Health Consultation

ESCAMBIA TREATING COMPANY

CLARINDA TRIANGLE SOIL EVALUATION

CITY OF PENSACOLA, ESCAMBIA COUNTY, FLORIDA

EPA FACILITY ID: FLD008168346

JUNE 2, 2005

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

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Prepared by:
Florida Department of Health
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Under Cooperative Agreement with the
U.S. Department of Health and Human Services
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HEALTH CONSULTATION

Escambia Treating Company

Clarinda Triangle Soil Evaluation

Pensacola, Escambia County, Florida

CERCLIS No. FLD008168346

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Contents

Foreword

This document summarizes the Florida Department of Health's evaluation of offsite soil data near the Escambia Treating Company site in Pensacola. Florida Department of Health evaluates site-related public health issues through the following processes:

- Evaluating exposure: Florida DOH scientists begin by reviewing available information about environmental conditions. The first task is to find out how much contamination is present, where contamination occurs, and how people might be exposed to it. Usually, Florida DOH does not collect its own environmental sampling data. The US Environmental Protection Agency's contractor, Camp, Dresser, and McKee (CDM) provided the information for this Health Consultation.
- Evaluating health effects: If there is evidence that people are exposed, or could be exposed, to hazardous substances, Florida DOH scientists will determine whether that exposure could be harmful to human health. This report 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 this evaluation report, Florida DOH outlines its conclusions regarding any potential health threat posed by soil offsite from the Escambia Treating Company 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 other agencies should take. If, however, an immediate health threat exists or is imminent, 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, 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 an evaluation report has been prepared, Florida DOH seeks feedback from the public. *If you have questions or comments about this report, we encourage you to contact us.*

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Summary and Statement of Issues

Escambia Treating Company (ETC) operated a wood treating facility in eastern Pensacola (Escambia County), from 1942 to 1982. The roughly 26-acre ETC property is at 3910 North Palafox Highway, also known as US Highway 29. The facility treated utility poles and foundation pilings with creosote, pentachlorophenol dissolved in diesel fuel, and possibly chromated copper arsenate. Between April 1982 and May 1992, the US Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (DEP) conducted several soil and groundwater investigations. They found creosote and pentachlorophenol contamination of groundwater and soil. The soil also contained dioxin, a common impurity of commercial-grade pentachlorophenol. ETC filed for bankruptcy and abandoned the site in 1991.

The EPA directed on-site emergency soil excavation (1991-1993) to prevent further groundwater contamination and to determine the quantity of solid waste on the site. During excavation activities, nearby residents complained about strong odors that caused eye and skin irritation. EPA temporarily relocated two residents because of health problems.

In 1995, EPA contractors analyzed soil samples from the neighborhoods north and south of ETC. The 1995 sampling identified off-site chemicals at elevated levels, including dioxin, polycyclic aromatic hydrocarbons (PAHs), arsenic, and lead. On February 12, 1997, EPA decided to relocate approximately 358 families. Relocated residents lived in three subdivisions north of ETC (Rosewood Terrace, Oak Park, and Escambia Arms) and one subdivision south of ETC (Herman Avenue and Pearl Street neighborhood). EPA relocated the last resident in 2003.

EPA's contractor, Camp, Dresser and McKee (CDM), collected more off-site soil samples in March 2004. CDM sampled soil at nine background locations and at the following five areas near the ETC:

- the "Clarinda Triangle", an area of mixed residential and commercial properties west of the ETC site,
- Palafox Industrial Park, located immediately south of the ETC site,
- Herman Avenue and Pearl Street, located immediately south of Palafox Industrial Park,
- the Palafox Highway /Hickory Street Commercial Strip located north of the Rosewood Terrace neighborhood, and
- north and east of Solid Waste Management Unit (SWMU) 10, an excavation area on the northeast edge of the ETC site.

The Clarinda Triangle area soil samples had arsenic, dioxins, lead, and polycyclic aromatic hydrocarbons (PAHs) above DEP's Soil Cleanup Target Levels (SCTLs) for residential areas.

EPA asked the Florida Department of Health (DOH) to evaluate the Clarinda Triangle data for possible public health effects. To do this, we estimated soil amounts children and adults might ingest (accidentally or incidentally), daily, for longer than a year—using the highest measured chemical levels and standard exposure assumptions. These estimates give an amount of chemical per body weight, also called a dose. We use doses to compare the highest expected exposure levels to amounts having known health effects from animal studies or from human medical

reports. The doses we estimate for children are usually higher than adult doses. This is because we assume children weigh less than adults do, and they might ingest more soil than adults might.

Florida DOH categorizes the Clarinda Triangle area surface soil as "No Apparent Public Health Threat". Our comparisons showed the highest measured levels of arsenic, dioxins, lead, and PAHs are unlikely to have non-cancer health effects for both children and adults. The dioxin dose we calculated for children is 10 to 100 times below any effect levels demonstrated, either experimentally or in epidemiologic studies, for both cancer and noncancer health endpoints. The adult dose is about 10 times lower than the estimated child dose.

We list the specific types of cancers associated with arsenic and PAHs in the Public Health Implications portion of this Health Consultation. We calculated increased theoretical cancer risks for arsenic and PAHs, again assuming children and adults would have daily contact with soil that would lead to them accidentally or incidentally eat or inhale it—at the highest measured levels. We found:

- for arsenic by the incidental soil ingestion exposure route – an increase of 3 to 6 theoretical cases in 100,000 – between "low" and "no apparent" risk,
- for arsenic by the dust inhalation exposure route – an increase of 4 to 6 theoretical cases in 1,000,000 – between "no apparent" and "no significant" risk,
- for PAHs by the incidental soil ingestion exposure route – an increase of 4 theoretical cases in 100,000, between "low" and "no apparent" risk, and
- for PAHs by the dust inhalation exposure route – an increase of less than 1 theoretical case in 1,000,000 – "no significant" risk.

