

Departmental Responses to Comments Received from Citizens on Maryland’s Marcellus Shale Risk Assessment

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Commenter: Mr. Wilfred Candler

The big risk/certainty of allowing fracking in Maryland (or anywhere) is that the fossil fuel produced will be used, thus accelerating global warming, with "unacceptable risks/certainty" world-wide. The report should be sent back for revision until it faces this issue directly and head on.

Response: As mentioned in the risk assessment (RA), global warming risks are outside the scope of the RA because an appropriate assessment is more national in scope and tied to the county's overall national energy policy and portfolio. Maryland is proposing best management practices like rigorous leak detection and repair as well as methane offsets which are designed to mitigate emissions contributing to global warming.

Commenter: Miss Sabine Dohrn

Here are my comments and concerns:

When I look at these assessments, the terms "low" and "moderate" for spills and contamination – whether caused by accidents, faulty storage and subsequent leaks or during and after the drilling process - do not set my mind to rest. Who is there to monitor if a leak occurs and who guarantees that the company does not try to cover up spills the effects of which would only come to light later when it is harder to prove the connection and also would be harder to mitigate? I suppose companies have no interest of making any spills or leaks public of their own accord.

The amount of additives used for one single well is mind boggling. How are we to believe that a distance of a few hundred feet is supposed to keep us or the environment especially our ground and surface water safe? How can those risks have been adequately assessed without even knowing the exact nature of these fluids? Why is it that these lists of additives or alternative lists cannot be obtained for this risk assessment but only be disclosed to first responders in the event of a spill? Companies have to ensure that qualified personnel is available within 24 hours? Isn't that rather late in a serious incident? And who is financially responsible if any such event occurs? Why are these drilling companies exempt from the Clean Air and Water Acts in the first place? If the proclaimed low risk of contamination of groundwater/air is correct, why do we have so many examples from other drill sites of obvious water contamination? How is the ill effect on cattle mentioned in the report explained and what does it mean for local residents and animals close to those sites? Where is the concern for the population when "moderate" and "serious" risks are to be expected? It sounds to me like the safety of people and environment are negotiable when other interests are seen as more important.

Response: The companies are required to monitor on site with the Departments' conducting environmental inspection, compliance and enforcement. In addition, the

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Departments' conduct broader monitoring to identify and correct any changes to water quality or living resources.

The Departments' are proposing stringent chemical disclosure requirements, which are outlined in detail in the State's final report – see [http://www.mde.state.md.us/programs/Land/mining/marcellus/Documents/Final Marcellus Shale Report.pdf](http://www.mde.state.md.us/programs/Land/mining/marcellus/Documents/Final_Marcellus_Shale_Report.pdf)

In the event of serious incidents on site, local emergency responders (fire and police departments) have the ability to act quickly to protect immediate threats to public health and safety. Companies have been provided longer response times because experts from outside the state may need to be brought in for remediation assistance. The drilling companies will be financially responsible for accidents and the Departments are proposing insurance/bonds, fees, and penalties for this purpose. Although unconventional gas well development (UGWD) is exempt from federal environmental laws, under State authority Maryland is proposing some of the strictest regulation in the country to protect public health and the environment should this activity go forward. The impacts documented in the scientific literature occur in states with little to no regulation of UGWD activities.

Commenter: Miss Elaine Phillips

I am a Maryland citizen against fracking for SO many reasons. This is absolutely the wrong investment--we are creating an unlivable planet! How can we do this to our kids and grand kids. Forget ruined water aquifers and the danger of explosions at Cove Point--we MUST stop with the green house gas emissions! Please don't let this go forward.

Response: The Departments' recognize your concerns and share your interest in protecting public health and the environment for future generations.

Commenter: Mr. Frank Fox

Comments on the Draft Report on the Risks of Fracking in Maryland:

The report as currently written does present many of the dangers to health and environment that gas fracking entails. But the experience of other Eastern states indicates that the reality of fracking is much worse, and those details should be part of the report.

The venting and leaking of methane is a major concern for human and animal health, and for the impact on global climate disruption. Everywhere methane gas is being extracted, stored, piped, compressed, and used, leakage occurs and increases the global greenhouse effect.

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Water contamination and extreme drawdowns are prevalent in fracking areas throughout the country. We cannot allow fresh water to be endangered and squandered. Many examples of distant contamination exist.

In the last six months, at least three explosions and fires related to methane drilling and transportation occurred in Ohio. Maryland would do well to avoid exposing citizens and disaster personnel to such catastrophes.

Response: The Departments, in conjunction with the Advisory Commission and the public, have proposed stringent best management practices (BMPs) to address the risks mentioned above. The purpose of the risk assessment (RA) is to evaluate the effectiveness of these practices in mitigating these risks and to identify areas where additional practices may be necessary. This information, in addition to several other studies (economic, public health), will be used to develop regulations designed to protect the environment and public health should Marcellus development move forward.

Commenter: Miss Nadine Grabania

Dear Ms. Kenney,

Thank you for the opportunity to submit comment on the Risk Assessment for UGWD in my community. I serve on Garrett County's Shale Gas Advisory Committee and my work on that committee in some cases informs my comments here. However, my comments should be considered those of a private citizen who will face the "considerable," "adverse," and "localized" high risks documented in this assessment, should fracking be permitted in western Maryland.

My family bought our small plot of land in the 1990s, long before UGWD technology was put to use in US shale plays. We chose to locate a home and business here precisely for the absence of risks—from traffic, noise, chemical exposures, air emissions, and fouled water—that the state is now assessing. I trust the absence of such "risks" is what draws many people to invest in this region, and I hope you will hear from others who take issue with the multiple times the Risk Assessment claims to reduce the degree and severity of risk because the impact is confined to a "localized" area.

