

Health Consultation

TALLEVAST AMBIENT AIR AND SOIL GAS

FORMER AMERICAN BERYLLIUM COMPANY

TALLEVAST, MANATEE COUNTY, FLORIDA

EPA FACILITY ID: FLD004100731

SEPTEMBER 23, 2008

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

Health Consultation: A Note of Explanation

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

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

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HEALTH CONSULTATION

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Prepared By:

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

Foreword

This document summarizes the Florida Department of Health's and Agency for Toxic Substances and Disease Registry's assessment of the public health risk during permanent water line installation along two Tallevast streets near the former American Beryllium site. The Florida Department of Health (DOH) evaluates site-related public health issues through the following processes:

- Evaluating exposure: Florida DOH scientists begin by reviewing available information about environmental conditions at the site. The first task is to find out how much contamination is present, where it is, and how human exposures might occur. Usually, the Florida DOH does not collect its own environmental sampling data. Manatee County, Utilities Maintenance Division provided the information for this health consultation.
- 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 evaluation report, the Florida DOH outlines its conclusions regarding any potential health threat posed by permanent water line installation, 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 (EPA) and the Florida DEP. If, however, an immediate health threat exists or is imminent, the Florida DOH will issue a public health advisory warning people of the danger, and will work to resolve the problem.
- Soliciting community input: The evaluation process is interactive. The Florida DOH starts by soliciting and evaluating information from various government agencies, individuals or organizations responsible for cleaning up the site, and those living in communities near the site. We share any conclusions about the site with the groups and organizations providing the information. Once we prepare an evaluation report, the Florida DOH seeks feedback from the public.

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

Please write to: Program Manager/Health Assessment Team
Bureau of Environmental Public Health Medicine
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4052 Bald Cypress Way, Bin # A-08
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Or call us at: (850) 245-4299, or toll-free during business hours: 1-877-798-2772

Summary and Statement of Issues

In June 2008, the Manatee County Health Department requested the Florida Department of Health assess the public health threat from breathing volatile organic chemicals (VOCs) during installation of permanent water lines along two Tallevast streets. Community members were concerned they would be exposed to harmful levels of VOCs when the county dug shallow trenches to bury permanent water lines. Ground water contaminated with trichloroethene (TCE) and other VOCs from the former American Beryllium facility exists under the Tallevast community.

Based on tests of 22 soil gas and six ambient air samples, inhalation of volatile organic chemicals during a 2-month Tallevast water line installation is no apparent public health hazard.

Background

From 1962 to 1996, the Loral Corporation owned and operated the American Beryllium Company at 1600 Tallevast Road in Tallevast, Florida (Figure 1). Tallevast is in southern Manatee County between Sarasota and Bradenton. American Beryllium operated an ultra-precision machine parts manufacturing plant. American Beryllium milled, lathed, and drilled beryllium-containing metals into various components. American Beryllium used and disposed of volatile organic chemical (VOC) solvents including trichloroethylene (TCE).

The Tallevast community surrounding the former American Beryllium site is a blend of single-family homes and light commercial/industrial development (Figure 2). The Tallevast community consists of about 85 homes in a one mile by half-mile area. In 2000, about 200 people lived within a 0.5-mile radius of the site. The population is predominantly African-American (BOC 2000).

In 1996, Lockheed Martin purchased America Beryllium and ceased operations. In 2000, Lockheed Martin discovered TCE groundwater contamination under the site. Initially, it appeared that groundwater contamination was contained on site.

In late 2003, surrounding Tallevast community leaders informed Lockheed Martin that some residents were still using their own wells for drinking, showering, and other indoor uses. In May 2004, the Florida Department of Environmental Protection (DEP) and the Manatee County Health Department (CHD) located and tested 17 private drinking water wells. They found TCE and other VOCs or "solvents" in 13 wells. In five of these wells, the contaminant levels were above drinking water standards (DEP 2004). In June 2004, the Manatee County Utilities Maintenance Division laid temporary, aboveground municipal water lines to all the homes still using private drinking water wells.

