

Health Consultation

ST. MARKS REFINERY

ST. MARKS, WAKULLA COUNTY, FLORIDA

MARCH 19, 2003

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

Agency for Toxic Substances and Disease Registry

Division of Health Assessment and Consultation

Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR

or

Visit our Home Page at: <http://www.atsdr.cdc.gov>

HEALTH CONSULTATION

ST. MARKS REFINERY

ST. MARKS, WAKULLA COUNTY, FLORIDA

Prepared by:

Florida Department of Health
Bureau of Environmental Epidemiology
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

TABLE OF CONTENTS

Background and Statement of Issues	1
Discussion .	2
A Screening Values	2
B. Exposure Doses	3
C. Public Health Implications	5
D. Additional Data Needs	6
E. ATSDR Child Health Initiative	6
F. Sensitive Populations	6
Conclusions	7
Recommendations	7
Public Health Action Plan	7
References	8
Site Team / Authors	9
<u>Appendices</u> ...	10
Figure 1: Location Map	11
Figure 2: Site Map ..	12
Table 1: Chemical Concentrations in Soil	
Table 2: Chemical Concentrations in Groundwater	
Table 3: Calculated Dose From Residential Exposure to Groundwater	14
ATSDR Glossary of Environmental Health Terms	
Certification	

Background and Statement of Issues

In June 2002, the Florida Department of Environmental Protection (DEP) asked the Florida Department of Health (DOH) if concentrations of chlorinated dibenzodioxins (CDD, or “dioxin”) and pentachlorophenol (PCP) in soil and water samples at a former petroleum refinery site in St. Marks, Florida are hazardous to human health. The Florida DOH, through a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta, Georgia, evaluates the public health significance of hazardous waste sites in Florida. This is the first review of the St. Marks Refinery site by either the Florida DOH or the ATSDR.

The St. Marks Refinery site is on Woodville Highway (Highway 363) in the town of St. Marks in Wakulla County (Figure 1). Built in 1954, the refinery processed crude oil for jet fuel and asphalt. The site is now owned by American International Petroleum, Inc. Seminole Refining Corporation owned the refinery from 1985 to 1992. The facility consists of a refined product storage area, a process area, a waste asphalt pond, petroleum tanks and refinery equipment. The facility closed in 1985. Tallahassee's Purdom power plant and Murphy Oil are south and north of the refinery, respectively. The St. Marks historic railroad state trail is west of the site. The St. Marks River is east of the site. Wetlands with winding tributaries throughout are northeast of the site. A stormwater outfall on the east side leads to a drainage ditch which empties into the St. Marks River (Figure 2). A dock on the St. Marks River allowed for barge transport of crude petroleum and finished product.

Testing of this property found elevated concentrations of dioxin, pentachlorophenol; benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, ideno[1,2,3-cd]pyrene, 2-methylnaphthalene, 2-methylphenol, aluminum, arsenic, manganese and benzene. In April 2002, the Florida DEP found chlorinated dibenzodioxins (CDD, or “dioxin”) and pentachlorophenol (PCP) on the site. In June 2002, they found dioxin off the site in the St. Marks River sediments. The Idacon wood treatment facility north of the site may be the source of PCP. The dioxin may be from an incinerator operated on the site prior to 1985. The highest dioxin levels are in a tributary near the crude oil storage area. In June 2002, the Wakulla County Health Department went door-to-door and confirmed there are no private wells within a half mile of the site. All nearby residences are on City of Tallahassee water.

For the purposes of this report, the Florida DOH calculated exposure doses for adults. Based on interviews with site workers and local residents, there is no evidence that children currently are or ever have been exposed to contaminants on the St. Marks Refinery site.

Currently, the Florida DEP is remediating the entire site. In June 2002, they shared with the Florida DOH a report that includes soil, sediment and groundwater results from April/May 2002. The Florida DOH will evaluate the potential for public health consequences. They will also evaluate fish and

crab tests from the Florida Fish and Wildlife Commission and the Florida DEP and determine if health advisories are necessary.

Discussion

A Screening Values

The Florida DOH compared soil and groundwater sample results for dioxin, pentachlorophenol, and other contaminants to health-based screening values. In addition to dioxin and pentachlorophenol, the Florida DOH evaluated potential health effects from exposure to eleven other contaminants that exceeded screening values. These were benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, ideno[1,2,3-cd]pyrene, 2-methylnaphthalene, 2-methylphenol, aluminum, arsenic, manganese and benzene (Tables 1 and 2).

