

Health Assessment for

PETROLEUM PRODUCTS COMPANY SITE

CERCLIS NO. FLD980798698

BROWARD COUNTY

PEMBROKE PARK, FLORIDA

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

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THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104(i) (7) (A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potentials risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risk assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, this Health Assessment has been conducted. Additional health assessments may be conducted for this site as more information becomes available to ATSDR.

HEALTH ASSESSMENT
PETROLEUM PRODUCTS COMPANY SITE
PEMBROKE PARK, BROWARD COUNTY, FLORIDA

Prepared by:
State Health Office
Florida Department of Health and Rehabilitative Services (HRS)

Prepared for:
Agency for Toxic Substances and Disease Registry (ATSDR)

SUMMARY

The Petroleum Products Company was located in Pembroke Park, Broward County, Florida, approximately 0.2 mile west of Interstate 95, 1.5 miles north of the Broward County-Dade County Line, and 10 miles south of Ft. Lauderdale. In 1985, the site was converted to the Pembroke Park Mini Warehouses, where most of the rented mini-warehouses have been converted to small industrial businesses. Surficial and intermediate ground water at the site are contaminated with lead, chromium, aluminum, iron, manganese, and benzene. A 20-inch thick waste oil layer is floating on the surficial aquifer beneath the mini warehouses. Surface run-off water is contaminated with lead. Surface soil and deep soil (10 ft - 35 ft) at the site and from the surrounding areas have been found to contain high levels of lead. The residences in the area receive water from the municipal water system. Private well water is used for irrigation. This site is of potential public health concern because contaminants are found in off-site surficial and intermediate aquifers and in off-site surface soils. The population at risk are employees at businesses at the site and the residents who live in the nearby trailer parks. Exposure may occur through contact with waste oil that seeps up to the surface and lead in surface soil and surface water run-off.

BACKGROUND

A. SITE DESCRIPTION

The Petroleum Products Company (PPC) site is a National Priorities List (NPL) site located in Pembroke Park, Florida, approximately 0.2 mile west of Interstate 95, 1.5 miles north of the Broward County-Dade County line, and 10 miles south of Ft. Lauderdale. The area surrounding the site is highly developed and contains a high density residential population as well as a variety of commercial/industrial operations. The site lies within the radius of influence of two major municipal well fields: the Hallandale well field, approximately 1 mile east-southeast of the site; and the Hollywood well field, approximately 1.5 miles northwest of the site (see Figure 1). The pump rate of the Hallandale well field is about 1 to 7 million gallons per day (MGD), and the pump rate of the Hollywood well field is about 17 to 20 MGD.

The site is currently occupied by an active commercial/industrial warehouse complex known as the Pembroke Park Mini Warehouse. An area in the southeastern corner of the site, including a fenced area that contained the former PPC tank farm, is the only portion of the site that was not sold and remains unpaved. The fenced area is currently being used to store drilling mud from the Remedial Investigation (RI) fieldwork and to recover waste oil from the surficial aquifer. Most of the warehouse complex is paved with asphalt or concrete. Other major unpaved areas include Carolina Road between Park Road and Southwest 32nd Avenue, the strip of land east of the buildings that front on Park Road, the strip of land south of the Park Road entrance into the warehouse complex, and the Kennel's areas (a dog training facility), north of the Park Road entrance.

A topographic survey conducted as part of the RI indicated that land surface elevations within the warehouse complex may be as much as four feet above areas south and west of the site (soil borings conducted as part of the RI showed that most of the upper eight to ten feet of soil in the warehouse complex is fill material).

South and west of the site are two trailer parks: Bamboo Paradise and Bamboo Lake. A number of man-made recreational lakes are located within the trailer parks. North of the site on the Orange Brook golf course is a series of shallow, interconnected, small lakes. Water from the lakes is used for irrigation by both trailer parks and the golf course. At present, there does not appear to be any surface water runoff from the site to the lakes. Most of the site and surrounding area drains internally. A number of drainage culverts are present in the warehouse complex. Ten of the culverts on the northern half of the warehouse complex include drainage wells. Gravel-filled drainage pits have been constructed in many areas of the Bamboo Paradise Trailer Park. Overall, the site and surrounding areas are poorly drained, and extensive local ponds appear after any significant rainfall.

