

Letter Health Consultation

Soil Vapor Intrusion Evaluation

GENERAL ELECTRIC FORT
EDWARD FACILITY

FORT EDWARD, WASHINGTON COUNTY, NEW YORK

AUGUST 13, 2008

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

Health Consultation: A Note of Explanation

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

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

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LETTER HEALTH CONSULTATION

Soil Vapor Intrusion Evaluation

GENERAL ELECTRIC FORT
EDWARD FACILITY

FORT EDWARD, WASHINGTON COUNTY, NEW YORK

Prepared By:

New York State Department of Health
Center for Environmental Health
Under Cooperative Agreement with
The U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
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2008011.59998



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May 27, 2008

Representative Kirsten E. Gillibrand
20th District Congress of the United States
House of Representatives
Washington D.C. Office
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Glens Falls, New York 12801

Dear Representative Gillibrand:

On June 28, 2007, you requested assistance from the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate health effects, specifically increased cancer risk, associated with potential exposures to trichloroethene (TCE) from the General Electric facility in Fort Edward, Washington County. In response to your letter, ATSDR indicated that additional details about public health assessment activities by the New York State Department of Health (NYS DOH) for the General Electric Fort Edward community would be provided by the NYS DOH under a separate letter. This letter and the attached health consultation document are provided to summarize these public health activities.

A 2005 soil vapor intrusion investigation performed by General Electric determined that soil vapor near the Fort Edward facility was contaminated with TCE. General Electric offered vapor mitigation systems for all structures within the delineated soil vapor plume area. Indoor air sampling performed in residential and commercial structures in the study area did not identify significant TCE indoor air impacts that could be attributed to soil vapor intrusion.

With respect to your reference to increased cancer rates in the Fort Edward area, the NYS DOH has and is performing several public health assessment activities. A 2003 Cancer Incidence ZIP Code Study performed by the NYS DOH, using cancer incidence data for the years 1996 to 2000, determined that the number of cancer cases diagnosed were not statistically different from the number of cancer cases expected for any particular type of cancer, or total cancers, among males or females in the Village and Town of Fort Edward. As you mentioned, more recent cancer incidence data for the years 1999 to 2003 show that the number of lung cancer cases diagnosed is 50 to 100% above the number of cases expected among males and females in ZIP Code 12828. These types of comparisons do not account for possible individual risk factors such as smoking, and include areas much larger than the area of concern.

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NEW YORK STATE DEPARTMENT OF HEALTH

The NYS DOH is currently conducting a health statistics review to evaluate cancer and birth outcomes for a portion of the General Electric Fort Edward neighborhood historically affected by private wells contaminated with TCE and other chemicals. This contamination was discovered in the mid-1980s and public drinking water has been supplied to the area. Since the area of concern is small, this evaluation is part of a larger project that combines exposure and health outcome data from Fort Edward with other areas in the state with similar exposures. Additionally, the NYS DOH is assessing the feasibility of a more in-depth health outcomes review for the residents of homes in the area where private drinking water wells were historically contaminated. The in-depth review will seek to follow up on health outcomes for residents of these homes even if they left the area prior to diagnosis of a health problem.

You noted that the NYS DOH, with the ATSDR, has done health effects (health outcome) studies for the IBM Endicott area, and asked that we do the same for Fort Edward. The research design of the Fort Edward health statistics review mentioned above is similar to that used for the IBM Endicott community. Therefore, we believe that the completed and on-going studies we are carrying out satisfy your request for health effects studies for the community surrounding the General Electric Fort Edward plant. The NYS DOH will continue to work with community members to address specific health and environmental concerns.

If you have any questions regarding the continuing activities at the General Electric Fort Edward site, you may contact me at 518/402-7500 or Mr. Richard Fedigan of my staff at 1-800-458-1158, extension 2-7870. You may also contact Mr. Greg Ulirsch of the ATSDR at 1-888-422-8737.

Sincerely,



Nancy K. Kim, Ph.D.

Interim Director

Center for Environmental Health

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Attachments: NYSDOH Letter Health Consultation: General Electric Fort Edward Facility Soil Vapor Intrusion Evaluation

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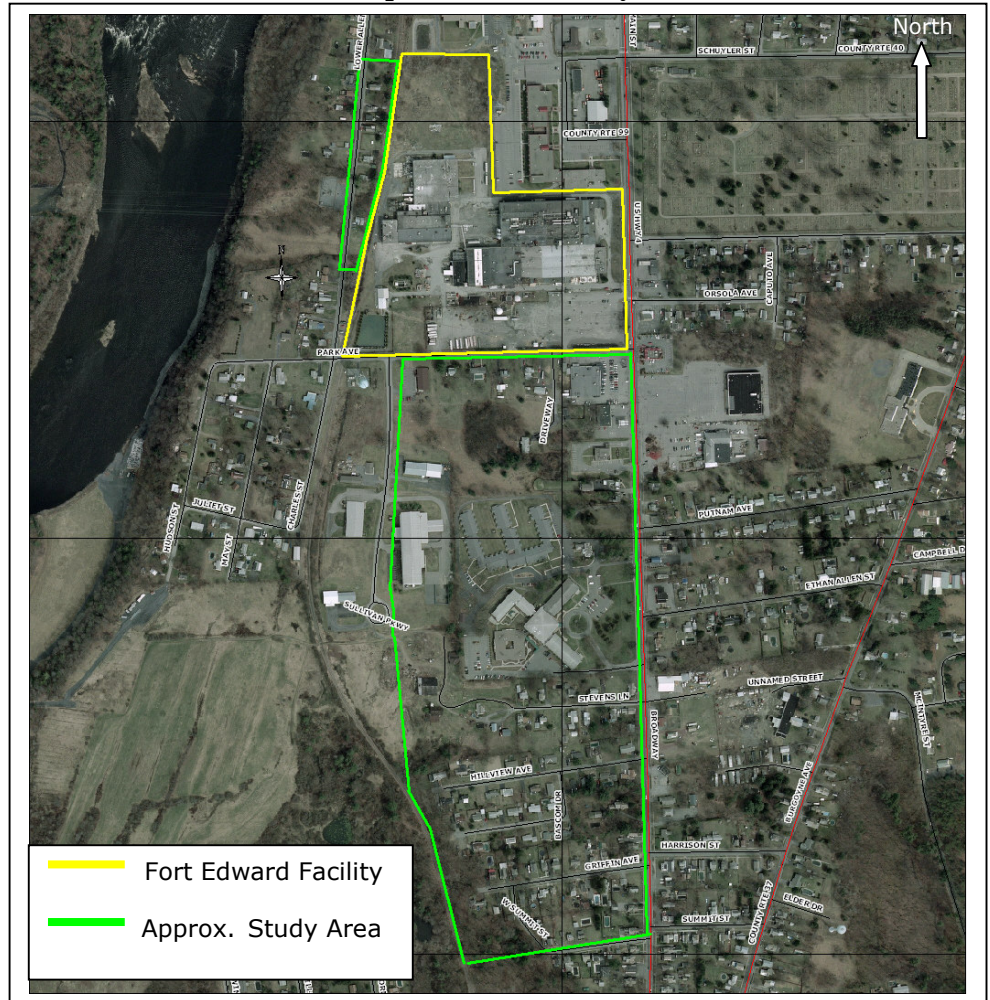
BACKGROUND AND STATEMENT OF ISSUE

The General Electric Fort Edward facility is an active capacitor manufacturing facility located in the Town of Fort Edward, Washington County. The general site layout is identified on Figure 1. Homes border the site to the south and west, with commercial businesses and government offices to the north and east. Historic practices at the facility have resulted in the release of trichloroethene (TCE) to groundwater. The groundwater plume of

TCE extends approximately 2,500 meters south of the facility. Current on-site and off-site groundwater recovery activities are significantly reducing the nature and extent of the off-site TCE groundwater plume. Groundwater contamination has resulted in an off-site TCE soil vapor plume which is generally consistent with the groundwater plume in extent. A soil vapor intrusion investigation performed by General Electric in 2005 defined the nature and extent of TCE in off-site soil vapor. As a preventive measure, General Electric offered the installation of vapor

mitigation systems in all structures that overlie the delineated TCE vapor plume. Indoor air sampling performed in residential structures in the study area did not identify significant TCE indoor air impacts associated with soil vapor intrusion. To date, vapor mitigation systems have been requested and installed in 51 structures with an on-going annual offer by General Electric to install mitigation systems in any remaining structures in the delineated TCE soil vapor mitigation area.

Figure 1: General Electric Fort Edward Facility and Soil Vapor Intrusion Study Area



DISCUSSION

A. Exposure to Volatile Organic Compounds (VOCs) Through Soil Vapor Intrusion

In some areas adjacent to the General Electric Fort Edward facility, VOC contamination (mainly TCE) from the groundwater has contaminated the overlying soil vapor. Soil vapor is the air found in the pore spaces between soil particles. VOCs can migrate through the

soil vapor into overlying structures through cracks and other openings in building foundations through a process known as soil vapor intrusion, as illustrated in Figure 2. This process is similar to the way that radon gas seeps into buildings. Soil vapor can enter a building whether it is old or new and whether the building is on a slab or has a crawl space or basement foundation.

