# O K L A H O M * A * S Y S T

## Home*A*Syst
## Home Assessment System

***Is your soil sandy or gravelly? Does it drain quickly? Does storm water flow from your property into a nearby lake or pond? Do you store hazardous chemicals? Are they stored close to your well or near a lake, stream, or river? This worksheet will help you identify risks to your water resources. This worksheet asks you to make a map of your home-site to identify potential trouble and to consider the following factors:***

- ***Soil type and depth***
- ***Depth to bedrock***
- ***Depth to the water table***
- ***Location of wetlands, streams, or lakes***
- ***Location of potential pollutant sources***

**Oklahoma Cooperative Extension Service**

**Division of Agricultural Sciences and Natural Resources**

**Oklahoma State University**

# Site Assessment:

## Protecting Water Quality Around Your Home

## Assessment Worksheet #1

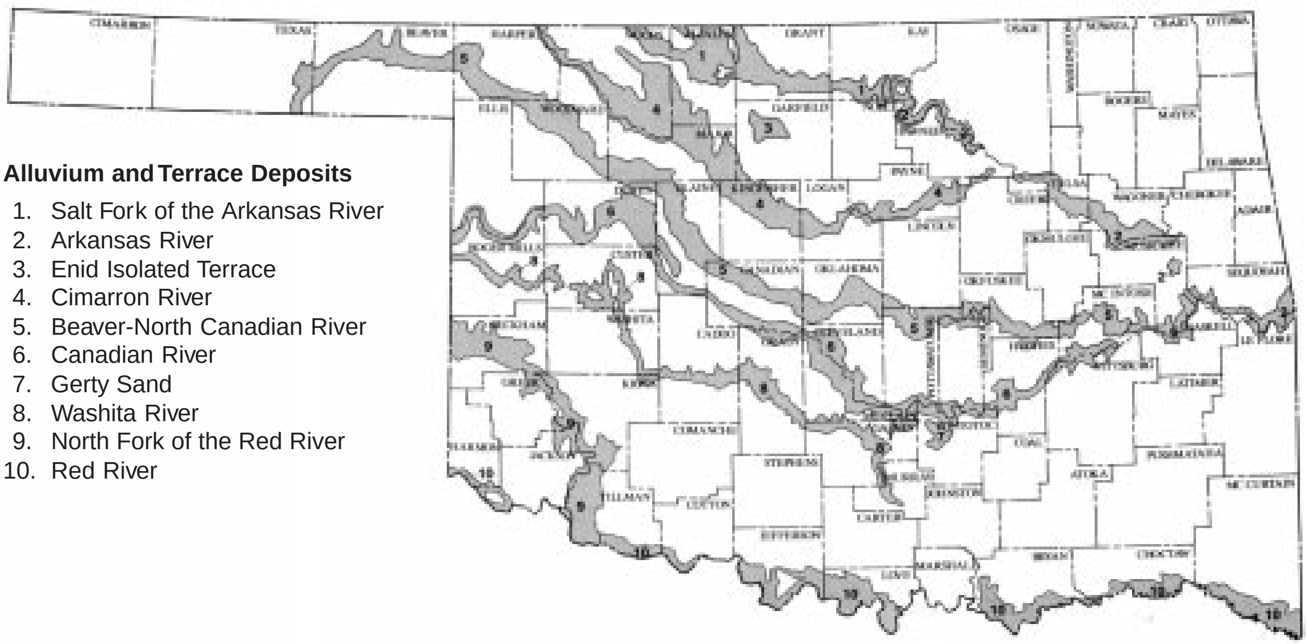
### *How does Home*A*Syst work?*

This worksheet introduces the Home*A*Syst assessment method you will use to evaluate your home and property. Other worksheets in the series cover specific health and pollution risks from septic systems, fuel storage, and solid waste. By completing this worksheet, you will becomes familiar with the format for ranking pollution risks and will gather information useful for later assessments.

If you identify potentially hazardous or unsafe conditions, what should you do? Develop an *action plan*. Each worksheet includes an Action Checklist and sources of additional information. A glossary of terms used in all of the Home*A*Syst worksheets is located at the end of this assessment.

