

### ***Affirming Gasland***

***A de-debunking document in response to specious and misleading gas industry claims against the film.***

Dear audience, press, and peers:

I have been overwhelmed by the amazing, positive responses to the film. From the incredible reviews, the great HBO ratings, the effusive and impassioned response to our website and Facebook page, the powerful responses of the news media and the thousands of audience members at sold-out community screenings, I am humbled that *Gasland* has been so well received and is helping to bring the crisis of gas drilling in the USA to greater attention.

Even before its release, the significance of the film was not lost on the gas industry. In the March 24th edition of the *Oil and Gas Journal*, Skip Horvath, the president of the Natural Gas Supply Association said that *Gasland* is “well done. It holds people’s attention. And it could block our industry.”

Although I am thoroughly dismayed and disappointed in the recent attacks on the veracity of *Gasland* and on my credibility as a filmmaker and journalist by Energy-In-Depth and other gas-industry groups, I can’t say that I am surprised.

When I was investigating gas drilling across the United States, I heard time after time from citizens that the industry disputed the citizens’ claims of water and air contamination and denied responsibility for their health problems and other problems related to drilling.

I now know how the people in my documentary feel, to have the things they know to be true and the questions they are raising so blatantly discounted and smeared. It is truly unfortunate that the gas-drilling industry continues to deny what is so obvious to Americans living in gaslands across the nation instead of taking responsibility for the damage they are causing.

I am issuing the following point-by-point rebuttal of their claims, not because I feel obligated to address what are clearly falsehoods and smear tactics, but to show the depth of the industry’s assault on the truth and to point out their obfuscations, misleading spin on information, and attempts to shut down questions about their practices. We will be continuing to do the work necessary to have the film seen as much as possible and to offer the *Gasland* team’s expertise as we move forward.

First, to reveal the accusers: [Energy-In-Depth](#) (E-I-D) is a PR firm/lobbying group funded by the American Petroleum Institute. It is a source of neither journalistic integrity nor educated opinion. There are no authors named on the document “Debunking GasLand,” but you can learn a bit about who they are [here](#).

We wish both E-I-D and the gas industry as a whole would behave differently towards people living in gaslands across the globe. We urge them to see the problems that they are causing and move swiftly to correct them — and if they cannot, to cease the practice of hydraulic fracturing immediately.

Please see our responses below to their claims.

I hope that you, too, continue to investigate the truth of gas drilling so that you can help us protect water, air, and public health from this unregulated industry.

Thanks in advance for reading this statement. I hope it will be a resource and a jumping-off point for your continued research.

Josh Fox

[www.gaslandthemovie.com](http://www.gaslandthemovie.com)

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**Note:** We have gone to our amazing team of experts to **Affirm Gasland**. You will see a tagline of the person responding to each point. Participating in this affirmation are **Barbara Arrindell**, cofounder and director of Damascus Citizens for Sustainability; **Ron Bishop**, PhD, lecturer in chemistry and biochemistry at SUNY Oneonta; **Steve Coffman**, author, educator, and former chair of Committee to Preserve the Finger Lakes; **Anthony R. Ingraffea**, PhD, the D.C. Baum professor of engineering at Cornell University; **Weston Wilson**, retired EPA environmental engineer and myself; with additional comments from **James Barth**, member of the steering committee of Damascus Citizens for Sustainability; **Laurie Spaeth**, founding blogger of [www.Un-NaturalGas.org](http://www.Un-NaturalGas.org); **Maura Stephens**, who edited.

### Our Rebuttals in BLACK

#### E-I-D in ORANGE

#### LINKS in BLUE

#### In “Debunking GasLand,” E-I-D writes:

For an avant-garde filmmaker and stage director whose previous work has been recognized by the “Fringe Festival” of New York City, HBO’s decision to air the GasLand documentary nationwide later this month represents Josh Fox’s first real foray into the mainstream – and, with the potential to reach even a portion of the network’s 30 million U.S. subscribers, a potentially significant one at that....

#### JOSH:

This is the beginning of a recurring little rant on my life's work thus far, which is as artistic director of the innovative theater company [International WOW](http://InternationalWOW.com). I am happy to be associated with avant-garde work, the cutting edge of the art form.

My company, International WOW, however, is far from being a fringe/unknown group. Our work has been produced all over the world and is the recipient of numerous awards and grants. Last year International WOW was nominated for a [Drama Desk Award](#) for our production *Surrender*, which was a collaboration with decorated Iraq War Veterans. International WOW Company has received five prestigious MAP fund grants, NEA, NYSCA and FORD foundation funding, several fellowships from the Asian Cultural Council, and many other accolades. I am very proud of the more than 25 full-length works of the company, and I think the company's [innovative working methods](#) and aesthetics are at work in *Gasland*.

If you want to know more about International WOW Company, please visit our website: [www.internationalwow.com](http://www.internationalwow.com).

#### E-I-D Writes:

#### *Misstating the Law*

[Quoting *Gasland*] (6:05) "What I didn't know was that the 2005 energy bill pushed through Congress by Dick Cheney exempts the oil and natural gas industries from Clean Water Act, the Clean Air Act, the Safe Drinking Water Act, the Superfund law, and about a dozen other environmental and Democratic regulations. "

This assertion, every part of it, is false. The oil and natural gas industry is regulated **under every single one of these laws**—under provisions of each that are relevant to its operations. See this fact sheet for a fuller explanation of that.

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### **JOSH:**

The first major section of E-I-D's piece is a denial that the industry is exempt from most major environmental laws. This is a blatant falsehood.

We will go into this in detail below, but first, let's let NRDC set the record straight. Click [this link for a complete spreadsheet of the EXEMPTIONS.](#)

### **WESTON WILSON:**

*Gasland* asserts that the effect of the 2005 Energy Policy Act was to remove EPA oversight from hydrofracking. It is well established that hydrofracking fell within the regulatory provisions of the Safe Drinking Water Act and that the Bush/ Cheney administration actively pushed for hydrofracking exemptions in the Energy Policy Act of 2005. Therefore, it is patently disingenuous for "Debunker" to claim otherwise.

**WESTON WILSON's extensive comments on EXEMPTIONS, please see the extended reading section starting on page 24.**

### **E-I-D:**

Far from being "pushed through Congress by Dick Cheney," the Energy Policy Act of 2005 earned the support of nearly three-quarters of the U.S. Senate (74 "yea" votes), including the top Democrat on the Energy Committee; current Interior Secretary Ken Salazar, then a senator from Colorado; and a former junior senator from Illinois named Barack Obama. In the U.S. House, 75 Democrats joined 200 Republicans in supporting the final bill, including the top Democratic members on both the Energy & Commerce and Resources Committees.

### **STEVE COFFMAN:**

In his second week in office, George W. Bush created the energy task force, officially known as the **National Energy Policy Development Group, with Vice President Dick Cheney as chairman.** In its mission, NEPDG aimed to: "develop a national energy policy **designed to help the private sector.** . . ."

Only when pressed by EPA chief Christie Todd Whitman did Cheney remove a recommendation to exempt fracturing from the task force's final report. Whereupon, the Bush/Cheney Energy Bill of 2003 included a provision to exempt fracturing from EPA drinking water regulation — but Congress removed the provision from the final draft.

Whereupon, in the Energy Policy Act of 2005, Congressmen James Inhofe of Oklahoma and Joe Barton of Texas inserted language to "Amend the Safe Drinking Water Act of 1996 to exempt hydraulic fracturing related to oil and gas production . . . and, thus, exclude this practice from . . . regulations related to the protection of underground sources of drinking water."

### **E-I-D:**

[Quoting from *Gasland*] (6:24) "But when the 2005 energy bill cleared away all the restrictions, companies . . . began to lease Halliburton technology and to begin the largest and most extensive domestic gas drilling campaign in history — now occupying 34 states."

Once again, hydraulic fracturing has never been regulated under SDWA — not in the 60-year history of the technology, the 36-year history of the law, or the 40-year history of EPA. Given that, it's not entirely clear which "restrictions" in the law Mr. Fox believes were "cleared away"

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by the 2005 energy bill. All the bill sought to do was clarify the existing and established intent of Congress as it related to the scope of SDWA.

Interest in developing clean-burning natural gas resources from America's shale formations began to manifest itself well before 2005. The first test well in the Marcellus Shale in Pennsylvania, for example, was drilled in 2004. In Texas, the first wells in the prolific Barnett Shale formation were spudded in the late 1990s. But even before natural gas from shale was considered a viable business model, energy producers had been relying on hydraulic fracturing for decades to stimulate millions of wells across the country. The technology was first deployed in 1948.

### **JOSH:**

This is a common industry tactic, to claim that hydraulic fracturing [HF] has been used for 60 years. This is deliberately misleading.

The new hydraulic fracturing that has brought about so much attention in the last few years is different in many ways from the historic fracturing:

- 1) [the pressure used is much higher and the duration of the frack job is longer](#). Today HF employs typically 13,500 pounds of pressure per square inch, whereas earlier HF was less than 10,000 pounds per square inch.
- 2) the volume of water used: two to seven million gallons per frack, with [Multi Stage Fracks](#) lasting up to three or four days, at 1,000 gallons per minute
- 3) the combination of HF with [horizontal drilling](#), a huge new aspect, and
- 4) [the complexity of the chemical cocktail used in the process](#).

However, the industry frequently contradicts itself, wanting to tout both the reassurance that this technique is tried and true and that it has created an innovative technology that unlocks gas that was previously not considered recoverable. The industry touts the "new technological breakthrough" of HF as unlocking the [Marcellus shale in ways that could not have been done years ago](#).

On Chesapeake Energy's Hydraulic Fracturing "fact" site, this contradiction is evident: "Hydraulic fracturing, commonly referred to as fracing, is a proven *technological advancement* which allows natural gas producers to safely recover natural gas from deep shale formations. This *discovery* has the potential to.... [emphasis added]." Later in the [same passage](#) we get the same refrain: "Hydraulic fracturing has been used by the oil and gas industry since the 1940s..."

**To READ MORE on the TECHNICAL ASPECTS of HIGH-PRESSURE FRACKING, see extended reading section starting on page 24.**

### **E-I-D:**

The contention that current energy development activity represents the "largest ... drilling campaign in history" is also incorrect. According to EIA, more natural gas wells were [developed in 1982](#) than today. And more than two times the number of petroleum wells were drilled back then as well, relative to the numbers we have today. Also, while it may (or may not) be technically true that fracturing activities take place in 34 states, it's also true that 99.9 percent of all oil and gas activity is found in only 27 U.S. states (page 9, Ground water Protection Council report).

### **JOSH:**

This is yet another obfuscation of the facts that is disproven quickly by looking up the very chart

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that E-I-D references. While it is true that in 1982 there were more gas wells drilled than in 2010 (and by the way, we're not done with 2010 yet), *Gasland* states that since 2005 a huge upswing in drilling took place. [The chart that E-I-D references](#) in this section shows this. Between 2005 and 2009, more gas wells were drilled in the US than at any time in history.

But what is even more significant is that leasing in unconventional drilling area plays throughout the [34 states was incredibly active](#) (follow this link and click on "drilling areas"), and that once the SDWA exemption came in, the gas industry charged forth into these areas full force and began planning for huge drilling campaigns in those regions, most notably perhaps in the [Marcellus shale in NY/PA/OH/WV](#), the Barnett Shale in the Fort Worth area, the Haynesville Shale in Louisiana/Arkansas, and the other major shale plays.

### **E-I-D:**

[Quoting from *Gasland*] (32:34) "The energy task force, and \$100 million lobbying effort on behalf of the industry, were significant in the passage of the 'Halliburton Loophole' to the Safe Drinking Water Act, which authorizes oil and gas drillers exclusively to inject known hazardous materials, unchecked, directly into or adjacent to underground drinking water supplies. It passed as part of the Bush administration's Energy Policy Act of 2005."

Not content with simply mischaracterizing the nature of existing law, here Fox attempts to assert that the law actually allows energy producers to inject hazardous chemicals "directly into" underground drinking water. This is a blatant falsehood. Of course, if such an outrageous thing were actually true, one assumes it wouldn't have taken five years and a purveyor of the avant-garde to bring it to light.

