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Vision: The AZ Water Association is the recognized advocate for enhancing Arizona’s water and environmental resources.

Mission: Provide value to our membership and the public through education, training, and public awareness regarding enhancement of Arizona’s water and environmental resources.
### CALENDAR OF EVENTS | April ~ September 2013

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I don’t know if this is a trend, but February 2013 was a month of lower than normal temperatures, including a day or two of severe cold (18 degrees F) and even snow... all happening in the Tucson region! Many water systems receive unexpected freeze damage when it gets this cold and damages can be costly. It was even worse two years ago (March 2011), we experienced enormous problems with freeze damage to many water systems. The local natural gas company was also impacted, where a large majority of customers were without gas service for several days before the issues with freezing were resolved.

Not as close to home, was the recent Superstorm Sandy, which occurred during the week of October 29, 2012. Interestingly, AWWA recently issued a report "Superstorm Sandy After-Action Report", which was sponsored by the Wastewater / Water Agency Response Network (WARN). The effects of Superstorm Sandy are still being experienced; lack of heating, lack of re-building, etc. Also during this event several major wastewater systems experienced sewer spills, due to lack of power. Water systems too without power, experienced many customers without water service. Even though many of these systems had back-up power generators, getting fuel for, or to the generators ended up a huge problem. Natural gas lines were shut off due to safety concerns. For those generators using diesel fuel, replenishment delivery would be denied and full time power would be a temporary luxury. Since Arizona is a WARN state, the candid discussion in this report identified both successes and areas for improvement that were objective and positive in their intent, which may someday impact us in this state. The biggest challenges identified in the report were the lack of the water and wastewater facilities to establish their facilities as high value to the federal and local authorities; to the degree that power was a priority. The other challenges identified were coordination and communication related. The bottom line of the report demonstrates, in my opinion, the need for utilities to establish a relationship with first response agencies and authorities NOW! Getting a facility established as high priority during a crisis, could prove futile without a pre-planning effort. The Arizona WARN program was started by AZ Water’s Security committee, chaired initially by Jean Voekel from Pima County RWRD and championed by the current chair, Steve Shepard from Metro Water District.

Since this is my last President’s Message before Teresa Smith-DeHesus takes the helm on June 1, there are a few other AZ Water leaders I would like to recognize. Working with Mark Stratton over the last 19 years, we have had the customary issues and challenges that typically face Arizona Water.
IS WASTEWATER REUSE IN YOUR PLANT'S FUTURE?

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For starters I am happy to tell you that Jim Chafee will be joining us at our annual conference as the AWWA National Representative. Jim will become President of AWWA at the June board meeting at ACE 13. Jim will be joined by his wife Jan, and is looking forward to meeting as many of you as he can. I hope you will be able to attend the 86th AZ Water Annual Conference & Exhibition as well as AWWA's ACE 13. Both will be great events.

AWWA Winter Board Meeting News

The AWWA winter Board meeting was held in Nashville in January. John Donahue was elected President-Elect and will become AWWA President in 2014. AZ Water supported Mike Simpson, a familiar face to many of you, in his run for Vice President. I’m happy to report Mike was elected. He will take office in June along with John Altman, Doug Brinkman and Jeff Nash. Congratulations to Mike and all the newly elected officers.

Here is some additional great news. AZ Water members received exceptional recognition from AWWA in several ways. First, Paul Westerhoff and Chao-An Chiu of Arizona State University received the AWWA Publications Award for an article they published in the July 2012 Journal titled “GAC Removal of Organic Nitrogen and Other DBP Precursors”. Second, former AZ Water President, Andy Richardson, will be recognized for his service to the water industry and contributions to AWWA including service as President. Andy will receive the prestigious AWWA Outstanding Service Award. Third, we should all be especially proud of longtime member of AWWA and AZ Water, Karl Kohlhoff. At ACE 13 Karl will be inducted into the AWWA Hall of Fame. Karl’s many, many years of service and contributions to the water industry, including service as President of AWWA and AZ Water, directing water resources programs for the City of Mesa and simply being a positive influence on us all for so long; are clear reasons he should be a member of the Hall of Fame. Congratulations Karl!

And, congratulations to all of our local water industry members receiving special recognition this year! Accolades well deserved! Also,”job well done” to our AZ Water Awards committee for making winning submittals to achieve these recognitions.

Buried No Longer Goes Local

Over the next few weeks, all AWWA utility members will be receiving a complimentary copy of the Buried No Longer Pipe Replacement Modeling Tool in the mail. Based on AWWA’s Buried No Longer infrastructure report and the Nessie™ infrastructure analysis method, the tool allows utilities to build their own locally-specific Buried No Longer report, assess pipe replacement needs into the future, forecast the consequences for water bills, and tell their own infrastructure story to local officials, customers, and the media. Both the Buried No Longer report and the Pipe Replacement Modeling Tool were developed with support from AWWA’s Water Utility Council through the Water Industry Technical Action Fund. (It’s also available for purchase by non-utility members.) Members are encouraged to use the tool when making the case for local water infrastructure investment and to advocate for a Water Infrastructure Finance and Innovation Authority (WIFIA). More information about the national infrastructure picture and the Buried No Longer report is available on the AWWA website.

AZ Water Annual Conference/ACE 13:

Please don’t forget the two pending premier events available to water industry members. First, May 1-3, 2013 is our 86th AZ Water Annual Conference & Exhibition, which is shaping up to be very educational and interesting with some fun thrown in. The Conference Technical Program Committee, headed up by John Masche, has put together a terrific compilation of sessions and panels to keep your interest and provide plenty of pdh’s. Make it a point to attend.

Following the AZ Water Conference, June 9 through 12 in Denver, will be the AWWA ACE 13 national conference. This conference provides an even bigger venue and an opportunity to network with colleagues from across the country and even internationally. Again, try to attend if possible. You won’t regret it!
Feed the brain and the belly!

Now your full-conference registration includes a FREE lunch on Monday or Tuesday!

ACE13 in Denver offers five days of education with more than 17 professional tracks and 900 expert presenters, a 500 booth exhibit hall with more events and networking than ever before!
The AZ Water Association strives to provide value to our members by offering an annual three-day conference designed to provide professional development, continuing education, and distribution of technical information regarding the enhancement of Arizona’s drinking water, water reuse, and environmental resources. The theme for our 86th Annual Conference and Exhibition is “Sustainable Water, Sustainable Arizona.”

Your company’s sponsorship of the conference will help AZ Water continue to develop quality education programs that serve our members, while keeping registration costs to a minimum. Sponsorships are used to help offset annual conference events such as the facility, exhibition, speakers, training materials, awards, luncheon programs, and other conference events. If your sponsorship form is received by April 12 your company will be listed in the Conference Program Guide. If not, you will still be listed on conference signage, conference slide show, the web site, and in the summer issue of the AZ Water Kachina News magazine.

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During this past election season, WEF conducted an offshoot of the “WATER’S WORTH IT” campaign. This outreach was called “WATER PUTS AMERICA TO WORK.” The Water Puts America to Work campaign is a partnership of leading water associations, organizations and companies working together to ensure that Congress and the President make investment in water infrastructure a national priority. Our crumbling water infrastructure is reaching a critical stage. With this crisis comes incredible opportunity – 40 years of data clearly demonstrates that investing in water infrastructure boosts the economy. This campaign is raising awareness that water investment creates jobs, drives innovation and safeguards public health. With millions of Americans out of work, the timing could not be better to reinvest in our essential water infrastructure.

Federal investment in water and wastewater leverages enormous benefits nationally and for our local economies. Each public dollar invested in water infrastructure increases private long-term Gross Domestic Product output by $6.35. It is estimated that $1 billion invested in water and wastewater infrastructure can create over 26,000 jobs. Further, the Department of Commerce estimates that each job created in the local water and wastewater industry creates 3.68 jobs in the national economy and each public dollar spent yields $2.62 dollars in economic output in other industries. Unfortunately, infrastructure needs are far outpacing available funding. Some argue that we cannot afford these investments during a time of economic distress. To the contrary, we cannot afford to neglect our infrastructure any longer. As the gap between needs and investment grows, the impacts on jobs, lost business sales and GDP worsens. We must have reliable and resilient water infrastructure systems to attract and retain industry, business, and qualified workers, which are essential to any thriving community.

