
Reasor Chemical Company

Castle Hayne, North Carolina

USEPA Facility ID: NCD986187094

Basin: Northeast Cape Fear

HUC: 03030007

Executive Summary

The Reasor Chemical Company site is an inactive outdoor stump rendering facility located in Castle Hayne, North Carolina just north of Prince George Creek. Stump rendering activities at the site included the extraction and distillation of pine tar from stumps using unknown solvents. PAHs, inorganic compounds, pesticides and dioxins have been documented at the site at concentrations exceeding screening guidelines. Several NOAA trust species utilize Prince George Creek as spawning or nursery habitat.

Site Background

The Reasor Chemical Company (Reasor Chemical) site is located in Castle Hayne, North Carolina on 10 hectares (25 acres) of land approximately 122 m (400 ft) north of Prince George Creek. Prince George Creek is a small creek that flows into the Northeast Cape Fear River approximately 8.9 km (5.5 mi) downstream of the site (Figure 1). The Northeast Cape Fear River joins the Cape Fear River approximately 22 km (14 mi) downstream of its confluence with Prince George Creek. The Cape Fear River then flows roughly 38 km (24 mi) into the Atlantic Ocean.

Outdoor stump rendering operations took place at the Reasor Chemical site from 1959 to 1972. In 1972 there was a fire and an explosion that destroyed all remaining site buildings and some material related to the stump rendering operations. Evidence of Reasor Chemical activities remaining after the fire include cement pads where buildings once were, five surface impoundments (ponds), a scrap copper refinery, two railroad sidings, a surface drum disposal area, a sluice area, and several drainage ditches (Figure 2). The rest of the site property is currently vacant and overgrown with brush and secondary growth forest (Weston 1999).

Stump rendering at the Reasor Chemical site involved the use of unknown solvents to extract pine tar from chipped stumps. After the extraction process was complete, raw pine tar was distilled and temporarily stored in the south tank cradle. Distilled product was then transferred to the north tank cradle before distribution via railway. The remaining wood chips were disposed of in the sluice area (Weston 1999) (Figure 2). Although little information was available regarding hazardous substances used at the Reasor Chemical site, typical hazardous wastes associated with stump rendering operations include spent solvents, SVOCs, dioxins, and metals (USEPA 2001a). Five surface impoundments (ponds) located on the site property were used for waste and cooling water storage. These impoundments had spillways connected to drainage ditches that flow toward Prince George Creek. Transformers containing PCBs were observed on the Reasor Chemical property (Weston 1999).

