

June 28, 2012

Mr. Andrew Fan  
US EPA Region III, 3WC23  
1650 Arch Street  
Philadelphia, PA 19103-2029

Ms. Barbara Brown  
Project Coordinator  
Maryland Department of the Environment  
1800 Washington Blvd.  
Baltimore, Maryland 21230

**Re: Consent Decree, Civil Action Nos. JFM-97-558, JFM-97-559**  
***Coke Oven Area Interim Measures Progress Report May 2012***

Dear Mr. Fan and Ms. Brown:

Enclosed with this correspondence is the ***Coke Oven Area Interim Measures Progress Report May 2012*** completed for the RG Steel Sparrows Point Facility in accordance with the requirements outlined in US EPA's September 2, 2010 approval letter for the Coke Oven Area Interim Measures work associated with the referenced Consent Decree. The report summarizes implementation progress for the approved interim measures (IMs) that have been developed to address identified environmental conditions at the Coke Oven Area through May 31, 2012.

Please contact me at (410) 388-6622 should questions arise during your review of the enclosed progress report.

Sincerely,



Russell Becker  
Division Manager, Environmental Engineering and Affairs

Enclosure

# COKE OVEN AREA INTERIM MEASURES PROGRESS REPORT (MAY 2012)

*Prepared for*

RG Steel Sparrows Point, LLC  
Sparrows Point, Maryland



June 29, 2012

# URS

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Project no. 15302745

## Introduction

In accordance with the United States Environmental Protection Agency's (US EPA)'s September 2, 2010 letter, this document is the monthly progress report for May 2012 for the US EPA-approved interim measures (IMs) that have been developed to address identified environmental conditions at the Coke Oven Area (COA) Special Study Area at the RG Steel Sparrows Point Facility (formerly Severstal Sparrows Point Facility) located in Sparrows Point, Maryland. This progress report summarizes IM progress for May 2012.

For mutual ease of understanding, and as agreed during the June 3, 2010 teleconference with US EPA, the following designations are applied in this document to the six (6) IM "Cells" (**Figure 1**) at the COA:

- Cell 1: Prototype Air Sparge/Soil Vapor Extraction (AS/SVE) System in the Former Benzol Processing Area,
- Cell 2: AS/SVE and Dual Phase Groundwater Extraction System in Former Coal Storage Area,
- Cell 3: AS/SVE System in "Cove" Area,
- Cell 4: In-Situ Anaerobic Bio-treatment Area,
- Cell 5: Groundwater Extraction at the Turning Basin Area, and
- Cell 6: Light Non-Aqueous Phase Liquid (LNAPL) Recovery at the Former Benzol Processing Area.

As of May 31, 2012, Cells 1, 3, 4 and 6 continue to be operational. Groundwater samples were collected from Cell 4 on May 23 and 24, 2012 to evaluate the effects of the fifth amendment dosing event, which occurred from April 24 to 26, 2012. The remaining Cells (Cells 2 and 5) are in various stages of evaluation, design, and under permitting considerations by Maryland Department of the Environment (MDE).

### Cell 1: Prototype AS/SVE System in the Former Benzol Processing Area

Cell 1 consists of a prototype IM, which includes AS/SVE coupled with vapor destruction via an electric catalytic oxidation (CATOX) unit. **Figure 2** shows the system layout of Cell 1 and locations of the major design components including the air sparging wells and vapor collection trenches.

#### **May 2012 Operational Performance**

Operational performance of Cell 1 during this reporting period is summarized in **Table 1**. In summary, the CATOX unit operated for 742 hours (99.7 %) during this reporting period. Operations were in conformance with the manufacturer's specifications at all times that soil gases were collected in accordance with the May 20, 2011 modified permit-to-construct conditions.

The hydrocarbon removal rate was calculated to be approximately 0.10 pounds per operating hour (estimated monthly total of 76.7 pounds). **Table 1** also includes a cumulative summary of operational performance since system startup on August 3, 2010. In total, Cell 1 has destroyed approximately 9,270 pounds of recovered hydrocarbons. **Figure 3** presents a graph of the cumulative estimated monthly hydrocarbon recovery in Cell 1 since the startup of the IM system.

Soil gas samples were collected for laboratory and/or field instrument (e.g., photoionization detector [PID]) analysis to monitor CATOX unit performance. One (1) untreated soil gas sample was collected in a Tedlar<sup>®</sup> bag and submitted to TestAmerica Laboratories, Inc. in Knoxville, Tennessee (TestAmerica) for analysis by US EPA Method TO-15. The influent soil gas hydrocarbon concentration collected on May 24, 2012 was 64.4 parts per million by volume (ppmv) as summarized in **Table 2**.

Hydrocarbon removal calculations were based entirely on the analytical results and the average daily field-measured influent flow rates. The mass removal calculations assume that the sample collected on May 24, 2012 is representative of hydrocarbon concentrations for the entire month of May. This assumption is based on the fact that the same sparge wells (AS-1 thru AS-8) and extraction wells (V-1 thru V-6) were online when the system was operational.

#### **May 2012 Groundwater Monitoring Results**

Groundwater samples were collected on May 24, 2012 from the following wells:

- BP-MW-09 (upgradient of Cell 1),

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- CO18-PZM006 (upgradient of Cell 1 at edge of berm), and
- CO02-PZM006 (downgradient of Cell 1).

The groundwater samples were submitted to Microbac Laboratories, Inc. of Baltimore, Maryland (Microbac) for the analyses shown in **Table 3**. These data indicate benzene is the most prevalent volatile organic compound (VOC) constituent.

**Figure 4** presents a graph of the total measured VOC concentration in Cell 1 groundwater for each well on a monthly basis since the startup of the IM system. Since system startup in August 2010, a decreasing total VOC concentration trend is documented at well CO18-PZM006 while a generally decreasing trend is observed at wells BP-MW-09 and C002-PZM006. The identified trend for these monitoring wells will continue to be monitored and assessed during system operation in future months.

### Cell 3: AS/SVE System in the “Cove” Area

Cell 3 consists of an AS/SVE system coupled with vapor destruction via an electric CATOX unit. **Figure 1** shows the location of the Cell 3 AS/SVE treatment area at the COA. The major design components are described in the Cell 3 final design report (*Coke Oven Area Interim Measures Cell 3 “Cove” Area Air Sparge/Soil Vapor Extraction System Design*), submitted to US EPA on March 1, 2011.

#### May 2012 Operational Performance

Operational performance of Cell 3 during this reporting period is summarized in **Table 4**. In summary, the CATOX unit operated for 742 hours (99.7 %) during May. Operations were in conformance with the manufacturer’s specifications at all times that soil gases were collected in accordance with the May 20, 2011 modified permit-to-construct conditions.

The hydrocarbon removal rate was calculated to be approximately 0.02 pounds per operating hour (estimated monthly total of 11.5 pounds). **Table 4** also includes a cumulative summary of operational performance since system startup on June 24, 2011. In total, Cell 3 has destroyed approximately 565 pounds of recovered hydrocarbons. **Figure 3** presents a graph of the cumulative estimated monthly hydrocarbon recovery in Cell 3 since the startup of the IM system.

Soil gas samples were collected for laboratory and/or field instrument (e.g., PID) analysis to monitor CATOX unit performance. One (1) untreated soil gas sample was collected in a Tedlar<sup>®</sup> bag and submitted to TestAmerica. The influent soil gas hydrocarbon concentration collected on May 24, 2012 was 10.71 ppmv as summarized in **Table 5**.

Hydrocarbon removal calculations were based entirely on the analytical results and the average daily field-measured influent flow rates. The mass removal calculations assume that the sample collected on May 24, 2012 is representative of hydrocarbon concentrations for the entire month of May. This assumption is based on the fact that the same sparge wells (AS-2 thru AS-12) and extraction wells (V-2 thru V-4) were online when the system was operational.

#### May 2012 Cell 3 Groundwater Monitoring

Groundwater samples were collected on May 24, 2012 from the following wells (**Figure 1**):

- MW-CELL3-1 (downgradient of Cell 3),
- MW-CELL3-2 (upgradient of Cell 3),

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- MW-CELL3-3 (upgradient of Cell 3, and
- CO30-PZM015 (downgradient of Cell 3).

