# Health Consultation

*AIR TESTING*

FORMER ROYAL OAKS CHARCOAL FACILITY

MARION COUNTY, FLORIDA

JANUARY 17, 2007

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

*AIR TESTING*

FORMER ROYAL OAKS CHARCOAL FACILITY

MARION COUNTY, FLORIDA

Prepared By:

Florida Department of Health
Bureau of Community Environmental Health
Under a 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 health consultation report evaluates March 2006 indoor and outdoor air test results near the former Royal Oaks Charcoal Facility in Ocala, Marion County, Florida.

*Evaluating exposure:* Florida Department of Health (FDOH) 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 people might be exposed to it. Usually, 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, businesses, and the public.

*Evaluating health effects:* If evidence is found that people are being exposed—or could be exposed—to hazardous substances, Florida DOH scientists will take steps to determine whether that exposure could be harmful to human health. Their assessment focuses on public health; that is, the health impact on the community as a whole, and is based on existing scientific information.

*Developing recommendations:* In an evaluation report—such as this exposure investigation report—Florida DOH outlines its conclusions regarding any potential health threat posed by a site, and offers recommendations for reducing or eliminating human exposure to contaminants. The role of Florida DOH in dealing with hazardous waste sites is primarily advisory. For that reason the evaluation report will typically recommend actions to be taken by other agencies—including the EPA and Florida DEP. If, however, the health threat is immediate, Florida DOH will issue a public health advisory warning people of the danger and will work to resolve the problem.

*Soliciting community input:* The evaluation process is interactive. Florida DOH starts by soliciting and evaluating information from various government agencies, the organizations or individuals responsible for cleaning up the site, and from community members who live near the site. Any conclusions are shared with the organizations and individuals who provided information. Once an evaluation report has been prepared, Florida DOH seeks feedback from the public. *If you have questions or comments about this exposure investigation report, we encourage you to contact us. Please write to:*


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| *Please write to:* | Susan Skye / Health Assessment Team<br>Bureau of Community Environmental Health<br>Florida Department of Health<br>4052 Bald Cypress Way, Bin # A-08<br>Tallahassee, FL 32399-1712 |
| *Or call us at:* | (850) 245-4299, or toll-free during business hours: (877) 798-2772 |

## Summary and Statement of Issues

This health consultation report evaluates March 2006 indoor and outdoor air test results near the former Royal Oaks Charcoal Facility in Ocala, Marion County, Florida. In March 2006, nearby indoor and outdoor air quality was not likely to cause either cancer or non-cancer illness. The facility ceased operations in February 2006 before air samples could be collected. The lack of air testing while the facility was in operation prevents an assessment of the past health risk. Because the laboratory detection for arsenic was higher than the ATSDR screening guideline, it is not possible to determine the health risk, if any, from airborne arsenic. Because some of the naturally occurring VOCs detected in the indoor air (isobutene, butane, limonene and pentane) were estimates only, we can not assess the risk of illness from these VOCs.

Levels of benzene measured in indoor air may be related to improper gasoline storage. Nearby residents should store gasoline in a well ventilated area. Any future air testing should use lower detection limits for arsenic.

## Purpose and Health Issues

The Marion County Health Department (CHD) requested the Florida Department of Health (DOH) review indoor and outdoor air test results collected near the Royal Oaks Charcoal Facility in Ocala, Florida. Nearby residents had complained of soot and poor air quality.

## Background

### Site Description and History

The former Royal Oaks Charcoal manufacturing facility is at 1921 NW 17$^{th}$ Place, Ocala, Marion County, Florida (Figure 1 and Figure 2). Since 1972, the facility operated under a Florida Department of Environmental Protection (DEP) air permit. Florida DEP permitted a retort carbonizer, char house, mill/briquetting tanks, baggers, hoppers, silos, hammer mill, briquette press room, and dryers (DEP, 2006**).**

In 1994-1995, the Royal Oaks Charcoal Facility was the largest user of process fuel in Florida. Process boiler fuel is composed of yard, wood and/or paper wastes. Facilities process the material and use it as fuel or sell it to other facilities (DEP 1999, 2000).

In a February 2002 permit application, the facility claimed its furnace used a direct flame afterburner with an exit temperature of 3000° Fahrenheit to control 80% of its furnace emissions. During a September 2005 inspection, the facility was unable to locate the afterburner. The facility admitted it did not have a direct flame afterburner but claimed the gas streams in the furnace stacks “act as an afterburner by virtue of the operating temperature and residence time” (DEP 2006).

Also in September 2005, the Florida DEP observed excess visible emissions emanating from the facilities retort furnace south stack. The highest six minute reading was approximately 39%

opacity, in violation of its permit. In February 2006, Florida DEP observed excess visible emissions emanating from the facilities retort furnace north stack. The highest six minute reading was approximately 41.5% opacity, in violation of its permit. These permit violations indicated improper afterburner operation. The facility's operation records indicated the permit violations were caused by wet feed, rather than start up, shutdown, or malfunction conditions. Between 2001 and 2004 the facility reported 93-97 tons of methanol air emissions per year. In July 2005, the facility disputed the permit violations but entered into a consent order with Florida DEP. In February 2006, the facility ceased operations (DEP 2006).

The Marion County Health Department, responding to ongoing air quality complaints, collected indoor and outdoor air samples near the facility. The facility, however, ceased operations before they could collect samples. In June 2006, Florida DOH sent the Marion CHD a letter summarizing its evaluation of the air testing (Appendix B). The Marion CHD emailed a copy of the Florida DOH's letter to the neighborhood president and their attorney. Neither the Marion CHD nor the Florida DOH received a response. In July, 2006, the Marion CHD held a public meeting attended by two residents and the media.

### Demographics

Approximately 3000 people reside within one mile of the Royal Oaks Charcoal Facility. 30% are white, 60% are black and 10% are Hispanic or from other racial/ethnic groups (Census 2000).

## Community Health Concerns

While the facility was in operation, nearby residents complained of soot and poor air quality. Even after the facility closed in February 2006, nearby residents were still concerned. They requested air testing. The Marion County Health Department (CHD) funded air testing through their existing Protocol for Assessing Community Excellence (PACE) environmental health program in this area.

