PUBLIC HEALTH ASSESSMENT

MADISONVILLE CREOSOTE WORKS
ST. TAMMANY PARISH, LOUISIANA

Prepared by

Louisiana Office of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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1. SUMMARY

The Madisonville Creosote Works Superfund Site (MCW site) is an inoperative wood preserving facility located approximately three miles west of Madisonville in St. Tammany Parish, Louisiana. The site was declared a Superfund site and placed on the National Priorities List (NPL) in December of 1996. A variety of wastes generated by the wood preserving process were disposed of at the facility prior to closure. Contaminants have been detected in samples from soil and groundwater on-site, and in sediments and soil off-site. Contaminants of concern at this site include arsenic, mercury, and polycyclic aromatic hydrocarbons (PAHs).

The Louisiana Office of Public Health (LOPH) and the Agency for Toxic Substances and Disease Registry (ATSDR) conclude the site posed a public health hazard in the past because of worker exposure to contaminants in soil. At present, the level of contaminants are not expected to cause adverse health effects in trespassers, remedial workers, or area residents. However, if contaminated shallow groundwater migrates off-site or if MCW land use changes, site contaminants may pose a future health concern.

Residential wells sampled during prior inspections do not appear to have been impacted by contaminants from the site; however, there is potential that contaminated shallow groundwater from the site could migrate to these private wells exposing residents using them. The air and off-site surface water pathways have been eliminated as potential exposure pathways because there were no detectable levels of polycyclic aromatic hydrocarbons found in the laboratory analysis of ambient air and off-site surface water was determined not to be contaminated.

The Louisiana Office of Public Health has made recommendations to reduce and prevent exposure to site contaminants and to respond to community health concerns in this Public Health Assessment. The community health concerns include: migration of site-related contamination to their property, the possibility of increased cancer rates in the area, exposure of local children to the site contaminants, and decreased well water quality related to the site. An evaluation of current health outcome data revealed no statistically significant elevated rates of cancer incidence for area residents as compared with those of Southeastern Louisiana.

2. BACKGROUND

A. Site Description and History

Madisonville Creosote Works (MCW) is a 29-acre wood preserving facility in St. Tammany Parish, Louisiana, approximately three miles west of Madisonville on State Highway 22 (see Figure 1). The area surrounding the MCW facility is predominantly rural and wooded. Roughly 150 people live within a one-mile radius of the facility. The nearest residents are located within one-tenth of a mile on both the east and west sides of the site. A pine/hardwood forest lies to the north and northeast which is undergoing development for a housing subdivision. No residents are known to live in the marsh on the southern side of the facility. The facility is not completely secured and can be accessed through breaches in the perimeter fence.

The site is located near the north bank of Lake Pontchartrain, a coastal tidal water body used for both commercial and recreational fishing. Drainage from the site enters an unnamed intermittent stream that empties into a large perennial wetland approximately 3,500 feet southeast from the site. This wetland is a fresh-to-brackish marsh and is neighboring Lake Pontchartrain.

Wood products have been treated with creosote at the MCW facility since it first opened in the mid-1950s. Because creosote is a synthetic chemical and does not occur naturally in the environment, wood treatment facilities (e.g. MCW) are the largest source of creosote in the environment. Other wood preservatives, such as pentachlorophenol and chromated copper arsenate, were not utilized at the site. All wood preserving activities were stopped on July 5, 1994. The site has been identified to contain the following operable units: process area, on-site soil, off-site wetlands, and subsurface contamination. (see Figure 2) The process area includes hazardous materials within and on structures and equipment which were integral to the operation and maintenance of the facility. This includes drums, above ground storage tanks, pressure vessels, a condensation tank, outer buildings, mud boxes, log storage areas, and miscellaneous debris.

Four surface impoundments and two process ditches underwent closure in 1986. These impoundments were not certified as a clean closure due to groundwater contamination underneath the facility. Louisiana Department of Environmental Quality (LDEQ) conducted a Remedial Investigation (RI) of off-site contamination near the site in 1991. The RI identified off-site creosote contamination and resulted in a remediation plan for an unnamed stream behind the facility; however, removal activities were stopped and only a portion of the polluted soil in the stream was removed.

The site was proposed to the Environmental Protection Agency's National Priorities List (NPL) on June 17, 1996. On December 23, 1996, MCW was added to the NPL.

B. Site Visits

September 10, 1996
Staff from the Louisiana Office of Public Health (LOPH), Section of Environmental Epidemiology and Toxicology, met Steve Tzhone, site EPA Regional Project Manager on September 10, 1996. Many of the site's buildings and physical structures related to site operations were still remaining on-site. They observed pressure tanks where in the past, logs were injected with creosote. Large tanks covered with creosote on a concrete slab were also on-site. Beyond the tanks, were trash bags of garbage that had been dumped on-site in a wooded area close to the site's fence line. There were no other signs of site activities.

A barbed wire fence was constructed around the site but it was broken in several places. The southeast section of the site previously contained three evaporation or storage ponds where waste water from site operation was stored. A small fish pond was next to these waste ponds; however, most contaminated sludge and soils from the waste ponds have been removed and incinerated off-site. These four units were backfilled with clean soil and a two foot clay cover was set in place. The ponds were covered with grass and no contamination was seen around them. At the southernmost part of the site is a creek that runs from the site into the marsh.

February 6, 1997
Staff from LOPH met with representatives of EPA Region 6 on February 6, 1996. A new fence with combination lock secured the entrance on the northern roadside (Hwy 22) boundary of the site. Even from the road it was obvious that buildings associated with this 29 acre process area had been demolished. No tanks remained on-site. Only the old office and adjacent bathroom buildings remained standing closest to the plant entrance. Otherwise one could see a pile of timbers in the southwest portion of the site and other wood debris on the northwest portion over a predominantly muddy landscape.

In the center of the site, where the above ground tanks were previously located, wood chips had been strewn to cover creosote saturated topsoil. Berms were placed around the northern perimeter of the wood chip covered area to prevent runoff in the northern direction. However, a shiny creosote sheen was visible on the surface of puddles in this area. A drainage stream spans from this mid-area southward and enters a intermittent unnamed stream which drains into an adjacent wetland. At least four or five monitoring wells were visible around the site.

The southeastern area of the site, directly east of the drainage stream, is currently covered with grass and bordered by shrubs. No contamination was seen around this section. A barbed wire fence of unknown integrity encases all other sides. The site is only secured on the northern roadside margin.

C. Demographics, Land Use, and Natural Resources

Madisonville, Louisiana, is the population center closest to the MCW facility. As reported from 1990 census figures, Madisonville has a population of 659. Approximately 150 people live within a one-mile radius of the MCW site. The census tract 40301, which includes the town of Madisonville and the area around the MCW site, has a population of 2964 (see figures 1 and 3). For a breakdown of the census data, see the table below:

1990 Census Data

	St. Tammany Parish	Census Tract 40301	Town of Madisonville
Population	144,508	2964	659
Black (%)	15,917 (11.0%)	319 (10.8%)	117 (17.8%)
White (%)	126,806 (87.8%)	2612 (88.1%)	537 (81.5%)
Other (%)	1,785 (1.2%)	33 (1.1%)	5 (0.7%)
Median Household Income	$37,814	$23,821	$21,750
Households	50,346	1065	267
Owner Occupied %	75.8%	76.6%	60.3%
Renter Occupied %	24.2%	23.4%	39.7%

Residences in the area are mainly concentrated along Highway 22 and Oak Park Drive. Although mostly rural, there are several tracts along Highway 22 zoned as commercial, suburban, and single family residential.

