

# **27th Annual WaterReuse Symposium 2012**

**Hollywood, Florida, USA  
9-12 September 2012**

**ISBN: 978-1-62276-917-9**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2012) by the WateReuse Association  
All rights reserved.

Printed by Curran Associates, Inc. (2013)

For permission requests, please contact the WateReuse Association  
at the address below.

WateReuse Association  
1199 North Fairfax Street  
Suite 410  
Alexandria, VA 22314

Phone: (703) 548-0880  
Fax: (703) 548-5085

[info@watereuse.org](mailto:info@watereuse.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

**A1: INDUSTRIAL REUSE – PART I***(Diplomat Ballroom 1)***Currents Trends in Water Reuse....1***David Prasifka and David Ammerman, AECOM*

This presentation will describe the expansion of non-traditional applications of water reuse in California, Texas and Florida including habitat restoration, recreational impoundments, seawater barriers, ground water recharge, car and train washing facilities, textile plants and industrial reuse.

**Reuse Practices in Central Florida's Tourism Industry..12***Ted McKim, Reedy Creek Energy Services*

This presentation will provide details of the above practices, chronicle the past 20 years of operating history, review operating practices, lessons learned and future intentions.

**Safe and Sustainable Water for the Future through Recovery and Reuse of Beverage Process Water.....24***Jocelyn Gadson, The Coca-Cola Company*

The Coca-Cola Company has developed and conducted extensive research and bench- and commercial-scale tests on a multi-barrier treatment system that provides high-quality water for reuse in clean-in-place and bottle washing. The project sets precedent for reuse in the beverage sector, is suitable to various sources, and meets or exceeds drinking water standards.

**Sale of the Century: Determining the Price of Reclaimed Water to be Leased to the Largest Nuclear Power Plant in the U.S.....31***Guy Carpenter, Carollo Engineers*

The process utilized to determine the asking price of 90,000 AFY (80 MGD) of secondary treated effluent for use by the nation's largest nuclear power plant will be described. Terms of the agreement and the price plus escalators will be presented.

**B1: MICROCONSTITUENTS – PART I***(Diplomat Ballroom 2)***Evaluating Capital and O&M Costs for Trace Organic Contaminant Oxidation in Water Reclamation.....40***Jean Debroux, Kennedy/Jenks Consultants*

This presentation will demonstrate the capital and O&M costs associated with multiple advanced water reuse treatment processes designed to achieve varying levels of TOC treatment. Data from this presentation are based bench- and pilot-scale tests from the project WateReuse-08-05 "Use of Ozone in Water Reclamation for Contaminant Oxidation".

**Elucidating the Relationship Between Biodegradable Carbon Content and Attenuation of Chemicals of Emerging Concern During Managed Aquifer Recharge.....50***Mazahirali Alidina, King Abdullah University of Science and Technology*

Utilizing Advanced Chemical and Metagenomic Characterization Tools to Elucidate the Relationship between Biodegradable Carbon Content and Attenuation of Chemicals of Emerging Concern (CECs) during Managed Aquifer Recharge.

**Pharmaceutically Active Compound Removal During Aquifer Recharge and Recovery Under Different Redox and Nitrogen Conditions.....60***Ahmed Hamadeh, King Abdullah University of Science and Technology*

ARR performance depends on many factors as; wastewater quality, temperature, soil type, redox conditions (aerobic & anoxic), and, Nitrogen species (ammonia & Nitrate) availability and concentrations. The current research aims to study the removal for a group of selected PhACs during ARR under different redox and several nitrogen concentrations.

**Predicting Removal Efficiency of Reverse Osmosis with Respect to Endocrine Disrupting Compounds and Pharmaceuticals and Personal Care Products...72***Frederick Bloetscher, Florida Atlantic University***C1: PLANNING FOR REUSE – PART I***(Diplomat Ballroom 3)***Tools for Integrated Water Reuse Planning:****A Case Study in Franklin, Tennessee....75***Kati Bell, CDM Smith*

Integrated water resource planning (IWRP) is an innovative method for developing long-term plans that encompass all water resource systems, with reuse as a central linking theme. The city of Franklin, Tennessee, has developed an IWRP that utilized a stakeholder process to communicate benefits of complicated and controversial project options, including indirect potable reuse.

## MONDAY

### **Smarter Water: Combining Water Reuse, Incentives and Information to Achieve Sustainability....84**

*Graham Symmonds, Global Water Resources*

The cost of water is going up while the availability of the resource is declining. Combining an infrastructure paradigm shift, a geo-temporal data model with economic incentives, education, and information in easily digestible and actionable forms, utilities can achieve sustained, meaningful reductions in demand and water sustainability.

### **Durham County Reclaimed Water Project—Retrofitting an Existing System to Deliver Reclaimed Water to RTP...90**

*William Mason, CDM Smith*

Highlights of the presentation will address the steps, sequences, and challenges associated with retrofitting abandoned facilities at the Triangle WWTP that were originally designed for other uses as well as the hydraulic flow controls and storage measures that were used to minimize the cost of constructing the new reclaimed water system and putting it into service.

### **City of Tavares—Funding a Public Access Reclaimed Water Distribution Project....95**

*Alexis Stewart, Malcolm Pirnie, the Water Division of ARCADIS*

In 2011, The City of Tavares broke ground on a reclaimed water infrastructure project, required by limited water resources of the surrounding area and increased regulatory requirements. This presentation will include a description of the funding efforts required to bring this project to construction.

## **D1: REUSE & SUSTAINABILITY—PART I**

*(Diplomat Ballroom 4)*

### **Guidance for Planning under Climate Change Scenarios to Better Assess the Role of Water Reuse...100**

*Robert Raucher and Karen Raucher, Stratus Consulting*

This tour of the report, “Evaluating Long- and Short-Term Planning under Climate Change Scenarios to Better Assess the Role of Water Reuse”, prepared for the WaterReuse Research Foundation, presents a framework for including climate change in water resource management planning and illustrates the role of water reuse in climate change adaptation/preparation.

### **Tenorio Project: A Case of Sustainable Development in Mexico.....111**

*Lucina Equihua & Fernando Gonzalez, Infilco Degremont*

Tenorio Project has already demonstrated how the economic and environmental benefits of reclaimed water are helping the city, farmers, and industry. Wastewater reuse provides industry with an affordable water source and the high quality

irrigation water produced in the same plant makes it possible for farmers to diversify crop production.

### **Challenges Faced for Customers Converting to Reclaimed Water.....121**

*Cole Newton, Austin Water*

The Austin-Bergstrom International Airport (ABIA) is the gateway to Austin for many visitors. ABIA is implementing several green initiatives, including the conversion of its irrigation system and cooling tower to use reclaimed water. This presentation will outline the steps and surprises encountered in converting a supposedly “reclaimed ready” irrigation system.

