BEFORE THE STATE OF NEW JERSEY

BOARD OF PUBLIC UTILITIES

OFFICE OF ADMINISTRATIVE LAW

I/M/O THE PETITION OF NEW JERSEY NATURAL GAS COMPANY FOR APPROVAL OF AN INCREASE IN ITS GAS RATES, DEPRECIATION RATES FOR GAS PROPERTY, AND FOR CHANGES IN THE TARIFF FOR GAS SERVICE, PURSUANT TO N.J.S.A. 48:2-18 AND 48:2-21	]	**BPU DKT. NO. GR07110889** **OAL DKT. NO. PUCRL 12545-07**

DIRECT TESTIMONY AND EXHIBITS OF HOWARD J. WOODS, JR., P.E. ON BEHALF OF THE NEW JERSEY DEPARTMENT OF THE PUBLIC ADVOCATE DIVISION OF RATE COUNSEL

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New Jersey Natural Gas Company
BPU Docket No. GR07110889
Direct Testimony of Howard J. Woods, Jr., P.E.

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I. STATEMENT OF QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND ADDRESS.

A. My name is Howard J. Woods, Jr. and my address is 138 Liberty Drive, Newtown, Pennsylvania 18940-1111.

Q. BY WHOM ARE YOU EMPLOYED?

A. I am an independent consultant and the Department of the Public Advocate, Division of Rate Counsel has engaged me in this matter.

Q. **PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL QUALIFICATIONS.**

A. I hold a Bachelor of Civil Engineering Degree from Villanova University (1977) and a Master of Civil Engineering Degree with a concentration in water resources engineering also from Villanova University (1985). I am a registered professional engineer in New Jersey, New York, Maryland, Pennsylvania, Delaware and New Mexico. I am also licensed to perform RAM-W^{SM} security assessments of public water systems. I am an active member of the American Society of Civil Engineers, the National Ground Water Association, the American Water Works Association, the Water Environment Federation and the International Water Association.

Q. HAVE YOU PROVIDED TESTIMONY IN UTILITY MATTERS ON PRIOR OCCASIONS?

A. Yes. I have testified in numerous rate setting proceedings and quality of service evaluations in matters before the Public Utility Commissions in New Jersey, New York, Connecticut and Kentucky. The focus of my testimonies is on matters involving utility operations, planning and engineering.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL EXPERIENCE.

A. A detailed description of my professional experience is provided in Appendix A of this Testimony. In summary, I have over 30 years experience in the planning, design, construction and operation of water and wastewater utility systems. I have worked for a Federal regulatory agency, a large investor-owned water and wastewater utility, a firm engaged in contract operations of municipally-owned water and wastewater utilities, and in engineering and operational consulting for the water and wastewater industry. During my career, I have been responsible for all operations functions including production, distribution, maintenance services and commercial services including meter reading.

II. SCOPE AND PURPOSE OF TESTIMONY

Q. MR. WOODS, PLEASE DESCRIBE YOUR AREA OF RESPONSIBILITY IN THIS MATTER.

A. I have been engaged by Department of the Public Advocate, Division of Rate Counsel to review the proposal by New Jersey Natural Gas Company to transition to monthly meter reading and billing by installing Automated Meter Reading (AMR) technology in its Monmouth County service area.

Q. WHAT MATERIALS HAVE YOU REVIEWED IN DISCHARGING THIS ASSIGNMENT?

A. I have reviewed the Company's filing including the 9+3 Update of Exhibit P-3, pertinent sections of the November 20, 2007 report prepared by Liberty Consulting Group on the Management Audit of New Jersey Natural Gas Company, and the Company's responses to discovery requests concerning AMR.

III. SUMMARY OF FINDINGS AND CONCLUSIONS

Q. HAVE YOU FORMED AN OPINION CONCERNING THE COMPANY'S PROPOSAL TO INSTALL AMR TECHNOLOGY IN ITS MONMOUTH COUNTY SERVICE AREA?

A. Yes, I have. I believe that the Company's proposal, while based on preliminary estimates of cost, is a reasonable approach to transitioning from manual bi-monthly meter reading to monthly reading for all of its customers in all service areas.

Q. HAS THE COMPANY COMPLETED THE INSTALLATION OF THE AMR SYSTEM IN MONMOUTH COUNTY?

A. No, it has not. The work to install this system has not started and the Company anticipates that installation will take 12 to 15 months[1] following the review of this proposal in the current rate proceeding.

Q. DO YOU BELIEVE THAT THE RATE ADJUSTMENT ALLOWED IN THIS PROCEEDING SHOULD REFLECT THE COSTS ASSOCIATED WITH THE AMR PROPOSAL?

A. No. The Company's proposal represents a prospective expense based on a vendor estimate of costs. The actual costs have not been incurred and the proposed equipment does not yet represent utility plant in service. In addition, some of the operating costs and potential savings are not fixed, known and measurable.

[1] Exhibit P-3; Direct Testimony of Jay S. Buth, Vice President and Controller (9+3 Update); p. 18, line 11.

