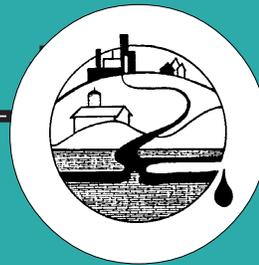


# Water Quali

School of Agriculture  
School of Consumer and Family Sciences  
Purdue University Cooperative Extension Service  
West Lafayette, Indiana  
USDA Cooperating



## Plugging Abandoned Water Wells: A Landowner's Guide

*Sarah L. Brichford and Gene A. Matzat, Department of Agronomy  
Terri Swoveland, Indiana Department of Natural Resources Division of Water*

Old, unused water wells dot the Indiana landscape—an old windmill, a pit near an abandoned farmhouse, or a pump standing in a field. Like those before them, most rural residents still depend on ground water for their drinking water. Abandoned wells pose a potentially serious threat to ground water quality.

Wells connect the land surface and ground water. Contaminated water can move down a well or along the outside of an ungrouted well casing (Figure 1). Contaminants enter directly into the ground water without being filtered by the soil.

Abandoned wells are also a safety hazard for children and animals. A small child can easily fall into a large-diameter well or even slip into a 10-inch wide hole.

You can eliminate health and safety risks by plugging abandoned wells on your property. This bulletin gives guidelines on how landowners can plug their own wells. In Indiana, you, the

landowner, are responsible for the abandoned wells on your property.

### Indiana Regulations

In Indiana, the date a well was abandoned determines whether the well must be closed by a well driller. Well drillers in Indiana are licensed and required to follow proper procedures when drilling and abandoning water wells. Landowners can close wells that do not require a licensed driller. No matter who does the job, the landowner is ultimately responsible for the proper plugging of an abandoned well.

Landowners and well drillers must follow the same regulations regarding abandoned wells. These regulations are stated in 312 IAC 13-10-2<sup>1</sup>. The Indiana Department of Natural Resources (IDNR) Division of Water enforces these laws. Current regulations state that an abandoned well is one “whose original purpose and use have been discontinued for more than five years; or that is in such a state of disrepair that using it to obtain ground water is impractical or a health hazard” (IC 25-39-2, sec. 2)<sup>2</sup>. The actions taken to plug or seal the well depend on the date the well was abandoned.

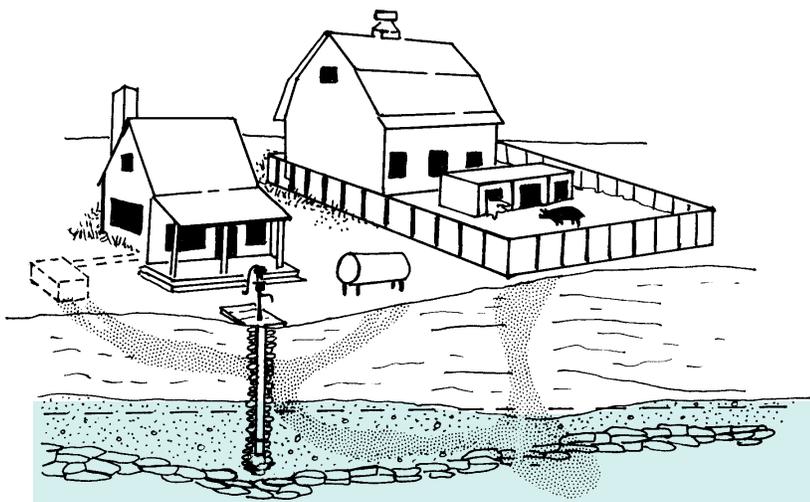


Figure 1. Ground water is naturally protected by the filtering effect of soil. Abandoned wells act like a pipe connecting ground water to the soil surface. Surface runoff contaminated with sediment, bacteria or chemicals can enter ground water directly through an abandoned well.

### ***Wells abandoned before 1988***

A well abandoned before January 1, 1988, must be sealed at or above the ground surface with a welded, threaded or mechanically attached watertight cap. A well which poses a hazard to human health must also be plugged according to the procedures stated in the regulations.

