2020 Groundwater Week Educational Programming

Virtual conference sessions

Due to the COVID-19 pandemic, NGWA's Groundwater Week 2020 conference will be held completely virtually. The most up to date information regarding Groundater Week can be found at www.GroundwaterWeek.com.

The information contained herein is accurate as of 10/19/2020.

Registration rates

All rates are per person (in USD) and include workshops, exhibit hall, general sessions, and networking events.

On/before November 6, 2020

- NGWA member or member's spouse — $75
- Nonmember — $200
- Student — full-time (ID required) — $75
- First person from nonexhibiting manufacturing company — $1,200
- Additional person from nonexhibiting manufacturing company — $400

Starting November 7, 2020

- NGWA member or member's spouse — $175
- Nonmember — $300
- Student — full-time (ID required) — $100
- First person from nonexhibiting manufacturing company — $1,200
- Additional person from nonexhibiting manufacturing company — $400

Attendance will be tracked via sign in and out times when the registered individual logs in and out of each session. NGWA will issue documentation in the form of a certificate or letter following the event.

The following pages list the educational sessions scheduled for Groundwater Week 2020. All events are virtual and can be accessed after their live air date up to November 29, 2021.

Workshop sessions begin on page two. Groundwater Summit sessions begin on page forty-eight.

Workshop sessions total 45.5 hours of educational time, Summit sessions total 23.67 hours of educational time for 69.17 total possible hours.

Attending live sessions of workshops only could total 14.5 hours of education time (excluding concurrent sessions). Live sessions of Summit events could total 10.5 hours of education time, excluding concurrent sessions. Attendees will have access to both workshops and summit sessions, so individuals may be able to accrue 19.25 total hours of education time across the various offerings without attending concurrent sessions.

Workshops

Date: Tuesday, December 8, 2020
Time: 9:00:00 AM
Education time: 1 hour

Family Business Succession in the Water Well Industry

According to the Family Business Institute only 30% of family businesses successfully make the transition from the first generation to the second generation; roughly 12% make it to the third generation; 4% make it to the fourth generation. The sad part about this low success rate is that in most cases the failure is voluntary. The conscious (or subconscious) choice to not develop your succession plans and share them with your family is the most significant problem. Most family businesses have a good chance of succeeding into the future if the principals would take time to develop sound transition plans.

This presentation provides a brief overview of some of the most important considerations in family business succession. This information will help start the process or, if you are one of the lucky ones that has already done some succession planning, reexamine and update your plans as necessary.

Jesse Richardson

Jesse J. Richardson, Jr. is the Lead Land Use Attorney at the Land Use and Sustainable Development Law Clinic and Associate Professor of Law at the West Virginia University College of Law. Before coming to WVU, Jesse was an Associate Professor in Urban Affairs and Planning at Virginia Tech, teaching land use law, environmental law, urban growth management and real estate. His research and experience focuses on land use law and water law. Prior to his academic endeavors, Jesse was in private practice in his home town of Winchester, Virginia, first with a large law firm, then as a solo practitioner. He presently serves on the Board of Directors of the American Agricultural Law Association, the Universities Council on Water Resources and the National Cave and Karst Research Institute. He previously served on the Virginia Farmland Protection Task Force and the Virginia Water Policy Technical Advisory Committee. Jesse was honored with the 1999 Professional Scholarship Award from the American Agricultural Law Association, the 2004 William E. Wine Award for a history of teaching Excellence from Virginia Tech (the highest teaching award granted by the university), and the 2009 University Certificate of Excellence in Outreach. He has worked with communities in West Virginia and Virginia on land use planning issues, including issues related to karst and water resources. He holds a B.S. and M.S. in Agricultural and Applied Economics from Virginia Tech and a J.D. from the University of Virginia School of Law.

Workshops

Date: Tuesday, December 8, 2020
Time: 9:00:00 AM
Education time: 1 hour

Groundwater Remediation Technologies

As more and more analytical evidence accumulates, it is apparent that groundwater is not immune to the increasing contamination affecting our surface water supplies. This groundwater contamination includes dissolved ionic and organic chemicals such as PFAS, as well as microorganisms and insoluble particles of plastics and even textile fibers.

This workshop addresses the sources of these diverse contaminants and describes remediation technologies appropriate for effective and economical removal. Application requirements and technical design details are covered.

Several case histories are described.

Peter Cartwright

Peter has been in the water/wastewater treatment industry for 45 years and has had his own consulting engineering firm since 1980. He has a BChE from the University of MN and is a Registered Professional Engineer in that state. He was the 2016 Distinguished McEllhiney Lecturer for the National Ground Water Research and Educational Foundation, and a contributor to the preparation of the NGWA document, "Groundwater and PFAS: State of Knowledge and Practice."

APPROVED

Workshops

Date: Tuesday, December 8, 2020
Time: 9:00:00 AM
Education time: 1 hour

Select the Right Pump for Your Job: Vertical Lineshaft and Submersible Turbines

When looking for a pumping system to move high volumes of water in continuous- or long-run applications, where should you start? You will learn the key advantages of these systems to increase performance and efficiency in your installations. During this workshop, you will discover how to identify the best solution for your customers' needs and expectations while leveraging advances in motor efficiency and drive technology.

Shane Wright

Shane Wright is Franklin Electric's Commercial Business Manager. He began his career in the pump industry as an Outside Sales Representative for an engineering firm, eventually working his way to Director of Sales and Marketing. Shane's immense pump expertise and experience are invaluable to Franklin Electric and our customers.

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Workshops

Date: Tuesday, December 8, 2020
Time: 10:15:00 AM
Education time: 1 hour

Marketing Your Business for the Future

The challenge of attracting young people to pursue a career in the groundwater industry and the increased number of millennials owning property will force contractors to turn to the Internet to market their companies on different, yet distinct levels. Having good systems in place for keeping in touch with past clients, in addition to attracting new customers will eventually reduce the need for extensive up-front marketing. In this workshop, we will explore how contractors can be more proactive in their market approach to exert greater control of their individual and their company's future without solely relying on referrals and good luck.

Charles Kile

Charles Kile is a Web Developer with Adapt Digital Solutions. My name is Charles but you can call me Chuck. I'm a website designer and digital marketer and I want to see you win. The internet is a competitive place and it's great at exposing our weaknesses. I believe we should take our online reputation as serious as we take our offline reputation. You provide your customers with an amazing experience and that should be reflected with what people learn about you online.

Workshops

Date: Tuesday, December 8, 2020
Time: 10:15:00 AM
Education time: 1 hour

Hey Hey PFAS Go Away! – The Forever Chemical That's Finite

We hear about it, it's all around us, but what to make of it? You, as the installer, can make a difference in the fight to make PFAS go away. This workshop will provide an overview of PFAS, the problems PFAS presents, pertinent guidelines and regulations, theoretical treatment technologies, and current PFAS treatment. This offering will also address the business opportunities of profit, professional duties, selling practices, and installation, and remediation for the installer.

Stephen Hamilton

Stephen Hamilton is a husband and father, and currently serves as the Director of Sales for the water treatment division of Franklin Electric. He has a Bachelor's degree in pre-medicine from Olivet Nazarene University with a background in biology and a minor in chemistry. He has almost a decade of experience in the water treatment field. Stephen previously served as a factory worker, technical advisor, system design and commercial water treatment specialist for Franklin Electric Water Treatment. In addition to his current role, he also advises in research and development of new products.

APPROVED

Workshops

Date: Tuesday, December 8, 2020
Time: 10:15:00 AM
Education time: 1 hour

Basic Curves and Residential Sizing Examples

The pump curve is one of the most valuable tools for industry professionals, but interpreting it can take some time to master. You will learn the main components of the pump curve and what they mean. Practical exercises to size pumps for residential water supply and irrigation applications are an integral part of the workshop.

Scott O'Brien

Scott O'Brien is currently the Senior Area Sales Manager at Pentair Flow Technologies. His sales include water well subs, jets, large centrifugal, sub and Lineshaft turbines, VFD's, and all of the waste water products through 150hp non-clog waste water pumps. Scott's sales position primarily focuses on water systems, Berkeley Ag, and variable frequency drives. Scott has worked in the water well service industry since 1982. In 1989, he took on a sales role at Pumpco Supply in Wichita, Kansas. By 1991, he was the branch manager, salesman, and delivery person at the Springfield, MO location. In 1998, Scott started a career at Aermotor Pumps, which was later purchased by Pentair.

Workshops

Date: Tuesday, December 8, 2020
Time: 12:30:00 PM
Education time: 1 hour

Proper Pump Selection Minimizes Operation and Maintenance Costs

Efficient operation of an ASR well requires an understanding of proper pump selection in order to maximize hydraulic efficiency. Vertical turbine pump types and installation differences will be discussed. Horsepower calculations will also be covered and the cost factor of an inefficient pump selection. Also pump and piping materials need to be considered to maximize the useful life of the pump system.

Variable speed VFD pump controls and their impact on cost of operation will also be discussed.

Equipment to control the injection cycle also needs to be part of the pump installation. Examples of this equipment will be provided.

David Kill

David L. Kill, PE, has a B.S. in Agricultural Engineering from the University of Minnesota. He has worked at the Minnesota Department of Transportation, Johnson Screens, and Fluid Systems Division UOP. Kill founded Recovery Equipment Supply in 1988. He joined Goulds Pumps ITT Industries in 1996. Throughout his career, he has been a lecturer at programs on groundwater, water well design, and pump selection and application. Kill is a member of the Minnesota Water Well Association, the Minnesota Ground Water Association, and the National Ground Water Association. He is a Registered Professional Engineer in Civil Engineering in the state of Minnesota.

Workshops

Date: Tuesday, December 8, 2020
Time: 12:30:00 PM
Education time: 1 hour

Pressure Hazards in the Groundwater Industry

Few who work in the water well construction industry truly understand pressure hazards unless they have seen or been the victim in an accident involving them. You will learn how to properly inspect fluid and air hoses, and hydraulic hoses as well as compressors in accordance with the regulations governing them. The impact of high pressure systems on cast vs. forged fittings will be addressed in addition to the hazards of hydraulic oil injection.

John Fowler

John Fowler is a father of three, a Safety Manager for National Exploration Wells and Pumps, a Certified Safety Professional (CSP) and a Certified Mine Safety Professional (CMSP). John graduated from Dartmouth College in 1999 with a B.A. in History and began his drilling career in 2001 in the Prudhoe Bay, Alaska oilfield on a deep exploration oil rig. He has worked in mines as a water well driller and on and scientific drilling projects in locations ranging from the U.S. South Pole Station in Antarctica to the ice pack at the geographic North Pole to a project in Greenland.

APPROVED

Workshops

Date: Tuesday, December 8, 2020
Time: 12:30:00 PM
Education time: 1 hour

Realistic Budgeting to Reinvest in Your Business

Much too often business owners focus primarily on meeting monthly expenses and disregard the need for a consistent reinvestment plan for their businesses. Every business owner should understand current equipment valuation in relation to its business life and projected replacement time frames and costs. You will learn the factors you should be considering in your financial planning as well as how to implement a reinvestment strategy for your business operation.

Jeffrey Williams

Jeffrey W. Williams, MGWC, CVCLD, vice president of Spafford and Sons Water Wells, has been employed in the groundwater industry for over 32 years. He has been an officer of the Vermont Ground Water Association for 27 years, serving in all capacities; he is currently serving as treasurer and educational director. Williams has served on the NGWA Safety, Affiliate States, and Rural Water subcommittees. He is currently serving as chairperson for the Government Affairs Committee, a member of the Geothermal Subcommittee, and completing his first three-year term as a Contractor Division and NGWA Board Director.

Workshops

Date: Tuesday, December 8, 2020
Time: 1:45:00 PM
Education time: 1 hour

Smarter and Faster – Tools to Manage your Day-to-Day Operations

Tools and apps can help your business scale capacity and reduce costs. Manage scheduling, book online, send service reminders, track service trucks, take payments, elicit feedback from customers, and even integrate QuickBooks all on either a desktop or mobile device. This seminar will use Jobber, a service scheduling software, as one example to show what's available to the professional contactor for managing their business.

Matt Hendrickson

Matt Hendrickson is Franklin Electric's Director of Digital Customer Experience. He is a graduate of the DeVry Institute of Technology and joined Franklin in 2014. Matt's background includes over 20 years of experience in the commercial truck manufacturing and groundwater distribution industries, with a track record of customer-focused initiatives.

McLean Karr

McLean Karr is Franklin Electric's Global Manager of Business Strategy and Development. He is a graduate of the United States Air Force Academy. He joined the Franklin Electric team in 2018. He has a strong background in management consulting, logistics, and data analysis focused on business growth and sustainability.

Workshops

Date: Tuesday, December 8, 2020
Time: 1:45:00 PM
Education time: 1 hour

Friction Loss Defined and Basic Friction Loss Calculations

Friction loss is a very important part when designing the complete pump system. Failing to understand friction loss could result in under-sizing the pump. This course focuses on the fundamentals of friction loss for the residential water system. During this presentation, friction loss will be defined and example calculations for a residential application will be reviewed, allowing attendees to learn the necessary steps to account for friction loss when designing a complete water system. This presentation is ideal for those seeking to learn or get a helpful review of friction loss concepts and practices.

Scott Tystad

Scott Tystad is the Education Leader for Pentair's Residential and Commercial business units. Scott has over 700 formal hours of training experience across multiple disciplines. As a civilian contractor supporting the United States Army National Guard, Scott earned the unique distinction of "Mission Command and Training Support Program (MCTSP) Certified Trainer." During his five years with Pentair, Scott has enhanced Pentair's factory training efforts, developed digital content, and implemented an online learning management system (LMS). Scott holds an M.A in Business Security from Webster University and a B.S in Horticulture from Kansas State University.

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Workshops

Date: Tuesday, December 8, 2020
Time: 1:45:00 PM
Education time: 1.25 hour

How COVID-19 Affected Our Business Operations: Lessons Learned

No industry and no individual's job have escaped the impact of COVID-19. Concern for the health and safety of employees and customers has necessitated each company adapt, re-engineer, and train to a new and evolving standard over and above government mandates. You will learn from industry peers how each met these challenges in their own operations (office, shipping and receiving, service calls, etc.) along with what worked well and what didn't in these past months.

Marie Maher

Marie Maher, PG Regional Exploration Manager, Chattanooga Growing up, I was always playing in the dirt. My family is very active in outdoor activities and that appreciation for the environment is what led me to a career in the earth sciences. I am grateful for my parents' guidance, which led me into a career more fulfilling than I could have imagined. I knew in childhood I wanted to be a scientist. I'm inspired by our team getting involved in projects other firms aren't confident enough to touch. Working at a firm that embraces the challenging projects and supports its scientists and engineers is priceless. At times, we've been asked to install a type of instrumentation we have not installed before. Figuring out the process with the geologists, exploration team members, project managers, and other team members, fires me up. How I innovate. We're leading the industry in collaborative geotechnical project management using GeoReport and leveraging our national database of geotechnical information by sharing it with clients through our new Report of Expected Geotechnical Conditions – it is an industry first. Since we are in the captain's chair, we have a responsibility to guide the industry in the right direction – a direction that is innovative.

John Fowler

John Fowler is a father of three, a Safety Manager for National Exploration Wells and Pumps, a Certified Safety Professional (CSP) and a Certified Mine Safety Professional (CMSP). John graduated from Dartmouth College in 1999 with a B.A. in History and began his drilling career in 2001 in the Prudhoe Bay, Alaska oilfield on a deep exploration oil rig. He has worked in mines as a water well driller and on and scientific drilling projects in locations ranging from the U.S. South Pole Station in Antarctica to the ice pack at the geographic North Pole to a project in Greenland.

Workshops

Date: Wednesday, December 9, 2020
Time: 9:00:00 AM
Education time: 1 hour

Power Quality and Pumps--Is Your Power Killing Your Pumps?

How familiar are you with power quality issues related to pumps? Do you thoroughly understand what they mean for pump performance and life span? Do you know how to detect power issues, and of greater importance, how can you fix them? You will also learn about motor protection devices and remote monitoring for power issues.

Alan Bixler

Alan Bixler is Product Specialist for Submersible Water Pump Systems for Grundfos Pumps North American Region. Bixler started with Grundfos in 2007 as a Senior Applications Engineer. During this time Bixler worked with customers across the broad range of Grundfos pumps and systems gaining knowledge and experience in the industry. Bixler accepted the Product Specialist position in August 2011. Prior to joining Grundfos Bixler worked as a Product Manager for GE Energy (BHA Group) with responsibilities in air pollution control and power generation technology. Bixler has a BS degree from the Agricultural Engineering department at the University of Missouri.

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Workshops

Date: Wednesday, December 9, 2020
Time: 9:00:00 AM
Education time: 1 hour

Asset Management for Sustainable Wells: Not Just for Utility Water Supply

Wells are a distinctive part of groundwater-source water facilities, large or small, including irrigation, environmental, and municipal water supply. These wells are in close contact with the nonengineered "wild" environment: numerous formation changes over depth, and water chemistry and microbiological changes. Well components have large surface areas.

Well deficiencies or failures can be hard to detect in a timely fashion. However, current or potential issues can be detected and tracked with available methods, permitting preventive maintenance actions and treatment.

A feature that wells and wellfield arrays have in common with other engineered systems is the benefit provided by good design, material choices, and expert construction. Thus, a total life-cycle asset management program for “wild” wells involves planning, design, baseline documentation of performance, environmental condition and performance tracking to establish trends and make decisions over time, and planning service events proactively based on that tracking.

Stuart Smith

Stuart A. Smith, CGWP, RG, hydrogeologist and microbiologist, is a partner in Smith-Comeskey Ground Water Science LLC and Ground+Water Tanzania Ltd. He has more than 35 years’ experience in the application of research, analysis, training, and consulting related to groundwater and wells, with a focus on efficient and cost-effective analysis and rehabilitation of well problems, and well and wellfield asset management. He is a pioneer in applying practical biofouling analytical methods in groundwater system analysis, rehabilitation, and asset management.

Smith is the author or coauthor of numerous publications, including Sustainable Wells: Maintenance, Problem Prevention, and Rehabilitation (CRC Press), the American Water Works Association’s manual M21 Groundwater; CRC Press’ Drilling: The Manual of Methods, Applications, and Management and its predecessors, and NGWA’s Manual of Water Well Construction Practices. He’s also contributed elsewhere to the literature of well maintenance and rehabilitation practice, starting with Water Well Journal® articles in 1980, and continuing through ASCE’s International Well Hydraulics Manual. He has instructed on, and set up, well and wellfield maintenance programs across the United States and in Argentina, Jordan, and Australia.

Past-chair of Standard Methods for the Examination of Water and Wastewater joint task group for Section 9240 Iron and Sulfur Bacteria, Smith is also a long-time volunteer and instructor with NGWA, and was active in the development of the NGWA-01-14 Water Well Construction Standard. He holds B.A. and M.S. degrees from Wittenberg University and Ohio State University, respectively.

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Workshops

Date: Wednesday, December 9, 2020
Time: 9:00:00 AM
Education time: 1 hour

Helping Well Owners Understand their Risks and Well Vulnerability

In 2015, an assessment tool to evaluate private well risk and vulnerability was developed as part of a national program of outreach and education to private well owners. The 8-page assessment allows a professional to determine how well construction, site conditions, land use, geology, and other factors might impact water quality and the risk of well contamination of a well. The RCAP Private well staff around the country have completed over 2400 of these assessments, all at the request of well owners in their areas. We have also trained over 1000 environmental health professionals on how to use the assessment tool in their local areas. Recently, the Private Well Class program developed a guide that explains all of the elements included in the assessment. The guide is meant to help those who are not as knowledgeable about certain topics, like backflow devices, or septic systems, so they can use the assessment tool to help well owners in their areas. The guide will be described, as well as the tools available to you to provide guidance to the well owners you serve.

