Health Consultation

Homegrown Produce

FAIRFAX STREET WOOD TREATERS SITE
JACKSONVILLE, DUVAL COUNTY, FLORIDA

EPA FACILITY ID: FLD000623041

Prepared by
Florida Department of Health

May 20, 2013

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
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

Homegrown Produce

FAIRFAX STREET WOOD TREATERS SITE
JACKSONVILLE, DUVAL COUNTY, FLORIDA

EPA FACILITY ID: FLD000623041

Prepared By:

Florida Department of Health
Division of Environmental Health
Under Cooperative Agreement with
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Table of Contents

Foreword

The Florida Department of Health (DOH) evaluates the public health threat of hazardous waste sites through a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry. This health consultation is part of an ongoing effort to evaluate health effects near the Fairfax Street Wood Treaters hazardous waste site. The Florida 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. The Duval County Health Department and the Florida Department of Health Laboratory 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, in plain language, its conclusions regarding any potential health threat posed by homegrown produce, 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 US Environmental Protection Agency and the Florida Department of Environmental Protection. 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. 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: 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 in Florida: 1-877-798-2772

Summary

INTRODUCTION

At the Fairfax Street Wood Treaters hazardous waste site, the Florida Department of Health (DOH) and the US Agency for Toxic Substances and Disease Registry's (ATSDR) top priority is to ensure nearby residents have the best information to safeguard their health.

The Fairfax Street Wood Treaters hazardous waste site is at 2610 Fairfax Street in Jacksonville, Florida. Between 1980 and 2010, the owners made pressure treated wood with chromated copper arsenate (CCA) which contaminated soil on the site. Stormwater runoff spread contaminated soil to an adjacent residential property with a large garden. Because produce from this garden may be contaminated, the US Environmental Protection Agency (EPA) requested this testing. Florida DOH will consider other possible exposures in separate reports.

CONCLUSION

Florida DOH concludes that eating homegrown onions, peppers, and pecans grown near the Fairfax Street Wood Treaters hazardous waste site is not expected to harm people's health.

BASIS FOR DECISION

The levels of copper, chromium, and arsenic in homegrown produce are not likely to cause illness. At most, the levels of arsenic in these pecans are likely to cause a "low" increase in the estimated skin cancer risk. The actual increased skin cancer risk, however, is likely lower because this assessment used very health-protective, worst-case exposure assumptions.

NEXT STEPS

In 2012, the EPA will test more soil on and around the Fairfax Street Wood Treaters hazardous waste site. Florida DOH will evaluate the public health threat from contaminated soil and other routes of exposure. The Florida DOH will report on homegrown produce tested in April 2012.

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 DOH toll-free at 877 798-2772 and ask for information about the Fairfax Street Wood Treaters hazardous waste site.

Background and Statement of Issues

The purpose of this health consultation report is to assess the public health threat from eating homegrown produce near the Fairfax Street Wood Treaters hazardous waste site. Stormwater runoff from this site used to flow across a residential property now used to grow fruits and vegetables. The owner of this residential property shares homegrown produce with other nearby residents. Because this produce might be contaminated, the US Environmental Protection Agency (EPA) requested this assessment. Florida DOH will consider other possible exposures in a separate report.

Health scientists look at what chemicals are present and in what amounts. They compare those amounts to national guidelines. These guidelines are set far below known or suspected levels associated with health effects. Florida DOH uses guidelines developed to protect children. If chemicals are not present at levels high enough to harm children, they would not likely harm adults.

This assessment considers health concerns of nearby residents and explores possible associations with site-related contaminants. This assessment requires the use of assumptions, judgments, and incomplete data. These factors contribute to uncertainty in evaluating the health threat. Assumptions and judgments in this assessment err on the side of protecting public health and may overestimate the risk.

This assessment estimates the health risk for individuals exposed to the highest measured level of contamination. This assessment, however, does not apply equally to all nearby residents. Not all nearby residents were exposed to the highest measured level of contamination. The health risk for most nearby residents is less than the health risk estimated in this report. For those nearby residents who do not eat homegrown produce, their risk from this route of exposure is essentially zero.

Site Description

The 12.5-acre Fairfax Street Wood Treaters hazardous waste site is at 2610 Fairfax Street, in a predominantly residential area of Jacksonville, Duval County, Florida (Figure 1). The site includes a building, parking lot, drip pad, and retention pond. The site is bordered to the north by St Johns/CSX railroad tracks, to the east by Fairfax Street and residential properties beyond, to the south by West 14th Street and residential properties beyond, and to the west by Susie Tolbert and R.V. Daniels Elementary Schools (Figure 2).