IV. ASSESSMENT OF THE AMR PROPOSAL

A. Existing Meter Reading Program

Q. PLEASE DESCRIBE THE COMPANY'S EXISTING METER READING PROGRAM.

A. The Company presently reads its meters manually on a bi-monthly schedule.[2] A summary of the performance of this program is presented in Schedules HJW-1 through HJW-3. Under the current program, the Company schedules a physical reading of each customer meter every other month. Bills are rendered on the basis of these actual readings and on the basis of estimates of use for those months during which no readings are scheduled. The meter readings are obtained by meter readers who must gain access to the meter and manually enter the visually observed reading into a hand-held recording device.[3]

Q. WAS THE EXISTING METER READING PROGRAM EVALUATED IN THE RECENT MANAGEMENT AUDIT?

A. Yes it was. The Liberty Consulting Group reviewed the performance of the meter reading program and noted: "**Meter Reading performance is improving, however NJNG's bi-monthly read schedule leads to more customer calls, billing and meter-related complaints, and rebills."**[4] Liberty also highlighted the importance of obtaining accurate actual meter readings from the customers'

[2] Exhibit P-3; Direct Testimony of Jay S. Buth, Vice President and Controller (9+3 Update); p. 17, line 25.
[3] RCR-AMR-13.
[4] Final Public Report, Focused Audit of Affiliated Transactions and Management Audit of the New Jersey Natural Gas Company, Volume Three: Management and Operations Review; The Liberty consulting Group; Quentin, Pennsylvania; November 20, 2007; page 101.

perspective when it stated: **"Failing to obtain actual readings forces a utility to issue bills based on estimated usage. Traditionally, utility customers are not satisfied with estimated bills. This creates more calls to the utility, more complaints, and usually more re-bills being issued to adjust a bill. Since 2004, the percentage of meter reading or billing related calls has escalated from 6 percent to 20 percent. The percentage of cancel and re-bills has also climbed."**[5]

Q. HOW DOES THE MORE RECENT DATA PROVIDED IN RESPONSE TO RCR-AMR-12 REFLECT THE ISSUES NOTED BY LIBERTY IN THE MANAGEMENT AUDIT?

A. First of all, the Company's existing meter reading program is a bi-monthly reading program. This means that the Company intends to estimate every other bill issued to its customers. Liberty noted that this is a source of customer dissatisfaction. Of those meters that are actually scheduled to be read, one should expect that a portion will not be read due to a host of accessibility and safety issues. As noted in HJW-1 through HJW-3, the Company estimated 1.5% of the scheduled reads in Morris County, 4.2% of the scheduled reads in Monmouth County and 4.8% of the scheduled reads in Ocean County.

[5] Ibid; page 102.

Q. WHAT SORT OF ISSUES WOULD PREVENT A METER READER FROM OBTAINING AN ACTUAL READING ON A SCHEDULED DATE?

A. Generally, the conditions that would prevent a meter reader from obtaining an actual meter reading on a scheduled date can be categorized as access problems or safety issues. Access problems include the inability of the meter reader to gain access to the meter because it is located within a customer's home and no one is home at the time of the reading. Safety issues can result from inclement weather or things like unrestrained animals on the customer's property. A more detailed list of issues was provided by the Company in response to RCR-AMR-11.

Q. PLEASE COMMENT ON THE PRODUCTIVITY OF THE COMPANY'S EXISTING METER READING PROGRAM.

A. Schedules HJW-1 through HJW-3 show the average number of meter readings obtained per day for each of the Company's service areas for the period from April 2007 through March 2008. The best performance can be seen in the Ocean County service area where a median read rate of 324 average reads per day was achieved during this period. By comparison, performance in Monmouth County was significantly worse at 215 average reads per day. For the twelve months I reviewed, Monmouth County consistently had the lowest meter reading productivity of the Company's three service areas.

Q. HAVE YOU CONSIDERED THE OVERALL PRODUCTIVITY OF THE METER READING PROGRAM?

A. Yes. Schedule HJW-4 shows the consolidated performance of the existing manual meter reading program for the Company. The median value of the average number of reads per day was 253 for the twelve month period I reviewed. For this same period, the Company estimated about 3.9% of its scheduled meter readings or about 10,200 customer accounts per month in addition to those intentionally scheduled to be calculated under the bi-monthly reading program.

Q. DO YOU BELIEVE IT IS POSSIBLE FOR THE COMPANY TO IMPROVE ITS PERFORMANCE USING A MANUAL READING SYSTEM?

A. Yes. Schedule HJW-5 shows the distribution of monthly meter reading performance and the percent of time various performance levels were exceeded or occurred. The Company was only able to achieve a performance better than 275 reads per day 8.3% of the time. Based on the performance achieved in Morris and Ocean Counties (269 reads per day and 324 reads per day, respectively) 275 reads per day is a realistic target for Company wide performance if a manual read system were to be retained. While I am optimistic that the Company could improve its overall meter reading productivity to this level, I am not optimistic that much improvement could be achieved with respect to the number of forced estimates for accounts that are scheduled to be read. If

the Company at least maintained the rate at which accounts are estimated (e.g. 3.9%), and it migrated to a monthly manual read system, it would be estimating approximately 18,800 accounts per month. As I have noted earlier, the reasons for these estimates are largely out of the Company's control.

B. The AMR Proposal

Q. PLEASE DESCRIBE THE COMPANY'S PROPOSAL TO TRANSITION TO MONTHLY METER READING.

A. The Company proposes to install an AMR system in its Monmouth County Service Area and reassign its Monmouth County meter readers to Morris and Ocean Counties. The AMR system will be used to collect monthly readings in Monmouth County and manual data collection will continue in Morris and Ocean Counties but at a monthly rate.

