Kansas Department of Health and Environment
Bureau of Environmental Field Services
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Recommended Water Tests for Private Wells
Technical Guidance Document WMS 20-871

This publication is provided to help users understand important factors and make critical decisions about when to test and which water tests to request, and to help improve management of private water supplies.

As an individual water system owner, it is your responsibility to make sure your water is safe to drink. Routine testing is the only reliable way to find pollutants and evaluate the safety of your water, and is necessary to determine the need for treatment.

Testing your private water supply is necessary to:

- ensure water is safe to drink (meets drinking water standards),
- evaluate the need for water treatment and
- form a baseline of water quality for comparison.

The most important factors for safe water are good well location and construction that follows current standards. The management of activities near the well and annual maintenance, including disinfection, are also critically important. If well location, construction or maintenance are deficient, they should be corrected before testing the water. Seven percent of Kansans depend on privately owned wells for their water supplies. System integrity, water quality and well protection are the owner's responsibility. Some county sanitary codes require water tests for private systems, but currently there are no state or federal requirements. Lending institutions may require water tests and evaluation of the water system before approving a real estate loan.

Ensuring Safe Drinking Water

Groundwater is the source of drinking water for 70% of Kansas residents overall, and 85% in rural areas. Groundwater is usually quite safe but well water can become contaminated as a result of poor well location and construction, lack of maintenance, and poor management. Human activities can also overload the soil's natural filtering, absorption and removal capacity. Contaminants such as sewage, fuel, wastes, pesticides and fertilizer can be found in groundwater.

Health effects from contaminated water can be acute (an immediate response, occurring within hours or days), or chronic (a long-term response from low-level exposure over many years). The highest priority is to ensure water is free of disease-causing organisms and pollutants that immediately affect body functions and health. Establishing a baseline over several years is important for critical decisions about water quality and safety.

Recommended Tests and Frequency

The Kansas Department of Health and Environment (KDHE) recommends water be tested for coliform bacteria and nitrates at least once a year. Common impurities and nuisance contaminants change slowly except in the case of chemical spills or flooding that may cause contamination. For most other contaminants, a test every one to three years is adequate and forms a baseline for detecting changes that indicate possible contamination.

Total Coliform Bacteria

An annual water test for total coliform bacteria is highly important to evaluate the safety of drinking water. Coliform bacteria are common and most strains do not cause disease. However, their presence indicates the well may be contaminated by sewage or animal wastes, which could introduce disease-causing bacteria, viruses and cysts. Special or more frequent testing for bacteria is needed when there is:

- flooding of the well or near the well;
- change in color, turbidity, odor or taste of water;
- recurring digestive illness in people or animals; or
- recent repair of well or plumbing system.

Emergency disinfection of water for drinking and food preparation can be done by vigorously boiling water for one minute. Contact your county environmental health professional or licensed water well contractor for recommended procedures to disinfect the well. See the latest copy of KDHE's publication, *Well Disinfection: Chlorination for Private Wells*.

Fecal Coliform or E. coli Bacteria

A test for fecal coliform is recommended any time total coliform bacteria are present. Fecal coliform bacteria live in the intestines of warm-blooded animals and are

included in the total coliform test. Finding fecal coliform could mean there is contamination from a human or animal fecal source. *E. coli* (*Escherichia coli)* is the most common strain of fecal coliform and is a known pathogen. If any fecal coliform is present, water must not be used for drinking, cooking or washing without disinfection.

Nitrates

An annual test for nitrate is the second most important test for safe water. A recent study by Kansas State University comparing nitrate levels from wells in 1970s and 1980s to those of the same wells in 2016 showed higher levels of nitrate. In warm-blooded animals, high nitrate concentrations can reduce the blood's ability to carry oxygen. In extreme cases, nitrate causes methemoglobinemia (infant cyanosis, or "blue baby" syndrome) in human and animal infants, which can be fatal. Elevated nitrate levels can affect adult horses and ruminant animals, and can interfere with livestock milk production, weight gain or reproduction before other symptoms are observed. Nitrate tests are especially important when livestock facilities, fertilizer storage or handling, or a septic system are or have been located within 400 feet of the well.

Pesticides and Other Organic Chemicals

A test for pesticides is recommended when nitrate is above the MCL and when pesticides have been stored, mixed, handled or disposed within 400 feet of the well. A test should also be done when there is a large source, such as a spill or accident, or if a commercial storage, or handling and mixing site, are within a quarter mile, especially upslope, of a well. Pesticides can be found in surface water, such as large reservoirs and rivers.

Tests for pesticides and other organic chemicals are expensive, and interpretation of results and health effects may be difficult and uncertain; however wells located close to production agriculture fields have the potential to be impacted by these chemicals.

Lead and Copper

A test for lead, copper or both is recommended when plumbing contains lead or copper pipes or fittings, and the water has corrosive properties (e.g. soft water or water with low pH), or there is evidence of corrosion. The action level (AL) of 0.015 mg/L for lead and 1.3 mg/L for copper. Groundwater at its source does not normally contain significant levels of lead or other toxic metals. However, water with corrosive properties delivered through lead or copper plumbing can result in elevated levels of these metals.