The warehouse complex and surrounding area support a variety of small commercial/industrial operations. The site is fairly active even on weekends and evenings. An anodizing facility was formerly located at the corner of Park and Carolina Road. A spray-painting operation near the corner of Park and Carolina is currently under a separate enforcement action to determine the extent of contamination that resulted when some of its storage drums were stolen and the contents poured onto the ground or into the drainage/or sewer systems.

The site history indicated that the PPC facility operated from 1958 to the 1970's under various company names as a broker and processor of used petroleum and other hydrocarbon products. It is suspected from earlier sample analyses that other materials such as solvents were handled at the site. A sulfuric acid/clay process was used at the site to refine used motor oil.

In 1970, community concern increased after an overflow of the disposal pit following heavy rain produced an oil slick on the trailer park lakes. PPC initiated major changes in its operation including selling of most of the PPC property. The northern half of PPC property was cleared and the disposal pit filled in, although the tank farm was still present. In 1971, the PPC site was transformed into a storage/distribution facility and with no major changes until 1981, except the reduction of the number of tanks in the tank farm.

In May 1979, a site inspection made by the Broward County Environmental Quality Control Board (BCEQCB) resulted in issuance of a warning notice concerning oil/water discharges from the tank farm bermed area and seepage of oil from filled pits. The oil and water discharges were observed to have pooled in depressions. On June 20 and June 25, 1979, a second warning notice was issued, citing the above violation. PPC implemented cleanup of two oil-soaked areas, rehabilitation of the tank farm berm, and filling of low spots with the clean fill.

In October 1980, the BCEQCB received a letter from the Environmental Protection Agency (EPA) Region IV Office concerning a complaint EPA had received reporting oil seepage within a warehouse and through parking lot asphalt on the PPC site. The resulting investigation was not performed until June 1983, when the Florida Department of Environmental Regulation (DER) issued a notice of violation and requested PPC to remove all waste oils from the site and to submit a detailed sampling and analysis plan. PPC hired Dames and Moore, Inc., and in February 1984 remediation work started.

In October of 1984, DER hired Environmental Science and Engineering, Inc. (ESE) to determine the extent of free hydrocarbon contamination at PPC.

In 1985, DER hired O.H. Materials Inc., to install a free-product recovery system in the tank farm area. A new recovery system was installed in April 1987. According to the DER site project manager, about 2,400 gallons of oil waste from the surficial aquifer has been recovered. The tank farm was deconstructed and fenced with barbwire to prevent trespassing and to protect the oil recovery system.

In 1986, DER hired Ecology and Environment to conduct a Remediation Investigation/Feasibility Study (RI/FS). According to the FS, alternative treatment would consist of the construction of a water treatment plant to remove metals from contaminated ground water and washing contaminated soils by a specific solvent solution. This would possibly require removing six warehouse storage buildings at the site and two rows of trailers at the Bamboo Paradise Trailer Park.

B. SITE VISIT

A site visit was conducted by staff from HRS on September 8, 1988, and with the DER project manager. The PPC site is located in the middle of a business area. It is now a mini-warehouse industrial park which has been in business since 1985. Most of the rented mini-warehouses were converted into businesses such as automobile repair shops, a boat shop, a ceramics shop, and a snack bar. The former PPC site is surrounded by other business complexes: Atlantic Generator I and II, Southern Street Lighting and Cabot Warehouse. No traces of waste material from the oil recovery were seen in the surrounding areas of the PPC site. The manager of Bamboo Trailer Park (Bamboo Paradise & Bamboo Lake) reported that the parks have had no problems of water or material overflow from the former PPC site for years. However, oil wastes (black viscous oil) were seen at the sump in mini warehouse #561 and on the street at the front of a mini warehouse across from warehouse #561. The viscous waste oil has seeped up to the surface, according to the site project manager. This phenomenon occurs during periods of heavy rainfall.

ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

A. ON-SITE CONTAMINATION

Contaminants of concern at the site consist of the following:

<u>MEDIA</u>	<u>CONTAMINANT</u>	<u>RANGE (UNIT)</u>		
Surficial Aquifer	Black Oil	18"	- 20"	thickness
	Lead	24.6	- 2,589	ug/L
	Chromium	<10	- 1,100	ug/L
	Aluminum	647	-376,000	ug/L
	Iron	1960	- 77,100	ug/L
	Manganese	57.1	- 308	ug/L
	Benzene	<2	- 60	ug/L
Drainage Wells	Lead	627	- 5,990	ug/L
	Chromium	33	- 294	ug/L
	Manganese	28	- 50	ug/L
Surface Soil	Lead	84.6	- 22,400	mg/kg
Deep soil >10 - 35 ft.	Lead	74.1	- 2,250	mg/kg
Sludge	Lead	516	- 14,000	mg/kg
Surface Water Runoff	Lead	<100	- 360	ug/L

B. OFF-SITE CONTAMINATION

Analytical results of the RI indicate that off-site contamination appears to be in ground water and soils in the south, east, and west areas adjacent to the site (see Figure 2). The contaminants of concern consist of the following.

<u>MEDIA</u>	<u>LOCATION</u>	<u>CONTAMINANT</u>	<u>RANGE (UNIT)</u> (ug/L)		<u>FREQUENCY</u>
Surficial South Aquifer		Aluminum	44,100	- 202,000	3/3
		Chromium	139	- 474	3/3
		Iron	11,700	- 27,600	3/3
		Lead	58	- 161	2/3
		Manganese	77.6	- 99.6	1/3
	East	Chromium	468		1/1
		Aluminum	169,000		1/1
		Iron	34,600		1/1
		Lead	219		1/1
		Manganese	99.6		1/1

<u>MEDIA</u>	<u>LOCATION</u>	<u>CONTAMINANT</u>	<u>RANGE (UNIT)</u> (ug/L)	<u>FREQUENCY</u>
	West	Aluminum	10,500	1/1
		Iron	5,250	1/1
		Lead	1,800	1/1
		Manganese	97.2	1/1
		Trichloroethylene	5.1	1/1
			(ug/L)	
Intermediate Aquifer	South	Aluminum	1,440	1/1
		Iron	757	1/1
	East	Aluminum	<200 - 2,560	3/5
		Iron	175 - 598	3/5
Surface Soil			(mg/kg)	
	South	Arsenic	<1.5 - 4.38	5/8
		Lead	<1.5 - 5.090	2/4
	East	Lead	3.87 - 1,860	1/3
	West	Arsenic	<1.5 - 1.58	1/2

Frequency = # of samples that exceeded the health concern level/total samples tested

C. PHYSICAL HAZARDS

No physical hazards are known to exist at the site.

DEMOGRAPHICS

The PPC site is located at 3130 S.W. 17th Street, Pembroke Park. The area surrounding the PPC site is a rapidly developing and growing residential area which supports a variety of recreational and industrial activities. Directly north of the PPC property is a golf course and at the eastern boundary of the site are located a business warehouse complex and a boat manufacturing company. Directly west of the PPC property line are Kennel's buildings. Two trailer parks, Bamboo Paradise and Bamboo Lake, located at the south boundary of the site, have past histories of receiving PPC waste overflow. There are 46 and 96 residents, respectively, in the Bamboo Paradise and Bamboo Lake trailer parks. All residents of both parks are adults. The population of Pembroke Park is approximately 20,000.

EVALUATION

A. SITE CHARACTERIZATION (DATA NEEDS AND EVALUATION)

1) Environmental Media

The investigation at the PPC site located multiple areas of metals contamination in surface soils and a plume of lead contamination in the surficial aquifer. However, the ground water plume of lead contamination at concentrations less than 5 ug/L was not well defined (the south and west sections of the plume).

2) Demographics and Land Use

No further information is required.

