Public Comments

The following comments were provided by members of the public and were considered during the technical review of this application.

No.	Comment	Comment Date
1	I am writing to you in regards to County Road 18, and the 12 wells proposed by Encana on the Regnier property: Section 19, T2N, R68 W. Having the kind of traffic associated with this magnitude of drilling on our one lane road will directly impact all of the residents. It is entirely inappropriate for this area.The foundation of the road will not be able to withstand the weight demands placed on it. In the past, when we have had heavy traffic from the oil companies combined with heavy snow or rain, the road is nearly impassable.Over the past 27 years, the maintenance of the road by the oil companies has been inconsistent and mostly unacceptable.The cost of maintaining the road has always been put on the people who live here. Pleasant View Ridge Cemetery will also be disturbed/destroyed; mail boxes and utility poles will need to be moved;utility lines elevated, and a new culvert placed. The most recent of the 22 graves in the cemetery is 1916, with the earliest being 1893. It is neither respectful or acceptable to damage this historical site. If the decision is made to widen the road and disregard the cemetery, the issue of safety needs to be taken into consideration.Turning onto Road 18 from County Line Road can be extremely hazardous from both north and south directions whenwaiting for access to the road.Numerous gravel trucks travel County Line, which has no shoulder. They have heavy loads and are usually exceeding the speed limit.It is a harrowing experience to sit on County Line waiting for a big truck to exit Road 18 so we can get out of the flow of traffic. Also,can you guarantee first responders will have immediate access to one of the neighbors if needed? It should not be our responsibility to schedule when we can safely travel Road 18 to get to our jobs. I am requesting the following: Move the entire Regnier Operation over to the already existing site. Using Road 18 as access should not be an option for the Regnier wells or facility sites. Reduce the Site to 4 wells. We are a Low Volume Hydrofracturing Area not a High Volume Hydrofracturing Area. Use an Electric Rig to keep noise levels in our neighborhood down. Conduct a traffic study for County Line and Road 18.	04/24/2015
2	This Form 2a Location Assessment permit application is deficient and should be rejected or denied for the following reasons: 1) Pursuant to Rule 604.c.(2)E.i.requiring an operator proposing a multi-well production facility within 1000 feet of a building unit to locate the facility as “far as possible” from homes. -Absence of supporting documentation from operator as to siting “as far as possible” from homes. -No “alternative location analysis” or “siting rationale” submitted Recommended/Requested Actions: -At least one additional 20-day comment period extension -The COGCC hold a public hearing on the requested Form 2A permit, providing local community citizens their only opportunity for due process under current law. -If permit(s) approved, COGCC require mitigation to reduce impacts. Such mitigation should include: Limitations on the daily time periods during which operations vehicles and traffic are allowed, from	04/24/2015

7:00AM to 7:00PM only.

The utilization of remote fracking operations technology, as developed by Anadarko, to the extent possible, but at a minimum to include piped-in water.

All operations be subject to an instrument-based leak detection and repair inspection. Employ VOC destruction or control technologies with at least 95% efficiency on all tanks capable of emitting over 2 tons of VOCs annually. Any un-repaired leak over 10,000 ppm of hydrocarbons after 24 hours results in a shut down until repaired.

Automated ground water monitoring systems with data available to non-operator personnel in real time.

Required use of electric-powered engines for all motors, compressors, pumps, and production systems to minimize noise levels.

2) Pursuant to COGCC Mission Statement: “exploration and production… in a manner consistent with the protection of public health, safety and welfare

Pursuant to COGCC Strategic Plan/Goals: “Prevent and mitigate adverse impacts to public health, safety, welfare and the environment.”

COGCChas not adequately assessed the risks to public health and welfare and, as such, issuance of this permit is contrary to the COGCC’s duty to act in accordance with its stated Mission and Goals to protect public health and environment. Therefore, this permit should be denied.

Toxic risks to the community’s health and well-being include the following*:

Benzene poisoning

Diesel fumes from app. 10,000 total truck trips (carcinogen)

Formaldehyde exposure

Hydrogen Sulfide exposure

24/7 Noise Light

Particulate exposure

The appropriation and partial removal from community use of the semi-private Rd 18

Contamination of local well-water supplies

Respiratory problems, rashes, lesions, dizziness, headaches.

Birth defects, lowered APGAR scores and newborn birth weights

Newborn livestock deformities

*Supporting documentation on public health and environmental risks:

Dieselexhaust and many individual substances contained in it (including arsenic, benzene, formaldehyde and nickel) have the potential to contribute to mutations in cells that can lead to cancer. In fact, long-term exposure to diesel exhaust particles poses the highest cancer risk of any toxic air contaminant evaluated by OEHHA. ARB estimates that about 70 percent of the cancer risk that the average Californian faces from breathing toxic air pollutants stems from diesel exhaust particles.

In its comprehensive assessment of diesel exhaust, OEHHA analyzed more than 30 studies of people who worked around diesel equipment, including truck drivers, railroad workers and equipment operators. The studies showed these workers were more likely to develop lung cancer than workers who were not exposed to diesel emissions. These studies provide strong evidence that long-term occupational exposure to diesel exhaust increases the risk of lung cancer. Using information from OEHHAs assessment, ARB estimates that diesel-particle levels measured in Californias air in 2000 could cause 540 excess cancers (beyond what would occur if there were no diesel particles in the air) in a population of 1 million people over a 70-year lifetime. Other researchers and scientific organizations, including the National Institute for Occupational Safety and Health, have calculated

cancer risks from diesel exhaust that are similar to those developed by OEHHA and ARB.

Exposure to diesel exhaust can have immediate health effects. Diesel exhaust can irritate the eyes, nose, throat and lungs, and it can cause coughs, headaches, lightheadedness and nausea. In studies with human volunteers, diesel exhaust particles made people with allergies more susceptible to the materials to which they are allergic, such as dust and pollen. Exposure to diesel exhaust also causes inflammation in the lungs, which may aggravate chronic respiratory symptoms and increase the frequency or intensity of asthma attacks.

Diesel engines are a major source of fine-particle pollution. The elderly and people with emphysema, asthma, and chronic heart and lung disease are especially sensitive to fine-particle pollution. Numerous studies have linked elevated particle levels in the air to increased hospital admissions, emergency room visits, asthma attacks and premature deaths among those suffering from respiratory problems. Because childrens lungs and respiratory systems are still developing, they are also more susceptible than healthy adults to fine particles. Exposure to fine particles is associated with increased frequency of childhood illnesses and can also reduce lung function in children.

Like all fuel-burning equipment, diesel engines produce nitrogen oxides, a common air pollutant in California. Nitrogen oxides can damage lung tissue, lower the bodys resistance to respiratory infection and worsen chronic lung diseases, such as asthma. They also react with other pollutants in the atmosphere to form ozone, a major component of smog.

http://oehha.ca.gov/public_info/facts/dieselfacts.html

Benzenecauses problems in the blood. People who breathe benzene for long periods may experience harmful effects in the tissues that form blood cells, especially the bone marrow. These effects can disrupt normal blood production and cause a decrease in important blood components. A decrease in red blood cells can lead to anemia. Reduction in other components in the blood can cause excessive bleeding. Blood production may return to normal after exposure to benzene stops. Excessive exposure to benzene can be harmful to the immune system, increasing the chance for infection and perhaps lowering the bodys defense against cancer.

Long-term exposure to benzene can cause cancer of the blood-forming organs. This condition is called leukemia. Exposure to benzene has been associated with development of a particular type of leukemia called acute myeloid leukemia (AML). The Department of Health and Human Services has determined that benzene is a known carcinogen (can cause cancer). Both the International Agency for Cancer Research and the EPA have determined that benzene is carcinogenic to humans.

Exposure to benzene may be harmful to the reproductive organs. Some women workers who breathed high levels of benzene for many months had irregular menstrual periods. When examined, these women showed a decrease in the size of their ovaries. However, exact exposure levels were unknown, and the studies of these women did not prove that benzene caused these effects. It is not known what effects exposure to benzene might have on the developing fetus in pregnant women or on fertility in men. Studies with pregnant animals show that breathing benzene has harmful effects on the developing fetus. These effects include low birth weight, delayed bone formation, and bone marrow damage.

We do not know what human health effects might occur after long-term exposure to food and water contaminated with benzene. In animals, exposure to food or water contaminated with benzene can damage the blood and the immune system and can cause cancer.

http://www.atsdr.cdc.gov/phs/phs.asp?id=37tid=14

Air concentrations of volatile compounds near oil and gas production: a community-based exploratory study: Results: Levels of eight volatile chemicals exceeded federal guidelines under several operational circumstances. Benzene, formaldehyde, and hydrogen sulfide were the most common compounds to exceed acute and other health-based risk levels. Conclusions: Air concentrations of potentially dangerous compounds and chemical mixtures are frequently present near oil and gas production sites. Community-based research can provide an important supplement to state air quality monitoring programs.

http://www.ehjournal.net/content/13/1/82

From the COMPENDIUM OF SCIENTIFIC, MEDICAL, AND MEDIA FINDINGS DEMONSTRATING RISKS AND HARMS OF FRACKING (UNCONVENTIONAL GAS AND OIL EXTRACTION (Concerned Health Professionals of NY)

	http://concernedhealthny.org/wp-content/uploads/2014/07/CHPNY-Fracking-Compendium.pdf First: A new study on fracking-related air pollution in northeastern Colorado: even though the volume of toxic emissions per well might be decreasing, overall air quality in the shale field continues to deteriorateas the rapid, continuing increase in the number of wells cancels out improvements to air quality brought about by more stringent regulations. (See footnote 4.) Similarly, the results of a new study from Texas raises the possibility that methane can migrate into aquifersthrough unseen cracks and fissures in the rock surrounding the wellbore in ways that no cementing and casing protocols, however strictly applied, can prevent. (See footnotes 55 and 56.) New findings from West Virginia show how unmapped, long-abandoned wells—including those drilled generations ago—can become re-pressurized during nearby fracking operations and serve as conduits for the contamination of drinking water. (See footnote 57.) A new study by Princeton researchers working in Pennsylvania found that, many decades after their abandonment, plugged and unplugged wells alike leaked significant amounts of methane into the atmosphere. There are an estimated three million abandoned oil and gas wells in the United States; the locations of many are unmapped and unknown. (See footnotes 265 and 266.) No set of regulations can obviate these problems. Second, drinking water is at risk from drilling and fracking activities and associated waste disposal practices. As documented by the Pennsylvania Department of Environmental Protection in a review of its records, 234 private drinking water wells in Pennsylvania have been contaminated by drilling and fracking operations during the past seven years. These do not include drinking water wells contaminated by spills of fracking wastewater or wells that went dry as a result of nearby drilling and fracking activities. (See footnotes 68 and 69.) In California, the injection of liquid fracking waste directly into groundwater aquifers threatens contamination of large numbers of public drinking water supplies. (See footnote 78.) Third, drilling and fracking emissions often contain strikingly high levels of benzene. A potent human carcinogen, benzene has been detected in the urine of wellpad workers (at levels known to raise risks for leukemia), in private drinking water wells contaminated by fracking operations, and in ambient air at nearby residences. In some cases, concentrations have far exceeded federal safety standards. Such exposures represent significant public health risks. (See footnotes 3–8, 12, 57, 174.) Fourth, public health problemsassociated with drilling and fracking are becoming increasingly apparent. Documented indicators variously include increased rates of hospitalization, ambulance calls, emergency room visits, self-reported respiratory and skin problems, motor vehicle fatalities, trauma, drug abuse, infant mortality, congenital heart defects, and low birth weight. (See footnotes 192–205.) Fifth, natural gas is a bigger threat to the climate than previously supposed. Methane is not only a more potent greenhouse gas than formerly appreciated, real-world leakage rates are higher than predicted. Within the last five months, multiple teams of independent scientists have published data on fugitive emissions that, all together, call into question earlier presumed climate benefits from replacing coal with natural gas. Further, evidence increasingly suggests that the natural gas abundance brought by fracking is slowing the transition to renewable energy and is thus exacerbating, rather than mitigating, the climate change crisis. (See footnotes 313–318.)	
3		04/28/2015
	Please read the Comments that are interspersed within the Weld County Code that has been Copied into this document: This is from the Planning and Land Use part of the Code: 1. A.Policy 7.1. County land use regulations should support commercial and industrial uses that are directly related to, or dependent upon, agriculture,Comment:Land Use Regulation for High Volume Hydrofracturing is not directly related to or dependent on High Volume Hydrofractuing, which is a Major Industrial Zone right in the middle of a communityto locate within the agricultural areas, when the impact to surrounding properties is minimal, or can be mitigated, and where adequate services are currently available or reasonably obtainable. E. I.Goal 5. New industrial uses or expansion of existing industrial uses should meet existing federal,	

state and local policies and legislation.1. I.Policy 5.1. Industrial uses should be evaluated using criteria, including but not limited to the effect the industry would have on air and water quality, natural drainage ways, soil properties and natural patterns and suitability of the land. a. Recommended Strategy I.5.1.a. Review the zoning regulations to ensure that they are consistent with this Policy. 2. I.Policy 5.2. Development improvements should minimize permanent visual scarringComment:The Facility Site would be a permanent visual blight with at least 5 % VOC emissions emitted for the life of the the production of the these 12 wells.The Infrastructure would last at least 30 years, and then will Encana be around then to remove it, likely not.The Facility sit would be a huge scar upon the land.from grading, road cuts and other site disturbances.Comment:Site Distrubances would be tremendous from the proposed operations and facility sites for the Regnier operations.Require stabilization and landscaping of final land forms, and that runoff be controlled at historic levels. F. I.Goal 6. Minimize the incompatibilities that occur between industrial uses and surrounding properties. 1. I.Policy 6.1. Consider the compatibility with surrounding land uses and natural site features. a. Recommended Strategy I.6.1.a. Establish development standards for such issues as use, building height, scale, density, traffic, dust and noise. b. Recommended Strategy I.6.1.b. Consider identifying industrial sub-areas and corresponding design guidelines after notification to the relevant landowners. 2. I.Policy 6.2. Support the use of visual and sound barrier landscaping to screen open storage areas from residential uses or public roads. 3. I.Policy 6.3. Encourage informational neighborhood meetings for proposed industrial uses that do not require a public hearing. a. Recommended Strategy I.6.3.a. Develop options for neighborhood meeting processes. 4. I.Policy 6.4. Ensure that industrial properties are free of derelict vehicles, refuse, litter and other unsightly materials.

Land use policies should support a high-quality rural character which respects the agricultural heritage and traditional agricultural land uses of the County, as agricultural lands are converted to other uses (excluding urban development). Rural character in the County includes those uses which provide rural lifestyles, rural-based economies and opportunities to both live and work in rural areas. The natural landscape and vegetation predominate over the built environment. Agricultural land uses and development provide the visual landscapes traditionally found in rural areas and communities. (Weld County Code Ordinance 2002-6; Weld County Code Ordinance 2008-13) To protect and enhance the quality of life for County residents through the implementation of the adopted Comprehensive Plan, Weld County Code, and Building Codes while providing professional, friendly and quality customer service to the community.

3. A.Policy 2.3. Encourage development of agriculture and agriculturally related businesses and industries in underdeveloped areas where existing resources can support a higher level of economic activity. Agricultural businesses and industries include those related to ranching, confined animal production, farming, greenhouse industries, landscape production and agri-tainment or agritourism uses.

Comment:If you read the above statment carefully you will see that what is being proposed by Encana and Regnier Family Farms does not fit this description.The Current level of Hydrofracturing in this area has fit in to a degree.This part of the code talks aboutthe natural landscape predominating over the built environment.The Scale of the Facility Site being proposed by Regnier and Encana does not fit into that category.Agricultural businesses are allowed, not Major Industrial Businesses.High Volume Hydrofracturing is not an appropriate business for this area, it does not fit in to the environment here at all.Access to minerals is one thing, destroying the natural and beautiful lanscape here is another.

1. A.Policy 7.1. County land use regulations should support commercial and industrial uses that are directly related to, or dependent upon, agriculture, to locate within the agricultural areas, when the impact to surrounding properties is minimal, or can be mitigated, and where adequate services are currently available or reasonably obtainable.

Comment:This is not minimal impact.Minimal Impact would be Low volume Hydrofracturing in this area.The Drilling site would be moved to the furthest point away from all of the homes in this area, and over to Weld County Road 20.5 on the already existing site on the Regniers property.That site is 1/4 mile away from WCR 20.5.It could be four wells and all access to the site would be from WCR7.CR1 and Rd.18 and Boulder County would not be involved at all.The drilling lines would go from the Northern edge of Section 18 and go south, instead of the Southern edge of Section 18 going north.Section 19 in Weld County is already dealing with at least 15 wells on it, and with the proposed Rasmussen Well site thee burden is too heavy on the envorinment and the community in this area.Boulder County citizens should be respected.

E. I.Goal 5. New industrial uses or expansion of existing industrial uses should meet existing federal, state and local policies and legislation.1. I.Policy 5.1. Industrial uses should be evaluated using criteria, including but not limited to the effect the industry would have on air and water quality, natural drainage ways, soil properties and natural patterns and suitability of the land. a. Recommended

Strategy I.5.1.a. Review the zoning regulations to ensure that they are consistent with this Policy. 2. I.Policy 5.2. Development improvements should minimize permanent visual scarring from grading, road cuts and other site disturbances. Require stabilization and landscaping of final land forms, and that runoff be controlled at historic levels. F. I.Goal 6. Minimize the incompatibilities that occur between industrial uses and surrounding properties. 1. I.Policy 6.1. Consider the compatibility with surrounding land uses and natural site features.

Comment:This statement in the Weld County code is being completely disregarded and dismissed by the LGD of Weld County.The Regnier Wells and the planned location fort he Facility Site are not in any way compatible with the surrounding land uses and natural site features.What is being proposed is a Major Industrial Site with all of the dangers (including spills, fires, explosions, releases and toxic emmsions), excessive tanker and semi-truck traffic and pollution and permanent and irreparable infrastructure that goes along wiith a major Industrial Site, low and high frequency noise pollution for the duration of the production of the oil and gas. the 14 planned months of nuisances for the construction and drilling will stop the normal life of all of the citizens who live within one 1 1/2miles of these operations with excessive truck traffic, drilling and fracking noises often above State Requirements for decibels (168 daysfor the Fracking).The Weld Code above does not support this level of Industrial activity in a pristine, rural historically significant community.

a. Recommended Strategy I.6.1.a. Establish development standards for such issues as use, building height, scale, density, traffic, dust and noise. b. Recommended Strategy I.6.1.b. Consider identifying industrial sub-areas and corresponding design guidelines after notification to the relevant landowners. 2. I.Policy 6.2. Support the use of visual and sound barrier landscaping to screen open storage areas from residential uses or public roads. 3. I.Policy 6.3. Encourage informational neighborhood meetings for proposed industrial uses that do not require a public hearing. a. Recommended Strategy I.6.3.a. Develop options for neighborhood meeting processes. 4. I.Policy 6.4. Ensure that industrial properties are free of derelict vehicles, refuse, litter and other unsightly materials.

Comment: Strategy I.6.1.a This has not been done to the satisfaction of the nieghborhood land owners.They have ot been included in this process and though requested numerous time of Miracle Pfister we have not had an informational meeting per 3.1Policy 6.3, prior to the submission of these applications.And though Encana has not submitted an application for the Facility Site it is stated 2 different times in Form 2A that the plan is to put the Facility Site for these 12 wells south of the wells on the current pad.The loop for the access to this pad would include using CR1 and Rd 18 and then out on the Regnier Driveway on CR1, and directly in front of a Boulder County Residents residentce.The traffic pattern for the production years of these 12 wells is planned to go 25 feet in front of one residents home and 75 feet n front ofanother residents home for up to 30 years.The first 18 months, afterall of the construction of the facility pad, will have 1 tanker truck every 1/2 hour. Deisel fumes cause cancer per the other comments submitted on this site.It is inappropriate to subject the residents who live east of Rd 18 to the massive truck traffic and the poisonous diesel fumes for that these 12 wells n this location will bring to the nieghborhood.

Land use policies should support a high-quality rural character which respects the agricultural heritage and traditional agricultural land uses of the County, as agricultural lands are converted to other uses (excluding urban development). Rural character in the County includes those uses which provide rural lifestyles, rural-based economies and opportunities to both live and work in rural areas. The natural landscape and vegetation predominate over the built environment. Agricultural land uses and development provide the visual landscapes traditionally found in rural areas and communities. (Weld County Code Ordinance 2002-6; Weld County Code Ordinance 2008-13) To protect and enhance the quality of life for County residents through the implementation of the adopted Comprehensive Plan, Weld County Code, and Building Codes while providing professional, friendly and quality customer service to the community.

Comment:1)The 12 Wells and Planned Facility Site for the Regnier property are a Visual Blight for at least one of the neighbors east in this area.It will block their current mountain view with a major Industrial Site; the Facilities Pad includes 28, 25 foot high towers, at leat 15 burn-off towers, and separators for the at least 30 years or the life of the well.This site goes completely against Weld County Code.If you read the above paragraph from Weld County Code carefully you will see that a Major Industrial Site doesnt not belong in this area.Additionally, the all of the homes that are planned to be 691 feet away from the 12 wells and about 1500 feet from the fFacility Pad will experience dramatically diminshed Property Values andin turn this will reduce the value of neighborhood homes. 2)The application does not have a comprehensive plan included.If there were a comprehensive plan, there would have been other plans adopted as:The drilling and the Facility Site are not the furthest away from all homes in this area, they would see that this is a Low Volume Fracking area not a High Volume Fracking area, they would see that because there is another High volume Hydrofracturing Sitecurently being planned within 3/4 square mile area of the Regnier Site and that it is completely inappropriate to add another burden of this scale into the community that lives nearby all of these

	proposed sites.Also if they would have developed and implemented a Comprehensive Plan there would have been serious consideration for the the requests of Boulder County Government.They asked for a CDPHE study and were denied that by the LGD Troy Swaine.In other words there isnt consistency wiith the Planning Code stated above and this application.It is an incomplete application.It is missing a Comprehensive Plan, it is missingthe Community Meeting, it is missing full acknowledgment of the Weld County code that which states Land Use requirements that are being ignored and dismissed by the LGD of Weld County.	
4	Below see the front page of 2 different Petitions that were circulated on Move-on.org regarding the 2 egregious 12 well High Volume Hydrofracturing proposals for Section 19 Weld County, regarding the Rasmussen and the Regnier proposals currently submitted for permitting on the COGCC website. There was knowledge of the forthcoming Regnier Proposal, at the time of the ciruclation of these petitions. 1)PROTECT Pleasant View To be delivered to The Colorado State House, The Colorado State Senate, and Governor John Hickenlooper Say NO to big oil and gas industrialized site in the midst of small rural historic community. There are currently 367 signatures. NEW goal - We need 400 signatures! Petition Background Big oil and gas development is threatening our health and welfare, compromising our air and water, dislocating wildlife (many which will not survive) and adversely impacting all quality of life and our property values. Historic landmarks, including a cemetery, are in the path of the destructive oil and gas operators that request permits for numerous wells and mega industrial storage and transfer facilities that will overshadow a small rural community with doom. Current petition signers 367. Jeff Burton from Erie, CO signed this petition on Jan 25, 2015. 366. Donna Burton from Erie, CO signed this petition on Jan 25, 2015. 365. ann wilson from ERIE, CO signed this petition on Jan 25, 2015. This is absolutely obscene. This is not an industrial area. It is rural. And no way should a handful of Coloradans bear the burden of pollution and destruction of the environment for the entire nation of gas users. There are not enough inspectors to ensure that these installations arent leaking, or for that matter, that they are built properly in the first place. And they are ugly as sin. We live within sight of them every day, but an installation this big would turn a nice rural area with a view into a nightmare day and night. Stop this travesty right now. 364. Laurie Anderson from Erie, CO signed this petition on Jan 25, 2015. 363. Lynn Hirshman from Black Hawk, CO signed this petition on Jan 25, 2015. 362. Lori Hewitt from Longmont, CO signed this petition on Jan 25, 2015. 361. Nicolas from denver, CO signed this petition on Jan 25, 2015. 360. Renee Erickson from Littleton, CO signed this petition on Jan 24, 2015. 359. Scott Esser from Boulder, CO signed this petition on Jan 24, 2015. 358. Christina Esser from Boulder, CO signed this petition on Jan 24, 2015. 2) Statewide Emergency Moratorium on High Volume Hydrofracturing Sites (HVHF) in Colorado	04/28/2015

Petition by Protect Pleasant View Rural Community

To be delivered to Doug Suttles, CEO Encana, Oil and Gas Task Force, Jared Polis, U.S. Representative, Matt Lepore, Director COGCC, The Colorado State House and 3 other targets (click here to see more)

Numerous neighborhoods and communities all over the state of Colorado are under siege and severely threatened by the Oil and Gas Industry with the recent permitting of High Volume Hydrofracturing Industrial Sites (for this petition 4 or more wells on a multi-well pad = HVHF) in or near rural and residential neighborhoods.

Please urge Governor Hickenlooper to declare an emergency ordinance to halt all permitting and construction of HVHF Industrial sites within a 1

mile square area around any homes or businesses and additionally, declare a 1 year moratorium on the permitting and construction of HVHF sites within a 1 mile radius of any homes or businesses.

This would allow time to define what constitutes a HVHF site and then enact necessary rule changes within State and Local governments to accurately reflect the scale of HVHF sites, and modify the mission of the COGCC to adequately protect the welfare of citizens in Colorado rather than maximizing oil and gas production.

There are currently 731 signatures.NEW goal - We need 750 signatures!

Petition Background

Our historic, rural, high density agricultural neighborhood Pleasant View Rural Community, on the border of Boulder and Weld County in Colorado is being severely threatened by two 12 well HFHV sites and two massive facility sites with 36, 25 foot high towers, 12 separators and 12 burn-off towers. Our neighborhood is an inappropriate place for this intensive level of Industrial Oil and Gas Extraction.

The current rules and regulations in our state do not protect us from these aggressive invasions. These two HVHF sites would devastate our way of life, the nature in our community, our roads, our property values and our health.

Please help us encourage the Governor of Colorado to take strong immediate steps to protect the health, safety and welfare of Colorado citizens. Governor Hickenlooper has the authority to stop HVHF sites from being built near homes and neighborhoods. It is his mandate to protect the precious resources of water and air quality that are currently threatened by major Oil and Gas Industrial Sites across the state.

Ask Governor Hickenlooper, Local Governments and the COGCC to stop putting corporate profits ahead of human rights and environmental stewardship.

Current petition signers

731. Cheryle Clarke from Longmont, CO signed this petition on Mar 16, 2015.

730. Thomas Rutledge from Glenwood Springs, CO signed this petition on Mar 10, 2015.

The Governor and COGCC should do everything in their power to protect the health and well being of the citizens of Colorado.

729. Peggy Woodward from Arvada, CO signed this petition on Mar 8, 2015.

728. Michael Melio from Westminster, CO signed this petition on Mar 8, 2015.

When was the peoples right to self-determination eviscerated?

727. Randee Webb from Aurora, CO signed this petition on Mar 7, 2015.

726. Mel Daniels from Whitewater, CO signed this petition on Mar 5, 2015.

725. Melody Safken from Whitewater, CO signed this petition on Mar 5, 2015.

724. Melody Safken from Whitewater, CO signed this petition on Mar 5, 2015.

	723. Maya Kurtz from Glenwood Springs, CO signed this petition on Mar 5, 2015. 722. don walker from Fort Collins, CO signed this petition on Mar 4, 2015. Comment: There is a rapidly growing group of citizens in Colorado and all over the United States that know these High Volume Hydrofracturing Sites (HVHF) are a threath to the health, welfare, safety and environment of citizens of Colorado.These HVHF should not be within 2 miles of any Occupied Dweillings. The COGCC State Rules for Oil and Gas extraction were made for Low Volume Hydrofractruing of Oil and Gas, and have not caught up to the size and scale of the High Volume Hydrofracturing Oil and Gas Extraction capabilities.The 12 Regnier Wells and the asssociated Major Industrial Facility Site south of the Wells do not belong in this densely populated, historically significant, rural location. The number of wells needs to be reduced to 4. The wells need to be moved to an area farthest away from Section 19 property owners to the already existing site 1/4 mile south of WCR20.5 on Regniers field.If the COGCC doesnt deny these 13 permits they are acting negligently. If Governor Hickenlooper doesnt stop these Regnier wells he acting negently. NumerousSurface Owners in Section 19 Weld County, need protection from these 2 High Volume Hydrofracturing sites: the Rasmussen and the Regnier applications as currently proposed, and if they are permitted the State of Colorado has acted negligently and has knowingly put this community in harms way of the clear and present danger of the Regnier and RasmussenHigh Volume Hydrofracturing sites.The property values of the homes within one and one half miles in both Weld and Boulder County will be significantly diminished if the 12 well Regnier Site is permitted at this location, and both the COGCC and Regnier Family Farms and Encana will be forcing at least one of the surface owners, on Section 19 or Section 30, who have by LAW equal property rights to the mineral owners to sell and move from their devalued homes.	
5	Per the Regnier Application – cited below are the errors, incomplete items, inconsistencies and behind- the- scenes assumptions covertly placed in the Location Assessment application Form 2A for the Regnier Wells: A) On the front page of the Location Assessment application if states ‘Approval of this Oil and Gas Location Assessment will allow for the construction of the below specified location; however, it does not supersede any land use rules applied by the local land use authority’.The Land Use Authority is the written document found on the Weld County Government Website in the Planning section of the Weld County Code, it states: Planning Department Mission Statement 3. A.Policy 2.3. Encourage development of agriculture and agriculturally related businesses and industries in underdeveloped areas where existing resources can support a higher level of economic activity. Agricultural businesses and industries include those related to ranching, confined animal production, farming, greenhouse industries, landscape production and agritainment or agritourism uses. 1. A.Policy 7.1. County land use regulations should support commercial and industrial uses that are directly related to, or dependent upon, agriculture, to locate within the agricultural areas, when the impact to surrounding properties is minimal, or can be mitigated, and where adequate services are currently available or reasonably obtainable. E. I.Goal 5. New industrial uses or expansion of existing industrial uses should meet existing federal, state and local policies and legislation.1. I.Policy 5.1. Industrial uses should be evaluated using criteria, including but not limited to the effect the industry would have on air and water quality, natural drainage ways, soil properties and natural patterns and suitability of the land. a. Recommended Strategy I.5.1.a. Review the zoning regulations to ensure that they are consistent with this Policy. 2. I.Policy 5.2. Development improvements should minimize permanent visual scarring from grading, road cuts and other site disturbances. Require stabilization and landscaping of final land forms, and that runoff be controlled at historic levels. F. I.Goal 6. Minimize the incompatibilities that occur between industrial uses and surrounding properties. 1. I.Policy 6.1. Consider the compatibility with surrounding land uses and natural site features. a. Recommended Strategy I.6.1.a. Establish development standards for such issues as use, building height, scale, density, traffic, dust and noise. b. Recommended Strategy I.6.1.b. Consider identifying	04/29/2015

industrial sub-areas and corresponding design guidelines after notification to the relevant landowners. 2. I.Policy 6.2. Support the use of visual and sound barrier landscaping to screen open storage areas from residential uses or public roads. 3. I.Policy 6.3. Encourage informational neighborhood meetings for proposed industrial uses that do not require a public hearing. a. Recommended Strategy I.6.3.a. Develop options for neighborhood meeting processes. 4. I.Policy 6.4. Ensure that industrial properties are free of derelict vehicles, refuse, litter and other unsightly materials.

And Most Importantly:

'Land use policies should support a high-quality rural character which respects the agricultural heritage and traditional agricultural land uses of the County, as agricultural lands are converted to other uses (excluding urban development). Rural character in the County includes those uses which provide rural lifestyles, rural-based economies and opportunities to both live and work in rural areas. The natural landscape and vegetation predominate over the built environment. Agricultural land uses and development provide the visual landscapes traditionally found in rural areas and communities. (Weld County Code Ordinance 2002-6; Weld County Code Ordinance 2008-13) To protect and enhance the quality of life for County residents through the implementation of the adopted Comprehensive Plan, Weld County Code, and Building Codes while providing professional, friendly and quality customer service to the community.'

As you can logically deduce from the Weld Code, a Major Industrial Site is not appropriate for our high density, historically significant, pristine, historically Low Volume Hydrofracturing area.The nuisances of the 10's of thousands of semitrucks and tankers with the associated diesel emissions, the permanent visual scarring of the Facility Site's infrastructure (30+ years can be considered permanent), the 14 months of 24/7 excessive sound, light, benzene and methane emissions are Industrial scale and do not provide us with 'High Quality Rural Character' or a 'rural lifestyle with rural based economies'.The Regnier 12 well High Volume Hydrofracturing (HVHF) Industrial Site and the 12 well Rasmussen High Volume Hydrofracturing Industrial Sites both proposed to be within a ¾ mile square area in our community in the very near future would dominate 'the visual landscape traditionally found in rural areas and communities' and 'the natural landscape and vegetation' will thus NOT 'predominate over the built environment' if either or both of these sites are approved by the COGCC.

B) The Application Maps.

1. The 19H-B268 PAD BHL Exhibit has 3 major errors on it.It shows the 12 wells abutting Weld County Road 20.5 going 1 mile south to County Road 18:

*The actual placement for the wells is 591 feet east of the Hansen family's home, which 1 mile south of Weld County Road 20.5. The actual proposed location for the wells is 1 mile south of WCR 20.5, not next to it. Currently there is not a Public or County road that goes from County Road 1 or WCR20.5 directly to the wells.

*The Road they have labeled as County Road 20.5 on the map is not a

Public or County Road at all, it is the Regnier's driveway from County Road

*It has a 'Private Road' sign and a small sign that says Regnier and is ½ mile north of Rd. 18 and 1 mile south of WCR20.5. This driveway goes as far east as the Hansen's home.The 12 wells are proposed 807 feet east of this Private Road but do not have direct access to it.

*Another error, is that the Road Encana has labeled County Road 18 is not a Public or County Road. In fact there is a question about whether or not Mr. Regnier has rights to use the east/west portion of Rd. 18 at all. He has an Agricultural Easement on a section of unnamed road running north/south on the east end of Road 18 but no 'right of way' for the east/west section of Rd. 18.Mr. Regnier's road is the Regnier Road coming off of CR1.As well, Encana likely does not have a right of way to use the Agricultural Easement running north/south for the exponential increase in truck traffic that would occur for the Facility Pad planned for these 12 wells.Mr. Regnier does not have the legal right to give permission to Encana to use the Agricultural Easement on the north/south section on the east end of Rd. 18, it is an Agricultural Easement and does not include Major Industrial Use of a road for Mr. Regnier, and would need permission granted from the Owner of that north/south section of Rd. 18 for Encana and their subsideraries to use it for Industrial purposes.Has permission been granted by the Owner of that section of the Road with the Easement?

2. The second map of the 19H-B268 Pad Access Exhibit has 1 error:

* It shows the 12 wells being drilled on the south end of Section 18, not in Section 19 which is how the

application reads.