Q. WHAT IS YOUR OPINION CONCERNING THE PROPOSED STAFFING LEVELS FOR THE COMPANY'S TRANSITIONAL PROGRAM?

A. I have assumed that the Company is in fact able to gain the productivity improvement noted earlier to determine the staffing level required to perform manual monthly meter reading. This is my baseline for the assessment of the AMR program. Schedule HJW-6 shows the number of meter readers that would be required in each service area to read each customer account on a monthly

basis. As you can see, the Company would need to deploy an average of 83 meter readers compared to 47 now deployed. This is an increase of 36 meter readers. The Company prepared its own estimate of the number of additional meter readers needed to accomplish manual monthly meter reading and they believe they would need 41 additional meter readers to accomplish this.[6] This higher estimate does not assume an increase in current productivity.

By comparison to the estimate of the number of meter readers required if the Company were to maintain a manual reading program, we can also see in Schedule HJW-6 that roughly the same number of meter readers would be required Company-wide if the Monmouth County operations were equipped with AMR technology. In estimating these staffing levels, I have made the same assumptions about overall manual meter reading performance and I have accepted the Company's estimate of the anticipated AMR system performance.[7] In this scenario, the Company would need to deploy a single meter reader in Monmouth County while 10 would be required in Morris County and 36 would be required in Ocean County. The total number of meter readers is consistent with the number currently deployed Company-wide. It is my conclusion that it would be feasible to reassign the Monmouth County meter readers to Morris County and Ocean County on a transitional basis to move toward monthly meter reading on a Company-wide basis.

[6] RCR-AMR-16.
[7] RCR-AMR-1.

Q. HAVE YOU CONSIDERED THE COST OF THE PROPOSED AMR PROGRAM IN RELATION TO THE COST OF CONTINUING THE MANUAL METER READING PROGRAM?

A. Yes. Schedule HJW-7 shows the annualized cost of the proposed AMR program in relation to the cost that would be incurred by increasing staff levels to perform monthly manual reads. In this analysis, I have also assumed that the Company would be able to improve meter reading performance from an average of 215 reads per meter reader per day to 275 reads per day, a 28% improvement in performance. At this performance level, the Company would need 37 meter readers (an increase of 12) to perform monthly meter reading in Monmouth County. Based on the average total cost of deploying a meter reader per year ($93,700),[8] and making an allowance for additional supervision of an expanded staff, the annual cost of manual reading in Monmouth County would be in excess of $3.6 million per year. This is significantly more than the cost of installing the AMR system to accomplish monthly meter reading in Monmouth County.

Q. WHAT IS YOUR OPINION CONCERNING THE COST OF THE AMR SYSTEM INSTALLATION AND THE COST OF THE ANNUALIZED ONGOING EXPENSES PROJECTED BY THE COMPANY?

A. The capital cost for this system is a preliminary estimate of cost prepared by ITRON. ITRON is a recognized leader in the field of AMR and they have installed numerous similar systems around the country. As a result, I have

[8] RCR-AMR-15.

confidence in their preliminary estimate; however, it is a preliminary estimate. A review of that estimate notes that certain cost items are not fully developed and could change as the program reaches implementation. A specific contingency allowance apparently has not been included in the Company proposal to address unknown field conditions that may be revealed at a later date. While I am concerned that the capital cost of the AMR installation may increase, I am also concerned that some of the operating expenses are over-estimated. For example, the Company projects that four meter readers will be needed in Monmouth County after the AMR system is deployed.[9] However, the Company also indicates that the AMR system will have a productivity rate of 10,000 to 12,000 reads per day.[10] At this rate, only one meter reader would be needed to read the Monmouth County service area.

Q. IN YOUR COMPARISON OF COSTS IN SCHEDULE HJW-7, HOW MANY METER READERS DID YOU INCLUDE IN THE AMR PROGRAM COST?

A. I included four meter readers, consistent with the Company's estimate. Even at this higher staffing level than what I believe will ultimately be needed, the AMR program produces the least costly meter reading system for the Company's customers. Nevertheless, it is my opinion that a lower level of operating expense for labor will actually be realized once the AMR system is installed.

[9] RCR-AMR-21.
[10] RCR-AMR-1.

Q. IN MAKING THE TRANSITION TO MONTHLY METER READING ON A COMPANY-WIDE BASIS, THE COMPANY HAS PROPOSED TO TRANSFER THE EXISTING METER READERS IN MONMOUTH COUNTY TO OCEAN AND MORRIS COUNTIES. DO YOU AGREE THAT THE NUMBER OF METER READERS REQUIRED TO MANUALLY READ METERS IN OCEAN AND MORRIS COUNTIES REQUIRES THE TRANSFER OF THE EXISTING METER READERS OR COULD SOME STAFF REDUCTION BE ANTICIPATED AT THIS TIME?

A. In Schedule HJW-6, I have shown my estimate of the staffing levels required for monthly meter reading in Ocean and Morris Counties. The increases required here are tempered by my opinion that the Company could achieve some improvement in manual meter reading performance above that recorded for the twelve months ended March 2008. Productivity in Ocean County, for example, improved throughout this twelve month period, indicative of the improvement that is possible. Even though I have assumed an improvement in productivity, I have reached the conclusion that the additional number of meter readers needed in the transition is equivalent to the number of meter readers currently deployed in Monmouth County.

Q. DO YOU BELIEVE THAT THE INSTALLATION OF THE AMR SYSTEM IN MONMOUTH COUNTY WILL PRODUCE ANY OVERALL OPERATIONAL COST SAVINGS?

