PUBLIC PERCEPTION OF POTABLE WATER REUSE: SCIENCE, RISK AND NECESSITY

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REFERENCE: Proceedings of the 2005 Georgia Water Resources Conference, held April 25 - 26, 2005, at the University of Georgia, Kathryn J. Hatcher, editor, Institute of Ecology, The University of Georgia, Athens, Georgia.

Abstract. The travel time between the discharge of treated wastewater and drinking water intakes in the Atlanta region is one to two days. And the proportions of discharge to base flow seem to be increasing. One concludes that indirect potable reuse is not going away.

Normal practice throughout the nation is to return treated wastewater to waterways. Some of those waterways happen to serve others as water supply. In the past the effluent limits placed on those discharges derived primarily from ambient water quality standards for aquatic ecosystems and recreation rather than for protection of drinking water supply and appurtenant public health issues. And the regulations promulgated under the Safe Drinking Water Act were premised on water supplies of the highest and best quality, which has not traditionally included substantial amounts of treated wastewater.

As Georgia moves away from unplanned indirect potable reuse toward planned indirect potable reuse, wastewater treatment has upgraded to advanced water reclamation methods employing technology such as membrane filtration, carbon adsorption, and ozonation. The life-cycle cost of advanced reclamation is approximately four times that of tertiary wastewater treatment. Advanced methods are incidentally that much more protective of aquatic habitat and recreational uses of the State's waters. Similarly, water treatment technology is evolving to address emerging contaminant issues, whether those contaminants enter water supplies from runoff or from treated effluent. In highly populated areas, sewage overflows exacerbate the downstream problems encountered by downstream drinking water plants.

Indirect potable recycling via surface waters and groundwater has been in vogue for several decades. Systems in Manassas, Virginia and Clayton County, Georgia, as well as those in the Chattahoochee basin from its' headwaters south are good examples of planned indirect reuse via surface water. However, projects for augmenting surface water with reclaimed water have been stymied by public reaction in San Diego and in Hillsborough County, Florida. An AWWARF project published a relevant report on the public's response to planned potable reuse under the title *Understanding Public Concerns and Developing Tools to Assist Local Officials in Planning Successful Potable Reuse Projects*. Another source is the book published in 1998 by the National Research Council titled *Issues in Potable Reuse.*

Some organizations advocate more direct methods of potable recycling whereby there would be zero release of treated wastewater. For example, a December 10, 2004 op-ed letter in the Atlanta Journal Constitution suggests the use of a blend pond whereby reclaimed water would be routed to a tank or holding pond where it would be mixed with source water and then the mixture would be pumped to the drinking water plant for treatment and distribution. The tank or pond would be hydrologically disconnected from the waters of the State, i.e., there would be no release of water from the pond except to the drinking water plant. Does holding the reclaimed water in a pond constitute direct or indirect potable reuse? In that the blend pond has closed-loop architecture, it can be thought of as direct reuse. In that the water spends some days in an open-air container before being pumped into the water plant, it has a temporal element of being indirect, like flowing through an extra-long canal. Thus the blend pond concept represents either direct potable reuse or time-lag closed-system reuse.

At present, federal drinking-water rules that were conceived before recent advances in treatment technology appear to preclude closed-loop recycling for water supply. Such treatment advances were constrained to Space Station technology. The Environmental Protection Agency's September, 2004 Guidelines for Water Reuse is a useful statement of the federal perspective on potable reuse. In that document, the EPA discusses the viability of augmenting surface water supplies for indirect potable reuse, which is

what we do in abundance in Georgia. However, the EPA suggests that the implementation of direct potable reuse is unlikely for several reasons, including public non-acceptance.

"Don't take the fence down until you know why it was put up." Since the discovery of waterborne pathogens, public health and the sanitary engineering professionals have put up a fence between water and wastewater. Media headlines are more likely to portray return flows as *treated sewage* than as simply water, thus reinforcing the saying that "sewage is still sewage until we lose track of it." Media accounts do not generally advance the cause of direct potable reuse because the idea is rife with scatological humor.

The question then becomes: Should the fence come down? Taking that fence down in an area that receives 30 to 70 inches of rain per year may be a needless innovation, per Winston Churchill who said "Beware of needless innovations, especially when guided by logic." Tucson or Southern California or the Middle East would seem more likely locations for direct potable recycling.

Presenters on this panel will include Dr. Christine Moe of the Rollins School of Public Health at Emory University who will speak on the Health Considerations of Potable Water Reuse. Dr. Moe's abstract follows:

Years of drought and rapid population growth in the metro Atlanta area have greatly strained the available water resources in the region. Local water utilities have responded to these needs by promoting water conservation and considering water reuse options. Indirect potable water reuse is being practiced in several parts of the USA and Singapore. Yet, there are few studies of the possible health risks associated with water reuse. This presentation will explore potential microbial and chemical health risks from traditional source water vs. potable reuse water, identify current knowledge gaps, review approaches for studying health effects possibly associated with potable water reuse, and review health studies and risk assessment studies conducted in the USA and Namibia of indirect and direct potable water reuse systems. Research needs in this are will be discussed.

Another presenter will be Mr. R. Wayne Jackson, Laboratory Division Manager of the Cobb County-Marietta Water Authority who will discuss the Impacts of Water Reuse on Drinking Water Treatment Plant Practices. Mr. Jackson's abstract follows:

As populations increase, discharges of treated wastewater into streams and lakes make minimal time lag raw water monitoring more important in maintaining drinking water integrity. Of a more acute nature, discharges of partially treated wastewater have profound impacts on treatment schemes practiced by drinking water treatment facilities. Introduction of anthropogenic contaminants, such as increased TOC, microbial components, non-specific increases in chlorine demand, ammonia are some of the factors, which negatively impact the treatment scheme. The presentation will address both of these scenarios as well as actual effects on a treatment plant in metropolitan Atlanta and the responses of the drinking water treatment plants to the disruptions.

At the time of this writing, it is uncertain whether a panelist will be available to discuss blend-pond or other types of planned potable reuse.

Environmental justice, economics, public acceptance, a dearth of baseline epidemiological and health-risk assessment studies on even the present modus operandi of indirect potable reuse, and the absence of regulations enabling direct potable reuse are, for the present, impediments to schemes for closed-loop recycling, even though the technology might be achievable. Regarding regulations, it would not behoove a local water or wastewater service provider who functions as a natural monopoly to propose direct potable reuse to its consumers without a higher state or federal public heath agency publishing standards for a) requisite treatment technology and b) a list of sentinel parameters to be monitored on a specified frequency. The first project in the U.S. to implement closed-system direct potable reuse, should that time come, will doubtless employ reverse osmosis, perhaps in addition to carbon adsorption and ozonation, which poses the further question of what to do with the concentrated sidestream generated by the RO membranes. Another issue attending direct potable reuse is pretreatment controls which limit the type and strength of industrial sewage entering the public sewer system.