K-STATE Kansas State University

FARM•A•SYST
Farmstead Assessment System

Worksheet 1

Assessing the Risk of Groundwater Contamination from
Drinking Water Well Condition

About 95 percent of this country's rural residents use groundwater to supply their drinking water and farmstead needs. Wells generally provide clean, safe water. If improperly located, constructed or maintained, however, they can allow bacteria, pesticides, fertilizer or oil products to contaminate groundwater. These contaminants can put family and livestock health at risk.

There are many documented cases of well contamination from farmstead activities near drinking water wells. The condition of your well and its location in relation to contamination sources determine the risk it poses to the water you drink. For example, a cracked well casing allows bacteria, nitrates, oil and pesticides to enter the well. A spill of pesticides being mixed and loaded near the well could result in a serious contamination of your family's drinking water supply. Feedlots, septic systems, fertilizer applications and waste storage areas can release large amounts of nitrate, and may contaminate your well.

Preventing well water contamination is very important. Once the groundwater supplying your well is contaminated, it is very difficult to clean up. The only options may be to treat the water, drill a new well, or obtain water from another source. A contaminated well can also affect surrounding wells, posing a serious health threat to others.

The goal of Farm•A•Syst is to help you protect the groundwater that supplies your drinking water.

- It will take you step by step through your drinking water well condition and management practices.
- It will rank your activities according to how they might affect the groundwater that provides your drinking water supplies.
- It will provide you with easy-to-understand rankings that will help you analyze the "risk level" of your drinking water well condition and management practices.
- It will help you determine which of your practices are reasonably safe and effective, and which practices might require modification to better protect your drinking water.

Follow the directions at the top of the chart on the next page. It should take you about 15–30 minutes to complete this worksheet and figure out your ranking.

Focus on the well that provides drinking water for your home or farm. If you have more than one drinking water well on your farmstead, fill out a worksheet for each one.

Glossary

Drinking Water Well Condition

These terms may help you make more accurate assessments when completing Worksheet 1. They may also help clarify some of the terms used in Fact Sheet 1.

Abandoned water well: A water well that has been unused for two years or more, or is in such a state of disrepair that it cannot be used to supply water, threatens to contaminate or pollute groundwater, poses potential health and safety hazards, or cannot be replaced in active or inactive status.

Air gap: An air space (open space) between the hose or faucet and water level, representing one way to prevent backflow of liquids into a well or water supply.

Anti-backflow (anti-backsiphoning) device: A check valve or other mechanical device to prevent unwanted reverse flow of liquids in a piping system.

Aquifer: An underground formation containing, and capable of supplying, groundwater.

Backflow: The unwanted reverse flow of liquids in a piping system.

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

Casing: Steel or plastic pipe installed while drilling a well, to prevent collapse of the well bore hole and entrance of contaminants, and to allow placement of pumping equipment.

Cross-connection: A link or channel between pipes, wells, fixtures or tanks carrying contaminated water and those carrying potable (safe for drinking) water. Contaminated water enters the potable water system if it has higher pressure.

Drilled wells: Wells not dug or driven, including those constructed by a combination of jetting or driving. These wells are normally 4 to 10 inches in diameter. These are the most common type of well in Kansas.

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 small in diameter (two inches or less), less than 50 feet deep, and installed in areas of relatively loose soils, such as sand.

Dug wells: Large-diameter, relatively shallow wells lined with rock or brick and often hand constructed. Typical dug wells are three to six feet in diameter and 15–50 feet deep.

Groundwater: Subsurface water in a zone of saturation.

Grout: Cement, neat cement, bentonite clay, or other material approved by KDHE that is used to create a watertight seal in the space between the outside of the well casing and the bore hole or between two or more strings of casing. Grout material is also used to plug abandoned wells.

Milligrams per liter (mg/l): The weight of a substance measured in milligrams contained in one liter. It is equivalent to 1 part per million in water measure.

Parts per million (ppm): A measurement of concentration of one unit of material dispersed in one million units of another.

Pitless adapter: An assembly placed below the frost line which permits pumped well water to pass through the casing without allowing contaminants to enter.

