FROM WATERSHED TO WELL

FEBRUARY 2004

water resources waste management community development

RCAP Solutions Liaison:
Keeping a Project Moving in the Face of Obstacles

Juan Campos, Water Resources Specialist

On September 21, 1998 Hurricane George swelled the Rio Grande of Jayuya River in Puerto Rico and flooded the Jayuya Wastewater treatment plant, which had been serving eight communities in the region. Compounding this emergency, a two ton chlorine tank drifted into the river. The Environmental Quality Board (the agency in Puerto Rico that deals with chemical emergencies) quickly joined forces with EPA and found the missing tank before any leakage occurred. But the floodwaters in the wastewater treatment plant brought processing to its knees.

EPA provided guidelines to the plant owner, Puerto Rico Aqueduct and Sewer Authority (PRASA), that allowed continuation of some operations under an administrative order. It was obvious that either an expansion of capability, or a new plant, would be required to meet current and future needs. The recent flood experience ruled out an expansion option so it would have to be a new facility.

The new plant was designed to be a secondary wastewater treatment facility using an Activated Sludge Oxidation Ditch Configuration Treatment System. Preliminary and primary treatment would consist of clarifer and grit-draw-off chamber structures, followed by secondary treatment units consisting of two oxidation ditches in parallel and two final clarifiers and two filters. The plant's effluent would be discharged to the Rio Grande of Jayuya. A set of design plans was hand-delivered to RUS Rural Development (RD) accompanied by a request for funding. The application was processed very promptly and RD made funds available.

Design Problems Crop Up

My involvement with the Jayuya project began at a December 18, 2002 meeting coordinated by PRASA project staff. Reviewing the proposed engineering plans we encountered some significant problem areas. For instance, there was an error of nearly one meter (3 feet) in the location of the inlet hole for the plant, which would skew the hydraulics very unfavorably. This treatment system works strictly on gravity; so slope and flow are critical dimensions affecting operational utility. The project team worked with the engineer, and later with the various agencies involved, to correct this problem in small increments at free-fall-drops from lines to tanks to avoid

altering the overall hydraulic gradient. This turned out to be just the beginning of many construction challenges.

- The chlorine room came under redesign, causing changes to anticipated project expenses.
- Then, the Department of Natural Resources required an evaluation study for the necessary extension of a wall near the river.
- The PRASA operation division requested a shelter for the blower and grid chamber that had not been part of the original specifications.

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Vice President's Notes...

Unaffordable?

Water and sewer rates have risen considerably over the past two decades, and this trend is expected to continue. Data collected by the Association of Metropolitan Sewerage Agencies (AMSA), suggest that the largest U.S. wastewater utilities have increased their sewer fees at 2 percent above inflation every year since 1985. According to data compiled by the Ohio EPA, average sewer and water fees in Ohio doubled between 1983 and 1999. And according to the American Water Works Research Foundation (AWWARF), the rising costs of meeting water safety regulations have created a steep increase in water rates for many utilities over the past 10 years.

Water and sewer rates are expected to continue rising over the coming decades. The Water Infrastructure Gap Analysis issued by the United States Environmental Protection Agency in 2002 indicates a need for communities to significantly increase spending on water and sewer system replacement and improvements, nationwide, over the next twenty years. The Water Infrastructure Network, a broad coalition of water and sewer service providers, not for profit agencies, local government and elected officials, issued their own report in 2001, emphasizing the need to increase spending to replace aging water infrastructure and protect health.

The cost of providing water and sewer service, and the resulting user rates, vary considerably from one community to another. There are many reasons for the differences in cost, including the quality of source water, treatment needed, distance from the users, the age of the pipe lines and treatment works, maintenance practices and quite a few other possible factors. In some cases cost differences seem determined by the luck of the draw, more dependent on accidents of geology and history than on anything individuals can control or influence. Whatever the reasons though, differences in user fees from one community to another can be large. The New Hampshire Department of Environmental Services tracks rates for some 100 water systems serving 500 people or more. Their information shows that rates for 2001 ranged from as little as $25/year in one system up to $714/year in another with the rest of the systems pretty well spread throughout the range. Data from other states show similar variations in the rates paid by users. In the rural areas the differences can be particularly dramatic because of the high cost of treatment works for small populations.

These rising costs for water and sewer are having a disproportionately negative impact on lower income people. According to the EPA Gap Analysis, user rates needed to provide water and sewer service have the potential to negatively impact segments of the population with low incomes. Data from the Census Bureau show that between 1980 and 1998, incomes at the lower range declined or stagnated. In addition, the limited assistance provided by federal and state governments for system improvements is targeted to communities and not to the lowest income members of these communities. A variety of Federal and State programs provide grants and low cost loans for water infrastructure, but these grants and loans are generally linked to the median household income (MHI), of the community, not to individual incomes. Households with high incomes located in low MHI communities receive the benefit of any grants or low cost loans, while households with lower incomes located in high MHI communities don't benefit from the same subsidies.