The groundwater samples were submitted to Microbac for the analyses shown in **Table 6**. These data indicate that benzene is the most prevalent VOC constituent.

**Figure 5** presents a graph of the total measured VOC concentration in Cell 3 groundwater for each well on a monthly basis relative to the baseline concentrations collected in February 2011. Since system startup on June 24, 2011, a decreasing VOC concentration trend is documented for each of the sampled wells. The trends for these monitoring wells will continue to be monitored and assessed during system operation in future months.

## **Cell 4: In-Situ Anaerobic Bio-treatment Area**

Cell 4 consists of an in-situ anaerobic bio-treatment system including extraction and mixing of groundwater in an above ground storage tank containing a nutrient amendment solution and reinjection of groundwater. A schematic layout of the Cell 4 system is shown on **Figure 6**. The major design components are described in the Cell 4 final design report (*Coke Oven Area Interim Measures Cell 4 In-Situ Anaerobic Bio-Treatment System Design*), submitted to US EPA on March 31, 2011.

### **May 2012 Operations**

The fifth amendment dosing event occurred from April 24 to 26, 2012 and was summarized in the *April 2012 Coke Oven Interim Measures Progress Report*. As per the approved design concept, groundwater at Cell 4 was monitored in May 2012 to document the potential impacts of the April 2012 dosing event.

### **May 2012 Groundwater Monitoring Results**

To monitor the effects of the fifth dosing event, groundwater samples were collected on May 23 and 24, 2012 (approximately one (1) month after the fifth dosing event) from the following wells (**Figure 7**):

- OBS-6
- OBS-8
- EXT-2
- AS-2
- MW-CELL4-1
- MW-CELL4-3
- MW-CELL4-4
- MW-CELL4-5
- MW-CELL4-6
- MW-CELL4-7

The groundwater samples were submitted to Microbac for the analyses shown in **Table 7**. These data indicate naphthalene is the most prevalent VOC constituent.

**Figure 8** presents a graph of the total VOC concentrations in Cell 4 groundwater on a monthly basis, as well as before and after the dosing events. With the exception of MW-CELL4-1, a generally decreasing trend is observed at all monitored Cell 4 wells since system dosing was initiated in July 2011. MW-CELL 4-5 has shown decreasing trend recently. Trends for these monitoring wells will continue to be monitored and assessed during system operation in future months.

**Cell 6: LNAPL Extraction at the Former Benzol Processing Area**

The Cell 6 LNAPL monitoring and recovery system was monitored approximately once every two weeks during May (two [2] site visits). **Table 8** summarizes LNAPL occurrence and recovery observed during the reporting period along with the cumulative LNAPL recovery since the beginning of the project. **Figure 9** illustrates the well locations.

During May, approximately 57 gallons (417 pounds) of LNAPL were recovered, bringing the total recovered LNAPL to 7,206 gallons (52,803 pounds) as of May 24, 2012. The LNAPL was recovered from the following wells:

Well	LNAPL Recovery (gal / lbs)		Notes
	During May 2012	Total thru May 24, 2012	
BP-MW-05	40.5 / 297	5,871 / 43,018	(c)
RW-04	7.7 / 56	964 / 7,064	(c)
BP-MW-08	8.8 / 64	357 / 2,619	(c)
BP-MW-11	0 / 0	7.8 / 57	(a)
RW-03	0 / 0	4.0 / 29	(b)
RW-01	0 / 0	1.3 / 10	(b)
RW-02	0 / 0	0.8 / 5.9	(b)

- (a) Recovery system moved from BP-MW-11 to BP-MW-08 on September 8, 2010.
- (b) Manual bailing.
- (c) Cumulative totals included estimated recovery from 12/28/11 to 1/18/12.

The wells are presented in **Table 8** generally in the order of decreasing LNAPL occurrence/recovery. During the reporting period, the range of LNAPL thicknesses varied as summarized below (wells are not listed if LNAPL was not present):

- BP-MW-10 (0.32 to 1.30 ft),
- BP-MW-05 (0.68 to 0.73 ft),
- BP-MW-11 (0.38 to 0.40 ft)
- RW-03 (0.38 to 0.45 ft)
- BP-MW-08 (0.19 to 0.22 ft),
- RW-01 (0.20 to 0.21 ft),
- RW-02 (0.13 to 0.14 ft),

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- RW-04 (0.01 to 0.04 ft), and
- BP-MW-07 (0.01 to 0.02 ft)

No LNAPL was observed in wells RW-05, BP-MW-06, BP-MW-09, or CO19-PZM004.

For all wells in which LNAPL accumulated, **Table 9** provides well-specific details concerning the measured depths to LNAPL, the water table, and calculated LNAPL thicknesses. Thickness trends will be evaluated in future months to determine if the skimming equipment should be relocated to provide better recoveries of LNAPL.

# Tables

**Table 1**  
**Summary of Operating Conditions**  
**Cell 1: Prototype AS/SVE System in Former Benzol Processing Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel Sparrows Point, LLC**

**Cell 1 May 2012 Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total CATOX Operating Time (May 1 - May 31, 2012)	hours	742
Overall CATOX Operational Time	%	99.7
Estimated Total Hydrocarbons Destroyed	pounds	76.71
Estimated Hydrocarbon Removal Rate	pounds/hour	0.10

**Cell 1 Cumulative Summary of Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (August 3, 2010 - May 31, 2012)	hours	12,269
Overall ICE/CATOX Operational Time	%	76.6
Estimated Total Hydrocarbons Destroyed	pounds	9,270
Estimated Average Hydrocarbon Removal Rate	pounds/hour	0.76

**Table 2**  
**Summary of Soil Gas Analytical Results (May 2012)**  
**Cell 1: Prototype AS/SVE System in Former Benzol Processing Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel Sparrows Point, LLC**

		Sample ID	CATOX Influent
		Date	5/24/2012
		Time	10:15
		Dilution Factor	5133.00
Analyte	Units		
<b>TO-15 Volatile Organics</b>			
trans-1,3-Dichloropropene	ppb	< 1,000 U	
Acetone	ppb	< 26,000 U	
Ethylbenzene	ppb	< 1,000 U	
2-Hexanone	ppb	< 2,600 U	
Methylene Chloride	ppb	< 2,600 U	
<b>Benzene</b>	ppb	<b>58,000</b>	
1,1,2,2-Tetrachloroethane	ppb	< 1,000 U	
Tetrachloroethene	ppb	< 1,000 U	
<b>Toluene</b>	ppb	<b>6,400</b>	
1,1,1-Trichloroethane	ppb	< 1,000 U	
1,1,2-Trichloroethane	ppb	< 1,000 U	
Trichloroethene	ppb	< 1,000 U	
Vinyl Chloride	ppb	< 1,000 U	
o-Xylene	ppb	< 1,000 U	
m-Xylene & p-Xylene	ppb	< 1,000 U	
2-Butanone (MEK)	ppb	< 5,200 U	
4-Methyl-2-pentanone (MIBK)	ppb	< 2,600 U	
Bromoform	ppb	< 1,000 U	
Carbon Disulfide	ppb	< 2,600 U	
Carbon tetrachloride	ppb	< 1,000 U	
Chlorobenzene	ppb	< 1,000 U	
Chloroethane	ppb	< 1,000 U	
Chloroform	ppb	< 1,000 U	
1,1-Dichloroethane	ppb	< 1,000 U	
1,2-Dichloroethane	ppb	< 1,000 U	
1,1-Dichloroethene	ppb	< 1,000 U	
trans-1,2-Dichloroethene	ppb	< 1,000 U	
1,2-Dichloropropane	ppb	< 1,000 U	
cis-1,3-Dichloropropene	ppb	< 1,000 U	
<b>Total Volatile Organics</b>	ppb	<b>64,400</b>	

**Notes:**

**BOLD** = Analyte detected

ppb = parts per billion

</U = Analyte not detected above corresponding laboratory reporting limit

**Table 3**  
**Summary of Groundwater Analytical Results (May 2012)**  
**Cell 1: Prototype AS/SVE System in Former Benzol Processing Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel Sparrows Point, LLC**