NOTE: On this1/4 section map, Encana shows the access to drilling the Wells as being from 'County Road 20.5'. Weld County Road 20.5 is 1 mile north of where the wells are planning on being drilled.This would make the access to the wells, if Encana was planning on using WCR 20.5, 1 mile.

It would not be economical for Encana to drive all of the rigs and semi-trucks 1 mile to drill the 12 wells. Either they made a mistake or I believe the reason they might be willing to drive the 1 mile to drill at this site is that they are acquiesing to the Regnier Family farms completely, and/or in the near future are planning on putting another 12 wells Hydrofrackednorth from this site in Section 18 sometime after they put the first set of 12 wells going south in Section 19.

If you look at the map carefully you can see a small Facility site on the Regnier Property in ¼-1/2 mile south of WCR 20.5.This is the legal place that the wells should be placed, and an already existing site.It is also the farthest distance from the largest amount of effected homes if you take into consideration the entire Regnier property.

Mr. Regnier is concerned about his Center Point Irrigation and using 5 acres of his precious agricultural land for a Facility Site and the Drilling – so the site is moved 591 feet away from his daughter, son in law and grandchildren's homes and access to the Facility Site is being planned ½ mile from 4 otheroccupied dwellings.This is not the furthest distance from all occupied dwellings in the area.

Legally, both the wells and the Facility site should be required to be moved to ½ mile south of Weld County Road 20.5, then a waiver wouldnt be needed.This location is the farthest distance from the most occupied dwellings on the Regnier property.Then Encana would only have to drive ½ mile or less, instead of 1 mile, to drill and reach the Facility pad during the Production Period of these wells.Encana would be able to access this Site from the east, I-25, to Weld County Road 7, onto Weld County Road 20.5 and then ½ mile to the Site.

The proposal cited above would lessen the driving of trucks dramatically, take all of the traffic off of County Road 1 and away from a Boulder County maintained road and Boulder County citizens who have a right to Low Volume

Hydrofracturing near their homes which are in a moratorium, and it would move all of the nuisances for 10+ neighbors who do not want the visual blight, the drilling and production emissions or the truck traffic to a much farther away location: 1 and ½ miles north. Mr. Regnier would need to move the sacrificed 5 acres of his farm land that he has sited for 591 feet east of his family to another part of his farm, but at least 10 families and property owners, and all of the property values in Section 19 would be better off for it.It's 5 acres either way you look at it for the drilled site or for the Facility site.We live in a high density rural neighborhood and we should have protections against Major Industrial sites and the Weld Code, as Land Use Authority, says we do have those protections.

Regnier Farms should be required by law to consider the impact their proposal is going to have on the community around them, instead of only considering the impacts on their own farm.

This alternate proposal would have a number of Community Benefits:It would remove all traffic off of County Road 1, it would remove all traffic off of Rd. 18 (6 land owners and neighbors only egress and access to a Public Road), it would move the entire nuisance issue 1 and ½ miles north of our neighborhood which is already at tremendous risk from the 12 proposed Rasmussen Wells and associated Facility Site. It would take this entire operation out of Boulder County.

It would be in the best interest of the property values in the area, particularly in Section 19, if the wells were reduced to 4 (to acknowledge and respect the wishes of Boulder County) and moved to the ACTUAL farthest distance from the largest number of homes, which is ½ mile south of WCR20.5 at the current site.

C)The Application has an area for completing a 'Comprehensive Drilling Plan' for the Proposed Location.The box is not checked.Encana submitted an application for another Major Industrial Site for this area in December 2014, the Rasmussen Well site.Looking at the maps for the Regnier site, I noticed there is not one map that shows the whole area and all of the wells and proposed now and for the near future.A 2 mile square area map study of the area needs to happen so that neighborhoods like ours do not get lambasted with a site here and a site there without the neighbors and the COGCC ever having a chance to consider the whole picture.

Looking at the Regnier Well and Location maps was like looking at a Picasso painting, a bunch of pieces put together, but not connected.The results of this narrow way of mapping created numerous

mistakes in the Application and a lack of actual impact implications for the area.It also prevented Encana from determining the farthest distance from ALL OCCUPIED DWELLINGS when planning the location of the drilling with Mr. Regnier.It's as if, Mr. Regnier picked a site that worked best for him, and then they drew a line around it and made minor adjustments so that the wells and Facility Site would 'seem' to be the 'farthest distance' from that 'chosen spot' but in actuality the wells are not at all the farthest distance from neighbors and occupied dwellings from the point of view of the Entire Regnier Property.

I am asking for a Comprehensive Drilling Plan and a CDP#, added into the Regnier application for a 2 mile square area and 2 years ahead, around the proposed Regnier Well Site and Facility Site to be reviewed by the COGCC and Community members. If a CDP# existed for this application and accurate maps of the area there could be prudent planning for this area regarding bringing 12- 24-36 wells in addition to the already 13+ wells that are here, to this Low Volume Hydrofracturing area.

With this kind of prudent and common sense thinking then the kinds of problems being expressed by community members and other entities would be reduced greatly.

Without a CDP# this application is incomplete.

D)Per Rule 303.b.(3)C.'Oil and Gas will flow combined to the facilities pad south of the well pad.'And 'Facilities Pad associated with Regnier Farms 19HB268 wells is not within a designated setback location'.And 'well site production facilities #435499, form 2A Doc. #400798141'.

These 3 references to the planned location for the Facility Site for the 12 Regnier Wells are contained within the

Form 2A application.Also, we were told by an Encana representative that the proposedlocation for the 12 wells was dependent a specific location for the associated Facilities Padwhich is on an already existent site ½ mile north of Rd. 18 on the north/south section of that road, and south of the proposed 12 wells¼ mile.

Where is the Form 2A for the Facilities Pad?If the 12 Well Site is dependent on this location for the facilities pad, and Encana is intending on using it, as has been stated in the current application, and we have been told as such by Encana, then approving the permits for the 12 wells in the current location is akin to approving the facility site for the wells in this southern location.

Yet, we have no legal voice in the Facilities Pad because there isn't an application Form 2A for it.This Facility Site is referred to 3 times in the Form 2A for the wells.

If the wells are approved, the COGCC is sentencing 10+ families to Rd 18 being abused by truck traffic for the production of these 12 Regnier wells for 30+ years.And the community never had a say in it!Again an incomplete application.The wells and the facility site should be moved to the WCR 20.5 location.

E)The application states there is a Public Road 807 feet from the Wells.This is not true.The road they are referring to is a Private Road, the Regnier Road as previously described in this document.The closest Public Road is County Road 1, ½ mile to the west, partially owned by Boulder County and maintained by Boulder County.(Please refer to Boulder County's view of the wells and road issues in their Comment Submission) The other road closest to the 12 proposed wells is WCR 20.5 which is 1 mile north of the 12 wells, and currently there is ½ mile of that road made that goes to a current well/facility site on the Regnier property. Encana and their operators would need to drive all of their equipment 1 mile to the site.

This inaccuracy is an error in view.It jumbles the information and then when it comes time to figure out the actual access roads Encana will use, they will have to force issues and force pathways.Planning and permitting 12 wells without the access roads exactly calculated and figured out is putting the cart before the horse (oh and then just get the community to adjust).

F) A CDPHE Study was not conducted. This is an error of judgement by the Weld County Government.A CDPHE study was formally requested of the LGD by a Community member and the Boulder County LGD

Without a CDPHE study completed and shared with the community before the approval of these wells, the application is incomplete.A 3rd party should be available to determine the need and appropriateness for a CDPHE study, not the Weld LGD.

G) Human Beings and Occupied Dwellings are not contained as an item on the list for Cultural

	Distance Information.All of the concerned property and surface owners in this area re stakeholders in this decision, therefore all of our comments and concerns should be given as high of priority as the mineral owners.To not do this, to not protect the civil rights of all of the stakeholders is in contrast to the COGCC mission statement and is an error in judgement on behalf of the COGCC.In an agricultural area and humans are stakeholders in the natural environment around them and have equal rights to the protections animals and plants get. A box is missing from the Cultural Distance part of the application that says 'Occupied Dwellings', therefore this application is incomplete. H)If Encana is this amazingly careless about submitting their application, I have no confidence in their Drilling and Hydrofracturing ability and neither should the COGCC.There is evidence that these sites are being forced through even though they are not in the best interest of at least 10 families living in this rural area. Encana's and Regnier Farms profits and 5 acres of land for a Facility Site, are not worth the health, safety and environmental risks associated with this proposed Major Industrial Operation.The devaluing of the neighborhood is not worth the short term profits of Regnier Farms and Encana. This scale of operation does not belong anywhere near Occupied Dwellings.Our area and homes will become a sacrifice zone for the apparent greed of the mineral owners, Encana, COGCC and Weld County Government if the wells are approved as proposed. Truly a tragedy. Move the location of the Regnier wells and it's associated Facility site to ½ mile south of WCR20.5 to a current well and facility site on the Regnier Property.Reduce the number of wells to a respectful 4, and keep the area near Boulder County a Low Volume Hydrofracturing area.Protect all of the home owners and surface rights owners in Section 19 from excessive and dangerous truck traffic on CR1 and Rd. 18.These suggestions are all common sense and reasonable. The right thing to do is to protect all citizen's and stakeholders' inalienable rights to safety, health, a clean environment and to peaceful enjoyment of their homes. Please fully address all the issues in this document and directly contact me with your determinations at: protectpleasantview@gmail.com	
6	Boulder County comments on the Encana - Regnier Farms Well location 19H-B268 Form 2A #400798140 planned to be located in Section 19 T2N R68W We appreciate the opportunity to comment on the twelve proposed wells located in Weld County by Encana, referred to as the Regnier Farms 19H-B268, Form 2A #400798140, planned to be located in Section 19 T2N R68W.This proposal is very similar to the Rasmussen Farms site that Boulder County commented on in January 2015.Similarly to that application we have heard from numerous Boulder County and Weld County residents expressing to our staff and the Boulder County Board of County Commissioners, the size, scope and location of this development in such close proximity to many neighboring residences raise numerous issues of concern that need to be resolved prior to approval.The well sites are proposed less than a 3/4 mile from the Boulder County line.The County has great concerns over the potential health impacts to nearby residents, both in and outside of Boulder County.There are many unknowns related to the potential health impacts resulting from the current practices involved in oil and gas development and hydraulically-fracked wells.As a result of our mission to protect public health, safety, welfare, and the environment, Boulder County has a temporary moratorium in place on such oil and gas development while studies and research are being conducted further evaluating the impacts.Air, water, noise, light and other pollution, as well as transportation and visual impacts, do not recognize political boundaries nor do they contain themselves within those lines.The twelve wells proposed on this site will have negative impacts on all of the above beyond the Weld County border.Acknowledging that the surface development is proposed to occur in Weld County and, therefore, is not subject to the County's moratorium, we offer the following comments. Public Health Concerns	04/29/2015

Boulder County Public Health is concerned about the potential impacts from this oil and gas well site for the residents near this location.We understand that COGCC Rules allow only the Local Government Designee from the jurisdiction where the wells are drilled to request that COGCC consult with the Colorado Department of Health and Environment (CPDHE).Although Boulder County asked the Weld County LGD to make such a Rule 306.b request of COGCC, we contacted the Weld County LGD and he verbally stated they would not submit such a request.Please note that there was no response from Weld County to our request seeking this study which leave less time for us to formulate any options. Boulder County strongly requests that COGCC take advantage of CDPHE's expertise on options for avoiding or mitigating the following impacts, and include appropriate measures as conditions of approval on the applicable COGCC permit(s):

•Noise and vibration

•Odor

•Dust

•Air quality

•Water quality

•Safety

Noise and Vibration

Noise and vibration complaints are the number one complaint received by the COGCC because of the significant effect on residents' quality of life and stress.For a facility of this size located near residential housing, noise and vibration complaints may become a daily occurrence.Based upon comments submitted by CDPHE for a different proposed operation, we understand that according to a sound/noise expert with the Colorado State University sounds walls do not fully address noise; however, specially designed buildings and equipment supports have been used to mitigate both high and low frequency noise.Boulder County recommends the following as conditions of approval to minimize the impacts from noise and vibration for this well site:

•Require electric or natural gas powered drilling rigs

•Employ noise suppression practices for engines (e.g. enclosures, sound blankets and hospital grade mufflers)

•Eliminate or mitigate the number of generators used on site and only allow electric motors to be used

•Prohibit vehicle backup and all other alarms from 7 pm to 7 am

•Require electric compressor engines and install compressors in a specially designed building to mitigate noise and vibration issues

•Line or cover storage bins, conveyors, and chutes with sound-deadening material

•Use acoustic enclosures, shields, or shrouds for equipment and facilities

•Use high-grade engine exhaust silencers and engine-casing sound insulation

•Monitor noise levels

•Minimize the use of generators to power equipment

•Limit use of public address systems

•Grade surface irregularities on construction sites

•Use moveable sound barriers at the source of the construction activity

•Limit or avoid the most noisy activities during nighttime hours – including drilling

Odor, Dust, and Air Quality

Mitigation measures to reduce odor and air quality impacts will serve the community as well as the

state and local public health agencies responding to these complaints.Boulder County recommends the following as conditions of approval for odor and air quality impacts:

•Require Tier 4 engines for equipment on this well site to reduce emissions

•Eliminate open tanks and pits for any fluids other than fresh water and during drill out operations (2-3 days maximum)

•Require green completion practices and ensure production facilities and pipelines are in place to ensure green completions practices are used

•Require natural gas sales line installation prior to completion activities to minimize flaring

•Require automated system to determine tank levels and methods to minimize emissions from tank unloading activities

•Require the installation of a vapor recovery unit

•Deploy optical gas imaging camera daily and during specific during tank unloading and completion activities to monitor for leaks

•Require dust suppression practices using a vacuum system or comparable process to control dust from completion activities

•Implement additional dust suppression measures

oProvide water for dust suppression on site at all times, monitor conditions hourly for dryness

oUse “Socks” or other mechanical dust collection and suppression technique during all sand transfer activities to capture dust from sand transfer from truck to on-site container.

oEnsure the “sock” is shaken after every loading event

oUse lower pressure air when moving sand between containers; limit air pressure used for sand movement to 12 psi

oCap all unused fill ports on sand movers

oDesign T belts and other operational designs and practices to minimize sand drop heights

oUse a mechanical dust collection and suppression system when operating in high density areas.

oOperate all dust capture systems properly and in accordance with manufacturer recommendations

oActively monitor dust conditions and take all necessary action to take corrective action and minimize impacts

•Install high definition cameras to monitor the site for dust

•Require signage with operator contact information for residents with complaints and concerns available 24 hours per day, seven days per week

Water Quality

Boulder County recommends the following as conditions of approval in regards to water quality:

•Line and berm all well and tank areas and install water quality monitoring wells down gradient of the site

•Design and implement a spill response plan and provide and maintain spill kits and instructions across the site

•Use only clean water, not reclaimed fluids, for dust suppression

•Report all spills and unintended releases to emergency dispatch (303-441-4444) to Boulder County Public Health

•Prohibit the use of partially buried vaults

Safety Concerns

Safety is a concern that must be addressed with an oil and gas facility of this size located near residential homes.Installation of a fire suppression system for this site would reduce the risk to residents living near this location. In addition, construction and maintenance at this well site will require countless trucks trips for this facility adding to the potential for automobile accidents.Boulder County recommends the following as conditions of approval as a starting point to address potential safety concerns:

•Require pipelines or water recycling to minimize truck trips

•Require telemetry system to notify the operator of upset conditions with remote well shut-in capability

•Install a fire suppression system for the well site

•Require outreach and training with local emergency response agencies within Weld and Boulder Counties

In sum, an oil and gas facility of this size near residential housing will undoubtedly impact the residents living nearby and affect their quality of life, as has been voiced by many of the residents that have come to Boulder County asking to be heard. Boulder County encourages Weld County, Encana and the COGCC to implement and require all of the recommendations provided and to request the consultation of theCDPHE.We also request an evaluation of the potential for moving this well site to another location as far as possible from residential housing.

The recommendations provided by Boulder County as conditions of approval have been used in other industrial situations and a facility of this size and scope must utilize all possible means to minimize safety concerns and the impacts to the residents living nearby.

The potential health and environmental impacts from emissions and noise could be tremendous and need full evaluation.None of these impacts end at the political boundary and must be considered and addressed for the Boulder County residents as well.We request a full CPDHE assessment of the proposal.

Roads and traffic impacts

The Access Road Map shows traffic entering the well site from Weld County Road 20.5.There is no further information in the application regarding the direction traffic will be travelling on 20.5.Boulder County requests that traffic impacts be contained to Weld County and access the site from the east.At this time no traffic impact report has been provided, we cannot speak to specific impacts of the proposed facility on the county transportation system.The road network in this area is not designed to accommodate the volume and weight of vehicles associated with a development as proposed.No other land use at this intensity would possibly be permitted without a traffic report and full mitigation measures.

East County Line Road is an arterial connecting Longmont and Erie with 3,100 – 5,600 Average Daily Traffic and with pavement in poor condition.East County Line Road is also a significant bicycle corridor, particularly on weekends.If the traffic were to leave the site and head west to East County Line Road then the addition of significant volumes of very heavy truck traffic will have safety implications as well as major impacts on the condition of the pavement on East County Line Road.Should the COGCC provide any permits, we request that any permit require use of Weld County Road 20.5 east.If that is not done then please require submission of a transportation impact study, routing plan, and proposed mitigation strategies and commitments that must be approved by Boulder County as a condition of the COGCC permit.In addition, because Weld County and Boulder County share ownership of East County Line Road, the operator will need to coordinate with both counties regarding local access permits and all other transportation-related issues.

In addition there is not locational information for the facilities pad.The same access concerns apply to that area.The system should not allow for separate timing for these two types of applications.There is a strong relationship between the facilities and location of one potentially limits the ability to address locational concerns of the other.

Impacts to the rural and residential neighborhoods

The intensity of oil and gas developments is increasing as more facilities are being clustered on larger

	sites.In general clustering in the right locations might be desirable to help lessen some impacts (fewer access roads, fewer road miles travelled for development, fewer impacts that may have occurred in a more scattered area), but clustering to this level and in this particular area makes these facilities less and less compatible with the surrounding residential and rural areas.This is especially true if the Rasmussen site is approved on the western ½ of Section 19.The cumulative impacts of this and future proposals are not adequately studied or addressed.This type of development contradicts accepted and traditional land use zoning of separating incompatible uses.The noise, lighting, traffic and physical occupation of space will have tremendous impacts on the surrounding area – impacts that could not have been reasonably foreseen by residents and which have not been adequately discussed and vetted with the nearby residents impacted the most.The Weld and Boulder County residents close to the site have requested to meet with the operator, understand the development proposal and have the opportunity to share their concerns.At this time there has not been a meeting scheduled although the operator has stated they are working on a plan for the meeting.The fact that this meeting will not occur prior to the public comment deadline is problematic.The public comments and concerns will not be as full developed because the opportunity for public participation with those most impacted has not occurred.. Conclusion The County requests the well applications be rejected since their public health impacts have not been sufficiently evaluated or vetted, especially considering the cumulative impacts of this application along with the Rasmussen site immediately west.Also, the traffic and transportation impacts been adequately addressed.Short of denying the applications, the County requests the comment period be extended to include an opportunity to incorporate the requested CPDHE consultation and to incorporate any agreements between Encana, Weld County, and Boulder County related to transportation system impact mitigation (including measures to address traffic and safety concerns).Prior to approval the COGGCC should consider the cumulative impacts in the Urban Mitigation Areas and respect the local moratorium put in place in Boulder County.Until the questions surrounding public health and environmental impacts are answered the County requests limited approvals within one mile of the Boulder County line.In addition the COGCC should make any future permitting contingent on the operator filing an acceptable Comprehensive Drilling Plan under Section 216 of the rules.As part of any Comprehensive Drilling Plan a Health Impact Study should be required taking into account the totality of the foreseeable activities. Given that much of the above will take time to consider and complete, Boulder County is asking that COGCC extend the comment window until such time the information above is made available and can be considered to make an informed and reasonable decision. Thank you for your consderation and we look forward to a response and further dialog on these issues.	
7	To All COGCC Commissioners, Matt Lepore, Mike King, Rebecca Trietz, John Noto, Greg Deranleau and Encana: The below exerpt from the New York Health Compendium is a vital piece of information for anyone working in the Oil and Gas Regulation Industry to read thoroughly and understand.I attempted to copy all 110 pages of this compendium but the document was too large for this public comments area. Therefore I will copy parts of it and enter it in sections. If you have not done so, before you approve the 12 Regnier wells and Location Assessment, it would behoove you to read this document in its entirety since thorough research is an iinherent part of your jobs as State Employees with the mandate to protect citizens. You have been mandated by the State of Colorado to protect all citizens of Colorado from the clear and present dangers of the Oil and Gas extraction industry and the entire New York Compendium is a thorough, but not complete compendium, of studies related to Hydrofracturing and its inherent dangers to human health and the environment. You are hereby put on notice that: I know that you know without a doubt that Encana and Regnier Family Farms would be engaging in the following behaviors with the approval and construction of Regniers 12 proposed wells and the associated facility site: using and polluting the air that I breathe - known as chemical trespass, blocking the roads I need for my work and safety, stealing the real estate values of my home, forcing some property owners and stakeholders to sell their homes/investments and move away at a diminished price, deliberately and knowingly marginalizing and condesending and laughing at the suffering of community members and me during this entire process, placed your externalized costs on the backs of me and my family and the nieghbors who are also concerned, knowingly putting me, my family and my nieghborbors in harms way of semi and tanker truck traffic, emissions from deisel engines, and emissions from High Volume and Low Volume	04/29/2015

Hydrofracturing -all of theseare Violations of the 5th Amendment of the Constitution for the sole financial benefit of Encana, Regnier Family Farms, Weld county government and the COGCC.It is against the law to do these things, so it is recommended that you withdraw the 13 Regnier Applications. Please carefully read the fist section of the Compendium below.

COMPENDIUM OF SCIENTIFIC, MEDICAL, AND MEDIA FINDINGS

DEMONSTRATING RISKS AND HARMS OF FRACKING

(UNCONVENTIONAL GAS AND OIL EXTRACTION)

2nd edition

December 11, 2014

Foreword to the Second Edition

The Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking (the Compendium) is a fully-referenced compilation of the evidence for the risks and harms of fracking that brings together findings from the scientific and medical literature, government and industry reports, and journalistic investigation. It is a public, open-access document that is housed on the website of Concerned Health Professionals of New York (www.concernedhealthny.org). Since its release in July 2014, it has been used and referenced all over the world.

The Compendium, a subject of public health forums on both sides of the Atlantic—and on both coasts here in the United States—has been translated into Spanish and adopted for use in the European Union, South Africa, and Australia. Here in New York State, it serves as the foundation and comprehensive rationale for a minimum three-to-five-year moratorium on fracking: from its first publication, the evidence contained in the Compendium leads us to this unwavering conclusion.

But this document has not traveled as fast as the science itself. In the five months since the Compendium's original release, dozens of additional investigative reports and research papers have been published that clarify, corroborate, and further explicate the intractable problems that natural gas extraction via hydraulic fracturing brings with it. As documented by the study citation database maintained by Physicians, Scientists and Engineers for Healthy Energy, threefourths of the available studies on the impacts of shale gas development have been published within the past 24 months. The number of peer-reviewed publications doubled between 2011 and 2012 and then doubled again between 2012 and 2013. In the last year alone, 154 peer-reviewed studies on the impacts of fracking were released. Almost all of them reveal problems. (See footnote 1.)

Thus, this second edition, which contains more than 80 new entries, continues to be top-heavy with recent publications.

Here are some emerging trends in the new data. First, growing evidence shows that regulations are simply not capable of preventing harm. That is both because the number of wells and their attendant infrastructure keeps increasing and, more importantly, because some of fracking's many component parts, which include the subterranean geological landscape itself, are simply not controllable.

As noted last month in a new study on fracking-related air pollution in northeastern Colorado: even though the volume of toxic emissions per well might be decreasing, overall air quality in the shale field continues to deteriorate as the rapid, continuing increase in the number of wells cancels out improvements to air quality brought about by more stringent regulations. (See footnote 4.) Similarly, the results of a new study from Texas raises the possibility that methane can migrate into aquifers through unseen cracks and fissures in the rock surrounding the wellbore in ways that no cementing and casing protocols, however strictly applied, can prevent. (See footnotes 55 and 56.) New findings from West Virginia show how unmapped, long-abandoned wells—including those drilled generations ago—can become re-pressurized during nearby fracking operations and serve as conduits for the contamination of drinking water. (See footnote 57.) A new study by Princeton researchers working in Pennsylvania found that, many decades after their abandonment, plugged and unplugged wells alike leaked significant amounts of methane into the atmosphere. There are an estimated three million abandoned oil and gas wells in the United States; the locations of many are unmapped and unknown. (See footnotes 265 and 266.) No set of regulations can obviate these problems.

Second, drinking water is at risk from drilling and fracking activities and associated waste disposal practices. As documented by the Pennsylvania Department of Environmental

Protection in a review of its records, 234 private drinking water wells in Pennsylvania have been

contaminated by drilling and fracking operations during the past seven years. These do not include drinking water wells contaminated by spills of fracking wastewater or wells that went dry as a result of nearby drilling and fracking activities. (See footnotes 68 and 69.) In California, the injection of liquid fracking waste directly into groundwater aquifers threatens contamination of large numbers of public drinking water supplies. (See footnote 78.)

Third, drilling and fracking emissions often contain strikingly high levels of benzene. A potent human carcinogen, benzene has been detected in the urine of wellpad workers (at levels known to raise risks for leukemia), in private drinking water wells contaminated by fracking operations, and in ambient air at nearby residences. In some cases, concentrations have far exceeded federal safety standards. Such exposures represent significant public health risks. (See footnotes 3–8, 12, 57, 174.)

Fourth, public health problems associated with drilling and fracking are becoming increasingly apparent. Documented indicators variously include increased rates of hospitalization, ambulance calls, emergency room visits, self-reported respiratory and skin problems, motor vehicle fatalities, trauma, drug abuse, infant mortality, congenital heart defects, and low birth weight. (See footnotes 192–205.)

Fifth, natural gas is a bigger threat to the climate than previously supposed. Methane is not only a more potent greenhouse gas than formerly appreciated, real-world leakage rates are higher than predicted. Within the last five months, multiple teams of independent scientists have published data on fugitive emissions that, all together, call into question earlier presumed climate benefits from replacing coal with natural gas. Further, evidence increasingly suggests that the natural gas abundance brought by fracking is slowing the transition to renewable energy and is thus exacerbating, rather than mitigating, the climate change crisis. (See footnotes 313–318.)

Introduction

Directional drilling combined with high-volume hydraulic fracturing and clustered multi-well pads are recently combined technologies for extracting oil and natural gas from shale bedrock. As this unconventional extraction method (collectively known as “fracking”) has pushed into more densely populated areas of the United States, and as fracking operations have increased in frequency and intensity, a significant body of evidence has emerged to demonstrate that these activities are inherently dangerous to people and their communities. Risks include adverse impacts on water, air, agriculture, public health and safety, property values, climate stability and economic vitality.

Researching these complex, large-scale industrialized activities—and the ancillary infrastructure that supports them—takes time and has been hindered by institutional secrecy. Nonetheless, research is gradually catching up to the last decade’s surge in unconventional oil and gas extraction from shale. A growing body of peer-reviewed studies, accident reports, and investigative articles is now detailing specific, quantifiable evidence of harm and has revealed fundamental problems with the entire life cycle of operations associated with unconventional drilling and fracking. Industry studies as well as independent analyses indicate inherent engineering problems including uncontrolled and unpredictable fracturing, induced seismicity, and well casing and cement impairments that cannot be prevented.

Earlier scientific predictions and anecdotal evidence are now bolstered by empirical data, confirming that the public health risks from unconventional gas and oil extraction are real, the range of adverse impacts significant, and the negative economic consequences considerable. Our examination of the peer-reviewed medical and public health literature uncovered no evidence that fracking can be practiced in a manner that does not threaten human health.

Despite this emerging body of knowledge, industry secrecy and government inaction continue to thwart scientific inquiry, leaving many potential problems—especially cumulative, long-term risks—unidentified, unmonitored and largely unexplored. This problem is compounded by nondisclosure agreements, sealed court records, and legal settlements that prevent families (and their doctors) from discussing injuries. As a result, no comprehensive inventory of human hazards yet exists.

At the same time, inflated estimates of shale reserves and potential profitability continue to fuel the rush to drill new wells, cut regulatory corners, and press into densely populated communities, as corporations attempt to compensate for the unexpectedly rapid depletion of their existing wells and coincident drop off in revenue. Thus do the fundamental economic uncertainties of shale gas and oil production further exacerbate the risks of fracking to public health and society.

Each day in the United States, more than two billion gallons of fluid are injected under high pressure into the earth with the purpose of enabling oil and gas extraction via fracking or, after the fracking is finished, to flush what’s left down any of the 177,000 disposal wells across the country that accept oil

and gas waste. All of those two billion daily gallons of fluid is toxic, and it all traverses our nation's groundwater aquifers on its way to the deep geological strata below. With more than 15 million Americans already living within a mile of a fracking well that has been drilled since 2000, the stakes could not be higher.

About This Report

The Compendium is a fully referenced compilation of the significant body of scientific, medical, and journalistic findings demonstrating risks and harms of fracking. Organized to be accessible to public officials, researchers, journalists and the public at large, the Compendium succinctly summarizes key studies and other findings relevant to the ongoing public debate about unconventional methods of oil and gas extraction. The Compendium should be used by readers to grasp the scope of the information about both public health and safety concerns and the economic realities of fracking that frame these concerns. The reader who wants to delve deeper can easily consult the reviews, studies, and articles referenced. In addition, the Compendium is complemented by a fully searchable, near-exhaustive citation database of peer-reviewed journal articles pertaining to shale gas and oil extraction, housed at the PSE Healthy Energy scientific literature database.

The pace at which new studies and information are emerging has rapidly accelerated in the past year and a half: the first few months of 2014 saw more studies published on the health effects of fracking than all studies published in 2011 and 2012 combined.In accordance, the Compendium is organized in reverse chronological order, with the most recent information first.

In our review of the data, sixteen compelling themes emerged: these serve as the organizational structure of the Compendium. The document opens with sections on two of the most acute threats—air pollution and water contamination—and ends with medical and scientific calls for more study and transparency. Readers will quickly notice the ongoing upsurge in reported problems and health impacts, making each section top-heavy with recent data.

The Compendium focuses on topics most closely related to the public health and safety impacts of unconventional gas and oil drilling and fracking. Many additional risks and harms arise from associated infrastructure and industrial activities that necessarily accompany drilling and fracking operations. These include pipelines, compressor stations, oil trains, sand mining operations, cryogenic and liquefaction facilities, processing and fractionation complexes, import/export terminals, and so forth. While impacts from infrastructure are critically important to public health and safety and while the Compendium refers to these impacts in certain instances when studies covered have also addressed them, a detailed accounting of these ancillary impacts are not included in this document.

Given the rapidly expanding body of evidence related to the harms and risks of unconventional oil and gas extraction, we plan to revise and update the Compendium approximately every six months. It is a living document, housed on the Concerned Health Professionals of New York website, and serves as an educational tool in the public and policy dialogue. The studies cited in this second edition are current through early December 2014.

The Compendium is not a funded project; it was written utilizing the benefit of the experience and expertise of numerous health professionals and scientists who have been involved in this issue for years.

We welcome your feedback and comments.

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Cover photo:Marcellus Shale wellpad in Doddridge County, West Virginia where private water wells were contaminated after a gas drilling accident. See footnote 57.

About Concerned Health Professionals of New York

Concerned Health Professionals of New York (CHPNY) is an initiative by health professionals, scientists and medical organizations for raising science-based concerns about the impacts of fracking on public health and safety. CHPNY provides educational resources and works to ensure that careful consideration of the science and health impacts are at the forefront of the fracking debate. http://concernedhealthny.org

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*Note that for the purposes of this compendium, the terms “fracking” and “drilling and fracking” refer to the entire unconventional oil and gas extraction and distribution process, from well site preparation to waste disposal and all associated infrastructure including pipelines and compressor stations. Not every aspect of this process is fully addressed in the Compendium.

Executive Summary

Evidence of risks, harms, and associated trends demonstrated by this Compendium:

•Air pollution – Studies increasingly show that air pollution associated with drilling and fracking operations is a grave concern with a range of impacts. Researchers have documented dozens of air pollutants from drilling and fracking operations that pose serious health hazards. Areas with substantial drilling and fracking build-out show high levels of ozone, striking declines in air quality, and, in several cases, increased rates of health problems with known links to air pollution. Air sampling surveys find exceedingly high concentrations of volatile organic compounds, especially carcinogenic benzene and formaldehyde, both at the wellhead and at distances that exceed legal setback distances from wellhead to residence. In some cases, concentrations exceeded federal

safety standards by several orders of magnitude.

•Water contamination – Emerging science confirms that drilling and fracking inherently threaten groundwater. In Pennsylvania alone, more than 240 private drinking water wells have been contaminated or have dried up as the result of drilling and fracking operations over a seven-year period. A range of studies from across the United States presents strong evidence that groundwater contamination occurs and is more likely to occur close to drilling sites. The nation's 172,000 injection wells for disposal of fracking waste also pose demonstrable threats to the drinking water aquifers. Disposal of fracking waste in sewage treatment plants can encourage the formation of carcinogenic byproducts during chlorination. Overall, the number of well blowouts, spills and cases of surface water contamination has steadily grown. Meanwhile, the gas industry's use of "gag orders," non-disclosure agreements and settlements impede scientific study and stifle public awareness of the extent of these problems.

•Inherent engineering problems that worsen with time – Studies and emerging data consistently show that oil and gas wells routinely leak, allowing for the migration of natural gas and potentially other substances into groundwater and the atmosphere. Recent research suggests that the act of fracking itself may induce pathways for leaks. Leakage from faulty wells is an issue that the industry has identified and for which it has no solution. For instance, Schlumberger, one of the world's largest companies specializing

in fracking, published an article in its magazine in 2003 showing that about five percent of wells leak immediately, 50 percent leak after 15 years and 60 percent leak after 30 years. Data from Pennsylvania's Department of Environmental Protection (DEP) for 2000-2012 show over nine percent of shale gas wells drilled in the state's northeastern counties leaking within the first five years. Leaks pose serious risks including potential loss of life or property from explosions and the migration of gas or other chemicals into drinking water supplies. Leaks also allow methane to escape into the atmosphere, where it acts as a powerful greenhouse gas. There is no evidence to suggest that the problem of cement and well casing impairment is abating. Indeed, a 2014 analysis of more than 75,000 compliance reports for more than 41,000 wells in Pennsylvania found that newer wells have higher leakage rates and that unconventional shale gas wells leak more than conventional wells drilled within the same time period. Industry has no solution for rectifying the chronic problem of well casing/cement leakage.

