Palmer Barge Line

Port Arthur, TX

EPA Facility ID: TXD068104561

Basin: Sabine Lake

HUC: 12040201

Executive Summary

The Palmer Barge Line site is on an islet in Sabine Lake, near Port Arthur, Texas, approximately 0.8 km (0.5 mi) southwest of the Neches River. The Palmer Barge Line property was the site of marine vessel service and associated maintenance activities from 1982 to 1996. Metals, PAHs, PCBs, and pesticides have been detected in groundwater, sediment, and soil at the site. Metals are the primary contaminants of concern to NOAA. The habitats of concern to NOAA are the estuarine surface waters, associated wetlands, and sediments of the lower Neches River and Sabine Lake, which provide valuable spawning, rearing, and foraging habitat for several species of anadromous and estuarine fish and shellfish. Surface water runoff and groundwater discharge are the primary pathways for the migration of contaminants from the site to NOAA trust resources.

Site Background

The Palmer Barge Line (Palmer) site is in an industrial area of Port Arthur, Texas, on the Southeast Industrial Islet in Sabine Lake. The islet is approximately 0.8 km (0.5 mi) southwest of the confluence of the Neches River and Sabine Lake. The site is approximately 7 ha (17 acres) in area and is bordered to the north by the mouth of the Neches River and to the east, south, and west by Sabine Lake (Figure 1).

In 1982, Palmer Barge Line, Inc., purchased the property from the City of Port Arthur. From 1982 to 1996, the Palmer site operated as a marine vessel service and maintenance facility. In 1997, the property changed ownership and marine vessel service and maintenance activities ceased. Currently, marine salvage operations and vehicle parking are the only activities that occur at the site (USEPA 2000).

While in operation, the Palmer facility performed cleaning, degassing, maintenance, and inspection of barges and marine equipment. Cleaning operations included the removal of sludge and other residuals from holds, engines, and boilers by pressure-steaming them. Engines were also degreased and slop tanks were vacuumed to remove residuals of oil spilled during the loading and unloading of barges. Degassing also took place, involving the removal of explosive vapors from barge holds using nitrogen or boiler exhaust (USEPA 2000).

During a reconnaissance visit to the Palmer site, several potential sources of contamination were identified. Aboveground storage tanks (ASTs) were observed at several locations on the site. It is speculated that the ASTs were used to store bulk waste, petroleum products, and fresh water. Stained soils were observed in the vicinity of several of the ASTs. Several other types of storage containers, including open-top slop tanks and roll-off boxes, were also found at the site (Figure 2). Used oil was stored in the open-top slop tanks. Stained soils were also observed surrounding a flare used to burn excess gasses. In addition, several 210-liter (55-gallon) drums, compressed gas cylinders, and paint cans and buckets were observed on the Palmer site (USEPA 2000).