Note that the law requires sealing or capping as a minimum procedure to prevent ground water contamination. The IDNR Division of Water strongly recommends plugging all wells abandoned before 1988 to protect ground water supplies. Many old wells were constructed without grout between the casing (the vertical pipe that lines the well) and the wall of the borehole. Sealing the well does not prevent contaminated water from running down the side of the casing and entering the well through holes caused by corrosion or tears in the casing. Sealing also does not prevent contaminants that have seeped through the soil from entering the well through holes in the casing below the ground surface. Plugging the well with an impervious material is the best way to prevent contamination and restore the integrity of the geologic formation. A landowner or a licensed well driller can do the work.

### ***Wells abandoned after 1988***

Wells abandoned after December 31, 1987, must be plugged with an impervious grouting material within one year of abandonment. A licensed water well driller must do the work. In addition, wells drilled after December 31, 1987, and not equipped with a casing must be plugged by the driller within 72 hours after completion.

### ***Temporary abandonment***

Wells idle for more than three months, but not abandoned, must be sealed at or above the ground surface by a welded, threaded or mechanically attached watertight cap. A landowner or a licensed well driller can do the work.

### ***Enforcement***

The IDNR employs conservation officers to enforce regulations. These officers generally do not actively search properties for abandoned wells; however, local government entities, licensed well drillers or concerned citizens can notify the IDNR Division of Water of existing abandoned wells on any landowner's property. Conservation officers will respond to questions and complaints.

A well driller who does not follow the appropriate procedures could put you at risk for problems. Licensed water well drillers have met the requirements established by the Indiana Legislature to obtain their license. Ask your county health department or the Indiana Well Drilling Contractors Association (317) 773-6927 about drillers in your area.

### ***Information***

Contact any of the following for more information regarding regulations, driller licensing, or well drilling and abandonment.

Indiana Department of Natural Resources  
Division of Water  
402 W. Washington Street, Rm. W264  
Indianapolis, Indiana 46204  
(317)232-4160

Indiana Well Drilling Contractors Association  
630 Westminster Drive  
Noblesville, Indiana 46060  
(317)773-6927

County Health Department

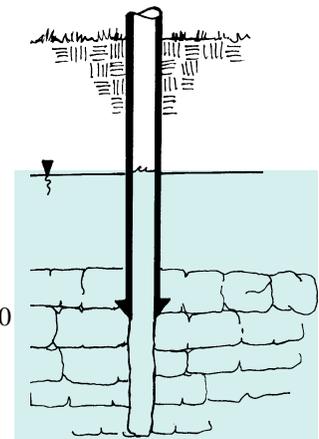
County office of Purdue University Cooperative  
Extension Service

### ***Types of Wells***

Wells tap aquifers to obtain ground water for drinking and other uses. An aquifer is a water-bearing geologic formation. In Indiana, aquifers are generally of sand and gravel, or fractured bedrock. Water moves through the spaces between sand particles and the cracks in the rock. Aquifers exist at various depths depending on the local geology.

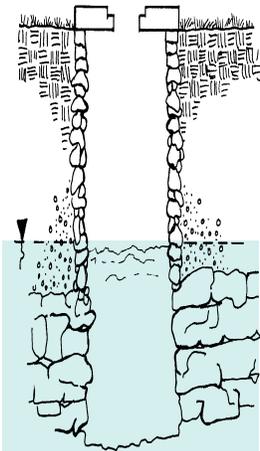
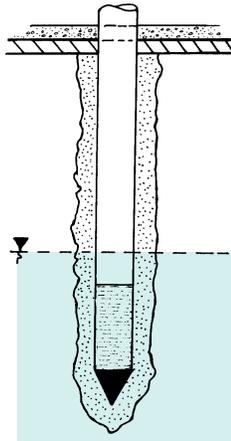
There are three types of wells commonly found in Indiana: drilled, driven and dug. Each is constructed with a different technique.

**Drilled wells** are the most common type of well. The well is drilled through the subsurface layers and completed in an aquifer of sand and gravel or fractured rock. A similar technique once used was to bore the well hole with an auger. Drilled wells for domestic use are usually 2 to 8 inches in diameter and more than 50 feet deep. Wells tapping a



sand and gravel aquifer have a special screen placed at the bottom of the borehole, and a solid casing that extends from the screen to the top of the well. The screen allows water to move into the well while keeping sand particles out. The casing prevents water from other depths along the borehole from mixing with the aquifer water.

