A Look at FSAWWA's Formative Years

The following article is Part 1 of a re-cap of the history of FSAWWA prepared by Ellis Phelps and the association's History Committee.

This article is reprinted from the October - November 1980 issue of The Overflow. If there was a Part 2 ever published, the current editor could not find it.

The Florida Section, American Water Works Association, came into being on November 18, 1926, at an organization meeting held in Tampa. However, for two years prior to this time many water works men teamed together to bring this auspicious event about. FSAWWA's history does not memorialize all of the men who worked so hard toward its creation and initial success, but the prime movers are of record.

Fred Lane, superintendent of water works at St. Petersburg, was the instigator in the break away from the Southeastern Section, AWWA. The parting took place in July, 1925, at which time Lane and H. T. Oberly, assistant superintendent at St. Petersburg, started working for permission to form a Florida section, ably abetted and encouraged by E. L. Filby, chief engineer of the Florida State Board of Health. They worked almost alone for the first six months in getting the ball rolling. As enthusiasm built up, others joined, principally Anson W. Squires, superintendent of the water department, Tampa; A. P. Michaels, chief engineer of utilities, Orlando; and C. C. Brown, Lakeland.

The legwork required in visiting the many water works men around the state was handled by Filby and several of the water works equipment salesmen, whose work required them to travel to the various water plants. Their reports as to the interest in the formation of a Florida section were collected and consolidated at the Mirror Lake office of the St. Petersburg water department. Most of the clerical work was handled by Lane and Oberly of St. Petersburg, who paid for this plus some travel [costs] out of their own pockets, and by Filby of the State Board of Health.

For a new section to be formed, a petition from the sponsoring group must be presented to the national association at one of their regular meetings. A delegation from Florida presented such a petition signed by 25 sponsors to AWWA at their annual meeting in Buffalo, New York, in June 1926. This petition, asking for a charter for the formation of a Florida section, was acted upon favorably. At this time there were listed 19 active AWWA members in Florida.

E. L. Filby wrote a series of inspiring messages he termed "Florida Section Notes" and mailed them to members of AWWA living in Florida and to prospective members. He also addressed a letter to "Honorable City Clerk" to all cities known to have water works, giving the reason for the formation of this group and its importance to the future of Florida, and asked that the city clerk take up this matter with the city council, encouraging the attendance of their water works superintendent at the Florida section organization meeting.

In 1926 the fantastic "land boom" in Miami had spread over most of the state. There was an enormous population increase. The "Florida Story," where millions were made overnight, was spread across the land as far as California. People came in everything from mule carts to palatial yachts to invest their money. During 1925 Miami issued over 7,500 real estate licenses. Since the start of the boom in 1921, nearly 1,000 subdivisions had been platted in the Miami area alone.

Development was not confined to the Dade County area. St. Petersburg, Tampa, Sarasota, Daytona Beach, and St. Augustine were also expanding rapidly, though not at the Dade County rate. Growth at these other locations took place in a more orderly and substantial manner.

With all of this in mind it is no wonder that responsible people in the water works industry became concerned. Probably of most concern to the State Board of Health was the potential for a massive epidemic due to overcrowded conditions in some areas, particularly in Dade County. Lack of safe water supplies was only one of the problems confronting residents and visitors at that time. Where was the water to come from to supply these people? ... for the physical facilities to produce and deliver it? It is of small wonder that the water works men wanted to band together to try and solve their mutual problems. This was the situation when Florida split off from the Southeastern Section, AWWA and petitioned for the formation of a Florida section. Florida's future looked very bright.

But then came the hurricane of September 17, 1926. The Florida boom ended, not to be regenerated until the end of World War II. Dade County suffered the greatest damage, with financial panic having been felt over most of the state. In spite of this disaster and the revision of water works priorities, plans for the Florida section went on. Oddly or perhaps intentionally, Filby's "Notes" made no mention of the hurricane and the resulting reduction in Florida's population as many thousands of busted and disgusted speculators left.

