

CHAPTER 14

Making a Well Measurement

Note: This chapter is from an article I wrote for the Ely Times following the creation of a citizen's ground-water observation network. Many of the local citizens wanted to participate in data collection, so we worked with them to start a well-monitoring program. The information addresses their specific needs, but certainly is transferable to other parts of Nevada with similar interests.

Because many people have shown an interest in being involved with making ground-water measurements, it may be useful to discuss the basics of the process. For the data to be accurate and applicable for a large monitoring network, it needs to be collected properly. The following are some of the key points:

WELL SELECTION: This is an important first step in putting together a monitoring network. Wells need to have good distribution so that a large area has adequate coverage and the wells are not all clustered into groups. Also important is that the various aquifers are represented.

For example, if in a certain valley 200 wells are available for measurement, wells should be selected so that measurements would be made throughout the valley (along the edges and near the center) as well as in the shallow alluvial aquifer and the deep bedrock aquifer. If 10 wells were within a single square mile and all in the alluvial aquifer, all 10 would not need to be measured because the information would be redundant. In this case, just one or two of the wells would need to be measured.

Besides location and aquifer type, important in well selection is the effect of other impacts. For example, one probably would not want to measure a well that is close to an irrigation well during the growing season. The drawdown caused by the irrigation well would affect the water levels in the observation well. This information could be useful for looking at impacts from pumping, but for a large-scale monitoring network, one typically is more interested in natural conditions, not pumping impacts.

Hydrologists can assist in the well selection process. It is important to consider which wells are being monitored by various agencies, so that any new monitoring network contributes to and compliments those efforts. It is important to make sure that wells supply useful information and can be monitored for long periods of time (available for the next few years). Many wells have been monitored in the past as part of other studies, and to select these wells and continue the monitoring would be useful information and would provide a longer period of record.

WELL CONSTRUCTION: It is really important to have information on the well construction. This is in the form of a drillers' log that is recorded at the time of well installation. The driller records such information as the depth of the well, the length of the casing, the aquifer or geologic material in which the well is open, the length of the well screen or open interval, the type of well casing (steel pipe, PVC, etc.), pumping rate maintained following well installation, and other important information. Many land owners have the logs for their wells, but if not, these are filed with the State of Nevada and can be requested.

WELL LOCATION: On the well log, the location of the well is provided (typically as either a location based on township, range, and section or in latitude and longitude). More recently, well locations are determined using GPS. Having an accurate well location is very important for the monitoring network.

MAKING WELL MEASUREMENTS: Once wells have been selected, doing the actual measurement is relatively simple, but needs to follow a standard procedure. Before going into the field, it is important to make sure one has tools (wrench, pliers, etc.); they may be needed to access some wells. Some observation wells are locked, so obtain keys ahead of time. Also, bring a well measuring tape, chalk, retractable tape measure (such as a carpenter's tape), and a log book to record measurements.

Water levels in wells are measured from the same spot each time. We call this the measuring point, and often it is marked with chalk on the top of the well casing. If there is not an established measuring point, then make the measurement from the north side of the well casing, mark this point with chalk, and record the location in your field notes.

In addition to recording the measuring point, it also is important to record the height of the measuring point above land surface. This is done by using the retractable tape measure and measuring from the measuring point to land at the base of the well.



Pat Glancy and Dave Berger, USGS, making a well measurement.

ELECTRIC TAPE MEASUREMENTS: An electric tape is on a reel and is marked in tenths of feet. The tapes typically are either 100, 500, or 1,000 feet in length. At the end of the tape is a metal probe which sounds a buzzer and a light turns on when it reaches the water in the well. Once this happens, hold the tape to the measuring point and record the depth.

STEEL TAPE MEASUREMENTS: A steel tape is on a reel and is similar to electric tapes in that increments are marked on the tape. The difference is that this measurement requires a little math. First, mark the first 10 feet or so of the tape with chalk so that it is possible to see the water mark easily. Lower the end of the tape into the well and continue until the tape goes into the water. Record the depth at the measuring point, then wind the tape back up out of the well. A water mark will be on the tape, hopefully in the section previously chalked, that will show the depth to water. Record this number. Then, in the log book, subtract the water mark from the measuring point to get true depth to the top of the water level.

For example, the tape is lowered and held at the measuring point at 50.0 feet. The water mark on the tape is at 3.4 feet. This indicates that the depth to water is 46.6 feet below the measuring point. If the measuring point is 2 feet above land surface, then the water in this well is 44.6 feet below land surface.

That is pretty much all there is to making a measurement. Please remember to record where the well is located, the date and time of measurement, and any other observations, such as if there is an irrigation well pumping nearby or if the well is near standing water, etc. These notes prove to be very useful later when evaluating water levels over time.

Once leaving a site, make sure the well is secured (capped and locked), that all tools and equipment are collected, and that all gates and other access are closed. Property owners are much more cooperative when respect is shown for their well and land.



**Well measurement at abandoned windmill well in Whiskey Flat, south of Hawthorne, Nevada.
Photograph by K.K. Allander, USGS.**



Measuring water levels in a monitoring well using an electric tape.



Automated water collection and satellite transmission instrumentation. Photograph from USGS archives.