ANNUAL GROUNDWATER MONITORING REPORT

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

RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

Submitted to:

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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.

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: S5W5, 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^{-5} 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^{-5} 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 µg/l during Second Quarter 2009. During Fourth Quarter 2009, TCE was detected in point of compliance well 5W5B at a concentration of 7 µg/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 µg/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^{-6} 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 x 10^{-3} ft/day or 3.2 ft/year, based on the following:

- Average hydraulic conductivity of 5.1 x 10^{-6} 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 Permit-specified background concentration of 64 µg/l as well as the December 2007 revised background concentration of 41 µg/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 µg/l, but less than the Permit-specified background concentration of 64 µg/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 µg/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 µg/l, but less than the Permit-specified background concentration of 17 µg/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 4.9×10^{-4} 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^{-4} 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 7.87×10^{-5} 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^{-5} 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

Prepared by:

Name: Ross G. Miller, Senior Project Geologist
Signature:
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: Michael D. Lawless, Environmental Program Manager
Signature:
Virginia Professional Certification Type and Number: PG 832
Company: Draper Aden Associates
Address: 2206 South Main Street
City/State/Zip: Blacksburg, Virginia 24060-6600

TABLES

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

MONITORING WELL ID	ELEVATION TOP OF WELL	SECOND QUARTER 2009		FOURTH QUARTER 2009	
		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 WELL ID	ELEVATION TOP OF WELL	SECOND QUARTER 2009		FOURTH QUARTER 2009	
		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 WELL ID	ELEVATION TOP OF WELL	SECOND QUARTER 2009		FOURTH QUARTER 2009	
		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 WELL ID	ELEVATION TOP OF WELL	SECOND QUARTER 2009		FOURTH QUARTER 2009	
		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

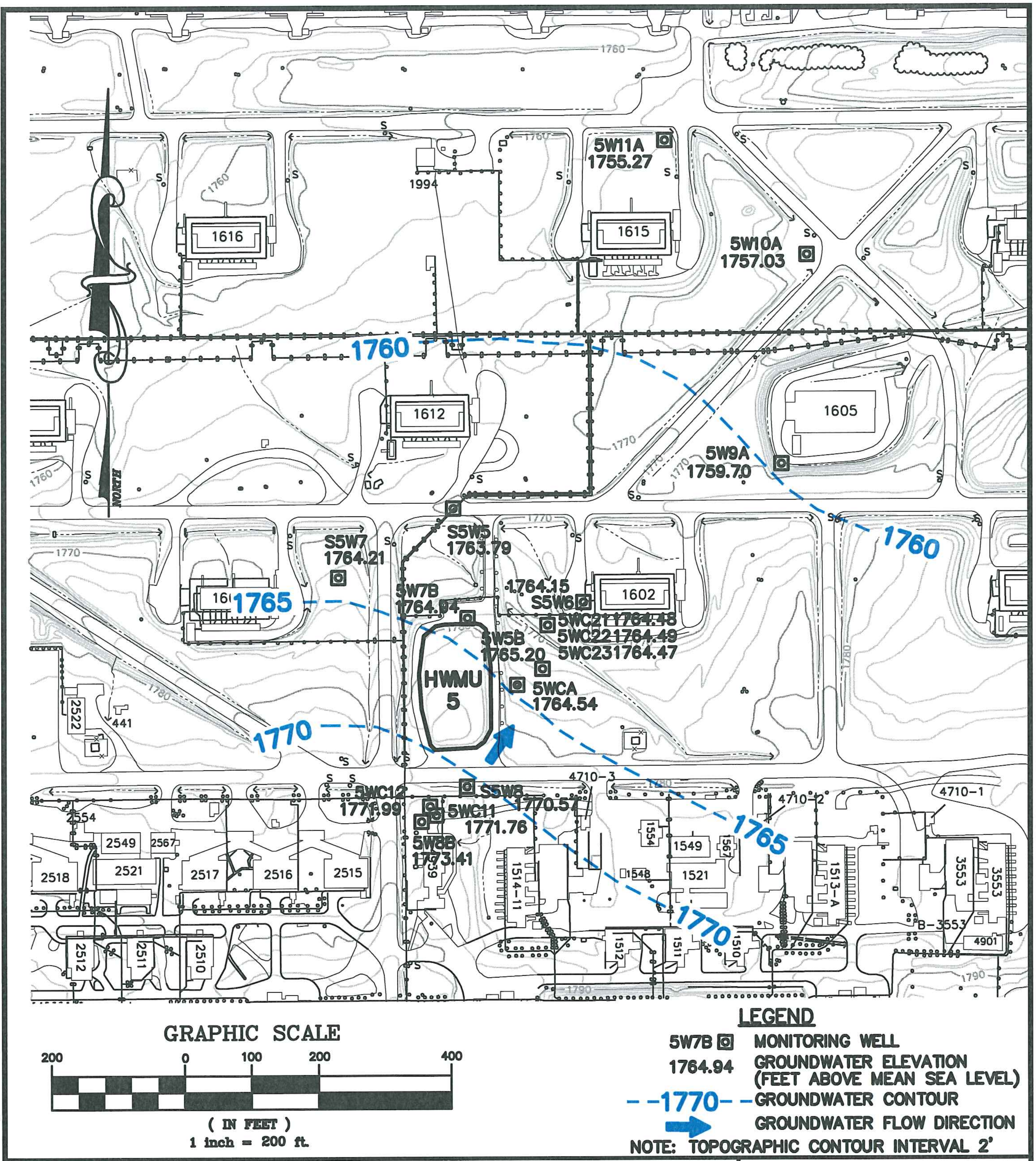
NOTES:
DTW: Depth to water from top of casing.
GW ELEV: Groundwater elevation.
All elevations in feet above mean sea level.
na: Not applicable.

APPENDIX A

HWMU-5

APPENDIX A-1

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



HWMU-5 POTENTIOMETRIC SURFACE MAP (2ND QUARTER 2009)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=200'

PLAN NO. B03204-07

Draper Aden Associates
Engineering • Surveying • Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

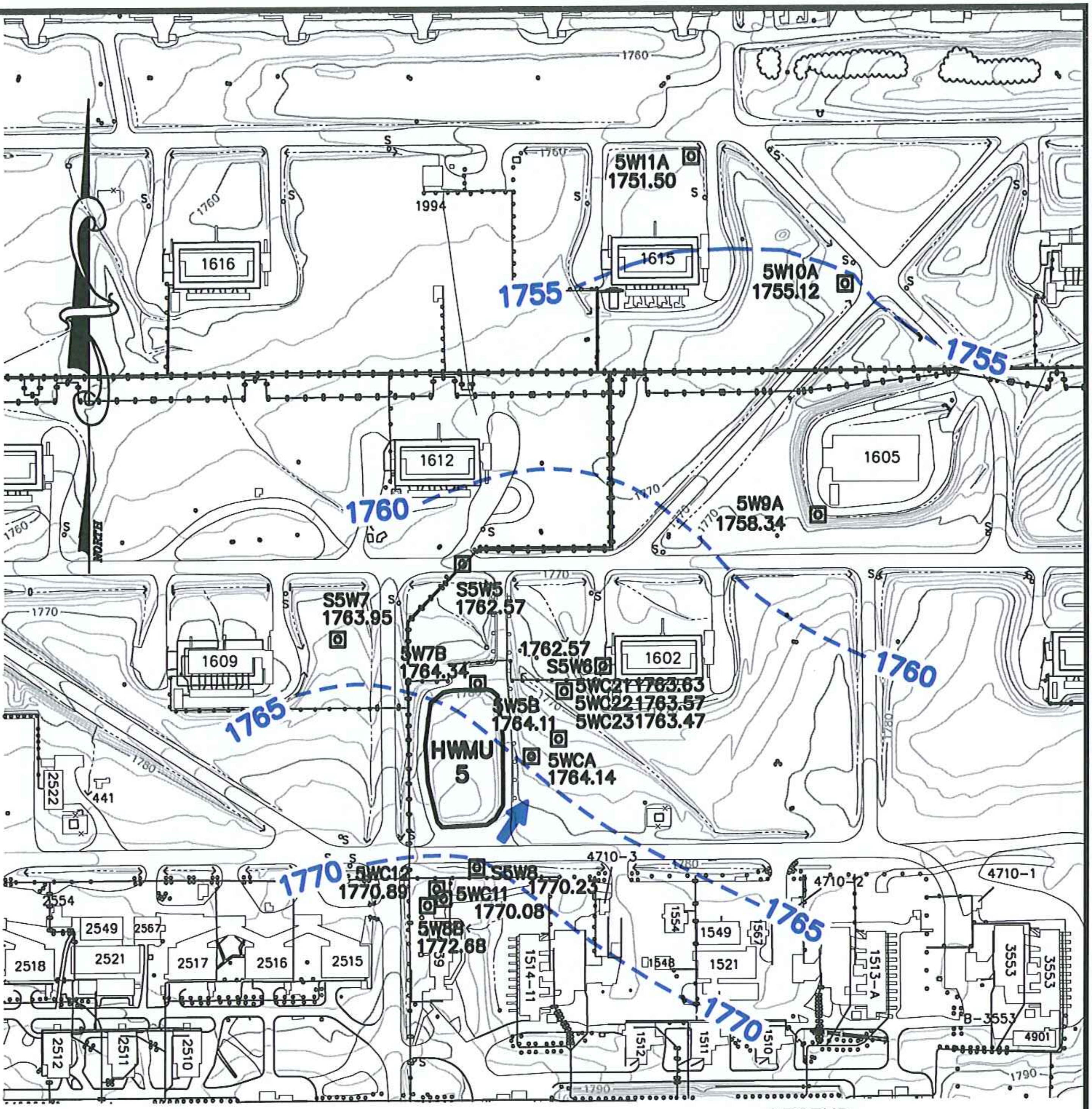
Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	RGM
DRAWN	JFF
CHECKED	MDL
DATE	7/29/2009

FIGURE

1

P:\B03\200\B03204\B03204-07\CAD\B03204-07 ENV\dwg\B03204-07_HWMU-5.dwg Jul 29, 2009 3:54pm



GRAPHIC SCALE

200 0 100 200 400

(IN FEET)
1 inch = 200 ft.

LEGEND

5W7B ▣	MONITORING WELL
1764.34	GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- -1770- -	GROUNDWATER CONTOUR
➡	GROUNDWATER FLOW DIRECTION

NOTE: TOPOGRAPHIC CONTOUR INTERVAL 2'

HWMU-5 POTENTIOMETRIC SURFACE MAP (4TH QUARTER 2009)
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=200'

PLAN NO. B03204-07

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	RGM
DRAWN	JFF
CHECKED	MDL
DATE	01/26/10

FIGURE
1

P:\B03\200\B03204\B03204-07\B03204-07 ENV\dwg\B03204-07_HWMU-5.dwg Jan 27, 2010 4:34pm

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	*5W8B*	*Q*	*5W5B*	*Q*	*5W7B*	*Q*	*5WC21*	*Q*	*5WC22*	*Q*	*5WC23*	*Q*	*QL*	*GPS*	*Method*
Antimony											*CAS #* 7440-36-0				
Second Quarter 2009	U		U		U	N	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		U		U		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											*CAS #* 7440-41-7				
Second Quarter 2009	0.24	J	U		0.52	J	1.9		U		U		1	4	6020
Fourth Quarter 2009	U		U		U		3.1	J	U		U		1	4	6020
Cadmium											*CAS #* 7440-43-9				
Second Quarter 2009	U		U		U		0.47	J	0.25	J	U		1	5	6020
Fourth Quarter 2009	U		U		U		U		U		U		1	5	6020
Chromium											*CAS #* 7440-47-3				
Second Quarter 2009	U		U		1.8	J	5.6		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											*CAS #* 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		U		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		U		40.1		U		U		10	313	6020
Selenium											*CAS #* 7782-49-2				
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				
Second Quarter 2009	U		U		U	N	U		U		U		2	78.25	6020
Fourth Quarter 2009	U		U		U		U		U		U		2	78.25	6020
Thallium											*CAS #* 7440-28-0				
Second Quarter 2009	U		U		U		U		U		U		1	2	6020
Fourth Quarter 2009	U		U		U		U		U		U		1	2	6020
Tin											*CAS #* 7440-31-5				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	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
Fourth Quarter 2009	U		U		14.3		48.3		U		U		10	4695	6020

See last page of this report for definitions.

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*	*5WC21*	*Q*	*5WC22*	*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 Phenolics											*CAS #* C-020				
Second Quarter 2009	U		U		U		U		U		U		60	-	9065
Acenaphthene											*CAS #* 83-32-9				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Acenaphthylene											*CAS #* 208-96-8				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	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				
Second Quarter 2009	U		U		U		U		U		U		20	-	8260B
Acetophenone											*CAS #* 98-86-2				
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											*CAS #* 107-02-8				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	25	-	8260B
Acrylonitrile											*CAS #* 107-13-1				
Second Quarter 2009	U		U		U		U		U		U		5	-	8260B
Aldrin											*CAS #* 309-00-2				
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	-	8270C
Aniline											*CAS #* 62-53-3				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Anthracene											*CAS #* 120-12-7				
Second Quarter 2009	U		U		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				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Benzo[a]anthracene											*CAS #* 56-55-3				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Benzo[b]fluoranthene											*CAS #* 205-99-2				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Benzo[k]fluoranthene											*CAS #* 207-08-9				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Benzo[ghi]perylene											*CAS #* 191-24-2				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Benzo(a)pyrene											*CAS #* 50-32-8				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
1,4-Benzenediamine											*CAS #* 106-50-3				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	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.

Analyte/Quarter	*5W8B*	*Q*	*5W5B*	*Q*	*5W7B*	*Q*	*5WC21*	*Q*	*5WC22*	*Q*	*5WC23*	*Q*	*QL*	*GPS*	*Method*
Benzyl alcohol											*CAS #* 100-51-6				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
alpha-BHC											*CAS #* 319-84-6				
Second Quarter 2009	U		U		U		U		U		U		0.05	-	8081A
beta-BHC											*CAS #* 319-85-7				
Second Quarter 2009	U		U		U		U		U		U		0.05	-	8081A
delta-BHC											*CAS #* 319-86-8				
Second Quarter 2009	U		U		U		U		U		U		0.05	-	8081A
gamma-BHC											*CAS #* 58-89-9				
Second Quarter 2009	U		U		U		U		U		U		0.05	-	8081A
bis(2-Chloroethoxy)methane											*CAS #* 111-91-1				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
bis(2-Chloroethyl)ether											*CAS #* 111-44-4				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
bis(2-Chloro-1-methylethyl)ether											*CAS #* 108-60-1				
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		6	10	8270C
Bromobenzene											*CAS #* 108-86-1				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Bromochloromethane											*CAS #* 74-97-5				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Bromodichloromethane											*CAS #* 75-27-4				
Second Quarter 2009	U		U		U		U		U		U		1	-	8260B
Bromoform											*CAS #* 75-25-2				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
4-Bromophenyl phenyl ether											*CAS #* 101-55-3				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
2-Butanone											*CAS #* 78-93-3				
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		U		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	U		U		U		U		U		U		5	-	8270C
Carbon disulfide											*CAS #* 75-15-0				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Carbon tetrachloride											*CAS #* 56-23-5				
Second Quarter 2009	U		U		U		U		U		U		1	5	8260B

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*	*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
p-Chloroaniline											*CAS #* 106-47-8				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	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
p-Chloro-m-cresol											*CAS #* 59-50-7				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Chloroethane											*CAS #* 75-00-3				
Second Quarter 2009	U		U		U		U		U		U		1	-	8260B
2-Chloroethyl vinyl ether											*CAS #* 110-75-8				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	0.5	-	8260B
Chloroform											*CAS #* 67-66-3				
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
2-Chloronaphthalene											*CAS #* 91-58-7				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
2-Chlorophenol											*CAS #* 95-57-8				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
4-Chlorophenyl phenyl ether											*CAS #* 7005-72-3				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Chloroprene											*CAS #* 126-99-8				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
2-Chlorotoluene											*CAS #* 95-49-8				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
4-Chlorotoluene											*CAS #* 106-43-4				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Chrysene											*CAS #* 218-01-9				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Cyclohexane											*CAS #* 110-82-7				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
2,4-Dichlorophenoxyacetic acid											*CAS #* 94-75-7				
Second Quarter 2009	U		U		U		U		U		U		5	-	8151A
4,4'-DDD											*CAS #* 72-54-8				
Second Quarter 2009	U		U		U		U		U		U		0.1	-	8081A
4,4'-DDE											*CAS #* 72-55-9				
Second Quarter 2009	U		U		U		U		U		U		0.1	-	8081A
4,4'-DDT											*CAS #* 50-29-3				
Second Quarter 2009	U		U		U		U		U		U		0.1	-	8081A
Diallate											*CAS #* 2303-16-4				
Second Quarter 2009	U	J	U	J	U	J	U	J	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
Dibenzofuran											*CAS #* 132-64-9				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	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.

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	QL	GPS	Method
Dibromochloromethane						CAS # 124-48-1			
Second Quarter 2009	U	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	U	0.5	-	8260B
1,2-Dibromoethane						CAS # 106-93-4			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
Di-n-butyl phthalate						CAS # 84-74-2			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
1,2-Dichlorobenzene						CAS # 95-50-1			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
1,3-Dichlorobenzene						CAS # 541-73-1			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
1,4-Dichlorobenzene						CAS # 106-46-7			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
3,3'-Dichlorobenzidine						CAS # 91-94-1			
Second Quarter 2009	U	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	U J	5	-	8260B
Dichlorodifluoromethane						CAS # 75-71-8			
Second Quarter 2009	U	U	U	0.2 J	0.4 J	0.3 J	1	125.2	8260B
Fourth Quarter 2009	U	U	U	U	U	U	1	125.2	8260B
1,1-Dichloroethane						CAS # 75-34-3			
Second Quarter 2009	U	U	U	U	U	U	1	-	8260B
1,2-Dichloroethane						CAS # 107-06-2			
Second Quarter 2009	U	U	U	U	U	U	1	5	8260B
Fourth Quarter 2009	U	U	U	U	U	U	1	5	8260B
1,1-Dichloroethene						CAS # 75-35-4			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
cis-1,2-Dichloroethene						CAS # 156-59-2			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
trans-1,2-Dichloroethene						CAS # 156-60-5			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
2,4-Dichlorophenol						CAS # 120-83-2			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
2,6-Dichlorophenol						CAS # 87-65-0			
Second Quarter 2009	U	U	U	U	U	U	5	-	8270C
1,2-Dichloropropane						CAS # 78-87-5			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
1,3-Dichloropropane						CAS # 142-28-9			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
2,2-Dichloropropane						CAS # 594-20-7			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
1,1-Dichloropropene						CAS # 563-58-6			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
cis-1,3-Dichloropropene						CAS # 10061-01-5			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B
trans-1,3-Dichloropropene						CAS # 10061-02-6			
Second Quarter 2009	U	U	U	U	U	U	0.5	-	8260B

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*	*5WC21*	*Q*	*5WC22*	*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											*CAS #* 60-29-7				
Second Quarter 2009	U		U		U	J	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		U		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-pyrazinyl											*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	U	J	U	J	U	J	U	J	5	-	8270C
Dimethyl ether											*CAS #* 115-10-6				
Second Quarter 2009	U		U		U		U		U		U		12.5	-	8260B
p-(Dimethylamino)azobenzene											*CAS #* 60-11-7				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
7,12-Dimethylbenz[a]anthracene											*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		U		5	-	8270C
a,a-Dimethylphenethylamine											*CAS #* 122-09-8				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	50	-	8270C
2,4-Dimethylphenol											*CAS #* 105-67-9				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Dimethyl phthalate											*CAS #* 131-11-3				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
m-Dinitrobenzene											*CAS #* 99-65-0				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
4,6-Dinitro-o-cresol											*CAS #* 534-52-1				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	10	-	8270C
2,4-Dinitrophenol											*CAS #* 51-28-5				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	10	-	8270C
2,4-Dinitrotoluene											*CAS #* 121-14-2				
Second Quarter 2009	U		U		U		U		U		U		10	31.3	8270C
Fourth Quarter 2009	U		U		U		U		U		U		10	31.3	8270C
2,6-Dinitrotoluene											*CAS #* 606-20-2				
Second Quarter 2009	U		U		U		U		U		U		10	15.65	8270C
Fourth Quarter 2009	U		U		U		U		U		U		10	15.65	8270C
Dinoseb											*CAS #* 88-85-7				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	2.5	-	8151A
Di-n-octyl phthalate											*CAS #* 117-84-0				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
1,4-Dioxane											*CAS #* 123-91-1				
Second Quarter 2009	U		U		U		U		U		U		100	-	8260B
Diphenylamine											*CAS #* 122-39-4				
Second Quarter 2009	U		U		U		U		U		U		10	-	8270C
Disulfoton											*CAS #* 298-04-4				
Second Quarter 2009	U		U		U		U		U		U		5	-	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.

Analyte/Quarter	*5W8B*	*Q*	*5W5B*	*Q*	*5W7B*	*Q*	*5WC21*	*Q*	*5WC22*	*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											*CAS #* 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											*CAS #* 72-20-8				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	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		U		U		U		U		U		0.1	-	8081A
Ethanol											*CAS #* 64-17-5				
Second Quarter 2009	U		U		U		U		U		U		250	-	8260B
Ethylbenzene											*CAS #* 100-41-4				
Second Quarter 2009	U		U		U		U		U		U		1	-	8260B
Ethyl methacrylate											*CAS #* 97-63-2				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Ethyl methanesulfonate											*CAS #* 62-50-0				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Ethylene oxide											*CAS #* 75-21-8				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	20	-	8260B
Famphur											*CAS #* 52-85-7				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Fluoranthene											*CAS #* 206-44-0				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Fluorene											*CAS #* 86-73-7				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Heptachlor											*CAS #* 76-44-8				
Second Quarter 2009	U		U		U		U		U		U		0.05	-	8081A
Heptachlor epoxide											*CAS #* 1024-57-3				
Second Quarter 2009	U		U		U		U		U		U		0.05	-	8081A
Hexachlorobenzene											*CAS #* 118-74-1				
Second Quarter 2009	U		U		U		U	J	U	J	U	J	5	-	8270C
Hexachlorobutadiene											*CAS #* 87-68-3				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Hexachlorocyclopentadiene											*CAS #* 77-47-4				
Second Quarter 2009	U	J	U	J	U	J	U		U		U		5	-	8270C
Hexachloroethane											*CAS #* 67-72-1				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Hexachlorophene											*CAS #* 70-30-4				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	500	-	8270C
Hexachloropropene											*CAS #* 1888-71-7				
Second Quarter 2009	U		U		U		U	J	U	J	U	J	5	-	8270C
2-Hexanone											*CAS #* 591-78-6				
Second Quarter 2009	U		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		U		5	-	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.

Analyte/Quarter	*5W8B*	*Q*	*5W5B*	*Q*	*5W7B*	*Q*	*5WC21*	*Q*	*5WC22*	*Q*	*5WC23*	*Q*	*QL*	*GPS*	*Method*
Isobutyl alcohol											*CAS #* 78-83-1				
Second Quarter 2009	U		U		U		U		U		U		25	-	8260B
Isodrin											*CAS #* 465-73-6				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Isophorone											*CAS #* 78-59-1				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Isopropylbenzene											*CAS #* 98-82-8				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Isopropylether											*CAS #* 108-20-3				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
4-Isopropyltoluene											*CAS #* 99-87-6				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Isosafrole											*CAS #* 120-58-1				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Kepone											*CAS #* 143-50-0				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Methacrylonitrile											*CAS #* 126-98-7				
Second Quarter 2009	U		U		U		U		U		U		5	-	8260B
Methapyrilene											*CAS #* 91-80-5				
Second Quarter 2009	U	J	U	J	U	J	U		U		U		5	-	8270C
Methoxychlor											*CAS #* 72-43-5				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8081A
Bromomethane											*CAS #* 74-83-9				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
3-Methylcholanthrene											*CAS #* 56-49-5				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Iodomethane											*CAS #* 74-88-4				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Methyl methacrylate											*CAS #* 80-62-6				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Methyl methane sulfonate											*CAS #* 66-27-3				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
2-Methylnaphthalene											*CAS #* 91-57-6				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Methyl parathion											*CAS #* 298-00-0				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
4-Methyl-2-pentanone											*CAS #* 108-10-1				
Second Quarter 2009	U		U		U		U		U		U		5	-	8260B
2-Methylphenol											*CAS #* 95-48-7				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
3 & 4-Methylphenol											*CAS #* m 108-39-4 p 106-44-				
Second Quarter 2009	U		U		U		U		U		U		10	-	8270C
Methyl tert-butyl ether											*CAS #* 1634-04-4				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Dibromomethane											*CAS #* 74-95-3				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Methylene chloride											*CAS #* 75-09-2				
Second Quarter 2009	U		U		U		U		U		U		1	5	8260B
Fourth Quarter 2009	U		U		U		U		U		U		1	5	8260B

See last page of this report for definitions.

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*	*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											*CAS #* 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	-	8270C
2-Naphthylamine											*CAS #* 91-59-8				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	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				
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				
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				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
p-Nitrophenol											*CAS #* 100-02-7				
Second Quarter 2009	U		U		U		U		U		U		10	-	8270C
4-Nitroquinoline-1-oxide											*CAS #* 56-57-5				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
N-Nitrosodi-n-butylamine											*CAS #* 924-16-3				
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		U		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	U		U		U		U		U		U		5	-	8270C
N-Nitrosomethylethylamine											*CAS #* 10595-95-6				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
N-Nitrosomorpholine											*CAS #* 59-89-2				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
N-Nitrosopiperidine											*CAS #* 100-75-4				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
N-Nitrosopyrrolidine											*CAS #* 930-55-2				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
5-Nitroso-o-toluidine											*CAS #* 99-55-8				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Parathion											*CAS #* 56-38-2				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Pentachlorobenzene											*CAS #* 608-93-5				
Second Quarter 2009	U		U		U		U	J	U	J	U	J	5	-	8270C

See last page of this report for definitions.

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*	*5WC21*	*Q*	*5WC22*	*Q*	*5WC23*	*Q*	*QL*	*GPS*	*Method*
Pentachloroethane											*CAS #* 76-01-7				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Pentachloronitrobenzene											*CAS #* 82-68-8				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Pentachlorophenol											*CAS #* 87-86-5				
Second Quarter 2009	U		U		U		U		U		U		10	-	8270C
Phenacetin											*CAS #* 62-44-2				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Phenanthrene											*CAS #* 85-01-8				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Phenol											*CAS #* 108-95-2				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Phorate											*CAS #* 298-02-2				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
2-Picoline											*CAS #* 109-06-8				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
Pronamide											*CAS #* 23950-58-5				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
1-Propanol											*CAS #* 71-23-8				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	1000	-	8260B
2-Propanol											*CAS #* 67-63-0				
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											*CAS #* 129-00-0				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Pyridine											*CAS #* 110-86-1				
Second Quarter 2009	U		U		U		U		U		U		5	-	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		U		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-Trichlorophenoxyacetic acid											*CAS #* 93-76-5				
Second Quarter 2009	U		U		U		U		U		U		2.5	-	8151A
1,2,4,5-Tetrachlorobenzene											*CAS #* 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											*CAS #* 79-34-5				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Tetrachloroethene											*CAS #* 127-18-4				
Second Quarter 2009	U		U		U		U		U		U		1	5	8260B

See last page of this report for definitions.

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*	*5WC21*	*Q*	*5WC22*	*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											*CAS #* 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	U	J	U	J	U	J	U	J	U	J	U	J	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											*CAS #* 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				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
1,2,3-Trichloropropane											*CAS #* 96-18-4				
Second Quarter 2009	U		U		U		U		U		U		1	-	8260B
1,1,2-Trichloro-1,2,2-Trifluoroethane											*CAS #* 76-13-1				
Second Quarter 2009	U		U		U		U		U		U		1	-	8260B
O,O,O-Triethyl phosphorothioate											*CAS #* 126-68-1				
Second Quarter 2009	U		U		U		U		U		U		5	-	8270C
1,2,4-Trimethylbenzene											*CAS #* 95-63-6				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
1,3,5-Trimethylbenzene											*CAS #* 108-67-8				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
sym-Trinitrobenzene											*CAS #* 99-35-4				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Vinyl acetate											*CAS #* 108-05-4				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Vinyl chloride											*CAS #* 75-01-4				
Second Quarter 2009	U		U		U		U		U		U		0.5	-	8260B
Xylenes (Total)											*CAS #* 1330-20-7				
Second Quarter 2009	U		U		U		U		U		U		3	10,000	8260B
Fourth Quarter 2009	U		U		U		U		U		U		3	10,000	8260B

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

QL 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.
Q 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

Facility: HWMU-5 Monitoring Event: Second Quarter 2009

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services

Method: 6020

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

Analyte	Sample ID	Laboratory Result (ug/L)	Q	Validated Result (ug/L)	Q	QL (ug/L)	Validation Notes
Barium	5WC21	13.9		13.9		10	No action taken.
	5WDUP	14.3		14.3		10	No action taken. Blind field duplicate for 5WC21.
Beryllium	5WC21	1.9		1.9		1	No action taken.
	5WDUP	2		2		1	No action taken. Blind field duplicate for 5WC21.
Chromium	5WC21	5.6		5.6		5	No action taken.
	5WDUP	5.5		5.5		5	No action taken. Blind field duplicate for 5WC21.
Cobalt	5WC21	50.7		50.7		5	No action taken.
	5WDUP	49.8		49.8		5	No action taken. Blind field duplicate for 5WC21.
Nickel	5WC21	27.9		27.9		10	No action taken.
	5WDUP	28.6		28.6		10	No action taken. Blind field duplicate for 5WC21.
Zinc	5WC21	30.3		30.3		10	No action taken.
	5WDUP	33.5		33.5		10	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

Facility: HWMU-5 Monitoring Event: Fourth Quarter 2009

Analyte	Sample ID	Laboratory Result (ug/L)	Q	Validated Result (ug/L)	Q	QL (ug/L)	Validation Notes
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.
	5WDUP	15.9		15.9		10	No action taken. Blind field duplicate result for 5WC21. RPD <10.
Beryllium	5WC21	3.1		3.1	J	1	Blind field duplicate 5WDUP, RPD <10. MSD and PDS recovered high (126%/155%).
	5WDUP	3.1		3.1	J	1	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.
	5WDUP	13.4		13.4	J	5	Blind field duplicate result for 5WC21. RPD >10 (22). Result estimated.
Cobalt	5WC21	77.9		77.9		5	No action taken. Blind field duplicate 5WDUP, RPD <10.
	5WDUP	79		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.
	5WDUP	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.
	5WDUP	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.
	5WDUP	50.5		50.5		10	No action taken. Blind field duplicate result for 5WC21. RPD <10.
Method: 8260B							
Laboratory: Lancaster Laboratories, Lancaster, PA							
Trichloroethene	5WC21	1.9		1.9		1	No action taken. Blind field duplicate result for 5WC21 (5WDUP) was 1.9 ug/l. RPD <10.
	5WDUP	1.9		1.9		1	No action taken. Blind field duplicate result for 5WC21. RPD <10.

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.

See last page of this report for definitions.

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 #	*5W8B*	*Q*	*5W9A*	*Q*	*5W10A*	*Q*	*5W11A*	*Q*	*S5W5*	*Q*	*S5W7*	*Q*	*QL*	*Background*	*Method*
Antimony													*CAS #7440-36-0*		
Second Quarter 2009	U		U		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	U		U		U		U		U		U		1	0.7	6020
Cadmium													*CAS #7440-43-9*		
Second Quarter 2009	U		U		U		U		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													*CAS #7439-92-1*		
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 #7439-97-6*		
Second Quarter 2009	U		U		U		U		U		U		2	0.9	7470A
Fourth Quarter 2009	U		U		U		U		U		U		2	0.9	7470A
Nickel													*CAS #7440-02-0*		
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													*CAS #7782-49-2*		
Second Quarter 2009	U		U		U		U		U		U		10	1	6020
Fourth Quarter 2009	U		U		U		U		U		U		10	1	6020
Silver													*CAS #7440-22-4*		
Second Quarter 2009	U		U		U		U		U		U		2	2.3	6020
Fourth Quarter 2009	U		U		U		U		U		U		2	2.3	6020
Thallium													*CAS #7440-28-0*		
Second Quarter 2009	U		U		U		U		U		U		1	2	6020
Fourth Quarter 2009	U		U		U		U		U		U		1	2	6020
Vanadium													*CAS #7440-62-2*		
Second Quarter 2009	U		U		U		U		U		U		10	17	6020
Fourth Quarter 2009	U		U		U		U		U		U		10	17	6020
Zinc													*CAS #7440-66-6*		
Second Quarter 2009	3.7	J	U		U		U		U		U		10	75	6020
Fourth Quarter 2009	U		U		U		U		U		14.3		10	75	6020
Acetone													*CAS #67-64-1*		
Second Quarter 2009	U		U		U		U		U		U		10	89	8260B
Fourth Quarter 2009	U		U		U		U		U		U		10	89	8260B

See last page of this report for definitions.

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 #	*5W8B Q*	*5W9A Q*	*5W10A Q*	*5W11A Q*	*S5W5 Q*	*S5W7 Q*	*QL*	*Background*	*Method*
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	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	U	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							*CAS #107-06-2*		
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*		
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	U	U	U	U	U	U	10	0.18	8270C
2,6-Dinitrotoluene							*CAS #606-20-2*		
Second Quarter 2009	U	U	U	U	U	U	10	0.08	8270C
Fourth Quarter 2009	U	U	U	U	U	U	10	0.08	8270C
Methylene chloride							*CAS #75-09-2*		
Second Quarter 2009	U	U	U	U	U	U	1	0.7	8260B
Fourth Quarter 2009	U	U	U	U	U	U	1	0.7	8260B
o-Nitroaniline							*CAS #88-74-4*		
Second Quarter 2009	U	U	U	U	U	U	10	20	8270C
Fourth Quarter 2009	U	U	U	U	U	U	10	20	8270C
p-Nitroaniline							*CAS #100-01-6*		
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*		
Second Quarter 2009	U	U	U	U	U	U	10	10	8270C
Fourth Quarter 2009	U	U	U	U	U	U	10	10	8270C
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	1	0.1	8260B
Trichloroethene							*CAS #79-01-6*		
Second Quarter 2009	U	U	U	U	U	U	1	0.8	8260B
Fourth Quarter 2009	U	U	U	U	U	U	1	0.8	8260B
Xylenes (Total)							*CAS #1330-20-7*		
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

See last page of this report for definitions.

Analyte/Quarter/CAS #	*5W8B*	*Q*	*5W9A*	*Q*	*5W10A*	*Q*	*5W11A*	*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 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 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.*

APPENDIX A-4

ESTABLISHED BACKGROUND VALUES AND COMPUTATIONS FOR HWMU-5

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^{-5} 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^{-5} 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.

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 Limit of Non-parametric Prediction Interval w/false 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				
Parameter	**Sample Size**	**% Non-Detects**	**DL (µg/l)**	**BTL (µg/l)**
Barium	13	0	2	172.87
Cadmium	13	23	0.1	1.45
Specific Conductivity	8	0	1 µS/cm	450 µS/cm
pH	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
pH	5WC23, 5W10A, 5W11A

TABLE 2
HWMU-5
CALCULATED BACKGROUND VALUES

Constituent	Background Concentration (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
HMWU-5	Fourth Quarter 2003	Chromium	QL	5	yes	100	USEPA MCL
		Diethyl Ether	QL	12	no	NA	NA
		2-Nitroaniline	QL	20	no	NA	NA
		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
	Second Quarter 2004	Zinc	Calculated	217	no	NA	NA
HWMU-10	First Quarter 2003	Cobalt	QL	5	no	NA	NA
	Second Quarter 2003	Vanadium	QL	10	no	NA	NA
	Second Quarter 2005	Acetone	QL	10	no	NA	NA
		2-Propanol	QL	50	no	NA	NA
HWMU-16	Second Quarter 2003	Chloroethane	Calculated	20.7	yes	20.7	Background/QL
		Diethyl Ether	Calculated	75.5	no	NA	NA
		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.

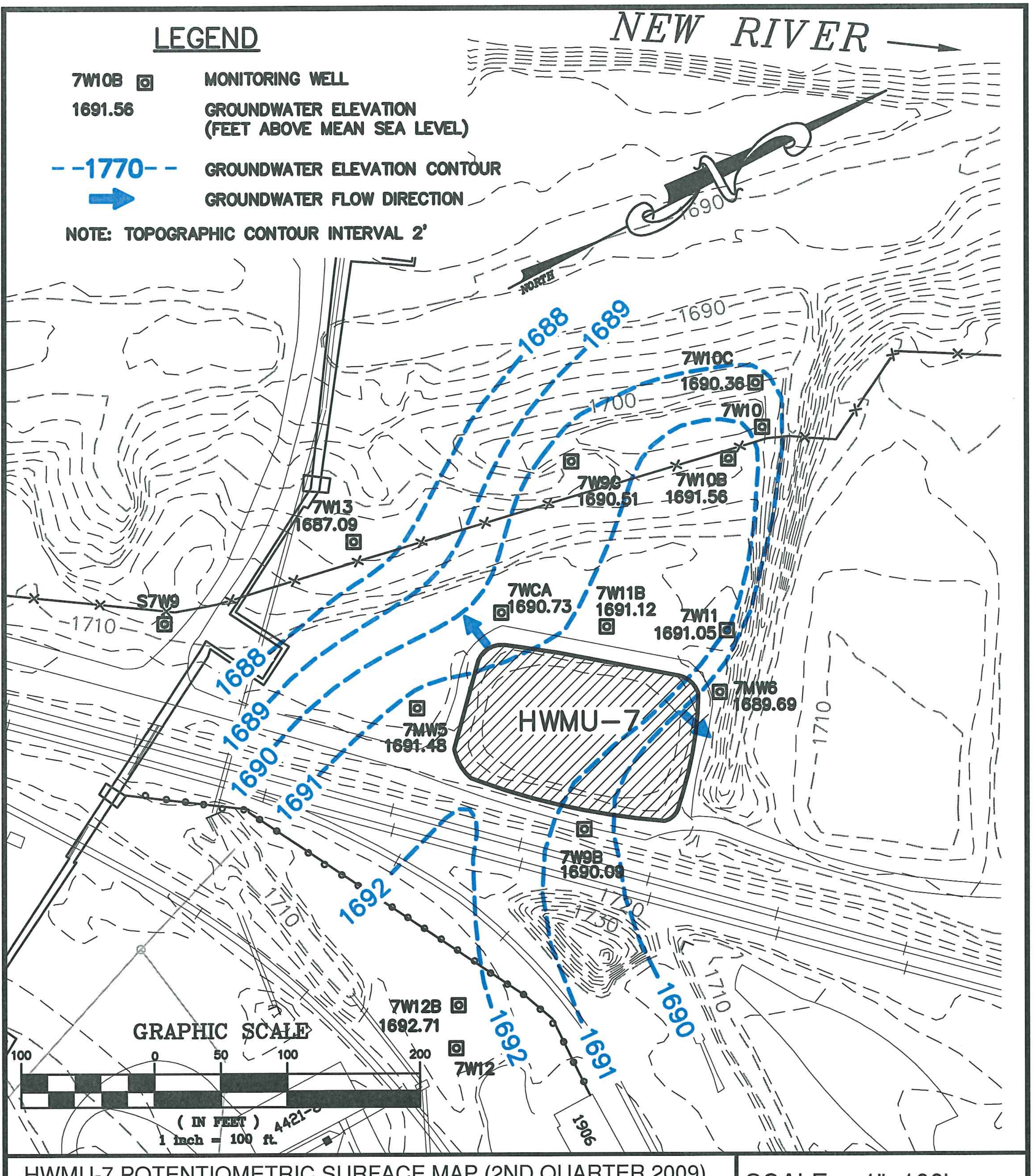
HWMU-16: Background concentrations for additional Appendix IX constituents chloroethane, diethyl ether, dimethyl ether, and methylene chloride were calculated using data collected from upgradient well 16C1 during the period from Third Quarter 2003 through Third Quarter 2004. The background concentration 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



HWMU-7 POTENTIOMETRIC SURFACE MAP (2ND QUARTER 2009)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=100'

PLAN NO. B03204-07

Draper Aden Associates

Engineering • Surveying • Environmental Services

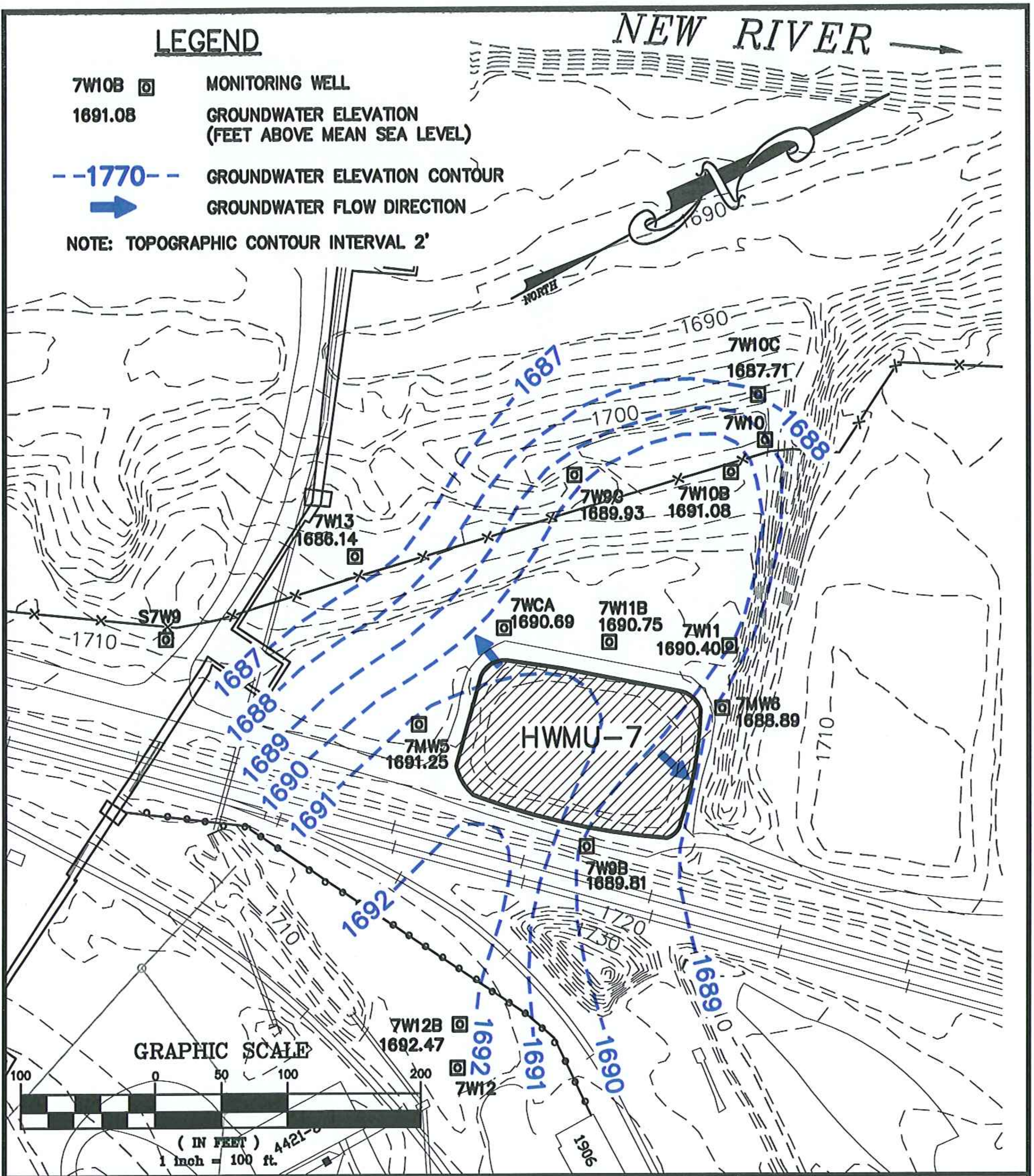
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED RGM
DRAWN JFF
CHECKED MDL
DATE 07/29/09

FIGURE 2

P:\B03\200\B03204\B03204-07\CAD\B03204-07 ENV\dwg\B03204-07_HWMU-7.dwg Jul 29, 2009 3:55pm



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HWMU-7 POTENTIOMETRIC SURFACE MAP (4TH QUARTER 2009)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=100'

PLAN NO. B03204-07

Draper Aden Associates
Engineering • Surveying • Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	RGM
DRAWN	JFF
CHECKED	MDL
DATE	01/25/10

FIGURE 2

APPENDIX B-2

HWMU-7 2009 LABORATORY ANALYTICAL RESULTS POINT OF COMPLIANCE WELLS

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B*	*Q*	*7MW6*	*Q*	*7WCA*	*Q*	*7W11B*	*Q*	*QL*	*GPS*	*Background*	*Method*
Antimony											*CAS #*	7440-36-0
Second Quarter 2009	U		U		U		U	N	1	6	1	6020
Fourth Quarter 2009	U		U		U		U		1	6	1	6020
Arsenic											*CAS #*	7440-38-2
Second Quarter 2009	U		U		U		U		10	10	10	6020
Fourth Quarter 2009	U		U		U		U		10	10	10	6020
Barium											*CAS #*	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											*CAS #*	7440-41-7
Second Quarter 2009	U		U		U		U		1	-		6020
Cadmium											*CAS #*	7440-43-9
Second Quarter 2009	U		U		U		U		1	5	1	6020
Fourth Quarter 2009	U		U		U		U		1	5	1	6020
Chromium											*CAS #*	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											*CAS #*	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											*CAS #*	7440-50-8
Second Quarter 2009	1	J	U		U		1.3	J	5	1300	5	6020
Fourth Quarter 2009	U		U		U	J	U		5	1300	5	6020
Lead											*CAS #*	7439-92-1
Second Quarter 2009	U		U	J	U		U		1	15	1	6020
Fourth Quarter 2009	U		U		U	J	U		1	15	1	6020
Mercury											*CAS #*	7439-97-6
Second Quarter 2009	U		U		U		U		2	2	2	7470A
Fourth Quarter 2009	U		U		U		U		2	2	2	7470A
Nickel											*CAS #*	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		U		10	313	10	6020
Selenium											*CAS #*	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
Silver											*CAS #*	7440-22-4
Second Quarter 2009	U		U		U		U		2	78.25	2	6020
Fourth Quarter 2009	U		U		U		U		2	78.25	2	6020
Thallium											*CAS #*	7440-28-0
Second Quarter 2009	U		U	J	U		U		1	2	1	6020
Fourth Quarter 2009	U		U		U		U		1	2	1	6020
Tin											*CAS #*	7440-31-5
Second Quarter 2009	U		U		U		U		5	-		6020
Vanadium											*CAS #*	7440-62-2
Second Quarter 2009	U		U		U		U		10	-		6020

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B Q*	*7MW6 Q*	*7WCA Q*	*7W11B Q*	*QL*	*GPS*	*Background*	*Method*
Zinc							*CAS #*	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	U J	U	10	4695	10.9	6020
Cyanide							*CAS #*	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							*CAS #*	18496-25-8
Second Quarter 2009	U	U	U	U	1000	-		9034
Total Recoverable Phenolics							*CAS #*	C-020
Second Quarter 2009	U	U	U	U	60	-		9065
Acenaphthene							*CAS #*	83-32-9
Second Quarter 2009	U J	U J	U J	U J	5	-		8270C
Acenaphthylene							*CAS #*	208-96-8
Second Quarter 2009	U J	U J	U J	U J	5	-		8270C
Acetone							*CAS #*	67-64-1
Second Quarter 2009	U	U	U	U	5	-		8260B
Acetonitrile							*CAS #*	75-05-8
Second Quarter 2009	U	U	U	U	20	-		8260B
Acetophenone							*CAS #*	98-86-2
Second Quarter 2009	U	U	U	U	5	-		8270C
2-Acetylaminofluorene							*CAS #*	53-96-3
Second Quarter 2009	U	U	U	U	5	-		8270C
Acrolein							*CAS #*	107-02-8
Second Quarter 2009	U J	U J	U J	U J	25	-		8260B
Acrylonitrile							*CAS #*	107-13-1
Second Quarter 2009	U	U	U	U	5	-		8260B
Aldrin							*CAS #*	309-00-2
Second Quarter 2009	U	U	U	U	0.05	-		8081
Allyl chloride							*CAS #*	107-05-1
Second Quarter 2009	U	U	U	U	0.5	-		8260B
4-Aminobiphenyl							*CAS #*	92-67-1
Second Quarter 2009	U	U	U	U	5	-		8270C
Aniline							*CAS #*	62-53-3
Second Quarter 2009	U	U	U	U	5	-		8270C
Anthracene							*CAS #*	120-12-7
Second Quarter 2009	U	U	U	U	5	-		8270C
Aramite							*CAS #*	140-57-8
Second Quarter 2009	U	U	U	U	5	-		8270C
Benzene							*CAS #*	71-43-2
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Benzo[a]anthracene							*CAS #*	56-55-3
Second Quarter 2009	U	U	U	U	5	-		8270C
Benzo[b]fluoranthene							*CAS #*	205-99-2
Second Quarter 2009	U	U	U	U	5	-		8270C
Benzo[k]fluoranthene							*CAS #*	207-08-9
Second Quarter 2009	U J	U J	U J	U J	5	-		8270C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B*	*Q*	*7MW6*	*Q*	*7WCA*	*Q*	*7W11B*	*Q*	*QL*	*GPS*	*Background*	*Method*
Benzo[ghi]perylene											*CAS #*	191-24-2
Second Quarter 2009	U		U		U		U		5	-		8270C
Benzo(a)pyrene											*CAS #*	50-32-8
Second Quarter 2009	U		U		U		U		5	-		8270C
1,4-Benzenediamine											*CAS #*	106-50-3
Second Quarter 2009	U	J	U	J	U	J	U	J	50	-		8270C
Benzyl alcohol											*CAS #*	100-51-6
Second Quarter 2009	U		U		U		U		5	-		8270C
alpha-BHC											*CAS #*	319-84-6
Second Quarter 2009	U		U		U		U		0.05	-		8081
beta-BHC											*CAS #*	319-85-7
Second Quarter 2009	U		U		U		U		0.05	-		8081
delta-BHC											*CAS #*	319-86-8
Second Quarter 2009	U		U		U		U		0.05	-		8081
gamma-BHC											*CAS #*	58-89-9
Second Quarter 2009	U		U		U		U		0.05	-		8081
bis(2-Chloroethoxy)methane											*CAS #*	111-91-1
Second Quarter 2009	U		U		U		U		5	-		8270C
bis(2-Chloroethyl)ether											*CAS #*	111-44-4
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
bis(2-Chloro-1-methylethyl)ether											*CAS #*	108-60-1
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
bis(2-Ethylhexyl)phthalate											*CAS #*	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											*CAS #*	108-86-1
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Bromochloromethane											*CAS #*	74-97-5
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Bromodichloromethane											*CAS #*	75-27-4
Second Quarter 2009	U		U		U		U		1	-		8260B
Bromoform											*CAS #*	75-25-2
Second Quarter 2009	U		U		U		U		0.5	-		8260B
4-Bromophenyl phenyl ether											*CAS #*	101-55-3
Second Quarter 2009	U		U		U		U		5	-		8270C
n-Butyl alcohol											*CAS #*	71-36-3
Second Quarter 2009	U		U		U		U		50	-		8260B
tert-Butyl alcohol											*CAS #*	75-65-0
Second Quarter 2009	U		U		U		U		10	-		8260B
n-Butylbenzene											*CAS #*	104-51-8
Second Quarter 2009	U		U		U		U		0.5	-		8260B
sec-Butylbenzene											*CAS #*	135-98-8
Second Quarter 2009	U		U		U		U		0.5	-		8260B
tert-Butylbenzene											*CAS #*	98-06-6
Second Quarter 2009	U		U		U		U		0.5	-		8260B

