TCEQ REGULATORY GUIDANCE
Environmental Assistance Division
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Managing Small Public Water Systems: Part B, Source Assessment and Planning

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Introduction

This publication is Part B of a five-part series Managing Small Public Water Systems (RG-501). Part B will help you:

- identify your water source,
- measure your water level,
- develop best management practices to manage your source,
- identify options for alternative sources, and
- plan for the future.

This guide includes a list of helpful contacts and worksheets to help you determine how reliable your source and distribution systems are.

An electronic version of the series is available at the TCEQ Small Business and Local Government Assistance Section's (SBLGA) Public Water Supply Compliance Tools webpage at <www.tceq.texas.gov/goto/help4pws>. If you do not have Internet access, call the SBLGA's hotline number 800-447-2827 to request a paper copy of the complete series Managing Small Public Water Systems (RG-501).

Note: This publication is not a substitute for the actual rules. To obtain the most current, official copy of state rules, contact the Secretary of State's office at 512-463-5561. The rules are also available online at <www.tceq.texas.gov/goto/TAC30>.

Health and Sustainability: What you must know

To avoid water shortages or outages, it is critical to evaluate your sources and plan for the future. A good start is to develop, implement, and revise your asset-management, water-conservation, and drought contingency plans (DCPs) as necessary. If you determine your water source is not adequate under current conditions or that it will not be in the next five years, you should consider budgeting for a new (alternate) source of drinking water. Part A of this series, *Asset Management* (RG-501a), will help you prepare a comprehensive budget.

Keep the following questions in mind as you work through Part B. They will help you focus on assessing the health and sustainability of your water source.

1. What sources of water are currently used for our public water system (PWS)?
2. Considering current demands, how long will each of these sources last?
3. What is the minimum water level elevation or flow rate of my water source needed to maintain an adequate water supply?
4. What are the appropriate water levels to be used as triggers in our drought contingency plan (DCP)?
5. In the event of a water outage, how will we get water to the system?
6. At what point (trigger level) do we need to seek an alternate source of water?
7. What alternate sources are available?
8. How much would each alternate source cost to develop?
9. How long would it take to bring an alternate source into production?
10. Does our PWS need to increase rates to fund an alternate source or infrastructure improvements?
11. What funding is available?

Where does my water come from?

Raw water that is treated and used for drinking water usually comes from groundwater, surface water sources, or a combination of both. For surface water, it is easy to see the water body that the intake pulls from. The health and long-term viability of surface water sources can be identified by streamflow or the measurement of lake and reservoir levels.

For groundwater systems, it is more complicated because the source is an underground aquifer. Specialized tools and techniques are used to measure the water available from the groundwater wells.

A PWS can obtain information about its system, including the water source, from the TCEQ Water Supply Division by calling 512-239-4691.

Groundwater: Basics of a groundwater well

When your groundwater well was initially drilled, the licensed driller developed a well (or boring) log report as required by Texas statute. The driller is required to submit the log to the Texas Department of Licensing and Regulation (TDLR) and a copy is included with the plans and specifications submitted to TCEQ during the initial approval of the well.

The Texas Water Development Board (TWDB) hosts an online application for the submission of required well log reports. TWDB also maintains two online resources that provides access to all well log reports:

- Submitted Drillers Report Database online at <www.twdb.texas.gov/groundwater/data/drillersdb.asp>.
- Groundwater Database Reports at <www.twdb.texas.gov/groundwater/data/gwdbrpt.asp>.

The well log contains information about the aquifer, the depth and diameter of the well, the depth to the top of the groundwater (before pumping began), and production levels measured after construction.

You can review current aquifer information on the TWDB's website at: <www.twdb.texas.gov/groundwater/aquifer/index.asp> or, if you do not have Internet access, contact the TWDB at 512-463-7847.

Figure 1: Cross-Section of a Groundwater Well

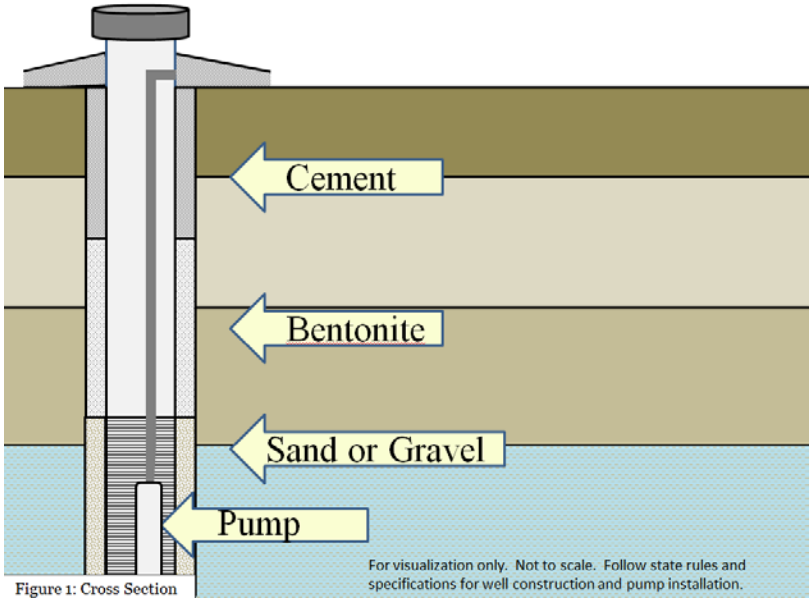


Figure 1 shows a cross-section of a typical well. The construction of the well is regulated, but there may be differences in its completion. Information on well completion is included in the well log and may show amounts of bentonite and cement used during construction. Most wells will have a well screen in the aquifer, which is also known as the saturated zone. The casing of most wells will stick up above the ground, and that distance is important when you are measuring water levels.

If you do not have your well log information, you can visit the TWDB's Drillers Report database referenced above or the TCEQ's Drinking Water Standards Section webpage at <www.tceq.texas.gov/drinkingwater/SWAP/wells.html> to obtain the well log. You can also contact the Water Supply Division at 512-239-4691 to request a well log if you do not have Internet access.

How do I measure my groundwater level?

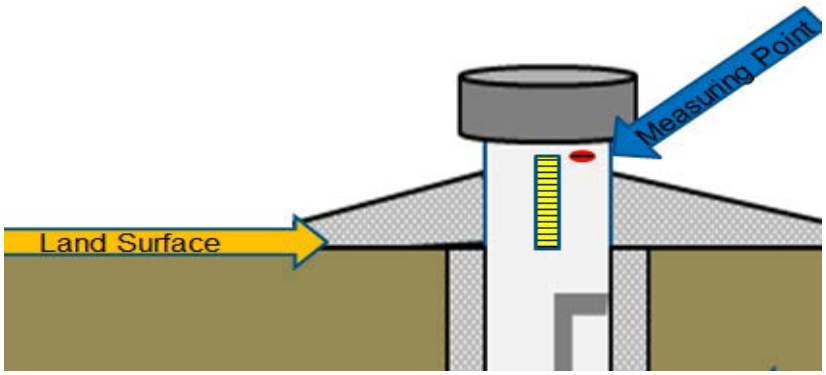
Groundwater level is a direct indicator of the groundwater supply. Follow Step 1 through Step 3 in this section to help determine annual and long-term changes of groundwater storage and estimate recharge rates of the groundwater supply so that you can plan for future needs.

