


MEMO

TO Ragesh R. Patel
Regional Manager
Environmental Cleanup and Brownfields

FROM Lisa Strobbridge, P.G.
Professional Geologist 

THROUGH C. David Brown, P.G.
Professional Geologist Manager

DATE December 27, 2021

RE ECB – Land Recycling Program
Act 2 Technical Memo Summary
Remedial Investigation Report – Second Addendum
AOI-9 Schuylkill River Tank Farm
eFACTS PF No. 778379
PESRM - Evergreen
Mingo Avenue
City of Philadelphia
Philadelphia County

Property Owner:

Hilco Redevelopment Partners
99 Summer Street, Suite 1110, Boston, MA 02110

Remediator:

Evergreen Resources Management Operations
2 Righter Parkway, Suite 120
Wilmington, DE 19083

Site Address:

Mingo Avenue
Philadelphia, PA 19153

Act 2 Standard(s) Sought: non-residential site-specific standard for soil and groundwater

Property Size: 211 acres

Project Site History: Petroleum refining began at the Philadelphia Refinery 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., and Evergreen is a Sunoco affiliate that is responsible for legacy environmental remediation. In 2020, PES was acquired by Hilco Redevelopment Partners (HRP).

The Philadelphia Refinery processed up to 330,000 barrels a day of crude oil. It produced gasoline, diesel, jet fuel, kerosene, home heating oil, and other petroleum liquids. The facility consisted of multiple process units, above-ground storage tanks, pipelines, as well as truck, railcar, and barge transfer equipment. The facility has been divided into eleven areas of interest (AOI 1–11) for purposes of characterizing contamination. The first ten are geographical areas of the facility, and AOI 11 represents the deep groundwater aquifer.

Area of Interest 9 of the Philadelphia Refinery complex (AOI 9) consists of the Schuylkill River Tank Farm (SRTF), which was a part of the Girard Point Refinery (previously Gulf). Tanks at SRTF were constructed circa 1952. At this time, there are 47 regulated aboveground storage tanks (ASTs) at this facility and no underground storage tanks (USTs). Of the 47 regulated ASTs, seven are in active status and the rest are empty and in temporarily out-of-service status.

Site Findings:

Soil

- Unconsolidated materials at SRTF extend to approximately 100 feet below grade and consist of fill (up to 22 feet thick), alluvium (silt, clay, and sand), the Trenton Gravel, and the Potomac-Raritan-Magothy (PRM) formations (sand and clay units). The Wissahickon Formation underlies the unconsolidated materials.
- Shallow groundwater depths range from ~1ft to ~12ft
- In 2009, 2015, and 2016 approximately 170 soil borings were advanced and a couple of hundred soil samples were collected at various depths for general characterization, in areas of releases, and to delineate previous exceedances.
 - Soil samples were analyzed for: 10 VOCs, 10 SVOCs, and lead.
 - VOCs include benzene, toluene, ethylbenzene, xylene (total), methyl tertiary butyl ether (MTBE), isopropylbenzene (cumene), 1,2-dichloroethane (EDC), ethylene dibromide (EDB), 1,2,4-trimethylbenzene (1,2,4-TMB), and 1,3,5-trimethylbenzene (1,3,5-TMB)
 - SVOCs include anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluorene, naphthalene, phenanthrene, and pyrene.
 - Soil sample results indicated numerous exceedances of soil to groundwater MSCs for VOCs and the exceedances were delineated.
 - Benzene, 1,2,4-TMB, 1,3,5-TMB, ethylbenzene, naphthalene, benzo(a)pyrene, benzo(b)fluoranthene, toluene, and lead are the COCs in surface soil that were reported above the PADEP non-residential soil MSCs and the exceedances were delineated.

