Nutrient Removal and Recovery
Draft Technical Program
(Updated June 5, 2018)

June 18-21, 2018
Hilton Midtown
Raleigh, North Carolina
Pre-Conference Workshops
(Additional fees apply)

Monday, June 18
8:30 AM – 5:00 PM
Room: Salon ABC

WORKSHOP A
Advances in Nitrogen Removal: New processes, pathways and process control
There have been concerted efforts to overcome inefficiencies of conventional nitrogen removal processes. Which is also aligned with wastewater utilities embracing a new paradigm of recovery of resources from wastewater. To this end, minimization of chemicals, energy and footprint requirements for nitrogen removal has been benefited from the use of efficient biological pathways as well as innovative process control strategies. The main objective this workshop is to address current needs and challenges of mainstream nitrogen removing by showcasing and debating about recent advances.

WORKSHOP B IS NO LONGER AVAILABLE

Monday, June 18
8:30 AM – 5:00 PM
Room: Salon FG

WORKSHOP C
Short Course: Fundamentals of Nutrients Removal and Recovery - Theory, Technologies, Process Control, and Troubleshooting
This workshop is designed as a short course on the fundamentals of design for biological nutrient removal. It is most appropriate for young professionals and operators. The microbiology, design fundamentals, and operating controls to biological nutrient removal will be presented. Class exercises will pertain to operational responses to optimize nutrient removal or to respond to process upsets. Process simulation software will also be presented as a method to train operators or to test new design parameters.
Opening General Session
Tuesday, June 19, 8:30 AM –12:15 PM
Room: Salon FG

8:30 - 8:40am Welcome to the 2018 Conference!
Belinda Sturm, University of Kansas, 2018 Co-Chair
Katya Bilyk, Hazen and Sawyer, 2018 Co-Chair

8:40 - 8:50am Stimulating Resource Recovery from Wastewaters by Healthy Competition Among Utilities – a WEF Benchmarking Exercise
Peter Vranolleghem, Université Laval, WEF Board of Trustees

8:50 - 8:55am Welcome from NC AWWA-WEA
TJ Lynch, City of Raleigh, NC AWWA-WEA

8:55 – 9:25 am WWTP Optimization at Nutrient Removal Plants and Future Policy Direction
Sally Gutiérrez (invited)
Director, Water Permits Division, Office of Wastewater Management

9:25 – 9:50am How Do Small Utilities Fit into the Paradigm?
Jeanette Brown, Manhattan College

9:50 – 10:00am Panel and Q&A

10:00 - 10:45am Networking Break in Exhibit Floor

10:45 – 11:05am Lower Neuse Basin – Watershed Load Limits and how Utilities are Planning for Very Low Nitrogen Limits
TJ Lynch, Assistant Utility Director, City of Raleigh

11:05 – 11:25am Making a Business Case for Nutrient Removal at a Small Utility
Todd Danielsen, Avon Lake Utilities Ohio

11:25 – 11:45am The Value of Long-range Planning and Starting a Research Program
Jeff Prevatt, Pima County

11:45 – 12:05pm The Value of a Research Program and Process Challenges with Meeting Low TN and TP Limits Simultaneously
Christine Debarbadillo, DC Water

12:05 – 12:15pm Panel and Q&A

12:15pm Session Adjourns for Luncheon
Session 01: Optimization
Tuesday, June 19, 1:30 PM – 5:15 PM
Room: Salon ABC

Moderators: Kumar Upendra Kumar, Veolia North America; Jeanette Brown, Manhattan College

1:30 PM  Nutrient Removal by Optimizing Conventional Wastewater Treatment
Grant Weaver, CleanWaterOps; Paul Shriner, EPA; Lori Weiss, ERG; Matthew Reusswig, PG Environmental

1:50 PM  Doing More With Less – Leveraging Existing Assets to Manage Capital and Operating Costs
Phill Yi, Wendell Khunjar, Ronald Taylor, Janice Carroll, Paul Pitt, Hazen & Sawyer; Sarah Lothman, Mike Latham, Michael Rumke, Rick Zaepfel, Loudoun Water

2:10 PM  Full-Scale Testing Postpones Total Nitrogen Reduction Expansion
Don Esping, Brown and Caldwell; David Green, City of Rochester; Mark Allenwood, Brown and Caldwell

2:30 PM  Technical Brief: Limited Operating Data? Monte Carlo Based Process Simulations Allow for Optimization of a Newly Constructed BNR Facility
Colin Fitzgerald, Adrienne Willoughby, CH2M - Jacobs

