

Health Consultation

MILL VIEW SUBDIVISION

CITY OF PORT ST. JOE, GULF COUNTY, FLORIDA

EPA FACILITY ID: FLN000407304

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

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

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

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HEALTH CONSULTATION

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Prepared by:

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

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Foreword

This document summarizes the Florida Department of Health's (DOH's) evaluation of additional data for the Mill View subdivision in Port St. Joe, Florida. A site evaluation prepared by the US Environmental Protection Agency's contractor, Weston Solutions, Inc. served as the basis for this report. The Florida DOH also reviewed data supplied by George C. Flowers, Ph.D., a consultant to the law firm representing some community members.

- *Evaluating exposure:* The Florida DOH scientists begin by reviewing additional available information about environmental conditions in the subdivision. These data add to our understanding of how much contamination is present, where it is in the subdivision, and how people's exposures might occur. Usually, the Florida DOH does not collect its own environmental sampling data. We rely on information provided by the Florida Department of Environmental Protection (DEP), the U.S. Environmental Protection Agency (EPA), and other government agencies, private businesses, and the public.
- *Evaluating health effects:* If there is evidence that exposures to hazardous substances are currently occurring or are likely to occur, the Florida DOH scientists will determine whether that exposure could be harmful to human health. Our report focuses on public health; that is, the health impact on the community as a whole, and existing scientific information is its basis.
- *Developing recommendations:* In this health consultation, the Florida DOH outlines its conclusions regarding potential health threats posed by a site, and offers recommendations for reducing or eliminating human exposure to contaminants. The role of the Florida DOH in dealing with hazardous waste sites is primarily advisory. For that reason, the evaluation report will typically recommend actions for other agencies—including the EPA and the Florida DEP—to take. If, however, a health threat exists or is imminent, the Florida DOH will issue a public health advisory warning people of the danger, and will work to resolve the problem.
- *Soliciting community input:* The evaluation process is interactive. The Florida DOH starts by soliciting and evaluating information from various government agencies, individuals or organizations responsible for cleaning up the site, and those living in communities near the site. Florida DOH shares any conclusions about the site with the groups and organizations providing the information. Once an evaluation report has been prepared, the 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

In this health consultation, the Florida Department of Health (DOH) evaluates the public health threat from chemicals measured by the US Environmental Protection Agency's (EPA) contractor, Weston, in Mill View subdivision soil, groundwater, and surface water samples (Weston 2003). We also evaluate additional soil metals data compiled by George C. Flowers, Ph.D., the consultant working for the community's law firm (Flowers 2004).

In 1938, the St. Joe Paper Company began paper mill operations in Port St. Joe, Florida (Figure 1). The Florida Department of Environmental Protection (DEP) found that from the 1940s to the early 1950s, the St. Joe Paper Company filled a canal and wetlands areas east of the paper mill with paper mill wastes (Figure 2). These wastes included tree bark, boiler ash, small pieces of limestone called "lime grits", and slag. In the mid-1950s, St. Joe Paper Company sold properties, including this filled area, for what became the Mill View Subdivision West (Figure 1).

After reviewing all of the available environmental data, Florida DOH concludes that soil, surface water, sediment, and groundwater in the Mill View subdivision pose no apparent public health hazard. However, the use of waste as fill in the Mill View subdivision has resulted in subsidence. This subsidence has caused structural damage to homes and in some cases has allowed access to insects, birds, rodents and other potential disease vectors. Subsidence has also broken water and wastewater pipelines, and has the potential to break natural gas pipes.

The agencies that conducted site assessments for the western Mill View neighborhood measured arsenic, polychlorinated biphenyls (PCBs), and vanadium in soil slightly above chronic and intermediate minimum risk levels set to protect sensitive populations. They measured lead in soil above the Florida Residential Soil Target Cleanup Level. While these levels are unlikely to cause illness, Mill View residents should follow "good gardening practices" to reduce their potential for exposure to these and other fill material chemicals. Lack of air monitoring data prevents assessment of the health risk from past exposures to airborne contaminants from the former St. Joe paper mill and other nearby industrial sources.

Florida DOH recommends Mill View residents in houses with cracking walls and foundations use flexible piping and connections for water, wastewater, and gas. Residents in houses with cracking walls and foundations should also repair openings to prevent entrance of insects, birds, rodents and other potential disease vectors. Mill View residents should follow "good gardening practices" to reduce possible exposures to fill chemicals.

As we do for all instances where the available information on past exposures is incomplete, the Florida DOH recommends people should see their doctor if they feel ill. This is especially important for people who may have contacted airborne contaminants from the former St. Joe paper mill and other nearby industrial sources. Florida DOH does not have information on the sources of contamination persons in Mill View could have contacted in addition to fill material in their yards.

Purpose

The Florida DOH evaluates the public health significance of hazardous waste sites through a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta, Georgia. In November 2003, the EPA asked the Florida DOH to review

and comment on their 2002 sampling results in the Preliminary Assessment/Site Inspection Report (Weston 2003). This health consultation report also reviews soil samples collected, analyzed, and evaluated on the community's behalf by a private contractor (Flowers 2004). These data sets augment the sampling information collected by the Florida DEP in 2001 and 2002, especially away from the Chickenhouse Branch fill area.