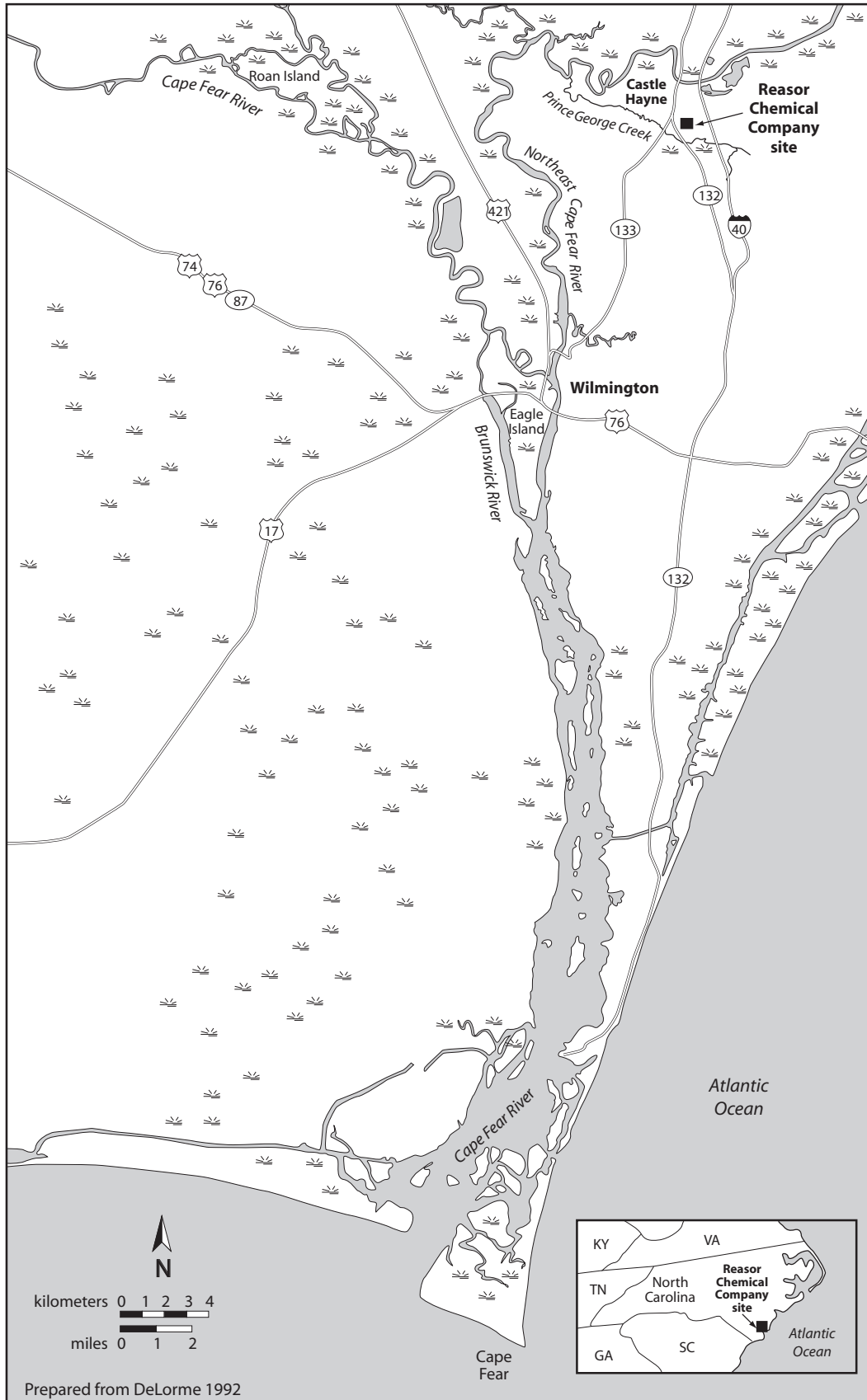


Figure 1. Location of Reasor Chemical Company site, Castle Hayne, North Carolina.