While lower income families are severely impacted, they are not the only ones affected. The cost increases falling upon lower income people, and their inability to pay, are also causing utilities to lose money, incur added collection costs and defer needed improvements that would benefit all.

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- By May 2003 the operation division at PRASA had not yet delivered specifications for the self skimmer of the clarifier, instrumentation and the conveyor for the entrance of the plant.

- During the summer construction working hours were changed to reduce adverse affects on local commerce and road traffic.

- An additional change order involved replacement of a galvanized steel water line and relocation of it outside the area of the sanitary line.

Crisis Leads to Complete Work Stoppage

On July 8, 2003, Rural Development called for investigation of a supposed archeological find at the Jayuya Sewer project, which put a complete stop to all construction activity. Thus began a pilgrimage from one office to another to resolve this major stumbling block.

Upon being notified of the situation by RD, I arranged to meet the next morning with the contractor chief of the treatment plant construction project, to look into the matter. Before that appointment I went to the office of the Department of Health inspector (who lives at Jayuya) and asked if he knew anything about archeological findings at the sanitary project. The inspector had no information, even by hearsay, but suggested that maybe the local office of the Culture Institute would know. He noted that there is another project in the same area of the city with an archeologist assigned to the project which involves restoration in the center of town.

While at the inspector's office, I received a call from the Department of Environmental Evaluations of PRASA. We arranged to meet with representatives from that agency at the city center. I suggested we go first to the Culture Institute, where we met with the Institute's director, Mr. Gerardo Ramos. He reported that the only things found at the Municipal restoration project were some bricks. He then referred us to Mr. Adrian Rosado from the Cedetra Center (center of information about Jayuya history), who could give us more information.

We moved along to the Cedetra Center. Mr. Adrian Rosado explained that the bricks found at the restoration project belonged to constructions in the area from a time when everything was built with bricks because they were cheap. Therefore, such bricks had been widely encountered during construction projects in 1925, 1955, 1972 and 2003. In none of the wastewater plant excavations had important artifacts been found, only these common bricks and rocks.

Now we needed to discuss what we had found out with the on-site construction companies. I explained the urgency of the situation to the team from the Department of Environmental Evaluations: until the State Historic Preservation Office (SHPO) certified and accepted the study, there was not supposed to be any work activity at the wastewater project site. Moreover, until this occurred, RD would not make any payments! The project was now firmly at a standstill with serious financial repercussions.

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JAYUYA NEW WASTEWATER PLANT SERVICE PROJECTIONS

COMMUNITY	PRESENT POPULATION	FUTURE POPULATION	PERCENT SERVED	NUMBER SERVED
Collores	1,490	1,794	35%	627
Coabey	1,753	2,145	38%	815
Veguitas	3,782	4,629	51%	2,360
Zamas	491	601	50%	300
Saliente	720	881	50%	440
Río Grande	607	743	40%	297
Jayuya Abajo	2,642	3,013	92%	2,771
Jayuya Urbano	1,560	1,903	100%	1,903
Total	**13,045**	**15,709**	**57% avg.**	**9,513**

On Site Wastewater Management:
Three Examples from New York State

Candace Balmer, Water Resources Specialist

Community leaders are expressing a desire to find solutions to concerns about the prohibitively high cost of central sewers, protection of drinking water sources (groundwater wells or surface water), and protection of recreational resources. Onsite wastewater management is receiving more and more attention as a means of addressing these concerns. For very small, poor, or sparsely-populated communities, or topographically challenged regions, it may be the only choice. The advantage is that management structures are flexible and can be tailored to meet the communities' needs.

In NY state, several towns and villages participate in some sort of onsite wastewater management program. Highlighted here are three management structures that accomplish similar goals: responsible oversight of individual residential onsite wastewater treatment systems (onsites). The three management structures include: a watershed approach (The Canandaigua Lake Watershed Rules and Regulations), an intermunicipal agreement (The Keuka Watershed Improvement Cooperative, KWIC), and a town-wide solution (The Town of Huron).

Canandaigua Lake Watershed

The Watershed Inspection Program, which is part of the NYS Public Health Law, and which dates back to the 1950's, is administered by the Ontario County Soil and Water Conservation District on behalf of the Canandaigua Lake Watershed Commission. The Commission consists of representatives from each of five municipalities whose public drinking water is supplied by Canandaigua Lake. Each of the five municipalities contributes to the $65,000 per year Canandaigua Lake Watershed Annual Operating Budget proportional to their water use. According to the Watershed Inspector George Barden, the inspection program accounts for less than 1% of a user's water bill.