It often takes a disaster to remind the public, the media and our elected officials that we rely on our infrastructure systems when extreme weather events occur. Our essential water infrastructure is failing and is woefully inadequate to address the “new normal” weather patterns. The American Society of Civil Engineers gave the nation’s drinking and wastewater infrastructure a D- grade. The Water Puts America To Work campaign is helping decision makers connect the dots by showing not only the indisputable link between water investment and the economy but also the importance of resilient systems to meet the challenges of today and the future.

Water infrastructure investment is critical to protect public health and our quality of life, and it promotes innovative technologies that can help keep America competitive. A recent survey found that 95 percent of the public rank clean water as the most important service government provides and 87 percent believe government should be taking the lead in identifying solutions to the current investment crisis. Despite this overwhelming public support, the federal role in funding water infrastructure has declined steadily over the past two decades.

The Water Put America To Work campaign is not advocating for any one solution or legislative proposal. This is not a partisan issue — it is an American issue and we need renewed political will, leadership and cooperation to find solutions to the funding gap. This campaign is working to ensure that we have political leadership by informing members of Congress and other elected officials about what is at stake if we fail to make our water infrastructure a top priority.

continued on page 56
For more than 15 years, Tap Into Quality (TIQ) has been educating water users in Arizona about the merits of tap water through a variety of means.

When it comes to getting the word out, TIQ has nearly done it all. Radio, TV, newspaper, and magazine advertising; billboard and shopping mall ads; public outreach at numerous science education fairs, street fairs and festivals, freeway ribbon cutting events, and even at Boy Scout and Girl Scout events. TIQ even once had a booth at the Arizona State Fair. In science classrooms throughout Arizona there are copies of the Award winning TIQ water science educational CD-ROM, first published in 2005. Then there is the Internet - in both English and Spanish.

Now, and not because TIQ ran out of options of trying to get the word out, a highly informative video has been produced and is now playing at a YouTube player near you. The video, also available on DVD, was produced with the generous support of Salt River Project (SRP). What began as a replacement to the water science CD-ROM, became a labor of love of the TIQ membership.

“Our members and SRP really stepped up and worked hard at delivering a video product that is of the highest quality,” said former TIQ Chair Christina Hoppes. “It really is something that definitively tells the tap water story in Arizona.”

The video covers the major topics of source waters, groundwater, treatment, water quality sampling and testing, and delivery, with the video illustrating through animations the actual processes in action.

Central Arizona Project (CAP), a longstanding TIQ member, also has stepped up and assisted TIQ with making sure the video can be played through the TIQ website and YouTube, thus expanding the audience into the realm of social media. Last summer, CAP, as part of their continuing in-kind and very helpful assistance to TIQ, began hosting the TIQ website, thus ensuring its continued existence.

To watch the video, visit www.tapintoquality.com.

David Cerull is the Chair of Tap Into Quality, a Subcommittee of AZ Water.
While the improving economy is great for the industry in general, the resurgence of hiring younger staff is also making an impact to the AZ Water Young Professional (YP) Committee. Through the end of February, we have already enrolled 12 new members to the committee. Turnouts at the first two monthly meetings, held at HDR and Stantec, both had 13 or more members attend. While this is outstanding news for those involved and engaged, we are always an open door to any new members that are looking for an avenue to some great networking opportunities.

Thus far in 2013, the YP committee has had two networking lunches and one happy hour (at Arizona State University). In addition, Mike Ambroziak (current chair) and Amy Baker (current vice chair) presented to Dr. Peter Fox’s Environmental Engineering Seminar class on Tuesday, February 12, 2013. These were great opportunities to reach out and discover new members, but we are always looking for new audiences. Let us know if you have a group (NAU or U of A, to name a few) that the YP group could reach out to.

As always, the YP Committee has been busy with early education outreach by judging at the Future City Competition and hosting a table at E-Day at the Arizona Science Center. We had nine volunteer judges at the weekday model display in Phoenix’s Burton Barr Library, and seven spent a wet Saturday at the ASU Preparatory judging the presentations. The winner for the AZ Water award, Best Use of Water & Environmental Resources, was the group from Our Lady of Perpetual Help for their city named Elysium. We plan to have this team present at the YP Committee meeting being held Thursday, May 2, 2013 at 4pm at the AZ Water Annual Conference.

E-Day at the Science Center was another great event to introduce elementary, middle, and high school students to the world of engineering. AZ Water YP hosted a booth with giveaways provided by Gamey Construction and the City of Peoria. Interactive displays included the pH testing strips and the bottled vs. tap blind taste test. Similar to last year the results of which tasted better were quite close and participants indicated that chilling tap water makes it taste better!

With the Conference approaching soon, so is the submission deadline for AZ Water Scholarships. Please get the word out to currently enrolled Arizona college or university students that have some connection to water in their education or future career ambitions. Scholarship awards will be presented to winners at the lunch program, Friday, May 3, 2013 at the Annual Conference.

Finally, the YP Committee will coordinate the raffle during the BBQ as well as a student poster contest both on Wednesday, May 1, 2013 at the Annual Conference and Exhibition. The judging of the posters will take place in the vendor hall on Wednesday, May 1, 2013, with the BBQ raffle that evening at Margaritaville. If you are interested in donating a prize, please contact Mike Ambroziak (michael.ambroziak@hdrinc.com) or Amy Baker (amy.baker@peoriaaz.gov). Thanks for your support; we look forward to seeing you another great annual conference this year.

Everyone, Forever: Water, Sanitation, Golf

A while back, Water For People began a campaign of “Everyone, Forever.” The phrase sounds catchy. They created a cool logo to go with it. An effective marketing ploy? Anything but! The concept of “Everyone, Forever” is at the core of everything that Water For People is, and does.

Everyone means every family, every clinic, and every school in the regions and districts where they work. This includes the hardest to reach, the poorest, and the most isolated, whose voices often go unheard. No one is left out.

When Water For People begins work in a district, they consider all the factors that affect Everyone’s access to water, and don’t limit ideas due to the size of a grant, the capacity of a pump, or the location of the farthest family. With their partners, the communities and the private sector, they work to support solutions that help every person to have these basic services, so that they stay healthy and for economic development to occur. Water For People’s approach is truly transformative.

As you can imagine, reaching Everyone requires a time and resources investment to develop local skills and capacity so that successful projects can be sustained into the future; that is,
Forever. Everyone sounds great, but Forever? Of course, it has to be Forever. When we purchase a home in Arizona, do we expect that water will flow from our taps for only two years, or ten years? We expect Forever. The Water For People approach is a lesson in sustainability, the central theme of the 86th Annual AZ Water Conference and Exhibition, Sustainable Water, Sustainable Arizona.

Much of the above text was liberally extracted from the Water For People website, where there is a wealth of information about Everyone Forever and the work they do. Explore the Water For People website at www.waterforpeople.org.

AZ Water Annual Conference and Exhibition

You can learn more about Everyone, Forever at the AZ Water Annual Conference. Come to the Water For People Track on Thursday afternoon. Check your program for the location. In addition to other talks pertaining to international development, Global Water’s Celeste Holm will talk about her recent Water For People IMPACT Tour in Guatemala. As an AZ Water for People Committee volunteer, she was selected from many candidates to participate in this behind the scenes tour.

The purpose of the IMPACT Tour is to highlight how Water For People fosters independence in local communities by working closely with them on water and sanitation programs. While in Guatemala, Celeste experienced Water For People’s work first-hand and interacted with Guatemalan Water For People staff, community leaders, and community members.

The tour consisted of visits to six different schools and villages. The three schools visited had water, sanitation, and hygiene education programs in place with new toilet facilities, hand washing stations, and an ongoing hygiene education. The various technologies used in village water systems included wells and springs, a water tower for storage, metering, and chlorination. In all cases, the systems were metered and an appropriate tariff system put in place. An appropriate tariff system is a key to system sustainability.

Sanitation technologies demonstrated included ecological sanitation (Ecosan) latrines. Ecosan latrines provide an economic benefit to the local farmers, converting human waste into nutrients that can be used as fertilizer or compost. Urine is used as a pesticide that can be applied to the land.