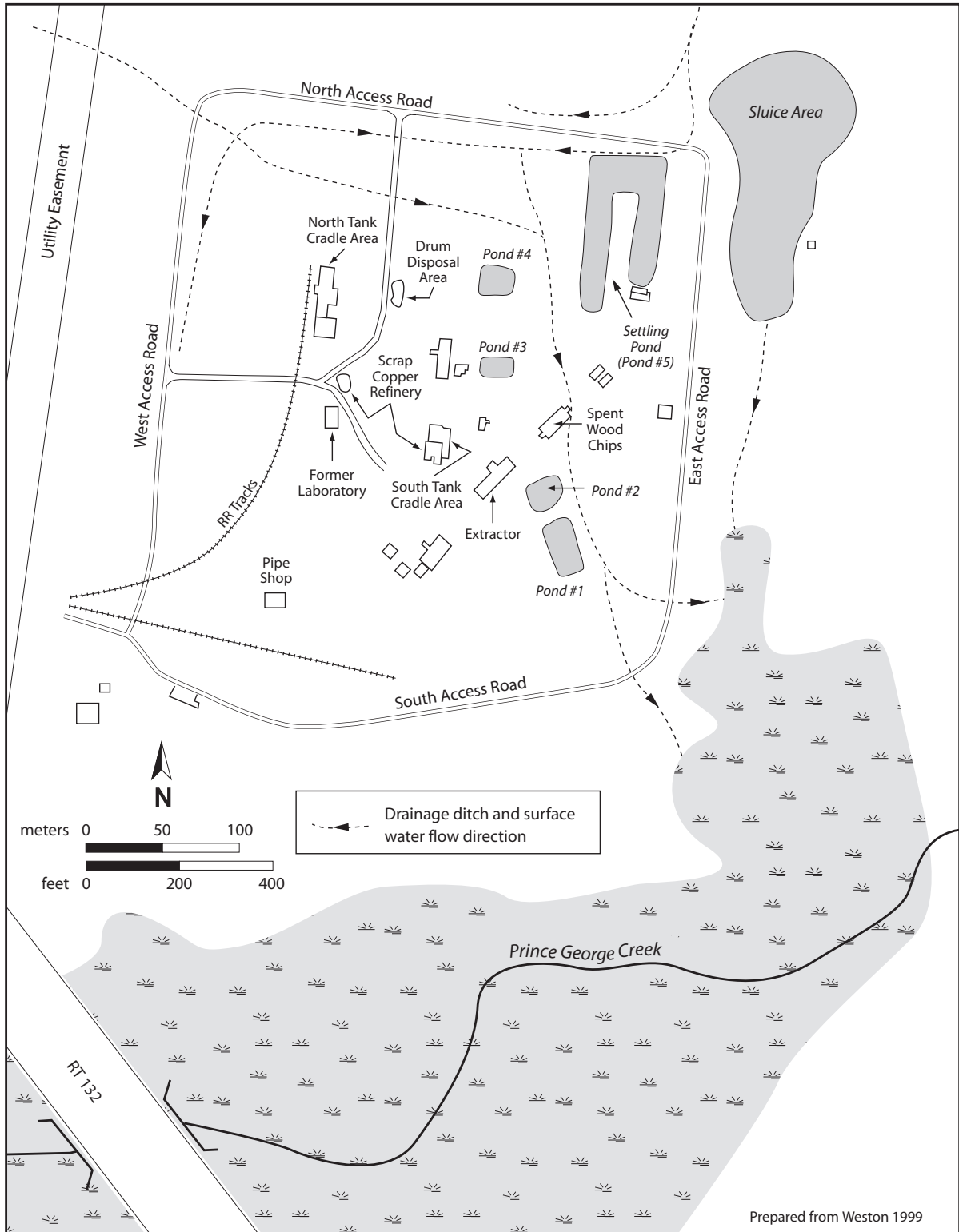


Figure 2. Detail of Reasor Chemical Company property.

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From 1997 to 1999 the United States Environmental Protection Agency (USEPA) conducted a remedial investigation/feasibility study (RI/FS) of the Reasor Chemical site. A screening-level ecological risk assessment was also completed in 1999 using data collected during the RI/FS. The Reasor Chemical site was proposed to the USEPA National Priorities Listing in September 2001 because toluene and dioxins were detected in wetlands adjacent to the site (USEPA 2001b).

Surface water runoff, groundwater, and sediment are the primary pathways for transport of contaminants from the site to NOAA trust resources. Surface runoff from the site drains via drainage ditches in a southeasterly direction toward Prince George Creek and the surrounding wetlands. In addition to surface runoff, the drainage ditches receive overflow from the surface impoundments (ponds) on the site property. Sediment present in the drainage ditches is transported towards NOAA resources with the surface water flow. Information on sediment composition at the site was not available for incorporation in this report. Groundwater flow beneath the site is southeast toward Prince George Creek. Groundwater in this area is encountered approximately 2 m (6.5 ft) below ground surface (Weston 1999).

NOAA Trust Resources

The Reasor Chemical site is located in the Cape Fear River basin approximately 200 m (700 ft) north of Prince George Creek. The NOAA trust habitat of concern is Prince George Creek, a small tributary of the Northeast Cape Fear River. Near the site, Prince George Creek is a westward-flowing freshwater creek. However, the creek experiences flow reversal and saltwater intrusion due to tidal influence, approximately 1.5 km (1 mi) downstream of the Reasor Chemical site (Weston 1999).

There are no dams present on the Cape Fear or Northeast Cape Fear Rivers to impede the migration of anadromous fish into Prince George Creek. Several anadromous fish are present in the segment of Prince George Creek near the Reasor Chemical site, including blueback herring, American shad, and striped bass (Table 1). Blueback herring spawn in Prince George Creek, while American shad and striped bass use the creek as nursery grounds. Atlantic and shortnose sturgeon are present in the Cape Fear and Northeast Cape Fear Rivers but do not ascend into smaller tributaries such as Prince George Creek. Shortnose sturgeon is listed as endangered by the state of North Carolina and the US Fish and Wildlife Service. The catadromous American eel is also present near the site (Rohde 2002).

A fish consumption advisory is in effect for eastern North Carolina which includes the location of the Reasor Chemical site. This advisory is due to elevated mercury concentrations in several fresh and saltwater fish species and restricts consumption of these fish. Shark, swordfish, tilefish, and king mackerel are several NOAA trust resources that are included in the advisory (North Carolina Department of Health and Human Services: Epidemiology 2002).

