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# 2015 Annual Monitoring Report Area B (PICA-205) Groundwater

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## Picatinny Arsenal, New Jersey

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*Prepared for*



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*Prepared by*

**EA Engineering, Science, and Technology, Inc., PBC**  
**Contract No. W91ZLK-13-D-0004-0009**

**March 2016**

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# 2015 Annual Monitoring Report Area B (PICA-205) Groundwater

## Picatinny Arsenal, New Jersey

*Prepared for*

U.S. Army

*Prepared by*



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A handwritten signature in blue ink, reading "Frank DeSantis Jr.", enclosed in a light blue rectangular box.

Frank DeSantis Jr.  
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8 March 2016

Date

A handwritten signature in blue ink, reading "James P. Costello", enclosed in a light blue rectangular box.

James Costello  
Deputy Program Manager

8 March 2016

Date

March 2016  
EA Project No. 62686.09

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3	Groundwater Monitoring Results
4	Surface Water Monitoring Results

**LIST OF ACRONYMS AND ABBREVIATIONS**

µg/L	Micrograms per liter
amsl	Above mean sea level
ARCADIS	ARCADIS U.S., Inc.
COCs	Contaminants of concern
CVOC	Chlorinated volatile organic compound
DCE	Dichloroethene
EA	EA Engineering, Science, and Technology, Inc., PBC
ERD	Enhanced reductive dechlorination
ft	Feet/foot
IW	Injection well
mg/L	Milligrams per liter
MW	Monitoring well
PCE	Tetrachloroethene
PDBs	Passive diffusion bags
PICA	Picatinny Arsenal
RD	Remedial design
ROD	Record of decision
SCLs	Site cleanup levels
TCE	Trichloroethene
TOC	Total organic carbon
USEPA	United States Environmental Protection Agency
VC	Vinyl chloride
VOCs	Volatile organic compounds

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## 1. INTRODUCTION

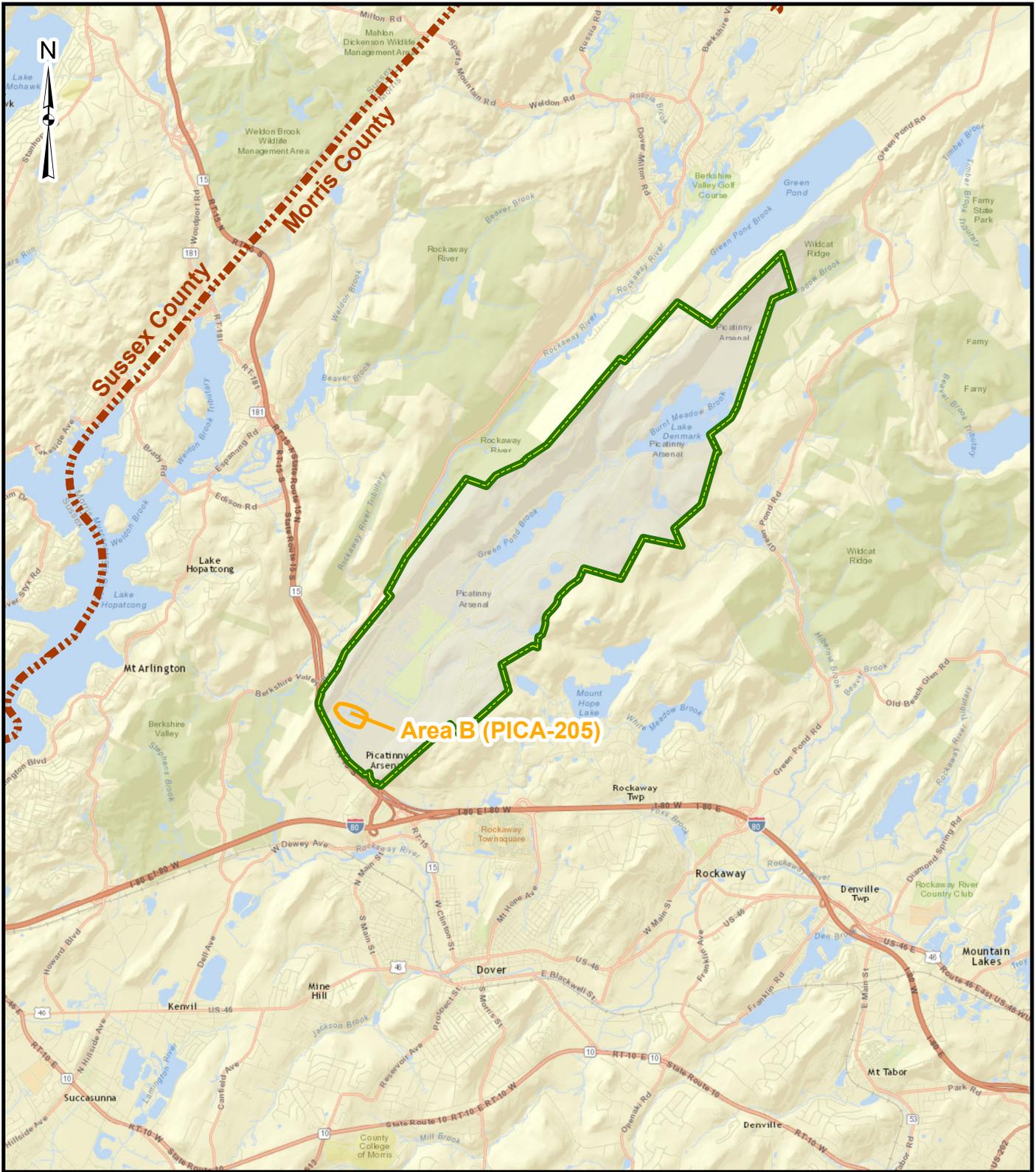
EA Engineering, Science, and Technology, Inc., PBC (EA) has been retained by the U.S. Army Environmental Command to perform Installation Restoration Program activities at Picatinny Arsenal (PICA), located in Morris County, New Jersey (**Figure 1**). This work is being performed under the Environmental Remediation Multiple Award Indefinite Delivery/Indefinite Quantity Contract W91ZLK-13-D-0004 Delivery Order 0009, and will be overseen by the USAEC and the United States Army Corps of Engineers (USACE) for PICA, under approval by the New Jersey Department of Environmental Protection (NJDEP), and United States Environmental Protection Agency (USEPA) Region 2. Field activities associated with this contract are being conducted by EA's subcontractor, Sovereign Consulting Inc. (Sovereign).

In accordance with the Record of Decision (ROD) (U.S. Army 2009) for Area B (PICA-205) (**Figure 2**), the selected Response Action - Expedited *In-Situ* Enhanced Bioremediation through injections of molasses has been implemented to address groundwater contaminated with chlorinated volatile organic compounds (CVOCs). The long-term monitoring program summary (including sample location and analytes) for Area B Groundwater (PICA-205) is presented in **Table 1**. Land Use Controls are also implemented as part of the selected remedy in accordance with the ROD. However, land use control activities are discussed under a separate cover as part of the 2015 Annual Land Use Control Report to be prepared prior to the end of the 2015 calendar year.

The work presented in this Annual Report was performed in accordance with the Final Remedial Design (RD) (ARCADIS 2008). This Annual Monitoring Report summarizes all the remedial activities conducted at Area B (PICA-205) during the 2015 annual event. This report also provides data analysis and interpretation of response action performance since remedy implementation through December 2015. The results of the following activities are presented in this report. Sampling locations are presented in **Figure 3**.

- **Annual Groundwater Monitoring:** Groundwater monitoring samples were collected from six injection wells and one monitoring well on 23 September 2015 and were analyzed for volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method 8260C.
- **Performance Monitoring:** Groundwater samples were collected from two injection wells and seven monitoring wells on 23 September 2015 and analyzed for VOCs (via USEPA Method 8260C). On 14 September 2015, samples were collected for total organic carbon (TOC), and dissolved gases. Field measurements of pH were also recorded. These additional samples were collected from nine monitoring wells directly down gradient of all three injection lines to evaluate the effectiveness of enhanced biodegradation and to determine the frequency of future injection events.
- **Surface Water Monitoring:** Four surface water samples were collected on 24 September 2015 from the landfill pond and adjacent drainage ditch. One surface water sample could not be collected as a result of dry conditions. Surface water samples were analyzed for VOCs by USEPA Method 8260C.

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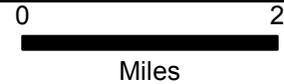
Sussex County

Morris County

Area B (PICA-205)



 Installation Boundary



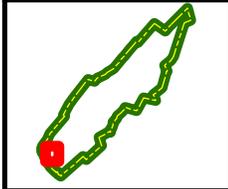
Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013



2015 ANNUAL REPORT  
 AREA B (PICA-205)  
 PICATINNY ARSENAL

**Figure 1**  
**Picatinny Arsenal**  
**General Location**

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-  Area B
-  Installation Boundary



2015 ANNUAL REPORT  
 AREA B (PICA-205)  
 PICATINNY ARSENAL

**Figure 2**  
**Area B (PICA-205)**  
**Location Map**

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-  Installation Boundary
-  Existing Injection Well
-  Area B
-  Annual Monitoring Well
-  Surface Water Sampling Location
-  Performance Monitoring Well

0 150  
 Feet



2015 ANNUAL REPORT  
 AREA B (PICA-205)  
 PICATINNY ARSENAL

**Figure 3**  
**Sample Locations**

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Table 1 Monitoring Program Summary

Calendar Year Operation Year					2009				2010				2011				2012					
					First Year		Second Year		Third Year		Fourth Year		Fifth Year <sup>2</sup>									
					Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
Category	Media	Schedule	Sample Locations	Analyte	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Performance Monitoring	Groundwater	Yr: 1-2 quarterly Yr 3-5: semi-annually <sup>2</sup> Yr 6-7: annually	20/24IW-3 20/24IW-10 <sup>1</sup> 20/24MW-6 20/24MW-6B 20/24MW-8 20/24MW-15 20/24MW-16 20/24MW-17 20/24MW-18 <sup>1</sup>	Tetrachloroethene Trichloroethene cis-1,2-Dichloroethene 1,1-Dichloroethene Vinyl Chloride Total Organic Carbon Methane Ethane Ethene	Completed	Completed	Completed	Completed	Completed	Completed	Complete	Completed	Completed		Completed		Completed		Completed		Completed	
Surface Water Monitoring	Surface Water	Yr: 1-2 quarterly Yr 3-5: semi-annually <sup>2</sup> Yr 6-7: annually	SW-1 SW-2 SW-3 SW-4 SW-5	Total Organic Carbon Tetrachloroethene Trichloroethene cis-1,2-Dichloroethene 1,1-Dichloroethene Vinyl Chloride	Completed	Completed	Completed	Completed	Completed	Completed	Complete	Completed	Completed		Completed		Completed		Completed		Completed	
Annual Groundwater Monitoring	Groundwater	Annually until 2011, thereafter 5 year review	20/24IW-1B 20/24IW-2B 20/24IW-3B 20/24IW-08 20/24IW-09 20/24IW-10 20/24MW-18	Tetrachloroethene Trichloroethene 1,1-Dichloroethene Vinyl Chloride	Completed				Completed				Completed						Completed		Completed	

**Notes:**

<sup>1</sup>Added to semi-annual program starting First Quarter 2012

<sup>2</sup>Annual sampling was initiated in the fifth year of operation.

<sup>3</sup>The annual seventh year sampling event was conducted in 2nd quarter of 2016 to facilitate transtion to new contractor.

COC - constituent of concern

Table 1 Monitoring Program Summary

Calendar Year Operation Year					2013				2014				2015				2016			
					Fifth Year		Sixth Year		Seventh Year		Eighth Year		Ninth Year							
					Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
Category	Media	Schedule	Sample Locations	Analyte	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Performance Monitoring	Groundwater	Yr: 1-2 quarterly Yr 3-5: semi-annually <sup>2</sup> Yr 6-7: annually	20/24IW-3 20/24IW-10 <sup>1</sup> 20/24MW-6 20/24MW-6B 20/24MW-8 20/24MW-15 20/24MW-16 20/24MW-17 20/24MW-18 <sup>1</sup>	Tetrachloroethene Trichloroethene cis-1,2-Dichloroethene 1,1-Dichloroethene Vinyl Chloride Total Organic Carbon Methane Ethane Ethene			Completed			Completed <sup>3</sup>					Completed					Planned
Surface Water Monitoring	Surface Water	Yr: 1-2 quarterly Yr 3-5: semi-annually <sup>2</sup> Yr 6-7: annually	SW-1 SW-2 SW-3 SW-4 SW-5	Total Organic Carbon Tetrachloroethene Trichloroethene cis-1,2-Dichloroethene 1,1-Dichloroethene Vinyl Chloride			Completed			Completed <sup>3</sup>					Completed					Planned
Annual Groundwater Monitoring	Groundwater	Annually until 2011, thereafter 5 year review	20/24IW-1B 20/24IW-2B 20/24IW-3B 20/24IW-08 20/24IW-09 20/24IW-10 20/24MW-18	Tetrachloroethene Trichloroethene 1,1-Dichloroethene Vinyl Chloride			Completed			Completed <sup>3</sup>					Completed					Planned

**Notes:**

<sup>1</sup>Added to semi-annual program starting First Quarter 2012

<sup>2</sup>Annual sampling was initiated in the fifth year of operation.

<sup>3</sup>The annual seventh year sampling event was conducted in 2nd quarter of 2016 to facilitate transition to next contractor.

COC - constituent of concern

## 2. SITE ACTIVITIES AND ANALYSIS

Site activities conducted in 2015 consisted of annual groundwater monitoring, performance monitoring, and surface water monitoring in accordance with the monitoring program established in the RD (ARCADIS 2008). Six injection events have been conducted to date, with the most recent injection event occurring during June 2011. No injection events were performed during the 2015 reporting period. Field forms were completed by Sovereign personnel at the time of sample collection and are included in **Appendix A**. Further, groundwater and surface water sample results are reported in laboratory analytical statements included in **Appendix B**.

### 2.1 GROUNDWATER ELEVATION MEASUREMENTS

Prior to groundwater sampling activities, water levels in the monitoring network were gauged. Monitoring well locations are presented in **Figure 3**. Well construction specifications and 21 September 2015 water level data for the monitoring well network are provided in **Table 2**. A groundwater potentiometric map is provided on **Figure 4**.

### 2.2 ANNUAL GROUNDWATER MONITORING

Annual groundwater monitoring consisted of sampling the monitoring wells listed below.

- Annual Monitoring Wells
  - 20/24Injection Well (IW)-01B
  - 20/24IW-02B
  - 20/24IW-03B
  - 20/24IW-08
  - 20/24IW-09
  - 20/24IW-10
  - 20/24Monitoring Well (MW)-18
  
- Performance Monitoring Wells Within the Injection Area
  - 20/24IW-03
  - 20/24MW-06
  - 20/24MW-06B
  - 20/24MW-08
  - 20/24IW-10
  - 20/24MW-15
  - 20/24MW-16
  - 20/24MW-17
  - 20/24MW-18

Annual monitoring samples were collected from seven monitoring wells (listed above) on 23 September 2015. Samples were collected using hydrasleeves and analyzed for VOCs by USEPA Method 8260C. Hydrasleeve samplers can be used to sample for most groundwater analytes including VOCs, SVOCs, and metals (ITRC 2007).

