



March 14, 2014

Environmental Quality Board  
P.O. Box 8477  
Harrisburg, PA 17105-8477  
[RegComments@pa.gov](mailto:RegComments@pa.gov)

**Re: Comment on Proposed Regulations 25 Pa. Code Chapter 78 (Oil and Gas Wells)**

Dear Environmental Quality Board,

Delaware Riverkeeper Network (DRN) submits these comments on behalf of our organization's more than 10,000 members, many of whom live and work in Pennsylvania. DRN also is a signatory to technical comments submitted by Deborah Goldberg of Earthjustice of behalf of several organizations. These are additional comments submitted by DRN focusing on some items regarding the proposed regulations.

**General Comments**

Responsibility to consider environmental rights of those potentially affected by this rulemaking, including present and future generations

We bring to the attention of the Environmental Quality Board the recent decision of the Pennsylvania Supreme Court regarding Article 1, Section 27 of the Pennsylvania Constitution and the connection with the Board's decisions regarding this rulemaking. The Pennsylvania Supreme Court's recent decision in Robinson Township, Delaware Riverkeeper Network, et al. v. Commonwealth made it clear that every agency and level of government in the Commonwealth -- including the Environmental Quality Board ("EQB") and the Department of Environmental Protection ("DEP") -- has obligations under Article I, Section 27 ("Section 27") of the Pennsylvania Constitution. The Court made clear that Section 27 requires Pennsylvania government entities to respect and protect the constitutionally-protected environmental rights of each individual citizen, and to conserve and maintain Pennsylvania's public natural resources as a trustee for the benefit of present and future Pennsylvanians.

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Section 27 states:

The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.

As explained in the Court's analysis, Section 27 restrains the EQB from enacting regulations that will: 1) cause unreasonable "actual or likely degradation" of air or water quality, or other protected constitutional features, such as natural and scenic values of the environment;<sup>1</sup> and/or 2) allow the "degradation, diminution, or depletion of public natural resources, whether such degradation, diminution, or depletion would occur through direct state action or indirectly, e.g., because of the state's failure to restrain the actions of private parties."<sup>2</sup> Just like the General Assembly, Section 27 restrains the EQB from unduly infringing upon individual environmental rights protected by Section 27, and from breaching its duties as a trustee of public natural resources under Section 27. The EQB must consider, in advance of enacting the proposed regulations, whether it will violate these Section 27 duties and restrictions.<sup>3</sup>

For instance, the EQB must consider and address whether its regulations place higher environmental burdens on some Pennsylvania citizens than others, or whether the regulations will have "significant of irreversible effects in the short or long term."<sup>4</sup> If the EQB fails to consider and address these issues, and enacts the proposed regulations anyway, the EQB would breach the duty of impartiality that it must abide by under Section 27. This duty mandates that the EQB, as a trustee, treat the beneficiaries of the Section 27 public trust – present and future Pennsylvanians – equitably in light of the trust's purposes.<sup>5</sup>

Also, as a trustee under Section 27, the EQB is bound by the duty of loyalty to act *solely* in the interest of the beneficiaries of the public trust.<sup>6</sup> Thus, the EQB may not elevate private interests over the interests of present and future Pennsylvanians to an environment of quality, and of the enjoyment of their public natural resources.

Section 27 equally limits the EQB's authority to permit development unless it is sustainable. Section 27 specifically establishes a preference for protecting the natural quality of the environment and its benefits over development and disturbance, requiring that the EQB take the

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<sup>1</sup> Robinson Twp., Delaware Riverkeeper Network, et al. v. Com., 83 A.3d 901, 951-955 (Pa. 2013)(plurality).

<sup>2</sup> Id. at 957.

<sup>3</sup> Id. at 952, 959 & n.46; see also id. at 959 n.45, 20 Pa.C.S. § 7203(a) & (c)(5); In re Scheidmantel, 868 A.2d 464, 492 (Pa. Super. Ct. 2005) ("trustee's action must represent an actual and honest exercise of judgment predicated on a genuine consideration of existing conditions").

<sup>4</sup> Id. at 959 & n.46, 980; see also id. at 959 n.45, 20 Pa.C.S. § 7773.

<sup>5</sup> Id. at 957, 959, 980.

<sup>6</sup> Id. at 957 & n.45; 20 Pa.C.S. § 7772(a) (describing trustee's duty of loyalty).

same focus and care in its own regulations.<sup>7</sup> Thus, Section 27 prevents the EQB from taking a narrow view in its regulations to focus only on technical requirements for segmented parts of the oil and gas process development process. As a trustee, and as a government agency whose actions could unreasonably infringe upon individual environmental rights, the EQB cannot be blind to a holistic view of the public natural resources and people being impacted. It equally cannot rely on the regulation of individual segments of oil and gas development process to substitute for examining and addressing the impact of the component parts of the process as a whole. The EQB cannot allow its focus on technical regulations to obscure broader considerations of whether the particular regulated action will damage the environment and human health.

Section 27, in effect, restrains the EQB from ignoring the environmental and human health context in which the regulated industry operates, and likewise prevents it from doing so solely to benefit the interests of the private regulated industry.

DRN requests that the Board consider this obligation fully before moving ahead with regulatory changes that have the potential to harm the environment and human health.

#### Electronic filing and public posting of documents

Throughout the proposed regulations, electronic submission of applications and other documents is proposed for some items. DRN advocates that all submissions for applications, reports, maps, monitoring data, and other filings be required to be made electronically. The Pennsylvania Department of Environmental Protection (DEP) should post all of these documents on a publicly accessible web platform to allow access by the public in a timely way. The technology is available and should be routine practice by operators in their internal documentation processes.

We state this with the backdrop of a recent news article reporting that natural gas production reports filed by operators with DEP had incorrect data which had to be corrected by the agency 94 times since 2010.<sup>8</sup> The news report contains a link to a DEP-generated document that shows several companies, operating in both unconventional and conventional formations, submitted incorrect information that DEP had to retract and resubmit to the database. Many of the errors were by the largest of companies such as Range Resources, Chevron, Chesapeake and Exxon's subsidiary XTO, companies that certainly should be able to use an electronic filing system with accuracy.