Demand for the latrines was low at first. Only 24 of the 90 houses in the village built a latrine. The remaining 66 houses did not want the latrines. As the project progressed, the villagers without the Ecosan latrines began to see its benefits, with a resultant increase in demand for the facilities. Celeste says that it was “amazing and interesting to see how Water For People had worked with each community to identify and address their certain needs, not just carry out the same project in these very different areas.” Celeste thanks her employer, Global Water, for their generous support of her in this endeavor.

Want to see the great photos that go with this trip? Don’t miss Celeste’s talk on Thursday afternoon.

Water For People Golf at Troon North, Scottsdale

The 17th Annual AZ Water/Water for People Golf Tournament will be held once again at the beautiful Troon North Golf Club in Scottsdale. Mark your calendars for June 22, 2013 and register early. See the registration forms and flyers in this issue. Come early to practice with a bucket of balls at the driving range. Shotgun start at 8:00AM.

The Water For People Golf Tournament is the perfect venue for the Arizona water community to demonstrate its commitment to Everyone. Show your support to Forever by participating in the tournament in one way or another. Become a sponsor. Various sponsorship opportunities are available to suit any budget. Field a foursome. Reward some deserving employees or show a client your firm’s commitment to a great organization.

Finally, spread the word. Tell a partner, spouse, neighbor, or friend about two great organizations: AZ Water and Water For People.

Save the date for the Southern Arizona Golf Classic at the Tucson Omni Resort on August 17, 2013. Details will be finalized by the next issue of the Kachina News.

7th Annual Water For People Volleyball Tournament

If you are reading this before April 13, and need last minute entertainment, come on over to the 7th Annual Water For People Volleyball Tournament on April 13, 2013. The venue for this fun time is the volleyball courts at Scottsdale Ranch Park, 10400 E Via Linda. Volleyball, sand, food, fun, and prizes for first, second, and third place. The coveted “Trident of Victory” will pass from last year’s winners to this year’s first place winners.

Check out our informative and updated webpage at: http://www.azwater.org/Commies/WastewaterTreatment/Pages/Events.aspx

The webpage is continually being updated and expanded by committee member and webpage master Bill Kenning along with other members. It includes information on the committee’s members and activities, along with links to many helpful information resources.

There are several upcoming events being presented by the committee:

- Webinar to help treatment plant operators understand the certification examination process and prepare for their exams, featuring Noah Adams of ADEQ, scheduled for May 22.
- Webinar on emerging contaminants and opportunities for treatment plant optimization to deal with them, to be held in June, date TBA.

These events are presented free of charge and are all eligible for PDHs.

Further details on each of these events will be posted on AZWater.org in the near future.

Recent plant tours presented by the committee included the Casa Grande WRF, sponsored by Carollo Engineers, and held on January 18; and tours of the two major Pima County water reclamation facilities, sponsored by CH2M Hill, held on February 13. Both events were “sell-outs” and very well-received by the participants. The committee plans to continue offering tours on a monthly basis; if you have a facility you would like to suggest for a tour, please contact Doug Kobrick.

The committee is working on an initiative to help improve the passing rate for operators taking the state certification exams. The committee has conducted discussions with operators, ADEQ, and other interested parties to develop an understanding of the issues involved in the relatively low success rates being achieved on the exams in recent years. We will be launching an initiative on this topic in the near future.

The committee also is developing plans for a database of “profiles” of Arizona wastewater treatment facilities. The profiles would contain information about the treatment plants and their processes, along with contact information. The purpose is to promote communication and information-sharing between facilities and for others within the industry. This project will be worked on over the coming months.

Wastewater Treatment

The Wastewater Treatment Committee is working on a number of education and outreach activities. The committee meets monthly and new members are always welcome to join in! Contact committee chair Doug Kobrick at 480-538-1513 or doug.kobrick@atkinsglobal.com.
## 17th Annual AZ Water Water for People Golf Tournament

**JOIN US AT**
**TROON NORTH GOLF CLUB**
10320 E. DYNAMITE BLVD.
SCOTTSDALE, ARIZONA
**JUNE 22ND, 2013**

### Schedule of Events
- Registration - 6:30 am
- Golfers "Cart Up" - 7:50 am
- Shotgun Start, Scramble Format - 8 am
- Luncheon, Awards Program & Prize Drawing Following Golf

### $120/Per Golfer
- Mulligans 2 for $20, Includes Entry for Door Prizes
- Proper Golf Attire Required, No Jeans or Cutoffs

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### Registration Form

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<th>Contact Name:</th>
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**GOLFER(S) NAMES:**

| 1. | ($120) |
| 2. | ($120) |
| 3. | ($120) |
| 4. | ($120) |

**T-SHIRT SIZE (circle one):**
- S
- M
- L
- XL
- XXL

**BE A SPONSOR:**
- Hole-in-One ($250+)
- Birdie ($500+)
- Eagle ($1500+)
- Par ($250+)
- Monetary Donation $
- Gift Prize

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Make check payable to “AZ Water Association” OR Register online. See below for details.

Fax or mail registration to: Venkat Radhakrishnan, ARCADIS, 410 N 44th St, Ste 1000, Phoenix, AZ 85008
Phone: 602-797-4580 • Fax: 602-231-0131 • Email: venkat.radhakrishnan@arcadis-us.com
OR register online at http://phxgolf.arizonawaterforpeople.org
17th Annual
AZ WATER
WATER FOR PEOPLE
GOLF TOURNAMENT

JOIN US AT
TROON NORTH
GOLF CLUB
10320 E. DYNAMITE BLVD.
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Proper Golf Attire Required, No Jeans or Cutoffs

Sponsorship Level • Contribution • Benefits

| HOLE-IN-ONE | $2500 minimum | The first Hole-In-One Sponsor gets a special prize, 2 Foursomes at the Golf Tournament, Large Logo on the back of the tournament t-shirt, Large Logo on the sponsors board, Acknowledgement in AZ Water Association Kachina Newsletter |
| EAGLE | $1500 minimum | 1 Foursome at the Golf Tournament, Medium Logo on the back of the tournament t-shirt, Medium Logo on the sponsors board, Acknowledgement in AZ Water Association Kachina Newsletter |
| BIRDIE | $500 minimum | Large Company Name on the back of the tournament t-shirt, Large Company Name on the sponsors board, Acknowledgement in AZ Water Association Kachina Newsletter |
| PAR | $250 minimum | Small Company Name on the back of the tournament t-shirt, Small Company Name on the sponsors board, Acknowledgement in AZ Water Association Kachina Newsletter |
| GIFT PRIZE | Golf Equipment, Logo Items, etc. | Acknowledgement in AZ Water Association Kachina Newsletter |

Fax or mail registration to: Venkat Radhakrishnan, ARCADIS, 410 N 44th St, Ste 1000, Phoenix, AZ 85008
Phone: 602-797-4580 • Fax: 602-231-0131 • Email: venkat.radhakrishnan@arcadis-us.com
OR register online at http://phxgolf.arizonawaterforpeople.org
Wastewater treatment by nature is a “green” industry. We collect and treat wastewater and return reclaimed water back to the environment or use it for beneficial reuse. However, while doing it, we are facing many challenges including regulations that are more stringent, growing population, higher energy costs, etc. Wastewater treatment processes are often energy intensive. As indicated in a previous article by Lisa Henderson, from the Governor’s Office of Energy Policy, federal estimates indicate that wastewater facilities consume an average of 3 kWh/kgal. Lots of work needs to be done before we can meet that target. Energy efficiency has not yet become a key performance measure for many wastewater treatment facilities.

In May 2007, the Pima County Board of Supervisors adopted Resolution No. 2007-84 in support of county sustainability initiatives. In August 2008, Pima County published its first Five-year Sustainable Action Plan for County Operations. The Resolution and the Sustainability Action Plan called for numerous Sustainability Goals. PCRWRD is taking a lead role in efforts of fulfilling the Sustainability Goals in many areas.

**Sustainable Goal:**

**Water Conservation and Management**

PCRWRD owns and operates ten wastewater reclamation facilities including three regional facilities, Ina Road Wastewater Reclamation Facility (WRF), Roger Road WRF, and Randolph Park WRF, which treat most of the wastewater generated in the metropolitan Tucson area, and seven sub-regional facilities. In 2008, PCRWRD commissioned its Regional Optimization Master Plan (ROMP). ROMP identified over $700 million in-need capital improvements to comply with new regulatory requirements and to upgrade the aging wastewater treatment system. Through the ROMP projects, PCRWRD will produce a much higher quality of effluent (82 MGD capacity), which is an important renewable water resource for our community.

