

# Health Consultation

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CAYUGA COUNTY GROUNDWATER CONTAMINATION

AURELIUS, FLEMING AND SPRINGPORT  
CAYUGA COUNTY, NEW YORK

EPA FACILITY ID: NYN000204289

**Prepared by:**  
**New York State Department of Health**

OCTOBER 27, 2015

Prepared under a Cooperative Agreement with the  
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Agency for Toxic Substances and Disease Registry  
Division of Community Health Investigations  
Atlanta, Georgia 30333

## **Health Consultation: A Note of Explanation**

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

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

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For additional information about this document, you may contact the:

New York State Department of Health  
Center for Environmental Health  
Empire State Plaza, Corning Tower, Room 1787  
Albany, New York 12237  
1-518-402-7860  
E-mail [bee@health.ny.gov](mailto:bee@health.ny.gov)

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## **SUMMARY**

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### **INTRODUCTION**

The New York State Department of Health (NYSDOH) and the Agency for Toxic Substances and Disease Registry's (ATSDR) top priority at the Cayuga County Groundwater Contamination site (Site) is to ensure that the community has the best information possible about how contaminants in soil vapor might affect their health. The NYSDOH requested that the United States Environmental Protection Agency (EPA) Region 2 collect data to evaluate the soil vapor intrusion pathway at this site. This health consult is a review of those data.

In June 2009, EPA began a soil vapor intrusion investigation at the Cayuga County Groundwater Contamination site. During the course of the investigation (June 2009 through January 2011), EPA collected soil vapor intrusion samples from 53 homes. These sample results were evaluated and are the basis for the conclusions and recommendations presented in this document by NYSDOH and ATSDR.

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### **CONCLUSION**

Breathing *cis*-1,2-dichloroethene (*cis*-1,2,DCE), trichloroethene (TCE), and vinyl chloride in the indoor air at properties sampled near the Cayuga County Groundwater Contamination Site is not expected to harm people's health.

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### **BASIS FOR CONCLUSION**

The levels of site-related contaminants in samples of indoor air collected from select buildings by EPA from June 2009 to January 2011 pose an insignificant increase in cancer risk (equal to or less than one-in-one million) and a minimal increased risk for non-cancer health effects. It should be noted that site related contaminants were either not detected or detected at levels similar to typical indoor air levels.

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### **NEXT STEPS**

Unless new information changes the current understanding of this pathway, NYSDOH considers the sampling that EPA completed for evaluating the potential for soil vapor intrusion to be adequate. The conclusion is based on our current understanding of the Cayuga County Groundwater Contamination Site, including the conceptual site model, the nature and extent of contamination, and potential exposure pathways. NYSDOH makes no additional recommendations for actions to address the soil vapor intrusion exposure pathway at the Cayuga County Groundwater Contamination site.

All future data collected by EPA in conjunction with the Site's long-term environmental monitoring program will be evaluated by NYSDOH and ATSDR to determine whether public health actions are needed for other human exposure pathways.

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### **FOR MORE INFORMATION**

If you have any questions about this Health Consultation or have other health concerns about this site, please contact NYSDOH at 1-800-402-7860. If you have questions about the investigation at the Cayuga County Groundwater Contamination site, please contact the EPA at 1-212-637-4248

## Background and Statement of Issue

In 2003, the New York State Department of Health (NYSDOH), through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), released a Public Health Assessment for the Cayuga County Groundwater Site (ATSDR 2003). At that time, NYSDOH and ATSDR did not identify soil vapor intrusion as a potential exposure pathway for this site. As part of the New York State effort to evaluate soil vapor intrusion at legacy remedial sites, NYSDOH requested that the United States Environmental Protection Agency (EPA) Region 2 evaluate the soil vapor intrusion pathway at this and other Federal Superfund National Priority List sites. In response to this request, the EPA collected soil vapor intrusion data from June 2009 through January 2011 in homes above and near the contaminated groundwater site. In this consultation, NYSDOH summarizes and evaluates the public health implications of those sampling data and provides conclusions.

## Site Background

The EPA added the Cayuga County Groundwater Contamination Site to the National Priorities List on September 4, 2002. The site is an area of contaminated groundwater in a deep bedrock aquifer, stretching from the City of Auburn to the Village of Union Springs (Appendix A, Figure 1). The groundwater contamination extends approximately seven miles to the Union Springs public water supply wells where low concentrations of volatile organic compounds have been detected since November 1988. A comprehensive private well sampling program (initiated by the Cayuga County Department of Health and the NYSDOH in December of 2000) investigated contaminant levels in all known private water supplies in a broad corridor between Union Springs and Auburn. This sampling program found contamination in many private wells, which included the volatile organic compounds *cis*- and *trans*-1,2-dichloroethene (*cis*- and *trans*-1,2-DCE), trichloroethene (TCE), and vinyl chloride.

In instances where water from a private well was found to be contaminated above public drinking water standards, access to public water or a treatment system was provided to the affected property. The Village of Union Springs installed an air stripping treatment system on its public water supply in May 2001 to reduce the concentration of volatile organic compounds in the drinking water and thereby reduce people's exposure. A 2013 EPA Record of Decision requires groundwater remediation in the portion of the groundwater plume closest to the source area (Area 1 shown in Appendix A, Figure 1) to reduce the levels of contamination in the groundwater plume in the future.