•METHODOLOGY

Is it appropriate to dismiss the severity of impacts because they will happen to a small but powerless population? MIAEH's Health Impacts Assessment documented that western Maryland (particularly Garrett County) citizens have limited access to health care and that, although local incidence of cancer is consistent with numbers statewide, deaths from cancer are higher in Garrett County. Because our population is underserved in the area of healthcare, the severity of

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any risks UGWD poses to public health should be raised, not lowered. *The state should re-examine this methodology for ranking risk severity and assume that harm or injury from UGWD—even to a single human being or a small “localized” population—is not acceptable;* those who allow this must take ownership of it. How can we embrace the logic of “If only a small number of people will be harmed by UGWD, it’s OK to go forward,” without considering the converse: “If only a small handful of landowners will benefit from UGWD, is it wise to take on the risks?”

Response: The intent of the risk assessment is not to minimize but rather describe the spatial extent of risks should UGWD move forward. This analysis helps to scale the magnitude of risks so that they can be appropriately addressed through any appropriate additional best practices.

•ECONOMY

The executive summary concludes that “existing and proposed practices serve to reduce many risks to western Maryland’s citizens, economy and its high quality water, air and natural resources.” However, *the state’s (RESI’s) study of economic impacts did not consider risks to the economy in the same way that the state has looked at public health and procedural risks.* But UGWD does present risks to the region’s economy; it would be helpful to see them quantified in the same manner as used in the Risk Assessment.

An analysis produced by the Garrett County Office of Economic Development (using the same production scenarios RESI assumed in its study and two property devaluation scenarios from a Weld County, Colorado study), projected that in 3 of 4 scenarios, UGWD would cause deficits to the area’s property tax revenues greater than the income it would generate from the county’s 5.5% severance tax. *This potential for very high economic risk (7-figure deficits) should be considered by the state in its final determination of acceptable risk for our region.*

Though Garrett County has appointed committees to study UGWD’s potential outcomes, the county has yet to address recommendations regarding the need for a permitting or fee program to assure adequate funding is in place for unfunded costs in areas such as police, emergency response, road repair or healthcare infrastructure. Should UGWD go forward in Maryland, Garrett County taxpayers are currently at risk for having to assume the burden of these costs, incurred during the development phase, because severance tax revenues will not be collected until the production phase.

Currently there are no mechanisms in place in Garrett County to protect residents from property devaluation if UGWD is allowed nearby. Yet studies (including RESI’s economic analysis) cite devaluation ranging from 4% to 30% in areas where UGWD is allowed. Declines in value of 22% have been documented at properties with private drinking water wells within 1 km of shale gas wells. (Muelenbachs, Resources for the Future, April 2014: <http://www.forbes.com/sites/jeffmcmahon/2014/04/10/pollution-fears-crush-home-prices-near-fracking-wells/>)

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At the minimum, *the Risk Assessment should acknowledge that a 1 km setback offers additional protections for property investments, as well as reducing the risk of methane contamination in groundwater and residential water supplies.*

Response: Land use planning and severance taxes are ultimately local decisions that are made at the county level. As such the county has sufficient authority to determine where UGWD should be allowed without adversely affecting property values. The Departments strongly encourage local governments to look at hydraulic fracturing closely in light of their zoning authority to ensure the economic interests of individuals are not adversely affected.

•TRUCK TRAFFIC RISK

The risk to the community of injury and death from traffic accidents (and need for road repair) is consistently moderate-to-high during all phases of development (Appendix A). It's alarming to read "risks to communities and people from truck traffic [during the fracturing phase] are high due to the noise, vibration and cost to repair road damage. Other factors related to traffic such as accidents, damage to vehicles, delays and inconvenience continue to be moderate." **It's uncertain whether use of CGDPs or any other measures can mitigate risk from excessive industrial truck traffic.**

Response: Thank you for pointing out this error. Accidents are a high risk, not moderate during the Hydraulic Fracturing phase; this and other corrections in the text have been made.

Yet, from the perspective of a resident familiar with local roads it's possible that the ranking of severity of traffic risks are still unrealistically low; risks for local residents will be compounded by the challenging topography of the region. The state's traffic study identified the area northwest of Friendsville for potential gas development. Three of the original permits sought by Chief Oil and Gas were sited on roads that lead to small residential communities along the west banks of Youghiogheny Reservoir. Access to these areas is limited because Frazee Ridge and Old Morgantown Road are not through-roads; they end at the reservoir. *Because there are no alternative routes to Frazee Ridge and limited alternates on Old Morgantown Road, development along these roads will concentrate and increase the risks to local residents forced to share the roads with heavy industrial trucking.* It's possible the only hope for mitigating traffic risks for these neighborhoods is for permits there to be disqualified in the CGDP process.

Response: The rural setting of UGWD makes this a frequent circumstance nationally. Small, local roads previously with no or few trucks may experience common truck traffic with gas development nearby. The risk ranking for "Delays and inconvenience (non-emergency vehicles)" and "Loss of rural character", like all other risks, are based on the combination of probability and consequence rankings. For these two aspects, though the

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probability varies by phase, the consequence remains Minor due to its definition, “Slight adverse impact on people or the environment; causes no injury or illness.” Other aspects including accidents and emergency vehicle delay are of higher consequence due to their potential of bodily harm to people. The CGDP process will include transportation planning, within which routes and other considerations can be directed. These plans should also be living documents that can be adjusted to address site-specific issues with traffic stoppage, limited alternate routes, etc., as they arise.

I do not think the Risk Assessment goes far enough to address the risk of stopped traffic incidents. When vehicles must stop or slow down to make a left turn, traffic on local roads often stops and backs up. Few county roads in Garrett have extended straightaways with extended visibility, and fewer still have adequate shoulders. There is often no place for a vehicle to go if it encounters stopped traffic at roadway speed, so dangerous, likely fatal, collisions will occur on Garrett County roads with UGWD traffic. The county Shale Advisory Committee has discussed this issue; it's possible that an ambitious flag man/warning system could provide a degree of mitigation, but funds would be needed, again, in the development phase.

Response: The “Injury and death from traffic accidents” risk addresses this concern. The CGDP is the means by which detailed management decisions can be made, should gas development move forward.