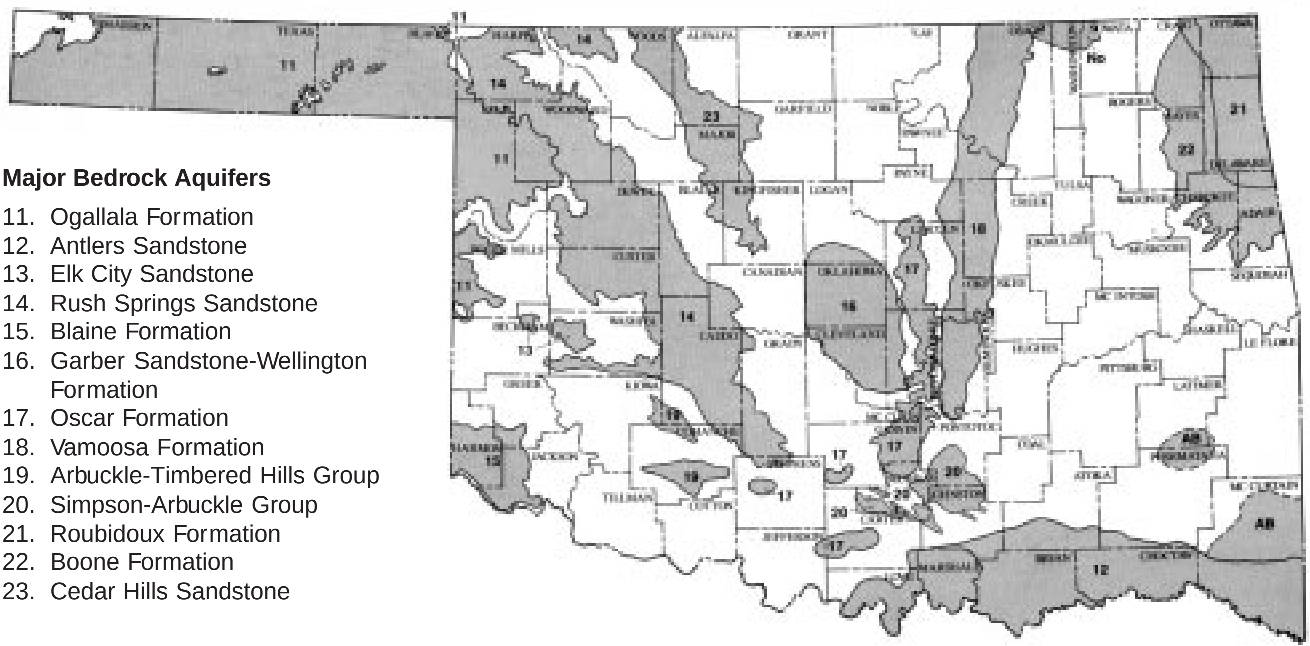
### *Why do the assessment?*

What you do in and around your home can affect water quality in ground water and nearby lakes, streams, or wetlands. This worksheet will help you evaluate important physical characteristics of your home-site, such as soils, geology, depth to ground water, and distance to surface water. By drawing a simple map of your homesite, you can see the potential impact of features and activities that may pose risks to your health and the environment. Animal wastes, garbage disposal methods, pesticides, fertilizers, and maintenance of your well and septic system can all affect ground water quality. Remember, this assessment is only a starting point. It is meant to encourage you to complete other Home*A*Syst worksheets.



**Alluvium and Terrace Deposits**

1. Salt Fork of the Arkansas River
2. Arkansas River
3. Enid Isolated Terrace
4. Cimarron River
5. Beaver-North Canadian River
6. Canadian River
7. Gerty Sand
8. Washita River
9. North Fork of the Red River
10. Red River



**Major Bedrock Aquifers**

11. Ogallala Formation
12. Antlers Sandstone
13. Elk City Sandstone
14. Rush Springs Sandstone
15. Blaine Formation
16. Garber Sandstone-Wellington Formation
17. Oscar Formation
18. Vamoosa Formation
19. Arbuckle-Timbered Hills Group
20. Simpson-Arbuckle Group
21. Roubidoux Formation
22. Boone Formation
23. Cedar Hills Sandstone

## *What is a Watershed?*

The water from your tap and in nearby lakes or streams is part of a much larger water system. Not everyone lives next to a pond or stream, but we all live in a *watershed*—all the land that drains to a specific point on the landscape such as a pond, creek, lake, wetland, or river. The crests of hills and high features of the land define the watershed boundary and valleys define the drainage system.

