Summary (100 words)

Narratives

Support Documents

(Total of 20 Pages)

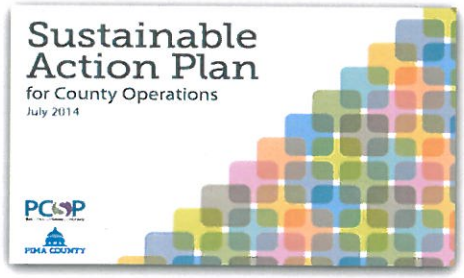
Summary (100 words)

In the process of providing wastewater services to the community, PCRWRD proactively deals with water, solids, and other byproducts, often considered as "wastes". PCRWRD has recognized the social, environmental, and economic value of the "wastes" and transformed the nature of its business from "wastes treatment/disposal" to "resource recovery". PCRWRD has developed a comprehensive Sustainability Program structured to address the sustainability goals in Public Works through seven focus areas: Reclaimed Water; Biosolids Utilization; Energy Management; Biogas Utilization; Nutrient Recovery; Research and Technology; and Green Team. PCRWRD enjoys the cost savings, the increased system efficiencies, and the community recognition of the Program.

Program Narratives

1: PROGRAM OVERVIEW

For nearly a decade Sustainability has been a buzzword commonly used in utilities to address limited and non-renewable resources. Oftentimes sustainability is addressed on a project-by-project basis, or on certain office practices, such as separation of recyclables from trash. The Pima County Regional Wastewater Reclamation Department (PCRWRD) has integrated its sustainability efforts into a living, comprehensive program that collaborates with other County departments and agencies for the enhanced welfare of the community. With the passage of the *Sustainable Action Plan for County Operations* by Resolution No. 2007-84, on May 1, 2007, and the succeeding *Sustainable Action Plan* by Resolution No. 2014 – 63 on June 17, 2014, the Pima County Board of Supervisors committed to creating and maintaining a sustainable community that promotes sound resource conservation and stewardship. With a significant carbon footprint associated with the PCRWRD operated facilities, it was natural for PCRWRD to be a major participant in the County's sustainability effort.



PCRWRD identified a number of sustainability and resource recovery milestones to track progress and reinforce commitment toward a "green" culture within the organization:

- In late 2012, the Department declared Sustainability as one of its six key strategic components, also known as "pillars".
- In early 2013, The Department created the "Sustainability and Energy Management Office (SEMO)" to identify and oversee PCRWRD's sustainability efforts.
- Utility-wide Integrated Sustainability and Resource Recovery Program (the Sustainability Program) was launched with seven key components, known as "building blocks", including:
  - **(i)** Reclaimed Water
  - **(ii)** Biosolids Utilization
  - **(iii)** Energy Management
  - **(iv)** Biogas Utilization
  - **(v)** Nutrients Recovery
  - **(vi)** Research and Technology
  - **(vii)** PCRWRD's Green Team

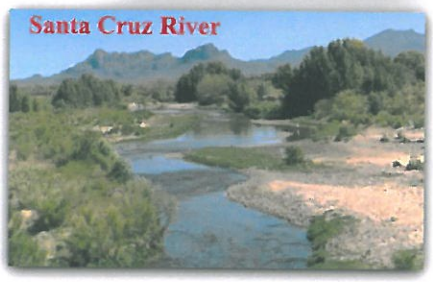
Figure 1: Seven Building Blocks of the Sustainability Program

1.1: RECLAMED WATER

In the arid regions of the Southwest, water is precious. Every attempt is made to efficiently reuse water for human, commercial, industrial and agricultural uses. Recent plant effluent upgrades have expanded the use of

reclaimed water in the community to offset potable waste consumption. Benefits of the wastewater system include:

- Strengthening system longevity and upgrade discharge water quality through PCRWRD's Regional Optimization Master Plan (ROMP) with a total program cost of $605 million, $115 million under its original budget.
- Producing 82 MGD of high quality effluent (Class A+) suitable for reclaimed water use in the community.
- Providing wastewater treatment capacity to meet the needs of Pima County residents until 2030.
- Improving Santa Cruz River's ecosystem and underlying ground water aquifer quality.
- Increasing water reuse opportunities including both indirect or future direct potable reuse.
- Incorporating wastewater treatment capability to proactively address future regulatory requirements.
- Implementing a good neighbor policy with state-of-the-art odor control technology.
- Incorporating Leadership in Energy and Environmental Design (LEED) concepts for sustainable construction.
- Providing a safe workplace for public employees and public visitors.



1.2: BIOSOLIDS UTILIZATION

Biosolids generated from the biological treatment processes are beneficially reused within the community since the 1980s. New opportunities are underway to use this resource to rehabilitate barren land within Pima County after decades of neglect.

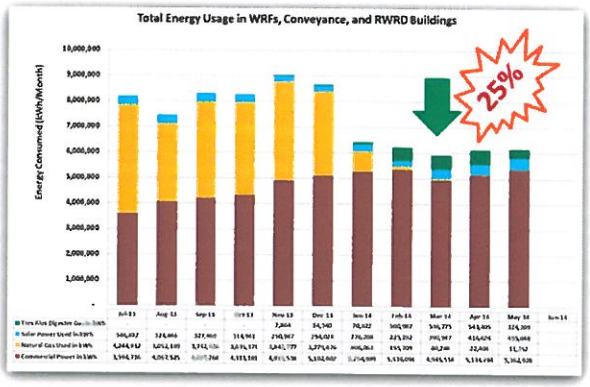
- 100% of the biosolids produced at the regional WRFs are beneficially utilized through an agricultural land application program.
- Completed PCRWRD's "System-wide Biosolids and Biogas Utilization Master Plan" in 2012 to evaluate current biosolids practices and position of PCRWRD for the future.
- As part of our Sustainability Program efforts, the Department has developed a pilot project to demonstrate the feasibility and practicality of restoring distressed or disturbed desert land with the application of biosolids. PCRWRD Sustainability and Energy Management Office staff is working with the land conservation program to restore barren land depleted of organic nutrients from past agriculture practices to a natural wildlife habitat. A biosolids application program will provide a nutrient boost to restore the perennial vegetation cover that existed in the region centuries ago. The vegetation will support and protect the multiple species habitats that are indigenous to the region. As an added benefit, during rain events new

vegetation slows or absorbs the overland flow to mitigate downstream flooding. Further ground cover prevents dust from blowing during high wind event.

1.3: ENERGY MANAGEMENT

Energy conservation and renewable solar energy has positive impacts on PWRWD operations by lowering the utility cost and lessening the dependence on fossil fuel.

1.3.1: Energy Conservation



- Energy consumption of the wastewater operations was reduced 25% through the energy efficiency improvements installed during recent plant improvements.
- On October 16, 2013, the Water Infrastructure Finance Authority of Arizona (WIFA) awarded a Planning and Design Assistance Grant of $35,000 to PCRWRD for Wastewater Reclamation Facilities Energy Audits. This 'Green' project aligns itself well with PCRWRD's Strategic Plan and countywide sustainability goals to increase energy efficiency throughout the organization.

- PCRWRD is among the first group of water and wastewater agencies to join the Department of Energy's Better Plants Program. PCRWRD is committed to improving energy performance by reducing energy intensity by an additional 25% over a ten-year period. The U.S. Department of Energy's Better Buildings, Better Plants Program is an important partnership, which consists of approximately 150 industrial companies, with 2,300 facilities, and nearly 11% of the total U.S. manufacturing energy footprint.
- Completed in December 2011, the Central Laboratory Complex at the Water and Energy Sustainability Center (WESC) created 40,000 square feet of state-of-the-art laboratory and a training center for the PCRWRD. The facility is environmentally friendly and is designed with a reduced environmental footprint as compared to typical laboratory and land development projects. The building has achieved a LEED Silver Certification. For example, all landscape vegetation was specifically selected to require low water irrigation. Planting are watered from passive rainwater harvesting techniques. As necessary, vegetation is irrigated using effluent from the adjacent water reclamation facility. No potable water is used for landscape purposes.
- The Administration building at Agua Nueva WRF was constructed to LEED Silver standards and awarded a certification through post construction audits.
- Completed in 2014, the Maintenance Building at Tres Rios WRF met the standards required for LEED Silver Certification.
- PCRWRD's building on Dodge Boulevard incorporated numerous passive energy savings technologies, including skylights, clerestory windows and an open design that transmits daylight throughout the building.

1.3.2: Solar Power

- About 10% of the electricity used for wastewater operations in Pima County is provided by solar power.

- In 2010 and 2011, two, one-megawatt (1MW) each, solar power projects were completed. One near the Tres Rios WRF (formerly Ina Road WRF) and the other near the new Agua Nueva WRF. The electric energy generated at these two solar facilities augments power used for the wastewater treatment processes at the two respective regional facilities. In FY 13/14, these two solar farms generated a total of 4,034,785 kWh of energy, enough energy to power approximately 400 homes.

