TCEQ REGULATORY GUIDANCE
Texas Groundwater Protection Committee
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Landowner's Guide to Plugging Abandoned Water Wells

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY • PO BOX 13087 • AUSTIN, TX 78711-3087

Introduction

Water is one of our state's most precious resources. It is crucial to all aspects of our economy and society. Groundwater derived from our many aquifers provides over half of the water used in the state. Protecting the quality of this vital resource is the responsibility of all Texans.

For many years, groundwater has been pumped through water wells. Over the years, many wells around homes, farms, industrial sites, and urban areas have been abandoned without being properly plugged. Not only can these abandoned wells become potential avenues for groundwater-contamination, but they can also constitute a safety hazard for children and animals. Plugging an abandoned well takes time and money, but these wells are a threat that cannot be ignored.

Texas law makes the landowner responsible for plugging abandoned wells. The landowner is also held responsible for injury or pollution related to the abandoned well. This publication is provided to help landowners understand how to plug a well properly. Before you begin the process of plugging a well, it is highly recommended that you seek advice from your local Groundwater Conservation District (GCD, or "district"), a licensed water well driller and/or pump installer in your area, or the Well Driller/Pump Installer/Abandoned Well Referral Program of the Texas Department of Licensing and Regulation (TDLR).

Abandoned wells are regulated by the TDLR and local GCDs through the Texas Occupations Code, sections 1901.255 and 1901.256 (see <www.license.state.tx.us/wwd/wwdlaw.htm>). "Well Plugging Information," toward the end of this document, provides phone numbers and websites where you can find additional information.

What Are the Hazards Associated with Abandoned Wells?

Personal Safety

The hazard to personal safety that an unmarked and uncovered large-diameter well presents is obvious to anyone who has ever encountered one. Accidents in which people or animals fall into abandoned wells have occurred, and they continue to occur. Even when a well is covered, the soil around it may be unstable and can cave in. The liability associated with abandoned wells has not been fully tested in Texas. A landowner with an abandoned well should ask himself: "Do I want to be the first legal test case in Texas?"

Groundwater Contamination

An abandoned well is a direct conduit from the surface to the aquifer below. Contaminants that enter the well are introduced directly into the aquifer with no opportunity for natural filtration by soils or geologic materials. If a contamination incident involves a concentrated chemical, the potential for reaching health-threatening levels in the underlying aquifer is high. Just a small amount of some chemicals (e.g., pesticides, solvents, and petroleum products) can contaminate millions of gallons of groundwater and spread out under many acres of land.

In addition, some contaminants break down very slowly and may affect the groundwater for decades. This puts other wells in the aquifer at risk, particularly those that are close by. Deterioration of the well casing can also allow the commingling of two chemically different aquifers.

When Is a Well Considered Abandoned?

According to state law, a well is considered abandoned if it has not been used for six consecutive months. However, even a well that has not been used for six consecutive months can be considered *in use,* if it falls into one of the following two categories:

- A non-deteriorated well that contains the casing, pump, and pump column in good condition.
- A non-deteriorated well that has been capped.

If you are uncertain whether your well is legally abandoned, consult a licensed water well driller, the Well Driller/Pump Installer/Abandoned Well Referral Program of the TDLR, or the local GCD (if one exists in your area).

How Can I Report an Abandoned Well?

The TDLR Well Driller/Pump Installer/Abandoned Well Referral Program web page, <www.license.state.tx.us/wwd/wwd.htm>, provides a wealth of useful information, including:

- Reporting an abandoned well online.
- Reviewing the status of an abandoned well complaint.
- A checklist that can be used to determine whether a well is abandoned.
- The definition of an abandoned or deteriorated well.
- A link to Frequently Asked Questions (FAQs) regarding abandoned wells (complete with example photos).

What Are My Options if I Have an Abandoned Well?

There are three different courses of action that can be taken to eliminate the hazards of an abandoned well:

- Return the well to an operable state by making sure the casing, pump, and pump column are in good condition.
- Cap the well to prevent surface water or contaminants from entering it. The cap must be able to support 400 pounds and prevent easy removal by hand. For more information, see the Texas AgriLife Extension Service publication L-5490, *Capping of Water Wells for Future Use* (online, at <https://agrilifebookstore.org>, or by phone, at 888-900-2577).
- Plug the well from the bottom to the top with bentonite chips, bentonite grout, or cement. Large-diameter wells can also be filled with clay-based soils, compacted clay, or caliche. Details on what you should do prior to plugging your well, as well as on the well plugging operation itself, are provided in "How Do I Plug My Own Well?," below.

Who Should Do the Work to Plug Abandoned Wells?

As the landowner, you may do the work necessary to plug an abandoned well on your property or you can hire a licensed well contractor to do the work for you. If you plan to do the work yourself, or if you have any questions about plugging your well, you may contact the Well Driller/Pump Installer/Abandoned Well Referral Program of the TDLR or your local GCD. Well plugging specifications can be found at <www.license.state.tx.us/wwd/wwdspecs.htm>.

You should request a state well plugging report form from the TDLR (see "Example of a Well Plugging Report," toward the end of this document) or you can download it from the TDLR forms web page, <www.license.state.tx.us/wwd/wwdforms.htm>. Within 30 days after the well is plugged, you must enter the plugging report online or send a copy of the completed form to the TDLR. You must also send a copy to the local GCD (if one exists in your area). To enter your report online, you will need a login name, a password, and GPS coordinates (latitude and longitude). You can call the TDLR (the phone number is listed in a later section) to get your login name and password, and then go to the State of Texas Well Report Submission and Retrieval System website, <134.125.70.235/drillers-new/index.asp>, to enter your plugging report.

Some areas of Texas have assistance programs for the plugging of abandoned water wells. Contact your local GCD or Texas State Soil and

Water Conservation Board representative to see if an assistance program is available in your area.

How Do I Plug My Own Well?

Well plugging may appear to be a simple process—just dump something into the open well until it's full. That might take care of the safety hazard—people and animals could no longer fall into the well. However, unless you use the right plugging materials and methods, you will end up with a poorly sealed well, one that will continue to allow contaminants to enter the groundwater.