Think of the watershed as a bathtub. The watershed outlet—the downstream end of a pond, lake, or river—is the tub's "drain." The watershed boundary is the tub's rim. A watershed's drainage system is the network of rivers, streams, manmade channels and storm drains, wetlands, and ground water aquifers that carry water out of the watershed. The drainage system can also carry, spilled motor oil, excess fertilizer, or lawn and garden chemicals downstream. Actions recommended here can help you protect your watershed and the water you drink.

## What is an Aquifer?

The water in your well comes from an aquifer, a subsurface soil or rock formation that contains usable water. There are two common types of aquifers—confined and unconfined. Water that is trapped under a rock formation or impermeable layer is known as a confined aquifer. An unconfined aquifer is in the uppermost saturated zone of the soil with no protecting layer above it. The maps on page 2 show the major aquifers in Oklahoma. The name of the aquifer your water comes from is important to know when you research information about your well, soil type, and watershed.

**What water resources are you trying to protect?**

1. Does your drinking water come from one of the major named aquifers? Which one?

   ____________________________________________

2. What water resource does your home affect?

   ____________________________________________

Keep these in mind as you read this assessment and locate potential sources of contamination. Making improvements to reduce your risk will benefit your own water source as well as downstream water users.

# Part 1. Physical Characteristics of Your Homesite

Every home comes with it's own unique set of physical conditions. Some you cannot change, but knowing them can help you understand and avoid those risks you *do control.* ***At the end of Part 1 is an assessment table to evaluate your risks. The information below will help you answer the questions in the table.***

### How does soil protect water quality?

All soils are permeable to some extent, which means water and other fluids percolate through them either quickly or slowly, depending on permeability. Very permeable soils offer little protection to ground water because they permit water and contaminants to seep through. Low permeability soils, like clayey soils, protect ground water but may produce more runoff to carry contaminants to surface waters.

Ground water and surface water are interconnected. Water moves from the water table into a stream or vice versa. If you keep impurities out of surface water but do not protect ground water or vice versa, contaminated waters may occur where you least expect.

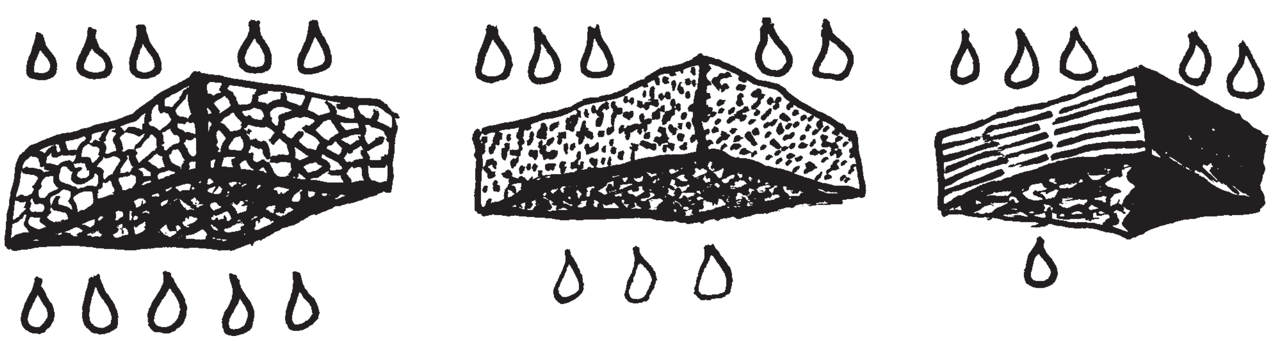
### What is your soil type?

Soils are grouped into three basic categories—clay, silt/loam, and sand/gravel. Clays have very low permeability. Sands and gravels have very high permeability and silts and loams are in between. You can get a good idea about your soil type by rubbing a moistened sample between two fingers. Is it sticky like clay, gritty and crumbly like sand, or somewhere in between?

