pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHEAST REGIONAL OFFICE

MEMO

TO Ragesh R. Patel
Regional Manager, Environmental Cleanup and Brownfields

FROM C. David Brown, P.G.
Licensed Professional Geologist

THROUGH Susan M. Kennedy, P.G.
Professional Geologist Manager

DATE October 17, 2017

RE ECB: Land Recycling Program
Act 2 Technical Memo Summary
Former Sunoco Philadelphia Refinery **AOI 2**
Remedial Investigation Report
eFACTS PF No. 778376
3144 West Passyunk Avenue
City of Philadelphia
Philadelphia County

Property Owner Name and Site Address:

Owner	Remediator	Site
Philadelphia Energy Solutions Refining and Marketing LLC 3144 W. Passyunk Ave. Philadelphia, PA 19145	Evergreen Resources Management Operations 2 Righter Parkway, Suite 200 Wilmington, DE 19803	3144 W. Passyunk Ave. Philadelphia, PA 19145

Coordinates: 39.9166°N, 75.1989°W

Act 2 Standard(s) Sought:
Soil and groundwater—nonresidential site-specific standard

Site Size: 111 acres

Project Site History:
Petroleum refining began at the site circa 1870. The facility consisted of two refineries, Point Breeze operated by Atlantic Petroleum Corporation (formerly ARCO) and Girard Point by Chevron (formerly Gulf). Sunoco purchased these two refineries in 1988 and 1994 and consolidated them into a single facility. In 2012 Sunoco sold the refinery to the Carlyle Group and entered a joint venture to operate it as Philadelphia Energy Solutions (PES). Sunoco, Inc. is now a subsidiary of Energy Transfer Partners, L.P. Evergreen Resources Management Operations is a Sunoco subsidiary responsible for its legacy environmental liabilities.

The refinery can process up to 330,000 barrels a day of crude oil. It produces gasoline, diesel, jet fuel, kerosene, home heating oil, and other petroleum liquids. The facility consists of multiple process units, above-ground storage tanks, and pipelines, as well as truck, railcar, and barge transfer equipment.

Area of Interest 2 (AOI 2) is known as the Point Breeze Process Area. It is bordered by the Schuylkill River to the west, the Philadelphia Gas Works facility to the north, and other areas of the refinery on the east and south. A sheet pile bulkhead exists along a portion of the river frontage. Historic and current operations in AOI 2 include: petroleum processing, material storage in regulated aboveground storage tanks, and a wastewater treatment plant. Office, laboratory, and operations buildings are present in AOI 2. The "short pier" is an active dock used for product loading and unloading.

Petroleum contamination exists from historical operations including releases from tanks and pipelines. Evergreen (Sunoco) is participating in the Act 2 program to address contamination predating the transfer of the property to PES on September 8, 2012. Corrective action responsibilities under the Storage Tank and Spill Prevention Act are being addressed simultaneously. There are presently three open historic tank incidents associated with three regulated ASTs in AOI 2 (51-19781). A site characterization report for these tanks was received September 19, 2017 and is presently under review.

Site Findings:
Unconsolidated materials at AOI 2, with increasing depth, consist of fill, alluvium (silt, clay, and sand), the Trenton Gravel, and the Potomac-Raritan-Magothy (PRM) formations (sand and clay units). The Wissahickon Formation bedrock is around 90′ deep. Shallow groundwater depths range from ~7′ to 30′.

Most of the general soil investigation was performed in 2010, 2013, and 2016. Sampling was focused on storage tanks, release locations, monitoring well borings, and delineation of exceedances. There are no RCRA SWMUs in AOI 2. Little to no sampling was conducted around the buildings and parking areas on the north side of AOI 2, within the operating units in the center and south of AOI 2, or along the pipeline routes between the units.

Approximately 110 surface soil samples (0–2′) and 85 subsurface soil samples (> 2′, typically up to ~10′) were collected. Samples were analyzed for 10 VOCs, 10 SVOCs, and lead.

Soil-to-groundwater MSC exceedances included benzene (maximum 12 mg/kg), lead, and isolated occurrences of 1,2,4-TMB and PAHs. The following direct contact MSC exceedances were identified in shallow soil (0–2′); there were no exceedances in subsurface soil. All exceedances were in the vicinity of the AST tank field in the west-central portion of AOI 2.

Substance	Location	Concentration (mg/kg)	Standard (mg/kg)
Benzo(a)pyrene	BH-16-005	24	12
	PB-140 NW	15	
	PB-141 NE	45	
Lead	BH-13-64	3540	2240
	BH-16-009	2500	
	PB-140 SW	2740	
	PB-279 SW	3080	

Tank PB 140 had a release of diesel in 2005. There were no reported releases at tanks 141 or 279. The lead exceedances are unlikely to be related to tank releases because these ASTs are not known to have stored leaded gasoline.

Monitoring well installations date from the 1980s through 2016. There are approximately 100 shallow wells, typically ~20–30′ deep, screened in the Trenton Gravel and above. There are five deep wells, up to 100′ deep, screened in the PRM lower sand. Recent gauging and sampling events took place in 2010, 2013, and 2016. Shallow groundwater is inferred to flow radially outward from the northern part of AOI 2 with an overall flow toward the west (river) and south. Localized leakage is evident along the Pollack Street combined sewer, which crosses AOI 2 from east to west, discharging to the river. Groundwater contamination and LNAPL also enter the sewer. Groundwater flow in the lower aquifer is toward the south.