## Discussion

The main exposure pathway for this site is inhalation of air. An exposure pathway is 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 five parts: source of contamination, environmental media and transport mechanism, point of exposure, route of exposure and receptor population. When all five parts of an exposure pathway are present, it is called a completed exposure pathway. For this site there are no other known completed pathways.

### Air Sample Collection

The Marion CHD collected both indoor and outdoor air samples near the Royal Oaks Charcoal facility. Indoor air quality is affected by outdoor air quality as well as use of household cleaning

products and other household chemicals. Outdoor air quality is affected by chemicals from nearby facilities, car exhaust, and other pollutant sources.

On March 1 and 2, 2006, the Marion CHD collected six 24-hour air samples for volatile organic chemical analysis (Summa canisters). They collected samples in four homes within 1/2 mile of the site. Three of the homes were concrete block and the fourth was an aluminum siding mobile home. All were built between 1966 and 1979 and are on small 1/5 to 1/3-acre lots. The Marion CHD also collected one outdoor air sample less than a block from the site and one outdoor air sample four miles northeast of the facility.

Also on March 1, 2006, the Marion CHD collected seven outdoor air samples including polycyclic aromatic hydrocarbons (PAHs), methanol, carbon, and metal analyses. They collected these samples at the vacant lot on 1670 NW 18$^{th}$ Court near the facility using air collection tubes and SKC low volume pumps. The Marion CHD used a different pump for each analysis. They collected four separate air samples for the methanol test; two samples at different times (using the same pump) and two tubes in tandem each time (Table II).

On the air testing dates, the temperature was the mid 70s and the relative humidity 60%. The wind was mostly less than 5 miles per hour from the north-northwest and the barometric pressure was 29.8 inches of mercury.

**Laboratory Methods and Analyses**

Of the six air samples collected for volatile organic chemicals (VOCs) in Summa canisters, five arrived at the EMSL Analytical laboratory in New Jersey with no vacuum and one still had a slight vacuum (-1 inches of mercury). Standard protocol calls for a vacuum of between -6 and -10 inches of mercury. This ensures that none of the air sample leaked out. Lack of a vacuum in these five canisters could lead to an underestimation of the VOC concentration in the original sample. Because the Royal Oaks Charcoal facility had closed and no additional air monitoring was planned, the Marion CHD instructed the laboratory to proceed with the analysis. EMSL Analytical tested the air samples for VOCs using Environmental Protection Agency (EPA) Method TO-15.

The laboratory detected VOCs in all six air samples. The concentrations of VOCs in the two outdoor air samples were lower than the concentrations in the four indoor air samples. Table 1 summarizes the highest levels of VOCs that have ATSDR or EPA screening guidelines. Other detected VOCs such as isopropyl alcohol, Freon-12, propylene, chloromethane, ethanol, Freon-11, ethyl acetate, tetrahydrofuran, and n-heptane are commonly found in indoor air but have no screening guidelines (Appendix C). The laboratory tentatively identified but did not quantify four naturally occurring VOCs: isobutene, butane, limonene and pentane.

Of the seven outdoor air samples collected in tubes at the vacant lot, EMSL Analytical tested one sample for PAHs using National Institute for Occupational Safety and Health (NIOSH) method 5506 (HPLC/UV/FLD). They tested four samples for methanol using NIOSH method 2000 (GC/FID). EMSL Analytical tested one sample for elemental carbon (diesel particulate) using NIOSH method 5040 (EGA) and one sample for arsenic, total chromium, and total copper using

NIOSH method 7300 (modified). The laboratory did not detect any PHAs, methanol, carbon, arsenic, chromium, or copper above detection limits (Table II).

**Interpretation of Air Test Results**

**Indoor Air**

The VOCs found in indoor air are most likely from common household products (Appendix C). Concentrations of two VOCs; benzene and 1,3-butadiene were above ATSDR's Cancer Risk Evaluation Guide (CREG) screening guidelines (Table I).

Benzene

Benzene is a colorless liquid with a sweet odor. Benzene evaporates into air very quickly. Benzene is found in gasoline and is highly flammable (ATSDR 2005).

The highest benzene concentration measured in indoor air was 1.5 parts per billion (ppb) (4.8 $\mu g/m^3$). This concentration is less than the ATSDR chronic Minimal Risk Level (MRL) for noncancerous health effects (3 ppb) and thus not likely to cause any non-cancer illness. It is also less than the maximum allowable average amount in workplace air during an 8-hour work day, 40-hour week (1,000 ppb). Keep in mind that the lack of a vacuum in the sample canister could lead to an underestimation of the VOC concentration in the original sample. So, even though the concentration of benzene measured (1.5 ppb or 4.8 $\mu g/m^3$) is uncertain, it was the amount measured in the laboratory and used for evaluation. Most people can begin to smell benzene in air at 2,000 to 5,000 ppb. Symptoms such as drowsiness, dizziness, rapid heart rate and headaches start when benzene air concentrations exceed 700,000 ppb (ATSDR 2005).

The International Agency for Cancer Research (IARC) has classified benzene as a human carcinogen and EPA has determined that it is a known human carcinogen (ATSDR 2005). Long-term exposure to relatively high levels of benzene in air can cause cancer of the blood forming organs, a condition called leukemia. Inhalation of benzene has been associated with development of a particular type of leukemia called acute myeloid leukemia (ATSDR 2005).

Florida DOH estimates the maximum theoretical excess cancer risk for continuous (24 hours/day) lifetime exposure to benzene at 1.5 ppb is "low" (1 in 10,000). This estimate is based on the assumption there is no safe level of exposure to a chemical that causes cancer. However, the theoretical calculated risk is not exact and tends to overestimate the actual risk associated with exposures that may have occurred. Since residents spend less than 24 hours per day in their homes, the overall theoretical cancer risk would be lower. Workers exposed to up to 1,000 ppb benzene showed no detectable excess leukemia rates. Given the low level of benzene detected (1.5 ppb), and intermittent residential exposure, it is unlikely that the indoor air exposure near the Royal Oaks Charcoal facility would result in an increased cancer risk.

