

U.S. Environmental Protection Agency
EPA Docket Center
Mail code: 28221T
1200 Constitution Avenue NW
Washington DC 20460

Attention Docket ID No. EPA-HQ-ORD-2010-0674

November 15, 2013

Dear Officials of the US Environmental Protection Agency:

We are writing to urge the Environmental Protection Agency (EPA) to conduct additional studies and a comprehensive human health risk assessment of the effects of contamination of drinking water resources via multiple pathways related to high-volume horizontal hydrofracking (also known as fracking). Additionally, we urge the EPA to propose cautious and strictly protective recommendations and to act with its full authority to assist individuals and communities already adversely affected by depletion and contamination of drinking water resources by activities related to fracking. We concur with a comprehensive approach to assessing the full life cycle of fracking's hazards (i.e., from water, sand and chemical acquisition to wastewater treatment and disposal), and we also request that you make public all data obtained about possible water contamination events and provide the public with full access to the information and principles used in your decisionmaking.

We note as a primary concern that natural gas produced from the Marcellus shale may contain levels of radon and radium and their associated decay products that are significantly higher than that in natural gas obtained from other sources. Wastewater and other drilling wastes from the Marcellus shale and other shale plays with high levels of Natural Occurring Radioactive Material (NORM) may contain concentrations of radionuclides that pose risks to drinking water, soil and aquatic life if disposed of improperly. Improperly treated or untreated radioactive waste materials can accumulate in the tissues of partially resistant plants and animals, thereby imposing additional health risks for humans.

Although radon and radium are classified as known human carcinogens by the International Agency for Cancer Research,¹ inadequate attention has been paid to the hazards that they cause when present in waste materials associated with fracking. For example, the New York State Department of Environmental Conservation's (DEC) draft environmental impact statement on shale gas drilling contains little analysis of radium

¹ Intl. Agency for Research on Cancer, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 43 Man-made Mineral Fibres and Radon. Accessed online June 14, 2013 at <http://monographs.iarc.fr/ENG/Monographs/vol43/volume43.pdf>. Intl. Agency for Research on Cancer, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 78 Ionizing Radiation, Part 2: Some Internally Deposited Radionuclides. Accessed online June 14, 2013 at <http://monographs.iarc.fr/ENG/Monographs/vol78/mono78.pdf>.

risks and only one sentence about radon.² Minimal attention to radionuclide issues is unacceptable and should be remedied at the federal level by doing a full exposure characterization and health risk assessment of radon, radium and other radioactive byproducts associated with shale gas drilling. The analysis should include a comprehensive study of the levels of radioactivity released from all stages of shale gas production and use and the potential for exposure during exploration, drilling and hydraulic fracturing, transmission to compressor stations and pipelines, delivery to consumers and disposal of drilling wastes.

According to the EPA and the Centers for Disease Control and Prevention (CDC), radon, a naturally occurring radioactive gas, is the nation's second-leading cause of lung cancer, after smoking. Radon is a radioactive decay product of radium, which, in turn, is a decay product of uranium and thorium, elements that are often located deep underground. The CDC recognizes that radon can collect in homes through the indoor use of natural gas that was previously trapped in underground deposits of uranium- and thorium-bearing rock.³

The New York Department of Environmental Conservation and U.S. Geological Survey have previously reported that the Marcellus shale contains both uranium and thorium and the Survey has noted that "the Marcellus is readily identified on geophysical logs by its high gamma-ray signal," a form of radiation.⁴ Moreover, the Survey recently released preliminary sampling data from a limited number of natural gas wells that confirmed that natural gas from the Marcellus shale contains radon. In a report published last year, the USGS examined 10 samples of gas collected near the wellheads of three wells producing from Pennsylvania's Marcellus shale. It found radon levels ranging from 1-to-79 picocuries per liter, with an average of 36 and a median of 32. The Survey's scientists noted that they knew of no other published measurements of radon in natural gas from the Appalachian Basin, which contains the Marcellus shale. They concluded that the number of samples "is too small to... yield statistically valid results" and that "the key to

² See, e.g., N.Y. State Dep't. Env'tl. Conservation, Supplemental Generic Env'tl 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 (2011), [hereinafter NYDEC SGEIS] at 4-35 through 4-36, 6-205 through 6-207, Appendix 13 (containing limited information and analysis about radium). The only sentence about radon appears at 6-206.

