



## Insights to Pennsylvania Marcellus Wastewater Treatment

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Penn State's Marcellus Center for Outreach and Research offers insightful comments on the Marcellus wastewater issues published in the New York Times last week.

Recent articles published in the New York Times raised questions about how Pennsylvania regulates and monitors wastewater discharges associated with Marcellus Shale natural gas development. The Marcellus Center for Outreach and Research (MCOR) believes that testing and monitoring of all influent waste and treated effluents from treatment facilities accepting Marcellus-derived fluids should occur routinely to ensure adequate water quality protection, and most importantly protection of human health. In addition, public water systems with surface water intakes located downstream from Marcellus fluid treatment facilities should also conduct routine monitoring to ensure that all safe drinking water standards are maintained. MCOR is conducting an independent, comprehensive analysis of the potential for flowback waters to impact the quality of water in the Commonwealth's streams, rivers, and aquifers. This analysis will ensure that a fair and representative summary of the data can be presented in a scientific manner to the public. In the meantime, the following should be considered to put the data published by the New York Times into perspective:

- ~ The levels of radium-226, radium-228, gross alpha, gross beta, and benzene cited in the articles were compared to US EPA drinking water standards; however, this wastewater was not used directly for drinking water purposes, therefore this is not a representative comparison.
- ~ The radionuclides present in the flowback water occur naturally in the brines reservoirs within the Marcellus shale and other rock formations. Radionuclides are not used as an additive in the drilling and hydraulic fracturing process.
- ~ The concentrations of naturally-occurring radionuclides in the flowback water vary geographically across Pennsylvania as a function of the initial concentrations of radioactive elements in the Marcellus Shale. In addition, concentrations in produced water depend on how much time the fluids have been in contact in the shale and the relative dilution by frac water added. The initial flowback water, that has only been in the shale for a short period of time, generally has lower radionuclide concentrations than the late-stage flowback waters that are less diluted and more like the in situ formation waters. The average and peak concentrations of radionuclides need to be measured for assessing treatment efficiency and potential for water quality impacts.
- ~The dedicated oil and gas wastewater treatment facilities generally use chemical precipitation treatment to remove the metals in the flowback water. This process is also effective at removing a large percentage of the radionuclides. The efficiency of radionuclide removal during this process and at municipal treatment plants needs

to be further evaluated and quantified with laboratory testing.

~Significant dilution occurs at municipal treatment facilities as they generally are only permitted to accept 1% of their average daily flow as flowback water; therefore, concentrations of residual elements are diluted by at least a factor of 99 to 1 prior to discharge. The receiving stream or river then adds another significant level of dilution, dependent on stream flow.

~The ultimate concentrations of radionuclides in the Commonwealth's waters depends on the initial concentrations in the flowback water, the treatment removal efficiency, and the level of dilution by the receiving stream. None of these factors were considered in these series of articles, however are crucial variables to consider when looking at the potential for any adverse water quality impacts.

~Ultimately, Pennsylvania's regulators must determine acceptable treatment and disposal methods and regulate the industry in a manner that is protective of our environment, our drinking water, and most importantly our health.

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