Steve Wilson

Steve Wilson is a groundwater hydrologist at the ISWS. He has a Masters Degree in Civil Engineering from the University of Illinois. Mr. Wilson has been involved in numerous groundwater assessment projects dealing with both groundwater quantity and quality issues. He recently completed an evaluation of the statewide arsenic occurrence in groundwater and is working with ISWS staff to assist in the development of GWINFO, a program to integrate groundwater data into a SQL-based system for archival, entry, and retrieval of groundwater data.

Workshops

Date: Wednesday, December 9, 2020
Time: 10:15:00 AM
Education time: 1 hour

NPSH and Avoiding Cavitation

Cavitation is bad. Not only can it reduce the efficiency of your pump, it can literally tear your pump apart. This course will explore NPSH and discuss how it directly relates to cavitation. Participants will see examples of cavitation damage, and the instructor will provide tips and techniques on how to select pumps to avoid cavitation.

Dan Featherstone

Dan Featherstone is an Applications Specialist and Trainer at Pentair Flow Technologies. He has been with Pentair for over 19 years, including 16 years directly involved in training. Dan has accrued over 1,000 hours of formal instruction and excels in delivering content to students using a number of different training mediums. He holds a Bachelor's degree in Business Management.

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Workshops

Date: Wednesday, December 9, 2020
Time: 10:15:00 AM
Education time: 1 hour

Federal Legislative Issues Affecting the Water Well Industry

The Water Systems Council and the National Groundwater Association collaborate on several issues pertinent to private wells and the water well industry. Each organization will provide insight and updates on national legislation, current and pending regulations, and the policies of federal agencies that can have an impact on the groundwater industry.

Margaret Martens

Margaret Martens is Executive Director of the Water Systems Council (WSC), a national nonprofit organization solely focused on household wells and small water well systems. In addition, she serves as Program Director for the Water Well Trust, the only national nonprofit helping Americans get access to a clean, safe water supply. Prior to joining WSC in 2010, Martens was Event Manager for the Town of Davidson, NC and Project Manager for Downtown Davidson Inc. She is the co-founder of two nonprofit organizations in the Charlotte, NC area, including the HAMMERS Program for the Davidson Housing Coalition, which provides home repair services for low-income residents. She has served as a member of the Lake Normal Community Development Council and currently serves on the Board of Directors for the Davidson Housing Coalition. Martens is a graduate of Arizona State University.

Jeff More

Jeff is currently a Vice President at the Alpine Group, a Washington, DC based consulting and advocacy firm specializing in environmental, energy and infrastructure policy. Jeff's clients include: ARCADIS US, the National Baseball Hall of Fame, the Water Infrastructure Network, the National Association of Clean Water Agencies, Milwaukee Metropolitan Sanitary District, Pheasants Forever, Progressive Waste Solutions, the Water Systems Council and Ducks Unlimited.

APPROVED

Workshops

Date: Wednesday, December 9, 2020
Time: 10:15:00 AM
Education time: 1 hour

Proper Drill Site Assessment, Preparation, and Execution

Every drill site should receive dedicated attention when estimating the cost of the job and prior to the movement of heavy equipment. Each site is unique but the factors governing its selection are not: safety, accessibility, productivity, and efficiency. A careful site survey should alert the contractor to overhead and underground utility issues, clearances, traffic flow concerns, security challenges, and ground stability. You will learn how to sharpen your assessment skills for potential site problems, in addition to properly planning or rig setup and stabilization.

Richard Thron

Richard Thron, MGWC, is currently with Mantyla Well Drilling Inc. in Lakeland, Minnesota, where he began working full-time in 1966. He enjoyed limited ownership in the company from 1973 to 2000 when he became the sole owner.

Thron, an NGWA member since the 1980s, has served on numerous Association committees and taskforces. In addition, he was president in 2015 and is currently a director. Thron has also participated in several panel discussions and seminars as a speaker on DOT-OSHA, safety, air rotary drilling, public education, and other related topics.

Richard Layman

Richard Layman, MGWC, CVCLD, a fourth-generation water well driller and owner of Pure Water Well Inc. in Lachine, Michigan, has been employed in the groundwater industry for more than 45 years. He currently serves on the NGWA Board of Directors and has served on several groundwater industry task forces and committees. In addition, Layman has served as a director on the Michigan Ground Water Association for 30 years, including being vice president for two years and president for three years.

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Workshops

Date: Wednesday, December 9, 2020
Time: 12:30:00 PM
Education time: 1 hour

Things You Didn't Know You Could do with a Variable Frequency Drive

VFDs give us a lot of flexibility other than just the standard constant pressure benefits. With fully functional VFDs, we can use advanced programming features, relays, and integration to accomplish creative control tasks to solve an issue in the field. This workshop will discuss examples of these unique applications and how VFDs accomplished the desired solution.

Tony Eisinger

Tony Eisinger is a Senior Field Service Engineer for Franklin Electric. Starting as a drill rig helper in 1984, Tony has been involved in every aspect of the well industry for the past 30 years. Tony currently troubleshoots, trains, and conducts site visits for contractor and distributor personnel in MN, WI, IA, NE, SD, ND, and parts of central Canada. Most recently, Tony was awarded Franklin Electric's 2019 Field Service Engineer of the Year award.

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Workshops

Date: Wednesday, December 9, 2020
Time: 12:30:00 PM
Education time: 1 hour

Groundwater Guardians: Spreading the Word to Protect the Resource

Groundwater is likely used from one source or another by the majority of the population. All of us hold some responsibility to protect and conserve this resource for both the present and future. Individuals, companies, organizations, and institutions have stepped up to become Groundwater Guardians and educate about and protect groundwater in their local communities through initiatives they choose. You will learn about this program and its 26 years of success in addition to how you can become a Groundwater Guardian, how the program works, and the available tools to assist you in fostering groundwater awareness.

Sara Brock

Sara Brock is a program manager with the Groundwater Foundation. Since 2016, she has managed the Groundwater Guardian program, a grassroots network of volunteers who conserve, protect, and educate communities on the importance of groundwater. She provides resources and learning opportunities to experts and the public, demonstrating groundwater education tools that complement existing curriculum and standards. As founder and former president of a college-based community engagement group, Drake University's Community Action Board, Sara trained individuals and groups to build strong relationships with the public with the goal of fostering a meaningful exchange of information and bringing about positive, long-term change

Workshops

Date: Wednesday, December 9, 2020
Time: 12:30:00 PM
Education time: 1 hour

Predictive Maintenance of Heavy Equipment

Every tool and piece of equipment has a working life/life cycle. Heavy equipment and support vehicles require scheduled maintenance and attention to both preserve that life cycle and to eliminate or at least minimize down time. Failure to adhere to prescribed maintenance impacts your on the job drilling operations and can even prevent your safely getting to the job. Technological advances in tires and low-sulfur and biofuels have altered some maintenance procedures and time frames.

Ray Kranzusch

Ray, currently Service Manager for Volvo Construction Equipment, has over 35 years of experience in the drilling industry, in roles ranging from field service to product manager. He has worked in water well, exploration, and oil & gas drilling industries.

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Workshops

Date: Wednesday, December 9, 2020
Time: 1:45:00 PM
Education time: 1 hour

Liability and Technical Considerations for GHX Design & Installation for GSHP Systems

Drilling contractors are sometimes asked to design and install a ground heat exchanger (GHX). Drillers may find themselves in a position of liability if variables of the entire system are not accounted for, both above and below ground. Considerations for GHX design, not just geology, include energy loads, GSHP equipment, HDPE schedules, manifold design, and other factors that increase the attention to detail necessary for a competent GHX system. Depending on work performed by others that is tied to the GHX, other challenges can be introduced into the system that can result in erroneous finger pointing. This presentation will provide an overview from a drilling contractor's perspective of hand-off points for a GHX design. Additionally we will address GHX design fundamentals, differences between residential and commercial ground loops, liability considerations, roles and responsibilities, quality assurance, and documentation and coordination during construction.

Terry Proffer

Terry is the Geothermal Manager for Major Geothermal in Wheat Ridge, Colorado. Terry is a Certified Geothermal Designer and one of 15 indivuals qualified to train additional certified designers. He has been in the geothermal business since 1992 and has experience on the wholesale side as well as loop and system installation on both residential and commercial projects. He is NATE and IGSHPA certified and is involved with the IGSHPA training and code committees. He also serves as a consultant and has experience as an expert witness (forensics) on design/installation cases involving geothermal systems.

APPROVED

Workshops

Date: Wednesday, December 9, 2020
Time: 1:45:00 PM
Education time: 1 hour

Installing All Types of Pump Controls at the Well

How aware are you about the benefits of installing controls at the well? Not only can you save about 50% of your time, but placing the control switch on a standard three-wire pump will reduce the amp draw on the pump motor by 10%. This approach applies to all standard three-wire pumps in addition to VFD's.

Stephen Anderson

Stephen has been the Design Engineer for Merrill Mfg. Co. since 1975 and has been President since 1981. He is the owner of 11 patents in the water well industry. He was the Iowa Inventor of the year in 1994 and Merrill was named the Exporter of the Year for the Midwest Division of the US Department of Commerce in 2012. He is a graduate of Iowa State University with a degree in Industrial and Manufacturing Systems Engineering and is currently a board member of The Water Systems Council, serves on the Board of Directors of the Water Well Trust, and is a member of the Iowa Water Well Association, The American Groundwater Trust, and NGWA.

Workshops

Date: Wednesday, December 9, 2020
Time: 1:45:00 PM
Education time: 1 hour

Water Well Inspections for Real Estate Transactions In Your State

Many water well drillers and pump installers perform the task of inspecting private and shared water wells for the sales and transfers of real property. Each state and even Canadian provinces have their own distinctive rules and regulations regarding who can perform them. Some states even have standards of what equipment to be tested and what water sampling must be performed for specific transactions. Other states have very few rules and regulations regarding the inspections for sales of real property served by a private or shared water well. This presentation will look at a number of individual state's rules and regulations and compare their standards to those of other states. The presenter will ask attendees to participate by contributing if and how they. perform these inspections. This presentation will help water well drillers and pump installers to understand that performing water well inspections for real estate buyers is not contracting and it is not a service call. Performing water well inspection reports for prospective buyers of real estate is a consulting service and the inspector must be aware of what this could mean to their business if they errored and caused the buyer financial harm.

Gary Hix

Gary L. Hix, PG, RG, CWD/PI, is the owner of In2Wells LLC. Gary was the 2019 McEllhiney Lecturer. He's a registered geologist and certified well driller and pump installer. Gary also is past president of the Arizona Water Well Association and he's chairman of the NGWA Education and Awareness Subcommittee. He has authored many articles on subjects related to well drilling issues for NGWA's Water Well Journal® and Toolkit.

Workshops

Date: Thursday, December 10, 2020
Time: 9:00:00 AM
Education time: 1 hour

Single Phase Motor and Control Testing

The first time you pull the end cap off the back of a motor or the lid off a control box, it can be a little confusing. Even more confusing is trying to determine what meter setting to use and where and how to place the probes. This presentation will walk you through the steps of routine motor tests and will provide a general overview of motor components and characteristics. This presentation is ideal for those seeking to learn or get a helpful review of basic motor testing practices.

Brian Broga

Brian Broga is a Product Manager at Pentair Flow Technologies. He has wide-ranging experience with many water system components including submersible well pumps, motors, VFDs and Internet-connected devices. Brian has more than 25 years of experience directing Operations, Quality and Marketing. He holds a MBA from Aurora University and an Industrial Engineering degree from the University of Illinois at Urbana-Champaign.

Scott Tystad

Scott Tystad is the Education Leader for Pentair's Residential and Commercial business units. Scott has over 700 formal hours of training experience across multiple disciplines. As a civilian contractor supporting the United States Army National Guard, Scott earned the unique distinction of "Mission Command and Training Support Program (MCTSP) Certified Trainer." During his five years with Pentair, Scott has enhanced Pentair's factory training efforts, developed digital content, and implemented an online learning management system (LMS). Scott holds an M.A in Business Security from Webster University and a B.S in Horticulture from Kansas State University.

APPROVED

Workshops

Date: Thursday, December 10, 2020
Time: 9:00:00 AM
Education time: 1 hour

Showcasing Your Business Online

Effective business marketing has changed dramatically over the years. With phone books being a thing of the past and social media continuing to evolve at a rapid pace, it is difficult to know exactly where to start. This workshop will provide guidance on how to manage online customer reviews, as well as how to make your business more visible to customers using Google and social media outlets.

Sarah Smith

Sarah Smith works in the greater Chicago area as Demand Generation Specialist at Xylem Inc. Prior to joining Xylem, Sarah specialized in marketing and hospitality management. She has a bachelor's degree from Purdue University in Hospitality & Tourism Management.

Amanda Holloway

Amanda Holloway is PR & Social Media Leader, Americas for Xylem Inc. in Milwaukee, WI. Amanda works to ensure that Americas Commercial Team (ACT) products and capabilities are effectively covered in industry trade outlets and social media venues (both print/online); build social media engagement to competitive levels. She has experience in lead content generation efforts to enable coverage, focusing on the stories that best position Xylem as an industry leader. She seeks and develops opportunities for ACT personnel to become known as thought leaders in the industry on topics of importance to customers and channel partners. She manages agency and freelance resources to support the ACT's PR and social media initiatives efficiently and for maximum value. Part of her work includes measuring outcome metrics of PR/social media work, using impact score as a proxy for memorability and persuasiveness. Amanda has a Bachelor of Business Administration degree in Marketing from University of Wisconsin Oshkosh

Workshops

Date: Thursday, December 10, 2020
Time: 9:00:00 AM
Education time: 1 hour

Well Cleaning Chemicals: Selection, Application and the Treatment Process

In this workshop we will examine the factors that influence the selection of the right response (chemical wise) for well cleaning. This includes knowing what is fouling the well, how badly the well is impacted, and choosing the right products to limit harm. We will explore and promote the treatment effort as a process.

You will learn to address the means of monitoring the reactions occurring during the cleaning process, as well as the follow-up procedures to keep the well moving in a positive direction.

Eric Duderstadt

Eric Duderstadt is an environmental biologist with Water Systems Engineering Inc., of Ottawa, Kan. He works within the firm's diagnostic and investigative laboratory centering on microbiology and chemistry. The company is a multi-tiered firm which specializes in ground water and surface water applications, industrial heating, cooling and water handling systems, and corrosion analysis and control.

APPROVED

Workshops

Date: Thursday, December 10, 2020
Time: 10:15:00 AM
Education time: 1 hour

Water Well Cleaning and Maintenance - Maintaining Quantity and Quality

Water Wells are are the most important asset in a groundwater system. As water systems age deterioration from many factors is an almost inevitable consequence. In groundwater systems water wells will experience deposits building up depending upon many factors. Formation damage as well as biological and mineral deposits will result in lost capacity and associated water quality problems including discoloration, taste and odor and Total Coliforms being detected in pumped water samples. Historically specific capacity has been utilized to determine the frequency of rehabilitation and maintenance. This reliance on specific capacity is the single largest contributor to operate to failure approach to well maintenance because the lost of pore space is not detected early enough. During the past 20 years a time based approach has been very effective at maintaining wells since deposits are soft and not extensive therefore are more effectively managed by periodic removal. Novel ideas and understanding about well problems and solutions will be presented based on many years of experience. Good rehabilitation and maintenance can be very effective at maintaining peak efficiency as well as maintaining more consistent water quality. With tight budgets and increasing energy costs of water production cost effective well maintenance can be used for fixed budget pricing and driving down life cycle costs. New effective and economical method of well rehabilitation and maintenance will be presented with case studies of cost savings and solving difficult bacterial issues.

Neil Mansuy

Neil Mansuy has approximately 35 yrs as a Well Rehabilitation and Maintenance Specialist. Neil graduated with a MSc in Groundwater Microbiology

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Workshops

Date: Thursday, December 10, 2020
Time: 10:15:00 AM
Education time: 1 hour

Solar Groundwater Pumping Systems

The future solar groundwater systems market will depend to a great degree on the knowledge level and expertise of those designing the products and those installing and servicing them. This workshop will address the fundamentals of solar-powered groundwater systems to include, but not limited to system components, proper sizing, and interpreting a solar pumping performance curve. Solar panels available in the market place will be addressed, as well as their basic wiring configurations.

Tom Drew

Tom Drew has been in the pump and controls industry for 28 years. He joined the Grundfos team in June of 2019 as the technical sales manager for Texas, Oklahoma, Louisiana, Arkansas and New Mexico. His industry background includes project/product management, marketing and engineering, and he has also served on several national committees for the industry.

APPROVED

Workshops

Date: Thursday, December 10, 2020
Time: 10:15:00 AM
Education time: 1 hour

How to Read a Profit and Loss Statement: More Than Just Numbers

If you are a business owner or company manager, it is imperative you grasp the importance of the financial image a profit and loss statement depicts. While you need to know your income and expenses in any given month for budget purposes, you will also need this information to share with your banker and accountant—and for long-term operational planning. You will learn what to look for when reviewing a financial statement and red flag areas deserving immediate attention. The workshop is recommended for those who have scant accounting knowledge and wish to hone their skills.

Becca Calkins

Becca Calkins, CPA, MBA, the Director of Finance at NGWA, has over a decade of accounting and finance experience. A self-proclaimed “numbers nerd,” she particularly enjoys scenario planning and harnessing the power of excel. She has also found her outgoing personality is not stereotypical of accountants and has used that to gain experience and a love for workplace culture. In addition to her love of numbers, she enjoys traveling and trying new foods with her husband and two kids.

Workshops

Date: Thursday, December 10, 2020
Time: 1:45:00 PM
Education time: 1 hour

Profiting From Adding Water Treatment and Service Operations

Adding water treatment to your business can be an additional way to both service your customers and diversify your business. Before you leap though, take time to consider what's needed to make a water treatment solution work, what service considerations are needed, and what investments you're willing to make. You will learn about the in-home water treatment business, the steps and knowledge needed to properly apply and maintain treatment, and options for companies that want to provide the correct solution for their customers but aren't yet ready to change their business model.

Clifford Fasnacht

With more than three decades of operational and management experience, Clifford L. Fasnacht has developed a keen sense of adaptability in the service and construction communities. He's an entrepreneur who successfully built Dougherty Pump & Drilling Inc. a general engineering and service business; and Pacific Purification Inc., a service and custom manufacturing business, where he works closely with his clients to design and build products for many applications worldwide. His clients have ranged from mega corporation giants who include fertilizer manufacturers, aerospace companies, pharmaceutical manufactures and water treatment companies, to private home owners.

Workshops

Date: Thursday, December 10, 2020
Time: 1:45:00 PM
Education time: 1 hour

Motor Mysteries Solved

This workshop delves into all things practical with both submersible and surface motors. You will learn about these factors and processes: nameplate data, installation, grounding, cooling, surge protection and troubleshooting and their significance to fully operational and safe water system.

Tom Stephan

Tom Stephan has managed all Xylem residential and commercial water training programs since 2011. This includes external customers, sales force, and other employees as well as being responsible for research, development, and implementation of web-based online training for the Goulds Water Technology, CentriPro, and Red Jacket Water Product brands. In his 25 years with Xylem, he has held positions as Global Process Expert, Customer Service Manager, Warranty Claims Manager, Regional Sales Manager, Marketing Manager, and Sales Representative. Stephan holds an AAS, Electrical Technology from Morrisville Ag & Tech and a B.S. in Business Management and Marketing from Cornell University.