•EMERGENCY ACCESS

Though the Risk Assessment notes “High risk to the community that emergency vehicles will be delayed during fracturing and completion; moderate risk during drilling,” I do not see that it takes into account the *potential for difficult topography and extreme local weather conditions to increase risks during upset conditions.*

Response: Topographical and weather constraints are factors in response times, but these natural factors independent of UGWD activity and affect response times universally. Since extreme weather conditions would increase risk across the board, they are part of the reason that damaged roads are considered a safety issue.

•LACK OF LOCAL CONTROLS

Assumptions about the ability of best practices to mitigate risk do not take into account the political reality in Garrett County: the broader public will not support commissioners who attempt to enact zoning or land use controls as recommended by the state's studies and best management practices. If local government is unable or unwilling to enact sufficiently protective measures—such as permit-based land-use ordinances—the whole community faces increased risks from uncontrolled development and industrialization, none of which will ever be acceptable to those who ultimately experience the impacts.

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There is also *no guarantee that adequate regulatory resources will be appropriated* to ensure that any practices promulgated as regulations will be properly implemented or enforced. These realities, as well as levels of disputed risk throughout, call for further consideration of levels of cumulative risk.

Response: The Departments concur that to mitigate risks and conduct UGWD safely, local and state regulations need to be updated to incorporate proposed best practices.

•SETBACKS

In the discussion of the Risk Assessment on Nov. 5, 2014, Matt Rowe said “with inadequate setbacks there could be significant risks of methane contamination to groundwater.” That is the fact that most alarms many faced with the prospect of UGWD in their communities. It’s fair to say that, if adequate setbacks were in place for UGWD on US shale plays, there might not be so many problems with residential water supplies, and the whole process might not be so controversial. I am grateful for the state’s reasonable consideration of this critical issue, and fully *support that the Assessment shows a science-based setback of 1 km reduces the risk of groundwater contamination through methane migration from moderate to low.*

Though the prospect of losing a home’s water supply will always be a fearsome risk, by enforcing an adequate setback, with no waivers, innocent bystanders can expect some protection from not only groundwater contamination, but also from noise, light, community industrialization, hazardous events and devaluation of property.

Response: The Departments concur.

Commenter: Miss Claude H el ene Guillemard

Dear MDA and DNR Members:

I find your draft report insufficient in pointing out all the risks of fracking in our state of Maryland. The overall risks for climate change are completely downplayed and the environmental impact is not assessed properly.

All you need to do is look at the past records of fossil-fuel companies in terms of compliance of regulations and safety management. It is pretty abysmal. There is absolutely to reason to believe that it will be easier to reinforce regulations with fracking than with any other energy. The risks of contamination of water, therefore, are much higher than reported.

Marylanders in their majority want clean energy - not backwards fossil-fuel energy. I use solar panels on my roof and I drive a hybrid car - until I get an electric one I will recharge from solar energy. This is where the real, sustainable, future lies - to the benefits of all without harming anyone's health or environment.

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Please act to give a more accurate and complete picture of what fracking would do to our state. Thank you.

Response: As mentioned in the risk assessment (RA), global warming risks are outside the scope of the RA because an appropriate assessment is more national in scope and tied to the county's overall national energy policy and portfolio. Maryland is proposing best management practices like rigorous leak detection and repair as well as methane offsets which are designed to mitigate emissions contributing to global warming.

You are also correct that rigorous monitoring, compliance and enforcement will be necessary to ensure protection of public health and the environment. The Departments' have the authority to develop a fee structure that ensures adequate resources for compliance and intend to use that authority in concert with a stringent set of proposed regulations.

At the same time we are proposing best practices for UGWD, the State of Maryland is implementing a Renewable Portfolio Standard (see <http://energy.maryland.gov/mdGoals.html>) to help move Maryland toward 20% renewable energy production by 2022, through programs that offset the cost of installing solar, wind, geothermal heating and cooling, bioenergy, and other renewable energy systems. These ambitious goals will help to ensure a clean future for all Maryland's citizens.

Commenters: Mr. and Mrs. William and Roxanne Gumbert

Please consider the following comments on the Marcellus Shale Risk Assessment (RA).

My wife and I own a home with a drinking water well north of Friendsville in Garrett County in an area of proposed shale gas drilling. After reading much of the RA I have here written my comments and concerns.

I do not believe the RA and the proposed Best Management Practices (BMP) adequately address certain risk concerns:

1. Ineffectiveness of requirements, regulations, and BMP's- If there is not an adequate staff of monitors to verify compliance on a continuous basis at all wells under development, how can this compliance be guaranteed? Nearly everyone acknowledges that this will be almost impossible to support.

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Response: The Departments concur that adequate staff to ensure compliance will be critical to conducting UGWD safely. The Department is proposing sufficient fees to fund a rigorous compliance program.

2. Integrity of the well casings is a risk that does not seem to be well addressed after the well is completed, during the production phase and during the plugging and abandonment phases. How is the risk of methane leaks into the ground surrounding each well to be monitored on a continuous basis over the years of use? And it seems that the very use of the word “abandonment” is indicative of how these wells will be treated once (most of) the gas has been extracted. Is this a risk that we will insure is not faced by future generations?

Response: The integrity of the wells are ensured through proposed best practices such as pilot holes, well logs to identify subsurface geology, casing strings that exceed expected well pressures, as well as cement logs, minimum set times and integrity testing. Proper construction techniques are the best mechanism to ensure long-term well stability.

3. Setback distances – To quote Appendix H of the RA: “The probability of (methane) groundwater contamination via casing/cement failure is being evaluated” and is noted as “moderate” for drinking water sources within 2000 ft of the gas well and “low” for those 1Km or more away. Yet a study cited in the RA (in PA) showed elevated levels of methane in water wells even up to 1Km (if I interpret the reference correctly). The risk assignments of “moderate” and “localized” are not acceptable to those of us with drinking water wells within 2000 ft of a fracked gas well. In addition, the air pollution problems associated with valley stagnation (as mentioned by Dr. McCawley in his comments) poses an increased risk not just during the drilling phase but possibly during production if there is methane leaking into the air because western MD is very hilly with deep valleys. To reduce these risks, the setbacks needs to be at least 1Km.

