Marcellus (and Utica) Shale Gas/(Oil) Drilling
and
Slippery Rock Township Residents

Community Environmental Defense Fund "link"

http://www.celdf.org/pittsburghs-?

This group will write a resolution, at no charge for legal fees[1], to protect rights of Pennsylvania citizens, as specified in the Constitution (Article I, Section 27) of the Commonwealth of Pennsylvania, to pure water, pure air, and a safe environment.

Approximately 100 municipalities across the Commonwealth have now passed a " … community-protection-from-natural-gas-extraction-ordinance … ." Attorneys for gas production corporations are suggesting/threatening that the Commonwealth will sue these municipalities, at the municipalities' expense, because they have enacted an ordinance conflicting with Commonwealth Law.

No suits have yet been filed. This may signify that the political leaders of the Common-wealth seek to assess "the will of the citizens and their attitude" on the controversial issue of Marcellus Shale gas drilling before acting.

Possible Economic Impacts

Water Supplies:

Land only has value when an adequate water supply for normal activities is available.

A business dependent upon water, dairying, truck farming, animal husbandry, *etc*., loses its value in the absence of water.

If a municipally operated, public water supply becomes contaminated, what are the implications for customers and the operating authority?

The "drilling company" is only responsible for damage to a water supply that lies within 2000 feet of the **vertical** borehole and within **six** months following the beginning of drilling.

A recent study conducted by The Pennsylvania State University has shown that water contamination has occurred in 18 per cent of the wells drilled into the Marcellus Shale.

A number of small, family-operated farms have adopted organic farming practices. A contaminated water supply for high-value crops means the end to organic farming!

Since contaminating chemicals are permanently in the ground, migration could take up to twenty years, or more, or less. Well owners, accordingly, must have their water tested twice a year.

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[1] If a visit to the community is required, the law firm only charges for lodging and subsistence.

Testing must be done at the Tier III level. Tier III tests currently cost $1000 to $1500. Every water well owner will, if to be assured of no contamination, will have added property owning expenses of $2000 to $3000 per year. The cost has been called the Water Well Owner Marcellus Shale Tax which has the effect of decreasing property values. This cost is not a tax deductible expense.

If a similar damage rate occurs to wells through Marcellus Shake gas drilling, as has occurred from longwall mining to dwellings, property, and wells, the Slippery Rock area would suffer serious economic damage. Most disconcerting is the 683 damaged springs, wells, or ponds, a third of which have still not undergone remediation.

Property Tax Implications:

Conceivably, a private, residential property owner or a business stringently dependent upon water, dairy farming, for example, could appeal the property valuation for tax assessment purposes.

Residential property may incur a significant financial hardship in making the originally available water potable. Barring access, distance or exorbitant expense, to an acceptable municipal water system, the value of the property has been significantly damaged.

Dairy farming or other agricultural endeavors, such as truck farming or animal husbandry: chicken, hog, or egg production, requiring a dependable, high volume, non-toxic air OR water supply OR **both** may well be forced to close! The value of the business would become ZERO!

Property Tax Assessment Consequences:

Property with known mineral resources has a higher market value.

Removal of sub-surface minerals from property should lead to a property value decrease.

Property in Butler County has not been uniformly re-assessed **prior to 1968.**

Home Mortgage Availability:

The FHA (Federal Housing Administration) which guarantees many home mortgage loans will not permit a mortgage to be originated for any property having a well or drilling site **AND** adjacent property.

Most banks, making mortgage loans, follow FHA policies.

What effect will this policy have on citizens of Pennsylvania?

Possible Number of Wells:

The New York State Department of Environmental Conservation estimates that a single drilling pad for multiple horizontal boreholes may effectively access Marcellus Shale gas over an area of 160 to 640 acres.[2] Slippery Rock Township has an approximate area of 26 square miles. Six hundred forty (640) acres per square mile suggests that one (1) drilling pad, give or take, per square mile will be required.

Can Slippery Rock Township safely handle, in all respects, the possibility of **26** drilling pads – up to 520 wells requiring fracking?