### **JOSH:**

This claim echoes the common industry line, "There has never been a proven case of water contamination caused by hydraulic fracturing." Industry representatives and lobbyists said this over and over again in the film. It's a carefully worded sentence that contains two major deceptions:

- 1) The word "proven" — How can you prove something that has never been investigated? HF has never been investigated fully by the EPA. The fact that non-naturally-occurring chemicals specifically associated with HF fluids and drilling muds are showing up in people's water supplies is the first level of proof; E-I-D denies the testimony of the citizens. Very tricky wording, which belies the real truth. Quite deliberately.
- 2) The words "hydraulic fracturing" The industry here defines HF here as the moment underground fractures are split — and not the entire drilling process. The industry could never claim that there has never been a proven instance of water contamination due to the whole process of GAS DRILLING, but when they confine their definition to the single moment of the underground fracturing — a part of the process that has never been investigated — they can legally deny the obvious.

E-I-D also claims here that hydraulic fracturing does not inject toxic fluids directly into drinking water supplies. Not true! Of course it does; in fact, [that is the biggest problem with HF — and it is exactly what the SDWA exemption allows.](#)

Their continual pot-shots at the [avant-garde](#) are also disappointing, not to mention puerile.

FURTHERMORE, drilling muds, which are multifunctional including acting as lubricants for the drill bit in the initial drilling process [contain hazardous chemicals](#), They are injected directly

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into the aquifers as this initial drilling is into the raw earth before the well is cased. Indicators and substances related to the initial drilling and the drilling muds such as arsenic, barium, and strontium [have been found in our subjects' water tests](#) just after drilling.

Also see: <http://ithaca.wishingwellmagazine.org/blogs/tompkins-weekly/2010/03/health-impacts-gas-drilling-examined>

<http://carbonwaters.org/tag/drinking-water-contamination/>

### **WESTON WILSON:**

The Energy Policy Act of 2005 defines hydraulic fracturing, unless the fluids contain diesel, as not subject to the Safe Drinking Water Act. Other provisions of the SDWA prohibit direct injection of hazardous materials directly into drinking water sources. Water underground that can be or is used for drinking water is known as an “underground source of drinking water” (USDW).

The disingenuous E-I-D response here is that direct injection of hazardous materials was not a provision of the Energy Policy Act of 2005, but that is not the context of Josh’s statement here. The context of Josh’s statement is that *all drillers must drill through USDWs to get to the natural gas*. Josh’s statement is accurate: the “Halliburton loophole” exempted HF wells from being tested under the SDWA for their mechanical integrity, which would have determined if they were adequately sealed to prevent hazardous materials from entering directly into a USDW or into an adjacent USDW (which could happen if the HF well releases methane and hazardous materials upwards into a USDW).

### **JOSH on fracking with diesel, a federal crime:**

In spite of the fact that the fracking companies were not supposed to use diesel to [frack, they did it anyway](#). As reported by *The New York Times* in February 2010, "Two of the world's largest oil-field services companies [Halliburton and BJ Services] have acknowledged to Congress that they used diesel in hydraulic fracturing after telling federal regulators they would stop injecting the fuel near underground water supplies."

### **E-I-D:**

The subsurface formations that undergo fracture stimulation reside thousands and thousands of feet [below formations that carry potable water](#). These strata are separated by millions of tons of impermeable rock, and in some cases, more than two miles of it.

### **JOSH:**

That target layers of fracking are far below underground drinking water sources was never contested by *Gasland*. We don't know why fracking chemicals and fugitive natural gas are getting into water supplies, we just know that they are. Again, there has never been a thorough nationwide investigation by a highly qualified government agency. But that is beginning to change. The nine major fracking companies are currently being [investigated by the U.S. Congress](#). The [EPA has been examining water contamination in Pavillion, Wyoming](#) for the past year and is now scoping a major [two-year study of HF at the behest of Congress](#).

### **E-I-D:**

Once again, to characterize the bipartisan 2005 energy bill as having a “loophole” for hydraulic fracturing requires one to believe that, prior to 2005, hydraulic fracturing was regulated by EPA under federal law. But that belief is mistaken. And so is the notion that the 2005 act contains a

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loophole for oil and natural gas. As stated, hydraulic fracturing has been regulated ably and aggressively by the states.

**WESTON WILSON:**

But not so ably or aggressively as to prevent the well-documented oil and gas production problems in [Garfield County, Colorado](#); [Pavilion, Wyoming](#); [DISH, Texas](#); or [Dimock, Bradford County](#), and [Hickory, Pennsylvania](#). [More](#).

**JOSH:**

It should be noted that generally the state DEP (Department of Environmental Protection) or DEC (Department of Environmental Conservation) or DEQ (Department of Environmental Quality) or DEQC (Department of Environmental Quality Control) does not have adequate budget or staff to investigate, inspect, or monitor HF wells — especially as they are spreading so rapidly. Exempting HF from federal law leaves this responsibility to the [states that have been overwhelmed by the drilling](#). For example, in [New Mexico there are only 18 inspectors](#) to deal with 99,000 gas wells. It's simply not possible for so few people to track so many wells.

**E-I-D:**

[Quoting *Gasland*] (1:32:34) "Diana DeGette and Maurice Hinchey's FRAC Act [is] a piece of legislation that's one paragraph long that simply takes out the exemption for hydraulic fracturing to the Safe Drinking Water Act."

Here Fox is referring to the [2008 iteration](#) of the FRAC Act, not the slightly longer (though equally harmful) [2009 version](#) of the bill. The legislation does not, as its authors suggest, "restore" the Safe Drinking Water Act to the way it was in 2004. It calls for a wholesale re-writing of it.

**JOSH:**

E-I-D is stating that the FRAC Act is "harmful." This is a strange choice of words when we are talking about restoring Safe Drinking Water Act protections. The SDWA aims to protect underground drinking water supplies from harmful chemical injection. So here E-I-D states that the Safe Drinking Water Act is considered "harmful" to the gas industry. (The FRAC Act and other efforts to regulate HF are in fact [being advanced](#) and negotiated currently.)

**E-I-D:**

Here's the critical passage from the FRAC Act: "Section 1421(d)(1) of the Safe Drinking Water Act is amended by striking subparagraph (B) **and inserting:** (B) includes the underground injection of fluids or propping agents pursuant to hydraulic fracturing operations related to oil and gas production activities."

Why would you need to "insert" new language into a 36-year-old statute if all you were looking to do is merely "restore" it?

**JOSH:**

The insertion is to make it crystal clear that the bill is a reaction to the injection of fracking fluids and the [thousands of documented cases](#) of contamination.

### On FLAMMABLE TAP WATER and Its CAUSES

#### JOSH:

I am taking this point out of order because it is so important to the film I want to address it near the beginning of this document:

#### E-I-D claims:

Mike Markham in *Gasland*]: Fox blames flammable faucet in Fort Lupton, Colo. on natural gas development. But that's not true [according to the Colorado Oil & Gas Conservation Commission \(COGCC\)](#). "Dissolved methane in well water **appears to be biogenic [naturally occurring] in origin**. ... There are no indications of oil & gas related impacts to water well." (complaint resolved 9/30/08, signed by John Axelson of COGCC)

#### JOSH:

**Biogenic gas can migrate as a result of gas drilling.** And hiding behind "biogenic" gas classification is yet another common industry obfuscation tactic.

E-I-D asserts that the gas that Mike Markham lights at his tap was classified as "biogenic" by the Colorado Oil and Gas Conservation Commission, so therefore the problem cannot be attributed to drilling. This is a very misleading assertion, and it is false in several ways.

A distinction is being made here between "biogenic" and "thermogenic" natural gas. "Biogenic" gas is created by decomposing organic material, and is found in pockets close to the surface.

"Thermogenic" natural gas is created by intense pressure in underground rock formations and can come only from deeper layers (including shale, which are targeted by fracking). The different types of gas can be identified by isotopic tests that "fingerprint" the gas. However, gas fingerprinting simply identifies the gas. **It does not identify the migratory pathway of the gas** — a key omission.

Just because Mike Markham's gas is "biogenic" doesn't mean that its migration into water supplies was not caused by drilling.

I asked Dr. Anthony Ingraffea, the D. C. Baum Professor of Engineering at Cornell University, whose research for more than 30 years has involved structural mechanics, finite element methods, and fracture mechanics: "**Can drilling and/or hydraulic fracturing liberate biogenic natural gas into a fresh water aquifer?**"

His reply: "**Yes, definitely.** The drilling process itself can induce migration of biogenic gas by disturbance of previously blocked migration paths through joint sets or faults, or by puncturing pressurized biogenic gas pockets and allowing migration through an as-yet un-cemented annulus, or though a faulty cement job. The hydraulic fracturing process is less likely to cause migration of biogenic gas; however, the cumulative effect of many, closely spaced, relatively shallow laterals, each fracked (and possibly re-fracked) numerous times, could very well create rock mass disturbances that could, as noted above, open previously blocked migration paths through joint sets or faults."

So, just because the COGCC labeled the gas "biogenic" doesn't mean that they actually looked into how it got there. As Professor Ingraffea states above, there are several ways that drilling and fracking can cause biogenic natural gas to migrate into aquifers. COGCC did not conduct a hydro-geologic study to determine the migratory pathways of the gas into the water supply — despite citizens' conviction that the problems with their water happened after fracking occurred nearby.



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At the very top of the *Gasland* interview with Mike Markham and his partner, Marsha Mendenhall, they state very clearly their intense frustration with the COGCC. Holding up the jar of their contaminated water, they explain that the COGCC had ruled that their contamination had nothing to do with gas drilling. This fact is not hidden by the film.

Renee McClure, who also had flammable tap water, expressed frustration with the COGCC as well, stating: "I thought that the Colorado Oil and Gas Conservation Commission was there for the people. They are not there for the people, they are there to work and help the oil and gas companies. And I asked them—who's there for the people? And he told me, 'NOBODY, call an attorney!' " Renee McClure was also told her methane contamination was naturally occurring. Both Markham and McClure stated on the record that their water got worse after nearby fracking and gas-drilling activity had occurred. (And in both cases, water tests showed other contaminants related to oil and gas production in their water wells, which is a fact that E-I-D leaves out.)

There are striking similarities between the industry's and regulators' responses in Weld County, Colorado and Dimock, Pennsylvania. In both cases, citizens had a fundamental distrust of the state regulatory agency, and in both cases gas companies called the gas "biogenic" until the claim was either disproved or additional cases of "thermogenic" gas contamination surfaced.

### **Widespread frustration with state agencies Like COGCC and PA DEP**

Frustration among citizens with their state agencies was very common in my travels, in Colorado, in Pennsylvania, in Texas, and in Arkansas. Citizens pointed out time and time again how they felt their state environmental agencies were not up to the job, or even worse, were in cahoots with the gas companies. In Dimock, Pennsylvania, we were told that Cabot Oil and Gas and DEP reps often walked in together with an air of camaraderie; in Texas, complaints about the Texas Commission on Environmental Quality (TCEQ) and the Railroad Commission were rampant. It is indeed part of the thesis of *Gasland* that state agencies are either overwhelmed or not to be trusted when it comes to gas drilling. Mike and Marsha make that point quite clearly. Among folks living in gaslands, state agencies are not living up to their responsibilities to protect citizens and are widely suspected of corruption.

I also experienced the same frustration with the Colorado Oil and Gas Conservation Commission (COGCC) and Pennsylvania Department of Environmental Protection. Dave Neslin, the COGCC executive director, scheduled an interview with me and then promptly canceled it when I asked him to sign a production release.

We included that refusal in the film. PA DEP secretary John Hanger said there was no contamination of Dimock's water in the beginning of his interview, but he promptly reversed his position when I offered him some Dimock water to drink, stating that the families that had been contaminated had been given replacement water by the gas companies.

### **Biogenic/thermogenic reversal in Dimock**

As pointed out before, just because the gas industry says the gas is biogenic doesn't mean that it actually is.

When I got to Dimock I called Cabot Oil and Gas spokesman Ken Komoroski to ask about Dimock's flammable tap water. He gave me the same explanation, saying that Dimock's water had been flammable prior to drilling and that the gas was biogenic. A few months later the PA DEP did extensive testing that showed that the gas was in fact thermogenic. (You can see the

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[attached PDF](#) with PA DEP's findings on the subject and Cabot Oil and Gas's plea to DEP to not identify the gas as "Marcellus" gas.) Here is a key quote from a PA DEP internal memo on the subject.

