



February 3, 2014

Mr. Andrew Fan, PE
US EPA Region III, 3LC20
1650 Arch Street
Philadelphia, PA 19103-2029

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

Re: *COKE OVEN AREA INTERIM MEASURES PROGRESS REPORT 4th QUARTER 2013*

Dear Mr. Fan and Ms. Brown:

Enclosed with this correspondence is the Coke Oven Area Interim Measures Progress Report for the fourth quarter of 2013 completed for the Sparrows Point site. This report was distributed electronically on February 3, 2014 in accordance with the reporting requirements outlined in the US EPA Interim Measures Progress Report frequency letter dated March 26, 2013. Please advise if paper copies are required for your use and we will distribute accordingly.

The report summarizes implementation progress for the interim measures (IMs) that have been developed to address identified environmental conditions at the Coke Oven Area through December 31, 2013. Please me at (314) 686-5611 should questions arise during your review of the enclosed progress report.

Sincerely,

Russell Becker
Vice President, Remediation
Sparrows Point LLC

Enclosure

COKE OVEN AREA INTERIM MEASURES PROGRESS REPORT

(Fourth Quarter 2013)

Prepared for

**SPARROWS POINT LLC
1428 SPARROWS POINT BOULEVARD
SPARROWS POINT MD 21219**

FEBRUARY 2014



EnviroAnalytics Group
1428 Sparrows Point Blvd
Sparrows Point, MD 21219

Introduction

This document presents operational data and monitoring information collected in the 4th quarter of 2013 for interim measures (IMs) that have been installed to address identified environmental conditions at the Coke Oven Area (COA) Special Study Area at the Sparrows Point LLC site located in Sparrows Point, Maryland. This progress report summarizes IM performance including data from the fourth quarter of 2013 and is submitted in accordance with reporting requirements outlined in correspondence received from US EPA on March 26, 2013. The following designations are applied in this document to the operating IM “Cells” (**Figure 1**) at the COA:

- Cell 1: Air Sparge/Soil Vapor Extraction (AS/SVE) System in the Former Benzol Processing Area,
- Cell 3: AS/SVE System in “Cove” Area,
- Cell 4: In-Situ Anaerobic Bio-treatment Area,
- Cell 6: Light Non-Aqueous Phase Liquid (LNAPL) Recovery at the Former Benzol Processing Area.

As of the end of the fourth quarter 2013, Cells 1, 3, and 6 continue to be operational. Groundwater and soil gas sampling were conducted during the third quarter of 2013 to assess current conditions and removal efficiencies of the operating IM systems. The results of these sampling events, including trending graphs from IM startup, are detailed in this report. LNAPL removal continued at Cell 6 without interruption.

Design work has been completed on the IM remediation systems for Cell 2 and Cell 5 and final approval for both systems was received from EPA on September 10, 2013. As part of this approval, the bio-treatment process at Cell 4 has been discontinued and a combined Cell4/Cell5 remediation design has been approved. As of December 31, 2013, contracts have been awarded for drilling and construction for IM Cells 2 & 5. Construction and well drilling is scheduled to begin in February 2014. Fabrication of remediation equipment required for Cells 2 and 4/5 has begun as well and delivery of equipment is tentatively scheduled for some time in March 2014.

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

Cell 1 consists of an AS/SVE system 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.

4th Quarter 2013 Operational Performance

Operational performance of Cell 1 during this reporting period is summarized in **Table 1**. In summary, the CATOX unit operated for 576 hours (26.4 %) during this reporting period. The system at Cell 1 continues to operate on a pulsing schedule; where the system is in recovery or on mode for one day and then turned off to let the area rebound for two or three days. This practice was implemented during the first quarter 2013 to improve recovery of hydrocarbons from the subsurface. Operations continue to be 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 0.06 pounds per operating hour (estimated quarterly total of 33.1 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 11,903 pounds of recovered hydrocarbons.

Soil gas samples were collected for laboratory analysis to monitor CATOX unit performance. Three (3) untreated soil gas sample were collected in Suma Canisters and submitted to Pace Analytical Services, Inc. in Minneapolis, Minnesota for analysis by US EPA Method TO-15. The average influent soil gas hydrocarbon concentration of the three samples taken throughout the fourth quarter was 43,903 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) as summarized in **Table 2**.

Hydrocarbon removal calculations were based on the analytical results and the average daily field-measured influent flow rates. The mass removal calculations assume that the samples collected throughout the fourth quarter are representative of hydrocarbon concentrations for the entire quarter. This assumption is based on the fact that the same air sparge wells (AS-1 thru AS-8) and extraction wells (V-1 thru V-6) were online when the system was operational. The pulsing operational method continues to show improved recovery concentrations in the influent soil gases and will be maintained in the future.

4th Quarter 2013 Groundwater Monitoring Results

Groundwater samples were collected on December 18, 2013 from the following wells:

- BP-MW-09 (upgradient of Cell 1),
- CO18-PZM006 (upgradient of Cell 1 at edge of berm), and
- CO02-PZM006 (downgradient of Cell 1).

The groundwater samples were submitted to Pace Analytical Services, Inc., located in Greensburg, Pennsylvania for the analyses shown in **Table 3**. These data indicate benzene is the most prevalent volatile organic compound (VOC) constituent. Since system startup in August 2010, a decreasing total VOC concentration trend is documented at the wells monitored for system performance. 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.

4th Quarter 2013 Operational Performance

Operational performance of Cell 3 during this reporting period is summarized in **Table 4**. In summary, the CATOX unit operated for 576 hours (26.4%) during the fourth quarter of 2013. The system at Cell 3 continues to operate on a pulsing schedule; where the system is in recovery or on mode for one day and then turned off to let the area rebound for two or three days. This practice was implemented to improve recovery of hydrocarbons from the subsurface. Operations continue to be 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 0.0137 pounds per operating hour (estimated quarterly total of 7.9 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 1,352.4 pounds of recovered hydrocarbons.

Soil gas samples were collected for laboratory analysis to monitor CATOX unit performance. Three (3) untreated soil gas sample were collected in Suma Canisters and submitted to Pace Analytical Services. The average influent soil gas hydrocarbon concentration of the three samples taken throughout the third quarter was 10,494 ug/m³ 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 samples collected throughout the third quarter are representative of hydrocarbon concentrations for the entire fourth quarter of 2013. This assumption is based on the fact that the same air sparge wells (AS-2 thru AS-12) and extraction wells (V-2 thru V-4) were online when the system was operational. Operations at this Cell will continue to be evaluated in the future to improve system recovery rates.

4th Quarter 2013 Groundwater Monitoring

Groundwater samples were collected on December 18, 2013 from the following wells (**Figure 1**):

- MW-CELL3-1 (downgradient of Cell 3),
- MW-CELL3-2 (upgradient of Cell 3),
- MW-CELL3-3 (upgradient of Cell 3), and
- CO30-PZM015 (downgradient of Cell 3).

