



## DIVISION OF WATER RESOURCES

John W. Hickenlooper  
Governor

Mike King  
Executive Director

Dick Wolfe, P.E.  
Director/State Engineer

### MEMORANDUM

**TO: Well Owners within Colorado flood areas**  
**FROM: Colorado Division of Water Resources**  
**DATE: September 16, 2013**  
**SUBJECT: Placing wells back in service following Inundation by flood waters —  
Decontamination of the well structure is imperative**

#### Background

The September 2013 Colorado flood waters have inundated large land areas where domestic, agricultural, commercial, and industrial water supply is provided by water wells. As the water recedes and cleanup and restoration of homes, businesses, and facilities proceeds, it is important that associated water wells are decontaminated and disinfected prior to placing the wells back in service.

In areas that were affected by high velocity water in and adjacent to canyons, gullies, and streams, many wells will be damaged to the extent that repairs cannot be made. These wells need to be properly abandoned to prevent groundwater contamination and physical hazards at the ground surface. In other areas inundated by slower moving flood water, water wells will be intact and can be reclaimed.

All wells that have been inundated by flood water over the well cap will have taken in significant surface water. Recently constructed wells should be hydraulically sealed, BUT their well caps have a small vent port that allows air to move in and out of the well during barometric pressure changes. If the well cap has been inundated with flood waters, it will have collected surface water in the production casing. The pressure head of surface water accumulating in the well casing may be enough to push that water into the aquifer to some extent. Therefore, it is important for well owners to ensure that the well is decontaminated before putting the well back into service.

#### Procedures

The following are the preferred procedures for decontamination of your water well and protection of groundwater in the aquifer.

1. It is best to contact your local *licensed* water well driller or pump installation contractor to perform this work. For a list of licensed water well contractors please refer to the DWR website at <http://water.state.co.us/groundwater/BOE/Pages/LicensedContractors.aspx>. This work may be performed by the homeowner, but most homeowners will not have the appropriate equipment or experience for proper decontamination of the well.
2. Requirements for proper decontamination of a well and its distribution system are outlined in Rule 15 of the State of Colorado Water Well Construction Rules (2 Colorado Code of Regulations 402-2; <http://water.state.co.us/DWRIPub/Documents/constructionrules05.pdf>. (Rule 15 is attached)

3. Prior to performing the decontamination steps outlined in Rule 15, each inundated well should be pumped for a 1- to 2-hour period to vacate the surface water that has entered the well and, possibly, the aquifer. Longer times of pumping may be appropriate for deeper wells and wells with well casing diameters larger than six (6) inches. The well water pumped during this process should be discharged from the water system before entering the interior water distribution system of a home or business. This may be at a location between the well and the pressure tank or just after the pressure tank. The well owner should ensure that the discharge does not go to areas where flooding persists, which would make any existing situations worse.
4. Older wells may not have a seal on the wellhead that would appreciably restrict flood water infiltration. In these cases the well may have also taken in a significant amount of sediment carried in the flood waters. For these situations, it may be necessary to ensure that the well pump is not encased by sediment before starting the pump, otherwise significant damage to the pump may result. On newer wells with sealed well caps the barometric vent has a screen. That vent screen, if not damaged, should prevent significant sediment from entering the well.
5. Wells may be buried by sediment transported in the flood waters. If at all possible, those wells should be located and dug out to reveal the wellhead. If such a well can be salvaged for subsequent use, the well surface casing and/or production casing should be extended to bring the wellhead at least one foot above the ground surface. Subsequently, the steps above should be followed. If it is determined that the well cannot be salvaged, the well must be properly abandoned (per Water Well Construction Rule 16).
6. After performing the steps above, and before putting a well into service again, a sample of the well water should be sent to a local laboratory to ensure harmful bacteria are not present in the well. Please contact Andrew Ross of the Colorado Water Quality Control Division (303-692-3395) or your county health department for the proper protocols involved and appropriate analytical labs.

#### Additional Information and Contacts

If you have any questions regarding the water well information above, please contact the Division of Water Resources (DWR) Denver office at (303) 866-3581 and direct your call to Matt Sares (ext 8290) or Chief Well Inspector, Nolan Lloyd (ext 8271).

If your well is able to be repaired and put back into use, there is no need for a new permit. If the well must be replaced, a permit for a replacement well must be obtained prior to redrilling the well. For permitting purposes, DWR makes a careful distinction between well repair and well replacement. Your licensed water well contractor can assist you in this determination. A guideline memo that clarifies this distinction can be found at <http://water.state.co.us/DWRIPub/Documents/2004-1.pdf>.

For questions about the well permitting process to replace a damaged well, call the DWR Groundwater Information Desk at (303) 866-3587. Well permit application forms are available on DWR's website at: <http://water.state.co.us/DWRDocs/Forms/Pages/WellPermittingForms.aspx>. Individual wells for domestic or livestock use will typically use the Residential form (GWS-44) and wells for irrigation, commercial, industrial, or other purposes will typically use the General Purpose form (GWS-45).

