Coastal Hazardous Waste Site

REVIEWS

July 1996

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PLEASE CITE AS:

Garman, Gayle and Lori Harris, eds. 1996. *Coastal Hazardous Waste Site Reviews, July 1996*. Seattle: Hazardous Materials Response and Assessment Division, National Oceanic and Atmospheric Administration. 113pp.

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1996

Coastal Hazardous Waste Site Reviews

Introduction

This report identifies uncontrolled hazardous waste sites that could pose a threat to natural resources for which the National Oceanic and Atmospheric Administration (NOAA) acts as a trustee. NOAA carries out responsibilities as a Federal trustee for natural resources under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan. As a trustee, NOAA identifies sites that could affect natural resources, determines the potential for injury to the resources, evaluates cleanup alternatives, and carries out restoration actions. NOAA works with the U.S. Environmental Protection Agency (EPA) to identify and assess risks to coastal resources from hazardous waste sites, and to develop strategies to minimize those risks.

NOAA regularly conducts evaluations of hazardous waste sites proposed for addition to the National Priorities List[1] (NPL) by EPA. The waste sites evaluated in this report are drawn from the list of all sites, including Federal facilities, proposed for inclusion on the NPL in Update 16.

The sites of concern to NOAA are located in counties bordering the Atlantic Ocean, Pacific Ocean, and Gulf of Mexico, or are near inland water bodies that support anadromous fish populations. Not all sites in coastal states will affect NOAA trust resources. To select sites on the National Priorities List for initial investigation, only sites in coastal counties or sites bordering important anadromous or catadromous fish habitat are considered to have potential to affect trust resources. This initial selection criterion works better in some states than in others. It depends on topography, hydrography, and the nature of political subdivisions.

These reports are an overall guide to the potential for injury to NOAA trust resources resulting from a site. NOAA uses this information to establish priorities for investigating sites. Sites that appear to pose ongoing problems will be followed by a NOAA Coastal Resource Coordinator (CRC) in the appropriate region. The CRC communicates concerns about ecological impact to EPA, reviews sampling and monitoring plans for the site, and helps plan and set objectives for remedial actions to clean up the site. NOAA works with other trustees to plan a coordinated approach for remedial action that protects all natural resources (not just those for which NOAA is a steward). Other Federal and state trustees can use the hazardous waste site reports to help determine the risk of injury to their trust resources. EPA uses the site reports to help identify the types of information that may be needed to complete an environmental assessment of the site.

These coastal site reports are often NOAA's first examination of a site. Sites with potential to impact NOAA resources may also have a more in-depth assessment of potential injury to environmental receptors, called a Preliminary Natural Resource Survey (PNRS). EPA may request a PNRS early in the remedial process to document the rationale for adding a site to the National Priorities List.

The current reporting brings the total number of sites considered by NOAA to 731. Defense Installation Natural Resource Assessment Guidance Reports, similar to PNRSs, were completed under a cooperative agreement with the U.S. Air Force in 1994. In 1996, waste site reviews were completed for eight coastal sites. NOAA has completed 292 coastal hazardous waste site reviews since 1984 (published in April 1984[2], June 1985[3], April 1986[4], June 1987[5], March 1989[6], June 1990[7], September 1992[8], December 1993[9], June 1995[10], September 1995[11], and this report). NOAA has completed 136 PNRSs and three U.S. Air Force reports since 1988 (see table below). Several sites have had multiple Reviews or PNRSs: these multiples are reflected in the total numbers above. A total of 289 sites have been reviewed (three sites more than once) and

Year	NPL Reports	PNRS	USAF Reports
1984	74		
1985	20		
1986	15		
1987	33		
1988		17	
1989	71	33	
1990	24	32	
1991		16	
1992	8	15	
1993	18	8	
1994		8	3
1995	21	6	
1996	8	1	
Total	292	136	3

133 sites have had PNRSs (three more than once).

The 1996 coastal hazardous waste site reviews contain four major sections. "Site Exposure Potential" describes activities at the site that caused the release of contaminants, local topography, and potential contaminant migration pathways. "NOAA Trust Habitats and Species" describes the types of habitats and species at risk of injury from releases at a site. The life stages of organisms using habitats near the site are discussed, as are commercial and recreational fisheries. "Site-Related Contamination" identifies contaminants of concern to NOAA, the partitioning of the contaminants in the environment, and the concentrations at which the contaminants are found. "Summary" cogently recaps this information.

Tables and Screening Values

Most of these reports contain tables of contaminants measured at the site. These tables were formulated to highlight contaminants that represent a potential problem, and to focus our concerns on only a few of the many contaminants normally present at a waste site. Data presented in tables were screened against standard comparison values, depending on the source of the sample. Screening values used are ambient water quality criteria[12], selected soil averages[13], and Effects Range Low (ERL) values[14]. Because releases to the environment from hazardous waste sites can span many years, we are concerned about chronic impacts. Therefore, we typically make comparisons with the lower standard value (e.g., chronic vs. acute AWQC). There is very little information regarding the toxicity of contaminated soil or sediment. No criteria similar to the AWQC are available. Thus, sediment concentrations were screened by comparison with the ERL reported by Long and MacDonald[14]. The ERL value is the concentration equivalent to that reported at the lower 10-percentile of the evaluated sediment toxicity data. As such, it represents the low end of the range of concentrations at which effects were observed in the studies compiled by the authors. Although freshwater studies were included, predominantly marine and estuarine toxicity studies were used for generating ERL values.

Soil samples were compared to selected average concentrations reported in *Hazardous Waste Land Treatment* (EPA 1983). These values were averaged from a data set from soil throughout the entire U.S. Ideally, reference values for soil would be calculated on a regional basis, from a data set large enough to give a value representative of the area. In the absence of such data, the EPA (1983) values were used as a reference for comparison purposes only.

All of the hazardous waste sites considered by NOAA in this review are contained in the Table of Contents, including the name and location of the site and the beginning page number of the site report. Table 1 lists all of the sites at which NOAA has been involved that could potentially affect trust resources, as of January 1996. Table 2 lists acronyms, abbreviations, and terms commonly used in these waste site reports.

[1]National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300.
[2]Ocean Assessments Division. 1984. *Coastal Hazardous Waste Site Review April 13, 1984.* NOAA/OAD, Seattle, Washington.
[3]Pavia, R., et al. 1985. *Coastal Hazardous Waste Site Review June 1985.* NOAA/OAD, Seattle, Washington
[4]Pavia, R., et al. 1986. *Coastal Hazardous Waste Site Review April 1986.* NOAA/OAD, Seattle, Washington.
[5]Pavia, R., et al. 1987. *Coastal Hazardous Waste Site Review June 1987.* NOAA/OAD, Seattle, Washington.
[6]Pavia, R., et al. 1989. *Coastal Hazardous Waste Site Review March 1989.* NOAA/OAD, Seattle, Washington.
[7]Hoff, R., et al. 1990. *Coastal Hazardous Waste Site Review June 1990.* NOAA/OAD, Seattle, Washington.
[8]Beckvar, N., et al. 1992. *Coastal Hazardous Waste Site Review September 1992.* NOAA/ORCA, Seattle, Washington.
[9]Beckvar, N., et al. 1993. *Coastal Hazardous Waste Site Review December 1993.* NOAA/ORCA, Seattle, Washington.
[10]Beckvar, N., et al. 1995. *Coastal Hazardous Waste Site Review June 1995.* NOAA/ORCA, Seattle, Washington.
[11]Garman, G., et al. 1995. *Coastal Hazardous Waste Site Review September 1995.* NOAA/ORCA, Seattle, Washington.
[12]U.S. Environmental Protection Agency. 1993. *Water quality criteria.* Washington, D.C.: U.S. Environmental Protection Agency, Office of Water, Health and Ecological Criteria Division. 294 pp.
[13]U.S. Environmental Protection Agency. 1983. *Hazardous waste land treatment.* EPA/530/SW-83/874. Cincinnati: Municipal Environmental Research Laboratory. 702 pp.
[14]Long, E.R. and D.D. MacDonald. 1992. National Status and Trends Program approach. In: *Sediment Classification Methods Compendium.* EPA 823-R-92-006. Washington, D.C.: EPA Office of Water (WH-556).

Table 1. Sites which NOAA has considered (731) as of June 1996, including those sites for which a Coastal Hazardous Waste Site Review (289), Preliminary Natural Resource Survey (PNRS; 133), or U.S. Air Force report (3) has been completed. (Sites in bold are included in this volume of reports.)

State	Cerclis No.	Site Name	Report Date Review	Report Date PNRS
Federal Region 1				
CT	CTD983884412	29 Pomperaug Road		
CT	CTD980732333	Barkhamsted-New Hartford Landfill	1989	
CT	CTD072122062	Beacon Heights Landfill	1984	
CT	CTD001155761	Dexter Corp.		
CT	CTD108960972	Gallup's Quarry	1989	
CT	CTD001145341	Hamilton Standard		
CT	CTD980670814	Kellogg-Deering Well Field	1987	
CT	CTD980521165	Laurel Park, Inc.		1988
CT	CTD001153923	Linemaster Switch Corp.		
CT	CTD980906515	New London Submarine Base	1990	
CT	CTD980669261	Nutmeg Valley Road		
CT	CTD980667992	O'Sullivan's Island	1984	
CT	CTD980670806	Old Southington Landfill		
CT	CTD051316313	Precision Plating Corp.		
CT	**CTD001186618**	**Raymark Industries, Inc**	**1996**	
CT	CTD004532610	Revere Textile Prints Corp.		
CT	CTD001449784	Sikorsky Aircraft Division UTC		
CT	CTD009717604	Solvents Recovery Service New England		
CT	CTD001168533	Upjohn Co-Fine Chemicals Division		
CT	CTD009774969	Yaworski Waste Lagoon	1985	1989
MA	MAD001026319	Atlas Tack Corp.	1989	
MA	MAD001041987	Baird & McGuire		
MA	MAD982191363	Blackburn and Union Privileges	1993	
MA	MAD079510780	Cannon Engineering Corp. (CEC)		1988
MA	MAD003809266	Charles-George Reclamation Landfill	1987	1988
MA	MAD981063142	Coal Tar Processing Facility (Former)		
MA	MA7210025154	Fort Devens		
MA	MAD980520670	Fort Devens-Sudbury Training Annex		
MA	MAD002084093	General Electric Co.		
MA	MAD980732317	Groveland Wells	1987	1988
MA	MA8570024424	Hanscom Field/Hanscom Air Force Base	1995	
MA	MAD980523336	Haverhill Municipal Landfill	1985	
MA	MAD980732341	Hocomonco Pond		
MA	MAD076580950	Industri-Plex	1987	1988

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 1, cont.				
MA	MAD051787323	Iron Horse Park		
MA	MA0213820939	Materials Technology Laboratory (USARMY)	1995	
MA	MA1210020631	Natick Laboratory Army Research, D&E Center	1995	
MA	MA6170023570	Naval Weapons Industrial Reserve Plant	1995	
MA	MAD980731335	New Bedford Site	1984	
MA	MAD980670566	Norwood PCBs		
MA	MAD990685422	Nyanza Chemical Waste Dump	1987	1993
MA	MA2570024487	Otis Air National Guard /Camp Edwards		
MA	MAD980525232	Plymouth Harbor/Cannon Engineering Corp.	1984	1990
MA	MAD980731483	PSC Resources		
MA	MAD980520621	Re-Solve, Inc.		
MA	MAD980524169	Rose Disposal Pit		
MA	MAD980525240	Salem Acres		1991
MA	MAD980503973	Shpack Landfill		
MA	MAD000192393	Silresim Chemical Corp		
MA	MA2170022022	South Weymouth Naval Air Station	1995	
MA	MAD980731343	Sullivan's Ledge	1987	1989
MA	MAD001002252	W.R. Grace & Co., Inc. (Acton Plant)		
MA	MAD980732168	Wells G&H		1990
ME	ME8170022018	Brunswick Naval Air Station	1987	1991
ME	MED981073711	Eastern Surplus Co.		
ME	MED000242701	Int Minerals And Chemicals Corp		
ME	ME9570024522	Loring Air Force Base		
ME	MED980524078	McKin Company	1984	
ME	MED980731475	O'Connor Company	1984	
ME	MED018980227	O'Connor Company Main Office		
ME	MED980732291	Pinette's Salvage Yard		
ME	ME7170022019	Portsmouth Naval Shipyard	1995	
ME	MED980504393	Saco Municipal Landfill	1989	
ME	MED980520241	Saco Tannery Waste Pits		
ME	MED042143883	Union Chemical Co., Inc.		
ME	MED980504435	Winthrop Landfill		
NH	NHD980524086	Auburn Road Landfill		1989
NH	NHD064424153	Coakley Landfill	1985	1989
NH	NHD980520191	Dover Municipal Landfill	1987	1990
NH	NHD001079649	Fletcher's Paint Works & Storage	1989	
NH	NHD069911030	Grugnale Waste Disposal Site	1985	
NH	NHD062002001	Kearsarge Metallurgical Corp		
NH	NHD092059112	Keefe Environmental Services		

State	Cerclis No.	Site Name	Report Date Review	Report Date PNRS
Federal Region 1, cont.				
NH	NHD980503361	Mottolo Pig Farm		
NH	NHD001091453	New Hampshire Plating Co.	1992	
NH	NHD990717647	Ottati & Goss/Kingston Steel Drum		
NH	NH7570024847	Pease Air Force Base	1990	
NH	NHD980671002	Savage Municipal Water Supply	1985	1991
NH	NHD980520225	Somersworth Sanitary Landfill		
NH	NHD980671069	South Municipal Water Supply Well		
NH	NHD099363541	Sylvester	1985	
NH	NHD989090469	Tibbetts Road		
NH	NHD062004569	Tinkham Garage		
NH	NHD981063860	Town Garage/Radio Beacon Site		
RI	RID980520183	Central Landfill		
RI	RID980731459	Davis (GSR) Landfill		
RI	RID980523070	Davis Liquid Waste	1987	
RI	RI6170022036	Davisville Naval Construction Batt Center	1990	1994
RI	RID093212439	Landfill & Resource Recovery, Inc. (L&RR)		
RI	RI6170085470	Newport Naval Education/Training Center	1990	1994
RI	RID055176283	Peterson/Puritan, Inc.	1987	1990
RI	RID980579056	Picillo Farm	1987	1988
RI	RID980521025	Rose Hill Regional Landfill	1989	1994
RI	RID980731442	Stamina Mills, Inc.	1987	1990
RI	RID981063993	West Kingston Town Dump/URI Disposal	1992	
RI	RID009764929	Western Sand & Gravel	1987	
VT	VTD981064223	Bennington Municipal Sanitary Landfill		
VT	VTD980520092	BFI Sanitary Landfill (Rockingham)	1989	
VT	VTD003965415	Burgess Brothers Landfill		
VT	VTD980520118	Darling Hill Dump		
VT	VTD000860239	Old Springfield Landfill	1987	1988
VT	VTD981062441	Parker Sanitary Landfill		
VT	VTD980523062	Pine Street Canal		
VT	VTD000509174	Tansitor Electronics, Inc.		
Federal Region 2				
NJ	NJD030253355	A.O. Polymer		
NJ	NJD000525154	Albert Steel Drum	1984	
NJ	NJD002173276	American Cyanamid Co.	1985	
NJ	NJD980654149	Asbestos Dump		
NJ	NJD011308988	Atlantic Aviaton Corporation		

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 2, cont.				
NJ	NJD980528731	Atlantic Development[1]	1984	
NJ	NJD063157150	Bog Creek Farm	1984	1992
NJ	NJD980505176	Brick Township Landfill	1984	
NJ	NJD053292652	Bridgeport Rental & Oil Services		1990
NJ	NJD078251675	Brook Industrial Park	1989	
NJ	NJD980504997	Burnt Fly Bog		1992
NJ	NJD048798953	Caldwell Trucking Co.		
NJ	NJD000607481	Chemical Control	1984	
NJ	NJD980484653	Chemical Insecticide Corp.	1990	1992
NJ	NJD047321443	Chemical Leaman Tank Lines, Inc.		1989
NJ	NJD980528889	Chemsol, Inc.		
NJ	NJD980528897	Chipman Chemical Co.	1985	
NJ	NJD001502517	Ciba-Geigy Corp	1984	1989
NJ	NJD980785638	Cinnaminson Ground Water Contamination		
NJ	NJD094966611	Combe Fill South Landfill		
NJ	NJD000565531	Cosden Chemical Coatings Corp.	1987	
NJ	NJD002141190	CPS/Madison Industries		1990
NJ	NJD011717584	Curcio Scrap Metal, Inc.	1987	
NJ	NJD980529416	D'Imperio Property		
NJ	NJD980761373	De Rewal Chemical Co.	1985	
NJ	NJD980529002	Delilah Road		
NJ	NJD046644407	Denzer & Schafer X-Ray Co.	1984	1992
NJ	NJD980528996	Diamond Alkali Co.	1984	
NJ	NJD002442408	Diamond Shamrock Corp.		
NJ	NJD980529085	Ellis Property		
NJ	NJD980654222	Evor Phillips Leasing		1992
NJ	NJD980761365	Ewan Property		
NJ	NJ9690510020	Federal Aviation Admin. Tech. Center	1990	
NJ	NJ2210020275	Fort Dix (Landfill Site)		
NJ	NJD986570992	Franklin Burn Site		
NJ	NJD041828906	Fried Industries		
NJ	NJD980771638	GAF Corp.		
NJ	NJD053280160	Garden State Cleaners Co.	1989	
NJ	NJD980529192	Gems Landfill		
NJ	NJD063160667	Global Sanitary Landfill	1989	1991
NJ	NJD980530109	Goose Farm		
NJ	NJD980505366	Helen Kramer Landfill		1990

[1]Formerly called Sayreville Pesticide Dump

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 2, cont.				
NJ	NJD002349058	Hercules, Inc. (Gibbstown Plant)	1984	1993
NJ	NJD053102232	Higgins Disposal	1989	
NJ	NJD981490261	Higgins Farm	1989	
NJ	NJD980532840	Hopkins Farm		
NJ	NJD980663678	Horseshoe Road	1984/1995	
NJ	NJD980532907	Ideal Cooperage Inc.	1984	
NJ	NJD980654099	Imperial Oil Co.,Inc./Champion Chemicals		
NJ	NJD981178411	Industrial Latex Corp.	1989	
NJ	NJD980505283	Jackson Township Landfill	1984	
NJ	NJD097400998	JIS Landfill		
NJ	NJD002493054	Kauffman & Minteer, Inc	1989	
NJ	NJD049860836	Kin-Buc Landfill	1984	1990
NJ	NJD980505341	King of Prussia		
NJ	NJD002445112	Koppers Co., Inc. /Seaboard Plant	1984	
NJ	NJD980529838	Krysowaty Farm	1985	
NJ	NJD980505416	Lipari Landfill		
NJ	NJD980505424	Lone Pine Landfill		1992
NJ	NJD085632164	M&T Delisa Landfill		
NJ	NJD980654180	Mannheim Avenue Dump		
NJ	NJD980529762	Maywood Chemical Co.		
NJ	NJD002517472	Metaltec/Aerosystems		
NJ	NJ0210022752	Military Ocean Terminal (Landfill)		
NJ	NJD000606756	Mobil Chemical Co.	1984	
NJ	NJD980505671	Monroe Township Landfill		
NJ	NJD980654198	Myers Property		
NJ	NJD002362705	Nascolite Corp.		
NJ	NJ7170023744	Naval Air Engineering Center		
NJ	NJ0170022172	Naval Weapons Station Earle (Site A)		
NJ	NJD061843249	NL Industries	1984	1992
NJ	NJD980529598	Pepe Field		
NJ	NJD980653901	Perth Amboy PCB's	1984	
NJ	NJD980505648	PJP Landfill	1984	1990
NJ	NJD981179047	Pohatcong Valley Ground Water Contamination		
NJ	NJD980769350	Pomona Oaks Residential Wells		
NJ	NJD070281175	Price Landfill	1984	1993
NJ	NJD980582142	Pulverizing Services		
NJ	NJD980529671	PVSC Sanitary Landfill[2]	1984	

[2]Formerly T. Fiore Demolition

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 2, cont.				
NJ	NJD000606442	Quanta Resources		
NJ	NJD986589190	Raritan Arsenal		
NJ	NJD980529713	Reich Farms		
NJ	NJD070415005	Renora, Inc.		
NJ	NJD980529739	Ringwood Mines/Landfill		
NJ	NJD073732257	Roebling Steel Co.	1984	1990
NJ	NJD030250484	Roosevelt Drive-In	1984	
NJ	NJD980505754	Sayreville Landfill	1984	1990
NJ	NJD070565403	Scientific Chemical Processing	1984	1989
NJ	NJD980505762	Sharkey Landfill		1990
NJ	NJD002365930	Shieldalloy Corp.		
NJ	NJD980766828	South Jersey Clothing Co.	1989	
NJ	NJD041743220	Swope Oil & Chemical Co.		
NJ	NJD064263817	Syncon Resins	1984	1992
NJ	NJD980761357	Tabernacle Drum Dump		
NJ	NJD002005106	Universal Oil Products (Chemical Division)	1984	
NJ	NJD980761399	Upper Deerfield Township Sanit. Landfill		
NJ	NJD980529879	Ventron/Velsicol	1984	
NJ	NJD002385664	Vineland Chemical Co., Inc.		1990
NJ	NJD054981337	Waldick Aerospace Devices, Inc.		1990
NJ	NJD001239185	White Chemical Corp.	1984	
NJ	NJD980529945	Williams Property	1984	1992
NJ	NJD980532824	Wilson Farm		
NJ	NJD045653854	Witco Chemical Corp. (Oakland Plt)		
NJ	NJD980505887	Woodland Route 532 Dump		
NJ	NJD980505879	Woodland Route 72 Dump		
NY	NYD980780829	93rd Street School		
NY	NYD072366453	Action Anodizing, Plating, & Polishing	1989	
NY	NYD980506232	ALCOA Aggregation Site		
NY	NYD002066330	American Thermostat Co.		
NY	NYD001485226	Anchor Chemicals		
NY	NYD980535652	Applied Environmental Services	1985	1991
NY	NYD980507693	Batavia Landfill		
NY	NYD980768675	BEC (Binghampton Equipment Co.) Trucking		1990
NY	NYD980768683	Bioclinical Laboratories, Inc.		
NY	NYD980652275	Brewster Well Field		
NY	NY7890008975	Brookhaven National Laboratory (USDOE)	1990	
NY	NYD980780670	Byron Barrel & Drum		
NY	NYD981561954	C & J Disposal Leasing Co. Dump	1989	

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 2, cont.				
NY	NYD010968014	Carroll & Dubies Sewage Disposal	1989	
NY	NYD981184229	Circuitron Corp.		
NY	NYD002044584	Claremont Polychemical		
NY	NYD000511576	Clothier Disposal		
NY	NYD980768691	Colesville Municipal Landfill		
NY	NYD982276933	Cornwall Landfill		
NY	NYD980528475	Cortese Landfill		
NY	NYD980508048	Croton Point Sanitary Landfill		
NY	NYD980780746	Endicott Village Well Field		
NY	NYD981560923	Forest Glen Mobile Home Subdivision		
NY	NYD091972554	General Motors (Central Foundry Division)		1989
NY	NYD002050110	Genzale Plating Co.		
NY	NYD980768717	Goldisc Recordings, Inc.		
NY	NY4571924451	Griffiss Air Force Base		
NY	NYD980785661	Haviland Complex		
NY	NYD980780779	Hertel Landfill		
NY	NYD980506810	Hooker (102nd Street)		
NY	NYD002920312	Hooker Chemical/Ruco Polymer Corp.		
NY	NYD980763841	Hudson River PCBs		1989
NY	NYD000813428	Jones Chemicals, Inc.		
NY	NYD980534556	Jones Sanitation	1987	
NY	NYD980780795	Katonah Municipal Well		
NY	NYD002041531	Lawrence Aviation Industries, Inc.		
NY	NYD986882660	Li Tungsten Corp.	1992	1992
NY	NYD053169694	Liberty Heat Treating Co. Inc.		
NY	NYD000337295	Liberty Industrial Finishing	1985	1993
NY	NYD000606947	Love Canal		
NY	NYD013468939	Ludlow Sand & Gravel		
NY	NYD980535124	Malta Rocket Fuel Area		
NY	NYD010959757	Marathon Battery Corp.	1984	1989
NY	NYD000512459	Mattiace Petrochemical Co., Inc.	1989	1990
NY	NYD980763742	MEK Spill-Hicksville		
NY	NYD002014595	Nepera Chemical Co., Inc.		
NY	NYD000514257	Niagara County Refuse		
NY	NYD980664361	Niagara Mohawk Power Co. (Saratoga Springs)		
NY	NYD980762520	North Sea Municipal Landfill	1985	1989
NY	NYD991292004	Pasley Solvents & Chemicals, Inc.		

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 2, cont.				
NY	NY6141790018	Pennsylvania/Fountain Ave. Landfill[3]		
NY	NYD000511659	Pollution Abatement Services		
NY	NYD980654206	Port Washington Landfill	1984	1989
NY	NYD980768774	Preferred Plating Corp.		
NY	NYD002245967	Reynolds Metals Co.		
NY	NYD980507735	Richardson Hill Road Landfill/Pond		
NY	NYD981486954	Rowe Industries Ground Water Contamination	1987	1991
NY	NYD980507677	Sidney Landfill	1989	
NY	NYD980535215	Sinclair Refinery		
NY	NYD980421176	Solvent Savers		
NY	NYD980780878	Suffern Village Wellfield		
NY	NYD000511360	Syosset Landfill		
NY	NYD980509285	Tri-Cities Barrel Co., Inc.		
NY	NYD002059517	Tronic Plating Co., Inc.		
NY	NYD980509376	Volney Municipal Landfill		
NY	NYD980535496	Wallkill Landfill		
NY	NYD980506679	Warwick Landfill		
NY	NYD980652259	Wide Beach Development		
NY	NYD000511733	York Oil Co.		
PR	PRD090416132	Clear Ambient Services Co.	1984	
PR	PRD980640965	Frontera Creek	1984	1991
PR	PRD090282757	GE Wiring Devices		
PR	PRD980512362	Juncos Landfill		
PR	PR4170027383	Naval Security Group Activity	1989	1991
PR	PRD980301154	Upjohn Facility		
PR	PRD980763775	Vega Alta Public Supply Wells		
VI	**VID980651095**	**Island Chemical Corp/V.I. Chemical Corp.**	**1996**	
VI	VID982272569	Tutu Wellfield	1993	
Federal Region 3				
DE	DED980494496	Army Creek Landfill	1984	
DE	DED980704860	Coker's Sanitation Service Landfills	1986	1990
DE	DED980551667	Delaware City PVC Plant	1984	
DE	DED000605972	Delaware Sand & Gravel	1984	
DE	DE8570024010	Dover Air Force Base	1987	1989
DE	DED980693550	Dover Gas and Light Company	1987	
DE	DED980555122	E.I. Du Pont, Newport Landfill	1987	1991/1992
DE	DED980830954	Halby Chemical	1986	1990

[3] Formerly Pennsylvania Avenue Landfill

State	Cerclis No.	Site Name	Report Date Review	Report Date PNRS
Federal Region 3, cont.				
DE	DED980705727	Kent County Landfill	1989	
DE	DED980552244	Koppers Co. Facilities Site	1990	
DE	DED043958388	NCR Corp., Millsboro	1986	
DE	DED058980442	New Castle Spill Site	1984	1989
DE	DED980705255	New Castle Steel Plant	1984	
DE	DED980704894	Old Brine Sludge Landfill	1984	
DE	DED980494603	Pigeon Point Landfill	1987	
DE	DED981035520	Sealand Ltd.	1989	
DE	DED041212473	Standard Chlorine Co.	1986	
DE	DED980494637	Sussex Co. Landfill #5	1989	
DE	DED000606079	Tybouts Corner Landfill	1984	
DE	DED980705545	Tyler Refrigeration Pit		
DE	DED980704951	Wildcat Landfill	1984	
MD	MDD069396711	Allied Chemical Corp. Baltimore Works		
MD	MDD980705057	Anne Arundel County Landfill	1989	
MD	MDD980504195	Bush Valley Landfill	1989	1993
MD	MDD980555478	Chemical Metals Industries		
MD	MDD030324073	Dundalk Marine Terminal		
MD	MDD000731356	Hawkins Pt / Md. Port Admin.		
MD	MDD030321178	Joy Reclamation Co.	1984	
MD	MDD980923783	Kane & Lombard Street Drums		
MD	MDD064882889	Mid-Atlantic Wood Preservers		
MD	MDD985397256	Naval Training Center Bainbridge		
MD	MDD982364341	Ordnance Products Inc.	1995	
MD	MDD980705164	Sand Gravel & Stone Site	1984	1990
MD	MDD980704852	Southern Maryland Wood Treating	1987	
MD	MDD000218008	Spectron Inc.		
MD	MD0120508940	US Agricultural Center Beltsville (2 Tenants)	1995	
MD	MD2210020036	USA Aberdeen - Edgewood	1986	
		Bush River Watershed		1994
		Gun Powder River Watershed		1994
MD	MD3210021355	USA Aberdeen, Michaelsville	1986	
		Romney Creek Watershed		1994
MD	MD9210020567	USA Fort George Meade		
MD	MD0570024000	USAF Andrews Air Force Base		1994[4]
MD	**MD7170024536**	**USN Patuxent Naval Air Station**	**1996**	
MD	MDD980504344	Woodlawn Co. Landfill	1987	
PA	PAD004351003	AIW Frank		

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State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 3, cont.				
PA	PAD000436436	Ambler Asbestos Piles		
PA	PAD009224981	American Electronic Lab, Inc.		
PA	PAD980693048	AMP, Inc.		
PA	PAD987341716	Austin Avenue Radiation Site	1993	
PA	PAD003053709	Avco Lycoming - Williamsport Division		
PA	PAD061105128	Bally Ground Water Contamination		
PA	PAD047726161	Boarhead Farms	1989	
PA	PAD980508402	Bridesburg Dump	1984	
PA	PAD980691760	Brodhead Creek		
PA	PAD980831812	Brown's Battery Breaking		1991
PA	PAD980508451	Butler Mine Tunnel	1987	
PA	PAD980419097	Crater Resources/Keystone Coke/Alan Wood	1993	
PA	PAD981035009	Croydon TCE Spill	1986	
PA	PAD981038052	Delta Quarries/Stotler Landfill		
PA	PAD002384865	Douglassville Disposal	1987	
PA	PAD003058047	Drake Chemical		
PA	PAD981740004	Dublin Water Supply		
PA	PAD987323458	East Tenth Street Site		
PA	PAD980830533	Eastern Diversified Metals		
PA	PAD980539712	Elizabethtown Landfill	1989	
PA	PAD980552913	Enterprise Avenue	1984	
PA	**PAD980714505**	**FMC Marcus Hook**	**1996**	
PA	PAD077087989	Foote Mineral Co.	1993	
PA	PAD987332541	Hamburg Playground Site		
PA	PAD002338010	Havertown PCP Site		
PA	PAD002390748	Hellertown Manufacturing Co.	1987	
PA	PAD009862939	Henderson Road Site		1989
PA	PAD980508493	Industrial Drive Site		
PA	PAD980829493	Jack's Creek/Sitkin Smelting	1989	
PA	PAD981036049	Keyser Ave Borehole	1989	
PA	PAD980508931	Lord Shope Landfill		
PA	PAD014353445	Malvern TCE Site		
PA	PAD046557096	Metal Bank of America	1984	1990
PA	PAD982366957	Metropolitan Mirror and Glass Co., Inc.		
PA	PAD980538763	Middletown Air Field		
PA	PAD980539068	Modern Sanitation Landfill		
PA	PAD980508766	Moyers Landfill		
PA	PAD980691372	MW Manufacturing		
PA	PAD107214116	National Vulcanized Fiber		
PA	PAD096834494	North Penn-Area 1		

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 3, cont.				
PA	PAD002342475	North Penn-Area 2		
PA	PAD980692693	North Penn-Area 5		
PA	PAD980926976	North Penn-Area 6		
PA	PAD002498632	North Penn-Area 7		
PA	PAD057152365	North Penn-Area 12		
PA	PAD079160842	Novak Sanitary Landfill		
PA	PAD980229298	Occidental Chem/Firestone	1989	
PA	PAD002395887	Palmerton Zinc Pile		
PA	PAD980692594	Paoli Rail Yard	1987	1991
PA	PAD981939200	Publicker/Cuyahoga Wrecking Plant	1990	
PA	PAD039017694	Raymark	1996	
PA	PAD002353969	Recticon/Allied Steel	1989	
PA	PAD051395499	Revere Chemical Co.	1986	
PA	PAD091637975	Rohm and Haas Landfill	1986	
PA	PAD980830889	Shriver's Corner Site		
PA	PAD014269971	Stanley Kessler		
PA	PA6143515447	Tinicum National Environmental Center	1986	
PA	PAD980692024	Tysons Dump #1	1985	
PA	PAD980539126	UGI Corp Gas Manufacturing Plant	1995	
PA	PA6170024545	USN Naval Warfare Center		
PA	PA4170022418	USN Philadelphia Naval Shipyard		
PA	**PA3170022104**	**USN Ships Parts Control Center**	**1996**	
PA	PAD980539407	Wade (ABM)	1984	
PA	PAD980537773	William Dick Lagoons		
VA	VAD980551683	Abex Corp.	1989	
VA	VAD042916361	Arrowhead Associates/Scovill	1989	
VA	VAD990710410	Atlantic Wood Industries, Inc.	1987	1990
VA	VAD049957913	C & R Battery Co., Inc.	1987	
VA	VAD980712913	Chisman Creek	1984	
VA	VAD007972482	Clarke L A & Son		
VA	VAD980539878	H & H Inc-Burn Pit		
VA	VAD988197133	Hampton Roads Welders Site		
VA	VA1170024722	Marine Corps Combat and Development Command	1995	
VA	VA2800005033	NASA-Langley Research Center	1995	
VA	VA7170024684	Naval Surface Warfare Center - Dahlgren	1993	
VA	VA8170024170	Naval Weapons Station - Yorktown	1993	
VA	VAD071040752	Rentokil Inc., Virginia Wood Preserving Division		
VA	VAD020312013	Richmond, Fredericksburg & Potomac Railroad		1994
VA	VAD003117389	Saunders Supply Co	1987	
VA	VAD980917983	Suffolk City Landfill		