Building occupants can potentially be exposed to VOCs through soil vapor intrusion when soil vapor contaminated with

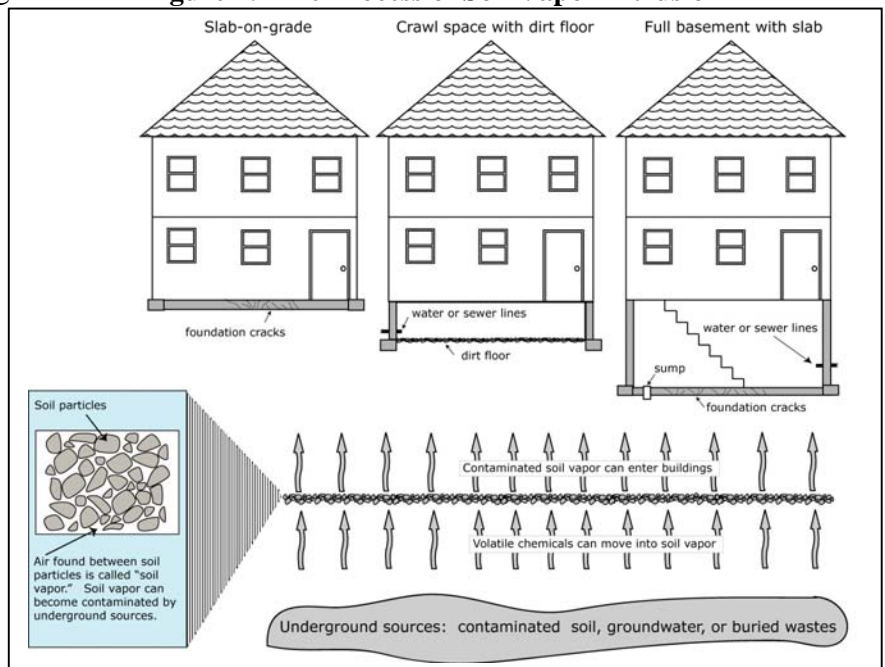
VOCs enters a building and mixes with the indoor air. Exposure occurs through breathing the indoor air that contains VOCs. Additional information pertaining to the process of soil vapor intrusion is provided in the New York State Department of Health (NYS DOH) fact sheet entitled: *Soil Vapor Intrusion: Frequently Asked Questions*, included as Attachment A.

One of the most common and effective methods of preventing exposures associated with soil vapor intrusion is the installation of a sub-slab depressurization system. A sub-slab depressurization system, also commonly known as a radon mitigation system, essentially prevents soil vapor from entering a structure. As shown in Figure 3, the system collects and redirects soil vapor from beneath a building to the outdoor air.

B. Fort Edward Soil Vapor Intrusion Investigation

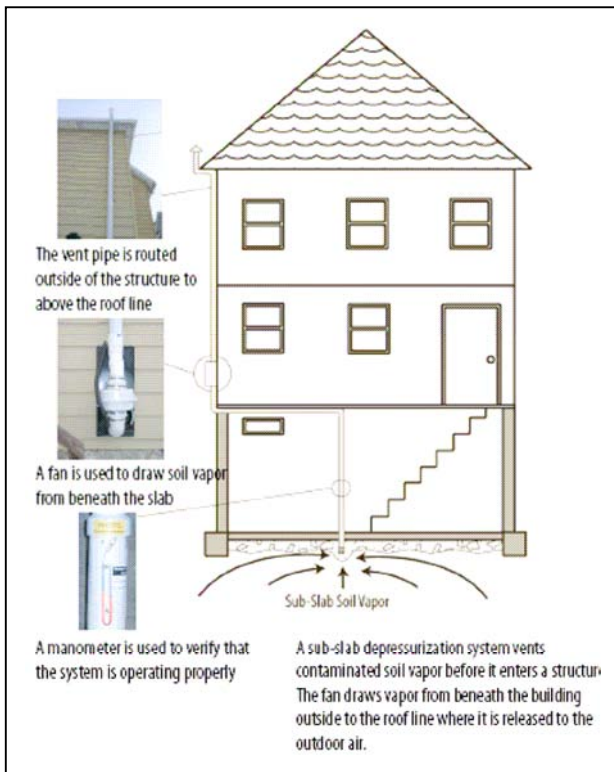
An off-site soil vapor intrusion investigation was performed by General Electric in 2005 at the request of the NYS DOH and the New York State Department of Environmental Conservation (NYS DEC). The soil vapor intrusion study area is identified on Figure 1. The investigation

Figure 2: The Process of Soil Vapor Intrusion



included thirty soil vapor points installed and sampled immediately above the water table to represent worst-case conditions (i.e. the potential maximum concentration of TCE and other volatile organic compounds in soil vapor). Multiple phases of soil vapor sampling were

Figure 3: Sub-Slab Depressurization System



performed to define the nature and extent of TCE in the off-site soil vapor plume. TCE was identified in off-site soil vapor at concentrations ranging from non-detect to 81 micrograms per cubic meter (mcg/m³). To supplement the existing off-site groundwater data, additional groundwater samples were collected from eight locations along the margins of the study area. The analytical results for these groundwater samples did not identify VOCs, including TCE. It should be acknowledged, however, that concentrations of TCE in off-site soil vapor and groundwater may have been historically higher prior to the implementation of actions to reduce the off-site TCE groundwater plume.

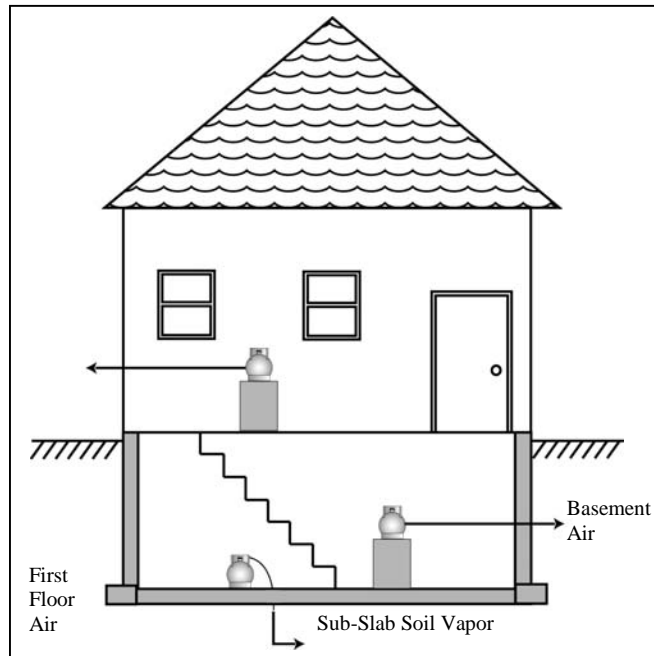
The State Agencies (NYS DOH and the NYS DEC) accepted General Electric’s “blanket mitigation” approach to address potential exposures associated with concentrations of TCE detected in soil vapor within the study area. Specifically, a soil vapor delineation (blanket mitigation) area was defined where detectable concentrations of site-related VOCs were

identified in soil vapor samples collected within the study area. The delineated soil vapor plume area includes the majority of residential structures located along the south side of Park Avenue between Upper Broadway and Sullivan Parkway; residential structures along the west side of Upper Broadway from Park Avenue to the north side of West Summit Street; the north side of West Summit Street, Hillview Avenue, Bascom Drive, and Stevens Lane; and three commercial structures located west of Upper Broadway between Park Avenue and Stevens Lane. General Electric has and continues to offer installation of soil vapor mitigation systems in all structures that overlie the delineated soil vapor plume area. While structure sampling was offered and performed by General Electric upon request of the property owner, the mitigation area was primarily based on the results of soil vapor sampling, as described above. The State has concurred with the implementation of similar “blanket mitigation” approaches at other sites, such as the Hillcrest and IBM Endicott sites. To date, General Electric has installed vapor mitigation systems in 51 structures within the soil vapor delineation area.

For consistency in implementing the soil vapor mitigation techniques, the State recommends that soil vapor mitigation systems be designed and installed in accordance with *Standard Practice for Installing Radon Mitigation Systems in Existing Low-rise Residential Buildings (ASTM E-2121)*. Information provided by General Electric indicates that the mitigation systems were designed and installed in accordance with this technical guidance document. During the commissioning of

each soil vapor mitigation system, General Electric’s installation contractor instructed the property owner/occupant on how the system works and how to verify the system is operational via reading a visual indicator of system performance, known as a manometer. Additionally, each property owner/tenant was provided with a fact sheet including contact information in the event of a system shutdown, questions or concerns. Sampling of structures within the study area was performed by General Electric upon request of the property owner. Structure sampling included the collection of indoor air samples in the basement and first occupied floor as well as sub-slab vapor sampling. Ambient (outdoor) air sampling was also done to evaluate background concentrations of TCE and other volatile organic compounds in outdoor air. Figure 4 provides a general schematic of typical structure sample locations.

Figure 4: Structure Sampling Locations



A total of 62 structures were sampled during the investigation, including 57 residential structures and 5 commercial structures. A summary of the findings of the structure sampling is presented in Table 1.