Although the Inspection Program is mostly funded by the five municipalities that draw drinking water from the lake, the 174 square-mile watershed encompasses parts of twelve towns, two villages, and the City of Candandaigua, spread across four counties. One inspector is responsible for oversight of new construction, including repairs or upgrades, anywhere in the watershed. He also inspects, at no charge, failing onsites. Says Barden, "People want to do what's right and fix their system. Folks are very appreciative that they don't get a bill for the inspection along with their violation notice."

Charges for inspection of new installations include $150 for inspection of the deep hole and percolation test, $50 for plan review, and $50 for the final system inspection. The homeowner is responsible for the cost of preparing the deep hole and percolation hole prior to the test. Hiring a backhoe operator at $50-70 per hour can result in expenses to the homeowner of between $150-200 for the excavation.

Inspections may also be conducted upon property transfer (not required by the watershed regulations) for $150. These inspections account for less than 5% of the total, although that number has been growing.

Between 2000 and 2003, the Watershed Commission estimates that 100 to 150 properties were investigated annually, requiring over 600 site visits. Inspection fees generate income which pays a part of the inspector's salary and benefits, vehicle, equipment, and supplies, the rest coming from contributions from the five towns. The inspector's responsibilities include inspections, billing, budget preparation, equipment purchase.

The Watershed Rules and Regulations allow for penalties for non-compliance. The Inspector petitions the local municipality to sit as the Board of Health under the State Sanitary Code. The Board has the authority to levy a fine. In 14 years, only one case is on record where the Program did not get voluntary compliance and the issue was brought to the attention of the Town.

The Keuka Watershed Improvement Cooperative

In the Finger Lakes Region, Keuka Lake supplies water for over 20,000 people via two municipal systems. Many homes draw their water directly from the lake. The lakeshore includes eight municipalities and two counties. The Keuka Lake Association received $180,000 in seed money from the NY legislature to collect data, educate residents, and build community support for the watershed management program.

The Keuka Watershed Improvement Cooperative

(KWIC) was formed in 1993 by intermunicipal agreement. An elected official from each of the eight municipalities forms the KWIC Board of Directors, which oversees the watershed management program, in cooperation with each town's Watershed Advisory Committee. The eight municipalities adopted a model wastewater law, which is enforceable throughout the watershed by a full-time Watershed Manager, and part-time administrative and legal staff. The intermunicipal agreement contains a sunset clause. Each Town and Village voted into the program for three years, and renews annually for another three years. If a community has an objection in a given year, they are still contracted to complete the three years. This gives KWIC time to resolve any conflict.

In 2003, the annual operating budget was $69,900. The participating municipalities contributed $6,000 each from their general revenues. Each has its own part-time Watershed Inspector at an annual cost of between $7000-12,000. Inspection fees covered remaining watershed management expenses.

> *"Wastewater management is an easy and effective way to protect the lake for less than it would cost to sewer the area."*
>
> *– Paul Bauter, KWIC Watershed Manager*

The model law provides for routine inspections of the estimated 2,800 onsites within 200' of the lake (Zone1) on a rotating basis, every three-to-five years, depending on the system's condition. The homeowner pays to have the tank pumped, but the inspection is courtesy. Each community inspects 20% of its systems annually. New or replacement systems, as well as property inspections, anywhere in the KWIC region must be inspected, for a $100 fee.

"Wastewater management is an easy and effective way to protect the lake for less than it would cost to sewer the area," says Paul Bauter, KWIC Watershed Manager.

J.C. Smith, former KWIC Watershed Manager states, "The management structure is much more important than technical issues. The group realized that some issues, such as what exactly what constitutes an inspection, needed to be left to the policymakers after the program was set up."

Town of Huron, Wayne County

The Town of Huron, on Sodus Bay on Lake Ontario has roughly 1600 housing units, more than a third of which are seasonal. Although two neighboring communities draw use the lake for their drinking water, most in Huron draw from private wells.

In 1996, the inspection program originally required onsites to be inspected upon real property transfer. Recognizing the need to do more in 2001, the Town modified the ordinance to require inspections of every onsite in Town on a 5-year cycle. Waterfront properties were targeted first, with inspections gradually moving away from the lake.

Two trained contractors perform the inspections for $30 per site. The two inspectors were received three days of county-sponsored training. The inspectors report their findings to the Code Enforcement Officer (CEO) who follows up with repair orders, permits, etc. These routine inspections, conducted during real property trans-

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Achieving Financial Viability through Asset Management

By Sharon Ostrander, Water Resources Specialist

Is There a Water Gap?

In September 2002, The U.S. Environmental Protection Agency (USEPA) undertook a study of the potential magnitude of investment needed to address the growing population and its economic needs, and to renew the aging infrastructure of the nation's drinking and wastewater systems. The results of this study were released in a report entitled, The Clean Water and Drinking Water Infrastructure Gap Analysis [EPA 816-F-02-017]. Steve Allbee, USEPA's Project Director for the Gap Analysis was the primary author. The "gap" to which the report refers is the estimated level of funding needed to restore our infrastructure, minus the current spending.