Sent: Thursday, January 29, 2009 6:54 AM  
To: Burch, Kelly; Bowman, Kenneth  
cc: sherman, Michael D; Schwartz, Ronald; Lobins, craig; Bialosky, Donald; carmon, Mark; Bedrin, Michael; Sexton, Barbara (DEP)  
Subject: RE: Stray gas incident - Dimock Twp., Susquehanna County

"Based on the existing geochemical data set, we can conclude that the origin of the stray gases detected in the Florentino and sautner [sic] water wells (nine samples analyzed thus far: two = stray gas, seven = potential sources) is thermogenic in origin, consistent with natural gas from Devonian production. The gas found in these water wells is not consistent with microbial gas that occurs in some shallow aquifer systems."

However, Cabot Oil and Gas's first response, like the gas industry's first response to *Gasland*, was to try to discredit the claim. Ken Komoroski stated that Dimock residents either had gas in their water from before the drilling, which all the citizens dispute, or that somehow magically at exactly the same time as drilling started, an unrelated source of natural gas began to migrate into their water supply.

### **Proven examples of "thermogenic" natural gas in water supplies**

Just because Mike Markham's gas may or may not be biogenic doesn't mean that all of the examples of lighting water on fire in the film are due to biogenic gas.

This leads me to discuss the case of Mike and Marsha and Renee's neighbors, Ameer and Jesse Ellsworth, who are featured in the film just after Mike and Marsha. They light their water on fire in the film. Unlike Mike and Marsha, the methane in their water was ruled "thermogenic" by the COGCC, to have come directly from the deeper layers, i.e., from the layers targeted by gas drilling. Ameer and Jesse's tests were done a year after Mike and Marsha's tests, which could indicate that thermogenic gas was pushing biogenic gas up to the surface. Biogenic would come up first into the aquifer as in Mike's 2008 test followed by Ameer's thermogenic gas, tested in 2009.

### **WHAT HAPPENED TO THESE FAMILIES:**

I will state again, that in neither case did the COGCC do any real hydro-geologic surveying; they only labeled the gas as "thermogenic" or "biogenic" and then walked away, leaving Mike and Marsha, Renee, and Ameer with no option but to start hauling water into their houses from a nearby municipal water source, move away and start over, or enter into a negotiation with the gas company for water.

Of the three cases, Mike and Marsha chose hauling water. They go to town once or twice a week to buy water from a coin-operated machine, as detailed in the film.

Renee McClure moved out of the area, presumably because of her water and health problems in Weld County.

Ameer and Jess Ellsworth chose to negotiate with the gas company and have now been silenced, compelled to sign a non-disclosure agreement. I checked in with Ameer recently to see how she

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was doing. She said, with regret in her voice, "I can't talk to you about gas." She can no longer talk on the record about what happened to her. I don't know the details, but I do know that she is still being delivered water by the company. She cannot speak to me or anyone about the gag order she was compelled to sign, I found out from a third party. She had to trade her silence for water. At that moment, the truth lost a very powerful and articulate voice. Without water, you cannot sell your property, and without water you cannot stay on your property. Ameer and Jesse's backs were against the wall; they took the only way out of the nightmare. They sold their first amendment rights for water.

In Dimock, the water problems continue. Cabot Oil and Gas is supplying water to 32 families as ordered by PA DEP, (up significantly from the 4 families that John Hanger notes in the film). In Hickory PA, replacement water is rampant, with some reports stating that over 200 families are receiving replacement water in exchange for non-disclosure agreements. Why should people have to sign an NDA to get clean water after a multi-billion-dollar corporation contaminates their water? Is it right for people to have to trade their silence for what should be their right?

### **CONCLUSION on biogenic or thermogenic gas:**

Whether the gas is determined biogenic or thermogenic, we believe the citizens when they say the problem happened post-drilling and post-fracking. Testing of the drinking water in Dimock prior to drilling showed no gas of any kind in any significant quantities. **The industry is using this biogenic/thermogenic distinction, often with the collusion of state agencies** who are not properly investigating, to dispute citizen's claims of contamination, **but it has *no basis in science*.**

### **E-I-D:**

[following previous statement] Context from our friends at ProPublica: "Drinking water with methane, the largest component of natural gas, isn't necessarily harmful. The gas itself isn't toxic—the Environmental Protection Agency doesn't even regulate it — and it escapes from water quickly, like bubbles in a soda." ([Abrahm Lustgarten, ProPublica, 4/22/09](#))

### **STEVE COFFMAN**

But Debunker might not have been so snarky had he quoted the entire passage the above quote was deviously plucked from.

"Drinking water with methane, the largest component of natural gas, isn't necessarily harmful. The gas itself isn't toxic -- the Environmental Protection Agency doesn't even regulate it -- and it escapes from water quickly, like bubbles in a soda.

But the gas becomes dangerous when it evaporates out of the water and into people's homes, where it can become flammable. It can also suffocate those who breathe it. According to the Agency for Toxic Substances and Disease Registry, a part of the U.S. Department of Health and Human Services, as the concentration of gas increases it can cause headaches, then nausea, brain damage and eventually death."

**READ the ProPublica piece by Abrahm Lustgarten, "COLORADO STUDY LINKS METHANE in WATER to DRILLING," whence the E-I-D excerpt came, in our extended reading section starting on page 24.**

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### E-I-D:

#### Misrepresenting the Rules

(1:00:56) “Because of the exemptions, fracking chemicals are considered proprietary ... The only reason we know anything about the fracking chemicals is because of the work of Theo Colborn ... by chasing down trucks, combing through material safety data sheets, and collecting samples.”

With due respect to eminent environmental activist and former World Wildlife Fund staffer Theo Colborn, no one has ever had to "chas[e] down a truck" to access information on the materials used in the fracturing process.

That's because there's actually a much easier way to obtain that information: simply navigate to [this website](#) hosted by regulators in Pennsylvania, this one from regulators in New York (page 130), [this one](#) for West Virginia, [this one](#) maintained by the Ground Water Protection Council and the U.S. Department of Energy (page 63), and [this one](#) on the website of Energy In Depth.

### JOSH:

Theo's chemical lists were published at least two years before John Hanger's DEP published the list of the chemicals on the PA DEP website in the spring of 2009. Activist groups like Damascus Citizens in Pennsylvania had complained that the [DEP was stating that the process used no fracking fluids, only "water and sand."](#) Of course, after they released the list, the DEP asserted that they never said that fracking used only water and sand.

Dr. Theo Colborn's research is [here](#).

### WESTON WILSON:

This is Orwellian reasoning indeed — as it was not until Dr. Colborn published her data on HF fluids that these data became available in the NY Supplemental Generic Environmental Impact Statement (SGEIS). The Groundwater Protection Council (GWPC) and Department of Energy (DOE) source entitled “Shale Gas: A Primer,” prepared by ALL Consultants, lists only classes of chemicals and their function in the well—there are no CAS (Chemical Abstracts Service) numbers provided by the GWPC/DOE. CAS registry numbers are unique numerical [identifiers](#) for [chemical elements](#), [compounds](#), [polymers](#), biological sequences, mixtures and [alloys](#). Yet neither the West Virginia statement cited by E-I-D, nor the E-I-D list contain CAS numbers, which are necessary to identify the chemical and its toxicity.

[http://en.wikipedia.org/wiki/CAS\\_registry\\_number\\_-\\_cite\\_note-crc-1#cite\\_note-crc-1](http://en.wikipedia.org/wiki/CAS_registry_number_-_cite_note-crc-1#cite_note-crc-1)

[Chemical Abstracts Service](#) (CAS), a division of the [American Chemical Society](#), assigns these identifiers to every chemical that has been described in the literature. The intention is to make database searches more convenient, as chemicals often have many names.

### JOSH:

[Gas companies also told NY DEC](#) that frack fluid was just water and sand.

### E-I-D:

(1:03:33) Dr. Colborn: “Once the public hears the story, and they'll say, ‘Why aren't we out there monitoring?’ We can't monitor until we know what they're using. There's no way to monitor. You can't.”

Theo continues to investigate and discover more chemicals. [Her list is up to 944.](#)

According to [environmental regulators](#) from Josh Fox's home state of Pennsylvania, “**Drilling companies must disclose the names of all chemicals to be stored and used at a drilling site ...** These plans contain copies of material safety data sheets for all chemicals ... This information is on file with DEP and is available to landowners, local governments and emergency responders.”

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### JOSH:

Although I applaud PA DEP's disclosure of some of the fracking chemicals, its list is still incomplete and [lists certain chemicals as "proprietary"](#) (At the link, see the listing for Super Pen, among others, third page, fourth column)

### E-I-D:

Environmental regulators from Fox's **adopted** state of New York also testify to having ready access to this information. From the NY Dept. of Environmental Conservation (DEC) [information page](#): "The [state] is assessing the chemical makeup of these additives and will ensure that all necessary safeguards and best practices are followed."

According to the [Ground Water Protection Council \(GWPC\)](#), "[M]ost additives contained in fracture fluids including sodium chloride, potassium chloride, and diluted acids, present low to very low risks to human health and the environment." GWPC members include state environmental officials who set and enforce regulations on ground water protection and underground fluid injection.

### WESTON WILSON:

PA DEP requires, as do most states, that MSDS (materials safety data sheets) be posted on chemicals shipped and stored. The purpose of an MSDS is to provide information to a first responder, such as a fireman, in the case of spill or fire. Dr. Theo Colborn [of the [Endocrine Disruption Exchange](#)] obtained various MSDS sheets from chemicals shipped for the purposes of HF. However, MSDS sheets do not contain CAS numbers. Dr. Colborn provided them where the chemical name was specific, but about 50 percent or so of these MSDS sheets lack a specific chemical name, and some MSDS sheets simply claim 'proprietary' status and list none of the chemicals in that container.

### STEVE COFFMAN:

E-I-D rightly tells us that lists of hundreds of added chemicals have recently been divulged in PA and NY. But E-I-D fails to add that the *specific* chemical formula of each individual well's fracking is still being held by companies as "proprietary trade secrets."

### JOSH:

MSDS sheets are photographed in the film, as are some of the chemicals' health effects, which include cancer and acute aquatic toxicity. Of course, what all this means is that the industry is acknowledging that they are injecting toxic chemicals in huge quantities underground. Most of this fluid stays under the ground. Only 25 to 50 percent of the toxic, non-biodegradable material is recovered. The rest is just left there, infused into the landscape forever or until it can be cleaned, which is enormously expensive and high in energy costs as well. To [build a treatment plant for New York City's water supply would cost \\$20 billion](#) and would cost approximately \$1 million a day to run. As a [Tennessee Water Fact Sheet](#) points out, "Once groundwater becomes contaminated, it is extremely costly and sometimes impossible to clean up."

### E-I-D:

#### **Mischaracterizing the Process**

(6:50) "[Hydraulic fracturing] blasts a mix of water and chemicals 8,000 feet into the ground. The fracking itself is like a mini-earthquake. ... In order to frack, you need some fracking fluid – a mix of over 596 chemicals."

As it relates to the composition of fluids commonly used in the fracturing process, [greater than 99.5 percent of the mixture](#) is comprised of water and sand. The remaining materials, used to help deliver the water down the wellbore and position the sand in the tiny fractures created in the

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formation, are typically components found and used around the house. The most prominent of these, a substance known as guar gum, is an emulsifier more commonly found in ice cream.

**STEVE COFFMAN (who fortunately has a sense of humor):**

*Yum.*

Never mind that typical fracking chemicals like BE-6, Aldecide G, FDP-S798, and Borate Crosslinker J532 are carcinogenic, mutagenic, causes of chemical pneumonia, and highly toxic to aquatic organisms.

These you would find in ice cream of the Jim Jones frozen Kool-Aid variety. And a great majority of the 596 are similarly delectable!

**RON BISHOP:**

"Where guar gum is used as a thickener, it is used along with a borax-type cross-linker and requires significant addition of biocides to prevent microbes from feasting on the guar gum. Then, when it's time to 'break' the gel, breaker additives — all of them toxic — must be used to thin the slurry so it can return from the well. A popular blend with guar gum includes "hydrotreated light petroleum distillates" (deodorized kerosene). This mixture is extremely toxic."

