FAQ Regarding Private Well Problems Experienced during Droughts

Declining groundwater elevations during droughts can cause problems with both the yield and water quality of private wells. Determining possible remedies for these problems can be difficult and in some instances the remedy implemented may not provide a guaranteed fix to the problem. This web page will discuss the various types of problems encountered and possible remedies.

To state the obvious, if your well is experiencing reduced yield during a drought, you should take steps to conserve your water use. See the "Tips for Saving Water" section of the following Drought Outreach and Response web page for ways to conserve water use: https://www.mass.gov/info-details/drought-outreach-and-response

What type of well do I have?

The most common types of wells in Massachusetts include bedrock wells, wells consisting of a well screen and well casing that is installed in a sand or sand and gravel aquifer, and shallow dug wells that are installed in the sediments above the underlying bedrock. The types of problems that may be encountered during a drought, and the possible remedies that can be implemented may be somewhat different for each of these well types.

Bedrock well: A bedrock well typically consists of a 6-inch diameter well boring that is drilled into the bedrock beneath the overlying loose sediments. A 6-inch diameter steel well casing is typically set within the upper section of the bedrock and runs from the bedrock to the ground surface. The 6-inch diameter steel well casing typically sticks up from the ground surface. Bedrock wells are typically hundreds of feet to approximately 1,000 feet deep.

Sand and gravel well: A sand and gravel well typically consists of a well screen that extends through the lower section of the well and a riser pipe (consisting of steel or PVC pipe) extends vertically from the top of the well screen to the ground surface. Sand and gravel wells are typically tens of feet to approximately 200 feet deep.

Dug well: Dug wells are commonly 3- or 4-foot diameter wells constructed by excavation and are usually not much deeper than 15 feet below land surface. Older dug wells are typically lined with fieldstone, and more recent construction utilizes inter-locking concrete tile[1].

Where can I obtain a copy of my well completion report?

Having a copy of your well completion report can be very useful when considering possible solutions to problems with your well yield. Massachusetts regulations have required the submittal of well completion reports by Massachusetts Certified Well Drillers to both the local board of health and the Commonwealth since sometime in the 1960s. All of the legible reports that have been submitted to the Commonwealth are available through the EEA data portal at https://eeaonline.eea.state.ma.us/portal/#!/home. To obtain a list of available well logs for your

[1] https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/dwgb-1-16.pdf

municipality scroll down to “See All Data Search Categories” then click on “Well Drilling”. That will open the “Search for Well Drilling” page. Choose your city or town from the dropdown menu and click on “Domestic” in the “Well Type” data field.

Unfortunately, not all well completion reports have been submitted to the Commonwealth as is required by the regulations, so it is possible that you may not find your well record in that database. If you can’t find it there, you may want to contact your local board of health to ask if they have a copy of that report.

Typical Problems Encountered:

Why am I not getting any water, or enough water, from my well?

Well yield problems encountered during a drought may have been caused by multiple issues. It’s important to try to determine the cause of the problem in order to determine the best possible solutions. Contacting a MassDEP Certified Well Driller or a well pump installer may be your best option for diagnosing the problem. Some common problems and symptoms associated with decreased well yield caused by drought conditions include the following:

- The groundwater elevation has dropped too low and sufficient water is not available.
- The decline in groundwater elevation has caused the shallower water bearing fractures in the bedrock well to run dry, resulting in water from the remaining water bearing fractures to enter the well at higher velocities than normal. Those higher entrance velocities may result in more sediment being drawn into the well and the well’s pump.
- Similarly, if the shallower depths of a well screen in a sand and gravel aquifer go dry or there is any decline in the groundwater elevation in a dug well, the remaining vertical saturated thickness of the well screen or the dug well will also experience higher entrance velocities when the well pump is running.
- Regardless of the well type, if the drop in water elevation results in more silt and/or sand entering the well this may result in cloudy or colored water and/or noticeable sand particles in the water delivered to the water fixtures in your home. This situation may eventually result in the clogging of plumbing fixtures and/or your sediment filter (if you have a filter). This may result in reduced flow rates from your plumbing fixtures and, in some instances could clog any existing sediment filters.
- Air bubbles appear in water drawn from non-aerated faucets. This may be a sign that when your well pump turns on, it is unable to fill your water pressure tank before the drawdown in the well results in air being sucked into the pump’s intake. This problem can result in the pump remaining on for longer periods of time because it is unable to pump enough water into the pressure tank to reach the pump’s cutoff pressure for the controlling solenoid switch.

Why does my water taste bad?