Some people were exposed in the past to elevated concentrations of vinyl chloride from private drinking water wells that resulted in a moderate or high estimated increased risk of getting cancer (i.e., risk greater than one-in-ten thousand). Therefore, based on extensive water sampling data and ATSDR's health hazard category classification, in 2003 the ATSDR and NYSDOH classified the Cayuga County Groundwater Contamination Site as a public health hazard (ATSDR 2003).



TCE, *cis*- and *trans*-1,2-DCE, and vinyl chloride are contaminants of concern at the site (ATSDR 2003) and can evaporate from groundwater, enter soil vapor (air spaces between soil particles) and migrate up through building foundations into indoor air, through a process called soil vapor intrusion. Therefore, NYSDOH requested that the EPA investigate the potential for site-related exposure to these chemicals through this exposure pathway.

### **Soil Vapor Intrusion Investigation**

The EPA performed soil vapor intrusion investigations at the Cayuga County Groundwater Contamination Site from June 2009 to January 2011. EPA collected samples of soil gas from beneath the concrete slab (called sub-slab vapor samples) of 53 residences overlying the area of groundwater contamination in June 2009 (Appendix B, Exhibit 1). The sampling detected the site-related volatile organic compounds *cis*-1,2-DCE and/or TCE under the slabs of about 11% (six) of the buildings (Units 114, 122, 128, 135, 140, and 144). No site-related VOCs were detected in any of the other sub-slab vapor samples. EPA determined no further sampling or actions were needed at Units 128, 135 and 140 because the sub-slab soil vapor concentrations did not exceed EPA's screening criteria. This determination is supported by the conceptual site model (e.g., what is known about the site and contamination). Groundwater contamination in the area of Units 128 and 135 is found in bedrock which is located as deep as 100 feet below the ground surface. A clean layer of water is found between the contaminated groundwater and buildings. In addition, site-related contaminants were either not confirmed in multiple sub-slab vapor locations within a building, and/or site-related contaminants were not detected in sub-slab vapor results obtained at neighboring properties to Units 128 and 140. Based on the multiple lines of evidence presented above, the detection of low level concentrations of TCE and *cis*-1,2-DCE beneath Units 128, 135, and 140 are not at concentrations that are expected to significantly affect the indoor air quality.

Of the buildings where site-related compounds were detected, EPA recommended additional indoor air sampling at Units 114, 122, and 144 because the sub-slab vapor concentrations exceeded EPA's screening criteria. In subsequent indoor air samples collected by EPA in December 2009, *cis*-1,2-DCE and vinyl chloride were detected in Unit 114 at 1.03 micrograms per cubic meter (mcg/m<sup>3</sup>) and 0.18 mcg/m<sup>3</sup>, respectively, and TCE at 0.27 mcg/m<sup>3</sup> in the indoor air of Unit 144. Appendix B, Exhibit 2 shows data for all units where contaminants were detected during the soil vapor intrusion investigation from June 2009 to January 2011.

### **Discussion**

NYSDOH screened the indoor air levels (i.e., concentrations) of *cis*-1,2-DCE, TCE and vinyl chloride by comparing them to indoor air background levels, the New York State air guideline for TCE (NYSDOH 2015), and ATSDR health based air comparison values (ATSDR 2013). Both the comparison values and the air guideline are air concentrations

at which we do not expect adverse health effects to occur even after a lifetime of continuous exposure. The comparison values are based solely on health-based criteria, while the air guideline considers other factors including the ability to reliably detect the chemicals and background levels.

We evaluated TCE and vinyl chloride because they are historical contaminants of concern at the Cayuga County Groundwater site and because their highest indoor air levels exceed ATSDR comparison values based on an increased lifetime cancer risk of one-in-one million (see Table 1). We evaluated *cis*-1,2-DCE further because there is no ATSDR comparison value. The highest *cis*-1,2-DCE indoor air level also exceeded indoor air background levels, while the highest levels of TCE and vinyl chloride were similar to background indoor levels (and therefore may or may not be site-related). The sampling detected *cis*-1,2-DCE and TCE in the soil vapor.

**Table 1. Cayuga County Groundwater Contamination Site:  
Air Background Levels, Guidelines and Comparison Values  
for Contaminants Detected in Indoor Air**  
(All values in micrograms per cubic meter (mcg/m<sup>3</sup>))

Chemical	Highest Level Detected in Indoor Air	Indoor Air Background Level <sup>a</sup>		New York State Air Guideline	ATSDR Comparison Value
		25 <sup>th</sup> – 75 <sup>th</sup> Percentile <sup>b</sup>	90 <sup>th</sup> Percentile <sup>c</sup>		
<i>cis</i> -1,2-DCE	1.03	<0.25 - <0.25	<0.25	---	---
TCE	0.27	<0.25 - <0.25	0.48	2	0.24 <sup>d</sup>
vinyl chloride	0.18	<0.25 - <0.25	<0.25	---	0.11 <sup>d</sup>

<sup>a</sup>Indoor air background levels from NYSDOH Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes (NYSDOH 2005).

<sup>b</sup>One quarter of the values are above and one quarter of the values are below the 25<sup>th</sup> to 75<sup>th</sup> percentile range.

<sup>c</sup>Ten percent of the values are above and 90 percent of the values are below the 90<sup>th</sup> percentile value.

<sup>d</sup>Air concentration corresponding to an increased lifetime cancer risk of one-in-one million, based on the EPA unit risk for TCE (EPA 2011) or the EPA unit risk for continuous lifetime exposure to vinyl chloride from birth (EPA 2000).