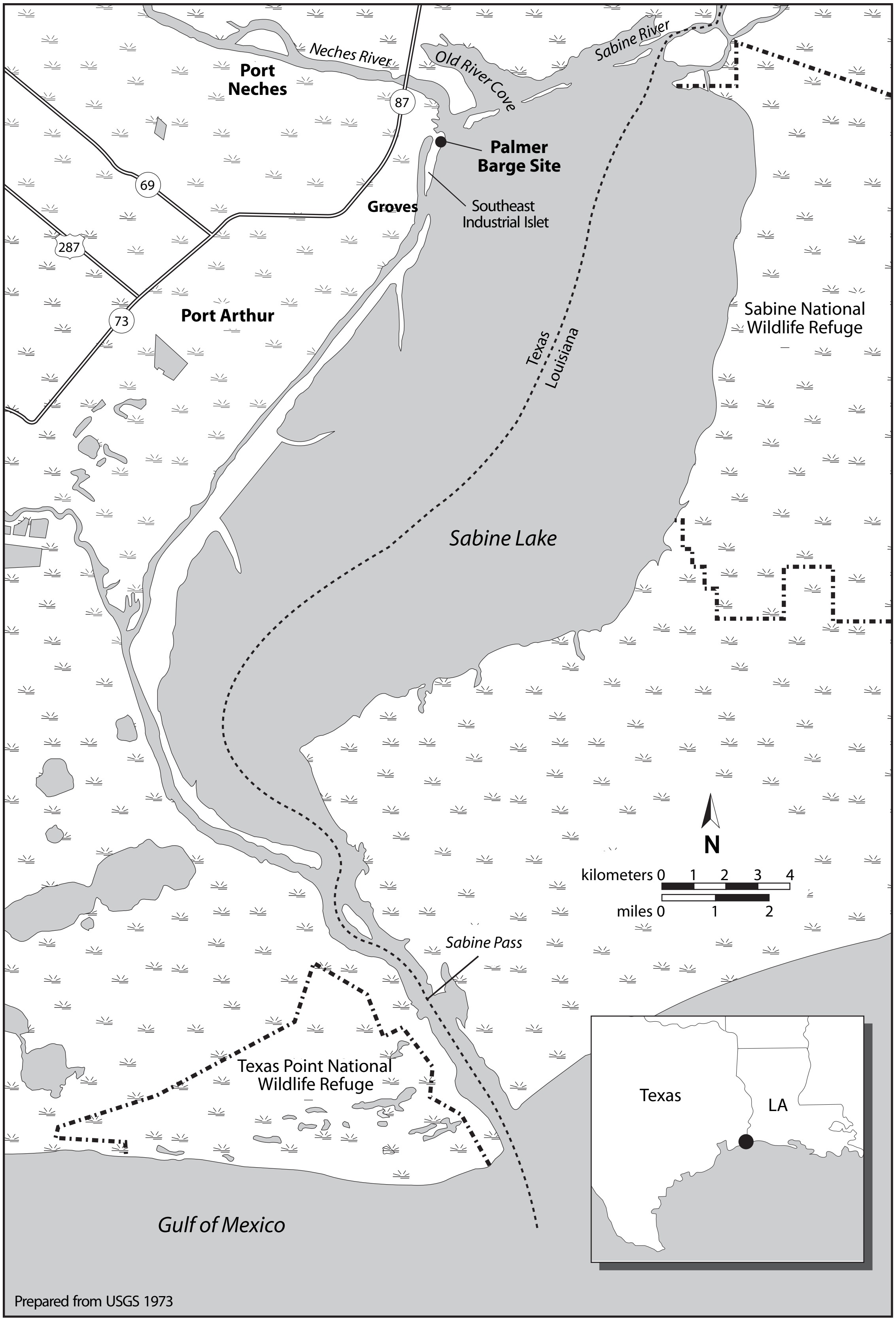

Figure 1. Location of the Palmer Barge Line, Inc. site, Port Arthur, Texas.