From 1980 to 2010, Fairfax Street Wood Treaters operated a wood treating facility that pressure treated utility poles, pilings, heavy timber items, and plywood lumber products using the wood treating preservative chromated copper arsenate (CCA). They did not treat wood products with creosote or pentachlorophenol. CCA is characterized by a bright green color and is composed of waterborne oxides, or salts, of chromium, copper, and arsenic. The copper serves as a fungicide, the arsenic serves as an insecticide, and

the chromium binds the copper and arsenic to the wood. In a typical pressure treatment process, wood is placed into horizontal cylinders or tanks. The air is then evacuated from the tanks, creating a vacuum. Later, the tanks are filled with the preservative chemical and the pressure is increased to 140 to 150 pounds per square inch (psi) for several hours, forcing the wood-treating chemical into the wood. After that step is complete, the preservative is drained from the tanks, and a vacuum is once again applied to clear any excess preservative left on the surface of the wood. This process takes approximately 6 hours. After treatment, the wood is transferred to drying racks to drip dry, where the water evaporates; leaving only the CCA salts [Tetra Tech 2011].

Between 1980 and 1990, stormwater runoff from the site was not contained. Some stormwater runoff collected in a retention pond on the Suzie Tolbert Elementary School property. In 1990, Fairfax Street Wood Treaters installed a stormwater collection and retention system, including site grading/paving, stormwater collection swales, diversion berms, and a lined retention pond. The CCA that dripped from the wood during the drying process mixed with stormwater. The system collected CCA-contaminated stormwater from the drip pad in an underground sump. A pump then recycled the CCA-stormwater mixture back into the high-concentrate CCA treatment solution [Tetra Tech 2011].

The system diverted stormwater that collected in areas other than the drip pad to ditches along the northern and western property boundaries. These ditches drained into the retention pond at the northwestern corner of the property. Overflow from the retention pond drained into a pipe that discharged two blocks (1,000 feet) west into Moncrief Creek, a tributary of the Trout River [Tetra Tech 2011].

In July 2010, Fairfax Street Wood Treaters went bankrupt and abandoned the site. Beginning in August 2010, EPA secured the site by containing stormwater, removing contaminated soil/pond sediment, removing leftover CCA chemicals, and dismantling the CCA storage tanks. In 2011 EPA began testing on-site and off-site soil for chromium, copper, and arsenic. Also in 2011, EPA removed contaminated soil and sediment from the Suzie Tolbert Elementary School property.

On August 25, 2011, Florida DOH and Duval County Health Department (CHD) staff visited the site. They observed that the site was fenced and access was restricted. That evening they attended an EPA-sponsored public meeting with about 100 nearby residents.

Demographics

The Florida DOH examines demographic and land use data to identify sensitive populations, such as young children, the elderly, and women of childbearing age, to determine whether these sensitive populations are exposed to any potential health risks. Demographics also provide details on population mobility and residential history in a particular area. This information helps Florida DOH evaluate how long residents might have been exposed to contaminants.

In 2000, approximately 17,845 people lived within one mile of the Fairfax Street Wood Treaters site. Ninety-eight percent (98%) were African-American, 1% were White, and 1% were "other." Twenty-nine percent (29%) were less than 18 years old and 17% were older than 65. Seventy-two percent (72%) of adults had a high school diploma or less. Fifty-five percent (55%) made $25,000 a year or less [EPA 2011a].

Land Use

Land use surrounding the site is residential. There is a church across the street east of the site and two schools west of the site.

Community Health Concerns

At the August 25, 2011 public meeting, nearby residents expressed several health concerns but none specifically about eating produce grown near this site. Florida DOH will address these health concerns in an upcoming comprehensive public health assessment report.

Discussion

Pathway Analyses

Chemical contamination in the environment might harm your health but only if you have contact with those contaminants (exposure). Without contact or exposure, there is no harm to health. If there is contact or exposure, how much of the contaminants you contact (concentration), how often you contact them (frequency), how long you contact them (duration), and the danger of the contaminant (toxicity) all determine the risk of harm.

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 human exposure pathways. Exposure pathways have five parts. They are:

1. a source of contamination 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 into contact with a contaminated medium like water at the tap or soil in the yard,
4. an exposure route like ingesting (contaminated soil or water) or breathing (contaminated air),

5. a population who could be exposed to contamination like nearby residents.

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 eating produce grown in soil adjacent to the Fairfax Street Wood Treaters site. For this completed pathway, the site is the source. Contaminated soil transported by stormwater runoff from the site onto an adjacent residential property is the environmental medium. Produce grown in soil of a residential yard on Pullman Court adjacent to the northwest corner of the site are the exposure points. Ingestion is the exposure route. Nearby residents who eat homegrown produce are the exposed population (Table 1).

Environmental Data

In 2011, consultants for EPA found a maximum of 36 milligrams per kilogram (mg/kg) of arsenic, 77 mg/kg of chromium, and 54 mg/kg of copper in the surface soil of a residential garden on Pullman Court adjacent to the northwest corner of the Fairfax Street Wood Treaters site [Tetra Tech 2011]. Subsequent soil testing found all of the chromium was in the chromium (III) state. EPA requested the Florida DOH assess the public health threat from eating the homegrown produce. On September 16, 2011, the Duval County Health Department collected 3 onions, 10 to12 peppers, and 20 to 25 pecans from this garden. Other fruits and vegetables were unavailable. Spring/Summer produce, not available in the fall of 2011, should also be tested.