In August 2004, Florida DOH and Manatee CHD tested the air quality in four buildings over the highest ground water contamination. They did not find any contaminants associated with the contaminated ground water. The levels of other volatile organic chemicals were not likely to cause illness (ATSDR 2005a).

In 2005, Florida DOH/ATSDR evaluated beryllium sensitivity in former workers, household members, and nearby residents (ATSDR 2005b, 2006a). Also in 2005, Florida DOH/ATSDR also tested homegrown fruits and vegetables (ATSDR 2006b).

In February 2007, Florida DOH reviewed soil gas test data from 21 Tallevast locations and estimated the highest undiluted soil gas concentration of TCE would be no more than a “low” (less than 2 in 10,000) increased risk from lifetime exposure (DOH 2007).

In 2007, community leaders expressed concerns about the integrity and safety of the temporary, above ground water lines. In early 2008, Manatee County Utilities Maintenance Division announced plans to install permanent water lines to replace the temporary, above ground water lines. In response to community concerns about breathing vapors released during the two-month water line soil excavation, Manatee County Utilities Maintenance Division tested soil gas and ambient air.

Community Health Concerns

Tallevast community members were concerned about the integrity and safety of temporary, above ground water lines Manatee County Utilities Maintenance Division installed in 2004. Community members were also concerned that they would be exposed to harmful levels of volatile organic chemicals (VOCs) when the county dug shallow trenches to bury permanent water lines.

Discussion

Ambient Air and Soil Gas Test Results

In June and July 2008, consultants for Manatee County Utilities Maintenance Division collected 22 soil gas and six ambient air (outdoor, aboveground) samples during permanent water line installation along 16th and 18th Streets in Tallevast. The laboratories analyzed the air samples for 1,4-dioxane and volatile organic compounds using EPA method TO-15 (Air Toxics 2008, Test America 2008a, Test American 2008b). Table 1 summarizes the highest concentrations found.

Selection of Contaminants of Concern

Florida DOH used the following comparison values in order of priority to select 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). The Agency for Toxic Substances and Disease Registry (ATSDR) calculates CREGs from EPA-established cancer slope factors (ATSDR 1992).
2. Environmental Media Evaluation Guide (EMEG). ATSDR derives an EMEG from a Minimal Risk Level (MRL), using standard exposure assumptions (e.g., ingestion of 200 milligrams of soil per day and body weight of 30 kilograms (kg) for children). ATSDR establishes MRLs: 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.

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3. Maximum Contaminant Levels (MCL). The Florida Department of Environmental Protection (DEP) derives MCLs from U.S. Environmental Protection Agency (EPA) standards or from health data compiled from state and federal resources. MCLs are fully enforceable standards and must be equal to or more stringent (i.e., lower) than federal MCLs (such as the EPA's).
 4. Health Advisory Levels (HALs). The Florida DEP and the Florida DOH set HALs based on U.S. EPA standards or from health data compiled from state and federal agencies. While not enforceable, the state agencies use HALs to protect human health.

Comparison values are conservative estimates of levels at which no health effects would be expected. The Florida DOH utilizes the above criteria to screen the ambient air and soil gas test results. Any contaminant that exceeded a comparison value was selected for further evaluation.

Using the above criteria, Florida DOH selected benzene, chloroform, 1,2-dichloropropane, ethanol, hexachlorobutadiene, and trichloroethylene (TCE) as contaminants of concern.

Identification of a contaminant of concern does not necessarily mean that exposure to the contaminant will cause illness. To be protective of health, ATSDR comparison values are usually set hundreds or thousands of times below levels that actually cause illness. Identification of contaminants of concern helps narrow the focus to those contaminants that require further evaluation for potential public health risk.

The laboratory reported trace levels of methylene chloride in the quality control blank. Because methylene chloride is a common laboratory contaminant, the trace levels reported in the ambient air and soil gas samples are not likely associated with actual Tallevast soil gas.