- 1,2,4-TMB, benzo(a)pyrene, and benzo(b)fluoranthene exceeded the direct contact MSCs, and the exceedances were delineated.
- Lead exceeded the site-specific direct contact standard of 2,240 mg/kg in 12 borings.
- From April through August 2021, Evergreen collected 14 additional surface soil samples for lead analysis.
 - Soil samples locations were selected to delineate previous exceedances of the site-specific standard for lead in surface soil.
 - Sample results indicate that surface soil in lead is delineated to the site-specific standard that is currently calculated to be 2,240 ug/kg.
 - Evergreen acknowledges that if the SSS is changed in the future, additional delineation will be necessary to satisfy potential changes to DEP standards.
 - Evergreen indicated that additional sampling is ongoing to further understand the extent of lead impacts at concentrations that range between the SSS and non-residential direct contact SHS MSC in preparation for the potential of a change in standards
Results of the additional lead soil sampling will be presented in future reports which is expected to satisfy EPA comments
 - A figure showing lead concentrations relative to the soil to groundwater MSC, direct contact MSC, and site-specific standard was included in response to public interest in this COC.

LNAPL

- LNAPL was historically detected in the blending building area through 2016, and in 2016 through 2018, the LNAPL distribution expanded to two additional areas of the site including: the area west of tanks SR-19 and SR-20, and the area east of Tank-37. A summary of hydrograph, mobility, and forensic analysis for each area is summarized below:
 - Blender Building area
 - Forensic results from LNAPL samples collected from the blender building area in 2004 and 2016 indicated the LNAPL was predominately gasoline. From 2016 through 2018, LNAPL distribution and thickness increased and additional LNAPL forensic samples were collected in 2019 and 2020 indicating a change in fuel type from gasoline to a combination of light and middle distillates suggesting a possible release occurred in the Blender Building area in the 2016 timeframe (during operation of the facility by PESRM)
 - Forensic results (comprehensive chemical fingerprinting data and review of historical whole oil chromatograms) and time series review of routine groundwater chemistry data through 2021 indicate a possible re-emergence of LNAPL from older sources
 - Lines of evidence of LNAPL evaluation indicate a potential mixture of newer and older LNAPL in this area

- The maximum LNAPL thickness from 2017 through 2021 was 3.61 ft (before 2017, the maximum LNAPL thickness was around 1 ft)
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- DEP will follow up with Hilco concerning known or suspected releases attributable to PES's operations and future transmissivity testing at MW-1SRTF
- Area west of tanks SR-19 and SR-20
 - The identified LNAPL type in October 2016 was undegraded diesel or #2 fuel oil
 - In 2014, a release from a subsurface pipe located east of well S-114SRTF was observed during leaded soil excavation. The leak was repaired at the time, and surrounding wells indicated a presence of LNAPL after 2016.
 - Forensic samples collected in 2017 and 2018, respectively, indicated mixtures of degraded light and middle distillates.
 - LNAPL has not been detected in 2020 or 2021 so transmissivity testing was not performed in this area
 - DEP will follow up with Hilco concerning known or suspected releases attributable to PES's operations.
- Area east of Tank-37
 - LNAPL was observed in May 2016 in this area
 - LNAPL sample from 2019 and indicated a mixture of slightly weathered gasoline and moderately weathered middle distillate
 - Whole oil characterization scan and degree of biodegradation, the middle distillate portion of the sample was estimated to have been released approximately 4 +/- 2 years.
 - LNAPL thickness in S-122SRTF from 2019 through 2021 has ranged from 1.04 ft to 1.36 ft
 - Transmissivity testing was conducted on S-122SRTF and LNAPL transmissivity was estimated to be 1.01 ft²/day
- The extent of LNAPL is laterally delineated
- DEP will follow up with Hilco concerning known or suspected releases attributable to PES's operations.

Groundwater

- Three aquifers are identified at the site
 - A shallow perched aquifer is present in a thicker section of artificial fill above the Holocene clay unit on the eastern side of the SRTF
 - Groundwater flow is radial from the blending building area towards the property boundaries
 - The perched aquifer is not present west of 2nd Street (also the location of the Schuylkill West Side Interceptor combined sewer)
 - An unconfined aquifer exists throughout the site in the alluvium, Trenton Gravel, and PRM Upper Sand

