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Madisonville Creosote Works

Madisonville, Louisiana
CERCLIS #LAD981522998

Site Exposure Potential

The Madisonville Creosote Works site covers approximately 12 ha in a predominantly wooded, rural area in St Tammany Parish about 3 km west of Madisonville, Louisiana. The facility is 2 km north of Lake Pontchartrain, a coastal tidal water body (Figure 1). Drainage from the site enters an unnamed, intermittent stream that empties into the Black River and farther downgradient into a series of large, perennial wetlands. This wetland is contiguous with Lake Pontchartrain, a shallow estuary which flows into Mississippi Sound approximately 90 km from the site. Mississippi Sound is an embayment of the Gulf of Mexico.

The Madisonville Creosote Works facility was opened in 1956; wood products were treated with creosote at the facility until operations ceased in 1984. From the 1960s to 1984, creosote sludge and wastewater were concentrated by sprinkler evaporation. Residual process waste liquids were stored in two process water ditches and two evaporation ponds (Figure 2). Waste creosote and wastewater drained from the process water ditches into Evaporation Pond No.1. Solids settled in Pond No.1 and water overflowed through a depression in the dike to Evaporation Pond No. 2. The Rainwater Pond provided backup containment of overflow from Evaporation Pond No. 2. The Fish Pond was