**Driven wells** are common along rivers in areas with glacial deposits. These areas have very shallow, but highly productive, sand and gravel aquifers. A driven well has a point (“sand point”) on the end attached to the well screen and is simply driven down into the aquifer. These wells are usually 1 to 2 inches in diameter and 10 to 40 feet deep.



**Wells dug by hand** were once very common, however, this technique is rarely used today. A dug well has a large diameter, usually greater than 2 feet, and is 10 to 50 feet deep. Rock, brick or concrete line the well. Dug wells are found all over the state, most often in areas with shallow aquifers or limited ground water supplies. Most large diameter wells are now installed by bucket rigs.

### Plugging Materials

Several materials may be used to plug an abandoned well. These materials form an impermeable plug that prevents water flow.

- neat cement: 6 gallons of water for each 94 pound bag of cement
- bentonite slurry: a mixture of water and commercial grouting or plugging bentonite
- pelletized or crushed bentonite: pellets or chips of bentonite clay

Bentonite clay swells to about 10 times its original size when in contact with water. The swollen clay forms a dense, virtually impermeable, putty. Gravel

sometimes fills the bottom of certain types of wells. Local soils can also be used to complete the plugging.

Landowners who wish to do their own work, should consider using coarse grade bentonite chips (average size of 3/8 to 3/4 inches). The chips are easy to handle and less likely to form a bridge within the well casing. If a bridge forms, the well will not plug properly (Figure 2). This expensive mistake will require the hole to be bored out and the plugging procedure repeated.

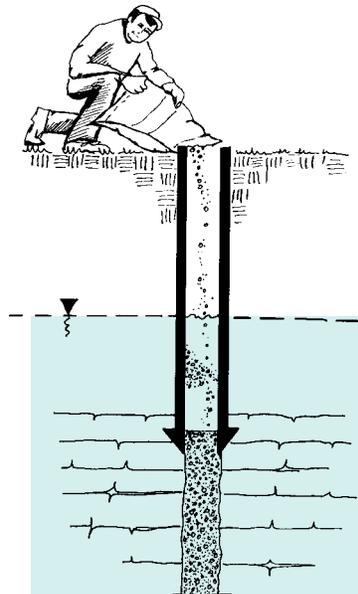


Figure 2. A bridge can form in the well if plugging materials are poured too quickly. To prevent bridging and ensure a complete fill without air pockets, pour materials slowly or use a small diameter pipe to agitate the material as it settles.

### Well Abandonment Procedures

Well abandonment can be easy or difficult depending on the well site and construction. If you have any questions regarding your situation, call a licensed well driller for advice **BEFORE** you begin the plugging procedure. If you have any doubts about the procedures, hire a qualified driller to do the work. Drillers are familiar with the local geology, various types of well construction and have the special equipment sometimes required. The cost of a driller’s services vary depending on the characteristics of the well and the time it takes to do the job. Discuss costs with the driller before the work begins. Remember, wells abandoned after December 31, 1987, must be plugged by a licensed driller.

The following procedures are suggested general guidelines for wells abandoned prior to January 1, 1988.

***Drilled or driven wells***

---

**To seal:**

1. Disconnect the well from the water system. Seal the well at or above the ground surface by a welded, threaded or mechanically-attached, watertight cap.
2. Divert surface runoff away from the abandoned well. Maintain the site so the well does not become a source of ground water contamination.

**To plug:**

1. Disconnect the well from the water system. Remove the old pump, drop pipe and other debris from the well casing and pit (if there is one). Do not remove the old casing.
2. Measure the depth of the water standing in the well and the total well depth. Drop a weighted tape measure, or appropriate length of rope that you can measure later, to the bottom of the well. Retrieve the tape or rope and note the total length and the length that is wet (the depth of water in the well). Measure the diameter of the well casing.
3. Disinfect the well with a chlorine solution as follows:
  - a) Determine the volume of water standing in the well. Use Table 1 to select the “gallons per foot” value appropriate for your well diameter, and multiply the value by the number of feet of water in the well.