•Radioactive releases – High levels of radiation documented in fracking wastewater from shale raise special concerns in terms of impacts to groundwater and surface water. Studies have indicated that the Marcellus Shale is more radioactive than other shale formations. Measurements of radium in fracking wastewater in New York and Pennsylvania have been as high as 3,600 times the United States Environmental

Protection Agency's (EPA) limit for drinking water. One recent study found toxic levels of radiation in a Pennsylvania waterway even after fracking wastewater was disposed of through an industrial wastewater treatment plant. In addition, the disposal of radioactive drill cuttings is a concern. Unsafe levels of radon and its decay products in natural gas produced from the Marcellus Shale, known to have particularly high radon content, may also contaminate pipelines and compressor stations, as well as pose risks to end-users when allowed to travel into homes.

•Occupational health and safety hazards – Fracking jobs are dangerous jobs. Occupational hazards include head injuries, traffic accidents, blunt trauma, burns, toxic chemical exposures, heat exhaustion, dehydration, and sleep deprivation. As a group, oil and gas industry workers have an on-the-job fatality rate that is 2.5 times higher than the construction industry and seven times that of general industry. A new investigation of occupational exposures found high levels of benzene in the urine of workers on the wellpad, especially those in close proximity to flowback fluid. Exposure to silica dust, which is definitively linked to silicosis and lung cancer, was singled out by National Institutes for Occupational Safety and Health as a particular threat to workers in fracking operations where silica sand is used. At the same time, research shows that many gas field workers, despite these serious occupational hazards, are uninsured or underinsured and lack access to basic medical care.

•Public health effects, measured directly – In Pennsylvania, as the number of gas wells increases in a community so to do rates of hospitalization. Drilling and fracking operations are correlated with elevated motor vehicle fatalities (Texas), self-reported skin and respiratory problems (southwestern Pennsylvania), ambulance runs and emergency room visits (North Dakota), infant deaths (Utah), birth defects (Colorado), and low birthweight (multiple states). Benzene levels in ambient air surrounding drilling and

fracking operations are sufficient to elevate risks for future cancers in both workers and nearby

residents, according to new studies.

•Noise pollution, light pollution and stress – Drilling and fracking operations and ancillary infrastructure expose workers and nearby residents to continuous noise and light pollution that is sustained for periods lasting many months. Chronic exposure to light at night is linked to adverse health effects, including breast cancer. Sources of frackingrelated noise pollution include blasting, drilling, flaring, generators, compressor stations and truck traffic. Exposure to environmental noise pollution is linked to cardiovascular disease, cognitive impairment, and sleep disturbance. Workers and residents whose homes, schools and workplaces are in close proximity to well sites are at risk from these exposures as well as from related stressors. A UK Health Impact Assessment identified stress and anxiety resulting from drilling-related noise—as well as from a sense of uncertainty about the future and eroded public trust—as key public health risks related to fracking operations.

•Earthquake and seismic activity – A growing body of evidence, from Ohio, Arkansas, Texas, Oklahoma and Colorado, links fracking wastewater injection (disposal) wells to earthquakes of magnitudes as high as 5.7, in addition to “swarms” of minor earthquakes and fault slipping. Many recent studies focus on the mechanical ability of pressurized fluids to trigger seismic activity. In some cases, the fracking process itself has been linked to earthquakes and seismic activity, including instances in which gas corporations have acknowledged the connection. In New York, this issue is of particular concern to New York City’s aqueduct-dependent drinking water supply and watershed infrastructure, as the New York City Department of Environmental Protection (NYC DEP) has warned repeatedly, but similar concerns apply to all drinking water resources. The question of what to do with wastewater remains a problem with no viable, safe solution.

•Abandoned and active oil and natural gas wells (as pathways for gas and fluid migration) – Millions of abandoned and undocumented oil and gas wells exist across the United States, according to the U.S. Department of Energy. All serve as potential pathways for pollution, heightening the risks of groundwater contamination and other problems when horizontal drilling and fracking operations intersect with pre-existing vertical channels leading through drinking water aquifers and to the atmosphere. New research from Pennsylvania shows that, cumulatively, abandoned wells are a significant source of methane into the atmosphere and may exceed cumulative total leakage from oil and gas wells currently in production. No state or federal agency routinely monitors methane leakage from orphaned and abandoned wells. Industry experts, consultants and government agencies including the U.S. Environmental Protection Agency, the U.S. General Accounting Office (now the Government Accountability Office), Texas

Department of Agriculture, New York State Department of Environmental Conservation,

Pennsylvania Department of Environmental Protection, Illinois Environmental Protection Agency and the British Columbia Oil and Gas Commission have all warned about problems with abandoned wells due to the potential for pressurized fluids and gases to migrate through inactive and in some cases, active wells.

•Flood risks – Massive land clearing and forest fragmentation that necessarily accompany well site preparation increase erosion and risks for catastrophic flooding, as do access roads, pipeline easements and other related infrastructure. In addition, in some cases, operators choose to site well pads on flood-prone areas in order to have easy access to water for fracking, to abide by setback requirements intended to keep well pads away from inhabited buildings, or to avoid productive agricultural areas. In turn, flooding increases the dangers of unconventional gas extraction, resulting in the contamination of soils and water supplies, the overflow or breaching of containment ponds, and the escape of chemicals and hazardous materials. In at least six of the past ten years, New York State has experienced serious flooding in parts of the state targeted for drilling and fracking.

Some of these areas have been hit with “100-year floods” in five or more of the past ten years. Gas companies acknowledge threats posed by flooding, and the New York State Department of Environmental Conservation (DEC) has recommended drilling be prohibited from 100-year flood areas; however, accelerating rates of extreme weather events make existing flood maps obsolete, making this approach insufficiently protective.

•Threats to agriculture and soil quality – Drilling and fracking pose risks to the agricultural industry. In California, fracking wastewater illegally dumped into aquifers has threatened crucial irrigation supplies to farmers in a time of severe drought. Studies and case reports from across the country have highlighted instances of deaths, neurological disorders, aborted pregnancies, and stillbirths in cattle and goats associated with livestock coming into contact with wastewater. Potential water and air contamination puts soil quality as well as livestock health at risk. Additionally, farmers have expressed concern that nearby fracking operations can hurt the perception of agricultural quality and nullify value-added organic certification.

•Threats to the climate system – A range of studies has shown high levels of methane leaks from gas drilling and fracking operations, undermining the notion that natural gas is a climate solution or a transition fuel. Major studies have concluded that early work by the EPA greatly underestimated the impacts of methane and natural gas drilling on the climate. Drilling, fracking and expanded use of natural gas threaten not only to exacerbate climate change but also to stifle investments in, and expansion of, renewable energy.

•Inaccurate jobs claims, increased crime rates, threats to property value and mortgages and local government burden – Experiences in various states and accompanying studies have shown that the oil and gas industry's promises for job creation from drilling for natural gas have been greatly exaggerated and that many of the jobs are short-lived and/or have gone to out-of-area workers. With the arrival of drilling and fracking operations, communities have experienced steep increases in rates of crime – including sex trafficking, sexual assault, drunk driving, drug abuse, and violent victimization, all of which carry public health consequences, especially for women. Social costs include strain on law enforcement, municipal services and road damage.

Economic analyses have found that drilling and fracking operations threaten property

values and can diminish tax revenues for local governments. Additionally, gas drilling and fracking pose an inherent conflict with mortgages and property insurance due to the hazardous materials used and the associated risks.

•Inflated estimates of oil and gas reserves and profitability – Industry estimates of oil and gas reserves and profitability of drilling have proven unreliable, casting serious doubts on the bright economic prospects the industry has painted for the public, media and investors. Increasingly, well production has been short-lived, which has led companies drilling shale to reduce the value of their assets by billions of dollars, creating shortfalls that are largely filled through asset sales and increasing debt load, according to a recent analysis by the US Energy Information Administration.

•Disclosure of serious risks to investors – Oil and gas companies are required to disclose risks to their investors in an annual Form 10-K. Those disclosures acknowledge the inherent dangers posed by gas drilling and fracking operations, including leaks, spills, explosions, blowouts, environmental damage, property damage, injury and death. Adequate protections have not kept pace with these documented dangers and inherent risks.

•Medical and scientific calls for more study and more transparency – With increasing urgency, groups of medical professionals and scientists are issuing calls for comprehensive, long-term study of the full range of the potential health and ecosystem effects of drilling and fracking. These appeals underscore the accumulating evidence of harm, point to the major knowledge gaps that remain, and denounce the atmosphere of secrecy and intimidation that continues to impede the progress of scientific inquiry. Health professionals and scientists in the United States and around the world have urged tighter regulation of and in some cases, suspension of unconventional gas and oil extraction activities in order to limit, mitigate or eliminate its serious, adverse public health hazards.

End of Part I

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Part II of the NY Compendium, see original Compendium for all citation and sources.

Compilation of Studies Findings

Air pollution

•November 20, 2014 – The Texas Commission on Environmental Quality (TECQ) confirmed high levels of benzene emissions and other volatile organic compounds around an oil and gas facility in the Eagle Ford Shale. Symptoms reported by local residents were consistent with those known to be associated with exposure to such chemicals.

•November 14, 2014 – A University of Colorado at Boulder research team found that residential areas in intensely drilled northeastern Colorado have high levels of frackingrelated air pollutants, including benzene. In some cases, concentrations exceed those found in large urban centers and are within the range of exposures known to be linked to chronic health effects. According to the study, "High ozone levels are a significant health concern, as are potential health impacts from chronic exposure to primary emissions of non-methane hydrocarbons (NMHC) for residents living near wells." The study

also noted that tighter regulations have not resulted in lower air pollution levels, “Even though the volume of emissions per well may be decreasing, the rapid and continuing increase in the number of wells may potentially negate any real improvements to the air quality situation.”

•October 30, 2014 – A research team assembled by University at Albany Institute for Health and the Environment identified eight highly toxic chemicals in air samples collected near fracking and associated infrastructure sites across five states: Arkansas, Colorado, Pennsylvania, Ohio, and Wyoming. The most common airborne chemicals detected included two proven human carcinogens (benzene and formaldehyde) and two potent neurotoxicants (hexane and hydrogen sulfide). In 29 out of 76 samples, concentrations far exceeded federal health and safety standards, sometimes by several orders of magnitude. Further, high levels of pollutants were detected at distances exceeding legal setback distances from wellheads to homes. Highly elevated levels of formaldehyde, for example, were found up to a half-mile from a wellhead. In Arkansas, seven air samples contained formaldehyde at levels up to 60 times the level known to raise the risk for cancer.“This is a significant public health risk,” said lead author David O. Carpenter, MD, in an accompanying interview, “Cancer has a long latency, so you’re not seeing an elevation in cancer in these communities. But five, 10, 15 years from now, elevation in cancer is almost certain to happen.”

•October 21, 2014 – Responding to health concerns by local residents, a research team from University of Cincinnati and Oregon State University found high levels of air pollution in heavily drilled areas of rural Carroll County, Ohio. Air monitors showed 32 different hydrocarbon-based air pollutants, including the carcinogens naphthalene and benzo[a]pyrene.The researchers plan additional monitoring and analysis.

•October 21, 2014 – Using a mobile laboratory designed by the National Oceanic and Atmospheric Administration, a research team from the University of Colorado at

Boulder, the NOAA Earth System Research Laboratory, and the Karlsruhe Institute of

Technology looked at air pollution from drilling and fracking operations in Utah’s Uintah Basin. The researchers found that drilling and fracking emit prodigious amounts of volatile organic air pollutants, including benzene, toluene, and methane, all of which are precursors for ground-level ozone (smog). Multiple pieces of equipment on and off the well pad, including condensate tanks, compressors, dehydrators, and pumps, served as the sources of these emissions. This research shows that drilling and fracking activities are the cause of the extraordinarily high levels of winter smog in the remote Uintah basin— which regularly exceed air quality standards and rival that of downtown Los Angeles.

•October 2, 2014. – A joint investigation by InsideClimate News and the Center for Public Integrity found that toxic air emissions wafting from fracking waste pits in Texas are unmonitored and unregulated due to federal exemptions that classify oil and gas field waste as non-hazardous.

•October 1, 2014 – In a major paper published in Nature, an international team led by the National Oceanic and Atmospheric Administration demonstrated that exceptionally high emissions of volatile organic compounds (VOCs) explain how drilling and fracking operations in Utah’s Uintah Basin create extreme wintertime ozone events even in the absence of abundant ultraviolet light and water vapor, which are typically required to produce ground-level ozone (smog). Current air pollution trends in the United States are toward lower nitrogen oxides from urban sources and power generation, but increasing methane and VOCs from oil and gas extraction activities threaten to reverse decades of progress in attaining cleaner air. According to the study, the consequences for public health are “as yet unrecognized.”

•September 6, 2014 – As part of a comparative lifecycle analysis, a British team from the

University of Manchester found that of shale gas extracted via fracking in the United Kingdom would generate more smog than any other energy source evaluated (coal, conventional and liquefied gas, nuclear, wind, and solar). Leakage of vaporous organic compounds during the necessary removal of hydrogen sulfide gas, along with the venting of gas both during drilling and during the process of making the well ready for production, were major contributors. “In comparison to other technologies, shale gas has high [photochemical smog]. In the central case, it is worse than solar PV, offshore wind and nuclear power by factors of 3, 26 and 45, respectively. Even in the best case, wind and nuclear power are still preferable (by factors of 3.3 and 5.6 respectively).”

•September 2014 – ShaleTest Environmental Testing conducted ambient air quality tests and gas-finder infra-red video for several children’s play areas in North Texas that are located in close proximity to shale gas development. The results showed a large number of compounds detected above the Method Reporting Limit (the minimum quantity of the compound that can be confidently determined by the laboratory). Air sampling found three known/suspected carcinogens, and a number

of other compounds associated with significant health effects. Benzene results from Denton, Dish, and Fort Worth are particularly alarming since they exceeded the long-term ambient air limits set by the Texas Commission on Environmental Quality, and benzene is a known carcinogen.

“Benzene was found at all but one sampling location …. This is particularly noteworthy as benzene is a known carcinogen (based on evidence from studies in both people and lab animals), AND because it exceeds both the TCEQ ESL and AMCV.”

•August 24, 2014 – A Salt Lake City Tribune investigation found that evaporation from 14 fracking waste pits in western Colorado has added tons of toxic chemicals to Utah’s air in the last six years. Further, the company responsible operated with no permit, underreported its emissions and provided faulty data to regulators.

•August, 2014 – A four-part investigation by the San Antonio Express-News found that natural gas flaring in the Eagle Ford Shale in 2012 contributed more than 15,000 tons of volatile organic compounds and other contaminants to the air of southern Texas—which is roughly equivalent to the pollution that would be released annually by six oil refineries. No state or federal agency is tracking the emissions from individual flares.

•June 26, 2014 – Public health professionals at the Southwest Pennsylvania Environmental Health Project reported significant recurrent spikes in the amount of particulate matter in the air inside of residential homes located near drilling and fracking operations. Captured by indoor air monitors, the spikes tend to occur at night when stable atmospheric conditions hold particulate matter low to the ground. Director Raina Ripple emphasized that spikes in airborne particulate matter are likely to cause acute health impacts in community members. She added, “What the long-term effects are going to be, we’re not certain.” At this writing, researchers from Yale University and the University of Washington are working to collect and analyze more samples.

•May 8, 2014 – Researchers at the National Oceanic and Atmospheric Administration (NOAA) found high levels of methane leaks as well as benzene and smog-forming volatile organic compounds in the air over oil and gas drilling areas in Colorado. Researchers found methane emissions three times higher than previously estimated and benzene and volatile organic compound levels seven times higher than estimated by government agencies. The Denver Post noted that Colorado’s Front Range has failed to meet federal ozone air quality standards for years.16

•April 26, 2014 – A Texas jury awarded a family $2.8 million because, according to the lawsuit, a fracking company operating on property nearby had “created a ‘private nuisance’ by producing harmful air pollution and exposing [members of the affected family] to harmful emissions of volatile organic compounds, toxic air pollutants and diesel exhaust.” The family’s 11-year-old daughter became ill, and family members suffered a range of symptoms, including “nosebleeds, vision problems, nausea, rashes, blood pressure issues.”Because drilling did not occur on their property, the family had initially been unaware that their symptoms were caused by activities around them.

•April 16, 2014 – Reviewing the peer-review literature to date of “direct pertinence to the environmental public health and environmental exposure pathways,” a U.S. team of researchers concluded: “[a] number of studies suggest that shale gas development contributes to levels of ambient air concentrations known to be associated with increased risk of morbidity and mortality.”18

April 11, 2014 – A modeling study commissioned by the state of Texas made striking projections about worsening air quality in the Eagle Ford Shale. Findings included the possibility of a 281 percent increase in emissions of volatile organic compounds (VOCs). Some VOCs cause respiratory and neurological problems; others, like benzene, are also carcinogens. Another finding was that nitrogen oxides—which react with VOCs in sunlight to create ground-level ozone, the main component of smog—increased 69 percent during the peak ozone season.”

•March 29, 2014 – Scientists warn that current methods of collecting and analyzing emissions data do not accurately assess health risks. Researchers with the Southwest Pennsylvania Environmental Health Project showed that methods do not adequately measure the intensity, frequency or durations of community exposure to the toxic chemicals routinely released from drilling and fracking activities. They found that exposures may be underestimated by an order of magnitude, mixtures of chemicals are not taken into account, and local weather conditions and vulnerable populations are ignored.

•March 27, 2014 – University of Texas research pointed to “potentially false assurances” in response to community health concerns in shale gas development areas. Dramatic shortcomings in air pollution monitoring to date include no accounting for cumulative toxic emissions or children’s exposures during critical developmental stages, and the potential interactive effects of mixtures of chemicals. Chemical mixtures of concern include benzene, toluene, ethylbenzene, and xylenes.21

•March 13, 2014 – Volatile organic compounds (VOCs) emitted in Utah's heavily drilled Uintah Basin led to 39 winter days exceeding the EPA's eight-hour National Ambient Air Quality Standards level for ozone pollutants the previous winter. "Levels above this threshold are considered to be harmful to human health, and high levels of ozone are known to cause respiratory distress and be responsible for an estimated 5,000 premature deaths in the U.S. per year," according to researchers at the University of Colorado. Their observations "reveal a strong causal link between oil and gas emissions, accumulation of air toxics, and significant production of ozone in the atmospheric surface layer." Researchers estimated that total annual VOC emissions at the fracking sites are equivalent to those of about 100 million cars.

•March 3, 2014 – In a report summarizing "the current understanding of local and regional air quality impacts of natural gas extraction, production, and use," a group of researchers from the NOAA, Stanford, Duke, and other institutions described what is known and unknown with regard to air emissions including greenhouse gases, ozone precursors (volatile organic compounds and nitrogen oxides), air toxics, and particulates. Crystalline

silica was also discussed, including as a concern for people living near well pads and production staging areas.

February 18, 2014 – An eight-month investigation by the Weather Channel, Center for Public Integrity and InsideClimate News into fracking in the Eagle Ford Shale in Texas revealed that fracking is "releasing a toxic soup of chemicals into the air." They noted very poor monitoring by the state of Texas and reported on hundreds of air complaints filed relating to air pollution associated with fracking.

•December 18, 2013 – An interdisciplinary group of researchers in Texas collected air samples in residential areas near shale gas extraction and production, going beyond previous Barnett Shale studies by including emissions from the whole range of production equipment. They found that most areas had "atmospheric methane concentrations considerably higher than reported urban background concentrations," and many toxic chemicals were "strongly associated" with compressor stations.

•December 10, 2013 – Health department testing at fracking sites in West Virginia revealed dangerous levels of benzene in the air. Wheeling-Ohio County Health

Department Administrator Howard Gamble stated, "The levels of benzene really pop out. The amounts they were seeing were at levels of concern. The concerns of the public are validated."

•October 11, 2013 – Air sampling before, during, and after drilling and fracking of a new natural gas well pad in rural western Colorado documented the presence of the toxic solvent methylene chloride, along with several polycyclic aromatic hydrocarbons (PAHs) at "concentrations greater than those at which prenatally exposed children in urban studies had lower developmental and IQ scores."

•September 19, 2013 – In Texas, air monitoring data in the Eagle Ford Shale area revealed potentially dangerous exposures of nearby residents to hazardous air pollutants, including cancer-causing benzene and the neurological toxicant, hydrogen sulfide.

•September 13, 2013 – A study by researchers at the University of California at Irvine found dangerous levels of volatile organic compounds in Canada's "Industrial Heartland" where there are more than 40 oil, gas and chemical facilities. The researchers noted high levels of hematopoietic cancers (leukemia and non-Hodgkin's lymphoma) in men who live closer to the facilities.

•April 29, 2013 – Using American Lung Association data, researchers with the

Environmental Defense Fund determined that air quality in rural areas with fracking was worse than air quality in urban areas.

•March, 2013 – A review of regional air quality damages in parts of Pennsylvania in 2012 from Marcellus Shale development found that air pollution was a significant concern, with regional damages ranging from $7.2 to $32 million dollars in 2011.

•February 27, 2013 – In a letter from Concerned Health Professionals of New York to Governor Andrew Cuomo, a coalition of hundreds of health organizations, scientists, medical experts, elected officials and environmental organizations noted serious health concerns about the prospects of fracking in New York State, making specific note of air pollution.Signatory organizations included the American Academy of Pediatrics of New York, the American Lung Association of New York and Physicians for Social Responsibility. The New York State Medical Society, representing 30,000

medical professionals, has issued similar statements.

•January 2, 2013 – A NOAA study identified emissions from oil and gas fields in Utah as a significant source of pollutants that contribute to ozone problems.Exposure to

elevated levels of ground-level ozone is known to worsen asthma and has been linked to respiratory illnesses and increased risk of stroke and heart attack.

December 3, 2012 – A study linked a single well pad in Colorado to more than 50 airborne chemicals, 44 of which have known health effects.

•July 18, 2012 – A study by the Houston Advanced Research Center modeled ozone formation from a natural gas processing facility using accepted emissions estimates and showed that regular operations could significantly raise levels of ground-level ozone (smog) in the Barnett Shale in Texas and that gas flaring further contributed to ozone levels.

•March 19, 2012 – A Colorado School of Public Health study found air pollutants near fracking sites linked to neurological and respiratory problems and cancer.41 The study, based on three years of monitoring at Colorado sites, found a number of "potentially toxic petroleum hydrocarbons in the air near gas wells including benzene, ethylbenzene, toluene and xylene." Lisa McKenzie, PhD, MPH, lead author of the study and research associate at the Colorado School of Public Health, said, "Our data show that it is important to include air pollution in the national dialogue on natural gas development that has focused largely on water exposures to hydraulic fracturing."

•December 12, 2011 – Cancer specialists, cancer advocacy organizations, and health organizations summarized the cancer risks posed by all stages of the shale gas extraction process in a letter to New York Governor Andrew Cuomo.

•October 5, 2011 – More than 250 medical experts and health organizations reviewed the multiple health risks from fracking in a letter sent to New York Governor Andrew Cuomo.

•April 21, 2011 – Environment Energy (EE) reported that ozone levels exceeding federal health standards in Utah's Uintah Basin, as well as wintertime ozone problems in other parts of the Intermountain West, stem from oil and gas extraction. Levels reached nearly twice the federal standard, potentially dangerous even for healthy adults to breathe. Keith Guille, spokesman for the Wyoming Department of Environmental Quality, said, "We recognize that definitely the main contributor to the emissions that are out there is the oil and gas industry…."

•March 8, 2011 – The Associated Press reported that gas drilling in some remote areas of Wyoming caused a decline of air quality from pristine mountain air to levels of smog and pollution worse than Los Angeles on its worst days, resulting in residents complaining of watery eyes, shortness of breath and bloody noses.

•November 18, 2010 – A study of air quality in the Haynesville Shale region of east Texas, northern Louisiana, and southwestern Arkansas found that shale oil and gas extraction activities contributed significantly to ground-level ozone (smog) via high emissions of ozone precursors, including volatile organic compounds and nitrogen oxides.Ozone is a key risk factor for asthma and other respiratory and cardiovascular illnesses.

•September, 2010 – A health assessment by the Colorado School of Public Health for gas development in Garfield County, Colorado determined that air pollution will likely "be high enough to cause short-term and long-term disease, especially for residents living

near gas wells. Health effects may include respiratory disease, neurological problems, birth defects and cancer."

January 27, 2010 – Of 94 drilling sites tested for benzene in air over the Barnett Shale, the Texas Commission on Environmental Quality (TECQ) discovered two well sites emitting what they determined to be "extremely high levels" and another 19 emitting elevated levels.

End of Part II.

Part III of the NY Compendium.

Water contamination

•November 27, 2014 – An interdisciplinary team of researchers found methane contamination in drinking water wells located in eight areas above the Marcellus Shale in Pennsylvania and the Barnett Shale in Texas, with evidence of declining water quality in the Barnett Shale area. By analyzing noble gases and their isotopes (helium, neon, argon), the investigators were able to isolate the origin of the fugitive methane in drinking water. The results implicate leaks through cement well casings as well as via naturally occurring cracks and fissures in the surrounding rock.55 In a related editorial, one of the study's authors, Robert Jackson, called on the EPA to re-open its aborted investigation into drinking water contamination in heavily fracked areas of Texas. Jackson also emphasized that methane migration through unseen cracks in the rock surrounding the wellbore "raises the interesting possibility that a drilling company could follow procedures — cementing and casing below the local aquifer — and still create a potential pathway for gas to migrate into drinking water."56

•November 3, 2014 – The West Virginia Department of Environmental Protection confirmed that three private drinking water wells were contaminated when Antero Resources mistakenly drilled into one of its own gas wells. Benzene, a human carcinogen, and toluene, a reproductive toxicant, were detected in the drinking water at concentrations four times the legal maximum limit. Additionally, a nearby abandoned gas

well, a drinking water well, and an actively producing gas well were all pressurized as a result of the mishap and began exhibiting "artesian flow."

October 22, 2014 – A follow-up to the August 2014 Environmental Integrity Project report describes an even greater potential public health threat from a loophole in the Safe Drinking Water Act, wherein companies are allowed to inject other petroleum products (beyond diesel) without a permit, and many of these non-diesel drilling fluids contain even higher concentrations of the same toxins found in diesel. The authors recommend that "EPA should revisit its guidance and broaden the categories of diesel products that require Safe Drinking Water Act permits before they can be injected into oil and gas wells."

•October 20, 2014 – While developing a technique to fingerprint and trace accidental releases of hydraulic fracturing fluids, researchers showed that liquid waste from shale gas fracking operations is chemically different than waste flowing out of conventional wells. The researchers hypothesized that the hydraulic fracturing process itself liberates elements from clay minerals in the shale formations, including boron and lithium, which then enter the liquid waste.

•October 15, 2014 – Four thousand gallons of liquid fracking waste dumped into Waynesburg sewer system was discovered by sewage treatment plant workers in Greene County, Pennsylvania. The Department of Environmental Protection surmised that "someone removed a manhole cover in a remote location and dumped the fluid." The treatment plant discharges into a creek that feeds the Monongahela River, which provides drinking water to more than 800,000 people.

•October 6, 2014 – A state investigation that found no fracking-related water contamination in a drinking water well in Pennsylvania's Washington County was invalidated by testimony presented to the state Environmental Hearing Board. Not all contaminants that were present in the water were reported, and the investigation relied on obsolete testing methods. More sophisticated testing revealed the presence of several chemical contaminants in the well water. The well is located 2,800 feet down gradient

from a drilling site and fracking waste pit where multiple spills and leaks more than four years earlier had contaminated two springs.

September 23, 2014 – In a two-part audit of records, the U.S. Government Accountability Office (GAO) found that the EPA is failing to protect U.S. drinking water sources from fracking-related activities such as waste disposal via injection wells. Nationwide, 172,000 injection wells accept fracking waste; some are known to have contaminated drinking water. And yet, both short-term and long-term monitoring is lax, and record-keeping varies widely from state to state. The EPA neither mandates nor recommends a fixed list of chemicals for monitoring on the grounds that "injection fluids can vary widely in composition and contain different naturally occurring chemicals and fluids used in oil and gas production depending on the source of the injection fluid." Disposal of oil and gas waste via injection wells is, in fact, subject to regulation under the Safe Drinking Water Act, but, in practice, no one knows exactly what the waste contains, and regulations are deficient. In the United States, at least two billion gallons of fluids are injected into the ground each day to enable oil and gas extraction via fracking or to dispose of liquid waste from fracking operations.

•September 18, 2014 – Range Resources was fined a record $4.5 million by the Pennsylvania Department of Environmental Protection for contaminating groundwater. The culprits were six leaking pits in Washington County that each held millions of gallons of fracking wastewater.

•September 12, 2014 – A Pennsylvania State ecosystems scientist, together with U.S. Geological Survey scientists, reviewed the current knowledge of the effects of fracking and its associated operations on terrestrial and aquatic ecosystems in 20 shale plays in the U.S. Findings of species and habitats at highest risk include (in addition to land-based examples) vernal pond inhabitants and stream biota. The research builds on previous reviews identifying “three main potential stressors to surface waters: changes in water quantity (hydrology), sedimentation, and water quality.” Researchers determined that there are no published data specifically on the effects of fracking on forest-dwelling amphibians, but “many species breed in vernal ponds which are negatively affected by changes in water quantity and quality and direct disturbance. Many amphibians are also highly sensitive to road salts.” Given that the U.S. EPA recently found 55% of all rivers and streams to be in poor condition, these researchers warned, “Large-scale development of shale resources might increase these percentages.” They expressed concern for the native range of brook trout by the cumulative effects of shale development, especially in Pennsylvania.

•September 9, 2014 – A research team from Stanford and Duke Universities discovered that fracking wastewater processed by sewage treatment plants contributes to the formation of carcinogenic chemical byproducts. These raise public health risks when downstream surface water is used for drinking. Even when fracking wastewater was diluted by a factor of 10,000, the bromides and iodides in the waste reacted with organic matter to create highly toxic halogenated compounds—at troublingly high concentrations. These toxic compounds are not filterable by municipal wastewater treatment plants. Halogenated disinfection byproducts in drinking water are linked to both colon and bladder cancers.

•August 29, 2014 – A review of Pennsylvania Department of Environmental Protection files on fracking-related damage to drinking water—which are kept on paper and stored in regional offices—revealed that 243 private water supplies in 22 counties had been contaminated or had lost flow and dried up as a result of nearby drilling and fracking operations in the past seven years. Pollutants included methane, metals, and salts as well as carbon-based compounds (ethylene glycol and 2-butoxyethanol) that are known to be constituents of fracking fluid. As reported by the Pittsburgh Post-Gazette, this tally— which came as a response to multiple lawsuits and open-records requests by media sources—was the first time the agency “explicitly linked a drilling operation to the presence of industrial chemicals in drinking water.”

•August 13, 2014 – Over the last decade, drilling companies have repeatedly claimed they are no longer using diesel fuel in fracking, although a 2011 investigation by U.S. House Democrats concluded otherwise. The Environmental Integrity Project examined disclosure data submitted to FracFocus and identified at least 351 wells in 12 states that have been fracked over the last four years with one or more of the five prohibited products identified as diesel. EIP researchers also discovered numerous fracking fluids

with high diesel content for sale online, including over a dozen products sold by Halliburton and advertised as additives, friction reducers, emulsifiers, etc.

August 13, 2014 – An international team of researchers found high levels of carbonbased compounds in liquid fracking waste. These impurities can react with chlorine and bromine to create toxic byproducts. This study suggests that chemical treatment of liquid fracking waste will magnify its toxic potency, as will reusing and recycling it.

•August 13, 2014 – A team from Lawrence Berkeley National Laboratory reported that scientific efforts to understand the hazards of fracking continue to be hampered by industry secrecy. A comprehensive examination of the chemical formulations of fracking fluid—whose precise ingredients are protected as proprietary business information— revealed that no publicly available toxicity or physical chemical information was available for one-third of all the fracking chemicals surveyed. Another ten percent of chemicals, including biocides and corrosion inhibitors, were known to be toxic to mammals.73

•August 12, 2014 – A Stanford University research team working in the Pavillion gas basin in Wyoming documented that fracking in shallow layers of bedrock, including those that serve as drinking water aquifers, is not uncommon. This finding overturns the industry claim that oil and gas deposits targeted by fracking operations are located at much greater depths than underground drinking water sources and are isolated from them by hundreds of feet of impermeable rock. Because it is exempt from provisions of the Safe Drinking Water Act, fracking in drinking water aquifers is not prohibited by law.

•August 3, 2014 – An investigation by the Pittsburgh Post-Gazette found that half of all fracking-related spills that resulted in violations and fines were not discovered by the gas companies themselves, even though Pennsylvania state law requires them to pro-actively seek and report such incidents. The newspaper's analysis of hundreds of thousands of state and company documents showed that self-regulation in the gas fields is a failure.

One third of all spills were discovered by state inspectors, while one-sixth were found by residents. Likely, much contamination is entirely undetected and unreported.

•July 21, 2014 – An investigation by the Columbus Dispatch showed that Halliburton delayed disclosure to federal and state EPA agencies of the full list of chemicals that spilled into a creek following a fire on a its well pad in Monroe County, Ohio. Although the creek is an important supply of drinking water for downstream communities and the spill precipitated a mass die-off of fish and other aquatic wildlife, five full days passed before EPA officials were provided a full inventory of chemicals used at Halliburton's operation. As a result, the public was denied knowledge of potential chemical exposures.

•July 17, 2014 – A team of environmental scientists, biologists, and engineers, from institutions including the University of Michigan and McGill University, assessed the current state of understanding of the impact fracking and its associated activities have on the ecological health of surface waters. Though various approaches such as geographic information systems and site monitoring provide insights into potential risks to aquatic ecosystems, the authors concluded that inadequate data currently exist. They identified possible outcomes such as, "erosion and sedimentation, increased risk to aquatic ecosystems from chemical spills or runoff, habitat fragmentation, loss of stream riparian zones, altered biogeochemical cycling, and reduction of available surface and hyporheic water volumes because of withdrawal-induced lowering of local groundwater levels."

•July 7, 2014 – California Department of Gas, Oil, and Geothermal Resources ordered seven energy companies to stop injecting liquid fracking waste into aquifers. The ongoing drought that has compelled farmers to supplement irrigation with water drawn from groundwater sources prompted state officials to look at the status of aquifers previously considered too deep for use or too poor in quality. They discovered that at least seven injection wells were very likely pumping liquid fracking waste into protected groundwater supplies rather than aquifers that had been sacrificed for the purpose of waste disposal. Across the United States, more than 1000 aquifers are exempt from any form of pollution protection at all, and many of these are in California, according to a related ProPublica investigation.

•June 25, 2014 – A study by Cornell University researchers found that fracking fluid and fracking wastewater mobilized previously deposited chemical contaminants in soil particles in ways that could potentially exacerbate the impacts of fracking fluid spills or leaks. That research team concluded that, by interfering with the ability of soil to bond to and sequester pollutants such as heavy metals, fracking fluids may release from soils an additional repository of contaminants that could migrate into groundwater.

