

# Water Metering in Texas

Mary Sanger  
Environmental Defense

As Texas faces challenges in meeting the water needs of its growing population, water regulators and water users are exploring every available tool to efficiently manage and conserve water. One of those tools is a flow measurement device, also known as a water meter. Unlike urban residential water users who are familiar with the meters used by water utilities to calculate monthly usage and monthly costs to the customer, domestic rural water users, who are supported predominately by groundwater resources, are not as familiar with meters.<sup>1</sup>

Concern for the increasing demands on groundwater in Texas has water managers, particularly groundwater districts, considering the installation of meters on groundwater wells, particularly those wells used for agricultural irrigation. In addition to the obvious benefit of giving managers the capacity to monitor water use, flow information gathered from meters can be used to enforce pumping limits, to better estimate groundwater availability, and improve overall effectiveness of groundwater management in the state.

Individual farmers are also finding that water meters can be helpful in operating a more cost effective business by detecting pump inefficiencies, as well as giving an accurate portrayal of water usage, which in turn might lead to changing irrigation practices. Moreover, as water marketing begins to play an increasing role in meeting our state's growing demands, well owners may find that meters can play an important role in providing verifiable data that can be used to prove historical water usage and establish compliance with permits.

## Water Meters

Source water metering involves the installation of gauges or other measurement devices at the point where water is withdrawn from the ground or diverted from surface water reserves to determine the volume of water being used. Metering measurement instruments are known as cold-water meters or flow meters.<sup>2</sup> There are different devices to measure water flow in pipelines, but the most commonly used flow meter in agriculture is the propeller type meter which provides flow rate and flow volume. This report will focus on water well flow meters, devices used to measure the flow from groundwater wells.

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<sup>1</sup> For perspective, hundreds of thousands of Texas homeowners living in unincorporated areas rely on groundwater from individual wells. Between 12,000 and 28,000 new supply wells are drilled into Texas aquifers every year. Approximately 58% of Texas' water needs are met with groundwater resources. About 80% of all groundwater used in the state is for irrigating crops.

<sup>2</sup> [www.ecy.wa.gov/programs/wr/measuring/measuring](http://www.ecy.wa.gov/programs/wr/measuring/measuring).

## Meter Requirements

Across the country and in Texas, water managers at the local and state level are beginning to require specific users to install water meters. When requiring meters, groundwater districts and other water management administrators generally employ a user classification system that differentiates among domestic, industrial (business) and agriculture water use. Domestic groundwater users are rarely, if ever, required to install meters. For instance, the Texas groundwater districts that require the use of water meters exempt wells not capable of producing greater than 25,000 gallons per day – usually constructed for domestic use –from metering requirements.

Several groundwater conservation districts in Texas require meters or are in the process of writing rules to require meters on non-exempt wells—those wells capable of producing greater than 25,000 gallons per day.<sup>3</sup> As a part of their water conservation practices, surface-water based irrigation districts in the Lower Rio Grande Valley require surface-water meters, as does the El Paso County Water Improvement District.<sup>4</sup>

The degree to which the managing authority dictates the specific type of meter to use varies. One state agency that has taken a more prescriptive approach to water meters is the Kansas Department of Agriculture's Division of Water Resources.<sup>5</sup> After conducting an extensive study of water meters, the division included meter specifications in its rules, including acceptable make, model, and size in addition to other specifications. It also developed requirements and procedures necessary for a manufacturer's meter to be included on the list of approved meters. Here in Texas, the North Plains GCD has followed in Kansas' footsteps by providing the water user a list of approved manufacturers and meter models.

The State of Georgia implemented a groundwater meter program in 2003. This program will eventually require all agricultural groundwater wells to be metered. The state will share the cost with the producer, as long as the water withdrawal permit was issued prior to July 2003. There is a six-year phase in period and wells are to be metered by July 2009. The Georgia Soil and Water Conservation Commission is charged with the oversight of meter installations.<sup>6</sup>

Though not all water managers, either state or local, followed Kansas lead, many require that well water meters be calibrated to meet the American Water Works Association's

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<sup>3</sup> The Lone Star Groundwater District and the Post Oak Savannah Groundwater District both have rules requiring meters for wells that are capable of producing 25,000 gallons per day or more. The North Plains GCD requires flow meters on all new wells.

<sup>4</sup> The El Paso County Water Improvement District charges users for the water they actually use, so it is important for the user to monitor his/her water use.

<sup>5</sup> Kansas State Department of Agriculture, Kansas Administrative Regulation, 5-1-8 and 5-1-9.