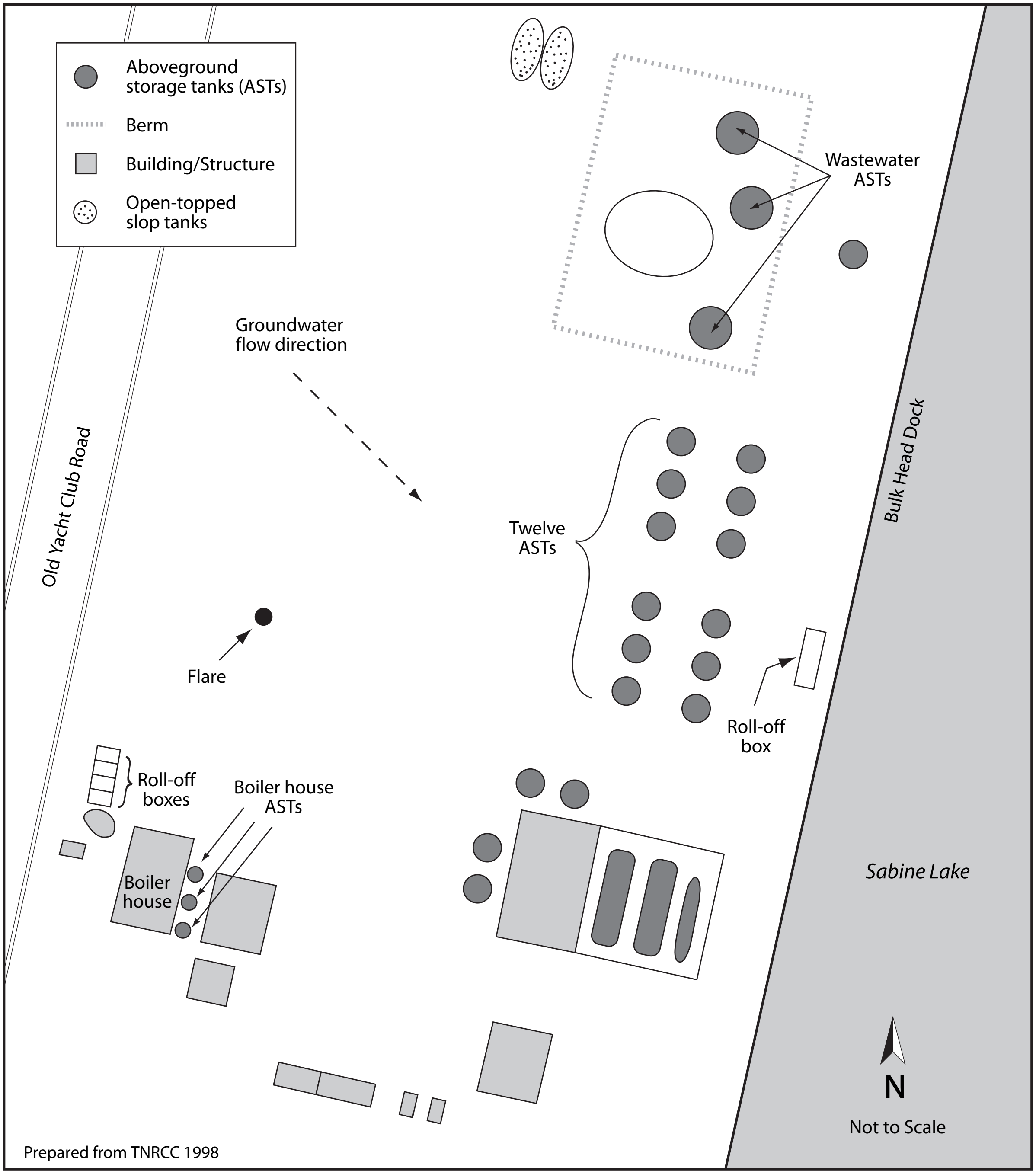

Figure 2. Detail of the Palmer Barge Line, Inc. property.

Contamination at the Palmer site was documented through the completion of a preliminary assessment/screening site inspection in 1998 and an expanded site investigation in 2000. In July 2000, the site was placed on the National Priorities List (USEPA 2004) based on evidence that metals had migrated from the site into Sabine Lake (USEPA 2000). Site work for a remedial investigation/feasibility study (RI/FS) began in fall 2002. Information on the current status of the RI/FS was not available at the time this report was prepared (USEPA 2004).

Surface water runoff and groundwater discharge are the primary pathways for the migration of contaminants from the site to NOAA trust resources. The Palmer site lies within the 100-year floodplain of the tidally influenced Sabine Lake. Runoff at the site drains in an easterly direction and discharges directly into Sabine Lake. On a regional scale, the groundwater below the site moves southeast toward the Gulf of Mexico. The depth to groundwater at the site is approximately 1 m (3 ft) below ground surface (USEPA 2000).

NOAA Trust Resources

The NOAA habitats of concern are the estuarine surface waters, associated wetlands, and sediments of the lower Neches River and Sabine Lake. Sabine Lake is connected to the Gulf of Mexico by a 10 km (6.2 mi) channel called Sabine Pass. Numerous NOAA trust resources, both fish and invertebrate species (Table 1), use the estuary for spawning, rearing, and foraging (Nelson et al. 1991). Of the major estuaries in Texas, Sabine Lake has the largest freshwater inflow. Combined inflow from the Sabine and Neches Rivers results in a low average salinity of 2.3 parts per thousand in Sabine Lake (Stelly 2000).

