Health Consultation

OFF-SITE SURFACE SOIL

KOPPERS HAZARDOUS WASTE SITE

GAINESVILLE, ALACHUA COUNTY, FLORIDA

EPA FACILITY ID: FLD980709356

Prepared by the
Florida Department of Health

JULY 17, 2009

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners 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 or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR Toll Free at
1-800-CDC-INFO
or
Visit our Home Page at: http://www.atsdr.cdc.gov

HEALTH CONSULTATION

OFF-SITE SURFACE SOIL

KOPPERS HAZARDOUS WASTE SITE

GAINESVILLE, ALACHUA COUNTY, FLORIDA

EPA FACILITY ID: FLD980709356

Prepared By:

Florida Department of Health
Division of Environmental Health
Under a cooperative agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Foreword

This document summarizes the Florida Department of Health's assessment of the health threat from exposure to contaminants in surface soil near the Koppers hazardous waste site in Gainesville, Florida. The Florida Department of Health (DOH) evaluates site-related public health issues through the following processes:

- Evaluating exposure: Florida 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 human exposures might occur. A consultant for Beazer East, Inc. with oversight from the US Environmental Protection Agency (EPA) provided the information for this assessment.
- Evaluating health effects: If we find evidence that exposures to hazardous substances are occurring or might occur, Florida DOH scientists will determine whether that exposure could be harmful to human health. We focus this report on public health; that is, the health impact on the community as a whole, and base it on existing scientific information.
- Developing recommendations: In this report, the Florida DOH outlines its conclusions regarding any potential health threat posed by surface soil, and offers recommendations for reducing or eliminating human exposure to contaminants. The role of the Florida DOH in dealing with hazardous waste sites is primarily advisory. For that reason, the evaluation report will typically recommend actions for other agencies, including the EPA and the Florida Department of Environmental Protection. If, however, an immediate health threat exists or is imminent, the 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. The Florida DOH starts by soliciting and evaluating information from various government agencies, individuals or organizations responsible for cleaning up the site, and those living in communities near the site. We share any conclusions about the site with the groups and organizations providing the information. Once we prepare an evaluation report, the Florida DOH seeks feedback from the public.

If you have questions or comments about this report, we encourage you to contact us.

Please write to: Hazardous Waste Site Health Assessment Team
Bureau of Environmental Public Health Medicine
Florida Department Health
4052 Bald Cypress Way, Bin # A-08
Tallahassee, FL 32399-1712

Or call us at: 850 245-4299 or toll-free 1-877-798-2772

INTRODUCTION

At the Koppers hazardous waste site, the Florida Department of Health (DOH) and the US Agency for Toxic Substances and Disease Registry (ATSDR) serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent people from coming into contact with harmful toxic substances.

CONCLUSIONS

The Florida DOH and US ATSDR conclude that incidental ingestion (swallowing) of very small amounts of dioxin-contaminated surface soil from the City of Gainesville easement just west of the Koppers hazardous waste site for more than a year could possibly harm children's health.

Incidental ingestion (swallowing) of very small amounts of surface soil in the neighborhood north and west of Koppers is not likely to cause harm.

BASIS FOR DECISION

Surface soil in the easement just west of Koppers is contaminated with dioxins. Children who play in this area likely ingest (swallow) small amounts of soil. Incidental soil ingestion (swallowing) is common in children less than 6 years old who put soiled fingers or toys in their mouths. Based on animal studies, scientists predict that swallowing small amounts of this dioxin-contaminated surface soil for more than a year could cause harm.

NEXT STEPS

- The US Environmental Protection Agency should work with the responsible party to test more surface soil west of Koppers.

- In the interim, parents should keep children from playing in the easement just west of Koppers.

FOR MORE INFORMATION

If you have concerns about your health or the health of your children, you should contact your health care provider. You may also call the Florida Department of Health at 1-877-798-2772 and ask for information about the Koppers hazardous waste site.

Background

The 90-acre Koppers hazardous waste site occupies the western part of the larger 140-acre Cabot-Koppers hazardous waste site. The Koppers site is near the intersection of North 23rd Avenue and North Main Street in Gainesville, Alachua County, Florida 32601 (Figure 1).

The Koppers site has been used for wood treatment since 1916. Historically, Koppers Industries preserved wood utility poles and timber using three different chemicals: creosote, pentachlorophenol (PCP) and chromated copper arsenate (CCA). Past waste disposal practices caused soil and ground water contamination. Contaminants from Koppers may have impacted soil west of the site.

On 50 acres east of Koppers, Cabot Carbon made chemicals and charcoal from pine trees starting in 1945. Like the Koppers site, past waste disposal practices at Cabot Carbon caused soil and ground water contamination. Cabot Carbon closed in 1966. In 1967, a developer released pine tar wastewater into a ditch leading to Springstead Creek which flows into Hogtown Creek. Subsequent investigations confirmed citizens' complaints of tarry wastes in these two creeks. A commercial shopping mall, a car dealership, and a series of smaller stores and businesses now occupy the Cabot site.