<sup>6</sup> Georgia Code, Chapter 12-5-105 available at [www.legis.state.ga.us](http://www.legis.state.ga.us).

(AWWA) accuracy reading range for actual flow.<sup>6</sup> In Texas, for example, the Post Oak and Lone Star GCD rules state “all meters must meet the requirements for registering accuracy as set forth in the AWWA standards for cold-water meters....”<sup>7</sup> Additional requirements for meters are also delineated in the District’s rules. The Lone Star GCD rules include similar requirements.

## **Verification of Meter Accuracy and Readings**

For a metering program to be effective in monitoring water use and/or detecting inefficiencies in a pump, there needs to be a system for verifying the accuracy of the meters and the report data. Water managers have established several measures to confirm meter accuracy. As the State of Kansas has done, verification can start with requiring the meter manufacturer to carry out tests before the models are put on an approved list. Taking some cues from the State of Kansas, the North Plains GCD has an approved list of manufacturers and models. In addition to this approach, water managers have used other means to confirm accuracy, including conducting random checks, requiring certification tests every few years and requiring the water user, at his or her own expense, to test the accuracy of the meter and submit a certificate of the test result; and requesting a third party to test the meter.

Reading meters correctly is as important as verifying meter accuracy. Effective farm management is dependent upon accurate readings and water managers need exact data to plan and protect groundwater resources. Most water managers rely on the water user to keep a log of the readings and the actual amount of pumpage. This is usually recorded on a monthly basis, and provided to the water manager on an annual basis. Water managers might require the logs to be available for inspection.

## **Associated Costs**

The cost of a meter can range from \$600 to \$2500, with an average cost of \$650 - \$800 per meter. In addition to the initial purchase price, there is also the cost of installation and maintenance. Yearly maintenance costs are estimated to be \$200 per meter. Given that in most situations well owners are responsible for buying, installing, operating and maintaining the meters, one of the objections to the required use of water well meters is the cost, particularly for a farmer who operates multiple wells.

For the most part, neither state water managers nor local water conservation districts provide money to well owners to cover the costs of meters. Surface water irrigation districts in the Lower Rio Grande Valley do have a 50% cost-share program. The State of Nebraska found it was in its interest to pay for 50% of the purchase cost for irrigation wells in a certain portion of an alluvial aquifer. Interestingly enough, Nebraska was

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<sup>7</sup> American Water Works Association, [www.awwa.org](http://www.awwa.org). Under AWWA standards, a cold-water flow meter must be calibrated to result in the metering of water volume within +/-2% of the actual flow.

<sup>8</sup> Post Oak Savannah GCD rules.

gathering data for a lawsuit brought by its neighboring state of Kansas. The State of Washington also implemented a cost-share program for source water metering in specific critical river basins.<sup>9</sup> This action also was the result of a lawsuit.

One approach to lessening the financial burden of metering on farmers is to allow farmers to initiate metering over a period of time (i.e. two to five years).<sup>10</sup> Another approach, as was discussed earlier, is for the state to provide a cost-share program (50%) to cover the purchase. The state could also invest money in research efforts to evaluate the most cost effective measurement techniques for single and multiple wells.

## **State of Texas and Meters**

The Texas Water Development Board (TWDB) administers an Agricultural Water Conservation Program that has for the last couple of years had approximately \$600,000 per year for water conservation activities. An applicant must be a political subdivision, such as a groundwater conservation district. In an effort to collect data to estimate countywide water use for statewide water planning, the program has provided grants to some groundwater conservation districts to purchase water meters, which are installed on private wells on a voluntary basis. The TWDB requires that the water use be monitored for ten years and the data be provided to the agency. The TWDB has also provided funds to groundwater districts to purchase mobile meters to help irrigators determine the efficiency of individual water pumps.<sup>11</sup>

## **Flow Measurement Alternatives**

In an effort to decrease the cost of meters to well owners, alternatives to individual cold-water flow meters have been considered. In Texas, the North Plains GCD's rules have provided for alternatives to flow meters for wells permitted before the metering rules went into effect. If a well owner decides to use one of the alternatives allowed, the operator must waive "all defenses as to accuracy and/or reliability."<sup>12</sup>

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<sup>9</sup> Washington State Department of Ecology, "Report to the Legislature, Actions and Progress on Water Use-Efficiency" (December 2003).