3) Quality Assurance/Quality Control (QA/QC)

The Quality Assurance and Quality Control (QA/QC) data that were included in the RI consist of results for analyses of several blank and duplicate samples. No contaminants were detected in the blank samples. The conclusions presented in this health assessment are based on the data contained in the RI. The validity of these conclusions are, therefore, dependent on the quality of the data provided.

The detection limits for some compounds such as Al (<200 ug/L) and Se (<50 ug/L) in water were higher than the recommended levels given by EPA, therefore, those analytical results were not appropriate for health-related criteria.

B. ENVIRONMENTAL PATHWAYS

Ground water: Ground water beneath the site consists of the surficial aquifer, intermediate aquifer, and Floridan aquifer. The surficial aquifer is heavily contaminated with waste oil, lead, chromium, aluminum, iron, manganese and benzene. The metals found in the surficial aquifer are also found in the intermediate aquifer at the PPC site at lower concentrations. The Floridan aquifer at the site is not contaminated. The off-site surficial and intermediate aquifers were found to be contaminated with similar contaminants in the areas south, east, and west of the PPC site.

The surficial aquifer is located in the soft limestone bedrock. Soil boring results from 20 - 30 feet depths indicated that this limestone is interbedded with higher percentage of sand, silt, and shell fragments. A deep well boring shows little lithologic variation between 30 feet and 200 feet. In deep wells, drilling mud had to be added continually to prevent loss of circulation, suggesting the presence of voids and cavities. The soil at the PPC site is very permeable. Therefore, migration of contaminated water from the upper aquifers into the Floridan aquifer will likely occur in the near future.

Surface soil (0-20 feet): Surface soil at the PPC site is highly contaminated with lead. High off-site lead concentrations were found only at the corner of Carolina Road and S.W. 31st Avenue (near the tank farm). Arsenic concentrations were of health concern at off-site areas, south and west areas of the site. The site and surrounding areas are developed and landscaped, therefore, inhalation of wind blown contaminated dust is not a current concern. This could be a concern during remediation.

Surface water: The Pembroke Park is a flat area, with a few man-made high-lying land areas. The elevation of the PPC site was raised about 5 inches when the waste oil pit was refilled. No disposal ponds or ditches are located on site. Surface water at the site is collected by drainage wells. The RI indicated that the drainage well water showed high concentrations of lead and moderate concentrations of chromium and manganese. Off-site surface waters from the nearby lakes, however, are not contaminated. The PPC site is located in a flooding area (the average annual rainfall is 60 inches per year). The contaminants found in drainage water may be carried by surface water run-off into the lakes at Bamboo Trailer Park, Ted's Aqua Golf course, and into the business complex at the PPC site.

Air: Analytical results of air sampling are not reported in the RI. However, the RI report mentioned that a strong smell of solvents was recognized from the open monitoring wells. Monitoring wells are normally capped, except the monitoring/recovery well in the fenced area. The air exposure pathway at the PPC site has not been fully evaluated. During remediation, the potential may be increased for the air exposure pathway to become an environmental pathway of concern.

C. HUMAN EXPOSURE PATHWAYS

Contamination of the environmental media identified above constitutes the following potential human exposure pathways.

1. Ingestion, dermal absorption, and inhalation of contaminated ground water. Analytical results showed that surficial and intermediate aquifers of the PPC site and off-site areas, south, west, and east of the site are contaminated. According to DER files, there are reports that people became ill after drinking water supplied by several of the private wells in the area. According to the RI, all drinking water in the area is currently provided by the Hallandale well field. Migration of contaminated ground water into the Floridan aquifer may contaminate the aquifer utilized by the Hallandale well field which would result in human exposures via ingestion to a large population. However, only Wells #7 and #8 of Hallandale well field are currently being used with additional water supplied by the North Miami utilities. These wells are sampled on a yearly basis. Dermal absorption and inhalation of contaminants in the ground water may occur to residents in the area who have irrigation wells.