Plugged well: A well that has been permanently closed according to Kansas regulations.

Water table: The upper level of groundwater in a zone of saturation. Fluctuates with climatic conditions on land surface, and with aquifer discharge and recharge rates.

Sanitary well seal: A manufactured device installed at the top of a well casing which creates an air- and watertight seal to prevent surface water and contaminants from gaining access to the groundwater supply.

Worksheet 1

Drinking Water Well Condition: Assessing Drinking Water Contamination Risk

1. Use a pencil. You may want to make changes.
2. For each category listed on the left that is appropriate to your farmstead, read across to the right and circle the statement that **best** describes conditions on your farmstead. (Skip and leave blank any categories that don't apply.)
3. Look above the description you circled to find your "rank number" (4, 3, 2 or 1) and enter that number in the blank under "your rank."
4. Directions on overall scoring appear at the end of the worksheet.
5. Allow about 15-30 minutes to complete the worksheet and figure out your risk ranking for well management practices.

	LOW RISK (rank 4)	LOW-MOD RISK (rank 3)	MOD-HIGH RISK (rank 2)	HIGH RISK (rank 1)	YOUR RANK
LOCATION					
1. **Position of drinking water well in relation to pollution sources**	Upslope from all pollution sources. No surface water runoff reaches well. Surface water diverted from well.	Upslope from or at grade with pollution sources. No surface water runoff reaches well.	Downslope from most pollution sources. Some surface water runoff may reach well.	Located in low area, depression or drainage way. Surface water runoff from livestock lot, chemical mixing area, fuel storage or farm dump reaches well.	____
2. **Separation distances between well and farmstead contamination sources***	400 feet or more separation distance from all potential contamination sources.	200 to 400 feet separation distance from potential contamination sources.	Less than 200 feet from all potential contamination sources but meets required minimum separation distance of 50 feet .	***Less than 50 feet to any potential contamination sources.****	____
3. **Soil and/or sub-surface potential to protect groundwater**	Fine-textured soils (clay loams, silty clay). Water table or fractured bedrock deeper than 50 feet.	Medium-textured soils (silt loam, loam). Water table or fractured bedrock deeper than 50 feet.	Medium- or coarse-textured soils with water table or fractured bedrock deeper than 20 feet.	Medium- or coarse-textured soils with water table or fractured bedrock shallower than 20 feet.	____

Boldface type: Besides representing a higher-risk choice, this practice also violates Kansas law.

*See page 2 of Fact Sheet 1, *Improving Drinking Water Well Condition*.

**Illegal for new well construction. Existing wells must meet separation requirements in effect at time of construction.

	LOW RISK (rank 4)	LOW-MOD RISK (rank 3)	MOD-HIGH RISK (rank 2)	HIGH RISK (rank 1)	YOUR RANK
CONDITION*					
4. Condition of casing, sanitary seal and pitless adapter	No holes or cracks in casing. A KDHE approved seal tightly secured. Screened vent. Pitless adapter in place.	No defects visible. Approved seal tightly secured. Well vented but not screened.	No holes or cracks visible. Seal loose.	Holes or cracks visible. ***Seal missing or loose. No pitless adapter.*** Can hear water running.	____
5. Casing depth and grout seal	Casing extends below water level in well and more than 20 feet below surface. At least 20 feet of grout seal is in place, or to confining layer or water table if less than 20 feet.**	Casing extends to water level, but not less than 20 feet below surface. Required 20-foot grout seal is in place.**	Casing extends to water level. ***Grout seal missing or less than required depth.****	***Casing does not extend to water level in well. No grout seal.****	____
6. Casing height above land surface	More than 12 inches above grade. No flood water reaches well.	12 inches above grade. Possibility of flood water reaching well.	***Less than 12 inches above grade.*** Possibility of flood water reaching well.	***Below grade or in pit or basement.*** Likely to flood.	____
7. Well age	Developed since 1975 following Kansas well regulations.	Developed before 1975 and up to 50 years old.	51–70 years old.	More than 70 years old.	____
8. Well type	_____	Drilled	Driven-point (sand point)	Dug well	____

Boldface type: Besides representing a higher-risk choice, this practice also violates Kansas law.

