
Naval Amphibious Base Little Creek

Virginia Beach, Virginia

EPA Facility ID: VA5170022482

Basin: Lynnhaven-Poquoson

HUC: 02080108

Executive Summary

Naval Amphibious Base Little Creek is a Federal facility on Chesapeake Bay, commissioned in 1945 to provide operational support to Naval ships. Seven separate sites consisting of four landfills, a plating shop, laundry facility, and a pentachlorophenol-treating area have been identified on the facility. Landfilling of industrial wastes; boat maintenance, sandblasting, painting, and repair; and electroplating are among the activities that took place on the facility. Trace elements and PAHs have been detected in soils, groundwater, and sediments of Little Creek Cove at concentrations that exceed screening guidelines. Sampling has not been expanded to include Chesapeake Bay, which contains numerous NOAA trust fish and invertebrate species. There are also commercial and recreational fisheries in the bay, although shellfishing is restricted along the beaches of the facility.

Site Background

The Naval Amphibious Base (NAB) Little Creek facility occupies approximately 870 ha (2,150 acres) in Virginia Beach, Virginia, on the shore of Chesapeake Bay and Little Creek Cove, a developed inlet of the Bay (Figure 1). The base was commissioned in 1945 and provides operational support services to homeported ships. Specific operations at the Little Creek facility include vehicle and boat maintenance, boat painting and sandblasting, construction and repair of buildings and piers, mixing and application of pesticides, electroplating of musical instruments, laundry and dry cleaning, medical and dental treatment, and generation of steam for heat. Industrial wastes were landfilled on the facility (USEPA 2000).

Seven sites have been identified by the U.S. Environmental Protection Agency (Figure 2):

- Site 7. Naval Amphibious Base Landfill
- Site 8. Demolition Debris Landfill
- Site 9. Driving Range Landfill
- Site 10. Sewage Treatment Plant Landfill
- Site 11. School of Music Plating Shop Contaminated Soil and Debris/ Neutralization Tank
- Site 12. Exchange Laundry Waste Disposal Area
- Site 13. Pentachlorophenol (PCP) Dip Tank and Wash Rack Area