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[2] *Hydraulic Fracturing Considerations for Natural Gas Wells of the Marcellus Shale*, Ground Water Protection Council. New York State Department of Environmental Conservation. September 21-24, 2008, p. 13. **(ONE copy of this paper has been submitted with the letters to the Township Supervisors.)**

Traffic Implications for Well Fracturing:

The fracturing process requires 500,000 to 1.3 million gallons per bore hole per fracturing stage. A borehole may require four or more stages. An 84,000 pound, 18 wheel tanker carries 7000 gallons of water. Between 71 to 185 tanker trips are required to supply the needed water for one stage.

Multiply each of these numbers by the number of needed fracturing stages to obtain the actual water volumes and number of tank truck trips. If four (4) fracturing stages are required per well, a reasonably conservative estimate would mean a total number of tank truck trips between 197,000 to 578,000 over six years within Slippery Rock Township.

Between one-third to one-half of the injected fracturing water returns and requires trucking to a disposal site. Add another 24 to 93 tank truck trips.

With a corresponding increase in heavy traffic, the Commonwealth, counties, and municipalities will incur additional road maintenance/rebuilding expenses even for roads built to handle legal maximum loads. The Commonwealth mandated bond of $12,500 per mile is an antiquated figure dating back to before the 1960s – probably before the 1950s.

School buses, their riders, children, will be exposed to greater risk from extensive traffic on single lane and rural (no centerline) roads. The collision risk for ordinary motorists must also rise.

Rig Set-Up:

A drilling rig requires a minimum area of FIVE acres. Site preparation and rig set-up could require one to one and a half months.

Well Drilling Time:

Completion of each well bore requires two (2) to three (3) months from the initial puncturing of surface soil. Given that up to **20** boreholes may be drilled, the total rig residence time could be two and a half (2½) to five (5) years.

Questionable Anaylsis Results:

Anecdotal stories suggest that the Department of Environmental Protection (DEP) of the Commonwealth of Pennsylvania may substitute analysis results for innocuous species instead of target substances pertinent to the situation at hand

Public Safety and Security Issues:

The degree of polarization between those having leases and those strongly opposed to, or incurring damage from, drilling, suggests that either visible and intense public support for drilling or public protest against drilling may require more law enforcement agency presence than has been anticipated.

Hydrofracturing Pressures:

The pressures applied to fracturing fluid depend strictly on the total length of the bore hole. The maximum pump pressure rule-of-thumb is one half (0.5) pound per square inch per foot of bore hole, both horizontal and vertical. A ten thousand foot long bore hole, from the surface to blind end, will require 5000 pounds per square inch. We know, from past experience, that a few to many years are required for potential contaminants migrating under naturally occurring forces. To what extent will fracturing pressures accelerate the contaminant migration process?

Geologic Implications – Appalachian Mountains:

The Appalachians are old, worn-down mountains composed of folded, sedimentary rocks. As the formerly flat ocean beds were folded by the pressure from drifting continents, vertical and horizontal cracks and fissures formed in the sediments. These cracks and fissures exist today **over** the Marcellus shale.

The potential exists for fracturing liquids to migrate upward, toward lower pressure, through these cracks to encounter aquifers through two different mechanisms. Movement of fracturing liquid into previously drilled, **unlogged**, or improperly plugged (deactivated) oil and gas wells communicating with aquifers seems more likely. Movement of escaping fracturing liquid through cracks and fissures directly to aquifers seems less likely than direct access through .

Fracturing Solution Quantities

A 0.5 (ONE HALF) per cent solution of 500, 0000 gallons will contain 20,000 pounds, 10 tons, of additives.

A 3 (THREE) per cent solution of 1.3 million gallons will contain pounds, 156 tons, of additives.

Since up to **twenty** wells may be drilled from one site, a half per cent fracking solution can inject up to 400,000 pounds, 200 tons, of additives into the tapped area. A 3 per cent fracking solution can inject up to 6,240,000 pounds, 3120 tons, of additives into a tapped area. Seemingly small percentages are not small!

The entire collection of hydrofracturing materials are not injected as a complete mixture. They are sequentially injected into the well bore, thus, individual portions of different fracturing solution composition can pass through cracks and fissures, maintaining the original chemical properties!