**E-I-D:**

From the U.S. Dept. of Energy / GWPC report: "Although the hydraulic fracturing industry may have a number of compounds that can be used in a hydraulic fracturing fluid, **any single fracturing job would only use a few of the available additives** [not 596!]. For example, in [this exhibit], there are 12 additives used, covering the range of possible functions that could be built into a fracturing fluid." (page 62)

**WESTON WILSON:**

The industry can claim that 99.5 percent is sand and water or that a particular HF fluid only contains 12 chemicals, but since the industry doesn't submit any of its HF fluids for government testing due to proprietary claims, this remains an unknown by any state or the EPA. That is the point of the FRAC Act, to require that disclosure.

Note that guar gum is food for bacteria underground, so a biocide is always used in HF fluids that contain guar gum to prevent bacteria from fowling and clogging the well.

Of the 596 chemicals on Dr. Colborn's 2009 list, approximately 2/3 lack either a CAS number or have a CAS number but lack any published toxicity information in the scientific literature (source: personal communication with Dr. Chris Poulet, ASTDR toxicologist in Denver.) Dr. Colborn's current list is just under 1000 chemicals.

**E-I-D:**

As it relates to the composition of fluids commonly used in the fracturing process, greater than 99.5 percent of the mixture is composed of water and sand.

**BARBARA ARRINDELL does the math:**

According to basic arithmetic, this 0.5% is actually **20 tons of chemicals per million gallons of water**. Their 99.5% of water and sand is by weight, so even figuring the sand as weighing the same as water (to keep this simple), even though we know that it is denser (sand sinks when swirled around with water) . . . water weighs 8.35 pounds per U.S. gallon: 8.35 pounds per gallon

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times 1,000,000 gallons (this is the million gallons of water and sand) times .005 (this is the 0.5%) = 41,750 pounds.

41,750 pounds divided by 1 ton (2,000 pounds) = **20.875 tons of chemicals, So over 20 tons of chemicals are used with every million gallons of water.**

### LAURIE SPAETH:

This claim takes advantage of the difference between percent by weight and percent by volume. The .5 percent to 1 percent of additives frequently cited by industry is reckoned by weight, which, given that water is denser than many of the additives, misleadingly gives the impression to the public of a lower *volume* of additives as a percentage of volume of water.

### RON BISHOP:

Typical hydrocarbon density is about 0.7 kilograms per liter; water is 1.0 Kg/L. An insidious effect of this density difference is that organic compounds in aqueous brine solutions (in flowback fluids, for example) will float to the surface. So, additives that make up 0.5 % of the bulk solution are much more concentrated at the surface of a holding pit, where some will affect the air quality of 'downwinders.'

### JOSH:

A note on the deceptively named [Groundwater Protection Council](#). During U.S. Representative Maurice Hinchey's cross-examination of Scott Kell of the GWPC before Congress in June 2004 (the hearings excerpted in *Gasland*), Kell was forced to admit that [the GWPC takes large contributions from the oil and gas industry](#) and, unlike true conservation/water advocacy groups, the GWPC often [sides with industry](#). In *Gasland*, Scott Kell of [GWPC testifies against reinstating the SDWA](#) for HF before Congress.

Most of these fracking chemicals are highly toxic. For example, one of the chemicals used is [2 Butoxy Ethanol](#). 2BE. [Learn about 2BE from Dr. Theo Colborn](#).

### E-I-D:

In the documentary, Fox graphically depicts the fracturing process as one that results in the absolute obliteration of the shale formation. In reality, the fractures created by the procedure and kept open by the introduction of proppants such as sand are typically less than a millimeter thick.

### JOSH:

Journalist Abrahm Lustgarten of ProPublica describes the process as "brute force," deploying ["enough pressure to strip paint off of a car."](#) But, to be clear, in the film we don't show the shale formation being obliterated. We show it being fractured: cracks open up and liquid rushes through. The fracking process is extremely violent, loud, and intense. When I have been on site [during frack jobs](#), the noise from the trucks and equipment is deafening, and the ground rumbles and shakes. You can feel it coming up through the soles of your shoes.

### E-I-D:

(50:05) "Each well completion, that is, the initial drilling phase plus the first frack job, requires 1,150 truck trips."

· Suggesting that every well completion in America requires the exact same number of truck trips is absurd. As could be guessed, the number of trips required to supply the well site with the needed equipment and personnel will vary (widely) depending on any number of factors.

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· As it relates to a source for Fox's identification of "1,150 truck trips," none is given – although it appears he may have derived those numbers from a back-of-the-envelope calculation inspired by a chart on page 6-142 of this document from NY DEC. As depicted on that page, the transportation of new and used water supplies, to and from the wellsite, account for 85 percent of the trips extrapolated by Fox.

**JOSH:**

This statistic of 1,150 truck trips comes directly from the NY State Department of Environmental Conservation's [Draft Supplemental Environmental Impact Statement](#), the agency's official projection on truck traffic.

**STEVE COFFMAN elaborates:**

Josh Fox's figure is well within the ballpark of experience and expectations. This from NY DEC's dSGEIS (6.13.1):

Truck Traffic for a Single Pad of Eight Wells

Drill Pad and Road Construction Equipment	10 – 45 Truckloads
Drilling Rig	60 Truckloads
Drilling Fluid and Materials	200 – 400 Truckloads
Drilling Equipment (casing, drill pipe, etc.)	200 – 400 Truckloads
Completion Rig	30 Truckloads
Completion Fluid and Materials	80 – 160 Truckloads
Completion Equipment – (pipe, wellhead)	10 Truckloads
Hydraulic Fracture Equipment (pump trucks, tanks)	300 – 400 Truckloads
Hydraulic Fracture Water	3,200 – 4,800 Tanker Trucks
Hydraulic Fracture Sand	160 – 200 Trucks
Flow Back Water Removal	1,600 – 2,400 Tanker Trucks

That's as many as 8,900 truckloads for one pad. Or an average of 1,112 truckloads per well (and, at some point, one would presume that those trucks are going to have to go *back*, too.)

**JOSH:**

It should be noted here that these estimations of truck traffic were averages. I also chose not to emphasize the highest figures. I worked with the middle ground. DEC says that these companies use 400-600 truck trips for water. My figure of 1,150 comes from using the number 500 for truck trips for water, so 1,150 is the mid-range. So some frack jobs require more, some less.

**E-I-D:**

Unrepresented in this chart is the enormous growth in the amount of produced water that is currently being recycled in the Marcellus – with industry in Pennsylvania reusing and recycling on average more than **60 percent of its water**, according to the Marcellus Shale Coalition.

**WESTON WILSON:**

The Marcellus Shale Coalition is an industry consortium, and its claims, generally, are theirs and theirs alone. See [SourceWatch](#)

**PROFESSOR INGRAFFEA weighs in on "Recycling" and "Air Drilling":**

When the industry began commercial scale development in Pennsylvania about three years ago, "recycling" was not even being attempted by most companies. It is another example of the



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technology-come-lately approach of the industry wherein new technologies are developed only after a foreseeable problem becomes a major safety/environmental issue.

**READ MORE on RECYCLING in the extended reading section starting on page 24.**

### **E-I-D:**

According to GWPC: “**Drilling with compressed air is becoming an increasingly popular alternative to drilling with fluids due to the increased cost savings from both reduction in mud costs and the shortened drilling times as a result of air based drilling.**” ([page 55](#))

### **PROFESSOR INGRAFFEA:**

E-I-D should have included the reference for this quotation. **Here it is, and note the year of publication:** Singh, M. M., Jr. The Pennsylvania State University. Goodwin, Robert J. Gulf Research and Development Company. **1965.** *Mechanism of Drilling Wells with Air as the Drilling Fluid.* SPE 1052-MS.

Drilling with compressed air probably *was* becoming “increasingly popular” in 1965. It is deceptive to imply that gas shale wells with total lengths of 10,000 feet or more can be drilled completely with compressed air. They can’t, and [E-I-D] know it. Compressed air drilling is used only in the upper section of the vertical portion of a well.

Further, to be honest and thorough, the E-I-D review should have finished the above quotation from the GWPC report by continuing on its Page 55 to note: “Air drilling is generally limited to low-pressure formations, such as the Marcellus shale in New York.”

The citation of this neglected part of the complete quote is: Kennedy, J. *Technology Limits Environmental Impact of Drilling.* Drilling Contractor. July/August 2000. 33-35.

Please show us your industry data from test wells in the Marcellus in New York that it is, in fact, a “low pressure formation.”

Please tell us where/how you are disposing of used drilling mud and wet cuttings?

### **WESTON WILSON:**

By the way, this is a misprint by E-I-D, since page 55 of the shale primer does not discuss compressed air drilling. Page 55 deals with pits, and is referenced later in this critique by E-I-D correctly regarding pits.

### **BARBARA ARRINDELL:**

Drilling with compressed air is also highly [explosive](#).

### **E-I-D:**

(51:12) “Before the water can be hauled away and disposed of somewhere, it has to be emptied into a pit – an earthen pit, or a clay pit, sometimes a lined pit, but a pit – where a lot of it can seep right back down into the ground.

· The vast majority of energy-producing states – 27 in total, including all the ones to which Fox travels for GasLand – have explicit laws on the books governing the type of containment structures that must be used for temporarily storing flowback water. A number of producers today choose to store this water in steel tanks, eliminating all risk of that water re-entering the surrounding environment.

GWPC (May 2009) “In 23 states, pits of a certain type or in a particular location must have a natural or artificial liner designed to prevent the downward movement of pit fluids into the

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subsurface. ... Twelve states also explicitly either prohibit or restrict the use of pits that intersect the water table.” ([page 28-29](#))

GWPC (April 2009): “Water storage pits used to hold water for hydraulic fracturing purposes are typically lined to minimize the loss of water from infiltration. ... In an urban setting, due to space limitations, steel storage tanks may be used.” ([page 55](#))

### **JOSH:**

Energy-In-Depth's own website features [a virtual tour of a gas well which includes a waste pit](#). Everywhere I went, [evaporation pits](#) to hold waste were used. They are common practice in most states, as most energy producers don't "choose" to use safer means. Many pit liners I saw were leaking, full of holes and in some instances, the pit liner, along with the fluids had been [ground up and buried](#) by a backhoe when the well was put on line.

### **E-I-D:**

#### **[Accusing Josh Fox/Gasland of] Flat-Out Making Stuff Up**

(53:36) “The Pinedale Anticline and the Jonah gas fields [of Wyoming] are directly in the path of the thousand year old migration corridor of pronghorn antelope, mule deer and sage grouse. And yeah, each of these species is endangered, and has suffered a significant decline of their populations since 2005.”

### **WESTON WILSON:**

E-I-D makes its claims about "endangered," which they put in quotes, since "endangered" usually refers to a specific government shorthand, meaning the word "endangered" is used only when explicitly referring to a species listed by the USFWS as officially "endangered" pursuant to Section 7 of the Endangered Species Act.

The Bureau of Land Management does consider that in Pinedale Anticline Project Area (PAPA) in Wyoming, oil and gas activities could significantly impact the sage grouse particularly by noise from drilling, which interferes with sage grouse breeding at their leks (places where male grouse call females), see <http://www.blm.gov/pgdata/etc/medialib/blm/wy/field-offices/pinedale/papadocs.Par.50955.File.dat/PAPA-SGNoiseRpt.pdf>.

A recent report by the Wyoming Wildlife Consultants, LLC, states: "Consistent with the 2008 annual report, the 2009 data [suggest] that sage-grouse are avoiding habitats near natural gas development with relatively high levels of activity." See: <http://www.prnewswire.com/news-releases/greater-sage-grouse-study-interim-results-released-89934752.html>.

