FRACK TO THE FUTURE?
CLOSING OIL- AND GAS-RELATED FRACTURES IN THE LAW OF WATER PROTECTION

by

Laura Ellen Pisoni

Professor Ryke Longest, Advisor
May 2011

Masters Project submitted in partial fulfillment of the requirements for the Master of Environmental Management degree in the Nicholas School of the Environment, Duke University

2011

ABSTRACT

In a world of increasing concern about foreign oil imports and climate change, natural gas is expected to become an increasingly important part of the United States' fuel mix. As conventional natural gas sources are depleted, the gas industry is turning to unconventional sources, including gas-containing shales. Gas shale can only be economically exploited using a method called hydraulic fracturing, which poses potentially grave dangers to surface and groundwater. North Carolina contains commercially viable gas shales. For this reason, the government of North Carolina must protect the state's water when commercial-scale hydraulic fracturing begins.

This masters project examines federal and state water-protection laws. Seven federal statutes were considered—Clean Water Act; Safe Drinking Water Act; National Environmental Policy Act; Resource Conversation and Recovery Act; Toxic Substances Control Act; Emergency Planning and Community Right-to-Know Act; and Comprehensive Environmental Response, Compensation, and Liability Act—along with two North Carolina state-level provisions. The project identifies exemption and exceptions that prevent these statutes from robustly protecting water quality from hydraulic fracturing.

The project concludes with three major recommendations for North Carolina. First, the state should enact a statutory moratorium on hydraulic fracturing. Second, the state should reassess and strengthen state water quality laws and regulations. Third, the state should require openness by passing a state-level community right-to-know act.

I
INTRODUCTION

"Energy independence" is one of the most popular catchphrases of the twenty-first century. Though the words are evocative of some magical future era where we are truly independent of energy, unmoored from petty requirements for electricity and transportation fuel, their meaning is of course more mundane. The quest for "energy independence" is a quest for freedom from imported energy, the realization of an almost equally magical future when Americans can collectively achieve the American dream of perfect self-reliance.

Though once the concept of energy independence required only decreasing reliance on *imported* oil, today it has come to mean a reduced reliance on oil of any provenance. President Obama announced in early 2009 that—even in the face of a growing and crippling recession—it was not unemployment but rather "America's dependence on oil" that posed "one of the most serious threats that our nation has faced."[1] Though Obama's plans have focused primarily on reducing energy demand and increasing production of renewable energy, there may yet be a role for non-oil petroleum products. Especially natural gas. In fact, the Energy Information Administration (EIA) projects that natural gas will fuel significantly more of our electricity in the future and that nearly all of our added generation in the next 20 years will come from natural gas, as illustrated in Figure 1 and Figure 2.

[1] President Barack Obama, Remarks by the President on Jobs, Energy Independence, and Climate Change (Jan. 26, 2009), *available at* http://www.whitehouse.gov/blog_post/Fromperiltoprogress/.

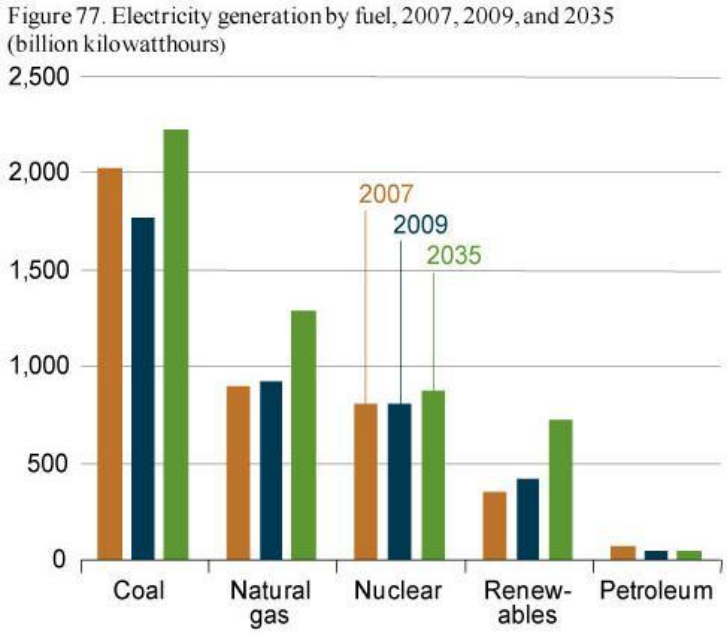

Figure 1. Electricity generation by fuel in 2007, 2009, and 2035, according to the EIA.[2]

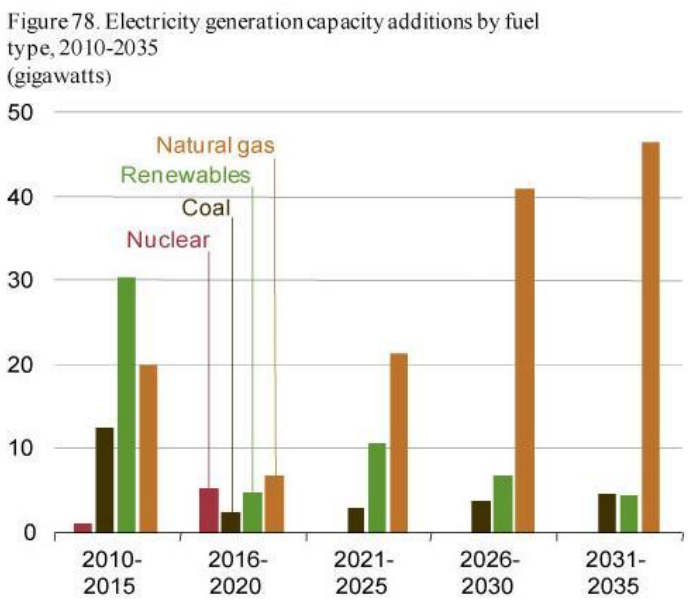

Figure 2. Electricity generation capacity additions by fuel type, according to the EIA.[3]

[2] *Annual Energy Outlook 2011: Electricity*, U.S. ENERGY INFO. ADMIN. (Apr. 26, 2011), http://www.eia.doe.gov/forecasts/aeo/MT_electric.cfm.

In an era of growing knowledge of and attention to anthropogenic climate change, it may seem strange to suggest increased usage of natural gas. When natural gas is burned, it releases carbon dioxide, just like the coal upon which American's rely for most of our electricity. But compared to coal, natural gas looks like a climate savior; burning natural gas releases fifty to seventy percent *less* carbon dioxide than burning coal.[4] And the United States has a whole lot of natural gas: 6.7 trillion cubic meters of natural gas are considered "proved resources" by the Department of Energy and alternative, "unproved" reserves could contain many trillions more.[5]

Much of this unproved natural gas exists in the kinds of formations that have always been too difficult and too expensive to bother exploring with any great vigor. While producing natural gas from traditional wells was akin to producing air by carefully inserting a drinking straw into a well-inflated balloon—in which case it would be almost impossible to *prevent* the air from escaping—the days of such easy production may be coming to an end. The future of natural gas will be in unconventional formations: deep gas, geopressurized zones, Arctic and subsea hydrates, tight gas, coalbed methane (CBM), and gas-containing shales.[6] Indeed, between 1998 and 2007, unconventional natural gas production increased by almost 65%, rising from 28% of

---

[3] *Id.*

[4] David Biello, *What the Frack? Natural Gas from Subterranean Shale Promises U.S. Energy Independence—With Environmental Costs*, SCIENTIFIC AM. (Mar. 30, 2010), http://www.scientificamerican.com/article.cfm?id=shale-gas-and-hydraulic-fracturing.

[5] *Id.*

[6] *What Is Tight Gas, and How Is It Produced?*, RIGZONE, http://www.rigzone.com/training/insight.asp?insight_id=346&c_id=4 (last visited Apr. 26, 2011).

total natural gas production in 1997 to 46% in 2007.[7] The EIA projects that by 2035, shale gas alone will make up more than 45% of American dry gas production, as illustrated in Figure 3.

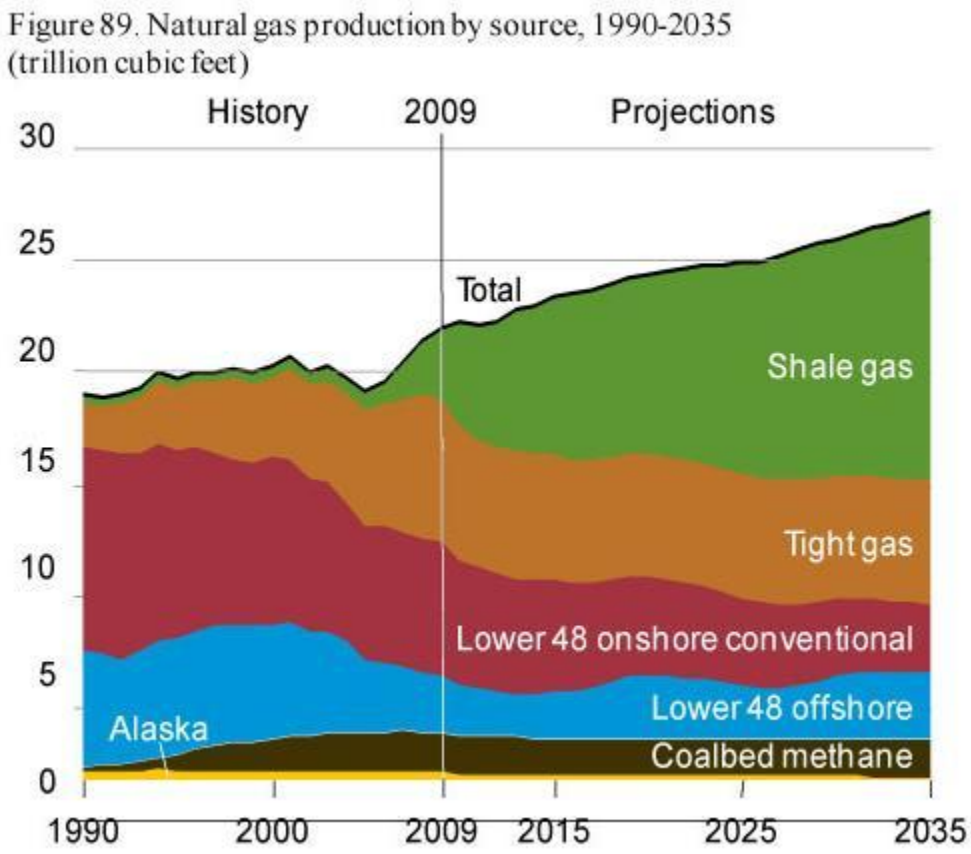

Figure 3. The EIA projects skyrocketing production of domestic gas shales between now and 2035.[8]

North Carolina is perhaps luckier than other states along the East Coast. While almost entirely unregulated oil shale development has begun many states, an obscure

[7] J. DANIEL ARTHUR, BRIAN BOHM & MARK LAYNE, HYDRAULIC FRACTURING CONSIDERATIONS FOR NATURAL GAS WELLS OF THE MARCELLUS SHALE 1 (2008), *available at* http://www.dec.ny.gov/docs/materials_minerals_pdf/GWPCMarcellus.pdf.

[8] *Annual Energy Outlook 2011: Natural Gas*, U.S. ENERGY INFO. ADMIN. (Apr. 26, 2011), http://www.eia.doe.gov/forecasts/aeo/MT_naturalgas.cfm. For the underlying information, showing that the EIA projects shale gas will make up 47% of domestic production by 2035, see *Natural Gas Production by Source, 1990-2035*, U.S. ENERGY INFO. ADMIN. (Apr. 26, 2011), http://www.eia.doe.gov/forecasts/aeo/excel/fig89.data.xls.

pair of laws in North Carolina currently prevents hydrofracturing in the state. This offers North Carolina's government—and in particular its legislature and Department of Environment and Natural Resources (NCDENR)—the opportunity to develop a regulatory framework to manage hydraulic fracturing in the state in a way that allows development of this economically valuable resource while protecting our irreplaceable natural environment. Because North Carolina has never been what one might call a hotbed of oil and gas development, the state's legislators and regulators are unlikely to be well-versed in the existing regulatory landscape controlling hydrofracturing's produced water.

The purpose of this project, then, is to briefly explain the current regulatory framework and to suggest changes to North Carolina's laws and regulations to protect the environment in the face of a potential deluge of produced water. Part II describes shale gas, hydraulic fracturing, and the risks to surface and groundwater posed by shale gas development. Part III describes the federal laws and regulations most likely to affect produced water disposal in North Carolina. Part IV describes the laws and regulations already on the books in North Carolina to deal with hydraulic fracturing. And finally, Part V suggests several specific changes to North Carolina's laws and regulations that should be made before the regulatory hydraulic fracturing ban is lifted.

II
A DELUGE OF DANGERS:
SHALE GAS, HYDRAULIC FRACTURING, AND THE RISKS TO WATER

It is not enough to know that shale gas is increasing of importance if we do not understand the process of getting it out of the ground. Hydraulic fracturing—the method used to extract gas from shale—is innovative and controversial and has made national headlines.

The problem with shale gas is this: Shale, by definition, is made up of very thin laminae, or compacted sheets of clay particles. Gas forms in these shales when bits of organic matter get trapped *between* layers as the laminae are forming. Because of this formation process, the shale is nearly impermeable to the gas—that is, the gas cannot move from horizontally or vertically from one layer to another.[9] In order to extract natural gas from rock formations with low permeability, like gas shales, a process called hydraulic fracturing—or "hydrofracturing" or simply "fracking"—is used.

North Carolina should be concerned about shale gas development and the shale gas boom. In fact, there is a substantial source of shale gas right below North Carolina's soil. The Deep River Basin is a 150-mile long half-graben with three subbasins—the Durham, Sanford, and Wadesboro subbasins—as shown in Figure 4.[10] The shale reservoir is relatively large at 25,000 acres and fairly shallow at 3,000 feet.[11] It has been estimated to contain enough gas to meet North Carolina's gas needs for 40 years,

---

[9] ARTHUR, BOHM & LAYNE, *supra* note 7, at 2.

