



2008

Annual Report





Our mission is to conduct and promote applied research on the reclamation, recycling, reuse, and desalination of water.

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Message from the President

Dear WasteReuse Foundation Subscribers and Colleagues,

After a challenging year in 2007, the WasteReuse Foundation rebounded to enjoy a year in 2008 that can only be classified as an unqualified success. The year was characterized by strengthening research alliances as well as forging new ones, leveraging resources to perform meaningful applied research in water reuse and desalination on behalf of our Subscribers and members, and substantial growth both internally and externally. Much of this success is due to the continuing support and assistance of our Subscribers. I want to take this opportunity to thank you for your support of the Foundation during the past year.

The lack of Federal funding in 2007, as well as the tumultuous economic environment which is impacting everyone, illustrates the importance of the Foundation's Equitable Sustainable Funding Model which will allow the Foundation to achieve sustainability through increased contributions from Subscribers. With more than \$2 million in Federal funding available for research in 2009, it is our hope that our Subscribers will continue to support the Foundation in its goal of raising \$1 million in matching funds.

The Foundation excels at leveraging the funds of its Subscribers, and 2008 was no exception. On April 8, the Foundation's existing funding agreement with the California State Water Resources Control Board was amended for \$650,000 in additional research funding. On September 5, the Foundation finalized a funding agreement with the California Energy Commission for more than \$1.3 million in collaborative research. Also in September, a cooperative agreement with the Bureau



of Reclamation was signed for \$2.4 million as a result of funds "earmarked" through the FY 2008 Congressional appropriations process. All told, the Foundation has leveraged its Subscriber fees by almost 12:1 since 2000.

The launch of many new exciting projects in 2008 coincided with the publication of several important studies funded by the Foundation. Reports addressing regional solutions for concentrate management, impacts of membrane process residuals on wastewater treatment, and salinity management for recycled water irrigators were published and represent excellent tools for reclaimed water and desalination practitioners.

To further assist the water reuse community, the National Database of Water Reuse Facilities was also released to the public. Covering over 1300 reuse programs nationwide, this database serves as the most comprehensive source of information on water reuse programs available today.

The Foundation Board and staff are looking forward to 2009 with cautious optimism. In the midst of economic uncertainty, we believe there remains substantial upside potential for the Foundation, and we will be working diligently to realize that potential over the next year and beyond. With your continuing support, we will continue to seek answers to the difficult water supply and water quality challenges facing the world through water reuse and desalination research. Thank you for being such an integral component of our continuing success.

David L. Moore
President, WasteReuse Foundation Board of Directors
Southwest Florida Water Management District



Leveraging Resources

The WaterReuse Foundation is committed to advancing the science of water reuse and desalination by working with other committed industry groups, government and state agencies, and nonprofits with similar interests.

By working collaboratively with these organizations, the Foundation is able to leverage its resources in order to maximize the value of research for Subscribers and stakeholders.

Facts and Figures: Data from 2000 through 2008

110	The number of projects funded to date (Foundation sponsored and co-sponsored)
38	The number of reports published to date (Foundation sponsored and co-sponsored)
4.5 : 1	The average number of outreach materials* produced per Foundation project
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\$35,526,153	Total Foundation funding to date (this number includes cash and in-kind services)
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90.5%	Percentage of total Foundation funding devoted solely to research
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\$12,907,500	Total federal funding from the Bureau of Reclamation
1.75 : 1	Ratio of other Foundation funding to Bureau of Reclamation funding
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\$4,300,000	Total California state funding committed to date
7.26 : 1	Ratio of other Foundation funding to California state funding
<hr/>	
\$2,749,175	Annual Foundation Subscriber fees received
11.92 : 1	Ratio of other Foundation funding to Subscriber fees

* Outreach materials are produced by the investigator as a result of their involvement with the project. Outreach materials consist of WaterReuse Foundation research reports, peer-reviewed journal articles, and conference presentations.