*cis*-1,2-DCE = *cis*-1,2-dichloroethene; TCE = trichloroethene; ATSDR = Agency for Toxic Substances and Disease Registry.

The health effects of *cis*-1,2-DCE, TCE and vinyl chloride have been reviewed (ATSDR 1996, 2006; NYSDOH 2006; EPA 2000a, 2010a, 2011a). Briefly, the EPA classifies both TCE and vinyl chloride as chemicals that are carcinogenic to humans (EPA 2000b, 2011b) based on positive evidence of carcinogenicity in human epidemiology studies. The National Toxicology Program lists vinyl chloride among substances known to be human carcinogens, and TCE among substances reasonably anticipated to be human carcinogens (NTP 2014). These classifications are supported by studies showing that laboratory animals exposed to high levels of TCE or vinyl chloride through their lifetimes develop cancer. There is inadequate information to

assess the carcinogenic potential of *cis*-1,2-DCE (EPA 2010b). Exposure to high levels of TCE and vinyl chloride can also cause noncancer health effects, primarily affecting the nervous system and liver (ATSDR 2006; EPA 2000a,b; 2011a,b). High levels of TCE exposure also affect the immune system of laboratory animals and can cause fetal heart malformations among their offspring (EPA 2011b). Some studies report an increased risk for adverse effects on human fetal heart development in the offspring of women who lived in areas with elevated levels of TCE in air or in drinking water (Goldberg et al., 1990; Forand et al., 2012), but it is not known if the effects are due to TCE or some other factor. Laboratory animals exposed to high levels of *cis*-1,2-DCE had effects on the kidneys, liver and the blood (ATSDR 1996; EPA 2010a,b).

### *Cancer Risk*

We calculated the estimated increased risk of developing cancer for people living in Units 114 and 144 using the measured indoor air concentrations and the EPA's inhalation unit risk values for TCE and vinyl chloride (EPA 2000a,b; 2011a,b). The inhalation unit risk value is a numerical estimate of the carcinogenic strength (potency) of a chemical. To calculate the estimated cancer risk for TCE and vinyl chloride, we followed EPA guidance that takes into account the greater vulnerability of children to the cancer effects of chemicals that cause the disease by a mutagenic mode of action (EPA 2000a,b; 2011a,b). We assumed that people are exposed to the highest measured levels of TCE and vinyl chloride on a continuous basis for 30 years. This duration of exposure approximates the 95<sup>th</sup> percentile value for residential occupancy, which is the amount of time between a person moving into a residence and the time the person moves out or dies (EPA, 2011c). The estimated increased cancer risk for long-term exposure (from birth to age 30) to the highest level of vinyl chloride detected in the indoor air of Unit 114 is about one in one million, which we consider to be an insignificant increase in cancer risk. The estimated increased cancer risk for long-term exposure to the highest level of TCE in Unit 141 is less than one in one million, which we also consider to be an insignificant increase in cancer risk. Appendix B shows example of calculations used in our evaluation of cancer risk.

### *Noncancer Risk*

We evaluated the noncancer risks for exposure to *cis*-1,2-DCE, TCE and vinyl chloride by comparing the measured levels in indoor air at Units 114 and 141 to the EPA reference concentration for each chemical. The reference concentration is a chemical-specific exposure (expressed as an air concentration) to the human population, including sensitive subgroups (e.g., children, the elderly, pregnant women), with uncertainty spanning perhaps an order of magnitude that is without appreciable risk of noncancer health effects, assuming the exposure lasts up to a lifetime. Reference concentrations are set by state, national and international health agencies (e.g., the

EPA, the ATSDR and others<sup>1</sup>). The highest levels of *cis*-1,2-DCE, TCE and vinyl chloride found in indoor air are lower than each chemical's reference concentration (Table 2). Therefore, the risk for noncancer health effects from these exposures is minimal.

**Table 2. Cayuga County Groundwater Contamination Site: Comparison of Indoor Air Levels of *cis*-1,2-DCE, TCE and Vinyl Chloride to Reference Concentrations**  
(All values in micrograms per cubic meter (mcg/m<sup>3</sup>))

Chemical	Highest Level Detected in Indoor Air	Reference Concentration	Reference
<i>cis</i> -1,2-DCE	1.03	60	RIVM (2009)
TCE	0.27	2	EPA (2011b)
Vinyl chloride	0.18	100	EPA (2000b)

*cis*-1,2-DCE = *cis*-1,2-dichloroethene; TCE = trichloroethene; RIVM = National Institute of Public Health & Environmental Protection, Netherlands; EPA = United States Environmental Protection Agency.

## Conclusions

Based on the soil vapor intrusion sampling data collected by the EPA from June 2009 to January 2011, breathing *cis*-1,2-DCE, TCE and vinyl chloride in the indoor air at properties sampled near the Cayuga County Groundwater Contamination Site is not expected to harm people's health. The levels of the chemicals pose an insignificant increase in cancer risk (equal to or less than one-in-one million) and a minimal risk for non-cancer health effects. These site related contaminants were either not detected or detected at levels similar to typical indoor air levels.

Based on our understanding of the Cayuga County Groundwater Contamination Site, including the conceptual site model, the nature and extent of contamination, and potential exposure pathways, the NYSDOH concludes that the sampling that EPA completed for evaluating the potential for soil vapor intrusion has been adequate and makes no additional recommendations for actions to address this exposure pathway.

