

## Facts about Fracking ...and Your Drinking Water Well

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Revisions to the Safe Drinking Water Act by the Energy Policy Act of 2005 exempted key aspects of hydraulic fracturing from rules that had previously regulated the injection of fluids underground. Texas is the first state in the United States to require public disclosure of the chemicals used in the process, but private domestic well owners will remain responsible for the monitoring of their own wells to ensure safe drinking water.

### Hydraulic fracturing:

The mechanical fracturing of water supply aquifers, oil/gas reservoirs, and for salt solution mining has existed for decades: new technology has made ‘fracking’ more prevalent. Hydraulic fracturing uses large quantities of water under pressure within a borehole to fracture the rock to increase production. In the water well industry, fracking can double the volume of yield in a well; in the oil/gas industry, fracking a well may be the difference between economic profit and loss.

### Geology:

Liquids and gases move through the subsurface in either consolidated or unconsolidated rock material. Within unconsolidated material, like sands and gravels, the porous space between the rocks and grains are all interconnected. You cannot hydraulically fracture porous material

because the pressure rapidly dissipates. In consolidated rock material, existing fractures and cracks in the rock may not be interconnected – forcing these fractures to open and connect increases the porosity and permeability of the rock. Fracking allows liquids and gases already within the rock to flow because of the increased permeability. Keeping the fractures open and interconnected by propping them with sand or small ceramic beads is key. Fracking the vertical thickness of a production zone to increase porosity has been an industry practice since the 1940’s.

### New technology:

Vertical wells were the norm until the development of new drilling technology in the 1970’s that allowed for directional subsurface drilling. Used most commonly in the oil and gas

industry, horizontal boreholes can extend for thousands of feet within a narrow production zone. It is not uncommon for a well to extend vertically one thousand feet or more, and then turn 90 degrees and continue horizontally within a rock layer for thousands of feet.

Another important technological development has been the design of packers or bladders that expand within the borehole to seal short sections in preparation for fracking. In the past, a well would be fracked over the vertical production length – today, the horizontal borehole can be fracked at higher pressures over multiple, shorter sections. New packer designs also allow for rapid entry/exit from the borehole and increased pressures that can be sustained for longer periods of time. Production rates have soared, making smaller oil and gas reservoirs more accessible for development.

### **Chemicals injected:**

In addition to the sand or ceramic beads used to prop open fractures (known as ‘proppants’), other chemicals are used during the fracking procedure. Chemicals include those to manage the density and viscosity of the fracking solution, dissolve scale, and flush clays that may clog fractures. Public disclosure of chemicals used and their associated health risks, if any, is the basis of current controversy. The Governor of Texas recently signed a bill requiring the Railroad Commission of Texas (RRC) to write disclosure rules for hazardous chemicals by July 1, 2012. The bill requires the RRC to complete rulemaking for all other chemicals used in the process by July 1, 2013. Potential water quality impacts are the focus of on-going EPA environmental studies.

### **Water use and disposal of waste:**

Several million gallons of water are needed for each fracking process, and a well can be fracked multiple times over the entire length of the borehole. Some concern has been expressed

that pumping groundwater from a water supply aquifer or from a surface water source will reduce the amount available for other uses, and could impact private wells. Proper wastewater management and disposal also are important because wastewater will contain some of the hydrocarbon constituents released from the oil or gas reservoir, in addition to the original fracking solution. The RRC regulates wastewater management from oil and gas development, and the Texas Commission on Environmental Quality (TCEQ) regulates the wastewater treatment facilities.

### **Recommendations for private well owners:**

Under current regulations and with proper management of the drilling process, it is unlikely that hydraulic fracturing will have any adverse impacts on your water well. However, individuals who use private water wells as a source of drinking water are responsible for ensuring that the water is safe for consumption. Because the potential exists for the quality of well water to change, it is recommended that private well owners obtain a background water sample and then test periodically thereafter (typically once per year) to monitor the quality of water in their well.

Routine testing is important, since some water contaminants cannot readily be detected during routine household use. Further, if a change in taste, color, or odor is detected, it can be difficult to establish the cause of the change without having first measured the original, background or baseline chemistry of the well water.