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B*	*Q*	*7MW6*	*Q*	*7WCA*	*Q*	*7W11B*	*Q*	*QL*	*GPS*	*Background*	*Method*
Butyl benzyl phthalate											*CAS #*	85-68-7
Second Quarter 2009	U		U		U		U		5	3130	10	8270C
Fourth Quarter 2009	U		U		U		U		10	3130	10	8270C
Carbon disulfide											*CAS #*	75-15-0
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Carbon tetrachloride											*CAS #*	56-23-5
Second Quarter 2009	U		U		U		U		1	-		8260B
Chlordane											*CAS #*	57-74-9
Second Quarter 2009	U		U		U		U		0.86	-		8081
p-Chloroaniline											*CAS #*	106-47-8
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
Chlorobenzene											*CAS #*	108-90-7
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Chlorobenzilate											*CAS #*	510-15-6
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
p-Chloro-m-cresol											*CAS #*	59-50-7
Second Quarter 2009	U		U		U		U		5	-		8270C
Chloroethane											*CAS #*	75-00-3
Second Quarter 2009	U		U		U		U		1	-		8260B
Chloroform											*CAS #*	67-66-3
Second Quarter 2009	1.7		U		0.9	J	1.1		1	-		8260B
2-Chloroethyl vinyl ether											*CAS #*	110-75-8
Second Quarter 2009	U	J	U	J	U	J	U	J	0.5	-		8260B
2-Chloronaphthalene											*CAS #*	91-58-7
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
2-Chlorophenol											*CAS #*	95-57-8
Second Quarter 2009	U		U		U		U		5	-		8270C
4-Chlorophenyl phenyl ether											*CAS #*	7005-72-3
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
Chloroprene											*CAS #*	126-99-8
Second Quarter 2009	U		U		U		U		0.5	-		8260B
2-Chlorotoluene											*CAS #*	95-49-8
Second Quarter 2009	U		U		U		U		0.5	-		8260B
4-Chlorotoluene											*CAS #*	106-43-4
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Chrysene											*CAS #*	218-01-9
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
Cyclohexane											*CAS #*	110-82-7
Second Quarter 2009	U		U		U		U		0.5	-		8260B
2,4-Dichlorophenoxyacetic acid											*CAS #*	94-75-7
Second Quarter 2009	U		U		U		U		5	-		8151A
4,4'-DDD											*CAS #*	72-54-8
Second Quarter 2009	U		U		U		U		0.1	-		8081
4,4'-DDE											*CAS #*	72-55-9
Second Quarter 2009	U		U		U		U		0.1	-		8081
4,4'-DDT											*CAS #*	50-29-3
Second Quarter 2009	U		U		U		U		0.1	-		8081

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B Q*	*7MW6 Q*	*7WCA Q*	*7W11B Q*	*QL*	*GPS*	*Background*	*Method*
Diallate							*CAS #*	2303-16-4
Second Quarter 2009	U J	U J	U J	U J	5	-		8270C
Dibenz(a,h)anthracene							*CAS #*	53-70-3
Second Quarter 2009	U	U	U	U	5	-		8270C
Dibenzofuran							*CAS #*	132-64-9
Second Quarter 2009	U J	U J	U J	U J	5	-		8270C
Dibromochloromethane							*CAS #*	124-48-1
Second Quarter 2009	U	U	U	U	0.5	-		8260B
1,2-Dibromo-3-chloropropane							*CAS #*	96-12-8
Second Quarter 2009	U	U	U	U	0.5	-		8260B
1,2-Dibromoethane							*CAS #*	106-93-4
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Di-n-butyl phthalate							*CAS #*	84-74-2
Second Quarter 2009	U	U	U	U	5	-		8270C
1,2-Dichlorobenzene							*CAS #*	95-50-1
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	U	U	U	0.5	-		8260B
3,3'-Dichlorobenzidine							*CAS #*	91-94-1
Second Quarter 2009	U	U	U	U	5	-		8270C
trans-1,4-Dichloro-2-butene							*CAS #*	110-57-6
Second Quarter 2009	U	U	U	U	5	-		8260B
Dichlorodifluoromethane							*CAS #*	75-71-8
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							*CAS #*	107-06-2
Second Quarter 2009	U	U	U	U	1	-		8260B
1,1-Dichloroethene							*CAS #*	75-35-4
Second Quarter 2009	U	U	U	U	0.5	-		8260B
cis-1,2-Dichloroethene							*CAS #*	156-59-2
Second Quarter 2009	U	U	U	U	0.5	-		8260B
trans-1,2-Dichloroethene							*CAS #*	156-60-5
Second Quarter 2009	U	U	U	U	0.5	-		8260B
2,4-Dichlorophenol							*CAS #*	120-83-2
Second Quarter 2009	U	U	U	U	5	-		8270C
2,6-Dichlorophenol							*CAS #*	87-65-0
Second Quarter 2009	U	U	U	U	5	-		8270C
1,2-Dichloropropane							*CAS #*	78-87-5
Second Quarter 2009	U	U	U	U	0.5	-		8260B
1,3-Dichloropropane							*CAS #*	142-28-9
Second Quarter 2009	U	U	U	U	0.5	-		8260B
2,2-Dichloropropane							*CAS #*	594-20-7
Second Quarter 2009	U	U	U	U	0.5	-		8260B

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B*	*Q*	*7MW6*	*Q*	*7WCA*	*Q*	*7W11B*	*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											*CAS #*	10061-01-5
Second Quarter 2009	U		U		U		U		0.5	-		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		U		0.1	-		8081
Diethyl ether											*CAS #*	60-29-7
Second Quarter 2009	U		U		U		U		12.5	-		8260B
Diethyl phthalate											*CAS #*	84-66-2
Second Quarter 2009	U		U		U		U		5	-		8270C
O,O-Diethyl O-2-pyrazinyl											*CAS #*	297-97-2
Second Quarter 2009	U		U		U		U		5	-		8270C
Dimethoate											*CAS #*	60-51-5
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
Dimethyl ether											*CAS #*	115-10-6
Second Quarter 2009	U		U		U		U		12.5	-		8260B
p-(Dimethylamino)azobenzene											*CAS #*	60-11-7
Second Quarter 2009	U		U		U		U		5	-		8270C
7,12-Dimethylbenz[a]anthracene											*CAS #*	57-97-6
Second Quarter 2009	U		U		U		U		5	-		8270C
3,3'-Dimethylbenzidine											*CAS #*	119-93-7
Second Quarter 2009	U		U		U		U		5	-		8270C
a,a-Dimethylphenethylamine											*CAS #*	122-09-8
Second Quarter 2009	U	J	U	J	U	J	U	J	50	-		8270C
2,4-Dimethylphenol											*CAS #*	105-67-9
Second Quarter 2009	U		U		U		U		5	-		8270C
Dimethyl phthalate											*CAS #*	131-11-3
Second Quarter 2009	U		U		U		U		5	-		8270C
m-Dinitrobenzene											*CAS #*	99-65-0
Second Quarter 2009	U		U		U		U		5	-		8270C
4,6-Dinitro-o-cresol											*CAS #*	534-52-1
Second Quarter 2009	U	J	U	J	U	J	U	J	10	-		8270C
2,4-Dinitrophenol											*CAS #*	51-28-5
Second Quarter 2009	U	J	U	J	U	J	U	J	10	31.3	10	8270C
Fourth Quarter 2009	U	J	U	J	U	J	U	J	10	31.3	10	8270C
2,4-Dinitrotoluene											*CAS #*	121-14-2
Second Quarter 2009	U		U		1.6	J	U		5	31.3	10	8270C
Fourth Quarter 2009	U		U		U		U		10	31.3	10	8270C
2,6-Dinitrotoluene											*CAS #*	606-20-2
Second Quarter 2009	U		U		U		U		5	15.65	10	8270C
Fourth Quarter 2009	U		U		U		U		10	15.65	10	8270C
Dinoseb											*CAS #*	88-85-7
Second Quarter 2009	U		U		U		U		2.5	-		8151A
Di-n-octyl phthalate											*CAS #*	117-84-0
Second Quarter 2009	U		U		U		U		5	-		8270C

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B*	*Q*	*7MW6*	*Q*	*7WCA*	*Q*	*7W11B*	*Q*	*QL*	*GPS*	*Background*	*Method*
1,4-Dioxane											*CAS #*	123-91-1
Second Quarter 2009	U		U		U		U		100	-		8260B
Diphenylamine											*CAS #*	122-39-4
Second Quarter 2009	U		U		U		U		5	-		8270C
Disulfoton											*CAS #*	298-04-4
Second Quarter 2009	U		U		U		U		5	-		8270C
Endosulfan I											*CAS #*	959-98-8
Second Quarter 2009	U		U		U		U		0.05	-		8081
Endosulfan II											*CAS #*	33213-65-9
Second Quarter 2009	U		U		U		U		0.1	-		8081
Endosulfan sulfate											*CAS #*	1031-07-8
Second Quarter 2009	U		U		U		U		0.1	-		8081
Endrin											*CAS #*	72-20-8
Second Quarter 2009	U		U		U		U		0.1	-		8081
Ethyl acetate											*CAS #*	141-78-6
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8260B
Endrin aldehyde											*CAS #*	7421-93-4
Second Quarter 2009	U		U		U		U		0.1	-		8081
Ethanol											*CAS #*	64-17-5
Second Quarter 2009	U		U		U		U		250	-		8260B
Ethylbenzene											*CAS #*	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											*CAS #*	62-50-0
Second Quarter 2009	U		U		U		U		5	-		8270C
Ethylene oxide											*CAS #*	75-21-8
Second Quarter 2009	U	J	U	J	U	J	U	J	20	-		8260B
Famphur											*CAS #*	52-85-7
Second Quarter 2009	U		U		U		U		5	-		8270C
Fluoranthene											*CAS #*	206-44-0
Second Quarter 2009	U		U		U		U		5	-		8270C
Fluorene											*CAS #*	86-73-7
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
Heptachlor											*CAS #*	76-44-8
Second Quarter 2009	U		U		U		U		0.05	-		8081
Heptachlor epoxide											*CAS #*	1024-57-3
Second Quarter 2009	U		U		U		U		0.05	-		8081
Hexachlorobenzene											*CAS #*	118-74-1
Second Quarter 2009	U		U		U		U		5	-		8270C
Hexachlorobutadiene											*CAS #*	87-68-3
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Hexachlorocyclopentadiene											*CAS #*	77-47-4
Second Quarter 2009	U		U		U		U		5	-		8270C
Hexachloroethane											*CAS #*	67-72-1
Second Quarter 2009	U		U		U		U		0.5	-		8260B

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B Q*	*7MW6 Q*	*7WCA Q*	*7W11B Q*	*QL*	*GPS*	*Background*	*Method*
Hexachlorophene							*CAS #*	70-30-4
Second Quarter 2009	U	U	U	U	500	-		8270C
Hexachloropropene							*CAS #*	1888-71-7
Second Quarter 2009	U	U	U	U	5	-		8270C
2-Hexanone							*CAS #*	591-78-6
Second Quarter 2009	U	U	U	U	5	-		8260B
Indeno[1,2,3-cd]pyrene							*CAS #*	193-39-5
Second Quarter 2009	U	U	U	U	5	-		8270C
Isobutyl alcohol							*CAS #*	78-83-1
Second Quarter 2009	U	U	U	U	25	-		8260B
Isodrin							*CAS #*	465-73-6
Second Quarter 2009	U	U	U	U	5	-		8270C
Isophorone							*CAS #*	78-59-1
Second Quarter 2009	U	U	U	U	5	-		8270C
Isopropylbenzene							*CAS #*	98-82-8
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Isopropylether							*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	U	5	-		8270C
Kepone							*CAS #*	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							*CAS #*	91-80-5
Second Quarter 2009	U	U	U	U	5	-		8270C
Methoxychlor							*CAS #*	72-43-5
Second Quarter 2009	U	U	U	U	0.5	-		8081
Bromomethane							*CAS #*	74-83-9
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Chloromethane							*CAS #*	74-87-3
Second Quarter 2009	U	U	U	U	1	-		8260B
3-Methylcholanthrene							*CAS #*	56-49-5
Second Quarter 2009	U	U	U	U	5	-		8270C
2-Butanone							*CAS #*	78-93-3
Second Quarter 2009	U	U	U	U	5	-		8260B
Iodomethane							*CAS #*	74-88-4
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Methyl methacrylate							*CAS #*	80-62-6
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Methyl methane sulfonate							*CAS #*	66-27-3
Second Quarter 2009	U	U	U	U	5	-		8270C
2-Methylnaphthalene							*CAS #*	91-57-6
Second Quarter 2009	U	U	U	U	5	-		8270C

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B*	*Q*	*7MW6*	*Q*	*7WCA*	*Q*	*7W11B*	*Q*	*QL*	*GPS*	*Background*	*Method*
Methyl parathion											*CAS #*	298-00-0
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
4-Methyl-2-pentanone											*CAS #*	108-10-1
Second Quarter 2009	U		U		U		U		5	-		8260B
2-Methylphenol											*CAS #*	95-48-7
Second Quarter 2009	U		U		U		U		5	-		8270C
3 & 4-Methylphenol											*CAS #* 08-39-4	p 106-44-5
Second Quarter 2009	U		U		U		U		10	-		8270C
Methyl tert-butyl ether											*CAS #*	1634-04-4
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Dibromomethane											*CAS #*	74-95-3
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Methylene chloride											*CAS #*	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											*CAS #*	134-32-7
Second Quarter 2009	U		U		U		U		5	-		8270C
2-Naphthylamine											*CAS #*	91-59-8
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
o-Nitroaniline											*CAS #*	88-74-4
Second Quarter 2009	U		U		U		U		10	-		8270C
m-Nitroaniline											*CAS #*	99-09-2
Second Quarter 2009	U		U		U		U		10	-		8270C
p-Nitroaniline											*CAS #*	100-01-6
Second Quarter 2009	U		U		U		U		10	-		8270C
Nitrobenzene											*CAS #*	98-95-3
Second Quarter 2009	U		U		U		U		5	-		8270C
o-Nitrophenol											*CAS #*	88-75-5
Second Quarter 2009	U		U		U		U		5	-		8270C
p-Nitrophenol											*CAS #*	100-02-7
Second Quarter 2009	U	J	U	J	U	J	U	J	10	50	20	8270C
Fourth Quarter 2009	U		U		U		U		10	50	20	8270C
4-Nitroquinoline-1-oxide											*CAS #*	56-57-5
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
N-Nitrosodi-n-butylamine											*CAS #*	924-16-3
Second Quarter 2009	U		U		U		U		5	-		8270C
N-Nitrosodiethylamine											*CAS #*	55-18-5
Second Quarter 2009	U		U		U		U		5	-		8270C
N-Nitrosodimethylamine											*CAS #*	62-75-9
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
N-Nitrosodiphenylamine											*CAS #*	86-30-6
Second Quarter 2009	U		U		U		U		5	-		8270C
N-Nitrosodipropylamine											*CAS #*	621-64-7
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B*	*Q*	*7MW6*	*Q*	*7WCA*	*Q*	*7W11B*	*Q*	*QL*	*GPS*	*Background*	*Method*
N-Nitrosomethylethylamine											*CAS #*	10595-95-6
Second Quarter 2009	U		U		U		U		5	-		8270C
N-Nitrosomorpholine											*CAS #*	59-89-2
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
N-Nitrosopiperidine											*CAS #*	100-75-4
Second Quarter 2009	U		U		U		U		5	-		8270C
N-Nitrosopyrrolidine											*CAS #*	930-55-2
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
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											*CAS #*	76-01-7
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Pentachloronitrobenzene											*CAS #*	82-68-8
Second Quarter 2009	U		U		U		U		5	-		8270C
Pentachlorophenol											*CAS #*	87-86-5
Second Quarter 2009	U		U		U		U		10	-		8270C
Phenacetin											*CAS #*	62-44-2
Second Quarter 2009	U		U		U		U		5	-		8270C
Phenanthrene											*CAS #*	85-01-8
Second Quarter 2009	U		U		U		U		5	-		8270C
Phenol											*CAS #*	108-95-2
Second Quarter 2009	U		U		U		U		5	-		8270C
Phorate											*CAS #*	298-02-2
Second Quarter 2009	U		U		U		U		5	-		8270C
2-Picoline											*CAS #*	109-06-8
Second Quarter 2009	U		U		U		U		5	-		8270C
Pronamide											*CAS #*	23950-58-5
Second Quarter 2009	U		U		U		U		5	-		8270C
1-Propanol											*CAS #*	71-23-8
Second Quarter 2009	U	J	U	J	U	J	U	J	1000	-		8260B
2-Propanol											*CAS #*	67-63-0
Second Quarter 2009	U		U		U		U		100	-		8260B
Propionitrile											*CAS #*	107-12-0
Second Quarter 2009	U		U		U		U		10	-		8260B
n-Propylbenzene											*CAS #*	103-65-1
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Pyrene											*CAS #*	129-00-0
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
Pyridine											*CAS #*	110-86-1
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
Safrole											*CAS #*	94-59-7
Second Quarter 2009	U		U		U		U		5	-		8270C

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B*	*Q*	*7MW6*	*Q*	*7WCA*	*Q*	*7W11B*	*Q*	*QL*	*GPS*	*Background*	*Method*
Silvex											*CAS #*	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											*CAS #*	3689-24-5
Second Quarter 2009	U		U		U		U		5	-		8270C
2,4,5-Trichlorophenoxyacetic acid											*CAS #*	93-76-5
Second Quarter 2009	U		U		U		U		2.5	-		8151A
1,2,4,5-Tetrachlorobenzene											*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		U		0.5	-		8260B
1,1,2,2-Tetrachloroethane											*CAS #*	79-34-5
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Tetrachloroethene											*CAS #*	127-18-4
Second Quarter 2009	U		U		U		U		1	-		8260B
Tetrahydrofuran											*CAS #*	109-99-9
Second Quarter 2009	U		U		U		U		5	-		8260B
2,3,4,6-Tetrachlorophenol											*CAS #*	58-90-2
Second Quarter 2009	U		U		U		U		5	-		8270C
Toluene											*CAS #*	108-88-3
Second Quarter 2009	U		U		U		U		1	-		8260B
o-Toluidine											*CAS #*	95-53-4
Second Quarter 2009	U	J	U	J	U	J	U	J	5	-		8270C
Toxaphene											*CAS #*	8001-35-2
Second Quarter 2009	U		U		U		U		2.5	-		8081
1,2,3-Trichlorobenzene											*CAS #*	87-61-6
Second Quarter 2009	U		U		U		U		0.5	-		8260B
1,2,4-Trichlorobenzene											*CAS #*	120-82-1
Second Quarter 2009	U		U		U		U		0.5	-		8260B
1,1,1-Trichloroethane											*CAS #*	71-55-6
Second Quarter 2009	U		U		U		U		1	-		8260B
1,1,2-Trichloroethane											*CAS #*	79-00-5
Second Quarter 2009	U		U		U		U		0.5	-		8260B
Trichloroethene											*CAS #*	79-01-6
Second Quarter 2009	U		U		U		U		1	-		8260B
Trichlorofluoromethane											*CAS #*	75-69-4
Second Quarter 2009	U		U		U		U		1	-		8260B
2,4,5-Trichlorophenol											*CAS #*	95-95-4
Second Quarter 2009	U		U		U		U		5	-		8270C
2,4,6-Trichlorophenol											*CAS #*	88-06-2
Second Quarter 2009	U		U		U		U		5	-		8270C
1,2,3-Trichloropropane											*CAS #*	96-18-4
Second Quarter 2009	U		U		U		U		1	-		8260B
1,1,2-Trichloro-1,2,2-Trifluoroethane											*CAS #*	76-13-1
Second Quarter 2009	U		U		U		U		1	-		8260B

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B Q*	*7MW6 Q*	*7WCA Q*	*7W11B Q*	*QL*	*GPS*	*Background*	*Method*
O,O,O-Triethyl phosphorothioate							*CAS #*	126-68-1
Second Quarter 2009	U	U	U	U	5	-		8270C
1,2,4-Trimethylbenzene							*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							*CAS #*	99-35-4
Second Quarter 2009	U J	U J	U J	U J	5	-		8270C
Vinyl acetate							*CAS #*	108-05-4
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Vinyl chloride							*CAS #*	75-01-4
Second Quarter 2009	U	U	U	U	0.5	-		8260B
Xylenes (Total)							*CAS #*	1330-20-7
Second Quarter 2009	U	U	U	U	3	-		8260B

Target Analyte Monitoring Results - HWMU-7 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 7W12B

All Results in ug/L.

Analtye/Quarter	*7W12B*	*Q*	*7MW6*	*Q*	*7WCA*	*Q*	*7W11B*	*Q*	*QL*	*GPS*	*Background*	*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 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 2008, 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

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services

Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Facility: HWMU-7 Monitoring Event: Second Quarter 2009

Analyte	Sample ID	Laboratory Result (ug/L)	Q	Validated Result (ug/L)	Q	QL (ug/L)	Validation Notes
Method: 6020							
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC							
Barium	7WCA	29.7		29.7		10	No action taken.
	7WDUP	30.3		30.3		10	No action taken. Field duplicate for 7WCA.
Cobalt	7WCA	5.7		5.7		5	No action taken.
	7WDUP	5.6		5.6		5	No action taken. Field duplicate for 7WCA.
Nickel	7WCA	14.6		14.6		10	No action taken.
	7WDUP	14.8		14.8		10	No action taken. Field duplicate for 7WCA.
Method: 8260B							
Laboratory: Lancaster Laboratories, Lancaster, PA							
Chloroform	7WCA	0.9		0.9	J	1	Result < permit QL 1 ug/l.
	7WDUP	0.9		0.9	J	1	Result < permit QL 1 ug/l. Duplicate for 7WCA. Duplicate 0.9 ug/l.

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

Facility: HWMU-7 Monitoring Event: Fourth Quarter 2009

Analyte	Sample ID	Laboratory Result (ug/L)	Q	Validated Result (ug/L)	Q	QL (ug/L)	Validation Notes
Method: 6020							
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC							
Barium	7WCA	29.3		29.3		10	No action taken. Blind field duplicate 7WDUP, RPD <10.
	7WDUP	28.6		28.6		10	Blind field duplicate result for 7WCA. RPD <10.
Nickel	7WCA	12.5		12.5		10	No action taken. Blind field duplicate 7WDUP, RPD <10.
	7WDUP	13		13		10	Blind field duplicate result for 7WCA. RPD <10.

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

See last page of this report for definitions.

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*	*7W10B*	*Q*	*7W10C*	*Q*	*7W13*	*Q*	*QL*	*Background*	*GPS*	*Method*	*CAS #*
Antimony															
Second Quarter 2009		U		U N		U		U		U	1	1	6	6020	7440-36-0
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	7440-38-2
Fourth Quarter 2009		U		U		U		U		U	10	10	10	6020	7440-38-2
Barium															
Second Quarter 2009	33.1		22.8		65.7		49.8		12.7		10	41	2000	6020	7440-39-3
Fourth Quarter 2009	36		22.8		79.7		59.6		16.5		10	41	2000	6020	7440-39-3
Cadmium															
Second Quarter 2009		U		U		U		U		U	1	1	5	6020	7440-43-9
Fourth Quarter 2009		U		U		U		U		U	1	1	5	6020	7440-43-9
Chromium															
Second Quarter 2009	7.8			U		U		U		U	5	9.9	100	6020	7440-47-3
Fourth Quarter 2009	7.5			U		U		U		U	5	9.9	100	6020	7440-47-3
Cobalt															
Second Quarter 2009		U		U		U		U	8.2		5	5	156.65	6020	7440-48-4
Fourth Quarter 2009		U		U		U		U	10.7		5	5	156.65	6020	7440-48-4
Copper															
Second Quarter 2009	1	J		U		U		U		U	5	5	1300	6020	7440-50-8
Fourth Quarter 2009		U		U		U		U		U	5	5	1300	6020	7440-50-8
Lead															
Second Quarter 2009		U		U J		U		U		U J	1	1	15	6020	7439-92-1
Fourth Quarter 2009		U		U		U		U		U	1	1	15	6020	7439-92-1
Mercury															
Second Quarter 2009		U		U		U		U		U	2	2	2	7470A	7439-97-6
Fourth Quarter 2009		U		U		U		U		U	2	2	2	7470A	7439-97-6
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															
Second Quarter 2009		U		U		U		U		U	10	10	50	6020	7782-49-2
Fourth Quarter 2009		U		U		U		U		U	10	10	50	6020	7782-49-2
Silver															
Second Quarter 2009		U		U		U		U		U	2	2	78.25	6020	7440-22-4
Fourth Quarter 2009		U		U		U		U		U	2	2	78.25	6020	7440-22-4
Thallium															
Second Quarter 2009		U		U J		U		U		U J	1	1	2	6020	7440-28-0
Fourth Quarter 2009		U		U		U		U		U	1	1	2	6020	7440-28-0
Zinc															
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															
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)phthalate															
Second Quarter 2009		U		U		U J		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 phthalate															
Second Quarter 2009		U		U		U J		U		U	5	10	3130	8270C	85-68-7
Fourth Quarter 2009		U		U		U		U		U	10	10	3130	8270C	85-68-7

See last page of this report for definitions.

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*	*7W10B Q*	*7W10C Q*	*7W13 Q*	*QL*	*Background*	*GPS*	*Method*	*CAS #*
2,4-Dinitrophenol										
Second Quarter 2009	U J	U J	U J	U J	U J	10	10	31.3	8270C	51-28-5
Fourth Quarter 2009	U J	U J	U J	U J	U J	10	10	31.3	8270C	51-28-5
2,4-Dinitrotoluene										
Second Quarter 2009	U	U	U J	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										
Second Quarter 2009	U	U	U J	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										
Second Quarter 2009	U J	U	U J	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.
CAS# Denotes Chemical Abstract Services registration number. **GPS** Denotes groundwater protection standard.

Notes:
-January 2005: Verification sampling event for 7MW13 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, 7W13 cobalt-original result reported.. 7W9C cobalt- Verification result reported.

-Dec 17, 2008: Verification sampling event for 7W13 . cobalt- Original result reported.

APPENDIX B-4

ESTABLISHED BACKGROUND VALUES AND COMPUTATIONS FOR HWMU-7

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.

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 Size*	*% Non-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.**

Parameter	*Sample Size*	*% Non-Detects*
Total Organic Carbon	36	27.2%
Silver	23	47.8%

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	SpCon
3/31/92	1.00		0.10		0.50		730.00
6/30/92	1.00		0.10		0.50		706.00
9/30/92	1.00		0.10		0.50		370.00
12/31/92	35.00	50.00	0.30	253.00	19.00		798.00
3/31/93	27.00	16.00	0.40	17.00	0.50		722.00
6/30/93	31.00	10.00	0.10	126.00	0.50		715.00
9/30/93	38.00	6.00	0.30	81.00	4.00		895.00
12/31/93	40.00	7.00	0.10	144.00	0.50		918.00
3/31/94	27.00	10.00	0.30	29.00	2.00		723.00
6/30/94	35.00	3.00	0.70	26.00	5.00		750.00
9/30/94	59.00	2.00	0.50	26.00	12.00		891.00
12/31/94	44.00	2.00	3.10	55.00	3.00		880.00
3/30/95	40.00	10.00	0.10	10.20	1.00		822.00
6/29/95	36.00	9.30	0.10	20.00	1.40		740.00
9/30/95	30.00	2.00	0.10	11.00	0.50	1250.00	610.00
12/31/95	37.00	10.00	1.90	49.00	6.00	875.00	840.00
3/31/96	31.00	8.00	0.10	55.00	2.00	500.00	652.00
6/30/96	26.00	3.00	0.10	1.00	0.50	2000.00	608.00
9/30/96	35.00	14.00	0.10	24.00	4.00	500.00	758.00
12/31/96	32.00	3.00	0.30	113.00	6.00	2000.00	768.00
3/31/97	40.00	16.00	0.40	105.00	6.00	1000.00	750.00
6/30/97	32.00	55.00	0.30	135.00	3.00	3000.00	720.00
9/30/97	43.00	29.00	1.20	45.00	3.00	500.00	850.00
Number of Samples	23.00	20.00	23.00	20.00	23.00	9.00	23.00
Mean	31.35	13.27	0.47	66.26	3.54	1291.67	748.52
Standard Deviation	13.91	14.92	0.71	63.06	4.38	870.52	119.05
Shapiro-Wilk W	0.84	0.70	0.57	0.84	0.70	0.87	0.89
Normal Distribution	No	No	No	No	No	Yes	Yes
K	2.33	2.40	2.33	2.40	2.33	3.03	2.33
UTL	63.74	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
HMWU-5	Fourth Quarter 2003	Chromium	QL	5	yes	100	USEPA MCL
		Diethyl Ether	QL	12	no	NA	NA
		2-Nitroaniline	QL	20	no	NA	NA
		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
	Second Quarter 2004	Zinc	Calculated	217	no	NA	NA
HWMU-10	First Quarter 2003	Cobalt	QL	5	no	NA	NA
	Second Quarter 2003	Vanadium	QL	10	no	NA	NA
	Second Quarter 2005	Acetone	QL	10	no	NA	NA
		2-Propanol	QL	50	no	NA	NA
HWMU-16	Second Quarter 2003	Chloroethane	Calculated	20.7	yes	20.7	Background/QL
		Diethyl Ether	Calculated	75.5	no	NA	NA
		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:

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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 µg/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)					
Parameter	**Sample Size**	**% Non-Detects**	**QL (µg/l)**	**NUPL (µg/l)**	**Background Value (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					
Parameter	**Sample Size**	**% Non-Detects**	**QL (µg/l)**	**UPL (µg/l)**	**Background Value (µg/l)**
Barium	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:\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
            Mean:        36.253        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.
GRIT/STAT Version 5.0
```

Parametric Prediction Interval

Report Printed December 17,2007

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,α=0.01: 0.8510
Mean: 36.253 ppb
Std Dev: 1.875 ppb
DF: 16
Conf. Level (1-α): 0.9500
Future Samples (k): 4
$t_{\left[1-\frac{\alpha}{k}\right]}$: 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
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
            Mean:         6.612      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.
GRIT/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-α): ~~94.440%~~ N/A

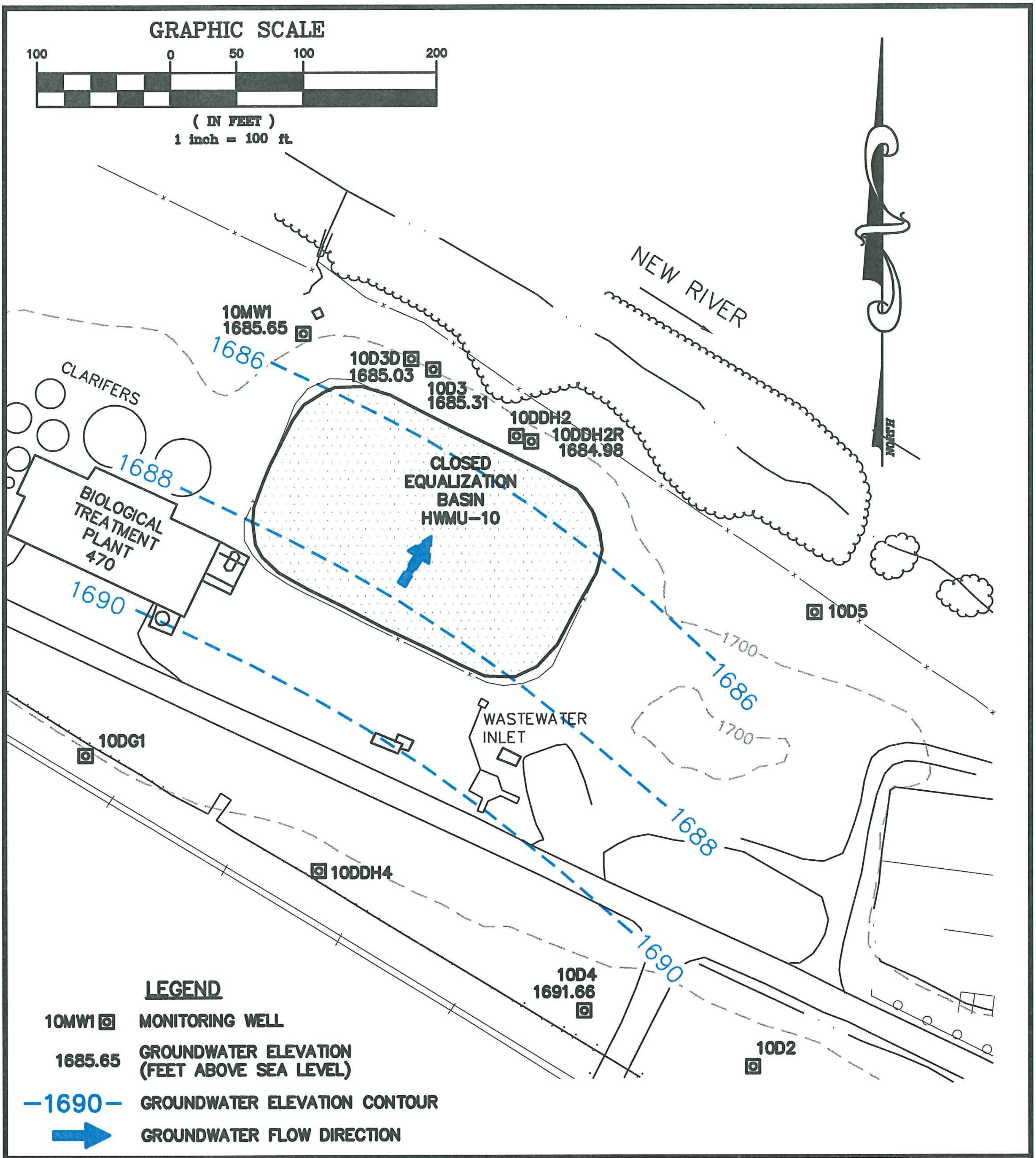
UL: 9.900 ppb
LL: 0.000

APPENDIX C

HWMU-10

APPENDIX C-1

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



HWMU-10 POTENTIOMETRIC SURFACE MAP (2ND QUARTER 2009)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=100'

PLAN NO. B03204-07

Draper Aden Associates

Engineering ✦ Surveying ✦ Environmental Services

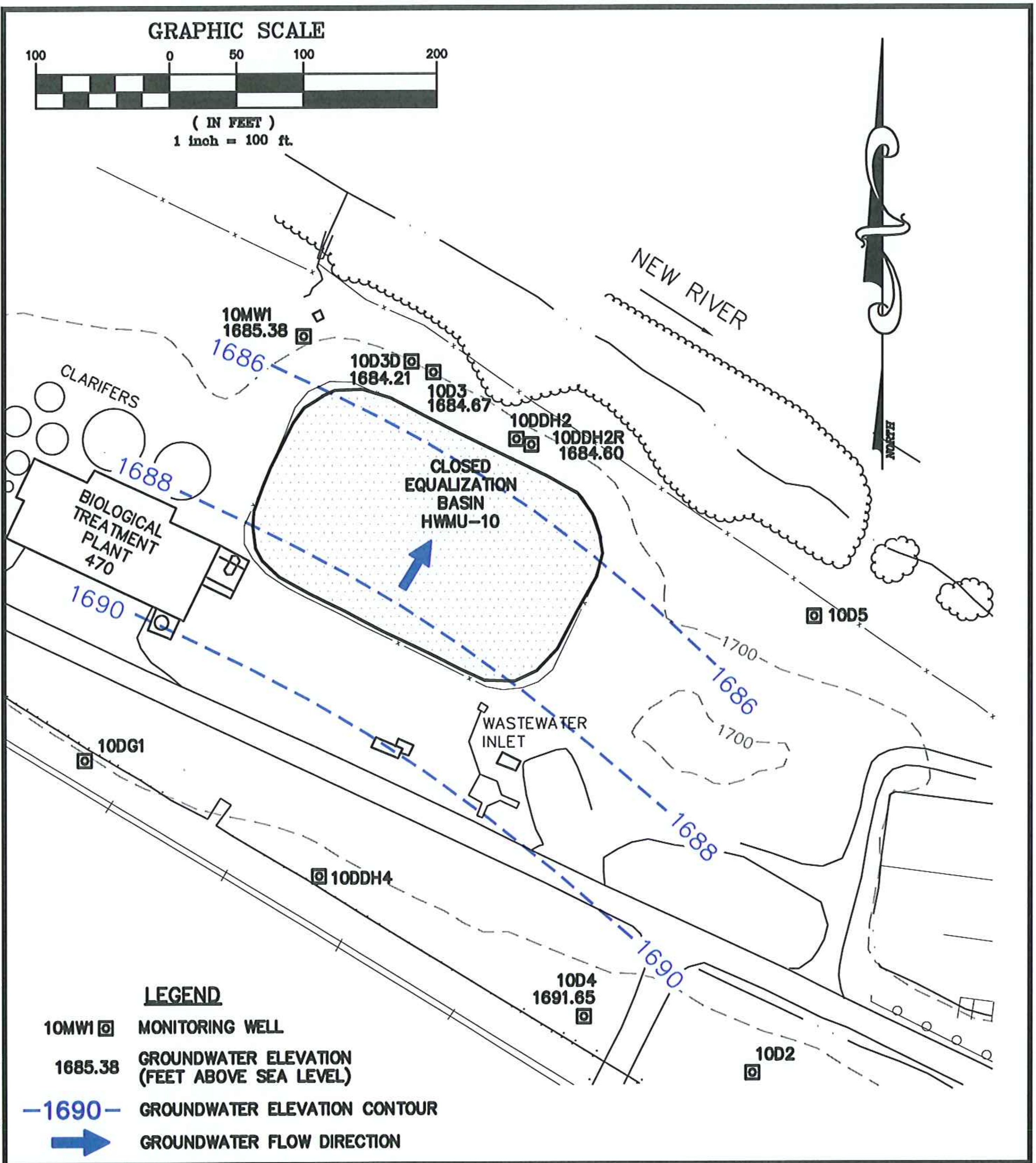
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	RGM
DRAWN	JFF
CHECKED	MDL
DATE	07/29/09

FIGURE
3

P:\B03\200\B03204\B03204-07\CAD\B03204-07 ENV\dwg\B03204-07_HWMU-10.dwg Jul 29, 2009 3:43pm



HWMU-10 POTENTIOMETRIC SURFACE MAP (4TH QUARTER 2009)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=100'

PLAN NO. B03204-07

Draper Aden Associates

Engineering ✦ Surveying ✦ Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	RGM
DRAWN	JFF
CHECKED	MDL
DATE	01/26/10

FIGURE

3

P:\B03\200\B03204\B03204-07CAD\B03204-07 ENV\dwg\B03204-07_HWMU-10.dwg Jan 26, 2010 2:17pm

APPENDIX C-2

HWMU-10 2009 LABORATORY ANALYTICAL RESULTS POINT OF COMPLIANCE WELLS

Target Analyte Monitoring Results - HWMU-10 Point of Compliance Wells

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*
Antimony							*CAS #*		*7440-36-0*				
Second Quarter 2009	U		U	J	U	J	U		U		1	-	6020
Arsenic							*CAS #*		*7440-38-2*				
Second Quarter 2009	U		U		U		U		U		10	50	6020
Fourth Quarter 2009	U		U		U		U		U		10	50	6020
Barium							*CAS #*		*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							*CAS #*		*7440-41-7*				
Second Quarter 2009	U		U		U		U		U		1	-	6020
Cadmium							*CAS #*		*7440-43-9*				
Second Quarter 2009	U		U		U		U		U		1	-	6020
Chromium							*CAS #*		*7440-47-3*				
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							*CAS #*		*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*				
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							*CAS #*		*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							*CAS #*		*7440-28-0*				
Second Quarter 2009	U		U		U		U		U		1	-	6020
Tin							*CAS #*		*7440-31-5*				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	6020
Vanadium							*CAS #*		*7440-62-2*				
Second Quarter 2009	1.6	J	U		U		U		U		10	-	6020
Fourth Quarter 2009	U		U		U		U		U		10	-	6020
Zinc							*CAS #*		*7440-66-6*				
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							*CAS #*		*18496-25-8*				
Second Quarter 2009	U		U		U		U		U		1000	-	9034

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-10 Point of Compliance Wells

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*
Cyanide							*CAS # 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 Phenolics							*CAS # PHENOLICS*						
Second Quarter 2009	U		U		U		U		U		60	-	9065
Acenaphthene							*CAS # 83-32-9*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Acenaphthylene							*CAS # 208-96-8*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Acetone							*CAS # 67-64-1*						
Second Quarter 2009	U		U		5700		U		U		5	-	8260B
Fourth Quarter 2009	U		U		12000		U		U		10	-	8260B
Acetonitrile							*CAS # 75-05-8*						
Second Quarter 2009	U		U		U		U		U		20	-	8260B
Acetophenone							*CAS # 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							*CAS # 107-02-8*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	25	-	8260B
Acrylonitrile							*CAS # 107-13-1*						
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	-	8260B
4-Aminobiphenyl							*CAS # 92-67-1*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Aniline							*CAS # 62-53-3*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Anthracene							*CAS # 120-12-7*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Aramite							*CAS # 140-57-8*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Benzene							*CAS # 71-43-2*						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
Benzo[a]anthracene							*CAS # 56-55-3*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Benzo[b]fluoranthene							*CAS # 205-99-2*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Benzo[k]fluoranthene							*CAS # 207-08-9*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Benzo[ghi]perylene							*CAS # 191-24-2*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Benzo(a)pyrene							*CAS # 50-32-8*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
1,4-Benzenediamine							*CAS # 106-50-3*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	50	-	8270C

Target Analyte Monitoring Results - HWMU-10 Point of Compliance Wells

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*
Benzyl alcohol							*CAS #* 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)methane							*CAS #* 111-91-1						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
bis(2-Chloroethyl)ether							*CAS #* 111-44-4						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
bis(2-Chloro-1-methylethyl)ether							*CAS #* 108-60-1						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
bis(2-Ethylhexyl)phthalate							*CAS #* 117-81-7						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Bromobenzene							*CAS #* 108-86-1						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
Bromochloromethane							*CAS #* 74-97-5						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
Bromodichloromethane							*CAS #* 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							*CAS #* 101-55-3						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
2-Butanone							*CAS #* 78-93-3						
Second Quarter 2009	U		U		U		U		U		5	691.08	8260B
Fourth Quarter 2009	U		U		U		U		U		10	691.08	8260B
n-Butyl alcohol							*CAS #* 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		U		U		0.5	-	8260B
tert-Butylbenzene							*CAS #* 98-06-6						
Second Quarter 2009	U		U		U		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							*CAS #* 56-23-5						
Second Quarter 2009	U		U		U		U		U		1	-	8260B

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-10 Point of Compliance Wells

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*
Chlordane							*CAS # 57-74-9*						
Second Quarter 2009	U		U		U		U		U		0.86	-	8081A
p-Chloroaniline							*CAS # 106-47-8*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Chlorobenzene							*CAS # 108-90-7*						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
Chlorobenzilate							*CAS # 510-15-6*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
p-Chloro-m-cresol							*CAS # 59-50-7*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Chloroethane							*CAS # 75-00-3*						
Second Quarter 2009	U		U		U		U		U		1	-	8260B
Chloroform							*CAS # 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							*CAS # 110-75-8*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	0.5	-	8260B
2-Chloronaphthalene							*CAS # 91-58-7*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
2-Chlorophenol							*CAS # 95-57-8*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
4-Chlorophenyl phenyl ether							*CAS # 7005-72-3*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Chloroprene							*CAS # 126-99-8*						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
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	U	J	U	J	U	J	5	-	8270C
Cyclohexane							*CAS # 110-82-7*						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
2,4-Dichlorophenoxyacetic acid							*CAS # 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		0.1	-	8081A
4,4'-DDE							*CAS # 72-55-9*						
Second Quarter 2009	U		U		U		U		U		0.1	-	8081A
4,4'-DDT							*CAS # 50-29-3*						
Second Quarter 2009	U		U		U		U		U		0.1	-	8081A
Diallate							*CAS # 17708-57-5*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Dibenz(a,h)anthracene							*CAS # 53-70-3*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Dibenzofuran							*CAS # 132-64-9*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Dibromochloromethane							*CAS # 124-48-1*						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-10 Point of Compliance Wells

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*
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
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							*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	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		1	-	8260B
1,1-Dichloroethene							*CAS #* 75-35-4						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
cis-1,2-Dichloroethene							*CAS #* 156-59-2						
Second Quarter 2009	U		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		5	-	8270C
2,6-Dichlorophenol							*CAS #* 87-65-0						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
1,2-Dichloropropane							*CAS #* 78-87-5						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
1,3-Dichloropropane							*CAS #* 142-28-9						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
2,2-Dichloropropane							*CAS #* 594-20-7						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
1,1-Dichloropropene							*CAS #* 563-58-6						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
cis-1,3-Dichloropropene							*CAS #* 10061-01-5						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
trans-1,3-Dichloropropene							*CAS #* 10061-02-6						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
Dieldrin							*CAS #* 60-57-1						
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

Target Analyte Monitoring Results - HWMU-10 Point of Compliance Wells

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*
Diethyl phthalate							*CAS # 84-66-2*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
O,O-Diethyl O-2-pyrazinyl							*CAS # 297-97-2*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Dimethoate							*CAS # 60-51-5*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Dimethyl ether							*CAS # 115-10-6*						
Second Quarter 2009	U		U		U		U		U		12.5	-	8260B
p-(Dimethylamino)azobenzene							*CAS # 60-11-7*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
7,12-Dimethylbenz[a]anthracene							*CAS # 57-97-6*						
Second Quarter 2009	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-Dimethylphenethylamine							*CAS # 122-09-8*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	50	-	8270C
2,4-Dimethylphenol							*CAS # 105-67-9*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Dimethyl phthalate							*CAS # 131-11-3*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
m-Dinitrobenzene							*CAS # 99-65-0*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
4,6-Dinitro-o-cresol							*CAS # 534-52-1*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	10	-	8270C
2,4-Dinitrophenol							*CAS # 51-28-5*						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	10	-	8270C
2,4-Dinitrotoluene							*CAS # 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							*CAS # 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							*CAS # 88-85-7*						
Second Quarter 2009	U		U		U		U		U		2.5	-	8151A
Di-n-octyl phthalate							*CAS # 117-84-0*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
1,4-Dioxane							*CAS # 123-91-1*						
Second Quarter 2009	U		U		U		U		U		100	-	8260B
Diphenylamine							*CAS # 122-39-4*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Disulfoton							*CAS # 298-04-4*						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Endosulfan I							*CAS # 959-98-8*						
Second Quarter 2009	U		U		U		U		U		0.05	-	8081A
Endosulfan II							*CAS # 33213-65-9*						
Second Quarter 2009	U		U		U		U		U		0.1	-	8081A
Endosulfan sulfate							*CAS # 1031-07-8*						
Second Quarter 2009	U		U		U		U		U		0.1	-	8081A

Target Analyte Monitoring Results - HWMU-10 Point of Compliance Wells

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*
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	U	J	U	J	U	J	U	J	U	J	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							*CAS #* 62-50-0						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Ethylene oxide							*CAS #* 75-21-8						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	20	-	8260B
Famphur							*CAS #* 52-85-7						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Fluoranthene							*CAS #* 206-44-0						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Fluorene							*CAS #* 86-73-7						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Heptachlor							*CAS #* 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							*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 #* 70-30-4						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	500	-	8270C
Hexachloropropene							*CAS #* 1888-71-7						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
2-Hexanone							*CAS #* 591-78-6						
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 #* 78-83-1						
Second Quarter 2009	U		U		U		U		U		25	-	8260B
Isodrin							*CAS #* 465-73-6						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Isophorone							*CAS #* 78-59-1						
Second Quarter 2009	U		U		U		U		U		5	-	8270C

Target Analyte Monitoring Results - HWMU-10 Point of Compliance Wells

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*
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	-	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	U	U	U	U	5	-	8270C
Methacrylonitrile				*CAS #* 126-98-7				
Second Quarter 2009	U	U	U	U	U	5	-	8260B
Methapyrilene				*CAS #* 91-80-5				
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
Methoxychlor				*CAS #* 72-43-5				
Second Quarter 2009	U	U	U	U	U	0.5	-	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
Iodomethane				*CAS #* 74-88-4				
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Methyl methacrylate				*CAS #* 80-62-6				
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Methyl methane sulfonate				*CAS #* 66-27-3				
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				
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
4-Methyl-2-pentanone				*CAS #* 108-10-1				
Second Quarter 2009	U	U	U	U	U	5	-	8260B
2-Methylphenol				*CAS #* 95-48-7				
Second Quarter 2009	U	U	U	U	U	5	-	8270C
3 & 4-Methylphenol				*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				*CAS #* 75-09-2				
Second Quarter 2009	U	U	U	U	U	1	-	8260B
Naphthalene				*CAS #* 91-20-3				
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,4-Naphthoquinone				*CAS #* 130-15-4				
Second Quarter 2009	U	U	U	U	U	5	-	8270C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-10 Point of Compliance Wells

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
1-Naphthylamine							CAS # 134-32-7						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
2-Naphthylamine							CAS # 91-59-8						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
o-Nitroaniline							CAS # 88-74-4						
Second Quarter 2009	U		U		U		U		U		10	-	8270C
m-Nitroaniline							CAS # 99-09-2						
Second Quarter 2009	U		U		U		U		U		10	-	8270C
p-Nitroaniline							CAS # 100-01-6						
Second Quarter 2009	U		U		U		U		U		10	-	8270C
Nitrobenzene							CAS # 98-95-3						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
o-Nitrophenol							CAS # 88-75-5						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
p-Nitrophenol							CAS # 100-02-7						
Second Quarter 2009	U		U		U		U		U		10	-	8270C
4-Nitroquinoline-1-oxide							CAS # 56-57-5						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
N-Nitrosodi-n-butylamine							CAS # 924-16-3						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
N-Nitrosodiethylamine							CAS # 55-18-5						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
N-Nitrosodimethylamine							CAS # 62-75-9						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
N-Nitrosodiphenylamine							CAS # 86-30-6						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
N-Nitrosodipropylamine							CAS # 621-64-7						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
N-Nitrosomethylethylamine							CAS # 10595-95-6						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
N-Nitrosomorpholine							CAS # 59-89-2						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
N-Nitrosopiperidine							CAS # 100-75-4						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
N-Nitrosopyrrolidine							CAS # 930-55-2						
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
5-Nitroso-o-toluidine							CAS # 99-55-8						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Parathion							CAS # 56-38-2						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Pentachlorobenzene							CAS # 608-93-5						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Pentachloroethane							CAS # 76-01-7						
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
Pentachloronitrobenzene							CAS # 82-68-8						
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Pentachlorophenol							CAS # 87-86-5						
Second Quarter 2009	U		U		U		U		U		10	-	8270C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-10 Point of Compliance Wells

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*
Phenacetin								*CAS #*	*62-44-2*				
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Phenanthrene								*CAS #*	*85-01-8*				
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Phenol								*CAS #*	*108-95-2*				
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Phorate								*CAS #*	*298-02-2*				
Second Quarter 2009	U		U		U		U		U		5	-	8270C
2-Picoline								*CAS #*	*109-06-8*				
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Pronamide								*CAS #*	*23950-58-5*				
Second Quarter 2009	U		U		U		U		U		5	-	8270C
1-Propanol								*CAS #*	*71-23-8*				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	1000	-	8260B
2-Propanol								*CAS #*	*67-63-0*				
Second Quarter 2009	U		U		2200		U		U		100	-	8260B
Fourth Quarter 2009	U	J	U	J	20000		U	J	U	J	50	-	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	-	8260B
Pyrene								*CAS #*	*129-00-0*				
Second Quarter 2009	U	J	U	J	U	J	U	J	U	J	5	-	8270C
Pyridine								*CAS #*	*110-86-1*				
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Safrole								*CAS #*	*94-59-7*				
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Silvex								*CAS #*	*93-72-1*				
Second Quarter 2009	U		U		U		U		U		2.5	-	8151A
Styrene								*CAS #*	*100-42-5*				
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
Sulfotep								*CAS #*	*3689-24-5*				
Second Quarter 2009	U		U		U		U		U		5	-	8270C
2,4,5-Trichlorophenoxyacetic acid								*CAS #*	*93-76-5*				
Second Quarter 2009	U		U		U		U		U		2.5	-	8151A
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	-	8260B
1,1,2,2-Tetrachloroethane								*CAS #*	*79-34-5*				
Second Quarter 2009	U		U		U		U		U		0.5	-	8260B
Tetrachloroethene								*CAS #*	*127-18-4*				
Second Quarter 2009	U		U		U		U		U		1	-	8260B
Tetrahydrofuran								*CAS #*	*109-99-9*				
Second Quarter 2009	U		U		U		U		U		5	-	8260B
2,3,4,6-Tetrachlorophenol								*CAS #*	*58-90-2*				
Second Quarter 2009	U		U		U		U		U		5	-	8270C
Toluene								*CAS #*	*108-88-3*				
Second Quarter 2009	U		U		U		U		U		1	-	8260B

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-10 Point of Compliance Wells

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*
o-Toluidine				*CAS #* 95-53-4				
Second Quarter 2009	U J	U J	U J	U J	U J	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				*CAS #* 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-Trifluoroethane				*CAS #* 76-13-1				
Second Quarter 2009	U	U	U	U	U	1	-	8260B
O,O,O-Triethyl phosphorothioate				*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	U J	U J	U J	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	U	3	10000	8260B

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

Facility: HWMU-10 Monitoring Event: Second Quarter 2009

Analyte	Sample ID	Laboratory Result (ug/L)	Q	Validated Result (ug/L)	Q	QL (ug/L)	Validation Notes
Method: 6020							
Laboratory: CompuChem, a Division of Liberty Analtyical, 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							
Chloroform	10D3	4.9		4.9		0.5	No action taken. Blind field duplicate result 4.7 ug/l.
	10DUP	4.7		4.7		0.5	No action taken. Field duplicate for 10D3.

Definitions:

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

See last page of this report for definitions.

Draper Aden Associates
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Comprehensive Data Validation Report

Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Facility: HWMU-10 Monitoring Event: Fourth Quarter 2009

Analyte	Sample ID	Laboratory Result (ug/L)	Q	Validated Result (ug/L)	Q	QL (ug/L)	Validation Notes
Method: 6020							
Laboratory: CompuChem, a Division of Liberty Analtyical, Cary, NC							
Barium	10D3	105		105		10	No action taken. RPD < 10. Blind field duplicate for this well is 10DUP.
	10DUP	109		109		10	No action taken. Blind field duplicate for 10D3. RPD < 10.
Method: 8260B							
Laboratory: Lancaster Laboratories, Lancaster, PA							
Chloroform	10D3	16		16		1	No action taken. Blind field duplicate for this well is 10DUP. RPD <10.
	10DUP	17		17		1	No action taken. Blind field duplicate for 10D3.

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

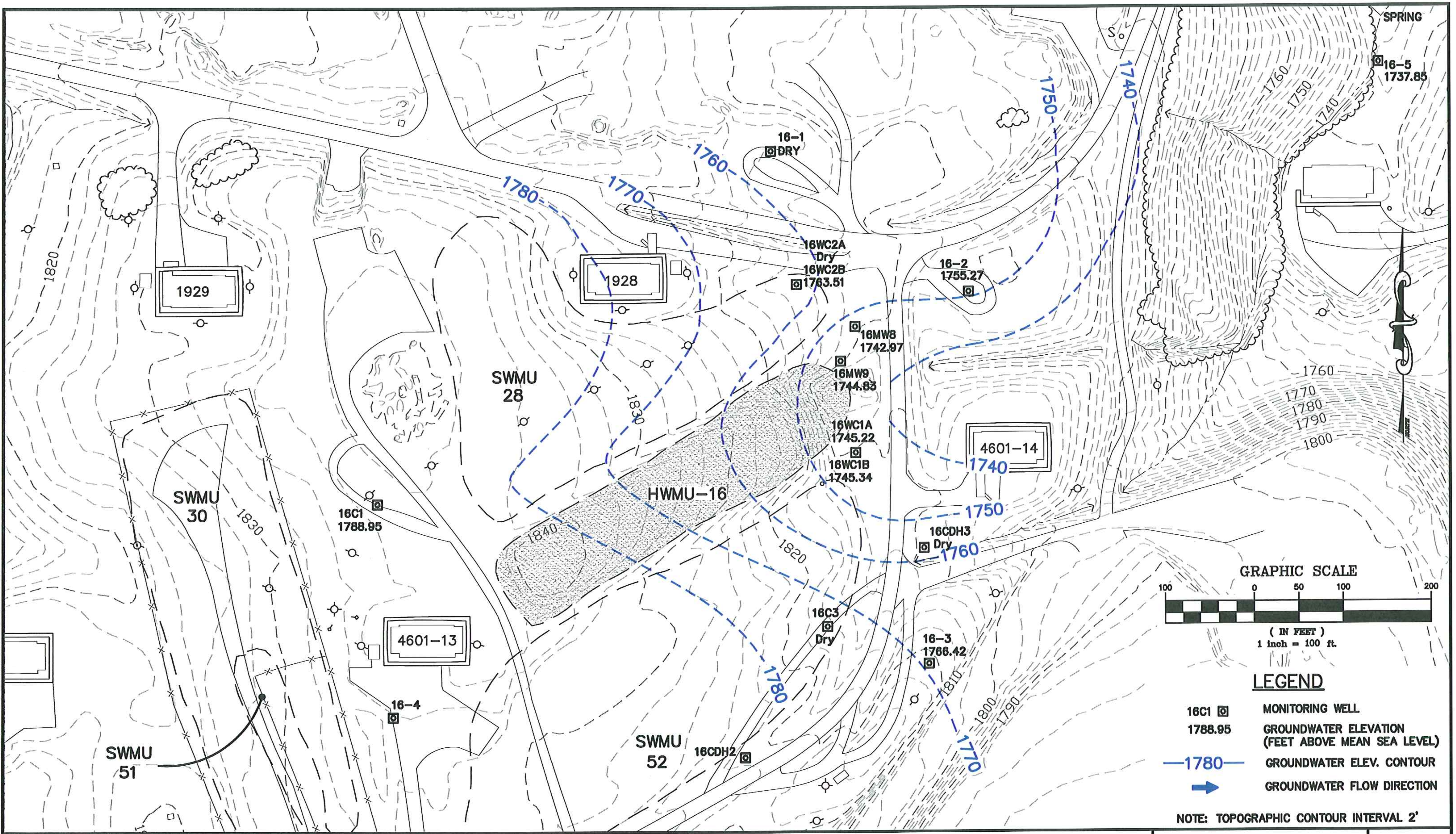
See last page of this report for definitions.

APPENDIX D

HWMU-16

APPENDIX D-1

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



NOTE: TOPOGRAPHIC CONTOUR INTERVAL 2'

Draper Aden Associates
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Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA

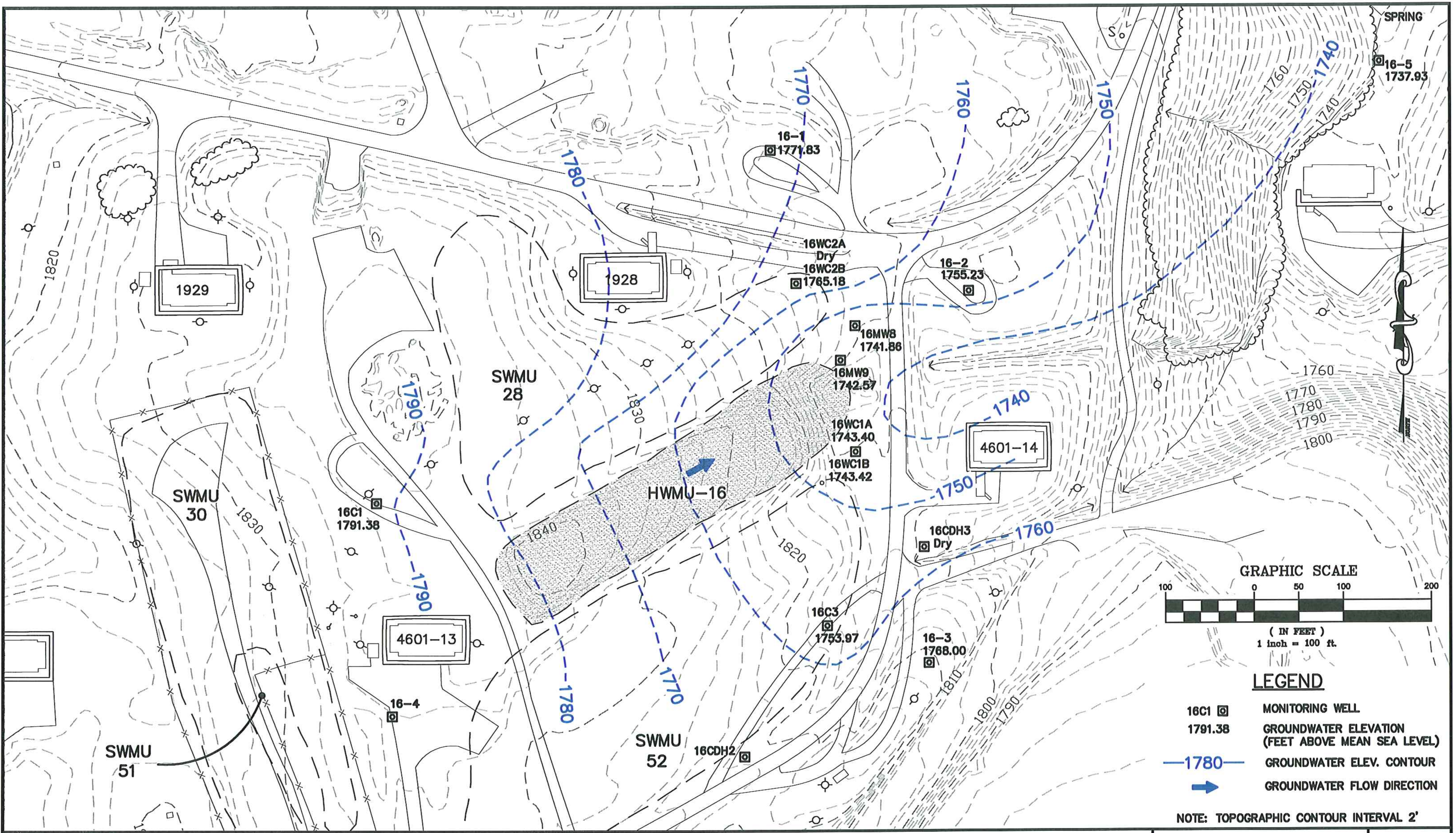
DESIGNED	RGM
DRAWN	JFF
CHECKED	MDL
DATE	07/29/09

HWMU-16 POTENTIOMETRIC SURFACE MAP (2ND QUARTER 2009)
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=100'
PLAN NO. B03204-07

FIGURE
4

P:\B03200\B03204\B03204-07\CAD\B03204-07 ENV\dwg\B03204-07_HWMU-16.dwg Jan 27, 2010 4:27pm



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Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	RGM
DRAWN	JFF
CHECKED	MDL
DATE	01/26/10

HWMU-16 POTENTIOMETRIC SURFACE MAP (4TH QUARTER 2009)
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=100'

PLAN NO. B03204-07

FIGURE
4

P:\B03\200\B03204\B03204-07\CAD\B03204-07 ENV\dwg\B03204-07_HWMU-16.dwg Jan 27, 2010 4:27pm

APPENDIX D-2

HWMU-16 2009 LABORATORY ANALYTICAL RESULTS POINT OF COMPLIANCE WELLS

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*	*QL*	*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	U J	U J	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	1	4	6020
Fourth Quarter 2009	U	U	U	U	U	1	4	6020
Cadmium					*CAS #*	*7440-43-9*		
Second Quarter 2009	U	0.23 J	U	U	U	1	5	6020
Fourth Quarter 2009	U J	U J	U J	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	U J	U J	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	U J	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	1	15	6020
Fourth Quarter 2009	U J	4	U J	U	U J	1	15	6020
Mercury					*CAS #*	*7439-97-6*		
Second Quarter 2009	U	U	U	U	1.4 J	2	2	7470A
Fourth Quarter 2009	U	U	U	U	U	2	2	7470A
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	U J	U J	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	U J	U J	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	U J	2.1 J	U J	U	U J	2	78.25	6020
Thallium					*CAS #*	*7440-28-0*		
Second Quarter 2009	U	U	U	U	U	1	-	6020
Tin					*CAS #*	*7440-31-5*		
Second Quarter 2009	U	U	U	U	U	5	-	6020
Vanadium					*CAS #*	*7440-62-2*		
Second Quarter 2009	U	U	U	U	U	10	109.55	6020
Fourth Quarter 2009	U	U J	U J	U	U J	10	109.55	6020
Zinc					*CAS #*	*7440-66-6*		
Second Quarter 2009	U J	25.3 J	U J	6.1 J	13.1 J	10	4695	6020
Fourth Quarter 2009	U	44.2 J	U J	U	18.2 J	10	4695	6020
Sulfide					*CAS #*	*18496-25-8*		
Second Quarter 2009	U J	U	U	U	U	1000	-	9034
Cyanide					*CAS #*	*57-12-5*		
Second Quarter 2009	U	U	U	U	U	20	-	9012A
Acenaphthene					*CAS #*	*83-32-9*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C

See last page of this report for definitions.

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*	*QL*	*GPS*	*Method*
Acenaphthylene					*CAS #*	*208-96-8*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
Acetone					*CAS #*	*67-64-1*		
Second Quarter 2009	U	U N	U	U	U	10	223.57	8260B
Acetonitrile					*CAS #*	*75-05-8*		
Second Quarter 2009	U	U	U	U	U	20	-	8260B
Acetophenone					*CAS #*	*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					*CAS #*	*107-02-8*		
Second Quarter 2009	U J	U J	U J	U J	U J	25	-	8260B
Acrylonitrile					*CAS #*	*107-13-1*		
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	-	8260B
4-Aminobiphenyl					*CAS #*	*92-67-1*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Aniline					*CAS #*	*62-53-3*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Anthracene					*CAS #*	*120-12-7*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Aramite					*CAS #*	*140-57-8*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Benzene					*CAS #*	*71-43-2*		
Second Quarter 2009	0.2 J	U	U	U	U	0.5	-	8260B
Benzo[a]anthracene					*CAS #*	*56-55-3*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Benzo[b]fluoranthene					*CAS #*	*205-99-2*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Benzo[k]fluoranthene					*CAS #*	*207-08-9*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
Benzo[ghi]perylene					*CAS #*	*191-24-2*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Benzo(a)pyrene					*CAS #*	*50-32-8*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
1,4-Benzenediamine					*CAS #*	*106-50-3*		
Second Quarter 2009	U J	U J	U J	U J	U J	50	-	8270C
Benzyl alcohol					*CAS #*	*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)methane					*CAS #*	*111-91-1*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
bis(2-Chloroethyl)ether					*CAS #*	*111-44-4*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
bis(2-Chloro-1-methylethyl)ether					*CAS #*	*108-60-1*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C

See last page of this report for definitions.

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*	*QL*	*GPS*	*Method*
bis(2-Ethylhexyl)phthalate					*CAS #*	*117-81-7*		
Second Quarter 2009	U	U	U	U	U	5	10	8270C
Bromobenzene					*CAS #*	*108-86-1*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Bromochloromethane					*CAS #*	*74-97-5*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Bromodichloromethane					*CAS #*	*75-27-4*		
Second Quarter 2009	U	U	U	U	U	1	-	8260B
Bromoform					*CAS #*	*75-25-2*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
4-Bromophenyl phenyl ether					*CAS #*	*101-55-3*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
2-Butanone					*CAS #*	*78-93-3*		
Second Quarter 2009	U	U	U	U	U	10	691.08	8260B
Fourth Quarter 2009	U	U	U	U	U	10	691.08	8260B
n-Butyl alcohol					*CAS #*	*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	U	U	0.5	-	8260B
tert-Butylbenzene					*CAS #*	*98-06-6*		
Second Quarter 2009	U	U	U	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					*CAS #*	*56-23-5*		
Second Quarter 2009	U	U	U	U	U	1	5	8260B
Fourth Quarter 2009	U	U	U	U	U	1	5	8260B
Chlordane					*CAS #*	*57-74-9*		
Second Quarter 2009	U	U	U	U	U	0.86	-	8081A
p-Chloroaniline					*CAS #*	*106-47-8*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
Chlorobenzene					*CAS #*	*108-90-7*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Chlorobenzilate					*CAS #*	*510-15-6*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
p-Chloro-m-cresol					*CAS #*	*59-50-7*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Chloroethane					*CAS #*	*75-00-3*		
Second Quarter 2009	3.7	U	0.9 J	0.3 J	U	1	-	8260B
Fourth Quarter 2009	4.4	U	1.7	U	U	1	-	8260B
Chloroform					*CAS #*	*67-66-3*		
Second Quarter 2009	U	U	U	U	U	1	80	8260B
2-Chloroethyl vinyl ether					*CAS #*	*110-75-8*		
Second Quarter 2009	U J	U J	U J	U J	U J	0.5	-	8260B
2-Chloronaphthalene					*CAS #*	*91-58-7*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
2-Chlorophenol					*CAS #*	*95-57-8*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
4-Chlorophenyl phenyl ether					*CAS #*	*7005-72-3*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
Chloroprene					*CAS #*	*126-99-8*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B

See last page of this report for definitions.

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*	*QL*	*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	U J	U J	U J	5	-	8270C
Cyclohexane					*CAS #*			
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
2,4-Dichlorophenoxyacetic acid					*CAS #*	*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	0.1	-	8081A
4,4'-DDT					*CAS #*	*50-29-3*		
Second Quarter 2009	U	U N	U	U	U	0.1	-	8081A
Diallate					*CAS #*	*2303-16-4*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
Dibenz(a,h)anthracene					*CAS #*	*53-70-3*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Dibenzofuran					*CAS #*	*132-64-9*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
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
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					*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	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	1	5	8260B
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	5	-	8270C
2,6-Dichlorophenol					*CAS #*	*87-65-0*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C

See last page of this report for definitions.

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*	*QL*	*GPS*	*Method*
1,2-Dichloropropane					*CAS #*	*78-87-5*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,3-Dichloropropane					*CAS #*	*142-28-9*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
2,2-Dichloropropane					*CAS #*	*594-20-7*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,1-Dichloropropene					*CAS #*	*563-58-6*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
cis-1,3-Dichloropropene					*CAS #*	*10061-01-5*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
trans-1,3-Dichloropropene					*CAS #*	*10061-02-6*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Dieldrin					*CAS #*	*60-57-1*		
Second Quarter 2009	U	U	U	U	U	0.1	-	8081A
Diethyl ether					*CAS #*	*60-29-7*		
Second Quarter 2009	22	1.2 J	5.9 J	1.5 J	U	12.5	-	8260B
Fourth Quarter 2009	24	U	15	U	U	12.5	-	8260B
Diethyl phthalate					*CAS #*	*84-66-2*		
Second Quarter 2009	U	U	U	U	U	5	12,520	8270C
O,O-Diethyl O-2-pyrazinyl					*CAS #*	*297-97-2*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Dimethoate					*CAS #*	*60-51-5*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
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	-	8260B
Fourth Quarter 2009	U	U	U	U	U	12.5	-	8260B
p-(Dimethylamino)azobenzene					*CAS #*	*60-11-7*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
7,12-Dimethylbenz[a]anthracene					*CAS #*	*57-97-6*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
3,3'-Dimethylbenzidine					*CAS #*	*119-93-7*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
a,a-Dimethylphenethylamine					*CAS #*	*122-09-8*		
Second Quarter 2009	U J	U J	U J	U J	U J	50	-	8270C
2,4-Dimethylphenol					*CAS #*	*105-67-9*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Dimethyl phthalate					*CAS #*	*131-11-3*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
m-Dinitrobenzene					*CAS #*	*99-65-0*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
4,6-Dinitro-o-cresol					*CAS #*	*534-52-1*		
Second Quarter 2009	U J	U J	U J	U J	U J	10	-	8270C
2,4-Dinitrophenol					*CAS #*	*51-28-5*		
Second Quarter 2009	U J	U J	U J	U J	U J	10	-	8270C
2,4-Dinitrotoluene					*CAS #*	*121-14-2*		
Second Quarter 2009	U	U	U	U	U	10	31.3	8270C
Fourth Quarter 2009	U	U	U	U	U	10	31.3	8270C
2,6-Dinitrotoluene					*CAS #*	*606-20-2*		
Second Quarter 2009	U	U	U	U	U	10	15.65	8270C
Fourth Quarter 2009	U	U	U	U	U	10	15.65	8270C
Dinoseb					*CAS #*	*88-85-7*		
Second Quarter 2009	U	U	U	U	U	2.5	-	8151A
Di-n-octyl phthalate					*CAS #*	*117-84-0*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
1,4-Dioxane					*CAS #*	*123-91-1*		
Second Quarter 2009	U	U	U	U	U	100	-	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	QL	GPS	Method
Diphenylamine					*CAS #*	*122-39-4*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Disulfoton					*CAS #*	*298-04-4*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Endosulfan I					*CAS #*	*959-98-8*		
Second Quarter 2009	U J	U J	U J	U J	U J	0.05	-	8081A
Endosulfan II					*CAS #*	*33213-65-9*		
Second Quarter 2009	U J	U J	U J	U J	U J	0.1	-	8081A
Endosulfan sulfate					*CAS #*	*1031-07-8*		
Second Quarter 2009	U	U	U	U	U	0.1	-	8081A
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	U J	U J	U J	U J	U J	100	-	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 J	U J	U J	U J	U J	100	-	8260B
Ethylbenzene					*CAS #*	*100-41-4*		
Second Quarter 2009	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	U J	U J	U J	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
Fluorene					*CAS #*	*86-73-7*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
Heptachlor					*CAS #*	*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					*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 #*	*70-30-4*		
Second Quarter 2009	U J	U J	U J	U J	U J	500	-	8270C
Hexachloropropene					*CAS #*	*1888-71-7*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
2-Hexanone					*CAS #*	*591-78-6*		
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 #*	*78-83-1*		
Second Quarter 2009	U	U	U	U	U	25	-	8260B
Isodrin					*CAS #*	*465-73-6*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C

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*	*QL*	*GPS*	*Method*
Isophorone					*CAS #*	*78-59-1*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
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	-	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	U	U	U	U	5	-	8270C
Methacrylonitrile					*CAS #*	*126-98-7*		
Second Quarter 2009	U	U	U	U	U	5	-	8260B
Methapyrilene					*CAS #*	*91-80-5*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
Methoxychlor					*CAS #*	*72-43-5*		
Second Quarter 2009	U	U	U	U	U	0.5	-	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	2.11	8260B
Fourth Quarter 2009	U J	U J	U J	U J	U J	1	2.11	8260B
3-Methylcholanthrene					*CAS #*	*56-49-5*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Iodomethane					*CAS #*	*74-88-4*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Methyl methacrylate					*CAS #*	*80-62-6*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Methyl methane sulfonate					*CAS #*	*66-27-3*		
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*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
4-Methyl-2-pentanone					*CAS #*	*108-10-1*		
Second Quarter 2009	U	U	U	U	U	5	-	8260B
2-Methylphenol					*CAS #*	*95-48-7*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
3 & 4-Methylphenol					*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					*CAS #*	*75-09-2*		
Second Quarter 2009	5.1	U	U	U	U	1	-	8260B
Fourth Quarter 2009	5.9	U	U	U	U	1	-	8260B
Naphthalene					*CAS #*	*91-20-3*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
1,4-Naphthoquinone					*CAS #*	*130-15-4*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
1-Naphthylamine					*CAS #*	*134-32-7*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
2-Naphthylamine					*CAS #*	*91-59-8*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C

See last page of this report for definitions.

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	QL	GPS	Method
o-Nitroaniline					CAS #	88-74-4		
Second Quarter 2009	U	U	U	U	U	10	-	8270C
m-Nitroaniline					CAS #	99-09-2		
Second Quarter 2009	U	U	U	U	U	10	-	8270C
p-Nitroaniline					CAS #	100-01-6		
Second Quarter 2009	U	U	U	U	U	10	-	8270C
Nitrobenzene					CAS #	98-95-3		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
o-Nitrophenol					CAS #	88-75-5		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
p-Nitrophenol					CAS #	100-02-7		
Second Quarter 2009	U	U	U	U	U	10	-	8270C
4-Nitroquinoline-1-oxide					CAS #	56-57-5		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
N-Nitrosodi-n-butylamine					CAS #	924-16-3		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
N-Nitrosodiethylamine					CAS #	55-18-5		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
N-Nitrosodimethylamine					CAS #	62-75-9		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
N-Nitrosodiphenylamine					CAS #	86-30-6		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
N-Nitrosodipropylamine					CAS #	621-64-7		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
N-Nitrosomethylethylamine					CAS #	10595-95-6		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
N-Nitrosomorpholine					CAS #	59-89-2		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
N-Nitrosopiperidine					CAS #	100-75-4		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
N-Nitrosopyrrolidine					CAS #	930-55-2		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
5-Nitroso-o-toluidine					CAS #	99-55-8		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Parathion					CAS #	56-38-2		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Pentachlorobenzene					CAS #	608-93-5		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Pentachloroethane					CAS #	76-01-7		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Pentachloronitrobenzene					CAS #	82-68-8		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Pentachlorophenol					CAS #	87-86-5		
Second Quarter 2009	U	U	U	U	U	10	-	8270C
Phenacetin					CAS #	62-44-2		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Phenanthrene					CAS #	85-01-8		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Phenol					CAS #	108-95-2		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
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	5	-	8270C
2-Picoline					CAS #	931-19-1		
Second Quarter 2009	U	U	U	U	U	5	-	8270C

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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	QL	GPS	Method
Pronamide					*CAS #*	*23950-58-5*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
1-Propanol					*CAS #*	*71-23-8*		
Second Quarter 2009	U J	U J	U J	U J	U J	100	-	8260B
2-Propanol					*CAS #*	*67-63-0*		
Second Quarter 2009	U J	U J	U J	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	-	8260B
Pyrene					*CAS #*	*129-00-0*		
Second Quarter 2009	U J	U J	U J	U J	U J	5	-	8270C
Pyridine					*CAS #*	*110-86-1*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Safrole					*CAS #*	*94-59-7*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Silvex					*CAS #*	*93-72-1*		
Second Quarter 2009	U	U	U	U	U	2.5	-	8151A
Styrene					*CAS #*	*100-42-5*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Sulfotep					*CAS #*	*3689-24-5*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
2,4,5-Trichlorophenoxyacetic acid					*CAS #*	*93-76-5*		
Second Quarter 2009	U	U	U	U	U	2.5	-	8151A
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	-	8260B
1,1,2,2-Tetrachloroethane					*CAS #*	*79-34-5*		
Second Quarter 2009	U	U	U	U	U	0.5	-	8260B
Tetrachloroethene					*CAS #*	*127-18-4*		
Second Quarter 2009	0.3 J	U	U	U	U	1	5	8260B
Fourth Quarter 2009	U	U	U	U	U	1	5	8260B
Tetrahydrofuran					*CAS #*	*109-99-9*		
Second Quarter 2009	14	U	U	U	U	1	-	8260B
2,3,4,6-Tetrachlorophenol					*CAS #*	*58-90-2*		
Second Quarter 2009	U	U	U	U	U	5	-	8270C
Toluene					*CAS #*	*108-88-3*		
Second Quarter 2009	U	U	U	U	U	1	1000	8260B
Fourth Quarter 2009	U	U	U	U	U	1	1000	8260B
o-Toluidine					*CAS #*	*95-53-4*		
Second Quarter 2009	U J	U J	U J	U J	U J	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	0.7	U	U	U	U	1	200	8260B
Fourth Quarter 2009	1.1	U	U	U	U	1	200	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	0.2 J	U	U	U	U	0.5	5	8260B
Fourth Quarter 2009	U	U	U	U	U	1	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*	*QL*	*GPS*	*Method*
Trichlorofluoromethane					*CAS #*	*75-69-4*		
Second Quarter 2009	0.6 J	U	U	U	U	1	469.5	8260B
Fourth Quarter 2009	U	U	U	U	U	1	469.5	8260B
2,4,5-Trichlorophenol					*CAS #*	*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	0.5	-	8260B
1,1,2-Trichloro-1,2,2-Trifluoroethane					*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 phosphorothioate					*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	U J	U J	U J	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	U	3	10000	8260B

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*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: 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.
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.
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).
