

# BTEX CONTAMINATION

A publication of the Hazardous Substance Research Centers' Technical Outreach Services for Communities (TOSC) Program.

## Hazardous Substance Research Centers

The five regional Hazardous Substance Research Centers were established in 1989 and funded by the U.S. Environmental Protection Agency (U.S. EPA). The Centers' mission is to support and conduct innovative research and technology development in hazardous substance control, cleanup and management. The Centers have an interdisciplinary group of knowledgeable scientists and engineers who can offer technical advice, review sites, and help increase understanding of hazardous contamination.

For more information write B100A Engineering Research, Michigan State University, East Lansing, MI 48824, visit <http://www.toscprogram.org/> or call 1-800-490-3890.



The Great Lakes & Mid-Atlantic Center is a consortium of the University of Michigan, Michigan State University and Howard University

## WHAT IS BTEX?

BTEX is the abbreviation used for four compounds found in petroleum products: benzene, toluene, xylene and ethylbenzene. These four chemicals are often found together at contaminated sites.

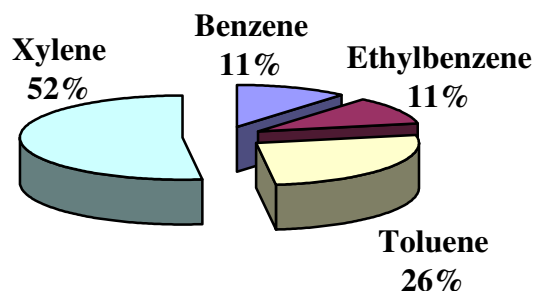
BTEX are found naturally in such petroleum products as crude oil, diesel fuel and gasoline, and ethylbenzene which is a gasoline and aviation fuel additive and used extensively in manufacturing processes. Benzene is used in the production of synthetic materials and consumer products, such as synthetic rubber, plastics, nylon, insecticides and paints. Toluene is used as a solvent for paints, coatings, gums, oils, and resins. Ethylbenzene may be present in consumer products such as paints, inks, plastics, and pesticides. Xylenes are used as a solvent in printing, rubber, and leather industries.

## HOW DOES BTEX ENTERS THE ENVIRONMENT

The main source of BTEX contamination is the leakage of gasoline from faulty and poorly

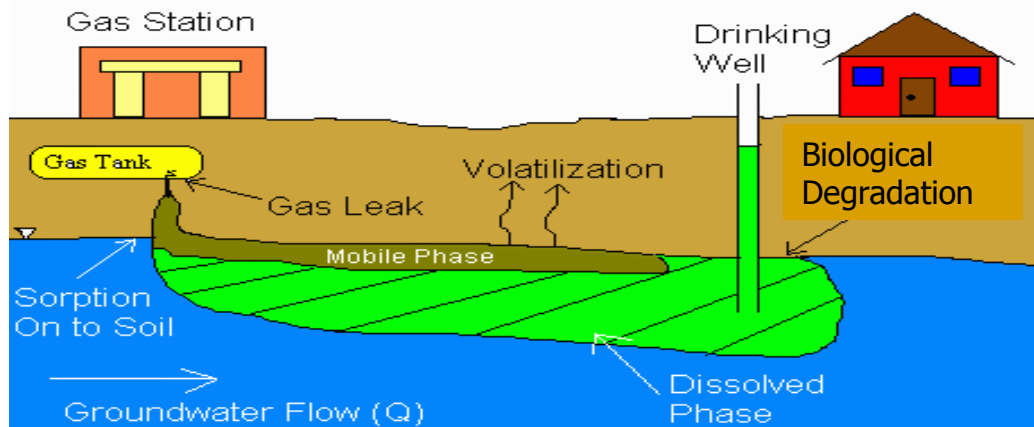
maintained underground storage tanks. Other sources of BTEX contamination are releases from large bulk facilities, surface spills, and pipeline leaks.