The laboratories reported finding seven chemicals (*cis*-1,2-dichloroethene, dichlorofluoromethane, 4-ethyl toluene, 2-hexanone, trichlorofluoromethane, 1,2,4-trimethylbenzene, and 1,3,5-tirmethylbenzene) for which toxicological data are insufficient to judge the human health risk. All other chemicals were either below laboratory detection limits or below ATSDR screening guidelines.

The next step in the process for toxicological review is to compare the highest ambient air or soil gas concentration to health studies in ATSDR's toxicological profiles. The toxicological profiles establish no observable adverse effect levels (NOAELs) and lowest observable adverse effect levels (LOAELs) that can be compared to the ambient air and soil gas concentrations.

Pathway Analysis

Some Tallevast residents along 16th and 18th Streets could breathe volatile organic chemicals (VOCs) during the 2-month water line installation. Ground water contaminated with TCE and other VOCs is the source, air is the environmental media, ambient (outdoor) air along 16th and 18th Streets is the point of contact, breathing is the route of exposure, and residents of 16th and 18th Streets are the exposed population.

Toxicological Evaluation

Benzene

Manatee County Utilities Maintenance Division found benzene above the comparison value in 21 of 22 soil gas samples. Benzene is not associated with ground water contamination from American Beryllium. The highest soil gas concentration was 71 parts per billion (ppb) or 0.23

milligrams per cubic meter (mg/m^3). Assuming no (zero) dilution of soil gas as it moves into the atmosphere, this concentration is compared to the EPA inhalation unit risk. The inhalation unit risk is an upper-bound estimate of the increased cancer risk from lifetime exposure.

The highest soil gas benzene concentration ($0.23 \text{ mg}/\text{m}^3$) converted to micrograms/m³ ($230 \text{ ug}/\text{m}^3$) multiplied by the EPA inhalation unit risk for benzene of $2.2 \text{ to } 7.8 \times 10^{-6}$ per micrograms/m³ and adjusted for less than lifetime exposure (2 months/840 months) results in an extremely small increased cancer risk (1 to 4 in 1,000,000).

The above discussion assumes no (zero) dilution of soil gas as it moves into the atmosphere. Soil gas, however, is diluted as it moves into the atmosphere. Although the magnitude of the dilution is not known, the resulting atmospheric concentration will be less than the soil gas concentration. The resulting health risk will be less as well.

Manatee County Utilities Maintenance Division found benzene in one of six ambient air samples at a concentration of 0.49 ppb or $0.0016 \text{ mg}/\text{m}^3$. This ambient air benzene concentration ($0.0016 \text{ mg}/\text{m}^3$) converted to micrograms/m³ ($1.6 \text{ ug}/\text{m}^3$) multiplied by the EPA inhalation unit risk for benzene of $2.2 \text{ to } 7.8 \times 10^{-6}$ per micrograms/m³ and adjusted for less than lifetime exposure (2 months/840 months) results in an extremely small increased cancer risk (0.008 to 0.03 in 1,000,000).

Chloroform

Manatee County Utilities Maintenance Division found chloroform above the comparison value in 10 of 22 soil gas samples. Although chloroform is not associated with ground water contamination from American Beryllium, the soil gas source is unknown. They did not detect chloroform in any of the six ambient air samples.

The highest measured chloroform concentration in soil gas was 5.9 ppb or $0.029 \text{ milligrams per cubic meter}$ (mg/m^3). Assuming no (zero) dilution of soil gas as it moves into the atmosphere, this concentration is compared to the EPA inhalation unit risk. The inhalation unit risk is an upper-bound estimate of the increased cancer risk from lifetime exposure.

The highest soil gas chloroform concentration ($0.029 \text{ mg}/\text{m}^3$) converted to micrograms/m³ ($29 \text{ ug}/\text{m}^3$) multiplied by the EPA inhalation unit risk for chloroform of 2.3×10^{-5} per micrograms/m³ and adjusted for less than lifetime exposure (2 months/840 months) results in an extremely small increase cancer risk (2 in 1,000,000).

