



Wellhead Protection Fact Sheet

CONTAMINANT SOURCES

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INTRODUCTION

More than 75 percent of Wyoming's population relies on groundwater for part or all of their drinking water supply. This water comes from more than 90,000 wells.

Around a farm, ranch, or rural home-site, there are many potential contaminants that should concern the owner. These contaminants are known to cause various illnesses and, possibly, in severe cases, death. Replacing a water supply well due to contamination of a groundwater aquifer can be a substantial financial burden. Additionally, the party responsible for the contamination may incur substantial legal repercussions if adjacent properties are affected by the pollution.

This fact sheet discusses some common contaminants and their sources around the home. Please read the Water Well Setback Distances Fact Sheet to learn about ways you can help protect your groundwater supply.

HOUSEHOLD WASTEWATER HANDLING SYSTEMS

Despite efforts to regulate design, placement and use, septic systems are still the largest reported cause of groundwater contamination resulting in disease outbreaks in the U.S. Property owners must remember that they are responsible for their septic systems, and for any contamination a poorly functioning system may cause.

Conventional septic systems are designed to prevent surface ponding of wastewater, and to provide an adequate treatment filter between the bottom of absorption fields and groundwater or bedrock. When these systems are properly designed, installed, operated, and maintained, potentially harmful contaminants in wastewater are adequately treated before reaching groundwater.

Improperly designed septic system leach fields can be a source of nitrate contamination. Nitrate (NO_3) is a form of nitrogen combined with oxygen. Nitrate contamination in groundwater can cause a blood disorder known as methemoglobinemia (blue baby syndrome), which primarily affects infants.

Elderly persons may also be affected, but nitrates can be harmful to adults of any age if consumed in excessive amounts.

The U.S. Environmental Protection Agency (EPA) has established a level of 10 milligrams per liter (mg/L) (1mg/L is equal to 1 part per million) as the drinking water standard for nitrate for public water systems. Nitrate levels in private water supplies also should be below 10 mg/L.

Various illnesses and diseases have been attributed to bacteria and viruses associated with water contaminated by septic systems. Gastrointestinal illnesses are common types of illnesses associated with drinking water contaminated with untreated or inadequately treated wastewater from septic systems.

Bacteriological quality of a water supply is most often determined by sampling and analyzing for coliform bacteria. Current standards specify that drinking water must not contain more than one coliform colony in 100 milliliter of water after undergoing a standardized laboratory procedure. If one or more coliform colonies are measured, a second sample should be tested to verify the results.

To prevent health problems and prevent solids from overflowing septic tanks and clogging leach fields, septic tanks should be pumped at regular intervals, at least every two or three years. A separation distance of at least four feet should be maintained between the bottom of the septic system leach field and the water table or bedrock. The lowest pollution risk occurs when at least six feet of medium to fine textured soil is maintained between the potential pollution source and the water table or bedrock.

Septic tanks should be at least 50 feet from water supply wells, leach fields should be at least 100 feet away.

BARNYARDS, FEEDLOTS, AND OTHER LIVESTOCK HOLDING AREAS

Barnyards and feedlots have the potential to be a source of nitrate and bacteria contamination if groundwater is shallow, or a pathway into groundwater is present. Ideally these types of activities should have a goal of no manure discharge into groundwater or surface water. Factors to be considered when siting a new feedlot include location and distance to existing water supply wells, topography, soil type, and depth to groundwater.

Animal barns or yards should be located at least 50 feet away from wells.

FERTILIZER STORAGE AND MANAGEMENT FACILITIES

Pollution can be prevented by storing dry fertilizer in an enclosed facility with impermeable floors away from any sources of moisture, or in wagons designed to protect fertilizers from moisture. Long-term storage of anhydrous ammonium or other liquid fertilizers should be in enclosed facilities with a watertight floor and containment walls. Care should be used in selecting materials for construction of fertilizer storage facilities, because some fertilizers can be very corrosive and may damage containers. To prevent pollution, storage tanks may need to be placed in a secondary containment structure designed to contain 125 percent of the tank's capacity. The valves, fittings, and integrity of the tank should be checked routinely. Timely cleaning up all fertilizer spills and applying fertilizers at correct agronomic rates will also help prevent groundwater pollution.

