pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHEAST REGIONAL OFFICE

MEMO

TO Ragesh 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 August 24, 2017

RE ECB: Land Recycling Program
Act 2 Technical Memo Summary
Former Sunoco Philadelphia Refinery **AOI 7**
Remedial Investigation Report
eFACTS PF No. 750870
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: 39.9072°N, 75.2086°W

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

Site Size: 130 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, pipelines, as well as truck, railcar, and barge transfer equipment.

Area of Interest 7 (AOI 7) is known as the Girard Point Fuels Processing Area. It is bordered by the Schuylkill River to the west and north and other areas of the refinery on the other sides. A sheet pile bulkhead exists along the river frontage. Historic and current operations in AOI 7 include: petroleum processing, a sulfur plant, a hazardous waste incinerator, material storage in regulated underground and aboveground storage tanks, a wastewater treatment plant, and various buildings.

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 15 open tank incidents associated with nine regulated ASTs and two USTs in AOI 7 (51-11554, 51-36558). A site characterization report for these tanks is forthcoming.

Site Findings:
Unconsolidated materials at AOI 7, with increasing depth, consist of fill, alluvium (silt, clay, and sand), the Trenton Gravel (only locally present), and the Potomac-Raritan-Magothy (PRM) formations (sand and clay units). The Wissahickon Formation bedrock is around 75′ deep. Shallow groundwater depths range from ~2′ to 12′.

Soil sampling performed in 2002–2013 was focused at five leaded tank bottom SWMUs (87–91), five ASTs, and selected other areas. Further soil investigation was performed in 2016 at storage tanks, at release locations and potential source areas, and to delineate previous exceedances. Surface (0–2′) and subsurface (2–15′) samples were obtained, with a couple hundred samples in each interval (1992–2016). No leaded tank bottom materials were observed. Analytes from DEP's petroleum short list included up to 10 VOCs, 11 SVOCs, and lead. Some samples were analyzed for other substances.

Soil-to-groundwater MSC exceedances included benzene (maximum 31 mg/kg), 1,2,4-TMB, naphthalene, and lead. A direct contact MSC exceedance was identified for benzo(a)pyrene, 13 mg/kg (GP-1100-1100-CV-2, 0–2′). (Other potential exceedances for hexavalent chromium were found in three 1992 surface soil samples.) Lead did not exceed the site-specific numerical value.

There are about 63 existing shallow and four deep wells in AOI 7 that have been installed since 1986. The shallow wells are commonly ~15′ deep, and they are screened in the fill, alluvium, and/or Trenton Gravel. The most recent sampling events were in 2010, 2012, 2013, and 2016. The overall shallow groundwater gradient is inferred to the west and north, toward the river,

although there is local mounding and other deviations. The deep groundwater, in the lower PRM units, is inferred to flow toward the west.

Measurable LNAPL was observed in 13 of the wells gauged in 2016 with a maximum thickness of 2.5′. The primary LNAPL body is next to the former No. 3 Separator and the river bulkhead. Sheening of the river was observed there in the past. Isolated LNAPL was identified at two other locations adjacent to the northwest bulkhead. Two wells were installed to delineate LNAPL near the western river bank in 2016, but PES restrictions on drilling near the bulkhead precluded a determination of the LNAPL extent close to the river. LNAPL was fingerprinted and classified as crude oil and heavy distillate. API modeling performed in 2012 indicated that LNAPL at some wells could be mobile.

Monitoring well sampling indicated exceedances of nonresidential MSCs for several substances. Analytes typically included 11 VOCs, 10 SVOCs, and lead. VOC exceedances correlate with the LNAPL areas along the bulkhead:

Substance	Maximum (µg/L)	NR MSC (µg/L)	Number*
Benzene	600	5	3
Naphthalene	830	100	3
1,2,4-TMB	250	62	3

* Number of wells with one or more exceedances of the standard.

Low-level SVOC exceedances are observed in numerous wells (~1 µg/L and less). They do not appear to represent contiguous plumes. Two wells show substantially elevated SVOC concentrations (e.g., 210 µg/L chrysene), also near the northern bulkhead.

Eight occupied buildings are present in AOI 7. Indoor air sampling was performed in 2016. There did not appear to be any exceedances of applicable vapor intrusion screening values. Outdoor air samples were also obtained at three locations; those results did not exceed occupational limits.

AOI 7 is industrialized and has impermeable surface covers in many areas. A 2016 PNDI review indicated the potential presence of three threatened and endangered species. Further ecological evaluation may be required.

Site Cleanup History:

NIR Received Date	October 16, 2006
RIR Received Date	March 1, 2012
RIR Addendum Received Date	September 20, 2013
RIR Disapproved Date	December 18, 2013
RIR Received Date	June 12, 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 7 on September 28, 2010 under the Clean Water

Program agreement. The site entered into the One Cleanup Program with DEP and EPA on November 8, 2011. A previous AOI 7 RIR was submitted March 1, 2012; DEP issued comments but no decision on that report. An addendum to the RIR was submitted September 20, 2013 and disapproved by DEP on December 18, 2013.

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:
LNAPL was identified near the former No. 3 Separator in 2011. Ten total fluids recovery wells were installed in August 2012. Approximately 112,000 gal of LNAPL was recovered through 2016 and recycled at the refinery. Groundwater is processed at the WWTP. The system continues to operate. (Some contamination is also attributable to a PES release.) The system provides partial hydraulic control of contamination near the bulkhead.

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. Further vapor intrusion evaluation will be performed. Groundwater contamination will be managed with a use restriction. An environmental covenant will be required.

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.

DEP Final Action Approval/Disapproval Letter:
I recommend approving the RIR. Soil and groundwater have been adequately characterized in AOI 7. Most deficiencies in the December 2013 disapproval have been resolved; others will be addressed in future reporting. U.S. EPA has reviewed the report and concurs with the approval. DEP will communicate several comments and concerns to Evergreen by e-mail and request follow-up.

DEP Contact:	C. David Brown	**Phone:**	484.250.5796
Site Contact:	Tiffani Doerr, Evergreen Charles Barksdale, PES Refining & Marketing	**Phone:**	302.477.1305 215.339.2074
Site Consultant:	Colleen Costello, GHD	**Phone:**	215.853.3282