The groundwater samples were submitted to Pace Analytical for the analyses shown in **Table 6**. These data indicate that benzene is the most prevalent VOC constituent. Since system startup on June 24, 2011, a generally decreasing VOC concentration trend is documented for some 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

The in-situ anaerobic bio-treatment system at Cell 4 has been discontinued as of the end of third quarter 2013. The treatment area at Cell 4 has been incorporated into the design of Cell 5, which will be installed in the first quarter 2014.

4th Quarter 2013 Groundwater Monitoring Results

Groundwater samples were collected on December 18 & 19, 2013. Groundwater samples were collected from the following wells (**Figure 7**):

- OBS-6 MW-CELL 4-3
- AS-2 MW-CELL 4-6
- MW-CELL 4-5
- MW-CELL 4-7

The groundwater samples were submitted to Pace Analytical for the analyses shown in **Table 7**. The data in Table 7 indicate naphthalene is the most prevalent VOC constituent. Figure 8 presents a graph of the total VOC concentrations in Cell 4 groundwater and indicates when former dosing events occurred. Unusually greater concentrations of naphthalene were noted in the groundwater wells sampled in the 4th quarter of 2013 as compared to previous sampling events. The naphthalene results were based on results reported from laboratory method EPA 8260. Laboratory method EPA 8270 had been used historically for the analyses of naphthalene in groundwater. Either method is acceptable ; however, results may have differed from use of differing laboratory methodology. VOC trends using method EPA 8260 for groundwater samples recovered from these monitoring wells will continue to be monitored and assessed in future months.

Cell 6: LNAPL Extraction at the Former Benzol Processing Area

The Cell 6 LNAPL monitoring and recovery system was monitored weekly during the fourth quarter of 2013. **Table 8** summarizes; 1) LNAPL occurrence and recovery observed in monitoring wells for this Cell during the reporting period, 2) the start date of extraction from recovery wells and 3) cumulative LNAPL recovered since the beginning of the interim measure. **Figure 9** illustrates the well locations. An estimated 232 gallons (1,700 pounds) of LNAPL were recovered during the fourth quarter 2013, bringing the total recovered LNAPL to 10,346 gallons (75,802 pounds) as of December 31, 2013. The LNAPL was recovered from the following wells:

Well	LNAPL Recovery (gal/lbs)	
	4 th Qtr 2013	Total thru 4 th Qtr 2013
BP-MW-05	164/1,202	8,189/60,002
RW-04	0/0	1,116/8,178
BP-MW-08	58/425	1,012/7,408
BP-MW-11	10/73	18/130
RW-03	0/0	19/141
RW-01	0/0	1/10
RW-02	0/0	0.8/5.9

LNAPL thicknesses during the reporting period are summarized below (wells are not listed if LNAPL was not present):

- RW-04 (2.5 ft),
- BP-MW-05 (1.0 ft),
- BP-MW-08 (2.8 ft),
- BP-MW-11 (5.5 ft),
- BP-MW-10 (0.01 ft),
- RW-03 (1.28 ft)
- RW-01 (0.30 ft), and
- BP-MW-07 (0.05 ft).

No LNAPL was observed in wells RW-02, 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.

Well RW-04 currently has a broken skimmer pump. A replacement skimmer pump is currently being purchased in order to resume product recovery at this well. A new pump is planned to be operational in February, 2014. Pumping trials took place at well BP-MW-11 during the fourth quarter 2013 to determine if LNAPL can be consistently recovered from this well. Based on the pumping trials it has been determined that this well has sufficient recovery to support the operation of a product recovery system. Sparrows Point LLC is currently evaluating options for this well and plans to have a product recovery system in place by the end of the first quarter 2014.

FIGURES

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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

APPROXIMATE SCALE



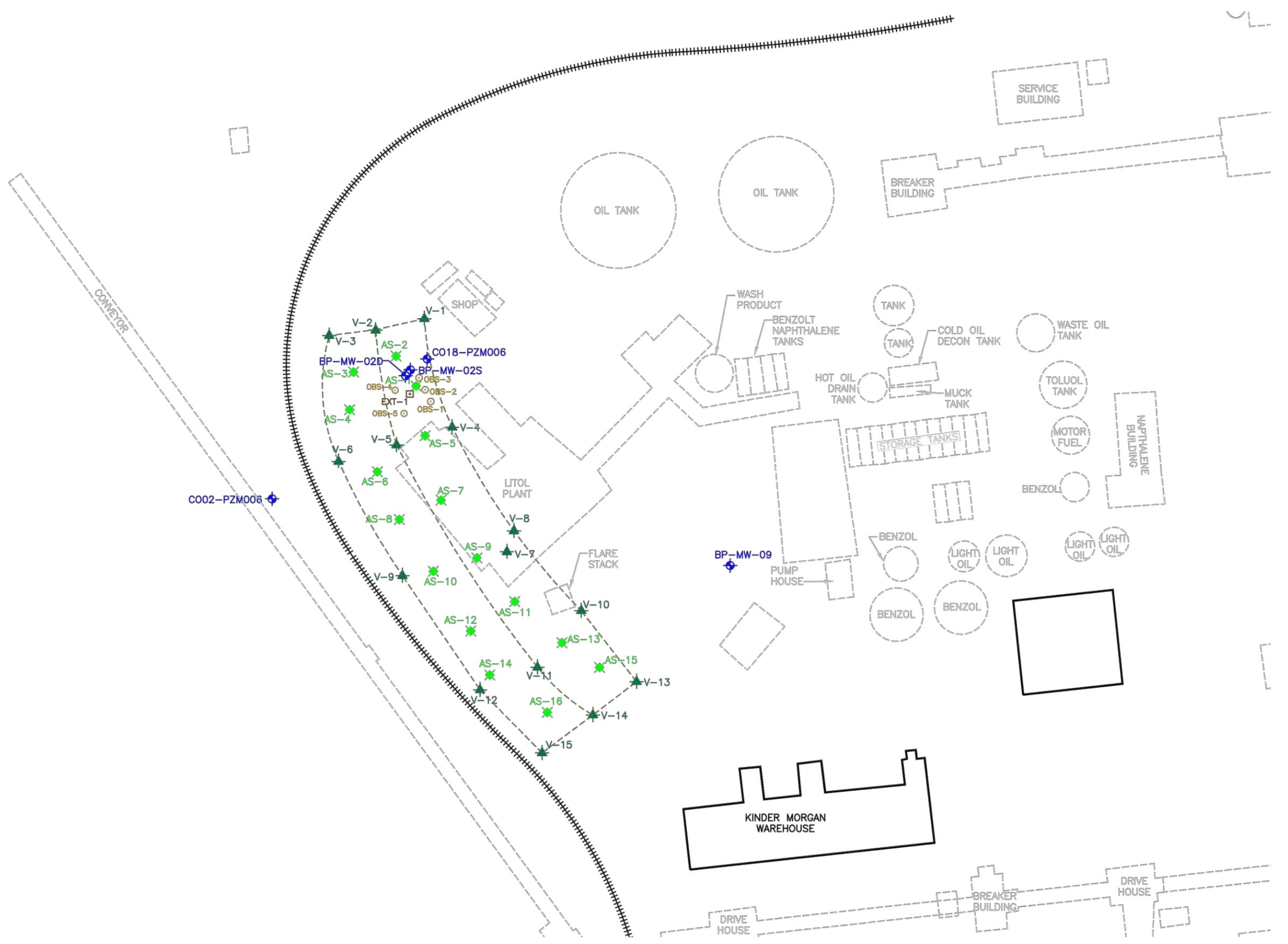
Project
Sparrows Point, LLC
Baltimore, Maryland