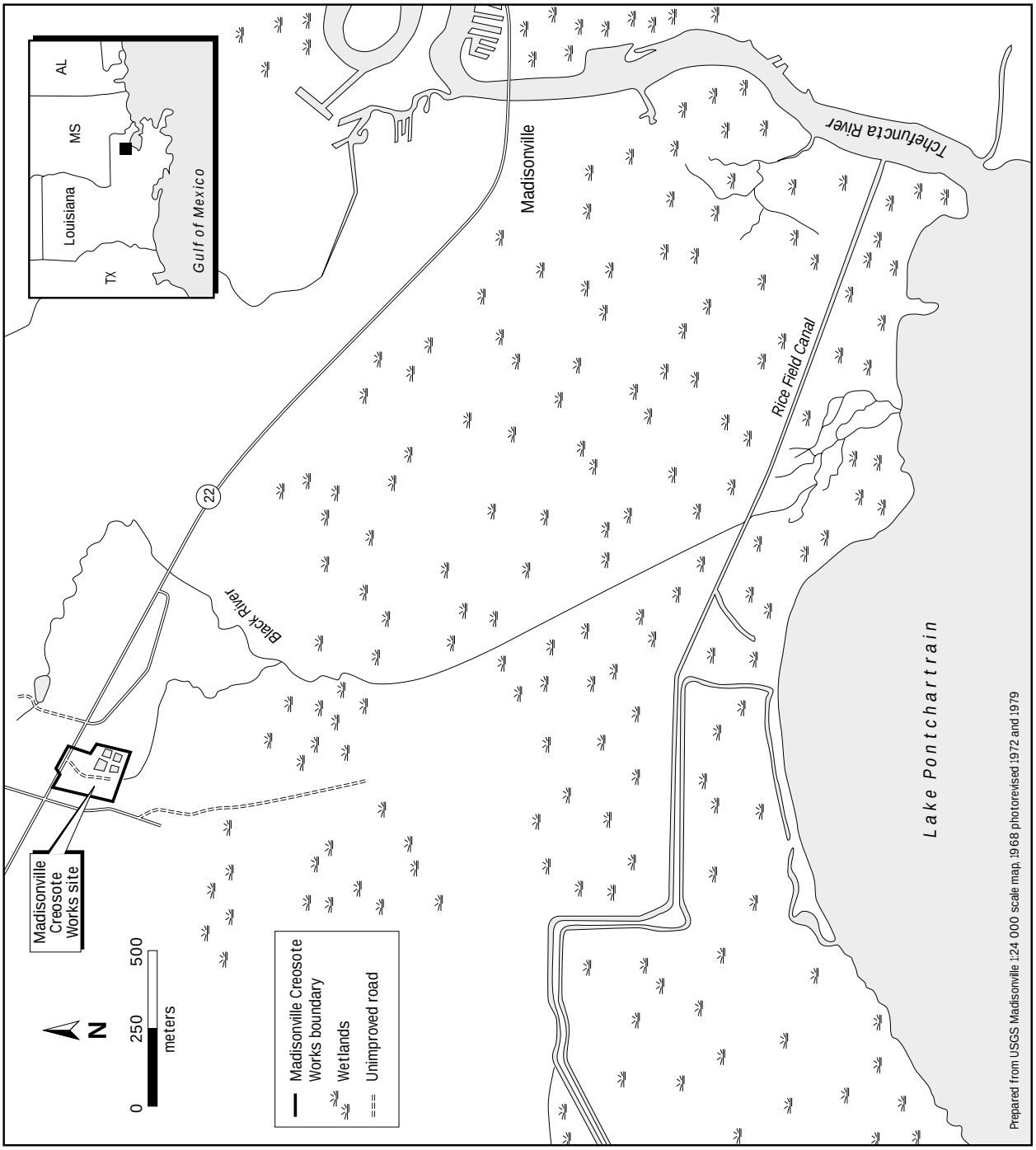

Figure 1. Location of the Madisonville Creosote Works site in Madisonville, Louisiana.

