Monitoring Your Well Water

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WHY MONITOR YOUR WELL WATER?

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In New Mexico, as in other arid and semi-arid regions of the country, few factors are more critical to farming and ranching operations than water quantity and quality. For residents who rely on well water, knowledge about water levels, whether the groundwater is recharging, and the quality of the well water allows them to make more informed decisions about their domestic and land management practices. Implementing a well monitoring program can help identify changes in water supply and quality before they become serious problems. That is why regular monitoring of water wells is so important. Being proactive and knowledgeable about the quantity and quality of your well water allows you to detect problems early and implement corrective measures. This information also allows users to make informed decisions about range and crop management practices and be in a much better position to plan for the future of their groundwater resources.

WHAT MEASUREMENTS SHOULD BE TAKEN?

The two well water measurements that should be taken on a routine basis are:

- Water level measurements
- Water quality measurements

WATER LEVEL MEASUREMENTS

Measuring the static water level in a well or group of wells is a good way to assess groundwater supply, and regular monitoring allows users to detect potential problems early and implement water conservation strategies as needed. Taking water level measurements on a regular basis (annually or biannually) will let you know if your water levels have changed substantially. As a well owner, it is a good practice to keep a record of water levels of your well over a few years to observe the short- and long-term behavior of your local water table. Significant declines in your local water levels can be the result of a number of factors, such as over pumping (pumping the well at a

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***Figure* 1. A 500-ft (left) and 300-ft (right) steel tape. (Photo courtesy of K. Ziegler.)**

***Figure* 2. Using a steel tape in an irrigation well in Union County. (Photo courtesy of K. Ziegler.)**

rate that exceeds the capacity of the local aquifer[s] to yield water) and/or depletion of the aquifer(s) the well is drawing water from.

Methods to measure water levels

There are two basic ways to measure the water level in a well. The most commonly used instruments are 1) a graduated steel tape and 2) electric sounders (electric depth gauges). For a higher-resolution record of your water table, small data loggers (also called transducers) can be installed that can record the water level hourly, daily, weekly, etc.

Steel tape

Measuring water levels in your well using metal tape is very accurate for water levels down to 500 feet or more. The instrument consists of a 300- or 500-ft specifically designed steel measuring tape that can slide past pumps, cables, sucker rods, and other items inside a well casing without getting stuck on anything (Figure 1). A 300-ft tape costs about $700 and a 500-ft tape can be over $2,000, and both are specially calibrated to account for the stretch of the tape as it is lowered into the well. Before lowering the tape into the well, the lowest 8–10 ft of the tape is lightly coated with chalk to show where the tape has gotten wet. The tape is then inserted into the outer casing and lowered down until the end of the tape is below the expected water table (Figure 2). After the tape is reeled back up, the water level is determined by subtracting the length of the tape that was submersed in water (and is therefore wet) from the total length of tape inserted in the well.

Electric sounder (electric depth gauge)

An electric sounder (or depth gauge) is a more convenient method for measuring water levels. It generally costs about $700 or more, depending on the length of tape that is needed. It consists of a weight suspended on an insulated wire with depth markings and a voltmeter (Figure 3). A 9-volt battery supplies an electrical current that flows through the wires in the tape. When the probe at the end touches the surface of the water and completes the circuit, the sounder makes a beeping sound. These tapes are sometimes referred to as e-tapes or "beepers" because of the loud noise they make when they come in contact with the water table.

The main drawback to sounders is that they can become stuck in the well on their way down or up if they get tangled with pump cables or safety lines, or if the tape swings around enough to wrap around the inner casing. If this happens, it is important not to pull on the sounder so hard that it breaks. If you can't immediately free the probe, you may need to call your well maintenance person to assist you with untangling everything.