[10] JEFFREY C. REID & KENNETH B. TAYLOR, SHALE GAS POTENTIAL IN TRIASSIC STRATA OF THE DEEP RIVER BASIN, LEE AND CHATHAM COUNTIES, NORTH CAROLINA WITH PIPELINE AND INFRASTRUCTURE DATA 1 (2009), *available at* http://www.geology.enr.state.nc.us/pubs/PDF/NCGS_OFR_2009-01_20090709.pdf.

[11] *Id.*

and at current usage, that would indicate a gas volume of about 10 trillion cubic feet.[12] And if commercial extraction were to take place, it would have to utilize hydraulic fracturing.

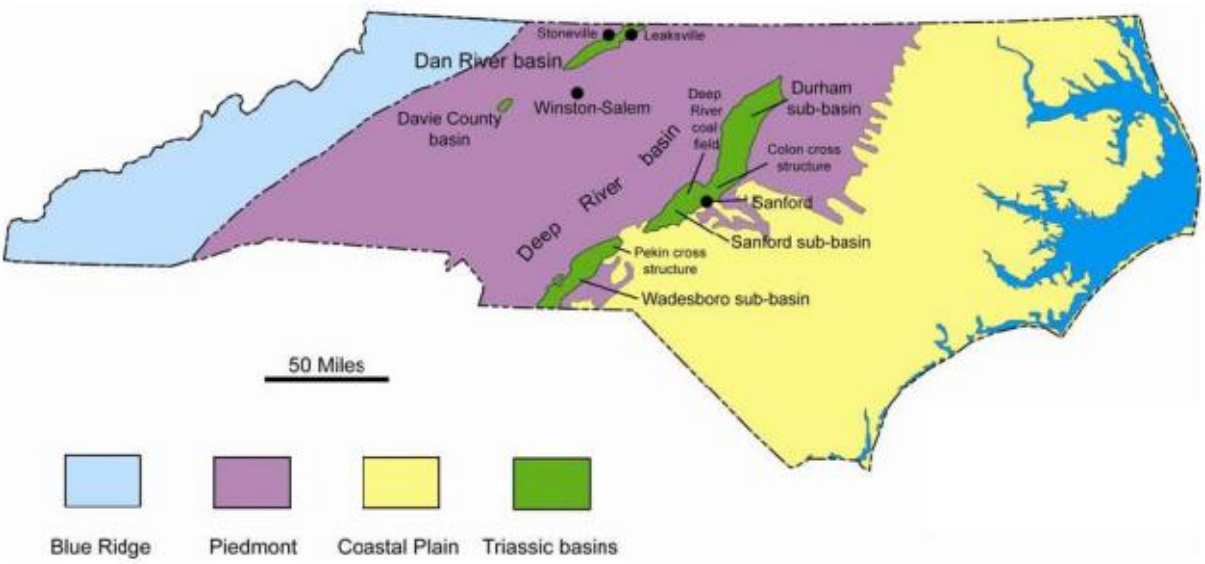

Figure 4. Map showing the distribution of Mesozoic shale basins in North Carolina. The Deep River Basin is believed to contain substantial shale gas resources.[13]

Fracturing rock in order to extract trapped petroleum originated in the 1860s, when oil well operators in Pennsylvania, New York, Kentucky, and West Virginia began injecting nitroglycerin into shallow wells in order to stimulate production.[14] By the 1930s, operators began injecting acid as a way to create a fracture in rock that, due to acid etching, would not re-close.[15] In the following years, engineers and operators made

[12] John Murawski, *N.C. Sits on Trove of Natural Gas*, NEWS & OBS. [Raleigh, N.C.], Apr. 4, 2010, http://www.newsobserver.com/2010/04/04/420496/nc-sitting-on-a-trove-of-natural.html.

[13] REID & TAYLOR, *supra* note 10, at 1.

[14] Carl T. Montgomery & Michael B. Smith, *Hydraulic Fracturing: History of an Enduring Technology*, J. PETROLEUM TECH., Dec. 2010, at 27, *available at* http://www.spe.org/jpt/print/archives/2010/12/10Hydraulic.pdf.

[15] *Id.*

the connection between treatment pressure and well performance, which led to the first hydraulic pressure fracturing experiments in 1947.[16]

The first commercial hydraulic fracturing treatments were carried out in 1949 by the official patent-holder of the process, Halliburton Oil Well Cementing Company.[17] These treatments—which took place in Oklahoma and Texas in March 1949—used a mixture of crude oil and gasoline and sand.[18] The practice grew rapidly when operators realized huge increases in well productivity due to hydraulic fracturing. By 2008, more than 50,000 hydraulic fracturing treatments were carried out worldwide.[19]

It is not necessary here to go into great technical detail about how a shale formation is hydraulically fractured. A fairly simple description of the process suffices to explain why hydrofracturing has garnered such media and political attention in the past few years, and also why water is of such particular concern. At its simplest, hydrofracturing a gas shale goes something like this.

First, a well is drilled into the shale formation, and fracturing fluid—a mixture of water and special fracturing chemicals—is injected into the well. The fluid moves to fill the cracks in the rock as far as it can flow until being cut off by impermeability, the place in the crack where the space between bits of rock is so small that the fluid molecules cannot seep through. Second, the pressure is increased and the fluid is forced into the formation, putting so much pressure on the rock that new cracks—or fractures—are formed, allowing gas from previously unconnected pore spaces to flow into the well.

---

[16] *Id.*

[17] *Id.*

[18] *Id.*

[19] *Id.*

Third, proppants—small, granular solids, usually sand—are injected in order to hold the newly formed fracture open. Finally, the operator extracts as much of the fracturing fluid as possible and gas production begins.[20]

The biggest water-related concern in the hydrofracturing process is the fracturing fluid. Hydrofracturing fluids are specially designed for each formation fracked. While water is the primary ingredient in all hydrofracturing fluids, a number of other chemicals are added, depending on the unique characteristics of the formation being fracked. Each of the chemical additives serves a particular purpose. For example, in a so-called "slickwater" fluid, a friction-reducer like petroleum distillate[21] might be added to reduce the friction between the fluid and the well-works and allow the operator to pump the fluid and the proppant to the correct area of the shale at a higher rate and at a lower pressure.[22] Biocides are added to reduce microorganism growth and biofouling—unwanted accumulation of biological material—of fractures.[23] Acids remove drilling mud damage in the wellbore and stabilizers inhibit corrosion in metal pipes.[24] Gelling agents are used to increase the viscosity of the fracturing fluid.[25] An example fracking fluid composition is shown in Figure 5.

---

[20] *See What Is Hydraulic Fracturing?*, PROPUBLICA, http://www.propublica.org/special/hydraulic-fracturing-national (last visited Apr. 29, 2011).

[21] ARTHUR, BOHM & LAYNE, *supra* note 7, at 11.

[22] *Id.* at 10.

[23] *Id.*

[24] *Id.* at 11.

[25] *See, e.g.*, HALLIBURTON, SGA-7 GELLING AGENT (2010), *available at* http://www.halliburton.com/public/pe/contents/Chem_Compliance/web/H07797.pdf.

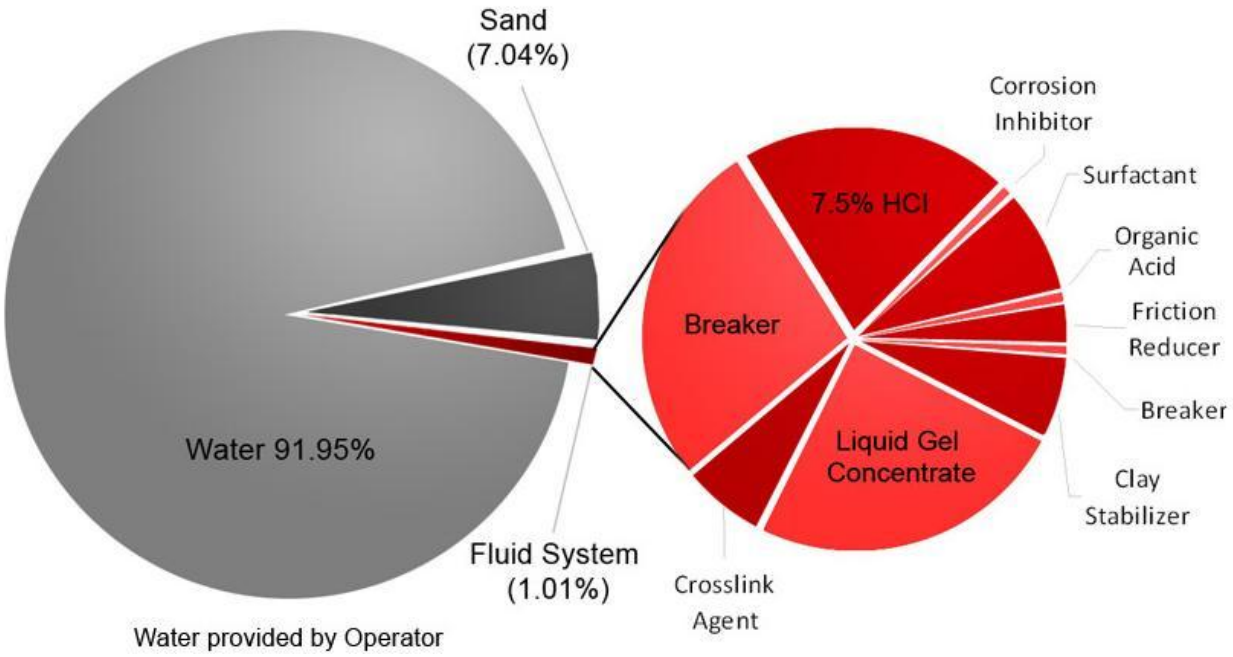

Figure 5. Halliburton's North Dakota Bakken Formation 3 fracturing fluid, broken down by component.[26]

There is nothing inherently dangerous about pumping chemicals belowground; many chemicals are benign and pose little danger to human health or the environment. Unfortunately, a number of the chemicals used in hydrofracturing fluid are extremely hazardous to humans and to the environment. According to a recent study of the largest hydrofracturing operators in the United States conducted by the minority staff of the House Committee on Energy and Commerce, as many as 750 different chemical additives and other components were used in hydrofracturing between 2004 and 2009.[27] Of the seven most commonly used chemicals,[28] at least four are dangerous to

[26] This image is drawn from the Halliburton fluids disclosure, which is located at *North Dakota Bakken Hybrid Formulation 3*, HALLIBURTON, http://www.halliburton.com/public/projects/pubsdata/hydraulic_fracturing/disclosures/images/ND_Bakken3.jpg (last visited Apr. 29, 2011).

[27] MINORITY STAFF OF H. COMM. ON ENERGY & COMMERCE, 112th Cong., CHEMICALS USED IN HYDRAULIC FRACTURING 5 (2011) [hereinafter CHEMICALS], *available at*

humans. Methyl alcohol can cause death and blindness and is thought to be both fetotoxic and teratogenic.[29] Chronic exposure to ethylene glycol can cause severe kidney problems, brain damage, and fetal defects.[30] Sodium hydroxide—also known as lye—can be fatal when ingested.[31] And ethylene glycol monobutyl ether—or 2-butoxyethanol—is known to cause hemolysis and damage to the spleen, liver, and bone marrow.[32] Almost 22 million gallons of fracturing fluid containing 2-butoxyethanol was injected as part of a hydrofracturing operation between 2005 and 2009.[33] Twenty-nine chemicals used in hydrofracturing are known or possible human carcinogens, are regulated under the Safe Drinking Water Act because of their risks to human health, or are listed as Hazardous Air Pollutants under the Clean Air Act.[34]

There is no question that these chemicals are hazardous to human health when they are injected into the shale formation. Perhaps this would be of less concern if the fluid *stayed* in the shale formation. But the dangerous chemicals do not remain down-hole; hydrofracturing operations bring as much of the fracturing fluid injected back up to the surface as they possibly can. That is, hydrofracturing operations pump three to

---

http://democrats.energycommerce.house.gov/sites/default/files/documents/Hydraulic%20Fracturing%20Report%204.18.11.pdf.

[28] *Id.* at 6 tbl.1.

[29] *See* MICROBIAL ID, MATERIAL DATA SAFETY SHEET: METHANOL (2009), *available at* http://www.midi-inc.com/pdf/MSDS_Methanol.pdf.

[30] *Material Data Safety Sheet: Ethylene Glycol*, J.T. BAKER (Sept. 16, 2009), http://www.jtbaker.com/msds/englishhtml/e5125.htm.

[31] *Material Data Safety Sheet: Sodium Hydroxide*, J.T. BAKER (Sept. 8, 2009), http://www.jtbaker.com/msds/englishhtml/s4034.htm.

[32] CHEMICALS, *supra* note 27, at 7.

[33] *Id.* at 7.

[34] *Id.* at 8.

eight million gallons of water underground per well[35] and must then contend with "flowback," the third to half of that water and fracking fluid which must be pumped back to the surface in order to get at the natural gas.[36] Once the water has been injected into the shale, it is no longer polluted only by the chemicals intentionally added for fracking purposes. Down-hole, the water is polluted by its contact with the shale and with the natural gas therein; the flowback pulled up from the well contaminated with dissolved solids, chloride, heavy metals, bromide, strontium, and barium.[37]

The question, then, is this: what are we to do with all of this flowback water? The problems of fracking flowback are becoming clearer and more pressing as development of unconventional gas formations from New York to Alabama has begun to grow at an exceptional pace. Produced water can be disposed of in a number of ways: The flowback can be hauled elsewhere to disposal—including out-of-state if in-state disposal is too expensive or difficult. It can be injected underground, back into a depleted oil or gas formation. It can be treated on-site and the water can be discharged, either directly into a surface waterbody or to a water-treatment facility, or land-applied. Finally, the flowback can be treated or diluted and reused on-site for further fracking operations.[38]

The potential risks to water inherent in these disposal methods should be relatively obvious. The most obvious is the blatant wrongdoer, who ignores any legal or

---

[35] Bruce Stutz, *A Controversial Drilling Practice Hits Roadblock in New York*, YALE ENVIRONMENT360 (Mar. 10, 2010), http://e360.yale.edu/feature/a_controversial_drilling_practice_hits_roadblock_in_new_york/2256/.