### **BARBARA ARRINDELL:**

#### **Greater Yellowstone herds are down 46 percent.**

The Jonah gas field is in the Greater Yellowstone ecosystem. It had herds of pronghorn, mule deer, and elk numbering 100,000 and was down more than 46 percent as of 2007. For at least 6,000 years, a herd of pronghorn have been migrating a 160-mile round trip, the longest land migration of any animals in the lower 48. These sturdy animals, who survive snowstorms, coyotes, badgers, bears, subdivisions, and SUVs, may not survive the industrial zone that the Jonah fields have been transformed into by fracking: [http://www.youtube.com/watch?v=H\\_lod2O2H2k&feature=related](http://www.youtube.com/watch?v=H_lod2O2H2k&feature=related). Mule deer abundance steadily declined by 46 percent in the first four years of [gas] development (2000-2004) and then appeared to stabilize in the fifth year (2005). The WGFD reported a 19 percent decline in deer numbers for the entire herd following the severe 2003-2004 winter,

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leading to the conclusion that the additional 27 percent reduction in the study area is likely the result of a combination of emigration and reduced survival rates. Read more from the summary at <http://www.ourpubliclands.org/resources/SawyerSummary>.

This linked from scientific studies on that page: <http://www.ourpubliclands.org/resources>

are links to a **dozen** studies of the degradation of populations of big game and other wildlife, and in particular mule deer, sage grouse, different kinds of fish, etc. Look at the summaries and then the full articles. They are quite clear and well written.

### E-I-D:

[Quoting *Gasland*] (8:07) “And now they’re coming east. They’re proposing 50,000 gas wells along a 75-mile stretch of the Delaware River and hundreds of thousands more across New York, Pennsylvania, Ohio and West Virginia. From 1972 until now – my whole life – all of this has been protected.”

- Not even the most optimistic scenario for future development in the Marcellus Shale in general, or along the Delaware River in particular, **comes anywhere close** to 50,000 natural gas wells. A recent study by Penn State Univ. projects that by the year 2020, producers will have developed 3,587 shale gas wells. A study conducted for policymakers in the Southern Tier of New York predicted a maximum of 4,000 wells for that region.

- Where Fox comes up with his 50,000 figure is unknown. The protections to the area apparently in place since 1972 to which he refers are also unknown

(19:27) “One thing was resoundingly clear: If the industry’s projections were correct, then this would be the end of the Catskills and the Delaware River Basin as we knew it. And it would mean a massive upheaval and redefinition of all of New York State and Pennsylvania.”

- According to the Energy Information Administration, Pennsylvania is already home to 55,631 active natural wells; New York, according to DEC, is home to roughly 14,000. Again, even assuming the most active development scenario, Marcellus wells are expected to account for less than 10 percent of all wells in these two states over the next 10 to 20 years – not exactly the type of dramatic “upheaval” and “redefinition” that Fox suggests in his film.

### JAMES BARTH:

Andrew Maykuth, in the article "Gas Drilling Going Deep" published in the *Philadelphia Inquirer* on March 14, 2010, writes the lease-holding acreage for the 18 top gas companies in the Marcellus Shale area amounts to 13,717 square miles under control of these lease companies.

Chesapeake Energy Corporation, among other industry sources, has claimed that **eight horizontal wells on one pad per square mile is a current optimum production plan**. Indeed, in western Pennsylvania, this is being borne out by the first few years of Marcellus drilling. These figures are **initial, and conservative, extraction averages**.

As we have seen, **the industry revises as it learns, and things change**, and that **normally results in an increase**, not a decrease, in numbers.

**Even if only one-half of that leased acreage is drilled** at that rate, it would result in 54,868 wells. And again, this is for **only the top 18** gas companies out of a much larger number that are operating in the Marcellus Shale.

On a separate note, Steve McConnell, writing in the *Wayne Independent* on January 23, 2009 ("Oregon Township May See Natural Gas Drilled"), referred to the **partnership between**

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**Chesapeake and StatoilHydro:** “The companies will also enter a strategic alliance to **explore natural gas deposits worldwide**. In Marcellus, the companies could develop **between 13,500 and 17,000 horizontal wells** during the next 20 years, covering more than 32,000 leases **in Pennsylvania, New York, West Virginia and Ohio.**” This stated goal **by Chesapeake alone wildly contradicts** the 3,587 figure. Mr. Fox’s projection has nothing to do with the year 2020.

Energy-In-Depth is misleading, to say the least.

As to the upper Delaware River Basin, the four counties that make up the acreage in the basin — Delaware, Sullivan, Wayne and Pike — total 3,712 square miles. According to Professor Anthony Ingraffea, who has a PhD in rock fracture mechanics, has taught at Cornell for 33 years, and who developed computer simulations on hydraulic fracturing for Schlumberger, Exxon, the Gas Technology Institute, and the National Science Foundation over a 20-year period, calculated that we **can expect an average of eight directional wells per square mile, over 70 percent of the land.** He has based his calculations on the numbers provided by Chesapeake and Professor Terry Engelder of Penn State. **This conservative, initial estimate would amount to 20,787 horizontal wells in these four counties of the upper Delaware River Basin alone.**

Recently, Deborah Goldberg, the lead attorney for Earthjustice, attended a forum sponsored by Energy Vision. Ms. Goldberg quoted David Spigelmyer, a vice president of government relations for **Chesapeake**, as saying the company is **considering increasing the optimum average number of horizontal wells to 18 per pad, per square mile.** If this revision were to take place, then **development over the same area would increase to 46,771 wells.**

The point is, everyone is projecting numbers, and the industry itself has changed them radically over the past two years. Who is to say that only 70 percent of the land will be drilled in this fashion?

### **STEVE COFFMAN:**

Another recent study by Penn State University projects the Marcellus Shale to be more than 10 times as big as the Texas Barnett Shale, which already has more than 10,000 active wells. Similarly, Anthony Ingraffea predicts **80,000 wells in New York and 100,000 in Pennsylvania.** Sierra Club member Carl Arnold, in a press conference speech to promote a moratorium on hydrofracking (June 11, 2010), said, “We can expect, conservatively, about 65,000 wells drilled across the Southern Tier. [\*The Hudson Valley Business Journal\* states that an estimated 200,000 wells will be sunk.](#)”

### **E-I-D:**

(31:32) “In 2004, the EPA was investigating a water contamination incident due to hydraulic fracturing in Alabama. But a panel rejected the inquiry, stating that although hazard materials were being injected underground, EPA did not need to investigate.”

### **JOSH:**

This voiceover was corrected before *Gasland's* release on HBO. Note that the only correction was to the **scope** of the EPA study. EPA was investigating water contamination incidents **across the country**, not only in Alabama. The court case is mentioned below in Weston Wilson’s extensive comments on the exemptions.

**READ MORE on EXEMPTIONS in the extended reading section starting on page 24.**

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### **E-I-D:**

- No record of the investigation described by Fox exists, so E-I-D reached out to Dr. Dave Bolin, deputy director of Alabama's State Oil & Gas Board and the man who heads up oversight of hydraulic fracturing in that state. In an email, he said he had "**no recollection**" of such an investigation taking place.
- That said, it's possible that Fox is referring to EPA's study of the McMillian well in Alabama, which spanned several years in the early- to mid-1990s. In 1989, Alabama regulators conducted four separate water quality tests on the McMillian well. The results indicated no water quality problems existed. In 1990, EPA conducted its own water quality tests, and found nothing.
- In a letter sent in 1995, then-EPA administrator Carol Browner (currently, President Obama's top energy and environmental policy advisor) characterized EPA's involvement with the McMillian case in the following way: "Repeated testing, conducted between May of 1989 and March of 1993, of the drinking water well which was the subject of this petition [McMillian] **failed to show any chemicals that would indicate the presence of fracturing fluids**. The well was also sampled for drinking water quality, and no constituents exceeding drinking water standards were detected."

### **JOSH:**

As stated earlier, fracking in the 1980s and '90s was very different from fracking now; therefore, results from testing between '89 and '93 is not relevant to looking at the widespread contamination today.

**READ more on HIGH-PRESSURE FRACKING in the extended section starting on page 24.**

### **E-I-D:**

(1:28:06) "Just a few short months after this interview, the Pennsylvania Department of Environmental Protection suffered the worst budget cuts in history, amounting to over 700 staff either being fired or having reduced hours and 25 percent of its total budget cut."

- DEP press release, issued January 28, 2010: "Governor Edward G. Rendell announced today that the commonwealth is strengthening its enforcement capabilities. At the Governor's direction, the Department of Environmental Protection **will begin hiring 68 new personnel** who will make sure that drilling companies obey state laws and act responsibly to protect water supplies. DEP also will strengthen oil and gas regulations to improve well construction standards."

### **BARBARA ARRINDELL:**

See this link for how many firings and total cuts: <http://republicanherald.com/news/environmental-protection-suffers-deep-state-budget-cuts-1.338592>

<http://www.pennbpc.org/senate-budget-calls-deep-sweeping-cuts> has comparison of % of various agency cuts. Most other agencies were cut much less drastically than the DEP.

### **JOSH:**

The film was finished January 20, 2010, eight days before Rendell's press release, above. However, as Barbara notes below, it is not clear whether or not new staff has actually been hired.

### **BARBARA ARRINDELL:**

PA DEP has its budget cut again - see [here](#)

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### Attacks on Weston Wilson, EPA

#### JOSH:

Herein follows a series of attacks on Weston Wilson, whom I consider to be a true American hero. He risked his job and reputation by pointing out the flaws of the 2004 EPA report on hydraulic fracturing. The foresight he exhibited in blowing the whistle on that report is evident by how much widespread contamination as well as widespread concern hydraulic fracturing is causing today.

**"WESTON WILSON Defends Himself" in the extended reading section starting on page 24.**

#### E-I-D:

**Dunkard Creek:** Fox includes images of dead fish along a 35-mile stretch of Dunkard Creek in Washington Co., Pa.; attributes that event to natural gas development. **(01:23:15)**

Fox's attempt to blame the Dunkard Creek incident on natural gas exploration is contradicted by an EPA report – issued well before GasLand was released – which blamed the fish kill on an algal bloom, which itself was fed by discharges from coal mines.

#### JOSH:

EPA ruled that Dunkard Creek was killed by chronic exposure to mine drainage. Those mines have been draining to the creek for decades. So what changed, suddenly, to kill off the creek? EPA is overlooking the testimony of several residents who claim that gas-drilling waste was being dumped into those mines just before the fish kill. Gas-drilling wastewater is highly saline and can cause an algae bloom like the one that killed Dunkard Creek. See [this video](#) and **READ MORE on DUNKARD CREEK in the extended reading section starting on page 24.**

#### E-I-D:

Lisa Bracken: Fox blames methane occurrence in West Divide Creek, Colo. on natural gas development.

· That assertion has also been debunked by COGCC, which visited the site six separate times over 13 months to confirm its findings: “Stable isotopes from 2007 consistent with 2004 samples indicting gas bubbling in surface water features is of biogenic origin.” (July 2009, COGCC presentation by Margaret Ash, environmental protection supervisor)

#### JOSH:

E-I-D is in contradiction to the facts.

Geoffrey Thyne's detailed investigation of the gas in Divide Creek shows it to be thermogenic in nature and therefore could not be shallow gas. Thyne is a geologist and an academic with three decades of fieldwork and experience as a research scientist in the oil and gas industry, including the last 13 years at Colorado School of Mines in Golden.

See this report <http://www.highbeam.com/doc/1G1-115967938.html>

#### E-I-D:

· Email from COGCC supervisor to Bracken: “Lisa: As you know since 2004, the COGCC staff has responded to your concerns about potential gas seepage along West Divide Creek on your property and to date **we have not found any indication that the seepage you have observed is related to oil and gas activity.**” (email from COGCC's Debbie Baldwin to Bracken, 06/30/08)

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### JOSH:

[Geoffrey Thyne's hydro-geologic study](#) contradicts this. It shows very clearly that the gas in Divide Creek was thermogenic gas, and it diagrams the migratory pathway from the producing layers to the creek via natural fissures widened by fracking. Thyne concludes: "The methane in Divide Creek is primarily thermogenic and essentially identical to produced gas." He also adds: "long-term ecological effects are unknown."

Additionally Thyne examines Garfield County's increasing problem of water contamination as gas drilling increases in the area: [http://s3.amazonaws.com/propublica/assets/methane/thyne\\_review.pdf](http://s3.amazonaws.com/propublica/assets/methane/thyne_review.pdf).

### E-I-D:

Calvin Tillman: Fox interviews mayor of DISH, Texas; blames natural gas development, transport for toxins in the air, benzene in blood.