"FRACKING" FLUID ISSUES:

1) Hydrofracturing Fluid Composition

Of the substance listed in Table I (below, Generally Employed Hydro-Fracturing "Ingredients," only *guar gum* and *citric acid* are recognized as **safe** food additives. The materials listed below are the ingredients that the gas drilling industry has decided to make public. ***Remember, the industry is under no obligation whatsoever to publically acknowledge, or admit to, the presence of ANY SUBSTANCES present in fracturing fluids.***

The actual amounts of "active ingredients" and "all ingredients"are not disclosed. The composition of fracking solutions is treated as a proprietary material, the composition of which is confidential – therefore, a secret. Not even courts have been able to order disclosure of the recipe.

Ammonium chloride, *potassium hydroxide*, *tetramethyl ammonium chloride* are alkaline materials, STRONG BASES, CAUSTICS, that will make water bitter.

Hydrochloric acid and *thioglycolic acid* will make water have sour taste. *Thioglycolic acid* also decomposes to form *hydrogen sulfide*, the odor associated with "rotten eggs." Hydrogen sulfide is more toxic than hydrogen cyanide!

Glutaraldehyde is used a biological tissue fixative (contact with living tissue brings the cellular processes we normally associate with "life" to a halt). *2,2-Dibromo-3-nitrilopropion-amide* is far more

effective than *glutraldehyde* in this respect.

The *peroxodisulfate* "family" are very powerful oxidizing agents that have only rare applications in synthetic organic chemistry (in my opinion).

Methanol, as we well know, is toxic to the human organism through conversion to *formaldehyde*, a carcinogen and neurotoxic agent.

Sodium acrylate, *polyacryamide*, and *polyacrylate* are monomer and polymeric materials designed to bond together (polymerize) to retain sand grains to "prop" the fractures open. These materials are not to be consumed by humans.

Ethylene glycol will readily oxidize (see *peroxodisulfates*, above) to oxalic acid which immediately reacts with calcium ions to form calcium oxalate, an insoluble substance. Calcium oxalate formation within the body can lead to kidney stones and nervous system damage.

Isopropanol undergoes oxidation (see *peroxodisulfates*, above) to acetone, again, a material that humans should not ingest.

Hydraulic Fracturing Fluid Additives (not representative because of proprietary secrets)

http://en.wikipedia.org/wiki/Hydraulic_fracturing

Table I
Generally Employed Hydro-Fracturing "Ingredients"

Classes of Additives?	Purpose?	Examples?
Acid	Facilitates entry into rock formations	hydrochloric acid *
Biocides	Kill bacteria and reduce risk of fouling	glutaraldehyde, 2,2 Dibromo -3-nitrilopropionamide
Breaker	Facilitate proppant entry	peroxodisulfates
Clay stabilizer	Clay stabilization	salts, ie: tetramethylammonium chloride
Corrosion inhibitor	Well maintenance	methanol
Crosslinker	Facilitate proppant entry	potassium hydroxide
Friction reducers	Improve surface pressure	sodium acrylate, polyacrylamide
Gelling agents	Proppant placement	guar gum
Iron control	Well maintenance	citric acid, thioglycolic acid
Scale inhibitor	Prevention of precipitation	ammonium chloride, ethylene glycol, polyacrylate
Surfactant	Reduction in fluid tension	methanol, isopropanol

* Items in red are definitely not compatible with people.

Return Fluid:

Two types of fluids are involved in hydrofracturing. The injection fluid does the actual fracturing. The return fluid removed from the well after fracturing is waste and cannot be re-used because of the acquired contaminants, most specifically, radium 226 and 228. About one-third of the fluid employed in hydrofracturing returns to the surface. Quantities of radioactive materials (radon and radium 226 and 228), barium, strontium and some of the organic additives (toluene, xylene, butane, *etc*.) also return. This fluid has to be removed from the drilling site for proper, acceptable disposal. Because only four sewage disposal plants are presently certified in Pennsylvania as being able to process waste return fluid, already, several instances of unlawful disposal have surfaced.

