Exhibit No.: ________________
Issue: Fire Flows/ Excess Capacity
Witness: Joel L. Wade
Type of Exhibit: Surrebuttal
Sponsoring Party: Algonquin Water Resources of Missouri, LLC
Case No.:WO-2005-0206
Date Testimony Prepared: July 11, 2005

MISSOURI PUBLIC SERVICE COMMISSION

ALGONQUIN WATER RESOURCES OF MISSOURI, LLC

CASE NO. WO-2005-0206

SURREBUTTAL TESTIMONY OF

JOEL L. WADE

Jefferson City, Missouri

July 11, 2005

WITNESS INTRODUCTION

Q. WOULD YOU PLEASE STATE YOUR NAME AND BUSINESS ADDRESS?

A. My name is Joel L. Wade and my business address is 111 W. Wigwam Boulevard, Suite B, Litchfield Park, AZ 85340.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Algonquin Water Services as Manager of Engineering & Construction Services.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL EXPERIENCE AND THE NATURE OF YOUR DUTIES.

A. Marked as **Schedule JLW-1** and attached hereto is a description of my education, professional experience and training.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to respond to the Rebuttal Testimony of Commission Staff witness James A. Merciel, Jr. concerning the Silverleaf plant capacities. This includes an assessment of the validity of water usage demand calculations provided by Mr. Merciel, such as average day, peak day and maximum month flow requirements of water production and distribution systems, subject to those flows considered for basic needs for these customers served, as well as fire flow requirements.

PLANT CAPACITY

Q. HAVE YOU REVIEWED THE REBUTTAL TESTIMONY OF STAFF WITNESS JAMES A. MERCIEL, JR.?

A. Yes.

Q. WHAT ISSUES DOES MR. MERCIEL ADDRESS?

A. Mr. Merciel's testimony attempts to assess the capacities of the various Silverleaf Resorts, Inc. (Silverleaf) Missouri regulated water utility systems (specifically the well capacities and the storage capacities) with some standards and industry benchmarks.

Q. WHAT DOES MR. MERCIEL CONCLUDE?

A. His analysis appears to conclude that there is excess capacity in these water systems. Mr. Merciel then goes on to suggest that this "excess capacity" should thus be considered as "plant held for future use" and excluded from the rate base of the respective systems. Mr. Merciel further states that "if and when additional customers connect to these systems, then it would be appropriate to include proportionately more plant in the calculation of the ratemaking rate base used in determining the utility's overall cost of providing service." (Merciel Reb., p. 6).

Q. HOW WOULD YOU DEFINE "EXCESS CAPACITY?"

A. All distribution pumping capacity above and beyond the peak hour delivery including the maximum fire flow rate, with the largest pumping element out of service, as recognized by industry standards, prudent water system design and engineering practices, namely by the Great Lakes Upper Mississippi River Board of States Sanitary Engineers (10-State Standards), as well as Heastead Methods among others.

Q. WHAT IS THE SIGNIFICANCE OF MR. MERCIEL'S CALCULATIONS AS THEY RELATE TO THIS CASE?

A. It appears that the purpose of this calculation is to somehow support Staff's calculation of an acquisition premium (which would be arrived at as the difference between a purchase price paid for these systems and the rate base of these systems). However, Mr. Merciel states that this issue does not directly affect the determination of whether the proposed sale of Silverleaf's assets to Algonquin meets the applicable standard of not being detrimental to the public interest. (Merciel, Reb., p. 6). He further states that he merely wants to ensure that Algonquin and the Commission are "fully aware of the excess capacity issue, and the position that the Staff would take on that issue in a rate case." (*Id.*).

Q. HOW WOULD YOU DESCRIBE THE GENERAL METHODOLOGY USED FOR THE CALCULATION?

A. The logic utilized in the calculations are fairly consistent with industry standards, however there are values utilized in the calculations which are inconsistent with industry standard and/or regulating authorities. The following are a number of concerns that require validation before these calculations can be considered. It is of the utmost importance that the water demand assessment meets the scrutiny of all regulations and industry standard, before any production and distribution pumping capability be considered in excess of customer demand.