INTERIM MEASURES TREATMENT AREAS

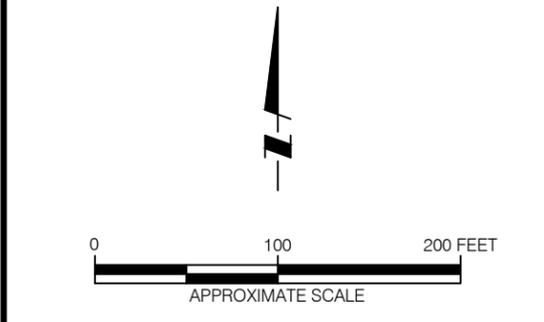
Project Number		File Number	
Date		Figure	
April 30, 2013		1	
PE/PG	PM	Drafter	

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

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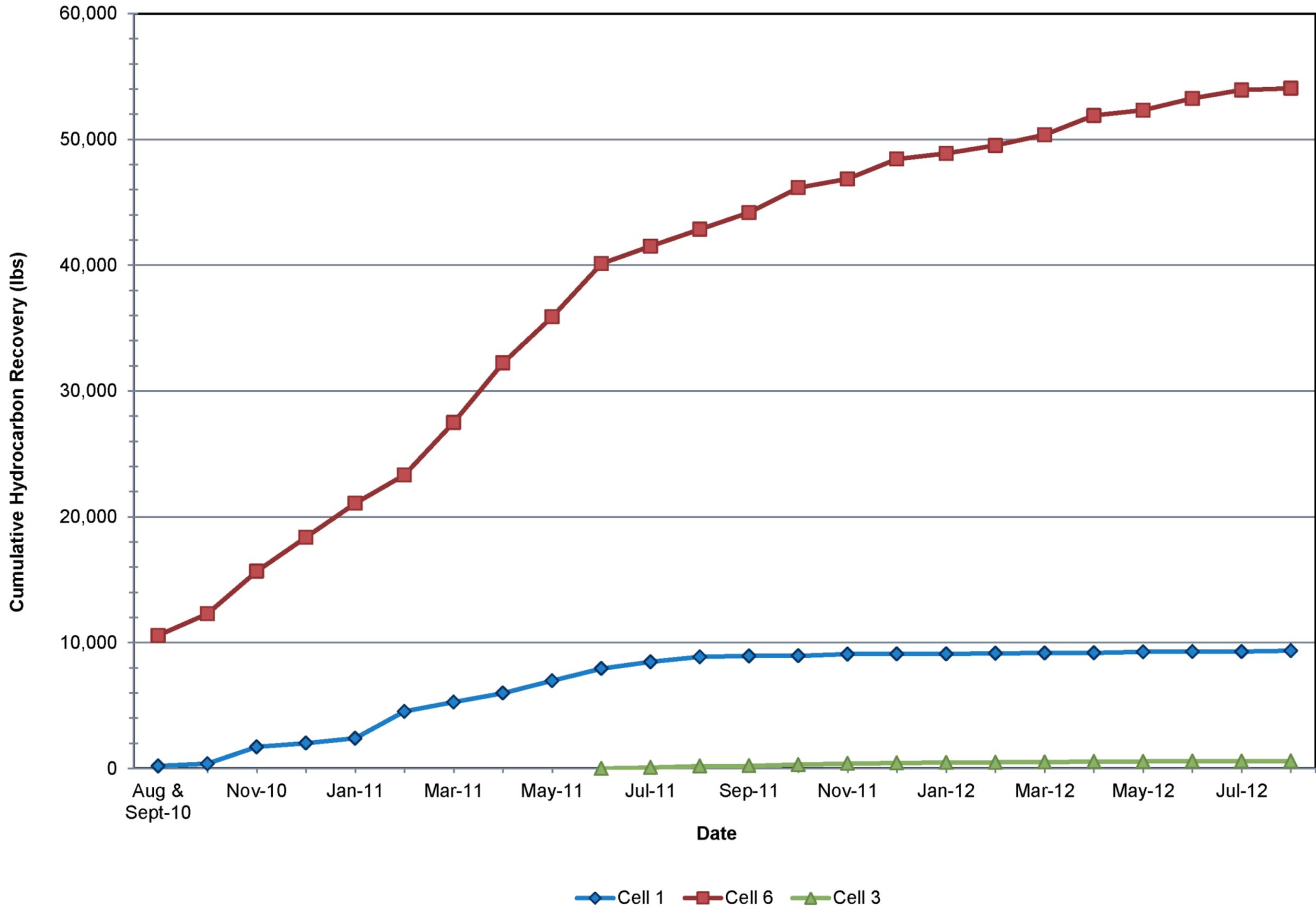
- LEGEND**
- V-1 TRENCH VAPOR EXTRACTION RISER
 - EXT-1 SVE PILOT TEST EXTRACTION WELL
 - OBS-1 SVE PILOT TEST OBSERVATION WELL
 - CO18-PZM006 EXISTING MONITORING WELL
 - AS-2 AIR SPARGE WELL
 - - - - - VAPOR COLLECTION TRENCHES
 - - - - - FORMER STRUCTURES (DEMOLISHED)