Although the Florida DOH only identified low increased risk of cancer (for daily exposure to several chemicals) as the health risks associated with the chemicals measured in the subdivision, persons may want to take precautions to lessen their potential for exposure. To reduce their soil ingestion potential, residents and workers can avoid hand-to-mouth contact with surface soil, and can avoid consuming vegetables and fruits grown in their yards, especially root crops. Residents and workers can reduce their potential for soil inhalation by avoiding working in dusty outdoor conditions or by using dust masks.

Florida DOH, Bureau of Community Environmental Health staff will evaluate any additional data that EPA takes near the ETC property for public health concerns. If EPA finds additional or higher levels of chemicals, Florida DOH will reevaluate the exposure pathways in this health consultation. Florida DOH will also inform and educate nearby residents about the public health evaluation completed for this site.

Purpose

EPA requested Florida DOH to review the 2004 soil sampling results for Clarinda Triangle and participate in a public meeting to address possible health-related questions associated with the screening evaluation of soil near the ETC site.

Background

Escambia Treating Company is in downtown Pensacola. Properties within one mile of the site are residential, mixed industrial, and commercial. Mixed residential and commercial properties are west of ETC, across North Palafox Highway. The CSX Railroad switching yard and a large quarry border ETC to the east. Former neighborhoods are north and south of the site. The EPA relocated residents from these areas. As of November 2004, joint efforts by the EPA, U.S Army Corps of Engineers, Escambia County and the City of Pensacola had demolished 45 abandoned homes and had begun property remediation. After remediation, EPA anticipates industrial or commercial use for these properties[11].

Potable water for this area comes from the Sand and Gravel aquifer. Locally, the poorly sorted, coarse-grained, quartz Sand and Gravel aquifer is about 300 feet thick. The interconnected spaces between the aquifer sediments allow rapid groundwater movement, making the aquifer vulnerable to groundwater contamination.

In 2000, about 5,606 people lived within a 1-mile radius of a point in the center of ETC[2]. Approximately 61% were black, 35% percent were white, and 2% were Hispanic or Latino. All other racial or ethnic groups made up less than 2%. There are 3 schools (Brown Barge, Booker T. Washington, and Brentwood), and University Hospital and Clinic hospital, within 1 mile of ETC.

ETC operated a wood treating facility in eastern Pensacola (Escambia County), from 1942 to 1982. The 26-acre ETC property is at 3910 North Palafox Highway, also known as US Highway 29. Initially the facility treated utility poles and foundation pilings with creosote. In 1963, ETC began using pentachlorophenol dissolved in diesel fuel in addition to creosote. After 1970, ETC mainly used pentachlorophenol preservative, although they may have used chromated copper arsenate (CCA), at least on a trial basis[3].

EPA began excavations in October 1991 to address the immediate threat that the ETC site soil posed for groundwater contamination. After installing a 12-foot fence to restrict access, EPA excavated approximately 255,000 cubic yards of contaminated soil and stockpiled the material on and under a secure cover to prevent further migration of contaminants into the groundwater. They completed preliminary excavation work in 1993[5].

In 1995, EPA contractors analyzed soil samples from the neighborhoods north and south of ETC[6]. Florida DOH evaluated these data and found that long-term daily exposure to dioxin at the highest levels measured in some surface soil samples could cause immune system impairment or liver damage in exposed children or adults[5]. The 1995 sampling also identified other chemicals at elevated levels, including polycyclic aromatic hydrocarbons (PAHs), arsenic, and lead[6]. On February 12, 1997, EPA issued a Record of Decision to relocate approximately 358 families. Relocation was completed in 2003. Relocated residents lived in three subdivisions north of ETC (Rosewood Terrace, Oak Park, and Escambia Arms) and one subdivision south of ETC (on Herman Avenue and Pearl Street).

CDM investigated the distribution of on-site and some off-site soil contamination for EPA in 1998[7]. On site, these 1998 soil data showed elevated polycyclic aromatic hydrocarbons (PAHs), pentachlorophenol, pesticides, metals, and dioxin concentrations.

Off-site, the 1998 soil data showed:

- the highest PAH, pesticide, and dioxin levels in the yards of several residences adjacent to ETC's northern border,
- PAHs and metals in many surface soil samples collected in the Rosewood Terrace, Oak Park, and Escambia Arms neighborhoods north of the site,
- PAHs and metals in soil at a drum manufacturing facility north of the site, and
- PAHs, pesticides, dioxins, and metals in soil in the Herman Avenue and Pearl Street neighborhood south of the site but especially near or adjacent to the CSX Railroad track.

Contaminants may have migrated from ETC to offsite areas via surface soil volatilization, dust generation[8], or movement of shallow groundwater above soil horizons that perch after periods of extended heavy rainfall[9]. Shallow slightly clayey, silty, sand layers (3.5 to 9 feet below land surface) appear to dip to the northwest and could account for temporary northwestern lateral shallow groundwater flow[9].

In 2004, EPA's contractor CDM did additional offsite soil investigation near ETC. They measured arsenic, dioxins, lead, and PAHs in surface soil in the Clarinda Triangle area, above DEP's Soil Cleanup Target Levels. Currently the EPA is working with the community to determine which of the following cleanup options to pursue:

- Temporary relocation with cleanup to residential standards,
- Permanent relocation with cleanup to commercial standards, no demolition, or
- Permanent relocation with cleanup to commercial standards, including demolishing existing structures.

Community Health Concerns

In April 2002, the local citizens group, Citizens Against Toxic Exposure (CATE) asked the EPA National Ombudsman for an independent review of the following items at the ETC site:

- an examination of the status of ETC cleanup planning,
- a determination of whether the home owner relocation was conducted appropriately and in accordance with EPA's guidelines, and
- an evaluation of the effectiveness of community relations activities.