This poor performance by gas operators makes it clear that more accountability is needed in terms of accurate reporting and the attention that operators give to it and it raises questions about the accuracy of all reports filed by operators with DEP. The need for accurate reporting of gas

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<sup>7</sup> Id. at 973 n.55.

<sup>8</sup> <http://m.thetimes-tribune.com/news/internal-report-shows-dep-corrected-production-data-94-times-since-2010-1.1647105>

and oil development activities is not just a bureaucratic exercise; it is the primary way that DEP provides oversight, especially considering that inspections and onsite visits are costly and require more staff than DEP can provide under current funding restraints.

We suggest that a requirement by DEP that all gas and oil reports be filed electronically will make this practice routine and mandatory filing will supply DEP with an enforcement mechanism when reporting is not accurate, complete or timely. DEP will need an internal review system that promptly verifies accuracy and should apply its power to issue violations and fines for inaccurate, incomplete or late reporting.

Finally, the posting of these reports on a publicly available web platform is crucial as a means of supplying information about operators and gas development activities to the public - activities that directly affect many people who live, work and recreate in Pennsylvania. Much of this information is only available to the public through file reviews, which are time consuming, have costs associated with them, and is beyond the reach of most of the general working public.

The transparency of DEP about these activities can be measured by evaluating how open the agency is regarding reports from the industry. Under the current practices, DEP does not measure up well in this regard. We are aware that overall the industry lacks a willingness to share information, especially considering the nondisclosure of formulas used in hydraulic fracturing and other closely-held information. This argues for DEP to provide public access to the data they should be able to get and, indeed, DEP is proposing more reports to be filed and more public postings in this rulemaking than are required in current regulations. In all specific sections of this rulemaking where filing of documents by operators to DEP is required, the filing should also be electronic and made available to the public on a web platform. But there are many areas where DEP shrinks from this task. DRN requests that electronic filing and public posting of reports and data from operators be required for all information relevant to gas and oil development activities.

#### Preventing and avoiding damage v. mitigation alone; cumulative impacts must be considered

In addition to the Pennsylvania Supreme Court ruling that makes clear the mandates of Article 1 Section 27 of the Pennsylvania Constitution, as discussed above, the Board must reconsider its general approach to decisionmaking regarding potentially harmful outcomes based on federal policies and science.

The bar needs to be raised to require that gas and oil development avoid harm to public resources, the environment, communities, and public health. In proposed Section 78.15, for instance, it is stated under (f)(3)(iii) "a description of the measures proposed to be taken to avoid or mitigate impacts, if any" are to be included in the application for a well permit, including a permit that will potentially negatively impact a public resource. To indicate that choosing to avoid or to mitigate is of equal value by not affirmatively stating the requirement to avoid harm in the first instance, is unacceptable and does not honor the duty to avoid damages.

The U.S. Council on Environmental Quality states that impacts should be avoided altogether by not taking a certain action or parts of a certain action and includes as options to minimize, reduce, rectify and compensate for adverse impacts of development.<sup>9</sup> Once a natural system such as a wetland is damaged or destroyed, it is very difficult to restore that resource's full function or to replace those lost ecosystem functions with another. The far better policy is to prevent the damage rather than try to repair or replace after the intact natural system is diminished.

A report from New Jersey Department of Environmental Protection concludes that less than half the wetlands mitigated were successful; only 48% concurred with their design specifications on average, leaving most sites without the mitigation goals accomplished.<sup>10</sup> A report from the New Hampshire Office of the Energy and Planning warns that there is a lack of scientific evidence that documents the success or failure of mitigating adverse impacts through wetlands creation or expansion; contracted wetlands are not necessarily successfully providing environmental benefit.<sup>11</sup> In other words, mitigation is a leap of faith not founded on scientific evidence.

DRN requests that it be stated affirmatively that harm to the environment should be avoided first and foremost. Only after avoidance or prevention has been thoroughly exhausted as an option should an application for a permit be allowed to proceed. This precautionary approach is reasonable when considering how much damage has already been done to the environment in the Commonwealth.

The cumulative impact of development activities has caused substantial harm that has handicapped our ability to achieve and maintain environmental quality and healthy communities. For instance, in regards to wetlands, Pennsylvania has lost approximately 56% of its original wetlands, according to EPA studies. 2200 miles of streams in Pennsylvania have been harmed by coal extraction.<sup>12</sup> When looking at both groundwater and streams, coal mine drainage has contaminated more than 3,000 miles of streams and associated ground waters in Pennsylvania.<sup>13</sup>

Pennsylvania cannot afford to absorb more environmental degradation; oil and gas development can reasonably be considered the straw that breaks the Commonwealth's back. A recent report by the Nature Conservancy concluded that by 2030, 38,000 to 90,000 acres of forest could be cleared by Marcellus gas well development in Pennsylvania; already 3,500 acres have been cleared and another 8,500 acres of forest is within 300 feet - a critically damaging distance - of

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<sup>9</sup> <http://www.gpo.gov/fdsys/granule/CFR-2012-title40-vol34/CFR-2012-title40-vol34-sec1508-20/content-detail.html>

<sup>10</sup> <http://www.state.nj.us/dep/dsr/wetlands/final.pdf>

<sup>11</sup> New Hampshire Office of Energy and Planning, "Wetlands Mitigation/ Restoration Issues", Technical Bulletin 2, spring 1988.