- Tillman in the press: "Six months ago, nobody knew that facilities like this would be spewing benzene. Someone could come in here and look at us and say, 'You know what? They've sacrificed you. You've been sacrificed for the good of the shale.'" ([Scientific American, 3/30/10](#))
- A little more than a month later, Texas Dept. of State Health Services debunks that claim: "Biological test results from a Texas Department of State Health Services investigation in Dish, Texas, indicate that residents' exposure to certain contaminants **was not greater than that of the general U.S. population.**" ([DSHS report, May 12, 2010](#))
- [More from the agency](#): "DSHS paid particular attention to benzene because of its association with natural gas wells. **The only residents who had higher levels of benzene in their blood were smokers.** Because cigarette smoke contains benzene, finding it in smokers' blood is not unusual."

### JOSH:

E-I-D is misstating the facts as well as spinning the results of this test to their purpose. The Texas DSHS report shows that of the 15 hazardous chemicals reported in the initial DISH Air Quality Study, that **50 percent of the people in DISH had levels elevated above what are over the standard for the United States.**

Wilma Subra, MacArthur Foundation Genius Award-winning chemist and first responder analyzed the new data at a recent public meeting: "According to DSHS, 50 percent of the people in DISH have levels of chemicals associated with compressor station and pipeline emissions over the general population of the United States in their blood, urine and tap water.

"Half the population is a huge percentage for people being exposed to the chemicals that are being released in DISH. And the chemicals that were found in the blood, the urine, and in the tap water are the same chemicals that are being found in the air in DISH. They found benzene in six people, and DSHS are saying that those people are smokers. Five of those *were* smokers. But they are trying to dismiss all of the chemicals in the 50 percent of DISH residents affected as being associated with smoking. This is not the case, it wasn't just benzene; 15 of the chemicals in the blood were over the standard for the United States. Ten of those 15 chemicals were more prevalent in nonsmokers than smokers. Two were equal in nonsmokers and smokers, and only three of the 15 chemicals were higher in smokers than nonsmokers. So it is not the issue that the people of DISH who smoke who have high concentrations of these chemicals in their blood and in their urine. The issue is 50 percent of the people in DISH have concentrations of those 15 chemicals over the average in the United States."

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**To READ more on DISH and the TCEQ, see section starting below.**

### **SUPPLEMENTAL READING SECTION STARTS HERE**

#### **More on EXEMPTIONS from WESTON WILSON, EPA**

The Safe Drinking Water Act requires EPA to promulgate regulations for states to administer these provisions of the law in order to protect underground sources of drinking water. However, although the SDWA gave the EPA the authority to regulate underground injection practices, Congress also directed that the EPA should not prescribe unnecessary regulation on oil- and gas-related injection. Therefore, after the Safe Drinking Water Act passed, the EPA erroneously took the position that hydraulic fracturing did not fall within the regulatory definition of underground injection as provided in the Act.

In 1997 the 11th Circuit Court of Appeals laid the matter to rest when it conclusively ruled in *LEAF v EPA*, 118 F.3d 1467 (11th Cir. 1997) that hydraulic fracturing activities constituted “underground injection” under Part C of the SDWA.

As a result of the court’s ruling, in 1999 the state of Alabama amended its rules and made hydrofracking subject to the provisions of Part C of the SDWA by requiring Class II permits for each hydrofracking well.

Cheney’s Halliburton (a prime developer and leading practitioner of hydraulic fracturing) began lobbying Washington to exempt fracturing from regulation under the Safe Drinking Water Act. Then in 2001, during his second week in office, George W. Bush created the Energy Task Force, with Vice President Dick Cheney as chairman. The mission of the task force aimed to “develop a national energy policy designed to help the private sector.” Its final report included a recommendation to exempt fracturing from regulation. Cheney removed the exemption from the draft only after being pressed by EPA chief Christie Whitman. The exemption surfaced again in the Bush/Cheney Energy Bill of 2003 which did not pass, and reemerged one final time, in the Energy Policy Act of 2005, thanks, in part, to the efforts of Congressmen James Inhofe of Oklahoma and Joe Barton of Texas. To avoid the effect of the ruling in *LEAF v EPA*, Sec 322 of the Act specifically provides that the term “underground injection” excludes the underground injection of fluids pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities. This clause from the law is actually photographed in *Gasland* at 31:42.

The 2005 Energy Policy Act also altered the Clean Water Act stormwater provisions. Pub.L. No. 109-58, § 323, 119 Stat. 694 (codified as amended at 33 U.S.C. § 1362(24)). Section 323 modified the Clean Water Act's definition of an oil and gas exploration and production activity to include oil and gas construction activities. Because the Clean Water Act mandates that the EPA not require a stormwater permit for oil and gas exploration and production activities, it has been argued that the change in the Energy Policy Act of 2005 excluded oil and gas construction activities from stormwater permit coverage, without regard of the size of acreage disturbed.

Previous laws exempted oil and gas drilling, known as oil and gas exploration and production, from Superfund (CERCLA) and RCRA (hazardous waste). CERCLA includes substances that are elements of petroleum as hazardous in Section 101(14), yet crude oil and petroleum are specifically exempt from coverage under the last clause of the section. Thus, hazardous chemicals that would otherwise fall under the ambit of CERCLA are immune from the statute



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when encompassed in petroleum or crude oil. Likewise, the Solid Waste Disposal Act (SWDA) of 1980 exempted oil field wastes from Subtitle C of the RCRA.

Oil and gas drilling is not typically covered by Clean Air Act permitting since EPA's CAA regulations do not allow EPA to aggregate or group a set of wells as a single source of air emissions. EPA has proposed rules that if promulgated would allow EPA and the states to aggregate air emissions coming from one company when the facilities are connected to one set of piping. Some oil and gas machines emit large enough air emissions to be subject to air permit requirements, for example gas dehydration units emitting over 10 tons per year of volatile organic compounds (VOCs) and gas compressions engines emitting over 50 tons of NOx per year.

However, the industry remains mostly unregulated under this statute by using many smaller compressors and dehydrators which individually emit less VOCs than the limits. If these units were to be aggregated and counted as one larger source (which they should be, in our view) the regulations would be in effect. In addition, neither the diesel engines used to drill nor the volatiles that come off the reserve pits are subject to CAA permit regulations.

For a more complete list of these exemptions please see the following websites:

<http://www.ewg.org/reports/Free-Pass-for-Oil-and-Gas/Oil-and-Gas-Industry-Exemptions>

<http://www.earthworksaction.org/pubs/PetroleumExemptions1c.pdf>

<http://www.nrdc.org/land/use/down/contents.asp>

<http://www.nrdc.org/media/2007/071031.asp>

The Energy Policy Act negated the effect of the Alabama LEAF case by expressly defining HF as not subject to the SDWA, provided that HF fluids did not contain diesel; HF that contains diesel remains subject to SDWA limitations.

### **HIGH-PRESSURE FRACKING**

From Pumps and Systems: <http://www.pump-zone.com/upstream-pumping/frac-pumps/the-evolution-of-hydraulic-fracturing-and-its-effect-on-frac-pump-technology.html>

Up to the early 2000s, frac pumps traditionally came in two types, triplex or quintuplex, and ranged in horsepower capacity from 1,300 to 2,000 bhp. The majority of fracturing operations took place on gas wells, almost entirely vertical in nature, requiring only one or two fracturing stages to complete the stimulation process. Being dependent on the formation's geologic makeup, pressure requirements were most often less than 10,000 psi. Pump design advancements during this time period were minimal. Pumps that had operated successfully for decades were capable of meeting the pressure and flow rate demands of the time.

The first dynamic shift in operation requirements for frac pumps occurred in the early 2000s with the widespread commercialization of the Barnett Shale unconventional resource play. The Barnett Shale represented a dramatic shift in pumping requirements, with horizontal drilling used for the first time on a wide scale as pumping pressures and operating times increased. This harsher pumping environment demanded stronger pumps capable of operating at pressures of 9,000 psi and pumping intervals of more than 8 hours. During the drilling boom of 2006 through 2008, well service companies in the Barnett Shale were pumping at nearly all hours of every day.

With the low permeability of these newer premium shale gas formations, new fracturing techniques have been developed in recent years to increase production rates to overcome the high

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costs of drilling and completion. Horizontal drilling and its associated multistage fracturing techniques have become the norm as shale formations have now become the leading sources of natural gas in North America. At the time of the writing of this article, the horizontal rig count is at an all time high, 659 rigs, or 49 percent of all U.S. operating rigs, up from 37 percent just one year ago, according to Baker Hughes.

The Haynesville Shale has put increased pressure on pumping equipment due to the severe pumping requirements of the wells. The average Haynesville wells are currently being fraced at pressures around 13,500 psi with frac stages numbering as high as 20 per well. In the Barnett, a pump may operate onsite for 6 to 8 hours, complete the job and then be returned to the shop for maintenance before being sent out on another job. In the Haynesville Shale, however, hydraulic fracturing operations might last several days with continuous pumping intervals of 3 to 4 hours and only a limited window between stages for rapid maintenance procedures while the next frac stage is prepared. These difficult operating conditions have required operators to place upwards of 50 percent spare horsepower capacity onsite to instantly replace any equipment that may fail during operation, whether it is the engine, transmission or pumping system. In addition to increased pressure requirements, Haynesville wells often require extremely hard synthetic proppant (sand). The new synthetic proppant, such as bauxite, wear pump expendable components and fluid ends at increasingly rapid rates.

The Haynesville Shale represents a major challenge for frac pump manufacturers. Pumping service companies demand a pump that can operate in a greater working envelope with no sacrifice on pump lifespan. Pump manufacturers are currently developing products to meet these challenging demands through innovative design features and new developments in pump expendable fabrication.

The challenge is to provide greater reliability and maintenance predictability, reducing the product downtime at frac sites and the user's need to have significant excess pumping equipment available to ensure continuity of pumping in the unlikely event of equipment failures. Manufacturers are responding to these requirements by evolving existing, well-established products, and in parallel, integrating new clean-sheet innovations and design programs with the latest computer analysis and simulation tools. Design engineers must further enhance the mechanical integrity of the frac pump to support higher pumping pressures, ensuring longer times between maintenance events, and making the maintenance activity itself safer, easier and faster.

For instance, one manufacturer has taken an existing frac pump and completely redesigned the power frame geometry, allowing an increase in rated maximum rod load while at the same time reducing its weight. The strength of the steel alloy forging used to manufacture the fluid cylinder was enhanced to provide greater fatigue life, while the geometry of the fluid end was further optimized to increase the rigidity. The pump's stay-rods were completely redesigned to reliably accommodate the additional loads. The increase in rod load allowed the pump to be comfortably rated at 2,400 bhp. This new horsepower capability was confirmed through intensive durability testing during which the pump was subjected to nearly 10 percent above the rated loads for much of the test's duration. The cylinder spacing, crankshaft stroke and all the geometry around expendable components was untouched during the redesign to ensure that the changes had no impact on currently accepted maintenance processes. This also allows the fluid end assembly to be retrofitted onto older power ends.

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As the global demand for natural gas continues to grow, new pumping technologies must be developed to ensure service companies can efficiently operate in more intense geological formations. Innovation has always been the key to success in the oilfield.

**Entire, in-context ProPublica piece by Abrahm Lustgarten,**

### **"COLORADO STUDY LINKS METHANE in WATER to DRILLING"**

Jesse Ellsworth thought something was wrong with his water when it began to smell funny and popped out of his faucet in bursts. Then, in February, the Fort Lupton resident launched an experiment: he flipped on the kitchen tap and took a cigarette lighter to the stream. As flint sparked steel, the water lit on fire like a torch.

Ellsworth is one of at least 29 residents in small farming communities northeast of Denver who have asked either the energy companies or the Colorado Oil and Gas Conservation Commission to test for natural gas in their water wells.

Now the commission is trying to figure out how the gas got there. Are some of Weld County's 13,957 gas wells leaking methane into drinking water? Or is methane seeping into the water naturally, as it has done from time to time over the years?

So far, officials have determined that at least nine of those contamination cases are not drilling-related; they are likely the result of a water well intersecting with gas underground. But the Ellsworth's well -- which has stronger evidence tying it to drilling -- remains a mystery.