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 3, cont.				
VA	VA3971520751	U.S. Defense General Supply Center		
VA	**VA6210020321**	**USA Ft. Eustis**	**1996**	
VA	VA7210020981	USA Woodbridge Research Facility		
VA	VA4570024477	USAF Langley AFB		
VA	VA5170022482	USN Naval Amphibious Base/Little Creek		
VA	VA1170024813	USN Naval Shipyard Norfolk		
VA	VA6170061463	USN Norfolk Naval Base		
VA	VA9170022488	USN Radio Transmitting Facility		
WV	WV0170023691	Allegany Ballistics Laboratory		
WV	WVD004336749	Follansbee Site		
Federal Region 4				
AL	ALD058221326	Alabama Wood Treating Corp., Inc.		
AL	ALD001221902	Ciba-Geigy Corp. (McIntosh Plant)	1990	
AL	ALD000604249	Gulf Oil Co.		
AL	ALD041906173	Interstate Lead Co. (Ilco)		
AL	ALD008188708	Olin Corp. (McIntosh Plant)	1990	
AL	ALD980844385	Redwing Carriers, Inc. (Saraland)	1989	
AL	ALD095688875	Stauffer Chemical Co. (Cold Creek Plant)		1990
AL	ALD008161176	Stauffer Chemical Co. (Lemoyne Plant)		
AL	ALD007454085	T.H. Agriculture & Nutrition (Montgomery)		
AL	AL2170024630	US Naval Outlying Barin Field		
AL	AL0570024182	USAF Maxwell Air Force Base		
FL	FLD980221857	Agrico Chemical Co.	1989	
FL	FLD004145140	Airco Plating Co.		
FL	FLD008161994	American Creosote Works (Pensacola Plant)	1984	1989
FL	FLD020536538	Anaconda Aluminum Co./Milgo Electronics		
FL	FLD981014368	Anodyne, Inc.		
FL	FLD004574190	B&B Chemical Co., Inc.		
FL	FLD088783865	Bay Drum		
FL	FLD980494660	Beulah Landfill		
FL	FLD052172954	BMI-Textron		
FL	FLD981930506	Broward County-21st Manor Dump	1992	
FL	FLD980709356	Cabot/Koppers		
FL	FLD080174402	Chemform, Inc.	1990	
FL	FLD004064242	Chevron Chemical Co. (Ortho Division)		
FL	FLD991279894	Coleman-Evans Wood Preserving Co.		
FL	FLD980602288	Davie Landfill		

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 4, cont.				
FL	FLD000833368	Dubose Oil Products Co.		
FL	FLD050432251	Florida Steel Corp.		
FL	FLD000602334	Harris Corp. (Palm Bay Plant)	1986	1990
FL	FLD053502696	Helena Chemical Co. (Tampa Plant)	1993	
FL	FLD980709802	Hipps Road Landfill		
FL	FLD004119681	Hollingsworth Solderless Terminal		
FL	FLD980727820	Kassouf-Kimerling Battery Disposal		
FL	FLD981019235	Madison County Sanitary Landfill		
FL	FLD084535442	Munisport Landfill	1984	
FL	FLD004091807	Peak Oil Co./Bay Drum Co.		
FL	FLD984259374	Peele-Dixie Wellfield Site		
FL	FL9170024567	Pensacola Naval Air Station	1990	
FL	FLD032544587	Pepper Steel & Alloys, Inc.		
FL	FLD980556351	Pickettville Road Landfill	1984	1990
FL	FLD004054284	Piper Aircraft/Vero Beach Water & Sewer		
FL	FLD984169763	Pleasant Grove Landfill		
FL	FLD000824888	Reeves SE Corp. Southeastern Wire Division		
FL	FLD000824896	Reeves SE Galvanizing Corp.		
FL	FLD980602882	Sapp Battery Salvage		1989
FL	FLD062794003	Schuylkill Metals Corp.		
FL	FLD043861392	Sherwood Medical Industries		
FL	FLD980728877	Sixty-Second Street Dump	1984	1989
FL	FLD004126520	Standard Auto Bumper Corp.	1989	
FL	FLD004092532	Stauffer Chemical Co. (Tampa Plant)	1993	
FL	FLD010596013	Stauffer Chemical Co. (Tarpon Springs)	1993	
FL	FLD000648055	Sydney Mine Sludge Ponds		1989
FL	FLD980494959	Taylor Road Landfill		
FL	FL6800014585	US NASA Kennedy Space Center		
FL	FL2800016121	USAF Cape Cavaveral AFB		
FL	FL7570024037	USAF Homestead AFB		
FL	FL6170022952	USAF NAS Key West (Boca Chica)		
FL	FL2570024404	USAF Patrick AFB		
FL	FL1690331300	USCG Station Key West		
FL	FL5170022474	USN Air Station Cecil Field	1990	
FL	FL6170024412	USN NAS Jacksonville	1990	
FL	FL9170024260	USN Naval Air Station Mayport		
FL	**FL2170023244**	**USN Naval Air Station Whiting Field Site 5**	**1996**	
FL	FL8170023792	USN Naval Coastal Systems Center		
FL	FLD980602767	Whitehouse Oil Pits		

State	Cerclis No.	Site Name	Report Date Review	Report Date PNRS
Federal Region 4, cont.				
FL	FLD041184383	Wilson Concepts of Florida, Inc.		
FL	FLD981021470	Wingate Road Municipal Incinerator Dump		
FL	FLD004146346	Woodbury Chemical Co. (Princeton Plant)	1989	
FL	FLD049985302	Zellwood Ground Water Contamination		
GA	GAD095840674	Cedartown Industries, Inc.		
GA	GAD980495402	Cedartown Municipal Landfill		
GA	GAD990741092	Diamond Shamrock Corp. Landfill		
GA	GAD981024466	Escambia Brunswick Wood		
GA	GAD008212409	Escambia Wood - Camilla		
GA	GAD990855074	Firestone Tire & Rubber Co(Albany Plant)		
GA	GAD980556906	Hercules 009 Landfill		
GA	GAD004065520	Hercules, Inc.		
GA	GAD000827444	International Paper Co		
GA	GAD099303182	LCP Chemicals Georgia, Inc.		1995
GA	GAD980838619	Mathis Brothers Landfill		
GA	GAD001700699	Monsanto Corp. (Augusta Plant)		
GA	GAD980495451	New Sterling Landfill		
GA	GAD042101261	T.H. Agriculture & Nutrition (Albany)		
GA	GAD982112658	Terry Creek Dredge Spoil Area		
GA	GA1570024330	USAF Robins AFB (Landfill/Sludge Lagoon)		
GA	GAD003269578	Woolfolk Chemical Works, Inc.		
MS	MSD008154486	Chemfax, Inc.	1995	
MS	MSD098596489	Gautier Oil Co., Inc.	1989	
MS	MS2170022626	US Naval Const Battalion Center		
NC	NCD024644494	ABC One Hour Cleaners	1989	
NC	NCD980840409	Charles Macon Lagoon & Drum Storage		
NC	NC1170027261	Cherry Point Marine Corps Air Station		
NC	NCD980840342	Dockery Property		
NC	NCD981475932	FCX, Inc. (Washington Plant)	1989	
NC	NCD981927502	Geigy Chemical Corp. (Aberdeen Plant)		
NC	NCD079044426	General Electric Co./Shepherd Farm		
NC	NCD003200383	Koppers Co. Inc. (Morrisville Plant)		
NC	NCD991278953	National Starch & Chemical Corp.		
NC	NCD981021157	New Hanover Cnty Airport Burn Pit	1989	
NC	NCD986186518	Old ATC Refinery		
NC	NCD981023260	Potter's Septic Tank Service Pits	1989	
NC	NC6170022580	USMC Camp Lejeune	1989	
SC	SCD987581337	Calhoun Park/Ansonborough Homes/Scegco		1993

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 4, cont.				
SC	SCD980558316	Carolawn, Inc.		
SC	SCD980846034	Charleston Landfill		
SC	SCD980711279	Geiger (C & M Oil)	1984	
SC	SCD058753971	Helena Chemical Co. Landfill	1989	
SC	SCD055915086	International Paper Co.		
SC	SCD094995503	Kalama Specialty Chemicals		
SC	SCD980310239	Koppers Co., Inc. (Charleston Plant)	1993	
SC	SCD991279324	Leonard Chemical Co., Inc.		
SC	SCD980558043	Lexington County Landfill Area		
SC	SC0170022560	Naval Shipyard - Charleston		
SC	SC8170022620	Naval Weapons Station - Charleston		
SC	SCD037398120	Palmetto Recycling, Inc.		
SC	SCD002601656	Para-Chem Southern, Inc.		
SC	SC6170022762	Parris Island Marine Corps Recruit Depot		1995
SC	SC1890008989	US DOE Savannah River Site	1990	
SC	SCD987572674	USDOI Charleston Harbor Site		1993
SC	SCD037405362	Wamchem, Inc.	1984	
Federal Region 5				
IL	ILD000802827	Outboard Marine Corporation		
MI	MID006007306	Allied Paper/Portage Creek/Kalamazoo River		
MI	MID980678627	Cannelton Industries		
MI	MID980679799	Deer Lake		
MI	MID006014906	Hooker Montague Plant		
MI	MID981192628	Manistique River/Harbor Area of Concern		
MI	MID072569510	Muskegon Chemical Co.		
MI	MID980901946	Torch Lake		
MN	MND039045430	St. Louis River - USX Duluth		
OH	OHD980614572	Fields Brook		
WI	WID006136659	Fort Howard Paper Co. Sludge Site		
WI	WID006141402	Fort Howard Steel Incorporated		
WI	WID006073225	Kohler Co. Landfill		
WI	WID039052626	Moss-American Kerr-McGee Oil Co.		
WI	WID980996367	Sheboygan Harbor & River		
Federal Region 6				
AR	ARD980496723	South 8th Street Landfill		
LA	LAD000239814	American Creosote Works, Inc. (Winnfield)		

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 6, cont.				
LA	LAD980745632	Bayou Bonfouca		
LA	LAD981916570	Bayou D'Inde		
LA	LAD980745541	Bayou Sorrel Site	1984	
LA	LAD985195346	Bayou Verdine		
LA	LAD980501423	Calcasieu Parish Landfill		
LA	LAD985202464	Devil's Swamp Lake		
LA	LAD985169317	GSU (North Ryan St.)/Utilities Yard		
LA	LAD981522998	Madisonville Creosote Works, Inc.		
LA	LAD057482713	Petro-Processors of Louisiana, Inc.		
LA	LAD062644232	Ponchatoula Battery Company		
LA	LAD008086506	PPG Industries, Inc.		
LA	LAD008149015	Southern Shipbuilding, Inc.		
TX	TXD008123168	ALCOA (Point Comfort)/Lavaca Bay	1995	
TX	TXD980864649	Bailey Waste Disposal	1985	1989
TX	TXD980625453	Brio Refining, Inc.	1989	1989
TX	TXD990707010	Crystal Chemical Company	1989	1989
TX	TXD089793046	Dixie Oil Processors, Inc.	1989	1989
TX	TXD980514814	French, Ltd.	1989	1989
TX	TXD980748453	Geneva Industries/Fuhrmann Energy		
TX	TXD980745582	Harris (Farley Street)		
TX	TXD980514996	Highlands Acid Pit	1989	
TX	TXD980625636	Keown Supply Company		
TX	TXD980629851	Motco, Inc.	1984	
TX	TXD980873343	North Cavalcade Street		
TX	TXD980873350	Petro-Chemical Systems (Turtle Bayou)		
TX	TXD062132147	Sheridan Disposal Services		
TX	TXD980513956	Sikes Disposal Pits	1989	
TX	TXD980873327	Sol Lynn/Industrial Transformers		
TX	TXD980810386	South Cavalcade Street		
TX	TXD062113329	Tex-Tin Corp.	1989	
TX	TXD055143705	Triangle Chemical Company		
Federal Region 9				
AS	ASD980637656	Taputimu Farm	1984	
CA	CAD980358832	Aerojet General Corp.		
CA	CA2170023236	Alameda Naval Air Station	1989	
CA	CA2170023533	Camp Pendleton Marine Corps Base	1990	1992
CA	CAD009114919	Chevron USA Richmond Refinery		
CA	CAD063015887	Coast Wood Preserving	1984	

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 9, cont.				
CA	CA7170024528	Concord Naval Weapons Station	1989/1993	1990
CA	CAD055753370	Cooper Drum Co.	1993	
CA	CAD980498455	Crazy Horse Sanitary Landfill		
CA	CAD009212838	CTS Printex, Inc.	1989	
CA	CAD029544731	Del Amo Facility	1992	
CA	CAD000626176	Del Norte Pesticide Storage	1984	
CA	CA6170023208	El Toro Marine Corps Air Station	1989	
CA	CAD981159585	Farallon Islands		1990
CA	CA7210020676	Fort Ord	1990	1992
CA	CAD980636914	Fresno Municipal Sanitary Landfill		
CA	CAD980498562	GBF & Pittsburg Dumps	1989/1993	
CA	CA3570024288	Hamilton AFB		
CA	CAD980884209	Hewlett-Packard (620-640 Page Mill Road)	1989	
CA	CAD058783952	Hexcel Corporation		
CA	CAD041472341	Intersil Inc./Siemens Components	1989	
CA	CAD980498612	Iron Mountain Mine	1989	1989
CA	CAD000625731	J.H. Baxter & Co.		
CA	CAD009103318	Jasco Chemical Corp.	1989	
CA	CA9800013030	Jet Propulsion Laboratory (NASA)		
CA	CAD008274938	Kaiser Steel Corp. (Fontana Plant)		
CA	CAD981429715	Kearney-KPF		
CA	CA3170024381	Lemoore Naval Air Station		
CA	CAT000646208	Liquid Gold Oil Corp.	1984	
CA	CA2170023194	Long Beach Naval Station		
CA	CAD065021594	Louisiana-Pacific Corp.		
CA	CAD982463812	M-E-W Study Area		
CA	CA7170024775	Mare Island Naval Shipyard		
CA	CAD009106527	McCormick & Baxter Creosoting Co.	1993	
CA	CAD000074120	MGM Brakes	1984	
CA	CAD981997752	Modesto Ground Water Contamination		
CA	CA2170090078	Moffett Naval Air Station	1986	
CA	CAD008242711	Montrose Chemical Corp.	1985	
CA	CA1170090483	Naval Shipyard Long Beach		
CA	CA0170090021	Naval Supply Center Pt. Molate Site		
CA	CAD981434517	Newmark Ground Water Contamination		
CA	CA7170090016	North Island Naval Air Station		
CA	CA4170090027	Oakland Naval Supply Center		
CA	CAD980636781	Pacific Coast Pipe Lines	1989	
CA	CA9170027271	Pacific Missile Test Center		

State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 9, cont.				
CA	CA1170090236	Point Loma Naval Complex		
CA	CA6170023323	Port Hueneme Naval Construct. Battalion Center		
CA	CAD982462343	Redwood Shore Landfill		
CA	CAT000611350	Rhone-Poulenc, Inc./Zoecon Corp.	1985	
CA	CA7210020759	Riverbank Army Ammunition Plant	1989	
CA	CAD009452657	Romic Chem Corp.		
CA	CA0210020780	Sacramento Army Depot		
CA	CA0170024491	Seal Beach Naval Weapons Station		
CA	CAD009164021	Shell Oil Co. Martinez		
CA	CAD980637482	Simpson-Shasta Ranch		
CA	CAD981171523	Sola Optical USA, Inc	1989	
CA	CAD059494310	Solvent Service, Inc.		
CA	CAD980894885	South Bay Asbestos Area	1985	
CA	CAD009138488	Spectra-Physics, Inc.		
CA	CAD980893275	Sulphur Bank Mercury Mine		
CA	CAD990832735	Synertek, Inc. (Building 1)		
CA	CAD000072751	Tosco Corp Avon Refinery		
CA	CA5570024575	Travis Air Force Base	1990	
CA	CA1170090087	Treasure Island Naval Station-Hunters Point Annex	1989	1989
CA	CAD009159088	TRW Microwave, Inc. (Building 825)		
CA	CAD981436363	United Heckathorn Co.		
CA	CA9570025149	Vandenberg AFB		1994[5]
GU	GU6571999519	Andersen Air Force Base	1993	
GU	GU7170027323	Naval Air Station Guam		
HI	HID033233305	ABC Chemical Corp.		
HI	HI3570028719	Bellows Air Force Station		
HI	HID981424138	Chemwood Treatment Co, Inc.		
HI	HID980637631	Del Monte Corp. (Oahu Plantation)	1995	
HI	HID981581788	Hawaiian Western Steel Limited		
HI	HI8570028722	Hickam Air Force Base		
HI	HI0000768382	Honolulu Skeet Club		
HI	HI4210090003	Johnston Atoll		
HI	HI6170090074	Kahoolawe Island		
HI	HID980497184	Kailua-Kona Landfill		
HI	HID980497176	Kapaa Landfill		
HI	HID980497226	Kewalo Incinerator Ash Dump		

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State	Cerclis No.	Site Name	Report Date Review	PNRS
Federal Region 9, cont.				
HI	HI6170022762	MCAS Kaneohe Landfill		
HI	HI3170024340	Naval Submarine Base		
HI	HID980585178	Pearl City Landfill	1984	
HI	HI4170090076	Pearl Harbor Naval Complex	1992	1993
HI	HI2170024341	Pearl Harbor Naval Station		
HI	HID982400475	Waiakea Pond/Hawaiian Cane Products Plant		1990
MQ	MQ6170027332	Midway Island Naval Air Station		
TT	TTD981622285	PCB Wastes (15 Saipan)		
WQ	WQ0570090001	Wake Island Air Field		
Federal Region 10				
AK	AK4170024323	Adak Naval Air Station	1993	
AK	AKD009252487	Alaska Pulp Corp.		1995
AK	AK6214522157	Fort Richardson (USARMY)	1995	
AK	AK6210022426	Fort Wainwright		
AK	AKD980978787	Standard Steel & Metals Salvage Yard (USDOT)	1990	1990
AK	AK9570028705	USAF Eareckson AFS		
AK	AK8570028649	USAF Elmendorf AFB	1990	1990/1994[6]
AK	AK0131490021	USDOC NOAA National Marine Fisheries Service		
ID	IDD980725832	Blackbird Mine	1995	1994
ID	IDD980665459	Stibnite/Yellow Pine Mining Area		
OR	ORD009051442	Allied Plating, Inc.	1987	1988
OR	ORD987185030	East Multnomah County Groundwater		
OR	ORD095003687	Gould, Inc.	1984	1988
OR	ORD068782820	Joseph Forest Products		
OR	ORD052221025	Martin-Marietta Aluminum Co.	1987	1988
OR	ORD009020603	McCormick & Baxter Creosote Co. (Portland)	1995	1995
OR	ORD980988307	Northwest Pipe & Casing Co.	1993	
OR	ORD009412677	Reynolds Metals Co.		
OR	ORD009025347	Rhone Poulenc Inc Basic Chemicals Division	1984	
OR	ORD009042532	Taylor Lumber and Treating, Inc.		1991
OR	ORD050955848	Teledyne Wah Chang	1985	1988
OR	ORD009049412	Union Pacific Railroad Tie Treatment	1990	1990
WA	WAD009045279	ALCOA (Vancouver Smelter)	1989	1989
WA	WAD057311094	American Crossarm & Conduit Co.	1989	1988
WA	WA5170027291	Bangor Naval Submarine Base	1990	1991

[6] U.S. Air Force report

State	Cerclis No.	Site Name	Report Date Review	Report Date PNRS
Federal Region 10, cont.				
WA	WA7170027265	Bangor Ordnance Disposal		1991
WA	WA1891406349	Bonneville Power Administration Ross (USDOE)	1990	1990
WA	WAD009624453	Boomsnub/Airco		
WA	WAD980836662	Centralia Municipal Landfill	1989	1989
WA	WAD980726368	Commencement Bay, Near Shore/Tide Flats	1984[7]	1988
WA	WAD980726301	Commencement Bay, South Tacoma Channel	1984[7]	
WA	WA5210890096	Hamilton Island Landfill (USA/COE)	1992	1991
WA	WA3890090076	Hanford 100-Area (USDOE)	1989	1988
WA	WAD980722839	Harbor Island (Lead)	1984	1989
WA	WA3170090044	Jackson Park Housing Complex (USNAVY)	1995	
WA	WA6170090058	Naval Air Station Whidbey Island (Seaplane)	1986	1989
WA	WA5170090059	Naval Air Station Whidbey Island (Ault)	1986	1989
WA	WA1170023419	Naval Undersea Warfare Station (4 Areas)		1989
WA	WAD027315621	Northwest Transformer(South Harkness St.)	1989	1988
WA	**WA8680030931**	**Old Navy Dump/Manchester Lab (USEPA/NOAA)**	**1996**	**1995**
WA	WAD009248287	Pacific Sound Resources	1995	1992
WA	WAD009422411	Pacific Wood Treating		
WA	WA4170090001	Port Hadlock Detachment (USNAVY)		1989/1995
WA	WA2170023418	Puget Sound Naval Shipyard Complex	1995	
WA	WAD980639215	Quendall Terminals	1985	
WA	WAD980639462	Seattle Municipal Landfill (Kent Highlands)	1989	1988
WA	WAD980976328	Strandley/Manning Site		1992
WA	WAD980639256	Tulalip Landfill	1992	1991
WA	WA2170023426	U.S. Navy Fuel Dept Naval Support Center Puget Sound		
WA	WAD988519708	Vancouver Water Station #1 Contamination		
WA	WAD980639280	Washington Natural Gas - Seattle Plant		1996
WA	WAD009487513	Western Processing Co., Inc.	1984	
WA	WAD009041450	Weyerhaeuser Co.		
WA	WAD009248295	Wyckoff Co./Eagle Harbor	1986	1988

[7]Incorporated into a single Coastal Hazardous Waste Site Review

Table 2. Acronyms and abbreviations used in Coastal Hazardous Waste Site Reviews

AWQC	Ambient water quality criteria for the protection of aquatic life
bgs	below ground surface
BHC	benzene hexachloride
BNA	base, neutral, and acid-extractable organic compounds
BOD	biological oxygen demand
CERCLA	Comprehensive Environmental Response Compensation Liability Act of 1980
CERCLIS	Comprehensive Environmental Response Compensation Liability Information System
cfs	cubic feet per second
cm	centimeter
COC	contaminant of concern
COD	chemical oxygen demand
COE	U.S. Army Corps of Engineers
CRC	Coastal Resource Coordinator
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DNT	dinitrotoluene
DOD	U.S. Department of Defense
DOI	U.S. Department of the Interior
EPA	U.S. Environmental Protection Agency
ERL	Effects range-low
ERM	Effects range-median
ETAG	Ecological and Technical Assessment Group
HMX	cyclotetramethylene tetranitramine
HRS	Hazard Ranking System
IRM	Immediate Removal Measure
kg	kilogram
km	kilometer
l	liter
LOEL	Lowest Observed Effects Level
m	meter
m^3/second	cubic meter per second
μg/g	micrograms per gram (ppm)
μg/kg	micrograms per kilogram (ppb)
μg/l	micrograms per liter (ppb)
μR/hr	microroentgens/hour
mg	milligram
mg/kg	milligrams per kilogram (ppm)
mg/l	milligrams per liter (ppm)
mR/hr	milliroentgens per hour
NFA	no further action
NOAA	National Oceanic and Atmospheric Administration

Table 2., cont.

NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PA/SI	Preliminary Assessment/Site Investigation
PCB	polychlorinated biphenyl
PCE	perchloroethylene (aka tetrachloroethylene)
pCi/g	pico Curies per gram (1 pico Curie=10^{-12} Curie)
pCi/l	pico Curies per liter
PCP	pentachlorophenol
PNRS	Preliminary Natural Resource Survey
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
PRP	Potentially Responsible Party
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RDX	cyclonite
REM/year	Roentgen Equivalent Man per year
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SVOC	semi-volatile organic compound
TCA	1,1,1-trichloroethane
TCE	trichloroethylene
TCL	Target Compound List
TNT	trinitrotoluene
TPH	total petroleum hydrocarbons
TSS	total suspended solids
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
VOC	volatile organic compound
=	equals
<	less than
>	greater than

1

Raymark Industries, Inc.

Stratford, Connecticut
CERCLIS #CTD001186618

Site Exposure Potential

The Raymark Industries, Inc. site covers about 13 hectares in Stratford, Connecticut, and is approximately 360 m from the Housatonic River (Figure 1). Until recently, surface runoff from the site flowed south into an underground culvert, which discharged into Ferry Creek. Ferry Creek enters the Housatonic River approximately 1.5 km from the site.

Raymark Industries produced brake linings, gasket material, sheet packing, clutch facing, transmission parts, and other friction-based products from 1919 to 1989. These products contained asbestos, metals, phenol-formaldehyde resins, and various adhesives. Wastes from this manufacturing process included wastewater, waste asbestos, lead solids, waste acids, cutting oils, and caustics.

During peak production at the facility in the 1970s, about 2.8 million liters per day of clarified wastewater were discharged into a series of on-site lagoons that ultimately discharged to Ferry Creek. An unknown quantity of solids accumulated in the lagoons during the early years of operation. During peak production, about 7,650 m^3 per year of dewatered asbestos and lead solids accumulated in the lagoons (Roy F. Weston 1993).

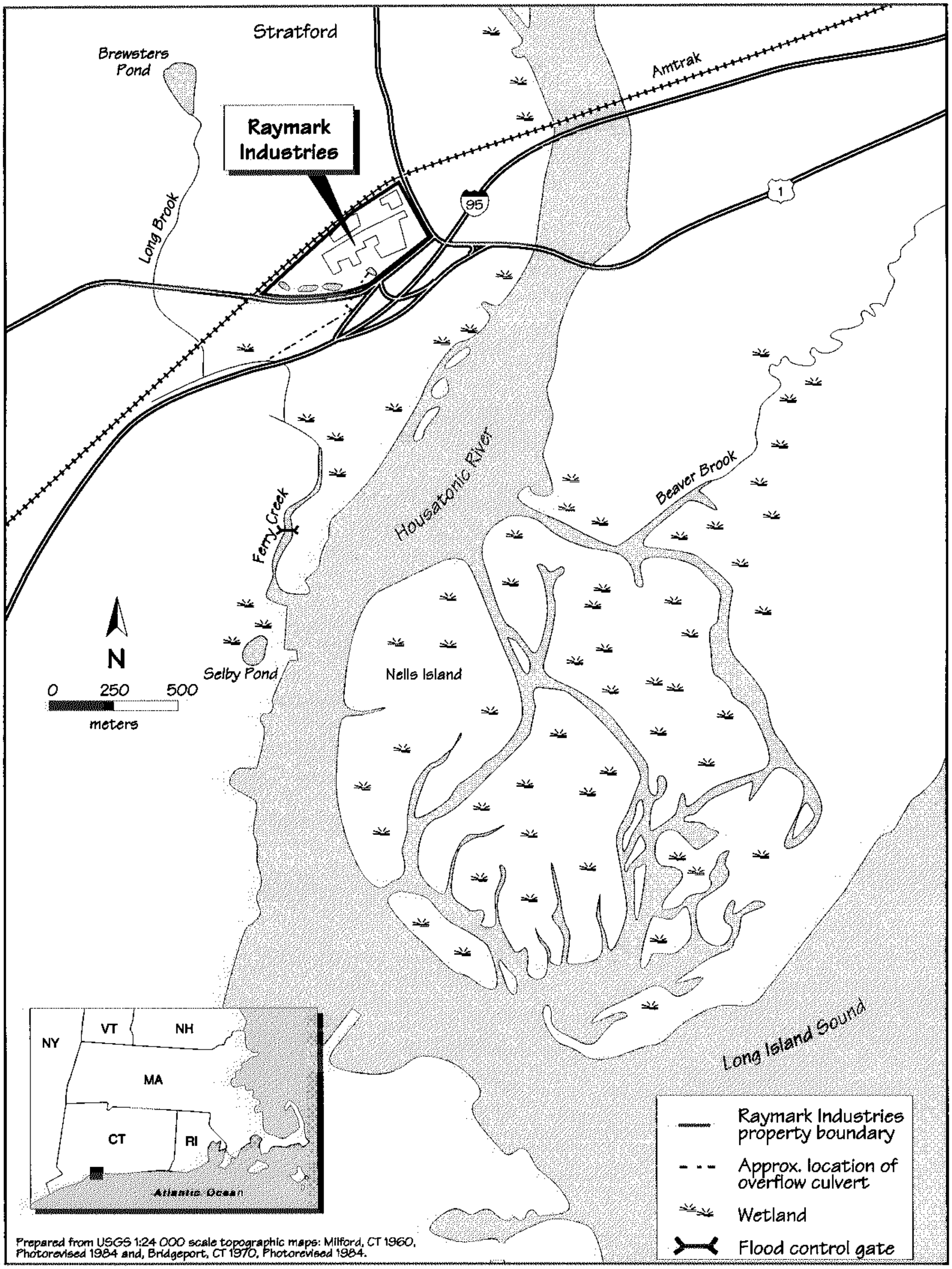

Figure 1. Location of the Raymark Industries site in Stratford, Connecticut.

Before 1970, the accumulated asbestos and lead solids were annually dredged from the lagoons and placed as on-site fill material to support land development at the facility (Roy F. Weston 1993). From at least the 1970s through the early 1980s, these solids were also disposed off-site in various locations throughout Stratford, including areas along Ferry Creek and the Housatonic River, and Raybestos Memorial Field north of the site (Roy F. Weston 1993).

Above- and below-ground storage tanks around the facility were used to store raw materials, process wastewater, and fuels. Several spills and leaks from these tanks have been documented, including a 22,700-liter phenol leak in 1983 and a 284,000-liter asbestos/phenol tank release in 1984 (Roy F. Weston 1993). About 80 percent of the hazardous materials in these tanks has been removed from the site. Hazardous wastes were also stored in drums at the site. Leaking drums were observed during EPA inspections of the site between 1980 and 1991. An unknown number of these drums have since been removed. Discarded cutting oils are the suspected source of low levels of dioxins. A temporary soil-and-gravel cap was placed over Lagoons 1, 2, and 3, and a temporary soil cap was placed over the Raybestos Memorial Field (Figure 2).

Migration of sediments contaminated by erosion of fill areas next to Ferry Creek and the Housatonic River is considered the primary pathway of contaminant transport to NOAA trust resources. Direct discharge from on-site lagoons, surface water runoff, and groundwater migration are secondary pathways of concern. Until 1993, overland flow at the site was directed into the lagoons, which then discharged to Ferry Creek via a 610-m underground culvert. In September 1993, Raymark rerouted site drainage around Lagoon 4. There may be other, unknown surface runoff pathways from the site to the Housatonic River.

Substrate immediately beneath the site generally consists of artificial fill, stratified outwash, peat, and swamp deposits. Surficial materials range from 6 to 9 m thick in the central portion of the site to more than 27 m thick in the northwest corner of the facility (Roy F. Weston 1993). The Derby Hill Schist, which underlies the surficial materials at the site, acts as a separate hydrologic unit. Groundwater occurs in fractures up to 60 m below the overburden-bedrock contact. Localized groundwater flows from northwest to southeast across the site towards the Housatonic River. There may be slight reversals in this flow caused by the tidal influence of the Housatonic River.

NOAA Trust Habitats and Species

Habitats of concern to NOAA are surface waters, bottom substrates, and estuarine marsh areas associated with Ferry Creek, Selby Pond, and the Housatonic River. A flapper tidegate about 1 km downstream from the site is believed to restrict

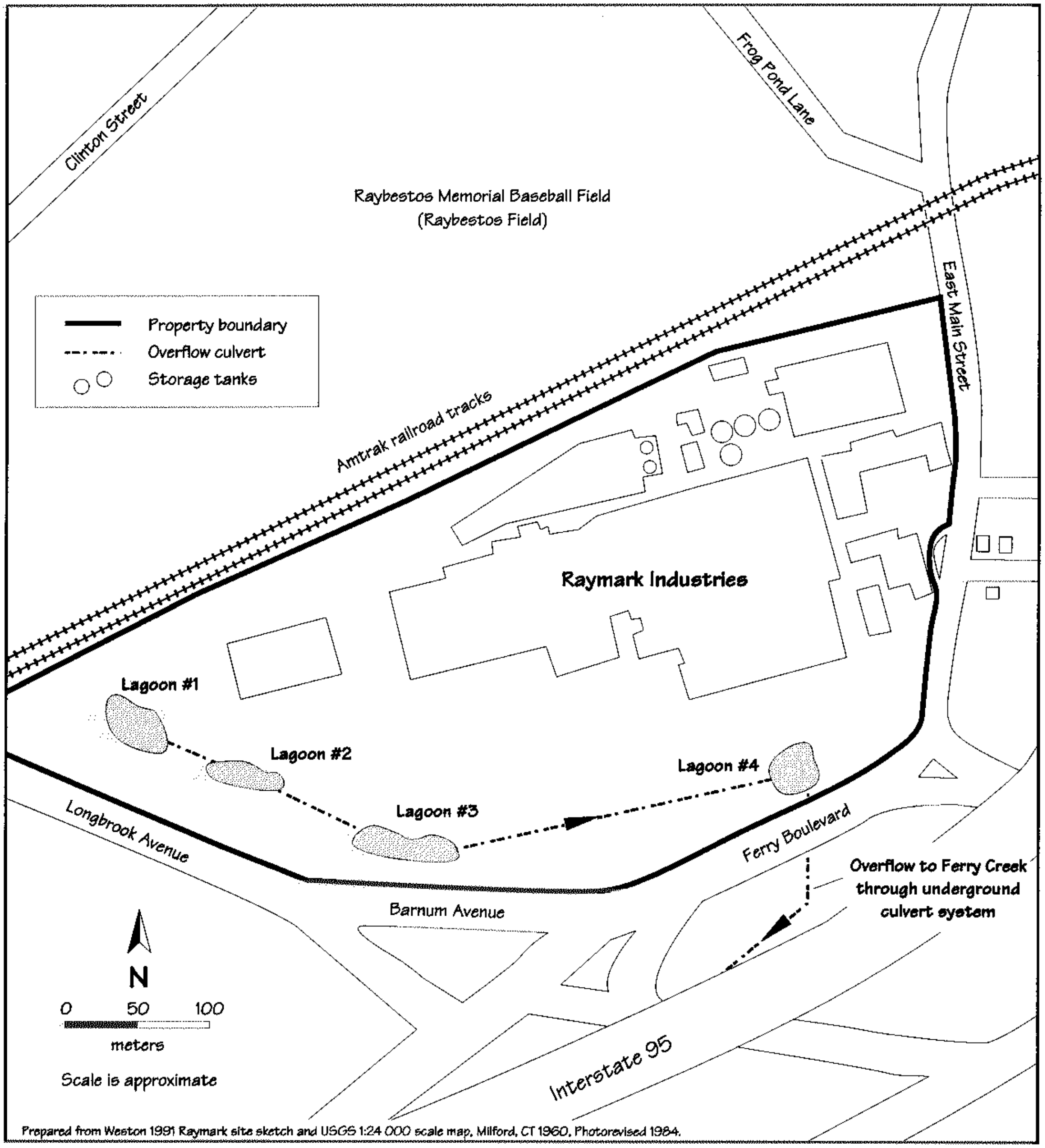

Figure 2. Detail of Raymark Industries in Stratford, Connecticut.

fish passage upstream, while allowing tidal influence to extend to Interstate 95. Ferry Creek near the site is less than 2 m wide and less than 1 m deep. Near the tidegate, the creek increases to 5 or 6 m wide. Bottom substrates of Ferry Creek are composed largely of silt and mud. Portions of the Housatonic River near the site range from 0.5 to 3.0 m deep and 0.25 to 0.75 km wide.