Response: The Departments' will take this recommendation under consideration as it finalizes best practices and proposes regulations.

4. Explosion and fire risk does not seem to be adequately addressed in the RA. How can it be acceptable to have a 1000 ft setback for a school or church, as is currently in the BMP, after the fire event this year in southwest PA, in which a worker was killed and which burned so intensely as to melt vehicles and be uncontained for over a week? Evacuations for such an event would likely extend to at least a mile. This is an unacceptable risk for our children.

We have many other concerns, too extensive to be listed here. Please take our comments and concerns into consideration.

Response: As mentioned in the RA, the greatest risk from well explosions or fires is to workers on site. Worker health and safety are not regulated by the Departments and thus outside the scope of the risk assessment. The Departments are not aware of any well explosions that have impacted the health of residents off the well pads but have nevertheless proposed 1,000-foot setbacks as a precautionary measure.

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Commenter: Miss Elisabeth Hoffman

Risk Assessment comments

I'd appreciate more time. Maryland needs more time as well. Here, though, are my comments so far:

1) To "manage" the risk of water contamination, the study says, the state should require "stringent casing and cementing standards followed by integrity tests and extensive monitoring to ensure the safest and most leak-proof wells are being developed." The oil and gas industry has tried for decades to minimize casing problems. So far, though, it has been unable to reduce the failure rate. The technology does not exist. The "most leak-proof wells" will still leak, 6 percent on Day 1, 60 percent in a couple decades and all the rest eventually.

<http://www2.epa.gov/sites/production/files/documents/ingraffea.pdf>

Response: The Departments' share this concern which is not unique to UGWD, but with natural gas extraction generally. Maryland's proposed requirements are more stringent than practices in Pennsylvania and are further expected to help reduce well failure cited in the referenced study. It must also be clarified that a well failure does not mean that gas migration into drinking water sources is occurring, but that some structural problems exist with the well.

2) The study presumes six wells per pad, when eight or more is certainly as likely as not. The truck trips, air emissions, water consumption and the rest would then increase substantially.

Response: This is correct, but the Comprehensive Gas Development Plan and the Departments' ability to deny permits can be used to control the number of wells on a pad.

3) The executive order said the commission was to examine short-term, long-term and cumulative risks related to fracking. The risk study says that it has been unable to determine the cumulative risks from air emissions ("consequences cannot be determined at this time" -- Appendix B, p. 44) and climate. Maryland has much more work to do before green-lighting fracking.

Response: It is correct that the risk assessment identified additional studies as necessary to assess air quality impacts, specifically mobile sources.

4) All the risk levels assigned assume that the state's best management practices will be in place and enforced. That's a misguided assumption that ends up low-balling risks. Matthew Rowe said at that the shale commission meeting: "We don't know what the level of enforcement is going to

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be, we don't know how many staff are going to be hired." Each state that has permitted fracking declares that it is doing so in a safe fashion. We've seen the results. Maryland officials are deceiving themselves and residents if they claim to be able to regulate this industry any better than the other states.

Response: You are correct that rigorous monitoring, compliance and enforcement will be necessary to ensure protection of public health and the environment. The Departments' have the authority to develop a fee structure that ensures adequate resources for compliance and intend to use that authority in concert with a stringent set of proposed regulations.

5) The use of the label "moderate" as a risk level is misleading. The report defines moderate as "Considerable adverse impact on people or the environment. Could affect the health of persons in the immediate vicinity; localized or temporary environmental damage." In that context, moderate sounds rather grim.

Response: The key point of differentiation between moderate and high consequence impacts is the geographical scope. Moderate impacts are more spatially limited while high impacts are widespread. Because the risk assessment is a qualitative analysis, it does not have a fine level of resolution between risk categories. As a result, there are uncertainties and limitations in the findings and a section has been added to the Executive Summary document explaining this.

6) Page 20 of Appendix C: *"Some practices in the UGWD process will inherently reduce the number of required truck trips. The placement of multiple wells on a single well pad decreases the amount of truck traffic among wells, various hauling sources, and destinations. Furthermore, horizontal wells allow for more shale access than vertical-only wells allow, requiring distinctly fewer wells and well pads to extract an equivalent amount of natural gas."* As Alice would say: Curiouser and curiouser. UGWD by definition has multiple wells on a pad, so that will not reduce the required number of truck trips. The estimates of truck trips already assume that. And UGWD inherently uses horizontal drilling. The paragraph would have one believe that the numbers of truck trips (hazards and fatalities) will be less than something, although I'm not sure what. Not true.

Response: You are correct that the comparison here is not consistently clear. Natural gas has also been extracted from vertical-only wells, without the horizontal extent underground, including in Maryland. In this setting, well pads contain only one vertical well, and both wells and their pads are more plentiful across the landscape. This comparison is referencing vertical-only gas wells, as was done in New York's Environmental Impact Statement on Hydraulic Fracturing. This will be clarified in the text.

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7) On the summary chart, 179 items (out of 330) are listed as N/A. Those N/As are misleading. NA is used when a category has no related risk (such as flaring risks during well construction) OR when sufficient information is unavailable, such as: 4.5 blowouts per year has an N/A under pollutants of concern.

Response: The NA stands for not assessed. Clarification has been provided in Appendix A to indicate NA means not assessed since risks are not anticipated.

Commenter: Mr. John McGowan

Ms. Kenney:

The similarity between the last paragraph of the Executive Summary and all but one sentence in the Conclusion section (page 12) is striking to say the least.

I would like to suggest that all but the final sentence of the Conclusion section be deleted. The remaining sentence might also be replaced with “no conclusion reached” as no recommendations have been offered by the authors of the report.

Response: Many additional clarifications and revisions have been made to the summary of findings report that will help address these concerns. Moreover, the appendices have many detailed conclusions that help pinpoint the activities of highest risk.