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Baltimore, Maryland

AS-BUILT LAYOUT PLAN

Project Number		File Number	
Date	April 30, 2013		Figure
PE/PG	PM	Drafter	2



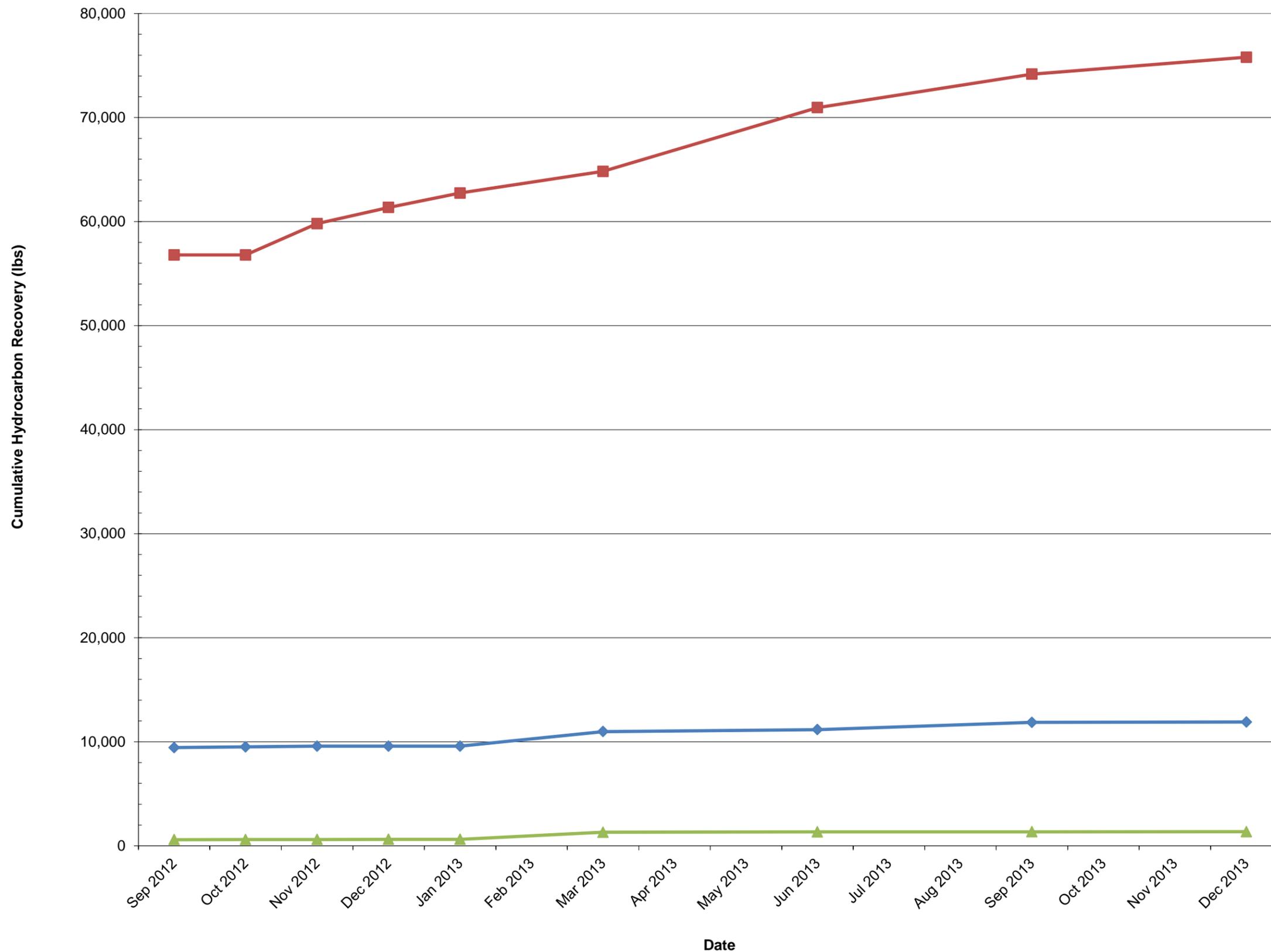
Project
Sparrows Point, LLC
Baltimore, Maryland

**CUMULATIVE SUMMARY OF ESTIMATED
HYDROCARBON RECOVERY
FORMER COKE OVEN AREA INTERIM
REMEDIAL MEASURES
AUGUST 2010 – AUGUST 2012**

Project Number _____ File Number _____

Date April 30, 2013 Figure

PE/RG PM DR **3**



LEGEND

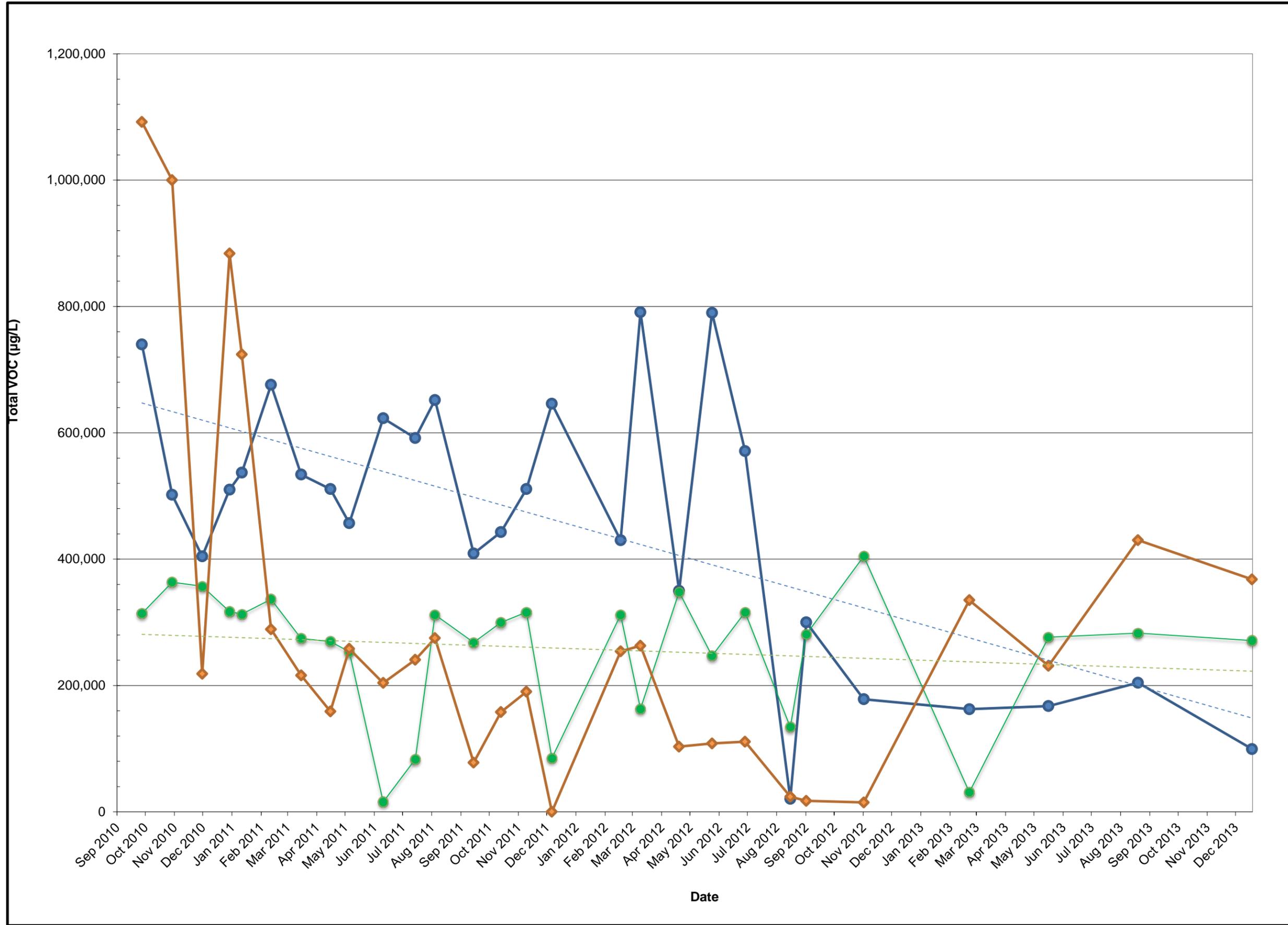
- Cell 1
- Cell 3
- Cell 6



Project
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Baltimore, Maryland

CUMULATIVE SUMMARY OF ESTIMATED
HYDROCARBON RECOVERY
FORMER COKE OVEN AREA
INTERIM REMEDIAL MEASURES
SEPTEMBER 2012 AND BEYOND