A dredged navigational channel is maintained in the lower portions of the Housatonic River. Substrates within this channel consist primarily of medium sands, with finer silts characteristically found in low-velocity areas (Aarestad personal communication 1995; Volk personal communication 1995).

Eiver discharge, depth, and tidal cycle vary salinities in the lower reach of the Housatonic River. Salinities range from 0 ppt on the surface during spring freshets, to 25 ppt at the bottom during flood tides in the low-flow summer season (Aarestad personal communication 1995). Tidal amplitude in this reach of the river averages 2.0 m (USGS 1984).

Wetlands in Ferry Creek above the tidegate are largely disturbed and are predominantly reed grass (*Phragmites communis*), jewelweed (*Impatiens capensis*), bindweed (*Polygonum* spp.), seabeach orach (*Atriplex arenaria*), and poison ivy (*Rhus radicans*). Smooth cord grass (*Spartina alterniflora*) and salt meadow hay (*Spartina patens*) dominate estuarine intertidal wetlands in the Housatonic River. Nells Island, a 245-hectare, estuarine, intertidal wetland complex of the lower Housatonic River, is opposite the mouth of Ferry Creek.

The Housatonic River is habitat for numerous migratory and estuarine-dependent fish and invertebrate species of interest to NOAA (Table 1; Aarestad personal communication 1995; Volk personal communication 1995). NOAA trust species most abundant throughout the year include four-spine stickleback, killifish, naked goby, Atlantic silverside, white perch, winter flounder, little skate, and northern pipefish. Other seasonally prevalent trust species in the lower Housatonic estuary include bay anchovy, Atlantic menhaden, black sea bass, smallmouth flounder, Atlantic tomcod, summer flounder, bluefish, striped searobin, northern puffer, tautog, and blue crab. Anadromous runs of alewife, blueback herring, American and hickory shad, and rainbow smelt commonly enter the Housatonic River during the spring to access suitable freshwater spawning habitats farther upstream. Juveniles generally return to the ocean by the following fall (Aarestad personal communication 1995).

Bluefish and striped bass migrate into the river during the summer to forage on alewife, blueback herring, American shad, Atlantic menhaden, killifish, and Atlantic silverside. Juvenile and adult Atlantic menhaden also migrate into the Housatonic estuary during the summer. Atlantic tomcod overwinter in the river from the late fall through the spring and later migrate to coastal and offshore areas during the summer months. Scup and tautog generally use nearshore waters and lower portions of the estuary (Aarestad personal communication 1995). NOAA trust resources are not believed to frequent Ferry Creek habitats because of the creek's restricted hydraulic input and small dimensions. Killifish (*Fundulus* spp.) and several unidentified macrobenthic invertebrates represent the only aquatic species identified during recent field investigations in Ferry Creek.

Table 1. NOAA trust species using habitats associated with the Housatonic estuary.

Species		Habitat Use			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
<u>ANADROMOUS/CATADROMOUS SPECIES</u>						
Blueback herring	*Alosa aestivalis*		◆	◆		
Hickory shad	*Alosa mediocris*		◆	◆		
Alewife	*Alosa pseudoharengus*		◆	◆		
American eel	*Anguilla rostrata*		◆	◆		
American shad	*Alosa sapidissima*		◆	◆		
Striped bass	*Morone saxatilis*			◆		
Rainbow smelt	*Osmerus mordax*		◆	◆		
Sea lamprey	*Petromyzon marinus*			◆		
<u>MARINE/ESTUARINE SPECIES</u>						
American sandlance	*Ammodytes americanus*	◆	◆	◆		
Bay anchovy	*Anchoa mitchilli*		◆	◆		
Four-spine stickleback	*Apeltes quadracus*	◆	◆	◆		
Atlantic menhaden	*Brevoortia tyrannus*		◆	◆		◆
Crevalle jack	*Caranx hippos*		◆	◆		
Black sea bass	*Centropristis striata*		◆	◆		◆
Atlantic herring	*Clupea harengus*		◆	◆		
Weakfish	*Cynoscion regalis*		◆	◆		
Sheepshead minnow	*Cyprinodon variegatus*	◆	◆	◆		
Fourbeard rockling	*Enchelyopus cimbrius*		◆	◆		
Smallmouth flounder	*Etropis microstomas*		◆	◆		
Mummichog	*Fundulus heteroclitus*	◆	◆	◆		
Striped killifish	*Fundulus majalis*	◆	◆	◆		
3-spine stickleback	*Gasterosteus aculeatus*	◆	◆	◆		
Naked goby	*Gobiosoma bosci*	◆	◆	◆		
Spot	*Leiostomus xanthurus*		◆	◆		
Atlantic tomcod	*Microgadus tomcod*	◆	◆	◆		◆
Atlantic croaker	*Micropogonias undulatus*		◆			
Tidewater silverside	*Menidia beryllina*	◆	◆	◆		
Atlantic silversides	*Menidia menidia*	◆	◆	◆		
Northern kingfish	*Menticirrhus saxatilis*		◆			
White perch	*Morone americana*	◆	◆	◆		◆
White mullet	*Mugil curema*			◆		
Oyster toadfish	*Opsanus tau*	◆	◆	◆		
Summer flounder	*Paralichthys dentatus*		◆	◆		◆
Fourspot flounder	*Paralichthys oblongus*		◆			
Butterfish	*Peprilus triacanthus*		◆			
Rock gunnel	*Pholis gunnellus*	◆	◆	◆		
Winter flounder	*Pleuronectes americanus*	◆	◆	◆		◆
Bluefish	*Pomatus saltatrix*		◆	◆		◆
Northern searobin	*Prionotus carolinus*		◆	◆		
Striped searobin	*Prionotus evolans*		◆	◆		
Nine-spine stickleback	*Pungitius pungitius*	◆	◆	◆		
Little skate	*Raja erinacea*		◆	◆		
Spanish mackerel	*Scomberomorus maculatus*		◆			
Windowpane	*Scophthalmus aquosus*		◆	◆		
Northern puffer	*Sphaeroides maculatus*		◆	◆		
Scup	*Stenotomus chrysops*		◆	◆		◆
Northern pipefish	*Syngnathus fuscus*	◆	◆	◆		
Inshore lizardfish	*Synodus foetens*		◆	◆		

Table 1., cont.

Species		Habitat Use			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
MARINE/ESTUARINE SPECIES						
Tautog	*Tautoga onitis*		◆	◆		◆
Cunner	*Tautogolabrus adspersus*		◆	◆		
Hogchoker	*Trinectes maculatus*	◆	◆	◆		
Spotted hake	*Urophycis regia*		◆			
INVERTEBRATE SPECIES						
Whelk	*Busycon spp.*	◆	◆	◆		
Blue crab	*Callinectes sapidus*	◆	◆	◆		◆
Atlantic rock crab	*Cancer irroratus*	◆	◆	◆		
Green crab	*Carcinus maenas*	◆	◆	◆		
Sand shrimp	*Crangon septemspinosa*	◆	◆	◆		
Eastern oyster	*Crassostrea virginica*	◆	◆	◆	◆	
Spider crab	*Libinia spp.*	◆	◆	◆		
Horseshoe crab	*Limulus polyphemus*			◆		
Hard-shelled clam	*Mercenaria mercenaria*			◆		
Soft-shelled clam	*Mya arenaria*			◆		
Blue mussel	*Mytilis edulis*	◆	◆	◆		
Lady crab	*Ovalipes ocellatus*	◆	◆	◆		
Shore shrimp	*Palaemonetes spp.*	◆	◆	◆		
Mud crab	*Panopeus spp.*	◆	◆	◆		
MARINE MAMMALS						
Minke whale	*Balaenoptera acutorostrata*	◆	◆	◆		
Fin whale*	*Balaenoptera physalus*	◆	◆	◆		
Hooded seal	*Crytophora cristata*	◆	◆			
Common dolphin	*Delphinus delphis*	◆	◆	◆		
Northern right whale*	*Eubalaena glacialis*	◆	◆	◆		
Atlantic pilot whale	*Globicephala melaena*	◆	◆	◆		
Gray seal	*Halichoerus grypus*	◆	◆			
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	◆	◆	◆		
Humpback whale*	*Megaptera noveangliae*	◆	◆	◆		
Harp seal	*Pagophilus groenlandicus*	◆	◆			
Harbor porpoise	*Phocoenna phocoena*	◆	◆	◆		
Harbor seal[b]	*Phoca vitulina concolor*	◆	◆			
Atlantic bottlenosed dolphin	*Tursiops truncatus*	◆	◆	◆		
Striped dolphin	*Stenella coeruleoalba*	◆	◆	◆		

a: This migratory area refers to the Atlantic Ocean and offshore portions of Long Island Sound.

b: The harbor seal is the most frequent visitor to the region and represents the only marine mammal known to use aquatic environments of the Housatonic River.

* Federally listed endangered species

Adult and juvenile blue crab use surface waters near the site as rearing, mating, and foraging habitat (Aarestad personal communication 1995). Males and juvenile females often reside in lower-salinity habitats, while gravid females migrate to higher-salinity areas and the coastal continental shelf for egg dispersal (Van Den Avyle and Fowler 1984.) Female blue crabs mate only once, but blue crab mating season occurs twice annually in the early spring and late fall. There are oyster beds throughout the lower portion of the Housatonic estuary with denser beds found in subtidal areas with firm, hard-packed substrates. No oysters have been observed in Ferry Creek (Svirsky personal communication 1995; Volk personal communication 1995).

During the winter, several pinnipeds inhabit the coastal waters of Long Island Sound, including the harbor, gray, harp, and hooded seals. The harbor seal, the most frequent visitor to the region, has been observed in the Housatonic River. Numerous cetaceans also use areas offshore of the site. The federally endangered humpback, northern right, and fin whales; and the minke and Atlantic pilot whales periodically migrate into Long Island Sound. Atlantic white-sided dolphin, harbor porpoise, striped dolphin, common dolphin, and Atlantic bottlenose dolphin also periodically migrate into Long Island Sound marine waters (Nowojchik personal communication 1995).

There is some recreational fishing and crabbing in the Housatonic River near the site. Recreational fisheries typically target black sea bass, Atlantic tomcod, white perch, summer flounder, bluefish, winter flounder, scup, and tautog. Sportfishing occurs primarily during warm-weather months when species of interest concentrate in the lower Housatonic River (Aarestad personal communication 1995).

The only commercial fishing-related activity in the lower Housatonic River is seed oyster production. The National Shellfish Sanitation Program prohibits fishing in river surface waters because of the threat of fecal coliform contamination. Oysters are seeded annually for reproduction and subsequently transplanted (relayed) to offshore certified areas in Long Island Sound, where they depurate and grow to maturity (in approximately three to four years) before being harvested for commercial use. Approximately 30,000 to 130,000 bushels of seed oyster are harvested from the lower Housatonic River and transplanted offshore each year (Volk personal communication 1995).

A statewide health advisory recommends limited consumption of bluefish and striped bass taken from state waters because of elevated PCB concentrations in edible tissue (Aarestad personal communication 1995).

Site-Related Contamination

Investigations at the site indicate that trace elements, PCBs, dioxins, and PAHs are the primary contaminants of concern to NOAA (Roy F. Weston 1993). Table 2 lists the maximum concentrations of selected contaminants detected around the Raymark site.

The trace elements arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc were detected in soil on-site and nearby at concentrations that exceed average U.S. soil concentrations by several orders of magnitude (Roy F. Weston 1993). The same trace elements were detected in groundwater at concentrations that exceed freshwater chronic AWQC by several orders of magnitude (Roy F. Weston 1993). These trace elements were also detected in sediments in Ferry Creek or the Housatonic River at concentrations above ERM screening guidelines (Long and MacDonald 1992). Copper was detected at a maximum concentration of 7,000 mg/kg in sediments of Upper Ferry Creek, exceeding by an order of magnitude the ERM screening guideline of 270 mg/kg (Long and MacDonald 1992). Lead was detected in sediments at Lagoon 4 at a maximum concentration of 14,000 mg/kg (Roy F. Weston 1993).

Several PAH compounds were detected in on-site soils, but there are no screening guidelines for these constituents in soil. Anthracene, dibenz(a,h)anthracene, fluoranthene, naphthalene, phenanthrene, pyrene, benz(a)anthracene, chrysene, and benzo(a)pyrene were detected in sediments of Ferry Creek or the Housatonic River at concentrations above ERM screening guidelines (Long and MacDonald 1992; Chemtech 1993, 1994; Skinner and Sherman 1993).

Although pesticides and PCBs were detected in surface soil, there are no screening guidelines for these contaminants in soil. PCBs were detected in groundwater at concentrations that exceed the freshwater chronic AWQC by several orders of magnitude (EPA 1993a). PCBs were detected in sediment at concentrations that exceed the ERM screening guideline for total PCBs by several orders of magnitude (Long and MacDonald 1992; Roy F. Weston 1993). Aroclor 1260 was detected at 150 mg/kg in sediment in the culvert inlet to Ferry Creek. DDD and DDE were also detected. There is no screening guideline for DDD in sediment but DDE exceeded the ERL screening guideline (Long and MacDonald 1992).

Dioxin was detected in surface soil at a maximum concentration of 7.2 µg/kg (expressed as 2,3,7,8-TCDD toxicity equivalents). Groundwater samples from the site were not analyzed for dioxin. Dioxin was detected at a maximum concentration of 3.9 µg/kg toxicity equivalents in sediment collected at Lagoon 4. A 2,3,7,8-TCDD concentration of 0.06 µg/kg in sediment has been shown to be a low risk to fish (EPA 1993b).

Numerous SVOCs and VOCs were detected in surface soil samples collected at or near the site,

Table 2. Maximum concentrations of selected contaminants detected at the Raymark site (Roy F. Weston 1993).

Contaminants	Soil (mg/kg)		Water (ug/l)			Ferry Creek and Housatonic River Sediment (mg/kg)		
	On-Site	Avg. U.S.[1]	Surface Water	Ground water	AWQC[2]	Sediment	ERL[3]	ERM[4]
Trace Elements								
Arsenic	130	5	93.4	930	NA	24	8.2	70
Cadmium	39	0.06	2.3	440	1.1+	16.2	1.2	9.6
Chromium	800	100	59.2	39,000	NA	1,060	81	370
Copper	164,000	30	138	25,000	12.0+	7,000	34	270
Lead	57,000	10	147	1,260	3.2+	6,150	46.7	218
Mercury	1.0	0.03	3.5	2.3	0.01	2.7	0.15	0.71
Nickel	1,600	40	11.7	32,000	160.0+	270	20.9	51.6
Silver	7.0	0.05	NA	4.0	0.12	6.8	1.0	3.7
Zinc	42,000	50	127	15,000	110.0+	1,420	150	410
Pesticides/PCBs								
DDD		NA	0.004	ND	NA	0.028	NA	NA
DDE	NA	NA	NA	ND	NA	0.004	0.0022	0.027
DDT	NA	NA	NA	ND	0.001	16	0.0016t	0.46t
Total PCBs	9,200	NA	NA	0.6	0.014x	18.2	0.023x	0.18x
Total Dioxins (2,3,7,8 TCDD TEQs[5])						0.0011		
PAHs								
Anthracene	37	NA	NA	NA	NA	1.1	0.09	0.5
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	2.0	0.063	0.26
Fluoranthene	170	NA	NA	NA	NA	17	0.016‡	0.6
Naphthalene	5.3	NA	NA	49	620‡	1.1	0.16	2.1
Benzo(k)fluoranthene	48	NA	NA	ND	NA	4.3	NA	NA
Phenanthrene	150	NA	NA	14	6.3p	5.8	0.24	1.5
Pyrene	140	NA	NA	2.0	NA	18	0.665	2.6
Benz(a)anthracene	62	NA	NA	ND	NA	7.0	0.26	1.6
Chrysene	54	NA	NA	ND	NA	10	0.38	2.8
Benzo(b)fluoranthene	35	NA	NA	ND	NA	14	NA	NA
Benzo(a)pyrene	26	NA	NA	ND	NA	6.8	0.43	1.6

1: EPA (1983).
2: Ambient water quality criteria for the protection of aquatic organisms. Freshwater chronic criteria presented (EPA 1993a).
3: Effects range-low; Long and MacDonald (1992).
4: Effects range-medium; Long and MacDonald (1992).
5: Toxic Equivalency Quotient
NA: Not available.
ND: Not detected; detection limits not available.
+: Hardness-dependent criterion.
‡: Lowest observed effect level (EPA 1993a).
t: Total DDT.
p: Proposed criteria.
x: Total PCBs

but no screening guidelines exist for these contaminants in soil. Although many of these same contaminants were detected in groundwater, no concentrations exceeded freshwater chronic AWQC, where criteria exist. Several SVOCs and VOCs were also detected in sediment.

Summary

Trace elements, PAHs, and PCBs were detected at elevated concentrations in soil, groundwater, and sediment associated with the Raymark site. Migration of site-related contaminants from fill areas next to Ferry Creek and the Housatonic River, and the historic discharge of these contaminants from Lagoon 4 to Ferry Creek, are the primary sources of potential risk to NOAA trust resources. The Housatonic River and associated wetlands downstream from Ferry Creek serve as habitat for numerous migratory and estuarine-dependent fish and invertebrate species of interest to NOAA.

References

Aarestad, P., Fisheries Biologist, Fisheries Division, Marine Fisheries, Connecticut Department of Environmental Protection, Old Lyme, Connecticut, personal communication, January 4, 1995.

Chemtech Consulting Group (Chemtech). 1993. Unpublished laboratory data sheets. Boston: U.S. Environmental Protection Agency, Region 1.

Chemtech Consulting Group (Chemtech). 1994. Unpublished laboratory data sheets. Boston: U.S. Environmental Protection Agency, Region 1.

Long, E.R., and D.D. MacDonald. 1992. National Status and Trends Program approach. In: *Sediment Classification Methods Compendium.* EPA 823-R-92-006. Washington, D.C.: U.S. Environmental Protection Agency, Office of Water (WH-556).

Nowojchik, R., Staff Biologist, Mystic Marine Life Aquarium, Mystic, Connecticut, personal communication, January 4, 1995.

Roy F. Weston, Inc. 1993. *Final Site Inspection Report for Raymark Industries, Stratford, CT.* Boston: U.S. Environmental Protection Agency.

Skinner and Sherman Laboratory. 1993. Unpublished laboratory data sheets. Boston: U.S. Environmental Protection Agency, Region 1.

Svirsky, S., BTAG Coordinator, U.S. Environmental Protection Agency, Boston, personal communication, January 6, 1995.

U.S. Environmental Protection Agency (EPA). 1983. *Hazardous waste land treatment.* EPA/530/SW-83/874. Cincinnati: Municipal Environmental Research Laboratory. 702 pp.

U.S. Environmental Protection Agency (EPA). 1993a. *Quality criteria for water.* Washington, D.C.: Office of Water, Health and Ecological Criteria Division. 294 pp.

U.S. Environmental Protection Agency (EPA). 1993b. Interim report on data and methods for assessment of 2,3,7,8-tetrachlorodibenzo-p-dioxin risks to aquatic life and associated wildlife. Washington, D.C.: Office of Research and Development.

USGS. 1984 (photo-revised). *Milford Quadrangle, Connecticut.* 7.5 minute series quadrangle. Reston, Virginia: U.S. Government Printing Office.

Van Den Avyle, M.J., and D.L. Fowler. 1984. *Species profile: life histories and environmental requirements of coastal fishes and invertebrates (South Atlantic)- blue crab.* FWS/OBS-82/ 11.19. TR EL-82-4. Washington, D.C.: U.S. Fish and Wildlife Center. 16 pp.

Volk, J., Director, Aquaculture Division, Connecticut Department of Agriculture, Milford, Connecticut, personal communication, January 4, 1995.

2

Island Chemical Company

St. Croix, U.S. Virgin Islands
CERCLIS #VID980651095

Site Exposure Potential

The Island Chemical Company site occupies about 1.2 hectares in south-central St. Croix, U.S. Virgin Islands (Figure 1). The site is bordered to the northeast and southeast by River Gut, an intermittent stream that originates north of the site. River Gut flows approximately 240 m before merging with Bethlehem Gut, forming Fair Plain Gut, which discharges to the Caribbean Sea approximately 1.4 km downstream from the site (Figure 1). Flow in River Gut near the site generally occurs only during the rainy season between September and December, but the gut becomes perennial before reaching Fair Plain Gut (NUS Corporation 1991).

Charles H. Steffey, Inc. purchased the site in 1968; it is now owned by the same corporation, which changed its name to CHS Holding Corporation (CHS) sometime before 1982. Between 1968 and 1982, the site was leased by numerous chemical companies and their subsidiaries, including Caribe Chemical Company, Pierrel S.p.a., Cooper Laboratories, Island Chemical Company, Berlex, and the Virgin Island Chemical Company. The plant was closed in 1982 and is now vacant (EPA 1994).

Chemicals produced and/or disposed at the site include pyridine, acids, solvents, benzyl chloride,

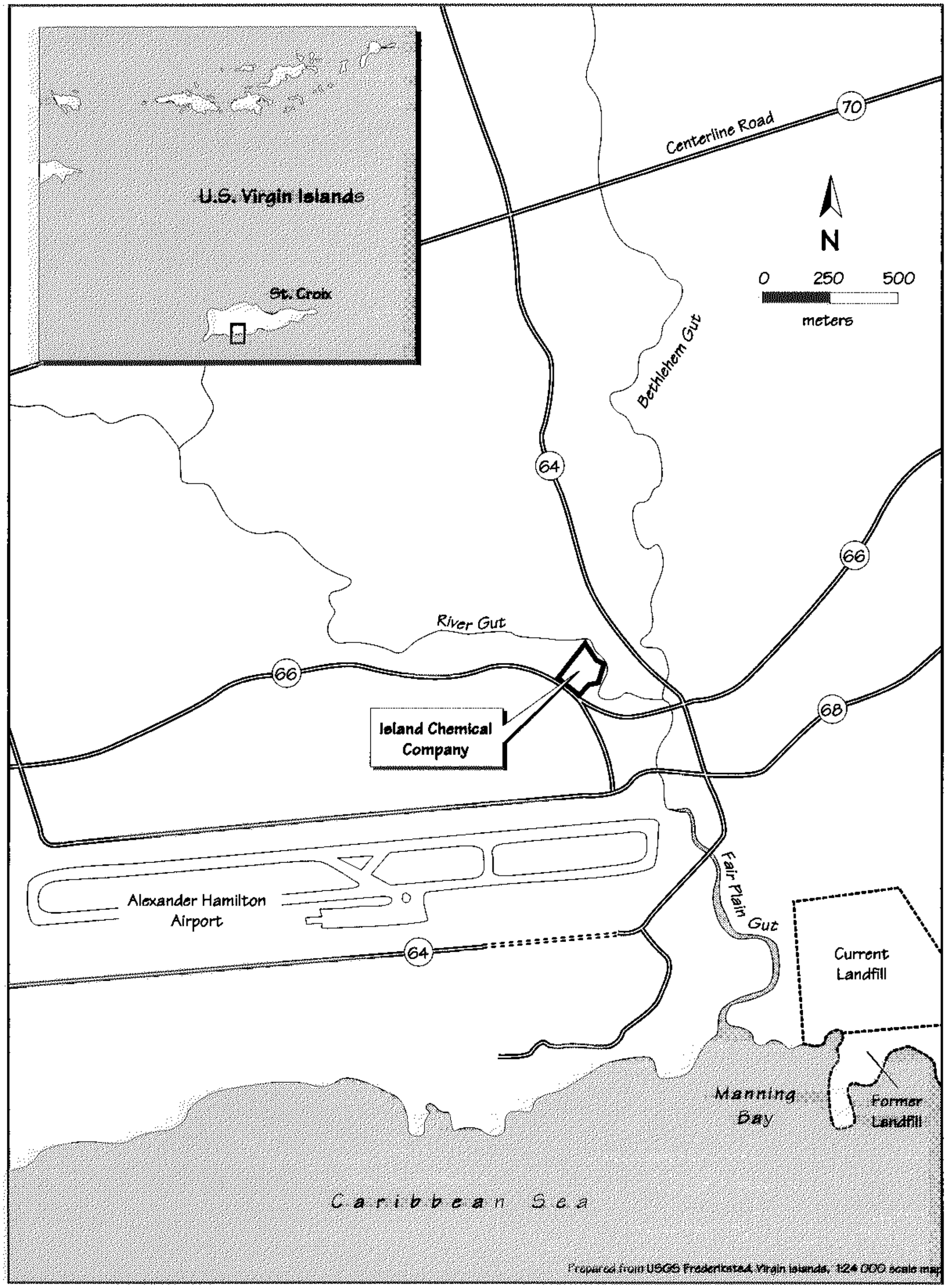

Figure 1. The Island Chemical Company site in St. Croix, U.S. Virgin Islands.

benzyl salicylate, phenacetin, ethoxyquin, quinine, quinidine, and toluene. Table 1 describes six areas of potential environmental concern.

When Island Chemical occupied the facility, it discovered that hazardous materials had been left on-site by the previous tenant. Between 1982 and 1983, about 100,000 liters of toluene and 26,000 liters of xylenes were removed from the site. In 1985, 192 drums of waste were disposed off-site by Island Chemical. In addition, contaminated soils were excavated and removed near the above-ground storage tanks (ASTs), and beneath the concrete pad near the ASTs. According to the RI Work Plan, toluene and pyridine represented the largest volume of releases at the site, based on previous studies (Harding Lawson Associates 1995).

The primary pathways of contaminant transport from the site are surface water runoff into River Gut and groundwater migration. All surface runoff from the site drains into the gut (Figure 2). The surface slopes gently across the site to the northeast. A berm partially separates the ASTs in the western portion of the facility from the remainder of the site. On the western side of the berm, runoff flows from southwest to northeast. On the eastern portion of the site, runoff from concrete and paved areas is channeled into three storm drains which empty into River Gut (Figure 2; Harding Lawson Associates 1995).

Groundwater occurs in the surficial aquifer at approximately 6 m below ground surface. Groundwater flow near the site is to the north and southeast (Harding Lawson Associates 1995). This alluvial aquifer consists of permeable

Table 1. Areas of environmental concern at Island Chemical Company.

Area	Description	Contaminants of Potential Concern
A	Laboratory and warehouse building	Environmental samples were not collected from this area.
B	Aboveground storage tank farm	Benzoquinone, fluorenone, benzophenone, toluene, xylenes, hydroxyfuranocoumarin, p-phenetidine in ASTs. Toluene, quinidine gluconate, quinine sulfate, trace elements (lead, copper, and zinc), and numerous pesticides in soils.
C	Former process pit	Trace elements in sludge. Pesticides and trace elements (lead and zinc) in sediment from storm drain leading from the pit.
D	Loading dock and former lab pit area	Pyridine, toluene, quinidine gluconate, quinine sulfate, and trace elements in soils.
E	Soil beneath concrete pad near ASTs	Five soil samples were collected in 1984 and analyzed for toluene, pyridine, quinidine gluconate, and quinine sulfate. These substances were not detected.
F	Concrete storage pad	Environmental samples have not been collected from this area. This pad was used for storage of drums of raw materials when the facility was in operation.

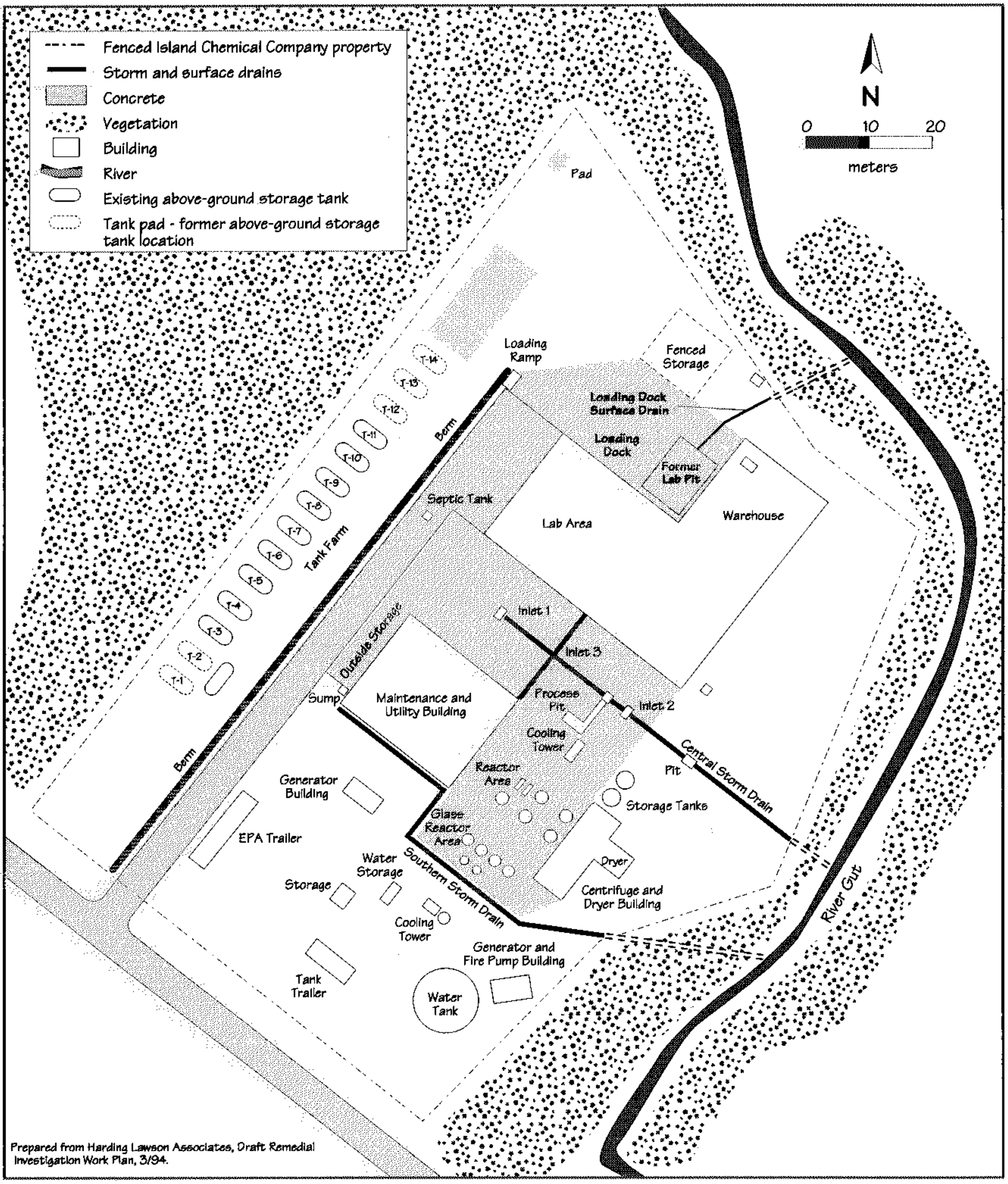

Figure 2. Detail of Island Chemical site.

layers of sand and gravel, ranging from 0.3 to 2.4 m thick, intermixed with low-permeability clay. The interconnection between the permeable layers is not known, but is believed to be isolated and limited. During a pumping test, ponded water in River Gut exhibited no elevation change, indicating that water in the gut may be perched above groundwater (NUS Corporation 1991).

NOAA Trust Habitats and Species

Principal habitats of concern to NOAA are the surface waters and bottom substrates associated with River Gut and Fair Plain Gut. The estuarine waters and reef habitats of Manning Bay are also a concern because of their high species abundance and diversity.

River Gut receives terrestrial runoff from a watershed of 2,700 hectares. The gut is at least partially submerged throughout the year and supports healthy red mangrove (*Rhizophora mangle)* communities. There is a natural buildup of sand deposits at the mouth of Fair Plain Gut due to longshore currents, wind, and wave energy. The berm is approximately 0.9 m high and 6 m wide. This berm is broken only during periods of heavy rains, high seas, or sewage overflows and otherwise blocks the flow of water from Fair Plain Gut to Manning Bay (Department of Planning and Natural Resources 1990; Adams 1995). In spite of the berm, biologists reported numerous fish in the gut. The guts are usually hyperhaline (saltier than the ocean; Adams 1995). Red, black and white mangroves (*Rhizophora mangle, Avicennia germinans, and Laguncularia racemosa* respectively), buttonwood (*Conocarpus erectus)*, and shrubs (*Acacious)* provide dense cover along the shoreline of both guts (Department of Planning and Natural Resources 1990). Information on depth, width, and substrate of both River and Fair Plain Guts was not available, but a high nutrient content is assumed in Fair Plain Gut due to sewage discharges (Department of Planning and Natural Resources 1987 and 1990).