The primary source of drinking water for this area is groundwater. Traditionally, many wells in the area have exhibited artesian characteristics, flowing freely without pumping for many years. Water is generally soft and of excellent potable quality with no treatment being necessary for use as a public supply. The Louisiana Department of Transportation and Development reports that there are thirty-eight registered water wells within one mile of the site. These wells are used for observation, industrial, irrigation and domestic purposes. Approximately four domestic wells are within ½ mile of the site.

The MCW facility is located within the basin of 632 square mile Lake Pontchartrain; however, drainage in the area of the MCW is not hydrologically connected directly to a major drainage system. It flows into Lake Pontchartrain via a minor stream, the Black River. The facility is enclosed by two macrohabitats, forested wetlands and marshes which produce a diversity of plant and animal wildlife. Demand for quality hunting areas is high because of the parish's proximity to Baton Rouge and New Orleans. Swift clean flowing streams and slow moving turbid bayous provide choice freshwater fishing.

3. ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

This section discusses the particular environmental contaminants and physical hazards of concern at the Madisonville Creosote Works site. The Agency for Toxic Substances and Disease Registry and LOPH select on-site and off-site contaminants of concern based on the concentration of the chemicals, background comparisons, if available and the quality of the field and laboratory data. The concentration of the chemicals are compared to their comparison values, which are used to screen contaminants for further evaluation. ATSDR and other agencies develop these comparison values to provide guidelines for effects, given a standard daily ingestion rate and standard daily ingestion rate and standard body weight. Therefore all of the contaminants discussed in this section will not necessarily cause adverse health effects, but are of concern due to their harmful potential. See Appendix B for definitions and explanations of comparison values and acronyms used in this public health assessment.

A. On-site Contamination

The primary source of on-site contamination is liquid creosote on surface soils and groundwater. To evaluate the potential risks of present or future incidental ingestion of soil, on-site soil samples from surface to twenty-four inches below ground surface were taken.

Surface soil

Surface soil samples (0-6" below ground surface) indicate relatively low to high contamination. Analysis of these samples at the site showed above comparison value levels of benzo(a)pyrene, fluoranthene, pyrene, aldrin, heptachlor epoxide, and beryllium (Table 1).

Table 1
Range of Contaminant Concentrations Detected in On-site Shallow Soil (0-6" bgs)

Contaminant	Concentration Range	Comparison Values		CV Exceeded?
	ppb	**ppb**	**Source**	YES/NO
Semivolatile Organics:				
Acenaphthene	120-1,260,000	3,000,000	RMEG	NO
Acenaphthylene	62-180,000	NA		
Anthracene	46-1,180,000	20,000,000	RMEG	NO
Benzo(a)anthracene	74-412,000	NA		
Benzo(a)pyrene	49-393,000	100	CREG	YES
Benzo(b)fluoranthene	74-350,000	NA		
Benzo(g,h,i)perylene	48-57,000	NA		
Benzo(k)fluoranthene	32-33,000	NA		
Carbazole	40-74,000	NA		
Chrysene	40-1,570,000	NA		
Dibenz(a,h)anthracene	54-27,000	NA		
Fluoranthene	47-2,190,000	2,000,000	RMEG	YES
Fluorene	82-1,450,000	2,000,000	RMEG	NO
Indeno(1,2,3-cd)pyrene	240-69,000	NA		
Naphthalene	97-85,000	1,000,000	EMEG	NO
Phenanthrene	48-2,360,000	NA		
Pyrene	81-2,120,000	2,000,000	RMEG	YES
Pesticides:				
Aldrin	2-420	40	CREG	YES
4,4'-DDE	4.9-830	2,000	CREG	NO
Heptachlor epoxide	2.1-1,900	80	CREG	YES
Inorganics:				
Antimony	1,100-1,800	20,000	RMEG	NO
Arsenic	1,200-14,300	500	CREG	YES
Beryllium	90-250	200	CREG	YES
Mercury	60-7,000	100,000	EMEG	NO
Nickel	1,000-18,100	1,000,000	RMEG	NO

bgs - below ground surface
NA - none available
ppb - parts per billion
CREG - Cancer Risk Evaluation Guide
EMEG - Environmental Media Evaluation Guide
RMEG - Reference Dose Media Evaluation Guide

Subsurface soil

Subsurface soil sampling (0-24") indicates that the comparison values were exceeded by benzo(a)pyrene, fluoranthene, pyrene, aldrin, beryllium, and mercury (Table 2).

Table 2
Range of Contaminant Concentrations Detected in On-site Deep Soil (0-24" bgs)

Contaminant	Concentration Range	Comparison Values		CV Exceeded?
	ppb	**ppb**	**Source**	**YES/NO**
Semivolatile Organics:				
Acenaphthene	120-1,260,000	3,000,000	RMEG	NO
Benzo(a)anthracene	74-412,000	NA		
Benzo(a)pyrene	49-393,000	100	CREG	YES
Benzo(b)fluoranthene	74-350,000	NA		
Benzo(g,h,i)perylene	48-57,000	NA		
Carbazole	40-520,000	NA		
Chrysene	40-1,570,000	NA		
Dibenz(a,h)anthracene	54-40,000	NA		
Fluoranthene	40-2,190,000	2,000,000	RMEG	YES
Fluorene	69-1,450,000	2,000,000	RMEG	NO
Indeno(1,2,3-cd)pyrene	1900-69,000	NA		
Naphthalene	97-410,000	1,000,000	EMEG	NO
Phenanthrene	48-2,360,000	NA		
Pyrene	0.0-2,120,000	2,000,000	RMEG	YES
Pesticides:				
Aldrin	2-420	40	CREG	YES
4,4'-DDE	5.1-7.3	2,000	CREG	NO
Heptachlor epoxide	2.1-1,900	80	CREG	YES
Inorganics:				
Antimony	1100-1,800	20,000	RMEG	NO
Arsenic	1200-14,300	500	CREG	YES
Beryllium	90-250	200	CREG	YES
Mercury	2990-714,000	500	CREG	YES

bgs - below ground surface
ppb - parts per billion
NA - none available
CREG - Cancer Risk Evaluation Guide
EMEG - Environmental Media Evaluation Guide
RMEG - Reference Dose Media Evaluation Guide

Groundwater

Data from monitoring wells were used to evaluate the on-site groundwater contamination. Data were summarized separately for two sampling episodes, 1992/1993 RCRA CME (LDEQ, 1993) and 1996 EE/CA (E&E, 1996), in order to consider natural decrease and groundwater concentration across years. For our purposes, it is more appropriate for us to use the latest collection of sampling data for calculating exposure estimates since these values are more reflective of current groundwater conditions. Results of the groundwater sampled indicate exceedance of comparison values by acenaphthene, fluoranthene, fluorene, naphthalene, pyrene, arsenic and barium (Table 3).