To do the job right, it is essential that you use the correct plugging materials and install them properly, in accordance with state regulations and any local GCD specifications that may exist. Regulations developed by the state outline the procedures and materials that are to be used for plugging abandoned wells and are reflected in this document. The Texas Administrative Code, Title 16, Section 76.1004 (which can be found at the TDLR website, at <www.license.state.tx.us/wwd/wwdrules.htm>) contains these standards. These rules may also be obtained by contacting the organizations listed in "Well Plugging Information," later in this document. If the well is located within a GCD, consult with the district to determine if they have any additional specifications.

Steps to Follow Prior to Plugging Your Well

You can hire a licensed water well driller and/or pump installer to plug an abandoned well. In some cases, this is recommended because a well contractor has the equipment needed for the job and an understanding of local soil conditions that affect how the well should be properly plugged. As the landowner, you may also plug an abandoned well yourself. Before beginning the plugging operation, you should take the following three steps.

Step 1. Understand the regulations regarding the plugging of an abandoned water well.

You should contact your local GCD, if one exists in your area, or a licensed well contractor to help you understand the local and state regulations regarding water well plugging. Learning about the rules and regulations will also help you decide if you want to plug your well yourself or hire a licensed well contractor to do the job for you.

Step 2. Obtain the water well driller's report for the well.

Since 1965, water well drillers have been required to submit water well driller's reports to the State of Texas. The water well driller's report includes details on your well's construction and the local geology. If you don't have this report, you may be able to obtain it from one of the following:

- TCEQ Water Well Report Viewer: www.tceq.state.tx.us/goto/findwell
- TDLR State of Texas Well Report Submission and Retrieval System: 134.125.70.235/drillers-new/index.asp, 512-936-0871
- TWDB Water Information Integration and Dissemination (WIID): http://wiid.twdb.state.tx.us/index_explain.asp
- Texas Alliance of Groundwater Districts (TAGD): www.texasgroundwater.org, 512-590-1422

If you are unable to acquire the water well driller's report, you are strongly advised to hire a licensed well contractor to plug the well for you—they have the tools and experience to properly assess your abandoned well.

If your water well driller's report indicates that the well is drilled through a confining layer that separates two different aquifers, it is highly recommended that you have the well plugged by a licensed well contractor—they will be able to plug this special type of well safely and correctly.

Licensed well contractors will also be familiar with completing and submitting the required paperwork after the well is plugged.

Step 3. Determine the depth of the well and the height of the standing water in the well.

If you know the details of your well's construction and the local geology from your water well driller's report, or you have been able to measure the depth of the well and the height of standing water in the well on your own, you can follow the well plugging steps outlined below.

You need to take accurate measurements (not estimates) of the depth of the well and the height of standing water in the well. This will allow you to correctly calculate the volume of the well and the volume of the water in the well. These volumes are needed for determining the correct amounts of disinfection and plugging materials. It would also be wise to have extra disinfection and plugging material on hand, in case there were any errors in the measurements or calculations. Refer to "Calculating the Amount of Plugging Material You Will Need," "Formulas for Calculating Volume," and "Calculating the Amount of Disinfectant You Will Need," toward the back of this document, for more information.

Plugging Materials

Several materials may be used to plug an abandoned well. These materials form an impermeable plug that prevents water flow. These materials include cement, bentonite, and bentonite grout.

- Cement. A Portland or construction cement mixture of not more than seven gallons of water per 94-pound sack of dry cement, or a cement slurry that contains cement along with bentonite, gypsum, or other additives, mixed to the manufacturer's recommendations.
- Bentonite. A sodium hydrous aluminum silicate clay mineral (montmorillonite) commercially available in powdered, granular (chips), or pellet form, which is mixed with potable (drinkable) water and used for a variety of purposes, including to stabilize borehole walls during drilling, to control potential or existing high fluid pressures encountered during drilling below a water table, and to provide a seal in the annular space between the well casing and the borehole wall.
- Bentonite Grout. A fluid mixture of sodium bentonite and potable water mixed at manufacturer's specifications to a slurry consistency that can be pumped through a pipe directly into the annular space between the casing and the borehole wall. Its primary function is to seal the borehole in order to prevent the subsurface migration or communication of fluids.

Bentonite has unique characteristics when used as a plugging material. Bentonite clay swells to about 10 times its original size when in contact with water. The swollen clay forms a dense, virtually-impermeable putty—water can take up to 80 years to penetrate 1 inch of swollen bentonite clay. Note that bentonite grout may not be used if a water zone contains chlorides above 1,500 parts per million (ppm) or if hydrocarbons are present. Bentonite also requires a two-foot-thick cement cap, which acts as an atmospheric barrier to prevent the plugging material from drying out.

Gravel is sometimes used to fill the bottom of certain types of wells. Local soils can also be used for the upper four feet of the well to complete the plugging operation. Clay-based soils can be used to plug large-diameter wells; however, you must obtain a variance from the TDLR before using clay-based soils to plug small-diameter wells.

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 are less likely to form a bridge within the well casing. If a bridge forms, the well will not plug properly (see Figure 4). This mistake would be expensive, requiring that the hole be bored out and the plugging procedure repeated.

Steps to Follow in Plugging Your Well

Step 4. Remove all obstructing materials from the well.

It is critical that fill materials do not slump or settle; therefore, obstructions that may cause incomplete filling of the voids must be removed. Remove the pump, pump rods, pipes, wiring, any other equipment, and as much trash as possible from the well. Floating debris, such as wood staves, should also be removed. One method used to accomplish debris removal is flushing. If water is pumped into the well, floating debris will move to the top as the well fills with water. Flushing may not be possible with larger-diameter wells, due to the volume of water required. In any event, you must remove as much obstructing material as possible from the well before plugging.

Step 5. Disinfect the well by adding household bleach.