Nearly 14,000 ha (35,000 acres) of vegetated wetlands dominated by saltgrass (*Distichlis spicata*) and cordgrass (*Spartina* spp.) border the estuary. The Texas Point National Wildlife Refuge, the largest salt marsh bordering the estuary, is to the west of the Sabine Pass Ship Channel (Stelly 2000). Smaller marshes occur along the Sabine and Neches Rivers at the head of the estuary (Armstrong 1987). Most of the salt marsh to the east of the estuary has been designated a National Wildlife Refuge (USFWS 1998).

Sabine Lake and the lower Neches River provide adult foraging, juvenile nursery, migratory, and spawning habitat to numerous fish species. The anadromous gizzard shad uses Sabine Lake as a migratory corridor to the Sabine and Neches Rivers during spring spawning runs. Small estuarine fish such as bay anchovy, gulf killifish, hardhead catfish, sheepshead minnow, and silversides spend their entire lives within the estuary. Adult Atlantic croaker, sheepshead, southern flounder, spot, and striped mullet are present in the estuary seasonally. Many other species spawn in more saline waters, but use the estuary as a juvenile nursery (Patillo et al. 1997).

Blue crab are abundant in Sabine Lake and the lower Neches River as both adults and juveniles. Adult males remain in the estuary after mating, while females usually return to more saline water to brood eggs. Larvae are released offshore and are subsequently transported back into estuaries, where they settle to the bottom. Grass shrimp are common in Sabine Lake, typically spending their entire lives in the estuary, where they prefer salt marsh and oyster reef habitats. Brown and white shrimp are also abundant in Sabine Lake and the lower Neches River, although spawning occurs offshore. The most abundant bivalve species is the common rangia, followed by eastern oyster. All oyster and rangia life stages are present within the estuary (Nelson et al. 1991; Patillo et al. 1997).

Both recreational and commercial fisheries occur in Sabine Lake and the lower Neches River (Table 1). Commercial fisheries in Sabine Lake and the lower Neches River include blue crab and white shrimp. Recreational fisheries include blue crab, spotted sea trout, southern flounder, and red and black drum. No health advisories or restrictions on fishing or consumption have been issued for the lower Neches River or Sabine Lake (TDSHS 2002).

Table 1. NOAA trust resources present in Sabine Lake and the Lower Neches River (Stelly 2000).

Species		**Habitat Use**			**Fisheries**	
Common Name	Scientific Name	Spawning Area	Nursery Area	Adult Habitat	Comm.	Rec.
ANADROMOUS FISH						
Gizzard shad	*Dorosoma cepedianum*		◆			
MARINE/ESTUARINE FISH						
Atlantic croaker	*Micropogonias undulatus*		◆	◆		◆
Bay anchovy	*Anchoa mitchilli*	◆	◆	◆		
Black drum	*Pogonias cromis*		◆	◆		◆
Gulf killifish	*Fundulus grandis*	◆	◆	◆		
Gulf menhaden	*Brevoortia patronus*		◆			
Hardhead catfish	*Arius felis*	◆	◆	◆		
Pinfish	*Lagodon rhomboides*		◆	◆		
Red drum	*Sciaenops ocellatus*		◆			◆
Sheepshead	*Archosargus probatocephalus*		◆	◆		◆
Sheepshead minnow	*Cyprinodon variegatus*	◆	◆	◆		
Silver perch	*Bairdiella chrysoura*		◆	◆		
Silversides	*Menidia spp.*	◆	◆	◆		
Southern flounder	*Paralichthys lethostigma*		◆	◆		◆
Spot	*Leiostomus xanthurus*		◆	◆		◆
Spotted seatrout	*Cynoscion nebulosus*		◆	◆		◆
Striped mullet	*Mugil cephalus*		◆	◆		◆
INVERTEBRATES						
Blue crab	*Callinectes sapidus*	◆	◆	◆	◆	◆
Brown shrimp	*Farfante penaeus aztecus*		◆	◆	◆	◆
Eastern oyster	*Crassostrea virginica*	◆	◆	◆		◆
Grass shrimp	*Palaemonetes pugio*	◆	◆	◆		
Rangia	*Rangia cuneata*	◆	◆	◆		◆
White shrimp	*Litopenaeus setiferus*		◆	◆	◆	◆