### **Regional Collaboration: A Survey of Recycled Water Use in the San Francisco Bay Area.....128**

*Cheryl Muñoz, San Francisco Public Utilities Commission*

In 2011, the Recycled Water Committee of the Bay Area Clean Water Agencies surveyed San Francisco Bay Area agencies to get information on current and projected production, and use of recycled water to better understand the trends in use, and how those trends are anticipated to change with time.

## **A2: INDUSTRIAL REUSE—PART 2**

*(Diplomat Ballroom 1)*

### **Wastewater Treatment with MBR & RO for Pulp & Paper Mills.....135**

*Vetrivel Dhagumudi, Layne Christensen Company*

Because of the increased environmental awareness and stringent legislation the paper and cellulose industry are forced to reduce their water consumption. Normally the wastewater from a paper plant is biologically treated, but the quality of the effluent may be good enough for disposal but it is not high enough for reuse as process water. One method to clean the water is to use membrane filtration as polisher or MBR. This technology, which combines conventional activated sludge treatment with low pressure membrane filtration, is attractive to water reuse planners and providers because of its small footprint requirement, ability to produce consistent/high-level effluent water quality, and minimal need for operator attention.

### **Case Studies for Water Reuse at Facilities of the Petroleum Processing Industries....148**

*Joseph Wong, Brown and Caldwell*

This presentation will describe the history and present status of worldwide industrial water reuse in oil refineries and petrochemical plants using membrane technologies, and presents several case studies. The case study information will

include impetus for reuse, water quality evaluation, process flow diagrams and operational results and lessons learned, and will be useful for similar industrial plants experiencing present and future water shortage or reliability issues.

**Making Reclaimed Work for Nuclear Power.....159**

*Andy Flajole, Florida Power and Light*

Florida Power & Light Company (FPL) began operating the largest natural gas-fired combined cycle power plant in the world last year in Palm Beach County, FL utilizing 100% reclaimed water for cooling. FPL is also currently licensing two proposed new nuclear units at the existing Turkey Point Plant in South Florida that plan on using approximately 60 MGD of reclaimed water for cooling. This presentation will discuss, for example, lessons learned by the corporation regarding use of reclaimed water supplies for power generation demands, the environmental and technical factors involved in the evaluation of using reclaimed water for the Turkey Point 6 & 7 Project, and the multiple benefits that will result from the potential public-private partnership.

**B2: MICROCONSTITUENTS – PART 2**

*(Diplomat Ballroom 2)*

**Formation of Nitrosamines during Ozonation in Water Reuse Applications.....167**

*Eric Dickenson, Southern Nevada Water Authority*

This presentation will discuss the formation of nitrosamines in water reuse applications using ozonation could be a serious concern and highlight useful mitigation strategies.

**Innovative Strategies for Removal of Total Organic Carbon as a Surrogate Parameter to Emerging Contaminants.....171**

*Chandra Mysore, GHD*

The focus of this presentation will be on the detailed evaluation of several advanced treatment technologies (e.g. Acticarb, Biomag, MIEX, Ferrate), associated bench- and pilot-scale study results, the challenges of implementing and maintaining the required treatment levels for meeting the regulatory requirements at an indirect potable reuse facility.

**listen. think. deliver.®**

*We are honored to have led the 2012 update to the EPA Guidelines for Water Reuse.*

**CDM Smith is proud to be a Gold Sponsor of the 27th Annual Water Reuse Symposium.**

**CDM Smith**  
cdmsmith.com

Offices worldwide.

## MONDAY

### **Evaluation of Risk Reduction Principles for Direct Potable Water Reuse.....183**

*Andrew Salvesson, Carollo Engineers*

Ideally, direct potable reuse systems (DPR), like aircraft, nuclear facilities, and bridges, should “fail-safe.” However, risk reduction and management protocols for DPR have yet to be defined. This presentation will explore how fail-safe engineering and hazard analysis principles are applied in other industries and considers how these concepts might be adapted for DPR.

### **C2: PLANNING FOR REUSE – PART 2**

*(Diplomat Ballroom 3)*

#### **Eastern Municipal Water District Recycled Water Program**

*Hossein Juybari, Eastern Municipal Water District.....189*

Eastern Municipal Water District (EMWD) provides water, wastewater and recycled water services over a 542 square mile area in Riverside County. Between 2007 and 2011, EMWD beneficially used about 60% of its treated wastewater; however, the goal is 100% beneficial utilization. This presentation will summarize how EMWD is proactively positioning itself to address these challenges so that it may fully leverage the many benefits resulting from Recycled Water.

#### **Water Reuse in Northwest Toronto – A Reality?.....201**

*Alan Rimer, Black & Veatch*

Water resources in the Province of Ontario, Region of York are strained and water reuse can help the Region meet stringent water quality requirements for a new 40MLD water reclamation center and provide reclaimed water to a variety of users in this first of a kind application.

#### **Pasco County Master Reuse System – A System on the Cutting Edge.....214**

*Pamela Wright, Pasco County Utilities*

Pasco County Florida reuses 100 percent of its reclaimed water with zero discharge saving over 7 billion gallons of potable water every year. This presentation will highlight Pasco County’s innovative reclaimed water system and the associated projects that have made this system successful.

### **D2: REUSE & SUSTAINABILITY – PART 2**

*(Diplomat Ballroom 4)*

#### **WARM: Increasing Water Supply by Reusing an Existing Drainage and Transfer System.....218**

*Arjan ter Harmsel, ARCADIS*

WARM investigates ways to increase surface water supply to west/central Netherlands. An intricate system has developed over centuries to drain the area. Now the opposite is needed. Through the combination of hydraulic modeling, MCA and stakeholder participation, solutions are developed. Cooperation between regions is needed for a cost-effective scheme.

#### **Storage Accounting in Multipurpose Reservoirs.....229**

*George McMahan, ARCADIS*

This presentation will illustrate alternative storage accounting procedures that (1) apply to multiple consumptive and non-consumptive water uses and (2) incentivize water conservation and reuse.

#### **Methodology for Obtaining Additional Biscayne Aquifer Capacity through Use of Reclaimed Water in Southeast Florida.....N/A**

*Jo Ann Jackson, Brown and Caldwell*

This presentation will present a methodology that has been used for several southeast Florida utilities that uses groundwater modeling to determine the potential for obtaining Biscayne Aquifer withdrawal credit by serving existing irrigation Consumptive Use Permit sites with reclaimed water for irrigation.