Nuisance Contaminants

The most common water quality problems are nuisances that make water less desirable for household use but do not directly affect health. Standards are designated "secondary" when there is no direct health concern for the general population. These include chloride, iron, manganese, sulfate, total dissolved solids (TDS) and zinc. Some laboratories have a drinking water suitability test that includes the most common nuisance impurities. KDHE recommends these chemicals be tested every one to three years, as discussed above.

Testing helps identify the problem, evaluate the need for treatment and size treatment equipment. Dealers usually do free tests for nuisance impurities to help select and size treatment equipment. The following are common nuisance contaminants that make water less desirable:

- **Acidic (low) or basic (high) pH** may cause corrosion that contributes to health concerns and staining of plumbing fixtures when some metals are corroded. The pH adjustment is simple with treatment.
- **Hardness** is a common nuisance problem in Kansas groundwater. It causes difficulty with cleaning and laundry, deposits in water heaters and shortened life of water-using appliances. Water softening treatments are readily available.
- **Hydrogen sulfide** gives water a disagreeable "rotten egg" or sulfur odor. A sensitive nose is a highly effective test. Periodic disinfection of the well is a highly effective treatment.
- **Iron and manganese** contribute to permanent black or red stains on water fixtures and laundry. Special iron filters are effective.
- **TDS/salts** are the sum of all impurities dissolved in water that give it the characteristics. At low levels they are a benefit because they give water its taste.

Showing Contamination

Activities of businesses and people may damage the quality of well and groundwater. Water tests before pollution begins, or in its early stages, are helpful in showing damage to the supply. Some activities that may affect groundwater quality and tests that may help show a cause are shown in Table 1. Additionally, KDHE Environmental Interest Finder, which can be found at maps.kdhe.state.ks.us/keif/, can provide guidance on nearby known contaminated sites as well as the probable contaminants of concern.

How to Take a Water Sample

Instructions for collecting a water sample usually accompany the sample container from the laboratory. Use the container provided and follow directions to ensure a representative sample. Before taking a sample, check whether there is a limit on time to deliver it to the laboratory — many tests require the sample be delivered within 24 hours of collection. Samples should always be taken from cold, unsoftened and untreated water. Select a faucet regularly used. Remove the aerator and allow the water to run several minutes. For lead tests, sample the first flush after water has remained in the system overnight. A private well sampling demonstration video on how to take a water sample is available at kdheks.gov/wellwateraware/water_well_testing.htm.

Where to Get Water Tested

Your local environmental health professional may offer sample kits or screening tests. Alternatively, well owners can find the nearest certified laboratory at http://www.kdheks.gov/envlab/KS_certified_laboratories.htm. Water treatment dealers often provide tests for nuisance problems; however, using a laboratory certified by KDHE is recommended. Multiple laboratories in Kansas and nationwide are accredited by KDHE and certified for drinking water testing. See the latest copy of KDHE's publication, *Testing to Help Ensure Safe Drinking Water* for laboratory information.

Interpreting a Laboratory Test Report

A water test report may look confusing. It often contains unfamiliar terms and abbreviations. The laboratory may not provide information about the MCL. Well owners can receive assistance interpreting the results by contacting the local health or public works department, the K-State Research and Extension office or the laboratory that provided testing. See KDHE's publication, *Understanding Your Water Test Report*, for more information on water test reports, MCLs and possible sources of contaminants and health risks.

Table 1. Common activities, causes of contamination and suggested test parameters.

Activities	Possible Causes	Parameters to Test
Cleanup of bulk storage facilities	Leaks, spills and disposal	Material(s) being stored or that has been stored
Mining: salt, coal, lead, zinc, and other metals and minerals	Mine drainage, leaks, spills, storage areas, subsidence areas, mined lands, tailings or spoil piles	Total dissolved solids (TDS), chloride, sodium, pH, heavy metals, corrosion index and sulfates
Oil and gas: test holes, old wells, abandoned wells, storage, brine disposal, etc.	Leaks, failed casings, poor plugging, unplugged test holes or abandoned wells, or spills	TDS, sodium, chloride, hydrocarbons, volatile organic compounds (VOCs) and petroleum components
Landfills and waste disposal sites	Percolation from site, spills and pollutant plume in groundwater	Chemical oxygen demand (COD), total organic carbon (TOC), ammonia, dissolved oxygen (DO), VOCs, heavy metals and synthetic organic compounds (SOCs)
Wastewater: lagoons, septic systems, sludge, septage disposal, etc.	Leaks, spills, overloading or poor maintenance	Total and fecal coliform bacteria, fecal streptococcus, nitrates, ammonia, TDS, TOC, chlorides and sodium
Livestock facilities	Accumulation of waste, improper storage or disposal of wastes, or runoff of wastewater	Total and fecal coliform bacteria, biochemical oxygen demand (BOD),ammonia, nitrate, phosphorus, TOC, COD and TDS
Industrial sites	Leaks, disposal, failures, poor management or spills	VOCs and SOCs of chemicals used, produced or stored on the site; process chemicals
Water wells for household, domestic or livestock uses	Wells with poor location, construction, maintenance or management	Total and fecal coliform bacteria, and nitrates