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Workshops

Date: Thursday, December 10, 2020
Time: 1:45:00 PM
Education time: 1.25 hour

Managing Remote Employees

Working from home was previously a known quantity, but in the age of COVID-19, WFH has become more the norm than an outlier for a significant

percentage of employees. The rapid transition to this state of work for those whose professional activities enabled them to do so has also created and amplified the need for good management practices and attuned managers. This expertise encompasses more than "getting the job done." It creates a

heightened challenge to the importance of good relationships with employees, knowing their strengths and weaknesses, and sustaining a feeling of team and connection. Good managers and company policies must also be flexible enough to accommodate how their employees are affected by other pandemic impacts like diminished or absence of day care services for infants and young children and the potential lack of good outlets and hotel accommodation for those already working in relatively remote locations to perform their jobs. How is it possible to bridge the communication and empathy gap between managers working from home with service-oriented employees who must still be in the field under challenging conditions? The pandemic will not last forever, but the lessons we learn about workplace dynamics and how we all address them will.

Thad Plumley

Thad Plumley is the director of publications for the National Ground Water Association, a not-for-profit organization comprised of more than 10,500 U.S. and international groundwater professionals. He oversees three member publications: a monthly trade magazine and two peer-reviewed publications. His department also includes a book division and a magazine website. Plumley writes for, edits, and designs Water Well Journal, the monthly publication with a circulation of nearly 20,000. He assists in the production of the two peer-reviewed publications, Groundwater and Groundwater Monitoring & Remediation.

Marie Maher

Marie Maher, PG Regional Exploration Manager, Chattanooga Growing up, I was always playing in the dirt. My family is very active in outdoor activities and that appreciation for the environment is what led me to a career in the earth sciences. I am grateful for my parents' guidance, which led me into a career more fulfilling than I could have imagined. I knew in childhood I wanted to be a scientist. I'm inspired by our team getting involved in projects other firms aren't confident enough to touch. Working at a firm that embraces the challenging projects and supports its scientists and engineers is priceless. At times, we've been asked to install a type of instrumentation we have not installed before. Figuring out the process with the geologists, exploration team members, project managers, and other team members,

fires me up. How I innovate. We're leading the industry in collaborative geotechnical project management using GeoReport and leveraging our national database of geotechnical information by sharing it with clients through our new Report of Expected Geotechnical Conditions – it is an industry first. Since we are in the captain's chair, we have a responsibility to guide the industry in the right direction – a direction that is innovative.

Scott Hartsough

Workshops

Date: Friday, December 11, 2020
Time: 8:00:00 AM
Education time: 1 hour

Improving Effectiveness (OEE) for a Single Irrigation System or Across All Your Systems Using Cloud Technology

In today's groundwater market, improving Overall Equipment Effectiveness (OEE) is a top priority for pumping applications. You will learn how to cost effectively collect and analyze operational, diagnostic, and statistical data from within a single system or across multiple locations. Improve OEE by gathering just enough of the right data.

Upgrading your existing pump system is less costly than completely replacing your system and allows you to finance this improvement from different budgets. With this solution, you can upgrade key pumps first and then bring more online when annual budgets allow it. A strength of this solution is the single sensor approach. The technology that provides operational and diagnostic data to maintain local operation can supply the same data to corporate management to use for a higher level of analysis.

Brad Hicks

Brad has 30+ years of electrical motor control expertise including Pump Panels, Reduced Voltage Soft Starters, Automation, and Remote Communication Solutions to well sites.

John Burns

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Workshops

Date: Friday, December 11, 2020
Time: 8:00:00 AM
Education time: 1 hour

EcoVoices Mimediately: Community Service and Outreach with Theatrical Energy!

A young girl with a concerned look on her face asked me, "Will there be enough clean water for us when we grow up?" I assured her that water quality professionals work on this 24/7! And then we acted out a play to show how they do it!

EcoVoices Expeditions, sponsored by the San Gabriel Basin Water Quality Authority (WQA), was the 2019 winner of the NGWA Groundwater Project Award. This workshop explains and demonstrates how we apply techniques of mime and improvisational theater to act out “Water Stories” to engage thousands of students annually about the importance of groundwater, and how water professionals work together to maintain the health and resilience of the local watershed ecosystem.

This year-round program is creating the next generation of youth EcoRangers– future environmental stewards and water-quality scientists-– while spreading the word about our groundwater supply to all those around them in the community.

Richard Shope

Dr. Richard Shope has 50 years of experience as a writer, mime artist, and educator. He has applied this experience to become a leader in science research, education, and workforce issues, known for his abilities to communicate science concepts in exciting and expressive ways. As President of the World Space Foundation, he develops collaborative projects, directs inquiry science expeditions, and produces science theatre productions. The San Gabriel Basin Water Quality Authority sponsors the EcoVoices program. He earned his Ed.D. in Learning and Instruction with emphasis on Science Education (2006) USC. He is a published poet with the Wandering Scholar Press.

Workshops

Date: Friday, December 11, 2020
Time: 8:00:00 AM
Education time: 1 hour

Federal Business Income Taxation Update

2020 has certainly been a year of surprises, unrest, and variables never imagined, thus it is the ideal time to explore the ever-changing landscape of federal taxation. We will review the relief provisions and changes made in response to COVID-19 and address what to look for after Coronavirus and the Election.

Melissa Dunkle

Melissa Dunkle, CPA, earned her bachelor's degree from The Ohio State University with a major in accounting and a minor in finance. She is responsible for the oversight of tax engagements, review of the staff's work, staff development and developing new business for the firm. Dunkle has over 8 years of experience in the accounting industry. Prior to joining Rea, she worked for Brady Ware, GBQ and Big Brothers Big Sisters of Central Ohio.

Workshops

Date: Friday, December 11, 2020
Time: 9:15:00 AM
Education time: 1 hour

How to Upgrade Your Irrigation Pump Motor Control to Reduce Downtime

Reducing maintenance costs in today's groundwater market is a top priority for those in the agriculture industry. You will learn how this can be done using motor management technology. Downtime can be reduced by diagnosing failures more quickly with this technology providing early warning conditions. Common failures like dry run, intake blockage, or a lost impeller can be easily detected. Key operational and statistical data is also available from this solution and can be fed up to a cloud-based server, thus allowing data from all their remote stations to be analyzed for overall equipment effectiveness (OEE). Redundancy and local logic also provide stand-alone functionality when communications are lost to the central control system.

Brad Hicks

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Workshops

Date: Friday, December 11, 2020
Time: 9:15:00 AM
Education time: 1 hour

Grouting and Drilling Jobs That Didn't Follow the Book

The day at the job site was pretty typical--and then. You will learn about some unique and problematic situation with grouting materials and engineered drilling fluids--and how they were resolved.

Jeff Blinn

Jeff Blinn has a geology degree and has worked as a drilling fluids engineer since 1978, holding several field positions in New Mexico, California, and Nevada. He joined Baroid Industrial Drilling Products in Nevada in 1997, transferred to Fort Worth, Texas, as the Senior Field Sales Representative for North Texas, and in 2008 transferred to Houston, Texas, as Senior Technical Professional. Mr. Blinn held the role of training manager from 2011-2020.

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Workshops

Date: Friday, December 11, 2020
Time: 9:15:00 AM
Education time: 1 hour

Groundwater is Captivating: Engaging Grades 3-12!

If we are to protect groundwater resources, we must both educate adults as well as equip them with the tools and resources to teach about this vital natural resource. Protecting and conserving groundwater is a multi-generational endeavor--one in which all adults, not solely formal educators, should be involved. It is critical that we engage in the early childhood years and cultivate the awe an underground aquifer presents. You will learn about the Groundwater Foundation's programs to accomplish this goal and the various resources it can offer to perpetuate the wonder of groundwater and the stewards it needs.

Sara Brock

Sara Brock is a program manager with the Groundwater Foundation. Since 2016, she has managed the Groundwater Guardian program, a grassroots network of volunteers who conserve, protect, and educate communities on the importance of groundwater. She provides resources and learning opportunities to experts and the public, demonstrating groundwater education tools that complement existing curriculum and standards. As founder and former president of a college-based community engagement group, Drake University’s Community Action Board, Sara trained individuals and groups to build strong relationships with the public with the goal of fostering a meaningful exchange of information and bringing about positive, long-term change

Workshops

Date: Friday, December 11, 2020
Time: 10:30:00 AM
Education time: 1 hour

Hydrogeologic Classification System for Water-Well Boreholes

Groundwater professionals are tasked with describing sample cuttings from boreholes drilled for water wells or hydrogeologic investigations. Drilling contractors and hydrogeologists whom have varying backgrounds and training in describing hydrogeologic systems, are tasked with producing borehole logs that are incorporated into the permanent hydrogeologic record. However, few water well professionals have been trained in describing cuttings from water-well boreholes. The result is borehole logs that are produced are inconsistent and in many instances so poor they cannot be interpreted for hydrogeologic assessment where important hydrogeologic data could have been collected. The HCSWB provides a concise menu driven format that insures basic information is recorded, yet allows enough flexibility for describing unique hydrogeologic features. Students will taught then use the Hydrogeologic Classification System for Water-Well Boreholes (HCSWB) to log a suite of drill cuttings and select filter pack and slot size for a municipal water-supply well.

Thom Hanna

Thom Hanna, RPG, is employed as Technical Director Water Well Products/Hydrogeologist for Johnson Screens where he works in areas of well design, construction, rehabilitation and development. Before working for Johnson Screens he worked over 15 years as a hydrogeologist for several ground-water consulting firms including Hydrologic Consultants, Inc., Papadopulos Associates, and Golder Associates. His experiences include hydrogeologic investigations, design and optimization of well efficiencies for mine dewatering and water supply investigations.

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Workshops

Date: Friday, December 11, 2020
Time: 10:30:00 AM
Education time: 1 hour

Remote Monitoring for Irrigation Systems that Continue to Run When Communication Links are Lost

Reducing maintenance costs and increasing productivity is a top priority for pumping applications. You will learn how you can upgrade your existing pump system to have stand-alone functionality when communication is lost with the central controller. Local control, monitoring, and protection can be provided using a Motor Management System. Common failure conditions in addition to the motor itself, such as pump blockage or failing mechanical components can be monitored for early warning conditions. Key operational and statistical data is also available from this solution and can be fed up to a cloud-based server. Redundancy and local logic also provide stand-alone functionality when communications are lost to the central control system.

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APPROVED

Workshops

Date: Friday, December 11, 2020
Time: 10:30:00 AM
Education time: 1 hour

State and Local Tax--Updates, Pitfalls, and Opportunities

Join us for a review of major national issues and trends in sate and local taxation. Many states are turning to the next phase of the COVID-19 response and addressing revenue shortfalls. What are the top things yo can do today to protect your business from increasing state audit activity? What can you do to obtain competitive advantage over your competition? If you are thinking of selling your business, you will learn why you should examine your state and local tax exposure now.

Joe Popp

Joe Popp, JD, LLM is the Director of State and Local Tax at Rea and Associates, a regional Ohio CPA firm. Joe is a graduate of The Ohio State University, the Moritz School of Law at Ohio State University, and Capital Law School. He has practiced in state and local tax, with a concentration on transactional tax for over 10 years. He is a frequent speaker on SALT topics for the Ohio Society of CPAs, Ohio State Bar Association, and various industry groups. Joe is an avid art collector and guest lectures at the Columbus College of Art and Design teaching students business and tax concepts. Joe lives in Clintonville with his 3 dogs and a kayak.

Workshops

Date: Friday, December 11, 2020
Time: 12:00:00 PM
Education time: 1 hour

Peristaltic Chemical Feed Metering Pumps: Installation and Maintenance

Peristaltic chemical feed metering pumps are used for residential, industrial, and commercial water treatment applications. How familiar are you with peristaltic pump technology and its advantages?What are the proper installation points? In this workshop you will learn the answers to these questions in addition to properly sizing the pump to the application, key maintenance procedures on a single head adjustable pump, wear and proper maintenance of the feed rate control, critical maintenance markers for a single head adjustable pump including reasons for tube failure, and maintenance and troubleshooting on the motor, gear, coil, and rotor.

Pat Bell

Regional Manager for Stenner Pump Company since 2003.

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Workshops

Date: Friday, December 11, 2020
Time: 12:00:00 PM
Education time: 1 hour

Five Ways to Build a Workplace Employees Love

You have become comfortable with mastering your company's income and expenses (and hopefully profit) on a monthly and quarterly basis. What can this information tell should you when you look beyond "the bottom line?" Make your new skills work for you by recognizing potential threats in addition to opportunities before they become irrevocably problematic: cash flow (deficits), seasonal ups and downs, inordinately high receivables, and redirect extra cash to a short-term asset investment option. This workshop is recommended as a follow up to "How to Read a Profit and Loss Statement: More Than Just Numbers.

Becca Calkins

Becca Calkins, CPA, MBA, the Director of Finance at NGWA, has over a decade of accounting and finance experience. A self-proclaimed "numbers nerd," she particularly enjoys scenario planning and harnessing the power of excel. She has also found her outgoing personality is not stereotypical of accountants and has used that to gain experience and a love for workplace culture. In addition to her love of numbers, she enjoys traveling and trying new foods with her husband and two kids.

Workshops

Date: Friday, December 11, 2020
Time: 12:00:00 PM
Education time: 1 hour

Large Wells/Small Spaces: The Challenges of Urban Drilling

The construction of wells in urban environments combines the routine well construction concerns with an additional set of unique challenges. The movement of heavy equipment and the presence of utilities can be especially problematic while also dealing with the site preparation, water and cuttings management, filtration issues, special permits, and even pets. Often the contractor must also employ both environmental and engineering solutions.

Roger Renner

Roger E. Renner, MGWC, is president of E.H. Renner & Sons Inc. He is the fourth of five generations of this family-owned business located in Elk River, Minnesota. Aside from the overall operation of this business, he is specifically responsible for the municipal, large well sealing, and monitoring markets. Renner is a 39-year member of NGWA. He successfully completed the Master Ground Water Contractor examination of the NGWA Voluntary Certification Program and is therefore entitled to use MGWC after his name. He is one of 70 contractors in this NGWA program qualified to take this special exam. He is also a past president of NGWA, past president of the Minnesota Water Well Association, and 25-year member and current Chair of the Minnesota Dept. of Health Advisory Council on Wells and Borings.

Groundwater Summit Conference Sessions

Date: Tuesday, December 8, 2020
Time: 10:00:00 AM
Education time: 0.33 hour

Groundwater and Energy

Produced Water Reuse and Protection of Groundwater

For over a decade, New Mexico has been considered a leader in pursuing the reuse of produced water to supplement fresh water supplies and reduce or eliminate the use of fresh water in oil and gas operations. These efforts were in support of more sustainable fresh water management in a state that has experienced significant reductions in average annual precipitation over the past century. In passing the 2019 Produced Water Act, New Mexico established a regulatory and policy framework for the ownership and management of produced water, giving statutory control and regulatory authority for the use of produced water outside the oil and gas industry to the NM Environment Department (NMED).

To establish science-based regulations and policies for reusing produced water, the NMED entered into a Memorandum of Understanding in September 2019 with New Mexico State University to create the New Mexico Produced Water Research Consortium(Consortium). The Consortium's role is to create a focused research and development program in collaboration with state and federal environmental and natural resource agencies, academia, industry, and non-profits to fill scientific and technical gaps for fit-for-purpose treatment and reuse of produced water, while protecting surface and ground water quality and availability and environment and human health and safety.

While using produced water has many potential benefits – reducing or eliminating fresh water use in the oil and gas sector, supplementing fresh water supplies, supporting mineral recovery - there are also challenges. These include not only ensuring produced water reuse is protective of the environment and public health, and that it also does not degrade fresh surface or groundwater quality or availability. This presentation provides an overview of the Consortium, research priorities, and efforts to minimize impacts on surface and groundwater availability and quality.

Mike Hightower

Mr. Hightower is Program Director of the New Mexico Produced Water Research Consortium, a joint effort by the NM Environment Department and New Mexico State University. Mike is a technical consultant at Sandia National Laboratories in the areas of water treatment, desalination, and energy and infrastructure resiliency where he worked for 38 years. Mike holds Bachelor's and Master's degrees in civil and environmental engineering from New Mexico State University and has experience in aerospace, weapons, energy, and natural resources research and engineering. His focus in the past two decades has been in the development of innovative energy and water treatment and desalination technologies to improve infrastructure and natural resource security and resiliency, and supplement water supplies by the treatment and use of non-traditional water resources.

Groundwater Summit Conference Sessions

Date: Tuesday, December 8, 2020
Time: 10:00:00 AM
Education time: 0.33 hour

Groundwater and Energy

Groundwater Wells as Mini Pump Storage Facilities - Solving Multiple Problems Simultaneously

The use of groundwater wells as mini pumped storage facilities can alleviate several major problems facing California. California has thousands of wells that have been shut down due to chemical and natural contamination and, with the inauguration of the Sustainable Groundwater Management Act (SGMA), thousands of additional wells will be idled due to disuse. California also has an overabundance of solar generation, resulting in an oversupply of electricity in the afternoons and a dearth of electricity in the evenings.

Converting unused groundwater wells to operate as mini pumped storage involves adding a pressure control valve, variable frequency drive (VFD), electric controls, and small surface reservoir. The unused well can then be used to consume electricity in the solar overabundance afternoons by acting as a pump and generate electricity in the evening deficit when water is injected into the ground, providing additional revenue from a previously unused asset.

This presentation is a summary of the California Energy Commission Grant GFO19-306 which was used to demonstrate the practicality, efficiency, and economics of converting groundwater wells to mini pumped storage operations at the Willow Springs Water Bank.

Lon House

Ph.D., M.S., M.A.,B.S. Co-Director for Hydropower at U.C.Davis Renewable Energy Institute. Formerly chief utility planner for the California Public Utilities Commission. Owner of Water and Energy Consulting, providing consulting service to public utilities and private clients for 25 years.

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Groundwater Summit Conference Sessions

Date: Tuesday, December 8, 2020
Time: 10:00:00 AM
Education time: 0.33 hour

Groundwater and Energy

Geothermal Case Study - Blatchford DESS Energy Center #1

The Blatchford project in Edmonton, Alberta was a geothermal project that required the drilling of 570 boreholes. The project at the Blatchford field the former Edmonton municipal airport called for district heating and cooling for a mixed residential & commercial development using geothermal technology. The challenge was to meet and maintain a thermal conductivity of 1.6 Btu/hr/ft/F. This proved a challenge to develop a grout mixture that hit both the specification and was easy to pump in the field.

This presentation is a case study to describe the steps taken to meet the required specifications and complete the project on time and on budget.

Mario Brunet

Mario Brunet is the technical sales manager for Canada, WA, Wy & Mt. With a strong background in HDD he has fluidly entered the vertical drilling market as well and supports his customers with technical support both on and off the field. Having a penchant for renewable energy he has worked closely with various contractors on small to large geothermal projects across his territory.

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Groundwater Summit Conference Sessions

Date: Tuesday, December 8, 2020
Time: 10:00:00 AM
Education time: 0.33 hour

Groundwater Remediation

Promoting Combined Biological-Chemical Reactions for In Situ Groundwater Remediation

Bioremediation is predicated on stimulating specific microorganisms to attenuate groundwater contaminants. While the standard approach is to have the microbial metabolism directly interact with the contaminant, e.g. direct microbial reduction of TCE to ethene, very often it is faster and more effective to have secondary chemical reactions catalyzed by microbial biomass transform the contaminants of interest.

