



# Well Owner's Manual

A Water Systems Council Publication



# Well Owner's Manual

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# Your Water Well System

## Important Records

If you are among the millions of Americans who rely on a private water well system for your household water supply, you can rest assured that your properly constructed well and pump system will provide you with many years of service.

This is a good place to keep the basic information you need to protect your investment and keep your well operating at its best. It is also a good place to keep a log of water testing results and maintenance performed.

These records are a good reference for someone you may hire to do an inspection or repair work to your well, if and when that is ever necessary. These records are also useful information for you or contractors to consult when you landscape or build on your property. Finally, they offer important information about your well for anyone who may purchase your property in the future.

## Your Well Permit and Well Completion Report

In most states before a well is drilled, the well contractor or property owner to get a well permit. This permit includes basic information on the location and design of your well. Often, this permit is issued by the health department.

When your well was completed, your well contractor was required to file a well completion report with the agency responsible for wells in your state. The well completion report contains more important details on your well's location, size and depth, as well as on materials used in construction and water quality. *Keep copies of your well permit and well completion report with this manual for future reference.*

If you don't have your well permit or well completion report, contact the well contractor who installed your well or your county or state health department. They may be able to locate these records.

# wellcare® Well Records

## Basic Information

Your Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_ Zip \_\_\_\_\_

Well Contractor \_\_\_\_\_

Contractor Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_ Zip \_\_\_\_\_

Contractor Phone \_\_\_\_\_

Well Permit Number: \_\_\_\_\_ Construction Date \_\_\_\_\_

### *Initial Water Testing Results:*

Bacteria \_\_\_\_\_

Minerals \_\_\_\_\_

Other (Name) \_\_\_\_\_

Other (Name) \_\_\_\_\_

System Disinfected After Construction \_\_\_\_ Yes \_\_\_\_ No

Disinfectant Used / Amount \_\_\_\_\_

## Well Location



Use this box to represent your property. Sketch in the location of your house, your well, and any other structures on your property. Include distances to your septic system and your neighbors' septic system, if you know where they are. Also include any garages, kennels, barns and barnyards, abandoned wells, and fuel storage tanks. Show which way the land slopes and how water drains on your property.

Consult this drawing when you are planning any construction or landscaping or when interpreting the results of any water tests.

# wellcare® Well Records

## Well Data

Depth\_\_\_\_\_ft. Diameter\_\_\_\_\_in. Estimated flow\_\_\_\_\_gal. per min.

Hole size\_\_\_\_\_inches from\_\_\_\_\_ft. to\_\_\_\_\_ft.

\_\_\_\_\_inches from\_\_\_\_\_ft. to\_\_\_\_\_ft.

\_\_\_\_\_inches from\_\_\_\_\_ft. to\_\_\_\_\_ft.

\_\_\_\_\_inches from\_\_\_\_\_ft. to\_\_\_\_\_ft.

Casing size\_\_\_\_\_inches from\_\_\_\_\_ft. to\_\_\_\_\_ft. Type\_\_\_\_\_

\_\_\_\_\_inches from\_\_\_\_\_ft. to\_\_\_\_\_ft. Type\_\_\_\_\_

\_\_\_\_\_inches from\_\_\_\_\_ft. to\_\_\_\_\_ft. Type\_\_\_\_\_

\_\_\_\_\_inches from\_\_\_\_\_ft. to\_\_\_\_\_ft.. Type\_\_\_\_\_

Screen size\_\_\_\_\_inches from\_\_\_\_\_ft. to\_\_\_\_\_ft. Type\_\_\_\_\_

\_\_\_\_\_inches from\_\_\_\_\_ft. to\_\_\_\_\_ft. Type\_\_\_\_\_

Gravel Pack? If yes: from\_\_\_\_\_ft. to\_\_\_\_\_ft. Size\_\_\_\_\_

Grout? If yes: from\_\_\_\_\_ft. to\_\_\_\_\_ft. Type\_\_\_\_\_

## Pump Information

Manufacturer\_\_\_\_\_Model No.\_\_\_\_\_Series/Date\_\_\_\_\_Code\_\_\_\_\_

Motor Brand\_\_\_\_\_HP\_\_\_\_\_Voltage\_\_\_\_\_Phase Date\_\_\_\_\_Code\_\_\_\_\_

Pump Depth\_\_\_\_\_ft. Riser Pipe\_\_\_\_\_in. Psi Rating\_\_\_\_\_Type\_\_\_\_\_

Pump Wire: Size\_\_\_\_\_awg. Type\_\_\_\_\_

Pump supported by: Well Seal\_\_\_\_or Pitless Adapter\_\_\_\_Size\_\_\_\_\_Model\_\_\_\_\_

Flow sleeve installed on pump: Yes\_\_\_\_\_No\_\_\_\_\_Size\_\_\_\_\_

Water Line: Size\_\_\_\_\_Psi Rating\_\_\_\_\_Type\_\_\_\_\_Length\_\_\_\_\_ft.