Table 3
Range of Contaminant Concentrations Detected in 1996 Sampling of On-site Monitoring Wells

Contaminant	Concentration Range	Comparison Values		CV Exceeded?
	ppb	**ppb**	**Source**	**YES/NO**
Semivolatile Organics:				
Acenaphthene	290-15,000	600	RMEG	YES
Anthracene	1.1-3,200	3,000	RMEG	YES
Benzo(a)anthracene	2-3,100	NA		
Benzo(b)fluoranthene	2-2,300	NA		
Benzo(k)fluoranthene	2-2,600	NA		
Bis(2-ethylhexyl)phthalate	1-4	NA		
Carbazole	21-2,300	NA		
Chrysene	2-3	NA		
Dibenzofuran	190-8,800	NA		
Fluoranthene	20-15,000	400	RMEG	YES
Fluorene	68-12,000	400	RMEG	YES
2-Methylnaphthalene	13-13,000	NA		
Naphthalene	13-4,500	20	LTHA	YES
Phenanthrene	71-27,000	NA		
Pyrene	10-9,100	300	RMEG	YES
Inorganics:				
Arsenic	24.5-5,440	.02	CREG	YES
Barium	25.1-808	700	RMEG	YES

bgs - below ground surface ppm- parts per million
EMEG - Environmental Media Evaluation Guide LTHA - Lifetime Health Advisory
RMEG - Reference Dose Media Evaluation Guide

B. Off-site Contamination

LDEQ identified approximately 300 linear feet of creosote-derived contamination along Louisiana Hwy 22 and approximately 2,300 feet of creosote-derived contamination along the streambed southeast of the Madisonville facility. Two separate areas of contamination, the off-site stream and the highway ditch, neighboring the MCW facility were investigated during the site assessment initiated by LDEQ. These areas of off-site contamination had been determined earlier to directly relate to wood processing activities at the MCW. The exact on-site source or sources have not been documented. It is possible that process wastes from MCW sludge could have been discharged from the site.

Sampling was executed at eighteen locations in the stream and at four locations in the highway ditch area. A total of six media types were sampled at one or more locations, including, shallow soil, deep soil (to depth of 4 feet), stream sediment, surface water, sediment leachate, and ambient air in the immediate sampling zone. Laboratory analysis of surface water and ambient air samples did not indicate contaminant levels of concern in these media. Soil and stream sediments samples from the stream and the ditch contained high concentrations of PAHs.

Surface soil

Surface soil sampling of off-site surface soil indicated exceedance of fluoranthene, fluorene, naphthalene, pyrene, aldrin and heptachlor epoxide (Table 4).

Table 4
Range of Contaminant Concentrations Detected in
Off-site Drainage Ditch Soil (0-12" bgs)

Contaminant	Concentration Range	Comparison Value		CV Exceeded?
	ppb	**ppb**	**Source**	**YES/NO**
Semivolatile Organics:				
2-Methylnaphthalene	16,000-1,310,000	NA		
Acenaphthene	900-2,560,000	3,000,000	RMEG	NO
Acenaphthylene	2,200-51,400	NA		
Anthracene	46-3,029,000	20,000,000	RMEG	NO
Benzo(a)anthracene	43-367,000	NA		
Benzo(b)fluoranthene	86-101,000	NA		
Benzo(k)fluoranthene	2,160-103,000	NA		
Carbazole	77,000-1,506,000	NA		
Chrysene	38-874,000	NA		
Dibenzofuran	20,000-1,150,000	NA		
Fluoranthene	79-2,504,000	2,000,000	RMEG	YES
Fluorene	28-2,290,000	2,000,000	RMEG	YES
Indeno(1,2,3-cd)pyrene	35-26,200	NA		
Naphthalene	17,000-2,320,000	1,000,000	EMEG	YES
Phenanthrene	24-7,152,000	NA		
Pyrene	76-2,500,000	2,000,000	RMEG	YES
Pesticides:				
Aldrin	2.6-570	40	CREG	YES
Heptachlor epoxide	2.6-4,900	80	CREG	YES
Inorganics:				
Arsenic	3,500-19,200	500	CREG	YES
Beryllium	210-500	200	CREG	YES

bgs - below ground surface
ppb- parts per billion
CREG - Cancer Risk Evaluation Guide
EMEG - Environmental Media Evaluation Guide
RMEG - Reference Dose Media Evaluation Guide

Subsurface soil

Subsurface soil sampling off-site indicates comparison value exceedance by acenaphthene, benzo(a)pyrene, fluoranthene, fluorene, pyrene, aldrin, heptachlor epoxide, arsenic and beryllium (Table 5).

Table 5
Range of Contaminant Concentrations Detected in Off-site Deep Soil (0-12" bgs)*

Contaminant	Concentration Range	Comparison Value		CV Exceeded?
	ppb	**ppb**	**Source**	**YES/NO**
Semivolatile Organics:				
Acenaphthene	120-4,070,000	3,000,000	RMEG	YES
Anthracene	46-7,110,000	20,000,000	RMEG	NO
Benzo(a)anthracene	43-4,020,000	NA		
Benzo(a)pyrene	45-823,000	100	CREG	YES
Benzo(b)fluoranthene	86-2,110,000	NA		
Benzo(g,h,i)perylene	30-39,000	NA		
Benzo(k)fluoranthene	100-1,740,000	NA		
Chrysene	38-4,230,000	NA		
Fluoranthene	58-7,630,000	2,000,000	RMEG	YES
Fluorene	28-3,850,000	2,000,000	RMEG	YES
Indeno(1,2,3-cd)pyrene	35-41,000	NA		
Phenanthrene	24-9,090,000	NA		
Pyrene	76-6,390,000	2,000,000	RMEG	YES
Pesticides:				
Aldrin	2.6-570	40	CREG	YES
Heptachlor epoxide	2.6-4900	80	CREG	YES
Inorganics:				
Arsenic	1,400-33,600	500	CREG	YES
Beryllium	170-500	200	CREG	YES

* - Includes all off-site locations except wetlands
bgs - below ground surface
ppb- parts per billion
CREG - Cancer Risk Evaluation Guide
RMEG - Reference Dose Media Evaluation Guide

Sediments

Sediment samples were obtained from the drainage ditch north of the site, north stream, in the unnamed stream south of the site, and the wetlands southeast of the site. Comparison values were exceeded by acenaphthene, benzo(a)pyrene, fluoranthene, fluorene, naphthalene, pyrene, heptachlor epoxide, arsenic, and beryllium (Table 6).

Table 6
Range of Contaminant Concentrations Detected in Off-site Sediments (0-12" bgs)

Contaminant	Concentration Range	Comparison Values		CV Exceeded?
	ppb	**ppb**	**Source**	**YES/NO**
Semivolatile Organics:				
Acenaphthene	67-3,090,000	3,000,000	RMEG	YES
Anthracene	110-16,300,000	20,000,000	RMEG	NO
Benzo(a)anthracene	51-834,000	NA		
Benzo(a)pyrene	51-242,000	100	CREG	YES
Benzo(b)fluoranthene	130-295,000	NA		
Chrysene	96-2,760,000	NA		
Dibenzofuran	49-2,060,000	NA		
Fluoranthene	110-3,010,000	2,000,000	RMEG	YES
Fluorene	97-5,300,000	2,000,000	RMEG	YES
Naphthalene	23-4,990,000	1,000,000	EMEG	YES
Phenanthrene	60-4,500,000	NA		
Pyrene	240-3,940,000	2,000,000	RMEG	YES
Pesticides:				
Aldrin	3.3-13	40	CREG	NO
Heptachlor epoxide	4.8-92	80	CREG	YES
Inorganics:				
Arsenic	12,000-49,000	500	CREG	YES
Barium	26,00-376,000	4,000,000	RMEG	NO
Beryllium	180-3,100	200	CREG	YES

bgs - below ground surface
ppb- parts per billion
CREG - Cancer Risk Evaluation Guide
EMEG - Environmental Media Evaluation Guide
RMEG - Reference Dose Media Evaluation Guide

Surface water

Analysis of off-site surface water revealed no contamination above given comparison values (Table 7).