[36] Stutz, *supra* note 35.

[37] Conrad Dan Volz, *The Devil's Details About Radioisotopes and Other Toxic Contaminants in Marcellus Shale Flowback Fluids*, FRACTRACKER (Mar. 11, 2011, 11:31 AM), http://www.fractracker.org/2011/03/devils-details-about-radioisotopes-and.html.

[38] MICHAEL KUZNETZ, MARCELLUS SHALE FRAC FLOWBACK FLUID DISPOSAL OPTIONS 4 (2010), *available at* http://www.lrkimball.com/Documents/White_Papers/CE.E53.2010-10.WP009.Marcellus%20Shale%20Frac%20Flowback.pdf.

social responsibilities and simply dumps the flowback, either onto the ground or into a surface waterbody. There is only so much the law can do to prevent malfeasance on the part of this kind of person; civil or criminal penalties, if high enough, may be able to dissuade irresponsible behavior but may have only limited effects if the wrongdoer feels she can get away with her wrongdoing.

But great damage could be done by even a conscientious well operator. Reinjected fluid could infiltrate groundwater, either through previously unknown fractures in the rock separating the shale formation from the groundwater or from leaks in the wellbore as it passes through groundwater layers. Leaks, spills, blowouts, and other accidents are common in the gas production industry, and hydrofracturing operations are not immune from these dangers.

And then there are the great number of operators in-between: not perfectly conscientious but not nefarious either. The behavior of this middle group can be affected by law and regulation; these operators might be swayed by law where social responsibility does not elicit the ideal behavior we would like. These operators are the ones who depend on law and regulation to tell them how to behave and how to align their interests with the interests of society at large.

And the possible dangers are not merely theoretical. Water pollution events linked to hydraulic fracturing occur with alarming frequency across the country. Many of these spills have occurred in Pennsylvania, a state which ran headlong into the hydraulic fracturing frenzy without putting in place protective legislation or regulation first. In 2009, Pennsylvania struggled to contain a spill of 8,000 gallons of fracking

fluid at a natural gas well near Dimock.[39] In January 2010, the Pennsylvania Department of Environmental Protection (DEP) fined Atlas Resources—a hydrofracturing operator—$85,000 for violations at 13 wells, including spills of fracturing fluids due to a torn pit liner.[40] In October 2010, a truck moving hydrofracturing flowback was forced off the road and spilled nearly 5,000 gallons of waste onto the soil.[41] In November 2010, a DEP inspector found a fracking fluid tank with its bottom valve open; the tank had leaked more than 13,000 gallons of fracking fluid into a small waterbody and a spring.[42] And on April 20 of this year, officials in Bradford County, Pennsylvania, announced that thousands, and potentially hundreds of thousands, of gallons of fracturing liquids were released onto a pasture and into a stream in central Pennsylvania.[43]

---

[39] Abraham Lustgarten, *Frack Fluid Spill in Dimock Contaminates Stream, Killing Fish*, PROPUBLICA (Sept. 21, 2009, 5:09 PM), http://www.propublica.org/article/frack-fluid-spill-in-dimock-contaminates-stream-killing-fish-921.

[40] Sabrina Shankman, *Pennsylvania's Gas Wells Booming—But So Are Spills*, PROPUBLICA (Jan. 27, 2010, 5:08 PM), http://www.propublica.org/article/pas-gas-wells-booming-but-so-are-spills-127.

[41] Kathie O. Warco, *Fracking Truck Runs Off Road; Contents Spill*, OBSERVER-REP. (Washington & Green Cntys., Pa.) (Oct. 21, 2010, 3:32 AM), http://www.observer-reporter.com/or/localnews/10-21-2010-fracking-truck-rolls.

[42] *State Environmental Agency Probes Fluid Spill at Natural Gas Well Site*, DAILY ITEM (Nov. 22, 2010), http://dailyitem.com/0100_news/x1293914969/State-environmental-agency-probes-fluid-spill-at-natural-gas-well-site.

[43] Timothy Puko, *Pa. Requires Emergency Plans for Deep-Shale Wells; Specifics Not Spelled Out*, PITTSBURGH TRIB.-REV. (Apr. 26, 2011, 12:32 PM), http://www.pittsburghlive.com/x/pittsburghtrib/news/pittsburgh/s_733986.html; Mike Ludwig, *Fracking Blowout Causes Massive Spill in Pennsylvania*, TRUTHOUT (Apr. 20, 2011), http://www.truth-out.org/fracking-blowout-causes-massive-spill-pennsylvania/1303282800.

III
FEDERAL WATER LAW:
A MINEFIELD OF NATURAL GAS-RELATED EXEMPTIONS

In the early 2000s—spurred by citizen comments and a ruling by the Eleventh Circuit that EPA-approved underground injection programs must regulate hydraulic fracturing as a form of underground injection[44]—the EPA undertook a study to evaluate the potential threats to underground drinking water sources from hydraulic fracturing.[45] EPA reported that it could find no confirmed cases of drinking well contamination linked to hydraulic fracturing fluid. Moreover, after considering hundreds of peer-reviewed publications, EPA "concluded that the injection of hydraulic fracturing fluids . . . poses minimal threat to USDWs [underground sources of drinking water]," and that no further study would be undertaken.[46] Even at the time of the report's publication, several EPA scientists questioned the study's methodology and the impartiality of the study's authors.[47]

In 2010, the EPA was directed once again to conduct a study of hydraulic fracturing in order to determine whether the practice may have any negative effects on

---

[44] Legal Envtl. Assistance Found. v. U.S. Envtl. Prot. Agency, 118 F.3d 1467 (11th Cir. 1997).

[45] U.S. ENVTL. PROT. AGENCY, EVALUATION OF IMPACTS TO UNDERGROUND SOURCES OF DRINKING WATER BY HYDRAULIC FRACTURING OF COALBED METHANE RESERVOIRS; NATIONAL STUDY FINAL REPORT 1 (2004), http://www.epa.gov/ogwdw/uic/pdfs/cbmstudy_attach_uic_final_fact_sheet.pdf.

[46] *Id.*

[47] *See EPA Findings on Hydraulic Fracturing Deemed "Unsupportable,"* UNION OF CONCERNED SCIENTISTS, http://www.ucsusa.org/scientific_integrity/abuses_of_science/oil-extraction.html (last visited Apr. 26, 2011); Letter from Weston Wilson to Senator Wayne Allard, Senator Ben Nighthorse Campbell & Representative Diana DeGette (Oct. 8, 2004), *available at* http://latimes.image2.trb.com/lanews/media/acrobat/2004-10/14647025.pdf; Tom Hamburger & Alan C. Miller, *Halliburton's Interests Assisted by White House*, L.A. TIMES (Oct. 14, 2004), http://articles.latimes.com/2004/oct/14/nation/na-frac14/8.

America's drinking water supply.[48] The scope of this second study, which was requested as part of the 2009 Interior and Environment Appropriations Bill, was determined by an external federal advisory board called the EPA Science Advisory Board Environmental Engineering Committee and is intended to be "scientifically robust and peer-reviewed."[49] The new study should be completed by 2012.[50]

It is on this uncertain ground that federal hydrofracturing policy has developed. It is not that the results of the EPA study will have the effect of activating an as-yet-dormant statute or regulation. Rather, if the EPA cannot decide whether or not hydrofracturing is a dangerous activity and if the federal government is actively supporting the goal of energy independence, it is unsurprising that other federal agencies have not rushed to utilize existing statutes and regulations to control the development of hydrofracturing throughout the country.

That the federal government has not yet acted, however, does not mean it is incapable of doing so. A number of statutes, including those described below, might be tools that federal regulators could use to slow down or control the increasing use of hydrofracturing to access unconventional natural gas. Many, however, include special exemptions for or are susceptible to amendments limiting their control over oil and natural gas discovery, exploration, and extraction.

---

[48] OFFICE OF RESEARCH & DEV., U.S. ENVTL. PROT. AGENCY, EPA/600/F-10/002, HYDRAULIC FRACTURING RESEARCH STUDY 1 (2010), *available at* http://www.epa.gov/safewater/uic/pdfs/hfresearchstudyfs.pdf.

[49] *Id.*; Abraham Lustgarten & Sabrina Shankman, *Congress Tells EPA to Study Hydraulic Fracturing*, PROPUBLICA (Nov. 10, 2009, 4:18 PM), http://www.propublica.org/article/congress-tells-epa-to-study-hydraulic-fracturing-hinchey-1110.

[50] Press Release, U.S. Envtl. Prot. Agency, EPA Submits Draft Hydraulic Fracturing Study Plan to Independent Scientists for Review (Feb. 8, 2011), *available at* http://www.epa.gov/aging/press/epanews/2011/2011_0208_1.htm.

A. The Clean Water Act

Any American water protection story must begin with the Federal Water Pollution Control Amendments of 1972—better known as the Clean Water Act (CWA).[51] Like many complex environmental statutes, the goals of the CWA are relatively simple and but achievement of those goals astoundingly complex. According to the statute's text, its "objective . . . is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[52] In order to meet this goal, the authors of the CWA designed a staggering array of water protection mechanisms which regulate nearly every way pollutants can enter waterways. One major limitation of the CWA that must be kept in mind is this: it applies only to what are called "waters of the United States," a category that, while very broad, still excludes some major water reservoirs. Waters of the United States generally include waters that span two or more states and their tributaries, waters contained within single states which nonetheless are used in interstate or foreign commerce and their tributaries, and wetlands adjacent to all of the foregoing.[53] Decisions by the Supreme Court continue to clarify this definition—especially with regards to smaller waterways, ephemeral waterbodies, isolated wetlands, and the like—but certain water reservoirs are distinctly *not* included within the definition, including some types of groundwater.[54]

---

[51] Federal Water Pollution Control Amendments of 1972, 33 U.S.C. §§ 1251–1387 (2009).

[52] *Id.* § 1251.

[53] *Introduction to the Clean Water Act: Introduction to WQS*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/owow/watershed/wacademy/acad2000/cwa/cwa2.htm (last updated Sept. 12, 2008).

[54] *See* Solid Waste Agency of N. Cook Cnty. v. U.S. Army Corps of Eng'rs, 531 U.S. 159, 174 (2001) (isolated wetlands do not fall within scope of Clean Water Act); Rapanos v. United States, 547 U.S. 715,

The initial innovation of the CWA—and the foundation of all of its other operations—was the system it described for setting water quality standards. After all, it is impossible to tell whether the chemical, physical, and biological integrity of waters is being protected if there does not exist some objective standard by which to judge such integrity. The major components of the Water Quality Standards (WQS) Program are designated uses, water quality criteria, and an antidegradation policy.[55] The designated uses are those uses that the government has decided should be possible in the water body; the water quality criteria are those levels of water quality necessary to allow the designated uses to take place; and the antidegradation policy requires special rules to protect water that is already of a quality higher than needed to support the designated uses.[56] While the number of designated uses is, of course, as varied as the myriad ways in which Americans use water, one use is specifically forbidden: "In no case shall a State adopt waste transport or waste assimilation as a designated use for any waters of the United States."[57]

One of these mechanisms is especially important when considering the possible regulation of fracking-related produced water. The CWA aggressively manages point source discharges into the nation's waterways.[58] Point source pollution—pollution

---

742 (2006) (Clean Water Act only regulates those waters with a significant nexus to navigable waters); Jason R. Jones, *The Clean Water Act: Groundwater Regulation and the National Pollutant Discharge System*, 8 DICK. J. ENV. L. & POL'Y 93 (1999).

[55] *Introduction to the Clean Water Act: Water Quality Standards*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/owow/watershed/wacademy/acad2000/cwa/cwa4.htm (last updated Sept. 12, 2008).

[56] *Id.*

[57] 40 C.F.R § 131.10 (2010).

[58] *Introduction to the Clean Water Act*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/owow/watershed/wacademy/acad2000/cwa/ (last updated Sept. 12, 2008).

emanating from a "discernable, confined, and discrete conveyance"[59]—is managed through the National Pollutant Discharge Elimination System (NPDES). Though the CWA states as its purpose the complete elimination of pollutant discharges, such a goal is obviously unattainable in any but the very long term. NPDES permitting represents the CWA's compromise: Pollutant discharges are allowed, but only when a special permit has been acquired by the discharger. Under the CWA, NPDES permits may be granted by the Administrator of the EPA or by a state agency to which permitting authority has been delegated so long as the discharge meets certain requirements,[60] including effluent limitations,[61] performance standards,[62] recording and reporting requirements, and inspection requirements.[63]

Hydrofracturing flowback is protected from operation of NPDES by certain statutory exemptions. The major exemption for hydrofracturing flowback and hydrofracturing fluids concerns the underground injection of such materials. Under the CWA, the term pollutant does not mean

> water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil or gas production and disposed of in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the State in which the well is located, and if such

[59] 33 U.S.C. § 1362(14) (2009).

[60] *See id.* § 1342(a)(1) ("[T]he Administrator may, after opportunity for public hearing, issue a permit for the discharge of any pollutant, or combination of pollutants . . . upon condition that such discharge will meet . . . all applicable requirements under sections 1311, 1312, 1316, 1317, 1318, and 1343 of this title.").

[61] *Id.* §§ 1311–12 (water quality related effluent limitations); *id.* § 1317 (toxic and pretreatment effluent standards).

[62] *Id.* § 1316.

[63] *Id.* § 1318.