Feeder Wire: Size\_\_\_\_\_awg. Type\_\_\_\_\_

## Tank Information

Manufacturer\_\_\_\_\_Model No.\_\_\_\_\_Precharge Pressure\_\_\_\_\_psi

Drawdown\_\_\_\_\_gal. w/pressure switch setting of \_\_\_\_\_psi on\_\_\_\_\_psi off

# wellcare® Well Records

## Water Test Results Summary

Date	Lab	Reason for Sampling	Bacteria	Nitrate	Other Tests

## Well & Plumbing Maintenance Record

Date	Work Performed	Company	Cost

*(File any receipts and warranties)*

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# Where Your Water Comes From

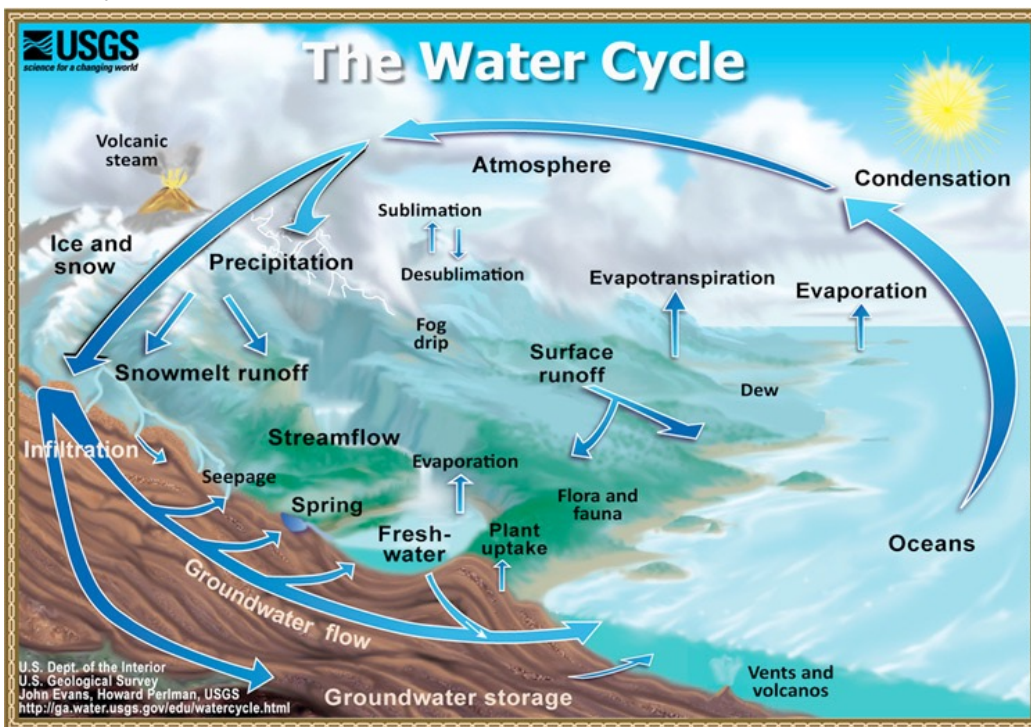
Groundwater is used for drinking water by 44% of the people in the United States, including those with private wells and public water customers. Groundwater is a renewable, reliable source for cool, pure water.

Groundwater from deep, drilled wells is naturally filtered and less likely to be contaminated than surface water in lakes and rivers. Deep, drilled wells recharge themselves and can provide a constant, steady supply of water even during bouts of dry weather.

## What is Groundwater?

Groundwater, which accounts for 90% of the world's fresh water, occurs below the ground, where it is filtered and purified naturally as it passes through layers of the earth. Groundwater is stored in aquifers -- layers of soil, sand and rocks -- but can come to the surface naturally through a spring or brought to the surface through a well. More than 43 million Americans depend on individual wells for their drinking water.

Water on the earth is constantly moving. The water cycle, pictured below, describes the continuous movement of water on, above and below the earth's surface. Water can change states (liquid, vapor, ice) at various stages of the water cycle.



When water falls as rain, hail or snow, some of it collects as surface water. The rest seeps into the earth to become groundwater. Groundwater flows slowly underground and emerges again as surface water. Evaporation of surface water takes place and the cycle begins again.

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# Where Your Water Comes From

## Steps You Should Take to Protect Your Groundwater and Well Water

- Maintain your well.
- Keep household chemicals and paint away from your well and dispose of them properly. Take used motor oil to a recycling center.
- Limit your use of pesticides and fertilizers.
- Install a well cap and keep it clear of leaves, mulch, dirt, snow, or other materials.
- Be careful when you mow around your well so you don't damage the well casing.
- And remember...even though your well can meet all the water needs of a modern household, it is important to conserve water to protect the nation's groundwater resources.

## For More Information on Groundwater

Your local well contractor, health department, cooperative extension service and state environmental or natural resources agency can provide you with more information about groundwater in your area. For help with locating these agencies, contact the wellcare® Hotline toll free at 888-395-1033 or check your local telephone directory.



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# Wells

Water from modern wells is naturally filtered, cool and pure.

## Three Basic Types of Wells

Bored or “shallow” wells are usually bored into an unconfined water source, generally found at depths of about 100 feet or less.

Consolidated or “rock” wells are drilling into a formation consisting entirely of a natural rock formation that contains no soil and does not collapse. Their average depth is about 250 feet.

Unconsolidated or “sand” wells are drilled into a formation consisting of soil, sand, gravel or clay material that collapses upon itself.

## Well Construction

All private well construction is based on establishing the right location for the well, sizing the system correctly and choosing the proper construction techniques. Only a professional water well contractor should install a well! They know the hydrogeology in your area and all the local codes and regulations for wells. They also have the modern equipment and expertise needed to make sure that your well is properly constructed to meet the water needs of your family.

Your well is located on your property according to certain regulations required by the state, county or other locality. These regulations are designed to protect the integrity of your water supply. In addition, the well contractor uses his experience and expertise to locate the well on your property that is suited to your lot size, the location of existing structures and utilities and the most likely location for a good supply of water.

Proper sizing is crucial to the construction and performance of your well system. Your system is designed to suit the needs of your household. Factors considered when sizing your system include such things as number of bathrooms, bedrooms and occupants, and anticipated water use for extras such as swimming pools, irrigation, spas or whirlpool baths.

Proper well construction is the key to operating and maintaining your well. The initial cost of a properly constructed well may be somewhat higher. However, in the long run, a properly constructed well results in improved efficiency, less maintenance and longer well life.

