# Health Consultation

FORMER FLORIDA TILE SITE
LAKE WIRE FISH

LAKELAND, POLK COUNTY, FLORIDA

EPA FACILITY ID: FLD004091583

JULY 07, 2008

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.

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# HEALTH CONSULTATION

## FORMER FLORIDA TILE SITE
## LAKE WIRE FISH

## LAKELAND, POLK COUNTY, FLORIDA

## EPA FACILITY ID: FLD004091583

Prepared By:

Florida Department of Health Services
Office of Environmental and Occupational Toxicology
Under Cooperative Agreement with the
The U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

## Table of Contents

## Foreword

This health consultation report evaluates the Florida Fish and Wildlife Conservation Commission (FFWCC's) fish testing results from fish collected from Lake Wire, Polk County, Florida in October 2007.

*Evaluating exposure:* Florida Department of Health (DOH) scientists begin by reviewing available information about environmental conditions at the site. The first task is to find out how much contamination is present, where it is on the site, and how people might be exposed to it. Usually, Florida DOH does not collect its own environmental sampling data. We rely on information provided by the Florida Department of Environmental Protection (DEP), the U.S. Environmental Protection Agency (USEPA), and other government agencies, businesses, and the public.

*Evaluating health effects:* If evidence is found that people are being exposed—or could be exposed—to hazardous substances, Florida DOH scientists will take steps to determine whether that exposure could be harmful to human health. Their assessment focuses on public health; that is, the health impact on the community as a whole, and is based on existing scientific information.

*Developing recommendations:* In an evaluation report—such as this exposure investigation report—Florida DOH outlines its conclusions regarding any potential health threat posed by a site, and offers recommendations for reducing or eliminating human exposure to contaminants. The role of Florida DOH in dealing with hazardous waste sites is primarily advisory. For that reason the evaluation report will typically recommend actions to be taken by other agencies—including the EPA and Florida DEP. If, however, the health threat is immediate, Florida DOH will issue a public health advisory warning people of the danger and will work to resolve the problem.

*Soliciting community input:* The evaluation process is interactive. Florida DOH starts by soliciting and evaluating information from various government agencies, the organizations or individuals responsible for cleaning up the site, and from community members who live near the site. Any conclusions are shared with the organizations and individuals who provided information. Once an evaluation report has been prepared, Florida DOH seeks feedback from the public. *If you have questions or comments about this exposure investigation report, we encourage you to contact us. Please write to:*


| | |
|---|---|
| *Please write to:* | Susan Skye / Health Assessment Team<br>Office of Environmental and Occupational Toxicology<br>Florida Department of Health<br>4052 Bald Cypress Way, Bin # A-08<br>Tallahassee, FL 32399-1712 |
| *Or call us at:* | (850) 245-4299, or toll-free during business hours: (877) 798-2772 |

## Summary and Statement of Issues

The Florida Fish and Wildlife Conservation Commission (FFWCC) requested the Florida Department of Health (DOH) assess the public health threat from eating fish from Lake Wire near the former Florida Tile hazardous waste site in Polk County. This health consultation evaluates test results for fish collected by FFWCC on October 11, 2007.

Florida Tile used metals in the manufacture of ceramic tiles. From 1954 to 1974 the facility discharged their process waste water into Lake Wire. The FFWCC collected fish from Lake Wire because the City of Lakeland is building a fishing pier there. The FFWCC collected 12 redear sunfish, 16 largemouth bass, 12 bluegill, four blue tilapia, and one brown bullhead and analyzed fish tissue for cadmium, lead, mercury and zinc.

Florida DOH found the levels of cadmium, lead and zinc in Lake Wire fish are not likely to cause illness. Although the levels of mercury in Lake Wire fish are lower than most lakes, Florida DOH recommends consumption of no more than two six-ounce meals (cooked weight) per week of largemouth bass, redear sunfish, bluegill or blue tilapia. Florida DOH will post a mercury fish consumption advisory at (http://www.doh.state.fl.us/environment/community/fishconsumptionadvisories/index.html). Florida DOH will review future fish or environmental test data and make recommendations as necessary.

## Purpose

The purpose of this health consultation is to determine if levels of metals in Lake Wire fish are a health hazard for fish eaters. The City of Lakeland notified the FFWCC of their plans to build a fishing pier in Lake Wire in 2008. Due to the history of hazardous waste disposal by Florida Tile, FFWCC collected and analyzed fish from the lake. FFWCC asked the Florida DOH to determine the public health threat from consumption of Lake Wire fish.

## Background

### Lake Wire Background and History

Lake Wire is a 25-acre natural lake with publicly accessible fishing all round the perimeter. It has a history of aquatic plant management issues, primarily a noxious infestation of Hydrilla. Over the years the City of Lakeland has managed this infestation through a combination of chemicals, mechanical harvesting, and grass carp. Because it is near residential areas, the lake is fished regularly for sport and subsistence. The lake's watershed is highly-urbanized. From 1954 to 1974 Florida Tile, once the nation's second largest manufacturer of ceramic tile, discharged their process waste water into Lake Wire (D& M 1999).