Sample ID	CO02-PZM006	CO18-PZM006	BP-MW-09
Date	5/24/2012	5/24/2012	5/24/2012
Time	14:10	15:05	15:50
Analyte	Units		
<b>Water Quality Parameters</b>			
Temperature	deg C	22.37	35.81
pH	std units	7.80	6.80
ORP	mV	-141.8	-65.5
Conductivity	mS/cm	1.41	2.63
Turbidity	NTU	2.7	35.0
Dissolved Oxygen	mg/L	0.05	0.10
<b>Volatile Organics</b>			
Vinyl Chloride	µg/L	< 5,000 U	< 5,000 U
Chloroethane	µg/L	< 5,000 U	< 5,000 U
1,1-Dichloroethene	µg/L	< 5,000 U	< 5,000 U
Acetone	µg/L	< 120,000 U	< 120,000 U
Carbon Disulfide	µg/L	< 5,000 U	< 5,000 U
Methylene Chloride	µg/L	< 25,000 U	< 25,000 U
trans-1,2-Dichloroethene	µg/L	< 5,000 U	< 5,000 U
1,1-Dichloroethane	µg/L	< 5,000 U	< 5,000 U
2-Butanone (MEK)	µg/L	< 25,000 U	< 25,000 U
Chloroform	µg/L	< 5,000 U	< 5,000 U
1,1,1-Trichloroethane	µg/L	< 5,000 U	< 5,000 U
Carbon Tetrachloride	µg/L	< 5,000 U	< 5,000 U
<b>Benzene</b>	µg/L	<b>790,000</b>	<b>100,000</b>
1,2-Dichloroethane	µg/L	< 5,000 U	< 5,000 U
Trichloroethene	µg/L	< 5,000 U	< 5,000 U
1,2-Dichloropropane	µg/L	< 5,000 U	< 5,000 U
Methyl Isobutyl Ketone (MIBK)	µg/L	< 25,000 U	< 25,000 U
cis-1,3-Dichloropropene	µg/L	< 5,000 U	< 5,000 U
<b>Toluene</b>	µg/L	< 5,000 U	<b>8,300</b>
trans-1,3-Dichloropropene	µg/L	< 5,000 U	< 5,000 U
1,1,2-Trichloroethane	µg/L	< 5,000 U	< 5,000 U
2-Hexanone (MBK)	µg/L	< 25,000 U	< 25,000 U
Tetrachloroethene	µg/L	< 5,000 U	< 5,000 U
Chlorobenzene	µg/L	< 5,000 U	< 5,000 U
1,1,1,2-Tetrachloroethane	µg/L	< 5,000 U	< 5,000 U
Ethylbenzene	µg/L	< 5,000 U	< 5,000 U
Bromoform	µg/L	< 5,000 U	< 5,000 U
1,1,1,2,2-Tetrachloroethane	µg/L	< 5,000 U	< 5,000 U
<b>Total Xylenes</b>	µg/L	< 15,000 U	<b>25,000</b>
<b>Total Volatile Organics</b>	µg/L	<b>790,000</b>	<b>108,300</b>

**Notes:**

- = Not Measured
- Bold** = Analyte Detected
- deg C = degrees Celcius
- mg/L = Milligram per liter
- mS/cm = Microsiemens per Centimeter
- mV = Millivolts
- NTU = Nephelometric Turbidity Units
- ORP = Oxidation Reduction Potential
- std units = standard units
- </U = Analyte not detected above corresponding laboratory reporting limit
- µg/L = Micrograms per liter

**Table 4**  
**Summary of Operating Conditions**  
**Cell 3: AS/SVE System in the "Cove" Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel Sparrows Point, LLC**

**Cell 3 May 2012 Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total CATOX Operating Time (May 1 - May 31, 2012)	hours	742
Overall CATOX Operational Time	%	99.7
Estimated Total Hydrocarbons Destroyed	pounds	11.49
Estimated Hydrocarbon Removal Rate	pounds/hour	0.02

**Cell 3 Cumulative Summary of Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total CATOX Operating Time (June 24, 2011 - May 31, 2012)	hours	6,844
Overall CATOX Operational Time	%	77.9
Estimated Total Hydrocarbons Destroyed	pounds	565.4
Estimated Hydrocarbon Removal Rate	pounds/hour	0.08

**Table 5**  
**Summary of Soil Gas Analytical Results (May 2012)**  
**Cell 3: AS/SVE System in the "Cove" Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel Sparrows Point, LLC**

	Sample ID	CATOX Influent
	Date	5/24/2012
	Time	10:28
	Dilution Factor	978.86
Analyte	Units	
<b>TO-15 Volatile Organics</b>		
trans-1,3-Dichloropropene	ppb	< 200 U
Acetone	ppb	< 4,900 U
Ethylbenzene	ppb	< 200 U
2-Hexanone	ppb	< 490 U
Methylene Chloride	ppb	< 490 U
<b>Benzene</b>	ppb	<b>10,000</b>
1,1,2,2-Tetrachloroethane	ppb	< 200 U
Tetrachloroethene	ppb	< 200 U
<b>Toluene</b>	ppb	<b>710</b>
1,1,1-Trichloroethane	ppb	< 200 U
1,1,2-Trichloroethane	ppb	< 200 U
Trichloroethene	ppb	< 200 U
Vinyl Chloride	ppb	< 200 U
o-Xylene	ppb	< 200 U
m-Xylene & p-Xylene	ppb	< 200 U
2-Butanone (MEK)	ppb	< 980 U
4-Methyl-2-pentanone (MIBK)	ppb	< 490 U
Bromoform	ppb	< 200 U
Carbon Disulfide	ppb	< 490 U
Carbon tetrachloride	ppb	< 200 U
Chlorobenzene	ppb	< 200 U
Chloroethane	ppb	< 200 U
Chloroform	ppb	< 200 U
1,1-Dichloroethane	ppb	< 200 U
1,2-Dichloroethane	ppb	< 200 U
1,1-Dichloroethene	ppb	< 200 U
trans-1,2-Dichloroethene	ppb	< 200 U
1,2-Dichloropropane	ppb	< 200 U
cis-1,3-Dichloropropene	ppb	< 200 U
<b>Total Volatile Organics</b>	ppb	<b>10,710</b>

**Notes:**

**BOLD** = Analyte detected

ppb = parts per billion

</U = Analyte not detected above corresponding laboratory reporting limit

**Table 6**  
**Summary of Groundwater Analytical Results (May 2012)**  
**Cell 3: AS/SVE System in the "Cove" Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel Sparrows Point, LLC**

Sample ID	CO30-PZM015	MW-CELL 3-1	MW-CELL 3-2	MW-CELL 3-3	
Date	5/24/2012	5/24/2012	5/24/2012	5/24/2012	
Time	11:15	11:55	12:35	13:15	
Analyte	Units				
<b>Water Quality Parameters</b>					
Temperature	deg C	17.13	17.54	17.64	18.92
pH	std units	11.89	11.92	11.59	12.16
ORP	mV	-173.4	-171.3	-146.1	-168
Conductivity	mS/cm	2.68	2.80	2.33	4.10
Turbidity	NTU	0.5	0.8	0.9	2.0
Dissolved Oxygen	mg/L	0.25	0.08	0.51	2.21
<b>Volatile Organics</b>					
Vinyl Chloride	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
Chloroethane	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
1,1-Dichloroethene	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
Acetone	µg/L	< 25,000 U	< 2,500 U	< 2,500 U	< 1,200 U
Carbon Disulfide	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
Methylene Chloride	µg/L	< 5,000 U	< 500 U	< 500 U	< 250 U
trans-1,2-Dichloroethene	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
1,1-Dichloroethane	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
2-Butanone (MEK)	µg/L	< 5,000 U	< 500 U	< 500 U	< 250 U
Chloroform	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
1,1,1-Trichloroethane	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
Carbon Tetrachloride	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
<b>Benzene</b>	µg/L	<b>10,000</b>	<b>5,200</b>	<b>8,300</b>	<b>1,700</b>
1,2-Dichloroethane	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
Trichloroethene	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
1,2-Dichloropropane	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
Methyl Isobutyl Ketone (MIBK)	µg/L	< 5,000 U	< 500 U	< 500 U	< 250 U
cis-1,3-Dichloropropene	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
<b>Toluene</b>	µg/L	< 1,000 U	<b>440</b>	<b>430</b>	<b>140</b>
trans-1,3-Dichloropropene	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
1,1,2-Trichloroethane	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
2-Hexanone (MBK)	µg/L	< 5,000 U	< 500 U	< 500 U	< 250 U
Tetrachloroethene	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
Chlorobenzene	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
1,1,1,2-Tetrachloroethane	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
Ethylbenzene	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
Bromoform	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
1,1,2,2-Tetrachloroethane	µg/L	< 1,000 U	< 100 U	< 100 U	< 50 U
Xylenes, Total	µg/L	< 3,000 U	< 300 U	< 300 U	< 150 U
<b>Total Volatile Organics</b>	<b>µg/L</b>	<b>10,000</b>	<b>5,640</b>	<b>8,730</b>	<b>1,840</b>