<sup>12</sup> <http://www.epa.gov/reg3wapd/nps/mining.html>

<sup>13</sup> <http://pa.water.usgs.gov/projects/energy/amd/>

new edges created by gas wells and their infrastructure.<sup>14</sup> 300 to 750 well pads can be expected within a half mile of Exceptional Value streams, the Pennsylvania's highest quality waterways. And between 900 and 2200 well pads can be expected across state lands; the State doesn't own 80% of State Park and Game Lands.<sup>15</sup>

According to a peer reviewed journal paper that examines the footprint of Marcellus shale gas and wind through scenario analysis, a model showed that 1.1 million acres of presently intact forest in the Marcellus shale play will be impacted by this "energy sprawl", most of it from natural gas development; approximately 70% of the land underlain by Marcellus shale is forested.<sup>16</sup> The report points out that forests provide important water quality benefits and the loss of forested land increases the cost of providing safe drinking water to the urban areas that rely on it.<sup>17</sup> The documented benefits of forest ecosystem services to water purification are discussed in a U.S. Forest Service report; the loss of these services can degrade water quality.<sup>18</sup> Scientific literature explains the clear link between forests and water quality, verifying that reductions in forest cover correlate with negative changes in water chemistry, such as increased levels of nitrogen, phosphorus, sodium, chlorides and sulfates as well as reduced levels of macroinvertebrate diversity.<sup>19</sup>

Researchers at the Academy of Natural Sciences have discovered that where high density of natural gas wells occur, adjacent streams in Pennsylvania's Marcellus are experiencing decreased water quality as demonstrated by lower macroinvertebrate density and higher levels of specific conductivity and total dissolved solids.<sup>20</sup>

Also projected in Evans et al is upwards of 1 ¼ million acres of new impervious surface across the Marcellus from gas well development, which has directly adverse impacts on water quality and

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<sup>14</sup> [http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCKQFJAA&url=http%3A%2F%2Fwww.nature.org%2Fourinitatives%2Fregions%2Fnorthamerica%2Funitdstates%2Fpennsylvania%2Fpa-energy-executive-summary.pdf&ei=V-wcU-vzOeS70AHsnIGgDg&usq=AFQjCNEwDZw8FFg8WauDz\\_NH6I8x0V-HXA&sig2=3qqXUNAbbDhe59Bsr03zg&bvm=bv.62578216.d.dmQ](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCKQFJAA&url=http%3A%2F%2Fwww.nature.org%2Fourinitatives%2Fregions%2Fnorthamerica%2Funitdstates%2Fpennsylvania%2Fpa-energy-executive-summary.pdf&ei=V-wcU-vzOeS70AHsnIGgDg&usq=AFQjCNEwDZw8FFg8WauDz_NH6I8x0V-HXA&sig2=3qqXUNAbbDhe59Bsr03zg&bvm=bv.62578216.d.dmQ)

<sup>15</sup> Ibid.

<sup>16</sup> Evans, Kiesecker, "Shale Gas, Wind, and Water: Assessing the Potential Cumulative Impacts of Energy Development on Ecosystem Services within the Marcellus Paly", PLOS/ One, DOI: 10.1371/journal.pone.0089210, February 19, 2014.

<sup>17</sup> Ibid.

<sup>18</sup> Robert A. Smail & David J. Lewis, Forest Service, U.S. Dep't of Agric., Forest Land Conversion, Ecosystem Services, and Economic Issues for Policy: A Review 12 (2009), [www.fs.fed.us/openspace/fote/pnw-gtr797.pdf](http://www.fs.fed.us/openspace/fote/pnw-gtr797.pdf)

<sup>19</sup> Jackson, J.K. & Sweeney, B.W., "Expert Report on the Relationship Between Land Use and Stream Condition (as Measured by Water Chemistry and Aquatic Macroinvertebrates) in the Delaware River Basin," Stroud Water Research Center, Avondale, PA.

<sup>20</sup> Academy of Natural Sciences of Drexel University, "A Preliminary Study of the Impact of Marcellus Shale Drilling on Headwater Streams," available at <http://www.ansp.org/research/pcer/projects/marcellus-shale-prelim/index.php>

water supplies and the maintenance of biological life in streams and causes increased polluted stormwater runoff, sedimentation and flooding to waterways. The report concludes that the cumulative impacts of this industrial development will be the most challenging and most damaging.<sup>21</sup> These cumulative impacts must be considered by DEP in this rulemaking. Viewed in the context of legacy pollution and ecosystem degradation from coal extraction, other development and prior land use changes across the State, the damage to Pennsylvania's environment that will result from the proposed gas and oil operations has the potential to cripple our air, water and natural values and must be fully analyzed by the Board from this perspective.

### Impacts from natural gas and oil infrastructure

The proposed rulemaking does not fully consider all infrastructures when analyzing for impacts from oil and gas operations on public resources. For instance, in proposed Section 78.15 (f) only the well and access road is considered for impacts to a public resource. The gathering pipeline, pit or open impoundment, soil stockpile area, and any area cleared of existing vegetation or where land use has changed or is impacted should also be analyzed for potential detrimental impacts. These impacts can occur a significant distance from the disturbance such as development of gas wells and related infrastructure near and adjacent to state parks and forest lands, national parks and the Wild and Scenic Delaware River, or high quality streams protected as special protection waters.

According to the Nature Conservancy, pipeline construction associated with natural gas wells in the Marcellus in Pennsylvania will increasingly impact the environment.<sup>22</sup> Significant clearing of open lands and forest and the crossing of streams and disturbance of wetlands by the gathering and transmission pipelines cause degradation of soils and loss of vegetative and forest cover, erosion and sedimentation and degrading stream impacts.

Stream crossings require streambank clearing and riparian area disturbance and are a routine source of sediment and other construction related pollution to waterways despite permitting requirements. The long periods of time the lines are under construction, the areas excavated and under active disturbance for long distances and on steep slopes, and the clearing, grading, and trench cutting done in a sequence that leaves these areas susceptible to erosion before re-vegetation is accomplished, results in substantial environmental impact to both land and water.<sup>23</sup>

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<sup>21</sup> Evans, Kiesecker, "Shale Gas, Wind, and Water: Assessing the Potential Cumulative Impacts of Energy Development on Ecosystem Services within the Marcellus Paly", PLOS/ One, DOI: 10.1371/journal.pone.0089210, February 19, 2014.

<sup>22</sup> The Nature Conservancy, "Natural Gas Pipelines," Excerpt from Report 2 of the Pennsylvania Energy Impacts Assessment, December 16, 2011, at 7.