If the increase of need for infrastructure replacement in America's communities continues at the current rate (no revenue growth), within 20 years the total gap is projected to be $271 billion dollars for Wastewater and $263 billion dollars for Drinking Water. If our systems instituted an annual real increase rate of 3% (i.e., 3% greater than the rate of inflation), then this gap would be reduced to $31 billion dollars for Wastewater and $45 billion dollars for Drinking Water. The conclusions of the "Gap Analysis" are that we are not on a sustainable course, that the "gap" is large and growing, and the current trends in capital spending are not adequate to replace the aging systems and make new high priority investments.

Capital Improvement Planning is an Asset Management tool used by private industry to sustain a company's viability and customer satisfaction. By performing in depth and detailed inventory of all of a company's assets and assessing the condition and expected life of these assets, they are able to project the revenues that will be needed to sustain their business. Municipalities can adopt this way of management to help them become sustainable, as well. By establishing this management tool, a consistent process of budgeting and rate setting can be instituted, which makes it easier for future board members to maintain the system. It is also less costly to the system's customers to build the capital for improvements than to acquire a bond for the project. A by-product of Asset Management is better communications between governing boards and the utility managers because both parties will need to cooperate to establish and maintain the inventory and lists of projected needs.

Steps in Assessment

To begin the process, a utility must first inventory all of their assets. Details on the assets can be found within the constructions documents. These documents contain quantities and descriptions of all materials used within the project and the date of installation. Next, the expected lifespan of each asset must be estimated. Each asset should be rated as to its condition, to increase the level of confidence in the asset replacement evaluation. The consequence of failure, the probability of failure, and the impact on future maintenance costs are all taken into account. With this information in hand, a renewal strategy can be assigned to each asset. Now that the renewal strategy is in place, the estimated renewal costs can then be estimated throughout the remaining life of the asset.

Don't be discouraged by what at first may appear an overwhelming task. Take the work in small bites. Start with those assets that need the most attention, and evaluate the remaining assets once the priority ones have been evaluated. Once the system is established, it will be easier to enter data from new improvement projects. ■

Depending on the system's complexity, a utility may need several years to fully establish and implement this style of financial management, but the rewards should be well worth the effort. Some of the larger utilities in the United States have begun using this system and there is free software available to help a utility to get started.

If you want to read the Gap Analysis, it is available on the web at www.epa.gov/safewater/gapfact.pdf. Copies can also be requested from the Safe Drinking Water Hotline at (800) 426-4791 or the Office of Water Resources Center at (800) 832-7828.

Non-Rate Revenue:
Creative Ways to Use Your Utility's Assets

Robert Morency, Ph.D., Water Resources Specialist

Drinking and wastewater utilities, and their customers, are facing increased financial pressure due to aging infrastructure and new regulations. Traditional means of producing income to maintain the operation of a utility include user rates, municipal and/or district taxation, service charges (hook-up and disconnection fees, hydrant fees, reinstatement of service fees, etc.) and interest on accounts. This article describes a few other ideas that have been attempted by utilities to raise revenues, with varying levels of success.

Identifying Options

The Main Idea is to assess what marketable assets or skills might be close at hand, and to look at what the potential demands are for those assets. You can examine your assets first, or else explore the market and then see if you have something to offer. Either way, the goal is to begin to think as though the utility has value, not only to the direct users, but also to others out there in the world that might have a need for what you have.

Some of the possibilities might include the following: bottled water, customer-side service warranty programs, cellular antenna leases, contract operations for water and wastewater systems, emergency bulk-water and pool water hauling, pump station design, point-of-use treatment devices, service line installation, and other ventures (fee-for-service use of backhoes and trucks, for example).

RCAP Solution's TA provider Scott Mueller reviews GIS map while working with Lee Harrington at SUNY CESF, Syracuse, NY

Exploring Ramifications

This writer has pointed out to several systems that excess water from their source might be an attractive source for a bottled water company to use. Given the concerns that arise when a new source is proposed for development, companies seeking to find new sources would find it very

advantageous to be able to eliminate the expense of permitting. Even at a significantly higher rate than residential and other commercial customers pay for their water, a bottled water producer would still be able to profit from their business. If a source is a spring, or if there is hydrogeological evidence that the source is connected to a spring, all the better since this allows the producer to market its water as "spring water."

The system should be certain that any additional withdrawals do not violate the terms of their operating permits. Contracts with producers should take into account the priority of the system to provide water for its regular customers, leaving the way open for suspending withdrawals during drought times. Plants and production activities should be conducted away from sanitary protected zones, and the system should have the right to ensure that best management practices be used at any facility.