Keep in mind that if a private drinking water well is in an area undergoing oil or gas exploration and development, it is possible that the aquifer may already contain naturally occurring contaminants from normal geologic processes. Small concentrations of petroleum constituents and natural gas have been known to seep towards the surface from reservoirs

deep underground. Trace concentrations of these contaminants may be naturally occurring prior to any fracking operation. It is important to measure the baseline chemistry of your well water so that you know the quality of the water you are currently using, and so that you can detect and verify any changes that may occur.

In addition to annual well testing for coliform bacteria, total dissolved solids, and nitrate, a screening for non-refined hydrocarbons is recommended to establish the presence /absence of constituents related to oil/gas development.

### **Sampling and Analysis of Well Water:**

Part of the decision on what to test for and how often depends on how much you are willing to pay. If you were to sample and analyze for all of the EPA recommended drinking water contaminant constituents, the laboratory fee would exceed several thousand dollars, and for that reason you should prioritize which constituents to test. Testing prior to any oil/gas

drilling is imperative, as it is difficult to prove water quality impact without a baseline to compare against.

The well owner can collect the sample, but the analyses should be conducted by a Texas-certified drinking water laboratory (see contact information below). The laboratory will provide sample collection bottles and instructions on how to collect, manage, and ship the samples back to the lab for analysis, and these instructions should be followed exactly. For example, the sample collection for dissolved methane requires the collection bottle be filled to the top with no air bubble. During shipment, the dissolved methane could degas out of the water and collect in the air bubble, and the sample analysis would not be valid.

It is recommended that drinking water wells in proximity to natural gas or oil development wells be tested for the following list of constituents. By providing the name of the recommended testing method to the laboratory, you will be assured of the use of the appropriate standard method.

<b><i>Constituent</i></b>	<b><i>Laboratory Method</i></b>	<b><i>Estimated Cost</i></b>
Total Dissolved Solids (TDS)	SM 2540C	\$20.00
Dissolved Methane	RSK-175 or 176	\$75.00
Total Petroleum Hydrocarbons (TPH)	TX-1005 or 1006	\$60.00

Total Dissolved Solids (TDS) is the sum of 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. Thus, all groundwater typically contains some level of naturally occurring TDS. TDS is most often correlated with the dissolved salts of sodium, potassium, calcium and magnesium (such as NaCl – sodium chloride). Natural groundwater will exhibit a range of TDS from around 150 to 400 mg/l, but

is considerably higher in water from some Texas aquifers. If the baseline value for TDS exceeds the EPA secondary drinking water standard of 500 mg/L, you should test to determine what the individual dissolved minerals may be. For example, bromide is common to brackish water and brines that may be associated with oil exploration or ocean water. Any change in TDS from baseline is of concern because it suggests groundwater contamination that may – or may not – be due to oil/gas development.

Dissolved methane and hydrocarbons are not expected to be found in groundwater, but may be present under natural conditions if the aquifer is in proximity to 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, you should speak to a professional and do further testing.

After fracking, or any oil/gas development activity, retesting your water quality to

compare against baseline is recommended. If significant change from baseline is detected, then further investigation by a professional is recommended. Any change in water taste, smell or color also calls for expanded water quality testing. The EPA also maintains a Drinking Water Hotline that is available Monday-Friday from 8:30 AM-4:30 PM Eastern time at 1-800-426-4791 to assist with your drinking water quality questions.

### For more information:

To locate a Texas National Environmental Laboratory Accreditation program (NELAC) certified drinking water laboratory in your area:

[http://www.tceq.state.tx.us/assets/public/compliance/compliance\\_support/qa/txnelap\\_lab\\_list.pdf](http://www.tceq.state.tx.us/assets/public/compliance/compliance_support/qa/txnelap_lab_list.pdf)

For additional information, contact your local County Extension Office, Kristine Uhlman ([kuhlman@tamu.edu](mailto:kuhlman@tamu.edu), 979-845-1641), Diane Boellstorff ([dboellstorff@tamu.edu](mailto:dboellstorff@tamu.edu), 979-458-3562) or Mark McFarland ([ml-mcfarland@tamu.edu](mailto:ml-mcfarland@tamu.edu), 979-845-2425).



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