**Notes:**

- = Not Measured
- Bold** = Analyte Detected
- deg C = degrees Celcius
- mg/L = Milligram per liter
- mS/cm = Microsiemens per Centimeter
- mV = Millivolts
- NTU = Nephelometric Turbidity Units
- ORP = Oxidation Reduction Potential
- std units = standard units
- </U = Analyte not detected above corresponding laboratory reporting limit
- µg/L = Micrograms per liter

**Table 7**  
**Summary of Groundwater Analytical Results (May 2012)**  
**Cell 4: In-Situ Anaerobic Bio-Treatment Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel Sparrows Point, LLC**

Sample ID		OBS-6	OBS-8	EXT-2	AS-2	Cell 4-1	Cell 4-3	Cell 4-4	Cell 4-5	Cell 4-6	Cell 4-7
Date		05/24/12	05/23/12	05/24/12	05/24/12	05/23/12	05/23/12	05/23/12	05/23/12	05/23/12	05/23/12
Time		8:05	12:13	9:05	10:05	11:10	14:55	9:44	13:59	13:12	10:25
Units											
<b>Water Quality Parameters</b>											
Temperature	deg C	15.57	17.7	16.65	16.79	17.72	16.78	17.75	16.72	17.29	17.45
pH	std units	11.68	11.53	8.96	11.04	9.39	9.52	11.25	11.54	11.82	12.02
ORP	mV	-146.3	-158	-60	-131.9	80.4	-140	-118.2	-187.1	-132.9	-108
Conductivity	mS/cm	2.55	1.93	1.930	3.57	1.74	1.69	1.70	2.25	2.91	3.83
Turbidity	NTU	1.09	1.25	6.41	0.89	8.9	19.9	5.81	0.71	1.01	1.18
Dissolved Oxygen	mg/L	0.19	0.28	0.15	0.90	0.39	0.13	0.27	0.18	0.05	0.27
<b>Volatile Organics</b>											
Vinyl Chloride	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
Chloroethane	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
1,1-Dichloroethene	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
Acetone	µg/L	< 2,500 U	< 1,200 U	< 2,500 U	< 12,000 U	< 2,500 U	< 2,500 U	< 2,500 U	< 2,500 U	< 2,500 U	< 2,500 U
Carbon Disulfide	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
Methylene Chloride	µg/L	< 500 U	< 250 U	< 500 U	< 2,500 U	< 500 U	< 500 U	< 500 U	< 500 U	< 500 U	< 500 U
trans-1,2-Dichloroethene	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
1,1-Dichloroethane	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
2-Butanone (MEK)	µg/L	< 500 U	< 250 U	< 500 U	< 2,500 U	< 500 U	< 500 U	< 500 U	< 500 U	< 500 U	< 500 U
Chloroform	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
1,1,1-Trichloroethane	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
Carbon Tetrachloride	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
<b>Benzene</b>	µg/L	<b>760</b>	<b>720</b>	<b>620</b>	<b>4,700</b>	<b>1,700</b>	<b>580</b>	<b>730</b>	<b>1,200</b>	<b>620</b>	<b>1,100</b>
1,2-Dichloroethane	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
Trichloroethene	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
1,2-Dichloropropane	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
Methyl Isobutyl Ketone (MIBK)	µg/L	< 500 U	< 250 U	< 500 U	< 2,500 U	< 500 U	< 500 U	< 500 U	< 500 U	< 500 U	< 500 U
cis-1,3-Dichloropropene	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
<b>Toluene</b>	µg/L	<b>540</b>	<b>460</b>	<b>420</b>	<b>3,600</b>	<b>1,300</b>	<b>430</b>	<b>450</b>	<b>990</b>	<b>420</b>	<b>730</b>
trans-1,3-Dichloropropene	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
1,1,2-Trichloroethane	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
2-Hexanone (MBK)	µg/L	< 500 U	< 250 U	< 500 U	< 2,500 U	< 500 U	< 500 U	< 500 U	< 500 U	< 500 U	< 500 U
Tetrachloroethene	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
Chlorobenzene	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
1,1,1,2-Tetrachloroethane	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
Ethylbenzene	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
Bromoform	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
1,1,2,2-Tetrachloroethane	µg/L	< 100 U	< 50 U	< 100 U	< 500 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
<b>Xylenes, Total</b>	µg/L	<b>610</b>	<b>570</b>	<b>530</b>	<b>1,900</b>	<b>1,100</b>	<b>530</b>	<b>590</b>	<b>840</b>	<b>540</b>	<b>1,300</b>
<b>Semi-Volatiles</b>											
Naphthalene	µg/L	7,900	3,700	4,600	18,000	8,700	4,800	4,500	9,100	5,100	210
<b>Total Volatile Organics</b>	µg/L	<b>9,810</b>	<b>5,450</b>	<b>6,170</b>	<b>28,200</b>	<b>12,800</b>	<b>6,340</b>	<b>6,270</b>	<b>12,130</b>	<b>6,680</b>	<b>3,340</b>

**Table 7**  
**Summary of Groundwater Analytical Results (May 2012)**  
**Cell 4: In-Situ Anaerobic Bio-Treatment Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel Sparrows Point, LLC**

Sample ID	OBS-6	OBS-8	EXT-2	AS-2	Cell 4-1	Cell 4-3	Cell 4-4	Cell 4-5	Cell 4-6	Cell 4-7	
Date	05/24/12	05/23/12	05/24/12	05/24/12	05/23/12	05/23/12	05/23/12	05/23/12	05/23/12	05/23/12	
Time	8:05	12:13	9:05	10:05	11:10	14:55	9:44	13:59	13:12	10:25	
<b>Wet Chemistry</b>											
<b>Ferric Iron</b>	mg/L	<b>0.23</b>	<b>0.28</b>	<b>0.40</b>	<b>0.31</b>	<b>0.74</b>	<b>0.81</b>	<b>0.29</b>	<b>0.31</b>	<b>0.21</b>	<b>0.33</b>
<b>Ferrous Iron</b>	mg/L	< 0.10 U	<b>0.11</b>	<b>0.11</b>	<b>0.13</b>	< 0.10 U	< 0.10 U	<b>0.13</b>	<b>0.19</b>	< 0.10 U	< 0.10 U
<b>Nitrite-N</b>	mg/L	<b>0.45</b>	<b>0.065</b>	<b>0.025</b>	<b>0.10</b>	<b>0.018</b>	<b>0.034</b>	<b>0.074</b>	<b>0.11</b>	<b>0.042</b>	<b>0.26</b>
Nitrate-N	mg/L	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U
Nitrate/Nitrite-N	mg/L	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U
<b>Orthophosphate as P</b>	mg/L	< 0.020 U	<b>0.026</b>	<b>0.44</b>	<b>0.032</b>	<b>0.77</b>	<b>1.0</b>	<b>0.032</b>	<b>0.017</b>	<b>0.015</b>	< 0.010 U
<b>Sulfate as SO4</b>	mg/L	<b>180</b>	<b>350</b>	<b>550</b>	<b>1,300</b>	<b>550</b>	<b>530</b>	<b>330</b>	<b>510</b>	<b>350</b>	<b>330</b>
<b>Total Kjeldahl Nitrogen</b>	mg/L	<b>22</b>	<b>36</b>	<b>53</b>	<b>280</b>	<b>75</b>	<b>56</b>	<b>23</b>	<b>41</b>	<b>46</b>	<b>51</b>
<b>Metals</b>											
<b>Iron, Total</b>	mg/L	<b>0.23</b>	<b>0.38</b>	<b>0.51</b>	<b>0.44</b>	<b>0.74</b>	<b>0.81</b>	<b>0.41</b>	<b>0.51</b>	<b>0.21</b>	<b>0.33</b>