The Ombudsman found EPA took appropriate cleanup planning actions at the ETC Superfund site[10]. The lining and covering of the soils stored on the site is protective, and this soil storage should be viable for several more years. The EPA expects completed Feasibility Studies for remedial action in mid-2005. At that time, with the completion of additional soil sampling and recent agreement between EPA and Florida regarding cleanup standards, the Ombudsman expects progress on a proposed plan for site cleanup.

Although the Ombudsman found the relocation project to be effective, she recommended Region 4 should continue to require the U.S. Army Corps of Engineers to:

- provide appraisal details to property owners,
- more closely monitor housing inspections, and

- allow residents a period of time to report replacement-housing problems and obtain reimbursement for legitimate repairs.

The Ombudsman found EPA had provided fact sheets, made periodic visits to update community members, held public meetings, and required administrative record files to be made available at the site repository. She recommended the EPA should consider reviewing and updating the site Community Involvement Plan, conduct additional public meetings, and provide courtesy copies of future administrative record documents to community representatives to bolster community relations in the future.

On February 23, 2005, EPA held two Public Availability Sessions near ETC at the New Hope Baptist Church. The first session was held from 10:00 am to 1:00 pm and the second session was held from 2:30 to 6:45 pm, to discuss the March 2004 sampling results. Connie Garrett, Health Assessor with the Florida DOH, attended the meeting. During the meeting, Ms. Garrett discussed the anticipated findings of this Health Consultation (this document had not been approved at that time). She listened and took notes of stakeholders' public health concerns.

Discussion

In this section, Florida DOH evaluates data from CDM's March 2004[1] soil investigation of the Clarinda Triangle neighborhood for possible public health concerns. Florida DOH attempts to moderate the uncertainties inherent in the health consultation process by using conservative assumptions when estimating or interpreting health risks in order to protect public health.

Florida DOH used DEP's residential Soil Target Cleanup Levels (SCTLs) and ATSDR's dioxin Environmental Media Evaluation Guide (EMEG) to select the contaminants of concern. Identification of a contaminant of concern in this section of the report does not necessarily mean that exposure to the contaminant will cause illness. Identification of contaminants of concern helps narrow the focus of the public health consultation to those contaminants that pose a potential public health risk to area residents.

CDM collected 52 surface soil samples from ground surface to 6 inches below the level of ground surface to evaluate surface soil quality in the Clarinda Triangle neighborhood. In Table 1, we list the highest measured levels and the locations for the chemicals measured above their screening values in Clarinda Triangle. CDM's Laboratories conducted their analyses in accordance with EPA Definitive Level requirements, which included data validation and Quality Control requirements; therefore, Florida DOH assumed that these data are valid.

Exposure Pathways

Most chemical contaminants in the environment will only harm people through direct exposure. It is essential to determine or estimate the frequency of contact people could have with hazardous substances in their environment in order to assess the public health significance of the contaminants.

Residents, or construction or landscaping workers could accidentally ingest soil if they got it on their hands and then put their hands into their mouths while playing, gardening, or digging in the soil. Residents, or construction or landscaping workers might inhale dust in windy conditions.

When soil conditions are dry, persons doing yard work, operating power machinery or using rakes might inhale dust.

Public Health Implications

Florida DOH evaluates exposures by estimating daily doses for children and adults (Table 2). A dose is an amount of chemical per body weight. Florida DOH uses estimated doses to compare potential exposure levels to amounts having known health effects from animal studies or from human medical reports. We use the units of milligrams (mg) of contaminant per kilogram (kg) of body weight per day (mg/kg/day). A milligram is 1/1,000 of a gram; a kilogram is approximately 1,000 grams or 2 pounds.

To estimate a daily dose, Florida DOH uses the highest measured levels of chemicals and standard assumptions about body weight, ingestion and inhalation rates, duration of exposure, and other factors needed for dose calculation[11]. To estimate exposure from incidental ingestion of contaminated soil, Florida DOH uses the following assumptions (and others, listed before Table 2)[11]:

1) children 1 - 4 years of age ingest an average of 200 mg of soil per day,
2) adults ingest an average of 100 mg of soil per day,
3) children 1 - 4 years of age weigh an average of 15 kg,
4) adults weigh an average of 70 kg,
5) children and adults ingest contaminated soil at the maximum concentration measured for each contaminant.

The measured levels of chemicals in the Clarinda Triangle soil samples are unlikely to cause non-cancer health effects. Table 3 details how our calculated doses compare with the lowest levels associated with health effects from medical reports or animal studies**.** In the following section, we discuss the theoretical increases in cancer that might result from daily ingestion and/or inhalation of soil containing the highest measured levels of arsenic and PAHs. We also discuss the potential health effects of low levels of lead exposure.

Arsenic

Figure 3 shows where surface soil samples contained arsenic above the residential Soil Cleanup Target Level. A surface soil sample taken west of a large commercial building on West 40th Lane and Palafox Highway had the highest measured arsenic level. This one measurement may be anomalous: it is about 6 times higher than the next highest measured arsenic value. The theoretical increased statistical cancer risk for children and adults exposed daily to soil containing 69 ppm arsenic is:

- for incidental soil ingestion – an increase of 3 to 6 theoretical cases in 100,000 – between "low" and "no apparent" risk,
- for arsenic by the dust inhalation exposure route – an increase of 4 to 6 theoretical cases in 1,000,000 – between "no apparent" and "no significant" risk.

From lowest to highest dose cancer effect levels, chronic arsenic exposures have been linked to lung, basal and squamous cell skin cancers, liver cancer (haemangioendothelioma), urinary tract cancers (bladder, kidney, prostate, ureter, and all urethral cancers), and intraepidermal† cancers[12].