Table 1: Percentage of Total Power from Solar, FY 13/14

Facilities	Tres Rios WRF	Agua Nueva WRF	All PCRWRD
Percentage of Power by Solar	6.64%	16.13%	9.60%

- In 2015, Pima County awarded a contract to develop new solar farms at three (3) sub-regional Water Reclamation Facilities – Green Valley WRF, Avra Valley WRF, and Corona de Tucson WRF. The total capacity of these sites is over 2.0MW. After this project, 85% of power used at each of these three facilities will be powered by solar. PCRWRD carbon footprint will be reduced significantly.
- All the PCRWRD solar facilities together results in environmental savings of 29,399 tons of CO_{2e}, 39,922 lbs of NO_x, 40,866 lbs, SO_x and 1,897,890 gallons of water.

1.4: BIOGAS UTILIZATION

Many byproducts of wastewater treatment are valuable resources if captured and utilized.

- PCRWRD beneficially utilized Biogas through Combined Heat and Power (CHP) technology since the 1970s. Biogas was used to generate 2MW power with supplemental natural gas in the Energy Recovery Facility at Tres Rios WRF.
- To increase overall system energy efficiency, the antiquated technology in the Energy Recovery Facility was taken out of service.
- Under the Department's Integrated Sustainability and Resource Recovery Program, a Public, Private, Partnership (P_3) project was initiated to convert wasted biogas into a natural gas like commodity, which is categorized as renewable energy by US EPA. A private party will design, build, finance, own, and operate the biogas cleaning/conditioning facility. Revenue generated by the project will be used to offset the Operational and Maintenance cost of the PCRWRD. This project captures and utilize a wasted resource and contributes to the Department's financial stability.
- The methane component (Biomethane) in Biogas will be scrubbed and conditioned to a natural gas pipeline quality and then injected into commercial natural gas grid. The Biomethane will be sold as renewable energy ("green "gas).

1.5: NUTRIENT RECOVERY

Wastewater treatment plants are traditionally designed to remove pollutants and nutrients from the raw wastewater. Additional process(es) are required to recover nutrients for beneficial reuse in the community or region.

- The Struvite Recovery Project is a great example of enhancing wastewater system sustainability. This project reduces or eliminates the use and handling of costly and corrosive commercial chemicals at Tres Rios WRF and recovers phosphorus, a vital and limited resource. The project also reduces the volume of sludge requiring disposal, and power needed in the main wastewater treatment plant to treat side stream loadings.

Struvite recovery generates a fertilizer product that is used in local agricultural markets, thereby generating revenue for public utilities.

1.6: RESEARCH AND TECHNOLOGY

RWRD continues to focus on research that will reduce energy and strengthen its commitment toward a more sustainability environment. Part of this effort is in industry leading issues in partnership with the University of Arizona (U of A).

- Lab Expansion is a cooperative venture with the University of Arizona to explore future water and wastewater treatment processes.
- "Beneficial Utilization of CO_2 from Biogas" is a research project, which was selected by Water Environment Research Foundation (WERF) as one of the Targeted Collaboration Projects in 2013. Collaborating with U of A, WERF, City of Chicago, Greeley and Hansen, and CH2M Hill, PCRWRD is not only looking to harvest methane for energy, but also is researching reuse options for CO_2 derived from digester gas. 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.
- Control of effluent trihalomethanes (THM) concentrations is a permit requirement in Arizona. Typically, this is not an issue with plants with higher nitrogen ammonia limits. But with plants with low effluent nitrogen-ammonia limits THMs concentrations can be elevated above permit limits. The typical solution is to feed commercial aqueous ammonia solution ahead of hypochlorite disinfection to inhibit THMs formation. RWRD experimented with air stripping and adding ammonia laden centrate to the effluent techniques for THM control. PCRWRD selected the centrate addition for THM control based on the sustainability aspects and cost cutting measures.
- Potential future research may include energy neutrality and process to remove nutrients from wastewater with low energy budgets.

1.7: GREEN TEAM

PCRWRD established a 25 member "Green Team" to champion a greener and healthier workplace at all levels throughout the entire organization. The Green Team members work at or travel to all PCRWRD facilities and serve as the "boots on the ground" to raise awareness of the many opportunities to advance sustainability in the workplace. Green Team members, known as "Eco Champions" routinely meet, and host events and activities within the Department to raise awareness. Since 2012,

the Green Team has been working on (i) Waste Reduction/Communication, (ii) Health and Wellness, (iii) Green Purchasing, and (iv) Sustainability Training. Due to the Green Team's efforts, PCRWRD has adopted a Green

Purchasing Policy and a Waste Reduction Policy. The Department's recycled paper use increased significantly and "environmentally conscious" purchasing behavior has improved dramatically.

The Green team has hosted numerous programs/activities, such as Office Recycle Program, Bike Program, Weekly Green Message, Sustainability Column in the Department Newsletter, "No Styrofoam" Campaign, Green Bulletin Board Contest, and Sustainable Living Kid's Art Calendar.

2: EVALUATION CATEGORIES

2.1: ECONOMY

Financial sustainability is one of the measures for system sustainability. Not all projects for the benefit of environment cost more money. Many projects can achieve sustainable goals and benefits with little or no additional costs, and some may even generate revenue and offset operational and maintenance cost of Public Works.

As part of the Sustainability Program, the Department is developing a Biogas Sale and Utilization Project through a Public Private Partnership (P_3) delivery. Private partner is responsible to Design, Build, Finance, Own, and Operate (DBFOO) the biogas cleaning and conditioning facility. Profit made by selling cleaned biogas to a renewable energy market will be shared with the Public partner.

Currently, two solar farms are providing clean energy to power a portion of our system. Three more solar facilities are under development. All the solar projects are developed through P_3 type of delivery. PCRWRD, as a Public Works entity enjoys a low electricity rate, but also operates with low carbon emissions. All these projects attract private investment to Pima County and ultimately stimulate the local economy and increase financial stability of government entities.

Resource recovery projects, such as the Struvite Recovery project that the Department is implementing, has a calculated payback of 8.7 years. This project not only benefits the environment but also increases the sustainability within the community by recycling a limited and vital resource.

2.1.1: Economic Development

As described earlier, the Biogas Sale and Utilization Project, the two existing Solar Power Projects, and the three new solar projects at sub-regional facilities have and will lower/stabilize operating expenses and decrease carbon footprint. All these projects attract private investment to Pima County to design, build, and operate the projects. Through these Public, Private, Partnership projects, PCRWRD will attract $14 -20 million ($4million - $6 million for the existing solar projects, $6-8 million from the Biogas sales and Utilization Project, and $4-6 Million from new solar projects) private investment to Pima County. The private investment will stimulate local economy and create much-needed jobs in the County.

The Focus Areas of the Sustainability Program contributing to "Economic Development" are Biogas Utilization, Nutrient Recovery, and Energy Management (Solar).

2.1.2: Financial Stability

Revenues from the Biogas project, solar projects, Struvite recovery project, and other resource recovery projects will certainly increase the financial stability of the Department.

Innovative project delivery methods, such as DB, DBO, and DBFOO, also help to maintain financial stability of a Public Works entity. PCRWRD carefully evaluates the project delivery method of any major capital improvement project (CIP) to ensure high quality projects at the lowest overall cost for financial stability. All the resource recovery projects must be justified based on business case analysis. As projects developed during the

design and construction phases, there were opportunities to reduce costs through value engineering, skilled negotiations, and appropriate project delivery approaches. Pima County RWRD recently completed a multi-year construction and rehabilitation program known as the Regional Optimization Master Plan (ROMP). ROMP was the largest and most complex public works program ever undertaken in the history of Pima County. The original budgeted was $720 million, the final cost was $605 million, $115 million under its original budget. Numerous delivery methods were used: CMAR, DBO, JOC, DBFOO, and progressive DB etc.

The Focus Areas of the Sustainability Program contributing to "Financial Stability" are Water Reclamation, Biogas Utilization, Nutrient Recovery, and Energy Management.

2.2: COMMUNITY

PCRWRD's core business is to provide public wastewater collection and treatment services for the community within Pima County. The Department owns and operates nine (9) water reclamation facilities (WRF) and associated conveyance systems including two regional WRFs, seven sub-regional WRFs, 28 pump stations, and over 3,400 miles of sewer, serving approximately 1 million population in southern Arizona. Our mission is to protect the public health, safety and the environment by providing quality service, environmental stewardship and renewable resources.

PCRWRD is committed to provide not only basic wastewater services but also the most sustainable services financially and environmentally to our communities in Pima County. Pima County is a desert community. Water scarcity and energy shortage are two major crises we are facing in this semi-arid region. As a wastewater management agency, it is also one of the largest energy consumers in local government. On average, PCRWRD spends over $4 million per year on energy.

The Department is very conscientious about water reclamation and energy conservation. The recently completed ROMP with $605 million capital improvement is the best contribution to the community in terms of water reclamation, reuse and recycle.

A major part of the Sustainability Program is Energy Management. Our goals are: (i) minimize energy consumption; (ii) maximize the use of renewable energy.