Step 1. Establish a permanent measuring point

It is important to take well measurements from the same point in your well casing or sample port each time.

To ensure you are measuring from the same point, you should establish a permanent measuring point (also referred to as "measuring point" in this document) and mark that point inside of the casing with a waterproof marker.

Figure 2: Measuring Point



The measuring point (see Figure 2) can be surveyed and designated as elevation above mean sea level (msl). If your measuring point is surveyed, and you know the elevation at the wellhead, then your water level measurements will be in elevation (feet) above msl by subtracting the depth-to-water water from the elevation of the measuring point.

If you do not have an elevation of the measuring point or of the land at the well head, you can subtract the distance from the ground to your measuring point from your total depth-to-water to determine your depth below land surface.

***Example**:*

If the distance from the ground to your measuring point is 3 ft and your depth-to-water is 100 ft then your depth below land surface is 97 ft.

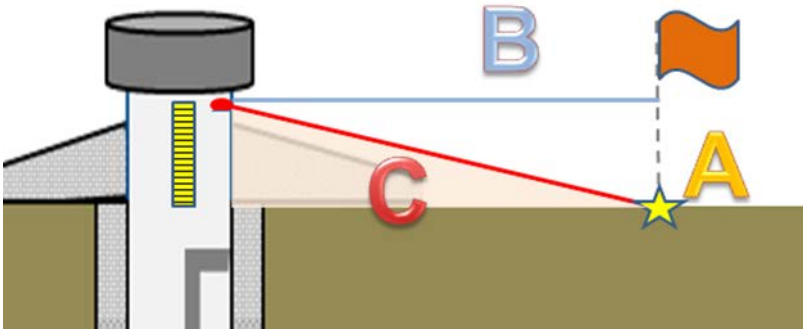
100 ft – 3 ft = 97 ft

If you have not had the well elevation surveyed, use this equation "$A^2 + B^2 = C^2$" to create a "virtual" triangle and calculate your measuring point. To use the equation:

1. Mark a spot on the ground with spray paint or a flag, shown as a star in Figure 3.
2. Measure the distance from the measuring point in the well to the marker (this distance is C).
3. Take a measurement from the mark inside the well until it is parallel with the marker or flag on the ground (this distance is B).
4. Calculate A.
5. Subtract your calculated distance to the land surface from your water level measurement taken from your measuring point to get your depth to water below the land surface.

Figure 3 (below) shows a diagram of the equation applied to calculating the distance to the land surface if you do not know the thickness of the well pad.

Figure 3: Land Surface to Measuring Point



Example Calculation for Land Surface to Measuring Point

If C is 3.16 ft, B is 3 ft, and $A^2 + B^2 = C^2$ then:

$A^2 + 3^2 = 3.16^2$

$A^2 + 9 = 10 =$

$A = \sqrt{(10-9)} = 1$ ft

The distance from the measuring point to the land surface is 1 ft (the square root of 1).

Step 2. Sanitize equipment, select a method, and measure the water level

There are several methods for measuring the depth to water level, including wetted steel tape, an electric water-level indicator, an acoustic well sounder, and the air-line method. Using a steel tape and chalk is the least expensive method and offers a reliable reading, although it may not work for your situation.

This guide discusses the most accessible methods for small systems. Regardless of the method you choose, if you measure consistently with the same method and technique each time, your data will show water -level trends.

Sanitize equipment

It is important that the tape (or line) that you send down your well is clean. To sanitize your equipment, wipe it down with a rag and household (unscented) bleach solution. Allow it to air dry, and avoid contact with soil or unclean surfaces.

The wetted-tape method

This method is typically used for depths up to 300 ft. To use this method, you must already have a good idea of the depth to water in your well (within approximately ten feet).

Materials you will need

- A steel measuring tape long enough to reach the water (ideally, the tape will show tenths of inches)
- A weight (a few ounces is usually sufficient)
- Carpenter's chalk

Steps to take

1. Coat the lower 3 to 4 ft of the tape with carpenter's chalk.
2. Note the previous depth to water (if this information is available) or consider what you suspect is the depth to water to determine the number of feet you intend to spool off the reel and into the well bore.
3. Securely attach the weight to the end of the measuring tape.

4. Lower the tape into the well until the weighted part of the tape is under water, and then lower the tape a little more until the next foot marker sits at your established measuring point.
5. Record the number of feet indicated at the measuring point.
6. Remove the tape from the well and record the length of tape that was under water. (The chalk that was under water will be wet or washed away.) The difference between these two measurements is the depth to water from the measuring point.

Example

Feet recorded at measuring point = 130 ft
Amount of tape under water (wet or missing chalk) = 2 ft 6 in
Depth to water from the measuring point = 130 ft – 2 ft 6 in = 127 ft 6 in below the measuring point
First, subtract the distance from the measuring point to ground level to get the depth to water from land surface.
Then convert inches to feet, if needed, by dividing the number of inches by 12, and then add to the number of feet.
For example, 3 ft 6 in becomes 3 + (6/12) = 3 + (0.50) = 3.50 ft = 127.5 ft – 3.5 ft = 124 ft depth to water below the land surface.

The air-line method

The air-line method is useful in areas where wells may be turbulent; once installed, the air-line can remain in the well. Piping is placed down the well to a depth of approximately 20 ft below the water level. As air is pumped into the piping, bubbles are forced out by the water pressure, until it comes to equilibrium. From the air pressure gauge reading, you can calculate the depth to water. The instructions provided in this guidance are general; more information about this method is available online through the USGS at <www.pubs.usgs.gov/tm/1a1/pdf/GWPD13.pdf>. Additionally, your local groundwater conservation district (GCD) or a well driller may be able assist with the initial installation of the air-line.

Materials you will need

- 1/8- to 1/4-inch diameter tubing, preferably seamless copper, brass or galvanized pipe, and tee fitting

- Calibrated pressure gauge, preferably filled with oil or silicone
- Compressed air source with Schrader valve. You can use a bicycle pump for shallow wells or an air compressor where the depth to water is hundreds of feet.
- Small open-end wrench
- Steel tape with measurements in hundredths of feet

Steps to take

1. Attach the air-line to the pump column, making sure it is at least 5 ft above the suction intake of the pump. Make note of the length of pipe required.
2. Use the wrench to fit the upper end of the pipe with a tee fitting, pressure gauge, and valve to attach air supply.
3. Pump air into the pipe until the pressure levels off, indicating that all of the water has been pumped from the line. This will be the pressure-gauge reading used in your calculations. Take water-level measurements with the steel tape at the same time to verify the pressure-gauge reading. If the two readings are not equal, use a correction factor when you take measurements.
4. Deduct the pressure in feet from the known length of air-line.

