Lower Darby Creek Area

Darby Township, Pennsylvania

EPA Facility ID: PASFN0305521

Basin: Lower Delaware

HUC: 02040202

Executive Summary

The Lower Darby Creek Area (Lower Darby Creek) site consists of two former landfills in Darby Township, Pennsylvania. One of those landfills, the Folcroft Landfill and Annex, is located in the John Heinz National Wildlife Refuge, which is owned by the U.S. Fish and Wildlife Service and is the largest marine tidal marsh in Pennsylvania. Several creeks near the Lower Darby Creek site, including Darby Creek, contain many NOAA trust resources, and are tributaries of the Delaware River. During an environmental investigation, the USEPA determined that heavy metals, solvents, petroleum products, VOCs, PAHs, and PCBs in sediment, soil, surface water, and groundwater pose a risk to aquatic resources near the Lower Darby Creek site.

Site Background

The Lower Darby Creek Area (Lower Darby Creek) site is in an industrialized section of Darby Township (which encompasses parts of both Delaware and Philadelphia Counties) in Pennsylvania. At the Lower Darby Creek site, hazardous materials were released into several creeks including Hermesprota, Cobbs, and Darby Creeks (Figure 1) and Thoroughfare Creek (Figure 2). Lower Darby Creek flows into the Delaware River approximately 4 km (2.5 mi) downstream of the site.

When the Lower Darby Creek site was proposed for placement on the USEPA National Priorities List (NPL) the six sources of contamination identified were 1) the Folcroft Landfill and Annex, 2) the former Delaware County Incinerator #2, 3) the former Delaware County Sewage Treatment Plant, 4) the Sun Oil-Darby Creek Tank Farm, 5) the Industrial Drive Properties, and 6) the Clearview Landfill (Figure 2). However, only the Clearview Landfill and the Folcroft Landfill and Annex were included as sources of contamination when the Lower Darby Creek site was placed on the final NPL (USEPA 2001).

The Folcroft Landfill and Annex are located in the tidal marsh of the John Heinz National Wildlife Refuge (NWR), the largest tidal marsh in Pennsylvania (Figure 2). Darby Creek and Thoroughfare Creek border the Folcroft Landfill to the south and east. Hermesprota Creek flows between the Folcroft Landfill and Annex. Photographs show that trash was being dumped at the landfill as early as 1953. In 1970, refuse was found on the banks of Darby Creek, with piles of oil-soaked materials and industrial wastes, and pools of leachate in direct contact with the creek. In 1972, a drum leaking methyl ethyl ketone was found on the property. In 1973, drums labeled methyl salicylate, rholex, epoxy, and dulux skins were identified. During a 1998 area-wide sampling event, it was observed that erosion caused by surface water runoff had exposed landfill materials along the creek banks (Weston 1999).