### **A3: MAKING DESALINATION SUSTAINABLE**

*(Diplomat Ballroom 1)*

#### **MicroDesal™ An Innovative Green Technology for Water Treatment.....241**

*Karen Sorber, Micronic Technologies*

Micronic Technologies, LLC, a woman-owned Virginia research development firm, has introduced a new water-desalination technology with greater throughput; reduced energy, O&M requirements, and costs; lower waste disposal; and greater portability than current technologies—all while delivering water effectively free of total dissolved solids (TDS) and other contaminants, including bacteria and spores.

**Progress in the Use of Brackish Wetlands for Concentrate Treatment: Overview of First-year Results of the Goodyear Regulating Wetlands Pilot Study.....249**

*James Bays, CH2M HILL*

The first year of a pilot study in Goodyear, AZ, has shown that wetlands can treat selenium, arsenic, chromium, and other metals, and nitrate in RO concentrate to state water quality standards. Results establish a foundation for the beneficial reuse of wetland-treated concentrate blended with concentrate for riparian habitat restoration.

**Simultaneous Water Desalination, Energy Production, and Wastewater Treatment in Microbial Desalination Cells.....261**

*Zhiyong Ren, University of Colorado, Denver*

Microbial desalination cell is a new technology that employs bacteria to convert organic matter to electricity and use the potential gradient to drive in situ desalination. This presentation will talk about our recent findings on system development, reactor performance in various conditions, membrane and ion transfer characterization, as well as future directions.

**B3: MICROCONSTITUENTS – PART 3**

*(Diplomat Ballroom 2)*

**Utilizing Microconstituents to Assess the Contribution of Reuse Overflow to Impaired Waters.....271**

*Joan Oppenheimer, MWH*

Sucralose is an effective indicator of wastewater volumetric loading to water bodies and the ratio of sucralose with other microconstituents such as gadolinium anomaly show promise in differentiating municipal and septic sources. Absence of sucralose in a watershed indicates that there is less than one percent volumetric loading from any wastewater source.

**On the Relative Occurrence of Acesulfame and Sucralose in U.S. Waters.....283**

*Andrew Eaton, Eurofins Eaton Analytical*

MWH has been measuring both sucralose and acesulfame in potable water sources and wastewater effluents across the US. This presentation will discuss the relative occurrence of these two indicator compounds.

Have you met your  
**WATER  
MATCH**



**Our motive is simple:  
To promote beneficial water reuse around the world today.  
Join us and help make matches happen.  
Because no water should be wasted.**

[www.ch2mhill.com/watermatch](http://www.ch2mhill.com/watermatch)

**CH2MHILL®**

## MONDAY

### **Minimal Production of Algal Toxins in Recycled Water Retention Ponds.....291**

*Jean McClain, University of Arizona Water Resources Research Center*

Over 18 months, we quantified algal toxin genes in reclaimed water- and groundwater-filled ponds, and found significantly lower toxin genes in reclaimed water, especially in winter. Heavy metals may be inhibiting toxin synthesis. This information could aid in management strategies to deter toxin production in natural and engineered water bodies.

### **C3: PLANNING FOR REUSE – PART 3**

*(Diplomat Ballroom 3)*

#### **The Cost and Benefits of Water Sensitive Cities: An Australian Case Study.....300**

*Steven Wallner, AECOM*

Australia has been at the forefront of developing the IWA's themes for Future Cities. The Southbank Integrated Water Master Plan presents a practical example of how these themes can be addressed while servicing growth in a high density inner-city precinct. Particular focus will be given to its decentralized water recycling components.

#### **Planning for a Range of Water Supplies: How Integrated Water Supply Modeling Yields Reliable Long-Term Solutions.....312**

*Shane Tyrrell & Mary Grace Pawson, GHD*

Grounded in case studies from Australia and the US, this paper describes how site-based models of integrated water use (conservation, rainwater and storm water capture, graywater recycled water and conventional potable supplies) are "scaled up" to create strategic water supply plans at the city and regional level.

#### **Water Quality Modeling in Reclaimed Water Treatment Plant Design.....325**

*Steven Pickle, AECOM*

To address declining cooling pond water quality and eliminate its reliance on groundwater, Tampa Electric Company plans to treat wetland effluent. The presentation will describe a model that was developed to evaluate individual treatment train processes and the overall impact of reclaimed water treatment on long term cooling pond water quality.

### **D3: REUSE & SUSTAINABILITY – PART 3**

*(Diplomat Ballroom 4)*

#### **The Emergence of Water Reuse Projects in New Buildings and New Developments for LEED Credits and Related Sustainability Goals.....333**

*Anni Luck, Hazen and Sawyer*

This presentation will review the emergence of water reuse projects in new buildings and developments, summarize a few of the more relevant case studies, present a reuse feasibility decision tool, and explore the advantages and challenges of implementing these types of systems for sustainability value and associated LEED credits.

#### **Water Reuse at the Denver Zoo.....336**

*Brian Good, Denver Water*

Increasing water demands are generating interest in innovative uses of recycled water. One example is using recycled water for zoo operations. Denver Zoo has successfully used recycled water since 2005 and is an industry leader both in the types of applications and overall volume of recycled water used on site.

#### **Water Reuse for U.S. Army Contingency Bases.....344**

*Richard Scholze, U.S. Army Corps of Engineers*

This presentation will describe the current water using scenarios of the Army showing the differences between installation water use at stateside locations and contrasting that with contingency base operations. Examples will be presented from both scenarios and also technologies found in both situations with a focus on water reuse. Additionally, the CBITEC facility will be introduced which will allow potential vendors to demonstrate applicable recycle/reuse technologies under conditions simulating an actual contingency base.



**A4: REUSE WATER QUALITY—PART I***(Diplomat Ballroom 1)***Characterization of the Suspended Solids in the Inland Empire Brine Line and Approaches to Minimizing Solids Formation.....355***Gordon Williams, Trussell Technologies*

The Inland Empire Brine Line, which conveys a mixture of desalter brines and domestic/industrial wastewaters, has experienced issues related to solids formation in the line. Results will be presented from a study characterizing the suspended-solids makeup (using advanced analytical techniques) and assessing the ability of pH adjustments to mitigate the problem.

**Waste Not Want Not: Innovation Leads to Beneficial Use of Nanofiltration Concentrate.....365***Dan Burden, Wade Trim, Inc.*

This presentation will describe the concept and permitting strategy which led to implementation. The monitoring plan and cost savings is discussed along with operational data. Two years of operating data is presented with a comparison of predicted and actual water quality results.

**Balancing Growth, TMDL Allocations, and Complete Reuse in Pasco County, FL.....374***Rafael Vazquez-Burney, CH2M HILL & Pamela Wright, Pasco County Utilities*

This presentation will explore the issues and successes surrounding Pasco County's Master Reuse System (PCMRS). Of particular focus is how the Hillsborough Bay Drainage Basin Total Maximum Daily Load (TMDL) will affect the future of the PCMRS.