**Table 1
Concentrations of TCE Detected in Structures Sampled: General Electric Fort Edward
Soil Vapor Intrusion Investigation**

Residential Structures				Commercial Structures			
Sample Location	Sub Slab	Basement Air	Indoor Air	Sample Location	Sub Slab	Basement Air	Indoor Air
TCE Concentration Range (mcg/m3)	ND to 330	ND to 2.2	ND to 1.6	TCE Concentration Range (mcg/m3)	ND to 1500 ¹	ND to 5.9 ¹	ND to 5.4 ¹
TCE Average Concentration (mcg/m3)	32.4	0.16	0.08	TCE Average Concentration (mcg/m3) ²	389.7	1.6	1.3
No. Samples Collected	58	74	52	No. Samples Collected	10	7	7

ND = non-detect

¹ from one commercial structure

² average influenced by a single commercial structure where numerous structure samples were collected

Only a few of the 62 structures sampled had a positive detection of a site-related volatile organic compound in indoor air. Additionally, no indoor air samples collected from residences exceeded the NYS DOH air guideline for TCE of 5 mcg/m³. Two indoor air samples collected from two commercial structures slightly exceeded the TCE air guideline value of 5 mcg/m³, however these detections are not believed to be solely attributable to soil vapor intrusion. The likelihood of health effects associated with exposure to TCE at the levels measured in the commercial buildings is low. The levels of TCE measured in indoor air in these structures (5.9 mcg/m³ and 5.4 mcg/m³) are lower than the levels that are known to cause health effects in people and animals. Additional information pertaining to TCE in indoor and outdoor air is presented in the NYS DOH fact sheet entitled *Trichloroethene (TCE) in Indoor and Outdoor Air* which is included as Attachment B.

General Electric provided each property owner with the analytical results of their structure sampling along with an explanation of how to read their analytical laboratory report. The findings of the soil vapor intrusion investigation did not identify significant indoor air impacts attributable to soil vapor intrusion in residential or commercial structures sampled. Vapor mitigation systems have been installed and will continue to be offered to any property owner within the delineated soil vapor plume area. General Electric is required to provide for operation, maintenance and monitoring of the mitigation systems for as long as the systems remain in operation and a plan for long-term operation, maintenance and monitoring of the vapor mitigation systems is in place. General Electric will continue to perform these activities under the oversight of the NYS DEC and the NYS DOH.

PUBLIC HEALTH ACTIVITIES

A. 2003 NYS DOH Cancer Incidence ZIP Code Study

In May of 2003, the NYS DOH Cancer Surveillance Program responded to a request from Fort Edward community residents to evaluate the incidence of cancer, particularly brain cancer, in two ZIP Codes, 12828 and 12839, that include the Village and Town of Fort Edward. The NYS DOH Cancer Surveillance Program performed the ZIP Code screening investigation that compared the number of diagnosed versus the number of expected cancers of all types in the ZIP Codes for the years 1996 to 2000, the most recent data available at the time of the study. The findings of the ZIP Code screening investigation, which evaluated all types of cancer, both individually and combined, among males and females separately, were that the number of cancer cases diagnosed were not statistically different from the number of cancer cases expected for any particular type of cancer, or total cancers, among males or females in the study area. A copy of the NYS DOH's 2003 Cancer Incidence ZIP Code Study is included as Attachment C.

More recent ZIP Code level data are available on NYS DOH's website for the four most frequently occurring types of cancer: lung/bronchus, colo-rectal, prostate and breast. The data for 1999-2003 show that all types of cancer are within the 15 to 49% above or below the expected range for males and females, except for lung cancer, which is 50 to 100% above expected for males and females in ZIP Code 12828. This elevation of lung cancer in ZIP Code 12828 is noted in your letter to ATSDR. For the 12839 ZIP Code, which also includes a part of the area of

concern, lung cancer is 15 to 49% above expected for males and 15 to 50% below expected for females. The ZIP Code cancer incidence comparisons are for an area much larger than the area of concern, and individual risk factors, such as tobacco exposures, are not taken into account in these comparisons. As described below, however, NYS DOH researchers are planning to look at all types of cancer for a small population near the General Electric Fort Edward plant where exposures are likely to have occurred from drinking contaminated well water prior to being connected to public water in the early 1980's. This past exposure history and plans for assessing cancer are described below.

B. NYS DOH VOC Exposure Registry: Health Statistics Review Project

The VOC Registry project identifies areas in New York State where exposures to VOCs in drinking water or indoor air, from landfills, industrial sites, spills, or other sources, for example, have been documented. The VOC Registry seeks to gain knowledge about the health risks that may be associated with low-level exposures to VOCs in drinking water or indoor air. As part of the VOC Exposure Registry Health Statistics Review project, the NYS DOH is in the process of evaluating cancer and birth outcomes (low weight births and birth defects) for individuals who may have been exposed to VOCs from contamination historically present in a limited number of private drinking water wells in the Fort Edward area near the General Electric Fort Edward facility. In the early 1980's, elevated concentrations of VOCs (primarily 1,1,1-trichloroethane and trichloroethene) were detected in 21 private residential drinking water wells south of the General Electric Fort Edward facility, primarily west of Broadway. Herbicide contamination, not associated with the General Electric Fort Edward facility, and/or PCB contamination were detected in 20 private residential drinking water wells south and primarily east of the General Electric Fort Edward facility. Public water was supplied to the affected properties.

The Health Statistics Review Project uses existing records to evaluate potential health effects in this potentially exposed population, to determine if particular health outcomes are occurring at a higher, lower, or about the same level as expected in comparison to the general population of New York State. Additional information pertaining to a health statistics review is provided on the NYS DOH information sheet included as Attachment D. Given the relatively small number of individuals who may have been exposed to VOC contamination through impacted private drinking water wells in these Fort Edward households, this specific investigation of cancer and birth outcomes will likely not yield statistically significant findings. For this reason, the VOC Exposure Registry Project will combine health outcome data for populations with similar exposures to better assess potential health effects within a larger exposed population. The currently underway NYS DOH VOC Exposure Registry Health Statistics Review project is anticipated to be completed in 2010.

C. NYS DOH VOC Exposure Registry In-Depth Health Outcomes Review

In addition, NYS DOH is seeking information for conducting a more in-depth health outcomes review for the residents of homes in Fort Edward where private drinking water wells showed contamination in the early 1980's. NYS DOH researchers have compiled a list of owners of the

homes, going back in time to the 1950's. The next steps are currently in the planning stage. We are seeking to complete a list of residents of the previously affected homes, and will seek information from birth records on adverse birth outcomes such as low birth weight and birth defects, from death records on causes of death, and from the NYS Cancer Registry on cancer diagnoses. This planned review differs from the health statistics review project described above. The health statistics review project will evaluate adverse birth outcomes and cancers diagnosed among Fort Edward area residents from approximately 1980 to the present (or most recent data), while the in-depth review will attempt to evaluate individual health outcome information for previous residents of the houses, even if they have moved, and will seek health outcome information for years prior to 1980 (as data are available) through the present (or most recent data). These VOC Exposure Registry projects have been discussed in various settings with Fort Edward residents and interested stakeholders.

CONCLUSIONS

The General Electric off-site TCE soil vapor plume has been investigated and delineated. Site-related VOCs were detected in only a few of the 62 structures sampled and TCE was not detected in the indoor air of any of the residences sampled at a concentration that exceeds the NYS DOH air guideline for TCE (5 mcg/m³). Given the concentrations of TCE detected (5.4 mcg/m³ and 5.9 mcg/m³) in the indoor air of two commercial structures, the likelihood of health effects associated with exposure to TCE at the measured concentrations is low. Installation of soil vapor mitigation systems has been and continues to be offered for all structures which overlie the delineated TCE soil vapor plume, although structure sampling did not indicate that indoor air of structures has been significantly impacted by TCE through soil vapor intrusion. Therefore, soil vapor potentially affected from the site poses no apparent public health hazard. A description of the ATSDR Health Hazard Categories is provided as Attachment E.

Public health assessment activities have been completed and are being performed by NYS DOH to evaluate health outcomes in the affected Fort Edward soil vapor plume community. NYS DOH researchers have noted the elevation of lung cancer among males and females in ZIP Code 12828 for the years 1999-2003, mentioned in your letter. This elevation is for a ZIP Code that is much larger than the area of concern near the General Electric facility in Fort Edward, and this type of cancer data review does not take into account possible individual risk factors such as smoking. A study of all types of cancer for the specific area where exposures through contaminated drinking water occurred in the past, from private wells, is underway as part of the NYS DOH VOC Exposure Registry. NYS DOH has provided information about health outcome research and environmental investigation and remediation activities to the Fort Edward community during numerous public meetings and public availability sessions. Additionally, NYS DOH continues to work with community members to address specific concerns pertaining to the soil vapor intrusion investigation, operation of their soil vapor mitigation systems etc.

RECOMMENDATIONS

The NYS DOH and ATSDR recommend that on-going activities with respect to remedial efforts

at the General Electric Fort Edward facility, including continued groundwater migration control and groundwater quality monitoring, be continued. Additionally, it is recommended that the existing plan for long-term operation, maintenance and monitoring of the vapor mitigation systems continue to be implemented under the oversight of the NYS DEC and NYS DOH. The health outcome evaluations that are planned and underway, as described above, are appropriate.

PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan (PHAP) for the off-site TCE soil vapor plume area associated with the site describes the actions to be taken by ATSDR and/or NYS DOH. Actions already taken have been discussed in this letter. The public health actions to be implemented by ATSDR and/or NYS DOH are as follows:

1. NYS DOH will evaluate cancer and birth outcomes in the Fort Edward population where exposures through contaminated private drinking water wells likely occurred in the past. These evaluations will assess potential health effects using a health statistics review approach, as for other VOC registry sites, that includes cancers and adverse birth outcomes diagnosed while people were living in these homes from 1980 to 2005. An additional, more in-depth evaluation will gather information about residents of these homes going back further in time, and will seek information about cancer and adverse birth outcomes that these people experienced over a longer time period, even if they moved out of these residences. The findings of these reviews, will be shared with participants and communicated to the public.
2. NYS DOH will continue to provide information about health outcome research and environmental investigation and remediation activities to the Fort Edward community using appropriate venues, such as public meetings and public availability sessions.
3. NYS DOH and NYS DEC will continue to work with Fort Edward community members to address specific concerns pertaining to the soil vapor intrusion investigation and the operation of their soil vapor mitigation systems.

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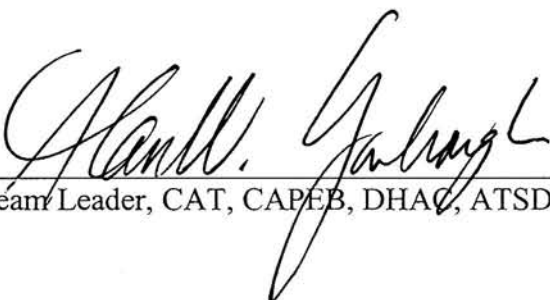
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CERTIFICATION

The Letter Health Consultation for the GE-Fort Edward petition site e was prepared by the New York State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated. Editorial review was completed by the cooperative agreement partner.


Technical Project Officer, CAT, CAPEB, DHAC

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


Team Leader, CAT, CAPEB, DHAC, ATSDR

ATTACHMENTS

Attachment A: NYS DOH Fact Sheet: Soil Vapor Intrusion: Frequently Asked Questions

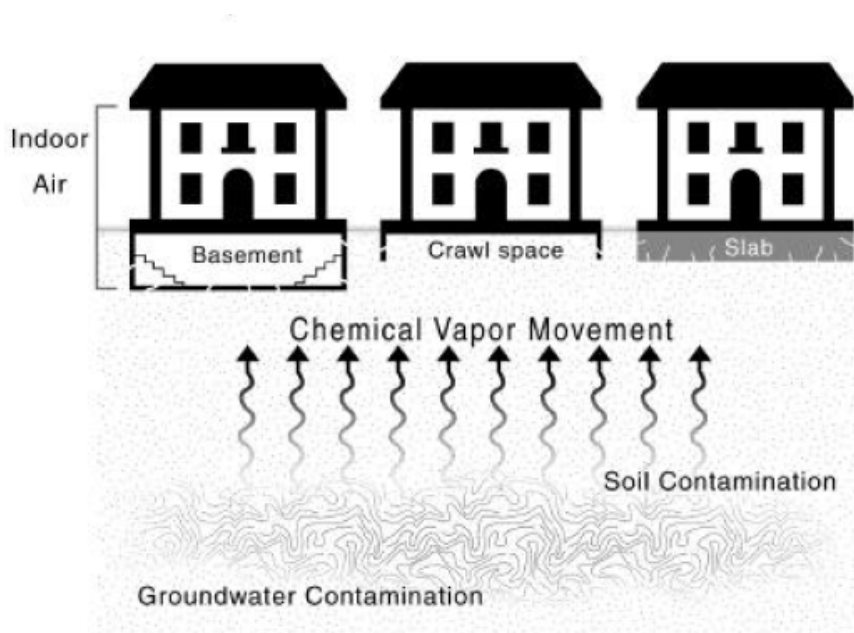
What is soil vapor intrusion?

The phrase "soil vapor intrusion" refers to the process by which volatile chemicals move from a subsurface source into the indoor air of overlying buildings.

Soil vapor, or soil gas, is the air found in the pore spaces between soil particles. Because of a difference in pressure, soil vapor enters buildings through cracks in slabs or basement floors and walls, and through openings around sump pumps or where pipes and electrical wires go through the foundation. Heating, ventilation or air-conditioning systems may create a negative pressure that can draw soil vapor into the building. This intrusion is similar to how radon gas seeps into buildings.

Soil vapor can become contaminated when chemicals evaporate from subsurface sources and enter the soil vapor. Chemicals that readily evaporate are called "volatile chemicals." Volatile chemicals include volatile organic compounds (VOCs). Subsurface sources of volatile chemicals may include contaminated soil and groundwater, or buried wastes. If soil vapor is contaminated, and enters a building as described above, indoor air quality may be affected.

When contaminated vapors are present in the zone directly next to or under the foundation of the building, vapor intrusion is possible. Soil vapor can enter a building whether it is old or new, or whether it has a basement, a crawl space, or is on a slab (as illustrated in the figure).



[Source: United States Environmental Protection Agency, Region 3]

How am I exposed to chemicals through soil vapor intrusion?

Humans can be exposed to soil vapor contaminated with volatile chemicals when vapors from beneath a building are drawn through cracks and openings in the foundation and mix with the indoor air. Inhalation is the route of exposure, or the manner in which the volatile chemicals actually enter the body, once in the indoor air.

Current exposures are when vapor intrusion is documented in an occupied building. *Potential* exposures are when volatile chemicals are present, or are accumulating, in the vapor phase beneath a building, but have not affected indoor air quality. Potential exposures also exist when there is a chance that contaminated soil vapors may move to existing buildings not currently affected or when there is a chance that new buildings can be built over existing subsurface vapor contamination. Both current and potential exposures are considered when evaluating soil vapor intrusion at a site that has documented subsurface sources of volatile chemicals.

In general, exposure to a volatile chemical does not necessarily mean that health effects will occur. Whether or not a person experiences health effects depends on several factors, including inhalation exposure, the length of exposure (short-term or acute versus long-term or chronic), the frequency of exposure, the toxicity of the volatile chemical, and the individual's sensitivity to the chemical.

What types of chemicals associated with environmental contamination may be entering my home via soil vapor intrusion?

Volatile organic compounds, or VOCs, are the most likely group of chemicals found in soil vapor, and which can move through the soil and enter buildings. Solvents used for dry cleaning, degreasing and other industrial purposes (e.g., tetrachloroethene, trichloroethene, 1,1,1-trichloroethane and Freon 113) are examples of VOCs. Examples of petroleum-related VOCs from petroleum spills are benzene, toluene, ethyl benzene, xylenes, styrene, hexane and trimethylbenzenes.

Is contaminated soil vapor the only source of volatile chemicals in my indoor air?

No. Volatile chemicals are also found in many household products. Paints, paint strippers and thinners, mineral spirits, glues, solvents, cigarette smoke, aerosol sprays, mothballs, air fresheners, new carpeting or furniture, hobby supplies, lubricants, stored fuels, refrigerants and recently dry-cleaned clothing all contain VOCs. Household products are often more of a source of VOCs in indoor air in homes than contaminated soil vapor.

Indoor air may also become affected when outdoor air containing volatile chemicals enters your home. Volatile chemicals are present in outdoor air due to their widespread use. Gasoline stations, dry cleaners, and other commercial/industrial facilities are important sources of VOCs to outdoor air.

What should I expect if soil vapor intrusion is a concern near my home?

If you live near a site that has documented soil, groundwater and/or soil vapor contaminated with volatile chemicals, you should expect that the potential for vapor intrusion is being, or has been, investigated. You may be contacted by the site owner or others working on the cleanup with information about the project. Your cooperation and consent would be requested before any testing/sampling would be done on your property. You may ask the person contacting you any questions about the work being done. You can also contact the NYSDOH's project manager for the site at 1-800-458-1158 (extension 2-7850) for additional information.

How is soil vapor intrusion investigated at sites contaminated with volatile chemicals?

The process of investigating soil vapor intrusion typically requires more than one set of samples to determine the extent of vapor contamination. Furthermore, four types of environmental samples are collected: soil vapor samples, sub-slab vapor samples, indoor air samples and outdoor air (sometimes referred to as "ambient air") samples.

Soil vapor samples are collected to characterize the nature and extent of vapor contamination in the soil in a given area. They are often collected before sub-slab vapor and/or indoor air samples to help identify buildings or groups of buildings that need to be sampled. Soil vapor samples are used to determine the *potential* for human exposures. *Soil vapor* samples are not the same as *soil* samples.

Sub-slab vapor samples are collected to characterize the nature and extent of vapor contamination in the soil immediately beneath a building with basement foundations or a slab. Sub-slab vapor results are used to determine the potential for *current* and *future* human exposures. For example, an exposure could occur in the future if cracks develop in the building's foundation or changes in the operation of the building's heating, ventilation or air-conditioning system are made that make the movement of contaminated soil vapor into the building possible.

Indoor air samples are collected to characterize the nature and extent of air contamination within a building. Indoor air sample results help to evaluate whether there are *current* human exposures. They are also compared to sub-slab vapor and outdoor air results to help determine where volatile chemicals may be coming from (indoor sources, outdoor sources, and/or beneath the building).

Outdoor air samples are collected to characterize site-specific background air conditions. Outdoor air results are used to evaluate the extent to which outdoor sources, such as automobiles, lawn mowers, oil storage tanks, gasoline stations, commercial/industrial facilities, and so forth, may be affecting indoor air quality.

What should I expect if indoor air samples are collected in my home?

