

PROPOSAL

Development of a Digital Computer Model for the Village's Water Supply System



Village of Croton-on-Hudson

July 5, 2011



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Mr. Marco Gennarelli
Superintendent of Public Works
Village of Croton-on-Hudson
Stanley H. Kellerhouse Municipal Building
One Van Wyck Street
Croton-on-Hudson, NY 10520-2501

RE: Request for Proposal (RFP) – Development of a Digital Computer Model for Village's Water Supply System

Dear Mr. Gennarelli:

The Village of Croton-on-Hudson desires engineering services in response to their RFP for Development of a Digital Computer Model for Village's Water Supply System. Enclosed is O'Brien & Gere's proposal, which was developed based on the RFP and our discussions with Village personnel, and our extensive experience with similar projects. This proposal includes a summary of our understanding of the project, a detailed proposed project approach, and a description of our firm's qualifications and project team to perform the project. Our estimated engineering fee has also been provided. Key issues to be addressed by the water supply system model are as follows:

- ***Identify impacts of maintenance activities***
- ***Identify system "bottlenecks" (flow and pressure)***
- ***Identify system water age issues***
- ***Test response of system flow, pressure and quality to multiple improvements***

O'Brien & Gere has reviewed the unique aspects of this project and identified what we believe to be keys to success:

- ***Experienced Project Team*** – The proposed project team consisting of Lowell A. Kachalsky, PE, as Project Officer, Rick Gell, PE, as Project Manager, Brian Edwards, PE, as Lead Modeler and Thomas Dumm, PE for QA/QC.
- ***Experienced Project Manager*** – As Project Manager, Rick Gell, PE will bring overall project management experience and experience with numerous water distribution system modeling studies and analyses to your project. He has been involved with water system planning and analysis throughout his 31 year career. He served in this same role for projects throughout New York State.
- ***Experienced Lead Modeler and QA/QC Team*** – Our modeling team, with Brian Edwards, PE (Lead Modeler) and Thomas Dumm, PE (QA/QC) will bring overall distribution system modeling experience second to none. Both Mr. Edwards and Mr. Dumm have significant experience with numerous water distribution system modeling studies and analyses to bring to the Village's project. They each have been involved with water system planning and analysis throughout their careers and bring National and New York State experiences to this project. Their experience with water model development and calibration, GIS integration, and system planning and operation will be applied to your project to bring it to a successful completion.

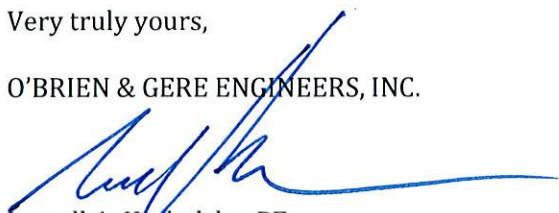
- **Relevant Project Experience-** Most of our water distribution system modeling and analysis projects have addressed the same issues the Village needs to address for this project. The recent projects shown in Section 3 of this proposal were selected as they were similar, with many fairly identical, to this project.

We look forward to serving the Village's needs for this project as your needs are well matched to our technical expertise. ***Our dedication of personal time and energy will reduce learning curves and enable us to again bring new ideas and added value to the project.***

We encourage your thorough review of our proposal, and welcome the opportunity to provide engineering services to Village. We encourage you to contact our references. Should you have any questions, please feel free to contact me at (301) 731-1162.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.



Lowell A. Kochalsky, PE
Vice President

Development of a Digital Computer Model for Village's Water Supply System

**Village of Croton-on-Hudson
New York**

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SECTION 1 – PROJECT APPROACH

PROJECT UNDERSTANDING

Through our recent discussions and meetings, O'Brien & Gere understands that the Village of Croton-on-Hudson recognizes the benefits of developing and calibrating a hydraulic model of the water system that accurately simulates the existing conditions. The Village has identified that the model could potentially assist with the following:

- Evaluating distribution system improvements.
- Evaluating and testing alternatives to improve system hydraulics.
- Evaluating and testing alternatives to improve system water quality and water age.
- Identify water quality and reliability benefits associated with various measures such as looping water mains.
- Checking fire flow capabilities throughout the system.
- Conducting a critical needs assessment to identify which CIP projects should be built.
- Developing maintenance measures such as water main flushing programs.

This proposal is issued in response to the Village's request. The objective is to develop and calibrate a digital hydraulic model of the Village's water system for use as a tool to improve understanding of the system. It is our understanding that modeling software will not be purchased by the Village at this time.

KEY ISSUES STUDY MUST ADDRESS

Based on this understanding, the study must address the following fundamental issues and specific questions:

- Model configuration - Model must accurately reflect the existing Village facilities (*e.g.*, physical configuration, wells, booster pump hydraulic performance, control logic, transmission and water main configuration, storage tanks, control valves, hydrants), and must be compatible with the Village's geographic information system (GIS)

- Model capabilities - Model must reflect *actual performance* of the existing facilities (*i.e.*, calibration critical)
- Water demands and patterns – Current and projected demands and diurnal patterns must be understood and properly applied to the model
- System operation - Existing controls, operational objectives, and priorities – and the reasons and history behind them – must be fully understood
- System improvements – Using modeling results to define critical hydraulic and water quality needs and identify practical Capital Improvement Plan (CIP) solutions

O'Brien & Gere's Team is familiar with these issues through previous modeling of many distribution systems in New York and nationwide. Clear answers to these questions will be formally developed during the study.

SCOPE OF SERVICES

To achieve the project objectives and address these key issues, O'Brien & Gere's proposed scope of services includes the following tasks:

- Task 1 – Data Collection
- Task 2 – Kick-off Meeting/Work Session No. 1
- Task 3 – Software Selection
- Task 4 – Water System Model Development
- Task 5 – Water Demand Allocation
- Task 6 – Work Session No. 2
- Task 7 – Model Calibration
- Task 8 – Work Session No. 3
- Task 9 – System Analyses
- Task 10- Deliverables
- Task 11 – Project Management

TASK 1 – DATA COLLECTION

O'Brien & Gere requests the following information (to the extent it is available) for use during model development and calibration:

- Record drawings (or latest revision available) of the Village's pumping stations, storage tanks, wells, piping and any wholesale meter locations;
- GIS shapefiles or geodatabase for piping (if available);
- Locations of any closed valves;
- Pump curves (factory certified if available) for existing Village pumps;
- Hydraulic configuration for all water storage tanks (*e.g.*, overflow elevation, ground elevation, operating range, diameter...obtain from existing model if available);
- Current pressure/level settings for any control (*e.g.*, altitude, pressure reducing) valves in the Village's water system;
- Any current capital improvement and rehabilitation/replacement plans for the Village;
- Water billing meter data compiled for at least one year;
- Hourly data and boundary conditions (*e.g.*, pumping pressure and flow, and tank levels) for a seven-day period encompassing the maximum day demand;
- Water supply contracts between the Village and other municipalities/districts;
- Any other reports or documentation related to system operation and control.

To allow an assessment of the available information to be made prior to the initial Kick-off Meeting, O'Brien & Gere will request that copies of this data be provided as soon as possible after issuance of an authorization to proceed.

TASK 2 – KICK-OFF MEETING

Upon receipt of authorization to proceed, O'Brien & Gere will conduct a Kick-off Meeting with the Village. During this meeting, the project scope and schedule will be reviewed, lines of communication will be confirmed, and a progress meeting schedule will be established. In addition, information reviewed to-date and information "data gaps" will be discussed. O'Brien & Gere will develop and provide meeting minutes within seven days of the Kick-off Meeting.

TASK 3 – SOFTWARE SELECTION

At the kickoff meeting, O'Brien & Gere will solicit input from the Village and make a recommendation regarding the hydraulic modeling software to be used in the study. The team selected for this project works with a wide variety of modeling software products and software developers to address client-specific needs. Based on experience, the following provides a general description of the most powerful and applicable modeling software packages for this project:

- WaterCAD by Bentley Systems, Inc. – WaterCAD is a hydraulic and water quality model for water distribution systems with stand-alone or AutoCAD interfaces, fully supported by mapping in CAD or GIS formats.
- WaterGEMS by Bentley Systems, Inc. – WaterGEMS is a water distribution model identical to WaterCAD with full, seamless integration with GIS applications. WaterGEMS can run on four different platforms: stand alone, Microstation, AutoCAD, or ArcGIS.
- InfoWater by Innovyze (formerly MWH Soft, Inc.) – InfoWater is a fully GIS-integrated water distribution modeling and management software application. Built atop ArcGIS using the latest Microsoft, .NET, and ESRI ArcObjects component technologies, InfoWater seamlessly integrates advanced water network modeling and optimization functionality with the latest generation of ArcGIS.
- H₂OMAP Water by Innovyze – H₂OMAP Water is a "stand alone" modeling package that operates outside of a GIS platform. The software fully supports geocoding and multiple mapping layers, which can be imported from one of many data sources, including CAD and GIS formats. The modules in H₂OMAP Water and InfoWater are the same so there is no reduction in software capabilities.

The evaluation criteria defined below can be used to differentiate between models.

- Capabilities and Limitations – This criterion addresses the ability of the software to allocate demands or flows, model water distribution

system water quality, calculate water system fire flow, links to SCADA, and links to GIS.

- Portability and System Requirements – Computer software should be adaptable to changing computing environments, such as Windows XP, ArcGIS 10, etc. This criterion also addresses use of the software on single computer versus networking multiple workstations.
- Software User Support – Privately developed programs have software license agreements that contain provisions for software support. Software support can include answering general modeling questions and repairing encountered software bugs.
- Ease of Use – This criterion includes data editing, documentation quality, diagnostic messages, and graphics capabilities (*e.g.*, annotation of model components, contour plots of model results).

Each software package described above will meet the project objectives. Based on our discussions with the Village, the capabilities and successful operating experience that O'Brien & Gere has had with the Innovyze and Bentley products, as well as other software selections recently conducted for other municipal clients, our preliminary recommendation is to develop the Village model using InfoWater software from Innovyze.

