

This can be calculated by the following formula:

$$3.142 \times (\text{diameter(in feet)/2})^2 \times 7.49 \text{ (gallons in a cubic foot)}$$

Most frequently found well casings are:

4 inches 0.65 gallons/foot  
6 inches 1.47 gallons/foot  
8 inches 2.62 gallons/foot  
12 inches 5.88 gallons/foot  
18 inches 13.24 gallons/foot  
24 inches 23.54 gallons/foot

(k) Repeat steps (a) through (j) regularly throughout the year until you can correctly estimate what you are going to find during each monitoring session. At that point, you will have developed an understanding of your well. Make sure that you continue to use the same procedures every time and record your results.

## Resources

As you begin to share the results of your well monitoring with your neighbors and help them measure their own wells, you will soon have a database that can be the foundation of a powerful community alliance that may be able to withstand any future threat to your neighborhood water supply.

Good luck. If you need help, local resources are:

1. Permit & Resource Management Department (Well Permitting, Construction and Destruction)

2550 Ventura Avenue, Santa Rosa, CA 95403

707-565-1900

contact: Mike Treinen

2. Local Well Drillers (from the Yellow Pages)

3. The Water Group

707-829-7617

sjfr2@aol.com

contact: Stephen Fuller-Rowell

### Measuring stick marked in inches

5 Gallon Bucket calibrated in gallons: You can do this very simply with a measuring cup and a felt tip pen.

Water detector: Redwood Creek Neighborhood Association uses a Fisher mScope that cost \$288 in 1985. This battery operated device consists of a cable and a sensor that is lowered down the well. When the end touches water, a buzzer sounds and an LED lights up. Fisher has a web site: <http://www.treasurenet.com/fisher>. You can also make your own. Or, if you can see the water in your well, you could use a calibrated and weighted line.

## **Procedure**

- (a) Allow the static level to recover fully overnight.
- (b) Note in your record book the date, the time of day, weather conditions, temperature and recent rainfall or drought conditions.
- (c) Thoroughly clear the area around the well to avoid contamination.
- (d) Isolate the pressure tank, if there is one.
- (e) Lower the water detector down the well and make a note of the static level.
- (f) Turn on the well pump and continue pumping until the water level is approximately half way between the static level and the pump or intake level. Note how long it took to lower the water each 10 feet. (This measurement, when adjusted for the recharge rate, will allow you to calculate the pumping rate of your well pump.)
- (g) Adjust the flow of water from the well by closing a valve until the water level in the well remains constant while pumping continues. At this point of constant recharge, the flow out of the well will be the same as the recharge rate. (If your pump is working well at full capacity and the water level does not go down, you will be one of the fortunate few whose well recharge rate exceeds the capacity of their well pump.)
- (h) With the water level constant, fill the 5-gallon bucket and time it. You can now calculate the recharge rate at this depth. Note it in your record book.
- (i) Now open up the valve and allow the water level to drop another 10 feet. Repeat steps (g) and (h) and note the recharge rate at the new depth. Continue checking recharge rates at different depths and note the results.
- (j) Now shut off the well pump and allow the water level to rise. Note the time it takes to recover each 10 foot of well depth. This will allow you to confirm the recharge rate. The volume of each foot of water in your well depends upon the diameter of the well casing.

This may be very important to you if your well yield or recharge rate begins to drop and you believe that this may be the result of someone else's actions. (Recharge may also drop when something goes wrong with your well and it needs the attention of a well expert.)

## Definitions

Water Table: At some depth beneath the surface, soil and porous rocks are saturated with water. The surface of this saturated area is the water table. The water table moves up and down seasonally in response to rainfall, drought and water use. It also moves up and down daily as trees and other vegetation respond to light and heat.

Well depth: This can be found on your Well Drillers Report.

Static Level: This is the distance from the top of the well to the surface of the water when the well has recharged completely.

Draw Down: When water is pumped from a well faster than the well is recharging, the water level drops. The distance between the static level and the level after pumping is the draw down.

Cone of Depression: As the water level drops, so does the water table in the soil and porous rock around the well. The water table forms an inverted cone around the well -- the cone of depression. If your well is very close to a neighbor's well, your cones of depression may overlap. In this case, the level in your neighbor's well will drop as you pump water from your well.

Recharge: As soon as the water level is lowered by pumping, water will immediately begin to flow back into the well from the surrounding soil and porous rock. This is recharge. Recharge increases with depth for the same reason that holes in the bottom of a barrel squirt water further than holes higher up. If you measure recharge and static levels several times a year for several years, you will become the world's expert on your own well.

## Equipment Needed

To measure the recharge of your well, you will need:

Permanent notebook: If this is bound rather than loose-leaf or in a ring binder, no one will be able to question the authenticity of the document.

Watch with stop watch function

Calculator

# Introduction to Well Monitoring

## Why it's Important

If you have a well, it's a good idea to learn how it works. The survival of our species over the millennia, has required a knowledge of where to find drinking water. Understanding your well can put you in touch with this key aspect of our human heritage. An automatic piped water supply is a blessing, yet it may sever our connection with the essentials of water if it is used without an awareness of what makes the water flow.

## Types of Wells

There are three types of well commonly found in Sonoma County:

- (a) Shallow wells in the gravel or alluvium beside creeks will continue to produce water so long as the creek continues to flow at the surface or below the ground.
- (b) Wells in fractured hard rock draw water stored in cavities and fractures in the rock. Such wells are unpredictable and may dry up suddenly when all the stored water has been pumped out and withdrawal exceeds recharge. Recharge may be slow. A 72-hour pump test may sometimes help establish the capacity of such wells.
- (c) Wells in water-bearing rock, such as sandstone, are the most common type of well found here. This type of well may be monitored and understood with a few simple tools and a little training.

## Record Keeping

There are many variables that may affect the operation of a well. It is therefore essential to keep a permanent written record of your well-monitoring. Every monitoring session should record the date, the time, the weather, recent rainfall or drought, your procedures and your results.

As the property owner, you have access to the Well Drillers Report -- the 'well log' -- for your well if you can find it. This will tell you what types of soil and rock the driller found when the well was drilled. It will also tell you what the approximate yield of your well was at that time. It will also tell you at what level the pump or intake was installed. If you cannot find your report, check with the Permit and Resource Management Department. They may have a copy and will allow owners to make a copy for their records.

As you accumulate information about your well, you will begin to understand how it changes over time. Eventually, you will be able to speak with authority about your well.