

Trichloroethylene (TCE)

For the residents of Menzie, Audrey and Lawrence Avenues in the City of Guelph

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What is trichloroethylene (TCE)?

TCE is a clear colourless liquid used mainly for degreasing metal parts in the automotive and metal industries. It can also be found in some household products, such as glues, adhesives, paint removers, spot removers, rug cleaning fluids, paints, metal cleaners and typewriter correction fluid.

How does TCE get into the environment?

The largest source of TCE in the environment is through air emissions from factories that use it to remove grease from metals. TCE can also enter air and groundwater if it is improperly disposed of or leaks into the ground. It evaporates easily but can stay in the soil and in groundwater for an extended period of time. The source of the TCE in the groundwater has not been identified. There has been industrial activity in this area for several decades, so the TCE may have come from multiple sources.

How can I be exposed to TCE?

Aside from workers with occupational exposure, the most common sources of exposure to TCE for the general population are through air and drinking water. The route of exposure of residents to TCE in the area is not through the outdoor air (which does not have elevated levels of TCE), but rather through the indoor air. This is due to the presence of TCE in the groundwater underneath the homes. TCE evaporates from the contaminated groundwater, enters the soil vapour (air spaces between soil particles), and migrates through building foundations into the building's indoor air. This process is called "soil vapour intrusion." Guelph's drinking water is not affected by the TCE in this study area.

What are the health risks associated with TCE exposure?

As with exposure to any chemical, a person's health risk depends on a number of factors, including:

- How much TCE an individual was exposed to (the dose);
- How long the exposure lasted (the duration);
- How the person was exposed (breathing, drinking, eating or skin contact);

- Other factors associated with the individual (such as age, health, lifestyle choices, family traits, and other chemicals the person is exposed to).

Health risks can be categorized into acute effects and chronic/ sub-chronic effects. Acute effects are those that occur after short-term exposure (e.g. minutes, a few days) to very high concentrations of TCE (e.g. concentrations in the hundreds of thousands of micrograms per cubic meters ($\mu\text{g}/\text{m}^3$) or greater).

Symptoms of acute exposure can include drowsiness, decreased memory and perception, visual effects and anesthesia. Indoor air concentrations of TCE in the area are significantly lower than those that give rise to acute effects.

Chronic effects are those that occur after long-term exposure (e.g. years). Sub-chronic effects are those that occur after intermediate-term exposure (e.g. months). These effects include cancer (from chronic exposure) and non-cancer effects (from sub-chronic or chronic exposure). The main concern with TCE exposure is the risk of cancer. Overall, studies in humans and animals are highly suggestive of an increased risk for cancer in people who are exposed to elevated levels of TCE over long periods of time (e.g. workers exposed to levels 20,000 $\mu\text{g}/\text{m}^3$). Cancers that have been associated with TCE include kidney, liver and lymphoid tissue cancers.

The risks of cancer associated with chronic exposures to low levels of TCE are as follows: An air level of TCE at 0.5 $\mu\text{g}/\text{m}^3$ corresponds to a one in one million risk of cancer over a lifetime (70-year exposure). An air level of TCE at 5 $\mu\text{g}/\text{m}^3$ corresponds to a one in one hundred thousand risk of cancer over a lifetime (70-year exposure). An air level of TCE at 50 $\mu\text{g}/\text{m}^3$ corresponds to a one in ten thousand risk of cancer over a lifetime (70-year exposure).

Chronic and sub-chronic effects, other than cancer, are less understood and research is ongoing. Potential effects include those to the central nervous system, kidney, liver, respiratory, developmental and reproductive systems. However, it is generally recognized that cancer is the most sensitive health outcome.

What is the level of risk to residents on Menzie, Audrey and Lawrence Avenues?

Although there are many health effects described for TCE, especially for acute exposures to high concentrations, the levels of TCE in the area are not expected to result in the acute effects described for TCE. While health risks associated with sub-chronic and chronic TCE exposure, in particular cancer, are possible, the risk is very low given the low concentrations of soil vapour TCE.

What are the recommended action levels?

Recommended action levels are many times lower than the levels that have caused health effects in human and animal studies that have been used to set action levels or standards. The recommended action levels are based on the assumption that people are continuously exposed

to TCE in air all day, every day for as long as a lifetime (70 years). This is rarely true for most people who, if exposed, are likely to be exposed for only part of the day and part of their lifetime. These action levels are for the general population, including infants, children, the elderly and those with pre-existing health conditions.

Where needed, remediation measures in homes are usually very successful at reducing the levels of TCE in indoor air.

Results from initial soil vapour testing showed that TCE could affect air quality in some houses in the study area. The City of Guelph has hired a consultant to conduct further soil vapour testing in the area to determine if indoor air testing in homes is necessary. If testing of homes is required, Public Health recommends that homes with levels above 0.5 µg/m³ continue to receive annual indoor air monitoring, and that homes above 5 µg/m³ be prioritized for indoor air assessments and remediation.

Public Health's action levels as of October 2019:

Less than 0.5 µg/m³

- No further remedial actions are required.

Between 0.5 µg/m³ and 5 µg/m³

- Annual indoor air monitoring until remedial options are available.

Above 5 µg/m³

- These homes should be prioritized for indoor air assessments and remediation and continue to receive annual indoor air monitoring.

Sources:

This fact sheet was created using materials and information from the Region of Waterloo Public Health and Emergency Services.

Ontario Ministry of the Environment, Standards Branch (consultation).

[New York State Department of Health](#)

[U.S. Department of Health and Human Services' Agency for Toxic Substances and Disease Registry \(ATSDR\)](#)

[The U.S. Environmental Protection Agency \(EPA\)](#)