TASK 4 – WATER SYSTEM MODEL DEVELOPMENT

Using information obtained under Task 1, O'Brien & Gere will develop the water system model using the selected software (see Task 3). The model will be developed such that extended period simulations (EPSs) can be performed. The following summarizes specifically how O'Brien & Gere will utilize the available data to populate the model:

- Pipe Locations and Diameters – O'Brien & Gere will obtain and import the most recent version of the Village's existing GIS shapefile (if available) or map for piping and use this information as the basis for creating the network model, including node/junction locations, pipe lengths, pipe sizes, and valve locations. After importing the piping shapefile or developing the piping network from mapping, network connectivity issues associated with the water system piping will be identified using features in the model and these problem areas will be provided to the Village for resolution in the GIS. Upon resolution of the connectivity issues, O'Brien & Gere will import the corrected piping shapefile which will be used for further model development. This revised piping layer will be combined with roadways/streets and parcel files obtained from the Village. Road centerlines will be used for the pipe centerlines with appropriate adjustments as needed. The result will be a geo-referenced map of the water system compatible with other digital data sources (*e.g.*, tax maps, elevation data).
- Pipe Material and Year of Installation – O'Brien & Gere will input this data into the model based on information provided by the Village in the piping shapefile or map and discussions with the Village.
- Pipe Roughness (C-factor) – O'Brien & Gere will make initial estimates of C-factors for pipes in the model, based on evaluation of the pipe material and age data provided by the Village. Pipe C-factors will be adjusted during model calibration.
- Node Elevations – The model will interpolate elevation data using contour mapping available through the Village or the NYS GIS clearing house. It will be important to confirm that elevations are referenced to a common datum.
- Node Demands – Water demands will be assigned to nodes/junctions in the model as discussed under water demand allocation.
- Valve Characteristics – Control valve data and valve position (*i.e.*, open or closed) will be put in the model based on information provided by the Village.
- Booster Pump Characteristics and Wells – O'Brien & Gere will input pump flow and head characteristics based on the manufacturers' pump performance curves, as well as any additional data that can be obtained from the Village or pump manufacturers. Pump control logic/constraints will be entered into the model to simulate current operating strategy based on discussions with Village staff.
- Storage Characteristics – O'Brien & Gere will input data to represent tank geometry for hydraulic and water quality modeling purposes based on information provided by the Village.

TASK 5 – WATER DEMAND ALLOCATION

Daily water production records will be used to establish overall system water use and demands. The allocation of that use across the Village's water system will be established using the individual water meter records from the January 2010 to December 2010. A multi-step process will estimate annual average water use for each meter.

First, the monthly or quarterly metered usage for each meter over the period of record will be estimated by averaging the metered usage over the billing period. Next, the total annual metered usage will be calculated as the sum of the monthly usage for individual meters for each calendar year. This total will be compared with the corresponding total water supplied to the Village to develop a correction factor addressing non-metered water usage.

The total average day water usage value assigned to individual meters will be an annualized average with the non-metered usage correction factor applied globally (*i.e.*, system-wide average of the non-metered use). The average day water usage for each meter will be assigned (*i.e.*, linked) to the parcel centroid using address data from the billing system and parcel data available in the Village.

The model will be used to assign the water usage at the parcel centroid to either the nearest pipe or node. O'Brien & Gere will show the linkage between the parcel node and the assigned node or pipe to confirm with the Village that usage assignments are correctly applied to the nodes or pipes at any locations that are questionable (*e.g.*, multiple meters).

TASK 6 – WORK SESSION NO. 2

The findings from the development of the water model will be presented and discussed at Work Session No. 2.

O'Brien & Gere will bring a laptop computer to the work session with the Village to demonstrate model development progress and illustrate issues directly with the Village.

Field-testing is a key component of the model calibration process. Field-testing (fire flow tests and flow/pressure monitoring) is required to obtain the necessary data for model calibration. It is recommended that fire flow tests be performed while the boundary conditions (*i.e.*, water levels in storage

tanks, pumping rates, etc.) are specifically being monitored. It is assumed that ten (10) to twenty (20) fire flow tests will be conducted for this study.

O'Brien & Gere will develop the field-testing program to be utilized in calibrating the water model. Hydrant flow tests locations will be identified by O'Brien & Gere and conducted by the Village personnel at various locations throughout the Village's system. It is assumed that the Village's personnel will operate hydrants, perform the tests, and record the data. We will coordinate closely with the Village regarding scheduling of field work, and if practical, have flow testing done in the Fall when the hydrant flushing activities are undertaken.

TASK 7 – MODEL CALIBRATION

The water model will be calibrated with the goal of predicting fire flow tests to within 5 psi of the measured static and residual pressures. For tests where modeled pressures are not within 5 psi of measured residuals, the boundary conditions and hydrant elevations will be verified and the potential for closed valves will be discussed with the Village.

Calibration results will be entered into a spreadsheet with information on the test location, model pipe/junction label, pipe size, flow magnitude, node demand, measured and modeled static and residual pressures, and difference between modeled and measured values.

TASK 8 – WORK SESSION NO. 3

The findings from the development of water demands, field testing, and model calibration, will be presented and discussed at Work Session No. 3.

O'Brien & Gere will bring a laptop computer to the work session to demonstrate the status of model development, and show the Village first-hand how the model is operated.

TASK 9 – SYSTEM ANALYSES

The Village envisions using the model to provide a better understanding of the water system and practical solutions to address both hydraulic (*i.e.*, pressure and flow to meet fire flows) and water quality/age concerns.

Hydraulic analyses

We will identify the system “bottlenecks” which for small systems like the Village are typically revealed under a stressed condition (i.e., low pressure and flow typically occur under a high demand/flow condition such as fire flow). O’Brien & Gere will conduct comprehensive hydraulic analyses under various demand conditions including fire flow using the calibrated model to identify “trouble spots” in the system that do not meet Village’s pressure and flow requirements (i.e., typically 20 psi minimum under fire flow conditions). The model will be used to identify the estimated residual pressure at the required fire flow demand. This fire flow data will be provided to the Village and will assist in identifying trouble spots or “bottlenecks” in their system where fire flow capacity is inadequate and provide direction for future improvements. A map showing the flow available at 20 psi for each node in the model will be presented to the Village for review and discussion. Water system improvement alternatives will be modeled to define how best to resolve the water system “bottlenecks” and the results will be presented to the Village.

Extended Period Simulations (EPS)

O’Brien & Gere will work with the Village to establish details for a 24-hour extended period simulation under average day and maximum day demand conditions. The intent of the EPS run is to analyze tank turnover rates and fill/drain times, and evaluate the effect of current system operation on the distribution system. We will use the EPS runs to provide a secondary level of calibration for the model and to help the Village characterize its system and provide insight for optimizing system performance with regard to pumping operation and tank turnover (i.e., water quality and energy use).

Water quality analyses

The starting point for water quality analyses is a water system model that is adequately calibrated and can accurately produce results for extended period simulations. The amount of information collected during the field services program will drive the level of confidence the modeler has with the model calibration as well as the prediction of water quality throughout the water system. Two common water quality applications which will be conducted include

water age analyses and source trace analyses which are briefly described below.

- Water age analyses. Water age is the cumulative residence time of water in the system and is regarded as a reliable surrogate for water quality. Water age is of particular interest in assessing water storage tank turnover and formation of disinfection byproducts. We recognize that many water utilities are currently focused on predicting how water age increases throughout the water system. We will perform modeling runs and generate a map showing the predicted water age at each storage tank and node in the water system. Impacts of operational changes and system improvements on the water age will be evaluated.
- Source trace analyses. Source trace analyses can be used to identify the area within a system that is influenced by a particular source (i.e., wells, water treatment plant or storage reservoir) or tracking water movement through a system. These analyses are particularly useful for defining where and to what extent mixing occurs at a particular location which can assist with identifying taste and odor problems, water age and disinfectant residuals maintenance issues. As part of Stage 2 disinfection byproducts studies, O’Brien & Gere has used water age analyses to identify water storage tanks that dramatically increased water age and conducted source trace analyses to predict which areas of the system were impacted by the “old” water draining from the reservoir or tank. In some cases, these investigations led to the recommendation that these “problem” tanks be taken offline. Source trace analyses will be conducted to assist the Village with understanding water quality under various operating conditions, and how storage influences water quality in the system. The percentage of flow from the sources in question (i.e., storage tanks) at key nodes in the system will be mapped to illustrate the influence of these sources on the nodes under various conditions.

O'Brien & Gere has conducted a number of water quality modeling and management studies for municipal clients over the past few years, including the following:

- Used hydraulic model (WaterCAD) to predict the "front" for switchover from chlorine to chloramines for DC Water.
- Conducted source trace and water age analyses (InfoWater) for finished water storage reservoir study for Rochester, NY (3 reservoirs totaling 150 MG) to assess impacts on DBPs as a result of covering three open finished water reservoirs.
- Conducted water age analyses to satisfy Stage 2 DBP requirements for Virginia American Water (Alexandria, Prince William, Hopewell and Ft. Lee water systems); Louisa, VA; Lebanon, KY; Bethlehem, NY; and Colonie, NY.
- Conducted water age analysis in support of proposed tank construction in Anne Arundel County (five 2 MG tanks), including recommendations for tank mixing devices as deemed appropriate.

Capital Improvements Plan

The results and conclusions of Tasks 1 through 9 will provide the basis for a sound Capital Improvement Plan (CIP) for the Village. O'Brien & Gere will work with the Village to develop a prioritized list of hydraulic and water quality improvement projects with associated budgetary costs for each. Separate project descriptions will be prepared for each recommended improvement. Project recommendations will include the justification (nature of deficiency and impact on system), the benefits of the project improvement, a discussion of alternatives considered, and the estimated project cost. With input from the Village, criteria will be identified to evaluate system improvements. These criteria may include documentation of the technical feasibility, benefits, capital and operating costs, and environmental and community impacts. Near-term improvements will be compared to long-term improvements for compatibility (eg; it may not be prudent to upsize a 6-inch main to an 8-inch to meet short-term needs if a 12-inch main is required to satisfy long-term needs). A map showing the existing system and proposed improvements will be

developed to identify the location of each recommended project.

If requested by the Village for this study, O'Brien & Gere has the ability to conduct state-of-the-art modeling to prioritize the CIP using Innovyze's CapPlan Water software. This software allows the modeling to conduct criticality analyses which would provide the Village with the consequence and likelihood of failure rankings for each system component. This information could be used to develop the overall risk assessment, break assessment and priority schedule for water main replacement (40-50 year plan). This effort would require input from the Village on the consequence of failure for critical customers (i.e., hospitals, industries, etc.).

TASK 10 – DELIVERABLES

O'Brien & Gere will prepare the following deliverables:

- Meeting Minutes – O'Brien & Gere will prepare minutes from project meetings and Work Sessions and submit copies to the Village within seven days. The minutes will focus on documenting important decisions and action items.
- Draft Report – O'Brien & Gere will prepare a Draft Report, clearly presenting the model development including input data, water demand allocation, field testing results, model calibration, and system needs and improvements. The report will summarize findings of the modeling analyses for baseline and recommended system conditions, including hydraulic and water quality results under current system operation and controls. It is anticipated that the report will be submitted electronically (Microsoft Word) to the Village for review and comment.
- Final Report – Upon receipt of comments from the Village, O'Brien & Gere will revise and issue the Final Report. Five (5) copies of the final report will be submitted, as well as a CD containing a PDF version of the final report and attachments.
- Other Work Products – O'Brien & Gere will provide electronic copies of work products to the Village on CD, including spreadsheets, GIS products, and model input files.