### How does soil type and depth affect ground water and surface water?

Ground water is the water below the surface of the earth. From the water table down, ground water fills the pore spaces in the soil and cracks in the bedrock. Clay soils have very small pores that slow the downward movement of water, protecting ground water from surface contamination. Sandy soils have large pores that allow rapid water movement and pose the greatest risk. When water percolates slowly, there is time for natural processes to degrade the contaminants and prevent pollution of the ground water. Therefore, deep soils offer more filtering

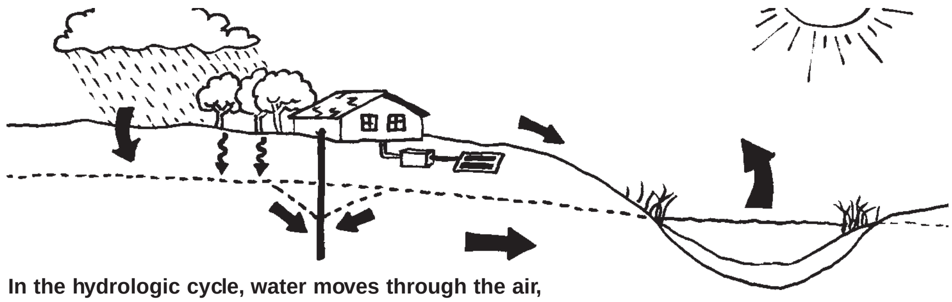
**Soil particles and the drainage of each type.**



**Sand** **Silt** **Clay**

and more opportunity to break down pollutants before they reach ground water. The highest risks for ground water contamination occur in soils that are less than three feet deep.

Clayey soils, because they are less permeable, produce more surface runoff. During a storm or flood—or even when watering your lawn—this runoff can wash contaminants from the land's surface into nearby surface waters.



**In the hydrologic cycle, water moves through the air, over land, and through the ground.**

### *How does bedrock affect ground water?*

Bedrock depth varies. It may be at the land's surface, just below the surface, or hundreds of feet down. The depth to bedrock and the type of bedrock influence pollution risks. Shales, granites, and other dense types of rock make an effective barrier to water and contaminants. Fractured or porous rocks, such as some limestone, can be highly permeable, transferring water through cracks and channels. When bedrock is split or fractured, water can move rapidly, spreading pollutants over long distances.

### *How deep is the water table?*

If you dig a hole, you will eventually reach soil saturated with water. This is the water table. In a wetland or poorly drained area, the water table is at the surface or just below. Your local water table fluctuates throughout the year and is usually highest in the wet months of spring and fall. In general, the closer the water table is to the land's surface, the more it is susceptible to contamination.

## *Assessment — Homesite Characteristics: Identifying the Risks*

This table is similar to the assessment tables in all Home*A*Syst worksheets. For each question, three choices describe situations or activities that could indicate high, medium, or low risks to human or environmental health. Do the best you can. For some questions, your well drilling records or local well drillers may be able to help. Some choices may not be exactly like your situation, so choose the response that fits best. Put the risk-level number (1, 2, or 3) in the column "Your Risk." Refer to Part 1 if you need more information to complete the table.

| | | **1. Low Risk / Safest Situation** | **2. Medium Risk / Potential Hazard** | **3. High Risk / Unsafe Situation** | **Your Risk** |
|---|---|---|---|---|---|
| **Surface water** | **Soil type** | Sand / gravel. | Silt / loam. | Clay. | |
| | **Distance to surface water** | More than 100 feet. | 25 to 100 feet. | Less than 25 feet. | |
| **Ground water** | **Soil type** | Clay. | Silt / loam. | Sand / gravel. | |
| | **Soil depth** | More than 12 feet. | 3 to 12 feet. | Less than 3 feet. | |
| | **Bedrock** | Shale or solid, not permeable, not fractured rock. | Solid limestone or sandstone, or fractured granite. | Fractured limestone or sandstone. | |
| | **Depth to water table** | More than 20 feet. | 10 to 20 feet. | Less than 10 feet. | |

***Responding to Risks—***Do not depend solely on soil type, bedrock, or other physical features to protect water quality. They are only part of the picture, and without analysis by a geohydrologist, there could be a great deal of uncertainty. Make it your goal to lower the risks you observe.

# Part 2: Making a Map of Your Homesite

## Why make a map?

Your map will help you complete the Home*A*Syst assessments. Making the map and completing the assessments can be fun and educational for children.

The materials you need to make your map are readily available: a measuring tape (optional), clipboard, pencil, and the graph paper on the last page of this fact sheet. The map you create will be an aerial view—the way your property would look if you took a photo of it from the air.