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Household Hazardous Waste Collection in Rural Areas

by Michael Pattavina, Solid Waste Specialist

Many rural communities do not have access to household hazardous waste (HHW) collection programs. Some of the reasons communities cite for not offering this important environmental protection program include costs, staffing, and lack of expertise. Economies of scale may also be a negative factor…there may not be enough participants to make the event feasible, or low population density may mean longer driving distances, which discourages participation. At the same time, some communities have found creative ways to organize relatively affordable and effective HHW collection events. This article discusses the various ways that technical assistance is offered to communities looking to maximize the efficiency of HHW collection.

Funding

One of the first concerns when planning an HHW event is how to pay for the program. Each community should explore the following options:

Grant money – A good example is the New York Department Environmental Conservation grant program, which reimburses communities up to 50% of the cost for HHW collection programs.

General fund – Requests for program funds can be made in the annual budget.

Tipping fees – A surcharge at the landfill or transfer station is a good source of funding.

User fees – Residents who use the program can be charged a fee.

Sponsorship – Support can be gathered from local wastewater treatment facilities, water districts, businesses and/or institutions (particularly Very Large Quantity Generators or Large Quantity Generators)

Cost Saving Options

Swap shops are a great way to minimize the amount of material a contractor needs to haul away. Materials in their original, well-labeled container, and still in usable condition can be placed in a swap shop for the public. Items found in swap shops include paint, stain, thinner, lamp oil, lighter fluid, car polishes and waxes, household cleaners, pesticides and other lawn chemicals. Swap shops do need staffing, however.

Multiple contractors can help keep the costs down. A local company may take materials for less money, or for free, because they have minimal transportation costs. Examples include auto batteries, waste oil and anti-freeze. Only those hazardous products that can not be managed locally should go to the main contractor.

Regional programs are one of the best cost saving options. A regional HHW event can be held at one location, or multiple locations, within a county or a group of counties. Regional approaches can provide substantial savings on advertising, collection, and personnel costs.

Single Day Collection Events

Single day collection events are the most popular HHW collection option, and continue to be a mainstay event in rural areas. The advantages include designating specific program dates (e.g. Earth Day), flexible collection times, a broad or narrow range of items collected, straightforward permitting, and good media coverage. However this type of collection is the most limited for including the cost savings options previously discussed. As more and more communities begin to provide HHW collection, cost saving models of the single day event are beginning to appear.

"Milk-Run" HHW Collections

This variation on the single day event is unique and effective. It recognizes that participation in an event is usually limited to those residents who live within a 40-mile radius of the collection site. A milk-run collection works as follows: HHW collection locations are determined around the county or region; dates and times are posted throughout the targeted area in advance of the collection event; your contractor mobilizes a service vehicle and trained staff; and the HHW is collected for transport and disposal from each site by the contractor.

Advantages of Milk-Run Collections

- Economy of scale keeps cost down
- Optimum participation in rural areas where landfills or transfer stations already exist and can be used as collection sites.
- Collection can be accomplished with a small number of personnel.
- An entire region or multi-county area can be covered.

As collection programs develop, trends will develop that prompt other cost-saving approaches.

Reciprocal HHW Collection Events

Another variation on the single-day collection event allows residents of one community or county to participate in collection events being held elsewhere. This approach recognizes that access to an annual HHW collection event can not adequately serve all residents. Participating counties or regional programs can stagger their collection dates and times. Reciprocal Collection Events depend on the cooperation of county or regional governments and the bidding of a contract that allows for a standard method of payment. Standard payment means that participating HHW collection programs are charged by the contractor on the number of vehicles that participate in the collection event. Once the cost per participant is established, residents of participating regions can then choose which collection event suits their schedule. Regions or counties then invoice each other for the number of non-residents participating in their respective collection event.

Advantages of Reciprocal Collections

- Increases participation by offering additional collection events.
- Offers convenience to the public.
- Utilizes the additional advan tages of milk-run collections.
- Suits multi-county waste authorities or districts.

Technical Assistance

Staff at RCAP Solutions is currently offering technical assistance on the planning and implementation of HHW collection programs in New York State and Massachusetts. Technical assistance includes: applying for state grants, providing model bidding documents, staffing at collection events, and model educational and outreach materials. ■

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Thinking Outside of the Box

Your storage tank might sit atop a prominent hill. As we are all aware (to some dismay), telecommunications companies are ever on the lookout for high points on which to place cellular towers. Depending on the situation in your area, it may be possible to contract for a long-term lease. If the tank is away from your source, there should not be a problem with the construction activities, or the presence of a tower, with an access road. Providing gated security fencing would be an example of a stipulation to any agreement.

What to do if your system doesn't have a significant asset, such as a hill, or excess source capacity? In this case, let's examine other points of strength, and begin an effort to market the strength. For instance, one of the commissioners, or an employee, might have a special interest in some aspect of their duties (testing, water treatment, pumps, etc.). By cultivating and fostering the development of the interest, not only will the person grow professionally, but the system can begin to contact other nearby systems and offer that expertise as a service. Almost every system needs to, at some point, hire an expert to deal with a situation, and why shouldn't that expertise come from another local system? ■

One of the long-term goals of the Safe Drinking Water Act is to foster partnerships, and build local capacity. Marketing a service to another local system is as good an introduction as any for building a local network.