Project Number		File Number	
Date	Dec. 31, 2013		Figure
PE/RG	PM	DR	3A



LEGEND

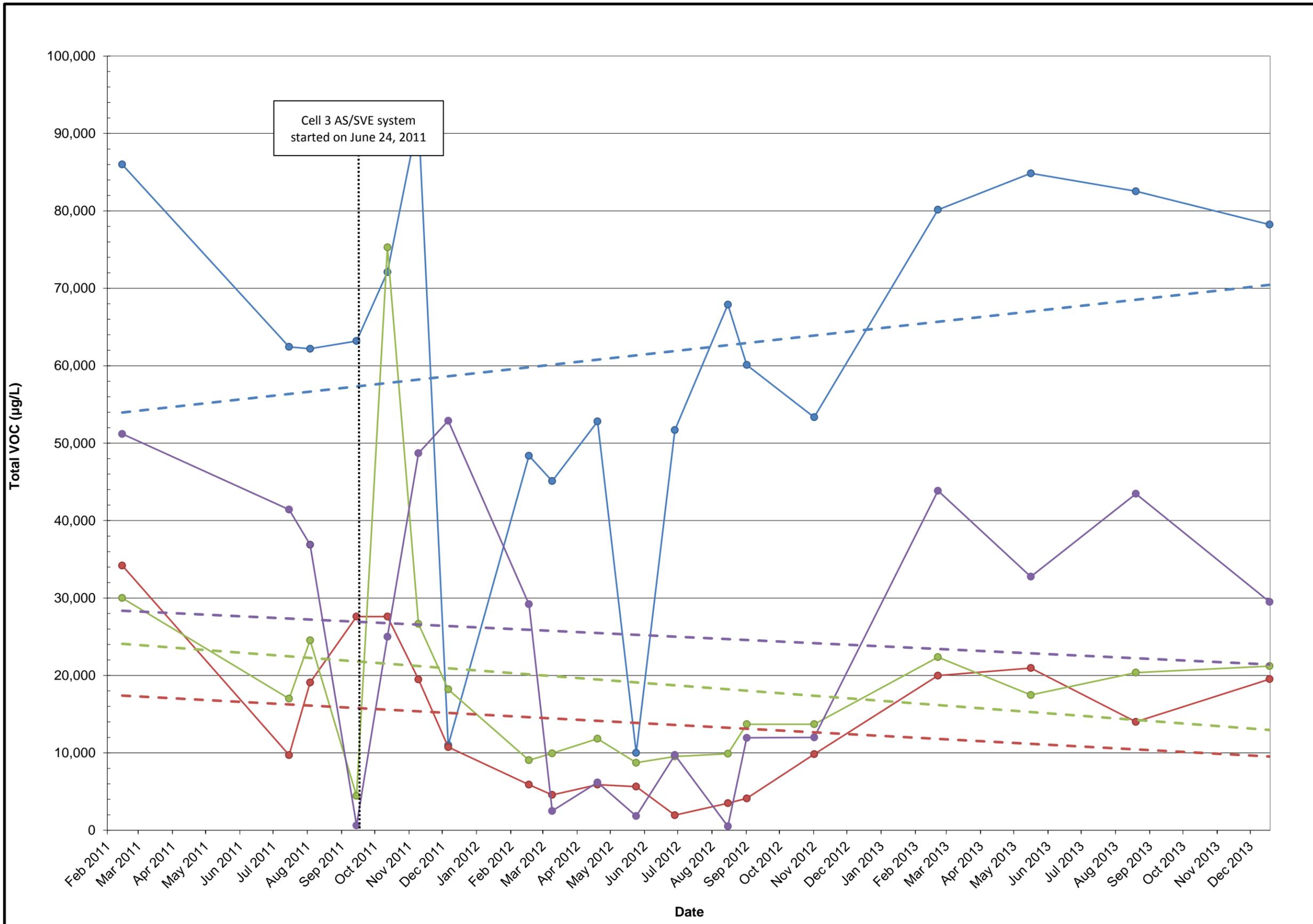
- CO2-PZM006
- BP-MW-09
- CO18-PZM006



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Baltimore, Maryland

MEASURED GROUNDWATER VOC
CONCENTRATION BY MONTH
CELL 1: PROTOTYPE AS/SVE
SYSTEM IN THE "COVE" AREA

Date		Figure	
Dec. 31, 2013		4	
PE/RG	PM	DR	



- LEGEND**
- CO30-PZM015
 - MW-CELL 3-1
 - MW-CELL 3-2
 - MW-CELL 3-3



Project
Sparrow Point, LLC
Baltimore, Maryland

MEASURED GROUNDWATER VOC
CONCENTRATION BY MONTH
CELL 3: PROTOTYPE AS/SVE
SYSTEM IN THE COVE AREA

Date		Dec. 31, 2013		Figure	
				5	
PE/RG	PM	DR			

Cell 4

In-Situ Anaerobic Bio-System



0 20 40 80 Feet

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