Plans for the Florida Section organization meeting were made at impromptu meetings held in St. Petersburg, Tampa, and Orlando. Squires of Tampa; Lane and Oberly of St. Petersburg; Michaels of Orlando; Filby of the State Board of Health, Jacksonville; and Brown of Lakeland were the principal organizers. The date set was November 18 and the place was to be Mr. Squires' office in the City Hall at Tampa. At this time it was estimated that between 15 to 20 interested men would attend.

At 9:30 a.m. on November 18, 1926, Anson Squires, acting chairman, called the organization meeting to order. He recounted the events leading up to the formation of the section, the preparation and presentation of the petition to the national association and their concurrence, thus granting a charter to the new Florida section. The following quote is from Filby's report on the meeting:

"The first meeting of the Florida Section, AWWA went off with a bang! Anson Squires and myself expected about 15 members to be present, but by noon 58 had registered and in the afternoon two more came in making a total of 60."

Following the introduction of those present, four papers were presented. Eugene Masters of St. Augustine read a paper on the water supply for his city. Next, W. E. Darrow, consulting engineer, Winter Haven, reported on the newly opened filtration plant for the city of Okeechobee. Raw water of excellent quality was obtained from the north shore of Lake Okeechobee. Frank Schwable, superintendent of the Clearwater water department, told of his experiences with a well supply, high in hydrogen sulfide. F. J. Stewart, water works superintendent of Hollywood, sent a paper telling of his experiences operating a water works system during a hurricane. He stressed the necessity of an adequate auxiliary power source and of housing the records and equipment in buildings substantial enough to withstand a hurricane's force, and a detailed knowledge of the location of valves in the system.

A tour of the new city of Tampa water filtration plant on the Hillsborough River was conducted during the afternoon, followed by a short business session held at the plant at which time officers of the new Florida section were elected. Anson W. Squires of Tampa was elected the first chairman, Eugene Masters of St. Augustine, vice chairman, and E. L. Filby of Jacksonville, secretary-treasurer. The directors elected were C. C. Brown, Lakeland; A. P. Michaels, Orlando; W. A. Richards, Daytona Beach; F. W. Lane, St. Petersburg; L. B. Duane, Sanford; and F. J. Stewart, Hollywood. A constitution had been prepared, which was read and adopted at this meeting; thus, the Florida section came into being. It was decided to hold the first annual meeting in Hollywood in April 1927. ■

A New Approach To Activated Sludge Process Control

David S. Sloan and Roy A. Pelletier

Orlando's Conserv II Water Reclamation Facility is operating in a process control regime that was not intended by design. The facility design, prior to 1986, was based on an average daily flow of 12 MGD to achieve effluent permit standards of 20 mg/L BOD and 20 mg/L TSS. The facility was expanded in 1986, increasing the permit capacity to 25 MGD and decreasing the effluent TSS limit to 5 mg/L, but still without any regulatory requirements addressing nitrate levels in the plant effluent. However, in 1992, a nitrate limitation of 10 mg/L as a monthly average was included in the facility's DEP operating permit. Since that time, the city has successfully met all nitrate permit limits by altering the design mode of operation within the plug flow conventional activated sludge process. Operational protocol of the plug flow conventional activated sludge system has been modified to allow nitrification and partial denitrification to take place simultaneously within the same aeration zone. The facility was not designed or constructed specifically to accomplish nitrification or denitrification, but under the present operational protocol the city is confident it can achieve a Total Nitrogen (TN) concentration of less than 10 mg/L to comply with anticipated future permit standards.

Operational Difficulties

In attempting to optimize existing equipment and tankage, the most significant difficulty in achieving nitrification and denitrification was manual control of the process blowers due to fluctuating ammonia levels during various flow periods of the day. Influent ammonia levels fluctuate significantly throughout the day because a large percentage of the facility's loading originates from industrial contributors. Because of the extreme fluctuation of influent ammonia, monitoring changes and making manual control adjustments of the process aeration blowers presented a problem. With manual aeration, at times, too much air would be delivered to the aeration system resulting in complete nitrification but reduced denitrification, which resulted in high nitrates in the effluent. At other times, insufficient air would be supplied to the aeration tanks resulting in extremely low nitrates but elevated ammonia levels, and, often, elevated nitrites. The elevated nitrites caused instability in the effluent chlorination process, making it difficult to maintain a chlorine residual. As nitrites increase, additional chlorine feed is required to satisfy the high chlorine demand before adequate chlorine residuals can be achieved; however, as ammonia increases, reduced chlorine demand requires a lower dose to maintain a combined chlorine residual.