Fertilizers should be stored at least 100 feet from wells. Fertilizer mixing and loading should be done at least 200 feet from wells.

UNDERGROUND/ABOVEGROUND STORAGE TANKS

Petroleum products such as gasoline, diesel, and heating oil are stored in underground or above ground storage tanks. Leaks may occur through holes in the tank or in any associated piping, fittings, or valves, or attached dispensers.

Some constituents of petroleum products are known carcinogens. For example, benzene, a known carcinogen found in gasoline, has a Maximum Contaminant Level (MCL) of 5 micrograms per liter ($\mu\text{g/L}$) (1 $\mu\text{g/L}$ is equivalent to one part per billion). Five $\mu\text{g/L}$ is equivalent to 5 gallons of pure benzene in one billion gallons of water.

Petroleum products in underground and/or above ground tanks should be located at least 100 feet away from wells.

PESTICIDE STORAGE AREAS AND APPLICATION

Pesticides, such as herbicides and insecticides, have potential to contaminate groundwater. Pesticides applied to soil may migrate through the soil to the water table. However, the highest potential for contamination occurs in areas where pesticides are mixed, and where application equipment is loaded and rinsed after each use. Soils under such areas may receive a much greater loading of pesticides than croplands to which the pesticides are applied.

Pesticides can find their way into groundwater through a poorly sealed well, from back-siphoning during spray-tank filling, or improper disposal of pesticide containers. In addition, data has revealed that pesticides move into groundwater even when they are applied at appropriate rates under typical farming practices. Soil types and topography are important factors in how and whether the chemicals leach through the soil into the groundwater.

Some pesticides may have carcinogenic effects; therefore, the standards (Maximum Contaminant Levels (MCLs)) established by the EPA are often very low. For example the MCL for atrazine is three parts per billion in water.

Pesticides should be stored at least 100 feet from wells. Pesticide mixing and loading should be done at least 200 feet from wells.

SILAGE STORAGE

Improperly stored silage can produce leachate with high concentrations of nitrate. If the silage is properly harvested and stored, the threat of leachate (silage juices) can be significantly reduced. The amount of leachate varies with the moisture and nitrogen content of the silage and the handling and storage conditions. The silage needs to be harvested and stored at a moisture content below 65 percent to eliminate the potential for leachate. Water-tight covers are needed for any silage storage structures (silos, earthen pits or trenches) to prevent additional water from entering the storage area. Old wooden silos with wooden floors can be relined to help make them water-tight.

Water-tight silos (glass-lined silo with concrete floor and drain) should be at least 50 feet from wells. Earthen trench or pit silos should be at least 250 feet from wells.

The following table identifies a few potential contaminants around ranches, farms, and rural home-sites, and their corresponding MCLs, health effects and sources:

CONTAMINANT	Maximum Contaminant Level	HEALTH EFFECT	SOURCES
Nitrate	10 ppm	"Blue Baby syndrome"	septic fields, barnyards, fertilizers, silage storage
Bacteria	1 coliform colony per 100 ml H ₂ O	Gastro-intestinal	septic field, barnyard
Benzene	0.005 ppm	Carcinogen	fuel storage tanks
Ethylbenzene	0.7 ppm	Internal Organs	fuel storage tanks, pesticides
Toluene	1 ppm	Central Nervous System	fuel storage tanks
Xylenes	10 ppm	Central Nervous System	fuel storage tanks
Atrazine	0.003 ppm	Carcinogen	field application, storage, handling
Picloram (Tordon)	0.5 ppm	Internal Organs, Central Nervous System	field application, storage, handling

Separate **Rural Wellhead Protection Fact Sheets and Worksheets** are available on proper water supply well construction, proper sealing of abandoned wells, and recommended setback distances from water supply wells to these potential sources of contamination.

Contacts

Wyoming Department of Agriculture Analytical Services Laboratory, 1174 Snowy Range Road, Laramie, WY 82070. (307) 742-2984.

Wyoming Department of Health/Preventive Medicine Division - Public Health Laboratory, Cheyenne, WY. (307)777-7431.

Wyoming Department of Environmental Quality, Water Quality Division, 122 W. 25th St. 4W, Cheyenne, WY 82002, (307) 777-7781.

Wyoming State Engineers Office, 122 W. 25th St. Herschler Bldg., 4E, Cheyenne, WY 82002, (307) 777-7354.