Commercial and recreational fishing of American shad and striped bass takes place in the Northeast Cape Fear River near the confluence of Prince George Creek. Information on fishing activities further upstream, in Prince George Creek, was not available at the time of this report (Rohde 2002).

Table 1. NOAA trust fish species present in the vicinity of the Reasor Chemical Company site (Rohde 2001).

Species		Habitat Use			Fisheries	
Common Name	Scientific Name	Spawning Area	Nursery Area	Adult Habitat	Comm.	Rec.
ANADROMOUS FISH						
American shad	<i>Alosa sapidissima</i>		◆		◆	◆
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>		◆			
Blueback herring	<i>Alosa aestivalis</i>	◆	◆			
Shortnose sturgeon	<i>Acipenser brevirostrum</i>		◆			
Striped bass	<i>Morone saxatilis</i>		◆		◆	◆
CATADROMOUS FISH						
American eel	<i>Anguilla rostrata</i>			◆		

Site-Related Contamination

Primary contaminants of concern detected at the site include metals and PAHs. However, pesticides and dioxins were also detected at lower concentrations throughout the site. Contamination was documented in soil, groundwater, surface water and sediment at the site during a remedial investigation/feasibility study (RI/FS) completed in 1999. During the RI/FS 131 soil samples, 29 groundwater samples, 15 surface water samples and 28 sediment samples were collected. All media sampled at the site were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, inorganics, and dioxins. Samples of environmental media were also analyzed for PCBs however, the results were not available for review at the time of this report. Maximum concentrations of contaminants were compared to screening guidelines (Table 2).

Surface Water

Metals, PAHs, and dioxins were detected in surface water samples collected from the Reasor Chemical site. Concentrations of copper, lead, silver, and zinc were detected in surface water collected from the drainage ditch in the southeast corner of the site property. Copper and silver were detected at concentrations that exceeded the ambient water quality criteria (AWQC) by at least one order of magnitude. The PAHs fluorene and phenanthrene were detected in Pond #3. Dioxins were detected in surface water samples at concentrations below the freshwater AWQC.

Groundwater

Metals, PAHs, and dioxins were detected in groundwater samples from several different monitoring wells located on the Reasor Chemical site property. Cadmium, copper, and lead were detected in a well just south of Pond #4, at concentrations at least one order of magnitude greater than the freshwater AWQC. Maximum concentrations of chromium and cadmium were detected in a monitoring well located at the southern end of the site property. The PAHs acenaphthene, fluoranthene, phenanthrene, and pyrene were detected in a groundwater well located in the southwest corner of the site property. The PAH naphthalene was detected at the greatest concentration but the concentration was below the freshwater AWQC. Dioxins were detected in 10 of the 19 samples analyzed. The maximum toxic equivalent value (TEQ) for dioxins was seven times the freshwater AWQC.

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Table 2. Maximum concentrations of contaminants of concern detected in environmental media at the Reasor Chemical Company site compared to screening guidelines (Weston 1999). Contaminant values in bold exceeded screening guidelines.