The nearest reef visible from the shoreline is approximately 1.2 km offshore. Manning Bay is a high-salinity environment with a predominantly sandy substrate. There are sea grasses and scattered rubble towards the reef and habitat conditions appear to support complex fish and invertebrate communities. The tidal range averages 0.1 m a day, with an annual range of 6 m.

EPA is negotiating with the St. Croix Port regarding mitigation for the destruction of mangrove habitat near the Alexander Hamilton Airport. Approximately 0.2 hectares of mangroves were bulldozed, including 107 m along Fair Plain Gut.

A great variety of NOAA trust species use Fair Plain Gut and Manning Bay (Table 2). Mangroves provide vital habitat for juvenile marine fishes and juvenile sea turtles because the interconnecting root systems and shallow water

Table 2. Primary fish and invertebrate species that use Fair Plain Gut and Manning Bay.

		Habitat			Fisheries	
Common Name	Scientific Name	Spawning Mating Nesting	Nursery	Adult Forage	Comm.	Recr.
FISHES						
Surgeonfishes	*Acanthuridae*	◆	◆	◆	◆	◆
Cardinalfishes	*Apogonidae*	◆	◆	◆		
Leatherjackets	*Balistidae*	◆	◆	◆	◆	◆
Jacks	*Carangidae*	◆	◆	◆	◆	◆
Snook	*Centropomus undecimalis*	◆	◆	◆	◆	◆
Butterflyfishes	*Chaetodontidae*	◆	◆	◆	◆	◆
Flying gurnard	*Dactylopterus volitans*	◆	◆	◆		
Cubbyu	*Equetus acuminatus*	◆	◆	◆		
Jackknife-fish	*Equetus lancealatus*	◆	◆	◆		
Spotted drum	*Equetus punctatus*	◆	◆	◆		
Mosquitofish	*Gambusia affinis*	◆	◆	◆		
Mojarras	*Gerreidae*	◆	◆	◆	◆	◆
Grunts	*Haemulidae*	◆	◆	◆	◆	◆
Squirrelfishes	*Holocentridae*	◆	◆	◆	◆	◆
Wrasses	*Labridae*	◆	◆	◆	◆	◆
Snappers	*Lutjanidae*	◆	◆	◆	◆	◆
Sand tilefish	*Malacanthus plumieri*	◆	◆	◆		
Tarpon	*Megalops atlantica*	◆	◆	◆		◆
Goatfishes	*Mullidae*	◆	◆	◆	◆	◆
Morays	*Muraenidae*	◆	◆	◆	◆	◆
Garden eel	*Nystactichthys halis*	◆	◆	◆	◆	◆
Angelfishes	*Pomacanthidae*	◆	◆	◆	◆	◆
Damselfishes	*Pomacentridae*	◆	◆	◆	◆	◆
Greater soapfish	*Rypticus saponaceus*	◆	◆	◆	◆	
Sea basses	*Serranidae*	◆	◆	◆	◆	◆
Porgies	*Sparidae*	◆	◆	◆	◆	◆
Parrotfishes	*Sparisoma sp*	◆	◆	◆		
	Scarus sp	◆	◆	◆		
Barracudas	*Sphyraenidae*	◆	◆	◆	◆	◆
Tilapia	*Tilapia sp*	◆	◆	◆	◆	◆
INVERTEBRATES						
Blue crab	*Callinectes sapidus*	◆	◆	◆	◆	◆
Spiny lobster	*Panulirus argus*	◆	◆	◆	◆	◆
Queen conch	*Strombus gigas*	◆	◆	◆	◆	◆
REPTILES						
Green sea turtle*	*Chelonia mydas*	◆	◆	◆		
Hawksbill sea turtle*	*Ertmochelys impricata*	◆	◆	◆		

*Federally listed Endangered Species

provide extensive cover. Tilapia occur in large numbers and are considered ubiquitous. Other dominant fish species include snapper, jack, barracuda, sea bass, butterflyfish, mojarra, mosquitofish, grunt, and wrasse (Adams 1995).

All primary species listed in Table 2 use reef habitats for spawning, nursery, and adult forage (Adams 1995). Turtle grass (*Thalassia testudinum)* colonizes the flat sandy substrates (Adey et al. 1977). Other sea grasses include *Valacia, Syrangodium, Halimeda,* and *Penicillus.* Sea grasses provide both forage and protective cover for sea turtles and nursery habitat for other marine species, including spiny lobster and queen conch (Adams 1995).

Of particular concern to NOAA are two federally endangered species of sea turtle, which are known to forage in Manning Bay and surrounding coastal waters. Turtle surveys have not been conducted near the site, but it is likely that turtles nest along the shoreline in Manning Bay because nesting is extremely common throughout St. Croix (Adams 1995).

Commercial fisheries are considered artisinal and subsistence in nature. Fishes and invertebrates that are harvested both commercially and recreationally include grunt, snapper, jack, surgeonfish, leatherjacket, barracuda, sea bass, butterflyfish, goatfish, mojarra, cardinalfish, porgy, moray, and wrasse, blue crab, spiny lobster, and queen conch (Adams 1995).

Lower Fair Plain Gut receives any overflow from the nearby sewage lift station. Documented fish kills relating to these events have been reported in 1981, 1985, 1987, 1988, and 1990. No health advisories have been documented from the sewage overflow events (Department of Planning and Natural Resources 1990).

Site-Related Contamination

Data collected during previous investigations indicate that groundwater, soils, sludge, storm drains, and sediment in River Gut contain elevated concentrations of site-related contaminants (Harding Lawson Associates 1994, 1995). Table 3 summarizes the contaminants found during previous investigations. The primary contaminants of concern to NOAA at the Island Chemical site are trace elements, organic compounds, and pesticides.

Trace elements, organic compounds, and pesticides have been detected in on-site soils (Table 3; Harding Lawson Associates 1995). Sludge samples taken from the former processing pit contained high concentrations of trace elements and toluene. No other contaminants were reported from the sludge samples, but complete analytical results were not available (Harding Lawson Associates 1995).

VOCs and SVOCs were detected in groundwater sampled during the RI, but at concentrations that would not threaten NOAA trust resources. Of the 15 Target Compound List (TCL) pesticides detected in groundwater, only gamma-chlordane and 4,4'-DDE were detected during both sampling events. Although organic compounds were detected in soils, there were no data to indicate whether they were measured or detected in groundwater. Trace elements were detected in 20 filtered groundwater samples and 21 unfiltered groundwater samples. Chromium, copper, lead, and zinc were detected in filtered samples from all

Table 3. Maximum concentrations of contaminants (mg/kg) detected in environmental media collected from the Island Chemical site during investigations conducted from 1984 to 1991.

	Source Areas			Pathways			
	Soil	Sludge[1]	Avg. Earth's Crust[2]	Storm Drains	River Gut Sediment	ERL[3]	ERM[4]
Trace Elements							
Arsenic	9.1	40	5	5.5	4.1	8.2	70
Cadmium	NR	23	0.06	4.5	2.4	1.2	9.6
Chromium	49	590	100	110	41	81	370
Copper	100	330	30	370	70	34	270
Lead	320	690	10	470	46	47	220
Mercury	NR	2.7	0.03	NR	NR	0.15	0.71
Nickel	34	130	40	48	32	21	52
Zinc	390	3,600	50	1,500	870	150	410
Organic Compounds							
Pyridine	3,000	NR	N/A	NR	NR	NA	NA
Quinidine gluconate	8,200	NR	N/A	NR	NR	NA	NA
Quinine sulfate	2,600	NR	N/A	NR	NR	NA	NA
Toluene	13,900	1,600	N/A	5,600	NR	NA	NA
Pesticides							
Aldrin	30	NR	N/A	0.02	NR	NA	NA
alpha-Chlordane	10	NR	N/A	NR	NR	0.0005	NA
gamma-Chlordane	5.8	NR	N/A	0.024	NR	0.0005	NA
p,p'-DDE	7.5	NR	N/A	0.016	NR	0.002	0.27
Heptachlor epoxide	4	NR	N/A	NR	NR	NA	NA

1: This sludge sample was collected from the former process pit.
2: EPA (1983).
3: Effects range-low, Long and MacDonald (1992).
4: Effects range-median, Long and MacDonald (1992).
NA: Not available.
NR: Data not reported.
N/A: Not applicable.

four monitoring wells during the 1995 sampling events, but data were not presented (Harding Lawson Associates 1995). It could not be determined from the available data whether surface water samples have been collected from storm drains or River Gut.

Sediments from storm drains which lead to River Gut were contaminated with trace elements, pesticides, and organic compounds, primarily toluene. Copper and lead concentrations in the storm drains exceeded ERL guidelines by an order of magnitude. Concentrations of cadmium, copper, nickel, and zinc in sediments from River Gut exceeded ERL guidelines, and zinc exceeded ERM guidelines as well (Harding Lawson Associates 1995). No data were available for organic compounds.

Summary

Results from site investigations indicate that former activities at the Island Chemical site have contaminated soil, sediment, and groundwater. All surface runoff from the site is channeled through storm drains to River Gut, which flows into Fair Plain Gut and discharges to the Caribbean Sea approximately 1.4 km downstream from the site. Primary and secondary habitats close to the site support species of concern to NOAA, including two species of sea turtle that are federally listed endangered species.

References

Adams, A., Fisheries Biologist, Division of Fish and Wildlife, Department of Planning and Natural Resources, Frederiksted, St. Croix, U.S. Virgin Islands, personal communications February 2, April 4, and May 17, 1995.

Adey, W. et al. 1977. Field guidebook to the reefs and reef communities of St. Croix, Virgin Islands. *Third International Symposium on Coral Reefs 1977.*

Department of Planning and Natural Resources. 1987. Memoranda re sewerage overflows. Frederiksted, St. Croix, U.S. Virgin Islands.

Department of Planning and Natural Resources. 1990. Memoranda re sewerage overflows. Frederiksted, St. Croix, U.S. Virgin Islands

Harding Lawson Associates. 1994. Draft Remedial Investigation Work Plan. St. Croix, Virgin Islands: Island Chemical Company.

Harding Lawson Associates. 1995. Remedial Investigation Draft Data Summary Report. St. Croix, Virgin Islands: Island Chemical Company.

Long, E.R., and D.D. MacDonald. 1992. National Status and Trends Program approach. In: *Sediment Classification Methods Compendium.* EPA 823-R-92-006. Washington, D.C.: U.S. Environmental Protection Agency, Office of Water (WH-556).

NUS Corporation. 1991. Final Draft Inspection Report for Island Chemical Corporation, Virgin Island Chemical Site. St. Croix, U.S. Virgin Islands: Island Chemical Corporation/Virgin Island Chemical.

U.S. Environmental Protection Agency (EPA). 1983. *Hazardous waste land treatment.* EPA/530/SW-83/874. Cincinnati: Municipal Environmental Research Laboratory. 702 pp.

U.S. Environmental Protection Agency (EPA). 1994. Administrative order on consent for Remedial Investigation/Feasibility Study in the matter of the Virgin Island Chemical site. New York: U.S. Environmental Protection Agency, Region 2.

3

FMC Marcus Hook, aka East Tenth St. Industrial Area

Marcus Hook, Pennsylvania
CERCLIS #PAD980714505

Site Exposure Potential

The 16-hectare FMC Marcus Hook (FMC) site is in a highly industrialized area about 0.5 km northeast of the Delaware River (Figure 1). The site is bordered on the east by Marcus Hook Creek, which flows 0.6 km southeast to the Delaware River; the Delaware River then flows about 80 km to Delaware Bay. The site also is bordered by Route 13 to the north, by a lumber yard to the south, by a BP refinery to the southwest, and by Marcus Hook Elementary School to the west.

American Viscose Corporation used the site from the 1940s through 1954 to produce rayon. In 1954 rayon production was gradually replaced with cellophane production, which became full-scale in 1958. Until 1945 American Viscose discharged acidic wastewater containing metal sulfides directly into Marcus Hook Creek. In 1945 the Sanitary Water Board ordered American Viscose to construct a wastewater treatment plant. The wastewater treatment plant treated approximately 330,000 l of raw waste per day containing 36,000 l of sulfuric acid, 20,000 l of glucose, 5,000 l of zinc sulfate, and 100,000 l of sodium sulfate, and produced a sludge of lead and zinc sulfides, organic matter, and colloidal sulfur. Treatment plant effluent was discharged to the creek. In 1957 a sludge dewatering unit

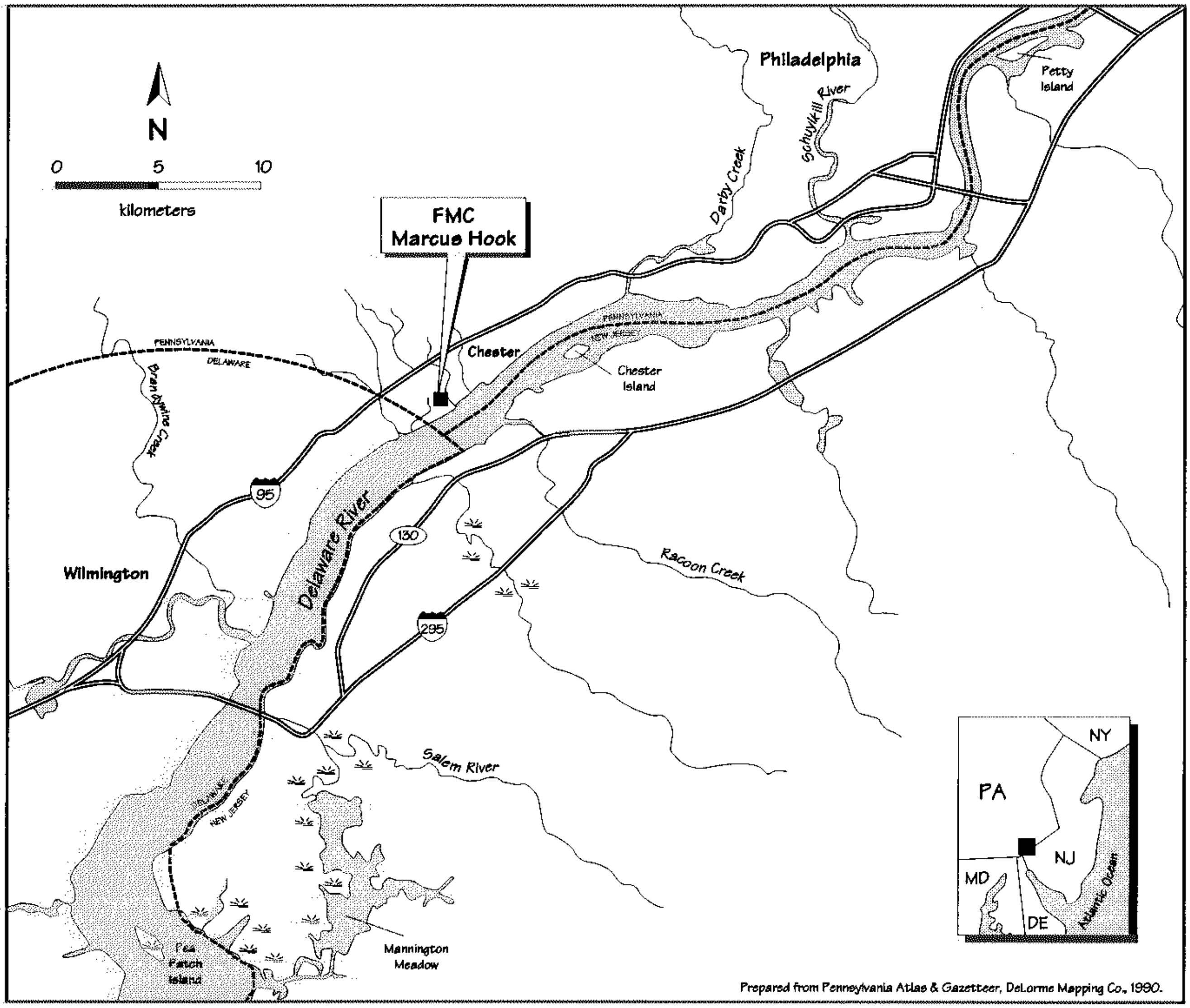

Figure 1. Location of the FMC Marcus Hook site in Pennsylvania.

was added and two unlined lagoons were excavated for sludge storage and consolidation. Ultimate disposal of the sludge removed from the lagoons is unknown (NUS 1991).

FMC Corporation bought the facility in 1963 and continued cellophane production using acids and solvents. Solvents were stored in 30 underground tanks with a total capacity of 300,000 liters. In 1977 solvents remaining in the underground tanks were removed and replaced with water (NUS 1991).

Marcus Hook Business & Commerce Center (MHBCC) purchased the facility in 1986 and demolished several buildings. K&S Processing bought a 1.2-hectare portion of the site, including an incinerator to operate as a hospital waste

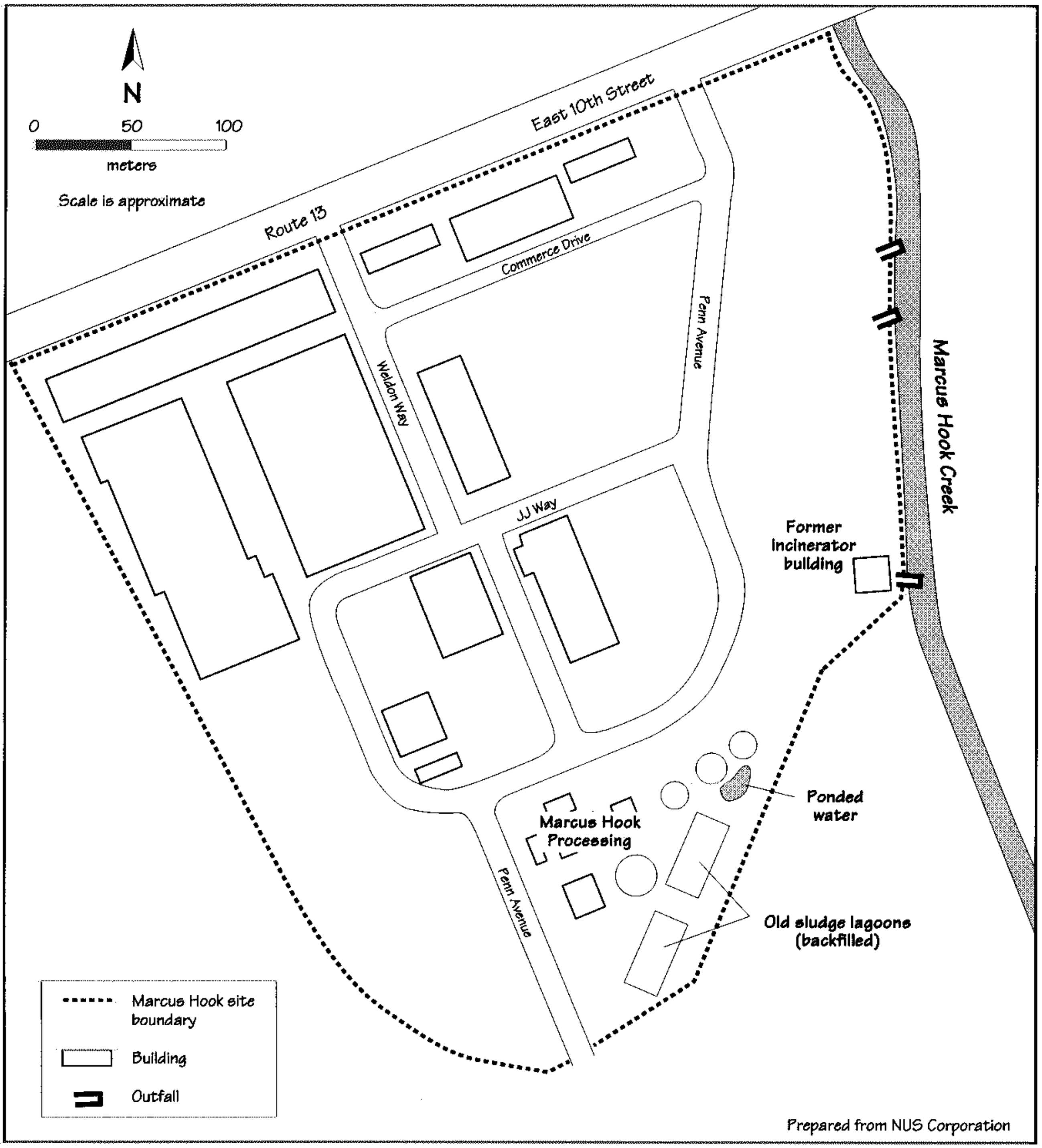

Figure 2. Detail of the FMC Marcus Hook site.

incinerator. Ash from the on-site incinerator and powerhouse had been dumped along the bank of Marcus Hook Creek until 1977. M.H. Processing purchased the existing wastewater treatment plant to operate as an interim hazardous waste treatment facility (NUS 1991). In late 1991, EPA and FMC agreed to an AOC for a site assessment on approximately 40% of the site, but did not include the wastewater treatment plant or medical waste incinerator (Roux Associates Inc. 1992).

Surface water runoff and groundwater migration are the potential pathways of contaminant transport from the site to NOAA trust resources and associated habitats. Surface water runoff flows directly, or indirectly via storm drains, into Marcus Hook Creek. While the manufacturing operations were active, FMC Corporation had NPDES permits for at least five outfalls that serviced the stormwater and sewer system (NUS 1991).

The site was filled with soils and demolition debris, including gravel and silty clay, brick, wood, and concrete, ranging from 1 to 4 m deep. Localized areas include layers of coal and/or ash that range up to 1.5 m thick (Roux Associates Inc. 1992). The Quaternary-age Trenton Gravel, a medium-to-coarse-grained, very gravelly sand that has high primary porosity and permeability, lies beneath the site. These deposits range from 1.5 to 6 m thick and grade into highly weathered schistose bedrock. The depth to bedrock ranges from 7 to 33 m (NUS 1991).

Groundwater investigations indicate groundwater depths of 1 to 4 m bgs and that the surficial aquifer flows primarily east toward Marcus Hook Creek and secondarily south toward the Delaware River. The tidal range in Marcus Hook Creek near the site is 0.5 to 1.5 m, but groundwater levels measured in monitoring wells screened in native soils and bedrock were minimally influenced by tidal fluctuations (Roux Associates Inc. 1992).

NOAA Trust Habitats and Species

Habitats of concern to NOAA are surface waters and associated bottom substrates of the Delaware River and Marcus Hook Creek. At the mouth of the creek, the western shoreline of the Delaware River has extensive pier and piling structures, riprap, and a fully bulkheaded shoreline. The eastern shoreline of the river remains largely undisturbed and possesses broad mudflats extending approximately 300 m from the shoreline near the site.

Near the site the Delaware River is a low-gradient, tidal freshwater system with varying flow velocities, depending on the tide and freshwater discharge. The river is about 2 km wide here. Mean depth is 10 m; maximum depth is 13 m in a centrally located, dredged shipping channel. Salinity in this reach is low (1 to 3 ppt). Substrate composition is primarily silty sands, gravel, and mud.

The Delaware River historically has been identified as a spawning site for over 60 species of fish (Daiber 1988). Near the site, the river supports diverse and abundant populations of NOAA trust resources (Table 1; Daiber 1988; Kaufmann personal communication 1993; Miller personal communication 1993). Many species migrate close to the site and reside for extended periods during sensitive life stages. Eight species of migratory fish use the Delaware River. Species of interest to NOAA due to their commercial importance or abundance in the area are alewife, Atlantic menhaden, American eel, American shad, bay anchovy, blueback herring, blue crab, striped bass, and white perch. The reach of the Delaware River near the site also supports migratory populations of shortnose sturgeon, a federally endangered species. This reach also supports populations of the New Jersey state-protected Atlantic

Table 1. Major species that use the Delaware River near the site.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
ANADROMOUS /CATADROMOUS SPECIES						
Shortnose sturgeon[1]	*Acipenser brevirostrum*		♦	♦		
Atlantic sturgeon	*Acipenser oxyrhynchus*			♦		
Alewife	*Alosa pseudoharengus*	♦	♦	♦		♦
American shad	*Alosa sapidissima*		♦		♦	
Blueback herring	*Alosa aestivalis*	♦	♦	♦	♦	♦
American eel[2]	*Anguilla rostrata*		♦	♦		♦
Striped bass	*Morone saxatilis*		♦	♦		♦
Sea lamprey	*Petromyzon marinus*			♦		
ESTUARINE/MARINE SPECIES						
Bay anchovy	*Anchoa mitchilli*	♦	♦	♦		
Atlantic menhaden	*Brevoortia tyrannus*		♦	♦		
Weakfish	*Cynoscion regalis*		♦			
Banded killifish	*Fundulus diaphanus*	♦	♦	♦		
Mummichog	*Fundulus heteroclitus*	♦	♦	♦		
Spot	*Leiostomus xanthurus*		♦			♦
Inland silverside	*Menidia beryllina*			♦		
White perch[2]	*Morone americana*	♦	♦	♦		♦
Striped mullet	*Mugil cephalus*			♦		
Atlantic croaker	*Micropongonias undulatus*		♦			
Bluefish	*Pomatomus saltatrix*		♦			
Hogchoker	*Trinectes maculatus*		♦	♦		
INVERTEBRATE SPECIES						
Blue crab[2]	*Callinectes sapidus*		♦	♦		♦

1: Federally endangered species
2: The Pennsylvania Bureau of Water Quality has an advisory in effect on human consumption of these species caught in the Delaware River due to high levels of PCBs and chlordane.

sturgeon (Kaufmann personal communication 1993; O'Herron personal communication 1993).

In May 1995 the Pennsylvania Department of Environmental Resources conducted tissue sampling in Marcus Hook Creek at the Route 13 bridge near the site (Young 1995). Approximately 105 m of stream were sampled at this time, including the confluence with the Delaware River. Captured NOAA trust species included mummichog, banded killifish, American eel, and stickleback. In addition, alewife, American shad, blueback herring, spot, and striped bass are known to use habitat in Marcus Hook Creek, though none of these species was caught during sampling.

The Delaware Estuary is the world's largest freshwater port (Delaware River Basin Commission 1988). Because of the heavy marine traffic, there is little commercial fishing near the site, except for small harvests of blue crab, American shad, and blueback herring. Most commercial fishing takes place approximately 60 km south of the site where the river begins to widen into Delaware Bay and brackish conditions predominate (Lupine personal communication 1992).

There is significant sport fishing in the Delaware River, with striped bass the favored recreational species in the area. Recreational harvests for striped bass, alewife, and blueback herring are closed during spring spawning runs (Lupine personal communication 1992). The striped bass harvest is otherwise regulated by fish size and daily catch limits. In recent years, a sport fishery for the white perch has developed and is expected to increase. Recreational crabbers harvest blue crab near the site from March through November (Delaware River Basin Commission 1988; Soldo personal communication 1992; Kaufmann personal communication 1993).

There are no hatcheries or supplemental stocking efforts for trust species in the Delaware River. However, in 1989 and 1990 the Delaware River Basin Commission released about 125,000 striped bass juveniles for mark and recapture studies to assess striped bass stock recruitment. These studies indicated that striped bass populations have grown in the Delaware River over the last decade (Miller personal communication 1993). There are no plans to build this effort into a supplemental stocking program (Lupine personal communication 1993; Miller personal communication 1993).

The Pennsylvania Bureau of Water Quality has issued an advisory against human consumption of several recreational fish species in the Delaware River due to elevated concentrations of PCBs and chlordane in edible tissue (Soldo personal communication 1992; Kaufmann personal communication 1993).

Site Related Contamination

A 1991 site investigation found soils throughout the site to be contaminated by asbestos, PCBs, trace elements, VOCs, and SVOCs (NUS 1991).

Marcus Hook Creek sediments were also contaminated (Table 2). Samples from the mixed ash and soil along the bank of the creek contained PCBs and elevated concentrations of PAHs (NUS 1991).

Soil samples collected from the lagoon area had elevated concentrations of lead (1,200 mg/kg), PCBs (1.3 mg/kg), and zinc (780 mg/kg; NUS 1991). An EPA removal assessment found an old tunnel in the northeast section of the site containing ash mixed with sludge about 0.3 m deep over a 42-m^2 area. Chemical sample analysis found 2.5 mg/kg mercury (NUS 1991). Some trace element and organic compound concentrations in soil and sediment samples exceeded U.S. soil averages and ERL guidelines, respectively. The reported concentrations could significantly affect NOAA trust resources. Contaminants were found in groundwater collected from beneath the

Table 2. Maximum concentrations (mg/kg) of selected contaminants detected in soil from the site and sediment from Marcus Hook Creek.

CONTAMINANT	On-site soil	Average U.S. Soil 1	Marcus Creek Sediment	ERL 2
INORGANIC SUBSTANCES				
Trace Elements				
Arsenic	147	NA	0.01	8.2
Cadmium	9.8	0.06	7.4	1.2
Chromium	118	100	92	81
Copper	1,630	17	NA	34
Lead	5,600	10	490	47
Mercury	28	0.03	1.3	0.15
Nickel	160	40	1,300	21
Zinc	7,500	50	350	150
pH	3.2	6.0-9.0	NA	NA
ORGANIC COMPOUNDS				
PCBs	430	NA	1,200	0.023
VOCs/SVOCs				
Acetone	NA	NA	0.12	NA
Anthracene	1.4	NA	0.20	0.09
Benzo(a)Anthracene	3.9	NA	0.58	0.26
Benzo(b)Fluoranthene	4.1	NA	0.50	NA
Benzo(k)Fluoranthene	3.9	NA	0.52	NA
Benzo(a)Pyrene	2.9	NA	0.30	0.43
Chrysene	4.5	NA	1.5	0.38
Fluoranthene	11	NA	0.66	0.60
Phenanthrene	5.7	NA	1.7	0.24
Pyrene	5.0	NA	0.94	0.67
Naphthalene	0.56	NA	1.4	0.16

1: EPA (1983).
2: Effects Range-Low (Long and MacDonald 1992).
NA: Data not available.
<: Not detected at concentration given.

site, surface water on site, and in Marcus Hook Creek next to the site (Table 3). Lead, chromium, copper, mercury, zinc, and nickel were found in groundwater at concentrations more than ten times their respective AWQC. Surface water samples from Marcus Hook Creek contained PCBs and trace elements at concentrations exceeding ERL screening guidelines by an order of magnitude. Concentrations in Marcus Hook Creek were not reported.

Table 3. Maximum concentrations (µg/l) of selected contaminants detected in groundwater from the site outfall discharges and surface water from Marcus Creek.

CONTAMINANTS	On-Site Groundwater	Marcus Creek Surface Water	Outfalls	AWQC[1] Freshwater
INORGANIC SUBSTANCES				
Trace Elements				
Arsenic	58	ND	NA	190
Cadmium	8.8	ND	NA	1.1+
Chromium	1,200	19	NA	11
Cobalt	1,240	NA	NA	NA
Copper	265	130	NA	12+
Cyanide	NA	12	NA	5.2
Lead	338	17	NA	3.2+
Mercury	2.0	NA	NA	0.012
Nickel	1,030	39	NA	160+
Zinc	2,860	120	NA	110+
ORGANIC COMPOUNDS				
Acetone	NA		76	
2-butanone	NA	2,200		
Butylbenzylphthalate	NA	86		3*
Carbon disulfide	18			
PCBs	0.36	2.1		0.014

1: EPA (1993).
+: Hardness-dependent criteria (100 mg/l $CaCO_3$ used).
NA: Data not available.
ND: Not detected
*: Lowest Observed Effect Level

Summary

The Delaware River is a spawning site for numerous species of fish. Near the FMC Marcus Hook site, the river supports a diverse, abundant population of NOAA trust resources. Many of these species migrate close to the site and reside for extended periods during sensitive stages of development. Marcus Hook Creek and surface waters near the site supply foraging grounds and intertidal habitats for various species. Mercury, nickel, and lead in sediment from Marcus Hook Creek exceeded the ERL by at least an order of magnitude. PCBs in both sediment and surface water exceeded screening guidelines by several orders of magnitude. Contaminants within the surface water and sediment of Marcus Hook Creek are a probable risk to NOAA trust resources.

References

Daiber, F.C. 1988. Finfish resources of the Delaware River Estuary. In: S.K. Mujumar, E. W. Miller, and E.L. Sage, ed. *Ecology and Restoration of the Delaware River Basin.* Easton, Pennsylvania: Pennsylvania Academy of Science. 431 pp.

Delaware River Basin Commission. 1988. Fish Health and Contamination Study. DEL USA Project Element 10. West Trenton, New Jersey: Pennsylvania Coastal Zone Management Program, Delaware Estuary Use Attainability Project.

Delorme Mapping. 1990. *Pennsylvania Atlas & Gazetteer. Third Edition.* Freeport, Maine.

Kaufmann, M., Area Fisheries Manager, lower Delaware drainage and lower Susquehanna drainage, Pennsylvania Fish Commission, Revere, Pennsylvania., personal communication, March 8, 1993.

Long, E.R. and D.D. MacDonald. 1992. National Status and Trends Program approach. In: *Sediment Classification Methods Compendium.* EPA 823-R-92-006. Washington, D.C.: U.S. Environmental Protection Agency, Office of Water.

Lupine, A., Fisheries Biologist. Division of Freshwater Fisheries, Department of Environmental Protection. Lebanon, New Jersey, personal communications March 12, 1992; March 13, 1993.

Miller, J., Coordinator, Delaware River Anadromous Fisheries Project, Delaware River Basin Commission, Trenton, New Jersey, personal communication, March 17, 1993.

NUS Corporation. 1991. Site Inspection of FMC Marcus Hook. Philadelphia: Hazardous Site Control Division, U.S. Environmental Protection Agency.