The US Environmental Protection Agency (EPA) detected various organics, including aromatic and polynuclear aromatic compounds in soil and ground water on both the Koppers and Cabot portions of the site. In 1983, EPA added the Cabot-Koppers site to their Superfund National Priorities List. Nearby homes and businesses receive municipal water from distant wells.

In 1989, the Florida Department of Health and Rehabilitative Services (HRS) reviewed the environmental data, found the site a potential health risk, recommended warning signs, and recommended additional environmental testing (ATSDR 1989). In 1993 Florida HRS found most of its 1989 recommendations had been followed but recommended a more complete public health assessment and again recommended warning signs (ATSDR 1993). In 1995, Florida HRS reviewed new environmental data and recommended restricted site access, additional environmental testing, and warning signs (ATSDR 1995a). The extent of contamination in the nearby residential soil and creek sediments has not been determined.

In 1985, Cabot installed a surface water interceptor system to prevent contamination from entering the ditch leading to Springstead Creek. In 1995, Cabot installed a trench to intercept contaminated shallow aquifer groundwater. Ground water treatment under the Koppers portion of the site has been on-going since 1995. In the near future, Beazer East plans to begin soil remediation on the Koppers property.

The purpose of this health consultation report is to assess the public health threat from contaminants in the residential soil near the Koppers sites. The Alachua County Health Department requested this assessment.

Community Health Concerns

For years nearby residents, especially those west and north of Koppers, have been concerned about the health threat from contact with contaminated soil in their neighborhood. Also nearby residents have been concerned about contaminants in sediments of the creek that drains this site.

Environmental Contamination

In preparation for an October 2007 sewer line repair, the Gainesville Regional Utilities (GRU) collected six soil samples (0-24 inches deep) near the intersection of NW 26th Avenue and NW 4th Terrace, just west of Koppers. They combined these six samples and analyzed for arsenic and dioxins. Using the 2005 World Health Organization method, they estimated a benzo(a)pyrene toxicity equivalence concentration of 54 nanograms per kilogram (ng/kg or parts per trillion). Florida DOH determined that during the short-term sewer line repair (few days) it was unlikely that nearby residents would be exposed to unhealthy levels of arsenic or dioxin. Because GRU collected these soil samples over a 24 inch depth range, however, they are not suitable for estimating the health threat from exposures to surface soil (0-6 inches deep).

In February 2009, consultants for Beazer East, Inc (the party currently responsible for the Koppers site) collected 17 surface soil samples (0-6 inches deep) along roads in the neighborhood north and west of Koppers (SS01AC – SS17AA, Figure 1). They also collected five surface soil samples from the 30-foot wide City of Gainesville easement between NW 26th and NW 30th Avenues just west of the 6-foot chain-link fence marking the Koppers site boundary (SS19AA – SS27AA, Figure 1). Nearby residents have easy access to this easement (Figure 2). For comparison, these consultants collected background surface soil samples from 18 locations 1.5 to 4 miles east, south, southwest, and northwest of Koppers (Figure 3). They analyzed all these surface soil samples for arsenic, polycyclic aromatic hydrocarbons (PAHs), and dioxins/furans (Miller 2009). For the carcinogenic PAHs, the laboratory calculated a benzo(a)pyrene toxicity equivalence (BaP-TEQ). For the dioxins/furans, the laboratory calculated a 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalence (TCDD-TEQ). This report assesses the public health threat based on these data.

In the easement just west of Koppers, surface soil concentrations of arsenic, BaP-TEQ, and TCDD-TEQ were all well above Gainesville area background levels (Table 1). In the neighborhood north and west of Koppers, the surface soil concentrations of BaP-TEQ and TCDD-TEQ were only slightly above Gainesville area background levels (Table 2).

Because the highest surface soil concentrations of arsenic, BaP-TEQ, and TCDD-TEQ exceeded their ATSDR comparison values, we evaluate the public health threat in more detail below. Exceeding an ATSDR comparison value does not necessarily mean that exposure will cause illness; it only serves to narrow the focus to those contaminants important to public health.

Pathway Analysis

Chemical contaminants in the environment can harm people's health, but only if people have contact with those contaminants at a high enough concentration (dose) to cause a health effect. Knowing or estimating the frequency with which people could have contact with hazardous substances is essential to assessing the public health importance of these contaminants. To decide if people can contact contaminants at or near a site, Florida DOH looks at the human exposure pathways. An exposure pathway has five parts. These parts are:

1. A source of contaminants, like a hazardous waste site,

2. An environmental medium like air, water or soil that can hold or move the contamination,

3. A point where people come in contact with a contaminated medium, like drinking water or soil in a garden,

4. An exposure route like drinking contaminated water from a well or incidental ingestion of contaminated soil on homegrown vegetables, and

5. A population who could be exposed to the contaminants.

Florida DOH eliminates an exposure pathway if at least one of the five parts referenced above is missing and will not occur in the future. Exposure pathways not eliminated are either completed or potential. For completed pathways, all five pathway parts exist and exposure to a contaminant has occurred, is occurring, or will occur. For potential pathways, at least one of the five parts is missing, but could exist. Also for potential pathways, exposure to a contaminant could have occurred, could be occurring, or could occur in the future.