**Sustainable Goal:**

**Renewable Energy and Conservation**

While many people understand that cleaner effluent results in a healthier aquifer and increased potential reuses, few realize that biogas, a byproduct generated during wastewater sludge treatment, is a renewable energy source, which can be used in lieu of fossil fuel in many forms reducing the nation’s dependence on petroleum products. On the other hand, if released to the atmosphere, methane (CH4) and carbon dioxide (CO2), two major components of biogas, are greenhouse gases (GHG), which contribute to global warming and other environmental issues. Anaerobic digesters operated by PCRWRD produce over 4,000 metric tons of CH4 and over 7,000 metric tons of CO2 every year. Since the 1970’s, PCRWRD has beneficially used a good portion of the biomethane produced at the two regional facilities by generating electricity through on-site combined heat and power (CHP) cogeneration facilities. As part of ROMP, the existing CHP facilities will be retired due to their ages, inefficiencies, high air pollutant emission, and high operational and maintenance (O&M) cost. PCRWRD is actively seeking new opportunities to beneficially utilize biogas as a renewable energy source. Recommended by multiple studies, PCRWRD is developing a public private partnership (P3) project to utilize the County’s biogas as a renewable energy source through either CHP or biogas cleaning for commercial sale through natural gas grid. A draft request for proposal (RFP) and draft service contract have been advertised nationwide for comments. The final RFP will be advertised in April 2013. After the completion of this project, PCRWRD’s will be able to beneficially utilize over 95% of the renewably generated biomethane and significantly reduce carbon footprints of wastewater treatment processes.

PCRWRD is not only looking to harvest energy from biomethane, but also is researching possible reuse options for CO2, which are not commonly available in the market place. Our staff has taken on the challenges and has made remarkable progress in bringing together the University of Arizona, local community experts, multi-government stakeholders, as well as interested parties and authorities at the national level. PCRWRD is taking the leadership role and striving for a higher standard of providing good environmental stewardship.

**Sustainable Goal:**

**Alternative Fuel Vehicles**

During the exploration of biogas utilization, PCRWRD has uncovered the benefits of utilizing compressed natural gas (CNG) as an alternative to fuel the County vehicle fleet. Due to the abundance of low-cost natural gas in the U.S., the use of vehicles powered by CNG becomes more and more popular. CNG is natural gas (primarily methane) at pressures above 3,100 psi. Worldwide, 12 million natural gas vehicles are in use. In the United States, there were over 100,000 natural gas vehicles in operation in 2009, and the number of CNG refueling stations in the United States reached 1,300. The biomethane in biogas can be cleaned and compressed to make CNG, often referred to as renewable CNG. Use of renewable CNG to replace 20% of gasoline demand as a transportation fuel would reduce overall greenhouse gas emissions by 39% and the use of 100% biomethane would be as clean as cars powered by 100% wind-derived electric energy.

PCRWRD initiated a countywide CNG program white paper study. The report concluded that it is cost effective to convert the County fleet into CNG fueled fleet. Upon implementation, this program will significantly reduce the County carbon footprint and support Pima County’s sustainability goal. A great number of stakeholders from both public and private sectors are involved.

**Sustainable Goal:**

**Waste Reduction for Energy Generation**

Food wastes, fats, oils, and grease (FOG) materials are great additives to anaerobic digesters and produce a great amount of biogas. Although some private companies recycle some of the material to make biofuel, most of the materials are sent to landfill. Ultimately, these materials fill up landfill space and produce GHG, which can contribute to climate change with no benefit to our community. With the completion of two new digesters at Ina Road WRF, we have additional capacity to introduce some food waste and/or FOG to maximize the use of our existing asset and increase biogas production. PCRWRD is commencing a study to develop a plan to consider FOG and food waste additions to our existing Ina Road digestion process.

**Jing LUO**

Pima County Regional Wastewater Reclamation Department (PCRWRD)
Sustainable Goal: Resource Recovery

PCRWRD’s vision also extends to other resource recovery opportunities from wastewater. As an example, side-stream flows are a high concentration wastewater streams derived from wastewater sludge thickening and dewatering processes. These streams contain 30-40 times more nutrient than regular municipal wastewater. Currently, side-streams are treated together with wastewater influent and consume high amounts of energy. However, if handled correctly, side-streams are a great candidate for potential nutrient recovery and reuse. Our staff is leading a team of consultants and looking for a sustainable and cost effective way to manage and recover this nutrient-rich stream and reduce the energy cost of the treatment plant.

Conclusion

Like many other wastewater management agencies, we deal with great amounts of material often described as “wastes”. However, PCRWRD chose to consider these “wastes” as resources. Wastewater treatment plants and associated infrastructures are often one of the largest single energy users in local government. PCRWRD pays great attention to its energy consumption and cost. To fulfill the Department energy goal, PCRWRD is initiating a system-wide energy study. As a result, a Five-year Energy Efficiency Improvement Action Plan will be developed as a guiding document for the Department’s energy program. Capital improvements will be identified and implemented to improve energy efficiency and reduce overall energy consumption and cost. PCRWRD has committed to be at the forefront of being green and sustainable while maintaining system efficiency and cost effectiveness.
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Bottom: Vertical Turbine Pump – San Tan Valley, Arizona
HDR, a leading engineering, architecture, and consulting firm, is pleased to announce Jim Nichols has joined the firm as Senior Water and Wastewater Engineer in the firm’s Water and Natural Resources Business Group in the Phoenix office. Jim brings over 35 years of experience as a project manager, technical advisor, project engineer, and resident engineer for major water resources projects in Arizona and the western United States. His experience includes the planning, design, value engineering, and construction management of more than 20 pump stations, 10 reservoirs, and 500 miles of pipelines and tunnels with diameters up to 168 inches. Over the past 10 years, Jim’s focus has been in design of large diameter pipeline rehabilitation projects for the water and wastewater industry. While Jim will be based in HDR’s Phoenix, Arizona office and will focus on clients in the Arizona market, he will also serve as a national resource for mentoring, value engineering, and quality control on design and rehabilitation of large diameter pipeline projects.

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I recently read a book written by Napoleon Hill, “Keys to SUCCESS, The 17 Principles of Personal Achievement” that I would like to share with each of you in the spring and summer Kachina News magazine.

In summary, the 17 principles of success are as follows:

1. Develop definiteness of purpose
2. Establish a mastermind alliance (or close circle of advisors)
3. Assemble an attractive personality
4. Use applied faith
5. Go the extra mile

6. Create personal initiative
7. Build a positive mental attitude
8. Control your enthusiasm
9. Enforce self-discipline

Part 2

10. Think accurately
11. Control your attention
12. Inspire teamwork
13. Learn from adversity and defeat
14. Cultivate creative vision
15. Maintain sound health
16. Budget your time and money
17. Use cosmic habit force

Develop definiteness of purpose with a positive mental attitude. You should have one high, desirable, outstanding goal, and keep it for most in your thoughts. In order for you not to lose your commitment toward reaching your definite purpose in life, it is important to have immediate, intermediate, and long-term objectives. One should determine and fix their mind exactly on what they desire. The more specific you can be the more effective you will be.

Setting a definite date for exactly when you intend to possess and what you desire is also a key to reaching your definite purpose. Identifying your desire with a definite written plan will help you achieve your objective. Putting your plan into action at once is also a key to your success.

Write precisely how and concisely what you want, exactly when you want to achieve it, and exactly what you intend to give or give up in return for achieving your objective.

Each and every day, morning and evening, read your written statement out loud. Believing is KEY to achieving. To guarantee your success you need to, engaged daily in study, thinking, and planning.

Answer the following question. My commitment to use this principle in my life is:

_________________________________________
_________________________________________
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Establish a mastermind alliance or close circle of advisors that you can meet with on a regular basis that will help you clarify and achieve your objectives. This also must be with others that have a positive mental attitude.