From the early 1950's to the early 1980's, Florida Tile discharged effluent from their tile manufacturing process to a storm drain that flowed directly to Lake Wire. In 1983, public health concerns from water use and fish consumption prompted the Florida Department of Environmental Regulation (DER) to test the water and fish. Florida Tile's consultant (Environmental Science and Engineering, Inc.) also tested the water and fish (FFWCC 2008).

After May 1974, no effluent discharge from the impoundment cell system was discharged to Lake Wire. From September 1983 to May 1984, a batch-type treatment system to remove excess water from the glaze waste was designed, constructed and made operational. The supernatant liquid was discharged into the City of Lakeland municipal sewer system (D&M 1999). In 2004 they ceased operations and demolished their buildings.

From 1958 to 1986, Florida Tile continuously released non-contact cooling water into Lake Wire. They also temporarily discharged non-contact cooling water into Lake Wire in1988. No effluent discharge from the impoundment cell system to Lake Wire occurred after May 1974 (Dames and Moore 1999). In 1994 Florida Tile discontinued their surface water discharge (D&M 1999).

Currently, there are other businesses and commercial properties within ½ mile of Lake Wire including unincorporated land owned by the City of Lakeland, office buildings, the Lakeland Civic Center, a school, the Lakeland Ledger Publishing Plant, an older residential area and the Lakeland post office.

**Florida Tile Site Description and History**

The 23-acre former Florida Tile site is at One Sikes Boulevard (previously 400 Kathleen Road) in Lakeland, Polk County, Florida. The site is bordered by Kathleen Road on the north and northeast, Sikes Boulevard on the east, and CSX Railroad on the south and southwest.

In 1954, Leon Sikes Sr. and his two sons James and Leon Jr. purchased a ceramic tile manufacturing company in Lakeland, Florida. Within 20 years Florida Tile became the nation's second largest manufacturer of ceramic tile. Milestone Partners now owns the site but Illinois Tool Works, Inc. still retains responsibility for some environmental issues including Lake Wire.

From 1954 until 1965, lead-bearing glaze waste water generated during the manufacturing process was collected within the factory and passed through a filter press to separate the inorganic solids from the water. The effluent from the filter press was released to a storm sewer system on the property, which in turn discharged through an outfall into Lake Wire.

In the 1960s through the late 1980s, the facility operated a surface impoundment for settling and storage of waste water. Solids were settled and the water (supernatant) was allowed to percolated or evaporate.

In 1983 Florida DEP and US EPA directed Sikes Corporation’s (later Florida Tile) to test water, sediment, and fish (largemouth bass, bluegill, redear sunfish, tilapia and brown bullhead) from Lake Wire and unaffected Lake Morton. The Florida Tile contractors (ES&E) found that for bluegill, redear sunfish, tilapia, and brown bullhead, lead concentrations were higher in Lake Wire compared to Lake Morton. For largemouth bass lead concentrations were similar in both lakes. Florida Tile’s contractor concluded lead levels in the fish from Lake Wire are neither a health hazard for consumption nor an ecological hazard (ES&E 1983).

In December 1985, the facility was issued a National Pollutant Discharge Elimination System (NPDES) permit for the discharge of storm water into Lake Wire. In June 1991, Lake Wire was designated an Area of Concern (W&AR 1999).

In November 1988, Florida Tile's contractor analyzed the glaze waste from the surface impoundments and found aluminum, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, nickel, silver, strontium, vanadium and zinc in a composite sample.

In January 1997, Florida Tile's contractor collected bluegill, largemouth bass and brown bullhead from Lake Wire for human health evaluation and collected largemouth bass, bluegill and gambusia (mosquito fish) for ecological evaluation. They collected fish from evenly distributed sampling locations including Outfall 001 where lead sediment concentrations were the highest. They analyzed fish fillets (with skins) for arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, silver and zinc. Florida Tile's contractor found that the fillets contained barium, cadmium, silver and zinc but no detectable levels of arsenic, chromium, copper, lead, mercury or nickel (W&AR 1997).

In December 1999, Florida Tile's contractor tested surface waters, sediments, benthic in fauna and fish from Lake Wire and three urban background lakes in Central Florida (W&AR 1999). In 2003, Florida Tile removed approximately 9,800 cubic yards of lead-impacted sediments from Lake Wire and 300 cubic yards of lead-impacted soils from along the shoreline.

In 2004 the owners ceased operations and demolished the buildings.

### Demographics and Land Use

According to 2000 US Census data, Lakeland has 78,452 residents and 33,509 households with the average of 2.2 individuals in each home. The City's land area is 45.84 square miles and has a water area of 5.61 square miles (Bureau of Census 2000). Within 1/2 mile radius of the facility, land use is varied with commercial, industrial and residential properties. According to Google Earth, there are both residential and industrial properties north and northwest of Lake Wire. Nearby industrial properties are south, southwest and east of Lake Wire.

## Community Health Concerns

Although nearby residents are aware of the past operations of Florida Tile, neither Florida DOH, the Polk CHD, nor Florida DEP have received concerns from nearby residents about eating fish from Lake Wire.