<sup>10</sup> Ronald G. Cummings, Nancy A. Norton, Virgil Norton, and David Eigenberg, "Changing Rules for Agricultural Water Use: Policy Options Related to Metering and Forfeiture for Non-Use", Georgia State University, Andrew Young School of Policy Studies, October 2001, 6.

<sup>11</sup> Several years ago the Texas' South Plains GCD bought a mobile meter at the cost of \$8,000 (the costs today is approximately \$6,000). At the request of landowners, the district mounts the equipment to the outside irrigation pipe to obtain flow rate information. The South Plains GCD uses this mobile meter more as a part of its on-going educational efforts and to help irrigators run more efficient operations.

<sup>12</sup> North Plains GCD, "Metering and Production Reporting Manual", December 2004.

## Benefits of Metering

### *For Irrigators*

Agriculture irrigators have voiced two overall concerns with the requirement for meters: cost and the possibility of increased water use restrictions. The cost associated with installing and maintaining meters is a legitimate concern. However, because meters can improve the overall management of water and improve the efficiency of the irrigation and pumping system, over the long term, the improvement of water efficiency provides a return on the investment. Research and on-the-ground observations show that greater water use efficiency directly benefits farmers by lowering pumping and distribution costs, and reducing water use.

Dr. Guy Fipps, Director of the Irrigation Technology Center at Texas A&M University, has been working with surface-water based irrigation districts in the Lower Rio Grande Valley on conservation measures. Dr. Fipps found that water measurement by itself reduced water use by 10%. When measurement was combined with training farmers in proper on-farm irrigation management, water use was reduced by 20-40%.<sup>13</sup> The Cooperative Extension Service in Kansas affirms that in most cases metering devices will pay for themselves in watering savings, optimum yields, and lowered energy costs.<sup>14</sup> On the ground observations by the hydrologist for the North Plains GCD confirms that some farmers have seen metering immediately pay off for irrigation systems tied to multiple wells. In one instance in the High Plains region, a landowner discovered one of the pumps was running, but no water flow was coming from the well. Locating that inefficiency right away saved the landowner about \$2,000.

Yet another concern of landowners is that metering will lead to water use restrictions. This concern is valid since information gained through a metering program would provide water managers with the information they need to help establish reasonable pumping limits, particularly during periods of drought. While seemingly a drawback, the establishment of pumping limits can ensure that there is sufficient water available for all water users in the community. It should be noted that in Texas, groundwater conservation districts are locally controlled by an elected board of directors and it is unlikely that these organizations would ever impose water restrictions without due cause and any restrictions would not be put in place without public hearings.

Moreover, as water marketing begins to play an increasing role in meeting our state's growing demands, well owners may find that meters can play an important role in providing verifiable data that can be used to prove historical water usage and establish compliance with permits.

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<sup>13</sup> "Potential Water Savings in Irrigated Agriculture for the Rio Grande Planning Region", 2001. Available at [idea.tamu.edu](http://idea.tamu.edu).

<sup>14</sup> Danny H. Rogers and Richard D. Black, "Irrigation Water Measurement," Cooperative Extension Service, Kansas State University. Manhattan, Kansas, September 1992.

### *For Water Managers*

Water policy makers and managers need accurate scientific based information to make good decisions, particularly as those decisions relate to the long-term viability of a finite commodity, such as groundwater. Groundwater management cannot be accomplished without a basic understanding of the hydrology of an aquifer system and how our growing demands across the state are affecting groundwater availability. The use of water well meters can help managers develop the science by giving them an accurate portrayal of the volume of water withdrawn from an aquifer system. They are one tool to assess water availability, water level declines and management strategies, including conservation planning. The Texas Water Conservation Implementation Task Force identified water audits as one of the most important Best Management Practices.<sup>15</sup>

Well meters have a particular importance to groundwater managers where discreet areas of an aquifer face critical water availability concerns. For example, the Blanco-Pedernales GCD will establish “Critical Groundwater Areas” where it could set the total annual extraction (production) limits. The district at this time relies on Groundwater Availability Models (GAMS) from TWDB, but meters could provide additional data on water levels to determine the need for extraction (production) limits and defining Critical Groundwater areas.

### **Final Word**

If it is in the state’s interest to have an accurate accounting of groundwater withdrawal in order to effectively manage water supplies, then it should consider the establishment of a cost-share program to assist well owners with the cost of purchasing and implementing well meters. In addition, the state might consider funding research projects that evaluate the most cost effective measuring devices and techniques.

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<sup>15</sup> The Best Management Practices identified by the Conservation Implementation Task Force are available at [www.twdb.state.tx.us](http://www.twdb.state.tx.us).