Example

Length of air-line = 150 ft
Air pressure = 26 psi
Convert air pressure to feet by multiplying psi by 2.31. In this case, 26 psi × 2.31 = 60 ft.
Subtract the air pressure in feet from the length of air-line. 150 ft – 60 ft = 90 ft. The distance to the water is 90 ft. As with other methods, you also need to subtract the distance from the measuring point to the land surface.

Water-Level-Indicator Measuring Tape

A WLI is a battery-powered electric measuring tape (“e-line”) or cable that is double wired, has an electrode probe on the tip, and is marked with feet, tenths, and hundredths. Most water-level indicators can be considered accurate to 0.01 foot (0.12 inch) at depths of less than 200 feet.

Materials you will need

- Water-level-indicator tape (can be rented from an equipment-supply company and require calibration)

Steps to take

1. Check the circuitry of the water-level indicator before lowering the probe into the well by dipping the probe into clean tap water and observing whether the indicator needle, light, and buzzer are functioning properly. If the tape has multiple indicators (some have sound and light), confirm that they are operating simultaneously. If not, determine the most accurate indicator. The strength of the buzzer and light intensity used should be the same on all measurements (be consistent—for example, if you record the measurement as soon as you hear the sound or see the indicator light, continue to do so throughout measuring).
2. Establish a measuring point as discussed in Step 1 and shown in Figure 2.
3. Lower the electrode probe slowly into the well (use the well port, or take the well cover off) until the indicator shows contact with the water surface. Place the tip of your index finger on the tape at the measuring point, and read the depth to water.
4. Repeat the measurement until you get consistent results (within 0.02 foot [0.24 inch]).
5. Record the date and time of the measurement.
6. Once you record the water level from your measuring point, subtract the distance to the land surface, so you have the depth to water from the land surface.

Example

Depth to water reading = 150 ft
Distance to land surface = 90 ft
150 ft – 90 ft = 60 ft
As with other methods, you also need to subtract the distance from the measuring point to the land surface. Repeat the measurement until you get consistent results (within 0.02 foot [0.24 inch]).

Step 3. Record your water levels

Record well data to track the health of your well, identify and predict trends, and to assist with planning activities. The examples discussed in this section represent some of the key well data that you should record.

Water level measurements should be recorded in feet, with reference to land surface. The elevation of the land surface above sea level should be documented in the well description, along with the height of the measuring point above or below land surface.

The measuring point should be described physically (such as top of casing, top of instrument shelf, and so forth), and in relation to the land surface (such as 1.3 ft or 1 ft 4 in above land surface). The description will help demonstrate that the same measuring point was used each time.

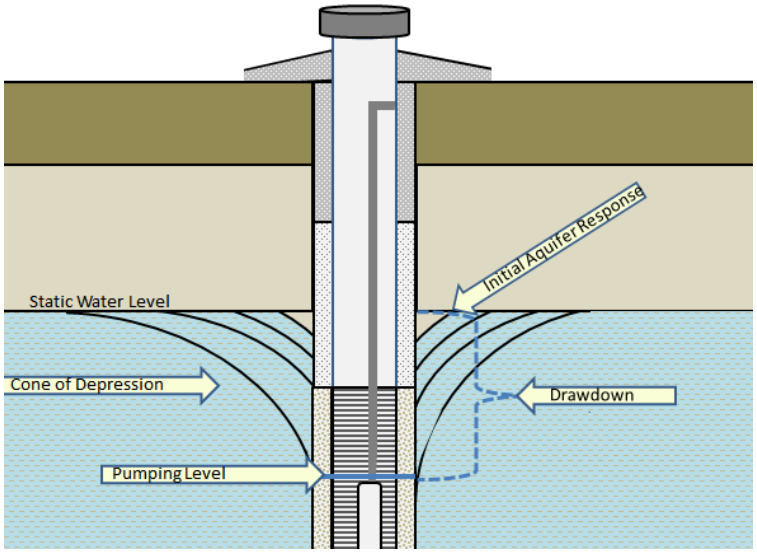
The **static water level** of the well is the level of water when the pumps are not operating. This level should have been measured and recorded in the well log when the well was drilled and before the initial 36-hour pump test. However, if that record cannot be located, you can take the well offline and record the static level once the pump has been off for 24 hours.

The **dynamic water level**, also known as the pumping level, of the well is the level of water when the pumps are operating. By tracking the dynamic water levels in the well, you can identify any mechanical issues as well as severe drawdown.

Drawdown (see **Figure 4**) is the drop in the water level when the water is pumped at a **constant yield** (sustained rate of water flow) for 24 hours. The pumping level minus the static level equals drawdown. Reasons to track drawdown include:

- detecting a slow decline in the water source;
- detecting pump or well screen issues before they become major problems; and
- evaluating efficiency and performance of the well.

Figure 4: Cross-Section Pumping Well



Drawdown may also be influenced by external factors. For instance, if the wells are in an agricultural area, you may find that drawdown is faster during periods of crop irrigation. It is also beneficial to track the **well recovery rate**. This is the time (measured in minutes) that it takes for the well to recover after being lowered to pumping level. A long recovery time coupled with a larger drawdown and greater cone of depression may indicate that the well is located in an area influenced by over-pumping, or that the aquifer is not being recharged.

A **cone of depression** occurs in an aquifer when groundwater is pumped from a well. In an unconfined aquifer (water table), this is an actual depression of the water levels. In confined aquifers, the cone of depression is a reduction in the pressure head surrounding the pumped well.

Another useful way to track the health of your well is by calculating specific capacity. The **specific capacity** is calculated by dividing the yield in gallons per minute by the drawdown in feet. For example, the specific capacity for a well with a yield of 3,000 gpm and 30 ft of drawdown would be 3,000 gpm/30 ft or 100 gpm/ft. The specific capacity can be calculated from the well driller's log and compared to the current data from your pump test. If there is more than a 25 percent decrease in specific capacity, you should consider rehabilitating the well.

Record water levels and identify trends

Maintaining records of your data will allow you to determine trends, and to identify potential problems or emergencies, such as extreme drought. A good practice is to measure and record the information once a week for a month, and then review the data to identify trends in the water level.

To record and track the water levels in your well use:

- Worksheet 1A if the groundwater *elevation* is known.
- Worksheet 1B if the groundwater *level below land surface* is known.

If problems are discovered, use Worksheet 2 to help determine solutions to the problem.

How do I calculate how much surface water is available?

It is important to track the level of your surface water source over time in order to stay informed about water availability. This section will help you determine whether you need to secure other sources to meet the needs of your system *before* you can no longer access the water from your intake location.

Tracking available water allows you to notice trends and fluctuations over time. Your source may lose a foot or more of water per week due to pumping and evaporation, or levels could drop rapidly as water is released to downstream water right holders. During a drought, tracking the amount of water available will help predict how long your supply will last to help you plan for securing alternative water sources.

How much water is available in my surface water source?

Various state and federal agencies track surface water levels in Texas. These agencies, the data they track, and how to access the water data is listed in Table 1.