While reviewing the calculations utilized for the production and distribution system capacity assessment, a number of concerns arose. These concerns are summarized below:

- Data collection – Data collection methods need to be validated. Why is 2003 data utilized while 2004 data should be available? Are data collection methods consistent with American Water Works Association (AWWA) industry standards? Are peak days relevant to data collection being recorded at varying times of day? If supporting production data is to be used in place of current industry standard usage averages, the data needs to be validated on a true 24-hour basis, and not on the convenience of data availability.
- Meter Accuracy – What method of metering is utilized to determine the flow data? Is the accuracy of metering methods utilized within the industry standard AWWA guidelines - Methods of Practice (MOP) manual M-6? Are calibration reports available to validate metering accuracy? If not, all meters utilized for these calculations should be tested and validated to be within the accuracies reported in AWWA MOP – M6.
- Day Demand Calculations – it is of the opinion of AWS that the peak day numbers are somewhat inconsistent with generally recognized practices. When previous demand data is used, the max day is normally calculated as 1.5 times the average day figure, while the peak hour demand is 2.5 times the max day figure. When metering data is not available, average day values are based on 325 gallons per day per person or capita. In this case we have some limited historical metering data however some of the parameters have changed that may make this of limited

usefulness. A year can be wetter or drier, the customer count has increased year over year, and amenities added such that historical data could be misleading. The generally accepted method of calculation to arrive at a capacity excess calculation would be to determine the average day flow based on 3 occupants per unit and 325 gallons per day per capita, multiply this figure by 1.5 to get the peak day flow, and multiply this value by 2.0 to calculate the peak hour flow. Of course, if the metering method which is the base for the data is found to be inaccurate, other calculations including the Peak Day and Peak Hour calculation would also be grossly inaccurate.

- System Redundancy – Are all system pumping capacities calculated with the largest pumping element out of service? Pumping capacity should only account for pumping equipment connected directly to the distribution system and should only consider system capacity beyond that of the largest pumping element out of service. This is consistent with industry standards for redundancy required for safety and reliability measures.
- Fire Flow Requirements – The fire flow requirements for each of the three calculated scenarios, listed a fire flow requirement of 250 gpm. AWS has researched the fire flow requirements reported by the regulating fire district. It is clear that the fire flow requirements reported in the calculations are grossly underestimated and need to be revised. It is of industry standards that all stated fire flow requirements are rated a minimum pressure of 20 pound per square inch (psi). This requirement is not addressed through out the testimony, and should be noted.

- Disinfection Contact Time - Water disinfectant products such as chlorine gas require Contact Time (CT) to meet regulatory guidelines. Contact time is based on pH values as well as available storage volume for the disinfectant to immobilize bacteria. Pumping capacity should not be considered in excess if the volume of water pumped reduces the contact time below safe values to assure proper disinfection of water distributed. The proper CT value must be considered before systems can be evaluated for excess capacity.

Q. DO YOU CONSIDER THE METHODOLOGY USED BY THE STAFF TO BE COMPLETELY APPROPRIATE OR ARE THERE OTHER CONSIDERATIONS THAT SHOULD BE INCLUDED?

A. There are several other considerations that should be included, some of which are subjective in nature and some of which are purely technical.

Q. PLEASE DESCRIBE AN EXAMPLE OF A SUBJECTIVE CONSIDERATION.

A. In the subjective category, we must remember that these systems serve resort communities and not typical rural residential subdivisions. There is a tradeoff between capacity and cost that customers evaluate in a particular context. The customers at the Silverleaf resorts are principally on vacation. They likely do not wish to notice in any way the consequences of an inadequacy of the water supply system at any point in time (today or tomorrow), and no matter for what purpose it is desirable or necessary or how it manifests itself (consumption, personal hygiene, in support of the housekeeping services, to supply the amenities, or in the irrigation of the landscaping, fire protection or the cumulative combination of all the above uses).

No one would purchase an interval owner unit in a resort with mediocre or marginal water supply system incapable of supplying their every wish including lush landscape maintenance. However, many people purchase homes in subdivisions with inadequate water supply or rely on minimal individual well systems. What applies in a residential system has little significance at a resort.

Q. WHAT DOES THIS MEAN IN REGARD TO THE SILVERLEAF WATER AND SEWER SYSTEMS?

A. Silverleaf chose, with an appreciation of the customers' expectations, to invest the appropriate amount in the water and sewer systems.

Q. ARE THERE ADDITIONAL CONSIDERATIONS THAT YOU FEEL SHOULD HAVE BEEN TAKEN INTO ACCOUNT IN EVALUATING THE SIZING OF THESE WATER SYSTEMS FROM A TECHNICAL PERSPECTIVE?