Commenter: Miss Joanna Miller

We are two sisters who live on adjoining properties surrounded by Garrett County farmlands. There are too many unknowns and too many alarming facts coming to light that show hazards in hydrofracking. The MDE Risk Assessment does not give proper weight to potential hazards affecting local residents. To minimize a risk because it is LOCALIZED is a slap in the face. Full public disclosure of all fracking ingredients is absolutely necessary. What human being, no matter in how remote an area, should be at the mercy of an industry that is allowed to inject our land with toxic and deadly chemicals? We do know that some casings leak early on. Eventually, more casings will leak. The industry that is so eager to drill here does not have to live with the aftermath. Both of us are cancer survivors. The thought that toxic substances could soon be introduced into our environment is frightening. Terribly frightening. In addition, if the state of Maryland invites fracking as an economic boon, how can decreased property sales and taxes support such a stance! We do not live in the lake watershed area, but we do live in our own homes year round. It is surely as important for individual property owners to be protected as it is for folks who own property at the lake. We sisters both have private drinking wells. We both live

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here on the land where we were raised. We both love the peace and quiet where we live. Do not allow powerful industry to determine your decision. We have solar and wind energy that is far less invasive to neighborhoods and far less detrimental to our health and environment.

Response: The intent of the risk assessment is not to minimize any localized effects but rather describe the spatial extent of risks should UGWD move forward. This analysis helps to scale the magnitude of risks so that they can be addressed through any appropriate additional best practices. From the very outset, Maryland's risk assessment was intended to be qualitative in nature and not assign a numeric risk. The reasons for this is that for most risks there were not sufficient scientific literature or other information to determine rates of occurrence or otherwise provide a finer level of resolution than a low, medium or high ranking. This necessarily made the risk assessment subject to limitations as well as introduced best professional judgment into the analysis. A section regarding limitations/uncertainty has been incorporated into the final risk assessment to address these concerns. Furthermore, Appendix A has been revised to show both the probability and consequence rather than a single risk ranking. Even with these limitations, however, the Departments are confident that the risk assessment does provide some meaningful differentiation between levels of risk and identifies activities where additional BMPs should be considered to protect public health and the environment.

As far as chemical disclosure and well construction, The Departments' are proposing stringent requirements that are outlined in detail in the State's final report – see http://www.mde.state.md.us/programs/Land/mining/marcellus/Documents/Final_Marcellus_Shale_Report.pdf. Also and after hydraulic fracturing, injected chemicals immediately begin flowing back to the surface where they are contained in tanks on well pads constructed to prevent any leakage into the environment. Any chemicals that do not flow back during this initial period are expected to remain underground due to gravitational forces and not reach the surface (industry actually has to pump liquids out of the wells periodically because underground fluids weight the gas down and keep it from flowing to the surface). All hydraulic fracturing chemicals are required to be treated on site or recycled to fractured additional wells.

Concerning property values, land use planning is a local decision made at the county level. As such the county has sufficient authority to determine where UGWD should be allowed without adversely affecting overall property values. The Departments strongly encourage local governments to look at hydraulic fracturing closely in light of their zoning authority to ensure the economic interests of individuals are not adversely affected.

Commenter: Mr. Kenneth Mitchell

MDE,

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I would like to make a comment on your draft report on fracking, as a component of gas drilling in MD. The RISKS of fracking should be thoroughly and rigorously documented in your draft report. It is not clear that this is the case at the moment.

Of major immediate concern to most of us here in MD is water quality, and the known general RISK that fracking can pose to water quality, both above ground and especially below ground. These generally acknowledged risks should be made specific in the report, specific to the hydrology of the areas/wells which would most likely see fracking as part of gas drilling. To the extent that an area's hydrology is not well known, then investment to acquire this knowledge needs to be made for each well, and in the meantime conservative "setback" regulations need to be established and enforced. The risks to MD's water sources and population as a result of not approaching the planning for fracking at each well in such a robust fashion need to be acknowledged.

Response: The Departments concur and this is why the best practices of pilot holes, well logs, and offsets are recommended. The pilot holes are essentially test wells to determine the extent of fresh water as well as any unusual geological conditions or hazards. This process allows drillers to determine how far to set the surface casing to protect drinking water as well as how to properly construct the well to local geology. The logs provide detailed descriptions of the geological features, including physical data such as depth. These investigations are site-specific and are recommended for every well pad. Furthermore, both horizontal and vertical setbacks are being proposed to protect drinking water sources.

Although catastrophic well "blowouts" are deemed to be rare events, nonetheless they should be adequately planned for and acknowledged as a RISK. Risk assessment should include the detailed ability of each area hosting wells to adequately respond to save lives and minimize property damage from a catastrophic event.

Response: Blowouts are acknowledged as a risk but mainly to workers on site which is not within the scope of the Departments' regulatory authority. Risks to residents are considered low due to the proposed setbacks and because no reports of harm to residents has been documented.

Finally, the major longer-term RISK of climate change from further carbon dioxide and methane emissions, both from the wells themselves and from the eventual end-use customers, needs to be adequately acknowledged addressed. Given the general political trends away from regulation and robust enforcement, the risk for further climate change from inadequately enforced government and state regulations on fossil-fuel development and use needs to be honestly and realistically addressed. Thank you.

Response: As mentioned in the risk assessment (RA), global warming risks are outside the scope of the RA because an appropriate assessment is more national in scope and tied to

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the county's overall national energy policy and portfolio. Maryland is proposing best management practices like rigorous leak detection and repair as well as methane offsets which are designed to mitigate emissions contributing to global warming.

Commenter: Mr. Paul Roderick

It time for Maryland to wake up an catch up with the other states on this. We have had enough studies it's time to start drilling. Thanks.

Response: Adequate regulations that incorporate best practices and an appropriate fee structure to ensure a compliance program should first be put in place before drilling occurs.

Mr. Patrick Riley

Thank you for the opportunity to comment on the MDE/DNR Marcellus Shale Risk Assessment.