TTHMs in Desalinated Seawater: Experience in the US Virgin Islands

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Introduction

Located about 1,100 miles east of Miami the US Virgin Islands (USVI) are the northern end of the Leeward Islands in the Caribbean Sea and are between 40 and 65 miles southeast of Puerto Rico. The three major islands are St. Croix, St. Thomas and St. John. Together they aggregate about 130 square miles. Rainfall in the period 1991 - 2001 averaged about 25.4 inches/yr. There is essentially no surface water on the Islands and relatively little groundwater. Virtually all distributed potable water is produced by the desalination units of The Water and Power Authority of the USVI (WAPA).

RCAP Solutions, Inc. has been providing technical assistance to the Virgin Islands in cooperation with the Department of Planning and Natural Resource, St. Croix, USVI. Our work there has focused on assisting WAPA with water quality problems, as well as addressing the technical, managerial and financial capacity of community water systems that are served by WAPA. This article reviews the efforts of WAPA, assisted by RCAP Solutions and the USVI Division of Environmental Protection, to address problematic levels of Disinfection By-Products.

WAPA business office, Christiansted, St. Croix.

Background

Water-poor coastal regions of the world are turning increasingly to desalination of seawater for supply. For instance, Tampa, FL has a new plant and San Diego, CA has one under consideration; the State of Texas is evaluating a large-scale desalination demonstration project for several sites along its Gulf Coast. While much of this desalination relies on membrane processes, sites where electrical power is generated using steam are uniquely suited to distillation processes.

WAPA examined various methods of desalination between about 1949 and 1979, when WAPA ordered 3 multi-effect distillation plants from Israel Desalination Engineering (IDE) and has operated hypobaric distillation desalination plants on the three major islands for almost 25 years. The two major plant complexes (on St. Thomas and St. Croix) each provide potable water for populations of about 50,000 persons. In routine sampling during the summer of 2000 and subsequently, one of the islands experienced a sudden increase in Trihalomentanes (THMs) at the long-residence-time site (LRT). In the preceding year or so, a number of changes in system treatment had occurred, including addition of a passivating chemical, some changes to intakes,

installation of a new electrolytic mixed-oxidant (MO) generator and changes in send-out disinfectant concentration.

WAPA immediately began sampling to verify the existence and location of THMs throughout the distribution system. Results were not consistent with earlier estimates of residence time, though most LRT sites were confirmed. Many samples in areas considered low residence time were higher than expected, though not in themselves worrisome. It is important to note that, unlike THMs in most systems, those in the WAPA system were between 50% and 70% bromoform, with up to 90% brominated species. Illustrative results are presented at Table 1. More typically, other sites in the US usually experience brominated species well below the level of chloroform, which is the opposite of what is seen in the WAPA water.

Results and Discussion

Brominated Species [Bromoform]

It was believed that bromine, common in seawater, was the reason for the preponderance of brominated species, especially bromoform [CHBr3] in TTHMs. Concentrations of bromine in seawater are normally around 65 mg/L. The mechanism of entry was the question since the units supply distilled water. The IDE units are hypobaric, multi-stage distillation units, generally using waste steam from the generation process at the WAPA plants.

It was found that all influent water to the units was being treated with mixed-oxidants (MO) generated by an electrolytic unit, using seawater instead of a brine from commercial salt. A series of experiments was conducted both by a consultant and WAPA in 2002. It became apparent that much or most of the bromine was associated with the use of electrolytically-generated MOs for disinfection in process water. Accordingly, the use of MO for all process water was suspended. Within a few days the bromoform contribution dropped dramatically, and by the end of the year was at a level more representative of other systems.

Passivation of Corrosivity

Occasional inspection of interior pipe walls has not demonstrated heavy growth, but this inspection is intermittent and casual. Additional study of this is ongoing, with alkalinity, pH, iron, Cl, TDS and HPC (ambient T, 7 days) analyzed quarterly over a year at about 40 sites selected to elucidate conditions in areas to select sites

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Representative results for TTHMs in USVI for one sampling [26Jun02]: all results in µg/L

Site	BrdiClMeth	DiBrClMeth	Bromoform	Chloroform	Total THM
1	ND	ND	7.8	ND	7.8
2	0.8	14	30	ND	44.8
3	0.1	7	160	1	23.2
4	ND	6	30	0.1	36.1
5	19	12	120	2.3	153.3
6	0.3	17	26	0.1	43.4

There were a number of confounding factors that might, or could, contribute to the increase in TTHMs, including:

1. A very successful leak-detection and repair program that had reduced unaccounted-for-water (UAW) from about 28% to less than 15%, thereby increasing residence time in the system.
2. Addition of a passivation agent to control corrosivity.
3. A concomitant increase in HPC organisms in LRT areas of the system, which led to increases in send-out chlorine levels.
4. Loss of a major user in the service area where the LRT site with elevated TTHMs was located.

