .		Post Pur	re DTW -	25.04	k	Initia	Purge-C	lear	
Post Purge D	TW-15.66	0	Ini	tial Pur	ge-Clear			Time	Temp(6)	(Condlus)	Dom9/L	- oH	_ORP(MU)		DesC
Jime	Temp(6)	Condlus)	Dongh	pH.	ORP(MU)	Purojek	Desc		12,69	883	6.14	6.44	41.4	0.34/min	Clear
(1245)	1170	934	4.67	6.78	192.1	0.34mi	in Clear	(1455)	12.68	835	5.21	6.42	53,7	11	Clear
(1250)	11.67	929	3.55	6.73	192.5	31	Clear	(1500)	12.51	772	4,02	6,39	58.9	11	Clear
(1255)	11.60	920	3.18	6.72	190.4	h	Clear	(1505)	12.45	748	3.45	6,38	60.7	/1	Clear
(1300)	11.63	916	3.10	6.71	187,7	11	Clear	(1510)	12.44	728	3.28	6.37	61.1	11	Clear
(1305)		915	2.98	6:71	184.7	11	Clear	(1515) /	12.44	708	3.04	6,36	48.3	11	Clear
	11.56	916	2.93	6.71	181,5	11	Clear	(1520)/		702	2.89	6.37	36.5	11	Clear
	)11.57	917	2,99	6.71	178.6	11	Clear.	(1525)		705	2.84	6,37	32.1		Clear
(1315)	Readings	Stabl	e						12.49	708	2.82	6,37	29.2	1)	Clear
(1332)	)11.72	915	3.75	6.73	173.8	ost Purge	Reading			ings Sto	ble			0 10	
	Sample			4 2	f		3	(1618)	12.80	745	2.93	6,43	38.3	Post Ruge	Reading
Sam	ples Collec	ted:(1)	TM,	(9)89	170,(1)	N								0	U
			(10	4)								(105)			4. 3

4/14/09		The section in the section of the	RAAP	The second of the second	Committee of the Commit	in or a committee of the	FB#8
111101		Ŧ	303204-0 DAS/TAL	7			
7WIIB (	(Cont.)		01707				
	Sample	le Time	(1535	5)			
	Samples Samples	Collecke	1: (9)824	0, (3) TM	(6)8270	, (6) 819	51
	η.		(3)CN,	(3) Sulfid	e,(3)900	5, (4) 80	81
			,		,		
TWCA						•	
	-24.67			Begin Pur	ge (1632	2)	
Post Purge		55	In	ifia Pui	rge - Clea	ar	
	Temple)		DOMIL	ptt	ORP(MU)	Purgek	Desc
	12.73	853	4.08	6.68	82.4	0,34min	Clear
(1640)		854	3,20	6.67	83.4	11	Clear
(1645)		861	2,93	6.65	87.3	11	Clear
(1656)		867	2.90	6.65	92.1	11	Clear
(1455)	12.98	873	2.84	6.65	96,6	11	Clear
(1700)	13.01	877	2.86	6.65	101,3	11	Clear
(1705)	13,00	881	2.79	4.65	103,0	11	Clear
1	Readings	Stable					
	13,04	894	2.87	6.69	105,21	Post Purge	Reading
		Time (i	-				J
4	Samples (	ollected	(3)8260	(i) TM	(2)8270	, (2)815	)
			(1) CN,	(1) Sulfie	de,(1)906	5,(2)808	71
			,		,	,	
TWD	uP.						
	Samo	le Tim	e (1725				
	Samples	Collecta	1:(3)824	0,(1)Th	1,(2)827	0, (2) 815	7
			(1)CN	(1)5a1fid	e, (1)906	5,(2)808	1
					,		1
*	Duplica	le well	Sampl	ed at	TWCA	, KO	3
					MAR	1013	
				2.0	Jample .	teel	
-					. Would		
6 N						٠	
			(1	06)			

4/15/09	Bo:	AAP 3204-07 45/70E			FB#8
General Notes					
Weather-1	Overcast, 40's				
PPE- Eve P	rotection, Nitr	ile gloves			
Calibration	5-45I 650 n	ADS			
04-4,00	= 4.00 , 7.00	= 7.00 ,10.0	00-91	98	
Conductivis	y reads 1413	us in 1413	3455	td	
Do % = 1					
· Dedicated tubi	ing and well sk	irts used at	! each	well	
· All equipment	Verned between	n each we	11		
· Purge water cor	tained and disper	sed of at N	edicate	d location	onsite
· All samples colle	acted stored an	d tonnsports	ed in a	solers on	ice
- All Samples Corre	CRG, 510.00 (1)	0 11011101011			
Static	Water Level	Table - L	Init	10	
WELL	DTW	Post Parge D	ITW	Notes	
10 DDHAR	19,40	19,46			
10 D3	17,64	17.82			
10D3D	17,61	17.69			
IOMWI	17.97	18.12			
10 D4	22.72				
IOMWI					
Dru - 17.97		Begin Pur	ge (10	24)	
Post Purge DTW - 18	3.12	Initial Pure	je - Cle	ear	
Time Tymo(2)	Coodlus Dougle	pH OR	P(mu)	Purgek	Desc
Post Purge DTW - 18 Time Temp(E) (1024) 13.46 (1030) 13.23	944 9.66	7,22 19	58.3	0.3 min	Clear
(1030) 13.23	623 8.05	7.16 1	78.4	)(	Clear
(1035) 13 17	595 792	716 15	229	11	Clear

DTW-17,9			13eqin	runge CIO	247		
Post Purge DTW - 1	8.12	I	nitial F	lurge - Cla	ear		
Time Temp(2)	Cond (us)	Doroll	pH	ORP(MU)		Desc	
(1024) 13.46	944	9.66	7,22	158.3	0,3 4 min	Clear	
(1030) 13.23	623	8.05	7.16	178.4	)(	Clear	
(1035) 13,17	585	7.82	7.16	182.9	71	Clear	
(1040) 13.10	538	7,36	7.15	192.7	11	Clear	
(1045) 12.94	508	7,10	7.14	198,8	11	Clear	
(1050) 12.93	487	6.92	7,14	200.9	11	Clear	
(1055) 12.87	476	6.88	7,14	202.5	8.0	Clear	
(1055) Readings	Stable						
(1114)13.02	447	6.77	7.13	202.0	Post Purge	Reading	
()			(107)		U	)	

4/15/09	RAAP	FB#8	4/15/09	RAAP	F6#8
	RAAP BO3ZO4-01 DASTAE			BO3204-07 DAS/TQE	
10MWI (Cont.)			1003		
	Time(1100)		D7W-17.64	Begin Purge (13	
Samples Col.	lected: (3)8240, (1)TM, (2)8151, (2)88	270	Post Purge DTW - 17.82	Initial Purge-CI	
	(1)CN, (1) Sulfide, (1)9065, (3	1)8081			Purgek_DesC
			(1310) 12.66 60		0.34 nain Clear
10030			(1315) 12.43 60		" Clear
DTW-17.61	Begin Purge (1128)		(1320) 12,43 58		Clear
Post Purge DTW - 17, 6	9 Initial Punge-Clear	u u	(1325) 12,45 57		Clear
Time Temp(8) Con		K Desc	(1330) 12,32 56		Clear
		min Clear	(1335) 12.35 56		Clear
(1135) 13,70 6	35 1,93 7,04 -213.4 11	Clear	(1340) 12.48 56		Clear
	61 2,10 7,05 -214,5	Clear	(1345) 12,34 56.		" Clear
(1145) 13,47 6	67 2,46 7,03 -212,1 "	Clear	3   1   1   1   1   1   1   1   1   1	table - Purge water had a re	Hen odor.
(1150) 13,35 6	71 2.72 7.02 -208.8 11	Clear	Sample	Time (1350)	
(1155) 13,10 6	75 3,20 7,03 -198,6	Clear	Samples Colle	ckd: (3)8260, (1)TM, (2)815	1,(2)8270
	79 3,20 7.02 -195.2 "	Clear		(1) cN, (1) Sulfide, (1)90	
(1205) 12,64 6	83 3.26 7.01 -191.3	Clear	(1433) 12.64 569	3,86 6.98 28.3	Post Purge Reading
(1205) Readings.	Stable				
(1258) 12.92 6	77 - 3.58 7108 - 180.4 Post P	urge Radine	IODDHAR		
Sample ?	Time (1210)	0	DTW-19.40		445)
Samples Collec	fed: (9)8260, (3) TM, (6)8151, (6)8270	,(3)CN	Post Purge Drw-19.4	W Initial Purge-	Clear
	(3) Sulfide, (3) 9065, (6)8081		Time Temple Co	nd(us) Dougle pH ORP(us	W) Purgek DesC
	,			42 2.55 6.96 40.1	0.39 min Clear
IODUP		. "		.44 1.72 7.00 22.8	Clear
Sample "	Time (1405)		(1455) 11.83 6	29 2.03 7.01 12.3	11 Clear
Samples (	Collected: (3) 8260, (1) TM, (2) 8151, (2	1)8270	(1500) i1.62 6	27 2.18 7.02 9.6	" Clear
/	(1)CN, (1)Sulfide, (1)9065		- (1505) 11.64 6.	24 2.29 7,02 8.4	" Clear
	, ,		(1510) 11.64 6	22 2.38 7,02 5.9	Clear
* Duplicate	well sampled at 1003			22 2.41 7.02 3.8	"Clear
1			(1515) Readings 5	Stable	2 1.0
			(1530) 11.77 5	93 2.51 6.78 8.6	Post Parge Reading
			Sample	Tima (1520)	
			Samples Collected	(3)8260, (1) TM, (2)8151, (2)8270	,(1)CN (1)Sulfide,(1)9065
	(08)		·	(109) (2)8081	

			ota savata il con il teleboro	and the state of the state of the state of	Thillens in not talk?	
4/15/09		RAA	P			FB#8
	E	BO3204-	O7 PE			
					14 21	
10D4						
DTW-22.72			Begin Pu	me (154:	3)	
Post Purge DTW -22.71	4			urge - Cl		
	and lus	DO MIL		ORP(NW)	PungeK	Tosc
	308	6.84			8.34 mm	Clear
	309	4.98	6.62	56.7	1/	Clear
7	305	4,20	6.56	61.8	7)	Clear
1.	295	3.96	6.54	58.8	11	Clear
				57.1	11	Clear
	292	3.84	4.53	54.3	11	Clear
X 1	291	3.80	6.53	34,3		Clear
(1610) Readings		ole	/ 10	101	2 1 0	0 1'
	290	4,21	6.60	59.61	ost Kurge	Keading
Samp	le lin	ve (161:	5)	-1 / 10	7- (-)	2:-21
Samples Co	Nected!	(3)8240	0, (2)81	51,(2)8	210, (a)	8081
		(I) TM,	(1) CN,	(1) Selfi	de,(1)9	065
				100	9	
			2017	10-13		
			SKIL	de		
			1	wy		
				)		
						-
						*
		(	(0)			•

