February 1, 2016

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 2015***

Dear Mr. Fan and Ms. Brown:

On behalf of Tradepoint Atlantic and Sparrows Point, LLC, enclosed please find the Coke Oven Area Interim Measures Progress Report for the fourth quarter of 2015 completed for the Tradepoint Atlantic site. This report was distributed electronically on February 1, 2016 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, 2015. Please contact me at (314) 620-3056 should questions arise during your review of the enclosed progress report.

Sincerely,

James Calenda

James Calenda
Project Manager

Enclosure

FORMER COKE OVEN AREA INTERIM MEASURES PROGRESS REPORT

(Fourth Quarter 2015)

Prepared for

TRADEPOINT ATLANTIC AND
SPARROWS POINT, LLC
1600 SPARROWS POINT BOULEVARD
SPARROWS POINT, MD 21219

February 1, 2016

EnviroAnalytics Group

Introduction

This document presents operational data and monitoring information collected in the 4th quarter of 2015 for Interim Measures (IMs) that have been installed to address identified environmental conditions at the former Coke Oven Area (COA) Special Study Area at the Sparrows Point Terminal site located in Sparrows Point, Maryland. This progress report summarizes IM performance including data collected from the 4th quarter of 2015 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 identify 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 2: Air Sparge/Soil Vapor Extraction (AS/SVE) System in the shallow groundwater zone, groundwater pump and treat (GW P&T) system in the intermediate zone, Former Coal Basin Area,
- Cell 3: AS/SVE System in "Cove" Area,
- Cell 5: Dual Phase Extraction (DPE) system for the shallow zone, "Turning Basin" side of former Coke Oven Area,
- Cell 6: Light Non-Aqueous Phase Liquid (LNAPL) Recovery at the Former Benzol Processing Area.

As of the end of the third quarter 2015, Cells 2, 3, 5 and 6 are operational. Cell 1 was in a reconstruction phase throughout the 4th quarter of 2015, therefore no data was collected. The Cell 1 SVE/Air Sparge unit is projected to return to full operation mid-1st quarter of 2016.

Groundwater and soil gas sampling were conducted during the fourth quarter of 2015 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 and DNAPL removal began at Cell 5 without interruption. Additional detail on the design, operation and groundwater monitoring for these systems is provided in this progress report.

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

Cell 1 consists of an AS/SVE system installed to remove volatile hydrocarbons that is 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, vapor collection trenches and groundwater monitoring wells.

4th Quarter 2015 Operational Performance

The CATOX unit did not operate during this reporting period. The system at Cell 1 underwent reconstruction to the air sparge piping and area layout. Construction is to be completed during the 1st quarter of 2016 and operations are to resume. Once operations are resumed, Cell 1 will operate continuously for the first few weeks. During this time, the air sparge system's performance will be assessed to determine whether it will produce more effective results to operate continuously or 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 will 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 as reflected in the Permit to Operate issued to Sparrows Point LLC on December 8, 2014.

Soil gas sample collection will resume the 1st quarter of 2016 for laboratory analysis to monitor CATOX unit performance. One untreated soil gas sample will be collected in a Suma Canister each month and submitted to Pace Analytical Services, Inc. in Minneapolis, Minnesota for analysis by US EPA Method TO-15.

4thQuarter 2015 Groundwater Monitoring Results

Groundwater samples were collected on November 9, 2015 from the following wells; the location of the wells are shown on Figure 2:

- CO93-PZM (former 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 as illustrated in **Figure 4**.

A recent increase in VOC concentration was observed in 4th quarter 2015 data in the Cell 1 monitoring wells. CO02-PZM006 showed an increase in benzene from 159,000 ug/L in the 3rd quarter to 267,000 ug/L the 4th quarter. No significant increase was found at monitoring well CO18-PZM006. Results for Cell 1 had become fairly consistent over the last 4 quarters. The recent increase of VOCs may be related to the maintenance shutdown of the Cell 1 recovery system and trending data for these monitoring wells will continue to be assessed during system operation in future months.

Cell 2: Air Sparge/Soil Vapor Extraction (AS/SVE) System in the Shallow Groundwater Zone, Groundwater Pump and Treat (GW P&T) System in the Intermediate Groundwater Zone, Former Coal Basin Area

Cell 2 consists of an AS/SVE system coupled with vapor destruction via an electric catalytic oxidation (CATOX) unit for volatile hydrocarbon groundwater treatment in the shallow zone and a pump and treat system for recovery of groundwater and volatile hydrocarbon treatment from the intermediate zone. The system design plans were approved by US EPA in correspondence received on September 10, 2013 and began full scale operation in October 2014. **Figure 5** shows the system layout of Cell 2 and locations of the major design components including the air sparging wells, vapor collection trenches, intermediate groundwater recovery wells, groundwater injection wells and groundwater monitoring well locations.

AS/SVE System

The delivery and recovery systems for the shallow AS/SVE system include the use of air sparge points and a horizontal vapor extraction trench. Eight (8) air sparge points along a 500 feet long stretch were installed near the shore line of Cell 2. Details of the air sparge zone and recovery trench include the following:

- Air sparge zone: 8 – 2-inch diameter AS points @ approximately 56 ft spacing, center to center (C-C)
  - Installed to 15 ft -17 ft bgs (bottom of slag fill)
  - Bottom 2 ft of each point to be screened with 20-slot screen

- Recovery trench
  - 500 ft of horizontal, 4-inch diameter perforated pipe (or 20-slot screen) installed to a total depth (TD) of 5 ft
  - 5 vertical 4-inch risers spaced every 100 ft, C-C
  - Top 2 ft is a clay cap
  - Geotextile fabric @ 2 ft bgs (under clay)
  - Granular screened slag backfill from 2 ft -5 ft
  - Horizontal recover piping located approximately 3 ft bgs (above water table)

GW P&T System

The pump and treat groundwater system includes a low profile air stripper that then utilizes an oxidizer to destroy all VOC vapors generated prior to exhausting to the atmosphere. The design groundwater flow is for a maximum of 40 gallons per minute (gpm). The oxidizer is sized to handle up to a 600 cubic feet per minute air flow. The recovery and re-injection systems include the use

of six groundwater recovery wells and six groundwater injection wells. The six recovery wells are installed along a 500 feet long stretch near the shore line of Cell 2.

- 6 – 4-inch diameter GW RWs @ approximately 83 ft spacing, C-C
  - Installed to 40-45 ft bgs (intermediate sand zone)
  - Bottom 15 ft of each RW screened with 20-slot screen
  - An electric pump in each RW, resting approximately 7-10 ft above the bottom of the well

- Recovered GW Treatment
  - Enters low profile air stripper
  - Off-gas sent to Electric Oxidizer for destruction
  - Treated groundwater pumped to six-6 inch diameter re-injection wells screened from 5 to 15 feet in depth for recirculation in shallow GW zone

4th Quarter 2015 Operational Performance

AS/SVE System

Operational performance of the AS/SVE System at Cell 2 during this reporting period is summarized in **Table 4**. In summary, the CATOX unit operated for 528 hours (23.9%) during this reporting period. During 4th quarter 2015, system operations were halted due to a temporary power loss that caused an error in the systems programming logic. This preventing the system from restarting until the issue was corrected. The system was returned to service in January 2016. The system at Cell 2 is planned to be operated on a continuous schedule during this reporting quarter to determine the initial performance of the system. Operations were in conformance with the manufacturer's specifications at all times that soil gases were collected in accordance with the March 24, 2014 permit-to-construct conditions as reflected in the Permit to Operate issued to Sparrows Point LLC on December 8, 2014.

The hydrocarbon removal rate was calculated to be approximately 0.001 pounds per operating hour (estimated quarterly total of 0.52 pounds). **Table 4** also includes a cumulative summary of operational performance since system startup in October 2014. In total, the AS/SVE system at Cell 2 has destroyed approximately 276.72 pounds of recovered hydrocarbons as shown graphically in **Figure 3**.

Soil gas samples were collected for laboratory analysis to monitor CATOX unit performance. One untreated soil gas sample per month is attempted to be gathered each quarter. During the 4th quarter 2015, Cell 2 AS/SVE system was only operational for one sample to be collected. The sample was collected December 2015 in a Suma Canister and submitted to Pace Analytical Services, Inc. in Melville, New York for analysis by US EPA Method TO-15. The average influent soil gas hydrocarbon concentration was 1,747 ug/m^3 as summarized in **Table 5**. 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 third quarter are representative of hydrocarbon concentrations for the entire quarter. This assumption is based on the fact that the same air sparge wells and extraction wells were online when the system was operational.

GW P&T System Evaluation

The Cell 2 groundwater pump and treat system was evaluated in the 4th quarter with regard to the effectiveness of this system with respect to the mass of volatile hydrocarbons removed from groundwater.

Evaluation of Pump and Treat System Effectiveness

A total of 641,907 gallons of water were extracted from the Cell 2 Area pumping wells and treated during the 4th quarter of 2015. The average pumping rate for the pump and treat system was 13,455 gpd, or 9.3 gpm.

