NATIONAL WATER RESEARCH INSTITUTE

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NWRI RELEASES TWO REPORTS ON ASSESSING RECYCLED WATER CRITERIA FOR STATE OF CALIFORNIA

FOUNTAIN VALLEY, Calif. – The National Water Research Institute (NWRI) has released two reports that evaluate different aspects of recycled water criteria for the State of California. One report provides conclusions as to whether recycled water used to irrigate food crops in California is sufficiently protective of public health, while the second report evaluates the suitability of a potential analytical technique to assess water quality during the recycled water treatment process.

The reports were each prepared by separate Independent Advisory Panels administered by NWRI, a research-oriented nonprofit focused on promoting innovation and practical solutions to water supply and resource challenges. NWRI specializes in facilitating these expert panels on behalf of water and wastewater utilities, as well as local, county, and state government agencies, to provide credible, objective review of industry projects and policies. Panels consist of academics, industry professionals, government representatives, and independent consultants who are experts in their fields.

California has led the nation in developing drought-resistant, sustainable water supplies through the use of water recycling – treating municipal wastewater for beneficial purposes such as irrigation, industrial processes, toilet flushing, and replenishing groundwater basins. Over 250 water recycling plants currently operate in the State, such as the Groundwater Replenishment System in Orange County (it can produce up to 70 million gallons per day of high quality water and is considered the world's largest purification system for potable reuse). According to survey results released by the California State Water Resources Control Board in 2011, over 650,000 acre-feet of wastewater is being recycled in the State per year. California is now in the process of increasing the amount of recycled water used over the next two decades by an additional 1 to 2 million acre-feet per year.

The reports were submitted to the California Department of Public Health (CDPH), the state agency responsible for regulating public water systems to protect public health. CDPH developed and adopted the Water Recycling Criteria included in Title 22, Division 4, Chapter 3 of the California Code of Regulations, which provide specific requirements for the treatment and use of recycled water. CDPH also reviews all proposals and plans for recycled water projects in California.

The first report, "Review of California's Water Recycling Criteria for Agricultural Irrigation," was developed in response to increased interest in expanding the amount of recycled water used for agricultural purposes. It specifically addressed the risk of exposure and infection from waterborne pathogens, such as *Cryptosporidium* and *E. coli*, due to the irrigation of a wide variety of food crops using recycled water.

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The report was prepared by a panel of nine experts jointly led by Robert C. Cooper, Ph.D., who is Professor Emeritus of the School of Public Health at the University of California, Berkeley, and Adam W. Olivieri, Dr.P.H., P.E., the Vice President of EOA, Inc., a public health and environmental engineering consulting firm based in Oakland, Calif. Cooper has published more than 70 papers on water quality and infectious disease, while Olivieri is an expert on the technical and regulatory aspects of water recycling and public health risk assessment.

Key issues addressed by the panel include:

- Characterizing "safe" recycled water for use in irrigation.
- Appropriate assumptions regarding an acceptable risk to public health.
- Relevancy of current criteria for reducing viruses and using chlorine disinfection.
- Need for a "multiple barrier" of treatment processes to remove microorganisms.
- Use of turbidity as a valid parameter to assess the performance of treatment processes.
- Standards used to clarify and define "secondary wastewater treatment," which involves biological treatment processes to remove contaminants and/or bacteria.
- Use of total coliform bacteria to assess the effectiveness of disinfection in reducing microorganisms.
- Ability of crops to take in viruses through their root systems, leaves, and other points of entry, and any associated risks to public health.

In the report, the panel includes responses to each of these issues, as well as provides suggestions to refining the State's Water Recycling Criteria. Among the conclusions, the panel stated that "current agricultural practices that are consistent with the [Water Recycling Criteria] do not measurably increase public health risk, and that modifying the standards to make them more restrictive will not measurably improve public health." The report is available at http://nwri-usa.org/cdph.ag.htm.

The focus of the second report, "BDOC as a Performance Measure for Organics Removal in Groundwater Recharge of Recycled Water," was on the suitability of using one water quality monitoring tool over another.

Recycled water can be used for groundwater recharge, which is the process of refilling aquifers used as drinking water supplies. Since the 1970s, California has specified in its groundwater recharge criteria that total organic carbon (TOC) – or, the amount of carbon in an organic compound – can be used to measure the concentration of organic matter in water to determine the effectiveness of organics removal during the water purification process. TOC is considered a surrogate for unregulated organic chemicals of wastewater origin; therefore, the less TOC found in the product water, the better the quality of that water.

However, the use of TOC as an indicator of water quality has some limitations. For instance, drinking water and wastewater both contain TOC, so communities that already have high concentrations of TOC in their potable groundwater supplies might be unable to meet TOC removal requirements for groundwater recharge with recycled water.

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Biodegradable dissolved organic carbon (BDOC) has been identified as a possible alternative to TOC for groundwater recharge projects that include the artificial percolation process of surface water spreading (that is, recycled water is spread on land as surface water and moves downward to refill the aquifer). The use of BDOC as a water-quality indicator involves measuring organic matter that is consumed or altered by naturally-occurring bacteria underground.

A seven-member panel of experts evaluated the suitability of BDOC as an alternative to TOC. The Panel was led by Dr.-Ing. Jörg Drewes, professor at the Colorado School of Mines and Director of Research for the NSF Engineering Research Center *ReNUWIt*. Drewes specializes in water reuse treatment technologies and is a member of the National Research Council Committee on Water Reuse as an Approach for Meeting Future Water Supply Needs.

In their report, the panel evaluated the use of TOC to assess the performance of groundwater recharge facilities and BDOC as a monitoring alternative. They prepared sections on:

- History of TOC as a performance measure.
- Water quality changes during groundwater recharge using various chemical parameters.
- Two alternative options involving the use of BDOC in place of TOC.

Among their final recommendations, the panel encouraged the State to "consider BDOC as an alternative performance measure to assess the efficiency of surface spreading operations." They also stated: "Following an evaluation of performance with indicator compounds to ensure that it remains consistent over time, it can be concluded that BDOC removal will reduce health risk from a variety of unmeasured chemicals with comparable physical-chemical properties. Thus, if properly validated with indicator chemical removals, BDOC is a much superior measure of health protection than estimates of wastewater TOC residuals in the receiving water." The report is available at http://nwri-usa.org/cdph.bdoc.htm.

"The most important outcome of these expert panel reviews is to ensure that the use of recycled water is safe and that public health is protected," said Jeff Mosher, Executive Director of NWRI. "We are pleased to be able to partner with CDPH on these panels. The results of the panels' efforts will assist CDPH in reviewing existing water reuse criteria and evaluating provisions for future criteria. The information will also help assure the public that existing practices are sound and that recycled water is a viable and valuable source of water to enhance our current water supplies."

Both reports can be also downloaded at CDPH's website at http://www.cdph.ca.gov/HealthInfo/environhealth/water/Pages/Waterrecycling.aspx. For more information about the NWRI Panel process, please visit http://nwri-usa.org/panels.htm.

The National Water Research Institute (NWRI) was founded in 1991 by a group of Southern California water agencies in partnership with the Joan Irvine Smith and Athalie R. Clarke Foundation to promote the protection, maintenance, and restoration of water supplies and to protect the freshwater and marine environments through the development of cooperative research work. NWRI's member agencies include Inland Empire Utilities Agency, Irvine Ranch Water District, Los Angeles Department of Water and Power, Orange County Sanitation District, Orange County Water District, and West Basin Municipal Water District. ####