*See page 3 of Fact Sheet 1 for construction requirements of the Kansas well regulations.

**A 20 foot grout seal is required for all new well installations. Existing wells must meet requirements in effect at time of construction. Placement of a grout seal in all wells is highly recommended.

	LOW RISK (rank 4)	LOW-MOD RISK (rank 3)	MOD-HIGH RISK (rank 2)	HIGH RISK (rank 1)	YOUR RANK
MANAGEMENT					
9. Backflow prevention	Anti-backflow devices installed on all faucets with hose connections. No cross-connections between water supplies. Six-inch air gap maintained.	Anti-backflow devices installed on all faucets with hose connections. Hose may be placed in tank.	No anti-backflow devices. Air gap maintained most times, but hose may be placed in tank.	No anti-backflow devices. Air gap not maintained. Cross-connections between water supplies.	____
Abandoned well	No abandoned, unsealed wells.	Abandoned wells plugged and protected according to Kansas specifications.	***Abandoned well, more than 200 feet from drinking water well, not plugged or plugged improperly.***	***Abandoned well, less than 200 feet from drinking water well, not plugged or plugged improperly.***	____
Water testing	Regular (at least annual) testing. Records indicate consistent, satisfactory water quality. Bacteria, nitrate and other tests meet standards.	Regular testing. Records indicate increased levels of bacteria, nitrate and other contaminants, but still meet standards.	Regular testing. Bacteria, nitrate and other tests do not meet standards some of the time but are closely monitored.	No water tests done or tests indicate bacteria, nitrate or other contaminant levels frequently above standards. Noticeable changes in color, clarity, odor or taste after rainstorms or during spring melt.	____

Boldface type: Besides representing a higher-risk choice, this practice also violates Kansas law.

TOTAL ☐

Use this total to calculate risk ranking on back page of worksheet.

What do I do with these rankings?

Step 1: Begin by determining your overall well management risk rank. Total the rankings for the categories you completed and divide by the number of categories you ranked:

_____ divided by _____ equals [ ]*
total of rankings; # of categories ranked; risk rank

*Carry your answer out to one decimal place.

3.6–4=low risk 2.6–3.5=low to moderate risk 1.6–2.5=moderate to high risk 1–1.5=high risk

This rank gives you an idea of how your well management practices **as a whole** might be affecting your drinking water. It should serve only as a **very general guide, not a precise diagnosis.** Because it represents an **average** of many individual rankings, it can mask any **individual** rank (such as 1's or 2's) that should be of concern (see Step 2).

Enter your boxed well management risk rank on page 1 of Worksheet 9. Later you will compare this risk rank with other farmstead management rankings. Worksheet 8 will help you identify your farmstead's site conditions (soil type, soil depth and bedrock characteristics), and Worksheet 9 will show you how these site conditions affect your risk rankings.

Step 2: Look over your rankings for individual activities:

- **Low-risk** practices (4's)—ideal; should be your goal despite cost and effort
- **Low-to-moderate-risk** practices (3's)—provide reasonable groundwater protection
- **Moderate-to-high-risk** practices (2's)—inadequate protection in many circumstances
- **High-risk** practices (1's)—inadequate; pose a high risk of polluting groundwater

Regardless of your overall risk rank, any individual rankings of "1" require immediate attention. Some concerns you can take care of right away; others could be major—or costly—projects, requiring planning and prioritizing before you take action.

Find any activities that you identified as 1's and list them under "High-Risk Activities" on pages 6-7 of Worksheet 9.

Step 3: Read Fact Sheet 1, *Improving Drinking Water Well Condition*, if you haven't already. Consider how you might modify your farmstead practices to better protect your drinking water.

FARM•A•SYST
Farmstead Assessment System

The Farmstead Assessment System is a cooperative project of the Cooperative Extension Service, Kansas State University, and the Kansas Department of Health and Environment.

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This material is based upon work supported by the U.S. Department of Agriculture, Extension Service, under special project number 91-EWQI-1-9293.

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

EP-42 August 1998