We faced challenges not only with the biological systems (activated sludge process), but also with the chemical systems (effluent chlorination process) due to the changes in the degree of nitrification achieved.

Aeration Profile Experiments

Before we arrived at our current air flow profile, we experimented with several different profiles of air placement throughout the aeration system. In 1992, the facility was issued a DEP effluent permit limit of 10 mg/L nitrate (NO_3). At that time, our objective was to devise a method of complying with the new permit limitation by altering the profile of air delivery throughout the aeration system without expensive capital modifications. Since 1992, we have experimented with the operational protocol of the activated sludge process and have never exceeded the average weekly or monthly NO_3 permit limit. Our internal target was to produce effluent nitrate levels of 6 to 8 mg/L, leaving 2 mg/L for a margin of error.

David S. Sloan and Roy A. Pelletier are with the city of Orlando, where they are the chief and assistant chief, respectively, of the Process & Operations Bureau, Public Works Department.

Various air flow delivery experiments included: (1) Cycling air ON and OFF in the first-stage aeration system, (2) No air in the first half of the first-stage aeration system, high air in the second half of the first-stage aeration system, and medium air throughout the second-stage aeration system, (3) No air in the entire first-stage aeration system and high air in the second-stage aeration system, (4) High air in the first-stage aeration system and low air in the second-stage aeration system.

All scenarios produced positive and negative responses. A brief explanation of each air flow profile follows:

1. Cycling air ON and OFF in the first-stage aeration system.

This was our first attempt at turning off air to any portion of the aeration system. The results were mixed; however, it did allow partial denitrification to take place during the OFF air cycles. Our experiments included several different cycling time frames, including 15 minutes air OFF and 45 minutes air ON; 30 minutes air OFF and 30 minutes air ON; and 60 minutes air OFF and 60 minutes air ON. It was estimated that the 60/60 cycle, in which 2 to 4 ppm of nitrates were reduced to nitrogen gas using this method, produced the best results. However, ammonia levels fluctuated and nitrate levels were unpredictable. The other problem experienced with this method was the potential long-term damage to the numerous aeration tank motorized air valves caused by cycling open and closed on a routine basis. At best, this method produced nitrate levels dangerously close to the new 10 mg/L nitrate permit standards.

2. No air in the first half of the first-stage aeration system, high air in the second half of the first-stage aeration system, and medium air in the second-stage aeration system.

Once we had overcome concerns with air off in a portion of the aeration system (and leaving it off), experiments began with shutting off the first half of the first stage of aeration. The first portion of the aeration tanks have the highest availability of carbon (primary effluent BOD) and the highest demand for oxygen. The concept was to use NO_3 in the RAS stream as a source of oxygen as the microorganisms use the carbon in the raw wastewater as food. This method worked very well and was much more predictable than cycling air on and off; however, achieving 10 mg/L of effluent nitrates was still difficult to do on a consistent basis. Due to delayed nitrification, effluent nitrate levels were low but ammonia was high. This method produced effluent nitrate levels between 7 to 9 mg/L, still somewhat higher than we were comfortable with, and TN levels, although not a permit issue at present, were a concern.

3. No air in the entire first-stage aeration system and high air in the second-stage aeration system.

We reasoned that if no air in the first half of the first-stage aeration system was partially successful, then no air in the entire first-stage aeration system might be even better. We were right — effluent nitrate levels were consistently in the 4 to 7 mg/L range. We achieved compliance with permit standards with this method of operation and followed the protocol for five years. It was not an uneventful five years. We had acquired a trade-off given the highly unstable effluent chlorine residuals and chlorination control methods. In 1992/1993 we were wondering what activated sludge process operations have to do with effluent chlorine residual stability. The answer is… a great deal!