We have been investigating contaminants such as explosives, insensitive munitions (IM), and metals as impacted by secondary reactions promoted by microbial metabolism. Fe(III) and Mn(IV) reducing bacteria are particularly effective at promoting these reactions, in which reactive ferrous minerals reduce explosives and IM. Rates of RDX and 2,4-DNAN degradation mediated by reactive ferrous iron are on the order of minutes to hours, while direct cellular reduction is on the order of days. Cr(VI) reduction is also promoted by combined microbial-chemical reactions more readily than direct cellular reduction, and data will be presented from a field pilot test demonstrating that stimulated Fe(III) reduction reduced Cr(VI) from over 100mg/L to non-detect within 18 months, while simultaneously raising the pH to promote complete dechlorination. In addition, fermentative cells are often overlooked as "passive" microorganisms that only generate molecular hydrogen to cross feed Dehalococcoides like cells, but we demonstrate that combined fermentative-chemical reactions can stimulate explosives degradation, at rates much faster than direct microbial degradation processes. Finally, we will present data on combined photobiological-chemical reactions for RDX and DNAN degradation in groundwater, which is an approach being tested for recalcitrant compounds including PFAS. Data presented will include laboratory and field research, as well as column studies related to combined biological-chemical reactions.

Kevin Finneran

Associate Professor of Environmental Engineering and Earth Sciences

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Groundwater Summit Conference Sessions

Date: Tuesday, December 8, 2020
Time: 10:00:00 AM
Education time: 0.33 hour

Groundwater Remediation

Removal Of Hardness From Water Using Moringa Oleifera Seeds Extract Coupled With An Electrocoagulation Process

Water hardness has a significant impact on groundwater, especially in countries where this liquid is the main drinking water source. The reduction of water hardness from groundwater has been important to prevent corrosion and efficiencydecrease in the industrial processes and domestic pipes. In this study, we used Moringa oleifera (MO) seed extract coupled with electrocoagulation (EC) for the removal of hardness from groundwater. MO extract, a natural coagulant, was prepared with 1 g of MO seed flour in 200 mL of 56 g L-1 of non-iodized NaCl, stirring the solution during 30 min and then filtered. All the experiments were performed using distilled water containing 400 mg L-1 calcium carbonate to resembles the water hardness. Different volume percent (%v/v) of MO extract (0, 12.5 and 25) and current density (32.9 and 57.5 mA cm-2) were employed to remove the water hardness in a sample. On the other hand, the removal of water hardness by EC coupled with MO (EC-MO) extract were performed. The EC was performed using two electrode plates of iron, each one having a geometrical area of 27 cm-2, with a interelectrode separation of 1 cm, in a baker containing 500 mL of synthetic hard water solution, all experiments were performed by duplicate. The best removal of hardness (63%) was achieved using 12.5 mL of MO extract followed by EC at 57.5 mA cm-2 during electrolysis time of 30 minutes. At the end of EC-MO trial, 150 mL of sludge and 300 mL of foam were attained. EC trials without MO achieved poorer removal than that of EC-MO, producing higher amounts of flocs and spume.

Daniela Partida Joya

Chemical engineering graduate

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Groundwater Summit Conference Sessions

Date: Tuesday, December 8, 2020
Time: 10:00:00 AM
Education time: 0.33 hour

Groundwater Remediation

Polyethylene microplastics degradation through advanced oxidation processes.

In the last decade microplastics (MPs) presence in fresh- and ocean-water have been reported. However, recently MPs have been found in pristine environment as groundwater. Therefore, MPs degradation research have been increasing among the years, but despite the several reports, MPs degradation technologies development remained as an important information gap. For that, in the present work 1.1 g L-1 low-density polyethylene (LDPE) was degraded at different sulfuric acid (0, 3.8, 7.5, 11.3 M), peroxymonosulfate (0, 75, 150, 300 mM) and cobalt (0 and 0.8 mM) concentrations. Also, a temperature (80, 100, 120°C) and pressure (environmental and autogenic) variation was performed. The experiments were run for 6 h in which samples were took every 2 h. As not MPs degradation direct analytical methodology have been development, MPs degradation follow was performed by chemical oxygen demand (COD) measured in the solution, because it was expected that the MPs degraded was solubilized. The best experimental conditions were achieved at 11.3 M, 300 mM and 0.8 mM of sulfuric acid, peroxymonosulfate and cobalt concentrations, respectively, with a 120 ° C temperature and an autogenous pressure. At these conditions, 84.7 g L-1 COD in solution was achieved after 2 h, then at same experimental conditions, MPs degradation was performed for 6 h, in which it was shown a 22% COD decreased (i.e., 66.2 g L-1).

Daniel Medina Orendain

Chemical engineering graduate

Groundwater Summit Conference Sessions

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Groundwater Remediation

Better Access to Contaminants: The Application of Targeted Injection with Slurries

Remedial agents may be either liquids or granular solids. Both can be delivered to the subsurface through borings or wells, although the physical mechanisms differ. Liquids can penetrate the formation by flow through porous media. Solids, which commonly have particle size larger than the pore throats of the target media, can be forced into a newly created space if suspended in fluid that permits pressure to be exerted on the formation. If liquids are too viscous or soil pores too small, flow through the formation will not occur, and the liquid will be distributed according to the same set of physics that controls the placement of slurry.

Injecting slurries composed of solids and viscous liquids will create sheetlike structures within the formation when injected. The form of these sheets – extent, thickness, dip, etc. – depends upon the geotechnical properties of the formation as well as injection practice. EPA research projects in the early 1990s developed techniques to create more or less horizontal sheets from the bottom of direct push borings. Since then, those methods have been advanced and adapted to be used in other types of borings. These techniques have been practiced at hundreds of sites using a variety of reagents to address diverse contaminants.

The key to successful use of the sheetlike forms is to recognize and exploit geotechnical properties of the formation and changes in local hydrology that can be affected. Sheet networks composed of granular solids can act as 1) passive, diffusive sources of slowly soluble reagents, 2) permeable barriers composed of reactive media, and 3) engineered preferential pathways that are typically used to enhance injection or extraction of low-viscosity fluids, both gas and liquid. The presentation will provide practical, real-world examples from multiple sites illustrating distribution of a variety of reagents in different geologic settings.

Drew Baird

Drew has over 16 years' experience in remediation design and implementation, project and team management, field support services, and environmental consulting. He is currently Senior Geologist at FRx, where he leads the company's business development efforts and provides technical support on soil and groundwater remediation projects to clients in the US and Canada. Prior to joining FRx, Drew was the East Region Manager at REGENESIS, where he was responsible for managing sales and technical support associated with the company's remediation products in the southeastern US. He also led a team of 5 staff professionals covering 20 states from Louisiana to Maine. In addition, he served as REGENESIS' internal technical leader for remediation of fractured crystalline bedrock. Drew began his career in environmental services as a Geologist for Rogers & Callcott Environmental in Greenville, South Carolina. He is based in Charlotte, North Carolina and is a registered Professional Geologist in South Carolina.

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Groundwater Remediation

There's a Method to This Madness: Dynamic Groundwater Recirculation (DGR™)

The dual-domain model (DDM) advanced our ability to represent heterogeneities in transport models but it still simplified subsurface heterogeneity by lumping together a broad range of aquifer permeability. Insights gained from high resolution site characterization (HRSC) data have shown that the true range of permeability in the subsurface cannot be adequately represented by the DDM model. While sands and gravels acting as pure transport zones and silts and clays acting as pure storage zones is consistent with the DDM model, we know that intermediate zones (interbedded sands/silts/clays) are prevalent in natural depositions. Groundwater moves slowly through these zones but at rates faster than the velocity of diffusion making them neither pure transport nor pure storage zones. This important distinction offers an improved framework (three-compartment model) for developing more effective remedial systems.

Dynamic Groundwater Recirculation (DGR™) is an innovative remedial strategy that advances conventional P&T by leveraging the knowledge behind the three-compartment model. DGR™ creates dynamic subsurface flow conditions that enhance the natural flushing processes within an impacted aquifer. The underlying concept of a DGR™ system is simple— accelerate the influx of clean groundwater to drive contaminant mass out via enhanced advection and diffusion. DGR™ can be a highly effective remedial technology particularly when applied to sites with soluble contaminants, complex geology, and/or large diffuse plumes. DGR™ systems have helped restore aquifers at multiple sites impacted by a range of contaminants in diverse geologic settings.

Since DGR™ is a relatively new remedial technique, fundamental design and operating principles and practices have not yet been fully established. As such, a systematic approach for design and operation of an effective DGR™ system has been developed though our collective experience. Several examples are presented to illustrate the guiding principles and to highlight the computer-based tools that are applied

Marc Killingstad

Marc is currently the Director of the Hydrogeology Community of Practice for Arcadis North America (NA). Previously the technical lead for Remediation Hydraulics, Groundwater Modeling, and Conceptual Site Models Practice Areas within Arcadis NA. His primary duties are to provide high-level hydrogeologic support for groundwater remediation projects as well as to promote innovation and ensure technical consistency across Arcadis' technical network. Marc has extensive experience and knowledge in applying state-of-the-art concepts and principles of quantitative hydrogeology to support site investigation/remedial design work and to help resolve water supply issues/support water resources investigation work in a wide variety of geologic settings throughout the world.

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Groundwater Remediation

PFAS Site Characterization: Why We Need to Rethink Our Approach to Remedial Investigations

Remediating PFAS in groundwater presents numerous challenges due to the complexities and unknowns associated with this class of compounds. The wide variety of potential PFAS sources, limited knowledge of the physicochemical characteristics associated with these compounds, and the low concentration screening levels that continue to be established for PFAS and drive plume delineation have confounded site characterization efforts. Specific PFAS characteristics that drive uncertainties and site characterization challenges include high solubility; generally low, but also variable (depending on the PFAS compound class) adsorption affinity; high recalcitrance (terminal PFAS are not biodegradable); surfactant behavior (attracted to air-water interfaces); and susceptibility to electrostatic forces (due to ionic form in solution).

The typical industry-approach to site characterization for most contaminants (e.g., chlorinated volatile compounds [cVOCs], petroleum hydrocarbons, pesticides/herbicides) has been to identify the location of the release to the subsurface (source area) and then proceed with a groundwater sampling program that involves “stepping out” from the source area until reported contaminant concentrations are below the established regulatory criteria. However, considering the complex PFAS chemistry, potential for multiple sources, chemical persistence, and very low (part per trillion) screening concentrations and detection limits, the conditions governing site characterization differ greatly from those associated with other contaminants, necessitating a site characterization workflow that differs from the industry standard. A step out, “plume chasing” approach to plume delineation is not recommended for most PFAS sites primarily because it has high potential to result in the flawed association of PFAS impacts with other sources. Additionally, this can be cost prohibitive and require many rounds of investigation and forensic analysis if PFAS groundwater detections are not clearly associated with the source and pathway of the PFAS release being characterized.

Brian Hoye

Brian Hoye, PG, leads the Burns & McDonnell remediation team and specializes in applying new technologies and innovative approaches to emerging contaminant, environmental site investigation and remediation projects.

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Groundwater Remediation

New Perspectives on Horizontal Wells for Assessment and Remediation

Remediation technologies can sometimes be established, but are not prevalent, for many reasons; however, creative economics and process improvements can drive new applications and levels of acceptance. We submit that this is what is happening with the deployment of nested, segmented horizontal wells for site assessment and remediation, where each segment is plumbed to the surface. Decreasing costs and “greater systems flexibility,” are two factors that have brought about a resurgence of new designs in horizontal well systems as described.

The two central applications of the new designs are in discrete site assessment and subsequent treatment, as objectives warrant. In assessment, gas and water can be extracted providing additional accuracy to site conceptual models (CSMs). This is especially important for sites challenged by access issues (e.g., the built environment, natural obstacles, secure locations, property interferences). Further, the same operations have a remediation application as well, if contaminant gases or liquids are actively extracted; but as required, the well systems are also an important tool for the surgical deployment of treatment reagents.

Three case studies will be presented that illuminate the advantages of next generation horizontal well systems. For site assessment, we will show how access under the built environment can be achieved and radically alter the CSM. For site remediation, another case study will illustrate treatment advantages of the segmented well system for the discrete application of a chemical oxidant “as needed”, thus saving time and cost to site closure and offering sustainable remediation benefits. Lastly, a large site with extensive dissolved phase hydrocarbon contamination was effectively addressed with a combination of air sparging (AS) and soil vapor extraction (SVE) operations mediated by the well systems as described.

Erik Piatt

Development for 15 years. Under the direction of Mr. Piatt, EN Rx has developed multiple products for the environmental industry. The current flagship product is the VertebraeTM Segmented Horizontal Well System capable of providing a unique approach to site assessment and remediation. In addition, he developed the EN Rx Support Package (SP) to facilitate pumping and/or extraction protocols in these operations. Erik is a Service-Disabled Veteran having served in Desert Storm as a Sergeant in the United States Marine Corps and has completed most of the requirements for a B.S. in Chemical Engineering.

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Groundwater Remediation

From Auto Salvage to Animal Care Center: MTBE Remediation Leads to Site Redevelopment

Background AKRF, Inc. (AKRF) led the environmental investigation and remediation of former auto salvage yard located in Queens, New York (the Site) under the NYSDEC Brownfield Cleanup Program. The Site soil and groundwater was contaminated with petroleum-related compounds and MTBE [4,300 mg/L]. The source of soil contamination was remediated by excavation, and an in-situ groundwater treatment program was designed to remediate MTBE. AKRF completed a remedial alternatives analysis and treatability study to assess potential remedial actions that would be compatible with the redevelopment schedule and proposed future use as an Animal Shelter and Care Center.

Approach AKRF conducted a treatability study for in-situ chemical oxidation (ISCO) and aerobic bioremediation, using soil and groundwater collected from the Site. The ISCO treatability study tested two oxidants: sodium persulfate and modified Fenton's reagent (MFR). The treatability study results showed that MFR achieved the highest MTBE removal (99%). The aerobic bioremediation tested MTBE degradation using combinations of oxygen, nutrients and a microbial culture and showed that adding a microbial culture while maintaining aerobic conditions resulted in a 95% MTBE removal rate.

Results AKRF developed a two-phased treatment plan consisting of an initial MFR ISCO treatment event and long term biosparge treatment. The ISCO event was conducted in March 2020 during site excavation (after source removal) while a majority of the treatment area was accessible. One month post injection groundwater sampling results showed an approximately 84% reduction in MTBE concentrations in the source area well.

The biosparging system will be installed in Summer 2020 and will include 23 sparge wells to increase dissolved oxygen concentrations and promote bioremediation. Bioaugmentation and stimulation events will be conducted periodically by injecting potable water, nutrients and the microbial culture into the well network to promote rapid degradation.

Howard Nichols

I am an environmental engineer with 20 years of experience. My career focus has been on the in-situ remediation of soil and groundwater contamination.

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Groundwater Remediation

Harnessing the Power of Stannous for Trace Metal Remediation

Tin, generally considered non-toxic, has been used in alloys in dental fillings, in lead-free solder, as a food preservative, and most recently, to remediate trace metals from contaminated water sources. Tin is an attractive reagent for trace metal remediation because of its reductive power and the insoluble nature of the reduced tin species, tin dioxide (SnO_2). This insoluble byproduct can simply be filtered out after treatment. Stannous can be applied to remove hexavalent chromium from groundwater, passivate lead/copper in service lines, passivate iron in cooling systems, recover selenium and mercury from industrial wastewater, and remove and inhibit biofilm growth in cooling systems to reduce corrosion and risk of legionella outbreaks.

An innovative insitu stannous generator has been developed to harnesses the power of this highly effective chemical reagent; delivering a controlled dose of stannous reagent (Sn^{2+}) to water treatment applications. Generating a stannous reagent onsite is a far more cost-effective treatment solution compared to traditional alternatives since tin and electricity are the only consumables with this novel approach.

The stannous reagent is generated on demand using non-toxic, food-grade reagent precursor material. As a result, there is no shelf life of the reagent and operational costs are drastically reduced since shipping and handling of hazardous chemicals associated are entirely avoided. Traditional tin reagents such as stannous chloride ($SnCl_2$), are a caustic, unstable material requiring specialized handling.

The stannous reagent generator incorporates proprietary continuous, real-time monitoring of contaminant levels at the influent and effluent to ensure optimal treatment and compliance with regulatory and operational targets 24/7/365.

There are presently no similar applications that integrate a low life-time cost contaminant treatment system with real-time performance controls. Case studies from this novel in-situ stannous generator will be presented.

Vladimir Dozortsev

Dr. Vladimir Dozortsev is the development manager of trace metal instrumentation for Aqua Metrology Systems (AMS). Prior to joining AMS, Dr. Dozortsev held R&D management positions at several instrumentation companies in United States and abroad. During his more than 25 year career Dr. Dozortsev has invented voltammetric devices and sample handling accessories for automated trace metal analysis and process control. Dr. Dozortsev is author and co-author of several patents in the field of automated electroanalysis, advanced electroplating and electrosynthesis.

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Groundwater Remediation

Percarbonate decomposition using iron for organic contaminants degradation from groundwater.

The textile industry has a high environment pollution impact because important wastewater effluents with high dye concentrations are discharged. As the dye can be easily transported for water, this can be carrying out to the underground and contaminate the groundwater. As groundwater is one of the most used water sources, groundwater contamination technologies have been development. However, many of these technologies generate by-products which can be more toxic (e.g., chlorine and sulfate by-products). Therefore, in the present work sodium percarbonate (SPC) was used as an oxidant, which it has been reported low-toxic by-products and, it was decomposed using ferrous sulfate (Fe2+). SPC decomposition by Fe2+ (SPC/Fe2+ process) was used for the Acid Blue 9 (AB9) dye degradation, which was selected as target contaminant for his important industrial application. For AB9 discoloration experiments, different SPC ([SPC] =0, 5, 10, 20, 40, 60, 80 mM,) and Fe2+ ([Fe2+] = 0.4, 0.8, 1.6 mM) concentrations were used. The experiments were run for 30 minute and samples were took every 5 minutes. From the experimental results, it was determinate that a 45% AB9 discoloration was achieved after 30 minutes using SPC alone. However, when the SPC/Fe2+ process was used at 40 and 1.6 mM, SPC and Fe2+ concentrations, respectively, a 90% AB9 discoloration was achieved after 10 minutes.

Leonor Granados

Estudiante del Instituto Tecnológico de Tepic, de la carrera de Ing. Bioquímica

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Managed Aquifer Recharge

Introduction to Managed Aquifer Recharge: Principles and Industry Resources

Managed aquifer recharge (MAR) is the purposeful recharge of aquifers for subsequent recovery or environmental benefit.[1] A MAR project is basically comprised of a suitable aquifer for recharge, a predictable supply of source water of known quality, with infrastructure to move the water to where it can be placed into the aquifer, recharge and recovery facilities, and to recharge water for future beneficial uses, monitoring to measure the water quantities and quality changes, and maintenance to ensure the project operates effectively. MAR is conducted in a variety of ways, including but not limited to, using a well to inject and recover water (Aquifer Storage and Recovery - ASR), using wells to inject and recover water after it is stored and transported in the subsurface (Aquifer Storage Transfer and Recovery - ASTR), infiltration ponds and galleries to percolate water through ponds and buried trenches into the subsurface. Sources of water for MAR may include captured rainwater, stormwater, recycled water, stored reservoir water, and even in rare cases, other groundwater. Purposes of implementing MAR are largely driven by increasing water supply reliability and climate variability, and may include flood control, reducing urban water discharge, seawater intrusion protection and mitigation, saline water reduction, and enhancing environmental flows. MAR also comes in various scales, from distributed projects in urban settings as in low impact development including rainwater harvesting and swales and rain gardens to slow, spread and sink the rainfall encompassing 1000's to 10,000's of gallons per year, to large scale along stream recharge projects recharging and recovering 1,000's to 10,000s of acre-feet per year.