The screening values or comparison values serve to narrow the focus of the health consultation to those contaminants most important to public health. Screening values are health protective numbers, but do not necessarily mean that concentrations in excess of these values will cause illness.

The Florida DOH calculated ingestion and inhalation exposure rates for adults (workers and visitors to the site) assuming a "worst-case" scenario of 8 hour exposures per day, 350 days per year, for 30 years. Generally, an exposure rate (also called a daily dose) is given in milligrams of chemical per kilogram of body weight per day (mg/kg/day). A milligram is one-thousandth of a gram (a raisin or paperclip weigh about one gram). A kilogram is about two pounds. The Florida DOH assumed that a 70 kilogram adult accidentally ingests 100 milligrams of soil per day.

Dioxin

According to the ATSDR, only 2.5 percent of the estimated daily background exposure to dioxin in the general U.S. population comes from contaminated soil, contaminated water, or contaminated dust, while 97 percent comes from food sources (ATSDR 1998).

The most toxic form of dioxin is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). Exposure to large amounts of 2,3,7,8-TCDD may cause chloracne, a skin disease resembling acne. Other skin effects may include rashes, discoloration and hair loss. Additional health effects may include possible liver damage and changes in glucose metabolism and hormone levels. Animal studies have shown an increased risk of cancer from exposure to 2,3,7,8-TCDD. The Department of Health and Human Services (DHHS) has determined that 2,3,7,8-TCDD may reasonably be anticipated to cause cancer (ATSDR 1998).

The ATSDR screening value for dioxin in soil is 0.00005 parts per million (ppm). Two soil samples (0 - 24 inches below land surface - BLS) exceeded the ATSDR adult screening value. The levels were 0.00028 ppm and 0.105 ppm (Table 1).

The ATSDR screening value for dioxin in water is 0.00003 ppm. Two groundwater samples exceeded the ATSDR adult screening value. The levels were 0.041 ppm and 0.173 ppm (Table 2).

There is no screening value for dioxin in sediment. The soil dioxin level used to determine potential health risks is greater than the sediment dioxin levels measured at the site. Since people are more likely to be exposed to contaminated soil than sediment (because sediment is usually under water), sediment exposure was not calculated at this time. The Florida DOH has performed a Health Consultation for dioxin in fish, which is a more likely exposure route for dioxin in humans.

Pentachlorophenol

Pentachlorophenol (PCP) is a manufactured chemical not found naturally in the environment. Pentachlorophenol exposure happens mostly to workers at lumber mills and wood treatment facilities (ATSDR 2001). Although it is not used in consumer products anymore, PCP is still used as a wood preservative in power line poles, railroad ties, cross arms and fence posts. Short-term exposures to large amounts of PCP, or long-term exposures to small amounts of PCP, may effect the liver, kidneys, blood, lungs, nervous system, immune system and gastrointestinal tract. Direct contact with PCP can irritate the skin, eyes and mouth. There is little evidence that PCP causes cancer in humans. Animal studies show an increased risk of cancer in the liver and adrenal glands of mice after exposure to large amounts of PCP (ATSDR 2001).

The ATSDR screening value for pentachlorophenol in soil is 700 parts per million (ppm) for adults. Two soil samples on this site (0 - 24 inches BLS) exceeded the ATSDR adult screening value. The levels were 1,190 ppm and 2,420 ppm (Table 1).

The ATSDR screening value for pentachlorophenol in water is 0.2 ppm for adults. Two groundwater samples exceeded the ATSDR adult screening value. The levels were 6.7 ppm and 2.4 ppm (Table 2).

B. Exposure Doses

The Florida DOH calculated a dose and compared it to doses of dioxin and pentachlorophenol known to cause illness in people. The Florida DOH also calculated doses for eleven other contaminants and compared them to doses known to cause illness from these chemicals.

Non-Cancer Health Effects

Soil

The Florida DOH found that accidentally ingesting contaminated surface soil at the maximum levels for thirty years for all of the contaminants found on the site would not cause any non-cancer illness for adult workers and visitors. The Florida DOH also found that inhaling contaminated dust at the maximum levels for 30 years for all the contaminants found on the site would not cause any non-cancer illness in adult workers and visitors.