Background

In 1938, the St. Joe Paper Company began its Gulf of Mexico paper mill operations in Port St. Joe, Florida (Figure 1). From the 1940s to the early 1950s, the St. Joe Paper Company filled the Chickenhouse Branch and wetlands east of the paper mill with paper mill wastes (Figure 2). These wastes included tree bark, boiler ash, "lime grits" (small pieces of limestone) and slag. One Mill View resident reported the St. Joe Paper Company disposed of a large volume of "white liquor" mixed with wood chips in the Chickenhouse Branch wetlands (Tracy Moye, personal communication, 2001). This liquid was most likely a combination of lime mud (CaCO_3), grits (non-reactive glass-like material), and dregs (insoluble materials such as unburned carbon, calcium, and iron compounds) mixed with weak, green, and white liquors (Debra Gable 2004, ATSDR engineer and Technical Project Officer, personal communication).

In the mid-1950s, St. Joe Paper Company sold these filled areas for home sites as part of the Mill View Subdivision West (Figure 2). Some Mill View residents reported adding soil to their properties to fill holes, to raise the level of the land before building, and to grow lawns. Recent sampling has shown, however, that clean cover of the waste material is thin or non-existent in some areas. Dr. Flowers sampled soil from 50 fire ant mounds. His work shows that activities of ants and other burrowing animals bring buried materials to the surface in areas of cover (Flowers 2004). In August 2001, the Florida DEP reported five residences had gardens in or near the former Chickenhouse Branch fill area.

During the 1980s, St. Joe Paper Company filled a second wetlands area with limey clay, soil, and wood chips. The building of the second phase of the residential development, Mill View Subdivision East, occurred over part of this second filled area (Figure 2). Subsidence in these two areas has caused cracked walls (Photograph 1) and broken sewer lines in some homes. To avoid an explosion risk, the gas company discontinued service to one home (ATSDR 2001a).

In 1990, the Florida DEP found arsenic and solvents in groundwater beneath the Apalachicola Northern Railroad property, south of Mill View Subdivision West (Figure 1). The Florida DEP identified Chickenhouse Branch fill as a possible source of the arsenic groundwater contamination.

Data from the Florida DEP's investigation of the neighborhood fill material, shallow groundwater, and surface water served as the basis for the Florida DOH's initial health consultation report for this community. DEP analyzed these samples for five metals. In Florida DOH's first health consultation (released October 21, 2001), we recommended additional groundwater and soil testing for additional chemicals related to pulp and paper manufacture (ATSDR 2001).

In 2001 and 2002, the Florida DEP took additional soil and surface and groundwater samples. They analyzed these samples for additional metals, volatile organic compounds, semivolatile organic compounds, and polychlorinated biphenyls. The Florida DOH's second Health Consultation, released in May 2003, evaluated these additional 2001 and 2002 Florida DEP data

(ATSDR 2003). In this latest health consultation, the Florida Department of Health (DOH) evaluates the public health threat from chemicals measured by the US Environmental Protection Agency's (EPA) contractor, Weston, in Mill View subdivision soil, groundwater, and surface water samples (Weston 2003). We also evaluate additional soil metals data compiled by George C. Flowers, Ph.D., the consultant working for the community's law firm (Flowers 2004).

Site Description and History

The two parts of the Mill View subdivision ("the site") cover 520 acres (Figure 2) (Weston 2003). In the western part, the subdivision has 447 acres. The remaining 73 acres are in the newer part of the subdivision known locally as "Lizville," located to the east and separated by an area of undeveloped land.

The northern and central areas of western Mill View (along Avenue F and Battles Street) are within the 100-year flood plain. Areas along Avenue A, B, and C in the south-central part of the subdivision are within the 500-year flood plain.

On October 17, 2001, Florida DOH staff visited the site and talked with residents. Residents were concerned with area flooding. They were also concerned with land subsidence causing shifting of houses, steps, driveways, and carport slabs. Because of severe subsidence and the risk of broken gas lines/explosion, the gas company terminated service to one house. Without gas for heating, cooking, and hot water, this house became uninhabitable.

Demographics

In 2000, about 341 people lived within a 1/2-mile radius of the center of the western part of the site. Approximately 95% were black or African American, 5% percent were white, and one person (less than 1% of the total) was American Indian or Alaskan native. Within a 1.5-mile radius of the center of western Mill View, the total population was about 2,867. About 61% were white, 37% were black or African American, about 1% were two or more races, about 1% were Hispanic or Latino, and less than 1% were American Indian, and Alaskan Native (LandView[®] 5, 2000 US Census).

Land Use

Land use near the Mill View subdivision includes (Figure 2):

- To the north: undeveloped wooded land, railroad spurs, Arizona Chemical Company, and the Port St. Joe (former) Well Field and Wastewater Treatment Plant,
- To the west: Highway 98, the former paper mill, and St. Joe Bay
- To the southwest: Apalachicola Northern Railroad, Port St. Joe residences, commercial properties, and a marina.
- To the east: undeveloped wooded land.