- Groundwater elevations are depressed ($< -5'$), and reflect the pumping of the Mingo Basin on the south side which is maintained at a $-10'$ to $-11'$ water elevation
- Onsite groundwater flow is complex and inferred to the south and radially to the west and southwest
- PWD is located south of the site and Mingo Basin, and access was obtained to gauge and sample PWD wells concurrent with onsite wells.
 - Offsite PWD wells indicate groundwater flow on PWD is northwest towards Mingo Basin supporting the interpretation that pumping that occurs at Mingo Basin is acting as a groundwater capture zone and is controlling groundwater flow at the site
- The lower aquifer occurs in the PRM Lower Sand Unit
 - Groundwater flow is inferred to the south-southwest and is also influenced by pumping at Mingo Basin
- 73 active monitoring wells are present in AOI 9
 - Seven of these are deep ($70-90'$), screened entirely in the Lower Sand of the PRM.
 - One of these wells was installed in 2018 to further characterize offsite groundwater quality west of the site along Essington Avenue
 - The shallow wells are typically $15'$ deep, and they are screened either in the upper alluvium and fill, into the Trenton Gravel, or possibly the top of the Lower Sand of the PRM.
 - Four shallow wells were installed in 2018 to further characterize offsite groundwater quality west of the site along Essington Avenue.
 - Three of the new wells are on the west side of Essington Avenue and west of the Mingo Avenue Sewer
 - One well is on the east side of Essington Avenue and east of the Mingo Avenue sewer
 - The wells were gauged in 2009 and at least annually from 2015 through 2021. Sitewide sampling was conducted in 2009, 2015, and 2016, and from select wells during 8 sampling events conducted from 2017 through 2021.
 - Samples were historically analyzed for 10 VOCs, 10 SVOCs, and lead
 - Access to 15 PWD wells was obtained in 2018 and gauging and sampling of select PWD wells was conducted from 2018 through 2021
 - In 2018, TBA was added to the analysis list to evaluate the degradation of MTBE
 - In 2021, groundwater geochemistry was further evaluated through analysis of dissolved gasses, total iron, total calcium, total carbon, total inorganic carbon, total Kjeldahl nitrogen, and total alkalinity
 - Select monitoring wells in proximity to the Lower Schuylkill West Side Intercepting Sewer were also sampled for sucralose to collect data on the potential interaction between area groundwater and wastewater
 - Two wells in the lower aquifer on the southwestern portion of the property were

sampled and analyzed for MTBE compound specific isotope analysis (CSIA) to enhance understanding of the fate and transport and potential source for MTBE detected in the area

- Groundwater results in the perched and overburden aquifer onsite indicate the presence of nine COCs above SHS MSCs (benzene, ethylbenzene, 1,2,4-TMB, 1,3,5-TMB, MTBE, toluene, naphthalene, xylenes, and lead)
 - The groundwater plume in the perched aquifer appears to originate in the blending building area located in the southern portion of SRTF, and does not appear to reach the property boundary
 - A second, more extensive area of contamination is present in the overburden aquifer in the western section of the SRTF
 - This plume required offsite delineation that was conducted in 2018
 - All samples from offsite wells in the overburden aquifer met SHS MSCs from 2018 through 2021
- MTBE is the only COC above SHS MSCs in the lower aquifer onsite and extends to the southwestern property boundaries
 - The offsite lower aquifer well is considered to be hydraulically upgradient of Mingo Basin
 - Groundwater monitoring is ongoing to confirm groundwater flow direction in this area, and the results of the additional monitoring will be included in the fate and transport RIR
 - MTBE was detected in the offsite lower aquifer well at concentrations around 90 ug/l
 - Offsite MTBE concentrations are stable
 - Additional evaluation of offsite sources of MTBE in the lower aquifer are ongoing
 - EPA comments are expected to be addressed considering the ongoing evaluations and the fate and transport RIR. However, EPA Corrective Action may require additional activities.
- Impacted groundwater has the potential to infiltrate the Mingo Avenue Sewer, which discharges into Mingo Basin. Impacted groundwater could also infiltrate the Lower Schuylkill West Side Intercepting Sewer (Interceptor) and would migrate offsite to the adjacent PWD property.
 - The potential for offsite migration from groundwater into sewers will be evaluated in the Sitewide Fate and Transport RIR.