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.
Q 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.

Comprehensive Data Validation Report

Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Facility: HWMU-16 Monitoring Event: Second Quarter 2009

Analyte	Sample ID	Laboratory Result (ug/L)	Q	Validated Result (ug/L)	Q	QL (ug/L)	Validation Notes
Method: 6020							
Laboratory: CompuChem, a Division of Liberty Analtyical, Cary, NC							
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							
1,1-Dichloroethane	16WC1A	1		1		1	No action taken.
	16WDUP	1		1		1	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 or above quantitation limit and associated result is estimated.

Comprehensive Data Validation Report

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services

Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Facility: HWMU-16 Monitoring Event: Fourth Quarter 2009

Analyte	Sample ID	Laboratory Result (ug/L)	Q	Validated Result (ug/L)	Q	QL (ug/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	J	5	Blind field sample duplicate for 16WC1A. RPD <10. Internal standard relative intensity was low (65%). Result estimated.

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 # 7440-36-0*						
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		U	J	U		10	1	6020
Barium											*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											*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											*CAS # 7440-47-3*						
Second Quarter 2009	U		-		U		U		U		U		U		5	6.2	6020
Fourth Quarter 2009	U		U		U		U		U		U	J	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		U	J	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 # 7439-92-1*						
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											*CAS # 7439-97-6*						
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											*CAS # 7440-02-0*						
Second Quarter 2009	U		-		U		U		U		U		U		10	16	6020
Fourth Quarter 2009	U		U		U		U		U		U	J	U		10	16	6020
Selenium											*CAS # 7782-49-2*						
Second Quarter 2009	U		-		U		U		U		U		U		10	1	6020
Fourth Quarter 2009	U		U		U		U		U		U	J	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		U	J	U		10	151	6020
Zinc											*CAS # 7440-66-6*						
Second Quarter 2009	U	J	-		U	J	U	J	U	J	U	J	U	J	10	51	6020
Fourth Quarter 2009	U		U		U		U		U		U	J	U		10	51	6020
2-Butanone											*CAS # 78-93-3*						
Second Quarter 2009	U		-		U	J	U	J	U	J	U	J	U	J	10	1.1	8260B
Fourth Quarter 2009	U		U		U		U		U		U		U		10	1.1	8260B

See last page of this report for definitions.

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 tetrachloride											*CAS #56-23-5*						
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 #75-00-3*						
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
Dichlorodifluoromethane											*CAS #75-71-8*						
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 #75-34-3*						
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 #60-29-7*						
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											*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											*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 #74-87-3*						
Second Quarter 2009	U		-		U		U		U		U		U		1	0.3	8260B
Fourth Quarter 2009	U	J	U	J	U	J	U	J	U	J	U	J	U	J	1	0.3	8260B
Methylene chloride											*CAS #75-09-2*						
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-Trichloroethane											*CAS #71-55-6*						
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											*CAS #79-01-6*						
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
Trichlorofluoromethane											*CAS #75-69-4*						
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

See last page of this report for definitions.

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-Trifluoroethane *CAS # 76-13-1*										
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 COMPUTATIONS FOR 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.

Background Threshold Level (BTL) = Detection Limit (DL)				
Parameter	**Sample Size**	**% Non-Detects**	**DL (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)				
Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (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				
Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (µg/l)
Chromium	12	25	1	6.2

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	DL (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**	**DL (µg/l)**	**BTL (µg/l)**
Trichlorofluoromethane	12	0	0.5	11.3
Specific Conductivity	8	0	1 µS/cm	672 µS/cm
pH	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
Total Organic Carbon (x4)	7000
Total Organic Halides (x4)	42.2
Specific Conductivity	672 µS/cm
pH	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
HMWU-5	Fourth Quarter 2003	Chromium	QL	5	yes	100	USEPA MCL
		Diethyl Ether	QL	12	no	NA	NA
		2-Nitroaniline	QL	20	no	NA	NA
		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
	Second Quarter 2004	Zinc	Calculated	217	no	NA	NA
HWMU-10	First Quarter 2003	Cobalt	QL	5	no	NA	NA
	Second Quarter 2003	Vanadium	QL	10	no	NA	NA
	Second Quarter 2005	Acetone	QL	10	no	NA	NA
		2-Propanol	QL	50	no	NA	NA
HWMU-16	Second Quarter 2003	Chloroethane	Calculated	20.7	yes	20.7	Background/QL
		Diethyl Ether	Calculated	75.5	no	NA	NA
		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 2nd quarter 2004 through 3rd 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-Trifluoroethane	Non-Normal	NUPL	N/A	1.2

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 3rd 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 3rd quarter 2003 through 3rd 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 Data Distribution	Type of UPL	Multiple Comparisons/year	UPL (µg/l)
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	Minimum	Maximum	Mean	Std Dev
Original:	1.000	6.400	4.340	2.078
Log:	0.000	1.856	1.303	0.749

Pooled Statistics
Observations: 5

Statistic	Original Scale	Log Scale
Mean:	4.340	1.303
Std Dev:	2.078	0.749
Skewness:	-0.810	-1.296*
Kurtosis:	-0.555	-0.011
Minimum:	1.000	0.000
Maximum:	6.400	1.856
CV:	0.479	0.575

Shapiro-Wilk Statistics

Scale	Test Statistic	5% Critical Value	1% Critical 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

Parametric Prediction Interval
Report Printed February 2,2005

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

ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n): 5
Shapiro-Wilk (W): 0.9037
Critical W,α=0.01: 0.6860
Mean: 4.340 ppb
Std Dev: 2.078 ppb
DF: 4
Conf. Level (1-α): ~~0.9500~~ 0.99
Future Samples (k): 10
$t_{\left[1-\frac{\alpha}{k}\right]}$: 7.1732
Kappa: 7.8579

UL: 20.669 ppb
LL: $-\infty$

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	Minimum	Maximum	Mean	Std Dev
Original:	12.000	30.000	21.200	6.907
Log:	2.485	3.401	3.007	0.355

Pooled Statistics
Observations: 5

Statistic	Original Scale	Log Scale
Mean:	21.200	3.007
Std Dev:	6.907	0.355
Skewness:	-0.122	-0.491
Kurtosis:	-1.140	-1.024
Minimum:	12.000	2.485
Maximum:	30.000	3.401
CV:	0.326	0.118

Shapiro-Wilk Statistics

Scale	Test Statistic	5% Critical Value	1% Critical Value
Original:	0.9768	0.7620	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

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

ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n): 5
Shapiro-Wilk (W): 0.9768
Critical W,α=0.01: 0.6860
Mean: 21.200 ppb
Std Dev: 6.907 ppb
DF: 4
Conf. Level (1-α): ~~0.9500~~ 0.99
Future Samples (k): 10
$t_{\left[1-\frac{\alpha}{k}\right]}$: 7.1732
Kappa: 7.8579

UL: 75.470 ppb
LL: $-\infty$

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

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

Shapiro-Wilk Statistics

Scale	Test Statistic	5% Critical Value	1% Critical 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-α):	33.330%

UL: 17.000 ppb
LL: 0.000

Report Produced by GRITS/STAT 5.01

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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


 Constituent:MeCl    Dichloromethane (Methylene chloride)

  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      Minimum      Maximum        Mean      Std Dev
 Original:      4.100        6.800        5.800       1.037
      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      Value        Value
Original:    0.8964     0.7620       0.6860
```

```
    Log:    0.8519       0.7620       0.6860

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

Parametric Prediction Interval

Report Printed February 2,2005

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

ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n): 5
Shapiro-Wilk (W): 0.8964
Critical W,α=0.01: 0.6860
Mean: 5.800 ppb
Std Dev: 1.037 ppb
DF: 4
Conf. Level (1-α): ~~0.9500~~ 0.99
Future Samples (k): 10
$t_{\left[1-\frac{\alpha}{k}\right]}$: 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.*

Analyte/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Chloroethane					*CAS #*	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	U J	U J	U J	U J	U J	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	U J	3.7 J	U J	U J	1	20.7	8260B
Second Quarter 2005	U J	U	U J	U	U	1	20.7	8260B
Third Quarter 2005	4.7 J	U J	U	U J	U J	1	20.7	8260B
Fourth Quarter 2005	4.6 J	U	2.6 J	U	U	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	U	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	U J	U J	12	-	8260B
Third Quarter 2004	17	U	U	U	U	12	-	8260B
Fourth Quarter 2004	24	U J	U	U	U J	12	-	8260B
First Quarter 2005	29	U	14	U	U	12	-	8260B
Second Quarter 2005	20	U J	9.2	U J	U J	12	-	8260B
Third Quarter 2005	30	U	15	U	U	12	-	8260B
Fourth Quarter 2005	25	U	18	U	U	12	-	8260B
First Quarter 2006	19	U	U	U	U	12	-	8260B
Second Quarter 2006	17	U	U	U	U	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	U J	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	U J	13 J	U J	U J	12	-	8260B
Second Quarter 2004	U J	U J	6.6 J	U J	U J	12	-	8260B
Third Quarter 2004	U J	U J	U J	U J	U J	12	-	8260B
Fourth Quarter 2004	16 J	U J	12 J	U	U J	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	U	U	U	12.5	-	8260B
Third Quarter 2006	11 J	U J	3.2 J	2.8 J	U J	12.5	-	8260B
Fourth Quarter 2006	U	U	U	U	U	12.5	-	8260B
First Quarter 2007	U	U	U	U	U	12.5	-	8260B
Second Quarter 2007	11 J	U	7 J	2.6 J	1.2 J	12.5	-	8260B

See last page of this report for definitions.

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*	*QL*	*GPS*	*Method*
Methylene chloride					*CAS #* 75-09-2			
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	U	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	U N	U N	U N	U N	U N	1	13.95	8260B
Fourth Quarter 2006	U A	U	U	U A	U	1	13.95	8260B
First Quarter 2007	6.3	U	U	U	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-Trifluoroethane					*CAS #* 76-13-1			
Third Quarter 2003	U	U	U	U	U	1	-	8260B
Second Quarter 2004	1.2	U J	U J	U J	U J	1	-	8260B
Third Quarter 2004	U	U	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	U	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	U	U	U	U	1	-	8260B
Second Quarter 2007	U	U	U	U	U	1	-	8260B

See last page of this report for definitions.

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*	*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 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). 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

Draper Aden Associates
Engineering • Surveying • Environmental Services
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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, RAD17	SDG RAD09
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 904138/0904139	SDG: 0904096/0904097	SDG 904109	SDG 0904069
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.

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Draper Aden Associates
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8.4.09

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Engineering ◆ Surveying ◆ Environmental Services

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: 6020		
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC		
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	1
Vanadium	10	1
Zinc	10	3
Method: 7470A		
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC		
Mercury	2	0.2
Method: 8081A		
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC		
Aldrin	0.05	0.005
alpha-BHC	0.05	0.005
beta-BHC	0.05	0.005
delta-BHC	0.05	0.005
gamma-BHC	0.05	0.005
Chlordane	0.86	0.86
4,4'-DDD	0.1	0.01
4,4'-DDE	0.1	0.01
4,4'-DDT	0.1	0.01
Dieldrin	0.1	0.01
Endosulfan I	0.05	0.005
Endosulfan II	0.1	0.01
Endosulfan sulfate	0.1	0.01
Endrin	0.1	0.01
Endrin aldehyde	0.1	0.01
Heptachlor	0.05	0.045
Heptachlor epoxide	0.05	0.005
Methoxychlor	0.5	0.05
Toxaphene	2.5	1
Method: 8151A		
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC		
2,4-Dichlorophenoxyacetic acid	5	1
Dinoseb	2.5	0.5
Silvex	2.5	0.2
2,4,5-Trichlorophenoxyacetic acid	2.5	0.2

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: 8260B		
Laboratory: Lancaster Laboratories, Lancaster, 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
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

Summary of Quantitation Limits and Detection Limits

Appendix IX Monitoring Event

Monitoring Event: Second Quarter 2009

Method: 8260B

Laboratory: Lancaster Laboratories, Lancaster, PA

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
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

Summary of Quantitation Limits and Detection Limits

Appendix IX Monitoring Event

Monitoring Event: Second Quarter 2009

Method: 8270C

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

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
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
2,4-Dimethylphenol	5	1
Dimethyl phthalate	5	1
m-Dinitrobenzene	5	1
4,6-Dinitro-o-cresol	10	2
2,4-Dinitrophenol	10	2
2,4-Dinitrotoluene	10	1
2,6-Dinitrotoluene	10	1
Di-n-octyl phthalate	5	1
Diphenylamine	10	1
Disulfoton	5	1

Summary of Quantitation Limits and Detection Limits
Appendix IX Monitoring Event
Monitoring Event: Second Quarter 2009

Method: 8270C

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

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
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
Isophorone	5	1
Isosafrole	5	1
Kepone	5	5
Methapyrilene	5	5
3-Methylcholanthrene	5	1
Methyl methane sulfonate	5	1
2-Methylnaphthalene	5	1
Methyl parathion	5	1
2-Methylphenol	5	1
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
N-Nitrosodi-n-butylamine	5	1
N-Nitrosodiethylamine	5	1
N-Nitrosodimethylamine	5	1
N-Nitrosodiphenylamine	5	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
Phenol	5	1
Phorate	5	1
2-Picoline	5	1
Pronamide	5	1
Pyrene	5	1
Pyridine	5	1

Summary of Quantitation Limits and Detection Limits

Appendix IX Monitoring Event

Monitoring Event: Second Quarter 2009

Method: 8270C

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

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
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	5

Method: 9012A

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

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
Cyanide	20	3.5

Method: 9034

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

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
Sulfide	1000	660

Method: 9065

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

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
Total Recoverable Phenolics	60	18

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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

Analytical Method	**Hazardous Waste Management Unit (HWMU)**				**Laboratory**
	HWMU 5	**HWMU 7**	**HWMU 10**	**HWMU 16**	
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 µg/l for both diethyl ether and dimethyl ether. The laboratory reported the QL for each analyte as 13 µg/l due to rounding. Draper Aden Associates revised the QL to 12.5 µg/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 µg/l for bis-2(ethylhexylphthalate). The low calibration point of the initial calibration curve and the MDL study supports a QL of 6 µg/l, the USEPA MCL. The final QL for this target was reported at 6 µg/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 µg/l instead of 10 µg/l for 2,4-dinitrophenol and 4-nitrophenol. The low calibration point of the curve for each analyte supports a QL of 10 µg/l. The laboratory revised the final results to reflect the correct QL.
- The laboratory reported a QL of 10 µg/l for bis-2(ethylhexylphthalate). The low calibration point of the initial calibration curve and the MDL study supports a QL of 6

µg/l, the USEPA MCL. The final QL for this target was reported at 6 µg/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.

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
- ☑ Each target analyte %RSD ≤ 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
- ☑ % 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_8 (80-120%), 1,2-dichloroethane-d_4 (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_5, 1,4-dichlorobenzene-d_4
- ☑ Internal standard areas within ± 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%.

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 2nd 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
- ☑ Samples received at ≤6°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
- ☑ Each target analyte %RSD ≤ 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_6 Or - d_6 (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_4, Naphthalene-d_8, Acenapththene-d_{10}, Phenanthrene-d_{10}, Chrysene-d_{12}, Perylene-d_{12}
- ☑ Internal standard areas within ± 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%.

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 2nd 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:

☑ Sample results included for all sample locations
☑ Target analyte QLs reported at permit required QL
☑ Sample digestion method: 3005A
☑ Electronic data file reviewed

B. TECHNICAL HOLDING TIMES / PRESERVATION REVIEW CRITERIA:

☑ 6 month holding time, pH<2 with Nitric Acid (HNO3)

C. INSTRUMENT CALIBRATION/TUNE CRITERIA:

☑ Target analytes, 1 calibration blank and at least 1 standard
☑ Instrument tuned prior to analysis (%RSD <5%)

D. INSTRUMENT CALIBRATION CRITERIA:

☑ 10 sample frequency
☑ Use of calibration blank and check standard
☑ Recovery within 90-110%

E. BLANK CRITERIA:

N/A Trip Blank (check only if analyzed)
N/A Equipment Blank
☑ Method/Other Lab Blanks (check only if analyzed)
☑ Interference free
☑ CCB 10 sample frequency

F. INTERFERENCE CHECK SAMPLES (ICS) CRITERIA:

☑ At beginning of batch or every 12 hours (80-120%)

G. MATRIX SPIKE DUPLICATE (MSD) CRITERIA:

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

H. MATRIX SPIKE (MS) CRITERIA:

☑ 75-125% recovery, all analytes
☑ All analytes, spiked prior to digestion
☑ One matrix spike per analytical batch
☑ No more than 20 samples per analytical batch

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_3

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
☑ RPD ≤ 20 between MS and MSD results or sample and duplicate results
☑ Control limit is ± 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.

A. QC DELIVERABLES PACKAGE:

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

B. TECHNICAL HOLDING TIME / PRESERVATION CRITERIA:

- ☑ 14 day holding time
- ☑ Cool ≤6° C
- ☑ Adjust pH >12 w/ NaOH

C. INSTRUMENT CALIBRATION CRITERIA:

- ☑ 1 calibration blank and at least 3 standards, correlation coefficient >0.995
- ☑ Standard at or below QL

D. INITIAL / CONTINUING CALIBRATION VALIDATION CRITERIA:

- ☑ 10 sample frequency
- ☑ Use of check standard with every batch of samples
- ☑ Recovery within 85-115% range (± 15%)

E. BLANK CRITERIA:

- ☑ Interference free
- ☑ Verification Blank analysis analyzed every 10 samples

F. MATRIX SPIKE DUPLICATE (MSD) CRITERIA:

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

G. MATRIX SPIKE (MS) CRITERIA:

- ☑ 75-125% recovery
- ☑ Spiked prior to distillation
- ☑ One MS required per analytical batch. No more than 20 samples per batch

H. 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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Error! Objects cannot be created from editing field codes.

This Report has been prepared by:

1-26-2010

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Date:

This Report has been subjected to technical and quality review by:

1-28-2010

Srikanth Nathel~~la, P.E.~~,
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snathella@daa.com
www.daa.com

Date:

acct# 11200 Grp# 1168612

CHAIN OF CUSTODY RECORD

Samp# 5820380-95

ac JLK 10-9-09

Laboratory: Lancaster Laboratories, 2425 New Holland Pike, Lancaster, PA 17605-2425/ Barb Weyandt, Manager/ (717) 656-2300

Client: Draper Aden Associates
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU5
Event: 2009 2nd Semiannual Monitoring
DAA JN: B03204-07
Lab JN:

Project Specific (PS) or Batch (B) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO
UPS Carrier: 12-237-301-01-5653-5299
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic
AG Amber Glass
V VOA
CG Clear Glass

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on ice: ☑ YES ☐ NO

Box 4 - Sample Type	G
Box 3 - Filtered/Unfiltered	U
Required pH of Sample	<2
Box 2 - Preservative	A
Box 5 - Sample Container Type	3-40ml V

25 ml purge ok [illegible] 10-09

Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	8260B/5030B	
5W8B	10/27	0910	GW	3	X	
5W5B		1015	GW	3	X	
5W7B		1130	GW	9	X	USE FOR QC
5WC21		1305	GW	3	X	
5WDUP		1320	GW	3	X	
5WC22		1420	GW	3	X	
5WC23	10/27	1520	GW	3	X	
S5W5	10/26	1220	GW	3	X	
S5W7		1110	GW	3	X	
5W9A		1330	GW	3	X	
5W10A		1450	GW	3	X	
5W11A	10/26	1600	GW	3	X	
Trip Blank 1	10/15		GW	3	X	
Trip Blank 2	10/15		GW	3	X	
~~Trip Blank 3~~			~~GW~~	~~3~~	~~X~~	not required JLK 10/28/09

GENERAL NOTES:

1. Report results at or greater than QL.
2. Level 1 with EDD.

1 trip blank required per day of collection. JLK 10-8-09

Unit 5

Clients Special Instructions: level 1 with edd.

Received by lab in Good Condition ____ Yes ____ No Custody Seal Intact ____ Yes ____ No Temperature upon arrival ____ Received on Ice ____ Yes ____ No

Describe problems, if any:

Sampler Name (Print): Dale Slaughter	Date: 10/26/09	#1 Relinquished by (Signature): Dale Slaughter	Date: 10/28/09	#2 Relinquished by (Signature):	Date: 10/28/09	Sample Storage Time Requested:
Sampler Signature: Dale Slaughter	Time: 0900	Company Name: DAA	Time: 0830	Company Name: DAA	Time: 1700	
Sampler Name (Print): Tyler Emery	Date: 10/26/09	#1 Received by (Signature):	Date: 10/28/09	#2 Received by (Signature):	Date: 10/29/09	30 DYS ORG/6 MTHS INORG
Sampler Signature: Tyler Emery	Time: 0900	Company Name: DAA	Time: 0830	Company Name: LLI	Time: 940	

[illegible] 1/2 JLK 10-9-09

acct#11200
Cp#11685612
sample#5820380-95

HWMU5
Radford Army Ammunition Plant
2009 2nd 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)	67-66-3	1
3.	2-butanone (methyl ethyl ketone - MEK)	78-93-3	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	79-01-6	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.

25 ml
Volume purge
JCF
10-9-09

2/2 JCF [illegible]

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CHAIN OF CUSTODY RECORD

JUE 10-20-09

Lab: CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097

Client:	Draper Aden Associates	Consultant:	Draper Aden Associates	Sample Site:	RAAP, Radford, Virginia	Project Specific (PS) or Batch (B) QC:	☑ yes ☐ no
Attn:	0	Attn:	Janet C. Frazier	Location:	HWMU5	Sample Collection for Project Complete?	☑ yes ☐ no
Address:	0 0	Address:	2206 South Main Street Blacksburg, Virginia 24060	Event:	2009 2nd Semiannual Monitoring	Carrier:	NC COURIER SERVICE
Phone:	0	Phone:	(540) 552-0444	DAA JN:	B03204-07	Tracking Number:	
Fax:	0	Fax:	(540) 552-0291	Lab JN:			
Fax:	0						

Box 1: Matrix
SW Surface Water — T Trip Blank
GW Groundwater — E Equipment Blank
L Leachate — P Product
S Soil — O Other

Box 2: Preservative
A HCL — E NaOH
B HNO_3 — F ZnAc
C H_2SO_4 — G Other (Specify)
D $Na_2S_2O_3$ — H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic — V VOA
AG Amber Glass — CG Clear Glass

Invoice
Copy to Consultant: ☑ yes ☐ no
Bill: ☐ Client ☑ Consultant
Preserved and shipped on Ice: ☑ yes ☐ no

Box 4 - Sample Type	G	G	G	
Box 3 - Filtered/Unfiltered	U	U	U	
Required pH of Sample	<2	<2		
Box 2 - Preservative	B	B	H	
Box 5 - Sample Container Type	1 - 500 ML P		2-1L AG	

Residual Chlorine Present?
Yes ____ No ✓

Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	ICP/MS 6020/3005A (Metals-Total)	7470A/3020A (Mercury-Total) (1-PL) STORE KM 10.28.09	8270C/6320C (Semivolatiles) (2-AL)	Metals pH	Svoc (KM) 10.28.09					Lab ID
5W8B	10/27	0910	GW	3	X	X	X	<2						0910223-02
5W5B		1015	GW	3	X	X	X	<2						-03
5W7B		1130	GW	9	X	X	X	<2						0910223-01 USE FOR QC
5WC21		1305	GW	3	X	X	X	<2						-04
5WDUP		1320	GW	3	X	X	X	<2						-05
5WC22		1420	GW	3	X	X	X	<2						-06
5WC23	10/27	1520	GW	3	X	X	X	<2						-07
S5W5	10/26	1220	GW	3	X	X	X	<2						-08
S5W7		1110	GW	3	X	X	X	<2						-09
5W9A		1330	GW	3	X	X	X	<2						-10
5W10A		1450	GW	3	X	X	X	<2						-11
5W11A	10/26	1600	GW	3	X	X	X	<2						-12

GENERAL NOTES:

1. Report results at or greater than QL.
2. Level 4 with EDD.
3. Eris deliverable regu'd JUE 10-9-09

uMx5

Clients Special Instructions: level 4 with edd.

Received by lab in Good Condition ✓ Yes ____ No Custody Seal Intact ✓ Yes ____ No Temperature upon arrival 1.9°C, 0.8°C, 1.4°C, 3.2°C Received on Ice ✓ Yes ____ No

Describe problems, if any:

Sampler Name (Print): Dale Slaughter	Date: 10/26/09	#1 Relinquished by (Signature): Dale Slaughter	Date: 10/28/09	#2 Relinquished by (Signature): Ken Coddington	Date: 10/28/09	Sample Storage Time Requested:
Sampler Signature: Dale Slaughter	Time: 0900	Company Name: DAA	Time: 0830	Company Name: DAA	Time: 1100	
Sampler Name (Print): Tyler Emery	Date: 10/26/09	#1 Received by (Signature): Ken Coddington	Date: 10/28/09	#2 Received by (Signature): Zac A Swanson	Date: 10/28/09	30 DYS ORGS 6 MTHS INORG
Sampler Signature: Tyler Emery	Time: 0900	Company Name: DAA	Time: 0830	Company Name: NC Courier	Time: 11 AM	

Customer Delivery ✓ 10-28-09 JUE K. Manning 1505-10-28-09 1/3 JUE 10-9-09

HWMU5
Radford Army Ammunition Plant
2009 2nd 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 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
5.	Cadmium	7440-43-9	1
6.	Chromium	7440-47-3	5
7.	Cobalt	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.	Thallium	7440-28-0	1
14.	Vanadium	7440-62-2	10
15.	Zinc	7440-66-6	10

OK JCF 10/9/09

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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2/3

HWMU5.sub

HWMU5
Radford Army Ammunition Plant
2009 2nd 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

OK

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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CHAIN OF CUSTODY RECORD

Unit 7

Laboratory: CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097

Client: Draper Aden Associates
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU7
Event: 2009 2nd Semiannual Monitoring
DAA JN: B03204-07
Lab JN:

Project Specific (PS) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO
Carrier: NC Carrier Service
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCl
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic
V VOA
AG Amber Glass
CG Clear Glass

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on ice: ☑ YES ☐ NO

Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	ICP/MS 6020/3005A (Metals-Total)	7470A (Mercury-Total)	8270C - Semivolatile	9012A (Cyanide) 9010B/9012A pH 4.5	Metals/Hg pH					
Box 4 - Sample Type					G	G	G	G						
Box 3 - Filtered/Unfiltered					U	U	U	U						
Required pH of Sample					<2	<2		>12						
Box 2 - Preservative					B	B	~~H~~	E/F						
Box 5 - Sample Container Type					1-~~500~~ml P 1000 A.		2-1L A	~~500 P~~ 250 P 10/21/09						
7W12B	10/19	1300	GW	4	X	X	X	X	<2					0910166-02
7WCA	10/20	1525	GW	4	X	X	X	X	<2					-03
7WDUP	10/20	1540	GW	4	X	X	X	X	<2					-04
7W11B	10/20	1410	GW	12	X	X	X	X	<2					0910166-01 USE AS QC
7MW6	10/20	1310	GW	4	X	X	X	X	<2					-05
7W9C	10/19	1410	GW	4	X	X	X	X	<2					-06
7W10B	10/19	1515	GW	4	X	X	X	X	<2					-07
7W10C	10/19	1620	GW	4	X	X	X	X	<2					-08
7W13	10/20	1200	GW	4	X	X	X	X	<2					-09

✓

GENERAL NOTES:

1. Report results at or greater than QL.
2. Report Level 4 with EDD.
3. Eris deliverable required.

Residual Chlorine Present? Yes ______ No ______

JUE 9-1-09

Clients Special Instructions: level 4 with edd. -0.3, -1.9, -2.0°C, 0.8°C ✓

Received by lab in Good Condition ✓ Yes ____ No Custody Seal Intact ✓ Yes ____ No Temperature upon arrival ^ Received on Ice ✓ Yes ____ No

Describe problems, if any:

Sampler ~~Name~~ (Print): Dale Slaughter	Date: 10/19/09	#1 Relinquished by (Signature): Dale Slaughter	Date: 10/21/09	#2 Relinquished by (Signature):	Date: 10/21/09	Sample Storage Time Requested:
Sampler Signature: Dale Slaughter	Time: 0600	Company Name: DAA	Time: 0800	Company Name: DAA	Time: 1110	
Sampler Name (Print): Tyler Emecy	Date: 10/19/09	#1 Received by (Signature):	Date: 10/21/09	#2 Received by (Signature): Eli	Date: 10-21-09	30 DYS ORG/6 MTHS INORG
Sampler Signature: Tyler Emery	Time: 0600	Company Name: DAA	Time: 0800	Company Name: N.C. Courier	Time: 1110	

Cathy Dover 10/21/09

1x JUE 10/21/09

10

WO # 0910166

HWMU7
Radford Army Ammunition Plant
2009 2nd 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

OK
JW 12-15-09

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

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Review 09 2005 JCF

3/4 JLK 10 9 25

HWMU7
Radford Army Ammunition Plant
2009 2nd Semiannual Monitoring Event
DAA JN: B03204-07

ANALYTICAL METHOD: 9012/9010A
TYPE METHOD: CLO
CLASS: CYANIDE

No. (µg/l)	ANALYTE	CAS RN	Required PERMIT QL
1	Cyanide	57-12-5	20

JCF 10/2007

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Review 09 2005 JCF

9/9

JK 10/9/05

HWMU7
Radford Army Ammunition Plant
2009 2nd 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.	Bis(2-ethylhexyl)phthalate	117-81-7	10
2.	Butylbenzyl phthlate	85-68-7	10
3.	2,4-Dinitrophenol	51-28-5	10
4.	2,4-dinitrotoluene	121-14-2	10
5.	2,6-dinitrotoluene	606-20-2	10
6.	p-nitrophenol, 4-nitrophenol	100-02-7	10

JCF 10/2007

OK JLR
12-6-05

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Review 09 2005 JCF

2/4 12.5 JR 05

acct#11200 Gp#1167595 **CHAIN OF CUSTODY RECORD** Sample# 5813614-22

Laboratory: Lancaster Laboratories, 2425 New Holland Pike, Lancaster, PA 17605-2425/ Barb Weyandt; Manager/ (717) 656-2300

Client: Draper Aden Associates
Attn: 0
Address: 0
0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU10
October 2009
Event: 2009 2nd Semiannual Monitoring
DAA JN: B03204-07
Lab JN: JLF 10-9-0C

Project Specific (PS) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO
Carrier: ______
Tracking Number: ______

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

JLF 10-6-09

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic
V VOA
AG Amber Glass
CG Clear Glass

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on ice: ☑ YES ☐ NO

Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	8260B/5030B 25ml purge	-additional sample aliquot JLF 10/22/09
Box 4 - Sample Type					G	G
Box 3 - Filtered/Unfiltered					U	U
Required pH of Sample					<2	<2
Box 2 - Preservative					A	A
Box 5 - Sample Container Type					3-40ml V	3-40ml V
10D4	10/21	1500	GW	~~3~~ 6	X	X
10MW1	|	1010	GW	~~3~~ 6	X	✓
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
10D3	|	1240	GW	~~3~~ 6	X	X
10DUP	|	1255	GW	~~3~~ 6	X	X
10D3D	10/21	1130	GW	~~3~~ 6	X	X
Trip Blank	10/9		GW	~~3~~ 6	X	X

GENERAL NOTES:

1. **Report results at or greater than QL.**
2. **Level 1 with EDD.**
3. analyze 1 trip blank for each day of sampling. JLF 10-6-09

Unit 10

Clients Special Instructions: level 1 with edd.

Received by lab in Good Condition ____ Yes ____ No Custody Seal Intact ____ Yes ____ No Temperature upon arrival ____ Received on Ice ____ Yes ____ No
Describe problems, if any:

Sampler ~~Name~~ (Print): Dale Slaughter Date: 10/21/09
Sampler Signature: Dale Slaughter Time: 0800
Sampler Name (Print): Tyler Emery Date: 10/21/09
Sampler Signature: Tyler Emery Time: 0800

#1 Relinquished by (Signature): Dale Slaughter Date: 10/21/09
Company Name: DAA Time: 1700
#1 Received by (Signature): Date:
Company Name: Time:

~~#2 Relinquished~~ by (Signature): Date:
Company Name: Time:
#2 Received by (Signature): Date: 10/22/09
Company Name: LLI Time: 530

Sample Storage Time Requested:
30 DYS ORG/6 MTHS INORG

1/2 JLF 10-6-09

acct # 11200
Cp # 1167595
sample # 5813614-22

HWMU10
Radford Army Ammunition Plant
2009 2nd Semiannual Monitoring Event
DAA JN: B03204-07

2/2

ANALYTICAL METHOD: 8260B/5030B
TYPE METHOD: GCMS
CLASS: VOLATILE

No.	ANALYTE	CAS RN	Required QL (µg/l)
1.	Bromodichloromethane	75-27-4	1
2.	Chloroform (trichloromethane)	67-66-3	1
3.	2-butanone (methyl ethyl ketone - MEK)	78-93-3	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

25 ml purge

JCF 10-6-09

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CHAIN OF CUSTODY RECORD

Laboratory: CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097

Client: Draper Aden Associates
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU10
Event: 2009 2nd Semiannual Monitoring
DAA JN: 803204-07
Lab JN:

Project Specific (PS) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO
Carrier: NC Courier Pick-up
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 5: Sample Container Type
P Plastic
V VOA
AG Amber Glass
CG Clear Glass

Box 4: Sample Type
G Grab
C Composite

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on Ice: ☑ YES ☐ NO

Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	ICP/MS 6020/3005A (Metals-Total)	7470A (Mercury-Total)	8270C/5320C (Semivolatiles)	9012A 9014 (Cyanide) / 9010B okJIF 11/6.19	metals pH	cyanide pH					GENERAL NOTES:
Box 4 - Sample Type					G	G	G	G							1. Report results at or greater than QL.
Box 3 - Filtered/Unfiltered					U	U	U	U							2. Level 4 with EDD.
Required pH of Sample					<2	<2		>12							3. Eris deliverable required. JLF 11-2-09
Box 2 - Preservative					B	B	H	E/F							
Box 5 - Sample Container Type					1-500 ml P		2-1L A	1-500 ml P							
10D4	10/21	1500	GW	4	X	X	X	X	<2	~~>12~~ 9					0910176-02 will resample for CN- CSI 10/23/09
10MW1		1010	GW	4	X	X	X	X	<2	>12					-03
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
10D3		1240	GW	4	X	X	X	X	<2	>12					-04 bottle w/ pH >12
10DUP		1255	GW	4	X	X	X	X	<2	>12					-05
10D3D	10/21	1130	GW	4	X	X	X	X	<2	>12					-06

Residual Chlorine Present?
Yes ____ No ✓

Unit 10

Clients Special Instructions: level 4 with edd.

Received by lab in Good Condition ✓ Yes ___ No Custody Seal Intact ✓ Yes ___ No Temperature upon arrival → -1.7°, -0.2°, -3.1°C Received on Ice ✓ Yes ___ No
Describe problems, if any:

Sampler Name (Print): Dale Slaughter	Date: 10/21/09	#1 Relinquished by (Signature): Dale Slaughter	Date: 10/22/09	#2 Relinquished by (Signature):	Date:	Sample Storage Time Requested:
Sampler Signature: Dale Slaughter	Time: 0800	Company Name: DAA	Time: 1115	Company Name:	Time:	
Sampler Name (Print): Tyler Emery	Date: 10/21/09	#1 Received by (Signature): Eli	Date: 10-22-09	#2 Received by (Signature): Cathy Dover	Date: 10/22/09	30 DYS ORG/6 MTHS INORG
Sampler Signature: Tyler Emery	Time: 0800	Company Name: N.C. Courier	Time: 1115	Company Name: CompuChem	Time: 1600	

ok JLF 11/6/09

CHAIN OF CUSTODY RECORD

JF 10-26-0

Laboratory: CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097

Batch QC: OK

Client:	Draper Aden Associates	Consultant:	Draper Aden Associates	Sample Site:	RAAP, Radford, Virginia
Attn:	0	Attn:	Janet C. Frazier	Location:	HWMU10
Address:	0 0	Address:	2206 South Main Street Blacksburg, Virginia 24060	Event:	2009 2nd Semiannual Monitoring Re-sample
Phone:	0	Phone:	(540) 552-0444	DAA JN:	B03204-07
Fax:	0	Fax:	(540) 552-0291	Lab JN:	
Fax:	0				

Project Specific (PS) QC: ☑ YES ☐ NO

Sample Collection for Project Complete? ☑ YES ☐ NO

Carrier: NC COURIER SERVICE

Tracking Number:

Box 1: Matrix
- SW Surface Water
- GW Groundwater
- L Leachate
- S Soil
- T Trip Blank
- E Equipment Blank
- P Product
- O Other

Box 2: Preservative
- A HCL
- B HNO_3
- C H_2SO_4
- D $Na_2S_2O_3$
- E NaOH
- F ZnAc
- G Other (Specify)
- H None

Box 3: Filtered/Unfiltered
- F Filtered
- U Unfiltered

Box 5: Sample Container Type
- P Plastic
- V VOA
- AG Amber Glass
- CG Clear Glass

Box 4: Sample Type
- G Grab
- C Composite

Invoice

Copy to Consultant: ☑ YES ☐ NO

Bill: ☐ Client ☑ Consultant

Preserved and shipped on ice: ☑ YES ☐ NO

Box 4 - Sample Type					G									
Box 3 - Filtered/Unfiltered					U									
Required pH of Sample					>12									
Box 2 - Preservative					E/F									
Box 5 - Sample Container Type					1-500 ml-P									
Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	8014 (Cyanide)	Cyanide								
10D4	10 27	1635	GW	1	X	>12			0910176-07					

GENERAL NOTES:

1. **Report results at or greater than QL.**
2. **Level 4 with EDD.** 1 ~~this~~,

JF 10-26-09

Rec'd KM 10-28-09

JF 10-26-09

* This ~~was re sampled~~ resampling requird due to initial sample event sample received at lab @ pH 10 instead of pH 12.

JF 10-26-09

Clients Special Instructions: level 4 with edd.

Received by lab in Good Condition ✓ Yes ___ No Custody Seal Intact ✓ Yes ___ No Temperature upon arrival 1.9°C Received on Ice ✓ Yes ___ No

Describe problems, if any:

Sampler Name (Print):	Dale Slaughter	Date: 10/27/09	#1 Relinquished by (Signature):	Dale Slaughter	Date: 10/28/09	#2 Relinquished by (Signature):		Date: 10/28/09	Sample Storage Time Requested:
Sampler Signature:	Dale Slaughter	Time: 0730	Company Name:	DAA	Time: 0830	Company Name:	DAA	Time: 11 00	
Sampler Name (Print):	Tyler Emery	Date: 10/27/09	#1 Received by (Signature):		Date: 10/28/09	#2 Received by (Signature):	Lee Swanson	Date: 10/28/09	30 DYS ORG/6 MTHS INORG
Sampler Signature:	Tyler Emery	Time: 0730	Company Name:	DAA	Time: 0830	Company Name:	NC Courier	Time: 11 00 AM	

Customer Delivery ✓ KM 10-28-09

K. Manning 10-28-09 1505 10-28-09

HWMU10
Radford Army Ammunition Plant
2009 2nd 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	7440-22-4	2
10.	Vanadium		10
11.	Zinc	7440-66-6	10

Method SW 7470A

No.	ANALYTE	CAS RN	Required QL (μg/l)
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 2nd Semiannual Monitoring Event
DAA JN: B03204-07

ANALYTICAL METHOD: 8270C/3520C
TYPE METHOD: GCMS
CLASS: SEMIVOLATILE

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

10/2007 jcf

3/4

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HWMU10
Radford Army Ammunition Plant
2009 2nd Semiannual Monitoring Event
DAA JN: B03204-07

ANALYTICAL METHOD: 9012A
TYPE METHOD: CLO
CLASS: CYANIDE

No.	ANALYTE	CAS RN	Required QL (μg/l)
1	Cyanide	57-12-5	20

10/2007 jcf

acct# 11200 Grp# 1165741

CHAIN OF CUSTODY RECORD

Sample# 5802043-59

Laboratory: Lancaster Laboratories, 2425 New Holland Pike, Lancaster, PA 17605-2425/ Barb Wyant, Manager/ (717) 656-2300 9/25/09

Client: 0
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU16
Event: 2009 - 2nd Semiannual Monitoring Event
DAA JN: B03204-07
Lab JN:

Project Specific (PS) or Batch (B) QC: ☑YES ☐NO
~~Sample Collection~~ for Project Complete? ☑YES ☐NO
Carrier:
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 5: Sample Container Type
P Plastic
V VOA
AG Amber Glass
CG Clear Glass

Box 4: Sample Type
G Grab
C Composite

Invoice
Copy to Consultant: ☑YES ☐NO
Bill: ☐Client ☑Consultant
Preserved and shipped on ice: ☑YES ☐NO

Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	8260B/5030B - 25 ml purge									GENERAL NOTES:
Box 4 - Sample Type					G									
Box 3 - Filtered/Unfiltered					U									
Required pH of Sample					<2									
Box 2 - Preservative					A									
Box 5 - Sample Container Type					3-40ml V									
16C1	10/8	1445	GW	3	X									
16MW8	10/7	1345	GW	3	X									
16MW9	10/8	1025	GW	3	X									
16WG1A	10/8	1200	GW	3	X									USE FOR QC
16WDUP	10/8	1220	GW	3	X									
16WC1B	10/8	1330	GW	3	X									
16-1	10/7	1015	GW	3	X									
16-2	10/7	1120	GW	3	X									
16-3	10/6	1635	GW	3	X									
16-5	10/7	1500	GW	3	X									
16WC2B	10/7	1240	GW	3	X									
16SPRING	10/7	1535	GW	3	X									
Trip Blank1	9/25		GW	3	X									For Samples Collected 10/6/09
Trip Blank2	9/25		GW	3	X									For Samples Collected 10/7/09
Trip Blank3	9/25		GW	3	X									For Samples Collected 10/8/09

GENERAL NOTES:

1. DAA EDD required.
2. Level 1 deliverables required.
3. See attached target analyte list.
4. Report results at or greater than QL.
5. 1 Trip Blank to be analyzed per day of sample collection.
6. Report results at or greater than QL.
7. Project required LOQ's attached. Please report these LOQ's, not lab LOQ's.

Unit 16

Clients Special Instructions: Level 1 with add. See attached target analyte list. See Genral Notes block.

Received by lab in Good Condition _____ Yes _____ No Custody Seal Intact _____ Yes _____ No Temperature upon arrival _____ Received on ice _____ Yes _____ No

Describe problems, if any:

Sampler Name (Print): Dale Slaughter	Date: 10/6/09	#1 Relinquished by (Signature): Tyler Emery	Date: 10/8/09	#2 Relinquished by (Signature):	Date:	Sample Storage Time Requested:
Sampler Signature: Dale Slaughter	Time: 0730	Company Name: DAA	Time: 1700	Company Name:	Time:	
Sampler Name (Print): Tyler Emery	Date: 10/6/09	#1 Received by (Signature):	Date:	#2 Received by (Signature):	Date: 10/9/09	30 DYS ORG/6 MTHS INORG