A north-south rail spur and wetland area separates the Mill View subdivision into two parts. West of this division is a former school. A park, a community garden, and community center with a gymnasium and adult education center now operate on the former school property. While most of the subdivision is residential, businesses, churches, and daycare centers are also present. Many of the yards in the neighborhood are not fenced.

Natural Resource Use

People boat, swim, fish, and harvest shellfish in nearby St. Joe Bay and the Gulf of Mexico. St. Joe Peninsula State Park is across the bay from the town of Port St. Joe. A dredged shipping channel leads from the Gulf of Mexico to the former St. Joe paper mill. The Gulf County Canal north of the Mill View subdivision connects St. Joe Bay to the Intercoastal Waterway.

Because municipal water supplies are available, shallow groundwater under the subdivision is not a current or potential source of drinking water. Prior to 2001, the City of Port St. Joe used four 150-400 feet deep municipal wells on the City's wastewater treatment property. The wells were less than ¼-mile from an unlined sludge lagoon. In 2001, the City of Port St. Joe switched to surface water from the Gulf County Canal.

Community Health Concerns

A long-time resident of Port St. Joe is concerned about rates of cancer, lupus, chronic obstructive pulmonary disease, asthma, heart disease, and diabetes in Gulf County. She is also concerned about relative reproductive health effect rates, birth defect rates, and cleanup of St. Joe Bay (Blackwell 2000, 2001).

The Florida DOH held two public meetings in the community on February 16, 2002 to discuss the findings of their initial health consultation and gather health concerns. Thirty-five residents attended the meetings and reported the following health concerns:

- Heart disease,
- Babies born with cleft palate and hydrocephalus,
- Bone cancer and heart attack,
- Sinus (nasal) infections and headaches,
- Illness and death from exposures to chemicals in the garden soil,
- Cancer, diabetes, high blood pressure, and aching knees,
- Breast cancer, diabetes, diabetes related eye problems, arthritis, and
- Parathyroidism resulting in partial removal of the parathyroid gland

Mill View residents were also concerned about the possible health effects from exposure to arsenic in soil.

Discussion of Environmental Contamination

In this report, the Florida DOH reviews analytical data from soil, surface water, and groundwater samples collected November 19-21, 2002 in western Mill View by the EPA's contractor Weston Solutions, Inc. (Weston 2003). The EPA carried out this preliminary assessment/site investigation to address data gaps in the Florida DEP's investigations. In this report, the Florida DOH also reviews analytical data from soil samples collected by George C. Flowers, Ph.D., a consultant for the community's law firm of Levin, Papantonio, Thomas, Mitchell, Echsner, and Proctor, PA (Flowers 2004).

We evaluated the available data by considering the following factors:

1. Concentrations of contaminants found on the site. The Florida DOH eliminates contaminants from further consideration only if background concentrations and on-site concentrations are both below standard comparison values established by the ATSDR and the Florida DEP.
2. Field-data quality, laboratory-data quality, and sample design.
3. Community health concerns. These are concerns expressed by members of the nearby community about possible adverse health effects from exposure to site contaminants.
4. Comparisons of the maximum concentrations of contaminants identified at the site to ATSDR standard comparison values for contaminated environmental media for which a completed exposure pathway, or potential exposure pathway, is found to exist at the site. Standard comparison values are specific to the type of environmental media (water, soil, sediment) that is contaminated. We use these standard comparison values to select site contaminants for further evaluation. The Florida DOH does not use these values to predict health effects or to establish clean-up levels. We evaluate the contaminant further when media concentrations are above the ATSDR's standard comparison values. This does not necessarily mean that a contaminant represents a health risk. The Florida DOH does not evaluate site contaminants further if they fall below an ATSDR chemical-specific standard comparison value and consequently are unlikely to be associated with illness. The Florida DOH also evaluates a contaminant further if the community has expressed a specific concern about it.
5. Comparisons of maximum site concentrations found in completed and potential exposure pathways to toxicological information published in ATSDR's chemical-specific Toxicological Profiles (<http://www.atsdr.cdc.gov/toxpro2.html#-A->). These chemical-specific profiles summarize information about the toxicity of chemicals from the scientific literature.

The Florida DOH used the following standard comparison values, in order of priority, to select the contaminants of concern:

1. Cancer Risk Evaluation Guide (CREG). A CREG is the contaminant concentration estimated to result in no more than one excess cancer per 1 million persons exposed during a lifetime (i.e., 70 years). We calculate CREGs from the EPA-established cancer slope factor (ATSDR 2004).
2. Environmental Media Evaluation Guide (EMEG). We derive an EMEG from the ATSDR-established Minimal Risk Level (MRL), using standard exposure assumptions (e.g., ingestion of 2 liters of water per day and body weight of 70 kg. for adults). Chronic MRLs are estimated levels of daily human exposure to a chemical for a period of 1 year or longer which is likely to be without any appreciable risk of noncancerous illnesses (ATSDR 2004).
3. Soil Cleanup Target Levels (SCTLs). In absence of the above criteria, we used Florida DEP soil cleanup target levels (SCTLs) (Florida DEP 1999, 2002a).