4/16/09	RAAP	FB#18
	B03204-07 DAS/TOE	
General Notes		
Weather	- Sanny, 50-60's	
PRE-Eye	- Sunny, 50-60's Protection, Nitrile gloves	
	Maintenance Log - Unit 433	
WELL	Notes .	
	Replaced water level port plug	
74MW5		
74mw4	Replaced water level port plug	
74 MW 1	Replaced Water level port plug	10001001
74MW3	Repaired well head sample tubing, Replaced was	Port Plub
741446	Kepaired Well head Sample tubing, Replaced Wo	ater level plage
14/11/10 1	- Could not replace plug due to suspended	Dot tware
	based conductivity meter.	
WELL	Maintenance Log - Unit-10	
WELL	Notes	
IODDHAR	Replaced water level port plus	7
10D3	Replaced Water love port plu	, .a
10D3D	Replaced water here port plu	g
IOMWI	Replaced water level port plu	8
1004	Replaced water level port plu Replaced water level port plu Replaced water level port plu	g
		9
- Annie de Rose, de la company		

112/20/09	BAAP		FB#8
1100101	803204-07 DASITAE	i l	
General Notes			
Wanthor-			
PPE- Eye Protection	on, Nitrile gloves, t	lard Hats	
Calibrations	in, Nitrile glaves, to - YSI 650 MD	5	
-11- 4M=4	00 7.00 = 7.01	10,00 = 10,2	00
Conductivity	reads 1414 us	in 1413 us	std.
DO % = 100	23		

Dedicated taking and well skirts used at each well

All equipment decored between each well

Runge water contained and disposed of at dedicated location onsite

All samples collected, stored and transported in coolers on ice.

Static	Water Lei	el Table - Unit - 5.	
WELL	Drw	Post Purge DTW	Notes
S5W7	11.87	11.87	
S5W5	8,52	9.07	
5W9A	2,50	2.51	
5WIOA	14.37	14,55	
5WIIA	10.93	12.04	
5W8B	16.17	16.53	
5W7B	9,24	9.91	
5W5B	9,93	11,06	6
5WCal	9.95	10.01	
5WC22	9.96	10.02	
5wc23	9.37	9,51	
		SWL ONLY	,
5WCA	14,51	1)	
S5W6	7.28	11	
S5W8	13.11	21	
5WCII	17.16	11	
5wc12	16.97	/1	
	. , , ,		

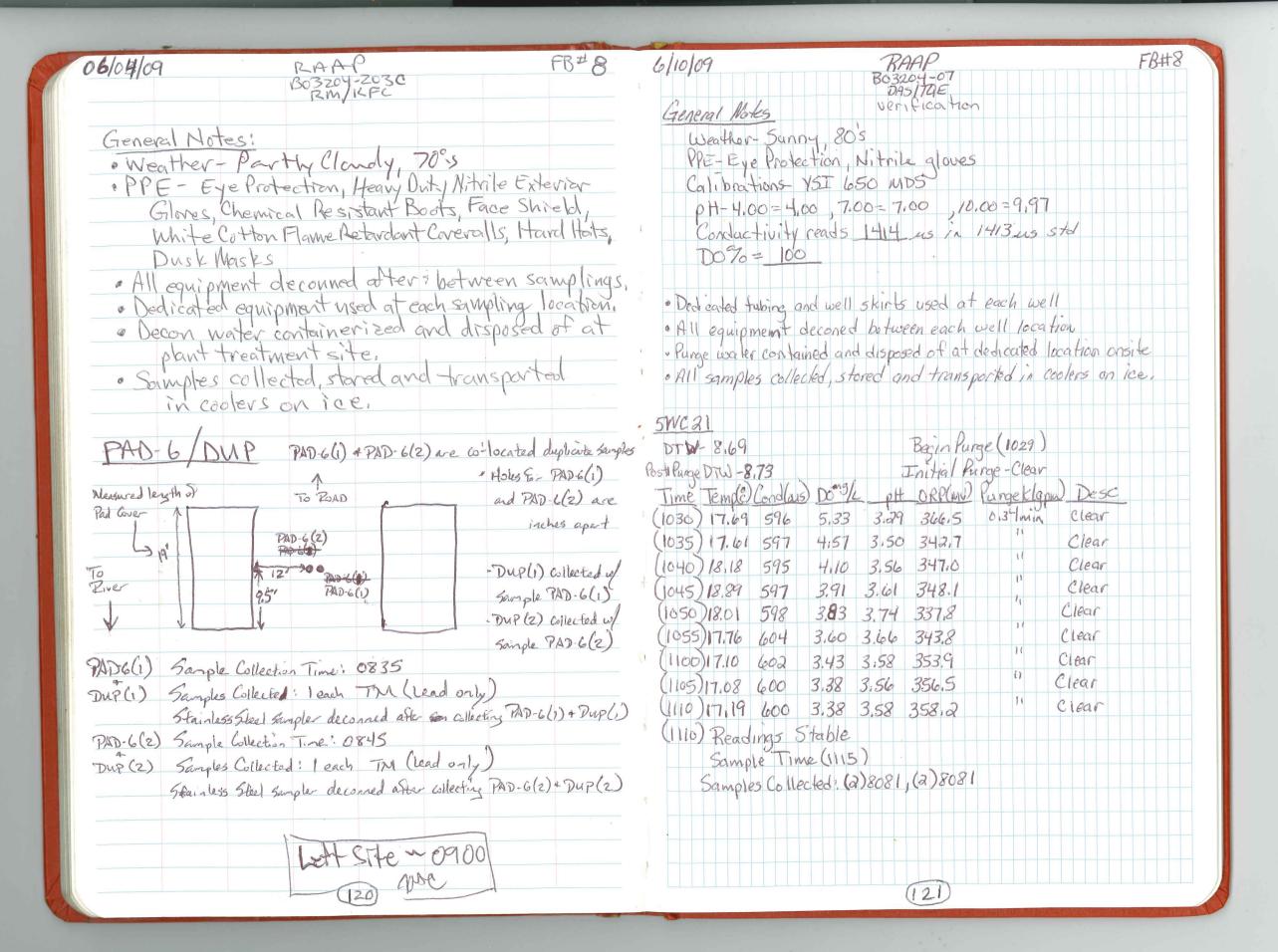
(112)

A CHARLES AND A SHEET AND A SHEET ASSESSMENT	and the best produced and the best parties at	Lord Company of the State of		Color and the Co
4/20/09	RA	MAP		F8#8
	1503 Dx	201-07 15/1QE		
5WBB				
DTW-16.17		Regin P	urge (0951)	
Post Purge Drw-12	0.53	1.1	urge-Clean	y I I I I I I I I I I I I I I I I I I I
Time Temp(8)	Condlus Do 19/L		RP(MU) Pura	
(0955) 13.18	161 7.91	4,62 0	and the same of th	Imin Clear
(1000) 13.71	114 6,30	4,40 0		Clear
(1005) 13.62	98 5,98	. 4.37 6		
(1010) 13,48	88 5.69	4,33 à	1	Clear
(1015) 13,52	83 5,49	4,32 0	1	
(1020) 13,43		4,33	A	Clear
(1020) Readings				
(1044) /324	64 5.04	4,33	281,8 Bot	Purge Reading
Sample	Time (1025)			
Samples	Collected: (3)820	60 (a)815.	1, (2) 8270, (	2)8081
	(1)900	5 (1) CN,	(1) TM, (1)	Sulfide
5WSB				
DTW-9,93		Begin F	Purge (1114)	
Post Parge Drw-	11.06	In Fig 1	Purge-Clear	
Time Temple	(c) Cond(us) Da	My pH	ORP(MU)	Purgek Desc
(1115) 11.36	380 6.4	The same of the sa		5,3 min Clear
(1120) 11,27	336 6.4		234,4	11 Clear
(1125) 11,20	301 6.4.		230,8	" Cleav
(1130) 11.12	276 6.40	5.71	228,4	11 Clear
(1135) 11,10	274 6,40		225,1	11 Clear
(1140) 11,19	272 6.45			11 Clear
(1145) 11,15	273 6.41	5,75	224.8	" Clear
(1145) Readings	5 Slab b			
(1209) 11,14	287 6,20	5.65	221, 2 Ps.	st Rusge Reading
Sampl	e Time (1150)	)		J , J
Samples C	ollected; (3)82	60, (a)815	1,(2)8270	(2)8081
	(1)90	65, (1)CN,	(i) TM, (i	)Sulfide
		(113)		

	And the second s	coil a	11/20/00	RAAP	FBH8
4/20/08	RAAP BO3204-07 DAS/70E	FB#8	4/20/09	RAAP B03204-07 DAS/TQE	
	DAS/TOE		<u> </u>	DA5/1QE	
5W78	A /		C		
DTW-9,84	Begin Purge (122)	7)	S5W7	P - D	(1523)
Post Purge DTW-9,91	Initial Purge - Cla	av	Drw-11.87	Begin Punge Initial Punge	(1323)
Time Temple Condlas	DOM9/L pH ORP(MU)	Pugek Desc	Post Purge DTW-11.87	Initial lung	Purgek Desc
(1230) 11,28 206	6.33 3.58 348.5	013 min Clear	Time Temple (and Cus)		
(1235) 11.51 212	5.79 3.51 401.8	11 Clear	(1525) 14:08 325	1.83 6.78 190.2	
(1240) 11,52 215	5.75 3.52 423.4	" Clear	(1536) 14.19 330	1.74 6.79 189.0	Clear
(1245) 11.45 214	5.78 3.55 428.3	11 Clear	(1535) 14.27 333	1.77 6.78 185.2	() () ()
(1250) 11.45 210	5.78 3.57 433.8	" Clear	(1540) 14,27 335	1.82 6.77 181.5	(1)
(1255) 11.48 207	5,79 3,58 434,3	" Clear	(1545) 14,30 336	1.88 6.77 176.2	Clear
(1300) 11,55 205	5.79 3.58 440.1	Clear	(1550) 14,47 336	1.93 6.77 173.6	11 01
(1300) Readings Stable			(1555)14.58 337	1,97 6,78 171.1	11 Clear
(1358) 12,05 216	5.73 3.45 3435.2	Post Purge Reading	(1555) Readings Stal	ole	
Sample Tim	0 (1305) DS 4/20/0	9	(1613) 14.46 340	1.98 6.79 165,2	Post Runge Reading
Sample 11m	1:(9)8240, (6)8151, (6)8270	(6)8081	Sande Tin	ne (1600)	
Jampies Cottection	(3)9065, (3)CN, (3)TM, (3)	Sulfide	Samples Collecte	ed:(2)8276, (3)8260, (1	774
	(3)4063, (3)CN, (3)1141, (0)	2017100			
67115			1		
55W5 DTW-2.52	Begin Purge (141	2)			
IN F	Initial Purge · Cla				
Post Purge DTW - 9,07	Initial rurge cre	Pungek Dosc			
	Company of the Compan				
(146) 12,34 292	3.57 6.04 284.7	0.3 min Clear			
(1420) 12,21 256	2.55 5.98 272.7	Clear			
(1425) 12,27 253	2.03 5.98 261,6	Cital			
(1430) 12,29 253	1.90 5.99 257.4	Clear			
(1435) 12.34 257	1.64 5.98 247.3	Clear			
(1440) 12.35 261	1.57 6.00 239.7	11 Clear			
(1445)12.36 265	1,53 5,99 235,4	Clear			
(1450)12.39 269	1.56 6.00 231.9	Clear			7
(1450) Readings S	table				
(1504) 12.58 276	1.67 6.00 226.1	Post Parge Reading			
Sample	Time (1455)	9			
Samples Caller	Time (1455) ed:(3)82100 (2)8270, (1) Th	1			
J. pes Svee				(115)	