# Wells

## Your Well

Your well is constructed of quality materials, designed to prolong its life and performance. The following is a list of the most important materials used in construction of your well:

**Casing** is used to maintain an open access in the earth while not allowing any entrance or leakage into the well from the surrounding formations. The most popular materials used for casing are black steel, galvanized steel, PVC pipe or concrete pipe.

**Grout** is a sealant that is used to fill in the spaces around the outside of the well. It protects the well against the intrusion of contaminants. A grout mixture can be made of neat cement, bentonite or concrete, each used separately.

**Screen** keeps sand and gravel out while allowing ground water and water from formations to enter into the well. Screen is available in many materials, the most popular being stainless steel and PVC. Screen is used when wells are drilled in unconsolidated materials.

**Gravel Pack** is placed around the outside of the screen to prevent sand from entering the well or clogging the screen and to stabilize the well assembly.

The modern drilling process makes use of sophisticated technology. Two drilling methods are commonly used for private wells:

**Air rotary drilling:** A drill rig or truck outfitted with a large drill is driven onto the well site. The drill is lowered to the ground and turned on. As the drill spins, a hammer at its end smashes rock and soil creating the well shaft. The hammer is powered by air that is shot through the drill at very high speed.

At the same time, water is pumped around the drill to make the drilling easier. As the drill moves down, the same air that moves the hammer clears out the broken rock, dirt and excess water. When the drill hits a solid rock formation, a casing is placed in the well shaft to keep unwanted materials from entering the opening. Drilling then continues into the rock until water is found. The space between the casing and the ground is then filled with grout and the well is cleaned and capped.

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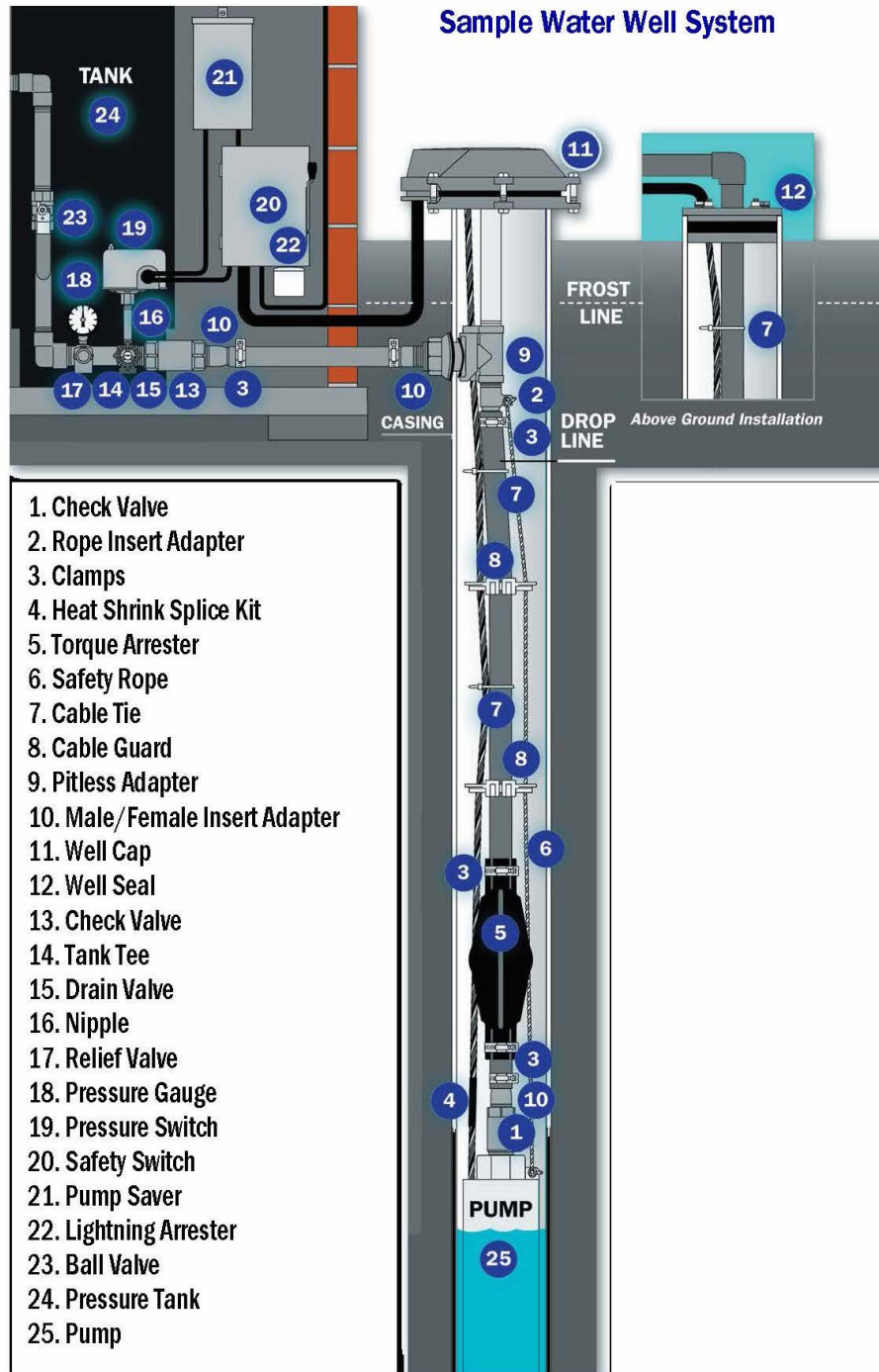
## Wells

**Mud rotary drilling:** Mud rotary drilling is used to drill where the soil is loose and sandy. It is similar to rotary drilling except that as the drill bit spins, a fluid (drilling mud) shoots down through the middle of the drill, then flows out at very high speeds at the sides and the tip of the drill. Without this fluid moving up and around the drill, the walls of the hole would cave in and the well could not be made.