For this assessment, we evaluate the long-term health threat from incidental ingestion of very small amounts of surface soil as a complete exposure pathway. Incidental soil ingestion is common in children less than 6 years old who put soiled fingers or toys in their mouths. This hand to mouth activity causes ingestion (swallowing) of a very small amount of soil. Incidental ingestion of soil also occurs to a lesser degree in adults who eat or smoke without first washing their hands. We assume the Koppers site is the source of contamination and surface soil is the environmental medium. We assume the easement adjacent to Koppers and the neighborhood north and west of Koppers are where people could contact the surface soil. Incidental ingestion (swallowing) is the exposure route. Nearby residents are the exposed population.

Public Health Implications

The Florida DOH evaluates exposures by estimating daily doses for children and adults. Kamrin (1988) explains the concept of dose in the following manner:

> . . .all chemicals, no matter what their characteristics, are toxic in large enough quantities. Thus, the amount of a chemical a person is exposed to is crucial in deciding the extent of toxicity that will occur. In attempting to place an exact number on the amount of a particular compound that is harmful, scientists recognize they must consider the size of

an organism. It is unlikely, for example, that the same amount of a particular chemical that will cause toxic effects in a 1-pound rat will also cause toxicity in a 1-ton elephant.

Thus instead of using the amount that is administered or to which an organism is exposed, it is more realistic to use the amount per weight of the organism. Thus, 1 ounce administered to a 1-pound rat is equivalent to 2,000 ounces to a 2,000-pound (1-ton) elephant. In each case, the amount per weight is the same; i.e., 1 ounce for each pound of animal.

This amount per weight is the *dose*. Toxicology uses dose to compare the toxicity of different chemicals in different animals. We use the units of milligrams (mg) of contaminant per kilogram (kg) of body weight per day (mg/kg/day) to express doses in this public health assessment. A milligram is 1/1,000 of a gram; a kilogram is approximately 2 pounds.

To calculate the daily dose of each contaminant, the Florida DOH uses standard assumptions about body weight, ingestion rates, duration of exposure (length of time), and other factors needed for dose calculation (ATSDR 2005, EPA 1997). We assume that people are exposed daily to the maximum concentration measured. We also make the health protective assumption that 100% of the ingested chemical is absorbed into the body. The percent actually absorbed into the body is likely less. The general formula for estimating a dose is:

Dose = (soil concentration X soil ingestion rate) / body weight

ATSDR groups health effects by duration (length) of exposure. Acute exposures are those with duration of 14 days or less; intermediate exposures are those with duration of 15 - 364 days; and chronic exposures are those that occur for 365 days or more (or an equivalent period for animal exposures). ATSDR Toxicological Profiles also provide information on the environmental transport and regulatory status of contaminants.

To estimate exposure from incidental ingestion (swallowing) of contaminated surface soil, Florida DOH uses the following assumptions:

1) children ingest an average of 200 milligrams (mg) of soil per day (about the weight of a postage stamp),
2) adults ingest an average of 100 mg of soil per day,
3) children weigh an average of 10 kilograms (kg) or about 22 pounds,
4) adults weigh an average of 70 kg, or about 155 pounds
5) children and adults ingest contaminated surface soil at the maximum concentration measured for each contaminant.

For non-cancer illnesses, we first estimate the health risk for children. Because children are smaller and swallow more soil than adults, their exposure is higher. Therefore if children are not at risk, then adults are not either. For cancer, we estimated the risk from lifetime exposure. This includes both children and adults.

Limitations of Data

Depending on depths of soil sampling, data limitations may occur. Typically, the Florida DOH estimates the likelihood of illness from exposures to the top three inches of soil since people are most apt to come into contact with the top layer of soil during daily activities.

However, the available soil data at Koppers is based on sampling depths of 0-6 inches. Such depths may have diluted the concentration of contamination. Therefore, the results may not be representative of typical surface soil. In absence of data based on 0-1 inch samples, Florida DOH cannot be sure of the actual exposure.

Arsenic

Arsenic is a naturally occurring metal widely distributed in soil. It is usually found combined with oxygen, chlorine, and sulfur. Most arsenic compounds have no smell or special taste. Arsenic was used at the Koppers site to make wood resistant to rotting and decay ("pressure treated" wood). The background concentration of arsenic in Gainesville area surface soil averages about 1.1 mg/kg (Table 1). Background surface soil concentrations were measured at 18 locations 1.5 to 4 miles east, south, southwest, and northwest of Koppers (Figure 3).

Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons (PAHs) are a group of chemicals formed during the incomplete burning of coal, oil, gas, wood, garbage, tobacco, and charbroiled meat. More than 100 different PAHs exist. PAHs generally occur as complex mixtures. PAHs are contained in asphalt used in road construction, crude oil, coal, coal tar pitch, creosote, and roofing tar. In the past, Koppers treated wood with creosote which contains PAHs. PAHs are found throughout the environment in air, soil, and water. Other sources include cigarette smoke, vehicle exhaust, wildfires, agriculture burning, and residential wood burning. PAHs do not easily dissolve in water but stick tightly to soil particles.

