

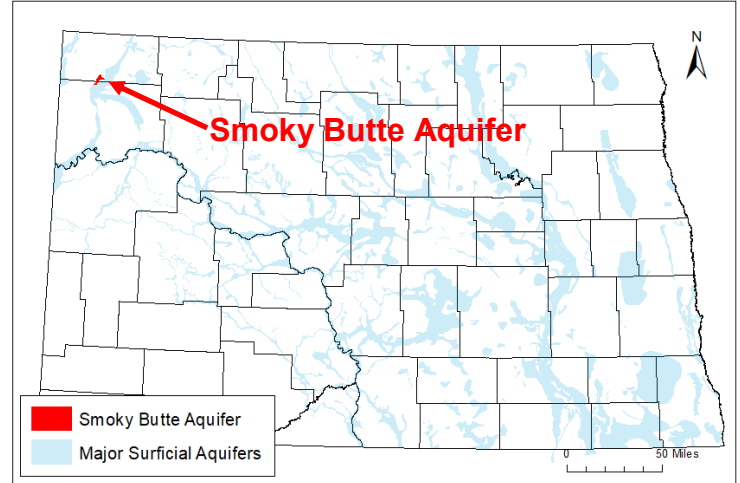
# Smoky Butte Aquifer

Divide and Williams Counties

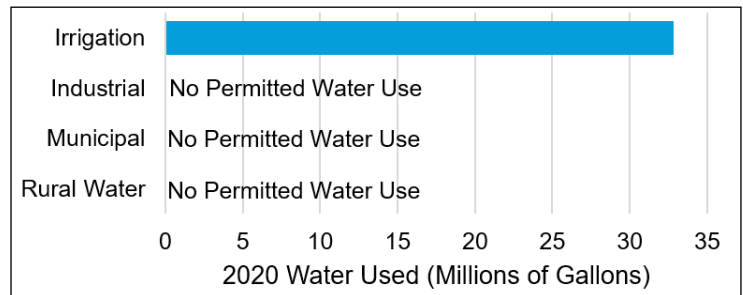
Aquifer At-a-Glance	
Area	10.0 square miles
Aquifer Type	Unconfined and Confined Surficial
Major Land Uses over Aquifer (percentage of aquifer area covered in 2017) <sup>1</sup>	Crops (43%) Grassland/Pasture (34%)
Depth to Water (2021)*	7-48+ feet
Total Unique Wells Sampled	6
Wells Sampled in 2021	6
Years Sampled	2014/2015, 2016, 2018, 2019, 2021

\*Depths to water may vary seasonally, year to year, and across the aquifer

- Aquifer materials consist of sands and gravels deposited by streams carrying meltwater away from glaciers during the last ice age. The aquifer consists of two major layers separated by around 30 feet of clay deposited by glaciers. Most of the upper aquifer is also overlain by 20 or more feet of clay of glacial origin.<sup>2</sup>
- Based on well logs, the aquifer layers average around 30 feet thick.
- Several domestic, stock, and irrigation wells are installed in the aquifer.
- In North Dakota, permits are required to withdraw large quantities of groundwater. In 2020, 33 million gallons of permitted water were drawn from the aquifer; irrigation use consumed the largest quantity of water. For more information on water use and permits, contact the North Dakota Department of Water Resources ([dwr.nd.gov](http://dwr.nd.gov)).



2020 Smoky Butte aquifer permitted water use (from North Dakota Department of Water Resources ([dwr.nd.gov](http://dwr.nd.gov))) ↓



## About the Western Groundwater Monitoring Program

- The North Dakota Department of Environmental Quality (NDDEQ) monitors a network of wells in approximately 20 surficial aquifers that are at elevated risk of oilfield contamination.
- Aquifers are sampled on a 1.5-year rotation.
- Monitoring began in 2013.
- The monitored aquifers are all within the oil-producing counties of northwestern North Dakota.
- Water is tested for general chemistry parameters, trace metals, diesel and gasoline range organics, benzene, toluene, ethylbenzene, and xylenes.