Operations were in conformance with the manufacturer's specifications at all times that stripped hydrocarbons were discharged through the CaTOX unit to the atmosphere in accordance with the March 24, 2014 permit-to-construct conditions as reflected in the Permit to Operate issued to Sparrows Point LLC on December 8, 2014. In addition, treated groundwater discharges were in compliance with discharge permit conditions outlined in Discharge Permit 11-DP-3746 issued to Sparrows Point LLC on May 6, 2013. These pumping rates appear to effectively capture the most impacted groundwater beneath Cell 2, as revealed by **Figure 7** discussed in the following section.

A total of 185 lbs of benzene, toluene and xylene compounds (btex) and 4.8 lbs of naphthalene were removed and treated during the third quarter of 2015. This total is shown graphically in **Figure 3**. The following table presents data for influent and effluent (treated) groundwater.

Field ID	Analysis	Units	OCT	OCT	11- NOV	13- NOV	28- DEC	30- DEC	**Quarter Average**
GWPT Cell 2 INFLUENT	Benzene	ug/L			25,000	19,000	34,000	45,000	**30,750**
GWPT Cell 2 INFLUENT	Toluene	ug/L			2,300	1,900	3,400	4,000	**2,900**
GWPT Cell 2 INFLUENT	Total Xylenes	ug/L			0	0	770	920	**422.5**
GWPT Cell 2 INFLUENT	Naphthalene	ug/L			840	1,000	1,200	1,100	**1,035**
GWPT Cell 2 EFFLUENT	Benzene	ug/L			410	190	210	400	**302.5**
GWPT Cell 2 EFFLUENT	Toluene	ug/L			47	21	24	40	**33**

GWPT Cell 2 EFFLUENT	Total Xylenes	ug/L			11	6	7	10	**8.5**
GWPT Cell 2 EFFLUENT	Naphthalene	ug/L			99	45	180	200	**131**

The pump and treat system is removing significant amounts of volatile hydrocarbons from groundwater within the intermediate water bearing zone at the current pumping rates, and it is controlling groundwater flow and associated migration within the intermediate water bearing zone.

The system was out of service approximately two weeks during the month of October in 2015 for repairs and scheduled maintenance. Maintenance included draining, disassembling and cleaning the system air stripper using a pressure washer. Repairs also included replacing electrical parts and clearing blockages in water treatment plumbing.

4th Quarter 2014 Groundwater Monitoring Results

Groundwater samples were collected in September 2015 from the following wells; the well locations are shown on **Figure 5**.

- CO27- PZM012 – shallow zone
- CO27-PZM046 - intermediate zone
- CO36-PZM008 – shallow zone
- CO36-PZM043 – intermediate zone
- CO37-PZM038 – intermediate zone
- CO38-PZM006 – shallow zone
- CO38-PZM043– intermediate zone
- CO39-PZM007– shallow zone
- CO39-PZM042– intermediate zone
- CO40-PZM008– shallow zone
- CO41-PZM 001– shallow zone
- CO41-PZM 036– intermediate zone
- CO42-PZM004 – shallow zone

Exception to the wells list as sampled in November is well CO37-PZM003. CO37-PZM003 was not sampled due to the presence of free product first identified in November 2014 and is discussed further below.

The groundwater samples were submitted to Pace Analytical Services, Inc., located in Greensburg, Pennsylvania for the analyses shown in **Table 7**. These data indicate benzene is the most prevalent volatile organic compound (VOC) constituent. The VOC concentrations for the

2015 sampling events are shown for the groundwater wells monitored for system performance in **Figure 6A** and **6B**.

Shallow zone groundwater with the exception of groundwater monitored at CO41-PZM001 has remained at consistent VOC levels since the first sampling event in 3rd quarter 2014. CO41-PZM001 had a significant increase of benzene during the 2nd quarter 2015 sampling event and had shown a steady decrease in concentrations throughout 2015 sampling events. During the 4th quarter 2015 sampling event, CO41-PZM001 showed a substantial drop in VOC concentrations. This data will be further examined and compared against future data from the 1st quarter 2016 sampling event to determine actual permanent change in concentrations. It may be determined that the groundwater treatment system has had the greatest effect at this location.

Figure 7 presents a plan view of the concentration of VOCs in the intermediate zone from analytical results from the November 2015 monitoring event. Slight decreases were noted in the intermediate well CO27-PZM046. These wells will continue to be monitored to assess possible trends associated with operation of the interim measure.

Light non-aqueous product (LNAPL) was encountered in well CO37-PZM003 in the shallow groundwater zone in November 2014. This well was bailed on a bi-weekly basis throughout each quarter of 2015. Two (2) gallons of product was bailed from this well during the 4th quarter 2015. The amount of LNAPL has decreased, but still a small amount remains. The well will continue to be monitored on a weekly basis going forward to determine the extent of continued presence of LNAPL.

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 2015 Operational Performance

Operational performance of Cell 3 during this reporting period is summarized in **Table 8**. In summary, the CATOX unit operated for 528 hours (23.9%) during the 4th quarter of 2015. 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 0.004 pounds per operating hour (estimated quarterly total of 145 pounds). **Table 8** also includes a cumulative summary of operational performance since system startup on June 24, 2011. In total, Cell 3 has destroyed approximately 1,632 pounds of recovered hydrocarbons as shown graphically in **Figure 3**.

Soil gas samples were collected for laboratory analysis to monitor CATOX unit performance. One untreated soil gas sample was collected in a Suma Canister and submitted to Pace Analytical Services. The average influent soil gas hydrocarbon concentration of the two samples taken throughout the 4th quarter was 24,425 ug/m^3 as summarized in **Table 9**.

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 4th quarter are representative of hydrocarbon concentrations for the entire quarter. 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 2015 Groundwater Monitoring

Groundwater samples were collected in September 2015 from the following wells (**Figure 8**):

- CO101-PZM (downgradient of Cell 3),
- CO102-PZM (upgradient of Cell 3),
- CO103-PZM (upgradient of Cell 3),
- CO104-PZM (downgradient of cell 3),
- CO30-PZM015 (downgradient of Cell 3).

The groundwater samples were submitted to Pace Analytical for the analyses shown in **Table 10**. These data indicate that benzene is the most prevalent VOC constituent. Since system startup on June 24, 2011, a generally inconclusive VOC concentration trend is documented, as illustrated in **Figure 9**. The VOC concentrations at CO103-PZM showed similar results from the previous quarter. Results from the last 3 quarters for CO103-PZM closely reflect historical concentrations for this well; therefore it is currently interpreted that an increasing trend is not apparent in this well as potentially defined in the 3rd quarter of 2014. Groundwater will continue to be monitored and assessed during system operation in future months. The wells have shown consistent concentrations over the last 2 years.

Cell 5: Dual Phase Extraction (DPE) System for the Shallow Zone, "Turning Basin" side of Former Coke Oven Area

Cell 5 consists of a dual phase (vapor and water) system (DPE) with a low profile air stripper followed by vapor phase granular activated carbon (VGAC) for removal and treatment of vapor and dissolved volatile hydrocarbons in the shallow groundwater zone. The system design plans were approved by US EPA in correspondence received on September 10, 2013 and began full scale operation in October 2014. **Figure 10** shows the system layout of Cell 5 and locations of the major design components including the dual phase recovery points, treatment system, groundwater injection wells and groundwater monitoring well locations.

The recovery and re-injection systems include the use of dual phase (soil vapor and groundwater) recovery wells and six groundwater re-injection wells. Twelve (12) recovery wells were installed along an approximate 500 feet long stretch downgradient of the most recent 10,000 ug/L isocontour line for naphthalene (between the naphthalene source area and the eastern shore line along the Turning Basin).

- 12 – 1.5-inch diameter DPE RWs @ approximately 42 ft spacing, C-C
  - Installed to 15-17 ft bgs (to bottom of shallow slag)
  - Bottom 2 ft of each RW screened with 20-slot screen
  - Vapor recovery perforations located between 10-12 ft bgs

- Recovered GW and vapor Treatment
  - Enters MS knockout tank to separate air and water phases
  - Water sent to low profile air stripper
  - Off-gas sent to VGAC for capture
  - Treated groundwater pumped to six-6 inch diameter re-injection wells screened from 5 to 15 feet in depth for recirculation in shallow GW zone

4th Quarter 2015 Operational Performance

Evaluation of Pump and Treat System Effectiveness

A total of 1,357,706 gallons of water were extracted from the Cell 5 Area dual phase extraction wells and treated during the 4th quarter of 2015. The average recovery rate for the DPE system was 15,085 gpd (10.5 gpm).

Operations were in conformance with the manufacturer's specifications at all times that stripped hydrocarbons were discharged to the atmosphere in accordance with the March 24, 2014 permit-to-construct conditions as reflected in the Permit to Operate issued to Sparrows Point LLC on December 8, 2014.

A total of 57 pounds (lbs) of benzene, toluene and xylene compounds (btex) and 25 pounds (lbs) of naphthalene were removed during the 4th quarter of 2015. This total is shown graphically in **Figure 3**. The following table presents data for influent and effluent (treated) groundwater.