Identification of a contaminant of concern in this section of the report does not necessarily mean that exposure to the contaminant is likely to cause illness. Identification of contaminants of concern helps narrow the focus of the public health assessment to those contaminants that pose a potential public health risk to area residents.

The Florida DOH lists the contaminants measured above screening values for each investigation in separate tables, and then lists the highest measured values from all the investigations. Tables

4, 5, and 6 summarize the intervals sampled and the analyses performed by the Florida DEP, the EPA and Dr. Flowers. Table 7 contains the soil concentrations measured by the EPA. Tables 8 and 9 contain the contaminant concentrations measured by Dr. Flowers, and the Florida DEP, respectively. Table 10 summarizes the highest levels of chemicals measured above screening values in all of the investigations. The chemicals measured above their screening values include arsenic, barium, copper, dieldrin, dioxin Toxicity Equivalence (TEQs—Table 3), lead, mercury, N-nitroso di-n-propylamine, polycyclic aromatic hydrocarbons (PAH) TEQs (Table 2), polychlorinated biphenyls (PCBs), and vanadium.

The Florida DOH did not differentiate soil depths with the Florida DEP's data or the new data evaluated in this assessment. All the material was brought in and was likely mixed as the material was spread, so there was no reason to treat chemical concentrations as if they were related to one another, or were otherwise stratified as commonly occurs on sites with dumped or spilled hazardous waste.

Soil Samples

Sample Descriptions

In 2002, the Florida DEP collected soil samples in 54 different locations in Mill View: 47 in the western part, and seven in the eastern (newer) part.

In 2003, the EPA collected:

- 24 surface samples (0–6") including one background and two duplicate samples, and
- 24 subsurface samples (12–24"), including one background and two duplicate samples.

EPA's contract lab analyzed these soil samples for target analyte list metals and cyanide, target compound list volatile organic compounds, pesticides, and polychlorinated biphenyls. They analyzed ten surface soil samples for dioxin and furan congeners; MA-01-SS, MA-04-SS, MA-05-SS, MA-08-SS, MA-10-SS, MA-12-SS, MA-17-SS, MA-20-SS, MA-23-SS.

In August and November 2003, George C. Flowers, Ph.D., collected 41 subsurface soil samples (average 10.6 inches deep) and 115 surface soil samples (0 to 2 inches deep) in the Mill View west subdivision. Fifty of these surface soil samples were from ant piles. In January 2004, Dr. Flowers collected 30 background ("control") soil samples from dune fields on St. Joseph Peninsula, beach ridges north of the subdivision, and streets in Port St. Joe (25 samples were 0–2", two were 18–20", two were 12–14", one was 6–8" below land surface). Severn Trent laboratory analyzed these samples for metals. They analyzed:

- the 41 subsurface soil samples for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver,
- the 115 surface soil samples for arsenic and lead, and
- the 30 control samples for arsenic and lead.

The Florida DOH received data summary tables with Dr. Flowers' report. We were not able to address data quality issues for these data because the report did not list data qualifiers and we did not receive the original laboratory reports.

Soil Sample Results

Florida DEP found arsenic, polycyclic aromatic hydrocarbons, and polychlorinated biphenyls were present above health-based screening levels. The additional studies by EPA's contractor and Dr. Flowers found higher levels of arsenic, barium, copper, dieldrin, TEQ dioxins, lead, mercury, n-nitro di-n-propylamine, and vanadium than the Florida DEP found. Tables 4, 5, and 6 summarize the analyses performed on the different soil samples.

Dr. Flowers work suggests ants bring buried contaminated soil to the surface.

Surface Water Samples

Sample Descriptions:

EPA's contractor, Weston, collected four surface water samples from the perennial drainage pathway that transects the western part of the subdivision (the former location of Chickenhouse Branch). These four samples included one background sample and one duplicate sample. Water travels through an underground culvert, under most of western Mill View. Weston took a sample from a ditch along the southern part of the subdivision and from the natural creek bed north of the subdivision.

Sample Results:

Weston considered the southern ditch surface water a background sample. However, the proximity of the southern ditch to the Apalachicola Northern Railroad Property could explain why their lab measured lead at 28 micrograms per liter ($\mu\text{g/L}$) in surface water from the southern ditch. Lead was the only chemical measured above its primary drinking water standard ($15 \mu\text{g/L}$) in all four surface water samples. They did not detect any volatile organic chemicals (VOCs), semivolatile organic chemicals (SVOCs), pesticides, or polychlorinated biphenyls (PCBs) in the surface water.

All surface water samples exceeded the secondary drinking water standard for iron. Surface water from both non-background sample locations also exceeded the secondary standard for manganese, while the background and one other surface water sample exceeded the secondary standard for aluminum. Secondary standards address acceptable taste and odor standards for drinking water. Aluminum, iron, and manganese levels in surface water do not exceed health-based screening levels. In addition, no one in the Mill View subdivision is using the Chickenhouse Branch surface water as a drinking water source.