The fluid and sand that come out of the hole are pumped to a pit. The fluid in the pit is pumped out and used again, while the extra sand stays put. After the drill hits an area of sand that is filled with water, the casing and screen are put in to keep things from getting in the well. When the drilling is finished, the driller grouts the well, cleans the well and puts a cap on it.

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# Wells



*This illustration is intended to demonstrate some of the components that can be included in a water well system and is not intended as an illustration guide. Check local codes for actual requirements and restrictions.*

# Wells

## Well Pumps and Tanks

Your private water system has two important components in addition to the well itself – a pump and a tank.

**Pumps:** There are many types and sizes of pumps for water systems. Some are only designed to remove water from a source. Others not only remove the water, but also force it through the rest of the water system. Some pumps are for special jobs such as boosting pressure or supplying a special outlet. Selecting the appropriate pump size and type is critical to good well performance.

**Tanks:** Tanks provide storage for your water system. There are three general types of water storage tanks: (1) diaphragm bladder tanks with permanent separation between the air and water; (2) tanks with a float or wafer separating the air from the water; and (3) plain steel tanks. Each kind of tank serves a specific purpose. If your water supply provides plenty of water for your needs and you have selected the proper pump, it is easy to select the right size and type of tank. The amount of stored water in the tank is equal to the pump discharge in gallons per minute.

**Additional storage:** Some well owners may consider additional water storage tanks. Generally speaking, additional storage capacity of one day's water supply is sufficient. Additional water storage is useful when there are power outages and other emergencies. Be sure to have the installer provide manual access to your storage unit.

## For More Information on Your Well

Contact the well contractor who installed your well or find a water well contractor in your area by searching online or looking in your local telephone directory. Many states maintain lists of licensed or registered well contractors. Most states also have state water well associations, state well driller associations or state groundwater associations that maintain a list of contractor members. Contact your local or state health department or environmental agency, your state water well or groundwater association or the wellcare® Hotline at 888-395-1033 to find out where you can obtain a list of well contractors.

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## Well Maintenance

The safety and purity of your drinking water and the efficient operation of your private well system depends on a well-organized maintenance program. Protect your investment in a quality water supply through regular inspection, testing and repair or treatment.

### Create a Well Maintenance Log

Gather a comprehensive history on your well and water quality. If you don't already have a well log (also known as a water well record or drilling report), ask your well contractor or state environmental agency for a copy.

The well log will include a reference number for the well, original site owner, location of the well, construction and contractor details, as well as the results from any water tests. The well log should help establish the location, age and condition of the well. This information will provide the basis on which to schedule regular tests of water quality and inspections of well equipment, as well as regular maintenance and repairs.

### Set a Well Maintenance Schedule

Plan for the maintenance of the wellhead, well system, water quality, water treatment devices and septic system.

#### Well Inspection

- Inspect your wellhead several times a year. Check the condition of the well covering, casing, and well cap to make sure all are in good repair, leaving no cracks or other entry points for potential pollutants.
- Have the well system, including the pump, storage tank, pipes and valves, and water flow inspected every 10 years by a qualified well driller or pump installer.
- If you have no inspection record and cannot determine the age of the well, have it inspected immediately by a water well professional.
- When your well reaches the end of its serviceable life, usually more than 20 years, contact your water well professional to install a new system and properly close the old well.

# Well Maintenance

## Water Testing

- ✓ Test drinking water immediately if you have no recent test results or any record of previous tests.
- ✓ Test drinking water for bacteria every year. Also test annually for nitrates if you live in an agricultural area or have an on-site septic system. The best time to perform these annual tests is in the spring.
- ✓ Test if you notice any change in the taste, color or odor of your water.
- ✓ Test more than once a year in special situations: someone in the household is pregnant or nursing; there are unexplained illnesses in the family; your neighbors find a dangerous contaminant in their water; or there is a spill of chemicals or fuels into or near your well.
- ✓ Test after disinfection, within one or two weeks, to make sure the water is pure.
- ✓ Test after any flooding in or near the well, to determine if flood water carried bacteria or other contaminants into the well system.

*Contact your local health department, cooperative extension office, state environmental agency or the wellcare® Hotline at 888-395-1033 for other water testing guidelines and to find a state-certified water testing laboratory in your area.*

## Water Treatment System

- ✓ Test drinking water before installing any water treatment device.
- ✓ Test water every year to make sure the device is working properly.
- ✓ Follow the inspection and maintenance schedule provided by your water treatment device manufacturer or water systems professional.

*Review the Water Systems Council information sheet, "Well Water Treatment Options and Costs."*

## Septic System Testing

- ✓ Inspect the septic tank each year for capacity and leaks.
- ✓ Pump out the tank as needed, usually every three to five years, based on the number of people in the household and the size of the tank.
- ✓ Repair the tank or drainfield system as needed to prevent leaks of bacteria and nutrients into groundwater.
- ✓ A poorly maintained wastewater treatment system poses a serious threat to the quality of your drinking water and can require expensive repairs. The cost of pumping a septic tank is far less than the expense of replacing a drainfield clogged by solids.

*Review the Water Systems Council information sheet, "Your Septic System."*

# Selecting a Well Contractor

## Hiring a Water Well Professional

Selecting the right water well professional is somewhat like searching for a new doctor or dentist. All are directly involved in your health. An experienced well contractor is your best guarantee of a good supply of clean drinking water. Take the time to learn more to find the right person and company.

## Well Professionals

To find a well contractor or drilling company in your area, ask your neighbors, contact your state water well association or local health department, or check in the yellow pages of the telephone book under “water well drilling & well pump installations.” Once you’ve identified a few prospective companies, ask a lot of questions.