Table 1: Surface Water Tracking Agencies

Agency (Phone)	*Data Tracked*	*Webpage(s)*
Texas Water Development Board (512-463-7847)	Level of most reservoirs in Texas	www.waterdatafortexas.org/reservoirs/statewide
United States Geological Survey (888-275-8747)	Daily surface water level Streamflow data	• www.waterdata.usgs.gov/tx/nwis/current?type=lake • www.waterdata.usgs.gov/tx/nwis/current/?type=flow
United States Department of the Interior (512-899-4150)	Water level data for four minor Texas reservoirs.	www.usbr.gov/gp-bin/arcweb_sanford.pl

Determine how much water is available to your PWS from a reservoir

Reservoirs are a specific type of surface water source used to store water. PWS's pulling water from a reservoir, can calculate how much water is in the reservoir. Follow the steps below to learn how to do this simple calculation.

Step 1. Look up amount of water in the reservoir

Look up the amount of water in the reservoir or the source's elevation (msl) for the day of measurement. Obtain this information from resources listed in Table 1.

Step 2. Measure the amount of water over the top of your raw water intake

Measure how much water is over the top of your raw water intake to calculate how much water is available. This will establish a reference point for tracking water availability.

Remember that the water available to your system may be limited by your water right or water rights of others who use the same reservoir. Mere availability of water does not guarantee that it is yours to use; however, tracking available water can be useful in assessing the need for an alternative supply.

Step 3. Complete your calculations

Calculate the elevation of your intake by subtracting the measurement of the amount of water over the top of your raw water intake from the source's elevation. This is your "critical pumping level," below which you will not be able to pump water.

Example

On September 27, 2012, you measure 10 ft of water over your intake. The source elevation listed on the TWDB's website for the same day is 200 ft above sea level. You can then find out the intake's elevation as follows:

Lake level 200 ft above msl – 10 foot of water over intake = 190 ft msl. This is the intake location above sea level (the critical pumping level).

Periodically (at least weekly during drought conditions, or more frequently if needed) check how much water is over the top of the raw water intake by checking the source elevation online, and then subtracting the intake elevation level from the source elevation. Use Worksheet 3 at the end of this document to track the amount of water available.

Determining how much water is available to your PWS from a river or stream

If your water system is diverting from a river or stream, you should be particularly aware of your source, your water right, and other water users upstream and downstream of your intake. You can check for streamflow gauges nearby to assess the available water. You may want to maintain records of the flow to see how it is changing over time. If you have questions about your source or if you need to amend your water right, contact the TCEQ's Water Availability Division at 512-239-4691.

Water-Shortage Reporting

TCEQ rules in 30 Texas Administrative Code (TAC) 290.41(b) require that you report to the agency when you have less than a 180-day supply of water. If you are experiencing water outages or having issues due to drought, contact the TCEQ's Water Supply Division's drought team at 512-239-4691.

Identify Alternative Sources

Following water conservation measures will help prolong your water supply. However, you need to monitor your source-water levels to determine how reliable your supply is and whether an alternate source is needed. The reliability of your water source is important for long-term planning and when dealing with drought conditions. The TWDB provides assistance for long-term planning and financial assistance for developing new or alternate water sources.

As a part of your drought contingency plan, you should assess the need for additional water *before* the primary water source is showing signs of stress (reduced flow, decreased well recovery, etc.).

You can buy and haul water, obtain additional water rights, drill a new well, construct an emergency interconnection, or convert a non–drinking water well for temporary emergency use as a drinking-water source.

How do I haul potable water?

In case of extreme emergencies, hauling potable water to your PWS may be necessary. Water haulers that carry potable water are required to get the water from an approved source and carry the water using equipment approved by the TCEQ.

If you are considering hauling your own potable water, there are specific requirements for the water truck or trailer, including proper labeling, materials, and construction. The rules for hauling potable water are located in 30 TAC 290.44(i).

To become an approved potable water hauler, you must send the TCEQ:

- a cover letter describing the purpose of your submission,
- an engineering report,
- plans and specification, signed and sealed by a professional engineer licensed in Texas, and
- a TCEQ Core Data Form (TCEQ—10400) available at <www.tceq.texas.gov/goto/coredata>.

To find out more about becoming an approved water hauler, contact the TCEQ's Plan Review Team in the Water Supply Division at 512-239-4691.

To hire an approved water hauler, review the list of approved haulers online at <www.tceq.texas.gov/assets/public/agency/water_haulers.pdf>.

How do I get additional surface water rights?

In Texas, surface water is owned and managed by the state. The TCEQ grants the right to use this water for municipal (for example, drinking water, domestic, and household use), industrial use, farming, ranching, and other activities.

The rights to surface water are issued on a first-come, first-served basis. That means that if your water right is older (senior), your rights to use the water come before the rights of someone who received a water right after you (junior).

In non-watermaster areas, the TCEQ will limit the water that junior water right holders can divert by either suspending or adjusting their water right if restrictions are warranted. This will ensure that senior water right holders — those first in line — will receive water in the river before junior right holders.

If you want to get additional surface water, you will need to submit a water right application. You can visit the TCEQ's water rights webpage <www.tceq.texas.gov/permitting/water_rights> or call a member of the Water Rights Permitting Team at 512-239-4691 for more information about submitting an application.

Note: Applying for a water right does not ensure that the water will be available.

How do I drill a new well?

After exploring your alternative water source options, you may choose to drill a new well. Any new PWS well must be drilled to meet all of the TCEQ standards.

Before you drill, check with the GCD in your area, if one exists, to determine the amount of water that can be withdrawn from the district's groundwater sources. To view a map of the GCDs and to determine what the requirements are for new water wells drilled in their jurisdictional area, visit the TCEQ's GCD webpage at <www.tceq.texas.gov/groundwater/districts.html>.

The first step to drilling a new well is hiring an engineer to submit plans and specifications to the TCEQ. To assist engineers with completing and submitting the appropriate plans and specifications use the TCEQ checklists provided online at <www.tceq.texas.gov/drinkingwater/udpubs.html>. Specifically, the Checklist for a Proposed Public Water Supply Well/Spring (TCEQ form 10205) lists components of the plan to be submitted.

A licensed water-well driller must drill PWS wells. Information about licensed drillers is available on the TDLR's License Search webpage at <www.license.state.tx.us/licensesearch/>.

After the well has been drilled, the engineer must submit well-completion data to the TCEQ. The required data on well completion are listed on the TCEQ's Public Well Completion Data Checklist for Interim Approval (TCEQ form 10234) at <www.tceq.texas.gov/drinkingwater/udpubs.html>. Based on these data, the TCEQ will evaluate whether to approve use of the well.

What is the process for drilling an emergency well?

If your PWS needs to drill an emergency well, the owner, contractor, or engineer must contact the appropriate regional TCEQ office, which will verify the emergency while working with the TCEQ's Plan Review Team in the Water Supply Division.

The TCEQ will respond with a letter stating if construction of the emergency well is approved or disapproved. The letter will also include the checklists discussed under the "How do I drill a new well?" heading of this guidance.

After drilling the emergency well, you are required to submit plans and specifications, according to the TCEQ's Public Well Completion Checklist for Interim Approval (TCEQ form 10234) in order to get approval for use as a PWS well.