1,3-Butadiene

1,3-Butadiene is a colorless gas with a mild gasoline-like odor. 1,3-Butadiene is almost always found at low levels in urban air. It is a component of motor vehicle exhaust. Sunlight speeds the breakdown of 1,3-butadiene. On sunny summer days, half the 1,3-butadiene breaks down every 2 hours. On overcast winter days, half the 1,3-butadiene breaks down every 2 days (ATSDR 1993).

The highest 1,3-butadiene concentration measured in indoor air near Royal Oaks Charcoal was 1.2 ppb (2.6 µg/$m^3$). Although ATSDR has not established an MRL for 1,3-butadiene, this concentration is only slightly higher than EPA's noncancer reference concentration (2 µg/$m^3$). Because EPA's reference concentration includes large safety factors, the highest 1,3-butadiene measured at Royal Oaks Charcoal is not likely to cause non-cancer illness. This is also less than the Occupational Safety and Health Administration (OSHA) 8-hour workday, 40-hour workweek workplace standard for 1,3-butadiene of 1,000,000 ppb. Keep in mind that the lack of a vacuum in the sample canister could lead to an underestimation of the VOC concentration in the original sample. So, even though the concentration of 1,3-butadiene measured (1.2 ppb or 2.6 µg/$m^3$) is uncertain, it was the amount measured in the laboratory and used for evaluation. Short term exposure to very high levels of 1,3-butadiene can cause eye, nose, and throat irritation.

The International Agency for Cancer Research (IARC) has classified 1,3-butadiene as a human carcinogen and EPA has determined that it is a known human carcinogen. Florida DOH estimates the maximum theoretical excess cancer risk for continuous (24 hours/day) lifetime exposure to 1,3-butadiene at 1.2 ppb is "no apparent" to "low". This estimate is based on the assumption there is no safe level of exposure to a chemical that causes cancer. However, the theoretical calculated risk is not exact and tends to overestimate the actual risk associated with exposures that may have occurred. Since residents spend less than 24 hours per day in their homes, the overall theoretical cancer risk would be lower. Given the low level of 1,3-butadiene detected (1.2 ppb), and intermittent residential exposure, it is unlikely that the indoor air exposure near the Royal Oaks Charcoal facility would result in an increased cancer risk.

**Outdoor Air**

The laboratory did not detect any PHAs, methanol, carbon, arsenic, chromium, or copper above detection limits in the outdoor air samples collected at the vacant lot on 1670 NW 18$^{th}$ Court (Table II). The laboratory detection for arsenic, however, is higher than the ATSDR screening guideline. Florida is unable to determine the health risk, if any, from airborne arsenic dust.

## Child Health Considerations

This health consultation considers children breathing indoor and outdoor air from the Royal Oaks Charcoal facility pregnant woman, women of child-bearing age and children maybe more sensitive to the effects of VOCs in air. Children can be exposed to VOCs by breathing air containing these chemicals. A child's VOC exposure can differ substantially from an adult's exposure because children drink more fluids, eat more food, and breathe more air per kilogram of body weight than do adults. Children have a larger skin surface in proportion to their body volume. A child's diet—that often differs from that of an adult's—and a child's behavior and lifestyle can also influence exposure. Children, especially small children, are closer to the ground

than are adults. They crawl on the floor, put things in their mouths, and might ingest inappropriate items such as dirt or paint chips. Children also spend more time outdoors than do adults. Finally and perhaps most importantly, children do not have the judgment of adults for avoiding hazards (ATSDR 1999). 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.

Because the levels in outdoor air were taken after the facility closed and there is no past air data for this site, the past health risk for children is indeterminate.

## Conclusions

1. In March 2006, two weeks after the Royal Oaks Charcoal facility ceased operations, nearby indoor and outdoor air quality was not likely to cause either cancer or non-cancer illness.

2. The lack of air testing while the facility was in operation prevents an assessment of the past health risk.

3. Because the laboratory detection for arsenic was higher than the ATSDR screening guideline, it is not possible to determine the health risk, if any, from airborne arsenic.

4. Levels of benzene measured in indoor air may be related to improper gasoline storage.

5. Because some of the naturally occurring VOCs detected in the indoor air (isobutene, butane, limonene and pentane) were estimates only, we can not assess the risk of illness from these VOCs.

6. The lack of a vacuum in the sample canisters could lead to an underestimation of the VOC concentration in the original sample. Therefore the concentrations of benzene and 1,3-butadiene could be underestimated.

## Recommendations

1. Nearby residents should store gasoline in a well ventilated area.
2. Any future air testing should use lower detection limits for arsenic.

## Public Health Action Plan

***Past Actions:***

In June 2006, the Florida DOH sent the Marion CHD a letter evaluating the air testing near the Royal Oak Charcoal facility (Appendix B).

In June 2006, the Marion CHD emailed a copy of the Florida DOH's letter to the neighborhood president and their attorney.

In July 2006, the Marion CHD held a public meeting regarding the air testing results.

***Planned Actions:***

Because the facility ceased operations, the Florida DOH does not anticipate any further actions.

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## References

[ATSDR] Agency for Toxic Substances and Disease Registry. 2005. ATDSR Toxicological Draft Profile for Benzene.

[ATSDR] Agency for Toxic Substances and Disease Registry. 1993. ATDSR Toxicological Profile for 1,3-Butadiene.

[DEP][a] Department of Environmental Protection. 1999/2000. http://www.dep.state.fl.us/waste/quick_topics/publications/shw/recycling/1999-2000AnnualReport/chapters/chapter%203.pdf. Page 36. Last viewed September 13, 2006.

[DEP][b] Department of Environmental Protection. 2006. Consent Order DEP vs. Royal Oak Enterprises, Inc OGC File No: 05-2882, July 24, 2006.