Financial Summary

Comparison of Revenues and Expenses for Period
2007 to 2008

Revenues	2007	2008
Federal Cooperative Agreements	\$1,874,274	\$1,921,541
State and Agency Contracts	\$1,209,798	\$786,694
Subscriber Fees	\$762,425	\$907,728
Contributions	\$41,162	\$42,190
Conferences and Other Income	\$127,024	\$191,321

Expenses	2007	2008
Research Programs	\$2,882,508	\$2,690,052
Conferences/Workshops	\$73,456	\$76,766
General and Administrative	\$330,167	\$413,403





2008 Milestones

Foundation Partners with California Energy Commission

The WaterReuse Foundation signed an agreement with the California Energy Commission on September 5, 2008 for a \$1.3 million program which will study the future impacts of the energy/water nexus on water reuse and desalination. This new program will have five separate projects and will address topics such as the role of water reuse in climate change scenarios, the use of recycled water in energy and power production, and reducing greenhouse gas emissions at water reuse and desalination facilities.

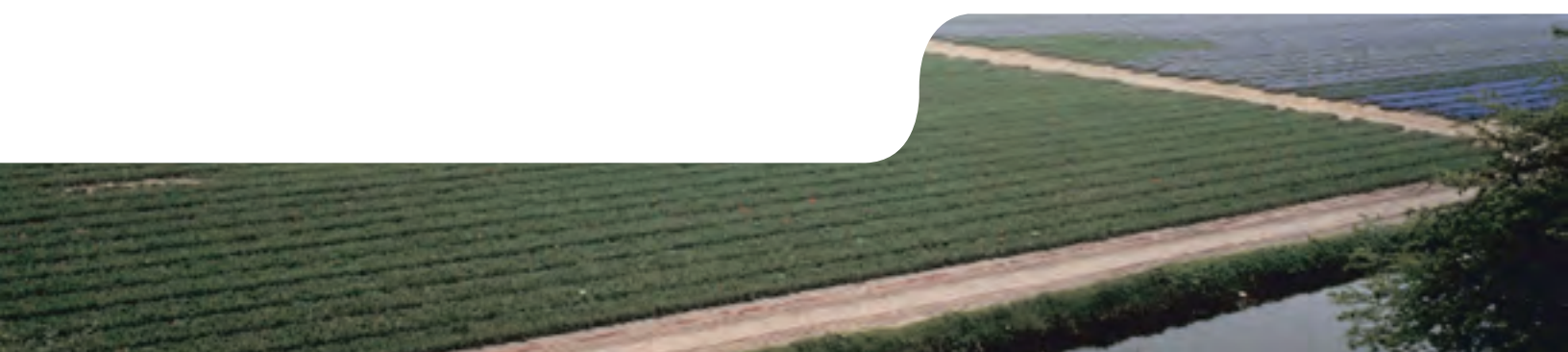
National Database of Water Reuse Facilities Launched

The National Database of Water Reuse Facilities was released to the public and serves as the most comprehensive source of information on water reuse programs in the United States today. With more than 1300 water reuse programs nationwide, the database is easily searchable by the following categories: utility, facility, treatment technologies, and end use. The database is available to professionals, regulators, educators, researchers, and interested citizens and will serve as an industry benchmark as water reuse expands in the future.

Foundation Releases Studies on Concentrate Management

The Foundation released three research reports in 2008 relating to concentrate management for utilities considering membrane projects. The studies were funded by the WaterReuse Foundation in conjunction with the Bureau of Reclamation, California State Water Resources Control Board, AwwaRF (now the Water Research Foundation), Water Environment Research Foundation, and the City of Phoenix Water Services Department. The new reports are as follows:

- Impacts of Membrane Process Residuals on Wastewater Treatment (WRF-02-006c-01).
- Regional Solutions for Concentrate Management (WRF-02-006d-01)
- Survey of High-Recovery and Zero Liquid Discharge Technologies for Water Utilities (WRF-02-006a-01)





New Subscribers Join the Foundation

WaterReuse Foundation Subscribership increased by nearly 14% in 2008 with the addition of eight organizations. These organizations help to increase the diversity of Foundation Subscribers from coast to coast, as well as internationally. The new Subscribers in 2008 are as follows:

Edmonton Waste Management
Centre of Excellence,

Hazen and Sawyer,

Magna Water Company,

Sonoma County Water Agency,

St. Johns River Water Management District,

Stratus Consulting, Inc.,

Tarrant Regional Water District, and

University of California, Santa Cruz
– Center for Integrated Water Research

Successful Research Conference Convened in Denver, CO

The Foundation convened the 12th Annual Water Reuse & Desalination Research Conference on May 5–6, 2008 at the Westin Tabor Center in Denver, CO. More than 30 presentations on “cutting edge” research topics were featured at the conference addressing salinity management, the energy/water nexus, membrane applications, and risk assessment.