Dioxin

A surface soil sample taken near the western end of Clarinda Lane yielded the highest TEQ dioxin level. Figure 4 shows the calculated dioxin levels above DEP's residential Soil Cleanup Target Level and the location of the one sample that was above ATSDR's Environmental Media Evaluation Guide. The dioxin dose we calculated for children exposed to the highest calculated dioxin TEQ is 10 to 100 times below any effect levels demonstrated, either experimentally or in epidemiologic studies, for both cancer and noncancer health endpoints. Likewise, we would not expect cancer or noncancer health effects for adults because the estimated adult dose is 10 times lower than the estimated child dose. Unlike many carcinogens, information linking dioxins to cancer sites is not definite. Statistically significant increases in risks for all cancers were found in workers exposed to high levels of dioxins many years after their exposures (called a long latency period). The evidence linking low doses with site-specific cancers is weaker, with some data suggesting a possible relationship between soft-tissue sarcoma, non-Hodgkin's lymphoma, or respiratory cancer[13].

PAHs

A surface soil sample taken north of a building at the intersection of Palafox and Clarinda Lane yielded the highest measured TEQ PAH level. Figure 5 show the locations of the PAHs measured above DEP's residential Soil Cleanup Target Level. The theoretical increased statistical risks of cancer for children and adults exposed to the highest level of TEQ PAHs measured (9.4 ppm) daily, (for longer than a year) are:

- for incidental soil ingestion – an increase of 4 theoretical cases in 100,000 – between "low" and "no significant" risk, and
- for dust inhalation – an increase of less than 1 theoretical case in 1,000,000 – "no significant" risk.

Worker exposures to high levels of PAHs show cancers (skin, bladder, lung and gastrointestinal) are the most significant endpoint of PAH toxicity[14]. Long-term worker PAH exposures have been linked with skin and eye irritation, photosensitivity, respiratory irritation (with cough and bronchitis), leukoplakia†, precancerous skin growths enhanced by exposure to sunlight, erythema nodosum,Δ skin burns, acneiform lesions, mild hepatoxicity, and haematuria‡. In addition, several

† Intraepidermal is the name for the early pre-invasive form of squamous cell skin cancer. "Pre-invasive" means that the cancer cells are confined to the outermost layer of skin, the epidermis. At this stage, the cancer cells are unlikely to have spread to the lymph nodes, but they can spread along the skin surface. If left untreated, these cells can develop into an invasive cancer and spread into the lymphatic system.
† Leukoplakia is a common, potentially pre-cancerous disease of the mouth that involves the formation of white spots on the mucous membranes of the tongue and inside of the mouth. Despite the increased risk associated with having leukoplakia, most people with this condition never get oral cancer
Δ Erythema nodosum is an inflammation of subcutaneous fat tissue.
‡ Hematuria is passage of blood in the urine.

PAHs are immunotoxic, and some suppress selective components of the immune system. Workers' dermal exposure studies indicate that although direct contact may be of concern at high exposure levels, they do not suggest that lower levels are likely to cause significant irritation[15].

Lead

A surface soil sample taken west of a large commercial building on West 40th Lane and Palafox Highway had the highest measured lead level, 790 ppm. Figure 5 shows (in green) where lead was measured in surface soil above DEP's residential Soil Cleanup Target Level. For lead, estimated blood levels more accurately predict health effects than traditional dose estimates. Florida DOH used a simple model to estimate blood lead levels and likely health effects[16] for exposures to the highest measured levels of lead in soil. This model takes into account children and adults' exposures to lead from sources other than the site. Florida DOH assumed people would be exposed to lead-contaminated soil eight hours per day.

The modeled blood lead levels for daily long-term exposure varied from 2.5 to 6.6 micrograms per deciliter (µg/dl) for children and from 1.8 to 6.6 µg/dl for adults—below the US Centers for Disease Control and Prevention's level of concern (10 µg/dL). Lead in the bloodstream interferes with the body's ability to make new red blood cells[17]. Too few red blood cells (anemia) mean the body's uptake of energy from food and oxygen from air is less efficient. The processes leading to anemia occur at all levels of lead exposure: there is no threshold for this effect. There also may be no threshold for adverse neurological effects of lead in children: intelligence, balance, hearing, and attention deficit/hyperactivity disorder[17] (Table 3).

Child Health Considerations

ATSDR and Florida DOH recognize the unique vulnerabilities of infants and children demand special attention[18]. Children are at a greater risk than are adults to certain kinds of exposure to hazardous substances. Because they play outdoors and may eat outdoors, children are more likely to be exposed to contaminants in surface soil. Children are shorter than adults, which means they breathe dust, soil, and heavy vapors closer to the ground. They are also smaller, resulting in higher doses of chemical exposure per body weight. If toxic exposures occur during critical growth stages, the developing body systems of children can sustain permanent damage. Probably most important, however, is that children depend on adults for risk identification and risk management, hygiene awareness, and access to medical care. Thus, adults should be aware of public health risks in their community, so they can guide their children accordingly. In recognition of these concerns, ATSDR developed the chemical screening values for children's exposures that Florida DOH used in preparing this report.

Other susceptible populations may have different or enhanced responses to toxic chemicals than will most persons exposed to the same levels of that chemical in the environment. Reasons may include genetic makeup, age, health, nutritional status, and exposure to other toxic substances (like cigarette smoke or alcohol). These factors may limit that persons' ability to detoxify or excrete harmful chemicals or may increase the effects of damage to their organs or systems.

Conclusions

Florida DOH categorizes the Clarinda Triangle surface soil as "No Apparent Public Health Hazard". Although the levels of arsenic, dioxins, lead, and polycyclic aromatic hydrocarbons (PAHs) measured in the Clarinda Triangle area surface soil sample are above DEP's Soil Cleanup Target Levels, Florida DOH identified low increased risk of cancer as the only health risks for daily exposure. Properties in this area of Pensacola are residential and commercial.

Florida DOH evaluated the analytical results for 52 surface soil samples for possible threats to public health. We compared doses estimated using the highest measured chemical levels to chemical-specific doses linked with health effects. The highest measured levels of arsenic, dioxins, lead, and PAHs are unlikely to have non-cancer health effects for children and adults. The estimated child dioxin dose is 10 to 100 times below any effect levels demonstrated, either experimentally or in epidemiologic studies, for both cancer and noncancer health endpoints. The adult dose is about 100 to 1000 times higher.