**TABLE I**
**Highest Concentrations of Volatile Organic Chemicals in Indoor Air near the Royal Oaks Charcoal Facility**

| *Volatile Organic Chemical* | *Highest Air Concentration* | *ATSDR Screening Guideline* | *EPA Screening Guideline* | *Location* |
|---|---|---|---|---|
| acetone | 210 ppb | MRL = 26,000 ppb acute<br>MRL = 13,000 ppb interm<br>MRL = 13,000 ppb chronic | | home #2 |
| benzene | 1.5 ppb<br>(4.8 µg/m$^3$) | MRL = 9 ppb acute<br>MRL = 6 ppb interm<br>MRL = 3 ppb chronic<br>CREG = 0.1 µg/m$^3$ | | home #1 |
| 1,3-butadiene | 1.2 ppb<br>(2.6 µg/m$^3$) | LOAEL = 40,000 ppb acute<br>CREG =0.03 µg/m$^3$ | | home #1 |
| 2-butanone (MEK) | 2.4 ppb<br>(7.1 µg/m$^3$) | NOAEL = 100,000 ppb acute | RfC = 5000 µg/m$^3$ | home #3 |
| 1,4-dichlorobenzene | 3.1 ppb | MRL = 2000 ppb acute<br>MRL = 100 ppb interm<br>MRL = 20 ppb chronic | | home #3 |
| n-hexane | 1.1 ppb<br>(3.9 µg/m$^3$) | MRL = 600 ppb chronic | RfC = 200 µg/m$^3$ | home #3 |
| tetrachloroethene | 0.94 ppb | MRL = 200 ppb acute<br>MRL = 40 ppb chronic | | home #4 |
| toluene | 4.3 ppb<br>(16 µg/m$^3$) | MRL = 1000 ppb acute<br>MRL = 80 ppb chronic | RfC = 400 µg/m$^3$ | home #4 |
| 1,1,1-trichloroethane | 0.73 ppb | MRL = 2000 ppb acute<br>MRL = 700 ppb interm<br>MRL = None - chronic | | home #2 |
| xylene | 1.1 ppb | MRL = 2000 ppb acute<br>MRL = 600 ppb interm<br>MRL = 50 ppb chronic | | home #3 |

ppb = parts per billion µg/m$^3$= micrograms per cubic meter
MRL = Minimal Risk Level
CREG = ATSDR's Cancer Risk Evaluation Guide
RfC = EPA's Reference Concentration
LOAEL = Lowest Observed Adverse Effect Level for less serious effects (animals)
Acute = exposure 1-14 days Interm = Intermediate = exposure 14 days – 364 days
Chronic = exposure greater than 365 days
EPA = Environmental Protection Agency
ATSDR = Agency for Toxic Substances and Disease Registry

**TABLE II**

**Highest Concentrations of Chemicals in Outdoor Air near the Royal Oaks Charcoal Facility**

| ***Chemical*** | ***Air Concentration*** ($\mu g/m^3$) | ***ATSDR Screening Guideline*** ($\mu g/m^3$) | ***EPA Screening Guideline*** ($\mu g/m^3$) |
|---|---|---|---|
| Elemental Carbon | | | |
| | <0.10* | none | none |
| Methanol | | | |
| Sample #1 | <250* | none | none |
| Sample #2 | <250* | none | none |
| Sample #3 | <250* | none | none |
| Sample #4 | <250* | none | none |
| | | | |
| Metals | | | |
| Arsenic, Total | <0.80* | 0.0002 | 0.0043 |
| Chromium, Total | <1.0* | none | none |
| Copper, Total | <2.0* | none | none |
| | | | |
| PAHs | | | |
| Acenaphthene | <2.1* | none | none |
| Acenaphthylene | <2.1* | none | none |
| Anthracene | <0.21* | none | none |
| Benzo(a)anthracene | <0.52* | none | none |
| Benzo(a)pyrene | <0.21* | none | none |
| Benzo(b)fluoranthene | <0.52* | none | none |
| Benzo(k)fluoroanthene | <0.52* | none | none |
| Benzo(g,j,i)perylene | <0.52* | none | none |
| Benzo(e)pyrene | <0.52* | none | none |
| Chrysene | <0.21* | none | none |
| Dibenzo(a,h)anthracene | <0.52* | none | none |
| Fluorene | <0.52* | none | none |
| Fluoranthene | <0.52* | none | none |
| Indeno(1,2,3-c,d)pyrene | <0.52* | none | none |
| Naphthalene | <0.21* | none | none |
| Phenanthrene | <0.21* | none | none |
| Pyrene | <0.52* | none | none |