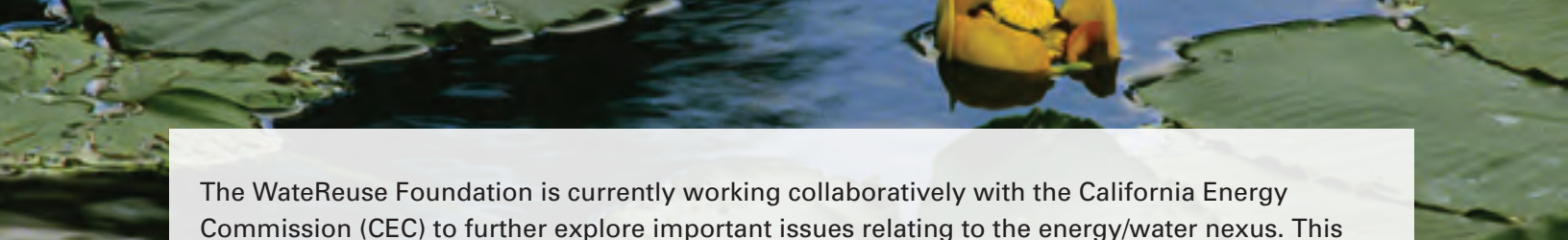
The keynote address was provided by H.J. “Chips” Barry, General Manager of Denver Water, and Bureau of Reclamation Commissioner Robert W. (Bob) Johnson was the luncheon speaker on the first day of the conference. Also featured was a tour of Denver Water’s 30 MGD Recycling Plant, the first water reuse facility to utilize biological aerated filtration to provide source water ammonia removal. The conference was jointly sponsored by AwwaRF (now the Water Research Foundation), the Bureau of Reclamation, and the Environmental Protection Agency’s Office of Research & Development.



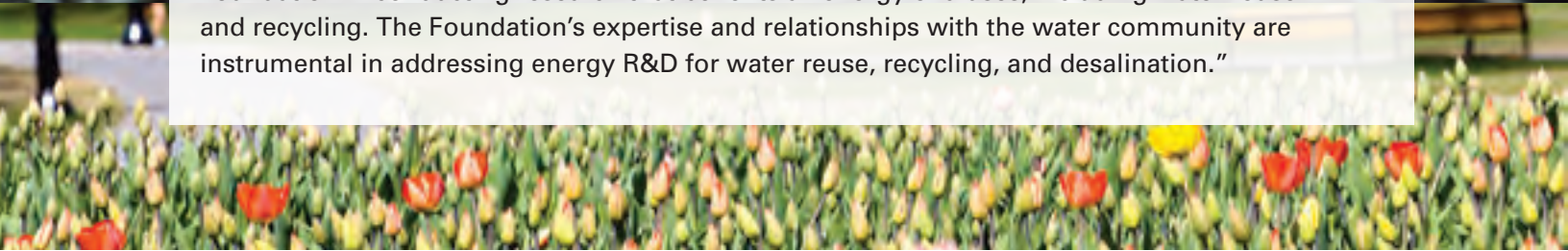
The Foundation's Research at the Forefront of Innovation... In Policy, Social Sciences and Applications

Selected Active Projects in 2008:

- Water Reuse in 2030 (WRF-06-017)
- Talking About Water: Vocabulary/Images that Support Informed Decisions about Water Reuse (WRF-07-03)
- Investigation of Social, Environmental, Natural and other Informational Factors that Influence Judgments and Decisions about Water Reuse (WRF-08-03)
- Value of Water Supply Reliability in Residential Sector (WRF-08-09)
- Water Reuse Requirements for Energy and Biofuels Production (WRF-08-012)
- Evaluating Long and Short Term Planning Under Climate Change Scenarios to Better Assess the Role of Water Reuse (WRF-08-015)
- Implications of Future Water Supply Sources on Energy Demands (WRF-08-016)



The WaterReuse Foundation is currently working collaboratively with the California Energy Commission (CEC) to further explore important issues relating to the energy/water nexus. This important partnership will help the Foundation and CEC to better evaluate the roles of water reuse and desalination in response to climate change.




"In California, water-related energy uses account for nearly 20% of the electricity and 30% of natural gas consumption," said California Energy Commissioner Julia Levin. "The Energy Commission's Public Interest Energy Research program is pleased to work with the WaterReuse Foundation in conducting research that benefits all energy end uses, including water reuse and recycling. The Foundation's expertise and relationships with the water community are instrumental in addressing energy R&D for water reuse, recycling, and desalination."