To summarize the toxicity of the mixture of carcinogenic PAHs found in surface soil, the laboratory reported PAH concentrations in relation to the toxicity of benzo(a)pyrene, one of the most studied PAHs. In animals, ingestion of benzo(a)pyrene causes cancer of the stomach, esophagus, and larynx. Florida DOH evaluated the toxicity of the carcinogenic PAHs in terms of benzo(a)pyrene toxicity equivalents (BaP-TEQ). The background concentration of BaP-TEQ in Gainesville area surface soil averages about 0.03 mg/kg (Table 1). Background surface soil concentrations were measured at 18 locations 1.5 to 4 miles east, south, southwest, and northwest of Koppers (Figure 3).

Dioxins/Furans

Dioxins and furans are a family of chlorinated compounds with similar structures but varying toxicities. They have very low solubility in water and tend to stick to ash, soil, or any surface with a high organic content, such as plant leaves. They are produced naturally during forest fires and unintentionally in the manufacture of pentachlorophenol wood preservative and bleached

paper. They are also byproducts of burning coal, oil, natural gas, wood, and garbage. Dioxins and furans may have been contaminants in the pentachlorophenol used at Koppers or produced during the burning of wood bark at Koppers.

Based on animal studies, scientists express the toxicity of dioxins and furans as a fraction of the toxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), the most toxic dioxin congener. In animal studies, ingestion of 2,3,7,8-tetrachlorodibenzo-p-dioxin increases the risk of many different types of cancer. The background concentration of dioxins (reported as 2,3,7,8-tetrachlorodibenzo-p-dioxins toxicity equivalents or TCDD-TEQ) in Gainesville area surface soil averages about 1.6 nanograms per kilogram (ng/kg) (Table 1). Background surface soil concentrations were measured at 18 locations 1.5 to 4 miles east, south, southwest, and northwest of Koppers (Figure 3).

Easement West of Koppers

Arsenic

Non-cancer risk – Children incidentally ingesting (swallowing) very small amounts of surface soil with the highest arsenic levels from the easement just west of Koppers are not likely to suffer any non-cancer illness (Table 3). The maximum arsenic ingestion dose for children playing in this easement (0.0003 milligrams per kilograms per day or mg/kg/day) is 2.5 times less than the highest arsenic dose that does not cause any skin changes in humans (0.0008 mg/kg/day) and over 70 times less than the lowest arsenic dose causing gastrointestinal irritation, diarrhea, nausea, and precancerous skin changes in humans (0.022 mg/kg/day) (ATSDR 2007).

Cancer risk - People incidentally ingesting (swallowing) very small amounts of surface soil with the highest arsenic levels from the easement just west of Koppers over an entire lifetime (70 years) are at a very low increased theoretical risk of skin cancer (Table 3). Multiplying the maximum dose (0.00002 mg/kg/day) times the EPA cancer slope factor (1.5 $mg/kg/day^{-1}$) results in a very low additional increased theoretical cancer risk of 0.00003 or 3×10^{-5}.

Polycyclic Aromatic Hydrocarbons (PAHs)

Non-cancer risk - Children incidentally ingesting (swallowing) very small amounts of surface soil with the highest PAH (BaP-TEQ) levels from the easement just west of Koppers are not likely to suffer any non-cancer illness (Table 3). The maximum BaP-TEQ dose for children playing in this easement (0.0001 mg/kg/day) is millions of times less than the BaP-TEQ dose causing liver toxicity in mice (100 mg/kg/day) (ATSDR 1995b).

Cancer risk - People incidentally ingesting (swallowing) very small amounts of surface soil with the highest PAH (BaP-TEQ) levels from the easement just west of Koppers over an entire lifetime (70 years) are at a very low increased theoretical risk of cancer (Table 3). Multiplying the maximum dose (0.000009 mg/kg/day) times the EPA cancer slope factor (7.3 $mg/kg/day^{-1}$) results in a very low additional increased theoretical cancer risk of 0.00007 or 7×10^{-5}.

Dioxins/Furans

Non-cancer risk - Children incidentally ingesting (swallowing) very small amounts of surface soil with the highest dioxin/furans (TCDD-TEQ) levels from the easement just west of Koppers are at an increased risk of non-cancer illness (Table 3). The maximum TCDD-TEQ dose for children playing in this easement (0.00003 ug/kg/day) is only four times less than the lowest TCDD-TEQ dose causing moderate endometriosis and altered social behavior in monkeys (0.00012 ug/kg/day). It is also just 21 times less than the lowest TCDD-TEQ dose causing increased abortions, reduced reproduction, severe endometriosis, decreased off-spring survival, and learning impairment in monkeys (0.00064 ug/kg/day) (ATSDR 1998). Given the uncertainty in interspecies extrapolation, this is too small a margin of safety to say with certainty this dose of TCDD-TEQ would not cause illness in humans. Therefore, it is prudent for parents to keep children from playing in this easement.

