Ms. Dorothy, M. Gunn, Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph Street, Suite 11-5000
Chicago, Il 60601

pc#21

Re: Docket Number R-04-021
Revisions to Radium Water Quality Standards

Dear M. Gunn:

Thank you for this opportunity to provide comments on the referenced issue. Please include them with the record of this docket.

Radium is currently regulated under Sections 302.207. a and b of Illinois' Water Quality Standards for general use waters. Paragraph a addresses gross beta concentration, and paragraph b limits radium 226.

The USEPA has completed extensive research on the effects of pollutants in the environment. The Agency states on its *Technology Transfer Network Air Toxics Website* that "No information is available on the acute effects of uranium, radium, or radon in humans." My review of available literature has failed to find any study identifying acute toxicity levels of radium for any animal, which would be translated into a water quality standard below the current gross beta WQS.

Radium's chronic effects on humans as well as wildlife can be documented, but the resultant water quality standards should not be based upon acute toxicity. The end result of a chronic versus acute toxicity loading is that the assumed stream flow associated with the calculated discharge limits of wastewater treatment plants. Typically, for most pollutants, wastewater treatment plant discharge limits are based upon the acute toxicity and the ten year seven day low flow. This is the appropriate way to protect wildlife from acute toxicity for pollutants such as ammonia, due to the fact that short term exposures to ammonium are toxic to wildlife. Radium, on the other hand, does not present similar acute environmental hazards. If a radium standard is to be met, then the NPDES limits should be based on annual average flows instead of ten year seven day low flows.

If a water quality standard is to be based upon chronic effects of humans or wild and domestic animals, then the current level associated with drinking water standards would be appropriate. This level has been studied and documented to assure protection from the chronic effects of radium. The level is based upon long term consumption of the water at the 95th percentile of water usage. Once again this limit is based on long term usage and chronic effects. Primary contact in surface waters would present a significantly lower health risk due to the limited amount of consumption and contact of the waters as compared to drinking water.

Communities that have radium in sources for drinking water have a limited number of alternatives for reducing levels. Many of these alternatives generate recycle streams that are

discharged to sanitary sewers. By requiring NPDES discharge limits be based on ten year seven day low flows and that the allowable level is only twenty percent of what is considered safe to drink, the cost effective method of addressing radium throughout the community will be affected.

There is limited information on cost effective methods for removal of radium in wastewater treatment plants. Activated sludge processes have been found to remove between twenty to eighty percent of influent radium in waste sludge. While the literature on removal is scarce, apparently the mechanism for removal is either chemical precipitation or absorption into waste sludge. An oversimplified model may attribute the twenty percent base line removal as absorption and the remaining sixty percent to be dependant upon plant chemistry.

USEPA research on the mater has identified barium sulfate and gypsum as possible coagulants for radium. Barium may be found in trace amounts in wastewater, but it probably is not present in sufficient quantities to account for radium removal. The components of gypsum (CaSO4 2H2O) are found in most wastewaters. How these components are allocated to different compounds is dependant upon many variables. Calcium is found in water hardness that may be used for nitrification. Sulfur compounds can be found in many forms that tend to depend on pH and dissolved oxygen of the sewage as it travels through the sewer system and treatment facilities.

In order for either coagulant to assist in the removal of radium, the sulfur must be in the form of sulfate. Sulfates are removed from wastewaters when anaerobic conditions exist. Treatment plants designed to remove phosphorous biologically, are required to include anaerobic zones which will also remove the sulfates from the mixed liquor. Improvements that will result in the reduction of phosphorous to the waters of the State, may reduce POTW's ability to remove radium.

Treatment methods to further reduce radium levels at wastewater treatment facilities are essentially the same methods available for potable water treatment. Most of these methods result in a back wash stream relatively high in radium. These methods would not be feasible, because they could not be discharged to surface waters. The only methods that could be used to are those that remove the radium in a sludge or on a filter media that is concentrated and disposed of.

The typical source of radium for communities is from the raw water from deep wells. If a community is to treat its source water to meet drinking water standards, then the cost effective method of reducing radium in wastewater treatment discharges will most likely be removal facilities for the raw water. This will also apply to those communities that currently meet drinking water standards, but have POTW discharges greater than the WQS. The allowable treatment methods will be limited to those that do not generate concentrated waste streams that will need to be treated as wastewater.

Enforcement of the current water quality standard will have the effect of creating de facto drinking water standard that is not based upon the protection of human health, but on the wastewater treatment limits. Developing NPDES limits based on ten year seven day low flows in the stream will further magnify the discrepancy between the WQS and the drinking water

limit. Communities that are including biological nutrient removal in the wastewater treatment process will be further penalized due to requirements associated with the process.
Thank you for this opportunity to provide the Board with my comments.

Sincerely,

Curtis Craigmile, P.E.

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