By limiting nitrification under this operating protocol, the system was allowing ammonia to "bleed through" aeration during peak flow and/or peak loading periods. The system would achieve complete nitrification during the average to low-flow and loading periods. When the operating protocol achieved complete nitrification, zero ammonia in the effluent, the chlorination system operated in breakpoint and the chlorine residual was stable. However, as ammonia bled through the aeration system and reached the chlorine contact chamber, even though the dose rate and flow rate would remain constant, the chlorine residual would drop. In response to the lower residual, operators would rush to increase the chlorine feed rate. The residual would then drop even lower as they continued to incrementally increase the chlorine feed. They suffered through a learning curve until discovering relationships between ORP readings in the effluent as an indicator of ammonia presence. The bottom line was that the operations staff had to be conditioned to accept that sometimes the chlorine feed rate had to be decreased in order to increase the effluent chlorine residual.

Briefly, as chlorine reacts with ammonia, chloramines are formed. Chloramines provide combined residual as long as the chloramines are not destroyed through over-chlorination. However, if the chlorine feed rate is increased in response to falling TRC, which is what occurs on the back side of the breakpoint hump, the higher levels of chlorine dosage react with the generated chloramines and begin to destroy them. As the chloramines are destroyed, the chlorine residual drops. If more chlorine is fed, the combined residual will drop even more, until breakpoint is achieved. At that point (which could take a great deal of chlorine to achieve), every 1 ppm of chlorine feed becomes 1 ppm of free chlorine residual.

So, for five years we achieved consistent levels of effluent nitrates (almost always below 8 mg/L) but suffered with fluctuating chlorine residuals due to incomplete nitrification and varying concentrations of ammonia in the plant effluent. We went back to the experimental drawing board.

4. High air in the first-stage aeration system and low air in the second-stage aeration system.

In this method, we were hoping to find a way to produce a higher level of nitrification consistently while, of course, being able to maintain a comfortable level of effluent nitrates. We rearranged the air flow profile to provide high air volume to the first-stage aeration system and low air volume throughout the second-stage aeration system. The goal was to accomplish near complete nitrification in the first-stage aeration system, and then to accomplish denitrification in the second-stage aeration system. We were able to accomplish this fairly well, with some ammonia break-through happening during peak flow and/or loading periods. However, even during these first-stage ammonia-bleed-through periods, nitrification was completed in the second-stage aeration system. The effluent nitrate values still remained at acceptable levels between 6 to 8 mg/L, and the effluent chlorine residual stability condition improved significantly.

The operating protocol is to regulate air in the first-stage aeration system to maintain about 1 to 1.5 mg/L ammonia in the outlet. This appears to allow enough CBOD to remain in the second-stage aeration system to accomplish adequate denitrification. Even though the D.O. value in first-stage aeration is normally between 2 to 3 mg/L, initial investigation shows that partial denitrification is being achieved. On June 21, 1999, nearly 25% denitrification occurred in a high D.O. environment. To encourage maximum denitrification, we use just enough air in the second-stage aeration system to prevent settling of the MLSS and provide polishing of the nitrification process should small amounts of ammonia breakthrough first-stage aeration. D.O. levels in the second stage are normally less than 1.0 mg/L.

High air in the first-stage aeration system and low air in the second-stage aeration system presented a few downsides: (1) settleability of MLSS is fairly slow — producing higher than normal clarifier sludge blankets, and, (2) filamentous bacteria growth rate and dominance is much higher as compared with low air in the first stage. We overcame these problems through implementation of RAS stream chlorination, which provides for an acceptable sludge blanket depth and control of filamentous organisms.

We have selected the high air in the first-stage aeration system and low air in the second-stage aeration system, based on several years of experience, as the optimal operating protocol at Conserv II to achieve nitrification and denitrification as well as chlorine residual stability.

Nitrogen Profile Analyzer

We could not have refined the aeration system operating protocol without the on-line nitrogen profile analyzers, which were selected after completing a 30-day demonstration (performed for 9 months). The analyzers receive filtered MLSS samples sequentially drawn from each aeration tank in service and perform UV spectrum analysis to identify the nitrite, nitrate, and ammonia concentrations in about 4 to 5 minutes per tank.