2. Ingestion, inhalation, and dermal exposure to contaminated soil. Inhalation of contaminated soils is not a concern at the present time because most of the contaminated soil at the PPC site is beneath asphalt. However, when the PPC site is activated for cleanup, the population at risk would be remediation workers and residents in the Bamboo Paradise and Bamboo Lake trailer parks.
3. Ingestion and dermal absorption of contaminated surface water and sediment. The analytical results of water and sediments at the lakes surrounding the PPC site show that concentrations of lead, arsenic, and other contaminants are below the levels of health concern. However, the flooding problem at the site shows that there is a potential of dermal absorption of contaminated drainage well water by people working in the shops at the former PPC site.

PUBLIC HEALTH IMPLICATIONS

Each contaminant of concern will be discussed as it relates to potential to elicit acute and chronic health effects. In addition, emphasis will be placed on potential health threats through identified exposure pathways.

Lead - Because surface soils at the site are highly contaminated with lead, potential human exposure pathways to on-site soil are ingestion, inhalation of suspended particles and dust, and direct dermal contact. These human exposure pathways may not pose a potential health concern to current on-site workers because most of the surface soil at the site is capped with asphalt. However, exposure pathways would be of concern to remediation workers engaged in activities which disturb contaminant-laden soil. The highest concentration of lead (22,400 ug/kg) was found at the area between the former PPC site and Park Road. Lead was also found in soil at the trailer park but its level was low (up to 20 mg/kg).

Human exposure by incidental ingestion and inhalation of lead-contaminated soil may result in a number of adverse effects. Lead has been demonstrated to cause central nervous system (CNS) effects including sensory disturbances known as lead palsey; kidney pathology; and adverse effects on the blood forming organs and processes (Hammond and Beliles, 1980). These overt illnesses usually occur at high doses but there is evidence of the organ systems (excluding kidney) being negatively affected at low levels of exposure. New evidence also suggests an association between low blood lead levels and hypertension with no apparent threshold value. Possible increases in the risk of stroke, heart attack and death have also been reported (EPA, 1984a).

Children represent a highly sensitive and susceptible population to lead toxicity. This is due to greater intestinal absorption of lead, and a comparatively greater susceptibility to encephalopathy (EPA, 1985a). In addition, lead accumulates in the body and is only slowly excreted; therefore, repeated low dose exposures may result in excessive body burdens which may produce toxic effects (CDC, 1985).

Permanent and severe mental retardation has been documented in severe poisonings. More sinister is the ability of lead to cause neuropsychologic defects such as decreases in cognitive abilities and behavioral changes at very low blood levels (EPA, 1985a). There is recent concern that lead may act at even low levels with *in utero* exposures (Bellinger *et al.*, 1987). Lead has also been shown to effect various enzyme systems related to proper blood forming processes with no evidence of a safe threshold value (EPA, 1985a).

Chromium - Chromium is commonly encountered in the trivalent and hexavalent forms. In water, chromium is predominantly in the hexavalent form with small amounts of trivalent chromium present as organic complexes (EPA, 1984b). In a survey of 91 public water supplies in Florida, the U.S. Geological Survey (USGS) found chromium concentrations of less than 1 ug/L to 10 ug/L in 88 sites, with 3 sites having greater than 25 ug/L (Irwin *et al.*, 1985).

Trivalent chromium is an essential nutrient in the human diet. In contrast, hexavalent chromium is the more toxic form which has been implicated in producing liver and kidney damage, internal hemorrhage, dermatitis and respiratory damage (EPA, 1985b). In the industrial setting, it is hexavalent chromate which is the most toxicologically important form. Injuries include ulceration and perforation of the nasal septum, rhinitis and pharyngitis (EPA, 1984b).

Much of the difference in toxicity between forms of chromium is due to variability in the solubility and poor intestinal absorption of the trivalent form. Hexavalent chromium is more readily absorbed across membranes (EPA, 1984b). This ability, along with its action as a strong oxidizing agent, contributes much to the toxic potential of the hexavalent form.