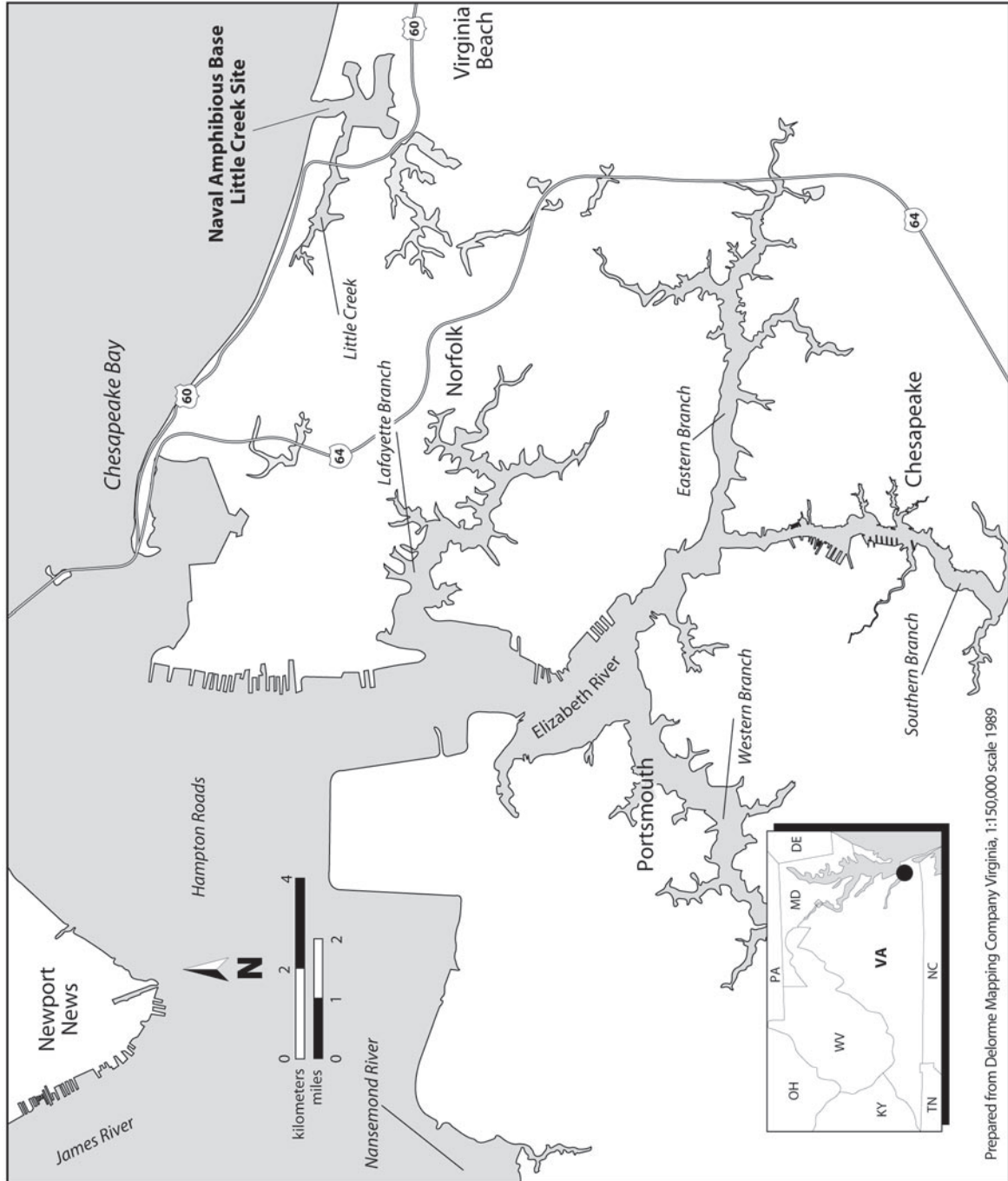


Figure 1. Location of the Naval Amphibious Base Little Creek Facility Site in Virginia Beach, Virginia.