Water

The Florida DOH found that ingesting contaminated groundwater at the maximum levels for 30 years for all the contaminants found on the site could cause non-cancer illness in adults. The doses for pentachlorophenol, arsenic and manganese all exceeded the level shown to cause illness in animals (see Table 3). However, a door-to-door survey of residents living in the St. Marks area, the City of Tallahassee supplies drinking water for the town, and groundwater wells are only used for irrigation purposes. There is no evidence to suggest that any local residents are drinking contaminated groundwater from the St. Marks Refinery site.

Pentachlorophenol - Drinking groundwater from under the site at the maximum level for 30 years equals or exceeds the dose shown to cause increased relative weights of kidneys and livers, decreased antibody response and negative endocrine and reproductive responses in animals.

Arsenic - Drinking groundwater from under the site at the maximum arsenic level for 30 years could cause increased skin discoloration, increased risk of dying from heart disease, increased diarrhea and nausea, and some liver damage.

Manganese - Drinking groundwater from under the site at the maximum manganese level for 30 years could cause mild neurologic signs.

Other Contaminants - Very little information was available on potential health effects from exposure to benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, ideno[1,2,3-cd]pyrene, 2-methylnaphthalene, and 2-methylphenol. Because of a lack of studies on the health effects of these contaminants, adverse reactions could not be adequately described.

Cancer

Arsenic, pentachlorophenol and benzene are human carcinogens. Ingestion of arsenic, pentachlorophenol and benzene in groundwater under the St. Marks Refinery for 30 years could increase the risk for cancer.

Arsenic - One human study demonstrated that the dose of arsenic in groundwater similar to the level measured at the St. Marks refinery could increase the risk of lung cancer after 30 years of exposure. Long term (chronic) ingestion of arsenic-contaminated groundwater at the St. Marks Refinery could result in a “moderate” increased risk of cancer.

Pentachlorophenol - One human study demonstrated that the dose of PCP in groundwater similar to the levels at the St. Marks Refinery could increase the risk for non-Hodgkins lymphoma and soft tissue sarcoma after 30 years of exposure. The exposure pathway for the study was fish consumption and drinking well water. Long term (chronic) ingestion of pentachlorophenol-contaminated groundwater at the St. Marks Refinery could result in a “high” increased risk of cancer.

Benzene - Long term (chronic) ingestion of benzene-contaminated groundwater at the St. Marks Refinery could result in a “low” increased risk of cancer after 30 years of exposure.

Dioxin - While 2,3,7,8-TCDD, one of seventeen dioxin forms, is a probable human carcinogen, the other sixteen congeners have not been established as suspected human carcinogens. When the Florida DOH looked at the highest level of 2,3,7,8-TCDD in soil and groundwater and calculated a chronic (30 year) exposure dose, the level of 2,3,7,8-TCDD was too low to exhibit a statistically-significant increase in the occurrence of cancer or other adverse health effect. Consequently, when all seventeen forms of dioxin were factored together into an exposure dose, no likely increase in cancer or other illness is expected.

Other Contaminants - There is insufficient information to determine if 2-methylnaphthalene, 2-methylphenol, aluminum, and manganese cause cancer in humans or animals. Benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene and ideno[1,2,3-cd]pyrene are all polycyclic aromatic hydrocarbons (PAHs) which have been shown to cause tumors in animals. They are all in a class of suspected human carcinogens. However, none of the doses were high enough to have the potential to cause cancer in the worst-case scenario tested for adult workers and visitors.

C. Public Health Implications

Adults exposed to contaminated soil and dust on site for 30 years would not be expected to suffer any adverse health effects. Adults who drink two liters of groundwater from the site each day for 30 years and which is contaminated at the highest level measured may suffer adverse health effects, including an increased risk of cancer.

The Florida DOH recommends that people not drink the contaminated groundwater from the St. Marks Refinery site. Based on a door-to-door survey of residents living in the St. Marks area, the City of Tallahassee supplies drinking water for the town, and groundwater wells are only used for

irrigation purposes. There is no evidence to suggest that any local residents are drinking contaminated groundwater from the St. Marks Refinery site.

D. Additional Data Needs

The Florida DOH recommends additional sampling to further characterize the lateral extent of contamination of the surface soil and groundwater, including off site contamination (surrounding property). Additional analyses of surface soil should include samples from no more than three inches below land surface (≤ 3 inches BLS). Residents have reported rainwater runoff from the St. Marks facility draining into ditches and yards around the site. Off-site surface soil sampling would likely detect contaminants carried from the site to off-site locations. Shallow groundwater can also carry contaminants from the site to off-site locations.