For detailed information about the approval process, contact the Plan Review Team at 512-239-4691 and ask to speak with someone about emergency well approvals.

Can I use an irrigation or domestic supply well as a drinking water source?

If you want to use an irrigation or domestic supply well as a PWS source, you first need to send the TCEQ Plan Review Team information regarding the well's construction, including the well log (if available), as-built plans and specifications, and bacteriological and chemical analyses. Also, include a survey of potential sources of pollution within one-fourth mile of the well.

If you want to convert an existing well in an unconfined aquifer to a PWS well, an engineer will need to perform a well assessment and submit engineering plans.

For more information, refer to the TCEQ's Emergency Use of Wells for Public Water Supplies (TCEQ publication RG-485) online at <www.tceq.texas.gov/goto/rg-485>.

How do I establish an emergency interconnection?

You should consider securing an interconnection with a nearby water system *before* their source water is depleted. Once a neighboring water system has agreed to provide an emergency interconnection, the receiving system should contact the regional TCEQ office for verification of the emergency. If the interconnection is approved by the TCEQ, the applicant will receive a letter authorizing construction.

Plans and specifications must be submitted to the TCEQ within 30 days of the date of the acceptance letter.

For more information, refer to the TCEQ fact sheet *Emergency Interconnection Procedure for Public Water Systems* online at <www.tceq.texas.gov/assets/public/agency/emergency_interconnection.pdf> or you may contact the Water Supply Division at 512-239-4691.

We don't have an alternative source—what should we do?

Planning for emergencies, including taking steps as described in the next section on best management practices (BMPs), will help ensure that the system can afford to take the required steps toward seeking alternative water sources.

If you are at risk of running out of water and have no alternatives, call your local or county emergency-management office while there is still time to plan for your community. Review the Texas Department of Public Safety's *Drought Assistance Directory for Public Officials and Drinking Water Utilities*, which includes a flowchart on the process for responding to PWS problems at <www.dps.texas.gov/dem/CouncilsCommittees/droughtCouncil/droughtAssistDir.pdf>.

Develop Best Management Practices (BMPs) For Protecting Your Source

BMP 1: Develop an Asset Management Plan

Without developing an asset management plan, your system may not be prepared for emergency conditions, such as extreme drought. As described in Part A of this series, along with Attachment 501A, Expense and Revenue

Projections, you can determine your budgetary needs by comparing your annual revenues to your expenditures. If there is a shortfall within your budget, you may need to consider raising rates or seek outside funding.

Keep in mind, rate studies are often required before outside funding can be obtained. For help with rate studies and rate setting, the Public Utility Commission of Texas (PUC) offers free one-on-one assistance.

The PUC's publication *Utili-Facts* explains types of assistance available and how to get assistance. For more information about this program go to <www.puc.texas.gov/consumer/facts/factsheets/waterfacts/UtilityOnsiteAssistance.pdf> or call the PUC's Water Utility Division at 512-936-7405.

BMP 2: Create a Drought Contingency Plan

Most DCPs define three to five drought response stages and include "triggering criteria" for both initiating and terminating each stage. Triggering criteria should be designed to ensure timely action in response to a developing drought and that the response is appropriate to the level of severity. Make sure your DCP is tailored to your system and updated at least annually.

The following suggestions will assist you with developing and implementing your DCP.

Customer Involvement

- Help the public understand the need for the DCP. Often, successful implementation of a DCP depends upon how well the public understands the need for the plan.
- Get input from customers and city council members.
- Give the public an opportunity to participate directly in the planning.
- Schedule field trips to the well or intake structure to show customers and board members where their water comes from and why it is critical to conserve and protect their water source.
- Remember that sometimes change is easiest to accept in several small steps, instead of one big step.

Triggering Criteria

- Ensure that your plan's water-use-reduction stages have triggering criteria that correspond to your water source's critical pumping level.
- Create triggering criteria that will give you enough time to respond to the corresponding water shortage. Allow time to notify customers and see a decrease in water usage *before* the source reaches critical pumping levels.

Keep Records

- Keep a log of what works with your plan and what needs improvement, and update your plan accordingly; it is a living document.

Coordinate with Other PWS

- Coordinate your DCP stages with your neighboring water systems. If you and your neighbor are both pulling from the same source, it is likely that you will both be in trouble when the water levels start dropping. This coordination will also reduce customer complaints due to comparisons in water restrictions.

Review the TCEQ Handbooks and Resources

- Use the TCEQ's DCP handbooks for different types of water systems. Contact our Water Availability Section at 512-239-4691, or email the team at <WRAP@tceq.texas.gov> to request copies of the handbooks.
- You can also go to the TCEQ's DCP webpage at <www.tceq.texas.gov/goto/drought_plan> to find model DCP forms, requirements, and information on submissions.

BMP 3: Launch a leak detection program

On average, 14 percent of the water treated by water systems is lost to leaks; therefore, it is important to conduct a leak detection survey of all the equipment in the distribution system. The results of a leak detection survey show where and how your PWS loses water and how much this loss is costing your system.

Reducing water loss will extend the PWS and decrease operating costs. Additionally, state and federal funding agencies may also award funds

preferentially to water systems that have conducted a leak detection survey, also known as a water loss audit.

Conducting a leak detection survey demonstrates that you are:

- making the best use of the DWS's resources
- taking care of the DWS's assets
- concerned about saving money

Leak detection programs should include both public and internal campaigns.

Public Leak detection

Educate the public about leak detection. Encourage residents to check for and fix leaks in toilets, sinks, irrigation systems, and other water-using equipment to prevent waste.

Internal Leak detection

To assist utilities with identifying leaks and determining flow rates, the TWDB loans leak detection equipment free of charge. Visit their website at <www.twdb.texas.gov/conservation/municipal/waterloss/leak detection.asp> for more information about borrowing this equipment.

TWDB's water-loss audit webpage at <www.twdb.texas.gov/conservation/municipal/waterloss/index.asp%20> is a resource available to provide water-loss audit assistance.

By using leak detection and water-loss audit results, you can decide where infrastructure improvements should be made.

BMP 4: Review pump conditions and maintenance

You should assess the condition of your well pump or water-intake pump annually. Often, an aging or poorly maintained pump, rather than a drop in the water table, is the cause of lost pumping capacity.

Regular assessments of the well pump will help you determine if the pump's capacity has diminished. Knowing this information will help you

create a timeline for future repairs and replacements. This information will also help you establish a budget for pump maintenance and for the eventual cost of pump replacement.

Use Part C of this series to help you develop an operation and maintenance program.

BMP 5: Flush water mains wisely

The TCEQ requires PWSs to flush all dead-end mains monthly, and as needed to address water quality complaints and inadequate disinfection residual.

It is necessary to balance the need to conserve water with these flush requirements. You can accomplish this balance by following these BMPs while flushing:

- Minimize water used for flushing activities. Monitor the water quality during flushing, and only flush as much water as necessary to meet requirements.
- Reuse flush water. Capture the flushed water for use in lawn watering or dust suppression.
- Use unidirectional flushing to respond most efficiently to water quality concerns. This involves closing adjacent valves and using a single hydrant per flush to isolate individual sections of the main, and intensely scouring the line to flush the water quickly while minimizing water waste.