Field ID	Analysis	Units	OCT	OCT	11-Nov	13-Nov	15-Dec	16-Dec	**AVG**
GWPT Cell 5 INFLUENT	Benzene	ug/L			360	340	370	360	357.5
GWPT Cell 5 INFLUENT	Toluene	ug/L			190	160	200	190	185
GWPT Cell 5 INFLUENT	Styrene	ug/L			275	200	306	307	272
GWPT Cell 5 INFLUENT	Total Xylenes	ug/L			51	272	58	56	109.25
GWPT Cell 5 INFLUENT	Naphthalene	ug/L			4100	3300	4500	4600	4125
GWPT Cell 5 EFFLUENT	Benzene	ug/L			2	0	0	0	**0.5**
GWPT Cell 5 EFFLUENT	Toluene	ug/L			0	0	0	0	**0**
GWPT Cell 5 EFFLUENT	Total Xylenes	ug/L			0	0	0	0	**0**
GWPT Cell 5 EFFLUENT	Naphthalene	ug/L			68	0	0	0	**17**

The DPE system is removing volatile hydrocarbons from groundwater within the shallow water bearing zone at the current recovery rates. The system has shown continual improvement in performance since the first few quarters of operation, mostly attributed to the recent addition of the liquid carbon treatment tanks during the 2nd quarter of 2015. The Cell 5 groundwater treatment system has had little downtime during the 4th quarter. The bulk of the downtime was experienced during the month of October briefly for pump

replacements and routine maintenance to the system.

4th Quarter 2015 Groundwater Monitoring Results

Groundwater samples were collected in September 2015 from the following shallow zone monitoring wells; the well locations are shown on **Figure 10**.

- CO23- PZM008
- CO24-PZM007
- CO26-PZM007
- CO55-PZM000
- CO56-PZP001
- CO57-PZP002
- CO58-PZM001
- CO59-PZP002
- CO60-PZP001

The groundwater samples were submitted to Pace Analytical Services, Inc., located in Greensburg, Pennsylvania for the analyses shown in **Table 11**. These data indicate naphthalene is the most prevalent hydrocarbon constituent. The naphthalene concentrations for the 2014-2015 sampling events are shown for the groundwater wells monitored for system performance as illustrated in **Figure 11A** and **11B. Figure 14A** presents shallow groundwater naphthalene concentration trends for wells presumed to be upgradient of the treatment system. No apparent trends are present in the analytical data. This presumed upgradient set of wells will continue to be monitored to further assess possible trends associated with operation of the interim measure in future quarters. **Figure 12** presents a plan view of the concentration of naphthalene in the shallow zone from analytical results from the November 2015 monitoring event.

Cell 5: DNAPL Extraction

DNAPL product removal began to be extracted from the Cell 5 area in the latter part of the 4th quarter 2015. DNAPL was extracted from several newly constructed extraction wells that have constructed DNAPL sumps below the screened interval. Compressed air DNAPL skimmer pumps were installed within two specific extraction wells that had shown to produce the greatest amounts of DNAPL: CO125-PZM and CO123-PZM. A 55-gallon drum has been placed next to each pump location. Product that is removed from the wells is pumped into the 55 gallon drums and taken offsite every 90 days. Results of the Cell 5 operations, findings and product removal amounts will be discussed in detail in the 1st quarter 2016 report.

Cell 6: LNAPL Extraction at the Former Benzol Processing Area

The Cell 6 LNAPL monitoring and recovery system was monitored weekly during the 4th quarter of 2015. **Table 12** 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 13** illustrates the well locations. An estimated 505 gallons (3,701 pounds) of LNAPL were recovered during the 4th quarter 2015, bringing the total recovered LNAPL to 14,553 gallons (106,645 pounds) as of December 31, 2015. Well BP-MW-10 did not produce measurable amounts of LNAPL. LNAPL was recovered from wells in the Cell 6 area as shown below.

The LNAPL was recovered from the following wells:

Well	Previous Well Identifier	LNAPL Recovery (gal/lbs)	
		4th Qtr 2015 (gal/lbs)	Total thru 4thQtr 2015 (gal/lbs)
CO99-PZMxxx	RW-04	101/740	1,638/10,588
CO89-PZMxxx	BP-MW-05	115/843	9,451/68,220
CO92-PZMxxx	BP-MW-08	99/725	1,693/11,666
CO95-PZMxxx	BP-MW-11	220/1,612	1,226/8,982
CO97-PZMxxx	RW-02	0/0	0.8/6
CO98-PZMxxx	RW-03	0/0	86.8/636
CO96-PZMxxx	RW-01	0/0	1.3/10
	TOTAL	**505/3,701**	**14,553/106,645**

Table 13 provides well-specific details concerning the measured depths to LNAPL, the water table, and calculated LNAPL thicknesses for monitoring wells in the Cell 6 area.

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 2015 Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total CATOX Operating Time (October1, 2015 - December 31 2015)	hours	0
Overall CATOX Operational Time	%	0.0%
Estimated Total Hydrocarbons Destroyed	pounds	0.000
Estimated Hydrocarbon Removal Rate	pounds/hour	0.00000

Cell 1 Cumulative Summary of Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (August 3, 2010 - December 31, 2015)	hours	22,516
Overall CATOX Operational Time	%	57.3%
Estimated Total Hydrocarbons Destroyed	pounds	12,501
Estimated Hydrocarbon Removal Rate	pounds/hour	0.56

Table 2
Summary of Soil Gas Analytical Results (Fourth Quarter 2015)
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 2015
TO-15 Volatile Organics		
Acetone	ug/m^3	NS
Benzene	ug/m^3	NS
Bromoform	ug/m^3	NS
2-Butanone (MEK)	ug/m^3	NS
Carbon disulfide	ug/m^3	NS
Carbon tetrachloride	ug/m^3	NS
Chlorobenzene	ug/m^3	NS
Chloroethane	ug/m^3	NS
Chloroform	ug/m^3	NS
1,1-Dichloroethane	ug/m^3	NS
1,2-Dichloroethane	ug/m^3	NS
1,1-Dichloroethene	ug/m^3	NS
trans-1,2-Dichloroethene	ug/m^3	NS
1,2-Dichloropropane	ug/m^3	NS
cis-1,3-Dichloropropene	ug/m^3	NS
trans-1,3-Dichloropropene	ug/m^3	NS
Ethylbenzene	ug/m^3	NS
2-Hexanone	ug/m^3	NS
Methylene Chloride	ug/m^3	NS
4-Methyl-2-pentanone (MIBK)	ug/m^3	NS
1,1,2,2-Tetrachloroethane	ug/m^3	NS
Tetrachloroethene	ug/m^3	NS
Toluene	ug/m^3	NS
1,1,1-Trichloroethane	ug/m^3	NS
1,1,2-Trichloroethane	ug/m^3	NS
Trichloroethene	ug/m^3	NS
Vinyl chloride	ug/m^3	NS
m&p-Xylene	ug/m^3	NS
o-Xylene	ug/m^3	NS
Total Volatile Organics	ug/m^3	**0.0**

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/m^3 = micro grams per cubic meter

ND = Analyte not detected above laboratory reporting limit

Table 3
Summary of Groundwater Analytical Results (Fourth Quarter 2015)
Cell 1: Prototype AS/SVE System in Former Benzol Processing Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

New Sample ID		CO02-PZM006	CO18-PZM006	CO93-PZMxxx
Former Sample ID		CO02-PZM006	CO18-PZM006	BP-MW-09
Date		11/9/2015	11/9/2015	11/9/2015
Analyte	Units			
Volatile Organics				
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND
1,2,3-Trichloropropane	µg/L	ND	ND	ND
1,2-Dibromo-3-chloropropane	µg/L	ND	ND	ND
1,2-Dibromoethane (EDB)	µg/L	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND
1,2-Dichloroethane	µg/L	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND
2-Hexanone	µg/L	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	µg/L	ND	ND	ND
Acetone	µg/L	ND	**28.6**	**29.9**
Acrylonitrile	µg/L	ND	ND	ND
Benzene	µg/L	**267,000**	**73,600**	**318,000**
Bromochloromethane	µg/L	ND	ND	ND
Bromodichloromethane	µg/L	ND	ND	ND
Bromoform	µg/L	ND	ND	ND
Bromomethane	µg/L	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	**21.3**
Carbon tetrachloride	µg/L	ND	ND	ND
Chlorobenzene	µg/L	**2.4J**	ND	**17.7**
Chloroethane	µg/L	ND	ND	ND
Chloroform	µg/L	ND	ND	ND
Chloromethane	µg/L	ND	ND	ND
Dibromochloromethane	µg/L	ND	ND	ND
Dibromomethane	µg/L	ND	ND	ND
Ethylbenzene	µg/L	**731**	**17.2**	**4,020**
Iodomethane	µg/L	ND	ND	ND
Methyl-tert-butyl ether	µg/L	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND
Styrene	µg/L	**31.5**	ND	**4,350**
Tetrachloroethene	µg/L	ND	ND	ND
Toluene	µg/L	**15,400**	**730**	**78,200**
Trichloroethene	µg/L	ND	ND	ND
Trichlorofluoromethane	µg/L	ND	ND	ND
Vinyl acetate	µg/L	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND
Xylene (Total)	µg/L	**4,310**	**279**	**51,000**
cis-1,2-Dichloroethene	µg/L	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND
trans-1,3-Dichloropropene	µg/L	ND	ND	ND
trans-1,4-Dichloro-2-butene	µg/L	ND	ND	ND
Total Volatile Organics	µg/L	**287,473**	**74,655**	**455,639**
Semi-Volatiles				
Naphthalene	µg/L	**664**	**279**	**54,800**