$\mu g/m^3$= micrograms per cubic meter * detection limit

ATSDR = Agency for Toxic Substances and Disease Registry

EPA = Environmental Protection Agency

# Appendix A. Figures

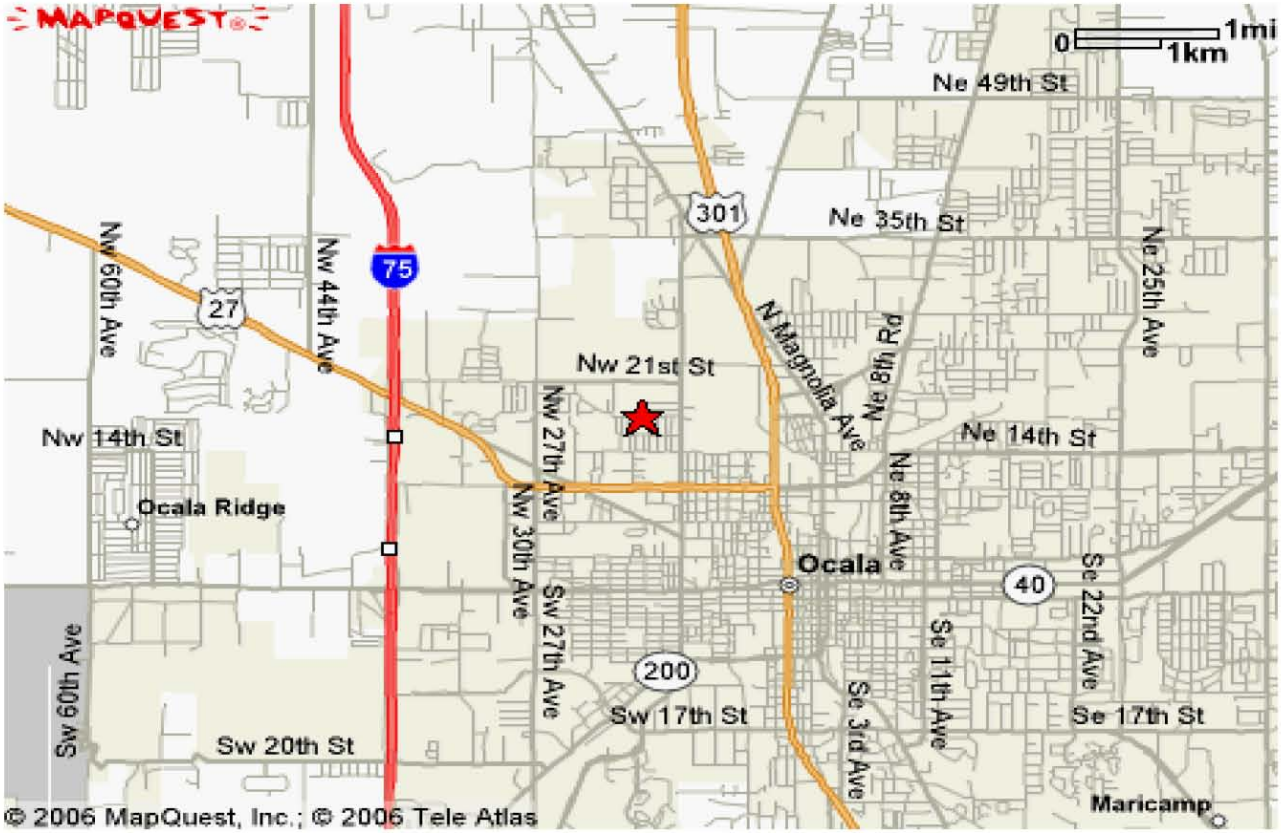
**FIGURE 1**

**Marion County Map**

**Source: http://www.floridacountiesmap.com/marion_county.shtml**

**FIGURE 2**

**Site Location Map**



**APPENDIX B**
**Letter from Florida DOH to Marion CHD June 2006**

June 1, 2006

Mr. Tom Moore
Environmental Health Director
Marion County Health Department
1801 SE 32nd Avenue
Ocala, Florida 34478

Subject: Indoor and Outdoor Air Testing Near the Royal Oaks Charcoal Facility in Ocala

Dear Tom:

I received Mr. Padgett's April 2006 letter requesting a review of indoor and outdoor air testing results from homes and properties near the Royal Oaks Charcoal facility.

First, I reviewed the March 2006 PAH (polyaromatic hydrocarbons), methanol, elemental carbon, arsenic, chromium and copper outdoor air testing results collected from the vacant lot at 1670 NW 18th Ct near the facility. For this type sampling, air samples were collected in sampling tubes rather than canisters. The air data including quality assurance data appear sufficient. All of the levels of these chemicals except arsenic were all below the laboratory's detection limits.

For all the chemicals tested from the vacant lot, arsenic is the only chemical that has an Agency for Toxic Substance's (ATSDR) air screening guideline for comparison. However, the laboratory detection limit for arsenic was higher than the air screening guideline for arsenic. The arsenic air sample result is <0.80 ug/$m^3$. The ATSDR's Cancer Risk Evaluation Guide (CREG) for arsenic is 0.0002 ug/$m^3$ and the detection limit is 0.8 ug/$m^3$. So, I am unable to tell if the arsenic found in the air is truly above or below the screening guideline. A CREG is the contaminant concentration estimated to result in no more than 1 excess cancer per 1 million persons exposed during a lifetime (i.e., 70 years). CREGs are calculated from the EPA-established cancer slope factor.

I also reviewed the March 2006 Volatile Organic Compound (VOC) 24-hour air testing data collected in air canisters from six locations near the facility. As you know, EMSL laboratories in New Jersey received five of the six air canisters with pressure readings at zero and one canister at -1 negative pressure in inches of mercury. In April 2006, I called the lab to verify these readings and reviewed the chain of custody forms including this information. To conduct TO-15 analysis, the lab requires pressure readings between -6 and -10 units negative pressure in inches of mercury. The lab accepted the six canisters and analyzed them with the insufficient pressure readings per the Marion CHD's request as no future air monitoring was planned. This was a one

time sampling event as the facility is no longer operating and the air samples were collected two weeks after the facility closed.

Even though the air samples may have underestimated the true concentrations, I compared the air results with the Agency for Toxic Substances and Disease Registry (ATSDR) screening air guidelines. Your staff collected indoor air samples from four homes (locations #1-#4) near the facility and the lab analyzed them for Total Organic TO-15. The two outdoor control samples (one collected on-site one block from the facility and the other collected four miles NE of the facility) were also analyzed for TO-15.

The levels of VOCs detected at the two control locations were all less than those detected at the four indoor air sample locations. The highest levels of VOCs with health based screening guidelines found from all locations are shown in the table below. Other VOCs (isopropyl alcohol, Freon 12, propylene, chloromethane, ethanol, freon11, ethyl acetate, tetrahydrofuran and n-heptane) were also detected at all or some of the four locations but there are currently no air screening guidelines. These chemicals are all commonly found in indoor air (Attachment A). Additional VOCs (i.e. isobutene, butane, limonene and pentane) were also found in the air samples. Nonetheless, the additional VOCs are only estimates as they were tentatively identified by the lab but unable to determine the exact levels. Although some of these VOCs are naturally occurring, the levels found are estimations only. Therefore, we can not assess the risk of illness from these additional detected VOCs.

