



Protecting, maintaining and improving the health of all Minnesotans

April 10, 2015

Mr. Eric Pederson, Project Manager
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155-4194

Dear Mr. Pederson:

This Letter Health Consultation is in response to your request to MDH to provide an assessment of the need to treat outside water taps at the Baytown Township Groundwater Contamination site.

Background

Investigations of the Baytown Township Groundwater Contamination Site, beginning in 1987, identified a trichloroethylene (TCE) plume that covers over 11 square miles in Washington County, including portions of Baytown Township, West Lakeland Township, the City of Lake Elmo, and the City of Bayport. The TCE was used in degreasing operations at a former metal finishing company that once operated at 11325 Stillwater Boulevard, Lake Elmo, Minnesota. On-site disposal of the TCE resulted in contaminated soil and groundwater beneath the property. Remedial activities are on-going at the site to reduce the concentrations of TCE on-site and to prevent further migration of TCE away from the site. Before site remediation began, groundwater flow transported the TCE eastward toward the St. Croix River. As it traveled, the TCE contaminated the groundwater in the unconsolidated Quaternary glacial/alluvial deposits, St. Peter Sandstone, Prairie du Chien Group, Jordan Sandstone, and Tunnel City Group aquifers that underlay the area. Further site details can be found in an earlier MDH document (MDH, 2004).

TCE has been detected in over 435 residential drinking water wells in Baytown and West Lakeland townships and Bayport – more than 350 of these wells have TCE concentrations above the Minnesota Department of Health (MDH) Health Based Value (HBV) of 0.4 micrograms per liter ($\mu\text{g}/\text{L}$). Drinking water advisories have been issued for the wells that exceed the HBV and the Minnesota Pollution Control Agency (MPCA) has offered to install and maintain whole-house, granular activated carbon (GAC) filter systems in these residences to remove the TCE from the water inside their homes. Typically, the GAC filter systems are plumbed to treat only indoor water; not outside water. Over the years, residents have inquired about health concerns regarding exposure to TCE from outdoor usage of their water and questioned whether their outside water should be treated. MDH evaluated the various potential outdoor exposure pathways raised by residents (lawn sprinklers, swimming pools, garden produce, drinking from garden hoses, etc.).

This letter health consultation memo summarizes those earlier assessments, none of which identified exposures of health concern.

TCE Health Concerns

In 2013, Minnesota Department of Health (MDH) conducted a toxicological review of TCE in drinking water. MDH has concluded that the main health concerns from exposure to TCE at the lowest exposures are immune system effects such as immunosuppression or autoimmune disease including increased hypersensitivity; an increased chance of cancer from long-term exposure; and heart defects in the developing fetus if the pregnant mother is exposed in the first trimester. Other health effects related to TCE are observed only at higher exposures.

MDH considers a TCE drinking water concentration of 0.4 micrograms per liter ($\mu\text{g}/\text{L}$ or parts per billion) safe to consume during any period of life, or over an entire lifetime. This level is referred to as a Health Based Value (HBV). This concentration of TCE in drinking water is safe for all people exposed to TCE in drinking water at any time during their life, including pregnant women and their fetuses, infants, children, and other sensitive people, including those with already impaired immunity. The HBV takes into account the fact that exposure to residents in homes supplied with water that contains TCE are exposed by both drinking the water and inhaling indoor air into which the TCE has evaporated.

At or below 2 $\mu\text{g}/\text{L}$ TCE in drinking water, the risk of cancer to any person exposed for an entire lifetime is considered negligible. This concentration is also safe for healthy adults who are only exposed to TCE after age 18, and protects pregnant women and their developing fetus from heart defects.

These values are protective of health and account for all the ways people use household water (i.e., drinking water, showering, bathing, cooking, etc.).

Potential Exposure to TCE from Outdoor Water Use

TCE is extremely volatile. Most TCE released into the environment will evaporate and quickly become diluted in outdoor air where it is rapidly broken down by exposure to ultraviolet light and oxygen.