Groundwater performance samples were collected from nine monitoring wells located within the injection monitoring areas (listed above). Groundwater performance samples were collected from these nine wells on 14 September 2015 and were analyzed for TOC (Method SM 5310B), and dissolved gases (methane, ethane, and ethane via Method RSK 175). Additional groundwater performance samples from these nine wells were collected on 23 September 2015 and were analyzed for VOCs by USEPA Method 8260C.

### **2.3 SURFACE WATER MONITORING**

Surface water monitoring consisted of surface water sampling at SW-2, SW-3, SW-4, and SW-5 (**Figure 3**) using grab sampling methodology. One surface water sample (SW-1) could not be collected as a result of dry conditions. Surface water samples were analyzed for VOCs by USEPA Method 8260C.

### **2.4 DATA VALIDATION AND USABILITY**

All data collected were third party validated in accordance with the USEPA National Functional Guidelines for Organic Data Review, dated August 2014. The validation criteria for long-term monitoring data include a review of the laboratory report narrative for noted deficiencies and the potential impact to data usability. Therefore, a review of chain-of-custodies, sample preservation, sample receipt logs, and a review of quality control parameters were performed for all data packages. No deficiencies were identified during the data validation; therefore, no additional review was performed. A copy of the Data Validation Report is included with **Appendix B**.

Matrix interference required dilution during VOC analysis of groundwater samples collected from 20/24 MW-17, 20/24 MW-16, 20/24 MW-15, 20/24 IW-03, 20/24 MW-06B, 20/24 MW-06, and 20/24 MW-08. Dilution of these samples resulted in an elevated detection limit, which exceeded site cleanup levels (SCLs) for 1,1-dichloroethene (DCE), tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride (VC). This adds uncertainty to the data; however, it is not an unusual occurrence when matrix interference is observed. Results for these compounds from all of these wells, except 20/24 MW-08, were below SCLs in 2014. In 2014, an exceedance of VC was reported in 20/24 MW-08. This is consistent with the results observed in 2015.



 Installation Boundary	 Existing Injection Well	 Groundwater Flow Direction	Note: Groundwater elevations reported in feet above mean sea level and were measured on 21 September 2015.  * Upper-semi-confined aquifer wells excluded from groundwater interpretation
 Area B	 Annual Monitoring Well		
 Surface Water Sampling Location	 Performance Monitoring Well		

0  100

Feet

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Table 2 Groundwater Elevation Data

Well ID	Monitored Hydrostratigraphic Unit <sup>1</sup>	Surface/Ground Elevation <sup>2 and 3</sup>	Surface Completion	RPE <sup>2 and 3</sup> (inner casing/cam height)	5/14/2008		6/25/2008		9/11/2008 (Baseline)		9/15/2008 (Pre injection)		9/15/2008 (Post Injection)		12/15/2008 (Pre injection)		1/27/2009 (Pre injection)	
					Depth to Water (ft bmp)	Water Level Elevation (ft msl)	Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)	Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)	Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)	Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)	Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)	Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)
DM20-2	Unconfined	685.4	Stick-Up	686.78	2.34	684.44												
20/24MW-18	Unconfined	688.9	Stick-Up	690.17	4.85	685.32									4.33	685.84		
MW24-2A	Unconfined	690.48	Stick-Up	692.23	3.78	688.45	4.70	687.53							3.72	688.51		
MW24-2B	Upper Semi-Confined	690.24	Stick-Up	691.38	0.40	690.98	2.11	689.27							0.00	691.38		
MW24-3	Unconfined	686.18	Stick-Up	687.41	2.58	684.83	3.25	684.16										
20/24MW-1	Upper Semi-Confined	687.66	Stick-Up	687.06	1.87	685.19	3.25	683.81										
20/24MW-02	Upper Semi-Confined	687.8	Stick-Up	690.01	4.54	685.47	5.19	684.82							3.89	686.12		
20/24MW-2D	Lower Semi-Confined	687.53	Stick-Up	689.13	1.90	687.23									2.40	686.73		
20/24MW-3	Unconfined	688.47	Stick-Up	690.57	5.02	685.55									4.44	686.13		
20/24MW-5	Unconfined	689.85	Stick-Up	692.15	4.45	687.70									3.91	688.24		
20/24MW-6	Unconfined	690.4	Stick-Up	692.29	6.76	685.53	7.42	684.87	6.98	685.98	6.26	686.70	6.64	686.32	6.12	686.17	6.99	685.30
20/24MW-7	Unconfined	689.97	Stick-Up	691.64	6.18	685.46	6.81	684.83							5.50	686.14		
20/24MW-8	Unconfined	689.95	Stick-Up	691.44	5.98	685.46									5.3	686.14	6.18	685.26
20/24MW-9	Unconfined	692.64	Stick-Up	694.19	7.83	686.36									7.39	686.80		
20/24MW-10	Unconfined	692.36	Stick-Up	694.33	8.15	686.18									7.82	686.51		
20/24MW-11	Unconfined	692.08	Stick-Up	693.76	7.56	686.20									6.81	686.95		
20/24MW-12	Unconfined	690	Stick-up	692.13	6.62	685.51					6.19	685.94	6.52	685.61	5.98	686.15		
20/24MW-13	Unconfined	690.5	Stick-up	692.59	7.07	685.52									6.41	686.18		
20/24MW-14	Unconfined	690.5	Stick-up	692.20	6.70	685.50									6.04	686.16		
20/24MW-6B	Upper Semi-Confined	690.4	Stick-up	692.24	6.71	685.53	7.37	684.87	6.92	685.32	6.10	686.14	6.59	685.65	6.08	686.16	6.90	685.34
20/24IW-1	Unconfined	689	Stick-up	691.50	6.40	685.10			6.76	685.86					5.72	685.78		
20/24IW-2	Unconfined	689.67	Stick-Up	691.99	5.80	685.52			6.8	685.19	6.44	685.66	6.1	686	5.91	686.08	6.87	685.12
20/24IW-3	Unconfined	690.18	Stick-up	692.1	6.31	685.79			6.64	685.46	6.57	686.92	5.8	687.69	5.75	686.35	6.6	685.50
20/24IW-4	Unconfined	690.87	Stick-up	693.49	6.73	686.09	7.52	685.97	7.94	685.55					6.8	686.69	7.87	685.62
20/24IW-5	Unconfined	691.25	Stick-up	693.26	6.91	686.35									6.1	687.16		
20/24IW-6	Unconfined	693.5	Stick-up	696.09	8.52	686.9			10.1	685.99	7.1	686.66	7.16	686.6	8.64	687.45		
20/24IW-7	Unconfined	691.92	Stick-up	693.76	6.41	687.35			7.29	686.47					5.79	687.97		
20/24IW-8	Unconfined	687.59	Stick-up	689.55	4.25	685.3	4.8	684.75							3.21	686.34		
20/24IW-9	Unconfined	687.04	Stick-up	688.74	3.90	684.84	4.87	683.87							2.8	685.94		
20/24IW-10	Unconfined	685.85	Stick-up	687.65	2.21	685.44	3.77	683.88							2.22	685.43		
20/24IW-1B	Upper Semi-Confined	687.07	Stick-up	689.46	4.12	685.34	4.57	684.89							3.18	686.28		
20/24IW-2B	Upper Semi-Confined	687.42	Stick-up	689.92	3.91	686.01	4.61	685.31							3.43	686.49		
20/24IW-3B	Upper Semi-Confined	685.96	Stick-up	688.31	2.89	685.42	3.53	684.78							1.99	686.32		
20/24IW-11	Unconfined	689.16	Stick-up	691.57					6.55	685.02					5.51	686.06		
20/24IW-12	Unconfined	691.18	Stick-up	693.65					8.12	685.53					6.41	687.24		
20/24IW-13	Unconfined	688.77	Stick-Up	689.94					4.41	685.53					3.01	686.93		
20/24IW-14	Unconfined	693.4	Stick-up	694.47											7.36	687.11		
20/24IW-15	Unconfined	694.223	Flush mount	693.62					6.77	686.85					7.75	685.87		
20/24IW-16	Unconfined	694.37	Flush mount	693.44					7.32	686.12					6.35	687.09	7.83	685.61
20/24IW-17	Unconfined	693.51	Flush mount	695.23					9.28	685.95					7.72	687.51	8.95	686.28
20/24IW-18	Unconfined	693.33	Stick-up	694.26											7.36	686.90		
20/24IW-19	Unconfined	693.16	Stick-up	694.17					8.1	686.07					7.18	686.99	8.55	685.62
20/24IW-20	Unconfined	692.77	Stick-up	693.77					7.7	686.07					6.77	687.00		
20/24MW-15	Unconfined	690.69	Stick-up	692.27					6.71	685.56	6.56	685.71	5.78	686.49	5.76	686.51	6.58	685.69
20/24MW-16	Unconfined	693.29	Stick-up	694.87					8.97	685.9	8.55	686.32	8.02	686.85	7.68	687.19	8.7	686.17
20/24MW-17	Unconfined	694.06	Flush mount	693.62					7.64	685.98	6.61	687.01	6.49	687.13	6.26	687.36	7.38	686.24

<sup>1</sup> Based upon previously designated lithostratigraphy.

<sup>2</sup> Per Shaw, July 2005 Area B (Site 20/24) HRC or Groundwater Treatment Pilot Study Report.

<sup>3</sup> Per ARCADIS, January 2007, April 2008, or August 2008 Area B (Site 20/24) Survey.

All elevations in feet relative to NAVD 88.

MSL-Mean Sea Level

RPE - Reference Point Elevation for groundwater depth mesurment

Table 2 Groundwater Elevation Data

Well ID	Monitored Hydrostratigraphic Unit <sup>1</sup>	Surface/Ground Elevation <sup>2 and 3</sup>	Surface Completion	RPE <sup>2 and 3</sup> (inner casing/cam height)	6/4/2009		9/1/2009		11/16/2009		3/30/2010		6/8/2010		8/13/2010		9/10/2010		3/24/2011	
					Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)	Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)	Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)	Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)	Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)	Depth to Water (ft bmp)	Water Level Elevation (ft msl)	Depth to Water (ft bmp)	Water Level Elevation (ft msl)	Depth to Water (ft bmp)	Water Level Elevation (ft msl)
DM20-2	Unconfined	685.4	Stick-Up	686.78			2.86	683.92												
20/24MW-18	Unconfined	688.9	Stick-Up	690.17			5.11	685.06									6.7	683.47		
MW24-2A	Unconfined	690.48	Stick-Up	692.23			4.31	687.92							6.47					
MW24-2B	Upper Semi-Confined	690.24	Stick-Up	691.38			3.50	687.88							6.78					
MW24-3	Unconfined	686.18	Stick-Up	687.41			3.06	684.35												
20/24MW-1	Upper Semi-Confined	687.66	Stick-Up	687.06			2.13	684.93												
20/24MW-02	Upper Semi-Confined	687.8	Stick-Up	690.01			4.83	685.18												
20/24MW-2D	Lower Semi-Confined	687.53	Stick-Up	689.13			3.47	685.66												
20/24MW-3	Unconfined	688.47	Stick-Up	690.57			5.26	685.31												
20/24MW-5	Unconfined	689.85	Stick-Up	692.15			5.03	687.12							7.05					
20/24MW-6	Unconfined	690.4	Stick-Up	692.29	6.76	685.53	7.07	685.22	6.93	685.36	6.01	686.28	7.50	684.79	692.29	7.59	684.70	5.54	686.75	
20/24MW-7	Unconfined	689.97	Stick-Up	691.64			Abandoned													
20/24MW-8	Unconfined	689.95	Stick-Up	691.44	5.94	685.50	6.27	685.17	6.18	685.26	5.22	686.22	6.71	684.73	691.44	6.8	684.64	5.76	685.68	
20/24MW-9	Unconfined	692.64	Stick-Up	694.19			8.18	686.01												
20/24MW-10	Unconfined	692.36	Stick-Up	694.33			Abandoned													
20/24MW-11	Unconfined	692.08	Stick-Up	693.76			Abandoned													
20/24MW-12	Unconfined	690	Stick-up	692.13			6.92	685.21												
20/24MW-13	Unconfined	690.5	Stick-up	692.59			7.35	685.24												
20/24MW-14	Unconfined	690.5	Stick-up	692.20			6.99	685.21												
20/24MW-6B	Upper Semi-Confined	690.4	Stick-up	692.24	6.78	685.46	7.03	685.21	6.88	685.36	6.42	685.82	7.56	684.68	692.24	7.72	684.52	6.80	685.44	
20/24IW-1	Unconfined	689	Stick-up	691.50			6.86	684.64												
20/24IW-2	Unconfined	689.67	Stick-Up	691.99			6.89	685.10												
20/24IW-3	Unconfined	690.18	Stick-up	692.1	6.44	685.66	6.63	685.47	6.52	685.58	5.36	686.74	7.13	684.97	692.10	5.83	686.27	6.45	685.65	
20/24IW-4	Unconfined	690.87	Stick-up	693.49			7.70	685.79												
20/24IW-5	Unconfined	691.25	Stick-up	693.26			7.40	685.86			5.44	687.82								
20/24IW-6	Unconfined	693.5	Stick-up	696.09			9.50	686.59							11.37					
20/24IW-7	Unconfined	691.92	Stick-up	693.76			7.05	686.71							8.92					
20/24IW-8	Unconfined	687.59	Stick-up	689.55			4.35	685.20									5.65	683.90		
20/24IW-9	Unconfined	687.04	Stick-up	688.74			4.76	683.98									5.84	682.90		
20/24IW-10	Unconfined	685.85	Stick-up	687.65			3.72	683.93									4.72	682.93		
20/24IW-1B	Upper Semi-Confined	687.07	Stick-up	689.46			4.22	685.24									5.58	683.88		
20/24IW-2B	Upper Semi-Confined	687.42	Stick-up	689.92			4.33	685.59									5.36	684.56		
20/24IW-3B	Upper Semi-Confined	685.96	Stick-up	688.31			3.19	685.12									4.53	683.78		
20/24IW-11	Unconfined	689.16	Stick-up	691.57			Bee nest													
20/24IW-12	Unconfined	691.18	Stick-up	693.65			7.64	686.01												
20/24IW-13	Unconfined	688.77	Stick-Up	689.94			4.36	685.58												
20/24IW-14	Unconfined	693.4	Stick-up	694.47			8.38	686.09												
20/24IW-15	Unconfined	694.223	Flush mount	693.62			8.09	685.53												
20/24IW-16	Unconfined	694.37	Flush mount	693.44			7.36	686.08							9.46					
20/24IW-17	Unconfined	693.51	Flush mount	695.23			8.82	686.41							10.62					
20/24IW-18	Unconfined	693.33	Stick-up	694.26			8.59	685.67							10.35					
20/24IW-19	Unconfined	693.16	Stick-up	694.17			8.52	685.65							10.18					
20/24IW-20	Unconfined	692.77	Stick-up	693.77			Bee nest								9.97					
20/24MW-15	Unconfined	690.69	Stick-up	692.27	6.51	685.76	6.64	685.63	6.53	685.74	5.30	686.97	7.42	684.85	692.27	8.68	683.59	6.30	685.97	
20/24MW-16	Unconfined	693.29	Stick-up	694.87	8.66	686.21	8.75	686.12	8.53	686.34	7.05	687.82	9.26	685.61	694.87	10.65	684.22	7.91	686.96	
20/24MW-17	Unconfined	694.06	Flush mount	693.62	7.37	686.25	7.31	686.31	7.13	686.49	5.82	687.80	7.88	685.74	693.62	9.39	684.23	5.25	688.37	

<sup>1</sup> Based upon previously designated lithostratigraphy.