In Chemistry and Toxicology

Selected Active Projects in 2008:

- Identifying Hormonally Active Compounds, Pharmaceutical Agents, and Personal Care Product Ingredients of Most Health Concern in Water Intended for Indirect Potable Reuse (WRF-05-005)
- Identifying Health Effects Concerns of the Water Reuse Industry (WRF-06-004)
- Comparisons of Chemical Composition of Recycled and Conventional Waters (WRF-06-006)
- Optimization of Advanced Oxidation Processes for Water Reuse (WRF-06-012)
- Attenuation of PPCP/EDCs through Golf Courses using Reuse Water (WRF-08-02)
- Use of Ozone in Water Reclamation for Contaminant Oxidation (WRF-08-05)



The WateReuse Foundation works collaboratively with our Subscribers to address projects of local and regional significance. One such partner is the Southern Nevada Water Authority (SNWA), whose mission is to manage water resources and develop solutions that will ensure adequate future water supplies for the Las Vegas Valley.

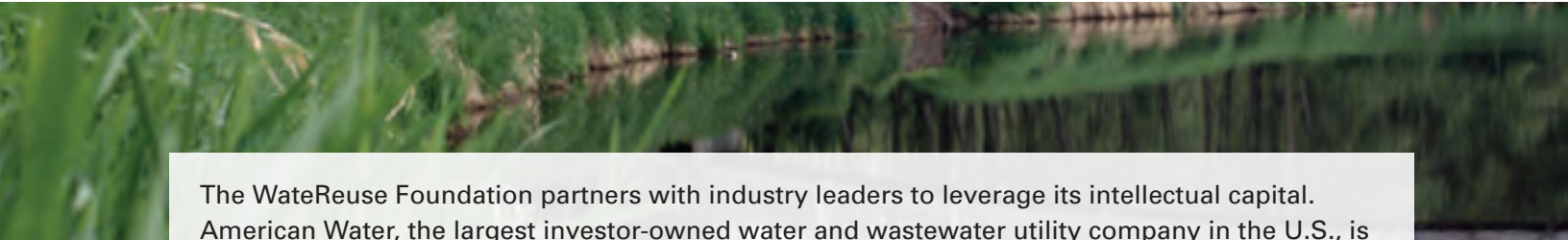
Dr. Shane Snyder, the R&D Project Manager for SNWA, provides expertise to the Foundation as one of the world's leading authorities on trace organic compounds in water. On working with the Foundation, Snyder said, "The WateReuse Foundation provides critical and timely information related to a variety of water reuse challenges facing our community. The Las Vegas Valley must cope with severe water resource limitations, and the ability to reuse water is critical to our community's survival. Through the WateReuse Foundation, we have been able to identify and collaboratively address emerging issues of concern and network with water professionals around the globe to develop innovative, practical solutions.



The Foundation's Research at the Forefront of Innovation... In Microbiology and Disinfection

Selected Active Projects in 2008:

- Occurrence of Infectious *Cryptosporidium* Oocysts in Raw, Treated, and Disinfected Wastewater (WRF-06-003)
- Enhanced Disinfection of Adenoviruses with UV Irradiation (WRF-06-011)
- Sequential UV and Chlorination for Reclaimed Water Disinfection (WRF-06-15)
- Validation of Microbiological Methods for Use with Reclaimed Waters (WRF-07-01)
- Approaches to Maintain Consistently High Quality Reclaimed Water in Storage and Distribution Systems (WRF-08-04)
- Disinfection Guidelines for Satellite Water Recycling Facilities (WRF-08-07)
- Potential Infectivity Assay for *Giardia lamblia* Cysts (WRF-08-18)



The WateReuse Foundation partners with industry leaders to leverage its intellectual capital. American Water, the largest investor-owned water and wastewater utility company in the U.S., is active in the Foundation through its Research Advisory Committee and on individual projects of mutual interest.

According to Dr. Mark LeChevallier, the Director of Innovation & Environmental Stewardship at American Water, "The WateReuse Foundation shares our enthusiasm for developing new approaches to enhancing reuse applications. Research is at the core of demonstrating the sustainability and value to reclaimed water." LeChevallier added, "The Foundation is important because they enable us [American Water] to participate in an industry-wide research program that leverages tremendously more resources than any one utility could alone."