You should expect the following:

- Indoor air samples are generally collected from the lowest-level space in a building, typically a basement, during the heating season. Indoor air samples may also be collected from the first floor of living space. Indoor air is believed to represent the greatest exposure potential with respect to soil vapor intrusion.
- Sub-slab vapor and outdoor air samples are usually collected at the same time as indoor air samples to help determine where volatile chemicals may be coming from (indoor sources, outdoor sources, and/or beneath the building).
- More limited sampling may be performed outside of the heating season. For example, sub-slab vapor samples without indoor air or outdoor air samples may be collected to identify buildings and areas where comprehensive sampling is needed during the heating season.
- An indoor air quality questionnaire and building inventory will be completed. The questionnaire includes a summary of the building's construction characteristics; the building's heating, ventilation and air-conditioning system operations; and potential indoor and outdoor sources of volatile chemicals. The building inventory describes products present in the building that might contain volatile chemicals. In addition, we take monitoring readings from a real-time organic vapor meter (also known as a photoionization detector or PID). The PID is an instrument that detects many VOCs in the air. When indoor air samples are collected, the PID is used to help determine whether

products containing VOCs might be contributing to levels that are detected in the indoor air.

What happens if soil vapor contamination or soil vapor intrusion is identified during investigation of a site?

Depending on the investigation results, additional sampling, monitoring or mitigation actions may be recommended. Additional sampling may be performed to determine the extent of soil vapor contamination and to verify questionable results. Monitoring (sampling on a recurring basis) is typically conducted if there is a significant potential for vapor intrusion to occur should building conditions change. Mitigation steps are taken to minimize exposures associated with soil vapor intrusion. Mitigation may include sealing cracks in the building's foundation, adjusting the building's heating, ventilation and air-conditioning system to maintain a positive pressure to prevent infiltration of subsurface vapors, or installing a sub-slab depressurization system beneath the building.

What is a sub-slab depressurization system?

A sub-slab depressurization system, much like a radon mitigation system, essentially prevents vapors beneath a slab from entering a building. A low amount of suction is applied below the foundation of the building and the vapors are vented to the outside (see illustration). The system uses minimal electricity and should not noticeably affect heating and cooling efficiency. This mitigation system also essentially prevents radon from entering a building, an added health benefit. The party responsible for cleaning up the source of the soil vapor contamination is usually responsible for paying for the installation of this system. If no responsible party is available, New York State will install the system. Once the contamination is cleaned up, the system should no longer be needed. In areas where radon is a problem, the NYSDOH recommends that these systems remain in place permanently.

What else can I do to improve my indoor air quality?

Household products and other factors, such as mold growth, carbon monoxide, and radon, can degrade the quality of air in your home. Consider the following tips to improve indoor air quality:

- Be aware of household products that contain VOCs. Do not buy more chemicals than you need at a time.
- Store unused chemicals in tightly-sealed containers in a well-ventilated location, preferably away from the living space in your home.
- Keep your home properly ventilated. Keeping it too air-tight may promote build up of chemicals in the air, as well as mold growth due to the build up of moisture.
- Fix all leaks promptly, as well as other moisture problems that encourage mold growth.
- Make sure your heating system, hot water, dryer and fireplaces are properly vented and in good condition. Have your furnace or boiler checked annually by a professional.
- Test your home for radon; take actions to reduce radon levels if needed.
- Install carbon monoxide detectors in your home; take immediate actions to reduce carbon monoxide levels if needed.

Where can I get more information?

For additional information about soil vapor intrusion, contact the NYSDOH's Bureau of Environmental Exposure Investigation at 1-800-458-1158 (extension 2-7850).

Attachment B: NYS DOH Fact Sheet: Trichloroethene (TCE) in Indoor and Outdoor Air



Trichloroethene (TCE) in Indoor and Outdoor Air

What is trichloroethene?

Trichloroethene is a manufactured, volatile organic chemical. It has been used as a solvent to remove grease from metal. Trichloroethene has also been used as a paint stripper, adhesive solvent, as an ingredient in paints and varnishes, and in the manufacture of other organic chemicals. Other names for trichloroethene include TCE and trichloroethylene. TCE is a common name for trichloroethene and will be used for the rest of this fact sheet.

TCE is a clear, colorless liquid, and has a somewhat sweet odor. It is non-flammable at room temperature and will evaporate into the air.

How can I be exposed to TCE?

People can be exposed to TCE in air, water and food. Exposure can also occur when TCE, or material containing TCE, gets on the skin.

TCE gets into the air by evaporation when it is used. TCE can also enter air and groundwater if it is improperly disposed or leaks into the ground. People can be exposed to TCE if they drink groundwater contaminated with TCE, and if the TCE evaporates from the contaminated drinking water into indoor air during cooking and washing. They may also be exposed if TCE evaporates from the groundwater, enters soil vapor (air spaces between soil particles), and migrates through building foundations into the building's indoor air. This process is called "soil vapor intrusion."

How can TCE enter and leave my body?

If people breathe air containing TCE, some of the TCE is exhaled unchanged from the lungs and back into the air. Much of the TCE gets taken into the body through the lungs and is passed into the blood, which carries it to other parts of the body. The liver changes most of the TCE taken into the blood into other compounds, called breakdown products, which are excreted in the urine in a day or so. However, some of the TCE and its breakdown products can be stored in the fat or the liver, and it may take a few weeks for them to leave the body after exposure stops.

What kinds of health effects are caused by exposure to TCE in air?

In humans, long term exposure to workplace air containing high levels of TCE (generally greater than about 40,000 micrograms of TCE per cubic meter of air (mcg TCE/m^3)) is linked to effects on the central nervous system (reduced scores on tests evaluating motor coordination, nausea, headaches, dizziness) and irritation of the mucous membranes. Exposure to higher levels (generally greater than 300,000 mcg TCE/m^3) for short periods of time can irritate the eyes and respiratory tract, and can cause effects on the central nervous system, including dizziness, headache, sleepiness, nausea, confusion, blurred vision and fatigue. In laboratory animals, exposure to high levels of TCE has damaged the central

nervous system, liver and kidneys, and adversely affected reproduction and development of offspring. Lifetime exposure to high levels of TCE has caused cancer in laboratory animals.

Some studies of people exposed for long periods of time to high levels of TCE in workplace air, or elevated levels of TCE in drinking water, show an association between exposure to TCE and increased risks for certain types of cancer, including cancers of the kidney, liver and esophagus, and non-Hodgkin's lymphoma. One study showed an association between elevated levels of TCE in drinking water and effects on fetal development. Other studies suggest an association between workplace TCE exposure and reproductive effects (alterations in sperm counts) in men. We do not know if the effects observed in these studies are due to TCE or some other possible factor (for example, exposure to other chemicals, smoking, alcohol consumption, socioeconomic status, lifestyle choices). Because all of these studies have limitations, they only suggest, but do not prove, that exposure to TCE can cause cancer in humans and can cause developmental and reproductive effects as well.

What are background levels of TCE for indoor and outdoor air?

The exact meaning of background depends on how a study selected sampling locations and conditions. Generally, sampling locations are selected to be not near known sources of volatile chemicals (for example, a home not near a chemical spill, a hazardous waste site, a dry cleaner, or a factory). In some studies, the criteria for sampling indoor air may require checking containers of volatile chemicals to make sure they are tightly closed or removing those products before samples are taken. The New York State Department of Health (NYSDOH) has used several sources of information on background levels of TCE in indoor and outdoor air. One NYSDOH study of residences heated by fuel oil found that background concentrations of TCE in indoor and outdoor air are less than 1 mcg/m³ in most cases. In this study, most homes did not have obvious sources of volatile organic compounds (VOCs). In those homes with VOC sources, samples were taken and the data are included in the study.

What are sources of TCE in air in homes?

TCE is found in some household products, such as glues, adhesives, paint removers, spot removers, rug cleaning fluids, paints, metal cleaners and typewriter correction fluid. These and other products could be potential sources for TCE in indoor air.

Another source of TCE in indoor air is contaminated groundwater that is used for household purposes. Common use of water, such as washing dishes or clothing, showering, or bathing, can introduce TCE into indoor air through volatilization from the water.

TCE may also enter homes through vapor intrusion as described on page 1 in the question "How can I be exposed to TCE?".

What is the level of TCE that people can smell in the air?

The reported odor threshold (the air concentration at which a chemical can be smelled) for TCE in air is about 540,000 mcg TCE/m³. At this level, most people would likely be able to start smelling TCE in air. However, odor thresholds vary from person to person. Some people may be able to detect TCE at levels lower than the reported odor threshold and some people may only detect it at concentrations higher than the reported odor threshold.

If I can't smell TCE in the air, am I being exposed?

Just because you can't smell TCE doesn't mean there is no exposure. Sampling and testing is the best way to know if TCE is present.

What is the NYSDOH's guideline for TCE in air?

After a review of the toxicological literature on TCE, the NYSDOH set a guideline of 5 mcg/m³ for TCE in air. This level is lower than the levels that have caused health effects in animals and humans. In setting this level, the NYSDOH also considered the possibility that certain members of the population (infants, children, the elderly, and those with pre-existing health conditions) may be especially sensitive to the effects of TCE.

The guideline is not a bright line between air levels that cause health effects and those that do not. The purpose of the guideline is to help guide decisions about the nature of the efforts to reduce TCE exposure. Reasonable and practical actions should be taken to reduce TCE exposure when indoor air levels are above background, even when they are below the guideline of 5 mcg/m³. The urgency to take actions increases as indoor air levels increase, especially when air levels are above the guideline. In all cases, the specific corrective actions to be taken depend on a case-by-case evaluation of the situation. The goal of the recommended actions is to reduce TCE levels in indoor air to as close to background as practical.