Table 7
Range of Contaminant Concentrations Detected in Off-site Surface Water

Contaminant	Concentration Range	Comparison Values		CV Exceeded?
	ppb	**ppb**	**Source**	**YES/NO**
Semivolatile Organics:				
Chrysene	0.6-13.1	NA		
Fluoranthene	0.6-40.1	400	RMEG	NO
Phenanthrene	0.8-32.9	NA		
Pyrene	0.6-31.1	300	RMEG	NO
Inorganics:				
Barium	8.2-206	700	RMEG	NO
Mercury	0.12-0.24	20	EMEG	NO

ppb- parts per billion
EMEG - Environmental Media Evaluation Guide
RMEG - Reference Dose Media Evaluation Guide

Groundwater

Results of the groundwater sampled off-site from residential wells exhibit heavy metal contamination. One well out of four sampled indicated concentrations of arsenic that exceed the comparison value. The levels are considered to be consistent with background concentrations of this contaminant; however, there is a remote possibility that this contaminant could have migrated from the site. The extent to which arsenic is present in other residential wells and the correlation to Madisonville Creosote Works site is unknown (Table 8).

Table 8
Range of Contaminant Concentrations Detected in Off-site Groundwater

Contaminant	Concentration Range	Comparison Values		CV Exceeded?
	ppb	**ppb**	**Source**	**YES/NO**
Inorganics:				
Arsenic	9.7	0.02	CREG	YES
Barium	34-102	700	RMEG	NO

ppb- parts per billion
CREG - Cancer Risk Evaluation Guide
RMEG - Reference Dose Media Evaluation Guide

C. Quality Assurance and Quality Control

LOPH and Agency for Toxic Substance and Disease Registry rely on information obtained from EPA and other environmental agency documents to prepare the public health assessment. We assume, unless otherwise stated, that adequate quality assurance and quality control measures were followed regarding; sampling, chain of custody, laboratory procedures and data analysis.

D. Physical and Other Hazards

There are breaches in the perimeter fence of MCW which allow public access. The main buildings have been demolished. A former office building and adjacent bathroom facilities remain standing closest to the site entrance at the northern roadside margin. Timber and other wood debris litter a predominantly muddy landscape. Trespassers into this area risk injury from glass shards, wood, and scattered nails. No other physical hazards were evident in this area.

4. PATHWAYS ANALYSES

To determine whether nearby residents are exposed to contaminants migrating from the site, LOPH and ATSDR evaluates the environmental and human components that lead to human exposure. This pathway analysis consists of five elements:

1) a source of contamination
2) transport through an environmental medium
3) point of exposure
4) a route of human exposure
5) an exposed population

ATSDR and LOPH categorize an exposure pathway as a completed or potential exposure pathway, if the exposure pathway cannot be eliminated. Completed pathways require that the five elements exist and indicate that exposure to a contaminant has occurred in the past, is currently occurring , or will occur in the near future. Potential pathways, however, require that at least one of the five elements is missing, but could exist. Potential pathways indicate that exposure to a contaminant could have occurred in the past, could be occurring now, or could occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present.

A. Completed Exposure Pathways

Sediments

Past exposures have likely occurred from contact with off-site contaminated streambed sediments. Present and future exposures may occur from ingesting or skin contact with these sediments. Populations at risk for exposure include residents and visitors who may play or fish in these areas.

Surface soil

Contaminated surface soil on-site serves as point of exposure to workers and trespassers who roam about the site and accidentally ingest soil or have skin contact with it. Off-site ditches containing contaminated surface soil serve as a point of exposure to workers, residents, visitors, and children who wade in these areas.

Surface water

Past exposures occurred from flooding and surface water contamination at MCW. At the Madisonville Creosote Works site area, there were waste pits that were located higher than the natural drainage of the surrounding area. During elevated rainfall periods, the pits overflowed into the unnamed stream which eventually connects with Lake Pontchartrain. Workers and trespassers were the most likely exposed populations from dermal contact or incidental ingestion of surface water.

Groundwater

One off-site residential well revealed some arsenic found in the water. This sample result is not believed to be site-related but rather due to naturally-occurring background depositions of metal. The residents of this household have been exposed in the past and are presently being exposed. These residents and their visitors will be exposed in the future if this source of water continues to be used.

Pathway Name	**Completed Exposure Pathways**				**Time**
	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population	
Sediment	Sediment	Site, unnamed stream (off-site)	Dermal contact, ingestion	Workers, residents, visitors	Past, present, future
Surface soil (off-site)	Soil	Ditch	Dermal contact, ingestion	Workers, residents, visitors	Past, present, future
Surface soil (on-site)	Soil	Site	Dermal contact, ingestion	Workers, trespassers	Past, present, future
Surface water (on-site)	Surface water	Site	Dermal contact, ingestion	Workers, residents, visitors, trespassers	Past
Groundwater (off-site)	Groundwater	Residences (tap)	Ingestion	Residents, visitors	Past, present, future

B. Potential Exposure Pathways

Groundwater

Off-site groundwater contamination could result if site-related contaminated sediments migrate to residential wells exposing residents and visitors to contaminated drinking water. Contaminated monitoring wells on-site are secure and are not used for drinking water.

Subsurface soil

Workers and trespassers could be exposed to contaminants present in subsurface soil on-site and off-site in the future. It is unlikely that residents would be exposed by this medium since the contaminated soil is not generally accessible.

Biota

It is unknown if site-related contaminants have had adverse effects on local plants and animals. No sampling data were available for these populations; hence, no conclusions can be drawn with certainty on how hunters or fishermen might be effected by an ingestion pathway. If site-related contaminants are present in plants and animals, exposure has occurred in the past, is occurring at

present, and will occur in the future.

Pathway Name	**Potential Exposure Pathways**				**Time**
	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population	
Groundwater (off-site)	Groundwater	Residences (tap)	Ingestion	Residents, visitors	Past, present, future
Subsurface soil (on-site)	Soil	Soil	Dermal contact, ingestion	Workers, trespassers	Future
Subsurface soil (off-site)	Soil	Soil	Dermal contact, ingestion	Workers, trespassers	Future
Biota	Soil, sediment uptake by biota	Edible plants & animals	Ingestion	Hunters, fishers	Past, present, future

C. Eliminated Exposure Pathways

Surface water (off-site) was determined not to be contaminated. There were no detectable levels of PAHs found in the laboratory analysis of ambient air. This particular finding is compatible with the postulates of sediment migration in which more volatile compounds dislodge to areas of lower contamination leaving after less volatile substances attached to the soil. Both of these media were eliminated from further investigation as vehicles of contamination.

