

Baseline Water Quality in Areas of Oil Development

Roxanne Johnson
Water Quality Associate
North Dakota State University

Tom Scherer, Ph.D.
Extension Agricultural Engineer
North Dakota State University

As oil development increases in North Dakota, private water well owners may be concerned about the quality and quantity of water they use or may use in the future.

Baseline testing on water should be done two to 12 months prior to oil activity near your home or near water sources for livestock, and again two months after drilling. Whether you do additional testing in the first year after drilling begins depends on the level of drilling activity and how often you can afford testing.

Initial sampling should be collected by a third party using proper "chain of custody" collection methods and analyzed by a certified laboratory to provide you with legally admissible results in case you have pollution concerns in the future. If laboratory results detect increased levels of chloride, bromide or other parameters, additional testing is appropriate.

If the water quality parameters fall below EPA maximum contaminant levels (<http://water.epa.gov/drink/contaminants/index.cfm#List>), the homeowner can do the annual testing, which will reduce the cost of sampling. Once you have baseline tests that show your water quality to be suitable, you also can reduce



costs by purchasing an inexpensive total dissolved solids (TDS) or conductivity meter from an online supplier for \$50 to \$100. These meters allow the water supply owner to measure the total amount of dissolved contaminants in his or her water quickly and easily.

Large increases in the TDS or conductivity in conjunction with nearby gas drilling activity would warrant follow-up testing by an accredited laboratory. Keep in mind, a sample collected by the well owner cannot be used as a legally acceptable sample.

State-certified laboratories are listed on Pages 7 and 8 of NDSU publication WQ-1341, "Drinking Water Quality: Testing and Interpreting Your Results" (www.ag.ndsu.edu/pubs/h2oqual/watsys/wq1341.pdf) and can be contacted to schedule water sampling, if that service is available.

If you are doing your own sampling, you can request sampling bottles and special instructions for handling requirements or preservatives from the same laboratories.

Diminished or lost water supplies resulting from oil well drilling have occurred but are rare. When this does occur, it is usually an obvious, complete loss of water, rather than a subtle decrease in water yield.

To determine the baseline condition of your well, an evaluation of the well or spring is necessary. Most laboratories can refer you to professionals who can make these determinations for you.

Additional charges for certifying the flow of your well or spring and/or the level of water at your well typically run from \$800 to \$1,000, depending on the location

and number of wells or springs. These prices also vary with the level of water quality testing, the number of sites sampled and the distance the sampler travels. Mileage charges may be reduced if you schedule multiple stops in conjunction with neighbors.

Your state-certified water testing laboratory can assist with selection of water quality parameters and many offer standard test packages that relate to oil drilling activities. Keep in mind that testing for all of the possible contaminants will be costly (many hundreds of dollars for the tests alone).

Table 1 lists the three general categories of contaminants. The more contaminants you test for, the more information you will have; but the increased information comes with a greater cost.

Information on each test can be found in “Table 2. Terms.”

Table 1. Private Well Water Quality Testing for Areas of Oil Development.

■ **Basic parameters** – Request a complete mineral chemistry plus bromide; the approximate cost is \$125 (2012 pricing). The emphasis of this group is on parameters that are most likely to change if drilling affects ground water and providing some legal protection at a minimal cost.

A complete chemistry may include calcium, magnesium, sodium, potassium, iron, manganese, pH, conductivity, chloride, sulfate, bicarbonate, carbonate, nitrate + nitrite, total dissolved solids (TDS), hardness, cation sum, anion sum, sodium percentage, sodium adsorption ratio and fluoride.

■ **Additional tests** – These are more expensive. This should include all of the tests in the basic parameters plus a few additional tests to increase legal protection. Additional tests might include diesel range organics (DRO), selenium, strontium, trace metals and nutrients. For an explanation of these tests, see the section titled “Table 2. Terms” on the following page.

■ **More comprehensive testing** will determine levels for additional pollutants, which also means more expense. This group includes volatile organic compounds (VOCs) and semi-VOCs. Typical charges (in 2012) for VOCs are about \$200 and the semi-VOCs run a little more than \$500.

Testing Always is Good

A third party must be used to sample the water to have a legally admissible report.

For more information on water testing for legal purposes, see the National Testing Laboratories Ltd website at www.ntllabs.com/.