Two complete and self-contained continuous sequencing nitrogen profile analyzer systems are in service to test for nitrite, nitrate, and ammonia concentrations in the first stage and second-stage aeration tanks. Each aeration tank is a plug flow reactor with modulating in-line air valve upstream of the fine bubble air diffusers. The detention time at 12.5 MGD is 4.0 hrs in the first-stage aeration system and 8.3 hrs in the second-stage aeration, for a total of 12.3 hrs under various aeration conditions.

Sequential samples of MLSS are withdrawn from each aeration tank, either from the middle or the end of the tank, and supplied to the ultra-filtration units to remove a clean water source from the mixed liquor. The clean water sample is then supplied to the UV analyzer for the nitrogen profile analysis.

Operational Control

After two years of process evaluation, an automated control system utilizing the on-line UV analyzers was selected for the aeration blowers. In the manual control mode, facility operators monitor the analyzer data and make corresponding process air supply adjustments to either the appropriate aeration tank inlet air valves, the blower inlet air valves, and/or the number of blowers in service.

Process air adjustments are made when nitrate levels rise above a target value, which signals the operators to close air valves and/or turn-down blowers, or ammonia levels rise above a target value, which signals the operators to open air valves and/or increase blower output. The manual control system operates well, but it requires constant operator attention and frequent adjustments to maintain target nitrogen levels throughout the aeration process.

Automated Aeration and Blower Control System

The facility staff has developed a PLC-based process control system to allow automatic adjustment of aeration tank air supply valves, blower inlet valves, and the number of blowers in service based on target ammonia and nitrate values at various points within the aeration tanks. The automated control system reduces operator involvement while achieving nearly complete nitrification on a more consistent basis. The enhanced consistency prevents swings of ammonia in the activated sludge process from adversely affecting the stability of the effluent chlorine residual while increasing confidence in compliance with permit nitrate standards.

Table 1. Typical Process Data

Parameter	Units	Result
Average Daily Flow	MGD	12.5
Daily Peak Flow	MGD	20
Influent CBOD	mg/L	215
Influent NH_3	mg/L	25
Influent TKN	mg/L	39
Influent NO_x	mg/L	0.37
Primary Effluent CBOD	mg/L	155
Primary Effluent NH_3	mg/L	22
Primary Effluent TKN	mg/L	32
Primary Effluent NO_x	mg/L	1.63
Aeration MLSS	mg/L	2500
Aeration MLVSS	mg/L	2170
Average RAS Q	MGD	9.0
RAS TSS	mg/L	5000
Average RAS NO_x	mg/L	1.5
Average WAS Q	Kgpd	145

Each aeration tank has a motorized air valve on the main air line. The valves can be controlled using either ammonia or nitrate as the base setpoint signal. In the portion of the aeration system selected for NH_3 control mode, as the on-line analyzer sequentially updates the results for each tank, the actual NH_3 value is monitored, and, if it rises above the NH_3 setpoint value, an OPEN adjustment signal is sent to the air valve for that tank to increase the valve opening a certain percentage. Also, in the NH_3 control mode, if the actual NH_3 reading falls below the NH_3 setpoint value, a CLOSED adjustment signal is sent to the air valve for that tank to decrease the valve opening a certain percentage. In the portion of the aeration system selected for NO_3 control mode, if the actual NO_3 value rises above the NO_3 setpoint value, a CLOSED adjustment signal is sent to the air valve for that tank. The amount of adjustment, either OPEN or CLOSED, of an aeration tank air valve depends on the degree of deviation between the setpoint and actual values. When the deviation is at a minimal value, the percent adjustment to the air valve is a minimal adjustment. However, as the deviation increases, the percent adjustment of the air valve also increases proportionately.

Blower Control Mode

Automatic blower control uses the difference between the ammonia setpoint vs. actual ammonia readings in the selected aeration tanks. The operational staff can select whether the ammonia setpoint for blower control is derived from the first stage or second-stage aeration tanks. In either selected control location, the concept for blower control is the same. The typical location for blower control will be the bank of aeration tanks where the majority of nitrification is intended to be accomplished. When high air is supplied to the first-stage aeration tanks, nitrification will be at its highest, and this location would be selected for the ammonia-based blower control system. However, if low air is supplied to the first-stage aeration tanks and high air is supplied to the second-stage aeration tanks, then the second-stage aeration tanks will be performing the majority of the nitrification, and this location would be selected for ammonia-based blower control.