The purpose of this alliance is to associate with others, to acquire and utilize the knowledge and experience needed for the activities and or personal payment required to achieve any desired goal in life. The most successful people surround themselves with the advice, counsel, and personal cooperation of several people willing to lend you their wholehearted aid for the attainment of your objective.

You can create this alliance with your spouse, coworkers, friends, or others that you believe will be compatible with you and your personality and will encourage you toward achieving your goals.

Answer the following question. My commitment to use this principle in my life is:

_________________________________________
_________________________________________
_________________________________________
_________________________________________
Assemble an attractive personality with a positive mental attitude. We all know that your personality is your greatest asset, or it can be your greatest liability. It’s essential that you develop a pleasing personality, pleasing to yourself and most importantly to others. Special attention should be given to becoming sensitive to your own reactions to others, circumstances, and to the reactions of individuals and groups to what you say, think, or do.

Think of the following characteristics of a pleasing personality:
- Tolerance
- Alertness
- Courtesy
- Flexibility
- Being Tactful
- A pleasant tone of voice
- Control of facial expressions
- Sportsmanship
- Sincerity
- A sense of humor
- Humility
- Smiling
- Enthusiasm
- Temperance
- Patience

Answer the following question. My commitment to use this principle in my life is:

_________________________________________
_________________________________________
_________________________________________

Use applied faith with a positive mental attitude. Faith is a state of mind through which your aims, desires, plans, and purposes may be translated into their physical or financial equivalent.

Applied faith is not some complex principle. It merely means action specifically applied through habit and application of your faith under all circumstances. Applied faith is most effective when it is accompanied by unqualified activity. For example, if you want results, try prayer. In your prayer express your gratitude and thankfulness for the blessings you have already received: then ask the good Lord for his help. But most importantly, get up off your chair and get going!

Inspire your imagination to see yourself already in possession of your goal or objective. Act precisely as if you already are in physical possession of this goal or objective. Remember that all things first take place mentally before they take place, physically.

Answer the following question. My commitment to use this principle in my life is:

_________________________________________
_________________________________________
_________________________________________

Go the extra mile with a positive mental attitude. Rendering more and better service than for which you are paid. Remember that doing it with a positive mental attitude will be a key to your future success. It’s been said that every seed of useful service you sow will multiply itself and come back to you in overwhelming abundance.

Application of this principle will move you toward becoming an indispensable person in your work and circles of influence.

Answer the following question. My commitment to use this principle in my life is:

_________________________________________
_________________________________________
_________________________________________

Create personal initiative with a positive mental attitude. Personal initiative is the inner power that starts all action. It’s the dynamo that starts the faculty of the imagination and moves you to action. Some people say it is self-motivation that is motivation which induces action or determines choice. A motive is that inner urge only within the individual which incites you to action, such as an idea, and emotion, a desire, or an impulse.

When you know principles that can motivate you, you will know principles that can motivate others. Hope is the magic ingredient in motivation, but the secret of accomplishment is ACTION.

Answer the following question. My commitment to use this principle in my life is:

_________________________________________
_________________________________________
_________________________________________

Enforce self-discipline with a positive mental attitude. Self-discipline enables you to develop control over yourself. It begins with mastery of your thoughts, what you really are and what you’re really doing. Self-discipline is perhaps the most important function in aiding an individual in the development and maintenance of habits of thought which enable the person to focus their attention upon any desired purpose and hold it there until the purpose has been attained.

If you do not control your thoughts, you do not control your future.

Answer the following question. My commitment to use this principle in my life is:

_________________________________________
_________________________________________
_________________________________________

Build a positive mental attitude (PMA) with a positive mental attitude. A positive mental attitude is the right, honest, constructive thought, action, or reaction to any person, situation, or set of circumstances that does not violate the laws of God or the rights of one’s fellow man.

PMA allows you to build on, hold, and overcome the negative attitudes of despair or discouragement that are common in our culture. You create and maintain a positive mental attitude through your own willpower, based upon motives of your own adaptation. Developing a positive mental attitude can occur through application of the Golden Rule. A person who is considered sensitive to the reactions of others will be sensitive to their own reactions and allow themselves to control their emotional responses. The positive mental attitude is the catalyst necessary for achieving worthwhile success.

My hope is that this issue of Success and Fun will help each one of us change the way we think and act in our daily lives. I am honored to share my perspective on “SUCCESS and FUN”. I hope to hear from you, contact me at phendricks@cox.net if I can be of assistance to you.
In the Desert Southwest, population growth and development are challenging water utilities to obtain supplemental water supplies, construct additional infrastructure, and consistently deliver sufficient fresh, high-quality water. In addition, the Southwest has been characterized as “ground zero” for climate change impacts in North America. Climate change models generally agree that temperature will increase, precipitation patterns may change, and annual precipitation may even decrease. Projected climate change will mean utilities must meet peak seasonal demand in conditions likely to be hotter and drier than in the past. They may be managing stormwater from more intense rainfall events, and facing floods exceeding historic levels. In addition, federal stormwater quality regulations will continue to require mechanisms to reduce the contaminant load of urban stormwater reaching waterways.

All these challenges entail costs to the community. The bulk of these costs will be related to capital investments in new or expanded infrastructure. Traditionally, communities have invested millions of dollars in large scale stormwater infrastructure to eject rainfall runoff as quickly as possible from the urban environment. Harvesting rain and stormwater instead produces many potential benefits.

A suite of techniques known today as Green Infrastructure (GI) and Low Impact Development (LID) collect and manage rainwater/stormwater in ways that capture those benefits. Unlike traditional approaches to stormwater management, these techniques mimic natural predevelopment systems and enhance them so as to direct water where it can be used and away from where it is a nuisance. A multitude of benefits can accrue including potable water savings, cost savings, reduced flood peaks, reduced flooding, stormwater water quality management, erosion control, habitat enhancement and reduction of urban heat island effects (see Figure 1).

For many years, the Tucson region has been at the forefront of efforts to incorporate water harvesting into water supply and stormwater management practices. In 2010, Tucson became the first city in the nation to implement a commercial water harvesting ordinance. The ordinance requires developers of commercial properties to meet at least 50 percent of their landscape irrigation needs through the use of water harvesting. The development standards written in consultation with developers encouraged its acceptance. To promote residential water harvesting, the City’s water utility provides a rebate program that reimburses a portion of the costs residents incur for implementing water harvesting at their homes. The program requires that applicants attend a three-hour training session helping to ensure proper implementation of these residential systems. Tucson’s transportation department is currently working with local entities to develop new policies to incorporate GI/LID infrastructure into new road construction and major road reconstruction (see Figure 2).

The argument is often heard that water harvesting will not work in desert communities because there is not enough rain. But experience in Tucson contradicts that claim. The Ed Pastor Kino Environmental Restoration Project (KERP), a joint effort by the U.S. Army Corps of Engineers and Pima County, reconstructed a regional flood control detention basin, incorporating urban stormwater harvesting. The 125-acre KERP facility retains and can use up to 1880 AF of stormwater for irrigating ball fields and the facility’s hydro-riparian native vegetation, saving the complex hundreds of thousands of dollars in water costs and providing environmental habitat and community recreation opportunities (see Figure 3).

Green Streets programs for neighborhood improvement led by Watershed Management Group, a nonprofit organization in Tucson, are demonstrating that appropriately designed and installed curb cuts, microbasins and bump outs in the right-of-way can radically reduce flooding while enhancing a neighborhood’s natural amenities. Pima County Flood Control District studies show that water harvesting potential is greatest at the residential scale. In Tucson, water harvested from roofs and other impermeable surfaces can replace...
a large portion of landscape irrigation demand for potable water (see Figure 4).

As the benefits of water harvesting are recognized, the number and diversity of individuals and agencies exploring its potential has grown, yet most of the work has been performed in relative isolation with correspondingly little organized data and information sharing. In an effort to assist researchers and practitioners to share information and coordinate their activities, the Water Resources Research Center (WRRC) initiated the Desert Water Harvesting Initiative (DWHI), an umbrella program for research and information sharing activities. Research is ongoing into use of GIS to locate potential LID/GI sites and concerns about cistern water quality.

The idea for the DWHI was conceived in July 2011, when the WRRC hosted a round-table on water harvesting that brought together many of the individuals and organizations involved in developing and implementing water harvesting in the Tucson region. A major result of this initial round-table was formation of the Rainwater-Stormwater Professionals Networks (RSPN) that meets semi-annually at the WRRC. Its purpose is to keep members abreast of current and planned activities, resources, and data.