1,2-Dichloropropane

Manatee County Utilities Maintenance Division found 1,2-dichloropropane above the comparison value in one of 22 soil gas samples. Although 1,2-dichloropropane is not associated with ground water contamination from American Beryllium, the soil gas source is unknown. They did not detect 1,2-dichloropropane in any of the six ambient air samples.

The highest estimated 1,2-dichloropropane concentration in soil gas was 1.5 ppb or $0.007 \text{ milligrams per cubic meter}$ (mg/m^3). Little is known about the health risk to people from breathing 1,2-dichloropropane. Assuming no (zero) dilution of soil gas as it moves into the atmosphere, the highest measured concentration in soil gas is about 200 times less than the

lowest concentration that caused hyperplasia (new cell growth) on the inside lining of the nose of rats breathing 1,2-dichloropropane for 13 weeks (1.3 mg/m³).

Ethanol

Manatee County Utilities Maintenance Division found ethanol in three of six ambient air samples. Although ethanol is not associated with ground water contamination from American Beryllium, the source is unknown. They did not detect ethanol in any of the 22 soil gas samples. The highest concentration of ethanol in ambient air (3.8 ppb) is not likely to cause illness.

Hexachlorobutadiene

Manatee County Utilities Maintenance Division found hexachlorobutadiene above the comparison value in one of 22 soil gas samples. Although hexachlorobutadiene is not associated with ground water contamination from American Beryllium, the soil gas source is unknown. They did not detect hexachlorobutadiene in any of the six ambient air samples.

The highest measured hexachlorobutadiene concentration in soil gas was 19 ppb or 0.2 milligrams per cubic meter (mg/m³). Assuming no (zero) dilution of soil gas as it moves into the atmosphere, this concentration is compared to the EPA inhalation unit risk. The inhalation unit risk is an upper-bound estimate of the increased cancer risk from lifetime exposure.

The highest soil gas hexachlorobutadiene concentration (0.2 mg/m³) converted to micrograms/m³ (200 ug/m³) multiplied by the EPA inhalation unit risk for hexachlorobutadiene of 2.2×10^{-5} per micrograms/m³ and adjusted for less than lifetime exposure (2 months/840 months) results in no apparent increased cancer risk (10 in 1,000,000).

Trichloroethene (TCE)

Manatee County, Utilities Maintenance Division found trichloroethene (TCE) above the screening guideline in two of 22 soil gas samples. TCE is associated with ground water contamination from American Beryllium. Manatee County did not detect TCE in any of the six ambient air samples.

The highest measured TCE concentration in soil gas was 28 ppb or 0.153 milligrams per cubic meter (mg/m³). Assuming no (zero) dilution of soil gas as it moves into the atmosphere, this air concentration was converted to an exposure dose. Assuming an intake (breathing) rate of 13 cubic meters of air per day and a body weight of 70 kilograms, the estimated maximum inhalation dose was 0.03 milligrams per kilogram per day (mg/kg/day). Multiplying this dose by the EPA cancer slope factor (0.02 to 0.4 per mg/kg-day) and adjusting for less than lifetime exposure (2 months/840 months) results in an extremely small to no apparent increased cancer risk (1 to 30 in 1,000,000).

Child Health Considerations

ATSDR and the Florida DOH recognize the unique vulnerabilities of infants and children demand special attention. Children are at a greater risk than are adults to certain kinds of exposure to hazardous substances. Because they play outdoors and because they often carry food into contaminated areas, children are more likely to be exposed to contaminants in the

environment. Children are shorter than adults, which mean 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.

The screening guidelines and cancer risk factors used in this health consultation take into account the unique vulnerabilities of infants and children.

Conclusions

Based on soil gas and ambient air testing, inhalation of volatile organic chemicals during the 2-month Tallevast water line installation is no apparent public health hazard.

Recommendations

No actions are necessary at this time.

Public Health Action Plan

By the end of 2008, Florida DOH/ATSDR will finalize a public health assessment report on soil, ground water, and surface water.