The Florida DOH laboratory shelled the pecans and peeled the onions. They homogenized the sample and then digested 0.5 grams of it in 10 milliliters of nitric acid in a high pressure microwave (EPA method 3051). They analyzed for chromium, copper, and arsenic using EPA Method 6020. The analytical results are summarized in Tables 2, 3, and 4.

Identifying Contaminants of Concern

Florida DOH compares the maximum concentrations of contaminants found at a site to ATSDR and other agency comparison values.

Because there are no EPA or ATSDR comparison values for food, Florida DOH selected all three contaminants tested (chromium, copper, and arsenic) for further evaluation.

Public Health Implications

Florida DOH provides site-specific public health recommendations on the basis of toxicological literature, levels of environmental contaminants, evaluation of potential exposure pathways, duration of exposure, and characteristics of the exposed population. Whether a person will be harmed depends on the type/amount of contaminant, how they are exposed, how long they are exposed, how much contaminant is absorbed, genetics, and individual lifestyles.

After identifying contaminants of concern, Florida DOH evaluates exposures by estimating daily doses for children and adults. Kamrin [1988] explains the concept of dose as follows:

> "…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; 1 ounce for each pound of animal."

This amount per weight is the *dose*. Toxicology uses dose to compare 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 assessment. A milligram is 1/1,000 of a gram; a kilogram is approximately 2 pounds.

To calculate the daily doses of each contaminant, Florida DOH uses standard factors needed for dose calculation [ATSDR 2005; EPA 1995]. 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.

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.

For homegrown produce near the Fairfax Street Wood Treaters site, Florida DOH calculated a dose for each contaminant using the ATSDR homegrown food ingestion dose equation [ATSDR 2005]:

$$D = \sum^{n} (CL \times CR \times EF)$$

where D = exposure dose (milligrams per kilogram per day)
CL = produce contaminant concentration (milligrams per gram)
CR = produce ingestion rate per body weight (grams per kilogram per day)
EF = exposure factor (unitless)
^{n} = number of produce types

For consumption of homegrown produce Florida DOH calculated an exposure factor based on the following formula:

$$EF = (F \times ED) / AT$$

where F = frequency (days per year)
ED = exposure duration (years)
AT = averaging time (days)

Florida DOH made the following assumptions (see appendix)

F = 182 days/year
ED = 35 years
AT = ED x 365 days/year (for non-carcinogens); 70 years x 365 days/year (for carcinogens)

Florida DOH used mean ingestion rates for consumer-only intake of homegrown produce contained in EPA's 2011 Exposure Factors handbook: Table 13-45 (onions) and Table 13-50 (peppers) [EPA 2011b]. For pecans, Florida DOH used USDA's estimated tree nut consumption of 4 grams per day. The mean produce ingestion rate takes body weight off all ages into account, including children.

We compare estimated exposure doses to ATSDR chemical specific minimal risk levels (MRLs). MRLs are health guideline values that establish exposure levels many times lower than levels where no effects were observed in animals or human studies. The MRL is designed to protect the most sensitive, vulnerable individuals in a population. The chronic MRL is an exposure level below which non-cancerous harmful effects are unlikely, even after daily exposure over a lifetime. We use chronic MRLs where possible because exposures are usually longer than a year. If chronic MRLs are not available, we use intermediate length MRLs [ATSDR 2005].

For cancer, we quantify the increased risk by multiplying the estimated dose by the EPA cancer potency slope factor. This is a high estimate of the increased cancer risk. The actual increased cancer risk is likely lower. Because of large uncertainties in the way

scientists estimate cancer risks, the actual cancer may be as low as zero. If there is no cancer slope (potency) factor, we can not quantify the risk.

To put the cancer risk into perspective, we use the following descriptors for the different numeric cancer risks:

1 in	10 (10^{-1})	"very high" increased risk
1 in	100 (10^{-2})	"high" increased risk
1 in	1,000 (10^{-3})	"moderate" increased risk
1 in	10,000 (10^{-4})	"low" increased risk
1 in	100,000 (10^{-5})	"very low" increased risk
1 in	1,000,000 (10^{-6})	"extremely low" increased risk

We usually estimate the cancer risk from lifetime (70 year) exposure. Or we may estimate the cancer risk from exposure over a significant portion of the lifetime (at least 35 years). Studies of animals exposed over their entire lifetime are the basis for calculating most cancer slope factors. Usually, little is known about the cancer risk in animals from less than lifetime exposures. Therefore, we also use lifetime exposure to estimate the cancer risk in people. Estimating the cancer risk for children, or from less than 35 years exposure, may introduce significant uncertainty.

Chromium

Chromium is a naturally-occurring element found in rocks, animals, plants, and soil. It can exist in different oxidation states. The most common oxidation states for chromium are trivalent chromium (III) and hexavalent chromium (VI). Chromium occurs naturally in the chromium (III) state, rarely in the chromium (VI) state. In most soils, chromium will be present predominantly in the chromium (III) state. This form has very low solubility and low reactivity, resulting in low mobility in the environment [ATSDR 2008].