<sup>2</sup> Per Shaw, July 2005 Area B (Site 20/24) HRC or Groundwater Treatment Pilot Study Report

<sup>3</sup> Per ARCADIS, January 2007, April 2008, or August 2008 Area B (Site 20/24) Survey.

All elevations in feet relative to NAVD :

MSL-Mean Sea Level

RPE - Reference Point Elevation for groundwater depth measurement

Table 2 Groundwater Elevation Data

Well ID	Monitored Hydrostratigraphic Unit <sup>1</sup>	Surface/Ground Elevation <sup>2 and 3</sup>	Surface Completion	RPE <sup>2 and 3</sup> (inner casing/cam height)	9/2/2011		2/17/2012		3/8/2012		9/6/2012		8/7/2013		6/23/2014		9/21/2015	
					Depth to Water (ft bmp)	Water Level Elevation (ft msl)	Depth to Water (ft bmp)	Water Level Elevation (ft msl)	Depth to Water (ft bmp)	Water Level Elevation (ft msl)	Depth to Water (ft bmp)	Water Level Elevation (ft msl)	Depth to Water (ft bmp)	Water Level Elevation (ft msl)	Depth to Water (ft bmp)	Water Level Elevation (ft msl)	Depth to Water (ft bmp)	Water Level Elevation (ft msl)
DM20-2	Unconfined	685.4	Stick-Up	686.78														
20/24MW-18	Unconfined	688.9	Stick-Up	690.17			4.83	685.34	4.93	-4.93	5.94	-5.94	5.33	684.84	5.11	685.06	6.68	683.49
MW24-2A	Unconfined	690.48	Stick-Up	692.23														
MW24-2B	Upper Semi-Confined	690.24	Stick-Up	691.38														
MW24-3	Unconfined	686.18	Stick-Up	687.41														
20/24MW-1	Upper Semi-Confined	687.66	Stick-Up	687.06														
20/24MW-02	Upper Semi-Confined	687.8	Stick-Up	690.01														
20/24MW-2D	Lower Semi-Confined	687.53	Stick-Up	689.13														
20/24MW-3	Unconfined	688.47	Stick-Up	690.57														
20/24MW-5	Unconfined	689.85	Stick-Up	692.15														
20/24MW-6	Unconfined	690.4	Stick-Up	692.29	6.35	685.94			6.82	679.93	7.99	678.76	7.22	685.07	6.97	685.32	8.61	683.68
20/24MW-7	Unconfined	689.97	Stick-Up	691.64														
20/24MW-8	Unconfined	689.95	Stick-Up	691.44	5.54	685.90			6.04	679.64	7.18	678.50	6.45	684.99	6.19	685.25	7.86	683.58
20/24MW-9	Unconfined	692.64	Stick-Up	694.19														
20/24MW-10	Unconfined	692.36	Stick-Up	694.33														
20/24MW-11	Unconfined	692.08	Stick-Up	693.76														
20/24MW-12	Unconfined	690	Stick-up	692.13														
20/24MW-13	Unconfined	690.5	Stick-up	692.59														
20/24MW-14	Unconfined	690.5	Stick-up	692.20														
20/24MW-6B	Upper Semi-Confined	690.4	Stick-up	692.24	6.56	685.68			6.88	678.56	8.08	677.36	7.17	685.07	6.89	685.35	8.72	683.52
20/24IW-1	Unconfined	689	Stick-up	691.50														
20/24IW-2	Unconfined	689.67	Stick-Up	691.99	6.31	685.68												
20/24IW-3	Unconfined	690.18	Stick-up	692.1	6.37	685.73			6.42	679.23	7.75	677.90	6.82	685.28	6.57	685.53	8.3	683.8
20/24IW-4	Unconfined	690.87	Stick-up	693.49	6.98	686.51												
20/24IW-5	Unconfined	691.25	Stick-up	693.26														
20/24IW-6	Unconfined	693.5	Stick-up	696.09														
20/24IW-7	Unconfined	691.92	Stick-up	693.76														
20/24IW-8	Unconfined	687.59	Stick-up	689.55			4.1	685.45			5.34	-5.34	4.68	684.87	4.38	685.17	5.92	683.63
20/24IW-9	Unconfined	687.04	Stick-up	688.74			4.16	684.58			5.18	-5.18	4.17	684.57	3.87	684.87	5.42	683.32
20/24IW-10	Unconfined	685.85	Stick-up	687.65			3.21	684.44	3.35	-3.35	3.98	-3.98	3.16	684.49	2.77	684.88	4.22	683.43
20/24IW-1B	Upper Semi-Confined	687.07	Stick-up	689.46			3.92	685.54			5.26	-5.26	4.55	684.91	4.11	685.35	5.8	683.66
20/24IW-2B	Upper Semi-Confined	687.42	Stick-up	689.92			8.94	680.98			5.97	-5.97	5.3	684.62	4.16	685.76	6.17	683.75
20/24IW-3B	Upper Semi-Confined	685.96	Stick-up	688.31			2.88	685.43			4.12	-4.12	3.42	684.89	3.07	685.24	4.2	684.11
20/24IW-11	Unconfined	689.16	Stick-up	691.57														
20/24IW-12	Unconfined	691.18	Stick-up	693.65														
20/24IW-13	Unconfined	688.77	Stick-Up	689.94														
20/24IW-14	Unconfined	693.4	Stick-up	694.47														
20/24IW-15	Unconfined	694.223	Flush mount	693.62														
20/24IW-16	Unconfined	694.37	Flush mount	693.44	7.91	685.53												
20/24IW-17	Unconfined	693.51	Flush mount	695.23	8.24	686.99												
20/24IW-18	Unconfined	693.33	Stick-up	694.26														
20/24IW-19	Unconfined	693.16	Stick-up	694.17	7.50	686.67												
20/24IW-20	Unconfined	692.77	Stick-up	693.77														
20/24MW-15	Unconfined	690.69	Stick-up	692.27	6.3	685.97			6.44	679.53	7.86	678.11	6.91	685.36	6.58	685.69	8.45	683.82
20/24MW-16	Unconfined	693.29	Stick-up	694.87	8.03	686.84			8.39	678.57	11.14	675.82	9.01	685.86	8.61	686.26	10.8	684.07
20/24MW-17	Unconfined	694.06	Flush mount	693.62	6.61	687.01			6.98	681.39	8.91	679.46	7.61	686.01	7.17	686.45	9.38	684.24

<sup>1</sup> Based upon previously designated lithostratigraphy.

<sup>2</sup> Per Shaw, July 2005 Area B (Site 20/24) HRC or Groundwater Treatment Pilot Study Report

<sup>3</sup> Per ARCADIS, January 2007, April 2008, or August 2008 Area B (Site 20/24) Survey.

All elevations in feet relative to NA'

MSL-Mean Sea Level

RPE - Reference Point Elevation for groundwater depth measurement

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### 3. 2015 ANNUAL RESULTS

This section presents the results of annual site activities conducted in 2015. Results from the groundwater and surface water sampling events are provided in **Tables 3 and 4**, respectively. Laboratory analytical reports are included in **Appendix B**. Sampling logs are provided in **Appendix A**.

#### 3.1 GROUNDWATER ELEVATIONS

Depth to groundwater measurements were collected on 21 September 2015. Groundwater elevations measured in September 2015 ranged from a minimum of 683.32 feet (ft) above mean sea level (amsl) at 20/24IW-09 to a maximum of 684.24 ft amsl at 20/24MW-17. These groundwater elevations are approximately 1.5 ft lower than what was observed in 2014. General groundwater flow direction is to the southeast, towards the landfill pond. Depth to groundwater measurements, including historical measurements, and corresponding groundwater elevations are provided in **Table 2**. A groundwater potentiometric map is provided on **Figure 4**.

#### 3.2 2015 GROUNDWATER RESULTS

The following five contaminants of concern (COCs) were identified in the ROD (U.S. Army 2009) for Area B Groundwater (PICA-205):

- 1,1-DCE
- Cis-1,2- DCE
- PCE
- TCE
- VC

The detections of each of these COCs during the 2015 sampling event are summarized below:

- PCE, TCE, cis-1,2-DCE, and 1,1-DCE, were not detected above their respective SCLs.
- VC was detected above the SCL of 1.0 microgram per liter ( $\mu\text{g/L}$ ) in 2 of the 14 wells sampled during the annual and performance monitoring events in September 2015. VC detections were observed at 20/24MW-08 (18.6  $\mu\text{g/L}$ ) and 20/24MW-18 (4.6  $\mu\text{g/L}$ ).

In addition to the collection and analysis of VOCs, dissolved gases (methane, ethane, and ethene) were evaluated at performance monitoring wells. The evaluation of these gases yielded the following observations:

- The ethene concentration within 20/24MW-8 (the farthest down gradient portion of the plume) was 12.4  $\mu\text{g/L}$ , an increase from 9.5  $\mu\text{g/L}$  detected in 2014. Monitoring well 20/24MW-6B (downgradient of injection line 3) also had an ethene detection of 8.7  $\mu\text{g/L}$ , an increase from 0.19  $\mu\text{g/L}$  observed in 2014. Ethene concentrations within the remaining seven wells were not detected above the reporting limit.

- Ethane concentrations within the Site decreased in all except two of the nine wells sampled for ethane (20/24MW-6B [58.6 µg/L] and 20/24IW-03 [8.4 µg/L] since the previous sampling event in 2014 (7.6 µg/L and 5.7 µg/L, respectively).
- All nine of the wells have either maintained an elevated methane concentration above baseline or have experienced an increased methane concentration from the previous sampling event.

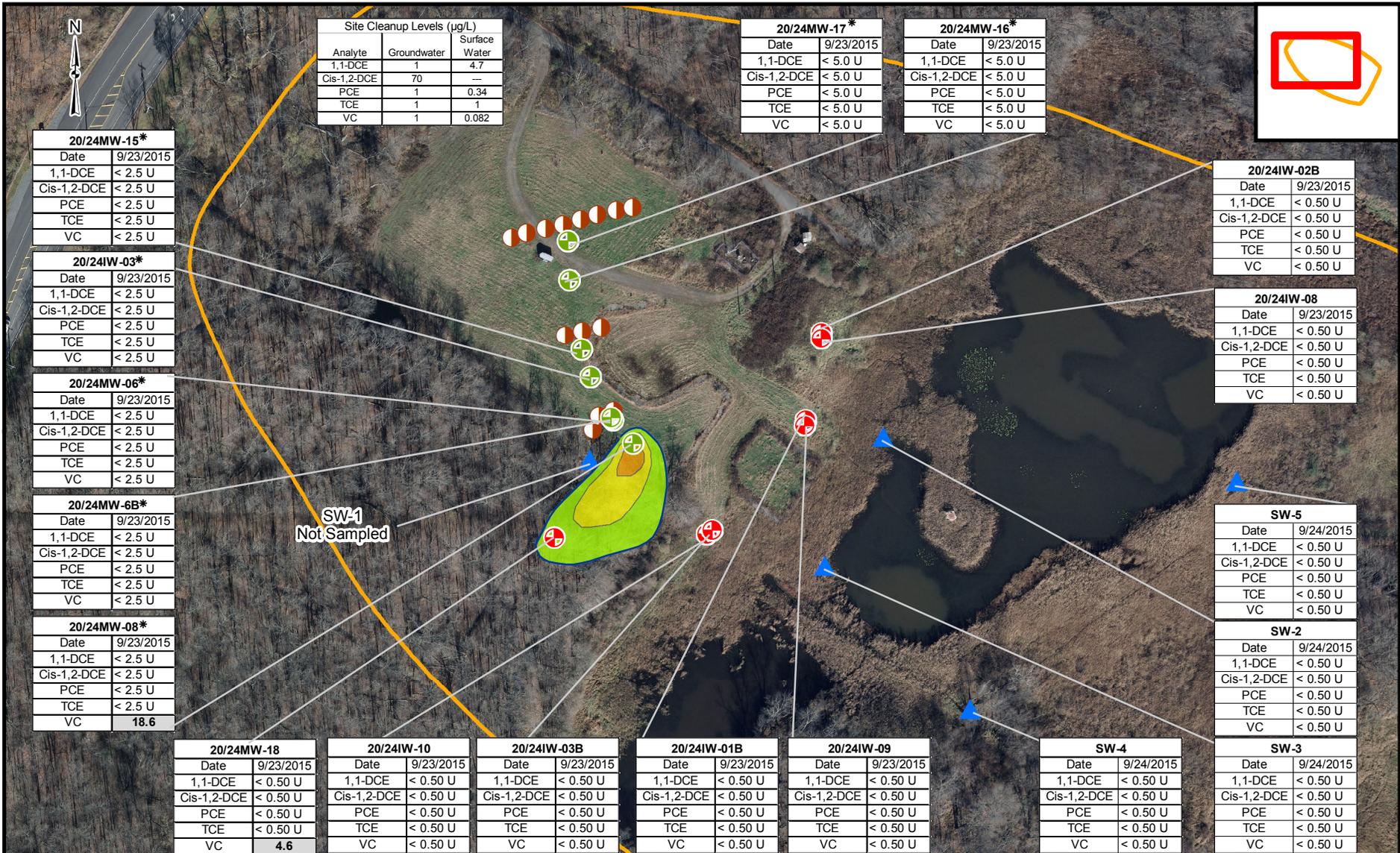
**Table 3** presents the September 2015 performance monitoring analytical results for each monitoring well. A summary of COC analytical results is provided on **Figure 5**. VOC concentration charts for groundwater samples are included in **Appendix C**. Data trend plots are included in **Appendix D**.

### 3.3 TOTAL ORGANIC CARBON AND PH MONITORING

In addition to the annual performance monitoring, monitoring of TOC and pH was conducted to evaluate the effectiveness of enhanced biodegradation and to determine the frequency of future injection events. During the September 2015 sampling event, the highest TOC concentration (55.7 milligrams per liter [mg/L]) was observed at 20/24MW-06 (located adjacent to and slightly downgradient of injection line 3, **Figure 3**) and the lowest TOC concentration (5.6 mg/L) was observed at 20/24MW-18 (located on the plume periphery, downgradient from injection line 3). The TOC concentrations obtained during the 2015 event are reported in **Table 3**. Data trend plots, including pH and TOC results, are provided in **Appendix D**.