It is recommended that all wells containing standing water be disinfected prior to plugging the well in order to kill existing microorganisms. Disinfection can be accomplished by adding liquid chlorine product (do not use any scented or solid products!) at the rate of 1 gallon of bleach for every 500 gallons of water—this is equivalent to a "shock" chlorination concentration of 100 parts per million chlorine. The chlorination process ensures that disease-causing microorganisms are not sealed in the aquifer. Disinfect the well for 8 to 10 hours prior to plugging. For more information, refer to "Calculating the Amount of Disinfectant You Will Need," toward the back of this document.

Step 6. Remove as much casing from the well as possible.

State plugging specifications require that you remove all removable casing from the well. You must attempt to pull the casing out of the well. However, if the casing cannot be pulled out, you are required to cut it off at least 4 feet below the ground surface (i.e., "plowable" depth), or as far below the ground surface as possible.

Step 7. Fill the well with plugging materials.

Plugging procedures vary depending on which of the following categories you well falls under:

- Large-diameter wells up to and including 100 feet deep.
- Large-diameter wells more than 100 feet deep.
- Small-diameter wells with up to and including 100 feet of standing water.
- Small-diameter wells with more than 100 feet of standing water.

Large-diameter wells

Large-diameter wells are defined as being 36 inches or more in diameter.

Large-diameter wells up to and including 100 feet deep

Completely fill the well from the bottom to the ground surface with clay-based soils, compacted clay, caliche, or cement (see Figure 1), or with bentonite chips or bentonite grout (cement cap required; see Figure 2).

- Note that bentonite grout may not be used if a water zone contains chlorides above 1,500 ppm or if hydrocarbons are present.
- If clay-based soils, compacted clay, or caliche are used, mound the plugging material above the ground surface to compensate for settling.
- If bentonite chips are used, alternate pouring in equal amounts of chips and water in order to properly hydrate the bentonite as the well is filled.
- If bentonite grout or cement are used, completely pressure-fill the well by using a tremie tube (see Figure 3). When the well is pressure-filled with a tremie tube, some plugging material may also enter any annular space that may exist outside of any non-removable casing.
- If bentonite chips or bentonite grout are used, the plug must be capped with cement at least 2 feet thick. The cement cap acts as an atmospheric barrier (see Figure 2) and can be positioned in two ways:
  - It can be set at the ground surface. Or,
  - It can terminate within 4 feet of the ground surface and then be topped off with local soils. In this case, you must mound the local soils above the ground surface to compensate for settling.

Large-diameter wells more than 100 feet deep

Using a tremie tube, completely pressure-fill the well with bentonite grout or cement from the bottom of the well to the ground surface (see Figure 3). When the well is pressure-filled with a tremie tube, some plugging material may also enter any annular space that may exist outside of any non-removable casing.

- Note that bentonite grout may not be used if a water zone contains chlorides above 1,500 ppm or if hydrocarbons are present.
- Alternatively, pressure-fill the well with cement to within 100 feet of the ground surface, and then finish the plugging operation by following the directions above for a large-diameter well that is up to and including 100 feet deep.

