

Hydraulic Fracturing and your Private Water Well

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Hydraulic fracturing (“fracking”) is the process of sending large amounts of water under pressure into a borehole to fracture the rock underground. The process is used to increase the production of oil, gas, or water.

Geology

Underground, liquids and gases move through two types of rock material: consolidated, such as bedrock; and unconsolidated, such as sand and gravel.

The cracks and fractures in consolidated rock may not be interconnected. Fracking forces these fractures to open and connect, allowing liquids and gases within the rock to flow. The key is to keep the fractures open and interconnected by propping them with sand or small ceramic beads, which are called “proppants.”

In unconsolidated material, the spaces between the rocks are interconnected. This porous material cannot be fractured because the pressure dissipates rapidly.

New technology

Vertical wells were the norm until the 1970s, when new drilling technology was developed. This technology enabled industries to drill underground horizontally.

Used most commonly in the oil and gas industry, horizontal boreholes can extend for thousands of feet within a narrow production zone. It is common for wells to extend vertically more than a mile beneath the surface, turn 90 degrees, and continue horizontally within a rock layer for thousands of feet.

Another technological development has been the design of packers or bladders that expand in a borehole to seal short sections in preparation for fracking. In the past, a well would be fracked over the entire vertical production length; today, a horizontal borehole can be fracked at higher pressures over multiple shorter sections.

New designs enable the packers to be placed in and removed from boreholes quickly; they also allow increased pressure that can be sustained for longer periods. Production rates have soared, making smaller oil and gas reservoirs more accessible for development.

Chemicals injected

The fracking process uses chemicals to dissolve scale deposits, flush out clays that can clog the fractures, and manage the density and viscosity (thickness) of the fracking solution.



Some Texas residents are concerned about the chemicals used for fracking and their associated health risks, if any. The Texas Railroad Commission (RRC) requires that companies disclose the chemicals they use for hydraulic fracturing, except for chemicals considered “trade secrets” or proprietary.

The names of the chemicals are posted at <http://fracfocus.org/>. The EPA is studying their potential effects on water quality.

Water use and waste disposal

Each hydraulic fracturing process uses several million gallons of water, and a well can be fracked multiple times over the entire length of the borehole. Some people have expressed concern that pumping groundwater from a water supply aquifer or from a surface water source (such as a river or lake) could affect private wells and reduce the amount of water available for other uses.

The wastewater must be managed and disposed of properly because it contains a portion of the fracking solution as well as some of the hydrocarbon constituents released from the oil or gas reservoir. The RRC regulates the management of wastewater from oil and gas development, and the Texas Commission on Environmental Quality (TCEQ) regulates the wastewater treatment facilities.

Recommendations for well owners

Under current regulations and when the drilling process is managed properly, hydraulic fracturing is unlikely to harm your water well. However, the owner of a private water well who uses it as a source of drinking water is responsible for ensuring that the water is safe for consumption.

Because the quality of well water can change, private well owners should have a water sample tested to serve as a baseline and then test periodically thereafter (typically once a year) to monitor the quality of water in their wells. The tests serve several purposes:

- It can identify contaminants that are undetectable during normal household use.
- If the taste, color, odor, or quality of the water changes, it can be difficult to establish what caused the change without having first measured the water’s baseline chemistry.
- Private drinking water may already contain contaminants that occur naturally from normal geologic processes. Small concentrations of

petroleum constituents and natural gas can seep toward the surface from reservoirs deep underground. Trace amounts of these contaminants may occur naturally before any fracking operation is conducted.

Sampling and analysis of well water

Although well owners can collect water samples, the analyses should be conducted by a laboratory that is certified to test drinking water in Texas (see contact information below). The laboratory will provide collection bottles and instructions on how to collect, manage, and ship the samples back to the lab for analysis.

Follow the laboratory’s instructions exactly. For example, if you collect a water sample to have it tested for dissolved methane, bubbles may form in the sample bottle. Dissolved methane could degas from the water during shipment and collect in air bubbles, which would escape when the bottle is opened by the laboratory, invalidating the analysis. If bubble formation occurs, ask the laboratory how to reduce it; the lab may recommend that you collect samples early in the morning when the air is cooler.

Because it would cost several thousand dollars to have your water analyzed for all of the EPA contaminants of concern, prioritize which constituents to test. If the well is a source of drinking water, have the water tested annually for nitrate, fecal coliform bacteria, and total dissolved solids (TDS). To establish whether the water contains constituents related to oil and gas development, also have the water analyzed for non-refined hydrocarbons.

If the water well is near natural gas or oil development wells, have the water tested for TDS, dissolved

Table 1. Recommended tests for water from wells near natural gas or oil development wells.

Constituent	Laboratory method	Estimated cost
Total dissolved solids (TDS)	SM 2540C	\$20
Dissolved methane	RSK-175 or 176	\$75
Total petroleum hydrocarbons (TPH)	TX-1005 or 1006	\$60

methane, and total petroleum hydrocarbons. Give the name of the recommended testing method to the laboratory to make sure that it uses the appropriate testing method (Table 1).

The test for total dissolved solids measures all dissolved constituents in the water. Because water is an excellent solvent, it dissolves various minerals as it moves downward through the soil and into an aquifer. All groundwater typically contains some level of naturally occurring TDS.

The dissolved solids found most often in TDS tests are the salts of calcium, magnesium, potassium, and sodium (such as NaCl, sodium chloride). In natural groundwater, TDS ranges from about 150 to 400 mg/L; however, it is considerably higher in water from some Texas aquifers.

If the test finds TDS levels higher than 500 mg/L (the EPA secondary drinking water standard), have the water tested again to determine which minerals it contains. For example, bromide is common to the brackish water and brines that may be associated with oil exploration or ocean water.

Any change in TDS from the baseline is of concern because it suggests groundwater contamination that may—or may not—be caused by oil or gas development.

Although groundwater usually does not contain dissolved methane or hydrocarbons, they may be present naturally if the aquifer is near an oil- and gas-producing zone. Methane may also be associated with coal beds. If you find these constituents in your baseline water quality testing, speak to a professional and do further testing.

After hydraulic fracturing, or any oil/gas development activity, in your area, retest your water to compare against the baseline. If the quality has changed significantly, have it tested further by a professional. Retest also if there is any change in the water's taste, odor, or color.

For more information

AgriLife Extension Service county offices:

<http://counties.agrilife.org/>

EPA Safe Drinking Water Hotline: (800) 426-4791; available Monday through Friday from 7:30 a.m. to 3:30 p.m. Central Time

Hydraulic Fracturing Chemical Disclosure Registry: <http://fracfocus.org/>

Laboratories certified to test drinking water in Texas: National Environmental Laboratory Accreditation Program (NELAP): http://www.tceq.texas.gov/goto/certified_labs

Railroad Commission of Texas: <http://www.rrc.state.tx.us/>

Texas Well Owner Network: [http://twon.tamu.edu/Texas Well Owner Network: Texas Well Owner's Guide to Water Supply](http://twon.tamu.edu/TexasWellOwnerNetwork:TexasWellOwnersGuideToWaterSupply). By K. Uhlman, D. Boellstorff, M. L. McFarland, B. Clayton, and J. W. Smith. 2013. Texas A&M AgriLife Extension publication B-6257, 96 pp.

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