Thunderheads tantalize St. Croix's hunger for fresh drinking water

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for further study. A study of corrosivity is also planned and will utilize at least some of these additional sample sites.

Chlorine Concentration

WAPA on St. Thomas had operated for some years with a send-out residual of about 1 mg/L free chlorine and has regularly supplemented routine residual concentration measurements with both HPC and Pseudomonas counts to control flushing and disinfectant residuals in the distribution system. Chlorine (Ca hypochlorite) application was by means of piston pumps. A number of problems were identified and addressed.

1. The feed line for the automatic residual monitoring device was found to have a residence time of over 40 minutes. The line was changed and residuals are now measured within 2 minutes of sampling.

2. To help reduce the excursions in the residual concentration the piston stroke (volume) was changed to about 60% of full (from much lower), the concentration of the slurry was reduced by about a third and the Cl application site was moved. Excursions continue, though at much reduced scale and frequency and further study is ongoing, including consideration of alternative disinfectants and means of application.

3. The send-out residual was reduced slowly in increments of about 0.5 mg/L with a concentration of about 1.5 mg/L the goal. Service, or booster, chlorination was not possible at the time, though at least one site was identified and equipment is on order.

4. Finally, one of the reasons for elevated residual concentrations at sendout concerned the Donoe Storage tank, which served the LRT site with elevated THMs. Chlorine residuals were raised, in part, to supply effective residuals in the area past Donoe Tank. When the Donoe Tank is rehabilitated (scheduled for spring, 2004), a recirculating and aeration system will be installed to improve the quality of water stored here.

Residence Time

The USVI, like all the Caribbean, is a zone both geologically active and subject to hurricanes and tropical storms and each island is, well, an island. WAPA, accordingly, must maintain a substantial quantity of potable water on hand to prevent shortfalls in the event of interruptions to supply caused by either vulcanism or weather. WAPA currently has sufficient excess production to allow the operation of a Donoe Tank, and it is estimated that there is sufficient capacity to allow considerable flexibility in storage; this is still under study at this time. However, it is clear that storage requirements will always be a major factor in residence time in this system.

As noted previously, residence time is still under study, but it is clearly a factor in the WAPA problems. Among the residence time factors affecting the change in TTHMs at the LRT site we studied the following.

Flushing

Desalinated water is expensive, and WAPA must use extreme care

in using potable water for flushing. In part to correct for the good work in reducing UAW, WAPA has:

1. Completed a tentative progressive flushing program for implementation to complement corrosivity studies throughout the system.

2. Purchased and installed a number of automatic flushing devices in dead ends or extreme low use areas. At this time these are sited utilizing data from residual, HPC and Pseudomonas analyses.

Customer complaints are also considered in siting. As more data become available from the corrosivity and biofilm studies that data will be used in siting the automatic flushing devices.

Change in East End Use

Usage in the East End, the area of the high TTHM LRT site, fell in 2000 from about 1.5 million gallons per day (MGD) to 0.5 MGD, around the same time as the increase at the LRT site. This increased residence time in the Donoe Tank from about 6 days to about 11 days. In order to allow minimal disinfectant residual concentration at send-out a booster or service chlorination station will also be established at this site. In the interim a change in pumping regime has helped reduce residence time in the tank.

Storage

WAPA maintains about 30 MG in 3 storage tanks near the pump house. This water is part of the strategic reserve held to provide emergency supply in the event of production failure due to natural or operational interruptions. WAPA is studying required piping changes to allow more flexible operation. Serial operation would be the ideal, but, again, considerations of security and integrity in the face of possible geologic and weather damage to the system will require thorough consideration and careful planning. In addition, devices to reduce stratification and allow aeration through the tank will be installed when these tanks are rehabilitated.

The desalination plant

Harold Mark visits the desalination plant

Downtown Christiansted, St. Croix

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RCAP Solutions Salutes Congressman Olver and Massachusetts Senator Brewer

RCAP Solution's annual meeting in October 2003 saluted two public figures who work earnestly to maximize the quality of life for rural people in need. John McCarthy, Vice President, presented the first RCAP Solutions' Community Development Leadership awards to Congressman John Olver of the Massachusetts First Congressional District and to Massachusetts State Senator Stephen M. Brewer.

MA State Senator Stephen Brewer receives award from President & CEO of RCAP Solutions, Inc., Karen A. Koller, with Chairman of the Board Janice Conlon and Vice President John McCarthy looking on. Also named as a recipient of RCAP Solutions' initial Community Development Leadership Awards was Congressman John Olver of the Massachusetts First Congressional District (not pictured).