With either location, the SCADA program compares the actual ammonia level to a setpoint ammonia target and automatically performs the following blower-related tasks based on the following changing process conditions:

Event #1 — Add more air by OPENING the on-line blower inlet valves,

Event #2 — Add more air by STARTING the next lag blower,

Event #3 — Reduce process air by CLOSING the on-line blower inlet valves,

Event #4 — Reduce process air by STOPPING the lag blower.

As identified in Event #1, when the actual ammonia level exceeds the target level, the control system opens the inlet valves of all on-line blowers equally. The system is designed to perform a calculation to determine how much to open the blower valves according to the percentage difference between the actual and target ammonia levels — the deviation.

Event #2 will automatically start another blower when the inlet valves for the on-line blowers are wide open and the actual ammonia level still exceeds the target value. As the next lag blower is being started, all on-line blowers automatically reduce their output (turned down) to an operator-definable position. Then, all blower inlet valves are opened simultaneously to a system-calculated percent opening to achieve the required air flow rate and match the ammonia setpoint.

Continues Page 36

Table 2. Aeration System Information

Parameter	Units	Results
Number of Aeration Tanks		10
Air Diffusion		Fine Bubble Ceramic Stones
Tank Depth	feet	152
1st Stage Tanks Capacity (4)	gallons, each	520,000
1st Stage Tanks Detention Time	hours @ 12.5 MGD ADF	4.0
	hours @ 20 MGD peak	2.5
	hours @ 25 MGD design	2.0
Typical D.O. 1st Stage Aeration Tanks	mg/L	3.3
2nd Stage Tanks Capacity (6)	gallons, each	720,000
2nd Stage Tanks Detention Time	hours @ 12.5 MGD ADF	8.3
	hours @ 20 MGD peak	5.2
	hours @ 25 MGD design	4.1
Typical D.O. 2nd Stage Aeration Tanks	mg/L	<1.0
Total Aeration System Volume	gallons	6,400,000
Total Aeration System Detention Time	hours @ 12.5 MGD ADF	12.3
	hours @ 20 MGD peak	7.7
	hours @ 25 MGD design	6.1

The GUA — A Solution for Utility Infrastructure Delivery for Both Public and Private Entities

Frederick Bloetscher and William Lynch

Utility systems have traditionally fallen into one of three classes: those operated by government entities, those operated by developers, and those operated by private companies (which tend to be holding companies that acquire smaller utilities and provide services under a corporate framework).

A public water and sewer utility is created to develop safe, reliable, and financially self-supporting potable water and sanitary sewage systems that will meet the water and sewerage needs of the areas it serves; to ensure that existing and future utility facilities are constructed, operated, and managed at the least possible cost to users without outside subsidies; and to develop a system that is compatible with the area's future growth.

Governmentally operated utilities operate to provide high quality, customer service-oriented water and sewer service to its customers, with enough redundancy to minimize the risk of system failure.

Developer systems are operated as a vehicle to provide service to an area so the land can be developed. Effective operation is not a primary goal of the system, except to the extent that the utility may be deemed to be not providing service, which can create a moratorium on development.

Private systems are operated to provide service to customers in a satisfactory manner, while allowing the owners of the company to earn a profit. The primary motivation is for profits for the investors in the system.

All three operations must constantly change their methods and programs to meet ever increasingly stringent state and federal mandates, directives, and regulations, and to provide service to an increasingly conscious user base.

As a result of recently enacted legislation, it is possible to create a single, multi-jurisdictional, governmental entity — a governmental utility authority (GUA) with the ability to own, operate, and manage multiple utility systems throughout the state. In 1999, the first actual GUA entity was created – the Florida Governmental Utility Authority.