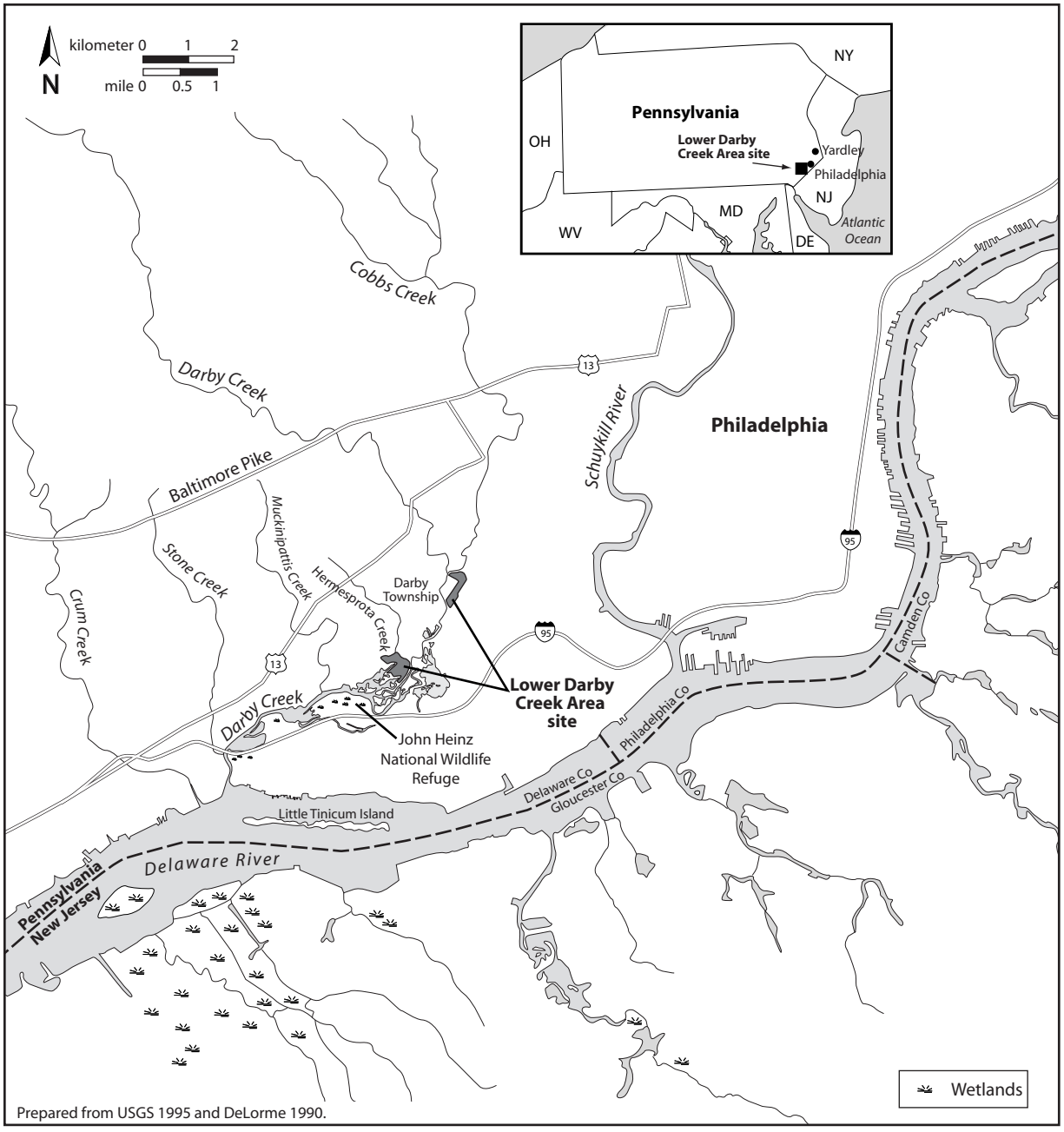

Figure 1. Location of the Lower Darby Creek Area site in Darby Township, Pennsylvania.

The Clearview Landfill forms a plateau on the east bank of Darby Creek immediately downstream of its confluence with Cobbs Creek. The landfill has been owned and operated by the Clearview Land Development Corporation since the 1950s. Originally used to dispose of municipal wastes from the city of Philadelphia and sections of Delaware County, the landfill was closed in 1973, capped with 0.6 m (2 ft) of fill material, and seeded. Erosion of the cap by surface water runoff was also observed here in 1998. The Clearview Landfill property is currently used by a trash hauling business to store trucks (Weston 2000).