**Notes:**

- [1] Temperature meter not functioning properly. Could not Read.
- = Not Measured
- Bold** = Analyte Detected
- deg C = degrees Celcius
- mg/L = Milligram per liter
- mS/cm = Microsiemens per Centimeter
- mV = Millivolts
- NTU = Nephelometric Turbidity Units
- ORP = Oxidation Reduction Potential
- std units = standard units
- </U = Analyte not detected above corresponding laboratory reporting limit
- µg/L = Micrograms per liter

**Table 8**  
**LNAPL Occurrence and Recovery**  
**Cell 6: LNAPL Recovery System in Former Benzol Processing Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel-Sparrows Point, LLC**

Well	LNAPL Occurrence During May 2012 (ft)	Total LNAPL Recovery Period		Cumulative Total LNAPL Recovered thru May 24, 2012 (d)		Estimated LNAPL Recovered During May 2012	
		Begin	End	(gal)	(lbs) (a)	(gal)	(lbs) (a)
RW-04	0.01 to 0.04	23-Jul-10	On-going (b)	964	7,064	7.7	56
BP-MW-05	0.68 to 0.73	28-Jan-10	On-going (b)	5,871	43,018	40.5	297
BP-MW-08	0.19 to 0.22	8-Sep-10	On-going (b)	357	2,619	8.8	64
BP-MW-11	0.38 to 0.40	23-Jul-10	8-Sep-10	7.8	57	0	0
RW-02	0.13 to 0.14	1/28/2011	On-going (c)	0.8	5.9	0	0
RW-03	0.38 to 0.45	11/24/2010	On-going (c)	4.0	29	0	0
RW-01	0.20 to 0.21	28-Oct-10	On-going (c)	1.3	10	0	0
BP-MW-10	0.32 to 1.30	na	na	0	0	0	0
BP-MW-07	0.01 to 0.02	na	na	0	0	0	0
RW-05	none	na	na	0	0	0	0
BP-MW-06	none	na	na	0	0	0	0
BP-MW-09	none	na	na	0	0	0	0
CO19-PZM004	none	na	na	0	0	0	0
<b>Total Recovery:</b>				<b>7,206</b>	<b>52,803</b>	<b>57</b>	<b>417</b>

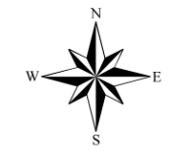
Notes:

- (a) Weight is calculated based on average BP-MW-05 and BP-MW-08 oil density of 0.878 grams per cubic centimeter, measured by EA (2009) by ASTM method D1481.
- (b) Skimmer
- (c) Bailing
- (d) Cumulative recovery volumes are calculated using an estimated recovery from 12/28/11 to 1/18/12.

**Table 9**  
**Depths (feet) to Water and LNAPL**  
**Cell 6: LNAPL Recovery System in Former Benzol Processing Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel-Sparrows Point, LLC**

Date	RW-01			RW-02			RW-03		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
5/11/2012	11.90	12.11	0.21	12.25	12.38	0.13	9.93	10.38	0.45
5/24/2012	11.72	11.92	0.20	12.05	12.19	0.14	9.70	10.08	0.38
Date	RW-04			BP-MW-05			BP-MW-07		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
5/11/2012	10.41	10.45	0.04	11.73	12.41	0.68	11.55	11.57	0.02
5/24/2012	10.31	10.32	0.01	11.62	12.35	0.73	11.40	11.41	0.01
Date	BP-MW-08			BP-MW-10			BP-MW-11		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
5/11/2012	12.73	12.95	0.22	9.45	10.75	1.30	11.75	12.15	0.40
5/24/2012	12.60	12.79	0.19	9.20	9.52	0.32	11.48	11.86	0.38

# Figures



- Legend**
- New Monitoring Well
  - Existing Monitoring Well
  - AS/SVE Treatment Area
  - Special Study Area

**INTERIM MEASURES TREATMENT CELLS**

"Cell 1": Prototype AS/SVE System in Benzol Area

"Cell 2": AS/SVE and Dual Phase GW Treatment/Injection System in the Former Coal Storage Area

"Cell 3": AS/SVE System in the "Cove" Area

"Cell 4": In-Situ Anaerobic Bio-treatment System in the Coal Tar Area

"Cell 5": Groundwater Extraction/Treatment/Injection at the Turning Basin Area

"Cell 6": LNAPL Recovery at the Former Benzol Processing Area



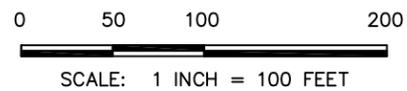
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GIS: AER	 12420 Milestone Center Drive Germantown, MD 20876
CHECKED: RL	
SENIOR: BE	

**Figure 1**  
**Interim Measures Treatment Areas**

Image source: World Imagery, ESRI, GeoEye, 2009.

**LEGEND:**

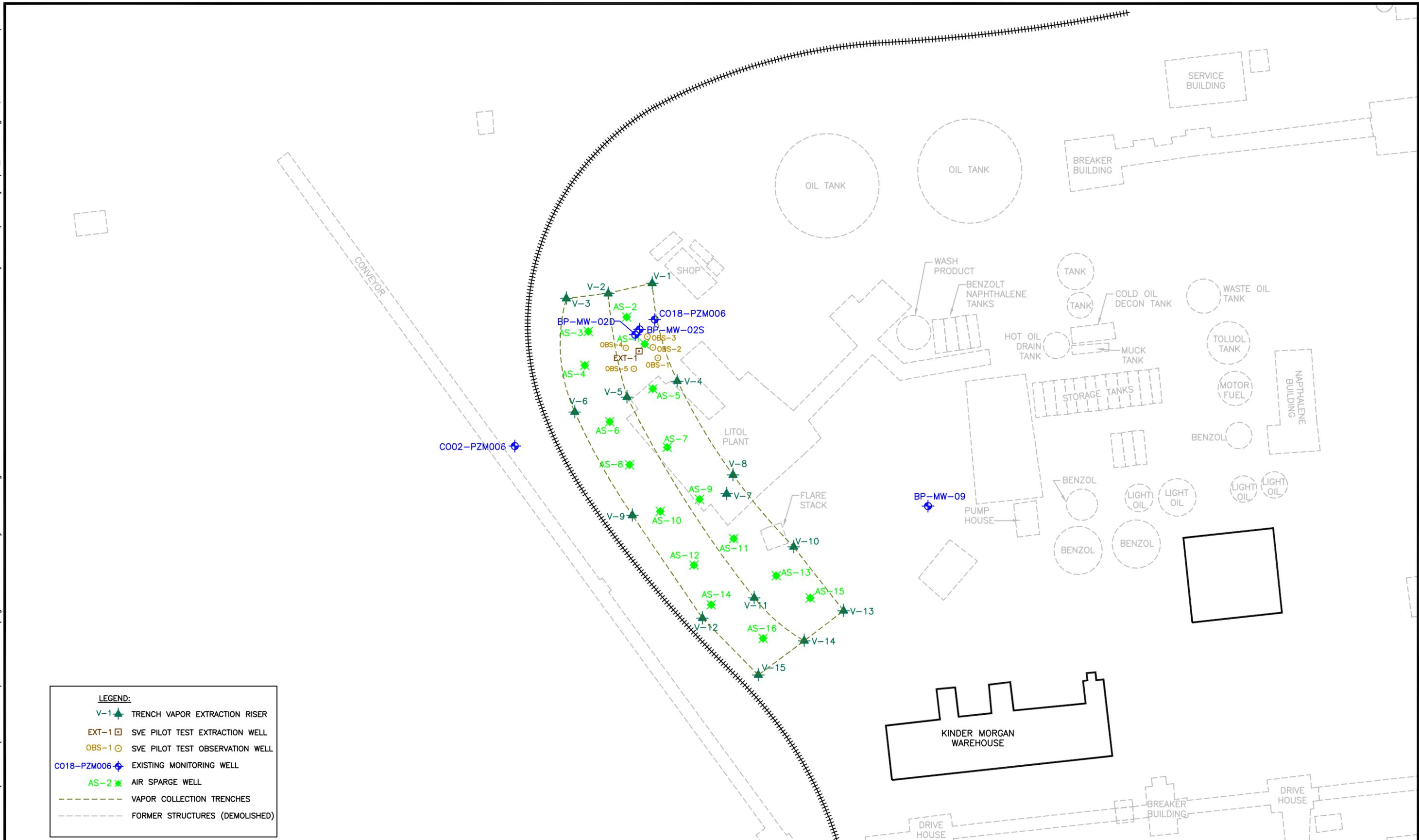
V-1	TRENCH VAPOR EXTRACTION RISER
EXT-1	SVE PILOT TEST EXTRACTION WELL
OBS-1	SVE PILOT TEST OBSERVATION WELL
CO18-PZM006	EXISTING MONITORING WELL
AS-2	AIR SPARGE WELL
- - - - -	VAPOR COLLECTION TRENCHES
- - - - -	FORMER STRUCTURES (DEMOLISHED)



