



NEW YORK STATE WATER RESOURCES INSTITUTE

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Private Water Well Testing in Areas Impacted by Marcellus Shale Gas Drilling

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Purpose

Private water well owners are responsible for their own water quality. Even in the absence of shale-gas drilling, well owners are strongly encouraged to evaluate their water on a regular basis in order to ensure that basic water quality standards are being met. Information on general testing that applies to all private water supplies can be found [here](#). This bulletin discusses additional testing in order to more specifically document potential impacts of Marcellus Shale gas development on drinking water supplies. It is intended for landowners and private water well users who seek information on the need, frequency, and thoroughness of testing in the context of shale-gas activity.

The issue of testing private water wells raises these key questions:

- Who should test their water?
- When should testing occur?
- What should be tested for?

Resources

Data presented here were compiled and adapted from the sources below. Individuals wishing to obtain more detailed information are encouraged to review these sources.

NYS DEC – Revised Draft Supplemental Generic Environmental Impact Statement (2011). New York State Department of Environmental Conservation

<http://www.dec.ny.gov/energy/75370.html>

- An extensive review of shale gas drilling in New York State, as well as a comprehensive collection of data and consultant-supplied analyses. Details and private water well testing recommendations are found on pages 7-44 through 7-49

PA-DEP Recommended Basic Oil & Gas Pre-Drill Parameters (2010). PA Department of Environmental Protection Fact Sheet 5500-FS-DEP4300

<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-82193/5500-FS-DEP4300.pdf>

- Information on testing private drinking water wells related to shale gas drilling in Pennsylvania

PSU - Gas Well Drilling and Your Private Water Supply (2010). Penn State University Cooperative Extension Water Facts #28

<http://extension.psu.edu/water/webinar-series/past-webinars>

- Provides information for landowners with respect to private water supply testing, including what parameters may be important to test for

NGWA – Water Wells in Proximity to Natural Gas or Oil Development (2011). National Ground Water Association

[http://www.ngwa.org/Documents/ClipCopy/Hydraulic Fracturing Info Sheet.pdf](http://www.ngwa.org/Documents/ClipCopy/Hydraulic_Fracturing_Info_Sheet.pdf)

- Basic information, guidance, and testing recommendations

CRP - The Impact of Marcellus Gas Drilling on Rural Drinking Water Supplies (2011). The Center for Rural Pennsylvania

http://www.rural.palegislature.us/documents/reports/Marcellus_and_drinking_water_2012.pdf

- A study of private drinking water well quality with respect to nearby Marcellus Shale gas drilling; not a well testing guidance document, but offers related suggestions

Who should test their water?

Anyone who uses a water well located within 2000 ft of a gas drilling well pad should have their water tested. Owners of wells within 1 mile of a well pad should consider testing.

In NYS, the Department of Environmental Conservation (DEC) has proposed that drilling operators be required to test private wells – at industry expense - within 1000 ft of gas drilling well pads. If no private wells are present, it is proposed that the distance be expanded to 2000 ft. If your water well is within 2000 ft of a proposed gas drilling well pad you should have your well tested, either by the operator or at your own expense. Groundwater contamination, once it has occurred, can travel large distances underground, and can persist for many years. Owners of wells beyond this 2000 ft

radius (perhaps out to 1 mile) should consider having at least some baseline water quality testing done to protect themselves against potential contamination.

When should testing occur?

At the very least, testing should be done prior to drilling activity and a few months after drilling operations. Additional testing can be performed, but should be viewed in the context of cost and effectiveness.

Each of the sources mentioned above discuss or provide advice for when testing should be done.

NYS DEC proposes that drilling operators test nearby private wells:

1. Prior to drilling activity
2. Prior to additional drilling occurring at the same site (i.e. multi-well pads)
3. 3 months after drilling, regardless of hydraulic fracturing activity
4. 3, 6, and 12 months after hydraulic fracturing in any single gas well

PA-DEP recommends that private well owners test:

1. Within 1 year prior to drilling

PSU recommends that private well owners test:

1. Prior to drilling activity
2. Within 6 months after drilling

NGWA recommends that private well owners test:

1. Prior to drilling activity
2. Regularly thereafter

Deciding on a testing schedule depends on the level of drilling activity, as well as how often you can afford testing. Tests performed prior to drilling activity help to establish a baseline of water quality against which future changes may be judged. It is important to note that water quality will vary naturally due in part to season, rainfall, and local geology. Multiple tests, both before and after drilling, help to clarify the difference between contamination events and natural variability.