[1] Dillon, P., Pavelic, P., Page, D., Beringen, H., and J. Ward, 2009. Managed Aquifer Recharge: An Introduction. Waterline Report Series No. 13. National Water Commission, Australian Government.

Timothy Parker

Tim Parker is Principal Hydrogeologist, Parker Groundwater Management, California, specializing in groundwater resources management. His experience includes water policy analysis, groundwater management and monitoring, recharge & storage, and assessing potential impacts to groundwater from carbon sequestration and hydraulic fracturing. Tim serves GRA as Director and Legislative Chairman, CGC as Director, and National Ground Water Association as Scientist's and Engineers Division Director. He is principal writer on Sustainability from the Ground Up, Groundwater Management in California, a Framework (ACWA 2011), and co-authored the books Potential Groundwater Quality Impacts Resulting from Geologic Carbon Sequestration (WRF 2009), and California Groundwater Management (GRA 2005).

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Managed Aquifer Recharge

Aquifer Storage Recovery (ASR): How to Successfully Store Water Deep Underground

ASR is an important subset of Managed Aquifer Recharge (MAR). Water of suitable quality is stored deep underground through wells in fresh, brackish and saline aquifers, usually confined or semi-confined, and is recovered from the same wells when needed to meet an expanding array of currently about 30 water supply objectives. ASR is complementary to surface recharge and is often viable where surface recharge is infeasible. Understanding several unique elements in the design, construction, permitting and operation of ASR wells is important to achieving ASR success. Key design features include selection of appropriate materials of construction and storage intervals; control of cascading and air entrainment during aquifer recharge; wellhead facilities design to hold pressure and vent air; automated operation; adequate casing and borehole diameter. Well construction should provide the ability to recharge down the pump column and also down the casing annulus. Well permitting requirements vary state by state. Some provide for efficient ASR operations while others constrain such operations with annual limits on water storage volumes so that ASR wells cannot store more water during wet years for recovery during dry years. Effective operation usually requires initial formation and maintenance of a buffer zone, separating the stored water from the surrounding native groundwater. Once the buffer zone has been formed, it is usually possible to achieve close to 100% recovery of the water stored in each operating cycle, less any losses due to regional lateral flow or density stratification.

R David Pyne

David Pyne, P.E. is a civil engineer and is the president of ASR Systems LLC, Gainesville, FL and Knoxville TN. He pioneered the development of ASR technology since 1978 and has directed or contributed significantly to the development of almost half of the approximately 140 ASR wellfields in the USA plus others overseas. Since 1994 he has presented many ASR workshops nationwide and internationally for NGWA, ASCE, IAH, AGWT, World Bank and other organizations. He is the author of a technical book on ASR, “Aquifer Storage Recovery: A Guide to Groundwater Recharge Through Wells,” now in its second edition.

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Managed Aquifer Recharge

Provo Aquifer Storage and Recovery – From Planning to Pilot

In early 2019, Provo City (Utah) began a year-long study and selection of possible aquifer storage locations within their city limits. The study included both infiltration and injection sites with the end goal to be able to replenish groundwater storage and secure long term sustainable water supply. The candidate sites were selected and permits with state and federal agencies were obtained to commence pilot studies at each site. This talk will focus on the implementation of the pilot studies and what was learned in development of successful ASR final projects.

R Jeffrey Davis

Jeff is a Senior Hydrogeologist/Environmental Consultant with Barr Engineering in Salt Lake

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Managed Aquifer Recharge

Operations and Maintenance of Water Conserv II Ensures Sustainability of MAR and Irrigation in Central Florida

In 1986, the City of Orlando and Orange County implemented one of the largest water reclamation projects of its kind in North America. Integral to this project is the use of treated wastewater for agricultural irrigation and aquifer recharge. Aquifer recharge is accomplished through a system of rapid infiltration basins (RIBs) positioned over a sand ridge ranging in thickness from 30 to 200 feet. This sand body is positioned on top of the Hawthorn Formation comprised in this area primarily of semipermeable clay that separates the surficial sands from the underlying, upper portions of the Floridan Aquifer. The management and dispersal of reclaimed water flows for both agricultural irrigation and aquifer recharge are accomplished through a computerized control system tied to a comprehensive monitoring database. This system allows the operators to distribute reclaimed water to RIBs based on forecasting of the potential impact on localized and regional groundwater flow systems. Flexibility in applying recharge to select RIBs or groups of RIBs ensures that water is applied where it can most readily flow and ultimately recharge the Floridan Aquifer. This system combined with the reduced reliance on direct irrigation using water pumped from the aquifer further enhances the overall sustainability of the Floridan Aquifer. A comprehensive system of maintenance checks and activities ensures the distribution system and RIBs maintain maximum efficiency. This presentation will focus on the data usage in forecasting proper distribution of flows, monitoring of the impact of those flows on aquifer recharge, and the key maintenance activities that have allowed continuous operation for over 30 years.

Jason House

Jason House is a Senior Hydrogeologist with experience focused on hazardous waste site investigations and new water supply site investigations utilizing both invasive and non-invasive techniques. His expertise includes all aspects of design, installation, testing, and sampling of groundwater monitoring and pumping wells. Additionally, he has designed, constructed, calibrated, and verified numerous groundwater flow and contaminant transport models that were subsequently employed in hazardous waste investigations and remediation efforts. House is a Certified Geologist in the state of Maine, a Professional Geoscientist in Texas, a Professional Geologist in Pennsylvania, and a Registered Professional Geologist in Georgia.

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Managed Aquifer Recharge

Multiple Advantages Realized with Managed Aquifer Recharge in Massachusetts

Managed Aquifer Recharge (MAR) encompasses many techniques including management of nutrient loads and protection of discharge locations. On Cape Cod and in nearby Southeastern Massachusetts, nitrogen in groundwater is contributing to nutrient enrichment and algal growth in saltwater harbors and estuaries. A significant portion of the nitrogen load is from septic system effluent which has triggered the need for wastewater management planning. Primary among the solutions selected is implementation of wastewater collection, treatment, and MAR to dispose of treated wastewater. The MAR portion of the remedy requires analysis of the recharge capacity of potential locations, consideration of the large seasonal variability in wastewater flows and water table elevation, impacts to public water supply wells and changes in nutrient loads to ponds, harbors and estuaries. The MAR approach to dispose of treated effluent has multiple benefits including protection of water supply wells, significant reduction in nitrate discharged to groundwater and maintenance of water levels in groundwater fed ponds. This presentation will demonstrate how this approach is being implemented in several towns, including at least regional solutions involving multiple municipalities.

Robert Schreiber

Robert Schreiber is a registered professional engineer with more than 43 years of experience in water resource planning and computerized engineering analysis. He graduated from MIT's Civil Engineering Department where he focused on groundwater hydrology and water resource systems analysis. He is a senior technical leader specializing in modeling of groundwater flow and contaminant fate and transport, and serves as a company-wide resource at CDM Smith. Schreiber was recently ASCE's alternate representative to the Federal Advisory Committee on Water Information, and was co-chair of its Subcommittee on Ground Water, focusing on implementation of a National Ground-Water Monitoring Network.

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Managed Aquifer Recharge

Washington State Managed Aquifer Recharge Regulation

Washington State authorizes aquifer storage and recovery and distributed aquifer recharge (infiltration) projects through a patchwork of regulations, rules and guidance documents. Adding to the regulatory complexity is the hydrologic complexity created by the north-south trending Cascade Mountain range, which serves to divide the east and west sides of the State into separate hydrologic regimes. The predominance of precipitation falls on the westerns side; where the major population centers (Seattle, Tacoma, Olympia) and the State capital (Olympia) are. The arid eastern half of the state, with its lower population density, hosts an expanding agricultural production industry served by the Bureau of Reclamation's Columbia Basin Irrigation Project. The relatively small municipalities in eastern Washington depend on groundwater for municipal supply. However, the expanding agricultural processing operations, that are not serviced by Reclamation diverted Columbia River water, are competing for increasingly scarce groundwater resources. Aquifer recharge, storage and recovery presents an option by which to restore and maintain groundwater resources, and to support the growing agricultural production industry. However, implementation of aquifer recharge and recovery projects has been hampered by a disjointed regulatory framework.

Washington's authorization of Aquifer Storage and Recovery was initially regulated entirely through a water rights program based on access to a defined quantity of water for storage in aquifer, the aquifer volumes available for storage, and the capacity to recover the actual water stored from the aquifer. Protecting groundwater quality was not required. More recently, Washington enacted a Reclaimed Water Rule which established conditions for storage of wastewater treated to very high standards in groundwater, and rights to the entire quantity of reclaimed water stored in an aquifer. Implementation of the new Reclaimed Water Rule has proceeded slowly, with the actual conditions for injection, storage and recovery of reclaimed being developed through individual project implementation.

Llyn Doremus

Ms. Doremus works for the Washington Department Ecology's Water Quality Program on groundwater quality regulation. She brings to the water quality regulatory role experience with groundwater remediation at a Department of Energy cleanup site; consulting and expert testimony on contaminated site remediation, geotechnical stability, groundwater and stormwater management; and working to protect Tribal treaty water resources for salmon habitat restoration.

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Managed Aquifer Recharge

Evaluation of MAR Potential in the Edmonton-Calgary Corridor, Alberta, Canada

The Edmonton-Calgary Corridor (ECC) is a fast-growing industrial and population center in Alberta, Canada. Water stresses are growing due to economic growth and natural hydrologic variation, compounded by climate-change. Water use in the ECC is a mix of surface water and groundwater. Surface water comes mainly from Rocky Mountain glacier and snowpack-sustained rivers or secondary perennial streams fed by groundwater baseflow and summer runoff. Groundwater for irrigation and domestic use is sourced from a variety of bedrock and unconsolidated aquifers. The former includes Cretaceous to Paleogene fractured sandstones and coals. The latter included Neogene gravels in buried bedrock-incised valleys and Quaternary glacio-sedimentary complexes. Brackish to saline groundwater is also sourced from the Cretaceous formations during production of natural gas and coalbed methane in the ECC, though most co-produced water is disposed by injection to deep Devonian-carbonate saline aquifers without reuse. Surface-water storage sites for water supply and flood control are limited due to topography, high summer evaporation, and winter freeze-up. Yet managed aquifer recharge (MAR) is not deployed at any significant scale in the ECC despite theoretical attractiveness and abundant candidate aquifers. This analysis considers the regional hydrogeology, the hydro-economics, and the sociohydrology of the ECC to ask why this is so, and to understand where and under what conditions could MAR become attractive to water users. Using forecasts of growth in water demand and hydrological impacts of climate change, we also ask when these conditions may emerge in coming years, if not already present.

Kevin Parks

Dr. Kevin Parks is a Canadian hydrogeologist with 35 years of experience in the water-resource hydrogeology and petroleum hydrogeology of Western Canada. He was formerly Provincial Geologist of Alberta at the Alberta Geological Survey and was Chief Geologist at the Alberta Energy Regulator. He presently consults and does research on groundwater issues pertaining to climate-change adaptation, sustainable development, and energy issues. He leads the Groundwater Resources Working Group for the United Nations Expert Group on Resource Management.

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Managed Aquifer Recharge

Assessing and Monitoring Groundwater Quality Effects from Applying Managed Aquifer Recharge to Agriculture Fields

Managed Aquifer Recharge (MAR) operations in former or active (i.e. Flood MAR) agricultural fields can flush high concentrations of salinity, fertilizers and other contaminants from residual drainage water stored in the vadose zone. In addition, high concentrations of antecedent nitrate and/or soluble oxyanions (i.e. arsenic and selenium) can naturally occur in alluvial sediments within arid and semi-arid environments. Although long-term MAR operations will eventually flush the vadose zone and dilute residual constituents, an assessment of potential water quality effects from initial recharge operations is warranted to determine impacts to nearby water supply wells.

A baseline assessment of the potential solute loading from residual agricultural water can be made by estimating evapo-concentration and the penetration depth of drainage water from historic agricultural practices. Drilling/coring samples from within the proposed recharge areas can be tested for electrical conductivity (EC) at each sample depth, with intermittent samples sent for more extensive geochemical analyses. Typically, EC decreases with depth in the vadose zone, with some variability associated with sediment texture and parent material type.

Laboratory leaching experiments can be useful to assess the time needed to leach residual solutes from the vadose zone. Depending on the sediment type (i.e. coarse vs fine-grained), flushing may require anywhere from 2 to 15 pore volumes of recharge water. Nonetheless, because finer-grained sediment layers may transmit only a small fraction of the recharge water, the vadose zone water quality typically spikes within 5 pore volumes or less, and quickly improves to the recharge source water quality. Nested monitor well(s) with dual-chamber suction lysimeters at various depths can provide both vadose zone and groundwater quality data on how water quality improves during MAR operations.

Michael Milczarek

Michael Milczarek has more than 20 years of experience in developing, implementing, and managing vadose zone and hydrogeologic studies. He has actively managed or participated in more than 25 groundwater recharge and vadose zone characterization investigations. Milczarek earned a master's degree in Soil and Water Science from the University of Arizona.

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Groundwater Summit Conference Sessions

Date: Tuesday, December 8, 2020
Time: 10:00:00 AM
Education time: 0.33 hour

Managed Aquifer Recharge

Success Criteria for Aquifer Recharge in the Pacific Northwest, an Example from the Hanford Site

Once a region of abundant water, increasing water needs in the Pacific Northwest are not being met by new surface water storage infrastructure. This demand has facilitated increased interest in artificial recharge and storage of groundwater for municipal, agricultural, and environmental/ecological use. However, the success criteria for recharge site suitability are often overly broad, specific to one particular technology, or are applied incorrectly. Additionally, the demand for and availability of recharged and stored groundwater may not be reasonably accounted for or quantified. Indeed, the nomenclature assigned to specific types of recharge and storage methodologies can be ill-defined, causing confusion from the outset of a proposal or feasibility study. We use the Hanford Site, a closed Department of Energy facility in eastern Washington, as a case study for properly assessing aquifer recharge. We present the history of aquifer recharge investigations at Hanford and a high-level desktop suitability study for the site. Recharge suitability at Hanford is compared to a variety of metrics from an extensive study of recharge and storage projects within Washington and Oregon. Our work has shown that relatively straightforward, but robust and thorough, screening-level models for recharge suitability are necessary prior to complicated, and often expensive, site-specific modeling and investigations. As aquifer recharge projects increase in number, an empirical approach to site suitability may be feasible on a regional basis.

Sean Culkin

Sean Culkin is a consultant with over 10 years of experience working in the Western US. He is a California registered professional geologist and certified hydrogeologist, and has supported a wide range of water resource and groundwater remediation projects for public, industrial, and commercial clients. Mr. Culkin has extensive experience with analytical and numerical modeling applications, and has developed site-specific groundwater models to support both remediation system design and evaluation, as well as basin-wide models to support resource management planning for water supply and sustainability.

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Groundwater Summit Conference Sessions

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Managed Aquifer Recharge

Integrated Vadose Zone Characterization Methods To Optimize Managed Aquifer Recharge Site Selection

Groundwater recharge via surface spreading is the most cost-effective managed aquifer recharge (MAR) method if hydrogeologic conditions are favorable and land is available. There are many successful MAR projects in the western USA, but also a significant number of marginal projects and failures. Typical causes for marginal projects include failure to collect sufficient or appropriate data and/or a focus on characterizing groundwater conditions rather than the unsaturated (vadose) zone. Consequently, some regulatory agencies have adopted requirements for pilot projects prior to MAR project authorization. Based on our experience, pilot project requirements are generally unnecessary unless the hydrogeologic conditions are extremely complex.

We present a phased characterization approach designed to collect vadose zone property data which minimizes the potential for project failure and precludes expensive characterization of marginal sites. The phased approach consists of collecting rapid and high quality near-surface data to quantify potential infiltration rates and integrating exploratory drilling, geological logging, and multiple-scale in-situ vadose zone testing, as needed, to quantify deeper subsurface heterogeneities that may limit long-term recharge success. In example, where extensive fine-grained subsurface layers may exist to limit recharge, in-situ testing in instrumented exploratory boreholes can quantify vadose zone hydraulic properties in much the same way aquifer tests quantify saturated zone hydraulic properties. In-situ testing at multiple scales (i.e. intermediate - borehole permeameter, large-scale - atmospheric pressure wave) also provides a better understanding of subsurface heterogeneities and the efficacy of vadose zone sediments to transmit water. This approach maximizes field-based data collection, and we have successfully used it to characterize more than 40 proposed recharge projects. In addition, the phased approach is well suited for comparing relative recharge characteristics between proposed sites.

Michael Milczarek

Michael Milczarek has more than 20 years of experience in developing, implementing, and managing vadose zone and hydrogeologic studies. He has actively managed or participated in more than 25 groundwater recharge and vadose zone characterization investigations. Milczarek earned a master's degree in Soil and Water Science from the University of Arizona.

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Managed Aquifer Recharge

Bringing Injection Wells to Life, A Case Study

The Albert Robles Center (ARC) is an Advanced Water Treatment Facility (AWTF) recently constructed in Pico Rivera, California, by the Water Replenishment District of Southern California (WRD). The AWTF produces approximately 10,000-acre feet per year (up to 14.8 million gallons per day [MGD]) of advanced treated recycled water (ATW) for surface spreading to replenish groundwater basins in southern California. As part of the AWTF, three supplemental recharge wells were constructed on site to allow direct injection of up to 50% of the ATW into underlying aquifers. The intent of the wells is to provide an alternative storage option for the ATW when downstream storage facilities (spreading basins) are not available due to storm water capture or maintenance activities. The wells were installed in 2017, prior to the AWTF construction, with total depths to almost 800 feet below ground surface and two of the three wells utilize glass beads as the filter pack. Due to shallow groundwater contamination emanating from an upgradient property, it was determined injection would need to occur in the deeper Sunnyside Aquifer. After their installation in 2017, the wells were immediately developed utilizing traditional techniques for the installation of production wells and subsequently discovered not to have the desired minimum capacity of 5 MGD needed for the project. Due to AWTF construction activities, the wells have been idle for several years pending additional enhanced well development techniques. During the summer of 2020, WRD will be employing a Radial Injection Surge Development (RISD) method to advance develop these wells and determine if they can achieve the desired injection rates. This presentation will highlight the hydrogeologic conditions and issues observed during the well installation phase and the results of implementing an injection-well-specific development approach utilizing a low energy and high volume methodology.

Everett Ferguson

Everett Ferguson is a Senior Hydrogeologist at the Water Replenishment District of Southern California (WRD) working on projects related to aquifer replenishment, groundwater monitoring, recycled water reuse, seawater intrusion, modeling, and water quality. His primary role at is managing groundwater replenishment activities on behalf of the WRD. He has been actively engaged in the practice of geology and hydrogeology for over 20 years and holds a BS in Geology, an MBA, and is a California Professional Geologist and Certified Hydrogeologist.

