

# Protecting Wells from Contamination

There are numerous preventative measures that a well owner can take to help protect their well from possible contamination. If water becomes contaminated, it can affect the health of people and livestock. It may also affect the quality of the water in nearby lakes, streams, dugouts, or other wells, impacting neighbouring water users. It is much easier and less expensive to prevent contamination than to clean it up. Treating contaminated water, drilling a new well, or getting water from another source are all inconvenient and expensive options.

Wellhead protection against contamination is important for all well owners. Wells can provide a direct route for contaminants to reach groundwater. It is therefore imperative that wells be constructed in a way that protects the water resource and inhibits the downward movement of contaminants.

Well owners should pay especially close attention to protecting the aquifer from contamination if it is naturally vulnerable. Where water can infiltrate below the root zone, there is a risk of pollution from dissolved chemicals in the water. The risk is increased when the aquifer is shallow, and where there are coarse textured soils such as sands and loamy soils that have large pore spaces which allow water to percolate through quickly.

## Well Head Protection

### Proper Well Siting

There is a greater risk of water contamination if the well is drilled in close proximity to potential contamination sources such as livestock yards, septic systems, and manure storage facilities.

### Proper Well Construction

The following design considerations can help prevent the contamination of a well:

- A proper casing and annulus seal maintains water quality by preventing the movement of contaminants between aquifers and from the ground surface.
- The top of the well casing should be approximately 0.6-0.9 m (2-3 ft) above ground level, and the area around the well should be built up with good clay soil and sloped away from the well so that surface water will drain away from the well in all directions.
- A vented watertight well lid should be installed to prevent water and bugs or other creatures from entering the well.

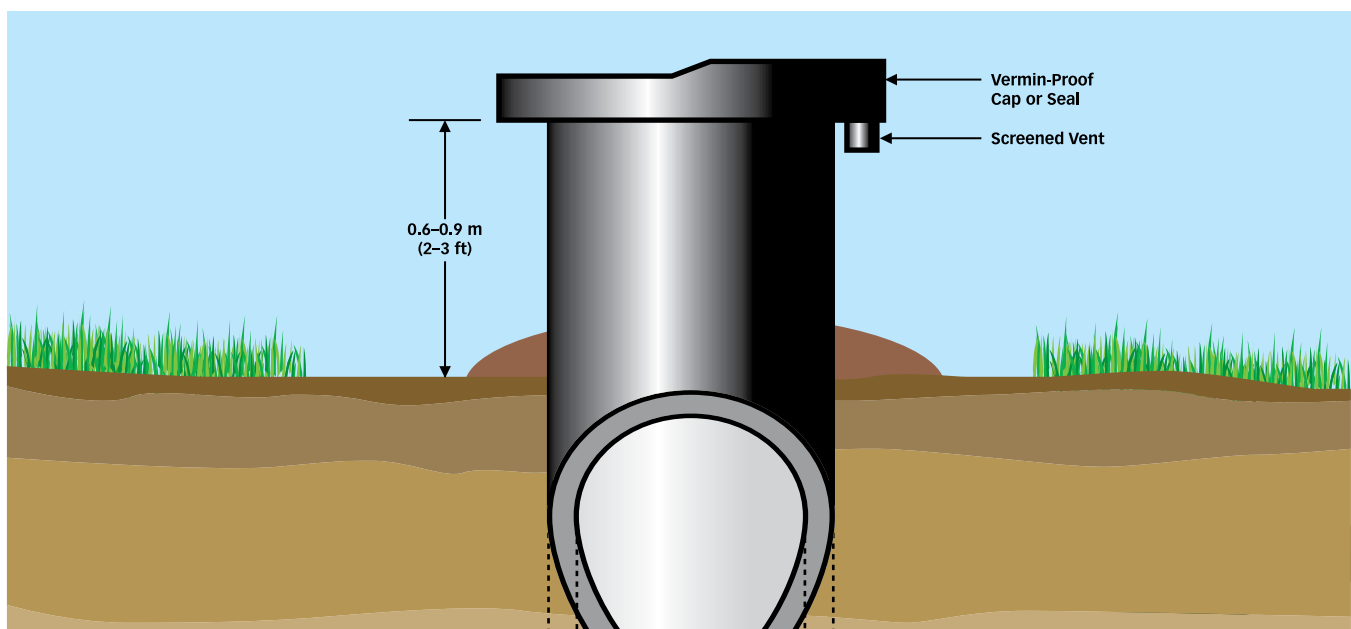


Figure 19: Well Cap

## Well Contamination During Maintenance

Water can become contaminated when equipment is placed in the well without being properly disinfected. This can occur during the construction of a new well or during maintenance when piping or equipment is laid on the ground.