## Limitations

The conclusions described in this report are based in part on limited soil gas and indoor air data obtained by EPA between 2009 and 2011. However, the data available, in conjunction with information from the conceptual site model, the nature and extent of

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<sup>1</sup> A reference concentration for *cis*-1,2-DCE was not available from EPA or ATSDR. RIVM (National Institute of Public Health and Environmental Protection) is a Dutch research institute that is an independent agency of the Dutch Ministry of Health, Welfare and Sport, whose research is used to support the Dutch government in making policy decisions. RIVM's chemical-specific reference concentration for *cis*-1,2-DCE was used to evaluate this chemical. The reference concentration is based on lung and liver effects in female rats exposed via inhalation to *trans*-1,2-dichloroethene in a subchronic study. A total uncertainty factor of 3000 was applied to a lowest observed effect level of 186,000 mcg/m<sup>3</sup> to obtain the reference concentration of 60 mcg/m<sup>3</sup>. ATSDR has not formally reviewed this value.

contamination, and the potential exposure pathways, allow us to conclude that EPA's SVI evaluation is adequate and we make no additional recommendations for actions to address this exposure pathway.

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## **AGENCY INFORMATION**

### **New York State Department of Health Authors**

Justin Deming  
Public Health Specialist  
Bureau of Environmental Exposure Investigation

Thomas Johnson, Ph.D.  
Research Scientist  
Bureau of Toxic Substance Assessment

Fay S. Navratil  
Public Health Specialist  
Bureau of Environmental Exposure Investigation

### **ATSDR Technical Project Officers**

Eva D. McLanahan, Ph.D.  
Lieutenant Commander, US Public Health Service  
Division of Community Health Investigation

Gregory V. Ulirsch, Ph. D.  
Environmental Health Scientist  
Division of Community Health Investigation

### **ATSDR Regional Representatives**

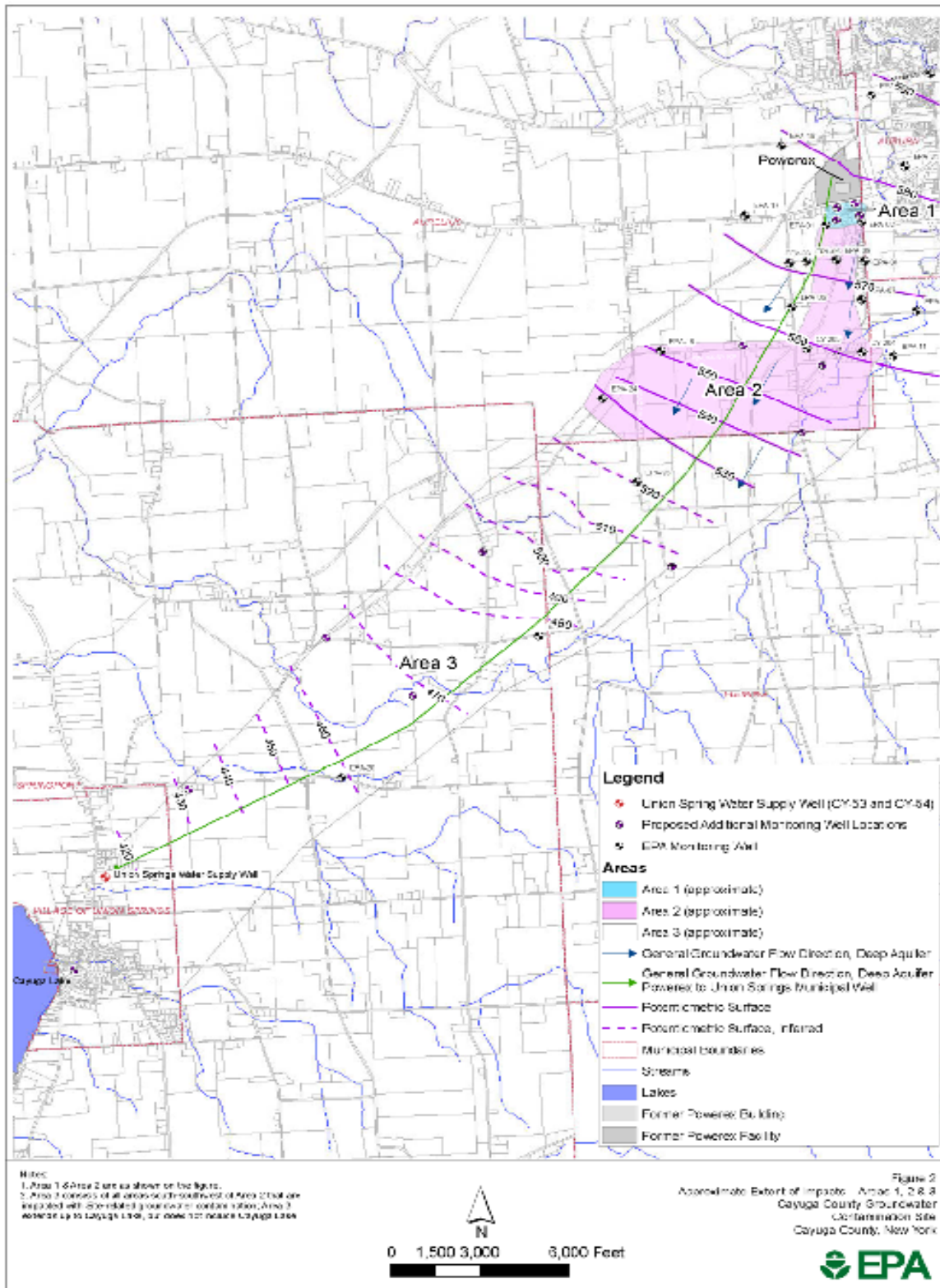
Leah Graziano, R.S.  
Regional Director - Region 2  
Division of Community Health Investigation