LNAPL was observed in 29 of 139 monitoring and recovery wells gauged in November 2016. The maximum thickness was ~7′. Light, middle, and heavy distillate are present in the area. LNAPL plumes occur near the river in the northwest, along the Pollack sewer, and near the alky unit in the southeast. The characteristics of the northwest plume indicate possible mobility. Evergreen installed two new wells west of that plume to delineate potential river impacts; results were not yet available from those wells. Other LNAPL plumes are inferred to be stable or hydraulically controlled.

Analytes for groundwater sampling include 10 VOCs, 10 SVOCs, and lead. Most contaminants of concern have exceeded MSCs in AOI 2, but there has been an overall decrease in concentrations and numbers of exceedances over time. Five plumes were identified based on persistent benzene or MTBE exceedances. All of these plumes appear to have stable or decreasing source areas and extents.

Substances that have shown significant recent exceedances in groundwater are listed below.

Substance	Maximum (µg/L)	NR MSC (µg/L)
Benzene	400	5
MTBE	240	20
1,2,4-TMB	5300	62
Naphthalene	1200	100
Lead	33	5

Low-level SVOC exceedances are observed in numerous wells (~10 µg/L and less). They do not appear to represent contiguous plumes. There have been no contaminant exceedances in the deep wells since 2012 except at S-294D (in the northeast), which had a seemingly isolated round of elevated benzene, 1,2,4-TMB, benzo(a)pyrene, and naphthalene concentrations in 2013.

Multiple buildings are present in AOI 2. Indoor air samples were collected in four occupied buildings in 2012. Six additional buildings were sampled in 2016. Various other buildings in the area are not occupied. Evergreen identified four buildings that are positively pressurized. Indoor air results indicated potential exceedances of applicable site-specific standard screening values (based on EPA RSLs with a cancer risk of 10^{-5} and a hazard quotient of 0.1) at two buildings. Evergreen intends to perform further investigation of vapor intrusion. Outdoor samples were also obtained at five locations in 2016 near areas of LNAPL and other potential sources. Those results did not exceed occupational limits.

AOI 2 is industrialized and has impermeable surface covers in many areas. A 2016 PNDI review indicated the potential presence of two species of concern: the endangered shortnose sturgeon and the threatened eastern redbelly turtle. Further ecological evaluation is required.

Site Cleanup History:

NIR Received Date December 14, 2016
RIR Received Date July 25, 2017

An initial NIR was submitted October 16, 2006; it was revised with updated information on November 17, 2014 and December 14, 2016. The facility entered into a consent order and agreement with DEP's Clean Water Program in December 1993; the agreement was succeeded by another in December 2003 which terminated in December 2013. The facility is currently subject to a DEP buyer–seller agreement which became effective September 8, 2012. A site characterization report was submitted for AOI 2 on September 29, 2010 under the Clean Water Program agreement. The site entered into the One Cleanup Program with DEP and EPA on November 8, 2011.

On May 6, 2015 DEP approved a site-specific numerical standard of 2240 mg/kg for lead in soil at the Philadelphia Refinery. This standard was developed in a risk assessment report received February 26, 2015.

Discussion of Cleanup Involved and Demonstration of Attainment:

There are active and formerly active remedial systems in AOI 2.

- The Pollack Street vertical well system was installed in 1995. It consisted of ten recovery wells. This system was deactivated and replaced by others.
- The Pollack Street horizontal well system consists of three active recovery wells installed in 2004–2006. They collect total fluids along segments of the Pollack sewer within AOI 2. The system discharges to the process sewer, and the fluids are treated at the WWTP. The quantity of recovered LNAPL has not been determined.
- The Pollack Street west end system was installed in 2011–2012 to address an area of LNAPL near the river. It is an active total fluids system with 30 recovery wells. LNAPL is separated and reprocessed in the refinery; groundwater is treated at the WWTP. Over 60,000 gal of LNAPL has been recovered to date.

- Controls are used at the Philadelphia Water Department's Pollack Street combined sewer outfall at the Schuylkill River. A tide gate was installed in the 1990s to mitigate the tidal flux into the sewer. Booms and a skimmer at the outfall collect LNAPL.
- The Short Pier system was used to recover LNAPL at a location near the river. It was deactivated in 2002.

A groundwater fate-and-transport model will be developed for the entire refinery complex and provided in a future report. This analysis will include a surface water assessment. An ecological evaluation will be performed for the facility. Further vapor intrusion evaluation will be performed and included in a risk assessment report.

Evergreen intends to attain a site-specific standard with pathway elimination for soil and groundwater. Soil direct contact exceedances and potential LNAPL exposure pathways will be addressed in a cleanup plan. Exposure to groundwater contamination will be managed with a use restriction. An environmental covenant will be required.

DEP Final Action Approval/Disapproval Letter:
I recommend approving the RIR. Soil and groundwater have been adequately characterized in AOI 2. EPA concurs with this recommendation. DEP will communicate several comments and concerns to Evergreen by e-mail and request follow-up.

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