Vermillion – Community Focused Private Well Sampling

The purpose of community focused sampling is to provide all county residents using a private well for drinking water a chance to test their well water for common contaminants. This report contains a summary of the results from private wells located in the Vermillion area in Dakota County, Minnesota for 2020, 2021 and 2025. Water samples were tested for the presence of geologically derived contaminants manganese and arsenic, as well as human-related contaminants lead, chloride, and nitrate.

Study Approach

Dakota County offered free water testing to 471 private well owners in Vermillion Township and the City of Vermillion in 2020, 2021, and 2025. A total of 129 well owners participated (27%), and there were 25 households that participated in multiple years. For participants that sampled in multiple years, only the most recent result was used in the summary. Participants collected two water samples: one from an untreated outdoor spigot and one from their primary drinking water tap. All outside samples were tested for manganese, arsenic, nitrate, coliform bacteria, and chloride. All indoor samples were tested for lead, and nitrate, manganese, arsenic, and nitrate, if they showed elevated levels of those contaminants in the outdoor sample.

Chemical	# of Well Samples	# of Detects	Drinking Water Guideline (DWG)	# of Samples above DWG	Mean (Average) Result	Maximum Result
Outside Arsenic µg/L	129	34	10 µg/L – No safe amount	0	0.29	3.88
Outside Chloride mg/L	129	85	250 mg/L	0	11.63	107
Outside Manganese (Infants 12 months and younger) µg/L	129	76	100 µg/L	12	44.71	992
Outside Manganese (All Others) µg/L	129	76	300 µg/L	5	44.71	992
Outside Nitrate mg/L	129	83	10 mg/L	52	7.49	27
Coliform Bacteria (2025 only)	61	7	Absent	7	-	-
Inside Arsenic µg/L	40	21	10 µg/L – No safe amount	0	0.45	2.43
Inside Lead µg/L	129	39	15 µg/L – No safe amount	2	0.81	29.9
Inside Manganese (Infant < 1yr) µg/L	13	9	100 µg/L	4	106.91	483
Inside Manganese (All Others) µg/L	13	9	300 µg/L	2	106.91	483
Inside Nitrate mg/L	73	71	10 mg/L	33	9.63	27.1

mg/L milligrams of chemical per liter of water equivalent to parts per million (ppm)
µg/L micrograms of chemical per liter of water equivalent to parts per billion (ppb)
< less than (result is below the level that the laboratory can report)
Absent means no coliform bacteria were detected in your water sample

Arsenic

Arsenic occurs naturally in some rocks and soils and dissolves into groundwater. Long-term exposure to arsenic in drinking water can increase the risk of several types of cancer and may contribute to heart, lung, skin, and developmental health problems in children. The drinking water standard for arsenic is 10 µg/L, but the U.S. Environmental Protection Agency's health goal is 0 µg/L because any level of arsenic exposure may increase cancer risk over time.

Results and findings

- Arsenic was detected in 26% of outdoor samples (34 wells) and 52% of indoor samples (21 of 40 inside samples). None of the indoor samples exceeded the drinking water guideline of 10 µg/L.
- Arsenic is correlated with manganese, which means when one is present the other is likely present.
- There is no relationship between well depth and the presence of arsenic.