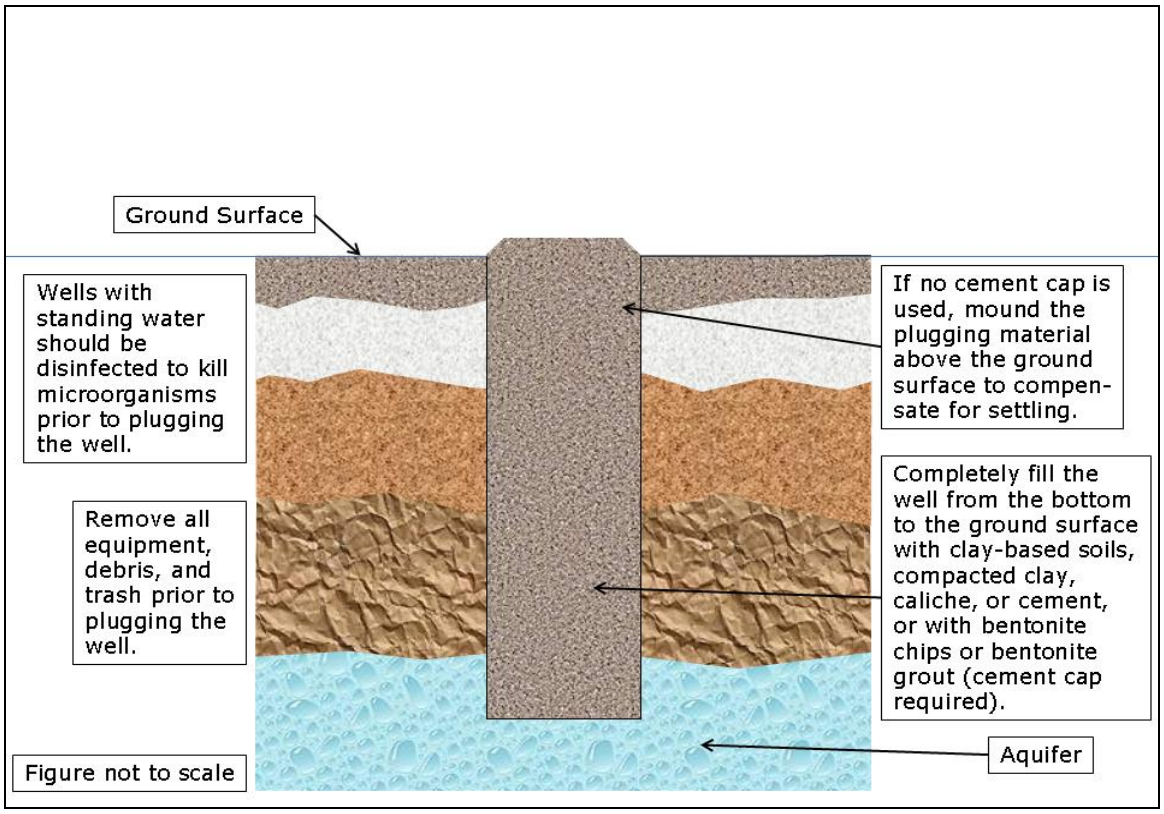

Figure 1. Plugged Large-Diameter Well

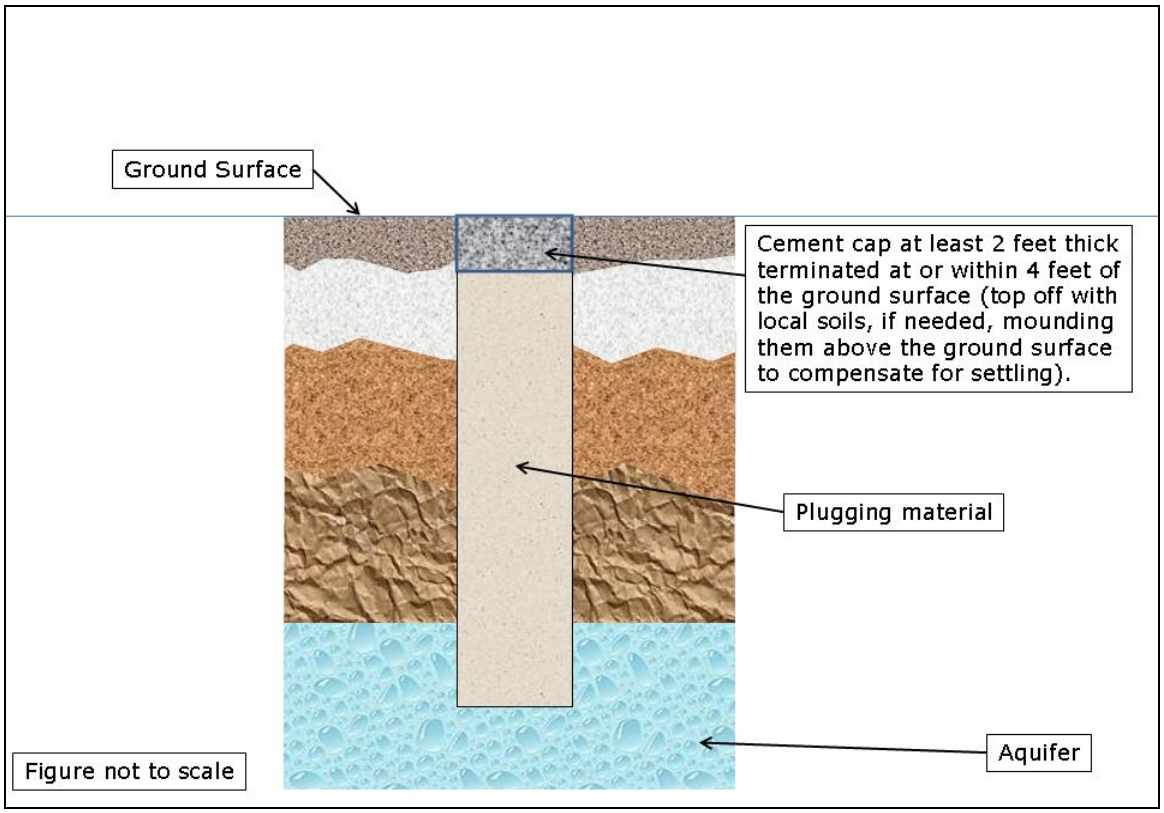

Figure 2. Plugged Well Using Bentonite Chips or Bentonite Grout

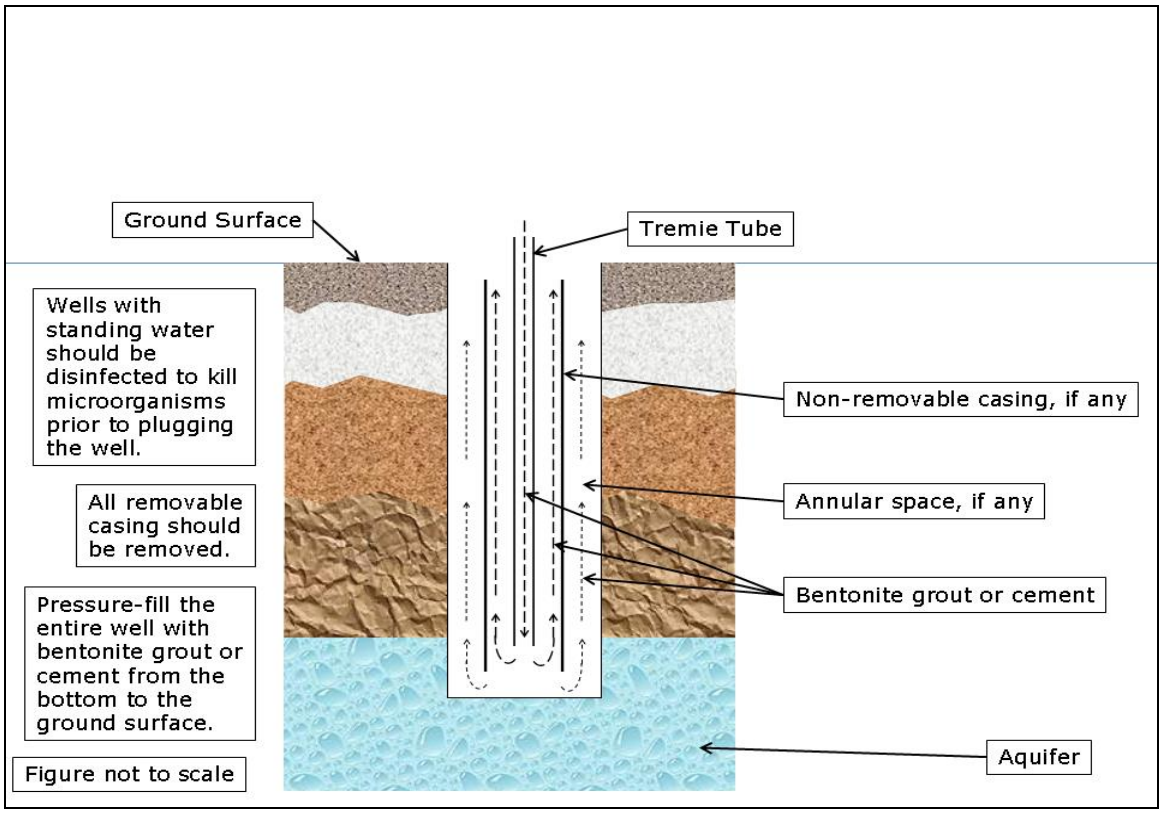

Figure 3. Plugging a Well with Bentonite Grout or Cement Using a Tremie Tube

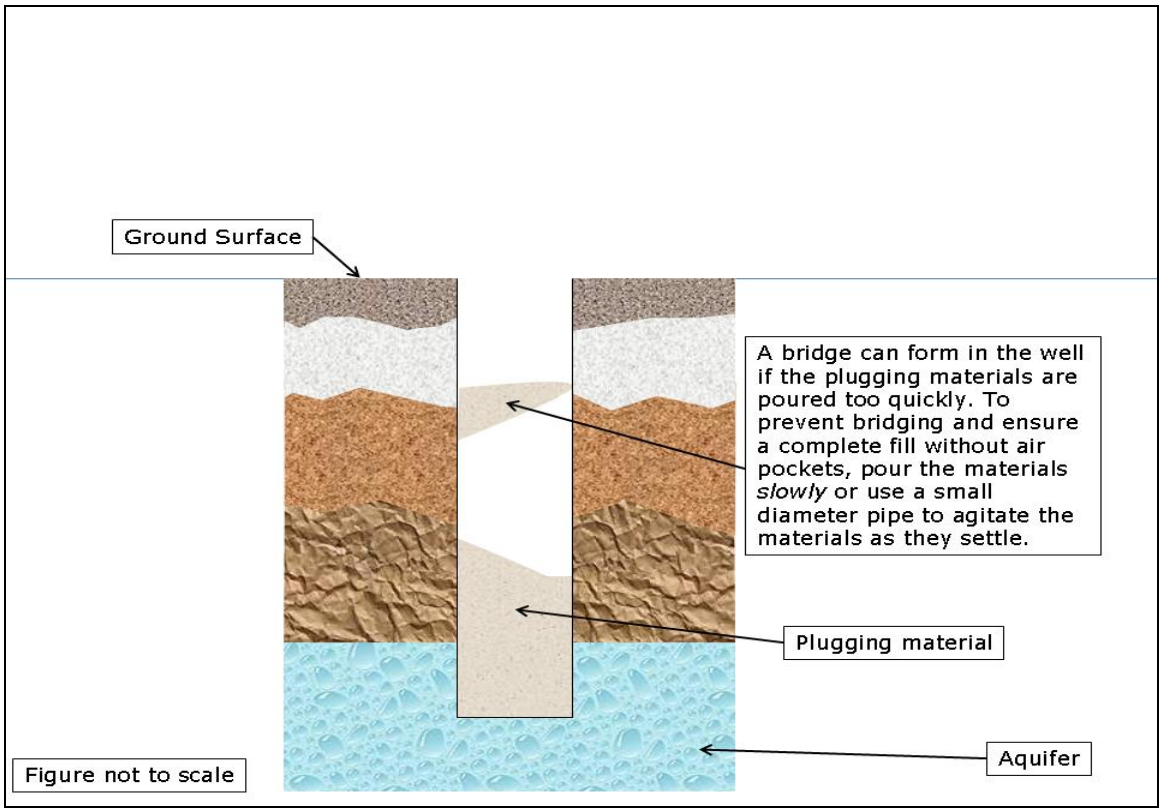

Figure 4. Bridging Within a Small-Diameter Well

Small-diameter wells

Small-diameter wells are defined as being less than 36 inches in diameter. A bridge can form in a small-diameter well if the plugging materials are poured too quickly (see Figure 4). To prevent bridging and ensure a complete fill without air pockets, pour the materials *slowly* or use a small-diameter pipe to agitate the materials as they settle. In addition, floating bentonite fines can also contribute to a bridging situation within a small-diameter hole—these fines can be separated from the chips using a screen and added to the cap near the completion of the plugging operation.

Small-diameter wells with up to and including 100 feet of standing water

Completely fill the well with bentonite chips, bentonite grout, or cement from the bottom of the well to the ground surface.

- Note that bentonite grout may not be used if a water zone contains chlorides above 1,500 ppm or if hydrocarbons are present.
- If bentonite chips are used, alternate pouring in equal amounts of chips and water in order to properly hydrate the bentonite as the well is filled.
- If bentonite grout or cement are used, completely pressure-fill the well by using a tremie tube (see Figure 3). When the well is pressure-filled with a tremie tube, some plugging material may also enter any annular space that may exist outside of any non-removable casing.
- If bentonite chips or bentonite grout are used, the plug must be capped with cement at least 2 feet thick. The cement cap acts as an atmospheric barrier (see Figure 2), and can be positioned in two ways:
  - It can be set at the ground surface. Or,