## Discussion

Florida DOH evaluated these fish test results at the request of the FFWCC. There is a completed exposure pathway from people fishing and eating fish from Lake Wire. Although there is a statewide fish consumption advisory for mercury at

**http://www.doh.state.fl.us/environment/community/fishconsumptionadvisories/index.html**, there are currently no fish advisories specific for Lake Wire**.**

## Fish Collection

For six hours on October 11, 2007, FFWCC collected (electrofished) 41 fish representing 5 species commonly caught and consumed by anglers (Appendix C). They kept 12 largemouth bass, 12 bluegill, 12 redear sunfish, four blue tilapia and one brown bullhead fish. For largemouth bass, bluegill, and redear sunfish they collected enough fish for three composite samples where the smallest individual was no more than 75% smaller in length than the largest (Table I). They collected the fish with dip nets, measured to the nearest millimeter, wrapped in heavy duty aluminum foil, bagged by species, and kept on ice. FFWCC staff wore disposable latex gloves throughout the collection and handling process. They delivered the fish to the FFWCC laboratory in Eustis, Florida for filleting and compositing.

## Laboratory Analyses

The FFWCC laboratory in Eustis weighted each fish to the nearest gram and measured for total length to the nearest millimeter (Table I). They removed the scales and left the skins intact. They placed the fillets in plastic zip-lock bags and prior to freezing, sorted into like species composites of four fish each based on fish total length as described above. Using equal weights of each component fish, they homogenized the fish to a consistent paste in a Retch Grindomix GM 200 homogenizer equipped with a polypropylene vessel and a stainless steel cutter blade. FFWCC shipped three composites of largemouth bass (four fish in each composite), three composites of bluegill (four fish in each composite), three composites of redear sunfish (four fish in each composite) and four individual blue tilapia and one brown bullhead overnight on dry-ice to Pace Analytical Laboratory in Wisconsin. Chain of custody forms were filled out in the field and transported with the fish. Prior to Pace's analyses, samples and composites were further homogenized under liquid nitrogen to facilitate destruction of skin.

The laboratory analyzed the 10 composites and five individual fish for cadmium, lead, mercury and zinc using EPA Method SW 846 6020 and SW 846 M7471A. The percentage recovery for the method blanks was sufficient.

## Eating Fish/Mercury in Fish

Eating fish is an important part of a healthy diet. Rich in vitamins and low in fat, fish contains protein we need for strong bodies. It is also an excellent source of nutrition for proper growth and development. In fact, the American Heart Association recommends that you eat two meals of fish or seafood every week (FDOH 2006).

However, most Florida seafood (freshwater and marine) has low to medium levels of mercury. Depending on the age of the fish, the type of fish and the condition of the water the fish lives in, the levels of mercury found in fish are different (FDOH, 2006).

To lower the risk of harm from mercury found in fish caught in Florida, guidelines based on tests of various freshwater, marine and estuarine water bodies are found at (http://www.doh.state.fl.us/environment/community/fishconsumptionadvisories/index.html). Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury (ATSDR, 1999). For people who have eaten fish in the past with mercury levels above these guidelines, they can ask their physician for a mercury hair test. There are no definitive symptoms of low level mercury poisoning. Consuming fish has many health benefits, including a reduced risk of heart disease; that must be considered when deciding whether fish should be consumed. Don't avoid fish; avoid mercury.

For most people, the risk of eating fish exposed to mercury is not a health concern. However, developing fetuses and young children are more sensitive to the harmful effects mercury has on the brain than other people. As a result, women of childbearing age and young children should eat less fish than all others to avoid the higher health risks (FDOH 2006).

**Fish Test Results**

Table II in Appendix A summarizes the laboratory analytical results for cadmium, lead, mercury and zinc in Lake Wire fish. Appendix B contains an estimated dose of each metal from eating fish from Lake Wire. If the calculated dose is less than the Minimal Risk Level (MRL) then the metal is not likely to cause illness. MRLs are conservative estimates of daily human exposures to specific chemicals at which noncancer illnesses are considered not likely to occur. FFWCC collected too few brown bullhead fish to determine the public health risk from eating this species.

*Mercury*

Largemouth bass is the predator species bioaccumulating the most mercury over time.The highest mercury level was found in largemouth bass (0.025 parts per million (ppm)). Using Florida's Mercury Health Guidelines for the Consumption of Fish and Shellfish (Table III), this level of 0.025 ppm is less than the FDOH guidelines of <0.1 ppm total mercury in fish flesh for women of childbearing age and young children, and <0.43 ppm total mercury in fish flesh for men and women of all other ages.

Even though the levels of mercury in Lake Wire fish are lower than most lakes, the Florida DOH recommends that no more than two six-ounce meals (cooked weight) be eaten each week (Table III).

Although FFWCC only collected four blue talapia instead of 12, it is unlikely that collecting eight more would result in a different recommendation because the mercury levels in the four were so low.

*Lead*

The maximum level of lead (0.26 mg/kg) was found in redear sunfish. We calculated a dose assuming a child weighing 15 kilograms eats 30 grams of fish per day (Appendix B). The

calculated dose is four times less than 30 micrograms per day which is the amount of lead in fish a child would need to eat for their blood lead level to be 5 micrograms per deciliter.