5. PUBLIC HEALTH IMPLICATIONS

A. Toxicologic Evaluation

This section will discuss the potential health effects in persons exposed to specific contaminants, evaluate state and local health databases, and address specific community health concerns. To evaluate health effects, ATSDR has developed minimal risk levels (MRL) for contaminants commonly found at hazardous waste sites. The MRL is an estimate of daily human exposure to a contaminant below which non-cancerous, adverse health effects are unlikely to occur. The MRLs are developed for each route of exposure, such as ingestion and inhalation, and for length of exposure, such as acute (less than 14 days), intermediate (15 to 364 days) and chronic (greater than 365 days). ATSDR presents these MRLs in Toxicological Profiles. These chemical-specific profiles provide information on health effects, environmental transport, human exposure, and regulatory status. When MRLs are not available, reference doses (RfD) provided by the EPA are evaluated. The reference dose is an estimate of the daily level of human exposure that is likely to be without an considerable risk of adverse health effects during a portion of a person's lifetime. For carcinogenic effects, an excess cancer risk was calculated using the Cancer Potency Factor (CPF).

The adverse health effects which result from the interaction of an individual with a hazardous substance in the environment depends on several factors. One factor is the route of exposure, for instance, whether the chemical is inhaled, consumed with food or water, or contacts the skin. Another factor is the level of contaminant to which a person is exposed, and the amount of the exposure dose that is actually absorbed into the body. Mechanisms by which chemicals are altered in the environment, or inside the body once absorbed, are also important. Many variations in these mechanisms exist between individuals, making them more or less susceptible to adverse health effects.

The toxicological profiles for chemical substances of concern at the MCW site have been reviewed. These documents interpret all known information on the substances and specify the level at which people might be harmed.

When performing an exposure assessment, all routes of exposure (ingestion, inhalation, and skin contact) must be considered to establish the overall exposure to a chemical. Because it is difficult to accurately determine the amount of absorption through the skin, MRLs for skin exposure have not been formulated; hence, the health effects resulting from skin exposure are not easily calculated. The levels of many of the chemicals detected are relatively low and generally not widespread. It is unlikely that harmful effects from exposure through skin contact have occurred in the past or will occur in the future. Skin contact, as a route of exposure will not be evaluated additionally. Five different exposure scenarios will be considered to assess the extent of exposure for the various populations which may have been affected in the past or may be affected in the future by site contamination. The scenarios will be considered and referred to throughout this section.

To estimate the exposure dose from past soil ingestion, the following assumptions are made:

1. Adult worker during facility operation

ED (Exposure Duration) = 38 years (Number of years facility operated)
EF (Exposure Frequency) = 250 days/year
IR (Ingestion Rate) = 100 mg/day
BW (Body Weight) = 70 kg

2. Elementary-age child or teenage trespasser

ED = 3 years (Number of years facility abandoned)
EF = 78 days/year (Assumed 3 days/week * 26 weeks/year)
IR = 200 mg/day
BW = 10 kg

To estimate the exposure dose for future soil ingestion, the following assumptions are made:

3. Elementary-age child or teenage trespasser

ED = 13 years (Maximum number of years child 5-18 years old might play/visit)
EF = 78 days/year (Assumed 3 days/week * 26 weeks/year)
IR = 100 mg/day
BW = 30 kg

To estimate the exposure dose for future water ingestion, the following assumptions are made:

4. Child Resident

ED = 70 years
EF = 365 days/year
IR = 1 liter/day
BW= 10 kg

5. Adult Resident

ED = 70 years
EF = 365 days/year
IR = 2 liters/day
BW = 70 kg

Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons have been detected in the soils and sediments on and off the site and in surface water on the site. Exposure to PAHs through soil ingestion may have occurred in the past to adults who worked at the site and to children or teens who may have wandered or played on the site. Exposure may also occur in the future to children or teens who wander or play on the site. Exposure to PAHs through water ingestion may occur in the future if the contaminated groundwater from the site migrates to private well locations near the site and if the residents drink this water.

Polycyclic aromatic hydrocarbons are a group of chemicals formed by combustion and are often found in the environment in smoke, tobacco, creosote, soot, coal and charbroiled meat. PAHs usually occur as complex combinations of chemicals, not as single compounds. More than 100 different PAHs exist. Generally, PAHs are less soluble in water and strongly absorbed to soil, so migration is limited. They bioaccumulate in the food chain and may have additive toxic effects. PAHs can be divided into noncarcinogenic and carcinogenic compounds.

Noncarcinogenic PAHs

Noncarcinogenic PAHs at this site include acenaphthene, anthracene, dibenzofuran, fluoranthene, fluorene, naphthalene, and pyrene. Acenaphthene, anthracene, and fluorene are chemical intermediates in dyes, plastics, pesticides, explosives, and chemotherapeutic agents. Of the noncarcinogenic contaminants detected, fluoranthene is the only PAH which produced tumors in animal laboratory tests. Fluoranthene is used as a lining material to protect the interior of steel and iron drinking water pipes and storage tanks.

Noncarcinogenic PAHs were found on-site in subsurface soil, shallow soil, and monitoring wells; and, they were also found off-site in subsurface soil, surface soil, sediments and surface water. At the reported maximum concentrations, it is not expected that noncarcinogenic PAHs will cause adverse health effects (noncancer) in former workers, or adults and children trespassing on-site who might ingest the surface soil.

Noncarcinogenic PAHs are ubiquitous in soil. Data from national background soil concentrations reveal that urban areas generally have higher levels of noncarcinogenic PAHs than agricultural and rural areas. Noncarcinogenic PAHs may escape from the soil, especially the ones with lower molecular weights (acenaphthene, anthracene, and fluorene).

Carcinogenic PAHs

Studies have found that certain PAHs can cause cancer in animals. There have been no studies located which give evidence of a direct association between human skin exposure to single PAHs and the induction of cancer. There are reports of skin tumors among individuals exposed to mixtures of PAHs. These reports provide qualitative suggestions to the potential of carcinogenicity of PAHs. Studies in animals have documented the ability of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indeno(1,2,3-cd) pyrene to induce skin tumors following intermediate skin exposure. These contaminants are considered complete carcinogens.

Benzo(a)pyrene was detected in the on-site sediments, surface soil, subsurface soil, and off-site in subsurface soil and surface water. A variety of other PAHs, which are considered less toxic than benzo(a)pyrene, were also detected in the on-site sediments, soils and monitoring wells in addition to the off-site subsurface soils. The estimated exposure doses were calculated using the maximum concentration for benzo(a)pyrene detected, benzo(a)pyrene toxic equivalency factors, and the assumptions of soil exposure scenarios presented in the Toxicologic Evaluation introduction. By using this approach, the carcinogenic influence of other PAHs can be approximated based on their proportional potency to benzo(a)pyrene.

Carcinogenic PAHs were found on-site in subsurface soil, surface soil, and monitoring wells. There is a moderate increase in cancer risk posed to former workers who may have ingested on-site subsurface soil and surface soil. There is a high increase in cancer risk to former workers if they ingested the maximum concentrations of carcinogenic PAHs found in on-site monitoring wells. A low increase in cancer risk is posed to adults who trespass on-site and ingest PAH-contaminated water from monitoring wells. There is no apparent increased cancer risk posed to adults who may trespass on-site and incidentally ingest subsurface soil or surface soil contaminated with PAHs.