In Treatment Technologies

Selected Active Projects in 2008:

- Investigation of Membrane Bioreactor Effluent Water Quality and Technology (WRF-06-007)
- Low Cost Treatment Technologies for Satellite Water Reclamation Plants (WRF-06-008)
- Predictive Models to Aid in Design of Membrane Systems for Organic Micropollutants Removal (WRF-06-009)
- Investigating the Feasibility of MBfR to Achieve Low Nitrogen Levels for Water Reuse (WRF-06-013)
- Evaluation of Impact of Nanoparticle Pollutants on Water Reclamation (WRF-07-04)
- Membrane Distillation for Water Reuse using Nanostructured Ceramic Membranes (WRF-07-05)
- Evaluation of Alternatives to Domestic Ion Exchange Water Softeners (WRF-08-06)
- Pilot-Scale Oxidative Technologies for Reducing Fouling Potential in Water Reuse and Drinking Water Treatment Membrane Systems (WRF-08-08)



The WateReuse Foundation relies on leading international scientists to provide creative approaches to answering important research questions. Dr. Jörg Drewes, the Director of the Advanced Water Technology Center (AQWATEC) at the Colorado School of Mines, is one such scientist who is currently an active investigator and advisory committee member on several WateReuse Foundation projects.


As a leader in the field, Dr. Drewes has seen the expansive growth of recycled water and understands the impact the Foundation has made in water reuse research. “Before the WateReuse Foundation, recycled water was just a niche application,” Drewes said. “However, the Foundation’s promotion of this unconventional supply by funding comprehensive research has dramatically impacted the field, allowing an excellence in technology that would not have existed otherwise.”




The Foundation's Research at the Forefront of Innovation... In Desalination and Concentrate Management

Selected Active Projects in 2008:

- Assess Potential Presence of Chemical Contaminants in Water Produced by Desal Systems (WRF-05-011)
- Feasibility Study of Offshore Desalination Plants (WRF-06-010b)
- Considerations for Co-siting of Desalination Facilities with Municipal and Industrial Facilities (WRF-06-010d)
- Development of Selective Recovery Methods for Desalination Concentrate Salts (WRF-06-010e)
- Characterization of US Seawaters and Development of Standardized Protocols for Evaluation of Foulants in Seawater Reverse Osmosis Desalination (WRF-06-014)
- Development of a Knowledge Base on Concentrate and Salt Management Practices – Phase I (WRF-07-02)
- Reclaimed Water Desalination Technologies: A Full-Scale Performance and Cost Comparison Between EDR and MF/RO (WRF-08-17)



Tampa Bay Water is one of Florida's largest wholesalers of water, bringing water to more than 2.4 million Florida residents. Tampa Bay Water lends its expertise to the Foundation through involvement with the Board of Directors, Research Advisory Committee, and various Project Advisory Committees.



According to David Bracciano, the Demand Management Coordinator at Tampa Bay Water, the relationship is mutually beneficial, "The WaterReuse Foundation has been an important organization for us because they create an interaction or linkage between practitioners and researchers. This interaction helps optimize the development and implementation of various water development strategies."



Board of Directors

The Foundation is governed by a 15-person Board of Directors, which oversees the Foundation's research program. The Board is comprised of water professionals from utilities, engineering firms, and industry who have

the responsibility to establish an annual budget, approve the research agenda, establish policies, and provide direction to the staff and committees.

David L. Moore (President)
Southwest Florida Water Management District

Andy Hui
Metropolitan Water District of Southern California

Joe Jacangelo (Vice President)
MWH

Rich Nagel
West Basin Municipal Water District

Tom Minwegan (Secretary/Treasurer)
Las Vegas Valley Water District

Don Polmann
Tampa Bay Water

Ron Young (Immediate Past President)
Elsinore Valley Municipal Water District

Dave Richardson
RMC Water and Environment

Ed Archuleta
El Paso Water Utilities

Phil Rolchigo
Pentair, Inc.

Marjorie Craig
South Florida Water Management District

John Shearer
Shearer Consulting, Inc.

Phil Friess
Sanitation Districts of Los Angeles County

Mike Wehner
Orange County Water District

John Gaston
CH2M HILL



Research Advisory Committee

The Foundation's Research Advisory Committee (RAC) is responsible for proposing the research agenda for the Foundation. The RAC meets semi-annually to identify priority research needs and recommend projects based on the Foundation's research agenda, Board of Directors' guidance, and the research interests of Subscribers and funding partners.