### Professional Qualifications

Your well contractor should be certified, licensed or registered with your state health or environmental agency. Specific requirements vary from state to state. Ask for proof of proper credentials and well association memberships.

### References

Ask for two to three references from former customers. Find out how long the company has worked in your area, how many wells they have drilled and how satisfied their customers really are.

### Contracts

A professional well contractor uses a written contract. The contract should include details of the job and warranties or guarantees, if any.

### Insurance and Bonding

A drilling company and its personnel should be insured. Some states require bonding; some do not. Find out what the law requires.

### Local Geology

An experienced well contractor knows about the geology of the area in which he or she drills and can clearly explain it to you.

### State and Local Laws

A knowledgeable well contractor knows state and local regulations that govern well drilling.

### Maintenance and Repair

Timely maintenance and repair services are important to well owners. A company that offers these services can make life easier for you and ensure the proper function of your well system.



# Selecting a Well Contractor

## Responsibilities

Before signing a contract, discuss who is responsible for various aspects of the well construction or repair work.

**Permits, Site Visits, Fees, Etc.** -- The homeowner or his/her representative typically secures permits required by the local government or health agency. A well contractor can tell you what agencies to contact and what fees must be paid. The contractor coordinates site visits by inspectors and construction activities.

**Well Location** -- In most states, strict regulations govern location of the well. A competent well contractor knows the regulations and will tell you if health officials or other regulators must be present during the well location process.

**Well Capacity** -- The well contractor can estimate the water requirements for your household. Help your contractor by discussing things like the number of bathrooms, the number of people in the household or anticipated water use for irrigation of lawns and gardens, spas, whirlpool baths or pools.

**Water Quantity/Quality** -- The quality and quantity of water from your well depends on the geology and hydrology of the area. Well water comes from underground aquifers, which exist throughout the ground at different depths. These “storage spaces” contain different amounts of water. A well contractor cannot tell you exactly how deep he/she will have to go to get water. An estimate can be based on other wells drilled in your area. In addition, a contractor cannot predict the exact quality of the water that will be tapped. What a contractor can do is make reasonable judgments about water quality based on previous experience. However, some states or localities may have regulations on minimum quantity and or quality of water on newly drilled wells. Check with your state or local environmental agency for these regulations.

**Well Records** -- Your well contractor should make a construction record (well log). Ask for a copy. If the law requires an inspection, keep that report as well. Keep repair bills and information on equipment purchases. Well records are very useful for maintenance purposes. Some states require the well contractor to submit records to regulatory agencies. Ask the contractor what your state requires.

**Troubleshooting** -- Ask the well contractor what will be done if water is not reached at the estimated depth. Also, ask what options are available if the water needs some form of treatment.

# Selecting a Well Contractor

## Potential Cost

Finally, discuss the cost of well construction and maintenance or repair. There are several factors that will influence the final cost, including:

### Depth of Well

The depth of a well is a determining factor in figuring the basic cost of drilling and the cost of pipe, because most drillers charge by the foot. A well contractor will base estimates on what experience shows is an average depth for your area. If the water first tapped is adequate for your family, then drilling can stop. If not, then drilling may have to go deeper.

### Materials and Equipment

A complete well includes casing material, pipe, a pump, a tank and grout to seal the well. Choose superior quality products to improve the efficiency and longevity of the well.

### State Regulations

Most states require specific construction practices designed to protect health and the groundwater. Some states prohibit use of certain construction materials. Ask the well contractor how state construction requirements may effect cost.

### Labor

Labor is usually figured into the charge-per-foot for drilling a well. However, there may be labor costs for installing the pump and tank or for performing repairs on an existing well. Experience teaches a well contractor to anticipate problems that may occur. However, nature is full of surprises, some of which even the most experienced contractor cannot anticipate.

### Cost Effectiveness

Over the long term, the cost of water from your well will be pennies per day. Even factoring in construction and routine maintenance, a private well is still cost effective when compared to other systems.

If you need further assistance with selecting a well contractor, contact your state health department or environmental agency, the local extension service, your state water well or groundwater association or the wellcare® Hotline at 888-395-1033.

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# Protecting Your Wellhead

The most visible portion of your drinking water system is the wellhead, the structure built over your well to protect its various parts. By protecting your wellhead, you will ensure the quality of your drinking water supply.

## Maintaining Your Wellhead

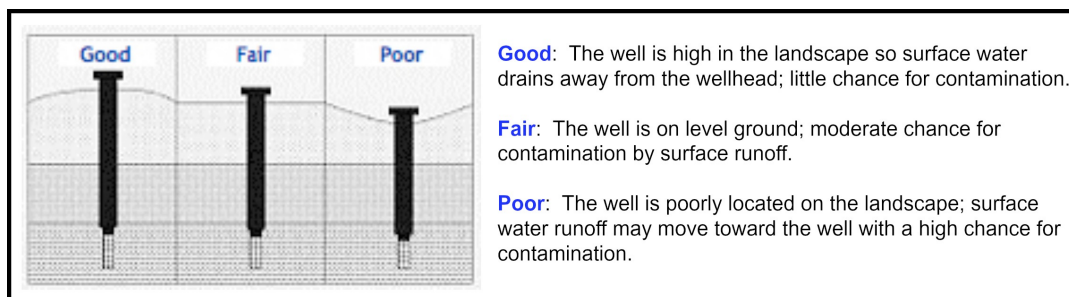
The wellhead protects the well casing, which is the lining of the well, and the well cap, which provides a tight-fitting seal at the top of the well. The wellhead is your first line of defense to prevent pollutants from penetrating your drinking water system. Inspect your wellhead regularly to make sure these elements are in good condition.

To keep your well safe, hire a licensed water well professional to perform any new well construction or modification, or to close an old well.