  - It can terminate within 4 feet of the ground surface and then be topped off with local soils. In this case, you must mound the local soils above the ground surface to compensate for settling.

Small-diameter wells with more than 100 feet of standing water

Using a tremie tube, completely pressure-fill the well with bentonite grout or cement from the bottom of the well to the ground surface (see Figure 3).

- Note that bentonite grout may not be used if a water zone contains chlorides above 1,500 ppm or if hydrocarbons are present.
- If bentonite grout is used, the plug must be capped with cement at least 2 feet thick. The cement cap acts as an atmospheric barrier (see Figure 2), and can be positioned in two ways:
  - It can be set at the ground surface. Or,
  - It can terminate within 4 feet of the ground surface and then be topped off with local soils. In this case, you must mound the local soils above the ground surface to compensate for settling.

Step 8. Complete and submit a state well plugging report.

Within 30 days after the well is plugged, you must enter the plugging report online or send a copy of the completed form to the TDLR. To enter your report online you will need a log-in name, a password, and GPS coordinates (latitude and longitude). You can call the TDLR (the phone number is listed in the next section) to get your log-in name and password, and then go to the Texas Well Report Submission and Retrieval System, at <134.125.70.235/drillers-new/index.asp>, to enter your plugging report. You can also request a plugging report form from the TDLR, or download it from the TDLR website, on the web page <www.license.state.tx.us/wwd/wwdforms.htm>, and then mail the completed form to the TDLR at this address:

Water Well Driller and Pump Installer Program
Texas Department of Licensing and Regulation
P.O. Box 12157
Austin TX 78711
800-803-9292, 512-463-7880

If the well is located within a GCD, you must also comply with that GCD's reporting requirements. An example of a completed state well plugging report form can be found in "Example of a Well Plugging Report," toward the back of this document.

