TREATING A GROUNDWATER WELL THAT HAS TESTED POSITIVE FOR COLIFORM BACTERIA FOLLOWING A FLOOD EVENT

Often if the source water is contaminated you will have to wait for the bacteria that has been washed into the aquifer to die off before the well can be successfully treated and begin to produce sterile water again. There are multiple treatment methods including UV disinfection, Chlorine injection, and Ozonation. These methods are capable of treating the water to a drinkable standard even if the source water is not sterile. Shock treating the well via chlorination is the first step in disinfecting the well and plumbing system.

***Shock treatment is only effective if the source water has returned to normal sterile conditions.**

DISINFECTING PRIVATE WELLS (CHLORINATION)

It was determined from the results of your water analysis that coliform organisms are present in the well and/or the water system. Total coliform organisms are widely found in nature, but are not common in groundwater. They do not generally cause disease, but their presence indicates the possibility of other pathogenic bacteria. The absence of total coliform in water is used as a basis of determining safe drinking water. Fecal coliform presence indicates contamination from human or animal wastes with the possibility of accompanying enteric pathogens. Water should not be consumed until the well and water system have been disinfected and retested.

Since the results of the Coliform analysis were positive, the well should be shock chlorinated. You will need to add chlorine to the well water to kill any disease-causing organisms that may have entered the well.

In addition to the well, you should also disinfect water treatment equipment, such as water heaters, softeners and pressure tanks. During the shock chlorination process, temporarily disconnect or by pass drinking water filters such as carbon filters and reverse osmosis systems.

During the disinfection process, water from the system is unsuitable for consumption; do not allow people or animals to have prolonged contact for at least 12 hours, preferably 24 hours. If there is an automatic watering system for animals and irrigation, provide an alternative water source during the treatment period.

The two most common sources of chlorine for well disinfection are liquid bleach (5.25 percent sodium hypochlorite) and dry chlorine (65 percent Calcium hypochlorite). Do not use bleach with a "fresh scent," lemon fragrance or other additives.

PRE-CHLORINATION PROCEDURE

The well owner/operator or person performing the chlorination should be familiar with the water system. They should know if the well system provides water to more than one

location such as the house and livestock watering facility, or are they on separate systems with the same well using cutoffs to each separate system. They should know the location of each faucet within each system including outside faucet (yard faucets and faucets coming from the house system to an outside wall).
The use of chlorine test equipment (used for testing swimming pools) is helpful in determining the presence of chlorine both during the chlorination procedure and when discharging the chlorine from the system.
Performing the following steps prior to chlorination should be helpful when the procedure begins:

Step 1 Determine the approximate amount of chlorine needed to disinfect the well and system(s). The amount of chlorine needed is determined by the amount of water standing in the well. The standing water depth in the well is the depth of the well minus the static water level, which is the level of the water table in a well when the pump is not operating.

If the amount or approximate amount of water standing in the well is known, use the following chart to determine the amount of chlorine bleach or dry chlorine to use:

LIQUID CHLORINE (e.g., Clorox, Purex, etc.)

Standing water depth	Amount of chlorine bleach based on Casing diameter				
in well (in feet)	**4 inch**	**6 inch**	**8 inch**	**10 inch**	**12 inch**
10	½ cup	1 cup	1 ½ cups	1 pint	2 pints
25	1 cup	1 pint	2 pints	3 pints	4 ½ pints
50	1 pint	1 quart	2 quarts	3 quarts	1 gallon
100	1 quart	2 quarts	1 gallon	1 ½ gallons	2 gallons
150	3 pints	3 quarts	1 ½ gallons	2 gallons	3 gallons

DRY CHLORINE (HTH 65-70% hypochlorite)

Standing water depth	Amount of dry chlorine based on Casing diameter				
in well (in feet)	**4 inch**	**6 inch**	**8 inch**	**10 inch**	**12 inch**
10	0	0	0	0	0
25	0	0	0	¼ pound	¼ pound
50	0	0	1/3 pound	½ pound	¾ pound
100	0	1/3 pound	¾ pound	1 pound	1 ½ pounds
150	¼ pound	½ pound	1 pound	1 ½ pounds	4 pounds

Using a plastic bucket(s) mix the dry chlorine with water until it dissolves. Depending on the amount of dry chlorine used, more than one 5-gallon bucket may be needed.

If the amount or approximate amount of water standing in the well is not known, use the following chart to determine the amount of chlorine bleach to use:

LIQUID CHLORINE (e.g., Clorox, Purex, etc.)