You can search for wells online using DWR's well database at: <http://www.dwr.state.co.us/WellPermitSearch/default.aspx> OR use the mapping tool (AquaMap) at: <http://water.state.co.us/DataMaps/GISandMaps/AquaMap/Pages/default.aspx>.

Decontamination and disinfection of your well is important to the long-term use of your well and the aquifer itself. Within our authority and ability, the Colorado Division of Water Resources will assist your communities in the ongoing recovery efforts.

## RULE 15 MINIMUM DISINFECTION STANDARDS

15.1 Purpose - All materials installed in wells or cistern shall be thoroughly and carefully cleaned and disinfected to ensure that all harmful or disease carrying or causing organisms are eliminated. Care should be exercised to make certain that all areas of the well or cistern, including the filter pack, come in contact with the disinfecting solution as provided for in this Rule. Gravel pit wells, dewatering wells and recovery wells are exempt from this disinfection requirement. Monitoring and observation holes/wells, where the use of a disinfectant may interfere with the purpose of the hole/well, are exempt from this Rule.

15.2 Disinfection Solution - Disinfection of wells shall be accomplished with chlorine or chlorine compounds. Other disinfecting agents may only be used upon written approval by the Board. Sufficient disinfectant shall be used to produce a minimum concentration of one hundred (100) mg/l (milligrams per liter or parts per million) chlorine in the well (see Table 4). Dry disinfectants used in the preparation of solutions shall not be outdated, shall be full strength, and shall be prepared to the required concentration in accordance with the manufacturer's directions for mixing.

15.3 Placement - All wells and cisterns shall be disinfected after completion of well construction, or cistern installation and after the installation of production equipment. After completion of construction of the well, agitation of the solution is best accomplished through use of a pump and recirculation. If no pump is available, a bailer or plunger shall be used. After installation of the pumping equipment, the disinfectant solution shall be thoroughly circulated through the entire well and installed water system.

15.4 Contact Time - The disinfection solution shall be in contact with the well, cistern, pump and distribution system for sufficient time to eliminate any harmful bacteria.

15.4.1 Decontamination of wells, cisterns where a pump will not be installed in the immediate future, can be accomplished by adding and mixing enough disinfectant to reach a concentration of at least one hundred (100) milligrams per liter. The disinfectant shall be left in the well to await pump installation at a later date.

15.4.2 Following the installation of a pump in a well or cistern, it is necessary to disinfect the well cistern, pump, and the distribution system. After placement, mixing and circulation, the disinfectant solution shall remain undisturbed in the well and distribution system for as long as possible, but not less than three (3) hours, after which time, the residual chlorine concentration shall be at least twenty five (25) milligrams per liter.

15.5 Flushing of Disinfectant - After disinfection of the entire water system by the pump installer and prior to the use of water, the remaining disinfectant solution shall be thoroughly flushed from the well and water supply system and disposed of properly. The disinfectant solution shall not be discharged into the surface waters of the State (see Rule 6.8).

15.6 Test Equipment Disinfection - All equipment inserted into wells for sampling, measuring, and test-pumping shall be disinfected prior to being used in a well unless the entire well will be

disinfected after completion of the testing operations. Disinfection of the test equipment shall consist of contact with a solution having a minimum concentration of three hundred (300) milligrams per liter total chlorine for a period of not less than fifteen (15) minutes.

15.7 Tanks and Vessels for Hauling and Storing Water for Drilling - Tanks used for hauling water to the drilling site and any vessel used to store water for drilling purposes shall be constructed of a material approved for use with potable water and shall be regularly decontaminated. Tanks or vessels used for hauling and/or storage of hydrocarbons, waste materials, chemicals, or other contaminants shall not be used for hauling or storing water for drilling purposes.

**TABLE 4: APPROXIMATE QUANTITIES OF CHLORINE FOR PREPARING DISINFECTING SOLUTIONS**

One ounce of dry HTH or equal powder (70 % available Chlorine) dissolved in 52.2 gallons of water makes a 100 ppm strength disinfectant solution. One cup of liquid household bleach (5% available chlorine) mixed into 31.2 gallons of water makes a 100 ppm strength disinfectant solution. Various proportions can be calculated using the following approximate quantities:

Approximate amount of dry powder or liquid bleach required for a 100 ppm chlorine solution			
Diameter of water column (inches)	Volume of water in 100 feet of column (gallons)	Cups of dry powder 1)	Cups of liquid bleach 2)
4	65.5	¼	3
6	147	½	5
8	261	¾	9
10	408	1	14
12	587	1 ½	19

- 1) The volume of dry powder, based on 70% available chlorine, has been rounded up to the next ¼ cup marking on a standard measuring cup.
- 2) The volume of liquid bleach, based on 5% available chlorine, has been rounded up to the next full cup marking on a standard measuring cup.

**Cistern Disinfecting Solution**

The approximate amount of dry powder or liquid bleach required for a 100 ppm chlorine solution consists of 1 1/4 cup of dry powder or 16 cups of liquid bleach per 500 gallons.