U.S. Geological Survey, Water Resources Division, 2617 E. Lincolnway, Cheyenne, WY 82007, (307) 772-2153.

U.S. Environmental Protection Agency, Region VIII, 999 18th St., Suite 500, Denver, CO 80202-2466, (800) 227-8917.

RURAL WELLHEAD PROTECTION

CONTAMINANT SOURCES WORKSHEET

This worksheet is designed to accompany the *Contaminant Sources Fact Sheet*. Please refer to the *Contaminant Sources Fact Sheet* when completing the worksheet. Leave blank any areas that do not apply to you. After completing the worksheet, review the *Fact Sheet* to determine whether your drinking water well may be threatened by potential contaminant sources at your ranch, farm, or rural home-site. This *Worksheet* can be used together with the *Water Well Setback Distances Fact Sheet* to evaluate whether the setback distances between potential sources and your water well(s) are adequate.

HOUSEHOLD WASTEWATER HANDLING SYSTEMS

1. What is the distance from your well to the septic tank? _____ feet
_____ do not know
2. What is the distance from your well to the leach field? _____ feet
_____ do not know
3. What is the vertical distance from the bottom of your leach field to the water table? _____ feet
_____ do not know
4. Where is the septic system in relation to your water supply well? _____ Down gradient
_____ Cross gradient
_____ Up gradient
5. What types of soils lay beneath your septic field? _____ sand/gravel
_____ silt
_____ clay
_____ do not know
6. Do you ever dump paints, solvents, or household chemicals down your drains? _____ never
_____ occasionally
_____ frequently

BARNYARDS, FEEDLOTS, AND OTHER LIVESTOCK HOLDING AREAS

1. What is the distance from the nearest feedlot, or livestock holding area to your water supply well? _____ feet
2. What type of soil lies beneath the feedlot? _____ sand/gravel
_____ silt
_____ clay
3. Where is the feedlot in relation to your water supply well? _____ Down gradient
_____ Cross gradient
_____ Up gradient

FERTILIZER STORAGE/HANDLING

1. What is the distance from the nearest fertilizer storage facility to your water supply well? _____ feet

FERTILIZER STORAGE/HANDLING (continued)

- 2. Where is the nearest fertilizer storage facility located in relation to your water supply well?
 Down gradient
 Cross gradient
 Up gradient
- 3. Does your storage area provide an impermeable floor such as concrete or asphalt?
 yes
 no
- 4. If floor is not concrete or asphalt, what type of soil lies beneath it?
 sand/gravel
 silt
 clay
- 5. Do you immediately clean up spilled materials?
 yes
 no
- 6. Are your fertilizer containers clearly labeled?
 yes
 no
- 7. Are your fertilizer containers without holes or weak seams?
 yes
 no
- 8. Are your fertilizer containers sealed with tight lids?
 yes
 no
- 9. Does your storage area provide a curb built around liquid fertilizer storage area(s) to prevent contamination from spreading to other areas?
 yes
 no
- 10. What is the distance from your mixing/loading area to your well?
 feet
- 11. Do you have a concrete mixing/loading pad?
 yes
 no
- 12. Do you have a backflow prevention device installed on your water supply?
 yes
 no

PESTICIDE STORAGE/HANDLING

- 1. Does your storage area have a concrete floor?
 yes
 no
- 2. Does your storage area contain a bermed area to contain spills of liquids?
 yes
 no
- 3. What is the distance from your pesticide storage area to your well?
 feet
- 4. Where is your pesticide storage facility located in relation to your water supply well?
 Down gradient
 Cross gradient
 Up gradient

FUEL STORAGE TANKS

1. Do you have an underground or above ground fuel storage tank on your property?
 yes
 no
 do not know
2. What year was it installed?
 year
 do not know
3. What is the distance from the fuel tank to your well?
 feet
4. Where is the tank located in relation to the water supply well?
 Down gradient
 Cross gradient
 Up gradient
5. Upon what type of soil is the tank located?
 sand/gravel
 silt
 clay
6. What is the approximate depth to groundwater beneath the tank?
Upon what type of soil is the tank located?
 feet
 do not know
7. Do you have a liner and collection system beneath the above ground tank?
 yes
 no
 do not know