

TWDB-Approved Water-Level Methods for Cooperators

The method of water-level measurement used depends on the configuration of the well head, access to the measuring point, and type of equipment available. The TWDB recommends following the USGS-approved methods for measuring water levels in groundwater wells. These methods can be found in [Groundwater Technical Procedures of the U.S. Geological Survey](#), and are summarized below.

Graduated Steel Tape

A steel tape graduated in feet, tenths, and hundredths of feet.

Data Accuracy and Limitations

1. Steel tapes are commonly accurate to +/- 0.01 foot and most accurate for water levels less than 200 feet below land surface.
2. The steel tape should be calibrated against a steel tape that is maintained in the office for use only for calibrating steel tapes, and this calibration tape is never used in the field. TWDB recommends calibration be performed at least once a year.
3. When measuring deep water levels (greater than 500 feet), tape expansion and stretch is an additional consideration.

Electric Tape/Line (E-line)

An electric tape, double-wired and graduated in feet, tenths, and hundredths of feet.

Data Accuracy and Limitations

1. A modern graduated electric tape commonly is accurate to +/- 0.01 foot and is most accurate for water levels less than 200 feet below land surface.
2. The electric tape should be calibrated against a steel tape that is maintained in the office for use only for calibrating tapes, and this calibration tape is never used in the field. TWDB recommends calibration be performed at least once a year.
3. If the water in the well has very low specific conductance, an electric tape may not give an accurate reading.
4. Material on the water surface, such as oil, ice, or debris, may interfere with obtaining consistent readings.
5. When measuring deep water levels, tape expansion and stretch is an additional consideration.

Air Line

A flexible plastic tubing extending from the surface to a known depth below water level that measures air pressure in the tube.

Data Accuracy and Limitations

1. Water-level measurements using an altitude or pressure gauge can be as accurate as 0.1 foot but may only be accurate to 1 foot or more, depending on the gauge accuracy and range.
2. Water-level measurements using a pressure gauge are approximate and should not be considered accurate to more than the nearest foot.

Flowing Wells (Tubing, Pressure Gauge)

Wells in which the groundwater is under pressure and rises above land surface. Transparent tubing attached to the well discharge point and raised until the water no longer flows from the tubing is used for low-pressure head. For high pressure head, a pressure gauge is attached to the well discharge point.

Data Accuracy and Limitations

1. Low-pressure head measurements are most feasible with heads less than 6 feet above land surface.
2. With care and experience, both low-pressure and high-pressure head measurements can be measured to an accuracy of 0.1 foot, but the latter may only be accurate to 1 foot or more, depending on the gauge accuracy and range.
3. A pressure gauge is the most accurate in the middle third of the gauge's range. Never let the well pressure exceed the altitude/pressure gauge limits.

Recorders (Float & Weight, Pressure Transducer)

Float-activated recorders sense changes in water level by the movement of a weight-balanced float that is lowered into the well.

Pressure transducers have a sensor attached to a long cable that is submerged as close as possible to the bottom of the well and measures hydrostatic pressure, to determine the height of the liquid above it.

Data Accuracy and Limitations

1. The initial water-level setting for a float-activated recorder should be determined using a graduated steel or electric tape which is commonly accurate to 0.01 foot.
2. Water-level measurements for the in-place calibration of pressure transducers should be made to the nearest 0.01 foot.
3. Float-activated recorder and pressure transducer readings should be manually checked against the water level in the well during every visit and at minimum once a year and recalibrated as needed. Float-activated recorder data are only as accurate as the calibration measurements.

Sonic (Acoustic) Groundwater Level Devices

Sonic or acoustic meters use sound waves to measure the distance from the bottom of the probe to the water level and come in two forms, hand-held single-reading meters and in-situ continuous monitoring devices. USGS does not typically use acoustic devices to monitor groundwater levels and does not list this as an approved method in their Groundwater Technical Procedures.

Data Accuracy and Limitations

1. Accuracy of acoustic groundwater level devices varies depending on well construction and other site-specific factors.
2. Continuous acoustic devices are generally calibrated once during the initial setup. An in-situ temperature measurement is recommended for initial calibration for increased accuracy.
3. Hand-held devices are calibrated at least once a day but should be done more frequently if air temperature increases or decreases.
4. It is recommended that the user collect side-by-side comparisons of the acoustic device along with a calibrated electric tape and (or) steel tape in a variety of well types and water depths to determine how the acoustic device performs and the level of accuracy and precision of acoustic readings.

If you have any questions regarding these water-level measurement methods, please contact us at GroundwaterData@twdb.texas.gov