Some areas of Texas have assistance programs for the plugging of abandoned water wells. Contact your local GCD or Texas State Soil and Water Conservation Board representative to find out if an assistance program is available in your area.

Well Plugging Information

State Agencies, Programs, and Resources

Texas Department of Licensing and Regulation (TDLR)

Well Driller/Pump Installer/Abandoned Well Referral Program
www.license.state.tx.us/wwd/wwd.htm, 800-803-9202, 512-463-7880

State of Texas Well Report Submission and Retrieval System
134.125.70.235/drillers-new/index.asp, 512-936-0871

Well Construction and Plugging Specifications
www.license.state.tx.us/wwd/wwdspecs.htm

Frequently Asked Questions (FAQs) on Abandoned Wells
www.license.state.tx.us/wwd/wwdfaq.htm#adw

Texas Commission on Environmental Quality (TCEQ)

Groundwater Planning and Assessment
www.tceq.state.tx.us/goto/groundwaterplanning, 512-239-4512

Water Well Report Viewer
www.tceq.state.tx.us/goto/findwell

Texas Groundwater Protection Committee (TGPC)

Abandoned Wells
www.tgpc.state.tx.us/WaterWells.htm#Aband

Texas Water Development Board (TWDB)

Water Information Integration and Dissemination (WIID)
http://wiid.twdb.state.tx.us/index_explain.asp

Texas State Soil and Water Conservation Board
www.tsswcb.state.tx.us, 800-792-3485, 254-773-2250

Texas AgriLife Extension Service (TAES)
texasextension.tamu.edu, 979-845-7800

About Groundwater Conservation Districts

Texas Alliance of Groundwater Districts (TAGD)
The TAGD represents the majority of the GCDs in the state.
www.texasgroundwater.org, 512-590-1422

TCEQ's GCD Web Page
The TCEQ's GCD web page lists the most current map of Texas GCDs, a summary description of GCDs, and a contact list for created and confirmed GCDs.
www.tceq.state.tx.us/goto/gcd

Publications

What Is a Groundwater Conservation District (GCD)? Texas Groundwater Protection Committee.
www.tgpc.state.tx.us/subcommittees/POE/FAQs/GCDs_FAQ.pdf

How Do You Form a Groundwater Conservation District (GCD)? Texas Groundwater Protection Committee.
www.tgpc.state.tx.us/subcommittees/POE/FAQs/FormingGCDs_FAQ.pdf

Questions about Groundwater Conservation Districts in Texas, by Bruce J. Lesikar, Valeen Silvy, and Ronald A. Kaiser. Texas AgriLife Extension Service, pub. no. B-6120.
https://agrilifebookstore.org

Calculating the Amount of Plugging Material You Will Need

Table 1, below, can be used to help you calculate the amount of material (cement or bentonite chips) that you will need to plug a well. For example:

- For a well with a diameter of 2 inches, one (94-pound) sack of cement will plug 50.3 linear feet, while one (50-pound) bag of bentonite chips will plug 31.3 linear feet,
- For a well with a diameter of 16 inches, one sack of cement will plug 1.0 linear foot, while one bag of bentonite chips will plug 0.48 linear feet.

Table 1. The amount of plugging material required, based on the diameter of the well

Well or hole diameter (inches)[1]	Cement – Linear feet of well that one 94-lb. sack of cement will plug[2]	Bentonite chips – Linear feet of well that one 50-lb. bag of bentonite chips will plug[3]
2	50.3	31.3
3	28.8	13.9
4	16.2	7.9
5	10.4	5.0
6	7.2	3.5
7	5.3	2.6
8	4.0	2.0
9	3.2	1.5
10	2.6	1.3
12	1.8	0.86
14	1.3	0.63
16	1.0	0.48
18	0.8	0.38
20	0.6	0.31
24	0.4	0.21
36	0.2	0.097
40	0.16	0.078
44	0.13	0.065
48	0.11	0.054

Notes:

1. If the measured well diameter falls between two listed diameters, use the larger diameter in order to ensure that adequate amounts of plugging material are purchased. The diameters are for cylindrical wells only.
2. The mixing ratio for the cement slurry is 7 gallons of water for each 94-pound sack of cement.
3. Coarse-grade bentonite chips (average size of 3/8 to 3/4 inches) should be used.

Making the Calculation

To calculate the number of 94-pound sacks of cement (or 50-pound bags of bentonite chips) you will need to plug a well, divide the depth of the well by the linear feet indicated in Table 1 for that well diameter. For example, if a well is 4 inches in diameter and 100 feet deep, and you are plugging it with cement:

- 100 ft ÷ 16.2 ft = 6.17 sacks of cement

If you are plugging the well with bentonite chips:

- 100 ft ÷ 7.9 ft = 12.66 bags of bentonite chips

Formulas for Calculating Volume

The following formulas are provided for reference, if needed.

Area of a Circle = $\pi \times r^2$

Volume = area × depth

Volume of a Circular Cylinder = $\pi \times r^2 \times d$

Legend:

π: 3.1416
r: radius of the circle
d: depth

Calculating the Amount of Disinfectant You Will Need

Before conducting plugging operations, disinfection or "shock" chlorination of the well is recommended, in order to kill existing microorganisms in the well water. Table 2, below, can be used to help you calculate the volume of liquid chlorine product that you will need to disinfect a well.