TASK 11 – PROJECT MANAGEMENT

Under this task, O'Brien & Gere will manage the project schedule to maintain continuity of project execution and compliance with project milestones, and will regularly communicate with the Village regarding project scope, schedule, and budget.

PRELIMINARY PROJECT SCHEDULE

O'Brien & Gere is able to begin work on this project immediately upon receiving a notice to proceed and propose to complete all tasks in approximately 120 calendar days, depending on ability of the Village to provide the hydrant flow test data in a timely manner.



SECTION 2 – QUALIFICATIONS OF THE FIRM

FIRM OVERVIEW

Water system modeling and planning has been an essential part of O'Brien & Gere's services to its clients for over 65 years. Such studies have resulted in comprehensive water system plans for individual villages, towns and cities, as well as regional water authorities, agencies, and districts, many involving system expansion and storage facility evaluations.

O'Brien & Gere starts by allocating existing demands and projecting future water demands using demographics, and projected land use and development. The firm develops, calibrates, and uses GIS and sophisticated computer models to assist in identifying system deficiencies and planning to meet the near-term and long-term demands of the water system customers. Working with staff, specialized analyses are performed to identify improvements to address water quality complaints and maintain water quality and assess operational efficiency of pumping and storage.

SPECIALIZED EXPERIENCE

MUNICIPAL SERVICES

O'Brien & Gere provides comprehensive water, wastewater, energy/sustainability, and environmental services to municipalities, public and private water and sewer utilities, and state agencies (our "Municipal Clients"). O'Brien & Gere works with its clients from the first stage of the project, developing a solid foundation to provide 360 degree service through planning, design, construction, and start-up phases. A fully integrated approach produces proven results– saving time, money, and stress.

WATER / WASTEWATER MASTER PLANNING

Water supply and system planning studies, rate and financial studies, and system valuations, both local and regional, have been an essential part of O'Brien & Gere's services to its clients for 65 years. Such studies have resulted in comprehensive plans for individual villages, towns and cities, as well as regional water authorities, agencies, and districts, many spanning planning periods of 20-50 years.

The firm provides the full range of services necessary to develop sound conclusions and recommendations concerning how to supply water over the long-term to

O'Brien & Gere's experience and expertise includes:

- Hydraulic/hydrologic modeling and water quality analysis
- Water demand projections and allocation
- Hydraulic model development and calibration
- Water system field services model calibration data collection (i.e., fire flow testing, tracer studies, etc.)
- Water distribution system corrosion studies, leakage and flow tests
- System mapping
- Multi-jurisdictional coordination between water purveyors
- Regulatory agency negotiations and permitting
- Regional water system planning
- Feasibility studies for plant capacity expansions
- Siting studies for treatment, pumping, storage and transmission facilities
- Ecological studies and environmental impact statements
- Treatment process evaluations, pilot testing and optimization studies
- System valuations for bonding programs
- Rate studies
- Water consumption and demand projections
- Groundwater and surface water source of supply studies
- Development of cost estimates
- Capital improvements prioritizing and scheduling
- Assistance in obtaining funding
- Serving under Trust Indentures and as Engineer-of-Record
- Development of facility operation and maintenance manuals

meet the demands and quality required for specific water system customers. In addition to financial, environmental, regulatory and technical factors, O'Brien & Gere evaluates demographics, historical land use, archaeology, traffic and transportation planning, projected land development, geography and geotechnical issues, interconnections with neighboring water purveyors and potential joint supplier mergers, and emerging environmental issues and legislation that may affect water supply development and system planning. The end recommendations permit the client to make fully informed decisions on capital investments, prioritizing them by such factors as projected demand, cost, technical feasibility, environmental acceptance, and regulatory requirements.

The following matrix reflects some key water system modeling and facility planning studies conducted by O'Brien & Gere followed by a table that reflects recent water system hydraulic modeling experience for the firm.

O'Brien & Gere National Water Distribution System Modeling



O'Brien & Gere Water System Modeling Matrix for Recent Relevant Projects					
Client	Project	Services	GIS Integration	Model Calibration	Water Quality
Town of Colonie, NY	Water System Facilities and Water Quality Management Plan (Ongoing)	✓	✓	✓	✓
Village of Rosendale, NY	Potable water System Model (2008)	✓	✓	✓	✓
Town of Bethlehem, NY	Water System Model Development and Planning Study (Ongoing)	✓	✓	✓	✓
City of Rochester, NY	Reservoir Optimization Study (2008)	✓		✓	✓
City of Johnstown, NY	Water Distribution System Model(2008)		✓	✓	✓
Jackson Township Municipal Utilities Authority, NJ	Water System Modeling and Master Plans (2001/2009)	✓	✓	✓	✓
Town of Louisa, VA	Waterworks Improvements / Disinfection By-products Study (2009)	✓	✓	✓	✓
City of Fairfield, OH	Water System Master Plan (Ongoing)	✓	✓		✓
City of Lebanon, KY	Water System Modeling and IDSE Plans (Ongoing)	✓	✓	✓	✓
City of Annapolis, MD	Water and Sewer System Study (Ongoing)	✓	✓	✓	✓
American States Utilities Services (Andrews AFB, MD)	Water and Sewer System Master Plan (Ongoing)	✓	✓	✓	✓
Anne Arundel County, MD	Water Strategic Plan and Modeling Services (Ongoing)	✓	✓	✓	✓
Virginia American Water (City of Alexandria, Prince William County, City of Hopewell, Ft. Lee)	Comprehensive Planning Study and IDSE Plans (Four Distinct Systems) (Ongoing)	✓	✓	✓	✓
Frederick County Sanitation Authority, Winchester, VA	Strategic Plan for Water Supply (2008)	✓		✓	✓
Stafford County, VA	Water and Wastewater Master Plan (2005)	✓	✓	✓	✓

REFERENCES

This section concludes with four client references for water quality modeling projects that are of a similar scope and magnitude and are current or completed less than five years ago.

Water System Hydraulic Model

The Town of Bethlehem provides approximately 6 MGD of water to 30,000 people and several large industrial customers. Present sources of water supply are not sufficient to reliably meet current demands or projected future needs, and the Town retained O'Brien & Gere to perform a water supply and treatment study. An additional project coinciding with this study is the development of a water system hydraulic model. The modeling software is InfoWater by MWH Soft, Inc., a GIS-based package accessed via ESRI Arc View.

The following is a brief description of the scope of services performed for this project.

MODEL SELECTION

Four GIS-based modeling platform packages were evaluated based on capabilities and limitations, portability and system requirements, purchase price, annual cost, software user support, and ease of use.

MODEL DEVELOPMENT

The model is being developed so that extended period simulations (EPSs) can be performed. The following data was used to populate the model: pipe locations and diameters, pipe material and year of installation, pipe roughness ("C"-factor), elevations, water demands, valve locations and characteristics, pump characteristics (i.e., pump curves), and storage tank characteristics (i.e., diameter, floor elevation, and high water elevation). Improve security of critical water treatment and transmission facilities.

WATER DEMAND ALLOCATION

Demands were developed using daily water production records for a three-year period. The allocation of that use across the distribution system was established using the individual water meter records. The total annual metered usage was calculated as the sum of the monthly usage for all individual meters for each calendar year. This total was compared with the corresponding total water production from the sources to develop a correction factor addressing non-metered water usage.

DIURNAL DEMAND CURVE DEVELOPMENT

Average day and maximum day diurnal demand curves were developed and used for model calibration and the EPSs. Approximately one week of water production, pumped flows, and tank level data was used to calculate the hourly system demands and net changes in tank storage volume for both demand conditions.

MODEL CALIBRATION

Fire flow field tests and information on the concurrent boundary conditions (i.e., flow and pressure into the system, and storage tank levels) were used to

CLIENT

Town of Bethlehem

REFERENCE

Richard Sayward
Chief Water Treatment Plant
Operator
(518) 765-4433

LOCATION

New York

KEY FEATURES

Calibration to within 5 psi of measured values

Prioritized list of "looping" projects to address fire flow, water age and water pressure

Provided training to Town's staff on how to use the model

Water System Hydraulic Model (cont'd)

calibrate the model. The model calibration goal was to simulating 95% of the fire flow tests to within 5 pounds per square inch (psi) of the measured values. The model was successfully calibrated 95% of the fire flow tests within 5 pounds per square inch (psi) of the measured static and residual pressures.

WATER SYSTEM EVALUATIONS

The model is being used to evaluate a number of scenarios for improving the Town's water transmission and distribution system. Specific scenarios include:

- The Town currently has two water treatment plants, each with a separate service area. The model will be used to evaluate the capability of the system to operate as a single system. Modeling runs were performed to identify key performance factors including: approximate water age (i.e., water quality); pressure; fire flow; and tank refill capabilities. Capital projects and the need for flushing to minimize water age were identified
- The model was also used to evaluate the impacts of taking one of the treatment plants off-line. The approximate age of water from the other WTP, pressure differences, and fire flow capabilities of the system were identified. Specific attention was given to identify areas of "reversed" pipe flow and approximate change in water age, particularly near the WTP taken off-line
- Using the model, a water storage analysis was performed with the goal of identifying the most logical locations for future tanks (over a 20-year period). Specific locations evaluated included sites that meet certain criteria (i.e., ground elevations, proximity to existing water infrastructure, water demand centers, etc.). Tank refill and drawdown graphs were generated for a shortlist of sites based on the hydraulic modeling results
- Criteria for looping major transmission dead-ends and locations where the Town should consider looping to connect major transmission dead ends were identified. Based on this, a prioritized list of projects was developed considering the overall benefit (i.e., increase fire flows, improved pressures, improved water age, etc.) and estimated construction costs. Documented water quality complaints were reviewed as part of the looping considerations.

TRAINING

O'Brien & Gere conducted training of the Town's staff, during which they were shown how to perform the following tasks:

- Edit information associated with existing pipes including diameter, length, and "C" factor
- Edit information associated with junction nodes including elevation and water demand
- Edit storage tank, valve, and pump characteristics
- Add new pipes, junction nodes, tanks, pumps, valves, and other items
- Run the model using different scenarios (e.g., average daily demands, maximum day demands, peak hourly demands, and fire flows)
- Run an Extended Period Simulation (EPS)
- Perform water quality analyses

Water System Comprehensive Facilities and Water Quality Management Plan

O'Brien & Gere has been providing water system engineering services to the Town of Colonie, Division of Latham Water, since the 1960s. O'Brien & Gere was retained to complete a multi-phased Water System Comprehensive Facilities and Water Quality Management Plan in order to provide a "roadmap" for near-term and long-term development and operation of the Town's water infrastructure. Two phases of the work have been completed and the third is underway. Major tasks include the following:

DISTRIBUTION OPERATIONAL STRATEGY REVIEW

O'Brien & Gere coordinated with Latham Water to confirm the current operational strategy and the basis of this strategy for pumping stations and storage tanks throughout the distribution system. This strategy was summarized in a memorandum and used as reference for developing system changes that address current operational limitations and plan for future operational changes to improve water quality or delivery pressure.