> State determines that such injection or disposal will not result in the degradation of ground or surface water.[64]

Only point source discharges of pollutants require NPDES permits. Thus, as long as the state determines that the injection—or reinjection—will not degrade ground or surface water, the most hazardous hydrofracturing fluid will not be considered a pollutant under the CWA and the injection will not require a NPDES permit.

Aside from this exemption, discharges of fracking fluid or flowback—say, into a stream or lake—are almost certainly discharges of pollutants governed by the CWA. The CWA defines "pollutant" to include "industrial . . . waste,"[65] which flowback—including or not including dangerous fracking fluids—certainly is. And though no court has directly addressed the question of whether fracking fluid or flowback is a pollutant under the CWA, at least one court has acknowledged that a far more natural—though perhaps not less dangerous—oil and gas production waste constitutes a pollutant under the CWA's definition.

In *Northern Plains Resource Council v. Fidelity Exploration and Development*, the Ninth Circuit found that even unaltered groundwater can constitute a pollutant under the CWA.[66] Fidelity Exploration and Development, a CBM developer, argued that the unaltered groundwater it was discharging into a nearby waterway did not constitute a pollutant, but the Court strongly disagreed. First, the Court stated plainly that "CBM water is a 'pollutant' because it is 'industrial waste,'" because the ordinary meanings of words would define "industrial waste" as "any useless byproduct derived from the

---

[64] *Id.* § 1362(6)(B).

[65] *Id.* § 1362(6).

[66] 325 F.3d 1155, 1160 (9th Cir. 2003).

commercial production and sale of goods and services."[67] Because Fidelity's commercial activity was methane production and because water was produced as an inevitable byproduct of the process, the Court found that there was no way such water did not fit within the definition of industrial waste.[68]

The Court also considered it important that the CWA specifically exempts from the "pollutant" definition only certain types of produced water. The only reason for a specific exemption for reinjected produced water is that generally produced water *does* fall within the CWA's definition of "pollutant"; otherwise the exemption would be obvious surplusage.[69]

Other courts have similarly concluded that produced water constitutes a pollutant under the CWA. The Fifth Circuit Court of Appeals, like the Ninth Circuit, considered the CWA's specific exemption for reinjected produced water "a strong indicator of Congress's concern over the effects of produced water on the environment."[70] And "[i]f, absent an exemption, produced water reinjected into a state-approved well *is* a pollutant, then it is hardly a stretch to say that produced water deposited directly into a [waterbody] is also a pollutant."[71] The Fifth Circuit also noted that the EPA had recognized the citizen's right to sue "Coastal Subcategory" operators

---

[67] *Id.* at 1160–61.

[68] *Id.* at 1161.

[69] *Id.*

[70] Sierra Club, Lone Star Chapter v. Cedar Point Oil Co., 73 F3d 546, 568 (5th Cir. 1996).

[71] *Id.*

discharging produced water without a permit, a right which can only exist if the produced water is a pollutant under the CWA.[72]

Because flowback is a pollutant under the CWA, hydrofracturing operators are prohibited from discharging flowback into surface waters unless they have a NPDES permit, which should establish effluent limits for the discharge. Effluent limits in NPDES permits are based on both the water quality standards that apply to the receiving water—that is, water quality-based effluent limits—and the technology available to control the pollutant—technology-based effluent limitations.[73]

Technology-based effluent limitations for hydrofracturing operations are controlled by regulations which apply to onshore facilities "engaged in the production, field exploration, drilling, well completion and well treatment in the oil and gas extraction industry."[74] Though gas-producing shales are considered "unconventional" gas sources, the waste generated by hydrofracturing was considered and meant to be included within these regulations.[75]

It is because of these regulations that hydrofracturing flowback cannot be directly discharged into surface waters but must be treated first: "[T]here shall be no discharge of waste water pollutants into navigable waters from any source associated with production, field exploration, drilling, well completion, or well treatment (i.e. produced

---

[72] *Id.*; *see also* Proposed NPDES General Permits for Produced Water and Produced Sand Discharges from the Oil and Gas Extraction Point Source Category to Coastal Waters in Louisiana and Texas, 57 Fed. Reg. 60,926, 60,944–45 (Dec. 22, 1992).

[73] U.S. ENVTL. PROT. AGENCY, NATURAL GAS DRILLING IN THE MARCELLUS SHALE: NPDES PROGRAM FREQUENTLY ASKED QUESTIONS 6 (2011) [hereinafter FAQ], *available at* http://www.epa.gov/npdes/pubs/hydrofracturing_faq.pdf.

[74] *Id.*; 40 C.F.R. § 435.30 (2010).

[75] 41 Fed. Reg. 44,946 (Oct. 13, 1976) ("The waste waters generated in this subcategory are the result of several different sources. These sources are: . . . well treatment . . . . Well treatment wastes result from acidizing and hydraulic fracturing.")

water . . .)."[76] That is, the level of pollution abatement possible when a hydrofracturing operator uses the "best practicable control technology currently available" to control discharges of flowback or fracking fluid is in fact complete; if the best practicable control technologies currently available are used, no fluid or flowback should be discharged at all.[77] Even when these technologies are utilized, of course, wastewater migration into surface waters is not impossible to imagine. Surface evaporation pools can leak or burst; water injected incorrectly or water leaking from wells can migrate through the soil to nearby surface waters, and so on.

If the operator does not choose to treat water onsite, she can potentially discharge flowback into a "publicly owned treatment works" (POTW), a public water treatment system. Currently, there are no EPA guidelines that specifically forbid or regulate the introduction of hydrofracturing wastewater into a POTW, but there are general guidelines that regulate *all* discharges into POTWs.[78] No discharges into POTWs are permitted which "pass through" or cause "interference" with POTW operations.[79] Interference is defined to mean any inhibition or disruption of the POTW, its treatment processes or operation, or its sludge processes, use, or disposal.[80] Thus, these general regulations also prohibit the introduction of pollutants into the POTW that would pollute the POTW's produced biosolids in such a way that they could not be disposed of or used according to the POTWs wishes.[81] "Pass through" is defined to

[76] 40 C.F.R. § 435.32 (2010).

[77] *Id.*

[78] *See* FAQ, *supra* note 73, at 8.

[79] 40 C.F.R. § 403.3 (2010).

[80] *Id.*

[81] FAQ, *supra* note 73, at 8.

mean "a discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NDPES permit (including an increase in the magnitude of a violation)."[82] According to the EPA, "[b]ecause there is a significant possibility that SGE [shale gas extraction] wastewater may 'pass through' the POTW, causing the POTW to violate its permit, cause 'interference' with the POTW's operation, or contamination of biosolids, acceptance of the waste is not advisable unless [its] effects on the treatment system are well understood and the wastewater is not reasonably expected to cause pass through or interference."[83] That is, according to the EPA, most water treatment facilities are not capable of adequately treating fracking flowback and thus flowback should not be discharged into them.

But as well as *direct* discharges of hydrofracturing waste are controlled, there are of course other was that such waste can end up in nearby waterbodies. During precipitation events, water falls onto the ground and, if the ground is impermeable, flows across it. Along the way, the water can pick up pollutants from the ground it washes over. Large construction projects often require special stormwater permits, because the runoff produced at these sites can be particularly polluted. The Energy Policy Act of 2005, however, in part of what has been termed the "Halliburton Loophole,"[84] redefined "oil and gas exploration, production, processing, or treatment operations"—which were already excluded from NPDES stormwater permitting

[82] 40 C.F.R. § 403.3 (2010).

[83] FAQ, *supra* note 73, at 11.

[84] *2005 Energy Policy Act*, MARCELLUS-SHALE.US, http://www.marcellus-shale.us/2005-Energy-Act.htm (last visited Apr. 26, 2011).

requirements—to include all of the field activities and operations related to those facilities "whether or not such field activities may be considered to be construction activities."[85] This meant that well site activities that disturbed more than one acre were exempted from the CWA's requirement for NPDES stormwater permits for construction projects,[86] unless the facility has had a "discharge of storm water resulting in the discharge of a reportable quantity [of pollutant] for which notification is or was required" pursuant to 40 CFR 117.21, 302.6, or 110.6, or if the facility "[c]ontributes to a violation of a water quality standard."[87]

Overall, then, while many hydrofracturing-related discharges are controlled by the CWA, many important exemptions have been carved out to make fracturing easier and less-permitted than many other industrial activities. Though the CWA seems to be the gold standard for water protection, it probably does not do enough to truly regulate fracking discharges.

B. Safe Drinking Water Act

The Safe Drinking Water Act (SDWA), passed in 1974, is the main federal law that protects the safety and quality of America's drinking water. The SDWA allows the EPA to set health-based standards to protect against drinking water contamination and

---

[85] *Effect of Federal Safe Drinking Water Act, Clean Water Act, and Emergency Planning and Community Right-to-Know Act*, N.Y. DEP'T OF ENVTL. CONSERVATION, http://www.dec.ny.gov/energy/46445.html (last visited Apr. 26, 2011).

[86] *Id.*

[87] 40 C.F.R. § 122.26(c)(1)(iii) (2010). *See also* Natural Res. Def. Council v. U.S. Envtl. Prot. Agency, 526 F.3d 591, 606 (9th Cir. 2008) (striking down an EPA final rule that would have exempted oil and gas operations from getting stormwater permits even when the sediment discharges led to a violation of a water quality standard).

applies to the more than 170,000 public water systems in the United States. As originally passed in 1974, the SDWA focused on water treatment as the primary way to protect water quality, but in 1996, the Act was amended to increase emphasis on other aspects of the water quality process, particularly source water protection.[88] Under these amendments, water systems and states can adopt rules and laws that will—along with the CWA—protect the quality of the source waters.

As with the CWA, the SDWA contains provisions exempting reinjection of produced water. The Underground Injection Control Program establishes minimum requirements for underground injection programs in order to protect groundwater from injected pollutants.[89] Until 2005, it seemed that the same rules that applied to other injections applied to hydrofracturing injections—both of fracking fluid and of produced water.

In 2005, however, a special exemption was added to the SDWA. President Bush, "acting on [the] widely criticized EPA study [described above] . . . concluded that fracking was safe" and pushed for an exemption to the SDWA.[90] As a result, the Energy Policy Act of 2005 changed the definition of "underground injection,"[91] specifically *excluding* from the definition "the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities."[92] It is not entirely clear from this definition

---

[88] U.S. ENVTL. PROT. AGENCY, EPA 816-F-04-030, UNDERSTANDING THE SAFE DRINKING WATER ACT 1 (2004), *available at* http://water.epa.gov/lawsregs/guidance/sdwa/upload/2009_08_28_sdwa_fs_30ann_sdwa_web.pdf.

[89] 40 C.F.R. § 144 (2010).

[90] Stutz, *supra* note 35.

[91] 42 U.S.C. 300h(d) (2009).

[92] Energy Policy Act of 2005, Pub. L. No. 109-58, § 332, 119 Stat. 594, 694 (2005).

whether only the original fracking fluid injection is contained within this exemption, or whether the exemption also protects the reinjection of flowback water. But whatever the exemption covers *cannot* be regulated by the EPA under the SDWA, no matter the danger posed to drinking water by the practice.

Surface water disposal of flowback water may be more complex. The SDWA requires EPA to set standards to control the level of contaminants in the nation's drinking water. Since the SDWA's passage, EPA has set standards for ninety different chemical, biological, radiological, and physical contaminants.[93] For some of these contaminants, the level set by EPA is at or very near zero; that is, there is no safe level of the contaminant in drinking water. Of the contaminants with maximum contaminant level goals (MCLGs)[94] of near zero, several are among the chemicals found in some fracking fluid formulations, including acrylamide, epichlorohydrin, ethylbenzene, styrene, and xylene.[95] Acrylamide and epichlorohydrin are carcinogens,[96] while styrene and xylene can have harmful neurological effects.[97] Thus, one might expect that the

---

[93] *Regulating Public Water Systems and Contaminants Under the Safe Drinking Water Act*, U.S. ENVTL. PROT. AGENCY, http://water.epa.gov/lawsregs/rulesregs/regulatingcontaminants/basicinformation.cfm (last updated Mar. 14, 2011).

[94] 40 C.F.R. § 141.50 (2010).

[95] *Id.; Health Effects Spreadsheet*, ENDOCRINE DISRUPTION EXCH., http://www.endocrinedisruption.com/files/MultistateSpreadsheet3-29-11States.xls (last visited Apr. 26, 2011); Sierra Crane-Murdoch, *Unpacking Health Hazards in Fracking's Chemical Cocktail*, HIGH COUNTRY NEWS, Feb. 21, 2011, http://www.hcn.org/issues/43.3/unpacking-health-hazards-in-frackings-chemical-cocktail.

[96] *Acrylamide Questions and Answers*, U.S. FOOD & DRUG ADMIN. http://www.fda.gov/food/foodsafety/foodcontaminantsadulteration/chemicalcontaminants/acrylamide/ucm053569.htm (last updated May 13, 2009); *Product Safety Assessment: Epichlorohydrin*, DOW, http://www.dow.com/productsafety/finder/epi.htm (last visited Apr. 26, 2011).

[97] AGENCY FOR TOXIC SUBSTANCES & DISEASE REGISTRY, U.S. DEP'T OF HEALTH & HUMAN SERVS., TOXICOLOGICAL PROFILE FOR XYLENE 106 (2007), *available at* http://www.atsdr.cdc.gov/toxprofiles/tp71.pdf; AGENCY FOR TOXIC SUBSTANCES & DISEASE REGISTRY, U.S. DEP'T OF HEALTH & HUMAN SERVS., STYRENE 1 (2007), *available at* http://www.atsdr.cdc.gov/tfacts53.pdf.

EPA—under the authority granted by the SDWA—could aggressively protect sources of drinking water from pollution by these chemicals already acknowledged to be dangerous.