In addition to well yield problems, some people encounter water quality problems during a drought. A very common problem is increased concentrations of naturally occurring iron and manganese. Under

normal precipitation conditions, the water being drawn from your well is typically coming from certain portions of the groundwater aquifer and, with certain exceptions, that water tends to have higher concentrations of dissolved oxygen due to the oxygen that is brought into the aquifer from the percolation of water through the overlying sediment from precipitation. During a drought, as the groundwater elevation declines, water is probably being drawn from further distances toward your well and it probably has lower dissolved oxygen content and is of an older average age. All of these issues can contribute to higher concentrations of iron and manganese, in addition to higher concentrations of other naturally occurring contaminants that you may not taste, such as arsenic.

Possible Remedies:

I've discovered that my well pump is not running dry but that I have a large increase in sediment in my water, what should I do?

If you already have a whole house sediment filter, you may need to increase the frequency of filter cartridge replacements. You may also need to consider either replacing your filter with a larger filter that can retain a greater volume of sediment or install additional sediment filters in parallel with your existing sediment filter. Larger filters or additional filters in parallel will allow for longer periods of time between filter replacements and increase the flow rates from your plumbing fixtures.

There may also be an increase in the proportion of silt and/or very fine sand particles that is in the sediment entering your well. This may result in sediment bypassing a filter with a larger micron size rating that had previously worked well prior to the drought. The smaller the micron size rating, the smaller the particles that the filter cartridge can remove. You may need to consider replacing your filter cartridge with one that has a smaller micron rating.

If you don't have a sediment filter because you didn't previously have a sediment problem, you may wish to consider having one installed.

I've discovered that the water level in my well has dropped too low, what should I do?

This situation is one in which it is extremely helpful to have a copy of the original well completion report, especially for bedrock wells. In addition, the depth of the pump setting or the pump's intake setting is also extremely useful information. The options vary somewhat depending upon your well type.

For all well types, one option to consider is whether or not the well pump or well pump intake may be lowered to a deeper depth. There are potential downsides to this option, including the possibility that the water may include more sediment than it did at its previous higher setting. There are also limitations as to how far the water level in a well can drop before a suction lift pump (i.e. hydraulic lift or jet pump) is no longer able to lift the water out of the well. Lowering the elevation of a submersible pump will also reduce, to some extent, the flow rate of that pump, assuming that the drawdown water level in the well drops below the elevation that it dropped to at the previous pump setting.

Another option is to deepen the existing well or install a deeper replacement well. The following discussions concern deepening your existing well:

My well is a dug well: You may want to consider replacing your dug well with a conventional bedrock aquifer well or a conventional sand and gravel well (if you are located in an area where a sand and gravel well option is feasible). Deepening an existing dug well is only possible if the bottom of the well is not currently at, or very close to, the elevation of the top of bedrock. In addition, if there is additional depth from the bottom of the dug well to the bedrock surface, if that material consists of too many fine particles such as silt or clay, it may not result in a significant increase in well yield.

My well is a conventional vertical well installed in a sand or sand and gravel aquifer: Sand and gravel aquifer wells are typically not as deep as bedrock aquifer wells. Due to the shallower depths and the lower drilling cost per vertical foot, a replacement well may not cost more than attempting to deepen an existing well. The options should be discussed with your well driller.

My well is a bedrock well: Unlike sand and gravel aquifers, there are a tremendous amount of unknowns involved in drilling a bedrock well. Assuming that the existing water bearing fractures have not gone dry, at a minimum, deepening an existing well will allow for a lower pump or pump intake setting and the added well depth will allow for more storage of water in the added length of open borehole. This may allow the drought-reduced well yield to slowly fill the well during off-peak water use periods so that more water is available during peak use periods. In the best case scenario, the deepened well will have encountered additional water bearing fractures that are below the previous elevation of the bottom of the well. If you are fortunate enough to encounter additional water bearing fractures, they will replace some, or perhaps all, of your lost well yield.

I have a bedrock well, should I hydrofrac it to increase my well yield?

Hydraulic fracturing (a.k.a. hydrofracking) of bedrock drinking water wells is done by injecting pressurized water into the bedrock fractures to clean out and open existing fractures. Unlike the hydrofracking methods used in the oil and natural gas industry, the hydrofracking methods used on drinking water wells don't include the injection of chemical additives. Although hydraulic fracturing (a.k.a. hydrofracking) of a bedrock well is often beneficial for increasing well yield under normal groundwater elevation conditions, if the water level in the bedrock aquifer surrounding your well has dropped to, or below, the elevation of the lowest water bearing fracture in your well, your chances of increasing your well yield during a drought may be quite low. There may be a very short-term increased well yield related to the volume of water that is injected into your well during the hydrofracking process.

Are there any short-term solutions to having a dry well?