Sampler Signature: Tyler Emery	Time: 0730	Company Name:	Time:	Company Name: LLI	Time: 930	

9/25/09 1/2

acct#11200
Cp# 1165741
sample# 5802043-59

HWMU16
Radford Army Ammunition Plant
2009 2nd 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
10.	Trichloroethene	79-01-6	1
11.	Trichlorofluoromethane (CFC-11)	75-69-4	1
12.	Xylenes (total)	1330-20-7	3
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
17	1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	1

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

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

OK
JUF 9/29/09

25 ml purge volume.
JUF
9.29.09

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2/2

CHAIN OF CUSTODY RECORD

01 JJF 9/24/09

Laboratory: CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097

Client: 0
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU16
Event: 2009 - 2nd Semiannual Monitoring Eve
DAA JN: 603204-07
Lab JN:

Project Specific (PS) or Batch (B) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO
Carrier: NC. Courier
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 5: Sample Container Type
P Plastic
AG Amber Glass
V VOA
CG Clear Glass

Box 4: Sample Type
G Grab
C Composite

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on ice: ☑ YES ☐ NO

Box 4 - Sample Type					G	G				
Box 3 - Filtered/Unfiltered					U	U				
Required pH of Sample					<2	-				
Box 2 - Preservative					B	H				
Box 5 - Sample Container Type					500 ml P	2-1L A				
Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	ICP/MS 6020/3005A (Metals-Total) (500ml)	8270C/8320C (Semivolatiles) (AL)	Metal PH's			
16C1	10/8	1445	GW	3	X	X	<2		0910073-02	
16MW8	10/7	1345	GW	3	X	X	<2		-03	
16MW9	10/8	1025	GW	3	X	X	<2		-04	
16WC1A	10/8	1200	GW	9	X	X	<2		0910073-01	USE FOR QC
16WDUP	10/8	1220	GW	3	X	X	<2		-05	
16WC1B	10/8	1330	GW	3	X	X	<2		-06	
16-1	10/7	1015	GW	3	X	X	<2		-07	
16-2	10/7	1120	GW	3	X	X	<2		-08	
16-3	10/6	1635	GW	3	X	X	<2		-09	
16-5	10/7	1500	GW	3	X	X	<2		-10	
16WC2B	10/7	1240	GW	3	X	X	<2		-11	
16SPRING	10/7	1535	GW	3	X	X	<2		-12	

Residual Chlorine Present?
Yes ____ No ✓

GENERAL NOTES:

1. ERIS EDD & DAA EDD required.
2. Level 4 deliverables required.
3. See attached target analyte list.
4. report results to at or above LOQ (project), attached.

JJF 9/29/09

Clients Special Instructions: level 4 with edd. See attached target analyte list.

Received by lab in Good Condition ✓ Yes ___ No Custody Seal Intact ✓ Yes ___ No Temperature upon arrival ___ Received on Ice ✓ Yes ___ No
Describe problems, if any: 0.1°C; 0.2°C; 0.8°C * See Sheet for ~~AB~~ 500ml's above temp. (17.7°C)

Sampler Name (Print): Dale Slaughter	Date: 10/6/09	#1 Relinquished by (Signature): Tyler Emery	Date: 10/8/09	#2 Relinquished by (Signature):	Date:	Sample Storage Time Requested:
Sampler Signature: Dale Slaughter	Time: 0730	Company Name: DAA	Time: 1630	Company Name:	Time:	
Sampler Name (Print): Tyler Emery	Date: 10/6/09	#1 Received by (Signature): Lee H Simmons	Date: 10/8/09	#2 Received by (Signature): Jennifer Dover	Date: 10/8/09	30 DYS ORG/6 MTHS INORG
Sampler Signature: Tyler Emery	Time: 0730	Company Name: NC Courier	Time: 4:30 PM	Company Name:	Time: ~~8~~ 20:20 pm	

10/9/09
1/2 JJF 9/29/09

unit 16

HWMU16
Radford Army Ammunition Plant
2009 2nd 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.	Beryllium	7440-41-7	1
5.	Cadmium	7440-43-9	1
6.	Chromium	7440-47-3	5
7.	Cobalt	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

2/3

HWMU16
Radford Army Ammunition Plant
2009 2nd 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

FALL2 cont

Time	Temp(°C)	pH	Cond(us)	DO mg/L	ORP(mV)	Purge	Desc
(1120)	Readings Stable						
(1135)	12.90	6.46	924	7.27	199.7		

Sample Time (1125)

Samples Collected: (1)TM, (3)8260, (2)8011

FALL3

DTW - 68.66

PostPurgeDTW - 68.94

Begin Purge (1155)

Initial Purge - clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc
(1200)	12.90	952	7.34	6.88	200.0	0.34/min	clear
(1205)	13.50	987	6.51	6.79	198.2	"	clear
(1210)	13.45	1026	6.00	6.68	200.2	"	sl cloudy
(1215)	12.97	1092	4.74	6.53	204.7	"	sl cloudy
(1220)	12.72	1159	3.26	6.41	203.2	"	sl cloudy
(1225)	12.85	1184	2.44	6.37	196.9	"	sl cloudy
(1230)	13.00	1185	2.44	6.38	193.3	"	clear
(1235)	13.27	1203	2.21	6.38	186.8	"	clear
(1240)	13.31	1208	1.96	6.37	183.3	"	clear
(1245)	13.47	1205	1.89	6.36	181.6	"	clear
(1245)	Readings Stable						
(1301)	13.70	1220	2.29	6.46	170.4	"	clear

Sample Time (1250)

Samples Collected: (1) TM, (3) 8260, (2) 8011

WELL 7

DTW - 26.86

PostPurgeDTW - 26.95

Begin Purge (1323)

Initial Purge - clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc
(1325)	12.09	627	7.35	6.04	197.9	0.34/min	clear
(1330)	11.74	566	6.89	6.02	204.7	"	clear
(1335)	11.86	551	6.51	6.04	206.0	"	clear
(1340)	11.91	556	6.40	6.05	206.4	"	clear
(1345)	11.88	564	6.37	6.06	207.0	"	clear
(1350)	11.81	570	6.35	6.07	207.3	"	clear
(1355)	11.66	571	6.32	6.07	207.7	"	clear
(1355)	Readings Stable						
(1410)	11.89	579	6.40	6.13	204.1		

Sample Time (1400)

Samples Collected: (1)TM, (3)8260 (2) 8011

16-3

DTW - 58.35

Post Purge DTW - 65.16

Begin Purge (1433)

Initial Purge - clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc
(1435)	12.34	223	8.88	7.56	1505	0.34/min	clear
(1440)	12.28	222	7.87	7.64	150.2	"	clear
(1445)	12.32	222	7.46	7.70	149.7	"	clear
(1450)	12.37	219	7.18	7.75	148.3	"	clear
(1455)	12.48	217	6.97	7.78	147.1	"	clear
(1500)	12.64	216	6.70	7.81	145.7	"	clear
(1505)	12.75	216	6.41	7.84	144.1	"	clear
(1510)	12.59	216	6.42	7.82	144.9	"	clear
(1515)	12.47	215	6.40	7.82	144.7		
(1515)	Readings Stable						
(1535)	12.69	214	6.71	7.83	146.4		

Complete! 6-15-09

Sample Time (1520)

Samples Collected: (2)TM, (6) 8260, (2) 8011, (2)8270

General Notes

- Weather: Overcast 30°
- PPE: Eye Protection, Nitrile Gloves
- Calibrations: YSI 650 MDS
  pH: 4.00 = 4.00, 7.00 = 6.99, 10.00 = 10.00
  Conductivity reads 1414 µs in 1413µs std
  DO% = 100
- Dedicated tubing and well skirts used @ each well and disposed of after each use
- All equipment deconed between each well
- Purged water contained and disposed of at dedicated location onsite
- Samples collected, stored and transported on ice in coolers

Static Water Level Table - Unit 16

Well	DTW	Post Purge DTW	Notes
16-1	DRY		
16-2	55.72	55.80	
16-3	58.35	65.16	
16-5	4.75	6.75	
16WC2B	55.20	58.95	
16MW8	72.85	75.39	
16WC1B	67.61	68.04	
16WC1A	67.39	69.42	
16MW9	64.05	64.75	
16C1	51.19	51.21	
16CDM3	DRY		
16C3	DRY		
16WC2A	DRY		

16-1 = DTW - DRY No Samples Collected (0945)

16-2

DTW - 55.72 Begin Purge (1006)

Post Purge DTW - 55.80 Initial Purge - clear

Time	Temp(°C)	Cond(µs)	DO mg/L	pH	ORP(mV)	Purge R	Desc
(1010)	10.19	642	7.77	6.58	200.8	0.3L/min	clear
(1015)	9.93	646	7.04	6.57	200.5	"	clear
(1020)	9.59	645	6.60	6.56	201.2	"	clear
(1025)	9.65	640	6.23	6.53	202.4	"	clear
(1030)	10.12	631	6.08	6.54	202.1	"	clear
(1035)	10.24	630	5.80	6.57	199.9	"	clear
(1040)	10.34	632	5.71	6.56	200.3	"	clear
(1045)	10.45	631	5.67	6.58	199.8	"	clear
(1050)	10.51	633	5.67	6.57	200.0	"	clear

(1050) Readings Stable

Sample Time (1055)

Samples Collected: (3) 8260, (1) TM, (2) 8270

(1100) 10.66 620 5.84 6.60 195.7 Post Purge Reading

16WC2B

DTW - 55.20 Begin Purge (1121)

Post Purge DTW - 58.95 Initial Purge - Clear

Time	Temp(°C)	Cond(µs)	DO mg/L	pH	ORP(mV)	Purge R	Desc
(1125)	10.82	288	8.00	7.48	156.9	0.3L/min	clear
(1130)	10.62	289	7.03	7.40	161.4	"	clear
(1135)	10.57	288	4.00	7.42	146.5	"	clear
(1140)	10.99	287	1.78	7.51	101.4	"	Clear
(1145)	11.00	287	1.72	7.53	86.9	"	Clear
(1150)	11.04	286	1.37	7.53	83.0	"	Clear
(1155)	11.06	286	1.35	7.54	79.5	"	Clear
(1200)	11.07	286	1.30	7.54	75.4	"	Clear
(1200) Readings Stable							
(1210)	10.97	286	1.62	7.57	70.3	"	Clear

Sample Time (1205) Samples Collected: (2) 8260, (1) TM, (2) 8270

4/7/09 RAAP B03204-07 DAS/TQE FB#8

16-5

DTW - 4.75
Post Purge DTW - 6.75

Begin Purge (1230)
Initial Purge - clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge(gpm)	Desc
(1235)	10.86	438	2.75	7.16	113.5	0.3 L/min	Clear
(1240)	10.81	444	2.16	7.11	118.0	"	Clear
(1245)	10.92	447	2.07	7.10	120.3	"	Clear
(1250)	11.26	447	2.74	7.12	123.4	"	Clear
(1255)	11.44	448	2.82	7.13	125.6	"	Clear
(1300)	11.11	450	2.91	7.11	129.4	"	Clear
(1305)	10.99	449	2.91	7.10	131.7	"	Clear
(1305)	Readings Stable						
(1320)	11.27	450	3.15	7.04	140.2		clear

Sample Time (1310)
Samples Collected: (3) 8260, (1) TM, (2) 8270

Spring 16

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)
(1343)	11.29	603	10.09	7.00	66.3

Sample Time (1345)
Samples Collected: (3) 8260, (1) TM, (2) 8270

4/7/09 RAAP B03204-07 DAS/TQE FB#8

16C1

DTW - 51.19
Post Purge DTW - 51.21

Begin Purge (1407)
Initial Purge - clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc
(1410)	10.31	551	6.76	6.84	153.9	0.3 L/min	clear
(1415)	11.61	695	4.32	6.56	181.3	"	clear
(1420)	10.76	704	3.48	6.48	188.9	"	clear
(1425)	10.64	702	3.09	6.44	187.1	"	clear
(1430)	10.81	703	2.68	6.46	175.0	"	clear
(1435)	11.12	705	2.67	6.46	167.2	"	clear
(1440)	11.27	707	2.47	6.45	160.3	"	clear
(1445)	11.31	709	2.27	6.45	156.8	"	clear
(1450)	11.40	707	2.26	6.45	152.9	"	clear
(1455)	11.44	708	2.22	6.46	150.0	"	clear
(1455)	Readings Stable						
(1530)	12.21	712	2.51	6.49	141.7		

Sample Time (1500)
Samples Collected: (3) 8260, (1) TM, (2) 8151
(2) 8270, (1) Cyanide, (1) Sulfide, (1) Total Phenol, (2) 8081

General Notes

- Weather: Sunny 50s
- PPE: Eye Protection, Nitrile Gloves
- Calibrations: YSI 650 MDS
  pH: 4.00 = 4.00, 7.00 = 7.00, 10.00 = 10.00
  Conductivity reads 1413 us in 1413us std.
  DO% = 100
- Dedicated tubing and well skirts used at each well and disposed of after each use
- All equipment deconed between each well.
- Purged water contained and disposed of at dedicated location onsite
- Samples collected, stored and transported on ice in coolers

16WC1B

DTW - 67.61
Post Purge DTW - 68.04

Begin Purge (1000)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeR	Desc
(1005)	12.30	333	5.20	5.76	194.3	0.3 L/min	clear
(1010)	12.29	317	4.51	5.72	194.6	"	Clear
(1015)	12.18	301	4.14	5.62	200.2	"	clear
(1020)	12.43	283	3.86	5.61	208.0	"	clear
(1025)	12.56	271	3.52	5.57	244.7	"	clear
(1030)	12.61	268	3.28	5.62	263.9	"	Clear
(1035)	12.88	266	3.20	5.63	269.5	"	clear
(1040)	12.44	270	3.10	5.63	266.5	"	clear
(1045)	12.38	270	2.98	5.59	269.0	"	clear
(1050)	12.21	270	2.94	5.60	267.1	"	Clear
(1050)	Readings	Stable					
(1123)	12.43	294	3.04	5.75	274.9		

Sample Time (1055)
Samples Collected: (3) 8260, (1) TM, (2) 8151, (2) 8270
(1) CN, (1) Sulfide (1) TOTAL Phenol, (2) 8081

16WC1A

DTW - 67.39
Post Purge DTW - 69.42

Begin Purge (1139)
Initial Purge - clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeR	Desc
(1140)	11.74	471	8.98	7.27	234.7	0.3 L/min	clear
(1145)	11.98	582	6.24	6.90	229.2	"	clear
(1150)	12.14	620	3.86	6.74	223.5	"	clear
(1155)	12.22	644	2.88	6.77	209.4	"	clear
(1200)	12.10	647	2.75	6.77	205.3	"	clear
(1205)	12.00	652	2.66	6.75	202.8	"	clear
(1210)	12.17	650	2.52	6.74	182.0	"	clear
(1215)	12.29	650	2.36	6.74	117.6	"	clear
(1220)	12.36	653	2.21	6.75	83.0	"	clear
(1225)	12.51	656	2.19	6.76	70.7	"	clear
(1230)	12.62	656	2.17	6.76	67.2	"	clear
(1235)	12.71	658	2.16	6.74	61.9	"	clear
(1235)	Readings	Stable		~~6.67~~			
(1350)	13.01	652	2.21	6.67	58.1		

Sample Time (1240)
Samples Collected: (9) 8260, (3) TM, (6) 8151,
(6) 8270, (3) CN, (3) Sulfide, (3) Total Phenol, (6) 8081

16W DUP

Sample Time (1300)
Samples Collected: (3) 8260, (1) TM, (2) 8151,
(2) 8270, (1) CN, (1) Sulfide, (1) Total Phenol, (2) 8081
Duplicate well was sampled at 16WC1A

16MW09

DTW - 64.05
Post Purge DTW - 64.75

Begin Purge (clear)
Initial Purge - 1407

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc
(1410)	13.10	676	8.03	6.76	114.6	0.3 L/min	Clear
(1415)	13.45	690	6.48	6.57	104.4	"	clear
(1420)	13.47	731	3.30	6.43	75.1	"	Clear
(1425)	13.45	751	2.19	6.41	66.1	"	clear
(1430)	13.41	740	2.03	6.37	73.9	"	clear
(1435)	13.59	688	2.13	6.34	84.1	"	clear
(1440)	13.46	668	2.17	6.32	90.7	"	clear
(1445)	13.17	630	2.26	6.28	97.5	"	clear
(1450)	13.01	613	2.20	6.24	98.7	"	clear
(1455)	12.91	606	2.12	6.24	98.1	"	clear
(1500)	12.87	603	2.09	6.24	97.9	"	clear
(1500)	Readings Stable						
(1521)	13.10	597	2.31	6.29	87.1		

Sample Time (1505)
Samples Collected: (3) 8260, (1) TM, (2) 8151
(2) 8270, (1) CN, (1) Sulfide, (1) TOTAL Phenol, (2) 8081

16MW8

DTW - 72.85
Post Purge DTW - 75.39

Begin Purge (1534)
Initial Purge - sl Cloudy

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc
(1535)	13.55	104	6.42	5.39	230.7	0.3 L/min	sl. cloudy
(1540)	13.13	91	2.45	5.05	187.7	"	cloudy
(1545)	12.97	89	2.08	5.03	183.0	"	cloudy
(1550)	13.14	89	1.94	5.07	165.3	"	sl cloudy
(1555)	13.27	91	1.82	5.15	146.1	"	sl cloudy
(1600)	13.31	90	1.80	5.12	149.2	"	clear
(1605)	13.28	87	1.84	5.09	155.6	"	clear
(1605)	Readings Stable						

16MW8 cont

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)
(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) Sulfide, (1) Total Phenol, (1) 8081
Note: well was purged dry during sample collection

Completed
LJK 6-14-09

Static Water Level Table - Unit 7

WELL	DTW	Post Purge DTW	Notes
7W12B	24.60	24.62	
7W9C	13.94	16.86	
7W10B	15.09	15.66	
7W10C	18.94	20.67	
7W13	18.33	20.19	
7MW6	25.61	29.97	
7W11B	24.78	25.04	
7WCA	24.67	26.55	
7W9B	22.40	SWL ONLY	
7W11	23.77	"	
7MW5	24.72	"	

7W13

DTW - 18.33 Begin Purge (1253)
Post Purge DTW - 20.19 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc
(1255)	13.06	1268	7.00	7.36	101.7	0.3L/min	Clear
(1300)	13.32	1286	4.86	7.23	17.1	"	Clear
(1305)	13.49	1310	4.00	7.21	- 3.0	"	Clear
(1310)	13.40	1327	3.71	7.22	-13.7	"	Clear
(1315)	13.22	1333	3.70	7.23	-5.8	"	Clear
(1320)	13.25	1331	3.72	7.25	-2.0	"	Clear
(1325)	13.18	1335	3.71	7.25	2.6	"	Clear
(1330)	13.07	1334	3.70	7.26	5.0	"	Clear

(1330) Readings Stable

Sample Time (1335)

Samples Collected: (1)TM, (1)CN, (2) 8270

(1344)	12.98	1345	3.85	7.27	10.0	Post Purge Reading	

7W10C

DTW - 18.94 Begin Purge (1403)
Post Purge DTW - 20.67 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc
(1405)	12.71	806	2.05	7.06	92.5	0.3L/min	Clear
(1410)	13.20	797	1.91	7.06	93.1	"	Clear
(1415)	13.46	794	1.97	7.06	96.8	"	Clear
(1420)	13.33	796	1.97	7.05	100.9	"	Clear
(1425)	13.14	796	1.89	7.04	104.2	"	Clear
(1430)	13.13	795	1.90	7.03	105.3	"	Clear
(1435)	13.04	794	1.92	7.03	107.1	"	Clear

(1435) Readings Stable

(1452)	12.83	786	1.88	7.04	94.1	"	Clear

Sample Time (1440)

Samples Collected: (1)TM, (1)CN, (2)8270

7W9C

DTW - 13.94 Begin Purge (1513)
Post Purge DTW - 16.86 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc
(1515)	12.40	1141	2.63	6.83	115.2	0.3L/min	Clear
(1520)	12.31	1167	1.96	6.77	125.4	"	Clear
(1525)	12.25	1185	1.72	6.74	128.1	"	Clear
(1530)	12.26	1190	1.68	6.73	124.2	"	Clear
(1535)	12.27	1198	1.69	6.73	109.0	"	Clear
(1540)	12.27	1203	1.72	6.73	106.5	"	Clear
(1545)	12.30	1202	1.78	6.75	100.6	"	Clear

(1545) Readings Stable

(1600)	12.39	1186	2.06	6.76	90.3	Post Purge Reading	

Sample Time (1550)

Samples Collected: (1)TM, (1)CN, (2)8270

7W12B

DTW - 24.60 Begin Purge (1127)
Post Purge DTW - 24.62 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(MV)	Purge R	Desc
(1130)	12.98	684	8.30	6.98	182.3	0.3L/mm	Clear
(1135)	12.90	684	7.54	6.95	186.6	"	Clear
(1140)	12.76	682	7.10	6.93	190.7	"	Clear
(1145)	12.68	681	6.90	6.93	192.9	"	Clear
(1150)	12.54	680	6.73	6.92	194.5	"	Clear
(1155)	12.35	677	6.61	6.91	196.7	"	Clear
(1200)	12.21	677	6.58	6.91	197.3	"	Clear
(1205)	12.17	677	6.54	6.91	197.0	"	Clear
(1205)	Readings Stable						
(1226)	11.95	669	6.63	6.90	194.2	Post Purge Reading	

Sample Time (1210)

Samples Collected: (3)8260, (1)TM, (2)8270, (1)CN, (2)8151
(1) Sulfide, (1) 9065, (2)8081

7W10B

DTW - 15.09 Begin Purge (1244)
Post Purge DTW - 15.66 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(MV)	Purge R	Desc
(1245)	11.70	934	4.67	6.78	192.1	0.3L/min	Clear
(1250)	11.67	929	3.55	6.73	192.5	"	Clear
(1255)	11.60	920	3.18	6.72	190.4	"	Clear
(1300)	11.63	916	3.10	6.71	187.7	"	Clear
(1305)	11.63	915	2.98	6.71	184.7	"	Clear
(1310)	11.56	916	2.93	6.71	181.5	"	Clear
(1315)	11.57	917	2.99	6.71	178.6	"	Clear
(1315)	Readings Stable						
(1332)	11.72	915	3.75	6.73	173.8	Post Purge Reading	

Sample Time (1320)

Samples Collected: (1)TM, (2)8270, (1)CN

7MW6

DTW - 25.61 Begin Purge (1341)
Post Purge DTW - 29.97 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(MV)	Purge R	Desc
(1345)	12.21	1535	2.53	7.31	-19.9	0.3L/min	Clear
(1350)	12.21	1601	2.26	7.20	-62.4	"	Clear
(1355)	12.34	1649	2.17	7.13	-78.6	"	Clear
(1400)	12.46	1664	2.17	7.11	-84.6	"	Clear
(1405)	12.53	1677	2.29	7.11	-91.5	"	Clear
(1410)	12.53	1679	2.25	7.08	-93.7	"	Clear
(1415)	12.64	1678	2.26	7.08	-96.5	"	
(1415)	Readings Stable						
(1434)	12.90	1565	2.37	7.24	-88.1	Post Purge Reading	

Sample Time (1420)

Samples Collected: (3)8260, (1)TM, (2)8270, (1)CN, (2)8151
(1) Sulfide, (1)9065, (2)8081

7W11B

DTW - 24.78 Begin Purge (1448)
Post Purge DTW - 25.04 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(MV)	Purge R	Desc
(1450)	12.69	883	6.14	6.44	41.4	0.3L/min	Clear
(1455)	12.68	835	5.21	6.42	53.7	"	Clear
(1500)	12.51	772	4.02	6.39	58.9	"	Clear
(1505)	12.45	748	3.65	6.38	60.7	"	Clear
(1510)	12.44	728	3.28	6.37	61.1	"	Clear
(1515)	12.44	708	3.04	6.36	48.3	"	Clear
(1520)	12.48	702	2.89	6.37	36.5	"	Clear
(1525)	12.48	705	2.84	6.37	32.1	"	Clear
(1530)	12.49	708	2.82	6.37	29.2	"	Clear
(1530)	Readings Stable						
(1618)	12.80	745	2.93	6.43	38.3	Post Purge Reading	

7W11B (Cont.)

Sample Time (1535)

Samples Collected: (9)8260, (3)TM, (6)8270, (6)8151
(3)CN, (3)Sulfide, (3)9065, (6)8081

7WCA

DTW - 24.67 Begin Purge (1632)

Post Purge DTW - 26.55 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge k	Desc
(1635)	12.73	853	4.08	6.68	82.4	0.34/min	Clear
(1640)	12.74	854	3.20	6.67	83.4	"	Clear
(1645)	12.75	861	2.93	6.65	87.3	"	Clear
(1650)	12.89	867	2.90	6.65	92.1	"	Clear
(1655)	12.98	873	2.84	6.65	96.6	"	Clear
(1700)	13.01	877	2.86	6.65	101.3	"	Clear
(1705)	13.00	881	2.79	6.65	103.0	"	Clear
(1705)	Readings Stable						
(1740)	13.04	894	2.87	6.69	105.2	Post Purge Reading	

Sample Time (1710)

Samples Collected: (3)8260, (1)TM, (2)8270, (2)8151
(1)CN, (1)Sulfide, (1)9065, (2)8081

7WDUP

Sample Time (1725)

Samples Collected: (3)8260, (1)TM, (2)8270, (2)8151
(1)CN, (1)Sulfide, (1)9065, (2)8081

* Duplicate well sampled at 7WCA

QAR Completed 6-15-09

General Notes

Weather - Overcast, 40's
PPE - Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 9.98
Conductivity reads 1413 us in 1413 us std
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purge water contained and disposed of at dedicated location onsite
- All samples collected, stored and transported in coolers on ice

Static Water Level Table - Unit 10

WELL	DTW	Post Purge DTW	Notes
10DDH2R	19.40	19.46	
10D3	17.64	17.82	
10D3D	17.61	17.69	
10MW1	17.97	18.12	
10D4	22.72		

10MW1

DTW - 17.97 Begin Purge (1024)

Post Purge DTW - 18.12 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge k	Desc
(1024)	13.46	944	9.66	7.22	158.3	0.34/min	Clear
(1030)	13.23	623	8.05	7.16	178.4	"	Clear
(1035)	13.17	585	7.82	7.16	182.9	"	Clear
(1040)	13.10	538	7.36	7.15	192.7	"	Clear
(1045)	12.94	508	7.10	7.14	198.8	"	Clear
(1050)	12.93	487	6.92	7.14	200.9	"	Clear
(1055)	12.87	476	6.88	7.14	202.5	"	Clear
(1055)	Readings Stable						
(1114)	13.02	447	6.77	7.13	202.0	Post Purge Reading	

10MW1 (Cont.)

Sample Time (1100)

Samples Collected: (3)8260, (1)TM, (2)8151, (2)8270
(1)CN, (1)Sulfide, (1)9065, (2)8081

10D3D

DTW - 17.61 Begin Purge (1128)

Post Purge DTW - 17.69 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc
(1130)	13.45	598	1.95	7.13	-193.9	0.3L/min	Clear
(1135)	13.70	635	1.93	7.04	-213.4	"	Clear
(1140)	13.76	661	2.10	7.05	-214.5	"	Clear
(1145)	13.47	667	2.46	7.03	-212.1	"	Clear
(1150)	13.35	671	2.72	7.02	-208.8	"	Clear
(1155)	13.10	675	3.20	7.03	-198.6	"	Clear
(1200)	12.83	679	3.20	7.02	-195.2	"	Clear
(1205)	12.64	683	3.26	7.01	-191.3	"	Clear
(1205) Readings Stable							
(1258)	12.92	677	3.58	7.08	-180.4	Post Purge Reading	

Sample Time (1210)

Samples Collected: (9)8260, (3)TM, (6)8151, (6)8270, (3)CN
(3)Sulfide, (3)9065, (6)8081

10DUP

Sample Time (1405)

Samples Collected: (3)8260, (1)TM, (2)8151, (2)8270
(1)CN, (1)Sulfide, (1)9065

* Duplicate well sampled at 10D3

10D3

DTW - 17.64 Begin Purge (1310)

Post Purge DTW - 17.82 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc
(1310)	12.66	605	4.49	6.91	-24.4	0.3L/min	Clear
(1315)	12.43	601	3.77	6.91	-2.7	"	Clear
(1320)	12.43	580	3.80	6.92	14.3	"	Clear
(1325)	12.45	571	3.81	6.93	21.5	"	Clear
(1330)	12.32	564	4.18	6.96	26.7	"	Clear
(1335)	12.35	561	3.96	6.94	30.9	"	Clear
(1340)	12.48	560	3.90	6.94	34.5	"	Clear
(1345)	12.34	562	3.92	6.94	35.6	"	Clear
(1345) Readings Stable - Purge water had a rotten odor.							

Sample Time (1350)

Samples Collected: (3)8260, (1)TM, (2)8151, (2)8270
(1)CN, (1)Sulfide, (1)9065, (2)8081

(1433)	12.64	569	3.86	6.98	28.3	Post Purge Reading

10DDH2R

DTW - 19.40 Begin Purge (1445)

Post Purge DTW - 19.46 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc
(1445)	12.50	642	2.55	6.96	40.1	0.3L/min	Clear
(1450)	12.27	644	1.72	7.00	22.8	"	Clear
(1455)	11.83	629	2.03	7.01	12.3	"	Clear
(1500)	11.62	627	2.18	7.02	9.6	"	Clear
(1505)	11.64	624	2.29	7.02	8.4	"	Clear
(1510)	11.64	622	2.38	7.02	5.9	"	Clear
(1515)	11.59	622	2.41	7.02	3.8	"	Clear
(1515) Readings Stable							
(1530)	11.77	593	2.51	6.78	8.6	Post Purge Reading	

Sample Time (1520)

Samples Collected: (3)8260, (1)TM, (2)8151, (2)8270, (1)CN, (1)Sulfide, (1)9065
(2)8081

10D4

DTW - 22.72
Begin Purge (1543)
Post Purge DTW - 22.74
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc
(1545)	12.50	308	6.84	6.78	43.8	0.3L/min	Clear
(1550)	12.66	309	4.98	6.62	56.7	"	Clear
(1555)	12.37	305	4.20	6.56	61.8	"	Clear
(1600)	12.22	295	3.96	6.54	58.8	"	Clear
(1605)	12.10	292	3.84	6.53	57.1	"	Clear
(1610)	12.09	291	3.80	6.53	56.3	"	Clear
(1610)	Readings Stable						
(1628)	12.28	290	4.21	6.60	59.6	Post Purge Reading	

Sample Time (1615)

Samples Collected: (3) 8260, (2) 8151, (2) 8270, (2) 8081
(1) TM, (1) CN, (1) Sulfide, (1) 9065

SLK 6-15-09
Completed

General Notes

Weather - Sunny, 50-60's
PPE - Eye Protection, Nitrile gloves

WELL Maintenance Log - Unit 433

WELL	Notes
74MW2	Replaced Water level port plug
74MW5	Replaced water level port plug
74MW4	Replaced Water level port plug
74MW1	Replaced Water level port plug
74MW3	Repaired well head sample tubing, Replaced water Level Port Plug
74MW6	- Repaired Well head Sample tubing, Replaced water level plug
74MW7	- Could not replace plug due to suspended software based conductivity meter.

WELL Maintenance Log - Unit 10

WELL	Notes
10DDH2R	Replaced water level port plug
10D3	Replaced Water level port plug
10D3D	Replaced water level port plug
10MW1	Replaced water level port plug
10D4	Replaced Water level port plug

General Notes

Weather -
PPE - Eye Protection, Nitrile gloves, Hard Hats
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00 , 7.00 = 7.01 , 10.00 = 10.00
Conductivity reads 1414 us in 1413 us std.
DO % = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purge water contained and disposed of at dedicated location onsite
- All samples collected, stored and transported in coolers on ice.

Static Water Level Table - Unit - 5

WELL	DTW	Post Purge DTW	Notes
S5W7	11.87	11.87	
S5W5	8.52	9.07	
5W9A	2.50	2.51	
5W10A	14.37	14.55	
5W11A	10.93	12.04	
5W8B	16.17	16.53	
5W7B	9.84	9.91	
5W5B	9.93	11.06	
5WC21	9.95	10.01	
5WC22	9.96	10.02	
5WC23	9.37	9.51	
		SWL ONLY	
5WCA	14.51	"	
S5W6	7.28	"	
S5W8	13.11	"	
5WC11	17.16	"	
5WC12	16.97	"	

5W8B

DTW - 16.17
Post Purge DTW - 16.53
Begin Purge (0951)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge R	Desc
(0955)	13.18	161	7.91	4.62	240.2	0.3L/min	Clear
(1000)	13.71	114	6.30	4.40	264.8	"	Clear
(1005)	13.62	98	5.98	4.37	270.5	"	Clear
(1010)	13.48	88	5.69	4.33	273.4	"	Clear
(1015)	13.52	83	5.49	4.32	277.7	"	Clear
(1020)	13.43	79	5.34	4.33	279.4	"	Clear
(1020)	Readings Stable						
(1044)	13.24	64	5.04	4.33	281.8	Post Purge Reading	

Sample Time (1025)
Samples Collected: (3)8260, (2)8151, (2)8270, (2)8081
(1)9065, (1)CN, (1)TM, (1)Sulfide

5W5B

DTW - 9.93
Post Purge DTW - 11.06
Begin Purge (1114)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge R	Desc
(1115)	11.36	380	6.40	5.62	240.8	0.3L/min	Clear
(1120)	11.27	336	6.42	5.67	234.4	"	Clear
(1125)	11.20	301	6.43	5.69	230.8	"	Clear
(1130)	11.12	276	6.42	5.71	228.4	"	Clear
(1135)	11.10	274	6.42	5.74	225.1	"	Clear
(1140)	11.19	272	6.45	5.75	224.6	"	Clear
(1145)	11.15	273	6.41	5.75	224.8	"	Clear
(1145)	Readings Stable						
(1209)	11.14	287	6.20	5.65	221.2	Post Purge Reading	

Sample Time (1150)
Samples Collected: (3)8260, (2)8151, (2)8270, (2)8081
(1)9065, (1)CN, (1)TM, (1)Sulfide

5W7B

DTW - 9.84
Begin Purge (1229)
Post Purge DTW - 9.91
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge k	Desc
(1230)	11.28	206	6.33	3.58	348.5	0.3 L/min	Clear
(1235)	11.51	212	5.79	3.51	401.8	"	Clear
(1240)	11.52	215	5.75	3.52	423.4	"	Clear
(1245)	11.45	214	5.78	3.55	428.3	"	Clear
(1250)	11.45	210	5.78	3.57	433.8	"	Clear
(1255)	11.48	207	5.79	3.58	436.3	"	Clear
(1300)	11.55	205	5.79	3.58	440.1	"	Clear
(1300)	Readings Stable						
(1358)	12.05	216	5.73	3.45	435.2 DS 4/20/09	Post Purge Reading	

Sample Time (1305)

Samples Collected: (9)8260, (6)8151, (6)8270, (6)8081
(3)9065, (3)CN, (3)TM, (3)Sulfide

S5W5

DTW - 8.52
Begin Purge (1413)
Post Purge DTW - 9.07
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge k	Desc
(1415)	12.34	292	3.57	6.04	284.7	0.3 L/min	Clear
(1420)	12.21	256	2.55	5.98	272.7	"	Clear
(1425)	12.27	253	2.03	5.98	261.6	"	Clear
(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	"	Clear
(1445)	12.36	265	1.53	5.99	235.4	"	Clear
(1450)	12.39	269	1.56	6.00	231.9	"	Clear
(1450)	Readings Stable						
(1504)	12.58	276	1.67	6.00	226.1	Post Purge Reading	

Sample Time (1455)

Samples Collected: (3)8260, (2)8270, (1)TM

S5W7

DTW - 11.87
Begin Purge (1523)
Post Purge DTW - 11.87
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge k	Desc
(1525)	14.08	325	1.83	6.78	190.2	0.3 L/min	Clear
(1530)	14.19	330	1.74	6.79	189.0	"	Clear
(1535)	14.27	333	1.77	6.78	185.2	"	Clear
(1540)	14.27	335	1.82	6.77	181.5	"	Clear
(1545)	14.30	336	1.88	6.77	176.2	"	Clear
(1550)	14.47	336	1.93	6.77	173.6	"	Clear
(1555)	14.58	337	1.97	6.78	171.1	"	Clear
(1555)	Readings Stable						
(1613)	14.46	340	1.98	6.79	165.2	Post Purge Reading	

Sample Time (1600)

Samples Collected: (2)8270, (3)8260, (1)TM

General Notes

- Weather: Overcast, 40's
- PPE: Eye Protection, Nitrile Gloves, Hard Hats

Calibrations - YSI 650 MDS

pH - 4.00= , 7.00 = , 10.00 =

Conductivity reads ______ us in 1413us std

DO % = 100

5WC21

DTW - 9.95 Begin Purge (0914)

Post Purge DTW - 10.01 Initial Purge - Clear

Time	Temp(°c)	Cond(us)	DO^{mg}/L	pH	ORP(mv)	PurgeK	Desc
(0914)	13.09	593	8.73	3.31	317.9	0.3^{L}/min	Clear
(0915)	13.11	593	8.50	3.29	321.3	"	Clear
(0920)	13.11	576	7.00	3.30	371.9	"	Clear
(0925)	12.97	583	6.54	3.29	385.5	"	Clear
(0930)	13.00	578	6.08	3.29	397.3	"	Clear
(0935)	13.08	573	5.45	3.30	408.8	"	Clear
(0940)	12.97	569	5.00	3.29	418.6	"	Clear
(0945)	12.89	566	4.75	3.28	422.1	"	Clear
(0950)	12.81	563	4.42	3.29	428.9	"	Clear
(0955)	12.97	559	4.15	3.30	431.2	"	Clear
(1000)	13.05	558	3.95	3.31	430.6	"	Clear
(1005)	12.89	556	3.91	3.31	434.1	"	Clear

(1005) Readings Stable

(1043) 12.81 552 3.96 3.34 425.8 Post Purge Reading

Sample Time (1010)

Samples Collected: (4)8260, (2)8151, (2)8270, (2)8081, (1)TM
(1)CN, (1)9065, (1) Sulfide

5WDUP

Sample Time (1025)

Samples Collected: (4)8260, (2)8151, (2)8270, (2)8081, (1)TM, (1)CN
(1)9065, (1) Sulfide

*Collected at 5WC21

5WC22

DTW - 9.96 Begin Purge (1059)

Post Purge DTW - 10.02 Initial Purge - Clear

Time	Temp(°c)	Cond(us)	DO^{mg}/L	pH	ORP(mv)	PurgeK	Desc
(1100)	12.78	803	4.12	6.38	295.1	0.3^{L}/min	Clear
(1105)	12.71	810	2.92	6.36	278.7	"	Clear
(1110)	12.56	812	2.62	6.39	261.5	"	Clear
(1115)	12.63	813	2.55	6.40	248.3	"	Clear
(1120)	12.78	817	2.53	6.41	235.8	"	Clear
(1125)	13.22	817	2.55	6.44	223.0	"	Clear
(1130)	12.98	820	2.48	6.44	210.9	"	Clear
(1135)	12.93	819	2.45	6.43	206.5	"	Clear
(1140)	12.84	819	2.42	6.43	203.7	"	Clear

(1140) Readings Stable

(1201) 12.71 816 2.57 6.48 186.5 Post Purge Reading

Sample Time (1145)

Samples Collected: (4)8260, (2)8151, (2)8270, (2)8081
(1)CN, (1)TM, (1)9065, (1) Sulfide

5WC23

DTW - 9.37 Begin Purge (1214)

Post Purge DTW - 9.51 Initial Purge - Clear

Time	Temp(°c)	Cond(us)	DO^{mg}/L	pH	ORP(mv)	PurgeK	Desc
(1215)	12.03	830	5.27	6.83	143.2	0.3^{L}/min	Clear
(1220)	12.29	830	3.25	6.48	169.6	"	Clear
(1225)	12.21	828	2.73	6.43	168.4	"	Clear
(1230)	12.19	824	2.62	6.44	166.3	"	Clear
(1235)	12.10	824	2.62	6.46	160.1	"	Clear
(1240)	12.17	823	2.61	6.47	156.5	"	Clear
(1245)	12.32	821	2.57	6.47	150.8	"	Clear
(1250)	12.43	824	2.57	6.49	148.7	"	Clear

(1250) Readings Stable

(1313) 12.76 821 2.58 6.52 153.9 Post Purge Reading

5WC23 (Cont)

Sample Time (1255)

Samples Collected: (4)8260, (2)8270, (2)8151, (2)8081
(1)TM, (1)CN, (1)9065, (1) Sulfide

5W9A

DTW - 2.50 Begin Purge (1334)
Post Purge DTW - 2.51 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge L	Desc
(1335)	13.67	405	4.32	7.19	136.2	0.3 L/min	Clear
(1340)	13.98	392	4.45	7.27	134.6	"	Clear
(1345)	14.18	387	4.47	7.30	133.5	"	Clear
(1350)	14.51	383	4.49	7.32	132.3	"	Clear
(1355)	14.67	382	4.45	7.33	131.6	"	Clear
(1400)	14.29	380	4.41	7.28	134.4	"	Clear
(1405)	13.84	380	4.39	7.27	133.9	"	Clear

(1405) Readings Stable

(1419) 14.16 377 4.46 7.32 126.1 Post Purge Reading

Sample Time (1410)

Samples Collected: (4)8260, (2)8270, (1)TM

5W10A

DTW - 14.37 Begin Purge (1433)
Post Purge DTW - 14.55 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge L	Desc
(1435)	14.87	387	2.92	7.45	124.0	0.3 L/min	Clear
(1440)	14.96	384	2.79	7.47	123.8	"	Clear
(1445)	14.52	381	2.76	7.45	124.2	"	Clear
(1450)	14.16	377	2.80	7.45	122.3	"	Clear
(1455)	14.21	374	2.84	7.45	120.2	"	Clear
(1500)	14.07	374	2.83	7.46	118.1	"	Clear
(1505)	14.30	374	2.90	7.47	114.2	"	Clear

(1505) Readings Stable

5W10A (Cont.)

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge L	Desc
(1519)	14.53	379	2.87	7.50	116.4	0.3 L/min	Clear

Sample Time (1510)

Samples Collected: (4)8260, (2)8270, (1)TM

5W11A

DTW - 10.93 Begin Purge (1534)
Post Purge DTW - 12.04 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge L	Desc
(1535)	14.09	766	2.84	6.40	79.8	0.3 L/min	Clear
(1540)	14.16	725	2.58	6.34	101.7	"	Clear
(1545)	14.14	648	2.41	6.33	113.3	"	Clear
(1550)	14.18	645	2.39	6.33	113.4	"	Clear
(1555)	14.18	637	2.38	6.32	112.6	"	Clear
(1600)	14.28	633	2.42	6.33	110.3	"	Clear
(1605)	14.34	630	2.44	6.33	108.6	"	Clear
(1610)	14.30	630	2.45	6.33	107.4	"	Clear

(1610) Readings Stable

(1626) 14.41 626 2.55 6.35 100.6 Post Purge Reading

Sample Time (1615)

Samples Collected: (4)8260, (2)8270, (1)TM

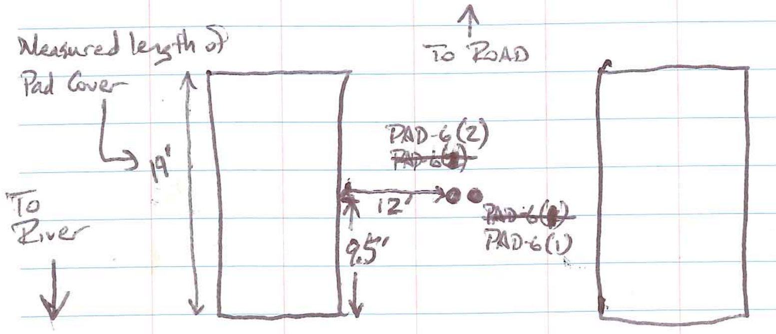
06/04/09
RAAP
B03204-203C
RM/KFC
FB# 8

General Notes:

- Weather - Partly Cloudy, 70°s
- PPE - Eye Protection, Heavy Duty Nitrile Exterior Gloves, Chemical Resistant Boots, Face Shield, White Cotton Flame Retardant Coveralls, Hard Hats, Dusk Masks
- All equipment deconned after & between samplings.
- Dedicated equipment used at each sampling location.
- Decon water containerized and disposed of at plant treatment site.
- Samples collected, stored and transported in coolers on ice.

PAD-6 / DUP

PAD-6(1) & PAD-6(2) are co-located duplicate samples



- Holes for PAD-6(1) and PAD-6(2) are inches apart

- DUP(1) collected w/ Sample PAD-6(1)
- DUP(2) collected w/ Sample PAD-6(2)

PAD6(1) & DUP(1) Sample Collection Time: 0835
Samples Collected: 1 each TM (Lead only)
Stainless Steel Sampler deconned after collecting PAD-6(1) + Dup(1)

PAD-6(2) & DUP(2) Sample Collection Time: 0845
Samples Collected: 1 each TM (Lead only)
Stainless Steel Sampler deconned after collecting PAD-6(2) + DUP(2)

Left Site ~ 0900

6/10/09
RAAP
B03204-07
DAS/TQE
verification
FB#8

General Notes

Weather - Sunny, 80's
PPE - Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 9.97
Conductivity reads 1414 us in 1413 us std
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well location
- Purge water contained and disposed of at dedicated location onsite
- All samples collected, stored and transported in coolers on ice.

5WC21

DTW - 8.69
Post Purge DTW - 8.73
Begin Purge (1029)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge R(gpm)	Desc
(1030)	17.69	596	5.33	3.29	366.5	0.34l/min	Clear
(1035)	17.61	597	4.57	3.50	342.7	''	Clear
(1040)	18.18	595	4.10	3.56	347.0	''	Clear
(1045)	18.89	597	3.91	3.61	348.1	''	Clear
(1050)	18.01	598	3.83	3.74	337.8	''	Clear
(1055)	17.76	604	3.60	3.66	343.8	''	Clear
(1100)	17.10	602	3.43	3.58	353.9	''	Clear
(1105)	17.08	600	3.38	3.56	356.5	''	Clear
(1110)	17.19	600	3.38	3.58	358.2	''	Clear

(1110) Readings Stable
Sample Time (1115)
Samples Collected: (2)8081, (2)8081

5WC22

DTW - 8.55 Begin Purge (1141)

Post Purge DTW - 8.59 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK(gpm)	Desc
(1145)	16.50	895	2.76	6.07	199.7	0.34/min	Clear
(1150)	16.49	927	2.73	6.08	197.0	"	Clear
(1155)	16.63	955	2.81	6.12	191.8	"	Clear
(1200)	16.50	978	2.85	6.14	184.4	"	Clear
(1205)	16.43	982	2.89	6.15	182.7	"	Clear
(1210)	16.32	986	2.92	6.19	164.3	"	Clear
(1215)	16.34	988	2.85	6.17	167.5	"	Clear
(1220)	16.30	989	2.86	6.17	169.6	"	Clear

(1220) Readings Stable

Sample Time (1225)

Samples Collected: (2)8081, (2)8081

5WC23

DTW - 7.94 Begin Purge (1306)

Post Purge DTW - 7.95 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK(gpm)	Desc
(1310)	16.90	927	3.81	6.32	141.3	0.34/min	Clear
(1315)	16.94	1035	3.58	6.26	147.4	"	Clear
(1320)	16.67	1101	3.46	6.25	147.8	"	Clear
(1325)	16.61	1117	3.33	6.24	147.3	"	Clear
(1330)	16.85	1121	3.36	6.23	146.4	"	Clear
(1335)	16.99	1117	3.31	6.23	147.4	"	Clear
(1340)	16.97	1119	3.36	6.22	147.2	"	Clear
(1345)	17.03	1116	3.35	6.22	148.1	"	Clear

(1345) Readings Stable

Sample Time (1350)

Samples Collected: (2)8081, (2)8081

5W5B

DTW - 8.34 Begin Purge (1428)

Post Purge DTW - 9.73 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK(gpm)	Desc
(1430)	14.46	587	6.59	5.33	162.4	0.34/min	Clear
(1435)	14.05	620	6.39	5.32	173.3	"	Clear
(1440)	13.78	622	6.44	5.32	180.5	"	Clear
(1445)	13.82	629	6.52	5.37	183.9	"	Clear
(1450)	13.94	624	6.58	5.40	185.7	"	Clear
(1455)	13.87	624	6.55	5.42	186.7	"	Clear
(1500)	1385	622	6.60	5.43	187.5	"	Clear

(1500) Readings Stable

Sample Time (1505)

Samples Collected: (3)8260, (3)8260, (2)8081, (2)8081

5W7B

DTW - 8.68 Begin Purge (1537)

Post Purge DTW - 8.73 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK(gpm)	Desc
(1540)	15.22	264	8.00	3.34	377.8	0.34/min	Clear
(1545)	14.64	263	7.90	3.27	406.5	"	Clear
(1550)	14.52	262	7.88	3.27	417.1	"	Clear
(1555)	14.46	264	7.85	3.29	425.6	"	Clear
(1600)	14.35	267	7.87	3.32	433.3	"	Clear
(1605)	13.96	265	7.86	3.36	430.7	"	Clear
(1610)	13.90	265	7.86	3.36	436.6	"	Clear

(1610) Readings Stable

Sample Time (1615)

Samples Collected: (3)8260, (3)8260, (2)8081, (2)8081

General Notes

Weather - Overcast, 70's
PPE - Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 9.98
Conductivity reads 1413 us in 1413 us std
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purge water disposed of at dedicated location onsite
- All samples collected, stored and transported in coolers on ice

7MW6

DTW - 24.76 Begin Purge (1003)
Post Purge DTW - 30.82 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK(gpm)	Desc
(1005)	14.92	1761	9.62	7.04	20.1	0.34/min	Clear
(1010)	14.89	1895	6.03	6.90	-79.9	"	Clear
(1015)	14.86	1938	4.80	6.87	-96.2	"	Clear
(1020)	14.96	1894	4.13	6.88	-106.4	"	Clear
(1025)	14.97	1845	3.95	6.92	-105.6	"	Clear
(1030)	14.91	1797	3.82	6.99	-100.1	"	Clear
(1035)	14.91	1780	3.73	7.03	-102.9	"	Clear

(1035) Readings Stable
Sample Time (1040)
Samples Collected: (3)8260, (3)8260

16MW8

DTW - 70.14 Begin Purge (1151)
Post Purge DTW - 70.65 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK(gpm)	Desc
(1155)	15.51	203	8.08	4.95	212.6	≤0.34/min	Clear
(1200)	15.99	177	4.70	4.88	173.5	"	Clear
(1205)	16.10	163	4.36	4.91	162.7	"	Clear
(1210)	16.08	156	4.07	4.99	140.9	"	Clear
(1215)	15.91	154	3.84	5.01	136.8	"	Clear
(1220)	15.76	154	3.72	5.00	134.4	"	Clear

(1220) Readings Stable
Sample Time (1225)
Samples Collected: (3)8260, (3)8260

10DDH2R

DTW - 17.62 Begin Purge (1249)
Post Purge DTW - 17.68 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purgek(gpm)	Desc
(1250)	14.51	543	5.98	6.79	30.4	0.34/min	Clear
(1255)	14.39	611	3.15	6.88	21.5	"	Clear
(1300)	14.07	636	2.80	6.90	20.1	"	Clear
(1305)	13.87	625	2.98	6.76	39.7	"	Clear
(1310)	13.81	524	3.56	6.49	59.5	"	Clear
(1315)	13.81	434	4.37	6.34	76.7	"	Clear
(1320)	14.08	374	5.39	6.30	86.2	"	Clear
(1325)	13.99	368	5.56	6.28	89.5	"	Clear
(1330)	14.00	363	5.66	6.27	91.8	"	Clear

(1330) Readings Stable
Sample Time (1335)
Samples Collected: (3)8260, (3)8260

Completed
LRK 6-17-09

16-3

DTW-56.77
Purge DTW-62.15

Begin Purge (1554)
Initial Purge-Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge Rate	Desc
(1555)	15.36	242	8.40	7.36	131.7	0.34/min	Clear
(1600)	15.27	240	7.08	7.54	129.5	"	Clear
(1605)	14.74	232	6.64	7.72	125.4	"	Clear ✓
(1610)	14.30	229	6.40	7.78	123.9	"	Clear
(1615)	14.28	228	6.28	7.81	122.6	"	Clear
(1620)	14.69	228	6.31	7.81	120.7	"	Clear
(1625)	15.10	228	6.36	7.85	119.1	"	Clear
(1630)	15.14	228	6.36	7.87	118.8	"	Clear

(1630) Readings Stable
(1646) 14.72 225 6.50 7.81 120.9 Post Purge Reading

Sample Time (1635)

Samples Collected: (6)8260, (2)8011, (2)8270, (2)TM

General Notes

Weather-
PPE- Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
pH- 4.00 = 4.00, 7.00 = 7.00, 10.00 = 10.00
Conductivity reads 1413 us in 1413 us std
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purged water disposed of at dedicated location onsite
- All samples collected, stored and transported in coolers on ice

Static Water Level Table - Unit 16

WELL	DTW	Post Purge DTW	Notes
16-1	43.99	47.49	
16-2	55.76	55.79	
16-3	56.77	62.15	
16-5	4.67	9.74	
16WC2B	53.53	57.75	
16MW8	73.96	75.34	
16WC1B	69.53	69.76	
16WC1A	69.21	70.89	
16MW9	66.31	66.78	
16C1	48.76		
			DTW-ONLY
16CDH3	DRY		"
16C3	68.25		"
16WC2A	DRY		"

✓

10/7/09 RAAP FB#8
B03204-07
DAS/TQE

16-1

DTW - 43.99 Begin Purge (0939)
Post Purge DTW - 47.49 Initial Purge - Sl. Cloudy

Time	Temp(°C)	Cond(us)	DO ug/L	pH	ORP(mv)	Purge R	Desc	DTW
(0940)	15.31	550	7.62	6.93	209.4	0.34/min	Sl. Cloudy	45.45
(0945)	15.60	541	7.08	6.92	205.1	"	Sl. Cloudy	46.08
(0950)	16.16	481	6.61	6.98	194.6	"	Clear	46.36
(0955)	15.54	441	6.58	6.97	190.6	"	Clear	46.82 ✓
(1000)	15.83	428	6.47	6.94	188.4	"	Clear	46.96
(1005)	16.08	422	6.42	6.99	183.0	"	Clear	47.13
(1010)	16.18	418	6.46	7.01	180.2	"	Clear	47.22

(1010) Readings Stable
(1025) 16.14 404 6.70 6.95 172.7 Post Purge Readings

Sample Time (1015)
Samples Collected: (3) 8260, (2) 8270, (1) TM

16-2

DTW - 55.76 Begin Purge (1039)
Post Purge DTW - 55.79 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc	DTW
(1040)	16.14	567	7.26	6.88	174.9	0.34/min	Clear	55.77
(1045)	15.97	580	5.79	6.69	172.5	"	Clear	55.77
(1050)	15.20	586	4.47	6.61	171.6	"	Clear	55.78 ✓
(1055)	14.77	583	4.16	6.61	169.2	"	Clear	55.78
(1100)	15.44	581	4.00	6.65	165.6	"	Clear	55.78
(1105)	15.10	582	3.81	6.65	164.9	"	Clear	55.78
(1110)	14.94	579	3.75	6.63	164.5	"	Clear	55.78
(1115)	15.05	578	3.71	6.64	162.5	"	Clear	55.78

(1115) Readings Stable
(1130) 14.90 567 3.82 6.65 166.1 Post Purge Reading

Sample Time (1120)
Samples Collected: (3) 8260, (2) 8270, (1) TM

10/7/09 RAAP FB#8
B03204-07
DAS/TQE

16WC2B

DTW - 53.53 Begin Purge (1154)
Post Purge DTW - 57.75 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc	DTW
(1155)	16.67	293	8.69	7.64	146.7	0.34/min	Clear	54.60
(1200)	15.74	283	4.04	7.48	149.7	"	Clear	55.28
(1205)	15.57	282	2.16	7.58	117.3	"	Clear	55.89
(1210)	15.98	277	1.81	7.58	115.2	"	Clear	56.01
(1215)	16.20	273	1.64	7.58	113.9	"	Clear	56.14
(1220)	16.57	274	1.46	7.63	102.8	"	Clear	56.51
(1225)	16.19	272	1.25	7.61	104.3	"	Clear	56.76 ✓
(1230)	16.40	272	1.16	7.58	104.2	"	Clear	56.92
(1235)	16.57	272	1.20	7.59	100.3	"	Clear	57.04

(1235) Readings Stable
(1251) ~~16.58~~ 272 1.10 7.45 109.8 Post Purge Reading

Sample Time (1240)
Samples Collected: (3) 8260, (2) 8270, (1) TM

16MW8

DTW - 73.96 Begin Purge (1307)
Post Purge DTW - 75.34 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc	DTW
(1310)	16.46	111	2.47	5.34	232.1	0.34/min	Clear	74.39
(1315)	16.70	106	1.51	5.12	184.8	"	Clear	74.59
(1320)	16.69	93	1.17	5.00	183.0	"	Clear	74.67
(1325)	16.95	91	1.16	4.97	179.0	"	Clear	74.74 ✓
(1330)	17.37	87	1.19	5.00	174.3	"	Clear	74.84
(1335)	17.62	86	1.15	5.02	170.0	"	Clear	74.93
(1340)	17.38	83	1.16	4.98	168.1	"	Clear	75.17

(1340) Readings Stable
(1354) 17.82 87 1.23 5.03 157.6 Post Purge Reading

Sample Time (1345)
Samples Collected: (3) 8260, (2) 8270, (1) TM

16-5

DTW - 4.67 Begin Purge (1423)

Post Purge DTW - 9.74 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1425)	15.91	411	3.09	7.06	118.2	0.3l/min	Clear	5.64
(1430)	16.44	418	2.01	6.89	120.0	"	Clear	6.33
(1435)	16.92	431	1.77	6.88	118.8	"	Clear	6.91
(1440)	17.07	432	1.75	6.89	118.4	"	Clear	7.11 ✓
(1445)	17.20	437	1.78	6.89	117.7	"	Clear	7.28
(1450)	16.86	438	1.75	6.85	118.8	"	Clear	7.48
(1455)	16.54	437	1.70	6.77	119.4	"	clear	8.13
(1455)	Readings Stable							
(1512)	16.52	435	2.35	6.80	123.9	Post Purge Reading		

Sample Time (1500)

Samples Collected: (3)8260, (2)8270, (1)TM

