



pennsylvania

DEPARTMENT OF ENVIRONMENTAL PROTECTION

SOUTHEAST REGIONAL OFFICE

MEMO

TO Sachin Shankar, P.E.
Assistant Regional Director

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

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

DATE June 21, 2017

RE ECB: Land Recycling Program
Act 2 Technical Memo Summary
Philadelphia Refinery AOI 4
Remedial Investigation Report
eFACTS PF No. 770318
3144 West Passyunk Avenue
City of Philadelphia
Philadelphia County

Property Owner Name and Site Address:

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

Coordinates: 39.9098°N, 75.1965°W

Act 2 Standard(s) Sought:

Soil and groundwater—nonresidential site-specific standard

Property Size: 105 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 acquired 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 includes multiple process units, above-ground storage tanks, and pipelines, as well as truck, railcar, and barge transfer equipment. Adjacent to the refinery is the Belmont Terminal which is owned and operated by Sunoco Logistics Partners L.P.

Area of Interest 4 of the Philadelphia Refinery complex (AOI 4) is known as the Point Breeze No. 4 Tank Farm Area. It is located in the southwest section of the Point Breeze South Yard. It is bordered by AOIs 1 and 2 to the north, AOI 3 to the west, Penrose Avenue to the southeast, and 26th Street to the east. (The nearest surface water body, the Schuylkill River, is ~1200' to the west.) Approximately 40 above-ground storage tanks have been located in AOI 4, as well as oil pipelines and pump stations.

Petroleum contamination exists in AOI 4 from historical operations, including releases from above ground storage 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 were 11 open tank incidents associated with 11 regulated storage tanks in AOI 4 (51-19781). A combined site characterization report and remedial action completion report for these tanks was received on February 17, 2017 and was approved on May 11, 2017. All incidents were closed.

Site Findings:

Unconsolidated materials at AOI 4, with increasing depth, consist of recent fill and alluvium (sand, silt, and clay), the Trenton Gravel (coarse sand and gravel), and the Potomac-Raritan-Magothy (PRM) formations (sand and clay units). The Wissahickon Formation bedrock is around 80–110' deep. Shallow groundwater depths range from ~10' to ~28' in different areas of AOI 4.

Soil sampling was performed in 2005 and 2013–2016. Samples were obtained for general characterization, in monitoring well borings, at regulated storage tanks with reported incidents, and to delineate previously identified exceedences. About 63 surface (0–2') and 48 subsurface (2–15') samples were collected. Numerous additional samples were obtained for individual regulated AST closures and investigations (2003–2007). Analytes from DEP's petroleum short list included up to 10 VOCs, 10 SVOCs, and lead. More recent sampling using a comprehensive analyte list included 14 VOCs, 28 SVOCs, and five metals.

There were numerous, widespread exceedences of soil-to-groundwater MSCs for benzene (maximum 36 mg/kg) and lead. Isolated exceedences of soil-to-groundwater MSCs were found

for 1,2,4-trimethylbenzene, toluene, and naphthalene. Lead exceeded the site-specific direct contact standard (2240 mg/kg) in surface soil at four locations, listed below. There were no other direct contact MSC exceedences.

Boring	Depth (ft)	Lead (mg/kg)	Location
BH-13-99	1.5–2.0	12,000	Tank 848
BH-13-103	0–1	3000	Tank 252
BH-16-011	0–2	6000	Tank 252
S-381	0.0–0.5	26,000	Tank 252

There are about 65 shallow aquifer wells that have been installed since 1982 (generally ~15–40' deep), typically screened in the Trenton gravel and/or the PRM upper sand. There are six deep wells in AOI 4, screened in the PRM lower/middle sand. Evergreen was unable to acquire access to install offsite monitoring wells in the southeast. Comprehensive sampling events occurred in 2005, 2013, and twice in 2016. Additional, approximately annual, sampling is performed at selected wells.

Shallow groundwater elevations are relatively flat across AOI 4 (~1–2'). Infiltration is inferred into the 26th Street sewer in the northeast. In the southern section, flow is inferred to the southeast. Flow in the lower aquifer is apparently toward the south.

Monitoring well sampling indicated exceedences of multiple substances. Analytes historically consisted of 10 VOCs, 10 SVOCs, and lead. The 2016 samples were analyzed for the larger comprehensive list. Significant exceedences in the shallow aquifer are tabulated below (2014–2016 data).