Table 2. Volume of chlorine required, based on the diameter of the well

Well or hole diameter (inches)[1]	Volume of standing water in the well (gallons per linear foot of well)	Volume of liquid chlorine product required (ounces per linear foot of well)[2,3]	Volume of liquid chlorine product required (approx. std. measure per linear foot of well)[2,3,4]
2	0.16	0.041	1/4 t
3	0.37	0.094	1/2 t
4	0.65	0.165	1 t
5	1.02	0.259	1 1/2 t
6	1.50	0.381	2 1/4 t
7	2.00	0.508	1 T
8	2.61	0.660	1 T + 1 t
9	3.30	0.838	1 T + 2 t
10	4.08	1.036	2 T + 1/4 t
12	5.88	1.490	3 T
14	8.00	2.031	1/4 C
16	10.44	2.650	1/3 C
18	13.22	3.354	1/3 C + 1 T
20	16.32	4.145	1/2 C
24	23.50	5.966	3/4 C
36	52.88	13.430	1 1/4 C
40	65.28	16.579	2 C
44	78.99	20.061	2 1/2 C
48	94.00	23.873	3 C

Notes:

1. The listed diameters are for cylindrical wells only.
2. Typical 5.25–6.00% liquid chlorine product. Some common product brands are Clorox, Purex, Sno-White, Kandu, and Topco. Do not use any scented or solid products!
3. Added volume produces an equivalent concentration of 100 parts per million of chlorine per linear foot of water.
4. Approximate standard (approx. std.) measure:
   t = teaspoon, T = tablespoon, C = cup

Making the Calculations

Step 1. Measure the depth of the well and the height of the standing water in the well.

If you are unable to obtain the water well driller's report for your well, you can measure the depth of the well and the height of the standing water in the well using the following procedure.

1. Obtain a measuring tape with a sounding weight ("popper"), or an electrical measuring device ("e-line"), from a water well supply company or an environmental equipment supply company.
2. Set a reference point at the top of the borehole or well casing.
   a. Measure the height of the reference point from the ground surface (A).
3. Lower the tape or probe (with the audible signal turned on) into the well until the splash or signal is heard.
   a. Record the reading on the tape or probe at the reference point (B). This is the distance from the reference point to the top of the standing water in the well.
4. Continue lowering the tape or probe (with the audible signal turned off) into the well until the line goes slack.
   a. Record the reading on the tape or probe at the reference point (C). This is the distance from the reference point to the bottom of the well.
5. The depth of the well = C – A
6. The height of the standing water in the well = C – B
7. For increased accuracy, you can repeat steps 3 and 4 several times and average the readings.

Example

Referring to Figure 5, if

1. the height of the reference point from the ground surface (A) is 1 foot,
2. the distance from the reference point to the top of the standing water in the well (B) is 45 feet, and
3. the distance from the reference point to the bottom of the well (C) is 100 feet, then:

Depth of well (C – A) = 100 feet – 1 foot = 99 feet

Height of standing water in well (C – B) = 100 feet – 45 feet = 55 feet

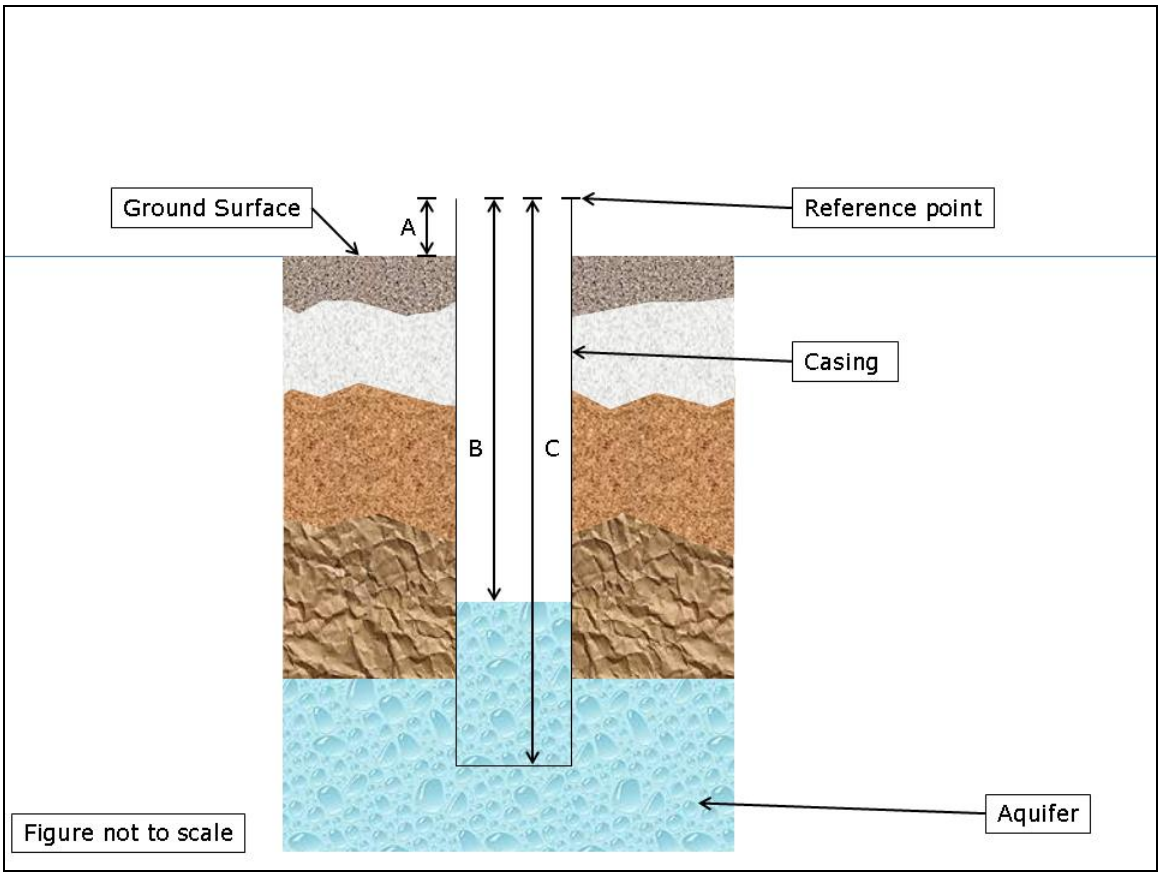

Figure 5. Measuring the Depth of the Well and the Height of Standing Water in the Well

Step 2. Calculate the amount of liquid chlorine product needed to disinfect the well.