•June 23, 2014 – Building on earlier findings that water samples collected from sites with confirmed fracking spills in Garfield County, Colorado exhibited moderate to high levels of estrogen and androgen-disrupting activity, a University of Missouri team extended their investigation to other types of hormonal effects. As reported at a joint meeting of the International Society of Endocrinology and the Endocrine Society, their research documented that commonly used fracking chemicals can also block the receptors for thyroid hormone, progesterone, and glucocorticoids (a family of hormones involved in both fertility and immune functioning). Of 24 fracking chemicals tested, all 24 interfered with the activity of one or more important hormone receptors. There is no known safe level of exposure to hormone-disrupting chemicals.

•May 11, 2014 – According to the U.S. Government Accountability Office, the federal government is failing to inspect thousands of oil and gas wells located on public land, including those that pose special risks of water contamination or other environmental damage. An investigation by the Associated Press found that the Bureau of Land Management (BLM) "had failed to conduct inspections on more than 2,100 of the 3,702 wells that it had specified as 'high priority' and drilled from 2009 through 2012. The agency considers a well 'high priority' based on a greater need to protect against possible water contamination and other environmental safety issues."

•May 4, 2012 – A report for the Canadian Government, released under the Access to Information Act, reviewed the process, the regulatory framework globally, the health hazards related to water and air contamination, and evaluated sub-processes for potential impacts, risks, regulations, and summarized

the data knowledge and data gaps. Regarding water contamination, the report determined, “Although quantitative data are lacking, the qualitative data available indicate that potential contamination of water related to the shale gas industry may present hazard to the public health, especially for local population.” And, “it can be concluded that air emissions related to the shale gas industry present health hazards since the air pollutants originating from the vehicles and engines fuelled by diesel are toxic to the respiratory and cardiovascular systems and can cause premature mortality, volatile organic compounds have been associated to neurotoxicity and some of these compounds (e.g. benzene) as well as NORMs are known or possible human carcinogens.” The report concluded, “Any step of shale gas

exploration/exploitation may represent a potential source of drinking water and air contamination; Hydraulic fracturing and wastewater disposal were identified as the main potential sources of risk.”

•March 25, 2014 – An industry-funded study of oil and gas well integrity found that more than six percent of wells in a major shale exploration region in Pennsylvania showed evidence of leaking and conceded that this number is likely an underestimate. Researchers concluded that the percentage of wells with some form of well barrier or integrity failure is highly variable and could be as high as 75 percent. A separate analysis in the same study found 85 examples of cement or casing failures in Pennsylvania wells monitored between 2008 and 2011.

•March 7, 2014 – In a comprehensive evaluation, Duke University scientists and colleagues reviewed the state of knowledge on possible effects of shale gas and hydraulic fracturing on water resources in the United States and concluded, “Analysis of published data (through January 2014) reveals evidence for stray gas contamination, surface water impacts in areas of intensive shale gas development, and the accumulation of radium isotopes in some disposal and spill sites.”

•February 19, 2014 – A Pennsylvania court found a gas corporation guilty of contaminating a woman’s drinking water well in Bradford County. Methane levels after fracking were 1,300 to 2,000 times higher than baseline, according to the court brief. Iron levels and turbidity had also increased. The brief stated, “In short, Jacqueline Place lived for ten months deprived totally of the use of her well, and even after its ‘restoration,’ has been burdened with a water supply with chronic contamination, requiring constant vigilance and ongoing monitoring.”

•January 16, 2014 – Data from the Colorado Oil and Gas Commission showed that fracking-related chemical spills in Colorado exceed an average rate of one spill per day.

Of the 495 chemical spills that occurred in that state over a one-year period of time, nearly a quarter impacted ground or surface water. Sixty-three of the spills spread within 1,500 feet of pigs, sheep and cows, and 225 spread within 1,500 feet of buildings.

•January 10, 2014 – Duke University water tests revealed ongoing water contamination in Parker County, Texas, providing evidence that EPA had prematurely ended its prior investigation into the water contamination.A letter sent to the EPA from more than 200 environmental organizations called on the EPA to re-open its investigation.88

•January 5, 2014 – An Associated Press investigation into drinking water contamination from fracking in four states—Pennsylvania, Ohio, West Virginia and Texas—found many cases of confirmed water contamination and hundreds more complaints. The Associated Press noted that their analysis “casts doubt on industry view that it rarely happens.”8

•December 24, 2013 – A report from the EPA Inspector General concluded that evidence of fracking-related water contamination in Parker County, Texas was sound and faulted the EPA for prematurely ending its investigation there, relying on faulty water testing data from the gas industry in doing so, and failure to intervene when affected residents’ drinking water remained unsafe.As reported by Business Insider, “The EPA Screwed Up When It Dropped This Fracking Investigation.”

•December 16, 2013 – Lead by Susan Nagel of the University of Missouri School of Medicine, researchers documented endocrine-disrupting properties in chemicals commonly used as ingredients of fracking fluid and found similar endocrine-disrupting activity in groundwater and surface water samples collected near drilling and fracking sites in Garfield County, Colorado. Endocrine disruptors are chemicals that interfere with the activity of hormones in the body and, at very low concentrations, can raise the risk of reproductive, metabolic, and neurological disorders, especially when exposures occur in early life.

•December 7, 2013 – Reporting on the second gas leak at a single gas well in one month, the Fort Worth Star-Telegram uncovered another inherent risk of fracking for groundwater contamination: Silica sand, which is used as an ingredient in fracking fluid for its ability to prop open the shale

fractures, can damage steel pipes as it flows back up the well along with the gas. According to Dan Hill, head of the petroleum engineering department at Texas AM University, new wells are the most susceptible to sand erosion because “the amount of sand and gas rushing through valves and flow lines is at its greatest when a well first goes into production.”

•November 28, 2013 – An Associated Press investigation uncovered nearly 300 oil pipeline spills in North Dakota in the previous ten months, all with no public notification. These were among some 750 “oil field incidents” that had occurred in the state over the same time period, also without public notification. Until the AP inquiry, industry and state officials had kept quiet about one particular “massive spill” that had been accidentally discovered by a wheat farmer. Even small spills can contaminate water sources permanently and take cropland out of production.

•November 26, 2013 – A U.S. Geological Survey report found serious impacts of fracking on watersheds and water quality throughout the Appalachian Basin, as well as issues with radiation and seismic events. As noted in the report, the knowledge of how extraction affects water resources has not kept pace with the technology.Meanwhile, clean fresh water is becoming an increasingly scant resource. A report from the U.S. State

Department found that the United States will face a serious freshwater shortage by 2030, with demand exceeding supply by 40 percent.

•November 22, 2013 – A U.S. Geological Survey study of pollution from oil production in North Dakota, where horizontal drilling and hydraulic fracturing are heavily used, identified two potential plumes of groundwater contamination covering 12 square miles. The cause was traced to a casing failure in a wastewater disposal well. Drilling companies had incorrectly assumed that, once injected underground, the wastewater would remain contained. According to EnergyWire, the development of the Bakken oil formation is “leaving behind an imprint on the land as distinct as the ones left by the receding ice sheets of the ice age.”

•September 10, 2013 – Pennsylvania Attorney General Kathleen Kane filed criminal charges against Exxon Mobil Corporation’s subsidiary, XTO Energy Corporation, for a spill of 50,000 gallons of toxic drilling wastewater in 2010 that contaminated a spring and a tributary of the Susquehanna River. In July, XTO settled civil charges for the incident without admitting liability by agreeing to pay a $100,000 fine and improve its wastewater management.101

•September 10, 2013 – Out of concern for risks posed to drinking water in the nation’s capital, George Hawkins, general manager of DC Water, Washington, DC’s local water provider, called for a prohibition on horizontal drilling and hydraulic fracturing in the George Washington National Forest until the process can be proven safe.The Potomac River is the source of the District’s water supply and has its headwaters in the George Washington National Forest, which sits atop the Marcellus Shale. The general managers of Fairfax Water, provider of drinking water for Fairfax County, Virginia, and the U.S. Army Corps of Engineers have called for a similar prohibition.

•September 3, 2013 – The North Dakota Department of Mineral Resources voiced concern about an increasing number of fracking well blowouts (23 incidents in the past year) that result in spills and public safety threats.

•August 28, 2013 – A joint U.S. Geological Survey and U.S. Fish and Wildlife Service study documented a causal link between a fracking wastewater spill and the widespread death of fish in the Acorn Fork, a creek in Kentucky.

•July 25, 2013 – A University of Texas at Arlington study of drinking water found elevated levels of arsenic and other heavy metals in some samples from private drinking water wells located within five kilometers of active natural gas wells in the Barnett Shale.

•July 3, 2013 – ProPublica reported that the EPA was wrong to have halted its investigation of water contamination in Wyoming, Texas and Pennsylvania—where high levels of benzene, methane, arsenic, oil, methane, copper, vanadium and other chemicals associated with fracking operations have been documented.Although numerous organizations and health professionals around the country have since called on the agency to resume its investigation, no action has been taken.

•June 6, 2013 – Bloomberg News reported,

In cases from Wyoming to Arkansas, Pennsylvania to Texas, drillers have agreed to cash settlements or property buyouts with people who say hydraulic fracturing, also known as fracking, ruined their water according to a review by Bloomberg News of hundreds of regulatory and legal filings. In most cases homeowners must agree to keep quiet. The strategy keeps data from regulators, policymakers,

the news media and health researchers, and makes it difficult to challenge the industry's claim that fracking has never tainted anyone's water.

Bloomberg quoted Aaron Bernstein, associate director of the Center for Health and the Global Environment at the Harvard School of Public Health, saying that non-disclosure agreements "have interfered with the ability of scientists and public health experts to understand what is at stake here."The EPA also long ago noted how non-disclosure agreements challenge scientific progress and keep examples of drilling harm secret from the public. In a 1987 report, the EPA wrote,

Very often damage claims against oil and gas operators are settled out of court, and information on known damage cases has often been sealed through agreements between landowners and oil companies. This is typical practice, for instance, in Texas.In some cases, even the records of well-publicized damage incidents are almost entirely unavailable for review. In addition to concealing the nature and size of any settlement entered into between the parties, impoundment curtails access to scientific and administrative documentation of the incident.

•June 3, 2013 – A study by Duke University researchers linked fracking with elevated levels of methane, ethane, and propane in nearby groundwater.Published in Proceedings of the National Academy of Sciences, the study included results from 141 northeastern Pennsylvania water wells. Methane levels were, on average, six times higher in drinking water wells closer to drilling sites when compared with those farther away, while ethane was 23 times higher.

•May 19, 2013 – In Pennsylvania, the Scranton Times-Tribune released details of an investigation that revealed at least 161 cases of water contamination from fracking between 2008 and the fall of 2012, according to state Department of Environmental Protection records.

•April 2013 – Researchers analyzing publicly available Colorado data found 77 surface spills impacting groundwater in Weld County alone. Samples of these spills often exceeded drinking water maximum contaminant levels (MCLs) for benzene, toluene, ethylbenzene and xylene; for benzene, a known carcinogen, 90% of the samples exceeded the legal limit.

•March 4, 2013 – Researchers at the University of Pittsburgh Graduate School of Public Health analyzed samples of gas drilling wastewater discharged to surface water through wastewater treatment plants. Barium, strontium, bromides, chlorides, and benzene all exceeded levels known to cause human health impacts.

•December 9, 2012 – State data in Colorado showed more than 350 instances of groundwater contamination resulting from more than 2,000 spills from oil and gas operations over the past five years. Further, as the Denver Post reported, "Contamination

of groundwater—along with air emissions, truck traffic and changed landscapes—has spurred public concerns about drilling along Colorado's Front Range."

•May, 2012 – A report by researchers at Natural Resources Defense Council and Carnegie Mellon University found that the options available for dealing with fracking wastewater are inadequate to protect public health and the environment, resulting in increasing quantities of toxic wastewater as an ongoing problem without a good solution.

•January 11, 2012 – The U.S. Geological Survey found that the Marcellus Shale is already highly fractured and that numerous fissures naturally occurring within the formation could potentially provide pathways for contaminants to migrate vertically into water supplies.

•October 17, 2011 – Thomas P. Jacobus, General Manager of the U.S. Army Corps of Engineers' Washington Aqueduct, that provides drinking water to Washington, DC, Arlington County, Virginia, and Falls Church, Virginia, called for a prohibition on horizontal hydraulic fracturing in the George Washington National Forest because of concern that fracking poses risks to drinking water.The Washington Aqueduct—which provides drinking water to Washington, DC, Arlington County, Virginia, and Falls Church, Virginia—is supplied by the Potomac River, which has its headwaters in the George Washington National Forest that sits atop the Marcellus Shale. Jacobus said, "Enough study on the technique [hydraulic fracturing] has been published to give us great cause for concern about the potential for degradation of the quality of our raw water supply…."

•October 11, 2011 – Charles M. Murray, General Manager of Fairfax Water, the water provider for Fairfax County, Virginia, called for a prohibition on horizontal hydraulic fracturing in the George Washington National Forest. "Natural gas development activities have the potential to impact the quantity and quality of Fairfax Water's source water," Murray wrote. "Downstream water users and consumers will bear the economic burden if drinking water sources are contaminated or the quality of

our source water supply is degraded."

•September 7, 2011 – In its draft Supplemental Generic Environmental Impact Statement (SGEIS), the NYS DEC acknowledged that "there is questionable available capacity"for New York's public sewage treatment plants to accept drilling wastewater, yet the agency said that it would allow those facilities to accept such waste if the plants meet permitting conditions.The NYS DEC proposed underground injection as one alternative to sewage treatment procession of fracking waste. Although it is a common method of disposal for fracking wastewater,the last significant government study of pollution risks from oil and gas wastewater injection wells occurred in 1989 and found multiple cases of costly groundwater contamination.In subsequent years, studies have continued to link underground injection of drilling wastewater to pollution as well as earthquakes.

•September, 2011 – A team led by Theo Colburn of the Endocrine Disruptor Exchange found that 25 percent of chemicals known to be used in fracking fluids are implicated in cancer, 37 percent could disrupt the endocrine system, and 40 to 50 percent could cause nervous, immune and cardiovascular system problems. The research team also found that more than 75 percent could affect the skin, eyes and respiratory system, resulting in various problems such as skin and eye irritation or flu-like symptoms.

•August 4, 2011 – As reported by The New York Times, the EPA had alerted Congress in

1987 about a case of water contamination caused by fracking. Its report documented that

a shale gas well hydraulically fractured at a depth of more than 4,200 feet contaminated a water supply only 400 feet from the surface.

•May 17, 2011 – The state of Pennsylvania fined Chesapeake Energy Corp. $900,000 for an incident in which improper cementing and casing in one of the company's gas wells allowed methane to migrate underground and contaminate 16 private drinking water wells in Bradford County.

•May 9, 2011 – A Duke University study documented "systematic evidence for methane contamination of drinking water associated with shale gas extraction." The study showed that methane levels were 17 times higher in water wells near drilling sites than in water wells in areas without active drilling.

•April 18, 2011 – As part of a year-long investigation into hydraulic fracturing and its potential impact on water quality, U.S. Representatives Henry Waxman (D-Calif.), Edward Markey (D-Mass.) and Diana DeGette (D-Colo.) released the second of two reports issued in 2011.Their analysis of hydraulic fracturing fluids used by the 14 leading oil and natural gas service companies between 2005 and 2009 found, among other things, that the companies used more than 650 different products that contained chemicals that are known or possible human carcinogens, regulated under the Safe Drinking Water Act, or listed as hazardous air pollutants under the Clean Air Act. The report also showed that "between 2005 and 2009, the companies used 94 million gallons of 279 products that contained at least one chemical or component that the manufacturers deemed proprietary or a trade secret … in most cases the companies stated that they did not have access to proprietary information about products they purchased 'off the shelf' from chemical suppliers.In these cases, the companies are injecting fluids containing chemicals that they themselves cannot identify." These findings were reported in the New York Times.

January 2011 – A team of scientists led by a University of Central Arkansas researcher called attention to the threat posed to surface waters by rapidly expanding shale gas development, noting a lack of data collection accompanying the rush to drill. "Gas wells are often close to surface waters that could be impacted by elevated sediment runoff from pipelines and roads, alteration of stream flow as a result of water extraction, and contamination from introduced chemicals or the resulting wastewater." In October, after receiving new information from two companies, the members of Congress updated their findings to show that "between 2005 and 2009, oil and gas service companies injected 32.7 million gallons of diesel fuel or hydraulic fracturing fluids containing diesel fuel in wells in 20 states."

•April 29, 2010 – In 2010, the Colorado Oil and Gas Conservation Commission fined OXY USA a record $390,000 for an incident of pollution, discovered in 2008, when its drilling wastes leaked through an unlined pit, contaminated two springs with benzene and polluted other nearby water sources. In addition, the regulators separately fined OXY USA $257,400 for a nearby case of pollution, also discovered in 2008, in which a torn liner in a pit caused drilling waste fluids to leak out and contaminate two springs with benzene.

•April 22, 2011 – Describing one of many blowouts, the Associated Press reported on a shale gas

well in Canton, Pennsylvania that spewed thousands of gallons of chemicallaced water on farmland and into a stream for two consecutive days before being brought under control.

•January 31, 2011 – As part of a year-long investigation into hydraulic fracturing and its potential impact on water quality, U.S. Representatives Henry Waxman (D-Calif.), Edward Markey (D-Mass.) and Diana DeGette (D-Colo.) reported that "between 2005 and 2009, oil and gas service companies injected 32.2 million gallons of diesel fuel or hydraulic fracturing fluids containing diesel fuel in wells in 19 states." Furthermore, revealing apparent widespread violation of the Safe Drinking Water Act, the investigation found that no oil and gas service companies had sought—and no state or federal regulators had issued—permits for the use of diesel fuel in hydraulic fracturing.

•June 5, 2009 – A leaking pipe carrying fracking waste in Washington County, Pennsylvania, polluted a tributary of Cross Creek Lake, killing fish, salamanders, crayfish and aquatic insect life in approximately three-quarters of a mile of the stream.

•April 26, 2009 – Officials in three states linked water contamination and methane leaks to gas drilling. Incidents included a case in Ohio where a house exploded after gas seeped into its water well and multiple cases of exploding drinking water wells in Dimock, PA.

•November 13, 2008 – ProPublica reported more than 1,000 cases of drilling-related contamination documented by courts and state and local governments in Colorado, New Mexico, Alabama, Ohio and Pennsylvania.140

•December 15, 2007 – In Bainbridge, Ohio, a gas well that was improperly cemented and subsequently fractured by Ohio Valley Energy Systems Corp. allowed natural gas to migrate outside of the well, causing a home to explode. In addition, 23 nearby water wells were contaminated, two of which were located more than 2,300 feet from the drilling site.

End of Part III.

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Part IV of the NY compendium:

Inherent engineering problems that worsen with time

•December 2, 2014 – Problems with structural integrity have been documented in a well at the only hydraulically fractured site in the United Kingdom. Email messages obtained under freedom of information laws reveal that problems with wellbore integrity emerged in April of 2014 and attempts were made to remediate the problem, although nothing was reported at that time to regulators. The drilling company, Cuadrilla Resources, continues to deny that any problems exist with the well, emphasizing that "no leak of fluids" occurred and that "the issue" was resolved during the abandonment process. Cuadrilla had previously been reprimanded for failing to disclose a more minor deformation in the

well casing. The well was abandoned at the end of last year, following two earthquakes in 2011, which scientists determined to have been caused by fracking at the site.

•August 11, 2014 – Researchers affiliated with multiple universities and with the Los Alamos National Laboratory summarized recent field observations of wellbore-integrity failure, concluding that, because at least some well failures are not identified, reported barrier failure rates of 1-10% of wells and reported rates of groundwater contamination of

0.01-0.1% of wells constitute a "lower bound" for possible environmental problems. Citing hydraulic fracturing, as well as temperature and pressure changes, as operations that can induce pathways for leaks, the authors point out that few studies have considered the very-long-term fate (">50 years") of wellbore systems. They include "whether unconventional resource development alters the frequency of well integrity failures" as a critical topic for future research.

•July 30, 2014 – Based on records obtained from Pennsylvania's Department of

Environmental Protection (PA-DEP), Scranton's Times-Tribune reported that five natural gas wells in Bradford County have leaked methane for years because of persistent casing and cement problems. In the most recent violation, a PA-DEP inspector found combustible gas flowing through vents connected to the cement between layers of pipe. The department issued a notice of violation for each

well, saying combustible gas outside the well's surface casing violates state regulations. Each of the wells has four layers of steel casing, but nothing prevents leaking (stray) methane from flowing into the atmosphere. No evidence of water contamination has yet been seen. None of the wells have produced any gas for sale.

•June 30, 2014 – A study published in Proceedings of the National Academy of Sciences by a Cornell University research team projected that over 40 percent of shale gas wells in Northeastern Pennsylvania will leak methane into groundwater or the atmosphere over time. Analyzing more than 75,000 state inspections of more than 41,000 oil and gas wells in Pennsylvania since 2000, the researchers identified high occurrences of casing and cement impairments inside and outside the wells. A comparative analysis showed that newer, unconventional (horizontally fracked) shale gas wells were leaking at six times the rate of conventional (vertical) wells drilled over the same time period. The leak rate for unconventional wells drilled after 2009 was at least six percent, and rising with time. In the state's northeastern counties between 2000-2012, over nine percent of shale gas wells drilled leaked within the first five years.The study also discovered that over

8,000 oil and gas wells drilled since 2000 had not received a facility-level inspection. This study helps explain the results of earlier studies that documented elevated levels of methane in drinking water aquifers located near drilling and fracking operations in Pennsylvania and points to compromised structural integrity of well casings and cement as a possible mechanism.

•May 22, 2014 – In a 69-page report, University of Waterloo researchers warned that natural gas seeping from 500,000 wellbores in Canada represents "a threat to environment and public safety" due to groundwater contamination, greenhouse gas emissions and explosion risks wherever methane collects in unvented buildings and spaces. The report found that 10 percent of all active and suspended gas wells in British Columbia now leak methane. Additionally, the report found that some hydraulically fractured shale gas wells in that province have become "super methane emitters" that spew as much as 2,000 kilograms of methane a year.

•May 1, 2014 – Following a comprehensive review of evidence, the Council of Canadian Academies identified inherent problems with well integrity as one of its top concerns about unconventional drilling and fracking. According to one expert panel, "the greatest threat to groundwater is gas leakage from wells from which even existing best practices cannot assure long-term prevention."Regarding their concerns related to well integrity and cement issues, the panel wrote:

Two issues of particular concern to panel members are water resources, especially groundwater, and GHG emissions.Both related to well integrity…. Natural gas leakage from improperly formed, damaged, or deteriorated cement seals is a long-recognized yet unresolved problem …. Leaky wells due to improperly placed cement seals, damage from repeated fracturing treatments, or cement deterioration over time, have the potential to create pathways for contamination of groundwater resources and to increase GHG emissions.

They further explain:

Cement may crack, shrink, or become deformed over time, thereby reducing the tightness of the seal around the well and allowing the fluids and gases … to escape into the annulus between casing and rock and thus to the surface…. The challenge of ensuring a tight cement seal [will] be greater for shale gas wells that are subjected to repeated pulses of high pressure during the hydraulic fracturing process than for conventional gas wells. This pressure stresses the casing and therefore the cement that isolates the well from surrounding formations repeatedly.

•2013 – According to state inspections of all 6,000 wells drilled in Pennsylvania's Marcellus Shale before 2013, six to ten percent of them leaked natural gas, with the rate of leakage increasing over time. The rate was six percent in 2010 (97 well failures out of 1,609 wells drilled); 7.1 percent in 2011 (140 well failures out of 1,972 wells drilled); and 8.9 percent in 2012 (120 well failures out of 1,346 wells drilled).These data include wells that were cited for leakage violations, and wells that were noted to be leaking by inspectors but which had not been given violations. The New York State DEC forecasts that 50,000 wells could be drilled over the life of the Marcellus Shale play. If they fail at the same rate as wells in Pennsylvania, 4,000 wells would fail and leak in New York almost immediately.

•2009 – A study published by the Society of Petroleum Engineers of more than 315,000 oil, gas and injection wells in Alberta, Canada, found that 4.5 percent of the wells had unintended gas flow to the surface. In one designated area, officials required testing for gas migration outside the well casings in addition to routine testing for gas leaks within the rings of steel casings (annuli). Within this special testing zone, 15.5 percent of wells (3,205 of 20,725) leaked gas, and the incidence of gas leaks was four times percent higher in horizontal or deviated wells than in vertical wells.

•Autumn 2003 – Schlumberger, one of the world's largest companies specializing in hydraulic fracturing and other oilfield services, reported in its in-house publication, Oilfield Review, that more than 40 percent of approximately 15,500 wells in the outer continental shelf area in the Gulf of Mexico were leaking gas. These included actively producing wells, in addition to shut-in and temporarily abandoned wells. In many cases, the gas leaked through the spaces (annuli) between layers of steel casing that drilling companies had injected with cement precisely to prevent such gas leaks. Leakage rates increased dramatically with age: about five percent of the wells leaked immediately; 50 percent were leaking after 15 years; and 60 percent were leaking after about 30 years.Gas leaks pose serious risks including loss of life from explosions and migration of gas and associated contaminants into drinking water supplies. Leaks also allow the venting of raw methane into the atmosphere where it acts as a powerful greenhouse gas.

•November 2000 – Maurice Dusseault, a professor at the University of Waterloo in Ontario who specializes in rock mechanics, and two co-authors presented a paper published by the Society of Petroleum Engineers, in which they reported that oil and natural gas wells routinely leak gas through cracks in their cement casings, likely caused by cement shrinkage over time and exacerbated by upward pressure from natural gas. According to their paper, in Alberta, it is common for wells to leak natural gas into aquifers. "Because of the nature of the mechanism, the problem is unlikely to attenuate," they wrote, "and the concentration of the gases in the shallow aquifers will increase with time."

Radioactive releases

•May 8, 2014 – A group of leading medical experts and the American Lung Association of the Northeast detailed research and growing concerns about potential health impacts of radon and radium associated with natural gas production and the Marcellus Shale, in particular. High levels of radiation in the Marcellus Shale could pose health threats if high concentrations of radon and its decay products travel with natural gas, a problem compounded by the short distance Marcellus gas could travel in pipelines to people's homes.

•March 24, 2014 – A team led by toxicology researchers at the University of Iowa identified high levels of radioactivity in fracking wastewater as a significant concern and noted that the testing methods used and recommended by state regulators in the Marcellus Shale region can dramatically underestimate the amount of radioactivity— specifically radium—in fracking wastewater.Results obtained using EPArecommended protocols can be obscured by a mix of other contaminants present. Regarding the use of EPA protocols with fracking wastewater or other highly saline solutions, Avner Vengosh, a geochemist at Duke University, noted, "People have to know that this EPA method is not updated."

•February, 2014 – The Marcellus Shale is known to have high uranium and radium content. According to Mark Engle, U.S. Geological Survey geochemist, the concentration of radium-226 can exceed 10,000 picoCuries/Liter (pCi/L) in the shale. Radium-226 has a half-life of 1,600 years. Radium and other naturally occurring radioactive materials (NORM) can be released from shale rock during drilling and fracking and can emerge with flowback and produced waters. It can thus enter the ambient environment and become concentrated in the sludge which results from treatment of flowback water, and in river sediment around water treatment facilities. It can also be found in landfills in which sludge and sediment have been disposed. Some radium can be found in drinking water. As stated by Dr. Avner Vengosh, a geochemist at Duke University, Once you have a release of fracking fluid into the environment, you end up with a radioactive legacy.

•October 2, 2013 – A peer-reviewed study of the impacts of drilling wastewater treated and discharged into a creek by a wastewater facility in western Pennsylvania documented radium levels approximately 200 times greater in sediment samples near the discharge location than in sediment samples collected upstream of the plant or elsewhere in western Pennsylvania. "The absolute levels that we found are much higher than what you allow in the U.S. for any place to dump radioactive material," one of the authors told Bloomberg News. The pollution occurred despite the fact that the treatment plant removed a substantial amount of the radium from the drilling wastewater before discharging it. The researchers wrote that the accumulation of radium in sludge removed from the wastewater "could pose significant exposure risks if not properly managed."160

•February 2013 – In an analysis of fracking sludge samples from Pennsylvania, researchers "… confirmed the presence of alpha, beta, and gamma radiation in the soil and water in reserve pits located on agricultural land." Total beta radiation exceeded regulatory guideline values by more than 800 percent, and elevated levels of some of the radioactive constituents remained in a vacated pit that had been drained and leveled. It is imperative, the research team concluded, "that we obtain better knowledge of the quantity of radioactive material and the specific radioisotopes being brought to the earth's surface from these mining processes."

•January 11, 2012 – In its review of the New York State DEC's SGEIS on high-volume fracturing, the EPA expressed concerns about the diffusion of responsibility for the ultimate disposal of radioactive wastes generated by treatment or pretreatment of drilling wastewater. The EPA also raised concerns about the lack of analysis of radon and other radiation exposure. "Who is responsible for addressing the potential health and safety issues and associated monitoring related to external radiation and the inhalation of radon and its decay products?" the EPA asked. "Such potential concerns need to be addressed."

•2012 – Responding to concern about radon in natural gas produced from the Marcellus Shale, the U.S. Geological Survey analyzed ten samples of gas collected near the wellheads of three Pennsylvania gas wells. The agency found radon levels ranging from 1 to 79 picocuries per liter, with an average of 36 and a median of 32. (The highest radon activity reported here would decay to 19.8 pCi/L in approximately a week; by comparison, the EPA's threshold for indoor air remediation is 4 pCi/L.) Asserting they knew of no previous published measurements of radon in natural gas from the

Appalachian Basin, which contains the Marcellus Shale, agency scientists concluded that the number of samples "is too small to … yield statistically valid results" and urged

"collection and interpretation of additional data."

•September 7, 2011 – The U.S. Geological Survey reported that radium levels in wastewater from oil and gas wells in New York and Pennsylvania, including those in the Marcellus Shale, "have a distinctly higher median … than reported for other formations in the Appalachian Basin, and range to higher values than reported in other basins." The median level of radium found in Marcellus Shale wastewater in New York, 5,490 picocuries per liter, is almost 1,100 times the maximum contaminant level for drinking water, which is five picocuries per liter. In other words, if a million gallons of Marcellus Shale wastewater contaminated with the median level of radium found in New York were to spill into a waterway, 1.1 billion gallons of water would be required to dilute the radium to the maximum legal level.(The EPA's health-based goal for radium in drinking water is zero.) Over time, radium naturally decays into radioactive radon gas. Thus, higher radium levels also suggest that higher levels of radon may also be present in natural gas produced from the Marcellus Shale.

•February 27, 2011 – The New York Times reported on the threat to drinking water from Pennsylvania drilling waste due to the presence of chemical contaminants, including high levels of radioactivity. The investigation found that sewage treatment plants were neither testing for nor capable of removing that radioactivity, which was subsequently discharged into waterways that supply drinking water. Drillers sent some of this waste to New York State. The article states:

In December 2009, these very risks led E.P.A. scientists to advise in a letter to New York that sewage treatment plants not accept drilling waste with radium levels 12 or more times as high as the drinking-water standard. The Times found wastewater containing radium levels that were hundreds of times this standard. The scientists also said that the plants should never discharge radioactive contaminants at levels higher than the drinking-water standard.

•2008-2009 – The New York State DEC found that wastewater from 11 of 13 vertical wells drilled in New York's Marcellus Shale in 2008 and 2009 contained radium levels ranging from 400 times to nearly 3,400 times EPA's safe level for radium in drinking water. These figures later informed the 2011 study of radium in drilling wastewater conducted by the U.S. Geological Survey.167

Occupational health and safety hazards

•December 4, 2014 – Benzene, a naturally occurring component of crude oil and natural gas, is a known carcinogen, with no known threshold of safety. Although the American Petroleum Institute stated in 1948 that "the only absolutely safe concentration … is zero," the organization since then undertook an intensive campaign to combat strict exposure limits. An investigation by the Center for Public Integrity found that, "[f]or decades, the petrochemical industry spent millions on science seeking to minimize the dangers of benzene. … Taken together, the documents — put in context by interviews with dozens of lawyers, scientists, academics, regulators and industry representatives — depict a 'research strategy' built on dubious motives, close corporate oversight and painstaking public relations."

•November 11, 2014 – University of Wisconsin toxicologist Crispin Pierce documented that super-fine dust drifts from facilities that process silica sand for fracking operations. Pierce and his team detected silica dust in ambient air near frac sand operations at levels that that exceed EPA air quality standards by a factor of four. Occupational exposure to respirable crystalline silica is linked in adult workers to silicosis, lung cancer, and pulmonary tuberculosis. Health threats to the general public

from frac sand-related air pollution have not yet been studied directly. One of the first investigations of silica dust levels in the community environment, the Wisconsin study will appear next year in the National Journal of Environmental Health.

•November 11, 2014 – A high-pressure water line ruptured, killing one worker and seriously injuring two others during the hydraulic fracturing of an oil well in Weld County, Colorado.

•October 6, 2014 – Toxicologist Peter Thorne, chair of University of Iowa's Department of Occupational and Environmental Health, warned the Winneshiek County Board of Supervisors about potential community impacts and cancer risk of silica exposure from sand used for fracking operations. Thorne's ongoing investigation, which involves air sampling, risk assessments, and inhalation toxicology studies, focuses on the public health hazards of mining, processing and storing sand. His team has documented spikes in silica particulate matter related to the transport of the silica sand by rail. The study aims to determine if mining poses an "unacceptable exposure" to the public and quantify the level of risk. For silica-exposed workers, the National Institute for Occupational Safety and Health (NIOSH) continues to identify needed heath protections. Thorne noted, "Workers handling materials should be using respirators, but most are not."

•September 25, 2014 – The Civil Society Institutes Boston Action Research, in cooperation with Environmental Working Group and Midwest Environmental Advocates, issued a report on the hazards of silica mining. The report noted that frac sand mining is expanding rapidly in the United States and poses a little-understood threat to public health, the environment, and local economies. Given the pace of the drilling and fracking boom, silica extraction could spread to a dozen other states with untapped or largely untapped sand deposits, including Illinois, Maine, Massachusetts, Michigan, Missouri, New York, North Carolina, South Carolina, Pennsylvania, Tennessee, Vermont and

Virginia.The International Business Times published a summary of the findings.

•August 29, 2014 – In a peer-reviewed study, NIOSH partnered with oil and gas operators and service companies to evaluate worker exposures to, and internal uptake of, volatile organic chemicals at six sites in Colorado and Wyoming where wells were being prepared for production. The study found benzene in the urine of wellpad workers. Benzene is "naturally present in flowback fluids and the time spent working around flowback and production tanks … appears to be the primary risk factor for inhalation exposures." In some cases, airborne concentrations of benzene exceeded the NIOSH Recommended Exposure Limit concentrations and, in a few instances, the American

Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value, "when workers performed work tasks near a point source for benzene emissions."