"This one I think is best characterized as an isolated circumstance," said David Neslin, director of the COGCC, "We can't, sitting here today, say 'Yes' that this is coming from somebody's gas well."

While the search for clues continues in Weld County, investigations about methane contamination in Garfield County and other parts of the country have clearly tied the contamination to energy development, strengthening arguments across the country that drilling can put drinking water at risk.

Near Cleveland, Ohio, a house exploded in late 2007 after gas seeped into its water well. The Ohio Department of Natural Resources later issued a [153-page report](#) that blamed a nearby gas well's faulty cement casing and [hydraulic fracturing](#) -- a deep-drilling process that shoots millions of gallons of water, sand and chemicals into the ground under explosive pressure -- for pushing methane into an aquifer and causing the explosion.

In Dimock, Pa., where drilling recently began in the mammoth Marcellus shale deposit, several drinking water wells have exploded and nine others were found with so much gas that one homeowner was told to open a window if he planned to take a bath. In February, the Pennsylvania Department of Environmental Protection charged Cabot Oil & Gas with two violations that it says caused the contamination, theorizing that gas leaked from the well casing into fractures underground.

Industry representatives say methane contamination incidents are statistically insignificant, considering that 452,000 wells produced gas in the United States last year. They point out that

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methane doesn't necessarily come from gas wells -- it's common in nature and can leak into water from biological processes near the surface, like rotting plants.

The industry also defends its construction technology, saying it keeps gas and drilling fluids -- including any chemicals used for hydraulic fracturing -- safely trapped in layers of steel and concrete. Even if some escapes, they say, thousands of feet of rock make it almost impossible for it to migrate into drinking water aquifers. When an accident happens, the blame can usually be traced to a lone bad apple -- some contractor who didn't follow regulations, they say. Those arguments helped the gas drilling industry win rare exemptions from the Safe Drinking Water Act and the Clean Water Act when Congress enacted the 2005 Energy Policy Act.

Now an exhaustive examination of a methane problem on Colorado's Western Slope is offering a strong scientific repudiation of that argument. Released in December by Garfield County, the report concludes that gas drilling has degraded water in dozens of water wells.

The three-year study used sophisticated scientific techniques to match methane from water to the same rock layer -- a mile and a half underground -- where gas companies are drilling. The scientists didn't determine which gas wells caused the problem or say exactly how the gas reached the water, but they indicated with more clarity than ever before that a system of interconnected natural fractures and faults could stretch from deep underground gas layers to the surface. They called for more research into how the industry's practice of forcefully fracturing those deep layers might increase the risk of contaminants making their way up into an aquifer.

"It challenges the view that natural gas, and the suite of hydrocarbons that exist around it, is isolated from water supplies by its extreme depth," said Judith Jordan, the oil and gas liaison for Garfield County who has worked as a hydrogeologist with DuPont and as a lawyer with Pennsylvania's Department of Environmental Protection. "It is highly unlikely that methane would have migrated through natural faults and fractures and coincidentally arrived in domestic wells at the same time oil and gas development started, after having been down there ...for over 65 million years."

The Garfield County analysis comes as Congress considers legislation that would toughen environmental oversight of drilling and reverse the exemptions enjoyed by the gas companies. Colorado has already overhauled its own oil and gas regulations, despite stiff resistance from the energy industry. The new rules, which went into effect earlier this month, strengthen protections against, among other things, methane contamination.

Drinking water with methane, the largest component of natural gas, isn't necessarily harmful. The gas itself isn't toxic -- the Environmental Protection Agency doesn't even regulate it -- and it escapes from water quickly, like bubbles in a soda.

But the gas becomes dangerous when it evaporates out of the water and into people's homes, where it can become flammable. It can also suffocate those who breathe it. According to the Agency for Toxic Substances and Disease Registry, a part of the U.S. Department of Health and Human Services, as the concentration of gas increases it can cause headaches, then nausea, brain damage and eventually death.

The Garfield County report is significant because it is among the first to broadly analyze the ability of methane and other contaminants to migrate underground in drilling areas, and to find

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that such contamination was in fact occurring. It examined over 700 methane samples from 292 locations and found that methane, as well as wastewater from the drilling, was making its way into drinking water not as a result of a single accident but on a broader basis.

As the number of gas wells in the area increased from 200 to 1,300 in this decade, methane levels in nearby water wells increased too. The study found that natural faults and fractures exist in underground formations in Colorado, and that it may be possible for contaminants to travel through them.

Conditions that could be responsible include "vertical upward flow" "along natural open-fracture pathways or pathways such as well-bores or hydraulically-opened fractures," states the section of the report done by S.S. Papadopulos and Associates, a Maryland-based environmental engineering firm specializing in groundwater hydrology.

The researchers did not conclude that gas and fluids were migrating directly from the deep pockets of gas the industry was extracting. In fact, they said it was more likely that the gas originated from a weakness somewhere along the well's structure. But the discovery of so much natural fracturing, combined with fractures made by the drilling process, raises questions about how all those cracks interact with the well bore and whether they could be exacerbating the groundwater contamination.

"One thing that is most striking is in the area where there are large vertical faults you see a much higher instance of water wells being affected," said Geoffrey Thyne, the hydrogeologist who wrote the report's summary and conclusion. He is a senior research scientist at the University of Wyoming's Enhanced Oil Recovery Institute, a pro-extraction group dedicated to tapping into hard-to-reach energy reserves.

The report, referred to as the Garfield County Hydrogeologic Study, has been met with cautious silence by the industry and by its regulators.

The Colorado Oil and Gas Conservation Commission, the state's regulatory body, would not respond to questions from ProPublica because it hasn't thoroughly analyzed the data behind the November report, said its acting director, David Neslin.

Neither the Colorado Oil and Gas Association nor Encana, the Canadian energy company that drills in the study area, would comment on the Garfield County report. Both referred questions to Anthony Gorody, a Houston-based geochemist who specializes in oil and gas issues and frequently is employed by the energy industry.

Gorody dismissed the report's conclusions as "junk science."

"This is so out of whack. There are a handful of wells that have problems. These are rare events," said Gorody, president of Universal Geosciences Consulting. "They are like plane crashes -- the extent tends to be fairly limited. I do not see any pervasive impact."

Most of the methane in the study area, Gorody said, came from shallow gas-bearing rock or decaying matter near the surface -- not from the deep gas produced by the energy industry. He criticized the report's methodology, saying the way that researchers linked the stray gas with the deep gas formations was speculative at best.

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Thyne, standing by his report, said researchers had traced the origin of the gas by conducting the equivalent of a forensic investigation, analyzing its isotopic signature, or molecular fingerprint. The molecular structure showed that most of it was thermogenic, meaning it matched the deeply buried deposit where gas was being drilled, called the Williams Fork Formation. A minority of the samples were difficult to identify by this method, so Thyne used another scientific process to study them. He is confident they, too, were thermogenic in origin.

In most cases, the study couldn't pinpoint the exact pathway the contaminants had used to travel a mile and a half up into the drinking water aquifer. So Thyne could only reason the possibilities.

The methane could be seeping into water wells through natural fractures, he said, or through leaks in the well casings or cement, or from the well heads.

When a pipe extends 8,000 feet below the earth's surface, he said, "there are numerous potential leak points along the way. So is it leaking at 8,000 feet and coming up a well bore, a natural fault or fracture? Or is it leaking 500 feet from the surface? We don't know."

The most plausible explanation, Thyne said, is that the same type of well casing and cementing issues that had proved problematic in Ohio and are suspected in Pennsylvania were presenting problems in Colorado too.

"The thesis is that because of the way the wells are designed they could be a conduit," said Garfield County's Jordan, who commissioned the report.

Jordan worries that the methane leaks could be a sign of worse to come.

"We suspect the methane would be the most mobile constituent that would come out of the gas fields. Our concern is that it's a sort of sentinel, and there are going to be worse contaminants behind it," she said. "It's not just sitting down there as pure CH<sub>4</sub> (methane). It's in a whole bath of hydrocarbons," she said, and some of those "can be problematic." [end]

### **MORE on RECYCLING of "PRODUCED" WATER:**

#### **PROFESSOR INGRAFFEA, continued:**

We would like to see the industry continuously reveal their industry-wide data to completely explain the "reusing and recycling on average more than 60 percent of its water" quote. Here are some problems with it:

It is possible that *over the last few months of development* in Pennsylvania a significant amount of flowback fluid recycling is happening. However, **here are direct quotes from the industry that clearly indicate that this is a very recent development:**

*From the AP, Sunday, February 7, 2010*

With fortunes, water quality and cheap energy hanging in the balance, exploration companies, scientists and entrepreneurs are scrambling for an economical way to recycle the wastewater. "Everybody and his brother is trying to come up with the 11 herbs and spices," said Nicholas DeMarco, executive director of the West Virginia Oil and Natural Gas Association. "

*From the Houston Chronicle, Fri 12/11/2009*

□ "...The industry is also trying to find ways to recycle the water used in fracturing in order to reduce the effect on local water supplies. "We're still in the infancy of trying to figure out

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how to recycle the water," said Ron Hyden, the manager for Halliburton's production enhancement business. "We're trying to be good corporate citizens on that front."

From the [Chesapeake website](#):

### **Recycling Technology: Why can't the water generated from natural gas production be recycled?**

- Most of the water generated from natural gas production contains too many naturally occurring minerals, such as salt, to be recycled effectively. There has been some success in recycling the first 5% of produced water during flowback operations. However, by the end of the first few days after fracturing (and in some cases a few hours), salt content of the produced water can reach as high as 70,000 parts per million (ppm), more than twice the salinity of seawater (30,000 ppm). The majority (95%) of the produced water returned from the well, with its high salt content, is too saturated to make recycling currently economically viable. Chesapeake and others in the industry are constantly evaluating opportunities to treat produced water, so that less of it will need to be injected into saltwater disposal wells."

### **WESTON WILSON Defends Himself**

#### **E-I-D:**

**Weston Wilson** (EPA "whistleblower"): "One can characterize this entire [natural gas] industry as having a hundred year history of purchasing those they contaminate." (33:36)

- Mr. Wilson, currently on staff at EPA's Denver office, was not part of the team of scientists and engineers that spent nearly five years studying hydraulic fracturing for EPA. That effort, released in the form of a [landmark 2004 study](#) by the agency, found "no evidence" to suggest any relationship between hydraulic fracturing and the contamination of drinking water.

- Wilson has a [well-documented history](#) of aggressive opposition to responsible resource and mineral development. Over his 35-year career, Mr. Wilson has invoked "whistleblower" status to fight dam construction in Colorado, oil and gas development in Montana, and the mining of gold in Wyoming.

- Wilson in [his own words](#): "The American public would be shocked if they knew we make six figures and **we basically sit around and do nothing.**"

#### **WESTON WILSON:**

The first part, that I was not part of the EPA team working on the HF in coal report issued June 2004, is correct—see my Oct 2004 report to Congress where I stated:

"I was not involved in either the preparation or review of EPA's report on the hydraulic fracturing of coal bed methane reservoirs."

[EPA's June 2004 report](#) did establish—as I said in my [whistleblower response to that report](#) delivered to Congress, that: "EPA has established that: 1) coal bed methane hydraulic fracturing occurs within underground sources of drinking water, 2) hydraulic fracturing fluids contain toxic components that are not entirely removed during methane gas production, and 3) this fracturing process can create pathways which allow methane to migrate into high quality ground water."

There was a pivotal press article at that time by Tom Hamburger of the *Los Angeles Times*: "Halliburton's Interests Assisted by White House":

The administration has lent support to a lucrative drilling technique. Some in the EPA consider it

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an environmental concern." See <http://www.commondreams.org/headlines04/1014-07.htm> or <http://articles.latimes.com/2004/oct/14/nation/na-frac14>

Incidentally, this White House influence done then in early 2000 on fracking, is under some intense scrutiny again related to how Cheney apparently obtained limits on the use of blowout preventers and the BP Gulf disaster.

Here's another source for history from the Western Organization of Resource Councils on the LEAF case and EPA IG 2005 investigation: <http://www.worc.org/userfiles/file/EPA-FracStudyFactSheet.OA.pdf>

Here's the Waxman 2005 letter to EPA IG Nikki Tinsley: [http://waxman.house.gov/UploadedFiles/Letter\\_to\\_EPA\\_IG.pdf](http://waxman.house.gov/UploadedFiles/Letter_to_EPA_IG.pdf)

The part I particularly appreciate is this: "The concerns expressed by Weston Wilson find substantiation in the body of the (EPA) report."