Site-Related Contamination

The primary contaminants of concern to NOAA are metals. Groundwater, sediment, and soil samples were collected during the 2000 expanded site investigation. The samples were analyzed for metals; semivolatile organic compounds, including polycyclic aromatic hydrocarbons (PAHs) and phenols; volatile organic compounds; and pesticides and polychlorinated biphenyls (PCBs). Thirty-eight soil samples were collected from areas surrounding several groups of ASTs, the open-top slop tanks, and the flare (Figure 2). Sediment samples were collected from 17 sampling locations in Sabine Lake. Two groundwater samples were collected, one downgradient of the wastewater ASTs and one downgradient of the 12 ASTs (Figure 2).

Table 2 summarizes maximum contaminant concentrations detected during the site investigations and compares them to appropriate screening guidelines. The screening guidelines are the ambient water quality criteria (AWQC) for groundwater, the effects range-low (ERL) for sediment, and the Oak Ridge National Laboratory final preliminary remediation goals (ORNL-PRGs) and the U.S. Environmental Protection Agency's (USEPA) ecological soil screening guidelines for soil, with exceptions as noted on Table 2. Only maximum concentrations that exceeded relevant screening guidelines are discussed below.

Groundwater

Metals were detected in groundwater samples collected from a monitoring well downgradient of the 12 ASTs at maximum concentrations in excess of the AWQC. The maximum concentration of lead exceeded the AWQC by two orders of magnitude. Maximum concentrations of mercury and zinc exceeded the AWQCs by one order of magnitude, while the maximum concentration of nickel exceeded the AWQC by a factor of approximately eight. The maximum concentrations of arsenic and chromium slightly exceeded the AWQC. Cadmium and the pesticide 4,4'-DDD were also detected, but at concentrations below the AWQCs.

Sediment

Metals, anthracene (a PAH compound), and PCBs were detected in sediment samples taken from Sabine Lake at maximum concentrations in excess of the ERLs. Maximum concentrations of arsenic, lead, nickel, selenium, and zinc slightly exceeded the ERLs. Chromium and silver were also detected, but at concentrations below the AWQCs. Anthracene and PCBs were detected at maximum concentrations that exceeded the ERLs by one order of magnitude. The pesticide heptachlor epoxide was also detected, but no ERL is available for comparison to the maximum concentration of heptachlor epoxide.

Soil

Metals, PAHs, pentachlorophenol (PCP), pesticides, and PCBs were detected in soil samples collected from throughout the site at maximum concentrations in excess of screening guidelines. The maximum concentrations of metals were detected in soil samples taken in the vicinity of the boiler house ASTs. The maximum concentration of mercury exceeded the ORNL-PRG by three orders of magnitude, while the maximum concentrations of chromium, lead, and zinc exceeded the ORNL-PRGs by two orders of magnitude. The maximum concentration of cadmium exceeded the USEPA ecological soil screening guideline by one order of magnitude, and the maximum concentrations of copper and selenium exceeded the ORNL-PRGs by one order of magnitude. The maximum concentration of arsenic exceeded the ORNL-PRG by a factor of approximately eight. Maximum concentrations of nickel and silver exceeded the ORNL-PRGs by a factor of four.

PAHs were detected in soil samples taken near the open-top slop tanks and the wastewater ASTs at maximum concentrations that ranged from 110 mg/kg to 1,300 mg/kg. The maximum concentration of acenaphthene exceeded the ORNL-PRG by a factor of eight. No ORNL-PRGs or USEPA ecological soil screening guidelines are available for comparison to the maximum concentrations of other detected PAHs. The maximum concentration of PCP exceeded the ORNL-PRG by two orders of magnitude.