A. Yes. Fire flow capacity should have received much more attention than the brief mention it received in the testimony. The fire flow requirements need be considered before qualifying the capacity calculation process.

Q. WHAT FIRE FLOW CAPACITY HAS BEEN USED BY THE STAFF WITNESS?

A. Staff witness Merciel has assumed that 250 gallons per minute for one hour is sufficient fire flow capacity to be included in each of these systems.

Q. HOW SHOULD FIRE FLOW CAPACITY BE DETERMINED?

A. Determination of the fire flow requirement is complicated due to the fact that there are best practices standards and specific code requirements. In Missouri, each county or fire district may utilize quite different fire codes rules and regulations based on the acting fire district. Generally the fire flows capacities presented in the calculations are not considered good practice as stated in numerous industry standards (AWWA-M31, NFPA, ISO and others). There are also some additional requirements, which can affect the fire flow requirements.

Q. WHERE ARE THE WATER SYSTEMS LOCATED THAT ARE THE SUBJECT OF THIS CASE?

A. The Ozark Mountain Resort (OMR) is located in Stone County, the Holiday Hills (HH) Resort is located within Taney County, and the Timber Creek Resort is located in Jefferson County Missouri.

Q. WHAT IS THE COUNTY FIRE FLOW REQUIREMENT FOR THE TIMBER CREEK FACILITY?

A. It is of the opinion of Algonquin Water Services (AWS) that the Jefferson County Fire Prevention Code, which is the governing fire district for Timber Creek, requires all single and two family dwellings to meet a fire flow no less than 1,000 gpm, while all other facilities require no less than 1,500 gpm.

Q. WHAT ARE THE SPECIFIC JEFFERSON COUNTY REQUIREMENTS?

A. The Jefferson County Fire District serves in an ancillary role and reviews street width and emergency vehicle access, fire hydrant water supply needs and fire hydrant locations. The minimum acceptable fire flow in a residential development is 1,000 gallons of water per minute (gpm) per fire hydrant at a minimum pressure of 20 psi. This requirement is for all single and two family dwelling units. Hydrant spacing in residential developments shall not exceed 500 ft unless approved by the Fire District. The formula for calculating the actual amount of water needed via the fire hydrant system is based upon the materials used to build the building (wood, steel, block, etc.), what the structure is used for (mercantile, storage, manufacturing, etc.) and the dimensions of the building. These calculations determine the needed fire flow (NFF) to effectively fight a fire in the structure

Q. DO THESE SAME REQURIEMENTS APPLY TO THE OZARK MOUNTAIN AND HOLIDAY HILLS FACILITIES?

A. No. The Ozark Mountain and Holiday Hills (HH) Resorts fall under the code and fire flow requirements for Stone and Taney Counties.

Q. WHAT ARE THE FIRE FLOW REQUIREMENTS FOR THE OZARK MOUNTAIN AND HOLIDAY HILLS RESORTS?

A. The counties call for a significantly higher minimum fire flow of 500 gpm than that used by the Commission Staff but the reality is that the code generally envisions more conventional residential and small commercial structures than what is typically found at the Silverleaf properties. It must also be remembered that this code allows for "Water Shuttling" by the fire agency as a fire flow source for any on-site production and distribution capacity deficiencies, something that is not very practical in regard to the properties in question.

Q. IS WATER SHUTTLING A REALISTIC ALTERNATIVE FOR THE RESORT PROPERTIES?

A. No. In consideration of public safety, if the maximum fire flows cannot be met, water shuttling would not be practical.

Q. PLEASE DESCRIBE THE CODE THAT HAS BEEN ADOPTED BY STONE AND TANEY COUNTIES.

A. Most recently the Stone and Taney County Fire District has adopted the Building Officials and Code Administrators (BOCA) National Building Code (1996 edition), National Fire Prevention Code (1996 edition). In addition, the National Fire Protection Association (NFPA) Life Safety Code (1997 edition), NFPA 1 Fire Prevention Code (1997 edition) and NFPA referenced and related fire; hazardous material, water supply and building standards are in effect. Taney County Fire District codes are consistent with Southern Stone County Codes. This eliminates the potential for contradictory standards.