•July 29, 2014 – As part of an investigation into the health impacts of drilling and fracking on animal health, veterinarian Michelle Bamberger and Cornell biochemist Robert Oswald, published an interview with a twenty-year oil and gas industry worker about his experiences and worker safety. His account included injuries, 16-hour work days, and fatigue, exposure to chemicals, and inadequate health and safety training. "No one out there tells you about stuff that has latency. That is the last thing they are going to do is tell you that something that you are handling will take you out in 20 years or 10 years or cause you some kind of ailment, or you can potentially drag this home to your family."

•July 14, 2014 – As part of an analysis of safety and research needs associated with drilling and fracking, researchers at the Colorado School of Public Health and the College of Health Sciences at the University of Wyoming documented high injury and on-the-job mortality rates among gas and oilfield workers. The occupational fatality rate was 2.5 times higher than that of the construction industry and seven times higher than that of general industry. By contrast, injury rates were lower than the construction industry, suggesting that injuries are underreported. Researchers documented crystalline silica levels above occupational health standards and identified the existence other hazards, including particulate matter, benzene, noise, and radiation. The team called for exposure assessments for both chemical hazards and physical hazards that lead to occupational illness (noise, radioactivity); screening and surveillance systems to assess incidence and prevalence of occupational illness; industry/academic collaboration to conduct occupational epidemiologic studies; and assessment of the effectiveness of industry interventions to reduce exposures.

•July 2014 – The British labor journal Hazards, identified health concerns in the drilling and fracking industry: increased rate of death on the job, toxic releases, silica exposure,

and exposure to hydrocarbons and endocrine disruptors. The union that organizes the construction, rig and transport workers on which fracking would rely, agreed at its July

2014 national conference to lobby for a moratorium on fracking because "(d)elegates want union

members to be made aware of the dangers of fracking and be advised not to work on fracking sites."

•June 29, 2014, and August 31, 2014 – An initial report and follow-up analysis in The Columbus Dispatch examined fire hazards at well pads. In one notable case, malfunctioning hydraulic tubing allowed a wellpad fire in Monroe County, Ohio to spread rapidly, prompting evacuations. Local firefighters had neither the correct equipment nor did they know the chemicals they were trying to extinguish. One firefighter was treated for smoke inhalation. 178

•May 19, 2014 – Underscoring the dangerous nature of chemicals used in fracking operations, the National Institute for Occupational Safety and Health reported that at least four gasfield workers have died since 2010 from acute chemical exposures during flowback operations and warned that that flowback operations can "result in elevated concentrations of volatile hydrocarbons in the work environment that could be acute exposure hazards." The agency further noted that such volatile hydrocarbons "can affect the eyes, breathing, and the nervous system and at high concentrations may also affect the heart causing abnormal rhythms."

•May 16, 2013 – A NIOSH study revealed that worker exposure to crystalline silica dust from sand used in fracking operations exceeded "relevant occupational health criteria" at all eleven tested sites, and the magnitude of some exposures exceeded National Institute for Occupational Safety and Health limits by a factor of 10 or more. "[P]ersonal respiratory protection alone is not sufficient to adequately protect against workplace exposures." Inhalation of crystalline silica can cause incurable silicosis, lung cancer, chronic obstructive pulmonary disease, kidney disease and autoimmune

diseases.182 Although community exposures distant from mines are possible, there are no

federal or state standards for silica in ambient air. A first-ever study on public health risks from frac sand is now in progress.

•May 8, 2014 – A report by the AFL-CIO found that the fracking boom has made North Dakota the most dangerous state for U.S. workers—with a fatality rate five times higher than the national average—and that North Dakota's fatality rate has doubled since 2007. The AFL-CIO called North Dakota "an exceptionally dangerous and deadly place to work." U.S. Secretary of Labor Thomas E. Perez called the rising rate of workplace deaths suffered in the oil and gas sector "unacceptable."

•April 24, 2014 – A University of Texas San Antonio report commissioned by the

Methodist Healthcare Ministries found that many oil and gas field workers in the Eagle Ford Shale are uninsured or underinsured and that "the most noticeable health impacts so far are work-related illnesses and injuries: heat exhaustion, dehydration, sleep deprivation, exposure to oil and gas spills and accidents." The study also noted that oil and gas production has put strain on healthcare facilities.

•April 10, 2014 –West Virginia University researcher Michael McCawley reported that some of the nation's highest rates of silicosis are in heavily drilled areas within the Northern Panhandle of West Virginia and southwestern Pennsylvania. A disease that hardens the lungs through inflammation and development of scar tissue, silicosis is entirely attributable to exposure to silica dust, a known occupational hazard at drilling and fracking operations. Two years earlier, the Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health issued a joint "Hazard Alert" to warn fracking workers of the health hazards of exposure to silica dust, including silicosis.

•February 25, 2014 – A year-long investigation by the Houston Chronicle found that fracking jobs are deadly, with high fatality rates and high rates of serious injury. Within just one year in Texas, 65 oil and gas workers died, 79 lost limbs, 82 were crushed, 92 suffered burns and 675 broke bones. From 2007 to 2012, at least 664 US workers were killed in oil and gas fields.

•December 27, 2013 –National Public Radio (NPR) reported spiking rates of fatalities related to oil and gas drilling operations, which had increased more than 100 percent since 2009. NPR noted that in the previous year, 138 workers were killed on the job, making the fatality rate among oil and gas workers nearly eight times higher than the allaverage rate of 3.2 deaths for every 100,000 workers across all industries.

•October 30, 2012 – In a policy statement, the American Public Health Association

(APHA) asserted that, high-volume horizontal hydraulic fracturing (HVHF) "poses potential risks to public health and the environment, including groundwater and surface water contamination, climate change, air pollution, and worker health." The statement also noted that the public health perspective

has been inadequately represented in policy processes related to HVHF.The policy statement added:

[H]ydraulic fracturing workers are potentially exposed to inhalation health hazards from dust containing silica. There may also be impacts on workers and communities affected by the vastly increased production and transport of sand for HVHF. Inhalation of fine dusts of respirable crystalline silica can cause silicosis. Crystalline silica has also been determined to be an occupational lung carcinogen.

•2005 – A researcher at Stanford University examined hazards associated with oil and gas extraction from exposure to radiation and determined that inhalation of high-levels of radon gas is a serious concern to workers and those living nearby. "…[G]aseous radon (222Rn) is concentrated in ethane and propane fractions due to the fact that the boiling point of radon lies between those of propane and ethane. Elevated Rn activity concentration values have been measured at several processing plant sites…. It is well known that the radiological impact of the oil and gas-extracting and processing industry is not negligible."

Public Health Effects, Measured Directly

•October 2, 2014 – According to researchers from the University of Pennsylvania's Center of Excellence in Environmental Toxicology, an increasing number of gas wells in Pennsylvania is significantly correlated with inpatient rates of hospitalization. The research team collected data from seven different insurance providers for three counties; the study's publication is forthcoming.

•September 11, 2014 – In Texas, commercial vehicle accidents have increased more than

50 percent since 2009 when the state's ongoing drilling and fracking boom began, according to an investigation by the Houston Chronicle and Houston Public Media News

88.7. "For six decades, highway deaths have dropped steadily all across the United States

….But in Texas all motor vehicle fatalities – and accidents involving commercial trucks – have turned back upward since the state's oil drilling and fracking boom began in 2008." This rising motor vehicle death toll is especially felt in formerly rural counties in the Eagle Ford and Permian Basin, now places of heavy drilling and fracking. A new "Road Check" program finds annually, "… 27 to 30 percent of Texas' commercial trucks shouldnt be operating at all due to potentially life-threatening safety problems like defective brakes, bald tires, inoperable safety lights and unqualified, unfit or intoxicated drivers."

•September 10, 2014 – A Yale University-led study of 492 people found that those who live near gas wells in southwestern Pennsylvania have a higher prevalence of reported skin conditions and upper respiratory conditions than those further away. The conditions were more common in households less than one kilometer from gas wells, compared to those more than two kilometers away. The authors of this study, the largest to date on the link between reported symptoms and natural gas drilling activities, say that their findings are "… consistent with earlier reports of respiratory and dermal conditions in persons living near natural gas wells." They also cite literature demonstrating the biological plausibility of a link between oil and gas extraction activities and both categories of health effects reported.194

•August 3, 2014 – Hospitals in the Bakken Shale region reported a sharp rise in ambulance calls and emergency room visits after 2006. "Mercy Medical Center in Williston and the Tioga Medical Center in neighboring Williams County saw their ambulance runs increase by more than 200 percent. Tioga's hospital saw a staggering leap in trauma patients by

1,125 percent. Mercy had a 373 percent increase." Drugs (including overdoses of prescription drugs, methamphetamine, and heroin) explain many of the cases, with oilfield related injuries such as "fingers crushed or cut off, extremity injuries, burns and pressure burns" accounting for 50% of the cases in one of the region's hospital emergency rooms.

•May 21, 2014 – Raising questions about possible links to worsening air pollution from the Uintah Basin's 11,200 oil and gas wells, health professionals reported that infant deaths in Vernal, Utah, rose to six times the normal rate over the past three years. Physician Brian Moench said, "We know that pregnant women who breathe more air pollution have much higher rates of virtually every adverse pregnancy outcome that exists …. And we know that this particular town is the center of an oil and gas boom that's been going on for the past five or six years and has uniquely high particulate matter and high ozone."Although it formerly had pristine air quality, Uintah County, Utah received a grade "F" for ozone in the American Lung Association's 2013 State of the Air Report.

	•January 28, 2014 – Congenital heart defects, and possibly neural tube defects in newborns, were associated with the density and proximity of natural gas wells within a 10-mile radius of mothers' residences in a study of almost 25,000 births from 1996-2009 in rural Colorado. The researchers note that natural gas development emits several chemicals known to increase risk of birth defects (teratogens). January 4, 2014 –Preliminary data from researchers at Princeton University, Columbia University and MIT showed elevated rates of low birthweight among infants born to mothers living near drilling and fracking operations during their pregnancies. •October, 2013 – A preliminary 2013 Cornell University study of the health impacts of oil and gas extraction on infant health in Colorado found that proximity to wells—linked with air pollutants from fracking operations—was associated with reductions in average birthweight and length of pregnancy as well as increased risk for low birthweight and premature birth.A study by the same author, currently under review, which analyzed births to Pennsylvania mothers residing close to a shale gas well in Pennsylvania from 2003-2010, also identified increased risk of adverse effects. This includes low birth weight, as well as a 26% increase in APGAR scores under 8 (APGAR—or American Pediatric Gross Assessment Record—is a measure of newborn responsiveness. Scores of less than 8 predict an increase in the need for respiratory support). •August 26, 2013 – Medical experts at a rural clinic in heavily-drilled Washington County, PA reported case studies of 20 individuals with acute symptoms consistent with exposure to air contaminants known to be emitted from local fracking operations. •May 2, 2013 – Reports of symptoms commonly linked to exposure to elevated levels of ground-level ozone associated with gas drilling have been documented in shale-heavy states. In Pennsylvania in 2012, a study of more than 100 state residents living near gas facilities found that reported health symptoms closely matched the scientifically established effects of chemicals detected through air and water testing at those nearby sites, and that those negative health effects occurred at significantly higher rates in households closer to the gas facilities than those further away.Indicative of the growing prevalence of such health impacts in the state, a poll showed that two-thirds of Pennsylvanians support a moratorium on fracking because of concern about negative health impacts. End of Part IV.	
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	Part V of the NY Compendium: Noise pollution, light pollution and stress •December 1, 2014 – Range Resources Inc. warned supervisors in Pennsylvania's Donegal Township that a "big burn" natural gas flare will continue for as long as a week and "will produce a continuous noise of as much as 95 decibels at the well pad. Sustained decibel levels between 90 and 95 can result in permanent hearing loss, but workers will be equipped with ear protection." Township supervisor Doug Teagarden expressed concern for residents, saying, "They told us the flare would be double the size of other well flares, and the noise will be like a siren on a firetruck …. There are houses within a couple of hundred yards of the well pad, and those folks are going to hear it." •November 6, 2014 –Sakthi Karunanithi, Director of Public Health in Lancashire, UK, reported on a Health Impact Assessment (HIA) of the two proposed shale gas exploration sites in Lancashire. Karunanithi's study determined that key risks to the health and wellbeing of the residents who live near the two proposed sites in Lancashire include stress and anxiety from uncertainty that could lead to "poor mental wellbeing," and noiserelated health effects due to continuous drilling. The HIA also noted a lack of public trust and confidence.08 •September 2014 – The Ohio Shale Country Listening Project, a collaborative effort to solicit, summarize, and share the perspectives and observations of those directly experiencing the shale gas build out in eastern Ohio, found that the more shale gas wells a community has, the less popular the oil and gas industry becomes. Many residents reported that they had not experienced the economic benefits promised by the oil and gas industry. They complained of increased rents and costs of gas and groceries, an influx of out-of-state workers, more vehicular accidents, road destruction from large trucks, and damaged landscape and cropland. Locals reported feeling less secure and more	

financially strapped.

•June 20, 2014 – In its discussion of "Oil and Gas Drilling/Development Impacts," the U.S. Office of Indian Energy and Economic Development detailed noise pollution from bulldozers, drill rigs, diesel engines, vehicular traffic, blasting, and flaring of gas. "If noise-producing activities occur near a residential area, noise levels from blasting, drilling, and other activities could exceed the EPA guidelines. The movement of heavy vehicles and drilling could result in frequent-to-continuous noise …. Drilling noise would occur continuously for 24 hours per day for one to two months or more depending on the depth of the formation."Exposure to chronic noise can be deadly. The World Health Organization has documented the connection between environmental noise and health effects, including cardiovascular disease, cognitive impairment, sleep disturbance, and tinnitus. At least one million "healthy life years" are lost every year from traffic-related noise in the western part of Europe.

•February 24, 2014 – In a review of the health effects from unconventional gas extraction published in the journal Environmental Science Technology, leading researchers noted, "Noise exposure is a significant hazard due to the presence of multiple sources, including heavy equipment, compressors, and diesel powered generators. Loud continuous noise has health effects in working populations. It is likely that exposure to noise is substantial for many workers, and this is potentially important for health because drilling and servicing operations are exempt from some sections of the Occupational Safety and Health Administration noise standard." They noted that research should investigate stressors such as noise and light in the context of drilling and fracking operations in order to understand the overall effect of chemical and physical stressors together.212

May 30, 2014 – The Denver Post reported that in order to help meet Colorado's noise limits for fracking operations in suburban neighborhoods (and partially block the glare of floodlights), Encana Oil and Gas erected 4-inch-thick polyvinyl walls up to 32 feet high and 800 feet long. Residents said that the plastic walls do not completely solve the problem.

•October 25, 2013 – An analysis of well location and census data by the Wall Street Journal revealed that at least 15.3 million Americans now live within a mile of a well that has been drilled since 2000. According to this investigation, the fracking boom has ushered in "unprecedented industrialization" of communities across wide swaths of the nation and, with it, "24/7" industrial noise, stadium lighting, earth-moving equipment, and truck traffic.

•April 16, 2013 – In a presentation on oil field light pollution for a conference on "Sustainable Environment and Energy: Searching for Synergies," Roland Dechesne of the Royal Astronomical Society of Canada described problems of "light trespass," glare, and poorly-aimed fixtures in oil fields in Alberta. He described resulting "mass waterfowl mortality" linked to artificial illumination and other biochemical impacts of light pollution on wildlife, as well as the possibility of these effects on humans, including circadian disruption, melatonin suppression and possible resulting hormonally-linked diseases.Known to have ecological impacts, outdoor light pollution from drilling and fracking operations may also be linked to artificial light-associated health effects documented in humans, including breast cancer.

•April, 2013 – Led by the University of Pittsburgh Graduate School of Public Health, a study of community members living in proximity to Marcellus Shale drilling in Pennsylvania found adverse impacts to mental health, with stress the most frequentlyreported symptom. At least half of all respondents in each set of interviews reported these specific stressors, including: being taken advantage of; health concerns; concerns/complaints ignored; corruption; denied information or provided with false information. Many also reported the desire to move or leave community, estrangement from community, and financial damages. Researchers noted that stress can result in direct health impacts.Notably, mounting evidence indicates that chronic stress magnifies individuals' susceptibility to effects of pollution; for children, this interactive effect can begin during prenatal life.

•September 7, 2011 – A study by researchers at Boise State University and Colorado State University at Fort Collins modeled the potential impacts of compressor station noise from oil and gas operations on Mesa Verde National Park in Colorado. The study found the sound of 64 compressors outside Mesa Verde elevated the sound level within the park by 34.8 decibels on average, and by 56.8 decibels on the side of the park located closest to the compressors. According to the EPA, 55 decibels is the highest "safe noise level" to avoid damage to the human ear.

Earthquakes and seismic activity

•October 23, 2014 – Researchers from the U.S. Geological Survey and the Global Seismological Services in Golden, Colorado, linked a 2011 magnitude 5.3 earthquake in

Colorado, which damaged the foundations of several homes, to underground disposal of

fracking wastewater. The study determined that the earthquake ruptured an 8 to 10 kilometer-long segment of normal faults–an unexpectedly long length for a magnitude 5.3 earthquake–suggesting that wastewater disposal may have triggered a low stress drop.Lead author Bill Barnhart, a U.S. Geological Survey geophysicist, told Reuters,

“We saw a big increase in seismicity starting in 2001, including magnitude 5 earthquakes, in many locations in the basin, and that coincided with a surge in gas production and injection of wastewater.”

•September 23, 2014 – Youngstown State University geologist Ray Beiersdorfer described increased seismic activity in Youngstown, Ohio in a essay that explores how that fracking and fracking-related processes are causing “earthquake epidemics” across the United States.222

•September 15, 2014 – Researchers at the National Energy Technology Laboratory teamed up with researchers from industry and academia to publish data and analysis from a closely watched project that involved field monitoring of the induced fracturing of six horizontal Marcellus Shale gas wells in Greene County, Pennsylvania. Touted in earlier media reports as demonstrating that, during short-term follow-up, fracking chemicals injected into these six wells did not spread to overlying aquifers , the study’s most notable finding is striking documentation of fractures from three of the six wells extending vertically to reach above an overlying rock layer previously thought to create an impenetrable “frac barrier” (that is, an upper barrier to fracture growth). In one case, a fracture extended vertically 1,900 feet, a surprisingly far distance. No pre-existing fault had been detected at this location, suggesting that small “pre-existing fractures or smalloffset (sub-seismic) faults may have focused the energy of hydraulic fractures on certain areas….” Perhaps because of the extremely small sample size and a design focused primarily on monitoring for potential gas and fluid migration, the study’s analysis includes no discussion of the seismic relevance of extremely long, vertical induced fractures.

•September 15, 2014 – Scientists from the U.S. Geological Society ascribed causality to wastewater injection wells from coal-bed methane production for increases in seismic activity in New Mexico and Colorado and, in particular, for an earthquake that measured magnitude 5.3 in Colorado in 2011, the second largest earthquake to date for which there is clear evidence that the earthquake sequence was induced by fluid injection.

•September 6, 2014 – The Ohio Department of Natural Resources suspended operations at two deep-injection wells for fracking wastewater near Warren in northeastern Ohio after discovering evidence that the operation possibly caused a 2.1-magnitude earthquake. The injection well operator, American Water Management Services, had recently received permission to increase pressures at the site of the wells. In 2012, Governor John Kasich had halted disposal of fracking wastewater surrounding a well site in the same region after a series of earthquakes were tied to a deep-injection well. The company that ran that well has disputed the link. The state placed seismic-monitoring devices in the Warren area under protocols adopted after the series of earthquakes in nearby Youngstown.

•September 1, 2014 – Explaining the need for increased seismic monitoring,

Andrew Beaton, director of the Alberta Geological Survey (AGS), stated that over a long period of time, stresses increase in and around an injection well bore. Seismic movement can be caused if the rate of injection is too fast or if there is a geological feature, such as a fault or fracture in nearby areas. Although Albertans in rural areas have been reporting for years that they can feel tremors under their feet near oil and gas activity, especially around areas of fracking, the Alberta Energy Regulator noted that deep well injections have been shown to create more of an earthquake hazard then hydraulic fracturing. Alberta experienced 819 earthquakes between 1918 and 2009. In comparison,

Saskatchewan recorded 13 in the same time and British Columbia recorded more than 1,200 earthquakes in 2007 alone. There are currently 24 seismic monitors in Alberta, which are tied into other networks, such as those belonging to Environment Canada, University of Calgary and University of Alberta.

•August 26, 2014 – In a first-of-its-kind lawsuit, a resident of Prague, Oklahoma, sued two energy companies after rocks fell from her chimney and injured her leg during an earthquake of greater than magnitude 5. The lawsuit claims that underground injection of fracking wastewater conducted by New Dominion LLC, based in Oklahoma City, and Spess Oil Company, based in Cleveland, Oklahoma, is causing shifts in fault lines

resulting in earthquakes.

•July 31, 2014 – William Ellsworth, a research geophysicist at the U.S. Geological Survey Earthquake Science Center, reported that the U.S. Geological Survey is developing a hazard model that takes induced earthquakes into account. In addition, residents of Oklahoma, where a sharp spike in earthquake activity has been noted over the past decade, are showing an increased interest in obtaining earthquake insurance.

•July 3, 2014 – Using data from the Oklahoma Corporation Commission, a team of researchers led by Katie Keranen, a geophysics professor at Cornell University, found that a steep rise in earthquakes in Oklahoma can be explained by fluid migration from wastewater disposal wells. Moreover, injected fluids in high-volume wells triggered earthquakes over 30 kilometers (over 18 miles) away. All of the wells analyzed were operated in compliance with existing regulations. Similar mechanisms may function in other states with high volumes of underground injection of wastewater from unconventional oil and gas production.230 Reporting on the study and the increase in earthquakes across the United States and the link to fracking and wastewater disposal, the Associated Press noted that some states, including Ohio, Oklahoma and California, have introduced new rules compelling drillers to measure the volumes and pressures of their injection wells as well as to monitor seismicity during fracking operations.

•July 1, 2014 – Seismologists linked the emergence of a giant sinkhole that formed in August 2012 near Bayou Corne in southeast Louisiana to tremors (earthquakes) caused by high-pressure pulses of either natural gas or water charged with natural gas. The surges of natural gas that caused the explosive tremors (earthquakes) may have weakened the salt cavern and caused its collapse. Alternatively, part of the salt cavern may have collapsed, causing a nearby gas pocket to give off surges of gas, later followed by the complete collapse of the salt cavern. These findings help illuminate the role of pressurized fluids in triggering seismic events.232

•June 24, 2014 – Following two earthquakes within a one-month period, the Colorado Oil and Gas Conservation Commission directed High Sierra Water Services to stop disposing wastewater into one of its Weld County injection wells. Monitoring by a team of seismologists from the University of Colorado had picked up evidence of continuing lowlevel seismic activity near the injection site, including a 2.6-magnitude event less than a month following a 3.4 magnitude earthquake that shook the Greeley area on May 31, 2014.

•May 2, 2014 – The U.S. Geological Survey and Oklahoma Geological Survey jointly issued an official earthquake warning for Oklahoma, pointing out that the number of earthquakes in the state has risen 50 percent since just October—when the two agencies had issued a prior warning. The advisory stated that this dramatic increase in the frequency of small earthquakes “significantly increases the chance for a damaging quake in central Oklahoma.” Injection wells used for the disposal of liquid fracking waste have been implicated as the presumptive cause of the earthquake swarm. According to the Oklahoma Geological Survey, about 80 percent of the state of Oklahoma is closer than ten miles from an injection well.Since the joint earthquake advisory was released in May, the number of earthquakes in Oklahoma has continued to rise. During the first four months of 2014, Oklahoma had experienced 109 earthquakes of magnitude 3 or higher on the Richter scale. By mid-June, the number of earthquakes had topped 200, exceeding the frequency of earthquakes in California.

•May 2, 2014 – At the annual meeting of the Seismological Society of America, leading geologists warned that the risks and impacts of earthquakes from fracking and injection wells are even more significant than previously thought, pointing out that such earthquakes could occur tens of miles away from wells themselves, including quakes greater than 5.0 magnitude on the Richter scale. Justin Rubinstein, a research geophysicist at the U.S. Geological Survey said, “This demonstrates there is a significant hazard. We need to address ongoing seismicity.”Seismologist Gail Atkinson reported, “We don’t know how to evaluate the likelihood that a [fracking or wastewater] operation will be a seismic source in advance.”

April 11, 2014 – State geologists reported a link between fracking and a spate of earthquakes in Ohio, prompting the Ohio Department of Natural Resources to place a moratorium on drilling in certain areas and to require greater seismic monitoring.

•April 3, 2014 – Researchers in Mexico linked earthquakes to fracking in the Eagle Ford Shale. They also noted a statistical correlation between seismic activity and fracking, particularly in Nuevo Leon, which registered at least 31 quakes between 3.1 and 4.3 on the Richter scale.

•April, 2014 – Researchers from the University of Alberta and the Alberta Geological Survey published a study in the Journal of Geophysical Research that found waste-water injection in Alberta is highly correlated with spikes seismic activity between October, 2006 and March, 2012.240 On November 13, 2014, CBC News reported on a more recent increase in earthquakes, which may also

be linked to injection wells.

•March 7, 2014 – U.S. Geological Survey researchers published a study confirming that Oklahoma's damaging 5.7 magnitude earthquake in 2011 was caused by fracking wastewater injection.The author of the study, seismologist Elizabeth Cochran with the U.S. Geological Survey, noted, "Even if wastewater injection only directly affects a lowhazard fault, those smaller events could trigger an event on a larger fault nearby."

•January 30, 2014 – A U.S. Geological Survey research team linked the rise in earthquakes in Colorado to fracking wastewater injection wells and announced that a study will be published in six to nine months.

•December 12, 2013 – The New York Times detailed the growing link between fracking wastewater injection wells and earthquakes, as well as between fracking itself and earthquakes, with a focus on Oklahoma and a recent magnitude 4.5 earthquake there. As The New York Times noted, "Oklahoma has never been known as earthquake country, with a yearly average of about 50 tremors, almost all of them minor. But in the past three years, the state has had thousands of quakes. This year has been the most active, with more than 2,600 so far, including 87 last week …. State officials say they are concerned, and residents accustomed to tornadoes and hail are now talking about buying earthquake insurance."

•November 19, 2013 – Reuters reported that a series of Oklahoma earthquakes in September of 2013 damaged several homes, and that more scientists in a number of states are concerned about earthquakes related to oil and gas development. Seismologist Austin

Holland with the University of Oklahoma said, "This is a dramatic new rate of seismicity."

•July 19, 2013 – A study from the Lamont-Doherty Earth Observatory linked 109 earthquakes in Youngstown, Ohio to fracking wastewater disposal.247248

•July 11, 2013 – A study in Science by Columbia University's Lamont-Doherty Earth Observatory showed that deep-well injection of fracking waste can stress geological faults in ways that make them vulnerable to slipping. The research shows that distant natural earthquakes triggered swarms of smaller earthquakes on critically stressed faults.

The researchers wrote, "The fluids [in wastewater injection wells] are driving the faults to their tipping point …. Areas with suspected anthropogenic earthquakes are more susceptible to earthquake-triggering from natural transient stresses generated by the seismic waves of large remote earthquakes."24

•April 2013 – A group of British researchers stated that hydraulic fracturing itself was the likely cause of at least three earthquakes powerful enough to be felt by human beings at the surface. The researchers proposed that increases in the fluid pressure in fault zones were the causal mechanism for these three known instances of "felt seismicity" in the United States, Canada and the United Kingdom. The largest of these earthquakes was a magnitude 3.8 in the Horn River Basin, Canada.

March 27, 2013 – Scientists from the University of Oklahoma, Columbia University and the U.S. Geological Survey linked a 2011 swarm of earthquakes in Oklahoma to fracking waste disposal in that state.This included a magnitude 5.7 earthquake—the largest ever triggered by wastewater injection—that injured two people, destroyed 14 homes, and was felt across 17 states.

•December 14, 2012 – At a 2012 American Geophysical Union meeting, scientists presented data and concluded that some U.S. states, including Oklahoma, Texas and Colorado, have experienced a significant rise in seismic activity coinciding with a boom in gas drilling, fracking and wastewater disposal. Scientists further found that Oklahoma has seen a significant increase in earthquakes linked to wastewater injection, that a 5.3 earthquake in New Mexico was linked to wastewater injection, and that earthquakes were increasingly common within two miles of injection wells in the Barnett Shale region of Texas. Art McGarr, a researcher at the U.S. Geological Survey Earthquake Science Center, concluded that, "The future probably holds a lot more in induced earthquakes as the gas boom expands."

•November 30, 2012, January 11, 2012, December 22, 2009 – In three sets of comments on proposed fracking guidelines and regulations, citing scientific reports linking oil and gas infrastructure to seismic activity, the NYC DEP raised serious concerns about the impacts of potential seismic activity from fracking-related activities on New York City's water supply infrastructure.256 The NYC DEP has consistently raised concerns that seismic activity surrounding New York City's aquifers and watershed infrastructure could threaten the city's drinking water supply. For instance, DEP wrote that,

Given the similar geological mechanisms, the City has further investigated the risk that seismic activity from shale gas drilling poses to our tunnels and, based on that investigation, has concluded that the proposed protections do not go far enough to protect the integrity of the tunnels.Seismic activity from natural gas drilling can be divided into two categories:hydraulic fracturing microseismicity and small induced earthquakes.

NYC DEP went on to discuss cases in Blackpool, England and Oklahoma, concluding that,

The Blackpool earthquakes and probably the Oklahoma earthquakes demonstrate that hydraulic fracturing fluids can reach a nearby fault and can trigger a seismic event. It should be noted that the natural gas wells in both of these cases were vertical, not horizontal, and neither well directly intercepted a fault.

Nevertheless, the earthquakes generated were several miles away from the well.Horizontal wells, in contrast, have an even greater chance of directly intercepting a fault and, the distance from a well pad in which HVHF could reactivate a fault is therefore greater.... Thus, the RDSGEIS conclusion that induced seismic activity is not a significant impact is not supported by the evidence.

•September 6, 2012 – The British Columbia Oil and Gas Commission determined that fracking itself causes earthquakes, pointing to the results of a probe into 38 seismic events near fracking operations in the Horn River Basin. The report noted that no quakes had been recorded in the area prior to April, 2009, before fracking activities began. The report recommended that the link between fracking and seismic activity be further examined.

•March 29, 2012 – The U.S. Geological Survey found that between 2001 and 2011, there was a six-fold increase in earthquakes greater than magnitude 3.0 in the middle of the United States that “are almost certainly manmade.”The agency reported that the increase appears to be linked to oil and gas production and deep injection of drilling wastewater.261

July 31, 2011 – Numerous earthquakes in Arkansas motivated the Arkansas Oil and Gas Commission to shut down a disposal well and enact a permanent moratorium on future disposal wells in a nearly 1,200 square-mile area of the Fayetteville Shale.

•March 10, 2010 – In Texas, a 2008-2009 swarm of earthquakes in the Dallas-Fort Worth area, where the Barnett Shale is being developed, was linked to produced water disposal wells.263

•June 12, 2009 – The Wall Street Journal reported that earthquakes shook Cleburne, Texas, a small town at the epicenter of fracking activity, including a number of earthquake clusters in the Dallas-Fort Worth area. The U.S. Geological Survey noted that more earthquakes were detected during that period of fracking activity than in the previous 30 years combined.

Abandoned and active oil and natural gas wells (as pathways for gas and fluid migration)

•December 8, 2014 – A Princeton University team found that abandoned oil and gas wells in Pennsylvania, left over from prior decades of conventional drilling, leak significantly more methane than previously thought. Between 300,000 and 500,000 abandoned oil and gas wells are located in Pennsylvania, and many go unchecked and unmonitored for leaks. Based on direct measurements of methane flow from 19 such wells, most of which were a half century old or older, the researchers estimated that the methane leaks from abandoned wells alone could account for between 4 and 7 percent of human-caused methane emissions in the state. Based on these measurements of positive methane flow from decades-old wells, the study concluded that “cumulative emissions from these abandoned wells may be significantly larger than the cumulative leakage associated with oil and gas production, which has a shorter lifetime of operation.” Further, methane flow rates from plugged wells measured in this study were not consistently lower than unplugged wells and indeed were sometimes higher, even though wells are plugged for the precise purpose of limiting the escape of gases. The authors noted that an estimated three million abandoned oil and gas wells are scattered across the United States and likely represent “the second largest potential contribution to total US methane emissions above

US Environmental Protection Agency estimates.” In the United States, no regulatory requirements for monitoring methane leaks from abandoned wells exist.266

•December 1, 2013 – An analysis of reports from the NY DEC found that three-quarters of the state’s abandoned oil and gas wells were never plugged. New York State has approximately 48,000 such wells; many of their locations remain unknown.

•Aug. 4, 2011 – A report from the U.S. EPA to Congress in 1987—and discovered by The New York Times—concluded that abandoned natural gas wells may have served as a pathway for hydraulic fracturing fluids to migrate underground from a shale gas well to a water well in West Virginia. In noting that the water well was polluted due to hydraulic fracturing and that such contamination was "illustrative" of contamination from oil and natural gas drilling, the report suggested that additional cases of groundwater contamination from hydraulic fracturing may exist.268

•April 4, 2011 – ProPublica reported that abandoned wells have caused problems across the nation including contamination of drinking water in Colorado, Kentucky, Michigan, New York, Texas and other states. ProPublica also found that a draft report from the Pennsylvania DEP described a 2008 incident in Pennsylvania in which a person died in an explosion triggered by lighting a candle in a bathroom after natural gas had seeped into a septic system from an abandoned well. The same draft report documented at least two dozen additional cases in which gas leaked from old wells, and three in which gas from new wells migrated into old wells, seeping into water supplies and requiring the evacuation of homes.

•May 20, 2010 – The British Columbia Oil and Gas Commission issued a safety advisory after hydraulic fracturing caused a large "kick," or unintentional entry of fluid or gas, into a nearby gas well. The commission reported that it knew of 18 incidents in British Columbia and one in Western Alberta in which hydraulic fractures had entered nearby gas wells. "Large kicks resulted in volumes up to 80 cubic meters [about 100 cubic yards] of fluids produced to surface. Invading fluids have included water, carbon dioxide, nitrogen, sand, drilling mud, other stimulation fluids and small amounts of gas." These cases occurred in horizontal wells with a distance between wellbores of up to 2,300 feet.

The Commission wrote, "It is recommended that operators cooperate through notifications and monitoring of all drilling and completion operations where fracturing takes place within 1000m [3,280 feet] of well bores existing or currently being drilled."

Such communication between active wells raises the potential that similar communication can occur between active wells and abandoned wells.

•2010 – The NY DEC cautioned that "abandoned wells can leak oil, gas and/or brine; underground leaks may go undiscovered for years. These fluids can contaminate ground and surface water, kill vegetation, and cause public safety and health problems." As the agency reported, "DEC has at least partial records on 40,000 wells, but estimates that over 75,000 oil and gas wells have been drilled in the State since the 1820s. Most of the wells date from before New York established a regulatory program. Many of these old wells were never properly plugged or were plugged using older techniques that were less reliable and long-lasting than modern methods."The NY DEC published similar comments in 2008 and 2009.