³ U.S. Env'tl. Prot. Agency. A Citizen's Guide to Radon. Accessed online June 4, 2013 at <http://www.epa.gov/radon/pubs/citguide.html>. Agency for Toxic Substances and Disease Registry, Radon Toxicity, What is Radon? Accessed online June 4, 2013 at <http://www.atsdr.cdc.gov/csem/csem.asp?csem=8&po=4>. Agency for Toxic Substances and Disease Registry, Radon Toxicity, Where is Radon Found? Accessed online June 4, 2013 at <http://www.atsdr.cdc.gov/csem/csem.asp?csem=8&po=5>. U.S. Env'tl. Prot. Agency. Radiation Protection, Radon. Accessed online June 14, 2013 at <http://www.epa.gov/rpdweb00/radionuclides/radon.html>.

⁴ N.Y. State Dep't. Env'tl. Conservation, Supplemental Generic Env'tl 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 (2011), [hereinafter NYDEC SGEIS] at 4-35, 6-206. E.L. Rowan et al. U.S. Geological Survey, Radium Content of Oil- and Gas-Field Produced Waters in the Northern Appalachian Basin (USA): Summary and Discussion of Data, 2011, at 15. Accessed online June 4, 2013 at <http://pubs.usgs.gov/sir/2011/5135/>.

better understanding radon, its sources, and behavior in hydrocarbon reservoirs lies with the collection and interpretation of additional data.”⁵

The EPA similarly highlighted the lack of analysis of radon and other radiation exposure in its review of the DEC’s draft plan for shale gas drilling in New York. “Who is responsible for addressing the potential health and safety issues and associated monitoring related to external radiation and the inhalation of radon and its decay products?” the EPA asked. “Such potential concerns need to be addressed.”

As for radium, evidence suggests that levels in wastewater from Marcellus shale gas drilling are unusually high. Radium contaminates underground water deposits that come into contact with uranium- or thorium-bearing rock.⁶ In 2011, the U.S. Geological Survey reported that radium levels in produced water from oil and gas wells in New York and Pennsylvania, including those in the Marcellus shale, “have a distinctly higher median... than reported for other formations in the Appalachian Basin, and range to higher values than reported in other basins.” (Produced water is generally a term for naturally occurring water that comes to the surface in the oil and gas production process; it is distinct from “flowback,” hydraulic fracturing fluid that returns to the surface after being injected during the drilling process; here, however, the U.S. Geological survey defines produced water as “produced from an oil or gas well at any point during its life cycle.”) The agency also found that the range of radium levels from produced water in Pennsylvania’s Marcellus shale was similar to New York’s, although the median level was lower.⁷

The New York Times reported in 2011 that drilling companies were dumping millions of gallons of wastewater from Marcellus shale gas wells in Pennsylvania into ill-equipped treatment plants, and that the wastewater from 42 wells studied contained radium levels up to 3,600 times EPA’s safety standard for drinking water. In some cases, the treatment plants were not equipped to treat the wastewater and discharged it essentially untreated into rivers just upstream from drinking water intakes.⁸ A peer-reviewed study of the impacts of drilling wastewater treated and discharged into a creek by a wastewater facility in western Pennsylvania recently documented radium levels approximately 200 times greater in sediment samples near the discharge than in sediment samples collected upstream of the plant or in other locations in western Pennsylvania. “The absolute levels that we found are much higher than what you allow in the U.S. for any place to dump radioactive material,” one of the authors told Bloomberg.⁹ The New York Department of

⁵ E.L. Rowan and T.F. Kraemer, U.S. Geological Survey, Radon-222 Content of Natural Gas Samples from Upper and Middle Devonian Sandstone and Shale Reservoirs in Pennsylvania: Preliminary Data, 2012. Accessed online June 7, 2013 at <http://pubs.usgs.gov/of/2012/1159/>. Agency for Toxic Substances and Disease Registry, Radon Toxicity, What is Radon? Accessed online June 4, 2013 at <http://www.atsdr.cdc.gov/csem/csem.asp?csem=8&po=4>. U.S. Evtl. Prot. Agency. A Citizen’s Guide to Radon. Accessed online June 4, 2013 at <http://www.epa.gov/radon/pubs/citguide.html>.

⁶ U.S. Evtl. Prot. Agency. Radiation Protection, Radium. Accessed online June 7, 2013 at <http://www.epa.gov/radiation/radionuclides/radium.html#environment>.

⁷ E.L. Rowan et al., supra note 4, at 15. Accessed online June 4, 2013 at <http://pubs.usgs.gov/sir/2011/5135/>.

⁸ Ian Urbina, Regulation Lax as Gas Wells’ Tainted Water Hits Rivers, N. Y. Times, Feb. 27, 2011 at A1.