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- Test American 2008b. Test America, Santa Ana, California. July 11, 2008 laboratory results for Professional Services Industries. Work Order: LRG0059 (Tallevast 18th Street Project).

Figure 1. Location of Tallevast in Manatee County

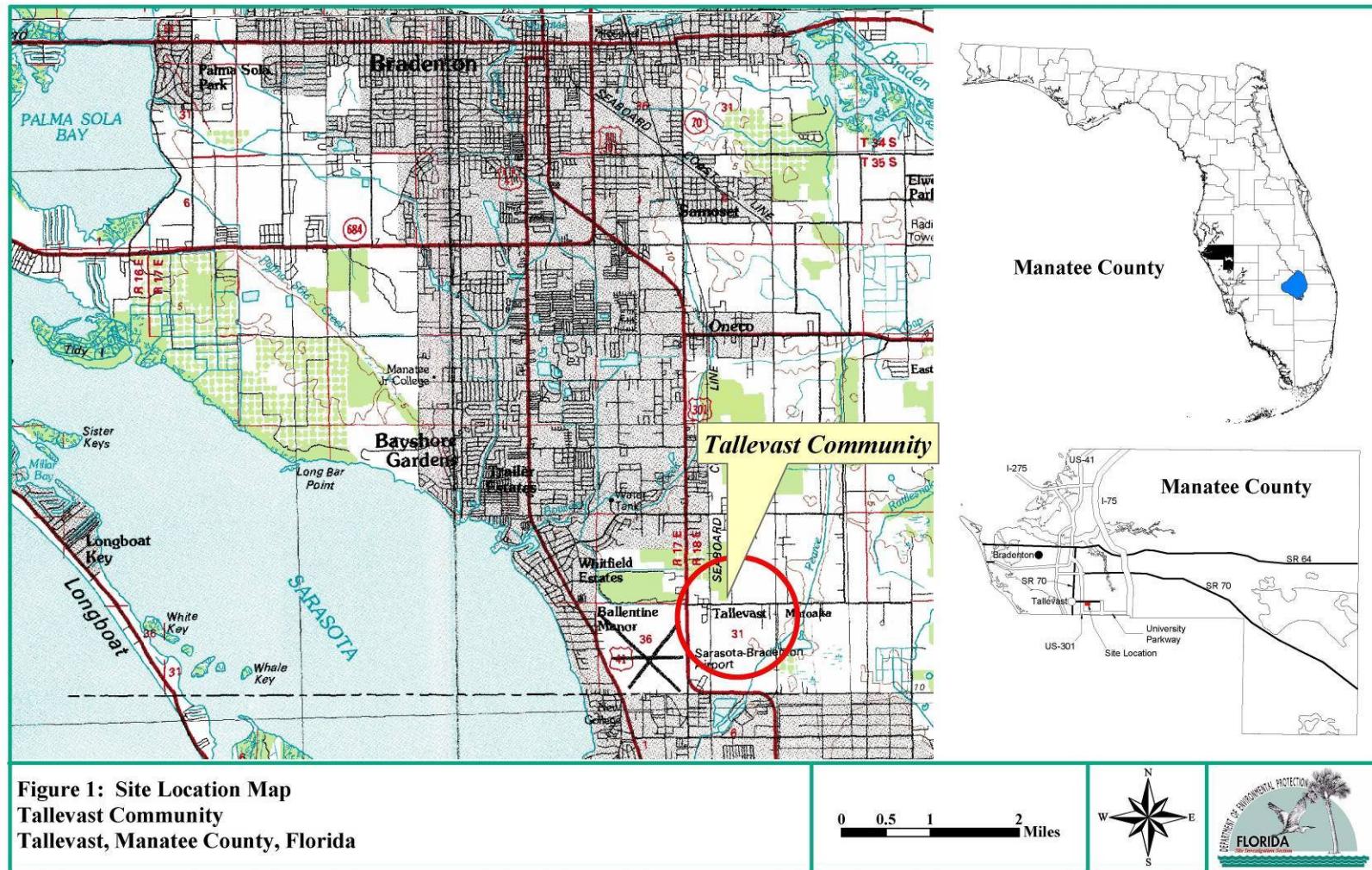


Figure 2. Site Map

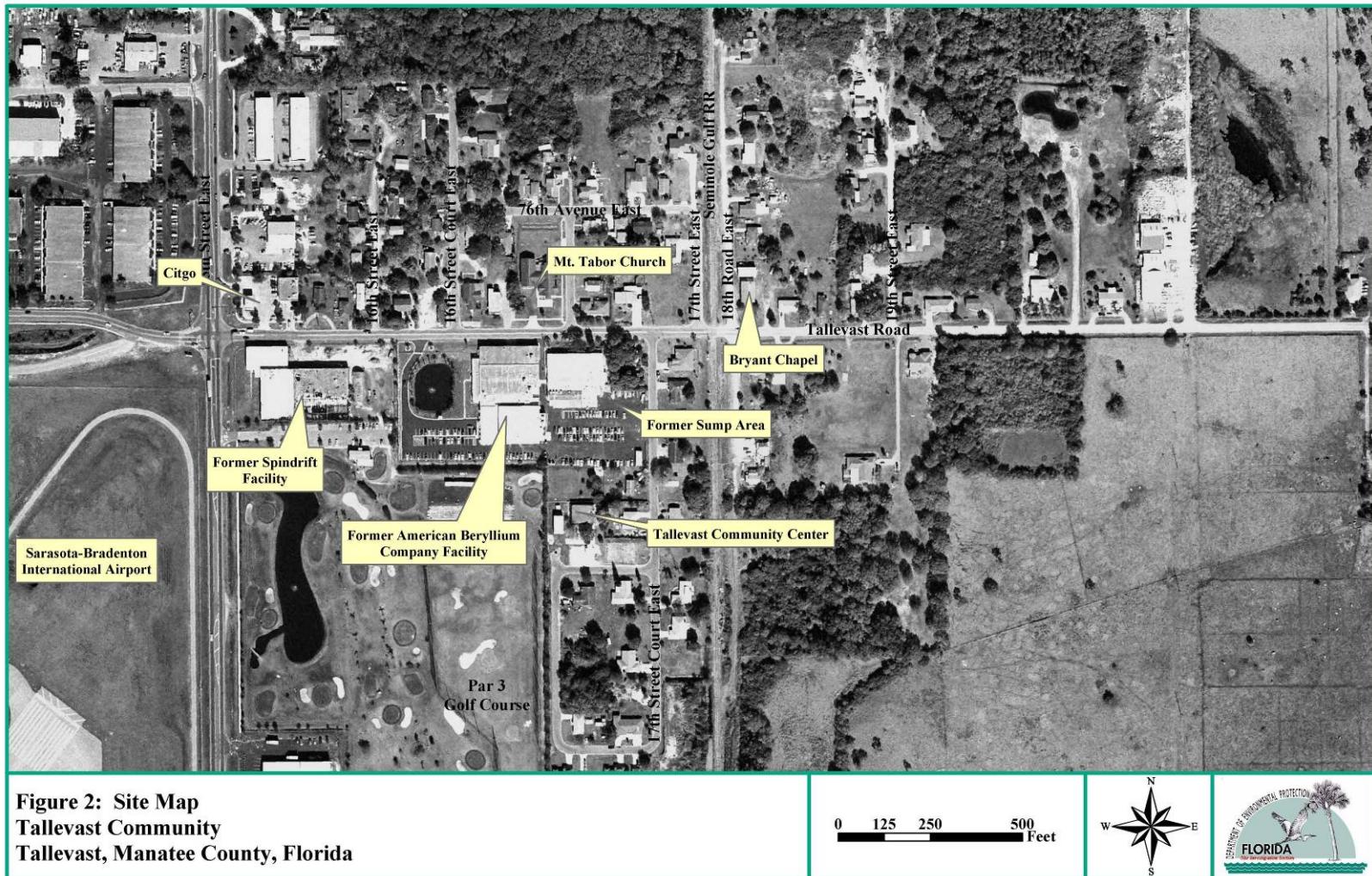


Table 1. June & July 2008 Tallevast Soil Gas and Outdoor Air Test Results

Contaminant	Maximum Soil Gas Level (ppb)	# Soil Gas Samples Above Detection Limits/Total # Samples	Maximum Outdoor (Ambient) Air Level (ppb)	# Outdoor Air Samples Above Detection Limits/Total # Samples	ATSDR Comparison Value (ppb)
acetone	120	0/22	9.9 J	0/6	13,000
benzene	71	21/22	0.49	1/6	0.03
2-butanone (MEK)	25	0/22	0.37	0/6	2,000
carbon disulfide	59	0/22	2.3 J	0/6	300
chloroform	5.9	10/22	ND	0/6	0.008
chloromethane	2.2 J	0/22	0.83	0/6	50
cyclohexane	ND	0/22	0.5	0/6	6,000
<i>cis</i> -1,2-dichloroethene	17	1/22	ND	0/6	none
Dichlorofluoromethane (Freon 12)	ND	0/22	0.48	3/6	none
1,2-dichloropropane	1.5 J	1/22	ND	0/6	0.9
1,4-dioxane	2.3 J	0/22	ND	0/6	1,000
ethanol	ND	0/22	3.8	3/6	none