The Fire District serves in an ancillary role and reviews street width and emergency vehicle access, fire hydrant water supply needs and fire hydrant locations. The minimum acceptable fire flow in a residential development with fire suppression (sprinklers) is 250 gallons of water per minute (gpm) per fire hydrant based upon square footage of the structure. The 250 gpm requirement increases to 500 gpm, if homes exceed 2500 square feet. Hydrant spacing in residential developments shall not exceed 500 ft unless approved by the Fire District. The minimum acceptable fire flow in a commercial development is 500 gpm per fire hydrant. The formula for calculating the actual amount of water needed via the fire hydrant system is based upon the materials used to build the building (wood, steel, block, etc.), what the structure is used for (mercantile, storage, manufacturing, etc.) and the dimensions of the building. These calculations determine the needed fire flow (NFF) to effectively fight a fire in the structure.

Q. ARE THERE OTHER FACTORS THAT HAVE AN IMPACT UPON APPROPRIATE FIRE FLOWS?

A. Yes. Fire casualty companies (insurance companies) establish fire insurance rates for all communities or fire protection areas. These rates are solely up to the individual companies and may be predicated on numerous factors. Most companies, however, use a grading schedule established by the Insurance Services Office (ISO), a rating bureau supported by the insurance industry.

Q. HOW IS THIS SCHEDULE DEVELOPED?

A. The engineering model used by ISO to rate individual fire departments evaluates a number of fire protection factors. The final rating is proportionately developed based on fire protection capability (50%), community water supply (40%) and communications (10%). Fire protection encompasses fire department stations, equipment, personnel, training, maintenance, etc. Community water supply encompasses size and locations of fire hydrants, water main sizes, water storage tank/towers, wells/pumps, etc. Communications encompasses the emergency dispatch center, 911 telephone system, back-up generators for the system, etc.

Q. DO THE SILVERLEAF FACILITIES INCLUDE A VARIETY OF FACILITY TYPES?

A. Yes. The Silverleaf facilities include facilities like restaurants, pro shops, clubrooms, activity centers, visitor centers, maintenance facilities, laundries, offices, and other similar facilities.

Q. WHAT IS THE NATURE OF THE STRUCTURE ITSELF?

A. These structures are all primarily of wood construction. All are constructed with sprinkler systems incorporated in the design that would have been a building code requirement. Some of these structures are constructed quite close together, being less than 50 feet apart. There are many people active in these structures at any time. Most of the units include fireplaces, furnaces, cooking facilities and other potential fire sources. Additionally, only a small number of the structures are single family units with the vast majority of these being substantial multiple level structures (up to 14,000 square feet) generally consisting of 6 to 12, two bedroom living units. Some of these living units include lockouts that permit the subdivision of the unit into two separate apartments, meaning that there are potentially 12 to 24 dwelling units per most structures.

Q. HOW FAR ARE THE UNITS FROM FIRE DEPARTMENTS?

A. These resorts are all some distance from potential fire fighting responders and back up systems and hence must maintain a very high level of self sufficiency. Water supply for fire flow capacity has to be a very important consideration and deserves a much more thorough assessment given the type, size and spacing of these structures.

Q. TAKING THESE FACTORS INTO ACCOUNT, WHAT DO YOU BELIEVE THE APPROPRIATE FIRE FLOWS TO BE?

A. ISO would indicate that a minimum fire flow recommendation of 1250 gpm for a comparable 2,000 square-foot, two-story wood structure. Given the various factors, I would suggest afire flow rate of 1500 gpm be used for the assessment of the useable capacity at the three resorts.

Q. WHAT BENCHMARKS SHOULD BE USED TO DETERMINE WHETHER THERE IS ANY EXCESS CAPACITY ON THE THREE SYSTEMS?

A. Based on industry standards of 325 gpcd and an average occupancy of 3.0 persons per unit, and a commercial fire flow rate of 1500 gpm would certainly be supportable parameters in calculating whether any excess capacity exists as these are generally accepted best practices benchmarks. Additionally, AWS feels that excess capacity should only be considered if the following production and distribution benchmarks or targets can be met with the largest pumping element out of service:

- **<u>Timber Creek Peak Hour Demand</u>** – (theoretical 325 gpcd * 3 occupants * 194 units)/1440 min/day) * 1.5 (Max day)* 2.5 (Peak Hour) + 1500 gpm fire flow to arrive at the gpm minimum supply and pumping capacity requirement with largest pump out of service.
- **<u>Holiday Hills Peak Hour Demand</u>** – (theoretical 325 gpcd * 3 occupants * 466 units)/1440 min/day) * 1.5 (Max day)* 2.5 (Peak Hour) + 1500 gpm fire flow to arrive at a gpm desirable supply and pumping capacity with largest pump out of service.