Therefore, the maximum level of lead found in the fish (0.26 ppm), is not likely to cause illness in adults or children.

*Zinc*

The maximum level of zinc (27 mg/kg) was found in bluegill. We calculated a dose assuming a child weighing 15 kilograms eats 30 grams of fish per day (Appendix B). The calculated dose is 5.6 times less than the Minimal Risk Level (MRL).

Therefore, the maximum level of zinc found in the fish (27 ppm) is not likely to cause illness in adults or children.

*Cadmium*

Cadmium was not detected in any of the fish collected, therefore the levels are not likely to cause illness.

**Other Health Based Standards**

For mercury, the U.S. Food and Drug Administration's (FDA) action level is 1 part per million methyl mercury in the edible portion of fish (DHHS 2000). All mercury levels in the fish collected from Lake Wire were well below this action level. There are no U.S. FDA action levels for cadmium, lead or zinc.

## Child Health Considerations

Pregnant women and children are more sensitive to the effects of mercury than are adults. Children drink more fluids, eat more food, and breathe more air per kilogram of body weight than do adults. Children have a larger skin surface in proportion to their body volume. A child's diet—that often differs from that of an adult's—and a child's behavior and lifestyle can also influence exposure. Children, especially small children, are closer to the ground than are adults. They crawl on the floor, put things in their mouths, and might ingest inappropriate items such as dirt or paint chips. Children also spend more time outdoors than do adults. Finally and perhaps most importantly, children do not have the judgment of adults for avoiding hazards (ATSDR 1999). Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health.

Based on the recent levels of mercury detected in the fish, all fish eaters, including children should only eat two 6 ounce meals of cooked largemouth bass, redear sunfish, bluegill and blue tilapia per week.

## Conclusions

1. Although the levels of mercury in Lake Wire fish are lower than most lakes, Florida DOH recommends consumption of no more than two six-ounce meals (cooked weight) per week of largemouth bass, redear sunfish, bluegill or blue tilapia. Even though low levels of mercury were found in fish, the source is most likely from non-point sources rather than from the nearby former Florida Tile site. Therefore, eating fish from this lake is a no apparent public health risk if the consumption advisory for mercury is followed.

2. Levels of lead and zinc in Lake Wire fish are not likely to cause illness in adults or children. Cadmium was not detected in any Lake Wire fish so is not likely to cause illness in adults or children. Therefore, based on the levels of lead, zinc and cadmium detected, eating fish from this lake is a no apparent public health risk.

## Recommendations

1. People should limit their consumption to no more than two six-ounce meals (cooked weight) per week of largemouth bass, redear sunfish, bluegill or blue tilapia from Lake Wire.

## Public Health Action Plan

1. Florida DOH will post a mercury fish consumption advisory on its website: (http://www.doh.state.fl.us/environment/community/fishconsumptionadvisories/index.html).

2. Florida DOH will review future fish or environmental test data and make recommendations as necessary.

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Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

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[W&AR] Water and Air Research, Inc. 1997. Test Results for Metals in Fish Relative to the Lake Wire AOC;RFI Workplan for Florida Tile Lakeland Facility. Letter and Fish Results to Narindar Kumar, EPA.

[W&AR] Water and Air Research, Inc. 1999. Interim Report of Quarterly Monitoring Data and Fish Sampling Data for Ecological Assessment. Prepared for Florida Tile Industries, Inc. Lakeland, Florida.

# APPENDIX A
## FIGURES AND TABLES

## TABLE I
## October 2007 Fish Lengths/Weights

| Sample # | Type Fish | # fish per sample | length (mm) | weight (grams) |
|---|---|---|---|---|
| 1 | Blue tilapia | 1 individual | 304 | 671 |
| 2 | Blue tilapia | 1 individual | 350 | 773 |
| 3 | Blue tilapia | 1 individual | 382 | 1087 |
| 4 | Blue tilapia | 1 individual | 409 | 1461 |
| 5 | Brown bullhead | 1 individual | 242 | 157 |
| 6 | Largemouth bass | 4 fish composite | 185-200 | 58-78 |
| 7 | Largemouth bass | 4 fish composite | 193-233 | 78-144 |
| 8 | Largemouth bass | 4 fish composite | 400-449 | 995-1571 |
| 9 | Largemouth bass (Duplicate) | 4 fish composite | 400-449 | 995-1571 |
| 10 | Bluegill | 4 fish composite | 129-143 | 31-51 |
| 11 | Bluegill | 4 fish composite | 134-144 | 41-50 |
| 12 | Bluegill | 4 fish composite | 146-188 | 51-128 |
| 13 | Redear sunfish | 4 fish composite | 95-127 | 15-29 |
| 14 | Redear sunfish | 4 fish composite | 133-142 | 30-36 |
| 15 | Redear sunfish | 4 fish composite | 143-151 | 32-49 |