16Spring ✓

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)
(1530)	13.70	471	6.86	6.79	79.4

Sample Time (1535)

Samples Collected: (3)8260, (2)8270, (1)TM

General Notes

Weather - Sunny, 70's

PPE - Eye Protection, Nitrile gloves

Calibrations - YSI 650 MDS

pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 10.00

Conductivity reads 1413 us in 1413 us std

DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purge water disposed of at dedicated location onsite
- All samples collected, stored and transported on ice in coolers

16MW9

DTW - 66.31 Begin Purge (0936)

Post Purge DTW - 66.78 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(0940)	14.48	668	8.14	6.81	214.8	0.3l/min	Clear	66.43
(0945)	14.79	751	5.49	6.61	161.4	"	clear	66.51
(0950)	15.47	834	3.32	6.53	91.7	"	Clear	66.51
(0955)	15.01	834	2.39	6.50	83.4	"	Clear	66.59
(1000)	15.18	828	2.34	6.47	80.3	"	Clear	66.65 ✓
(1005)	15.67	803	2.19	6.45	80.7	"	Clear	66.51
(1010)	16.05	759	2.26	6.38	79.2	"	Clear	66.51
(1015)	16.36	749	2.28	6.40	78.8	"	Clear	66.51
(1020)	16.25	744	2.31	6.40	79.3	"	Clear	66.52
(1020)	Readings Stable							
(1035)		721	2.20	4.34	76.2	Post Purge Reading		

Sample Time (1025)

Samples Collected: (3)8260, (2)8270, (1)TM

16WC1A

DTW - 69.21 Begin Purge (1102)
Post Purge DTW - 70.89 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc	DTW
(1105)	15.90	475	9.00	7.38	119.9	0.3L/min	Clear	69.84
(1110)	15.53	564	6.00	6.72	93.1	"	Clear	69.74
(1115)	15.40	609	4.26	6.65	107.2	"	Clear	69.74
(1120)	15.67	612	3.90	6.67	110.7	"	Clear	69.74 ✓
(1125)	15.95	617	3.50	6.69	84.0	"	Clear	69.68
(1130)	15.10	626	2.81	6.72	42.2	"	Clear	69.70
(1135)	15.03	622	2.60	6.72	37.5	"	Clear	69.72
(1140)	15.26	620	2.34	6.73	35.8	"	Clear	69.70
(1145)	15.64	619	2.19	6.75	36.6	"	Clear	69.70
(1150)	15.89	619	2.13	6.77	33.2	"	Clear	69.68
(1155)	15.81	620	2.05	6.77	30.1	"	Clear	69.70

(1155) Readings Stable
(1230) 15.37 628 2.11 6.74 54.7 Post Purge Reading

Sample Time (1200)
Samples Collected: (9) 8260, (6) 8270, (3) TM

16WDUP

Sample Time (1220)
Samples Collected: (3) 8260, (2) 8270, (1) TM

16WC1B

DTW - 69.53 Begin Purge (1242) ✓
Post Purge DTW - 69.76 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc	DTW
(1245)	16.23	338	8.04	6.33	178.1	0.3L/min	Clear	69.65
(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	"	Cloar	69.67

16WC1B (Cont.)

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc	DTW
(1300)	16.09	334	2.06	5.69	154.1	0.3L/min	Clear	69.67
(1305)	15.84	320	1.90	5.65	154.6	"	Clear	69.67
(1310)	15.68	290	1.52	5.62	153.7	"	Clear	69.69
(1315)	15.52	285	1.44	5.62	152.9	"	Clear	69.69 ✓
(1320)	15.41	281	1.42	5.62	151.4	"	Clear	69.70
(1325)	15.63	279	1.37	5.63	149.8	"	Clear	69.72

(1325) Readings Stable
(1341) 15.55 278 1.35 5.75 141.9 Post Purge Reading

Sample Time (1330)
Samples Collected: (3) 8260, (2) 8270, (1) TM

16C1

DTW - 48.76 Begin Purge (1358)
Post Purge DTW - 48.80 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc	DTW
(1400)	15.98	616	3.98	6.53	114.3	0.3L/min	Clear	48.77
(1405)	16.09	617	2.50	6.21	122.8	"	Clear	48.79 ✓
(1410)	16.34	613	1.94	6.17	121.6	"	Clear	48.79
(1415)	16.69	609	1.90	6.16	118.1	"	Clear	48.79
(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
(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
(1455) 16.13 604 1.41 6.16 115.3 Post Purge Reading

Sample Time (1445)
Samples Collected: (3) 8260, (2) 8270, (1) TM

13MW6 (Cont)

Sample Time (1030)

Samples Collected: (3)8260, (2)8270, (1)TM, (1)314.0, (3)8332/8330

13MW7

DTW - 16.23 Begin Purge (1052)

Post Purge DTW - 16.34 Initial Purge - Clear ✓

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1055)	14.14	532	4.84	6.90	182.5	0.34/min	Clear	16.33
(1100)	14.19	601	2.72	6.84	174.9	"	Clear	16.33
(1105)	14.28	648	1.50	6.83	169.1	"	Clear	
(1110)	14.47	667	1.25	6.83	165.4	"	Clear	16.33
(1115)	14.69	675	1.21	6.83	162.6	"	Clear	16.33
(1120)	14.83	673	1.14	6.81	160.5	"	Clear	
(1125)	14.94	671	1.17	6.79	159.3	"	Clear	

(1125) Readings Stable

(1140) 14.62 668 1.23 6.77 157.4 Post Purge Reading

Sample Time (1130)

Samples Collected: (3)8260, (2)8270, (1)TM, (1)314.0, (3)8332/8330

Static Water Level Table - Unit 7

WELL	DTW	Post Purge DTW	Notes
7W12B	24.84	24.86	
7W9C	14.52	16.77	
7W10B	15.57	16.00	
7W10C	21.59	22.86	✓
7W13	19.28	21.05	
7MW6	26.41	31.55	
7W11B	25.15	25.18	
7WCA	24.71	25.63	
7W9B	10/20/09 DS ~~[illegible]~~ 22.68		SWL ONLY
7W11	24.42		"
7MW5	24.95		"

7W12B

DTW - 24.84 Begin Purge (1227)

Post Purge DTW - 24.86 Initial Purge -

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1228)	14.26	616	8.21	7.08	168.4	0.34/min	Clear	24.86
(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	
(1245)	14.41	616	7.64	7.00	166.5	"	Clear	24.84
(1250)	14.46	616	7.63	7.00	166.1	"	Clear	
(1255)	14.50	616	7.65	7.00	165.8	"	Clear	

(1255) Readings Stable

(1316) 14.65 619 7.70 7.01 161.7 Post Purge Reading

Sample Time (1300)

Samples Collected: (2)8270, (1)TM, (1)CN

7W9C

DTW - 14.52 Begin Purge (1334)

Post Purge DTW - 16.77 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1335)	13.41	1073	2.61	6.85	60.7	0.34/min	Clear	15.61
(1340)	13.38	1077	2.05	6.78	71.8	"	Clear	15.72
(1345)	13.70	1085	1.58	6.77	83.7	"	Clear	15.81
(1350)	13.80	1091	1.50	6.77	90.0	"	Clear	15.90 ✓
(1355)	14.03	1096	1.36	6.76	93.2	"	Clear	16.02
(1400)	14.29	1098	1.27	6.76	91.6	"	Clear	16.07
(1405)	14.42	1102	1.24	6.75	90.1	"	Clear	16.14

(1405) Readings Stable

(1423) 14.63 1102 1.30 6.69 90.5 Post Purge Reading

Sample Time (1410)

Samples Collected: (2)8270, (1)TM, (1)CN

7W10B

DTW - 15.57 Begin Purge (1438)

Post Purge DTW - 16.00 Initial Purge - Clear

Time	Temp(C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1440)	1353	832	3.55	6.82	122.7	0.34/min	Clear	16.18
(1445)	13.44	828	2.84	6.75	128.0	"	Clear	15.98
(1450)	13.31	815	2.40	6.74	128.3	"	Clear	15.98
(1455)	13.37	813	2.22	6.76	126.5	"	Clear	15.93
(1500)	13.29	811	2.09	6.77	125.9	"	Clear	15.87 ✓
(1505)	13.44	808	1.96	6.77	125.0	"	Clear	15.87
(1510)	13.57	806	1.95	6.77	124.6	"	Clear	15.85

(1510) Readings Stable

(1528) 13.78 797 1.88 6.80 125.8 Post Purge Reading

Sample Time (1515)

Samples Collected: (2) 8270, (1) TM, (1) CN

7W10C

DTW - 21.59 Begin Purge (1540)

Post Purge DTW - 22.86 Initial Purge - Clear

Time	Temp(C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1541)	13.25	719	2.35	7.16	-52.0	0.34/min	Clear	21.85
(1545)	13.22	719	1.60	7.07	-27.1	"	Clear	22.03 ✓
(1550)	13.19	720	1.17	7.05	-4.8	"	Clear	22.19
(1555)	13.11	721	1.04	7.05	5.7	"	Clear	22.26
(1600)	13.00	721	0.90	7.04	24.8	"	Clear	22.53
(1610)	12.89	720	0.84	7.04	23.2	"	Clear	22.61
(1615)	12.83	720	0.80	7.04	26.0	"	Clear	22.70

(1615) Readings Stable

(1634) 12.58 717 0.79 7.06 32.3 Post Purge Reading

Sample Time (1620)

Samples Collected: (3) 8270, (1) TM, (1) CN

General Notes

Weather - Sunny, 60's

PPE - Eye Protection, Nitrile gloves, Cotton suits

Calibrations - YSI 650 MDS

pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 10.00

Conductivity reads 1413 us in 1413 us Std

DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purge water disposed of at dedicated location onsite
- All samples collected, stored and transported on ice in coolers

13MW4

DTW - 16.83 Begin Purge (0727)

Post Purge DTW - 16.90 Initial Purge - ✓

Time	Temp(C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(0730)	13.36	477	5.51	6.47	228.4	0.34/min	Clear	16.88
(0735)	13.14	525	2.94	7.03	200.6	"	Clear	
(0740)	13.40	545	2.36	7.10	194.8	"	Clear	16.88
(0745)	13.70	564	2.20	7.14	188.2	"	Clear	
(0750)	13.84	569	2.19	7.14	182.9	"	Clear	16.88
(0755)	13.93	571	2.10	7.13	178.3	"	Clear	
(0800)	13.98	570	2.07	7.12	176.5	"	Clear	

(0800) Readings Stable

(0839) 14.10 520 3.15 6.71 170.6 Post Purge Reading

Sample Time (0805)

Samples Collected: (3) 8260, (2) 8270, (1) TM, (1) 314.0, (3) 8332/8330

13WDUP

Sample Time (0820)

Samples Collected: (3) 8260, (2) 8270, (1) TM, (1) 314.0, (3) 8332/8330

* Dup samples collected at 13MW4

13MW12

DTW - 21.76 Begin Purge (0853)

Post Purge DTW - 2288 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(0855)	12.98	663	5.67	6.85	170.3	0.37/min	Clear	22.10
(0900)	13.01	667	4.30	6.85	165.8	"	Clear	22.28
(0905)	13.01	669	3.50	6.86	161.5	"	Clear	22.38 ✓
(0910)	12.87	671	3.29	6.86	159.8	"	Clear	22.50
(0915)	12.63	672	3.16	6.86	157.2	"	Clear	22.59
(0920)	12.49	671	3.13	6.86	156.7	"	Clear	22.61
(0925)	12.25	672	3.12	6.86	155.3	"	Clear	22.64

(0925) Readings Stable

(0946) 12.31 665 3.22 6.85 151.5 Post Purge Reading

Sample Time (0930)

Samples Collected: (3)8260, (2)8270, (1)TM, (1)314.0, (3)8332/8330

13MW1

DTW - 21.58 Begin Purge (0959) ✓

Post Purge DTW - 21.73 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1000)	12.56	593	6.90	6.82	157.9	0.37/min	Clear	21.71
(1005)	12.56	645	5.41	6.80	152.2	"	Clear	21.70
(1010)	12.74	667	4.67	6.80	147.0	"	Clear	21.66
(1015)	12.79	690	4.34	6.81	143.1	"	Clear	21.66
(1020)	12.90	706	4.20	6.81	139.8	"	Clear	
(1025)	13.06	714	4.09	6.81	137.2	"	Clear	21.64
(1030)	13.18	719	3.99	6.81	135.6	"	Clear	
(1035)	13.27	722	3.90	6.81	132.6	"	Clear	

(1035) Readings Stable

(1057) 13.51 725 3.64 6.83 131.2 Post Purge Reading

Sample Time (1040)

Samples Collected: (3)8260, (2)8270, (1)TM, (1)314.0, (3)8332/8330

7W13

DTW - 19.28 Begin Purge (1123)

Post Purge DTW - 21.05 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1125)	13.89	1383	4.39	7.28	-6.6	0.37/min	Clear	20.62
(1130)	13.84	1398	2.01	7.23	-41.8	"	Clear	20.84
(1135)	13.99	1398	1.62	7.21	-42.4	"	Clear	21.06 ✓
(1140)	14.23	1399	1.61	7.20	-36.0	"	Clear	21.00
(1145)	14.59	1398	1.62	7.20	-31.7	"	Clear	21.00
(1150)	14.80	1398	1.65	7.21	-28.9	"	Clear	20.90
(1155)	14.93	1397	1.64	7.21	-30.0	"	Clear	20.81

(1155) Readings Stable

(1213) 14.64 1393 1.83 7.2 -19.7 Post Purge Reading

Sample Time (1200)

Samples Collected: (2)8270, (1)TM, (1)CN

7MW6

DTW - 26.41 Begin Purge (1231)

Post Purge DTW - 31.55 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1235)	14.43	1679	1.70	7.30	-23.2	0.37/min	Clear	28.76 ✓
(1240)	14.75	1715	1.23	7.15	-44.7	"	Clear	29.66
(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
(1255)	15.34	1716	0.94	7.07	-64.8	"	Clear	30.10
(1300)	15.64	1700	0.95	7.08	-65.7	"	Clear	30.45
(1305)	15.76	1688	0.95	7.10	-64.2	"	Clear	30.77

(1305) Readings Stable

(1324) 15.43 1656 0.98 7.07 -61.7 Post Purge Reading

Sample Time (1310)

Samples Collected: (2)8270, (1)TM, (1) CN

7W11B

DTW - 25.15 Begin Purge (1335)
Post Purge DTW - 25.18 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc	DTW
(1335)	14.69	869	4.41	6.44	71.6	0.34/min	Clear	25.17
(1340)	14.95	875	2.58	6.35	76.2	"	Clear	25.16
(1345)	15.26	886	2.05	6.37	74.9	"	Clear	25.16 ✓
(1350)	15.43	891	1.86	6.38	74.3	"	Clear	25.15
(1355)	15.54	893	1.84	6.39	74.2	"	Clear	25.15
(1400)	15.70	893	1.84	6.39	74.5	"	Clear	25.16
(1405)	15.59	895	1.80	6.40	74.6	"	Clear	

(1405) Readings Stable
(1435) 15.22 906 1.73 ~~2.12~~ DS 10/20/09 6.44 ~~6.53~~ 76.5 Post Purge Reading
Sample Time (1410)
Samples Collected: (6) 8270, (3) TM, (3) CN

7WCA

DTW - 24.71 Begin Purge (1449)
Post Purge DTW - 25.63 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc	DTW
(1450)	14.42	970	2.47	6.77	75.7	0.34/min	Clear	25.78
(1455)	14.39	966	1.65	6.70	79.1	"	Clear	
(1500)	14.33	962	1.24	6.68	79.1	"	Clear	25.40
(1505)	14.37	961	1.06	6.69	78.8	"	Clear	✓
(1510)	14.30	960	0.95	6.70	77.9	"	Clear	25.41
(1515)	14.34	960	0.93	6.70	78.3	"	Clear	
(1520)	14.28	961	0.90	6.71	78.0	"	Clear	

(1520) Readings Stable
(1550) 14.15 969 1.10 6.75 75.4 Post Purge Reading
Sample Time (1525)
Samples Collected: (2) 8270, (1) TM, (1) CN

uP

ple Time (1540) Samples Collected: (2) 8270, (1) TM, (1) CN
Samples Collected at 7WCA

General Notes

Weather - Sunny, 60's
PPE - Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00 , 7.00 = 7.00 , 10.00 = 9.99
Conductivity reads 1413 us in 1413 us std
DO % = 100

Static Water Level Table - Unit 10

WELL	DTW	Post Purge DTW	Notes
10DDH2R	19.78	19.83	✓
10D3	18.28	18.34	
10D3D	18.43	18.47	
10MW1	18.24	18.34	
10D4	22.73		

10MW1

DTW - 18.24 Begin Purge (0934)
Post Purge DTW - 18.34 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc	DTW
(0935)	14.32	442	9.01	7.18	219.2	0.34/min	Clear	18.31
(0940)	14.03	424	8.17	7.37	225.6	"	Clear	"
(0945)	13.99	408	8.02	7.37	225.6	"	Clear	18.30
(0950)	13.92	401	8.03	7.36	224.5	"	Clear	" ✓
(0955)	13.70	394	8.01	7.35	221.7	"	Clear	"
(1000)	13.58	383	8.04	7.34	218.6	"	Clear	
(1005)	13.70	376	7.89	7.31	217.7	"	Clear	18.31

(1005) Readings Stable
(1027) 14.17 361 7.63 7.33 210.3 Post Purge Reading
Sample Time (1010)
Samples Collected: (6) 8260, (2) 8270, (1) TM, (1) CN

10D3D

DTW - 18.43
Begin Purge (1047)
Post Purge DTW - 18.47
Initial Purge - Clear

Time	Temp(°c)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc	DTW
(1050)	14.72	602	2.84	7.28	-163.9	0.3L/min	Clear	18.45
(1055)	14.80	598	1.33	7.19	-173.3	"	Clear	
(1100)	15.03	590	2.02	7.15	-142.1	"	Clear	
(1105)	15.11	585	2.38	7.13	-116.0	"	Clear	18.45 ✓
(1110)	15.20	576	2.57	7.12	-104.6	"	Clear	
(1115)	15.23	573	2.65	7.12	-100.9	"	Clear	
(1120)	15.24	569	2.72	7.11	-96.7	"	Clear	18.45
(1125)	15.20	567	2.74	7.10	-94.3	"	Clear	

(1125) Readings Stable — Purge water had Rotten Egg odor
(1145) 14.92 558 2.89 7.07 - 107.5 Post Purge Reading

Sample Time (1130)
Samples Collected: (6) 8260, (2) 8270, (1) TM, (1) CN

10D3

DTW - 18.28
Begin Purge (1201)
Post Purge DTW - 18.34
Initial Purge - Clear

Time	Temp(°c)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc	DTW
(1205)	15.62	494	4.10	6.99	27.3	0.3L/min	Clear	18.34
(1210)	16.16	467	3.98	6.96	40.9	"	Clear	
(1215)	15.81	452	3.72	6.92	53.5	"	Clear	✓
(1220)	15.56	446	3.60	6.86	61.7	"	Clear	
(1225)	15.58	439	3.56	6.80	70.6	"	Clear	
(1230)	15.53	440	3.55	6.78	73.3	"	Clear	
(1235)	15.45	440	3.53	6.76	78.3	"	Clear	

(1235) Readings Stable
(1303) 451 3.40 6.75 85.2 Post Purge Reading

Sample Time (1240)
Samples Collected: (6) 8260, (2) 8270, (1) TM, (1) CN

10DUP Sample Time (1255) Samples Collected: (6) 8260, (2) 8270, (1) TM, (1) CN
Dup collected at 10D3

10DDH2R

DTW - 19.78
Begin Purge (1317)
Post Purge DTW - 19.83
Initial Purge - Clear

Time	Temp(°c)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc	DTW
(1320)	15.84	357	3.23	6.68	52.2	0.3L/min	Clear	19.84
(1325)	15.49	511	1.02	6.73	63.2	"	Clear	
(1330)	15.50	522	1.07	6.72	66.3	"	Clear	19.82
(1335)	16.16	526	1.17	6.74	67.1	"	Clear	
(1340)	16.93	532	1.23	6.79	67.0	"	Clear	
(1345)	17.22	533	1.28	6.81	65.6	"	Clear	19.79 ✓
(1350)	17.47	533	1.33	6.84	64.3	"	Clear	

(1350) Readings Stable
(1408) 17.20 520 1.63 6.79 62.9 Post Purge Reading

Sample Time (1355)
Samples Collected: (18) 8260, (6) 8270, (3) TM, (3) CN

10D4

DTW - 22.73
Begin Purge (1423)
Post Purge Reading - 22.76
Initial Purge - Clear

Time	Temp(°c)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc	DTW
(1425)	16.93	268	4.76	6.69	81.5	0.3L/min	Clear	22.78
(1430)	16.98	257	3.94	6.48	86.4	"	Clear	
(1435)	17.05	251	3.86	6.45	87.4	"	Clear	22.74
(1440)	17.13	250	3.85	6.46	87.9	"	Clear	
(1445)	17.26	248	3.86	6.45	88.3	"	Clear	✓
(1450)	17.37	249	3.88	6.45	88.1	"	Clear	22.75
(1455)	17.51	248	3.95	6.47	87.6	"	Clear	

(1455) Readings Stable
(1516) 16.86 246 4.13 6.55 86.8 Post Purge Reading

Sample Time (1500)
Samples Collected: (6) 8260, (2) 8270, (1) TM, (1) CN

General Notes

Weather - Sunny,
PPE - Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
Conductivity reads 1413 us in 1413us Std
pH - 4.00 = 4.00 , 7.00 = 7.00 , 10.00 = 10.00
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- All purge water disposed of at dedicated location onsite
- All samples collected, stored and transported on ice in coolers

Static Water Level Table - Unit 5

WELL	DTW	Post Purge DTW	Notes
S5W7	12.13	12.15	
S5W5	9.74	10.06	
5W9A	3.86	3.88	
5W10A	16.28	16.33	
5W11A	14.70	15.11	
5W8B	16.90	17.16	
5W7B	10.44	10.48	
5W5B	11.02	11.88	
5WC21	10.80	10.87	
5WC22	10.88	10.91	
5WC23	10.37	10.56	
		SWL ONLY	
5WCA	14.91	"	
S5W6	DE 10/27/09 ~~8.06~~ 8.86	"	
S5W8	13.45	"	
5WC11	18.84	"	
5WC12	18.07	"	

✓

S5W7

DTW - 12.13
Begin Purge (1028)
Post Purge DTW - 12.15
Initial Purge - Clear

Time	Temp(C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge K	Desc	DTW
(1030)	16.19	431	7.87	6.46	142.2	0.34/min	Clear	12.14
(1035)	16.17	437	4.11	6.57	132.4	"	Clear	
(1040)	16.34	439	3.62	6.60	127.6	"	Clear	
(1045)	16.49	441	3.35	6.64	122.9	"	Clear	12.14
(1050)	16.73	441	3.01	6.69	118.5	"	Clear	
(1055)	16.61	442	2.86	6.71	115.4	"	Clear	
(1100)	16.54	441	2.78	6.72	113.9	"	Clear	12.15
(1105)	16.51	442	2.73	6.72	112.1	"	Clear	
(1105)	Readings Stable - Black particles in purge/sample water							
(1124)	16.53	439	2.80	6.83	106.1	Post Purge Reading		

✓

Sample Time (1110)
Samples Collected: (3) 8260, (2) 8270, (1) TM

S5W5

DTW - 9.74
Begin Purge (1137)
Post Purge DTW - 10.06
Initial Purge - Clear

Time	Temp(C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge K	Desc	DTW
(1140)	17.78	345	6.67	6.19	119.6	0.34/min	Clear	9.96
(1145)	17.54	332	3.73	6.01	118.3	"	Clear	
(1150)	17.56	326	3.17	5.98	117.4	"	Clear	
(1155)	17.60	321	2.93	5.96	114.7	"	Clear	9.90
(1200)	17.61	317	2.74	5.95	113.0	"	Clear	
(1205)	17.51	317	2.59	5.94	110.6	"	Clear	9.90
(1210)	17.50	315	2.53	5.94	110.3	"	Clear	
(1215)	17.47	314	2.49	5.93	109.7	"	Clear	
(1215)	Readings Stable							
(1233)	17.73	309	2.28	6.03	111.2	Post Purge Reading		

✓

Sample Time (1220)
Samples Collected: (3) 8260, (2) 8270, (1) TM

SW9A

DTW - 3.86
Post Purge DTW - 3.88

Begin Purge (1253)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1255)	16.15	389	5.30	7.37	139.8	0.34/min	Clear	3.88
(1300)	16.07	389	4.90	7.32	134.9	"	Clear	
(1305)	15.98	389	4.75	7.29	129.6	"	Clear	
(1310)	16.00	389	4.68	7.29	125.8	"	Clear	3.88
(1315)	16.00	390	4.56	7.30	120.4	"	Clear	
(1320)	15.98	390	4.52	7.32	118.1	"	Clear	✓
(1325)	15.94	391	4.50	7.33	114.0	"	Clear	
(1325)	Readings Stable							
(1342)	15.69	392	4.57	7.40	105.6	Post Purge Reading		

Samples Collected: (3)8260, (2)8270, (1)TM
Sample Time (1330)

5W10A

DTW - 16.28
Post Purge DTW - 16.33

Begin Purge (1414)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORD(mv)	PurgeK	Desc	DTW
(1415)	15.56	399	3.00	7.55	101.8	0.34/min	Clear	16.31
(1420)	15.30	399	2.20	7.49	100.5	"	Clear	
(1425)	15.30	397	1.71	7.48	98.7	"	Clear	
(1430)	15.38	396	1.55	7.48	95.5	"	Clear	
(1435)	15.38	394	1.40	7.50	91.6	"	Clear	16.33
(1440)	15.39	392	1.39	7.52	89.5	"	Clear	✓
(1445)	15.39	391	1.42	7.53	88.7	"	Clear	
(1445)	Readings Stable							
(1505)	15.18	396	1.68	7.60	93.6	Post Purge Reading		

Sample Time (1450)
Samples Collected: (3)8260, (2)8270, (1)TM

5W11A

DTW - 14.70
Post Purge DTW - 15.11

Begin Purge (1517)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1520)	15.39	660	4.83	6.51	-38.1	0.34/min	Clear	15.22
(1525)	15.33	740	4.30	6.53	9.9	"	Clear	✓
(1530)	15.31	775	4.02	6.56	35.6	"	Clear	
(1535)	15.29	801	3.76	6.58	56.7	"	Clear	15.01
(1540)	15.23	810	3.50	6.59	61.5	"	Clear	
(1545)	15.20	813	3.38	6.58	63.4	"	Clear	
(1555)	15.21	814	3.30	6.58	65.3	"	Clear	
(1555)	Readings Stable							
(1614)	14.98	807	2.95	6.60	67.1	Post Purge Reading		

Sample Time (1600)
Samples Collected: (3)8260, (2)8270, (1)TM

10/27/09

RAAP
B03204-07
DAS/TOE

FB# 8

General Notes

Weather - Overcast, Scattered Showers, 50's
PPE - Eye Protection, Nitrile gloves, Hard Hats
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 9.99
Conductivity reads 1413 us in 1413 us Std.
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purge water disposed of at dedicated location onsite
- All samples collected stored and transported in coolers on ice

✓

10D4

DTW - 22.75

Begin Purge (1559)

Initial Purge - Clear

Post Purge DTW -

Time	Temp(C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc	DTW
(1600)	14.78	322	4.94	6.78	114.7	0.34/min	Clear	22.76
(1605)	14.71	308	3.52	6.67	113.5	"	Clear	
(1610)	14.78	303	3.33	6.65	112.3	"	Clear	
(1615)	14.82	300	3.31	6.64	112.0	"	Clear	22.78
(1620)	14.82	299	3.40	6.67	111.8	"	Clear	✓
(1625)	14.91	299	3.53	6.67	111.6	"	Clear	
(1630)	14.93	299	3.56	6.67	111.5	"	Clear	
(1630)	Readings Stable							
(1641)	15.01	298	3.29	6.67	112.6	Post Purge Reading		

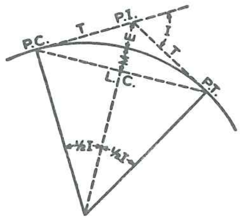
Sample Time (1635)
Samples Collected: (1) CN

completed
11-23-09

5WDUP

Sample Time (1320)
Samples Collected: (3) 8260, (2) 8270, (1) TM
* Continued in field Book #9
* Duplicate sample collected at 5WC21

CURVE AND REDUCTION TABLES



CURVE FORMULAS

1. Radius : $R = \frac{50}{\sin D/2}$
2. Degree of Curve: $D = 100\frac{I}{L}$. Also, $\sin D/2 = \frac{50}{R}$
3. Tangent : $T = R \tan \frac{1}{2} I$. Also, $T = \frac{T \text{ for } 1^\circ \text{ curve}}{D} + C$.
4. Length of Curve: $L = 100\frac{I}{D}$
5. Long Chord : $L.C. = 2R \sin \frac{1}{2} I$.
6. Middle Ordinate: $M = R\,(1 - \cos \frac{1}{2} I)$
7. External : $E = \frac{R}{\cos \frac{1}{2} I} - R$. Also, $E = T \tan \frac{1}{4} I$.

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. P. T. = P. C. + L, and $L = 100\,\frac{I}{D} = 100\,\frac{45.33}{6.5} = 697.38$ 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 $= 5.66 \times \left(\frac{27.62}{100}\right)^2 = .432$ ft. Also, square of any distance, divided by twice the radius equals (approximately) the distance from tangent to curve. Thus $(27.62)^2 \div (2 \times 881.95) = .432$ ft.

Deflections—Deflection angle = ½ D for 100 ft., ¼ D for 50 ft., etc. For "X" ft., Deflection Angle (in minutes) $= .3 \times X \times D$. For Sta. 80 of above curve Deflection Angle $= .3 \times 27.62 \times 6.5 = 53.86'$. Also Deflection Angle = dfl. for 1 ft. from Table III $\times X = 1.95 \times 27.62 = 53.86'$. For Sta. 181 Deflection Angle $= 53.86' + \frac{6^\circ 30'}{2} = 4^\circ 8.86'$.

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.

Projects (continued).

Nam

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for
DT

10/27/09 RAAP FB# 9
B03204-07
DAS/TQE

5W8B

DTW - 16.90 Begin Purge (0834)

Post Purge DTW - 17.16 Initial Purge - Clear

Time	Temp(c)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	DesC	DTW
(0835)	13.24	76	9.03	4.09	212.3	0.3 L/min	Clear	17.45
(0840)	13.19	75	6.10	4.18	202.4	"	Clear	
(0845)	13.22	75	5.85	4.20	200.3	"	Clear	
(0850)	13.28	74	5.73	4.18	199.0	"	Clear	17.11
(0855)	13.32	73	5.68	4.19	197.2	"	Clear	
(0900)	13.34	74	5.64	4.20	196.0	"	Clear	
(0905)	13.38	72	5.60	4.18	196.3	"	Clear	17.11 ✓
(0905)	Readings Stable							
(0922)	13.40	70	5.57	4.19	194.1	Post Purge Reading		

Sample Time (0910)

Samples Collected: (3) 8260, (2) 8270, (1) TM

5W5B

Begin Purge (0937)

DTW - 11.02 Initial Purge - Clear

Post Purge DTW - 11.88

Time	Temp(c)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	DesC	DTW
(0940)	14.75	567	6.15	5.59	166.1	0.3 L/min	Clear	11.48
(0945)	14.60	600	3.85	5.38	163.7	"	Clear	
(0950)	14.66	612	3.66	5.35	160.2	"	Clear	
(0955)	14.68	620	3.59	5.35	156.8	"	Clear	11.63
(1000)	14.60	622	3.64	5.36	154.3	"	Clear	✓
(1005)	14.45	623	3.72	5.37	152.7	"	Clear	
(1010)	14.58	624	3.78	5.38	150.6	"	Clear	
(1010)	Readings Stable							
(1029)	14.81	639	3.95	5.40	151.3	Post Purge Reading		

Sample Time (1015)

Samples Collected: (3) 8260, (2) 8270, (1) TM

5W7B

DTW - 10.44 Begin Purge(1054)

Post Purge DTW -10.48 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1055)	17.13	209	7.15	4.01	195.0	0.34/min	Clear	10.48
(1100)	17.01	190	6.43	4.13	191.5	"	Clear	
(1105)	16.86	174	6.23	4.05	192.0	"	Clear	
(1110)	16.91	156	6.07	4.08	195.4	"	Clear	10.48
(1115)	16.87	154	6.02	4.09	194.9	"	Clear	
(1120)	16.81	152	5.99	4.07	196.9	"	Clear	✓
(1125)	16.70	152	5.96	4.02	200.1	"	Clear	

(1125) Readings Stable

(1158) 17.16 160 5.59 3.94 203.5 Post Purge Reading

Sample Time (1130)

Samples Collected: (9)8260, (6)8270, (3)TM

5WC21

DTW - 10.80 Begin Purge(1227)

Post Purge DTW - 10.87 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1230)	14.88	571	2.97	3.43	218.4	0.34/min	Clear	10.84
(1235)	14.75	575	2.31	3.32	232.0	"	Clear	
(1240)	14.73	575	2.00	3.31	233.9	"	Clear	
(1245)	14.76	576	1.71	3.32	235.4	"	Clear	10.84
(1250)	14.82	576	1.64	3.32	237.5	"	Clear	✓
(1255)	14.79	580	1.62	3.32	235.6	"	Clear	
(1300)	14.82	582	1.55	3.32	234.8	"	Clear	10.84

(1300) Readings Stable

(1331) 14.58 590 1.40 3.34 240.6 Post Purge Reading

Sample Time (1305)

Samples Collected: (3)8260, (2)8270, (1)TM

5WC22

DTW - 10.88 Begin Purge(1342)

Post Purge DTW - 10.91 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1345)	14.63	923	1.16	6.52	162.4	0.34/min	Clear	10.89
(1350)	14.80	904	1.07	6.51	154.4	"	Clear	
(1355)	14.77	892	1.10	6.52	143.7	"	Clear	✓
(1400)	14.70	888	1.16	6.52	137.3	"	Clear	10.90
(1405)	14.57	886	1.20	6.52	130.9	"	Clear	
(1410)	14.47	883	1.30	6.52	123.2	"	clear	
(1415)	14.47	882	1.38	6.53	121.5	"	Clear	

(1415) Readings Stable

(1432) 14.25 883 1.33 6.54 126.3 Post Purge Reading

Sample Time (1420)

Samples Collected: (3)8260, (2)8270, (1)TM

5WC23

DTW - 10.37 Begin Purge(1445)

Post Purge DTW - 10.56 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1446)	14.81	989	4.29	6.81	127.6	0.34/min	Clear	10.43
(1450)	14.41	953	2.07	6.60	119.2	"	Clear	
(1455)	14.36	920	1.56	6.58	114.2	"	Clear	
(1500)	14.33	904	1.59	6.58	111.0	"	Clear	10.42 ✓
(1505)	14.35	896	1.57	6.58	107.3	"	Clear	
(1510)	14.31	895	1.52	6.58	105.3	"	Clear	
(1515)	14.34	893	1.45	6.58	102.5	"	Clear	10.42

(1515) Readings Stable

(1534) 14.20 896 1.24 6.60 109.5 Post Purge Reading

Sample Time (1520)

Samples Collected: (3)8260, (2)8270, (1)TM

RMK
Completed
11-23-09

1/25/10

RAAP
B03204-07
Unit 10 resample
TGE/KFC

FB#9

General Notes

- Weather: Sunny 40's
- PPE: Eye Protection, Nitrile Gloves
- Calibrations: YSI 650 MDS

PH - 4.00 = 4.00, 7.00 = 6.98, 10.00 = 10.00

Conductivity reads 1413 µs in 1413 µs STD.

DO% = 100

- Dedicated tubing and well skirts used
- All sample equipment decon'd after each well
- Purge water disposed of at wastewater treatment plant
- All samples stored and transported on ice

10D4

DTW: 22.02

Post Purge DTW: 22.03

Begin Purge (1021)

Initial Purge: clear

Time	Temp(C)	Cond(µs)	DO mg/L	PH	ORP(mV)	Purge	Desc
(1025)	12.29	334	7.25	6.68	204.9	≤0.3L/min	Sl cloudy
(1030)	13.12	335	6.91	6.73	188.7	"	Sl cloudy
(1040)	12.85	332	6.44	6.78	183.5	"	Sl cloudy
(1045)	12.95	331	6.37	6.79	179.6	"	Sl cloudy
(1050)	13.19	329	6.34	6.81	173.1	"	Clear
(1055)	13.31	329	6.37	6.82	170.4	"	Clear
(1100)	13.39	328	6.39	6.90	167.4	"	Clear
(1105)	13.32	327	6.42	6.83	164.9	"	Clear
(1110)	13.24	328	6.41	6.83	163.5	"	Clear
(1110)	Readings Stable						
(1130)	13.31	326	6.58	6.83	158.6	Post Purge Reading	

Sample Time (1115)

Samples Collected: (1) Cyanide

Duplicate Sample Time (1125)

Samples Collected: (1) Cyanide

1/25/2010

RAAP
B03204-07
(UNIT 10 Resample)
TGE/KFC

FB#9

* Used pH test strip to check sample for pH after being collected in preserved container. Strip indicated roughly between 11-12. Preformed an additional pH reading on calibrated Myron L Ultrameter and had a reading of: 12.70!

KYC
1-25-2010

Draper Aden Associates
Engineering • Surveying • Environmental Services
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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, RAD17	SDG RAD09
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 904138/0904139	SDG: 0904096/0904097	SDG 904109	SDG 0904069
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.

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Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services

This Report has been prepared by:

8.4.09

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Date:

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8-4-09

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Date:

Summary of Quantitation Limits and Detection Limits

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services

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 Liberty Analytical, Cary, NC		
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	1
Vanadium	10	1
Zinc	10	3
Method: 7470A		
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC		
Mercury	2	0.2
Method: 8081A		
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC		
Aldrin	0.05	0.005
alpha-BHC	0.05	0.005
beta-BHC	0.05	0.005
delta-BHC	0.05	0.005
gamma-BHC	0.05	0.005
Chlordane	0.86	0.86
4,4'-DDD	0.1	0.01
4,4'-DDE	0.1	0.01
4,4'-DDT	0.1	0.01
Dieldrin	0.1	0.01
Endosulfan I	0.05	0.005
Endosulfan II	0.1	0.01
Endosulfan sulfate	0.1	0.01
Endrin	0.1	0.01
Endrin aldehyde	0.1	0.01
Heptachlor	0.05	0.045
Heptachlor epoxide	0.05	0.005
Methoxychlor	0.5	0.05
Toxaphene	2.5	1
Method: 8151A		
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC		
2,4-Dichlorophenoxyacetic acid	5	1
Dinoseb	2.5	0.5
Silvex	2.5	0.2
2,4,5-Trichlorophenoxyacetic acid	2.5	0.2

Summary of Quantitation Limits and Detection Limits

Appendix IX Monitoring Event

Monitoring Event: Second Quarter 2009

Method: 8260B

Laboratory: Lancaster Laboratories, Lancaster, PA

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
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
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

Summary of Quantitation Limits and Detection Limits

Appendix IX Monitoring Event

Monitoring Event: Second Quarter 2009

Method: 8260B

Laboratory: Lancaster Laboratories, Lancaster, PA

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
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

Summary of Quantitation Limits and Detection Limits

Appendix IX Monitoring Event

Monitoring Event: Second Quarter 2009

Method: 8270C

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

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
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
2,4-Dimethylphenol	5	1
Dimethyl phthalate	5	1
m-Dinitrobenzene	5	1
4,6-Dinitro-o-cresol	10	2
2,4-Dinitrophenol	10	2
2,4-Dinitrotoluene	10	1
2,6-Dinitrotoluene	10	1
Di-n-octyl phthalate	5	1
Diphenylamine	10	1
Disulfoton	5	1

Summary of Quantitation Limits and Detection Limits

Appendix IX Monitoring Event

Monitoring Event: Second Quarter 2009

Method: 8270C

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

Analyte	Quantitation Limit/QL (ug/L)	Detection Limit/DL (ug/L)
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
Isophorone	5	1
Isosafrole	5	1
Kepone	5	5
Methapyrilene	5	5
3-Methylcholanthrene	5	1
Methyl methane sulfonate	5	1
2-Methylnaphthalene	5	1
Methyl parathion	5	1
2-Methylphenol	5	1
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
N-Nitrosodi-n-butylamine	5	1
N-Nitrosodiethylamine	5	1
N-Nitrosodimethylamine	5	1
N-Nitrosodiphenylamine	5	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
Phenol	5	1
Phorate	5	1
2-Picoline	5	1
Pronamide	5	1
Pyrene	5	1
Pyridine	5	1

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 Liberty 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	5
Method: 9012A		
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC		
Cyanide	20	3.5
Method: 9034		
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC		
Sulfide	1000	660
Method: 9065		
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC		
Total Recoverable Phenolics	60	18

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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

Analytical Method	**Hazardous Waste Management Unit (HWMU)**				**Laboratory**
	HWMU 5	**HWMU 7**	**HWMU 10**	**HWMU 16**	
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 µg/l for both diethyl ether and dimethyl ether. The laboratory reported the QL for each analyte as 13 µg/l due to rounding. Draper Aden Associates revised the QL to 12.5 µg/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 µg/l for bis-2(ethylhexylphthalate). The low calibration point of the initial calibration curve and the MDL study supports a QL of 6 µg/l, the USEPA MCL. The final QL for this target was reported at 6 µg/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 µg/l instead of 10 µg/l for 2,4-dinitrophenol and 4-nitrophenol. The low calibration point of the curve for each analyte supports a QL of 10 µg/l. The laboratory revised the final results to reflect the correct QL.
- The laboratory reported a QL of 10 µg/l for bis-2(ethylhexylphthalate). The low calibration point of the initial calibration curve and the MDL study supports a QL of 6

µg/l, the USEPA MCL. The final QL for this target was reported at 6 µg/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.

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
- ☑ Each target analyte %RSD ≤ 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
- ☑ % 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_8 (80-120%), 1,2-dichloroethane-d_4 (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_5, 1,4-dichlorobenzene-d_4
- ☑ Internal standard areas within ± 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%.

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 2nd 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
☑ Samples received at ≤6°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
☑ Each target analyte %RSD ≤ 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_6 Or - d_6 (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_4, Naphthalene-d_8, Acenapththene-d_{10}, Phenanthrene-d_{10}, Chrysene-d_{12}, Perylene-d_{12}
☑ Internal standard areas within ± 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%.

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 2nd 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:

☑ Sample results included for all sample locations
☑ Target analyte QLs reported at permit required QL
☑ Sample digestion method: 3005A
☑ Electronic data file reviewed

B. TECHNICAL HOLDING TIMES / PRESERVATION REVIEW CRITERIA:

☑ 6 month holding time, pH<2 with Nitric Acid (HNO3)

C. INSTRUMENT CALIBRATION/TUNE CRITERIA:

☑ Target analytes, 1 calibration blank and at least 1 standard
☑ Instrument tuned prior to analysis (%RSD <5%)

D. INSTRUMENT CALIBRATION CRITERIA:

☑ 10 sample frequency
☑ Use of calibration blank and check standard
☑ Recovery within 90-110%

E. BLANK CRITERIA:

N/A Trip Blank (check only if analyzed)
N/A Equipment Blank
☑ Method/Other Lab Blanks (check only if analyzed)
☑ Interference free
☑ CCB 10 sample frequency

F. INTERFERENCE CHECK SAMPLES (ICS) CRITERIA:

☑ At beginning of batch or every 12 hours (80-120%)

G. MATRIX SPIKE DUPLICATE (MSD) CRITERIA:

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

H. MATRIX SPIKE (MS) CRITERIA:

☑ 75-125% recovery, all analytes
☑ All analytes, spiked prior to digestion
☑ One matrix spike per analytical batch
☑ No more than 20 samples per analytical batch

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_3

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
☑ RPD ≤ 20 between MS and MSD results or sample and duplicate results
☑ Control limit is ± 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.

A. QC DELIVERABLES PACKAGE:

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

B. TECHNICAL HOLDING TIME / PRESERVATION CRITERIA:

- ☑ 14 day holding time
- ☑ Cool ≤6° C
- ☑ Adjust pH >12 w/ NaOH

C. INSTRUMENT CALIBRATION CRITERIA:

- ☑ 1 calibration blank and at least 3 standards, correlation coefficient >0.995
- ☑ Standard at or below QL

D. INITIAL / CONTINUING CALIBRATION VALIDATION CRITERIA:

- ☑ 10 sample frequency
- ☑ Use of check standard with every batch of samples
- ☑ Recovery within 85-115% range (± 15%)

E. BLANK CRITERIA:

- ☑ Interference free
- ☑ Verification Blank analysis analyzed every 10 samples

F. MATRIX SPIKE DUPLICATE (MSD) CRITERIA:

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

G. MATRIX SPIKE (MS) CRITERIA:

- ☑ 75-125% recovery
- ☑ Spiked prior to distillation
- ☑ One MS required per analytical batch. No more than 20 samples per batch

H. 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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Error! Objects cannot be created from editing field codes.

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1-26-2010

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Date:

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1-28-2010

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www.daa.com

Date:

acct#11200 Grp# 1168612

CHAIN OF CUSTODY RECORD

Sample# 5820380-95

Laboratory: Lancaster Laboratories, 2425 New Holland Pike, Lancaster, PA 17605-2425/ Barb Weyandt, Manager/ (717) 656-2300

ac JUK 10-9-09

Client: Draper Aden Associates
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU5
Event: 2009 2nd Semiannual Monitoring
DAA JN: B03204-07
Lab JN:

Project Specific (PS) or Batch (B) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO
Carrier: UPS 12-237-301-01-5653-5299
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic
AG Amber Glass
V VOA
CG Clear Glass

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on ice: ☑ YES ☐ NO

GENERAL NOTES:

1. Report results at or greater than QL.
2. Level 1 with EDD.

1 trip blank required per day of collection. JUK 10-8-09

Box 4 - Sample Type					G	
Box 3 - Filtered/Unfiltered					U	
Required pH of Sample					<2	
Box 2 - Preservative					A	
Box 5 - Sample Container Type					3-40ml V	
Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	8260B/5030B	25ml purge ok [illegible] 10-09
5W8B	10/27	0910	GW	3	X	
5W5B		1015	GW	3	X	
5W7B		1130	GW	0	X	USE FOR QC
5WC21		1305	GW	3	X	
5WDUP		1320	GW	3	X	
5WC22		1420	GW	3	X	
5WC23	10/27	1520	GW	3	X	
S5W5	10/26	1220	GW	3	X	
S5W7		1110	GW	3	X	
5W9A		1330	GW	3	X	
5W10A		1450	GW	3	X	
5W11A	10/26	1600	GW	3	X	
Trip Blank 1	10/15		GW	3	X	
Trip Blank 2	10/15		GW	3	X	
~~Trip Blank 3~~			~~GW~~	~~3~~	~~X~~	not required JUK 10/28/09

Clients Special Instructions: level 1 with edd.

Received by lab in Good Condition ____ Yes ____ No Custody Seal Intact ____ Yes ____ No Temperature upon arrival ____ Received on Ice ____ Yes ____ No

Describe problems, if any:

Sampler Name (Print): Dale Slaughter	Date: 10/26/09	#1 Relinquished by (Signature): Dale Slaughter	Date: 10/28/09	#2 Relinquished by (Signature): Ken Golightly	Date: 10/28/09	Sample Storage Time Requested:
Sampler Signature: Dale Slaughter	Time: 0900	Company Name: DAA	Time: 0830	Company Name: DAA	Time: 1700	
Sampler Name (Print): Tyler Emery	Date: 10/26/09	#1 Received by (Signature): Ken Golightly	Date: 10/28/09	#2 Received by (Signature):	Date: 10/29/09	30 DYS ORG/6 MTHS INORG
Sampler Signature: Tyler Emery	Time: 0900	Company Name: DAA	Time: 0830	Company Name: LLI	Time: 940	

units

[illegible] 10/29/09 1/2

JUK 10-9-09

acct#11200
Gp#11686012
sample#5820360-95

HWMU5
Radford Army Ammunition Plant
2009 2nd 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)	67-66-3	1
3.	2-butanone (methyl ethyl ketone - MEK)	78-93-3	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	79-01-6	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.

25 ml
volume purge
JCF
10-9-09

rev'd JCF 2/2

CHAIN OF CUSTODY RECORD

OK JUE 10-9-09

Lab: CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097

Client: Draper Aden Associates
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU5
Event: 2009 2nd Semiannual Monitoring
DAA JN: B03204-07
Lab JN:

Project Specific (PS) or Batch (B) QC: ☑ Yes ☐ No
Sample Collection for Project Complete? ☑ Yes ☐ No
Carrier: NC COURIER SERVICE
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic
V VOA
AG Amber Glass
CG Clear Glass

Invoice
Copy to Consultant: ☑ Yes ☐ No
Bill: ☐ Client ☑ Consultant
Preserved and shipped on Ice: ☑ Yes ☐ No

Residual Chlorine Present?
Yes ____ No ✓

Box 4 - Sample Type					G	G	G			
Box 3 - Filtered/Unfiltered					U	U	U			
Required pH of Sample					<2	<2				
Box 2 - Preservative					B	B	H			
Box 5 - Sample Container Type					1 - 500 ML P		2-1L AG			
Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	ICP/MS 6020/3005A (Metals-Total)	7470A/3020A (Mercury-Total) (1-PL) Store 5RC (KM) 10.28.09	8270C/3520C (Semivolatiles) (2-AL)	Metals pH	SVOC (KM) 10.28.09	
5W8B	10/27	0910	GW	3	X	X	X	<2		0910223-02
5W5B		1015	GW	3	X	X	X	<2		-03
5W7B		1130	GW	9	X	X	X	<2		0910223-01 USE FOR QC
5WC21		1305	GW	3	X	X	X	<2		-04
5WDUP		1320	GW	3	X	X	X	<2		-05
5WC22		1420	GW	3	X	X	X	<2		-06
5WC23	10/27	1520	GW	3	X	X	X	<2		-07
S5W5	10/26	1220	GW	3	X	X	X	<2		-08
S5W7		1110	GW	3	X	X	X	<2		-09
5W9A		1330	GW	3	X	X	X	<2		-10
5W10A		1450	GW	3	X	X	X	<2		-11
5W11A	10/26	1600	GW	3	X	X	X	<2		-12

GENERAL NOTES:
1. Report results at or greater than QL.
2. Level 4 with EDD.
3 Eris deliverable required JUE 10-9-09

Clients Special Instructions: level 4 with edd.

Received by lab in Good Condition ✓ Yes ____ No Custody Seal intact ✓ Yes ____ No Temperature upon arrival 1.9°C, 0.8°C, 1.4°C, 3.2°C Received on Ice ✓ Yes ____ No

Describe problems, if any:

Sampler Name (Print): Dale Slaughter	Date: 10/26/09	#1 Relinquished by (Signature): Dale Slaughter	Date: 10/28/09	#2 Relinquished by (Signature): Ken Eddington	Date: 10/28/09	Sample Storage Time Requested:
Sampler Signature: Dale Slaughter	Time: 0900	Company Name: DAA	Time: 0830	Company Name: DAA	Time: 11:00	
Sampler Name (Print): Tyler Emery	Date: 10/26/09	#1 Received by (Signature): Ken Eddington	Date: 10/28/09	#2 Received by (Signature): Zac P Swanson	Date: 10/28/09	30 DYS ORG/6 MTHS INORG
Sampler Signature: Tyler Emery	Time: 0900	Company Name: DAA	Time: 0830	Company Name: NC Courier	Time: 11:00 AM	

Customer Delivery ✓ (KM) 10.28.09 10/28/09 JUE K. Manning 1505-10.28.09 1/3 JUE 10-9-09

5 xml

HWMU5
Radford Army Ammunition Plant
2009 2nd 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 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
5.	Cadmium	7440-43-9	1
6.	Chromium	7440-47-3	5
7.	Cobalt	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.	Thallium	7440-28-0	1