<http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/pennsylvania/ng-pipelines.pdf>

<sup>23</sup> Comments on Environmental Assessment of MARC I Hub Line Project, Exhibit G, FERC Docket No. CP10-480-000, Submittal 20110711-5189 (filed Jul. 22, 2011) (statement of Susan Beecher, Executive Director, Pike County PA Conservation District (Jul. 8, 2011)),

[http://elibrary.ferc.gov/idmws/docket\\_sheet.asp](http://elibrary.ferc.gov/idmws/docket_sheet.asp)

The average shale gas well with infrastructure will clear approximately 7.4 acres of land directly and will cause indirect forest impacts from new edges of 18.5 acres, with a total 25.9 acres of direct and indirect impacts from each well.<sup>24</sup> The thousands of gathering lines – at a larger diameter than for shallow gas wells, perhaps even larger and operating at greater pressure than interstate transmission lines<sup>25</sup> -- required to move gas from the well to transmission lines will affect between 120,000 and 300,000 acres in Pennsylvania, an area that is larger than the amount expected from all the other parts of the typical gas well (pads, roads, etc.) combined according to the Nature Conservancy study. About half of these pipeline impacts are expected to occur in currently forested areas.<sup>26</sup> These forested areas will experience habitat value loss; “interior” forest species habitat could be eliminated on 360,000 to 900,000 acres, depending on the build out scenario. The report points out that this is far greater than the combined forest interior impacts of all other energy types examined in their report.<sup>27</sup>

Jurisdictional agencies, including municipalities, should be encouraged to participate in decision making

Jurisdictional agencies and local governments should be attracted to participate in decisions that may impact public resources. No requirement for municipalities to be notified about impacts to public resources is proposed in the rulemaking. Only allowing 15 days for jurisdictional agencies to provide comments on actions that could affect resources they are responsible for or reliant on is not adequate. These entities should be notified and given ample response time, which should be at least 30 days because in many instances agencies and municipalities operate in a public process (such as discussion at a regular public meeting) and/or have restrictions on the resources they can engage, requiring a longer response time.

Similarly other aspects of the proposed rulemaking that result in permits or decisions that can impact agencies and local governments and the resources they responsible for should be designed to encourage participation and sharing of information. Participation of these entities will improve the public input process and, in turn, provide DEP with valuable information and perspective, resulting in better decisions by the agency. There are several reporting requirements proposed, for instance, in this rulemaking. Municipalities and jurisdictional agencies should be copied on reports, sampling results, and other information that will assist in the management and protection of important resources and community assets.

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<sup>24</sup> The Nature Conservancy, “An Assessment of the Potential Impacts of High Volume Hydraulic Fracturing on Forest Resources,” December 19, 2011, at 13.

<sup>25</sup> The Nature Conservancy, “Natural Gas Pipelines,” Excerpt from Report 2 of the Pennsylvania Energy Impacts Assessment, December 16, 2011, at 1.

<http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/pennsylvania/ng-pipelines.pdf>

<sup>26</sup> The Nature Conservancy, “Natural Gas Pipelines,” Excerpt from Report 2 of the Pennsylvania Energy Impacts Assessment, December 16, 2011, at 8.

<sup>27</sup> Ibid.

Prohibition of open pits, open tanks, and centralized impoundments that contain waste and/or contaminated materials

As addressed extensively in comments filed jointly by Delaware Riverkeeper Network with Earthjustice dated 3.14.14 (“joint comments”), we oppose the use of open pits, open tanks, and central impoundments because of the numerous pathways of pollution these facilities provide and which cannot be avoided. The pollution from these open facilities also cannot be mitigated due to their very nature. Whether used as “temporary”, as is proposed for the open pits, or for a longer time frame, the water and air pollution caused by the pits, open tanks, and centralized impoundments is not justified and must be altogether prohibited.

One note we want to emphasize is our opposition to the allowance of acid mine drainage (or “mine influenced water”) or other fluids (such as sewage effluent, landfill leachate, cooling tower water, etc.) to be placed in centralized impoundments or otherwise mixed with other fluids (usually for reuse for hydraulic fracturing) and considered to be “fresh water”. The proposed provision that DEP can allow contaminated fluids to be used on well sites and mixed with other waters in impoundments intended and constructed only for fresh water rather than hazardous materials is completely unacceptable and is an irresponsible provision in this rulemaking. DRN is opposed to this proposal.

Prohibition of the placement in a pit, the burial and land application of drill cuttings and prohibition of the spreading of brine for dust control, road stabilization, and pre-wetting, anti-icing and de-icing

The drilling muds, cuttings, solids and liquids, including tophole water, produced by oil and gas extraction contain contaminants that must be treated and disposed as waste. The burial, land application, use in road stabilization or spreading of these materials allow the placement and movement of pollutants, threatening water supplies and the environment. It is unacceptable to allow and facilitate this pathway of pollution, as discussed in joint comments.

**Specific Section Comments**

In addition to joint comments on specific sections of the proposed regulations, DRN provides these additional comments.

**Section 78.58 Processing of fluids generated by the development, drilling, stimulation, alteration, operation, or plugging of oil or gas wells at the well site.**

Comment: The processing of fluids on site allows and prolongs the handling and reuse of hazardous materials at the well site. Due to the current exemption of oil and gas activities from the U.S. Resource Conservation and Recovery Act Subtitle C standards, these materials are not classified as hazardous and are not required to be handled as hazardous substances despite their hazardous properties. DRN opposes the reuse and injection of liquid and solid waste produced by

hydraulic fracturing (“fracking”) or by the development, drilling, stimulation, alteration, operation, or plugging of oil or gas wells on a well site unless Safe Drinking Water Act standards are applied to the reused or “recycled” materials.

Safe Drinking Water Act water quality standards must be applied to ensure the fluids being reused do not exceed safe limits because these fluids are being injected through the aquifer and can leak into the groundwater from pits or tanks or as a result of casing or cement leakage or construction flaws, can spill on the surface and seep into the ground or migrate through underground fissures and fractures to groundwater, surface water, or the surface of the land. This exposes aquifers, water supplies, and the environment to an unacceptable risk of contamination.

As explained in a report by hydrogeologist Paul Rubin, aquifers need to be protected into the future and the long life of aquifers and their irreplaceable nature require that the measures used to isolate gas and pollutants from water must be long-lived as well. Cement and steel casing now available and employed will fail in 100 years or less. This means that wells will inevitably leak gas and contaminated fluids into aquifers within 100 years, adversely impacting the use of groundwater by future generations.<sup>28</sup>

Even if cement were to successfully isolate contaminants from aquifers and surface waters and land, naturally occurring and seismically induced vertical fractures or other conduits such as water wells or abandoned gas wells, or frack-induced fractures that leave the target zone and enter other formations can be expected to allow contaminated fluids and gas to migrate to water supplies, to the land surface, and to other non-target receptors.