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2) Water Analysis:

Table II lists the substances which a standard, comprehensive, very expensive domestic well water analysis seeks to both detect and measure. Only those substances with a red asterisk (*) are potentially found in normal aquifers and aquifers contaminated with hydrofracturing fluid. No testing occurs for substances normally used in hydrofracturing. *Because the total list of ingredients in hydrofracturing solutions cannot **and will not** be disclosed, no easily valid analysis can be made for contaminants in potable water supplies exposed to hydrofracturing fluid.* Identifying unknown substances or compounds has always been a challenge to chemists. The laboratory process and procedure consumes both time and money – often a lot of money. The instrumentation exists; not every laboratory uses or has access to the equipment. Please see Table II, Standard Drinking Water Analysis Target Compounds (next page)

3) Water Analysis Suggestions: (courtesy: The Mountain Watershed Association)

While well fracturing fluids may not "necessarily contain substances hazardous to humans and animals, the return fluid may contain and release into aquifers the following materials:

1) Barium
2) Strontium
3) Methane
4) Butane *
5) Toluene *
6) Ethane *
7) Xylene *

* Grouped as "BTEX"

The above materials should be considered as *indicators of aquifer contamination*! Standard water analysis methods do not include a determination of either entrained or dissolved methane in a water supply.

The Mountain Watershed Association web site, through a link included in their web site, has a list, sorted by county, of DEP Certified water testing labs in southwestern Pennsylvania.

Table II

Standard Drinking Water Analysis Target Compounds

(*courtesy of* The Pennsylvania State University)

Pesticides

2,4-D (2,4-Dichlorophenoxyacetic Acid)(mg/L)
Atrazine (mg/L)
Carbofuran (mg/L)
Chlorodane (mg/L)
DBCP (Dibromochloropropane) (mg/L)
Dioxin (2,3,7,8-TCDD) (∶/L)
Diquat (mg/L)
Endothall (mg/L)
Endrin (mg/L)
Ethylene Dibromide (EDB) (mg/L)
Glyphosate (mg/L)
Lindane (mg/L)
Methoxychlor (mg/L)
PCBs (Polychlorinated Biphenyls)(mg/L)
Silvex (2,4,5-TP)(mg/L)
Simizine

Volatile Organics Compounds

Benzene*
Carbon Tetrachloride (mg/L)
MTBE (Methyl Tert-Butyl Ether) (mg/L)
Styrene (mg/L)
Tetrachloroethylene (PCE) (mg/L)
Toluene* (mg/L)
Trichloroethane* (TCE) (mg/L)
Total Trihalomethanes* (mg/L) (continued)

Vinyl Chloride (mg/L)
Xylenes (total) (mg

Inorganic Elements

Arsenic* (mg/L)
Barium* (mg/L)
Cadmium (mg/L)
Chromium (mg/L)
Copper (mg/L)
Cyanide (mg/L)
Fluoride (mg/L)
Lead (mg/L)
Mercury (mg/L)
Nitate (NO3-N) (mg/L)
Selenium (mg/L)
Thallium (mg/L)
Turbidity (Total Suspended Sediment) (NTU)

Water Supply Characterization

Acidity (mg/L)
Alkalinity (mg/L)
Aluminum (mg/L)
Chloride (mg/L)
Color (color units)
Corrosivity
Foaming agents* (mg/L)
Hardness (mg/L)
Iron (mg/L)
Manganese (mg/L)
Odor (T.O.N.)
pH (pH units)
Silver (mg/L)
Sulfate (mg/L)
Total Dissolved Solids (TDS) (mg/L)
Zinc (mg/L)

Radionuclides

Radium 226 + 228* (pCi/L)
Radon (proposed) (pCi/L)
Uranium (∶g/L)

Bateriological (Health)

Total Coliform Bacteria (bacteria per 100 ml)
Fecal Coliform Bacteria (bacteria per 100 ml)
E. Coli (bacteria per 100 ml)
Giardia lamblia (oocysts) (PARASITES)
Cryptosporidium parvum (oocysts) (PARASITES)

* Substances that could readily appear in private or public water supplies at any time following well bore hydrofracturing.

