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Private Drinking Water Wells: The Water Well

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This publication is one of six in a series designed to help rural families understand and manage their private drinking water wells.

A contaminated well is a serious problem that can be costly and time-consuming to solve. Often, contamination can be avoided if care is taken in locating and constructing a well. Constructing a well according to state regulations, Nebraska Department of Health and Human Services (NDHHS) Title 178, Chapter 12, "Water Well Standards," will reduce the chances of water contamination. This guide provides general information. For more information, contact NDHHS, the Nebraska Well Drillers Association, or a Nebraska-licensed water well contractor.

Who Can Do The Work?

Private drinking water wells must be constructed and repaired in accordance with NDHHS Title 178, Chapters 10 and 12. Regulations state that well construction and repair must be done by either a Nebraska-licensed water well contractor or supervisor, or a person working directly under the supervision of a licensed contractor or supervisor. The supervisor must be readily available either in person or by telecommunication.

An exception to the rule allows unlicensed individuals to construct or work on their own drinking water well if they own the land and either live on the site or use it for farming, ranching, or agricultural purposes.

Well Location

All wells must be protected from surface water runoff and flood waters, which contain contaminants. A drinking water well should be located at the highest possible point on the land so that surface water will be naturally directed away from the well. If this is not possible, surface runoff should be directed away from the well by grading.

Ideally, potential sources of contamination such as septic systems, gasoline storage, chemical storage, etc., should be located downgrade from the well. In addition, minimum distances are required between drinking water wells and possible sources of contamination. Most rural property with a private drinking water well is also served by an onsite wastewater treatment system. The well must be located at least 50 feet from any septic tank and at least 100 feet from any drainfield, cesspool, privy, or other subsurface disposal system (*Figure 1*). Depressions that could retain stagnant water also present

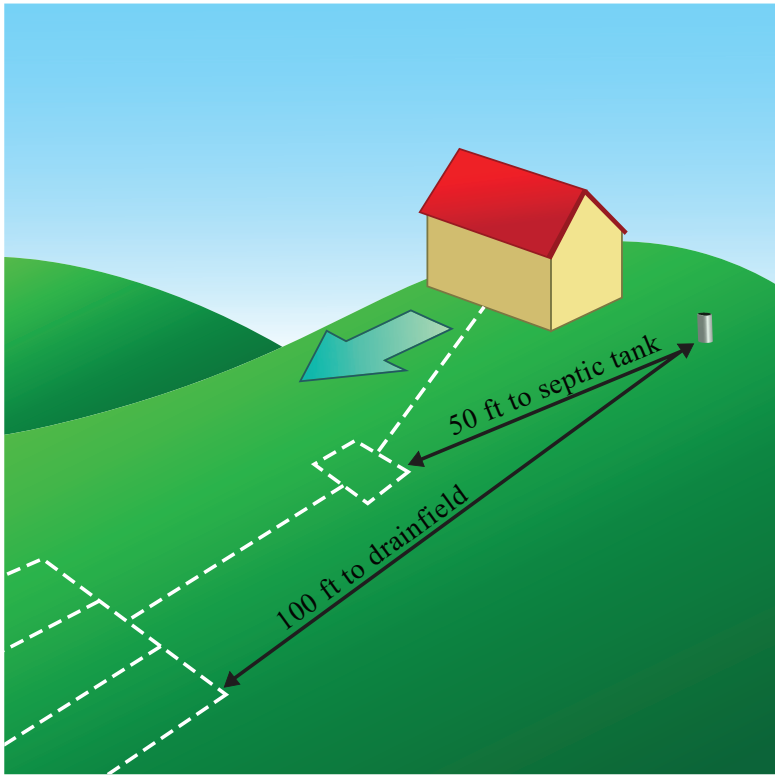

Figure 1. Locate wells at least at least 50 feet from any septic tank and at least 100 feet from any drainfield.

a risk of contamination. The well must be located at least 10 feet from any depression and at least 10 feet from a well pit. It must be 10 feet from sewer lines or frost-proof hydrants. For a well to be located 10 to 50 feet from a sewer line, the line must be constructed so that it is watertight when subjected to a pressure equivalent to a column of water 10 feet high. There are many additional pollution sources on rural property. The well must be located at least 100 feet from any other known source of contamination or pollution.