References

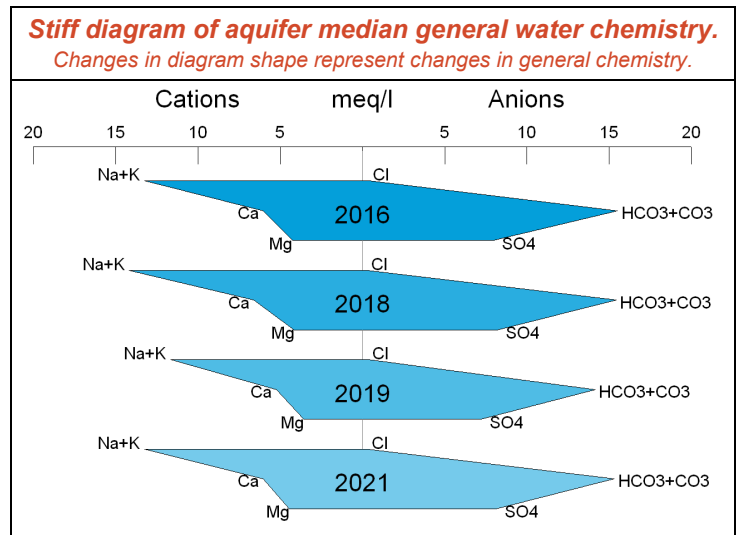
- (1) US Department of Agriculture, 2017, National Agricultural Statistics Service Cropland Data Layer.
- (2) North Dakota State Water Commission, 2018, Written communication.

# Water Chemistry

Is Aquifer Water High in...?	Analyte	Result	2021 Median Concentration	Potential Effects
	Arsenic	YES	0.026 mg/L	Skin or circulatory system damage, increased cancer risk
	Iron	YES	3.86 mg/L	
	Manganese	YES	0.27 mg/L	Metallic taste/odor, discoloration of surfaces
	Sodium	YES	300 mg/L	
	Sulfate	YES	391 mg/L	Taste, people with certain health conditions may need to limit intake
For more information about Maximum Contaminant Levels (MCLs), health effects, and treatment options for these contaminants and more, see the NDDEQ's fact sheets ( <a href="http://deq.nd.gov/wq/1_Groundwater">deq.nd.gov/wq/1_Groundwater</a> ) or visit the US EPA website ( <a href="http://epa.gov/ground-water-and-drinking-water">epa.gov/ground-water-and-drinking-water</a> ).				

Dominant Water Type	Water Hardness
Sodium-Bicarbonate	Very Hard

Nitrate
<i>Percentage of Wells Exceeding the Nitrate Maximum Contaminant Level (MCL)* (10 mg/L as N).</i>
<b>No Nitrate MCL Exceedances</b>



# Oilfield Compounds

Gasoline and Diesel Range Organics	
Gasoline and diesel range organics (GRO and DRO) are groups of chemical compounds containing carbon that are common in either gasoline or diesel fuel. Neither group has a regulatory limit, but the NDDEQ uses a screening level of 500 µg/L. Detections below this may be from other natural carbon sources such as decaying plant matter rather than oil byproducts.	
GRO Screening Level Exceedances	None
DRO Screening Level Exceedances	None

Chloride	
Chloride is both a natural component of groundwater and a component of brine (salt water), a byproduct of oil production.	
<i>Percentage of Wells Exceeding the Non-regulatory Chloride Secondary Water Quality Standard (250 mg/L).</i>	
<b>No Chloride Standard Exceedances</b>	

BTEX	
Benzene, toluene, ethylbenzene, and xylenes (BTEX) are a group of compounds that are naturally occurring in petroleum. All four have Maximum Contaminant Levels (MCLs)* that can be used as screening levels to determine the severity of any detection.	
Benzene Detections	None
Toluene Detections	Toluene was detected in one well in 2014 at 0.5 µg/L, below the MCL of 1000 µg/L. It has not been detected in the well since.
Ethylbenzene Detections	None
Xylenes Detections	None

Bromide	
Bromide is a natural component of groundwater and can also be introduced through oil and gas extraction.	
Wells Exceeding NDDEQ's 3-5 mg/L Screening Level:	None

\*Note that MCLs are for public drinking water systems; private wells are not regulated in North Dakota. MCLs still provide guidelines for drinking groundwater.

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