The RAC is comprised of 24 volunteer members selected based upon their research expertise and experience. The RAC's membership is comprised of a broad spectrum of water reuse and desalination interests and includes individuals from academia, water and wastewater utilities, consulting firms, manufacturers, and federal and state government agencies.

Rhodes Trussell, Ph.D. (Chair)

Trussell Technologies, Inc.

Fred Hauchman, Ph.D.

U.S. Environmental Protection Agency

Theresa Slifko, Ph.D. (Vice Chair)

Sanitation Districts of Los Angeles County

Jim Larkin

Scientific Methods, Inc.

Samer Adham, Ph.D.

ConocoPhillips

Mark W. LeChevallier, Ph.D.

American Water

David A. Balgobin

California State Water Resources Control Board

Adam Lovell

Water Services Association of Australia

David Bracciano

Tampa Bay Water

Linda Macpherson

CH2M HILL

Patrick V. Brady, Ph.D.

Sandia National Laboratories

Margie Nellor

Nellor Environmental Associates, Inc.

Richard J. Bull, Ph.D.

MoBull Consulting

Kevin Price

Bureau of Reclamation

Joseph Cotruvo, Ph.D.

Joe Cotruvo and Associates

Bob Raucher, Ph.D.

Stratus Consulting, Inc.

James Crook, Ph.D.

Environmental Engineering Consultant

Alan E. Rimer, Ph.D.

Black & Veatch

Jean Debroux, Ph.D.

Kennedy/Jenks Consultants

Harry Seah

Singapore Public Utilities Board

Philippe Gislette

Suez Environnement

Shane Snyder, Ph.D.

Southern Nevada Water Authority

Brent Haddad, Ph.D.

University of California, Santa Cruz

Paul Westerhoff, Ph.D.

Arizona State University

Subscribers

Foundation Subscribers are a group of forward-looking organizations and individuals who help shape the Foundation's research agenda. They are an international group of water and wastewater utilities, consulting firms, equipment suppliers, and other organizations interested in supporting a cooperative program to meet the research needs of the water reuse and desalination community.

Subscribership is an integral component of the Foundation's funding base and is fundamental to the Foundation's ability to attract top-notch researchers and leverage its intellectual and financial resources.

Advanced Concepts and Technologies International

AECOM

Alan Plummer Associates

Alliance Environmental

American Water

Bahman Sheikh, Water Reuse Consultant

Black & Veatch

Brown and Caldwell

Carollo Engineers

CDM

Central Basin Municipal Water District

Central Contra Costa Sanitary District

CH2M HILL

City of Chandler

City of Phoenix Water Services Department

City of Redwood City

City of Santa Rosa

City of Scottsdale

Craddock Consulting

Data Instincts, Public Outreach Consultants

Delta Diablo Sanitation District

Denver Water

Dublin San Ramon Services District

East Bay Municipal Utility District

ECO:LOGIC Engineering

Edmonton Waste Management Centre of Excellence

El Paso Water Utilities

Elsinore Valley Municipal Water District

Hazen and Sawyer

HDR Engineering

Inland Empire Utilities Agency

Irvine Ranch Water District

Kennedy/Jenks Consultants

Long Beach Water Department

Loudoun Water

Magna Water Company

Malcolm Pirnie

Merritt Smith Consulting

Metropolitan Water District of Southern California

Monterey Regional Water Pollution Control Agency

MWH

Northern California Golf Association

Orange County Sanitation District

Orange County Water District

Pentair

Pima County Wastewater Management

Poseidon Resources Corporation

Psomas

RMC Water and Environment

San Francisco Public Utilities Commission

Sanitation Districts of Los Angeles County

Santa Clara Valley Water District

Sewer Authority Mid-Coastside

Sonoma County Water Agency

South Florida Water Management District

Southern Nevada Water Authority

Southwest Florida Water Management District

St. Johns River Water Management District

Stratus Consulting

Suez Environnement

Tampa Bay Water

Tarrant Regional Water District

The Cadmus Group

Trinity River Authority

Trussell Technologies

University of California, Santa Cruz – Center for Integrated Water Research

Water Replenishment District of Southern California

West Basin Municipal Water District



1199 North Fairfax Street, Suite 410

Alexandria, VA 22314 USA

(703) 548-0880

Foundation@WateReuse.org

www.WateReuse.org