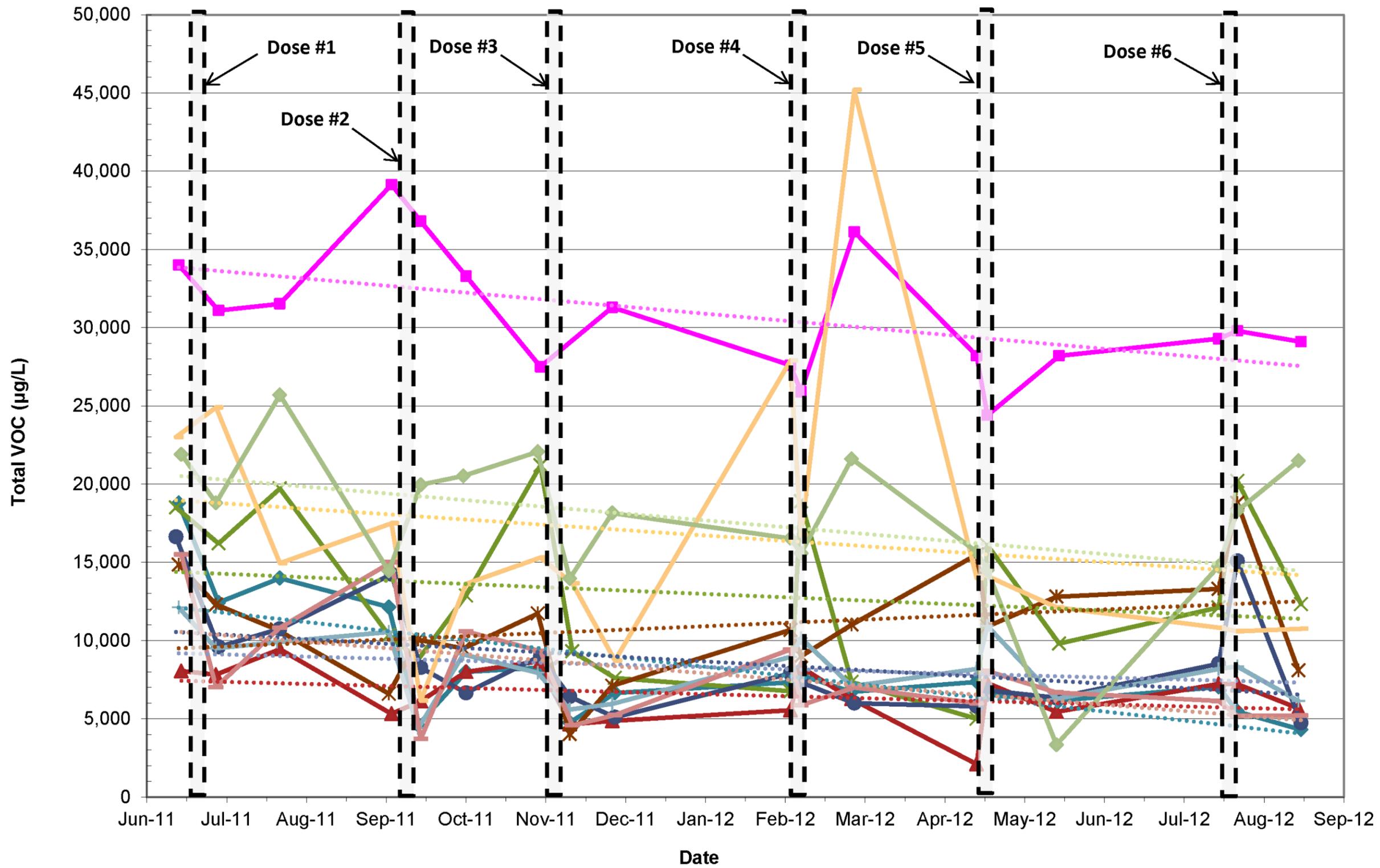
CELL 4 WELLS

Sparrows Point, LLC
Baltimore, Maryland

Date	Drafter
April 30, 2013	



PE/PG	Project Number	Figure 7
Project Manager	File	



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



Project
Sparrows Point, LLC
Baltimore, Maryland

**MEASURED GROUNDWATER VOC
CONCENTRATION BY MONTH
CELL 4: IN-SITU ANAEROBIC BIO-
TREATMENT AREA
JUNE 2011 – AUGUST 2012**

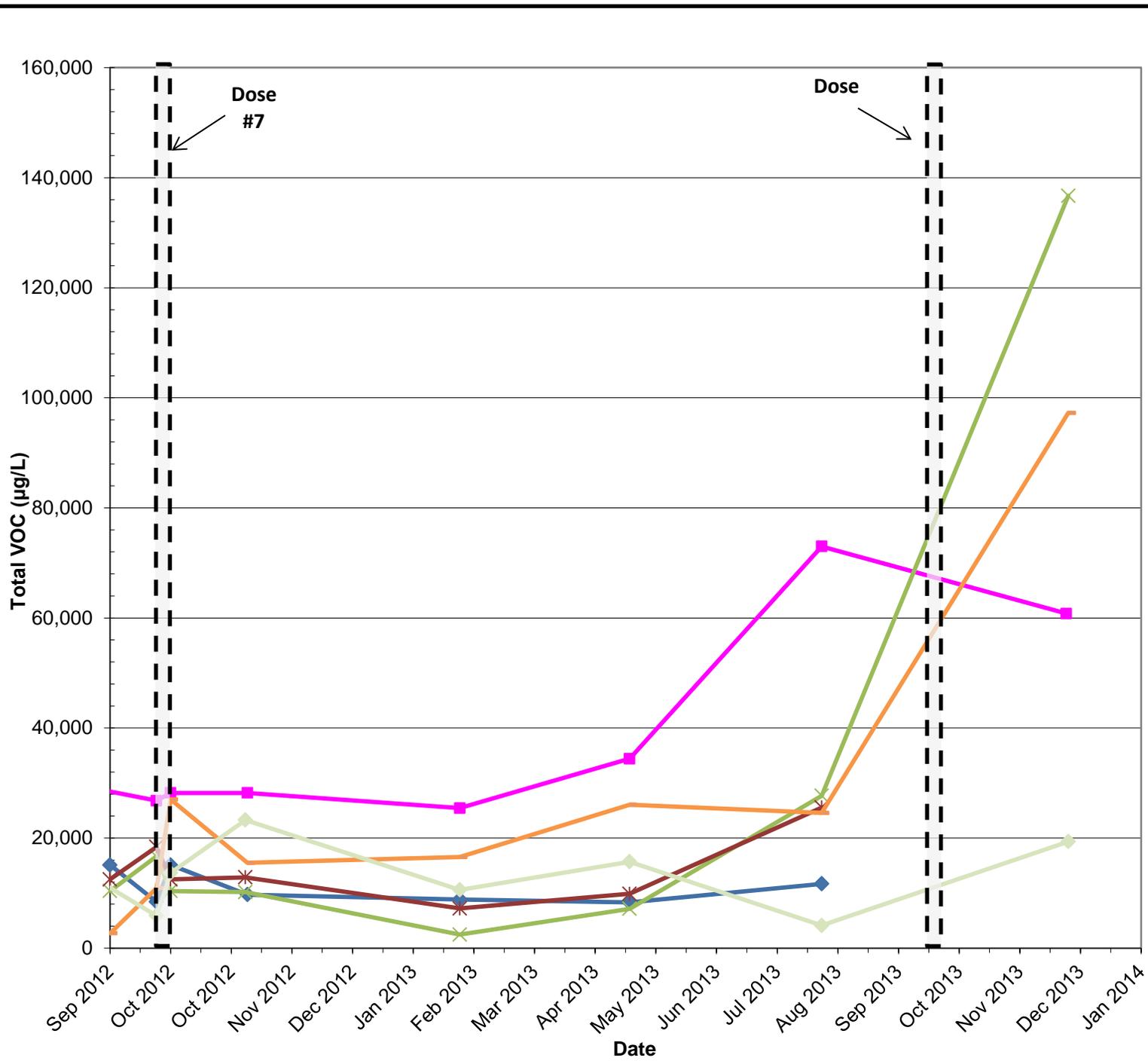
Project Number File Number

Date
April 30, 2013

Figure

PE/RG PM DR

8



LEGEND

- AS-2
- EX T-2
- OB S-6
- Cell 4-1



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MEASURED GROUNDWATER VOC
CONCENTRATION BY MONTH
CELL 4: IN-SITU ANAEROBIC
BIO-TREATMENT AREA
SEPTEMBER 2012 AND BEYOND