## TABLE II
## Contaminant Concentrations in Lake Wire Fish

| Contaminant | Highest Fish Concentration * (ppm) | Florida DOH Guideline (ppm) | Calculated Dose (mg/kg/day) | MRL or NOAEL (mg/kg/day) |
|---|---|---|---|---|
| Cadmium | ND | none | ---- | ---- |
| Lead | 0.26 (redear sunfish) | none | 0.0005 | none |
| Mercury | 0.025 (largemouth bass) | <0.1 ppm (all fish eaters – two 6 ounce meal per week of fish) | ---- | ---- |
| Zinc | 27.0 (bluegill) | none | 0.054 | 0.3 mg/kg/day (intermediate) |

MRL = ATSDR minimal risk level
* Wet weight
ppm = parts per million
ND = not detected NA = not analyzed

Note: the mercury range levels for each composite species were as below:
Redear - 0.0032* to 0.0065* ppm
Largemouth bass – 0.012 to 0.025 ppm
Blue tilapia – 0.0024 to 0.0037 ppm
Bluegill – 0.0043* to 0.0061* ppm

* = the analyte was detected between the maximum detection limit and the reporting limit so result could be as high as 0.009 ppm

**TABLE III**
**Summary of Florida Mercury Health Guidelines for the Consumption of Fish and Shellfish**

| Frequency of Consumption | Women of Childbearing Age & Young Children | All Other Individuals |
|---|---|---|
| Two 6 ounce meals per week of fish* | With <0.1 ppm total mercury in flesh** | With <0.43 ppm total mercury in flesh** |
| One 6 ounce meal per week of fish* | With <0.2 ppm total mercury in flesh** | With <0.86 ppm total mercury in flesh** |
| One 6 ounce meal per month of fish* | With <0.85 ppm total mercury in flesh** | With <1.5 ppm total mercury in flesh** |
| Do not eat fish* | With ≥ 0.85 ppm total mercury in flesh** | With ≥ 1.5 ppm total mercury in flesh** |
| On meal per month of Largemouth Bass, Bowfin, or Gar | For water bodies not listed in the DOH advisories | NA |
| One meal per week of Largemouth Bass, Bowfin, or Gar | N/A | For water bodies not listed in the DOH advisories |
| Do not eat *** | Shark, Swordfish, King Mackerel, or Tilefish from unknown or untested waters: | Shark > 43 inches, King Mackerel > 31 inches |
| Commonly eaten fish low in mercury include Shrimp, canned light Tuna, Salmon, Pollock, & Catfish | limit consumption to 12 ounces of fish and shellfish per week | NA |

| Frequency of Consumption | Women of Childbearing Age & Young Children | All Other Individuals |
|---|---|---|
| For recreationally caught fish from unknown or untested waters. | Limit to 6 ounces per week*** | NA |
| Limit to 6 ounces per week*** | Albacore Tuna and a second meal of fish low in mercury | NA |

- 6 ounces of fish after cooked
- ** Concentration values were furnished by Dr. Joe Sekerke, Toxicologist, Bureau of Community Environmental Health, The Florida Department of Health, Tallahassee, Florida.

***From Florida Health, The Florida Department of Health, Fish Consumption Advisory, Eat Healthy, Eat Smart, Your Guide to Eating Fish Caught in Florida, September, 2006 (http://www.doh.state.fl.us/Environment/community/fishconsumptionadvisories/index.html).