2:35 PM  Facilitated Panel Discussion

3:00 PM  Networking Break

3:45 PM  The Importance of Carbon Availability for SND: Improved Nitrogen Removal at Low DO Concentration is not Guaranteed
Stephanie Klaus, Virginia Tech; Lindsey Ferguson, Old Dominion University; Cody Campolong, Virginia Tech; Christopher Wilson, HRSD; Bernhard Wett, ARA Consut; Sudhir Murthy, DC Water; Charles Bott, HRSD

4:05 PM  Achieving BPR Without Nitrification – A Low SRT Dilemma
Chris Maher, Tom Thorson, Peter Schauer, Clean Water Services

4:25 PM  Assessing Biodegradation and Exposure Effects of Bisphenol-A with Microbial Communities Involved in Biological Nutrient Removal
Catherine Hoar, Columbia University; Sandeep Sathyamoorthy, Columbia University/Black & Veatch; Kartik Chandran, Columbia University

4:45 PM  Facilitated Panel Discussion

5:15 PM  Session Adjourns for Networking Reception in Exhibit Hall

Poster  Minimizing Mixing Energy in Activated Sludge Selector Basins - A Mixing Energy Pilot Study
Sidharta Arora, Milwaukee Metropolitan Sewerage District; James Fischer, Xylem Water Solutions
Session 02: Sustainability as a Driver for Planning and Decision Making  
Tuesday, June 19, 1:30 PM – 5:15 PM  
Room: Salon DE

**Moderators:** Uma Vempati, ISG

1:30 PM  
**Adopting Sustainability as the Guiding Principle in Prioritizing R&D Projects at a Water Utility**  
Per Nielsen, Troels Bjerre, VCS Denmark

1:50 PM  
**Balancing Future Growth and Nitrogen Discharge Limits in Wastewater Master Planning for the City of Raleigh**  
Susan Auten, Christine Polo, John Brinkley, Black & Veatch; Eileen Navarrete, TJ Lynch, Erika Bailey, City of Raleigh Public Utilities; Steve Tedder, Tedderfarm Consulting

2:10 PM  
**The Role of Location in Sustainable Nitrogen Removal for Onsite Wastewater Treatment Systems**  
Xiaofan Xu, Nancy Diaz-Elsayed, Qiong Zhang, University of South Florida

2:30 PM  
**Facilitated Panel Discussion**

3:00 PM  
**Networking Break**

3:45 PM  
**Regulations Drive Nutrient Recovery and Reuse at Winnipeg’s Largest Treatment Facility: The Winnipeg North End Sewage Plant Design-Build Upgrade Project**  
Terry Goss, Damian Kruk, James Marx, Keith Sears, Simon Baker, AECOM; Michelle Paetkau, City of Winnipeg

4:05 PM  
**Unforeseen Consequences: The Impact of Water Conservation on Wastewater Characteristics and the Knock-on Effect on Biological Nutrient Removal**  
Andrew Shaw, Black & Veatch; Wayne Bagg, Water Corporation; Rajendra Bhattarai, Austin, TX; Allen Deur, NYCDEP; Soeren Eriksen, VCS Denmark Ltd; Jim McQuarrie, MWRD; Per Nielsen, VCS Denmark; Ana Pena-Tijerina, City of Fort Worth

4:25 PM  
**Evaluating Nutrient Removal for Madison’s Utility of the Future**  
Don Esping, Nancy Andrews, Lloyd Winchell, Brown and Caldwell

4:45 PM  
**Technical Brief: Impact of Water Conservation on Nutrient Removal and Utilities in General**  
Mario Benisch, David Clark, HDR; Werner Maier, IAT Stuttgart

5:15 PM  
**Session Adjourns for Networking Reception in Exhibit Hall**
Session 03: Mainstream Innovations in Nitrogen Removal
Tuesday, June 19, 1:30 PM – 5:15 PM
Room: Salon FG

Moderators: Belinda Sturm, University of Kansas; Tim Ware, Arcadis

1:30 PM  Achieving Low TN Effluent by Operating AvN Control Coupled with Partial Denitrification-Anammox Control
Tri Le, Catholic University of America/DC Water; Rahil Fofana, DC Water; Arash Massoudieh, Catholic University of America; Ahmed Al-Omari, Sudhir Murthy, DC Water; Bernhard Wett, ARA Consut; Kartik Chandran, Columbia University; Christine Debarbadillo, DC Water; Charles Bott, HRSD; Haydee De Clippeleir, DC Water

1:50 PM  Testing of Novel Denitratation/Deammonification Process for Mainstream Total Nitrogen Removal
Anthony Niemiec, Hazen and Sawyer; Robert Sharp, Manhattan College/ Hazen and Sawyer; Allen Deur, NYCDep