Notes:

Bold = Analyte Detected

ND = Analyte not detected above laboratory reporting limit

µg/L = Micrograms per liter

Table 4
Summary of Operation Conditions
Cell 2 AS/SVE System
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Cell 2 Fourth Quarter 2015 Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total CATOX Operating Time (October 1, 2015 - December 31, 2015)	hours	528
Overall CATOX Operational Time	%	23.9%
Estimated Total Hydrocarbons Destroyed	pounds	0.52
Estimated Hydrocarbon Removal Rate	pounds/hour	0.001

Cell 2 Cumulative Summary of Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (October 1, 2014 - December 31, 2015)	hours	7,080
Overall CATOX Operational Time	%	64.6%
Estimated Total Hydrocarbons Destroyed	pounds	276.72
Estimated Hydrocarbon Removal Rate	pounds/hour	0.039

Table 5
Summary of Soil Gas Analytical Results (Fourth Quarter 2015)
Cell 2 AS/SVE System
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Analyte	Sample ID Date Time Dilution Factor Units	CATOX Influent Q4 2015
TO-15 Volatile Organics		
Acetone	ug/m^3	ND
Benzene	ug/m^3	**1,160**
Bromoform	ug/m^3	ND
2-Butanone (MEK)	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
trans-1,3-Dichloropropene	ug/m^3	ND
Ethylbenzene	ug/m^3	**19**
2-Hexanone	ug/m^3	ND
Methylene Chloride	ug/m^3	ND
4-Methyl-2-pentanone (MIBK)	ug/m^3	ND
1,1,2,2-Tetrachloroethane	ug/m^3	ND
Tetrachloroethene	ug/m^3	ND
Toluene	ug/m^3	**410**
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
m&p-Xylene	ug/m^3	**105**
o-Xylene	ug/m^3	**53**
Total Volatile Organics	ug/m^3	**1,747**

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/m^3 = micro grams per cubic meter

ND = Analyte not detected above laboratory reporting limit

Table 7
Summary of Groundwater Analytical Results (Fourth Quarter 2015)
Cell 2
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

New Sample ID		CO27-PZM012	CO27-PZM046	CO36-PZM008	CO36-PZM043	CO37-PZM038	CO37-PZM003	CO38-PZM043	CO38-PZM006	CO39-PZM007	CO39-PZM042	CO40-PZM008	CO41-PZM001	CO41-PZM036	CO42-PZM004
Former Sample ID		CO27-PZM012	CO27-PZM046	Cell 2-MW1 (S)	Cell2-MW8 (I)	Cell2-MW9 (I)	Cell2-MW2 (S)	Cell2-MW10 (I)	Cell2-MW3 (S)	Cell2-MW4 (S)	Cell2-MW11 (I)	Cell2-MW5 (S)	Cell2-MW6 (S)	Cell2-MW12 (I)	Cell2-MW7 (S)
Date		11/5/2015	11/5/2015	11/5/2015	11/5/2015	11/6/2015	NS	11/5/2015	11/5/2015	11/6/2015	11/6/2015	11/6/2015	11/9/2015	11/9/2015	11/6/2015
Analyte	Units														
Volatile Organics															
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	**2.6**	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	µg/L	**7.4**	**55.4**	**21.2**	**17.4**	ND	NS	ND	ND	ND	**21.6**	ND	ND	ND	**6.8**
Acrylonitrile	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	**15,200**	**374,000**	**33,100**	**21,800**	**34,900**	NS	**5.7**	**12,300**	**9,350**	**38,000**	**7,900**	**1,160**	**557,000**	**526**
Bromochloromethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	**2.2**	**7.3**	**8.2**	**6.8**	ND	NS	**0.58**	**2.5**	**2.8**	**5.2**	ND	ND	ND	ND
Carbon tetrachloride	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	µg/L	**0.34**	**3.7**	ND	ND	ND	NS	ND	ND	**0.15 J**	**1**	ND	ND	ND	ND
Chloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	**178**	**1,240**	**131**	**64.9**	**399**	NS	ND	**148**	**87.2**	**428**	**78.9**	**129**	**1,320**	**149**
Iodomethane	µg/L	ND	ND	ND	ND	ND	NS	ND	**2.3**	ND	ND	ND	ND	ND	ND
Methyl-tert-butyl ether	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	**1.2**	ND	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	µg/L	**231**	**357**	**33**	**14**	**696**	NS	ND	**78**	**61.1**	**710**	**109**	**7.9**	**397**	**154**
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	**5,160**	**72,700**	**7,410**	**2,980**	**15,400**	NS	**1.3**	**2,040**	**1,710**	**13,800**	**1,960**	**1,640**	**175,000**	**1,300**
Trichloroethene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl acetate	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Xylene (Total)	µg/L	**1,580**	**18,600**	**2,160**	**860**	**3,280**	NS	**0.85**	**821**	**460**	**3,140**	**851**	**1,660**	**40,700**	**1,370**
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,4-Dichloro-2-butene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatile Organics	µg/L	**22,359**	**466,963**	**42,863**	**25,743**	**54,675**	**0**	**8**	**15,392**	**11,671**	**56,107**	**10,902**	**4,597**	**774,417**	**3,506**
Semi-Volatiles															
Naphthalene	µg/L	**4,030**	**12,500**	**1,020**	**642**	**1,870**	NS	**3.2**	**2,900**	**20,700**	**8,540**	**13,800**	**120**	**327**	**847**

Notes:

Bold = Analyte Detected

ND = Analyte not detected above laboratory reporting limit

µg/L = Micrograms per liter

Table 8
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 2015 Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total CATOX Operating Time (October 1 - December 31, 2015)	hours	528
Overall CATOX Operational Time	%	23.9%
Estimated Total Hydrocarbons Destroyed	pounds	6.762
Estimated Hydrocarbon Removal Rate	pounds/hour	0.012807

Cell 3 Cumulative Summary of Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (August 3, 2010 - December 31, 2015)	hours	17,543
Overall CATOX Operational Time	%	58.6%
Estimated Total Hydrocarbons Destroyed	pounds	1,637.3
Estimated Hydrocarbon Removal Rate	pounds/hour	0.09

Table 9
Summary of Soil Gas Analytical Results (Fourth Quarter 2015)
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 2015
TO-15 Volatile Organics		
Acetone	ug/m^3	ND
Benzene	ug/m^3	**20,300**
Bromoform	ug/m^3	ND
2-Butanone (MEK)	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
trans-1,3-Dichloropropene	ug/m^3	ND
Ethylbenzene	ug/m^3	**48**
2-Hexanone	ug/m^3	ND
Methylene Chloride	ug/m^3	ND
4-Methyl-2-pentanone (MIBK)	ug/m^3	ND
1,1,2,2-Tetrachloroethane	ug/m^3	ND
Tetrachloroethene	ug/m^3	ND
Toluene	ug/m^3	**2,960**
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
m&p-Xylene	ug/m^3	**705**
o-Xylene	ug/m^3	**382**
Total Volatile Organics	ug/m^3	**24,394**

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/m^3 = micro grams per cubic meter

ND = Analyte not detected above laboratory reporting limit

Table 10
Summary of Groundwater Analytical Results (Fourth Quarter 2015)
Cell 3: AS/SVE System in the "Cove" Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

New Sample ID		CO30-PZM015	CO101-PZM	CO102-PZM	CO103-PZM	CO104-PZM
Former Sample ID		CO30-PZM015	MW-CELL 3-1	MW-CELL 3-2	MW-CELL 3-3	MW-CELL 3-4
Date		11/10/2015	11/9/2015	11/9/2015	11/9/2015	11/9/2015
Analyte	Units					
Volatile Organics						
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	µg/L	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	µg/L	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	µg/L	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/L	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND	ND	ND
2-Hexanone	µg/L	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	µg/L	ND	ND	ND	ND	ND
Acetone	µg/L	ND	ND	ND	ND	ND
Acrylonitrile	µg/L	ND	ND	ND	ND	ND
Benzene	µg/L	**82,800**	**27,900**	**31,800**	**52,000**	**64.2**
Bromochloromethane	µg/L	ND	ND	ND	ND	ND
Bromodichloromethane	µg/L	ND	ND	ND	ND	ND
Bromoform	µg/L	ND	ND	ND	ND	ND
Bromomethane	µg/L	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	ND	ND	ND
Carbon tetrachloride	µg/L	ND	ND	ND	ND	ND
Chlorobenzene	µg/L	ND	ND	ND	ND	ND
Chloroethane	µg/L	ND	ND	**6.2**	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND
Chloromethane	µg/L	ND	ND	ND	ND	ND
Dibromochloromethane	µg/L	ND	ND	ND	ND	ND
Dibromomethane	µg/L	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	**115**	**32.4**	**37.1**	**102**	**0.59**
Iodomethane	µg/L	ND	ND	ND	ND	ND
Methyl-tert-butyl ether	µg/L	ND	ND	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND	ND	ND
Styrene	µg/L	**23.6**	**12.7**	**16.1**	**18.2**	ND
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND
Toluene	µg/L	**5,820**	**1,730**	**2,610**	**3,620**	**12.4**
Trichloroethene	µg/L	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/L	ND	ND	ND	ND	ND
Vinyl acetate	µg/L	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND
Xylene (Total)	µg/L	**1,620**	**353**	**396**	**1,570**	**8.5**
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND
trans-1,4-Dichloro-2-butene	µg/L	ND	ND	ND	ND	ND
Total Volatile Organics	µg/L	**90,379**	**30,028**	**34,865**	**57,310**	**86**
Semi-Volatiles						
Naphthalene	µg/L	**12,100**	**781**	**1,180**	**10,500**	**23**