Should I be concerned about health effects if I am exposed to air levels slightly above the guideline? Below the guideline?

The possibility of health effects occurring is low even at air levels slightly above the guideline. In addition, the guideline is based on the assumption that people are continuously exposed to TCE in air all day, every day for as long as a lifetime. This is rarely true for most people who are likely to be exposed for only part of the day and part of their lifetime.

How can I limit my exposure to TCE?

TCE can get into indoor air through household sources (for example, commercial products that contain TCE), from contaminated drinking water, or by vapor intrusion. As with any indoor air contaminant, removing household sources of TCE will help reduce indoor air levels of the chemical. Maintaining adequate ventilation will also help reduce the indoor air levels of TCE. If TCE is in the indoor air as a result of vapor intrusion, a sub-slab depressurization system, much like a radon mitigation system, will reduce exposures by minimizing the movement of vapors that are beneath a slab into a building. If TCE is in the water supply of a house, a carbon filter on the water supply to remove the TCE will minimize ingestion and inhalation exposures.

Is there a medical test that can tell me whether I have been exposed to TCE?

TCE can be measured in people's breath soon after they are exposed. TCE and some of its breakdown products can be measured in the urine and blood. These tests are not routinely available at a doctor's office. Urine and blood tests can indicate that you may have recently (within the last few days) been exposed to a large amount of the chemical. However, they cannot tell you the source of the exposure. Some of the breakdown products of TCE can also be formed from other chemicals.

When should my children or I see a physician?

If you believe you or your children have symptoms that you think are caused by TCE exposure, you or your children should see a physician. You should tell the physician about the symptoms and about when, how and for how long you think you and/or your children were exposed to TCE.

What is the NYSDOH doing to educate physicians about TCE?

The NYSDOH maintains an Infoline (1-800-458-1158) that physicians or the public can call when they have questions related to various types of chemical exposures. A certified occupational and environmental health nurse is available to triage physicians' questions and to direct their inquiries to the appropriate staff member.

The NYSDOH also works closely with the federal Agency for Toxic Substances and Disease Registry (ATSDR), making their educational materials available to physicians upon request. One of these items is an environmental medicine case study entitled "Trichloroethylene (TCE) Toxicity," which provides the opportunity for physicians to earn continuing medical education credits from the Centers for Disease Control and Prevention. Physicians who would like to complete this training are encouraged to contact the NYSDOH for more information. A printed copy can be mailed to the physician or it can be accessed on-line at the following web site <http://www.atsdr.cdc.gov/HEC/CSEM/tce/index.html>.

Where can I get more information?

If you have any questions about the information in this fact sheet or would like to know more about TCE, please call the NYSDOH at 1-800-458-1158 or write to the following address:

New York State Department of Health
Bureau of Toxic Substance Assessment
Flanigan Square, 547 River Street
Troy, NY 12180-2216

Attachment C: 2003 NYS DOH Cancer Incidence Zip Code Study

**REVIEW OF CANCER INCIDENCE IN ZIP CODES 12828 AND 12839
FORT EDWARD, WASHINGTON AND SARATOGA COUNTIES, NEW YORK, 1996-2000**

BACKGROUND

In May 2003, the Cancer Surveillance Program of the Bureau of Chronic Disease Epidemiology and Surveillance, New York State Department of Health, received a request for an investigation of cancer incidence in Fort Edward, Washington County, New York. At that time, there was a concern about the incidence of cancer, particularly brain cancers, in the area. A ZIP Code screening study of cancer in ZIP Codes 12828 and 12839 was conducted for the time period 1996-2000, the most recent data available (a map is attached). This report describes the findings of the Cancer Surveillance Program's review for that area.

METHODS

A summary of the methods used to conduct the investigation is attached. In a ZIP Code screening study, people living in the selected ZIP Codes who were diagnosed with cancer during a five-year period are identified through a review of records maintained by the New York State Cancer Registry. The number of people diagnosed with cancer is then compared with the number of people we would expect to find given the population size and age and sex distribution of the area. Comparisons are conducted for all types of cancer combined, and for the most common types of cancer in males and females.

FINDINGS

The attached table shows that the total number of males with cancer was not statistically significantly different from the number expected (280 observed, 266 expected). The small difference seen is consistent with random variation. For any of the individual sites of cancer, except for stomach, numbers of cancer cases actually diagnosed were not statistically significantly different from the numbers expected. The number of cases of stomach cancer was statistically significantly less than expected but is not included on the table because of a small number of cases. (To protect patient confidentiality, we will not be able to disclose the exact numbers of individuals identified with specific types of cancer with fewer than six observed cases.) The total number of females with cancer was not statistically significantly different from the number expected (283 observed, 275 expected). The small difference seen is consistent with random variation. The numbers of cancer cases actually diagnosed were not statistically significantly different from the numbers expected for any particular type of cancer found among females in the study area.

Cancer of the Brain and Other Parts of the Nervous System

There were fewer than six males and fewer than six females diagnosed with cancer of the brain and other parts of the nervous system in the study area. For males and females combined, nine cases of these cancers were diagnosed. This was similar to the eight cases that were expected. Characteristics of these cancer diagnoses were examined. The ages of the males and females ranged from childhood to the 70s. Most of the individuals were in their 60s or older. The types of cancers diagnosed were typical for the age at which they were diagnosed. The number of individuals diagnosed with these cancers in each year of the study was stable. The residence of each of the individuals at the time of their cancer diagnosis was marked on a street map of the study area. The residences were located throughout the study area in both ZIP Codes with no obvious concentration in any section of the study area.

GENERAL CANCER INFORMATION

Background information on cancer of the brain and well as cancer in general is attached. Cancer, unfortunately is a common disease. One of every two men and one of every three women will develop cancer during his/her lifetime. The number of people with cancer is increasing in most communities because more people are living to the older ages, where cancer is more common.

For additional questions regarding this investigation, please contact Ms. Aura L. Weinstein, New York State Department of Health, Cancer Surveillance Program, at (518) 474-2354.

12/04

**BUREAU OF CHRONIC DISEASE EPIDEMIOLOGY AND SURVEILLANCE
NEW YORK STATE DEPARTMENT OF HEALTH**

Observed and Expected Numbers of Incident Cancer Cases,
ZIP Codes 12828 and 12839
Saratoga and Washington Counties, New York, 1996-2000
New York State exclusive of New York City Standard 1996-2000

SITES (ICD-O-2) ^a	MALES		FEMALES	
	Observed	Expected	Observed	Expected
All Sites ^d	280	266	283	275
Oral Cavity / Pharynx	10	7	6	4
Esophagus	6	4	– ^e	– ^e
Colorectal	32	33	33	35
Pancreas	10	6	11	7
Lung / Bronchus	56	43	43	37
Female Breast			79	81
Cervix uteri			6	5
Corpus Uterus / Uterus NOS			17	16
Ovary			13	11
Prostate	67	76		
Urinary Bladder (including in situ)	22	20	9	8
Kidney / Renal Pelvis	11	8	7	5
Lymphomas	13	13	18	12
Leukemias	10	8	5	6

^aClassification of site is based on ICD for Oncology, 2nd Edition.

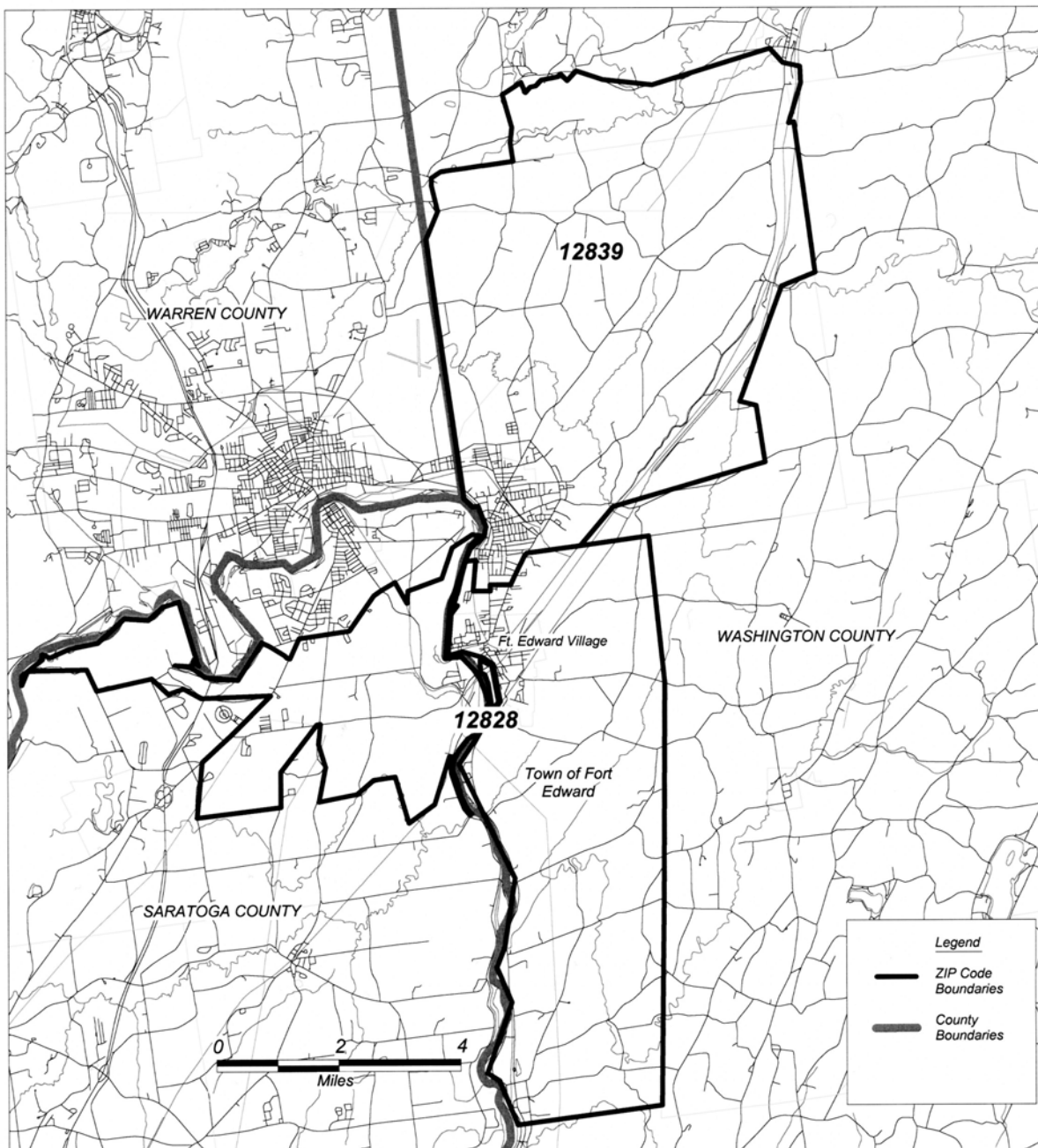
^bData were obtained from the New York State Cancer Registry (database as of June 2004).