Given the recommendations above, it is essential to test for water quality prior to drilling activity, and at least once after drilling has been completed. If there is frequent and/or persistent drilling activity and cost is not prohibitive, additional tests can be performed. More specifically, testing can be done at least once prior to drilling activity, several times within the first year following any drilling activity, and once or twice more several years after completion of all drilling and hydraulic fracturing activity.

What should be tested for?

There are several parameters that are essential to any water quality testing with the purpose of detecting shale-gas related contamination. Additionally, there are many parameters that may serve as good indicators of contamination that should be included if possible. Lastly, there are some parameters that are not strictly necessary for detection of shale-gas contamination, but which nevertheless can be performed at additional cost, or which serve as indicators of water quality in general.

Below is a table that lists the parameters recommended for testing by each of the above resources, including a list of parameters recommended by WRI based on the other three. Parameters are numbered according to tiers of relative importance, with 1 being most important. Each tier is described below.

Resource					
Parameter	WRI	NY DEC	PA DEP	PSU	NGWA
Methane	1	1	1	1	1
Total Dissolved Solids (TDS)	1	1	1	1	1
Chloride	1	1	2	1	1
Sodium	1	1	1	2	1
pH	1	1	1	1	1
Barium	1	1	2	1	1
Iron & Manganese	1	1	1	2	1
Bromide	1*				1
Total Suspended Solids (TSS)	2		2	2	1
(Specific) Conductivity	2	1	2		1
Potassium	2		2		1
Sulfate	2		2	2	1
Calcium	2		2		1
Alkalinity	2		2	2	1
Volatile Organic Compounds (VOC - including BTEX)	2	1		3	1
Hardness	3		2	2	
Ethane	3	1	1		
Oil & Grease	3		2	2	1
Gross alpha	3	1		3	
Gross beta	3	1			
Strontium	3		2	2	
Magnesium	3		2		1
Arsenic	3			2	1
Surfactants	3			2	
Coliform Bacteria	3		2	2	
Static Water Level	3	1			

* Recommended based on results of CRP study performed in Pennsylvania

Overall

There are a few points that apply to testing that well owners should keep in mind.

1. Testing is never a bad thing. Although parameters are ranked in the above table, all listed parameters potentially offer useful information related to water quality.
2. For testing results to be legally useful, a state accredited laboratory must be used (see below). Additionally, samples must be collected by lab personnel, preferably using chain of custody protocol (the lab will know what this is). This will cost extra, but will give your results needed credibility. Do not take samples yourself if you wish your water quality information to be legally admissible.
3. Guidance on how to interpret water testing results is offered [here](#).

Tier 1 (blue): Essential Parameters

These parameters are most likely to be effected in the event of contamination and can be tested for a reasonable cost.

Tier 2 (green): Supporting Parameters

Testing for these parameters further supports indication of contamination by shale-gas drilling activities. These tests come at an additional cost, but provide specific information not always covered in typical water quality evaluations.

Tier 3 (yellow): Additional Parameters

Testing for these additional parameters may help to evaluate shale-gas related contamination in some cases. Some parameters are indicators of water quality in general. Others add significant cost, but can increase overall testing effectiveness in some cases.

Why do recommendations differ?

There are many reasons why testing recommendations vary. Differences in geology, as well as the composition of gas drilling fluids from site to site and company to company mean that the nature of potential contamination is difficult to predict. Also, recommendations may vary depending on the degree to which they balance the goals of detecting gas drilling contamination specifically and/or detecting water quality issues in general. Parameters such as Coliform Bacteria are excellent indicators of water quality, but are not prioritized here because they are unlikely to be diagnostic for shale-gas related contamination.

In an ideal world, all wells would be tested for all parameters on a frequent basis. However, given the cost of testing and the limited value of some parameters in being broadly effective at indicating contamination, testing for all parameters is not always practical. Only a small number of tests may be required to determine if shale-gas related contamination has occurred. However, additional tests may reveal the exact nature of that contamination and lead to a more complete picture of how to address such contamination.

This bulletin is meant to serve only as a guide to private water well testing. It is important to contact local, [state accredited laboratories](#) to get more information on the kinds of testing available and associated costs.