1. PUBLIC HEALTH STATEMENT

This public health statement tells you about ethylene glycol and the effects of exposure to it.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites are then placed on the National Priorities List (NPL) and are targeted for long-term federal clean-up activities. Ethylene glycol has been found in at least 37 of the 1,689 current or former NPL sites. Although the total number of NPL sites evaluated for this substance is not known, the possibility exists that the number of sites at which ethylene glycol is found may increase in the future as more sites are evaluated. This information is important because these sites may be sources of exposure and exposure to this substance maybe harmful.

When a substance is released either from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. Such a release does not always lead to exposure. You can be exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to ethylene glycol, many factors will determine whether you will be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider any other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT IS ETHYLENE GLYCOL?

Colorless liquid that is odorless	Ethylene glycol is a synthetic liquid substance that absorbs water. It is odorless, but has a sweet taste.
Used in consumer products	Ethylene glycol is used to make antifreeze and de-icing solutions for cars, airplanes, and boats. Consumer products containing ethylene glycol include: • Antifreeze • Hydraulic brake fluids • Inks used in stamp pads, ballpoint pens, and print shops

For more information on the sources, properties, and uses of ethylene glycol, see Chapters 4 and 5.

1.2 WHAT HAPPENS TO ETHYLENE GLYCOL WHEN IT ENTERS THE ENVIRONMENT?

Released into air, water, and soil	The primary source of ethylene glycol in the environment is from run-off at airports where is used in de-icing agents for runways and airplanes. Ethylene glycol can also enter the environment through the disposal of products that contain it.
Quickly broken down	*Air:* Ethylene glycol in air will break down in about 10 days. *Water and soil:* Ethylene glycol in water and in soil will breakdown within several days to a few weeks.

See Chapters 5 and 6 for more information on ethylene glycol in the environment.

1.3 HOW MIGHT I BE EXPOSED TO ETHYLENE GLYCOL?

Antifreeze	The general public can be exposed to ethylene glycol through skin contact when using automobile antifreeze. Accidental or intentional ingestion can occur because antifreeze is a sweet tasting, brightly colored liquid.
Air, water, soil	Background concentrations of ethylene glycol in air, surface water, groundwater, drinking water, soil, and sediment have not been reported. Exposure to ethylene glycol in air, drinking water, or soil is not expected.
Workplace air	People who work in industries that use ethylene glycol may be exposed by touching products such as solvents, antifreeze, and feedstocks that contain this substance Workers can also be exposed to low levels from ethylene glycol-containing products such as airplane de-icing solutions that have been sprayed into the air.

See Chapter 6 for more information on exposure to ethylene glycol.

1.4 HOW CAN ETHYLENE GLYCOL ENTER AND LEAVE MY BODY?

Enters your body after ingestion, inhalation, or dermal contact	Ingested ethylene glycol is quickly absorbed in large amounts. There is some information suggesting that inhaled ethylene glycol is also absorbed. Ethylene glycol can also slowly enter your bloodstream through your skin if you come in direct contact with it and do not wash it off.
Typically leaves your body within 1–2 days	Once in your body, most of the ethylene glycol is broken down (into other more toxic chemicals) and some of it remains unchanged. Ethylene glycol and its break down products are removed from your body through the excretion of urine.

1.5 HOW CAN ETHYLENE GLYCOL AFFECT MY HEALTH?

This section looks at studies concerning potential health effects in animal and human studies.

Scientists use many tests to protect the public from harmful effects of toxic chemicals and to find ways for treating persons who have been harmed.

One way to learn whether a chemical will harm people is to determine how the body absorbs, uses, and releases the chemical. For some chemicals, animal testing may be necessary. Animal testing may also help identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method for getting information needed to make wise decisions that protect the public's health. Scientists have the responsibility to treat research animals with care and compassion. Scientists must comply with strict animal care guidelines because laws today protect the welfare of research animals.

The effect of ethylene glycol on human health depends on how much ethylene glycol is present.

Very small amounts will not affect your health	Your health is not likely to be seriously affected by the very small amounts of ethylene glycol that could be tasted or otherwise accidentally eaten (for example, by putting your fingers in your mouth after getting them wet with antifreeze). Accidental or intentional ingestion of larger amounts of ethylene glycol can cause serious illness or death.

Large amounts can damage the kidneys, nervous system, and heart	When ethylene glycol breaks down in the body, it forms chemicals that crystallize, and the crystals can collect in your kidneys and affect kidney function. Ethylene glycol also forms acidic chemicals in the body, which can change the body's acid/base balance and affect your nervous system, lungs, and heart.
Early treatment can prevent damage	Treatment after early diagnosis has been very successful in people drinking large amounts of ethylene glycol.