Take care when working or mowing around your well. It is easy to damage the wellhead with heavy equipment, which will jeopardize the sanitary protection of your well, permitting contaminants to enter the water supply. Don't pile snow, leaves or other materials around the well, where they can carry pollutants into the system.

When landscaping around your well or siting a new well, make sure the top of the well sits at least one foot above the ground. Slope the ground down and away from your well for proper drainage.

## Well Location & Surface Drainage



*Chart reprinted with permission from "BMPs for Wellhead Protection" by R.L. Mahler and K.A. Loeffelman, Soil Sciences Division, University of Idaho, Moscow, Idaho.*

## Ensure Clean Drinking Water

Some common household activities can actually threaten the quality of your drinking water. Even small spills of pesticides, fertilizers or fuels near your well can seep into the ground and contaminate the water.

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## Protecting Your Wellhead

Avoid mixing or using pesticides, fertilizers, herbicides, degreasers, fuels or other pollutants within 100 feet of your well. When siphoning water for these tasks, be careful to avoid back-flow back into the well system.

Conduct a quick visual check for activities that might threaten to enter your drinking water system at or near the wellhead which may include the following: septic tanks, lateral fields, cesspools, pit privy; chemical storage areas, machinery maintenance areas, waste piles, lagoons, sewers; underground storage tanks for chemicals, fertilizers, or petroleum products, above-ground tanks for chemicals, fertilizers or petroleum products; animal pens or feedlots and manure storage areas.

If your existing well is located near these activities, you may need to test your water quality more often than once a year. Try to move the risky activities away from your well. Check that your well is located on your property according to standards set by the state, county or locality. These regulations are designed to protect the integrity of your water supply.

You should also inspect and pump septic systems on your property as often as recommended by your local health department or septic service, usually at three to five year intervals. Failing septic systems can leach contaminants into the water supply.

### **For More Information on Protecting Your Wellhead**

Contact the well contractor who installed your well or find a water well contractor in your area by searching online or looking in your local telephone directory. Many states maintain lists of licensed or registered well contractors. Most states also have state water well associations, state well driller associations or state groundwater associations that maintain a list of contractor members. Contact your local or state health department or environmental agency, your state water well or groundwater association or the wellcare® Hotline at 888-395-1033 to find out where you can obtain a list of well contractors.

# Water Well Testing

To keep your well water clean and pure and your well operating at peak performance, regular water testing is an important maintenance tool. Private well owners are solely responsible for the quality of their drinking water. So it is up to you, the well owner, to decide when and how to test your water.

## Recommended Testing

At a minimum, your water should be tested every year for bacteria, the most common water quality problem. Other tests may be required, depending on where you live and what is located near your water supply.

**Table 1** on the following pages describes some conditions that may prompt you to test for select contaminants. **Table 2** on the following pages lists the limits for some primary contaminants.

For example, if your well is in an area of intensive agricultural use, test for nitrates and the pesticides commonly used in that region. If household tests of radon in the air are high, test for radon in water. If you have problems with taste, odor, staining or color of your water, then test levels of iron, manganese and sulfate.

Testing more than once a year may be warranted in special situations:

- someone in your household is pregnant or nursing
- there are unexplained illnesses in the family
- your neighbors find a dangerous contaminant in their water
- you note a change in water taste, odor, color or clarity
- there is a spill of chemicals or fuels into or near your well.

Contact your local health department, cooperative extension service, state health or environmental agency or your well professional for guidance in selecting tests.

## Choosing a Testing Lab

Approach water testing as a smart shopper. Get an up-to-date list of all state-approved laboratories and the specific tests they are certified to perform from your state health or environmental agency. Check with individual laboratories to get prices. Ask how soon you should expect results and about the information that will be provided with the test results. A good lab should help you interpret the results and make sense of the scientific data.

# Water Well Testing

**Table 1: Tests for Specific Conditions**

<b>Conditions or Nearby Activities</b>	<b>Recommended Test</b>
Recurrent gastrointestinal distress	Coliform bacteria
Household plumbing contains lead	Copper, hardness, lead, pH, salts
Radon present in indoor air or region	Radon
Scaly residues, soaps don't lather	Chloride, hardness, sodium
Water softener to treat hardness	Iron, manganese (before purchase)
Stained plumbing fixtures, laundry	Iron, manganese, sulfate, tannins
Objectionable taste or smell	Hydrogen sulfide, pH, hardness, metals
Water is cloudy, frothy or colored	pH, salts, tannins, turbidity
Corrosion of pipes, plumbing	Copper, lead, pH, salts
Rapid wear of water treatment equipment	Hardness, iron, manganese, pH, salts
Nearby areas of intensive agriculture	Coliform bacteria, nitrate, pesticides
Nearby coal, other mining operation	Metals, pH, TDS
Gas drilling operation nearby	Barium, chloride, sodium, strontium
Gasoline or fuel oil odor	Volatile organic compounds (VOCs)
Dump, landfill, factory or dry cleaning operation nearby	Metals, pH, salts, VOCs
Salty taste and seawater or a heavily salted road nearby	Boron, chloride, sodium, TDS

# Water Well Testing

**Table 2: Tests for Specific Contaminants**

Contaminant	When to Test	How to Test	When to Treat/ Max. Limits
Arsenic	Baseline test in areas prone to arsenic/annually after treatment	State laboratory	10 parts/billion
Bacteria	Annually in spring; newborn in house; well equipment installed	Local health department test of total coliforms	Positive test of total coliforms; presence of fecal coliforms
Chromium	Near steel/pulp mills or in at-risk states*	State laboratory	100 parts/billion
Iron	Water colored or leaving stains of orange, red, rusty	State laboratory	300 parts/billion
MTBE (methyl tertiary butyl ether)	Water has oil/gas smell or oily film in area where MTBEs used	State laboratory	20 parts/billion
Nitrate	Annually in farm areas; pregnant woman/infant in house	State laboratory	10 parts per million
Radium	Area with high radium in bedrock	State laboratory	5 picocuries per liter
Radon	Before buy/move into new home	State laboratory	Check with State Radon Office
Sulfur & Manganese	Bitter taste, rotten egg odor, black/brown water or staining	Local health dept.	Sulfur: 250 parts/million Manganese: 50 parts/billion
TCE (trichloroethylene)	Near factories/dry cleaners or in at-risk states**	State laboratory	5 parts/billion