2:10 PM  Optimizing Carbon Addition to a Polishing Partial Denitrification/Anammox MBBR Using Online Control
Cody Campolong, Stephanie Klaus, Virginia Tech; Lindsey Ferguson, Old Dominion University; Christopher Wilson, HRSD; Bernhard Wett, ARA Consut; Sudhir Murthy, DC Water; Charles Bott, HRSD

2:30 PM  Facilitated Panel Discussion

3:00 PM  Networking Break

3:45 PM  Mainstream ANITA Mox Pilot Testing at the Joint Water Pollution Control Plant
Michael Liu, Eric Krikorian, Thomas Knapp, Nikos Meilias, Sanitation Districts of LA County; Hong Zhao, Mitch Johnson, Veolia Water Technology

4:05 PM  Enhancing the Decoupling of Solids Retention Times In Full-Scale Deammonification Processes Using Screens
Tim Van Winckel, Ghent University/DC Water/University of Kansas; Ahmed Al-Omari, DC Water; Imre Takacs, Dynamita; Bernhard Wett, ARA Consut; Benjamin Bachmann, University of Innsbruck; Belinda Sturm, University of Kansas; Charles Bott, HRSD; Siegfried Vlaeminck, Universiteit Antwerp/Ghent University; Sudhir Murthy, Haydée De Clippeleir, DC Water

Minxi (Joanna) Jiang, Zheqin Li, Kartik Chandran, Columbia University

4:45 PM  Technical Brief: Membrane-Aerated Biofilm Reactor (MABR) Demonstration at Ejby Mølle WRRF
Nerea Uri, VCS Denmark; Tim Constantine, J. Sandino, A. Willoughby, CH2M; Per Nielsen, VCS Denmark
*Please see affiliated poster

4:50 PM  Facilitated Panel Discussion

5:15 PM  Session Adjourns for Networking Reception in Exhibit Hall
Session 04: Phosphorus Removal: Sidestream Fermentation, Modeling, and Operations
Wednesday, June 20, 8:30 AM – 12:15 PM
Room: Salon ABC


8:30 AM The Case for Side-Stream RAS or Mixed Liquor Fermentation to Enhance EBPR
James Barnard; Edmund Kobylinski, Black and Veatch

8:50 AM Side-Stream EBPR Practices and Fundamentals - Rethinking and Reforming the Enhanced Biological Phosphorus Removal Process
Nicholas Tooker, Guangyu Li, Varun Srinivasan, Northeastern University; James L. Barnard, Black & Veatch; Charles Bott, HRSD; Paul Dombrowski, Woodard & Curran; Peter Schauer, Adrienne Menniti, Clean Water Services; Andrew Shaw, Black & Veatch; Beverly Stinson, Gerry Stevens, AECOM; Patrick Dunlap, Black & Veatch; Imre Takács, Dynamita; Heather Phillips, City of Olathe; Howard Analla, City of Henderson; Andy Russell, Town of Cary; Angela Lambrecht, Regional District of Central Okanagan; James McQuarrie, Isaac Avila, Metro Water Reclamation District; Annalisa Onnis-Hayden, Northeastern University; April Z. Gu, Cornell University

9:10 AM Sidestream RAS Fermentation for Stable Bio-P Combined with Short Cut Nitrogen Removal in an A/B Process
Lindsey Ferguson, Old Dominion University/ HRSD; Cody Campolong, Stephanie Klaus, Virginia Tech/HRSD; Christopher Wilson, HRSD; Bernhard Wett, ARA Consultant; Sudhir Murthy, DC Water; Charles Bott, HRSD

9:30 AM Technical Brief: A Model Based Study: Revisiting Conventional BNR Configurations with Advanced Aeration Control
Pusker Regmi, Jose Jimenez, Brown and Caldwell

9:35 AM Facilitated Panel Discussion

10:00 AM Networking Break

10:45 AM Comparison of Microbial Ecology Between Conventional and Side-Stream Full-Scale EBPR Systems
Varun Srinivasan, Nicholas Tooker, Guangyu Li, Northeastern University; James Barnard, Black & Veatch; Charles Bott, HRSD; Paul Dombrowski, Woodard & Curran; Peter Schauer, Clean Water Services; Adrienne Menniti, Clean Water Services; Annalisa Onnis-Hayden; Ameet Pinto, Northeastern University; April Gu, Northeastern University/Cornell University