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Managed Aquifer Recharge

Design of Efficient Wells for MAR

Design of wells used for Managed Aquifer Recharge (MAR) have many similarities to production wells, however, wells used for injection and extraction require additional design considerations for a successful long-term operation. Inefficient wells used for MAR are more expensive to own, operate and require more maintenance resulting in downtime. Materials used in construction need to be resistant to corrosion so that the corrosion products do not cause aquifer degradation due to physical clogging and chemical reaction with the aquifer materials and water in the aquifer. Glass bead filter pack can aid in well development and well efficiency, but as with any filter pack, selection of filter pack size must be optimized to ensure maximum efficiency and prevent to pumping of fines. Annular seals are an important of MAR wells as they are required to seal injection zones and withstand injection pressures that are not typically realized in pumping wells.

Thom Hanna

Thom Hanna, RPG, is employed as Technical Director Water Well Products/Hydrogeologist for Johnson Screens where he works in areas of well design, construction, rehabilitation and development. Before working for Johnson Screens he worked over 15 years as a hydrogeologist for several ground-water consulting firms including Hydrologic Consultants, Inc., Papadopulos Associates, and Golder Associates. His experiences include hydrogeologic investigations, design and optimization of well efficiencies for mine dewatering and water supply investigations.

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Groundwater Summit Conference Sessions

Date: Tuesday, December 8, 2020
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Education time: 0.33 hour

Geophysics for Groundwater Model Development and Monitoring

Mapping Aquifers and Water Quality Using a Towed Cart Time-Domain Electromagnetic Induction System

Mapping aquifers and water quality using electrical geophysical methods is well established but has been limited by slow data collection time in the field. Airborne methods have been developed to rapidly cover large areas. However, these methods do not produce the same lateral and vertical resolution as ground based methods and the cost to cover sites of a few hundred acres or less can be prohibitive. The AgTEM4™ is a cart based Time-Domain Electromagnetic Induction (TEM) exploration system that has been developed in Australia. The system can produce high resolution images of the subsurface to depths of 200 to 300 feet with field production rates of tens of linear miles per day. The system has been extensively used in Australia to:

- map sand and gravel aquifers,
- find freshwater zones in brackish aquifers,
- find productive fracture zones in hard rock aquifers, and
- identify zones of connection between surface water bodies and groundwater.

The system has been extensively used for agricultural irrigation studies, potable water supply, and to evaluate dams and levees. The system will be available for field testing in the US soon.

Towed sled and cart TEM systems have been used for tens of years but have not realized a large market due to slow speed of acquisition and/or cumbersome logistics. The AgTEM system uses a compact design with the practical ability to pass through farm gates and over rough terrain and can be towed by a small ATV. The system uses an automated inversion code to produce real time cross sections of the subsurface resistivity structure for in-field data quality control and field interpretation.

This presentation will show the key technical elements of the system and present several case histories that illustrate the data density and resolution they system can provide.

John Jansen

John has a B.S. in Geology and a M.S. and Ph.D. in Geological Sciences with an emphasis in hydrogeology and geophysics, all from the University of Wisconsin-Milwaukee. He is a Senior Geophysicist and Hydrogeologist for Collier Geophysics. John works on a wide variety of ground water projects around the country specializing in high capacity wells, aquifer recharge, and groundwater resource management. He received the NGWA Keith A Anderson Award in 2012 for service to NGWA and the groundwater industry and was the NGWA McEllhiney Distinguished Lecturer in Water Well Technology in 2013.

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Groundwater Summit Conference Sessions

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Education time: 0.33 hour

Geophysics for Groundwater Model Development and Monitoring

Neotectonics and electrical resistivity to explore for groundwater in the Eastern Cape Province, South Africa

Rocks of the Karoo Supergroup crop out over a large area of the Eastern Cape Province, South Africa's second largest province, while a small portion in the south hosts rocks of the Cape Supergroup. The Eastern Cape Province has 3 neotectonic zones (eastern, southern, and northern), and a fourth zone almost located in the central part, which is static and inactive. The eastern neotectonic zone is characterised by a surface uplift that was accompanied by springs and spas. The northern neotectonic zone is located near the border of the country of Lesotho within the Senqu seismotectonic belt and hosts seven hot springs. Topography induced stress may be the origin of observed numerous seismic epicenters in the northern neotectonic zone. In the south, the Kango fault was reactivated during the Quaternary. Vertical electrical sounding (VES) was conducted in the following areas: 1) the Fort Beaufort Fracture that was generated by the Amatole-Swaziland surface uplift, 2) around Port Alfred in the southern neotectonic zone, and 3) around Tabankulu almost at the junction of the northern and eastern neotectonic belts. Results from VES surveys indicate that the investigated subsurface near the Fort Beaufort fracture presents a four-layer model with HA curve type. In the southern neotectonic zone near Port Alfred, the VES depicted a three-layer model with A, K, and H curve types. In the area of Tabankulu, the subsurface is characterised by three-layer model with predominance of H curve type. It can be concluded that, because of neotectonics that implies creation of new fractures and reactivation of old ones, the three zones can be considered as potential targets for groundwater. Moreover, the Tabankulu area should be more investigated because of previously recorded groundwater higher discharge rates, presence of springs, and predominance of H curve types from VES.

Kakaba Madi

Dr K Madi obtained his BSc Hons (Geology) from the University of Lubumbashi (Democratic Republic of Congo) and his PhD (Geology) from the University of Fort Hare (Republic of South Africa). Dr Madi previously worked for the Ministry of Mines and Geology in the DRC-Zambia Copper Belt as exploration geologist. His PhD research was based on the application of neotectonics for the exploration of groundwater in the South African Karoo aquifers. He currently lectures geology at the University of Mpumalanga. He is member of the Geological Society of South Africa, and is registered with the South African Council for Natural Scientific Professions.

Groundwater Summit Conference Sessions

Date: Wednesday, December 9, 2020
Time: 10:00:00 AM
Education time: 0.33 hour

Groundwater Modeling

Building a Better Mousetrap: The Evolution of MODALL

Over the last 10 years, we have seen a shift towards weighing remedial endpoints against the constraints of the natural system within a mass flux framework and, consequently, pursuing remedial strategies that focus on the "mass that moves". While increasingly adopted at impacted sites, tools and techniques to evaluate/demonstrate remedy performance within a mass flux framework have been slow to develop and become widely accepted.

Historically, particle-tracking codes like MODPATH, in conjunction with a calibrated flow model (MODFLOW), were used to design and evaluate hydraulic-based remedial systems via simulated capture zones. Volumetric-tracking codes, such as MODALL, offer an improved approach by directly calculating the fraction of flow in each model grid cell that either originated from a given source or flows to a specified sink. MODALL has been modified over the last several years to include pore volume exchange and mass flux components to compute the ratio of plume (mass) captured, mass flux distribution (laterally and vertically), ratio of mass flux captured, and even estimate the time to cleanup based on pore volume flushing (i.e., complete mix theory), all of which further supports the design, evaluation, and optimization of hydraulic-based remedies.

Our updated version of MODALL merges the concepts of hydraulic capture with plume (mass) capture, contaminant mass flux, and pore volume flushing, providing a unique flux-informed tool that can support the design, evaluation, and optimization of hydraulic-based remedies. The case study presented demonstrates, through application to a large, complex Superfund site, the utility of this tool and how it can be applied to serve as (1) another line of evidence to assess remedy performance, (2) an effective way to visualize and communicate remedy performance/risks to stakeholders, (3) additional insight on plume behavior, and (4) a consistent, objective framework to assess the potential (flux-based) benefits of system optimization steps.

Marc Killingstad

Marc is currently the Director of the Hydrogeology Community of Practice for Arcadis North America (NA). Previously the technical lead for Remediation Hydraulics, Groundwater Modeling, and Conceptual Site Models Practice Areas within Arcadis NA. His primary duties are to provide high-level hydrogeologic support for groundwater remediation projects as well as to promote innovation and ensure technical consistency across Arcadis' technical network. Marc has extensive experience and knowledge in applying state-of-the-art concepts and principles of quantitative hydrogeology to support site investigation/remedial design work and to help resolve water supply issues/support water resources investigation work in a wide variety of geologic settings throughout the world.

Groundwater Summit Conference Sessions

Date: Wednesday, December 9, 2020
Time: 10:00:00 AM
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Groundwater Modeling

Groundwater Level Impacts in Philadelphia due to Green Stormwater Infrastructure Infiltration and Climate Change

More and more major U.S. cities are considering green stormwater infrastructure to reduce stormwater impacts from their separate and combined sewers. “Green stormwater infrastructure” (GSI) is a term used to refer to a number of strategies for handling storm precipitation at its source rather than after it has entered a sewer system, and it often relies heavily on systems designed to infiltrate stormwater. The Philadelphia Water Department’s (PWD) proposed Long Term Control Plan Update for Combined Sewer Overflow control calls for “greening” more than 30 percent of the city’s impervious cover in the coming years. Urban applications at the scale at which Philadelphia proposes are unusual, and one concern associated with urban GSI is the long-term impact of enhanced recharge on the groundwater table.

PWD has also evaluated projected climate change impacts to Philadelphia, and increased storm intensity coupled with rising sea levels will also impact groundwater levels. PWD has previously analyzed GSI contribution to rising groundwater table concerns using groundwater models. A three-dimensional groundwater model has now been applied to assess the long-term impacts on the water table elevation of the GSI program coupled with climate change impacts. At full implementation of PWD’s program, the groundwater table could eventually stabilize up to 1.5 meters higher than its current level in some areas of the city due to GSI implementation alone. With precipitation projected to increase due to climate change coupled with sea level rise impacts along the Delaware River shoreline, spatially variable additional increases in the groundwater table are likely and must be considered in light of basement flooding and increased sewer infiltration.

Mark Maimone

Dr. Maimone is a senior water resource management specialist with CDM Smith and holds professional engineering licenses in New York State and in the European Economic Community. He has a PhD. in Water Resource Planning from the University of Groningen, a M.S. in Environmental/Regional Planning and a B.S. in Civil Engineering from the University of Technology, Delft, The Netherlands. Dr. Maimone has 30 years experience in groundwater and surface water management, water quality studies, urban water management, and mathematical modeling of ground and surface water. He has over 50 publications on topics ranging from water resources, climate change, and decision support science. He has been instrumental in helping the Philadelphia Water Department develop and implement their Green City Clean Waters program, as well as to establish a climate change adaptation program.

Groundwater Summit Conference Sessions

Date: Wednesday, December 9, 2020
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Groundwater Modeling

A Practical Model for Contaminant Transport in Highly Heterogeneous Media and Back-Diffusion

Numerous studies including high resolution site characterization show that aquifers are highly heterogeneous with not only preferential plume transport but also multiple rates of back-diffusion from low permeability zones. When the variance of the hydraulic conductivity (natural log) is greater than one, preferential transport emerges in which most of the contaminant flux occurs within small zones that are difficult to fully characterize. Because subsurface heterogeneity occurs at multiple scales (pore to field), upscaling methods are necessary to develop governing equations that can capture effects of small-scale variability including heterogeneous advection in mobile zones and multiple rates of back-diffusion from heterogeneous immobile zones. Based on its assumptions, the standard deterministic advection-dispersion equation (ADE) may not be able to capture the slow decreases in concentration tails over time observed in monitoring wells and its use may underestimate the cleanup timeframe.

In order to address limitations in the standard deterministic ADE, various nonlocal stochastic models have been developed including moment equation, projector formalism, multi-rate mass-transfer (MRMT), fractional advection-dispersion equation (FADE), and continuous-time random walk (CTRW) models. Based on the CTRW framework, this paper presents an extended ADE model that can be applied to examine sorption and sequential degradation of PFAS, TCE, pesticides, and radionuclides in highly heterogeneous media with back-diffusion. Monte Carlo simulations of highly heterogeneous media using a stochastic ADE can require large numbers of single-simulation realizations with potentially long computer run times for each simulation. The semi-analytical stochastic model solutions in this paper are computationally efficient and can be easily applied to examine non-Fickian transport for practical MNA applications. This extended ADE has a small number of parameters (parsimonious) and can still simulate many key processes that are not captured by available models. Sensitivity analyses are presented to better understand its model parameters including the limited degradation rates in immobile zones.

Daniel Burnell

Dr. Burnell has over 30 years of experience in applying both groundwater flow and solute transport models to solve groundwater problems at over 100 sites throughout the U.S. This experience includes site characterization, interpretation, and modeling at sites throughout the U.S. Areas of expertise include risk-based transport modeling, flow model calibration, remedial design and optimization, applied statistics, and aquifer test analysis. He currently serves as Associate Editor for the leading international journal Groundwater. Dr. Burnell has written over 25 papers in refereed journals and conference proceedings and is an author of the book entitled Numerical Modeling of TCE Sequential Biodegradation in Groundwater. He has developed many practical modeling software codes and graphical user interfaces including the well-known semi-analytical transport modeling code AT-123D-AT.

For the past 10 years, he served as an adjunct professor of mathematics at Strayer University. Dr. Burnell is currently developing new practical modeling frameworks that extend the standard advection-dispersion equation (ADE) to better estimate cleanup timeframes for preferential transport and back-diffusion of contaminants in highly heterogeneous media that is now commonly observed at cleanup sites.

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Groundwater Modeling

Flux-Informed Optimization: The Next Generation of Applied Modeling

Environmental restoration has always been a judicious balance of three components: (1) site characterization; (2) remedy design/application; and (3) remedy O&M. Overemphasis placed on any of these components can often result in reduced remedy efficiency, increased scope, escalated life cycle costs, and, in extreme cases, complete remedy failure. When the balance is optimized, though, it will lead to more effective and sustainable outcomes. Over the last 10 years we have seen a shift towards weighing these three phases against the constraints of the natural system within a mass flux framework: pursuing a remedy that focuses on the "mass that moves". In practice, however, O&M/remedy optimization and decision making is often still largely subjectively driven rather than objectively through site-specific metrics.

Since groundwater remedies often incorporate remediation wells (for hydraulic control and/or mass removal), a practical and effective approach to remedy optimization was developed based on a new, flux-informed objective function that merges the hydraulic capture with predicted plume capture and mass flux. This approach is achieved through combining the flow allocation code MODALL with MODFLOW. MODALL uses a volumetric-tracking approach to quantify the fraction of flow moving through a model grid cell that is ultimately 'captured' by a specific pumping well. This code has been recently modified to compute the ratio of plume captured, mass flux distribution, and estimated time to cleanup based on pore volume flushing. These parameters can be optimized using a variety of numerical global optimization tools.

For this demonstration, we chose very fast simulated annealing, a probabilistic method for estimating the global optimum of a function to create a consistent, objective framework for effective design and operation of hydraulic-based remedies. Results from a simple case study demonstrate not only the utility of this method but also the potential that could be realized through further development.

Marc Killingstad

Marc is currently the Director of the Hydrogeology Community of Practice for Arcadis North America (NA). Previously the technical lead for Remediation Hydraulics, Groundwater Modeling, and Conceptual Site Models Practice Areas within Arcadis NA. His primary duties are to provide high-level hydrogeologic support for groundwater remediation projects as well as to promote innovation and ensure technical consistency across Arcadis' technical network. Marc has extensive experience and knowledge in applying state-of-the-art concepts and principles of quantitative hydrogeology to support site investigation/remedial design work and to help resolve water supply issues/support water resources investigation work in a wide variety of geologic settings throughout the world.

Extended Learning Sessions

Date: Wednesday, December 9, 2020
Time: 10:00:00 AM
Education time: 1.50 hour

Biology and Chemistry of In Situ Activated Carbon during Remediation Applications (with Dr. Erick Bandala)

Activated carbon is a reactive sorbent used to control contaminant transport in groundwater, both in situ and ex situ. While sorption, then (bio)degradation seems like a reasonable approach, an underlying problem to the technology is the lack of understanding of the complex chemical and biological reactions that are catalyzed once reactive carbon is introduced into aquifers. In many ways, the commercial applications have actually been guessing at follow-on (bio)degradation, without experimental evidence suggesting the materials sorbed do in fact biodegrade. The problem with this approach is significant because, in the absence of (bio)degradation, the materials may desorb at a later date, when it is unexpected, and the site is no longer being monitored. We will discuss past and current data associated with this topic, and how to use this technology most effectively. There is no marketing associated with this session, as neither presenter has a stake in vending this technology.

Kevin Finneran

Associate Professor of Environmental Engineering and Earth Sciences

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Extended Learning Sessions

Date: Wednesday, December 9, 2020
Time: 10:00:00 AM
Education time: 1.50 hour

New Recovery Wellfield Due-diligence and Design in Southern Arizona

Recovery of recharged water from a new well field first requires due-diligence to determine whether that new wellfield will meet production expectations. Colorado River water recharged at nearby MAR facilities will be recovered and transported to the project partners' respective delivery systems.

Drilling and testing of two exploratory boreholes aided evaluation of aquifer water quality and productivity and demonstrated the viability of three proposed recovery well sites. The assessment included lithologic logging, borehole magnetic resonance logging, and depth-specific water quality and pneumatic hydraulic conductivity testing, oxygen and hydrogen isotopic analysis, and aquifer test analysis.

Depth-specific sampling near an effluent-dependent river indicated that nitrate concentrations were somewhat elevated at depth, and that nitrate, 1,4-Dioxane, and PFAS were present at depth. Proximal recharged Colorado River water forms a lens that overlies groundwater affected by recharge of treated wastewater along the river and has displaced contaminants in the upper part of the aquifer.

Gary Burchard

Gary C. Burchard is a Registered Geologist employed by the Metropolitan Domestic Water Improvement District northwest of Tucson, Arizona. He has a master's degree in hydrology and water resources from the University of Arizona. During his sixteen years of professional practice, he has been a regulator, regulatee, and private consultant. As Metro Water's hydrogeologist, he currently specializes in water resources development and well installation and rehabilitation.

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Extended Learning Sessions

Date: Wednesday, December 9, 2020
Time: 10:00:00 AM
Education time: 1.50 hour

Improving the Value of Legacy Data Sets Using Modern Methods

As methods for data collection, storage, and analysis evolve, legacy datasets often become under-utilized or eliminated entirely from conceptual site models. This is not necessarily because the data are obsolete, but rather that there is a lack of understanding around how to integrate data of varying resolutions. In this workshop, we will be discussing the challenges associated with comparing modern and legacy data and provide examples where using modern methods have resulted in valuable insights being gained from legacy data sets

Robert Stuetzle

Robert J. Stuetzle is a Hydrogeologist working as a Remediation Specialist for The Dow Chemical Company in La Porte, Texas. He earned his M.A.Sc in Water Resources Engineering supervised by Dr. Beth Parker and Dr. John Cherry, from the University of Guelph in 2014 and a B.Sc. in Science and Business: Hydrogeology Specialization from the University of Waterloo in 2010. He is also a registered Professional Geoscientist (P.Geo.) in Ontario, Canada.

Mark Higgins

- B.S. in Geological Sciences from University of Connecticut - Recently served as the East Coast Regional Manager for FLUTe, specializing in: High-resolution downhole flow profiling; and Design and implementation of multi-level groundwater monitoring systems -Currently pursuing a Ph.D. in Geological Sciences at University of Connecticut

Groundwater Summit Conference Sessions

Date: Wednesday, December 9, 2020
Time: 2:30:00 PM
Education time: 1.00 hour

The Holy Grail – In Search of ASR Well Development Optimization

The construction of water supply wells includes rigorous development steps from swab and air-lift development to pump and surge development. Each step is critical to optimize well pumping operations. Since the widespread use of ASR is just out of infancy, there are no established development standards or methods that are utilized by the industry. How and when should an ASR well be developed to optimize recharge operations? What valuable information is derived from developing an ASR well?In this presentation, we will summarize the results and analysis on the development of ASR Wells. For the last 12 years, extensive testing and calculations (specific capacity, sand content, and injection/recovery rates) have been conducted on these ASR wells to verify the efficacy of methods employed to develop ASR wells. This body of knowledge and experience has facilitated the development of a methodology that establishes the following the duration of recharge operations, recharge rate, and estimation of the backwashing frequency and duration.