Reproductive effects have also been seen in laboratory animal bioassays. The documented ability of chromium to cross the placenta has been implicated in its ability to induce cleft palates, skeletal defects, and neural tube defects (EPA, 1984b).

There is sufficient evidence for carcinogenicity of chromium via inhalation exposures from epidemiological studies of workers in the chromate producing industry and possibly with chromium platers and alloy workers. These workers had significant increases in lung cancer with indications that cancers at other sites may also be associated with such exposures. These responses in human populations are supported by positive findings for carcinogenicity in a number of animal bioassays assessing various routes of administration (EPA, 1984b).

Iron - Iron is an essential micronutrient, with drinking water contributing approximately 140 ug/day (Carson *et al.*, 1986) to 490 ug/day (NRC, 1980). Iron was found in the surficial aquifer at levels up to 77,100 ug/L. Levels of iron found naturally in drinking water supplies would not expose individuals to toxicologically important quantities of

the metal. However, it is possible that anthropologically increased levels may result in toxic responses. There is limited evidence that dietary ingestion of iron in excess of 200 mg/day is associated with increased body deposition of the metal.

Acute iron poisoning is normally associated with children ingesting ferrous sulfate tablets. This occurs in approximately 2,000 cases per year (Hammond and Beliles, 1980). Children can be poisoned at doses greater than 1 gram, fatal doses may be in excess of 2 grams. Symptoms include those associated with gastrointestinal irritation, such as nausea, vomiting and shock; pallor, cyanosis, lassitude, drowsiness, hematemesis, diarrhea and green and subsequently tarry stools, and cardiovascular collapse (Herbert, 1975).

At concentrations of 1.0 mg/L (Salvato, 1982) to 3.4 mg/L (EPA, 1976) the metal imparts a noticeable taste. Staining of laundry and plumbing occurs at 0.1 mg/L to 0.3 mg/L (Salvato, 1982, EPA, 1976).

Benzene - Benzene was detected in ground water at concentrations up to 60 ug/L. It is a major constituent of gasoline contributing up to 6 % to the total volume of the fuel. Acute, high level exposure to benzene affects the CNS, producing symptoms including dizziness, giddiness, exhilaration, nausea, vomiting, headaches, drowsiness, staggering, loss of balance, narcosis, coma and death. Mild intoxication has been shown to be reversible (EPA, 1985c) but may last for several weeks. Dermal exposure results in systemic uptake but at a much lower rate than via inhalation or ingestion. Benzene is a skin irritant and causes defatting of the keratin layer resulting in erythema, vesicalation, and dry scaly dermatation (Sandmeyer, 1981).

Chronic exposures to benzene elicit symptoms generally the same as short term exposure, with CNS effects very apparent. Hemotologic involvement is much more significant, however, with numerous pathologies described. These include hyperbilirubinemia, blood dyscrasia, anemia, aplastic anemia, hyperplastic bone marrow effects and a myriad of other disturbances. At high exposures, blood dyscrasia are irreversible. Increased chromosomal aberrations have also been documented (Sandmeyer, 1981).

Benzene has been found in both maternal and cord blood (route of exposure not reported) (Sandmeyer, 1981). Experiments assessing teratogenicity have not found clear evidence of an ability to cause birth defects. Decreased fetal weight, increased fetal deaths/reabsorptions and skeletal variants have been found but were thought to be due to embryo and fetotoxicity (ATSDR, 1987; Coate et al., 1984).

Benzene is a known human carcinogen. Occupational epidemiologic investigations have found significant increases in leukemia, mostly non-lymphocytic, in workers exposed to benzene via inhalation (IARC, 1982). Recent animal bioassay studies have supported this effect. Past bioassays via ingestion exposure have produced leukemia and solid tumors in rats (EPA, 1985c).

Although ground water aquifers which are used as sources for private wells near and in the site are known to be contaminated at levels of public health concern, all previous ground water well users have been placed on municipal water service. Therefore, there is no longer any exposure risk as a result of private ground water use; however, it is not known if there was impact from potential past exposures.