Chromium (III) is an essential nutrient required for normal energy metabolism. Low levels of chromium (III) occur naturally in a variety of foods such as fruits, vegetables, nuts, fish, and meats (0.01 to 1.3 mg/kg). The US Food and Drug Administration, however, has not established a recommended daily allowance (RDA) for chromium. In general chromium has a low mobility for translocation from roots to the aboveground parts of plants. Therefore, bioaccumulation of chromium from soil to aboveground parts of plants that people might eat is unlikely [ATSDR 2008].

Chromium (VI) combined with copper and arsenic is used as a wood preservative. Ingestion of chromium (VI) can cause anemia and irritation of the stomach and intestines. Chromium (III), however, is much less toxic and does not appear to cause these problems [ATSDR 2008].

The laboratory analysis of homegrown produce near the Fairfax Street Wood Treaters site reported the concentration of all states of chromium combined: it did not differentiate

between chromium (III) and chromium (VI). Although the wood treating process used chromium (VI), the chromium in the soil of this garden was in the chromium III state. None was in the chromium (VI) state. Therefore this evaluation assumes the chromium in the homegrown produce is in the chromium (III) state.

The estimated doses of total chromium from eating homegrown onions, peppers, and pecans near the Fairfax Street Wood Treaters site are below both the corresponding ATSDR MRL for chromium (VI) and EPA RfD for chromium (III) and thus are not likely to cause non-cancer illness (Table 2).

Chromium (VI) is a known human carcinogen by the inhalation route of exposure. Some animal studies have found evidence that chromium (VI) is carcinogenic by the oral route of exposure. It is unclear, however, how these studies apply to humans. There is little evidence, however, that chromium (III) is carcinogenic [ATSDR 2008]. Therefore, there is little cancer risk from ingestion of chromium in this produce.

Copper

Copper is a metallic element essential for both plants and animals; it is a component of several enzymes that perform important physiological functions. The ability of copper to easily accept and donate electrons explains its important role in oxidation-reduction reactions. Copper is necessary in minute amounts in the soil of plants and the diet of animals.

In plants, copper is a constituent of several proteins (mostly enzymes) that have varied but important metabolic functions. These copper proteins and enzymes have key roles in plant respiration, photosynthesis, lignification, phenol metabolism, protein synthesis, and regulation of growth hormones [CDA 1988].

In animals, copper is necessary for good health. Copper combines with certain proteins to produce enzymes that act as catalysts to help a number of body functions. Some help provide energy required by biochemical reactions. Others are involved in the transformation of melanin for pigmentation of the skin and still other help to form cross-links in collagen and elastin and thereby maintain and repair connective tissues. This is especially important for the heart and arteries. Copper helps regulate blood pressure and heart rate and is needed to absorb iron from the intestines [CDA 1988].

People in the United States take in 1 to 10 milligrams (mg) of copper each day in their diets. Foods such as nuts (especially brazils and cashews), seeds (especially poppy and sunflower), chickpeas, liver, and oysters are especially rich in copper. The US Food and Drug Administration reports that the mean copper concentrations in onions is 0.4 mg/kg, in peppers is 0.7 mg/kg, and in nuts is 15.5 mg/kg [FDA 2000]. The National Academy of Sciences recommends 2 to 3 mg of copper as a safe and adequate daily intake for adults. The minimum recommended dietary allowance (RDA) for copper is 0.9 milligrams per day (0.013 mg/kg/day) for most adults.

The range between copper deficiency and copper toxicity, however, is small. The World Health Organization [WHO 1996] states:

> "In the assessment of a safe level of intake for copper, it is important to distinguish ionic copper ingested in water or as a supplement from dietary copper in foods, which is largely present in the form of organic compounds. While there is little doubt that the uncontrolled ingestion of soluble inorganic copper salts in milligrams quantities should be regarded with caution, levels of copper in food up to 10 mg/day seem to have no detrimental effect on human health."

The World Health Organization recommends the average copper intake not exceed 0.18 mg/kg/day: 12 mg/day for adult males and 10 mg/day for adult females [WHO 1996].

Absorption of copper following ingestion is normally regulated by homeostatic mechanisms so that the balance between copper intake and excretion is controlled. About 50% of the ingested copper is absorbed into the bloodstream. Water-soluble forms of copper (copper sulfate and copper nitrate) are more readily absorbed than insoluble (protein bound) forms. Most absorbed copper is transported to the liver, with minor amounts going to the bone and other tissues.

Copper poisoning is rare, but occurs in people who drink homemade alcohol distilled using copper tubing or people who eat acidic food or drink that has had prolonged contact with a copper container. Excess copper (more than about 0.08 mg/kg/day) causes nausea and vomiting limiting the amount absorbed. These effects are not usually persistent and have not been linked with other health effects. In the past, doctors used copper sulfate and copper nitrate to induce vomiting. Excess copper is usually excreted in the bile/feces. Wilson's disease is a rare (1 in 30,000 people) inherited genetic defect in which copper is not properly excreted and builds up in the liver, kidney, and cornea. This buildup causes cirrhosis of the liver but can be treated using chelating agents. Both the International Agency for Research on Cancer (IARC) and EPA describe copper as "not classifiable as to human carcinogenicity" [ATSDR 2004].