A. Yes. The AMR system should reduce the number of customer complaints regarding estimates, the number of re-reads, and the number of canceled and reissued bills. All of these activities represent real costs of the current operation. The transition to monthly meter reading in Morris and Ocean Counties, while achieved with manual reading, should also produce benefits in these areas but I do not expect the manual read system to be as effective as the automated read system. The manual system is likely to be faced with meter access and safety issues and these problems will continue to result in forced estimates.

Q. DO YOU BELIEVE THAT THE COST OF THE PROPOSED TRANSITIONAL SYSTEM SHOULD BE REFLECTED IN RATES RESULTING FROM THIS PROCEEDING?

A. No. The cost of installing the system has not been incurred, and in fact, the installation has not even begun. In addition to the fact that the proposed capital cost is based on a vendor estimate, the operational costs and the resulting cost savings have not been fully developed. A rate adjustment should not be made until these costs and savings are fixed, known and measurable.

Q. HAVE YOU CONSIDERED THE IMPACT OF THE PROPOSED TRANSITIONAL AMR SYSTEM ON THE COMPANY'S OPERATIONS IN ALL THREE SERVICE AREAS AND DO YOU HAVE AN OPINION CONCERNING THE FUTURE USE OF AMR ON A COMPANY-WIDE BASIS?

A. Schedule HJW-8 shows my estimates of the costs that would likely be incurred if the AMR system were scaled-up to cover all Company service areas. As a point of reference, I have also shown my estimate of the cost of manual reading on a Company-wide basis (Manual – Full). In estimating the cost of manual reading, I have concluded that 87 employees (meter readers and supervisors) would be required. The estimated annual cost of this program is $8,167,000 per year. The transitional program wherein Monmouth County customers are read using the AMR system and all other customers are read manually would cost less than this. I have estimated the total cost of this program at $6,898,000 per year. This is a savings of $1,269,000 over the estimated cost of a full manual read system. The cost of installing the AMR system is largely driven by the cost of acquiring and installing the ERT (Encoder-Receiver-Transmitter) unit at each meter. As a result, it is reasonable to develop a planning level estimate for full deployment based on the additional number of meters that would need to be equipped with an ERT. In developing an estimate of the cost of a Company-wide system, I have also concluded that at 12,000 reads per day, the entire service area could be read with three meter readers. These individuals would not be able to conduct operational surveys now conducted by existing meter readers.[11] An allowance should be made for approximately five employees to accomplish these tasks. Given these estimates, the preliminary estimate of the annual cost of a Company-wide AMR system is $5,218,000 per year. This represents a savings of $1,680,000 over the likely cost of the transitional program.

[11] RCR-AMR-20

Q. IS IT YOUR OPINION THAT THE COMPANY SHOULD FULLY EVALUATE THE DEPLOYMENT OF AMR IN ALL OF ITS SERVICE AREAS?

A. Yes.

Q. **DOES THIS COMPLETE YOUR TESTIMONY AT THIS TIME?**

A. Yes, it does.

APPENDIX A - Qualifications

Detailed Discussion of Professional Qualifications

Of

Howard J. Woods, Jr., P.E.

Q. PLEASE PROVIDE A MORE DETAILED DESCRIPTION OF YOUR PROFESSIONAL EXPERIENCE.

A. From October 1977 through October 1981, I worked with the U.S. Environmental Protection Agency's Region III Water Supply Branch. In this position I developed system surveillance programs, evaluated the sanitary integrity of existing water supply facilities, provided technical assistance to water suppliers and engineers in regard to water treatment and the construction, operation and maintenance of water supply facilities. I recommended treatment techniques and the addition of sanitary facilities to municipal and investor owned utilities, coordinated emergency responses to cases of water supply contamination and was individually responsible for the implementation of the Safe Drinking Water Act in a 14 county area of Pennsylvania.

From October 1981 through May 1983, I worked as a project engineer for the engineering firm of Johnson, Mirmiran and Thompson, P.A. of Silver Spring, Maryland. While working for this firm I designed numerous water supply systems wastewater treatment and conveyance systems and storm drainage facilities. I investigated the suitability and condition of various existing water supply systems and developed comprehensive facility plans for a number of the firm's clients. In this position I functioned as a project engineer responsible for defining and carrying out engineering work necessary for the timely and accurate completion of design projects. As a client’s representative, I also bid projects involving the construction of facilities using construction documents I prepared for the client.

These were for new projects as well as for projects requiring the renovation of existing facilities.

From May 1983 through November 1984, I served as Director of Engineering for American Water Works Service Company's Eastern Division. In this position I directed the long-range planning and design functions of New York-American Water Company and New Jersey-American Water Company. I supervised the execution of engineering projects related to the design, construction, operation and maintenance of company water and sewer facilities. In this position, I was responsible for the successful completion of an annual construction budget of approximately $15 million and a facility maintenance budget of approximately $10 million. This work included the maintenance and renovation of wells in Burlington and Camden Counties and the construction of new wells in Atlantic and Warren Counties. I evaluated facilities, prepared or directed the preparation of engineering designs, pre-qualified bidders, solicited bids, and served as the Company's representative in managing construction and maintenance projects. I had authority to review and execute change orders on construction projects when actual field conditions were found to differ from anticipated conditions.