These topics will be discussed in this presentation: • Concept of recharge well development

• What operational steps are taken to develop the well for recharge operations

• How data is used to estimate recharge duration, backwashing duration, and frequency.

Gary Gin

Gary Michael Gin is the City Hydrologist for Phoenix, and is currently working on implementing and operating Phoenix's first Aquifer Storage and Recovery wellfield. He received a bachelor's degree in Geologic Science (with distinction) from Sonoma State University in California, and earned a master's degree in Geological Sciences from the University of Nevada, Las Vegas. Gin is a Registered Professional Geologist in Arizona and Texas with 14 years of experience in water resource development, management, and optimizing wellfield operations.

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Groundwater Summit Conference Sessions

Date: Wednesday, December 9, 2020
Time: 2:30:00 PM
Education time: 1.00 hour

Sustainable Groundwater Management: Examining How Our Metrics and Modeling Approaches Support Our Decision-Making

What does it mean for groundwater extraction to be sustainable? Can we ever make ethical use of a fossil aquifer? As water supply shortages and new regulations are increasingly challenging our management abilities, it may be time to rethink what groundwater protection means. In this workshop, we will begin with an introduction to the principles and metrics that define groundwater sustainability, and how we can use both simple and sophisticated models to aid in our decision making. We will examine the approaches to groundwater management taken by both Texas and California, discussing the strengths and weaknesses of each and how available scientific and policy tools aid or detract from our efforts. We will also share our own perceptions of the trade-offs between the present and future availability of groundwater and how they compare with society's goals. Participants in this interactive workshop will be encouraged to actively engage with the material, sharing their own perspectives and experiences.

Gretchen Miller

Gretchen Miller is an associate professor in the Zachry Department of Civil Engineering at Texas A&M University, where she teaches fluid mechanics, water resources engineering, and groundwater engineering. She completed her B.S. and M.S. degrees in geological engineering at the Missouri University of Science and Technology (formerly University of Missouri-Rolla), and her Ph.D. in civil and environmental engineering at the University of California, Berkeley. Her research focuses on groundwater resource sustainability, and includes studies of groundwater-ecosystem interactions, modeling across the groundwater-plant-atmosphere continuum, and managed aquifer recharge methods.

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Groundwater Summit Conference Sessions

Date: Wednesday, December 9, 2020
Time: 2:30:00 PM
Education time: 1.00 hour

Drones plus Geophysics: A Better Platform for Better Site Characterization

Small unmanned aerial systems (UAS), often referred as “drones”, are revolutionizing surface and subsurface geoscientific mapping. Drone magnetic surveys are replacing ground magnetic as well as a pilot-on-board aeromagnetic surveys due to several factors including obtaining a higher definition data volume, accessing to difficult terrain, and reducing the cost for each data point and risk to field staff. Drone enabled electromagnetic (EM) surveys are beginning to replace traditional ground EM surveys resulting in the acquisition of more data in less time.

You will also learn how drones are being used to improve the collection of geophysical data directly and indirectly as well as the improvements in the accuracy of the information extracted from geophysical surveys

Several recent case histories that demonstrate the use of drone based geophysical surveys for geologic and environmental applications including locating abandoned wells;buried pipe lines; and mapping geologic structures will be presented.

John Jansen

John has a B.S. in Geology and a M.S. and Ph.D. in Geological Sciences with an emphasis in hydrogeology and geophysics, all from the University of Wisconsin-Milwaukee. He is a Senior Geophysicist and Hydrogeologist for Collier Geophysics. John works on a wide variety of ground water projects around the country specializing in high capacity wells, aquifer recharge, and groundwater resource management. He received the NGWA Keith A Anderson Award in 2012 for service to NGWA and the groundwater industry and was the NGWA McEllhiney Distinguished Lecturer in Water Well Technology in 2013.

Ron Bell

Ron is a Senior Geophysicist for Collier Consulting in the Lakewood, CO office. Ron has broad experience in mining geophysics and has recently developed new drone based geophysical systems through his company, Aerobotic Geophysical Systems, LLC.

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Groundwater Summit Conference Sessions

Date: Thursday, December 10, 2020
Time: 10:00:00 AM
Education time: 0.33 hour

Sustainability and Planning

The environmental implication of the procurement of clean water in developing countries

Procuring potable water in developing nations is always challenging despite surface water being not in short supply because most surface waters are polluted. During the process of procurement, unintended environmental consequences may occur. Some of these environmental consequences include high energy consumption and waste generation, land subsidence and cross-contamination of waters in aquifers.

The procurement of potable water is not well coordinated, as observed in most parts of Nigeria. Due to the limited government water supply and the pollution of most surface waters, people have resorted to sourcing water from shallow wells or the few pipe-borne water supplied by the government. We examine the procurement of potable water supply in Ogun State, Nigeria and compare the environmental impact of the procurement process for public pipe-borne water supply from borehole wells and sachet water. We reviewed relevant literature and discuss our observation.

Maintenance culture is lacking in many developing countries as evident from the increasing number of broken and unkempt public water supply pipes in some parts of Nigeria. For the public water pumps, the vicinity of public water taps has become breeding grounds for diseases and sources of pollution to both surface water and groundwater. The environment around public water taps, due to ponding, are dumping grounds for waste plastic bags that plug drains, leading to street flooding, that create suitable environments for disease-causing vectors. To produce sachet water, the environmental impacts of sourcing this water include production machine and power generator noise, air pollution, increased litters and lowering of the groundwater table. We recommend that measures be taken to minimize wastage of water from public water taps and the use of renewable energy, such as solar energy, for powering the operations of water production companies in order to minimize the environmental implications of water procurement

Solomon Isiorho

Emeritus Professor of Geosciences

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Sustainability and Planning

Impact of land-use for urbanization on Groundwater YANGON

Impact of land-use for urbanization on Groundwater YANGON

Myint Thein*

Abstract

The City, Yangon, the former administrative capital of Myanmar, has more than five million people and is also the major commercial area.

Before 1990 the area of Rangoon (Yangon) was 347.36 Km 2. Over the last decades, definitely since 1990, significant changes in land use have occurred in Yangon. These are continuing present and future too. The impact of land-use for urbanization on Groundwater has a significant concern since the year 2000. Urban expansion in the impervious area due to urbanization results show decreased infiltration, affecting the groundwater storage and involved in groundwater quantity and quality in the discharge. The land-use changes the area with population increase, rise in food, and industrial activities have to reform the land-use patterns. The result of Groundwater has decreased the recharge, but discharge is an increase. In this study, a reference to the real picture of land use, the progressive urbanization of Yangon (Rangoon), stared in 1963. The ratio of the land area is 1:2 before 1988 and after 1988. Population about 1 million in 1960 become 5.2 Million in 2014. The drastic increase of built-up area and reduced green cover within the city boundary limit. The expansion of the new settlement areas will directly impact the decrease of groundwater parameters. Proper land-use planning and Groundwater management is key to the socioeconomic enlistment of a region. The recharge and discharge ratio became 1:2 in 1983 to 1:1 in 2014. The objectives of this study refer to the existing data and reports are the impact of land use for urbanization on Groundwater in present days and future Mega City Yangon.

Keywords: Urban, Groundwater, Land use, and cover change by urbanization, Yangon

Myint Thein

I am a freelance consultant (Groundwater & Wells Myanmar). Now I am here under Medicare period. But I am continuous writing articles related to Myanmar water sectors through journal and web pages. I got post Graduate (Groundwater Exploration) from Delft in 1988. Now 73 Years old.

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Sustainability and Planning

Flooding Impacts to Groundwater

Flooding has significantly affected many communities across large areas of the United States, impacting wells and groundwater. A history of recent flooding across the US will be reviewed. Impacts to groundwater and wells will highlight needs for greater attention to flood effects on the subsurface environment. Policy implications and enterprise support will be identified.

Charles Job

Chuck Job currently serves as Regulatory Affairs Manager for the National Ground Water Association and also addresses groundwater resource sustainability. He previously worked at the US Environmental Protection Agency for over 29 years, having served since 2000 as its Infrastructure Branch chief. At the Agency, Chuck worked with states to utilize a backlog of over $1 billion in infrastructure financial assistance and also led critical work in standards and risk management, underground injection control, regulatory coordination, and information collection. During part of his Agency tenure, Chuck worked in EPA Region V-Chicago in groundwater protection and water quality standards planning. Previously, Chuck worked as a planner for Ohio Department of Natural Resources and the Great Lakes Basin Commission and as a financial analyst for Fortune 500 companies. He also was a charter participant in the recent development of the National Ground Water Monitoring Network, a multi-agency-private sector data sharing project. Chuck earned master's degrees in Environmental Science (Miami University) and Applied Economics (University of Michigan). He holds credentials as a sustainability professional with both the US Green Building Council and the Institute for Sustainable Infrastructure.

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PFAS

Development of a Forensics Based Approach to Evaluating Impacts of PFAS Contamination in the Environment

Per- and polyfluoroalkyl substances (PFAS) are considered persistent organic pollutants (POPs). As such our expectation is that they remain in the environment for years and in many cases are not biodegradable. As the analysis and investigation of sites contaminated with PFAS continues to mature there is a growing interest in determining the contributions of different sources, to the overall contamination. Treatment technologies are also maturing in application and complexity of remedy options. The complexity and magnitude of the treatment can significantly impact costs for said treatment. Therefore, the development of analytical methodologies that can at least, start to delineate sources/contributions and assign responsibility can be a useful tool in environmental investigations.

There are several tools already available in the analytical chemist's toolbox, from the recognition of the presence of branched chain isomers and relative ratios, to the unique targeted compound profile presented by certain PFAS contamination sources. Add to that, the judicious use of results from the Total Oxidizable Precursor (TOP) Assay and a reasonably good foundation has been established upon which to build a forensics discipline. If we now add the results of accurate mass qTOF, applied to targets, known/unknowns and unknown/unknowns, we are progressing towards a robust forensic profiling application. In addition to the limited libraries that have been obtained, we will show how we have assembled libraries from known sources (AFFF and other products) that can be used like a fingerprint, to borrow terminology from our petroleum hydrocarbon colleagues.

The presentation will describe the process that we went through in deriving a forensics based approached to identifying PFAS source/contributions. We will demonstrate how the various techniques complement each other towards source identification and how the use of some relatively standard statistical programs improve the strength of the analytical results and solidify the conclusions drawn from the data.

Charles Neslund

Mr. Neslund is the Scientific Officer for Eurofins Lancaster Laboratories Environmental, LLC. He is responsible for identifying and framing trends in analytical testing and equipment. He assesses the technical needs of the environmental market and our clients in order to initiate new methodology for research and development. He was instrumental in the setup of the HRMS analytical section of the lab as well as in the setup of method EPA 537 for the testing of PFAS compounds in various matrices. He has over 33 years of laboratory experience. He has a B.S. in Chemistry from the University of Pittsburgh

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PFAS

Assessment and Responses to Per- and Polyfluoroalkyl Substances (PFAS) in Private Wells in Southeastern NM

Private well (PW) drinking water quality in New Mexico (NM) is unregulated making testing and treatment the well owner's responsibility. The NM Department of Health (NMDOH) Private Wells Program (PWP) works to reduce potentially harmful exposures. Addressing emerging contaminants, like per- and polyfluoroalkyl substances (PFAS), presents challenges requiring strategic partnerships and leveraging resources. Described here are PWP and partner responses to PFAS groundwater contamination affecting well owners in one NM community.

PFAS include 4,500+ man-made compounds, with a chain of carbon-fluorine (C-F) bonds and a functional group, with widespread use and environmental persistence. Little is known conclusively about health effects, especially short chain or novel chemical combinations.

Responding to a joint agency (NMDOH and NM Environment Department) press release confirming PFAS groundwater detection in SE NM, the NMDOH Epidemiology and Response Division's Environmental Health Epidemiology Bureau on-call service became the point of contact for water testing and health questions. As most area residents use private wells, the response included: water testing, outreach and education, and compiling other resources. The PWP maintains a PW water quality database and supported responses through data gathering and geographic information system (GIS)-based analysis. The PWP supported outreach through resource gathering and worked with partners in the Environmental Public Health Tracking Program to leverage funding and develop educational materials for residents and partners.

A recruitment strategy and well-water sampling plan was created and implemented, providing free PFAS water testing to PW users within a four-mile radius of known contamination. Risk communication strategies resulted in direct communication with 130 residents, distribution of 100 information packets, and online resource access 500+ times. Sampling resulted in laboratory analysis of 112 well water samples. Multiple program and agency partnerships were essential to the response and public health intervention efforts. Also described are challenges, lessons learned, and next steps.

Rose Galbraith

Rose Galbraith is the Private Wells Epidemiologist for New Mexico Department of Health (NMDOH), Epidemiology and Response Division, Environmental Health Epidemiology Bureau. Rose coordinates the NMDOH Private Wells Program. She received her bachelor's degree in Environmental Science from Oregon State University and a Master's of Public Health (MPH) from the University of New Mexico. Prior to receiving her MPH she worked in environmental chemistry and molecular biology.

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PFAS

Coupling ESS and Numerical Models to Maximize Mass Flux Reduction and Certainty of Performance

The accuracy of the Conceptual Site Model (CSM) is arguably the most important factor affecting the success or failure of remedial action at a contaminated groundwater site. Poorly understood and/or communicated CSMs, especially at complex sites, can lead to estimates of hydraulic conductivity and mass flux that can be off by three or more orders of magnitude. A geology-focused approach called Environmental Sequence Stratigraphy (ESS) has recently become recognized by USEPA as a best practice for constructing accurate, geologically constrained CSMs (Shultz et al., 2017). The objective of this presentation is to demonstrate how the use of ESS can substantially improve the accuracy of contaminant fate and transport models, making them an excellent tool to develop mass flux estimates and evaluate various remedial options for effectiveness.

The application of ESS to develop the CSM defined the stratigraphic framework underlying a chlorinated solvent plume site located in a Western US alluvial fan setting. This provided a substantially improved understanding of the hydraulic conductivity architecture – i.e., the subsurface “plumbing”, a fundamental element of a numerical groundwater model. The ESS-informed CSM was critical to identifying key source terms and transport parameters for the model (such as source mass distribution, sorption coefficients, degradation rates), that govern the fate and transport of the contaminants of concern because many of those parameters are greatly affected by the sediment grain size, sorting, and facies-controlled spatial variations of these parameters.

Models that are well-calibrated and based on an accurate CSM can be a powerful tool to simulate groundwater flow, as well as contaminant fate and transport. In this case study, an ESS-based model was used to simulate remedial options that target the preferential (high-permeability) pathways, and identify the option(s) that maximize the reduction in mass flux, concentrations, plume limits, time of remediation, and/or level of effort/cost.

Galen Kenoyer

Associate Hydrogeologist, Ph.D, PG, ENV SP Over 30 years as a hydrogeologist in environmental consulting, with a focus on groundwater/soil remediation, contaminant fate and transport modeling, and hydrogeologic investigations at a wide variety of sites across the US with a focus on California. CERCLA, RCRA, CEQA/NEPA, clean water development, permitting. Professional Geologist (California), Environmental Sustainability Professional, PhD from U of Wisconsin-Madison, MS and BS in Geology from U. of Maine.

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PFAS

Multiple Treatment Systems Combine To Enhance Removal Of PFAS From Impacted Water At Australian Site

Between approximately 2014 and 2018, the Australian Department of Defence conducted a comprehensive site investigation at RAAF Base Williamtown to determine the impacts from the historical use of aqueous film forming foam (AFFF), containing per- and poly-fluoroalkyl substances (PFAS) (including perfluorooctane sulfonate (PFOS), perfluorohexane sulfonic acid (PFHxS) and perfluorooctanoic acid (PFOA)).

Emerging Compounds Treatment Technologies (ECT2) were engaged to supply, install and operate water treatment systems at the base.

APPROACH

Regenerable ion exchange (IX) resin treatment systems were selected as the best solution for this application. Through the installation and use of a central regeneration system to service all three treatment systems on the site, minimal waste is generated, primarily because the spent resin is regenerated onsite. 3 systems were installed. One to manage stormwater leaving the base, One at the fire training area, and one at the Southern Area – a notoriously impacted stormwater retention pond.

Central Regeneration System

A single IX resin regeneration system was installed on the Williamtown base in 2018 to serve all three PFAS water treatment systems. This system ultra-concentrates the PFAS compounds into a small volume of solid waste.

RESULTS AND DISCUSSION

A multi-layered approach to addressing water contamination flowing from and beneath the property has provided the greatest opportunity to remove PFAS contamination quickly, while ensuring the aquifer is not adversely affected through excessive extraction and reinjection. The monitoring results to date demonstrate a substantial reduction in overall contamination in all extraction areas, including a 65 percent decrease in average PFAS concentration in the former FTA source area extraction wells.

CONCLUSIONS

Installing multiple IX water treatment systems, along with a central regeneration facility, has proven to be an effective, efficient, sustainable approach to removing PFAS and achieving consistent compliance with Australia's HBGVs and other project objectives.

Dale Wynkoop

Dale is the Director of Sales and Applications of ECT2 (Emerging Compounds Treatment Technologies). Dale has been in the industrial and municipal water treatment segments since 1993 and joined ECT2 in 2017 to lead the Business Development of ECT2's Synthetic Media technologies for the sustainable treatment of PFAS, 1,4-dioxane, and other emerging contaminants found in drinking water, ground water, surface water, waste water and other contaminated waters. Prior to joining ECT2, he was the Vice President of Veolia Water Technologies Standard Products Group where he was responsible for the sale, marketing, design, fabrication, installation and startup/commission of industrial water treatment products, including media filtration, ion exchange and reverse osmosis systems, throughout North America. He received his B.S. in Mechanical Engineering from The Ohio State University in 1988.

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PFAS

Source Removal Combined With Drinking Water Treatment On A PFAS-Contaminated Groundwater

The United States Air Force Civil Engineering Center (AFCEC) has conducted response activities to remove and remediate groundwater impacted by poly- and perfluoroalkyl substances (PFAS) at the former Pease Air Force Base in New Hampshire. AFCEC responded by contracting with Wood Group PLC to conduct a side-by-side pilot test in 2016, comparing the performance of Emerging Compound Treatment Technology's (ECT2) regenerable ion exchange (IX) resin and bituminous granular activated carbon (GAC).

Similar work was conducted in parallel on drinking water supply wells for the City of Portsmouth, New Hampshire which are also affected by contamination from the Pease Air Force Base. A side-by-side pilot test was conducted to compare the effectiveness of ECT2's single-use SORBIX LC1 IX resin versus Calgon's F400 GAC.

APPROACH

A 120 GPM system was installed to meet the primary project objective of producing treated water to below the 70 ng/l HAL. The full-scale IX resin system was installed in the spring of 2018. The PFAS removal system includes bag filters, GAC pretreatment, lead-lag regenerable IX resin vessels, and a regen recovery system.

For the drinking water system, the pilot skid was double sided, supporting both resin and GAC columns. Samples were routinely taken from the raw influent and from each column effluent, and analyses were performed for 23 PFAS compounds.

CONCLUSION

The full-scale FTA source area remediation system began operation in April 2018. The effluent quality from the IX resin system has been consistently non-detect for all 13 monitored PFAS compounds. No PFAS waste has been taken off site after 30 million gallons treated.