- **<u>Ozark Mountain Resort Peak Hour Demand</u>** – (theoretical 325 gpcd * 3 occupants * 249 units)/1440 min/day) * 1.5 (Max day)* 2.5 (Peak Hour) + 1500 gpm fire flow to arrive at a gpm desirable supply and pumping capacity with largest pump out of service.

Q. USING THIS STANDARD, IS THERE ANY EXCESS CAPACITY?

A. No.

Q. ARE THERE ANY OTHER CONSIDERATIONS THAT YOU THINK SHOULD BE ADDRESSED IN REAGRD TO AVAILABLE CAPACITY?

A. Yes. Determining the value or cost of any excess capacity is not simply a matter of multiplying the percentage of excess capacity by the total cost of the installation and assuming that is a proper valuation of that percentage of excess capacity that might be determined to exist. In other words, there is not a linear correlation between cost and capacity.

As a simplified example, let us consider water storage. The cost of installing such will include design, permits approvals, tendering, mobilization, site preparation, foundations and supports, installation or erection of the storage tank (lets assume it a bolted steel tank), controls automation and instrumentation, installation of electrical and plumbing, commissioning and startup, etc. The capacity of such a storage tank could be increased by 30% (say from 300,000 to 400,000 gallons) by including one additional ring of bolt on steel wall segments, but that would not require any material change to any of the other components or labor. Adding this 30% additional incremental capacity might add 5% to the cost of the entire installation.

The same is true for almost every type of installation in a water system to a greater or lesser degree. The relationship between cost and capacity is closest to linear for the installation of straight pipe in the ground (although, design, permits and approvals mobilization/demobilization, commissioning are all closer to fixed cost than variable cost) and the cost of installing 8" pipe is not 4 times the price of installing 2" pipe or 16 times the price as would reflect its water transmission capacity.

Q. HOW DO WELL CAPACITY AND STORAGE RELATE TO THIS CONCEPT?

A. Well capacity and storage are fairly far away from the linear cost capacity relationship, and while I have only run approximate numbers, I would suggest that the actual cost of the approximately 25% incremental capacity that Staff witness Merciel claims is excessive, only has a value of 5% of the total installation cost and is not really material

Q. ARE THERE ANY OTHER CONSIDERATIONS THAT YOU THINK THE ANALYSIS SHOULD HAVE ADDRESSED?

A. Yes. A valuable factor to consider is the concept of "investments prudently made". It is inconceivable that capacity can be added to water systems in infinite increments to make capacity always match the theoretical requirement of the systems. It is hard to imagine the horrendous cost and inefficiency and waste of money of installing incremental storage every time a single additional dwelling unit customer was added to a system. Given the non-linear relationship between capacity and cost this would be very expensive and wasteful. The customer should be protected from this sort of wasteful situation. As a consequence, it is much cheaper to add capacity in blocks that optimize the relationship between up front cost and the time value of money to the period where the capacity actually becomes useful to the system. Balancing this relationship effectively results in situations where there may be excess capacity for periods of time, but the investments can still be considered the most wise and prudent action. The utility should not be penalized for taking such actions which in the fullness of time will be proven to be in the best interests of the utility in that they will have secured the capacity at an appropriate cost.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. The systems do not have any excess capacity based on the appropriate criteria for evaluating these types of systems. Even if some excess capacity would be found to exist because of local aberrations (like local fire code anomalies), the capacity is still desirable from other perspectives and from the demands of the customers and hence is prudently made and worthy of rate base inclusion.

To properly value the capacity, an evaluation of the actual incremental cost of that excess capacity must be determined. This is really the difference between the cost of an installation that would have met the capacity goal, versus the cost of the installation that was installed. The witness focuses on percentages.

It is important to point out that while I do not believe that the systems include excess capacity, should such excess be found to exist, there is a methodology to calculate an appropriate valuation that is well established and generally accepted.

Q. WILL THE CAPACITY REQUIREMENTS OF A RESORT COMMUNITY DIFFER FROM THOSE OF A CONVENTIONAL SMALL SUBDIVIDION?

A. Yes. Mr. Merciel describes the developments as generally residential type structures, mostly condos and a few commercial customers. This does not mean that the systems bear some resemblance to the average small rural subdivision residential development. Rather than consisting primarily of detached single family dwelling structures, the buildings are mostly condominium type structure consisting of some town home structures and multi-story building with 6 to 12 units per structure.

Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?

A. Yes.

AFFIDAVIT

STATE OF Arizona)
) ss
COUNTY OF Maricopa)

I, Joel L. Wade, state that I am employed by Algonquin Water Services as its Manager of Engineering & Construction Services; that the Surrebuttal Testimony attached hereto has been prepared by me or under my direction and supervision; and, that the answers to the questions posed therein are true to the best of my knowledge, information and belief.

Joel L. Wade

Subscribed and sworn to before me this 13th day of July, 2005.

Barbara Risden
Notary Public

My Commission Expires:

Feb. 3, 2007

(SEAL)

OFFICIAL SEAL
BARBARA RISDEN
Notary Public - State of Arizona
MARICOPA COUNTY
My Comm. Expires Feb. 3, 2007

Name:	Joel L. Wade
Title:	Manager of Engineering and Construction
Immediate Supervisor:	Michael D. Weber, P.E.

I. Primary Job Responsibilities:

Overall responsibility for the design and construction oversight of utility capital improvement projects.

II. Education, Certifications, Awards, Recognitions:

- BS Civil Engineering Southern Illinois University – 1991
- Master of Business Administration – Keller Graduate School of Management – 1999
- Graduate Certificate - Project Management - Keller Graduate School of Management – 1999
- State of Illinois Grade - A Water Operators Certification
- State of Illinois Grade - 1 Wastewater Operators Certification
- State of Arizona Grade - 4 Water Treatment Certification
- State of Arizona Grade - 4 Water Distribution Certification
- State of Arizona Grade - 4 Wastewater Treatment Certification
- State of Arizona Grade - 4 Wastewater Collection Certification.
- Arizona Water and Pollution Control Association – Operator of the Year -1999

III. Publications/Presentations:

"Elements for Corrosion Control Study for the City of Phoenix"
Vance G. Lee, P.E. Steve Reiber, P.E., as presented at the 1995 AWWA National Conference on Water Quality

"Determining Flocculation Basin Baffle Performance using Particle Count Technology"
Joel L. Wade, Michael D. Weber, P.E., as presented at the 1995 AWWA National Conference on Water Quality Anaheim, CA

"ESWTR-Are You Enhanced?" Joel L. Wade, as presented at the 1995 Salt River Project Operations Forum Phoenix, AZ

"Flocculation Performance Modeling" Joel L. Wade, Michael D. Weber, P.E. as presented at the 1996 Arizona Water Pollution Control Association Regional Conference, Tuscan, Arizona

"Problems and Solutions Regarding the Design of a Membrane Bioreactor WWTP in Anthem, Arizona" - Kevin Alexander, P.E., Brian McBride, P.E., Ron Jackson, P.E. and Joel Wade as presented at the Water Environment Federation Technical Conference, Atlanta, Georgia 2001

"Bench Scale Evaluation of Perchlorate Biodegradation Using Municipal Wastewater" - Laurie Lapat-Polasko, PhD., Brain Scott Aiken, Joel L. Wade and Anthony Pantaloni, Ph.D., as presented at the In Situ and On-Site Bioremediation Symposium, Orlando FL, 2003

"Pilot Scale Evaluation of Perchlorate Biodegradation Using Municipal Wastewater" - Laurie Lapat-Polasko, PhD., Brain Scott Aiken, Joel L. Wade and Anthony Pantaloni, Ph.D., as presented at the Remediation of Chlorinated & Recalcitrant Compounds Syposium, Monterey CA, 2004

IV. Summary of Experience:

Mr. Wade is currently Manager of Engineering and Construction for Algonquin Water Services. His experience in the design, development, operation and management of water and wastewater treatment facilities spans over 22 years, including 10 years in the privatization, contract operations area. His diverse background as facility manager, designer and technical consultant has led to the successful start-up and procurement of seven treatment facilities, ranging from 0.250 to 180 million gallons per day (MGD), as well as consulting service to 25 individual facilities including project engineering, planning and investigation, civil design, technical research, development, and efficiency evaluation. Mr. Wade was instrumental in the construction and start-up of the first wastewater membrane treatment facility in the state of Arizona. Current projects include simultaneous start-up of two 0.500 MGD reverse-osmosis wellhead treatment units and one 0.650 MGD ion exchange resin wellhead treatment units. City of Goodyear AZ, 6/03.