4/21/09 RAAP	FB#8	4/21/09 RAAP FB#8 B03204-07 DAS/TQE	
DASTRE			_
General Notes		5wc23	-
- Weather: Overcas +, 40's		DTW-9.96 Begin Purge (1059)	-
- PPE: Eye Protection, Natrile Gloves, Hard Hats		Post Punge DTW-10.02 Initial Punge-Clear	-
Calibrations - YSI 650 MDS		Time Temple Condlas DONG/L DH ORP(NN) Pringek Dosc	-
0H-4.00= 7.00= 10.00=		(1100) 12.78 803 4.12 6.38 295.1 0.34min Clear (1105) 12.71 810 2.92 6.36 278.7 11 Clear	-
Conductivity reads us in 1413 us 5:4d  Do 90 = 100			- 1
D 76 - 700		(1110) 12,56 812 2.62 6.39 261.5 1 Clear	-
5wc21		(1115) 12.63 813 2.55 6.40 248.3 ( Clear	- 1
DTW-9.95 Bagin Purge (0914)		(1120) 12.78 817 2.53 6.41 235.8 11 Clear (1125) 13.22 817 2.55 6.44 223.0 11 Clear	
Post Purge DTW-10.01 Begin Purge (0914) Post Purge DTW-10.01 Initial Purge-Clear			
Time Temple Condlus Domg/L pH ORP(WW) Pungek	Desc	(1135) 12,98 820 2.48 6.44 210,9 "Clear (1135) 12,93 819 2.45 6.43 206.5 "Clear	
(0914) 13.09 593 8.73 3.31 317.9 0.34 min	n Clear	(1140) 12.84 819 2.42 6.43 203.7 " Clear	
(0915) 13.11 593 8.50 3,29 321.3	Clear	(1140) Readings Stable	-
(0920) 13,11 576 7,00 3,30 371.9 "	Clear	(1201)12.71 816 2.57 6.48 186.5 Post Purge Reading	
(0925) 12.97 583 6.54 3,29 385.5 "	Clear	Sample Time (1145)	
(0930) 13.00 578 6.08 3.29 397.3 "	Clear	Samples Collected: (4)8260,(2)8151,(2)8270,(2)8081	
(0935) 13.08 573 5.45 3.30 408.8 "	Clear	(DCN, (DTM, (1) 9065, (1) Balfide	
(0940) 13,97 569 5,00 3,29 418,6 "	Clear		
(0945) 12.89 566 4.75 3.28 422.1	Clear	5wc23	
(0950) 12.81 563 4.42 3.29 428.9	Clear	Post Purge Drw-9.51  Post Purge Drw-9.51  To. tral Purge - Clear	1
(0955) 12.97 559 4.15 3.30 431.2 "	Clear	Post Purge Drw-9,51 In. Fral Purge - Clear	
(1000) 13.05 558 3.95 3.31 430.6	Clear	Post Purge Drw-9,51 In. Fral Purge - Clear Time Temple Condlus Do Myle pH CRP(MW) Purck Desc	
(1005) 12.89 556 3.91 3.31 434.1 "	Clear	(1215) 12.03 830 5.27 6.83 143.2 0.3 min Clear	
(1005) Readings Stable		(1220) 12,29 830 3,25 6.48 169.6 " Clear	
(1043) 12.81 552 3.96 3.34 425.8 Post Purg	e Reading	(1225) 12.21 828 2.73 6.43 168.4 " Clear	_
Sample Time (1010)		(1230) 12.19 824 2.62 644 166,3 " Clear	
Samples Collected, (4)8260, (2)8151, (2)8270, (2)8081,	(1) TM	(1235) 12,10 824 2.62 6.46 160.1 " Clear	
(1) cN, (1) 9065, (1) Sulfide		(1240) 12,17 823 2.61 6.47 156.5 " Clear	_
		(1245) 12.32 821 2.57 6.47 150.8 " Clear	_ 7
5WDUP	***	(1250) 12.43 224 2.57 6.49 148.7 " Clear	_
Sample Time (1025)	(1) 501	(1250) Readings Stable	_
Samples Collected: (4)8260, (2)8151, (2)8270, (2)8081, (1)TM + Collected at 5wc21 (16) (1)9065, (1) 5014	VII)CN	(1313) 12.76 821 2.58 6.52 153.9 Post Purge Reading	
# Collected at 5wc21 (116) (1)9065, (1) 5alt	100		

4/21/09	RAP	ap	FB‡	-8 4/21/09	RAAF 803204 DAS[7		FB#8
	B03201 DA5/7	70E				Q.C.	
5WC23(Cont)				5WIOA (	ont.)	.)	
Sample	Time (1255)			Time Tev	pp(E) Cond(us) DOM/L p	tt ORP(MV) Purgek	Desc
Samples C	Mected: (4)8260.(	(2)8270,(2)8151	1808(2)	(1519)14		50 116.4 0.34 min	Clear
	(1)TM,(1)	)cn, (i)9065, (i)	Sultide	50	mple Time (1510) mples Collected: (4)8260, (	2)2270 (:)7714	
				29	nples collected. (4) 8240, (	x/82/0,(1)114	
5W9A	T	20 0 m (1324)		5WILA			
Dtw-2.50	J	Bajin Parge (1334) Pal Parge - Clear	2.,	DTW-1	0,93 Rec	in Puroje (1534)	
Post Purge DTW-2.5		pit orp(MV	Purpe K Dos	2 2	-12.04 Tation	1 Purge-Clear	
(1335) 13.67	Cond(as) Dong/c 405 4.32	7.19 136.2	0.3 min Clea		p(E) Cond(us) Do mg/L pH		sc
(1340) 13.98	392 4,45	7,27 134,6	li clea	1		44 .	
(1345) 14.18	387 4:47	7.30 133.5	11 Clea			. 11	ar
(1350) 14,51	383 4.49	7.32 132.3	11 Clea		14 648 2.41 6.33		
(1355) 14.67	382 4.45	7.33 131.6	" Clea			3 113.4 " Cle	ar
(1400) 14,29	380 4.41	7.28 134.4	" Clea	7		//	
(1405) 13.84	380 4,39	7,27 133,9	11 Clea	43			
(1405) Reading	s Stable			(1605)14		108,6	
(1419) 14.16	377 4.46	7.32 126.1	Post Purge Readin	(1610)14		107,4 Clea	r
Samo	ble Time (1410)		, ,	(1610) Ka	adings Stable	100 ( 2 ( 0 )	1.
Samples	Collected (4) 8260	, (2)8270, (i)Ti	М	(1626)14	41 626 2.55 6.35	100.6 Post Kurge Kea	ding
					Sample Time (1615)	(2)022 (1) The	
560A		0 ///		Ja	mples Collected: (4)8260,	(2)8910, (1) 119	
DTW-14.37		Begin Punge (1433		1			
Post Purge DTW-14.5		Hial Purge-Clear	Dark Die				
Time Temp(E)	Cond(us) Dorg/L 387 2.92	7.45 124.0	Purgek Des 0.3 / min Cle				
(1435) 14,87	384 2.79	7.47 123.8	1) Clea	1			
(1445) 14,76	381 2.76	7.45 124.2	11 Clea				
(1450)14,16	377 2.80	7.45 122.3	11 Clea				
(1455) 14,21	374 2.84	7.45 120.2	11 Clea				
(1500) 14.07	374 2,83	7,46 118,1	11 Clea				
(1505)14,30	374 2.90	7,47 114,2	11 Clear				
(1505) Reading	s Stable						
		18)			(119		