O'Herron, J., Fisheries Biologist, Tom Lloyd Associates, Burlington, New Jersey, personal communication, March 9, 1993.

Roux Associates, Inc. 1992. Site Assessment Report, FMC Corporation, Former East Tenth Street Site, Marcus Hook, PA. Philadelphia: Hazardous Site Control Division, U.S. Environmental Protection Agency.

Shirey, C., Fisheries Biologist, Division of Fish and Wildlife, Department of Natural Resources and Environmental Control, Smyrna, Delaware, personal communication, February 1, 1995.

Soldo, J., Fisheries Biologist, Pennsylvania Fish Commission, Revere, Pennsylvania, personal communication, August 3, 1992.

U.S. Environmental Protection Agency (EPA). 1983. *Hazardous waste land treatment.* EPA/ 530/SW-83/874. Cincinnati: Municipal Environmental Research Laboratory. 702 pp.

U.S. Environmental Protection Agency (EPA). 1993. *Water quality criteria.* Washington, D.C.: Office of Water, Health and Ecological Criteria Division. 294 pp.

U.S. Geological Survey. 1976. Wilmington: DE, NJ, PA, MD. 1:250 Series. Reston, Virginia: U.S. Government Printing Office.

Young, L., Fisheries Biologist, Pennsylvania Division of Environmental Services, Harrisburg, Pennsylvania, personal communication, May 18, 1995.

3

Fort Eustis

Newport News, Virginia
CERCLIS #VA6210020321

Site Exposure Potential

Fort Eustis is located in the city of Newport News in southeastern Virginia. Fort Eustis is bounded to the west and south by the James River and to the east by the Warwick River, a tributary of the James River. The James River flows into Chesapeake Bay about 35 km from the site (Figure 1).

The 3,350-hectare facility is the transportation training center for the U.S. Army. Investigations of the facility have focused on eight RI sites (Figure 2): the Fire Training Area (Site 11B), the Central Heating Plant (Site 9), the Oil/Sludge Holding Pond (Site 11C), Browns Lake (Site 16), Baileys Creek (Site 17A - PCB Area), Baileys Creek (Site 17B - Lead Area), Milstead Island Creek (Site 18), and Felker Army Airfield Fuel Farm (Site FA). Contamination at these sites may have resulted from past fire training activities, spillage or release of fuel oil, disposal of contaminated dredge spoil, leakage from underground and above-ground storage tanks, stormwater runoff from vehicle maintenance facilities, aviation fueling activities, and lead contamination from a skeet range (Montgomery Watson 1994). See Table 1 for a summary of waste disposal and removal actions at the RI sites.

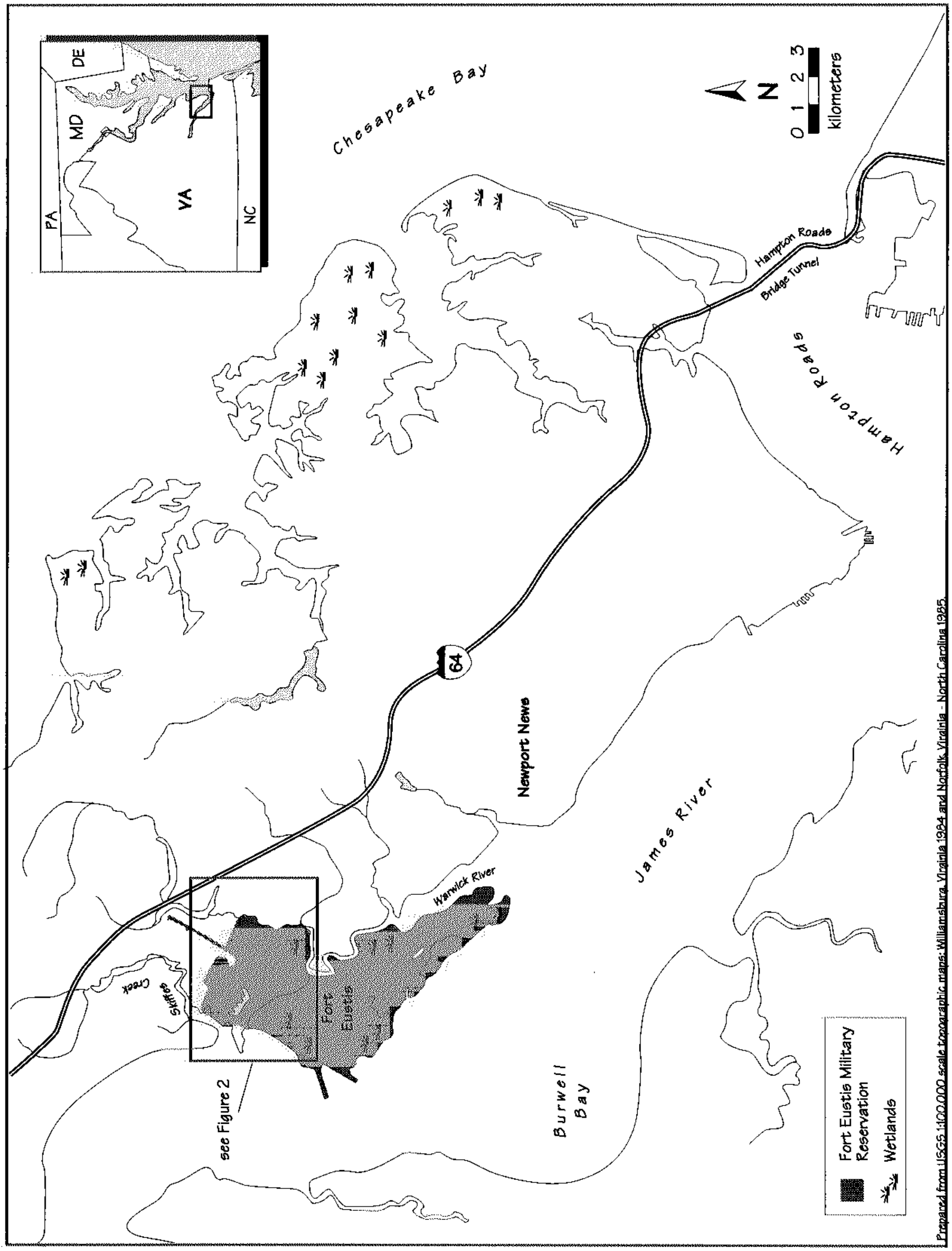

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Figure 1. Location of the Fort Eustis Military Reservation in Newport News, Virginia.

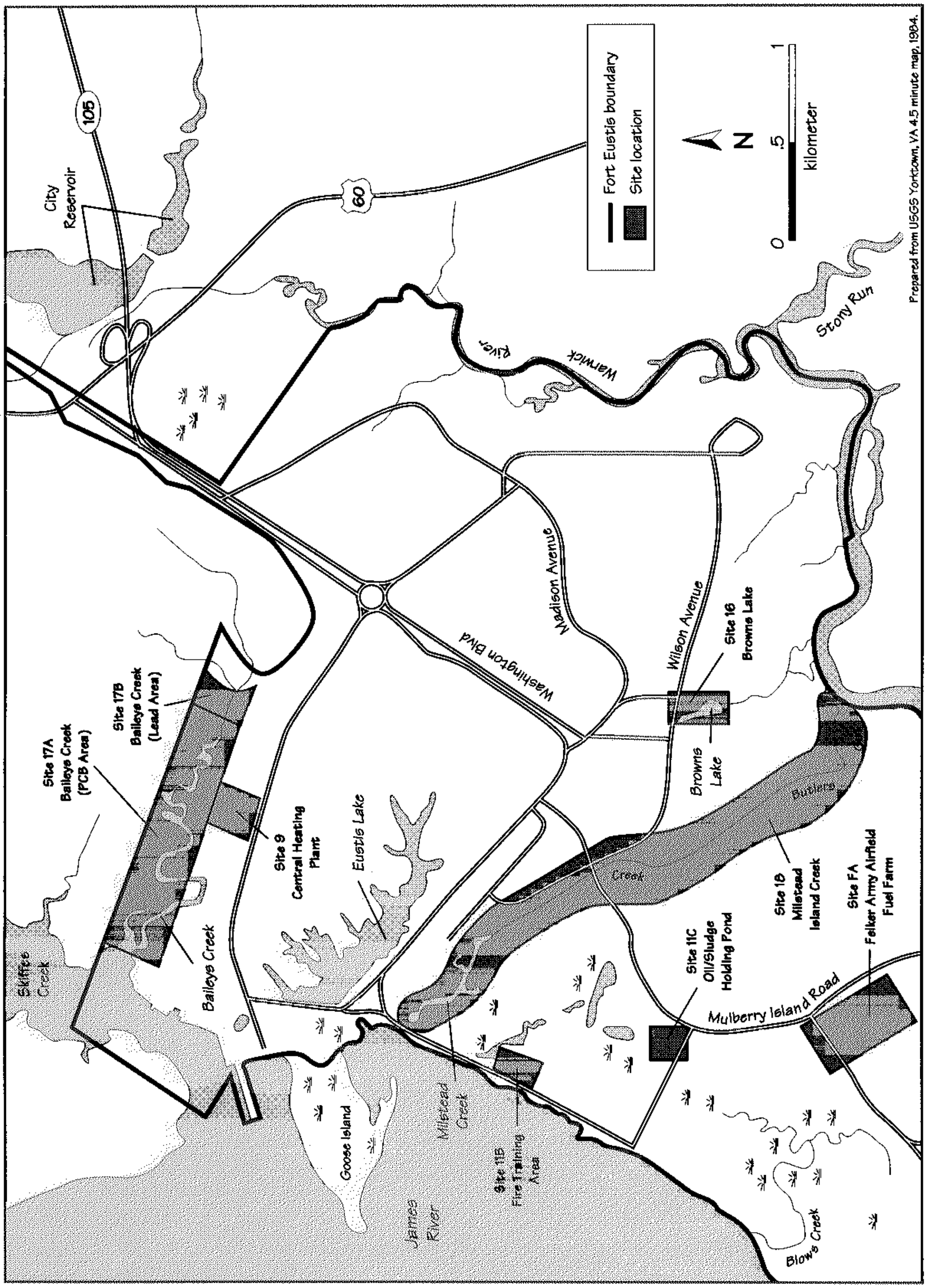

Figure 2. Location of Remedial Investigation sites at Fort Eustis.

Surface-water runoff and groundwater discharge are the potential pathways of contaminant transport from the site to NOAA resources and associated habitats. Surface drainage within the area of Fort Eustis that contains the sites of concern is controlled and directed to the James or Warwick rivers by creeks, storm sewers, or open ditches. The major waterways within the area of concern are Baileys Creek, Milstead Creek, Island Creek, and Blows Creek. Baileys Creek is tidally influenced and flows in a westerly direction and empties into Skiffes Creek, a James River tributary.

The geology of the Fort Eustis area is characterized by Virginia Coastal Plain sediments more than 550 m thick. These generally consist of unconsolidated, interbedded sands and clays with minor occurrences of gravel and shell fragments, all underlain by crystalline basement rocks. The uppermost aquifer in the area, the Columbia Aquifer, is about 9 m thick and consists primarily of silty to clayey fine sand, interbedded with lenses of silty clay, fine sand, and peat. Surficial formations in the region are mostly fluvial-estuarine deposits. Groundwater flow varies depending on the site of concern, though most flow is directed either to the James or Warwick rivers. The water table at several of the sites is

Table 1. Summary of Waste/Removal Actions at Remedial Investigation sites at Fort Eustis.

Site	Types of Waste/Removal Actions
Central Heating Plant (Site 9)	An estimated 23,000 to 30,000 liters of No. 4 fuel oil were released in 1984. Visibly stained soil was removed in a cleanup action, but the amount of soil removed is not known. Other fuel releases, including one in 1990, have been reported. Visibly stained soil was also removed after the 1990 release.
Fire Training Area (Site 11B)	Fire training activities were performed monthly at the site until 1980. These activities reportedly involved pouring 150 to 190 liters of JP-4 jet fuel into an unlined pit and igniting the fuel. The initiation date was not known.
Oil/Sludge Holding Pond (Site 11C)	In 1979 a mixture of oil, digested sewage, and fuel residues was placed in the holding pond and later covered with 3 to 3.5 m of fill.
Browns Lake (Site 16)	The lake was constructed in the 1950s as a holding pond to prevent contaminant releases to the Warwick River. Storm water from vehicle maintenance facilities and a locomotive shop north of Browns Lake discharges to a stream that leads directly to the lake.
Baileys Creek (Site 17A; PCB Area)	The 1990 RI identified Site 9 as the probable source of PCB contamination in Baileys Creek at site 17A.
Baileys Creek (Site 17B; Lead Area)	This site is near a skeet range. High lead concentrations are probably from lead shot.
Milstead Island Creek (Site 18)	This site was a natural waterway until it was dredged by the U.S. Army Corps of Engineers and Fort Eustis personnel to construct a drainage canal between the James and Warwick rivers. Contaminant sources to the creek include a sewage treatment plant and several warehouses.
Felker Army Airfield Fuel Farm (Site FA)	Two 114,000-liter, aboveground fuel storage tanks are on the property. During a remedial action in 1993 and 1994, some contaminated soil was removed and replaced with clean soil.

tidally influenced. Information on the depth to groundwater was available for only one of the RI sites, the Fire Training Area (Site 11B), where the water table was encountered about 1.2 m from the surface (Montgomery Watson 1994).

NOAA Trust Habitats and Species

Habitats of concern to NOAA are the surface waters, wetlands, and tidal creeks associated with the Warwick and James rivers. The Warwick River meanders approximately 10 km from the site before joining the James River. Salinities in the James River near the site range from 5 to 15 ppt and fluctuate throughout the year, depending on rainfall, saltwater intrusion, and urban runoff (Norman personal communication 1992). James River substrate is mainly silt and sand (Eades personal communication 1992), while Warwick River substrate is primarily mud (Lancaster personal communication 1992). Little or no submerged aquatic vegetation is present in the James River contiguous to the military reserve (Nowak personal communication 1992). The site is approximately 35 km upstream from the Chesapeake Bay.

The James and Warwick rivers support diverse, abundant populations of NOAA trust resources (Table 2; Eades personal communication 1992). Numerous species may migrate close to the site and reside for extended periods during sensitive life stages. The shortnose sturgeon, a federally listed endangered species, and the state-protected Atlantic sturgeon historically used this reach of the James River as a migratory corridor, but neither species has been seen in recent years (Travelstead personal communication 1992). Six additional species of anadromous fish are known to use the James River as a migratory corridor: alewife, American shad, blueback herring, hickory shad, striped bass, and white perch. Significant numbers of hogchoker, weakfish, and oyster toadfish also reside in the James River. In addition, the catadromous American eel is found throughout the James River drainage (Eades personal communication 1992).

Limited data were available regarding resource useof the creeks within the site, although tidal exchange and proximity of the creeks to the James and Warwick rivers suggest that there are NOAA trust resources within site boundaries. Species likely to use the creeks include weakfish, silversides, bay anchovy, American eel, banded killifish, and mummichog. All six of the anadromous species present in the James River may also use the aquatic habitats near the site as adult forage and nursery habitat. Although stocks have substantially diminished in recent years, eastern oyster, hard-shell clam, and soft-shell clam were historically abundant in this reach of the James River (Eades personal communication 1992). Hard- and soft-shell clam still use the Warwick River. Blue crab is abundant throughout the Warwick River drainage (Lancaster personal communication 1992).

Table 2. Major species that use the James River near Fort Eustis.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
ANADROMOUS /CATADROMOUS SPECIES						
Atlantic sturgeon [1,2]	*Acipenser oxyrhynchus*			♦		
Shortnose sturgeon [1,3]	*Acipenser brevirostrum*			♦		
Blueback herring	*Alosa aestivalis*		♦	♦	♦	
American shad	*Alosa sapidissima*		♦	♦	♦	
Hickory shad	*Alosa mediocris*		♦	♦		
Alewife	*Alosa pseudoharengus*		♦	♦	♦	
American eel	*Anguilla rostrata*		♦	♦	♦	
White perch	*Morone americana*		♦	♦		♦
Striped bass	*Morone saxatilis*		♦	♦	♦	♦
ESTUARINE /MARINE FISH						
Bay anchovy	*Anchoa mitchilli*	♦	♦	♦		
Atlantic manhaden	*Brevoortia tyrannus*		♦	♦		
Weakfish	*Cynoscion regalis*	♦	♦	♦		♦
Gizzard shad	*Dorosoma cepedianum*		♦	♦		
Banded killifish	*Fundulus diaphanus*	♦	♦	♦		
Mummichog	*Fundulus heteroclitus*	♦	♦	♦		
Spot	*Leiostomus xanthurus*		♦	♦	♦	♦
Silversides	*Menidia spp.*		♦	♦		
Atlantic croaker	*Micropongonias undulatus*		♦	♦	♦	♦
Oyster toadfish	*Opsanus tau*	♦	♦	♦		
Summer flounder	*Paralichthys dentatus*	♦	♦	♦		♦
Bluefish	*Pomatomus saltatrix*		♦	♦		♦
Northern puffer	*Sphoeroides maculatus*		♦	♦		
Hogchoker	*Trinectes maculatus*	♦	♦	♦		
INVERTEBRATE SPECIES						
Blue crab	*Callinectes sapidus*	♦	♦	♦		♦
Hardshell clam [4]	*Mercenaria mercenaria*	♦	♦	♦		♦
Softshell clam [4]	*Mya arenaria*	♦	♦	♦		♦

1: Rare and infrequent in the James River. Species historically used the area as a migratory corridor.
2: State-protected species.
3: Federally protected species.
4: Harvesting restrictions apply for the capture of shellfish originating from surface waters surrounding the site.

There are numerous commercial and recreational fisheries in the James River. A moratorium on striped bass fishing has been lifted, allowing an annual, six-week recreational and commercial season in the James River. Blue crab are intensively fished both recreationally and commercially. American shad are commercially harvested in the main stem of the James River near the site. A smaller commercial effort is directed toward spot and Atlantic croaker. Recreational fishing is popular in the Warwick and James rivers. The Warwick River is actively fished during the striped bass season. There is a popular public boat landing and fishing pier approximately 5 km upstream from the mouth of the Warwick River. Sport fishing efforts in the lower reaches of the Warwick River also are directed toward Atlantic croaker, summer flounder, spot, and weakfish (Lancaster personal communication 1992). Fishing from the James River Bridge is also popular (Eades personal communication 1992).

Since the 1970s, kepone contamination has been responsible for a consumption advisory for all fish from the James River and its tributarie. The advisory extends from the fall line at Richmond, approximately 140 km upstream from Fort Eustis, to the Hampton Norfolk Bridge tunnel (Lanham-Ridley personal communication 1995). Migrating fish, such as spot and croaker, which come in from Chesapeake Bay and the Atlantic Ocean, are known to be harvested and consumed by local fishermen. Shellfish have been included in the consumption advisory in the past, but were removed in recent years (Perry personal communication 1995).

The State of Virginia requires a statutory shellfishing buffer zone around all sewage outfalls. Consequently, shellfishing in the James and Warwick rivers near the site is restricted due to the sewage treatment plant at Fort Eustis (Wright personal communication 1992). The entire western boundary of the site is included in the restricted area (Virginia Department of Health 1993). Relaying of shellfish from this area for depuration is permitted when water temperatures exceed 50°F (Wright personal communication 1992).

Site-Related Contamination

Trace elements, PCBs, and pesticides are the primary contaminants of concern to NOAA. Elevated concentrations of these contaminants were found in on-site soil, surface water, and sediments (Montgomery Watson 1994). Table 3 presents the maximum concentrations of trace elements, PCBs, and pesticides detected in soil, surface water, groundwater, and sediment.

Maximum concentrations of trace elements detected in on-site soils exceeded average concentrations in U.S. soils, particularly at the Oil/Sludge Holding Pond (Site 11C) and the Central Heating Plant (Site 9). Lead was detected in groundwater at the Oil/Sludge Holding Pond at a dissolved concentration several orders of magnitude above its freshwater AWQC. Zinc was detected in surface water of a wetland next to the Fire Training Area (Site 11B) at a concentration that exceeded its AWQC. Lead was detected in sediment from Baileys Creek near Site 17B at 94,000 mg/kg, far exceeding its ERM screening guideline of 220 mg/kg (Long and MacDonald 1992; Montgomery Watson 1994).

PCBs were detected in soils at the Central Heating Plant (Site 9) and DDD was detected in soils at the Fire Training Area (Site 11B). No screening guidelines are available for these contaminants in soils. No pesticides were detected in surface water and no pesticides or PCBs were detected in groundwater at Fort Eustis. However, pesticides were detected above their respective screening

Table 3. Maximum concentrations of selected contaminants detected at Fort Eustis.

Contaminants	Soil (mg/kg)		Water (µg/l)			Sediment (mg/kg)		
	On-Site	Avg. U.S.[1]	Surface Water	Ground-water	AWQC[2]	Sediment	ERL[3]	ERM[4]
Trace Elements								
Arsenic	30	5	<10	50	190	38	8.2	70
Cadmium	19	0.06	<50	<10	1.1+	8.4	1.2	9.6
Chromium	60	100	<10	70	NA	60	81	370
Copper	510	30	<30	<30	12+	110	34	270
Lead	120	10	45	10	3.2+	94,000	46.7	218
Mercury	10	0.03	<2.0	0.0	0.012	0.39	0.15	0.71
Nickel	90	40	<40	<40	160+	25	20.9	51.6
Silver	170	0.05	<10	<10	0.12	1.3	1.0	3.7
Zinc	1,800	50	360	800	110+	440	150	410
Pesticides/PCBs								
DDD	0.02	N/A	ND	ND	NA	1.3	NA	NA
DDE	<0.004	N/A	ND	ND	NA	0.01	0.0022	0.027
DDT	<0.004	N/A	ND	ND	0.001	0.6	0.0016t	0.46t
Aroclor-1260	2.0	N/A	6.4	ND	NA	220	22.7*	180*

1: EPA (1983).
2: Ambient water quality criteria for the protection of aquatic organisms. Freshwater chronic criteria presented (EPA 1993).
3: Effects range-low (Long and MacDonald 1992).
4: Effects range-median (Long and MacDonald 1992).

NA: Not available.
ND: Not detected; detection limits not available.
N/A: Not applicable.
+: Hardness -dependent criteria (100 mg/l $CaCO_3$ used).
t: DDT total.
*: total PCBs

guidelines in sediments collected from Browns Lake (Site 16). PCBs were found at 220 mg/kg Bailey's Creek sediments near Site 17A. PCBs were also found in Bailey's Creek surface water near Site 17A (Montgomery Watson 1994).

Summary

High concentrations of PCBs and lead have been detected in Baileys Creek near Ft. Eustis Sites 17A and 17B, respectively. NOAA trust species that use Baileys Creek and the nearby wetlands could be at substantial risk from these contaminants. The degree to which these contaminants have migrated from Baileys Creek to the James River has not been fully investigated. NOAA trust species that use tidal flat areas in the James River near Fort Eustis may also be at risk as a result of contaminant migration from Sites 11B and 11C.

References

Eades, R., fisheries biologist, Fisheries Division, Virginia Department of Game and Inland Fisheries, Virginia Beach, personal communication, November 20, 1992.

Lancaster, D., fishing guide, Newport News, Virginia, personal communication, November 20,1992.

Lanham-Ridley, L., Classification Assistant, Virginia Department of Health, Bureau of Shellfish Sanitation, Richmond, personal communications, December 8, 1995; December 11, 1995.

Long, E.R., and D.D. MacDonald. 1992. National Status and Trends Program approach. In: *Sediment Classification Methods Compendium.* EPA 823-R-92-006. Washington, D.C.: Office of Water, U.S. Environmental Protection Agency.

Montgomery Watson. 1994. Remedial Investigation and Confirmatory Studies, Analytical Results Report. Fort Eustis, VA.

Norman, M., Fisheries Biologist, Fisheries Division, Virginia Department of Game and Inland Fisheries, Virginia Beach, personal communication, November 20, 1992.

Nowak, J., Environmental Scientist, Virginia Institute of Marine Science, Gloucester Point, Virginia, personal communication, November 19, 1992.

Perry, K., Information Officer, Virginia Department of Game and Inland Fisheries, Richmond, personal communication, December 11, 1995.

Travelstead, J, Fisheries Biologist, Virginia Marine Resources Commission, Newport News, personal communication, December 9, 1992.

U.S. Environmental Protection Agency (EPA). 1983. *Hazardous waste land treatment.* EPA/530/SW-83/874. Cincinnati: Municipal Environmental Research Laboratory. 702 pp.

U.S. Environmental Protection Agency (EPA). 1993. *Water quality criteria.* Washington, D.C.: U.S. Environmental Protection Agency, Office of Water, Health and Ecological Criteria Division. 294 pp.

Virginia Department of Health. 1993. Notice and Description of Shellfish Area Condemnation Number 23, James River - Opposite Fort Eustis. Richmond: State of Virginia.

Wright, M., Classification Chief, Virginia Department of Health, Bureau of Shellfish Sanitation, Richmond, personal communication, December 8, 1992.

3

Naval Air Station Patuxent River

St. Mary's County, Maryland
CERCLIS #MD7170024536

Site Exposure Potential

Naval Air Station (NAS) Patuxent River is in St. Mary's County in southern Maryland at the confluence of the Patuxent River and Chesapeake Bay (Figure 1). The station covers 2,600 hectares on a broad headland peninsula known as Cedar Point. Most of the station's operations are concentrated in the western portion of the peninsula. Since 1942 the site has been one of the U.S. Navy's main centers for testing naval aircraft and equipment.

During the Initial Assessment Study, 31 sites within the NAS Patuxent River were identified as potentially contaminated, and 14 were recommended for further study. Two of these sites were transferred to the Navy's Underground Storage Tank Program. After the confirmation studies in 1985 and 1987, two sites were dropped from further investigation because contaminants were not detected. The remaining sites were included in the RI. Table 1 presents the size, location, dates of operation, and type and quantity of wastes disposed at each of the ten sites that were included in the RI, as well as Sites 9 and 34, which were dropped from the RI. The locations of these sites are shown in Figure 2.

The primary pathways for the transport of contaminants from the site to NOAA trust habitats

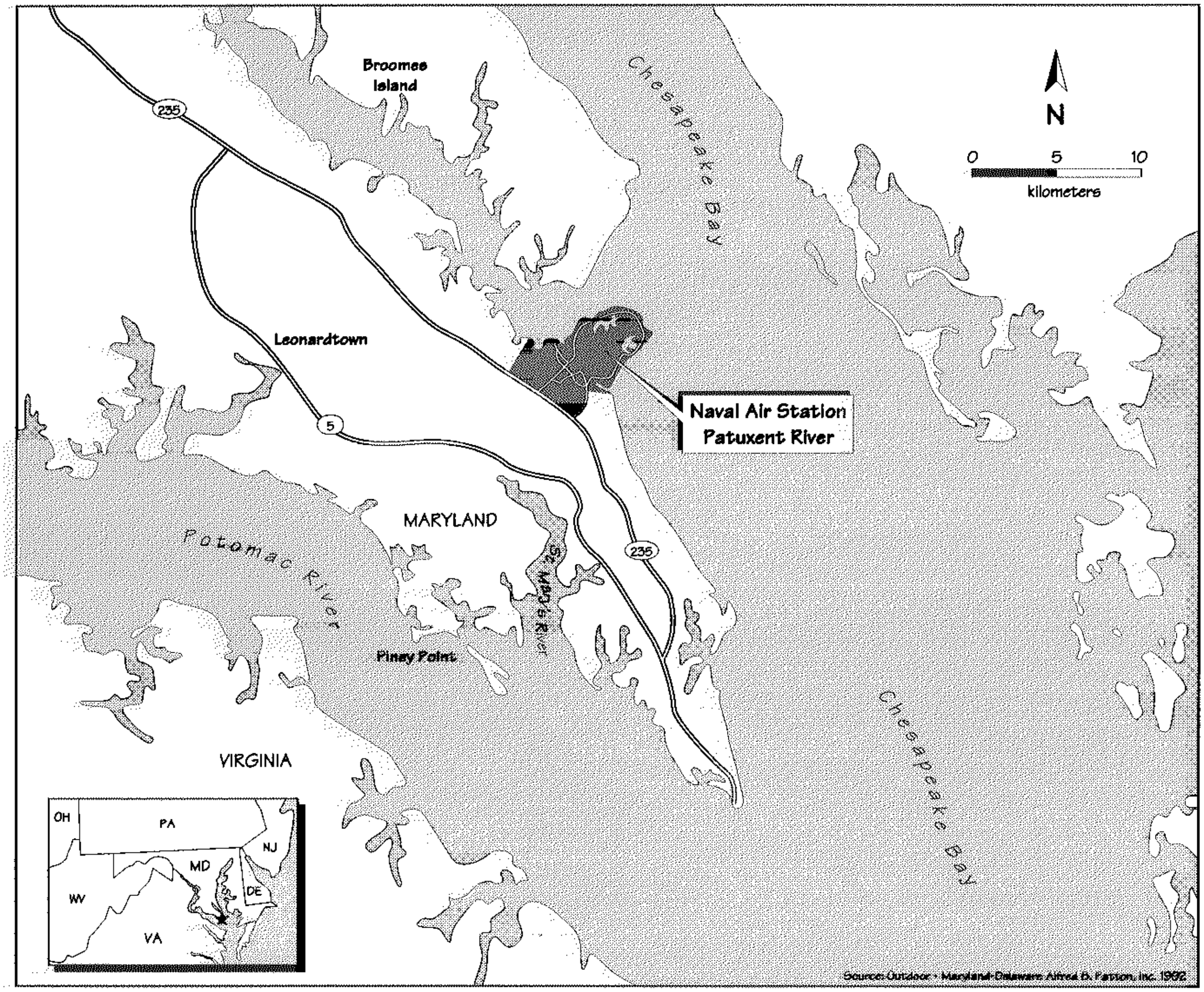

Figure 1. Location of Naval Air Station Patuxent River in St. Mary's County, Maryland.

are surface water runoff and groundwater migration. Two major drainage areas on NAS Patuxent River receive runoff from the ten waste sites. The first of these drainage areas contains Pond 1, and is located in the western portion of NAS Patuxent River (Figure 2). Pond 1 does not appear to have an outlet to the Patuxent River. However, the ground surface near Pond 1 slopes downward to the north toward West Patuxent Basin, which is connected to the Patuxent River. Runoff from Pond 1 would probably flow toward this basin. Three waste sites are situated within the Pond 1 drainage basin: Sites 2, 6, and 29. When wastes were disposed at Site 2, the pond area was a wetland at the bottom of a ravine. In 1950, this wetland was excavated and dammed to create

Table 1. The twelve sites of concern at NAS Patuxent River, Patuxent, Maryland (CH2M Hill 1992).

Site	Dates of Operation	Size	Type and Quantity of Waste/Contaminants of Concern (COCs)
Site 1 Fishing Point Landfill	1960 - 1974	10 hectares	Unspecified amounts of mixed waste were disposed here, including petroleum, oil and lubricant products, construction debris; sewage treatment sludges, paints, solvents, anti-freeze solution, and pesticides. COCs: lead, mercury, silver
Site 2 Disposal Site near Pond 1	1942 -1943	1 hectare	Unspecified quantities of construction debris, miscellaneous wastes, and 55-gallon drums containing various oils were dumped here. COCs: lead, mercury, pesticides/PCBs, PAHs
Site 4 Hermanville Disposal Site	1943 - 1960		Same waste types as described for Site 1. Quantities of waste were not reported. COCs: lead, mercury, silver
Site 6 Boneyard	1943 - 1949	2 hectares	Approx. 5,400 metric tons of fly and bottom ash from the Patuxent NAS coal-fired power plant were disposed here, and about 7,300 metric tons of liquid waste oils, paints, solvents and, possibly, pesticides were stored in drums. The drums have been removed, but a partially buried tank containing waste oil remains. COCs: cadmium, copper, lead, mercury, silver, zinc
Site 9 Drum Disposal Area	Unknown	2 hectares	Approx. 100 55-gallon drums (thought to be empty), scrap aluminum piping, trash cans, sheet metal, and tires were reportedly located near the bottom of a steep embankment bordering the north edge of the Supply Pond. Most of the debris was removed in 1984 during a general cleanup of the site. COCs: PAHs, pesticides
Site 11 Former Sanitary Landfill	1974 - 1980	2.6 hectares	Approx. 20,400 metric tons of paper and plastic trash were dumped. An additional 39 metric tons of waste were dumped, including oil-contaminated soils; petroleum, oil and lubricating wastes; paints, thinners, and solvents; pesticides; and photo lab wastes. COCs: mercury, silver, lead, beryllium, benzene, PCE, DCE, DCA
Site 17 Pest Control Building	1962 - 1989	1 hectare	Approx. 1,100 to 1,500 l/day of pesticide wash waters were generated. The waste was allowed to run off into soils or drainage ditches. Water that collects in ditches near this site eventually discharges to Pond 3. COCs: pesticides, lead

Table 1, cont.