The copper concentrations in onions, peppers, and pecans grown near the Fairfax Street Wood Treaters site (Table 3) are 2 to 3 time higher than the national average. The maximum copper dose from eating these onions, peppers, and pecans however, is below the corresponding ATSDR MRL and thus is not likely to cause any non-cancer illness (Table 3).

Arsenic

Arsenic is a naturally occurring element that is widely distributed in the Earth's crust. Inorganic arsenic is usually found in the environment combined with oxygen, chlorine, and sulfur. Organic arsenic is usually found in the environment combined with carbon and hydrogen. Prior to 2003, most of the arsenic produced in the US was used in chromated copper arsenate (CCA) to make "pressure-treated" wood [ATSDR 2007].

A small amount of arsenic is taken in from the air you breathe, the water you drink, and the food you eat. Of these, food is usually the largest source of arsenic. The predominant dietary source of arsenic is seafood, followed by rice/rice cereal, mushrooms, and poultry. Most of the arsenic in food is in the organic form which is less toxic than the inorganic form. Arsenic in seafood is mostly in an organic form called arsenobetaine. Levels of arsenic in food range from about 0.02 to 0.14 mg/kg [ATSDR 2007].

The single most characteristic effect of long-term oral exposure to the more toxic inorganic arsenic is a pattern of skin changes. These include patches of darkened skin and the appearance of small "corns" or "warts" on the palms, soles, and torso, and are often associated with changes in the blood vessels of the skin. Skin cancer may also develop. The US Department of Health and Human Services, the IARC, and the EPA have all concluded that inorganic arsenic is a known human carcinogen [ATSDR 2007].

The laboratory analysis of homegrown produce near the site reported the concentration of total arsenic: it did not differentiate between inorganic and organic arsenic. Although most of the arsenic in food is in the less toxic organic form, this evaluation makes the health protective assumption that the arsenic in this produce is in the more toxic inorganic form.

Assuming all of the arsenic found in the onions, peppers, and pecans near the Fairfax Street Wood Treaters site is in the more toxic inorganic form, the combined ingestion dose (0.000023 mg/kg/day) is below the ATSDR MRL and thus is not likely to cause non-cancer illness (Table 4).

At most, the level of arsenic in homegrown onions, peppers, and pecans near the Fairfax Street Wood Treaters site is likely to cause a "very low" increase in the estimated cancer risk. Assuming all of the arsenic in homegrown produce is in the more toxic inorganic form and they are eaten for 70 years, Florida DOH calculated a "very low" estimated increased cancer risk of 3×10^{-5} or 3 in 100,000 by multiplying the total arsenic ingestion dose (0.000023 mg/kg/day) by the EPA cancer slope factor of 1.5 $(mg/kg/day)^{-1}$ [EPA 2011c]. This is a high estimate of the increased cancer risk. The actual increased risk is likely lower because this assessment used very health-protective, worst-case exposure assumptions.

Combined Toxicity of Chromium, Copper, and Arsenic

Ingestion of chromium, copper, and arsenic combined at the maximum levels measured in produce grown near the Fairfax Street Wood Treaters site is not likely to cause illness.

Ingestion of both chromium and copper can cause gastrointestinal irritation and liver toxicity. If one makes the health protective assumption that all of the chromium in produce grown near this site is in the more toxic chromium VI form, the dose is still hundreds of times less than the dose causing gastrointestinal irritation and liver toxicity in

rats. Although inorganic copper dissolved in water causes gastrointestinal irritation and liver toxicity, the organic form found in plants near this site does not. Therefore the combined ingestion of chromium and copper in produce grown near this site is not likely to cause gastrointestinal irritation or liver toxicity.

Ingestion of both chromium and arsenic can affect the skin. Ingestion of chromium VI can cause skin irritation while ingestion of inorganic arsenic can increase the risk of skin cancer. Because the chromium in the produce is likely in the chromium III form, it does not likely to contribute to the increase risk of skin cancer posed by the arsenic.

Child Health Considerations

In communities faced with air, water, or soil 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 sometime engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than 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 system 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. The mean ingestion rates used to calculate doses include the ingestion rates for children.

Public Comment

On February 15, 2012 Florida DOH mailed a fact sheet to 800 nearby residents announcing the availability of a draft of this report. The fact sheet also announced a February 27, 2012 open house at the Suzie Tolbert Elementary School. Approximately 50 people attended this open house. Eighteen people either filled out a comment form there or mailed written comments before the April 23 deadline. Most had general health concerns such as cancer, respiratory problems, allergies, etc. None commented on this draft report.

Conclusions

1. In August 2011, the only homegrown produce available in the community garden adjacent to the site was onions, peppers, and pecans.

