Blackout in the Gas Patch CASE STUDY

PAT KLOTZ Warren Center, Bradford County PA

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http://blackout.earthworksaction.org

Summary

Anyone can long for the past, but Pat Klotz has better reason than most to be nostalgic for her life before shale gas drilling came to Bradford County. For many years, she had a large garden and horses, with plenty of fresh air and time outdoors every day. Even after moving to a smaller property, she stayed active caring for rescued dogs, doing home renovations, and walking in the woods and meadow behind her house.

Which is why it came as a shock in 2011 to frequently be exhausted and have intense headaches, nose and throat irritation, muscle cramps, and dizzy spells. Her dogs would refuse to drink the tap water and were more lethargic and unsteady on their feet. Then her water turned fizzy and black.

Pat started keeping a log of what happened when—and realized that her health symptoms often occurred at the same time as drilling and production activities on the gas well pad located less than 1,000 feet away on a neighboring property. Pat then made sure that she, her boyfriend, and her dogs only drank bottled water.

Pat has documentation that should have resulted in help from the Pennsylvania Department of Environmental Protection (DEP) and possibly a replacement water supply provided by the operator of the well closest to her, Talisman Energy. This includes results of a pre-drill water sample and several other water tests—which taken together show clear evidence of changes to water quality after drilling began.

In addition, Pat's house is well within the "zone of presumption" for attributing water quality changes to nearby drilling.[1] Yet more than two years ago, DEP neglected to issue a determination after testing Pat's water and has done nothing since to hold Talisman accountable. It isn't clear whether this has to do with time and resource constraints, insufficient information and training provided to inspectors, or other factors. For her part, Pat continues to file complaints with DEP about odors, noise, and air and water quality concerns—and is still waiting for something to change.

For more about gas development in Pat's community, see:

News story at
https://www.facebook.com/FrackNation/posts/503577369707135

Summary of the Bradford County drilling boom
http://stateimpact.npr.org/pennsylvania/tag/bradford-county/

PHOTOS BELOW, L-R:

Tanks venting. Photo by Frank Finan

A water "buffalo" for clean water storage next to a methane vent on a contaminated water well. Photo by Nadia Steinzor/Earthworks

Well site construction. Photo by Frank Finan

Flaring at the Young well pad. Photo by Pat Klotz




Wells and Facilities Around the Klotz Home

Currently, 14 unconventional wells have been drilled within two miles of the Klotz home. Three are less than 1,000 feet away: the Young 1H well was permitted in January 2011 and the Young 2H and 3H in January 2012. Drilling of the Young 3H well was completed in 2013, but it doesn't appear that fracturing has occurred yet.[2]

In addition, there are gas processing tanks on the Young Unit pad, as well as three other wells that have been permitted but not yet drilled. Today, pipeline construction is surging across the area, including behind Pat's house and across the road.

Air testing conducted by Earthworks at the Klotz home in 2011 and 2013 revealed the presence of multiple volatile organic chemicals. In 2011, the year when the Young 1H well was drilled and fractured, our samples detected seven chemicals, including toluene—one of the BTEX chemicals that can cause health symptoms and impact the reproductive and central nervous systems.[3] Our 2013 tests found fewer chemicals in the air near the Klotz home, although methane was detected in one instance.[4]

Photo by Frank Finan

In December 2012, an operator installing a well casing spilled drilling water across the Young well pad. According to Pat, runoff flowed onto her property and possibly into a nearby creek. A DEP inspector visiting the site reported that the pad surface "was being flooded by what appeared to be water emanating from the small rig…no action was taken to control/capture this water, and no action was taken to control the cuttings. Thus 1/3 of pad covered by muddy water originating from the drilling activity. Further investigation revealed what appeared to be an oily sheen on the surface of this muddy water."

DEP issued a violation to Talisman for an uncontrolled discharge of possibly contaminated water and "failure to adopt pollution prevention measures required or prescribed by DEP by handling materials that create a danger of pollution." DEP records indicate that soil samples taken after the spill detected a petroleum product, possibly hydraulic oil or motor oil. However, a DEP inspection report a few months later stated that soil testing didn't show "organic contamination." An assessment report by a contractor hired by Talisman shows that soil samples taken after the spill contained low levels of several chemicals associated with petroleum products and that "the area of pooled water contained a black, powdery film on its surface."

The contractor's report indicates that Talisman and DEP worked together to clean up the site, which included removal of the pooled water and top hole cuttings. There was no indication in DEP records and Talisman's report that the operator or DEP had investigated whether the contaminated water impacted soil or water beyond the pad, including in Pat's backyard and water well.

Water Quality Changes

Following a complaint that Pat filed with DEP, the agency tested her water in February 2012. She received a letter several weeks later stating that DEP could not make a clear determination about the cause of the changes in her water and stated that, "The Department is continuing to investigate." However, DEP has never returned to re-test Pat's water, followed up about the condition of her water, or provided her with additional information.