The potential still exists for exposure of area residents as a result of contaminant migration to nearby municipal well fields. Because neither the extent of contamination nor the potential for future migration have been characterized, public health implications of this potential exposure cannot be adequately assessed. Many of the site-related ground water contaminants would be of public health concern if they were to migrate to these municipal wells and their concentrations exceeded health based advisories or standards. Benzene is a volatile organic compound that is readily volatilized, is absorbed orally and via inhalation, and to a lesser extent dermally. Domestic use of benzene-contaminated water would result in exposure via ingestion (drinking water), inhalation (volatilization during showering), and direct dermal contact (bathing, washing). Therefore, migration and subsequent contamination of the municipal well fields would increase the risk of both carcinogenic and non-carcinogenic toxicity, particularly with long-term exposure.

In addition to benzene, the area ground water is contaminated with a variety of metal compounds. The potential for migration of these contaminants to the nearby well fields is also of public health concern. Although these contaminants are not readily volatilized and are, generally, poorly absorbed dermally, they are well absorbed following oral exposure.

Analyses of surface and deep soil (>10 - 35 feet) demonstrated significant contamination with lead. High concentrations of the metal were detected on-site (22,400 mg/kg) with lower levels off-site (1,800 mg/kg). Soil samples collected in the Bamboo Paradise Trailer Park contained even lower concentrations of the metal (8.1 - 20 mg/kg).

The site is located within a mini warehouse storage complex which supports many small manufacturing and repair operations. Adjacent to the site are larger operations including auto repair shops and a paving company. Due to the nature of the businesses, no small children use the site area, and there is no threat from ingestion of contaminated soil by this high-risk population. Incidental ingestion of contaminated soil may occur during the remediation process by workers. The toxic threshold for adults is much greater than for small children, therefore, the risk is appreciably less for the workers. In addition, potential exposure would be limited to the duration of remediation, which would limit exposure. Off-site contamination has been found in two areas; one east of the site and another in the adjacent trailer park. The greatest off-site concentrations of lead were found in a business area. There does not appear to be a current complete exposure pathway from this area. The

trailer park is exclusively inhabited by adults and the presence of small children would only be for limited periods of time. In addition, concentrations of lead in the soil are low. Therefore, both off-site areas of contamination do not constitute public health threats.

There were no volatile compounds detected in the soil either on-site or off-site. Lead was detected in soils at high concentrations. Because the area where lead was detected is mostly vegetated, generation of dust from contaminated soils would be very small. There is, therefore, no present health threat from inhalation of airborne contaminated dust/soil. However, once remediation activities begin, atmospheric concentrations of contaminated particles may dramatically increase. Inhalation exposure may become a significant pathway of concern in the future to remediation workers, workers in the businesses in the area, and nearby residents.

CONCLUSION AND RECOMMENDATIONS

This site is of potential health concern because of the potential risk to human health resulting from possible exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in the Environmental Contamination and Physical Hazards section, human exposure to benzene, lead, chromium, aluminum, and iron may occur through contact with contaminated ground water. Human exposure to lead may also occur through contact with contaminated surface water run-off and surface soils.

The Petroleum Products site in its current state of contamination poses a potential health concern. The susceptible receptor populations are the residents of Bamboo Paradise and Bamboo Lake Trailer Park, workers involved in site remediation and trespassers.

ATSDR recommends the following:

1. Off-site testing for lead in the superficial aquifer southwest of the site should be extended. Lead at concentrations of greater than 5 ug/L in ground water at this area was not well defined in the RI report (Figure 6-15, RI report).
2. In accordance with CERCLA as amended, the Petroleum Products site has been evaluated for appropriate follow-up with respect to health effects studies. Although there are indications that human exposure to on-site/off-site contaminants may be currently occurring and may have occurred in the past, this site is not being considered for follow-up health studies at this time because the information on a population at risk is not sufficient to perform a health study.

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APPENDIX

1. Figure #1: Location of Petroleum Products Site
2. Figure #2: PPC Site and The Vicinity



Figure 1-1 LOCATION OF PETROLEUM PRODUCTS CORPORATION (PPC) SITE