### Instructions: Your homesite map

**Homesite features to include:**

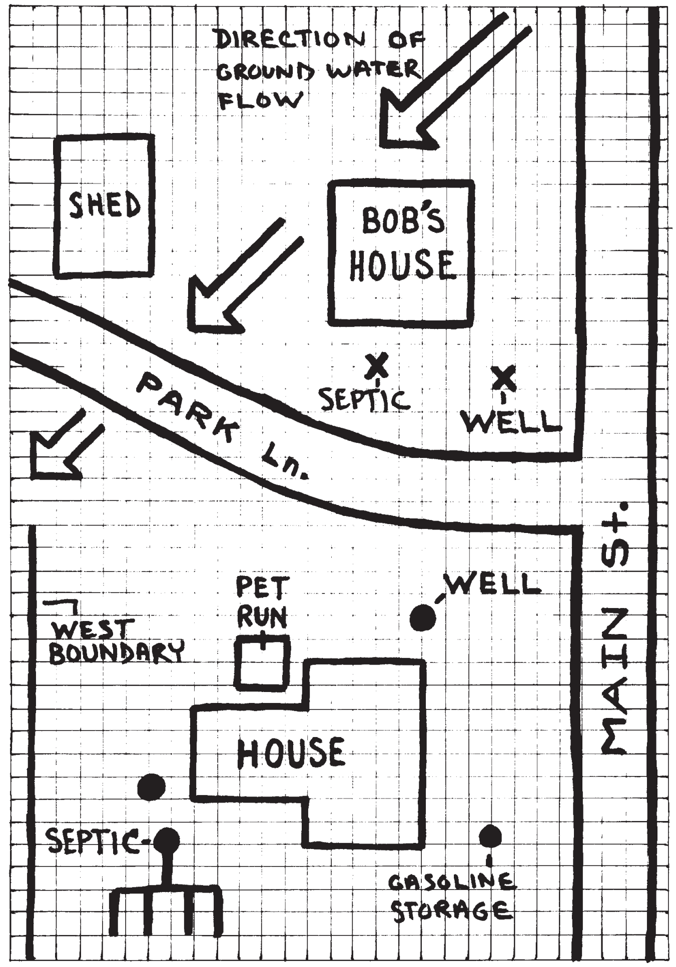
- property boundaries
- outbuildings, sheds, and storage areas
- nearest surface water
- petroleum storage tank
- french drains
- floor drains
- lawn areas
- flower beds and other cultivated areas
- arrows indicating direction of water flow
- house and garage
- animal pens and pet runs
- septic system and drainfield
- water wells, gas, and oil wells
- dry well
- abandoned well
- vegetable garden
- roads and driveways
- drainage ditches
- storm sewers

**Location codes.** On your map, note the areas where you store chemicals and other potential hazards by using letter codes. Make up your own code letters or symbols as needed. Examples:

F = Fuel tanks for gasoline.
A = Automotive products like motor oil, gasoline, and anti-freeze.
P = Pesticides.
H = Hazardous products like solvents and acids.

**Other map-making ideas.** For larger view maps, add landscape features, such as hills, rivers, lakes, ponds, roads, bridges, and surface and subsurface drains. Note potential sources of contamination beyond the boundaries of your property, such as farm fields, dumps, petroleum or gas wells, and gas stations. Indicate seasonal changes at your homesite. For example, are there wet areas in the spring? Such areas might indicate a high water table.

**Don't leave out things you cannot see.** Inquire about previous or current industrial or agricultural activities in the area. Old landfills, oil wells, and buried fuel tanks are just a few of the possibilities. Find out if any underground fuel tanks exist on neighboring properties. If there are tanks, septic systems, or other potential sources of contaminants *upgradient* (or up-slope) from your water well, they could affect the safety of your ground water.