Notes:

Bold = Analyte Detected

ND = Analyte not detected above laboratory reporting limit

µg/L = Micrograms per liter

Table 11
Summary of Groundwater Analytical Results (Fourth Quarter 2015)
Cell 5 DPE Groundwate Pump and Treat System
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

New Sample ID		CO23-PZM008	CO24-PZM007	CO26-PZM007	CO55-PZM000	CO56-PZP001	CO57-PZP002	CO58-PZM001	CO59-PZP002	CO60-PZP001
Former Sample ID		CO23-PZM008	CO24-PZM007	CO26-PZM007	Cell5-MW1 (S)	Cell5-MW2 (S)	Cell5-MW3 (S)	Cell5-MW4 (S)	Cell5-MW5 (S)	Cell5-MW6 (S)
Date		11/12/2015	11/12/2015	11/10/2015	11/12/2015	11/10/2015	11/10/2015	11/10/2015	11/12/2015	11/10/2015
Time		11:32	11:57	13:48	9:58	15:54	12:21	13:14	10:48	15:22
Analyte	Units									
Volatile Organics										
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	**0.78**	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	µg/L	ND	ND	ND	**9.4**	ND	**5.5**	ND	**6.2**	**8.2**
Acrylonitrile	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	**727**	**6.2**	**129**	**15.6**	**484**	**23**	**270**	**62.4**	**371**
Bromochloromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	µg/L	ND	ND	ND	**2.5**	ND	**1.7**	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	µg/L	**1.1**	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/L	ND	ND	ND	**1**	ND	**3.2**	ND	ND	ND
Dibromochloromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	**54.4**	**6.6**	**5.2**	**0.47**	**20.1**	ND	**14.3**	**3.6**	**14.1**
Iodomethane	µg/L	ND	ND	ND	**2.5**	ND	ND	ND	ND	ND
Methyl-tert-butyl ether	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	µg/L	**51.8**	**1.2**	**25.5**	ND	**75.2**	ND	**43.9**	**3**	**60.9**
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	**424**	**4.6**	**73.7**	**5.8**	**208**	**2.6**	**108**	**34.1**	**69.9**
Trichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl acetate	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene (Total)	µg/L	**855**	**15.1**	**110**	**8.1**	**405**	ND	**239**	**56.4**	**278**
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,4-Dichloro-2-butene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Semi-Volatiles										
Naphthalene	µg/L	**2,960**	**3,380**	**937**	**31.9**	**8,870**	**2.7**	**2,320**	**229**	**2,180**
Total Volatile Organics	µg/L	**5,073**	**3,414**	**1,280**	**77**	**10,062**	**39**	**2,996**	**395**	**2,982**

Notes:

Bold = Analyte Detected

ND = Analyte not detected above laboratory reporting limit

µg/L = Micrograms per liter

Table 12
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 ID	Former Well ID	LNAPL Occurrence During Third Quarter 2015 (ft)	Total LNAPL Recovery Period		Cumulative Total LNAPL Recovered		Estimate LNAPL Recovered During Fourth Quarter 2015	
			Begin	End	(gal)	(lbs) (a)	(gal)	(lbs) (a)
CO99-PZMxxx	RW-04	2.39	23-Jul-10	On-going (b)	1,638	12,003	71	520
CO89-PZMxxx	BP-MW-05	0.94	28-Jan-10	On-going (b)	9,451	69,257	115	843
CO92-PZMxxx	BP-MW-08	1.87	8-Sep-10	On-going (b)	1,693	12,406	99	725
CO95-PZMxxx	BP-MW-11	2.85	23-Jul-10	On-going (b)	1,651	12,099	220	1,612
CO97-PZMxxx	RW-02	trace	28-Jan-11	On-going (c)	0.8	6	0	0
CO98-PZMxxx	RW-03	0.16	24-Nov-10	On-going (c)	118	865	0	0
CO96-PZMxxx	RW-01	0.2	28-Oct-11	On-going (c)	1.3	10	0	0
CO94-PZMxxx	BP-MW-10	0.08	na	na	0	0	0	0
CO91-PZMxxx	BP-MW-07	0.05	na	na	0	0	0	0
CO90-PZMxxx	BP-MW-06	0	na	na	0	0	0	0
CO100-PZMxxx	RW-05	0	na	na	0	0	0	0
CO93-PZMxxx	BP-MW-09	0	na	na	0	0	0	0
CO19-PZM004	CO19-PZM004	0	na	na	0	0	0	0
				Total Recovery:	**14,553**	**106,645**	**505**	**3,701**

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 13
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	CO89-PZM			CO90-PZM			CO91-PZM		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
11/4/2015	10.82	11.76	0.94	11.68	11.68	0	11.97	12.02	0.05

Date	CO92-PZM			CO93-PZM			CO94-PZM		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
11/4/2015	11.83	13.7	1.87	11.1	11.1	0	9.74	9.82	0.08

Date	CO95-PZM			CO96-PZM			CO97-PZM		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
11/4/2015	12.15	15	2.85	12.25	12.45	0.2	11.86	11.86	0

Date	CO98-PZM			CO99-PZM			CO100-PZM		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
	9.06	9.22	0.16	9.10	11.49	2.39	10.21	10.21	0

Date	CO19-PZM004		
	Depth to LNAPL	Depth to Water	LNAPL Thickness
	11.54	11.54	0

FIGURES

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Former Coke Oven Area
Interim Measures Cell Locations

0 250 500 1,000 Feet

Figure 1

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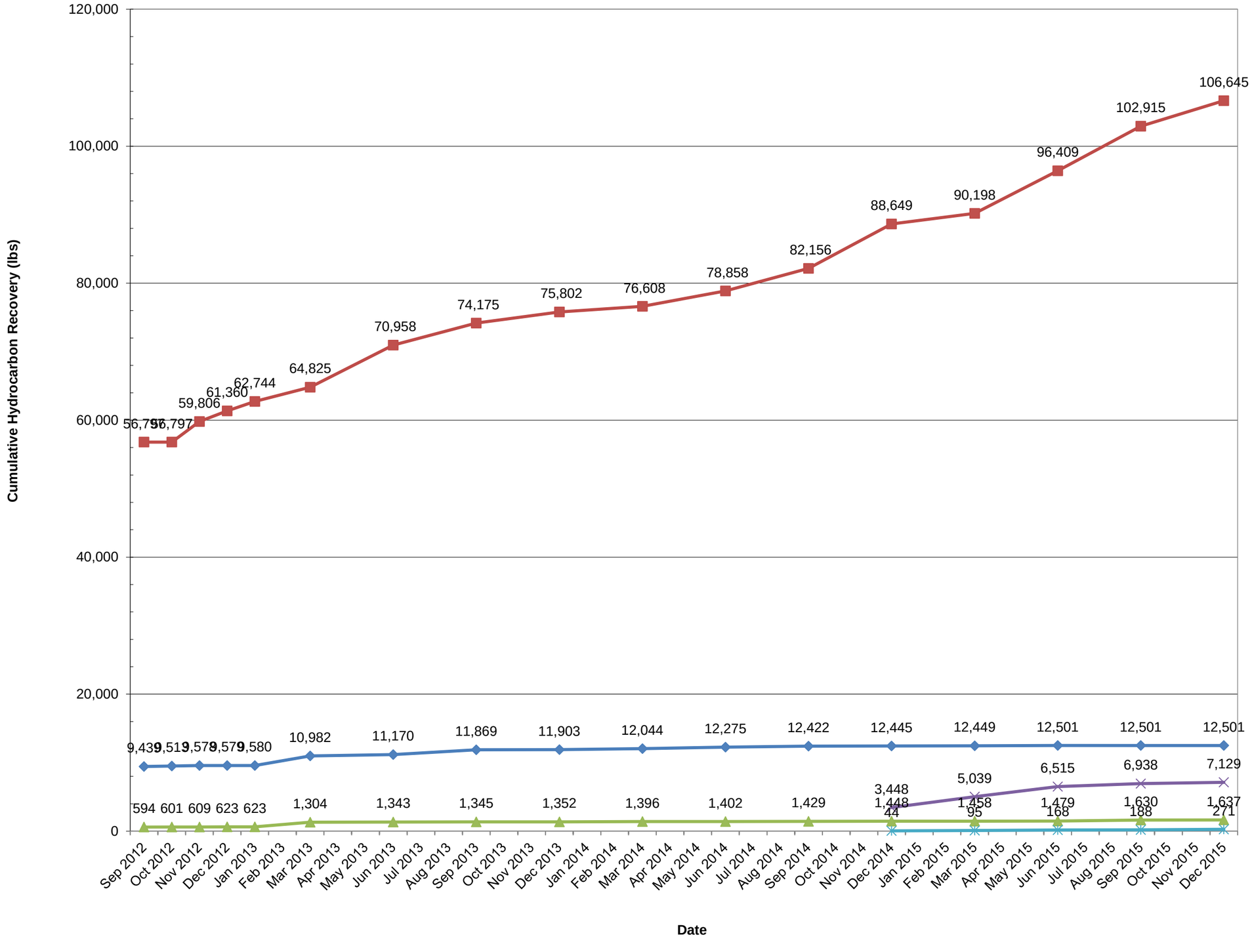
Former Coke Oven Area
Cell 1 System Layout