Table 1 – Highest Air Concentrations for Contaminants with Health-Based Screening Guidelines

| Chemical | Highest Concentration | ATSDR Screening Guideline | EPA Screening Guideline | Location |
|---|---|---|---|---|
| | | | | |
| acetone | 210 ppb | MRL = 26,000 ppb acute<br>MRL = 13,000 ppb interm<br>MRL = 13,000 ppb chronic | | home #2 (blue) |
| benzene | 1.5 ppb or 4.8 $ug/m^3$ | MRL = 9 ppb acute<br>MRL = 6 ppb interm<br>MRL = 3 ppb chronic<br>CREG = 0.1 $ug/m^3$ | | home #1 (red) |
| 1,3-butadiene | 1.2 ppb or 2.6 $ug/m^3$ | LOAEL = 40,000 ppb acute<br>CREG =0.03 $ug/m^3$ | | home #1 (red) |
| 2-butanone (MEK) | 2.4 ppb or 7.1 ug/m3 | NOAEL = 100,000 ppb acute | RfC = 5000 $ug/m^3$ | home #3 (yellow) |
| 1,4-dichlorobenzene | 3.1 ppb | MRL = 2000 ppb acute<br>MRL = 100 ppb interm<br>MRL = 20 ppb chronic | | home #3 (yellow) |
| n-hexane | 1.1 ppb or 3.9 $ug/m^3$ | MRL = 600 ppb chronic | RfC = 200 $ug/m^3$ | home #3 (yellow) |

| | | | | |
|---|---|---|---|---|
| tetrachloroethene | 0.94 ppb | MRL = 200 ppb acute<br>MRL = 40 ppb chronic | | home #4 (green) |
| toluene | 4.3 ppb or 16 ug/$m^3$ | MRL = 1000 ppb acute<br>MRL = 80 ppb chronic | RfC = 400 ug/$m^3$ | home #4 (green) |
| 1,1,1-trichloroethane | 0.73 ppb | MRL = 2000 ppb acute<br>MRL = 700 ppb interm<br>MRL = None - chronic | | home #2 (blue) |
| xylene | 1.1 ppb | MRL = 2000 ppb acute<br>MRL = 600 ppb interm<br>MRL = 50 ppb chronic | | home # (yellow) |

ppb = parts per billion ug/$m^3$ = micrograms per cubic meter
MRL = Minimal Risk Level
CREG = ATSDR's Cancer Risk Evaluation Guide
RfC = EPA's Reference Concentration
LOAEL = Lowest Observed Adverse Effect Level for less serious effects (animals)
Acute = exposure 1-14 days
Intermediate = exposure 14 days – 364 days
Chronic = exposure greater than 365 days
EPA = Environmental Protection Agency
ATSDR = Agency for Toxic Substances and Disease Registry

As shown in Table 1, VOCs were detected in the canisters from all four 24-hour indoor air testing locations. However, the data are questionable as the lack of pressure may have diluted the samples. If a vacuum remained in each canister, the levels may have been higher. VOCs found in the residents' indoor air are most likely from common household products (Attachment A).

As shown in Table 1 only benzene and 1,3-butadiene were detected above the ATSDR's CREG screening guidelines.

Although the level of 1,3-butadiene in home #1 (2.6 ug/$m^3$) is above the CREG screening guideline, long-term exposure (30 years) could result in a low increased risk of cancer. Neither outdoor control sample collected by the Marion CHD detected 1,3-butadiene.

For benzene, there was no correlation of the outdoor control samples with indoor air samples. One of the control samples (collected outside and located 4 miles NE of the facility) detected 1.8 ug/m3 which is 18 times greater than ATSDR's CREG of 0.1 ug/$m^3$. Whereas, no benzene was detected in the control sample one block south of the facility.

Benzene in the indoor air samples (location 1 – 4.8 ug/$m^3$, location 2 – 1.8 ug/$m^3$ and location 3 – 3.2 ug/$m^3$). The highest level (4.8 ug/$m^3$) is less than the acute, intermediate and chronic exposure ATSDR guidance levels.

Long-term (>1 year) inhalation of benzene at 4.8 ug/$m^3$ could result in a no apparent to low theoretical increased cancer risk. Therefore, all residents living at location 1, 2 and 3 should

avoid or reduce the usage of products containing benzene as shown in Attachment A. In addition, the residents may consider storing gasoline products in a shed rather than a nearby garage attached to their homes. Benzene is found in gasoline and is commonly found in indoor and outdoor air at low levels.

References:

2006 Draft ATSDR Toxicological Profile for Benzene.

1993 ATSDR Toxicological Profile for 1,3-butadiene

If you have any questions, please call me at (850)245-4444 ext. 2310 or SC 205- 4444 ext. 2310.

Sincerely,

*Susan A. Skye*

Susan Ann Skye
Biological Scientist
Bureau of Community Environmental Health

SAS

## APPENDIX C

### Information on Chemicals Found in Indoor Air

**Acetone**[a] - used primarily as an intermediate in chemical production and as a solvent; manufactured chemical also found naturally in the environment; used to make plastic, fibers, drugs and other chemicals; found in vehicle exhaust, tobacco smoke, particle board, household chemicals, nail polish, paint, certain nail polish removers, particle board, some paint removers, many liquid of paste waxes or polishes, certain detergents or cleansers, carpet backing, adhesives, carburetor and choke cleaners; occurs naturally in plants, trees, forest fires and as a product of the breakdown of body fat; in air, about one-half of the total amount breaks down from sunlight or other chemicals every 22 days

**Benzene**[a]**–** found in certain plastics, glues, paints, furniture wax, resins, nylon and synthetic fibers; used to make some types of rubbers, lubricants, dyes, detergents, drugs and pesticides; a natural part of crude oil, gasoline and cigarette smoke; it reacts with other chemicals in the air and breaks down within a few days

**1,3-butadiene**[a] – found in urban and suburban air, contaminated air from car and truck exhaust, waste incineration, wood fires and cigarette smoke. It is used to make plastics including acrylics. Small amounts are found in gasoline. It breaks down quickly in air by sunlight; in sunny weather, half of it breaks down in about 2 hours. When not sunny, it takes a few days for about half of it to break down in the air.

