ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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1,4-Dioxane and Drinking Water

1,4-dioxane has historically been used as a stabilizer for chlorinated solvents, especially trichloroethane. This compound is also present in some consumer products such as shampoos, toothpastes, deodorants and other personal care products. 1,4-dioxane is generally not listed as an ingredient in personal care products that it can be detected in. It is a contaminant in these products that forms as part of secondary reaction when ethylene oxide is added during the manufacturing process. Ethylene oxide is added to make the cleaning agents in personal care products less harsh or abrasive.

Drinking Water Health Standards

RSA 485-C:6 requires the New Hampshire Department of Environmental Services (NHDES) to establish an ambient groundwater quality standard (AGQS) based on a one-in-one-million cancer risk when the federal government indicates such a risk exists for a particular contaminant.

In 2005, NHDES initially adopted an AGQS for 1,4-dioxane of 3.0 µg/L based on information provided at that time by the US Environmental Protection Agency's (EPA) Integrated Risk Information System (IRIS) toxicological review. By regulation, ambient groundwater quality standards are also considered drinking water standards if a Maximum Contaminant Level standard has not been developed for a particular compound. The IRIS Program published a revised toxicological review in 2010 for 1,4-dioxane, which lowered the concentration of 1,4-dioxane in drinking water that would cause a one-in-one-million cancer risk from 3.0 µg/L to 0.32 µg/L. In 2010, NHDES began working on studies with laboratories to determine which existing analytical methods could achieve detection limits less than 0.32 µg/L. NHDES also assessed if water treatment systems could adequately remove 1,4-dioxane to concentrations below 0.32 µg/L. Additionally, NHDES assessed strategies for managing domestic wastewater that is discharged to groundwater. Typical domestic wastewater can contain 1-2 µg/L of 1,4-dioxane. On September 1, 2018, NHDES revised the AGQS for 1,4-dioxane to 0.32 µg/L.

Assessing the Occurrence of 1,4-Dioxane in Drinking Water

In March 2011, NHDES sent water systems information regarding the potential health effects regarding 1,4-dioxane. NHDES requested that community water systems and non-transient public water systems voluntarily sample their water sources for 1,4-dioxane and to share this data with NHDES. Additionally, NHDES targeted sources of water for public water systems that historically had detected chlorinated solvents. Approximately 200 sources of water were sampled and approximately 5% of the sources of water detected 1,4-dioxane. The majority of the sources that detected 1,4-dioxane historically had low concentrations of chlorinated solvents detected in the water.

1,4-Dioxane has been detected in groundwater at approximately 150 waste clean-up sites throughout the state. The majority of these sites are associated with landfills or chlorinated solvent contamination sites. 1,4-Dioxane has also been detected in groundwater near a car wash likely associated with the use of detergents. Additionally, 1,4-dioxane has been detected in groundwater at a site where animals used in biochemical research were buried. The source of 1,4-dioxane at this site is likely associated with the use of liquid scintillation cocktails to detect radioisotopes as part of the research.

1,4-Dioxane has been detected in the groundwater at 14 out of 45 sites where treated wastewater is discharged to groundwater.

Treatment Options for 1,4-Dioxane

Treatment methods are available for reducing 1,4-dioxane in drinking water to a concentration that is below 0.32 µg/L. Granular activated carbon has been used by some drinking water systems and homeowners on private wells to reduce the concentration of 1,4-dioxane to concentrations of less than 0.32 µg/L, however the carbon has to be changed out frequently and sometimes the performance of these treatment systems has not been consistently reliable. Treatment methods using various combinations of ultra-violet light, ozone and hydrogen peroxide have been very effective in reducing the concentration of 1,4-dioxane in drinking water although studies have not generally focused on reducing the concentration of 1,4-dioxane below 0.32 µg/L.

NHDES researched and tested the effectiveness of a point of use reverse osmosis water treatment system. Research and testing results obtained by NHDES demonstrate that reverse osmosis is effective in removing 70%-80% of the 1,4-dioxane in water. Reverse osmosis membranes are most effective at removing contaminants having a molecular weight of 100 grams/mol or greater. The molecular weight of 1,4-dioxane is 88.11 grams/mol.

For More Information

Please contact the Drinking Water and Groundwater Bureau at (603) 271-2513 or dwgbinfo@des.nh.gov or visit our website at www.des.nh.gov.

Note: This fact sheet is accurate as of August 2019. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.