Elena Vaouli  
Lieutenant Commander, U.S. Public Health Service  
Regional Representative, Region 2



## **Appendix A: Site Map**

**Figure 1. Location Map of the Cayuga County Groundwater Contamination Site**



## **Appendix B: Exhibits**

**Exhibit 1. Soil Vapor Intrusion Sample Results from the Cayuga County Groundwater Contamination Site** (All values in micrograms per cubic meter)

Sample	Sub Location	Sample Location	Sampling Date	TCE*	<i>cis</i> -1,2-DCE*	Vinyl Chloride
52150	Unit 100 SS-Boiler Rm E	Soil Gas	June-09	0.27 U**	0.20 U	0.13 U
52154	Unit 100 SS-Crawl Spac	Soil Gas	June-09	0.27 U	0.20 U	0.13 U
52155	Unit 100 SS-Electrical	Soil Gas	June-09	0.27 U	0.20 U	0.13 U
52152	Unit 100 SS-LE Office 2	Soil Gas	June-09	0.27 U	0.20 U	0.13 U
52151	Unit 100 SS-Maint Shop	Soil Gas	June-09	0.27 U	0.20 U	0.13 U
52153	Unit 100 SS-Tech Stor	Soil Gas	June-09	0.27 U	0.20 U	0.13 U
52156	Unit 101 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52157	Unit 101 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52158	Unit 102 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52159	Unit 103 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52160	Unit 103 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52161	Unit 104 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52162	Unit 104 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52163	Unit 105 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52164	Unit 105 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53402	Unit 106 AMB1	Outdoor Air	June-09	0.27 U	0.20 U	0.13 U
53403	Unit 106 AMB2	Outdoor Air	June-09	0.27 U	0.20 U	0.13 U
53400	Unit 106 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53401	Unit 106 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53404	Unit 107 SS1	Soil Gas	June-09	1.1 U	0.79 U	0.51 U
53405	Unit 108 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53406	Unit 108 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53407	Unit 109 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53408	Unit 109 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53409	Unit 110 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53410	Unit 111 SS1-042309	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53411	Unit 111 SS2-042309	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53412	Unit 112 SS1-042309	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53413	Unit 112 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53414	Unit 113 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53415	Unit 114 SS1	Soil Gas	June-09	<b>2.7</b>	<b>3.2</b>	0.26 U
53416	Unit 114 SS2	Soil Gas	June-09	<b>20</b>	<b>26</b>	0.26 U
53417	Unit 115 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53418	Unit 115 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53420	Unit 116 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53421	Unit 117 AMB1	Outdoor Air	June-09	0.54 U	0.40 U	0.26 U
53422	Unit 117 AMB2	Outdoor Air	June-09	0.54 U	0.40 U	0.26 U
53446	Unit 117 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52165	Unit 118 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52166	Unit 118 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U

\*TCE = trichloroethylene, and *cis*-1,2-DCE = *cis*-1,2-dichloroethene  
\*\*U denotes that the chemical was not detected in the sample, at the detection limit noted.

**Exhibit 1 (continued). Soil Vapor Intrusion Sample Results from the Cayuga County  
Groundwater Contamination Site** (All values in micrograms per cubic meter)

Sample	Sub Location	Sample Location	Sampling Date	TCE	<i>cis</i> -1,2-DCE	Vinyl Chloride
52167	Unit 119 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52168	Unit 119 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52169	Unit 120 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52170	Unit 121 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52171	Unit 121 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53424	Unit 122 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53425	Unit 122 SS2	Soil Gas	June-09	<b>2.3</b>	<b>2.1</b>	0.26 U
53426	Unit 123 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53427	Unit 123 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53430	Unit 124 AMB1	Outdoor Air	June-09	0.54 U	0.40 U	0.26 U
53428	Unit 124 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53429	Unit 124 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53431	Unit 125 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53432	Unit 126 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53433	Unit 126 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52172	Unit 127 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52173	Unit 127 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52174	Unit 128 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52175	Unit 128 SS2	Soil Gas	June-09	0.54 U	<b>0.43</b>	0.26 U
52176	Unit 128 SS3	Soil Gas	June-09	0.54 U	<b>57</b>	0.26 U
52177	Unit 129 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52178	Unit 130 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52179	Unit 130 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52180	Unit 131 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52181	Unit 132 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52182	Unit 133 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52183	Unit 133 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52184	Unit 133 SS3	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52185	Unit 134 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52186	Unit 134 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52187	Unit 134 SS3	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52188	Unit 135 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52189	Unit 135 SS2	Soil Gas	June-09	<b>0.89</b>	0.40 U	0.26 U
52190	Unit 135 SS3	Soil Gas	June-09	<b>0.6</b>	0.40 U	0.26 U
53436	Unit 136 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53439	Unit 137 AMB1	Outdoor Air	June-09	0.54 U	0.40 U	0.26 U
53440	Unit 137 AMB2	Outdoor Air	June-09	0.54 U	0.40 U	0.26 U
53437	Unit 137 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53438	Unit 137 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53441	Unit 138 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53442	Unit 138 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U

\*TCE = trichloroethylene, and *cis* -1,2-DCE = *cis* -1,2-dichloroethene  
\*\*U denotes that the chemical was not detected in the sample, at the detection limit noted.