Vapor Intrusion

- Vapor intrusion was evaluated for offsite neighboring properties and determined that the offsite properties were outside of proximity distance for vapor intrusion or dissolved concentrations were below the groundwater screening levels.
- There are several occupied buildings in the SRTF
- Indoor air samples were collected in 2012, 2015, and 2016 at buildings that are not positively pressurized
 - None of the results exceeded occupational limits (such as OSHA PELs)

- There were not exceedances of applicable DEP screening values other than at the pump house.
 - Outdoor air samples were also collected at locations of potential exposure to vapors from subsurface sources. Those results did not exceed occupational limits.
- In March 2017, additional indoor air samples were collected from 5 onsite occupied buildings that are not positively pressurized. An ambient air sample was also collected at the same time
 - None of the results exceeded occupational limits (such as OSHA PELs)
 - Naphthalene was detected at concentrations above RSLs and applicable DEP screening values at four locations
 - 1,2,4-TMB was detected at concentrations above applicable DEP screening values at the same four locations where naphthalene was detected
 - 1,3,5-TMB was detected at a concentration above applicable DEP screening values
 - Ethylbenzene, toluene, naphthalene, 1,2,4-TMB, 1,3,5-TMB and total xylenes were also detected above background concentrations
 - One outdoor air sample was also collected at a location of potential exposure to vapors from subsurface sources. Those results did not exceed any occupational limits or screening levels.

Ecological Evaluation

- A PNDI review was performed in September 2015, updated in 2018, and again in 2021.
 - In 2015, there was a decision of no impacts of concern following further communications with Pennsylvania Department of Conservation and Natural Resources (DCNR) and the Fish and Boat Commission (PFBC).
 - In 2018 and 2021, US Fish and Wildlife did not identify any species of concern
 - In 2018 and 2021, PFBC identified species of concern and there was one less species in 2021 than in 2018.
 - In 2018 and 2021, the Pennsylvania Game Commission identified marsh wren and least bittern and these two species were included in the Ecological Risk Assessment previously performed in 2018 and 2019.
- An Ecological Risk Assessment is being prepared by Evergreen for AOI 1 through AOI 9 and will be submitted following approval of the Remedial Investigation reports.
 - The potential impact to these species will be evaluated in the June 2022 Ecological Risk Assessment (ERA), as required by the COA.
 - The Ecological Risk Assessment evaluates risk from site COCs to threatened species, endangered species, and species of concern identified by PNDI
 - Species evaluated in AOIs 1 through 9 include bird species (marsh wren, peregrine falcon, and least bittern), fish species (Atlantic sturgeon, shortnose sturgeon, and hickory shad), reptile species (eastern redbelly turtle) and plant species (waterhemp ragweed, eastern baccharis, Walter's barnyard-grass, multiflowered mudplantain, bugleweed, shrubby camphor-weed, and river bullrush).

Exposure Pathways

- Direct contact exposure to soil, groundwater, and/or LNAPL to the onsite worker is currently managed through HASP, PPE, and workplan/permitting protocols.
 - Groundwater and LNAPL from the perched zone have the potential for surface expressions in topographically low areas near the Blender building
- Future direct contact exposure to soil impacts will be addressed in the Cleanup Plan.
- Mingo Basin and the Schuylkill River are surface water exposure pathways. Due to near constant pumping to keep Mingo Basin at an elevation of -10.5ft, groundwater from the unconfined and lower aquifers flows toward Mingo Basin. The contaminant migration pathway includes groundwater flow from the unconfined aquifer into Mingo Basin, and upwelling of groundwater from the lower aquifer into the unconfined aquifer. Mingo Basin discharges a combination of groundwater and surface water to the Schuylkill River.
- Soil and groundwater vapor receptors include both sewers and onsite buildings.
 - The Mingo Avenue Sewer and Lower Schuylkill West Side Intercepting Sewer (interceptor) do not meet horizontal or vertical proximity distances.
 - Naphthalene indoor air concentrations exceeded the RSLs at four buildings
 - This exposure pathway will be addressed in the Cleanup Plan
- No active potable supply wells are located within a mile radius of the SRTF
- Evergreen will be required to address all potentially complete exposure pathways through the submission of a risk assessment report and/or a cleanup plan.

Site Cleanup History: 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 and was amended June 26, 2020. The site entered the One Cleanup Program with DEP and EPA on November 8, 2011.