Well Construction

Most drinking water wells are drilled. Water from bored (seep or cistern) wells can be used for human consumption if they are constructed to the same minimum standards required for drilled potable wells. State regulations state that new wells to be used for human consumption cannot be constructed as driven sandpoint wells. This publication will focus on drilled wells constructed to supply water for human consumption. Contact the NDHHS or a Nebraska-licensed water well contractor for additional information on potable wells.

The aquifer is the geologic formation into which the well will be drilled. The aquifer must contain enough saturated material (usually sand and gravel) to yield a sufficient supply of water. Saturated means that all pore spaces or voids between the sand and gravel particles are filled with water. Unsaturated material will have some pore spaces filled with air. The first step in well construction is to drill a borehole into the aquifer. Care must be taken so that contaminants are not introduced into the groundwater during the drilling process. Contractors must ensure that all equipment used in the borehole is free of contamination.

After drilling, a casing is placed in the center of the borehole (*Figure 2*). The casing is a pipe that supports the hole from collapsing and provides a conduit for water to be drawn out of the aquifer. The casing should be positioned to maintain

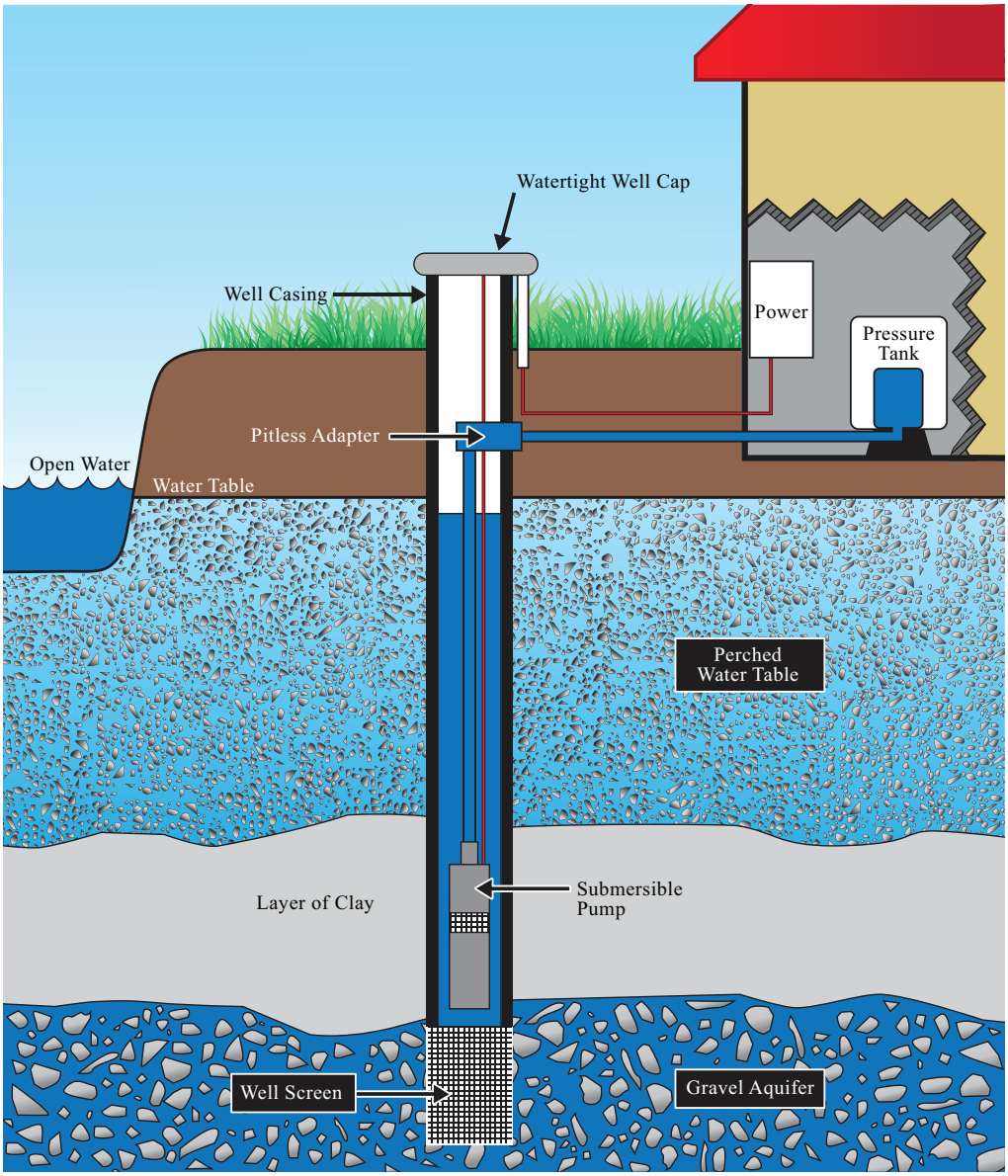

Figure 2. The casing, positioned in the center of the borehole, provides a conduit for water to be drawn out of the aquifer.