11:05 AM Turning Lemons into Lemonade: Conversion of a Conventional Activated Sludge System into an Enhanced Biological Phosphorus Removal System for High Strength Waste Management
Kam Law, Greeley and Hansen; Thomas Meyer, Paul Keturi, Greater Peoria Sanitary District

11:25 AM Application of Agent-Based Modeling to Reveal Competition Between PAOs and GAOs in Side-Stream EBPR (S2EBPR) Systems
Guangyu Li, Nicholas Tooker, Dongqi Wang, Varun Srinivasan, Northeastern University; James Barnard, Black & Veatch; Peter Schauer, Clean Water Services; Imre Takács, Dynamita; Annalisa Onnis-Hayden, Northeastern University; April Gu, Cornell University

Annalisa Onnis-Hayden; Nicholas Tooker, Guangyu Li, Dongqi Wang, Varun Srinivasan, Northeastern University; James Barnard, Black & Veatch; Charles Bott, HRSD; Paul Dombrowski, Woodard & Curran; Peter Schauer, Adrienne Menniti, Clean Water Services; Andrew Shaw, Black & Veatch; Beverley Stinson, Gerry Stevens, AECOM; Patrick Dunlap, Black & Veatch; Imre Takács, Dynamita; Heather Phillips, City of Olathe; Angela Lambrecht, Regional District of Central Okanagan; Howard Analla, City of Henderson; Andy Russell, Town of Cary; April Gu, Cornell University

11:50 AM Facilitated Panel Discussion

12:15 PM Session Adjourns for Luncheon in Exhibit Hall
Session 05: Control Systems for Enhanced Nitrogen Removal
Wednesday, June 20, 8:30 AM – 10:00 AM
Room: Salon DE

8:30 AM  Startup, Optimization, and Operational Results from a Biological Nutrient Removal Process with Ammonium Based Airflow Controls
Eric Redmond, Jacobs-CH2M; Matthew Jalbert, Mike Young, Trinity River Authority; Leon Downing, Black and Veatch; Thomas Johnson, Jacobs-CH2M

8:50 AM  Understanding Simultaneous Nutrient Removal through Low Dissolved Oxygen Operation
Jose Jimenez, Pusker Regmi, Mark Miller Brown and Caldwell

9:10 AM  Oxygen Uptake Rate as Control Parameter for Carbon Management in High-Rate Activated Sludge
Tim Van Winckel, Ghent University/DC Water/University of Kansas; Olajide Olagunju, DC Water/Howard University; Belinda Sturm, University of Kansas; Siegfried Vlaeminck, Universiteit Antwerp/Ghent University; Kimberly Jones, Howard University; Charles Bott, HRSD; Bernhard Wett, ARA Conus; Ahmed Al-Omari, Sudhir Murthy, Haydée De Clippeleir, DC Water

9:30 AM  Technical Brief: Implementation of Aeration Control Strategies and Nitrate-Based Internal Mixed Liquor Recycle Control Employing In-Situ Sensors and Feedback PID Controllers in an Integrated Fixed-Film Activated Sludge Wastewater Treatment Facility
Amanda Ford, Hazen; Shawn Hawley, Robert Rutherford, HRSD; Kshitiz Uprety; Charles Bott, HRSD

9:35 AM  Facilitated Panel Discussion

10:00 AM  Session Adjourns for Networking Break in Exhibit Hall
Session 06: Alternate Electron Donors and Their Applications
Wednesday, June 20, 8:30 AM – 10:00 AM
Room: Salon FG

Moderators: Sarina Ergas, Laura Rodriguez-Gonzalez, University of South Florida

8:30 AM  Making Methanol on the Backs of Nitrifying Bacteria
          Sandeep Sathyamoorthy, Black & Veatch; Yu-Chen Su, Kartik Chandran, Columbia University

8:50 AM  Sulfur-Based Autotrophic Denitrification for Nitrate Removal in Marine Recirculating Aquaculture Systems
          Qiaochong He, Zhang Cheng, Victoria Burnett, Sarina Ergas, University of South Florida

9:10 AM  Woodchip Bioreactors for Nitrate Removal in Wastewater: Recent Findings, Applications, and Economics
          Bryan Maxwell, François Birgand, NCSU

9:30 AM  Technical Brief: Characterizing Nitrogen Transformation Processes in Nitrogen Removing Biofilters For Onsite Wastewater Treatment
          Stuart Waugh, NYS Center for Clean Water Technology; Xinwei Mao, Harold Walker, Christopher Gobler,
          NYS Center for Clean Water Technology/Stony Brook University
          * See affiliated poster