On receiving this award, Senator Brewer commented: "I work closely with RCAP Solutions on a daily basis and take comfort in knowing that rural and small town residents are treated with the utmost dignity and care during their time of need. The New England community is fortunate to have the extensive resources and knowledge of the RCAP Solutions' staff at its fingertips and I will continue to support RCAP Solutions in all of their efforts." In conferring the Community Development Leadership award, RCAP Solutions commends the Senator for similar reasons as well as congratulating Congressman Olver for his work on behalf of the residents of central and western Massachusetts.

"On-Site Wastewater" from pg. 5

fer and new construction and repairs, include a plumbing inspection, and a dye test to identify rogue discharges. If the homeowner refuses access to the interior of the home, the tank must be uncovered. The inspector may require pumping of the tank if it appears warranted.

Despite the relatively low per-household cost of the program, there was opposition in the community. Two well-attended public hearings took place. The Town Board supported the program despite opposition. According to Dave Scudder, Town Assessor and inspection proponent, more community education about the benefits of routine inspections and repair of failing systems might have eased the way. Scudder states, "The Great Lakes provide 20% of the fresh water on the entire planet. Therefore, we need to take stern measures with respect to our custodial responsibility for the Great Lakes."

Conclusion

Onsite wastewater management is receiving more and more attention as a means of addressing these concerns. For very small, poor, or sparsely-populated communities, or topographically challenged regions, onsite wastewater management may be the only choice. The advantage is that management structures are flexible and can be tailored to meet the communities' needs. ■

"RCAP Solutions Liaison" from pg. 3

We asked if there were any other area where the now idle workers could be utilized. The head of the construction company pointed out that the only tasks left were the installation of sewer lines along Guillermo Estevez Street and whatever work remained at the plant. Both options presented problems: another team was already working at the plant and there were only two hundred meters of line left to be installed!

We kept the paperwork process moving. Within a few days construction resumed. Between change orders, the archeological-find interruption and rains during October and November the completion date for this project is now September, 2004, a slippage of only four months from the original schedule despite the many obstacles that it have arisen since the first days of group discussion over flawed engineering drawings.

RCAP Solutions' technical assistance providers don't always have to step into the breach to keep a project moving. But this time, being a key element coordinating communication among agencies, contractors, and owners, our work turned out to be pivotal in overcoming obstacles that almost brought this project to a halt. Technical assistance in the RCAP Solutions tradition involves encouraging team work and incorporating multiple parties in problem solving, for the betterment of the community. Jayuya is just one example. ■

"Unaffordable?" from pg. 2

In response, the US EPA and other organizations have recommended that systems consider affordability programs and individually targeted subsidies to reduce the negative impact on low income people. In October of 2002, the US EPA issued a report to the District of Columbia Water and Sewer Authority suggesting they consider differential wastewater rates or other assistance to lower income residents of the District of Columbia.

While providing subsidies to lower income households could be a valuable part of the solution, the large number of people requiring such assistance could make this a very expensive approach. What is more, the amount of subsidy per family needed in some of our rural communities could make the cost even higher. And as long as water and sewer fees vary dramatically from one community to another, the problem of keeping the fees af-fordable will be even more difficult. ■

RCAP Solutions, Inc. is a comprehensive nonprofit community development organization providing direct services and community consultation throughout the Northeast U.S., Puerto Rico and the U.S. Virgin Islands.

Cyber Corner

This bulletin, which regularly appears in From Watershed to Well, highlights some of the valuable Internet tools and resources we have found that deal with issues of importance to rural communities. In general you will find here a wide range of web site references dealing with topics that relate to "community development" in the broadest sense. In this issue of the bulletin we are focusing on water supply, with a nod to wastewater management.

In every instance our readers may rest assured that the websites listed and described here have been utilized and thoroughly validated by our professional field staff as accurate and authoritative sources of information.

http://nemo.uconn.edu/index.htm

NEMO, Nonpoint Education for Municipal Officials, provides a valuable educational program for local land use officials that addresses the relationship of land use to natural resource protection. Much high-quality information here relating to workshops and initiatives, publications, case studies, mapping, as well as specific environmental topics such as reducing runoff.

http://www.groundwater.org

This is the official website of The Groundwater Foundation. The purpose of this site is to inform visitors about groundwater and the related environment and inspire them to get involved in groundwater protection through our programs and events relating to groundwater protection. There's a wealth of information here for adults and kids.

http://www.awwa.org/waterwiser/

This American Water Works Association website can help you develop a rational program of water conservation for your community – or your own home! The site includes a link to Water Saver Home (**http://www.h2ouse.org/**), and a well organized "virtual encyclopedia" of water-saving tips.

http://www.nesc.wvu.edu/ndwc/

The National Drinking Water Clearinghouse (of the National Environmental Service Center) was established to help small communities by collecting, developing, and providing timely information relevant to drinking water issues. This website offers a very wide range of informational topics concerning drinking water, as well as publications, free subscriptions to "On Tap," discussion groups, and a wealth of related resources.

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