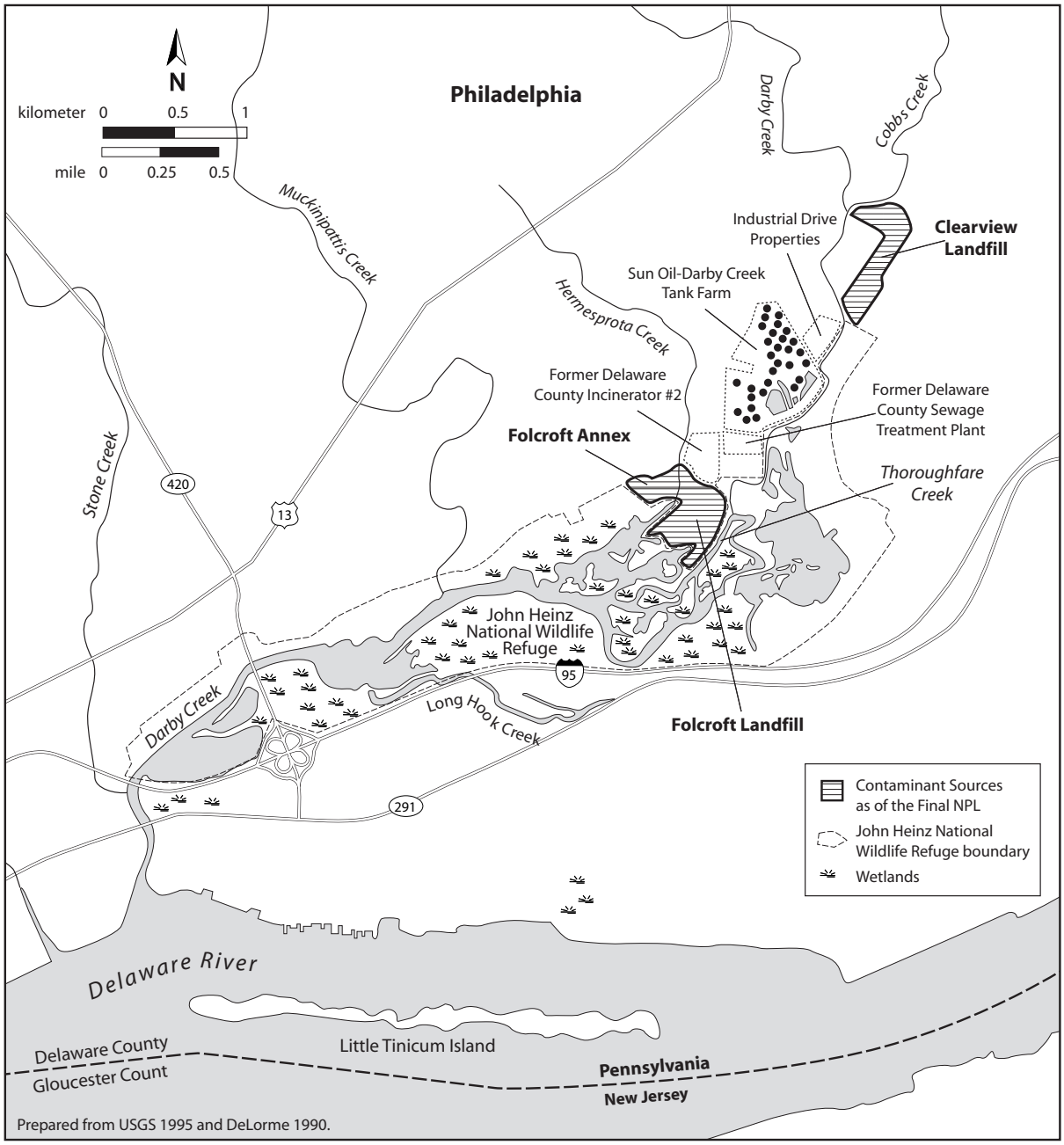

Figure 2. Detail of the Lower Darby Creek Area site.

Surface water runoff, erosion, and groundwater transport are the likely pathways for the migration of contaminants to NOAA trust resources. Gradients in the upstream reaches of Darby Creek and Cobbs Creek were estimated to be high enough to cause scouring of stream sediments. Waste deposits at the Folcroft Landfill extend below the depth at which groundwater is encountered. Beneath the Lower Darby Creek site groundwater generally flows to the southwest. The groundwater in the unconsolidated surface deposits at the site is unconfined and tidally influenced. Groundwater below the site likely discharges into Lower Darby and Hermesprota Creeks, however documentation confirming this discharge was not available at the time of this report. (Gannett 1989; Weston 1999).

A site inspection was completed at the Lower Darby Creek site in 1999 and, after a Hazard Ranking Score Package was completed in 2000, the site was placed on the NPL on June 14, 2001 (USEPA 2001). Information regarding further actions, if any, was not available at the time of this report.

NOAA Trust Resources

The NOAA trust habitats of concern are lower Darby Creek, Thoroughfare Creek, and Hermesprota Creek. Within the John Heinz NWR, Darby Creek ranges from 23 to 76 m (75 to 250 ft) in width and has an average low-tide depth of 1.8 m (6 ft). Years of industrialization and urbanization have reduced the tidal marsh from 230 km2 (5,700 acres) to less than 1.4 km2 (350 acres) (Gannett 1989). Tidal influence in Darby Creek extends to the confluence of Darby and Cobbs Creeks. Lower Darby Creek is free flowing; no dams are present to block the migration of anadromous fish (Tibbott 2002).

The John Heinz NWR is Pennsylvania's largest freshwater fish habitat. The estuarine habitat consists of supratidal and intertidal zones that support a wide range of aquatic species (Kaufmann 2002), many of which are NOAA trust resources (Table 1). Many juvenile fish are found in Darby Creek, including alewife, blueback herring, striped bass, and white perch (Weston 2000). Darby Creek is a spawning area, juvenile rearing, and adult habitat for the anadromous gizzard shad and white perch. Several estuarine species, including banded killifish, hogchoker, and mummichog, spend their entire lives in Darby Creek. None of the NOAA trust resources in Darby Creek are listed as federal or state threatened or endangered species. The red-bellied turtle, which is not a NOAA trust resource but is a state and federally listed threatened species, is present in Darby Creek (Kaufmann 2002).