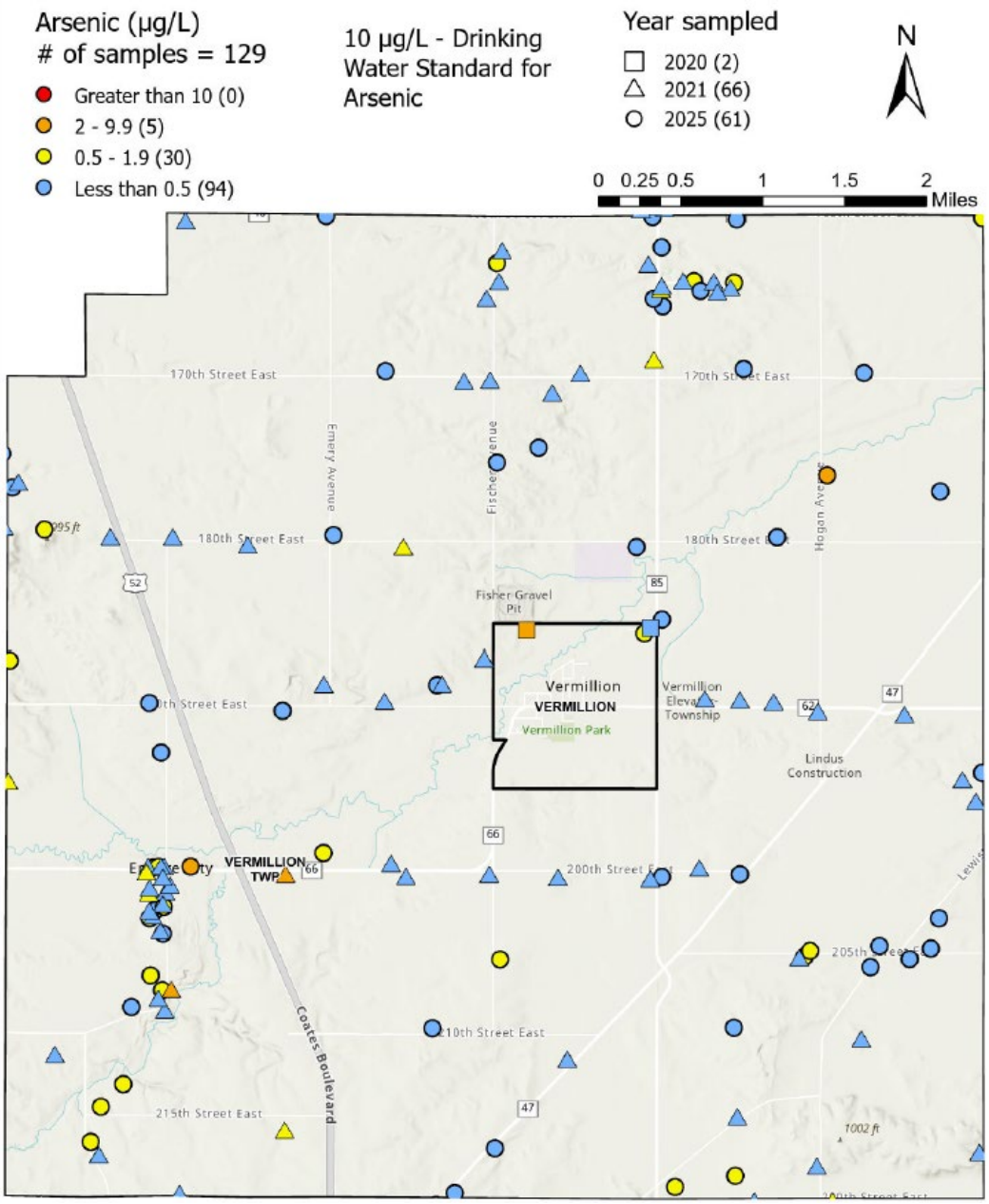

Fig 1. Arsenic results in untreated wells in outside spigots.

Manganese

Manganese occurs naturally in rocks and soil and dissolves into groundwater. While manganese is an essential nutrient that people normally get from food, drinking water with elevated manganese over long periods may affect memory, attention, and motor skills. Infants are especially sensitive to manganese exposure. The Minnesota Department of Health recommends manganese levels in drinking water remain below 100 µg/L for infants 12 months or younger and below 300 µg/L for everyone older than 12 months. Manganese can also cause a metallic taste and stain plumbing fixtures at levels above 50 µg/L.

Results and findings

- Manganese was found in 65% (85 wells) of the outside samples and in 69% of inside samples (9 of 13 inside samples).
- In outdoor samples, manganese exceeded the health guideline of 100 µg/L for infants under 1 year of age in 12 wells. Five of the wells also exceeded the guideline of 300 µg/L for older children and adults.
- In indoor samples, 4 wells exceeded the lower health guideline of 100 µg/L, and 2 exceeded the upper guideline of 300 µg/L.
- Manganese is correlated with arsenic, which means when one is present the other is likely present.
- There is no relationship between well depth and the presence of manganese.