Cancer risk - People incidentally ingesting (swallowing) very small amounts of surface soil with the highest TCDD-TEQ levels from the easement just west of Koppers over an entire lifetime (70 years) are at a low increased theoretical risk of cancer (Table 3). Multiplying the maximum dose (2×10^{-9} mg/kg/day) times the EPA cancer slope factor (1.5×10^{5} mg/kg/day^{-1}) results in a low additional increased theoretical cancer risk of 0.0003 or 3×10^{-4}.

Neighborhood North and West of Koppers

Arsenic

Non-cancer risk - Children incidentally ingesting very small amounts of surface soil with the highest arsenic levels in the neighborhood north and west of Koppers are not likely to suffer any non-cancer illness (Table 4). The maximum arsenic dose for children playing in this soil (0.00006 mg/kg/day) is 13 times less than the highest arsenic dose that does not cause any skin changes in humans (0.0008 mg/kg/day) and over 360 times less than the lowest arsenic dose causing gastrointestinal irritation, diarrhea, nausea, and precancerous skin changes in humans (0.022 mg/kg/day) (ATSDR 2007).

Cancer risk - People incidentally ingesting (swallowing) very small amounts of surface soil with the highest arsenic levels in the neighborhood north and west of Koppers over an entire lifetime (70 years) are at a very low increased theoretical risk of skin cancer (Table 4). Multiplying the maximum arsenic dose (0.000004 mg/kg/day) by the EPA cancer slope factor (1.5 mg/kg/day^{-1}) results in a very low additional increased theoretical cancer risk of 0.000006 or 6×10^{-6}.

Polycyclic Aromatic Hydrocarbons (PAHs)

Non-cancer risk - Children incidentally ingesting very small amounts of surface soil with the highest PAH (BaP-TEQ) levels in the neighborhood north and west of Koppers are not likely to suffer any non-cancer illness (Table 4). The maximum BaP-TEQ dose for children playing in soil in this neighborhood (0.00001 mg/kg/day) is millions of times less than the BaP-TEQ dose causing liver toxicity in mice (100 mg/kg/day) (ATSDR 1995b).

Cancer risk - People incidentally ingesting (swallowing) very small amounts of surface soil in this neighborhood with the highest PAH (BaP-TEQ) levels over an entire lifetime (70 years) are at a very low increased theoretical risk of cancer (Table 3). Multiplying the maximum BaP-TEQ dose (0.0000008 mg/kg/day) times the EPA cancer slope factor (7.3 $mg/kg/day^{-1}$) results in a very low additional increased theoretical cancer risk of 0.000006 or 6×10^{-6}.

Dioxins/Furans

Non-cancer risk - Children incidentally ingesting (swallowing) very small amounts of surface soil with the highest dioxin/furans (TCDD-TEQ) levels in the neighborhood are not likely to suffer any non-cancer illness (Table 4). The maximum TCDD-TEQ dose for children playing in this neighborhood (0.000001 ug/kg/day) is 120 times less than the lowest TCDD-TEQ dose causing moderate endometriosis and altered social behavior in monkeys (0.00012 ug/kg/day) (ATSDR 1998).

Cancer risk - People incidentally ingesting (swallowing) very small amounts of surface soil with the highest TCDD-TEQ levels in the neighborhood over an entire lifetime (70 years) are at a very low increased theoretical cancer risk (Table 3). Multiplying the maximum dose (8×10^{-11} mg/kg/day) times the EPA cancer slope factor (1.5×10^{5} $mg/kg/day^{-1}$) results in a very low additional increased theoretical cancer risk of 1×10^{-5}.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. 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.

This assessment takes into account the special vulnerabilities of children. It specifically assesses the health risk for children playing in soil near the Koppers hazardous waste site.

Conclusions

1. The Florida Department of Health and US Agency for Toxic Substances and Disease Registry conclude that incidental ingestion (swallowing) for more than a year of very small amounts of dioxin contaminated surface soil from the City easement between NW 26th and NW 30th Avenues just west of Koppers could possibly harm children's health. Incidental ingestion

(swallowing) of very small amounts of soil is common in children less than 6 years old who put soiled fingers or toys in their mouths.

2. The extent of surface soil contamination west of Koppers has not been fully tested.

3. Incidental ingestion (swallowing) of very small amounts of arsenic or polycyclic aromatic (PAH) contaminated surface soil from easement just west of Koppers over a lifetime is not likely to cause harm. Likewise, incidental ingestion of very small amounts of arsenic, PAHs, and dioxin/furan contaminated surface soil from the neighborhood north and west of Koppers is not likely to cause harm.

Recommendations

1. Parents should keep children from playing in the 30-foot wide City of Gainesville easement between NW 26th and NW 30th Avenues just west of the 6-foot chain link fence marking the Koppers boundary.

2. Collect more surface soil samples (0-3 inches deep) west of Koppers to find out the extent and degree of contamination. Test for arsenic, polycyclic aromatic hydrocarbons (PAHs), and dioxins/furans.