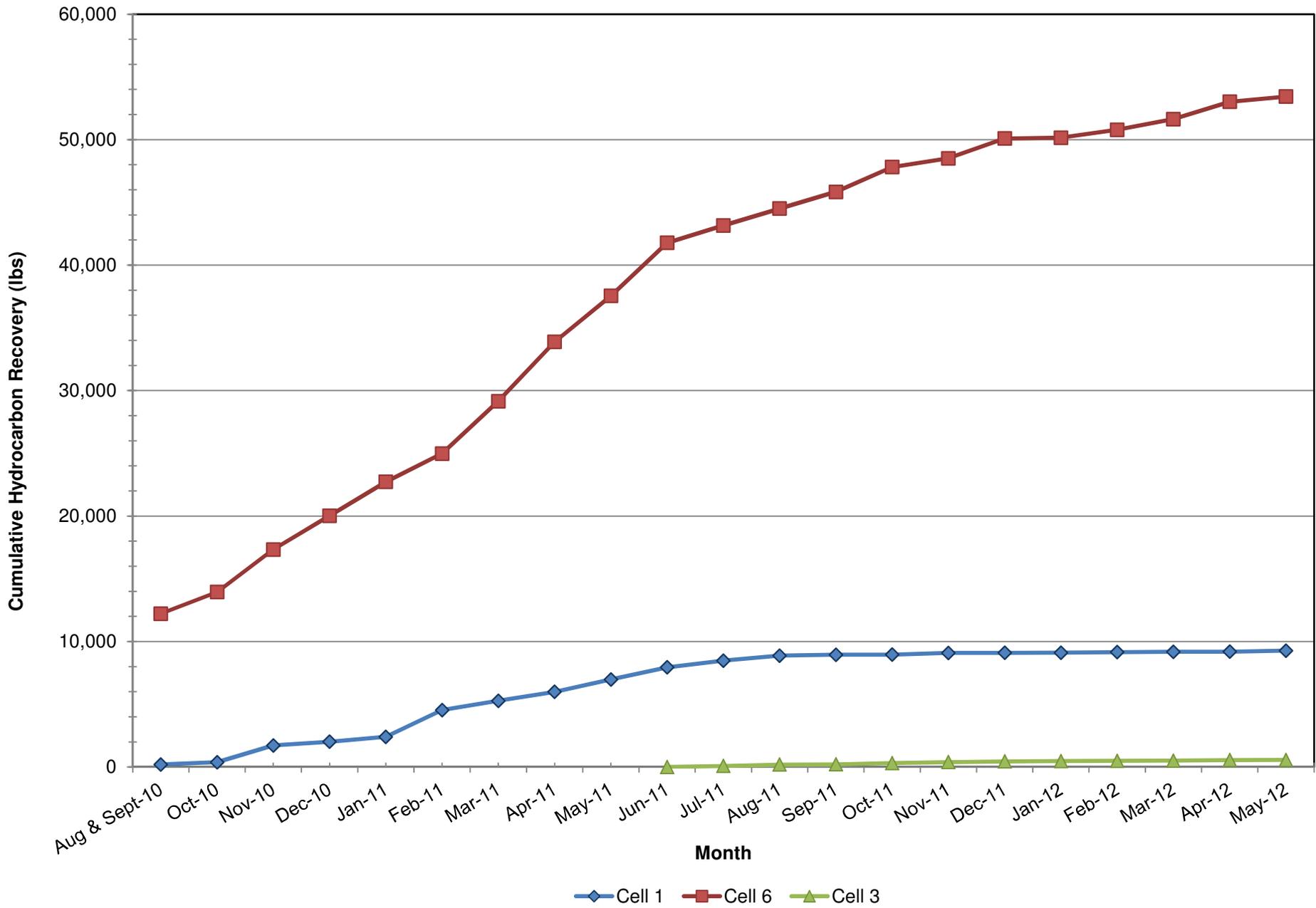
**URS**  
 335 COMMERCE DRIVE, SUITE 300  
 FORT WASHINGTON, PA 19034  
 PHONE: (215) 367-2500 FAX: (215) 367-1000

Job: 15302307.11001  
 Prepared by: JES  
 Checked by: JH  
 Date: 10/27/10

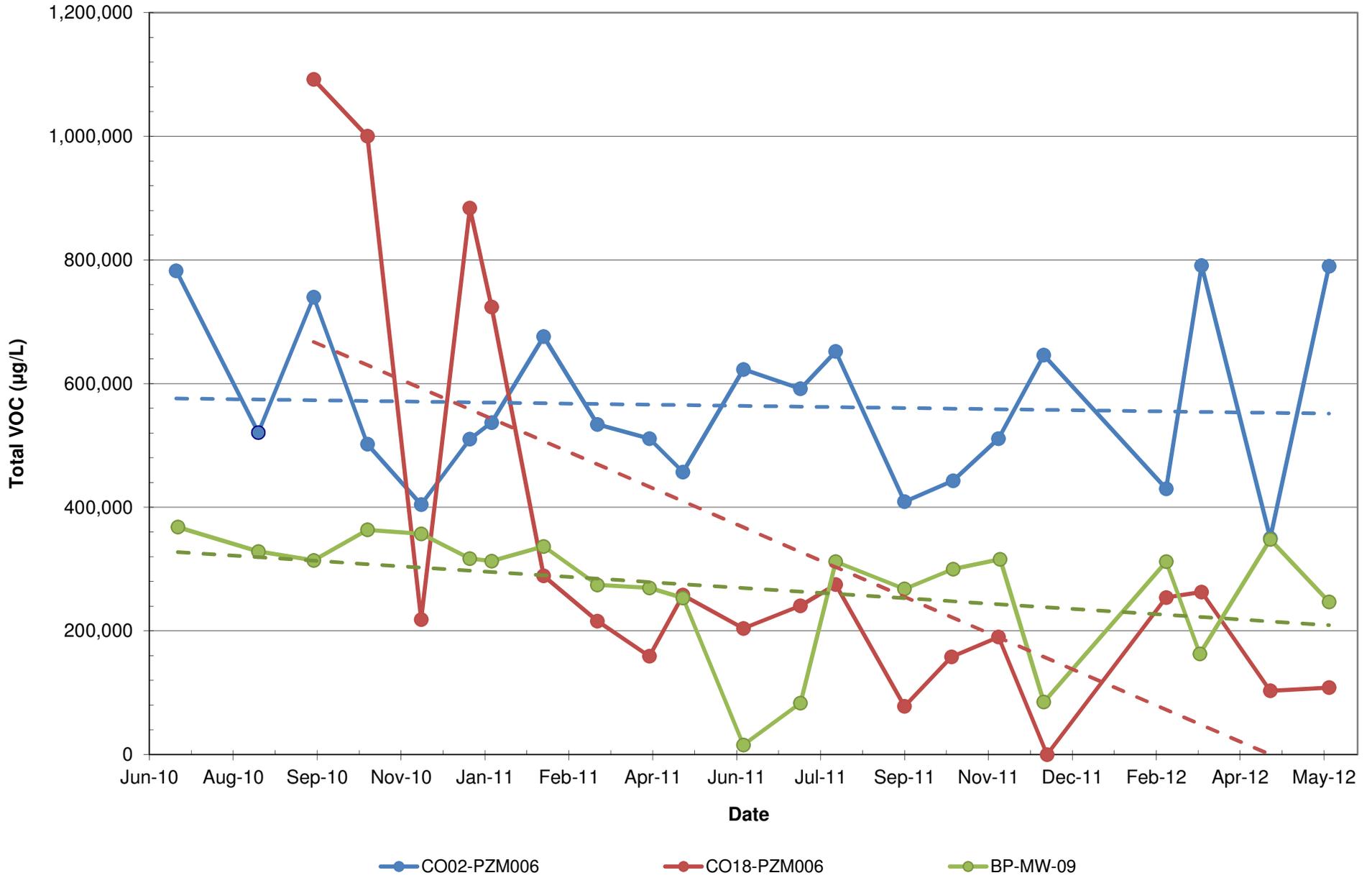
AS-BUILT LAYOUT PLAN  
 CELL 1: FORMER BENZOL PROCESSING AREA  
 RG STEEL SPARROWS POINT, LLC FACILITY  
 BALTIMORE, MARYLAND