9:35 AM  Facilitated Panel Discussion

10:00 AM Session Adjourns for Networking Break in Exhibit Hall
Achieving Energy Neutrality in the Face of Stringent Effluent Nutrient Requirements: Setting a Vision and Empowering Operations Staff
Tim Constantine, Julian Sandino, Jacobs; Per Nielsen, Mads Leth, VCS Denmark; Adrienne Willoughby, Jacobs

Process Model Simulation Provides Effective Hands-On Approach to BNR Operator Training
Paul Dombrowski, Woodard & Curran

Using Collaborative Efforts to Maximize Nutrient Removal Permit Compliance During Facility Upgrade Construction
Thor Young, Ladan Holakoo; Greg Jablonski, GHD; Jerome Napora; Bernard Williams, Anne Arundel County Department of Public Works

Warren Barlow, Fort Collins Utilities; Tanja Rauch-Williams, Carollo Engineers

Facilitated Panel Discussion

Session Adjourns for Luncheon in Exhibit Hall
### Session 08: Reuse and Recovery

**Wednesday, June 20, 10:45 AM – 12:15 PM**

**Room:** Salon FG

**Moderators:** Robert Sharp, Manhattan College/ Hazen and Sawyer; Christine Radke, Water Research Foundation

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<tr>
<th>Time</th>
<th>Session Title</th>
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<tr>
<td>10:45 AM</td>
<td><strong>Nutrient Recycles and Other Side Effects of Co-Digestion of Organic Waste</strong>&lt;br&gt;Alan Appleton, Tanja Rauch-Williams, Carollo Engineers; Mark Greene, O'Brien &amp; Gere Engineers Inc; Stefan Grimberg, Clarkson University</td>
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<td>11:05 AM</td>
<td><strong>Advancing Nutrient Recovery through Urine-Derived Fertilizers (UDF) in the United States</strong>&lt;br&gt;Nancy Love, University of Michigan; Abraham Noe-Hays, Rich Earth Institute; Krista Wigginton, University of Michigan; Linda Macpherson, New Water Resources; Diana Aga, University of Buffalo; Charles Bott, HRSD; Glen Daigger, University of Michigan; Arthur Davis, Rich Earth Institute; Joe Eisenberg, University of Michigan; Alexandria Gagnon, HRSD; Zerihun Getaneh, Addis Ababa University; Heather Goetsch, University of Michigan; Phoebe Gooding, Rich Earth Institute; Rebecca Hardin, Stephen Hilton, University of Michigan; Jose Jimenez, Brown and Caldwell; Greg Keoleian, Nicholas Lowe, Waylan Mui, University of Michigan; Rachel Mullen, University of Buffalo; Kim Nace, Rich Earth Institute; Audrey Pallmeyer, University of Michigan; Neil Patel, Rich Earth Institute; Dylan Raye-Leonard, Enrique Rodriguez, University of Michigan; Tatiana Schreiber, Rich Earth Institute, Alex Sinanaj, William Tarpeh, University of Michigan; Rebecca Wombacher, University of Buffalo; Bowen Zhou, University of Michigan</td>
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<td>11:25 AM</td>
<td><strong>Wastewater Treatment Selection and Operation to Benefit Downstream Resource Recovery: An Exploration of Three Case Studies</strong>&lt;br&gt;Stephanie Ishii, Wendell Khunjar, Phill Yi, Enrique Vadiveloo, Buddy Boysen, Chris Owen, Troy Walker, Hazen and Sawyer</td>
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<td>11:45 AM</td>
<td><strong>Facilitated Panel Discussion</strong></td>
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<td>12:15 PM</td>
<td><strong>Session Adjourns for Luncheon in Exhibit Hall</strong></td>
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Session 09: Innovations in Phosphorus Control and Recovery  
Wednesday, June 20, 1:30 PM – 5:15 PM  
Room: Salon ABC

Moderators: Thor Yong, GHD; Helene Kassouf, University of South Florida

1:30 PM  A Balancing Act: Achieving Both Low Level Phosphorus and Metals Limits at Upper Blackstone  
Maureen Neville, Alexandra Bowen, CDM Smith; Karla Sangrey, Upper Blackstone Water; Erik Grotton, Blueleaf

1:50 PM  Nutrient Recovery Performance and Optimization of Biological Phosphorus Removal at the F. Wayne Hill Water Resources Center  
Gaya Ram Mohan, JC Lan, Gwinnett County Department of Water Resources; Ron Latimer, Michael Lynch, Paul Pitt, Hazen and Sawyer