**2-butanone**[a] - used in paints and other coatings, glues, and as a cleaning agent; made by some trees and found in some fruits and vegetables in small amounts; released into the air from car and truck exhausts and cigarette smoke; in air, one-half of it will break down from sunlight in 1 day or less; also known as methyl ethyl ketone (MEK)

**1,4-dichlorobenzene**[b] **-** used to control moths, molds and mildew and to deodorize restrooms (toilet deodorizer blocks) and waste containers; is a vapor that acts as a deodorizer or insect killer; in air, it breaks down to harmless products in about a month

**n-Hexane**[a] - These solvents are also used as cleaning agents in the printing, textile, furniture, and shoemaking industries. Certain kinds of special glues used in the roofing and shoe and leather industries also contain *n*-hexane. Several consumer products contain *n*-hexane, such as gasoline, quick-drying glues used in various hobbies, and rubber cement. Since it is in gasoline, nearly everyone is exposed to very small amounts of *n*-hexane in the air. Exposure can occur at home if you use products containing *n*-hexane without proper ventilation.

**Tetrachloroethene**[a] – When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air. Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products. It has many industrial and household uses,

including use as a solvent to dissolve other substances, such as glues and paints; to remove oil or grease from manufactured metal parts; and as an ingredient of household products such as spot cleaners, glues, and aerosol sprays. Most of the 1,1,1-trichloroethane released into the environment enters the air, where it lasts for about 6 years

**Toluene**[a] - found in paints, paint thinners, fingernail polish, gasoline, kerosene, heating oil, lacquers, adhesives, rubber and in some printing and leather tanning processes; toluene usually does not stay in the environment long

**1,1,1 – trichloroethane**[a] **-** found in building materials, cleaning products, paints, and metal degreasing agents.

**Xylene**[a] – occurs naturally in petroleum and coal tar and is formed during forest fires; found in cleaning agents, paint thinner, paints, varnishes, shellac, rust preventatives, cigarette smoke, vehicle exhaust; used in printing, rubber and leather industries; in air, it is broken down by sunlight into other less harmful chemicals

Reference a – ATSDR TOXFAQs http://www.atsdr.cdc.gov/toxfaq.html

Reference b –
http://www.osha.gov/SLTC/healthguidelines

## APPENDIX D

# ATSDR Glossary of Environmental Health Terms

This glossary defines words used by the Agency for Toxic Substances and Disease Registry (ATSDR) in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-422-8737.

**Absorption**
The process of taking in. For a person or an animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.

**Acute**
Occurring over a short time [compare with chronic].

**Acute exposure**
Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].

**Additive effect**
A biologic response to exposure to multiple substances that equals the sum of responses of all the individual substances added together [compare with antagonistic effect and synergistic effect].

**Adverse health effect**
A change in body function or cell structure that might lead to disease or health problems

**Aerobic**
Requiring oxygen [compare with anaerobic].

**The Agency for Toxic Substances and Disease Registry (ATSDR)**
The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances.

**Ambient**
Surrounding (for example, *ambient* air).

**Anaerobic**
Requiring the absence of oxygen [compare with aerobic].

**Analyte**
A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.

**Analytic epidemiologic study**
A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.

**Antagonistic effect**
A biologic response to exposure to multiple substances that is **less** than would be expected if the known effects of the individual substances were added together [compare with additive effect and synergistic effect].

**Background level**
An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

**Biodegradation**
Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).

**Biologic indicators of exposure study**
A study that uses (a) biomedical testing or (b) the measurement of a substance [an analyte], its metabolite, or another marker of exposure in human body fluids or tissues to confirm human exposure to a hazardous substance [also see exposure investigation].

**Biologic monitoring**
Measuring hazardous substances in biologic materials (such as blood, hair, urine, or breath) to determine whether exposure has occurred. A blood test for lead is an example of biologic monitoring.

**Biologic uptake**
The transfer of substances from the environment to plants, animals, and humans.

**Biota**
Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

**CAP** [see Community Assistance Panel.]

**Cancer**
Any one of a group of diseases that occur when cells in the body become abnormal and grow or multiply out of control.

**Cancer risk**
A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

**Carcinogen**
A substance that causes cancer.

**Case study**
A medical or epidemiologic evaluation of one person or a small group of people to gather information about specific health conditions and past exposures.

**Case-control study**
A study that compares exposures of people who have a disease or condition (cases) with people who do not have the disease or condition (controls). Exposures that are more common among the cases may be considered as possible risk factors for the disease.

**Central nervous system**
The part of the nervous system that consists of the brain and the spinal cord.

**CERCLA** [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980]

**Chronic**
Occurring over a long time [compare with acute].

**Chronic exposure**
Contact with a substance that occurs over a long time (more than 1 year) [compare with acute exposure and intermediate duration exposure]

**Cluster investigation**
A review of an unusual number, real or perceived, of health events (for example, reports of

cancer) grouped together in time and location. Cluster investigations are designed to confirm case reports; determine whether they represent an unusual disease occurrence; and, if possible, explore possible causes and contributing environmental factors.

**Community Assistance Panel (CAP)**

A group of people from a community and from health and environmental agencies who work with ATSDR to resolve issues and problems related to hazardous substances in the community. CAP members work with ATSDR to gather and review community health concerns, provide information on how people might have been or might now be exposed to hazardous substances, and inform ATSDR on ways to involve the community in its activities.

**Comparison value (CV)**

Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

**Completed exposure pathway** [see exposure pathway].

**Comprehensive Environmental Response, Compensation, and Liability Act of 1980 CERCLA)**

CERCLA, also known as Superfund, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

**Concentration**

The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

**Contaminant**

A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

**Delayed health effect**

A disease or an injury that happens as a result of exposures that might have occurred in the past.

**Dermal**

Referring to the skin. For example, dermal absorption means passing through the skin.

**Dermal contact**

Contact with (touching) the skin [see route of exposure].

**Descriptive epidemiology**

The study of the amount and distribution of a disease in a specified population by person, place, and time.

**Detection limit**

The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

**Dose (for chemicals that are not radioactive)**

The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated

water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

**Dose (for radioactive chemicals)**

The radiation dose is the amount of energy from radiation that is actually absorbed by the body. This is not the same as measurements of the amount of radiation in the environment.