Note: the TCEQ may grant an alternative dead-end main flushing routine on a case-by-case basis, if drought has reduced the water supply to critical levels. Contact the TCEQ's Water Supply Division at 512-239-4691, and ask to speak to someone on the Technical Review and Oversight Team for more information about alternative dead-end main flushing.

BMP 6: Communicate with your water supplier

If you purchase water from another PWS, you should contact your water supplier for frequent updates about the status of its source. This information will help you determine which drought stage has been triggered.

You may have to contact several PWSs to determine which system actually pulls the water from the lake, reservoir, river, stream, or aquifer. For example, if you buy water from system C, which buys from system B, which buys from system A, which actually pulls water from the source, only system A will be able to tell you how stable the water source is. Another consideration is that the purchasing systems (B and C) may be limited by how much water they can supply based on their contracts with system A.

Communicating with the other systems that pull from the same source will help you coordinate your drought response in order to reduce water use more effectively.

BMP 7: Evaluate energy consumption

Conduct an evaluation to determine how much energy it takes to run your PWS. You may find that energy is a large portion of your budget.

After conducting an evaluation, you may discover opportunities to incorporate energy efficiencies into day-to-day operations and long-term planning for the PWS. These energy efficiencies can promote sustainability of your water system by saving money, while also reducing operating and maintenance costs.

For more information and resources to help you begin an energy assessment, read the Environmental Protection Agency's guidance *Strategies for Saving Energy at Public Water Systems* at <www.epa.gov/sites/production/files/2015-04/documents/epa816f13004.pdf>.

Need more help?

The TCEQ's Financial, Managerial, and Technical (FMT) Assistance Program offers free on-site assistance to help public water and wastewater systems. The FMT Program can help you with planning, funding, reporting, and many other aspects of running your water system.

For more information about the program:

- Visit the TCEQ's Assistance for Public Water and Wastewater Systems webpage at <www.tceq.texas.gov/drinkingwater/fmt>.
- Call the Water Supply Division at 512-239-4691.
- Email FMT@tceq.texas.gov.

Many state and federal funding agencies have grants and loans available for planning and development of new water sources and infrastructure improvements. The Texas Water Infrastructure Coordination Committee (TWICC) is a group of local, state, and federal agencies that collaborate to identify issues with water and wastewater infrastructure and compliance, and to seek affordable, sustainable, and innovative funding strategies for the protection of public health and efficient use of government resources in Texas. Visit the TWICC Web site <www.twicc.org> for more information or to fill out a Funding Inquiry Form.

Helpful Contacts

TCEQ Office of Water

The TCEQ's Office of Water oversees the design and operational requirements of all public water and wastewater systems.

<www.tceq.texas.gov/goto/water_main>

Water Supply Division..... 512-239-4691

TCEQ Watermaster Program

The Watermaster Program ensures compliance with water rights by monitoring stream flows, reservoir levels, and water use. It also coordinates diversions and regulates reservoirs as needed to prevent the wasting of water or its use in quantities beyond a user's right.

<www.tceq.texas.gov/permitting/water_rights>

Concho Watermaster..... 325-655-9479 or 866-314-4894
Rio Grande Watermaster..... 956-430-6046 or 800-609-1219
South Texas Watermaster..... 210-490-3096 or 800-733-2733

Brazos Watermaster.....254-761-3027 or 254-761-3006

Small Business and Local Government Assistance

800-447-2827

The Small Business and Local Government Assistance program provides confidential technical assistance without the threat of enforcement.

<**www.TexasEnviroHelp.org**>

Other Resources

River Authorities

Develop and manage the waters of designated geographic regions of the state through conservation, storage, control, preservation, use, and distribution for the benefit of the public.

<www.tceq.texas.gov/waterquality/clean-rivers>

Angelina-Neches River Authority 936-632-7795
Bandera County River Authority 830- 796-7260
Brazos River Authority .....254-761-3100 or 888-922-6272
Guadalupe-Blanco River Authority 830-379-5822
Lavaca-Navidad River Authority 361-782-5229
Lower Colorado River Authority .....512-473-3200 or 800-776-5272
Lower Neches Valley Authority 409-892-4011
Nueces River Authority 830-278-6810
Red River Authority 940-723-2236
Sabine River Authority 409-746-2192
San Antonio River Authority .....210-227-1373 or 866-345-7272
San Jacinto River Authority 936-588-3111
Trinity River Authority .....817-467-4343 or 877-872-4343
Upper Colorado River Authority 325-655-0565
Upper Guadalupe River Authority 830-896-5445

Texas Alliance of Groundwater Districts

512-596-3101

Membership of underground water conservation districts of Texas with powers and duties to manage groundwater as defined in Chapter 36 of the Texas Water Code (voting members) and other organizations that work in the groundwater arena (associate members).

< **www.texasgroundwater.org/**>

Texas Groundwater Protection Committee

512-239-4691

Identifies areas where new or existing groundwater programs could be enhanced, and improves coordination among agencies involved in groundwater activities.

<**www.tgpc.state.tx.us**>

Texas Water Conservation Association

512-472-7216

Serves as an advocate for water users and includes interests in groundwater users, irrigators, municipalities, river authorities, navigation and flood control districts, industrial users, drainage districts, utility districts, and general environmental interests.

Texas Water Development Board

State agency charged with statewide water planning and administration of low-cost financial programs, data collection and dissemination, and technical assistance.

TWDB Financial Assistance Programs 512-463-0991
TWDB Groundwater Resources Division 512-463-7847
TWDB Surface Water Data 512-463-7847
TWDB Water Uses and Projections 512-936-0829

Groundwater-Conservation Districts

512-936-0817

Local units of government that develop and implement plans for the effective management of groundwater.

<www.tceq.texas.gov/groundwater/districts.html>

Regional Water Planners

512-463-6277

Guide and support planning of the state's water resources by administering and assisting in the development of the regional and state water plans.

www.twdb.texas.gov/waterplanning/staff.asp

Team 1: Regions A, O, E, F 512-463-6021
Team 2: Regions G, B 512-475-1128
Team 3: Regions C, D..... 512-475-4816
Team 4: Regions H, I 512-463-0250
Team 5: Regions J, K, L, P 512-463-7959
Team 6: Regions M,N 512-475-0590

Find your region by county at **<www.twdb.texas.gov/waterplanning/rwp/>**.

United States Geological Survey—Texas Water Science Center

512-927-3500

This agency works in cooperation with municipalities, river authorities, groundwater districts, and state and federal agencies in Texas to provide reliable, impartial scientific information to resource managers, planners, and other customers by monitoring water, biological, energy, and mineral resources.

<tx.usgs.gov>

Glossary

C

- *Cone of depression:* The depression, tapering in shape, produced in the water table by the pumping of water from a well.
- *Constant yield* (also see yield): A continuous flow of water for a specific period of time.
- *Critical pumping level:* The minimum level of water at the intake at which water can be pumped.