**A Tale of Two Nutrients: Compliance Planning for an Uncertain World.....386***Steven Ravel, Hatch Mott MacDonald & Richard Leger, City of Aurora*

In 2010 new regulations were proposed to control nutrient discharge from point sources in Colorado. To prepare for the pending regulations, Aurora completed a nutrient evaluation to assess the ability of the Sand Creek Water Reuse Facility to meet potential permit limits for total nitrogen (TN) and total phosphorus (TP).

**B4: REUSE TECHNOLOGY—PART I***(Diplomat Ballroom 2)***Evaluation of Performance & Reliability of Advanced Water Purification Processes: City of San Diego Advanced Water Purification Demonstration Project....403***James DeCarolis, MWH*

The City of San Diego is operating a 1 MGD demonstration scale Advanced Water Purification (AWP) Facility comprised of MF, UF, RO, and AOP located at the North City Water Reclamation Plant. A key objective of the demonstration is to evaluate the performance and reliability of the AWP unit processes.

**Evaluation of Closed Circuit Reverse Osmosis for Water Reuse.....419***Richard Stover, Desalitech, Ltd.*

Closed circuit reverse osmosis (CC RO) is an emerging water reuse technology with the potential to improve process reliability by resisting membrane fouling and scaling and maximizing operational flexibility. Combining plant data and performance models, the authors evaluate CC RO technology as a water reuse platform for general application.

**Comparison of Operating Conditions and Performance of IPR Facilities for San Diego's Demonstration Plant....428***Greg Wetterau, CDM Smith*

The City of San Diego is operating an IPR demonstration facility, including parallel trains of MF/UF, two parallel RO systems, and a single ultraviolet light/advanced oxidation system. This presentation will compare operating results from existing full-scale IPR facilities with operation at the demonstration plant for various RO and MF/UF design parameters.

**Challenge Projects on Low Energy Treatment Schemes for Water Reuse....438***Andrew Salveson, Carollo Engineers*

Activated sludge is an energy-intensive process that requires a large footprint economically and environmentally, as well as physically. New lower energy treatment alternatives exist; a few are available at full-scale, some at pilot-scale, and some at bench-scale. Collectively, these represent the future of treatment for water reuse. This project (WRRF 10-06) looks to identify and test some of the best of these innovative technologies.

## TUESDAY

### C4: DECENTRALIZED REUSE – PART I

*(Diplomat Ballroom 3)*

#### **Graywater and Rainwater Reuse for a Shopping Mall in Sao Paulo, Brazil....444**

*Nancy Choi, Arup*

A new shopping mall in São Paulo, Brazil will integrate onsite treatment and reuse system that includes a Living Machine® to treat graywater and cooling tower blowdown and a separate harvesting system to collect rainwater and cooling system condensate. Reuse is intended for toilet flushing, irrigation, and cooling water make-up.

#### **Revitalizing and Urbanizing a Neighborhood with Reuse of Graywater and Rainwater: The Port Whitby Sustainable Community Plan, Canada....449**

*Nathan Chase, Arup*

This master plan for revitalizing the Port Whitby neighborhood in the Greater Toronto Area emphasized graywater reuse and rainwater harvesting to support its sustainability goals, including performance standards from LEED ND. A multi-criteria analysis of treatment technologies narrowed feasible alternatives to focus on optimal configurations, including constructed wetlands and membrane bioreactors.

#### **Decentralized Alternatives Improve Water Reuse Feasibility for Oahu's North Shore....460**

*Peter Ono, Brown and Caldwell*

A wastewater master plan identified regional reuse opportunities, which were both desired and well received by the local community. Essential to the plan was the incorporation of decentralized wastewater systems. Identified water reuse opportunities include park and landscape irrigation as well as agricultural irrigation for the North Shore.

#### **City of Sugarland Scalping Plant Feasibility Study....484**

*Kyle Jones & Mike Rolan, AECOM*

The use of decentralized wastewater treatment plants provides opportunity for reuse in the collection system. Review of the City's capital improvements plan, consideration of future planned developments and evaluation of state reuse regulations were conducted. Further analysis of select sites was conducted to evaluate plant constructability and phasing considerations.

### D4: DESALINATION PLANNING

*(Diplomat Ballroom 4)*

#### **A Triple Bottom Line Assessment of Reuse and Desalination at the El Paso Water Utilities....496**

*Robert Raucher and Karen Raucher, Stratus Consulting*

This presentation will examine the benefits and costs of brackish water desal and water reuse, for the El Paso Water Utilities (EPWU), in Texas. The analysis uses a Triple Bottom Line (TBL) approach to explore the social, environmental, and financial benefits of having reuse and desal in the EPWU water supply portfolio, through 2060. These results reveal significant net benefit in all three bottom lines, compared to EPWU accelerating its groundwater importation options.

#### **Sustainability Considerations for Desalination Plant Development and Siting....502**

*Sean Chaparro and Scott Lehman, Malcolm Pirnie, the Water Division of ARCADIS*

This presentation will discuss the need for additional, sustainable water supplies that lead to the decision to pursue seawater desalination. It will detail the incorporation of the concept of "sustainability" into the planning process and how sustainability shaped the evaluation of project alternatives including facility site selection.

#### **Piloting for Procurements....514**

*Joe Dysard and Leo Cannyn, SAIC Energy, Environment & Infrastructure*

This presentation will provide a unique insight into the benefits achieved through the use of pilot testing during the bidding process for projects of this type. It will explain how pilot testing led the shortlisted vendors to collect sufficient information upon which to base the technical and financial elements of their proposals for this 20-year long-term contract. It will also detail how the results were utilized by the City in its assessment and evaluation of the proposals. The presentation will also discuss some of the hurdles encountered when upsizing the pilot to a full-scale facility.

**Chino Basin Desalter Expansion—  
Project Delivery Approach.....526**

*Howard Steiman, SAIC Energy, Environment & Infrastructure*

This presentation will discuss the project delivery approach for the planned Chino Basin Desalter expansion. It will provide a unique insight into the benefits achieved with a program management approach using professional program managers for executing an integrated and complicated project construct within a multi-agency JPA and a status update.

**A5: REUSE WATER QUALITY—PART 2**

*(Diplomat Ballroom 1)*

**Nutrient Cycling in a Reuse Distribution System  
Significantly Lowers Landscape Irrigation Nutrient  
Loading Estimates.....546**

*Albrey Arrington, Loxahatchee River District*

Nitrogen and phosphorus concentrations are significantly reduced as reclaimed water flows through a reuse distribution system. Denitrification in a reclaimed water distribution pipeline appears to provide cost-effective nitrogen removal. End of pipe nutrient concentrations are not relevant when calculating potential nutrient loading from reclaimed water landscape irrigation to downstream watersheds.