Public Health Action Plan

On May 15, 2009 the Alachua County Health Department (CHD) hand delivered letters to about 20 nearby residences advising them to keep children from playing in the easement just west of Koppers. The City of Gainesville posted warning signs “keep out” and “no trespassing” signs along the easement May 29, 2009. The Alachua CHD will hold a public meeting to answer health questions. The Florida Department of Health and the US Agency for Toxic Substances and Disease Registry will recommend the US Environmental Protection Agency require additional surface soil testing west of Koppers. Florida DOH/ATSDR will evaluate these additional data.

Authors, Technical Advisors

Florida Department of Health Author
Randy Merchant
Bureau of Environmental Public Health Medicine
Division of Environmental Health
Florida Department of Health
850 245-4299

ATSDR Reviewer
Jennifer Freed
Technical Project Officer
Division of Health Assessment and Consultation

References

Miller 2009. Personal communication from Scott Miller, US Environmental Protection Agency to Randy Merchant, Florida Department of Health regarding surface soil test results near the Koppers hazardous waste site.

ATSDR 1989. Agency for Toxic Substances and Disease Registry. Health Assessment for Cabot Carbon/Koppers Site. U.S. Department of Health and Human Services, Atlanta, GA. April 24, 1989.

ATSDR 1993. Agency for Toxic Substances and Disease Registry. Site Review and Update for Cabot/Koppers. U.S. Department of Health and Human Services, Atlanta, GA. September 24, 1993.

ATSDR 1995a. Agency for Toxic Substances and Disease Registry. Health Consultation for Cabot Carbon/Koppers Superfund Site. U.S. Department of Health and Human Services, Atlanta, GA. November 15, 1995.

ATSDR 1995b. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Polycyclic Aromatic Hydrocarbons. U.S. Department of Health and Human Services, Atlanta, GA. August 1995.

ATSDR 1998. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Chlorinated Dibenzo-p-Dioxins. U.S. Department of Health and Human Services, Atlanta, GA. December 1998.

ATSDR 2005. Agency for Toxic Substances and Disease Registry. Public Health Assessment Guidance Manual (Update). U.S. Department of Health and Human Services, Atlanta, GA. January 2005.

ATSDR 2007. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Arsenic. U.S. Department of Health and Human Services, Atlanta, GA. August 2007.

EPA 1997. US Environmental Protection Agency, Office of Research and Development. Exposure Factors Handbook. Volumes I, II, and III. EPA/600/P-95/002F (a, b, and c).

Kamrin 1988. Toxicology – A Primer on Toxicology Principles and Applications. Lewis Publishers. Chelsea MI.

Table 1. Surface Soil Contamination (0-6 inches deep) in the Easement West of Koppers

Contaminant	Concentration Range	Screening Guideline*	# Above Screening Guideline/Total #	Gainesville Area Background
Arsenic	3.2 – 15.8 mg/kg	0.5 mg/kg (CREG)	7/7	Avg. = 1.1 mg/kg
BaP-TEQ	0.5 – 6.4 mg/kg	0.1 mg/kg (CREG)	7/7	Avg. = 0.03 mg/kg
TCDD-TEQ	46 – 1,302 ng/kg	50 ng/kg (chronic child EMEG)	6/7	Avg. = 1.6 ng/kg

mg/kg – milligrams per kilogram ng/kg – nanograms per kilogram
BaP-TEQ – Benzo(a)pyrene toxicity equivalence
TCDD-TEQ – 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalence
CREG – ATSDR cancer risk evaluation guide for 10^{-6} excess cancer risk
EMEG – ATSDR environmental media evaluation guide
* Screening guidelines only used to select chemicals for further scrutiny, not to judge the risk of illness
Source: Miller 2009

Table 2. Surface Soil Contamination (0-6 inches deep) in the Neighborhood North and West of Koppers.

Contaminant	Concentration Range	Screening Guideline*	# Above Screening Guideline/Total #	Gainesville Area Background
Arsenic	0.2 – 3 mg/kg	0.5 mg/kg (CREG)	11/20	Avg. = 1.1 mg/kg
BaP-TEQ	0.015 – 0.545 mg/kg	0.1 mg/kg (CREG)	3/20	Avg. = 0.03 mg/kg
TCDD-TEQ	0.7 – 58 ng/kg	50 ng/kg (chronic child EMEG)	1/20	Avg. = 1.6 ng/kg

mg/kg – milligrams per kilogram ng/kg – nanograms per kilogram
BaP-TEQ – Benzo(a)pyrene toxicity equivalence
TCDD-TEQ – 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalence
CREG – ATSDR cancer risk evaluation guide for 10^{-6} excess cancer risk
EMEG – ATSDR environmental media evaluation guide
* Screening guidelines only used to select chemicals for further scrutiny, not to judge the risk of illness
Source: Miller 2009

Table 3. Estimated Maximum Dose from Incidental Ingestion of Easement Surface Soil