D

- *Drawdown:* he drop in the water table or level of water in the ground when water is being pumped from a well.

- *Dynamic water level:* (also known as the pumping level) level of water in the well when the pumps are operating.

F

- *Flow rate:* Measurement in gallons per minute of water coming out of a well.

L

- *Leak detection survey (also see water loss audit):* A physical evaluation of a water system to identify specific leaks. It involves using a listening device to find leaks in pipes or fittings within the distribution system.

P

- *Permanent measuring point (measuring point):* Water levels in wells are usually reported as depths below land surface, although the measuring point can be any suitable fixed place near the top of the well.
- *Potable water:* Water that has been treated and is safe to drink or to use for food preparation without the risk of health problems.

- *Public water system (PWS):* A water system that provides water to the public with at least 15 service connections or serve at least 25 individuals for at least 60 days out of the year.
- *Pump cavitation:* Significant damage to the impeller and/or the pump housing typically caused by insufficient flow of water through the pump.
- *Pump run time:* The length of time the pump is running.
- *Pumping capacity:* The amount of water the pump will move – normally measured in gallons per minute.
- *Pumping water level (also see dynamic water level):* The pumping water level is the distance from the land surface (or measuring point) to the water in the well while it is pumping.

R

- *Raw water intake (also see intake):* A mechanical device used to pull in untreated water from a water body – usually a river, lake or reservoir.
- *Recharge rate:* The length of time it takes for the well or aquifer to recover after water is pumped out.
- *Recovery*: The difference in feet between the post-test static water level and the pumping level (dynamic water level).

S

- *Saturated zone (also see water table):* The area in a well which all the pores and rock fractures are filled with water. The top of the saturated zone is called the water table.
- *Specific capacity:* The discharge rate divided by the drawdown (usually expressed as gallons per minute per foot of drawdown).
- *Static water level:* The static water level is the distance from the land surface (or the measuring point) to the water in the well under non-pumping (static) conditions.
- *Surface water*: Water in a reservoir or river basin.
- *Sustained rate of water flow (also see constant yield):* A continuous flow rate of water for a specific period of time.
- *Triggering criteria:* Statistical analysis of the vulnerability of the water source; rationale used to define different stages in a Drought Contingency Plan.

W

- *Water-intake pump (also see well pump):* A mechanical device used to withdraw water from a water body (reservoir, lake or river).
- *Water loss audit (also see leak detection program):* Represents the efforts of water utilities to provide accountability in their operation by consistently assessing their water supplies and implementing controls to minimize system losses.
- *Water table:* The upper surface of the zone of saturation.
- *Watermaster*: Divides the water in their areas based on the adjudicated water rights, regulate as necessary the controlling works of reservoirs and diversion works, and monitor stream flows, reservoir levels, and water use.
- *Watermaster Program*: Ensures compliance with water rights by monitoring stream flows, reservoir levels, and water use.
- *Well depth:* Total depth of the well is the distance from land surface to the bottom of the bore.
- *Well pump (also see water-intake pump):* A mechanical device using suction or pressure to withdraw water from a well.
- *Well recovery rate:* The rate, in gallons per minute, at which water in the well returns to its static water level after the pump is turned off.

Y

- *Yield*: The amount of water measured in gallons per minute a well produces when pumped.

WORKSHEET 1A. GROUNDWATER LEVEL MEASUREMENTS: USING GROUNDWATER ELEVATION

This worksheet will help you maintain records of the water levels in your well. Use one worksheet for each well. Make copies if you need additional pages.

Instructions

1. Enter the date the measurements are taken in the Date column.
2. Record the depth to water in feet in Column A.
    a. Convert inches to feet, if needed, by dividing the number of inches by 12, and then add to the number of feet.
    b. For example, 3 ft 6 in becomes 3 + (6/12) = 6 + (0.5) = 3.5 ft
3. Calculate the groundwater elevation by subtracting the depth to water from your measuring point elevation and enter in Column B.

Example (week 1)
Depth to water = 200 ft
Measuring-point elevation = 600 ft
Groundwater elevation = measuring point elevation – depth to water
Groundwater elevation = 600 ft – 200 ft = 400 ft

Example (week 2)
Depth to water = 202 ft (measuring point is still 600 ft)
Groundwater elevation = 600 ft – 202 ft = 398 ft

4. Subtract the current week's groundwater elevation from the previous week's groundwater elevation and enter the difference in Column C.
    a. For example, B (week 2) – B (week 1) = C (week 2)
    b. 398 ft – 400 ft = –2 ft (this means a 2 ft loss in water depth)
5. Enter the number of days since the last measurement in Column D.
6. Divide Column C by Column D and enter the result into Column E.
    a. This result is the change in feet per day.
    b. For example, C (–2 ft) ÷ D (7 days) = –0.29 ft/day loss of water
7. Continue to measure and record data for subsequent weeks to identify trends.

Note: If the groundwater elevation shows a continuous trend downward, complete Worksheet 2 to help determine what problems may exist with the well. It could be related to large drawdown, or drought conditions,

but other factors can also diminish groundwater levels. Reviewing the trends will help determine the next steps to take when evaluating your water source.

WORKSHEET 1A. MEASURING THE GROUNDWATER LEVEL: USING GROUNDWATER ELEVATION

The elevation of your measuring point will not change unless you physically move the measuring point. If the measuring point changes, you will need to consider this change in your calculation.

Measuring-Point Elevation: _____

Well ID: _____

WORKSHEET 1A

Date	(A) Depth to Water (ft)	(B) Groundwater Elevation (ft)	(C) Change in the depth from last week (ft)	(D) Number of days since your last measurement	(E) Daily Level Change = (C/D)
Example (week 1): 10/11/12	200	400	*Gather 1 week's data to compare to depth next week*	*Gather 1 week's data to compare to depth next week*	*Gather 1 week's data to compare to depth next week*
Example (week 2): 10/18/12	202	398	–2	7	–0.29

Date	(A) Depth to Water (ft)	(B) Groundwater Elevation (ft)	(C) Change in the depth from last week (ft)	(D) Number of days since your last measurement	(E) Daily Level Change = (C/D)

WORKSHEET 1B. MEASURING THE GROUNDWATER LEVEL: USING GROUNDWATER LEVEL BELOW LAND SURFACE

This worksheet will help you maintain records of the water levels in your well.

Use one worksheet for each well. Make copies if you need additional pages.

Instructions

1. Enter the date the measurements are taken in the Date column.
2. Record the depth from the measuring point to the water in feet in Column A.
    a. Convert inches to feet, if needed, by dividing the number of inches by 12, and then add to the number of feet.
    b. For example, 3 ft 6 in becomes 3 + (6/12) = 6 + (0.5) = 3.5 ft
3. Calculate the depth to water from the land surface by subtracting the distance from your measuring point to the land surface (which does not change, as it is based on your specific measuring point in your well), from the depth to water from the measuring point and enter the result in Column B.