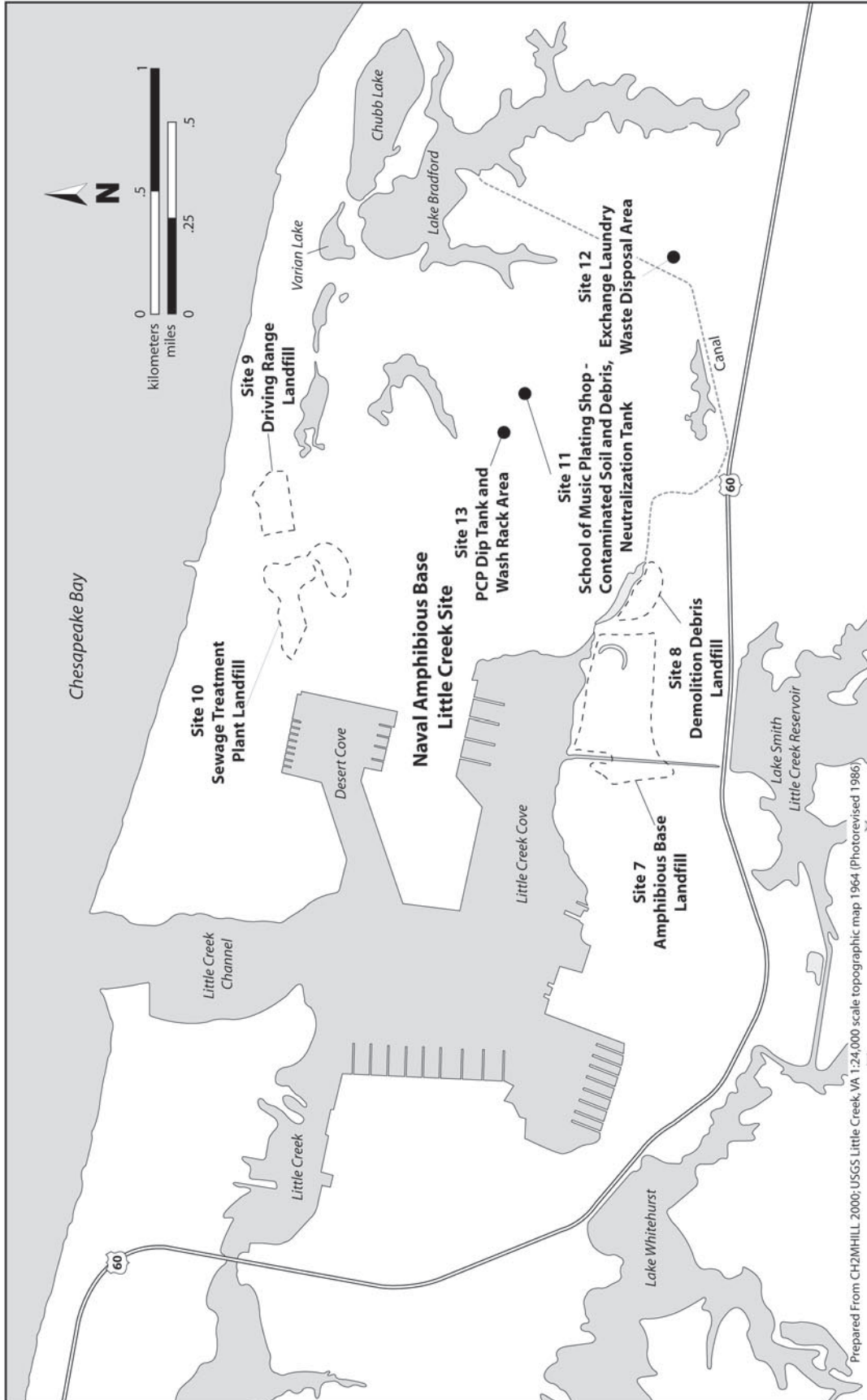


Figure 2. Location of source areas on Naval Amphibious Base Little Creek Site.

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Table 1 describes these sites. Groundwater, surface runoff, and storm sewer discharges provide pathways for the off-site transport of contamination. Groundwater is shallow, ranging from <1 m (3 ft) bgs at the Amphibious Base Landfill to approximately 2.5 m (8 ft) bgs in more central areas of the base. Because much of the base is covered with concrete, most surface runoff enters the storm sewer system and discharges to a canal that traverses the southern portion of the base. Specific pathways for individual sites include groundwater discharges to Little Creek Cove and Chesapeake Bay from the four landfills, and stormwater discharges to the canal from the Exchange Laundry, PCP Dip Tank, and Music Plating Shop (CH2M Hill 2000).

Table 1. Source areas on the NAB Little Creek facility (CH2M Hill 2000).

Site Name	Size	Dates Used	Description	Contaminants of Concern
Site 7 Amphibious Base Landfill	15 ha (37 acres)	1962-1979	Solid wastes, waste oils, and metal debris are suspected of disposal. Originally an arm of Little Creek Cove that was filled with dredge spoils.	-Trace elements -PAHs
Site 8 Demolition Debris Landfill	0.8 ha (2 acres)	1971-1979	Landfill accepted construction and demolition debris. Located on the lower portion of the canal before discharging to Little Creek Cove.	-Trace elements -PAHs
Site 9 Driving Range Landfill	2.4 ha (6 acres)	1952-1956	Landfill accepted mostly non-hazardous waste and incinerator ash. Located 150 m (500 ft) south of Chesapeake Bay.	-Trace elements -PAHs
Site 10 Sewage Treatment Plant Landfill	Unknown	1941-1968	Landfill accepted solid wastes, sewage sludge, industrial wastes, and demolition debris. Located 250 m (800 ft) south of Chesapeake Bay.	-Trace elements
Site 11. Music Plating Shop Contaminated Soil and Debris/ Neutralization Tank	Unknown	1964-1974	The plating shop used silver cyanide, copper cyanide, chromic acid, nickel plating baths, and various acids. A neutralization tank received plating wastes that eventually discharged to the storm sewer system, which itself eventually discharged to the canal leading to Little Creek Cove. Located in the east-central portion of the base about 1.2 km (0.7 mi) from the bay and Little Creek Cove.	-Trace elements
Site 12 Exchange Laundry	Unknown	Before 1987	A drycleaning facility that discharged dry-cleaning wastes to a storm sewer that, in turn, discharged to the canal leading to Little Creek Cove. Next to the canal on the southeast portion of the facility.	-Trace elements -VOCs
Site 13 PCP Dip Tank and Wash Rack Area	Unknown	Before 1975	A PCP wood treatment facility operated at this location. PCP-contaminated soils were excavated to a depth of 1.8 to 2.4 m (6 to 8 ft) in 1999. Located near the center of the base about 1 km (0.6 mi) from the bay.	- PCP -Trace elements -VOCs

The U.S. Environmental Protection Agency listed NAB Little Creek on the National Priorities List in May 1999 (USEPA 2000). Remedial investigations have been completed for all of the sites except Site 8, for which a Site Inspection has been completed (CH2M Hill 2000).