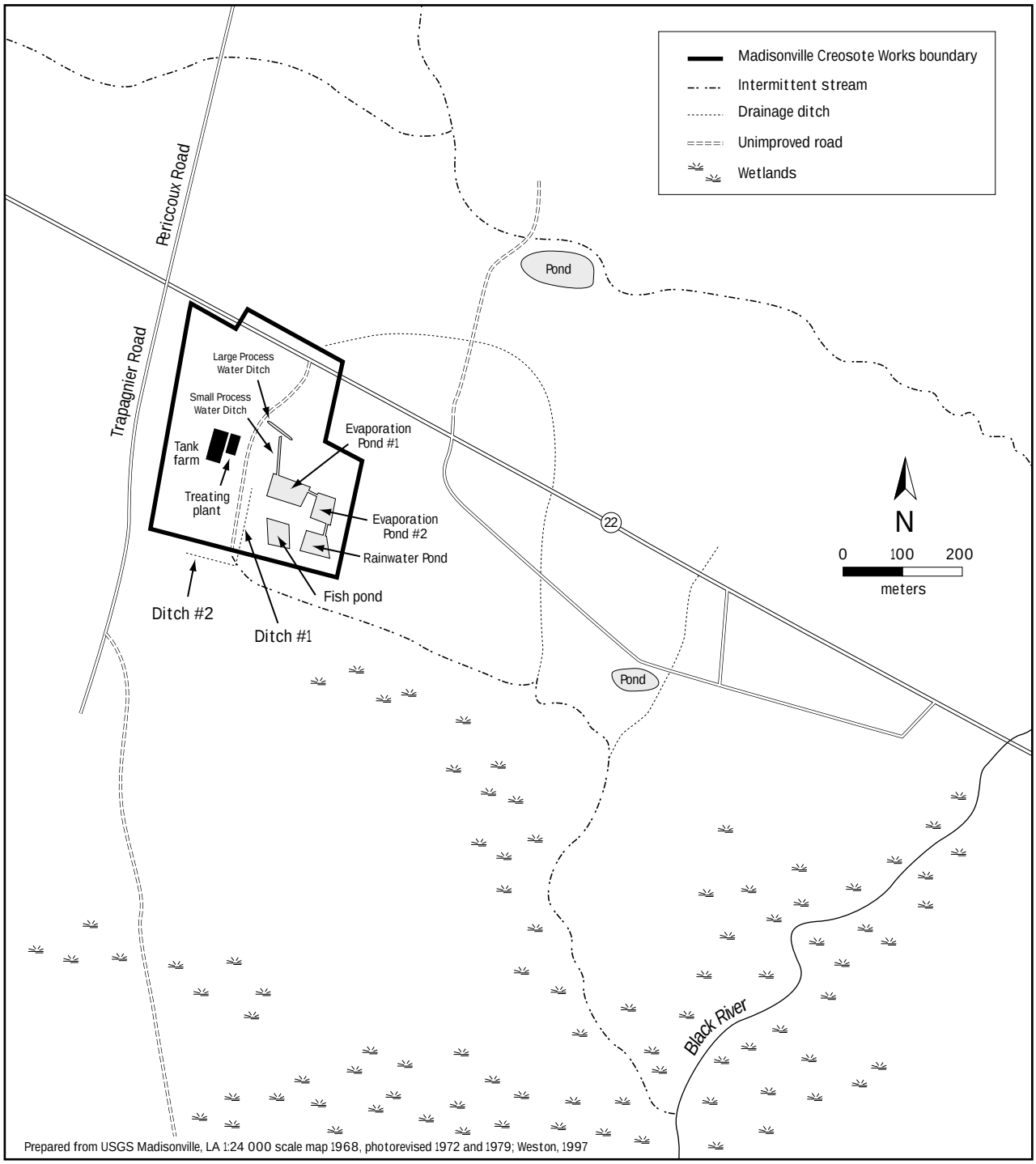

Figure 2. Detail of the Madisonville Creosote Works site.

intended for expansion of the evaporation ponds. Approximately 15 aboveground storage tanks (ASTs) that were used to store creosote and wastewater remain on-site. During a site inspection in 1995, eleven of these tanks still contained liquids.

The four surface impoundments and the process ditches were closed as hazardous waste management units in 1986. Closure activities included the removal and off-site incineration of contaminated sludge and soil. The units were then backfilled with a 0.6-m clay layer and vegetated. Post-closure sampling indicated the presence of residual creosote contamination in soils collected from these areas (Weston 1996).

Creosote contamination has been measured at the site in soils, sediments, and groundwater. Primary source contamination is in the form of liquid creosote or creosote sludge. Chemically, creosote consists primarily of PAHs. Past releases of PAHs from site source areas to site soil and groundwater and off-site ditches has been visually observed and confirmed by laboratory analysis. Secondary source contamination is in the form of contaminated soil (dried creosote particles in the soil or soil saturated with liquid creosote), pooled dense nonaqueous phase liquids (DNAPL) in subsurface soil, and dissolved contamination in groundwater.

Groundwater discharge, DNAPL migration, and surface water runoff are the potential pathways of contaminant transport from the site to NOAA trust resources and associated habitats. A drainage ditch immediately west of the former evaporation ponds (Ditch #1) drains surface water to the south where it joins a second drainage ditch (Ditch #2) to form an intermittent stream that flows from the northwest to the southeast approximately 1.2 km before its confluence with the Black River (Figure 2). After the confluence, the Black River crosses a large, perennial wetland beginning approximately 1.1 km southeast of the site and intersects the Rice Field Canal before continuing to Lake Pontchartrain (Figure 1).

The Madisonville Creosote Works is located on the Pleistocene prairie terrace in poorly drained, gently sloping, loamy soils. There are three aquifers below the site: the Shallow Aquifer, the Upper Ponchatoula Aquifer, and the Lower Ponchatoula Aquifer, all of which are thought to be hydraulically connected. A groundwater investigation at the site showed that creosote contamination was greatest at the center of the site. The groundwater in the upper alluvial deposits was shown to mound and flow radially from the center of the facility (Weston 1997).

NOAA Trust Habitats and Species

The primary habitats of concern to NOAA are the downstream surface waters, riparian wetlands, and bottom substrates of the Black River and Lake Pontchartrain. Numerous fish and invertebrate species use the estuary and are the NOAA trust resources of concern (Table 1).

Table 1. Representative NOAA trust species found in Lake Pontchartrain.