		Florid	Alinha	RAAP	F8#8
6/10/09	RAAP B03204-07	FB# 8	6/10/09	B03204-07 DAST TOPE	
	DAS ITAE.			verification	
5WC22			5W5B		
DTW - 815	Begin Parge (1141)	<i>c</i>	DTW-8.34	Begin Purge (1428)	
Post Purge DIW -2	P.59 Initial Purge-Clear Ochollus Dong/L pt off(MU) Purg	Warn Dosc	Part Dame Dille 9 73	Initial Purae - Clear	
		34min Clear	Time Touck Cody	) DOM/L pH ORP(MV) Purgelelap	W) Desc
(1145) 16,50 (1150) 16,49	895 2.76 6.07 199.7 0. 927 2.73 6.08 197.0	11 Clear	1430) 14.46 587	6,59 5.33 162.4 0.34min	Clear
	955 2.81 6.12 191.8	1) Clear	(1435) 14.05 620	6,39 5,32 173.3	Clear
(1155) 14.63 (1200) 16.50	978 2.85 6.14 184.4	11 Clear	(1440)13,78 622	6.44 5.32 180.5	Clear
(1205) 16.43	982 2.89 6.15 182.7	Clear	(1445)13.82 629	6.52 5.37 183.9 "	Clear
(1210) 16.32	986 2.92 6.19 164,3	Clear	(1450)13.94 624	4.58 5.40 185.7 "	Clear
(1215)16.34	988 2.85 6.17 167.5	11 Clear	(1455)13,87 624	6,55 5.42 186.7	Clear
(1220)16.30	989 2.86 6.17 169.6	11 Clear		6.60 5.43 187.5	Clear
(1220) Readi			(1500) Readings 5	table .	
	Dample Time (1225)		Sample 7	Time (1505)	
Samo	les Collected: (2)8081, (2)8081		Samples Colleck	ed:(3)8260,(3)8260,(2)8081,(a)80	981
,	,				
5wc23			5W7B	P. D. (1827)	
DTW-7,9	14 Begin Purge (1306	)	DTW-8.68	Begin Parge (1537) Initial Purge-Clear	
Post Purge DTW-7.	95 Initial Purge-Clear		Post Purge DTW - 8.73	Initial ruige-cleur	N Dose
Time Temple		(gpm) Desc	Time Temple Conduct	8.00 3.34 377.8 0.34 min	Clear
(1310) 16,90	927 3.81 6.32 141.3 0.34		(1540) 15,22 264	8.00 3.34 377.8 0.39 min 7.90 3.27 406.5 11	Clear
(1315) 16.94		Clear	(1545) 14.64 263 (1550) 14.52 262	7.88 3,27 417.1	Clear
(1320) 16.67	1101 3.46 6.25 147.8	Clear	(1555)14,46 264	7.85 3.29 425.6	Clear
(1325)/6.61	1117 3.33 6.24 147.3	Clear Clear	(1600)14.35 267	7.87 3.32 433.3 ''	Clear
(1330)16.85	112 3.36 6.23 146.4	Clear	(1605)13.96 265	7.86 3.36 430.7	Clear
(1335)16.99	1117 3,31 6,23 147.4	Clear	(1610)13,90 265		Clear
(1340)14,97			(1610) Readings Sta		
(1345)17.03	116 3.35 6.22 148,1 inas Stable	de la man i	· Sample 7	Tme(1615)	
(1373) Nead	Sample Time (1350)		Samples Collec	ed: (3)8240, (3)8240, (2)8081, (2)80	81
2	ples Collected: (2)8081, (2)8081				
JOWN	spes concerts, wiscon jes over				
				(123)	
	(122)				

	Alulas TAAD	FB#18
6/11/09  RAAP-Verification  BO3204-6  DASTIGE	6/11/09 RAAP B03204-01 DAS/TGE	I DAG
DASTQE		
General Notes	16/400	
Weather - Overcast, 70's	DTW + 70.14 Begin Ruge (1151)	
PPE-Eye Protection, Nitrilo gloves	Post Purge Disi-70.65 Initial Purge-Clear	
Calibrations - YSI 450 MDS	Time Temple Condlus Dong/L pH ORP(MV) Purgek	phi vesc
pH-4.00=4.00,7.00=7.00,10.00=9.98	(1155) 1551 203 8.08 4.95 212.6 40.34/1	
Conductivity reads 1413 us in 1413 us std	(1200) 15.99 177 4.70 488 173.5	Clear
Do % = 100	(1205) 16.10 163 4.36 4.91 162.7	Clear
	(1210) 16.08 136 4.07 4.99 140.9	Clear
· Dedicated tubing and well skirts used at each well	(1215) 15,91 154 3.84 5.01 136.8	Clear
· All equipment decored between each well	(1220) 15.76 154 3.72 5.00 134.4	Clear
· Purge water disposed of at dedicated location ensite	(1220) Readings Stable	
· All samples collected, stored and transported in coolers on ice	Sample Time (1225)	
THE SAMPLES CONFERENCE STORED AND THE THAT THE THE TELEVISION TO	Samples Coilected (3) 8260, (3) 8260	
7mw6		
DTW-24.76 Begin Purge (1003)	IODDH2R	
Post Purge DTW-30.22 Initial Purge-Clear	DTW-17.62 Begin Purge (1249)	
Time Temple Condlus Dong DH ORPLAN Purgeklapan Desc	Post Purge DTW-17.68 Initial Purge-Clear	
1	Time Temple Condlus DOBL AH ORPLAND Pungeklapu	) Desc
	(1256) 14,51 543 5198 6.79 30,4 0,34 min	Clear
(	(1255) 14.39 611 3.15 6.28 21.5	Clear
	(1300) 14.07 636 2.80 6.90 20.1 "	Clear
(1020) 14.96 1894 4.13 6.88 - 106.4 " Clear	(1305) 13,87 625 2.98 6.76 39.7 "	Clear
(1025) 14,97 1845 3.95 6.92 -105.6 " Clear	(1310)13.81 524 3.56 6.49 59.5 "	Clear
(1030) 14.91 1797 3.82 6.99 - 100.1 " Clear	(1315)13.81 434 4.37 6.34 76.7 "	Clear
(1035)14.91 1780 3.73 7.03 -102.9 " Clear	(1320)14.08 374 5.39 6.30 86.2 "	Clear
(1035) Readings Stable	(1325)13,99 368 5,56 6,28 89,5	Clear
Sample Time (1040)	(1330)14.00 363 5.66 6.27 91.8	Clear
Samples Collected: (3) 8260, (3) 8260	(1330) Readings Stable	
	Sample Time (1335)	
	Samples Collected: (3) 8260, (3) 8260	
	Damples Collected: (3)8260, (3)8260	welcher not
		KIILU
(124)	(123)	
		Markey - Price II a November 1984

10/6/09	RAI	4P 1-07	tookeel a bullen 1967	TRibuted to the year Laft	FB#8	10/7/09	3	RAAP 03204-07	F	8#8
	DA6/7	QE				C		DAS/TOE		
34 7						General Note				
14-3	· D	. 0 .	11004			Weather-		Inila almas		
Drw-56.77		egin run	ge (1554)	-		Calib li	ms - YSI 6	strile gloves		
Purge DTW-62.15	Jait1	al Purge	reolui)	D . L	Desc	Callbratio	0 = 400 7	00 = 7.00 10 0	2=10.00	
Time Tempé Condle		-		Purgek 0.34min		P 1 -4.00	ity con 1	00 = 7,00 , 10.00 113 us in 1413.	115 54	
(1555) 15.36 242			131.7	0.3 /min				119 115 11 1415.	us sia	
(1600) 15.27 240		7,54	129,5	11	Clear /	Do % =		skirts used at ea	ch well	
(1605) 14,74 232		7.72		11				tween each well	i we ii	
(1610) 14.30 229	6.40	7.78	123,9	11	Clear	e Purced water	s diegoged of	at dedicated loca	tion onsite	
(1615) 14,28 228	6,28	7.81		11	Clear	o All condes	a Marchal chan	I and tome as about	in coolect of	ico
(1620) 14.69 228	6.31	7.81	120.7	11	Clear	MII Samples	Collected) 5 1016	d and transported	IN CLOSE IS CI	, 100
(1625) 15.10 228	6.36	7,87	118.8	1)	Clear	State	hope La	rel Table-Un	1+16	
(1430) 15.14 228	6.36	1101	110.0		Clear	WELL		0 (0 0 1	Notes	
(1630) Readings Sto	able	721	1219	D. LP	e Reading	16-1	DTW +3.99	47.49	101-5	
(1646) 14.72 225	11136	1 1101	10011	1051 larg	* rendering	16-2	55.76	55.79		
Sample Ti	me (1633)	(2) 0011	(2)0270	(2)-+NA		16-3	56.77	62.15		
Samples Collecte	9:(6)8260)	(218011	) (d) 8&10	,(2) 1101		16-5	4.67	9.74		
						16WC2B	53.53	57.75		
					•	16MW8	73.96	75.34		
						16WC1B	69.53	69.76		
						16WCIA	69.21	70.89		
						16MW9	66.31	66.78		
						1601	48.76			
							1-1-1-1		DTW-ONLY	
						16CDH3	DRY		if	
						1623	68.25		17	
						16WCAA	DRY		17	
						*				
	(7.	36						(37)		

1017/09	RAAP B03204-07 DAS/TQE	F8#8	10/7/09		RAAP B03204+07 D145/179E		FB#8
	DASTRE		11.10.00		DIAS / TQE		
16-1	7 0 /200		16WC2B	-2	Begin Parge	41154)	
DTW-43.99	Begin Purge (0939 149 Initial Purge - 51 Clo	1	Part O Trul	.53	Initial Purge-	Claur	
Post Purge DTW - 47	Initial Punge - 51 Clo	way	To strange DIW	C I( ) In Mig/	pt orp(mu)	Prock Desc	DTW
Time Temple L	Condais Do 1/2 pt ORP(an) Pu	rger Desc Drw			7.64 146.7	0,3 Truin Clear	54.60
1		Min Si. Clarde 45,45	(1155) 16.67 (1200) 15.74		7.48 149.7	" Clear	55.28
	541 7.08 6.92 205.1	11 Si. Cloudy 46.08	(1205) 15.57		7.58 117.3	" Clear	55.89
K		Clear 46,36	(1210)15.98		7.58 115.2	" Clear	56.01
	141 6.58 6.97 190.6	Clear 46,82 1	(1215) 16,20		7.58 //3.9	" Clear	56.14
7 0	128 6.47 6.94 188.4	Clear 46.96 Clear 47.13	(1220)16.57	274 1.46	7.63 102.8	" Clear	56.51
7 - 2	22 6.42 6.99 183.0	11	(1225)16.19		7.61 104.3	11 Clear	56.76 /
	18 6.46 7.01 180,2	" Clear 47.22	(1230)16,40		7.58 104,2	" Clear	56.92
(1010) Readings	Stable	10.00	(1235)14.57	31,751	1.59 100.3	" Clear	57,04
(1025)16,14 4	404 6.70 6.95 172.7 Pe	ost runge Keadings	(1235) Readii		7000		
Sampl	e Time (1015)	24	(1251)458	272 114	7.45 109.8	Post Purge Read	ling
Samples	Collected: (3)8260, (2)8270, (1) TI	0	Saw	ple Time (1240			3
44.0			Sample	C. Upr Lod (3)83	360, (2)8270, (1)	tm	
16-2	Basi D. va (1638		Sample	) Collected ( 3)00	, , , , , , , , , , , , , , , , , , , ,		х .
016-55.16	Bazin Punge (1039	200	16MW8				
Post Purge DTW-55	5.79 Initial Runge-Cle	ok Desc Mil	DTW-7:	396	Begin Purge	(1307)	
	ond(us) Dom/L pH ORP(MV) Run	Main Clear 55.77	Post Parge DTU	75.34	Initial Purge	e-Clear	
	0 1 10 1-2 5	Clear 55.77	Time Tomol	(c) (cod(us) Dong	L pH ORPINU	) Pungel Dosc	DTW
		Clear 55.78	(1310) 16.46	111 247	5.34 232.1	0.34 min Clear	74.39
(1050) 15.20 3		' Clear 55.78	(1315) 16.70			Clear	74.59
7	583 4.16 6.61 169.2 "	" Clear 55,78	(1320) 16.69			11	74.67
	11.10	11 Clear 55.78	(1325)16.95		4,97 179.0	h Clear	74.74
(1105) 15, 10 5		11 Clear 55.79	(1330)17.37		5.00 174.3	" Clear	74.84
		11 Clear 55.78	(1335)17.62		5,02 170.0	Clear	74.93
(1115) 15.05 5	10	00,10	(1340)17.38		4.98 168.1	" Clear	75.17
(1115) Readings (1130) 4.90 5	1 - 1	st Pierce Reading	(1340) Ready	ngs Stable			
(130) 4:10 3	ple Time (1120)		(1354)17.82	27 1.23	5.03 157.6	Post lurge k	lead ive
Jam	Collected: (3) 8260, (2) 8270, (	i) TM	50	mas la Timese (1	1345)		
Samples			San	ples Collected: (3)	8260 (39) (2)827	0,(i) TM	
	138				(157)		STREET OF THE PROPERTY OF