Carcinogenic PAHs were also found off-site in subsurface soil, surface soil, sediments and surface water. There is no apparent increased cancer risk to adults with ingesting PAH-contaminated surface soil and sediments off-site. There is no increased cancer risk associated with ingestion of off-site surface water contaminated with low levels of PAHs. A moderate increase in cancer risk is posed to adults ingesting contaminated subsurface soil off-site through gardening or similar disruptive activity.

Benzo(a)pyrene is classified as an EPA group B2 carcinogen, a probable human carcinogen. Other probable carcinogens found at the site, although detected at lower levels and not as toxic as benzo(a)pyrene, are chrysene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene.

Pesticides

Aldrin
Aldrin is a insecticide that was used for timber preservation (to kill termites) among its other many uses. Aldrin was detected on-site in shallow and subsurface soils, and off-site in the ditch and subsurface soil. At the reported maximum concentrations, it is not expected that aldrin will cause adverse health effects (noncancer or cancer) in former workers or adults trespassing on-site and come in contact with the surface soil. It is unlikely children who wander on-site or play in the drainage ditch will experience adverse health effects (noncancer or cancer).

Heptachlor Epoxide
Heptachlor is a manmade chemical that was used in the past as a component of insecticides in homes, buildings, and on food crops. Heptachlor epoxide is a breakdown product of heptachlor. Heptachlor epoxide was detected on-site in surface, as well as subsurface, soils. Heptachlor epoxide was used as a termiticide; and, its presence is thought to be site-related. Maximum levels of heptachlor epoxide in on-site surface and subsurface soils were used to estimate the risks to residents and workers.

Noncancer health effects are not expected to occur in former workers exposed to soil on-site or children exposed to off-site surface soil and sediments. Very little is known about the effects of this contaminant after skin and inhalation exposures of workers or trespassers.

Heptachlor epoxide is classified as a possible human carcinogen, Group B2, under EPA's guidelines for carcinogen risk assessment based on positive cancer animal studies. Heptachlor epoxide is classified as Group 3[a] by the International Agency for Research on Cancer (IARC); that is, this agent is not classifiable as to its carcinogenicity to humans. The potential cancer risk posed by this contaminant was evaluated; and, it was found that at maximum detected concentrations in on-site surface and subsurface soil, that there is no significant cancer risk for past workers and future residents.

Metals

Arsenic
Arsenic was detected in the on-site monitoring wells and surface soil, and off-site in groundwater, sediment, surface soil and subsurface soil. Levels of arsenic in on-site monitoring wells were used to estimate the potential risk to future residents. The presence of arsenic in the off-site groundwater is not believed to be site-related, but representative of naturally-occurring background concentrations. Arsenic's presence in off-site sediment, surface water, and subsurface soil may or may not be related to the contamination on the site. The residents whose water contained arsenic and who use their water for cooking and drinking were exposed in the

past and will be exposed in the future if they continue these practices. Sediment and surface soil provide routes of exposure to those who have contact with these sources.

Ingestion of the residential well water containing the maximum concentration of arsenic is not expected to produce noncancer health effects for residents assuming that the reported concentration is representative of past and current arsenic contamination. Arsenic is a known human carcinogen. Ingestion of the well water for 70 years by a resident would result in an increased cancer risk for the resident.

Arsenic concentrations are significantly elevated in on-site monitoring wells. It is not known if the groundwater contamination could migrate off-site. Arsenic is classified as an EPA Group A carcinogen, a known human carcinogen. If the contamination did migrate off-site to private wells based on the values recorded for the monitoring wells, both cancer and noncancer health effects are expected to occur. There is a moderate increase in probability of developing cancer over a lifetime from exposure by ingestion of arsenic at levels detected in monitoring wells if this groundwater migrated to residential wells.

Off-site contaminated surface soil, subsurface soil and sediment is not expected to produce noncancer or cancer health effects to adults or children who ingest soil incidentally. There is no apparent increase in the risk of cancer for former workers who ingest contaminated soil on-site. No adverse noncancer health effects are expected in former workers who came into contact with contaminated surface soil. Additionally, there is no increased noncancer or cancer risk to children from ingestion of surface soil contaminated with arsenic on-site.

Barium

Barium was detected in on-site monitoring wells. It is unlikely that anyone would drink from a monitoring well; however, a dose was calculated for children who might trespass on the site and ingest the maximum concentration of barium-contaminated water found in the 1996 monitoring well sampling event. At the maximum concentration detected, no adverse noncancer health effects are expected in adults or children who may trespass and ingest barium- contaminated water from on-site monitoring wells.

DHHS, EPA, and IARC have not classified barium as to its carcinogenicity in humans. This metal has not been classified because the available animal studies were inadequate to determine whether or not barium causes cancer and there are no studies in people.

Beryllium

Beryllium was detected on-site in the surface and subsurface soils and off-site in the ditch and sediment. Exposure to beryllium through soil ingestion may have occurred in the past to adults

who worked at the site and to children or teens who may have wandered or played on the site. Exposure may also occur in the future to children or teens who wander or play on the site. Exposure to beryllium through water ingestion may occur in the future if soil or sediment contaminants migrate to private well locations near the site and if the residents drink this water.

Studies have found that beryllium can cause cancer in animals but there have been no studies to prove that it can cause cancer in humans. Beryllium is classified as an EPA group B2 carcinogen, a probable human carcinogen. To determine the possible cancer risk to humans from
beryllium, we must estimate from the animal studies the likelihood that humans will get cancer.

There is no increased noncancer or cancer risk for adults, children and former workers who have incidentally ingested beryllium-contaminated surface and subsurface soil on-site and in the off-site ditch and sediment.

Mercury

Mercury is a ubiquitous contaminant which occurs throughout the world. Potential sources of mercury to Louisiana's waters include atmospheric deposition, the alkali industry, natural geologic deposits and agricultural use as seed dressings. The most common form of organic mercury is methylmercury. It is produced by tiny organisms in the soil and water interacting with metallic mercury; the more mercury present in the environment can increase the amount of methylmercury produced by these organisms. The presence of mercury in the on-site surface and subsurface soils may be related to contamination on-site.

Mercury was detected above the comparison value in on-site subsurface soil. At the maximum concentration discovered, there are not expected to be any adverse noncancer effects to adults trespassing on-site who may ingest contaminated soil. The maximum concentration found in on-site subsurface soil poses noncancer health effects in children who ingest contaminated subsurface soil. If children were to ingest mercury-contaminated subsurface soil, with the application of the same assumptions for ingestion rate of surface soil, developmental health effects such as delayed walking and abnormal motor scores are expected.

ATSDR has derived acute oral/intermediate MRL for organic mercury based on developmental effects in rats. Children are a sensitive population to this type of outcome. Concentrations above the MRL have resulted in developmental effects in rats.

Mercury is classified as an EPA Group D, which indicates that it is not classifiable as to human carcinogenicity. There is a lack of data from studies on humans and laboratory animals.

B. Health Outcome Data Evaluation

Because of community concern, cancer data from the Louisiana Tumor Registry were evaluated to screen for any elevated health outcomes in the area. This evaluation cannot determine the association with the MCW site contaminants or any other possible factors, but simply serves as a starting point for any further health investigation, if needed.