At their first round-table the RSPN identified the need for guidance on benefits and costs of implementing water harvesting. The RSPN focused attention on benefits that are not easily quantified. These unquantified benefits include, for example, the services provided by urban forests supported by harvested rainwater, which produce energy savings from shading and mitigate urban heat island effects. Other benefits difficult to quantify include deferring infrastructure expansion, mitigating neighborhood flooding, and complying with stormwater quality regulation.

The traditional image of water harvesting as simply collecting rainwater in a tank needs to be expanded to include the broader range of techniques of Green Infrastructure and Low Impact Development. A suite of techniques such as bioswales, microbasins, and porous pavement keep stormwater on site where it can support vegetation and offset demand for potable supply. Soils and vegetation filter out and/or break down pollutants. The EPA has adopted Green Infrastructure and Low Impact Development in its regulatory process and encourages adoption of GI/LID practices in design of stormwater management permits. Meeting regulatory requirements may provide a strong incentive for incorporating these practices into stormwater management plans.

Although fairly well established in the humid eastern and northwestern U.S., relatively little is known about the use of such techniques in arid regions. In particular, there is a need to understand their effects on stormwater quality, urban hydrology, and the real costs and benefits to communities in the semi-arid and arid Southwest. The WRRC collaborated with conference organizers on a special workshop at the Arid LID Conference in Tucson in March 2012, to discuss a research agenda to address these issues. The participants highlighted a range of research needs relating to unique characteristics of regional soils, rain storms, land use patterns, laws and regulations, and public attitudes. The workshop report can be found at the DWHI web site (http://wrrc.arizona.edu/DWHI).

Recommendations of the RSPN provided impetus for a research project to develop guidance on the feasibility of water harvesting at multiple scales to capture multiple benefits in the southwestern region. The project, funded by the Bureau of Reclamation's WaterSMART program, is designing and testing guidance tools for use by water utilities, stormwater management agencies, flood control agencies, and other public departments that obtain, deliver, or otherwise manage potable water, rainwater and/or stormwater in the urban environment of the desert Southwest. Based on the specific conditions faced by a range of public utilities in the greater Tucson area, these guidance tools are imbedded in a process that involves the users in developing strategies uniquely appropriate to their communities. Ideally a cross-section of potential beneficiaries, from engineers to land use planners, would be represented in a joint meeting, but the toolbox includes tools to educate and build support within a community’s management structure, if needed. An interactive presentation guides the group step-by-step through the analysis of water harvesting benefits, requirements, challenges and options. The presentation references a workbook for recording and tracking community-relevant information and on-line resources with additional guidance, data and references.

Among the project’s tools is a new DWHI web site. The site is being populated with links to many useful resources, case studies, publications, and sources of expertise, most of which are focused on water harvesting in arid and semi-arid regions. The site is open to the public, but it is also intended to function as a reference source integral to the process described above for using water harvesting strategies to solve the unique challenges of individual communities. Numerous gaps in available data and information have been identified, but more resources are being developed every day as interest in the topic grows.
WATER TREATMENT GRADES 1 AND 2

1. What is the primary treatment process in a conventional water treatment that utilizes gravity?
   A. Screening
   B. Coagulation
   C. Sedimentation
   D. Filtration

2. What is the likely problem when feeding gaseous chlorine when the rotometer indicates no flow and the vacuum gauge on the feeder is 30?
   A. A vacuum leak near the injector
   B. A leak in the pigtail connection
   C. A water leak in the injector
   D. A closed valve on the inlet of the feeder

3. What is the Sodium Hypochlorite feed in gallons per hour (gph) for a water treatment plant producing 36 MGD if the dosage as chlorine is 2.5 mg/L? Presume there is 1.2 pounds of chlorine per gallon of Sodium Hypochlorite.
   A. 10 gph
   B. 12 gph
   C. 26 gph
   D. 36 gph

4. How many pounds of 20% sodium hydroxide are used daily by a water treatment plant if the level in an eight foot diameter tank starts at 9.25 feet and ends at 6.75 feet. Presume there are 2.04 pounds per gallon in 20% sodium hydroxide.
   A. 260 Ppd
   B. 490 Ppd
   C. 600 Ppd
   D. 950 Ppd

5. What is the normal endpoint pH of a total alkalinity titration?
   A. 2.0 pH
   B. 4.5 pH
   C. 7.0 pH
   D. 8.3 pH

WATER TREATMENT GRADES 3 AND 4

1. If a basin measures 180 feet long, 62 feet wide, and fills to a depth of 18 feet, how many Million Gallons (MG) does it hold?
   A. 1.5 MG
   B. 2.5 MG
   C. 4.0 MG
   D. 5.0 MG

2. What is the monthly (30 days) cost of Hydrofluorosilicic Acid for a surface water treatment plant treating 38.5 MGD and dosing 0.6 mg/L fluoride? Presume there is 3.94 pounds of fluoride per gallon of Hydrofluorosilicic Acid and it costs $3.88/gal.
   A. $5,700
   B. $6,000
   C. $8,800
   D. $9,200

3. What is the MCL for fluoride?
   A. 1.0 mg/L
   B. 2.0 mg/L
   C. 3.0 mg/L
   D. 4.0 mg/L

4. How many Million Gallons per Day (MGD) may be expected from a filter measuring 20 feet long and 16 feed wide with an application rate of 6 gallons per minute per square foot?
   A. 2.7 MGD
   B. 3.8 MGD
   C. 4.6 MGD
   D. 5.5 MGD

5. Which of the following federal agencies oversees Risk Management Plans for utilities using large quantities of gaseous chlorine?
   A. ADEQ
   B. DHS
   C. EPA
   D. OSHA

WATER DISTRIBUTION GRADES 1 & 2

1. What will it cost to feed 3.0 mg/L Sodium Hypochlorite (as chlorine) to 50 Million Gallons per Day of water for 1 year if the Sodium Hypochlorite averages 1.2 pounds of chlorine per gallon and costs $0.70 per gallon?
   A. $100,000
   B. $175,000
   C. $266,000
   D. $435,000

2. How many gallons of water will a pipe hold if it is 24 inches in diameter and 2,000 feet long?
   A. 24,000 gals
   B. 31,200 gals
   C. 47,000 gals
   D. 70,000 gals

3. What is the chlorine demand if 2.4 mg/L Chlorine is added at a well, and the residual is 1.0 mg/L?
   A. 1.4 mg/L
   B. 2.4 mg/L
   C. 3.4 mg/L
   D. 4.8 mg/L

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   A. 2.7 MGD
   B. 3.8 MGD
   C. 4.6 MGD
   D. 5.5 MGD

5. What is the pressure at the bottom of a standpipe in pounds per square inch (psi) if the water level is 100 feet above it?
   A. 43 psi
   B. 81 psi
   C. 100 psi
   D. 231 psi

WATER DISTRIBUTION GRADES 3 & 4

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   A. 24,000 gals
   B. 31,200 gals
   C. 47,000 gals
   D. 70,000 gals

3. How much head is on a pressure gauge that reads 85 psi?
   A. 20 feet
   B. 85 feet
   C. 120 feet
   D. 196 feet

By Ted BAILEY, Baileytb@att.net
4. If a 250 gallon tote of Sodium Hypochlorite is used in one week by a pump station pumping an average of 3.4 MGD, what is the dose of chlorine in ppm? Presume there is 1.2 pounds of chlorine per gallon of Sodium Hypochlorite.

A. 0.5 ppm  
B. 1.0 ppm  
C. 1.5 ppm  
D. 2.0 ppm

5. What is the action level for lead in drinking water?

A. 0.001 mg/L  
B. 0.015 mg/L  
C. 0.020 mg/L  
D. 0.050 mg/L

WASTEWATER COLLECTION GRADES 1 & 2
1. Manholes are 100 yards apart. A float takes 4 minutes and 21 seconds to travel between them. What is the speed in feet per second (fps)?

A. 1.00 fps  
B. 1.15 fps  
C. 1.51 fps  
D. 2.33 fps

2. The purpose of traffic control around manholes in the street is to:

A. Reduce dust and air pollution.  
B. Keep vehicles out of open trenches.  
C. Reduce speeds of vehicles.  
D. Provide a safe work area.