0.00	THE PARTY OF THE P	10/0/-0	2110	
10/7/09 RAAP B03204-07 DASITRE	F8#8	10/2/09	B03204-07 D45/19E	FB# 8
DAS 1 10 E			D45/10E	
16-5	5 5 6	General Notes		
DTW-4.67 Begin Purge (1423)		weather-Sun	14.705	
Post Purge Drw-9.74 Initial Purge-Clear		PPE-ENO Prot	ection, Nitribe glow	A & C
Time Temple Condlais) Domsk pH ORP(MW) Punge	K Dock Drul	Calibratins	YS1 650 MDS	765
Time temples conditions to the pit orrents large	in Clear 5.64		0,7.00 = 7.00	10.00 - 10.00
		9 1 1-10	2 1 413	10.00 - 10.00
(1430) 16,44 418 2.01 6,89 120,0 "	Clear 6.33	Conductivity	reads 1413 us in	1413 us 8ta
(1435) 16.92 431 1.77 6.88 118.8	Clear (0.91)	Do70 = 100	) \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
(1440) 17.07 432 1.75 6.89 118.4 "	Clear 7.11 V	· Dedicated tubing a	nd well skirts used	at each well
(1445) 17,20 437 1,78 6,89 117,7	Clear 7,28	· All equipment di	econed between each	h well
	Clear 7.48	· Punge wader dispose	ed of at dedicated	location orsite
(1455) 16.54 437 1.70 6.77 119.4	clear 8,13	· All samples collect	ed, stored and trans	ported on ice in coolers
(1455) Rondings Stable				
(1512)16.52 435 2.35 6.80 123.9 Post R	wee Reading	16MW9		
Sample Time (1500)	of receiving		Begin Purge (	093/2)
C 1 (1) (1) (2) (2) (2) (2) (2) (1) THA		Post Purge DTW-66.78	Initial Purge-	Clear
Samples Collected: (3)8260, (2)8270, (1) TM		The Toronto Carlo	) Days at adocu	I Purget Dosc DTW
			Dul DIT OKUM	, U <sub>0</sub>
12.0 *		7		0.3 min (lear 66.43
16Spring	/	(0945) 14.79 751	5.49 6.61 161.4	24
Time Temple Condlus Do" L pH ORAM	V	(0950) 15.47 834	3.32 6.53 91.7	2.0
(1530) 13.70 471 6.86 6.79 79.4		(0955/15.01 834	2.39 6.50 83.4	" Clear 66.59
		[1000] 15,18 828	2.34 6.47 80.3	" Clear 66.45"
Sample Time (1535)		(1005) 15,67 803	2.19 6.45 80.7	" Clear 66.51
Samples Collected: (3) 8260, (2) 8270, (1) TM		(1010) 16.05 759	2.26 6.38 79.2	" Clear 66.51
January Company of the State of			2.28 6.40 78.8	" Clear 66.51
			2.31 6.40 79.3	" Clear 66.52
		(1026) Readings Sta		7,041
			2.20 4.34 74.2	P. + D. P. 1°
			11000	Post Purge Reading
	×	Sample Ti		
1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	- 1	Jamples Collect	ed:(3)8260,(2)8270,(1)T	PM
(140)				

1018/09 F8#8 10	10/2/09 BAAP F-B# 8
DAS / 70E	10/2/09 RAAP F-6#8 B03204-07 DAS/70E
16WCIA	16WC1B(Cont.)
DTW-69.21 Begin Purge (1102)	Time Temple Condlus DOML pH ORPHIN Parget Desc DTW
Past Purge DIW-10,89 Initial runge-Clear	(1300) 16.09 334 2.06 5.69 154.1 0.37min Clear 69.67
Time Temple Condlass DOM/2 pt ORPLAN Purgek Desc DTW	(1305) 15.84 320 1.90 5.65 154.6 " Clear 69.67
(1103) 13.10 913	(1310) 15.68 290 1.52 5.62 153.7 " Clear 69.69
(1/10) 1313 301 6.00 4.15	(1315)15.52 285 1.44 5.62 152.9 " Clear 69.69
CIVS ISING	(1320) 15.41 281 1.42 5.62 151.4 Clear 69.70
	(1325) 15.63 279 1.37 5.63 149.8 " Clear 69.71
	(1325) Readings Stable
(1130)15.10 626 2181 6.12 4d.d Clear 69.10	(1341) 15.55 278 1.35 5.75 141.9 Post Purge Reading
(1135) 15.03 622 2.60 6.72 37,5 " Clear 69.72	Sample Time (1330)
(1146) 15.26 620 2,34 6.73 35.8 " Clear 69.70	Samples Collected: (3)8260, (2)8270, (1) TM
(1145) 15,64 619 dill 6113 36.6 Clew 69110	
(1.05)	1661
(1155) 15.81 620 2.05 6.77 30,1 " Clear 69.70	DTW-48.76 Begin Parge (1358)
(1135) 10001125 0010	Time Temple Cond(us) Domg/2 DH ORMAN Purgek Desc DTW
	1400) 1598 616 3.98 6.53 114,3 0.34 min Clear 48,77 (1405) 16.09 617 2.50 6.21 122.8 11 Clear 48.79
Jamples Corrected. (1) one of the	
7	
16WDUP	1420)16,83 608 1.86 6.17 117.3 "Clear 48.79 (1425)16.34 605 1.68 6.16 115.5 "Clear 48.79
	(1430)16.10 602 1.63 6.14 115.0 " Clear 48.79
201111 162 00 1111	(1435)16.19 600 1.59 6.14 114.4 " Clear 48.79
	(1440)16.25 599 1.55 6.15 112.7 " Clear 48.79
	(1440) Readings Stable
21.03	(1455) 16/13 604 1.41 6.16 115.3 Post Parge Reading
Post Purge Dow - 69.76 Initial Purge - Clear Time Temple Condlas Dom/L p. H. ORPhin Purgek Desc DTW	Sample Time (1445)
	Samples Collected: (3) 8260, (2) 8270, (1) TM
(1245) 16.23 338 8.04 6.33 178.1 0.37 min Clear 64.65 (1250) 16.33 368 5.11 6.07 164.0 " Clear 69.66	
(1255) 16.25 383 3.23 5.86 152.1 " Clear 69.66	
(1300) 16.16 368 2.60 5.76 152.6 " Clear 69.67	
142	(143)

Clear 69.67 Clear 69.69 Clear 69.69 Clear 69.70

n Clear 48.79 / Clear 48.79 / Clear 48.79 Clear 48.79

10/19/09 RAAP B03204-07	F6#8	10/19/09 RAAP BOBRY-07	F8#8
13MW6 (Cont)  Sample Time (1030)  Samples Collected: (3)8260, (2)8270, (1  13MW7  DTW - 16, 23  Post Purge DtW - 16, 34  Time Temple Condas Dougle p. H. (1055) 14,14 532 4,84 6,90  (1100) 14,19 601 2,72 6,84  (1105) 14,28 648 1,50 6,83  (1110) 14,47 667 1,25 6,83  (1115) 14,69 675 1,21 6,83	1)7M,(1)314.0,(3)8332/8330  Purge (1052)  Purge - Clear	7W12B  DTW-24.84  Bogin Purge (1227)  Post Purge DTW-24.86  Tinitial Purge-  Time Temple Cond(us) DOUL pt ORT(MV) Purgek Desc  (1228) 14.26 616 8.21 708 168.4 0.37min Clear  (1230) 14.31 616 7.96 7.06 168.9 " Clear  (1235) 14.27 616 7.76 7.03 167.8 " Clear  (1240) 14.33 617 7.70 7.02 167.7 " Clear	DTW 24.86
(1125)14.94 671 1.17 6.79 (1125) Readings Stable (1140)14,62 668 1.23 6.77	159.3 " Clear  157. H Post Purge Reading  10, (1) TM, (1) 314.0, (3) 8332/8330	Samples Cellected. (2) 8270, (1) TM, (1) EN  7W9C  DTW-14,52  Post Parge DTW-16,77  Tritial Purge-Clear	
Static Water Leve	1 Table - Unit 7 Post furge DTW Notes 24.86 16.77 16.00 22.86 21.05	Time Temple Cond(we) Do" PH ORTUN Runge K Desc (1335) 13.41 1073 2.61 6.85 60.7 0.3 min Clear (1340) 13.38 1077 2.05 4.78 71.8 " Clear (1345) 13.70 1085 1.58 6.77 83,7 " Clear (1350) 13.80 1091 1.50 6.77 90.0 " Clear (1355) 14.03 1096 1.36 6.76 93.2 " Clear (1400) 14.29 1098 1.27 6.76 91.6 " Clear (1405) 14.42 1102 1.24 6.75 90.1 " Clear	15.61 15.72 15.81 15.90 J 16.02 16.07 16.14
7mw6 26.41 7mw6 26.41 7w1B 25.15 7wcA 24.71 7w98 w26924.62 22.6 7w11 24.42 7mw5 24.95	31.55 25.18 25.63 8 SWL ONLY	(1405) Readings Stable (1423)14.63 1102 1.30 6.69 90.5 Post Punge R Sample Time (1410) Samples Collected: (2)8270, (1) TM, (1) CN	leading