- ROMP significantly increased the energy efficiency of the system and reduced the energy consumption by 25%.
- Approximately 10% of the electricity consumed by PCRWRD is provided by solar power. With the completion of the three new solar projects, more power will be provided by solar.
- Biogas is a renewable energy source. PCRWRD is actively seeking innovative solutions to capture and reuse it as an energy source.

It is PCRWRD's vision is to be an industry leader in the management and sustainability of the water reclamation cycle and other renewable resources. Maximizing resource recovery from wastewater is another important goal of our Sustainability Program. We are actively exploring numerous opportunities to recovery energy and resources from water, Biosolids, and Biogas. A few examples:

- To minimize carbon emission, the Department is collaborating with the University of Arizona, WERF, City of Chicago, Greeley and Hansen, CH_2M Hill to research an innovative way to beneficially utilize the CO_2 in Biogas.
- All Biosolids generated from our system are applied to agricultural land for beneficial use.
- The Sustainability Program is evaluating the feasibility of using wastewater Biosolids for barren land restoration.
- Please refer to Section 1 for more examples.

The Sustainability Program also engages in a large number of community and environmental activities, supports sustainable actions and practices surrounding water conservation, sustainable food systems, green infrastructure, and drought-tolerant landscaping.

2.2.1: Education

PCRWRD has established department-wide procedures and employee training in "green" workplace practices. The Department has found that education, and reinforcement of "green" behaviors boosts employee motivation to act more sustainably. This is demonstrated by the educational program implemented by the PCRWRD Green Team (See **Section 1, Focus Area 7**)

Through the Community Relations Section of the Department, the Sustainability Program has provided many community outreach and educational events throughout the year. These events provided opportunities for PCRWRD to showcase the sustainability related projects/programs. The activities and events include Drought Campaign, Holiday Grease Collection Program, and community education at public meetings and events such as "Tucson Meet Yourself". All these activities successfully increase the public awareness of water conservation, grease reduction from sewer systems, and community health and wellness.

The tremendous effort our staff made on wastewater system sustainability has enhanced interdepartmental and intergovernmental collaboration. Pima County, in conjunction with other local governments, made a strong commitment to reducing air pollution and greenhouse gases. Pima Association of Government (PAG) is the umbrella agency that has representation of all jurisdictions in Pima County along with two Indian nations, whose tribal lands fall within Pima County's boundaries. Our staffs have worked closely with the Clean Cities, PAG and City of Tucson's sustainable environment programs. These efforts have led to an examination of the multiple possibilities for the beneficial use of biogas and other renewable resources. The Pima County Department of Environmental Quality, Pima County Parks and Recreation Department, and Pima County's Sustainability Program have also worked with and supported the Sustainability Program.

In addition, our staffs have given numerous technical presentations in local, State, and National conferences and is becoming a positive representation of PCRWRD in the State and the Nation. Please see **Support Document Section** for the list of the presentations.

The Focus Areas in the Sustainability Program contributing to "Education" are Research and Technology, and Green Team.

2.2.2: Safety

Staff health and wellness is an important measure in the Sustainability Program. PCRWRD strongly supports a culture of safety within and outside of the organization. The Department targets and promotes a "zero accident" safety culture.

The recently completed ROMP projects greatly improve the water safety in the community. ROMP has resulted in the discharge of much cleaner water into the environment for our community to enjoy. Currently, we produce Class A^+ water from the regional facilities and most of our sub-regional facilities. Class A^+ is the highest quality of reclaimed water and is safe for reuse in cooling towers, washing cars, watering gardens, filling ponds and fountains, and toilet flushing. Other uses include watering sports fields, watering plants in retail nurseries, dust suppression and firefighting.

As potable water sources are strained by increasing populations and persistent drought conditions, these additional uses of reclaimed water will prove to be a great benefit to the community. The improved quality of our effluent also benefits the community's reclaimed water system operated by Tucson Water. In the past, leaks in

the reclaimed water system had to be repaired immediately because human contact was not advised. Improved water quality allows public workers to work under a safer condition.

The Focus Area in the Sustainability Program primarily contributing to "Safety" is Water Reclamation.

2.2.3: Enjoyment

A century ago, the Santa Cruz River flowed year-round at San Xavier del Bac Mission, and near downtown Tucson. Portions of creeks in the region supported mesquite, cottonwood and willow forests. Beaver swam in the Tanque Verde Creek, a tributary of the Santa Cruz River. Since then, these rich riparian corridors have been altered due, in part, to population growth, groundwater pumping and erosion.

Watercourses are gathering places for people and wildlife. This is why the Sustainability Program supports riparian restoration for environmental protection and quality of life for the community whenever possible.

The City of Tucson and Pima County have agreed to set aside up to 10,000 acre-feet of treated effluent per year for riparian projects.

PCRWRD has contributed to the development of a multi-use trail system, known as "The Loop" along the major washes in the region. Currently, Pima County residents and visitors enjoy, by foot, bike, horse, or skates, the 100 miles of the multi-use path that has been completed to date. Upon completion, the Loop will total 131 miles and connect the Rillito River Park, Santa Cruz River Park, and Pantano River Park with the Julian Wash and the Harrison Greenway.

As an effort of the Sustainability Program, we are evaluating the feasibility to use Biosolids to restore barren desert land. A pilot program is being planned. If deemed feasible, PCRWRD will potentially contribute to the regional efforts to restore hundreds of acres of barren desert land to natural grassland. This will help to prevent soil erosion and minimize sand storms along the Interstate 19 corridor.

PCRWRD has a "Good Neighbor" policy. All the new water reclamation facilities are architecturally designed with pleasing colors to blend in the natural desert landscape. All the facilities are equipped with state-of-the-art odor control.

The Focus Areas in the Sustainability Program primarily supporting "Enjoyment" are Water Reclamation and Biosolids Utilization.

2.2.4: Livability

"Livability" can be defined in many ways. Sustainability Program strives to improve the Livability in Pima County. The Sustainability Program contributes to the "Livability in Pima County in the following ways:

Water availability and quality is vital to human life. PCRWRD is directly involved with making available a high-quality reclaimed water, which eases the strain on potable water supplies, especially in light of on-going drought and population increases. This forethought is especially important in light of the fact that the water needs of current generations can be met without compromising the ability of future generations to meet their own needs.

Biosolids from wastewater treatment processes are applied to agricultural land for soil augmentation. This practice not only increases crop production, but also avoids sending vast amounts of material to landfill reducing its capacity.

Reducing carbon footprint from our operations is an important goal of the Program. It potentially slows down climate change driven by human activities and reduces air pollution through energy conservation and use of renewable energy. Biogas utilization reduces carbon emission, reduces air pollution, and recovers energy in Biogas to offset fossil fuel consumption.

Through the Green Team effort, the Program encourages employees to develop a more sustainable lifestyle. The goal is to create a healthier and pleasant work environment.

The Focus Areas of the Sustainability Program primarily contributing to "Livability" are Reclaimed Water, Biosolids Utilization, Biogas Utilization, Energy Management, and Green Team.

2.3: ENVIRONMENT

Our Sustainability Program is all about the environment. The whole program is designed to improve wastewater handling system sustainability, maximize water reclamation/reuse, minimize energy consumption, maximize the use of renewable energy, maximize resource recovery, reduce carbon footprint through innovative technology, and human behavior change.

2.3.1: Pollution Prevention or Clean Up

PCRWRD recently commissioned its Regional Optimization Master Plan (ROMP) with a total program cost of $605 million. Through ROMP, PCRWRD has capacity to produce 82 MGD of high quality effluent (Class A^+) suitable for reclaimed water use in the community. The upgraded and expanded facility is capable of providing wastewater treatment capacity to meet the needs of a majority of Pima County residents until 2030.

Higher water quality improves the Santa Cruz River's ecosystem and the underlying ground water aquifer quality; increases the water reuse opportunities; incorporates wastewater treatment capability to proactively address future regulatory requirements.

Biogas utilization is also an effective way to reduce carbon emission to the atmosphere. Biogas contains approximately 60% of methane and 40% of carbon dioxide (CO_2). After the decommissioning of the power generation facility, Biogas has been flared on-site. Flaring releases a significant amount of Green House Gas. The Biogas utilization is to clean and condition the methane component (Biomethane) in Biogas to pipeline quality and then inject it into commercial natural gas grid. The Biomethane will be sold as renewable energy. This will reduce the carbon emission locally. The energy recovered from Biomethane will offset the fossil fuel use for the end user.

The Focus Areas of the Sustainability Program primarily contributing to "Pollution Prevention" are Reclaimed Water and Biogas Utilization.

2.3.2: Natural Resource Use and Conservation

PCRWRD owns and operates nine (9) water reclamation facilities (WRF) and associated conveyance systems including two regional WRFs, seven sub-regional WRFs, 28 pump stations, and over 3,400 miles of sewer, serving approximately 1 million population in southern Arizona. Wastewater is a "green" commodity. PCRWRD collects and treats wastewater and recycles or returns purified water safely to the environment. In the process, we proactively deal with water, solids, and other byproducts, traditionally considered as "wastes". PCRWRD has recognized the social, environmental, and economic value of the "wastes" and transformed the nature of our business from "wastes treatment/disposal" to "resource recovery". One of the most important goals of the Sustainability Program is to maximize resource recovery from water, biosolids, biogas, and other byproducts.