**Exhibit 1 (continued). Soil Vapor Intrusion Sample Results from the Cayuga County  
Groundwater Contamination Site** (All values in micrograms per cubic meter)

Sample	Sub Location	Sample Location	Sampling Date	TCE	<i>cis</i> -1,2-DCE	Vinyl Chloride
53443	Unit 139 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53444	Unit 139 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53445	Unit 140 SS1	Soil Gas	June-09	<b>1.2</b>	0.40 U	0.26 U
53447	Unit 141 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53448	Unit 142 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53449	Unit 142 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53450	Unit 143 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53451	Unit 144 SS1	Soil Gas	June-09	<b>5</b>	0.40 U	0.26 U
53452	Unit 144 SS2	Soil Gas	June-09	<b>5.8</b>	0.40 U	0.26 U
53454	Unit 144 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53453	Unit 145 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53455	Unit 145 SS3	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53456	Unit 146 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53457	Unit 146 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53458	Unit 147 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53459	Unit 147 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53460	Unit 148 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53461	Unit 148 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53462	Unit 149 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53463	Unit 149 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53467	Unit 150 AMB1	Outdoor Air	June-09	0.54 U	0.40 U	0.26 U
53468	Unit 150 AMB2	Outdoor Air	June-09	0.54 U	0.40 U	0.26 U
53464	Unit 150 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53465	Unit 150 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53466	Unit 150 SS3	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53470	Unit 151 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53469	Unit 161 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
240012	Unit 113 AMB1	Outdoor Air	December-09	0.358 U	0.264 U	0.171 U
240013	Unit 113 AMB2	Outdoor Air	December-09	0.358 U	0.264 U	0.171 U
240011	Unit 113 FF	First Floor	December-09	0.358 U	0.264 U	0.171 U
240010	Unit 113 GF	Ground Floor	December-09	0.358 U	0.264 U	0.171 U
240009	Unit 113 SS1	Soil Gas	December-09	0.358 U	0.264 U	0.171 U
240008	Unit 114 FF	First Floor	December-09	0.358 U	<b>1.03</b>	0.171 U
240007	Unit 114 GF	Ground Floor	December-09	0.358 U	0.264 U	0.171 U
240005	Unit 114 SS1	Soil Gas	December-09	0.358 U	<b>2.82</b>	0.171 U
240006	Unit 114 SS2	Soil Gas	December-09	<b>31.7</b>	<b>36.7</b>	0.171 U
240015	Unit 122 GF1	Ground Floor	December-09	0.358 U	0.264 U	0.171 U
240016	Unit 122 GF2	Ground Floor	December-09	0.358 U	0.264 U	0.171 U
240014	Unit 122 SS1	Soil Gas	December-09	0.358 U	0.264 U	0.171 U
240017	Unit 122 SS2	Soil Gas	December-09	<b>3.08</b>	0.264 U	0.171 U
240003	Unit 152 AMB1	Outdoor Air	December-09	0.358 U	0.264 U	0.171 U

\*TCE = trichloroethylene, and *cis* -1,2-DCE = *cis* -1,2-dichloroethene  
\*\*U denotes that the chemical was not detected in the sample, at the detection limit noted.

**Exhibit 1 (continued). Soil Vapor Intrusion Sample Results from the Cayuga County  
Groundwater Contamination Site** (All values in micrograms per cubic meter)

Sample	Sub Location	Sample Location	Sampling Date	TCE	<i>cis</i> -1,2-DCE	Vinyl Chloride
240004	Unit 152 AMB2	Outdoor Air	December-09	0.358 U	0.264 U	0.171 U
240002	Unit 152 FF	First Floor	December-09	0.358 U	0.264 U	0.171 U
240001	Unit 152 GF	Ground Floor	December-09	0.358 U	0.264 U	0.171 U
0-024-0109	Unit 114 FF1	First Floor	January-11	0.27 U	<b>0.49</b>	<b>0.18</b>
0-024-0110	Unit 114 FF2	First Floor	January-11	0.27 U	<b>0.58</b>	0.13 U
0-024-0106	Unit 114 GF	Ground Floor	January-11	0.27 U	0.20 U	0.13 U
0-024-0108	Unit 114 SS1	Soil Gas	January-11	<b>1</b>	<b>0.51</b>	0.13 U
0-024-0107	Unit 114 SS2	Soil Gas	January-11	<b>2.5</b>	<b>2.5</b>	0.13 U
0-024-0105	Unit 144 AMB	Outdoor Air	January-11	0.27 U	0.20 U	0.13 U
0-024-0104	Unit 144 FF	First Floor	January-11	0.38 U	0.20 U	0.13 U
0-024-0102	Unit 144 GF	Ground Floor	January-11	<b>0.27</b>	0.20 U	0.13 U
0-024-0101	Unit 144 SS1	Soil Gas	January-11	<b>26</b>	0.20 U	0.13 U
0-024-0103	Unit 144 SS2	Soil Gas	January-11	<b>11</b>	0.20 U	0.13 U
0-024-0111	Unit 170 SS	Soil Gas	January-11	0.27 U	0.20 U	0.13 U
0-024-0114	Unit 171 AMB1	Outdoor Air	January-11	0.27 U	0.20 U	0.13 U
0-024-0115	Unit 171 AMB2	Outdoor Air	January-11	0.27 U	0.20 U	0.13 U
0-024-0112	Unit 171 SS1	Soil Gas	January-11	0.27 U	0.20 U	0.13 U
0-024-0113	Unit 171 SS2	Soil Gas	January-11	0.27 U	0.20 U	0.13 U
*TCE = trichloroethylene, and <i>cis</i> -1,2-DCE = <i>cis</i> -1,2-dichloroethene						
**U denotes that the chemical was not detected in the sample, at the detection limit noted.						