10/19/09 RAAP	FB#8	10/20/09 RA	AP F8#8
10/19/09 RAAP BO3204-07 DASTIGE	1 13 10	10 20 09 RAI 3032C DAS	1-07 170E
7W108		General Notes	
DTW-15.57 Begin Pange (1438)		Weather-Sunny, 60's	
Part Purce DTW - 1/200 Taitie Purge - Clear		PPE-Eye Protection, Ditri	le gloves, Cotton suits
Time Temple Cond(us) DOMS/L PH ORP(MO) Parget Desc	DTW	Calibrations - YSI 650	
(1440) 1353 832 3.55 6.82 122.7 0.34min Clear	16.18	pH-4.00=4.00 ,7.00	=7.00 , 10.00 = 10.00
(1445) 13.44 828 2.84 6.75 128.0 " Clear		Conductivity reads 14	13 us in 1413 us Std
(1450) 13.31 815 2.40 6.74 128,3 " Clear	15.98	Do% = 100	
(1455) 13.37 813 2,22 6,76 126.5 " Clear	15.93	· Dedicated tubing and well skirts	used at each well
(1500) 13,29 811 2.09 6.77 125,9 " Clear	15.87 √	· All equipment deconed between	en each well
(1505) 13.44 808 1.96 6.77 125.0 " Clear	15.87	· Purge water disposed of at a	ledicales location onsite
(1510)13,57 806 1,95 6,77 124.6 "Clear	15.85	· All samples collected, stored and	transported on ice in coolers
(1510) Readings Stable	J A		
(1528) 13.78 797 1.88 6.80 125,8 Post Purge Ro	eading	13mw4	2 . 0 . (277)
Sample Time (1515)		Post Purge DTW-16.90 In	Hal Purge -
Samples Collected: (2) 8270, (1) TM, (1) CN		Time Temp (E) Condiers) Dough	H apple Dunk Des Dall
7i noc			47 228.4 0,3 Ywin Clear 16.88
7W10C  DTW-21.59  Begin Purge (1546)			03 200.6 11 Clear
Post Purge DTW -22.86 Initial Purge - Clear		(0740) 13.40 545 2.36 7.	. 43
Time Temple Condlus Dong/L pH ORP(MV) Purgek Des	C DTW		14 188.2 " Clear
(1541) 13.25 719 2.35 7.16 -52.0 0.34 min Clear	21.85		14 183.9 11 Clear 16,88
(1545) 13,22 719 1.60 7.07 -27,1 " Clear	The state of the s	(0755) 13.93 571 2.10 7,1	
	22.19	(0800)13,98 570 2,07 7,1	2 176.5 " Clear
	22.26	(0800) Readings Stable	
	22.53	(0839)14,10 520 3.15 6.7	11 170.6 Post Purge Roading
	22.61	Sample Time (0805)	
(1615) 12.83 720 0.80 7.04 26.0 "Clear	22.70	Samples Collected! (3) 2240, (2) 23	270, (1) mm, (1) 314.0, (3) 8332/8330
(1615) Readings Stable			
(1634)12.58 717 0.79 7.06 32.3 Post Purge K	eading	13WDUP (282)	
Sample Time (1620)		Sample Time (0820)	
Samples Collected: (3)8270, (1) TM, (1) CN		Samples Collected: (3)8260, (2)8270	(1) TM, (1) 514.0, (3) 8532/8530
		* Dup samples collected a + 1.	3/11ω7
[H8]		. (1)	19)
(TIO)			

10/20/09 RAAP	FB#8	10/20/09 RAAP PB#8
B03204-07 Das/TQE		B03204-07 DAS/TOE
13Mula.		7W13 DTW-19.28 Begin Purge (1123)
Post Purge DTW-2288 Initial Purge-Clear		Post Purge DTW-21.05 Initial Rurge-Clear
Post Purge DTW-2288 Initial Purge-Clear Time Temple) Condlaws) DOMG/L pt ORP(M) Purgek Desc.	DTW	Time Temp(2) Condlus DO 19/L pH ORP(MV) Pangek Desc DTW
(0855) 12.98 663 5.67 6.85 170.3 0.37min Clear	22,10	(1125) 13,89 1383 4,39 7,28 -6.6 0.34min Clear 20.62
(0900) 13.01 667 4.30 6.85 165.8 " Clear	22.28	(1130) 13.84 1398 2.01 7.23 -41.8 " Clear 20.84
(0905) 13,01 669 3.50 6.86 161,5 " Clear	22,38 √	(1135) 13.99 1398 1.62 7.21 -42.4 " Clear 21.06 V
(0910)12.87 671 3,29 6.86 159.8 " Clear	22,50	(1140) 14,23 /399 1.61 7,20 -36.0 " Clear 21.00
(0915) 12.63 672 3,16 6.86 157.2 " Clear	22.59	>1175)17131 7310 7160 -31.1 CICHI 211,00
(0920) 12.49 671 3.13 6.86 1567 " Clear	22.61	(1150)14,80 1398 1.65 7.21 -28.9 " Clear 20.90
(0925) 12,25 6/2 5/12 6.86 155.5 CIECU	22.64	(1155)14.93 1397 1.64 7.21 -30.0 "Clear 20.81 (1155) Readings Stable
(0925) Readings Stable	/ `	(1213) 14.64 1393 1.83 7.2 -19.7 Post Purge Reading
(0946)12,31 665 3.22 6,85 151.5 Post Purge Rea	ding	Sample Time (1200)
Sample Time (0930) Samples Collected (3)8260, (2)8270, (1)714, (1)314.0, (3)8335	1/8330	Samples Collected: (2)8270, (1) TM, (1) CN
Samples Collected (3704 40, (17141, (1751 110))	7000	J. 11, 125 Control (12, 12, 12)
13Mwl	,	7mw6_
DTW-21.52 Begin Purge (0959)	$\sqrt{}$	DTW-26.41 Begin Parge (+231)
Pat Para Dru - 21.73 Traffal Barge - Clear		rostruge DIW-21133 Initial Burge-Clear
Time Temp (E) Condlows) DOM9/2 DH DRP(MU) Purgel Dosc	DTW	Time Temple Condlus DOM/2 pH ORP(M) Purget Desc DTW
(1000) 12.56 593 6.90 6.82 157.9 0.37min Clear	21.71	(1235) 14.43 1679 1.70 7.30 -23,2 0.37 min Clear 28.76 V
(1005) 12.56 645 5.41 6.80 152.2 " Clear	21.70	(1240)14.75 1715 1,23 7.15 -44.7 " Clear 29.66 (1245)15 17 1731 1.05 7.09 -55.1 " Class 29.66
(1010) 12,74 467 4,67 6,80 147.0 " Clear		(1245)15.10 1731 1.05 7.09 -55.1 " Clear 29.66 (1250)15.15 1732 0.95 7.08 -60.7 " Clear 29.89
(1015) 12.79 690 4.34 6.81 143.11 " Clear (1020) 12.90 706 4.20 6.81 139.18 " Clear	X1,66	(1255)15.34 1716 0.94 7.07 -64.8 " Clear 30.10
(1000) 101/10 100	2164	(1300)15,64 1700 0.95 7.08 -65.7 " Clear 30.45
(1025) 13.06 714 4.09 6.81 137.2 " Clear (1030) 13.18 719 3.99 6.81 135.6 " Clear	arie [	(1305)15.76 1688 0.95 7.10 -64.2 " Clear 30.77
(1035)13.27 722 3,90 618 132.6 "Clear		(1305) Readings Stable
(1035) Readings Stable		(1324)15.43 1656 0.98 7.07 -61.7 Post Purge Reading
(1057) 13,51 725 3.64 6.83 131,2 Post Purge Re	ading	Sample Time (1310)
SCAR 01- Trans (1040)	~	Samples Collected (2)8270, (1) TM, (1) CN
Samples Colleded: (3)8260, (2)8270, (1)TM, (1)314.0, (3)8332/8.	330	
		GED 7
(150)		(151)

PADD PADD	PB#8	10/21/09	RAAP	FB#8
10/20/09  RAAP  80 3204-07  PAS/TOE	1040		B03204-07 DAS /TOE	
		General Notes		
7W11B  Basin Purge (1335)			Sunny, 60's	
Post Purge DTW-25,18  Post Purge DTW-25,18  Tribal Purge - Clear		PPE-EVER	retection, Nitrile 9 bues	
Time Temple Condaus Dough pt orphing Pungek Desc	DTW	Calibration	25 - YSI 650 MDS	
(1335) 14,69 869 4,41 6.44 71,6 0,34min Clear	25,17		= 4.00 , 7.00 = 7.00 , 10.0	00 = 9,99
(1340) 14,95 875 2,58 4,35 74.2 " Clear	25.16	Sonducti	vity reads 1413 us in 1413	3 us std
(1345) 15,26 886 2,05 6.37 74.9 " Chear	25.16	Do % = 1		
(1350) 15.43 891 1.86 6.38 74,3 11 Clear	25:15			
(1355) 1554 993 1,84 6,39 74,2 11 Clear	25,15	Static	Water Level Table - Un	nit 10
[1400 15.70 893 1.84 6.39 74.5 " Clear	25.16	Control of the Contro	DTW Post Punge DT	The state of the s
(1405)15,59 895 1,80 6.40 74.6 "Clear		10DDH2R		
(1405) Randings Stable.		1003	12,28 18,34	V
(1435) 15,22 906 1.73 12,05 76,5 Post lunge Real Sample Time (1410)	ding	10 D3D	18.43 18.47	
Sample Time (1410)	)	10,000	18.24 18.34	
Samples (allected: (6)8270, (3) TM, (3) CN		1004	22.73	
Sample				
7WCA		10MWL		
Dyu - 24.71 Begin Purge (1449)		DTW-18.2	4 Begin Purge (093	34)
Post Purge Dity -25.63 Initial Purge-Clear		Post Punge DTW - 18	7.34 Initial Purge-Ci	ear
Time Temple Condas Dong pt of Orlaw Parget Desc	e DTW	Time Temple	Condlus Dougle DH ORP(MU)	Pangek Desc DTW
(1450) 14,42 970 2,47 6,77 75,7 0,39min Clear	25.78	(0935) 14.32	442 9.01 7.18 219.2	0.34/min Cleur 18.31
(1455) 14,39 966 1,65 6,70 791 " Clear		(0940) 14,03	424 8,17 7,37 225,6	11 Clear
(1500) 14.33 962 1.24 6.68 79.1 " Clear	25.40	(0945) 13,99		" Clear 18.30 ,
(1505) 14,37 961 1.06 6,69 78,9 11 Clear		(8950) 13.92	401 8,03 7,36 224.5	11 Clear 11
	r 25,41	(0955)13,70	394 8,01 7,35 221.7	Clear
(1515)14.34 960 0.93 6.70 78.3 11 Clear		(1000)13.58	383 8.04 7.34 218, 6	'' Clear
(1520)14.22 961 0.90 6.71 78.0 " Clear		(1005)/3.70	376 7.89 7.31 217.7	" Clear 18.31
(1520) Readings Stable	1	(1005) Reading	s Stable	
(1550)14,15 969 1.10 6.75 75.4 Post Purge Rea	ding	(1027)14.17	361 7.63 7.33 210.3	Post Purge Reading
Sample Time (1525)		Sample	Time (1010)	
Samples Collected: (2)8270, (1) TM, (1) CN		Samples Co	(lected: (6) 8260, (2) 8270, (1) TM	, LI) CN
<u>40</u>	(1)			
ple Time (1540) Samples Collected (2)8270, (1) TM, (	(1)CN		700	
Samples Collected at (52) TWCA			(153)	

