



2019 GREENVALE TOWNSHIP PRIVATE WELL STUDY FACT SHEET

Physical Development Division
Environmental Resources Dept.
Groundwater Protection Unit

Dakota County
Western Service Center
14955 Galaxie Ave.
Apple Valley, MN 55124

Phone: 952-891-7000
E-mail: groundwater@co.dakota.mn.us



The water testing
was funded by
Dakota County.

WHY WERE WELLS TESTED?

The purpose of this study was to evaluate the drinking water quality in Greenvale Township, Dakota County. Water samples were tested for the presence of naturally occurring manganese and arsenic, as well as human-caused chloride and nitrate. Previous sampling of private wells in Greenvale found that manganese is widely present at levels exceeding drinking water standards. Arsenic and nitrate were also detected, although most were below drinking water standards.

This study builds upon previous water quality studies to determine where drinking water contaminants exceed standards in Greenvale Township, and what water treatment devices are effective at removing these contaminants.

STUDY APPROACH

The County mailed sample bottles to all 278 private well owners in Greenvale. Eighty-nine well owners (32%) participated. Residents were asked to collect a water sample from both an outside untreated spigot and an inside primary drinking water tap. All outside samples were tested for manganese, arsenic, nitrate, and chloride. If the outside sample result exceeded 3.0 milligrams per liter (mg/L) for nitrate, 0.05 micrograms per liter (µg/L) for arsenic, or 0.090 mg/L for manganese, then the sample collected from the inside tap was tested for that chemical parameter. In addition, all inside tap samples were analyzed for lead. A hardness test strip was provided as part of the sampling kit for well owners to test and report when submitting samples. Wells were not tested for coliform bacteria in this study.

SUMMARY OF WATER TEST RESULTS:

	Parameter (units)	# of Samples	Drinking Water Standard	% above Drinking Water Standard	Mean (Average)	Min	Max
Outside Sample	Arsenic (µg/L)	89	10 µg/L No amount is safe	3%	2.9	< 0.5	50.1
	Chloride (mg/L)	89	NA	NA	11.66	< 3	110
	Manganese* (mg/L)	89	0.100 mg/L infant < 1yr	63%	0.226	< 0.005	1.020
				0.300 mg/L (All Others)			
	Nitrate (mg/L)	89	10 mg/L	4%	1.14	< 0.05	22
Hardness (mg/L)	89	NA	NA	389.7	0	425	
Inside Sample	Arsenic (µg/L)	59	10 µg/L No amount is safe	2%	1.84	< 0.5	16.70
	Lead (µg/L)	87	15 µg/L No amount is safe	0%	0.68	< 0.5	5.42
	Manganese (mg/L)	57	0.100 mg/L (Infant < 1 yr.)	22%	0.09	< 0.005	0.770
				0.300 mg/L (All Others)			
	Nitrate (mg/L)	8	10 mg/L	50%	10.03	1.10	21
Hardness (mg/L)	83	NA	NA	137	0	425	

mg/L - milligrams of chemical per liter of water or parts per million (ppm)
µg/L - micrograms of chemical per liter of water or parts per billion (ppb)
NA - not applicable
< - Less than (result is below the level that the laboratory can detect)

CHEMICAL CONTAMINANT INFORMATION AND SIGNIFICANT FINDINGS:

Arsenic: occurs naturally in rocks and soil and dissolves into groundwater. Arsenic in drinking water is linked to increased risk of cancers of the bladder, lungs, liver, and other organs. High levels of arsenic in drinking water can also contribute to cardiovascular and respiratory disease, reduced intelligence in children, and skin problems, such as lesions, discoloration, and the development of corns. The drinking water standard for arsenic is 10 µg/L, but the USEPA goal for arsenic in drinking water is 0 µg/L since prolonged exposure to any level of arsenic can increase risks of cancer.