Regarding Appendix H; Risk assessments relating to cementing failure. the assessment states that scientific studies show contamination of the drinking water aquifer due to cementing failures. Comar 26.19.01 is quoted as requiring "Permanently cement surface casing in the hole..." I do not think this is always possible.

On page seven it is stated that cementing failure is one of the most likely causes of environmental contamination in the hydraulic fracturing process. Your risk analysis on page 9 states that "failures of casing and cement are common, although best practices should greatly reduce them, they will probably will not be eliminated." Where you rate the pollution of human water supplies as a moderate risk I request you to rate it as a HIGH Risk. Obviously, the groundwater in the shale gas development area will be impacted.

Furthermore, companies engaged in the inherently high risk industry of shale gas development have little incentive to follow State regulation if the penalty is only a very small (relative to the company assets) monetary fine. If I were to violate the Common Law and disturb the peace of my neighborhood or poison my neighbors well, I will eventually be arrested and held Criminally liable. The principle owners, directors and employees of these companies need to be held criminally liable as individuals and arrested by the sheriff if they disturb the peace of my neighborhood or pollute my well just as you or I would be if I engaged in the same acts!

Response: Given the best practices proposed and application of the Departments' best professional judgment, a moderate ranked risk is appropriate. Companies engaging in criminal activities will be criminally prosecuted. The Department of the Environment has

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an Environmental Crimes Unit that specifically investigates and prosecutes environmental crimes.

Commenter: Miss Elizabeth Singer

Attached are comments on the draft "Assessment from Unconventional Gas Well Development in the Marcellus shale of Western Maryland" due November 17, 2015. The comments are also pasted below.

Risk Ranking

A major feature of the report is Appendix A, which provides a Summary Chart of the risk ranking of 65 identified risks. Prominent in the chart is the use of the initials "NA" that indicate that level of risk is not assessed during various of the six phases of well siting and preparation, construction and production. The report should make clear that NA does not mean there is no risk, but rather that there was no available information about the risk or that there is no risk at that phase.

Response: The NA stands for not assessed. Clarification has been provided in Appendix A to indicate NA means not assessed since risks are not anticipated.

The ranking depends on melding the probability of each the 65 risks occurring during each of the six phases with the consequence if an event does occur. Because the chart uses only the terms associated with probability, ie "low, "moderate", and "high," the result is a chart that shows a scenario of low risk to humans, the ecology, and the community. The potential risk consequences of adverse impact include "people or the environment" and are serious and potentially catastrophic. The ranking assessment should give more weight to the extreme consequences that may occur and better define what is meant by "low, "moderate" and "high," especially when the lack of data is a concern.

Response: Appendix A has been revised to show both the probability and consequence to be clearer regarding the factors in overall risk. This will provide readers with better context to differentiate gradations of risk.

The approach to the all-important ranking of risk does not consider the risk to human workers on site or in trucking traffic, which is considered the highest risk activity during drilling, casing and cementing, and well completion. The estimated 10,000 one-way truck trips required for a single well present an unacceptable risk when multiplied by 450, the number of wells drilled under Scenario 2.

Response: Though workers are outside the scope of this risk assessment as they are instead covered by occupational safety regulations, community residents and others on or near

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roads are also potentially affected. Injuries and fatalities were important in the risk assessment, and were attributed “Serious” consequence throughout. Also, the 12,974 one-way truck trips required are not for a single well, but for a single pad that contains six wells. As such, it would not be multiplied by 450 wells, but by 75 pads in Scenario 2. This risk assessment is not intended to comment on the acceptability of risks, but rather provides risk information and magnitude to decision-makers so that they can, in turn, decide on the acceptability of those risks.

The cumulative risk of methane and CO₂ emissions from fracking, pipelines, and deforestation and the resultant impact on the changing climate deserves specific consideration in the risk assessment report.

Response: As mentioned in the risk assessment (RA), global warming risks are outside the scope of the RA because an appropriate assessment is more national in scope and tied to the county's overall national energy policy and portfolio. Maryland is proposing best management practices like rigorous leak detection and repair as well as methane offsets which are designed to mitigate emissions contributing to global warming.

The risks to wildlife and aquatic life should be considered in the assessment. The impacts will be immediate and long-lasting.

Response: The Department of Natural Resources weighed in on wildlife/ecological impacts and these are considered in the risk assessment.

The cumulative risk of all phases of unconventional drilling should be addressed in the report. From the moment the drilling site is “prepared” the environment suffers damage and the 65 identified risks to humans and the ecology are present throughout the phases, i.e., drilling, casing and cementing, high volume fracking, production and well abandonment and reclamation.

Response: Two development scenarios were considered to assess cumulative risks, a 25% extraction scenario (150 wells) and a 75% extraction scenario (450 wells). Overall risk assessment findings generally did not differ between the two development scenarios for several reasons. First, for many risks (e.g., spills, well failures, noise, water withdrawals, etc.), increases in the number of wells drilled either did not change the probability or consequence enough to change the overall risk ranking. For example, a low probability and a minor consequence has the same overall risk ranking (i.e., low) as a medium probability and a minor consequence or a low probability and moderate consequence. This results from a relatively coarse methodology for assigning overall risk due to the qualitative nature of the assessment, although Appendix A has been revised to better reflect these nuances. Second, there was not enough information to numerically quantify risks. Where there was sufficient information to provide

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numerical estimates of risk (e.g., the rate of accidents associated with increases in well drilling) it was a flat rate and independent of the number of wells drilled. This and the lack of location-specific information on the actual distribution of wells and well pads created difficulty in differentiating risk between the two development scenarios.

Reference to “best management practices” is not an answer to eliminating or lessening risk since recognized best practices in the oil and gas industry, especially fracking, do not yet exist. As pointed out in the report, many BMPs are not easily enforceable through regulations. Without the needed personnel on the ground to inspect fracking operations, the likelihood of good enforcement decreases and risk increases.

Response: The Departments concur that enforcement is critical component to ensuring best practices. In addition to proposed regulations incorporating best practices, the Department will also determine a fee structure to implement appropriate levels of enforcement.