DISTRIBUTION SYSTEM MODEL DEVELOPMENT

GIS mapping of pipelines and facilities was used to generate a hydraulic model network in MWH Soft's InfoWater which included all piping (approximately 21,000 pipes or 451 miles) excluding water service lines and hydrant connections.

EXISTING WATER DEMAND ALLOCATION

Water plant production records and meter billing data were used to establish overall system water use and demands (individual water meter billing records from year 2000 to present). Assigned meter billing data to nearest pipe using GIS and model software features.

DIURNAL CURVE DEVELOPMENT

Diurnal curves were developed using one week of historical circular chart data on water production, pumped flows and water storage tank levels.

HYDRAULIC MODEL CALIBRATION

The model was calibrated with the goal of predicting fire flow tests to within 5 psi of the measured static and residual pressures. The Town compiled the age of the piping in the system and the material, which was used in the initial C-factor assignments.

IDENTIFICATION OF SYSTEM STORAGE DEFICIENCIES

The adequacy and performance of the storage within the water distribution system was assessed to identify the recommended storage to meet near-term and long-term needs, volume of useable storage within the system for

CLIENT

Town of Colonie

LOCATION

New York

REFERENCE

John W. Frazer, Jr. PE
(518) 783-2750

KEY FEATURES

Extensive use of GIS for water system piping configuration and billing/meter assignments

Field testing for model calibration (i.e., conducted 40 fire flow tests)

Water model calibration

Water modeling to identify system deficiencies

Water age analyses and tank siting investigations

DBP water quality management plan

Initial Distribution System Evaluation (IDSE)

Model training

Work sessions throughout project

in 2006, The American Public Works Association (APWA) awarded O'Brien & Gere its Project of the Year Award (Environmental / Water (>\$10 million) category) for the water treatment plant expansion for the Latham Water District.

Water System Comprehensive Facilities and Water Quality Management Plan (cont'd)

equalization, fire protection and emergencies, and the turnover rate in the tanks and retention time in the water system, and acceptability in terms of water quality. For water quality purposes, hydraulic modeling was conducted to assess the “turnover” of the storage tanks and water age on an average daily basis.

DISINFECTION BYPRODUCT MANAGEMENT

The water age calculations were used in conjunction with projected Total Trihalomethane (TTHM) and Haloacetic Acid (HAA5) data developed using Simulated Distribution System (SDS) testing to project locations in the distribution system where regulatory compliance is projected to be a problem.

HYDRAULIC ANALYSES

As part of this study, several items were investigated to assess adequacy and performance of the water system:

- Recommended storage to meet near-term and long-term needs
- Identified location of recommended storage within the distribution system
- Identified volume of useable storage within the system for equalization, fire protection and emergencies
- Evaluated turnover rate in the tanks and retention time in the water system, and acceptability in terms of water quality
- Defined accuracy of the diurnal curves for current and future design conditions
- Identified localized areas where water system pressures are excessive or inadequate, and potential need to redefine pressure zone boundaries
- Evaluated system’s ability to meet fire flow requirements
- Identified critical water system weaknesses
- Identified areas with high pipeline break frequency
- Identified areas with more frequent water quality or pressure complaints
- Identified adequacy of existing water quality monitoring sites and selection of future sites for Stage 2 D/DBP monitoring

MODEL MAINTENANCE

Currently working with MWH Soft staff to assist Latham Water to develop procedures for maintaining their model to reflect piping for new development in the Town as well as updating existing information.

SOFTWARE TRAINING

Assisted MWH Soft staff with 2-day training program for InfoWater in 2006 at Latham Water’s offices. Discussed specifics of how Latham Water’s model was constructed, assumptions regarding data, patterns and curves for demands and pumps, etc.

Water System Modeling and Master Plans

O'Brien & Gere completed an update to O'Brien & Gere's 2001 Water System Master Plan. The update of the 2001 water master plan included the following tasks:

AQUIFER SOURCE OPTIMIZATION

The 2001 Master Plan identified available groundwater sources based upon USGS information. O'Brien & Gere assessed the potential for use of these supplies by JTMUA. O'Brien & Gere reviewed NJDEP acceptability and the practical impact of critical areas limitations. We also reviewed current withdrawals and identified options that allow more complete utilization of JTMUA's current allocation. A review of the data was performed to assess the availability of the aquifer at alternate location(s). This review also included an assessment of historical problems associated with loss of capacity over time from the existing wells.

WATER MODEL DEVELOPMENT

Using MWH Soft's InfoWater, O'Brien & Gere developed an "all pipes" model of the water system using GIS files provided by the Authority.

CIP DEVELOPMENT AND PRIORITIZATION

O'Brien & Gere used the water model to review the adequacy of the prior master plan to address updated water demands and development plans. O'Brien & Gere provided the Authority with an updated Capital Improvement Plan (CIP), with detailed identification of project schedules through year 5, and general identification of project schedules through years 5-20.

LEGLER WATER SYSTEM MASTER PLAN

Acting on its commitment to provide a safe, efficient, and dependable water supply and adequate fire protection for its customers, the Jackson Township Municipal Utilities Authority (JTMUA) retained O'Brien & Gere to complete a master planning study for the Legler Water System. The planning study consisted of the following tasks:

- Evaluated water demands
- Assessed the adequacy of supply sources
- Analyzed water treatment facilities
- Evaluated piping and finished water storage
- Reviewed system operation and management practices
- Assessed facility compliance with Federal and State regulations
- Estimated costs for improvements
- Prepared a report documenting the study findings

CLIENT

Jackson Township Municipal Utilities Authority

LOCATION

Jackson Township, NJ

REFERENCE

Dave Harpell,
(732) 928-2222

KEY FEATURES

Selected InfoWater modeling software with input from the Authority

Developed "all pipes" water system model using GIS files and addressed connectivity issues

Geocoded water billing data and allocated to model

Identified locations for fire flow tests and used field data to calibrate water system model

Conducted modeling analyses for tank siting, pumping, and transmission improvements

Analyzed capital improvements for future developments

Conducted modeling to define water age

Conducted source trace analyses to assess water quality complaints

Water System Modeling and Master Plans (Continued)

ADDITIONAL MODELING SERVICES

Additional modeling services in support of the CIP improvements included:

- Water quality concerns for Bartley Road Tank area
- Operation of Vista Center water storage tank and outages at WTP's
- Water age and capacity analysis for Jackson Valley development and alternative transmission main connections
- Whitesville Road storage tank sizing and siting

Waterworks Improvements / Disinfection Byproducts Study

The Town of Louisa purchases water wholesale from Louisa County Water Authority (LCWA) and distributes it through Town-owned facilities. The Town and LCWA were issued a Notice of Violation (NOV) for exceeding the maximum contaminant level (MCL) for haloacetic acids (HAA5), which are regulated disinfection byproducts (DBPs). O'Brien & Gere conducted a study of the inadequacies in the water distribution systems that may be contributing to the elevated level of DBPs. The study objectives included:

- Developing a better understanding of the water quality concerns for the water distribution system
- Identifying system deficiencies to be corrected
- Conducting a tracer study
- Developing a uni-directional flushing program
- Developing a CIP of water quality improvements

The major tasks included:

MODEL DEVELOPMENT

Converted existing WaterCAD hydraulic model of the water distribution system to an "all pipes" InfoWater model.

DEMAND ALLOCATION

Allocated water demands using billing data to accurately depict water use throughout in the system (geocoding based on billing and parcel data).

FIELD SERVICES

Conducted 10 fire flow tests and a fluoride tracer study (one month duration) to obtain water system information needed to calibrate the steady state and EPS water models. Conducted fluoride tracer study for one month for use in EPS model calibration.

MODEL CALIBRATION

Calibrated water model using fire flow test data (static scenario), as well as tank level and tracer study data for the EPS scenario.

CAPITAL IMPROVEMENTS

Conducted analyses to identify system deficiencies and improvements that would benefit water quality. Conducted source trace analyses and water age analyses to understand system limitations and to generate a prioritized list of improvements which included: installation of automated flushing devices, tank mixers, decommissioning storage tanks, dead-end elimination, unidirectional flushing program, water main replacement/rehabilitation, and satellite treatment at springs.

UNIDIRECTIONAL FLUSHING PROGRAM

Developed a unidirectional flushing program for the entire water system. Printed output included mapping for each setup, valves to be operated, duration of flushing, etc.

CLIENT

Town of Louisa, VA

LOCATION

Town of Louisa, VA

REFERENCE

Brad Humphrey
(540) 967-1400

KEY FEATURES

Developed "all pipes" model of water system

Performed tracer study and field testing for model calibration

Water model calibration

Used GIS to allocate existing demands

Water modeling to identify system deficiencies and prioritized list of improvements

Cost estimating

Water age analyses and water quality management plan

Unidirectional flushing program

Other Recent O'Brien & Gere Local Projects & References

Project	Client	Contact Name	Contact Phone Number
Bedford Water Treatment Plant	Town of Bedford	Mr. Kevin Winn	914-666-7669
Camp Edward Isaacs WWTP Upgrade	Central Queens YM-YHWA	Mr. Rick Lewis	718-225-6750
Clearpool WWTP Upgrade	Clearpool, Inc.	Ms. Heather Boylston	845-225-8226
CSD#2 WWTP Upgrade CSD#4 WWTP Upgrade CSD#7 WWTP Upgrade	Town of Carmel	Mr. Robert Vara	845-628-1500
CKWIC Stormwater Retrofit Report	Town of Somers	Ms. Sabrina Charney-Hall	914-277-5366
Fox Lane Campus WWTP Upgrade	Bedford Central School District	Mr. Thomas Briggs	914-241-6015
Hunters Glen WWTP Upgrade	Hunters Glen Masters Association, Inc.	Mr. Kevin Cullen (Heritage Management, Inc.)	914-276-2509
Lewisboro ES WWTP Upgrade Katonah ES Sand Filter Replacement Increase Miller ES WWTP Upgrade	Katonah-Lewisboro School District	Mr. Thomas Psomas	914-763-7244
Somers HS WWTP Upgrade Somers IS Pump Station	Somers Central School District	Mr. Kenneth Crowley	914-277-2410
Thunder Ridge WWTP Upgrade	Patterson Center, LLC.	Mr. Robert Lusardi (Daniels & Porco)	845-225-8404
Yonkers Force Main Surge Analysis	Westchester County Department of Public Works	Mr. Angelo Sgobbo	914-995-8113



