ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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WD-DWGB-1-2 2019

Bedrock (Artesian, Drilled) Well Design

The most common type of water well in New Hampshire are bedrock wells, also referred to as artesian or drilled wells. These wells are constructed with a solid pipe (casing) from ground surface to a specific depth (varies by well) and an open borehole in the bedrock below the casing. The casing is installed to prohibit the unconsolidated surficial materials overlying the bedrock or the water in those materials from getting into the well. The availability of groundwater in bedrock is very irregular and depends mainly on the distribution of rock fractures, their size, orientation, the number of interconnections with other fractures, and with the overlying water-bearing soil. Most bedrock wells for household use are 200 to 500 feet deep; some are over 1,000 feet. The median depth of bedrock wells in New Hampshire is approximately 400 feet. The median yield is 15 gpm. More specific well information for your community can be obtained from well records and geologic data on file with NHDES' Water Well Program and the New Hampshire Geological Survey.

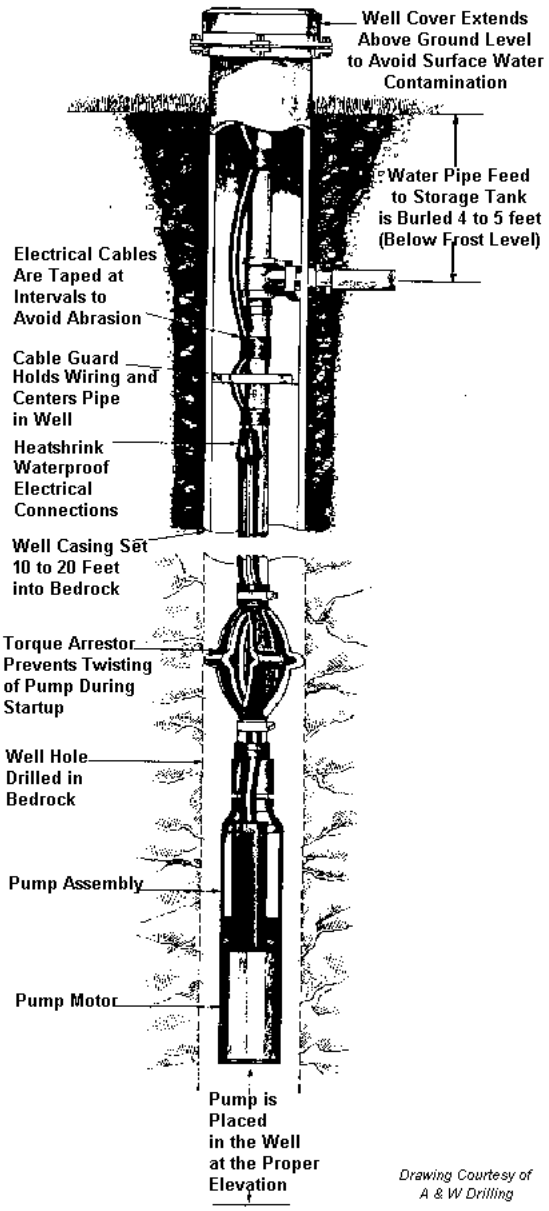
Well drillers and pump installers in New Hampshire are licensed by the Water Well Board under NH RSA 482. The rules of the Board are We 100-1000. These rules govern contractor licensing, well construction standards (including location requirements), and well reporting processes. For a private single family home, water wells shall be located 75 feet from any potential source of groundwater contamination (septic system components, livestock pens), 75 feet from property lines, and 50 feet from a surface water body. A well should not be placed in locations subject to any flooding unless the immediate vicinity (25-foot radius) of the well is built up above the maximum possible flood level. Refer to WD-DWGB-21-1, "Site Selection for Private Drinking Water Wells" for more information pertaining to locating private wells.

Bedrock Well Yield Considerations

There are no state requirements for what a private water well needs to yield. Every bedrock well is different. The depth and yield of your neighbors well does not mean you will find a similar yield at the same depth on your property. Ultimately, a well shall yield enough water to meet the daily demands of the home day after day. Refer to NHDES fact sheet WD-DWGB-1-8, "Recommended Minimum Water Supply Capacity for Private Wells" for guidance on well yield. Well drillers test and report the yield of a well after it is drilled. However, a well's yield may change with time.

A low yield well (1 to 3 gpm) may be acceptable if the well casing and storage tank(s) provide enough storage. The typical 6-inch well casing has a storage volume of approximately 1.5 gallons per foot of water depth above the pump, although this storage will be reduced if the static water level is low in your well. A safety device should be installed in low yielding wells to prevent overheating damage to the pump's electrical motor. In some instances, a large storage tank(s) and auxiliary pump installed in a basement can serve this same function of accumulating water during periods of low demand. Consult with a licensed well driller and refer to NHDES fact sheet WD-DWGB-1-13, "Determining the Reliable Capacity of a Private Water Supply Well and Pumping System," for more information.