Well depth	Amount of bleach based on well depth
Less than 100 ft	1 quart
100 - 200 ft.	1/2 gallon
200 - 300 ft.	3 quarts

300 and greater	+ 1 gallon

(These dosages are approximate. Greater amounts are recommended for excessively cloudy water or for hand-dug wells.)

If the system is extensive or the system has several hot water heaters, a sprinkler system, or provides water to more than one house additional liquid chlorine may be needed. Calculate the amount of static water within the system. Add approximately 1-cup liquid chlorine per 20 gallons of water.

Step 2 Locate the wellhead and remove an access plug or bolt so that the area within the well casing is exposed. Note: If the wellhead cover does not have an access plug a hole may be drilled in the wellhead. The hole should be drilled at least large enough to insert the small end of the funnel and may be drilled large enough to insert the end of a garden hose. (When drilling the hole a magnet placed next to the drill bit will decrease the amount of drill cuttings entering the well casing.) After drilling the hole, it is a good time to find an object to plug the hole when not in use.

Step 3 Drain as much water from the system as possible. If the system has a pressure tank that contains a bladder, the chlorine solution may damage the rubber air-water separator in the tank. Check your manufacturer's guide to see if the pressure tank should be bypassed. If the pressure tank has no bladder, release the air to allow the tank to be filled with the chlorinated water when the chlorination process begins.

CHLORINATION PROCEDURE

1. Insert the funnel in the access hole. Using the nearest faucet and a garden hose, allow water to run through the funnel into the well at a rate that will not over flow the funnel. If possible, while the water is running move the funnel around to allow the water to wet the sides of the casing.

2. After approximately 5 minutes, slowly begin to pour in an appropriate amount of liquid chlorine bleach (e.g., Clorox, Purex, etc or the solution of dry chlorine) into the well while the garden hose continues to run through the funnel, being careful not to over flow the funnel.

3. After pouring the chlorine or solution of dry chlorine into the well continue to allow water to run through the funnel into the well for at least 1 hour after chlorine is detected. This will circulate the chlorinated well water and improve the germ-killing action by allowing all fittings and equipment in the well to be exposed to the chlorine solution. If possible, occasionally, while the water is running move the funnel around to allow the water to wet the sides of the casing. (During this process, the water may become cloudy and possibly contain a red color. The cloudy water is usually air bubbles caused from the falling water. The red color may be caused from rust coming from steel casing.)

4. After the well water has circulated for at least an hour, the garden hose and funnel may be removed and the access plug replaced. The disinfection process should be extended throughout the entire plumbing system.

5. To disinfect the remainder of the plumbing system, turn on the next available faucet and allow it to run until the chlorine can be detected, then turn it off. Repeat this step throughout the plumbing system at each faucet including hot water faucets, hot and cold water in washing machine, dishwasher, toilet, and any outside faucet coming from within the house.

6. Allow the chlorinated water to remain in the plumbing system for at least 12 hours, preferably 24 hours. During this time, the water should not be used for drinking, cooking, bathing, or clothes washing.

7. Twelve to twenty-four hours after disinfecting the well and plumbing system, flush all faucets until the chlorine odor disappears and the water is clear of any debris or color. Flush outside faucets first - you do not want to flood the septic system. (If you are using a chlorine test equipment the water may be used after it reaches a safe level as determined by the results of the chlorine test.) This procedure disinfects the well casings and internal pipes—NOT THE WATER IN THE WELL. Please note that a single disinfection may not be sufficient. Certain well systems are more vulnerable to contamination.

8. After the system has been free of chlorine at least 96 hours, submit another bacteriological sample to determine if the disinfection process was successful. If bacteria are still detected in the water system, repeat the chlorination process and then test the water again.

9. If bacterial contamination is detected the third time, check for potential sources of reinfection such as improperly designed wellhead or livestock pens or septic tanks near the wellhead.

If after disinfecting, repeat samples do not achieve a negative analysis result, additional treatment may be necessary. You may need to install a continuous chlorination system or other continuous disinfection system. Information about continuous disinfection equipment may be obtained from local well drillers and plumbing suppliers.

Information in this publication came from the University of Nebraska publication G95-1255A, Auburn University publication ANR-790, Texas Natural Resource Conservation Commission publication GI-005, Texas Cooperative Extension, Texas A& M University System and other sources. For additional information, contact the Central Texas Groundwater Conservation District, 225 South Pierce, Suite 104, P.O. Box 870, Burnet, Texas 78611, Ph. 512-756-4900.