As explained by hydrogeologist Tom Myers, fluids can be expected to migrate from the Marcellus formation to aquifers and the surface from fracked shale gas wells, potentially contaminating water sources.<sup>29</sup>

The lack of water quality standards for produced water or flowback that is reused poses a substantial water quality problem. Operators reported to the GAO that they “treat the water to meet their own operating requirements” and that “...they had previously treated the water to a very high quality before reusing it for hydraulic fracturing, they are currently experimenting with lower levels of treatment.”<sup>30</sup> For example, one operator reported that they used to remove the salt but no longer go to that expense to reduce operating costs and are considering eliminating other treatment if the reused wastewater can still meet their individual operating needs.<sup>31</sup>

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<sup>28</sup> Paul Rubin, Report for the Delaware River Basin Commission on Natural Gas Development Regulations December 9, 2010, Article 7 of Part III – Basin Regulations, 2011.

<sup>29</sup> Tom Myers, “Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers”, Ground Water©2012, National Ground Water Association. doi: 10.1111/j.1745-6584.2012.00933.x

<sup>30</sup> The Nature Conservancy, “Natural Gas Pipelines,” Excerpt from Report 2 of the Pennsylvania Energy Impacts Assessment, December 16, 2011, at 8.

<sup>31</sup> Ibid.

One problem caused by reuse is the resulting concentration of certain contaminants. Reuse of this produced water will generally increase the contaminant load in the produced water in the subsequent well, both from additives and formation contaminants because there will be no dilution of the contaminants. If a leak occurs in the top few hundred feet in the well being fractured, the leak will contain very contaminated water under high pressure, and even a small leak can release large amounts of contaminants that can pollute aquifers and usable domestic water.<sup>32</sup>

Fluids containing chemicals coming with formation fluids and the toxic contaminants they naturally contain during the construction, drilling, stimulation (such as fracking), and extraction and production of gas from the gas well. Drill cuttings and muds that are produced by drilling and fracking also mix with these fluids during well development and may be stored together in pits or tanks. The chemical additives used in fracking are examined in New York State's Draft Supplemental Generic Environmental Impact Statement (DSGEIS). Table 5-3 lists many of the fracking chemicals, which include biocides, friction reducers, scale inhibitors, proppants, stabilizers, gelling agents, surfactants, corrosion inhibitors, cross linkers, iron control, and acids.<sup>33</sup>

Chemical suppliers operating in Pennsylvania's Marcellus Shale, West Virginia, and other states provided additive product compositional information to New York which includes approximately 260 unique chemicals whose CAS numbers have been disclosed to the New York Department of Environmental Conservation (DEC) and an additional 40 compounds which require further disclosure since many are mixtures. Table 5.4 of the DSGEIS lists products which only partial chemical composition information has been provided to the DEC. Table 5.6 is a list of chemical constituents and their CAS numbers that have been extracted from complete chemical compositional information and MSDS information submitted to New York and includes nearly 200 products used or proposed for use in hydraulic fracturing operations. Compound specific toxicity data are limited for many of the chemical additives so chemicals are grouped together based on their chemical structure in Table 5-7.<sup>34</sup>

According to the GAO, produced water is "generally of poor quality, with levels of contaminants varying widely".<sup>35</sup> Fracking can yield poorer quality produced water than other extraction

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<sup>32</sup> Glenn C. Miller, Ph. D., *Comments to Delaware Riverkeeper Network on the Delaware River Basin Commission's Draft Proposed Natural Gas Development Regulations*, 2011.

<sup>33</sup> NYSDEC Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program (DSGEIS), Sept 30, 2009.

<sup>34</sup> NYSDEC Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program (DSGEIS), Sept 30, 2009. Pages 5-34 – 5-62.

<sup>35</sup> US General Accountability Office, *Information on the Quantity, Quality, and Management of Water Produced During Oil and Gas Production*, GAO-12-56, January 2012.

processes.<sup>36</sup> A previous study from the U.S. Department of Energy concludes that produced water from gas drilling is 10 times more toxic than those from off shore oil drilling.<sup>37</sup>

Adding to pollution dangers posed by the reuse or recycling of frack fluids, Marcellus Shale contains radionuclides including uranium-238, thorium-232, and their decay products. Radioactive concentrations in the Marcellus Shale formation are at concentrations 20 to 25 times background, making shale gas wastewater extremely radioactive.<sup>38</sup> The produced water from Marcellus Shale has higher levels of radionuclides than water from Barnett Shale wells, according to the GAO.<sup>39</sup>

In a letter to PADEP in 2011, EPA highlighted the presence of radionuclides, along with other contaminants, as present in wastewater resulting from gas drilling operations and emphasized the importance of investigating the presence of radionuclides in public water supplies and their persistence in wastewater effluent.<sup>40</sup>

Sampling and data-gathering by New York State detected radiological parameters in Marcellus Shale flowback, including Radium-226<sup>41</sup>, the longest lived isotope of radium with a half-life of 1600 years. Gross Alpha, Gross Beta, Total Alpha Radium and Radium-228 were also found.<sup>42</sup> Radioactivity levels may more often than not exceed safe drinking water levels but with no testing or treatment required before reuse, these dangerous contaminants will not be controlled.

Reused frack fluid may also contain constituents found in frack wastewater. New York's DSGEIS contained a list of constituents in gas drilling Marcellus shale wastewater from Pennsylvania and West Virginia.<sup>43</sup> Many are hazardous, some have known harmful health impacts, some are carcinogenic. New York tested flowback from these shale gas extraction operations in Pennsylvania and West Virginia and found 154 parameters.<sup>44</sup>

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<sup>36</sup> Ibid.

<sup>37</sup> U.S. Dept. of Energy, Argonne National Laboratory, "A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane", January 2004.