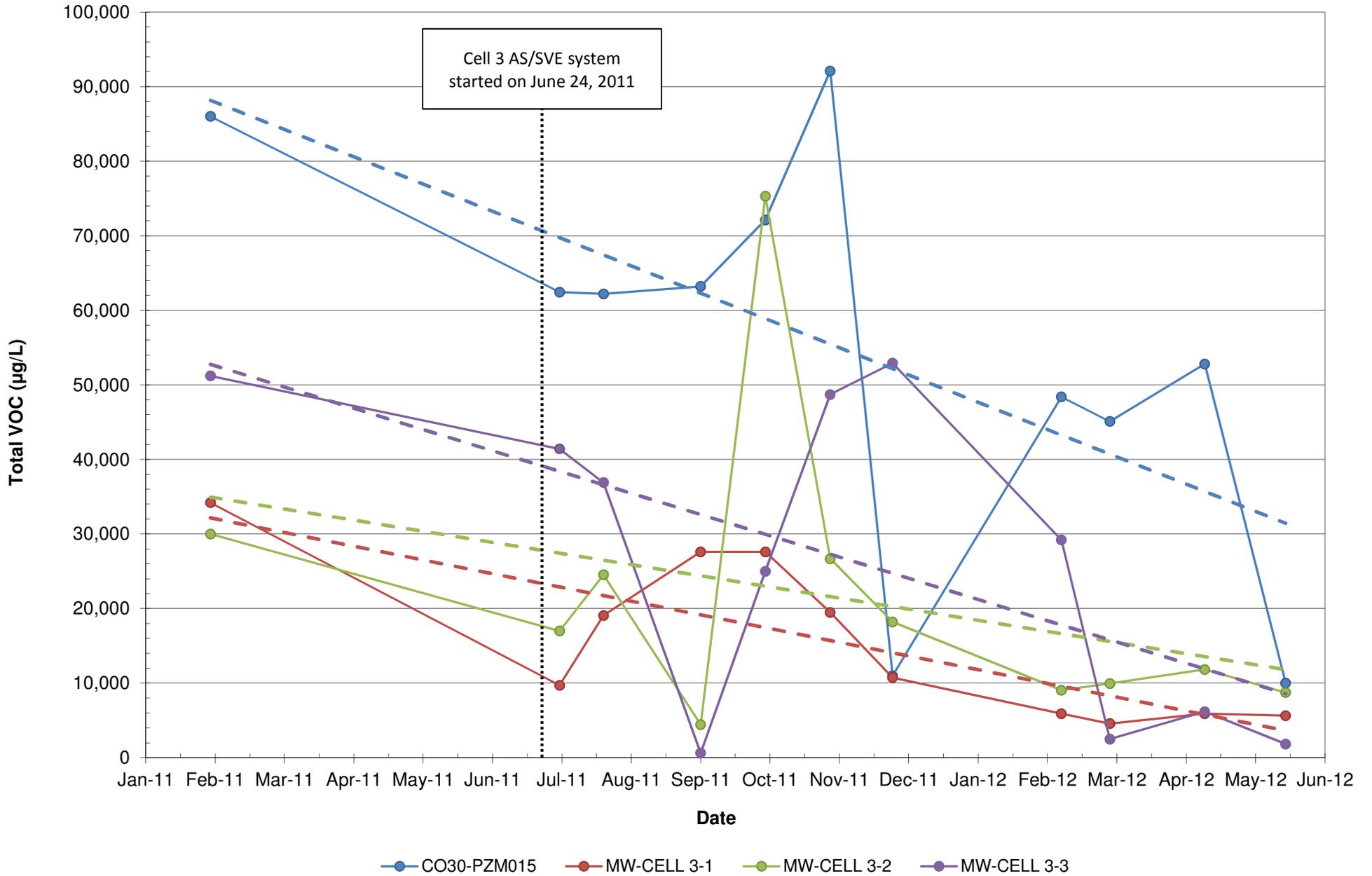
**Figure 3**  
**Cumulative Summary of Estimated Hydrocarbon Recovery**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel Sparrows Point, LLC**



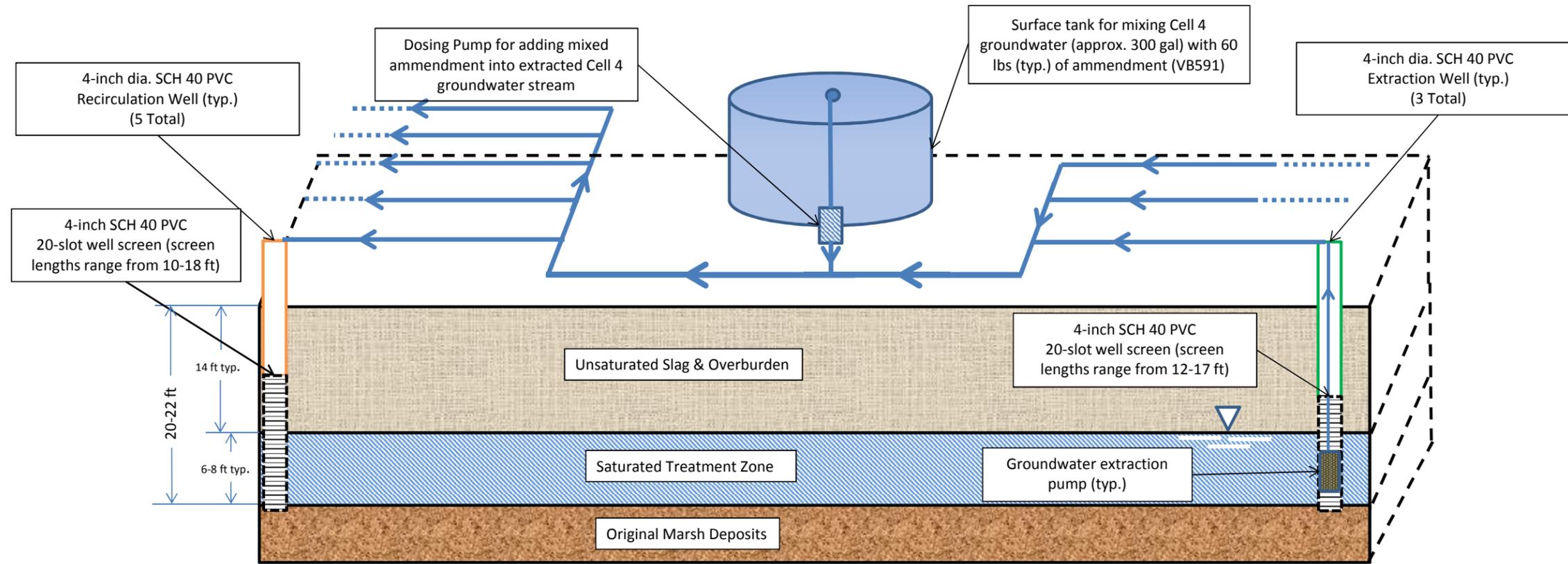
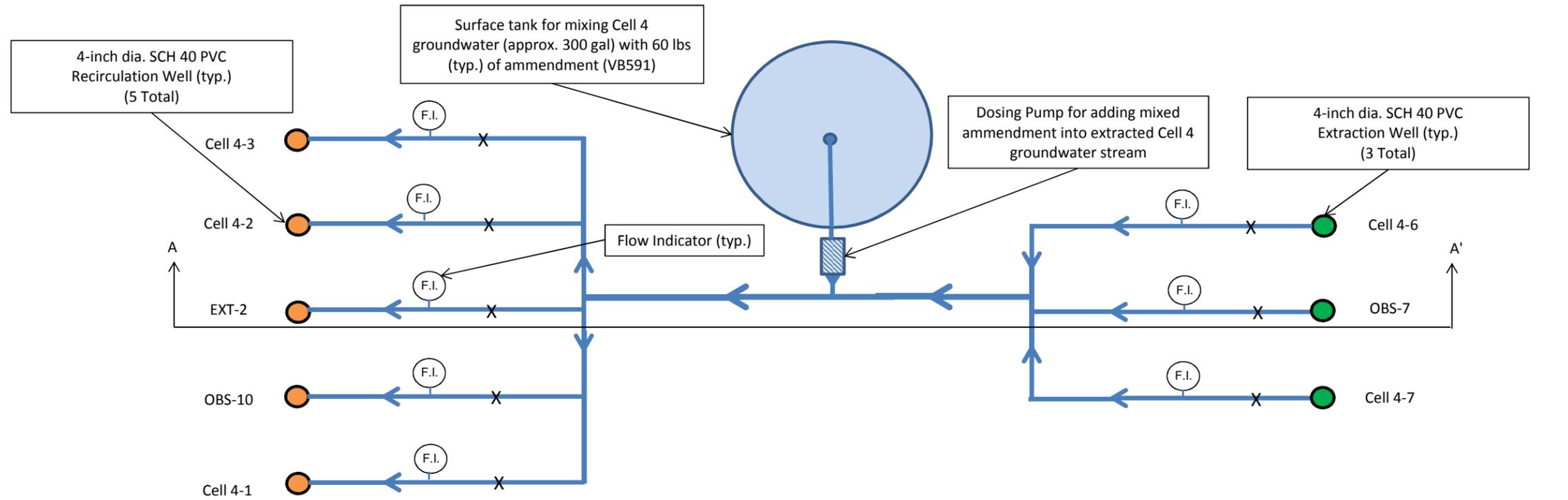
**Figure 4**  
**Measured Groundwater VOC Concentration by Month**  
**Cell 1: Prototype AS/SVE System in the "Cove" Area**  
**RG Steel Sparrows Point, LLC**



