ALABAMA A&M AND AUBURN UNIVERSITIES

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Underground Storage Tanks (USTs) And NPS Pollution

USTs And How They Affect Water Quality

Underground storage tanks (USTs) may contain a large variety of liquid chemicals including gasoline, other petroleum products, and hazardous substances. Millions of gallons of these potentially dangerous chemicals are stored in USTs prior to their use or disposal. Because of the widespread potential contamination threat these substances pose to groundwater, USTs have been described as "ticking time bombs."

USTs are a threat because no one knows exactly how many exist. The total UST population in the U.S. may be as high as 15 million. Only 1.5 to 3 million of these tanks, because of their size or other special features, fall under current federal regulations. The other 12 to 14 million tanks are small and unregulated. Many were abandoned decades ago and are hard to account for.

USTs are a threat because old tanks *will* leak. Of the 1.5 to 3 million USTs that fall under federal regulations, at least 25 percent are already leaking. Some surveys have estimated that 30 to 35 percent of these tanks have failed tank tightness tests.

USTs are also a threat because they can be found everywhere. Unlike most hazardous waste disposal sites, USTs are common in both urban and rural areas because they are used for storing heating oil, diesel fuels, and gasoline. Thus, the concern for USTs, unlike most other hazardous wastes, is not primarily an industrial concern but a concern for private citizens, service stations, local governments, schools, and almost everyone else storing significant quantities of fuel on their property.

Sources Of Underground Storage Tanks

Most original liquid chemical storage tanks were motor fuel tanks kept aboveground. Wholesalers, retailers, businesses, and governments started placing them below ground in the 1920s because aboveground tanks were considered more susceptible to vehicular accidents, theft, and tampering. They also took up valuable real estate space. The idea was to bury these storage tanks, and thus, bury most of the problems and liabilities associated with them. There was no way to predict how long they would last or what type of problems buried tanks would present.

From the 1920s to the 1980s, millions of underground storage tanks were installed at commercial, industrial, residential, and governmental sites. These systems were neither well designed nor carefully installed and maintained. In most cases, once the tanks were installed, the owner or operator simply forgot about them. The end result was a significant number of leaks and spills of the stored material, particularly gasoline.

By the 1960s and 1970s, underground storage tanks were identified as our nation's number one source of groundwater contamination. Eighty percent or more of the USTs installed prior to 1980 were made of unprotected steel. Steel tanks could leak after as little as 10 years in the ground, depending on soil and climatic conditions.

Causes Of Spills And Leaks

Spills and leaks are primarily the result of either system failure or human error. The specific reasons for leaks and spills are

- Operational errors.
- Improper installation.
- Piping failures.
- Tank failures.

Operational Errors. Filling and dispensing operations can cause numerous chemical releases from aboveground and underground storage tank systems. Overfills are common for tank systems, especially those that lack overfill protection or cutoff devices. Similarly, operator errors can result in product losses during dispensing activities. For most systems these types of losses are relatively small, but such losses may be frequent and can cause severe contamination of soil and groundwater over a long period of time.

Improper Installation. A large percentage of UST system leaks are the result of improper installation techniques. Tanks and piping are frequently damaged

during transportation and installation. Inappropriate backfill material, which contains rocks or concrete, can damage tanks and piping. The use of inappropriate backfill materials can also accelerate corrosion, and insufficient tightening of joints or fittings can result in leaks. Studies indicate that up to 10 percent of all newly installed tanks may have a leak somewhere in the system, most likely in the piping.

Piping Failures. Four out of five leaks in UST systems occur in the piping, not in the tank itself. While corrosion appears to be a primary cause of such failures, piping leaks can also occur because of the following: loose fittings; improper sealing of pipe joints; differential settling of the tank and piping; stresses caused by freeze-thaw cycles, wetting-drying cycles in high shrink-swell soils, or heavy traffic; hydraulic shock; and pump-induced vibrations.

Tank Failure. The most damaging leaks are likely to occur with tank failure. The most common cause is corrosion. Most tanks are steel, which has a natural tendency to corrode. Corrosion is a natural electrochemical process, and any factor in the design or installation of a tank system that enhances this process can result in accelerated corrosion and premature tank failure. For example, corrosion may be accelerated by the following: the use of corrosive or non-homogeneous backfill; the use of dissimilar metals in the tank or piping; the presence of shallow groundwater or temporary water around the tank; damage to corrosion control coatings; and stray currents from electrical power sources.

Effects Of Leaking USTs On Water Quality

Nationally, groundwater provides much of our daily needs for fresh water, including half of our drinking water supplies. In some areas, groundwater provides more than 95 percent of the water for all uses. In Alabama, at least 40 percent of the population drinks water from groundwater sources. Stored wastes or fuels seeping from underground storage tanks are capable of contaminating these valuable water supplies. Such contamination may be a direct threat to human health and is extremely expensive and very time consuming to clean up.

Gasoline is especially hazardous in drinking water. It contains numerous toxic chemicals and additives to reduce carbon monoxide emissions and boost octane. Many of the chemicals from gasoline can cause damage to the kidneys, liver, and nervous system. Benzene, toluene, xylene, and ethylbenzene, for example, are major contaminants likely to enter drinking water from leaking underground gasoline tanks. These four chemicals account for approximately 15 percent of the volume of unleaded gasoline and are among the more volatile and water soluble chemicals found in gasoline. All four chemicals are highly toxic.

Conclusion

Leaking USTs are one of our nation's leading causes of groundwater contamination. They pose the greatest threat in rural America, where 95 percent of the population depends on well water for drinking. As a result, local governments, businesses, and private citizens face substantial costs to comply with regulations covering both the tanks and potential cleanup, in case there is a problem. In 1990 the average cost for cleaning up a spill or leak was more than $50,000. By 1993, the average investigation and cleanup of contaminated soil and/or groundwater averaged over $100,000 per site in Alabama, a cost similar to that incurred and reported in other states. In some cases cleanup costs can run up to several million dollars.

The National Association of Towns and Townships in Washington, DC has developed valuable resource materials for local officials of towns and cities in dealing with underground storage tank issues (1522 K Street, N.W., Suite 600, 20005-1202, 202-737-5200). This organization has also compiled a list of available technical and non-technical resource materials on USTs.

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