## Improperly Decommissioned Wells

There are several ways that abandoned wells and improperly decommissioned wells may allow for the contamination of aquifers. They can act as a pathway for surface runoff to directly enter the aquifer. They can also permit cross-contamination of different aquifers along the length of the borehole. Nearby wells that are completed in the same aquifer may also eventually become contaminated.



Figure 20: An abandoned well in a cattle yard can contaminate the aquifer

Abandoned wells may also be a physical safety threat. Many unsealed, abandoned wells are not marked or covered, and they can pose a hazard to people or animals that might fall into them.

For the proper decommissioning procedure for abandoned wells, please refer to the following chapter.

## Well Pits

Well pits provide a place for contaminated surface water or shallow groundwater to collect. This water can directly enter the well or seep down around the well casing and eventually contaminate the aquifer. Well pits can also cause contamination by housing rodents or insects.

Well pits can be a safety hazard. Well gases or low oxygen content in the well pit has resulted in human death, as people entering the well pit have become asphyxiated or poisoned. Well pits can also be a potential danger to children.

Because of the unacceptable risks presented by well pits, they should never be used. Pitless adaptors should be used to connect the well to the distribution system. They provide a safer, more economical, and more sanitary option than the well pit. Where well pits are currently used, the well casing should be extended above ground and the well should be connected to the distribution system with a pitless adaptor, allowing the well pit to be decommissioned.