2. Consumption of homegrown onions, peppers, and pecans grown near the Fairfax Street Wood Treaters Site is not likely to cause noncancer health effects because the concentrations of chromium, copper, and arsenic are below levels that would cause health effects.
3. Consumption of the homegrown produce could result in a very low increase in the cancer risk. The actual increased risk is likely lower because this assessment used very health-protective, worst-case exposure assumptions.

Recommendations

1. The Florida DOH should test additional types of homegrown produce, not available in the fall of 2011.

2. Future tests of homegrown produce should consider determining the concentration of chromium VI and inorganic arsenic.

Public Health Action Plan

Actions Undertaken

1. In 2010 and 2011, EPA removed contaminated soil/sediments and leftover CCA chemicals from the site. They also removed contaminated soil/sediments from the Suzie Tolbert Elementary School property.

2. In August 2011, Florida DOH and the Duval CHD attended a public meeting.

3. On February 27, 2012, Florida DOH and the Duval CHD hosted an open house meeting at the Suzie Tolbert Elementary School.

4. On April 24, 2012, Florida DOH and Duval CHD staff collected collard greens, mustard greens, turnip greens, tomatoes, and green onions from this same garden. The Florida Department of Agriculture and Consumer Services laboratory analyzed these vegetables for chromium, copper, and arsenic.

Actions Planned

1. In 2012 EPA is planning more testing on and around the Fairfax Street Wood Treaters site to determine the extent of contamination. Based on those data, Florida DOH will evaluate the public health threat, as appropriate.

2. Florida DOH plans a separate report on the vegetables tested in April 2012.

References

[ATSDR 2004] Agency for Toxic Substances and Disease Registry. Toxicological Profile for Copper (Update). Atlanta: US Department of Health and Human Services; September 2004.

[ATSDR 2005] Agency for Toxic Substance 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 (Update). Atlanta: US Department of Health and Human Services; August 2007.

[ATSDR 2008] Agency for Toxic Substances and Disease Registry. Toxicological Profile for Chromium (Draft for Public Comment). Department of Health and Human Services. Atlanta, GA. September 2008.

[BOC 2002] Bureau of the Census. 2000 Census Population. Washington: US Department of commerce, 2002.

[CDA 1988] Copper Development Association. Copper in Plant, Animal, and Human Nutrition. CDA Publication TN35, 1988.

[EPA 1995] 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).

[EPA 2011a] Environmental Protection Agency. Envirofacts for Fairfax Street Wood Treaters. http://www.epa.gov/enviro/. Accessed November 3, 2011.

[EPA 2011b] Environmental Protection Agency. Exposure Factors Handbook: 2011 Edition. EPA/600/R-090/052F. September 2011. www.epa.gov.

[EPA 2011c] Environmental Protection Agency. Integrated Risk Information System. http://www.epa.gov/iris/index.html. Accessed October 28, 2011.

[FDA 2000] U.S. Food and Drug Administration. Total Diet Study Statistics on Elemental Results. Washington, DC.

[Kamrin 1988] Toxicology – A Primer on Toxicology Principles and Applications. Lewis Publications. Chelsea MI. 1988.

[Tetra Tech 2011] Tetra Tech EM Inc. Revised Final Integrated Site Inspection Report. Fairfax Street Wood Treaters. Jacksonville, Duval County, Florida. August 19, 2011.

[WHO 1996] World Health Organization. Trace Elements in Human Nutrition and Health. Geneva.

Appendix

Tables and Figures

Table1. Completed Human Exposure Pathway at the Fairfax Street Wood Treaters Site

COMPLETED PATHWAY NAME	COMPLETED EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
Homegrown produce	Fairfax Street Wood Treaters site	soil	Produce grown at adjacent property	Ingestion	15 to 25 nearby residents	Past (1980-2010) present, and future

Table 2. Chromium Concentrations, Ingestion Rate, Ingestion Doses, and Comparison Values for Homegrown Produce near the Fairfax Street Wood Treaters Site.

	Chromium (Total) Concentration (mg/g)	Ingestion Rate (g/kg-d)	Exposure Factor	Ingestion Dose (mg/kg/d)	MRL (mg/kg/d) (Cr-VI)	RfD (mg/kg/d) (Cr-III)
Onions	0.00067	0.30	0.5	0.0001	0.001	1.5
Peppers	0.0016	0.24	0.5	0.0002	0.001	1.5
Pecans	0.004	0.05	0.5	0.0001	0.001	1.5
Total	---	---	---	0.0004	---	---

mg/g = milligrams of contaminant per gram vegetable
g/kg-d = grams of vegetable per kilogram body weight per day
mg/kg/d = milligrams of contaminant per kilograms body weight per day
MRL = ATSDR minimal risk level for chromium (VI), chronic (more than one year) exposure
RfD = EPA reference dose for chromium (III)

Table 3. Copper Concentrations, Ingestion Rate, Ingestion Doses, and Comparison Values for Homegrown Produce near the Fairfax Street Wood Treaters Site.