Only one chemical had an estimated dose greater than an ATSDR minimum risk level, our estimated child dose for arsenic in a surface soil sample taken west of a large commercial building on West 40th Lane and Palafox Highway. Because this one value was measured on a commercial property, the data for surface soils in the Clarinda Triangle area fit ATSDR's "No Apparent Public Health Hazard" category.

We list the specific cancer types associated with arsenic, dioxins, and PAHs in the Public Health Implications portion of this Health Consultation. We calculated increased theoretical cancer risks for arsenic and PAHs, again assuming children and adults would have daily contact with soil—that would lead them to accidentally or incidentally eat or inhale it—at the highest measured levels. We found:

- for arsenic by the incidental soil ingestion exposure route – an increase of 3 to 6 theoretical cases in 100,000 – between "low" and "no apparent" risk,
- for arsenic by the dust inhalation exposure route – an increase of 4 to 6 theoretical cases in 1,000,000 – between "no apparent" and "no significant" risk,
- for PAHs by the incidental soil ingestion exposure route – an increase of 4 theoretical cases in 100,000, between "low" and "no apparent" risk, and
- for PAHs by the dust inhalation exposure route – an increase of less than 1 theoretical case in 1,000,000 – "no significant" risk.

Recommendations

Although the identified health risks for soil in the Clarinda Triangle area are low, Florida DOH makes the following recommendations to provide residents with advice on the "best public health practices", should they wish to avoid soil exposures. To avoid accidentally ingesting soil, residents and workers should avoid hand-to-mouth contact with surface soil, and should avoid consuming vegetables and fruits grown in contaminated soil, especially root crops. To avoid accidentally inhaling soil, residents and workers should avoid working in dusty conditions, or should use dust masks if they are unable to avoid dusty conditions.

Public Health Action Plan

If EPA takes additional samples off-site from the ETC soil property where people may have daily soil exposure, Florida DOH, Bureau of Community Environmental Health staff will evaluate the results. Florida DOH will reevaluate exposure pathways if additional chemicals are found.

Florida DOH will also inform and educate nearby residents about the limited public health threats identified at this site.

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Appendix A - Chemicals above DEP's Soil Cleanup Target Levels

List of chemicals above DEP's Soil Cleanup Target Levels by sample areas:

- "Clarinda Triangle" mixed residential and commercial properties west of the ETC site

  —arsenic (2/52 locations, 69 ppm highest), dioxins (5/52, 78 ppt highest), PAHs (2/52 locations, 1.5 ppm highest), exceed DEPs Industrial SCTLs,

  —arsenic (21/52 locations), dioxins (33/52 locations), lead (2 locations, 790 ppm highest), and PAHs (21/52 locations) exceed DEP residential SCTLs.

- Palafox Industrial Park immediately south of the ETC site

  — dioxin TEQs (only 1/5 locations, at 153 ppt) exceeds DEPs Industrial SCTL,
  —arsenic (3/5 locations, 5.2 ppm highest) and dioxin TEQs (2/5 locations), exceed DEP residential SCTLs.

- Herman Avenue and Pearl Street immediately south of Palafox Industrial Park

  —CSX documented extensive lead contamination in area surface soil; EPA is discussing lead plume remediation with Agrico potentially responsible parties (PRPs).

  —CDM only sampled for TEQ dioxins during this investigation, (3/30, 47.83 ppt highest, exceeded DEP's industrial SCTLs, 22/30 exceeded DEP's dioxin residential SCTLs.

- the Palafox Highway/Hickory Street Commercial Strip located north of the Rosewood Terrace neighborhood

  —no chemicals exceeded DEPs Industrial SCTL, and

  —arsenic (4/5 locations, 3.4 ppm highest), dioxins (3/5 locations, 13.13 ppt highest), and PAHs (3/5 locations, .37 ppm highest) exceed DEP residential SCTLs.

- north and east of Solid Waste Management Unit (SWMU) 10, an excavation area on the northeast edge of the ETC site

  —east of SWMU10, no chemicals measured above DEP Industrial SCTLs, TEQ dioxins (2/2, 21.6 ppt highest), PAHs (1/2 , 0.13 ppm highest) and arsenic (1/2, 5.8 ppm highest) exceed DEP residential SCTLs.

  —area north of SWMU10 under remediation—dioxins (4/4, 333.8 ppt highest), exceed DEPs Industrial SCTLs, PAHs (4/4 locations, 0.412 ppm highest), arsenic (1/4 locations, 2.5 ppm highest) and dioxins exceed DEP residential SCTLs.