Concentrations of TCE in residential wells in the Baytown area are relatively low. The highest TCE concentration recently detected in a private well is 52 $\mu\text{g}/\text{L}$; the second highest detection was 25 $\mu\text{g}/\text{L}$. However, the majority (65%) of wells with detectable TCE have concentrations below 5 $\mu\text{g}/\text{L}$, which is the federal drinking water standard for public water supply systems (known as the Maximum Contaminant Level, or MCL) and 41% of wells with detectable TCE have concentrations of 2 $\mu\text{g}/\text{L}$ or less.

Based on the low TCE concentrations in area groundwater and residential wells, high rates of evaporation and dilution in outdoor air, and the seasonal or intermittent use of outdoor water taps, MDH concludes that TCE exposure from outdoor water use is expected to be far below levels of health concern.

Drinking from garden hoses

While MDH does not encourage drinking water from garden hoses (due to potential bacterial contamination and leaching of chemicals from the hose), an occasional drink of well water from a garden hose in the Baytown Groundwater Contamination Area does not pose a health risk.

Swimming pools

A method to evaluate exposure to TCE from outdoor swimming pool water has been described in the literature (Blando and Cohn, 2004). Using this method and adjusting for more recent TCE toxicity information shows that exposure to TCE in swimming pools is far below a level of health concern, even for young children swimming every day over the summer. Because TCE is highly volatile, TCE in the pool water would decrease over time - according to this model, the half-life of TCE in water is expected to be about 5 days. Dermal exposure is considered to be the most important exposure route from swimming, but given the low TCE levels in wells (even assuming a high frequency of pool use over a summer) the exposure would not be enough to cause a health concern.

Sprinklers

Because the TCE will quickly evaporate from the water and become diluted in ambient air, dermal and inhalation exposure from running through a sprinkler is expected to be negligible.

Gardening

Garden vegetables watered with well water that contains TCE are expected to be safe to eat. Watering a garden, especially through spray irrigation will significantly lower the amount of TCE in the water due to evaporation. Therefore, very little TCE is expected to be available to garden plants. Although TCE that remains in the water can be taken up by plants, most of it will be lost through their leaves into the air. In two separate studies (Doucette, et al., 2007; Schanbel, et al. 1997), no TCE was detected in garden vegetables (carrots, tomatoes, spinach) after irrigation with water contaminated at much higher TCE concentrations than any found in private wells in the Baytown area (for comparison, 140 µg/L and 560 µg/L in one study and unspecified concentrations from 31 private wells from a groundwater plume with concentrations up to 1000 µg/L in the other study).

Conclusions

- When drinking water contains concentrations of TCE that exceeds the HBV, the exposures of concern include a combination of drinking water ingestion and inhalation of TCE vapor indoors (mostly due to volatilization in the shower).
- In contrast, TCE exposure from seasonal, intermittent, and outdoor uses of water (watering lawns/gardens, sprinklers, swimming pools, etc.) even with TCE at the highest concentrations present in the aquifers used by private wells in the Baytown area is expected to be negligible and far below a level of health concern.

Recommendation

- Untreated groundwater containing TCE at the concentrations measured in the aquifers used by private wells in the Baytown area can be used safely for outdoor purposes and does not need to be filtered.

Sincerely,



Emily Hansen, Health Assessor
Site Assessment and Consultation



Ginny Yingling, Hydrogeologist,
Site Assessment and Consultation

References:

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Doucette, WJ, Chard JK, Fabrizius H, Crouch C, Peterson MR, Carlsen TE, Chard BK, Gorder K (2007) Trichloroethylene Uptake into Fruits and Vegetables: Three-Year Field Monitoring Study. *Environmental Science and Technology* Volume 41 p 2505-2509.

MDH (2004) Public Health Assessment: Baytown Township Groundwater Contamination Site, Washington County, Minnesota. Prepared by MDH under Cooperative Agreement with the Agency for Toxic Substance and Disease Registry, September 14, 2004.

Schnabel WE, Dietz AC, Burken JG, Schnoor JL, Alvarez PJ (1997) Uptake and Transformation of Trichloroethylene by Edible Garden Plants.

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