Table 2. Terms

- **Trace metals:** These are metals with a high relative atomic mass or a specific gravity of more than 5. The term usually is applied to common transition metals such as copper, lead and zinc. The term “heavy metal” has been used as a general term for metals with potential human or environmental toxicity. Toxicity is rare with the exception of iron or lead toxicity. While the body needs some metals, the human benefit of others is unknown.
- **Nutrients:** This group includes ammonia, phosphorus, nitrate + nitrite, total nitrogen and total Kjeldahl nitrogen, all of which provide nutrition for algae and other plants. These nutrients may be applied to agricultural crops and urban lawns or be leached through the ground or via surface runoff because of septic system failure, livestock waste and compost piles. For more information on high levels of nitrates in drinking water, see this Environmental Protection Agency Web page: <http://water.epa.gov/drink/contaminants/basicinformation/nitrate.cfm>.
- **Anion and cation sum:** This sum is a check of the analytical accuracy of the data. The anions (negative ions) and cations (positive ions) should be relatively equal. Sample contamination, oil or solids can interfere with the anion/cation balance. Major contributors to the anion sum include alkalinity, chloride and sulfate, and for cations, they include calcium, magnesium and sodium. These are not indicators of water quality.
- **VOC:** Volatile organic compounds are a class of chemicals that have important properties in common. They evaporate or vaporize readily (they’re volatile), and they contain carbon (they’re organic). When present in water at low concentrations, some VOCs produce a sweet, pleasant odor. Drinking water containing high levels of volatile organic compounds may be harmful to human health, causing central nervous system depression.
- **DRO:** These are diesel range organics and their byproducts; the acronym commonly is used to refer to heavy-weight hydrocarbons such as diesel fuel, mineral oil and motor oil.
- **Arsenic:** It is an odorless and tasteless semimetallic element. It enters drinking water supplies from natural deposits in the earth or from agricultural and industrial practices. For more information on arsenic in drinking water, see the EPA Web page at: <http://water.epa.gov/lawsregs/rulesregs/sdwa/arsenic/index.cfm>.

For more information on oil development, fracking and your water, visit:

Facts about Fracking ... and Your Drinking Water Well. Kristine A. Uhlman, Diane E. Boellstorff, Mark L. McFarland and John W. Smith. Texas AgriLife Extension Service,

http://twon.tamu.edu/media/169670/facts_about_fracking_final.pdf

Northern Plains & Mountains Regional Water Program.
Resources for Landowners in Areas with Oil & Gas Development,

http://region8water.colostate.edu/fracking_resources.shtml

National Testing Laboratories Ltd.,

www.ntllabs.com/ North Dakota Department of Health, www.ndhealth.gov/wq/

North Dakota Industrial Commission, Department of Mineral Resources, Oil and Gas Division,

<https://www.dmr.nd.gov/oilgas/>

Related Publications

- WQ-1029** “It’s All In Your Water, Filtration: Sediment, Activated Carbon and Mixed Media,”
www.ag.ndsu.edu/pubs/h2oqual/watsys/wq1029.pdf
- WQ-1031** “It’s All In Your Water, Softening,”
www.ag.ndsu.edu/pubs/h2oqual/watsys/ae1031w.htm
- WQ-1032** “It’s All In Your Water, Distillation,”
www.ag.ndsu.edu/pubs/h2oqual/watsys/ae1032w.htm
- WQ-1046** “It’s All In Your Water, Chlorination,”
www.ag.ndsu.edu/pubs/h2oqual/watsys/ae1046w.htm
- WQ-1030** “It’s All In Your Water, Iron and Manganese,”
www.ag.ndsu.edu/pubs/h2oqual/watsys/ae1030w.htm
- WQ-1047** “It’s All In Your Water, Reverse Osmosis,”
www.ag.ndsu.edu/pubs/h2oqual/watsys/ae1047w.htm

The printing and development cost of this publication was paid, in part, by the Northern Plains & Mountains Regional Water Program in partnership with the USDA-NIFA.

- The NDSU Extension Service is solely responsible for the content of this publication.
- This material is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under Agreement No. 2004-51130-022848

For more information on this and other topics, see www.ag.ndsu.edu

NDSU encourages you to use and share this content, but please do so under the conditions of our Creative Commons license.

You may copy, distribute, transmit and adapt this work as long as you give full attribution, don't use the work for commercial purposes and share your resulting work similarly. For more information, visit www.ag.ndsu.edu/agcomm/creative-commons.

North Dakota State University does not discriminate on the basis of age, color, disability, gender expression/identity, genetic information, marital status, national origin, public assistance status, sex, sexual orientation, status as a U.S. veteran, race or religion. Direct inquiries to the Vice President for Equity, Diversity and Global Outreach, 205 Old Main, (701) 231-7708.

County Commissions, NDSU and U.S. Department of Agriculture Cooperating. This publication will be made available in alternative formats for people with disabilities upon request, (701) 231-7881.