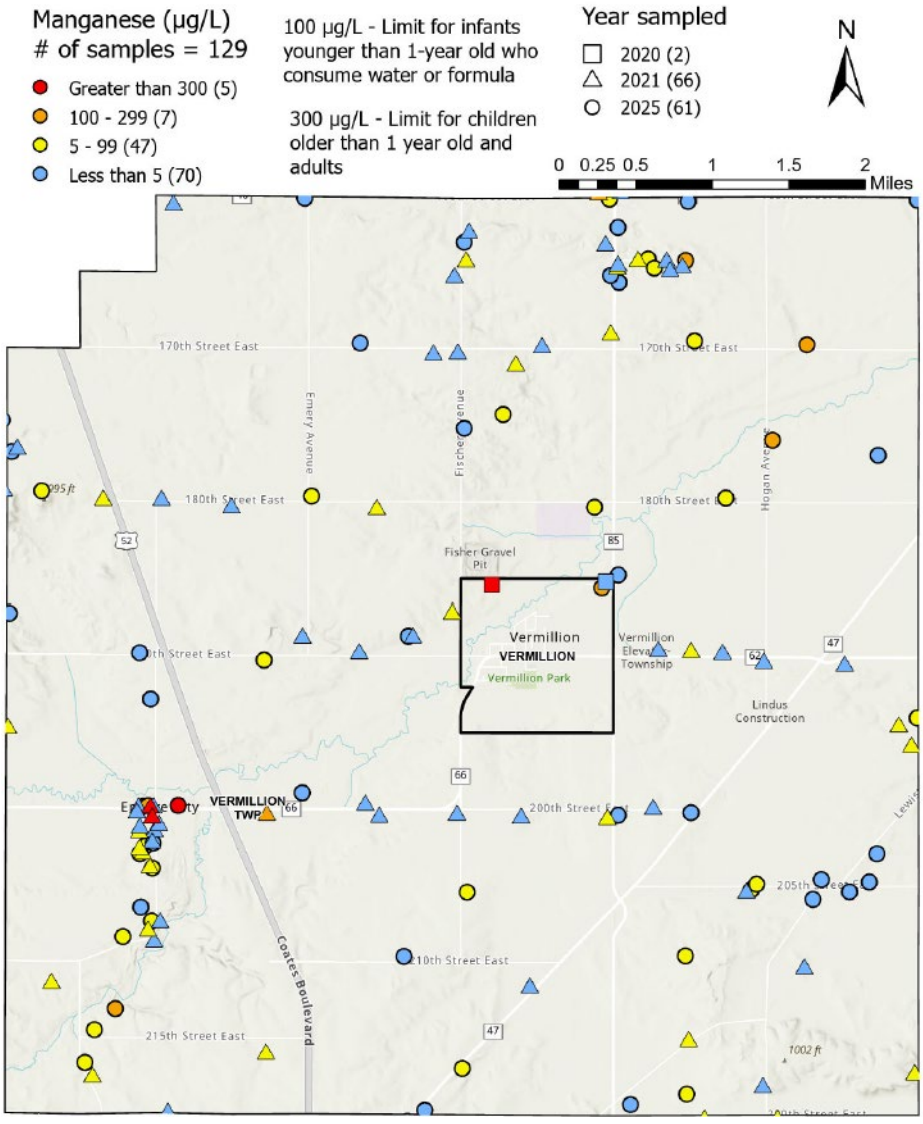

Figure 2. Manganese results in untreated water from outside spigot

Nitrate

Nitrate is naturally present in groundwater at very low levels, but higher concentrations are typically linked to human activities such as fertilizer use, septic systems, and animal feedlots. In Dakota County, agricultural fertilizer is the primary source of nitrate contamination in groundwater. Drinking water with nitrate levels above 10 mg/L can be harmful to infants and may cause methemoglobinemia ("blue baby syndrome"), a serious condition that reduces the blood's ability to carry oxygen. Testing well water for nitrate is especially important before using it for infant drinking water and formula. Nitrate in groundwater may also indicate the presence of agricultural chemicals such as herbicides. Reverse osmosis (RO) treatment systems can reduce both nitrate and many herbicides, which carbon filters can reduce some herbicides.

Results and findings

- Nitrate was detected in 64% of outdoor samples (83 wells) and 97% of indoor samples (71 of 73 inside samples). 45% of the indoor samples exceeded the drinking water guideline of 10 mg/L (33 inside samples).
- Of the 25 well owners that participated in both years, 3 wells saw a decrease in concentration and 3 wells saw an increase.
- Nitrate is correlated with chloride, which means when one is present the other is likely present.
- Nitrate concentrations are higher in shallow wells and decrease as well depth increases.