0 25 50 100 Feet

Figure 2



LEGEND

- Cell 1
- Cell 2
- Cell 3
- Cell 5
- Cell 6

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Baltimore, Maryland

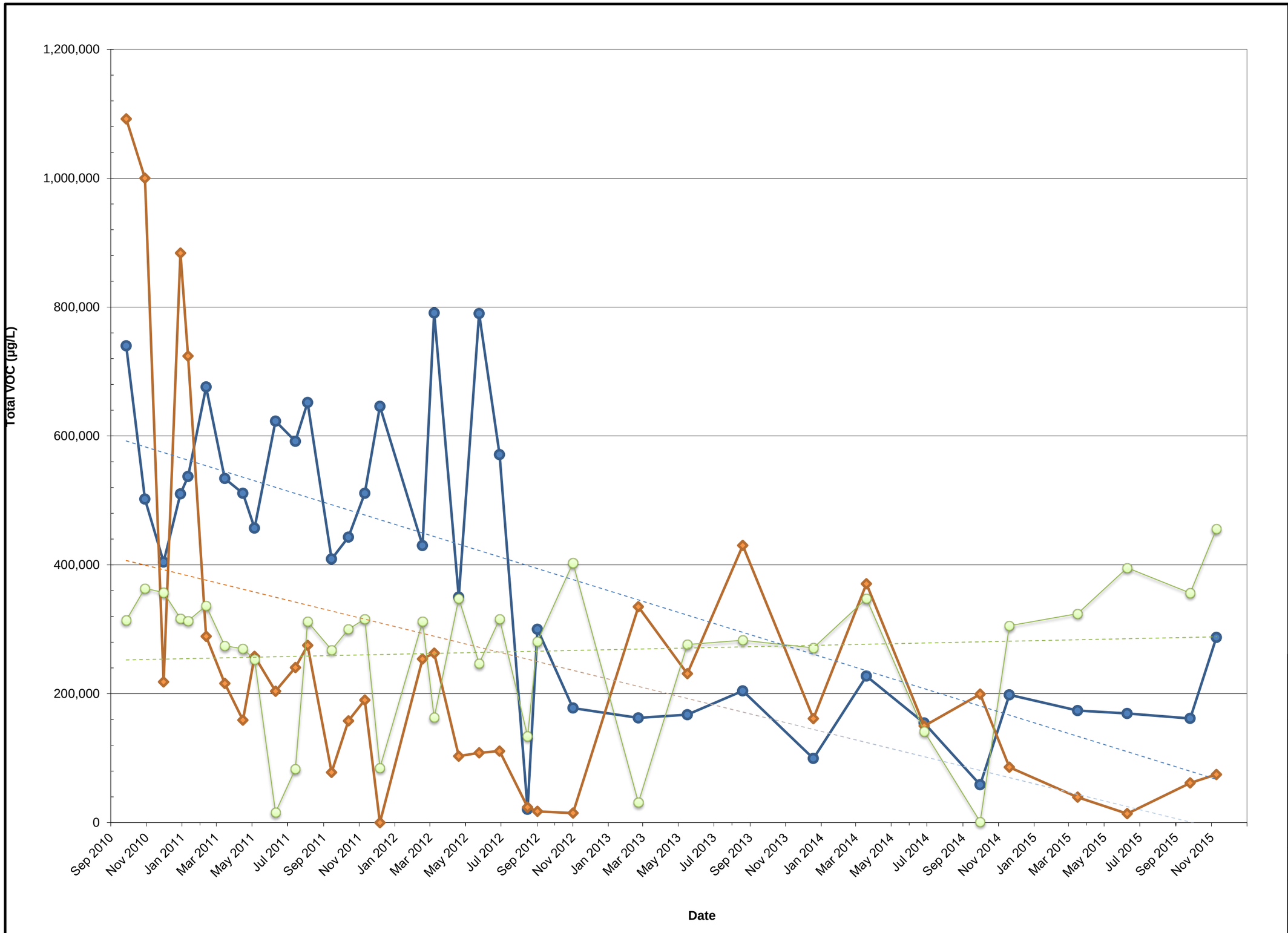
CUMULATIVE SUMMARY OF ESTIMATED HYDROCARBON RECOVERY FORMER COKE OVEN AREA INTERIM REMEDIAL MEASURES

Project Number	File Number

Date: December 31, 2015

Figure: 3

PE/RG	PM	DR



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**MEASURED GROUNDWATER VOC CONCENTRATION BY MONTH
CELL 1: PROTOTYPE AS/SVE SYSTEM
IN THE FORMER BENZOL PROCESSING AREA**

Date	Figure
December 31, 2015	4

PE/RG	PM	DR

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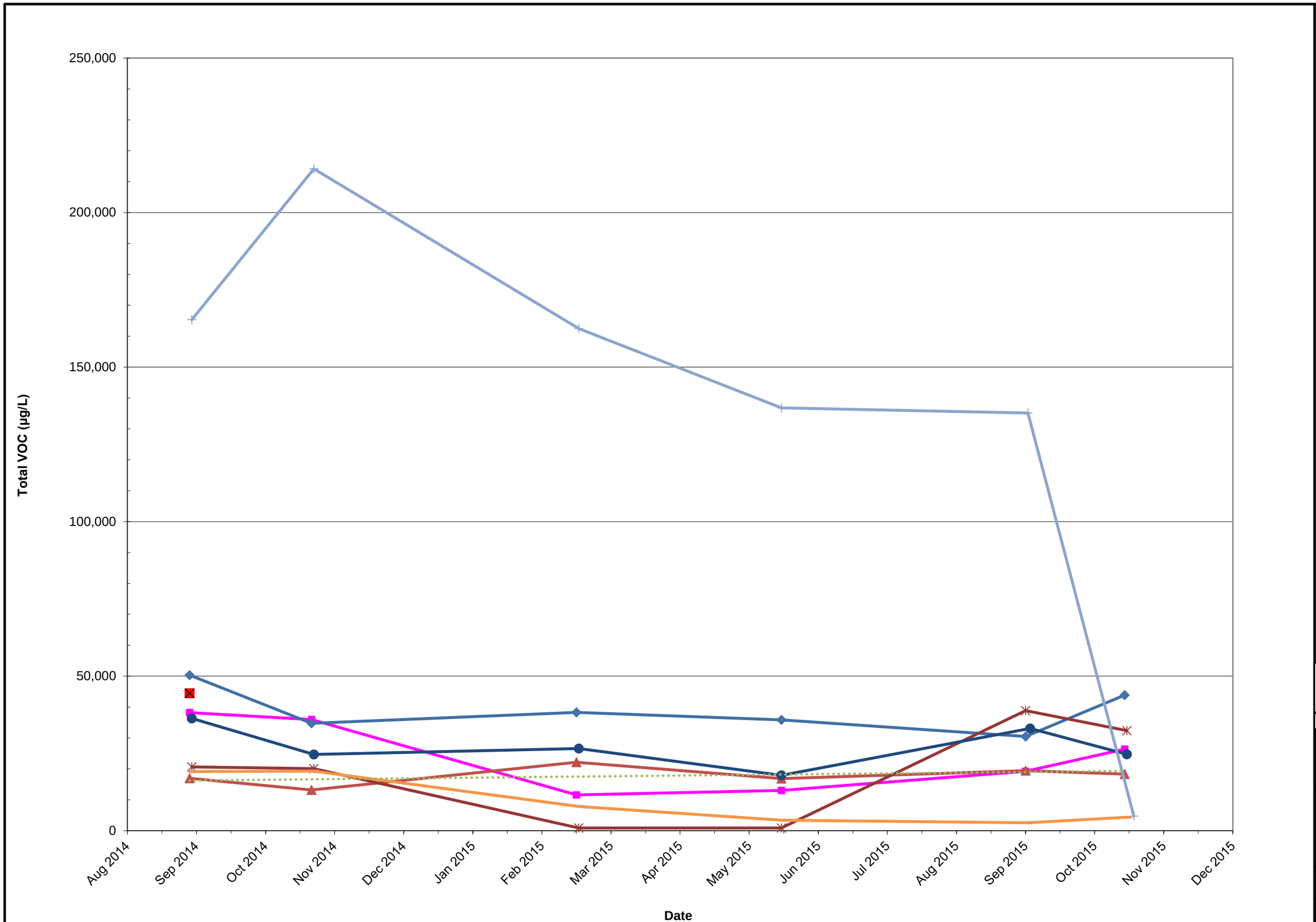
Former Coke Oven Area
Cell 2 System Layout