Species		Habitat Use			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
ANADROMOUS/CATADROMOUS SPECIES						
American eel	*Anguilla rostrata*		◆			
Gizzard shad	*Dorosoma cepedianum*		◆			
Gulf sturgeon	*Acipenser oxyrhynchus*		◆	◆		
MARINE/ESTUARINE SPECIES						
Atlantic croaker	*Micropogonias undulatus*		◆	◆		◆
Bay anchovy	*Anchoa mitchilli*	◆	◆	◆		
Black drum	*Pogonias cromis*		◆	◆		◆
Code goby	*Gobiosoma robustum*	◆	◆	◆		
Crevalle jack	*Caranx hippos*		◆			
Gulf killifish	*Fundulus grandis*	◆	◆	◆		
Gulf menhaden	*Brevoortia patronus*		◆			
Hardhead catfish	*Arius felis*	◆	◆	◆		
Pinfish	*Lagodon rhomboides*		◆	◆		
Red drum	*Sciaenops ocellatus*		◆			◆
Sand seatrout	*Cynoscion arenarius*		◆	◆		◆
Sheepshead	*Archosargus probatocephalus*		◆	◆		◆
Sheepshead minnow	*Cyprinodon variegatus*	◆	◆	◆		
Silver perch	*Bairdiella chrysoura*		◆	◆		
Silversides	*Menidia* spp.	◆	◆			
Southern flounder	*Paralichthys lethostigma*		◆	◆		◆
Spot	*Leiostomus xanthurus*		◆	◆		◆
Spotted sea trout	*Cynoscion nebulosus*		◆	◆		◆
Striped mullet	*Mugil cephalus*		◆	◆		◆
Tarpon	*Megalops atlanticus*		◆			
INVERTEBRATE SPECIES						
Bay squid	*Lollinguncula brevis*		◆			
Blue crab	*Callinectes sapidus*		◆	◆	◆	◆
Brown shrimp	*Penaeus aztecus*		◆	◆	◆	◆
Eastern oyster	*Crassostrea virginica*	◆	◆	◆		◆
Grass shrimp	*Palaemonetes pugio*	◆	◆	◆		
Rangia	*Rangia cuneata*	◆	◆	◆	◆	◆
White shrimp	*Penaeus setiferus*		◆	◆	◆	◆

Lake Ponchartrain is a shallow, enclosed estuary of low salinity (0.5-5.0 ppt). The Lake depths are generally less than 5 m, and sediments range from fine sand to silt (USGS 1968a,b; Gosselink 1984). Drainage from the site runs into the Black River, which empties into a large Cypress-Tupelo swamp. Farther downgradient, the swamp is dominated by bull-tongue (*Sagitaria* sp.), and eventually saltmarsh hay (*Spartina patens*) before joining Lake Ponchartrain (Day et al. 1989).

The estuary is used by numerous fish for adult habitat, juvenile nurseries, and spawning; and as a migratory corridor to several rivers within the watershed. Small estuarine fish such as bay anchovy, code goby, Gulf killifish, silversides, and sheepshead minnow spend their entire lives within the estuary (Table 1). Larger species are present in the estuary primarily during estuarine-dependent juvenile life stages. Adults of these species are present in the estuary seasonally. Like most of the marine species listed in Table 1, tarpon and crevalle jack spawn along the coast, but the juveniles require estuarine environments for survival (Nelson et al. 1992).

Lake Pontchartrain is a migratory corridor for the anadromous Gulf sturgeon and gizzard shad. Both species migrate up the Tchefuncta River, located approximately 5 km east of the site. The catadromous American eel also migrates to most larger streams that drain into the estuary. Anadromous species are not expected to use the Black River around the site because of its small size (Rogilio 1997).

Blue crab are abundant in Lake Pontchartrain. Juvenile stages of brown shrimp and white shrimp are abundant in the estuary on a seasonal basis. After mating, the females return to full seawater zones to brood eggs while the males often remain in low-salinity waters. Larvae are released by females offshore, and are subsequently transported back into the estuary where they settle to the bottom.

Grass shrimp spend their entire lives within the estuary and are commonly found in saltmarsh and oyster reef habitats. Juvenile stages of brown shrimp and white shrimp are abundant in the estuary on a seasonal basis. Of the bivalve species, rangia are most abundant, followed by eastern oyster. All life stages of these bivalves are found within the estuary (Nelson et al. 1992).

Several species are commercially harvested in Lake Pontchartrain; the largest fisheries are for brown shrimp, white shrimp, and blue crab. Substantial recreational fisheries are also present in the estuary; the most commonly harvested species include seatrout, croaker, red drum, blue crab, and rangia (Burdon 1997).