From November 1984 through December 1985, I served as Manager of Operations for the Eastern Division of American Water Works Service Company. In this position I supervised all aspects of engineering, water quality, materials management and risk management for the Company's Eastern Division. This included the Company's operations in New York and New Jersey. I managed a

$120 million maintenance and operations budget and a $20 million construction budget. I directed the procurement of engineering design services and construction services on approximately sixty major capital projects and hundreds of smaller maintenance and repair projects. During this period, I was responsible for the rehabilitation of the Company's Canoe Brook Well Field in Millburn, New Jersey. I also completed nearly $3 million in renovation work at Company wells in Burlington and Camden Counties.

From December 1985 through August of 1988, I served as System Director of Planning for American Water Works Service Company. In this position I directed the development of strategic and comprehensive plans for all American System companies located throughout the country through a staff of engineers and technical personnel working under my direction. I evaluated the suitability of existing source, treatment and distribution facilities, wastewater conveyance and treatment facilities and made long range projections concerning the need for new facilities or operational modifications to existing facilities.

In the next three assignments with American Water Works Company, I directed operations and maintenance budgets that averaged $150 million per year and capital budgets that ranged from $30 million to $120 million per year for the Company's operations in New Jersey, New York and Connecticut. Engineering designs were prepared under my direction. I directed the competitive bidding of capital and maintenance projects. The largest of these was the design and construction of the Delaware River Regional Water Treatment Plant; a $192

million treatment plant and pipeline system that now serves much of Burlington, Camden and Gloucester Counties.

From August 1988 through April 1989, I served as Regional Manager of Engineering for American Water Works Service Company's Eastern Region. In this position I developed engineering goals and objectives for each of the Company's operating systems in Connecticut, New York and New Jersey. I analyzed operating reports to determine the status of all phases of engineering, administration, planning, design and construction necessary to meet the Company's goals and objectives in providing safe, adequate and proper water supply service.

From April of 1989 to July 1993, I served as Regional Manager of Operational Services for American Water Works Service Company's Eastern Region. In this position I was responsible for the provision of administrative, engineering, loss control, resource conservation and water quality services required by the operating companies in the Eastern Region. In this position I directed water company operations to assure compliance with approved operating and maintenance budgets, capital construction programs, long range corporate and comprehensive plans, risk exposure reduction, safety and loss control procedures, water conservation programs and water quality objectives. In this position I also served as Vice President of New Jersey-American Water Company, Connecticut-American Water Company and New York-American Water Company.

From July 1993 through May 1997, I served as Vice-President of New Jersey-American Water Company. In this position, I served as chief operations officer for the Company. I was responsible for all operations functions including

production, distribution, maintenance services and commercial services. I directed a staff of 450 management and unionized employees. These responsibilities included the maintenance of over 150 wells located throughout New Jersey, several large surface water treatment facilities, nearly 100 distribution storage tanks and approximately 4,000 miles of water distribution mains. I was also responsible for the Company's sanitary sewer operations. These facilities were composed of several hundred miles of pipe and numerous pump stations. I planned and directed work required to maintain these facilities in peak operating performance. This work included electrical and mechanical maintenance associated with pumping equipment and controls.

In June of 1991, I was appointed by Governor Florio to serve as the investor-owned water supplier representative on the New Jersey Water Supply Advisory Council. The Council advises the New Jersey Department of Environmental Protection ("NJDEP," formerly the New Jersey Department of Environmental Protection and Energy") on a wide range of water supply issues such as water quality, facility construction requirements, statewide water supply planning and water supply management. Governor Whitman reappointed me to the Council 1994 and I served through mid 1997.

From May of 1997 through July 2000, I directed the acquisition and business development activities of American Water Works Service Company and a joint venture operation of the Company known as AmericanAnglian Environmental Technologies. I directed the development of bids on operations and maintenance contracts to operate municipally owned water and wastewater

systems. I reviewed contract documents and directed a staff of engineers and analysts in preparing responsive bids and proposals for prospective municipal clients. In 1999, my team returned the second best business development performance in the United States and we won the largest operations and maintenance contract awarded that year (Scranton Sewer Authority, Scranton, Pennsylvania). I also directed the operations of the joint venture. This business unit was the seventh largest private municipal water and wastewater contractor in the United States. I directed the maintenance and operations functions of over 175 contracts dedicated to the operation of municipal water and wastewater utilities and industrial and commercial clients.

Since July 2000, I have worked as an independent consultant. Representative clients include the New Jersey Department of the Public Advocate, Division of Rate Counsel ("Rate Counsel"), the Delaware Public Advocate, Passaic Valley Water Commission, Consumers New Jersey Water Company, PricewaterhouseCoopers LLP, BOC Gases Inc., the Pittsburgh Water & Sewer Authority/U.S. Water L.L.C., Upper Dublin Township (PA) and the Elmira (NY) Water Board. I have also served as an expert witness in a matter concerning the contamination of a municipal water system in New Jersey.

I directed and managed the procurement process leading to the sale of a municipal wastewater system in southeastern Pennsylvania. The Upper Dublin Township Sanitary Sewer System sold for $20,000,000. This system serves approximately 8,000 connections and has annual revenues of $3,000,000. I advised the Township on alternative outsourcing and contracting approaches,

reduced interim operating expenses by 30% by renegotiating the plant operations contract prior to the sale of the system.

I completed an energy management evaluation for the Elmira (NY) Water Board and provided operator training on energy management strategies. Recommendations from the study allowed the client to reduce energy expenses by 30% through a series of operational modifications.

I completed an energy management audit of the Pittsburgh Water and Sewer Authority and identified strategies for reducing power consumption. The results of this investigation provided the foundation for the Authority and its contract manager (U.S. Water L.L.C.) to develop and implement more effective maintenance and operations procedures to reduce energy costs.