**Figure 5**  
**Measured Groundwater VOC Concentration by Month**  
**Cell 3: Prototype AS/SVE System in the "Cove" Area**  
**RG Steel Sparrows Point, LLC**



**Figure 6**  
**Schematic Layout and Sections**  
**Cell 4 In-Situ Anaerobic Bio-Treatment System**  
**Former Coke Oven Area Interim Remedial Measures**  
**RG Steel Sparrows Point, LLC**



Section A-A' (not to scale)

# Cell 4

In-Situ Anaerobic Bio-System



Image source: World Imagery, ESRI, GeoEye, 2009.

### Legend

- Extraction Well (Existing)
- Extraction Well (New)
- Recirculation Well (Existing)
- Recirculation Well (New)
- ⊕ Monitoring Well (Existing)
- ⊕ Monitoring Well (New)
- ➔ Groundwater Flow Direction

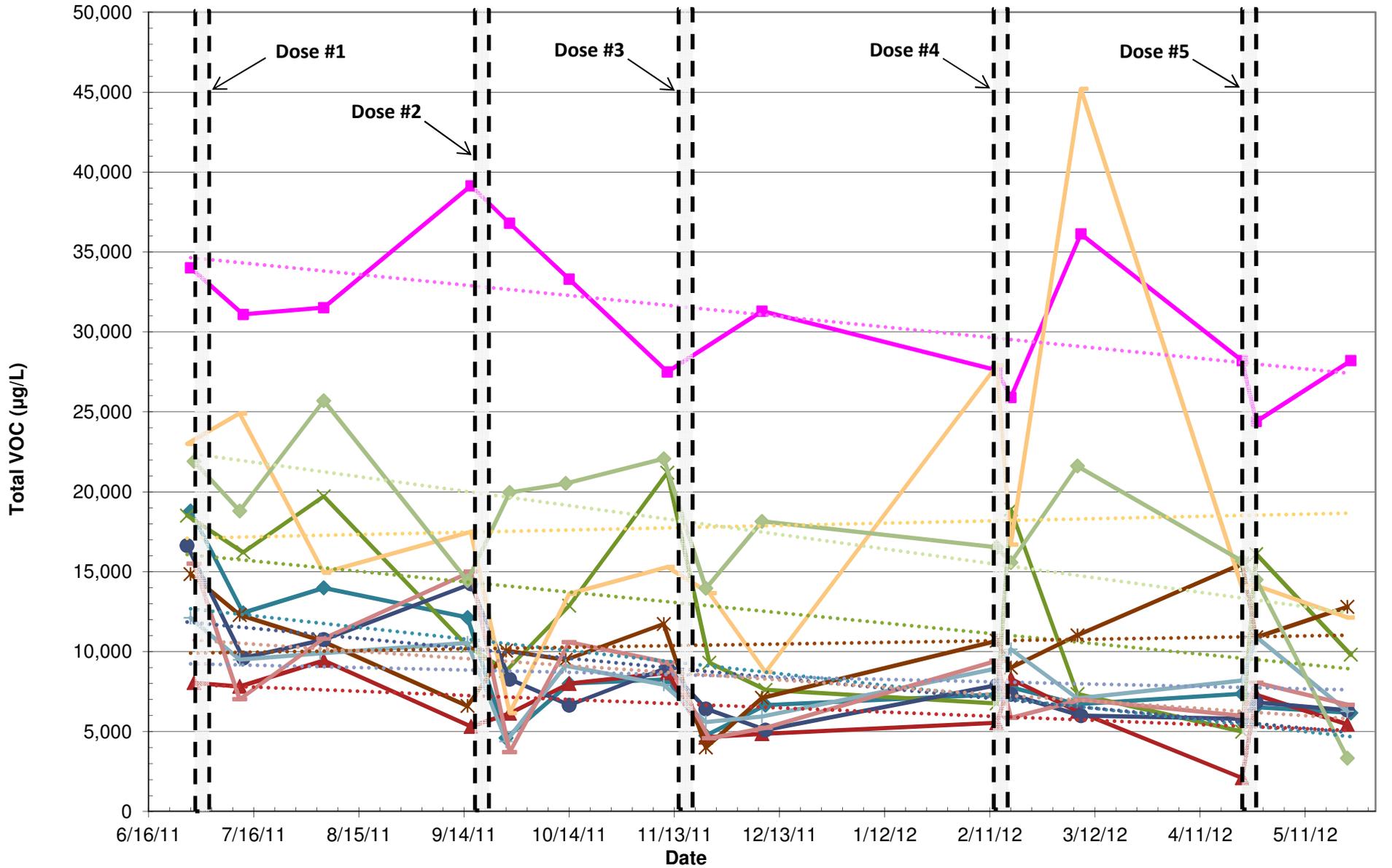
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LOCATION	Baltimore, MD		
 12420 Milestone Center Drive Germantown, MD 20876	GIS BY	JK/aer	11/18/2011
	CHK BY	BE	11/18/2011
	PM	BE	11/18/2011



**Figure 7**  
**Cell 4 Wells**

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**Figure 8**  
**Measured Groundwater VOC Concentration per Month**  
**Cell 4: In-Situ Anaerobic Bio-Treatment Area**  
**RG Steel Sparrows Point, LLC**



AS-2    EXT-2    OBS-6    OBS-8    Cell 4-1    Cell 4-3    Cell 4-4    Cell 4-5    Cell 4-6    Cell 4-7



CLIENT Sparrows Point

LOCATION Baltimore, MD

**URS**  
200 Orchard Ridge Drive  
Gaithersburg, MD 20878

GIS BY	JK	10/13/10
CHK BY	BE	10/14/10
PM	BE	10/14/10



**Figure 9**  
**LNAPL Monitoring and Recovery Wells**

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