Cancer incidence data from 1988-1992 (the most recent available) was obtained from the Tumor Registry for the eight parish area of Southeast Louisiana and census tract 40301 (see figure 3), which includes the Madisonville Creosote Works site. The most recent population estimates used are from the 1990 U.S. Bureau of the Census. See Appendix C for the tables showing the number of cases observed, the rates, and the number of cases expected by cancer site.

The following observation was made by comparing the cancer incidence rates of census tract 40301 to those of the thirty-five parish area of Southeast Louisiana. For all sites (types) of cancer combined and for lung, breast, prostate, and colon cancer calculated separately; the observed number of cases for the census tract 40301 are within the expected range as compared with the regional rates. Only those types of cancer with more than 4 observed cases over the five-year period were evaluated separately. No statistically significant difference was detected between the observed and expected cases; some were slightly higher than expected, some were slightly lower, but this variation is anticipated when using small populations like census tracts.

6. COMMUNITY HEALTH CONCERNS

A. Public Meetings and Activities

September 10, 1996

An EPA open house meeting was held on the evening of September 10, 1996. Approximately 30-50 people attended. Residents stressed concern that site-related material was on their properties. Throughout the meeting, citizens' concerns about their property value was the most frequent complaint heard. A resident of Koepp Road was concerned about her children playing behind her yard, in the marsh. She stated that her dog returns from the marsh smelling of creosote.

Two women present were concerned about the potential for residents to develop health effects such as cancer from past exposures to site contaminants. These women felt there was an excess of cancers in the Madisonville area. No specific types of cancers were named and they felt the cancers may be caused by many factors and not just from exposure to site contaminants. Another citizen was concerned about contamination of his well water. His family now drinks bottled water since "someone found contamination" in his well. He does not know who tested, nor testing results. No state or local agency has set up a formal citizens assistance or advisory panel.

February 6, 1997

After a site tour, LOPH representatives attended an EPA town meeting to update residents on removal activities on-site. The meeting was held in Madisonville's town hall on St. Francis Street. About twenty residents attended the meeting. The residents were well informed and are pleased with EPA efforts thus far; yet, they are anxious for remediation to begin.

Many residents present had concerns about the extent of pollution on the land and in the stream and marsh immediately south of the site. They feel that large, potentially hazardous amounts of creosote have drained into the unnamed stream and adjacent wetlands. Those who hunt and fish may be exposed at higher risk. About three residents were particularly concerned about the possibility of increased cancer occurrences in the Madisonville area. Attendees representing the Section of Environmental Epidemiology and Toxicology informed them of the general nature of the state's tumor registry and explained the purpose of a Community Assistance Panel. One resident stated that a group called Citizens for a Clean Highway 22 already exists and may soon consider a TAG proposal.

March 10-11, 1997

On March 10 and 11, Operational Technologies met with members of the community, representatives of the media, and local officials to conduct community interviews, which will develop the basis for EPA's Community Relations Plan for the MCW site. The results of the interviews have not been provided to LOPH yet.

B. Community Health Concerns Evaluation

Is there a possibility that the private wells around the site are or could become contaminated?

Private wells around the site have show no sign of contamination relating to past activities on the site. One residential well was found to contain arsenic, which is thought to be representative of background values.

Do the residents around the Madisonville Creosote Works site have a higher cancer rate than expected?

Cancer incidence rates from 1988-1992 were calculated for the Madisonville community in census tract 40301 and compared with the Southeastern Louisiana Region . In general, cancer rates were within the expected range for the area. More detailed information is available in the Health Outcome Data Evaluation section of this Public Health Assessment.

Is there a health threat by eating food from the wetlands?

The plants and animals in the wetlands have not been tested for site contaminants, so it is difficult to say for sure that they are free from contamination; however, consumption of wildlife in the area would be infrequent since the wetlands area is covered with thick vegetation and is difficult to access. Therefore, exposure to contaminants through ingestion of plant and animals is assumed minimal.

Who should be contacted about developing municipal water systems in the area?

The Louisiana Office of Public Health, Safe Drinking Water Program should be contacted for guidance in construction of municipal water systems.

Address:	DHH Safe Drinking Water Program 325 Loyola Avenue, Room 403 New Orleans, LA 70112
Phone #:	(504) 568-5101

7. CONCLUSIONS

1. The Madisonville Creosote Works site posed a public health hazard in the past because of worker exposure to contaminants in soil. At present, the level of contaminants are not expected to cause adverse health effects in trespassers, remedial workers, or area residents. However, if contaminated shallow groundwater migrates off-site or if MCW land use changes, site contaminants may pose a future health concern.

6. The contamination levels in the surface soil on and off-site are not expected to cause adverse health effects for trespassers and residents; however, former workers may have a moderate increase in cancer risk from ingestion of PAH-contaminated on-site surface soil.

7. The contamination levels of arsenic in subsurface soil (including ditch) off-site are not expected to cause adverse health effects for trespassers and residents. The level of mercury in on-site subsurface soil and the level of PAHs in off-site subsurface soil are of health concern if workers and residents are exposed regularly and ingest the soil in similar amounts as assumed with surface soil.

8. The contamination levels of arsenic and PAHs in the shallow groundwater under the site, as detected in the monitoring well, are not expected to cause adverse noncancer health effects for trespassers and residents. However, they would pose a increased cancer risk for former workers or trespassers if they drank the water from on-site, shallow wells on a regular basis.

9. Arsenic was detected in one off-site residential well. It's presence is not believed to be site-related, but representative of naturally-occurring background concentrations. The level of arsenic in the residential well is not expected to cause adverse noncancer health effects for residents and visitors; however, residents may have a low increased cancer risk if this water is consumed over 70 years.

10. The contamination levels in the sediment off-site are not expected to cause adverse health effects for trespassers and residents. Surface water has been determined to be uncontaminated.

11. Community health concerns include the possibility of increased cancer rates in the area, migration of site-related contamination to residential property, exposure of local children to the site contaminants, and decreased well water quality related to the site.

12. Cancer incidence data were reviewed for the Madisonville area and no statistically, significant difference was found between the cancer incidence rates near Madisonville as compared with the Southeast Louisiana Region.

8. RECOMMENDATIONS

1. Secure the site to prevent trespassing and place warning signs around the perimeter to identify MCW as a hazardous waste site.

2. Place warning signs or inform area residents that children should not play in ditches and in streambeds near the facility until authorities verify these areas as uncontaminated.

3. Reduce levels of contamination in off-site soil or limit the residents' exposure to areas of off-site contamination.

4. Provide on-site workers with adequate protective equipment and training, in accordance with 29 CFR 1910.120, and follow appropriate National Institute for Occupational Safety and Occupational Safety and Health Administration regulations.

5. Conduct long-term monitoring of the groundwater, including nearby residential well water, to ensure that the on-site shallow water contamination does not migrate from the site.

6. Discuss the results of private well sampling with the owners and residents. Inform the resident, whose well water had elevated levels of arsenic, of possible health risks involved with long-term use.

7. Sample area wildlife for site contaminants as determined necessary by reports of hunting and fishing activities in the wetlands south of the site and ecological plausibility.

8. Update this Public Health Assessment with latest sampling data from EPA's 1996 Remedial Investigation when available and with community interview results.

Public Health Actions

The following section describes actions taken by ATSDR and/or LOPH at the Madisonville Creosote Works site and surrounding areas. It also describes actions planned. The purpose of this section is to ensure that the public health assessment identifies public health hazards and provides a plan of action to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances found at the site. Included is a commitment by ATSDR/LOPH to follow-up on these actions to ensure that they are carried out. The following are public health actions planned by ATSDR/LOPH.