### 3.4 SURFACE WATER MONITORING

**Table 4** presents the 2015 analytical results for surface water. A summary of COC analytical results is provided on **Figure 5**. None of the surface water locations had COC detections that exceeded the SCLs.



Analyte	Site Cleanup Levels (µg/L)	
	Groundwater	Surface Water
1,1-DCE	1	4.7
Cis-1,2-DCE	70	—
PCE	1	0.34
TCE	1	1
VC	1	0.082

20/24MW-17*	
Date	9/23/2015
1,1-DCE	< 5.0 U
Cis-1,2-DCE	< 5.0 U
PCE	< 5.0 U
TCE	< 5.0 U
VC	< 5.0 U

20/24MW-16*	
Date	9/23/2015
1,1-DCE	< 5.0 U
Cis-1,2-DCE	< 5.0 U
PCE	< 5.0 U
TCE	< 5.0 U
VC	< 5.0 U

20/24IW-02B	
Date	9/23/2015
1,1-DCE	< 0.50 U
Cis-1,2-DCE	< 0.50 U
PCE	< 0.50 U
TCE	< 0.50 U
VC	< 0.50 U

20/24IW-08	
Date	9/23/2015
1,1-DCE	< 0.50 U
Cis-1,2-DCE	< 0.50 U
PCE	< 0.50 U
TCE	< 0.50 U
VC	< 0.50 U

SW-5	
Date	9/24/2015
1,1-DCE	< 0.50 U
Cis-1,2-DCE	< 0.50 U
PCE	< 0.50 U
TCE	< 0.50 U
VC	< 0.50 U

SW-2	
Date	9/24/2015
1,1-DCE	< 0.50 U
Cis-1,2-DCE	< 0.50 U
PCE	< 0.50 U
TCE	< 0.50 U
VC	< 0.50 U

SW-3	
Date	9/24/2015
1,1-DCE	< 0.50 U
Cis-1,2-DCE	< 0.50 U
PCE	< 0.50 U
TCE	< 0.50 U
VC	< 0.50 U

20/24MW-18	
Date	9/23/2015
1,1-DCE	< 0.50 U
Cis-1,2-DCE	< 0.50 U
PCE	< 0.50 U
TCE	< 0.50 U
VC	<b>4.6</b>

20/24IW-10	
Date	9/23/2015
1,1-DCE	< 0.50 U
Cis-1,2-DCE	< 0.50 U
PCE	< 0.50 U
TCE	< 0.50 U
VC	< 0.50 U

20/24IW-03B	
Date	9/23/2015
1,1-DCE	< 0.50 U
Cis-1,2-DCE	< 0.50 U
PCE	< 0.50 U
TCE	< 0.50 U
VC	< 0.50 U

20/24IW-01B	
Date	9/23/2015
1,1-DCE	< 0.50 U
Cis-1,2-DCE	< 0.50 U
PCE	< 0.50 U
TCE	< 0.50 U
VC	< 0.50 U

20/24IW-09	
Date	9/23/2015
1,1-DCE	< 0.50 U
Cis-1,2-DCE	< 0.50 U
PCE	< 0.50 U
TCE	< 0.50 U
VC	< 0.50 U

SW-4	
Date	9/24/2015
1,1-DCE	< 0.50 U
Cis-1,2-DCE	< 0.50 U
PCE	< 0.50 U
TCE	< 0.50 U
VC	< 0.50 U

- Installation Boundary
- Area B
- Surface Water Sampling Location

- Existing Injection Well
- Annual Monitoring Well
- Performance Monitoring Well

- VC Concentrations
- < 5 µg/L
  - 5-10 µg/L
  - 10-20 µg/L

ABBREVIATIONS:  
 µg/L – micrograms per liter  
 1,1-DCE – 1,1-Dichloroethene  
 cis-1,2-DCE – Cis-1, 2-dichloroethene  
 PCE – Tetrachloroethene  
 TCE – Trichloroethene  
 VC – Vinyl chloride  
 U – Indicates that the analyte was analyzed for but not detected.

0 200  
 Feet

NOTES:  
 1. All values reported in µg/L  
 2. Bolded and shaded values indicate concentrations above the site cleanup level.  
 \* Sample matrix interference resulted in elevated detection limits.



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**Figure 5**  
**Groundwater and Surface Water**  
**Monitoring Analytical Results**

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Table 3 Groundwater Monitoring Results

Groundwater Results	Location ID		20/24MW-06*	20/24MW-6B*	20/24MW-08*	20/24MW-15*	20/24MW-16*	20/24MW-17*	20/24MW-18	20/24IW-01B	20/24IW-02B	20/24IW-03*	20/24IW-03B	20/24IW-08	20/24IW-09	20/24IW-10	
	Sample Date		9/23/2015	9/23/2015	9/23/2015	9/23/2015	9/23/2015	9/23/2015	9/23/2015	9/23/2015	9/23/2015	9/23/2015	9/23/2015	9/23/2015	9/23/2015	9/23/2015	9/23/2015
	Units	Groundwater SCL															
<b>COCs</b>																	
1,1-Dichloroethene	µg/L	1	< 2.5 U	< 2.5 U	< 2.5 U	< 2.5 U	< 5.0 U	< 5.0 U (< 5.0 U)	< 0.50 U	< 0.50 U	< 0.50 U	< 2.5 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	
cis-1,2-Dichloroethene	µg/L	70	< 2.5 U	< 2.5 U	< 2.5 U	< 2.5 U	< 5.0 U	< 5.0 U (< 5.0 U)	< 0.50 U	< 0.50 U	< 0.50 U	< 2.5 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	
Tetrachloroethene	µg/L	1	< 2.5 U	< 2.5 U	< 2.5 U	< 2.5 U	< 5.0 U	< 5.0 U (< 5.0 U)	< 0.50 U	< 0.50 U	< 0.50 U	< 2.5 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	
Trichloroethene	µg/L	1	< 2.5 U	< 2.5 U	< 2.5 U	< 2.5 U	< 5.0 U	< 5.0 U (< 5.0 U)	< 0.50 U	< 0.50 U	< 0.50 U	< 2.5 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	
Vinyl chloride	µg/L	1	< 2.5 U	< 2.5 U	<b>18.6</b>	< 2.5 U	< 5.0 U	< 5.0 U (< 5.0 U)	<b>4.6</b>	< 0.50 U	< 0.50 U	< 2.5 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	
<b>Wet Chemistry</b>			9/14/2015	9/14/2015	9/14/2015	9/14/2015	9/14/2015	9/14/2015	9/14/2015			9/14/2015				9/14/2015	
Total Organic Carbon*	mg/L	--	55.7	19.0	21.0	35.7	32.4	46.8 (45.5)	5.6	NA	NA	14.8	NA	NA	NA	6.0	
<b>Dissolved Gases</b>			9/14/2015	9/14/2015	9/14/2015	9/14/2015	9/14/2015	9/14/2015	9/14/2015			9/14/2015				9/14/2015	
Methane	µg/L	--	8,230	1,190	1,070	4,610	3,990	4,620 (5,860)	94.7	NA	NA	1,060	NA	NA	NA	11,300	
Ethane	µg/L	--	32.6	58.6	9.8	31.4	40.5	25.3 (25.3)	< 5.0 U	NA	NA	8.4	NA	NA	NA	< 5.0 U	
Ethene	µg/L	--	< 5.0 U	8.7	12.4	< 5.0 U	< 5.0 U	< 5.0 U (< 5.0 U)	< 5.0 U	NA	NA	< 5.0 U	NA	NA	NA	< 5.0 U	
<b>Field Collected Parameters</b>			9/14/2015	9/14/2015	9/14/2015	9/14/2015	9/14/2015	9/14/2015	9/14/2015			9/14/2015				9/14/2015	
pH	--	--	7.30	6.58	8.17	6.63	7.00	6.54	7.57	NA	NA	7.10	NA	NA	NA	7.02	

1. Duplicate sample results are provided in parenthesis adjacent to results presented for the parent sample location.

2. Values exceeding the applicable screening criterion are boldfaced and shaded.

\* - Matrix interference resulted in elevated detection limits provided herein.

"--" - not applicable

NA - Not Analyzed

µg/L - microgram per liter

mg/L - milligram per liter

U - Indicates the analyte was analyzed but not detected above the detection limit (provide in table).

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Table 4 Surface Water Monitoring Results

Surface Water Results <sup>1</sup>	Location ID		SW-1	SW-2	SW-3	SW-4	SW-5
	Sample Date		9/24/2015	9/24/2015	9/24/2015	9/24/2015	9/24/2015
	Units	Surface Water SCL					
<b>COCs</b>							
1,1-Dichloroethene	µg/L	4.7	NS	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	µg/L	---	NS	0.50 U	0.50 U	0.50 U	0.50 U
Tetrachloroethene	µg/L	0.34	NS	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	µg/L	1	NS	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl chloride	µg/L	0.082	NS	0.50 U	0.50 U	0.50 U	0.50 U
<b>Wet Chemistry</b>							
TOC	mg/L	NA	NS	11.4	13.4	14.6	13.1

1. Values exceeding the applicable screening criterion are boldfaced and shaded.

µg/L - micrograms per liter

mg/L - milligrams per liter

COC - constituent of concern

NA - not analyzed

NS - Not Sampled - Dry

SCL - Site Cleanup Level

U - Indicates that the analyte was analyzed but not detected. Non-detects are presented less than the method detection limit.

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## 4. DATA TREND ANALYSIS

The following data trend analysis is based on the data collected from September 2008 to September 2015 at Area B (PICA-205). Trend charts for TOC, pH, and dissolved gases ethene, ethane, and methane, are constructed to assess the favorability of subsurface conditions for reductive dechlorination reactions (**Appendix D**). Data trends for the five COCs are presented to document the effectiveness of enhanced bioremediation. Trends are discussed for each set of performance monitoring wells downgradient of the respective injection lines. The COC concentration trend charts for groundwater and surface water are provided in units of  $\mu\text{g/L}$  in **Appendix C**. The COC charts in molar units are presented in **Appendix D**.

### 4.1 INJECTION LINE 1

The performance monitoring wells downgradient of injection line 1 are 20/24-MW-16 and 20/24-MW-17. The following trends were observed:

- TOC remained elevated above baseline concentrations at 20/24MW-16 and near baseline for 20/24-MW-17; pH values are within the optimal range for reductive dechlorination (6 - 8.5). Furthermore, sustained methane concentrations indicate methanogenic redox conditions, which are favorable for reductive dechlorination. The TOC, pH, and methane concentrations all demonstrate that conditions continue to be favorable for reductive dechlorination downgradient of injection line 1.
- PCE has not been detected above the SCL since remedy implementation. TCE concentrations have not exceeded the SCL since December 2008.
- 1,1-DCE has not been detected at 20/24MW-16 and 20/24MW-17 during the period of remedy implementation (September 2008 through the current sampling event).
- cis-1, 2-DCE continues to exhibit a decreasing trend at 20/24MW-17 and has been below the SCL since remedy implementation. The concentration of cis-1, 2-DCE fluctuates at 20/24MW-16, but has been below the SCL since November 2009.
- The VC concentration at 20/24MW-17 continues to exhibit a decreasing trend and has been below detection for five consecutive sampling events (March 2012, September 2012, August 2013, December 2014, and September 2015). The concentration of VC at 20/24MW-16 exceeded the SCL during the sampling events conducted in 2012 and 2013; however, the VC detection in 2013 ( $35.2 \mu\text{g/L}$ ) decreased significantly from the detection in September 2012 ( $318 \mu\text{g/L}$ ) and was not detected at concentrations above the laboratory reporting limits in June 2014 and September 2015.
- Detections of biodegradation end products ethane and/or ethene indicate that enhanced reductive dechlorination (ERD) is resulting in complete degradation of CVOCs.

The ERD remedy continues to be effective within and downgradient of injection line 1. There has been a sustained decrease of cis-1,2-DCE and VC at 20/24MW-17. Additionally, the

increased concentrations of VC observed at 20/24MW-16 in 2012 and 2013 decreased below reporting limits in June 2014 and September 2015.

## 4.2 INJECTION LINE 2

The performance monitoring wells downgradient of injection line 2 are 20/24MW-15 and 20/24IW-03. The following trends were observed:

- TOC at 20/24MW-15 is 35.7 mg/L and is above the baseline TOC concentrations. TOC at 20/24IW-03 is 14.8 mg/L, which is slightly lower than baseline conditions. Methane concentrations are sustained at levels above background at 20/24MW-15 and near baseline at 20/24IW-03. Methane results at 20/24MW-15 and 20/24IW-03 were 4,610 µg/L and 1,060 µg/L, respectively. The respective concentrations of TOC and methane demonstrate that conditions continue to be favorable for reductive dechlorination downgradient of injection line 2.
- PCE has not been detected at 20/24MW-15 and 20/24IW-03 during the period of remedy implementation (September 2008 through the current sampling event).
- TCE was not detected during the September 2015 sampling event. TCE concentrations have been below the SCL since November 2009 through the current sampling event at 20/24MW-15. TCE concentrations at 20/24IW-03 have been below the SCL during the period of remedy implementation (September 2008 through the current sampling event).
- 1, 1-DCE was not detected during the September 2015 sampling event. 1, 1-DCE concentrations have been below the SCL since November 2009 through the current sampling event at 20/24MW-15 and below the SCL during the period of remedy implementation (September 2008 through the current sampling event) at 20/24IW-03.
- There were no detections of cis-1,2-DCE during the September 2015 sampling event. The concentration of cis-1,2-DCE decreased from the September 2008 baseline concentration of 224 µg/L to below detection levels in August 2013 and June 2014 at 20/24MW-15. Low, estimated concentrations (i.e., less than 1.0 µg/L) of cis-1,2-DCE were detected at 20/24IW-03 during the 2014 sampling event. No concentrations above the SCL have been detected throughout the period of remedy implementation (September 2008 through the most recent 2015 sampling event).
- The intermediate biodegradation product VC was not detected at both 20/24MW-15 and 20/24IW-03 during the September 2015 sampling event. VC has not been detected at 20/24IW-03 during the period of remedy implementation (September 2008 through the current sampling event), with the exception of an SCL exceedance (2.74 µg/L) during September 2010 and an estimated concentration below the SCL during September 2012. VC concentrations have declined during the period of remedy implementation (September 2008 through the current sampling event) at 20/24MW-15 and was not

detected during the September 2015 sampling event, indicating complete biodegradation of CVOCs.

- Ethane concentrations at wells 20/24IW-3 and 20/24MW-15 have decreased but continue to be above baseline. Detections of end product gases ethane and ethene indicate that ERD is resulting in complete biodegradation of CVOCs.

The ERD remedy continues to be effective within and downgradient of injection line 2 based upon the elevated TOC, methane, and ethane concentrations coupled with the sustained decrease of COCs within both sampling locations.