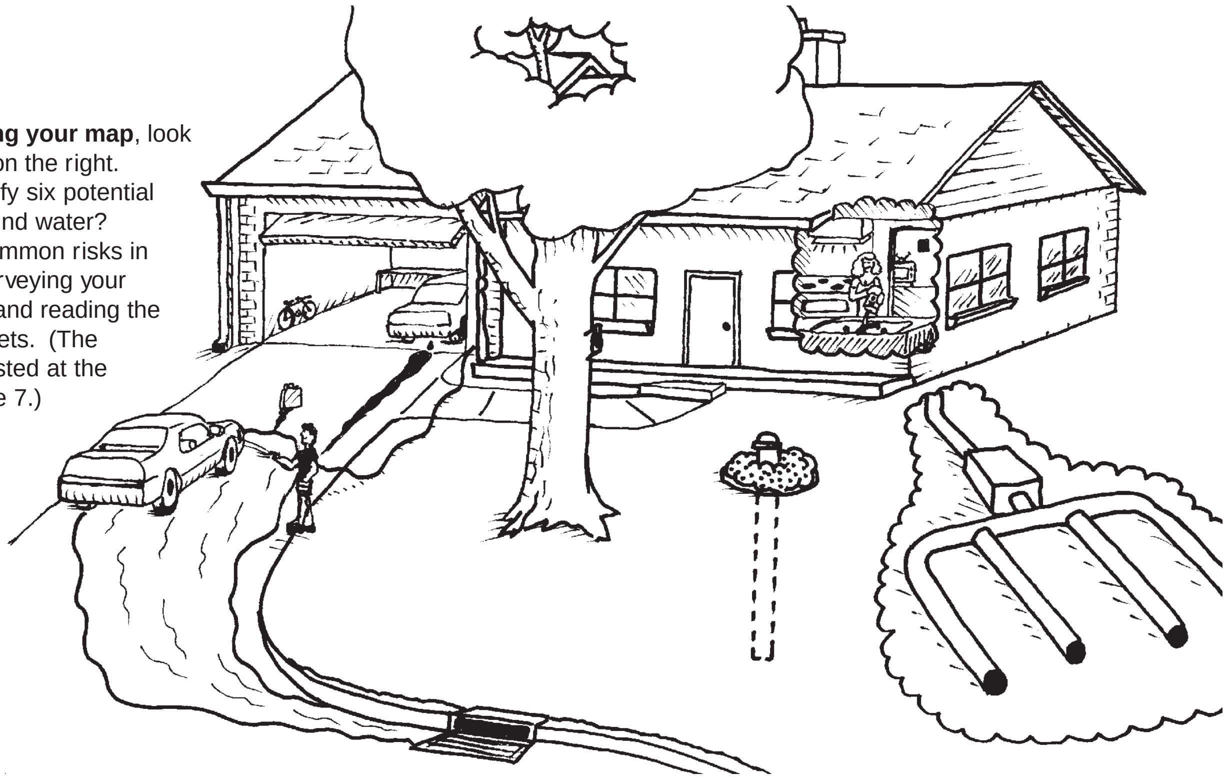



**Sample map—a suburban one-acre lot.**

### Putting it all together—and taking action

The final step is to put both pieces of your assessment together—the table and map—so you can identify potential problem areas. If you have rated any of the items in the table as medium or high risk (a 2 or 3) and have identified potential contamination sources in these areas, then you should be concerned. For example, you may have discovered that your septic system is located within 50 feet of your well, or that you apply lawn or garden chemicals within 25 feet of a lake or stream. Perhaps there is an old, abandoned well on your property that isn't properly sealed. To protect your family's health and the environment and to safeguard your financial investment, you will want to take steps to correct these problems.

**Before drawing your map**, look at the picture on the right. Can you identify six potential threats to ground water? Keep these common risks in mind when surveying your own property and reading the other worksheets. (The answers are listed at the bottom of page 7.)



### *Home*A*Syst Cares About Your Safety*

There are Home*A*Syst worksheets available on a variety of topics to help homeowners examine and address their most important environmental concerns.

This worksheet was adapted from Alyson McCann, Water Quality Program Coordinator, University of Rhode Island Cooperative Extension, Kingston, Rhode Island.

This publication, Home*A*Syst: An Environmental Risk Assessment Guide for the Home, NRAES-87, is available from National Regional Agricultural Engineering Services. Please contact NRAES for more information about the publication or about pricing and quantity discounts.

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## *Glossary*

The following definitions may help clarify some of the terms used in the Home*A*Syst assessments.

**Abandoned well.** A well unused for at least 12 months and not properly closed.

**Aerobic system.** An alternative to septic tanks or waste lagoons in which oxygen-using biological systems treat the wastewater. These systems are more expensive to operate and maintain because of the need for aeration.

**Alluvium and terrace deposits.** Shallow aquifers associated with river systems.

**Anti-backflow (anti-backsiphoning) device.** A check valve or other mechanical device used to prevent unwanted reverse flow of liquids back down a water supply pipe into the well or water supply system.