ethylbenzene	6.9	0/22	ND	0/6	300
4-ethyltoluene	16	11/22	ND	0/6	none
hexachlorobutadiene	19	1/22	ND	0/6	0.005
hexane	ND	0/22	0.24	0/6	2,000
2-hexanone	9.2 J	1/22	ND	0/6	none
methylene chloride	9.5 B	11/22	1.3 J,B	1/6	0.9
styrene	2	0/22	ND	0/6	200
toluene	57	0/22	1.6 J	0/6	80
1,1,1-trichloroethane	1.1 J	0/22	ND	0/6	700
trichloroethene	28	2/22	ND	0/6	*
Trichlorofluoromethane (Freon 11)	5.8	2/22	0.24	3/6	none
1,2,4-trimethylbenzene	28	9/22	0.23	1/6	none
1,3,5-trimethylbenzene	11	7/22	ND	0/6	none
xylenes (total)	48	0/22	0.42	0/6	50

ppb = parts per billion

Shaded values exceed the ATSDR guideline

B = found in blank

J = estimated concentration

ND = none detected

* See 2001 EPA risk assessment

Sources: Test America 2008a, Test America 2008b, and Air Toxics 2008

Glossary of Environmental Health Terms

ATSDR: The Agency for Toxic Substances and Disease Registry. ATSDR is a federal health agency in Atlanta, Georgia, that deals with hazardous substance and waste site issues. ATSDR gives people information about harmful chemicals in their environment and tells people how to protect themselves from coming into contact with chemicals.

Cancer: A group of diseases that occur when cells in the body become abnormal and grow, or multiply, out of control.

Cancer Risk: qualitative description

- | | |
|------|---|
| 1 in | 10: "very high increased risk" |
| 1 in | 100: "high increased risk" |
| 1 in | 1,000: "moderate increased risk" |
| 1 in | 10,000: "low increased risk" |
| 1 in | 100,000: "no apparent increased risk" |
| 1 in | 1,000,000: "extremely small increased risk" |

Carcinogen: Any substance shown to cause tumors or cancer in experimental studies.

Completed Exposure Pathway: See **Exposure Pathway**.

Comparison Value: (CVs) Concentrations or the amount of substances in air, water, food, and soil that are unlikely, upon exposure, to cause adverse health effects. Comparison values are used by health assessors to select which substances and environmental media (air, water, food and soil) need additional evaluation while health concerns or effects are investigated.

Concern: A belief or worry that chemicals in the environment might cause harm to people.

Concentration: How much or the amount of a substance present in a certain amount of soil, water, air, or food.

Contaminant: See **Environmental Contaminant**.