For the drinking water system, the IX resin substantially out-performed the GAC on all 12 PFAS that were present at detectable levels. The City selected LC1 IX resin for full-scale implementation to remove PFAS from the Haven water supply.

Patrick McKeown

After graduating from the University of Maine with a degree in Civil and Environmental Engineering, Mr. McKeown spent 4 years in the environmental engineering consulting field, focusing on wastewater and stormwater design. Mr. McKeown then joined Emerging Compounds Treatment Technologies (ECT2) as

an engineer on the design and fabrication team; building and operating systems treating PFAS contaminated water on project sites around the globe. Mr. McKeown earned his Professional Engineering license in Maine in the spring of 2019.

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PFAS

A Method for the Determination of Total Organic Fluorine and Its Correlation with PFAS Analysis

Estimates place the total possible number of per- and polyfluoroalkyl substances (PFAS) in excess of 4500 compounds. Considering that current targeted compound analyses offered by commercial labs may report as many as 40 or 50 specific compounds, it becomes apparent that we are only seeing a sliver of the possible total impact. Add to that the fact that most of the current analytical techniques only address the anionic forms of PFAS, ignoring cationic, zwitterionic and neutral forms, it seems that our total assessment of impact is significantly biased.

One of the analytical approaches that have been used extensively by our colleagues in Australia is the determination of Total Organic Fluorine (TOF). The application for determining TOF combines a total organohalogen analysis with ion chromatography and is therefore referred to as combustion ion chromatography. PFAS impacted samples are combusted and mineralized in a furnace at near 1100 C and the gaseous effluent is collected, and then chromatographed for fluoride ion by ion chromatography. An evaluation of the technique, advantages as well as pitfalls will be described, through comparison to the other analytical techniques described previously (targeted compound analysis and TOP assay) as well as qTOF analysis.

The presentation will describe the set-up and validation of the CIC analysis towards the determination of TOF. Results from spiked PFAS samples will be compared to the targeted compound results a part of the validation. PFAS impacted samples will be compared to the TOF results as well as TOP assay results from those same PFAS impacted samples. Lastly, some correlation with regard to the presence of polymeric PFAS, in the midst of the non-polymeric forms typically analyzed for will be made.

Charles Neslund

Mr. Neslund is the Scientific Officer for Eurofins Lancaster Laboratories Environmental, LLC. He is responsible for identifying and framing trends in analytical testing and equipment. He assesses the technical needs of the environmental market and our clients in order to initiate new methodology for research and development. He was instrumental in the setup of the HRMS analytical section of the lab as well as in the setup of method EPA 537 for the testing of PFAS compounds in various matrices. He has over 33 years of laboratory experience. He has a B.S. in Chemistry from the University of Pittsburgh

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PFAS

Novel adsorption media for PFAS removal from groundwater

There has been much research published on use of granular activated carbon (GAC) and anionic exchange resin for removal of PFAS from water. A novel granular specially-modified mineral media has recently been developed for removal of PFAS from groundwater and drinking water. This novel media comes in two types, based upon the PFAS contaminants of concern. The media exhibit high sorption kinetics and sorption capacity. The media has minimal impact from competitive adsorption of co-contaminates. This media can be used in filtration vessels to replace GAC or anionic exchange resin.

Small scale university research column experiments were performed. 1150 Liters of groundwater containing 50,000 ppt PFAS was pumped through 110 grams of FS200 media. Effluent did not reach > 70 ppt PFAS “breakthrough” until the media reached ~ 0.52 mg PFAS/g media loading. Comparatively, 270 liters of groundwater was pumped through 85 grams of re-agglomerated bituminous GAC. They observed > 70 ppt PFAS “breakthrough” when the media hit 0.16 mg PFAS/g media loading.

FS200 media demonstrated it can maintain high removal efficiency of PFOA and PFOS even in mixed waste streams containing 100 mg/l LNAPL, 1.0 mg/l BTEX or 1.0 mg/l TCE.

This data and adsorption isotherms between the novel media and many individual PFAS contaminants of concern will be presented.

James Olsta

Mr. Olsta is a Professional Engineer with 33 years experience in groundwater and remediation. He has a Master of Science degree in Environmental Engineering from the University of Illinois at Urbana-Champaign. He is a task group leader in ASTM Committee D18.

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Groundwater Monitoring

Leveraging an Evolving LNAPL Regulatory Framework to Facilitate Closure at a Hazardous Waste Site

The regulatory framework for managing hazardous waste sites contaminated by light nonaqueous phase liquids (LNAPL) often is established at the State level. In the context of site assessments and closure evaluations, the Commonwealth of Massachusetts recently updated its LNAPL regulations and guidance to emphasize site-specific mobility assessments instead of measured apparent LNAPL thickness as a metric for the feasibility of site closure. The study area has a history of LNAPL monitoring and conventional recovery efforts without success in developing an exit strategy due to large apparent LNAPL thicknesses routinely measured in monitoring wells. Updates to the Massachusetts LNAPL guidance provided the opportunity to utilize science-based tools to conduct LNAPL transmissivity testing to support the conceptual site model, and to develop a defensible line of evidence supporting plume stability and site closure. This case study presents the iterative approach to selecting an appropriate LNAPL field testing methodology based on site conditions and highlights the value of leveraging hydrogeology expertise with site-specific mobility assessments to achieve regulatory milestones at petroleum waste sites as the regulatory framework becomes more technically focused. Further, establishing strong collaboration between groundwater scientists and clients in developing a strong technical approach to site investigations has the potential to save efforts and resources while maintaining an adequate protection of human health and the environment.

Brent Aigler

Brent Aigler is a licensed Professional Geologist with Woodard & Curran, specializing in hydrogeologic modeling, geospatial analysis, data visualization, and site characterization. His responsibilities include planning and implementing field investigations programs at sites impacted by petroleum/LNAPL, VOCs, 1,4-Dioxane, and PFAS. He has served as the project geologist for groundwater modeling programs in New England and California and provides data analysis/data visualization support for state and federal remediation sites.

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Groundwater Monitoring

Adaptive Management of Land Subsidence by Monitoring at High Temporal Frequencies in the Chino Basin, CA

The Chino Basin, located in southern California, is a large adjudicated groundwater basin with storage exceeding 10 million acre-feet. The Chino Basin Watermaster is the Court-appointed agency responsible for management of the basin pursuant to the adjudication, Court-approved management agreements, and other regulatory requirements.

The Chino Basin has a long history of groundwater development dating back to the early 1900s. As a result, piezometric heads have declined during the past century – in some areas by more than 200 feet. Declines of this magnitude typically cause irreversible aquifer-system compaction, which in turn results in land subsidence. In some areas, land subsidence has been differential and accompanied by ground fissuring, which damaged existing infrastructure and poses concerns for new and existing development.

The Watermaster recognizes that land subsidence and ground fissuring should be minimized to the extent possible and implements an adaptive Subsidence Management Plan that includes monitoring, testing, and annual reporting. The monitoring program employs InSAR and ground-level surveying to monitor ground motion, and piezometers and extensometers to monitor and establish relationships between groundwater pumping, piezometric levels, and aquifer-system deformation. A key to the success of the monitoring program has been the high temporal frequencies of measurement.

The monitoring and testing program have been successful at identifying piezometric thresholds that, if crossed, cause aquifer-system compaction and land subsidence. In SGMA terminology, these thresholds are termed “Minimum Thresholds.” The monitoring program is identifying piezometric thresholds in (i) areas of “new subsidence” where recent pumping and head declines have caused aquifer-system compaction and (ii) areas of “legacy subsidence” where thick, slow-draining aquitards are permanently compacting in response to historical head declines. Continued monitoring at high temporal frequencies will improve understanding of the piezometric thresholds, which can result in the adaptation of the Subsidence Management Plan.

Mike Blazevic

Mike Blazevic is a Hydrogeologist at Wildermuth Environmental, Inc. In Lake Forest, CA. He has over 10 years of professional experience in the geological and hydrogeological sciences. He received a B.S. in Geological Sciences from California State University, Fullerton in 2005 and an M.S. in Geological Sciences from California State University, Fullerton in 2008. His technical expertise includes aquifer sedimentology, stratigraphy, and the application of Geographic Information Systems (GIS) to complex hydrological and hydrogeological problems. He has worked throughout Southern and Central California,

drilling and testing water supply and monitoring wells; collecting and interpreting basin-wide geologic, hydrogeologic, and hydrologic data.

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Groundwater Monitoring

The Hydrology Program at the Waste Isolation Pilot Plant: Groundwater Monitoring and Investigation

The Waste Isolation Pilot Plant (WIPP) is a Department of Energy deep geologic repository for the permanent disposal of defense-related transuranic waste located in southeast New Mexico. The WIPP hydrology program employs water quality monitoring to establish background water quality values and variability across the Site, and provide indications of possible impacts from surrounding industry; long-term monitoring that provides continuous groundwater-level and precipitation data to better understand regional and long-term trends; and other investigative efforts including well testing and analysis that contribute to characterization of the hydrology surrounding WIPP and add to our ability to accurately identify and investigate groundwater-related problems.

Although the underlying objectives for the WIPP facility have remained constant over the past twenty years, the technical demands required to support the operational integrity of the facility have changed with advancements in methods and technology. The hydrology monitoring program has identified emerging investigative techniques that will improve the state of knowledge of the hydrology surrounding WIPP to better understand the impact of external factors on the WIPP facility. This presentation summarizes some of the successes, difficulties encountered, and lessons learned for a hydrology monitoring program located in the Permian Basin. We will discuss the current monitoring techniques and investigations we employ in our monitoring network, including groundwater quality monitoring, high-frequency pressure collection, and remote telemetry, and look at the program advancements currently taking place and Sandia National Laboratories plans for the future.

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525. This research is funded by WIPP programs administered by the Office of Environmental Management (EM) of the U.S. Department of Energy. This is Sandia publication SAND2020-5039A

Amelia Hayes

Amelia Hayes grew up in the state of New Mexico. She graduated from New Mexico State University in 2013 with a B.S. in Geology. She went on to Colorado School of Mines to earn her M.S. in Hydology in 2017. Amelia returned to her home state and began her career as a Hydrologist with Sandia National Laboratories in Carlsbad, NM involved in monitoring and investigating the geohydrology relevant to the Waste Isolation Pilot Plant.

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Groundwater Monitoring

Anomalous Declines in Groundwater Radon and Aquifer Transmissivity Precursory to 2008 Mw 5.4 Earthquake

Monitoring precursory declines in groundwater radon and aquifer transmissivity at the Antung hot spring is a useful means of warning local disastrous earthquakes. Anomalous declines in both radon concentration and aquifer transmissivity were recorded at Antung in eastern Taiwan prior to the 2008 Mw 5.4 Antung earthquake. The concentration of groundwater radon decreased from a median value (750 pCi/L) to a minimum of 480 pCi/L prior to the 2008 Antung earthquake. The aquifer transmissivity decreased from a median value (0.0349 m2/min) to a minimum of 0.0214 m2/min prior to the 2008 earthquake. A small fractured aquifer such as the Antung andesitic spring is a suitable geological site to detect precursory declines in groundwater radon and aquifer transmissivity prior to local large earthquakes.

Ming Ching Kuo

T. Kuo is a research fellow with NCKU Research and Development Foundation, Tainan, Taiwan.

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Beyond PFAS: Other Contaminants of Emerging Concern

TCE, DX & PFAS: Tackling Contaminants at the Tucson International Airport Remediation Project

Tucson Water has operated the TARP remediation wellfields and water treatment plant to remove trichloroethene and other volatile organic chemicals from groundwater as part of the Tucson International Airport Area Federal Superfund site remediation since September of 1994. The treated water is used as a source for Tucson's potable water distribution system. In 2002, 1,4-dioxane was first detected in TARP groundwater due to technological advances in laboratory analysis methods. The original treatment process at the TARP WTP, packed column aeration, is ineffective for 1,4-dioxane removal. The only proven municipal-scale water treatment process for 1,4-dioxane is advanced oxidation. Tucson Water initially managed 1,4-dioxane concentrations by blending TARP treated water with other uncontaminated potable water sources while studying and testing the effectiveness of advanced oxidation processes for potential application at TARP. EPA published a toxicological review in 2010 and subsequently reduced the Drinking Water Health Advisory levels in 2011 for 1,4-dioxane by nearly an order of magnitude.

With direction from Tucson's Mayor and City Council, Tucson Water completed design, construction, and start-up of a new AOP facility for the TARP WTP in 2014. The treatment process includes a UV/hydrogen peroxide AOP followed by granular activated carbon for peroxide quenching. Since startup of the AOP facility in 2014, blending has no longer been needed for TARP treated water to meet EPA's 1,4-dioxane Drinking Water HA levels. The AOP Facility has been in operation for over five years.

Having solved the TCE and 1,4-dioxane challenges, Tucson Water is now faced with its third water quality challenge at TARP due to PFAS levels, along with ongoing operation, maintenance, and replacement challenges for aging wells. This presentation reviews TARP's history and details its challenges and evolving innovative solutions, including both short-term and long-term mitigation efforts underway for PFA and related contaminants.

Jeff Biggs

Jeff has over 36 years of experience in the water profession. Jeff's experience includes water treatment and quality, water resource management, public outreach, intergovernmental affairs, and research. Jeff also has extensive management experience and is a member of numerous Boards and committees. Jeff is an avid golfer and is the Chair of the Southern Arizona Golf Classic, which in thirteen years has raised over $360,000 for Water for People. Water for People is an international 501(c)(3) nonprofit humanitarian organization that focus on long-lasting, safe drinking water and improved sanitation for developing countries.

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Beyond PFAS: Other Contaminants of Emerging Concern

Pesticides and Pesticide Degradates in Groundwater from Public-Supply Wells across the United States

During 2013-18, the U.S. Geological Survey's National Water-Quality Assessment (NAWQA) Project analyzed raw samples from 1,204 public-supply wells in 23 Principal Aquifers for 109 pesticides and 116 degradates. Our objectives were to: 1) improve characterization of the occurrence of pesticide compounds in groundwater used nationally for public drinking-water supply by expanding the target list of degradates and 2) provide human-health context for the occurrence of degradates without benchmarks by including them in a process for screening concentrations of pesticide compounds. Among the 41% of wells where pesticide compounds were detected, nearly two-thirds had mixtures of 2 or more compounds and three-quarters had one or more degradates detected. The 10 most commonly detected compounds were 4 herbicides (atrazine, hexazinone, prometon, and tebuthiuron), 5 atrazine degradates, and 1 metolachlor degradate. To screen for potential human-health concerns, benchmark quotients (BQs) were calculated for compounds with human-health benchmarks by dividing concentrations by the benchmark; a BQ > 0.1 indicated the concentration was approaching a level of potential concern (>10% of the benchmark). BQs were summed for multiple compounds detected at an individual well. For degradates without benchmarks, BQs were first estimated by assuming equimolar toxicity to the most toxic parent; final analysis excluded degradates with likely overestimated toxicity. Compared with considering only compounds with benchmarks, adding degradates without benchmarks to screening resulted in small increases in the number of individual compounds with BQ > 0.1, from 4 (at 5 wells) to 6 (at 8 wells). Similarly, the number of wells with compound mixtures having a sum of BQs > 0.1 rose slightly, from 5 (0.4%) to 19 (1.6%). No compounds or mixtures had BQ > 1. These results indicate that degradates without benchmarks generally are unlikely to substantially increase human-health concerns associated with the occurrence of pesticide compounds in groundwater used for public supply.

Laura Bexfield

Laura Bexfield has been a hydrologist in the New Mexico Water Science Center of the U.S. Geological Survey since 1993, most recently contributing to the Groundwater Status and Trends Team of the National Water-Quality Assessment project. During her 27 years with the USGS, she has been involved with multiple projects characterizing groundwater quality across the Southwest and the Nation.

Groundwater Summit Conference Sessions

Date: Thursday, December 10, 2020
Time: 1:40:00 PM
Education time: 0.33 hour

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Transport of Polystyrene and Polyethylene Fine Micro & Nano-Plastic Granules in Glacial Till at Esmond, IL Well Field

It is widely understood that minuscule plastic particles from primary and secondary sources have infiltrated much of Earth's natural water systems. Microplastics have been found in the ocean, rivers, and lakes worldwide but now have even been reported in a few groundwater systems. This problematic phenomenon is no stranger to Illinois' water systems. Recent research has indicated many plastic micro-particles carry toxic contaminants, and even unintentional intake of clean micro plastic can cause long term harm to internal tissues. In order to mitigate the polluting and digestion of these tiny plastic pollutants, we need to better understand how they move in natural environments. The hypothesis of this study is that micro to nano sized plastic particles can migrate through a coarse-sandy aquifer and that the size and type of plastic will influence the transport. In order to test this hypothesis we will be running several controlled two-well forced gradient pumping tests at a research designated well field situated in the Henry formation at Esmond, Illinois. The findings from these experiments will help set a critical foundation for how micro plastics may be moving through and changing our modern drinking water systems.

Alyssa Graveline

In 2019 Graveline graduated from Smith college with a BA. During her time at Smith she completed four semesters of individual research and two semesters of collaborative research within the geosciences. While there she created and presented four different poster presentations at the annual GSA. She also worked part time as a geologic research assistant and department assistant. Currently Graveline is a Masters student at NIU, where she worked as a teaching assistant for 1 full academic year before obtaining a part time position at the Chicago EPA.

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Synthetic Media System Cleans Trichloroethylene Impacted Soil Vapor and Groundwater

Following site assessment and monitoring activities focused on defining the vertical and lateral extent of chlorinated volatile organic compound (cVOC) contamination in soil and groundwater, a feasibility assessment to evaluate remedial technologies was developed. Evaluations were performed with consideration of site-specific access issues, long-term operation and maintenance costs and complexities, and permitting nuances. Soil Vapor Extraction (SVE) and Dual Phase Extraction (DPE), coupled with regenerable synthetic media, was ultimately selected as the most suitable technology for the application.

Following successful demonstration at the pilot-scale, well installation and design studies were undertaken. Emerging Compounds Treatment Technologies (ECT2) fabricated skidded equipment allowing for rapid deployment, installation and startup. The system is centered around two treatment trains; 1) a groundwater treatment skid containing three resin vessels operated in a lead/lag/standby configuration, and 2) a vapor treatment skid containing two resin vessels operated in a lead/lag configuration with a temporary vapor activated carbon unit used as the lag vessel during vapor media regenerations.

In all vapor system regenerations performed to date, visible non-aqueous phase liquid (NAPL) has been observed and collected in the first two hours, accounting for approximately 97 percent of the VOC mass loaded. This demonstrates rapid removal of loaded mass and further confirms successful regeneration of the media. Condensate generated during the vapor regenerations is recirculated to the influent groundwater equalization tank and treated through the groundwater skid, while NAPL is collected in a 55-gallon drum and sent off for hazardous waste disposal.

The synthetic media systems have produced treatment results well within permitted guidelines, while profoundly reducing the amount of hazardous waste generated. Results of this application demonstrate the long-term benefits of synthetic media, with reoccurring operations costs being substantially less than GAC because of the in-vessel media regeneration and the associated dramatic reduction in hazardous waste generation and disposal.

Steven Woodard

Steve is the President and co-founder of ECT (Emerging Compounds Treatment Technologies). ECT is an equipment company focused on developing and commercializing treatment technologies for emerging, difficult-to-treat contaminants. Steve's focus is currently on commercializing Synthetic Media technologies for the sustainable treatment of PFAS, 1,4-dioxane, and other emerging contaminants. He received his Ph.D. in Environmental Engineering from Purdue University in 1992.