



WATER QUALITY

# Rural Domestic Water Supply

J. Vomocil and J. Hart

**W**hen purchasing a home or homesite, a water supply that meets standards for both quantity and quality is necessary. Poor quality water or an inadequate supply of water can take the pleasure from country living. Problems with quantity or quality of domestic water occur all over Oregon.

Oregon Groundwater Legislation Chapter 833, Oregon Laws, 1989, requires well testing with sale or exchange of property. "In any transaction for the sale or exchange of real estate that includes a well that supplies groundwater for domestic purposes, the seller of the real estate shall, upon accepting an offer to purchase that real estate, have the well tested for nitrates and total coliform bacteria."

The Health Division also may require additional tests for specific contaminants in an area of groundwater concern or groundwater management area. The seller shall submit the results of the test required under this section to the Health Division.

The legislation also states "The failure of a seller to comply with provisions of this section does not invalidate an

instrument of conveyance executed in the transaction."

Your real estate purchase agreement should include a clause providing the right to rescind or modify the contract if water test results are unsatisfactory. Include the names of testing laboratories and specify the tests you wish performed.

## Water quantity

The amount of water to satisfy a family's needs is set by occasional events, not routine use. The family needs sufficient water to fight a fire, water a lawn or garden, or wash a car, in addition to regular household uses such as drinking, cooking, laundry, dishes, toilets, and bath. The minimum flow rate and total volumes used for typical domestic activities is variable. It depends on how conservative or extravagant the user chooses to be. The table to the right provides some estimates of average use levels in flow rate and total use.

In addition to items in the table, consider these possible uses:

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- 1 1/2 gallons per 100 lb body weight per day as the drinking water for livestock (and pets) except for milking cows, which need 20–25 gallons per day.
  - 200 gallons per day per 1,000 square feet of garden or lawn.
  - 50 gallons at 5 gallons per minute for a 10-minute car wash.
- A country well should produce at least 5 to 6 gallons per minute continuous flow for a family with a three-bedroom, two-bathroom home. This is a minimum amount. A flow of

## Water requirements for home and outdoor living

|                                   | <i>Flow rate<br/>(gal/min )</i> | <i>Total use<br/>( gal)</i> |
|-----------------------------------|---------------------------------|-----------------------------|
| Adult or child                    |                                 | 50–100/day                  |
| Baby                              |                                 | 100/day                     |
| Automatic washer                  | 5                               | 30–50/load                  |
| Non-automatic washer,<br>hand tub | 5                               | 15–45/load                  |
| Dishwasher                        | 2                               | 7–15/load                   |
| Garbage disposer                  | 3                               | 4–6/day                     |
| Kitchen sink                      | 3                               | 2–4/use                     |
| Shower or tub                     | 5                               | 25–60/use                   |
| Toilet flush                      | 3                               | 4–7/use                     |
| Bathroom lavatory                 | 2                               | 1–2/use                     |
| Water softener regeneration       | 5                               | 50–100/time                 |
| Backwash filters                  | 10                              | 100–200 per<br>backwash     |
| Outside hose faucet               | 5                               | —                           |
| Fire protection                   | 10                              | 1,200/2-hr<br>period        |





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10 gallons per minute is highly desirable. A well producing 5 gallons per minute may require additional storage capacity and may restrict simultaneous activities. For example, a shower and washing machine could not be used at the same time. Well production (flow) may change seasonally. The flow may drop in late fall or early winter and peak in late spring or early summer.

In some cases, water storage tanks, varying in size to several thousand gallons, can be installed to alleviate supply deficiencies. For more information about water storage tanks, contact your county health department or check the yellow pages of your local telephone directory for local distributors under the heading "pumps and water storage systems."

## Well location

Wells should be located at least 100 feet upslope from any sewage disposal area and at least 50 feet from any septic tank, other treatment unit, or leaching field. They should be separated from barnyards, corrals, confined animal feeding operation and/or manure storage facilities by at least 50 feet.

Construct diversion terraces or ditches as necessary to intercept and divert surface runoff around the well site.

The diversion structure should be at least 50 feet upslope from the well.

Check with local health authorities regarding other well placement criteria.

## Well head

A properly installed well is protected from contamination by surface water. The protection is provided by a sanitary seal covering the exposed end of the well casing by grouting. Grouting is a mixture of clay and Portland cement packed around the outside of the casing. If there is an impermeable layer in the surface 18 feet, grouting should extend at least 5 feet into that layer. Where there is no impermeable layer in the earth close to the ground surface, grouting should extend to a depth of at least 18 feet.

Avoid perforation of the upper 18 feet or more of the well casing to minimize water contamination. We suggest there be a 5-foot diameter, 4-inch thick cement apron to divert water from the casing.

## Microbiological tests

Microbial contamination is the most widespread problem in Oregon rural water supplies. Drinking water can become

## Water quality

A safe, healthful, and pleasant drinking water has the following characteristics. Compare your test results to those standards.

|   | <i>Maximum level</i>                           |
|---|--|
| ○ virtually colorless   | 15 c.u. <sup>a</sup>                           |
| ○ virtually odorless  | 3 t.o.n. <sup>b</sup>                          |
| ○ low in total dissolved solids   | 500 mg/L <sup>c</sup><br>(but <i>not</i> zero) |
| ○ low in "heavy metals" <sup>d</sup>                                      |  |
| ○ low in hardness   | 7 gpg <sup>e</sup>                             |
| ○ low in nitrate nitrogen   | 10 mg/L  |
| ○ low in dissolved iron   | 0.5 mg/L                                       |
| ○ low in hydrogen sulfide   | 0.5 mg/L                                       |
| ○ low in suspended material   | 1-5 NTU <sup>f</sup>                           |
| ○ low in microorganisms <sup>d</sup>                                      | 1/100 mL <sup>g</sup>                          |
| ○ safe in terms of pesticides, organic toxins, radionuclides <sup>d</sup> |  |