# FIGURE 1

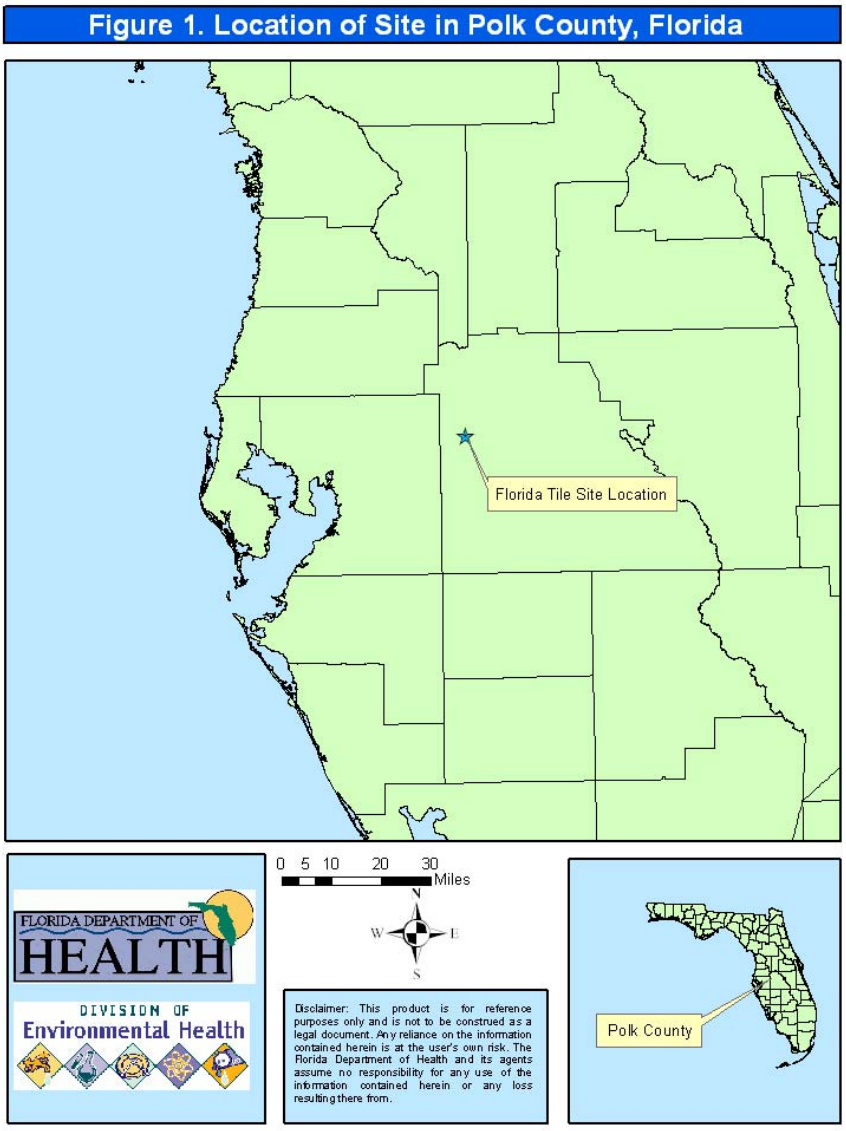
Figure 1. Location of Site in Polk County, Florida
Florida Tile Site Location
FLORIDA DEPARTMENT OF
HEALTH
DIVISION OF
Environmental Health
0 5 10 20 30
Miles
N
W
E
S
Disclaimer: This product is for reference purposes only and is not to be construed as a legal document. Any reliance on the information contained herein is at the user's own risk. The Florida Department of Health and its agents assume no responsibility for any use of the information contained herein or any loss resulting there from.
Polk County

# FIGURE 2

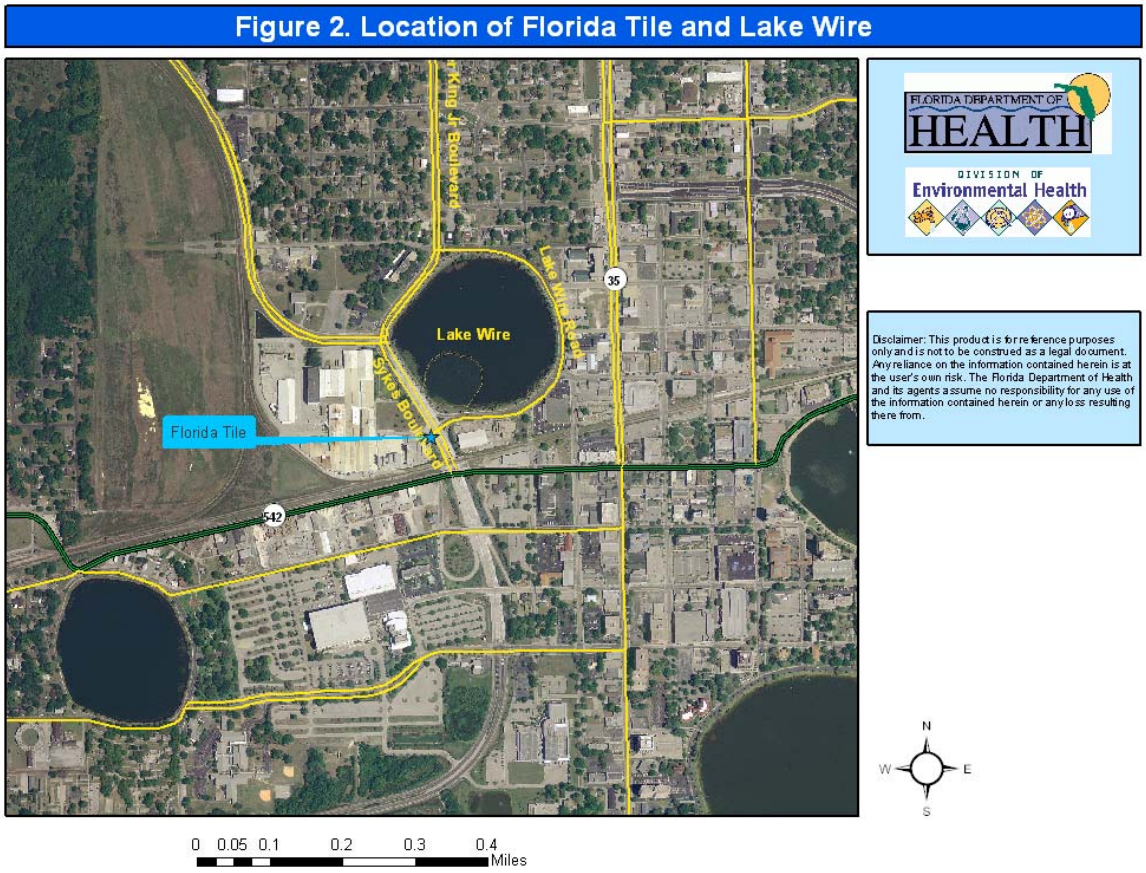
Figure 2. Location of Florida Tile and Lake Wire
Lake Wire
Florida Tile
Sykes Boulevard
35
542
FLORIDA DEPARTMENT OF HEALTH
DIVISION OF Environmental Health
Disclaimer: This product is for reference purposes only and is not to be construed as a legal document. Any reliance on the information contained herein is at the user's own risk. The Florida Department of Health and its agents assume no responsibility for any use of the information contained herein or any loss resulting there from.
N
W
E
S
0 0.05 0.1 0.2 0.3 0.4
Miles