Site-Related Contamination

Data collected in a series of site investigations show elevated concentrations of trace elements and organic compounds (PAHs and pesticides) in groundwater and surface soils collected at the site (LDEQ 1993; E&E 1996) and in surface water and sediment samples collected from off-site areas (ESE 1991; E&E 1995, E&E 1996). Creosote contamination in two off-site areas was investigated during a 1991 remedial investigation (RI; ESE 1991). Soils collected from the drainage ditch located north of the facility and the intermittent stream southeast of the facility were reported to be

contaminated with creosote (Figure 2). The RI identified creosote contamination in 90 m of the drainage ditch and in 700 m of the unnamed intermittent stream south of the site. A subsequent remedial action resulted in the removal and disposal of substrates from 290 m of the intermittent stream. The remaining contamination has not been removed. Maximum concentrations of the major contaminants at the site are listed in Table 2 along with the appropriate screening guidelines.

Lead concentrations in both groundwater and surface water, and mercury in surface water, exceeded chronic AWQCs (Table 2). Concentrations of arsenic, barium, lead, and mercury in site soils exceeded mean U.S. concentrations. Lead and mercury in sediment from the drainage ditch exceeded the ER-L values for these trace elements. However, concentrations of trace elements in sediment and surface water of the Black River near the site (Weston 1997) did not exceed screening values.

PAH concentrations measured in on-site groundwater, surface water, soils, and sediments were high compared to the screening concentrations for these media (Table 2). However, the available data suggest that PAH contamination is now limited to the site and off-site drainage ditches. The concentrations of PAHs reported in surface water and sediments collected from the Black River in the vicinity of the site (Weston 1997) did not exceed screening values for these compounds.

Some limited exceedances of screening criteria were observed for pesticides in surface water and sediments in the drainage ditch. The maximum surface water concentration of endrin exceeded the AWQC and the sediment concentrations of 4,4'-DDE in the drainage ditch exceeded the ER-L concentration. However, pesticides were not detected in either the water or sediments of the Black River.

Summary

A series of site investigations indicate that soil and groundwater collected at the Madisonville Creosote site, and the sediments and surface waters in drainage ditches near the site, are contaminated with trace elements, PAHs, and pesticides. Surface runoff, DNAPL migration, and groundwater discharge are the potential pathways of contaminant transport from the site to NOAA trust resources and associated habitats. The primary habitats of concern to NOAA are estuarine surface waters, riparian wetlands, and bottom substrates of Black River and Lake Pontchartrain.

Table 2. Maximum concentrations of contaminants of concern at the Madisonville Creosote Works site.

	Water			Soil		Sediment	
	Ground-water[a] (µg/L)	Surface Water[a,b] (µg/L)	AWQC[c] (µg/L)	Surface Soils[a] (mg/kg)	Mean U.S.[d] (mg/kg)	Sediment[a,b] (mg/kg)	ERL[e] (mg/kg)
TRACE ELEMENTS							
Arsenic	NA	12.3	36	14.3	5	6.5	8.2
Barium	202	650	NA	774	440	376	NA
Lead	30.7	54	8.5	273	16	181	46.7
Mercury	NA	0.24	0.012	7.0	0.058	0.490	0.150
ORGANIC COMPOUNDS							
PAHs							
Naphthalene	30500	ND	620 [f]	85.0	NA	4990	0.16
2-Methylnaphthalene	7200	ND	NA	8.5	NA	21900	0.07
Acenaphthylene	440	ND	NA	180	NA	37.3	0.04
Acenaphthene	8200	5.3	520 [f]	1260	NA	30900	0.02
Fluorene	6470	ND	NA	1450	NA	5300	0.02
Phenanthrene	14800	32.9	4.6p	2360	NA	14500	0.24
Anthracene	1710	2.00	NA	1180	NA	16300	0.09
Fluoranthene	8200	40.1	16 [f]	2190	NA	3010	0.60
Pyrene	5000	31.1	NA	2120	NA	3940	0.67
Chrysene	1610	13.1	NA	1570	NA	2760	0.38
Benz(a)anthracene	1680	1.00	NA	412	NA	834	0.26
Benzo(b)fluoranthene	1240	2.00	NA	350	NA	295	NA
Benzo(k)fluoranthene	1400	10.1	NA	33	NA	470	NA
Benz(a)pyrene	594	1.00	NA	393	NA	242	0.43
Benzo(g,h,i)perylene	220	ND	NA	57	NA	24	NA
Indeno(1,2,3-cd)pyrene	250	ND	NA	69	NA	31	NA
Dibenz(a,h)anthracene	80	ND	NA	27	NA	10	0.063
Pesticides							
alpha-Chlordane	NA	ND	0.0043	ND	NA	0.038	NA
4,4'-DDE	NA	ND	0.014[f]	0.83	NA	0.058	0.0022
4,4'-DDT	NA	ND	0.001	0.0073	NA	0.091	0.0016t
Endrin	NA	0.10	0.0023	ND	NA	0.0082	NA