Actions Planned:

1. LOPH will recommend that the appropriate state or federal improve site security as specified in the public health assessment.

9. LOPH will conduct a public meeting to explain the result of the public health assessment.

10. LOPH will monitor parish health statistics on a regular basis, using Geographical Information System technology, due to community concerns about health effects from site contaminants.

11. LOPH will recommend that the appropriate state or local agency institute measures to ensure that new shallow residential wells are not located within the contaminated alluvial plume beneath the site.

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10. REFERENCES

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Toxicological Profile for Beryllium, ATSDR, April, 1993.

Toxicological Profile for Creosote, ATSDR, August, 1996.

Toxicological Profile for Mercury, ATSDR, May, 1994.

Toxicological Profile for Heptachlor/Heptachlor Epoxide, ATSDR, April, 1993.

Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHs), ATSDR, August, 1995.

11. APPENDICES

APPENDIX A: Figures:

Figure 1 Site Location Map
Figure 2 Site and Areas of Off-Site Remedial Investigation
Figure 3 Location of Census Tract 40301

APPENDIX B: Comparison Values

APPENDIX C: Health Outcome Data

Appendix A

Appendix B

COMPARISON VALUES

Comparison values for ATSDR public health assessments are contaminant concentrations in specific media that are used to select contaminants for further evaluation as to potential public health effects. The values provide guidelines used to estimate a dose at which health effects might be observed. Below is a list and description of the comparison values used in the section Environmental Contamination and Other Hazards and in the Public Health Implications sections of this public health assessment. Also enclosed are other acronyms used in this PHA.

CREG = Cancer Risk Evaluation Guide
EMEG = Environmental Media Evaluation Guide
aEMEG = Environmental Media Evaluation Guide based on acute Minimal Risk Level
EPA SA = Environmental Protection Agency Site Assessment
MCL = Maximum Contaminant Level (µg/L)
MCLG = Maximum Contamination Level Goal (µg/L)
PMCLG = Proposed Maximum Contaminant Level Goal
MRL = Minimal Risk Level (mg/kg/day)
IMRL = Intermediate Risk Level
CMRL = Chronic Risk Level
LTHA = Lifetime Health Advisory
PEL = Permissible Exposure Limit (mg/m^3)
REL = Recommended Exposure Limit (mg/m^3)
RfD = Reference Dose (mg/kg/day)
RfC = Reference Concentration (mg/m^3)
RMEG = Environmental Media Evaluation Guide based on EPA's RfD or RfC
ppm = parts per million
= milligram per liter (mg/L water)
= milligram per kilogram (mg/kg soil)
ppb = parts per billion
= microgram per liter (µg/L water)
= microgram per kilogram (µg/kg soil)
kg = kilogram
mg = milligram
µg = microgram
pg = picogram
L = liter
ATSDR = Agency for Toxic Substances and Disease Registry
NAAQS = National Ambient Air Quality Standards
LDEQ = Louisiana Department of Environmental Quality
DHH = Louisiana Department of Health and Hospitals
EPA = Environmental Protection Agency
LOPH= Louisiana Office of Public Health
SIR = Standard Cancer Incidence Ratio

Cancer Risk Evaluation Guides (CREGs) are estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million ($10E^{-6}$) persons exposed over a lifetime. CREGs are calculated from EPA's cancer slope factors.

EPA has not established a final cancer slope factor for benzo(a)pyrene. Therefore, the comparison value used for carcinogenic PAHs is based on an interim cancer slope factor.

The drinking water equivalent level (DWEL) is a lifetime exposure level specific for drinking water (assuming that all exposure is from that medium) at which adverse, noncarcinogenic health effects are not expected to occur.

Environmental Media Evaluation Guides (EMEGs) are based on ATSDR minimal risk levels (MRLs) and factor in body weight and ingestion rates.

Maximum Contaminant Levels (MCLs) represent chemical concentrations that EPA deems protective of public health (considering the availability and economics of water treatment technology) over a lifetime (70 years) at an exposure rate of two liters of water per day (for an adult).

Maximum Contaminant Level Goals (MCLG) are drinking water health goals set at levels at which no known or anticipated adverse effects on the health of persons occurs and which allows an adequate margin of safety. Such levels consider the possible impact of synergistic effects, long-term and multi-stage exposures, and the existence of more susceptible groups in the population. When there is no safe threshold for a contaminant, the MCLG should be set at zero.

A Minimal Risk Level (MRL) is an estimate of daily human exposure to a chemical (mg/kg/day) that is not likely to cause an appreciable risk of deleterious effects (noncarcinogenic) over a specified duration of exposure. MRLs are based on human and animal studies and are reported for acute (≤14 days), intermediate (15-364 days), and chronic (≥365 days) exposures. MRLs are published in ATSDR Toxicological profiles for specific chemicals.

The Occupational Safety and Health Administration's Permissible Exposure Limit (PEL) in air is an 8-hour, time-weighted average developed for the workplace. The level may be exceeded, but the sum of the exposure levels averaged over 8 hours must not exceed the limit.

EPA's Reference Dose (RfD) is an estimate of the daily exposure to a contaminant that is unlikely to cause adverse health effects. RfDs do not consider carcinogenic effects.

Appendix C

HEALTH OUTCOME DATA SOURCE

LOUISIANA TUMOR REGISTRY:

The Louisiana Tumor Registry (LTR) is a population-based registry which covers all hospitals, radiation centers and pathology laboratories in the state. The LTR was established in 1974 by Charity Hospital at New Orleans as a cancer registry for the New Orleans area and as a participant of the National Cancer Institute, (NCI). In 1979, it was transferred to the states Office of Public Health as a pilot for a statewide registry. The LTR is now provided by the Louisianan State University Medical Center, P.O. Box 60630, New Orleans LA, 70160 (504-568-2616). Since 1983, LTR has gradually expanded by region, to cover the entire state by 1988.

The LTR is composed of 5 regional registries; each responsible for the complete recording of all cancer cases diagnosed and/or treated within its region. A monograph was produced in 1990 which includes all cases of cancer diagnosed during the period from January 1, 1983 through December 31, 1990. The monograph lists frequency of tumor occurrence (incident) cases by age, adjusted incidence rates by race, sex and region, cumulative rates (age 0 - >74) and average annual age-adjusted rates. Incidence rates are computed using population estimates by age, sex, and race for each geographic region. The population estimates are obtained from the U.S. Bureau of the Census and Louisiana Tech University. In addition to the monograph, the number of cases grouped by cancer type, zip code and/or block group, age, and sex are maintained on a computerized database. This information is available for all of Louisiana from 1983 to 1990.

OFFICE OF VITAL STATISTICS:

The Office of Vital Statistics has been officially collecting vital statistics in Louisiana since 1877. At that time, the Louisiana Legislature transferred the Orleans Parish Vital Records Registry to the Louisiana Board of Health. The office is a participator in the national birth and death registration system and provides stillbirth and marriage data to the National Center for Health Statistics and Induced Abortion data to Centers for Disease Control. Certificates of vital events and reports of communicable diseases are listed by address, from 1960 to the present and are available upon request. In addition, a monograph displaying trends in disease by Parish is produced annually.