**Ammonia Removal Alternatives Evaluation: Treating  
Wastewater to Below Drinking Water Standards.....555**

*Jayson Page and Tara Fishbain, Hazen and Sawyer*

This presentation will be a review of an evaluation of ammonia removal technologies for indirect potable reuse applications.

**Evaluation and Comparison of Reuse Water as  
Applied to Golf Course Greens in the Piedmont Region  
of North Carolina.....565**

*Marla Dalton, City of Raleigh Public Utilities*

The City of Raleigh developed a municipal turf grass research area to determine the effects of reclaimed water on sensitive turf grasses used in the golf course industry. Data will be collected and compared to golf courses that use reclaimed water on greens and those that do not.

**B5: REUSE TECHNOLOGY—PART 2**

*(Diplomat Ballroom 2)*

**Expanding the Leo J. Vander Lans Water Treatment Facility  
from 3 MGD to 8 MGD with No Additional Waste Flows.....571**

*Bruce Chalmers, CDM Smith*

The Leo J. Vanderlans WTP will be expanded from 3 mgd to 8 mgd with virtually no increase in waste flows.

**Optimizing and Expanding the World's Largest  
Advanced Water Purification Facility.....583**

*Mike Markus, Orange County Water District*

One of the world's largest indirect potable reuse projects, the Groundwater Replenishment (GWRS), includes a large treatment facility known as the Advanced Water Purification Facility (AWPF). During the first two and a half years of operation issues were identified with the initial plant design. These issues served as "lessons learned" and were able to be addressed in the first planned expansion of the existing facility. The solutions to these issues will be discussed in detail and can serve as guidance to other utilities considering implementation of a large scale reclamation facility.

**Ozonation of a Non-Nitrified Secondary Effluent Before  
Water Reuse Treatment.....594**

*Shane Trussell, Trussell Technologies*

This research investigated the consequences of ozonating a non-nitrified secondary effluent before a water reuse treatment train including microfiltration (MF) and reverse osmosis (RO). Topics discussed will include the formation and fate of n-nitrosodimethylamine, MF and RO performance, and ozone dose control strategies using ultraviolet transmittance.

## TUESDAY

### C5: DECENTRALIZED REUSE – PART 2

(Diplomat Ballroom 3)

#### Urban Landscape Irrigation Using a SB MBR System for On-site Wastewater Reclamation.....608

Ana Prieto, Colorado School of Mines

A full-scale pilot SBR-MBR wastewater treatment system is tested at the Colorado School of Mines (Golden, Colorado) for its capability to produce tailored effluents for landscape irrigation. This study suggests that the system not only efficiently removes nutrients, but achieves tailored effluent nutrient concentrations (nitrate and ammonia) for localized reuse.

#### Microbial Inactivation and Process Control Strategy for Reduction of Chlorine Disinfection Requirements for Satellite MBRs....615

Joe Jacangelo, MWH and John Hopkins University

Membrane bioreactors have the capability to produce superior effluent water quality as compared to more conventional wastewater plants with tertiary treatment. As such, a study was undertaken to assess disinfection and plant operational issues necessary to allow consideration by regulatory agencies to lower disinfection requirements.

#### Water Reuse in Healthcare Applications.....622

Christy Love, Mazzetti Nash Lipsey Burch

In a hospital application, re-using treated wastewater is not as simple as implementing an out-of-the-box treatment system. Hospitals are documented point sources for a host of contaminants of concern that are not easily removed by conventional treatment processes.

### D5: BRACKISH WATER DESALINATION

(Diplomat Ballroom 4)

#### The Potential of Brackish Groundwater as a Water Supply Source.....629

René Hoeijmakers, ARCADIS Nederland B.V.

Salt water intrusion or up coning of salt from deeper aquifers can threaten the sustainable abstraction of fresh groundwater. Brackish groundwater abstraction within the well field, in a combination with brine infiltration in a deeper layer can offer a cost effective and sustainable solution, enabling long term fresh groundwater abstraction.

#### Sulfate Removal from Surface Water Treatment Using RO— Impact of Pretreatment on RO Performance at the Fargo WTP.....634

Srinivas Veerapaneni, Black & Veatch

This presentation will discuss the impact of pretreatment on reverse osmosis in surface water applications. Pretreatment technologies considered include ozonation, softening, membrane filtration with clarification.

#### Economic and Performance Assessment of Electropositive Filtration as a Pretreatment Process for Reverse Osmosis.....642

Jonathan Brant, University of Wyoming

Nano-particulates and dissolved organics are problematic foulants for reverse osmosis (RO) membranes. Electropositive filters remove these foulants through charge interactions, rather than size exclusion. This presentation will cover improvements in process economics and performance that are realized when using electropositive filters as pretreatment processes for RO in water reuse applications.

### A6: HOW FLORIDA ORGANIZED AND RESPONDED TO EPA'S PROPOSED NNC

(Diplomat Ballroom 1)

Once EPA published its Proposed Numeric Nutrients Concentration rules utilities and industries aligned across the State to quantify the potential cost benefit of these rules. Due to the potential impacts identified an unprecedented alliance was created between the Associated Industries of Florida (AIF), local governments and public utilities that resulted in the creation of the Numeric Nutrient Criteria (NNC) Task Force. This session will inform you about the organization of such efforts and what to expect and do when these new regulations are applied to your state.

**B6: INDUSTRIAL REUSE – PART 3***(Diplomat Ballroom 2)***Overview of Membrane Technology Applications in Industrial Reuse....654***Robert McCandless, Brown and Caldwell*

Membrane technologies, including membrane bioreactors, ultrafiltration, nanofiltration and reverse osmosis are well-suited to providing consistently high-quality water for reuse in an industrial setting. Some well-known applications include the petrochemical industry, semi-conductor industry, food and beverage processing, pharmaceuticals, and metal plating and similar waste streams. This paper presents an overview of the application of membranes along with examples and some important considerations for implementing membrane technologies in an industrial water reuse setting.

**Landscape Irrigation Using Cooling Water Blowdown: An Innovative and Sustainable Approach.....665***Philip Vella, VRTX Technologies*

Controlled Hydrodynamic Cavitation prevents scaling in cooling water without chemicals. Data on using cooling water blowdown from this technology for landscape irrigation will be presented. No significant difference between potable water versus 100% blow down water on plant growth was observed saving over 5 million gallons of water.

**An Evaluation of Cooling Tower Conversions from Potable Water to Recycled Water.....675***John Tiangco, Tiangco Consulting Services*

Denver Water conducted an evaluation in 2011 to determine the feasibility of using recycled water in cooling towers historically operated on potable water. This presentation will discuss the study results, including water quality data, operational recommendations, and economic evaluations for converting cooling towers from potable water to recycled water.

