



# Ethylbenzene

This fact sheet describes the Canadian Soil Quality Guidelines for ethylbenzene to protect environmental and human health. It is part of the series *Guidelines at a Glance*, which summarizes information on toxic substances and other parameters for which there are Canadian Environmental Quality Guidelines.

The National Guidelines and Standards Office of Environment Canada coordinates the development of Canadian Environmental Quality Guidelines in cooperation with the Canadian Council of Ministers of the Environment (CCME).

## Where does ethylbenzene come from?

Ethylbenzene is a compound used in paints, lacquers, adhesives, inks, and cleaning materials. It is also used in the production of dyes, perfumes, plastics, pharmaceuticals, and pesticides. Ethylbenzene exists naturally in petroleum, and therefore it is found in gasoline. In Ontario, ethylbenzene is typically 1.4% of regular unleaded gasoline and 1.7% of premium unleaded gasoline. Sources of ethylbenzene to the atmosphere include petroleum and coal refining, vehicle emissions, and evaporation from solvents and thinners. Ethylbenzene is released to the soil and water from leaking underground petroleum storage tanks, landfill sites, spills during transportation, pesticide use, and discharges of industrial and municipal waste. Natural sources of toluene are forest fires, volcanic eruptions, and volatile emissions from vegetation.

Ethylbenzene is related to two other compounds, toluene and xylene, which are also found in gasoline. Together, the three compounds are often referred to as TEX.

## What happens to ethylbenzene released into the environment?

Ethylbenzene can be very mobile when released into the environment. There are four main routes that ethylbenzene takes: (i) Ethylbenzene easily evaporates from soil into the atmosphere, depending on factors such as temperature and humidity. (ii) Ethylbenzene binds well to some soils, especially soils rich in organic matter. Clay minerals also bind ethylbenzene. (iii) Ethylbenzene is converted into carbon dioxide and water when soil microbes degrade it. Degradation occurs in both oxygen-rich and oxygen-poor conditions. (iv) Ethylbenzene is moderately soluble in water, so rainwater leaching through the ground can carry ethylbenzene with it into the groundwater.

Ethylbenzene has a moderate attraction to fats so may accumulate in animals.

## What effects can ethylbenzene have on terrestrial forms of life?

There are very few studies of ethylbenzene toxicity to invertebrates, plants, and mammals and none of toxicity to soil microbes. A study of earthworms found that they may die when exposed to ethylbenzene in soil. Lettuce and radish seeds exposed to ethylbenzene in the soil were less likely to emerge as seedlings. Ethylbenzene also reduced the growth of roots in alfalfa and early northern wheatgrass.

In laboratory studies, ethylbenzene reduced the levels of dopamine (a chemical messenger) in the brains of rabbits. Rats that inhaled ethylbenzene experienced irritation of the eyes and nose, dizziness, loss of control of body movements, and fluid build-up in the lungs. With long-term exposure, rats' livers increased in weight and their blood had more platelets (cell fragments involved in blood clotting). Ethylbenzene is not considered to cause cancer in humans. There are no studies of the effects of benzene on livestock, wildlife, or birds.



# Guidelines at a Glance

## Ethylbenzene

### What levels of ethylbenzene are safe for humans and for plants and animals that live in or on Canadian soils?

The Canadian Soil Quality Guidelines (CSoQG) depend on the type of land and its use. The four land uses considered are agricultural, residential and parkland, commercial, and industrial. The guidelines also distinguish soil textures (coarse and fine) and soil depths (surface soil:  $\leq 1.5$  metres deep, and subsoil:  $> 1.5$  metres deep). The guidelines are based on a number of toxicity studies that examined the effects of soil contact on laboratory mammals and on plants and animals that live in or on our soils. In the case of agricultural land, the effects of soil and food ingestion are also considered.

The CSOQG to protect environmental and human health for all land uses and for both surface soils and subsoils is 0.082 milligrams of ethylbenzene per kilogram of coarse-textured soil and 0.018 milligrams of ethylbenzene per kilogram of fine-textured soil.

If the level of ethylbenzene measured in soil is less than the respective guideline, one would not expect to see adverse effects. In places where the CSOQG for ethylbenzene is exceeded, adverse effects will not necessarily occur. Whether effects will occur depends on the amount by which the guideline level is exceeded and on the plants and animals that live there. Further investigation is needed at a particular site to determine whether or not there is a negative impact.

### How do levels of ethylbenzene in Canadian soils compare to the guidelines?

Very little information is available on the levels of ethylbenzene in Canadian soils. Soil samples taken from undisturbed parklands in Ontario are considered to represent the background level of ethylbenzene. The level was 0.00046 milligrams of ethylbenzene per kilogram of soil, which is within the guidelines for both coarse- and fine-textured surface soils and subsoils on all land types.

### How can CSOQGs be used to make a difference?

In general, Canadian Soil Quality Guidelines can be used by Canadian federal, provincial, and territorial governments on a voluntary basis to set local guidelines and clean-up targets. CSOQGs are most commonly used in environmental assessments as benchmarks or yardsticks to which measured levels are compared. Anyone can use the guidelines to determine if the level of ethylbenzene measured in a soil sample has the potential to cause adverse environmental effects.

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