14.	Vanadium	7440-62-2	10
15.	Zinc	7440-66-6	10

OK
JUZ 10 9 09

Method SW 7470A/CVAA

No.	ANALYTE	CAS RN	Required Permit Quantitation limit (µg/l)
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.

2/3

HWMU5.sub

HWMU5
Radford Army Ammunition Plant
2009 2nd 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

OK

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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Unit 7

CHAIN OF CUSTODY RECORD

Laboratory: CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097

Client: Draper Aden Associates
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU7
Event: 2009 2nd Semiannual Monitoring
DAA JN: B03204-07
Lab JN:

Project Specific (PS) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO
Carrier: NC Carrier Service
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCl
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic
V VOA
AG Amber Glass
CG Clear Glass

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on ice: ☑ YES ☐ NO

Box 4 - Sample Type					G	G	G	G		
Box 3 - Filtered/Unfiltered					U	U	U	U		
Required pH of Sample					<2	<2		>12		
Box 2 - Preservative					B	B	~~G~~ H	E/F		
Box 5 - Sample Container Type					1 - ~~500~~ ml P 1000 A.		2-1L A	~~500 P~~ 250 P 10/21/09		
Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	ICP/MS 6020/3005A (Metals-Total)	7470A (Mercury-Total)	8270C - Semivolatile	9012A (Cyanide) 9010/13 pH>12	Metals/Hg pH	
7W12B	10/19	1300	GW	4	X	X	X	X	<2	0910166-02
7WCA	10/20	1525	GW	4	X	X	X	X	<2	-03
7WDUP	10/20	1540	GW	4	X	X	X	X	<2	-04
7W11B	10/20	1410	GW	12	X	X	X	X	<2	0910166-01 USE AS QC
7MW6	10/20	1310	GW	4	X	X	X	X	<2	-05
7W9C	10/19	1410	GW	4	X	X	X	X	<2	-06
7W10B	10/19	1515	GW	4	X	X	X	X	<2	-07
7W10C	10/19	1620	GW	4	X	X	X	X	<2	-08
7W13	10/20	1200	GW	4	X	X	X	X	<2	-09

GENERAL NOTES:

1. **Report results at or greater than QL.**
2. **Report Level 4 with EDD.**
3. Eris deliverable required.

Residual Chlorine Present?
Yes ______ **No** ______

JUE 9-15-09

Clients Special Instructions: level 4 with edd.

-0.3, -1.9, -2.0°C, 0.8°C ✓

Received by lab in Good Condition ✓ Yes ____ No   Custody Seal Intact ✓ Yes ____ No   Temperature upon arrival ^   Received on Ice ✓ Yes ____ No
Describe problems, if any:

Sampler ~~Name~~ (Print): Dale Slaughter
Sampler Signature: Dale Slaughter
Date: 10/19/09
Time: 0600
#1 Relinquished by (Signature): Dale Slaughter
Company Name: DAA
Date: 10/21/09
Time: 0800
#2 Relinquished by (Signature):
Company Name: DAA
Date: 10/21/09
Time: 1110

Sampler Name (Print): Tyler Emery
Sampler Signature: Tyler Emery
Date: 10/19/09
Time: 0600
#1 Received by (Signature):
Company Name: DAA
Date: 10/21/09
Time: 0800
#2 Received by (Signature):
Company Name: N.C. Courier
Date: 10/21/09
Time: 1110

Sample Storage Time Requested:
30 DYS ORG/6 MTHS INORG

10/21/09

1x JUE 10-21-09

WO # 0910166

HWMU7
Radford Army Ammunition Plant
2009 2nd 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

01C
JW2 10-09

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Review 09 2005 JCF

3/4 JK 10-5 25

HWMU7
Radford Army Ammunition Plant
2009 2nd Semiannual Monitoring Event
DAA JN: B03204-07

ANALYTICAL METHOD: 9012/9010A
TYPE METHOD: CLO
CLASS: CYANIDE

No. (µg/l)	ANALYTE	CAS RN	Required PERMIT QL
1	Cyanide	57-12-5	20

JCF 10/2007

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Review 09 2005 JCF

9/9 JK 10/24/05

HWMU7
Radford Army Ammunition Plant
2009 2nd 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.	Bis(2-ethylhexyl)phthalate	117-81-7	10
2.	Butylbenzyl phthlate	85-68-7	10
3.	2,4-Dinitrophenol	51-28-5	10
4.	2,4-dinitrotoluene	121-14-2	10
5.	2,6-dinitrotoluene	606-20-2	10
6.	p-nitrophenol, 4-nitrophenol	100-02-7	10

JCF 10/2007

OK JLR
12-6-05

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Review 09 2005 JCF

2/4

12-5 JLR 05

acct#11200 Gp#1167595

CHAIN OF CUSTODY RECORD

Sample# 5813614-22

Laboratory: Lancaster Laboratories, 2425 New Holland Pike, Lancaster, PA 17605-2425/ Barb Weyandt, Manager/ (717) 656-2300

Client: Draper Aden Associates
Attn: 0
Address: 0
0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU10
October 2009
Event: 2009 2nd Semiannual Monitoring
DAA JN: B03204-07
Lab JN: JLF 10-9-oc

Project Specific (PS) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO
Carrier: ______
Tracking Number: ______

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

JLF 10-6-09

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic
V VOA
AG Amber Glass
CG Clear Glass

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on ice: ☑ YES ☐ NO

Box 4 - Sample Type					G	G
Box 3 - Filtered/Unfiltered					U	U
Required pH of Sample					<2	<2
Box 2 - Preservative					A	A
Box 5 - Sample Container Type					3-40ml V	3-40ml V
Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	8260B/5030B 25ml purge	-additional sample aliquot JLF 10/22/09
10D4	10/21	1500	GW	~~3~~ 6	X	X
10MW1	|	1010	GW	~~3~~ 6	X	✓
[redacted]						
10D3	|	1240	GW	~~3~~ 6	X	X
10DUP	|	1255	GW	~~3~~ 6	X	X
10D3D	10/21	1130	GW	~~3~~ 6	X	X
Trip Blank	10/9		GW	~~3~~ 6	X	X

GENERAL NOTES:

1. Report results at or greater than QL.
2. Level 1 with EDD.
3. analyze 1 trip blank for each day of sampling. JLF 10-6-09

Unit 10

Clients Special Instructions: level 1 with edd.

Received by lab in Good Condition ____ Yes ____ No Custody Seal Intact ____ Yes ____ No Temperature upon arrival ____ Received on Ice ____ Yes ____ No

Describe problems, if any:

Sampler ~~Name~~ (Print): Dale Slaughter Date: 10/21/09
Sampler Signature: Dale Slaughter Time: 0800
Sampler Name (Print): Tyler Emery Date: 10/21/09
Sampler Signature: Tyler Emery Time: 0800

#1 Relinquished by (Signature): Dale Slaughter Date: 10/21/09
Company Name: DAA Time: 1700
#1 Received by (Signature): Date:
Company Name: Time:

~~#2 Relinquished by (Signature):~~ Date:
Company Name: Time:
#2 Received by (Signature): Date: 10/22/09
Company Name: LLI Time: 530

Sample Storage Time Requested:
30 DYS ORG/6 MTHS INORG

1/2 JLF 10-6-09

acct#11200
Cp# 11 67595
sample#58136l4-22

HWMU10
Radford Army Ammunition Plant
2009 2nd Semiannual Monitoring Event
DAA JN: B03204-07

2/2

ANALYTICAL METHOD: 8260B/5030B
TYPE METHOD: GCMS
CLASS: VOLATILE

No.	ANALYTE	CAS RN	Required QL (µg/l)
1.	Bromodichloromethane	75-27-4	1
2.	Chloroform (trichloromethane)	67-66-3	1
3.	2-butanone (methyl ethyl ketone - MEK)	78-93-3	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

25 ml purge

10-6-09

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CHAIN OF CUSTODY RECORD

Laboratory: CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097

Client: Draper Aden Associates
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU10
Event: 2009 2nd Semiannual Monitoring
DAA JN: B03204-07
Lab JN:

Project Specific (PS) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO
Carrier: NC Courier Pick-up
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic
AG Amber Glass
V VOA
CG Clear Glass

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on Ice: ☑ YES ☐ NO

Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	ICP/MS 6020/3005A (Metals-Total)	7470A (Mercury-Total)	8270C/5320C (Semivolatiles)	~~9014~~ 9012A (Cyanide) 9010B okJLK 12/6.19	metals pH	cyanide pH
Box 4 - Sample Type					G	G	G	G		
Box 3 - Filtered/Unfiltered					U	U	U	U		
Required pH of Sample					<2	<2		>12		
Box 2 - Preservative					B	B	H	E/F		
Box 5 - Sample Container Type					1-500 ml P		2-1L A	1-500 ml P		
10D4	10/21	1500	GW	4	X	X	X	X	<2	9
10MW1		1010	GW	4	X	X	X	X	<2	>12
[redacted]										
10D3		1240	GW	4	X	X	X	X	<2	>12
10DUP		1255	GW	4	X	X	X	X	<2	>12
10D3D	10/21	1130	GW	4	X	X	X	X	<2	>12

GENERAL NOTES:

1. **Report results at or greater than QL.**
2. **Level 4 with EDD.**
3. Eris deliverable required. JLK 12-6-09

0910176-02 will resample for CN- (CST) 10/23/09
-03
-04 bottle w/ pH >12
-05
-06

Residual Chlorine Present?
Yes ____ No ✓

Unit 10

Clients Special Instructions: level 4 with edd.

Received by lab in Good Condition ✓ Yes ____ No Custody Seal Intact ✓ Yes ____ No Temperature upon arrival → -1.7°, -0.2°, -3.1°C Received on Ice ✓ Yes ____ No
Describe problems, if any:

Sampler Name (Print): Dale Slaughter	Date: 10/21/09	#1 Relinquished by (Signature): Dale Slaughter	Date: 10/22/09	#2 Relinquished by (Signature):	Date:	Sample Storage Time Requested:
Sampler Signature: Dale Slaughter	Time: 0800	Company Name: DAA	Time: 1115	Company Name:	Time:	
Sampler Name (Print): Tyler Emery	Date: 10/21/09	#1 Received by (Signature): Eli Cumbie	Date: 10-22-09	#2 Received by (Signature): Cathy Dover	Date: 10/22/09	30 DYS ORG/6 MTHS INORG
Sampler Signature: Tyler Emery	Time: 0800	Company Name: N.C. Courier	Time: 1115	Company Name: CompuChem	Time: 1600	

ok JLK 12/6/09

11

CHAIN OF CUSTODY RECORD

JLF 10-26-0

Batch QC: OK

Laboratory: CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097

Client: Draper Aden Associates
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU10
Event: 2009 2nd Semiannual Monitoring Re-sample
DAA JN: B03204-07
Lab JN:

Project Specific (PS) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO
Carrier: NC COURIER SERVICE
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic
V VOA
AG Amber Glass
CG Clear Glass

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on ice: ☑ YES ☐ NO

Box 4 - Sample Type					G										
Box 3 - Filtered/Unfiltered					U										
Required pH of Sample					>12										
Box 2 - Preservative					E/F										
Box 5 - Sample Container Type					1-500 ml-P										
Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	8014 (Cyanide)	Cyanide									
10D4	10/27	1635	GW	1	X	>12			0910176-07						

GENERAL NOTES:

1. Report results at or greater than QL.
2. Level 4 with EDD. 1 sris,

JLF 10-26-09

Rec'd (KM) 10-28-09

JLF 10-26-09

* This ~~was re-sampled~~ resampling required due to initial sample event sample received at lab @ pH 10 instead of pH 12.

JLF 10-26-09

Clients Special Instructions: level 4 with edd.

Received by lab in Good Condition ✓ Yes ___ No Custody Seal Intact ✓ Yes ___ No Temperature upon arrival 1.9°C Received on Ice ✓ Yes ___ No
Describe problems, if any:

Sampler Name (Print): Dale Slaughter
Sampler Signature: Dale Slaughter
Date: 10/27/09
Time: 0730

Sampler Name (Print): Tyler Emery
Sampler Signature: Tyler Emery
Date: 10/27/09
Time: 0730

#1 Relinquished by (Signature): Dale Slaughter
Company Name: DAA
Date: 10/28/09
Time: 0830

#1 Received by (Signature):
Company Name: DAA
Date: 10/28/09
Time: 0830

#2 Relinquished by (Signature):
Company Name: DAA
Date: 10/28/09
Time: 11:00

#2 Received by (Signature): Lee Swanson
Company Name: NC Courier
Date: 10/28/09
Time: 11:00 AM

Sample Storage Time Requested:
30 DYS ORG/6 MTHS INORG

Customer Delivery ✓ (KM) 10-28-09

K. Manning 10-28-09 1505 10-28-09

HWMU10
Radford Army Ammunition Plant
2009 2nd 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	7440-22-4	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 2nd Semiannual Monitoring Event
DAA JN: B03204-07

ANALYTICAL METHOD: **8270C/3520C**
TYPE METHOD: **GCMS**
CLASS: **SEMIVOLATILE**

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

✓

10/2007 jcf

3/4

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HWMU10
Radford Army Ammunition Plant
2009 2nd Semiannual Monitoring Event
DAA JN: B03204-07

ANALYTICAL METHOD: 9012A
TYPE METHOD: CLO
CLASS: CYANIDE

No.	ANALYTE	CAS RN	Required QL (µg/l)
1	Cyanide	57-12-5	20

10/2007 jcf

acct# 11200 Cup# 1165741

CHAIN OF CUSTODY RECORD

Sample# 5802043-59

9/25/09

UNIT 16

Laboratory: Lancaster Laboratories, 2425 New Holland Pike, Lancaster, PA 17605-2425/ Barb Wyant, Manager/ (717) 656-2300

Client: 0
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU16
Event: 2009 - 2nd Semiannual Monitoring Event
DAA JN: B03204-07
Lab JN:

Project Specific (PS) or Batch (B) QC: ☑ YES ☐ NO
~~Sample Collection for~~ Project Complete? ☑ YES ☐ NO
Carrier:
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic
V VOA
AG Amber Glass
CG Clear Glass

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on ice: ☑ YES ☐ NO

Box 4 - Sample Type					G									
Box 3 - Filtered/Unfiltered					U									
Required pH of Sample					<2									
Box 2 - Preservative					A									
Box 5 - Sample Container Type					3-40ml V									
Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	8260B/5030B - 25 ml purge									
16C1	10/8	1445	GW	3	X									
16MW8	10/7	1345	GW	3	X									
16MW9	10/8	1025	GW	3	X									
16WC1A	10/8	1200	GW	9	X									USE FOR QC
16WDUP	10/8	1220	GW	3	X									
16WC1B	10/8	1330	GW	3	X									
16-1	10/7	1015	GW	3	X									
16-2	10/7	1120	GW	3	X									
16-3	10/6	1635	GW	3	X									
16-5	10/7	1500	GW	3	X									
16WC2B	10/7	1240	GW	3	X									
16SPRING	10/7	1535	GW	3	X									
Trip Blank1	9/25		GW	3	X									For Samples Collected 10/6/09
Trip Blank2	9/25		GW	3	X									For Samples Collected 10/7/09
Trip Blank3	9/25		GW	3	X									For Samples Collected 10/8/09

GENERAL NOTES:

1. DAA EDD required.
2. Level 1 deliverables required.
3. See attached target analyte list.
4. Report results at or greater than QL.
5. 1 Trip Blank to be analyzed per day of sample collection.
6. Report results at or greater than QL.
7. Project required LOQ's attached. Please report these LOQ's, not lab LOQ's.

Clients Special Instructions: Level 1 with add. See attached target analyte list. See Genral Notes block.

Received by lab in Good Condition _____ Yes _____ No Custody Seal Intact _____ Yes _____ No Temperature upon arrival _____ Received on ice _____ Yes _____ No

Describe problems, if any:

Sampler Name (Print): Dale Slaughter	Date: 10/6/09	#1 Relinquished by (Signature): Tyler Emery	Date: 10/8/09	#2 Relinquished by (Signature):	Date:	Sample Storage Time Requested:
Sampler Signature: Dale Slaughter	Time: 0730	Company Name: DAA	Time: 1700	Company Name:	Time:	
Sampler Name (Print): Tyler Emery	Date: 10/6/09	#1 Received by (Signature):	Date:	#2 Received by (Signature):	Date: 10/9/09	30 DYS ORG/6 MTHS INORG
Sampler Signature: Tyler Emery	Time: 0730	Company Name:	Time:	Company Name: LLI	Time: 930	

9/25/09 1/2

acct# 11200
Cp# 1165741
Sample# 5802043-59

HWMU16
Radford Army Ammunition Plant
2009 2nd 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
10.	Trichloroethene ✓	79-01-6	1
11.	Trichlorofluoromethane (CFC-11) ✓	75-69-4	1
12.	Xylenes (total) ✓	1330-20-7	3
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
17	1,1,2-Trichloro-1,2,2-Trifluoroethane ✓	76-13-1	1

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

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

OK
JUF 9/29/09

25 ml purge volume.
JUF
9.29.09

.\\bbg-files\projects\admin\divisions\envr\templates\bburg eteam temp\field events\raap\sample event set up\semi-annual events\hwmu-16\hwmu16-target analyte list-q.doc JCF 11/04/2004

2/2

CHAIN OF CUSTODY RECORD

01 JCF 9/24/09

Laboratory: CompuChem Environmental, 501 Madison Avenue, Cary, NC 27513/Cathy Dover, Manager/1-800-833-5097

Client: 0
Attn: 0
Address: 0
0
Phone: 0
Fax: 0
Fax: 0

Consultant: Draper Aden Associates
Attn: Janet C. Frazier
Address: 2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444
Fax: (540) 552-0291

Sample Site: RAAP, Radford, Virginia
Location: HWMU16
Event: 2009 - 2nd Semiannual Monitoring Eve
DAA JN: 803204-07
Lab JN:

Project Specific (PS) or Batch (B) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO
Carrier: NC. Courier
Tracking Number:

Box 1: Matrix
SW Surface Water
GW Groundwater
L Leachate
S Soil
T Trip Blank
E Equipment Blank
P Product
O Other

Box 2: Preservative
A HCL
B HNO_3
C H_2SO_4
D $Na_2S_2O_3$
E NaOH
F ZnAc
G Other (Specify)
H None

Box 3: Filtered/Unfiltered
F Filtered
U Unfiltered

Box 4: Sample Type
G Grab
C Composite

Box 5: Sample Container Type
P Plastic
V VOA
AG Amber Glass
CG Clear Glass

Invoice
Copy to Consultant: ☑ YES ☐ NO
Bill: ☐ Client ☑ Consultant
Preserved and shipped on ice: ☑ YES ☐ NO

	ICP/MS 6020/3005A (Metals-Total)	8270C/8320C (Semivolatiles)
Box 4 - Sample Type	G	G
Box 3 - Filtered/Unfiltered	U	U
Required pH of Sample	<2	-
Box 2 - Preservative	B	H
Box 5 - Sample Container Type	500 ml P	2-1L A

Residual Chlorine Present?
Yes ____ No ✓

Sample ID	Date: 2009	Time	Box 1: Matrix	Number of Bottles	ICP/MS 6020/3005A (Metals-Total) (500ml)	8270C/8320C (Semivolatiles) (AL)	Metal PH's		
16C1	10/8	1445	GW	3	X	X	<2	0910073-02	
16MW8	10/7	1345	GW	3	X	X	<2	-03	
16MW9	10/8	1025	GW	3	X	X	<2	-04	
16WC1A	10/8	1200	GW	9	X	X	<2	0910073-01	USE FOR QC
16WDUP	10/8	1220	GW	3	X	X	<2	-05	
16WC1B	10/8	1330	GW	3	X	X	<2	-06	
16-1	10/7	1015	GW	3	X	X	<2	-07	
16-2	10/7	1120	GW	3	X	X	<2	-08	
16-3	10/6	1635	GW	3	X	X	<2	-09	
16-5	10/7	1500	GW	3	X	X	<2	-10	
16WC2B	10/7	1240	GW	3	X	X	<2	-11	
16SPRING	10/7	1535	GW	3	X	X	<2	-12	

GENERAL NOTES:

1. ERIS EDD & DAA EDD required.
2. Level 4 deliverables required.
3. See attached target analyte list.
4. report results to at or above LOQ (project), attached.

JCF 9/29/09

Clients Special Instructions: level 4 with edd. See attached target analyte list.

Received by lab in Good Condition ✓ Yes ____ No   Custody Seal Intact ✓ Yes ____ No   Temperature upon arrival ____ 0.1°C; 0.2°C; 0.8°C   Received on Ice ✓ Yes ____ No
Describe problems, if any: * See Sheet for 500ml's above temp. (17.7°C)

Sampler Name (Print): Dale Slaughter	Date: 10/6/09	#1 Relinquished by (Signature): Tyler Emery	Date: 10/8/09	#2 Relinquished by (Signature):	Date:	Sample Storage Time Requested:
Sampler Signature: Dale Slaughter	Time: 0730	Company Name: DAA	Time: 1630	Company Name:	Time:	
Sampler Name (Print): Tyler Emery	Date: 10/6/09	#1 Received by (Signature):	Date: 10/8/09	#2 Received by (Signature): Jennifer Dover	Date: 10/8/09	30 DYS ORG/6 MTHS INORG
Sampler Signature: Tyler Emery	Time: 0730	Company Name: NC Courier	Time: 4 30 PM	Company Name:	Time: 20:20 pm	

10/9/09
1/2 JCF 9/29/09

Unit 16

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.	Beryllium	7440-41-7	1
5.	Cadmium	7440-43-9	1
6.	Chromium	7440-47-3	5
7.	Cobalt	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

3/2

HWMU16
Radford Army Ammunition Plant
2009 2nd 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

5/5

FALL2 cont

Time	Temp(°C)	pH	Cond(us)	DO mg/L	ORP(mV)	Purge R	Desc
(1120)	Readings Stable						
(1135)	12.90	6.46	924	7.27	199.7		

Sample Time (1125)

Samples Collected: (1) TM, (3) 8260, (2) 8011

FALL3

DTW - 68.66
Post Purge DTW - 68.94

Begin Purge (1155)
Initial Purge - clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge R	Desc
(1200)	12.90	952	7.34	6.88	200.0	0.3L/min	clear
(1205)	13.50	987	6.51	6.79	198.2	"	clear
(1210)	13.45	1026	6.00	6.68	200.2	"	sl cloudy
(1215)	12.97	1092	4.74	6.53	204.7	"	sl cloudy
(1220)	12.72	1159	3.26	6.41	203.2	"	sl cloudy
(1225)	12.85	1184	2.44	6.37	196.9	"	sl cloudy
(1230)	13.00	1185	2.44	6.38	193.3	"	clear
(1235)	13.27	1203	2.21	6.38	186.8	"	clear
(1240)	13.31	1208	1.96	6.37	183.3	"	clear
(1245)	13.47	1205	1.89	6.36	181.6	"	clear
(1245)	Readings Stable						
(1301)	13.70	1220	2.29	6.46	170.4	"	clear

Sample Time (1250)

Samples Collected: (1) TM, (3) 8260, (2) 8011

WELL 7

DTW - 26.86
Post Purge DTW - 26.95

Begin Purge (1323)
Initial Purge - clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge R	Desc
(1325)	12.09	627	7.35	6.04	197.9	0.3L/min	clear
(1330)	11.74	566	6.89	6.02	204.7	"	clear
(1335)	11.86	551	6.51	6.04	206.0	"	clear
(1340)	11.91	556	6.40	6.05	206.4	"	clear
(1345)	11.88	564	6.37	6.06	207.0	"	clear
(1350)	11.81	570	6.35	6.07	207.3	"	clear
(1355)	11.66	571	6.32	6.07	207.7	"	clear
(1355)	Readings Stable						
(1410)	11.89	579	6.40	6.13	204.1		

Sample Time (1400)

Samples Collected: (1) TM, (3) 8260 (2) 8011

16-3

DTW - 58.35
Post Purge DTW - 65.16

Begin Purge (1433)
Initial Purge - clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge R	Desc
(1435)	12.34	223	8.88	7.56	150.5	0.3L/min	clear
(1440)	12.28	222	7.87	7.64	150.2	"	clear
(1445)	12.32	222	7.46	7.70	149.7	"	clear
(1450)	12.37	219	7.18	7.75	148.3	"	clear
(1455)	12.48	217	6.97	7.78	147.1	"	clear
(1500)	12.64	216	6.70	7.81	145.7	"	clear
(1505)	12.75	216	6.41	7.84	144.1	"	clear
(1510)	12.59	216	6.42	7.82	144.9	"	clear
(1515)	12.47	215	6.40	7.82	144.7		
(1515)	Readings Stable						
(1535)	12.69	214	6.71	7.83	146.4		

Complete!
6-15-09

Sample Time (1520)

Samples Collected: (2) TM, (6) 8260, (2) 8011, (2) 8270

General Notes

- weather: Overcast 30s
- PPE: Eye Protection, Nitrile Gloves
- Calibrations: YSI 650 MDS
  pH: 4.00 = 4.00, 7.00 = 6.99, 10.00 = 10.00
  Conductivity reads 1414 µs in 1413µs std
  DO% = 100
- Dedicated tubing and well skirts used @ each well and disposed of after each use
- All equipment deconed between each well
- Purged water contained and disposed of at dedicated location onsite
- Samples collected, stored and transported on ice in coolers

Static Water Level Table - Unit 16

Well	DTW	Post Purge DTW	Notes
16-1	DRY		
16-2	55.72	55.80	
16-3	58.35	65.16	
16-5	4.75	6.75	
16WC2B	55.20	58.95	
16MW8	72.85	75.39	
16WC1B	67.61	68.04	
16WC1A	67.39	69.42	
16MW9	64.05	64.75	
16C1	51.19	51.21	
16CDM3	DRY		
16C3	DRY		
16WC2A	DRY		

16-1 = DTW - DRY No Samples Collected (0945)

16-2

DTW - 55.72 Begin Purge (1006)
Post Purge DTW - 55.80 Initial Purge - clear

Time	Temp(°C)	Cond(µs)	DO mg/l	pH	ORP(mV)	Purge R	Desc
(1010)	10.19	642	7.77	6.58	200.8	0.3L/min	clear
(1015)	9.93	646	7.04	6.57	200.5	"	clear
(1020)	9.59	645	6.60	6.56	201.2	"	clear
(1025)	9.65	640	6.23	6.53	202.4	"	clear
(1030)	10.12	631	6.08	6.54	202.1	"	clear
(1035)	10.24	630	5.80	6.57	199.9	"	clear
(1040)	10.34	632	5.71	6.56	200.3	"	clear
(1045)	10.45	631	5.67	6.58	199.8	"	clear
(1050)	10.51	633	5.67	6.57	200.0	"	clear

(1050) Readings Stable
Sample Time (1055)
Samples Collected: (3) 8260, (1) TM, (2) 8270
(1100) 10.66 620 5.84 6.60 195.7 Post Purge Reading

16WC2B

DTW - 55.20 Begin Purge (1121)
Post Purge DTW - 58.95 Initial Purge - Clear

Time	Temp(°C)	Cond(µs)	DO mg/l	pH	ORP(mV)	Purge R	Desc
(1125)	10.82	288	8.00	7.48	156.9	0.3L/min	clear
(1130)	10.62	289	7.03	7.40	161.4	"	clear
(1135)	10.57	288	4.00	7.42	146.5	"	clear
(1140)	10.99	287	1.78	7.51	101.4	"	Clear
(1145)	11.00	287	1.72	7.53	86.9	"	Clear
(1150)	11.04	286	1.37	7.53	83.0	"	Clear
(1155)	11.06	286	1.35	7.54	79.5	"	Clear
(1200)	11.07	286	1.30	7.54	75.4	"	Clear

(1200) Readings Stable
(1210) 10.97 286 1.62 7.57 70.3 " Clear
Sample Time (1205) Samples Collected: (2) 8260, (1) TM, (2) 8270

16-5

DTW - 4.75
Begin Purge (1230)
Post Purge DTW - 6.75
Initial Purge - clear

Time	Temp(°)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge(gpm)	Desc
(1235)	10.86	438	2.75	7.16	113.5	0.3L/min	Clear
(1240)	10.81	444	2.16	7.11	118.0	"	Clear
(1245)	10.92	447	2.07	7.10	120.3	"	Clear
(1250)	11.26	447	2.74	7.12	123.4	"	Clear
(1255)	11.44	448	2.82	7.13	125.6	"	Clear
(1300)	11.11	450	2.91	7.11	129.4	"	Clear
(1305)	10.99	449	2.91	7.10	131.7	"	Clear
(1305)	Readings Stable						
(1320)	11.27	450	3.15	7.04	140.2		clear

Sample Time (1310)

Samples Collected: (3) 8260, (1) TM, (2) 8270

Spring 16

Time	Temp(°)	Cond(us)	DO mg/L	pH	ORP(mv)
(1343)	11.29	603	10.09	7.00	66.3

Sample Time (1345)

Samples Collected: (3) 8260, (1) TM, (2) 8270

16C1

DTW - 51.19
Begin Purge (1407)
Post Purge DTW - 51.21
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc
(1410)	10.31	551	6.76	6.84	153.9	0.3L/min	clear
(1415)	11.61	695	4.32	6.56	181.3	"	clear
(1420)	10.76	704	3.48	6.48	188.9	"	clear
(1425)	10.64	702	3.09	6.44	187.1	"	clear
(1430)	10.81	703	2.68	6.46	175.0	"	clear
(1435)	11.12	705	2.67	6.46	167.2	"	clear
(1440)	11.27	707	2.47	6.45	160.3	"	clear
(1445)	11.31	709	2.27	6.45	156.8	"	clear
(1450)	11.40	707	2.26	6.45	152.9	"	clear
(1455)	11.44	708	2.22	6.46	150.0	"	clear
(1455)	Readings Stable						
(1530)	12.21	712	2.51	6.49	141.7		

Sample Time (1500)

Samples Collected: (3) 8260, (1) TM, (2) 8151
(2) 8270, (1) Cyanide, (1) Sulfide, (1) Total Phenol, (2) 8081

General Notes

- Weather: Sunny 50s
- PPE: Eye Protection, Nitrile Gloves
- Calibrations: YSI 650 MDS
  pH: 4.00 = 4.00, 7.00 = 7.00, 10.00 = 10.00
  Conductivity reads 1413 us in 1413us std.
  DO% = 100
- Dedicated tubing and well skirts used at each well and disposed of after each use
- All equipment deconed between each well.
- Purged water contained and disposed of at dedicated location onsite
- Samples collected, stored and transported on ice in coolers

16WC1B

DTW - 67.61
Post Purge DTW - 68.04
Begin Purge (1000)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeR	Desc
(1005)	12.30	333	5.20	5.76	194.3	0.3 L/min	clear
(1010)	12.29	317	4.51	5.72	194.6	"	Clear
(1015)	12.18	301	4.14	5.62	200.2	"	clear
(1020)	12.43	283	3.86	5.61	208.0	"	clear
(1025)	12.56	271	3.52	5.57	244.7	"	clear
(1030)	12.61	268	3.28	5.62	263.9	"	Clear
(1035)	12.88	266	3.20	5.63	269.5	"	clear
(1040)	12.44	270	3.10	5.63	266.5	"	clear
(1045)	12.38	270	2.98	5.59	269.0	"	clear
(1050)	12.21	270	2.94	5.60	267.1	"	Clear
(1050)	Readings	Stable					
(1123)	12.43	294	3.04	5.75	274.9		

Sample Time (1055)
Samples Collected: (3) 8260, (1) TM, (2) 8151, (2) 8270
(1) CN, (1) Sulfide (1) TOTAL Phenol, (2) 8081

16WC1A

DTW - 67.39
Post Purge DTW - 69.42
Begin Purge (1139)
Initial Purge - clear

Time	Temp(°)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc
(1140)	11.74	471	8.98	7.27	234.7	0.3 L/min	clear
(1145)	11.98	582	6.24	6.90	229.2	"	clear
(1150)	12.14	620	3.86	6.74	223.5	"	clear
(1155)	12.22	644	2.88	6.77	209.4	"	clear
(1200)	12.10	647	2.75	6.77	205.3	"	clear
(1205)	12.00	652	2.66	6.75	202.8	"	clear
(1210)	12.17	650	2.52	6.74	182.0	"	clear
(1215)	12.29	650	2.36	6.74	117.6	"	clear
(1220)	12.36	653	2.21	6.75	83.0	"	clear
(1225)	12.51	656	2.19	6.76	70.7	"	clear
(1230)	12.62	6.56	2.17	6.76	67.2	"	clear
(1235)	12.71	658	2.16	6.74	61.9	"	clear
(1235)	Readings	Stable		~~6.67~~			
(1350)	13.01	652	2.21	6.67	58.1		

Sample Time (1240)
Samples Collected: (9) 8260, (3) TM, (6) 8151,
(6) 8270, (3) CN, (3) Sulfide, (3) Total Phenol, (6) 8081

16W DUP

Sample Time (1300)
Samples Collected: (3) 8260, (1) TM, (2) 8151,
(2) 8270, (1) CN, (1) Sulfide, (1) Total Phenol, (2) 8081
Duplicate well was sampled at 16WC1A

16MW9

DTW - 64.05
Post Purge DTW - 64.75

Begin Purge (clear)
Initial Purge - 1407

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc
(1410)	13.10	676	8.03	6.76	114.6	0.3 L/min	Clear
(1415)	13.45	690	6.48	6.57	104.4	"	clear
(1420)	13.47	731	3.30	6.43	75.1	"	Clear
(1425)	13.45	751	2.19	6.41	66.1	"	clear
(1430)	13.41	740	2.03	6.37	73.9	"	clear
(1435)	13.59	688	2.13	6.34	84.1	"	clear
(1440)	13.46	668	2.17	6.32	90.7	"	clear
(1445)	13.17	630	2.26	6.28	97.5	"	clear
(1450)	13.01	613	2.20	6.24	98.7	"	clear
(1455)	12.91	606	2.12	6.24	98.1	"	clear
(1500)	12.87	603	2.09	6.24	97.9	"	clear
(1500)	Readings Stable						
(1521)	13.10	597	2.31	6.29	87.1		

Sample Time (1505)
Samples Collected: (3) 8260, (1) TM, (2) 8151
(2) 8270, (1) CN, (1) Sulfide, (1) TOTAL Phenol, (2) 8081

16MW8

DTW - 72.85
Post Purge DTW - 75.39

Begin Purge (1534)
Initial Purge - sl Cloudy

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge	Desc
(1535)	13.55	104	6.42	5.39	230.7	0.3 L/min	sl. cloudy
(1540)	13.13	91	2.45	5.05	187.7	"	cloudy
(1545)	12.97	89	2.08	5.03	183.0	"	cloudy
(1550)	13.14	89	1.94	5.07	165.3	"	sl cloudy
(1555)	13.27	91	1.82	5.15	146.1	"	sl cloudy
(1600)	13.31	90	1.80	5.12	149.2	"	clear
(1605)	13.28	87	1.84	5.09	155.6	"	clear
(1605)	Readings Stable						

16MW8 cont

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)
(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) Sulfide, (1) Total Phenol, (1) 8081
Note: well was purged dry during sample collection

Completed
LJK 6-14-09

Static Water Level Table - Unit 7

WELL	DTW	Post Purge DTW	Notes
7W12B	24.60	24.62	
7W9C	13.94	16.86	
7W10B	15.09	15.66	
7W10C	18.94	20.67	
7W13	18.33	20.19	
7MW6	25.61	29.97	
7W11B	24.78	25.04	
7WCA	24.67	26.55	
7W9B	22.40	SWL ONLY	
7W11	23.77	"	
7MW5	24.72	"	

7W13

DTW - 18.33 Begin Purge (1253)

Post Purge DTW - 20.19 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purgek	Desc
(1255)	13.06	1268	7.00	7.36	101.7	0.3L/min	Clear
(1300)	13.32	1286	4.86	7.23	17.1	"	Clear
(1305)	13.49	1310	4.00	7.21	-3.0	"	Clear
(1310)	13.40	1327	3.71	7.22	-13.7	"	Clear
(1315)	13.22	1333	3.70	7.23	-5.8	"	Clear
(1320)	13.25	1331	3.72	7.25	-2.0	"	Clear
(1325)	13.18	1335	3.71	7.25	2.6	"	Clear
(1330)	13.07	1334	3.70	7.26	5.0	"	Clear

(1330) Readings Stable

Sample Time (1335)

Samples Collected: (1)TM, (1)CN, (2) 8270

(1344)	12.98	1345	3.85	7.27	10.0	Post Purge Reading

7W10C

DTW - 18.94 Begin Purge (1403)

Post Purge DTW - 20.67 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purgek	Desc
(1405)	12.71	806	2.05	7.06	92.5	0.3L/min	Clear
(1410)	13.20	797	1.91	7.06	93.1	"	Clear
(1415)	13.46	794	1.97	7.06	96.8	"	Clear
(1420)	13.33	796	1.97	7.05	100.9	"	Clear
(1425)	13.14	796	1.89	7.04	104.2	"	Clear
(1430)	13.13	795	1.90	7.03	105.3	"	Clear
(1435)	13.04	794	1.92	7.03	107.1	"	Clear

(1435) Readings Stable

(1452)	12.83	786	1.88	7.04	94.1	"	Clear

Sample Time (1440)

Samples Collected: (1)TM, (1)CN, (2)8270

7W9C

DTW - 13.94 Begin Purge (1513)

Post Purge DTW - 16.86 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purgek	Desc
(1515)	12.40	1141	2.63	6.83	115.2	0.3L/min	Clear
(1520)	12.31	1167	1.96	6.77	125.4	"	Clear
(1525)	12.25	1185	1.72	6.74	128.1	"	Clear
(1530)	12.26	1190	1.68	6.73	124.2	"	Clear
(1535)	12.27	1198	1.69	6.73	109.0	"	Clear
(1540)	12.27	1203	1.72	6.73	106.5	"	Clear
(1545)	12.30	1202	1.78	6.75	100.6	"	Clear

(1545) Readings Stable

(1600)	12.39	1186	2.06	6.76	90.3	Post Purge Reading

Sample Time (1550)

Samples Collected: (1)TM, (1)CN, (2)8270

7W12B

DTW - 24.60 Begin Purge (1127)
Post Purge DTW - 24.62 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(MV)	Purgek	Desc
(1130)	12.98	684	8.30	6.98	182.3	0.3L/mm	Clear
(1135)	12.90	684	7.54	6.95	186.6	"	Clear
(1140)	12.76	682	7.10	6.93	190.7	"	Clear
(1145)	12.68	681	6.90	6.93	192.9	"	Clear
(1150)	12.54	680	6.73	6.92	194.5	"	Clear
(1155)	12.35	677	6.61	6.91	196.7	"	Clear
(1200)	12.21	677	6.58	6.91	197.3	"	Clear
(1205)	12.17	677	6.54	6.91	197.0	"	Clear
(1205)	Readings Stable						
(1226)	11.95	669	6.63	6.90	194.2	Post Purge Reading	

Sample Time (1210)

Samples Collected: (3)8260, (1)TM, (2)8270, (1)CN, (2)8151
(1) Sulfide, (1)9065, (2)8081

7W10B

DTW - 15.09 Begin Purge (1244)
Post Purge DTW - 15.66 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(MV)	Purgek	Desc
(1245)	11.70	934	4.67	6.78	192.1	0.3L/min	Clear
(1250)	11.67	929	3.55	6.73	192.5	"	Clear
(1255)	11.60	920	3.18	6.72	190.4	"	Clear
(1300)	11.63	916	3.10	6.71	187.7	"	Clear
(1305)	11.63	915	2.98	6.71	184.7	"	Clear
(1310)	11.56	916	2.93	6.71	181.5	"	Clear
(1315)	11.57	917	2.99	6.71	178.6	"	Clear
(1315)	Readings Stable						
(1332)	11.72	915	3.75	6.73	173.8	Post Purge Reading	

Sample Time (1320)

Samples Collected: (1)TM, (2)8270, (1)CN

7MW6

DTW - 25.61 Begin Purge (1341)
Post Purge DTW - 29.97 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(MV)	Purgek	Desc
(1345)	12.21	1535	2.53	7.31	-19.9	0.3L/min	Clear
(1350)	12.21	1601	2.26	7.20	-62.4	"	Clear
(1355)	12.34	1649	2.17	7.13	-78.6	"	Clear
(1400)	12.46	1664	2.17	7.11	-84.6	"	Clear
(1405)	12.53	1677	2.29	7.11	-91.5	"	Clear
(1410)	12.53	1679	2.25	7.08	-93.7	"	Clear
(1415)	12.64	1678	2.26	7.08	-96.5	"	
(1415)	Readings Stable						
(1434)	12.90	1565	2.37	7.24	-88.1	Post Purge Reading	

Sample Time (1420)

Samples Collected: (3)8260, (1)TM, (2)8270, (1)CN, (2)8151
(1) Sulfide, (1)9065, (2)8081

7W11B

DTW - 24.78 Begin Purge (1448)
Post Purge DTW - 25.04 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(MV)	Purgek	DesC
(1450)	12.69	883	6.14	6.44	41.4	0.3L/min	Clear
(1455)	12.68	835	5.21	6.42	53.7	"	Clear
(1500)	12.51	772	4.02	6.39	58.9	"	Clear
(1505)	12.45	748	3.65	6.38	60.7	"	Clear
(1510)	12.44	728	3.28	6.37	61.1	"	Clear
(1515)	12.44	708	3.04	6.36	48.3	"	Clear
(1520)	12.48	702	2.89	6.37	36.5	"	Clear
(1525)	12.48	705	2.84	6.37	32.1	"	Clear
(1530)	12.49	708	2.82	6.37	29.2	"	Clear
(1530)	Readings Stable						
(1618)	12.80	745	2.93	6.43	38.3	Post Purge Reading	

7W11B (Cont.)

Sample Time (1535)

Samples Collected: (9)8260, (3)TM, (6)8270, (6)8151
(3)CN, (3)Sulfide, (3)9065, (6)8081

7WCA

DTW - 24.67
Begin Purge (1632)
Post Purge DTW - 26.55
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	Do mg/L	pH	ORP(mV)	PurgeR	Desc
(1635)	12.73	853	4.08	6.68	82.4	0.3L/min	Clear
(1640)	12.74	854	3.20	6.67	83.4	"	Clear
(1645)	12.75	861	2.93	6.65	87.3	"	Clear
(1650)	12.89	867	2.90	6.65	92.1	"	Clear
(1655)	12.98	873	2.84	6.65	96.6	"	Clear
(1700)	13.01	877	2.86	6.65	101.3	"	Clear
(1705)	13.00	881	2.79	6.65	103.0	"	Clear
(1705)	Readings Stable						
(1740)	13.04	894	2.87	6.69	105.2 Post Purge Reading		

Sample Time (1710)

Samples Collected: (3)8260, (1)TM, (2)8270, (2)8151
(1)CN, (1)Sulfide, (1)9065, (2)8081

7WDUP

Sample Time (1725)

Samples Collected: (3)8260, (1)TM, (2)8270, (2)8151
(1)CN, (1)Sulfide, (1)9065, (2)8081

* Duplicate well sampled at 7WCA

QAQC Completed 6-15-09

General Notes

Weather - Overcast, 40's
PPE - Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 9.98
Conductivity reads 1413 us in 1413 us std
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purge water contained and disposed of at dedicated location onsite
- All samples collected, stored and transported in coolers on ice

Static Water Level Table - Unit 10

WELL	DTW	Post Purge DTW	Notes
10DDH2R	19.40	19.46	
10D3	17.64	17.82	
10D3D	17.61	17.69	
10MW1	17.97	18.12	
10D4	22.72		

10MW1

DTW - 17.97
Begin Purge (1024)
Post Purge DTW - 18.12
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	Do mg/L	pH	ORP(mV)	PurgeR	Desc
(1024)	13.46	944	9.66	7.22	158.3	0.3L/min	Clear
(1030)	13.23	623	8.05	7.16	178.4	"	Clear
(1035)	13.17	585	7.82	7.16	182.9	"	Clear
(1040)	13.10	538	7.36	7.15	192.7	"	Clear
(1045)	12.94	508	7.10	7.14	198.8	"	Clear
(1050)	12.93	487	6.92	7.14	200.9	"	Clear
(1055)	12.87	476	6.88	7.14	202.5	"	Clear
(1055)	Readings Stable						
(1114)	13.02	447	6.77	7.13	202.0 Post Purge Reading		

10MW1 (Cont.)

Sample Time (1100)

Samples Collected: (3)8260, (1)TM, (2)8151, (2)8270
(1)CN, (1)Sulfide, (1)9065, (2)8081

10D3D

DTW - 17.61 Begin Purge (1128)

Post Purge DTW - 17.69 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc
(1130)	13.45	598	1.95	7.13	-193.9	0.3L/min	Clear
(1135)	13.70	635	1.93	7.04	-213.4	"	Clear
(1140)	13.76	661	2.10	7.05	-214.5	"	Clear
(1145)	13.47	667	2.46	7.03	-212.1	"	Clear
(1150)	13.35	671	2.72	7.02	-208.8	"	Clear
(1155)	13.10	675	3.20	7.03	-198.6	"	Clear
(1200)	12.83	679	3.20	7.02	-195.2	"	Clear
(1205)	12.64	683	3.26	7.01	-191.3	"	Clear
(1205) Readings Stable							
(1258)	12.92	677	3.58	7.08	-180.4	Post Purge Reading	

Sample Time (1210)

Samples Collected: (9)8260, (3)TM, (6)8151, (6)8270, (3)CN
(3)Sulfide, (3)9065, (6)8081

10DUP

Sample Time (1405)

Samples Collected: (3)8260, (1)TM, (2)8151, (2)8270
(1)CN, (1)Sulfide, (1)9065

* Duplicate well sampled at 10D3

10D3

DTW - 17.64 Begin Purge (1310)

Post Purge DTW - 17.82 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc
(1310)	12.66	605	4.49	6.91	-24.4	0.3L/min	Clear
(1315)	12.43	601	3.77	6.91	-2.7	"	Clear
(1320)	12.43	580	3.80	6.92	14.3	"	Clear
(1325)	12.45	571	3.81	6.93	21.5	"	Clear
(1330)	12.32	564	4.18	6.96	26.7	"	Clear
(1335)	12.35	561	3.96	6.94	30.9	"	Clear
(1340)	12.48	560	3.90	6.94	34.5	"	Clear
(1345)	12.34	562	3.92	6.94	35.6	"	Clear

(1345) Readings Stable - Purge water had a rotten odor.

Sample Time (1350)

Samples Collected: (3)8260, (1)TM, (2)8151, (2)8270
(1)CN, (1)Sulfide, (1)9065, (2)8081

(1433)	12.64	569	3.86	6.98	28.3	Post Purge Reading

10DDH2R

DTW - 19.40 Begin Purge (1445)

Post Purge DTW - 19.46 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc
(1445)	12.50	642	2.55	6.96	40.1	0.3L/min	Clear
(1450)	12.27	644	1.72	7.00	22.8	"	Clear
(1455)	11.83	629	2.03	7.01	12.3	"	Clear
(1500)	11.62	627	2.18	7.02	9.6	"	Clear
(1505)	11.64	624	2.29	7.02	8.4	"	Clear
(1510)	11.64	622	2.38	7.02	5.9	"	Clear
(1515)	11.59	622	2.41	7.02	3.8	"	Clear
(1515) Readings Stable							
(1530)	11.77	593	2.51	6.78	8.6	Post Purge Reading	

Sample Time (1520)

Samples Collected: (3)8260, (1)TM, (2)8151, (2)8270, (1)CN, (1)Sulfide, (1)9065
(2)8081

10D4

DTW - 22.72
Post Purge DTW - 22.74

Begin Purge (1543)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc
(1545)	12.50	308	6.84	6.78	43.8	0.3 L/min	Clear
(1550)	12.66	309	4.98	6.62	56.7	"	Clear
(1555)	12.37	305	4.20	6.56	61.8	"	Clear
(1600)	12.22	295	3.96	6.54	58.8	"	Clear
(1605)	12.10	292	3.84	6.53	57.1	"	Clear
(1610)	12.09	291	3.80	6.53	56.3	"	Clear
(1610)	Readings Stable						
(1628)	12.28	290	4.21	6.60	59.6	Post Purge Reading	

Sample Time (1615)

Samples Collected: (3) 8260, (2) 8151, (2) 8270, (2) 8081
(1) TM, (1) CN, (1) Sulfide, (1) 9065

SLK 6-15-09
Completed

General Notes

Weather - Sunny, 50-60's
PPE - Eye Protection, Nitrile gloves

WELL Maintenance Log - Unit 433

WELL	Notes
74MW2	Replaced water level port plug
74MW5	Replaced water level port plug
74MW4	Replaced water level port plug
74MW1	Replaced water level port plug
74MW3	Repaired well head sample tubing, Replaced water Level Port Plug
74MW6	Repaired Well head Sample tubing, Replaced water level plug
74MW7	Could not replace plug due to suspended software based conductivity meter.

WELL Maintenance Log - Unit 10

WELL	Notes
10DDH2R	Replaced water level port plug
10D3	Replaced Water level port plug
10D3D	Replaced water level port plug
10MW1	Replaced water level port plug
10D4	Replaced Water level port plug

General Notes

Weather -
PPE - Eye Protection, Nitrile gloves, Hard Hats
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00 , 7.00 = 7.01 , 10.00 = 10.00
Conductivity reads 1414 us in 1413 us std.
DO % = 100

- Dedicated tabing and well skirts used at each well
- All equipment deconed between each well
- Purge water contained and disposed of at dedicated location onsite
- All samples collected, stored and transported in coolers on ice.

Static Water Level Table - Unit - 5

WELL	DTW	Post Purge DTW	Notes
S5W7	11.87	11.87	
S5W5	8.52	9.07	
5W9A	2.50	2.51	
5W10A	14.37	14.55	
5W11A	10.93	12.04	
5W8B	16.17	16.53	
5W7B	9.84	9.91	
5W5B	9.93	11.06	
5WC21	9.95	10.01	
5WC22	9.96	10.02	
5WC23	9.37	9.51	
		SWL ONLY	
5WCA	14.51	"	
S5W6	7.28	"	
S5W8	13.11	"	
5WC11	17.16	"	
5WC12	16.97	"	

5W8B

DTW - 16.17
Post Purge DTW - 16.53
Begin Purge (0951)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge R	Desc
(0955)	13.18	161	7.91	4.62	240.2	0.3 L/min	Clear
(1000)	13.71	114	6.30	4.40	264.8	"	Clear
(1005)	13.62	98	5.98	4.37	270.5	"	Clear
(1010)	13.48	88	5.69	4.33	273.4	"	Clear
(1015)	13.52	83	5.49	4.32	277.7	"	Clear
(1020)	13.43	79	5.34	4.33	279.4	"	Clear
(1020)	Readings Stable						
(1044)	13.24	64	5.04	4.33	281.8	Post Purge Reading	

Sample Time (1025)
Samples Collected: (3)8260, (2)8151, (2)8270, (2)8081
(1)9065, (1)CN, (1)TM, (1)Sulfide

5W5B

DTW - 9.93
Post Purge DTW - 11.06
Begin Purge (1114)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge R	Desc
(1115)	11.36	380	6.40	5.62	240.8	0.3 L/min	Clear
(1120)	11.27	336	6.42	5.67	234.4	"	Clear
(1125)	11.20	301	6.43	5.69	230.8	"	Clear
(1130)	11.12	276	6.42	5.71	228.4	"	Clear
(1135)	11.10	274	6.42	5.74	225.1	"	Clear
(1140)	11.19	272	6.45	5.75	224.6	"	Clear
(1145)	11.15	273	6.41	5.75	224.8	"	Clear
(1145)	Readings Stable						
(1209)	11.14	287	6.20	5.65	221.2	Post Purge Reading	

Sample Time (1150)
Samples Collected: (3)8260, (2)8151, (2)8270, (2)8081
(1)9065, (1)CN, (1)TM, (1)Sulfide

S5W7B

DTW - 9.84

Begin Purge (1229)

Post Purge DTW - 9.91

Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purgek	Desc
(1230)	11.28	206	6.33	3.58	348.5	0.3 L/min	Clear
(1235)	11.51	212	5.79	3.51	401.8	"	Clear
(1240)	11.52	215	5.75	3.52	423.4	"	Clear
(1245)	11.45	214	5.78	3.55	428.3	"	Clear
(1250)	11.45	210	5.78	3.57	433.8	"	Clear
(1255)	11.48	207	5.79	3.58	436.3	"	Clear
(1300)	11.55	205	5.79	3.58	440.1	"	Clear
(1300)	Readings Stable						
(1358)	12.05	216	5.73	3.45	~~3~~435.2 DS 4/20/09	Post Purge Reading	

Sample Time (1305)

Samples Collected: (9)8260, (6)8151, (6)8270, (6)8081
(3)9065, (3)CN, (3)TM, (3)Sulfide

S5W5

DTW - 8.52

Begin Purge (1413)

Post Purge DTW - 9.07

Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purgek	Desc
(1415)	12.34	292	3.57	6.04	284.7	0.3 L/min	Clear
(1420)	12.21	256	2.55	5.98	272.7	"	Clear
(1425)	12.27	253	2.03	5.98	261.6	"	Clear
(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	"	Clear
(1445)	12.36	265	1.53	5.99	235.4	"	Clear
(1450)	12.39	269	1.56	6.00	231.9	"	Clear
(1450)	Readings Stable						
(1504)	12.58	276	1.67	6.00	226.1	Post Purge Reading	

Sample Time (1455)

Samples Collected: (3)8260, (2)8270, (1)TM

S5W7

DTW - 11.87

Begin Purge (1523)

Post Purge DTW - 11.87

Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	DesC
(1525)	14.08	325	1.83	6.78	190.2	0.3 L/min	Clear
(1530)	14.19	330	1.74	6.79	189.0	"	Clear
(1535)	14.27	333	1.77	6.78	185.2	"	Clear
(1540)	14.27	335	1.82	6.77	181.5	"	Clear
(1545)	14.30	336	1.88	6.77	176.2	"	Clear
(1550)	14.47	336	1.93	6.77	173.6	"	Clear
(1555)	14.58	337	1.97	6.78	171.1	"	Clear
(1555)	Readings Stable						
(1613)	14.46	340	1.98	6.79	165.2	Post Purge Reading	

Sample Time (1600)

Samples Collected: (2)8270, (3)8260, (1)TM

General Notes

- Weather: Overcast, 40's
- PPE: Eye Protection, Nitrile Gloves, Hard Hats

Calibrations - YSI 650 MDS
pH - 4.00 = , 7.00 = , 10.00 =
Conductivity reads ______ us in 1413 us std
DO % = 100

5WC21

DTW - 9.95 Begin Purge (0914)
Post Purge DTW - 10.01 Initial Purge - Clear