**C6: MBR SYSTEMS FOR REUSE***(Diplomat Ballroom 3)***An Effluent Disposal Challenge: It's Not Only the Quality, but also the Quantity....N/A***PengFei Chao, ELS, Inc.*

Application of UF membrane treated effluent for onsite landscape subsurface drip irrigation of common areas for the disposal of excessive effluent. Secondary effluent is treated by a PVC-made UF membrane technology to provide consistent high quality effluent to meet the regulatory requirements in a cost-effective, sustainable, and environmentally friendly manner.

**Innovative Energy Curtailment Strategy for Minimization of Energy Cost in a Full Scale Reuse Plant in Fillmore California.....685***Thomas Peterson, American Water*

The City of Fillmore California reuses 100% of its treated wastewater for irrigation and aquifer recharge. A 1.8 MGD membrane bioreactor is the core treatment process at the plant. A benchmark comparison of energy use of MBRs across the US will be presented in this contribution. Results of an innovative energy curtailment strategy will be presented. Wastewater is stored and release for treatment when energy rates are low at night. We will describe results and discuss the costs and benefits of the operation. We will discuss the challenges to operation that are derived from this practice in terms of water quality compliance. We will present calculations of the savings that the plant is actually accruing from this practice and will present recommendations to plant operators for optimization of energy costs.

**Final Summary and Lessons Learned from WateReuse-08-08: Evaluation of MF MBR-O<sub>3</sub>-RO and UF-UV/H<sub>2</sub>O<sub>2</sub>-RO Systems for Water Reuse.....695***Benjamin Stanford, Hazen and Sawyer*

This presentation will summarize the major project findings from the WateReuse Research Foundation Project "Pilot-Scale Oxidative Technologies for Reducing Fouling Potential in Water Reuse and Drinking Water Treatment Membrane Systems" and will present implications for future design, including a discussion of the energy costs associated with oxidative pretreatment and the potential energy and cost savings by reduced maintenance cycles on RO membranes.

**D6: DESALINATION TREATMENT TECHNOLOGIES – PART I***(Diplomat Ballroom 4)***Pretreatment and Membrane Fouling During Treatment of Desalination Concentrate Using Electrodialysis....703***Pei Xu, Colorado School of Mines*

Treatment of desalination concentrate of reclaimed water is a new application for ED and EDR. There is currently lack of understanding of ED performance and pretreatment requirement to enhance desalination water recovery. This talk will present the findings on impacts of membrane properties, operating conditions and pretreatment processes on ED performance.

## TUESDAY

### **Demonstrating Concentrate Minimization Technologies for Inland Reclaimed Water Desalination.....712**

*Guy Carpenter, Carollo Engineers*

This presentation will provide an overview of the available tools in the concentrate management tool box. It will focus on the new improvements in this area especially new technologies developed and commercialized in the last two years. It will provide a comprehensive summary of industry trends on membrane improvements, advanced control and configurations, hybrid design, salt recovery, biological technologies, etc.

### **Innovative and Developmental Desalination Technologies-How Mature They Are....728**

*Ufuk Erdal, CH2M HILL*

A comprehensive literature search that identifies innovative/developmental desalination technologies and highlights advantages, disadvantages of these technologies, where and when the technologies have been tested or implemented (if applicable), testing results, state of development, and implement ability potential of the technologies in next 5 years.

### **A7: INNOVATIVE AND SUSTAINABLE SOLUTIONS TO FLORIDA'S WATER SUPPLY AND WATER QUALITY CHALLENGES**

*(Diplomat Ballroom 1)*

In this session, representatives from state, regional and local agencies will discuss innovative solutions being proposed and implemented to simultaneously meet both the water supply and water quality challenges, across the state. These water supply recycling projects have the ability to solve the vast majority of the over 800 MG of effluent continuing to be discharged, through aquifer recharge and other economically feasible and environmental sustainable systems.

### **B7: INDUSTRIAL REUSE – PART 4**

*(Diplomat Ballroom 2)*

### **The Power Plant Triple Bottom Line: Reclaimed Water for Cooling Water and Process Water Systems.....741**

*Michael Wilson, CH2M HILL*

The use of reclaimed water by power plants for cooling water systems is an important sustainability feature and is becoming accepted in many watersheds due to stresses being placed on habitat, potable water systems and consumptive use. This in fact is a triple bottom line advantage since reclaimed water that is recycled for power production is the definitive example of the energy-water nexus.

### **Recognizing the Benefits of Reclaimed Water Use in Energy from Waste Facilities....759**

*Valerie Going, CDM Smith*

This presentation will discuss the use of reclaimed water for industrial purposes and how it can benefit both the municipal WTE facility and utility. A case study of the Hillsborough County WTE facility will also be presented. This WTE facility uses approximately 1 million gallons per day of reclaimed water from the adjacent advanced wastewater treatment plant (AWTP) for cooling tower makeup and other internal process water uses. In turn, the AWTP receives renewable electricity to power the reclamation plant at a significant annual savings and accepts wastewater for treatment from the WTE facility. This case study demonstrates the many positive benefits that can be achieved with this type of synergistic arrangement.

### **Extreme Water Recycling in a Food Products Industry.....767**

*Nicholas Cooper, AECOM*

A food grade products company had to reduce its water use and the high-strength waste stream in its effluent. In an innovative approach, it used physical/chemical treatment to generate near-potable reuse water, replacing 75 percent of its water use, and reduced waste stream solids by more than 90 percent.

**C7: AQUIFER STORAGE & RECOVERY**

*(Diplomat Ballroom 3)*

**Economic Comparison of Treated Wastewater Recharge Versus Disposal.....774**

*Grace Johns, Hazen and Sawyer*

This presentation will discuss the economic issues associated with the use of reclaimed water for ASR and groundwater recharge in terms of their net benefits compared to the net benefits of effluent disposal. Quantifying the difference in net benefit using examples from Florida projects will be the primary focus.

**Use of Aquifer Storage and Recovery to Optimize Expansion of Reclaimed Water.....779**

*Albert Muniz, Hazen and Sawyer*

This presentation will discuss the investigation, permitting and development of a saline water ASR system for storage of excess reuse and surface water that is subsequently recovered to meet peak irrigation demands. The presentation will present results from permitting, construction, testing and development and ongoing operation of an ASR system which uses a saline storage zone. Both hydraulic and water quality data is discussed. This project allows optimization of a valuable fresh water resource while has eliminated surface discharge and loss of resources, and prolonged the useful life of the City's wellfields and water treatment plant.