Further information on the health effects of ethylene glycol in humans and animals can be found in Chapters 2 and 3.

1.6 HOW CAN ETHYLENE GLYCOL AFFECT CHILDREN?

This section discusses potential health effects in humans from exposures during the period from conception to maturity at 18 years of age.

Children are likely to have similar effects as adults	Clinical findings in children who were poisoned by accidentally or intentionally drinking ethylene glycol indicate that it is likely that children would show the same health effects as adults. We do not know whether children differ in their susceptibility to the effects of ethylene glycol.
Birth defects	We do not know whether ethylene glycol causes birth defects in people. Skeletal defects and low birth weights have occurred in newborn animals whose mothers ingested large amounts of ethylene glycol during pregnancy.
Lactation exposure	We do not know whether ethylene glycol can accumulate in breast milk.

1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO ETHYLENE GLYCOL?

If your doctor finds that you have been exposed to substantial amounts of ethylene glycol, ask whether your children might also have been exposed. Your doctor might need to ask your state health department to investigate.

Avoid ingestion of antifreeze by careful handling and storage	Antifreeze products should be used with caution and kept out of the reach of children. Open bottles of antifreeze should not be left on or near the ground where children can reach them. Antifreeze should not be stored in anything other than the original container, such as in a cup or soft drink bottle, to avoid someone mistaking it for a beverage. Antifreeze containers should have a child-proof cap, be stored away from food, and be properly marked.
Get medical advice if antifreeze is ingested	Ethylene glycol poisoning can be effectively treated, but early diagnosis is needed to prevent serious injury. Medical attention should be sought as soon as possible in cases of known or suspected antifreeze ingestion.
Limit dermal exposure to products containing ethylene glycol	Minimize skin contact when using antifreeze and other consumer products containing ethylene glycol. Avoid spilling or draining antifreeze on the ground to prevent children from playing in a puddle of ethylene glycol.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO ETHYLENE GLYCOL?

Analysis of blood and urine	Ethylene glycol and its effects can be measured in blood and urine. The metabolites cause characteristic chemical changes in the blood and urine that help to diagnose ethylene glycol poisoning. You should have these tests done within a few hours after exposure occurs because ethylene glycol leaves the body very quickly and early diagnosis is necessary for effective treatment. The presence of crystals in the urine may indicate kidney damage.

Refer to Chapters 3 and 7 for more information on these tests.

1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health. Regulations can be enforced by law. The EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that develop regulations for toxic substances. Recommendations provide valuable guidelines to protect public health, but cannot be enforced by law. The Agency for Toxic Substances and Disease Registry (ATSDR) and the National

Institute for Occupational Safety and Health (NIOSH) are two federal organizations that develop recommendations for toxic substances.

Regulations and recommendations can be expressed as "not-to-exceed" levels. These are levels of a toxic substance in air, water, soil, or food that do not exceed a critical value. This critical value is usually based on levels that affect animals; they are then adjusted to levels that will help protect humans. Sometimes these not-to-exceed levels differ among federal organizations because they used different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or other factors.

Recommendations and regulations are also updated periodically as more information becomes available. For the most current information, check with the federal agency or organization that provides it.

Some regulations and recommendations for ethylene glycol include the following:

Levels in drinking water set by EPA	The EPA has determined that exposure to ethylene glycol in drinking water at concentrations of 20 milligrams per liter (mg/L) for 1 day or 6 mg/L for 10 days is not expected to cause any adverse effects in a child. The EPA has determined that lifetime exposure to 14 mg/L ethylene glycol in drinking water is not expected to cause any adverse effects.

For more information on the regulations and guidelines that apply to ethylene glycol, see Chapter 8.

1.10 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your regional poison control center (1-800-222-1222), community or state health or environmental quality department, or contact ATSDR at the address and phone number below.

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses that result from exposure to hazardous substances.

Toxicological profiles are also available on-line at www.atsdr.cdc.gov and on CD-ROM. You may request a copy of the ATSDR ToxProfiles™ CD-ROM by calling the toll-free information and technical

assistance number at 1-800-CDCINFO (1-800-232-4636), by e-mail at cdcinfo@cdc.gov, or by writing to:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental Medicine
1600 Clifton Road NE
Mailstop F-62
Atlanta, GA 30333
Fax: 1-770-488-4178

Organizations for-profit may request copies of final Toxicological Profiles from the following:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Phone: 1-800-553-6847 or 1-703-605-6000
Web site: http://www.ntis.gov/