Time	Temp(°c)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc
(0914)	13.09	593	8.73	3.31	317.9	0.3L/min	Clear
(0915)	13.11	593	8.50	3.29	321.3	"	Clear
(0920)	13.11	576	7.00	3.30	371.9	"	Clear
(0925)	12.97	583	6.54	3.29	385.5	"	Clear
(0930)	13.00	578	6.08	3.29	397.3	"	Clear
(0935)	13.08	573	5.45	3.30	408.8	"	Clear
(0940)	12.97	569	5.00	3.29	418.6	"	Clear
(0945)	12.89	566	4.75	3.28	422.1	"	Clear
(0950)	12.81	563	4.42	3.29	428.9	"	Clear
(0955)	12.97	559	4.15	3.30	431.2	"	Clear
(1000)	13.05	558	3.95	3.31	430.6	"	Clear
(1005)	12.89	556	3.91	3.31	434.1	"	Clear
(1005)	Readings Stable						
(1043)	12.81	552	3.96	3.34	425.8	Post Purge Reading	

Sample Time (1010)
Samples Collected: (4)8260, (2)8151, (2)8270, (2)8081, (1)TM
(1)CN, (1)9065, (1) Sulfide

5WDUP

Sample Time (1025)
Samples Collected: (4)8260, (2)8151, (2)8270, (2)8081, (1)TM, (1)CN
(1)9065, (1) Sulfide

*Collected at 5WC21

5WC22

DTW - 9.96 Begin Purge (1059)
Post Purge DTW - 10.02 Initial Purge - Clear

Time	Temp(°c)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc
(1100)	12.78	803	4.12	6.38	295.1	0.3L/min	Clear
(1105)	12.71	810	2.92	6.36	278.7	"	Clear
(1110)	12.56	812	2.62	6.39	261.5	"	Clear
(1115)	12.63	813	2.55	6.40	248.3	"	Clear
(1120)	12.78	817	2.53	6.41	235.8	"	Clear
(1125)	13.22	817	2.55	6.44	223.0	"	Clear
(1130)	12.98	820	2.48	6.44	210.9	"	Clear
(1135)	12.93	819	2.45	6.43	206.5	"	Clear
(1140)	12.84	819	2.42	6.43	203.7	"	Clear
(1140)	Readings Stable						
(1201)	12.71	816	2.57	6.48	186.5	Post Purge Reading	

Sample Time (1145)
Samples Collected: (4)8260, (2)8151, (2)8270, (2)8081
(1)CN, (1)TM, (1)9065, (1) Sulfide

5WC23

DTW - 9.37 Begin Purge (1214)
Post Purge DTW - 9.51 Initial Purge - Clear

Time	Temp(°c)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge R	Desc
(1215)	12.03	830	5.27	6.83	143.2	0.3L/min	Clear
(1220)	12.29	830	3.25	6.48	169.6	"	Clear
(1225)	12.21	828	2.73	6.43	168.4	"	Clear
(1230)	12.19	824	2.62	6.44	166.3	"	Clear
(1235)	12.10	824	2.62	6.46	160.1	"	Clear
(1240)	12.17	823	2.61	6.47	156.5	"	Clear
(1245)	12.32	821	2.57	6.47	150.8	"	Clear
(1250)	12.43	824	2.57	6.49	148.7	"	Clear
(1250)	Readings Stable						
(1313)	12.76	821	2.58	6.52	153.9	Post Purge Reading	

5WC23 (Cont)

Sample Time (1255)

Samples Collected: (4)8260, (2)8270, (2)8151, (2)8081
(1)TM, (1)CN, (1)9065, (1) Sulfide

5W9A

DTW - 2.50
Begin Purge (1334)
Post Purge DTW - 2.51
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge L	Desc
(1335)	13.67	405	4.32	7.19	136.2	0.3L/min	Clear
(1340)	13.98	392	4.45	7.27	134.6	"	Clear
(1345)	14.18	387	4.47	7.30	133.5	"	Clear
(1350)	14.51	383	4.49	7.32	132.3	"	Clear
(1355)	14.67	382	4.45	7.33	131.6	"	Clear
(1400)	14.29	380	4.41	7.28	134.4	"	Clear
(1405)	13.84	380	4.39	7.27	133.9	"	Clear
(1405)	Readings Stable						
(1419)	14.16	377	4.46	7.32	126.1	Post Purge Reading	

Sample Time (1410)

Samples Collected: (4)8260, (2)8270, (1)TM

5W10A

DTW - 14.37
Begin Purge (1433)
Post Purge DTW - 14.55
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge L	Desc
(1435)	14.87	387	2.92	7.45	124.0	0.3L/min	Clear
(1440)	14.96	384	2.79	7.47	123.8	"	Clear
(1445)	14.52	381	2.76	7.45	124.2	"	Clear
(1450)	14.16	377	2.80	7.45	122.3	"	Clear
(1455)	14.21	374	2.84	7.45	120.2	"	Clear
(1500)	14.07	374	2.83	7.46	118.1	"	Clear
(1505)	14.30	374	2.90	7.47	114.2	"	Clear
(1505)	Readings Stable						

5W10A (Cont.)

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge L	Desc
(1519)	14.53	379	2.87	7.50	116.4	0.3L/min	Clear

Sample Time (1510)

Samples Collected: (4)8260, (2)8270, (1)TM

5W11A

DTW - 10.93
Begin Purge (1534)
Post Purge DTW - 12.04
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge L	Desc
(1535)	14.09	766	2.84	6.40	79.8	0.3L/min	Clear
(1540)	14.16	725	2.58	6.34	101.7	"	Clear
(1545)	14.14	648	2.41	6.33	113.3	"	Clear
(1550)	14.18	645	2.39	6.33	113.4	"	Clear
(1555)	14.18	637	2.38	6.32	112.6	"	Clear
(1600)	14.28	633	2.42	6.33	110.3	"	Clear
(1605)	14.34	630	2.44	6.33	108.6	"	Clear
(1610)	14.30	630	2.45	6.33	107.4	"	Clear
(1610)	Readings Stable						
(1626)	14.41	626	2.55	6.35	100.6	Post Purge Reading	

Sample Time (1615)

Samples Collected: (4)8260, (2)8270, (1)TM

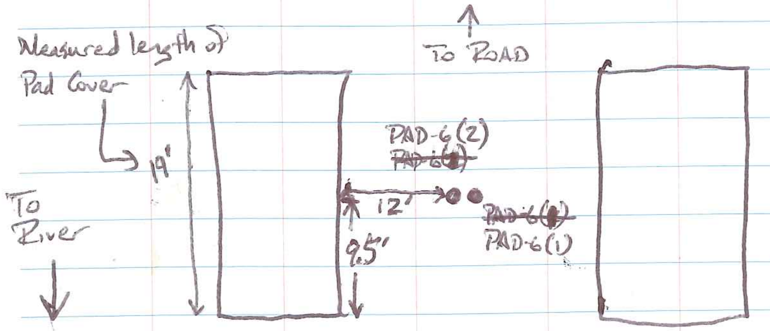
06/04/09 RAAP FB# 8
B03204-203C
RM/KFC

General Notes:

- Weather - Partly Cloudy, 70°s
- PPE - Eye Protection, Heavy Duty Nitrile Exterior Gloves, Chemical Resistant Boots, Face Shield, White Cotton Flame Retardant Coveralls, Hard Hats, Dusk Masks
- All equipment deconned after ; between samplings.
- Dedicated equipment used at each sampling location.
- Decon water containerized and disposed of at plant treatment site.
- Samples collected, stored and transported in coolers on ice.

PAD-6 / DUP

PAD-6(1) + PAD-6(2) are co-located duplicate samples



- Holes for PAD-6(1) and PAD-6(2) are inches apart

- DUP(1) collected w/ Sample PAD-6(1)
- DUP(2) collected w/ Sample PAD-6(2)

PAD6(1) + DUP(1) Sample Collection Time: 0835
Samples Collected: 1 each TM (Lead only)
Stainless Steel sampler deconned after collecting PAD-6(1) + Dup(1)

PAD-6(2) + DUP(2) Sample Collection Time: 0845
Samples Collected: 1 each TM (lead only)
Stainless Steel sampler deconned after collecting PAD-6(2) + DUP(2)

Left Site ~0900

6/10/09 RAAP FB#8
B03204-07
DAS/TAE
verification

General Notes

Weather - Sunny, 80's
PPE - Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 9.97
Conductivity reads 1414 us in 1413 us std
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well location
- Purge water contained and disposed of at dedicated location onsite
- All samples collected, stored and transported in coolers on ice.

5WC21

DTW - 8.69 Begin Purge (1029)
Post Purge DTW - 8.73 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge Rate(gpm)	Desc
(1030)	17.69	596	5.33	3.29	366.5	0.34 l/min	Clear
(1035)	17.61	597	4.57	3.50	342.7	"	Clear
(1040)	18.18	595	4.10	3.56	347.0	"	Clear
(1045)	18.89	597	3.91	3.61	348.1	"	Clear
(1050)	18.01	598	3.83	3.74	337.8	"	Clear
(1055)	17.76	604	3.60	3.66	343.8	"	Clear
(1100)	17.10	602	3.43	3.58	353.9	"	Clear
(1105)	17.08	600	3.38	3.56	356.5	"	Clear
(1110)	17.19	600	3.38	3.58	358.2	"	Clear

(1110) Readings Stable
Sample Time (1115)
Samples Collected: (2)8081, (2)8081

5WC22

DTW - 8.55
Begin Purge (1141)
Post Purge DTW - 8.59
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR(gpm)	Desc
(1145)	16.50	895	2.76	6.07	199.7	0.34/min	Clear
(1150)	16.49	927	2.73	6.08	197.0	"	Clear
(1155)	16.63	955	2.81	6.12	191.8	"	Clear
(1200)	16.50	978	2.85	6.14	184.4	"	Clear
(1205)	16.43	982	2.89	6.15	182.7	"	Clear
(1210)	16.32	986	2.92	6.19	164.3	"	Clear
(1215)	16.34	988	2.85	6.17	167.5	"	Clear
(1220)	16.30	989	2.86	6.17	169.6	"	Clear

(1220) Readings Stable
Sample Time (1225)
Samples Collected: (2)8081, (2)8081

5WC23

DTW - 7.94
Begin Purge (1306)
Post Purge DTW - 7.95
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR(gpm)	Desc
(1310)	16.90	927	3.81	6.32	141.3	0.34/min	Clear
(1315)	16.94	1035	3.58	6.26	147.4	"	Clear
(1320)	16.67	1101	3.46	6.25	147.8	"	Clear
(1325)	16.61	1117	3.33	6.24	147.3	"	Clear
(1330)	16.85	1121	3.36	6.23	146.4	"	Clear
(1335)	16.99	1117	3.31	6.23	147.4	"	Clear
(1340)	16.97	1119	3.36	6.22	147.2	"	Clear
(1345)	17.03	1116	3.35	6.22	148.1	"	Clear

(1345) Readings Stable
Sample Time (1350)
Samples Collected: (2)8081, (2)8081

5W5B

DTW - 8.34
Begin Purge (1428)
Post Purge DTW - 9.73
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR(gpm)	Desc
(1430)	14.46	587	6.59	5.33	162.4	0.34/min	Clear
(1435)	14.05	620	6.39	5.32	173.3	"	Clear
(1440)	13.78	622	6.44	5.32	180.5	"	Clear
(1445)	13.82	629	6.52	5.37	183.9	"	Clear
(1450)	13.94	624	6.58	5.40	185.7	"	Clear
(1455)	13.87	624	6.55	5.42	186.7	"	Clear
(1500)	1385	622	6.60	5.43	187.5	"	Clear

(1500) Readings Stable
Sample Time (1505)
Samples Collected: (3)8260, (3)8260, (2)8081, (2)8081

5W7B

DTW - 8.68
Begin Purge (1537)
Post Purge DTW - 8.73
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR(gpm)	Desc
(1540)	15.22	264	8.00	3.34	377.8	0.34/min	Clear
(1545)	14.64	263	7.90	3.27	406.5	"	Clear
(1550)	14.52	262	7.88	3.27	417.1	"	Clear
(1555)	14.46	264	7.85	3.29	425.6	"	Clear
(1600)	14.35	267	7.87	3.32	433.3	"	Clear
(1605)	13.96	265	7.86	3.36	430.7	"	Clear
(1610)	13.90	265	7.86	3.36	436.6	"	Clear

(1610) Readings Stable
Sample Time (1615)
Samples Collected: (3)8260, (3)8260, (2)8081, (2)8081

General Notes

Weather - Overcast, 70's
PPE- Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00 , 7.00 = 7.00 , 10.00 = 9.98
Conductivity reads 1413 us in 1413 us std
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purge water disposed of at dedicated location onsite
- All samples collected, stored and transported in coolers on ice

7MW6

DTW - 24.76 Begin Purge (1003)
Post Purge DTW - 30.82 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge K(gpm)	Desc
(1005)	14.92	1761	9.62	7.04	20.1	0.3 L/min	Clear
(1010)	14.89	1895	6.03	6.90	-79.9	"	Clear
(1015)	14.86	1938	4.80	6.87	-96.2	"	Clear
(1020)	14.96	1894	4.13	6.88	-106.4	"	Clear
(1025)	14.97	1845	3.95	6.92	-105.6	"	Clear
(1030)	14.91	1797	3.82	6.99	-100.1	"	Clear
(1035)	14.91	1780	3.73	7.03	-102.9	"	Clear

(1035) Readings Stable
Sample Time (1040)
Samples Collected: (3)8260, (3)8260

16MW8

DTW - 70.14 Begin Purge (1151)
Post Purge DTW - 70.65 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge K(gpm)	Desc
(1155)	15.51	203	8.08	4.95	212.6	≤0.3 L/min	Clear
(1200)	15.99	177	4.70	4.88	173.5	"	Clear
(1205)	16.10	163	4.36	4.91	162.7	"	Clear
(1210)	16.08	156	4.07	4.99	140.9	"	Clear
(1215)	15.91	154	3.84	5.01	136.8	"	Clear
(1220)	15.76	154	3.72	5.00	134.4	"	Clear

(1220) Readings Stable
Sample Time (1225)
Samples Collected: (3)8260, (3)8260

10DDH2R

DTW - 17.62 Begin Purge (1249)
Post Purge DTW - 17.68 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge K(gpm)	Desc
(1250)	14.51	543	5.98	6.79	30.4	0.3 L/min	Clear
(1255)	14.39	611	3.15	6.88	21.5	"	Clear
(1300)	14.07	636	2.80	6.90	20.1	"	Clear
(1305)	13.87	625	2.98	6.76	39.7	"	Clear
(1310)	13.81	524	3.56	6.49	59.5	"	Clear
(1315)	13.81	434	4.37	6.34	76.7	"	Clear
(1320)	14.08	374	5.39	6.30	86.2	"	Clear
(1325)	13.99	368	5.56	6.28	89.5	"	Clear
(1330)	14.00	363	5.66	6.27	91.8	"	Clear

(1330) Readings Stable
Sample Time (1335)
Samples Collected: (3)8260, (3)8260

Completed
6-17-09

16-3

DTW - 56.77 Begin Purge (1554)

Purge DTW - 62.15 Initial Purge - Clear

Time	Temp(°)	Cond(us)	DO mg/L	pH	ORP(mV)	Purge k	Desc
(1555)	15.36	242	8.40	7.36	131.7	0.34/min	Clear
(1600)	15.27	240	7.08	7.54	129.5	"	Clear
(1605)	14.74	232	6.64	7.72	125.4	"	Clear ✓
(1610)	14.30	229	6.40	7.78	123.9	"	Clear
(1615)	14.28	228	6.28	7.81	122.6	"	Clear
(1620)	14.69	228	6.31	7.81	120.7	"	Clear
(1625)	15.10	228	6.36	7.85	119.1	"	Clear
(1630)	15.14	228	6.36	7.87	118.8	"	Clear
(1630)	Readings Stable						
(1646)	14.72	225	6.50	7.81	120.9	Post Purge	Reading

Sample Time (1635)

Samples Collected: (6)8260, (2)8011, (2)8270, (2)TM

General Notes

Weather -

PPE - Eye Protection, Nitrile gloves

Calibrations - YSI 650 MDS

pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 10.00

Conductivity reads 1413 us in 1413 us Std

DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purged water disposed of at dedicated location onsite
- All samples collected, stored and transported in coolers on ice

Static Water Level Table - Unit 16

WELL	DTW	Post Purge DTW	Notes
16-1	43.99	47.49	
16-2	55.76	55.79	
16-3	56.77	62.15	
16-5	4.67	9.74	✓
16WC2B	53.53	57.75	
16MW8	73.96	75.34	
16WC1B	69.53	69.76	
16WC1A	69.21	70.89	
16MW9	66.31	66.78	
16C1	48.76		
			DTW-ONLY
16CDH3	DRY		"
16C3	68.25		"
16WC2A	DRY		"

10/7/09 RAAP FB#8
B03204-07
DAS/TQE

16-1

DTW - 43.99 Begin Purge(0939)

Post Purge DTW - 47.49 Initial Purge - Sl. Cloudy

Time	Temp(°C)	Cond(us)	DO ug/L	pH	ORP(mv)	PurgeK	Desc	DTW
(0940)	15.31	550	7.62	6.93	209.4	0.34/min	Sl. Cloudy	45.45
(0945)	15.60	541	7.08	6.92	205.1	"	Sl. Cloudy	46.08
(0950)	16.16	481	6.61	6.98	194.6	"	Clear	46.36
(0955)	15.54	441	6.58	6.97	190.6	"	Clear	46.82 ✓
(1000)	15.83	428	6.47	6.94	188.4	"	Clear	46.96
(1005)	16.08	422	6.42	6.99	183.0	"	Clear	47.13
(1010)	16.18	418	6.46	7.01	180.2	"	Clear	47.22
(1010)	Readings Stable							
(1025)	16.14	404	6.70	6.95	172.7	Post Purge Readings		

Sample Time (1015)

Samples Collected: (3)8260, (2)8270, (1)TM

16-2

DTW - 55.76 Begin Purge(1039)

Post Purge DTW - 55.79 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1040)	16.14	567	7.26	6.88	174.9	0.34/min	Clear	55.77
(1045)	15.97	580	5.79	6.69	172.5	"	Clear	55.77
(1050)	15.20	586	4.47	6.61	171.6	"	Clear	55.78 ✓
(1055)	14.77	583	4.16	6.61	169.2	"	Clear	55.78
(1100)	15.44	581	4.00	6.65	165.6	"	Clear	55.78
(1105)	15.10	582	3.81	6.65	164.9	"	Clear	55.78
(1110)	14.94	579	3.75	6.63	164.5	"	Clear	55.78
(1115)	15.05	578	3.71	6.64	162.5	"	Clear	55.78
(1115)	Readings Stable							
(1130)	14.90	567	3.82	6.65	166.1	Post Purge Reading		

Sample Time (1120)

Samples Collected: (3)8260, (2)8270, (1)TM

10/7/09 RAAP FB#8
B03204-07
DAS/TQE

16WC2B

DTW - 53.53 Begin Purge(1154)

Post Purge DTW - 57.75 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1155)	16.67	293	8.69	7.64	146.7	0.34/min	Clear	54.60
(1200)	15.74	283	4.04	7.48	149.7	"	Clear	55.28
(1205)	15.57	282	2.16	7.58	117.3	"	Clear	55.89
(1210)	15.98	277	1.81	7.58	115.2	"	Clear	56.01
(1215)	16.20	273	1.64	7.58	113.9	"	Clear	56.14
(1220)	16.57	274	1.46	7.63	102.8	"	Clear	56.51
(1225)	16.19	272	1.25	7.61	104.3	"	Clear	56.76 ✓
(1230)	16.40	272	1.16	7.58	104.2	"	Clear	56.92
(1235)	16.57	272	1.20	7.59	100.3	"	Clear	57.04
(1235)	Readings Stable							
(1251)	16.58	272	1.10	7.45	109.8	Post Purge Reading		

Sample Time (1240)

Samples Collected: (3)8260, (2)8270, (1)TM

16MW8

DTW - 73.96 Begin Purge(1307)

Post Purge DTW - 75.34 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1310)	16.46	111	2.47	5.34	232.1	0.34/min	Clear	74.39
(1315)	16.70	106	1.51	5.12	184.8	"	Clear	74.59
(1320)	16.69	93	1.17	5.00	183.0	"	Clear	74.67
(1325)	16.95	91	1.16	4.97	179.0	"	Clear	74.74 ✓
(1330)	17.37	87	1.19	5.00	174.3	"	Clear	74.84
(1335)	17.62	86	1.15	5.02	170.0	"	Clear	74.93
(1340)	17.38	83	1.16	4.98	168.1	"	Clear	75.17
(1340)	Readings Stable							
(1354)	17.82	87	1.23	5.03	157.6	Post Purge Reading		

Sample Time (1345)

Samples Collected: (3)8260, (2)8270, (1)TM

16-5

DTW - 4.67 Begin Purge (1423)
Post Purge DTW - 9.74 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1425)	15.91	411	3.09	7.06	118.2	0.37min	Clear	5.64
(1430)	16.44	418	2.01	6.89	120.0	"	Clear	6.33
(1435)	16.92	431	1.77	6.88	118.8	"	Clear	6.91
(1440)	17.07	432	1.75	6.89	118.4	"	Clear	7.11 ✓
(1445)	17.20	437	1.78	6.89	117.7	"	Clear	7.28
(1450)	16.86	438	1.75	6.85	118.8	"	Clear	7.48
(1455)	16.54	437	1.70	6.77	119.4	"	clear	8.13

(1455) Readings Stable
(1512) 16.52 435 2.35 6.80 123.9 Post Purge Reading

Sample Time (1500)
Samples Collected: (3)8260, (2)8270, (1)TM

16Spring ✓

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)
(1530)	13.70	471	6.86	6.79	79.4

Sample Time (1535)
Samples Collected: (3)8260, (2)8270, (1)TM

General Notes

Weather - Sunny, 70's
PPE - Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 10.00
Conductivity reads 1413 us in 1413 us std
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purge water disposed of at dedicated location onsite
- All samples collected, stored and transported on ice in coolers

16MW9

DTW - 66.31 Begin Purge (0936)
Post Purge DTW - 66.78 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(0940)	14.48	668	8.14	6.89	214.8	0.37min	Clear	66.43
(0945)	14.79	751	5.49	6.61	161.4	"	clear	66.51
(0950)	15.47	834	3.32	6.53	91.7	"	Clear	66.51
(0955)	15.01	834	2.39	6.50	83.4	"	Clear	66.59
(1000)	15.18	828	2.34	6.47	80.3	"	Clear	66.65 ✓
(1005)	15.67	803	2.19	6.45	80.7	"	Clear	66.51
(1010)	16.05	759	2.26	6.38	79.2	"	Clear	66.51
(1015)	16.36	749	2.28	6.40	78.8	"	Clear	66.51
(1020)	16.25	744	2.31	6.40	79.3	"	Clear	66.52

(1020) Readings Stable
(1035) 721 2.20 6.34 76.2 Post Purge Reading

Sample Time (1025)
Samples Collected: (3)8260, (2)8270, (1)TM

16WC1A

DTW - 69.21 Begin Purge (1102)

Post Purge DTW - 70.89 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1105)	15.90	475	9.00	7.38	119.9	0.34/min	Clear	69.84
(1110)	15.53	564	6.00	6.72	93.1	"	Clear	69.74
(1115)	15.40	609	4.26	6.65	107.2	"	Clear	69.74
(1120)	15.67	612	3.90	6.67	110.7	"	Clear	69.74
(1125)	15.95	617	3.50	6.69	84.0	"	Clear	69.68
(1130)	15.10	626	2.81	6.72	42.2	"	Clear	69.70
(1135)	15.03	622	2.60	6.72	37.5	"	Clear	69.72
(1140)	15.26	620	2.34	6.73	35.8	"	Clear	69.70
(1145)	15.64	619	2.19	6.75	36.6	"	Clear	69.70
(1150)	15.89	619	2.13	6.77	33.2	"	Clear	69.68
(1155)	15.81	620	2.05	6.77	30.1	"	Clear	69.70

(1155) Readings Stable

(1230) 15.37 628 2.11 6.74 54.7 Post Purge Reading

Sample Time (1200)

Samples Collected: (9) 8260, (6) 8270, (3) TM

16WDUP

Sample Time (1220)

Samples Collected: (3) 8260, (2) 8270, (1) TM

16WC1B

DTW - 69.53 Begin Purge (1242)

Post Purge DTW - 69.76 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1245)	16.23	338	8.04	6.33	178.1	0.34/min	Clear	69.65
(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

16WC1B (Cont.)

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1300)	16.09	334	2.06	5.69	154.1	0.34/min	Clear	69.67
(1305)	15.84	320	1.90	5.65	154.6	"	Clear	69.67
(1310)	15.68	290	1.52	5.62	153.7	"	Clear	69.69
(1315)	15.52	285	1.44	5.62	152.9	"	Clear	69.69
(1320)	15.41	281	1.42	5.62	151.4	"	Clear	69.70
(1325)	15.63	279	1.37	5.63	149.8	"	Clear	69.72

(1325) Readings Stable

(1341) 15.55 278 1.35 5.75 141.9 Post Purge Reading

Sample Time (1330)

Samples Collected: (3) 8260, (2) 8270, (1) TM

16C1

DTW - 48.76 Begin Purge (1358)

Post Purge DTW - 48.80 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	Purgek	Desc	DTW
(1400)	15.98	616	3.98	6.53	114.3	0.34/min	Clear	48.77
(1405)	16.09	617	2.50	6.21	122.8	"	Clear	48.79
(1410)	16.34	613	1.94	6.17	121.6	"	Clear	48.79
(1415)	16.69	609	1.90	6.16	118.1	"	Clear	48.79
(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
(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

(1455) 16.13 604 1.41 6.16 115.3 Post Purge Reading

Sample Time (1445)

Samples Collected: (3) 8260, (2) 8270, (1) TM

13MW6 (Cont)

Sample Time (1030)

Samples Collected: (3)8260, (2)8270, (1)TM, (1)314.0, (3)8332/8330

13MW7

DTW - 16.23 Begin Purge (1052)

Post Purge DTW - 16.34 Initial Purge - Clear ✓

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1055)	14.14	532	4.84	6.90	182.5	0.3L/min	Clear	16.33
(1100)	14.19	601	2.72	6.84	174.9	"	Clear	16.33
(1105)	14.28	648	1.50	6.83	169.1	"	Clear	
(1110)	14.47	667	1.25	6.83	165.4	"	Clear	16.33
(1115)	14.69	675	1.21	6.83	162.6	"	Clear	16.33
(1120)	14.83	673	1.14	6.81	160.5	"	Clear	
(1125)	14.94	671	1.17	6.79	159.3	"	Clear	

(1125) Readings Stable

(1140) 14.62 668 1.23 6.77 157.4 Post Purge Reading

Sample Time (1130)

Samples Collected: (3)8260, (2)8270, (1)TM, (1)314.0, (3)8332/8330

Static Water Level Table - Unit 7

WELL	DTW	Post Purge DTW	Notes
7W12B	24.84	24.86	
7W9C	14.52	16.77	
7W10B	15.57	16.00	✓
7W10C	21.59	22.86	
7W13	19.28	21.05	
7MW6	26.41	31.55	
7W11B	25.15	25.18	
7WCA	24.71	25.63	
7W9B	10/20/09 DS ~~22.62~~ 22.68		SWL ONLY
7W11	24.42		"
7MW5	24.95		"

7W12B

DTW - 24.84 Begin Purge (1227)

Post Purge DTW - 24.86 Initial Purge -

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1228)	14.26	616	8.21	7.08	168.4	0.3L/min	Clear	24.86
(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	
(1245)	14.41	616	7.64	7.00	166.5	"	Clear	24.84
(1250)	14.46	616	7.63	7.00	166.1	"	Clear	
(1255)	14.50	616	7.65	7.00	165.8	"	Clear	

✓

(1255) Readings Stable

(1316) 14.65 619 7.70 7.01 161.7 Post Purge Reading

Sample Time (1300)

Samples Collected: (2)8270, (1)TM, (1)CN

7W9C

DTW - 14.52 Begin Purge (1334)

Post Purge DTW - 16.77 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1335)	13.41	1073	2.61	6.85	60.7	0.3L/min	Clear	15.61
(1340)	13.38	1077	2.05	6.78	71.8	"	Clear	15.72
(1345)	13.70	1085	1.58	6.77	83.7	"	Clear	15.81
(1350)	13.80	1091	1.50	6.77	90.0	"	Clear	15.90 ✓
(1355)	14.03	1096	1.36	6.76	93.2	"	Clear	16.02
(1400)	14.29	1098	1.27	6.76	91.6	"	Clear	16.07
(1405)	14.42	1102	1.24	6.75	90.1	"	Clear	16.14

(1405) Readings Stable

(1423) 14.63 1102 1.30 6.69 90.5 Post Purge Reading

Sample Time (1410)

Samples Collected: (2)8270, (1)TM, (1)CN

7W10B

DTW - 15.57 Begin Purge (1438)

Post Purge DTW - 16.00 Initial Purge - Clear

Time	Temp(C)	Cond(us)	DO mg/L	pH	ORP(MV)	PurgeK	Desc	DTW
(1440)	1353	832	3.55	6.82	122.7	0.34/min	Clear	16.18
(1445)	13.44	828	2.84	6.75	128.0	"	Clear	15.98
(1450)	13.31	815	2.40	6.74	128.3	"	Clear	15.98
(1455)	13.37	813	2.22	6.76	126.5	"	Clear	15.93
(1500)	13.29	811	2.09	6.77	125.9	"	Clear	15.87 ✓
(1505)	13.44	808	1.96	6.77	125.0	"	Clear	15.87
(1510)	13.57	806	1.95	6.77	124.6	"	Clear	15.85

(1510) Readings Stable

(1528) 13.78 797 1.88 6.80 125.8 Post Purge Reading

Sample Time (1515)

Samples Collected: (2) 8270, (1) TM, (1) CN

7W10C

DTW - 21.59 Begin Purge (1540)

Post Purge DTW - 22.86 Initial Purge - Clear

Time	Temp(C)	Cond(us)	DO mg/L	pH	ORP(MV)	PurgeK	Desc	DTW
(1541)	13.25	719	2.35	7.16	-52.0	0.34/min	Clear	21.85
(1545)	13.22	719	1.60	7.07	-27.1	"	Clear	22.03 ✓
(1550)	13.19	720	1.17	7.05	-4.8	"	Clear	22.19
(1555)	13.11	721	1.04	7.05	5.7	"	Clear	22.26
(1600)	13.00	721	0.90	7.04	24.8	"	Clear	22.53
(1610)	12.89	720	0.84	7.04	23.2	"	Clear	22.61
(1615)	12.83	720	0.80	7.04	26.0	"	Clear	22.70

(1615) Readings Stable

(1634) 12.58 717 0.79 7.06 32.3 Post Purge Reading

Sample Time (1620)

Samples Collected: (3) 8270, (1) TM, (1) CN

General Notes

Weather - Sunny, 60's

PPE - Eye Protection, Nitrile gloves, Cotton suits

Calibrations - YSI 650 MDS

pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 10.00

Conductivity reads 1413 us in 1413 us Std

DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purge water disposed of at dedicated location onsite
- All samples collected, stored and transported on ice in coolers

13mw4

DTW - 16.83 Begin Purge (0727) ✓

Post Purge DTW - 16.90 Initial Purge -

Time	Temp(C)	Cond(us)	DO mg/L	pH	ORP(MV)	PurgeK	Desc	DTW
(0730)	13.36	477	5.51	6.47	228.4	0.34/min	Clear	16.88
(0735)	13.14	525	2.94	7.03	200.6	"	Clear	
(0740)	13.40	545	2.36	7.10	194.8	"	Clear	16.88
(0745)	13.70	564	2.20	7.14	188.2	"	Clear	
(0750)	13.84	569	2.19	7.14	182.9	"	Clear	16.88
(0755)	13.93	571	2.10	7.13	178.3	"	Clear	
(0800)	13.98	570	2.07	7.12	176.5	"	Clear	

(0800) Readings Stable

(0839) 14.10 520 3.15 6.71 170.6 Post Purge Reading

Sample Time (0805)

Samples Collected: (3) 8260, (2) 8270, (1) TM, (1) 314.0, (3) 8332/8330

13WDUP

Sample Time (0820)

Samples Collected: (3) 8260, (2) 8270, (1) TM, (1) 314.0, (3) 8332/8330

* Dup samples collected at 13mw4

13MW2

DTW - 21.76 Begin Purge (0853)

Post Purge DTW-2288 Initial Purge- Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(0855)	12.98	663	5.67	6.85	170.3	0.3L/min	Clear	22.10
(0900)	13.01	667	4.30	6.85	165.8	"	Clear	22.28
(0905)	13.01	669	3.50	6.86	161.5	"	Clear	22.38 ✓
(0910)	12.87	671	3.29	6.86	159.8	"	Clear	22.50
(0915)	12.63	672	3.16	6.86	157.2	"	Clear	22.59
(0920)	12.49	671	3.13	6.86	156.7	"	Clear	22.61
(0925)	12.25	672	3.12	6.86	155.3	"	Clear	22.64

(0925) Readings Stable

(0946) 12.31 665 3.22 6.85 151.5 Post Purge Reading

Sample Time (0930)

Samples Collected: (3)8260, (2)8270, (1)TM, (1)314.0, (3)8332/8330

13MW1

DTW - 21.58 Begin Purge (0959) ✓

Post Purge DTW - 21.73 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1000)	12.56	593	6.90	6.82	157.9	0.3L/min	Clear	21.71
(1005)	12.56	645	5.41	6.80	152.2	"	Clear	21.70
(1010)	12.74	667	4.67	6.80	147.0	"	Clear	21.66
(1015)	12.79	690	4.34	6.81	143.1	"	Clear	21.66
(1020)	12.90	706	4.20	6.81	139.8	"	Clear	
(1025)	13.06	714	4.09	6.81	137.2	"	Clear	21.64
(1030)	13.18	719	3.99	6.81	135.6	"	Clear	
(1035)	13.27	722	3.90	6.81	132.6	"	Clear	

(1035) Readings Stable

(1057) 13.51 725 3.64 6.83 131.2 Post Purge Reading

Sample Time (1040)

Samples Collected: (3)8260, (2)8270, (1)TM, (1)314.0, (3)8332/8330

7W13

DTW - 19.28 Begin Purge (1123)

Post Purge DTW-21.05 Initial Purge- Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1125)	13.89	1383	4.39	7.28	-6.6	0.3L/min	Clear	20.62
(1130)	13.84	1398	2.01	7.23	-41.8	"	Clear	20.84
(1135)	13.99	1398	1.62	7.21	-42.4	"	Clear	21.06 ✓
(1140)	14.23	1399	1.61	7.20	-36.0	"	Clear	21.00
(1145)	14.59	1398	1.62	7.20	-31.7	"	Clear	21.00
(1150)	14.80	1398	1.65	7.21	-28.9	"	Clear	20.90
(1155)	14.93	1397	1.64	7.21	-30.0	"	Clear	20.81

(1155) Readings Stable

(1213) 14.64 1393 1.83 7.2 -19.7 Post Purge Reading

Sample Time (1200)

Samples Collected: (2)8270, (1)TM, (1)CN

7MW6

DTW - 26.41 Begin Purge (1231)

Post Purge DTW - 31.55 Initial Purge-Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1235)	14.43	1679	1.70	7.30	-23.2	0.3L/min	Clear	28.76 ✓
(1240)	14.75	1715	1.23	7.15	-44.7	"	Clear	29.64
(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
(1255)	15.34	1716	0.94	7.07	-64.8	"	Clear	30.10
(1300)	15.64	1700	0.95	7.08	-65.7	"	Clear	30.45
(1305)	15.76	1688	0.95	7.10	-64.2	"	Clear	30.77

(1305) Readings Stable

(1324) 15.43 1656 0.98 7.07 -61.7 Post Purge Reading

Sample Time (1310)

Samples Collected: (2)8270, (1)TM, (1) CN

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7W11B

DTW - 25.15 Begin Purge(1335)
Post Purge DTW - 25.18 Inital Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1335)	14.69	869	4.41	6.44	71.6	0.34/min	Clear	25.17
(1340)	14.95	875	2.58	6.35	76.2	"	Clear	25.16
(1345)	15.26	886	2.05	6.37	74.9	"	Clear	25.16 ✓
(1350)	15.43	891	1.86	6.38	74.3	"	Clear	25.15
(1355)	15.54	893	1.84	6.39	74.2	"	Clear	25.15
(1400)	15.70	893	1.84	6.39	74.5	"	Clear	25.16
(1405)	15.59	895	1.80	6.40	74.6	"	Clear	
(1405)	Readings Stable							
(1435)	15.22	906	~~2.12~~ 1.73 DS 10/20/09	~~6.53~~ 6.44	76.5	Post Purge Reading		

Sample Time (1410)
Samples Collected: (6) 8270, (3) TM, (3) CN

7WCA

DTW - 24.71 Begin Purge(1449)
Post Purge DTW - 25.63 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(1450)	14.42	970	2.47	6.77	75.7	0.34/min	Clear	25.78
(1455)	14.39	966	1.65	6.70	79.1	"	Clear	
(1500)	14.33	962	1.24	6.68	79.1	"	Clear	25.40
(1505)	14.37	961	1.06	6.69	78.8	"	Clear	✓
(1510)	14.30	960	0.95	6.70	77.9	"	Clear	25.41
(1515)	14.34	960	0.93	6.70	78.3	"	Clear	
(1520)	14.28	961	0.90	6.71	78.0	"	Clear	
(1520)	Readings Stable							
(1550)	14.15	969	1.10	6.75	75.4	Post Purge Reading		

Sample Time (1525)
Samples Collected: (2) 8270, (1) TM, (1) CN

uP

ple Time(1540) Samples Collected: (2) 8270, (1) TM, (1) CN
Samples Collected at (152) 7WCA

10/21/09 RAAP FB#8
B03204-07
DAS/TQE

General Notes

Weather - Sunny, 60's
PPE - Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 9.99
Conductivity reads 1413 us in 1413 us std
DO % = 100

Static Water Level Table - Unit 10

WELL	DTW	Post Purge DTW	Notes
10DDH2R	19.78	19.83	✓
10D3	18.28	18.34	
10D3D	18.43	18.47	
10MW1	18.24	18.34	
10D4	22.73		

10MW1

DTW - 18.24 Begin Purge (0934)
Post Purge DTW - 18.34 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mV)	PurgeK	Desc	DTW
(0935)	14.32	442	9.01	7.18	219.2	0.34/min	Clear	18.31
(0940)	14.03	424	8.17	7.37	225.6	"	Clear	"
(0945)	13.99	408	8.02	7.37	225.6	"	Clear	18.30
(0950)	13.92	401	8.03	7.36	224.5	"	Clear	" ✓
(0955)	13.70	394	8.01	7.35	221.7	"	Clear	"
(1000)	13.58	383	8.04	7.34	218.6	"	Clear	
(1005)	13.70	376	7.89	7.31	217.7	"	Clear	18.31
(1005)	Readings Stable							
(1027)	14.17	361	7.63	7.33	210.3	Post Purge Reading		

Sample Time (1010)
Samples Collected: (6) 8260, (2) 8270, (1) TM, (1) CN

10D3D

DTW - 18.43 Begin Purge (1047)
Post Purge DTW - 18.47 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purgek	Desc	DTW
(1050)	14.72	602	2.84	7.28	-163.9	0.34 min	Clear	18.45
(1055)	14.80	598	1.33	7.19	-173.3	"	Clear	
(1100)	15.03	590	2.02	7.15	-142.1	"	Clear	
(1105)	15.11	585	2.38	7.13	-116.0	"	Clear	18.45 ✓
(1110)	15.20	576	2.57	7.12	-104.6	"	Clear	
(1115)	15.23	573	2.65	7.12	-100.9	"	Clear	
(1120)	15.24	569	2.72	7.11	-96.7	"	Clear	18.45
(1125)	15.20	567	2.74	7.10	-94.3	"	Clear	

(1125) Readings Stable Purge water had Rotten Egg odor
(1145) 14.92 558 2.89 7.07 -107.5 Post Purge Reading

Sample Time (1130)
Samples Collected: (6) 8260, (2) 8270, (1) TM, (1) CN

10D3

DTW - 18.28 Begin Purge (1201)
Post Purge DTW - 18.34 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purgek	Desc	DTW
(1205)	15.62	494	4.10	6.99	27.3	0.34 min	Clear	18.34
(1210)	16.16	467	3.98	6.96	40.9	"	Clear	
(1215)	15.81	452	3.72	6.92	53.5	"	Clear	✓
(1220)	15.56	446	3.60	6.86	61.7	"	Clear	
(1225)	15.58	439	3.56	6.80	70.6	"	Clear	
(1230)	15.53	440	3.55	6.78	73.3	"	Clear	
(1235)	15.45	440	3.53	6.76	78.3	"	Clear	

(1235) Readings Stable
(1303) 451 3.40 6.75 85.2 Post Purge Reading

Sample Time (1240)
Samples Collected: (6) 8260, (2) 8270, (1) TM, (1) CN

10DUP Sample Time (1255) Samples Collected: (6) 8260, (2) 8270, (1) TM, (1) CN
Dup collected at 10D3

10DDH2R

DTW - 19.78 Begin Purge (1317)
Post Purge DTW - 19.83 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purgek	Desc	DTW
(1320)	15.84	357	3.23	6.68	52.2	0.34 min	Clear	19.84
(1325)	15.49	511	1.02	6.73	63.2	"	Clear	
(1330)	15.50	522	1.07	6.72	66.3	"	Clear	19.82
(1335)	16.16	526	1.17	6.74	67.1	"	Clear	
(1340)	16.93	532	1.23	6.79	67.0	"	Clear	
(1345)	17.22	533	1.28	6.81	65.6	"	Clear	19.79 ✓
(1350)	17.47	533	1.33	6.84	64.3	"	Clear	

(1350) Readings Stable
(1408) 17.20 520 1.63 6.79 62.9 Post Purge Reading

Sample Time (1355)
Samples Collected: (18) 8260, (6) 8270, (3) TM, (3) CN

10D4

DTW - 22.73 Begin Purge (1423)
Post Purge Reading - 22.76 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purgek	Desc	DTW
(1425)	16.93	268	4.76	6.69	81.5	0.34 min	Clear	22.78
(1430)	16.98	257	3.94	6.48	86.4	"	Clear	
(1435)	17.05	251	3.86	6.45	87.4	"	Clear	22.74
(1440)	17.13	250	3.85	6.46	87.9	"	Clear	
(1445)	17.26	248	3.86	6.45	88.3	"	Clear	✓
(1450)	17.37	249	3.88	6.45	88.1	"	Clear	22.75
(1455)	17.51	248	3.95	6.47	87.6	"	Clear	

(1455) Readings Stable
(1516) 16.86 246 4.13 6.55 86.8 Post Purge Reading

Sample Time (1500)
Samples Collected: (6) 8260, (2) 8270, (1) TM, (1) CN

General Notes

Weather - Sunny,
PPE - Eye Protection, Nitrile gloves
Calibrations - YSI 650 MDS
Conductivity reads 1413 us in 1413us Std
pH - 4.00 = 4.00 , 7.00 = 7.00 , 10.00 = 10.00
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- All purge water disposed of at dedicated location onsite
- All samples collected, stored and transported on ice in coolers

Static Water Level Table - Unit 5

WELL	DTW	Post Purge DTW	Notes
S5W7	12.13	12.15	
S5W5	9.74	10.06	
5W9A	3.86	3.88	
5W10A	16.28	16.33	
5W11A	14.70	15.11	
5W8B	16.90	17.16	
5W7B	10.44	10.48	
5W5B	11.02	11.88	✓
5WC21	10.80	10.87	
5WC22	10.88	10.91	
5WC23	10.37	10.56	
		SWL ONLY	
5WCA	14.91	"	
S5W6	DF 10/27/09 ~~8.86~~ 8.86	"	
S5W8	13.45	"	
5WC11	18.84	"	
5WC12	18.07	"	

S5W7

DTW - 12.13 Begin Purge (1028)
Post Purge DTW - 12.15 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1030)	16.19	431	7.87	6.46	142.2	0.34/min	Clear	12.14
(1035)	16.17	437	4.11	6.57	132.4	"	Clear	
(1040)	16.34	439	3.62	6.60	127.6	"	Clear	
(1045)	16.49	441	3.35	6.64	122.9	"	Clear	12.14
(1050)	16.73	441	3.01	6.69	118.5	"	Clear	
(1055)	16.61	442	2.86	6.71	115.4	"	Clear	
(1100)	16.54	441	2.78	6.72	113.9	"	Clear	12.15
(1105)	16.51	442	2.73	6.72	112.1	"	Clear	

✓

(1105) Readings Stable - Black particles in purge/sample water
(1124) 16.53 439 2.80 6.83 106.1 Post Purge Reading

Sample Time (1110)
Samples Collected: (3)8260, (2)8270, (1)TM

S5W5

DTW - 9.74 Begin Purge (1137)
Post Purge DTW - 10.06 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1140)	17.78	345	6.67	6.19	119.6	0.34/min	Clear	9.96
(1145)	17.54	332	3.73	6.01	118.3	"	Clear	
(1150)	17.56	326	3.17	5.98	117.4	"	Clear	
(1155)	17.60	321	2.93	5.96	114.7	"	Clear	9.90
(1200)	17.61	317	2.74	5.95	113.0	"	Clear	
(1205)	17.51	317	2.59	5.94	110.6	"	Clear	9.90
(1210)	17.50	315	2.53	5.94	110.3	"	Clear	
(1215)	17.47	314	2.49	5.93	109.7	"	Clear	

✓

(1215) Readings Stable
(1233) 17.73 309 2.28 6.03 111.2 Post Purge Reading

Sample Time (1220)
Samples Collected: (3)8260, (2)8270, (1)TM

SW9A

DTW - 3.86
Post Purge DTW - 3.88

Begin Purge(1253)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1255)	16.15	389	5.30	7.37	139.8	0.34/min	Clear	3.88
(1300)	16.07	389	4.90	7.32	134.9	"	Clear	
(1305)	15.98	389	4.75	7.29	129.6	"	Clear	
(1310)	16.00	389	4.68	7.29	125.8	"	Clear	3.88
(1315)	16.00	390	4.56	7.30	120.4	"	Clear	
(1320)	15.98	390	4.52	7.32	118.1	"	Clear	✓
(1325)	15.94	391	4.50	7.33	114.0	"	Clear	
(1325)	Readings Stable							
(1342)	15.69	392	4.57	7.40	105.6	Post Purge Reading		

Samples Collected: (3)8260, (2)8270, (1)TM
Sample Time (1330)

5W10A

DTW - 16.28
Post Purge DTW - 16.33

Begin Purge(1414)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORD(mv)	PurgeK	Desc	DTW
(1415)	15.56	399	3.00	7.55	101.8	0.34/min	Clear	16.31
(1420)	15.30	399	2.20	7.49	100.5	"	Clear	
(1425)	15.30	397	1.71	7.48	98.7	"	Clear	
(1430)	15.38	396	1.55	7.48	95.5	"	Clear	
(1435)	15.38	394	1.40	7.50	91.6	"	Clear	16.33
(1440)	15.39	392	1.39	7.52	89.5	"	Clear	
(1445)	15.39	391	1.42	7.53	88.7	"	Clear	✓
(1445)	Readings Stable							
(1505)	15.18	396	1.68	7.60	93.6	Post Purge Reading		

Sample Time (1450)
Samples Collected: (3)8260, (2)8270, (1)TM

5W11A

DTW - 14.70
Post Purge DTW - 15.11

Begin Purge (1517)
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeK	Desc	DTW
(1520)	15.39	660	4.83	6.51	-38.1	0.34/min	Clear	15.22
(1525)	15.33	740	4.30	6.53	9.9	"	Clear	✓
(1530)	15.31	775	4.02	6.56	35.6	"	Clear	
(1535)	15.29	801	3.76	6.58	56.7	"	Clear	15.01
(1540)	15.23	810	3.50	6.59	61.5	"	Clear	
(1545)	15.20	813	3.38	6.58	63.4	"	Clear	
(1555)	15.21	814	3.30	6.58	65.3	"	Clear	
(1555)	Readings Stable							
(1614)	14.98	807	2.95	6.60	67.1	Post Purge Reading		

Sample Time (1600)
Samples Collected: (3)8260, (2)8270, (1)TM

10/27/09

RAAP
B03204-07
DAS/TOE

FB# 8

General Notes

Weather - Overcast, Scattered Showers, 50's
PPE - Eye Protection, Nitrile gloves, Hard Hats
Calibrations - YSI 650 MDS
pH - 4.00 = 4.00, 7.00 = 7.00, 10.00 = 9.99
Conductivity reads 1413 us in 1413 us Std.
DO% = 100

- Dedicated tubing and well skirts used at each well
- All equipment deconed between each well
- Purge water disposed of at dedicated location onsite
- All samples collected stored and transported in coolers on ice

✓

10D4

DTW - 22.75
Begin Purge (1559)
Post Purge DTW -
Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge Rt	Desc	DTW
(1600)	14.78	322	4.94	6.78	114.7	0.34/min	Clear	22.76
(1605)	14.71	308	3.52	6.67	113.5	"	Clear	
(1610)	14.78	303	3.33	6.65	112.3	"	Clear	
(1615)	14.82	300	3.31	6.64	112.0	"	Clear	22.78
(1620)	14.82	299	3.40	6.67	111.8	"	Clear	✓
(1625)	14.91	299	3.53	6.67	111.6	"	Clear	
(1630)	14.93	299	3.56	6.67	111.5	"	Clear	
(1630)	Readings Stable							
(1641)	15.01	298	3.29	6.67	112.6	Post Purge Reading		

Sample Time (1635)
Samples Collected: (1) CN

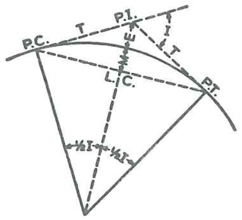
completed
11-23-09
LDK

5WDUP

Sample Time (1320)
Samples Collected: (3) 8260, (2) 8270, (1) TM
* Continued in field Book #9
* Duplicate sample collected at 5WC21

(160)

CURVE AND REDUCTION TABLES



CURVE FORMULAS

1. Radius : $R=\frac{50}{\sin D/2}$
2. Degree of Curve: $D=100\frac{I}{L}$. Also, $\sin D/2=\frac{50}{R}$
3. Tangent : $T=R\tan \frac{1}{2} I$. Also, $T=\frac{T \text{ for } 1^\circ \text{ curve}}{D}+C$.
4. Length of Curve: $L=100\frac{I}{D}$
5. Long Chord : $L. C.=2R\sin \frac{1}{2} I$.
6. Middle Ordinate: $M=R\,(1-\cos \frac{1}{2} I)$
7. External : $E=\frac{R}{\cos \frac{1}{2} I}-R$. Also, $E=T\tan \frac{1}{4} I$.

EXPLANATION AND USE OF TABLES

Given P.I. Sta. 83+40.7, I = 45° 20′ and D = 6°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. P. T. = P. C. + L, and $L=100\,\frac{I}{D}=100\,\frac{45.33}{6.5}=697.38$ 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 $=5.66\times\left(\frac{27.62}{100}\right)^2=.432$ ft. Also, square of any distance, divided by twice the radius equals (approximately) the distance from tangent to curve. Thus $(27.62)^2\div(2\times881.95)=.432$ ft.

Deflections—Deflection angle = ½ D for 100 ft., ¼ D for 50 ft., etc. For "X" ft., Deflection Angle (in minutes) = .3 × X × D. For Sta. 80 of above curve Deflection Angle = .3 × 27.62 × 6.5 = 53.86′. Also Deflection Angle = dfl. for 1 ft. from Table III × X = 1.95 × 27.62 = 53.86′. For Sta. 181 Deflection Angle $=53.86'+\frac{6^\circ 30'}{2}=4^\circ 8.86'$.

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.

Projects (continued)

Nam

Addr

Phon

This
for
DT

10/27/09 RAAP FB# 9

B03204-07
DAS/TQE

5W8B

DTW - 16.90 Begin Purge (0834)

Post Purge DTW - 17.16 Initial Purge - Clear

Time	Temp(C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge K	Desc	DTW
(0835)	13.24	76	9.03	4.09	212.3	0.34/min	Clear	17.45
(0840)	13.19	75	6.10	4.18	202.4	"	Clear	
(0845)	13.22	75	5.85	4.20	200.3	"	Clear	
(0850)	13.28	74	5.73	4.18	199.0	"	Clear	17.11
(0855)	13.32	73	5.68	4.19	197.2	"	Clear	
(0900)	13.34	74	5.64	4.20	196.0	"	Clear	
(0905)	13.38	72	5.60	4.18	196.3	"	Clear	17.11 ✓
(0905)	Readings Stable							
(0922)	13.40	70	5.57	4.19	194.1	Post Purge Reading		

Sample Time (0910)

Samples Collected: (3) 8260, (2) 8270, (1) TM

5W5B

Begin Purge (0937)

DTW - 11.02 Initial Purge - Clear

Post Purge DTW - 11.88

Time	Temp(C)	Cond(us)	DO mg/L	pH	ORP(mv)	Purge K	Desc	DTW
(0940)	14.75	567	6.15	5.59	166.1	0.34/min	Clear	11.48
(0945)	14.60	600	3.85	5.38	163.7	"	Clear	
(0950)	14.66	612	3.66	5.35	160.2	"	Clear	
(0955)	14.68	620	3.59	5.35	156.8	"	Clear	11.63
(1000)	14.60	622	3.64	5.36	154.3	"	Clear	✓
(1005)	14.45	623	3.72	5.37	152.7	"	Clear	
(1010)	14.58	624	3.78	5.38	150.6	"	Clear	
(1010)	Readings Stable							
(1029)	14.81	639	3.95	5.40	151.3	Post Purge Reading		

Sample Time (1015)

Samples Collected: (3) 8260, (2) 8270, (1) TM

5W7B

DTW - 10.44 Begin Purge(1054)

Post Purge DTW - 10.48 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc	DTW
(1055)	17.13	209	7.15	4.01	195.0	0.3L/min	Clear	10.48
(1100)	17.01	190	6.43	4.13	191.5	"	Clear	
(1105)	16.86	174	6.23	4.05	192.0	"	Clear	
(1110)	16.91	156	6.07	4.08	195.4	"	Clear	10.48
(1115)	16.87	154	6.02	4.09	194.9	"	Clear	
(1120)	16.81	152	5.99	4.07	196.9	"	Clear	✓
(1125)	16.70	152	5.96	4.02	200.1	"	Clear	
(1125)	Readings Stable							
(1158)	17.16	160	5.59	3.94	203.5	Post Purge Reading		

Sample Time(1130)

Samples Collected: (9)8260, (6)8270, (3)TM

5WC21

DTW - 10.80 Begin Purge(1227)

Post Purge DTW - 10.87 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc	DTW
(1230)	14.88	571	2.97	3.43	218.4	0.3L/min	Clear	10.84
(1235)	14.75	575	2.31	3.32	232.0	"	Clear	
(1240)	14.73	575	2.00	3.31	233.9	"	Clear	
(1245)	14.76	576	1.71	3.32	235.4	"	Clear	10.84
(1250)	14.82	576	1.64	3.32	237.5	"	Clear	✓
(1255)	14.79	580	1.62	3.32	235.6	"	Clear	
(1300)	14.82	582	1.55	3.32	234.8	"	Clear	10.84
(1300)	Readings Stable							
(1331)	14.58	590	1.40	3.34	240.6	Post Purge Reading		

Sample Time (1305)

Samples Collected: (3)8260, (2)8270, (1)TM

5WC22

DTW - 10.88 Begin Purge(1342)

Post Purge DTW - 10.91 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc	DTW
(1345)	14.63	923	1.16	6.52	162.4	0.3L/min	Clear	10.89
(1350)	14.80	904	1.07	6.51	154.4	"	Clear	
(1355)	14.77	892	1.10	6.52	143.7	"	Clear	✓
(1400)	14.70	888	1.16	6.52	137.3	"	Clear	10.90
(1405)	14.57	886	1.20	6.52	130.9	"	Clear	
(1410)	14.47	883	1.30	6.52	123.2	"	clear	
(1415)	14.47	882	1.38	6.53	121.5	"	Clear	
(1415)	Readings Stable							
(1432)	14.25	883	1.33	6.54	126.3	Post Purge Reading		

Sample Time (1420)

Samples Collected: (3)8260, (2)8270, (1)TM

5WC23

DTW - 10.37 Begin Purge(1445)

Post Purge DTW - 10.56 Initial Purge - Clear

Time	Temp(°C)	Cond(us)	DO mg/L	pH	ORP(mv)	PurgeR	Desc	DTW
(1446)	14.81	989	4.29	6.81	127.6	0.3L/min	Clear	10.43
(1450)	14.41	953	2.07	6.60	119.2	"	Clear	
(1455)	14.36	920	1.56	6.58	114.2	"	Clear	
(1500)	14.33	904	1.59	6.58	111.0	"	Clear	10.42 ✓
(1505)	14.35	896	1.57	6.58	107.3	"	Clear	
(1510)	14.31	895	1.52	6.58	105.3	"	Clear	
(1515)	14.34	893	1.45	6.58	102.5	"	Clear	10.42
(1515)	Readings Stable							
(1534)	14.20	896	1.24	6.60	109.5	Post Purge Reading		

Sample Time (1520)

Samples Collected: (3)8260, (2)8270, (1)TM

RWK
completed
11-23-09

1/25/10

RAAP
B03204-07
Unit 10 resample
TGE/KFC

FB#9

General Notes

- Weather: Sunny 40s
- PPE: Eye Protection, Nitrile Gloves
- Calibrations: YSI 650 MDS
  - PH - 4.00 = 4.00, 7.00 = 6.98, 10.00 = 10.00
  - Conductivity reads 1413 µs in 1413 µs STD.
  - DO% = 100
- Dedicated tubing and well skirts used
- All sample equipment decon'd after each well
- Purge water disposed of at wastewater treatment plant
- All samples stored and transported on ice

10D4

DTW: 22.02

Post Purge DTW: 22.03

Begin Purge (1021)

Initial Purge: clear

Time	Temp(°C)	Cond(µs)	DO mg/L	PH	ORP(mV)	Purge R	Desc
(1025)	12.29	334	7.25	6.68	204.9	≤0.3L/min	Sl cloudy
(1030)	13.12	335	6.91	6.73	188.7	"	Sl cloudy
(1040)	12.85	332	6.44	6.78	183.5	"	Sl cloudy
(1045)	12.95	331	6.37	6.79	179.6	"	Sl cloudy
(1050)	13.19	329	6.34	6.81	173.1	"	Clear
(1055)	13.31	329	6.37	6.82	170.4	"	clear
(1100)	13.39	328	6.39	6.90	167.4	"	Clear
(1105)	13.32	327	6.42	6.83	164.9	"	clear
(1110)	13.24	328	6.41	6.83	163.5	"	Clear
(1110)	Readings Stable						
(1130)	13.31	326	6.58	6.83	158.6	Post Purge Reading	

Sample Time (1115)
Samples Collected: (1) Cyanide
Duplicate Sample Time (1125)
Samples Collected: (1) Cyanide

1/25/2010

RAAP
B03204-07
(UNIT 10 Resample)
TGE/KFC

FB#9

* Used pH test strip to check sample for pH after being collected in preserved container. Strip indicated roughly between 11-12. Preformed an additional pH reading on calibrated Myron L Ultrameter and had a reading of: 12.70!

KYC
1-25-2010