Halliburton's "Drinkable" Fracturing (slickwater) Fluid

Halliburton's website lists ***CleanStim***'s ingredients as enzyme, exthoxylated sugar-based fatty acid ester, inorganic and organic acids, inorganic salt, maltodextrin, organic ester, partially hydrogenated vegetable oil, polysaccharide polymer and sulfonated alcohol.

http://www.post-gazette.com/pg/11235/1169188-84.stm?cmpid=marcellusshale.xml#ixzz1VtubmGvT

This is not a solution that I would personally want to drink on a regular basis. I would also advise others against drinking this or related mixtures.

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4) [The] Groundwater Contamination Debate
http://www.fractracker.org/?p=889

By Sam Malone
– August 4, 2011Posted in: Articles, News and Information, Our Perspectives

The Debate: Can the process of hydraulically fracturing underground natural gas wells contaminate groundwater?

Industry Position: There has never been a documented case of groundwater contamination due to hydraulic fracturing; the process occurs thousands of feet below drinking water aquifers. Therefore, the chemicals used in the fracturing process pose no threat to drinking water.

Opposition Position: It can and has contributed to pollution of underground drinking water sources.

The Data: *Previous lawsuits from landowners were settled by the industry and the plaintiff and the data kept private for various litigation reasons.* A U.S. EPA report now indicates that hydraulic fracturing has been linked to at least one case of drinking water contamination in West Virginia in 1987 and could likely contribute to future problems. (emphasis added, DCT)

Future Obligations: Some improved regulations and protections have been put in place since 1987, but the risk still exists if natural gas drilling is done hastily or if abandoned wells exist nearby. Once pollutants are introduced into underground water aquifers they are very difficult to remove, so significant care and review must be taken if drilling is going to continue. The EPA report further supports the need for increased government and industry transparency across the board. It should also be stated that a large-scale health impact assessment is needed to comprehensively determine the risk that the entire natural gas drilling operation poses to public health.

Compiled by: Samantha Malone, MPH, CPH – Communications Specialist, Center for Healthy Environments and Communities (CHEC), Environmental and Occupational Health (EOH) department, University of Pittsburgh Graduate School of Public Health (GSPH); and Doctoral Student, GSPH.

Comment from:

Marc W. McCord
Posted August 20, 2011 at 11:31 AM

"There is at least one other proven case where frac'ing led to groundwater contamination. The EPA cited Range Resources of Fort Worth, Texas for polluting the water well of the Lipshy family of Parker County, Texas. After the Region 6 office of the EPA did fingerprint testing they determined that the pollution in the Lipshys' water well exactly matched that found to be in use in the frac'ing process of the nearby Range Resources well.

"The Lipshys have filed a multimillion dollar lawsuit against Range Resources, and Range will probably settle that one out of court and seal the records so that industry can continue its false claims about no proven cases of contamination existing.

"It is a fool who believes that the earth is perfectly sealed and that no migration paths exist for chemicals to migrate from deep within the earth to the surface. If you look at mountains, then you will see trillions of cracks and fissures in the rocks. It is the same underground, as well. Only a liar would make the claim that there is no way for deeply injected chemicals to come back up into groundwater or to the surface."

Washington County family settles lawsuit over Marcellus Shale drilling
Outspoken critics of gas drilling said effects on water, air harmed children and property value
[*Pittsburgh Post-Gazette*, August 25, 2011]

http://www.post-gazette.com/pg/11237/1169736-58.stm?cmpid=MOSTEMAILEDBOX#ixzz1W4i0B3Rp

"A Washington County family has agreed to settle a lawsuit alleging their health was harmed by air pollution and water contamination from Marcellus Shale gas drilling operations adjacent to their 10-acre farm in Mount Pleasant Township. ...

"Soon after the Hallowiches built their house in 2007, four Marcellus gas wells, access roads, a gas processing facility, compressor stations and a 3-acre holding pond were installed on properties bordering theirs. Because of the noise, lights and emissions from those industrial facilities, Ms. Hallowich has said their house and property are worthless. ...

"Ms. Hallowich, who gave numerous print and video interviews during that period, said in those reports that water tests found ethylbenzene, toluene, styrene and tetrachloroethylene – all compounds known to cause cancer. She said the air and water contaminants caused them to experience burning eyes, sore throats, headaches and earaches. They've had to pay about $500 a month to have water delivered to the farm."