One of the resource recovery projects is Struvite Recovery. It is a great example of enhancing wastewater system sustainability. This project reduces or eliminates the use and handling of costly and corrosive commercial chemicals at Tres Rios WRF and recover phosphorus, a vital and limited resource. The project also reduces the volume of sludge requiring disposal, and power needed in the main wastewater treatment plant to treat side stream loadings. Struvite recovery generates a fertilizer product that is used in local agricultural markets, and thereby generates revenue for public utilities.

The Focus Areas of the Sustainability Program primarily contributing to "Natural Resource Use and Conservation" are Reclaimed Water, Biosolids Utilization, Nutrient Recovery, Energy Management (Solar), and Biogas Utilization.

2.3.3: Energy Efficiency

PCRWRD is one of the largest energy consumers in Pima County government. Approximately $4 million a year is spent on energy. A major part of the Sustainability Program is Energy Management. Energy conservation and renewable solar energy have had positive impacts on PCRWRD's bottom line.

Two, one-megawatt (1MW) each solar power projects were constructed in 2010 and 2011 at the Tres Rios WRF and the Agua Nueva WRF, the two regional WRFs within Pima County. In FY 13/14, these two solar farms generated a combined 4,034,785 kWh of energy. Three additional solar farms are proposed for construction in 2015 at three separate sub-regional WRF's at a combined capacity of over two megawatt (2MW). All the PCRWRD solar facilities together results in **environmental savings of 29,399 tons of CO_{2e}, 39,922lbs of NOx, 40,866lbs, SOx and 1,897,890gallons of water.**

Through ROMP, PCRWRD energy consumption is reduced by 25%. On October 16, 2013, Water Infrastructure Finance Authority of Arizona (WIFA) awarded a Planning and Design Assistance Grant of $35,000 to PCRWRD for Wastewater Reclamation Facilities Energy Audits. This 'Green' project aligns itself well with PCRWRD's Strategic Plan and countywide sustainability goals.

PCRWRD is within the first group of water and wastewater agencies that join the Department of Energy's Better Plants Program. PCRWRD is committed to improve energy performance by reducing energy intensity by 25% over a ten-year period. The U.S. Department of Energy's Better Buildings, Better Plants Program is an important partnership, which consists of approximately 150 industrial companies, with 2,300 facilities, and nearly 11% of the total U.S. manufacturing energy footprint.

The Focus Areas of the Sustainability Program primarily contributing to "Energy Efficiency" are Energy Management and Biogas Utilization.

3: FUTURE OPPORTUNITIES

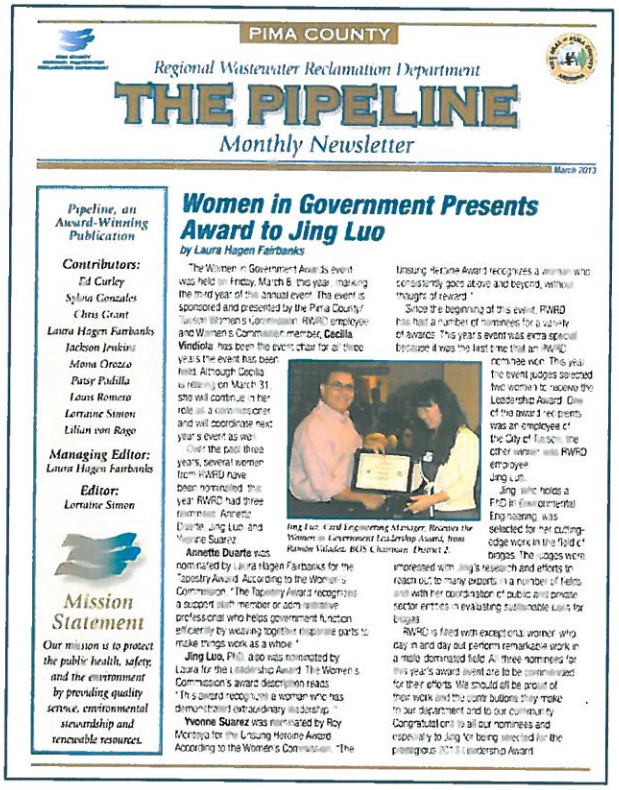
Our Sustainability Program is young. In the past three years, several project tasks have been accomplished. We are proud of the progress made. A number of future opportunities are under consideration, such as Energy Neutrality, Fat Oil and Grease (FOG) and Food Waste, Direct Potable Reuse, Compressed Natural Gas (CNG) as vehicle fuel, and low head hydropower to add to the sustainability portfolio of PCRWRD.

We are very grateful for the tremendous support received from:

- PCRWRD Senior Management
- Pima County Government (Administration and other Departments)
- Governor's Office of Energy Policy,
- Pima Association of Government (PAG),
- City of Tucson,
- Water Infrastructure Finance Authority of Arizona (WIFA),
- Department of Energy,
- Water Environment Research Foundation,
- University of Arizona,
- Various Consultants

Support Documents

Awards/Descriptions



PIMA COUNTY

Regional Wastewater Reclamation Department

THE PIPELINE

Monthly Newsletter

March 2013

Pipeline, an Award-Winning Publication

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Mission Statement

Our mission is to protect the public health, safety, and the environment by providing quality service, environmental stewardship and renewable resources.

Women in Government Presents Award to Jing Luo

by Laura Hagen Fairbanks

The Women in Government Awards event was held on Friday, March 8, this year, marking the third year of this annual event. This event is sponsored and presented by the Pima County/Tucson Women's Commission. RWRD employee and Women's Commission member, Cecilia Vindiola, has been the event chair for all three years the event has been held. Although Cecilia is retiring on March 31, she will continue in her role as a commissioner and will coordinate next year's event as well.

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Jing Luo, PhD, also was nominated by Laura for the Leadership Award. The Women's Commission's award description reads: "This award recognizes a woman who has demonstrated extraordinary leadership."

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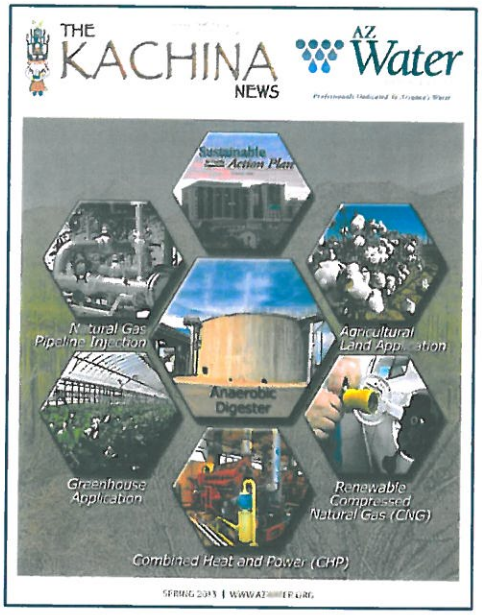
Jing, who holds a PhD in Environmental Engineering, was selected for her cutting-edge work in the field of biogas. The judges were impressed with Jing's research and efforts to reach out to many experts in a number of fields and with her coordination of public and private sector entities in evaluating sustainable uses for biogas.

RWRD is filled with exceptional women who, day in and day out, perform remarkable work in a male dominated field. All three nominees for this year's award event are to be commended for their efforts. We should all be proud of their work and the quiet bulldog they make in our department and to our community. Congratulations to all our nominees and especially to Jing for being selected for the prestigious 2013 Leadership Award.

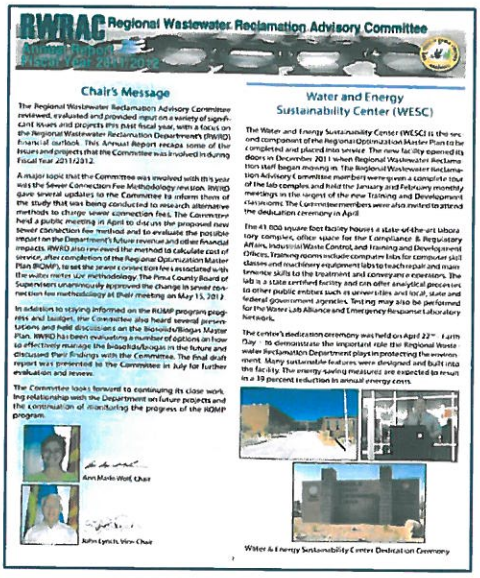
❖ Jing Luo, PhD, PE, Manager of PCRWRD Sustainability and Energy Management Office received the "Women in Government Leadership Award" from Supervisor Ramon Valadez, Pima County Board of Supervisors Chairman, March 2013. (Full page included in Attachment)

❖ PCRWRD was the recipient of the 2014 "Sisterhood in Government Award" by Pima County/City of Tucson Women's Commission, May 9, 2014.