Date	Figure
Dec. 31, 2013	8A
PREPARED BY	DR

TABLES

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

Cell 1 Fourth Quarter 2013 Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total CATOX Operating Time (October 1 - December 31, 2013)	hours	576
Overall CATOX Operational Time	%	26.4%
Estimated Total Hydrocarbons Destroyed	pounds	33.1
Estimated Hydrocarbon Removal Rate	pounds/hour	0.06

Cell 1 Cumulative Summary of Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (August 3, 2010 - December 31, 2013)	hours	19,368
Overall CATOX Operational Time	%	73.9%
Estimated Total Hydrocarbons Destroyed	pounds	11,903
Estimated Hydrocarbon Removal Rate	pounds/hour	0.6

Table 2
Summary of Soil Gas Analytical Results (Fourth Quarter 2013)
Cell 1: Prototype AS/SVE System in Former Benzol Processing Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Analyte	Sample ID Date Time Dilution Factor Units	CATOX Influent Q4 2013
TO-15 Volatile Organics		
trans-1,3-Dichloropropene	ug/m ³	ND
Acetone	ug/m ³	65
Ethylbenzene	ug/m ³	88
2-Hexanone	ug/m ³	ND
Methylene Chloride	ug/m ³	ND
Benzene	ug/m ³	40,600
1,1,2,2-Tetrachloroethane	ug/m ³	ND
Tetrachloroethene	ug/m ³	ND
Toluene	ug/m ³	2,073
1,1,1-Trichloroethane	ug/m ³	ND
1,1,2-Trichloroethane	ug/m ³	ND
Trichloroethene	ug/m ³	ND
Vinyl Chloride	ug/m ³	ND
o-Xylene	ug/m ³	390
m-Xylene & p-Xylene	ug/m ³	563
2-Butanone (MEK)	ug/m ³	124
4-Methyl-2-pentanone (MIBK)	ug/m ³	ND
Bromoform	ug/m ³	ND
Carbon Disulfide	ug/m ³	ND
Carbon tetrachloride	ug/m ³	ND
Chlorobenzene	ug/m ³	ND
Chloroethane	ug/m ³	ND
Chloroform	ug/m ³	ND
1,1-Dichloroethane	ug/m ³	ND
1,2-Dichloroethane	ug/m ³	ND
1,1-Dichloroethene	ug/m ³	ND
trans-1,2-Dichloroethene	ug/m ³	ND
1,2-Dichloropropane	ug/m ³	ND
cis-1,3-Dichloropropene	ug/m ³	ND
Total Volatile Organics	ug/m ³	43,903

Notes:

VOC concentrations are averages derived from the 3 monthly influent air samples taken during the quarter (one sample taken each month of the quarter)

BOLD = Analyte detected

ug/m³ = micro grams per cubic meter

ND = Analyte not detected above laboratory reporting limit

Table 3
Summary of Groundwater Analytical Results (Fourth Quarter 2013)
Cell 1: Prototype AS/SVE System in Former Benzol Processing Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Analyte	Sample ID	CO02-PZM006	CO18-PZM006	BP-MW-09
	Date	12/18/2013	12/18/2013	12/18/2013
	Units			
Volatile Organics				
Vinyl Chloride	µg/L	ND	ND	ND
Chloroethane	µg/L	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND
Acetone	µg/L	ND	35	25.7
Carbon Disulfide	µg/L	ND	5.8	16.7
Methylene Chloride	µg/L	8.6	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND
Chloroform	µg/L	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND
Carbon Tetrachloride	µg/L	ND	ND	ND
Benzene	µg/L	97,500	155,000	193,000
1,2-Dichloroethane	µg/L	ND	ND	ND
Trichloroethene	µg/L	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND
Methyl Isobutyl Ketone (MIBK)	µg/L	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND
Toluene	µg/L	339	3,860	41,900
trans-1,3-Dichloropropene	µg/L	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND
2-Hexanone (MBK)	µg/L	ND	ND	ND
Tetrachloroethene	µg/L	ND	ND	ND
Chlorobenzene	µg/L	ND	ND	15.2
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND
Ethylbenzene	µg/L	293	67	2,420
Styrene	µg/L	22.1	ND	1,740
Bromoform	µg/L	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND
Total Xylenes	µg/L	1,290	2,570	32,100
Total Volatile Organics	µg/L	99,453	161,538	271,218

Notes:

Bold = Analyte Detected

ND = Analyte not detected above laboratory reporting limit

µg/L = Micrograms per liter

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

Cell 3 Fourth Quarter 2013 Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total CATOX Operating Time (July 1 - September 30, 2013)	hours	576
Overall CATOX Operational Time	%	26.4%
Estimated Total Hydrocarbons Destroyed	pounds	7.9
Estimated Hydrocarbon Removal Rate	pounds/hour	0.0137

Cell 3 Cumulative Summary of Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (August 3, 2010 - September 30, 2013)	hours	14,087
Overall CATOX Operational Time	%	74.2%
Estimated Total Hydrocarbons Destroyed	pounds	1,352.4
Estimated Hydrocarbon Removal Rate	pounds/hour	0.10

Table 5
Summary of Soil Gas Analytical Results (Fourth Quarter 2013)
Cell 3: AS/SVE System in the "Cove" Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Analyte	Sample ID Date Time Dilution Factor Units	CATOX Influent Q4 2013
TO-15 Volatile Organics		
trans-1,3-Dichloropropene	ug/m ³	ND
Acetone	ug/m ³	22
Ethylbenzene	ug/m ³	ND
2-Hexanone	ug/m ³	ND
Methylene Chloride	ug/m ³	407
Benzene	ug/m ³	9,416
1,1,1,2-Tetrachloroethane	ug/m ³	ND
Tetrachloroethene	ug/m ³	1
Toluene	ug/m ³	574
1,1,1-Trichloroethane	ug/m ³	ND
1,1,2-Trichloroethane	ug/m ³	ND
Trichloroethene	ug/m ³	ND
Vinyl Chloride	ug/m ³	ND
o-Xylene	ug/m ³	0.43
m-Xylene & p-Xylene	ug/m ³	73
2-Butanone (MEK)	ug/m ³	ND
4-Methyl-2-pentanone (MIBK)	ug/m ³	ND
Bromoform	ug/m ³	ND
Carbon Disulfide	ug/m ³	1
Carbon tetrachloride	ug/m ³	ND
Chlorobenzene	ug/m ³	ND
Chloroethane	ug/m ³	ND
Chloroform	ug/m ³	ND
1,1-Dichloroethane	ug/m ³	ND
1,2-Dichloroethane	ug/m ³	ND
1,1-Dichloroethene	ug/m ³	ND
trans-1,2-Dichloroethene	ug/m ³	ND
1,2-Dichloropropane	ug/m ³	ND
cis-1,3-Dichloropropene	ug/m ³	ND
Total Volatile Organics	ug/m ³	10,494

Notes:

VOC concentrations are averages derived from the 3 monthly influent air samples taken during the quarter (one sample taken each month of the quarter)

