1. PUBLIC HEALTH STATEMENT

This statement was prepared to give you information about 1,3-dinitrobenzene (1,3-DNB) and 1,3,5-trinitrobenzene (1,3,5-TNB) and to emphasize the human health effects that may result from exposure to them. The Environmental Protection Agency (EPA) has identified 1,397 waste sites as the most serious in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal clean-up activities. 1,3-DNB and 1,3,5-TNB have been found in at least 19 of the sites on the NPL. However, the number of NPL sites evaluated for 1,3-DNB and 1,3,5-TNB is not known. As EPA evaluates more sites, the number of sites at which 1,3-DNB and 1,3,5-TNB are found may increase. This information is important because exposure to 1,3-DNB and 1,3,5-TNB may cause harmful health effects and because these sites are potential or actual sources of human exposure to 1,3-DNB and 1,3,5-TNB.

When a chemical is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment as a chemical emission. This emission, which is also called a release, does not always lead to exposure. You can be exposed to a chemical only when you come into contact with the chemical. You may be exposed to it in the environment by breathing, eating, or drinking substances containing the chemical or from skin contact with it.

If you are exposed to a hazardous chemical such as 1,3-DNB or 1,3,5-TNB, several factors will determine whether harmful health effects will occur and what the type and severity of those health effects will be. These factors include the dose (how much), the duration (how long), the route or pathway by which you are exposed (breathing, eating, drinking, or skin contact), the other chemicals to which you are exposed, and your individual characteristics such as age, sex, nutritional status, family traits, lifestyle, and state of health.

1.1 WHAT ARE 1,3-DNB and 1,3,5-TNB?

1,3-DNB and 1,3,5-TNB are synthetic substances that are used in explosives. In making 1,3,5-TNB, 1,3-DNB is often made first. Both 1,3-DNB and 1,3,5-TNB are formed as by-products when another explosive, trinitrotoluene (TNT), is made. 1,3-DNB is also used to make certain dyes, as an intermediate in the synthesis of .organic chemicals, and in the plastics manufacturing industry. 1,3,5-TNB is used in .making rubber. Other names for 1,3-DNB include *m*-dinitrobenzene, 1,3-dinitrobenzol, 2,4-dinitrobenzene, binitrobenzene, and *m*-DNB. Other names for 1,3,5-TNB include benzite, s-trinitrobenzene, sy*m*-trinitrobenzene, symmetric trinitrobenzene, syn-trinitrobenzene, and TNB. Both 1,3-DNB and 1,3,5-TNB are yellow, crystal-like solids at room temperature. They may exist in the air in very small amounts as a dust or a vapor and can dissolve in certain liquids. If either compound is put under very high heat, it will explode. These compounds have no odor or taste.

In this profile, 1,3-DNB and 1,3,5-TNB are discussed together because they have very similar structures. Since the two compounds are similar in structure, their toxic effects may not be very different. More information on the chemical and physical properties of 1,3-DNB and 1,3,5-TNB is found in Chapter 3. More information on the production and use of 1,3-DNB and 1,3,5-TNB is in Chapter 4.

1.2 WHAT HAPPENS TO 1,3-DNB or 1,3,5-TNB WHEN IT ENTERS THE ENVIRONMENT?

Waste discharges from Army ammunition plants or other chemical manufacturers are the primary sources for the releases of both compounds to air, water, and soil. They can also enter the environment from their use as explosives and from spills or improper disposal. It is unlikely that either compound would normally be.found in the air. However, under some industrial use conditions, some 1,3-DNB and 1,3,5-TNB may enter the air in the form of dust. We have very little information about what happens to 1,3-DNB and 1,3,5-TNB in the air. The small amounts of 1,3,5-TNB that may enter the air are likely to break down very slowly. It might persist for many years in the air. 1,3-DNB is also likely to break down in the air;

however, we do not know how long this would take. Both compounds are slightly soluble in water. 1,3-DNB evaporates slowly from water; 1,3,5-TNB does not evaporate from water. Neither compound sticks strongly to soil; therefore, both can move through soil into groundwater. I,3-DNB breaks down slowly in water and soil. It stays for days to months in water. Although 1,3,5-TNB probably breaks down in water and soil, we do not know how long this takes. Neither compound is likely to build up in fish or humans. See Chapters 4 and 5 for more information on 1,3-DNB and 1,3,5-TNB in the environment.