**The water-energy nexus is one of the greatest global challenges we face.**

## TUESDAY

### **Get with the Program: Maximizing ASR Well Efficiency through Programming.....794**

*Nathan Nutter, Carollo Engineers*

In 2011, the City of Phoenix completed its first ASR well (Well 299). Sophisticated logic programming was incorporated to reduce costs associated with management, operation, maintenance, and regulator reporting. This presentation will detail the programming concepts used to reduce costs, and outline benefits relating to increased well operation efficiencies.

### **D7: DESALINATION TREATMENT TECHNOLOGIES – PART 2**

*(Diplomat Ballroom 4)*

### **Removal of Micropollutants and Natural Organic Matter from Brackish Water and Seawater using Combined Coagulation and Adsorption with Carbon Nanomaterials.....800**

*Chanil Jung, University of South Carolina*

This presentation will describe the ability of coagulation-adsorption processes to remove natural organic matter and endocrine disrupting compounds from brackish water. The

target compounds are bisphenol A and 17 alpha-ethinyl estradiol. The adsorbents of interest are single walled carbon nanotubes (SWNTs), multiwalled carbon nanotubes (MWNTs), and powdered activated carbon (PAC).

### **Brackish Water Concentrate Management in Florida: Lessons Learned and Challenges Ahead.....812**

*Chris Hill, Brown and Caldwell*

Florida boasts over 150 desalination facilities employing nearly every conceivable concentrate disposal alternative. This presentation focuses on the conditions—technological, hydrogeological, and regulatory—that have enabled such widespread use of brackish water desalination as a source of public water supply and the obstacles to future brackish water supply development.

### **Challenges of High-Sulfate Wastewater Recycle.....824**

*William Matheson, Duraflow*

Sulfate removal in water and wastewater treatment has begun to be a common objective. This paper explores some of the challenges, chemistries and economics experienced during a recent study conducted to evaluate options for sulfate removal and water recycling in cement products manufacturing.





# SESSION DESCRIPTIONS

## **A8: ENGAGING THE PUBLIC**

*(Diplomat Ballroom 1)*

### **Engaging the Public: Are you Serious? On Purpose?.....N/A** *Honey Rand, The Environmental PR Group*

This is a session that should be titled: You're allowed to swear, but not in front of anyone. Seriously. You treat, manage and protect water resources for a living...and you have to "engage the public" too? How fair is that? In sitting new projects, implementing new technologies and changing costs, "engaging the public" may be a requirement. Unfortunately, sometimes "engaging the public" can "enrage the public." Is that *really* in the public interest? What to do... what to do? This session will discuss the decision process to determine whether "engaging the public" is necessary or required for the task at hand. Then, the session will address appropriate and sufficient means to ensure that engagement leads to public judgment. To gain support for public projects and policy, you don't need public opinion. You need public judgment. This session will explain how and why.

### **Water Reuse: Continued Advocacy, Branding, and Investment.....832**

*John Ruetten, Resource Trends*

Securing local and national investment will remain an uphill battle. The branding of government as inefficient, and investment as "spending," will continue to be obstacles. Water reuse and desalination advocates need to continue improving their ability to make the case for investment, and ensure that their products are properly valued.

### **"Seeing is Believing" for the Water Purification Process..838**

*Marsi Steirer, City of San Diego Public Utilities Department*

The City of San Diego developed and implemented an extensive tour program as part of the outreach efforts for its Water Purification Demonstration Project. This presentation will describe how to develop a tour program, the tour experience, post-tour outreach, and lessons learned.

### **Water Independence Now (WIN) Outreach Program Regarding Recycled Water for Groundwater Replenishment in Southern California.....843**

*Albert Robles, Water Replenishment District of Southern California*

The Water Replenishment District of Southern California (WRD) was formed to manage the groundwater replenishment in 43 cities in south Los Angeles County. WRD implemented its Water Independence Now (WIN) program that increases the amount of recycled water for groundwater recharge and is being promoted through different public outreach efforts.

### **Integrated Resources Plan Implementation... 5 Years Later.....845**

*Ali Poosti, Bureau of Sanitation, City of Los Angeles*

Integrated Resources Plan Implementation...5 Years Later: implementing the integrated planning of water supply, water conservation, water recycling, runoff management and wastewater facilities planning while keeping the public engaged through the process.

### **Climate Change Communication to Support Water and Wastewater Utility Planning and Adaptation.....855**

*Robert Raucher and Karen Raucher, Stratus Consulting*

Utilities are not always certain how to communicate the need for reuse and desal. This presentation, based on an on-going Water research Foundation project, will identify tools to easily identify the targeted audience, the specific informational needs of that target audience, and messages likely to resonate with that audience.

## **B8: DISINFECTION APPLICATIONS FOR REUSE**

*(Diplomat Ballroom 2)*

### **Sizing UV Systems Using the "Right" Bioassay....863**

*Kati Bell, CDM Smith*

Bioassay validation of UV systems use surrogates in lieu of target organisms to measure performance. A discussion of how bioassay doses are determined and characteristics of indicating organisms is provided with a comparison of two systems sized based on MS2 and T1 showing potential applicability for sizing reuse disinfection systems.

### **Overview of the Largest UV Installation for Municipal Wastewater Reuse in Qatar.....870**

*Adam Festger, Trojan Technologies*

This presentation will provide an overview of the largest UV installation in Qatar located in North Doha designed to meet local reuse standards. The open-channel UV system configuration will be presented along with associated life-cycle costs, practical considerations for successfully implementing UV technology and routine maintenance for site personnel.

**On-site Sodium Hypochlorite Generator for Treatment of Reclaimed Water.....881**

*Luis Diaz, NextEra Energy*

The use of Reclaimed water for cooling application must be carefully evaluated due to it's high biocide demands for controlling biological activities. On-site sodium hypochlorite generator (OSG) can be an alternative to bleach to effectively control bio-fouling and reduce cost. OSG use solar salt and water to generate sodium hypochlorite

**Direct Control of Ozonation in Water Treatment.....891**

*Petra Ross, ARCADIS Nederland B.V.*

In this research it was shown that it was possible to control the ozone dosage on-line, by measuring the raw water quality and simulation of the required dosage. This resulted in achieving sufficient disinfection at lower ozone dosages, leading to lower energy consumption. Besides the water quality improved.

**Impact of Wastewater Disinfection on Reuse Applications....897**

*Mark LeChevallier, American Water*

Disinfection of reclaimed water needs to be balanced between inactivation of pathogenic microbes and the formation of unwanted by-products. The presentation will integrate consideration of Title 22 requirements, fully nitrified /denitrified effluents, occurrence data for viruses and Cryptosporidium oocysts, and the potential for downstream regrowth to develop an overall strategy.