a minimum of 2 inches of uniform space between the outside of the casing wall and the sides of the borehole. Well casing must be nontoxic, durable material that will be compatible with the quality of the water in the aquifer. It can be made from steel, PVC, fiberglass, or Teflon®. Plastic casings must be made of virgin material and must be manufactured expressly for water well use, and approved by NSF International. NSF International is an independent, not-for-profit organization that provides standards development and product certification that help protect food, water, and health.

The depth of the borehole and the well casing will depend on the depth and thickness of the aquifer's saturated material. All drinking water well casings must extend at least 12 inches above the grade of the land surface. The top of the well is capped with a watertight, secure cover. A screened vent on the cap, which is an inverted U-shaped tube covered with wire mesh, equalizes the air pressure inside the well with that of the atmosphere (*Figure 3*).

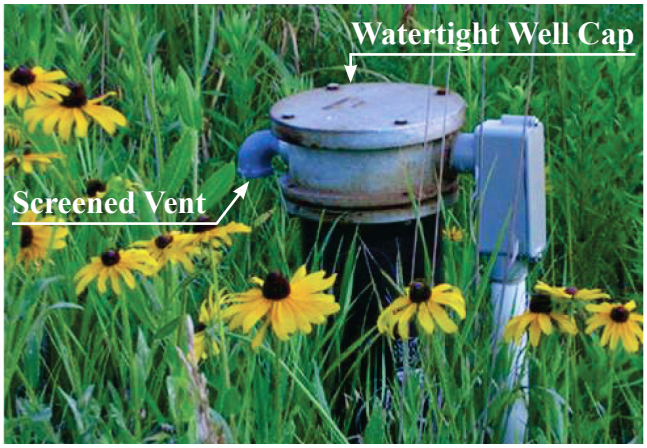

Photo by Jan Hygnstrom

Figure 3. A watertight, secure cover caps the top of the well.

Water in the aquifer's saturated zone must have a way to enter the well casing. This is achieved with a well screen. The screen is located in the aquifer's water-bearing zone. It has apertures (slots or louvers) in the casing that allow water to pass through. The area around the well screen is packed with clean sand or gravel that stabilizes the aquifer material while allowing water to move into the well (*Figure 4*).