Publications/Descriptions



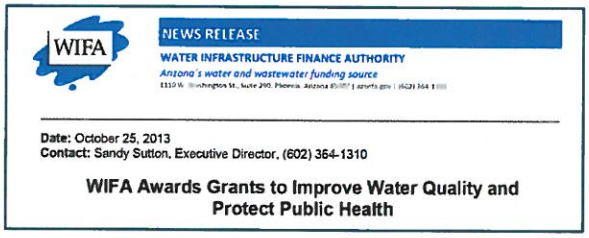
❖ KACHINA News, AZ Water Magazine Cover Story: Maximizing the Sustainability of Wastewater Treatment in Pima County, Spring 2013 (Full pages included in the Attachment)



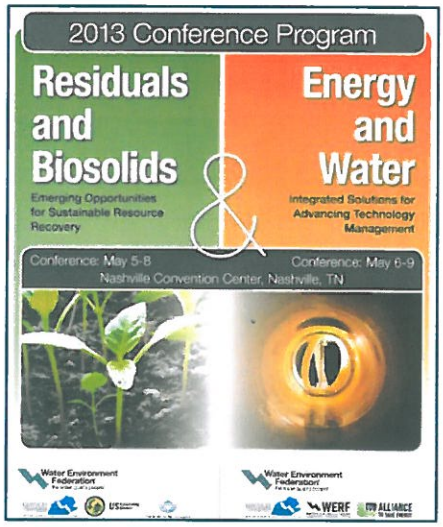
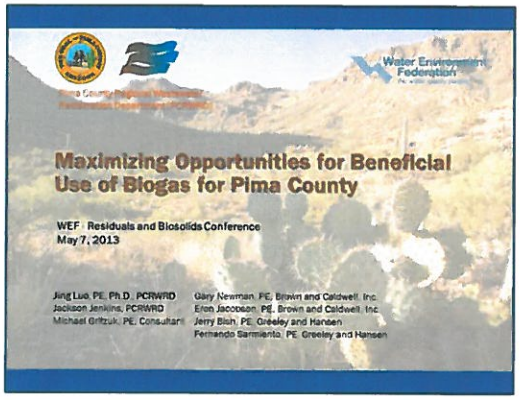
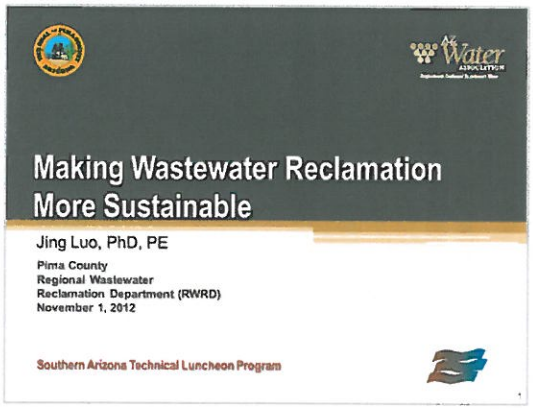
❖ Acknowledged by Regional Wastewater Reclamation Advisory Committee, PCRWRD completed the Water and Energy Sustainability Center and the Biosolids and Biogas Master Plan (Full pages included in the Attachment)

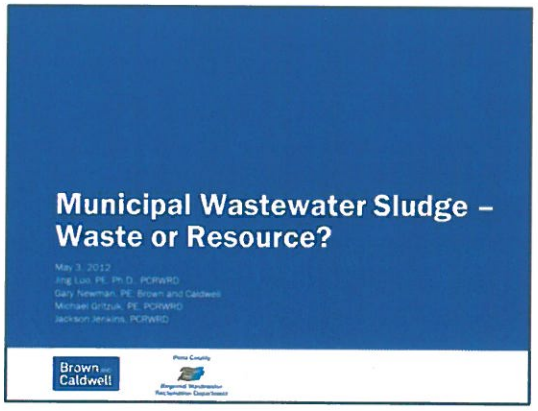
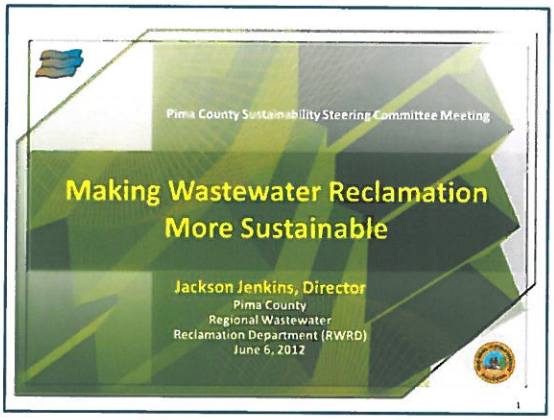
Media Interview and Grant Ward	Descriptions

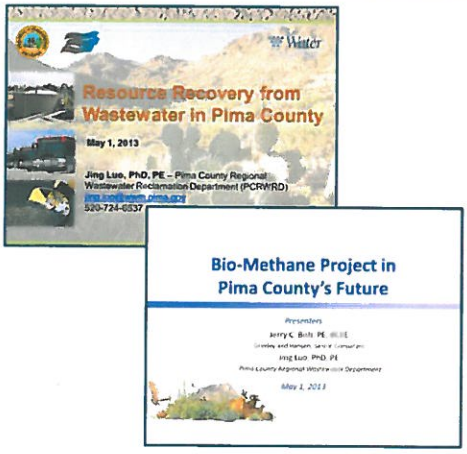
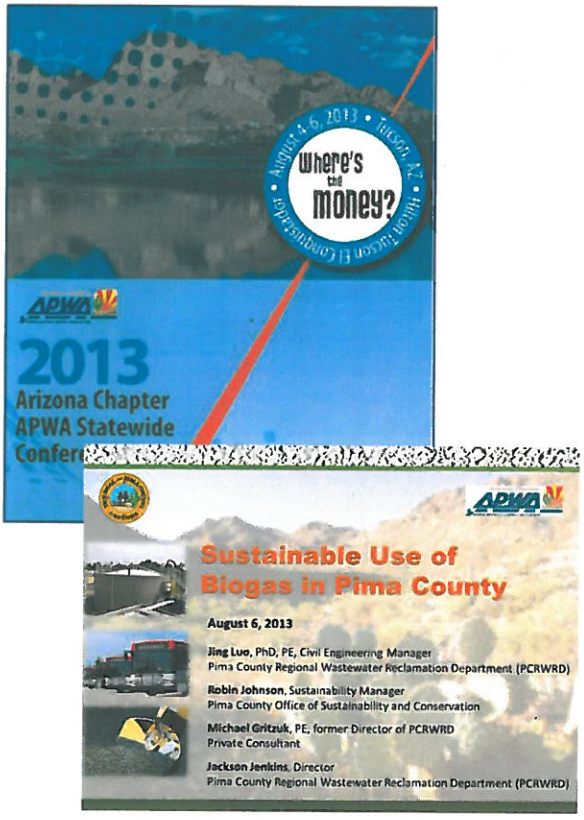
- KUAT 6 (AZ Illustrated) interviewed Jackson Jenkins, Director of PCRWRD on Biogas Utilization, February 26, 2014, (http://webcms.pima.gov/cms/One.aspx?portalId=169&pageId=79528)

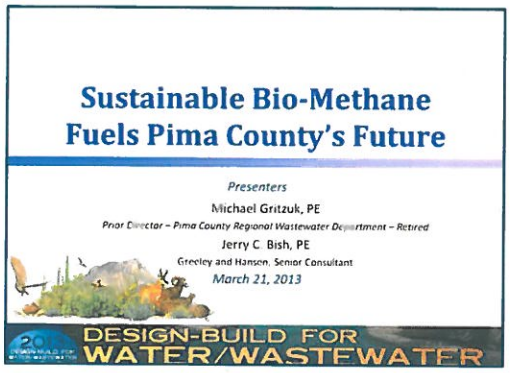
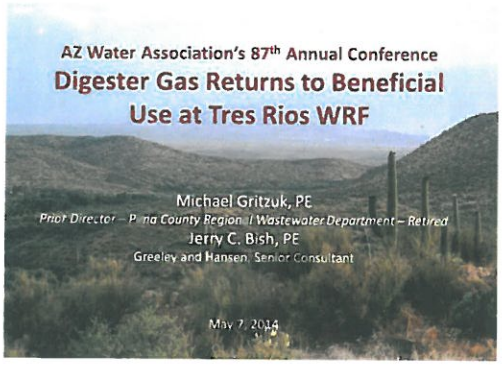


- WIFA awarded PCRWRD a Grant of $35,000 to conduct a comprehensive energy efficiency study of seven of its wastewater treatment facilities

Technical Presentations	Descriptions
	❖ Jing Luo, PhD, PE presented at the 2013 WEF's Residuals and Biosolids Annual Conference in Nashville, TN, May 7, 2013
	
	❖ Jing Luo, PhD, PE presented at AZ Water Southern Arizona Technical Luncheon Program, Tucson, AZ, November 1, 2012