	Copper Concentration (mg/g)	Ingestion Rate (g/kg-d)	Exposure Factor	Ingestion Dose (mg/kg/d)	MRL (mg/kg/d)	RfD (mg/kg/d)
Onions	0.0013	0.30	0.5	0.0002	0.01	NA
Peppers	0.002	0.24	0.5	0.0002	0.01	NA
Pecans	0.022	0.05	0.5	0.0006	0.01	NA
Total	---	---	---	0.001	---	---

mg/g = milligrams of contaminant per gram vegetable
g/kg-d = grams of vegetable per kilogram body weight per day
mg/kg/d = milligrams of contaminant per kilograms body weight per day
MRL = ATSDR minimal risk level for copper, intermediate (14 days to 365 days) exposure
RfD = EPA reference dose for copper NA = not available

Table 4. Arsenic Concentrations, Ingestion Rate, Ingestion Doses, and Comparison Values for Homegrown Produce near the Fairfax Street Wood Treaters Site.

	Arsenic (Total) Concentration (mg/g)	Ingestion Rate (g/kg-d)	Exposure Factor	Ingestion Dose (mg/kg/d)	MRL (mg/kg/d)	RfD (mg/kg/d)
Onions	0.00011	0.30	0.25	0.000008	0.0003	0.0003
Peppers	0.00018	0.24	0.25	0.00001	0.0003	0.0003
Pecans	0.00036	0.05	0.25	0.000005	0.0003	0.0003
Total	---	---	---	0.000023	---	---

mg/g = milligrams of contaminant per gram vegetable
g/kg-d = grams of vegetable per kilogram body weight per day
mg/kg/d = milligrams of contaminant per kilograms body weight per day
MRL = ATSDR minimal risk level for arsenic, chronic (more than one year) exposure
RfD = EPA reference dose for arsenic