<sup>38</sup> Marvin Resnikoff, Ph.D., Radioactive Waste Management Associates, "Comments on Marcellus Shale Development", October 2011.

<sup>39</sup> US General Accountability Office, ***Information on the Quantity, Quality, and Management of Water Produced During Oil and Gas Production***, GAO-12-56, January 2012.

<sup>40</sup> USEPA letter from Shawn M. Garvin, Regional Administrator to The Honorable Michael Krancer, Acting Secretary, PADEP, 3.7.11.

<sup>41</sup> Ibid. Table 5.24.

<sup>42</sup> Ibid.

<sup>43</sup> NYSDEC Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program (DSGEIS), 2009, Tables 5-8 and 5-9, p. 5-109

<sup>44</sup> New York State Department of Environmental Conservation, ***Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs***, September 2011, Table 5.9.

Attached is a table with 20 chemicals commonly used in fracking with data culled from a Marcellus Shale Coalition Report (the Hayes Report) (Attachment 1). These chemicals were also disposed of at the Love Canal site in Niagara Falls, New York, one of the most infamous hazardous waste health disasters in the U.S. in the last 50 years. It is important to note the levels detected in flowback water as reported in the Hayes Report compared to maximum contaminant levels for the regulated chemicals listed. This table illustrates the public health risks that arise from the handling, use and reuse of these dangerous and toxic materials.<sup>45</sup>

Furthermore, there may be constituents in flowback and produced waters from gas development that are not regulated under the Safe Drinking Water Act even though they have human health risks and ecosystem/environmental impacts. Some substances are chemicals that are unregulated and for which there is no maximum contaminant level (MCL) yet set by U.S. Environmental Protection Agency (EPA) or the State for drinking water quality. Many of these are known as “emerging contaminants” and have known harmful human health effects but standards are still in the process of being developed. These pose additional unacceptable risks because they may be released into the environment without detection or any requirement for monitoring, detection, or treatment. Some of these are endocrine disruptors (EDC) or pharmaceuticals that may occur in gas drilling wastewater.<sup>46</sup>

EDCs used in hydraulic fracturing fluids and found in flowback are of special concern due to the biological effects of these constituents at extremely low concentrations. Suspected EDC’s found in gas drilling wastewater include arsenic and selenium; hydraulic fracturing fluids may contain others such as 2BE, 2-Ethylhexanol, and Crystalline Silica. Scientists and health professionals are beginning to analyze these materials and measure their impacts on human health in a different way, testing these compounds at very low levels in the range of human exposures and at various endpoints.<sup>47</sup>

In an effort to protect human health from these very dangerous materials, scientists are concluding that there are no safe doses for endocrine disruptors; the fact that they have biological effects proves that EDC’s have biological activity – what the induced effects are is the question.<sup>48</sup> As stated by Linda Birnbaum, Director, National Institutes of Health, “It is time to start the conversation between environmental health scientists, toxicologists, and risk assessors to determine how our understanding of low-dose responses influence the way risk assessments are

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<sup>45</sup> Hydroquest for Delaware Riverkeeper Network, “Partial comparison of chemicals buried at the Love Canal site in NYS, USA, with gas industry flowback water chemicals used in hydraulic fracturing on 19 gas wells”, 1.30.2014.

<sup>46</sup> 2010 NWRI Final Project Report on "Source, Fate, and Transport of Endocrine Disruptors, Pharmaceuticals, and Personal Care Products in Drinking Water Sources in California", May 19, 2010. <http://www.nwri-usa.org/pdfs/cecresearchprofile.pdf>

<sup>47</sup> Vandenberg et. al., “Hormones and Endocrine-Disrupting Chemicals: Low-Dose Effects and Nonmonotonic Dose Responses”, The Endocrine Society, doi:10.1210/er.2011-1050, 3.14.12.

<sup>48</sup> Laura Vandenberg, Tufts University, “There Are No Safe Doses for Endocrine Disruptors”, Environmental Health News, 3.12

performed for chemicals with endocrine-disrupting activities. Together, we can take appropriate actions to protect human and wildlife populations from these harmful chemicals and facilitate better regulatory decision making”.<sup>49</sup>

The track record of the industry in terms of spills, well bore failures, and other pollution incidents as reported in numerous investigative reports, on *SKYTRUTH*<sup>50</sup> and *FRACTRACKER*<sup>51</sup>, and as evidenced by PADEP’s on-line reporting platform, is poor in terms of compliance and frequency of accidents that result in adverse environmental impacts and/or pollution to the waters of the Commonwealth..

Pollution incidents from accidents and the mishandling of frack fluids and other produced fluids that would be reused or recycled on site in Pennsylvania continue to occur. The poor record of operators reinforces our lack of support for the handling and reuse of this material on well sites. Unless Safe Drinking Water Act water quality standards are required to be met for fluids that are reused and unless the handling is done with maximum oversight and in highly controlled conditions, it is an unacceptable risk to Pennsylvania’s public and the environment to allow the processing and use, reuse or recycling of any materials that are produced by natural gas drilling or fracking.

**Section 78.66 Requirements for the reporting and remediation of releases.** (i) *A spill or release of a regulated substance causing or threatening pollution of the waters of this Commonwealth*, [shall comply with the following reporting and corrective action requirements: of § 91.33 (relating to incidents causing or threatening pollution).]

Comment: Remove “regulated” and include any substance causing or threatening pollution of the waters or nearby environment/ground/groundwater and air of the Commonwealth. If regulated is not removed, DEP should define all “regulated substances” and ensure that, for example, sediment pollution is also specifically listed and included since earth disturbance and soil erosion and impacts can cause significant harm to nearby water resources. If a substance is not “regulated specifically by DEP” but can still cause pollution or threaten pollution of the waters, that substance should be reported.

DEP should expand releases to include not only threats to waters (vernal pools, groundwater, surface water, wetlands) but also releases to air and local environment, upland areas including the ground.

*A spill or release of 5 gallons or more of a regulated substance over a 24-hour period*

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<sup>49</sup> Linda S. Birnbaum, Director, NIEHS and NTP, National Institutes of Health, U.S. Department of Health and Human Services, “Environmental Chemicals: Evaluating Low-Dose Effects”, doi:10.2189/ehp.1205179, Environmental Health Perspectives, Vol. 120, Number 4, April 2012.