10/21/09  RAAP  B03204-67  DAS/TAE	F8#8	10/21/09	RAAP B03204-07	FB#8
		1.22	DAS (TOE	
101)30		<u>loddhar</u>		
DTW-18,43 Begin Purge (1047)		DTW-19.78	Begin Purge (1317)  Initial Purge-Clear	
Post Purge DTW-18.47 Initial Purge-Clear	Name of the last o	105+ Kinge DTW-19.83	Initial Purge-Clear	
Time Temple Condlaw DONG/L pH ORP(M) Parget Desc 1	2.15	Time temple (on	dlas Doms/L pH ORP(Mu) Purget	
(1050) 14.72 602 2.84 7.28 -163,9 0.34min Clear 1.	8.45		57 3,23 6.68 <b>5</b> 2,2 0,34mim	
(1055) 14.80 598 1,33 7,19 -173.3 " Clear (1100) 15.03 590 2,02 7,15 -142,1 " Clear	,	(1335) 15,49 51 (1330) 15,50 52		lear is as
(1100) 15:03 590 2:02 7:15 -142.1 "Clear (1105) 15:11 585 2:38 7:13 -116.0 "Clear 18	45 1	(1335) 16.16 52		lear 19,82
(1110) 15,20 576 2.57 7.12 -104.6 " Clear	.75 V	(1340) 16.93 53		ear ear
(1115) 15.23 573 2.65 7,12 -100,9 "Clear		(1345) 17,22 53:		
(1120)15,24 569 2,72 7,11 -96,7 " Clear 18	.45	(1350) 17,47 533		
(1125)15,20 567 2.74 7.10 -94.3 "Clear	, 15	(1350) Readings Sta		
(1125) Readings Stable Purge water had Rotten Egg ode	F	(1408) 17,20 52	0 1.63 6.79 62,9 Post Purge	Peading
(1145)14.92 558 2,89 7,07 - 107.5 Post Ruge Reading		Sample Ti	ime (1355)	
Sample Time (1130)			ted: (18)8260, (4)8270, (3) Tom, (3)0	CN
Samples Collected: (4) 8260, (2) 8270, (1) TM, (1) CN				
		1004		
10D3		DTW-22.73	Begin Range (1423)	
DTW-18.28 Begin Purge (1201)		Post Purge Reading - 22	76 Initial Ringe - Clear	
Post Parge DTW-18.34 Initial Purge-Clear		Time Temple (and		Dosc Drw
Time Temple Cond(aus) DOM/L pH ORP(uw) Purget Desc	DTW	(1425) 16.93 268	8 4.76 6.69 81.5 0.3 min (	lear 28.78
[1205] 15.62 494 4.10 6.99 27,3 0,34min Clear	18.34	(1430) 16,98 257	7 3.94 6.48 86.4 " (	lear
(1210) 16.16 467 3.98 6.96 40.9 (1 Clear	1	(1435) 17,05 251		lear 22.74
(1215) 15.81 452 3.72 6.92 53.5 " Clear		(1440) 17,13 250		lear
(1200) 15136 776 5.60 6.86 6111 Clear		(1445) 17.26 248	3,86 6,93 88,3	ear
(1235) 15.58 439 3.56 6.80 70.6 11 Clear	-	(1450)17,37 249	5.88 (c.75 8011 LI	ear 22.75
(1230) 15.53 440 3.55 6.78 73.3 11 Clear	1	(1455)17.51 248		ear
(1235) 15.45 440 3.53 6.76 78.3 " Clear		(1455) Readings Sta		0 1 -
(1235) Readings Stable		(1516)16.86 246	4.13 6.55 86.8 Post Parge 1	Keading
(1303) 451 3.40 6.75 85.2 Post Purge Roaling			True (1500)	
Sample Time (1240)		samples Collect	ted: (6) 8260, (2) 8270, (1) TM, (1)	(2)
Samples Collected: (6)8260, (2)8270, (1)TM, (1)CN 10DUP Sample Time (1255) Samples Collected: (6)8260, (2)8270, (1)TM	W. ()(A)			
Dup collected at 10D3 (154)	~ (1) (~		(155)	
GWF 12		A CONTROL HE WAS INCOMED TO BE A SHARE WAS INCOME.		

10/36/09 RAAP	FB#S	10/26/09 RAAP FAITS
10/26/09 RAAP BO3204-07 DAS/TRE	1048	10/26/09 RAAP FB#8
General Notes		55W7
Weather-Sanny		DTW-1213 Rain Dung (1222)
PRE-Eye Protection, Nitribe gloves		Post Punge DTW - 12:15 Initial Punge - Clear Time Temple Condaus Domale pH ORP(mo) Pungek Desc DTW
Calibrations - YSI 650 MDS		Time Temple Condais Do 19/2 pH ORP(MO) Parack Desc Drw
Conductivity reads 1413 us in 1413 us Std	- 1	(1030) 16.19 431 7.87 6.46 142,2 0.34min Clear 12.14
ptt - 4.00 = 4.00 ,7,00 = 7.00 , 10.00 = 10.00		(1035) 16,17 437 4.11 6.57 132,4 " Clear
Do % = 100		(1040) 14.34 439 3.63 6.60 127.6 1' Clear
· Dodicaled tubing and well skirts used at each well		(1045) 14.49 441 3,35 6,64 132.9 " Clear 12.14
· All equipment deconed between each well		(1050)16.73 441 3,01 6,69 118.5 " Clear
· All purge water disposed of at dedicated location envite		(1055)16.61 442 2.86 6.71 115.4 " Clear
· All samples collected, stored and transported on iee in coolers		(1100)16.54 441 2.78 6.72 113.9 " Clear 12.15
		(1105)14.51 442 2.73 6,72 1/2.1 " Clear
Static Water Level Table - Unit 5		(105) Readings Stable - Black particles in purge /samok water
WELL DTW Part Purge DTW Notes		(1124)16.53 439 2.80 6.83 106.1 Post Purge Reading
S5W7 12.13 12.15		Sample Time (1110)
S5W5 9,74 10.06		Samples Collected: (3) 8260, (2) 8270, (1) TM
5W9A 3.86 3188		
5WIOA 1628 16,33		\$5w5
SW11A 14.70 15.11	-	DTW-9.74 Begin Pange (1137)
5W88 16,90 17.16		Vost Purge DIW-10.06 In tig Purgo-Clar
5W78 10.44 10.48	1 2 7 1	Time Temple Condlus DOM9/L DH ORP(MV) Purgek Desc DTW
5W5B 11.02 11.88		(1140) 11,18 345 6.67 6.19 119,6 0.37 min Clear 9,96
5wca1 10.80 10.87		(1145) 17.54 332 3.73 6.01 118.3 11 Clear
5WC22 10.88 10.91		(1150) 17,56 326 3.17 5.98 117.4 " elear
5wc 23 10.37 10.56		(1155)17.60 321 2.93 5.96 114.7 " Clear 9.90
SWL ONLY		(1200)17.61 317 2.74 5.95 113.0 " Clear V
5weA 14.91 "		(1205)17.51 317 2.59 5.94 110.6 " Clear 9.90
55W6 1027 101 8.86 11	<u>\</u>	(1210)17.50 315 2.53 5.94 110.3 " clear
S5w8 13.45		(1215)17.47 314 2.49 5.93 109.7 11 Clear
5 WCII 18,84 "		(1215) Readings Stable
5WC12 18.07 "		(1233)17,73 309 2,28 6.03 111.2 Post Purge Reading
		Sample Time (1220)
		Samples Collected: (3) 8260, (2) 8270, (1) TM
(56)		(157)

10/26/09	RAAP BO3204-07	FB#8	10/26/09	RAAP B03204-07 DA6/79E
SW9A	DAS/TQE		- 1112	DAS   79E
Dtw-3.86	Begin Purge (1253)		5WIIA	3 10
Post Pune DW - 3.88	Initial Purge-Clean		DTW-14.70	Begin Pur
Time Temple Co	nd (us) Dong/ pt office) Pur	ack Dosc Die	Post Parge DIW-13.1	Initial Pur
(1255) 14,15		Ymin Clear 3.88	Time Temple Con	
	89 4.90 7.32 134.9 1	1	/ \	60 4,83 6,51 -3 40 4.30 6,53
7	01 1113 1141 1411	Clear 3,88	(120)	40 4.30 6.53 ° 75 4.02 6.56 3
	81 4.40 101 193,0	Clear	(1535) 15,29 80	
(1315) 16.00 3 (1320) 15.98 3°	1 4 1 1 1 1 1	Clear 1	(1540)15.23 81	
(1325) 15.94 39	10 1130 1130		(1545) 15,20 81	
(1325) Readings 5	,	Olar	(1555)15.21 811	
(1342) 15,69 39		+ Runge Reading	(1555) Readings Sta	
Samolas	Collected: (3)8240, (2)8270, (1)	Tim	(1614)14.98 80	
Sample	2 Time (1330)		Sample Til	
			Samples Co	lleckd: (3)8240, (2)827
5WIDA				
Drw-16.28	Begin Purge (1414	)		
Post Purge DW - 16,3.	3 Initial Purge-Clea			
lime lemple) (a	indus) DOPL OFF OKUMU FO	inge K Dese DTW	-	
7 4	100 100	34min Claur 14.31		
	99 2.20 1.71 100.3	" Clear		
	1 1 1 2 2 5	11 Clear	1	
(1436)15.38 3 (1435)15.38 39		11 Clear 16,33		
(1440) 15.39 39	1 11	11 Chear 1		
(1445)15,39 3		" Clear		
(1445) Ronding	5 Stable	V	· Para	
(1505)5.18 3	6 1.68 7.60 93.6 Pos	+ Punge Reading		
5	1. Two (1450)			
Samples	Collected: (3)8240, (2)8270	D(I)TM		

(158)

Purge (1517)
Purge - Clear

ORP(MU) Purge K DOSC DTW

-38,1 0.34 min Clear 15,22

9,9 " Clear

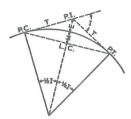
35.6 " Clear 56.7 61.5 Clear 15.01 11 Clear " Clear " Clear 3,4 7. 1 Post Purge Reading 270, (1) Tan