2:10 PM  Nutrient Whack-a-Mole - Sidestream Nutrient Control and Assessment of the Fate of Fe, S, and P  
Colin Fitzgerald, CH2M-Jacobs; Leon Downing, Black and Veatch; Thomas Johnson, Eric Redmond, CH2M-Jacobs; Mike Young, Mark Reeves, Matthew Jalbert, Trinity River Authority

2:30 PM  Technical Brief: There is Light at the End of the Pipe! Causes and Control of Struvite and Vivianite Scaling at WRRFs  
Samuel Jeyanayagam, Jacobs; Douglas Miller, Douglas L Miller Consulting LLC

2:35 PM  Facilitated Panel Discussion

3:00 PM  Networking Break

3:45 PM  Holistic Approach to Phosphorus Sequestration and Recovery at Fox River WRD  
Stephen Arant, Bikram Sabherwal, James Barnard, Black & Veatch; Beth Vogt, Jack Russell, James Kerrigan, Fox River WRD

4:05 PM  Comparison of Phosphorus Recovery Through Pre-Anaerobic-Digestion Brushite Precipitation and Post-Anaerobic-Digestion Struvite Crystallization  
Zhongtian Li, Menachem Tabanpour, Gerhard Forstner, Centrisys/CNP

4:25 PM  Quantification of Struvite Content of Biosolids Is Necessary to Avoid Bias in The Assessment of Digester and Dewaterability Performance  
Wendell Khunjar, Hazen and Sawyer; Isaac Avila; Liam Cavanaugh, MWRD; Alexandria Gagnon; Ron Latimer, Hazen and Sawyer; Christopher Wilson, HRSD; Blair Wisdom

4:45 PM  Technical Brief: Lost Crystals– Impacts of Struvite Recovery Performance on Plant Capacity for Achieving Low-P Effluent  
Adrian Romero, Thomas Johnson, Leon Downing, CH2M; Adrienne Menniti, Clean Water Services; William Leaf, CH2M; Matt Seib, Madison Metropolitan Sewerage District; Ron Gearhart, City of Boise; Colin Fitzgerald, Greater Minneapolis-St. Paul Area

4:50 PM  Facilitated Panel Discussion

5:15 PM  Session Adjourns
Many municipalities on the east coast have to meet some of the strictest nutrient standards in the country, and have been doing so for over 15 years. This session will include representatives from six municipalities in the region representing nine water reclamation facilities and they will share their stories about nutrient removal. The speakers will make 15-minute presentations and the remainder of the time will be held for a 50-minute Q&A panel with the audience. The majority of the speakers are the Wastewater Operations Director for their utility.
Session 11: Evolving World of Biofilm Systems for Nutrient Removal
Wednesday, June 20, 1:30 PM – 5:15 PM
Room: Salon FG

Moderators: Pusker Regmi, Brown and Caldwell; Christine Debarbaadillo, DC Water

1:30 PM  A Pilot Scale Evaluation of Membrane Aerated Biofilm Reactor (MABR) Technology for Biological Nutrient Removal Process Intensification
Sandeep Sathyamoorthy, Samik Bagchi, Black & Veatch; Daniel Coutts, Suez Treatment Solutions; Kelly Gordon, Black & Veatch; Dwight Houweling, Suez Treatment Solutions

1:50 PM  Partial Nitritation / Anammox Membrane Aerated Biofilm Reactor for Nitrogen Removal from Aerobic Secondary Effluent
Brett Wagner, Glen Daigger, Nancy Love, University of Michigan

2:10 PM  Achieving Low Nutrient Effluent Quality at Lagoon Facilities using MBBR Technology: Low Temperature Performance and Bacterial Community Analysis
Robert Delatolla, Patrick D’Aoust, G. LeBlond, Raheleh Arabgol, Warsama Ahmed, Chris Kinsley, University of Ottawa; Simon Vincent, Bradley Young, University of Ottawa

2:30 PM  Facilitated Panel Discussion

3:00 PM  Networking Break

3:45 PM  New Generation of MBBR for Biological Treatment of Carbon, Nitrogen and Phosphorus
Hugues Humbert, Romain Lemaire, Tristan Germain, Veolia; Sofia Lind, AnoxKaldnes; Erin Gallimore, Kruger - Veolia Water & Technologies

4:05 PM  Retrofitting a Roughing Filter/Activated Sludge Plant for Continuous Ammonia Removal (<1 mg/L)
Matthew Kallerud, Carollo Engineers; Ken Cook, West County Wastewater District
*Please see affiliated poster

4:25 PM  Dynamic Aerobic Granular Sludge Modeling
Bruce Johnson, Heather Stewart, Jacobs