•January 2009 – Drilling industry consultant M.C. Vincent wrote an article published by the Society of Petroleum Engineers in which he reported that fractures from hydraulically fractured wells can intersect with nearby wells:

Contrary to common expectations, there are numerous examples of fractures intersecting offset wells [existing oil or natural gas wells near the well being fractured] but subsequently providing little or no sustained hydraulic connection between the wells. There is an understandable reluctance to publish reports documenting the intersection of adjacent wellbores with hydraulic fractures. Such information could unnecessarily alarm regulators or adjacent leaseholders who may infer that well spacing or fracture treatments are allowing unexpected capture of reserves.

Vincent added, "Although computing tools have improved, as an industry we remain incapable of fully describing the complexity of the fracture, reservoir, and fluid flow regimes." The article's findings raise the possibility that there could be similar communications between existing fracked wells that are fractured and abandoned wells and that operators cannot accurately predict how these will interact.

•2005 – M.K. Fisher, vice president of Business Management at Pinnacle, a service of Halliburton that specializes in hydraulic fracturing, reported in an article published by the Society of Petroleum Engineers that a single fracture produced during a fracking operation in the Texas Barnett Shale had unexpectedly spread 2,500 feet laterally in two directions. He also described fractures in the Barnett Shale as "extremely complex."These findings raise the possibility that well communication over very large distances could occur due to fractures that spread "unexpectedly."

•October 1999 – The U.S. Department of Energy reported that there were approximately

2.5 million abandoned oil and gas wells in the U.S.

•Early 1990s – An underground waste disposal well in McKean County, Pennsylvania, contaminated groundwater when the wastewater traveled up a nearby abandoned, unmapped and unplugged oil well. Owners of private water wells that were contaminated in the incident eventually had to be connected to a public water system.

•July 1989 –In the past, the investigative agency for Congress, the U.S. General Accounting Office [now the Government Accountability Office] studied oil and natural gas underground injection disposal wells and found serious cases of contamination. The agency reported that, in several cases, wastewater from oil and natural gas operations had migrated up into abandoned oil and natural gas wells, contaminating underground water supplies. The GAO found that "if these abandoned wells are not properly plugged—that is, sealed off —and have cracked casings, they can serve as pathways for injected brines [waste fluids from natural gas and oil drilling] to enter drinking water …. Because groundwater moves very slowly, any contaminants that enter it will remain concentrated for long periods of time, and cleanup, if it is technically feasible, can be prohibitively costly."

•December 1987 – The EPA submitted a report to Congress on oil and natural gas wastes in which the agency cautioned:

… [T]o avoid degradation of ground water and surface water, it is vital that abandoned wells be properly plugged.Plugging involves the placement of cement over portions of a wellbore to permanently block or seal formations containing hydrocarbons or high-chloride waters (native brines). Lack of plugging or improper plugging of a well may allow native brines or injected wastes [from a waste fluid disposal well] to migrate to freshwater aquifers or to come to the surface through the wellbore. The potential for this is highest where brines originate from a naturally pressurized formation such as the Coleman Junction formation found in West Texas …. Proper well plugging is essential for protection of ground water and surface water in all oil and gas production areas.

While the EPA did not address the potential for contamination through abandoned wells as a result of hydraulic fracturing, both hydraulic fracturing and underground injection disposal wells require underground injection of fluid under pressure, raising the potential that there is a similar risk of groundwater contamination when hydraulic fracturing occurs near abandoned wells.

•1985 – In an investigation of 4,658 complaints due to oil and natural gas production, the Texas Department of Agriculture found that "when a water well is experiencing an oilfield pollution problem (typically, high chlorides), the pollution source is often difficult to track down. The source could be a leak in the casing of a disposal well, leakage behind the casing due to poor cement bond, old saltwater evaporation pits, or, most often, transport of contaminants through an improperly plugged abandoned well" (emphasis in original). The agency found more than a dozen confirmed or suspected cases in which pollutants had migrated up abandoned wells and contaminated groundwater. In one case, drilling wastewater migrated up an abandoned well a half mile away from where the wastewater was injected underground for disposal.

•November 1978 – In a report later cited by the EPA in its 1987 report to Congress (cited above), the state of Illinois Environmental Protection Agency found that oil and natural gas wastes injected underground could migrate through abandoned oil and natural gas wells and contaminate groundwater. The agency wrote, "In old production areas, abandoned wells may pose a serious threat to ground water quality. Unplugged or improperly plugged wells provide possible vertical communication between saline and fresh water aquifers."

End Part V of the NY Compendium.

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Part VI of the NY Compendium:

Flood risks

•June 20, 2014 –The Coloradoan reported that Noble Energy storage tanks damaged by spring flooding in Colorado dumped 7,500 gallons of crude oil, fracking chemicals, and fracking wastewater into the Poudre River, which is both a National Heritage area and a habitat for Colorado's only self-sustaining population of wild trout. Recent high river flows had undercut the bank where the oil tank was located, which caused the tank to drop and break a valve.

•September 2013 – An extraordinary flood that struck the Front Range of Colorado killed ten people, forced the evacuation of 18,000 more, destroyed more than 1850 homes, and damaged roads, bridges, and farmland throughout the state. More than 2650 oil and gas wells and associated facilities

were also affected, with 1614 wells lying directly within the flood impact zone. Many of these storm-damaged facilities and storage tanks leaked uncontrollably. In a later accounting, Matt Lepore, director of the Colorado Oil and Gas Conservation Commission, estimated the flooding had resulted in the release to the environment of 48,250 gallons of oil or condensate and 43,479 gallons of fracking wastewater from 50 different spill sites across the state. In Colorado, more than 20,850 oil and gas wells lie within 500 feet of a river, stream, or other drainage. According to Commissioner Lepore, setback requirements that keep drilling and fracking operations away from residential areas inadvertently encourage operators to drill in unoccupied floodplains. At the same time, oil and gas operators prefer locations close to supplies of water for use in fracking. These twin factors result in a clustering of drilling and fracking operations in low-lying areas prone to catastrophic flooding.281

•2004-2013 – In at least six of the last ten years (2004, 2005, 2006, 2009, 2011 and 2013), several counties where shale gas drilling is most likely to occur in New York State have experienced serious flooding. These include the counties of Albany, Broome,

Cattaraugus, Chautauqua, Chenango, Delaware, Erie, Greene, Madison, Orange, Otsego,

Schoharie, Sullivan and Ulster. In at least five of the past 10 years (2004, 2005, 2006, 2009 and 20011), floods have exceeded 100-year levels in at least some of the

counties.282

•February 7, 2013 – In its 2012 annual report to investors, oil and natural gas drilling company Noble Energy stated, “Our operations are subject to hazards and risks inherent in the drilling, production and transportation of crude oil and natural gas, including … flooding which could affect our operations in low-lying areas such as the Marcellus Shale.”

•September 7, 2011 – The NYS DEC’s draft shale gas drilling plan recommended that drilling be prohibited within 100-year floodplains but acknowledged that many areas in the Delaware and Susquehanna River basins that were affected by flooding in 2004 and 2006 were located outside of officially designated flood zones.In 2004, 2005, 2006, 2009 and 2011, flooding in New York exceeded 100-year levels in at least some of the counties where drilling and fracking may occur.

•1992 – In its Generic Environmental Impact Statement (GEIS) for oil and natural gas drilling, the New York State DEC raised concerns that storage tanks holding drilling wastewater, spent hydraulic fracturing fluid or other contaminants could be damaged by flooding and leak. At the time, the GEIS called for at least some of these tanks to be properly secured.However, if horizontal high-volume hydraulic fracturing (HVHF) is approved, shale gas operations will require many more storage tanks for fracking fluids

282 Brooks, L. T. (2005). Flood of September 18-19, 2004 in the upper Delaware River basin, New York (Rep.).

Retrieved June 11, 2014, from United States Geological Survey website: http://ny.water.usgs.gov/pubs/of/of051166/

and wastewater than conventional drilling operations anticipated by the DEC twenty years ago. In 1992, the agency anticipated that oil and gas wells in the state would require between 20,000 and 80,000 gallons of fracking fluid.As of 2011, the agency anticipated that HVHF shale gas wells will require between 2.4 and 7.8 million gallons of fluid.

Threats to agriculture and soil quality

•October 14, 2014 – State documents obtained by the Center for Biological Diversity show that almost three billion gallons of fracking wastewater have been illegally dumped into central California aquifers that supply drinking water and farming irrigation. The California Water Board confirmed that several oil companies used at least nine of 11 injection wells that connect with high-quality water sources for disposal of fracking wastewater, which included high levels of arsenic, thallium, and nitrates. The California Division of Oil, Gas and Geothermal Resources has shut down 11 oil field injection wells and is scrutinizing almost 100 others for posing a “danger to life, health, property, and natural resources.” At least one farming company has sued oil producers in part for contaminating groundwater that farms use for irrigation.

•September 6, 2014 – Al Jazeera America examined the challenges that North Dakota farmers are facing in light of wastewater spills from oil and gas development. Notably, in heavily drilled Bottineau County, some levels of chloride, from sites where an estimated 16,800 to 25,200 gallons of wastewater had seeped into the ground, were so high that they exceeded the levels measurable with

the North Dakota Department of Health's test strips. State records, testimonies from oil workers and various residents, and the decadeslong failure of contaminated fields to produce crops indicate that wastewater spills are a significant hazard in the current fracking boom.

•August 6, 2014 – The Pennsylvania Department of Environmental Protection found that leaks of fracking wastewater from three impoundments contaminated soil and

groundwater. The findings prompted the state to issue a violation and increase monitoring and testing.

•August 5, 2014 – Michelle Bamberger, a veterinarian and researcher, and Robert Oswald, a professor of molecular medicine at Cornell University, published a book that describes their research into the impacts of drilling and fracking on agriculture and animal health. They detail results of 24 case studies from six gas drilling states, including follow-up on cases they previously published in the peer-reviewed literature, raising numerous concerns about the effects of drilling and fracking on agriculture and the health of animals.

•August 1, 2014 – At least 19,000 gallons of hydrochloric acid spilled during completion of a fracking well on an alfalfa farm in Kingfisher County, Oklahoma. The Oklahoma Corporation Commission reported concerns about rain pushing chemical runoff into a nearby creek that flows into the town of Hennessey's water system. The company planned to pay for the alfalfa crop for six years. The landowner and a neighbor were pursuing litigation.

•May 4, 2014 – In an analysis of state data from Colorado, the Denver Post reported that fracking related to oil and gas drilling is putting soil quality and farmlands at risk due to significant amounts of toxic fluids penetrating the soil. According to the Denver Post 578 spills were reported in 2013, which means that, on average in the state, a gallon of toxic liquid penetrates soil every eight minutes. Eugene Kelly, professor of Soil and Crop Sciences at Colorado State University, said that the overall impact of the oil and gas boom "is like a death sentence for soil."

•November 28, 2012 – In conjunction with the Food Environment Reporting Network, The Nation reported that serious risks to agriculture caused by fracking are increasing across the country and linked these concerns to risks to human health.

•January, 2012 – A study of gas drilling's impacts on human and animal health concluded that the drilling process may lead to health problems. The study reported and analyzed a number of case studies, including dead and sick animals in several states that had been exposed to drilling or hydraulic fracturing fluids, wastewater, or contaminated ground or surface water.The researchers cited 24 cases in six states where animals and their owners potentially affected by gas drilling. In one case a farmer separated 96 head of cattle into three areas, one along a creek where fracking wastewater was allegedly dumped and the remainder in fields without access to the contaminated creek; the farmer found that, of the 60 head exposed to the creek, 21 died and 16 failed to produce, whereas the unexposed cattle experienced no unusual health problems. In another case, a farmer reported that of 140 head of cattle that were exposed to fracking wastewater, about 70 died, and there was a high incidence of stillborn and stunted calves in the remaining cattle.

•January 2011 – U.S. Forest Service researchers reported dramatic negative effects on vegetation caused by the drilling and fracking of a natural gas well in an experimental forest in northeastern West Virginia.In June 2008, the researchers found browning of foliage near the well pad, a lack of ground foliage and that many trees nearby had dropped their foliage. They attributed these impacts to the loss of control of the well bore on May 29, 2008, which caused an aerial release of materials from the well. Trees showed no apparent symptoms the following summer.However, the researchers also found "dramatic impacts on vegetation" where drilling and fracking wastewater had been sprayed on the land as a disposal technique following completion of the well. Just after the spraying of approximately 60,000 gallons of wastewater at the first disposal site, the Forest Service researchers found 115 damaged trees and other evidence of harm. This figure grew to 147 trees almost a year later.At a second site, where about 20,000 gallons of wastewater was sprayed, the damage was less dramatic, yet the researchers still found "considerable leaf browning and mortality of young northern red oak seedlings."The researchers concluded that the spraying of the drilling fluids resulted in an "extreme" dose of chlorides to the forest.

•May 2010 – Pennsylvania's Department of Agriculture quarantined 28 cows in Tioga County after the animals wandered through a spill of drilling wastewater and may have ingested some of it. The Department was concerned that beef eventually produced from the cows could be contaminated as a result of any exposure. In May 2011, only ten yearlings were still quarantined, but the farmer who owned the cows, Carol Johnson, told National Public Radio that of 17 calves born to the quarantined cows in the spring of 2011, only six survived, and many of the calves that were lost were stillborn.

"They were born dead or extremely weak. It's highly unusual," she said, continuing, "I might lose one or two calves a year, but I don't lose eight out of eleven."

•March 2010 – A Pennsylvania State Extension analysis of dairy farms in the state found a decline in the number of dairy cows in areas of the state where fracking was prevalent. Pennsylvania counties that had both more than 10,000 dairy cows and more than 150

Marcellus Shale wells experienced a 16-percent decline in dairy cows between 2007 and 2010.

•April 28, 2009 – Seventeen cows in Caddo Parish, Louisiana died within one hour after apparently ingesting hydraulic fracturing fluids spilled at a well that was being fractured.

"It seemed obvious the cattle had died acutely from an ingested toxin that had drained from the 'fracking' operation going on at the property," Mike Barrington, a state veterinarian said in a document obtained from the state Department of Environmental Quality by the New Orleans Times-Picayune.

•August, 1977 – A paper in the Journal of Arboriculture describes how natural gas leaks in soil can damage plants and crops. The paper notes that vegetation dies in the vicinity of natural gas leaks. Due to the oxidation of methane by methane-consuming bacteria, gas leaks drive down the oxygen concentration to extremely low levels and cause carbon dioxide concentration to rise. The resulting low oxygen concentration is the greatest contributing factor in the death of trees and other vegetation near natural gas leaks.

Threats to the climate system

•October 23, 2014 – Adding to the debate about natural gas and climate change, a multicenter, international research team used a sophisticated, integrated approach to the global energy-economy-climate systems question and found no climate benefit to natural gas over other fossil fuels. As summarized by the editor of Nature, "The development of hydraulic fracturing technologies has led to rapid growth in the use natural gas as an energy source. Some evidence has suggested that this growing adoption of natural gas might lead to a reduced greenhouse gas burden and consequent mitigation of climate change. This collaboration between five energy–climate modelling teams show that instead — under a scenario of abundant natural gas availability — increased consumption will have little or no impact on climate change." The authors concluded, "although market penetration of globally abundant gas may substantially change the future energy system, it is not necessarily an effective substitute for climate change mitigation policy."

•October 6, 2014 – Utilizing satellite data for the Bakken and Eagle Ford formations, scientists from Germany, the United Kingdom, and the University of Maryland confirmed that higher "top-down" estimates of fugitive methane leaks from oil and gas fields (which are obtained via tall tower flask samples, aircraft measurements and road surveys) are more accurate than lower "bottom-up" estimates (which are obtained by summing emissions from different types of known sources at sites provided by participating utility companies). According to "bottom-up" estimates, the average U.S. leakage rate ranges from 1.2 – 2.0 percent. But satellite data show much higher leakage rates: 10.1 percent?(±?7.3 percent) and 9.1 percent (±?6.2 percent), for the Bakken and Eagle Ford formations respectively. These higher estimates indicate that current inventories likely underestimate fugitive emissions and call into question any immediate climate benefit from switching from coal to natural gas. Similar results were seen for the Marcellus shale region, but as a result of technical and geographical limitations, the authors declined to quantify their results, pending future studies with enhanced equipment.

•September 24, 2014 – According to a paper published by scientists from the University of California and Stanford University, "… without strong limits on [greenhouse gas] emissions or policies that explicitly encourage renewable electricity, abundant natural gas may actually slow the process of decarbonization, primarily by delaying deployment of renewable energy technologies." The study builds on previous research by examining natural gas in a range of supply curves, with a tested economic model, and across three different types and levels of climate policy. Researchers found that abundant natural gas, even with low rates of methane leakage, does little to reduce – and may increase – greenhouse gases. They conclude that, "… delaying deployment of renewable energy technologies, may actually exacerbate the climate change problem in the long term."

•September 2, 2014 – Analyzing the level of greenhouse gas emissions attributable to electricity from natural-gas-fired power plants and coal-fired power plants, economist Chris Busch and physicist Eric Gimon conclude that, over short time frames and at high rates of leakage, natural gas offers little benefit compared to coal and could exacerbate global warming. Although Busch and Gimon acknowledge that natural gas offers some reductions in greenhouse gas emissions over longer time frames, they point out that such reductions are not large enough for natural gas to play an expanded

role in efforts to manage emissions. They conclude that under the best of circumstances, natural gas-fired electric power offers a modest benefit toward abating climate change, while if poorly developed (i.e., with extensive methane leaks, estimated by these authors to be on the order of 4% or higher), or if used to displace energy efficiency or renewable energy, natural gas could seriously contribute to increased greenhouse gas emissions.

•August 5, 2014 – A Climate Central piece appearing in Scientific American outlined the natural gas-related factors that threaten any ability to achieve climate goals through President Obama's proposed Clean Power Plan. "No one has any idea how much methane is leaking from our sprawling and growing natural gas system. This is a major problem, because without a precise understanding of the leak rate natural gas could actually make climate change worse." Referring to an interactive Climate Central tool that runs various methane leakage scenarios, the article notes that, "… even with modest leak rates and a fairly aggressive transition, we could still end up with little or no climate benefits by 2030 after an enormous financial and political investment in natural gas."

•July 25, 2014 – A report released as part of the U.S. EPA's Office of Inspector General's

"products associated with climate change," determined that "EPA has placed little focus and attention on reducing methane emissions from pipelines in the natural gas distribution sector." The report notes that in 2012, the EPA said methane leaks from pipelines "accounted for more than 13 million metric tons of carbon dioxide equivalent emissions," are almost 100 percent methane, and are more than 10 percent of total methane emissions from natural gas systems. The report also noted that the EPA has not done a comprehensive analysis of the emissions factors it uses since a 1996 study that has a "high level of uncertainty," and the agency does not have the partnerships in place to begin controlling methane leaks, such as with the Pipeline and Hazardous Materials Safety Administration.

•May 15, 2014 – A recent review of existing data on lifecycle emissions of methane from natural gas systems concluded that, as a strategy for addressing climate change, natural gas is a "bridge to nowhere." The review found that, over a 20-year time frame, natural gas is as bad as or worse than coal and oil as a driver of climate change.Referencing this review and other recent studies, Bloomberg Business News reported that the EPA has underestimated the impact of methane leakage resulting from the production transmission, and distribution of natural gas and is using outdated estimates of methane's potency compared to more recent estimates from the Intergovernmental Panel on Climate Change (IPCC).

•April 25, 2014 – A reassessment of the heat-trapping potential of greenhouse gases revealed that current methods of accounting underestimate the climate-damaging impact of methane pollution from all sources, including drilling and fracking operations.

•April 14, 2014 – A study from researchers at Purdue University, NOAA, Cornell University, University of Colorado at Boulder and Pennsylvania State University, published in Proceedings of the National Academy of Sciences found very high levels of methane emissions above many wells being drilled at fracking sites in Pennsylvania. Levels were 100 to 1,000 times above the estimates of federal regulators, who have always assumed very low methane emissions as wells are drilled.

•February 26, 2014 – The United Nations' top environmental official—Achim Steiner, who heads the UN Environmental Programme (UNEP)—argued that the shale gas rush is

'a liability' in efforts to slow climate change and that a switch from coal to natural gas is delaying critical energy transition to renewables.

•February 13, 2014 – A major study in Science by Stanford University, Massachusetts Institute of Technology and the U.S. Department of Energy found that methane leaks negate any climate benefits of natural gas as a fuel for vehicles, and that the EPA is significantly underestimating methane in the atmosphere. Lead author Adam R. Brandt told The New York Times, "Switching from diesel to natural gas, that's not a good policy from a climate perspective."This study also concluded that the national methane leakage rate is likely between 3.6 and 7.2 percent of production.

•January 15, 2014 – The Guardian reported that even a new a study by BP found that "Shale gas … will not cause a decline in greenhouse gases" and will do little to cut carbon emissions.

•December 30, 2013 – An analysis of fracking-related truck transportation in the Susquehanna River Basin, Pennsylvania found that greenhouse gas emissions from frack water and waste hauling operations were 70–157 metric tons of CO_2 equivalent per gas well.328

•November 11, 2013 – In a letter to California Governor Jerry Brown, twenty of the nation's top climate scientists warned that pro-fracking policies will worsen climate disruption and harm

California's efforts to be a leader in reducing greenhouse gas emissions. The letter called on Governor Brown to place a moratorium on fracking.On

November 21, 2013, a group of Governor Brown's former policy and campaign advisors

made a similar request in light of concerns about the effects of fracking on climate change and water pollution.

•October 18, 2013 – A team of researchers from multiple institutions including Harvard, the University of Michigan and NOAA reported that methane emissions due to drilling activities in the south-central U.S. may be almost five times greater than reported by the world's most comprehensive methane inventory. "These results cast doubt on the US EPA's recent decision to downscale its estimate of national natural gas emissions by 2530 percent," the authors wrote.As The New York Times reported, "The analysis also said that methane discharges in Texas and Oklahoma, where oil and gas production was concentrated at the time, were 2.7 times greater than conventional estimates. Emissions from oil and gas activity alone could be five times greater than the prevailing estimate."

•October 18, 2013 – A major study spearheaded by Stanford University's Energy Modeling Forum concluded that fracking and the shale gas revolution will have no longterm climate benefit. The study brought together a working group of about 50 experts and advisors from companies, government agencies and universities, and modeling teams from 14 organizations. The study also found that build-out of infrastructure for fracking and natural gas will discourage efforts to conserve energy and boost efficiency. The study did not examine methane leaks in order to weigh in on the short-term climate impacts of natural gas.

•October 11, 2013 – As reported in the Guardian, key climate scientists argued that the growth in fracking across the United States is hurting the United States' credibility on climate change.

•October 2, 2013 – Updated measurements from the IPCC determined that methane is even worse for the climate than previously thought. The IPCC determined that methane is

34 times more potent as a greenhouse gas in the atmosphere than CO2 over a 100-year timeframe, and 86 times more potent over a 20-year timeframe.

•September 27, 2013 – The IPCC formally embraced an upper limit on greenhouse gases for the first time, warning that the world will exceed those levels and face irreversible climatic changes in a matter of decades unless steps are taken soon to reduce emissions. The IPCC reported that humanity faces a "carbon budget"—a limit on the amount of greenhouse gases that can be produced by industrial activity before irreversible, damaging consequences—of burning about a trillion metric tons of carbon. The world is on track to hit that by around 2040 at the current rate of energy consumption.

•August 12, 2013 – A New Scientist review of the science on fracking and global warming concluded that fracking could accelerate climate change rather than slow it.

•May 28, 2013 – A research team led by Jeff Peischl, an associate scientist at NOAA's Cooperative Institute for Research in Environmental Sciences, estimated that the methane leak rate from Los Angeles-area oil and gas operations was about 17 percent.

•May, 2013 – A group of scientists and journalists studying climate change, led by Eric Larson, a scientist with Princeton University and Climate Central, reported that the oftenpurported 50 percent climate advantage of natural gas over coal is unlikely to be achieved over the next three to four decades given methane leaks and other factors.The 50 percent claim is based on the fact that natural gas produces half as much carbon dioxide when burned than coal, but it ignores the significant greenhouse gas impacts of methane leakage that occurs throughout the life-cycle of natural gas production, transmission and distribution.

•January 2, 2013 – A NOAA study found methane emissions from oil and gas fields in Utah to be as high as nine percent of production. These levels are considered extremely damaging to the climate.

•November, 2012 – A review by the United Nations Environment Programme found that emissions from fracking, as well as other non-conventional natural gas extraction methods, could increase global warming in the short term and be comparable to coal over a 100-year timeframe.

•November, 2012– The International Energy Agency found that a large natural gas boom—even with improvements in place to reduce leakage—would eventually lead to greenhouse gas concentrations of 650 parts per million and a global temperature rise of 3.5 degrees Celsius, far exceeding the 2 degree Celsius limit which is critical to avoid the most severe effects of climate change.

•May 29, 2012 – The Guardian summarized a special report on natural gas by the International Energy Agency: “A ‘golden age of gas’ spurred by a tripling of shale gas from fracking and other sources of unconventional gas by 2035 will stop renewable energy in its tracks if governments do not take action.”

•February, 2012 – A study found that the carbon dioxide emitted from the burning of natural gas — even neglecting the impacts of methane leakage—contributes significantly to greenhouse gas emissions that are driving climate change.345

•February 7, 2012 – A NOAA study of Colorado gas fields measured methane emissions of about four percent, a significant percentage that could be very damaging to the climate.

•December 29, 2011 – As reported by The New York Times, levels of methane in the atmosphere have been steadily rising since 2007—coinciding with the onset of the fracking boom and posing a serious threat to the Earth’s climate.

•October, 2011 – A study from the National Center for Atmospheric Research concluded that substituting the use of natural gas for coal will increase rather than decrease the rate of global warming for many decades.

•July 6, 2011 – According to the U.S. Energy Information Administration and other research, significant amounts of methane are leaking from aging gas pipelines and infrastructure.

•April, 2011 – A comprehensive analysis of the greenhouse gas footprint of natural gas from shale formations found that between 3.6 percent to 7.9 percent of the methane from natural gas production wells escapes into the atmosphere, rather than being combusted, thereby undermining any climate benefits of gas over coal as a source of energy.

Inaccurate jobs claims, increased crime rates, threats to property value and mortgages and

local government burden

•October 30, 2014 – The New York Times profiled the profound impact heavy drilling has had on Glasscock County, Texas, including its farming community. Farmers described increases in trash, traffic accidents, clashes around farmers selling groundwater to drillers, and economic detriment. In many cases, acres of farmland around a drill site

“will probably never be suitable for fertile farming again,” and farmers are “at the mercy” of what drillers want to pay. The county itself receives revenue, but “… most of that additional money is being used to repair roads damaged by oil field truck activity. Overall, the gains from drilling are not viewed as worth the drawbacks in a county long dominated by cotton farming.”352

•September 11, 2014 – An editor for the Washington Post examined jobs and manufacturing data in Youngstown, Ohio, to demonstrate that drilling and fracking are not resulting in a revitalization of the Rust Belt as some proponents and a prominent New York Times story asserted. The Post determined that in Youngstown, Ohio, the manufacturing sector has lost jobs by the tens of thousands in the last twenty years and

the oil and gas industry has created approximately two thousand jobs since the recession ended. Six years ago, there were 13,000 more jobs in the Youngstown metro area than there were this past summer.

•September 6, 2014 – In Williams County, North Dakota, in the Bakken shale, increases in crime have corresponded with the flow of oil. The infusion of cash has attracted career criminals who deal in drugs, violence and human sex trafficking. The Williston Herald portrayed, in a “reader’s discretion advised” article, the rapid rise of “index crimes”— “violent crimes that result in the immediate loss of an individual’s property, health or safety, such as murder, larceny and rape.” With fewer than 100 law enforcement personnel, “[c]rime in Williams County has risen in kind with the county’s population, but funding, staffing and support training for law enforcement has not.”

•September, 2014 – An article in the magazine Governing: The States and Localities described the social, environmental, health and safety, and economic burdens endured by localities from fracking. “In addition, fracking, in many cases, negatively impacts property values, which in turn depresses property tax revenue. For property owners who own the rights to the oil and gas on their land, the effects of drilling can be offset by royalty payments. But localities have no revenue offset if properties lose value.”355

•August 26, 2014 – The U.S. Justice Department Office of Violence Against Women awarded three million dollars to five rural and tribal communities to prosecute crimes of violence against women and provide services to victims of sexual assault, domestic violence and stalking in the Bakken Region of North Dakota and Montana.356 Rationale documented by tribal leaders, law enforcement and the FBI included, "rapid development of trailer parks and modular housing developments often referred to as 'man camps;' abrupt increase in cost of living, especially housing; rapid influx of people, including transients, in a previously rural and stable community; constant fear and perception of danger; and a lost way of life. Local and tribal officials and service providers reported that these changes have been accompanied by a rise in crime, including domestic and sexual violence."

•May 27, 2014 – A Bloomberg News analysis of 61 shale drilling companies found that the economic picture of shale oil and gas is unstable. Shale debt has almost doubled over the last four years while revenue has gained just 5.6 percent. For the 61 companies in their analysis, Bloomberg News reported: "In a measure of the shale industry's financial burden, debt hit $163.6 billion in the first quarter." Further, Bloomberg News noted that drillers are caught in a bind because they must keep borrowing to pay for exploration needed to "offset steep production declines typical of shale wells …. For companies that can't afford to keep drilling, less oil coming out means less money coming in, accelerating the financial tailspin."

•May 5, 2014 – An Associated Press analysis found that traffic fatalities have spiked in heavily drilled areas of six states whereas most other roads in the nation have become safer even as population has grown. In North Dakota drilling counties, for instance, traffic fatalities have increased 350 percent.

•April 16, 2014 – A comprehensive article in the Albany Law Review concluded that the risks inherent with fracking are not covered by homeowner's insurance, not fully insured by the oil and gas industry and threaten mortgages and property value.360

•April 2014 – A report by the Multi-State Shale Research Collaborative, "Assessing the Impacts of Shale Drilling: Four Community Case Studies," documented economic, community, government and human services impact of fracking on four rural communities. The study found that fracking led to a rapid influx of out-of-state workers and, although some new jobs were created, these were accompanied by additional costs for police, emergency services, road damage, and social services.In addition, increased rents, and a shortage of affordable housing accompanied the fracking boom. Unemployment rose after one county's "boom" ended and, in another county, stayed above the state average throughout.

•March 27, 2014 – A report by researchers at Rand Corp. determined that each shale gas well in Pennsylvania causes between $5,400 and $10,000 in damage to state roads. The report did not calculate damage to local roads, which is also significant. Researchers used estimates of truck trips that are significantly below the number estimated for New York by the NYS DEC.

•February 15, 2014 – The Los Angeles Times detailed steep increases in crime that have accompanied fracking in parts of the Eagle Ford Shale in Texas, including sexual assaults and thefts.

•February 14, 2014 –Pennsylvania landowners with fracking leases rallied in Bradford County against gas companies for precipitous drops in royalty payments.

•December 20, 2013 – The National Association of Realtors' RealtorMag summarized a growing body of research showing that fracking and gas drilling threaten property values, including a University of Denver survey and a Reuters analysis.

•December 12, 2013 – A Reuters analysis discussed how oil and gas drilling has made making some properties "unsellable" and researched the link between drilling and property value declines. The analysis highlighted a Duke University working paper that finds shale gas drilling near homes can decrease property values by an average of 16.7 percent if the house depends on well water.

•December 10, 2013 – Pennsylvania's The Daily Review reported that more gas companies are shifting costs to leaseholders and that royalty payments are drastically shrinking. The story quoted Bradford County commissioner Doug McLinko saying that some gas companies "are robbing our landowners" and that the problem of royalty payments being significantly reduced by deductions for post-production costs "is widespread throughout our county."

•November 30, 2013 – The New York Times reported striking increases in crime in Montana and North Dakota where the oil and gas boom is prevalent, as well as challenges faced by local residents from the influx of out-of-area workers and the accompanying costs. The New York Times reported, "'It just feels like the modern-day Wild West,' said

Sgt. Kylan Klauzer, an investigator in Dickinson, in western North Dakota. The Dickinson police handled 41 violent crimes last year, up from seven only five years ago."

•November 21, 2013 – The Multi-State Shale Research Collaborative released a six-state collaborative report demonstrating that the oil and gas industry has greatly exaggerated the number of jobs created by drilling and fracking in shale formations. The report found that far from the industry's claims of 31 direct jobs created per well, only four jobs are created for each well. It also demonstrated that almost all of the hundreds of thousands of 'ancillary' jobs that the drilling industry claims are related to shale drilling existed before such drilling occurred. As Frank Mauro, executive director of the Fiscal Policy Institute put it, "Industry supporters have exaggerated the jobs impact in order to minimize or avoid altogether taxation, regulation, and even careful examination of shale drilling."

•November 12, 2013 – The American Banker reported that the "Fracking Boom Gives Banks Mortgage Headaches," with a number of financial institutions refusing to make mortgages on land where oil and gas rights have been sold to an energy company. The article stated that the uniform New York state mortgage agreement used by Fannie Mae and Freddie Mac requires that homeowners not permit any hazardous materials to be used or located on their property. Fracking is therefore a problem because it is just such a hazardous activity with use of hazardous materials.

•September 25, 2013 – A report found that fracking is linked to significant road damage, increased truck traffic, crime, and strain on municipal and social services. Data from the past ten years on the social costs of fracking including truck accidents, arrests, and higher rates of sexually transmitted diseases are all causes for alarm.

•September 12, 2013 – In a feature titled "Pa. fracking boom goes bust," The Philadelphia Inquirer presented data from the independent Keystone Research Center detailing "flat at best" job growth and declines in production and royalty payments.

August 22, 2013 – A University of Denver study in the Journal of Real Estate Literature found a 5 percent to 15 percent reduction in bid value for homes near gas drilling sites.

•August 21, 2013 – The Atlantic Cities and MSN Money reported that fracking operations may be damaging property values and may impair mortgages or the ability to obtain property insurance. 376

•August 13, 2013 – A ProPublica investigative analysis found that Chesapeake Energy is coping with its financial difficulties in Pennsylvania by shifting costs to landowners who are now receiving drastically reduced royalty payments.

•August 4, 2013 – In a survey of West Virginia landowners with shale wells on their property, more than half reported problems including damage to the land, decline in property values, truck traffic and lack of compensation by the oil and gas company.

•May 24, 2013 – Pennsylvania Department of Transportation Secretary Allen D. Biuhler, P.E., and Pennsylvania State Police Commissioner Frank Pawlowski said that gas drilling has led to increases in truck traffic, traffic violations, crime, demand for social services, and the number of miles of roads that are in need of repairs. They noted that drilling companies that committed to repairing roads have not kept pace with the roads they damage. Police Commissioner Pawlowski reported that 56 percent of 194 trucks checked were over the legal weight limit and 50 percent were also cited for safety violations.

•May 4, 2013 – Pennsylvania's Beaver County Times asked "What boom?" in pointing to Keystone Research Center data showing that the number of jobs numbers created by shale gas extraction do not add up to what the gas industry claims, noting that unemployment has increased and the state actually fell to 49th in the nation for job creation.