You could consider purchasing or renting a holding tank and have it filled by a bulk water hauler. If you choose to have that water temporarily connected to the plumbing of your home you should check with your local plumbing inspector to find out what local permitting requirements may exist in your

municipality. If you connect to the potable water plumbing of your home you should only use water of drinking water quality. Even if the source of the water is of drinking water quality, you should consider using bottled water for drinking, food preparation, and cooking purposes to avoid the risk of ingesting any pathogens that may be present in the water or the holding tank or the temporary hoses or plumbing with which the water comes into contact. The Massachusetts Emergency Management Agency (MEMA) provides a list of bottled and bulk water providers at the following web site: https://www.mass.gov/doc/drought-resources-private-sector-water-suppliers/download

Should I have a tanker truck load of water injected into my well?

This option is not recommended. In most instances, the majority of water injected into the well will flow out of the well screen or bedrock well fractures and most of it will probably not be available for pumping back out of the well. If you have deep bedrock well where the lowest 200 feet or more of the well have no water bearing fractures, then you may obtain some marginal benefit from filling that section of the borehole with injected water, depending upon the depth of your pump or your pump intake. The typical bedrock well boring is approximately 6 inches in diameter. Every vertical foot of 6-inch diameter borehole contains approximately 1.5 gallons of storage. Therefore, every 100 vertical feet of borehole would possibly hold 150 gallons of water (assuming it's not leaking out of the well through dry fractures).

If you choose to use this option, you should only use water of drinking water quality. If the water source is not of drinking water quality, or the tanker and/or piping and pumps used to inject water into your well are not disinfected prior to use, you run a risk of introducing pathogen contamination into your well. You should consider using bottled water for drinking, food preparation, and cooking purposes after injecting water into your well, until you are able to disinfect your well and household plumbing after the drought has ended.

Additional considerations for drilling deeper at coastal or near coastal properties:

Extending the depth of an existing well or drilling a deeper replacement well in a coastal environment will increase the chance that the well may extend below the elevation of the base of the freshwater aquifer. The nature of the typical interface between fresh groundwater and saline groundwater is that it slopes inland from the coastline such that the further from the coast, the thicker the vertical thickness of the freshwater aquifer and the deeper the depth to the transition to brackish and saline water. This needs to be taken into consideration when drilling a deeper well in a coastal setting. A well driller that has done extensive work in your municipality may have a sense as to how deep a well may be drilled at your property before running a significant risk of encountering brackish or saline water. An additional problem during a drought is that the thickness of the saturated fresh water aquifer will tend to become smaller and the depth to the transition into brackish or saline water will decrease which increases the chance of encountering brackish or saline water. To reduce your chances of pumping brackish or saline water from your well during drought conditions, you should consider taking steps to reduce your water consumption until the drought has ended.

My water tastes bad should I install a water treatment system?

If your water has a metallic taste and/or, if you are experiencing orange, brown, or black staining of sink basins, bathtubs, and toilet bowls, or staining of laundry, it may be the result of increased concentrations of naturally occurring iron and manganese. If so, you may wish to consider having your water tested by a MassDEP Certified Laboratory for iron and manganese. If the manganese concentration is no greater than 0.3 milligrams per liter (mg/L), then it is within the public drinking water limit. There is no health-based upper concentration limit for iron.

If your well is a bedrock well and is located in an area that is known to have increased risk of containing high concentrations of arsenic, you may wish to also have your water tested for arsenic. If the arsenic concentration is no greater than 0.010 mg/L, then it is within the public drinking water limits.

As long as you don't exceed public drinking water limits, then you will have to do your own cost benefit analysis, based upon your personal preferences, to determine whether you want to install a treatment system to reduce the iron and manganese concentrations to avoid the taste and staining problems for what may be a relatively short-term problem that ends when the drought ends.

If your laboratory analytical results exceed either the manganese (and/or arsenic) public drinking water limits then you should more strongly consider installing treatment to remove those contaminants that exceed the limits. The younger the members of your household (including fetuses), the more strongly you should consider installing a water treatment system. Alternatively, using bottled water for drinking, food preparation, and cooking purposes may be a less costly option for a short-term water quality problem.

MassDEP always recommends collecting a second round of water samples for laboratory analyses to confirm any contaminant results that exceed a health-based public drinking water limit before you finalize your decision regarding the need for a water treatment system.

I connected a temporary water tank to the plumbing system in my home, or I had my well hydrofracked, or I had bulk water injected into my well. Now that the drought has ended, what should I do?

You should disinfect your well and plumbing system. Running bulk water through your household plumbing or injecting your well with bulk water or hydrofracking fluids has potentially introduced microbial contamination into your well and/or household plumbing. These microbial contaminants could include human pathogens or bacteria that may metabolize iron and manganese in the ground-water, causing incrustation of the well screen or clogging of the pore space or water bearing fractures in the aquifer.

See the well disinfection section starting on page 68 of MassDEP's Private Wells Guidelines. These guidelines are available at: https://www.mass.gov/service-details/private-well-guidelines