I assisted the Banco Gubernamental de Fomento para Puerto Rico, Autoridad para el Financiamiento de la Infrastructura de Puerto Rico and PricewaterhouseCoopers in developing a new operating contract for the Puerto Rico Aqueduct and Sewer Authority (PRASA). The contract was developed, bid and awarded in less than six months, cutting the normal procurement time by nearly two-thirds. The new ten-year agreement with Ondeo will allow the government of Puerto Rico to eliminate the annual operations subsidy while service is improved. The value of the contract is $300 million per year.

I reviewed engineering plans and operational practices in numerous water and wastewater rate adjustment proceedings and quality of service proceedings for New Jersey Rate Counsel. These reviews involved an assessment of utility engineering design and construction plans, the development of alternatives to

utility proposed projects, and evaluations of the utility companies' ability to render safe, adequate and proper water or wastewater service. In these proceedings, I served as an engineering and operations expert:

- Acacia Lumberton Manor Fire Service Complaint
  BPU Docket No. WC01080495
- Applied Waste Water Management Rates
  BPU Docket No. WR03030222
- Applied Waste Water Management Franchise
  BPU Docket No. WE03070530
- Applied Waste Water Management Andover Franchise
  BPU Docket No. WE04111466
- Applied Waste Water Management Hillsborough Franchise
  BPU Docket No. WE04101349
- Applied Waste Water Management Oakland Franchise
  BPU Docket No. WE04111467
- Applied Waste Water Management Union Twp Franchise
  BPU Docket No. WE050414
- Aqua NJ Pine Hill Franchise
  BPU Docket No. WE05070581
- Aqua NJ Upper Freehold Franchise
  BPU Docket No. WE05100822
- Aqua New Jersey Base Rate Case
  BPU Docket No. WR07120955
- Bayview Water Company Rates
  BPU Docket No. WR01120818
- Borough of Haledon Rates
  BPU Docket No. WR01080532
- City of Orange Privatization Review
  BPU Docket No. WO03080614
- Crestwood Village Loan Approval
  BPU Docket No. WF04091042
- Crestwood Village Water Co Base Rates
  BPU Docket No. WR07090706
- Elizabethtown Water Co. v. Clinton Board of Adjustment
  BPU Docket No. WE02050289
- Elizabethtown Water Company Rates
  BPU Docket No. WR03070510
- Elizabethtown Water Company Franklin Franchise
  BPU Docket No. WE05020125
- Elizabethtown Water Company Purchased Water Adjustment Clause
  BPU Docket No. WR04070683
- Environmental Disposal Corporation Main Extension Agreement
  BPU Docket No. WO04091030
- Environmental Disposal Corporation Rates
  BPU Docket No. WR04080760

- Environmental Disposal Corporation Rates
  BPU Docket No. WR07090715
- Fayson Lake Water Company Rates
  BPU Docket No. WR03040278
- Fayson Lake Water Company Base Rates
  BPU Docket No. WR07010027
- Gordon's Corner Water Company Rates
  BPU Docket No. WR03090714
- Lake Valley Water Company Rates
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- Middlesex Water Company Rates
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- New Jersey American Water Company Rates
  BPU Docket No. WR06030257
- New Jersey American Water Purchased Water Adjustment Clause
  BPU Docket No. WR05110976
- Parkway Water Company Rates
  BPU Docket No. WR05070634
- Pinelands Water Company Rates
  BPU Docket No. WR03121016
- Pinelands Wastewater Company Rates
  BPU Docket No. WR03121017
- Seabrook Water Company Franchise
  BPU Docket No. WC02060340
- Shorelands Water Company Rates
  BPU Docket No. WR04040295
- South Jersey Water Supply Change in Control
  BPU Docket No. WM07020076
- United Water Acquisitions Evaluation
  BPU Docket No. WM02060354

- United Water New Jersey Base Rates
  BPU Docket No. WR07020135
- United Water New Jersey Management Audit
  BPU Docket: WA05060550

I prepared a long-range water supply needs forecast for the Passaic Valley Water Commission. I analyzed water use patterns within the Commission's retail service area and for over two dozen large contract customers. I produced population forecasts for the service area and individual water demand forecasts for each contract sale-for-resale customer using statistical and numeric forecasting techniques. The forecast projects total annual demand, average day, maximum month and maximum day demands and forms the basis for other ongoing facility and operations planning efforts. Current efforts involve the preparation and support of a renewed surface water diversion permit for the Commission which will support more flexible operations and more efficient source utilization. The Commission serves a retail service population of 325,000 and effectively serves an additional 260,000 people through sale-for-resale connections.

I have also developed, on behalf of Passaic Valley Water Commission, a model of the major water resources facilities in the Passaic, Pompton, Ramapo and Hackensack River Basin that allows the calculation of the safe and dependable yield of the Wanaque/Monksville, Point View and Oradell Reservoir systems under varying drought conditions. The model is being used by Passaic Valley Water Commission to evaluate long term water supply management strategies and to plan for future water supply needs.

I completed an independent assessment of the planning and engineering decision making for a major water treatment plant renovation project undertaken by Aquarion Water Company of Connecticut in Stamford Connecticut. I evaluated process selection decisions, project sizing and regulatory compliance issues and testified before the Connecticut Department of Public Utility Control on the findings of the evaluation.