1.3 HOW MIGHT I BE EXPOSED TO 1,3-DNB OR 1,3,5-TNB?

Most of the population will not be exposed to 1,3-DNB or 1,3,5-TNB. If you live or work near an Army ammunition plant or other chemical manufacturer, you may be exposed to these compounds by contaminated drinking water, food, air, or soil. At this time, it is not known how much of these compounds you might consume or how much might be in the air. We also do not know how many workers are exposed to the compounds. Both 1,3-DNB and 1,3,5-TNB have been found in water and soil at some Army ammunition plants. Groundwater samples had levels of 1,3-DNB ranging from 0.0012 to 0.195 parts per one million parts of water (ppm). 1,3-DNB was present at higher levels in soil, with concentrations ranging from 0.77 to 1.5 ppm. 1,3,5-TNB was also present in groundwater samples at concentrations up to 8 ppm. 1,3,5-TNB was present at higher levels in soil, with concentrations ranging from 368 to 3,920 ppm. See Chapter 5 for more information on exposure to 1,3-DNB and 1,3,5-TNB.

1.4 HOW CAN 1,3-DNB AND 1,3,5-TNB ENTER AND LEAVE MY BODY?

1,3-DNB can enter your bloodstream if you breathe it in the air or get it on your skin. There is no information on how 1,3,5-TNB can enter or exit your body. Exposure of the general population to 1,3-DNB or 1,3,5-TNB is not likely, so most people exposed to 1,3-DNB have come in contact with it in their work place. Results of studies in people and animals show that 1,3-DNB enters the body very quickly through the skin or lungs. Once 1,3-DNB is inside your body, it breaks down quickly. 1,3-DNB and its related breakdown products also exit the body very quickly in the urine. Some breakdown products of 1,3-DNB may also

leave in the feces. Results of studies in people and animals show that most of the 1,3-DNB exits the body within 2 to 3 weeks after exposure. Chapter 2 has more information on how 1,3-DNB can enter and leave the body.

1.5 HOW CAN 1,3-DNB AND 1,3,5-TNB AFFECT MY HEALTH?

1,3-DNB and 1,3,5-TNB are suspected to cause similar health effects. Exposure to high concentrations of 1,3-DNB can reduce the ability of blood to carry oxygen and can cause your skin to become bluish in color. If you are exposed to 1,3-DNB for a long time, you can develop a reduction (or loss) in the number of red blood cells (anemia). Other symptoms of 1,3-DNB exposure include headache, nausea, and dizziness. We do not know if there are any long-term health effects of exposure to 1,3-DNB or 1,3,5-TNB in people. We also do not know if 1,3-DNB or 1,3,5-TNB causes birth defects or cancer in people.

Results of studies in animals show that *effects* of 1,3-DNB and 1,3,5-TNB *on* the blood are similar to the effects seen in people. Results from animal studies also show some other effects of 1,3-DNB exposure, such as behavioral changes, damaged sperm production, and male reproductive damage. We do not know if these other effects could occur in people. Animal studies also show that, in certain cases, a large enough single oral dose of 1,3-DNB can cause death. Neither 1,3-DNB or 1,3,5-TNB have been tested to see whether or not they cause cancer in animals.

The Environmental Protection Agency has determined that 1,3-DNB is not classifiable as to its human carcinogenicity and has not classified the carcinogenicity of 1,3,5-TNB.

More information on the health effects of 1,3-DNB and 1,3,5-TNB is in Chapter 2.

1.6 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO 1,3-DNB OR 1,3,5-TNB?

No tests are available commercially to determine if you have been exposed to 1,3-DNB or 1,3,5-TNB. There are tests to detect 1,3-DNB and its breakdown products in the blood and urine of exposed animals, but these tests have not been used for people. Refer to Chapters 2 and 6 for more information on these tests for animals.

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

The government has developed regulations and guidelines for 1,3-DNB and 1,3,5-TNB. These are designed to protect the public from the harmful health effects of the chemicals. EPA has classified 1,3-DNB and 1,3,5-TNB as hazardous wastes that must meet certain disposal requirements. The Department of Transportation has many regulations on the transportation of explosives including 1,3-DNB and 1,3,5-TNB.

The Occupational Safety and Health Administration (OSHA) regulates levels of 1,3-DNB in the workplace. The maximum allowable amount of 1,3-DNB in workroom air during an 8-hour workday, 40-hour workweek, is 1.0 milligram per cubic meter (mg/m^3).

See Chapter 7 for more information on regulations and guidelines on 1,3-DNB and 1,3,5-TNB.

1.8 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop E-29
Atlanta, Georgia 30333
(404) 639-6000

This agency can also tell you where to find the nearest occupational and environmental health clinic. These clinics specialize in the recognition, evaluation, and treatment of illness resulting from exposure to hazardous substances.