## BTEX Components of Gasoline (% weight)



## HOW BTEX MOVES THROUGH THE ENVIRONMENT

Once released to the environment, BTEX can volatilize (evaporate), dissolve, attach to soil particles or degrade biologically. Volatilization occurs when chemicals evaporate, allowing them to move from a liquid into the air. Volatilization of the BTEX components of gasoline commonly occurs when you pump gasoline into your car, and is responsible for the characteristic odor. This phenomenon can also occur within the air pockets present in soils.



## Full Disclosure

BTEX can also dissolve into water, allowing it to move in the groundwater. Since BTEX can "stick" to soil particles, these chemicals move slower than the groundwater. If oxygen is present in sufficient quantities, BTEX can also degrade biologically, albeit slowly.

**BTEX HEALTH EFFECTS**

Exposure to BTEX can occur by ingestion (consuming water contaminated with BTEX), inhalation (exposure to BTEX present in the air) or absorption through the skin. Inhalation of BTEX can occur while pumping gasoline or while showering or bathing with contaminated water. Absorption of these chemicals can occur by spilling gasoline onto one's skin or by bathing in contaminated water. Acute exposures to high levels of gasoline and its BTEX components have been associated with skin and sensory irritation, central nervous system depression, and effects on the respiratory system. These levels are not likely to be achievable from drinking contaminated water, but are more likely from occupational exposures. Prolonged exposure to these compounds has similar effects, as well as the kidney, liver and blood systems. According to the U.S. Environmental Protection Agency (U.S. EPA), there is sufficient evidence from both

human and animal studies to believe that benzene is a human carcinogen. Workers exposed to high levels of benzene in occupational settings were found to have an increase incidence in leukemia.

**BTEX REGULATIONS**

The U.S. EPA has established permissible levels for chemical contaminants in drinking water supplied by public water systems. These levels are called Maximum Contaminant Levels (MCLs). To derive these MCLs, the US EPA uses a number of conservative assumptions, thereby ensuring adequate protection of the public. In the case of known or suspected carcinogens, the MCL is calculated based on assumption that the average adult weighs 154 lbs (70 kg) and drinks approximately 2 quarts (2 L) of water per day over a lifetime (70 years). The MCL is set so that a lifetime exposure to the contaminant at the MCL concentration would result in no more than 1 to 100 (depending on the chemical) excess cases of cancer per million people exposed.

Chemical	MCL (mg/liter=ppm)
benzene	0.005
toluene	1
ethylbenzene	0.7
xylenes (total)	10

**REDUCING EXPOSURE TO BTEX**

The U.S. EPA recommends that exposure to BTEX be minimized. To avoid or reduce exposure to BTEX, people should use water supplies having concentrations of these compounds that are below the MCL, and/or apply appropriate water treatment or filtration systems. If necessary, short-term reductions in exposure may be accomplished by using bottled water for food and beverage preparation and avoiding bathing or showering with the contaminated water. With in-home treatment processes, such as activated charcoal filtration, it is usually possible to remove sufficient BTEX from water to meet the MCL and thereby minimize health risks. If benzene is present above the MCL, treatment should be applied to all household water because of inhalation hazards.

**Routes of Pollutant Intake****FOR MORE INFORMATION**

-Related materials from US EPA

([www.epa.gov/swrust1/pubs/catalog98.htm](http://www.epa.gov/swrust1/pubs/catalog98.htm))

-Ohio EPA, Underground Storage Tanks  
([www.com.state.oh.us/odoc/sfm/bustr/](http://www.com.state.oh.us/odoc/sfm/bustr/))



The TOSC program promotes effective citizen involvement in site cleanup projects by providing independent technical expertise to communities. Funded under a U.S. EPA grant, TOSC is housed in the Great Lakes and Mid-Atlantic Center (GLMAC) for Hazardous Substance Research. The GLMAC comprises three leading research universities: The University of Michigan, Michigan State University and Howard University. For more information, contact Kirk Riley at (800) 490-3890 or send e-mail to [tosc@egr.msu.edu](mailto:tosc@egr.msu.edu)