The problem, however, is that EPA only has authority over public water systems, from which EPA can demand compliance with the water safety standards.[98] EPA has no direct control over the quality of the drinking water *sources*, only over the drinking water *providers*. Under the 1996 amendments to the SDWA, states devise Source Water Assessment Programs, under which the state must do four primary things: delineate source water protection areas, inventory potential sources of contamination within those areas, determine the vulnerability of public water systems to those sources, and make the results of these determinations public.[99] But no action beyond these mandated assessments is required. EPA "encourage[s] states . . . to use the information from source water assessments to protect the delineated source water protection areas," but ultimately it is up the locality or state to devise a method to protect drinking water sources.[100] The state can, if it chooses, rely on Section 303 of the CWA to protect the area around drinking water sources.[101] Ultimately, though, source water protection is only as good as the regulations, agreements, and laws that protect drinking water sources.

---

[98] U.S. ENVTL. PROT. AGENCY, EPA 816-F-04-031, DRINKING WATER MONITORING, COMPLIANCE, AND ENFORCEMENT 1–2 (2004), *available at* http://water.epa.gov/lawsregs/guidance/sdwa/upload/2009_08_28_sdwa_fs_30ann_monitoring_web.pdf.

[99] *Id.*

[100] U.S. ENVTL. PROT. AGENCY, EPA 816-F-04-032, PROTECTING DRINKING WATER SOURCES 2 (2004), *available at* http://water.epa.gov/lawsregs/guidance/sdwa/upload/2009_08_28_sdwa_fs_30ann_swp_web.pdf.

[101] *Id.*

C. National Environmental Policy Act

The National Environmental Policy Act (NEPA) represents another of Congress's efforts in the 1970s to protect what may have seemed like quickly shrinking amount of unpolluted environment in the United States. NEPA marked several departures from earlier environmental law. For instance, NEPA declared a national environmental policy, stating that it was the responsibility of the federal government to use "all practicable means" to improve federal functioning in order to protect each American's access to a safe and healthful environment and to avoid environmental degradation, among other goals.[102]

But the critical innovation of NEPA, of course, was its requirement that federal agencies include with every proposal for a "major federal action[] significantly affecting the environment" a "detailed statement"—now called an Environmental Impact Statement (EIS)—about the environmental impacts of the proposed action.[103] So-called "major federal actions" occurs more often than the phrase might immediately suggest. If the effects of the action will have a significant effect on the environment—considering both the context and the intensity of the action—then it is "major," according to regulations promulgated by the Council on Environmental Quality (CEQ).[104] "Actions" include "new and continuing activities, including projects and programs entirely or partly financed, assisted, conducted, regulated, or approved by federal agencies; [and]

---

[102] 42 U.S.C. § 4331(a) (2009).

[103] *Id.* § 4331(b).

[104] 40 C.F.R. § 1508.27 (2010).

new or revised agency rules, regulations, policies, or procedures."[105] Thus, "[f]ederal actions" usually fall within a few categories: "adoption of official policy," "adoption of formal plans," "adoption of programs," and "approval of specific projects" through permitting or assisting.[106]

Based on these definitions, hydrofracturing operators might need to create an EIS for two reasons: either the hydrofracturing project requires a federal permit or the hydrofracturing project is on land owned by the federal government—typically by the Department of Interior. But for a number of reasons, it is unlikely that a hydrofracturing operator would actually need to create an EIS in *either* of these situations.

First, a hydrofracturing operator may very well not require any *federal* permits. Hydraulic fracturing is exempted from many federal permitting programs, like the SDWA and the Resource Conservation and Recovery Act, Subtitle C programs. In these circumstances, hydrofracturing operators would not need a permit even if someone engaged in a similarly polluting activity would need one. And the permitting regimes from which hydrofracturing is not explicitly exempt are typically administered not by the federal government but by the state government. The fact that the state government administers the program shifts the permit from a federal permit to a state permit, which means that such permit can no longer be the basis of the NEPA requirement.[107] For example, the NPDES program is administered by authorized states and not by the EPA; NPDES permits, then, do not trigger NEPA's EIS requirements.

---

[105] *Id.* § 1508.18(a).

[106] *Id.* § 1508.18.

[107] U.S. ENVTL. PROT. AGENCY, EIA GUIDELINES FOR MINING: ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR NEW SOURCE NPDES PERMITS 2-7 (1994).

Second, even if hydrofracturing operators occur on federal land—when an EIS would certainly be required—the Energy Policy Act of 2005[108] created a special exemption that would allow hydrofracturing operations on federal land to avoid the EIS requirement. Section 390 of the Act created a categorical exclusion from NEPA review of Department of Interior and United States Forest Service land management decisions concerning activities, like hydraulic fracturing, conducted pursuant to the Mineral Leasing Act for purposes of exploration or development of oil or gas.[109] This categorical exclusion applies when the surface disturbance is less than five acres, when drilling took place at the same site within the previous five years, or when drilling will occur within a developed field for which an approved land-use plan or NEPA document has been prepared.[110] Because most drill pads are less than five acres, they would fit within this exception. There is a similar exception for oil and gas exploration activities on land owned by the Bureau of Land Management, so long as the project does not require new road building. [111]

Perhaps most importantly, however, is that NEPA creates only informational requirements. Once an EIS is created, NEPA imposes no further burdens on the operators of the project or activity being studied.

---

[108] 42 U.S.C. § 15942 (2009).

[109] *Id.*

[110] *Id.*

[111] *See* Notice of Final Action to Adopt Revisions to the Bureau of Land Management's Procedures for Managing the NEPA Process, Chapter 11 of the Department of the Interior's Manual Part 516, 72 Fed. Reg. 45,504, 45,539 (Aug. 14, 2007).

D. Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) gives the federal government authority to require responsible hazardous waste management. Of its many subtitles, we are most concerned with Subtitles C and D.

Subtitle C, "Hazardous Waste Management," requires EPA to engage in "cradle-to-grave" management of hazardous wastes.[112] First, Subtitle C requires the Administrator of the EPA to promulgate "criteria for identifying the characteristics of hazardous waste" and to create a list of those wastes.[113] The Administrator is asked to consider a number of possible criteria, including toxicity, persistence, degradability, bioaccumulation potential, flammability, and corrosiveness and the presence of certain dangerous constituents, such as carcinogens, mutagens, and teratogens.[114] Once the wastes are identified, the EPA must create regulations establishing standards for the production of hazardous waste, dictating, for example, how records should be kept, how wastes should be labeled, and how manifests should be used to track hazardous waste on its way to its disposal site.[115] Similar regulations must be promulgated relating to the transportation, storage, treatment, and disposal of wastes classified as hazardous.

Subtitle D of RCRA addresses the management of non-hazardous solid waste and hazardous wastes exempted from Subtitle C. Unlike Subtitle C, under which EPA has primary authority for the management of hazardous waste until it authorizes a state to

---

[112] *Summary of the Resource Conservation and Recovery Act*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/regulations/laws/rcra.html (last updated Mar. 2, 2011).

[113] 42 U.S.C. §§ 6921(a) & (b)(1) (2009).

[114] *Id.*

[115] *Id.* § 6922.

operate the program in EPA's stead, Congress granted Subtitle D authority *solely* to the states.[116] Under Subtitle D, state governments are responsible for planning, permitting, regulating, and enforcing non-hazardous solid waste management rules, subject only to minimum national technical criteria promulgated by EPA.[117]

Unsurprisingly, perhaps, the oil and gas industry is largely exempt from the provisions of RCRA. Congress specifically excluded from Subtitle C regulation "drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil or national gas," and subjects them instead to state programs, unless the Administrator determined that such wastes should be managed under Subtitle C.[118] In 1988, EPA announced that it had completed its consideration of drilling wastes and determined that regulation under Subtitle C was unwarranted, largely because Subtitle C regulations are rigid and may not offer the flexibility necessary to take into account differences between drilling operations in different parts of the country.[119] Instead, EPA decided to pursue a multipronged strategy to regulate these wastes under RCRA Subtitle D. While EPA recognized that existing Subtitle D standards "[did] not fully address the specific concerns posed by oil and gas wastes," it believed that any gaps could be filled by promulgating new regulations under Subtitle D and by "more broadly utiliz[ing]" the authority available to EPA under the CWA and SDWA.[120] As discussed above, hydrofracturing flowback is largely exempt from these

---

[116] *Managing Non-Hazardous Municipal and Solid Waste (RCRA)*, U.S. ENVTL. PROT. AGENCY, http://yosemite.epa.gov/r10/owcm.nsf/RCRA/nonhaz_waste (last updated Apr. 26, 2011).

[117] *Id.*; 40 C.F.R. §§ 257 & 258 (2010).

[118] 42 U.S.C. § 6921(2)(A) (2009).

[119] Regulatory Determination for Oil and Gas Geothermal Exploration, Development and Production Wastes, 53 Fed. Reg. 25,446, 25,226 (July 6, 1988).

[120] *Id.*

other statutory frameworks and thus those other statutes are unlikely to be able to fill the gaps in RCRA Subtitle D. The continued exemption of oil and gas wastes from RCRA Subtitle D was reaffirmed by the EPA in 1993.[121] In September 2010, the National Resources Defense Council petitioned the EPA requesting EPA to reconsider its 1988 decision and move regulation of exploration, development, and production wastes from Subtitle C to Subtitle D.[122]

One provision of RCRA may continue to protect citizens from potential pollution from hydrofracturing operations. Under RCRA Section 7003, which describes cleanup actions in situations that present "imminent and substantial endangerment to health or the environment," the EPA can bring actions against any person—including generators of waste or owners or operators of waste-producing facility—where there is evidence that "past or present handling, storage, treatment, transportation or disposal of any solid waste or hazardous waste may present an imminent and substantial endangerment to health or the environment."[123] In these cases, generators, operators, transporters and

---

[121] Clarification of the Regulatory Determination for Wastes from the Exploration, Development and Production of Crude Oil, Natural Gas and Geothermal Energy, 58 Fed. Reg. 15,284 (Mar. 22, 1993). *See also Mining Waste*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/osw/nonhaz/industrial/special/mining/ (last updated Jan. 13, 2009); Letter from Elizabeth A. Cotsworth, Acting Dir., Office of Solid Waste, U.S. Envtl. Prot. Agency, to Senator Vance Hartke, *available at* http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc62147252852 56bf00063269d/554BCDE3F227E5538525 6936006AC4BF/$file/14260.pdf; U.S. ENVTL. PROT. AGENCY, EXEMPTION OF OIL AND GAS EXPLORATION AND PRODUCTION WASTES FROM FEDERAL HAZARDOUS WASTE REGULATIONS (2002) [hereinafter EXEMPTION], *available at* http://www.epa.gov/epawaste/nonhaz/industrial/special/oil/oil-gas.pdf.

[122] Petition for Rulemaking Pursuant to Section 6974(a) of the Resource Conservation and Recovery Act Concerning the Regulation of Wastes Associated with the Exploration, Development, or Production of Crude Oil or Natural Gas or Geothermal Energy from National Resources Defense Council to U.S. Envtl. Prot. Agency (Sept. 8, 2010), *available at* http://docs.nrdc.org/energy/files/ene_10091301a.pdf. *See also* Lee Fuller, *Oil and Natural Gas RCRA Exemption Under Attack*, IPAA REP., Sept. 24, 2010, at 1, *available at* http://www.ipaa.org/news/wr/2010/WR-2010-09-24.pdf.

[123] 42 U.S.C. § 6973 (2009).

the like can be enjoined from further activity or may be required to "take such other action as may be necessary" as determined by the court.[124] Thus, under this provision, hydrofracturing operators that create otherwise exempt hazardous waste may be enjoined in a suit brought by the EPA and may liable for the costs of cleaning up environmental contamination so long as the exempt wastes are considered "solid waste." EPA has acknowledged that operators are potentially liable under this standard, but has also recognized that the RCRA hazardous waste exemption permits the operator to choose a waste disposal option that might be less stringent than would be required under Subtitle C, even if it is found liable.[125]

The right of citizens to bring suit under this provision was not always clear. In *Jones v. Inmont Corp.*, an Ohio District Court held that this section represented a substantive provision that *could* be vindicated in a citizen suit.[126] The District Court so held for a number of reasons, including the fact that, if citizen suits were impermissible under Section 7003, there would be a "gap in enforcement of RCRA's provisions that was probably not in the contemplating of Congress and is surely not in the best interests of the public," because the authority granted to the EPA in the section is optional and not obligatory. If the EPA chooses not to pursue a polluter under this provision and citizen suits were not available, then the polluter could continue the activity which is—by definition, if the action is being brought under Section 7003—imminently and substantially endangering human health or the environment.[127]

---

[124] *Id.* § 6973(a).

[125] EXEMPTION, *supra* note 121, at 5.

[126] 584 F. Supp. 1425, 1433 (S.D. Ohio 1984).

[127] *Id.* at 1435.

The *Inmont Corp*. Court was nearly alone in its finding that Section 7003 could support a citizen suit provision.[128] Apparently in response to decisions that found that no citizen suit could rely on Section 7003, Congress actually amended RCRA in 1984 to provide explicitly for a *citizen* suit "against any person . . . who has contributed or who is contributing to the . . . handling, storage, treatment, transportation, or disposal of any kind of solid or hazardous waste which may present an imminent and substantial endangerment to health or the environment."[129] Under this clear amendment, then, citizens are empowered to sue to stop imminent and substantial endangerment from hydrofracturing fluid. However, creating "private EPA administrators" who must be relied upon to vindicate a statutory right may end in disappointment; many citizens are undereducated about what constitutes an imminent and substantial risk or lack the time and resources to successfully carry out a lawsuit against a larger and better funded hydrofracturing operator.

E. Toxic Substances Control Act

The Toxic Substances Control Act (TSCA), like NEPA, is an informational statute that allows EPA to require reporting, record-keeping, and testing requirements and to place certain restrictions on certain chemicals.[130] TSCA allows the Administrator of the

---

[128] *See* McGregor v. Indus. Excess Landfill Inc., 709 F. Supp. 1401 (N.D. Ohio 1987); U.S. v. Conservation Chem. Co., 619 F. Supp. 162 (W.D. Mo. 1985); United States v. Hooker Chems. & Plastics Corp., 749 F.2d 968 (2d Cir. 1984).