Technical Presentations	Descriptions
	❖ Jing Luo, PhD, PE and Gary Newman, PE (Brown and Caldwell) presented at the 2012 AZ Water Annual Conference, Glendale, AZ, May 3, 2012 ❖ Same presentation was also presented at the Department of Energy Clean City Program Meeting, Tucson, AZ, May 18, 2012
	❖ Jackson Jenkins, Director of PCRWRD presented at Pima County Sustainability Steering Committee Meeting, Tucson, AZ, June 6, 2012 ❖ Same presentation was also presented to PAG Environmental Planning Advisory Committee, Tucson, AZ, September 7, 2012 ❖ Same presentation was also made to City of Tucson Environmental Management Meeting, Tucson, AZ, September 27, 2012
	❖ Jing Luo, PhD, PE and Gary Newman (Brown and Caldwell) presented to the Stakeholders Meeting, Pima County, AZ, July 19, 2012

Technical Presentations	Descriptions
	❖ Jing Luo, PhD, PE presented at the 2013 AZ Water Annual Conference, Glendale, AZ, May 1, 2013 ❖ Jerry Bish, PE (Greeley and Hansen) and Jing Luo, PhD, PE presented at the 2013 AZ Water Annual Conference, Glendale, AZ, May 1, 2013
	❖ Jing Luo, PhD, PE and Robin Johnson (Pima County Sustainability and Conservation Office) presented at the 2013 APWA Annual State Conference, Tucson, AZ, August 6, 2013

Technical Presentations	Descriptions
	❖ Michael Gritzuk, PE, Prior Director of PCRWRD and Jerry Bish, PE (Greeley and Hansen), presented at the 2013 Design-Build for Water/Wastewater Annual Conference, Orlando, FL, March 21, 2013
	❖ Michael Gritzuk, PE, Prior Director of PCRWRD, Jerry Bish, PE (Greeley and Hansen) and Gary Newman, PE (Brown and Caldwell) presented at the 2012 Design-Build for Water/Wastewater Annual Conference, Phoenix, AZ, April 24, 2012
	❖ Michael Gritzuk, PE, prior Director of PCRWRD and Jerry Bish, PE (Greeley and Hansen) presented at the 2014 AZ Water Annual Conference, Glendale, AZ, May 7, 2014

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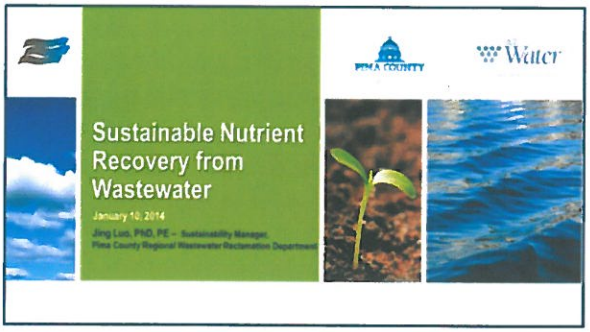
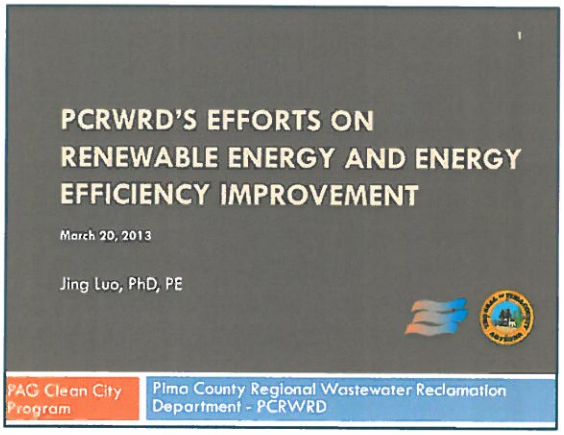
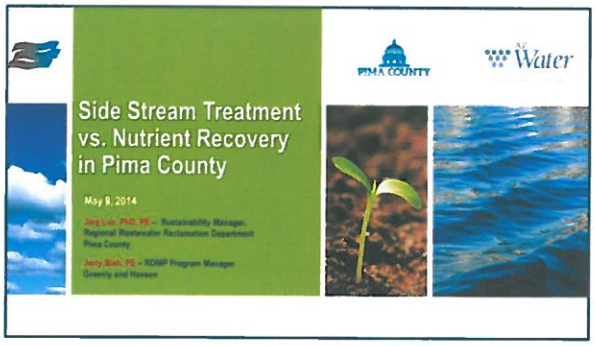
	❖ Jing Luo, PhD, PE presented at Southern Arizona Technical Luncheon Program, Tucson, AZ, January 10, 2014
	❖ Jing Luo, PhD, PE presented at the Department of Energy Clean City Program Meeting, Tucson, AZ, March 20, 2013
	❖ Jing Luo, PhD, PE presented at AZ Water Annual Conference, Glendale, AZ, May 9, 2014

Attachments

PIMA COUNTY
PIMA COUNTY REGIONAL WASTEWATER RECLAMATION DEPARTMENT
Regional Wastewater Reclamation Department
THE PIPELINE
Monthly Newsletter
March 2013

Pipeline, an Award-Winning Publication

Contributors:
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Laura Hagen Fairbanks
Jackson Jenkins
Mona Orozco
Patsy Padilla
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Lorraine Simon
Lilian von Rago

Managing Editor:
Laura Hagen Fairbanks

Editor:
Lorraine Simon

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MAXIMIZING THE SUSTAINABILITY OF WASTEWATER TREATMENT IN PIMA COUNTY

Jing LUO
Pima County Regional Wastewater Reclamation Department (PCRWRD)

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 indicates that wastewater facilities use an average of 3kWh/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

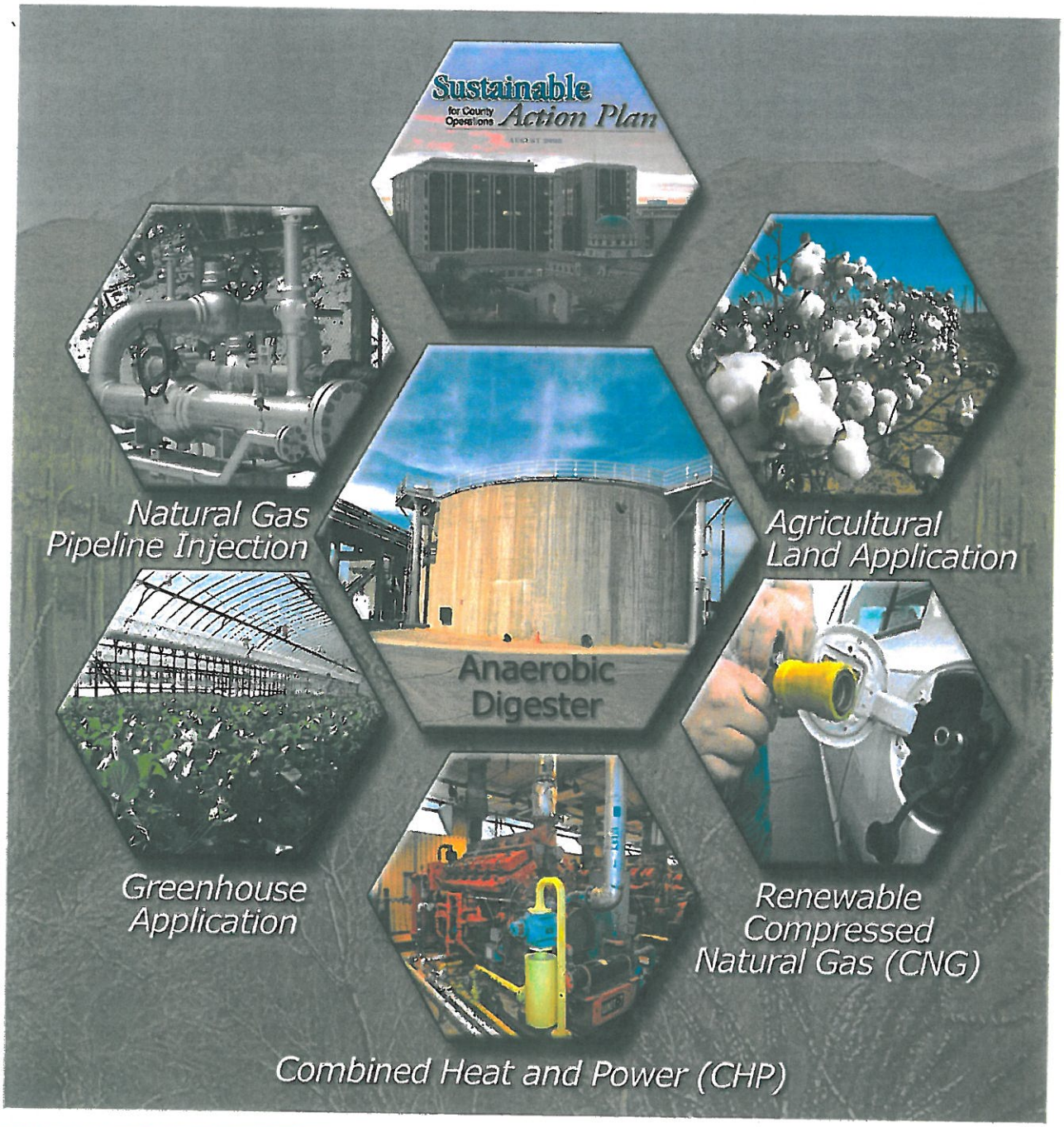
Food wastes, fats, oils, and grease (FOG) materials are great additives to anaerobic digesters and produce a great amount of biogas. Although some private companies recycle some of the material to make biofuel, most of the materials are sent to landfill. Ultimately, these materials fill up landfill space 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.