<sup>50</sup> [www.skytruth.org](http://www.skytruth.org)

<sup>51</sup> <http://www.fractracker.org>

that is not completely contained by a containment system.

Comment: Since the nature of the chemicals used for fracking and the flowback include a mix of many different constituents, DEP should expand and strengthen this provision to include any release of substances (regardless of quantity or timing) where containment is not working or ineffective and where harm could be caused to the environment, air, ground or nearby water bodies.

For example, according to the EPA, one gallon of motor oil can contaminate one million gallons of water— that's a years' supply of freshwater for 50 people. So any substance of any size that is spilled should be accounted, cleaned up and reported. Testing upstream and downstream of the spill or in the soil layers should also be required to ensure adequate clean up. DEP should remove the 24 hour timeframe or clarify that if a persistent spill is occurring over a long timeframe, reports are filed daily until the spill has been contained properly and cleaned up.

Comment: Section 91.33 states that if a pollution event occurs, the polluter must "immediately notify the Department by telephone of the location and nature of the danger and, if reasonably possible to do so, to notify known downstream users of the waters." Because of the highly industrial nature of gas drilling and the multitude of chemicals used in the process as well as often the close proximity to people's homes or because of operation in very sensitive natural habitats, it is critical that the regulation goes farther than 91.33 in way of public notification of spills and threats to ensure the public is protected.

It would be unreasonable NOT to contact downstream water users so that must be a requirement of the regulations – again due to the nature of the combination of chemicals these operators use. Notifying downstream water users, local emergency response personnel, surrounding community members, and other agencies like the Fish and Boat Commission and the Game Commission should be required of the operator and laid out clearly in the operator's emergency response preparedness plan. Before an operator is permitted, they should be required to have a listing of all residences and businesses within a certain radius of the operation so that in the event of an emergency, those in the vicinity can be notified and move out of harm's way. The operator should have an emergency response plan that includes all residences in the vicinity with various methods of contact information as well as the Department numbers and other agencies who are responsible to ensuring enforcement is followed through.

Due to the nature and extent of gas drilling, a public notification system involving possibly a siren or other public notification where signs are posted throughout the community of a certain radius from the industrial activity should be required of the operator, perhaps similar to that at a nuclear power plant – again to ensure the public gets timely notification of community threats.

Signs would have an emergency contact number, radio station, TV station, and website where people can obtain quick information on the current threat. The operator should have to maintain

and share these public emergency contact outlets regularly in the news and in the media to ensure the community becomes educated on where to look if an emergency occurs and how to obtain accurate and timely information about the immediate pollution event.

How is Pennsylvania Emergency Management Agency (PEMA), and the Coast Guard's National Response Center (NRC), and other agencies incorporated into the emergency response triage and protocol for the operator?

(1) Spills or releases to the ground of less than 42 gallons at a well site that do not impact or threaten to pollute of waters of the Commonwealth may be remediated by removing the soil visibly impacted by the release and properly managing the impacted soil in accordance with the Department's waste management regulations. The operator or responsible party shall notify the Department of its intent to remediate a spill or release in accordance with this paragraph at the time the report of the spill or release is made. Completion of the cleanup should be documented through the process outlined in 25 Pa.Code § 250.707(b)(1)(iii)(B) (relating to statistical tests).

(2) For spills or releases to the ground of more than 42 gallons or that impact or threaten pollution of waters of the Commonwealth, the operator or responsible person may satisfy the requirements of this subsection by demonstrating attainment of one or more of the standards established by Act 2 and 25 Pa.Code Chapter 250 (relating to administration of land recycling program).

Comment: How did DEP select 42 gallons as a cut off for remediation measures required? Is this based on some kind of scientific reasoning or contamination equation? As indicated above, this 42 gallon cut off is grossly unprotective of the environment and the surrounding community, especially due to the nature of the chemicals used by oil and gas operations. Chemicals could leach into the ground and depending on the depth of the water table, impact groundwater. As such, the requirements of monitoring laid out at 25 Pa.Code § 250.707(b)(1)(iii)(B) is likely not protective enough. For example, much of this code outlines samples being taken and "compared with the Statewide health MSC as determined using Tables 1—4 and 6 in Appendix A". However many of the chemicals used in gas drilling do not have MSC established. How can DEP protect the public from these pollution threats if there are no established limits?

The timeframe of sampling outlined in 25 Pa.Code § 250.707(b)(1)(iii) may also not be long enough to detect problems in groundwater or during soil and groundwater migration and the regulations allow some variance to monitoring methodology. For example, the code reads "In lieu of eight-quarter sampling in subparagraphs (iii) and (v), the Department may allow the eight samples to be taken during a period of four quarters, or less with written approval from the Department if the following criteria can be met". More frequent sampling and sampling over a longer amount of time would be more protective and help guard against legacy issues and contamination that might take time to be detected.

For soil contamination - the code reads, “The minimum number of samples to be collected is ten from the background reference population and ten from each distinct area of contamination”. Is this number of samples protective enough and thorough enough due to the nature of this type of oil and gas operation or should more samples be required? How does DEP ensure that proper sample locations are selected for sampling contamination? What kind of independent testing will be conducted by DEP for larger spills? Where are those measure and protocols outlined?

For groundwater contamination, the code reads, “On each onsite well, eight samples shall also be collected during the same eight-quarter period.” Due to the nature of the chemicals and groundwater movement over time, required sampling for only two years after an incident could lead to legacy pollution that goes undetected. Longer sampling requirements should be required due to the highly toxic nature of the materials used at the oil and gas operations.

25 Pa.Code § 250.707(b)(1)(iii) reads – “For groundwater attainment determination at each compliance monitoring well, subparagraph (i) or (ii) shall be met in addition to the attainment requirements in §250.702 and §250.704 (relating to general attainment requirements for groundwater). Seventy-five percent of all samples collected within each monitoring well over time shall be equal to or less than the Statewide health standard or the limit related to PQLs with no individual sample exceeding both of the following: (A) Ten times the Statewide health standard on the property. And B) Two times the Statewide health standard beyond the property boundary.