0 25 50 100 Feet

Figure 5



LEGEND

- CO27-PZM012
- CO36-PZM008
- CO37-PZM003
- CO38-PZM006
- CO39-PZM007
- CO40-PZM008
- CO41-PZM001
- CO42-PZM004
- Linear (CO38-PZM006)

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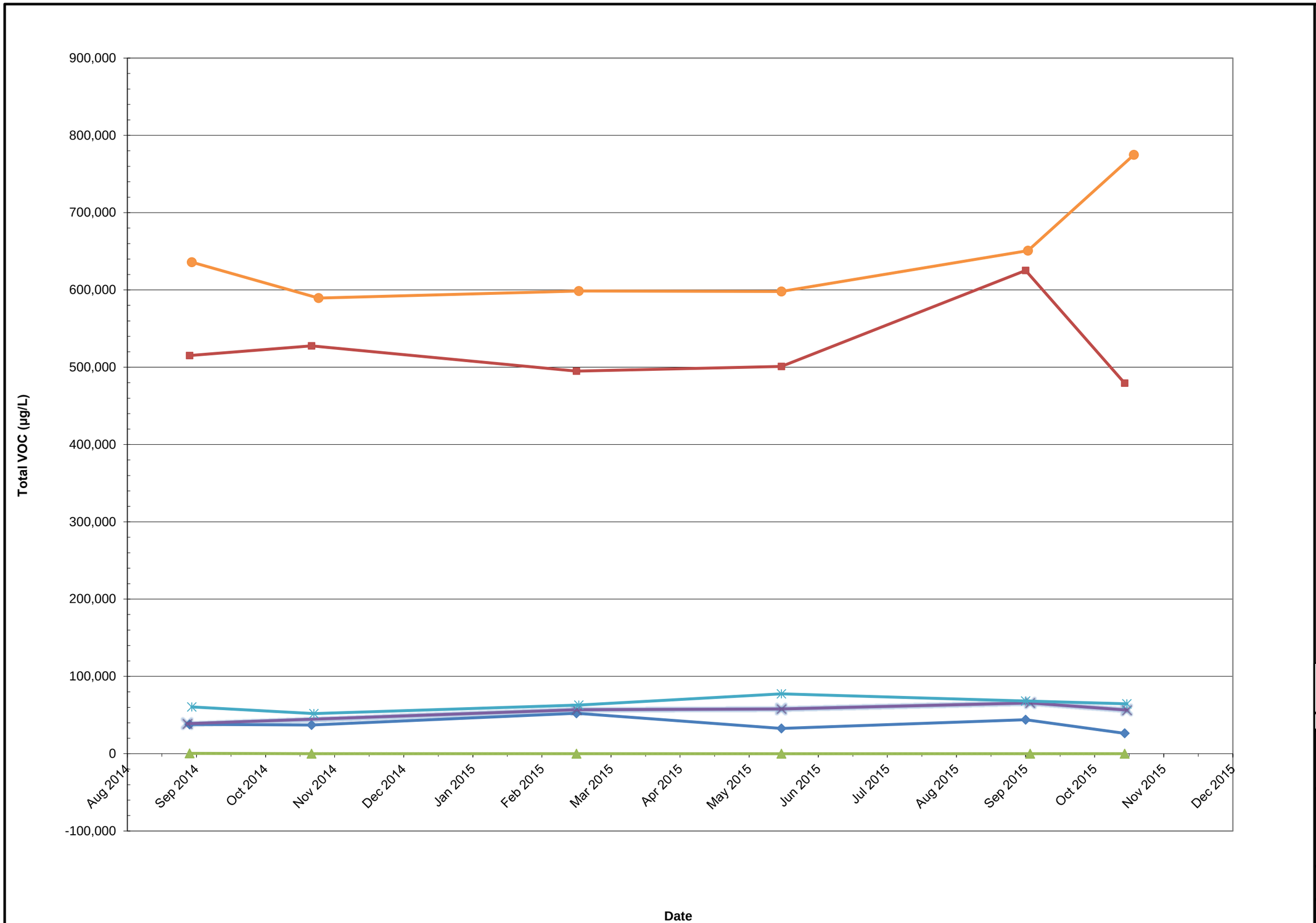
MEASURED GROUNDWATER VOC CONCENTRATION BY MONTH
CELL 2: GROUNDWATER PUMP AND TREAT SYSTEM
SHALLOW ZONE

Date	Figure
December 31, 2015	6A

PE/RG	PM	DR



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MEASURED GROUNDWATER VOC CONCENTRATION BY MONTH
CELL 2: GROUNDWATER PUMP AND TREAT SYSTEM
INTERMEDIATE ZONE

Date	Figure
December. 31, 2015	6B

PE/RG	PM	DR

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Former Coke Oven Area
Cell 2 Benzene Concentrations Intermediate Zone

0 30 60 120 Feet

Figure 7

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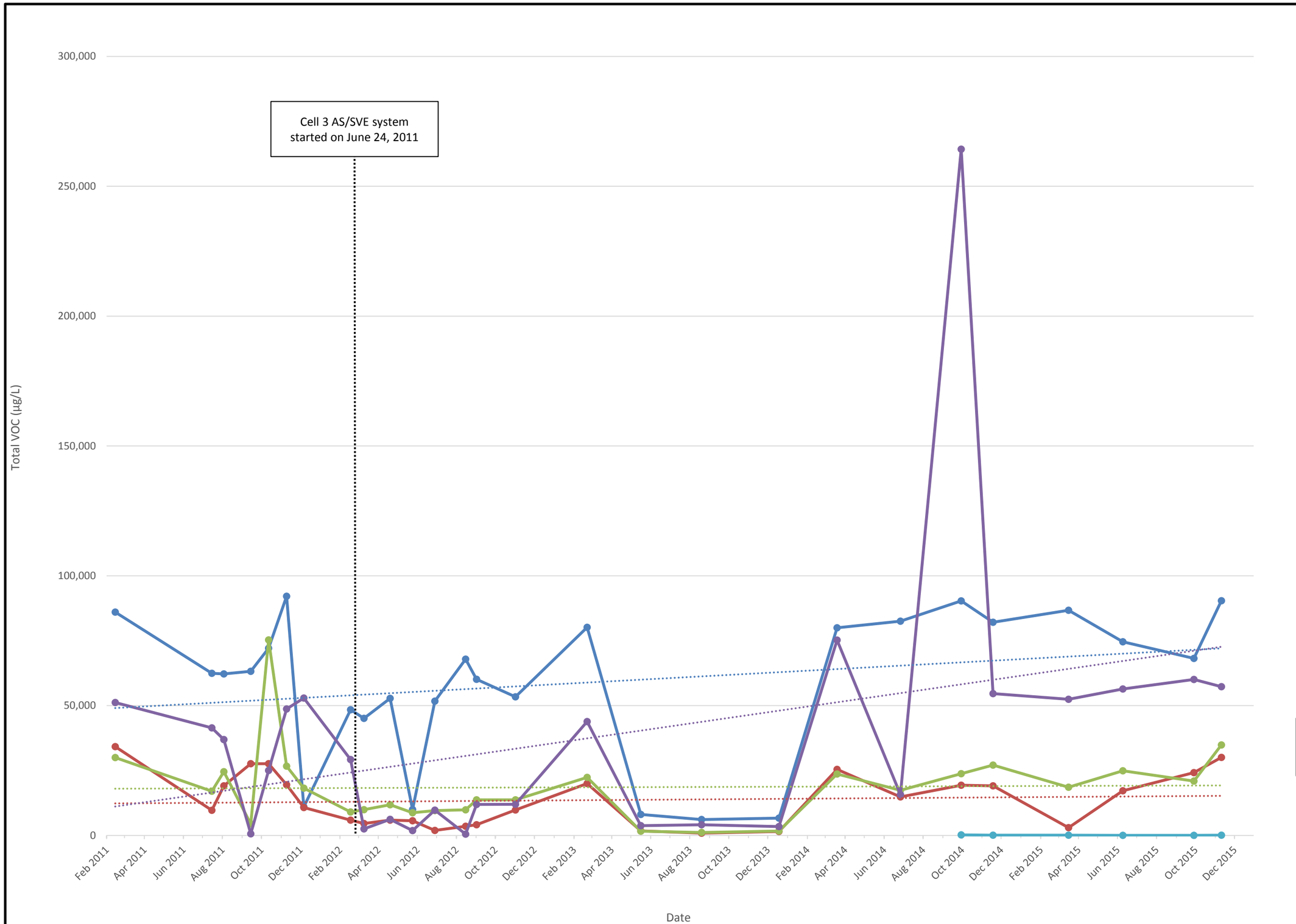
Former Coke Oven Area
Cell 3 System Layout