Contaminant	Soil (mg/kg)		Water (µg/l)			Sediment (mg/kg)		
	Soil	Mean U.S. Soil ^a	Ground-water	Surface Water	AWQC ^b	Pond Sediment	Prince George Creek Sediment	TEC ^c
Metals/Inorganics								
Arsenic	10	5.2	96	ND	150	3.1	ND	9.79
Cadmium	6.1	0.06	6	ND	0.25 ^d	0.94	ND	0.99
Chromium ^e	55	37	290	ND	11	21.1	28	43.4
Copper	5,900	17	240	110	9 ^d	660	ND	31.6
Lead	410	16	330	13	2.5 ^d	59	28	35.8
Mercury	2.4	0.058	2	ND	0.77 ^f	0.23	ND	0.18
Nickel	90	13	530	ND	52 ^d	55	ND	22.7
Silver	6.9	0.05	NA	44	3.2 ^{dg}	1.5	2.6	NA
Zinc	2,300	48	870	95	120 ^d	120	94	121
PAHs/Phenols								
Acenaphthene	0.26	NA	1	ND	520 ^h	0.082	ND	NA
Acenaphthylene	1.8	NA	ND	ND	NA	ND	ND	NA
Anthracene	2	NA	ND	ND	NA	ND	ND	0.0572
Benz(a)anthracene	4.4	NA	ND	ND	NA	ND	ND	0.108
Benzo(b)fluoranthene	5.3	NA	ND	ND	NA	ND	ND	NA
Benzo(a)pyrene	3.9	NA	ND	ND	NA	ND	ND	0.15
Chrysene	4.7	NA	ND	ND	NA	14	ND	0.166
Dibenz(a,h)anthracene	0.36	NA	ND	ND	NA	ND	ND	0.033
Fluoranthene	6.6	NA	1	ND	NA	8.4	ND	0.423
Fluorene	1.7	NA	ND	2	NA	0.078	ND	0.0774
2-Methylnaphthalene	1.2	NA	8	ND	NA	12	ND	NA
Naphthalene	1.2	NA	13	ND	620 ^h	5.1	ND	0.176
Phenanthrene	7.1	NA	1	3	NA	11	ND	0.204
Pyrene	8.5	NA	1	ND	NA	20	ND	0.195
Pesticides								
DDT	0.095	NA	ND	ND	0.001	ND	0.025	0.00528 ⁱ
Endosulfan (alpha + beta)	0.0028	NA	ND	ND	0.056	ND	ND	NA
Endrin	0.038	NA	ND	ND	0.036	ND	0.056	0.00222
Dioxins/Furans								
TEQ (Toxic Equiv. Value) ^j	0.00007	NA	0.00007	0.00000044	0.00001 ^{h,k}	0.0053	0.0000029	0.000008 ^{k,l}

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

b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 2002); Freshwater chronic criteria presented.

c: Threshold Effects Concentration (TEC). Concentration below which harmful effects are unlikely to be observed (MacDonald 2000).

d: Criterion expressed as a function of total hardness; concentrations shown correspond to hardness of 100 mg/L CaCO₃.

e: Screening guidelines represent concentrations for Cr.¹⁶

f: Chronic criterion not available; acute criterion presented.

g: Criterion derived from inorganic, but applied to total mercury.

h: Lowest Observable Effects Level (LOEL) (USEPA 1986).

i: Expressed as total DDT.

j: Maximum toxic equivalent value (TEQ) is provided. Each dioxin/furan is assigned a toxic equivalency factor (TEF) relative to 2,3,7,8 tetrachlorodibenzodioxin, which is the most toxic compound in this group. To determine the toxicity of a mixture of dioxin/furan compounds, the measured concentration of the individual dioxin/furans is multiplied by its assigned TEF. The results are summed to produce a TEQ.

k: Value is for 2,3,7,8-TCDD.

l: TEC not available; Upper Effects Threshold (UET) presented.

NA: Screening guidelines not available..

ND: Not detected.

Sediment

Sediment samples collected from ponds located onsite, Prince George Creek, and surrounding wetlands contained elevated concentrations of metals, PAHs, pesticides, and dioxins. The maximum concentrations of copper, lead, mercury, nickel, zinc, and arsenic were detected in samples collected from Pond #4. The maximum copper concentration in sediment exceeded the Threshold Effects Concentration (TEC) by one order of magnitude. The maximum concentrations of chromium and silver were detected in sediment samples collected from Prince George Creek. Maximum concentrations of cadmium, lead, mercury, and nickel were all slightly greater than their respective TECs. No PAHs were detected in samples collected from Prince George Creek. However, several PAHs including chrysene, fluoranthene, phenanthrene, and pyrene were detected in the drum disposal area and sample concentrations exceeded the TECs by at least one order of magnitude. The maximum dioxin TEQ was two orders of magnitude greater than the TEC screening guideline in a sediment sample collected from Pond #2.

Soil

Elevated concentrations of metals and PAHs were detected in soils samples collected from the Reasor Chemical site. The maximum concentrations of eight metals were detected in soil at the southwest corner of the site property near the pipe shop. Concentrations of copper, lead, and mercury all exceeded mean U.S. soil concentrations by at least one order of magnitude. Fourteen PAHs were detected at various locations throughout the site. Maximum concentrations ranged from 0.26 mg/kg (acenaphthene) to 8.5 mg/kg (pyrene). Of the soil samples that were analyzed for PAHs, phenanthrene, flouranthene, and pyrene were detected in the greatest percentages. Pesticides and dioxins were detected in soil samples from the Reasor Chemical site at minimal concentrations.

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