

LAW OFFICE OF GARY A. ABRAHAM

170 No. Second Street
Allegany, New York 14706
716-372-1913; fax is same (please call first)

gabraham44@eznet.net
www.garyabraham.com

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TO: Concerned lawmakers and policymakers

SUBJECT: Disposal of low-level radioactive Marcellus shale drilling waste in New York landfills

The New York State Department of Environmental Conservation (DEC) recently completed an issues conference on an application to expand landfilling at the Chemung County Landfill, leased to and operated by a subsidiary of Casella Waste Systems of Rutland, Vermont. The purpose of the conference was to determine whether further evidence should be considered regarding issues proposed by an intervening party, Residents for the Protection of Lowman and Chemung (RFPLC).

I represent the environmental organization RFPLC, which has raised the issue, whether it is legal to dispose of low-level radioactive Marcellus shale drilling waste in the landfill, because the waste is 25 to 1,000 times more radioactive than background, and because the radioactivity in the waste originates mainly from Radium-226 (Ra-226), which can be fatal when ingested or inhaled. An administrative law judge within DEC has issued a decision rejecting the issue, with the result that there will be no hearing on evidence of the harmfulness of this waste. This memo summarizes the arguments and evidence offered in support of this issue made by RFPLC. Details are provided in submissions to DEC provided by RFPLC, Casella, and DEC Staff, posted on my website¹ and referenced further below.

Although DEC has yet to finalize its analysis of the environmental impacts of Marcellus shale gas development, including the impacts associated with managing drilling wastes from such development, in January 2010 regional DEC Staff approved disposal of Marcellus shale gas drilling wastes in the landfill, without any analysis of its radioactivity or the manner in which the waste is generated. Months before the approval, Casella began accepting such wastes at three New York landfills it operates (Hakes C&D in Painted Post, Hyland Landfill in Angelica, and Chemung County Landfill). In fact, today Casella has diverted most municipal solid waste away from the Chemung County Landfill in order to devote most of its permitted disposal limit, or about 2,000 tons per week, to shale drilling wastes. It's application to DEC seeks to expand the disposal limit by another 50 percent to take in even greater volumes of such wastes.

DEC regulations prohibit disposal of low-level radioactive waste in a landfill if it is also "processed and concentrated."² In that case, the waste must be managed at a licensed low-level radioactive waste landfill. If not processed and concentrated, DEC Staff's position is that it does not matter how radioactive the waste is; in that case it may be transported to and disposed in any New York landfill.

Drilling wastes produced by developing a Marcellus shale well site include drill cuttings (pulverized rock), naturally occurring brine, and drilling fluid.³ The radionuclide of concern in the waste is Ra-226, a decay product of Uranium-238 which occurs naturally in the shale. Radium in Marcellus shale is about 25 times more radioactive than the level of radioactivity in the surface environment, which is naturally occurring and historically elevated primarily due to atomic fallout.⁴ Because Ra-226 is highly water-soluble, the brine and drilling fluid can be 500 to 1,000 times more radioactive than background, having leached Radium from the shale.⁵ Ra-226 has a half life of 1,600 years.⁶ As a practical matter, therefore, the surface environment will host this newly introduced radioactivity forever.

Drilling wastes from a Marcellus shale gas well site are dewatered by means of a “shale shaker,” an industrial centrifuge, or by discharging the wastes into a sloped separation pit that allows the solids to collect at one end.⁷ However, the dewatered waste continues to contain a substantial amount of liquid, and may look like sludge. New York regulations governing the landfilling of waste allow sludge to be disposed if it is “dewatered to 20 percent solids.”⁸ The Chemung County Landfill permit prohibits disposal of non-municipal wastes containing “free liquids, sludges, slurries, chemical or industrial wastes which are *less than* 20% solids.”⁹ Thus, up 80% of the volume of landfilled sludge or industrial waste can be liquid.