Table 1. Well Volume

Diameter of Well (inches)	Gallons per Foot
2	0.16
3	0.37
4	0.65
5	1.00
6	1.50
8	2.60

- b) For each 100 gallons of water in the well use one of the following:
 

laundry bleach (5.25% chlorine)	or	hypochlorite granules (70% chlorine)
3 cups		2 ounces (= 2 heaping tablespoons)
    - c) Pour the appropriate amount of chlorine into a container of water (e.g., a plastic milk jug or bucket) then pour this solution down the well. Make sure to wet the sides of the casing.
  4. Determine the amount of bentonite clay needed to fill the well casing to within 2 feet of the ground surface. Consult the information on a bag of bentonite chips or use Table 2.

Table 2. Well Size and Volume Chart for Coarse Bentonite Fill

Well diameter (inches)	Well volume (cubic feet/foot of well depth)	Coarse bentonite to fill 1 foot of well depth (pounds)	Feet filled by 1 50 lb. bag of coarse bentonite	Bags of coarse bentonite to fill 100 feet of well depth
2	0.022	1.6	31.3	3.2
3	0.049	3.5	14.3	7.0
4	0.087	6.3	7.9	12.6
6	0.196	14.1	3.5	28.2
8	0.349	25.1	2.0	50.2

Purchase the required amount of bentonite chips from a local well driller. Buy coarse-grade crushed or pelletized bentonite (e.g., Hole Plug, Enviro Plug).

5. Pour the contents of each bag slowly into the well casing until it is filled to a depth no less than 2 feet below ground surface. Pour each bag slowly to prevent a bridge from forming in the well. In some cases a small diameter pipe inserted into the casing may be helpful to stir or agitate the bentonite chips. Stirring breaks up air pockets that may form.
6. Cut the casing off at least 2 feet below the ground surface. Seal the top of the well by installing a cement plug larger than the well casing over the top. If you choose not to cut the casing off below ground, use a welded, threaded or mechanically attached watertight cap to seal off the well.
7. Backfill the hole with local soil. If the well is in a pit, you may wish to remove the pit walls before backfilling. Crown the backfill so that surface water does not accumulate or puddle over the abandoned well.

### ***Dug wells***

---

#### **To seal:**

*Option 1.* Cover the well with a reinforced concrete slab at least 4 inches thick and larger in diameter than the well borehole.

*Option 2.* Cover the well with a reinforced platform larger in diameter than the well borehole. The cover can be made with pressure treated lumber. Protect the cover against weather with roofing or other water repelling material.

NOTE: Do not use this option if the cover comes in direct contact with ground or surface water.

#### **To plug:**

1. Disconnect the water system from the well. Remove the platform, pump, drop pipe and other debris from the well. NOTE: If there is a drilled or driven well extending below the bottom of the dug well, plug the small-diameter well first following the steps listed for drilled/driven wells.
2. Disinfect the well with a chlorine solution as follows:
  - a) Measure the depth (in feet) of standing water in the well with a measuring tape or rope with a small weight attached to the end. Measure the well diameter.
  - b) Use Table 3 to determine the amount of chlorine, either laundry bleach or hypochlorite granules, needed for your well diameter. The chlorine value is the amount needed per foot of standing water in the well.

Table 3. Chlorine Solutions

Well Diameter (feet)	Amount of 5.25% laundry bleach to use per foot of water in well (cups)	Amount of 0.70% hypochlorite granules to use per foot of water in well (cups)
3	1.5	1
4	3	2
5	4.5	3
6	6	4
7	9	6
8	12	8
10	18	12

- c) Multiply the appropriate chlorine value from the table by the depth (in feet) of standing water in the well. The resulting number is the total amount of chlorine needed to disinfect the well.
- d) Mix the chlorine with approximately 10 gallons of water. Splash the solution around the lining of the well, wetting all sides.
3. Fill the well with gravel to less than 5 feet below the ground surface.
4. Remove the top section of the well casing using a sledge hammer or pick to break up the rock or brick lining.
5. Pour a 1 foot layer of bentonite chips into the well borehole.
6. Seal the well by installing a cement plug larger than the well casing over the top.
7. Fill the remaining borehole to the ground surface with local soil, preferably clay. Crown the fill so water will not accumulate or puddle over the abandoned well.