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.



RWRAC Regional Wastewater Reclamation Advisory Committee

Annual Report Fiscal Year 2011/2012

Chair's Message

The Regional Wastewater Reclamation Advisory Committee reviewed, evaluated and provided input on a variety of significant issues and projects this past fiscal year, with a focus on the Regional Wastewater Reclamation Department's (RWRD) financial outlook. This Annual Report recaps some of the issues and projects that the Committee was involved in during Fiscal Year 2011/2012.

A major topic that the Committee was involved with this year was the Sewer Connection Fee Methodology revision. RWRD gave several updates to the Committee to inform them of the study that was being conducted to research alternative methods to charge sewer connection fees. The Committee held a public meeting in April to discuss the proposed new sewer connection fee method and to evaluate the possible impact on the Department's future revenue and other financial impacts. RWRD also reviewed the method to calculate cost of service, after completion of the Regional Optimization Master Plan (ROMP), to set the sewer connection fees associated with the water meter size methodology. The Pima County Board of Supervisors unanimously approved the change in sewer connection fee methodology at their meeting on May 15, 2012.

In addition to staying informed on the ROMP program progress and budget, the Committee also heard several presentations and held discussions on the Biosolids/Biogas Master Plan. RWRD has been evaluating a number of options on how to effectively manage the biosolids/biogas in the future and discussed their findings with the Committee. The final draft report was presented to the Committee in July for further evaluation and review.

The Committee looks forward to continuing its close working relationship with the Department on future projects and the continuation of monitoring the progress of the ROMP program.

Ann Marie Wolf, Chair

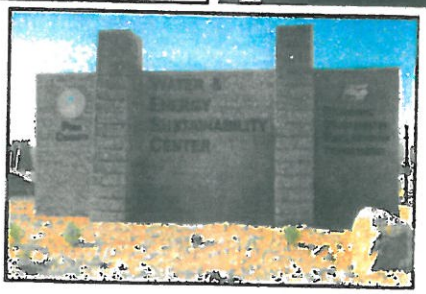
John Lynch, Vice-Chair

Water and Energy Sustainability Center (WESC)

The Water and Energy Sustainability Center (WESC) is the second component of the Regional Optimization Master Plan to be completed and placed into service. The new facility opened its doors in December 2011 when Regional Wastewater Reclamation staff began moving in. The Regional Wastewater Reclamation Advisory Committee members were given a complete tour of the lab complex and held the January and February monthly meetings in the largest of the new Training and Development classrooms. The Committee members were also invited to attend the dedication ceremony in April.

The 41,000 square foot facility houses a state-of-the-art laboratory complex, office space for the Compliance & Regulatory Affairs, Industrial Waste Control, and Training and Development Offices. Training rooms include computer labs for computer skill classes and machinery equipment labs to teach repair and maintenance skills to the treatment and conveyance operators. The lab is a state certified facility and can offer analytical processes to other public entities such as universities and local, state and federal government agencies. Testing may also be performed for the Water Lab Alliance and Emergency Response Laboratory Network.

The center's dedication ceremony was held on April 22nd – Earth Day – to demonstrate the important role the Regional Wastewater Reclamation Department plays in protecting the environment. Many sustainable features were designed and built into the facility. The energy-saving measures are expected to result in a 39 percent reduction in annual energy costs.



Water & Energy Sustainability Center Dedication Ceremony

Biosolids/Biogas Master Plan Update

This past year, the Regional Wastewater Reclamation Department (RWRD) has been exploring various options on how to cost effectively utilize biosolids and biogas. The RWRAC received several presentations on this issue and continues to receive updates on the ongoing process.

Effluent is an often sought-after product of the wastewater treatment process. However, biosolids, a major by-product of wastewater treatment, is viewed as a disposal problem. Biosolids result from the treatment of organic matter and some inorganic materials, such as sand and grit in the wastewater treatment process. During the treatment process, these organic and inorganic materials are referred to as "sludge," or "biosolids".

Biosolids that are beneficially utilized through land application are typically provided to farmers, allowing them to supplement commercial fertilizer. Biosolids that meet the Class B pathogen treatment and pollutant criteria – in accordance with the EPA standard – can be land applied with formal site restrictions and strict record-keeping requirements. Through land application, RWRD beneficially utilizes its biosolids and saves money by not having to pay expensive landfill disposal costs.

For the time being, the application of biosolids on agricultural lands appears to be the most cost-effective and beneficial method of disposal. It costs Pima County approximately $85 per dry ton to haul its biosolids to agricultural lands; this is one of the lowest costs in the nation. In comparison, for example, to some communities in California that pay over $300 per ton to dispose of their biosolids.

Although there has been some loss of agricultural lands in Pima County, there is still enough nearby farmland to allow RWRD to continue this type of disposal method. However, should area agricultural lands dramatically decrease, RWRD is considering the use of biosolids on properties owned by the County.

Biosolids produced by RWRD today are classified as a Class B product. Class B biosolids are significantly less expensive to produce than Class A biosolids, although there are far more restrictions and regulatory requirements surrounding the disposal of a Class B product. In the future, federal or state regulations may mandate the transition to the production of Class A biosolids. RWRD is preparing to respond to this possibility. However, significant research and marketing efforts would be required to "sell" biosolids (both figuratively and literally) to businesses and residents. It is important to be aware that a mandate to treat biosolids to a Class A standard would impact sewer user fees.

Biogas, another by-product of the wastewater treatment process, is produced through the anaerobic digestion of sludge (biosolids) in the wastewater treatment process. Biogas generated by the anaerobic treatment process is comprised primarily of methane gas, carbon dioxide, siloxanes, and other contaminants. Biogas can be used to generate power in a co-generation facility, or it can be cleaned to a very high level through the removal of carbon dioxide, siloxanes and other impurities. Once cleaned, it becomes biomethane and can be added to natural gas pipelines that provide gas to a number of different customers. When cleaned to pipeline quality, biogas also can be compressed and turned into compressed natural gas (bioCNG) for use as fuel in automobiles and other vehicles.

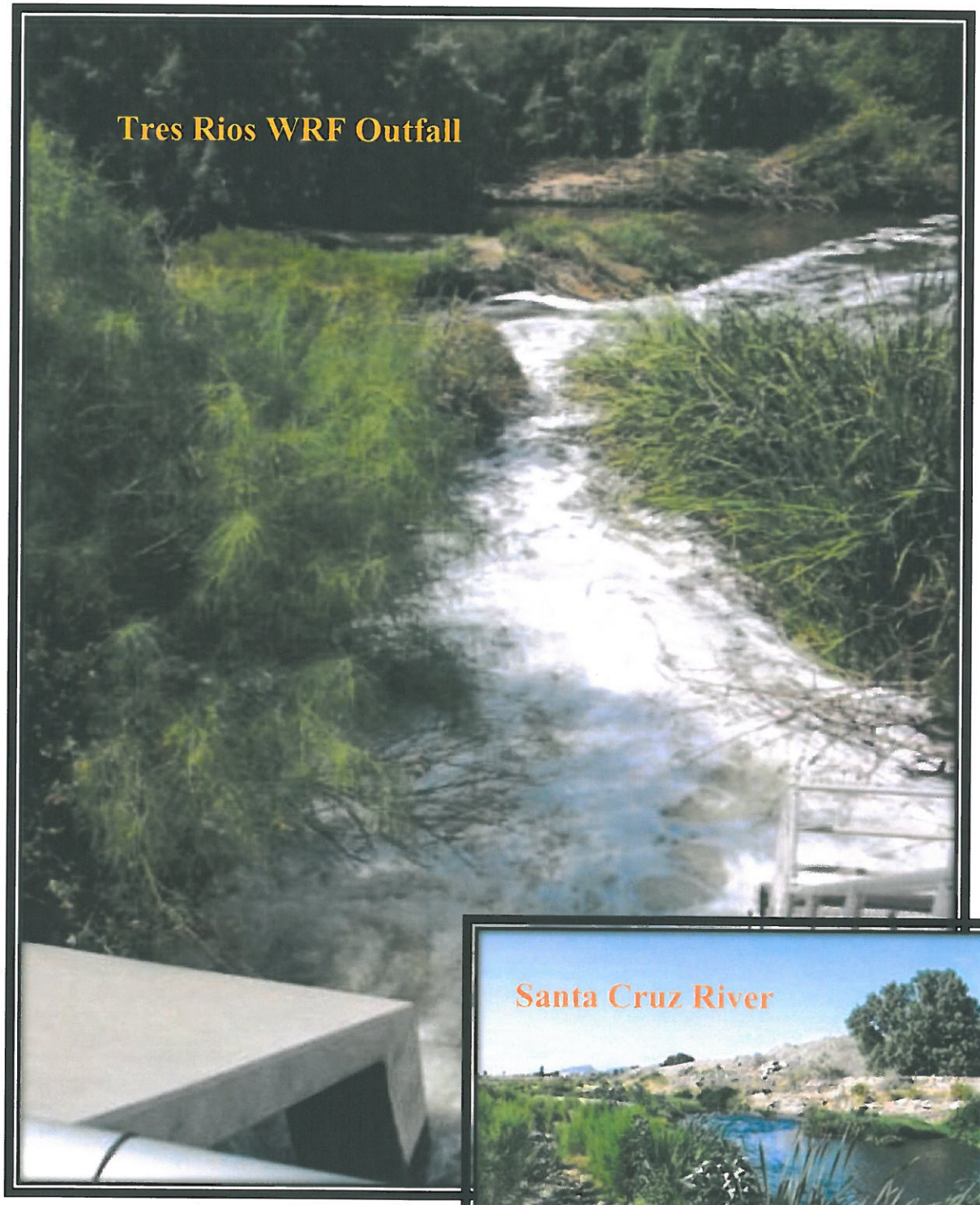
Pima County has a number of options for putting the biogas generated at both the Roger Road and Ina Road facilities to beneficial use. Because the facility replacing the existing Roger Road Wastewater Reclamation Facility (WRF) will not treat sludge, the biosolids generated at the new facility will be piped to and treated at the upgraded and expanded Ina Road WRF. In addition, biosolids from the Green Valley WRF will be hauled and treated at the Ina Road WRF. This influx of biosolids will increase the amount of biogas that will be generated at the Ina Road WRF.