Groundwater Samples

Sample Descriptions:

EPA's contractor, Weston, collected five groundwater samples from temporary monitoring wells, including one background well.

Sample Results:

Florida DEP found three monitoring wells that contained sodium above the drinking water standard. Use of sodium hydroxide at the St. Joe paper mill could be responsible for the basic (high) pH levels found in some wells. Florida DEP measured lead at $109 \mu\text{g/L}$ in groundwater from one irrigation well; this level is above the drinking water standard ($15 \mu\text{g/L}$). Florida DEP

found very low levels of dioxins and furans in one groundwater sample; however, the laboratory blank also contained dioxins and furans, indicating laboratory contamination.

Like the Florida DEP, EPA's contractor, Weston, found relatively little groundwater contamination. Weston found elevated sodium, but none above the drinking water standard. Regardless of the source of sodium and lead, no one in the Mill View Subdivision West or East is using either surface water or groundwater as drinking water.

Sediment Samples

Weston collected four sediment samples from the northern and southern ends of the perennial drainage pathway that transects the western part of the subdivision (the former location of Chickenhouse Branch). These samples included one background sample and one duplicate sample. They did not detect any metals, VOCs, SVOCs, pesticides, or PCBs above their screening levels in sediments. They measured environmentally persistent pesticides (chlordane and DDT derivatives) in trace amounts. However, they measured these pesticides at levels less than the health-based screening values.

Quality Assurance and Quality Control – The Florida DOH used EPA's contractor, Weston, and Severn Trent Laboratory data to prepare this public health assessment. We assumed that these data are valid. The completeness and reliability of the referenced environmental data determine the validity of the analyses and conclusions drawn for this public health assessment. Some of the EPA contract laboratory data had qualifiers; **J** indicates that qualitative analysis was acceptable. **J** also indicates the lab estimated a quantitative value. The Florida DOH evaluated **J**-modified values. **N** indicates presumptive evidence, the chemical was only tentatively identified; its detection cannot be considered a positive indication of its presence and the Florida DOH did not evaluate these values. **U** indicates that the Florida DOH did not detect a chemical; however, the reported value is the lab-derived sample quantitative limit for the constituent in that sample. **JN** indicates that EPA did not have the chemical on the target compound list. **JN** also indicates that the lab tentatively identified a chemical, and estimated its quantity. The lab rejected **R**-values, and the Florida DOH did not use **R**-qualified data. The contract lab confirmed **C** values by gas chromatography or mass spectrometry; both are alternate laboratory instrument methods.

The Severn Trent data were available only in summary data tables; data qualifier values were not included.

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.

Soil in the Mill View Subdivisions is a mixture of paper mill waste, fill, and native soil. Thus, the Florida DOH assessed the potential public health threat from exposure to all soil samples regardless of depth. Mill View residents could have accidentally eaten small amounts of contaminated soil from their hands or from homegrown vegetables. Residents could also have breathed contaminated dust from this soil.

Some of the persons living in the neighborhood could have had past exposure to arsenic, lead PCBs, and vanadium in soil, in addition to other chemicals from airborne emissions. They may also have had exposures to these and other chemicals from working at the mill, or from parents who worked at the mill and brought materials home on their clothing. Air and work-related exposure routes might also be attributable to current and past industrial businesses including but not limited to: Allied Chemical, Corp., Amerada-Hess, Amoco S/S, Arizona Chemical Company, Apalachicola Northern Railroad, Combustion Engineering, Inc., Miller Agency, Inc., Raffield Shipbuilders and Dry Dock, Sing Food Store, St. Joseph Land and Development, Co., and St. Joseph Telephone and Telegraph Company. Florida DOH found these sites on an EPA database, so these businesses are either currently located nearby, or were located nearby in the recent past.

Public Health Implications

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

. . .all chemicals, no matter what their characteristics, are toxic in large enough quantities. Thus, the amount of a chemical a person is exposed to is crucial in deciding the extent of toxicity that will occur. In attempting to place an exact number on the amount of a particular compound that is harmful, scientists recognize they must consider the size of an organism. It is unlikely, for example, that the same amount of a particular chemical that will cause toxic effects in a 1-pound rat will also cause toxicity in a 1-ton elephant.

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

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

To calculate the daily dose of each contaminant, the Florida DOH uses standard assumptions about body weight, ingestion and inhalation rates, duration of exposure (period of time), and other factors needed for dose calculation (ATSDR 1992, EPA 1997). We assume that people ingest, inhale or have dermal contact daily to/with the maximum concentration measured at the site. ATSDR's toxicological profiles on contaminants separate exposures into three exposure routes - inhalation, ingestion, and dermal (skin) exposure. For each of these exposure routes, ATSDR also groups health effects by duration (period) 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's Toxicological Profiles also provide information on the environmental transport and regulatory status of contaminants.

To estimate exposure from incidental ingestion of contaminated soil, the Florida DOH used the following assumptions (EPA 1997):

- 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.