[129] 42 U.S.C. § 6972(a)(1)(B) (2009); *see also* Ringbolt Farms Homeowners Ass'n v. Town of Hull, 714 F. Supp. 1246 (D.Mass. 1989).

[130] *Summary of the Toxic Substances Control Act*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/lawsregs/laws/tsca.html (last updated Mar. 30, 2011).

EPA to find that "the manufacture, distribution in commerce, processing, use, or disposal of a chemical substance or mixture . . . may present an unreasonable risk of injury to health or the environment" and that there is insufficient information about the chemical, and subsequently to require testing of the chemical.[131] Moreover, before a new chemical can be manufactured or an existing chemical can be manufactured for a significant new use, the manufacturer must submit testing data,[132] and the Administrator can determine whether or not the chemical presents and unreasonable risk, a situation under which the Administrator can ban the manufacture.[133]

In 2010, Congress requested that EPA once again study the potential effects of hydraulic fracturing on groundwater and drinking water.[134] Pursuant to the study, EPA asked nine American hydrofracturing services to provide data on their operations.[135] The information requested included the names and constituents of each hydraulic fracturing fluid distributed or used by the company in the past five years and the Standard Operating Procedures used by the company, including those for managing flowback.[136] The company responding could designate information it provided as Confidential Business Information, which would require EPA to keep the information

---

[131] 15 U.S.C. § 2603(a) (2009).

[132] *Id.* § 2604(a).

[133] *Id.* § 2604(f).

[134] *Underground Injection Control: Hydraulic Fracturing*, U.S. ENVTL. PROT. AGENCY, http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/index.cfm (last updated Mar. 30, 2011).

[135] *Id.*

[136] Letter from Lisa Jackson, Adm'r, U.S. Envtl. Prot. Agency, to major hydrofracturing companies (2010), *available at* http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/upload/HFvoluntaryinformationrequest.pdf.

confidential except under limited circumstances.[137] That means that, despite the fact that EPA has the information, it cannot and will not release the information to the public or the states.

One company, Halliburton, refused to comply with EPA's request for voluntary disclosure. In November 2010, EPA issued a subpoena to Halliburton, based partially on its authority under TSCA.[138] Halliburton eventually agreed to comply with the subpoena.[139] The Administrator of the EPA's subpoena power under TSCA section 11(c) extends no further than the rest of the Act; the Administrator may issue subpoena's "[i]n carrying out [the Toxic Substances Control] Act."[140] Thus, if the subpoena power can be used to manage the hydraulic fracturing industry, then *all* of the powers within TSCA should be able to be used similarly.

At the very least, the EPA's use of TSCA's subpoena power—along with state-level use of right-to-know acts—seems to have led to some changes in how the fracking industry regards its right to keep the chemical formulas of its fracking fluids secret. Until recently, fracking fluid manufacturers aggressively defended their right to keep their formulations secret; a decision that led to bad press and bad blood. This may be changing. Halliburton responded to EPA's subpoena by creating a public website disclosing information—including Material Data Safety Sheets—for many of its

---

[137] *See* 40 C.F.R. §§ 2.201–2.209 (2010).

[138] U.S. ENVTL. PROT. AGENCY, SUBPOENA AND INFORMATION REQUEST (2010), *available at* http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/upload/hydrofrac_halliburton_subpoena_11-9-2010.pdf.

[139] *Underground Injection Control: Hydraulic Fracturing, supra* note 134.

[140] 15 U.S.C. § 2610(c) (2009).

fracturing fluid solutions.[141] Even the American Petroleum Institute announced its support for a voluntary disclosure registry being developed by the Groundwater Protection Council and the Interstate Oil and Gas Compact Commission.[142] And Halliburton recently announced its intention to make fracking fluid from ingredients sourced from the food industry, perhaps in response to the EPA-mandated disclosures.[143]

F. Emergency Planning and Community Right to Know Act of 1986

Another statute might provide the tools that the federal government and state governments need to find out the constituents in fracking flowback. Such information can be used in a variety of ways, including planning for spills and other emergencies. Title III of the Superfund Amendments and Reauthorization Act of 1986 created a program called the Emergency Planning and Community Right-to-Know Act (EPCRA) to improve community access to information about chemicals and their dangers and to help in the development of emergency response plans.[144]

---

[141] *Hydraulic Fracturing Fluids Disclosure*, HALLIBURTON, http://www.halliburton.com/public/projects/pubsdata/Hydraulic_Fracturing/fluids_disclosure.html (last updated Mar. 29, 2011).

[142] *API Endorses State-Based Proposal from GWPC and IOGCC on Hydraulic Fracturing Chemical Disclosure*, AM. PETROLEUM INST. (Dec. 14, 2010), http://www.api.org/Newsroom/chemical-disclosure.cfm.

[143] *CleanStim Hydraulic Fracturing Fluid System*, HALLIBURTON, http://www.halliburton.com/ps/Default.aspx?navid=93&pageid=4184&prodid=PRN%3a%3aKWTBF215&TOPIC=HydraulicFracturing (last visited Apr. 29, 2011).

[144] *Emergency Planning and Community Right-to-Know Act*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/agriculture/lcra.html (last updated Feb. 14, 2011).

EPCRA creates state emergency response commissions (SERCs) and local emergency planning committees (LEPCs) and requires obliges facilities that store or manage certain chemicals to report information about chemicals in four ways. First, EPCRA requires facilities to notify the SERC and LEPC of any "extremely hazardous substance" if the facility has the substance in excess of the substance's threshold planning quantity.[145] Second, facilities must notify the SERC and LEPC if there is a release of an extremely hazardous substance exceeding the reportable quantity.[146] Third, if a facility contains hazardous chemicals as defined in the Occupational Safety and Health Act above a threshold level, the facility must submit to the SERC, LEPC, and local fire department material safety data sheets about those chemicals.[147] Finally, EPCRA requires certain manufacturers to submit an annual toxic chemical release report if they have more than ten employees and if they manufacture, process, or use certain chemicals in order to allow the EPA to compile its Toxic Release Inventory (TRI), which is available to the public.[148] TRI information can have a strong effect on companies. The information shared through the TRI is reported on by the press. And when a company reports particularly negative pollution information through the TRI, it may suffer economic consequences.[149]

While the oil and gas industry is not technically exempt from reporting under the toxic chemical release provisions of EPCRA, it is not covered by those provisions, either.

---

[145] *Id.*; 40 C.F.R. § 355 (2010); 42 U.S.C. § 11002 (2009).

[146] *Emergency Planning and Community Right-to-Know Act*, *supra* note 144.

[147] *Id.*

[148] *Id.*

[149] James T. Hamilton, *Pollution as News: Media and Stock Market Reactions to the Toxics Release Inventory Data*, 28 J. ENVTL. ECON. & MGMT. 98 (1995).

The toxic chemical release reporting provisions, the fourth type of reporting requirements above, only apply to owners and operators of facilities that have ten or more employees and are listed in certain Standard Industrial Classification Codes—which include clothing manufacturing, logging, and petroleum refining, but do not include oil and gas production.[150] Thus, despite the fact that hydrofracturing operations may require large volumes of listed hazardous chemicals, they are not required to report for the TRI.[151]

G. Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)—also known as Superfund—is not a direct regulatory statute. Rather, CERCLA establishes certain regulations concerning closed and abandoned hazardous waste sites, creates liability for persons responsible for the hazardous releases at those sites, and establishes a trust fund to cover cleanup costs when no responsible party can be located.[152] CERCLA can provide an impetus to the manufacturers and users of hazardous chemicals to alter their behavior and act in a more environmentally

---

[150] *See SIC Search*, U.S. DEP'T OF LABOR, OCCUPATIONAL SAFETY & HEALTH ADMIN., http://www.osha.gov/pls/imis/sicsearch.html (last visited Apr. 26, 2011). *See also* Joel Gehman, *Graham Spanier, Gasland and the FRAC Act*, JOHNGEHMAN.COM (Oct. 4, 2010), http://www.joelgehman.com/2010/10/04/graham-spanier-gasland-and-the-frac-act/.

[151] *Effect of Federal Safe Drinking Water Act, Clean Water Act, and Emergency Planning and Community Right-to-Know Act*, *supra* note 85; W. ORG. OF RES. COUNCILS, FACT SHEET: HYDRAULIC FRACTURING (2009), *available at* http://www.worc.org/userfiles/file/HyrdraulicFractuiring.pdf.

[152] *CERCLA Overview*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/superfund/policy/cercla.htm (last updated Mar.25, 2011).

responsible way by attaching liability to corporate behavior *and* the behavior of individual corporate officers.[153]

Portions of the oil and gas industry are exempt from CERCLA liability. CERCLA defines "hazardous substance" by reference to several other statutes: the CWA, RCRA, the Clean Air Act, and TSCA.[154] The relevant provisions all contain exemptions for exceptions for oil and gas production wastes.[155] The definition specifically excludes "petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed [in CERCLA] . . . and the term does not include natural gas, natural gas liquids, [or] liquefied natural gas."[156] EPA has interpreted this exemption—and courts have agreed—to include "hazardous substances indigenous to petroleum."[157] Thus, if the flowback water has been polluted not by the fracking fluid but rather by its contact with the natural gas, and the flowback then causes aboveground pollution, CERCLA liability will not flow.

---

[153] Valerie Ann Zondorak, *A New Face in Corporate Environmental Responsibility: The Valdez Principles*, 18 B.C. ENVTL. AFF. L. REV. 457, 465 (1990–1991).

[154] 42 U.S.C. § 9601(14) (2009).

[155] *List of Oil and Gas Exemptions from Federal Environmental Laws*, NAT'L RES. DEF. COUNCIL http://www.tcgasmap.org/media/NRDC%20List%20of%20Oil%20and%20Gas%20Exemptions%20from%20Federal%20Environmental%20Laws.xls (last visited Apr. 26, 2011).

[156] *Id.*

[157] Daniel L. McKay, *RCRA's Oil Field Wastes Exemption and CERCLA's Petroleum Exclusion: Are They Justified?*, 15 J. ENERGY NAT. RESOURCES & ENVTL. L. 41, 41 (1995).

IV
UNSURE GROUND:
EXISTING NORTH CAROLINA STATE LAWS AND REGULATIONS

Two provisions of North Carolina currently bar hydraulic fracturing in North Carolina. First, North Carolina law contains a ban on so-called "horizontal drilling." Second, North Carolina's regulations contain a provision banning hydraulic fracturing.

A. Horizontal Drilling Ban

Consider traditional drilling: a well is drilled perpendicular to the surface of the Earth through thousands of feet of rock in order to extend twenty or thirty feet through an oil or gas layer.[158] The oil or gas around the bore would be removed, but once the petroleum immediately surrounding the wellbore was removed, the well was essentially useless. Oil moves extremely slowly, so it might take millions of years for the well to naturally refill. Though gas moves faster, if the gas reservoir has any limits of its permeability—that is, if the reservoir is broken into compartments, whether large or small—eventually the vertical well will deplete the gas in the well's immediate vicinity. But there is typically far more oil or gas in the reservoir; indeed "most oil and gas reservoirs are much more extensive in their horizontal (areal) dimensions than in their vertical (thickness) dimension."[159] In the past, when a well was thus depleted, the operator would move 200 feet and dig a new well.[160]

---

[158] *More Bright Ideas: Horizontal Drilling*, UNIV. OF WIS. (1999), http://www.geology.wisc.edu/courses/g115/oil/4.html.

[159] ENERGY INFO. ADMIN. U.S. DEP'T OF ENERGY, DRILLING SIDEWAYS—A REVIEW OF HORIZONTAL WELL TECHNOLOGY AND ITS DOMESTIC APPLICATION 1 (1993) [hereinafter DRILLING SIDEWAYS], *available at*

Horizontal drilling is an enhanced recovery method allowing higher recovery from a single well than could be achieved without it.[161] A horizontal well is essentially a well where the lowest part of the well—which is drilled down perpendicular to the surface of the Earth—is turned so that the well parallels the oil or gas zone. The EIA defines horizontal drilling as

> the process of drilling and completing, for production, a well that begins as a vertical or inclined linear bore which extends from the surface to a subsurface location just above the target oil or gas reservoir called the "kickoff point," then bears off on an arc to intersect the reservoir at the "entry point," and, thereafter, continues at a near-horizontal attitude tangent to the arc, to substantially or entirely remain within the reservoir until the desired bottom hole location is reached.[162]

Thus, instead of drilling dozens of wells in the same area, one or two wells can be drilled horizontally, effectively tapping just as much of the oil or natural gas. This technique is illustrated in Figure 6, below.

---

http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/drilling_sideways_well_technology/pdf/tr0565.pdf.

[160] *More Bright Ideas: Horizontal Drilling*, *supra* note 158.

[161] *Horizontal – Directional Oil & Gas Wells*, HORIZONTALDRILLING.ORG, http://www.horizontaldrilling.org/ (last visited Apr. 26, 2011).

[162] DRILLING SIDEWAYS, *supra* note 159, at 1.