Appendix B - Figures and Tables

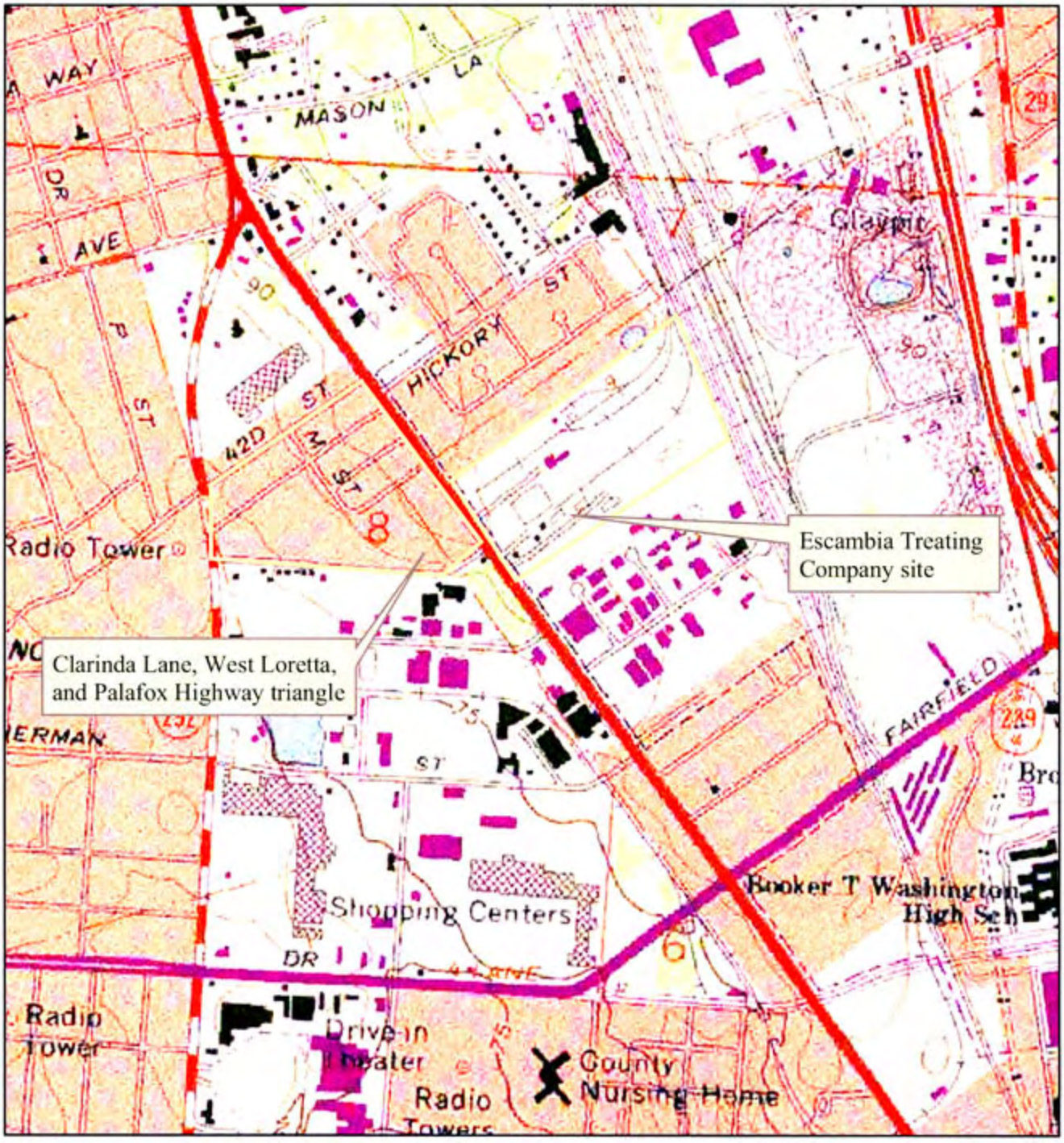

Figure 1: Pensacola locations for Escambia Treating Company and Clarinda Triangle

0 0.05 0.1 0.2 0.3 0.4 Miles

Sites locations in Escambia County, Florida

Figure 2: Air photo (1999) showing locations where soil was sampled in March 2004

0 0.05 0.1 0.2 0.3 0.4 Miles

Figure 3: All values plotted have the units of milligrams per kilogram, or parts per million (ppm). One part per million is analogous to about 1 second in about 12 days. Locations plotted had arsenic measured in surface soil higher than DEP's draft residential Soil Cleanup Target Level (2.1 ppm).

Florida Department of Health

Figure 4: All values plotted have the units of nanograms per kilogram, or parts per trillion (ppt). One part per trillion is analogous to about 1 second in 320 centuries. Locations plotted had soil dioxin TEQs higher than DEP's residential Soil Cleanup Target Level (7 ppt). Circled value is the only sample with a dioxin TEQ value above ATSDR's screening value for children (50 ppt). None are above the ATSDR adult screening value (700 ppt).

Florida Department of Health

Figure 5: All PAH TEQ values plotted have the units of milligrams grams per kilogram, or parts per million (ppm). One part per million is analogous to about 1 second in 12 days. Locations plotted in yellow had soil PAH TEQs higher than DEP's residential Soil Cleanup Target Level and DOH's cancer screening level (0.1 ppm). Locations plotted in green had soil lead levels greater than DEP's residential Soil Cleanup Target Level of 400 ppm.

Florida Department of Health

Table 1. Maximum concentrations in off-site surface soil (0-6 inches below ground surface)

Contaminants of Concern	Maximum Concentration (mg/kg)	Location of sample with maximum	Number of Soil Samples Above Screening Values	Comparison Value* (mg/kg)	Source
Arsenic	69	CTSS36	24/68	2.1	DEP RSCTL
Dioxins (TEQ)	0.000078	CTSS27	5/98	0.00005	ATSDR child EMEG
Lead	790 Ω	CTSS34	2/68	400	DEP RSCTL
PAHs (TEQ)	1.5	CTSS51	26/68	0.1	ATSDRCREG DEP RSCTL

* Florida DOH uses Comparison values to select chemicals for further scrutiny, not for determining the possibility of illness.
Ω The Herman Avenue and Pearl Street area has a known area of lead contamination in the surface soil (investigation done by CSX); CDM did not sample for lead during this investigation, EPA is discussing lead plume remediation with Agrico potentially responsible parties (PRPs).
CREG- Cancer Risk Evaluation Guide [19]
EMEG- Environmental Medial Evaluation Guide[19]
mg/kg = milligrams per kilogram of soil
PAH- polycyclic aromatic hydrocarbons expressed in terms of benzo(a)pyrene toxicity equivalents (**TEQ**)
RSCTL- Residential Soil Cleanup Target Level[20]

Model Parameters and Assumptions for Tables

N.D.- Not detected
N.A.- Not applicable
N.S.- Not significant

Exposure Medium: Soil
Exposure Point: **On-site soil and dust**
Scenario: Future
Land Use Conditions: Residential

Receptor Population: Residents
DOH calculated these doses were using Risk Assistant software and accepted values for soil consumption, dust inhalation exposure and dermal exposure parameters.