**FIGURE 3**
**STREET MAP NEAR LAKE WIRE**


Reference: www.mapquest.com

# APPENDIX B

Cadmium: No calculations necessary as all result non-detect

Lead:

If a child ingests 60 ug/day of lead in fish or water then the blood lead level will be 10 ug/dL
If a child ingests 30 ug/day of lead in fish or water then the blood lead level will be 5 ug/dL

For this site the maximum level of lead (0.26 mg/kg) was found in redear sunfish
Therefore, to calculate a dose assuming a child eats 30 grams of fish per day:

$$\text{Dose (mg/kg/day)} = \frac{(\text{kg fish per day})(\text{conc in fish})}{\text{body weight}}$$

$$\frac{(0.03 \text{ kg fish/day})(0.26 \text{ mg/ kg lead in fish})}{15 \text{ kg body weight}}$$

= 0.0005 mg/kg/day (15 kg) = 0.0075 mg/day = 7.5 ug/day which is 4x less than 30 ug/day so the level of lead in the fish is ok

Mercury:

Maximum mercury concentration found in largemouth bass 0.025 compared with the Florida DOH guidelines in Table III

Zinc:

Maximum zinc concentration found in bluegill = 27 mg/kg
Zinc ATSDR Comparison Value = 0.3 mg/kg/day intermediate dose

Assuming a child eats 30 grams fish/day

$$\frac{(0.03 \text{ kg/day})(27 \text{ mg/kg zinc})}{15 \text{ kg body wt}} = 0.054 \text{ mg/kg/day}$$

Zinc dose is 5.6 times less than the Minimal Risk Level (MRL)

# APPENDIX C

## Fish Protocol

**Lake Wire Fishery Contaminant Evaluation-October 2007**

Lake Wire

- 25 Acre urban lake in Lakeland, FL
- Received historical releases of lead silicate glazing material (frit) through stormwater drains
- 1983 survey of lead in water, sediment, and fish was inconclusive
    - public health and aquatic health assessments were not performed due to low numbers of fish analyzed.

**Current Program**

- City/County proposes public fishing pier and improved access
- FWC/DOH to conduct human health risk assessment for common sport Fish
- Sample Collection
    - FWC (Paul Thomas) to collect 12 harvestable sized fish representing 5-6 sport fish species including largemouth bass, bluegill, redear sunfish, blue tilapia and catfish (either channel catfish or brown bullhead or both) on October 11th, 2007.
    - In the field each fish should be collected with a dip-net and immediately wrapped in heavy duty aluminum foil*. Fish of like species can be placed in a plastic bag on ice for transport to the laboratory.
    - Individual fish length should be crudely estimated in order to insure that adequate size distributions are retained to allow for creation of three composite samples for each species. Each composite should have 4 fish available so that the smallest fish in the composite must be no more than 75% smaller than the largest fish.
        - (Min length/Max length)*100=_____≥ 75%
        - Example: Bluegill sizes: 150, 160, 172, 184
            - (150/184)*100=82% which is OK for composite

        *Fish can be retained for a short time in site water in a precleaned bucket or livewell with like species. Preclean with liquid alconox or equivalent.
- Fish Processing
    - Paul Thomas will deliver fish to Eustis Fisheries Laboratory on October 12, 2007 for processing
    - Fish processing will be conducted using protocols for metals analyses of fish tissue as outlined in EPA's, Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume 1, Fish Sampling and Analysis, Third Edition. EPA 823-B-00-007, November 2000.
    - Each fish will be weighted to the nearest gram and measured to the nearest mm. Sagital otoliths will be removed from all largemouth bass for determination of age.
    - All largemouth bass, bluegill, and redear sunfish will have their scales removed and be further processed as skin-on samples.
    - All catfish and blue tilapia will be further treated as skinless samples.
    - An axial fillet (or two on smaller individuals) will be removed and placed in a pre-labeled plastic ziplock bag.