E. ATSDR Child Health Initiative

The ATSDR and the Florida DOH, through the ATSDR's Child Health Initiative, recognize that in communities faced with the contamination of their environment, the unique vulnerabilities of infants and children demand special attention. Children are at a greater risk than are adults for certain kinds of exposure to hazardous substances emitted from waste sites. Because they play outdoors and because they often carry food into contaminated areas, children are more likely to be exposed to contaminants in the environment. Children are shorter than adults, which means they breathe dust, soil, and heavy vapors (such as those released by metallic mercury) close to the ground. They are also smaller, resulting in higher doses of chemical exposure per body weight. If toxic exposures occur during critical growth stages, the developing body systems of children can sustain permanent damage. Probably most important, however, is that children depend on adults for risk identification and risk management, housing, and access to medical care. Thus, adults should be aware of public health risks in their community, so they can accordingly guide their children.

For the purposes of this report, the Florida DOH calculated exposure doses for adults. Based on interviews with site workers and local residents, there is no evidence that children currently are or ever have been exposed to contaminants on the St. Marks Refinery site. In the future, after off site sampling and analysis is complete, the Florida DOH will evaluate the potential for adverse health effects to children from exposure to site related contaminants.

F. Sensitive Populations

Sensitive populations exhibit a different or enhanced response to contaminants than will most persons exposed to the same level of a contaminant in their environment. Reasons may include genetic makeup, age, health and nutritional status, and exposure to other toxic substances. Persons

unusually susceptible to contaminant exposures include unborn children, children, the elderly, and persons with diseases, compromised immune systems and/or dietary insufficiencies. With regard to the St. Marks Refinery site, people most susceptible to the contaminants in the groundwater would be those who are immunocompromised, have existing liver, kidney or heart disease, or who already have debilitating conditions such as cancer.

Conclusions

The St. Marks Refinery site is categorized as a “No Apparent Public Health Hazard” for adult workers and visitors. Workers are not being exposed to contaminants at doses high enough to cause adverse health effects.

The St. Marks Refinery site is categorized as an “Indeterminate Public Health Hazard” for the surrounding community. There is no evidence that workers or local residents are being exposed to groundwater contamination from the St. Marks Refinery site. However, the extent of contamination of surface soil and groundwater has not been adequately characterized. Residents have reported rainwater runoff from the St. Marks facility draining into ditches and yards around the site. Off-site surface soil sampling would likely detect contaminants carried from the site to off-site locations. Shallow groundwater can also carry contaminants from the site to off-site locations. Future testing should include more surface soil samples (≤ 3 inches BLS) and groundwater samples to delineate the lateral extent of on-site and off-site contamination.

Unremediated groundwater associated with the St. Marks Refinery site should not be used as a drinking water source. The level of contamination in the groundwater on the site can contribute to a dose high enough to cause observable health effects and/or cancer.

Recommendations

Collect and analyze additional surface soil (≤ 3 inches BLS) and groundwater samples to further characterize the lateral extent of on site and off site contamination. Analyze for dioxin (CDD), base/neutral/acid extractable organic compounds (including PCP), volatile organic compounds (VOCs) and total metals (TAL metals).

Avoid drinking or otherwise coming into contact with contaminated groundwater from the St. Marks Refinery site.

Public Health Action Plan

The Florida DOH will continue to assist the Florida DEP and the St. Marks community by reviewing additional environmental data as they become available.

References

- Florida DEP Secondary Interim Summary of Investigation Activities at the St. Marks Refinery Site, Ecology & Environment, Inc., June 2002.
- ATSDR, 1998. Toxicological Profile for Chlorinated Dibenzo-p-Dioxins. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.
- ATSDR, 2001. Toxicological Profile for Pentachlorophenol. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.
- ATSDR, 1999. Toxicological Profile for Aluminum. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.
- ATSDR, 2000. Toxicological Profile for Arsenic. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.
- ATSDR, 1997. Toxicological Profile for Benzene. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.
- ATSDR, 1990. Toxicological Profile for Benz[a]anthracene. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.
- ATSDR, 1990. Toxicological Profile for Benzo[b]fluoranthene. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.
- ATSDR, 1990. Toxicological Profile for Benzo[a]pyrene. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.
- ATSDR, 2000. Toxicological Profile for Manganese. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.
- Risk*Assistant for Windows, Software Version 1.1, Hampshire Research Institute, 1996.
- Florida DEP Soil Target Cleanup Levels, Chapter 62-777, May 1999.
- Florida DEP Groundwater Cleanup Target Levels, Chapter 62-302, May 1999.