### 4.3 INJECTION LINE 3

The performance monitoring wells downgradient of injection line 3 consist of 20/24MW-06, 20/24MW-06B, and 20/24MW-8. Performance monitoring wells 20/24/MW06 and 20/24-MW-8 are screened in the unconfined aquifer; 20/24MW-6B is screened in the upper semi-confined aquifer. The data are discussed below.

- TOC concentrations within all locations remain elevated above baseline concentrations (20/24MW-06 at 55.7 mg/L; 20/24MW-6B at 19.0 mg/L; and 20/24MW-08 at 21.0 mg/L). Furthermore, sustained methane detections indicate methanogenic redox conditions, which are favorable for reductive dechlorination. The TOC and methane concentrations demonstrate that conditions continue to be favorable for reductive dechlorination within and downgradient of injection line 3.
- PCE has not been detected during the period of remedy implementation (September 2008 through the current sampling event) at 20/24MW-06, 20/24MW-6B, and 20/24MW-8.
- TCE concentrations have declined over the period of remedy implementation (September 2008 through the current sampling event) and were below detection at all locations during the September 2015 sampling event. Concentrations of TCE have been below the SCL since March 2010 at 20/24MW-6B, below the SCL since September 2010 at 20/24MW-8, and below the SCL since June 2009 at 20/24MW-06.
- 1,1-DCE concentrations were below the detection limit at all locations during the September 2015 sampling event. Concentrations of 1,1-DCE have been below the SCL since June 2009 at 20/24-MW-6B, below the SCL since September 2010 at 20/24MW-8, and have been not detected during the period of remedy implementation (September 2008 through the most recent 2015 sampling event) at 20/24-MW-06.
- Intermediate biodegradation product cis-1,2-DCE has been detected at concentrations above the SCL at two locations (20/24MW-6B and 20/24MW-8), and below the SCL at one location (20/24MW-06) during the period of remedy implementation. However, concentrations have declined and have been below the SCL at 20/24MW-06B since

November 2009 and at 20/24-MW-8 since September 2011. For the 2015 event, cis-1,2-DCE results were below detection at 20/24MW-6B and 20/24MW-8.

- Concentrations of the intermediate biodegradation product VC are declining or non-detect at these locations. At 20/24-MW-06, the concentration of VC has been below the SCL since November 2009. Concentrations of VC at 20/24MW-06B have declined significantly during the period of remedy implementation from a peak concentration of 354 µg/L (December 2008) to five consecutive non-detects (March 2012, September 2012, August 2013, June 2014, and September 2015). Further, concentrations have been below the SCL since March 2010. At 20/24MW-8, VC concentrations have exhibited a strongly declining trend: the September 2008 concentration of 414 µg/L decreased to 18.6 µg/L in September 2015.
- Detections of end product gases ethane and ethene indicate that ERD is resulting in complete biodegradation of COCs, although VC concentrations at 20/24MW-8 will continue to be monitored.

The ERD remedy continues to be effective downgradient of injection line 3 based upon the elevated TOC and methane concentrations coupled with the sustained decrease of COCs in 20/24MW-06, 20/24-MW-6B, and 20/24MW-8. Moreover, the downgradient portion of the plume, characterized by 20/24MW-8, is influenced by the upgradient injections within injection line 3. This assertion is based upon the sustained concentration of TOC, methane, and biodegradation end products (ethane and ethene), following the June 2011 injection event.

#### **4.4 SURFACE WATER DATA TRENDS**

All COCs were below the SCL at all surface water samples collected during the September 2015 sampling event. Only surface water location SW-3 of the 4 sampled surface water locations has had an exceedance of SCLs (VC only) since 2013, indicating an improvement in surface water quality since remedy implementation.

## 5. REMEDY PERFORMANCE AND FUTURE ACTIONS

A review of the data trends discussed in Chapter 4 indicate that concentrations of PCE, TCE, and their degradation products continue to decline in groundwater at Area B (PICA-205). Decreasing concentrations of chlorinated VOCs in conjunction with detections of biodegradation end products (ethene and ethane) indicate that complete reductive dechlorination is occurring and the selected remedy continues to be effective. Although VC was detected at an uncharacteristically high concentration at monitoring well 20/24-MW-16 during 2012, it was not detected above detection limits in follow on events conducted in June 2014 or September 2015.

The 2009 ROD stipulates expected compliance with remedial action objectives within 7 years (September 2015). As of September 2015, the SCLs were attained for all COCs at five of the seven monitoring wells within the plume. Two locations (20/24-MW-08 and 20/24-MW-18) had exceedances of the VC SCL (SCL of 1.0 µg/L) with a reported concentration of 18.6 µg/L and 4.6 µg/L, respectively, during the September 2015 sampling event. However, both reported concentrations were lower than those detected during previous events. Conditions remain favorable to sustaining complete reductive dechlorination of residual VC at these locations, as indicated by TOC, pH, and methane data, as well as the detection of biodegradation products ethane and ethene. Furthermore, residual VC can be degraded under both anaerobic and aerobic aquifer conditions. Therefore, degradation of residual VC is expected to continue as TOC within groundwater is depleted and the groundwater conditions transition from an anaerobic/reducing environment to an aerobic environment.

The seven downgradient monitoring wells (20/24-IW-01B, 20/24-IW-02B, 20/24-IW-03B, 20/24-IW-08, 20/24-IW-09, 20/24-IW-10, and 20/24-MW-18) are sampled annually to quantify COC concentrations at the plume periphery. The annual sampling results indicated no detections of PCE, TCE, cis-1,2-DCE, and 1,1-DCE above their respective SCLs. The only analyte detected above the SCL was VC at 20/24-MW-18 (4.6 µg/L), as discussed above. The data from the downgradient monitoring wells indicate stability of the COC plume and demonstrate that the plume is almost completely attenuated at these locations. The trends in surface water data further indicate that although occasional detections of COCs exceed an SCL, surface water quality has improved since implementation of the ERD remedy in 2008. Continued improvement in surface water quality is expected as the clean water front generated by ERD continues to propagate downgradient.

A need for future injections is not anticipated based on the following lines of evidence:

- There were no SCL exceedances of PCE, TCE, cis-1,2-DCE or 1,1-DCE
- There continues to be sustained concentrations of TOC, methane, and ethane
- The residual VC within the limited number of wells will degrade under both reducing and aerobic conditions.

The 2009 ROD stipulates expected compliance with remedial action objectives by the end of 2015. Although, remedial action objectives have not been met in the anticipated timeframe,

interpretation of monitoring results indicate that the injections of molasses have been effective at remediating VOCs in site groundwater, conditions remain favorable to sustain dechlorination, and only VC in two wells remain above SCLs (at decreased concentrations from previous events). Therefore, it is currently anticipated that remedial action objectives will be achieved in a longer timeframe than projected in the ROD and continued monitoring is recommended until objectives are met. An Explanation of Significant Differences will be developed, as required, and submitted under separate cover.

Future monitoring in 2016 will continue in accordance with the Monitoring Program established in the RD (ARCADIS 2008) and as presented in **Table 1** of this report. The next annual sampling event is anticipated to be conducted in the third quarter of 2016.

## 6. REFERENCES

ARCADIS U.S., Inc. (ARCADIS). 2007. *Final Quality Assurance Project Plan*. August.

———. 2008. *Final Remedial Design Area B (PICA-205) Groundwater*. October.

———. 2012. *2012 Semi-Annual Monitoring Report (First and Second Quarter) Area B (PICA-205) Groundwater*. October.

Interstate Technology and Regulatory Council. 2007. *Protocol for use of Five Passive Samplers to Sample for a variety of Contaminants in Groundwater*. February.

U.S. Army. 2009. *Record of Decision, Area B Groundwater – Picatinny Arsenal, New Jersey*. April.

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## **Appendix A**

### **Field Forms**

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Site: Picatinny Arsenal

Location: Area B

Well ID: MW 18

Well Type:  Monitoring  Other: \_\_\_\_\_

Well Finish:  Stick-up  Flush Mount

Measuring Pt:  Top of Casing  Other: \_\_\_\_\_

Total Depth as Constructed (ft bgs): 18.45 Screened Interval: \_\_\_\_\_

Well Casing: Diameter: 4 Material: PVC

Well Screen: Diameter: 4

Deployment

Date and Time of Deployment 9-9-15 @ 11:40

Weather Conditions Sunny 80's

Depth to GW @ Time of Deployment 6.96

Total Well Depth at Time of Deployment 18.45

Dimensions of HydraSleeve Length (in.) 36 Diameter (in.) 1.75

Deployment Method/Position of Weight:  Bottom Anchor: Weight attached to bottom of HydraSleeve. Weight rests on well bottom  
 Top-Down: Weight attached to bottom of HydraSleeve. Weight suspended in well.  
 Top-Down: Weight attached to top of HydraSleeve. Weight suspended in well.

Deployment Depth (Top of HydraSleeve)(ft bgs): 12'

Retrieval

Date and Time of Retrieval: Date: 9-14-15 Time: 1330

Total # of Days Deployed: 5

Weather Conditions: Sunny 70's

Retrieval Method:  Continuous Pull (preferred)  
 Short Strokes

Depth to GW at Time of Retrieval (measured before retrieval): 6.02

Total Well Depth at Time of Retrieval (measured before retrieval): 18.45

Downhole Field Parameters Upon Retrieval:

Temp: <u>16.65</u>	ORP: <u>-94</u>	Cond: <u>0.641</u>
pH: <u>7.57</u>	DO: <u>2.94</u>	Turb: <u>27.3</u>

Turbidity of GW Sample (dispensed from HydraSleeve):  
Turbidity: 27.3 Meter Type: U-52 Serial #: ENGETDCY

Notes/Observations: \_\_\_\_\_

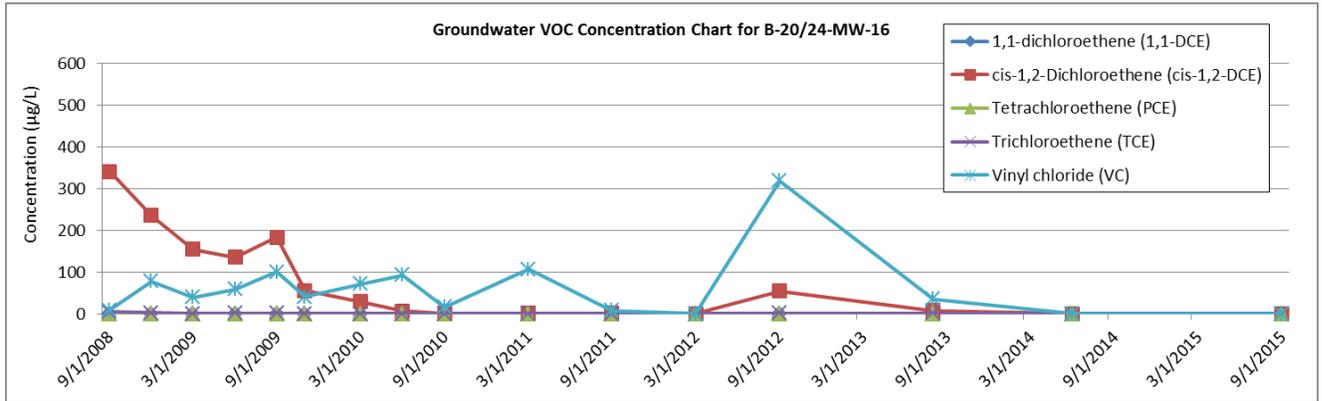
Field Sampling Tech: D. Thompson Company: Sovereign

## **Appendix C**

### **VOC Concentration Charts for Groundwater and Surface Water**

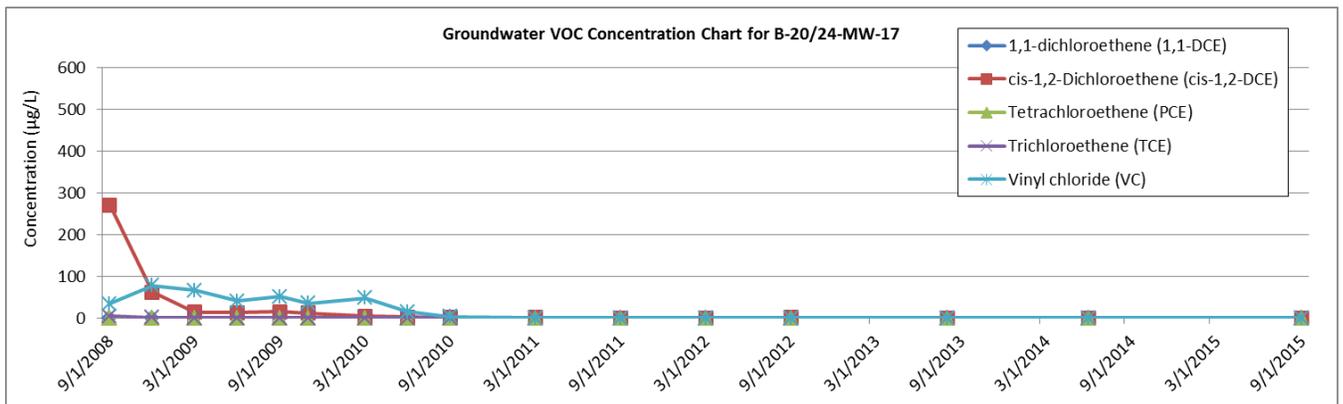
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**Appendix C**  
**VOC Concentration Charts**  
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Analyte	SCL	9/12/2008	12/12/2008	3/30/2009	6/18/2009	9/1/2009	11/16/2009	3/30/2010	6/8/2010	9/10/2010	3/24/2011	9/2/2011
1,1-DCE	1	0	0	0	0	0	0	0	0	0	0	0
cis-1,2-DCE	70	340	235	154	135	183	55.4	28.7	6.07	0.653	0.694	0.74
PCE	1	0	0	0	0	0	0	0	0	0	0	0
TCE	1	3.72	1.96	0	0.345	0.455	0	0	0	0	0	0
VC	1	8.49	77	38.9	58.7	99.8	39.6	70.8	92.6	16	106	6.95

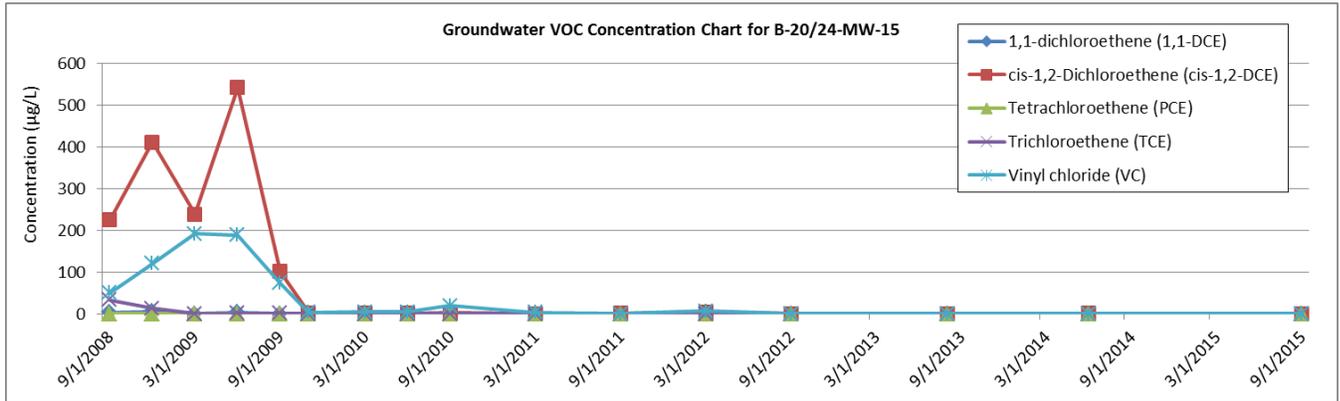
Analyte	SCL	3/21/2012	9/20/2012	8/30/2013	6/23/2014	9/23/2015
1,1-DCE	1	0	0	0	0	0
cis-1,2-DCE	70	0	54.4	7.37	0	0
PCE	1	0	0	0	0	0
TCE	1	0	0.381	0.298	0	0
VC	1	0	318	35.2	0	0