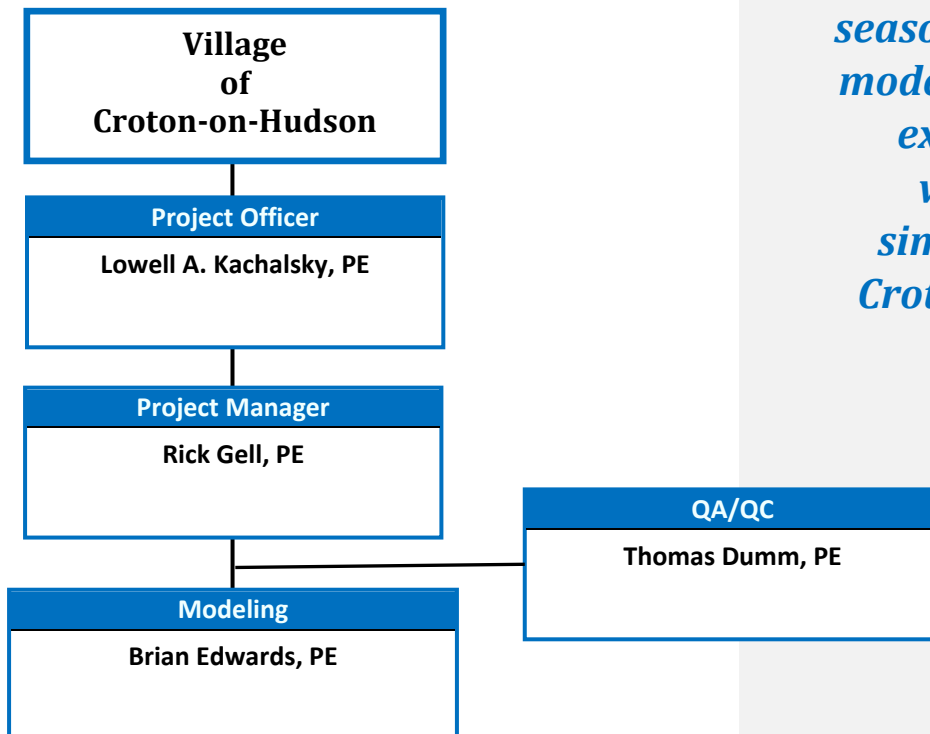
SECTION 3 – QUALIFICATIONS OF THE PROJECT TEAM

O'Brien & Gere proposes an exceptionally qualified project team whose experience mirrors the Village of Croton-on-Hudson's needs. Understanding that the work required under this project, we have assembled a team that is exceptionally well qualified to complete the work started by the Village of Croton-on-Hudson and provide a functional and calibrated InfoWater model. Our Team is built on a strong local foundation, with proven project management and client accountability from our Hawthorne, New York office.

Our project team is made up of professionals with a strong background in water model development and calibration, GIS integration, water facilities planning, water quality, training and related services that may be assigned under this contract.

ORGANIZATION

The following organization chart depicts the personnel assignments and lines of communication for proposed project team members.



O'Brien & Gere has assembled a project team of personnel that are seasoned in water system modeling with decades of experience developing water quality models similar to the Village of Croton-on-Hudson using InfoWater software.

KEY PERSONNEL

Project Officer, Lowell A. Kachalsky, PE - directs both large and small comprehensive water and wastewater programs involving multidisciplinary teams of engineers and scientists. His 34 years of experience includes having directed large scale water quality study and modeling projects for municipalities. Mr. Kachalsky has a thorough understanding of state and federal regulatory issues, provides technical advice to project and technical managers and other professionals, and assumes responsibility for the technical completeness and accuracy of all work for which he is the project officer.

In his role as Project Officer, Mr. Kachalsky will provide direction and project control and will also maintain contact with the Village of Croton-on-Hudson for the duration of the project.

Project Manager, Rick Gell - brings 31 years of water resources experience, mostly on projects in New York State. He has served as project manager for a wide array of water resources projects including master plans, water system modeling, source development, hydraulic analysis, pilot studies, water treatment facility design, water treatment, process evaluations, pumping stations, water transmission and storage, instrumentation and emergency planning, process control, sludge management, corrosion control, surge analysis and water rate analysis.

Lead Modeler, Brian Edwards - Mr. Edwards has more than 11 years of engineering experience in the area of water resources engineering including hydraulic modeling, field testing, and evaluations/simulations, pump station design, storage tank design, treatment plan design,

Mr. Edwards' water planning projects have routinely included use of InfoWater software in performing water demand projections; model development and calibration; staff training; field services; model analyses; capital improvements; water quality analyses, IDSE plans; selection of IDSE monitoring sites; tank sizing and siting; pumping station siting, sizing, and condition assessments; hydraulic modeling of distribution systems; cost estimating; and prioritizing capital projects.

QA/QC, Thomas Dumm - brings to the team water modeling experience, which is both extensive and exhaustive and includes participation in the most programs listed in Section 3 of this proposal. Mr. Dumm has over 22 years of experience exclusively in developing comprehensive models and infrastructure planning programs for large and small water and wastewater systems.

O'Brien & Gere's proposed personnel have extensive experience in the areas important to Croton-on-Hudson for successful completion of this project:

- *Experience developing similar water models*
- *Experience with model development and calibration using InfoWater*
- *Creative, tested and proven approaches in developing improvements to correct system deficiencies*
- *Extensive New York State experience*

PROJECT TEAM RESUMES

Individual resumes for project team personnel are available immediately following this section.

Lowell A. Kachalsky, PE

Vice President

TECHNICAL EXPERTISE

Water resources
Water quality planning
Water and wastewater master planning and design
Engineering services during construction
Membrane filtration (water and wastewater)
Water reuse
Municipal wastewater
CSO sewerage and drainage

PROJECT ASSIGNMENT

Project Officer

YEARS OF EXPERIENCE

33

EDUCATION

M Eng/1980/Environmental Engineering;
Manhattan College
B Eng/1977/Civil Engineering; Manhattan College

PROFESSIONAL REGISTRATION

Professional Engineer: CT, MI, NJ, NY, PA

PROFESSIONAL AFFILIATION

American Society of Civil Engineers
American Water Works Association
Westchester Water Works Conference
Water Environment Federation, National and Metropolitan Chapter
The Municipal Engineers of the City of New York

Mr. Kachalsky has more than 33 years of professional engineering experience in municipal wastewater management, water resources, and industrial pretreatment. He has performed both water and wastewater master planning and design. Mr. Kachalsky provides program direction to engineers and scientists engaged in various engineering projects. Under his direction project teams develop, evaluate, and prepare design documents to support cost-effective, environmentally sound engineering solutions. Projects have involved coordination and management of multi-disciplined teams comprised of engineers, specialists, support disciplines, and consultants. Mr. Kachalsky is also currently responsible for major business development in the Metropolitan New York City area, and also heads the Hawthorne office for the firm.

REPRESENTATIVE PROJECTS

Water Resources

Participated in studies and design work for municipal and industrial water resources projects. Representative projects have included C-Factor Testing for the Villages of Elmsford and Scarsdale, NY. Leak Detection Surveys have been performed for: Pelham, NY; Rye Playland, Westchester Co., NY; and the Bronx River Road, Yonkers, NY.

Town of Bedford, NY, Project Officer – New 2 MGD microfiltration water treatment plant. Source waters include the Delaware Aqueduct and Cross River Reservoir (NYC Supplies). Working for the Town and the Town Engineer, O'Brien & Gere leading the design and selection of microfiltration membrane system as well as the electrical, I&C and HVAC designs.

Monmouth Consolidated Water Company – Designed and prepared contract drawings, specifications and construction cost estimates for a 5 MGD raw water intake on the Manawquan River. Also coordinated and obtained all required State, Federal and Corps of Engineer permits. The project site was located in designated wetlands and bog turtle habitat, an endangered species, whereby permits required the design to include protection of the environmentally sensitive areas.

Shore Water Company – Designed and prepared contract documents and construction cost estimates for construction

a 200 GPM well, well house, and chlorination facilities. Work also include obtaining construction permit.

Middlesex County Utility – Contributed to the preparation of the report on Potable Water System Planning, and financial analyses of the alternatives including the impacts of bonding, operation and maintenance and deferred construction. Provided hydraulic analyses of several transmission main and pump station alternatives. The transmission main alternatives were 16 miles in length and ranged in size from 24 to 54 inches in diameter and some involved pump stations ranging in size from 10 to 45 MGD.

City of Norfolk, VA – Designed improvements to solids collection facilities for WPCP. Work involved design and retrofitting new submersible pumps for twelve existing sedimentation basins to remove settled solids. The work also included design of two inground pumping stations to transfer solids removal from the sedimentation basins to new thickener facilities.

Shorelands Water Company – Designed and prepared contract drawings and construction cost estimates for a backwash recovery system for two 5 MGD WTPs requiring iron removal and backwash water settled in lagoons. Due to new restrictions on groundwater withdrawals, the Company desired to recover as much settled backwash water as possible. The design involved a pump station and floating skimming facility to operate at various water levels in the lagoon without drawing in iron sludge.

Village of Pleasantville, NY – Prepared a water rate study and water system adequacy study, which included a necessary detailed economic analysis of the Village's water budget in order to recommend revised water rates to raise revenue to run the water system and fund projects recommended in the adequacy study.

Westchester County, NY – Prepared reports for emergency interconnection of water systems with Westchester County and the effect of Federal trihalomethane regulations on the County.

West Keansburg Water Company, NJ – Prepared contract drawings, technical specifications and construction cost estimates for expansion of Water Treatment Plant No. 2 requiring an increase in supply in order to have adequate firm capacity to insure a supply of potable water and fire protection during period of maximum demand. Required the addition of a well and well house, a clarifier and pressure filter.

Village of Tarrytown, NY – Inspected construction and start-up of an 800 GPM water booster pumping station.

Fort Dix, NJ – Designed improvements to a 2 MGD water filtration plant including a continuous sludge withdrawal system from settling tanks, and design of a pumping station to deliver decanted water from the existing sludge holding tank to the head end of the plant. Plans, specifications and construction cost estimates were prepared using Corps of Engineers guidelines and standards.

Water System Locating and Mapping:

- Grasslands Reservation, Westchester County, NY
- Tibbets Brook Park, Westchester County, NY

Municipal Wastewater

Village of Mamaroneck Department of Environmental Facilities, Pressure Outfall Pipeline for Sewage Treatment Plant, Westchester County, NY, Project Officer – Completed final design of 6,000 lf of 60-inch diameter pressure outfall pipeline, which included hydraulic evaluations, subaqueous harbor crossing, air release facility, and extensive rock removal/blasting evaluations. The design utilized pre-stressed concrete cylinder pipe (PCCP). The pipeline profile provided for full pipe flow under the harbor, with a controlled break to atmospheric pressure as the pipeline rises back above sea level, then down below sea level for discharge into Long Island Sound. This design incorporated features to allow pigging/flushing, air intake and air release. Design profile minimized sub-aqueous rock excavation, and established blasting criteria to protect nearby structures.