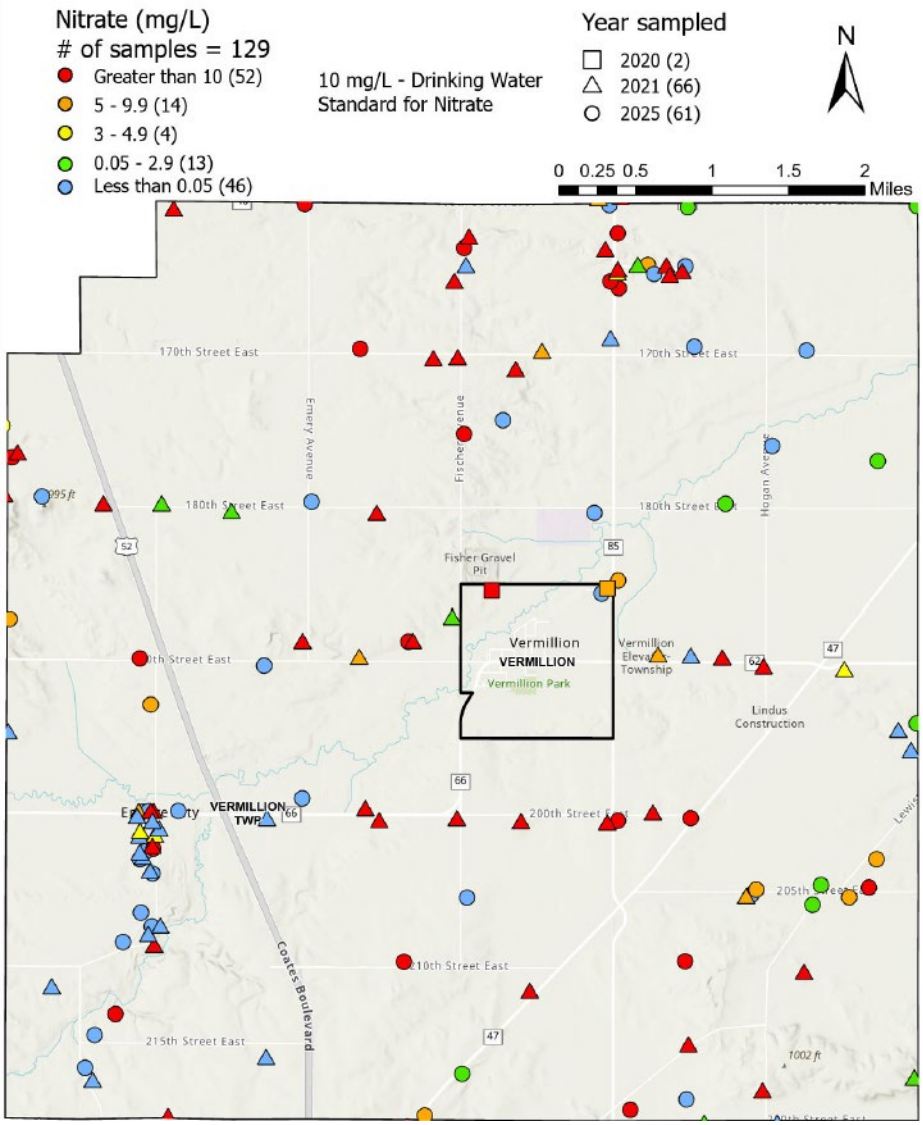

Figure 3. Nitrate results in untreated water from outside spigot

Chloride

Chloride occurs naturally in groundwater at very low levels. Elevated chloride levels are usually caused by human activities such as road salt use, fertilizer application, water softener discharge, or deicing salt applied to sidewalks and parking lots. While there is no health-based drinking water standard for chloride, the U.S. Environmental Protection Agency recommends levels below 250 mg/L to prevent a salty taste. High chloride levels may also increase the likelihood of metals, such as lead, leaching from plumbing materials into drinking water. The presence of chloride in well water can indicate that a well is vulnerable to contamination from activities at the land surface.

Results and findings

- Chloride was found in 65% of the outside samples (85 wells), no wells exceeded the guideline of 250 mg/L.
- Chloride is correlated with nitrate, which means when one is present the other is likely present.
- Chloride concentrations are higher in shallow wells and decrease as well depth increases.