Analyte	SCL	9/12/2008	12/12/2008	3/30/2009	6/18/2009	9/1/2009	11/16/2009	3/30/2010	6/8/2010	9/10/2010	3/24/2011	9/2/2011
1,1-DCE	1	0	0	0	0	0	0	0	0	0	0	0
cis-1,2-DCE	70	270	61.6	13.6	12.9	14.1	11.4	3.93	1.73	0.364	0.26	0
PCE	1	0	0	0	0	0	0	0	0	0	0	0
TCE	1	4.06	0.805	0	0	0	0	0	0	0	0	0
VC	1	33.6	77.4	65.7	39.8	50.5	34.5	47.1	14.9	2.35	0	0

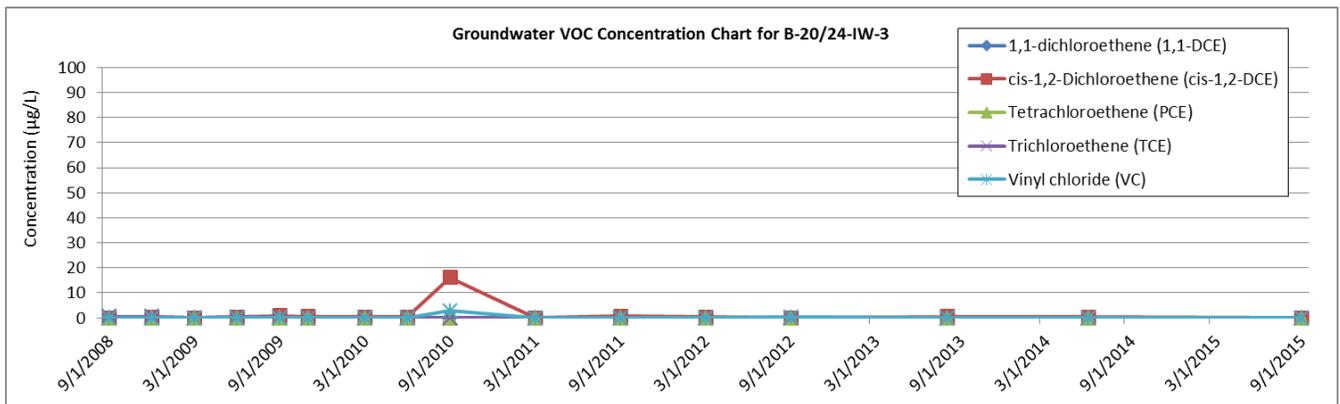
Analyte	SCL	3/21/2012	9/20/2012	8/30/2013	6/23/2014	9/23/2015
1,1-DCE	1	0	0	0	0	0
cis-1,2-DCE	70	0	0.267	0	0	0
PCE	1	0	0	0	0	0
TCE	1	0	0	0	0	0
VC	1	0	0	0	0	0

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Analyte	SCL	9/12/2008	12/12/2008	3/30/2009	6/18/2009	9/1/2009	11/16/2009	3/30/2010	6/8/2010	9/10/2010	3/24/2011	9/2/2011
1,1-DCE	1	2.51	4.81	0	2.35	0	0	0	0	0	0	0
cis-1,2-DCE	70	224	411	238	542	101	2.08	0.505	0.423	1.43	0	0.3
PCE	1	0	0	0	0	0	0	0	0	0	0	0
TCE	1	32.5	12.5	0	1.16	0.268	0	0	0	0	0	0
VC	1	49.2	120	191	188	73.2	2.31	4.16	3.47	19.3	2.84	0

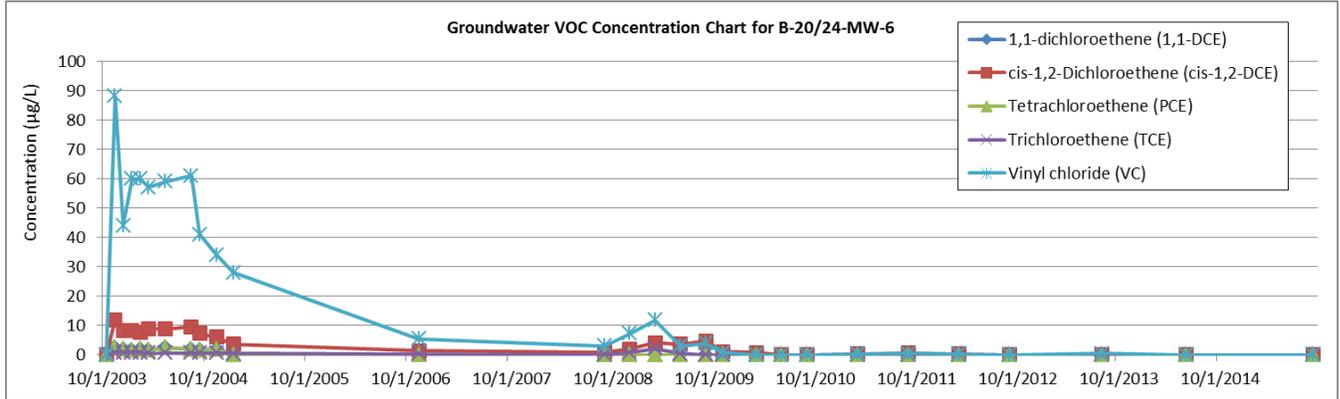
Analyte	SCL	3/21/2012	9/20/2012	8/30/2013	6/23/2014	9/23/2015
1,1-DCE	1	0	0	0	0	0
cis-1,2-DCE	70	3.58	0	0	0.271	0
PCE	1	0	0	0	0	0
TCE	1	0	0	0	0	0
VC	1	5.75	0	0	0	0



Analyte	SCL	5/29/2008	9/11/2008	12/12/2008	3/30/2009	6/18/2009	9/1/2009	11/16/2009	3/30/2010	6/8/2010	9/10/2010	3/24/2011
1,1-DCE	1	0	0	0	0	0	0	0	0	0	0	0
cis-1,2-DCE	70	1.03	0	0.273	0	0.324	0.828	0.434	0.272	0.345	16	0
PCE	1	0	0	0	0	0	0	0	0	0	0	0
TCE	1	0.407	0.468	0.492	0	0.332	0.333	0	0	0	0	0
VC	1	1	0	0	0	0	0	0	0	0	2.74	0

Analyte	SCL	9/2/2011	3/21/2012	9/20/2012	8/30/2013	6/23/2014	9/23/2015
1,1-DCE	1	0	0	0	0	0	0
cis-1,2-DCE	70	0.615	0.271	0	0.394	0.349	0
PCE	1	0	0	0	0	0	0
TCE	1	0	0	0	0	0	0
VC	1	0	0	0.254	0	0	0

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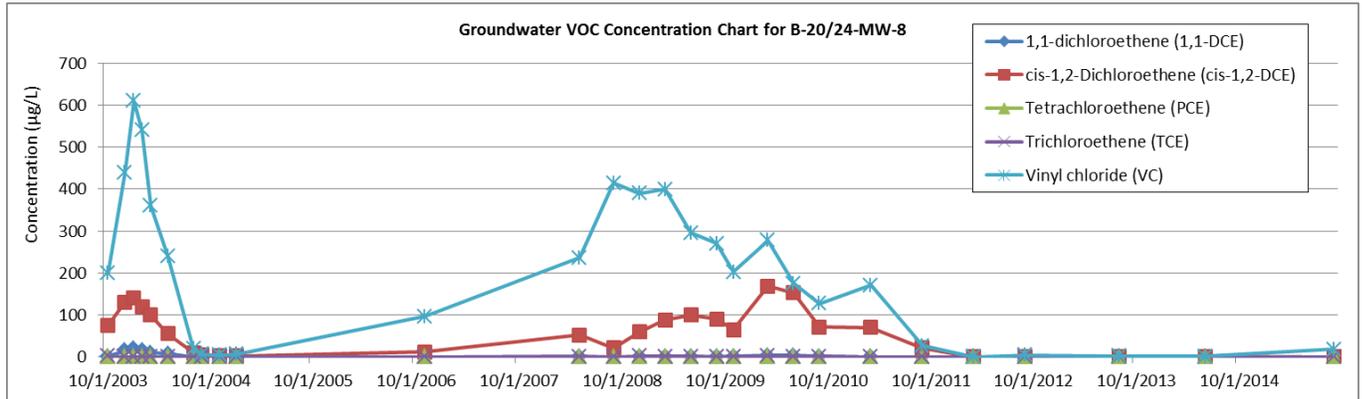


Analyte	SCL	10/27/2003	11/3/2003	12/11/2003	1/22/2004	2/18/2004	3/17/2004	5/19/2004	8/3/2004	9/23/2004	11/15/2004	1/6/2005
1,1-DCE	1	0	2.5	2	1.7	2	1.7	2.5	2	1.7	2	0.18
cis-1,2-DCE	70	0	12	8.3	8.3	7.7	8.9	8.8	9.6	7.3	6	3.6
PCE	1	0	2.5	2	1.7	2	1.7	2.5	2	1.7	2	0
TCE	1	0	0.74	0.73	0.76	0.74	0.63	0.6	0.69	0.65	0.69	0.54
VC	1	0	88	44	60	60	57	59	61	41	34	28

Analyte	SCL	11/15/2006	9/12/2008	12/12/2008	3/30/2009	6/18/2009	9/1/2009	11/16/2009	3/30/2010	6/8/2010	9/10/2010	3/24/2011
1,1-DCE	1	0	0	0	0	0	0	0	0	0	0	0
cis-1,2-DCE	70	1.31	0.924	1.91	4.1	3.61	4.7	1.15	0.808	0	0	0.3
PCE	1	0	0	0	0	0	0	0	0	0	0	0
TCE	1	0.33	0	0.834	2.15	0.431	0	0	0	0	0	0
VC	1	5.42	3.06	7.26	11.8	3.04	3.98	0.739	0	0	0	0.286

Analyte	SCL	9/2/2011	3/21/2012	9/20/2012	8/30/2013	6/23/2014	9/23/2015
1,1-DCE	1	0	0	0	0	0	0
cis-1,2-DCE	70	0.597	0.332	0	0	0	0
PCE	1	0	0	0	0	0	0
TCE	1	0	0	0	0	0	0
VC	1	0.48	0.305	0	0.544	0	0

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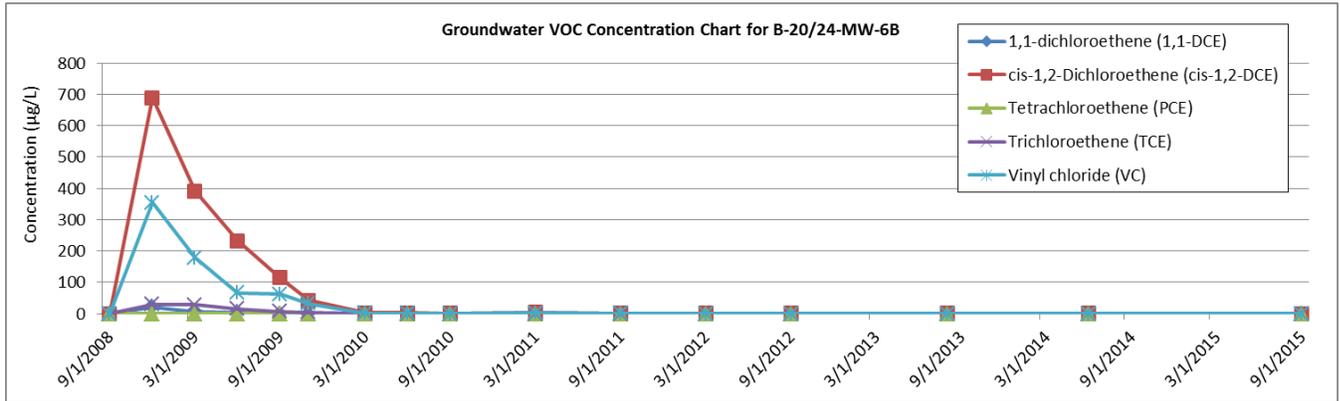


Analyte	SCL	10/28/2003	12/11/2003	1/22/2004	2/18/2004	3/17/2004	5/19/2004	8/3/2004	9/23/2004	11/15/2004	1/6/2005	11/15/2006
1,1-DCE	1	0.8	15	20	15	10	8	0	0	2	0	0
cis-1,2-DCE	70	75	130	140	120	100	55	9.7	4.5	3	2.3	12
PCE	1	0	0	0	0	0	0	0	0	0	0	0
TCE	1	1.9	0	0	0	0	0	0.39	0.36	0	0	0.595
VC	1	200	440	610	540	360	240	19	6.2	4.2	6.4	97

Analyte	SCL	5/29/2008	9/12/2008	12/12/2008	3/30/2009	6/18/2009	9/1/2009	11/16/2009	3/30/2010	6/8/2010	9/10/2010	3/24/2011
1,1-DCE	1	0	0	0	1.28	1.69	0	0.752	3.66	3.27	0.777	0.563
cis-1,2-DCE	70	51.8	21.6	58.9	87.5	100	89.7	64.5	169	153	71.2	70.4
PCE	1	0	0	0	0	0	0	0	0	0	0	0
TCE	1	0.754	0	2.63	1.01	1.51	0	1.32	2.22	1.66	0.848	0.555
VC	1	236	414	390	399	296	270	202	278	175	127	171