Here is a copy of my talking points I used to respond to the press in late 2004. This deals with my professional expertise, experience at EPA, and why I objected to Congress about EPA's shortcomings in that 2004 report on coal bed fracking.

*\*Talking Points, Oct 19, 2004, prepared by Wes Wilson*

Who I am — I am an environmental engineer with 30 years experience at EPA. Since 1972 the Clean Air Act has required that EPA conduct independent reviews of other federal agencies' environmental impact statements. That's what I do. I review the environmental impacts of oil and gas development on the nation's public lands – lands managed by the Bureau of Land Management or the National Forest Service.

What I did — I objected to EPA's conclusion that injecting toxic fluids, fluids that are carcinogenic, into underground sources of drinking water poses little or no threat to drinking water and need not be studied any further. I objected because this practice is improper under the Safe Drinking Water Act, egregiously improper in my view. On October 8th, I sent an 18-page report to my congressional delegation requesting they investigate EPA's failures to protect underground sources of drinking water.

Why I did it — I have 3 reasons for blowing the whistle.

**1. EPA did not follow its own science policy, which required EPA to obtain water quality data in each coal basin where hydraulic fracturing is occurring.**

- a. EPA found that toxic and carcinogenic fluids were injected into the ground where the water is used, or could be used, to supply drinking water, and found that some but not all of these fluids would be pumped out and simply assumed that the remainder would be diluted to some unspecified degree.
- b. EPA's own science-based Quality Assurance Plan, EPA's scientific basis for this study, specified EPA would obtain data in each coal basin if it found toxic fluids were injected.[1]
- c. EPA has no data on the amount of toxic fluids are injected, what remains in the ground, whether the water will still be usable for drinking, and what the health risks are.
- d. Yet EPA reached the unsupportable and scientifically unsound conclusion that hydraulic fracturing poses little or no threat to drinking water sources.

**2. EPA's decision is inconsistent with the purposes of the law.**



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- a. The Safe Drinking Water Act requires EPA to protect drinking water sources. 80% of Americans rely of water from wells for fresh drinking water. EPA does this with a program called the Underground Injection Program, and although a federal court ordered EPA to regulate the injection of fluids for hydraulic fracturing, EPA has done this only in Alabama where the case began.
- b. Prior to the court ruling, way back in 1996, EPA had the view that the primary purpose of these wells was to produce natural gas, and EPA claimed it should not regulate gas production wells. The court ruled EPA's view was "inconsistent with the plain language of the law — the Safe Drinking Water Act." [2] The court found that hydraulic fracturing wells fit squarely within a certain class of well which must be regulated.
- c. So all states should be regulating this practice [3], but they are not.
- d. EPA's only response was to obtain a voluntary agreement [4] with 3 oil service companies. These 3 companies voluntarily agreed not to inject diesel fuel, a very toxic part of the injection fluids because diesel fuel contains benzene which is **carcinogenic in drinking water at just 5 parts per billion. But this agreement does not apply to:**
  1. any other company doing the same thing
  2. any other toxic or carcinogenic chemical in the fluids. And, since the fluids are considered "proprietary," the public does not know what else may be in these hydraulic fracturing fluids.

### **3. EPA relied on an expert Peer Review Panel whose members had potential conflicts of interest.**

- a. Once again, EPA did not follow its own science policy.
- b. EPA's policy is that peer reviewers should be free of real or perceived conflicts-of-interest and there should be a balancing of interests among peer reviewers. Obtaining a fair and credible peer review is essential to maintaining the credibility and scientific validity at EPA. [5]
- c. Yet most of EPA's 7-member expert peer review panel appear to have conflicts of interest:
  - An engineer at Halliburton,
  - A manager of an industry-funded group that previously worked for Halliburton,
  - An engineer at BP Amoco,
  - Two academics who had worked for the industry,
  - A state regulator who also worked for Amoco.The 7th panel member is from DOE's Sandia National Labs.
- d. It's a hand-picked, conflicted small group, who failed to even read the final report and met only once.
- e. This is not peer review — this is a mockery of what is supposed to be an independent and balanced review. This is the thin veneer cover to a scientifically unsound study while the scientific process of Peer Review was abandoned.

\*\*End of these talking points.

[1] Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs, EPA, June 2004, Appendix B, Quality Assurance Plan, page App. B-5.

[2] Legal Environmental Assistance Foundation vs. United States Environmental Protection Agency, United States Court of Appeals for the Eleventh Circuit, No. 00-10381, EPA No. 65-02889-Fed. Reg., December 21, 2001. <http://www.epa.gov/safewater/uic/leaf2.pdf>

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[3] Letter to EPA Administrator Michael Leavitt from Senators Jeffords and Boxer, October 14, 2004.

[4] Memorandum of Agreement Between the United States Environmental Protection Agency and BJ Services Company, Halliburton Energy Services, Inc. and Schlumberger Technology Corporations, Elimination of Diesel Fuel in Hydraulic Fracturing Fluids Injected into Underground Sources of Drinking Water During Hydraulic Fracturing of Coalbed Methane Wells, signed by Tracy Mehan, III; EPA Office of Water and representatives of the above companies,

[5] Science Policy Handbook, Office of Science Policy, U.S. Environmental Protection Agency, Office of Research and Development, December 2000, EPA 100-B-00-001, Sections 3.4.5-6.  
<http://epa.gov/osa/spc/htm/prhandbk.pdf>

### **More on DUNKARD CREEK**

#### **BARBARA ARRINDELL:**

Golden algae do not grow and flourish in fresh water, only in saline (salty) water environments. Dunkard Creek went from fresh to salt from Marcellus gas well waste being dumped into coal mine voids. Legal or illegal, this is what changed Dunkard Creek to a saline environment.

#### **STEVE COFFMAN:**

The following article was written by environmental reporter Don Hopey of *Pittsburgh Post-Gazette* (Sunday, September 20, 2009):

#### **Sudden Death of Ecosystem Ravages Long Creek. 'Everything is being killed': 161 aquatic species have died along Dunkard Creek**

An early and continuing focus of the investigation has been discharges from a mine water treatment facility located at Consol Energy's Blacksville No. 2 mine in West Virginia.

But state and federal investigators are confounded because chemical analysis shows the creek water at the treatment facility site contains extremely high total dissolved solids, or TDS, and chlorides—properties found in wastewater from Marcellus Shale gas well drilling operations but not mine water. Total dissolved solids may include metals, salts and other elements.

Marcellus Shale well drilling water contains about 100 chemicals added to reduce friction, eliminate algae growth and perform other functions when water is pumped underground under pressure to fracture the shale and release natural gas.

Up to 4 million gallons are used for each Marcellus Shale well. Disposal of wastewater from the wells has caused problems throughout Pennsylvania, including TDS readings that exceeded federal safe drinking water standards in the Monongahela River last winter and this year.

On Thursday, investigators found dead fish for the first time about a mile and a half up the creek above the treatment plant discharge.

"Our hypothesis was that it's coming out of the Blacksville No. 2 mine, but the finding of dead fish upstream from the Blacksville discharge indicates the sole cause cannot be Blacksville," said West Virginia DEP spokeswoman Kathy Cosco.

[end]

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### **More on METHANE MIGRATION/FLAMMABLE WATER**

#### **WESTON WILSON:**

I talked to an oil industry insider who doesn't want to be named. He told me a plausible explanation of how the methane in Mike Markham's well and the other domestic wells in Weld County could be the result of drilling. As a geologist I believe this theory is relevant and in need of testing by the state:

Drilling in this geologic basin, the Denver-Julesburg Basin, requires drilling through coals that contain some gas. Since those shallow coals have bacterial decay, the biogenic gas is there—biogenic gas is what the Colorado Oil and Gas Conservation Commission inspector found in Markham's well. The biogenic gas in these near-surface coals will remain there as long as there is groundwater on top of it to hold it in place.

This near-surface gas in these coals is not what the companies are drilling for — they are drilling deeper in the basin for economically recoverable gas deposits. However, when the industry takes out massive amounts of water for drilling and fracking purposes, they obtain that water from the upper aquifer that includes the coals. This causes the water table to drop and release the biogenic gas in those coals. If there is a domestic well nearby, then it can show up at the tap and be burned.

The groundwater drawdown in this geologic basin is also due to water pumped for irrigation, so this might be a combination of too much ground water pumping by both oil/gas drilling and irrigation, but the point is that it is a plausible cause and effect relationship to prior drilling. This fits the basic pattern that gas in people's wells comes AFTER drilling.

If this is accurate, then the COGCC would have been in error concluding that the gas in Markham's well was not due to drilling, but keep in mind the COGCC is using the phrase "not due to oil and gas activities" based only on the point that such gas is not DIRECTLY due to a driller's mistake. In this case, if this theory holds, it could be due to the combined impacts of groundwater drawdown from the combination of both drilling in the RED zone and irrigation drawdown.

### **More on DISH and TCEQ**

Original DISH air tests quoted in the film:

[http://www.townofdish.com/objects/DISH\\_emergency\\_res\\_report\\_pdf.pdf](http://www.townofdish.com/objects/DISH_emergency_res_report_pdf.pdf)

Texas state agencies have a history of obfuscation on gas issues. TCEQ's spin is similar to the DSHS spin:

Read the Texas *Observer's* startling exposé on the Texas Commission on Environmental Quality:

#### **Agency of Destruction**

*Texas' environmental commission serves its customers well. Too bad they're not the public.*

Last September, the tiny town of DISH—frustrated by the lack of action on TCEQ's part—announced the results of a bombshell air-quality study it spent 10 percent of the town's annual budget to commission from outside experts. Air samples from residential areas near gas-compressor stations contained high levels of benzene, and other carcinogens and neurotoxins—much higher than TCEQ health-based standards. Evidence in hand, DISH Mayor Calvin Tillman,

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a conservative who's become the bane of North Texas gas interests, called on the industry to clean up its act or get out of town.

The fallout from the DISH study prompted TCEQ to do its own testing during three days in December. On Jan. 12, Deputy Director John Sadlier presented the much-anticipated results to the Fort Worth City Council.

"Everything you hear today will be good news," Sadlier told the packed council meeting. The commission staff, he said, had visited 126 sites in the Fort Worth area and found no evidence of benzene or other cancer-causing chemicals. "Based on this study, the air is safe," Sadlier told the council.

Later, Mayor Mike Moncrief, who comes from a prominent oil and gas family, pronounced himself "grateful" for the results. Since that burst of good news, Fort Worth city officials, including Moncrief, have generally resisted calls to impose more stringent rules on gas drilling. "Sadlier's comments only emboldened the council's belief that the air quality is okay," wrote Don Young, a drilling reform activist in Fort Worth.

If council members had squinted, they would have seen a disclaimer stamped at the bottom of each page of Sadlier's PowerPoint presentation: "This data is for screening purposes only and may include samples that did not meet the established quality control acceptance criteria," the disclaimer read.

As drilling activists discovered, the state's study was rubbish. The testing was done on cold days, when benzene tends to be inactive. The inspectors took samples only if the levels measured 140 times the Metroplex average—far above state health standards. Only eight samples were collected.

Confronted with these facts, commission PR staffers stuck with the original message. "We were trying to do that really fast," TCEQ spokesperson Terry Clawson told the *Fort Worth Weekly*. "If you are going to do testing and use certified labs and have it legal quality, that takes a long time."

TCEQ used those results to "prove" that benzene wasn't a problem. And an internal investigation prompted by an anonymous fraud complaint revealed that upper management, including Sadlier and Executive Director Mark Vickery, knew the study was flawed. In fact, they ordered that the eight canister samples "be analyzed using a more sensitive laboratory technique." The results came back on Jan. 22, 10 days after Sadlier's rosy depiction at the Fort Worth meeting. Four of the eight samples measured benzene at levels above what the state considers safe for long-term health. Still, the fraud investigation states, Sadlier was "not confident in accuracy [sic] of the results from the field" or the fresh lab findings, and ordered inspectors to return to Fort Worth for more samples.

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