a: Maximum concentrations cited in Weston (1997).
b: Surface water and sediment concentrations reported for off-site drainage ditches.
c: Ambient Water Quality Criteria (U.S. EPA 1993). Lowest value was chosen from fresh- and marine-water criteria because river is estuarine.
d: Shacklette and Boerngen (1984).
e: 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 et al. (1995).
f: Lowest Observed Effect Level (U.S. EPA 1993).
ND: Not detected; detection limit not available.
NA: Screening guidelines not available; data not available.
p: Proposed criterion.
t: DDT total.

References

Burdon, J., Fisheries Biologist, Louisiana Department of Wildlife and Fisheries, Baton Rouge, personal communication, July 28, 1997.

Day, J.W. Jr., C.A.S. Hall, W.M. Kemp, and A. Yanez-Arancibia. 1989. *Estuarine Ecology.* New York: Wiley Interscience Publications.

Environmental Science & Engineering, Inc. (ESE). 1991. *Remedial Investigation of Off-Site Contamination Near Madisonville Wood Processing, Inc.* Baton Rouge: Louisiana Department of Environmental Quality, Inactive and Abandoned Sites Division.

Ecology and Environment (E&E). 1995. *Integrated Site Inspection for Madisonville Creosote Works, Madisonville, St. Tammany Parish, Louisiana.* Dallas: Emergency Response Branch, EPA Region 6.

Ecology and Environment (E&E). 1996. *Engineering Evaluation/Cost Analysis Work Plan for Madisonville Creosote Site, Madisonville, St. Tammany Parish, Louisiana.* Dallas: EPA Region 6.

Gosselink, J.G. 1984. *The ecology of delta marshes of coastal Louisiana: A community profile.* FWS/OBS-84/09. Vicksburg: U.S. Fish and Wildlife Service.

Louisiana Department of Environmental Quality (LDEQ). 1993. *RCRA Groundwater CME, Madisonville Wood Preserving.* LAD #008171191. Baton Rouge: Louisiana Department of Environmental Quality, Groundwater Protection Division.

Long, E. R., D. D. MacDonald, S. L. Smith, and F. D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environmental Management 19*:81-97.

Nelson, D.M., M.E. Monaco, C.D. Williams, T.E. Czapla, M.E. Pattillo, L. Coston-Clements, L.R. Settle, and E.A. Irlandi. 1992. *Distribution and abundance of fishes and invertebrates in Gulf of Mexico estuaries. Volume I: Data Summaries.* Rockville, Maryland: NOAA/NOS Strategic Environmental Assessments Division. 273 p.

Roy F. Weston, Inc. 1996. *Final Report: Madisoville Creosote, Madisonville, St. Tammany Parish, LA, November 1996.* Edison, New Jersey: U.S. Environmental Protection Agency, Environmental Response Team Center.

Roy F. Weston, Inc. 1997. *Draft Final Baseline Human Health and Ecological Screening Risk Assessment, Madisonville Creosote Works, Madisonville, St. Tammany Parish, Louisiana.* Dallas: U.S. Environmental Protection Agency, Region 6.

Rogilio, H., Fisheries Biologist, Louisiana Department of Wildlife and Fisheries, Baton Rouge, personal communication, July 28, 1997.

Shacklette, H. T. and J. G. Boerngen. 1984. Element concentrations in soils and other surficial materials of the conterminous United States. *U.S. Geological Survey Professional Paper 1270.* Washington, D.C.: U.S. Government Printing Office.

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 (USGS). 1968a. 7.5 minute series topographic map. Covington, SW, LA. Washington, D.C.: U.S. Department of the Interior.

U.S. Geological Survey (USGS). 1968b. 7.5 minute series topographic map. Madisonville, FL. Washington, D.C.: U.S. Department of the Interior.