Conclusion

The assessment of risks leaves many vulnerabilities unresolved because protection relies on future best management practices, regulation that is not yet in place and there is a lack of an effective enforcement strategy. The reliance on the probability of low occurrence because there is little hard data, and lack of adequate weight for the acknowledged consequences to determine level of risk are major problems of the risk assessment.

Response:

Commenter: Mr. Chris Surowiec

Ms. Kenney:

I am submitting this e-mailed correspondence as my public comment contribution on MDE/MDNR's unconventional gas drilling risk assessment (RA). My statements here follow up previous comments I submitted on Maryland's best management practices study on the same topic. My earlier comment was dated September 6, 2013.

The position I took at that time remains largely unchanged. If anything, my strong disapproval of Marcellus shale gas extraction as either an income generator or potential energy solution has strengthened.

The RA's methodology, which takes into account both probability of an adverse consequence and the damage that would ensue from such an occurrence, seems theoretically sound. However, I find this draft report, like the previous one I commented on, biased in favor of industry. On the

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Summary Chart (pp. 18-24), too many categories of risk are assigned NA for “Not Assessed” and *far* too few an “Insufficient Data.” Beyond that, one could argue almost endlessly as to whether a particular risk is moderate, high or low. The report purports to clarity in its designation of intensity levels. But how does one differentiate between “considerable” adverse impact, the stated threshold for moderate, and “major” adverse impact, which raises potential damage to serious? I find the distinction fuzzy, except that classifying a harm as moderate and localized probably makes drilling more likely. As the study acknowledges, the prospective situation on the ground entails tremendous gradation of effects by distance and other circumstances. But localization of harms is certainly not absence of harm.

No one would argue that the effects from hydraulic fracturing and subsequent gas well development and waste disposal are wholly environmentally benign. Those nearest the activity, including workers, will absolutely be breathing benzene and other toxins. I own Maryland property in the Marcellus region and a 15-acre well pad on my land or anywhere near it would absolutely ruin the asset this land represents. Those who reside near Marcellus development and have no say in extraction of this resource (I cringe using the term) because some other entity controls the mineral rights simply become victims in a “sacrifice zone.”

Response: The intent of the risk assessment is not to minimize any localized effects but rather describe the spatial extent of risks should UGWD move forward. This analysis helps to scale the magnitude of risks so that they can be addressed through any appropriate additional best practices. From the very outset, Maryland's risk assessment was intended to be qualitative in nature and not assign a numeric risk. The reasons for this is that for most risks there were not sufficient scientific literature or other information to determine rates of occurrence or otherwise provide a finer level of resolution than a low, medium or high ranking. This necessarily made the risk assessment subject to limitations as well as introduced best professional judgment into the analysis. A section regarding limitations/uncertainty has been incorporated into the final risk assessment to address these concerns. Furthermore, Appendix A has been revised to show both the probability and consequence rather than a single risk ranking. Even with these limitations, however, the Departments are confident that the risk assessment does provide some meaningful differentiation between levels of risk and identifies activities where additional BMPs should be considered to protect public health and the environment.

I concede that trucks burning ultra-low sulfur diesel are preferable to trucks burning less refined diesel or “coal roller” trucks with modified fuel systems that belch big clouds of black smoke, intended as a symbolic nosethumb or upthrust middle finger to people with ecological concerns. Yet nearly 10,000 heavy truck trips projected per well pad amounts to a gross environmental insult even with the least objectionable fuel used.

Response: The Departments concur that the level of truck traffic associated with UGWD creates risks unique to this industry.

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Pictures in the RA report seem to come from industry PR sources. The specific BMP (best management practices) techniques referenced – implying the feasibility of extremely low-emission drilling, compression, and transmission, along with minimal environmental disturbance from fracking and post-frack flowback – may be barely within the capability of industry. I am not convinced of this. What I do feel certain of is that such ideal outcomes bear only the most tenuous possible relationship with actuality. On the ground gas extraction operations will feature some occurrence of methane leaks, gas flaring, casing failure, and toxic fluid spills, even if history to date suggests that the odds are somewhat against a full-scale blowout in Maryland given the number of wells projected.

Response: The Departments agree that implementation of the proposed best practices along with a robust compliance and enforcement program must both occur to guarantee performance standards.

Hydrology is not among the most exhaustively compiled bodies of scientific knowledge. Assurances that since fracking takes place at such a great depth, ordinary water supplies in the vicinity should be unaffected, seem like “I hope” statements that conveniently accommodate industry, not proven truths. Industry promoters play up the depth of the Marcellus layer while correspondingly downplaying the tremendous pressures involved in accessing it. All groundwater presumably circulates on some kind of (generally long) cycle. Flowback can bring to the surface hazardous substances such as radon that would reside only at great depth without fracking. As I emphasized in my September 2013 comment, the massive volume of water required for the fracking process is an intrinsic and unconscionable misuse of a precious and limited resource. I strongly condemn unconventional fossil fuel extraction for this reason alone, whatever position one takes in the debate over pollutants.

Response: The Departments' are proposing stringent requirements to protect water supplies that are outlined in detail in the State's final report – see http://www.mde.state.md.us/programs/Land/mining/marcellus/Documents/Final_Marcellus_Shale_Report.pdf. Also and after hydraulic fracturing, injected chemicals immediately begin flowing back to the surface where they are contained in tanks on well pads constructed to prevent any leakage into the environment. Any chemicals that do not flow back during this initial period are expected to remain underground due to gravitational forces and not reach the surface (industry actually has to pump liquids out of the wells periodically because underground fluids weight the gas down and keep it from flowing to the surface). All hydraulic fracturing chemicals are required to be treated on site or recycled to fractured additional wells. Furthermore and please refer to Appendix G for more details, but compared to other industries UGWD consumes relatively little water.