In September 2013, Earthworks sampled drinking water at the Klotz home, detecting arsenic, barium, strontium, methane, and other chemicals. Although none of the chemicals that have federal primary drinking water standards (i.e., for health effects) exceeded them, iron and manganese greatly exceeded secondary drinking water standards (i.e., for aesthetics, taste, and color).[5] According to Penn State Extension, iron and manganese can change the taste and color of water to the point of making it unusable without extensive treatment.[6]

In addition, concentrations of iron, manganese, and sodium were all higher than the median concentrations typically found in Pennsylvania groundwater. For example, iron was found at concentration more than 14 times the median concentration and manganese was more than 200 times that found in typical Pennsylvania groundwater.[7]

According to the US Environmental Protection Agency, "Although manganese is an essential nutrient at low doses, chronic exposure to high doses may be harmful. The health effects from over-exposure of manganese are dependent on the route of exposure, the chemical form, the age at exposure, and an individual's nutritional status. Regardless, the nervous system has been determined to be the primary target organ with neurological effects generally observed."[8]

EPA has established a drinking water lifetime health advisory for manganese of 0.3 mg/L, which "will protect against concerns of potential neurological effects." EPA has also developed a one-day and 10-day health advisory of 1 mg/L for acute exposure.[9] As seen from the water sampling results table above, Pat Klotz's drinking water exceeded 1 mg/L even prior to drilling, although levels after drilling increased by 8-12 percent and remained at the higher levels at least through September 2013.

According to the Center for Rural Pennsylvania, drilling activities can increase concentrations of iron and manganese in groundwater by disturbing aquifers.10 In addition, recent research indicates that iron and manganese levels can be elevated when methane enters drinking water supplies.11 It is also possible that the Klotz household water has been affected by natural gas activities because several of the constituents detected are also found in Marcellus shale wastewater (e.g., chloride, sodium, barium, strontium, and iron).[12]

Changes in Pat's water over time also point to a link to gas development. As seen in the table below, water test results (including those found in DEP files and provided by Pat) show that **concentrations of many constituents (arsenic, barium, calcium, iron, magnesium, manganese, potassium, sodium,**

chloride, and methane) were higher after drilling and fracking were completed at the Young gas wells than prior to drilling. By the time Earthworks sampled Pat's water in September 2013, some of the parameters had returned to pre-drill levels (e.g., barium, iron, potassium, and sodium).

Klotz water test results and drinking water (DW) standards

Parameter (mg/L) unless otherwise indicated	Klotz sample (1/6/11)	Klotz sample (4/12/11)	Klotz sample (2/3/12)	Klotz DEP sample (2/14/12)	Klotz Earthworks sample (9/18/13)	Approx. median concen. in typical PA groundwater*	Federal Maximum Contaminant Level in DW	Federal or DEP Secondary DW standard; Fed. DW Health Advisory (HA)
Arsenic	0.006	0.009	0.009	NT	0.007	No data	0.01 mg/L	
Barium	0.063	0.071	0.070	0.066	0.063	0.070	2.0 mg/L	
Calcium	56.4	59.3	59.3	59.5	61	No data	None	None
Iron	5.6	6.67	6.53	6.35	2.9	0.20	None	FED: 0.3 mg/L
Magnesium	18.9	20.6	20.1	20.6	20.8	No data	None	None
Manganese	1.8	1.94	2.04	1.94	2.02	0.01	None	0.05 mg/L
Potassium	1.1	1.25	1.02	1.13	1.08	No data	None	None
Sodium	45.5	46.0	46.6	46.7	41	6.87	None	None
Strontium	NT	0.143	0.136	0.14	0.14	0.26	None	FED HA: 4 mg/L
Chloride	4.6	4.2	4.12	5.3	<5.0	5.3	None	FED: 250 mg/L
Nitrate	<0.1	<0.05	<0.05	NT	<1.0	0.5	10	None
Alkalinity	310	310	310	289	290	No data	None	DEP: minimum of 20 mg/L
TDS	294	339	395	384	372	No data	None	DEP: <500 mg/L monthly avg.
pH (lab)	7.2	7.38	7.78	7.4	7.4	7.5	None	FED: 6.5 - 8.5
pH (field)	NT	6.76	6.63	NT	NT	NT	None	FED: 6.5 - 8.5
Methane	<0.026	0.017	0.007	0.046	0.01	No data	None	None. **
Gross Alpha*	NT	2.48	0.12	NT	NT	No data	15 pCi/L	
Gross Beta*	NT	1.34	0.79	NT	NT	No data	None	
Radium-226*	NT	0.16	0.09	NT	NT	No data	5 pCi/L	
Radium-228*	NT	0.17	0.38	NT	NT	No data	5 pCi/L	
Radon *	NT	1,335	1,266	NT	NT	No data	4,000 pCi/L	

ND: not detected; NT: not tested.