**C8: REUSE FOR GROUNDWATER RECHARGE**

*(Diplomat Ballroom 3)*

**IPR Trumps Landscape Irrigation.....909**

*Steven Friedman, HDR Engineering*

Indirect potable reuse is the City of Riverside's primary recycled water focus in lieu of traditional direct uses for a multitude of reasons including a favorable unit cost and the abundance of sufficient facilities and the operational know-how to manage the extraction side of IPR.

**Role of Retention Time in the Environmental Buffer during Artificial Recharge and Recovery.....921**

*Julia Regnery, Colorado School of Mines*

The removal characteristics of 15 indicator CECs, which represent different degrees of biodegradability and sorption characteristics, obtained in laboratory experiments with well-adapted soil columns (sandy aquifer material) under controlled geochemical and hydrological conditions representative of full-scale MAR systems are presented.

**South Hillsborough Aquifer Recharge Program (SHARP), Hillsborough County, Florida.....928**

*Bart Weiss, Hillsborough County Public Utilities Department*

Hillsborough County has taken the initiative to be a leader in addressing a regional water resource mitigation issue by further evaluating the use of aquifer recharge for a salinity barrier system to beneficially use available reclaimed water to protect source water quality and develop water source flexibility in the area.

**Groundwater Storage Plan for Southern California.....938**

*James Cathcart, HDR Engineering*

This presentation will detail a programmatic approach to groundwater storage planning in southern California using potential water sources including recycled water and stormwater.

**50 Years of Successful Groundwater Recharge using Recycled Water in the Montebello Forebay Spreading Grounds.....949**

*Monica Gasca, Los Angeles County Sanitation Districts*

Since 1962, groundwater recharge using recycled water has occurred successfully at the Montebello Forebay Groundwater Recharge Project in Los Angeles County, making it the oldest planned groundwater recharge project in California. A summary of the last 50 years of the project, including research performed and future plans, will be presented.

**D8: REUSE REGULATIONS**

*(Diplomat Ballroom 4)*

**National Legislative and Water Policy Panel.....N/A**

The panel will provide an update on federal legislative and related issues including several bills related to recycling and desalination infrastructure funding. Panelists will share their insights as to the changing landscape in federal assistance for project funding. Learn how the Association is approaching this challenge. Panelist include: Mark Limbaugh, The Ferguson Group, Jen Silva, Congresswoman Napolitano's Office, Doug Manson, Manson Law Group.

**EPA Guidelines for Water Reuse 2012 Advance Preview....956**

*Robert Bastian, U.S. Environmental Protection Agency*

The U.S. Environmental Protection Agency (EPA) Guidelines for Water Reuse was first developed in 1980 and a team of more than 150 volunteer contributors are developing the 2012 guidelines. The 2012 guidelines are in final production and to be released in October 2012. This presentation will highlight expanded coverage from graywater to potable reuse and highlight over 100 new case studies.

## WEDNESDAY

---

### **ASTM Standards Offer a Solution to the Pipe Color Code Issue.....964**

*Don Vandertulip and Nicole Kolankowsky, CDM Smith*

Both plumbing code organizations rejected water industry proposals for non-purple non-potable pipes based on the plumbing code requirement for the color green to designate potable water in buildings. So, the issue is not black and white—or even green and purple—the issue is a consistent pipe color code for public health protection. Existing ASTM Standards are proposed as an educational tool to leverage discussions.

### **Promoting Water Use Efficiency—Streamlining Regulation of Alternative Onsite Water Reuse in San Francisco....976**

*Paula Kehoe and Sarah Rhodes, San Francisco Public Utilities Commission*

Developers are proposing unique applications for onsite water reuse. The lack of state regulation has created an opportunity for the SFPUC and SFDPH to develop a comprehensive program to regulate and promote onsite nonpotable water use (rainwater, graywater, etc) while ensuring protection of public health and the municipal water system.

## **POSTER PRESENTATIONS** ...N/A

### **Combining QSAR and Mass Transport Models to Predict the Removal of Organic Contaminants by an NF Membrane**

*Arash Shahmansouri and Christopher Bellona, Clarkson University*

### **Effect of Calcium on Membrane Fouling in MBRs Applying Alginate as a Substitute for Preliminary Study**

*Yongjia Xin, Xiaomao Wang, Tongxu Liu, T. David Waite, University of New South Wales*

### **Feasibility of Extracting Dissolved Metals from Reverse Osmosis Brine for Economic Gain**

*Laura Tiche, Arash Shahmansouri, Joon Min, Christopher Bellona, Clarkson University*

### **Identification and Characterization of Graywater Microbial Communities by High Throughput Pyrosequencing**

*Nichole Brinkman & Scott Keely, U.S. Environmental Protection Agency*

### **Industrial Wastewater Reuse and Water Minimization at Bonnell Aluminum, Newnan Georgia**

*Ronald Ruocco, Golder Associates*

### **Integration of Renewable Energy Resources into Produced Water Treatment Systems for Beneficial Reuse Applications**

*Jonathan Brant, University of Wyoming*

### **Investigation of Residential Water Reuse Technologies**

*William Kuru, Kohler Company*

### **Life Cycle Assessment of Wastewater Reuse in Industrial Park: A Case Study in China**

*Le Tong and Zengwei Yuan, Nanjing University*

### **Natural Treatment Methods for Filter Backwash Effluent Reuse in Streamflow Augmentation**

*Venkata D. Gullapalli, University of Louisville*

### **Planning a Recycled Water Program in a Groundwater Rich Environment**

*Steven Friedman, HDR Engineering*

### **Unique Opportunities for Effluent Reuse with Decentralized Treatment**

*Bruce Petrik, MWH*

### **Utilization of HACCP Approach for Evaluating Integrity of Treatment Barriers for Reuse—WRF-09-03**

*Debra Burris, DDB Engineering*

## **CLOSING PLENARY SESSION (Great Hall 3)**

### **Selecting the Best Path to a Sustainable Water Supply**

There are a diversity of water reuse opportunities available, and each one can lead to improving the sustainability of our water supply. The challenge is selecting the best reuse opportunities for your system. Our panel of global experts will discuss the relative strengths and weaknesses of various reuse alternatives, including Direct Potable Reuse, Indirect Potable Reuse, Environmental Reuse, Industrial Reuse, Decentralized Reuse, and reuse with Produced Water & Hydrofracking. If you're planning significant upgrades to your reuse system or if you're designing a reuse system from scratch you won't want to miss this session!

*Panelist: Mike Hoover, North Carolina State University; Alan Rimer, Black & Veatch; David Chew, Fairmount Minerals; Guy Carpenter, Carollo Engineers; Tom Richardson, RMC Water and Environment, and Elise Goldman, West Basin Municipal Water District*