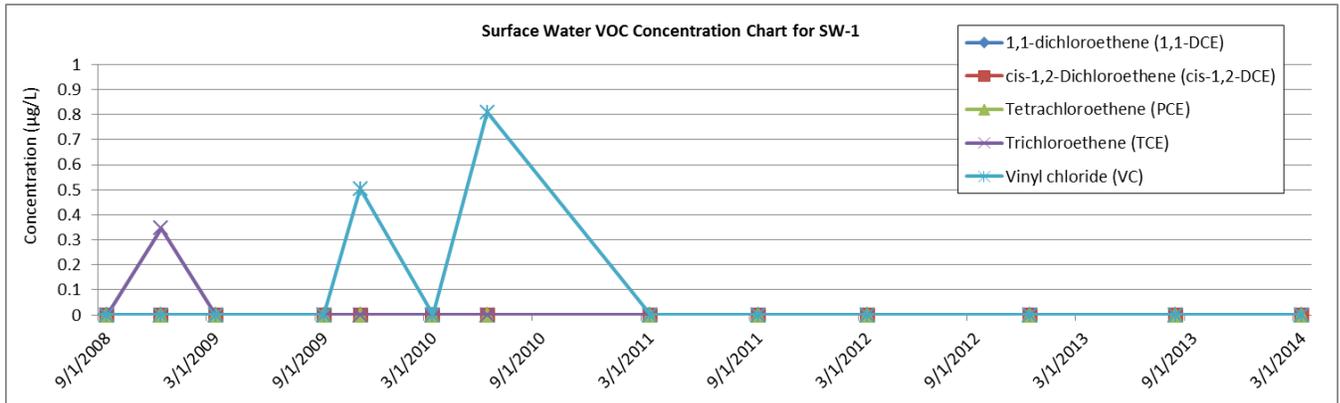
Analyte	SCL	9/2/2011	3/21/2012	9/20/2012	8/30/2013	6/23/2014	9/23/2015
1,1-DCE	1	0	0	0	0	0	0
cis-1,2-DCE	70	21.1	0.264	0.539	1.45	1.62	0
PCE	1	0	0	0	0	0	0
TCE	1	0.281	0	0	0	0	0
VC	1	27.1	0	4.07	2.69	1.03	18.6

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Analyte	SCL	9/12/2008	12/12/2008	3/30/2009	6/18/2009	9/1/2009	11/16/2009	3/30/2010	6/8/2010	9/10/2010	3/24/2011	9/2/2011
1,1-DCE	1	0	21.3	6.46	3.83	0	0	0	0	0	0	0
cis-1,2-DCE	70	0	689	391	232	114	42.6	2.32	1.78	1.57	3.76	1.36
PCE	1	0	0	0	0	0	0	0	0	0	0	0
TCE	1	0	28.6	28.2	15.2	7.13	3.68	0.284	0	0	0	0
VC	1	0	354	178	66.7	61.3	32.5	1.16	0.293	0	3.02	0.263

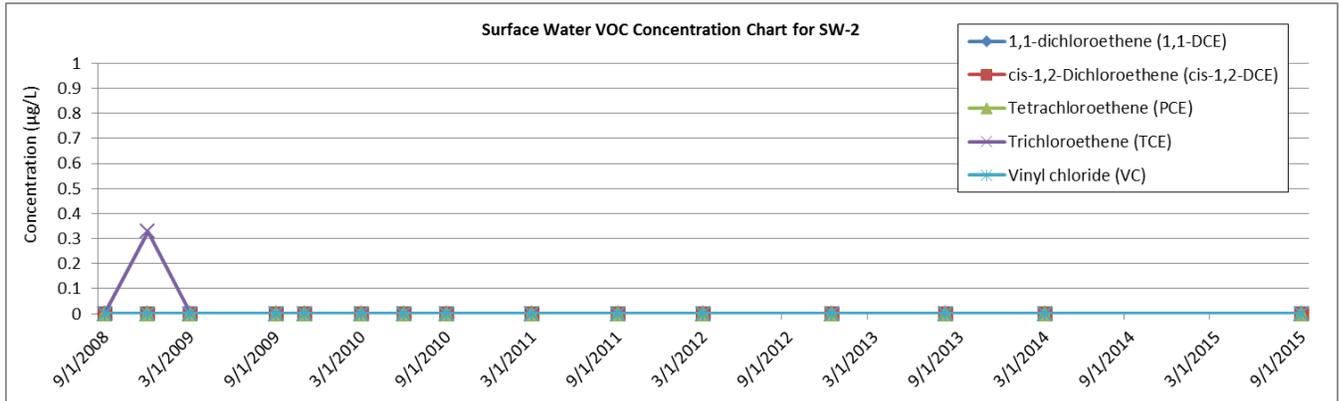
Analyte	SCL	3/21/2012	9/20/2012	8/30/2013	6/23/2014	9/23/2015
1,1-DCE	1	0	0	0	0	0
cis-1,2-DCE	70	1.18	1.1	0.673	0.604	0
PCE	1	0	0	0	0	0
TCE	1	0	0	0	0	0
VC	1	0	0	0	0	0



Analyte	SCL	5/28/2008	9/11/2008	12/12/2008	3/30/2009	9/1/2009	11/16/2009	3/30/2010	6/8/2010	3/24/2011	9/2/2011	3/9/2012
1,1-DCE	4.7	0	0	0	0	0	0	0	0	0	0	0
cis-1,2-DCE	---	0	0	0	0	0	0	0	0	0	0	0
PCE	0.34	0	0	0	0	0	0	0	0	0	0	0
TCE	1	0	0	0.345	0	0	0	0	0	0	0	0
VC	0.082	0	0	0	0	0	0.503	0	0.809	0	0	0

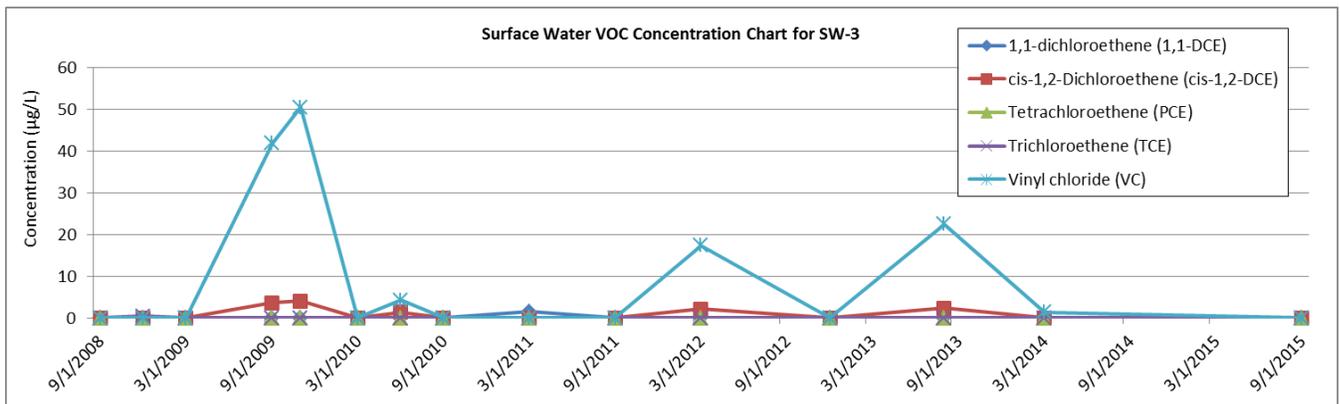
Analyte	SCL	12/18/2012	8/16/2013	3/26/2014
1,1-DCE	4.7	0	0	0
cis-1,2-DCE	---	0	0	0
PCE	0.34	0	0	0
TCE	1	0	0	0
VC	0.082	0	0	0

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Analyte	SCL	9/11/2008	12/12/2008	3/30/2009	9/1/2009	11/16/2009	3/30/2010	6/8/2010	9/10/2010	3/24/2011	9/2/2011	3/9/2012
1,1-DCE	4.7	0	0	0	0	0	0	0	0	0	0	0
cis-1,2-DCE	---	0	0	0	0	0	0	0	0	0	0	0
PCE	0.34	0	0	0	0	0	0	0	0	0	0	0
TCE	1	0	0.328	0	0	0	0	0	0	0	0	0
VC	0.082	0	0	0	0	0	0	0	0	0	0	0

Analyte	SCL	12/18/2012	8/16/2013	3/26/2014	9/24/2015
1,1-DCE	4.7	0	0	0	0
cis-1,2-DCE	---	0	0	0	0
PCE	0.34	0	0	0	0
TCE	1	0	0	0	0
VC	0.082	0	0	0	0



Analyte	SCL	9/11/2008	12/12/2008	3/30/2009	9/1/2009	11/16/2009	3/30/2010	6/8/2010	9/10/2010	3/24/2011	9/2/2011	3/9/2012
1,1-DCE	4.7	0	0	0	0	0	0	0	0	1.48	0	0
cis-1,2-DCE	---	0	0	0	3.56	4.06	0	1.33	0	0	0	2.13
PCE	0.34	0	0	0	0	0	0	0	0	0	0	0
TCE	1	0	0.358	0	0	0	0	0	0	0	0	0
VC	0.082	0	0	0	41.8	50.4	0	4.23	0	0	0	17.3

Analyte	SCL	12/18/2012	8/16/2013	3/26/2014	9/24/2015
1,1-DCE	4.7	0	0	0	0
cis-1,2-DCE	---	0	2.32	0	0
PCE	0.34	0	0	0	0
TCE	1	0	0	0	0
VC	0.082	0	22.4	1.33	0

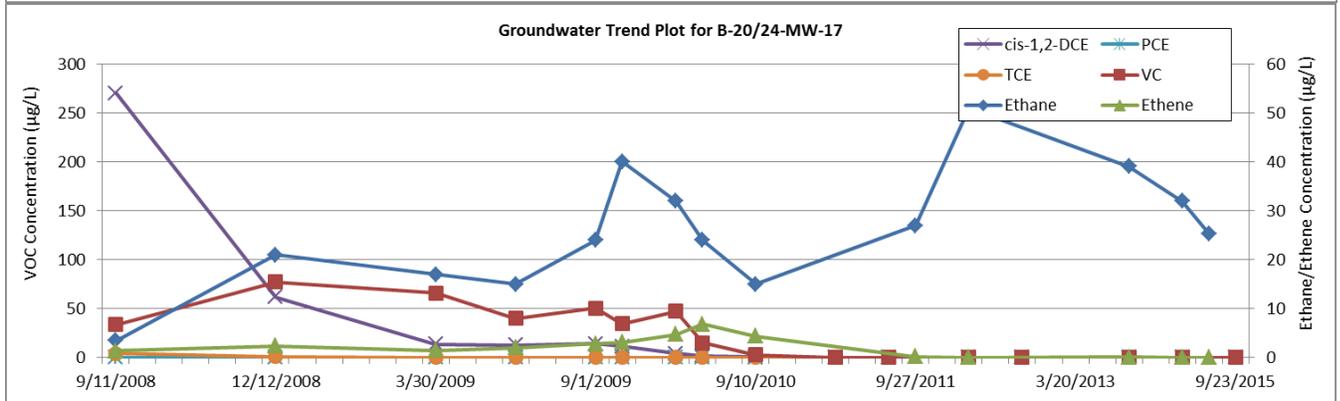
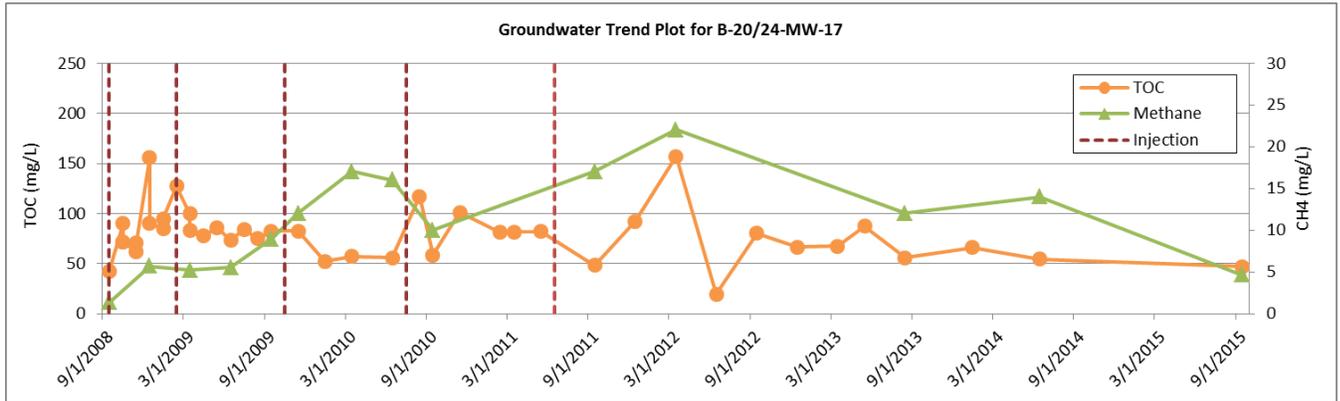


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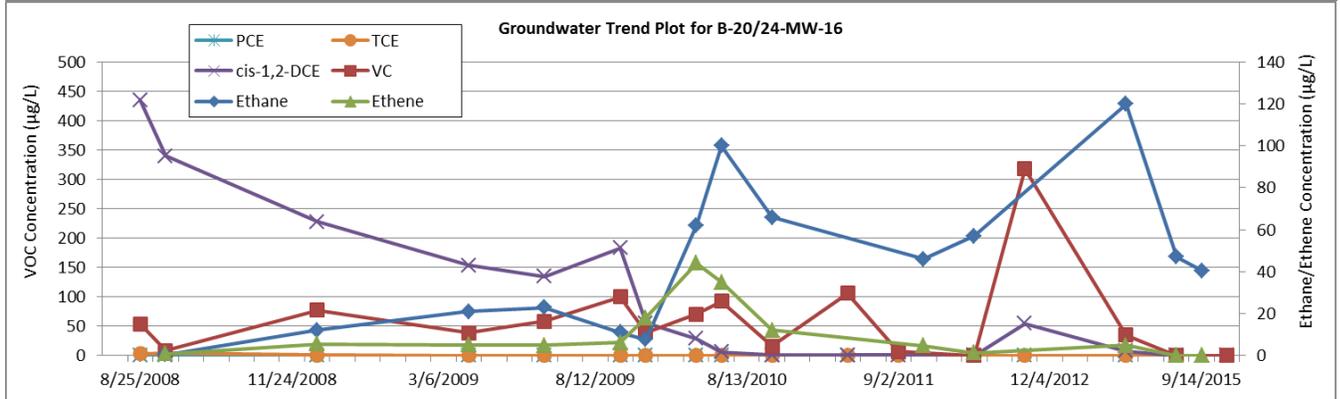
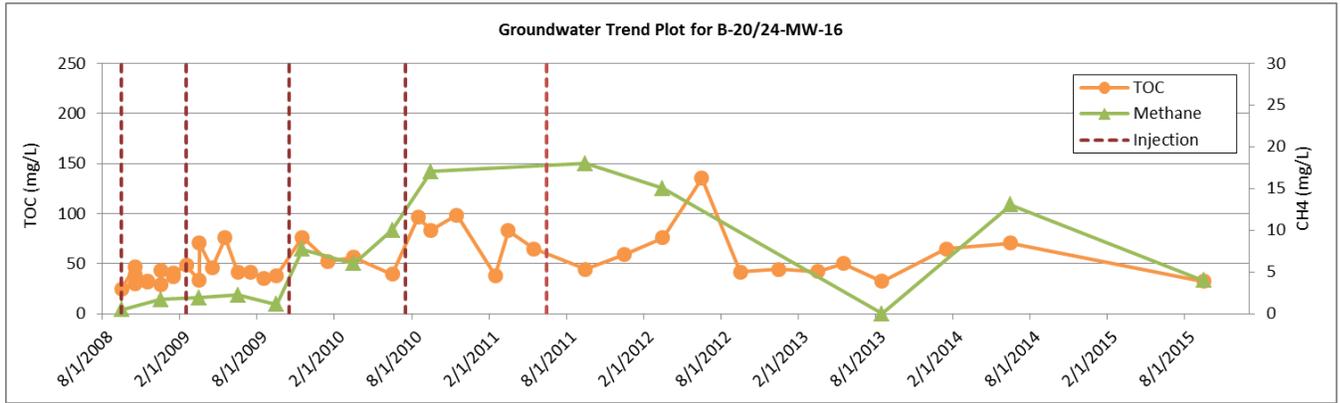
**Appendix D**  
**Data Trend Charts**