BOLD = Analyte detected

ug/m³ = micro grams per cubic meter

ND = Analyte not detected above laboratory reporting limit

Table 6
Summary of Groundwater Analytical Results (Fourth Quarter 2013)
Cell 3: Prototype AS/SVE System in the "Cove" Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Sample ID	Date	CO30-PZM015	MW-CELL 3-1	MW-CELL 3-2	MW-CELL 3-3
		12/18/2013	12/18/2013	12/18/2013	12/18/2013
Analyte	Units				
Volatile Organics					
Vinyl Chloride	µg/L	ND	ND	ND	ND
Chloroethane	µg/L	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND	ND
Acetone	µg/L	ND	ND	ND	26.7
Carbon Disulfide	µg/L	ND	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND	ND
Carbon Tetrachloride	µg/L	ND	ND	ND	ND
Benzene	µg/L	71,400	18,000	19,500	26,000
1,2-Dichloroethane	µg/L	ND	ND	ND	ND
Trichloroethene	µg/L	ND	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND	ND
Methyl Isobutyl Ketone (MIBK)	µg/L	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND	ND
Toluene	µg/L	4,940	1,240	1,380	2,310
trans-1,3-Dichloropropene	µg/L	ND	ND	ND	ND
trans-1,4-Dichloro-2-butene	µg/L	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND	ND
2-Hexanone (MBK)	µg/L	ND	ND	ND	ND
Tetrachloroethene	µg/L	ND	ND	ND	ND
Chlorobenzene	µg/L	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND	ND
Ethylbenzene	µg/L	120	20.9	24.8	62
Styrene	µg/L	28.1	7.7	9.4	14.2
Bromoform	µg/L	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND	ND
Total Xylenes	µg/L	1,750	254	292	1,080
Total Volatile Organics	µg/L	78,238	19,523	21,206	29,493

Notes:

Bold = Analyte Detected

ND = Analyte not detected above laboratory reporting limit

µg/L = Micrograms per liter

Table 7
Summary of Groundwater Analytical Results (Fourth Quarter 2013)
Cell 4: In-Situ Anaerobic Bio-Treatment Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Sample ID	4-1	4-5	4-7	AS-2	EXT-2	OBS-6	
Date		12/19/2013	12/19/2013	12/18/2013		12/19/2013	
Time		11:45	10:45	15:45		10:00	
Analyte	Units						
Volatile Organics							
Vinyl Chloride	µg/L	NS	ND	ND	ND	NS	ND
Chloroethane	µg/L	NS	ND	ND	ND	NS	ND
1,1-Dichloroethene	µg/L	NS	ND	ND	ND	NS	ND
Acetone	µg/L	NS	ND	6.4	42.2	NS	ND
Carbon Disulfide	µg/L	NS	ND	ND	ND	NS	ND
Methylene Chloride	µg/L	NS	ND	ND	ND	NS	ND
trans-1,2-Dichloroethene	µg/L	NS	ND	ND	ND	NS	ND
1,1-Dichloroethane	µg/L	NS	ND	ND	ND	NS	ND
2-Butanone (MEK)	µg/L	NS	ND	ND	ND	NS	ND
Chloroform	µg/L	NS	ND	ND	ND	NS	ND
1,1,1-Trichloroethane	µg/L	NS	ND	ND	ND	NS	ND
Carbon Tetrachloride	µg/L	NS	ND	ND	ND	NS	ND
Benzene	µg/L	NS	1,390	1,120	4,470	NS	1,100
1,2-Dichloroethane	µg/L	NS	ND	ND	ND	NS	ND
Trichloroethene	µg/L	NS	ND	ND	ND	NS	ND
1,2-Dichloropropane	µg/L	NS	ND	ND	ND	NS	ND
Methyl Isobutyl Ketone (MIBK)	µg/L	NS	ND	ND	ND	NS	ND
cis-1,3-Dichloropropene	µg/L	NS	ND	ND	ND	NS	ND
Toluene	µg/L	NS	1,090	845	3,620	NS	748
trans-1,3-Dichloropropene	µg/L	NS	ND	ND	ND	NS	ND
1,1,2-Trichloroethane	µg/L	NS	ND	ND	ND	NS	ND
2-Hexanone (MBK)	µg/L	NS	ND	ND	ND	NS	ND
Tetrachloroethene	µg/L	NS	ND	ND	ND	NS	ND
Chlorobenzene	µg/L	NS	ND	ND	ND	NS	ND
1,1,1,2-Tetrachloroethane	µg/L	NS	ND	ND	ND	NS	ND
Ethylbenzene	µg/L	NS	37.1	48	76.7	NS	29.8
Styrene	µg/L	NS	340	288	984	NS	164
Bromoform	µg/L	NS	ND	ND	ND	NS	ND
1,1,1,2,2-Tetrachloroethane	µg/L	NS	ND	ND	ND	NS	ND
1,3,5-Trimethylbenzene	µg/L	NS	ND	ND	ND	NS	ND
1,2,4-Trimethylbenzene	µg/L	NS	ND	ND	ND	NS	ND
Xylenes, Total	µg/L	NS	903	1,050	2,200	NS	673
Semi-Volatiles							
Naphthalene	µg/L	NS	93,500	16,000	49,400	NS	134,000
Total Volatile Organics	µg/L	0	97,260	19,357	60,793	0	136,715

Notes:

Bold = Analyte Detected

ND = Analyte not detected above laboratory reporting limit

µg/L = Micrograms per liter

NS = Not Sampled

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

Well	LNAPL Occurrence During Fourth Quarter 2013 (ft)	Total LNAPL Recovery Period		Cumulative Total LNAPL Recovered		Estimate LNAPL Recovered During Fourth Quarter 2013	
		Begin	End	(gal)	(lbs) (a)	(gal)	(lbs) (a)
RW-04	2.5	23-Jul-10	On-going (b)	1,116	8,178	0	0
BP-MW-05	1	28-Jan-10	On-going (b)	8,189	60,002	164	1,202
BP-MW-08	2.8	8-Sep-10	On-going (b)	1,012	7,408	58	425
BP-MW-11	5.55	23-Jul-10	9/8/2010	17.8	130	10	73
RW-02	0	28-Jan-11	On-going (c)	0.8	5.9	0	0
RW-03	1.28	24-Nov-10	On-going (c)	19.3	141	0	0
RW-01	0.3	28-Oct-11	On-going (c)	1.3	10	0	0
BP-MW-10	0.01	na	na	0	0	0	0
BP-MW-07	0.05	na	na	0	0	0	0
BP-MW-06	none	na	na	0	0	0	0
RW-05	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
Total Recovery:				10,356	75,875	232	1,700

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 as well as 5/24/12 to 6/22/12.

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
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
12/31/2013	11.1	11.4	0.3	10.6	10.6	0	9.1	10.38	1.28
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
12/31/2013	9.4	11.9	2.5	10.95	11.95	1	10.95	11	0.05
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
12/31/2013	11.6	14.4	2.8	7.9	7.91	0.01	11	16.55	5.55

All measurement are presented in feet