Village of Mamaroneck Department of Environmental Facilities, Siphon Area Interceptor System, Westchester County, NY, Project Officer –

Completed final design of siphon area interceptor system, including 1.3 MGD and 5.1 MGD sewage pumping stations, emergency power facilities, 3,400 lf of 8- to 24-inch gravity sewers and 2,700 lf of 10- and 16-inch force mains; included pipe bridge crossing, features for enhancing aesthetics of construction in park lands and residential neighborhoods, odor control, and all below ground construction.

New York City Department of Environmental Protection (NYCDEP) Long Term Control Plan (LTCP) for Combined Sewer Overflow, New York, NY, Project Manager – Member of the Joint Venture team for a \$25 million program to develop a Long Term Control Plan (LTCP) for CSO abatement in New York City. Tasks involve extensive field investigations, sewer system monitoring, water quality monitoring, development of landside and water quality mathematical models, evaluation of engineering alternatives, and conceptual designs of recommended solutions. Based on cost-benefit analyses, the project will optimize existing infrastructure to fulfill the City's responsibilities in New York Harbor for achieving the fishable/swimmable water quality goals of the Clean Water Act. Ultimately this program will be coordinated with other water quality planning programs and design/construction projects, and the LTCP will be integrated with the wet weather operation plan of the 14 wastewater pollution control plants.

New York City Department of Environmental Protection, Clearpool, Hunters Glen, and Carmel Sewer District No. 2 No. 4, and No. 7, Katonah-Lewisboro CSD (3 plants), Somers CSD (2 plants), Camp Edward Isaacs, Thunder Ridge, and Bedford CSD Wastewater Treatment Plant Regulatory Upgrades, New York, NY, Project Manager – Completed design of upgrades to four treatment plants in the Croton and Delaware Watersheds. Prepared the facility plan reports, and design specifications and drawings, coordinated the bidding process, and submitted bidding documents for the construction contract. Prepared construction and O&M cost estimates. These projects were completed under the New York City Watershed Memorandum of Agreement (MOA) and NYCDEP regulatory upgrade program. The MOA established the New York City Watershed Rules and Regulations, which set new mandatory requirements for existing wastewater

treatment plants that discharge within the watersheds of the City of New York.

New York City Department of Environmental Protection, Project Manager – Reviewed the NYCDEP's compliance with an order on consent for the North River WPCP (170 MGD). Project involved review of a multitude of water conservation and sewer flow monitoring initiatives, odor control upgrades, plant influent and effluent flow monitoring functions and O&M procedures, engine exhaust stack tests.

CSO Sewerage and Drainage

New York City Department of Environmental Protection (NYCDEP), Hunts Point In-Line Storage (ILS) Prototype Facility, Project Manager – Developed and designed an innovative technology for combined sewer overflow abatement. The project utilizes inflatable dams installed in existing sewer lines. The dams are controlled to temporarily store CSO in excess of what can be treated by the downstream sewage treatment plant until a storm event has passed and flow has receded to acceptably low levels. The dams have been installed at two sites, Metcalf Avenue and Lafayette Avenue. At Metcalf Avenue, two inflatable dams are installed in each 10 ft high by 8 ft wide barrel of an existing double-barrel reinforced concrete box culvert combined sewer. The control structure at this location is completely below ground. At Lafayette Avenue one inflatable dam is installed in an existing 5 ft 3 inches wide by 6 ft high reinforced concrete box culvert sewer. The control vault at this location is located adjacent to the sewer in the bed of Lafayette Avenue. Wastewater level monitoring equipment has been installed at 8 sites. These monitors will signal the control panels when sewage flows have risen to a point that indicates that a rain event has begun that may result in flow that exceeds treatment plant capacity. The control panel will then initiate dam inflation. When sewage flow levels have subsided, the level monitors will signal the control panels to deflate the dams. One monitor will be installed upstream of each dam. If water surface elevations upstream of the dams rise to a point where they threaten to surcharge, these monitors can trigger an automatic dam deflation. The second function of these monitors is as a data collection device to enable analysis of the effectiveness of the inflatable dams regarding the volume of CSO retained for each storm. The program is part of the Jamaica Bay Combined Sewer Overflow Facilities Planning Project.

Bridgestone and Sumitomo Factories, Japan, Inspector – Shop witness testing of inflatable dam carpets. Witnessed tongue tear, wear, tensile and adhesion tests. Visited factories and examined where factory quality control tests were done and how the Client, in the future, should witness manufacturer of the dam carpets and subsequent shop witness tests. There are differences in Japan and ASTM standards that required coordination.

New York City Department of Environmental Protection (NYCDEP), Jamaica Bay Combined Sewer Overflow Facilities Planning Project, Project Manager – Managed major New York City CSO project (drainage area of 53,000 acres and 14 tributaries), which includes evaluating existing sewer system (twenty in-line flow monitors in place for four months), several pumping stations and four treatment plants (Coney Island WPCP 100 MGD, Jamaica WPCP 100 MGD, 26th Ward WPCP 85 MGD, Rockaway WPCP 45 MGD), intensive water body and sewer system sampling program (three boats sampling five days per week for three months and five rainfalls sampled at ten sewer locations), coordination of SWMM sewer modeling and water body mathematical modeling efforts, reviewing applicable abatement technologies, overall problem assessment, impact of existing WPCPs, recommendation of system improvements and preliminary design for a below grade 34 million gallon CSO retention tank. Prepared facility planning construction and O&M cost estimates. Participated in OMB value engineering work shop sessions. Jamaica Bay is part of the Gateway National Recreation Area and is a National Wildlife Refuge.

New York City Department of Environmental Protection, (NYCDEP), North CSO Storage Facility, NY, Project Manager – Completed conceptual design for the Fresh Creek-North CSO off-line storage facility in the 26th Ward POTW service area in Jamaica Bay consisting of \$300M, 34 MG CSO storage facility and sewers. This design required reconfiguration of over 9,000 ft of large diameter sewers, six internal storage basins, eight 8 ft x 10 ft catenary screens, floatables containment, and hypochlorite disinfection capability. Key design operating parameters incorporated into the design included:

- Capability to process at a 2500 MGD rate, even with storage basins full, at the onset of a storm

- Six independently operable internal storage basins
- Minimum availability of driving head due to tidal cycles at the discharge end of the facility
- Use of disinfected effluent from the 26th Ward WPCP for storage facility washdown
- Provision for recreational ball fields and park maintenance building above grade
- Continuous ventilation of the screenings area at 12 air changes per hours, and similar ventilation of the storage basins when occupied or filled with screened wastewater
- Odor control equipment (carbon adsorbers and wet scrubbers) for minimizing/eliminating odor exhaust to the adjacent neighborhoods
- Two independent electric service connections for redundancy

Atlantic City Sewerage Company, NJ – Prepared a report evaluating the impacts of the proposed Atlantic City Convention Center and Railroad Terminal on the existing sanitary sewerage system, and recommended proposed new sewerage facilities. Work required studying sewerage service areas and capacity design flows following existing zoning requirements, studying impact of future development, review of existing sewer capacities, review of a proposed sewerage scheme to serve the Convention Center, technical and construction cost evaluation of several sewerage schemes, and recommendations.

Atlantic City Sewerage Company, NJ, Resident Engineer – Managed two sewer projects involving 14-, 16-, and 20-inch pipe within a half mile of streets.

Suffolk County Department of Public Works, NY – Prepared design and contract drawings, construction cost estimates, and specifications for 17,000 ft of 18-inch force main transporting secondary effluent, and 10,000 ft of 10-inch force main transporting raw sewage.

Suffolk County Department of Public Works, NY – Prepared design and contract drawings, construction cost estimates, and specifications for a new 1.2 MGD sewage pumping station to serve a new sewage treatment plant.

Village of Pleasantville, NY – Prepared design, construction drawings, and construction cost estimates for 6,000 ft of storm sewers of various sizes.

Village of Tarrytown, NY – Inspected the construction of sewerage and drainage facilities for large condominium projects. Represented the engineering interests of the Village at Planning Board meetings.

Village of Pleasantville, NY – Prepared an engineering report and construction cost on the hydraulic and structural limitations which led to failure of a one mile long stretch of 8-inch sanitary sewer. Presented results to the New York State Department of Environmental Conservation. This effort resulted in the Village receiving a grant for reconstruction of the sewer.

Westchester County, NY – Prepared design and drawings, contract documents and construction cost estimates for various drainage culvert construction projects.

Richard E. Gell, PE

Senior Managing Engineer

TECHNICAL EXPERTISE

Water system security
Water system master plans
Water transmission and storage
Corrosion control
Wastewater system design
I/I Studies
Sludge management studies
Site development/ redevelopment

PROJECT ASSIGNMENT

Project Manager

YEARS OF EXPERIENCE 30

EDUCATION

BS/1979/Civil Engineering; Syracuse University

PROFESSIONAL REGISTRATION

Professional Engineer: NY

SPECIAL TRAINING

O'Brien & Gere Project Management Boot Camp

PROFESSIONAL AFFILIATION

Tau Beta Pi
Chi Epsilon
American Water Works Association
New York Section AWWA Registration
Committee and Program Committee

Mr. Gell has more than 30 years of experience and is responsible for marketing, supervising, budgeting, scheduling, and implementing complex, multi phase projects. He has served in an advisory role in master plans, water system modeling, source development, hydraulic analysis, pilot studies, water treatment facility design, water treatment, process evaluations, pumping stations, water transmission and storage, instrumentation and emergency planning, process control, sludge management, corrosion control, surge analysis and water rate analysis.

REPRESENTATIVE PROJECTS

Town of Colonie, Division of Latham Water District, Water System Master Plan, Colonie, NY, Project Manager – Performed comprehensive modeling of water distribution system, for purposes of evaluating distribution system water quality issues, including disinfection byproducts, low chlorine residual, and red water complaints. The model will be used to perform the initial distribution system evaluation (IDSE) required in connection with the upcoming Stage 2 D/DBP Rule. The model was developed using InfoWater, by MWH Soft, Inc., and was designed to be fully integrated with the Town's GIS system.

Town of Bethlehem, Water Supply Study/Improvements, Bethlehem, NY, Project Manager – Completed a water supply study and system improvements. Work includes projection of future demand versus available supply, evaluation and ranking of available sources, safe yield evaluation of existing supply, detailed evaluation of transmission and distribution issues, and water treatment plant evaluation with recommendations for improvements. Prepared design of 10MGD water treatment plant upgrades including filter bottom replacements and media replacement.

City of Johnstown, Water System Evaluation, Johnstown, NY, Project Manager – Managed a comprehensive distribution system evaluation including development of a plan to replace an open finished water reservoir and implementation of a

centralized SCADA system with a radio based communication network. The scope included development of a water system hydraulic model utilizing H2OMap by MWH Soft, Inc. The calibrated model was used to evaluate storage tank options for replacing the existing reservoir. Criteria used to evaluate the impacts including pressure changes, flow reversal, estimated fire flow, and water quality (i.e., water age).