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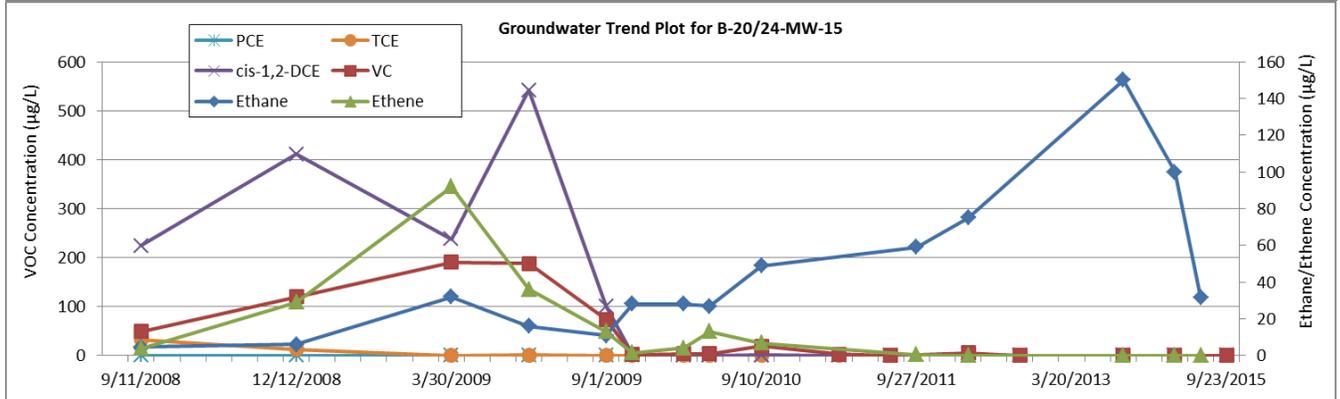
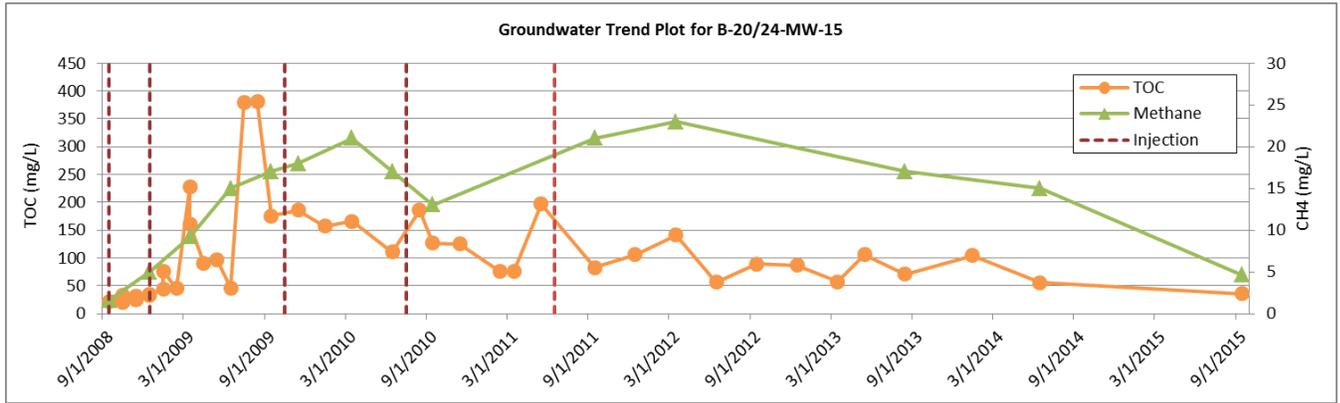
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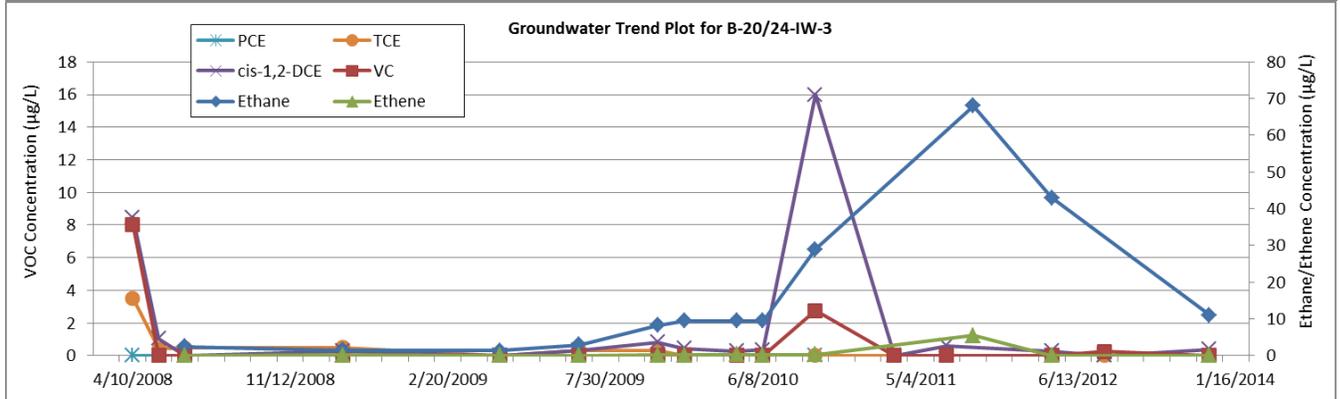
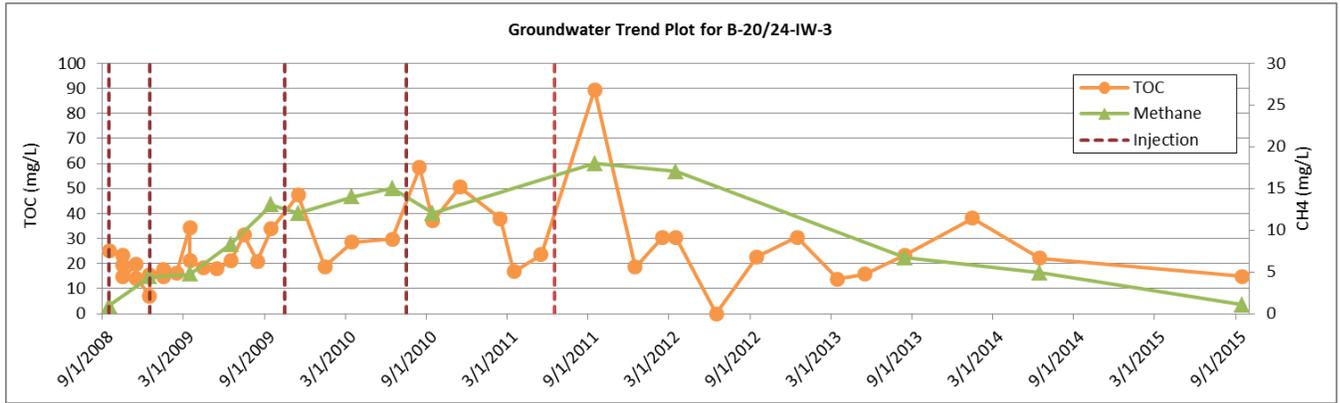
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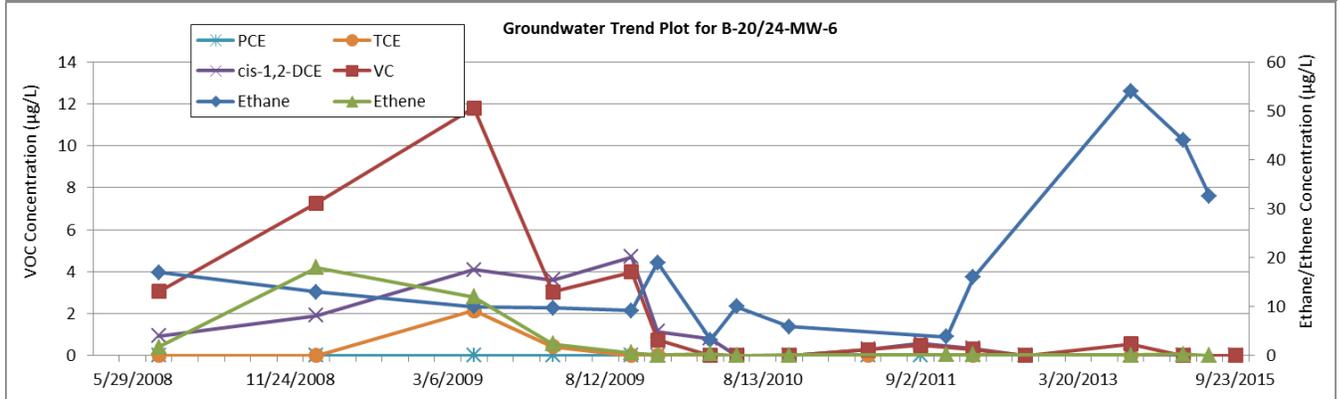
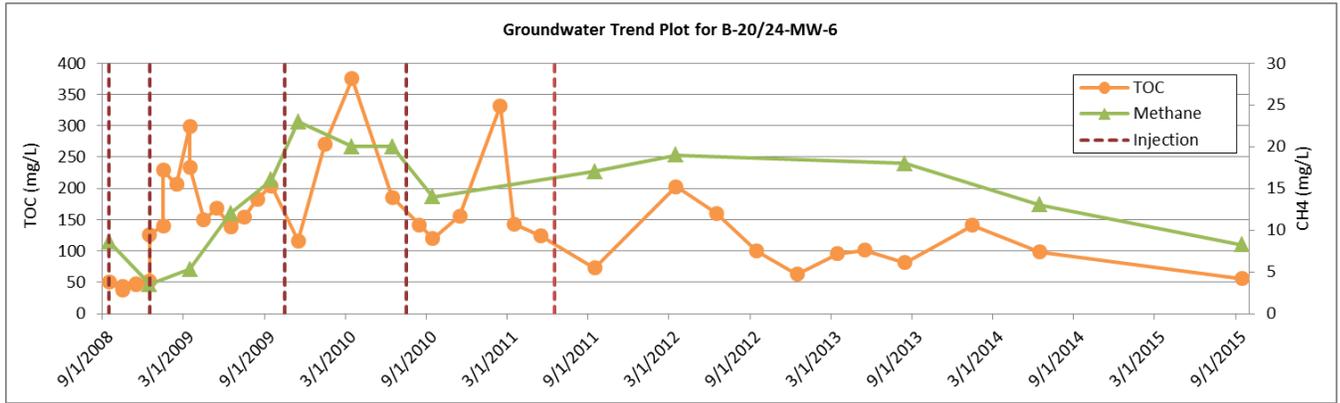
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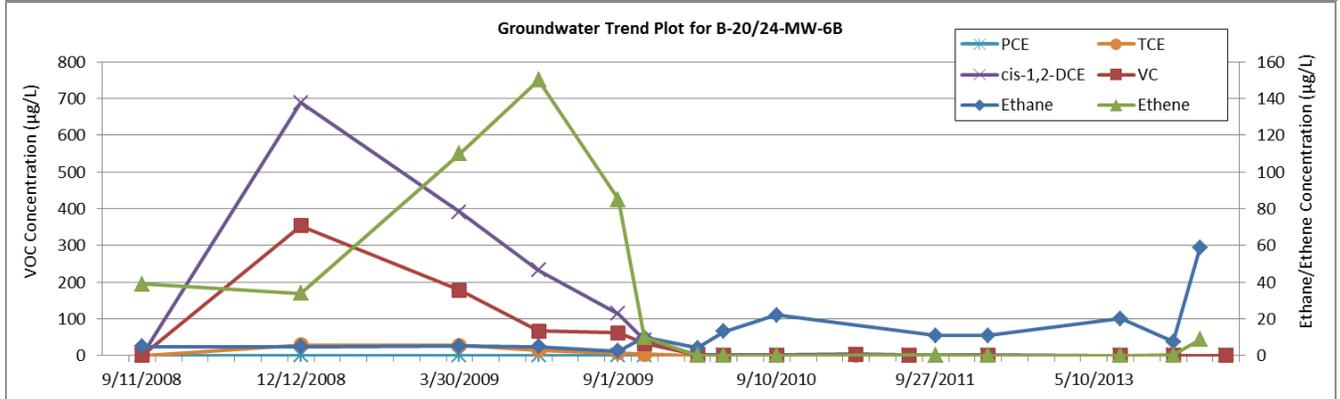
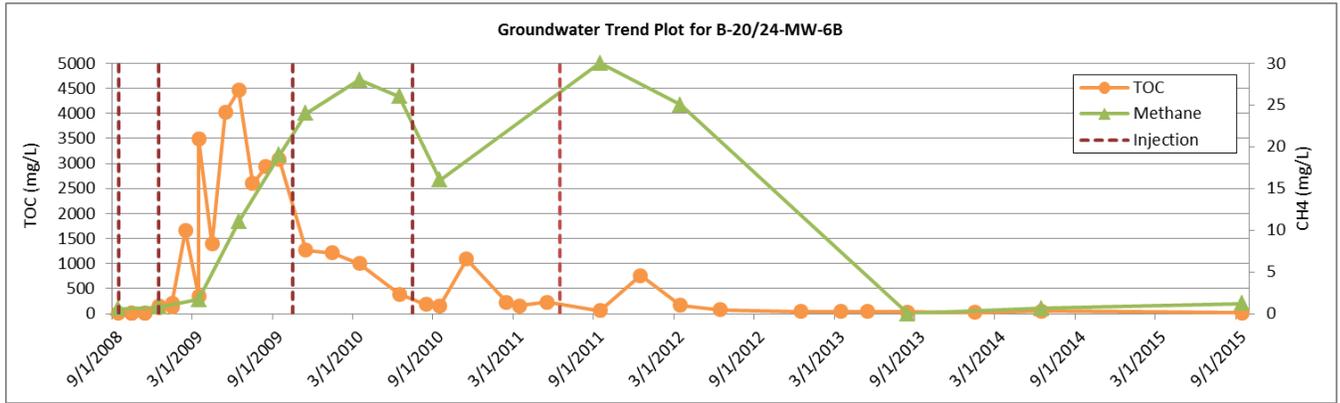
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