FB#8

(159)

interina	RAAP	FB#8			
10/27/09	B03204-07 DASTTUE				
P 1 11-1-0	U 1108 : V ==				
General Notes	1 Salbred Showers 50's				
Weather-Over	cast, Scattered Showers, 505				
VPE-Eye Protec	tion, Nitrile gloves, Hard Hats				
Calibrations -	YSI 650 MDS	79			
pH - 4.00 = 4.	.00 ,7.00 = 7.00 , 10.00 = 9.5	Std			
Conductivity	reads 1413 us in 1413 us				
70 cg - 100					
· Dedicated tubing	g and well skirts used at ea	(0.1) 0(0.1)			
All an inment	decembed between each we				
D lac die	reser at at applicate localin	naloge an ice			
· All samples collec	ted stored and transported in c	oolers on too			
*					
1004	- 1 /1000	V			
DTW - 22.75	Begin Purge (1559)	)			
Post Purge DTW -	Initial Purge - Clear	k D . a DTM			
Time Temple Cons	1	ek Dese DTW			
(1600) 14.78 3.	22 4.94 6.18 11711 010	Irum Clear 22.76			
(1605) 14.71 30	08 3,50 6,61 113.0	Clear Class			
(1610) 14.78 30	93 3.33 6.63 11 dis	Chear 22.70			
(1615) 14.82 30	00 3.31 6.69 110,0	11 Clear 22.78			
(1620)14.82 29	99 3.40 6.67 111.8	Clear			
(1625)14.91 29	9 3.53 6.67 111.6	Clear			
(1630)14.93 29	9 3.54 6.67 111.5	11 Clear			
1110-100	c Clabla	24 0 0 :			
111-41 15:01 29	18 3,69 6,61 112,6 Pag	+ Purge Koading			
Sam	10 le Time (1635)				
Samola	s Collected: (1) CN	completed			
Jevery C.		MARIENOS			
5WDUP		2316			
Samples Collected: (3)8260, (2)8270, (1) TM					
of Cali	* I astinued in the 10 DOOK to				
V D I	La sample collected at 54	JC21			
* Duplico	* Duplicate sample collected at 5WC21				

### CURVE AND REDUCTION TABLES



#### CURVE FORMULAS

 $: R = \frac{50}{\sin D/2}$ 

2. Degree of Curve:  $D=100 \frac{I}{L}$ . Also,  $\sin D/2 = \frac{50}{R}$ 

:  $T=R \tan \frac{1}{2}I$ . Also,  $T=\frac{T \text{ for } 1^{\circ} \text{ curve}}{D} + C$ .

4. Length of Curve:  $L=100\frac{I}{D}$ 

1. Radius

5. Long Chord : L. C.=2R sin ½ I.
6. Middle Ordinate: M=R (1-cos ½ I)
7. External : E=\frac{R}{\cos \frac{1}{\sqrt{2}} \text{I}} - R. Also, E=T \text{tan \frac{1}{\sqrt{2}}} I.

### EXPLANATION AND USE OF TABLES

Given P.I. Sta. 83+40.7,  $I = 45^{\circ} 20'$  and  $D = 6^{\circ}30'$  find:

Stations - P. C. = P. I. - T.  $T = \frac{T \text{ for } 1^{\circ} \text{ Curve}}{D} + C.$  From Tables V and VI

T = \frac{2392.8}{6.5} + .197 = 368.32 = 3 + 68.32. Sta. P. C. = 83 + 40.7 - (3 + 68.32) = 79 + 72.38.

6.5 T. 181 - 300.32 = 3+03.32. Sta. P. C. = 83+40.7 - (3+68.32) = 79+72.38.

P. T. = P. C. + L, and L = 100 \( \frac{1}{D} = 100 \) \( \frac{45.33}{6.5} = 697.38 \) Therefore, P. T. = (79+72.38) \( + (6+97.38) = 86+69.76. \)

Offsets—Tangent offsets vary (approximately) directly with D and with the square of the distance. From Table III Tangent Offset for 100 feet = 5.669 feet. Distance = 80 - Sta. P. C. = 27.62. Hence offset = 5.66 \times \left( \frac{27.62}{100} \right)^3 = .432 \text{ ft. Also, square of any distance, divided by twice the radius equals (approximately) the distance from tangent Deflections—Deflection angle = \frac{1}{2} D \text{ for 100 ft., } \( \frac{1}{2} D \text{ for 50 ft., etc. For "X" ft. } = 3 \times \times 27.62 \times 6.5 = 53.86'. Also Deflection Angle = dfl. for 1 ft. from Table III \times X = 1.95 \)

\times 27.62 = 53.86'. For Sta. 181 Deflection Angle = 53.86' + \frac{6\*30'}{2} = 4\*8.86'.

\text{Externals}—From Table V for 1° curve, with central angle of 45° 20' F = 479.6

Externals—From Table V for 1° curve, with central angle of 45° 20', E = 479.6. Therefore, for 6° 30′ curve,  $E = \frac{479.6}{6.5} + Correction from Table VI = 7.378 + .039 = 7.417.$ 

		10/27/09	BAAR	FB# 9
			BOB204-07	
		5W8B	470110	
	Projects (continued)	Drw-14.90	Begin Purge (0	834)
			Pila	Alson
	***************************************	Post Purge DTW - 1710	1 Dough 4 000	NO at Discount
1		Time Tempe Cond		W) Ringer Des C DTU
	***************************************	(0835) 13.24 70		3 0.39mm Clear 17.45
	***************************************	(0840) 13.19 75	5 4.10 4.18 202.4	1 " Clear
		(0845) 13.22 75	5.85 4,20 200,	3 '' Clear
		(4850) 13.28 72	1 5.73 4.18 199.1	0 " Clear 17.11
Name	1	(0855) 13.32 73	5.68 4.19 197.	2 " Clear
	•	(0900) 13.34 74	5.64 4,20 196.0	clear /
Addr		(0905) 13,38 72	5.60 4.18 196:	3 " Clear 17,11
	•••••••••••••••••••••••••••••••••••••••	(0905) Readings Stab		
Phor	•••••••••••••••••••••••••••••••••••••••	(0922) 13,40 70	5.57 4.19 194.1	Post Purge Reading
	•••••••••••••••••••••••••••••••••••••••	Sample Time		
	•••••••••••••••••••••••••••••••••••••••			
		Samples Collect	led:(3)2260,(3)8270,(i)7M	
			2 0 (24)	2-2
		5W5B	Begin Kunge (09)	
	***************************************	DTW-11.02	Initial Ruge-CI	ear
	•••••••••••••••••••••••••••••••••••••••	Post Ruge DTW-11.88		
		Time Temple Condlus	DOUL DH ORP(mu)	Pungek Desc Dru
	,	(0940) 14.75 567	6,15 5,59 146,1	0.37min Clear 11.48
		(0945)14,60 600	3.25 5.38 163.7	1) Clear
		(0950) 14.66 612	3.66 5.35 160, 2	(1) Clear
		(0955)14,68 620	3,59 5,35 156.8	" Clear 11.63
E.		(1000)14.60 622	3.64 5.36 154.3	" Clear /
	***************************************		3.72 5.37 152.7	11 12 100
	***************************************	(1005)14.45 623 (1010)14.52 624	3.78 5.38 150.6	II Class
	***************************************		5118 5158 15016	Clfar
		7 2.1121	1016	0 4 0 0 73
Thic		(1029)14.81 639		Post Karge Kandung
This for	•••••••••••••••••••••••••••••••••••••••		Ime (1015)	
DT		Samples Co	Meched: (3)8260, (2)82	70, (1) Try

RAAP FB#9	10/27/09 RAAP
10/27/09 RAAP FBH 9 B03204-07 DAS 170E	303204-07 DAS/TRE
	54C22
5W7B Drw-10.44 Begin Aurge (1054)	Drus-10.88 Begin Purge (1342)
Post Purge Drw -10.48 Initial Purge - Clear	Post Punge DTW-10.91 Initial Punge-Clear
Time Temple Condlus Dough pt ORPLAN Purget Desc DAN	- Time temple (and hus) Dong/L pH ERP(MV) Purget De
(1055) 17,13 209 7,15 4,01 195,0 0,34min Clear 10,48	(1345) 14.63 923 1.16 652 162.4 0.37min Cle
(1100) 1201 190 1043 4,13 191.5 " Clear	(1350) 14.80 904 1,07 6.51 154.4 " Clas
(1105) 1/286 174 (6,23 405 192.0" Clear	(1355)14,77 892 1,10 6,52 143,7 " Clea
(DIO) 16.91 156 6.07 4.08 195.4 " Clear 10.48	(1400)14,70 888 1.16 6,52 137,3 " Clear
1115 16.27 154 602 409 194.9 11 Clear	(1405)14.57 886 1.20 6.52 130.9 " Clear
(1120)1681 158 599 4,07 196,9 " Clear	(1410)14.47 883 1.30 6.52 123.2 " clear
(1125)16.70 152 5.96 4,00 200,1 " Clear	
(1125) Readings Stable	(1415) Readings Stable
(1158)17.16 160 5.59 3.94 203.5 Post Rige Reading	(1432)1425 9883 1,33 6.54 126.3 Post Purge Ro
Sample Time (1130)	Sample Time (1420)
Samples Collected: (9) 8240, (6) 8270, (3) TM	5amples Collected (3) 8260, (2) 8270, (1) The
5WC2(	5WC-23  DTW-10,37  Begin Ruge (1445)
Dtw-10.80 Begin Purge (1227)	
Post Purge Drw-10.87 Initial Purge-Clear  To 18) Cod(w) Dough of ORRINO) Purgek Dasc Dru	
Time temple constant to the	
1000 11	(1416) 14.81 989 9.29 6.80 127.6 0.37 linion Clean (1450) 14.41 953 2.07 6.60 119.2 11 Clean
(7835) 17.13 5/3 41.1	
11 010	(1500) 14,33 904 1.59 6.58 111.0 " Clear
(1245) 14,76 576 1,71 3,32 235,4 " Clear 10,8" (1250) 14,82 576 1,64 3,32 237,5 " Clear	(1505)14,35 896 1.57 6.58 107.3 " Clear
(1255) 14.79 580 1.62 3.32 235.6 " Clear	(1510) 14,31 895 1,52 6.58 105,3 " Clear
(1300) 14.82 582 1.55 3.32 234.8 " Clear 10.86	(1515)14134 893 1.45 6.58 102.5 " Clear
(1300) Readings Stable	(1515) Readings Stable
(1331) 14,58 590 1.40 3.34 240.6 Post Purge Reading	(1534) 14 20 896 1.24 6.60 109.5 Post Purga Re
Sample Time (1305)	Sample Time (1520)
Samples Collected: (3) 8240, (2) 8270, (1) TM	5amples Collected (3) 8240, (2) 8270, (1) TM
(2)	3.)