<sup>a</sup>Color units

<sup>b</sup>Threshold odor number

<sup>c</sup>Milligrams per liter, approximately the same as parts per million

<sup>d</sup>See EPA drinking water standards. These change as new information becomes available. Those in effect as of Jan. 1, 1989 are reported in OSU Extension publication SP 53-414. Your county health department and the Oregon Department of Health have information on which metals and/or chemicals have been found in local groundwater. Check with those offices before deciding which tests are needed. Also see "For more information," next page.

<sup>e</sup>Grains per gallon

<sup>f</sup>Nephelometric turbidity unit

<sup>g</sup>One coliform bacteria per 100 milliliters for a monthly average, 4 per 100 mL as maximum per single example. (See "Microbiological tests," next page.)

contaminated with disease-causing organisms such as bacteria, fungi, protozoa, viruses, cysts, and intestinal worms. The most common source of contamination is human or animal waste which has come in contact with the water.

A disorder commonly associated with contaminated groundwater causes diarrhea. If you and your family experience this symptom persistently, water testing for microbial contamination is indicated. Even if you have no immediate symptoms, annual testing for coliform is recommended. If you are buying a home in the country, insist on this test before completing the purchase.

Many laboratories throughout Oregon are equipped and qualified to test water for microbial contamination. Ordinarily water is tested for fecal coliform, which are organisms found in the intestines of humans and animals, as well as in soils and plant materials. Coliform bacteria are not necessarily harmful but do indicate the water supply is subject to contamination, the cause of which should be investigated. Contact the county health office or sanitarian for directions to disinfect a well or water.

Obtain water samples in a sterile bottle or bag. Use a container provided by the

laboratory and follow sampling directions carefully. Don't rinse out the container as it may contain a small amount of chemical to neutralize chlorine.

Names and addresses of state-approved laboratories located in your area are available from the county Extension Service office, the county health office or county sanitarian, and the Drinking Water Section of the Oregon State Health Division.

Limited quantities of Fertilizer Guide 74, *A List of Analytical Laboratories Serving Oregon*, are available without charge from county Extension offices or from Publications Orders, Agricultural Communications, Oregon State University, Administrative Services A422, Corvallis, OR 97331-2119, telephone 737-2513.

Laboratories are certified by various agencies. Before choosing a laboratory, determine the use for analytical data and any certification necessary.

You can disinfect contaminated water by boiling for one minute, chlorination, ultraviolet light, ozone, or iodine. An activated carbon filter is recommended as a treatment to follow disinfection, especially after chlorination. Each method has advantages and disadvantages. Disinfection will not remove odors, taste, sediments, nitrates, or salts. Additional information is

## Characteristics of low quality drinking water

Good drinking water has none of the following characteristics:

- astringent taste caused by sulfate
- metallic taste caused by iron
- salty taste caused by impurities or softener
- soda taste caused by dissolved salts
- medicinal taste caused by chlorinator
- foul/putrid odor caused by organic matter
- rotten egg odor caused by hydrogen sulfide
- rotten egg odor in hot water caused by a magnesium rod in water heater

All of these adverse conditions as well as others can be remedied by water treatments. In addition to taste and odor problems, treatment can also overcome lack of suds or discoloration for laundry and baths, water spots on dishes and utensils from hardness, iron, or manganese. See your county health department or check the yellow pages of the telephone directory for water purification and filtration equipment for more information. Treatment can also remove nitrates, lead, or arsenic that can be detrimental to health.

available from the county office of the OSU Extension Service or your county health office.

## Nitrates and pesticides

Oregon's groundwater is of excellent quality. Nitrate nitrogen at or above health advisory levels of 10 mg/L

nitrate-nitrogen has been found on the Clatsop Plain, Mission Bottoms, the LaPine area, near Klamath Falls, in the Hermiston-Boardman region, near Island City, and in some portions of the Malheur and Owyhee Irrigation Districts.

Elevated levels (above 5 but below 10 mg/L) have also been reported for East Portland, North Albany, and North Eugene.

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Testing for nitrate nitrogen is easy and relatively inexpensive. Excess nitrate nitrogen can be removed or reduced by distillation, anion exchange resin, or reverse osmosis. Nitrates are *not* removed by boiling (they are increased), filtration (activated carbon, greensand, etc), or water softeners.

The occurrence of pesticides in Oregon groundwater is rare and in virtually all cases levels are far below the health advisory. Testing for pesticides is expensive, very exacting work, and verification by multiple tests is necessary. Pesticide testing should not be undertaken by individuals or individual families. If you have reason to suspect pesticide contamination of your water supply, contact the Water Quality Control Division of the Oregon Department of Environmental Quality at 811 SW Sixth Avenue, Portland, OR 97204, (503) 229-5279.

If found, pesticides can be removed from water or reduced in concentration by reverse osmosis or filtration through activated carbon. In some cases, depending on the chemical in question, ion exchange resins or distillation may be useful. Request the assistance of your county office of the OSU Extension Service or the Department of Environmental Quality before making a decision.

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## For more information

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Mancl, Karen M. *Bacteria in Drinking Water*. Columbus: Ohio State University Extension Bulletin 795, 1989.

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