The formula for the amount of liquid chlorine product that you will need to disinfect a well is as follows:

height of standing water in the well
×
volume of liquid chlorine product required per linear foot of well (from Table 2)
=
total volume of liquid chlorine product required to disinfect the well

Example

If the height of standing water in the well is 55 feet and the well or hole diameter is 12 inches, then:

55 feet of standing water in the well
×
1.490 ounces of liquid chlorine product required per linear foot of well (from Table 2)
=
81.95 ounces of liquid chlorine product required to disinfect the well

Table 3, below, can be used to help you convert from ounces to cups, pints, quarts, and gallons, and from cups to pints and quarts.

Table 3. Liquid Conversions

1 ounce = 1/8 cup
2 ounces = 1/4 cup
8 ounces = 1 cup
16 ounces = 1 pint
32 ounces = 1 quart
128 ounces = 1 gallon
2 cups = 1 pint
4 cups = 1 quart

82 ounces
=
2 quarts, 1 pint, and 1/4 cup of liquid chlorine product,

OR:

82 ounces
=
0.64 gallons of liquid chlorine product required to disinfect the well

Step 3. Apply the disinfectant.

Using appropriate precautions for handling chemicals (e.g., wearing safety glasses and protective gloves), pour the calculated amount of liquid chlorine product into the well and allow the mixture to stand (disinfect) for 8 to 10 hours prior to plugging.

Glossary of Selected Terms

Aquifer – A geological stratum or zone below the surface of the earth capable of producing groundwater.

Bentonite – A sodium hydrous aluminum silicate clay mineral (montmorillonite) commercially available in powdered, granular (chips), or pellet form.

Bentonite Grout – A fluid mixture of sodium bentonite and potable water mixed at the manufacturer's specifications to a slurry consistency that can be pumped through a pipe.

Bridge – Plugging materials that lodge partway down a well borehole so as to obstruct passage of subsequent plugging materials, preventing them from reaching the bottom of the well.

Confining Layer – A geological stratum or zone below the surface of the earth that impedes the movement of groundwater.

Portland Cement – A finely ground, carefully proportioned mixture of limestone and shale (sold commercially).

Surging – Alternately raising and lowering a column of water in a well to induce water movement into and out of the well borehole and aquifer.

Tremie Tube – A tube or pipe running to the bottom of a well (after removal of the casing) that is used to transport plugging materials to the bottom of the well. The tube is raised as the bottom of the well is filled.

Example of a Well Plugging Report

Texas Department of License and Regulation
Water Well Driller/Pump Installer Program
P.O. Box 12157 Austin, Texas 78711 (512)463-7880 FAX (512)463-8616
Email address: water.well@license.state.tx.us

This form must be completed and filed with the department within 30 days following the plugging of the well.

PLUGGING REPORT

A. WELL IDENTIFICATION AND LOCATION DATA

1) OWNER

Name	Address	City	State	Zip
John J Jones	100 Main St	Houston	TX	75111

2) WELL LOCATION

County	Physical Address	City	State	Zip
Harris				

3) Owner's Well No.	Long.	Lat.	Grid #
			60-60-1

4) Type of Well ☒ Water ☐ Monitor ☐ Injection ☐ De-Watering

5) N↑

Drill, Pump Installer, or Landowner performing the plugging operations must locate and identify the location of the well within a specific grid on a full scale gridded map available from Texas Natural Resource Information Service. The location of the well should be denoted within the grid by placing a corresponding dot in the square to the right. The legal description is optional.

B) HISTORICAL DATA ON WELL TO BE PLUGGED (if available)

6) Driller	License No.

7) Drilled / /	8) Diameter of hole _____ Inches	9) Total depth of well _____ feet.

C. CURRENT PLUGGING DATA

10) Date well plugged 4 / 4 / 2004

12) Name of Driller/Pump Installer or Well Owner performing the plugging
Will Dreller

License No. 10000 WI

13) CASING AND CEMENTING DATA RELATIVE TO THE PLUGGING OPERATIONS

CASING LEFT IN WELL

DIAMETER (inches)	FROM(feet)	TO (feet)
7 7/8	0	200

CEMENT/BENTONITE PLUG(S) PLACES IN WELL

FROM (feet)	TO (feet)	SACKS
2	200	25 bentonite
2	0	2 cement

11) REMOVE ALL REMOVEABLE CASING
Please check box beside the method of plugging used

☐ Tremmie pipe cement from bottom to top.

☒ Tremmie pipe bentonite from bottom to 2 feet from From surface, cement top 2 feet.

☐ Pour in 3/8 bentonite chips when standing water in well is less than 100 feet depth, cement top 2 feet.

☐ Large diameter well filled with clay material from top to bottom.

COMMENTS

D. VALIDATION OF INFORMATION INCLUDED IN FORM

I certify that I plugged this well (or the well was plugged under my supervision) and that all of the statements herein are true and correct. I understand that failure to complete items 1 through 13 will result in the report(s) being returned for completion and resubmitted.

Company or individual's Name (type or print) Dreiker Drilling

Address	City	State	Zip
Rt 1 Box 1	Wellville	TX	78787

Signature	Date	Signature	Date
Will Dreller	4 / 4 / 2004		/ /
Licensed Driller/Pump Installer		Apprentice	

TDLR FORM a004WWD *White - TDLR Yellow - Owner Pink - Driller/Pump Installer*

Publication Notes: The Texas Groundwater Protection Committee

Created in 1989 by the Texas Legislature, the Texas Groundwater Protection Committee (TGPC) is the primary coordinating mechanism for nine state agencies and one statewide association with groundwater-related responsibilities.

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TGPC Members:

- Texas Commission on Environmental Quality (*Chair*)
- Texas Water Development Board (*Vice Chair*)
- Railroad Commission of Texas
- Department of State Health Services
- Texas Department of Agriculture
- Texas State Soil and Water Conservation Board
- Texas Alliance of Groundwater Districts
- Texas AgriLife Research
- University of Texas Bureau of Economic Geology
- Texas Department of Licensing and Regulation

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- Texas Rural Water Association
- Texas Farm Bureau

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