Site	Dates of Operation	Size	Type and Quantity of Waste
Site 23 Defense Property Disposal Office (DPDO) Salvage Yard	1961 - 1971	Less than 1 hectare	Wastes were stored, dumped, or spilled on the ground until the site was paved in 1971. Approx. 6.5 metric tons of sulfuric acid and unspecified amounts of solvents were dumped. Unspecified quantities of residual liquids containing metal plating wastes, trichloroethylene, aliphatic naphthas, and kerosene were disposed here. COCs: lead, SVOCs
Site 24 Dry Well	1943 - 1970	Unspecified area	An estimated 8,300 l /day of rinsate waters from plating operations containing chromium, copper, cadmium, and silver were discharged to the dry well. COCs: cadmium, copper, lead, silver, chromium, cyanide
Site 28 Transformer Storage Area	1940s - 1973	Less than 1 hectare	Unknown quantities of transformer oils containing PCBs were drained onto soils adjacent to concrete pads where transformers were stored. COCs: PCBs
Site 29 Carbon Tetrachloride Disposal Area	Approx. 1947 - 1950	Less than 1 hectare	Approx. 6.8 metric tons of waste oil and 27 metric tons of carbon tetrachloride were poured on the ground. Also, 110 l/month of hydraulic fluid and 380 l/month of motor oil and aviation fuel were dumped on the ground. COCs: pesticides, PAHs, cadmium, copper, lead, zinc
Site 34 Borrow Pit	Unknown	4 hectares	Used as a borrow pit for the excavation of sand and gravel for landfill cover; since used for the disposal of construction debris and soil. COCs: DDT and its metabolites, PAHs

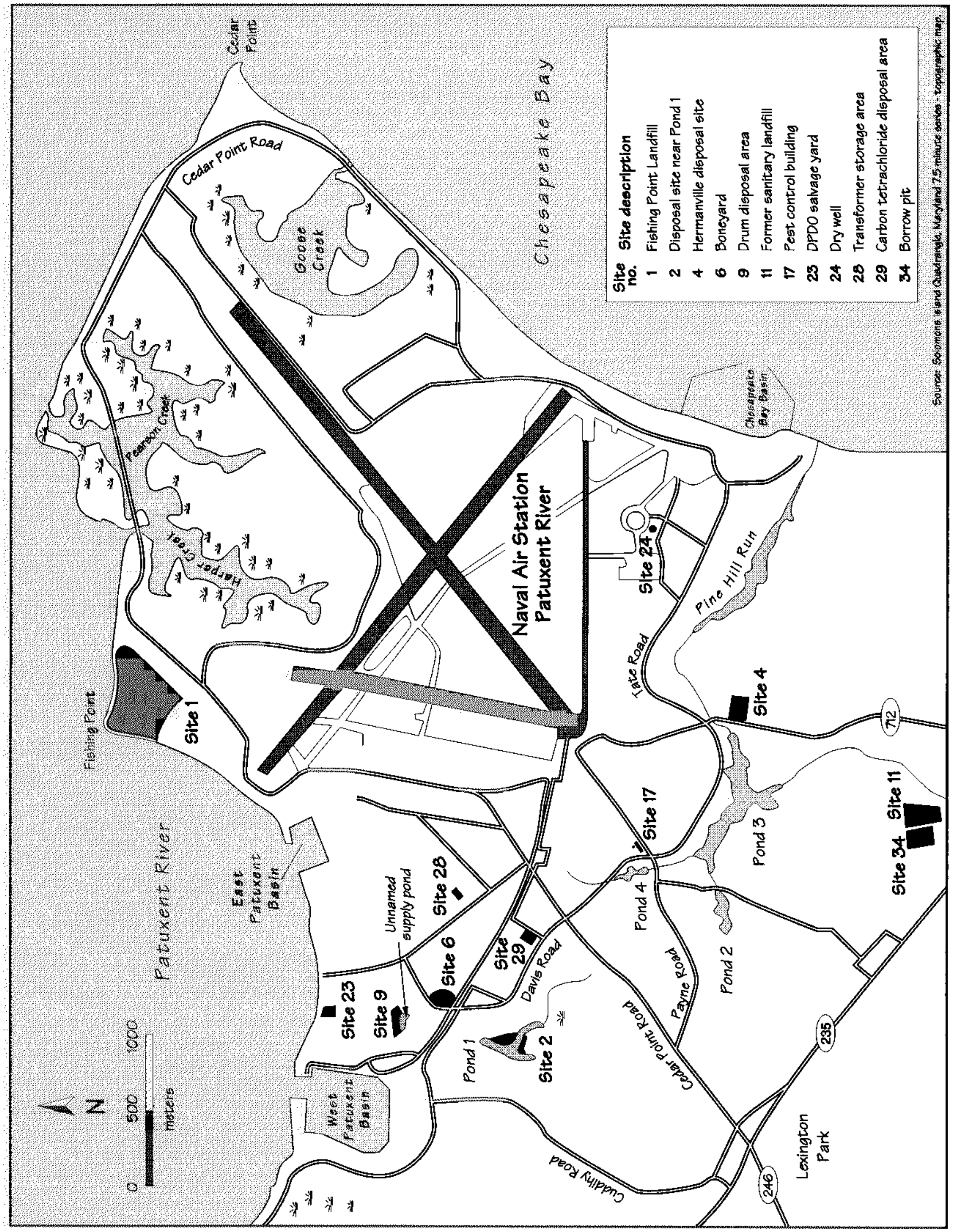

Figure 2. Detail of Naval Air Station Patuxent River in St. Mary's County, Maryland.

Pond 1. Surface runoff from Site 6 is expected to flow to the northwest toward West Patuxent Basin. During storms, surface runoff from Site 29 flows to a drainage ditch, which then flows through underground pipes for 460 m before discharging into Pond 1 (CH2M Hill 1992).

The second major drainage area of concern is Pond 3 and Pine Hill Run, in the southern part of NAS Patuxent River. The discharge from Pond 3 and its associated tributaries enters Pine Hill Run, which flows east into Chesapeake Bay approximately 2.5 km downstream from the pond. There are four waste sites within this drainage basin: Sites 4, 11, 17, and 34. Runoff from Site 4 enters a shallow drainage, which flows into Pine Hill Run to the northeast. Surface water from Sites 11 and 34 flows into two ephemeral tributaries of Pond 3 east and west of the sites. Pesticide rinse water from the Pest Control Building at Site 17 was released into drainage ditches that lead to Pond 3 (CH2M Hill 1992).

Surface water from the five remaining sites flows directly into the Patuxent River or Chesapeake Bay. Sites 1, 9, and 23 are located along the northern shore of the naval station, on land that slopes toward the Patuxent River. Sections of the Site 1 Landfill eroded into the Patuxent River before the shore was stabilized in 1994. Surface runoff from Site 24 is believed to flow into Chesapeake Bay Basin, also known as the Chesapeake Bay Seaplane Basin, about 1 km southeast of the site.

The surficial geological unit underlying NAS Patuxent River consists of about 30 m of unconsolidated gravel, sands, silts, and clays. Groundwater discharges from the surficial aquifer to surface water bodies on the base, including ponds, streams, the Patuxent River, and Chesapeake Bay (CH2M Hill 1994). Groundwater flows from Sites 1, 23, and 28 toward the Patuxent River; from Site 9 to the unnamed supply pond to the immediate south; from Sites 4, 11, 17, and 34 toward Pond 3 and Pine Hill Run; from Sites 6 and 29 toward Pond 1; and from Site 24 toward the Chesapeake Bay.

NOAA Trust Habitats and Species

Primary habitats of concern to NOAA are the surface waters and associated bottom substrates of the Patuxent River and Chesapeake Bay. Secondary habitats of concern are surface waters, bottom substrates, and estuarine emergent wetlands associated with Pine Hill Run.

Salinities in the Patuxent River and Chesapeake Bay near the site range from 10 to 25 ppt and fluctuate throughout the year, depending on rainfall, saltwater intrusion, and upstream freshwater input (Blazer 1992). The Patuxent River and Chesapeake Bay support diverse, abundant populations of NOAA trust resources that migrate close to the site and reside near the site for extended periods during sensitive life stages (Table 2; Ault 1992; Beavin 1992; Blazer 1992; Luo 1992; Rambo 1992). Seven species of anadromous fish use surface waters near the site for juvenile and adult habitat, including American shad, alewife, blueback herring, hickory shad, striped bass, white perch, and yellow perch, which are considered anadromous in this region. The shortnose sturgeon, a state- and federally listed endangered species, use bottom-dwelling habitats in Chesapeake Bay (Rambo 1992).

Resident estuarine species of the Patuxent River and Chesapeake Bay that occur in substantial numbers include Atlantic menhaden, bay anchovy, mummichog, spot, and silversides (Luo 1992). Spot and Atlantic croaker are commonly present in surface waters surrounding the site during the spring and summer. Catadromous American eel are found throughout the Patuxent River and Chesapeake Bay. Forage fishes in the area include killifish, menhaden, mummichog, silversides, spot, and striped mullet. These species are food for larger predatory species including American eel, bluefish, striped bass, and weakfish (Rambo 1992). Notable populations of

Table 2. Major species that use the Patuxent River and Chesapeake Bay near the Patuxent NAS.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
ANADROMOUS/CATADROMOUS SPECIES						
Blueback herring	*Alosa aestivalis*		◆	◆	◆	
Hickory shad	*Alosa mediocris*		◆	◆		
Alewife	*Alosa pseudoharengus*		◆	◆	◆	
American shad	*Alosa sapidissima*		◆	◆		
American eel	*Anguilla rostrata*			◆		
White perch	*Morone americana*		◆	◆	◆	◆
Striped bass	*Morone saxatilis*		◆	◆		◆
Yellow perch	*Perca flavescens*		◆	◆		
MARINE/ESTUARINE SPECIES						
Bay anchovy	*Anchoa mitchilli*	◆	◆	◆	◆	
Atlantic menhaden	*Brevoortia tyrannus*	◆	◆	◆		
Weakfish	*Cynoscion regalis*	◆	◆	◆	◆	◆
Gizzard shad	*Dorosoma cepedianum*			◆		
Mummichog	*Fundulus heteroclitus*	◆	◆	◆		
Killifish	*Fundulus spp.*	◆	◆	◆		
Spot	*Leiostomus xanthurus*		◆	◆		◆
Silversides	*Menedia spp.*	◆	◆	◆		
Atlantic croaker	*Micropongonias undulatus*	◆	◆	◆		◆
Striped mullet	*Mugil cephalus*	◆	◆	◆		◆
Summer flounder	*Paralichthys dentatus*	◆	◆	◆	◆	◆
Bluefish	*Pomatus saltatrix*			◆	◆	◆
Northern puffer	*Sphoeroides maculatus*		◆	◆		◆
Hogchoker	*Trinectes maculatus*	◆	◆	◆		
INVERTEBRATE SPECIES						
Blue crab	*Callinectes sapidus*	◆	◆	◆	◆	◆
Eastern oyster	*Crassotrea virginica*	◆	◆	◆	◆	◆

eastern oyster are found in surface waters surrounding the site. Surface waters north of the site provide important habitat to large, overwintering populations of blue crab (Ault 1992).

Although limited data were available regarding resource use of the Pine Hill Run, its tidal exchange and proximity to Chesapeake Bay would suggest that trust species periodically use the creek. These species include anchovy, flounder, killifish, mullet, mummichog, weakfish, and silversides (Rambo 1992).

Tidal amplitude near the site is commonly 0.5 m (Rambo 1992). The majority of the NAS Patuxent River shoreline along the Patuxent River and Chesapeake Bay is retained with concrete and timber bulkheads, gabions, and riprap. Limited portions of the shoreline remain as natural beach or bank. Several areas along the northern shore of the site were highly eroded (Rambo 1992). Pine Hill Run is tidally influenced for approximately 1.5 km upstream from Chesapeake Bay and is obstructed by both natural and manmade barriers. Creek depths commonly range from 0.3 to 1.0 m deep. Pond 3, the largest freshwater pond located on the base, is impounded by a structure that limits upstream migration into the freshwater habitat for all trust species except American eel.

Three major types of wetlands are found at NAS Patuxent, including freshwater wetlands, estuaries, and salt marshes. Principal estuaries and associated salt marshes are located at the confluence, and surround the perimeters of Chesapeake Bay, Pine Hill Run, and Goose, Pearson, and Harper creeks (Roy F. Weston, Inc. 1994a). Vegetation within the wetland surrounding Pine Hill Run is dominated by smooth cordgrass *(Spartina alterniflora)*, common reed *(Phragmites communis)*, and button bush *(Cephalanthus occidentalis)*. Bottom substrates of Pine Hill Run and associated wetlands are composed mostly of silt and muck. There are extensive submerged aquatic beds of widgeon grass *(Ruppia maritima)* and horned pondweed *(Zannichellia palustris)* in Pine Hill Run and the other creeks on the base (Rambo 1992).

The Patuxent River and Chesapeake Bay near the site support important recreational and commercial fisheries (Table 2). Commercially harvested species in this area include Atlantic croaker, alewife, white perch, blueback herring, bay anchovy, bluefish, summer flounder, weakfish, eastern oyster, and blue crab. Popular sport fisheries in the area include Atlantic croaker, blue crab, northern puffer, spot, summer flounder, striped bass, and weakfish. Bank and boat fishing are popular along the Patuxent River and Chesapeake Bay surrounding the base (Blazer 1992), as well as on the northern shore, seaplane walls, and Cedar Point (Fred C. Hart and Associates, Inc. 1984). Oyster beds in Harper and Pearson creeks are occasionally seeded. These oyster beds have a history of temporary closures due to nonpoint source pollution (Fred C. Hart and Associates, Inc. 1984).

Moratoriums have been historically imposed near the site due to declining populations of several

NOAA trust resources, including American shad, hickory shad, striped bass, and yellow perch. In 1991, moratoriums on striped bass and yellow perch fishing were lifted, and the fisheries are now managed under strict state regulation (Blazer 1992; Rambo 1992). There has been a moratorium on hickory and American shad fishing since 1972 (Blazer 1992, 1996).

Site-Related Contamination

Data collected during site investigations indicate that groundwater, surface water, sediments, and soils at the NAS Patuxent River site are contaminated (Table 3). All sites had concentrations of at least one contaminant that exceeded screening guidelines. Overall, trace elements and pesticides are the primary contaminants of concern.
Sites 1 and 23 are of concern to NOAA due to their proximity to the Patuxent River and the elevated concentrations of trace elements detected in surface waters at and near the sites.

Site 17 had elevated concentrations of pesticides in soils and groundwater, and in sediment and surface water from Pond 3 and a small tributary flowing to Pond 3. These results indicate widespread contamination in all media at the site and a pathway for contaminant migration from the site.

Surface water, sediment, and fish tissue were sampled at Site 2. Numerous contaminants were found in sediment at concentrations exceeding their screening guidelines. Some of these contaminants were also detected in fish tissue from Pond 1, but no screening guidelines are available for fish tissue. Detection limits for surface water contaminants exceeded guidelines. Groundwater and soil have not been collected from this site, so source and pathway information are not available.

At Sites 6, 28, and 29, elevated concentrations of trace elements and pesticides were detected in soils, but no information about sediments or pathways from these sites has been gathered.

Although silver appears to be a concern in groundwater at Sites 4 and 11, information is not available on contaminant migration from these sites to Pine Hill Run.

The data also indicate a source area and movement of trace elements from Site 24 towards Chesapeake Bay. However, sampling has not yet been conducted in the bay downstream from the site to determine whether trace elements have been transported to NOAA trust habitats.

Sites 9 and 34 are of less concern to NOAA because pesticides were detected at relatively low concentrations at the sites. It is not likely that these pesticides have been transported off site at concentrations of concern because of the apparent lack of drainage outlets, the distance from trust habitats, and the relative immobility of pesticides.

Table 3. Concentrations of primary contaminants in media collected from the twelve sites at NAS Patuxent River compared to screening guidelines (CH2M Hill 1994; Roy F. Weston 1994a, 1994b; Halliburton NUS 1995).

	Water (µg/l)			Soil (mg/kg)		Sediment (mg/kg)	
Contaminant	NAS Patuxent Groundwater	Surface Water	Marine Chronic AWQC[1]	NAS Patuxent Soil	Mean Earth's Crust[2]	NAS Patuxent Sediment	ERL[3]
Site 1							
Cadmium	25	<20	9.3	NA	0.06	<2.0	1.2
Lead	30	250	8.5	NA	10	23.0	46.7
Mercury	2.1	4.0	0.025	NA	0.03	<0.4	0.15
Silver	5	50	0.92[p]	NA	0.05	<2.0	1.0
Site 2							
Lead	NA	<80	8.5	NA	10	140	46.7
Mercury	NA	<0.4	0.025	NA	0.03	0.078	0.15
4,4'-DDD	NA	<0.04	3.6[a]	NA	N/A	0.31	NA
4,4'-DDE	NA	<0.04	14[a]	NA	N/A	0.26	0.0022
4,4'-DDT	NA	<0.1	0.001	NA	N/A	0.590	0.0016t
Dieldrin	NA	NR	0.0019	NA	N/A	0.093	NA
PCP	NA	NR	7.9	NA	N/A	0.110	NA
Aroclor 1260	NA	NR	0.03	NA	N/A	0.150	0.0227
Total PAHs	NA	NR	NR	NA	N/A	4.65	4.022
Site 4							
Lead	90	NA	8.5	32	10	NA	46.7
Mercury	UR	NA	0.025	0.6	0.03	NA	0.15
Silver	60	NA	0.92[p]	4.3	0.05	NA	1
Site 6							
Cadmium	2.4	NA	9.3	14	0.06	NA	1.2
Copper	50	NA	2.9[c]	170	30	NA	34
Lead	1,300	NA	8.5	500	10	NA	46.7
Mercury	ND	NA	0.025	0.9	0.03	NA	0.15
Silver	2.0	NA	p 0.92	33	0.05	NA	1
Zinc	94	NA	86	440	50	NA	150
TPH	<60	NA	N/A	18,000	N/A	NA	NA
Site 9							
Total PAHs	ND	ND	N/A	48	N/A	0.6	4.022
4,4'-DDD	ND	ND	3.6[a]	1.7	N/A	0.3	NA
4,4'-DDE	0.067	ND	14[a]	0.16	N/A	0.7	0.0022
4,4'-DDT	ND	ND	0.001	1.2	N/A	0.03	0.0016t
Site 11							NA
Mercury	2	<0.5	0.025	ND	0.03	ND	0.15
Silver	40	7.7	2.3	ND	0.05	ND	1

1: EPA (1993)
2: EPA (1983)
3: Long and MacDonald (1992)

Table 3, cont.

Contaminant	Water (μg/l)			Soil (mg/kg)		Sediment (mg/kg)	
	NAS Patuxent Groundwater	Surface Water	Marine Chronic AWQC[1]	NAS Patuxent Soil	Mean Earth's Crust[2]	NAS Patuxent Sediment	ERL[3]
Site 17							
Lead	82	2.7	8.5	450	10	372	46.7
Aldrin	ND	NR	1.3[c]	94	N/A	NR	0.002[d]
Chlordane	ND	NR	0.004	530	N/A	6.0	0.002[d]
a-Chlordane	0.11	21	0.004	28	N/A	NR	N/A
g-Chlordane	0.11	19	0.004	27	N/A	NR	N/A
4,4'-DDD	0.088	93	3.6[a]	2,900	N/A	420	NA
4,4'-DDE	0.06	17	14[a]	76	N/A	9.9	0.0022t
4,4'-DDT	0.17	480	0.001	5,000	N/A	4.9	0.0016t
Dieldrin	1.9	37	0.0019	220	N/A	0.034	N/A
Endrin ketone	0.37	<0.10	0.0023	NR	N/A	NR	N/A
Site 23							
Lead	ND	37	8.5	23.2	10	NR	46.7
Site 24							
Cadmium	240	<5	9.3	100	0.06	12	1.2
Chromium	<40	9	N/A	3,900	100	140	81
Copper	160	70	2.9[c]	610	30	28	34
Lead	130	37	8.5	934	10	80	46.7
Silver	20	<5	p 0.92	13.8	0.05	<0.6	1
Cyanide	26	NR	1	NR	NR	NR	N/A
Zinc	390	20	86	370	50	42	150
Site 28							
Aroclor-1260	0.48	NA	0.03	6,100	N/A	NA	0.0227
Site 29							
Cadmium	<20	NA	9.3	15	0.06	NA	1.2
Copper	<30	NA	2.9[c]	69	30	NA	34
Lead	<80	NA	8.5	630	10	NA	46.7
Zinc	70	NA	86	270	50	NA	150
4,4'-DDD	NR	NA	3.6[a]	0.28	N/A	NA	NA
4,4'-DDE	NR	NA	14[a]	0.023	N/A	NA	0.0022
4,4'-DDT	NR	NA	0.001	1.0	N/A	NA	0.0016t
Total PAHs	NR	NA	N/A	13	N/A	NA	4.022
Oil and Grease	NR	NA	N/A	2,189	N/A	NA	N/A
Site 34							
4,4'-DDD	0.073	ND	3.6[a]	0.12	120	0.003	NA
4,4'-DDE	0.073	ND	14[a]	0.23	230	0.007	0.0022
4,4'-DDT	0.073	ND	0.001	0.04	43	0.009	0.0016t

1: EPA (1993)
2: EPA (1983)
3: Long and MacDonald (1992)
< Less than the reported detection limit.
NA: Not analyzed.
N/A: Screening guidelines not available.
NR: Not reported.
ND: Concentration was below detection limits, but detection limits were not reported.
UR: Concentration reported in RI was unreadable.
a: Insufficient data to develop criterion; listed concentration is the acute lowest observed effect level (LOEL).
b: Apparent Effects Threshold; entry is lowest value among four AET tests: A - Amphipod bioassay, B - Benthic community impacts, M - Microtox bioassay, O - Oyster larvae bioassay
c: No chronic criterion has been developed. The listed concentration is the acute criterion.
d: Overall Apparent Effects Threshold (OAET)
p: Proposed criterion
t: DDT total

Summary

Elevated concentrations of trace elements, pesticides, PCBs, and petroleum products have been detected in groundwater, surface water, sediment, and soils at NAS Patuxent River. Several of these contaminants were measured at concentrations that far exceed screening guidelines. Data collected during several site investigations indicate a pathway for off-site migration of contaminants to NOAA trust resource habitats. The Patuxent River and Chesapeake Bay support numerous NOAA trust resources, including the shortnose sturgeon, which is listed as an endangered species by both the state of Maryland and the Federal Endangered Species Act. Trust species may also use Pine Hill Run and its associated wetland habitats. These data suggest that site-related contaminants pose a risk to NOAA trust resources.

References

Ault, J., research associate, Chesapeake Biological Lab, Solomon's Island, Maryland, personal communication, October 29, 1992.

Beavin, M., natural resource manager, Maryland Department of Natural Resources, Tidewater Administration, Fisheries Division, Annapolis, Maryland, personal communication, November 2, 1992.

Blazer, D., natural resource manager, Maryland Department of Natural Resources, Tidewater Administration, Fisheries Division, Annapolis, Maryland, personal communications, October 29, 1992 and January 29, 1996.

CH2M Hill. 1992. Draft Remedial Investigation Report, Patuxent River Naval Air Station, Volume 1. Washington, D.C.: Engineering Field Activity, Chesapeake Naval Facilities Engineering Command, Washington Navy Yard.

CH2M Hill. 1994. Interim Remedial Investigation Report, Patuxent River Naval Air Station. Washington, D.C.: Engineering Field Activity, Chesapeake Naval Facilities Engineering Command, Washington Navy Yard.

Fred C. Hart and Associates, Inc. 1984. Initial Assessment Study, Naval Air Station, Patuxent River, Maryland.

Halliburton NUS Corporation. 1995. Engineering Evaluation/Cost Analysis (EE/CA) for Site 6, 17, and 24, Naval Air Station, Patuxent River, Maryland.

Long, E.R., and D.D. MacDonald. 1992. National Status and Trends Program approach. In: *Sediment Classification Methods Compendium.* EPA 823-R-92-006. Washington, D.C.: Office of Water, U.S. Environmental Protection Agency.
Luo, J., research associate, Chesapeake Biological Lab, Solomon's Island, Maryland, personal communication, October 29, 1992.

Rambo, K., natural resource manager, Patuxent Naval Air Station, Lexington Park, Maryland, personal communication, November 4, 1992.

Roy F. Weston, Inc. 1994a. Final Screening Site Inspection for Site 9, Naval Air Station, Patuxent River, Maryland. Washington, D.C.: Engineering Field Activity, Chesapeake Naval Facilities Engineering Command, Washington Navy Yard.

Roy F. Weston, Inc. 1994b. Final Screening Site Inspection for Site 34, Naval Air Station, Patuxent River, Maryland. Washington, D.C.: Engineering Field Activity, Chesapeake Naval Facilities Engineering Command, Washington Navy Yard.

U.S. Environmental Protection Agency (EPA). 1983. *Hazardous waste land treatment.* EPA/530/SW-83/874. Cincinnati: Municipal Environmental Research Laboratory. 702 pp.

U.S. Environmental Protection Agency (EPA). 1993. *Water quality criteria.* Washington, D.C.: U.S. Environmental Protection Agency, Office of Water, Health and Ecological Criteria Division. 294 pp.

U.S. Geological Survey. 1974. Solomon's Island Quadrangle, Maryland. Reston, Virginia: U.S. Government Printing Office.

3

U.S. Navy Ships Parts Control Center

Mechanicsburg, Pennsylvania
CERCLIS #PA3170022104

Site Exposure Potential

Drainage from the U.S. Navy Ships Parts Control Center (NSPCC) in Mechanicsburg, Pennsylvania discharges to a 2.4-km ditch that joins Trindle Spring Run. From the confluence of this ditch, Trindle Spring Run flows 1 km to Conodoguinet Creek, which meanders about 25 km to the Susquehanna River, a NOAA trust habitat (Figure 1; EA Engineering 1993). The Susquehanna River flows another 120 km before discharging to Chesapeake Bay.

Since NSPCC was established in 1942, site activities have included storage of metal ores, ammunition management, and maintenance and engineering support. Site investigations identified eleven disposal sites (EA Engineering 1993; Figure 2; Table 1):

1. Carter Road Landfill
2. Building 904 Landfill
3. Ball Road Landfill and Burn Pits
4. Radioactive Waste Disposal Area
5. Golf Course Landfill
6. Underground Fuel Tank Leak
7. Buildings 403/404 Solvent Disposal Area
8. Ore Storage Area
9. Stormwater Drainage Ditch
10. Building 608 Underground Storage Tanks
11. Ingot Storage Areas

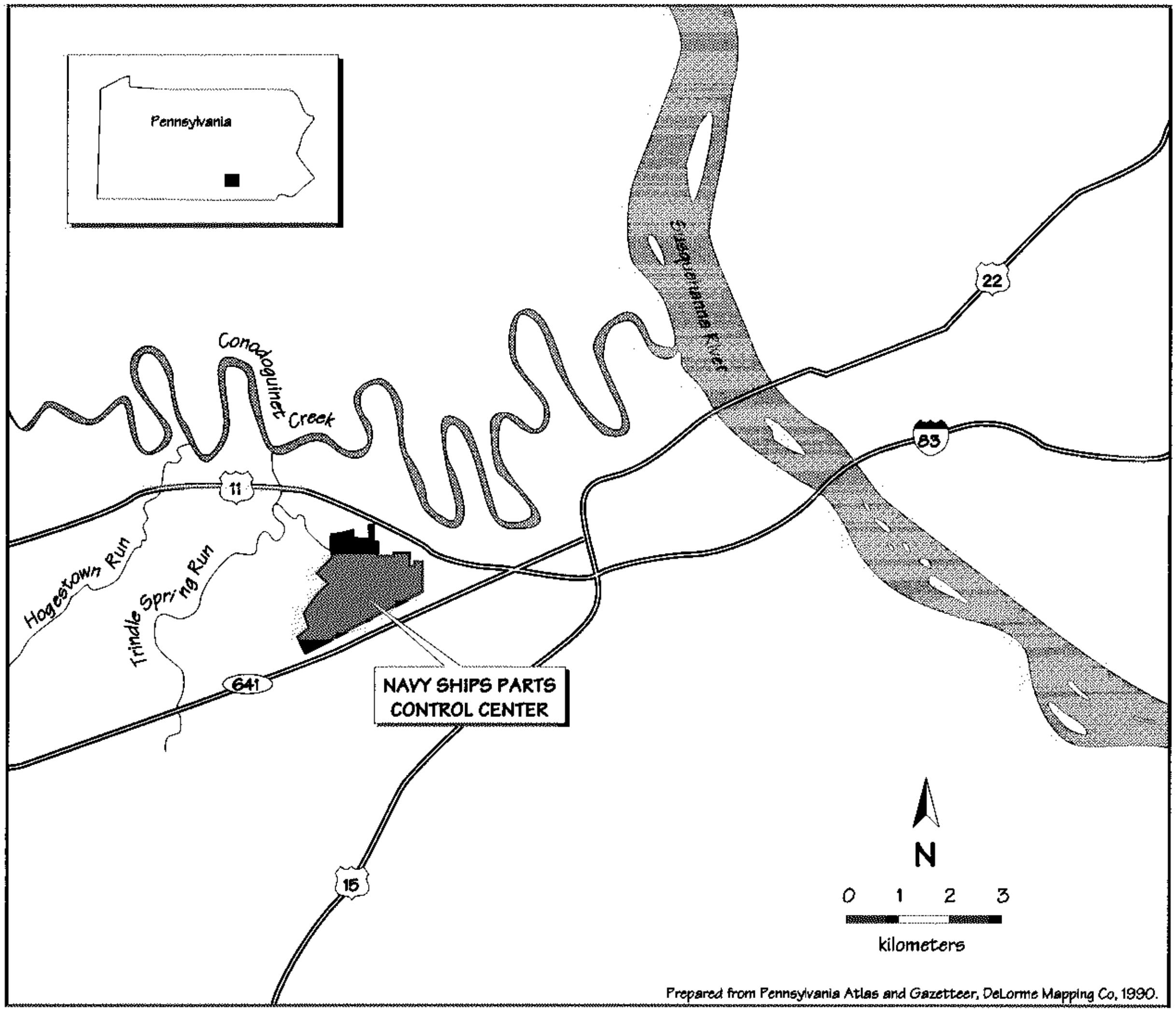

Figure 1. Location of Navy Ships Parts Control Center in Mechanicsburg, Pennsylvania.

Remedial investigations were completed at Sites 1, 3, 7, and 9. The Navy proposes no further investigations for Sites 2, 4, 5, 6, 7, 8, 10, and 11 based on evaluation of data collected during preliminary assessment, site inspection, and remedial investigation. A remedial action in 1990 and 1991 removed 6,100 metric tons of sediment contaminated with PCBs from Site 9, the 2.4-km stormwater drainage ditch. A long-term, post-remedial monitoring program is underway (EA Engineering 1993).

Surface water runoff and groundwater migration are contaminant transport pathways that could affect NOAA resources and associated habitats. The partially remediated drainage ditch on the northwestern edge of NSPCC (Site 9) collects most of the site's surface runoff. During heavy

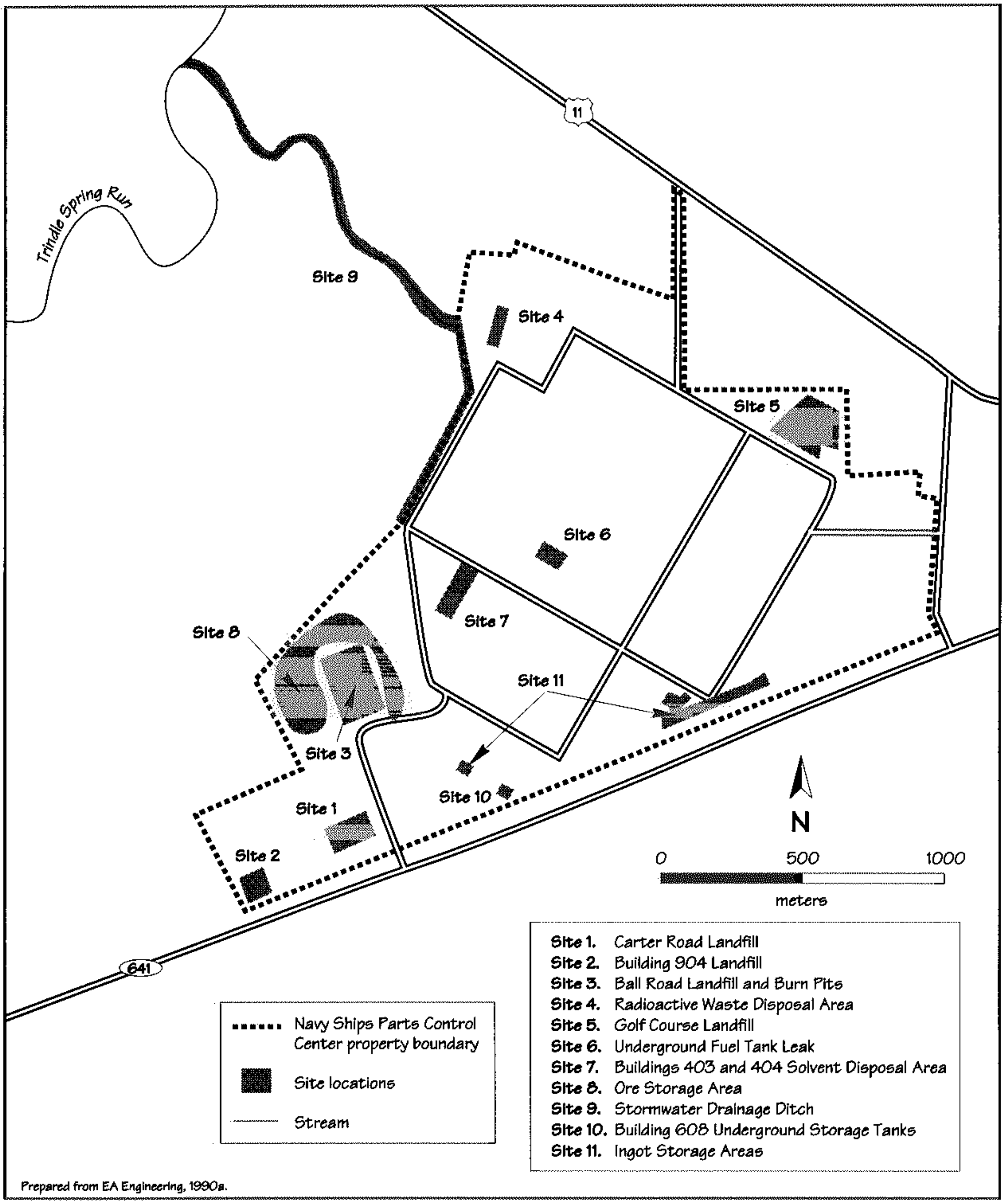

Figure 2. Detail of Navy Ships Parts Control Center.

Table 1. Individual site summaries for the Navy Ships Parts Control Center (EA Engineering 1993).