Florida Department of Health Author

Shaun Anthony Crawford
Bureau of Environmental Epidemiology
Division of Environmental Health
(850) 245-4299

Florida Department of Health Designated Reviewer

Randy Merchant
Manager
Bureau of Environmental Epidemiology
Division of Environmental Health

ATDSR Designated Reviewer

Debra Gable
Technical Project Officer
Division of Health Assessment and Consultation

Appendices

Figure 1: Location Map

Figure 2: Site Map

Table 1: Chemical Concentrations in Soil

Table 2: Chemical Concentrations in Groundwater

Table 3: Calculated Dose From Residential Exposure to Groundwater

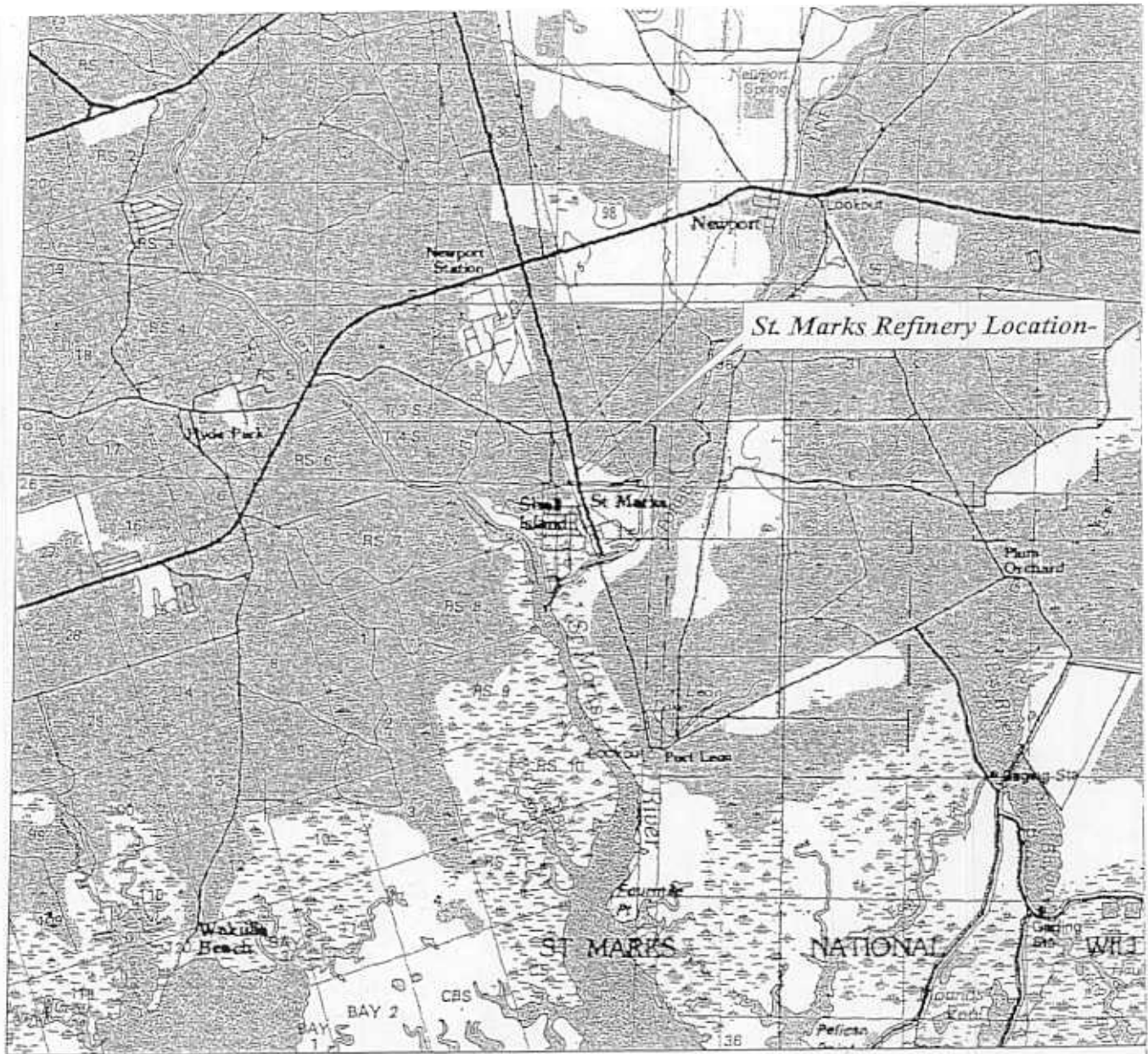


Figure 1: Site Location Map
 St. Marks Refinery
 St. Marks, Florida





Figure 2: Site Map
 St. Marks Refinery
 St. Marks, Florida



Table 1: Chemical Concentrations in Soil in parts per million (ppm)