- Samples will be segregated by species and composite group and processed into composites for submission to the analytical laboratory. A minimum of 10 grams is required for analyses.
    - For skinless composite samples (catfish and blue tilapia)
        - An equal mass of tissue will be removed from each fillet and homogenized to a uniform consistency in a Retch Grindomix GM 200 homogenizer. Weigh each sample on shiny side out aluminum foil. The mass of each fillet should be noted on the laboratory data sheet. Retain remainder in freezer for later use.
    - For Skin-on composite samples (largemouth bass, bluegill, redear sunfish).
        - Each fillet should be individually homogenized prior to combining into a composite sample.
        - After homogenization, an equal mass of tissue from each sample in the composite should be combined and homogenized in the homogenizer. Weigh each sample on shiny side out aluminum foil. The mass of each fillet should be noted on the laboratory data sheet. Retain remainder in freezer for later use.
    - Each composite should be double bagged in plastic ziplock bags with a new lab identification number with lab ID stickers on both bags. Note the total weight of the sample on the laboratory data sheet along with the individual lab identifiers that make up each composite sample.
  - All fish processing will be conducted on clean shiny side out, aluminum foil. Stainless steel knives will be pre-cleaned in liquid alconox and rinsed in 2-propynol between fish.
- Laboratory Analyses
  - Samples will be shipped via overnight express to Pace Analytical, Inc. in Madison Wisconsin for analyses of total Pb, Cd, and Zn in each composite by acid digestion followed by ICP-MS.
  - Pace will re-homoginize samples, if required using liquid nitrogen techniques that can more efficiently bring the samples to a constant consistency.
- Data Evaluation
  - Data will be summarized by FWC and submitted to FLDOH for a human health risk assessment.

# APPENDIX D

## ATSDR Glossary of Environmental Health Terms

This glossary defines words used by the Agency for Toxic Substances and Disease Registry (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, 1-888-422-8737.

**Absorption**
The process of taking in. For a person or an 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].

**Additive effect**
A biologic response to exposure to multiple substances that equals the sum of responses of all the individual substances added together [compare with antagonistic effect and synergistic effect].

**Adverse health effect**
A change in body function or cell structure that might lead to disease or health problems

**Aerobic**
Requiring oxygen [compare with anaerobic].

**The Agency for Toxic Substances and Disease Registry (ATSDR)**
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.

**Ambient**
Surrounding (for example, *ambient* air).

**Anaerobic**
Requiring the absence of oxygen [compare with aerobic].

**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.

**Analytic epidemiologic study**
A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.

**Antagonistic effect**
A biologic response to exposure to multiple substances that is **less** than would be expected if the known effects of the individual substances were added together [compare with additive effect and synergistic effect].

**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).

**Biologic indicators of exposure study**
A study that uses (a) biomedical testing or (b) the measurement of a substance [an analyte], its metabolite, or another marker of exposure in human body fluids or tissues to confirm human exposure to a hazardous substance [also see exposure investigation].

**Biologic monitoring**
Measuring hazardous substances in biologic materials (such as blood, hair, urine, or breath) to determine whether exposure has occurred. A blood test for lead is an example of biologic monitoring.

**Biologic uptake**
The transfer of substances from the environment to plants, animals, and humans.

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

**CAP** [see Community Assistance Panel.]

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

**Cancer risk**
A theoretical risk 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.

**Case study**
A medical or epidemiologic evaluation of one person or a small group of people to gather information about specific health conditions and past exposures.

**Case-control study**
A study that compares exposures of people who have a disease or condition (cases) with people who do not have the disease or condition (controls). Exposures that are more common among the cases may be considered as possible risk factors for the disease.

**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 [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]

**Cluster investigation**
A review of an unusual number, real or perceived, of health events (for example, reports of

cancer) grouped together in time and location. Cluster investigations are designed to confirm case reports; determine whether they represent an unusual disease occurrence; and, if possible, 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. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

**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.

**Delayed health effect**

A disease or an injury that happens as a result of exposures that might have occurred in the past.

**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].

**Descriptive epidemiology**

The study of the amount and distribution of a disease in a specified population by person, place, and time.

**Detection limit**

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

**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.

**Epidemiologic surveillance** [see Public health surveillance].

**Epidemiology**

The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

**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 follow up 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.

**Groundwater**

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

**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 investigation**

The collection and evaluation of information about the health of community residents. This information is used to describe or count the occurrence of a disease, symptom, or clinical measure and to evaluate the possible association between the occurrence and exposure to hazardous substances.

**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.

**Incidence**

The number of new cases of disease in a defined population over a specific time period [contrast with prevalence].

**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/cm$^2$**
Milligram per square centimeter (of a surface).

**mg/m$^3$**
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.

**National Toxicology Program (NTP)**
Part of the Department of Health and Human Services. NTP develops and carries out tests to predict whether a chemical will cause harm to humans.

**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]

**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.

**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 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 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.

**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 health surveillance**
The ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.

**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.

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

**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 an environment.

**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.

**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** [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)

**Superfund Amendments and Reauthorization Act (SARA)**

In 1986, SARA amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (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].

**Surveillance** [see public health surveillance]

**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].

**Synergistic effect**

A biologic response to multiple substances where one substance worsens the effect of another substance. The combined effect of the substances acting together is greater than the sum of the effects of the substances acting by themselves [see additive effect and antagonistic effect].

**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 that, 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.

**Tumor**

An abnormal mass of tissue that results from excessive cell division that is uncontrolled and

progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).

**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, and methylene chloride.

# CERTIFICATION

The Florida Department of Health, Office of Environmental and Occupational Toxicology 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. The Cooperative Agreement Partner completed editorial review.

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

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