***Figure* 3. A 300-ft electric sounder or e-tape with its probe. The small hole in the middle of the probe contains the ends of the wire that run through the length of the tape. (Photo courtesy of K. Ziegler.)**

Tritium isotope analysis

Static water level measurements tell you about changes in your local water table over time, but how do we determine whether or not monsoon rain or snowpack is making its way down to recharge the local aquifers? Tritium is an isotope of hydrogen that generally occurs naturally in the upper atmosphere. Natural levels of tritium are barely noticeable, but in the 1950s, when atomic bombs were tested in the western U.S., large amounts of human-made tritium were released into the atmosphere. Thus, if your well water has measurable levels of tritium (recorded in "tritium units" or TUs), there is post-1950s water making its way down to the water table. If there is no measurable tritium, then your well is drawing on older waters that may take hundreds to thousands of years to recharge. From a groundwater conservation perspective, lack of tritium effectively means lack of recharge, and if the water table is continuously dropping in that well, it's time to start considering water conservation efforts like solar panels, timers, and/or float valves. Unfortunately, tritium has a very short half-life (about 12.7 years), so that huge cloud of tritium that provides such a useful marker of "new" water is rapidly dwindling, and tritium will no longer be useful within the next decade. Analysis of a water sample for tritium is not a routine measurement, but it is something done at least once for a given well and costs $325. A second or third sample might be collected after unusually wet seasons to see how the aquifer system responds. The primary laboratory for tritium analyses is the Tritium Laboratory at the University of Miami (https://tritium.rsmas.miami.edu/).

WATER QUALITY MEASUREMENTS

State and federal agencies do not monitor or regulate water quality in private wells. If you are a well owner, it is your responsibility to ensure the quality and safety of your well water. It is highly advisable to monitor your well water on a routine basis to ensure that it is safe for consumption, crop irrigation, or livestock watering, depending on the purpose of your well. If your family gets its drinking water from a private well, you should test your well annually for total coliform bacteria, nitrates, total dissolved solids, and pH levels. If there are any other contaminants that you suspect might be present, you should test for those as well. For example, homeowners living in very old houses in which there are lead pipes, or copper pipes with lead solders, should have their water tested for lead levels. Lead and copper enter the drinking water primarily from corrosion of lead- and copper-containing pipes and plumbing material. Costs of analyses will depend on the type of tests that are requested. If you are testing a private well that provides your drinking water, make sure to only use a laboratory that is certified to do drinking water testing. In New Mexico, a list of certified laboratories is provided by the New Mexico Environment Department at https://www.env.nm.gov/dwb/sampling/CertifiedLabs.htm. Many laboratories will provide information and assistance to help you sample well water correctly and provide you with proper sampling containers.

If your well is used for crop irrigation or livestock watering, water should be tested for things like nitrates, salinity, sulfate, and metals to ensure levels do not exceed those considered safe. More information on these and other compounds, as well as corresponding levels considered safe for all classes of livestock, can be found in NMSU Extension Guides M-112, *Water Quality for Livestock and Poultry* (http://aces.nmsu.edu/pubs/_m/M112.pdf), and M-114, *Nitrate in Drinking Water* (http://aces.nmsu.edu/pubs/_m/M114.pdf).

Free testing of well water: Water fairs in New Mexico

In New Mexico, free testing of private wells is available at approximately 10 water fairs held in communities throughout the state conducted by the New Mexico Environment Department in conjunction with the New Mexico Department of Health. Each water fair event provides free testing of water samples for arsenic, electrical conductivity (salinity), fluoride, iron, nitrate, pH, and sulfate. For more information on these events, how to collect water samples for such events, and the dates and locations of upcoming fairs, visit https://www.env.nm.gov/gwqb/water-fairs/.

SUMMARY

Knowledge about groundwater resources, whether water levels are stable or declining, and well water quality is critical to rural homeowners who rely on groundwater for their domestic and agricultural uses. Regular monitoring of water levels and water quality allows well owners to detect problems early, make adjustments as needed, and better plan for the future. In New Mexico, some Soil and Water Conservation Districts (SWCDs) have initiated well and water quality monitoring efforts. Contact your SWCD to see if there are resources available (http://www.nmacd.org/swcds).

GLOSSARY

Aquifer: Underground layer of permeable rock that bears water

Column: Pipe leading from the surface down to the well pump

Drawdown: The reduction or drop in water level in a well due to pumping

Static water level: The depth below ground level at which water stands in a well when it is not being pumped (also known as the water table)

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ADDITIONAL RESOURCES

For more information on well monitoring, groundwater quality, and protection, see the following references.

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