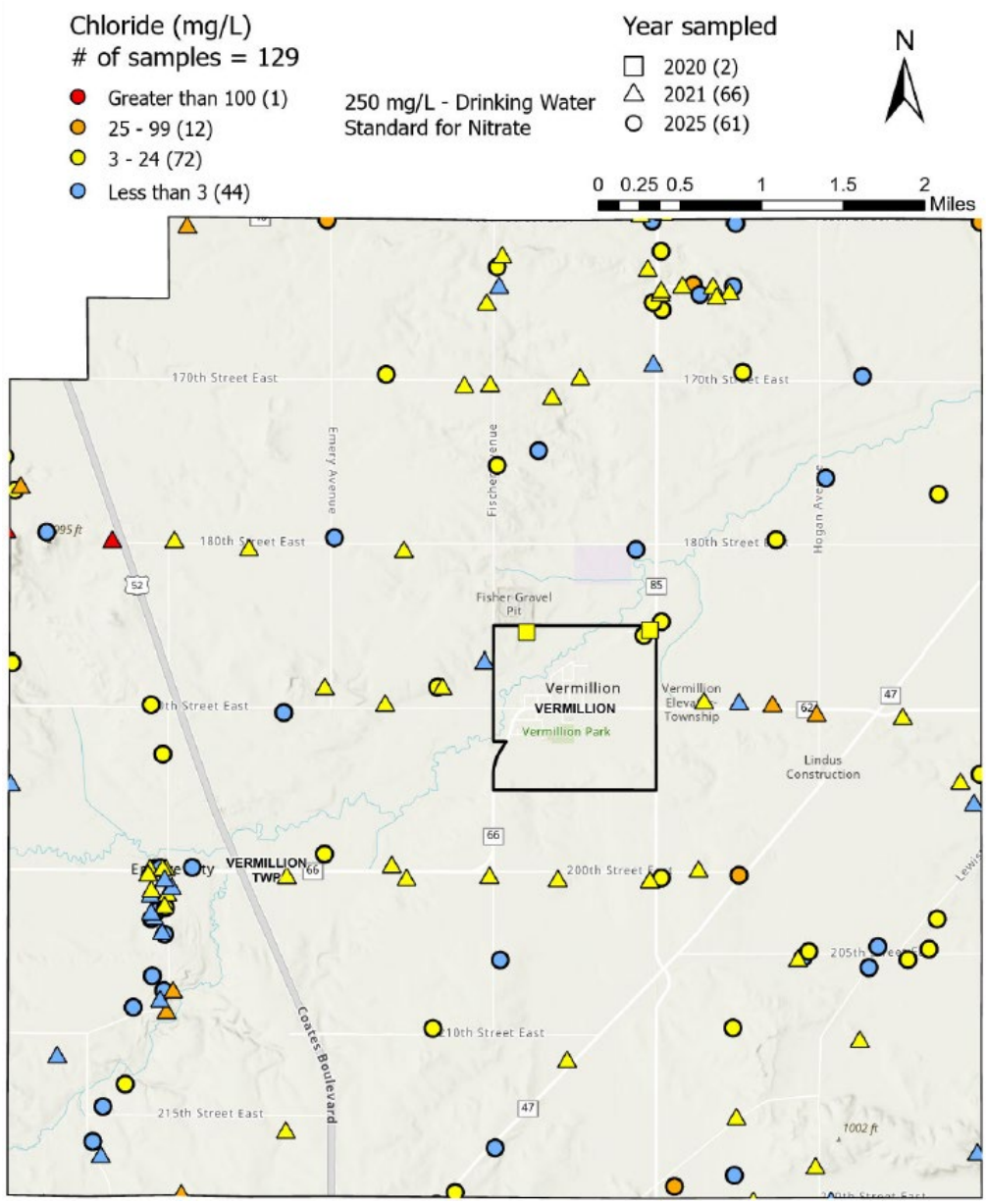

Figure 4. Chloride results in untreated water from outside spigot

Lead

Lead is rarely found naturally in groundwater but can enter drinking water through household plumbing materials, including pipes, solder, faucets, fittings, and valves. Exposure to lead can harm the brain, nervous system, kidneys, and blood cells, and may affect learning, behavior, and development in children. Pregnant women, infants, and young children are especially vulnerable to the effects of lead. The U.S. Environmental Protection Agency action level for lead is 15 µg/L; however, no level of lead exposure is considered completely safe. Although federal regulations have greatly reduced the amount of lead allowed in plumbing products, even newer fixtures labeled as “lead-free” may still contain small amounts of lead.

Results and findings

- All samples collected from the inside primary drinking water tap were tested for lead. Lead was detected in 30% of the samples (39 wells). Two samples exceeded 15 µg/L, the drinking water guideline for lead; however, no amount of lead is safe to drink. When purchasing a water treatment device look for one that is certified to reduce lead.