If a bedrock well yield is only a few gpm at a well depth of 100 t drilled deeper. On the other hand, if there are only a few gpm a drilling on that particular well, providing it satisfies needs. If a b be improved by either surging or hydro-fracturing. Refer to WD- Hydrofracturing" for more information.



Bedrock Well Water Quality Considerations

There are no state laws requiring private wells meet a certain w authority to withhold building or occupancy permits if the wate influenced by the rock they are drilled in, concentrations of arse and uranium) are fairly common in bedrock wells. The occurren wells is approximately the same as in wells in gravel deposits. Th due to the longer time required for the water to percolate and f recommendations on water quality testing, refer to a brochure Department of Human Health Services titled "What's in Your W Water Quality Testing for Private Wells." Know that when selling 477:4-c requires disclosure of the water system's location, malfu recent water test, and whether or not the seller has experience

Bedrock Well Drilling Techniques

Two techniques are used to drill bedrock wells, the rotary and t borehole is drilled through any unconsolidated overburden (silt, length of pipe is installed in this borehole (the casing) to keep th competent bedrock out of the finished well. Then, the borehole flows through cracks (fractures) in the rock and into the open bo purposes are 6-inches in diameter.

In the rotary process, a drill bit on a long shaft is rotated to grin hole. A water/mud slurry is pumped down through the rotating the well. Most bedrock wells are drilled using the rotary process cable tool drilling or "pounder" drilling, a falling weight is used t hole. Periodically a separate, long thin bailing device is used to r

Some experts contend that the percussion process better fractu and the bailing of water and pulverized particles keeps the rock drilling mud and rock cuttings. These two actions are believed t the percussion process. In recent years, drill bits for rotary drilling machines have been redesigned to include a percussion action to better fracture and pulverize the rock. Rotary drilling is normally less expensive and much less time consuming than percussion drilling. NHDES does not recommend either method of construction over another.

Bedrock Well Casing

Bedrock well casing is a pipe seated into a socket (drive shoe) at least 10 feet into the hard bedrock. Steel casing is most common and recommended; but, casing can be thick plastic. The primary determining factor for the length of the casing depends on geology and how deep it is to bedrock. However, in some cases, extra casing is installed as a protective measure from degraded water quality due to land uses at the ground surface. When the casing is installed, the area (annulus) between the outside of the pipe and the ground needs to be filled in. Typically, this area is filled with the chopped up rock from drilling or fills in from the natural collapse of the earth materials. Cement-grouting the casing to the bedrock is recommended to ensure a good seal. In some instances, grouting is required (for public water supply wells and wells that do not meet setback distances). Residential well

casing shall extend at least 8 inches above ground surface. Only in rare occasions can wells be buried. Refer to NHDES fact sheet WD-DWGB-1-14 “Extending Bedrock Well Casings,” for more guidance.

In some cases, poor water quality from certain fractures, or a poor seal of the casing to the bedrock, can be eliminated by sealing off particular depths of the well by the use of special mechanical seals (e.g., a Jaswell seal). Refer to NHDES fact sheet WD-DWGB-1-9 “Secondary Well Seals and Liners,” for more guidance.

Water Supply Line and Pump

A submersible pump is recommended and most often used in bedrock wells. The pump is typically set so as to provide at least a 20- to 50-foot clearance between the bottom of the well and the submersible pump. Jet (suction) pumps can be used if the static and pumping water levels are shallow. If a deep well jet pump requires maintenance or replacement, they are often replaced with a submersible pump.

For submersible pumps, a torque arrestor and cable guards are used to prevent twisting of the pump and position the power cable and discharge pipe in the center of the borehole. These devices help extend the life expectancy of the pump, discharge line and power cable. The water line to the home comes off the well at a pitless adaptor buried four to five feet deep for frost protection. The water line shall be steel or thick plastic rated for 160 psi or greater. Fittings used shall not be made of plastic or nylon.

Drilled wells often act as electrical grounds. Lightning protection of the motor and electrical controls is recommended. The well pump must be grounded to the home’s electric service and the grounding conductor must be bonded to the well casing, if steel well casing is used. The electrical wires are buried at least 18-inches deep in a conduit from the well to the house. It is good practice to seal around the electrical conduit in the basement and at the wellhead to reduce radon migration into the home and to keep groundwater out of the basement (in the event of artesian well conditions). Artesian conditions is when the water level in the well rises above ground surface, potentially overflowing out the well. If artesian conditions exist, a drain can be installed to direct water away from the well. The end of the drain pipe shall drain to daylight and be screened to prevent backflow and intrusion by bugs and rodents.

For Additional Information

Please contact the Drinking Water and Groundwater Bureau and the New Hampshire Water Well Board at (603) 271-2513 or dwgbinfo@des.nh.gov or visit our website at www.des.nh.gov.

Note: This fact sheet is accurate as of June 2019. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.