“Ra-226 is a carcinogen¹⁰ and, when ingested or inhaled, concentrates in the bone and can cause leukemia.”¹¹ At the current rate of disposal in the Chemung County Landfill, Casella could be disposing 312 trillion picocuries (pCi) of radium per year in the landfill.¹² Ra-226 decays to radon gas. “As an inert gas, the landfill gas combustion device cannot control radon.”¹³ EPA has set a recommended radon action level of 4 pCi per liter of air in residences.¹⁴

EPA has set a soil concentration limit for Ra-226 of 5 pCi per gram in the first 15 centimeters of soil and 15 pCi/g in deeper soil.¹⁵ This limit assumes that control of land cannot be assured for more than 1,000 years and, because of the long life of Ra-226, eating radium contamination in food grown on the land 1,000 years from now would result in substantial excess cancer.¹⁶

In the present, transport trucks can be expected to leak radioactive liquid. “The leaking liquid is particularly radioactive and, over time, can be expected to contaminate local roadways and roadways inside the landfill.”¹⁷ Inhalation of dust contaminated with Ra-226 is of most concern because internal exposure can result in leukemia.

In addition, because Ra-226 is highly water-soluble, it will be present in the landfill’s leachate.¹⁸ In the event of a catastrophic failure of the landfill’s containment system, large volumes of contaminated liquid and waste could be discharge to the Chemung River, a few hundred feet downslope from the landfill. Under normal conditions, several thousand gallons of leachate per day are sent to the Elmira water treatment plant, which discharges treated waste water to the Chemung River. However, the plant is not equipped to (and is not permitted to) remove radioactive contaminants from waste water. All the radioactive contaminants in the leachate will therefore be discharged into the river.

REFERENCES

1. See <www.garyabraham.com> under “Documents & Blogs”.
2. 6 N.Y.C.R.R. §§ 360-1.2(e), 382.1(c)(5), 360-1.1(a).
3. Chemung County Landfill, DEC No. 8-0728-00004/00013, Issues Conference transcript (I.C. Tr.) at 84:1-19.
4. Resnikoff, memo to Gary A. Abraham, Esq. (June 30, 2010), p. 1.
5. Resnikoff, memo to Abraham (April 7, 2010), p. 3; included as Exhibit B to Intervenor’s Petition, Matter of Chemung County Landfill, DEC No. 8-0728-00004/00013 (DEC 2009 Draft SGEIS reports Marcellus rock cuttings are about 25 pCi/gram, drilling fluid is about 12,000 pCi/gram); Resnikoff, “Radioactivity in Marcellus Shale,” *op. cit.*, p. 3 (citing DEC 2009 Draft SGEIS, which reports brine from Marcellus shale is 15,000 pCi/gram).
6. *Id.*, p. 6.
7. Marvin Resnikoff, Ph.D., Radioactive Waste Management Associates, “Radioactivity in Marcellus Shale: Report prepared for Residents for the Preservation of Lowman and Chemung” (May 19, 2010), p. 2.
8. 6 N.Y.C.R.R. § 360-2.17(n).
9. Chemung County Landfill, DEC Permit No. 8-0728-00004/00013-0 (February 21, 2006), Special Condition 31(b).
10. Cancer is a delayed response to exposure to radiation. There is therefore no safe threshold for exposure. Instead, risk of cancer resulting from radiation exposure is estimated over a lifetime. *Cf.* EPA, “User’s Guide: Radionuclide Carcinogenicity,” available at <<http://www.epa.gov/radiation/heast/index.html>> (“Radionuclide Carcinogenicity Slope Factors: HEAST”).
11. Resnikoff, “Radioactivity in Marcellus Shale,” *op. cit.*, p. 2.
12. *Id.*, p. 7.
13. *Id.*
14. U.S. EPA, “A Citizen’s Guide to Radon,” <<http://www.epa.gov/radon/pubs/citguide.html>>.
15. Resnikoff, “Radioactivity in Marcellus Shale,” *op. cit.*, text at note 9 (citing 40 C.F.R. § 192.12).

16. *Id.*, text before note 9.

17. *Id.*

18. *Id.*