0 20 40 80 Feet

Figure 8



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

Date	Figure
December 31, 2015	9

PE/RG	PM	DR

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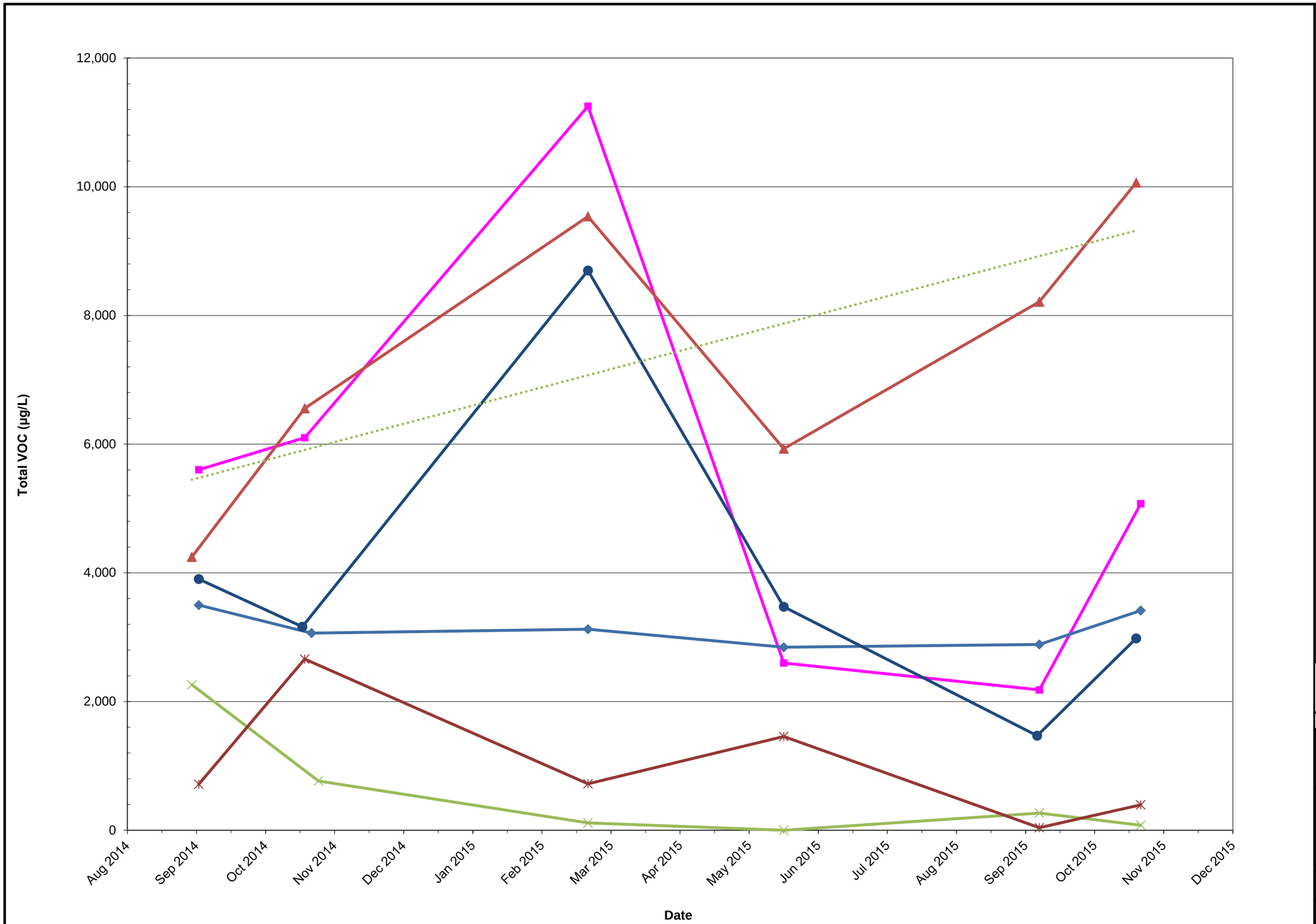
Former Coke Oven Area
Cell 5 System Layout

0 50 100 200 Feet

Figure 10



LEGEND

- CO23-PZM008
- CO24-PZM007
- CO55-PZM000
- CO56-PZP001
- CO59-PZP002
- CO60PZP001
- Linear (CO56-PZP001)

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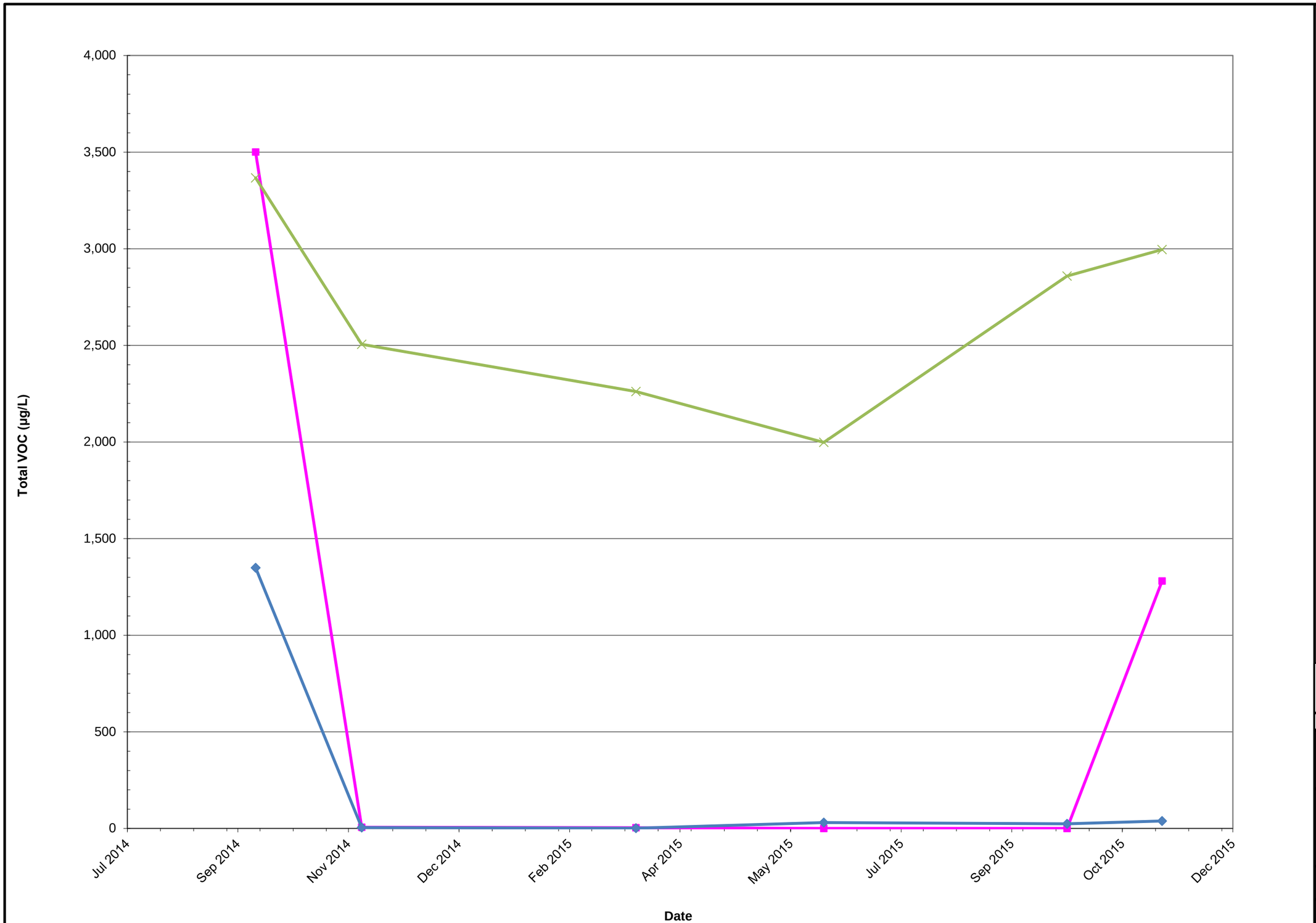
**MEASURED GROUNDWATER VOC CONCENTRATION BY MONTH
CELL 5: DPE GROUNDWATER PUMP AND TREAT SYSTEM**

Date	Figure
December. 31, 2015	11A

PE/RG	PM	DR



LEGEND

- CO26-PZM007
- CO57-PZP002
- CO58-PZM001

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**MEASURED GROUNDWATER VOC CONCENTRATION BY MONTH
CELL 5: DPE GROUNDWATER PUMP AND TREAT SYSTEM**

Date: December 31, 2015

Figure: 11B

PE/RG | PM | DR

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Former Coke Oven Area
Cell 5 Naphthalene Concentrations Shallow Zone

0 50 100 200 Feet

Figure 12

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Former Coke Oven Area
Cell 6 Well Locations

0 25 50 100 Feet

Figure 13