⁹ Nathaniel R. Warner et al. Impacts of Shale Gas Wastewater Disposal on Water Quality in Western Pennsylvania, Evtl. Sci. & Tech., Oct. 2, 2013, <http://pubs.acs.org/doi/abs/10.1021/es402165b>

Environmental Conservation has previously found that produced water from 11 of 13 vertical wells drilled in New York's Marcellus shale in 2008 and 2009 contained radium levels ranging from 400 times to nearly 3,400 times EPA's safe level. The U.S. Geological Survey's study of radium included this data.¹⁰

Despite this evidence, a full assessment of radium risks and how to contend with them appears lacking. Although in New York the DEC report stated that "there is questionable available capacity"¹¹ for New York's public sewage treatment plants to accept drilling wastewater, it would allow those facilities to accept it if the plants meet permitting conditions.¹² The DEC said that underground injection (perhaps the most common method of disposal of drilling wastewater) might be an alternative,¹³ even though the last significant government study of pollution risks from oil and gas underground injection wells took place in 1989 and found significant instances of groundwater contamination.¹⁴ In subsequent years, news stories and studies have continued to link underground injection of drilling wastewater to contamination as well as earthquakes.¹⁵

We are also deeply concerned about onsite "storage" of untreated wastes and transport of wastes to landfills for long-term, largely unmonitored "storage." The liners of open onsite storage pits can tear during installation or be ripped by animals attracted by waste brines.¹⁶ Accidental and possibly intentional spills into ponds and streams have been documented, and current regulations create financial incentives for wastes not to reach expensive treatment sites.¹⁷ Unconscionably, some states permit untested and untreated wastewater from fracking sites to be used as a deicing agent on roads or a dust-control measure on fields and in parks,¹⁸ virtually insuring that fracking chemicals and potentially toxic radioactive by-products will reach roadside ditches and enter streams, rivers, reservoirs, and wetlands, thereby inevitably polluting the water table.

(subscription required). Jim Efstathiou Jr. Radiation in Pennsylvania Creek Seen as Legacy of Fracking, Bloomberg, Oct. 2, 2013, <http://www.bloomberg.com/news/2013-10-02/radiation-in-pennsylvania-creek-seen-as-legacy-of-frackin.html>.

¹⁰ NYDEC SGEIS, at 5-133, 5-141, 7-60, Appendix 12, Appendix 13.

¹¹ NYDEC SGEIS, at 6-62.

¹² NYDEC SGEIS at 6-57 through 6-63.

¹³ NYDEC SGEIS, at 6-64.

¹⁴ U.S. Gov't Accountability Office, Safeguards Are Not Preventing Contamination from Oil and Gas Wastes (1989), <http://www.gao.gov/products/RCED-89-97>.

¹⁵ See, e.g. Henry Fountain, Disposal Halted at Well After 11th Quake in Ohio, N.Y. Times, Jan. 2, 2012, at A11. Ohio Dep't of Natural Resources, Preliminary Report on the Northstar 1 Class II Injection Well and the Seismic Events in the Youngstown, Ohio, Area, Mar. 2012, at 4.

¹⁶ Paul Rubin, personal communication.

¹⁷ Legere L. Sunday Times review of DEP drilling records reveals water damage, murky testing methods. Scranton Times-Tribune, May 19, 2013: <http://thetimes-tribune.com/news/sunday-times-review-of-dep-drilling-records-reveals-water-damage-murky-testing-methods-1.1491547> (accessed online November 7, 2013)

¹⁸ Congressional Research Service. Hydraulic Fracturing: Selected Legal Issues. Washington DC October 2013; and New York State Department of Environmental Conservation. Beneficial Use Determinations (BUDs). Published online, undated

<http://www.dec.ny.gov/chemical/8821.html> (accessed November 8, 2013)

The New York DEC assessment reported that a radioactive materials license might be required for facilities that concentrate naturally occurring radioactive materials during pre-treatment or treatment of drilling wastewater.¹⁹ In its review of the Department's analysis, the U.S. EPA noted that it was unclear who would be responsible for ultimate disposal of these concentrated radioactive materials.²⁰

To protect the public's health, it is essential to conduct a thorough assessment of exactly whether and how radium and other radioactive wastes from Marcellus shale drilling operations can be safely handled and what health risks these wastes pose. In addition, the EPA should determine whether such wastes should be generated, if they cannot be disposed of safely.

Sincerely,

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¹⁹ NYDEC SGEIS, at 5-142.

²⁰ U.S. Envtl. Protection Agency, Region II, Comments on Revised Draft NYSDEC Revised dSGEIS for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs, Jan. 11, 2012.