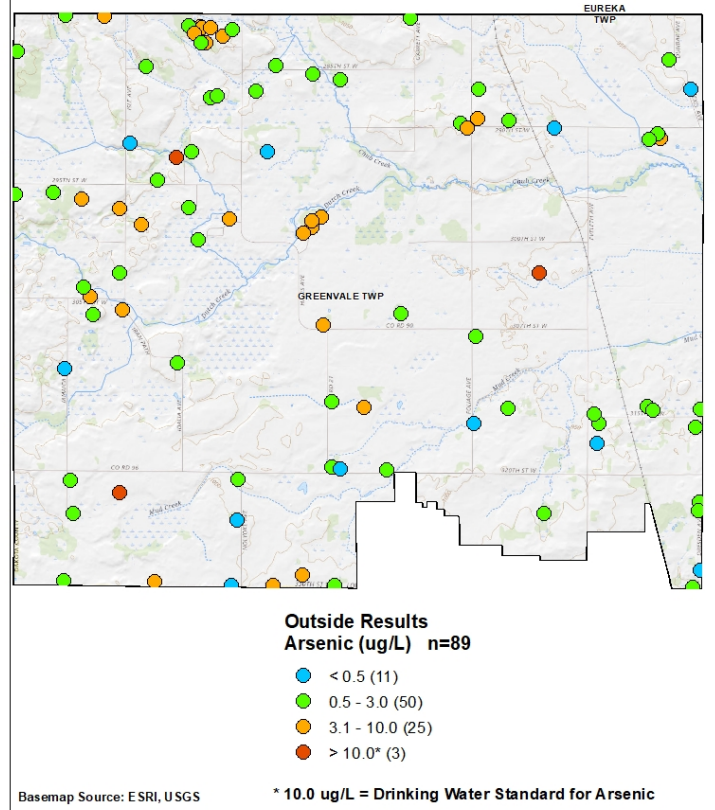
Results:

- Arsenic was found in 67% of the outside samples making it the second most commonly detected chemical parameter analyzed. Three percent (3%) of the sampled wells exceeded the drinking water standard of 10 µg/L.
- Wells located in the western half of the Township tend to have higher concentrations compared to those located on the eastern half.
- Effectiveness of arsenic treatment by Reverse Osmosis (RO) treatment systems was variable. Arsenic was reduced by an average of 56%.

Arsenic exists in different forms and may require specialized treatment systems to remove completely.

No amount of arsenic is safe.

**2019 Private Well Sampling - Greenvale Township
Arsenic Results - Untreated Sample**



Chloride: occurs naturally in the rocks and soil across Dakota County at very low levels. High levels of chloride in groundwater indicate contamination from the application of road salt, water softener brine discharge into septic systems, or deicing salt applied to sidewalks and parking lots. Elevated chloride can potentially leach metals, like lead, from plumbing into the drinking water. There is no health-based guideline for chloride, but the USEPA recommends levels no higher than 250 mg/L to avoid undesirable tastes (salty).

Results:

- Chloride was found in 56% of the outside samples, with the highest levels detected along the major roadways where road salt is applied most heavily.
- There is no health standard for chloride but its detection in well water indicates that the well is vulnerable to surface contamination.
- Chloride levels decrease with increased depth of the well casing.

Further Water Testing

Request water sample bottles from Dakota County by calling (952) 891-7000 or ordering from www.dakotacounty.us Search: *Water Test Kit*.

- Coliform Bacteria**
(Every year) \$18
- Nitrate**
(Every other year) \$18
- Arsenic**
(At least once) \$18
- Lead**
(At least once) \$18
- Manganese**
(At least once) \$18

Lead: rarely occurs naturally in groundwater. Lead can leach into drinking water from lead pipes, lead solder on copper pipes, brass faucets, fittings and valves, including those advertised as lead-free. Brass fixtures, including fixtures that don't have a brass color can contribute lead to drinking water such as chrome plate brass products. The USEPA federal drinking water standard for lead is 15 µg/L, however, there is no safe level of lead. Lead exposure usually has no obvious health symptoms and goes unrecognized. Health concerns include impaired physical and mental development, hearing problems, and damage to the brain, kidneys, red blood cells and nervous system. Pregnant women, infants and children under six years of age are at the highest risk. The federal "Reduction in Lead in Drinking Water Act" (2014) reduced the amount of lead allowed in water systems and plumbing products by changing the definition of "lead free" from 8% lead content to not more than 0.25% lead in drinking water plumbing components.