Contaminant	Maximum Surface Soil Concentration	Maximum Child Daily Dose (mg/kg/day)	Maximum Adult Daily Dose (mg/kg/day)
Arsenic	15.8 (mg/kg)	0.0003	0.00002
BaP-TEQ	6.4 (mg/kg)	0.0001	0.000009
TCDD-TEQ	1,302 (ng/kg)	0.00003*	0.000002*

mg/kg – milligrams per kilogram ng/kg – nanograms per kilogram
mg/kg/day – milligrams per kilogram per day
BaP-TEQ – Benzo(a)pyrene toxicity equivalence
TCDD-TEQ – 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalence
* micrograms per kilogram per day

Table 4. Estimated Maximum Dose from Incidental Ingestion of Neighborhood Surface Soil

Contaminant	Maximum Surface Soil Concentration	Maximum Child Daily Dose (mg/kg/day)	Maximum Adult Daily Dose (mg/kg/day)
Arsenic	3 mg/kg	0.00006	0.000004
BaP-TEQ	0.545 mg/kg	0.00001	0.0000008
TCDD-TEQ	58 ng/kg	0.000001*	0.00000008*

mg/kg – milligrams per kilogram ng/kg – nanograms per kilogram
mg/kg/day – milligrams per kilogram per day
BaP-TEQ – Benzo(a)pyrene toxicity equivalence
TCDD-TEQ – 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalence
* micrograms per kilogram per day

Figure 1. Surface Soil Test Results Near Koppers (0-6 inches deep)