April 2, 2013 – The New York Times reported that manufacturing jobs resulting from an abundance of shale gas have not appeared. "The promised job gains, other than in the petrochemical industry, have been slow to materialize," the New York Times reported. The article suggested that increased automation has made it unlikely that manufacturers will add many jobs.

•March 19, 2013 – The Wall Street Journal reported that the shale gas boom has not had a big impact on U.S. manufacturing because lower energy prices are only one factor in a company's decision on where to locate factories, and not always the most important factor. "Cheap energy flowing from the U.S. shale-gas boom is often touted as a 'game changer' for manufacturing," the Journal reported. "Despite the benefits of lower energy costs, however, the game hasn't changed for most American manufacturers."

•February, 2013 – A peer-reviewed analysis of industry-funded and independent studies on the economics of fracking found that it is unlikely that fracking will lead to long-term economic prosperity for communities. The analysis noted that shale gas development brings a number of negative externalities including the potential for water, air and land contamination; negative impacts on public health; wear and tear on roads and other infrastructure; and costs to communities due to increased demand for services such as police, fire departments, emergency responders, and hospitals.

•November 16, 2012 – A Duke University study showed a drop in home values near fracking for properties that rely on groundwater.

•September 27, 2012 – The New York Times reported that the prospect of fracking has hindered home sales in the Catskills and raised concerns about drops in property values, according to real estate agents and would-be buyers.

August 17, 2012 – A study by the state agencies, the Montana All Threat Intelligence Center and the North Dakota State and Local Intelligence Center, found that crime rose by 32 percent since 2005 in communities at the center of the oil and gas boom.

•October 30, 2011 – A comprehensive article in the New York State Bar Association

Journal concluded that the risks inherent with fracking threaten mortgages.

•October 26, 2011 – The Associated Press reported that areas with significant fracking activity, including Pennsylvania, Wyoming North Dakota and Texas, are “seeing a sharp increase in drunken driving, bar fights and other hell-raising.”

•October 19, 2011 – A New York Times investigation found that fracking can create conflicts with mortgages, and that “bankers are concerned because many leases allow drillers to operate in ways that violate rules in landowners’ mortgages,” and further that “[f]earful of just such a possibility, some banks have become reluctant to grant mortgages on properties leased for gas drilling. At least eight local or national banks do not typically issue mortgages on such properties, lenders say.”389

•September 7, 2011 – The NYS DEC estimated that 77 percent of the workforce on initial shale gas drilling projects would consist of transient workers from out of state. Not until the thirtieth year of shale gas development would 90 percent of the workforce be comprised of New York residents.

•August 15, 2011 – The Pittsburgh Post-Gazette reported that increases in crime followed the Pennsylvania gas drilling boom, noting, for instance, that drunken driving arrests in Bradford County were up 60 percent, DUI arrests were up 50 percent in Towanda, and criminal sentencing was up 35 percent in 2010.

July 26, 2011 – A New York State Department of Transportation document estimated that fracking in New York could result in the need for road repairs and reconstruction costing $211 million to $378 million each year.

•June 20, 2011 – A Keystone Research Center study found that the gas industry’s claim of 48,000 jobs created between 2007 and 2010 as a result of natural gas drilling in Pennsylvania is a far cry from the actual number of only 5,669 jobs—many of which were out-of-state hires.

•May 9, 2011 – A study in the Journal of Town City Management found that shale gas development can impose “significant short- and long-term costs” to local communities. The study noted that shale gas development creates a wide range of potential environmental hazards and stressors, all of which can adversely impact regional economies, including tourism and agriculture sectors.394

•November 30, 2010 – The Dallas Morning News featured a story, “Drilling Can Dig into Land Value,” reporting that the Wise County Central Appraisal District Appraisal Review Board found that a drilling company had caused an “extraordinary reduction” in property value, by 75 percent.395

•November 28, 2010 – The Texas Wise County Messenger reported that some landowners near fracking operations experience excessive noise, exposure to diesel fumes, and problems with trespassing by workers.

End Part VI of the NY Compendium.

Part VII of the NY Compendium. The final installment to the COGCC Comissioners, Matt Lepore, Mike King, Rebecca Trietz, John Noto, Greg DDeranleau, Doug Suttles, Miracle Pfister and The Regnier Family Farms, for all of the reasons stated in Part I of the NY Compendium in these Public Comments for the 12 Regnier Wells and Location Assessment.

Inflated estimates of oil and gas reserves and profitability

•August 29, 2014 – Andrew Nikiforuk, a Canadian energy analyst, reported on diminishing returns and higher-cost, higher-risk nature of fossil fuel extraction by fracking. Nikiforuk wrote, “Most of the world’s oil and gas firms are now pursuing extreme hydrocarbons because the cheap and easy stuff is gone …. That means industry will spend more good money chasing poor quality resources. They will inefficiently mine

and frack ever larger land bases at higher environmental costs for lower energy returns.”

•July 29, 2014 – According to the US Energy Information Administration, energy companies are incurring increasing debt and selling assets to continue drilling in shale. “Based on data compiled from quarterly reports, for the year ending March 31, 2014, cash from operations for 127 major oil and natural gas companies totaled $568 billion, and major uses of cash totaled $677 billion, a difference of almost $110 billion. This shortfall was filled through a $106 billion net increase in debt and $73 billion from sales of assets....”

•July, 2014 – Researchers at the Washington, DC-based Environmental Law Institute and Washington Jefferson College in Pennsylvania collaborated to produce a report designed in part to help communities avoid the “boom and bust” cycles of extractive industries. Authors warned, “While resource extraction has long been regarded as an economic benefit, a body of academic literature suggests that long term growth based chiefly on resource extraction is rare.” Confounding factors include transience of the workforce, localized inflation, widening disparities in royalties and impact fee disbursement, commodity price volatility, and communities overspending on infrastructure.399

•June 19, 2014 – Energy analyst Deborah Lawrence Rogers outlined the spiraling debt and severe deterioration of the assets of five major shale gas drillers over the last five years.

She concluded that, “This is not sustainable. It could be argued that it is not even moral. It is a failed business model of epic proportion. While companies could make the argument at one time that this was a short term downtrend, that no longer holds water because this pattern is long term.”

•April 10, 2014 – A report by a petroleum geologist and petroleum engineer concluded the 100-year supply of shale gas is a myth, distinguished between what is technically recoverable and economically recoverable shale gas, and asserted that at current prices, New York State has no economically recoverable shale gas.

•February 28, 2014 – The chief of the International Energy Agency reported that there is only a decade left in the US shale oil and gas boom, noting that the growth would not last and that production would soon flatten out and go down.

•December 18, 2013 – A University of Texas study in Proceedings of the National Academy of Sciences found that fracking well production drops sharply with time, which undercuts the oil and gas industry’s economic projections.In an interview about the study with StateImpact NPR in Texas, Tad Patzek, chair of the Department of Petroleum and Geosystems Engineering at University of Texas at Austin, noted that fracking “also interferes now more and more with daily lives of people. Drilling is coming to your neighborhood, and most people abhor the thought of having somebody drilling a well in their neighborhood.”

•August 18, 2013 – Bloomberg News reported that low gas prices and disappointing wells have led major companies to devalue oil and gas shale assets by billions of dollars.

•October 21, 2012 – The New York Times reported that many gas drilling companies overproduced natural gas backed by creative financing and now “are committed to spending far more to produce gas than they can earn selling it.” “We are all losing our shirts today,” said Exxon CEO Rex Tillerson in the summer of 2012.

•July 13, 2012 – The Wall Street Journal reported that ITG Investment Research, at the request of institutional investors, evaluated the reserves of Chesapeake Energy Corp.’s shale gas reserves in the Barnett and Haynesville formations and found them to be only 70 percent of estimates by Chesapeake’s engineering consultant for the company’s 2011 annual report. Chesapeake and its

consultant defended their figures.

•August 23, 2011 – The U.S. Geological Survey cut the government's estimates of natural gas in the Marcellus Shale from 410 trillion cubic feet to 84 trillion cubic feet, equivalent to a reduction from approximately 16 years of U.S. consumption at current levels of natural gas use, to approximately 3.3 years of consumption. The U.S. Geological

Survey's updated estimate was for natural gas that is technically recoverable, irrespective of economic considerations such as the price of natural gas or the cost of extracting it.

•June 26-27, 2011 – As reported in two New York Times stories, hundreds of emails, internal documents, and analyses of data from thousands of wells from drilling industry employees combined with documents from federal energy officials raised concerns that shale gas companies were overstating the amount of gas in their reserves and the profitability of their operations.4 The New York Times' public editor criticized the stories, but offered no evidence that the major findings were wrong. The New York Times' news editors publicly defended both stories against the public editor's criticism. 414

Disclosure of serious risks to investors

A snapshot of the dangers posed by natural gas drilling and fracking pose can be found in an annual Form 10-K that oil and natural gas companies are required to disclose annually to the U.S. Securities and Exchange Commission (SEC). Federal law requires that companies offering stock to the public disclose in their Form 10-K, among other things, the "most significant factors that make the offering speculative or risky."415

In a review of the most recent Form 10-Ks available on the SEC's website, oil and natural gas companies routinely warned of drilling's serious risks. In the words of Exxon Mobil Corp.'s subsidiary XTO Energy Corp., these included "hazards and risks inherent in drilling" ; or in the language of Range Resources Corp., "natural gas, NGLs [natural gas liquids] and oil operations are subject to many risks."

Such hazards and risks include leaks, spills, explosions, blowouts, environmental damage, property damage, injury and death. Chesapeake Energy Corporation, which has been interested in drilling in New York, has stated that "horizontal and deep drilling activities involve greater risk of mechanical problems than vertical and shallow drilling operations."Companies want to use horizontal drilling and fracking to extract shale gas in New York State.

The companies also routinely warn of inadequate insurance to cover drilling harms. XTO Energy Corporation, which holds thousands of acres of natural gas leases in New York, states that "we are not fully insured against all environmental risks, and no coverage is maintained with respect to any penalty or fine required to be paid by us."

Houston-based Noble Energy provides a representative example of the risks that at least several drilling companies include in their annual reports. Noble states:

Our operations are subject to hazards and risks inherent in the drilling, production and transportation of crude oil and natural gas, including:

•injuries and/or deaths of employees, supplier personnel, or other individuals;

•pipeline ruptures and spills;

•fires, explosions, blowouts and well cratering;

•equipment malfunctions and/or mechanical failure on high-volume, high-impact wells;

•leaks or spills occurring during the transfer of hydrocarbons from an FPSO to an oil tanker;

•loss of product occurring as a result of transfer to a rail car or train derailments;

•formations with abnormal pressures and basin subsidence;

•release of pollutants;

•surface spillage of, or contamination of groundwater by, fluids used in hydraulic fracturing operations;

•security breaches, cyber attacks, piracy, or terroristic acts;

•theft or vandalism of oilfield equipment and supplies, especially in areas of increased activity such as the DJ Basin and Marcellus Shale;

•hurricanes, cyclones, windstorms, or “superstorms,” such as Hurricane Sandy which occurred in 2012, which could affect our operations in areas such as the Gulf Coast, deepwater Gulf of Mexico, Marcellus Shale, Eastern Mediterranean or offshore China;

•winter storms and snow which could affect our operations in the Rocky Mountain areas;

•unseasonably warm weather, which could affect third party gathering and processing facilities, such as occurred in the Rocky Mountain areas during 2012;

•volcanoes which could affect our operations offshore Equatorial Guinea;

•flooding which could affect our operations in low-lying areas such as the Marcellus Shale;

•harsh weather and rough seas offshore the Falkland Islands, which could limit certain exploration activities; and • other natural disasters.

Any of these can result in loss of hydrocarbons, environmental pollution and other damage to our properties or the properties of others.

Noble has language similar to that found in other companies’ annual reports about inadequate insurance and adds, “coverage is generally limited or not available to us for pollution events that are considered gradual.”421

The risks identified by Noble and other drilling companies are not just hypothetical.Many, if not all of these risks have become realities as illustrated in the other sections of this compendium.

Medical and scientific calls for more study and more transparency

•December 5, 2014 – A team of medical and scientific researchers, including from the Institute for Health and Environment at the State University of New York (SUNY) at Albany, reviewed the scientific evidence that both adult and early life – including prenatal – exposure to chemicals from fracking operations can result in adverse reproductive health and developmental effects. These include: endocrine-disrupting chemicals potentially increasing risk for reproductive problems, breast cancer, abnormal growth and developmental delays, and changes in immune function; benzene, toluene and xylene (BTX chemicals) increasing risk for impaired sperm quantity and quality in men and menstrual and fertility problems in women; and heavy metals increasing the risk of miscarriage and/or stillbirths. Potential exposures occur through both air and water. Based on their review, the authors concluded, “Taken together, there is an urgent need for the following: 1) biomonitoring of human, domestic and wild animals for these chemicals; and 2) systematic and comprehensive epidemiological studies to examine the potential for human harm.”Lead author Susan Nagel said in an accompanying interview, “We desperately need biomonitoring data from these people. What are people actually exposed to? What are the blood levels of people living in these areas? What are the levels in the workers?”

•September 15, 2014 – Researchers led by University of Rochester’s Environmental Health Sciences Center conducted interviews in New York, North Carolina, and Ohio to evaluate community health concerns about unconventional natural gas development. They identified many areas where more study is needed, including baseline measures of air quality, ongoing environmental monitoring, and health impact assessments. They noted that other areas where data are lacking involve the assessment of drilling and fracking impacts on vulnerable populations such as very young children, and the potential consequences of interactions between exposures resulting from shale gas extraction operations. Researchers suggested incorporating the input of potentially affected community members into the development of the research agenda.

•July 21, 2014 – An independent assessment report by Scientists for Global Responsibility and the Chartered Institute of Environmental Health reviewed current evidence across a number of issues associated with shale gas extraction by hydraulic fracturing, including environmental and public health risks, drawing on academic research. Among the report’s conclusions: there are major shortcomings in regulatory oversight regarding local environmental and public health risks; there is a large potential for UK shale gas exploitation to undermine national and international efforts to tackle climate change; the water-intensive nature of the fracking process which could cause water shortages in many areas; the complete lack of evidence behind claims that shale gas exploitation will bring down UK energy

bills; and concerns that it will impact negatively on UK energy security. Despite claims to the contrary, the report noted that evidence of local environmental contamination from shale gas exploitation is well reported in the scientific literature. It emphasizes that, “[t]here are widespread concerns over the lack of evidence on frackingrelated health impacts,” and that there is a lack of “substantive epidemiological study for populations exposed to shale gas extraction.”425

•July 18, 2014 – A working group of the Environmental Health Sciences Core Centers, supported by the National Institute of Environmental Health Sciences, reviewed the available literature on the potential health impacts of fracking for natural gas. They concluded that further research is urgently needed. Needs identified included: monitoring of air and water quality over the entire lifetime of wells; further epidemiologic research addressing health outcomes and water quality; and research addressing whether air pollution associated with fracking increases the risk of pulmonary and cardiovascular disease. The working group advocated for the participation of potentially affected communities in all areas of research.

•July 12, 2014 – Eli Avila, Pennsylvania’s former health secretary, said that health officials need to be proactive in protecting the public from the health effects of unconventional shale gas extraction. In 2011 funding was approved for a Pennsylvania public health registry to track drilling related complaints and address concerns, but was cut at the last minute. Speaking to the problem posed by the dearth of information, Avila asked, “How can you keep the public safe if you’re not collecting data?”

•June 30, 2014 – In a letter to the Pennsylvania Department of Environmental Protection, director of the Mid-Atlantic Center for Children’s Health and the Environment, Jerome A. Paulson, MD, called for industry disclosure of all ingredients of fracking fluid; thorough study of all air contaminants released from drilling and fracking operations and their protected dispersal patterns; and study and disclosure of fracking-related water contamination and its mechanisms. Dr. Paulson said:

In summary, neither the industry, nor government agencies, nor other researchers have ever documented that [unconventional gas extraction] can be performed in a manner that minimizes risks to human health. There is now some evidence that these risks that many have been concerned about for a number of years are real risks. There is also much data to indicate that there are a number of toxic chemicals used or derived from the process, known or plausible routes of exposure of those chemicals to humans; and therefore, reason to place extreme limits on [unconventional gas extraction].428

•June 20, 2014 – Highlighting preliminary studies in the United States that suggest an increased risk of adverse health problems among individuals living within ten miles of shale gas operations, a commentary in the British medical journal The Lancet called for a precautionary approach to gas drilling in the United Kingdom. According the commentary, “It may be irresponsible to consider any further fracking in the UK

(exploratory or otherwise) until these prospective studies have been completed and the health impacts of fracking have been determined.”

•June 20, 2014 – Led by an occupational and environmental medicine physician, a Pennsylvania-based medical and environmental science research team documented “… the substantial concern about adverse health effects of [unconventional natural gasdevelopment] among Pennsylvania Marcellus Shale residents, and that these concerns may not be adequately represented in medical records.” The teams identified the continued need to pursue environmental, clinical and epidemiological studies to better understand associations between fracking, medical outcomes, and residents’ ongoing concerns.

•June 17, 2014 – A discussion paper by the Nova Scotia Deputy Chief Medical Officer and a panel of experts identified potential economic benefits as well as public health concerns from unconventional oil and gas development. On the health impacts, they wrote, “uncertainties around long term environmental effects, particularly those related to climate change and its impact on the health of both current and future generations, are considerable and should inform government decision making.” The report noted potential dangers including contamination of groundwater, air pollution, surface spills, increased truck traffic, noise pollution, occupational health hazards and the generation of greenhouse gases. It also noted that proximity of potential fracking sites to human habitation should give regulators pause and called for a health impact assessment and study of long-term impacts.Responding to the report, the Environmental Health Association of Nova Scotia applauded the go-slow approach and called for a 10-year moratorium on fracking.

•May 29, 2014 – In New York State, more than 250 medical organizations and health professionals released a letter detailing emerging trends in the data on fracking that show significant risk to public

health, air quality, water, as well as other impacts. With signatories including the American Academy of Pediatrics, District II, the American Lung Association in New York, Physicians for Social Responsibility, and many leading researchers examining the impacts of fracking, they wrote, “The totality of the science — which now encompasses hundreds of peer-reviewed studies and hundreds of additional reports and case examples—shows that permitting fracking in New York would pose significant threats to the air, water, health and safety of New Yorkers.”

•May 9, 2014 – In a peer-reviewed analysis, leading toxicologists outlined some of the potential harm and uncertainty relating to the toxicity of the chemical and physical agents associated with fracking, individually and in combination. While acknowledging the need for more research and greater involvement of toxicologists, they noted the potential for surface and groundwater contamination from fracking, growing concerns about air pollution particularly in the aggregate, and occupational exposures that pose a series of potential hazards to worker health.

•May 1, 2014 – A 292-page report from a panel of top Canadian scientists urged caution on fracking, noting that it poses “the possibility of major adverse impacts on people and ecosystems” and that significantly more study is necessary to understand the full extent of the risks and impacts. The Financial Post reported that the panel of experts “found significant uncertainty on the risks to the environment and human health, which include possible contamination of ground water as well as exposure to poorly understood combinations of chemicals.”

•April 30, 2014 – Medical professionals spoke out on the dearth of public health information collected and lack of long-term study five years into Pennsylvania’s fracking boom. Walter Tsou, MD, MPH, of Physicians for Social Responsibility and former health commissioner of Philadelphia commented, “That kind of study from a rigorous scientific perspective has never been done.” Other experts added, “There has been more health research involving fracking in recent years, but every study seems to consider a different aspect, and … there is no coordination.”

•April 17, 2014 – In the preeminent British Medical Journal, authors of a commentary, including an endocrinologist and a professor of clinical public health, wrote, “Rigorous, quantitative epidemiological research is needed to assess the risks to public health, and data are just starting to emerge. As investigations of shale gas extraction in the US have continually suggested, assurances of safety are no proxy for adequate protection.”

•April 15, 2014 – The Canadian Medical Association Journal reported on the increasing legitimacy of concerns about fracking on health: “While scientists and area residents have been sounding the alarm about the health impacts of shale gas drilling for years, recent studies, a legal decision and public health advocates are bringing greater legitimacy to concerns.”

•March 3, 2014 – In the Medical Journal of Australia, researchers and a physician published a strongly worded statement, “Harms unknown: health uncertainties cast doubt on the role of unconventional gas in Australia’s energy future.” They cited knowledge to date on air, water, and soil pollution, and expressed concern about “environmental, social and psychological factors that have more indirect effects on health, and important social justice implications” yet to be understood. They wrote in summary:

The uncertainties surrounding the health implications of unconventional gas, when considered together with doubts surrounding its greenhouse gas profile and cost, weigh heavily against proceeding with proposed future developments. While the health effects associated with fracturing chemicals have attracted considerable public attention, risks posed by wastewater, community disruption and the interaction between exposures are of also of concern.

•March 1, 2014 – In the prestigious British medical journal The Lancet, researchers summarized workshops and research about the health impacts of fracking:

Scientific study of the health effects of fracking is in its infancy … but findings suggest that this form of extraction might increase health risks compared with conventional oil and gas wells because of the larger surface footprints of fracking sites [due to the large number of well pads being developed]; their close proximity to locations where people live, work, and play; and the need to transport and store large volumes of materials.

•February 24, 2014 – In a review of the health effects of unconventional natural gas extraction published in the journal Environmental Science Technology, leading researchers identified a range of impacts and exposure pathways that can be detrimental to human health. Noting how fracking disrupts communities, the review states, “For communities near development and production sites the major stressors are air pollutants, ground and surface water contamination, truck traffic and noise pollution, accidents and malfunctions, and psychosocial stress associated with community change.”

They concluded, “Overall, the current scientific literature suggests that there are both substantial public concerns and major uncertainties to address.”

•August 30, 2013 – A summary of a 2012 workshop by the Institute of Medicine Roundtable on Environmental Health Sciences, Research, and Medicine featured various experts who discussed health and environmental concerns about fracking and the need for more research. The report in summary of the workshop stated, “The governmental public health system, which retains primary responsibility for health, was not an early participant in discussions about shale gas extraction; thus public health is lacking critical information about environmental health impacts of these technologies and is limited in its ability to address concerns raised by regulators at the federal and state levels, communities, and workers employed in the shale gas extraction industry.”

•June, 2013 – A group of three nursing professors published a cautionary review questioning the rollout of “new energy practices” in shale development at a time when, though “[l]ongitudinal reports from long-term exposure to contaminated air and water from gas extraction don’t exist … anecdotal reports make clear that the removal of fossil fuels from the earth directly affects human health.” “Evidence of the negative human and ecologic health effects of fracking are emerging, and it should be noted that sufficient evidence has been presented to the [American Nurses Association], the American Public Health Association, and the American Medical Association’s Resident and Fellow Section to result in a call for a moratorium on the issuance of new fracking permits nationally.” They urge nurses to contribute to keeping health issues “front and center as we address national energy needs and policies.”

•April 22, 2013 – In one of the first peer-reviewed nursing articles summarizing the known health and community risks of fracking, Professor Margaret Rafferty, Chair of the Department of Nursing at New York City College of Technology wrote, “Any initiation

or further expansion of unconventional gas drilling must be preceded by a comprehensive Health Impact Assessment (HIA).”

•May 10, 2011 – In the American Journal of Public Health, two medical experts cautioned that fracking “poses a threat to the environment and to the publics health. There is evidence that many of the chemicals used in fracking can damage the lungs, liver, kidneys, blood, and brain.” The authors urged that it would be prudent to invoke the precautionary principle in order to protect public health and the environment.

Conclusion

All together, the findings from the scientific, medical, and journalistic investigations indicate that fracking poses significant threats to air, water, health, public safety, and long-term economic vitality. Concerned both by the rapidly expanding evidence of harm and by the fundamental data gaps still remaining, Concerned Health Professionals considers a moratorium on unconventional oil and natural gas extraction (fracking) the only appropriate and ethical course of action while scientific and medical knowledge on the impacts of

End of NY Compendium.All of this material is heavily cited and referenced for further study and research.

14 04/29/2015

COGCC you are hereby put on notice and responsible to know every single study presented in the PSA link below before approving any more wells in the State of Colorado. Due to the clear and present inherent dangers associated with Hydraulic Fracturing and especially High Volume Hydraulic Fracturing near and around homes aka Occupied Buildings/residences, the 13 applications for the Regnier Site should be removed from the COGCC website.

‘PSE STUDY CITATION DATABASE

on Shale Gas Tight Oil Development

This citation database provides bibliographic information, abstracts, and links to many of the vetted scientific papers housed in the PSE Healthy Energy Library, as well as other peer-reviewed journal articles. This database is a near exhaustive and evolving list of the peer-reviewed literature that directly pertains to shale gas and tight oil development. This literature is organized into twelve different categories, including air quality, water quality, climate, public health, and regulations. PSE Healthy Energy does not necessarily support the methods and the findings of the studies included in

	this database. Once accessed, users have the ability to sort, search, and select from the database. We recommend sorting the list by author name. This can be done by clicking the creator heading on the right side of the screen. Library settings can also be changed by clicking the button above date modified (here we recommend including year in the library view). Additionally, the Zotero library search bar (top right) is useful and can be used to search journal articles by topic, author, title, etc. For questions, problems, and suggestions please email Jake Hays at hays@psehealthyenergy.org. Zotero is free and open-source citation management software that enables users to manage bibliographic data and to generate in-text citations and bibliographies in word processers such as Microsoft Word and OpenOffice. The PSE Study Citation Databaseon shale gas and tight oil development organizes peer-reviewed journal articles on this subject, allowing users to access and cite bibliographic information. See more at: http://www.psehealthyenergy.org/site/view/1180#sthash.oloE1Df5.dpuf	
15		04/29/2015
	2 Letters: April 13, 2015 Hello Ms. Pfister, Mr. Suttles and COGCC Commssioners, Ms. Pfister, thank you for your e-mail of April 7, 2015.I appreciate that you addressed the detailing of some of the process that your Corporation is engaging in with regards to CR1 and Rd. 18, and that you are making progress towards setting up for the Community Meeting. Numerous members of our community will be interested in your viewing your presentation and engaging in a dialogue with representatives from Encana. We hope you will seriously consider our concerns and requests and adopt them into your plans as you move forward. We are inviting a number of stakeholders to this meeting so we would appreciate expediency in the matter of date setting. It would be best for our Community and possibly others, if the meeting could be at least one week before the April 29th Public Comment deadline. In the excerpts below from your letter, you have utilized the word ‘when’ and ‘when we begin operations’ numerous times:‘We will include an agenda item about truck traffic in our meeting with you and your neighbors so that we will have the opportunity to share our traffic study results with you and get your feedback.We will do our best to address your concerns about traffic when we begin operations-and will be happy to share them with you when we get closer to beginning that phase of the project. We have a great deal of experience operating in and around communities, so we believe we have good systems in place to minimize the effects of our truck traffic as best as is possible given constraints and limitations around existing roads, terrain, community traffic patterns, etc.’ Does this statement mean you have prior knowledge about permit approval for the Regnier and Rasmussen Sites?Does this mean that the access plans and road use plans are being determined after the approval of the wells and locations?Does this mean you plan on somehow, fitting the exponential increase of semi and tanker truck traffic into our lives After the permits are approved, or are you planning on presenting how you are going to implement access plans Before permitting but After our input at the Community Meeting?It seems that the Location and Number of wells, which are both arbitrary and negotiable, should be determined in conjunction with the Community because traffic plans and access to sites would likely influence the viability and appropriateness of the Drilling and Facility Sites for fitting into our Community.Would you consider doing the latter and if not, why? I am concerned that in your description, ‘Our permit for the Regnier well pad represents the best option we have to access the minerals given our existing surface use agreements, state and local laws, and our business objectives.We know that you have concerns about its location, but please understand that once we get underway, we are committed to mitigating the impacts of our operations on you and your neighbors as much as possible.’ that you have not considered all of the factors involved in choosing the number of wells, size of facility sites, locations of wells and facility sites. It appears you think you are accountable to the mineral rights owners alone and have thus addressed 3 out of 8 necessary realities for viability and legality of your decisions about number of wells and location:	

You stated these 3:

1. ‘existing surface use agreement’s (all were made without surrounding surface owners input)

2. ‘State and local laws’

3. ‘Business objectives’.

But you are missing 5 critical components in your process for determining the complete picture, validity, legality and viability of your proposed operations:

4.Community Satisfaction, Safety and Appropriateness of these 2 Major Industrial sites which include an additional 24 wells, in a currently Low Volume Hydrofracturing area.As of yet, I have not perceived any reasonable degree of consideration or willingness to negotiate and include our needs and concerns about the impacts from these sites from your Corporation or the COGCC adopted into your permit applications.For instance, a CDPHE study has not been conducted as requested by both the Community and Boulder County. Also, I see no evidence that your corporation has studied and taken into consideration all available peer reviewed research regarding the health and safety of HVHF near occupied dwellings. Where is evidence that you have researched all of the studies that point to conclusive evidence that surface owner property values in the surrounding areas around HVHF sites are diminished?Mineral owners are taking away the nearby surface owner rights to their property values and I see no evidence that you understand this.

5. You have not shown evidence that a Comprehensive Plan for a 2 mile radius around Section 19, including working with other operators who have interest in the area, so that excessive Oil and Gas Extraction in this area and the impacts of any further drilling would be mitigated apriori to the permitting of any future sites, has been conducted, per a Community Members request per the Rasmussen Site.

6. Boulder County doesn’t want you to impose High Volume Hydrofracturing near their border. Have Buffer Zones been considered and voluntarily adopted by both you, as the Operator and Weld County?

7. Most of the Community would agree to the following 3 reasonable and prudent amendments to your proposals.These proposals represent a moderate, good neighborly and reasonable approach to Hydro-fracturing in our Community and the surrounding area:

*If both well sites are reduced to 4 wells or fewer, these would be in in addition to the many current wells already producing on both properties.

*Both the wells and the Facilities for the Regnier Site are moved 2 miles away to the North end of Section 18 on Weld County Road 20.5. CR1 would not be used for the Regnier Site, regardless of the surface agreements with the mineral owner, he should give in and do what is right for all surface owners.

*Rd. 18 would not be used for either site, so the Rasmussen site would be moved to the existing Hydro-fracked Location.

8. The 5th Amendment Rights of the Surface Owners surrounding these Sites to not have our property values and quality of life taken or diminished by Mineral Owners.

Once these projects are permitted as is, and underway, is too late for this entire area and our neighborhood. I am 100% assured the Community will not think that ‘as much as possible’ will be adequateenough to mitigate the devastation to our community that is being forced on this community; traffic wise, lifestyle wise,health wise and property value wise.

Please address whether or not the Community’s concerns and proposals for protecting their surface property rights will be considered and given their due through study and consideration apriori to the permitting of these 2 major Industrial Sites.

Thank you for your time,

Goose Feather Farm LLC

Letter #2:

Ms. Pfister and Mr. Suttles and COGCC Commissioners,

I need to be clear with you about my personal concerns regarding the impacts of both of these projects in my familys and farm's life:

For the record, if Rd 18 is used for either the Rasmussen Wells and/or the Regnier Facility Site, and if the amount of wells remains at 12, and the Regnier site remains in the current location, we will not be able to live at our home anymore.

Regarding any proposals for systems you are planning to use to mitigate the 10's of thousands of semi, tanker and other truck traffic for CR1 and Rd. 18 for the 2, 12 well proposals-I assure there isn't a single mitigation that couldreduce the pollution and dramatic change of Road Use and impact of 10s of thousands of trucks in our neighborhood over the course of the 14 months of drilling and fracking (if drilled simultaneously- double the impact and 2 years if drilled separately) enough that would make our home a place we could live anymore.

After all of the construction, drilling and fracking truck traffic which will lead to years and years of exponentially larger Production traffic than what is currently happening in our neighborhood from Encana and their subsidiaries, the traffic plans cannot remotely correct or mitigate the devastating effects that would happen in our neighborhood and community on Rd. 18 and County Road 1 from these 2 Proposed Sites.The exponential increase in semi and tanker trucks that have beenproposed would radically alter our bucolic lifestyle, our safety and the landscape we have chosen to live in.We chose to live a lifestyle free of excessive traffic, and diesel fumes, the sounds, the lights, the strangers, the road blockages, the general nastiness of semi-trucks and the visual blight of the hideous Major Industrial Scaled Facility Sites needed for the trucks, all of which would be devastating to our health, our landscape and our quiet existence here.

I am changing my original request from complete denial of the permits by the COGCCC to a moderate approach, and am now asking Rasmssen/Regnier and Encana and the COGCC to voluntarily adopt a respectful, neighborly reasonable proposal:Develop a Low Volume Hydrofracturing policy, or MOU or Inter-government Agreement, or some other agreement, with our Community and Boulder County which would mean that no more than 4 wells can be permitted for either of these sites and that Rd 18 cannot be used for either, and that the wells and the Facilities for the Regnier Site are moved entirely to 1/2 mile south of WCR 20.5, to the already existing site on Regniers property, regardless of the what the surface owner, Regnier Family Farms, wants.

If these 3 requests cannot happen, if you continue to think that my family would adapt to your current proposals I want to assure you that managing the road traffic for this scale of operation'As much as possible' could never be enough management or mitigation for our family and my farm, Goose Feather Farm LLC to be able to live and work here.

We are being forced out of our home and farm.My farm, Goose Feather Farm has in the past until 2013 was producing dairy and egg operation. This springI had planning on returning to those businesses. I was considering buying another flock of 50-75 eggs for production and sale of eggs and because of the 2 sites you are proposing, by necessity I am putting those projects on hold. Encana, Rasmussen LLP and Regnier LLP are taking their mineral rights and surface rights and placing them above or more important than Goose Feather Farm Surface Rights.Our property values, our rights to a 100% safe life in our homes, and the bucolic lifestyle that we chose here in the country are being significantly diminished by each of these proposals.

Again, it would be impossible for us to live near the 24 proposed wells and 2 associated Industrial Facility sites.We would not endure the assault on our lifestyle; the 14 months of the sports stadium lights, the grinding days of drilling and then the 168 days of fracking at 80+ decibels, and the major amounts of emissions emitted from the sites and the trucks during all of those processes. And after all of that, our beautiful Rd. 18 would be ruined, a 100% transformation from a country road to a destroyed Industrial Use road; altering it or widening it in anyway will mean destroying a grove of trees and/or destroying a beautiful historically significant cemetery it cannot ever be returned to the pristine natural state that it is currently in.

If the projects go through as is, Rasmussens entire farm would transform into a Huge Major Industrial Facility Pad and that would become our main westward view. His property would blight the beautiful view we have now of the mountains and a farm. Rasmussens farmhouse value would be significantly diminished with 28, 25 foot high towers and 8, 40 feet VRU units on top and 12 separators and the burn-off towers and the ugly blight of the wells on all of the compacted acres and acres, 300 feet from his home.Acres and Acres of ugly compacted earth surrounding huge ugly 10 foot high wells on a pad, that is what we would pass by as we drive along the 1/2 mile stretch of road we use to access our home every day.So you can see, his property would ruin our surface use and diminish our

property value.