These standards are not protective of public health, since these highly industrial processes are taking place so near groundwater that is used by the community. Rural areas rely on groundwater for their water supply so because of this close nexus of industry to rural water supply, more protective measures need to be in place to better protect the public. And again, if there are no health standards for some of the chemicals used by the industry, then the public is also not protected due to inadequate standards. How does DEP rectify this issue?

Because methane is considered “naturally occurring”, it also appears that through this code, migration of this substance will not be regulated as heavily as non-naturally occurring constituents. How does the Dept. plan on ensuring gas migration issues that are common, are addressed and the public is protected? What long term monitoring is required by DEP?

§ 250.704. General attainment requirements for groundwater. (a) For any standard selected, the attainment demonstration for the groundwater media shall be made at the point of compliance as defined in Subchapters B—D (relating to background standards; Statewide health standards; and site-specific standards).

Comment: As mentioned above, how does DEP reconcile the point that there are not statewide health standards for all of the contaminants that are used in the drilling process?

We thank the Environmental Quality Board for the opportunity to comment on the proposed rulemaking and for the extension of the comment period to 90 days. DRN requested a 120 day comment period so the extension did not satisfy our request and did not allow for the full and robust public input for which we advocate but the additional 30 days did allow for more public participation in this rulemaking. Similarly, we appreciate the added public hearings that allowed for additional public testimony although we do not feel enough public hearings were held in various locations and times (especially due to extreme weather on some hearing dates) to allow for all geographic regions to take part without personal hardship.

Sincerely,



Maya K. van Rossum  
the Delaware Riverkeeper



Tracy Carluccio  
Deputy Director

Attachment: Attachment 1 – Hydroquest Table

**Table 2: Partial comparison of chemicals buried at the Love Canal site in NYS, USA with gas industry flowback water chemicals used in hydraulic fracturing on 19 gas wells. Chemical migration occurred outward from Love Canal, as it does from state regulated gas wells. DW: Drinking Water**

Love Canal/Gas Well Contaminant (Chemical Parameter)	Love Canal Data Source	2009 Gas Industry Data Source (ASWCMC <sup>2</sup> )	Flowback water – high concentration examples (ug/L or ppb)	DW: Legally Enforceable Fed. Maximum Contaminant Level (ppb)	Potential Health Effects from Long-Term Exposure above the MCL
Benzene*	EPA 1982	Hayes Report <sup>1</sup>	2,000	5	Anemia; increased cancer risk
Ethylbenzene	EPA 1982	Hayes Report	270	700	Liver or kidney problems
1,2,3-Trichlorobenzene*	EPA 1982	Hayes Report	170	-----	
1,3,5-Trichlorobenzene	EPA 1982	Hayes Report	11,000	-----	
Toluene*	EPA 1982	Hayes Report	6,200	1,000	Nervous system, kidney, liver problems
Xylenes (total)*	EPA 1982	Hayes Report	6,500	10,000	Nervous system damage
Acetone	EPA 2003	Hayes Report	66,000	-----	
Bis(2-chloroisopropyl)ether	EPA 1982	Hayes Report	4,300	-----	
Bis (2-ethylhexyl) phthalate	EPA 1988	Hayes Report	870	6	Liver problems; increased cancer risk
Arsenic*	EPA 1982	Hayes Report	124	10	Skin damage; increased cancer risk
Aluminum	EPA 1988	Hayes Report	47,200	200	
Barium	EPA 1982	Hayes Report	13,900,000	2,000	Increase in blood pressure
Calcium	EPA 1988	Hayes Report	33,000,000	-----	
Chromium*	EPA 1982	Hayes Report	460	100	Allergic dermatitis
Lead*	EPA 1982	Hayes Report	970	Action level: 15 MCL goal: 0	Developmental delay; kidney problems; high blood pressure
Iron	EPA 1988	Hayes Report	223,000	300	
Magnesium	EPA 1988	Hayes Report	2,020,000	-----	
Manganese	EPA 1988	Hayes Report	18,600	50	
Sodium	EPA 1988	Hayes Report	95,500,000	-----	
Zinc*	EPA 1982	Hayes Report	247,000	5,000	

\*: U.S. EPA Love Canal Contaminant of Concern selected by the health assessor. U.S. National Library of Medicine. <sup>1</sup>: Report prepared for the Marcellus Shale Coalition (with involvement of 17 member companies; test plan development by ASWCMC, PA DEP and WV DEP). <sup>2</sup>: ASWCMC: Appalachian Shale Water Conservation and Management Committee. Table prepared by HydroQuest for Delaware Riverkeeper Network. 1-30-14

Table 2: Hundreds of chemicals were disposed of at the Love Canal site in Niagara Falls, New York State. The table above lists 20 of about 421 chemicals that led to this hazardous waste site becoming one of the worst health disasters in the United States (e.g., “*Public Health Time Bomb*”, NYSDOH 1978). Many families were evacuated from the surrounding area due to health issues (i.e., birth and heart defects, miscarriages, missing and nonfunctional organs, extra appendages, deafness and retardation, cancer). Chemicals starred above were declared to be contaminants of concern. The 21,800 tons of buried Love Canal chemical wastes are dwarfed by gas industry chemical usage. Many of the same chemicals forced underground by the oil and gas industry (~ 750 compounds) during the hydraulic fracturing process are migrating within both shallow and deep groundwater flow systems to valley bottoms, where aquifer and surface water is used by large population centers for drinking, irrigation, and other purposes. Fracking chemicals are adversely impacting people and animals’ health as contaminant migration occurs slowly and continuously. The manner in which the United States deals with disposal and use of toxic contaminants (i.e., evacuation and remediation vs. permitted massive injection into regional groundwater flow systems that contaminate aquifers & waterways) stems solely from Congressional legislation which exempts oil and gas operations and chemicals from major federal environmental laws (e.g., Clean Air Act, Clean Water Act, Safe Drinking Water Act, RCRA, CERCLA). Hydrogeologically, fracking chemicals migrate within both deep and shallow groundwater flow systems from up-gradient recharge areas to down-gradient water supplies where the risk of adverse public health impacts is greatest. **Legislation has effectively removed all environmental and health protections.**