Site	Size/Volume	Period of Operation	Disposal/Operation	Contaminants of Concern/Media	Distance to Trindle Spring Run	Pathway	RI/FS Stage
1	1.8 hectares	1950-1962	Construction rubble and medical supplies were disposed in landfill.	PAHs, PCBs, DDTs, lead in soils	2 km	Groundwater	RA
2	0.4 hectares	1950s	Construction debris and medical supplies were disposed in landfill.	SVOCs in soils	2 km	Groundwater	NFA
3	8,400 m^3	1946-1977	Solvents, petroleum lubricants, paints, varnishes, gasoline, and medical supplies were disposed in landfill and burn pits. Wastes were doused with gasoline and burned weekly.	SVOCs, PCBs, arsenic, tin, mercury in soils and groundwater	1.4 km	Groundwater	RI
4	Unknown	1950s-1960s	Potential disposal of radioactive waste. Ground-penetrating radar and focused excavation at six test pits found only background radioactivity.	Radioactive substances in soils and groundwater	200 m	Groundwater/ Drainage ditch	NFA
5	1.6-2 hectares	~1946-1947	NSPCC waste material was disposed in this landfill in 1946 and 1947.	PAHs, trace elements in soils and groundwater	1.2 km	Drainage ditch	NFA
6	At least 13,600-l of gasoline leaked	Unknown	Two leaking underground storage tanks were discovered, one in 1977, the other in 1984. Both have been removed.	Low-lead gasoline, # 2 fuel oil in soils and groundwater	1 km	Groundwater	NFA
7	Unknown	1950s	Large quantities of spent trichloroethylene and stoddard solvent were poured onto the ground. Spent solvents were used to remove preservative oils and grease. Hydraulic fluid contaminated with PCBs may have been cleaned off machinery.	PCBs, trace elements in soils and groundwater	1 km	Groundwater/ Drainage ditch	NFA
8	Unknown	Unknown	Stockpiles of mineral ores including chromite and manganese, kyanite, and aluminum oxide were stored at Site 8.	PAHs, PCBs, trace elements in soils and sediments	1.4 km	Drainage ditch	NFA
9	2.4-km drainage ditch	Unknown	Site 9 collects stormwater from the entire NSPCC and discharges to Trindle Spring Run. In 1990-1991, 6,700 tons of sediment highly contaminated with PCBs, trace elements, and PAHs were removed. Post-remedial monitoring shows signifcant residual PCB contamination.	PCBs, PAHs, trace elements in sediments	Direct discharge	Direct discharge	RD/RA
10	Two 76,000-l underground storage tanks	Unknown	In 1970, water was discovered in fuel oil stored in the tanks. The tanks were emptied and filled with sand.	VOCs, SVOCs in soils	1.6 km	Groundwater	NFA
11	Unknown	Unknown	Lead and zinc ingots were stored at the site.	Trace elements in soils	1.5 km	Drainage ditch	NFA

RA: Remedial Action — RI: Remedial Investigation
NFA: No Further Action — RD: Remedial Design

rains, flow from the drainage ditch discharges to Trindle Spring Run, a tributary of Conodoguinet Creek. At other times, discharges to the ditch are intercepted by a series of sinkholes percolating to the water table, providing a pathway for site-related contamination to be transported by groundwater to Conodoguinet Creek. There are several unconfined, water-bearing formations beneath the site. Depending on the season, groundwater is encountered at 1.5 to 24 m bgs (EA Engineering 1990a, 1993).

NOAA Trust Habitats and Species

Habitats of concern to NOAA are surface waters, bottom substrates, and associated wetlands of Trindle Spring Run, Conodoguinet Creek, and the Susquehanna River. NSPCC is located in the lower Susquehanna River Subbasin, which has a drainage area of 54,488 km^2 encompassing eleven watersheds covering 46 percent of the state of Pennsylvania. The NSPCC straddles the Conodoguinet Creek and Yellow Breeches Creek watersheds, but all NSPCC drainage flows into the Conodoguinet Creek watershed.

Bottom substrates of Trindle Spring Run, Conodoguinet Creek, and the Susquehanna River are primarily gravel and cobble intermixed with areas of sand and silt. The downstream reaches of Trindle Spring Run and Conodoguinet Creek near the site are low-gradient, highly productive limestone streams. Conodoguinet Creek is approximately 15 m wide near the site. In the summer months, the Creek averages 1.0 to 1.5 m deep, but depth increases considerably during the spring. The Susquehanna River is a slow-moving, meandering river with many switchbacks and oxbows. In this area, it is about 1 km wide and 1 to 2.5 m deep (St. Pierre personal communication 1995a).

No wetlands have been identified within the boundaries of the NSPCC. Two small wetlands immediately outside the perimeter fence to the northwest are classified as Palustrine Unconsolidated Bottom, Permanent Excavated Wetlands (EA Engineering 1993).

Riparian modifications and construction of hydroelectric dams on the Susquehanna River have significantly reduced habitat accessible to NOAA trust resources. Four major dams control the river downstream of the site. Only Conowingo Dam, less than 20 km from the River mouth, has fish passage facilities. The Holtwood Dam, approximately 42 river km upstream from the River mouth, restricts natural upstream migration of anadromous NOAA trust resources. American shad and American eel are the only NOAA trust resources recently identified in the Susquehanna River above the York Haven Dam, 54 km upstream of the Holtwood dam and 24 km downstream from NSPCC. Shad are maintained in the upper river through stocking of juveniles and adults above the York Haven Dam, in the Harrisburg area. Although there are American eel throughout the river basin, there has been an unexplained decline in the population over the past ten years. There is no established eel stocking program (St. Pierre personal communication 1995a).

A restoration program has been instituted for American shad, blueback herring, alewife, and American eel. The scope of this program is to (1) encourage the utilities to implement facility improvements that will enable migration, and (2) sustain hatchery stocking as well as lift, trap, and transport stocking of juveniles and adults until the fish populations naturally rejuvenate. A permanent passageway completed at the Conowingo Dam in 1991 passed 25,000 American shad during its first two years of operation. Utilities that maintain the other dams are planning similar construction programs. Proposed fish passage facilities on the Holtwood and Safe Harbor dams are projected to be completed in 1997 (St. Pierre personal communication 1995a). These fish passage projects are expected to restore multi-species migration to the NSPCC area by the year 2000. In addition, the fish passages would greatly reduce out-migration mortality caused by the hydroelectric turbines.

Authorities hope that near-historic patterns of migration and spawning populations of American shad, blueback herring, alewife, and American eel can be restored. There has been targeted stocking along several tributaries in the area. American shad larvae were released into the Conodoguinet Creek during Spring 1995. Approximately 230,000 differentially tagged larvae were released at the mouth of the Conodoguinet Creek, and 220,000 tagged larvae were released above blockages on the river near the town of Carlisle. Recovery catch of the juvenile American shad was completed in Fall 1995 to measure current habitat value of this area and natural production. A good percentage of those recovered were from Conodoguinet Creek (St. Pierre personal communication 1995b).

Adult herring were stocked during Summer 1995 on tributaries near Conodoguinet Creek. Though no herring were released directly into Conodoguinet Creek during 1995, approximately 5,000 herring are targeted for release in late April or early May 1996. In 1996, there may be further habitat evaluations, removal of fish ladders, and, potentially, dam removals. Although there are no commercial or recreational fisheries for NOAA trust resources near the site, these fisheries are expected to reappear as habitats are restored and stocks proliferate (St. Pierre personal communication 1995b).

Site-Related Contamination

Nine trace elements, PCBs, and PAHs are the major contaminants of concern to NOAA. Table 2 presents maximum concentrations reported from site inspections for Sites 1-8, 10, and 11 (EA Engineering 1990a). (Maximum concentrations of PCBs in the Stormwater Drainage Ditch following sediment removal are presented for Site 9; EA Engineering 1994).

Table 2. Maximum concentrations of contaminants of concern at sites on the Navy Ships Parts Control Center compared with applicable screening criteria (EA Engineering 1990a, 1994).

	Groundwater		Soils		Sediment		
Contaminant	Maximum (µg/l) Total/Dissolved	AWQC[1] (µg/l)	Maximum (mg/kg)	Average Soil (mg/kg)[2]	Trindle Spring Run (mg/kg)	On-site (mg/kg)	ERL (mg/kg)[3]
INORGANIC SUBSTANCES							
Arsenic	24/170	190	380	5	15	38	8.2
Cadmium	150/2.8	1.1+	75	0.06	0.6	2.8	1.2
Chromium	1000/12	11	120	100	29	89	34
Copper	2000/14	12+	3100	30	47	200	81
Lead	27000/1.7	3.2+	1100	10	0.15	130	46.7
Mercury	33/3.5	0.012+	3.3	0.03	0.23	ND	0.15
Nickel	940/170	160	87	40	ND	46	20.9
Silver	72/23	0.12	89	0.05	0.23	15	1.0
Zinc	8400/45	110+	3600	50	68	130	150
ORGANIC COMPOUNDS							
Anthracene	ND	300*	1.3	NA	ND	0.86	0.0853
Benz(a)anthracene	ND	300*	6.2	NA	ND	4.9	0.26
Benzo(a)pyrene	ND	300*	5.6	NA	ND	5	0.43
Benzo(b)fluoranthene	ND	300*	5.9	NA	ND	5.5	3.2**
Benzo(k)fluoranthene	ND	300*	4.1	NA	ND	3.4	3.2**
Fluoranthene	ND	3980	12	NA	ND	11	0.6
Naphthalene	68	620†	2.1	NA	ND	0.13	0.16
2-methylnaphthalene	ND	300*	28	NA	ND	0.16	0.07
Phenanthrene	ND	6.3	7.5	NA	ND	7.8	0.24
Pyrene	ND	300*	12	NA	ND	11	0.665
Chrysene	ND	300*	7.4	NA	ND	5.7	0.384
1,4-Dichlorobenzene	140	763***	14	NA	ND	ND	0.11
PCBs	83	0.014	240	NA	2.7	200	0.0227
DDD	ND	0.6†	0.46	NA	ND	ND	NA
DDE	ND	1050†	0.89	NA	ND	ND	0.002
DDT	ND	0.001	1.8	NA	ND	ND	0.0016

1: Ambient water quality criteria for the protection of aquatic organisms. Freshwater chronic criteria presented (EPA 1993).
2: EPA (1983)
3: Effects range-low; the concentrations representing the lowest 10 percentile value for the data in which effects were observed or predicted in studies compiled by Long and MacDonald (1992).
*: Value for chemical class
**: Apparent effects threshold value.
***: Value for the summation of all isomers
†: Criteria have not been developed; concentration presented is the lowest observed effect level.
ND: Not detected
NA: Guidelines not available
+: Hardness-dependent criterion (100 mg/l $CaCO_3$ used)

Based upon current data, Site 9 continues to be the primary threat to NOAA trust resources. As reported, this site receives runoff from much of the NSPCC and discharges to Trindle Spring Run, a potential habitat for NOAA trust species. Before remedial sediment removal at Site 9, maximum concentrations of PCBs in sediment exceeded 1,000 mg/kg, and concentrations over 100 mg/kg were commonly observed in the upstream half of the ditch (EA Engineering 1990b). Elevated concentrations of trace elements and PAHs were also measured. Concentrations up to 200 mg/kg PCBs were measured in the drainage ditch following the remedial action. Only PCBs were analyzed during post-remedial sampling (EA Engineering 1994).

During several post-remedial sampling rounds, PCBs were found in sediment collected from Trindle Spring Run at concentrations exceeding NOAA screening guidelines. Concentrations ranged from 0.04 to 2.7 mg/kg at stations immediately downgradient of the Stormwater Drainage Ditch (EA Engineering 1994). Concentrations of lead and mercury also slightly exceeded NOAA screening guidelines (EA Engineering 1990b). Sampling has not been conducted farther downstream in Trindle Spring Run or Conodoguinet Creek.

Current data indicate that Site 3, Ball Road Landfill and the Burn Pits, may contribute PCBs to the Stormwater Drainage Ditch. Rhodamine dye studies conducted during the Site 3 remedial investigation indicate that groundwater beneath the site flows to Trindle Spring Run and Conodoguinet Creek. Maximum concentrations of PCBs were 240 mg/kg in soil samples and 83 µg/l in groundwater (EA Engineering 1993).

The data also indicate that Site 1, Carter Road Landfill, may contribute trace elements to the Stormwater Drainage Ditch. Nine elements were measured in soils at concentrations one to three orders of magnitude above average soil concentrations in the U.S. (EA Engineering 1993). Neither dye studies nor an extensive evaluation of surface pathways were conducted at this site.

Concentrations of trace elements in unfiltered groundwater exceeded freshwater AWQC at most NSPCC sites. Dissolved concentrations of mercury, nickel, and silver exceeded screening guidelines at Sites 2, 3, 5, and 8. One element exceeded the screening guideline at Sites 1 and 11 (EA Engineering 1990a).

Soil samples collected at Sites 2 and 5, and sediment samples at Site 8, contained moderate to high concentrations of PAHs. Concentrations of ten PAHs in sediment collected from Site 8 exceeded NOAA screening guidelines. These contaminated sediments appear to be within the drainage area of the Stormwater Drainage Ditch (EA Engineering 1990a).

Summary

Hazardous wastes were disposed at the NSPCC; site-related contamination has been found in the Stormwater Drainage Ditch, which discharges to a Susquehanna River tributary. Restoration plans for anadromous fish on the Susquehanna River could allow NOAA trust resources access to the immediate area of the ditch by the year 2000. PCB concentrations detected in the sediment of the drainage ditch exceeded NOAA screening guidelines by several orders of magnitude. PCBs detected in sediment downstream of the site in Trindle Spring Run at concentrations above screening guidelines indicate a potential risk to NOAA trust resources that may use the stream in the future.

References

EA Engineering. 1990a. *Final report, site inspection studies, Navy Ships Parts Control Center, Mechanicsburg, Pennsylvania. Volume I. Site inspection.* Philadelphia: U.S. Navy, Northern Division Naval Facilities Engineering Command.

EA Engineering. 1990b. *Final report, remedial investigation/feasibility study, stormwater drainage ditch sediment, Navy Ships Parts Control Center, Mechanicsburg, Pennsylvania. Volume I. Remedial investigation.* Philadelphia: U.S. Navy, Northern Division Naval Facilities Engineering Command.

EA Engineering. 1993. *Final Report, Phase I Remedial Investigation, Navy Ships Parts Control Center, Mechanicsburg, Pennsylvania.* Philadelphia: U.S. Navy, Northern Division Naval Facilities Engineering Command.

EA Engineering. 1994. Draft second annual report, sediment monitoring plan, stormwater drainage ditch, Navy Ships Parts Control Center, Mechanicsburg, Pennsylvania. Philadelphia: U.S. Navy, Northern Division Naval Facilities Engineering Command.

Long, E.R., and D.D. MacDonald. 1992. National status and trends program approach. In: Sediment classification methods compendium. EPA 823-R-92-006. Washington, D.C.: U.S. Environmental Protection Agency, Office of Water (WH-556).

St. Pierre, R., Fisheries Biologist, U.S. Fish and Wildlife Services, Harrisburg, Pennsylvania, personal communications, January 17, 1995; December 6, 1995.

U.S. Environmental Protection Agency (EPA). 1983. *Hazardous waste land treatment.* EPA/ 530/SW-83/874. Cincinnati: Municipal Environmental Research Laboratory. 702 pp.

U.S. Environmental Protection Agency (EPA). 1993. *Ambient water quality criteria.* Washington, D.C.: Office of Water, Health and Ecological Criteria Division.

4

Naval Air Station Whiting Field

Milton, Florida
CERCLIS #FL2170023244

Site Exposure Potential

The Naval Air Station (NAS) Whiting Field site occupies approximately 1,000 hectares in northwestern Florida, about 32 km northeast of Pensacola (Figure 1). The site is located within the Clear Creek and Big Coldwater Creek watersheds, approximately 7 km upstream from the Blackwater River. Clear Creek meanders in and out of the eastern site boundary and Big Coldwater Creek is approximately 3 km beyond the western site boundary. Water from the Blackwater River flows successively into Blackwater Bay, East Bay, Pensacola Bay, and eventually, the Gulf of Mexico. NAS Whiting Field is approximately 65 km from the Gulf of Mexico.

NAS Whiting Field has served as a naval aviation training facility since 1943. Historical records indicate that NAS Whiting Field generated a variety of wastes related to pilot training, the operation and maintenance of aircraft and ground support equipment, and the station's facility maintenance activities. Before hazardous waste management programs were established, most of the hazardous wastes were reportedly disposed on-site. It has been estimated that thousands of liters of wastes, including paints, paint thinners, solvents, waste oils, gasoline, hydraulic fluids, aviation gasoline (AVGAS), tank-bottom sludges, transformer fluids containing PCBs, and paint-stripping wastewater were potentially dumped

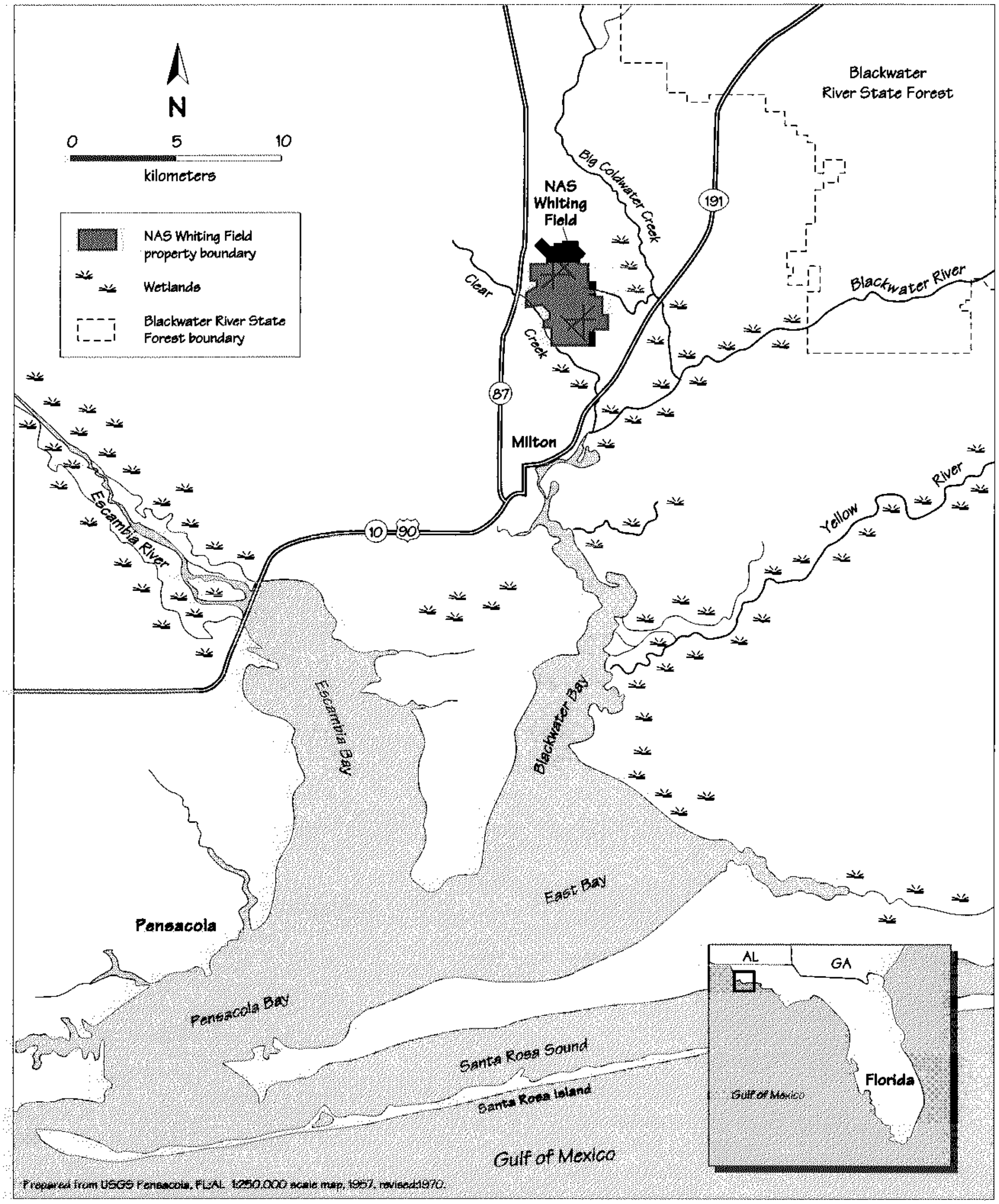

Figure 1. Location of NAS Whiting Field in Milton, Florida.

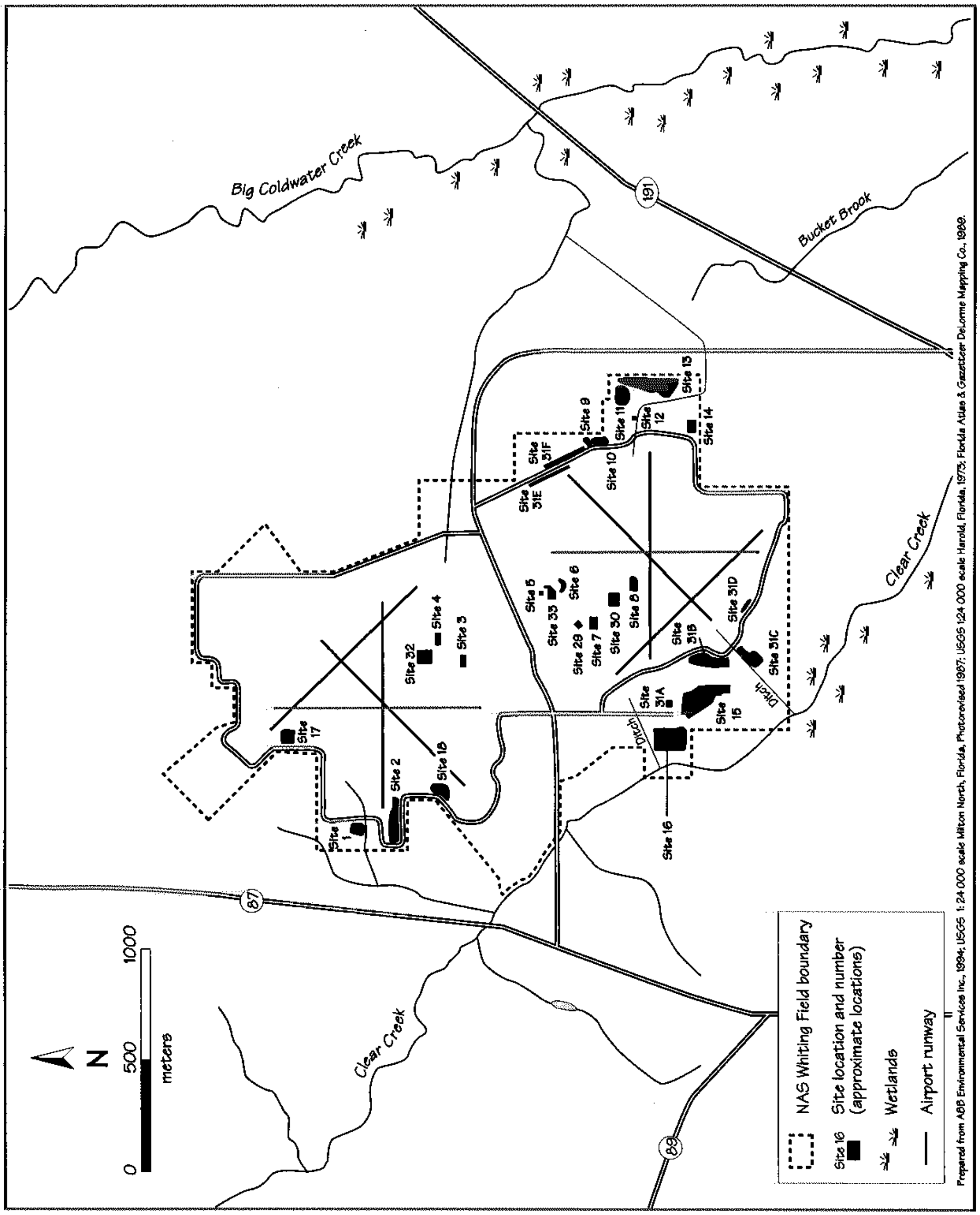

Figure 2. Waste sites at NAS Whiting Field.

Table 1. Waste sites of concern at NAS Whiting Field.

Site	Site Description	Period of Operation	Types of Materials Disposed or Spilled
1	Northwest Disposal Area	1943 - 1965	Refuse, waste paints, thinners, solvents, waste oils, hydraulic fluids
2	Northwest Open Disposal Area	1976 - 1984	Construction and demolition debris, tires, furniture
3	Underground Waste Solvent Storage Area	1980 - 1984	Waste solvents, paint stripping residue, and 450-liter spill
4	North AVGAS Tank Sludge Disposal Area	1943 - 1968	Tank bottom sludge containing tetraethyl lead
5	Battery Acid Seepage Pit	1964 - 1984	Waste electrolyte solution containing heavy metals and waste battery acid
6	South Transformer Oil Disposal Area	1940s - 1960s	PCB-contaminated dielectric fluid
7	South AVGAS Tank Sludge Disposal Area	1943 - 1968	Tank bottom sludge containing tetraethyl lead
8	AVGAS Fuel Spill Area	1972	AVGAS containing tetraethyl lead
9	Waste Fuel Disposal Pit	1950s - 1960s	Waste AVGAS containing tetraethyl lead
10	Southeast Open Disposal Area(A)	1965 - 1973	Construction and demolition debris, waste solvents, paint, oils, hydraulic fluids, PCBs, pesticides, and herbicides
11	Southeast Open Disposal Area(B)	1943 - 1970	Construction and demolition debris, waste solvents, paint, oils, hydraulic fluid, and PCBs
12	Tetraethyl Lead Disposal Area	1968	Tank bottom sludge and fuel filters contaminated with tetraethyl lead
13	Sanitary Landfill	1979 - 1984	Refuse, waste solvents, paint, hydraulic fluids, and asbestos
14	Short-Term Sanitary Landfill	1978 - 1979	Refuse, waste solvents, oils, paint, hydraulic fluids
15	Southwest Landfill	1965 - 1979	Refuse, waste paints, oils, solvents, thinners, asbestos, hydraulic fluid
16	Open Disposal and Burning Area	1943 - 1965	Refuse, waste paints, oils, solvents, thinners, PCBs, hydraulic fluid
17	Crash Crew Training Area	1951 - Present	JP-5 (light petroleum)
18	Crash Crew Training Area	1951 - Present	JP-5 (light petroleum)
29	Auto Hobby Shop	1940s - Present	Paints, oils, and solvents
30	South Field Maintenance Hangar	1940s - Present	Fuels, solvents, and oils
31	Sludge Drying Beds and Disposal Areas (A through F)	1940s - 1990	Sludge from wastewater treatment plant
32	North Field Maintenance Hangar	1940s - Present	Fuels, solvents, and oils
33	Midfield Maintenance Hangar	1940s - Present	Fuels, solvents, and oils

into on-site disposal areas (ABB 1992a). Disposal areas and waste sites at NAS Whiting Field are described in Table 1. Figure 2 shows the locations of the waste sites.

NAS Whiting Field is located on a plateau bounded by Clear and Big Coldwater creeks, both tributaries to the Blackwater River. The airfield and installation facilities are located on relatively flat, open land. An extensive storm drainage system collects runoff from industrial, support, and runway areas of NAS Whiting Field in a series of concrete drainage ditches that discharges to Clear Creek and Big Coldwater Creek. In general, surface runoff from sites west of the airfields drains into Clear Creek, and surface runoff from sites east of the airfields drains into Big Coldwater Creek. None of the waste sites at NAS Whiting Field is located within the one hundred-year floodplain (ABB 1992b).

The surficial aquifer at NAS Whiting Field lies within sand and gravel sediments, which extend to about 100 m below ground surface. Two deep artesian aquifers, the Upper Floridan and Lower Floridan, lie below the sand-and-gravel aquifer. Groundwater in the sand-and-gravel aquifer at the site flows south-southwest towards Clear Creek in the western half of the installation and to the southeast towards Big Coldwater Creek in the eastern half. Hydraulic conductivities calculated from slug tests and pumping tests conducted at NAS Whiting Field ranged from 3 to 46 m/day (ABB 1992c).

NOAA Trust Habitats and Species

Primary habitats of concern to NOAA are surface waters, bottom substrates, and associated estuarine and palustrine wetlands of Clear Creek, Big Coldwater Creek, the Blackwater River, and Blackwater Bay. Secondary habitats of concern to NOAA are surface waters and associated bottom substrates of East Bay.

The Blackwater River system drains a total area of 2,227 km^2 and extends 94 km in total length (Florida Game and Fresh Water Fish Commission 1983). Big Coldwater Creek, a major tributary of the Blackwater River with a similarly large drainage area, has fast-flowing waters and a sandy substrate. Clear Creek is a narrow, shallow, slow-moving creek with a sandy substrate. Big Coldwater Creek and Clear Creek are both freshwater near NAS Whiting Field. The lower reaches of the Blackwater River are low-gradient and tidal, with shallow depths allowing regular fluctuations in salinity. Surface waters typically range from brackish (5 to 20 ppt) to saline (>20 ppt), depending on precipitation and tidal activity. Sandy substrates and small patches of sea grasses, which provide excellent cover and forage for juvenile fish and invertebrate species, are commonly found farther downstream in Blackwater Bay. Rushes (*Juncus* spp.) predominate at the headwaters of Blackwater Bay and the lower reaches of the Blackwater River (Florida Game and Fresh Water Fish Commission 1983; Stith personal communication 1992).

American eel are found throughout the Blackwater River watershed. Big Coldwater Creek provides habitat for American eel and, possibly, striped mullet and hogchoker, although the presence of the latter two species has not been confirmed (Bass personal communication 1995). The lower reaches of the Blackwater River provide nursery habitat during high-salinity periods for tarpon, Gulf menhaden, bay anchovy, pinfish, sand seatrout, spotted seatrout, spot, Atlantic croaker, red drum, striped mullet, code goby, and southern flounder. Gulf killifish and sheepshead minnow spawn in the tidal freshwater reaches of the river (NOAA 1990).

Blackwater Bay provides spawning, nursery, and adult habitat for numerous NOAA trust species (Table 2; Peruga personal communication 1994; Stith personal communication 1994; Bass personal communication 1995). The area also is habitat for the salt marsh topminnow, a species of special concern to the State of Florida, and the Gulf sturgeon, a species listed by the Federal government as threatened (Peruga personal communication 1994). Consequently, the State of Florida has designated the entire Escambia and Santa Rosa counties coastal plain as a critical area of state concern. Gulf sturgeon are historically known to prefer larger, deeper channels, but were recently observed in the Blackwater River. Gulf sturgeon may migrate past the site to upstream spawning habitats (Peruga personal communication 1994).

The Blackwater River provides an extensive sport fishery for striped bass and various freshwater fishes. Angling efforts in Big Coldwater Creek, however, are not directed toward NOAA trust resources. Fish species of commercial and recreational significance in Blackwater Bay include red drum, southern flounder, and spotted seatrout (Bass personal communication 1992). Red drum and spotted seatrout are the most popular sport fisheries in the area, and are known to migrate upstream to the lower reaches of the Blackwater River as juveniles (Stith personal communication 1994). There are no restrictions on fisheries other than general regulations on take, season, and minimum size (Bass personal communication 1994).

All shellfisheries in Blackwater Bay are closed due to fecal coliform believed to originate in urban areas at the northern end of Blackwater Bay. There are no other health advisories or restrictions.

The Florida Game and Fresh Water Fish Commission runs the Blackwater River State Hatchery, about 15 km upstream from the site. This hatchery specializes in producing striped bass, stocked as juveniles in the Blackwater River over the past eight years to help restore the striped bass fishery (Bass personal communication 1992). It is unknown whether striped bass were historically present in the Blackwater River, although there are native populations in the Yellow River to the southeast. Since 1987, approximately 220,000 juvenile striped bass have been released in the Blackwater River. These efforts have been more successful recently, although spawning has yet to be observed because stocked fish are just reaching reproductive maturity (Yeager personal communication 1994). In the future, striped

Table 2. NOAA trust resources that use Blackwater Bay.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
ANADROMOUS/CATADROMOUS SPECIES						
Gulf sturgeon[1]	*Acipenser oxyrinchus desotoi*		♦	♦		
American eel	*Anguilla rostrata*		♦	♦		
Striped bass	*Morone saxatilis*		♦	♦		♦
MARINE/ESTUARINE FISH						
Skipjack herring	*Alosa Chrysochloris*	♦	♦	♦		
Bay anchovy	*Anchoa mitchilli*	♦	♦	♦	♦	
Hardhead catfish	*Arius felis*	♦	♦	♦		
Gaftopsail catfish	*Bagre marinus*	♦	♦	♦		
Gulf menhaden	*Brevoortia patronus*		♦	♦		
Crevalle jack	*Caranx hippos*		♦	♦	♦	♦
Bull shark	*Carcharhinus leucas*		♦	♦		
Sand sea trout	*Cynoscion arenarius*	♦	♦	♦	♦	♦
Spotted sea trout	*Cynoscion nebulosus*	♦	♦	♦	♦	♦
Gizzard shad	*Dorosoma cepedianum*	♦	♦	♦		
Threadfin shad	*Dorosoma petenense*	♦	♦	♦		
Killifishes	*Fundulus spp.*	♦	♦	♦		
Saltmarsh topminnow	*Fundulus jenkinsi*	♦	♦	♦		
Pinfish	*Lagodon rhomboides*		♦		♦	♦
Spot	*Leiostomus xanthurus*		♦	♦	♦	♦
Inland silverside	*Menidia beryllina*	♦	♦	♦		
Atlantic croaker	*Micropogonias undulatus*		♦	♦	♦	♦
Striped mullet	*Mugil cephalus*		♦	♦	♦	
Southern flounder	*Paralichthys lethostigma*		♦	♦	♦	♦
Red drum	*Sciaenops ocellatus*		♦	♦	♦	♦
Atlantic needlefish	*Strongylura marina*	♦	♦	♦		
Florida pompano	*Trachinotus carolinus*		♦	♦	♦	♦
Hogchoker	*Trinectes maculatus*		♦	♦		
INVERTEBRATE SPECIES						
Blue crab	*Callinectes sapidus*		♦	♦	♦	♦
American oyster	*Crassostrea virginica*	♦	♦	♦	♦	♦
Brown shrimp	*Penaeus aztecus*		♦	♦	♦	♦
Pink shrimp	*Penaeus duorarum*		♦	♦	♦	♦
White shrimp	*Penaeus setiferus*		♦	♦	♦	♦
Common rangia	*Rangia cuneata*	♦	♦	♦	♦	♦

1: Federally threatened species.

bass may use habitat in Big Coldwater Creek for spawning and adult foraging because of these stocking efforts (Bass personal communication 1995).