Example (week 1)

Depth to water from measuring point = 200 ft

Distance from the measuring point to land surface = 3 ft

Depth to water from land surface = 200 ft – 3 ft = 197 ft

Example (week 2)

Depth to water from measuring point = 198 ft

Depth to water from land surface = 198 ft – 3 ft = 195 ft

4. Subtract the current week's depth to water from the land surface from the previous week's depth to water from the land surface and enter the difference in Column C.
    a. B (week 2) – B (week 1) = C (week 2)
    b. For example, 195 ft – 197 ft = –2 ft (This means a 2 ft loss in water depth)
5. Enter the number of days since the last measurement in Column D.
6. Divide Column C by Column D and enter in Column E. This is the change in feet per day.
    a. For example, C (–2 ft) ÷ D (7 days) = –0.29 ft/day loss of water

Note: If the groundwater elevation shows a continuous trend downward, complete Worksheet 2 to help determine what problems may exist with the well. It could be related to large drawdown, or drought conditions, but other factors can also

diminish groundwater levels. Reviewing the trends will help determine the next steps to take when evaluating your water source.

WORKSHEET 1B. MEASURING THE GROUNDWATER LEVEL: USING GROUNDWATER LEVEL BELOW LAND SURFACE

The elevation of your measuring point will not change unless you physically move the measuring point. If the measuring point changes, you will need to consider this change in your calculation.

Distance to the land surface from the measuring point: _____

Well ID: _____

Worksheet 1B

Date	(A) Depth to Water from Measuring Point (ft)	(B) Depth to Water from Land Surface (ft)	(C) Change in the depth from last week (ft)	(D) Number of days since your last measurement	(E) Daily Level Change = (C/D)
Example (week 1): 10/11/12	200	197	*Gather 1 week's data to compare to depth next week*	*Gather 1 week's data to compare to depth next week*	*Gather 1 week's data to compare to depth next week*
Example (week 2): 10/18/12	198	195	−2	7	−0.29

Date	(A) Depth to Water from Measuring Point (ft)	(B) Depth to Water from Land Surface (ft)	(C) Change in the depth from last week (ft)	(D) Number of days since your last measurement	(E) Daily Level Change = (C/D)

WORKSHEET 2. TROUBLESHOOTING A GROUNDWATER WELL

It is critical that you determine the effect of drought on your PWS. This worksheet will help you determine if your source water is being affected by drought.

Has your system experienced any of the following conditions?

Worksheet 2: Conditions

Condition	Is the condition present?	Notes: *When did you notice the problem? What did you notice?*
Pump cavitations	Yes No	
Pumping sand	Yes No	
Pump lowered to bottom of well	Yes No	
Pump lowered within the last year	Yes No	
Reduced daily well production	Yes No	
Increased pump run times or pump hours	Yes No	
Increased electricity usage	Yes No	

Note: If you answered **"Yes"** to any of the above questions, you should consider taking one or more of the actions on the following page — Troubleshooting a Groundwater Well.

WORKSHEET 2. TROUBLESHOOTING A GROUNDWATER WELL

Worksheet 2: Action

Action	Date	Results
Conduct a well test (measure the time it takes for the well to recover after being pumped)		
Determine current static water level of well and compare to previous levels		
Contact the groundwater conservation district* for assistance		
Contact a well driller for assistance		

*Information on GCDs can be found in the "Helpful Contacts" section of this document, or on their website at <www.twdb.texas.gov/groundwater/conservation_districts/>.

Fill in the blanks next to the items listed below to help determine whether your groundwater supply may be affected by drought conditions:

_____ ft well depth
_____ ft pump depth when constructed
_____ ft current pump depth (if moved since construction)
_____ ft static water level

If you have lowered the pump, or water levels have fluctuated, options to explore include:

- Review and implement your DCP.
- Consider an interconnection with another public water supply.
- Consider drilling another well.
- Consider video logging the well to identify physical problems. This may lead to a decision to conduct well rehabilitation.
- Find an alternative source.
- Contact the TCEQ for assistance at 800-447-2827, or visit the drought webpage at <www.tceq.texas.gov/response/drought> for more information.

WORKSHEET 3. MEASURING THE SURFACE WATER LEVEL

This worksheet will help you maintain records of the water levels in your reservoir. Make copies if you need additional pages.

Instructions

1. Enter the date in the Date column.
2. Record the elevation of your water source in Column A in feet (ft) above mean sea level (msl) (published on the TWDB, USGS, or USGI website or by physically measuring the depth).
3. Enter the depth to the intake, in feet, in Column B.
    a. Determine the depth to the intake by subtracting the elevation of your intake from the water elevation published online (A), or by physically measuring the depth to your intake (recommend weekly measurements).
    b. Convert inches to feet, if needed, by dividing the number of inches by 12, and then add to the number of feet.
    c. For example, 6 ft 3 in becomes 6 + (3/12) = 6 + (0.25) = 6.25 ft

Example (week 1)
Source water elevation = 200 ft
Depth to intake = 20 ft

4. Subtract the current week's depth to the intake from the previous week's depth to intake and enter the difference in Column C.

Example (week 2)
B (week 2) – B (week 1) = C (week 2)
19 ft – 20 ft = –1 ft (This means a loss of 1 ft water depth)

5. Enter the number of days since the last measurement in Column D.
6. Divide Column C by Column D and enter into Column E. This is the change in feet per day. For example, C (–1 ft) ÷ D (7 days) = –0.14 ft/day loss of water
7. Estimate the number of days remaining by dividing Column B by Column E and enter the result in Column F.
    a. For example, B (19 ft) ÷ E (0.14 ft) = ~136 days remaining (if no additional water is added via rain or inflows; based on current 7-day calculated water-loss rate)

Note: If the surface water levels show a continuous trend downward, it could be related to drought conditions or other factors that can affect reservoir or lake levels. Reviewing the trends will help determine the next steps to take when evaluating the water source, and whether alternative sources are needed.

WORKSHEET 3. MEASURING THE SURFACE WATER LEVEL

The elevation of your intake will not change unless you physically move the intake. If the intake has been moved, you will need to consider this change in your calculation.

Calculate: Elevation (feet above mean sea level) of raw water intake

= reservoir elevation – depth (in feet) to the intake on the same day

= _____ Elevation of raw water intake

Worksheet 3

Date	(A) Source water elevation (ft msl)	(B) Depth to the intake (ft)	(C) Change in the depth from last week (ft)	(D) Number of days since your last measurement	(E) Daily Level Change = (C/D)	(F) Estimated Days Remaining = (B/E)
Example (week 1): 10/11/12	200	20	*Gather 1 week's data to compare to depth next week*	*Gather 1 week's data to compare to depth next week*	*Gather 1 week's data to compare to depth next week*	*Gather 1 week's data to compare to depth next week*
Example (week 2): 10/18/12	199	19	–1	7	–0.14	136

Date	(A) Source water elevation (ft msl)	(B) Depth to the intake (ft)	(C) Change in the depth from last week (ft)	(D) Number of days since your last measurement	(E) Daily Level Change = (C/D)	(F) Estimated Days Remaining = (B/E)