The Pennsylvania Department of Environmental Protection (PADEP) has designated five creeks in the area as warm-water fisheries; as such, they have protected water-use status (Weston 1999). There are no commercial fisheries in Darby Creek. Recreational fishing occurs in Lower Darby Creek, Hermesprota Creek, and Thoroughfare Creek. Recreational fishers do not target particular fish species, although white perch and striped bass are the most abundantly fished of the NOAA trust resources (Kaufmann 2002).

A fish consumption advisory is in effect for the Delaware River and its tributaries downstream of Yardley, Pennsylvania, to the Delaware state line. This advisory recommends limited consumption of white perch, striped bass, carp, and channel catfish and recommends against consumption of American eel (PADEP 2002).

Site-Related Contamination

Elevated concentrations of inorganic compounds, polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PAHs) were detected at the Lower Darby Creek site. Extensive sediment, soil, surface water, and groundwater sampling has been conducted at the Clearview Landfill, at the Folcroft Landfill and Annex, and in the surrounding surface waters. All media collected at the Lower Darby Creek site were analyzed for inorganic compounds, semivolatile organic compounds (SVOCs) including PAHs, volatile organic compounds (VOCs), pesticides, and PCBs. The maximum concentrations of selected contaminants of concern are summarized in Table 2.

Table 1. NOAA trust resources present in the vicinity of the Lower Darby Creek Area site (Gannett 1989; Kaufmann 2002)

Species		Habitat Use			Fisheries	
Common Name	Scientific Name	Spawning Area	Nursery Ground	Adult Forage	Comm.	Recr.
ANADROMOUS FISH						
Alewife	*Alosa pseudoharengus*	◆	◆			◆
Blueback herring	*Alosa aestivalis*	◆	◆			◆
Gizzard shad	*Dorosoma cepedianum*	◆	◆	◆		◆
Striped bass	*Morone saxatilis*		◆	◆		◆
White perch	*Morone americana*	◆	◆	◆		◆
MARINE/ESTUARINE FISH						
Atlantic menhaden	*Brevoortia tyrannus*			◆		
Banded killifish	*Fundulus diaphanus*	◆	◆	◆		◆
Hogchoker	*Trinectes masculatus*	◆	◆	◆		◆
Mummichog	*Fundulus heteroclitus*	◆	◆	◆		◆
Spot croaker	*Leiostomus xanthurus*			◆		◆
CATADROMOUS FISH						
American eel	*Anguilla rostrata*			◆		◆
INVERTEBRATES						
Asiatic clam	*Corbicula fluminea*	◆	◆	◆		◆
Blue crab	*Callinectes sapidus*			◆		◆
Grass shrimp	*Palaemonetes pugio*	◆	◆	◆		◆

Inorganic compounds, PAHs, pesticides, and PCBs were detected in soil from the Lower Darby Creek site. Maximum concentrations of cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc were detected in soil from the Clearview Landfill. The maximum concentrations of arsenic and silver were detected in soil samples from the Folcroft Landfill. Cadmium, copper, lead, and silver were detected at concentrations that exceeded the average concentrations found in U.S. soil (mean U.S. soil concentrations) by two orders of magnitude. Maximum PAH concentrations in soil samples ranged from 0.088 mg/kg (acenaphthylene) to 16 mg/kg (2-methylnaphthalene), in soil collected from throughout the Lower Darby Creek site. No mean U.S. soil concentrations are available for comparison to the maximum concentrations of PAHs detected in soil samples. The pesticides DDD, DDE, DDT, and dieldrin were detected in soil samples, as were Aroclor 1254 and 1260. No mean U.S. soil concentrations exist for comparison to the maximum concentrations of pesticides and PCBs detected in soil samples.

Metals and PAHs were detected in both groundwater and surface water samples. Maximum concentrations of eight metals were detected in a single groundwater sample from the Clearview Landfill. Copper, lead, mercury, nickel, and zinc were all detected in groundwater samples at concentrations exceeding the saltwater ambient water quality criteria (AWQC) by at least one order of magnitude. PAHs were detected in groundwater samples at maximum concentrations ranging from 1 ug/L (chrysene and benz(a)anthracene) to 32 ug/L (naphthalene). No groundwater samples from the Lower Darby Creek site had concentrations of PAHs in excess of the AWQC.

Table 2. Maximum concentrations of contaminants of concern in environmental media from the Lower Darby Creek Area site (Gannett 1989; Weston 1999; Weston 2000).