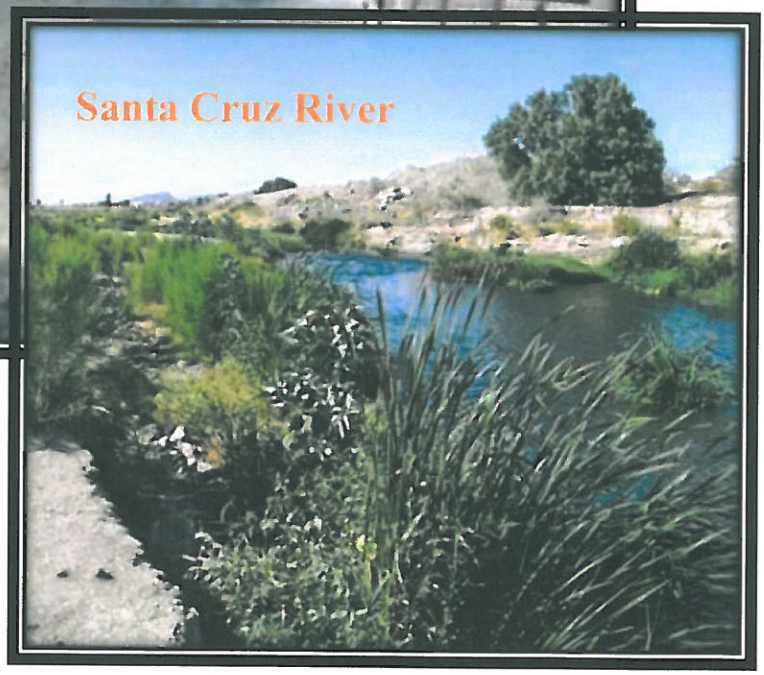
RWRD carefully considered the economics of upgrading and operating the existing co-generation facility, as well as the economics of constructing and operating a new co-generation facility. In both scenarios, it was determined that commercial rate power purchased from Tucson Electric Power (TEP) was a more cost effective-option than an on-site power generation facility.

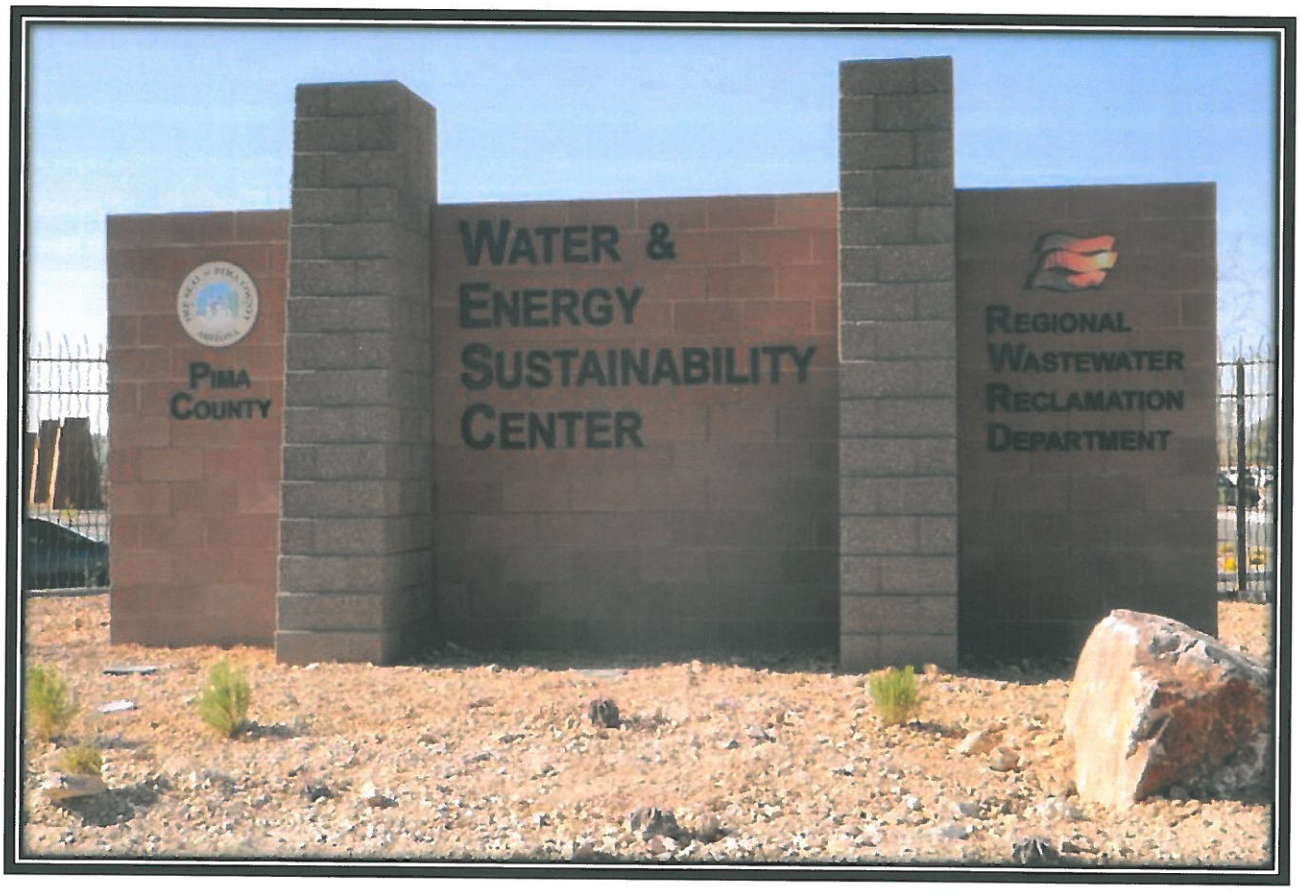
Even with the addition of biosolids from the new Roger Road WRF and the Green Valley WRF, there would not be enough biogas to fully power the expanded and upgraded Ina Road WRF. Under this circumstance, it would require the purchase of electricity from TEP to supplement on-site generated electricity. However, if RWRD were to forgo generating its own electricity and purchase all required power from TEP, it would benefit from cost-saving tariffs enjoyed by large users.

After analyzing the potential alternatives, RWRD recommended that Pima County enter a contract with a private sector firm to design, build, finance, own and operate a facility that would clean RWRD's biogas to pipeline standards. That company would be responsible for selling the cleaned product - biomethane - to interested parties. In return, the company would pay RWRD for the raw biogas it provides. These payments could help defer costs associated with the operation and maintenance of Pima County's publicly owned treatment works.

The RWRAC is charged with advising RWRD on program and policy decisions, as well as short- and long-term operating capital program funding needs and the annual Financial Plan. The Committee holds monthly meetings to accomplish these functions. During the last fiscal year, the RWRAC discussed and acted upon a number of issues of importance to Pima County as described in this report.


Tres Rios WRF Outfall


Santa Cruz River


PIMA COUNTY
WATER & ENERGY SUSTAINABILITY CENTER
REGIONAL WASTEWATER RECLAMATION DEPARTMENT

-----The End of the Submittal----