DOH calculated doses in the following table using the following values:
Adult body weight- 70 kg
Child body weight- 15 kg
Adult soil consumption- 100 mg/day
Child soil consumption- 200 mg/day
Adult Inhalation- 8 hours, 1.6m^3/hour (adult female, moderate activity)
Child Inhalation- 8 hours, 2.0m^3/hour (child, moderate activity)
* DOH gives the air concentration in milligrams per cubic meter because the values for inhalation studies in most of the Toxicological Profiles are given in these units. The air concentration is not a dose, therefore it is the same for adults and children.
mg/kg = milligram per kilogram of soil
mg/kg/day = milligrams per kilogram body weight per day

Table 2. Estimated dose from daily exposures to off-site surface soil, doses calculated from highest measured levels

Contaminant of Concern (maximum concentration) (mg/kg)	Oral MRL (mg/kg/day)	Soil/dust-Ingestion (mg/kg/day)		Inhalation MRL (mg/m^3)	Soil/dust-Inhalation (mg/m^3)
		Child	Adult		Child and Adult
Arsenic (69)	0.0003 Chr	0.0009	0.0001	None	0.000004
Dioxins (0.000078)	0.0000002 Acute 0.00000002 Int. 0.000000001Chr.	0.000000001	0.0000000001	None	0.000000000004
PAHs (1.5)	None	0.00002	0.000002	None	0.00000008

MRL – Minimal Risk Level. An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure.
mg/kg = milligrams per kilogram
PAHs = polycyclic aromatic hydrocarbons
Acute – Acute exposure is exposure lasting 0 to 14 days
Int. – Intermediate is exposure lasting 15 to 364 days
Chr – Chronic exposure is exposure lasting more than 365 days
mg/kg/day – milligram chemical per kilogram body weight per day
mg/m3 – microgram of chemical per cubic meter of air

Table 3. Comparison of doses calculated from highest measured values to most sensitive effects (effects occurring at the lowest doses in animal and human medical studies).

Chemical	Doses are in mg/kg/day children's dose	adult's dose	children's theoretical increased cancer risk	adult's theoretical increased cancer risk
Arsenic[12] (69 ppm) Soil	Ingestion 0.0009 Inhalation 0.000004	Ingestion 0.0001 Inhalation 0.000004	Ingestion 6 in 100,000 Inhalation 4 in 1,000,000	Ingestion 3 in 1,000,000 Inhalation 6 in 1,000,000
	Child ingestion dose (0.0009) is 24 times less than the Lowest Observable Adverse Effect Level dose (LOAEL) (0.022) associated with gastrointestinal irritation, diarrhea, nausea, skin pigmentation changes, and hyperkeratosis (dark raised spots on the skin that are possibly precancerous); persons in this study continuously ingested arsenic in their drinking water. This level (0.0009) is 3 times more than the Minimum Risk Level 0.0003 (MRL) calculated from the No Observable Adverse Effects Level (NOAEL) (0.0008) for effects from long-term ingestion of arsenic in drinking water. ATSDR scientists divided this skin NOEL dose (0.0008) by 3 to account for human diversity in calculating the 0.0003 MRL. Adult ingestion dose is 3 times less than the MRL, therefore we would not expect skin or gastrointestinal health effects for adults. Inhalation dose (0.000004) is 175 times less than the amount associated with increased risk of stillbirth in humans (0.0007) and 1,750 time less than the dose causing dermatitis (0.007) in humans inhaling arsenic. Dermatitis is skin inflammation that may cause redness, pain, and occasionally itching. Associated cancers: From lowest to highest dose cancer effect levels, chronic arsenic exposures in people have been linked to lung cancer, basal and squamous cell skin cancers, liver cancer (haemangioendothelioma), urinary tract cancers (bladder, kidney, ureter, and all urethral cancers), and intraepidermal cancers. Intraepidermal is the name for the early pre-invasive form of squamous cell skin cancer. Pre-invasive means that the cancer cells are confined to the outermost layer of skin, the epidermis. At this stage, the cancer cells are unlikely to have spread to the lymph nodes, but they can spread along the skin surface. If left untreated, these cells can develop into an invasive cancer and spread into the lymphatic system.			

Chemical	Doses are in mg/kg/day			Soil
	children's dose	adult's dose	children's theoretical increased cancer risk	adult's theoretical increased cancer risk
Dioxin TEQ[13] (0.000078)	Ingestion 0.000000001 Inhalation 0.000000000004	Ingestion 0.0000000001 Inhalation 0.000000000004	No cancer slope.	No cancer slope.
	Child ingestion dose (0.000000001) is 120 times less than the dose (0.00000012) associated with reproductive effects (moderate endometriosis) and developmental effects (altered social behavior) in a rhesus monkey dioxin study. Oral animal studies suggest that the effects that occur at the lowest levels of dioxin doses are immune, endocrine, and developmental. People's ingestion exposures are mainly known from low levels of food contamination. Adult ingestion dose (0.0000000001) is 1,200 times less than the (0.00000012) sensitive dose associated with the health effects described for child ingestion dose. Inhalation of dioxins has not been studied in animals. People's occupational and accidental exposures to dioxin involve primarily inhalation and dermal exposure, but health effects are known primarily from associations with the levels stored in fat. The lowest levels of exposure are associated with hormone changes that can result in changes in sex ratios in children (more females are born). Higher levels are associated with immunosuppression, changes in the liver, abnormal glucose tolerance, and increased risk of diabetes. The highest exposure levels are associated with nervous system effects, chloracne, respiratory effects, and increased risk of cancer. Cancers Statistically significant increases in risks for all cancers were found in workers highly exposed to dioxins with longer latency periods. Although the estimated Standardized Mortality Ratios are low†, they are consistent across studies with the highest dioxin exposures. The evidence linking doses with site-specific cancers is weaker, with some data suggesting a possible relationship between soft-tissue sarcoma, non-Hodgkin's lymphoma, or respiratory cancer.			