Table 2. Fish and invertebrate species present near the NAB Little Creek facility (Stone et al. 1994).

Species		Habitat Use			Fisheries	
		Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
Common Name	Scientific Name					
MARINE/ESTUARINE FISH						
Atlantic croaker	<i>Micropogonias undulatus</i>		◆	◆		◆
Atlantic herring	<i>Clupea harengus</i>		◆	◆		
Atlantic menhaden	<i>Brevoortia tyrannus</i>		◆	◆		
Bay anchovy	<i>Anchoa mitchilli</i>	◆	◆	◆		
Black drum	<i>Pogonias cromis</i>		◆	◆		
Black sea bass	<i>Centropristis striata</i>		◆	◆		
Bluefish	<i>Pomatomus saltatrix</i>		◆	◆		◆
Butterfish	<i>Peprilus triacanthus</i>		◆	◆		
Cownose ray	<i>Rhinoptera bonasus</i>		◆	◆		
Gobies	<i>Gobiosoma spp.</i>	◆	◆	◆		
Hogchoker	<i>Trinectes maculatus</i>	◆	◆	◆		
Killifish	<i>Fundulus spp.</i>	◆	◆	◆		
Mullet	<i>Mugil spp.</i>		◆			
Northern pipefish	<i>Syngnathus fuscus</i>	◆	◆	◆		
Northern searobin	<i>Prionotus carolinus</i>		◆			
Pinfish	<i>Lagodon rhomboides</i>		◆	◆		
Red drum	<i>Sciaenops ocellatus</i>		◆	◆		
Red hake	<i>Urophycis chuss</i>		◆			
Oyster toadfish	<i>Opsanus tau</i>	◆	◆	◆		
Scup	<i>Stenotomus chrysops</i>		◆			
Spotted seatrout	<i>Cynoscion nebulosus</i>		◆	◆		◆
Sheepshead minnow	<i>Cyprinodon variegatus</i>	◆	◆	◆		
Silversides	<i>Menidia spp</i>	◆	◆	◆		
Skates	<i>Raja spp.</i>		◆	◆		
Summer flounder	<i>Paralichthys dentatus</i>		◆	◆		◆
Spot	<i>Leiostomus xanthurus</i>		◆	◆		◆
Tautog	<i>Tautoga onitis</i>		◆	◆		
Weakfish	<i>Cynoscion regalis</i>		◆	◆		
Windowpane flounder	<i>Scophthalmus aquosus</i>		◆	◆		
ANADROMOUS/CATADROMOUS FISH						
Alewife	<i>Alosa pseudoharengus</i>		◆	◆		
American eel	<i>Anguilla rostrata</i>		◆			
American shad	<i>Alosa sapidissima</i>		◆	◆		
Blueback herring	<i>Alosa aestivalis</i>		◆	◆		
Striped bass	<i>Morone saxatilis</i>		◆	◆		
White perch	<i>Morone americana</i>		◆	◆		
INVERTEBRATES						
Bay shrimp	<i>Crangon septemspinosa</i>	◆	◆	◆		
Blue crab	<i>Callinectes sapidus</i>	◆	◆	◆	◆	◆
Blue mussel	<i>Mytilus edulis</i>	◆	◆	◆		
Eastern oyster	<i>Crassostrea virginica</i>	◆	◆	◆		◆
Grass shrimp	<i>Palaemonetes gugio</i>	◆	◆	◆		
Northern quahog	<i>Mercenaria mercenaria</i>	◆	◆	◆		◆

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NOAA Trust Resources

The NOAA trust habitat of concern is Chesapeake Bay, the largest estuary on the Atlantic coast. Adjacent to the NAB Little Creek facility, the bay is a shallow bank with maximum depths of under 3 m (10 ft) out to about 7 km (4 mi) from shore. Little Creek Cove is a shallow inlet except for a central channel that is maintained by dredging (depth unknown). The cove on the facility is highly developed with seawalls and piers along most of the shoreline. Very little freshwater input discharges to the cove (USGS and NOS/NOAA 1964). Bottom substrates are largely sands. Surface salinities in this portion of Chesapeake Bay range from 15 to 20 ppt with bottom salinities close to normal seawater (Majumdar et al. 1987).