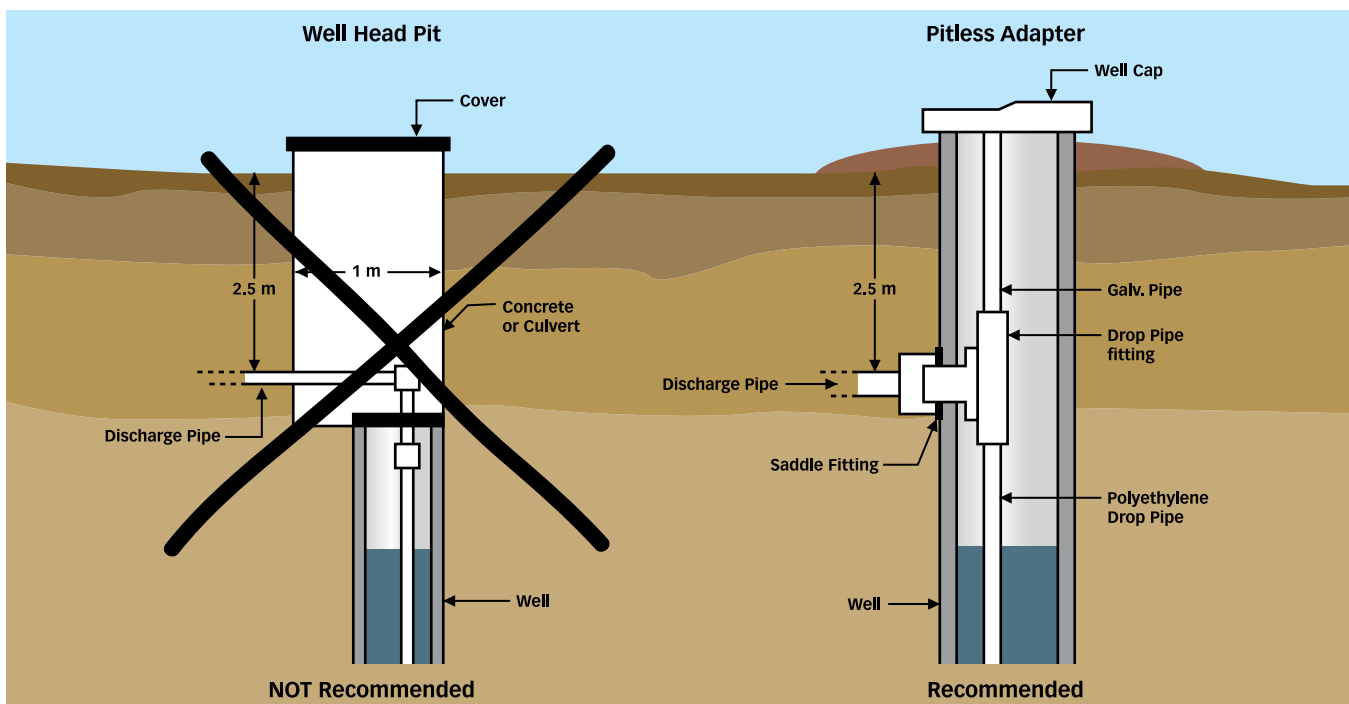


Figure 21: Well Pit and Pitless Adaptor

## Water Hydrants Installed in a Well or Well Pit

Water hydrants prevent freezing by draining water back down the well whenever they are shut off. In other words, the contents of the standpipe and hose are siphoned back into the well. Water hydrants can cause back siphoning that can draw contaminated water back down the well. For this reason, hydrants should never be completed in, or immediately adjacent to, a well.