The GUA concept is akin to to that of regional authorities, which are often used in areas with similar problems and needs and where underlying local governments may wish to divest themselves of full responsibility of water and sewer provision in exchange for monetary benefits, while retaining the utilities in the public sector and providing some control. With control often comes the responsibility for maintaining and upgrading the utility system. The GUA concept offers a potential solution to that dilemma. It is an overlying legal entity that would administer the water and sewer systems and would own, operate, improve, expand, and upgrade the system to meet the needs of the public. Debt and other obligations of local governments, along with assets, could be transferred to the GUA in exchange for annual revenues to the local governments, should the local governments wish to pursue regionalization further.

Operational Comparisons

We reviewed the costs of delivery of the varying service delivery options as best as could be defined in Florida. This resulted in a series of statistical parameters that provided insight into daily utility operations. Based on an analysis of those parameters, the following information was evident:

Frederick Bloetscher, P.E., is the Director of Engineering, Operations and Planning for the Florida Governmental Utility Authority. William Lynch, P.E., is with Geraghty & Miller, Atlanta.

- The comparative statistics that provide the best picture of the impact on the customer — the cost per thousand gallons for water treatment, water distribution, sewer collection, and wastewater treatment — clearly demonstrate the economy-of-scale of the larger utility operations versus small scale operations

- Debt service is a major issue handled differently by public and private systems. Public sector systems are able to clearly identify debt obligations, both in total and for a given fiscal year. None of the private systems reviewed did this. This is because the PSC permits only a one-to-one return on borrowed money, which encourages internal borrowing at high interest rates. In addition, many costs are simply expended and added to the rate base. The PSC permits a 12% return on the depreciated rate base. As a result, there was a clear pattern of private utilities minimizing maintenance costs to incur capital costs that would be added to the rate base. Some utilities went so far as to capitalize all maintenance costs, regardless of size, for this purpose. Maintenance costs are a one-to-one reimbursement, which is a major disincentive for private sector system maintenance. In addition, the true deferred maintenance obligations are hidden because the maintenance costs create an artificial picture of system investment.

- Management fees, overhead, profit sharing and other costs imposed on private sector utility systems cause the overhead costs to be higher than the public sector. However, the disparity may not be quite as significant, since many local governments take large amounts of money from the utility systems to subsidize their general fund.

- There appears to be an issue with actual condition and deferred maintenance obligations. While prior analyses indicated that smaller systems tend not to reinvest in the system, thus contributing to a generally poorer condition and higher deferred maintenance obligation than larger systems, the private sector systems are often in even poorer shape, but the deferred maintenance obligations are hidden by the manner in which maintenance is handled.

- Both public systems, with political concerns, or private sector systems, with PSC regulation, have problems with securing monies for re-investment in their system, often leading to long-term deterioration of the utility system.

From this analysis, and in comparing the benefits and disadvantages of the service delivery options, it appears that the regional utility authority tool can provide a useful option for local governments to address water and sewer infrastructure needs, to resolve political barriers to service provision and operations, and to justify the acquisition of private sector systems. The Chapter 163 special districts entitled governmental utility authorities to all of the benefits of the authority option.

Summary of the GUA Concept

The philosophy behind the GUA concept is that water and sewer infrastructure is best provided through the public sector. To this end, all of the infrastructure is owned by a governmental entity (the GUA). All services are provided via contract with public and/or private entities. The intent for current local government or private providers would be that the GUA would own the infrastructure, and would be responsible for all expansions, upgrades, permitting issues, and rehabilitation of the infrastructure, while the local government would remain responsible for day-to-day operations. The current provider would be compensated for the sale of assets (net of supportable debt minus current debt) that could be used for any purpose. The GUA could pay a franchise fee to the underlying local government each year and would be responsible for any capital needs or improvements. At the same time, the underlying local government would have input on the direction of the utility through a place on the GUA board so that growth and/or development needs, citizen issues, or long term strategic goals can be met at the GUA's expense, not the local government's. When a private provider is the current owner, it would remain the operator if it so chose.