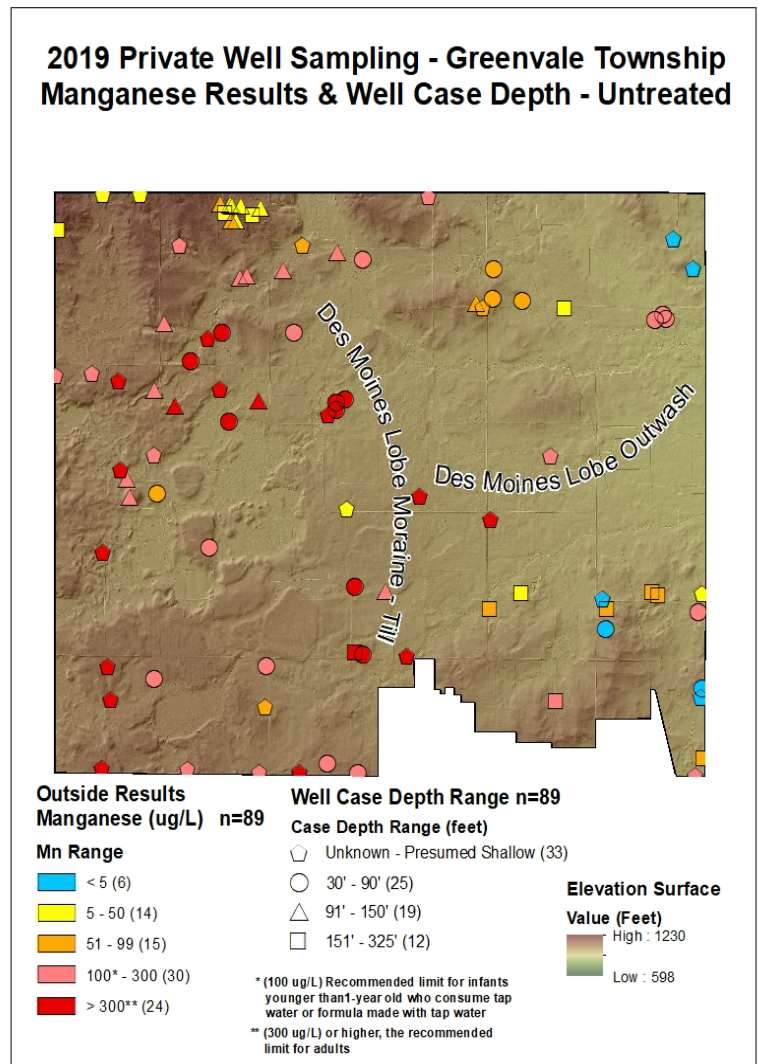
Results:

- All samples collected from the inside primary drinking water tap were tested for lead. Lead was detected in 11% of the samples. None of the samples exceeded 15 ug/L, the drinking water standard for lead; no amount of lead is safe to drink.
- Three of the RO systems did not completely remove lead. When purchasing a water treatment device look for one that is certified to reduce lead.

Manganese: occurs naturally in rocks and soil and dissolves into groundwater. Our bodies need a small amount of manganese to maintain health, and we get enough manganese from the foods we eat. However, research indicates that children and adults that drink water with high levels of manganese for a long time may develop problems with memory, attention and motor skills. Infants are more vulnerable to the effects of manganese. For infants who drink well water or formula made with well water, manganese should not exceed 0.100 mg/L. For everyone else, the level of manganese should not exceed 0.300 mg/L. Non-health related problems (metallic taste and staining plumbing fixtures) may occur above 0.050 mg/L.

Results:

- Manganese is the **most commonly detected chemical parameter in Greenvale Township. It was detected in 93% of the outside untreated samples** and above the health standard of 0.100 mg/L in 22% of the inside taps.
- Although widely detected across the Township, wells located in the western portion, dominated by the moraine feature deposited by the most recent glacial advance, tend to have higher concentrations of manganese as compared with wells located on the eastern half of the township. Heavy clay soils and glacial till on the western portion of the Township are the suspected source of manganese.
- Manganese concentrations were lower in deeper wells. Shallow wells and wells constructed before 1975 have the highest levels.
- Water softeners appeared to be effective at reducing manganese. Seventy-six percent (76%) of the households soften their water. A comparison between outside and inside manganese levels shows that water softening reduced manganese by an average of 97%.