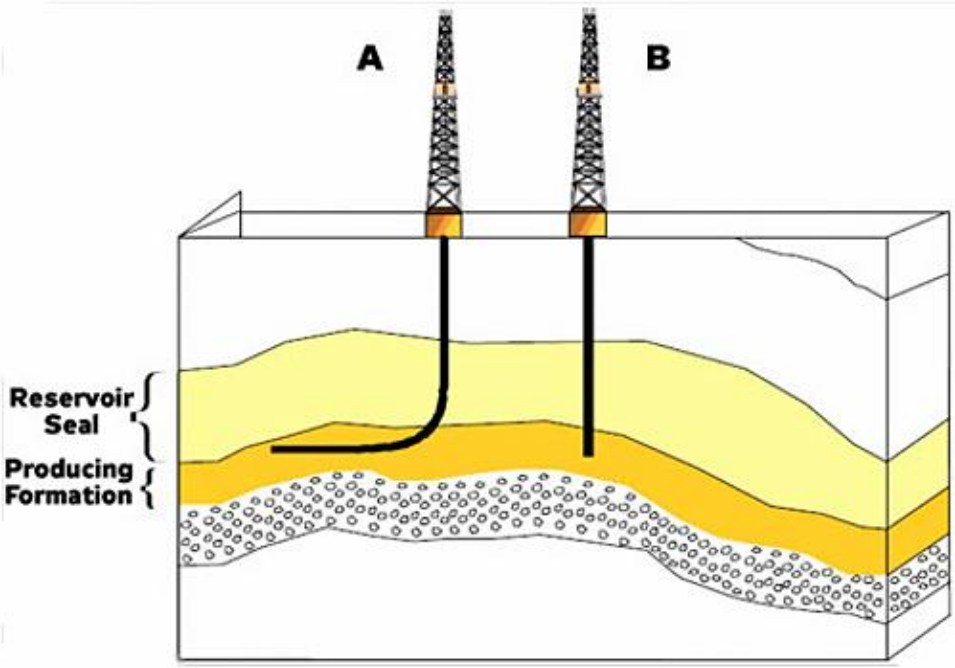

Figure 6. Illustration of horizontal and vertical wells, marked A and B, respectively. The orange layer represents the formation containing the oil or gas.[163]

Horizontal drilling remains move expensive than vertical drilling; a horizontal well can cost 25 percent to 300 percent more than a vertical well to drill and complete.[164] However, a horizontal well can not only reach much further than a single well, it can also lead to higher production *rates* than vertical wells.[165] The increased efficiency, along with reduced need to abandon depleted wells to drill new ones, means that horizontal wells may be cheaper in the long run than their vertical brethren. In fact, horizontal drilling—which allows operators to use a single well to fracture

[163] Andrew Moseman, *U.S. Natural Gas Boom: The Race to Tap Shale's Potential*, POPULAR MECHANICS (Dec. 18, 2009, 3:26 AM), http://www.popularmechanics.com/science/energy/coal-oil-gas/4318390.

[164] DRILLING SIDEWAYS, *supra* note 159, at 4.

[165] *Id.* at 5.

thousands of feet of a shale formation—has been critical in making shale gas production economically viable.[166]

However, North Carolina state law forbids horizontal drilling. According to state statute,

> [w]henever the Department [of Environment and Natural Resources] fixes the location of any well or wells on the surface, the point at which the maximum penetration of such wells into the producing formation is reached shall not unreasonably vary from the vertical drawn from the center of the hole at the surface, provided, that the Department shall prescribe rules and orders governing the reasonableness of such variation.[167]

According to regulations promulgated by NCDENR, "[a]ll wells shall be drilled in such a manner so that vertical deviation of the hole does not exceed three degrees between the bottom of the hole and the top of [the] hole."[168] A three-degree deviation is unlikely to be adequate to allow for economically viable production of North Carolina's shales.

However, this law-regulation combination is hardly ironclad. The horizontal drilling ban is located within the Oil and Gas Conservation Act of 1945, a fairly old law that might be amended or repealed without tremendous fanfare. This may be particularly true in today's North Carolina government, which tends to be business-friendly and skeptical of increased regulation. Moreover, the statutory ban allows NCDENR to determine what deviation from the vertical will be considered reasonable. NCDENR has set this deviation at three degrees, but ostensibly this regulation could be

---

[166] ARTHUR, BOHM & LAYNE, *supra* note 7, at 21.

[167] N.C. GEN. STAT. ANN. § 113-393(d) (West 2011).

[168] 15A N.C. ADMIN. CODE 05D.0107(e) (2011).

amended simply by following the North Carolina Administrative Procedures Act, which does not require the participation of the state's elected officials, barring passage of a disapproval bill by the General Assembly.[169]

B. Hydraulic Fracturing Regulatory Ban

This ban was adopted pursuant to state law controlling underground injection wells. The EPA recognizes five classes of injection wells, based on the types of fluids injected and the location and characteristics of the well. Class I wells are used for injection of hazardous wastes, Class II wells for injection of brines and fluids associated with oil and gas production, Class III wells for injection of fluids associated with solution mining of minerals under underground drinking water sources, and Class IV wells for injection of hazardous or radioactive waste into or above underground drinking water sources. Class V includes all injection wells not part of Classes I through IV.[170]

According to state law, "[t]he discharge of any wastes to the subsurface or groundwaters of the State by means of wells is prohibited."[171] The statute defines "waste" to include "industrial waste," which is defined as "any liquid, solid, gaseous, or other waste substance . . . resulting from any process of industry, manufacture, trade or business, or from the development of any natural resource."[172] Thus, wells of Classes I

---

[169] 150B N.C. GEN STAT. ANN. § 21.3(b) (West 2011).

[170] *Classes of Wells*, U.S. ENVTL. PROT. AGENCY, http://water.epa.gov/type/groundwater/uic/wells.cfm (last updated Apr. 19, 2011).

[171] 143 N.C. GEN STAT. ANN. § 214.2(b) (West 2011).

[172] *Id.* § 213(18).

through IV are explicitly prohibited by regulation.[173] The banning of Class II wells includes a prohibition on the injection of fluids "for enhanced recovery of oil or natural gas," which certainly seems to encompass hydraulic fracturing-fluid injection.[174] It also includes the injection of wastes that have been "brought to the surface in connection with . . . natural gas production."[175]

But in fact, North Carolina regulations contain an even more outright ban on hydraulic fracturing. According to the state Administrative Code,

> [p]ressure at [a] well head shall be limited to a maximum which will ensure that the pressure in the injection zone does not initiate new fractures or propagate existing fractures in the injection zone, initiate fractures in the confining zone, or cause the migration of injected or formation fluids outside the injection zone or area.[176]

This ban applies to Class V wells, the only injection wells permitted in North Carolina. Thus, even if hydraulic fracturing-related injections were somehow deemed to fall outside the definition of "enhanced recovery of . . . natural gas," and fall instead under the Class V catchall, the fracturing itself would be impermissible.

However, once again, all that it would take to lift this ban would be a change in state regulations, not a change in state statutory law. A complete ban on hydraulic fracturing is not necessary to effectuate the underlying state law, and thus the regulation could be lifted.

---

[173] 15A N.C. ADMIN. CODE 02C .0209(a)(3), (b)(2), (c)(3) & (d)(2) (2011).

[174] *Id.* at .0209(b)(1)(B).

[175] *Id.* at .0209(b)(1)(A).

[176] *Id.* at .0213.

V
CHARTING A NEW COURSE:
RECOMMENDED CHANGES TO NORTH CAROLINA'S LAWS AND REGULATIONS

The weaknesses of federal and state water law might give one pause. Considering the pressure that natural gas companies are undoubtedly putting on the state's government to lift regulations unfriendly to hydraulic fracturing, however, we cannot afford to be merely flummoxed by the astounding array of exemptions and exceptions protecting the oil and gas industry. Though hydraulic fracturing and shale gas development in North Carolina may be inevitable, we can learn from the mistakes of other states that have rushed headlong into natural gas booms without pausing to consider the consequences.

Based on the identified weaknesses in federal law and lessons learned from other hydrofracturing states, I make the following three recommendations.

A. Statutory Moratorium

Perhaps most importantly, the state *must* enact a statutory moratorium on hydraulic fracturing to protect against the possibility that changes in regulations will allow fracking to begin without proper oversight. This is essential, especially in light of the fact that EPA's current study on the safety of hydrofracturing and its effects on drinking water has not even been concluded; that is, the federal government is currently unsure whether or not hydrofracturing offers an unreasonable danger to our nation's drinking water. For this reason, any statutory moratorium passed should remain in force at least until the completion of the EPA's drinking water study.

New York is the only state to have passed a hydrofracturing moratorium. In August of 2010, the New York Senate passed a ban on hydraulic fracturing in deep, horizontal wells that would extend until May 15, 2011.[177] The ban as passed would have halted all natural gas permitted in New York State until the May cutoff.[178] The ban was adopted by the New York Assembly in November 2010.[179] New York Governor David Paterson, however, vetoed the ban passed by the legislature and instead issued Executive Order 41, directing the New York Department of Environmental Conservation to continue finish its study of hydraulic fracturing before issuing any permits allowing the practice.[180] While this does not amount to a *technical* moratorium, the effect is to continue a standing moratorium pending the outcome of the Department's study. Current New York Governor Cuomo has decided to continue the de facto moratorium.[181] A total ban on hydraulic fracturing has been again proposed by the New York legislature; on March 23, 2011, New York State Senator Tony Avella introduced S4220-

---

[177] Mary Esch, *Gas Drilling Moratorium Passes NY Senate*, BLOOMBERG BUSINESSWEEK, Aug. 4, 2010, http://www.businessweek.com/ap/financialnews/D9HCT98G0.htm.

[178] Edith Honan, *New York State Passes Gas Drilling Moratorium*, REUTERS, Aug. 4, 2010, *available at* http://www.reuters.com/article/2010/08/04/us-newyork-gas-idUSTRE67358R20100804.

[179] Marie C. Baca, *NY Assembly Approves Hydraulic Fracturing Moratorium* (Nov. 30, 2010, 3:41 PM), http://www.propublica.org/article/new-york-assembly-approves-hydraulic-fracturing-moratorium.

[180] *Executive Order No. 41: Requiring Further Environmental Review*, TOXICS TARGETING, http://www.toxicstargeting.com/MarcellusShale/documents/exec-order-41 (last visited Apr. 26, 2010); *Governor Paterson Issues Executive Order on Hydraulic Fracturing*, CNYCENTRAL.COM (Dec. 11, 2010, 5:48), http://www.cnycentral.com/news/story.aspx?id=553329.

[181] DEWEY & LEBOEUF, CLIENT ALERT: NEW YORK STATE MARCELLUS SHALE: REGULATORY HISTORY AND UPDATE 2 (2011), *available at* http://www.deweyleboeuf.com/~/media/Files/clientalerts/2011/20110411_NewYorkStateMarcellusShale_1.ashx.

2011, a bill that, if passed, would entirely prohibit the use of hydraulic fracturing in the state.[182]

While New York is the first state to pass an outright moratorium on hydrofracturing, similar bans have been proposed in other states as well. In late 2010, Maryland Delegate Heather Mizeur called for a similar moratorium in order to "exercise caution and restraint" in protecting the state's water.[183] The details of this moratorium are being hammered out, and the moratorium may actually be enacted soon.[184] Neither New York's moratorium or Mizeur's proposed Maryland moratorium are intended to be permanent; rather, both represent attempts to slow down the process and give scientists a chance to calmly and systematically assess the safety of the hydrofracturing process. Some states are considering outright bans, however. New Jersey's Senate Environment and Energy Committee reported out a bill flatly banning the use of hydraulic fracturing for natural gas,[185] partially based on concerns that hydrofracturing could add to the 105 Superfund sites the state is already attempting to remediate.[186]

Even individual cities are reacting to the quick development of hydrofracturing in the United States. For example, in early February 2011, the Buffalo Common Council made Buffalo the first city in New York and the second city in the nation to ban

---

[182] S4220-2011, 2011 Leg., Reg. Sess. (N.Y. 2011), *available at* http://open.nysenate.gov/legislation/bill/S4220-2011.

[183] Heather Mizeur, *Water on Fire? Time to Put This on Ice*, BALTIMORE SUN, Dec. 20, 2010, http://www.baltimoresun.com/news/opinion/oped/bs-ed-shale-natural-gas-20101220,0,3594191.story.

[184] David Saleh Rauf, *Fracking Moratorium Deal Under Discussion*, HOMETOWNANNAPOLIS.COM (Apr. 9, 2011), http://www.hometownannapolis.com/news/gov/2011/04/09-02/Fracking-moratorium-deal-under-discussion.html.

[185] S2576, 214th Leg., Reg. Sess. (N.J. 2010), *available at* http://www.njleg.state.nj.us/2010/Bills/S3000/2576_I1.PDF.

[186] Tom Johnson, *Lawmakers Declare New Jersey a No-Fracking Zone*, NJSPOTLIGHT (Mar. 10, 2011), http://www.njspotlight.com/stories/11/0310/2151/.

hydraulic fracturing. The "Buffalo's Community Protection from Natural Gas Extraction Ordinance" also bans the disposal of drilling wastewater or other production wastes within Buffalo's city limits.[187] And in Pennsylvania—which serves best as an example of a state that threw itself headlong into the hydrofracturing frenzy—Pittsburgh, in November 2010, became the first city in the country to ban hydraulic fracturing within its limits.[188] However, unlike Buffalo's ban, the Pittsburgh ordinance does not ban the disposal of hydrofracturing wastewater in the city.[189] Pennsylvania has been under fire after the Associated Press reported that the Pennsylvania Department of Environmental Protection allowed hydrofracturing operators to discharge at least 3.6 million barrels of treated flowback water into rivers; the fact that no one could decide whether this treated flowback posed a risk to humans or wildlife seems to have made the situation even more embarrassing for the state.[190] The environmental committee of the Philadelphia City Council, moreover, expressed concerns about the "kind of toxic stew that is required to ferret out the natural gas."[191] These concerns led the committee to suggest that the state halt all hydrofracturing operations in the state and that tax monies collected from the hydrofracturing industry be used to fund an early warning system that would allow

---

[187] *Buffalo Council Votes to Ban Fracking*, EMPIRESTATENEWS.NET (Feb. 9, 2011), http://www.empirestatenews.net/News/20110209-1.html.

[188] Marie C. Baca, *Pittsburgh Bans Natural Gas Drilling*, PROPUBLICA (Nov. 16, 2010, 5:49 PM), http://www.propublica.org/article/pittsburgh-bans-natural-gas-drilling.