Pesticides were detected in soil samples taken throughout the site. The maximum concentration of dieldrin, which exceeded the USEPA ecological soil screening guideline by two orders of magnitude, was detected in a sample collected near the boiler house ASTs. No ORNL-PRGs or USEPA ecological soil screening guidelines are available for comparison to the maximum concentrations of other detected pesticides. PCBs were detected in a sample collected in the vicinity of the flare at a maximum concentration that exceeded the ORNL-PRG by less than a factor of two.

Table 2. Maximum concentrations of contaminants of concern to NOAA detected in samples at the Palmer Barge Line site, Port Arthur, Texas (Weston 2000). Contaminant values in bold exceeded screening guidelines.

	Soil (mg/kg)		Water (µg/L)		Sediment (mg/kg)	
Contaminant	Soil	ORNL-PRG[a]	Groundwater	AWQC[b]	Sediment	ERL[c]
METALS/INORGANICS						
Arsenic	**87**	9.9	**46**	36	**12**	8.2
Cadmium	**13**	0.38[d]	1.9	8.8	ND	1.2
Chromium[e]	**150**	0.4	**70**	50	31	81
Copper	**4,300**	60	ND	3.1	ND	34
Lead	**5,100**	40.5	**1,000**	8.1	**61**	46.7
Mercury	**3.3**	0.00051	**1.1**	0.094[f]	ND	0.15
Nickel	**130**	30	**71**	8.2	**28**	20.9
Selenium	**3.3**	0.21	ND	71	**1.2**	1.0[g]
Silver	**8**	2	ND	1.9[h]	0.75	1
Zinc	**7,100**	8.5	**2,500**	81	**210**	150
PAHs						
Acenaphthene	**170**	20	ND	710[i]	ND	0.016
Acenaphthylene	140	NA	ND	300[h,i,j]	ND	0.044
Anthracene	240	NA	ND	300[h,i,j]	**0.96**	0.0853
Benz(a)anthracene	280	NA	ND	300[h,i,j]	ND	0.261
Chrysene	330	NA	ND	300[h,i,j]	ND	0.384
Dibenz(a,h)anthracene	110	NA	ND	300[h,i,j]	ND	0.0634
Fluoranthene	520	NA	ND	16[i]	ND	0.6
Fluorene	360	NA	ND	300[h,i,j]	ND	0.019
2-Methylnaphthalene	1,300	NA	ND	300[h,i,j]	ND	0.07
Naphthalene	530	NA	ND	2350[h,i]	ND	0.16
Phenanthrene	1,300	NA	ND	NA	ND	0.24
Pyrene	480	NA	ND	300[h,i,j]	ND	0.665
PHENOLS						
Pentachlorophenol	**570**	3	ND	7.9	ND	0.017[g]
PESTICIDES/PCBs						
Aldrin	0.03	NA	ND	1.3[h]	ND	0.0095[g]
4,4′-DDD	0.12	NA	0.14	3.6[h,i]	ND	0.002
Dieldrin	**0.03**	0.000032[d]	ND	0.0019	ND	0.00002
Endrin	0.04	NA	ND	0.0023	ND	NA
Heptachlor	1	NA	ND	0.0036	ND	0.0003[g]
Heptachlor Epoxide	0.04	NA	ND	0.0036	0.01	NA
Total PCBs	**0.64**	0.371	ND	0.03	**0.27**	0.0227

a: Oak Ridge National Laboratory (ORNL) final preliminary remediation goals (PRG) for ecological endpoints (Efroymson et al. 1997).
b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 2002). Marine chronic criteria presented.
c: Effects range-low (ERL) represents the 10th percentile for the dataset in which effects were observed or predicted in studies compiled by Long et al. (1998).
d: Ecological soil screening guidelines (USEPA 2005).
e: Screening guidelines represent concentrations for Cr^{+6}.
f: Derived from inorganic, but applied to total mercury.
g: Marine apparent effects threshold (AET) for bioassays. The AET represents the concentration above which adverse biological impacts would be expected.
h: Chronic criterion not available; acute criterion presented.
i: Lowest Observable Effect Level (LOEL) (USEPA 1986).
j: Value for chemical class.
NA: Screening guidelines not available.
ND: Not detected.

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