I served as an expert witness in a matter involving the alleged contamination of a New Jersey municipal water system with heavy metals and organic chemicals. I reviewed over 38,000 discrete water quality sample results, analyzed the operational records of the system and developed a computer model (EPANET2) depicting water flow and water quality changes over a period spanning two decades. I assisted the client in successfully defeating a threatened class action lawsuit at the certification level.

APPENDIX B - Schedules

LIST OF SCHEDULES

HJW-1: Meter Reading Performance – Morris County

HJW-2: Meter Reading Performance – Monmouth County

HJW-3: Meter Reading Performance – Ocean County

HJW-4: Meter Reading Performance – Company Wide

HJW-5: Productivity Assessment

HJW-6: Comparison of Staffing Levels for Manual and AMR Transition

HJW-7: Monmouth County Cost Comparison

HJW-8: Company Wide Comparison

SCHEDULE HJW-1: Meter Reading Performance - Morris County												
Month	Number of Customers	Number of Meters Scheduled to be Read	Percent Scheduled	Number of Actual Reads	Percent of Scheduled Actually Read	Number of Estimated Reads	Percent Estimated	Number of Meter Readers Deployed	Number of Read Days Utilized	Average Reads Per Day		Deployed Readers Required for Monthly Reading
Apr-07	56,301	27,728	49.2%	27,394	98.8%	334	1.2%	5.50	20	249		10.24
May-07	56,222	30,172	53.7%	29,715	98.5%	457	1.5%	5.25	22	257		9.29
Jun-07	56,184	28,132	50.1%	27,793	98.8%	339	1.2%	5.00	21	265		9.73
Jul-07	56,144	28,883	51.4%	24,677	85.4%	4,206	14.6%	4.50	21	261		9.72
Aug-07	56,137	34,054	60.7%	33,347	97.9%	707	2.1%	4.50	23	322		8.88
Sep-07	56,197	29,207	52.0%	28,708	98.3%	499	1.7%	5.25	19	288		10.76
Oct-07	56,256	33,811	60.1%	33,319	98.5%	492	1.5%	5.50	22	275		9.30
Nov-07	56,443	28,588	50.6%	28,200	98.6%	388	1.4%	5.00	20	282		10.26
Dec-07	56,616	27,963	49.4%	26,833	96.0%	1,130	4.0%	5.25	20	256		10.29
Jan-08	56,680	36,154	63.8%	35,700	98.7%	454	1.3%	5.50	22	295		9.37
Feb-08	56,724	27,478	48.4%	26,849	97.7%	629	2.3%	5.25	20	256		10.31
Mar-08	56,733	31,931	56.3%	31,575	98.9%	356	1.1%	5.50	21	273		9.82
Median	56,279	29,045	51.7%	28,454	98.5%	475	1.5%	5.25	21	269		9.8

Reference document: RCR-AMR-12

SCHEDULE HJW-2: Meter Reading Performance - Monmouth County												
Month	Number of Customers	Number of Meters Scheduled to be Read	Percent Scheduled	Number of Actual Reads	Percent of Scheduled Actually Read	Number of Estimated Reads	Percent Estimated	Number of Meter Readers Deployed	Number of Read Days Utilized	Average Reads Per Day		Deployed Readers Required for Monthly Reading
Apr-07	211,851	105,676	49.9%	84,453	79.9%	21,223	20.1%	18.75	20	225		38.52
May-07	211,923	117,140	55.3%	111,324	95.0%	5,816	5.0%	20.50	22	247		35.03
Jun-07	212,214	124,296	58.6%	117,362	94.4%	6,934	5.6%	23.50	21	238		36.75
Jul-07	212,171	114,483	54.0%	103,897	90.8%	10,586	9.2%	23.75	21	208		36.74
Aug-07	212,182	129,540	61.1%	121,752	94.0%	7,788	6.0%	23.50	23	225		33.55
Sep-07	212,106	107,249	50.6%	97,769	91.2%	9,480	8.8%	19.50	19	264		40.59
Oct-07	212,141	127,075	59.9%	123,583	97.3%	3,492	2.7%	26.25	22	214		35.06
Nov-07	212,731	108,009	50.8%	104,226	96.5%	3,783	3.5%	27.00	20	193		38.68
Dec-07	213,371	109,859	51.5%	107,605	97.9%	2,254	2.1%	26.75	20	201		38.79
Jan-08	213,661	131,112	61.4%	127,446	97.2%	3,666	2.8%	26.75	22	217		35.32
Feb-08	213,888	111,025	51.9%	109,065	98.2%	1,960	1.8%	27.25	20	200		38.89
Mar-08	213,933	121,048	56.6%	117,778	97.3%	3,270	2.7%	27.50	21	204		37.04
Median	212,198	115,812	54.6%	110,195	95.8%	4,800	4.2%	25.00	21	215		36.9