Coliform Bacteria

Total coliform bacteria are generally not harmful themselves, but their presence in well water can indicate that surface contamination has entered the well and that disease-causing microorganisms may also be present. Because testing for every possible pathogen is impractical, total coliform bacteria are used as an indicator of well and water system sanitary protection. These bacteria are commonly found in soil and on the ground surface but are not typically found deep underground. All samples were also tested for *E. coli*, a type of coliform bacteria that can cause illness. Disinfection is effective at eliminating both coliform bacteria and many disease-causing microorganisms.

Results and findings

- All samples collected from the outside spigot were tested for coliform bacteria in 2025. Coliform bacteria was detected in 11% (7 of 61) of the samples. No samples with coliform bacteria present had E.coli bacteria detected.

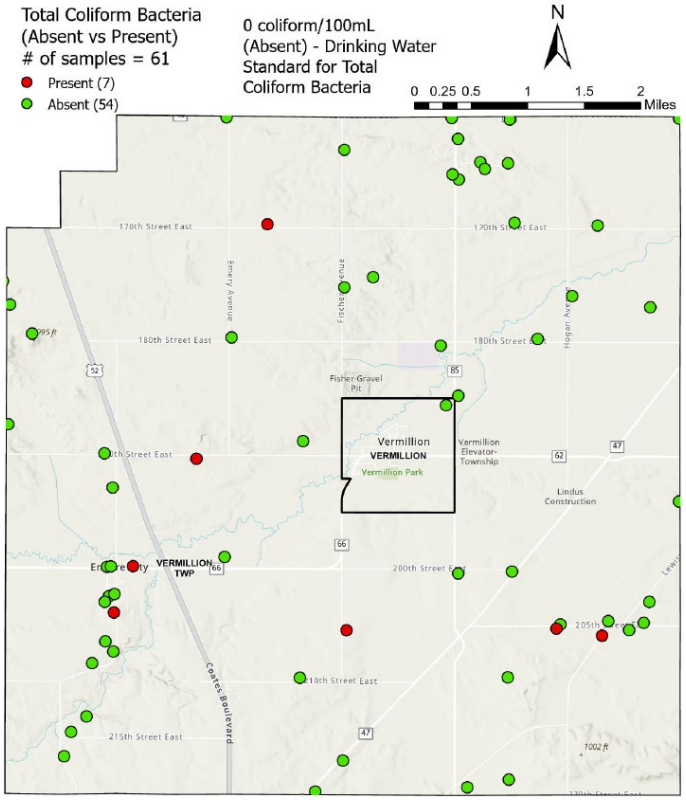

Figure 5. Coliform bacteria results in untreated water from outside spigot

If drinking water has elevated levels of chemicals, do the following:

- ✓ Prepare infant formula with bottled water.
- ✓ **Do not boil** drinking water. Boiling water may concentrate contaminants, but it is effective at killing bacteria.
- ✓ **Identify** and, if possible, **remove** sources of contamination near the well. Fertilizers, animal wastes and sewage systems should be located far from the well and managed to avoid contamination. The top of the well should be at least 12 inches above the surrounding dirt or landscaping.
- ✓ **Install** a NSF, UL, or WQA certified water treatment system and **maintain** it annually. No single treatment process can remove all substances in water. If there are several substances you want removed from your water, you may need to combine treatment processes. The MN Dept. of Health website has information on water treatment at http://www.health.state.mn.us search water treatment.
- ✓ **Continue sampling**. Test your drinking water after you install treatment because there is often no other way to know if a treatment system is working properly. To test for common chemicals of concern, you can have a water test kit mailed to you by requesting one online at www.co.dakota.mn.us search well testing.
- ✓ A **Coliform Bacteria** test is recommended annually for private wells.

We can help

- Dakota County may have a copy of your original well record on file if the well was drilled after 1975. The well record can tell you the aquifer your well is tapping and assist a well contractor who may do future work on your well. To request your well record, go to: www.co.dakota.mn.us, Search Well Information
- If you choose to install a new well and will no longer be using your existing well, the old well will need to be sealed by a MN licensed well contractor. Dakota County may have grant funds available (usually 50% of the cost to seal the well). The application is located at: www.co.dakota.mn.us, Search Well Sealing Grant.

Further testing

Request a sample kit online from Dakota County at www.co.dakota.mn.us, Search: *Water Test*. Available tests include Coliform Bacteria, Nitrate, Arsenic, Manganese, Lead, and Fluoride.

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