Chemical Name	Highest Concentration	Screening Value
Dioxin	0.105	0.00005 ^A
Pentachlorophenol	2,420	70 ^A
Benz[a]anthracene	19.5	5*
Benzo[a]pyrene	5.53	0.1 ^A
Benzo[b]fluoranthene	8.92	4.8*
Dibenz[a,h]anthracene	0.979	0.5*
Ideno[1,2,3-cd]pyrene	9.72	5.3*

^A = ATSDR Screening Level

* = SCTL - Florida Department of Environmental Protection Soil Cleanup Target Level

Table 2: Chemical Concentrations in Groundwater in parts per million (ppm)

Chemical Name	Highest Concentration	Screening Value
Dioxin	0.173	0.0003 ^A
Pentachlorophenol	133	0.2 ^A
2-Methylnapthalene	0.177 (J)	0.02*
2-Methylphenol	10.7	0.035*
Aluminum	3.05	0.2*
Arsenic	0.0592	0.01 ^A
Manganese	5.22	0.2 ^A
Benzene	0.589	0.0006*

^A = ATSDR Screening Level

* GCTL - Florida Department of Environmental Protection Groundwater Cleanup Target Level

J = Estimated Value

Table 3: Calculated Dose (mg/kg/day) From Residential Exposure to Groundwater

Contaminant of Concern (maximum concentration) mg/kg	Oral MRL chronic (mg/kg/day)	Water - Ingestion (mg/kg/day) Dose
Pentachlorophenol 133	0.2	3.644
Arsenic 0.0592	0.01	0.001622
Manganese 5.22	0.2	0.143

Scenario Time-frame: Future
 Land Use Conditions: Residential
 Exposure Medium- Groundwater
 Exposure Point- Ingestion of Drinking Water
 Receptor Population- Residents
 MRL - Minimum Risk Level for non-cancer illnesses
 mg/kg/day = milligrams per kilogram per day

These doses were calculated using Risk Assistant Software (Hampshire Research Institute) and accepted values for groundwater consumption (EPA, 1991).

Doses were calculated using the following values:

acute = exposure is 1- 14 days
 intermediate = exposure is 15-364 days
 chronic = exposure is 365 and longer

Adult body weight = 70 kg
 Adult water consumption = 2 liters
 Water exposure is 350 events per year,
 2 liters per day for 30 years

ATSDR Glossary of Environmental Health Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces environmental laws to protect the environment and human health.

This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

Absorption

The process of taking in. For a person or animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.

Acute

Occurring over a short time [compare with **chronic**]

Acute exposure

Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with **intermediate duration exposure** and **chronic exposure**].

Adverse health effect

A change in body function or cell structure that might lead to disease or health problems.

Ambient

Surrounding (for example, *ambient* air).

Analyte

A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.

Background level

An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

Biodegradation

Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).

Biota

Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

Body burden

The total amount of a substance in the body. Some substances build up in the body because they are stored in fat or bone or because they leave the body very slowly.

CAP

See **Community Assistance Panel**.

Cancer

Any one of a group of diseases that occurs when cells in the body become abnormal and grow or multiply out of control.

Cancer risk

A theoretical risk of for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

Carcinogen

A substance that causes cancer.

CAS registry number

A unique number assigned to a substance or mixture by the American Chemical Society Abstracts Service.

Central nervous system

The part of the nervous system that consists of the brain and the spinal cord.

CERCLA [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980]

Chronic

Occurring over a long time (more than 1 year) [compare with **acute**]

Chronic exposure

Contact with a substance that occurs over a long time (more than 1 year) [compare with **acute exposure** and **intermediate duration exposure**].

explore possible causes and contributing environmental factors.

Community Assistance Panel (CAP)

A group of people, from a community and from health and environmental agencies, who work with ATSDR to resolve issues and problems related to hazardous substances in the community.

CAP members work with ATSDR to gather and review community health concerns, provide information on how people might have been or might now be exposed to hazardous substances, and inform ATSDR on ways to involve the community in its activities.

Comparison value (CV)

Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

Completed exposure pathway [see exposure pathway].

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)

CERCLA, also known as **Superfund**, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances.