^cExpected numbers are based on standard cancer incidence rates by age and sex for New York State, exclusive of New York City. Standard rates are applied to the total 1996-2000 study population (47,826 males, 51,492 females) to obtain expected numbers of cases.

^dIncludes observed and expected numbers of cases at sites of cancer not listed below.

^eThe number of cases is not shown to protect patient confidentiality.

ZIP CODES 12828 AND 12839
FORT EDWARD STUDY AREA
WASHINGTON AND SARATOGA COUNTIES, NEW YORK



**New York State Department of Health
Cancer Surveillance Program
Methods for Cancer Incidence Studies of Small Areas**

Study Plan:

Small area studies are designed to determine if the number of cancers occurring among residents of a particular area is unusual. To do this, the number of residents of the study area diagnosed with cancer is compared to the number expected, based on the cancer rates for New York State, excluding New York City.

Identifying Cases (Observed):

Residents of the study area who were diagnosed with cancer between 1996 and 2000 are identified from the New York State Cancer Registry. As required by New York State law, the Cancer Registry contains information on all individuals diagnosed with cancer in the State. The Registry receives this information from hospitals, death certificates and various other sources. Cancer Registry files are continuously updated and all of the information received is combined to provide a complete and accurate picture of a person's cancer diagnosis.

Calculating Expected Cases (Expected):

To determine if the number of residents diagnosed with cancer in the study area is unusual, we calculate the number of cancers that would be expected in the area. This calculation takes into account the number of residents in the area (population), including their age and sex. In this study, the expected number of cases was calculated by multiplying the cancer incidence rates, by age and sex, for New York State (excluding New York City) by the estimated population of the study area, by age and sex. The study area population for 1996 through 2000 was estimated using the U.S. Census and information from commercial vendors.

Types of Cancer (Anatomic Sites) Studied:

We examined the anatomic sites (location in the body) of cancer that the requestor was concerned about. The number of cases for some anatomic sites of cancer may not appear on the attached table in order to protect the privacy of individuals reported to the New York State Cancer Registry.

Statistical Testing:

We compared the actual number of cancers in the study area to the expected number of cancers. Sometimes a difference between the observed number of cancers and the expected number occurs due to chance. We used a statistical test to determine the probability that the actual number of cancers was larger or smaller than the number expected due only to chance. We considered this difference to be statistically significant if there was a low probability that the difference was due to chance (less than 5%).

Study Limitations:

There are a number of things that should be kept in mind when looking at a study of this type. These include:

Effects of Chance (Multiple Comparisons): Approximately one out of every 20 statistical tests (5%) done in this type of study will be statistically significant due to chance alone. In this study, a large number of comparisons were made between expected and observed cancers for different anatomic sites for males and for females. When many statistical tests are done, the probability is high that at least one statistically significant difference may occur entirely by chance. It is not always possible to determine if a significant difference is due to chance alone.

Small Numbers of Cancer Cases (Statistical Power): In an area that has few cancer cases, it is difficult to detect an unusual difference between the number of cancers observed and the number expected. A large number of observed or expected cancers is required before we can be certain that what we observe is statistically different from what is expected. Our ability to detect this difference is called statistical power.

Migration (Residence): Migration is the movement of people in or out of the study area. For example, people who lived in the study area for a long time and move away shortly before they are diagnosed with cancer are not included in the study. People who lived elsewhere but moved into the study area shortly before their diagnosis are included in the study. Therefore, migration influences our ability to determine if living in the study area increases or decreases an individual's risk of getting cancer.

Populations/ZIP Code areas: As indicated in the section labeled "Calculating Expected Cases", an estimated population of the study area is used to calculate the number of expected cases. The population is estimated based on information from the U.S. Census and data from commercial vendors, incorporating information on births, deaths and migration. We believe the population estimates to be reasonably accurate. However, because they are estimates and the actual number of residents in the study area may differ, the expected number of cases is also an estimated number.

In a few cases, ZIP Code populations were combined with those of adjacent ZIP codes because of changes in mail delivery patterns during the study period. Also, when a ZIP Code had no mail delivery area (e.g. post office boxes only), it was combined with an adjacent ZIP Code.

Interpretation: Studies such as the one done here cannot determine a cause-and-effect relationship. Cancer surveillance investigations can only tell us about the pattern of cancer in a particular study area. They cannot tell us that living in the study area increases or decreases a person's risk for getting cancer. Findings that are considered to be "statistically significant" may provide leads for further investigation of the cancer experience of a community.



What is cancer?

Cancer is not a single disease, but more than 100 different diseases. It is characterized by the abnormal growth of cells in the body.

The body is made up of billions of cells. These cells reproduce by dividing. Through this process the body grows and repairs itself. Sometimes, a cell begins dividing abnormally and tumors form. Tumors may be *benign* or *malignant*. Malignant tumors (cancers) can spread to other tissues or organs nearby or to other parts of the body. This is called *metastasis*. Cancers grow at different speeds. Some may grow very quickly; others may grow slowly over a period of many years.

Some cancers are easily cured, others are more difficult to treat. This depends largely on the place in the body where the cancer cells grow, how large the tumor is when it is first found, and if it has spread. Doctors usually consider tumors that start in different parts of the body (not those that spread, but new tumors) to be different diseases. Generally, each type of cancer has its own risk factors, symptoms, outlook for cure, and methods of treatment.

What causes cancer?

No one knows for sure why a normal cell becomes a cancer cell. Many causes of cancer have been identified. Sometimes there is a family history of cancer. Scientists agree that people can get cancer through repeated long-term contact with *carcinogens*. These include tobacco, sunlight, X-rays, and certain chemicals that may be found in the air, water, food, drugs and workplace. Our personal habits and lifestyle may contribute to most cancers. It is believed that about 30% of cancer deaths are due to tobacco. Some cancer risk may be related to diet.

How soon after exposure to a carcinogen does the cancer appear?

Cancers develop slowly in people. They usually appear five to 40 years after exposure to a carcinogen. For example, cancer of the lung may not occur until 30 years after a person starts smoking. This long *latency* period is one of the reasons it is difficult to determine what causes cancer in humans.

Who gets cancer?

Cancer is a very common disease. One in three people will be diagnosed with cancer at some time in their life. Eventually, cancer occurs in three out of every four families. In New York, nearly one in four deaths is due to cancer.

Cancer occurs at all ages, but most often in middle-aged and older people. The number of people diagnosed with cancer has increased over the past 40 years. Most of this is due to the increase in the population and because people are living longer.

The most common cancers diagnosed among men, besides skin, are prostate, lung and colon cancer. Among women, they are cancers of the breast, lung and colon.

Terms
Benign Tumor - An unusual growth of cells that is not cancer. It cannot spread to other parts of the body.
Malignant Tumor - A cancerous tumor. It has the ability to spread to other parts of the body.
Metastasis - Cancer that has spread to another part of the body.
Carcinogen - Something that causes cancer, also known as a cancer causing agent.
Latency - The time between exposure to a cancer causing agent and when a person develops cancer

Tips for Lowering Cancer Risk
Stop smoking or using tobacco of any kind.
Get regular health check-ups.
Eat high-fiber, vitamin rich foods each day (fruits, vegetables, whole grain bread and cereal).
Eat foods low in fat (fruits, vegetables, cereals, lean meat and low-fat dairy products).
Exercise regularly.
Drink alcoholic beverages only in moderation.
Avoid exposure to known cancer causing agents.
Avoid unnecessary X-rays.
Avoid too much sunlight; wear protective clothing and use sunscreen.
Discuss the risk of hormone replacement therapy with your health care provider.
Be aware of health and safety rules at work and follow them.