Town of Colonie, Division of Latham Water District, Water System Master Plan, Colonie, NY, Project Manager – Performed comprehensive modeling of water distribution system, for purposes of evaluating distribution system water quality issues, including disinfection byproducts, low chlorine residual, and red water complaints. The model will be used to perform the initial distribution system evaluation (IDSE) required in connection with the upcoming Stage 2 D/DBP Rule. The model was developed using InfoWater, by MWH Soft, Inc., and was designed to be fully integrated with the Town's GIS system.

Town of Vestal, Water Storage Evaluation, Vestal, NY, Technical Review – Performed comprehensive evaluation of municipal water supply and distribution system. Distribution system comprises 13 separate pressure zones, and includes 14 water storage tanks and 8 booster pumping stations. The study evaluated the adequacy of existing storage to meet normal and emergency demands, and the impact that additional storage would have on energy (i.e., pumping) costs.

City of Ithaca, NY, Comprehensive Water Supply Plan, Ithaca, NY, Project Manager – Developed a comprehensive water supply plan to economically supply water to the greater Ithaca area. Project integrates three currently independent systems including the City of Ithaca, Cornell University, and the Southern Cayuga Lake Intermunicipal Water Commission. The study focused on optimizing the transmission and storage of water through extensive use of a composite Cybernet distribution system model and economic analyses. The systems operate with over 1,000 ft in change of static pressure and are able to realize significant savings in electrical costs from off-peak pumping. The study strategically sited and sized proposed water storage facilities to maximize benefits to all three participants.

Hamilton College, Water System Improvements, NY, Project Manager – Managed the design and construction phase services for piping modifications

to improve circulation and mixing of water within the existing water storage tank to manage water quality. The improvements also included reconstruction of the piping at the Control Building and installation of chlorination equipment to automatically feed chlorine into the water exiting the water storage tank to provide an independent means of restoring a free chlorine residual in the event of an unanticipated biological re-growth occurrence.

Town of Colonie, Division of Latham Water District, Relocation of Latham Tank Storage, Colonie, NY, Project Manager - Evaluation of alternatives to facilitate the demolition of an existing water storage tank and relocate the effective storage to another location. Ultimately led to the design of a remote ground storage and pumping system.

Town of Colonie, Division of Latham Water District, SCADA Link to District Office, Colonie, NY, Project Manager – Established a SCADA link at the Latham Water District Office to facilitate remote operation of the water treatment plant from the District Office.

City of Canandaigua, NY, Water Storage Tank Improvements, Project Manager – In order to provide for greater storage capacity, the City planned to construct two 4.5-MG pre-cast concrete water storage tanks. The construction of the first 4.5-MG AWWA D110 Type III pre-cast, pre-stressed concrete storage tank and the demolition of the existing reservoir was completed in 2007. The corresponding site work and piping along with controls were designed to incorporate the second 4.5-MG storage tank, planned for construction in 2009. Also in 2009, the 2-MG steel storage tank will be rehabilitated, including painting the interior and exterior and other miscellaneous improvements necessary to meet NYS Department of Health requirements.

City of Rochester, Reservoir Optimization Study, Rochester, NY, Project Manager – Conducted a reservoir optimization study for three open finished water reservoirs. Identified water demand and storage requirements for City customers; developed a list of alternatives and an alternative screening process; prepared a communication plan; and prepared construction, equipment, and operating costs. Organized bi-monthly workshops, conducted public meetings, and prepared a report that included findings and recommendations.

Mohawk Valley Water Authority, Water Quality and Storage Assessment, Utica, NY, Senior Managing Engineer – Conducted a third-party review of a distribution system water quality and storage study. This study established recommended volumes and locations for distribution storage and strategies for managing disinfection byproducts. O'Brien & Gere reviewed interim work products regarding the appropriateness of the storage for normal operations and emergencies as well as the implementation plan for a conversion to chloramines for residual disinfectant management in the distribution system.

City of Ithaca, NY, Pumping Station Upgrades, Ithaca, NY, Project Manager – Designed upgrades to the City's three water distribution pumping stations, including pump rehabilitation, emergency generators and new chlorination systems.

Town of Colonie, Division of Latham Water District, Pumping Station Construction, Colonie, NY, Design Engineer – Performed construction services for the 6 MGD Reservoir Raw Water Booster Pumping Station and the 10 MGD River Road High Lift Pumping Station.

Town of Colonie, Division of Latham Water District, Final Design Water Transmission Main, Colonie, NY, Design Engineer – Performed final design of 4,000 ft of 16-inch and 3,300 ft of 12-inch water transmission main. Final design and construction review of 3.4 MG steel reservoir. Construction review of a 10 MGD high lift pumping station and a 6 MGD raw water pumping station.

Town of Colonie, Division of Latham Water District, Water Supply Study, Colonie, NY, Project Manager – Completed a water supply study including water demand analysis, water system improvements requirements, and water rate analysis.

Town of Queensbury, Water System Study, Queensbury, NY, Lead Project Engineer – Performed water system study reviewing the existing water treatment plant services area, transmission system, and distribution system. The study evaluated expansion of the facilities to meet the immediate needs of the Town as well as the expanded service areas in the surrounding municipalities.

Town of Queensbury, Water Rate Study, Queensbury, NY, Lead Project Engineer – Performed a water rate study to develop a financing plan for a proposed water treatment plant expansion

and develop an equitable method of allocating costs among individual water districts within the Town.

Utica Water Supply Board, Storage Tank Design, Utica, NY, Lead Project Engineer – Completed design of two prestressed precast concrete storage tanks having capacities of 0.75 MG and 1.7 MG.

Mohawk Valley Water Authority, Cybernet Hydraulic Model, Utica, NY, Project Manager – Developed a Cybernet hydraulic model of the City's water transmissions system to evaluate distribution storage and potential replacement of over 200 MG of open reservoir.

Island of Aruba, Comprehensive Water Supply Master Plan, Aruba, Project Manager – Developed a comprehensive water supply master plan for the island of Aruba. Study includes development of a hydraulic model of the transmission/distribution system and development of a master plan to upgrade the complete water system to meet projected needs. Project required analysis of over thirty existing problem areas and integration of future growth projections. Key areas of concern included provisions for fire protection, storage, water quality, and low system pressures.

City of Pittsfield, Major Water System Improvement Project, Pittsfield, MA, Project Engineer – Prepared final design, construction review, construction inspection and coordination of a major water system improvement project with a total construction cost of \$20M. Final design of a 5 MG prestressed concrete tank, 8,000 ft of 30-inch transmission, two flow control stations, three steel standpipes, six pumping stations and 21,000 ft of 8-, 10-, 12- and 16-inch distribution system piping. Coordinated design of two water treatment plants, hydroelectric generator, raw water pipelines and an instrumentation and control system.

Lowville, Comprehensive Water Supply Study, Lowville, NY, Project Engineer – Completed comprehensive water supply study including water demand analysis, water system improvement requirements, and water rate analysis.

Oneida Indian Nation, Master Plan Development, New York, Project Engineer – Prepared a Master Plan for developing water and wastewater infrastructure to support long term projected growth on the Nation. The study evaluated the utilization of existing public systems in the region, development of new systems in cooperation with municipalities in the

region and the development of new sovereign systems.

Town of Queensbury, Comprehensive Water Supply Project, Queensbury, NY, Project Manager

– Prepared a map, plan, and report describing the design parameters and financial impacts of a

comprehensive water supply project. The report recommended upgrades to the water treatment plant to expand its capacity to 15 MGD, a new 1 MG water storage tank and a new 16-inch diameter transmission pipeline cased under an interstate highway.

Brian G. Edwards, PE

Sr. Project Engineer

TECHNICAL EXPERTISE

Water transmission and distribution
Water pumping station rehabilitation
Water storage tank design
Water treatment design
Water system hydraulic analysis

PROJECT ASSIGNMENT

Lead Modeler

YEARS OF EXPERIENCE

With O'Brien & Gere: 11
With Other Firms: 0

EDUCATION

BS/2000/Civil Engineering
(Environmental Option); Virginia Tech

PROFESSIONAL REGISTRATION

Professional Engineer: NY

PROFESSIONAL AFFILIATION

American Water Works Association

Mr. Edwards has more than 11 years of engineering experience in the area of water resources engineering including pump station design, storage tank design, treatment plan design, hydraulic modeling, field testing, and evaluations/simulations.

As a Senior Project Engineer with O'Brien & Gere, he is currently responsible for completing contract documents, reviewing schedule and cost of ongoing projects, and technical overview of projects. He also reviews completed work under his supervision; and conducts research and investigation for compiling written reports. In addition, Mr. Edwards maintains client contact during study, design, and construction, and is responsible for maintaining client contact following project completion.

REPRESENTATIVE PROJECTS

Water Facilities Engineering

Pharmaceutical Client, Hydraulic Analysis, West Point, PA, Design Engineer – Analyzed effects of future water demands on system pressure and supply for the site's potable water system. Used EPANET computer modeling program for analysis. Recommended necessary supply improvements to the system.

Pharmaceutical Client, Hydraulic Analysis, West Point, PA, Design Engineer – Analyzed effects of future water demands on system pressure and supply for two potable water systems located within separate buildings on site. Used EPANET computer modeling program for analysis. Recommended necessary supply improvements to the systems.

Pharmaceutical Client, Hydraulic Analysis, West Point, PA, Design Engineer – Analyzed effects of future water demands on system pressure and supply for a three USP/WFI water systems. Used PipeFlo computer modeling program for analysis. Recommended necessary supply improvements to the systems.

Pharmaceutical Client, New Six MG Water Tank, West Point, PA, Design Engineer – Conducted site drainage design, logged new project items into database, reviewed and filed shop drawings, specifications, and requests for information for ongoing engineering projects.

Pharmaceutical Client, Water Tank Equalization Line, West Point, PA, Design Engineer – Prepared specification book and design drawing. Project included field cutting existing 2.8 MG tank for the installation of about 10 ft of pipe and fittings and repair and disinfection of the tank.

Pharmaceutical Client, New Two MG Water Tank, West Point, PA, Design Engineer – Prepared setup/design of mechanical and site/civil bid packages, specification books and design drawings. Work includes site drainage, gravity pipe layout, mechanical pipe layout, surface preparation, and underground utility demolition.

Metropolitan Water Board, Pump Station Hydraulic Energy Evaluation, Onondaga County, NY, Design Engineer – Completed field testing of three water pumping stations to calculate efficiencies of existing pumps, motors, and drive equipment. Field test efficiencies were compared to the expected efficiencies of the equipment and with expected efficiencies of new equipment. Recommended improvements to the pumps, motors, drives, and accessories based on the comparison.