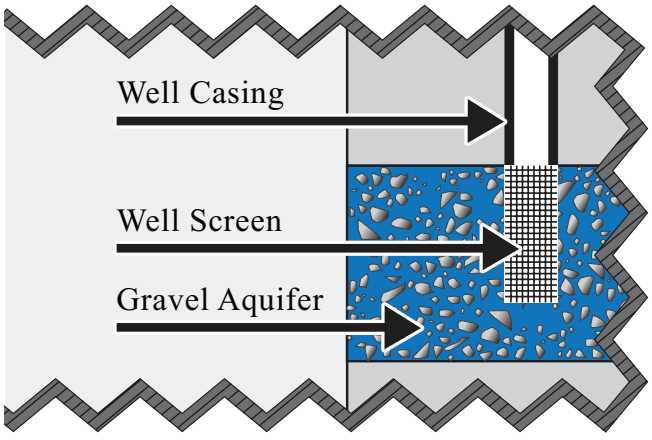

Figure 4. Water enters the well casing through a slotted well screen. Gravel packed around the well screen provides stabilization while allowing water to enter the well.

The space between the well casing and the borehole, along the entire length of the well, is called the annular space. Portions of this space must be filled with grout to prevent contaminants from running down the outside of the casing into the aquifer. Grout must meet NDHHS standards.

A pitless adapter is an underground connection. It attaches directly to the casing and provides a watertight subsurface connection for water discharge (*Figure 5*). This eliminates the need for a well pit.

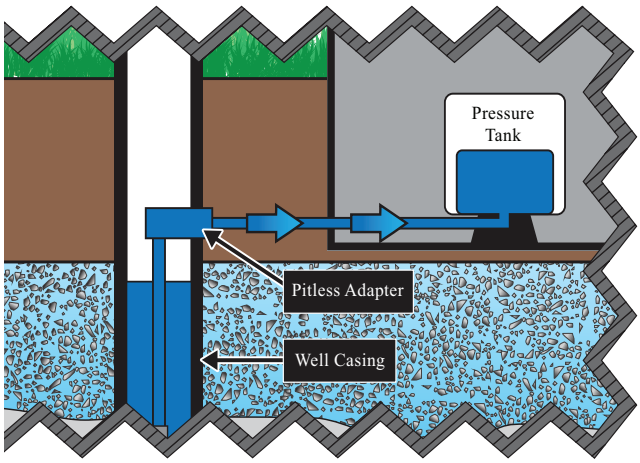

Figure 5. A pitless adapter attaches to the well casing and provides a watertight seal.

Upon completion of the well, it must be developed. Development is a procedure designed to remove excess grout, silt, or clay left over from the drilling operation, from the aquifer formation, and therefore maximize the well efficiency. The process involves surging, jetting, or other means to force water at velocity through the well screen. In addition, new drinking water wells must be disinfected to ensure that water is safe for drinking as soon as the disinfectant is flushed. An exception is allowed for owners who specifically waive disinfection in writing. Typically, bleach is used for disinfecting a well.

Well Logs

Any licensed water well contractor or owner who constructs a well must keep an accurate well log. If the work is done by a water well contractor, he or she must give a copy of the well log to the owner. The licensed well contractor or owner must register the well with the Nebraska Department of Natural Resources (*dnr.ne.gov*).

The well log will include:

- Legal description of the location of the water well.
- Description and depth of the geologic materials encountered.
- Depth and diameter of the water well.
- Diameter and depth of excavated hole.
- Depth, thickness, and placement of all grout.
- Casing information including length, inside diameter, wall thickness, and material.

- Screen information including length, trade name, inside and outside diameter, slot size, and material.
- Static water level.
- Water level when pumped at the designed rate.
- Yield of well in gallons per minute or gallons per hour.
- Dates when drilling commenced and construction was completed.
- Intended use of the well.
- Name and address of the owner.
- Name, address, and license number of the person who constructed the well.
- Signature of water well contractor.

Summary

When planning for a private drinking water supply, wells must be located and constructed to minimize risk of contamination. The work must be done in accordance with NDHHS Title 178, Chapters 10 and 12. All work must be done by a Nebraska-licensed water well contractor or supervisor, or a person working directly under the supervision of a licensed contractor or supervisor. An exception to the rule allows unlicensed individuals to construct or work on their own drinking water well if they own the land and either live on the site or use it for farming, ranching, or agricultural purposes.

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