Figure 22: Water Hydrant

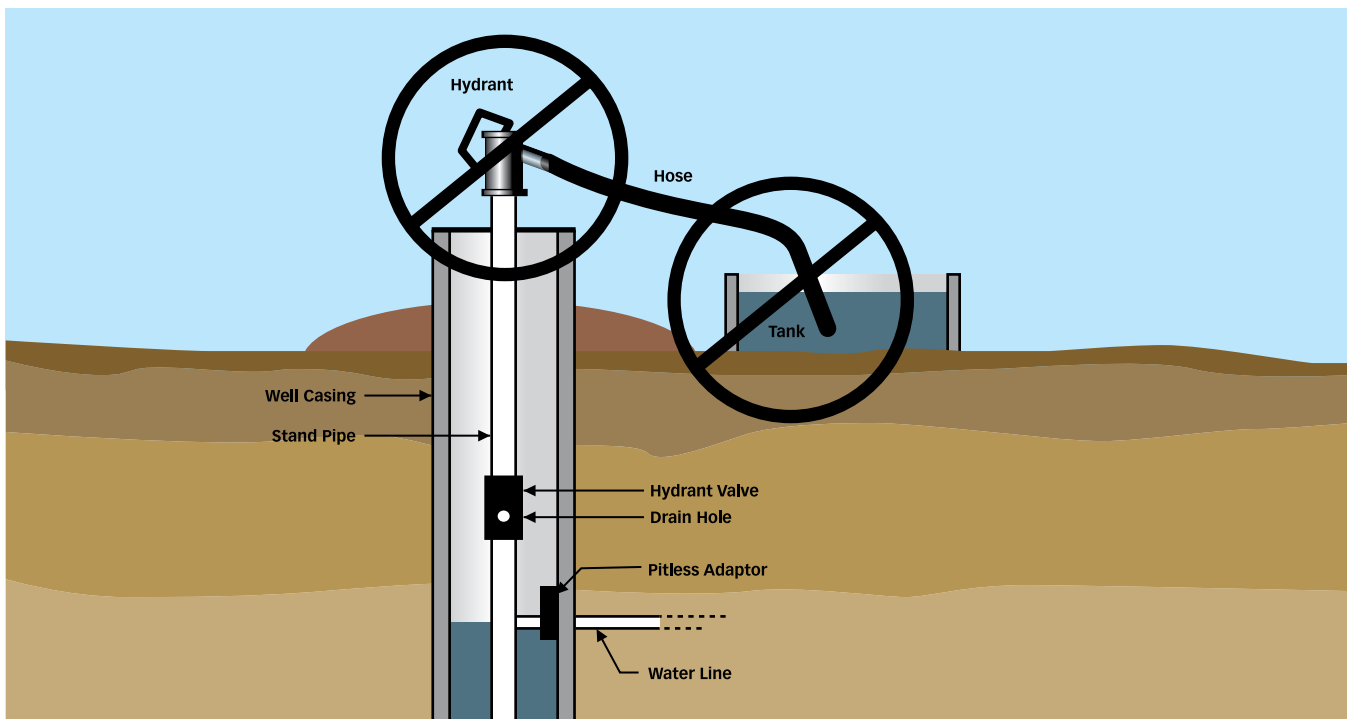


Figure 23: Water Hydrant

## Aquifer Protection

Some aquifers are more susceptible to contamination than others, especially those located at shallow depths and overlaid by coarse textured soils. Although the susceptibility to contamination for each well can only be judged on an individual basis, general attempts should always be made to maximize the distance between contamination sources and the well. The well should also be upslope from these sources, and in a well-drained location.

## Onsite Wastewater Systems

Onsite sewage systems can include holding tanks and septic tanks (which by themselves are a very low risk to groundwater supplies), chamber systems, absorption fields, mounds, jet type disposals, lagoons and package treatment systems. The Province of Saskatchewan has regulations to control the proper construction of onsite wastewater systems. All such systems (septic tanks and sewage disposal options) require a permit from the Health Region for a private sewage works under *The Plumbing and Drainage Regulations* and to be designed and installed according to The Saskatchewan Onsite Wastewater Disposal Guide. The system should also be maintained and operated within the design parameters, and the treated sewage should be disposed of properly. For an average household with a properly sized septic tank, the septic tank should be inspected for required cleaning at intervals of no more than two years to determine scum and sludge accumulation. It should also be ensured that the tank is not cracked or broken, and that the pump is functioning properly.