The City of Philadelphia requested a public involvement plan in a letter dated November 3, 2006. Sunoco held an initial public meeting on September 19, 2007. Sunoco began submitting Act 2 remedial investigation reports in 2011; multiple Act 2 reports were submitted by Sunoco and Evergreen through 2017. In 2018, DEP determined that Evergreen had not fulfilled the public participation requirements of Act 2 for the reports that had been submitted and reviewed. In a meeting on November 27, 2018 with Evergreen, the City, and EPA, and in subsequent communications and meetings, DEP directed Evergreen to rectify the lack of public involvement for the 2011-2017 reports and ensure that public involvement requirements were satisfied for all future reporting. Since 2019, Evergreen has reinvigorated the public participation program for the project and submitted the public involvement remedial investigation report on March 31, 2021. DEP reviewed the report and issued a technical deficiency letter on June 29, 2021. Evergreen submitted an addendum document responding to the deficiencies which was

submitted on August 28, 2021. DEP approved the Public Involvement Remedial Investigation Report, as amended on November 24, 2021. There were comments and responses related to AOI 9 that were presented in the PIP RI, as well as additional responses included in this Second Addendum. The additional responses include references to text, figures, and tables in this report that supplement the response.

Petroleum impact is present in AOI 9 from historical operations, including releases from ASTs and pipelines. Evergreen is participating in the Act 2 program to address soil and groundwater contamination that predates 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 tank incidents associated with two regulated tanks (SR-33 and SR-59) in SRTF. A site characterization report for these tanks was received on October 30, 2009, and Remedial Investigation Report Addendum was received on February 8, 2017.

The 2017 AOI 9 RI Addendum was disapproved on April 18, 2017 due to:

- Incomplete groundwater delineation along the western property boundary, along Essington Avenue, and at the southwest property boundary to determine the extent offsite.
 - Evergreen installed four additional unconfined groundwater monitoring wells along Essington Avenue to address this deficiency, and sampling results indicate that all COCs meet applicable SHS MSCs
 - Evergreen installed one additional lower aquifer well offsite
 - MTBE was detected in the offsite lower aquifer well at concentrations around 90 ug/l
 - Offsite and onsite MTBE concentrations are stable, and offsite groundwater is not used for drinking water
- Incomplete understanding of groundwater flow and extent of groundwater contamination to assess potentially complete current and future exposure pathways.
 - An evaluation of the pumping activities and associated groundwater and surface water flow was performed on Mingo Basin to better understand groundwater flow and contaminant migration in the perched, unconfined, and lower aquifers
 - Monitoring wells located on PWD property were accessed for sampling and gauging. These gauging activities confirmed that groundwater flow is controlled by the near-constant pumping of Mingo Basin
 - Mingo Basin receives groundwater from both the SRTF and PWD properties, in addition to stormwater

DEP and EPA discussed the report and this memo incorporates and reflects EPA comments.

Discussion of Public Involvement/Public Comments

- Public comments related to SRTF that were received as part of the PIP RI comment period were present in this Second Addendum

- On November 29, 2021, DEP received Evergreen's Response to public comments
 - Evergreen reported receipt of public comments from two members of the community and from the Clean Air Council
- DEP received, reviewed, and took into consideration comments from two members of the community, as well as comments from two representatives from CAC as part of the review.
 - One message received from CAC included a petition with 54 names referenced.
- Evergreen acknowledged that concerns raised in the comment relating to the site-specific direct contact standard for lead, the groundwater fate-and-transport analysis, and the vapor intrusion pathway evaluation are the subject of ongoing work that will be addressed in future reports.
- DEP reviewed the responses to public comments and was satisfied with the responses.

DEP Final Action: The Remedial Investigation Report Second Addendum for AOI-9 Schuylkill River Tank Farm is recommended for approval.

DEP Contact: Lisa Strobridge, P.G. **Phone:** 484-250-5796

Site Contact: Tiffani Doerr, P.G., Evergreen **Phone:** 302-477-1305

Site Consultant: Colleen Costello, Sanborn, Head & Associates, Inc.
Phone: 610-984-1712

One Cleanup Program

EPA Contact: Kevin Bilash, USEPA Region III **Phone:** 215-814-2796