Numerous estuarine and marine species use Chesapeake Bay as a juvenile nursery and adult residence (Table 2). Estuarine residents include bay anchovy, oyster toadfish, sheepshead minnow, killifishes, silversides, pipefish, gobies and hogchoker. All life stages of these species are spent within the estuary and several of the species are highly abundant. Fish such as mullets, bluefish, pinfish, butterfish and the sciaenids (croaker, weakfish, seatrout, spot, drum) are coastal spawners; eggs and larval stages free-drift offshore and juvenile stages migrate to the estuary. Because many of these species are long-lived, juveniles may spend several years in the estuary. Adults of several of the species also can be found within the estuary seasonally. Bluefish, spot, and Atlantic croaker are particularly abundant in the area (Stone et al. 1994).

Several anadromous fish including alewife, blueback herring, American shad, striped bass, and white perch spawn in freshwater portions of the James and Nansemond rivers upstream of the site. Adults are common to abundant in this portion of Chesapeake Bay using the area for adult residence. The catadromous American eel migrate past the site to freshwater residential areas in the rivers (Stone et al. 1994).

Several invertebrates are present in the estuary including blue crab, grass shrimp, Eastern oyster and northern quahog. Juvenile and adult blue crab are abundant; mating and larval stages also are observed in the estuary, although females usually migrate to coastal waters to brood and release eggs. Grass shrimp, oyster, mussel, and quahog spend all life stages in the estuary (Stone et al. 1994).

The Hampton Roads area just west of the facility supports substantial commercial and recreational fisheries. Popular recreational species include bluefish, croaker, spot, weakfish, flounder, blue crab, oyster, and quahog (Majumdar et al. 1987). Commercial fisheries are primarily for blue crab (O'Reilly 2000). The Virginia Department of Health restricts bivalve harvests along the beaches of NAB Little Creek because of potential point and non-point industrial discharges (Wright 2000).

Site-Related Contamination

Environmental investigations on the NAB Little Creek facility have found soil and groundwater contamination at most of the sites at concentrations exceeding screening guidelines. Surface water and sediment contamination above screening guidelines have also been measured in Little Creek Cove and the canal. Remedial investigations have been conducted for Sites 7, 9, 10, 11, 12, and 13, while a Site Inspection has been completed for Site 8. Groundwater and soil investigations were conducted at all of the sites. Surface water and sediment investigations were conducted adjacent to Site 12 in the canal, Site 8 in the lower canal, and Site 7 in Little Creek Cove. No investigations of Chesapeake Bay have been conducted (CH2M Hill 2000). In addition, no sediment samples were analyzed for tributyltin, a contaminant commonly associated with sand blast grit and ship painting facilities.

Table 3. Maximum concentrations of contaminants of concern at source areas on NAB Little Creek (CH2M Hill 2000).

Contaminant	Soils (mg/kg)			Mean U.S. Soils ^a			Groundwater (ug/L)			Surface Water (ug/L)			Sediments (mg/kg)			ERL ^c
	Site 7	Site 9	Site 10	Site 7	Site 9	Site 10	Site 7	Site 9	Site 10	Site 12	Site 13	Site 7	Site 12	Site 7	Site 12	
TRACE ELEMENTS																
Arsenic	3.5	3.1	4	5.2	6.9	47	130	40	10	23	36	8.9	7.5	5.4	8.2	
Cadmium	1.4	0.53	ND	0.06	1.5	8.6	17	ND	ND	7.5	9.3	3.1	ND	ND	1.2	
Chromium	27	14	9.7	37	ND	13	150	170	16	150	50	22	21	13	81	
Copper	78	24	17	17	8.3	8.8	69	49	36	310	3.1	86	36	ND	34	
Lead	640	170	20	16	6.4	8.9	88	43	11.2	310	8.1	140	110	23	46.7	
Mercury	0.07	ND	ND	0.058	ND	ND	1.3	ND	0.14	0.79	0.94	0.32	0.28	ND	0.15	
Nickel	18	6.5	5.8	13	25	33	75	67	ND	140	8.2	25	14	11	20.9	
Silver	ND	0.88	ND	0.05	ND	4.7	ND	ND	ND	ND	0.95 ^g	1.4	ND	ND	1.0	
Zinc	320	85	65	48	380	330	260	190	260	3,800	81	210	380	88	150	
SVOCs																
Anthracene	0.22	ND	ND	NA	ND	ND	ND	ND	ND	NA	300 ^d	0.088	NA	0.25	0.0853	
Benzo(a)anthracene	0.71	ND	ND	NA	ND	ND	ND	ND	ND	NA	300 ^d	0.088	NA	0.82	0.261	
Benzo(a)pyrene	0.45	ND	ND	NA	ND	ND	ND	ND	ND	NA	300 ^d	0.068	NA	0.62	0.43	
Benzo(b)fluoranthene	0.51	0.057	0.037	NA	ND	ND	ND	ND	ND	NA	300 ^d	0.91	NA	1.4	NA	
Benzo(k)fluoranthene	0.38	ND	ND	NA	ND	ND	ND	ND	ND	NA	300 ^d	0.16	NA	ND	NA	
Chrysene	0.39	0.047	ND	NA	ND	ND	ND	ND	ND	NA	300 ^d	0.96	NA	0.76	0.384	
Fluoranthene	1.3	0.052	0.041	NA	ND	ND	1.0	ND	ND	NA	16 ^e	2.4	NA	1.8	0.6	
Fluorene	0.06	ND	ND	NA	ND	ND	ND	ND	ND	NA	300 ^d	ND	NA	ND	0.019	
Phenanthrene	0.83	ND	ND	NA	ND	ND	1.0	ND	ND	NA	4.6 ^f	0.4	NA	0.96	0.24	
Pyrene	ND	0.075	0.059	NA	ND	ND	1.0	ND	ND	NA	300 ^d	1.9	NA	1.5	0.665	
Pentachloro-phenol	ND	ND	ND	NA	ND	ND	ND	63	ND	NA	7.9	ND	NA	ND	NA	
VOCS																
Tetrachloro-ethene	ND	ND	ND	NA	ND	ND	12,000	1,000	ND	15	450 [*]	ND	3	ND	NA	