**Exhibit 2. Soil Vapor Intrusion Sampling Results for  
Units with Detected Levels of Contaminants from the  
Cayuga County Groundwater Contamination Site (derived from Exhibit 1)**  
(All values in micrograms per cubic meter)

<b>Sample</b>	<b>Sub Location</b>	<b>Sample location</b>	<b>Sampling Date</b>	<b>TCE</b>	<b>cis-1,2-DCE</b>	<b>Vinyl Chloride</b>
53415	Unit 114 SS1	Soil Gas	June-09	<b>2.7</b>	<b>3.2</b>	0.26 U
53416	Unit 114 SS2	Soil Gas	June-09	<b>20</b>	<b>26</b>	0.26 U
240008	Unit 114 FF	First Floor	December-09	0.358 U	<b>1.03</b>	0.171 U
240007	Unit 114 GF	Ground Floor	December-09	0.358 U	0.264 U	0.171 U
240005	Unit 114 SS1	Soil Gas	December-09	0.358 U	<b>2.82</b>	0.171 U
240006	Unit 114 SS2	Soil Gas	December-09	<b>31.7</b>	<b>36.7</b>	0.171 U
0-024-0109	Unit 114 FF1	First Floor	January-11	0.27 U	<b>0.49</b>	<b>0.18</b>
0-024-0110	Unit 114 FF2	First Floor	January-11	0.27 U	<b>0.58</b>	0.13 U
0-024-0106	Unit 114 GF	Ground Floor	January-11	0.27 U	0.20 U	0.13 U
0-024-0108	Unit 114 SS1	Soil Gas	January-11	<b>1</b>	<b>0.51</b>	0.13 U
0-024-0107	Unit 114 SS2	Soil Gas	January-11	<b>2.5</b>	<b>2.5</b>	0.13 U
53424	Unit 122 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
53425	Unit 122 SS2	Soil Gas	June-09	<b>2.3</b>	<b>2.1</b>	0.26 U
240015	Unit 122 GF1	Ground Floor	December-09	0.358 U	0.264 U	0.171 U
240016	Unit 122 GF2	Ground Floor	December-09	0.358 U	0.264 U	0.171 U
240014	Unit 122 SS1	Soil Gas	December-09	0.358 U	0.264 U	0.171 U
240017	Unit 122 SS2	Soil Gas	December-09	<b>3.08</b>	0.264 U	0.171 U
52174	Unit 128 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52175	Unit 128 SS2	Soil Gas	June-09	0.54 U	<b>0.43</b>	0.26 U
52176	Unit 128 SS3	Soil Gas	June-09	0.54 U	<b>57</b>	0.26 U
52188	Unit 135 SS1	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
52189	Unit 135 SS2	Soil Gas	June-09	<b>0.89</b>	0.40 U	0.26 U
52190	Unit 135 SS3	Soil Gas	June-09	<b>0.6</b>	0.40 U	0.26 U
53445	Unit 140 SS1	Soil Gas	June-09	<b>1.2</b>	0.40 U	0.26 U
53451	Unit 144 SS1	Soil Gas	June-09	<b>5</b>	0.40 U	0.26 U
53452	Unit 144 SS2	Soil Gas	June-09	<b>5.8</b>	0.40 U	0.26 U
53454	Unit 144 SS2	Soil Gas	June-09	0.54 U	0.40 U	0.26 U
0-024-0105	Unit 144 AMB	OutdoorAir	January-11	0.27 U	0.20 U	0.13 U
0-024-0104	Unit 144 FF	First Floor	January-11	0.38 U	0.20 U	0.13 U
0-024-0102	Unit 144 GF	Ground Floor	January-11	<b>0.27</b>	0.20 U	0.13 U
0-024-0101	Unit 144 SS1	Soil Gas	January-11	<b>26</b>	0.20 U	0.13 U
0-024-0103	Unit 144 SS2	Soil Gas	January-11	<b>11</b>	0.20 U	0.13 U

Sample results with detected levels are bolded.

U = indicates compound not detected above the reporting limit listed.



## Sample Risk Calculations

### TCE Cancer Risk

We estimated the increased cancer risk due to inhalation of TCE using the guidance provided in Section 5.2.3.3.1 of EPA (2011a), using age dependent adjustment factors of 10 for 0 to <2 years, 3 for ages 2 to <16 years, and 1 for ages > 16 years. For a TCE air concentration of 0.27 mcg/m<sup>3</sup>, and assuming a person is exposed continuously every day and lives in a residence for 30 years of a 70-year lifetime (EPA, 2011c), the cancer risk estimate is calculated for each age group as summarized in the following table:

Age group	Air Concentration (mcg/m <sup>3</sup> )	Duration (years)	Fraction of Lifetime	Unadjusted Kidney Unit Risk (mcg/m <sup>3</sup> ) <sup>-1</sup>	ADAF	Adjusted Kidney Risk	NHL and Liver Unit Risk (mcg/m <sup>3</sup> ) <sup>-1</sup>	NHL and Liver Risk	Adjusted Kidney and Unadjusted NHL and Liver Risk
Birth to <1 month	0.270	0.083	0.0012	1.0E-06	10	3.2E-09	3.1E-06	1.0E-09	4.2E-09
1 to <3 months	0.270	0.167	0.0024	1.0E-06	10	6.4E-09	3.1E-06	2.0E-09	8.4E-09
3 to <6 months	0.270	0.250	0.0036	1.0E-06	10	9.6E-09	3.1E-06	3.0E-09	1.3E-08
6 to <12 months	0.270	0.500	0.0071	1.0E-06	10	1.9E-08	3.1E-06	6.0E-09	2.5E-08
1 to <2 years	0.270	1.000	0.0143	1.0E-06	10	3.9E-08	3.1E-06	1.2E-08	5.1E-08
2 to <3 years	0.270	1.000	0.0143	1.0E-06	3	1.2E-08	3.1E-06	1.2E-08	2.4E-08
3 to <5 years	0.270	2.000	0.0286	1.0E-06	3	2.3E-08	3.1E-06	2.4E-08	4.7E-08
5 to <11 years	0.270	6.000	0.0857	1.0E-06	3	6.9E-08	3.1E-06	7.2E-08	1.4E-07
11 to <16 years	0.270	5.000	0.0714	1.0E-06	3	5.8E-08	3.1E-06	6.0E-08	1.2E-07
16 to <18 years	0.270	2.000	0.0286	1.0E-06	1	7.7E-09	3.1E-06	2.4E-08	3.2E-08
18 to <21 years	0.270	3.000	0.0429	1.0E-06	1	1.2E-08	3.1E-06	3.6E-08	4.7E-08
21 to <30 years	0.270	9.000	0.1286	1.0E-06	1	3.5E-08	3.1E-06	1.1E-07	1.4E-07
30 to 70 years	0.000	40.000	0.5714	1.0E-06	1	0.0E+00	3.1E-06	0.0E+00	0.0E+00
<b>Total Cancer Risk =====&gt;</b>									<b>6.5E-07</b>

ADAF = age dependent adjustment factor; NHL = non-Hodgkins lymphoma; mcg/m<sup>3</sup> = micrograms per cubic meter.

### Vinyl Chloride Cancer Risk

We estimated the increased cancer risk due to inhalation of vinyl chloride using the US EPA unit risk (4.4E-6 per mcg/m<sup>3</sup>) for vinyl chloride and available US EPA guidance (EPA 2000a,b). For a vinyl chloride air concentration of 0.18 mcg/m<sup>3</sup>, and assuming a person is exposed continuously every day and lives in a residence for 30 years of a 70 year lifetime (EPA 2011b), the cancer risk estimate is calculated by the following equation:

$$\text{Cancer Risk} = [0.18 \text{ mcg/m}^3 \times 4.4\text{E-}6 \text{ (mcg/m}^3\text{)}^{-1}] + [0.18 \text{ mcg/m}^3 \times 4.4\text{E-}6 \text{ (mcg/m}^3\text{)}^{-1} \times 30 \text{ years/70 years}]$$

$$\text{Cancer Risk} = 7.92\text{E-}7 + 3.39\text{E-}7$$

$$\text{Cancer Risk} = 1\text{E-}6 \text{ (or one in one million)}$$

**Appendix C:  
Conclusion Categories and Hazard Statements**

## Conclusion Categories and Hazard Statements

ATSDR has five distinct descriptive conclusion categories that convey the overall public health conclusion about a site or release, or some specific pathway by which the public may encounter site-related contamination. These defined categories help ensure a consistent approach in drawing conclusions across sites and assist the public health agencies in determining the type of follow-up actions that might be warranted. The conclusions are based on the information available to the author(s) at the time they are written.

### **1. Short-term Exposure, Acute Hazard “ATSDR concludes that...could harm people’s health.”**

This category is used for sites where short-term exposures (e.g. < 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid public health intervention.

### **2. Long-term Exposure, Chronic Hazard “ATSDR concludes that...could harm people’s health.”**

This category is used for sites that pose a public health hazard due to the existence of long-term exposures (e.g. > 1 yr) to hazardous substance or conditions that could result in adverse health effects.

### **3. Lack of Data or Information “ATSDR cannot currently conclude whether...could harm people’s health.”**

This category is used for sites in which data are insufficient with regard to extent of exposure and/or toxicologic properties at estimated exposure levels to support a public health decision.

### **4. Exposure, No Harm Expected “ATSDR concludes that ... is not expected to harm people’s health.”**

This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.

### **5. No Exposure, No Harm Expected “ATSDR concludes that ...will not harm people’s health.”**

This category is used for sites that, because of the absence of exposure, are not expected to cause any adverse health effects.

Greetings,

You are receiving a document from the Agency for Toxic Substances and Disease Registry (ATSDR). We are very interested in your opinions about the document you received. We ask that you please take a moment now to complete the following ten question survey. You can access the survey by clicking on the link below.

Completing the survey should take less than 5 minutes of your time. If possible, please provide your responses within the next two weeks. All information that you provide will remain confidential.

The responses to the survey will help ATSDR determine if we are providing useful and meaningful information to you. ATSDR greatly appreciates your assistance as it is vital to our ability to provide optimal public health information.

<https://www.surveymonkey.com/r/ATSDRDocumentSatisfaction>

LCDR Donna K. Chaney, MBAHCM  
U.S. Public Health Service  
4770 Buford Highway N.E. MS-F59  
Atlanta, GA 30341-3717  
(W) 770.488.0713  
(F) 770.488.1542