Health Risk from Soil

The values given on the page before Table 11 list the exposure parameters used in estimating the daily doses for each exposure scenario. For soil exposures, we estimate the doses for incidental ingestion of soil and inhalation of dusts. In Table 11, we highlight doses that exceed the minimal risk level or MRL. Only arsenic, PCB, and vanadium doses calculated for children exceeded their respective MRLs. Lead is a special case and does not have an MRL. Table 12 compares the doses calculated for *all the chemicals measured above their screening values* and compares our calculated doses (using the highest measured levels) with the lowest doses associated with the health effects in animal and human medical studies (the sensitive doses). In this section, we only discuss the potential health effects of four chemicals: arsenic, lead, vanadium, and PCBs.

Table 12 compares the doses calculated from the highest measured chemical values to Minimum Risk Levels (MRLs). MRLs are conservative estimates of daily human exposure (doses) to a contaminant, below which, noncancerous illnesses are unlikely to occur. ATSDR bases their MRL calculations on animal studies and human medical reports. They use conservative exposure assumptions to calculate MRLs because the goal of the MRL is to protect public health. MRLs may exist for different routes of exposure, such as ingestion and inhalation, or for different lengths of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (greater than 365 days). ATSDR has prepared Toxicological Profiles for some chemicals, which provide information on the health effects, environmental transport, human exposure, and regulatory status of chemicals.

In the following paragraphs, the Florida DOH evaluates the doses we calculated for soil contaminants that occurred above their MRLs (and lead). We used the highest measured levels for each chemical and standard exposure assumptions to calculate doses for daily, long-term exposures.

Arsenic—accidentally ingesting contaminated soil or inhaling contaminated dust with the highest measured level of arsenic will not likely cause non-cancer illness. Arsenic levels were measured above the screening value ATSDR sets for children (for non-cancer health effects) at only four sample locations. Accidentally ingesting contaminated soil or inhaling contaminated dust with the highest measured arsenic concentration could increase the theoretical cancer risk by five cases in 100,000. Five cases in 100,000 are between the values ATSDR describes as “low” and “no apparent” increased risk. Because the number of known areas with elevated arsenic levels is small (four), it is possible that people may not be exposed daily, therefore the theoretical increased risk of cancer could be even less.

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 (haemangioendothe-

lioma), 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 cancer cells live only in the outermost or epidermis layer of the skin. Pre-invasive cancer cells can spread along the skin surface and they are unlikely to have spread to the lymph nodes. If left untreated, these cells can develop into an invasive cancer and spread into the lymphatic system.

Lead—estimated blood levels more accurately predict health effects than traditional dose estimates. The Florida DOH used a simple model to estimate blood lead levels and likely health effects for exposures to the highest measured levels of lead in soil (ATSDR 1999). This model takes into account children’s and adults’ exposures to lead from sources other than soil. The model assumes people’s exposures to lead-contaminated soil occur for eight hours per day at the highest measured levels. Estimated blood lead concentrations range from 2.5 to 6.7 micrograms per deciliter (µg/dL) for children (Table 13) and 1.9 to 6.3 µg/dL (Table 14) for adults.

Many studies have documented the effects of lead exposures in people. These effects often occur over a range of levels based on lead measured in test subjects’ blood. The following table lists those studies for which the known blood lead ranges overlap the ranges we estimated for exposure to the highest measured level of lead in Mill View. However, the model is based on conservative assumptions and may not represent actual exposure. Information about the assumptions used as a basis for the model can be found in Tables 13 and 14 in Appendix B.

Table 1: Possible Health Effects at Blood Lead Levels of 1.9 to 6.7 µg/dL

Children’s Blood Lead Levels (µg/dL)	Adults’ Blood Lead Levels (µg/dL)	Possible Health Effects
No threshold	3 - 56	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	—	Alterations in visual evoked potentials ¹ .
6.5	—	(Average value at 24 months of age) - Lower cognitive function test scores in children 5 to 10 years of age.
6 - 200	—	Decreased neurobehavioral function; slightly decreased performance on IQ tests and other measures of neuro-psychological function.
—	5.5 (average)	Decreased performance on neurobehavioral tests.

µg/dL = micrograms per deciliter Source: ATSDR 1999a

Lead in the bloodstream can interfere with the body’s ability to make new red blood cells (ATSDR 1999). Too few red blood cells (anemia) mean the body’s uptake of energy from food and oxygen from air is less efficient. Medical studies show the processes leading to anemia occur at all levels of lead exposure: there is no known threshold for this effect. There also may be no threshold for adverse neurological effects with children’s exposure to lead which may affect

¹The visual evoked potential measures the electrical response of the brain’s primary visual cortex to a visual stimulus.

intelligence, balance, hearing, attention deficit/hyper-activity disorder, and alterations in visual evoked potentials as described in Table 1 (ATSDR 2002). However, as with arsenic, children and adults in Mill View may not have accidentally eaten soil every day, and the highest levels measured may be out of the ordinary (the various investigations measured lead levels above 400 mg/kg in only three out of 307 samples or less than 1%).