3. A sewer wet well containing 321 cubic feet is emptied by a pump in 8 minutes. How many gallons per minute (gpm) was pumped?

A. 100 gpm  
B. 300 gpm  
C. 537 gpm  
D. 800 gpm

4. A sewer bailing operation is effective in:

A. Avoiding flooding of dwellings connected to sewers.  
B. Cleaning sewers on steep grades.  
C. Passing badly offset sewer joints.  
D. Removing grit from sewers.

5. Shoring is necessary to protect operators from cave-ins whenever the trench depth is:

A. 3 feet  
B. 4 feet  
C. 5 feet  
D. 6 feet

WASTEWATER COLLECTION GRADES 3 & 4
1. Screwing jacks for shoring must be placed in the trench from the bottom up.

A. True  
B. False

2. Closing an electrical circuit is similar to:

A. Adding pressure to a wastewater force main.  
B. Adjusting the voltage to a variable speed pump motor.  
C. Opening a valve in a water pipe.  
D. Switching a light off.

3. A sewer wet well is being filled by an influent flow of 100 gpm. The pump empties it at 250 gpm. The wet well is 5 feet in diameter and contains 12 feet of wastewater. How long will it take to lower the level to 5 feet?

A. 3.12 minutes  
B. 4.88 minutes  
C. 6.85 minutes  
D. 8.34 minutes

4. When excavating for installation of a gravity main, a trench 650 feet long, 4 feet wide, and an average of 16 feet deep is dug. How many yards of soil is excavated?

A. 1000 yards  
B. 1540 yards  
C. 3030 yards  
D. 6660 yards

5. If stormwater significantly increases sanitary sewer flow, what may be a primary problem?

A. Customers emptying pools into sewers  
B. Infiltration through gravity sewer joints  
C. Exfiltration through force main joints  
D. Roof drains plumbed to sewers  
E. B and E

WASTEWATER TREATMENT GRADES 1 & 2
1. What is the proper velocity range through grit chambers?

A. 0.5 – 1.0 ft/sec  
B. 1.0 – 2.0 ft/sec  
C. 2.0 – 5.0 ft/sec  
D. 5.0 – 10.0 ft/sec

2. Raw, fresh wastewater usually contains more than 5.0 mg/L dissolved oxygen.

A. True  
B. False

3. What is the biological load on a wastewater treatment plant with an influent BOD of 305 and a flow of 22 MGD?

A. 6611 pounds per day  
B. 22000 pounds per day  
C. 56,000 pounds per day  
D. It cannot be determined.

4. What is the biological loading to a trickling filter if the raw influent BOD is 303, the primary sedimentation basin effluent BOD is 122 and the flow is 14 MGD?

A. 14,250 Lbs  
B. 21,130 Lbs  
C. 35,378 Lbs  
D. 64,650 Lbs

5. Calculate the efficiency of a wastewater treatment facility with an influent BOD of 359 and an effluent BOD of 28.

A. 92 %  
B. 94 %  
C. 96 %  
D. 98 %

WASTEWATER TREATMENT GRADES 3 & 4
1. What is the detention time in a basin measuring 80 feet in diameter and 26 feet deep with a flow of 11 MGD?

A. 1 hour  
B. 2 hours  
C. 3 hours  
D. 4 hours

2. How many pounds of organics are removed in wastewater treatment facility treating a flow of 19 MGD with an influent BOD of 347 mg/L and an effluent BOD of 23 mg/L?

A. 3,645 pounds  
B. 34,380 pounds  
C. 51,340 pounds  
D. 55,000 pounds

3. Which of the following wastewater treatment processes removes the most BOD?

A. Grit Chambers  
B. Primary Sedimentation Basins  
C. Trickling Filters  
D. Aeration Basins

4. What is the surface hydraulic loading rate in gallons per minute per square feet (gmpsf) to a circular trickling filter 48 feet in diameter with an influent flow of 9.4 MGD?

A. 1.25 gmpsf  
B. 2.71 gmpsf  
C. 4.88 gmpsf  
D. 9.40 gmpsf

5. Which of the following is the best tool for operational monitoring on a daily basis?

A. Alkalinity analysis of raw wastewater.  
B. BOD of raw and effluent wastewater.  
C. DO of aeration basins.  
D. Suspended solids of primary effluent.

SEE ANSWERS ON PAGE 51
Energy costs typically represent the single largest non-labor operating cost in providing water or wastewater services to the public. Approximately $4 billion is spent annually in the United States on energy for water and wastewater utilities. Energy and cost efficiency in utility operations are a frequent topic of discussion and study, which will become even more relevant as energy costs continue to rise.

Over ninety-seven percent of the energy used by Tucson Water is for water pumping. As Tucson Water’s usage of Central Arizona Project (CAP) water through recharge and recovery has increased, the energy cost distribution between well pumping and water distribution system (booster) pumping has shifted, with booster pumping having a higher proportion than historically observed. Wells are routinely tested for operational efficiency, but these changes in water system operational approach have turned attention toward booster pump testing and efficiency. A grant opportunity led to the development of the Booster Pump Energy Efficiency Project by Tucson Water and WestLand Resources.

**Project Objectives**

The project undertook program development for the purpose of improving current practices and programs for booster pump operation and maintenance, while promoting efficient operations and implementing a pilot energy efficiency testing program. The project was funded by the Energy Efficiency and Conservation Block Grant (EECBG) program of the Department of Energy, under the American Recovery and Reinvestment Act. Multiple project tasks were performed to achieve the underlying project objective, including a three-day training for 70 employees on pump construction, design, maintenance, water system hydraulics, and pump efficiency considerations; baseline data collection at 125 sites for pump and motor nameplate and site data; cataloging all field data in a database including a secured web-based interface; field efficiency testing for 105 pumping units; and the implementation of 31 energy efficiency upgrades. In addition to these tasks, Standard Operating Procedures (SOPs) were developed that outlined interdivisional protocols to continue the program with in-house resources.

**Pump Efficiency Testing And Evaluation**

Prior to field testing, WestLand conducted a detailed assessment of existing site performance data, including energy bills and operational data, to prioritize potential sites for testing. This allowed the project resources to be focused on the “low-hanging fruit,” or those sites that appeared to have the greatest opportunities for energy and cost savings. Such sites generally have features like high utilization, high horsepower pumps, high energy bills, and aged equipment. Following the prioritization of all booster pump stations, which included an evaluation by Tucson Water operators and engineers, field pump efficiency testing was performed at 24 booster stations, for 105 individual pumps.

The test procedures involved obtaining several flow and head data points for each pump to establish a head versus flow relationship and a field pump curve. To develop each curve, only the test pump was operated while the other pumps at the booster station were shut off. At all times during the test, the test pump was delivering into the distribution system. Electrical data for each test condition was also collected.

Based on the hydraulic data collected, a field testing pump curve was developed and compared with the original manufacturer’s curve (see Figure 1). Conclusions were drawn based on the pump shutoff head and general shape of the pump curve in comparison to the original pump curve and typical operating conditions. Differences between the field testing pump curve and original pump curve were generally attributed to equipment wear.
Hydraulic and power data were used to determine the pumping unit's wire-to-water efficiency and estimate the possible energy and cost savings for a system optimized to work at peak efficiency. Based on the pump curve and energy usage data analysis, the need for upgrades and the possible appropriate upgrades for each pumping unit were evaluated.

The upgrade cost was estimated based on input from Tucson Water staff, and information obtained from vendors. Based on the estimated cost and energy savings, a payback analysis was performed. Figure 2 presents the number of pump upgrades that fell into various ranges of calculated payback period. Approximately two-thirds of the sites had a payback period of less than eight years. Approximately 25 percent of the sites showed a payback period of less than two years.

Generally, the payback period and appropriateness of conducting upgrades for any pumping unit are highly dependent on the observed efficiency of the equipment and the level of utilization of that equipment. Highly inefficient equipment may not be worth upgrading if the utilization is low or the cost of the upgrade is unusually high. Conversely, reconditioning large-horsepower, highly-utilized equipment could be a worthwhile investment, even if the efficiency increase is as low as 1 to 2 percent.