NA Not available.

ND Not detected, detection limit not available.

a Shacklette and Boerngen (1984), except for silver and cadmium which are mean concentrations in the earth's crust as reported by Lindsay (1979).

b Ambient water quality criteria for the protection of aquatic organisms (USEPA 1999). Marine chronic criteria presented.

c Effects Range-Low (ERL) value presented. The ERL represents the 10th percentile for the dataset in which effects were observed or predicted in studies compiled by Long et al. (1995, 1998).

d Value for chemical class; marine acute value is presented.

e LOEL: lowest observed effect level; marine chronic value presented.

f Proposed criteria.

g Chronic criteria have not been developed; acute value is presented.

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The contaminants of concern to NOAA include the trace elements and PAHs. These substances were detected in soils and groundwater at the identified sites and in surface water and sediments of the canal and Little Creek Cove. Table 3 lists maximum concentrations of contaminants of concern along with appropriate screening guidelines.

Maximum concentrations of cadmium, copper, lead, mercury, nickel, silver, and zinc at three of the landfills exceeded mean U.S. soil concentrations. The greatest concentrations were observed at the Amphibious Base Landfill (Site 7), followed by the Driving Range Landfill (Site 9) and Sewage Treatment Plant Landfill (Site 10). Few exceedances of soil guidelines were observed at the Demolition Debris Landfill (Site 8). Several PAHs also were detected in landfill soils, although soil screening guidelines are not available for these substances.

Screening guidelines were not substantially exceeded in groundwater for most contaminants. Concentrations of nickel and zinc beneath the Sewage Treatment Plant Landfill, copper and lead beneath the Exchange Laundry, and copper beneath the PCP Drip Tank exceeded the AWQC by an order of magnitude or greater. The VOC tetrachloroethene also was observed to exceed groundwater screening concentrations beneath the Exchange Laundry. Elevated concentrations of PCP also were detected beneath the PCP Drip Tank.

Concentrations of eight trace elements and four PAHs in sediment samples collected in Little Creek Cove adjacent to the Amphibious Base Landfill exceeded sediment screening guidelines. In addition, seven PAHs exceeded screening guidelines in sediment samples collected in the lower canal adjacent to the Demolition Debris Landfill just before discharging to Little Creek Cove. Further upstream in the canal, adjacent to the Exchange Laundry, concentrations of five trace elements exceeded sediment screening guidelines. The PAHs or other persistent organic contaminants were not analyzed for in canal sediment adjacent to the Exchange Laundry, so it is not known whether these substances are present at concentrations of concern in the upper canal.

Several trace elements (chromium, copper, lead, nickel, and zinc) exceeded the AWQC by an order of magnitude or greater in surface waters of Little Creek Cove adjacent to the Amphibious Base Landfill and in the canal adjacent to the Exchange Laundry.

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