Vanadium—accidentally ingesting contaminated soil or inhaling contaminated dust with the highest measured level of vanadium will not likely cause non-cancer illness. The child ingestion dose is 15 times less than the No Observed Adverse Effect Level in a rat study associating mild bleeding in the kidneys (renal hemorrhagic foci) with exposure to sodium metavanadate for three months. Animal studies and human medical case studies are insufficient for evaluating the carcinogenicity of vanadium (ATSDR 1992b).

Polychlorinated Biphenyls (PCBs)—Laboratories measure PCBs as concentrations of various mixtures. Two different laboratories measured the PCB mixtures known as “Arochlor-1260” in the western fill area. Accidentally ingesting contaminated soil or inhaling contaminated dust with the highest measured concentration of Arochlor-1260 will not likely cause non-cancer illness (ATSDR 2000b). The child ingestion dose is 55 times less than the dose associated with elevated and separated toenails and immune system effects in animal studies of primates given PCBs in their food, for longer than a year. Additionally, children in Mill View may not accidentally eat soil every day and the highest levels measured are out of the ordinary (PCB levels above 0.4 mg/kg [DEP’s residential Soil Cleanup Target Level]) were only measured in four out of 88 samples, or about 4.5%).

While accidentally ingesting contaminated soil or inhaling contaminated dust with the highest measured concentration of Arochlor 1260 increases the theoretical cancer risk, the level estimated for ingestion (for children) would be an increase of two theoretical cases in 100,000. ATSDR describes one increased case in 100,000 as “no apparent” increased risk. The level estimated for ingestion (for adults) is an increase of eight theoretical cases in 1 million people, which falls between the levels ATSDR describes as “no apparent” and “insignificant” increased risks. Because the number of known areas with elevated PCB levels is small (four), it is possible that people may not be exposed daily, therefore the theoretical increased risk of cancer could be even less.

In other communities, ATSDR has recommended residents not garden in soils having PCBs greater than 10 milligrams per kilogram (mg/kg) or parts per million (ppm). In soils having between 1 and 10 mg/kg PCBs, the ATSDR recommends “good gardening practices” (the following information was obtained from John Wheeler, ATSDR toxicologist, personal communication 2002). Figure 3 shows the locations, depths, and values of PCBs measured above the MRL. MA-17 contained PCBs at 3.2 and 4.1 mg/kg in duplicate soil samples collected from 6 inches to 1 below the surface. MV-42 contained PCBs at 1.3 mg/kg in a soil sample collected 2 to 3 feet below the surface. MV-6 contained PCBs at 6.9 mg/kg in a soil sample collected from 2.5 to 3.5 feet below the surface. Although these data do not indicate widespread PCB contamination in soil people are likely to come in daily contact with, until more is known about the locations and levels of fill contamination, residents using “good gardening practices” will be taking precautionary measures. Using “good gardening practices” could also reduce community members’ potential exposures to other contaminants in the fill material.

Good Gardening Practices:

- ☑ Add clean compost or soil to your garden.
- ☑ Be sure phosphate and pH levels do not fall below recommended values. Your county extension office can help evaluate your soil.
- ☑ Avoid dust. You can do this by using mulches and not gardening in dry soil on windy days.
- ☑ Don't eat and drink while in the garden.
- ☑ Limit intake of homegrown root crops, especially carrots. Root crops, in addition to dirt adhering to them, could take up PCBs under certain conditions. Crops that form above the ground are much less likely to contain PCBs. A layer of cells in roots stops PCBs from being transported into the rest of the plant. Residents can avoid any chemicals in the fill by growing root vegetables in raised beds containing only clean topsoil (not paper mill waste fill).
- ☑ Wash leafy vegetables that grow close to the ground (like collard greens) because contaminated soil can adhere to the large surface areas of such plants. Adding a little vinegar to the wash water will help remove dirt and contamination.

When coming in the house from working in the garden:

- ☑ Remove shoes before entering the house.
- ☑ Wash your hands.
- ☑ Wash dirty clothing.

The Florida DOH recommends Mill View residents follow these “good gardening practices” to reduce contact with contaminated soil but still allow the enjoyment and convenience of homegrown fruits and vegetables.

Health Risk from Surface Water and Groundwater

No one in the Mill View Subdivision West or East is using either the surface water or shallow groundwater beneath the subdivision as a source of drinking water. Nonetheless, the Florida DOH evaluated the Florida DEP and the EPA test results from groundwater and surface water.

In four surface water samples from the ditch south of the subdivision, lead was the only chemical above a primary drinking water standard. Weston (2003) measured lead at 28 micrograms per liter (µg/L). The primary drinking water standard for lead is 15 µg/L. The Florida DEP also found lead in a groundwater sample from an irrigation well at 109 µg/L. This is above the primary drinking water standard of 15 µg/L. Lead in water from this irrigation well is unlikely to accumulate to levels in plants that would cause illness.

Child Health Considerations

The ATSDR and the Florida DOH recognize the unique vulnerabilities of infants and children demand special attention (ATSDR, 1998). Children are at a greater risk than adults are for certain kinds of exposure to hazardous substances. Children tend to receive more exposures to contaminants in the environment because they play outdoors and because they often carry food into contaminated areas. Children are shorter than adults are. Therefore, 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, housing, 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, the Florida DOH used chemical screening values that the ATSDR developed for children's exposures in preparing this report. Therefore, these screening values would be protective of any children that might live in the neighborhood.