The original focus of the GUA concept was on the acquisition of multi-jurisdictional private utilities. However, it is clear that much of the same thought process is applicable to local governments, especially smaller ones that cannot afford upkeep of technical expertise to operate and manage the system. The following outlines this point:

Issues of Benefit to Local Governments

1. The local government significantly reduces its outstanding debt, which helps the local government's financial position.
2. The local government receives the difference between supportable debt service and bond obligations as cash.
3. The local government can retain control of day-to-day operations of utility through operating agreement with the GUA to operate with its employees.
4. The local government's current employees know the system and will provide seamless transition.
5. Local governments are not responsible for permitting, capital, debt, planning, or significant maintenance items.
6. The local government retains oversight by joining the GUA board.

Versus responsibilities of GUA:

1. GUA is responsible for all permitting
2. GUA will be responsible for all lab work
3. GUA will be responsible for all capital projects
4. GUA will assume all debt obligations
5. GUA could pay local governments a franchise fee each year
6. GUA will be responsible for major maintenance and upgrade items (over a certain dollar limit)
7. GUA will be responsible for all strategic and utility planning

The authority option should be compared with current operations and with the potential problems that would occur with contracting or sale to a private entity:

- Local government loses control over daily operations
- If sold, utility loses complete control of system including rate-making, resales, regulatory issues, etc.
- Front-end savings are often lost in change orders for maintenance items as a result of low maintenance deductibles
- Loss of control of direction of utility and/or conformance with growth and development plans

Example Public Utility System

The following is a brief summary of how the concept would work for the acquisition of a public sector system:

Gross Revenue:	$40 million
Expenses:	$27.5 million
Operations (minus lab, regulatory compliance, and Engineering):	$17.5 million
Billing Services:	$2 million
RRI Funds:	$5 million
Current GF Subsidy (franchise fee):	$3 million
Net:	$12.5 million
Potential Proceeds:	$250 million
Deducts:	
Current Capital Needs:	$45 million
Current Debt Service:	$113 million
SRF:	$10 million
Net Proceeds to Local Government Owner as Cash:	$90 million

***A new Approach** from Page 34*

Event #3 will be activated when the actual ammonia level is lower than the target value. The control system makes a system-calculated closed adjustment on all of the on-line blower inlet valves, the degree of which is determined by how much the ammonia level is below the target value.

As identified in Event #4, when all on-line blower inlet valves reach their pre-selected lowest position, the control system, after an appropriate time delay, will automatically shut off the lag blower. As this blower is being stopped, the inlet valves on the remaining blowers are automatically regulated to the optimal position to match the actual ammonia value to the ammonia setpoint value.

A back-up blower control mode utilizes a pressure sensing device on the blower discharge line. As aeration tank valves are opened in response to elevated NH_3 levels, the blower outlet pressure drops. As it falls to a setpoint low pressure, between 7.5 to 8.0 psi, the output of all active blowers is increased. The percent opening of the blower inlet valves is based on the difference between the actual pressure and the setpoint pressure value. As aeration tank valves are closed to reduce the NO_3 levels, the blower outlet pressure begins to increase. As it rises to a setpoint high pressure, between 9.5 to 10.0 psi, a signal is sent to decrease the output of all active blowers. The percent closing of the blower inlet valves depends on the difference between the actual pressure and the setpoint pressure value.

Cost Savings

We estimate an annual operational savings of approximately $125,000 per year at the Water Conserv II facility attributed to implementation of the nitrogen-profile based automated aeration control system. Estimated annual operational savings consist of $70,000 per year in reduced aeration blower horsepower due to optimization of the air delivery system, $20,000 per year associated with the reduction of previously required staff response and adjustment time of aeration tank air valves and blowers, and $35,000 per year in reduced chlorine consumption by minimizing ammonia and nitrite swings and breakthroughs allowing consistency in the selection and setting of chlorine dosage rates.

The greatest saving, however, is in the ability to utilize the existing conventional activated sludge plug flow tankage, originally designed only for BOD removal, to accomplish nitrification and significant denitrification, saving the city millions of dollars in averted capital expenditures. Estimates to design and construct traditional tankage for nitrification and denitrification, as an add-on to a 25 MGD conventional activated sludge facility, were received from nationally recognized design firms in the range of $20 million. ■