Duration: The amount of time (days, months, years) that a person is exposed to a chemical.

Environmental Contaminant: A substance (chemical) that gets into a system (person, animal, or the environment) in amounts higher than that found in **Background Level**, or what would be expected.

Environmental Media: Usually refers to the air, water, and soil in which chemicals of interest are found. Sometimes refers to the plants and animals that are eaten by humans. **Environmental Media** is the second part of an **Exposure Pathway**.

U.S. Environmental Protection Agency (EPA): The federal agency that develops and enforces environmental laws to protect the environment and the public's health.

Exposure: Coming into contact with a chemical substance.(For the three ways people can come in contact with substances, see **Route of Exposure**.)

Exposure Assessment: The process of finding the ways people come in contact with chemicals, how often and how long they come in contact with chemicals, and the amounts of chemicals with which they come in contact.

Exposure Pathway: A description of the way that a chemical moves from its source (where it began) to where and how people can come into contact with (or get exposed to) the chemical.

ATSDR defines an exposure pathway as having 5 parts:

- Source of Contamination,
- Environmental Media and Transport Mechanism,
- Point of Exposure,
- Route of Exposure, and
- Receptor Population.

When all 5 parts of an exposure pathway are present, it is called a **Completed Exposure Pathway**. Each of these 5 terms is defined in this Glossary.

Hazardous Waste: Substances that have been released or thrown away into the environment and, under certain conditions, could be harmful to people who come into contact with them.

Inhalation: Breathing. It is a way a chemical can enter your body (See **Route of Exposure**).

LOAEL: Lowest Observed Adverse Effect Level. The lowest dose of a chemical in a study, or group of studies, that has caused harmful health effects in people or animals.

MRL: Minimal Risk Level. An estimate of daily human exposure B by a specified route and length of time -- to a dose of chemical that is likely to be without a measurable risk of adverse, noncancerous effects. An MRL should not be used as a predictor of adverse health effects.

NOAEL: No Observed Adverse Effect Level. The highest dose of a chemical in a study, or group of studies, that did not cause harmful health effects in people or animals.

No Apparent Public Health Hazard: The category is used in ATSDR's Public Health Assessment documents for sites where exposure to site-related chemicals may have occurred in the past or is still occurring but the exposures are not at levels expected to cause adverse health effects.

PHA: Public Health Assessment. A report or document that looks at chemicals at a hazardous waste site and tells if people could be harmed from coming into contact with those chemicals. The PHA also tells if possible further public health actions are needed.

Point of Exposure: The place where someone can come into contact with a contaminated environmental medium (air, water, food or soil). For examples: the area of a playground that has contaminated dirt, a contaminated spring used for drinking water, the location where fruits or vegetables are grown in contaminated soil, or the backyard area where someone might breathe contaminated air.

Public Health Assessment(s): See **PHA**.

Route of Exposure: The way a chemical can get into a person's body. There are three exposure routes:

- breathing (also called inhalation),
- eating or drinking (also called ingestion), and
- or getting something on the skin (also called dermal contact).

Safety Factor: Also called **Uncertainty Factor**. When scientists don't have enough information to decide if an exposure will cause harm to people, they use "safety factors" and formulas in place of the information that is not known. These factors and formulas can help determine the amount of a chemical that is not likely to cause harm to people.

Source (of Contamination): The place where a chemical comes from, such as a landfill, pond, creek, incinerator, tank, or drum. Contaminant source is the first part of an **Exposure Pathway**.

Special Populations: People who may be more sensitive to chemical exposures because of certain factors such as age, a disease they already have, occupation, sex, or certain behaviors (like cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Toxic: Harmful. Any substance or chemical can be toxic at a certain dose (amount). The dose is what determines the potential harm of a chemical and whether it would cause someone to get sick.

Toxicology: The study of the harmful effects of chemicals on humans or animals.



CERTIFICATION

The Florida Department of Health, Division of Environmental Health prepared this Health Consultation under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. It followed approved methodology and procedures existing at the time it began and completed editorial review.

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

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