† Standardized Mortality / Morbidity Ratio (SMR) is a widely used method of reporting death or disease which adjusts for differences in age and sex across regions. It is a measure of premature mortality. Instead of giving an adjusted rate, the SMR gives a ratio that is a direct comparison with a standard (e.g. the entire state).

Chemical	Doses are in mg/kg/day			Soil
	children's dose	adult's dose	children's theoretical increased cancer risk	adult's theoretical increased cancer risk
Lead[16] 790 ppm	2.5- 6.6 µg/dl (modeled)	1.8 - 6.3 µg/dl (modeled)		
We compare the following health effects at blood lead levels between 1 and 200 micrograms per deciliter (µg/dl), in studies with the levels we modeled for exposure: 1.8 to 6.6µg/d **Children's Blood (µg/dl): Adults' Blood (µg/dl):**				
	No threshold	**3 - 56 µg/dl**	Decreased aminolevulinic acid dehydratase (ALAD) enzyme activity. ALAD is necessary for hemoglobin synthesis. A large decrease in ALAD activity can lead to anemia.	
	1 - 17 µg/dl		Alterations in visual evoked potentials[§].	
	6.5 µg/dl		(Average value at 24 months of age) - Lower cognitive function test scores in children 5 to 10 years of age.	
	6 - 200 µg/dl		Decreased neurobehavioral function; slightly decreased performance on IQ tests and other measures of neuro-psychological function.	
		5.5 µg/dl (average)	Decreased performance on neurobehavioral tests.	

§ The visual evoked potential measures the electrical response of the brain's primary visual cortex to a visual stimulus.

Chemical	Doses are in mg/kg/day			Soil
	children's dose	adult's dose	children's theoretical increased cancer risk	adult's theoretical increased cancer risk
PAHs[14] 1.5 ppm	Ingestion 0.00002 Inhalation 0.00000008	Ingestion 0.000002 Inhalation 0.00000008	Ingestion 7 in 1,000,000 Inhalation <1:1,000,000	Ingestion 2 in 1,000,000 Inhalation <1:1,000,000
	Child ingestion dose (0.00002) is 130,000 times less than the dose (2.6) associated with stomach cancer in mice exposed to benzo[a]pyrene ad lib in food for 30 to 197 days. Adult ingestion dose (0.000002) is 1,300,000 times less than the (2.6) sensitive dose health effects described above for children. Inhalation dose (0.00000008) is 1,250 times less than the dose (0.0001) associated with reduced lung function, abnormal chest x-ray, cough, bloody vomit, and throat and chest irritation, in persons exposed from 6 months to 6 years. Cancer and occupational studies; Worker exposures to high levels of PAHs show cancers (skin, bladder, lung and gastrointestinal) are the most significant endpoint of PAH toxicity. Long-term worker PAH exposures have been linked with skin and eye irritation, photosensitivity, respiratory irritation (with cough and bronchitis), leukoplakia†, precancerous skin growths enhanced by exposure to sunlight, erythemaΔ, skin burns, acneiform lesions, mild hepatoxicity, and haematuria‡. Also several PAH compounds are immunotoxic, and some suppress selective compounds of the immune system. Workers' dermal exposure studies indicate that although direct contact may be of concern at high exposure levels, they do not suggest that lower levels are likely to cause significant irritation**Error! Reference source not found.**			

† Leukoplakia is a common, potentially pre-cancerous disease of the mouth that involves the formation of white spots on the mucous membranes of the tongue and inside of the mouth. Despite the increased risk associated with having leukoplakia, many people with this condition never get oral cancer
Δ Erythema nodosum is an inflammation of subcutaneous fat tissue.
‡ Haematuria is passage of blood in the urine.

Table 4. Estimated Blood Lead Concentrations in Children Ingesting On-Site Surface Soil (micrograms per deciliter - µg/dl)

Media	**Conc. ***		**Time**	**Slope'**		Low	High
	Low	High		Low	High		
Air (out) *	0.1	0.2	0.33	2.46	3.04	0.08118	0.20064
Air (in) *	0.3	0.6	0.33	2.46	3.04	0.24354	0.60192
Food*	5	5	0.33	0.24	0.24	0.396	0.396
Water*	4	4	0.33	0.16	0.16	0.2112	0.2112
Soil	790	790	0.33	0.002	0.016	0.521	4.171
Dust	790	790	0.33	0.004	0.004	1.042	1.042
Total						**2.49612**	**6.62376**

*Default Value[16], Appendix D.
'These slopes were for children from[16], Appendix D, ATSDR's Regression Analysis with Multiple-uptake Parameters to Estimate Blood Lead from Environmental Exposures.

Table 5. Estimated Blood Lead Concentrations In Adults Ingesting On-Site Surface Soil (micrograms per deciliter - µg/dl)

Media	**Conc.**		**Time**	**Slope'**		Low	High
	Low	High		Low	High		
Air (out) *	0.1	0.2	0.33	1.59	3.56	0.05247	0.23496
Air (in) *	0.3	0.6	0.33	1.53	3.56	0.15147	0.70488
Food*	5	5	0.33	0.016	0.0195	0.0264	0.032175
Water*	4	4	0.33	0.03	0.06	0.0396	0.0792
Soil	790	790	0.33	0.002	0.016	0.5214	4.1712
Dust	790	790	0.33	0.004	0.004	1.0428	1.0428
Total						**1.83414**	**6.265215**

*Default Value[16], Appendix D.
'These slopes were for adults[16], Appendix D, ATSDR's Regression Analysis with Multiple-uptake Parameters to Estimate Blood Lead from Environmental Exposures.

CERTIFICATION

The Florida Department of Health prepared this Escambia Treating Company offsite soil Public Health Assessment under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health assessment was begun. Editorial review was completed by the Cooperative Agreement partner.

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Jennifer Freed
Technical Project Officer
Division of Health Assessment and Consultation (DHAC)
ATSDR

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

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Roberta Erlwein
Team Leader,
SPAB, DHAC, ATSDR