In general, the recitations of risk mitigation strategies for each phase of proposed Marcellus development in Maryland overlook Murphy's Law: if something can go wrong, it will. When multiple steps in the drilling, extraction, transmission and reclamation processes each require multiple, often technically complex safeguards, an expectation for one hundred percent perfection throughout this entire sequence of undertakings is wildly unrealistic.

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Response: As mentioned above and given the study limitations, the Departments are confident that the risk assessment does provide some meaningful differentiation between levels of risk and identifies activities where additional BMPs should be considered to protect public health and the environment.

Finally, the RA does not address the impact of methane as a greenhouse gas. Methane has a far more powerful effect than carbon dioxide in pushing terrestrial temperatures over the limits for continued normal civilization, while its residence time in the atmosphere is considerably shorter. No expansion of fracking for deep gas should be on the table until extensive research results on actual methane releases are available. At present, we have mostly assumptions, projections, and anecdotal information. The current partial state of knowledge about direct and indirect pollution effects from expanded unconventional gas extraction should instill skepticism about possible benefits and wariness about compounding known harms.

Technical barriers to scaling up renewable energy are moderate and not at all insurmountable. A political system designed to protect and enhance profits for the well-connected presents a far more formidable obstacle. I reject characterizations of fracked gas as a "bridge fuel" that will serve for some indefinite period before renewable energy sources supplant it. Fracked gas does more to block renewable energy adoption than usher it in. Thank you for the opportunity to comment.

Response: As mentioned in the risk assessment (RA), global warming risks are outside the scope of the RA because an appropriate assessment is more national in scope and tied to the county's overall national energy policy and portfolio. Maryland is proposing best management practices like rigorous leak detection and repair as well as methane offsets which are designed to mitigate emissions contributing to global warming.

At the same time we are proposing best practices for UGWD, the State of Maryland is implementing a Renewable Portfolio Standard (see <http://energy.maryland.gov/mdGoals.html>) to help move Maryland toward 20% renewable energy production by 2022, through programs that offset the cost of installing solar, wind, geothermal heating and cooling, bioenergy, and other renewable energy systems. These ambitious goals will help to ensure a clean future for all Maryland's citizens.

Commenter: Mr. Tom Rosser

The risk assessment seems thorough. The question that I have is, now that we have it, how will it be used, by whom, and when to make decisions about drilling and fracking in Western Maryland.

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Response: The decisions on whether fracking ultimately goes forward will be made by Maryland's elected officials. The risk assessment is one report among others completed under an Executive Order and that will be used to inform this decision-making process.

I am very concerned that the assessment recognizes declining property values in the lake watershed being a major issue, without acknowledging that for property owners outside the watershed, property values are as important, perhaps even more so, since these are not second homes, and are likely to be the only real estate investment these owners have. Property value is crucially important to those in that position.

Response: This is a valid comment that property values outside the lake watershed are at least equally important.

I am still unclear as how the assessment addresses drilling in the Accident Storage Dome area or the county. Is it safe, or are there too many risks in relation to the storage wells' integrity. This is not clearly addressed in the assessment.

Response: The risk assessment did not specifically address these risks. If approved at all, any decisions regarding this activity would currently have to be approved on a case-by-case basis.

I find wisdom in the overall assessment that the gas is not going anywhere, and as technology improves and drilling becomes safer, one option is to wait, and look at that gas as money in the bank. Only a decade ago there was no way to recover shale gas. It will become even more valuable as time passes and it becomes easier and safer to recover. Thanks for taking my comments.

Response: This is a valid perspective and current gas/oil prices coupled with the likely higher costs of gas development in Maryland very well may delay extraction efforts.

Commenter: Mr. TR Mazer

I support drilling for natural gas in the Marcellus shale formation. Primary risk per the assessment is related to traffic. There is no opportunity for significant job growth without an increase in traffic. Would Maryland turn away other major industries simply because more people would be using the roadways to travel to / from work, or because more trucks would be using the roadways to deliver raw materials and transport finished products? Traffic increases are manageable and roadway upgrades / repairs would be funded by increased tax revenue. I support drilling for natural gas.

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Response: The traffic involved with hydraulic fracturing is unique to other industries. First, the unusually large number and weight of trucks is great enough to require potentially extensive road fortification due to damage such as cracking and rutting, and sometimes complete failure of road structures and bridges. Other areas of the country with drilling have had difficulty paying for this, and existing Maryland taxes and fees are expected to partially offset costs. Second, especially as documented in Pennsylvania Police, more than half of trucks specifically associated with hydraulic fracturing operations have been noncompliant and cited for safety and/or weight violations. Third, areas with more drilling rigs have more fatal traffic accidents. The oil and gas industry in particular has documented issues with driver fatigue, more so than other industries, enough to attract regulatory concern and analysis from at least three federal agencies. For more detail, see Appendix C, sections "Road damage," "Traffic," and "Risk Mitigation." Decision makers will need to weigh this risk against the overall benefits of UGWD in Maryland.

Commenter: Mr. Troy Buckel

To Whom It May Concern:

I feel that fracking in Maryland would be extremely detrimental to the environment and most importantly our water. I use to work as a fisheries biologist and I studied the aftermath of coal mining in eastern North America. Because of the need for coal extraction, certain rivers and streams have been polluted for over 20 years, some unable to support even the simplest of lifeforms. What can you say with a pH level of 2.9 when you need greater than a pH of 5 to support most life and enough precipitated metals to kill anything else. I feel that fracking would be an even greater risk to our environment since it would pollute our ground water and streams for a much greater time period. I suggest investing in renewable energy sources such as wind, sunlight, and water that have a much cleaner impact on our environment. I do not approve of fracking in Maryland or any other state in North America. I will not use natural gas products and I would not live in a state that has a polluted environment.

Response: The Departments, in conjunction with the Advisory Commission and the public, have proposed stringent best management practices (BMPs) to address the risks mentioned above. The purpose of the risk assessment (RA) is to evaluate the effectiveness of these practices in mitigating these risks and to identify areas where additional practices may be necessary. This information, in addition to several other studies (economic, public health), will be used to develop regulations designed to protect the environment and public health should Marcellus development move forward.