	Soil (mg/kg)		Water (µg/L)			Sediment (mg/kg)	
Contaminant	Soil	Mean U.S.[a]	Ground-water	Surface Water	AWQC[b]	Sediment	ERL[c]
INORGANIC COMPOUNDS							
Arsenic	51	5.2	170	10	36	51	8.2
Cadmium	13	0.06	21	16	9.3	3.7	1.2
Chromium[j]	150	37	390	140	50	120	81
Copper	5,500	17	580	180	3.1	130	34
Cyanide, free	2	NA	79	94	1	1.5	NA
Lead	3,000	16	2,100	240	8.1	640	46.7
Mercury	3.2	0.058	3	0.2	0.094[d]	1.6	0.15
Nickel	630	13	270	70	8.2	130	20.9
Selenium	130	NA	<4	<3	71	5.7	1.0[g]
Silver	13	0.05	3	18	0.95[e]	4.8	1
Zinc	3,400	48	3,100	260	81	810	150
PAHs							
Acenaphthene	1.2	NA	19	<10	710[f]	1.7	0.016
Acenaphthylene	0.088	NA	6	ND	300[e,f,i]	0.42	0.044
Anthracene	2.2	NA	3	ND	300[e,f,i]	5	0.0853
Benz(a)anthracene	3.6	NA	1	<10	300[e,f,i]	14	0.261
Chrysene	4.3	NA	1	<10	300[e,f,I]	13	0.384
Dibenz(a,h)anthracene	0.77	NA	ND	ND	300[e,f,i]	2.9	0.0634
Fluoranthene	11	NA	4	<10	16[f]	27	0.6
Fluorene	2.3	NA	16	<10	NA	3.4	0.019
2-Methylnaphthalene	16	NA	8	<10	300[e,f,i]	0.1	0.07
Naphthalene	7.9	NA	32	36	2350[e,f]	0.73	0.16
Phenanthrene	12	NA	29	<10	NA	23	0.24
Pyrene	8.3	NA	3	<10	300[e,f,i]	24	0.665
PESTICIDES/PCBs							
DDD	0.049	NA	ND	ND	NA	0.16	0.002
DDE	4.2	NA	ND	ND	NA	0.025	0.0022
DDT	0.24	NA	ND	ND	0.001	0.048	0.00158[h]
Dieldrin	0.17	NA	ND	ND	0.0019	0.12	0.00002
Aroclor-1254[k]	1.2	NA	2.5	ND	0.03	0.29	0.0227
Aroclor-1260[k]	3	NA	0.79	ND	0.03	0.44	0.0227

a: Shacklette and Boerngen (1984), except for cadmium and silver, which represent average concentrations in the earth's crust from Lindsay (1979).

b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 1993). Marine chronic criteria presented.

c: Effects Range-Low represents the 10th percentile for the dataset in which effects were observed or predicted in studies compiled by Long et al. (1998).

d: Derived from inorganics but applied to total.

e: Chronic criterion not available; acute criterion presented.

f: Lowest Observable Effect Level (LOEL).

g: Marine Apparent Effects Threshold (AET) for amphipod bioassay. The AET represents the concentration above which adverse biological impacts would be expected.

h: Expressed as Total DDT.

i: Value for chemical class

j: Screening guidelines represent concentrations for $Cr.^{+6}$

k: Screening guideline is for total PCBs as aroclors.

ND: Not detected; detection limit not available.

NA: Screening guidelines not available.

Copper, cyanide, lead, and silver were all detected in surface water samples from Darby Creek at concentrations that exceeded the AWQC by one order of magnitude. The one PAH detected in surface water, naphthalene, was at a maximum concentration below the AWQC.

Inorganic compounds, PAHs, pesticides, and PCBs were detected at elevated concentrations in sediment samples from the Lower Darby Creek site. Lead and mercury were detected at concentrations that exceeded the screening guidelines by an order of magnitude (Table 2). Maximum concentrations of lead, selenium, and zinc were detected in sediment collected from Hermesprota Creek near the Folcroft Landfill and Annex. Maximum concentrations of cadmium, chromium, copper, and cyanide were detected in sediment from Darby Creek. Maximum concentrations of eight PAHs were detected in sediment collected near the Clearview Landfill at concentrations that exceeded the screening guidelines by an order of magnitude. Several pesticides, including DDD, DDE, DDT, and dieldrin, were detected in sediment samples at concentrations that exceeded the screening guidelines by at least one order of magnitude. PCB Aroclors 1254 and 1260 were detected in sediment from Darby Creek at maximum concentrations that exceeded the screening guidelines by an order of magnitude.

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