Reference document: RCR-AMR-12

SCHEDULE HJW-3: Meter Reading Performance - Ocean County												
Month	Number of Customers	Number of Meters Scheduled to be Read	Percent Scheduled	Number of Actual Reads	Percent of Scheduled Actually Read	Number of Estimated Reads	Percent Estimated	Number of Meter Readers Deployed	Number of Read Days Utilized	Average Reads Per Day		Deployed Readers Required for Monthly Reading
Apr-07	208,705	89,340	42.8%	80,935	90.6%	8,405	9.4%	17.00	20	238		37.95
May-07	208,954	118,224	56.6%	111,414	94.2%	6,810	5.8%	16.00	22	317		34.54
Jun-07	209,284	111,715	53.4%	104,611	93.6%	7,104	6.4%	20.50	21	243		36.24
Jul-07	209,479	122,386	58.4%	115,926	94.7%	6,460	5.3%	20.00	21	276		36.27
Aug-07	209,672	113,138	54.0%	105,860	93.6%	7,278	6.4%	20.00	23	230		33.15
Sep-07	209,923	108,120	51.5%	102,176	94.5%	5,944	5.5%	16.00	19	336		40.18
Oct-07	209,980	116,849	55.6%	113,463	97.1%	3,386	2.9%	13.50	22	382		34.71
Nov-07	210,343	115,799	55.1%	114,273	98.7%	1,526	1.3%	17.25	20	331		38.24
Dec-07	210,740	108,481	51.5%	106,451	98.1%	2,030	1.9%	15.00	20	355		38.32
Jan-08	211,027	125,047	59.3%	123,525	98.8%	1,522	1.2%	15.25	22	368		34.88
Feb-08	211,241	108,728	51.5%	104,083	95.7%	4,645	4.3%	17.75	20	293		38.41
Mar-08	211,402	122,454	57.9%	121,219	99.0%	1,235	1.0%	14.00	21	412		36.61
Median	209,952	114,469	54.5%	108,933	95.2%	5,295	4.8%	16.50	21	324		36.4

Reference document: RCR-AMR-12

SCHEDULE HJW-4: Meter Reading Performance - Company Wide												
Month	Number of Customers	Number of Meters Scheduled to be Read	Percent Scheduled	Number of Actual Reads	Percent of Scheduled Actually Read	Number of Estimated Reads	Percent Estimated	Number of Meter Readers Deployed	Number of Read Days Utilized	Average Reads Per Day		Deployed Readers Required for Monthly
Apr-07	476,857	222,744	46.7%	192,782	86.5%	29,962	13.5%	41.3	20.0	233.68		86.7
May-07	477,099	265,536	55.7%	252,453	95.1%	13,083	4.9%	41.8	22.0	274.85		78.9
Jun-07	477,682	264,143	55.3%	249,766	94.6%	14,377	5.4%	49.0	21.0	242.73		82.7
Jul-07	477,794	265,752	55.6%	244,500	92.0%	21,252	8.0%	48.3	21.0	241.30		82.7
Aug-07	477,991	276,732	57.9%	260,959	94.3%	15,773	5.7%	48.0	23.0	236.38		75.6
Sep-07	478,226	244,576	51.1%	228,653	93.5%	15,923	6.5%	40.8	19.0	295.32		91.5
Oct-07	478,377	277,735	58.1%	270,365	97.3%	7,370	2.7%	45.3	22.0	271.59		79.1
Nov-07	479,517	252,396	52.6%	246,699	97.7%	5,697	2.3%	49.3	20.0	250.46		87.2
Dec-07	480,727	246,303	51.2%	240,889	97.8%	5,414	2.2%	47.0	20.0	256.26		87.4
Jan-08	481,368	292,313	60.7%	286,671	98.1%	5,642	1.9%	47.5	22.0	274.33		79.6
Feb-08	481,853	247,231	51.3%	239,997	97.1%	7,234	2.9%	50.3	20.0	238.80		87.6
Mar-08	482,068	275,433	57.1%	270,572	98.2%	4,861	1.8%	47.0	21.0	274.14		83.5
Median	478,302	264,840	55.5%	248,233	96.1%	10,227	3.9%	47.3	21	253.36		83.1

Schedule HJW-5: Productivity Assessment				
Read Rate	Frequency	Cumulative	% Exceedance	% Occurance
235	1	1	91.7%	8.3%
245	4	5	58.3%	41.7%
255	1	6	50.0%	50.0%
265	1	7	41.7%	58.3%
275	4	11	8.3%	91.7%
285	0	11	8.3%	91.7%
295	0	11	8.3%	91.7%
305	1	12	0.0%	100.0%

Schedule HJW-6: Comparison of Staffing Levels for Manual and AMR Transition			
Manual			
Area	Current	Required	Change
Morris	5.25	9.8	4.53
Monmouth	25.00	36.9	11.90
Ocean	16.50	36.4	19.94
Total	46.75	83.11	36.36
AMR Transition			
Area	Current	Required	Change
Morris	5.25	9.78	4.53
Monmouth	25.00	1.00	(24.00)
Ocean	16.50	36.44	19.94
Total	46.75	47.22	0.47

Schedule HJW-7: Monmouth County Cost Comparison		
Monmouth County Cost Comparison	AMR	Manual
System Installation Cost	$ 14,400,000	$ -
AMR System Capital	$ 1,296,000	$ -
Depreciation	$ 721,000	$ -
Meter Readers	$ 374,800	$ 3,671,000
3 Utility Technicians	$ 225,000	$ -
ITRON Maintenance Fee	$ 16,000	$ -
	$ 1,336,800	$ 3,671,000

Schedule HJW-8: Company Wide Cost Comparison			
Company Wide Analysis	AMR	Manual - Full	Manual - Part
System Installation Cost	$ 32,316,000	$ -	$ 14,400,000
AMR System Capital	$ 2,908,000	$ -	$ 1,296,000
Depreciation	$ 1,618,000	$ -	$ 721,000
Meter Readers	$ 281,000	$ 8,167,000	$ 4,640,000
Utility Technicians	$ 375,000	$ -	$ 225,000
ITRON Maintenance Fee	$ 36,000	$ -	$ 16,000
	$ 5,218,000	$ 8,167,000	$ 6,898,000