Concentration

The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

Contaminant

A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

Dermal

Referring to the skin. For example, dermal absorption means passing through the skin.

Dermal contact

Contact with (touching) the skin [see **route of exposure**].

Detection limit

The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

Disease prevention

Measures used to prevent a disease or reduce its severity.

Disease registry

A system of ongoing registration of all cases of a particular disease or health condition in a defined population.

DOD

United States Department of Defense.

DOE

United States Department of Energy.

Dose (for chemicals that are not radioactive)

The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An “exposure dose” is how much of a substance is encountered in the environment. An “absorbed dose” is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

Dose (for radioactive chemicals)

The radiation dose is the amount of energy from radiation that is actually absorbed by the body. This is not the same as measurements of the amount of radiation in the environment.

Dose-response relationship

The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).

Environmental media

Soil, water, air, **biota** (plants and animals), or any other parts of the environment that can contain contaminants.

Environmental media and transport mechanism

Environmental media include water, air, soil, and **biota** (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur. The **environmental media and transport mechanism** is the second part of an **exposure pathway**.

EPA

United States Environmental Protection Agency.

Exposure

Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [**acute exposure**], of intermediate duration, or long-term [**chronic exposure**].

Exposure assessment

The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

Exposure-dose reconstruction

A method of estimating the amount of people's past exposure to hazardous substances. Computer and approximation methods are used when past information is limited, not available, or missing.

Exposure investigation

The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.

Exposure pathway

The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a **source of contamination** (such as an abandoned business); an **environmental media and transport mechanism** (such as movement through groundwater); a **point of exposure** (such as a private well); a **route of exposure** (eating, drinking, breathing, or touching), and a **receptor population** (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a **completed exposure pathway**.

Exposure registry

A system of ongoing followup of people who have had documented environmental exposures.

Feasibility study

A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.

Geographic information system (GIS)

A mapping system that uses computers to collect, store, manipulate, analyze, and display data. For example, GIS can show the concentration of a contaminant within a community in relation to points of reference such as streets and homes.

Groundwater

Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with **surface water**].

Half-life ($t_{1/2}$)

The time it takes for half the original amount of a substance to disappear. In the environment, the half-life is the time it takes for half the original amount of a substance to disappear when it is changed to another chemical by bacteria, fungi, sunlight, or other chemical processes. In the human body, the half-life is the time it takes for half the original amount of the substance to disappear, either by being changed to another substance or by leaving the body. In the case of radioactive material, the half life is the amount of time necessary for one half the initial number

of radioactive atoms to change or transform into another atom (that is normally not radioactive). After two half lives, 25% of the original number of radioactive atoms remain.

Hazard

A source of potential harm from past, current, or future exposures.

Hazardous Substance Release and Health Effects Database (HazDat)

The scientific and administrative database system developed by ATSDR to manage data collection, retrieval, and analysis of site-specific information on hazardous substances, community health concerns, and public health activities.

Hazardous waste

Potentially harmful substances that have been released or discarded into the environment.

Health consultation

A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with **public health assessment**].

Health education

Programs designed with a community to help it know about health risks and how to reduce these risks.

Health promotion

The process of enabling people to increase control over, and to improve, their health.

Indeterminate public health hazard

The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

Ingestion

The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see **route of exposure**].

Inhalation

The act of breathing. A hazardous substance can enter the body this way [see **route of exposure**].

Intermediate duration exposure

Contact with a substance that occurs for more than 14 days and less than a year [compare with **acute exposure** and **chronic exposure**].

In vitro

In an artificial environment outside a living organism or body. For example, some toxicity testing is done on cell cultures or slices of tissue grown in the laboratory, rather than on a living animal [compare with **in vivo**].

In vivo

Within a living organism or body. For example, some toxicity testing is done on whole animals, such as rats or mice [compare with **in vitro**].

Lowest-observed-adverse-effect level (LOAEL)

The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

Medical monitoring

A set of medical tests and physical exams specifically designed to evaluate whether an individual's exposure could negatively affect that person's health.

Metabolism

The conversion or breakdown of a substance from one form to another by a living organism.

Metabolite

Any product of **metabolism**.

mg/kg

Milligram per kilogram.

mg/cm²

Milligram per square centimeter (of a surface).

mg/m³

Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

Migration

Moving from one location to another.

Minimal risk level (MRL)

An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects.

MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see **reference dose**].

National Priorities List for Uncontrolled Hazardous Waste Sites (National Priorities List or NPL)

EPA's list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.