New York State Department of Health
Information Sheet
Cancer of the Brain and Other Nervous System

What should people know about cancer of the brain and other nervous system?

The brain, spinal cord, *meninges*, *cranial nerves* and other parts of the nervous system are responsible for communication in the body. Together, they control and organize all of the body's functions so that they work together.

True brain cancers usually do not spread outside of the nervous system. However, many other types of cancer (such as lung cancer and breast cancer) frequently spread to the brain. This is called *metastasis*. This fact sheet discusses only those cases of cancer that began in the brain and other nervous system. Cases of cancer that began in other parts of the body and spread to the brain are not discussed here. Benign (non-cancerous) brain tumors are also not included.

Each year, more than 700 men and about 640 women in New York are diagnosed with cancer of the brain and central nervous system. Almost 400 men and 350 women die from this disease each year in New York State.

Who gets cancer of the brain and other nervous system?

Cancers of the brain occur in people of all ages, but are more frequent in two age groups, children under the age of 15, and adults 65 years of age and older. Cancers of the spinal cord are less common than cancer of the brain. Although they also affect people of all ages, cancer of the spinal cord occurs most frequently in young and middle-age adults. Cancers of the brain and other nervous system are also more common in whites than in African-Americans.

What causes cancer of the brain and other nervous system?

Little is known about the causes of cancer of the brain and other nervous system. About 5% of brain tumors are due to hereditary factors. People with rare genetic conditions such as Li-Fraumeni cancer family syndrome, tuberous sclerosis, von Recklinghausen's disease (neurofibromatosis type 1), neurofibromatosis type 2, von Hippel Lindau disease and familial polyposis are more likely to get cancer of the brain and other nervous system.

Scientists are investigating whether additional factors may be linked to cancer of the brain and other nervous system. Studies are looking at ionizing radiation, electromagnetic fields, viruses, injuries, diet, chemicals, hormones, and environmental and occupational factors. It is not known whether any of these are associated with cancer of the brain and other nervous system. Much more research is necessary.

What does it mean when something "is associated with" cancer of the brain and other nervous system?

It means that there is a link between the two, but there is no proof of cause and effect. More research needs to be done before we know for certain.

Is the number of people with brain and other nervous system tumors increasing?

The number of people with metastatic brain tumors (those that have spread from another part of the body) is increasing. Cancer patients are living longer, giving cancer cells more time to spread to the brain.

Recent studies suggest that the number of primary brain cancers (those that began in the brain) may be increasing. However, scientists are unsure if this is an actual increase in disease or the result of better methods for diagnosing brain and other nervous system tumors. More research is needed before we can tell if the incidence of brain and other nervous system tumors is truly increasing.

Terms
<i>Meninges</i> - thin layers of tissue that surround and cover the brain.
<i>Cranial Nerves</i> - Twelve pairs of nerves that begin in the brain. Among the functions they control are hearing, smell, vision, taste and eye movement.
<i>Metastasis</i> - when a cancer spreads to other parts of the body forming other malignant tumors it is called metastasis.

Signs and Symptoms of Cancers of the Brain and Other Nervous System
Headaches - may be worse in the morning and improve through the day, rouse a person from sleep, worsen with coughing or exercise or change in body position.
Seizures or convulsions.
Mental changes including problems with memory, speech, reasoning or concentration. Changes in behavior, temper, interests or confusion.
Nausea and vomiting.
Drowsiness.
Vision problems - blurring, double vision.

Attachment D: NYS DOH Health Statistics Reviews Information Sheet



Information Sheet

Health Statistics Reviews

What is a health statistics review?

A health statistics review is an evaluation of information from sources such as birth certificates or hospital records to determine whether health outcomes are occurring at higher, lower, or about the same levels in a particular community compared to other areas in the state. A health statistics review takes into account individual risk factors (such as age and sex) commonly found on health records. A health statistics review may not take into account other individual risk factors not generally found on health records, such as medical history, smoking, genetics and occupational exposures. A health statistics review does not tell us why differences in health outcomes exist and cannot prove whether there is a link between exposures and health outcomes. Rather, a health statistics review may suggest ideas for additional research and could indicate whether a more in-depth study should be considered.

What health outcomes can be examined?

A health statistics review can evaluate cancer, congenital malformations (birth defects), and birth outcomes like low birth weight, preterm births, and male to female sex ratio. The number of individuals with a given health outcome in a community is compared to the number of cases we would expect to see. The number of cases expected for each health outcome takes into account the population size and age and sex distribution of the study area, and is calculated using the appropriate New York State health outcome rates (generally New York State, excluding New York City) for different age groups and genders.

Health Outcomes & Data Availability	
Cancers (all ages)	from 1980
Birth defects	from 1983
Low birth weight, preterm births, and sex ratio	from 1978

Who is included in a review?

Individuals residing in a specific geographic study area during a given time period are included in a review. The time period under review is usually based on what is known about the timing of potential exposures, and the years for which health outcome data are available.

The boundaries of the geographic study area are usually based on the potential for exposure. To calculate the number of expected cases for some health outcomes, information about the age and gender of the individuals living in the area is needed. The best source of this information is the U.S. Census Bureau. For this reason, study areas are generally defined using Census boundaries. While Census boundaries are unlikely to coincide exactly with likely exposure boundaries, the study area boundaries are chosen to capture the potentially exposed area population as closely as possible.

What will the study results mean?

This type of review can identify whether health outcomes in a particular community are occurring at higher, lower, or about the same levels compared to other areas of the state. However, this type of study cannot prove whether there is a link between exposures and health outcomes. While these

reviews are conducted for geographic areas with some documented exposures, exposure data are generally not available at every residence and historical exposure data are usually not available.

This type of review is based on information about where people lived when they were diagnosed with a health outcome. For example, it includes residents who may have been diagnosed with cancer or who gave birth to a child with an adverse birth outcome, even if they lived in the area for a short time and may not have had any type of exposure. Similarly, long-time residents who were potentially exposed and moved away prior to a cancer diagnosis or giving birth to a child with an adverse birth outcome are not included.

Additionally, personal factors that may impact a person's health risk, like smoking, residential or occupational history, and medical history, are not typically reviewed in this type of study. However, if unusual patterns of health outcomes are seen, the health statistics review can provide information to suggest if more rigorous environmental assessment and epidemiological studies should be carried out.

What happens after a health statistics review?

This type of study may help address community concerns about health and the environment. Possible follow-up activities will need to take into consideration the findings of the health statistics review and the feasibility of additional action. For example, additional in-depth studies may not be possible where the exposed population is too small.

When is a health statistics review conducted?

The New York State Department of Health receives requests for health statistics reviews in communities where environmental exposures are known or suspected to have occurred and possibly affected people's health. Decisions about whether a health statistics review is warranted take into account many factors, most importantly whether there are known unusual exposures. The following issues are also considered in deciding whether a health statistics review is warranted.

1. For a health statistics review to begin to address concerns about an environmental exposure, there needs to be enough information about the exposure so that the area and population to be studied can be defined.
2. A health statistics review may also be conducted in response to reports from the public of an elevation of a particular health outcome. The reported cases need to be confirmed using additional information, such as cancer diagnosis records, prior to beginning the review.
3. The size of the exposed population and/or the number of health outcomes of concern are important to consider, since very small numbers make it difficult to draw any conclusions about comparative levels of health outcomes.

The New York State Department of Health takes into consideration whether the review might advance scientific knowledge about exposures and health as well as whether the review might provide useful information to the community about its comparative health status.

For more information, please contact James Bowers, New York State Department of Health, toll-free at 800-458-1158, ext. 27950, or via email at beoe@health.state.ny.us.

Attachment E: Public Health Hazard Categories

INTERIM PUBLIC HEALTH HAZARD CATEGORIES

CATEGORY / DEFINITION	DATA SUFFICIENCY	CRITERIA
<p>A. Urgent Public Health Hazard This category is used for sites where short-term exposures (< 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.</p>	<p>This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.</p>	<p>Evaluation of available relevant information* indicates that site-specific conditions or likely exposures have had, are having, or are likely to have in the future, an adverse impact on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the presence of serious physical or safety hazards.</p>
<p>B. Public Health Hazard This category is used for sites that pose a public health hazard due to the existence of long-term exposures (> 1 yr) to hazardous substance or conditions that could result in adverse health effects.</p>	<p>This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.</p>	<p>Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical or safety hazards.</p>
<p>C. Indeterminate Public Health Hazard This category is used for sites in which “critical” data are <i>insufficient</i> with regard to extent of exposure and/or toxicologic properties at estimated exposure levels.</p>	<p>This determination represents a professional judgement that critical data are missing and ATSDR has judged the data are insufficient to support a decision. This does not necessarily imply all data are incomplete; but that some additional data are required to support a decision.</p>	<p>The health assessor must determine, using professional judgement, the “criticality” of such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.</p>
<p>D. No Apparent Public Health Hazard 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.</p>	<p>This determination represents a professional judgement based on critical data which ATSDR considers sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.</p>	<p>Evaluation of available relevant information* indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, or future are not likely to result in any adverse impact on human health.</p>
<p>E: No Public Health Hazard This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.</p>	<p>Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future</p>	

*Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data; monitoring and management plans