Figure 1. Location of Fairfax Street Wood Treaters Site in Duval County, Florida

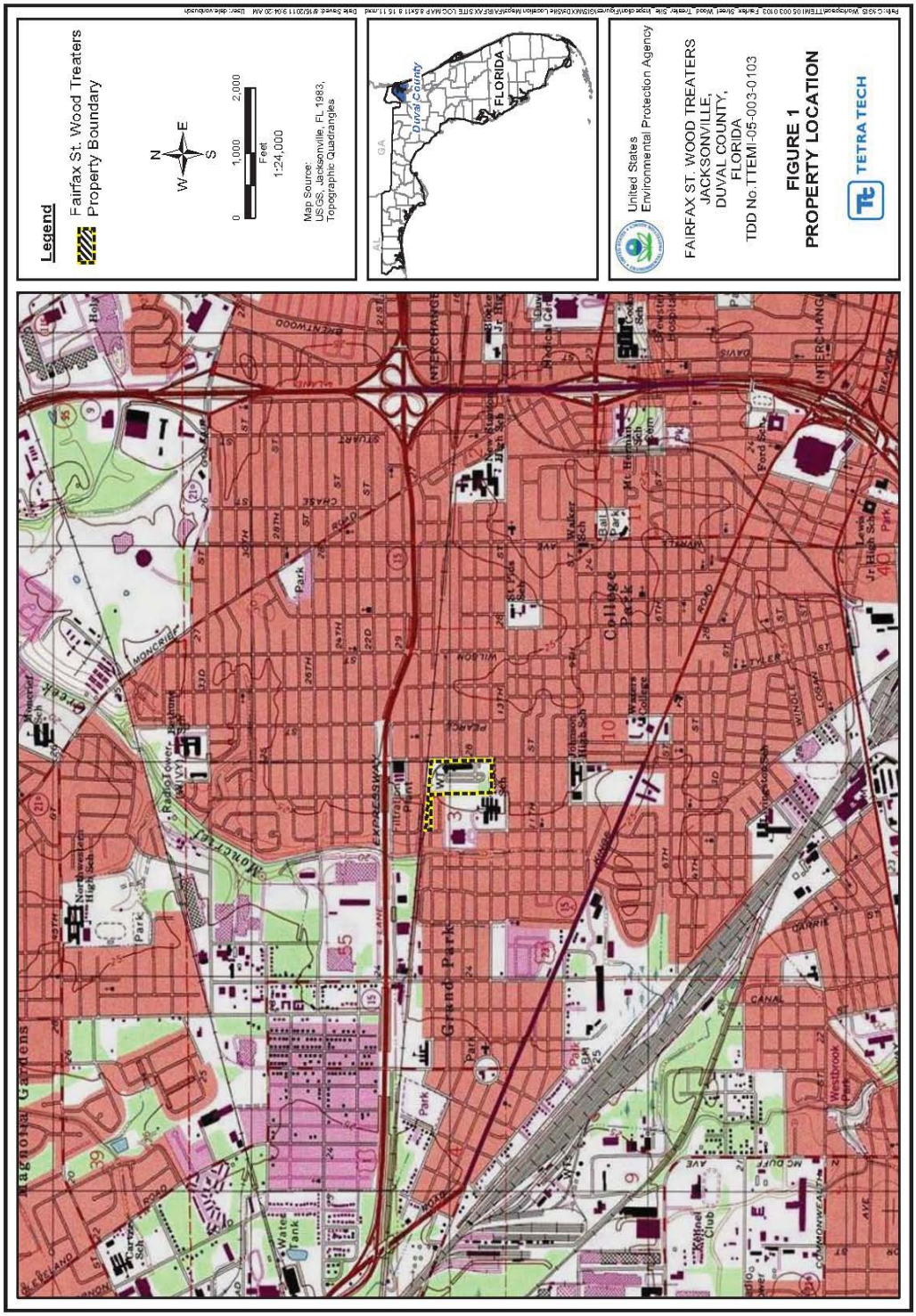
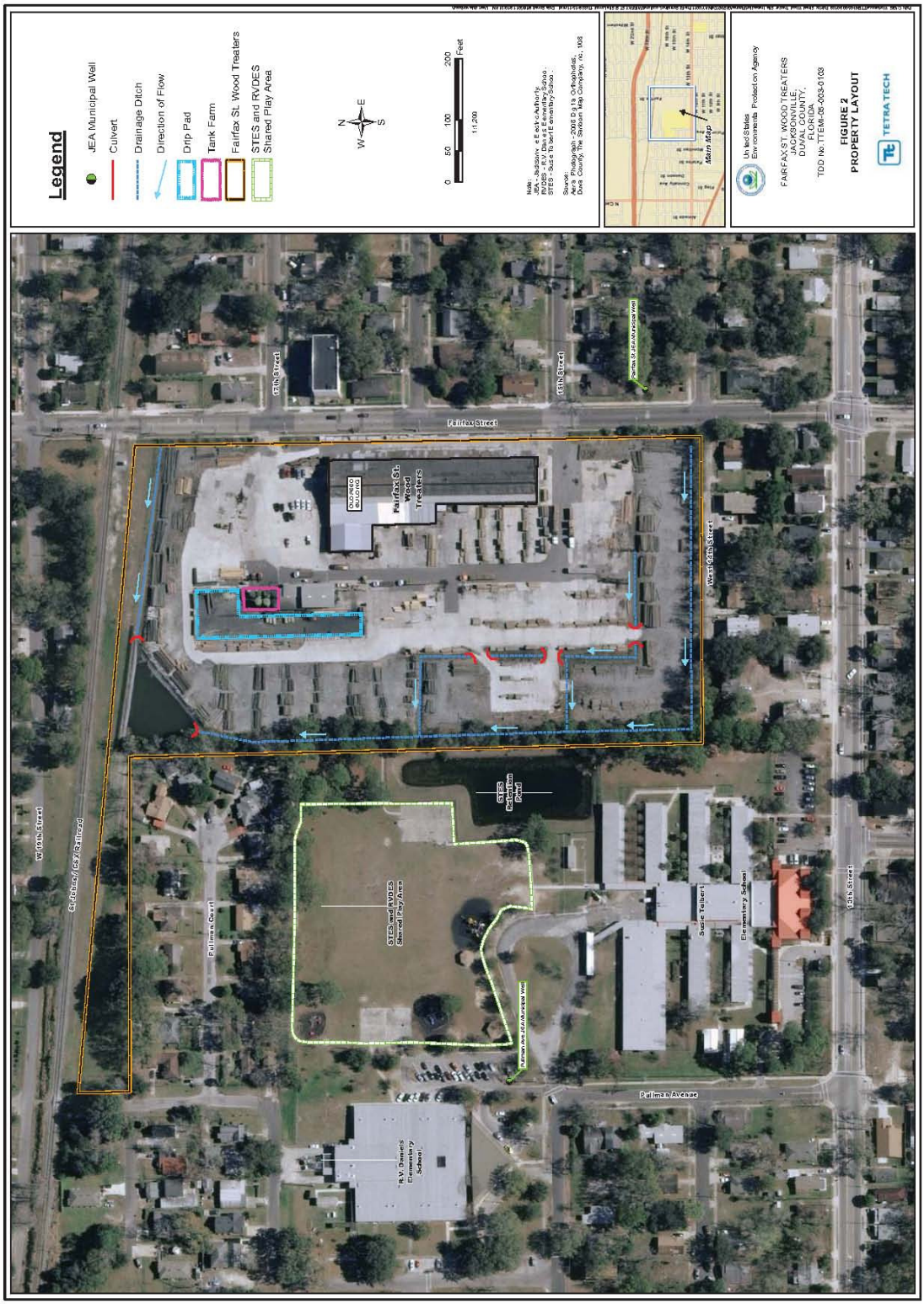


Figure 2. Fairfax Street Wood Treaters Site Features



REPORT PREPARATION

The Florida Department of Health prepared this health consultation for the Fairfax Street Wood Treaters site under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented.

Author
Randy Merchant
Bureau of Environmental Public Health Medicine
Division of Environmental Health

State Reviewers
Dr. Kendra Goff
Bureau of Environmental Public Health Medicine
Division of Environmental Health

Dr. Carina Blackmore
Bureau of Environmental Public Health Medicine
Division of Environmental Health

ATSDR Reviewers
Jennifer Freed and Alan Parham
Technical Project Officers
Division of Community Health Investigations (proposed)