**Dose-response relationship**

The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).

**Environmental media**

Soil, water, air, biota (plants and animals), or any other parts of the environment that can contain contaminants.

**Environmental media and transport mechanism**

Environmental media include water, air, soil, and biota (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur. The environmental media and transport mechanism is the second part of an exposure pathway.

**EPA**

United States Environmental Protection Agency.

**Epidemiologic surveillance** [see Public health surveillance].

**Epidemiology**

The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

**Exposure**

Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].

**Exposure assessment**

The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

**Exposure-dose reconstruction**

A method of estimating the amount of people's past exposure to hazardous substances. Computer and approximation methods are used when past information is limited, not available, or missing.

**Exposure investigation**

The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.

**Exposure pathway**

The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or

touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

**Exposure registry**

A system of ongoing follow up of people who have had documented environmental exposures.

**Feasibility study**

A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.

**Groundwater**

Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].

**Hazard**

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

**Hazardous Substance Release and Health Effects Database (HazDat)**

The scientific and administrative database system developed by ATSDR to manage data collection, retrieval, and analysis of site-specific information on hazardous substances, community health concerns, and public health activities.

**Hazardous waste**

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

**Health investigation**

The collection and evaluation of information about the health of community residents. This information is used to describe or count the occurrence of a disease, symptom, or clinical measure and to evaluate the possible association between the occurrence and exposure to hazardous substances.

**Indeterminate public health hazard**

The category used in ATSDR’s public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

**Incidence**

The number of new cases of disease in a defined population over a specific time period [contrast with prevalence].

**Ingestion**

The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].

**Inhalation**

The act of breathing. A hazardous substance can enter the body this way [see route of exposure].

**Intermediate duration exposure**

Contact with a substance that occurs for more than 14 days and less than a year [compare with acute exposure and chronic exposure].

**In vitro**

In an artificial environment outside a living organism or body. For example, some toxicity testing is done on cell cultures or slices of tissue grown in the laboratory, rather than on a living animal [compare with in vivo].

**In vivo**
Within a living organism or body. For example, some toxicity testing is done on whole animals, such as rats or mice [compare with in vitro].

**Lowest-observed-adverse-effect level (LOAEL)**
The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

**Medical monitoring**
A set of medical tests and physical exams specifically designed to evaluate whether an individual's exposure could negatively affect that person's health.

**Metabolism**
The conversion or breakdown of a substance from one form to another by a living organism.

**Metabolite**
Any product of metabolism.

**mg/kg**
Milligram per kilogram.

**mg/cm$^2$**
Milligram per square centimeter (of a surface).

**mg/m$^3$**
Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

**Migration**
Moving from one location to another.

**Minimal risk level (MRL)**
An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see reference dose].

**National Priorities List for Uncontrolled Hazardous Waste Sites (National Priorities List** or **NPL)**
EPA's list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.

**National Toxicology Program (NTP)**
Part of the Department of Health and Human Services. NTP develops and carries out tests to predict whether a chemical will cause harm to humans.

**No apparent public health hazard**
A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

**No-observed-adverse-effect level (NOAEL)**
The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

**No public health hazard**
A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

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

**Plume**

A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

**Point of exposure**

The place where someone can come into contact with a substance present in the environment [see exposure pathway].

**Population**

A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).

**Potentially responsible party (PRP)**

A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.

**ppb**

Parts per billion.

**ppm**

Parts per million.

**Public availability session**

An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.

**Public comment period**

An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.

**Public health action**

A list of steps to protect public health.

**Public health advisory**

A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human health.

**Public health assessment (PHA)**

An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health.

**Public health hazard**

A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or radionuclides that could result in harmful health effects.

**Public health hazard categories**

Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.

**Public health statement**
The first chapter of an ATSDR toxicological profile. The public health statement is a summary written in words that are easy to understand. The public health statement explains how people might be exposed to a specific substance and describes the known health effects of that substance.

**Public health surveillance**
The ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.

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

**Reference dose (RfD)**
An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

**Remedial investigation**
The CERCLA process of determining the type and extent of hazardous material contamination at a site.

**RfD** [see reference dose]

**Risk**
The probability that something will cause injury or harm.

**Risk reduction**
Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.

**Risk communication**
The exchange of information to increase understanding of health risks.

**Route of exposure**
The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].

**Safety factor** [see uncertainty factor]

**SARA** [see Superfund Amendments and Reauthorization Act]

**Sample**
A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

**Sample size**
The number of units chosen from a population or an environment.

**Source of contamination**
The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an exposure pathway.

**Special populations**
People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette

smoking). Children, pregnant women, and older people are often considered special populations.

**Statistics**

A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.

**Substance**

A chemical.

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

**Superfund Amendments and Reauthorization Act (SARA)**

In 1986, SARA amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.

**Surface water**

Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with groundwater].

**Surveillance** [see public health surveillance]

**Survey**

A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see prevalence survey].

**Synergistic effect**

A biologic response to multiple substances where one substance worsens the effect of another substance. The combined effect of the substances acting together is greater than the sum of the effects of the substances acting by themselves [see additive effect and antagonistic effect].

**Teratogen**

A substance that causes defects in development between conception and birth. A teratogen is a substance that causes a structural or functional birth defect.

**Toxic agent**

Chemical or physical (for example, radiation, heat, cold, microwaves) agents that, under certain circumstances of exposure, can cause harmful effects to living organisms.

**Toxicological profile**

An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

**Toxicology**

The study of the harmful effects of substances on humans or animals.

**Tumor**

An abnormal mass of tissue that results from excessive cell division that is uncontrolled and

progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).

**Uncertainty factor**

Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a safety factor].

**Urgent public health hazard**

A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.

**Volatile organic compounds (VOCs)**
Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, and methylene chloride.

# CERTIFICATION

The Florida Department of Health, Bureau of Community 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. The Cooperative Agreement Partner completed editorial review.

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CAT, SPAB, DHAC

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

Alan Yarbrough
Team Lead
CAT, SPAB, DHAC, ATSDR