Site-Related Contamination

Trace elements, PCBs, and PAHs are the primary contaminants of concern to NOAA at the site. Table 3 summarizes the contamination found in soils during Phases I and IIA of the remedial investigation at NAS Whiting Field (ABB 1992d, 1994).

Groundwater sampling was conducted as part of the Phase I RI (ABB 1992e). This study consisted of field screening of samples for metals and VOCs, so these data can only be used as a qualitative screening assessment of groundwater contamination at the site. Elevated concentrations of VOCs were detected in groundwater at various locations, but did not exceed the LOEL for those compounds by more than ten times. Lead concentrations exceeded the freshwater chronic AWQC of 3.2 µg/l by more than ten times at Site 7, the South AVGAS Tank Sludge Disposal Area (860 µg/l), and at Site 5, the Battery Acid Seepage Pit (37 µg/l).

Table 3. Extent of contamination in soils at source areas of concern to NOAA at NAS Whiting Field[1].

Source Areas	Extent of Contamination in Soils	Proximity to Surface Water Body
Site 11 Southeast Open Disposal Area	Total PAHs were detected at 14 mg/kg (no screening guidelines for PAHs): lead was detected at 2,200 mg/kg (over 200 times greater than the screening guideline).	This site is next to a drainage ditch that flows into a tributary to Big Coldwater Creek.
Sites 1, 12, 13, and 16 Various Landfills and Disposal Areas	Concentrations of trace elements at these sites were slightly greater than screening guidelines.	These sites are next to drainage ditches that flow into tributaries of either Big Coldwater Creek or Clear Creek.
Sites 17 and 18 Crash Crew Training Areas	Total PAHs at Site 18 were 43 mg/kg; copper was detected at 860 mg/kg (29 times greater than screening guideline).	These sites are more than 500 m from a drainage ditch that flows into a tributary to Clear Creek.
Sites 31 and 32 Sludge Disposal and Maintenance Hangar	At Site 31, PCBs were detected at 1.5 mg/kg; concentrations of cadmium, lead, mercury, and silver were over 150 times greater than their screening guidelines. At Site 32, PAHs were detected at 69 mg/kg.	All sites are at least 300 m from drainage ditches leading to tributaries of Clear Creek or Big Coldwater Creek.
Sites 5 and 6 Battery Acid and Transformer Oil Disposal Areas	Concentrations of trace elements at these sites were slightly greater than screening guidelines, except for copper, detected at Site 6 at 10,900 mg/kg (over 350 times greater than screening guideline). PCBs in soil from Site 6 were detected at 0.6 mg/kg.	Both sites are about 1 km from the tributary to Big Coldwater Creek.
Sites 3, 4, 7, 8 and 9 Fuel-related Areas	Concentrations of trace elements at these sites were slightly greater than screening guidelines.	Located no closer than 300 m from drainage ditches leading to tributaries of Clear Creek or Big Coldwater Creek.
Sites 2, 10, 14, and 15 Various Landfills and Disposal Areas	Concentrations of trace elements at these sites were slightly greater than screening guidelines. At Site 2, PCBs were detected at 0.32 mg/kg.	Located no closer than 300 m from drainage ditches leading to tributaries of Clear Creek or Big Coldwater Creek.
Sites 29, 30, and 33 Auto Body Shop and Maintenance Hangars	Concentrations of trace elements at these sites were slightly greater than screening guidelines.	Located no closer than 500 m from tributaries to Clear Creek or Big Coldwater Creek.

1: Based on data presented in Phase I and Phase IIA reports (ABB 1992d, ABB 1994).

During Phase I, sediment samples were collected from two drainage ditches: one in the southwest part of the NAS near Sites 15 and 16, and one in the southeast part of the NAS near Sites 11, 12, 13, and 14. Neither trace elements nor organic compounds were detected at concentrations above their screening guidelines (ABB 1992d).

Surface water and sediment samples were collected from Clear Creek and Big Coldwater Creek during the Phase I RI. Concentrations of contaminants did not exceed screening guidelines for surface water or sediment at any of the sampling stations, except for one station in the Clear Creek floodplain near Site 16 (ABB 1992b). Here, concentrations of copper and lead were marginally elevated in sediment (38 mg/kg and 330 mg/kg, respectively). Based on these results, additional surface water and sediment samples were collected from Clear Creek in July and August 1992 as part of the Phase IIA RI (ABB 1993a) and in March 1993 during a separate investigation of the Clear Creek Floodplain (ABB 1993b). Table 4 summarizes the maximum concentrations of contaminants detected during these two studies. In general, the most contaminated sediments were collected from a bog downgradient from a concrete drainage ditch leading from Site 16 to an unnamed tributary of Clear Creek.

Table 4. Maximum concentrations of contaminants detected in surface water and sediment collected from Clear Creek and adjacent floodplain near Site 16 at NAS Whiting Field (ABB 1992b, ABB 1994).

	Surface Water (µg/l)		Sediment (mg/kg)	
Contaminant	Clear Creek near Site 16	Freshwater Chronic AWQC[1]	Clear Creek near Site 16	ERL[2]
Trace Elements				
Arsenic	1.2	190	73	8.2
Cadmium	4	1.1+	20	1.2
Chromium	12	11	120	81
Copper	19	12+	440	34
Lead	9.3	3.2+	980	47
Mercury	0.17	0.012	6.5	0.15
Nickel	43	160+	12	21
Silver	2.9	0.12	110	1.0
Zinc	27	110+	1,300	150
Organic Compounds				
Total PAHs	ND	300*	3.0	4.02
PCBs	ND	0.014	0.45	0.023

1: EPA (1993)
2: Long and MacDonald (1992)
+: Hardness-dependent criterion; 100 mg/l $CaCO_3$ used
ND: Not detected; detection limits not available.
*: Lowest Observable Effect Level.

Summary

Sediment and surface water data at NAS Whiting Field indicate that trace elements, PAHs, and PCBs may have been transported from Site 16 to sediment in wetlands associated with Clear Creek at concentrations that pose a threat to aquatic organisms. American eel are the only NOAA trust species likely to be found near the contaminated sediments. Although striped mullet, hogchoker, and striped bass may use downgradient reaches of Big Coldwater Creek, data indicate that contaminants have not yet migrated this far from the source.

References

ABB Environmental Services, Inc. 1992a. Remedial Investigation and Feasibility Study, Technical Memorandum No. 6, Phase I Data Summary and Phase IIA Work Plan, Naval Air Station Whiting Field, Milton, Florida. North Charleston, South Carolina: U.S. Navy, Southern Division, Naval Facilities Engineering Command.

ABB Environmental Services, Inc. 1992b. Remedial Investigation and Feasibility Study, Technical Memorandum No. 4, Surface Water and Sediments, Naval Air Station Whiting Field, Milton, Florida. North Charleston, South Carolina: U.S. Navy, Southern Division, Naval Facilities Engineering Command.

ABB Environmental Services, Inc. 1992c. Remedial Investigation and Feasibility Study, Technical Memorandum No. 2, Hydrogeologic Assessment, Naval Air Station Whiting Field, Milton, Florida. North Charleston, South Carolina: U.S. Navy, Naval Facilities Engineering Command.

ABB Environmental Services, Inc. 1992d. Remedial Investigation and Feasibility Study, Technical Memorandum No. 3, Soils Assessment, Naval Air Station Whiting Field, Milton, Florida. North Charleston, South Carolina: U.S. Navy, Southern Division, Naval Facilities Engineering Command.

ABB Environmental Services, Inc. 1992e. Remedial Investigation and Feasibility Study, Technical Memorandum No. 5, Groundwater Assessment, Naval Air Station Whiting Field, Milton, Florida. North Charleston, South Carolina: U.S. Navy, Southern Division, Naval Facilities Engineering Command.

ABB Environmental Services, Inc. 1993a. Remedial Investigation and Feasibility Study, Phase IIA, Technical Memorandum No. 1, Surface Water and Sediment Assessment, Naval Air Station Whiting Field, Milton, Florida. North Charleston, South Carolina: U.S. Navy, Southern Division, Naval Facilities Engineering Command.

ABB Environmental Services, Inc. 1993b. Clear Creek Floodplain Investigation Report, Naval Air Station Whiting Field, Milton, Florida. North Charleston, South Carolina: U.S. Navy, Southern Division, Naval Facilities Engineering Command.

ABB Environmental Services, Inc. 1994. Draft Remedial Investigation and Feasibility Study, Phase IIA, Technical Memorandum No. 3, Soils Assessment, Naval Air Station Whiting Field, Milton, Florida. North Charleston, South Carolina: U.S. Navy, Southern Division, Naval Facilities Engineering Command.

Bass, G., Fisheries Biologist, Blackwater River State Hatchery, Florida Game and Fresh Water Fish Commission, Florida, personal communications, June 18, 1992, December 16, 1994, and July 24, 1995.

Florida Game and Fresh Water Fish Commission. 1983. Completion report for investigations project as required by Federal Aid in Fish Restoration. Study III. Rivers of Florida and their fishes. Dingell-Johnson Project F-36. Tallahassee: North Florida Streams Research Projects. 397 pp.

Long, E.R., and D.D. MacDonald. 1992. National Status and Trends Program approach. In: *Sediment Classification Methods Compendium.* EPA 823-R-92-006. Washington, D.C.: Office of Water, U.S. Environmental Protection Agency.

National Oceanic and Atmospheric Administration. 1990. *Distribution and Abundance of Fishes and Invertebrates in Eastern Gulf of Mexico Estuaries.* Rockville, Maryland: Strategic Assessment Branch, Office of Ocean Resources Conservation and Assessment.

Peruga, F., Fisheries Biologist, U.S. Fish and Wildlife Service, Panama City, Florida, personal communications, June 18, 1992 and December 19, 1994.

Stith, L., Fisheries Biologist, U.S. Fish and Wildlife Service, Panama City, Florida, personal communications, June 18, 1992 and December 16, 1994.

U.S. Environmental Protection Agency (EPA). 1993. *Water quality criteria.* Washington, D.C.: U.S. Environmental Protection Agency, Office of Water, Health and Ecological Criteria Division. 294 pp.

Yeager, D., Fisheries Biologist, Blackwater River State Hatchery, Florida Game and Fish Commission, Milton, Florida, personal communication, December 16, 1994.

10

Old Navy Dump

Kitsap County, Washington
CERCLIS #WA8680030931

Site Exposure Potential

The Old Navy Dump site lies along the western shore of Clam Bay, an embayment off the west side of Rich Passage, in Kitsap County, Washington (Figure 1). The U.S. Environmental Protection Agency and NOAA National Marine Fisheries Service (NMFS) operate laboratories on the site. The site is approximately 2.1 km north of Manchester, Washington.

Potential sources of hazardous waste releases at the site, all of which are associated with historic naval operations, include an inactive landfill, an inactive burn pit, a former paint and sandblasting shop, a former fire fighting school, and a former submarine net depot (Figure 2). The submarine net depot operated from 1945 to approximately 1963. A tidal lagoon was landfilled from about 1946 to 1958 with wastes generated on-site and at nearby Puget Sound naval Station in Bremerton, Washington (Hart Crowser 1995) The edge of the landfill is visible along the shoreline within the intertidal zone. The landfilled wastes are reported to include scrap metal from submarine net construction, paper and wood waste, paint cans, and, possibly, dispensary waste products. Wastes from the on-site dispensary and waste paper products were reportedly burned in the burn pit near the edge of Clam Bay. A paint and sandblasting shop associated with the naval depot

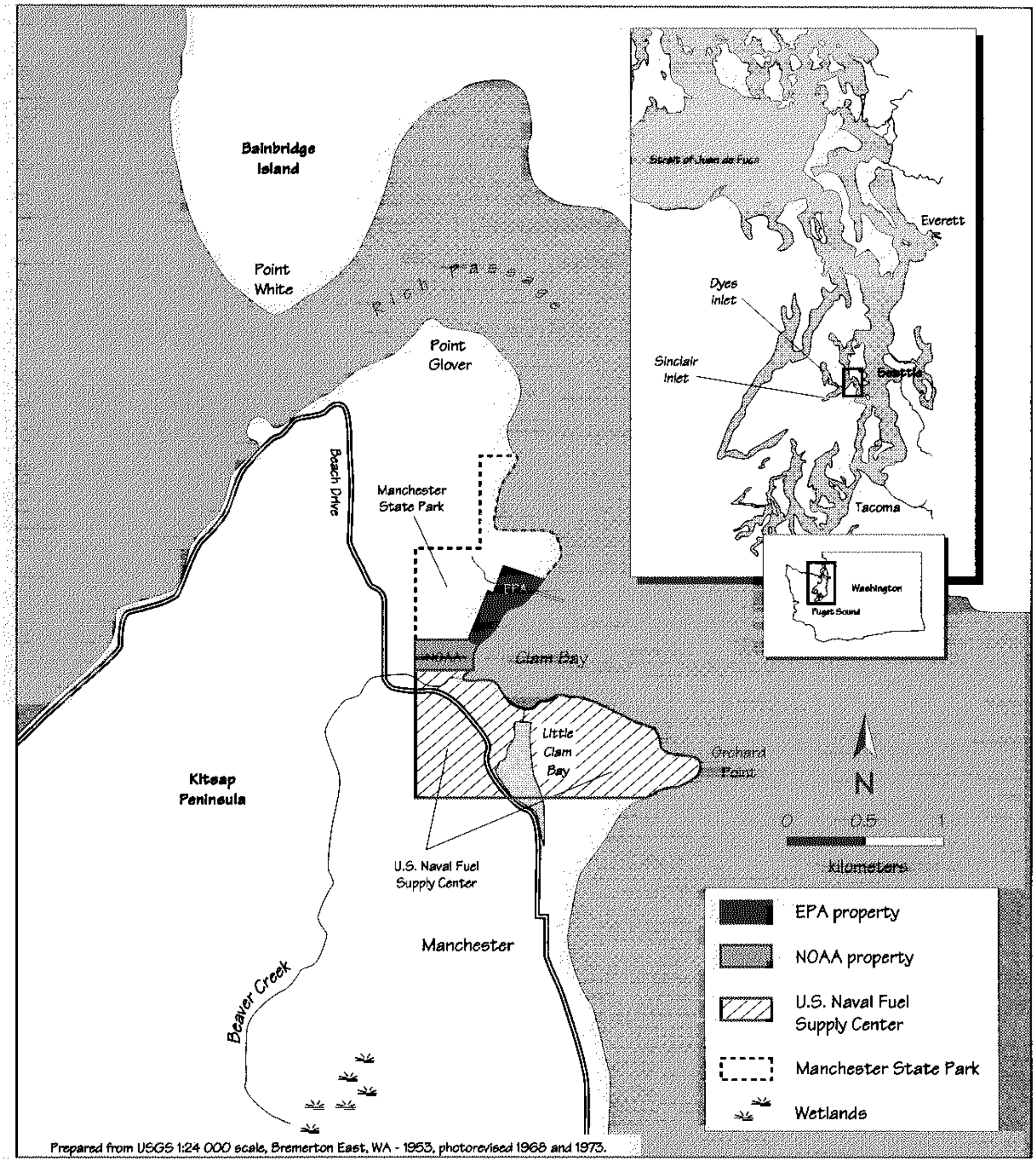

Figure 1. Location of the Old Navy Dump site in Manchester, Washington.

was removed sometime between 1957 and 1973 (Hart Crowser 1994). From World War II until the late 1950s, the fire fighting school was used by the U.S. Navy for training and practice in extinguishing shipboard fires. The school may possibly have been used briefly in 1970.

Potential contaminant transport pathways to Clam Bay are erosion from the landfill into the

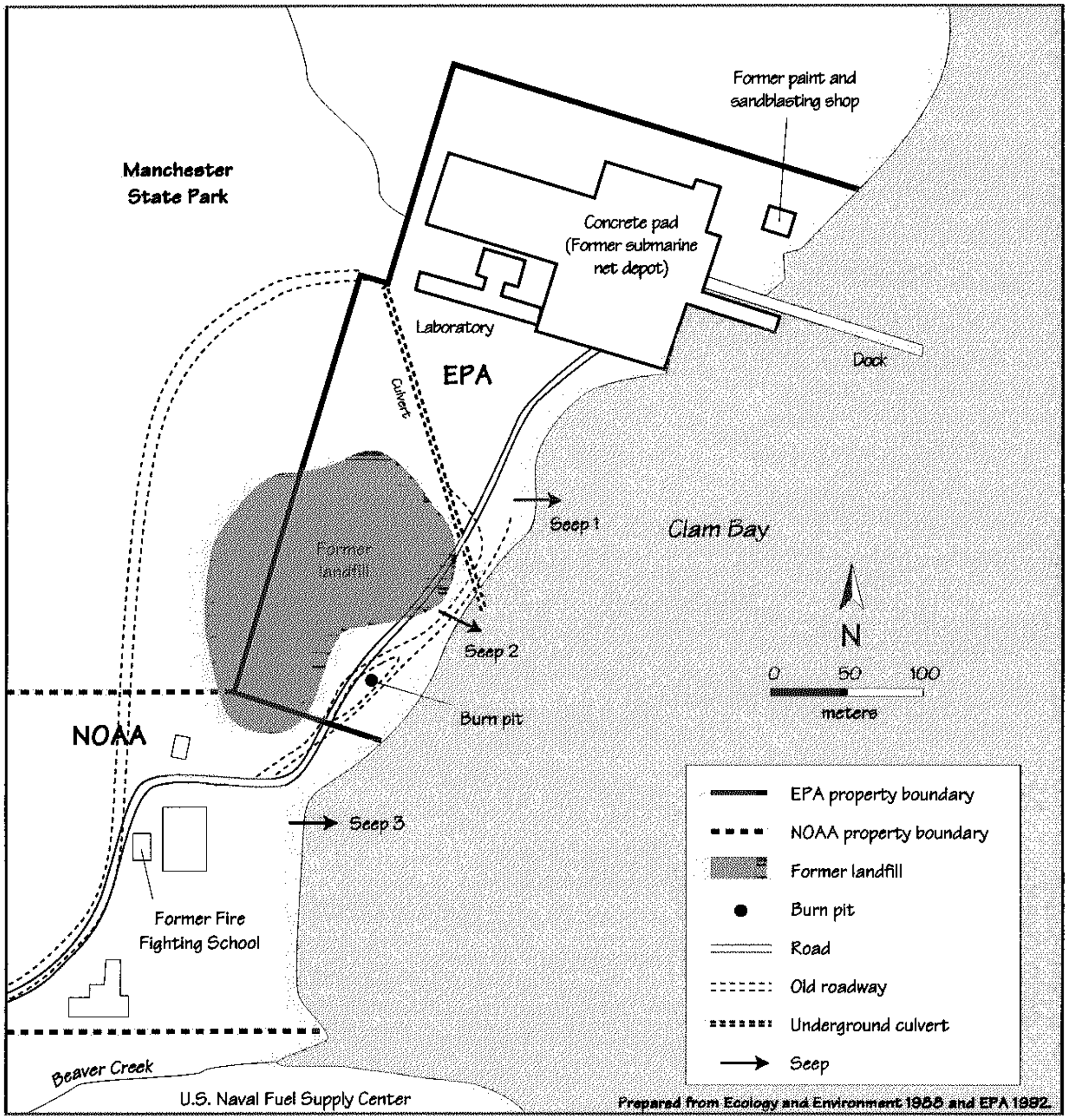

Figure 2. Detail of the Old Navy Dump site in Manchester, Washington.

intertidal area, groundwater discharge, and surface water runoff. The site is underlain by glacial till to depths ranging from 3 to 20 m, and by fill material. Groundwater has been encountered at depths ranging from 0.6 to 3.0 m bgs. Groundwater flows across the site, east-southeast toward Clam Bay (Hart Crowser 1994). Several groundwater seeps are located in the intertidal area east of the former landfill and fire training facility (EVS 1994). Surface runoff and an unnamed stream are diverted around the landfill into a culvert that discharges into Clam Bay. The culvert carries runoff from the hillside west of the laboratory and flows underneath the laboratory before it discharges into Clam Bay. Two surface-water drains also enter the culvert southwest of the laboratory (Hart Crowser 1994).

NOAA Trust Habitats and Species

Habitats of concern to NOAA are the surface waters and associated bottom substrates of Clam Bay, Rich Passage, and west central portions of Puget Sound. These waters are vital to marine fish and shellfish resources because they provide mixing and transition zones from the cool, dense, saline, ocean waters of Puget Sound to the warmer, less saline water layers of the shallow shelves, bays, and channels of the Kitsap Peninsula (Williams et al. 1975). An extensive shoreline with associated intertidal and subtidal zones abuts the site.

Aquatic habitats of Clam Bay are valuable nursery and adult forage areas for a large number of trust resources. Moreover, numerous aquatic species use the area to spawn. Table 1 lists aquatic species, habitat usage, and the existing commercial and recreational fisheries near the Old Navy Dump. Anadromous fish of particular interest to NOAA because of their commercial and recreational importance in the area include chinook, chum, and coho salmon, and steelhead and cutthroat trout. Marine invertebrate populations within the study area are relatively abundant and typically representative of species found in Puget Sound. Broad intertidal flats and bars provide excellent spawning and nursery substrate for mollusks. In general, these species congregate near intertidal and subtidal flats, especially where eelgrass beds are available (Zichke personal communication 1994).

A number of marine mammals that are federally listed as threatened and endangered, and of special concern to Washington state, are common visitors to surface waters near the site. The state-monitored harbor seal (*Phoca vitulina*) is the most common marine mammal observed in the area. California sea lions (*Zalophus californianus*), another state-monitored species, seasonally migrate into the area from November through late spring. The Steller sea lion (*Eumetopias jubatus*), a federally threatened species, is also an occasional visitor to central Puget Sound waters during the fall, winter, and spring. Both species of sea lion use the surface waters of the Sound to feed on migrating salmon and steelhead trout. Dall's porpoise (*Phocoenoides dalli*) and orca whales (*Orcinus orca*), both state-monitored species, also use central Puget Sound year-round. Gray whales (*Eschrichtius robustus*), a species only recently removed from the Federal endangered species list (and now state-monitored), periodically migrate into Sinclair and Dyes inlets to feed on ghost

Table 1. NOAA trust resources that use west-central Puget Sound around the Old Navy Dump site, Manchester, Washington.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nurs. Ground	Adult Forage	Comm. Fishery	Recr. Fishery
ANADROMOUS FISH						
Cutthroat trout	*Oncorhynchus clarki clarki*		♦	♦		♦
Pink salmon	*Oncorhynchus gorbuscha*		♦	♦	♦	♦
Chum salmon	*Oncorhynchus keta*		♦	♦	♦	♦
Coho salmon	*Oncorhynchus kisutch*		♦	♦	♦	♦
Steelhead trout	*Oncorhynchus mykiss*		♦	♦		♦
Chinook salmon	*Oncorhynchus tshawytscha*		♦	♦	♦	♦
MARINE FISH						
Pacific sand lance	*Ammodytes hexapterus*		♦	♦		
Sablefish	*Anoplopoma fimbria*			♦		♦
Speckled sanddab	*Citharichthys stigmaeus*		♦	♦		
Arrow goby	*Clevelandia ios*	♦	♦	♦		
Pacific herring	*Clupea harengus pallasi*	♦	♦	♦	♦	♦
Sculpin	*Cottus spp.*	♦	♦	♦		
Shiner perch	*Cymatogaster aggregata*		♦	♦	♦	♦
Striped sea perch	*Embiotoca lateralis*		♦	♦	♦	♦
Northern anchovy	*Engraulis mordax*		♦	♦		
Buffalo sculpin	*Enophrys bison*		♦	♦		
Pacific cod	*Gadus macrocephalus*		♦		♦	♦
Threespine stickleback	*Gasterosteus aculeatus*	♦	♦	♦		
Rex sole	*Glyptocephalus zachirus*		♦	♦		♦
Flathead sole	*Hippoglossoides elassodon*		♦	♦		
Kelp greenling	*Hexagrammus decagrammus*		♦	♦	♦	
Ratfish	*Hydrolagus colliei*		♦	♦		
Surf smelt	*Hypomesus pretiosus*		♦	♦	♦	♦
Rock sole	*Lepidopsetta bilineata*	♦	♦	♦		♦
Pacific staghorn sculpin	*Leptocottus armatus*		♦	♦		
Pacific hake	*Merluccius productus*		♦	♦		♦
Pacific tomcod	*Microgadus proximus*		♦	♦		
Dover sole	*Microstomus pacificus*	♦	♦	♦		♦
Ling cod	*Ophidon elongatus*		♦	♦		♦
English sole	*Parophyrs vetulus*		♦	♦		♦
Starry flounder	*Platichthys stellatus*	♦	♦	♦		♦
C-O sole	*Pleuronichthys coenosus*		♦	♦		♦
Sand sole	*Psettichthys melanostictus*		♦	♦		♦
Cabezon	*Scorpaenichthys marmoratus*		♦	♦		
Rockfish	*Sebastes spp.*		♦	♦		♦
Pile perch	*Rhacochilus vacca*		♦	♦	♦	♦
Walleye pollock	*Theragra chalcogramma*		♦	♦		

Table 1, cont.

Common Name	Scientific Name	Spawning Ground	Nurs. Ground	Adult Forage	Comm. Fishery	Recr. Fishery
INVERTEBRATE SPECIES						
Dungeness crab	*Cancer magister*		♦	♦		♦
Red crab	*Cancer productus*		♦	♦		
Pacific oyster	*Crassostrea gigas*	♦	♦	♦		
Pacific coast squid	*Loligo opalescens*		♦	♦		
Bent-nosed clam	*Macoma nasuta*	♦	♦	♦		♦
Soft-shell clam	*Mya arenaria*	♦	♦	♦		
Shrimp	*Pandalus spp.*		♦	♦		
Geoduck clam	*Panope generosa*	♦	♦	♦		
Sea cucumber	*Parastichopus californicus*	♦	♦	♦	♦	♦
Native littleneck clam	*Protothaca staminea*	♦	♦	♦	♦	♦
Kelp crab	*Pugettia productus*	♦	♦	♦		
Butter clam	*Saxidomus giganteus*	♦	♦	♦		♦
Horse gaper clams	*Tresus spp.*	♦	♦	♦		
Manila clam	*Venerupis japonica*	♦	♦	♦	♦	♦

shrimp during the spring and early summer (Calambokidas personal communication 1994).

There are moderate commercial and recreational fisheries near the site. In areas of Rich Passage, there is usually moderate sport fishing for salmon in September and October. The nearshore waters in the area support a demersal sport fishery that targets Pacific cod, starry flounder, and several species of sole. There is infrequent sport crabbing for Dungeness crab offshore in Port Orchard and Rich Passage. In addition, there are Atlantic salmon net pen operations both at the end of the dock on the EPA property and offshore in Rich Passage (Zichke personal communication 1994). The intertidal area next to the landfill is closed to commercial and recreational shellfish harvesting because of potential contamination from the landfill (Kievit 1995).

Beaver Creek, a moderate-gradient freshwater stream, discharges into Clam Bay immediately south of the site, next to and south of the NOAA/NMFS property. Beaver Creek is 4 km long and shallow, with sand/gravel substrates and riffle/pool profiles. The laboratory uses the creek's small run of coho salmon for research (Mahnken personal communication 1994).

Site-Related Contamination

Data collected during the site investigations indicate that soils, groundwater, surface water, and sediment at the Old Navy Dump site contain elevated concentrations of site-related contaminants (Tables 2 and 3; Ecology and Environment 1988; EPA 1992). Some of these contaminants were also detected in tissue samples of clams (native littleneck clam, *Protothaca staminea*; bentnose clam, *Macoma nasuta*; and *Macoma irus*) from Clam Bay. Trace elements and PCBs are the primary contaminants of concern to NOAA at the Old Navy Dump site.

Soils in the inactive landfill are heavily contaminated with arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc (Table 3). Concentrations of all of these trace elements exceeded their respective average concentrations found in the earth's crust, by up to five orders of magnitude. PCBs were also detected in soils collected from the landfill, although screening guidelines are not available for these compounds in soils (EPA 1992).

Marine sediments sampled next to the landfill were heavily contaminated with trace elements and PCBs. These samples were collected from along the mean high-water line and lower intertidal area. Lower levels of contamination were found in sediments from on-site streams and wetlands (Table 3). Trace elements have also been detected in samples collected from groundwater seeps along the shoreline, and in surface water near the landfill and burn pit (Table 2; EPA 1992).

Concentrations of contaminants in clam tissue from the site often exceeded concentrations in clam tissue from the reference station, but not substantially. However, highly variable contaminant concentrations were found in tissue samples

Table 2. Maximum concentrations of contaminants in groundwater, surface water, and seepage water at the Old Navy Dump site.

	Groundwater (µg/l)	Marine Surface Water (µg/l)	Seep Water (µg/l)	AWQC[1] (µg/l)
TRACE ELEMENTS				
Cadmium	17	<20	<20	9.3
Copper	33	350	320	2.9[2]
Mercury	<0.1	<0.1	0.13	0.025
Nickel	11	<100	<100	8.3
Zinc	38	250	150	86
PCBs				
Aroclor 1260	<0.072	<0.072	0.11	0.03

1 Chronic ambient water quality criteria for the protection of marine organisms (EPA 1993).
2 Chronic value not available; acute value presented.

Table 3. Maximum concentrations of contaminants in soil and sediment at the Old Navy Dump site.

	Soil (mg/kg)		Sediment (mg/kg)		
	Landfill	Average[2]	Marine Sediment	Stream Sediment	ERL[3]
TRACE ELEMENTS					
Arsenic	52	5.2	57	2.6	8.2
Cadmium	23,000	0.06	8.3	0.2	1.2
Chromium	690	37	140	19	81
Copper	23,000	17	19,000	52	34
Lead	56,000	16	2,700	26	46.7
Mercury	1.7	0.06	0.49	0.04	0.15
Nickel	930	13	490	16	21
Zinc	24,000	48	3,100	51	150
PCBs					
Aroclor 1260	5.5	NA	5.5	0.48	0.0227[4]
DIOXINS/FURANS (µg/kg)					
Total Dioxins/Furans	8.3	NA	NT	NT	NA
Total 2, 3, 7, 8-TCDD Toxicity Equivalent Concentration (TEC)[1]	0.026	NA	NT	NT	NA

1 Total includes undetected concentrations at one-half the sample detection limit.
2 EPA (1983)
3 Effects range-low; the concentration representing the lowest 10-percentile value for the data in which effects were observed or predicted in studies compiled by Long and MacDonald (1992).
4 Screening guidelines are for total PCBs.
NA Screening guideline was not available.
NT Not tested.

collected from the same reference station. Concentrations of PCBs were detected at a substantially higher concentration in tissue (maximum of 4,000 µg/kg) collected close to the site versus the reference location (maximum of 71 µg/kg; Hart Crowser 1995).

Summary

Available studies indicate that former U.S. Navy activities at the site have contaminated soil, sediment, groundwater, and surface water at the Old Navy Dump site. The areas of greatest concern are the landfill area, the former fire fighting school, and the former submarine net depot. Contaminants have been detected in tissues of clam species from intertidal habitats next to the site. Nearby areas of Puget Sound provide important spawning, nursery, and adult forage habitat for numerous trust species. In addition, the threatened Steller sea lion uses habitat close to the site, as do four species of marine mammals monitored by the State of Washington.

References

Ecology and Environment. 1988. Site inspection report for U.S. EPA Manchester Laboratory, Manchester, Washington. Seattle: U.S. Environmental Protection Agency, Region 10.

Calambokidas, J., Research Biologist, Cascadia Research Collective, Olympia, Washington, personal communication, December 16, 1994.

EVS Consultants. 1994. Site visit to the EPA Manchester Laboratory. Seattle: National Oceanic and Atmospheric Administration, Hazardous Materials Response and Assessment Division.

Hart Crowser. 1994. Manchester Annex RI/FS Preliminary Scoping, Old Navy Landfill and Fire Training Areas, Manchester, WA. Seattle: U.S. Army Corps of Engineers.

Hart Crowser. 1995. Draft Addendum Scoping Report, Manchester Annex Site. Seattle: U.S. Army Corps of Engineers.

Kievit, R.E. , U.S. Environmental Protection Agency, Lacey, Washington, memorandum of April 17, 1995 regarding Preliminary Natural Resource Survey comments, 3 pp.

Mahnken, C., Fisheries Biologist, National Marine Fisheries Service, Manchester, Washington, personal communication, December 16, 1994.

U.S. Environmental Protection Agency (EPA). 1983. *Hazardous waste land treatment.* EPA/530/SW-83/874. Cincinnati: Municipal Environmental Research Laboratory. 702 pp.

U.S. Environmental Protection Agency (EPA). 1992. Site investigation of an Old U.S. Navy Dump Site near Manchester, Washington. Seattle: Region 10, Environmental Services Division.

U.S. Environmental Protection Agency (EPA). 1993. *Water quality criteria.* Washington, D.C.: U.S. Environmental Protection Agency, Office of Water, Health and Ecological Criteria Division. 294 pp.

Williams, R.W., R. Laramie, and J. Ames. 1975. *A catalog of Washington streams and salmon utilization.* Volume I. Puget Sound. Olympia: Washington Department of Fisheries.

Zichke, J., fax transmission of December 16, 1994 regarding NOAA trust resource use and existing fisheries of Dyes Inlet, Fisheries Harvest Manager, Suquamish Tribe, Suquamish, Washington.