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 (including cigarette smoke or alcohol). These factors may limit a persons' ability to detoxify or excrete harmful chemicals or may increase the effects of damage to their organs or systems.

Evaluation of Health Concerns and Health Outcome Data

Based on what is currently known, the concentrations of contaminants measured in Mill View soil, surface water, or groundwater are not likely to have caused the illnesses reported by residents. Lack of air monitoring data prevents an assessment of the health risk from inhalation of air pollutants from the former paper mill and other nearby industrial sources.

In 2002, the estimated diabetes rate in Gulf County was statistically higher than the state rate (Dr. Schlottman, personal communication, August 2004). In 2002, the estimated diabetes rate in Gulf County was 11.1 percent (95% confidence intervals 5.7% to 16.5%) and the diabetes rate for the entire state was 7.6 % (95% confidence intervals 6.8% to 8.4%).

Florida DOH compared Gulf County cancer rates with statewide rates. For the entire period cancer data are available (1981 to 2000), both liver and total age-adjusted cancer rates were lower in Gulf County rates for all Florida counties (Appendix C).

Age-adjusted liver cancer rates were:

- 2.4 per 100,000 for Gulf County, and
- 2.9 per 100,000 for Florida.

Age-adjusted rates for all cancers were:

- 436.7 per 100,000 for Gulf County, and
- 464.9 per 100,000 for Florida.

Trends for the 1981-1999 reported cancers show similar values (Appendix C).

Age-adjusted liver cancer rates were:

- 1.8 per 100,000 for Gulf County, and
- 2.60 per 100,000 for Florida.

Age-adjusted rates for all cancers were:

- 429.82 per 100,000 for Gulf County, and
- 456.69 per 100,000 for Florida.

In summary, these Florida Cancer Data System values indicate liver and total cancer age-adjusted rates are lower in Gulf County than all Florida Counties, for the periods of 1981 to 2000, and 1981 to 1999.

Conclusions

The levels of chemicals measured in soil, surface water, sediments, and groundwater in the western Mill View subdivision pose no apparent public health hazard. Specific conclusions follow:

1. Disposal of waste from the former St. Joe paper mill in the Mill View subdivision has caused land subsidence. This subsidence has caused structural damage to homes and in some instances has allowed access to insects, birds, rodents and other potential disease vectors. Subsidence has also broken water, wastewater, and has the potential to break natural gas pipes.
2. Agencies and contractors assessing the soil and fill in the Mill View neighborhood measured arsenic, polychlorinated biphenyls (PCBs), and vanadium above the minimum risk levels and lead above the Florida DEP residential Soil Target Cleanup Level. These levels, however, are not likely to cause noncancer illness. PCBs were measured at levels for which the ATSDR has recommended “good gardening practices” in other communities.
3. Although levels of sodium in shallow groundwater under the Mill View subdivision are above drinking water standards, this groundwater is not a source of drinking water. Use of shallow groundwater to irrigate lawns and gardens is not likely to cause illness.
4. Lack of air monitoring data prevents assessment of the health risk from past exposures to airborne contaminants from the former St. Joe paper mill and other nearby industrial sources.
5. Accidental ingestion of small amounts of soil or drainage ditch sediments in the Mill View subdivision is not likely to cause illness. Likewise, inhalation of dust from soil in the Mill View subdivision is not likely to cause illness.
6. In 2002, the estimated Gulf County rates of diabetes was statistically higher than the state rate. The total age-adjusted cancer rate for the 1981-1999 time period was lower for Gulf County than for all Florida counties.

Recommendations

Florida DOH's recommendations parallel our numbered conclusions:

1. Mill View residents in houses with cracking walls and foundations should use flexible connections for water, wastewater, and gas. Residents in houses with cracking walls and foundations should also repair openings to prevent entrance of insects, birds, rodents and other potential disease vectors.
2. Mill View residents should follow "good gardening practices" to reduce their potential for exposure to arsenic, lead, PCBs, vanadium and other fill chemicals until more is known about the locations and levels of fill contamination. "Good gardening practices" include using clean soil and compost, adjusting soil phosphate and pH levels, suppressing dust formation, avoiding food and drink while gardening, limiting carrots and other root crops, washing leafy vegetables before eating, leaving gardening shoes outside, and washing hands and gardening clothes.
3. Mill View residents should continue to use municipal water for drinking and other household uses and should not use shallow groundwater as a drinking water source.
4. As we do for all instances where the available information on past exposures is incomplete, the Florida DOH recommends people should see their doctor if they feel ill. This is especially important for people who may have contacted airborne contaminants from the former St. Joe paper mill and other nearby industrial sources. Florida DOH does not have information on any other sources of contamination persons in Mill View may have contacted in addition to data on fill material in their yards and limited surface and groundwater data.

Public Health Action Plan

1. The Florida DOH will review any new data on chemicals in soil and groundwater.
2. The Florida DOH will inform and educate nearby residents about its public health findings.

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