DEPARTMENT OF HEALTH

Wellhead Protection Issues Related to Industrial and Commercial Liquid Chemical and Fuel Storage Tanks

The purpose for this document is to communicate Minnesota Department of Health (MDH) concerns about the impacts on drinking water related to the release of liquid chemicals and liquid fuels from above-ground and buried storage tanks in wellhead protection areas. Wellhead protection areas are distributed statewide and exist as a means of protecting groundwater supplies used for drinking water. As a result, this document focuses on issues pertaining to 1) the placement and operation of fuel and chemical storage tanks and 2) handling practices that have the potential to affect drinking water supplies. In addition, the MDH has authority to enforce drinking water standards established at federal and state levels and for some of the contaminants associated with liquid chemicals and liquid fuels. Therefore, concern about the public health impacts that are presented by these two general categories of contaminant sources is central to the issues raised in this document.

Specifically, the MDH is concerned about the impacts that contamination resulting from the storage and handling of liquid chemicals and liquid fuels may have on drinking water where the source water aquifer is geologically sensitive. An area is geologically sensitive where layers of fine-grained material, such as clay or shale, are not of sufficient thickness to prevent the vertical movement of contaminants from reaching groundwater resources over a time period of weeks to several years. In addition, fuels and some chemical solvents have the ability to disaggregate clay-rich material and reduce its capability to provide geologic protection. Therefore, areas exhibiting a moderate geologic sensitivity (recharge may occur over periods of years to decades) also are considered potentially vulnerable to the vertical movement of liquid chemicals and liquid fuels.

Liquid storage includes, both above-ground and underground tanks used for storing petroleum, fuel (gasoline, diesel, ethanol, and aviation fuel), fuel oil, and hazardous industrial or commercial chemicals. The list of potentially hazardous industrial or commercial chemicals is very long. Some common examples include 1) solvents used in dry cleaning or metal fabricating and degreasing, 2) chemicals used to treat wood, and 3) agricultural chemicals such as liquid fertilizers and pesticides. Furthermore, groundwater contamination arising from historical releases of liquid chemicals or liquid fuels on re-developed or abandoned properties may present a significant threat to drinking water quality and to public health.

If contaminated, the aquifer may no longer be suitable as a current or future drinking water source without the installation of costly treatment equipment. Public water supply distribution lines and storage facilities may need to be relocated to accommodate the construction of new water supply wells elsewhere. Furthermore, contamination of water supply wells may result in expensive legal and remediation costs to the owners of the properties that contributed the contaminants.

The following drinking water protection issues should be addressed for portions of a wellhead protection area that exhibit a high or moderate geologic sensitivity:

- **Contamination of drinking water by liquid chemicals and liquid fuels presents a significant risk to public health.** Some of these parent compounds or breakdown products are regulated under the Federal Safe Drinking Water Act as primary drinking water contaminants. For these contaminants, the U.S. Environmental Protection Agency establishes Maximum Contaminant Level Goals (MCLGs), which are a non-enforceable health goal set at a level at which no known or anticipated adverse effect on the health of people occurs and which allows an adequate margin of safety. The MCLGs for chemicals that cause cancer are set at zero. Enforceable standards are the Maximum Contaminant Levels (MCLs), which are set as close to the MCLGs as feasible using the best available analytical and treatment technologies and taking cost into consideration. MCLs have been set for chemicals such as benzene (a gasoline component), carbon tetrachloride (an industrial solvent), trichloroethylene (a metal degreaser), and alachlor (a pesticide) which are known or suspected to cause cancer in people. MCLs have also been established for toluene (a gasoline component), 1,1,1-trichloroethane (an industrial solvent), xylene (a fuel byproduct and industrial solvent), and 2,4-D (a pesticide), because long-term exposure to them may result in damage to a person's kidney, liver, or nervous system. Furthermore, MDH establishes health-based guidance values (e.g., Health Risk Limits) based solely on their potential to cause adverse health effects. This guidance is provided for other compounds that are not regulated under the Federal Safe Drinking Water Act in order to expand public health protection by reducing people's exposure to them in drinking water.

- **Spills and accidental releases of liquid chemicals or liquid fuels can readily enter drinking water supplies where there is no, or minimal, geologic protection.** Leaking storage tanks and associated piping, as well as accidental spills from handling liquid chemicals or liquid fuels, can result in aquifer contamination to the extent that the aquifer cannot be used for drinking water without treatment equipment that is costly to construct and operate. Areas where the aquifer has no or limited geological protection are particularly vulnerable because geologic materials in these settings 1) have limited capabilities to attenuate chemical or fuel compounds and 2) readily transmit contaminants either as a free product or in solution with groundwater.
- **Changing land and water uses may impact the future movement of contaminated groundwater.** The vertical and lateral movement of groundwater that has been contaminated by liquid chemicals or liquid fuels may change when local directions of groundwater flow change. This can occur when excavating to the water table or backfilling an excavation with more permeable material than occurred naturally. Excavations for buildings, ditches, or mining areas may create a localized sump that results in the movement of contaminated groundwater toward them. Also, constructing wells into the contaminated aquifer or altering the pumping of existing wells that are completed in it may cause a contamination plume to change direction and move toward wells that previously were not impacted.

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09/11/12
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