\* Chromium at-risk states: California, Connecticut, Delaware, Illinois, Indiana, Maryland, New York, New Jersey, Pennsylvania, Texas, Wisconsin

\*\* TCE at-risk states: Pennsylvania, Illinois, Georgia, Texas, Massachusetts, West Virginia

# Water Well Testing

## Taking a Water Sample

The laboratory you choose should provide specific sampling instructions and clean bottles in which to collect the water sample. Do not rinse lab containers or fill them to overflowing. Check to see if the sample must be refrigerated or treated with special chemicals.

You may need to take a sample from the tap with the first flush of water in the morning or after the tap has been allowed to run for a period of time. If you suspect a problem somewhere in your home plumbing, you may need to take samples from several points: before and after water enters the hot water tank, for example, or at the inlet and outlet of a filtering device.

Again, carefully follow instructions for taking samples. Sampling is the most important part of testing. A carelessly collected sample can give you inaccurate results.

## Understanding Test Results

The report of analysis, as some laboratories call test results, can take a variety of forms. It may be a computer printout of results for the specific tests you requested or a preprinted form with your results typed or written into blocks or spaces. It may include some general information about the laboratory that performs the test and the types of tests that were done or it may provide only your results.

The amount of a specific contaminant in your water sample will be expressed as a concentration of a specific weight of the substance in a specific volume of water. The most commonly used concentration units for drinking water analyses are provided in Table 2 on page 23.

### To Collect Most Water Samples

*Always follow laboratory directions carefully to ensure the accuracy of the test.*

**Step 1:** Remove the aerator from an indoor, lead-free cold water faucet. If testing for bacteria, flame the end of the faucet with a lighter to destroy any organisms in the tap itself.



**Step 2:** Let water run for five minutes to bring in water that has not been in contact with household plumbing.



**Step 3:** Reduce the water flow until the stream is about 1/4 inch in diameter.



**Step 4:** Fill the special container as instructed by the testing laboratory. Do not let anything touch the inside of the cap or the container.



**Step 5:** Close the sample container and transport it as instructed by the laboratory.



*\*From "Drinking Water Well Management," Home\*A\*Syst, Natural Resource, Agriculture and Engineering Service (NRAES)*



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## Water Well Testing

The test results may also include other symbols and abbreviations. Laboratory methods have detection limits, or levels below which contaminants cannot be reliably detected. That does not necessarily mean that the chemical is not present. There could be so little present that it cannot be reliably detected with the laboratory equipment or testing procedures being used.

The important question is whether the contaminant poses a health threat at that particular concentration. Compare your water test results to the federal standards in Table 2 on page 23 and to other guidance numbers, such as health advisories, to assess the potential for health problems. If in doubt, contact your state health department or environmental agency, the local extension service, your water well professional or the wellcare® Hotline at 888-395-1033.

After you get your first test results, you would be wise to follow up with a second test taken at a different time before you decide on any water treatment. This is because there is a certain margin of error in water testing and contamination problems may vary.

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## Understanding Your Test Results

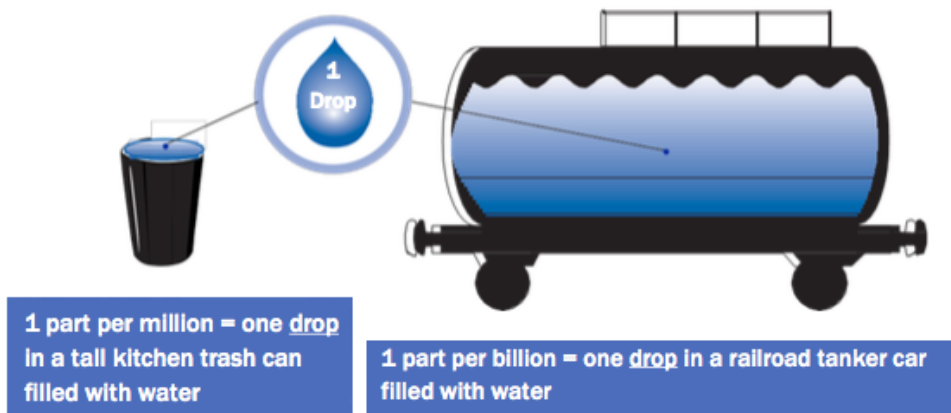
Regular water testing is essential to keep your drinking water clean and your well operating at peak performance. But many well owners are stumped when they receive their test results from the laboratory. The often confusing measurements, limits and standards make it tough to determine if your water is safe or if it needs some type of treatment.

### Figuring Out the Measurements\*

Most substances in water are measured as a concentration: a specific mass of a specific chemical within a specific unit or volume of water. The confusing part is that different terms can be used to reflect the exact same measurement.

- part per million/ppm = milligram per liter of water = mg/L
- per billion/ppb = microgram per liter of water = ug/L

So what do these terms really mean? Basically, they refer to very small amounts of a substance within about a quart of water. (A liter amounts to 1.05 quarts.) For example:



These are very diluted concentrations. For example, the recommendation for sodium in drinking water is no more than 20 parts per million. By comparison, the salt content of seawater is 32,000 parts per million.

\* Our thanks to ...

Water on the Web, <http://waterontheweb.org>, based at the University of Minnesota-Duluth and funded by the National Science Foundation.