* reported in picocuries per liter (pCi/L)

** Pennsylvania State University.[13]

*** Concentrations of dissolved methane greater than 28 mg/L are potentially explosive. Concentrations greater than 10 mg/L but less than 28 mg/L are a possible indication that methane may be increasing to dangerous levels.[14] Any water well with a detectable concentration of methane should be routinely tested to ensure that the methane concentration is not increasing to a dangerous level.[15]

Compared to water complaint cases in which DEP has determined causality with gas development activities, concentrations of methane in Pat Klotz's water are low. However, there is no federal or Pennsylvania standard for methane in drinking water. According to Penn State Extension, "Wells with methane concentrations below 10 mg/L are generally considered safe for use. However, any water well with a detectable concentration of methane should be routinely tested to ensure that the methane concentration is not increasing to a dangerous level."[16]

Data compiled by the Times-Tribune and FracTracker Alliance indicate that DEP investigated another water complaint 1.02 miles away in Warren Township.[17] As of March 2012, DEP found water contamination at the site but determined "causality unknown" and indicated an ongoing investigation. The closest confirmed water contamination linked to oil and gas activities was in August and November 2011, 5.84 miles away in Orwell Township. According to reports linked from the FrackTracker map, the DEP's determination was based on high methane levels, combustible gas in the well headspace, and elevated iron and manganese.

→ **For the full report and other case studies go to http://blackout.earthworksaction.org**

Endnotes

[1] Pennsylvania law is unique in establishing a "zone of rebuttable presumption," by which operators of unconventional (i.e., shale) wells are considered responsible for pollution of a water supply if it is up to 2,500 feet away and the pollution occurred within 12 months of completion, drilling, stimulation, or alteration of the well. Operators are required to share this baseline information with homeowners, but can rebut the presumption under certain conditions. See "Act 13 Frequently Asked Questions," Pennsylvania Department of Environmental Protection: www.portal.state.pa.us/portal/server.pt/community/act_13/20789/act_13_faq/1127392.

[2] We base this assumption on a lack of data for the well in DEP's oil & gas production database and no date for hydraulic fracturing of the well in the disclosure registry FracFocus.

[3] Earthworks, "Air Contaminants." www.earthworksaction.org/issues/detail/air_contaminants.

[4] Chemicals detected in 2011: chloromethane; acetone; trichlorofluoromethane; 1,1,2-trichloro-1,2,2-trifluoroethane; 2-butanone; carbon tetrachloride; and toluene. Chemicals detected in 2013: chloromethane; trichlorofluoromethane; 1,1,2-trichloro-1,2,2-trifluoroethane; carbon tetrachloride; and methane.

[5] US Environmental Protection Agency website: "National Primary Drinking Water Regulations" at http://water.epa.gov/drink/contaminants/; and "Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals," http://water.epa.gov/drink/contaminants/secondarystandards.cfm.

[6] Penn State Extension. "Iron and Manganese in Private Water Systems." http://extension.psu.edu/natural-resources/water/drinking-water/water-testing/pollutants/iron-and-manganese-in-private-water-systems.

[7] According to Boyer et al., the approximate median concentrations of iron, manganese and sodium in Pennsylvania groundwater are 0.20 mg/L, 0.01 mg/L and 6.87 mg/L, respectively. Concentrations in Pat Klotz's water in 2013 were: iron (2.9 mg/L), manganese (2.02 mg/L) and sodium (41 mg/L). See Boyer, E., Swistock, B., Clark, J., Madden, M. and Rizzo, D. The Impact of Marcellus Gas Drilling on Rural Drinking Water Supplies. Center for Rural Pennsylvania. 2012.

[8] US Environmental Protection Agency. January 2004. Drinking Water Health Advisory for Manganese. EPA-822-R-04-003. www.epa.gov/safewater/ccl/pdfs/reg_determine1/support_cc1_magnese_dwreport.pdf

[9] Ibid.

[10] Ibid.

[11] Glenn Miller and Ann Maest. Considerations for Determining the Source of Groundwater Contamination Associated with Hydraulic Fracturing. Paper prepared for the US EPA, 2013.

[12] Hayes, T. (2009). Sampling and Analysis of Water Streams Associated with the Development of Marcellus Shale Gas. Final Report for Marcellus Shale Coalition prepared by Gas Technology Institute (Thomas Hayes Principal Investigator). Cited in Boyer et al. 2012.

[13] Pennsylvania State University. 2011. Summary of Drinking Water Samples Tested by the Penn State Agricultural Analytical Services Laboratory, 2007-2011.

[14] US Geological Survey, "Methane in West Virginia Ground Water." 2006. http://pubs.usgs.gov/fs/2006/3011/.

[15] Penn State Extension web site. "Methane Gas and Its Removal from Wells in Pennsylvania." http://extension.psu.edu/natural-resources/water/drinking-water/water-testing/pollutants/methane-gas-and-its-removal-from-wells-in-pennsylvania.

[16] Ibid.

[17] Laura Legere. "Sunday Times Review of DEP drilling records reveals water damage, murky testing methods." Scranton Times Tribune, May 19, 2013. The Times-Tribune published the data on both alleged and confirmed contamination cases and the FracTracker Alliance mapped it; we included this location information in the maps generated for this report. See http://thetimes-tribune.com/news/gas-drilling-complaints-map-1.1490926.