Substance	Maximum (µg/L)	NR MSC (µg/L)
Benzene	21,000	5
Toluene	12,000	1000
Ethylbenzene	1400	700
Naphthalene	730	100
MTBE	5100	20
1,2,4-trimethylbenzene	1400	62

The most widespread contaminant of concern is benzene, which exceeds throughout most of AOI 4. The primary groundwater plume is at the southeast border of AOI 4, with the highest levels of benzene and other contaminants. Elevated benzene also occurs in the northeast, adjacent to 26th Street (S-369, ~2400 µg/L).

In the lower aquifer, benzene exceeds in only one well (< 10 µg/L), MTBE in two wells (< 100 µg/L), and lead in isolated locations.

LNAPL is observed in several areas of AOI 4: the north, northwest, south-central, and southeast, as well as in several isolated wells. Thicknesses in some wells are > 1.5', including in the southeast plume. Most of the LNAPL has been characterized as light/middle distillate. The plumes do not appear to be migrating, but some wells show increasing thickness trends. There have evidently been recent PES releases in the southeast that may have contributed to the pre-

existing LNAPL there. Stantec's analyses of LNAPL transmissivities, critical pore entry pressures, and seepage velocities indicate that most LNAPL plumes could be mobile and practicably recoverable.

Insufficient data is available to adequately understand plume stability. Further groundwater monitoring will be performed, and a site-wide fate-and-transport analysis will be prepared for future submittal. No groundwater use exists at the refinery, and none has been identified in the vicinity of the facility.

Stantec performed a Quick Domenico fate-and-transport analysis for benzene at the southeast property boundary. They calibrated the model using recent data from available wells, extrapolating conditions offsite. The potential, estimated plume length is ~900', which would extend on to several properties. There are no occupied buildings in the predicted area, and there is no known groundwater use.

Indoor and ambient air sampling was performed in 2012 at 15 Pump House, which is the only occupied building in AOI 4. Contaminant concentrations in indoor air were similar in magnitude to but somewhat less than outdoor ambient air. Only 1,2,4-TMB slightly exceeded DEP's indoor air screening value. Further VI evaluation will be performed. In 2016 an outdoor air sample was collected at S-104, a well in north-central AOI 4 that contains middle distillate LNAPL. Only 1,2,4-TMB was elevated. Indoor and outdoor results did not exceed occupational limits.

AOI 4 is industrialized and has impermeable or gravel surface cover in many areas. It does not provide viable habitat. It does not adjoin or encompass surface water. A 2016 PNDI request indicated the potential presence of sensitive species. Subsequent clearance letters from the Pennsylvania Fish and Boat Commission and DCNR stated that no species impacts are anticipated.

Site Cleanup History:

NIR Received Date	December 14, 2016
RIR Disapproved Date	January 15, 2014
RIR Received Date	March 27, 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 4 on August 29, 2005 under the Clean Water Program agreement. The site entered into the One Cleanup Program with DEP and EPA on November 8, 2011. A previous RIR received on October 18, 2013 was disapproved in January 2014.

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:

Two past and one present remedial systems have operated in AOI 4.

- S-30 system: This system pumped LNAPL from one well beginning in 1996. When operations ceased in 2010, ~40,000 gal of LNAPL had been recovered. Recent LNAPL thicknesses have been ~8'. Evergreen intends to replace the equipment and restart the system.
- S-36 system: Recovery at between one and three wells took place from 2004 to 2010. Approximately 1000 gal of LNAPL was collected.
- Penrose Avenue system: Operation commenced in March 2013 and continues at this time. It is a total fluids system located along the southeast property boundary. There are presently seven active recovery wells. LNAPL is separated from water and recycled by the PES facility. Water is discharged to the Philadelphia Water Department sewer. A biofilter and carbon vessels control vapors. Approximately 2900 gal of LNAPL have been recovered.

Evergreen intends to attain a site-specific standard with pathway elimination for soil and groundwater. Soil direct contact exceedences and potential LNAPL exposures will be addressed in a cleanup plan. A site-wide groundwater fate-and-transport analysis is being prepared for submission in a future report. Further vapor intrusion evaluation will be conducted. Groundwater contamination will be managed with a use restriction. An environmental covenant will be required. Institutional controls, such as OSHA workplace requirements, may be utilized for the inhalation pathway.

DEP Final Action Approval/Disapproval Letter:

I recommend disapproving the RIR for the following reason.

Offsite groundwater contamination at the southeast property boundary of AOI 4 has not been delineated. The plume is inferred to extend a significant distance offsite, but no offsite wells were installed. Evergreen used fate-and-transport modeling to estimate the plume extent; however, insufficient data on downgradient groundwater elevations and contaminant concentrations are available to support the analysis. The modeling involves excessive extrapolation from the source area. [§250.408(e)]

DEP will communicate several comments and concerns to Evergreen by e-mail that will require additional follow-up.

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