If you would have included our family, regardless of the setback rules, in the proposal from the beginning, we would have been forewarned about these projects 4 years ago and could have figured out much earlier in the process that everything about the process is entirely undemocratic and that there was truly nothing we could do to change the negotiations and mitigate the projects so they would fit into our neighborhood and lifestyle as Low Volume and Low Impact sites. We would have had more options and you may have negotiated a different plan that works in this neighborhood.As it stands now,we are stuck since the projects are virtually signed away as proposed, we cannot move and we cannot stay, by no bidding of our own, this egregious situation against our surface rights, has been forced upon us.

Our surface rights are being 100% superceded by the mineral rights of two neighbors with whom you engaged in a lengthy process with and colluded with, without ever once consulting with or including our family who is one of 2 families significantly impacted the most, or the many neighbors who are concerned and negatively effected in many ways.Rasmussen and Regniers and yours entire monetary gain from these 2 Industrial Sites will be 100% on our backs. There has been, and I am afraid there will continue to be, zero democracy in this process.My family is becoming victims of all of the greed and insensitivity of; the surface owners, the COGCC, Weld County Government and you all, Encana.We are 100% victims here, and you and the surface owners who seem to believe they live in a vacuum, are causing it.

We are also stuck because right now rules that were made for Low Volume Hydrrofracturing are being applied to High Volume Hydrofractuing and being applied to our lives, there may be future rule making on behalf of citizens in occupied dwellings so the imminent dangers and loss of property value as the Oil and Gas Industry moves from Low Volume Hydrofracturing to High Volume Hydrofracturing.The rules you speak of are completely inaccurate and inadequate and inappropriate, yet you all continually refer to them as if those rules are Gods Law. You may be following the rules set out by the COGCC in August 2013, but you a breaking human rights laws set out in the constitution of Colorado and the United States.

Meanwhile, the assault on our lives and lifestyle is beyond belief and worst of all, beyond my control and, no person, no conversation, no request appears to be able to protect us from these 2 assaults. You are planning on violating our Constitutional Rights to health, safety, welfare, a clean environment and peaceful existence in our homes because the COGCC rules say you can.As of yet the COGCC doesn't have little boxes to check off for Community Relations and Satisfaction and Safety, though it is in their mandate to protect us, they don't have a measuring tool by which to do so.This is a crime.Encana wont consider bending and adapting the Rules to save our situation here, but you will be breaking the Constitutional Laws of the Colorado State Constitution by moving forward with these projects regardless of the impacts and consequences in our lives.

Because of the permanent and irreparable damage that would be done to our property value and our lifestyle and safety in our homes, we will need to sell 517 County Rd. 18, Longmont CO, 80504, if either the Rasmussen and/or the Regnier 12 wells pads and their respective Major Industrial Facility sites are approved. Knowingly you and the COGCC would be putting my family in harms way and causing permanent, irreparable damages both to our property values and our lifestyle and health and environment by moving forward with the Rasmussen and Regnier Sites as they are proposed, you are taking away our rights to live in our home safely and peacefully.

Unfortunately our choices for leaving our home and farm are few and bleak and each involves a significant devaluing of our property value:

If we try to sell our home before all of this happens we will need to disclose this nightmare to the buyers.2) Of course during the 3 years of largest impact during the nightmare, absolutely no one would consider buying a home that has all of the construction and drilling and traffic going on.3)And then after it is all done and there is still a semi-truck every 1/2 hour all day and night passing 25 feet in front of our home for years and years, and the ugly blight and pollution as a significant portion of our Western View, the price will be severely negatively effected and we will have to dump it and lose our familys only financial investment.

Our family and farm need three mitigations in order to remain on this property:

*If both well sites are reduced to 4 wells or fewer, these would be in in addition to the many current wells already producing on both properties

*The Regnier Site is moved 2 miles away to the North end of Section 18 on Weld County Road 20.5. CR1 would not be used for the Regnier Site.

	*Rd. 18 would not be used for either site As the proposals are, we are in a double bind, a property value loss if we attempt to sell now or anytime in the future, or a living nightmare if we remain. And just for the record; 100% of peer reviewed research clearly indicates that there is significant pollution emitted from hydrofracked wells, trucks and Facility sites, and there are many Industrial dangers (spills, leaks, fires, explosions, releases) that come with your Industrys current practices, many of which have involved citizens who have been forced to sign disclosures for settlement. Even though I have repeatedly mentioned these facts to you in my e-mails, you have chosen time and again not to acknowledge or address those 2 huge issues in every response I have received from you. Choosing denial and ignorance about such important matters seems to me to be a dangerous and risky business approach. The information is out there, the studies have been done and continue to be done and the results reveal more and more facts that incriminate the poisonous practice of High Volume and Low Volume Hydrofracturing near homes. This is chemical trespass. The Oil and Gas Extraction Industry makes many mistakes, and violations have happened and continue to happen to people and the environment from HVHF and LVHV. Ultimately your hubris and denial will likely be your undoing around these health and safety issues. Unfortunately, in the meantime, significant sections of Colorado are being permanently destroyed with atrocious infrastructure is being erected that will be here 5,000 years from now, and for the next 30 years, air pollution and truck traffic that doesnt belong in neighborhoods will be ruining neighborhood after neighborhood in Colorado. Reclamation is rare and the Corporation will be long gone when the wells stop producing. Suffice it to say, I will not subject my growing teenage boy to the dramatic increase in toxins in the air and all of the dangers associated with your two Major Industrial Sites.Ethically as a parent, it is impossible for me to raise my child here with these two massive Oil and Gas Industrial Sites surrounding my home like a blanket of lethal doom. At this point we cannot sell our home to any buyer who wants to live in the country, we can only sell it to someone who wants to live in a Major Industrial zone. If Encana and the COGCC put us in this position you must think it is possible and satisfactory to live in the middle of two Major HVHF Industrial Sites. You are heartily wrong about this.We will not and cannot live and work here on our farm without the afore mentioned adjustments to the Rasmussen and Regnier proposals. Sincerely, Goose Feather Farm, LLC	
16	Letter to a neighbor for the COGCC and Encana to see: This letter is to inform you that this coming Wednesday, April 29th, is the last day to submit Public Comments to the COGCC website on behalf of yourselves and protecting your access road, your quiet country lifestyle and your property values.Were you contacted as a neighbor who was going to be potentially negatively effected by the Regnier Proposal? I am aware that your family and the Regnier family are friends and business partners.But did you realize that Regnier Family Farms and Encana have the 12 wells proposed less than 2,000 feet directly north/west of your home and directly in line with your view of the mountains? Less than 2,000 feet right on your horizon. That means that the current proposal goes through, that for 14 months a huge erected drilling operation (just look to the south and you can see one that is up now), stadium lights 24/7,big tan walls, continuous grinding and truck noise violations, which will include 14 days of fracking per well, or 168 days of grinding 80+ decibles of noise 24/7 during thehydrofracturing phase, days of 75 footflaring,and huge emissions of VOCs from the drilling are all being planned right in front of your home?Are you aware that many of the lines of the hydrofracturing go right under your home and property and that earth quakes have been proven in the areas with this heavy duty High Volume Hydrofracturing has occurred? (mortgage companies are beginning to get wind of these kinds of concerns).You are directly downwind and in line for inversions that would collect the air pollution emitted from the thousands and thousands of semi/tankers, the drilling and the 5%+ emissions from each condensate tank as well! Also, it has been stated byEncana andRegnier Family Farms, and is mentioned 4 times in the Form	04/29/2015

2A application that they are planning (but hasnt applied for yet) a semi and tanker truck loop as the access route to the south Facility Site during the production of their Oil and Gas for the next 30+ years.The loop goes along CR1, east on Rd. 18 and then north to the Facility Site and then continues out, passing right by the Hanson's place back onto CR1 (or the reverse of this). 100,000s of trucks over the lifetime of the Regniers proposed Major Industrial Facility Site would use this loop and block our right of way to County Road 1 and Rd. 18.

Thus this Regnier/Encana Facility proposal escalates semi-truck traffic on Rd. 18 with 100s of thousands of continuous tanker over the life of these 12 wells.Tanker traffic for yours and Regniers current wells is nothing compared to what could be headed this way.For at least 18 months after the 14 months of drilling and fracking there will be a semi-tanker truck every 1/2 hour on Rd 18,and then for 30 years after that, very elevated tanker traffic right down your part of the the small dirt road right west of your home? Did you know that Encana (and the Regniers?) are likely planning another 12 wells adjacent and a little north of these first 12 wells? Thehydrofracturing for this likely additional site would go north from the south section line 18, then there would be another 14 months of drilling operations and hydrofracturing and then there would be at least24 wells in the spot right in front of your home?I have seen an official map that shows 12 wells on Section 18 adjacent to the 12 wells on Section 19.But have they informed the neighbors or the COGCC of their plans? No.

Do you realize that your bucolic and beautiful westward view is going to be destroyed by the Regnier Facility Site? The well site was chosen to be 591 feet east of the Hanson's home because of a Sprinkler System.This seemingly self-serving choice of locations is going to ruin our way of life here.The Facility Site, a little bit south of the wells, is planned as a Major Industrial Site with 28 enormous, 25 foot high condensate tanks, 12 separators and all of the burn-off towers which will flare with 75 foot high flames on and off for days at a time.The complete Regnier proposal has the Facility Site Location right in front of your home, in front of your mountain view and is a determining factor for the location of the 12 wellsbeing proposed. The Regnier Facility site for the 12 wells is planned directly West and a little North of your home about a 1,000 feet.The Erie Hub is on hold, so the pipeline isn't happening anytime soon as you may have been told that is what is being planned.The pipeline has large problems and if they drill the 12 wells in the proposed location, they will need the associated Facility Site, sited to be in front of your home.

These 12(or eventually 24) wells and Major Facility Site will diminish your property value and your way of life..This will create road and emissions pollution and create a property value crisis for a whole neighborhood of people and all who use County Road 1 regularly.Have all of the possible permutations of where to drill been fully studied by Encana?What is truly the best case scenario for the entire Section 19, not just the Regnier Famiily Farms? I think not.

All of this nightmare could be prevented with an adjustment on the part of Regnier Family Farms.

A viable option that needs to be requested and demanded, is to move the whole operation, wells and Facility site, to the north side of Section 18, ½ mile south of Weld County Road 20.5.If the entire operation was moved to 1/2 mile south of Weld County Road 20.5 where the Regniers already have a small operation it would benefit all of the Section 19 neighbors and our way of life. This would move the operation 1 and 1/2 miles north of your home.This would solve almost all of the issues associated with the Regnier Proposal:The access to the well site and the Facility site would be from Weld County Road 20.5, and thus the semi's could use Weld County Road 7 for all drilling and production operations, this would remove all truck traffic from County Road 1 and Rd. 18, your driveway.It would remove the permanent visual blight that would be caused by the Facility site's infrastructure and move it 1 ½ miles away.

If they reduced the well number to 4 it would also respect the Boulder neighbors who currently have a moratorium as it would keep the entire area a Low Volume Hydrofracturing Area instead of changing it into a High Volume Hydrofracturing Area. It's the neighborly thing to do.

With the current proposal it appears that Encana is colluding with Regnier Family Farms to protect only their interests.We are all stakeholders in this situation.By the submittal of these applications they have shown they are willing to ruin our neighborhood with a huge scale operation collecting money in a BOOM rather than having long term economic gain, bydrilling in a reasonable way with a respectful numberwells drilled (4) in another place as far away from this neighborhood as they could get. Encana is supposed to by COGCC rules, supposed to choose locations as far away from occupied dwellings as possible.Encana and Regnier Family Farms has not done this.Evidently they are thinking about themselves and their money only, even though these dangerous, horrendous operations and the blight of the wells heads is going to be about 591 feet from their own family'shome. This would dramatically diminish their property values as well if they continue to push forward with these proposal.The diminishing of the Hanson's home value would be a further taking down of all of the values of homes in this area.

The Regnier Site is a neighborhoodtragedy and would potentially force people who live here out of their homes and force them to sell with diminished property values -- this is the BUST part of the BOOM and BUST Oil and Gas Economy, but it is an economic BUST for this neighborhood.Our neighborhood would be BUST.

Encanas idea of comprehensive planning is this:keep plans secret from effected parties as long as possible, and behind the scenes, set it up so they can get the most out of an area not matter what happens to the area and no matter what the community around the sites concerns are.Their lack of communication and negotiation with all of the stakeholders/community/neighbbors about these wells and Facility Site is a tragedy. It is a completely self-absorbed and dangerous approach to business.

These applications for these 12 wells and the facility Site and the 10s of thousands of semi-truck trips that the Regnier Family Farms is proposing is being pushed forward with Regnier Family Farms, Encana and Weld County who all know full well that at least 5-7 property owners in the area,including numerous neighbors on the Boulder county side, are very concerned about their loss oflifestyle, their property values that go along with Industrial visual blight and pollution and health issues thatthe proposed Regnier Major Industrial Site would bring to our homes and neighborhood -- and their very safety!! And many of these neighbors the Regniershave lived near for decades.

All of this tragedy would be in addition to the 12 Rasmussen Wells being drilled for 14 months off of Rd. 18, and the Major Industrial Site proposed right off of CR1 west of your home. Do you see that the apparent Encana and Regnier Family Farm's greed is going to ruin/diminish your home values and at least 2 other home values in this neighborhood.? All of the wealth that the Regniers would be gaining would be made on our backs, 100%. There is not a demonstration of good neighborly behavior with this proposal as it is.They appear to be operating in a vacuum devoid of consciousness of the community and the beautiful nature that is around them. They appear to be operating as if they believe that their mineral rights supercede and are more important than our surface rights.

Do you believe that the Regniers mineral rights are more important and valuable than your surface rights, your property values, your familys safety, your country way of life-the life you chose, your right to unobstructed road access and a clean environment?I do not.Why should we sacrifice our way of life and property values for their access to minerals and their money? They are breaking the law of the land, the 5th Amendment of the State and Federal constitutions.

Likewise Weld County Government doesnt know how to be a respectful neighbor to Boulder County Citizens and property owners. Boulder County has repeatedly asked for a Colorado Department of Health Study and a Traffic Impact Study for this area, and they have repeatedly been dismissed because of archaic setback rules that were made for Low Volume Hydrofracturing areas, like ours currently is. So even Weld County colludes with the Regniers and Encana in their apparent greed and refuses to protect all of our surface owner rights to safe, peaceful enjoyment of our homes.If these proposals go through as they are, we will be forced to live with 2 and potentially 3 Major Industrial Sites in our now quiet beautiful area. Or be forced out of our home.Boulder County property values will diminish as well with this change of landscape from Agricultural to Industrial. In the attached Weld County Code there are statements describing our rights to be protected from the kinds of Industrial blights and the dangers that come with Major Industrial Operations, which High Volume Hydrofracturing is.

In the short term, for 3-10 years, this area and your home are going to be ruined with excessive lights, sound, semi-truck traffic and pollution, and then, forever beyond that, the beautiful views of your property will be blighted with the huge Industrial infrastructures left behind.It is truly a tragedy that the land use legacy that Regnier Family Farms will leave behind is one of blight, environmental and neighborhood destruction.The greed and sort sightedness of Encana and apparently the Regnier Family Farmshas blinded sensibility, reasonableness, prudent action, the common sense of taking care of the area around a persons home.Though the States greedy and shortsighted rules say they can, they still shouldnt proceed with this 12 well proposal in this location.

I hope you tell the COGCC to demand and/or encourage Regnier Family Farms and Encana to do the right thing and move and reduce the number of wells for the sake of your property values and this beautiful area. The Public Comment portion of the COGCC website is there to help the public protect itself, to communicate all of these kinds of issues to the COGCC and Encana, to help you protect yourself from the apparent unconstitutional activities of your neighbors and Encana.For your sake, for the neighborhoods sake, for the sake of property values in the area, for the country lifestyle we all so enjoy.Save your lifestyle and Property Values!!!

	April 29, 2015 To: COGCC RE: Regnier Farms 1l- 19H-B268(and to include all 12 wells) I am writing to express my concern about the proposed drilling at Regnier Farms site.I am a property owner and live within a mile of the proposed site and within 1200 feet of the proposed Rasmussen site.These oil and gas extraction operations represent an unreasonable increase in industrial insult to this area. Each site is proposed to have twelve wells each requiring up to twelve months each for drilling. That means two years of noise pollution, air pollution, egress issues, and visual obstruction. It is unreasonable for a property owner to tolerate such abuses and a violation of property rights. The facility sites for these wells are even more of a concern.What size will they be?What road access is proposed? If the facility site is a similar size and scope to the Rasmussen proposed site then there will be a total of 72 tanks, each 25 feet high with 24 burn stacks and 24 separators all within a mile of each other.How is it appropriate and legal to subject this area and the people who live here to such industrial insult? I request that these applications be withdrawn and the property owners impacted by these proposed operations be consulted about reducing their scope, size and impact on the community.	
18		04/29/2015
	Tier I – Tier IV A Reflection on what it is to be a Good Neighbor in the Oil and Gas Extraction World.It will address the term Good Neighbor, as Encana likes to claim they are one, lets see if they pass the test: TierIEgregious Neighborly Behavior: Encana does not remove the applications from the COGCC website Encana delays a Community Meeting until after the Public Comment Period has ended and then they make it an 'Informational Meeting' so it is about how they can continue to get what they want, they perceive that they hold all the power, and express themselves in a condesending way without genuine concern for what the neighbors need to keep their neighborhood beautiful.The Community is marginalized. Encana continues their endless repeating of State rules, rules that do not fit the Major Industrial Scale of the proposed operations. The State rules fail to protect the Community or the environment from the egregious behavior of Encana, but they seem content with that. Even though, in the last 6 years, the game has changed the rules have remained the same. Encana listens to neighbors and community members but listens without empathy, regret or intent to change their behavior or the proposal at all because they have followed Oil and Gas Industry and COGCC rules, the ones that don't protect us. Encana still puts the 12 wells and the Facility site on the property, exactly how the applications are currently proposed. Encana doesn't care to, and is unable to prove without a doubt: That the emissions will not harm all the families within a 2 mile radius.That the VOC levels in our blood, would be at safe levels during the drilling of the wells and during the entire production phase. That the sports stadium lights going all night for 14 months won't interrupt or disturb our ability to sleep, and live the bucolic country life we chose here. That the noise levels will be under the Colorado State requirements won't disturb or interrupt our sleep That the visual blight of a 5 acre Facility site won't diminish our property values That our ingress and egress will be fully functional during the entire 3 years that they will be invading our Community.	

Thus Let it be Known;

The Community has to take it into their own hands to protect themselves and their environment.

The burden has been placed on the Community to prove that the 12 wells and the Facility site are not healthy safe or good for our Welfare or environment, so:

It is up to the Community to get their blood tested – baseline, during drilling and during production.

It is up to the Community to get appraisals on their homes before Encana destroys their rural agricultural landscapes.So when they go to sell their homes the losses will be covered by Encana.

It is up to the Community to find 3rd party air quality testing before, during and after all of the drilling and production.If the air quality diminishes with VOC content during any phase of the operations the CDPHE will be notified and a grievance filed.

It is up to the Community to fight for their rights to use their only ingress and egress in an unobstructed way

It is up to the Community to do water testing before, during and after these operations

It is up to the Community to call out and file complaints for every single bad neighborly behavior that Encana and their sub-contractors do throughout the entire operation from beginning to end.

The Community takes their Constitutional Rights into their own hands.If there is one iota increase in blood VOC content, if there are nose bleeds and numerous other symptoms of poisoning.Civil Suits will be filed.

If there is an emergency and a Community member cannot get to CR1 or to their homes, because of blocked egress and ingress, or an accident at the fragile and small intersection of CR1 and Rd. 18 occurs, there will be a Civil Suit.

There has been plenty of warning about this Egress and the Ingress and there will be Zero Tolerance on the part of Community members with regards to mistakes or violations on the part of Encana, the Mineral Rights Holders and all sub -contractors will be held liable for any harm caused to any Community member by Encana or their sub-contractors for the duration of the site's existence.

All Grievances, Complaints and Violations filed against Encana or their sub-contractors will become Public Record.

Tier II Poor Neighborly Conduct:

Encana does not remove the applications from the COGCC website

Encana has a Community Meeting but it is about how they can continue to get what they want, the way they want it. They continue to engage in the endless repeating of rules they followed that do not fit the game anymore.

Encana is willing to consider a few suggestions from The Boulder county LGD, and the COGCC to help mitigate and try to prevent nuisances for the Community who is going to be horribly effected for a minimum of 3 years.

Encana continues with; neither having to, or wanting to, understand another point of view other than the Mineral Holders and does not negotiate genuinely with all stakeholders.

Encana listens to neighbors and community members but listens without empathy or intent to change their behavior at all because they have followed Oil and Gas Industry and COGCC rules.

Encana still puts the 12 wells and the Facility site on the property.They may have added a few mitigation measures, and maybe even changed the location of the wells or the access road they use to get to the wells, VRU added to facility site

However, Encana is unable to prove without a doubt:

That the emissions will not harm all the families within a 2 mile radius.That the VOC levels in our blood, would be at safe levels during the drilling of the wells and during the entire production phase

That the sports stadium lights going all night for 14 months won't interrupt or disturb our ability to sleep, and prevent us from living the country life we chose.

That the noise levels will be under the Colorado requirements 100% won't interrupt or disturb our sleep

That the visual blight of a 5 acre Facility site won't diminish our property values

That our ingress and egress will be fully functional during the entire 3 years that Encana will be invading our landscape and our neighborhood.

Thus let it be Known:

The Community has to take it into their own hands to protect themselves and their environment. The burden is on them to prove that the 12 wells and the Facility site are not healthy safe or good for our Welfare or environment.

It is up to the Community to get their blood tested – baseline, during drilling and during production.

It is up to the Community to get appraisals on their homes before Encana destroys their rural agricultural landscape

It is up to the Community to find 3rd party air quality testing before, during and after all of the drilling and production

It is up to the Community to fight for their rights to use their only ingress and egress in an unobstructed way

It is up to the Community to do water testing before, during and after

It is up to the Community to constantly monitor the sound levels of the drilling operation for decibel levels that exceed

It is up to the Community to call out every single bad neighborly conduct that Encana and their sub-contractors do and file grievances with the Sherriff, and the COGCC

The Community takes their Constitutional Rights into their own hands.If oneiota increase in blood VOC content happens,if there are nose bleeds or any other symptoms associated with Hydro fracturing VOC poisoning,Civil Suits will be filed.

If there is an emergency and a Community member cannot get to CR1 or to their homes, because of blocked egress and ingress, or an accident at the fragile and small intersection of CR1 and Rd. 18 occurs, there will be a Civil Suit.

There has been plenty of warning about this Egress and the Ingress and there will be Zero Tolerance on the part of Community members with regards to mistakes or violations on the part of Encana, the Mineral Rights Holders and all sub -contractors will be held liable for any harm caused to any Community member by Encana or their sub-contractors for the duration of the site's existence.

All Grievances, Complaints and Violations filed against Encana or their sub-contractors will become Public Record.

Tier IIIModerate Neighborly Conduct:

Encana does not remove the applications from the COGCC website

After Matt Lepore signs the 12 wells into existence, real negotiations take place.

A Community Meeting is conducted with an agreed upon 3rd party as Mediator, someone, likely a judge, who is without vested interest in the results of the mediation.Present would be representatives from all potentially effected parties.This is round Table format with all voices being equal: Community Members, CDPHE, Mineral Holders, Lease Holders and Weld County and Boulder County representatives are present.All points of view and what the intent of the lease holder and mineral holders is clarified and understood fully by the rest of the parties.Concerns from the neighbors are understood respected, even to the point that a familys life could be ruined by the operations.

All parties realize they do not exist in a vacuum and that every action that is taken effects every part of the situation.People, landscapes, wildlife, road egress and ingress, any potential effects would be addressed fully and to the satisfaction of all parties.

Encana and the Mineral Holders realize the burden is on them, as the 'neighbor' with the intent to get their minerals out of the ground, thus making the change, to prove that the proposals they are making, without a doubt, are 100% safe for all neighbors within a 2 mile radius, including road safety, Hydro-carbon safety and that all neighbor's property investments are 100% protected.This must be done to the satisfaction of all parties involved using peer reviewed studies that are 3rd party, without a single study conducted by Encana or the Community, both of which have vested interest in the results.

All mitigation measures are agreed upon by all parties involved.It is understood from the beginning of this real negotiation that there will be compromise on both sides.It is frightening for both Encana and the Community to engage in this process because to be a good neighbor there is always compromise.The mineral and lease holders have a right to access their minerals but there are negotiable aspects as well.For instance, the rate the minerals need to be accessed and when and where.The Community has to live with the rights of property owners to access their minerals.

Tier IVGood Neighborly Conduct

Encana removes current 13 Regnier applications from Website before Matt Lepore is slated to sign the permits into existence on June 13, 2015.

Encana via all of their representatives are willing to listen to all points of view from all of the involved parties at a Mediated round table. Participants would include Matt Lepore and the COGCC, the CDPHE, Community Members (no matter what zoning) and all iinterested stakeholders including neighbors who live within a 2 mile circumference of proposed High Volume Hydrofracturing Sites (4 or more wells and their facility sites) and interested Boulder County representatives.

The Community Meeting is conducted with an agreed upon 3rd party who does not have vested interest in the results for any of the potentially effected parties. This is round Table format with all voices being equal: Community Members, CDPHE, Mineral Holders, Lease Holders, Weld County and Boulder county.All points of view and what the intent of the lease holder and mineral holders are clarified and understood fully by the rest of the parties.Concerns from the Community are understood and even to the point that a family's life could be ruined by the operations, all points of view are respected.

All parties realize they do not exist in a vacuum and that every action that is taken effects every otherpart of the situation.People, homes, landscapes, wildlife, road egress and ingress, any potential effects would be addressed fully and to the satisfaction of the Community.

Encana and the Mineral Holders realize the burden is on them, as the 'neighbor' with the intent to get their minerals out of the ground, thus proposing the changes, to prove that all of their operations from beginning to end, are 100% safe for all Community Members within a 2 mile radius, including road safety on CR1 and Rd. 18,Hydro-carbon safety, noise levels will be below State standards at all times, operations will never disturb the sleep of any Community Members, and that all Community Members' property investments are 100% protected.These evaluations and studies must be done to the satisfaction of all parties involved using peer reviewed studies that are 3rd party, not a single study conducted by Encana or a Community Member who has a vested interest in the results.

Any mitigation measures are agreed upon by all parties involved and should be adequate to protect all of the rights of the Community. It is understood from the beginning of this real negotiation that there will be compromise on both sides. It is frightening for both Encana and the Community to engage in this process because to be a good neighbor there is always compromise.The mineral and lease holders have a right to access their minerals but negotiable are the rate the minerals need to be accessed and when and where. Community Members have to live with the rights of Mineral owners to access their minerals.Let's just not ruin communities in the meantime.

Where does Regnier Family Farms stand in this picture?Where does Encana stand in this picture?

19		04/29/2015

Mitigation for Regnier Wells:

	*1-4 wells, not 12, this slows down extraction, but speed is a negotiable aspect of this application, and less wells work infinitely better for our neighborhood and better for longterm economic feasibility. *Waiver for Location site rejected.Move 4 wells over to the already existing well/facility site on Regnier property according to COGCC rules, new wells are supposed to be within 150 feet of existing wells.Using a map of the entire Regnier porperty, the furthest distance from All Occupied Dwellings would be in Regniers north field 1/2 mile from WCR 20.5.Then the hydrofracturing would go directionally to the south for 11/2 miles.This is an alternate plan that needs to beevaluated as it sets the drilling and facility site farthest away from the largest number of concerned roperty owners. The Site would be on the north end of Section 18 instead of the north end of Section 19.Create a Comprehensive Plan # and discuss with all stakeholders, including the positions of Boulder County stakeholders and any concerned Community Members. *Use only fresh water, not Fracking water forfracking and for dust mitigation on the roads. *Lower the tank heights to 10 feet, nothing should be above 10 feet in height.Lower the VRU unit. All of this keeps the area aLow Volume Hydrofracturing Area, respecting the moratorium of Boulder County. *60# Drought resistant trees planted to surround facility site on East, South and North sides.These trees are to be cared for by the Operator. *Any and All traffic mitigation measures determined as prudent by the results of this study would be used to protect public safety health and welfare of all the neighbors living on WCR 20.5 and WCR7.WCR7 would be used to access WCR 20.5 for all operations. *An Access permit would be applied for by Encana to Weld County Public Works for use of road off of WCR 20.5. Neither CR1 nor Rd. 18 CR1 would be used for the Facility Site or the construction/drilling of the 4 wells. *A CDPHE Assessment is done in this area.There is already a large amount of VOC pollution from Fracking sites near this location, so a base level study would need to be conducted. Then a projected amount of VOC's added to base if 4 more wells and their facility sites were added into equation to find out how detrimental 1-4 new wells would be to our health safety and welfare.Then the results would be shared with all interested Community members and Boulder County LGD and thenthere would be constant monitoring of the wells and their emissions thereafter with results being shared with all interested parties. *All new wells and the Facility Site would have a VRU that would accommodate emissions *All new wells would have cement casing *An Electric Drilling Rig would be used so there would not be Low Frequency Noise Violations and noise mufflers for any other part of the operations would be utilized wherever possible *Drilling would not happen at night – there would not be a need for Sports Stadium Lights *Employ all recommendations from CDPHE letter from Ken Kuster dated December 14, 2014 to the Regnier Well Site and Facility Site *There is an end date for when the reclamation is finished.It should be finished within 1 year of the ending of the drilling. *When the Wells reach 10% production they are plugged and the Well and Faciility Site Infrastructure is removed. *Employ all 10 mitigation measures stated in the Moratorium from Boulder County GE 4.03 to the Regnier Well and Facility Sites	
20	Please read the information below.The 12 Regnier Wells and the Facility Site would be a Major Industrial Site producing huge amouunts of toxic waste.The wells themselves are dangerous to have anywhere near homes.	04/29/2015

Fracking Waste Puts Public at Risk, Study Says

Three decades after EPA left regulation to states, theyre still taking a see no evil approach to oil-and-gas-waste, Earthworks says.

By David Hasemyer, InsideClimate News

Apr 15, 2015

Drilling waste pit in Pennsylvania. Disposal of oil-and-gas waste has generated little attention, yet it puts people at risk of exposure to chemicals including benzene, which can cause cancer. Credit: Frank Finan/Earthworks

[1]

Weakness in state regulations governing hazardous oil-and-gas waste have allowed the leftovers to be disposed of with little regard to the dangers they pose to human health and the environment, according to a recent study by the environmental organization Earthworks.

The report says states disregard the risks because of a decades-old federal regulation that allows oil-and-gas waste to be handled as non-hazardous material. Those rules, established by the U.S. Environmental Protection Agency in 1988, exempted the waste from the stricter disposal requirements required of hazardous substances and allowed the states to establish their own disposal standards.

In its report, Wasting Away [2]: Four states failure to manage gas and oil field waste from the Marcellus and Utica Shale [3], Earthworks [4] studied rules governing disposal of the often toxic waste—and the gaps in those regulations in New York, Pennsylvania, West Virginia and Ohio.

The organization, which is often criticized by the industry as being consistently biased, concludes the EPA was wrong when it applied the non-hazardous label to oil-and-gas waste.

Drilling waste harms the environment and health, even though states have a mandate to protect both, said Bruce Baizel, co-author of the report and Earthworks energy program director.

Their current see no evil approach is part of the reason communities across the country are banning fracking altogether. States have a clear path forward: if the waste is dangerous and hazardous, stop pretending it isnt and treat it and track it like the problem it is.

Disposal of oil-and-gas waste has generated little attention, yet it puts people at risk of exposure to chemicals including benzene, which can cause cancer. It has escaped scrutiny as a factor in air and water pollution and a possible contributor to the acceleration of climate change.

[5]

An investigation by InsideClimate News [6] last year disclosed lax regulations of oil-and-gas waste in Texas that left disposal facilities virtually unregulated.

READ: Open Pits Offer Cheap Disposal for Fracking Sludge, but Health Worries Mount [7]

The EPA granted the exemption from federal hazardous-waste laws even though the agency estimated that without the exemption, 10 to 70 percent of oil-and-gas waste could be considered hazardous. The EPA reasoned that states could adequately regulate the waste.

Legislation proposed by Pennsylvania congressman Matt Cartwright in 2013 would remove the industrys hazardous waste exemption; the bill has languished since its introduction.

The Earthworks study, which focused on the Marcellus and Utica shale regions of the four states, identified what it called shortcomings in existing and proposed state regulations of oil-and-gas waste generated during exploration, development and production.

In all of the states examined, persistent regulatory and information gaps remain and practices are underway that call into question the adequacy of state oversight, according to the report.

Some of the examples cited include the practice allowed in Pennsylvania of storing waste in open air pits and the spreading of waste on roads and open land.

In Ohio, Earthworks found no public information available on the number, location or use of oil-and-gas waste pits and impoundments. The state doesnt have specific requirements for the construction and use of pits and impoundments.

Solid oil-and-gas waste in West Virginia does not have to be disposed of in specialized facilities; it can be dumped in municipal landfills.

Across the Marcellus and Utica shale region, a create now, figure it out later view has guided the regulatory and policy response to a growing stream of drilling waste, according to the report.

The Earthworks report acknowledges the four states have taken some steps to address oil-and-gas waste management through improved regulations, operator practices and data collection. But reform initiatives in the four states continue to be piecemeal and reactive with gaps in regulations and oversight, the report says.

The primary reason for this lack of oversight circles back to operators and regulators treating oil-and-gas waste like other wastes and using existing treatment and disposal systems—rather than developing new ones based on the specific composition of sometimes toxic waste.

To stem risks to air quality, water and soil, Earthworks makes 11 recommendations to mitigate the threats posed by current oil-and-gas waste disposal measures and calls on the states to take immediate action to correct the deficiencies in existing regulations.

Among the recommendations:

•Require treatment and disposal of wastes at specialized facilities designed and equipped to remove chemicals, radioactive elements, metals and other contaminants.

•Prohibit municipal landfills and wastewater treatment plants from accepting oil-and-gas waste.

•Mandate operators to conduct comprehensive, consistent testing of waste before it leaves the well site.

This approach to handling oil-and-gas waste is vital now, especially because of the boom in fracking oil-and-gas wells across the country, according to the report.

Until measures are in place to ensure that these steps are taken, oil-and-gas waste management will continue to be, at its core, an experiment—one with potentially serious consequences for environment and communities both in the Marcellus and Utica Shale regions and nationwide, it says.

[8]

Source URL: http://insideclimatenews.org/news/15042015/fracking-waste-puts-public-risk-study-says

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[5] http://insideclimatenews.org/sites/default/files/styles/colorbox_full/public/WastePitChemicalGuide_0.jpg?itok=atW63u85

[6] http://books.insideclimatenews.org/infrackingswake

[7] http://insideclimatenews.org/news/20141002/open-pits-offer-cheap-disposal-fracking-sludge-health-worries-mount

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