[189] *Buffalo Council Votes to Ban Fracking*, *supra* note 187.

[190] David B. Caruso, *Pennsylvania Allows Dumping of Tainted Waters from Gas Boom*, TIMESFREEPRESS.COM, Jan. 4, 2011, http://online.wsj.com/article/AP95bf918140a14c239b51a842c00f4f5b.html.

[191] Susan Phillips, *Phila. Acts to Deflect Possibility of Pollution from Gas Drilling*, NEWSWORKS, Dec. 15, 2010, http://www.newsworks.org/index.php/health-science/item/9342-15spshale.

Philadelphia's water department to detect pollution in the drinking water system before the water was provided to consumers.[192]

A number of other cities, counties, and states have either announced or considered bans on hydraulic fracturing. New York City called for a drilling ban within its watershed.[193] The Town Boards of Otisco, Marcellus, Tully, DeWitt, Jerusalem, and Onondaga, New York, passed local moratoria in 2010.[194] The Quebec, Canada, provincial government has decided to stop issuing permits for hydraulic fracturing in the province.[195] The national government of France has enacted a country-wide moratorium.[196] And pressure from residents and interest groups for new moratoria is mounting communities around the United States.[197]

---

[192] *Id.*

[193] Joaquin Sapien, Abraham Lustgarten & Christopher Flavelle, *New York City Calls for Drilling Ban in Watershed, Rejects State Study*, PROPUBLICA (Dec. 24, 2009, 4:47 PM), http://www.propublica.org/article/new-york-city-calls-for-drilling-ban-in-watershed-rejects-state-study-1224.

[194] Ned Campbell, *Otisco Passes Six-Month Moratorium on Hydrofracking*, EAGLE OBSERVER [N.Y.], Dec. 17, 2010, http://www.eagle-observer.com/Articles-c-2010-12-17-96303.114134-sub-Otisco-passes-sixmonth-moratorium-on-hydrofracking.html; *Town of Dewitt: Town Board Meeting* (Mar. 8, 2010), http://www.townofdewitt.com/documents/231.pdf; John Christensen, *Yates Board Reviews Fracking Moratorium*, PENN YAN CHRON.-EXPRESS, Mar. 31, 2011, http://www.chronicle-express.com/news/x1315035706/Yates-board-reviews-fracking-moratorium.

[195] Kevin Dougherty, *Quebec Will No Longer Authorize Fracking for Oil, Gas*, MONTREAL GAZETTE [Can.], Mar. 17, 2011, http://www.montrealgazette.com/technology/Quebec+will+longer+authorize+fracking/4451532/story.html.

[196] Tara Patel, *The French Public Says No to 'Le Fracking,'* BLOOMBERG BUSINESSWEEK, Mar. 31, 2011, http://www.businessweek.com/magazine/content/11_15/b4223060759263.htm.

[197] Matthew Schomer, *Columbiana Asked to Ban Hydraulic Fracturing*, MORNING J. NEWS [Lisbon, Ohio], Dec. 24, 2010, http://www.morningjournalnews.com/page/content.detail/id/527391/Columbiana-asked-to-ban-hydraulic-fracturing.html; Coby Williams, *ProgressOhio Joins Groups Asking for 'Fracking' Moratorium*, PROGRESSOHIO CMTY. BLOG (Mar. 9, 2011, 11:00 AM), http://www.progressohio.org/blog/2011/03/progressohio-joins-groups-asking-for-fracking-moratorium.html; Randy Woock, *Colorado Groups Disagree on Importing N.Y. Fracking Moratorium*, TRINIDAD TIMES [Colo.], Dec. 23, 2010, http://trinidad-times.com/colorado-groups-disagree-on-importing-ny-fracking-moratorium-p1323-1.htm; Laura Nichols, *Protestors Urge Shale 'Fracking'*

Thus, creating a moratorium pending the outcome of the EPA's study, which would reinforce state regulations and make the legislature's intent to protect North Carolina's water supply clear, would not make North Carolina a trailblazer. Rather, doing so would allow us to make the same statement made by many around the country without unreasonably delaying natural gas development in the state.

B. Reassess and Strengthen State Water Quality Laws and Regulations

In light of the weakness of federal law to protect North Carolina's water, state law and regulation must be strengthened. First, North Carolina's NPDES and RCRA Subtitle D programs must be reconsidered in light of the new risks posed by hydraulic fracturing. As mentioned above, the federal government has already recognized that RCRA Subtitle D alone is unlikely to be able to fully protect water quality, but the program should be administered in as aggressive a manner possible when it comes to protecting our water. But, of course, because of hydrofracturing's exemptions and exceptions from both the CWA and RCRA, water protection may in fact be impossible without new state laws and regulations.

A bill being considered by the Arkansas legislature might serve as a template for a new North Carolina law. Arkansas HB1394 would require, first and foremost, the Arkansas Pollution Control and Ecology Commission to create rules requiring fracking operators to abide by best management practices at least as stringent as the United

---

Moratorium, DAILY COLLEGIAN [Pa.], Jan. 19, 2011, http://www.collegian.psu.edu/archive/2011/01/19/inaug_protestors_sidebar.aspx.

States Bureau of Land Management Gold Book Best Management Practices.[198] The Gold Book sets out certain rules for the management of hazardous waste and produced water, though the rules may not be stringent enough to truly protect water quality. For example, one approved method of disposing of produced water—of which flowback is a type—is in unlined pits,[199] though many would be very hesitant to call an unlined pit a "best" management practice.

The Arkansas bill offers other useful suggestions to North Carolina which might serve as a minimum for what should be enacted here. If passed, the Arkansas bill would direct the Pollution Control and Ecology Commission to require synthetic liners, clay liners, or both in all disposal pits.[200] A number of states with active oil and gas production industries already require liners in at least some disposal pits, including Colorado,[201] Wyoming,[202] and Utah.[203] The Arkansas bill would also limit the amount of time that disposed fluids could be stored before disposal. It would also require that hydrofracturing operators with open disposal pits put up signs and fences to protect the

---

[198] H.B. 1394, 88th Gen. Assemb., Reg. Sess. (Ark. 2011), *available at* http://www.arkleg.state.ar.us/assembly/2011/2011R/Bills/HB1394.pdf.

[199] BUREAU OF LAND MGMT., U.S. DEP'T OF INTERIOR, SURFACE OPERATING STANDARDS AND GUIDELINES FOR OIL AND GAS EXPLORATION AND DEVELOPMENT: THE GOLD BOOK 38 (2007), http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/oil_and_gas.Par.18714.File.dat/OILgas.pdf.

[200] H.B. 1394, 88th Gen. Assemb., Reg. Sess. (Ark. 2011), *available at* http://www.arkleg.state.ar.us/assembly/2011/2011R/Bills/HB1394.pdf.

[201] COLO. CODE REGS. § 404-1:904 (2011).

[202] 55-4 WYO. CODE R. § 1 (LexisNexis 2011).

[203] UTAH ADMIN. CODE r. 649-9-3 (2011).

public and wildlife.[204] The Arkansas bill would also require rulemaking on casing requirements and a study of the potential risks of casing and cementing failures.[205]

C. Require Openness Through a State-Level Community Right-to-Know Provision

Perhaps the biggest danger inherent in hydraulic fracturing is that the nature of the chemicals used is often kept secret by the company who produces the fluid. In one particularly alarming example of the danger of this policy, a gas worker involved in a spill was brought to the local emergency room. The nurse who treated him was nearly killed, in part because the fracking fluid company would not release the actual contents of the fluid to the doctors who treated her.[206]

In June 2010, Wyoming became the first state in the United States to pass a regulation requiring hydraulic fracturing operators to disclose the content of the fracturing fluid they use.[207] According to that rule, before a well is fracked, the operator must report to the Supervisor of the Wyoming Oil and Gas Conservation Commission "the chemical additives, compounds and concentrations or rates proposed to be mixed and injected," along with the additives' types—such as biocide or proppant—and

---

[204] H.B. 1394, 88th Gen. Assemb., Reg. Sess. (Ark. 2011), *available at* http://www.arkleg.state.ar.us/assembly/2011/2011R/Bills/HB1394.pdf.

[205] *Id.*

[206] Eric Frankowski, *Gas Industry Secrets and a Nurse's Story*, HIGH COUNTRY NEWS, July 28, 2008, http://www.hcn.org/wotr/gas-industry-secrets-and-a-nurses-story.

[207] Brodie Farquhar, *Wyoming First in Nation to Require Public Disclosure of Chemicals Used in Gas, Oil Drilling*, NEW WEST ENERGY (Sept. 8, 2010), http://www.newwest.net/topic/article/wyoming_first_in_nation_to_require_public_disclosure_of_chemicals_used_in_g/C618/L618/.

chemical compound name.[208] After the well has been fracked, the operator must report "[d]etail as to each fluid stage pumped, including actual volume by fluid stage, proppant rate or concentration, actual chemical additive name, type, concentration or rate, and amounts."[209] While drillers retain the right under the regulation to claim that the information is proprietary, which would prevent the Commission from disclosing that information to the public.[210] At least two companies have already sought this designation.[211]

Three other states have disclosure rules, though they are not as strong as Wyoming's. In Arkansas, hydraulic fracturing operators must report to the Director of the Arkansas Oil and Gas Commission "[a] list of all Additives used during the Hydraulic Fracturing Treatment specified by general type" and "[t]he names of all specific Additives for each Additive type . . . utilized during the Hydraulic Fracturing Treatment and the actual rate or concentration for each."[212] In Pennsylvania, as part of an operator's Preparedness, Prevention and Contingency Plan, which is required by law, the operator must "[l]ist the chemicals and additives utilized and the different wastes generated" during the production process.[213] And in Tennessee, to acquire a permit, an

---

[208] 55-3 WYO. CODE R. § 45(d) (LexisNexis 2011).

[209] *Id.* § 45(h)(ii).

[210] Nicholas Kusnetz, *Wyoming Fracking Rules Would Disclose Drilling Chemicals*, PROPUBLICA (Sept. 14, 2010, 4:17 PM), http://www.propublica.org/article/wyoming-fracking-rules-would-disclose-drilling-chemicals.

[211] Marie C. Baca, *Two Companies Seek Trade Secret Status for Fracking Fluids in Wyoming*, PROPUBLICA (Nov. 2, 2010, 11:03 AM), http://www.propublica.org/article/two-companies-seek-trade-secret-status-for-fracking-fluids-in-wyoming.

[212] 178-00-1 ARK. CODE R. § B-19(k)(4)–(5) (LexisNexis 2011).

[213] JIM KLINE, PA. DEP'T ENVTL. PROT., PPC PLANS 12, *available at* http://www.dep.state.pa.us/dep/deputate/minres/oilgas/new_forms/marcellus/training/ppc%20plans.ppt.

operator must provide information on the "nature of the injected fluid" and "estimated daily volume of fluid to be injected."[214]

The North Carolina state legislature should pass a statute requiring hydraulic fracturing operators in North Carolina to disclose the formulae of the fracking fluids used to NCDENR. Such a statute should be modeled on Wyoming's rule, because it requires robust reporting and public disclosure. Public disclosure will allow local governments to prepare adequate emergency plans in case of exposures or spills and will allow individuals to better monitor the behavior of fracturing operations in the state.

VI
CONCLUSION

There is hardly any doubt that hydraulic fracturing will eventually come to North Carolina. Natural gas is an extremely useful fuel that may play an important part of a lower-carbon future.[215] But our growing need for energy and for natural gas should not overwhelm us or force us down an irresponsible and dangerous path.

Federal law is, by design, incapable of dealing with the dangers posed by hydraulic fracturing. Exemptions and exceptions favoring the oil and gas industry have created a regulatory landscape that privileges oil and gas developers over hundreds of other industrial activities. The ostensible reasons for these exemptions and exceptions is the danger posed to Americans by fuel shortages or rising fuel prices, and surely these dangers are acute.

---

[214] TENN. COMP. R. & REGS. 1200-04-06-.11 (b)(5)–(6) (2011).

[215] Bibi van der Zee, *Natural Gas: The Answer to Reducing Carbon Emissions?*, GUARDIAN ENV'T BLOG (Feb. 3, 2009, 12:42 PM), http://www.guardian.co.uk/environment/blog/2009/jan/27/gas-power-carbon-emissions.

But the dangers posed by hydraulic fracturing are acute and imminent. To suggest that the oil and gas industry should be subjected to lower standards than other industries because of the possible dangers of a shortage or rising prices is to suggest that the federal government should reduce its regulation of the food industry because of the possible dangers of food shortages or rising food prices, the consequences to food quality be damned. It is to suggest that a possible shortage of antibiotics or cancer treatments should tie the federal government's hands when it comes to regulation of these medications.

The oil and gas industry produces a variety of unquestionably critical products to the American people. The industry should be lauded for its contributions to the American economy and for its continuing push for innovation in extraction and refining methodology. But our admiration should not lead us to feel incapable of protecting human health and the environment against possible dangers posed by even innovative oil and gas production methods.

Because so many federal laws have already made robust federal regulation of hydraulic fracturing impossible, it will be up to individual states to protect themselves against the potential dangers of fracking. Pennsylvania did not do so and should serve as a cautionary tale; when a state rushes headlong into the fracking boom without erecting strong regulatory controls on the process, grave environmental degradation can result.

North Carolina must walk a tightrope. On one side is our need for energy and the abundant energy source just belowground. On the other is our need to protect our state's citizens from poisoned drinking water and polluted waterways. Now—and not the height of the North Carolina fracking boom—is the time to create the regulations

that will protect our water in the future. Now—before and not after a possible environmental catastrophe—is the time for cooler heads to prevail and for strong regulations to be enacted.

It does not have to be a choice between human health and abundant energy. But unless North Carolina puts in place strong regulatory controls on hydrofracturing *before* it begins, the choice may very well be made for us.