**Approved disposal site.** A site for land application of wastewater or tank pumpage that meets state standards and is approved by the Department of Environmental Quality (DEQ).

**Aquifer.** A subsurface zone in which readily extractable water saturates the pores of the geologic formations.

**Backflow.** The unwanted reverse flow of liquids in a piping system, potentially contaminating well or water supply system.

**Backsiphonage.** Backflow caused by the formation of a vacuum in a water supply pipe.

**Bedrock.** A consolidated rock formation.

**Bedrock aquifer.** Deep geologic formations bearing water.

**Burn barrel.** An open container for burning household solid waste (see incinerator).

**Casing.** Steel or plastic pipe installed while drilling a well to prevent collapse of the well bore hole and protect the well from surface contamination.

**Cesspool.** Receives sewage directly from a buildings's sanitary system. It permits liquids to seep into soil the cavities. These are not approved in Oklahoma (see drainfield).

**Compost.** Organic matter stabilized by controlled decomposition.

**Cross-connection.** A connection between pipes, wells, fixtures, or tanks allowing contaminated water to mix with drinking water.

**Drainfield.** Known also as the soil absorption field, the drainfield is designed to distribute waste water from a perforated pipe to a soil area.

**Drilled wells.** Wells constructed by rotary and percussion tool drilling devices, not dug or driven. These wells are normally four inches and larger in diameter.

**Driven-point (sand-point) wells.** Wells constructed by driving assembled lengths of pipe into the ground with percussion equipment or by hand. These wells are usually smaller than two inches in diameter and less than 50 feet deep. They can only be installed in areas of relatively loose, sandy soils.

**Dug wells.** Large diameter shallow wells often constructed by hand. These wells are subject to contamination from nearby surface water sources.

**Effluent.** Liquid that is discharged from a pipe or channel. Sewage effluent must be treated in a septic tank or other waste treatment system.

**Ground water.** Subsurface water in a zone of saturation.

**Grout.** Cement or cement-clay mixture used to seal the space between the outside of the well casing and the bore hole. Grout may also be used to fill an abandoned well.

**Holding tank.** An approved watertight receptacle for the collection and temporary holding of sewage.

**Household hazardous waste collection program.** A special program in which household hazardous waste is collected by the city or county for disposal in specially constructed hazardous waste landfills or incineration.

**Hydrogeologist.** A professional who studies ground water—its origin, occurrence, movement, and quality.

**Impervious zone.** A soil or rock layer, such as dense clay or unfractured bedrock, which will not allow water to penetrate.

**Incinerator.** A device for complete combustion of solids waste.

**Lagoon.** A waste treatment system that uses biodegradation in a pond to convert wastes to more stable products. Domestic waste treatment lagoons must be approved be the DEQ.

**Leaching.** The removal of soluble material from soils or other material by percolation of water.

**Licensed landfill.** A landfill, approved by DEQ, specifically designed to protect ground water and public health through the use of a high-density clay and/or plastic liners, and effluent collection system.

**Organic matter.** Matter containing compounds of plant or animal origin, measured by organic carbon content.

**Recycling.** Reusing waste material to develop another useful product.

**Runoff.** Water that moves across the ground surface.

**Scum.** Floating waste solids such as grease and fat in a septic tank.

**Sludge.** Settled, partially decomposed waste solids in a septic tank or lagoon.

**Soil drainage class.** A general evaluation of a soil's permeability or ability to transmit water. Different drainage classes are described by such terms as excessively drained, well-drained, and poorly drained.

**Soil permeability.** The quality of a soil that enables water or air to pass though it. Slowly permeable soils consist of mostly fine-textured materials (like clays) that permit only slow water movement. Moderately or highly permeable soils have more coarse textured materials (like sands) that permit rapid water movement.

**Water table.** The top of the uppermost ground water zone. It fluctuates with climatic conditions on the land surface and with aquifer discharge and recharge rates.

**Well cap (seal).** A watertight cover to seal the top of a well casing pipe.

**Answers to the ground water risk question on page 6:**

1. The person in the kitchen is pouring chemicals down the drain.
2. The car in the garage is dripping oil.
3. The fuel can in the driveway is leaking.
4. Washing a car on pavement carries detergents, oil, and fuel directly into the storm sewer.
5. The septic system and well are too close together.
6. Fertilizer and pesticides used on a flower bed can cause contamination of the well.

**Draw a map of your property in the space provided below.**

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