4:45 PM  Facilitated Panel Discussion

5:15 PM  Session Adjourns
Session 12: Strategies for Meeting Ultra-Low Nutrient Effluent Quality Standards
Thursday, June 21, 8:30 AM – 11:45 AM
Room: Salon ABC

Moderators: Francis de los Reyes III, North Carolina State University; Tim Ware, Arcadis

8:30 AM Applying Molecular Tools for Increasing Biological Nutrient Removal: A Discussion on Best Practices on Using DNA of Operations
Leon Downing, Black and Veatch; George Wells, Northwestern University; Autumn Fisher; Matthew Jalbert, Freese & Nichols; Mike Young, Trinity River Authority; Colin Fitzgerald, Eric Redmond, Jacobs - CH2M; John Tillotson; Ralph Wagner, Microbe Detectives LLC

8:50 AM Characterizing BPR Activity to Understand Overall Process Health
Peter Schauer, Adrienne Menniti, Gavin Bushee, Clean Water Services

9:10 AM Quantification of Influent Non-Readily Biodegradable Dissolved Organic Nitrogen to Explore Nutrient Management via Pretreatment
Mary Sadler, Ronald Taylor, Stephanie Ishii, Hazen and Sawyer

Ruchi Joshi, North Dakota State University; Murthy Kasi, HDR; Tanush Wadhawan, Dynamita; Eakalak Khan, North Dakota State University
*Please see affiliated poster

9:35 AM Facilitated Panel Discussion

10:00 AM Networking Break

10:15 AM Lessons Learned After A Decade of Collaborative Nutrient Removal Research: What's in The Future?
JB Neethling, David Clark, HDR Inc; David Stensel, University of Washington; Julian Sandino, Jacobs; Roy Tsuchihashi, AECOM; Amit Pramanik, Christine Radke, Water Research Foundation

10:35 AM Leveraging Research & Real World Experience to Clarify Phosphorus LOT with Ballasted Sedimentation
Patrick Dunlap, James Fitzpatrick, Mark Steichen, Michael Tache, William Walkup, Black & Veatch

10:55 AM Save Coagulant Dosages with Sludge Recirculation in Tertiary Chemical Phosphorus Removal Process
Bryan Fincher, Hong Zhao, Harrison Fowler, Richard DiMassimo, Veolia Water Technologies

11:15 AM Facilitated Panel Discussion

11:45 AM Conference Adjourns
Session 13: Watershed
Thursday, June 21, 8:30 AM – 10:00 AM
Room: Salon DE

Moderators: Sandeep Sathyamoorthy, Black & Veatch; Victor D’Amato, Tetra Tech Engineering, P.C.

8:30 AM  Understanding Water Quality and Nutrients in a Large Watershed
          Mike Osborne, Drew Ackerman, Robert Osborne, Black and Veatch; Gina Kimble, Catawba-Wateree Water Management Group, Charlotte Water

8:50 AM  Neuse River Compliance Association: A Success Story but What Does the Future Hold?
          Haywood Phthisic, Neuse River Compliance Association; Dan McLawhorn, City of Raleigh/Neuse River Compliance Association; Erika Bailey, City of Raleigh

9:10 AM  The San Francisco Bay Area Nutrient Watershed Permit: Challenges Associated with Evaluating 37 Different WRRFs
          Michael Falk, JB Neethling, HDR Inc; Linda Sawyer, Brown and Caldwell; Holly Kennedy, HDR Inc

9:30 AM  Technical Brief: Exciting New Nutrient Discharge Permitting Frameworks Protect Water Quality and Provide Compliance Flexibilities
          David Clark, Thomas Dupuis, HDR Inc.; Mike Falk; Michael Kasch, JB Neethling, HDR Inc.

9:35 AM  Facilitated Panel Discussion

10:00 AM Session Adjourns for Networking Break
Session 14: Latest Concepts in Sidestream Nitrogen Removal and Recovery
Thursday, June 21, 8:30 AM – 10:00 AM
Room: Salon FG

Moderators: Katya Bilyk, Hazen and Sawyer; Phil Ackman, Sanitation Districts of Los Angeles County

8:30 AM Is PAD Worth It? Costs, Benefits, and Lessons Learned from the First PAD Retrofit in the US
Cole Sigmon, Donald Colgate, JR Finley, Brad Janoka, Conor Tyler, Emanuel Watson, Chris Douville, City of Boulder

8:50 AM Post Aerobic Digestion: Operational Experience from the Northern Treatment Plant
Alex Haeger, Liam Cavanaugh, Orren West, Kimberly Cowan, Metro Wastewater Reclamation District; Leon Downing, Black and Veatch