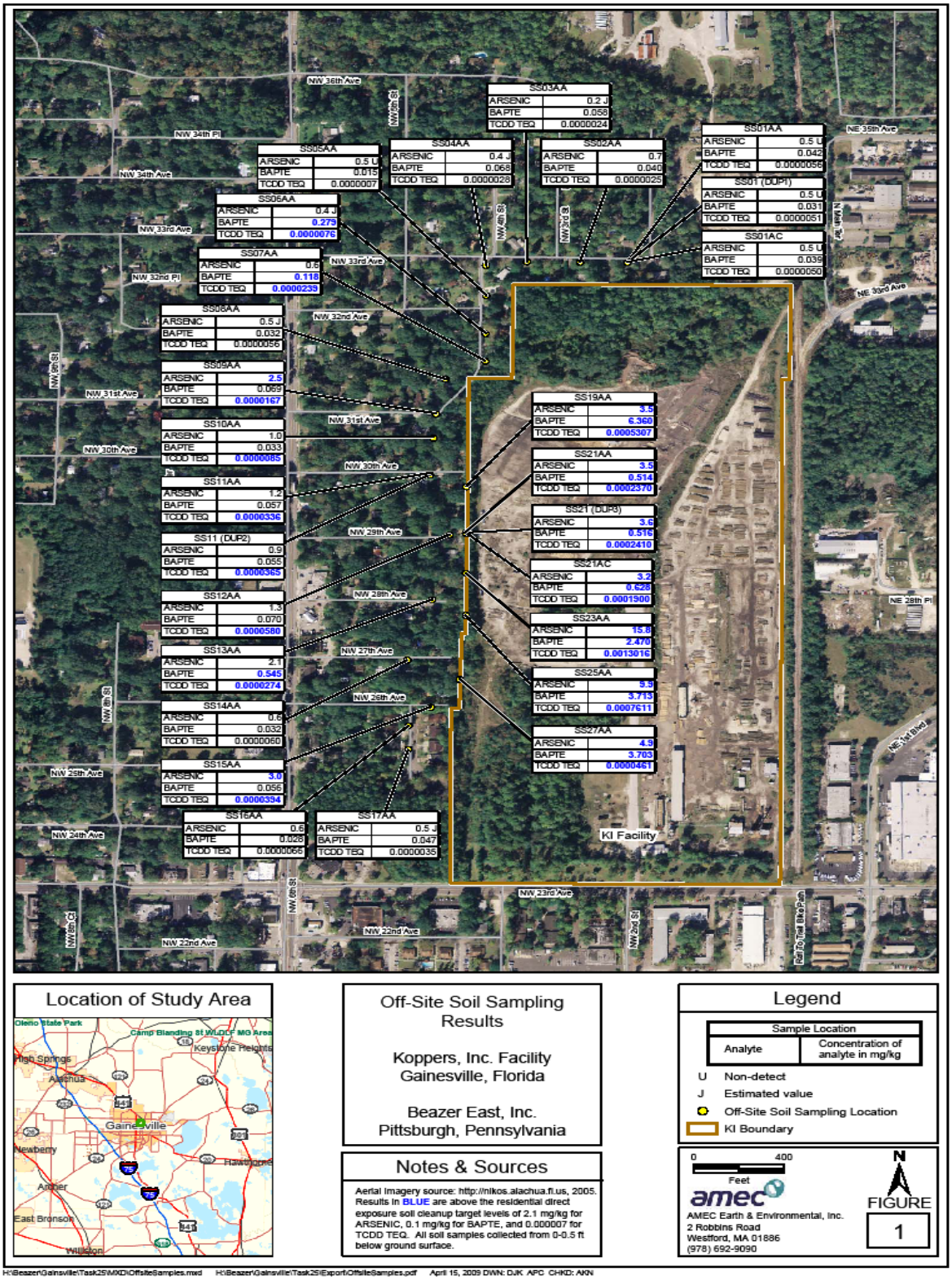
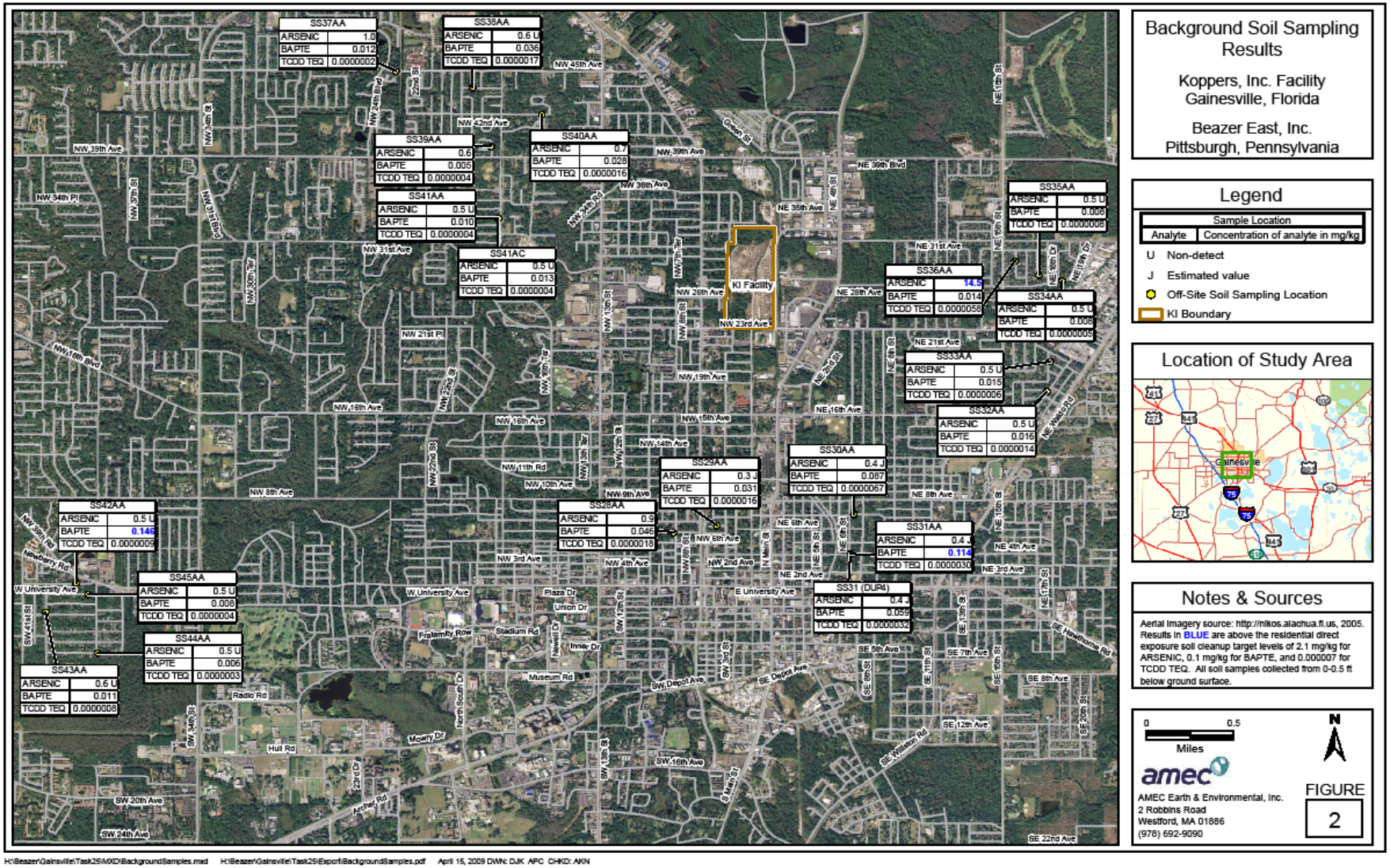


Figure 2. Photograph from the End of NW 26th Avenue Looking North Along the Easement Just West of Koppers

Figure 3. Gainesville Area Background Surface Soil Test Results (0-6 inches deep)



Glossary

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.

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.

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.

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.

Chronic
Occurring over a long time.

Chronic exposure
Contact with a substance that occurs over a long time (more than 1 year).

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].

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.

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.

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 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.

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

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

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].

mg/kg
Milligram per kilogram.

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.

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

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.

Receptor population

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

Risk

The probability that something will cause injury or harm.

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].

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.

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.

Substance

A chemical.

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

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.

Certification

The Florida Department of Health, Bureau of Environmental Public Health Medicine prepared this health consultation report under a cooperative agreement with the US Agency for Toxic Substances and Disease Registry. Florida DOH followed approved methodologies and procedures existing at the time it began its assessment. Florida DOH completed an editorial review.

Jennifer Freed
Technical Project Officer
CAT, CAPEB, DHAC, ATSDR

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

Alan Yarbrough
Team Lead
CAT, CAPEB, DHAC, ATSDR