Implementation Of Energy Upgrades

The data and analysis results were reviewed throughout the duration of the project by a team of WestLand and Tucson Water personnel. The final selections for upgrades considered the payback analysis, project schedule, operational and logistical considerations related to the upgrades, and other benefits such as addressing aging and problematic equipment. Table 1 presents the number of upgrades performed for each upgrade category.

Validation Testing

Validation testing was performed for eight pumping units, which represented the various types of upgrades performed. The primary objectives were to determine the effectiveness of the upgrades, compare the upgraded pumping efficiency with the baseline efficiency, and refine payback estimates. A non-upgraded pump was also tested at each site during the validation testing to confirm the baseline efficiency data and verify the observed changes in the operating efficiency of the upgraded pumps. Based on the validation test observations, Table 2 summarizes the estimated ranges of efficiency improvement based on the findings of the project. The level of improvement achieved is dependent on the condition and efficiency of the original equipment.
Estimated Energy And Cost Savings

The total upgrade cost of approximately $166,000 is estimated to result in an annual savings of approximately 615,000 kilowatt-hours (kWh) and $52,000, with an overall payback period of approximately three years. Table 3 presents a comparison of EECBG projections at the time of the grant application with project estimates based on the validation testing. Energy and cost saving estimates for the project exceed the EECBG application projections by a considerable margin.

Looking Ahead – Program Implementation

Because the components identified as necessary to the Program involve personnel from diverse Tucson Water Divisions (engineering, planning, maintenance, and operations), SOPs were developed in consultation with Tucson Water staff to outline tasks and workflow. These SOPs will allow Tucson Water to effectively implement the Program using in-house resources. The implementation of this program will require:
- Performing additional detailed baseline efficiency testing
- Monitoring inefficiency indicators in the field, through pump performance trending
- Performing pump operating data review based on SCADA data
- Performing ongoing pump field efficiency testing as indicated by prior data review steps
- Identifying and implementing efficiency upgrades

A flow diagram showing the workflow and critical decision-making milestones of the Program was developed for ongoing implementation. Tucson Water’s asset management and database tools integrate and automate data and task tracking. Critical human intervention checks are built into the Program workflow to avoid “false alarms.” Interdivisional communication is also critical. To facilitate communication and data flow, work orders will be used to trigger pump testing, data review, and upgrades at critical decision-making milestones. Through the development of the Program and SOPs, it was recognized that the implementation will require a dedicated Tucson Water team, whose job responsibilities include performing the specific functions of the Program. Tucson Water is using the project results and recommendations to implement a continued Booster Pump Energy Efficiency Program, and improve operating efficiencies both for booster pumping equipment and for the organization as a whole.

TRIVIA QUESTIONS

From the Office of the AZ Water Association Historian

A. Name three cities in Europe that now have “sewer” museums.
B. The “roots” of water reuse/conservation go back far into history – what area of early civilization is considered by many historians to be the birthplace of water reuse/conservation?
C. Location of oldest, still-in-service cast iron water pipe in the U.S.?
D. Earliest “purposely” made toilet paper in the U.S.?
E. What was the name of the goddess, in ancient Roman times (500 BCE through ?? AD) that was believed by them to be the deity that watched over Roman sewers and their workers?

See answers on page 42
Disinfect effluent to stringent permit levels, without using chemicals. Meet the TrojanUVFit™ – our closed-vessel wastewater UV solution for high-level disinfection and reuse. This compact, energy-efficient reactor is available in multiple configurations and treats a wide range of flow rates. And don’t worry about those chlorine-resistant microorganisms anymore; TrojanUVFit™ inactivates them, along with bacteria and viruses.

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LEADERSHIP

By Fred KRIESS, Severn Trent Environmental Services

IT’S ALL ABOUT BALANCE – MAKE EACH DAY AND MOMENT COUNT

W e have been discussing some tips from my top ten list on how to keep your career from becoming derailed. Since we are halfway through the list, I thought we might take a “breather” and talk about the importance of maintaining balance in our daily lives. Balance in life directly impacts productivity, happiness, health and well-being. And, as such, directly impacts our ability to function as leaders.

Another year is passing quickly. This reminds me of something that I heard at a seminar several years ago that was led by Dr. Dennis Whaitley. Dr. Whatley presented the following analogy as to why it seems as if each year of our life goes by faster. **When we are 10 years of age, a year is 10% of our life. On the other hand, when we are 50, a year is only 2% of our existence. This gives us the perception about how quickly the years seem to go by as our chronological age increases.**

The truth of the matter is, each day is just the same, 1,440 minutes and 86,400 seconds. We have the same amount of time each day and make choices as to how we want to invest (and balance) the time which has been granted to us. Once gone, a day is gone forever and the time we have is lost. Steven Covey said “The key is not spending time, but investing in it.”

The Key to a Successful Day is a Healthy Start

Do you ever find yourself sitting at your desk or jobsite “spinning your wheels?” For me, the most important thing to overcome this feeling is to start with a few minutes of quiet time and thinking about what it is that I want to accomplish during the day. This also has an important effect on health. Statistics indicate that the highest percentage of heart attacks happen early in the morning, and particularly on Monday mornings. Without a doubt, I am convinced that this is a direct result of stress associated with the start of the day and attempting to cope with all that has to get done. Listen to some quiet music, meditate and be thankful for another day on this planet to make a positive difference in the lives of others.

Another big drain on productivity is all the negative thoughts. The lessons of life have taught me about how critical it is to maintain a healthy balance as we wake, that frog will keep sitting on the plate staring back at us and sapping our energy and strength while we are doing dozens of other unimportant things.

One of the biggest drains on productivity is all of the digital devices that modern technology has provided. We live in a mobile society and a culture that is saturated with the ability to communicate information rapidly and without sensitivity to the schedule of others. A bit later, we will talk about the positive benefits from mobile devices. I can tell you from personal experience, that the worst thing to do is to check your phone (immediately when you wake up) for emails, text messages and the like. You quickly find yourself reacting and responding to events, most of which can wait until you get organized. If it is important enough that it requires an immediate response, someone would have called and left a message. **Another quick tip – is it really that critical or important to send that email out on an evening or weekend? What is the person going to do with the information?** I have to confess that I fell back into this trap recently and had to remind myself to get back on track and respect the needs of others during their time away from the office and work.

Another effect of losing balance is that due to procrastination. If we tackle it (even in small pieces at a time), it will give us energy throughout the rest of the workday. On the other hand, if we wait, that frog will keep sitting on the plate staring at us and sapping our energy and strength while we are doing dozens of other unimportant things.

Balance – The Key to Happiness

The key is not spending time, but investing in it. This also has an important effect on health. Statistics indicate that the highest percentage of heart attacks happen early in the morning, and particularly on Monday mornings. Without a doubt, I am convinced that this is a direct result of stress associated with the start of the day and attempting to cope with all that has to get done. Listen to some quiet music, meditate and be thankful for another day on this planet to make a positive difference in the lives of others. And, think about what positive things are going to happen during the day rather than dwelling on negative thoughts.

One of the biggest drains on productivity is all of the digital devices that modern technology has provided. We live in a mobile society and a culture that is saturated with the ability to communicate information rapidly and without sensitivity to the schedule of others. A bit later, we will talk about the positive benefits from mobile devices. I can tell you from personal experience, that the worst thing to do is to check your phone (immediately when you wake up) for emails, text messages and the like. You quickly find yourself reacting and responding to events, most of which can wait until you get organized. If it is important enough that it requires an immediate response, someone would have called and left a message. **Another quick tip – is it really that critical or important to send that email out on an evening or weekend? What is the person going to do with the information?** I have to confess that I fell back into this trap recently and had to remind myself to get back on track and respect the needs of others during their time away from the office and work.

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The lessons of life have taught me about how critical it is to maintain a healthy balance as we live those 1,440 minutes of each day. This wheel shows four key areas of our lives and is intended to show the need for balance in each of those areas. “Service” represents giving something back to your community, church, charitable or other organization with the gift of time.

Too often things can get off center, and typically it is becoming obsessed with a job and career that results in sacrifices being made in other areas. Stated simply – “Work to Live rather than Live to Work.”

Another reminder in my life about what can happen when I failed to make a scheduled appointment...