9:10 AM Tale of Two Cities: Operation of Sidestream ANITA™ Mox
Margaret Hollowed, Glenn Thesing, Samuel Liang, Veolia Water Technologies

9:30 AM Technical Brief: Impact of Ozonation and Electrocoagulation on Refractory Nutrients Generated from Thermal Hydrolysis Processes
Gregory Pace, Eric Dole, Hazen and Sawyer; Stephanie Ishii, University of Florida; Ruchi Joshi, Eakalak Khan, North Dakota State University; Wendell Khunjar, Marc Santos, Hazen and Sawyer; Robert Sharp, Manhattan College; Phill Yi, Hazen and Sawyer

9:35 AM Facilitated Panel Discussion

10:00 AM Session Adjourns for Networking Break

Poster Recovery of Ammonium from Sludge Dewatering Processes for the Production of Ammonium Sulfate Solution
Stephan Wasielewski, Eduard Rott, Ralf Minke, University of Stuttgart; Heidrun Steinmetz, University of Kaiserslautern
Session 15: US EPA National Priorities Nutrient Management Centers: Practical Outcomes from Five Years of Water Research Nationwide
Thursday, June 21, 10:15 AM – 11:45 AM
Room: Salon DE

Moderators: Amit Pramanik, Water RF; Ben Packard, USEPA

The U.S. Environmental Protection Agency (EPA) as part of its Science to Achieve Results (STAR) program established four Centers to conduct water research and demonstration projects that are innovative and sustainable using a systems approach for nutrient management in the Nation’s waters. These Centers were required to take a system view of nutrient management that considered societal and technological factors in the breadth of possibilities that may influence water quality. An overview of each Center’s key accomplishments will be presented along with more detailed presentations of Center products that attendees can integrate into their nutrient management strategies.

10.15 AM Overview of EPA Centers for Water Research on National Priorities Related to a Systems View of Nutrient Management
Ben Packard, USEPA

10:20 AM Smart Nonwater Urinals for Improved Water Conservation and Enhanced Nutrient Recovery
Treavor Boyer, Daniella Saetta, Hannah Ray, Arizona State University

10:40 AM Management of Diffuse Nutrients from Stormwater and On-Site Wastewater: New Science and Community Engagement Informing Field Demonstrations of New Technologies
Sarina Ergas, Maya Trotz, Qiong Zhang, James Mihelcic, Kebreab Ghebremichael, Laura Rodriguez-Gonzalez, Karl Payne, Michelle Henderson, Amulya Miriyala, Justine Stocks, Emma Lopez-Ponnada, Laura Rodriguez-Gonzalez, Karl Payne, Michelle Henderson, Amulya Miriyala, Justine Stocks, Emma Lopez-Ponnada, University of South Florida, Damann Anderson, Hazen and Sawyer, Thomas Lynn, Texas A&M University-Kingsville

11:05 AM Assessing Efficacy of Nutrient Removal and Recovery Technologies at Wastewater Treatment Facilities
Brock Hodgson, Sybil Sharvelle, Colorado State University

11:25 AM Questions and Discussion
Ben Packard, USEPA; Amit Pramanik, The Water Research Foundation
Session 16: Carbon Redirection
Thursday, June 21, 10:15 AM – 11:45 AM
Room: Salon FG

Moderators: Mehran Andalib, Stantec; Christine Radke, Water Research Foundation

10:15 AM  Evaluating Primary Sludge Fermentation at the Central Valley Water Reclamation Facility
            Adam Klein, Brown and Caldwell; Sharon Burton, Phillip Heck, Central Valley Water Reclamation Facility; Bryan Mansell, Henryk Melcer, Brown and Caldwell

10:35 AM  High-Rate Aerobic and Anaerobic Technologies for Carbon Management and Achieving Energy Neutrality
            Mark Miller, Jose Jimenez, Brown and Caldwell; Damien Batstone, University of Queensland

10:55 AM  Westside Process Replaces TF/AS at Central Valley WRF To Meet New Utah State Phosphorus Regulation
            Henryk Melcer, Brown and Caldwell; Sharon Burton, Central Valley Water Reclamation Facility; Bryan Mansell, Adam Klein, Brown and Caldwell; Phillip Heck, Central Valley Water Reclamation Facility; Trevor Lindley, Brown and Caldwell

11:05 AM  Technical Brief: Road Map to Achieving Effluent Total Phosphorus Limit of 0.043 mg/L
            Timur Deniz, John Bratby, CDM Smith

11:10 AM  Facilitated Panel Discussion

11:45 AM  Conference Adjourns