No apparent public health hazard

A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

No-observed-adverse-effect level (NOAEL)

The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

No public health hazard

A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

NPL [see National Priorities List for Uncontrolled Hazardous Waste Sites]

Physiologically based pharmacokinetic model (PBPK model)

A computer model that describes what happens to a chemical in the body. This model describes how the chemical gets into the body, where it goes in the body, how it is changed by the body, and how it leaves the body.

Pica

A craving to eat nonfood items, such as dirt, paint chips, and clay. Some children exhibit pica-related behavior.

Plume

A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

Point of exposure

The place where someone can come into contact with a substance present in the environment [see **exposure pathway**].

Population

A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).

Potentially responsible party (PRP)

A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.

ppb

Parts per billion.

ppm

Parts per million.

Prevention

Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

Public comment period

An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.

Public availability session

An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.

Public health action

A list of steps to protect public health.

Public health advisory

A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human health.

Public health assessment (PHA)

An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health [compare with **health consultation**].

Public health hazard

A category used in ATSDR's public health assessments for sites that pose a public health hazard

because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or **radionuclides** that could result in harmful health effects.

Public health hazard categories

Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are **no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.**

Public health statement

The first chapter of an ATSDR **toxicological profile**. The public health statement is a summary written in words that are easy to understand. The public health statement explains how people might be exposed to a specific substance and describes the known health effects of that substance.

Public meeting

A public forum with community members for communication about a site.

Radionuclide

Any radioactive isotope (form) of any element.

RCRA [See Resource Conservation and Recovery Act (1976, 1984)]

Receptor population

People who could come into contact with hazardous substances [see **exposure pathway**].

Reference dose (RfD)

An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

Registry

A systematic collection of information on persons exposed to a specific substance or having specific diseases [see **exposure registry and disease registry**].

Remedial Investigation

The CERCLA process of determining the type and extent of hazardous material contamination at a site.

Resource Conservation and Recovery Act (1976, 1984) (RCRA)

This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.

RFA

RCRA Facility Assessment. An assessment required by RCRA to identify potential and actual releases of hazardous chemicals.

RfD

See reference dose.

Risk

The probability that something will cause injury or harm.

Risk reduction

Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.

Risk communication

The exchange of information to increase understanding of health risks.

Route of exposure

The way people come into contact with a hazardous substance. Three routes of exposure are breathing [**inhalation**], eating or drinking [**ingestion**], or contact with the skin [**dermal contact**].

Safety factor [see uncertainty factor]**SARA [see Superfund Amendments and Reauthorization Act]****Sample**

A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see **population**]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

Sample size

The number of units chosen from a population or environment.

Solvent

A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).

Source of contamination

The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an **exposure pathway**.

Special populations

People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Stakeholder

A person, group, or community who has an interest in activities at a hazardous waste site.

Statistics

A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.

Substance

A chemical.

Superfund Amendments and Reauthorization Act (SARA)

In 1986, SARA amended CERCLA and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.

Surface water

Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with **groundwater**].

Survey

A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see **prevalence survey**].

Teratogen

A substance that causes defects in development between conception and birth. A teratogen is a substance that causes a structural or functional birth defect.

Toxic agent

Chemical or physical (for example, radiation, heat, cold, microwaves) agents which, under certain circumstances of exposure, can cause harmful effects to living organisms.

Toxicological profile

An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological

profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

Toxicology

The study of the harmful effects of substances on humans or animals.

Uncertainty factor

Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a **safety factor**].

Urgent public health hazard

A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.

Volatile organic compounds (VOCs)

Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Other glossaries and dictionaries:

Environmental Protection Agency <http://www.epa.gov/OCEPAterms/>

National Center for Environmental Health (CDC)

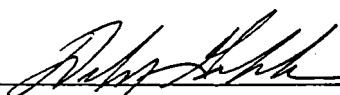
<http://www.cdc.gov/nceh/dls/report/glossary.htm>

National Library of Medicine

<http://www.nlm.nih.gov/medlineplus/dictionaries.html>

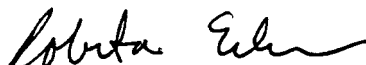
Certification

The Florida Department of Health, Bureau of Environmental Epidemiology prepared this Health Consultation under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. It followed approved methodology and procedures existing at the time it began.



Debra Gable
Technical Project Officer,
SPS, SSAB, DHAC
ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation, and concurs with its findings.



Roberta Erlwein
Section Chief,
SPS, SSAB, DHAC,
ATSDR