### **Make a Record of Your Work**

When a well driller plugs an abandoned well, the driller must submit a form to the IDNR Division of Water stating the location of the well and the plugging date and method. A landowner who does the plugging is not required by law to complete the form; however, it is recommended that the landowner submit a letter to the IDNR Division of Water stating information similar to that found on the form. The letter serves as a public record of the landowner's compliance with state regulations and will be important information for land appraisals and property transfer arrangements. An example letter is attached. Include a plat map with the exact location of the well marked.

<sup>1</sup>Indiana Administrative Code Title 312: Final Rule Concerning the Regulation of Water Well Drilling.

<sup>2</sup>Department of Natural Resources Indiana Code: Water Well Drilling Contractors.

Your Name  
Address  
City/Town, IN zip code

Date

Indiana Department of Natural Resources  
Division of Water  
RE: Abandoned Well Plugging  
402 W. Washington Street, Rm. W264  
Indianapolis, IN 46204

Dear Sir/Madam:

This letter is to inform you that a water well located on my property and abandoned prior to January 1, 1988, has been plugged in accordance with procedures stated in 310 IAC 16-10-2.

Well Location:

County \_\_\_\_\_ Township \_\_\_\_\_ Section \_\_\_\_\_ Range \_\_\_\_\_

Depth of Well: \_\_\_\_\_ feet

Age of Well: \_\_\_\_\_ years

Construction type: Drilled \_\_\_\_\_ Driven \_\_\_\_\_ Dug \_\_\_\_\_

Casing: yes \_\_\_\_\_ no \_\_\_\_\_

Date well was plugged: \_\_\_\_\_

Materials used: \_\_\_\_\_

Sincerely,

Your Name

## For Further Information

You may find the following Purdue University Cooperative Extension publications helpful.

- |       |   |       |   |
|-------|---|-------|---|
| WQ 1  | “Water Testing Laboratories”  | WQ 15 | “Bacterial Contamination of Household Water”  |
| WQ 2  | “What is Ground Water?”   | WQ 16 | “Animal Agriculture’s Effect on Water Quality: Manure Application”                                      |
| WQ 3  | “How to Take a Water Sample”  | WQ 17 | “Agriculture’s Effect on Environmental Quality: Key Management Issues”                                  |
| WQ 4  | “Why Test Your Water?”  | WQ 18 | “Agriculture’s Impact on Environmental Quality: Land Application of Municipal and Industrial Biosolids” |
| WQ 5  | “Interpreting Water Test Results Part One: Inorganic Materials”       | WQ 19 | “Pesticides and the Environment”  |
| WQ 6  | “Buying Home Water Treatment”   | WQ 20 | “Conservation Tillage and Water Quality”  |
| WQ 7  | “Animal Agriculture’s Effect on Water Quality: Pastures and Feedlots” | WQ 22 | “Indiana Farmstead Assessment”  |
| WQ 8  | “Animal Agriculture’s Effect on Water Quality: Waste Storage”         | WQ 23 | “Cryptosporidium: A Waterborne Pathogen”  |
| WQ 9  | “Water Quality for Animals”   | WQ 24 | “Wellhead Protection in Indiana”  |
| WQ 10 | “Wetlands and Water Quality”  | WQ 25 | “Home*A*Syst”   |
| WQ 11 | “Sulfur Water Control”  | WQ 26 | “Lead in Drinking Water”  |
| WQ 12 | “Distillation for Home Water Treatment”                               | WQ 27 | “Nitrate and Indiana’s Ground Water”  |
| WQ 13 | “Home Water Treatment Using Activated Carbon”                         |       |   |
| WQ 14 | “Reverse Osmosis For Home Treatment of Drinking Water”                |       |   |

Illustrator: Lou Jones, Department of Agronomy  
Editor: Cheri Janssen, Department of Agronomy

REV 9/98 (2M)