# Understanding Your Test Results

## Figuring Out the Standards

The U.S. Environmental Protection Agency (EPA) regulates public water supplies but not private wells. Well owners can use EPA's standards to judge their drinking water quality. Sometimes state standards are stricter than the EPA's, so check with your local or state health department for specific substances of concern.

Maximum Containment Levels (MCLs) are the highest level of a contaminant that the EPA allows in drinking water. MCLs are legally enforceable for public water supplies. When they turn up in the water, a utility must treat and remove or reduce the contaminant below the maximum level to protect public health.

EPA also sets standards for a second group of contaminants. These limits serve as guidelines for good water quality, but are not required by law. These National Secondary Drinking Water Regulations (NSDWRs), known as the secondary standards, regulate contaminants that may cause cosmetic effects, such as skin or tooth discoloration, or aesthetic effects, such as taste, odor or color, in drinking water. These contaminants are not considered threats to public health.

Finally, EPA studies another group of contaminants for possible regulation in the future. The Drinking Water Contaminant Candidate List (CCL) is published every five years. These standards are under discussion, but are not yet an official EPA recommendation or regulation.

Here's the confusing part. On most government charts, the standard for a given substance will be written in parts per million. But the great majority of limits actually relate to much smaller amounts, in parts per billion. If your laboratory chooses one over the other, you may not be able to figure out if your water needs treatment or not.

For example, arsenic is a naturally occurring mineral found in soil and bedrock. We know arsenic as a popular poison in murder mysteries. But the substance can also work its way into groundwater through erosion and build to dangerous levels in some wells. On most charts, the MCL for arsenic is written .010 mg/L. What they really mean is 10 parts per billion.

# Understanding Your Test Results

## Translating Your Test Results

The chart below is a road map to your test results. It lists each contaminant, how it is regulated or not, and the maximum levels in all the measurements you are likely to see. Cross reference your test results with the chart to determine your water quality.

Contaminant	MCL	Secondary	Candidate	PPM or mg/L	PPB or ug/L
Arsenic	X			0.01	10
Atrazine	X			0.003	3
Bacteria	X			Zero	Zero
Barium	X			2	2000
Benzene	X			0.005	5
Cadmium	X			0.005	5
Chromium	X			0.1	100
Chlorine	X			4	4000
Copper	X			1.3	1300
<i>Cryptosporidium</i>	X			Zero	Zero
Fluoride	X			4	4000
<i>Giardia lamblia</i>	X			Zero	Zero
Iron		X		0.3	300
Lead	X			0.015	15
Manganese		X		0.05	50
Mercury	X			0.002	2
MTBE			X	0.020	20
Nitrate	X			10	10000
Nitrite	X			1	1000
Perchlorate			X	0.004	4
Sodium			X	20	20000
Sulfate		X		250	250000
TCE	X			0.005	5
THMs	X			0.08	80
Toluene	X			1	1000
Total Dissolved Solids		X		500	500000
Uranium	X			0.03	30

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# Understanding Your Test Results

## Next Steps

Laboratories have detection limits, or levels below which contaminants cannot be reliably detected. That does not necessarily mean that the contaminant is not present. There could be so little present that it cannot be reliably detected with the laboratory equipment or testing procedures being used.

The important question is whether the contaminant poses a health threat at that particular concentration. Compare your water test results to the federal standards in the table to assess the potential for health problems. If in doubt, contact your local or state health department or environmental agency, the local extension service or your well professional.

After you get your first test results, you would be wise to follow up with a second test taken at a different time before you decide on any water treatment. This is because there is a certain margin of error in water testing and contamination problems may vary. Use bottled water until the second results are in.

**There is a major exception to this rule.** Any positive test for bacteria, such as fecal coliforms and E. coli, or microorganisms, such as cryptosporidium or Giardia lamblia, demands immediate disinfection of your well and water supply. These organisms can make you very sick. Contact your local health department, water well professional or the wellcare® Hotline at 888-395-1033 for help.

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## Checklist for Well Owners

Properly constructed private water supply systems require little routine maintenance. These simple steps will help protect your system and investment:

- Always use a licensed or certified water well contractor and pump installer when a well is constructed, a pump is installed, or the system is serviced.
- Perform an annual water test for a minimum of bacteria. Check with your local health department for other tests of local concern.
- Test your water any time there is a change in taste, odor or appearance, or someone is ill or pregnant.
- Keep hazardous chemicals, such as paint, fertilizer, pesticides and motor oil, far away from your well.
- Periodically check the well cover or well cap on top of the casing to ensure it is in good repair.
- Confirm your well is properly separated from buildings, waste systems, or chemical storage facilities.
- Take care in working or mowing around your well. Damage to your casing can jeopardize the sanitary protection of your well. Don't pile snow, leaves or other materials around your well.
- Always keep good well records, including using the maintenance and water testing logs in this manual.

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## The wellcare® Hotline

### The wellcare® Hotline: Answering Your Questions About Wells



If you have a question about wells or need help, contact the **wellcare® Hotline** Monday-Friday at **888-395-1033**, or visit **wellcarehotline.org** at any time for information on:

- Well construction codes and other regulations related to wells or water well systems
- Well care and maintenance
- Water testing
- Water quality
- Identifying possible contaminants
- Avoiding seasonal threats
- Understanding well mechanics
- Learning well basics
- Well components
- Water conservation
- Find a licensed well contractor
- And much more!

### Join the wellcare® Well Owners Network!

You will receive a quarterly e-newsletter with tips and tools to maintain your well and protect your well water as well as discounts on water test kits.

Signing up for the wellcare® Well Owners Network is easy and FREE! Sign up online at [watersystemscouncil.org/well-owners/join/](http://watersystemscouncil.org/well-owners/join/).



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