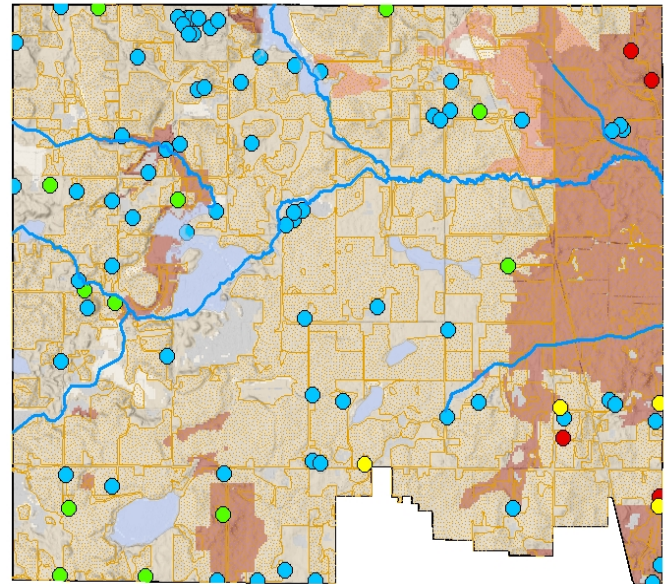


Nitrate: occurs naturally at very low levels. Nitrates in groundwater are usually associated with human activities including row crop agriculture, septic systems, and animal feedlots. In Dakota County, the major source is fertilizer used on agricultural crops that leaches to the drinking water aquifers. A nitrate level above 10 mg/L in drinking water can be harmful to infants under six months old. Infants that consume water or formula mixed with water that is high in nitrate may develop “blue baby syndrome” (methemoglobinemia), a life-threatening condition. Adults may be susceptible to methemoglobinemia if they have certain health conditions. Always test for nitrate before giving water to an infant. There is a significant relationship between the detection and levels of nitrate and herbicides. **The presence of nitrate is a strong indication that herbicides and herbicide breakdown products are also present.** Importantly, both nitrate and herbicides can be reduced by the use of a water treatment device such as RO.

Results:

- Nitrate was found in 24% of the outside samples; 4% exceeded the drinking water standard of 10 mg/L. Nitrate is not widespread in Greenvale Township, but concentrations can change over time.
- Nitrates are higher in the eastern half of the Township where weathered and dissolved limestone, known as karst, and sand and coarse-grained soils are present. Both karst and coarse-grained soils are very porous, which allows surface pollutants to move quickly to the groundwater. Wells constructed in karst are particularly susceptible to contamination.
- Nitrate concentrations are higher in shallow wells and decrease with increasing well casing depth.
- RO treatment systems are effective at reducing nitrate; nitrate was reduced by an average of 82%.

2019 Private Well Sampling - Greenvale Township Nitrate Results - Untreated Pollution Sensitivity & Land Use



**Outside Results
Nitrate (mg/L) n=89**

- < 0.05 (69)
- 0.05 - 3.0 (12)
- 3.1 - 10.0 (4)
- > 10.0 (4)

Pollution Sensitivity & Land Use

- | Sen. Rating | Land Use/Features |
|-------------|----------------------|
| Karst | Cultivated Cropland |
| Water | DNR Public Waterways |
| High | DNR Public Waters |
| Moderate | |
| Low | |

* 10.0 mg/L = Drinking Water Standard for Nitrate

IF DRINKING WATER HAS ELEVATED LEVELS OF CHEMICALS, DO THE FOLLOWING:

- ◇ **Responsibility.** It is the responsibility of the well owner to maintain and test their water supply well.
- ◇ **Prepare infant formula with bottled water.**
- ◇ **Do not boil your drinking water.** Boiling water may concentrate contaminants. However, it may be effective at killing bacteria.
- ◇ **Remove contamination sources.** 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.
- ◇ **Install a water treatment system.** Install a NSF, UL, or WQA certified water treatment system. Treatment systems require annual maintenance for effective operation. 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 several treatment processes. The MN Dept. of Health website has information on water treatment at www.health.state.mn.us search *water treatment*.
- ◇ **Continue sampling.** Continue to test your drinking water after you install a treatment unit because there is often no other way to know if a treatment system is working properly. All home water treatment units require regular maintenance to work properly. You can have a water test kit mailed to you by calling Dakota County at 952-891-7000 or request a test kit online at www.dakotacounty.mn.us search *well testing*.