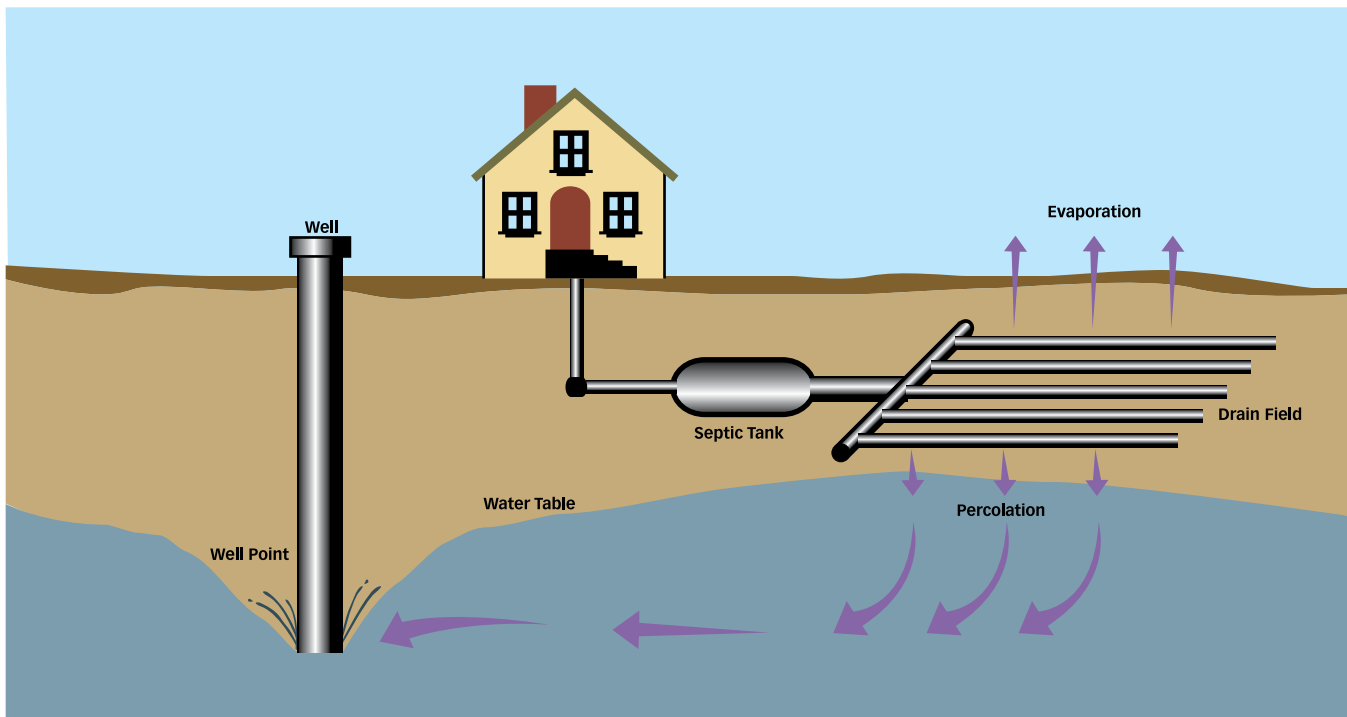


Figure 24: Septic System Contamination

## Fuel Storage Tanks

Contamination of groundwater by hydrocarbons from fuel storage tanks is a significant problem. To avoid a spill or leak, it is important to have a properly installed, approved tank that will resist corrosion. Fuel storage tank dispensers are required to meet legislated requirements and avoid accidental spills due to overfilling or siphoning. Only approved dispensers [e.g. by the Underwriters' Laboratory of Canada (ULC) or the Canadian Standards Association (CSA)] are acceptable. All fuel must be pumped in such a manner as to meet legislated requirements and to avoid unwanted dispensing of fuel.

Tanks should be monitored for leakage by keeping measurements of the amount of fuel used and by comparing this to the amount purchased. A spill or leak can occur in large quantities due to a tank rupture, or in small quantities due to pinhole leaks. If not contained, leaks can cause serious damage to groundwater quality. A dike can capture any spills or leaks from above-ground tanks. These spills should be cleaned up immediately. Above-ground fuel storage tanks are considered more desirable than underground tanks, as they are easier to monitor for leaks.

## Pesticide Contamination

Pesticide is a broad term that refers to substances such as insecticides, rodenticides, fungicides, and herbicides used to control insects, rodents, fungal disease, and weeds. Pesticide contamination usually occurs when pesticides are mishandled in the area surrounding the well. Therefore, pesticides should be handled carefully, and should not be mixed or stored near a well. A safe storage area should be used, and pesticide containers should be emptied and the rinsate disposed of safely.

## Manure and Fertilizer Contamination

Fertilizer or manure that is applied to agricultural land in excess of the crops' nutrient requirements can lead to nitrates being leached into groundwater. Regularly testing soil and manure can help maintain a balance between the nutrient requirements of the crops and the nutrient content of the manure or fertilizer.

Fertilizers should be handled carefully and stored in areas that meet all safety requirements. Storage facilities for manure should be large enough to safely hold all of the manure that is produced and should be checked regularly for leaks and damage.

## Improper Storage of Silage

Silage is an important source of feed for livestock, but if it is improperly handled or stored, liquid or seepage may escape from the storage site. This seepage can contain high concentrations of nutrients and acid and can negatively affect groundwater quality. Therefore, silage should be stored at an appropriate moisture level to minimize seepage, and all parts of the silage storage, including the lining, should be in good condition.

## Livestock Yards

Livestock yards include feedlots, cow-calf facilities, livestock handling facilities, stockyards, and assembly stations. Manure contains nutrients and microorganisms that could be a danger to groundwater quality. The livestock yard should be located a significant distance from nearby wells, and manure and all runoff from the facility should be collected and stored to avoid groundwater contamination. Under *The Agricultural Operations Act*, certain types of intensive livestock operations are required to obtain provincial approval of waste storage, manure management and dead animal disposal plans to ensure water protection.



Figure 25: Intensive Livestock Operation

## Disposal of Farm Wastes

Farm wastes include dead livestock, animal health care products, packaging, old farm buildings, and worn-out equipment or machinery. Farm wastes may adversely affect groundwater quality if they are stored or disposed of in the wrong way. Whenever possible, all material or equipment should be recycled. Organic material, including leaves and dead animals or portions of dead animals, should be composted. Intensive livestock operations should have a dead animal disposal plan which has been approved by Saskatchewan Agriculture and Food. All other material should be taken to a licensed landfill site.