

Office of Research and Development  
U. S. Environmental Protection Agency

Binghamton, NY  
September 13, 2010

Re: Potential Relationships Between Hydraulic Fracturing and Drinking Water Resources

I have reviewed your scoping materials released in March 2010, and would like to offer some comments for your consideration. A common theme among them is the idea of context: I encourage you to sense and communicate the most holistic viewpoint possible as this research initiative advances.

**The term “hydraulic fracturing”:**

As a biochemist and former construction professional, I’ve been striving to apprehend the gas industry’s foray into shale gas extraction for about two years. This study has brought me into contact with a large number of industry representatives, state and river basin commission officials, and environmental activists. I’ve found that people from the three groups not only are far apart in their perceptions, they employ technical language very differently. Of greatest significance here, environmentalists tend to apply the term “hydrofracking” to the overall process of gas extraction from unconventional reservoirs – from access road construction to pipeline pressurization, while industry insiders use the term chiefly to describe the specific technical steps taken to force fissures in rocks deep underground. Regulators and public health officials with whom I’ve discussed it have been split on this semantic question.

I recommend that, in addition to providing a glossary of terms, you include a section devoted to the various meanings that have been attached to the term “hydraulic fracturing”, and explain the definition by which it should be understood by those reading your report(s). Whatever choice you make with respect to the definition of hydraulic fracturing, I urge you to ensure that this investigation encompasses the broadest possible scope.

**Influence of human error:**

Another important element of context regards whether or not human error should be considered integral to the overall process of shale gas extraction. Industry representatives I’ve conferred with claim that the process is safe – *as long as it is done properly*. Incidents about which I’ve challenged them, from Alabama, Arkansas, Colorado, Louisiana, Michigan, New Mexico, Ohio, Oklahoma, Texas, West Virginia, Wyoming, and multiple sites in PA, have been met with explanations reasonably paraphrased as, “Yes, well, that was due to *human error*. The process itself is completely safe.” (This begs the questions of when and how the industry intends to shift its labor force to non-humans.) Whether and to what degree human error is included as a factor in your assessment of hydraulic fracturing should be explicitly stated.

### **Technology assessment:**

I believe it would be helpful to assess the relative influences of human error and current technology on the overall safety of shale gas extraction. Specific questions that might contribute to “pure technology” risk assessments include:

How many fractures are propagated in a typical hydraulic fracturing stage? (Hundreds? Thousands?)

What is the detection limit for fractures extending beyond the target zone? (1%? 10%?)

Do different rock strata overlying shales suppress out-of-zone fractures or propagate them? How are these fractures monitored empirically (if they ever are)? What is the current time-frame of fracture growth observation? (Days? Months?) What should that time frame be?

### **Long-term fate of infrastructure:**

With respect to time frames, I recommend that you develop longitudinal data on abandoned infrastructure (played-out wells, pipelines and underground storage facilities). How long will steel pipe within concrete casing withstand the corrosive effects of brines and sulfur-metabolizing microbes at temperatures up to 180 °F? (50 years? 150 years?) How much pressure redevelops in that time? What impact does repeated stimulation by hydraulic fracturing exert on the longevity of a gas well’s casing? How do hydraulic fracturing and underground injection in target zones above and beneath an abandoned horizontal well affect the integrity of its casing and plugs?

Here are some more readily accessible questions: What monitoring programs for abandoned infrastructure are maintained by energy companies and/or regulatory agencies? What reporting is required? What activities are underway to locate and stabilize “orphan” wells and pipelines?

### **Air quality concerns:**

While your congressional mandate is to study potential relationships between hydraulic fracturing and drinking water resources, the impact of shale gas extraction on air quality is also of real concern. In particular, the use of open pits for impounding flow-back fluids from gas wells practically guarantees health impacts on people and animals in close proximity. Most organic chemicals used as additives are less dense than water, so they float to the pond surface (classic oil / water separation). These organics concentrate until they comprise essentially 100% of the surface. There they vaporize and aerosolize into the overlying and surrounding air.

The widespread venting of condensate tanks and “glycol” reboilers, related to purifying “raw” natural gas, also contributes to diminished air quality in and around gas fields.

A possible consequence is the increasingly described “down-winder’s syndrome” characterized by frequent headaches, nausea, sore throats, rashes, dyspnea, and peripheral neuropathy, with occasional mental confusion, hair loss, fatigue and myalgia. I urge you to investigate possible links of shale gas extraction to this phenomenon as well as to locally elevated levels of ozone and diesel combustion particulates.

**Recapture of “lost” data:**

Citizens who complain to county or state agency officials about alleged damage from nearby gas extraction activities are often encouraged to seek redress from the companies they blame for their losses. Energy company officials typically (1) deny any culpability for the citizens’ losses, and (2) offer assistance as “good neighbors” in exchange for (3) the aggrieved citizens’ signatures on liability releases / non-disclosure agreements. Whenever such contracts are signed, local officials typically note that the reported problems were solved, and close their investigations.

The scale of ongoing retail purchases of bottled water, in locales where complaints against gas extraction companies had surfaced, suggest that many homeowners’ complaints have not been resolved, and significant incident data may be forfeited by their non-disclosure agreements. This data is non-discoverable; however, I recommend that you offer some legal mechanism (*e.g.* limited immunity) for damaged homeowners and gas company executives to contribute the benefit of their experiences to your investigation.

**Context of other investigations:**

I encourage you to evaluate the results of your investigation in the light of other federally-funded studies, particularly the 2010 Annual Report of the President’s Cancer Panel, “Reducing Environmental Cancer Risk: What We Can Do Now”, and the pending U. S. Department of Energy report on Energy and Water.

Thank you for your attention.

Respectfully submitted,

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