New York State Office of General Services (OGS), Groundwater Supply and Treatment Collins Correctional Facility, Collins, NY, Project Engineer – Prepared specification book and design drawing for water treatment process equipment. Project includes the installation of a green sand filter skid, water softener skid, pumps, chemical feed systems, piping and accessories.

Andrews Air Force Base, Water Distribution System Master Plan, MD, Hydraulic Analysis Task Manager – Developed hydraulic model of Base water distribution system using MWH Soft's InfoWater software (GIS based computer modeling program). Evaluated pipe sizes based on future expansion and prepared short and long-term recommendations for Distribution System Master Plan report.

Erie County Division of Sewerage Management (ECDSM), a division of the county's Department of Environment and planning, Erie County, NY-Project Engineer – Completed field testing of seven wastewater pumping stations to calculate efficiencies

of existing pumps, motors and drive equipment. Field Test efficiencies were compared to the expected efficiencies of the equipment and with expected efficiencies of new equipment. Based on the comparison, recommended improvements to the pumps, motors, drives and accessories.

City of Providence, Water Treatment Plant Expansion, Providence, RI, Project Engineer – Evaluated filter under drain alternatives. Design responsibilities included development contract documents for the replacement of the existing filter under drains.

Town of Colonie, Vulnerability Assessment Update, Colonie, NY, Project Engineer – Prepared an update to VA report, including update of risk assessment, construction cost estimate and project priority ranking.

Town of Colonie, Energy Audit, Colonie, NY, Project Engineer – Performed an assessment of the town's water and pure water facilities for potential energy savings. Facilities included in the review include water distribution pump stations and sanitary pump stations. The findings of the audit will be summarized in a report, which will include recommended changes or improvements and the estimated energy savings.

Town of Bethlehem, Water System Hydraulic Model, Bethlehem, NY, Project Engineer – Completed development of a water system hydraulic model utilizing InfoWater by MWH Soft, Inc., a GIS-based software package accessed via ESRI Arc View. Specific scope for this project included modeling software evaluation and selection assistance, model development, water demand allocation, diurnal demand curve development, model calibration based on field tests, and training of Town staff on the use of the model. The calibrated model was then utilized to help the Town evaluate a number of transmission and distribution system scenarios including: impacts on existing users by proposed large developments; location of new tanks; transmission main looping; and balancing between multiple water sources. Criteria used to evaluate the impacts including pressure changes, flow reversal, estimated fire flow, and water quality (i.e., water age).

Town of Bethlehem, IDSE Plans, Bethlehem, NY, Project Engineer – Prepared two separate IDSE plans for the Town's two distribution systems.

Anne Arundel County, Selby Grove Jumpers Hole Tank, Elvaton, MD Project Engineer – Prepared specifications and design drawings. Project includes the installation of a new 2.0 MG elevated water storage tank.

Town of Vestal, Case Drive Tank Replacement, Vestal, NY Design Engineer – Prepared specification book and design drawing. Project includes the installation of a new 1.0 MG water storage tank and valve building and demolition of an existing 0.5 MG tank.

City of Johnstown, Water System Hydraulic Model, Johnstown, NY, Project Engineer – Completed development of a water system hydraulic model utilizing H2OMap by MWH Soft, Inc.. Specific scope for this project included model development, water demand allocation, and model calibration based on field tests. The calibrated model will be used to help the Town evaluate storage tank options for replacing the existing reservoir. Criteria used to evaluate the impacts including pressure changes, flow reversal, estimated fire flow, and water quality (i.e., water age).

Mashantucket Pequot Tribal Nation, Water Treatment Plant Expansion, Mashentucket, CT, Project Engineer – Prepared specifications and design drawings and managed construction phase review. Project includes a 200,000 gallon clearwell, tube settling basin, membrane filtration, pumps and piping.

Town of Rosendale, Water System Hydraulic Model, Rosendale, NY, Project Engineer – Completed development of a water system hydraulic model utilizing InfoWater by MWH Soft, Inc., a GIS-based software package accessed via ESRI Arc View. Specific scope for this project included model development, water demand allocation, and model calibration based on field tests. The calibrated model was then utilized to help the Town evaluate a number of transmission and distribution system scenarios. Criteria used to evaluate the impacts including pressure changes, flow reversal, estimated fire flow, and water quality (i.e., water age).

New York State Office of General Services (OGS), Stormwater System Alder Creek DOT Facility, Alder Creek, NY, Project Engineer – Prepared specification book and design drawing. Project includes the installation of a new fuel unload station canopy and modifications to existing stormwater piping and holding tanks.

Town of St. Armand, Water System Improvements, St. Armand, NY, Design Engineer – Designed 12,500 feet of 8- and 6-inch distribution mains. Includes highway crossing and connections to existing utilities.

Town of Colonie, Division of Latham Water, Mohawk View Water Treatment Plant Expansion, Colonie, NY, Design Engineer – Developed service population estimates, evaluated alternatives for residuals handling and clarification, performed hydraulic analyses, data management, and cost estimating. In charge of operation of pilot study using Actiflo process followed by filtration. Design responsibilities included design of rapid mix, flocculation, sedimentation, filtration, and residual management operations; pump and mixer selection; piping layouts; and chemical feed systems design (bulk storage tanks, transfer pumps, day tanks and metering pumps).

Town of Colonie, NY, Division of Latham Water, Low Lift Pumping Station Upgrade, Colonie, NY, Design Engineer – Upgraded the existing 15 MGD pumping station. Responsibilities included bid review and tabulation and shop drawing review.

Reading Energy Company, Lake Bluff Water Supply Upgrade, Lake Bluff, NY, Design Engineer – Assisted in procurement and installation of a liner and geotextile underlayment for a wood stove tank.

PRIOR TO O'BRIEN & GERE

Air Management

Connecticut Department of Environmental Protection (CTDEP), Bureau of Air Management – Evaluated general and individual New Source Review permits for approval. Proposed, designed and supervised implementation of an Access 97 database for use in expediting the permitting process. Researched and reviewed pollution control issues related to nitrogen oxides from gas turbines and VOCs from industrial wastewater.

Thomas E. Dumm, PE

Senior Technical Director

TECHNICAL EXPERTISE

Water distribution system modeling

Water supply master planning

Water and wastewater systems

Regulatory permitting

PROJECT ASSIGNMENT

Model QA/QC

YEARS OF EXPERIENCE

22

EDUCATION

MS/1993/Water Resources Engineering;
George Washington University

BS/1987/Civil Engineering;
Pennsylvania State University

PROFESSIONAL REGISTRATION

Professional Engineer: VA, PA

PROFESSIONAL AFFILIATION

American Water Works Association

Water Environment Federation

TECHNICAL SOFTWARE

WaterCAD

WaterGEMS

XP-SWMM

InfoWater

InfoSWMM

H2OMAP Water

H2OMAP Sewer

ArcView

Mr. Dumm has more than 22 years of professional engineering experience developing comprehensive infrastructure planning programs for water and wastewater systems. He has conducted numerous studies involving master planning and regulatory permitting for large and small municipal and industrial clients.

Town of Louisa, Waterworks Improvements/ Disinfection Byproducts Study, Louisa, VA, Technical Director – Conducted a study to involving development and calibration of a water system model (InfoWater), geocoding of billing data, fire hydrant flow testing, fluoride tracer studies, water quality modeling, unidirectional flushing program, and identification of water system improvements to reduce disinfection byproducts.

Jackson Township, Water System Master Plan and Update, Jackson Township, NJ, Project Manager – Prepared a water system master plan (2000) and an update (2009) that identified the need for capital improvements. The study included projections of water demands, evaluation of existing and proposed groundwater sources, assessment of treatment process requirements for existing and proposed plants, development and calibration of a hydraulic model of the water distribution system (InfoWater), and identification and evaluation of system improvements. Modeled operational issues with storage tank, water quality complaints with flow reversals and water plant operation, and sizing of water mains for new developments.

Town of Colonie, Division of Latham Water, Comprehensive Distribution System Facilities and Water Quality Management Plan, Colonie, NY, Technical Director – Prepared a water system facilities and water quality management plan for the current (12 mgd) and future system (40 mgd). Study included development of water system model from GIS (InfoWater), allocation of water demands using GIS and billing data, field testing (fire flow tests) and computer model calibration, computer modeling of the water system to identify and evaluate CIP improvements, water quality analyses.

City of Fairfield, Water System Model Development, OH, Technical Director – Provided technical direction for the development of a comprehensive hydraulic model (InfoWater). The model was developed using GIS data and calibrated using fire flow tests and extended period simulation (EPS) data. Water demands were allocated using billing meter data.

City of Lebanon, Water System Hydraulic Model and IDSE Plan, City of Lebanon, KY, Technical Director – Developed and calibrated a water system hydraulic model (InfoWater). Project included development of GIS for piping and facilities, model development, water demand allocation, diurnal demand curve development, and model calibration based on field tests. The calibrated model was used to evaluate a number of system improvements including sizing and locating additional storage. The model was also used to prepare an Initial Distribution System Evaluation (IDSE) Plan for the City's water system. The InfoWater model was used to compute water age and select monitoring sites for the Stage 2 DBP Rule.

Monroe Township MUA, Water Reuse Study, Monroe Township, NJ, Technical Director – Developed an irrigation system master plan including technical, financial, and environmental aspects such as investigating nonpotable water supply alternatives (stormwater, nonpotable well supply, stream diversion and storage, water reuse via satellite treatment, etc.), identified "offset" costs, defined agreements, maintained instream flows, and satisfied NJDEP's request to use the lowest quality water for nonpotable uses.

Virginia American Water, IDSE Plans, Alexandria, VA, Technical Director – O'Brien & Gere prepared Initial Distribution System Evaluation (IDSE) Plans for four of Virginia American's water system (Alexandria, Prince William, Hopewell and Ft. Lee). Three of the models (WaterCAD) were updated and calibrated for use by American Water for selection of monitoring sites for the Stage 2 DBP Rule. A model was constructed for Ft. Lee (WaterCAD) using AutoCAD mapping and calibration was conducted using field data. Field services were performed to collect data for model calibration. Water age analyses were conducted to assist with selection of monitoring sites.

City of Annapolis, Water and Sewer System Study, Annapolis, MD, Technical Director – Prepared a water and sewer system study to provide a prioritized list of capital improvement projects. Study included projections of water demands and wastewater flows, assessment of existing facilities, review of roughly 5000 as-built drawings to populate water and sewer models, development and calibration of computer models for water (WaterGEMS) and sewer (SewerGEMS) systems to identify and evaluate CIP improvements, scheduling of recommended

improvements, cost estimating and financial impact assessment of proposed projects.

Additional projects:

- Water and Sewer Modeling and Master Planning, American States Utilities Services (Andrews AFB)
- Water System Hydraulic Model, Town of Bethlehem, NY
- Water and Wastewater Master Plan, Stafford County, VA
- Water and Wastewater Facilities Plan and Update, Salisbury, MD
- Water Strategic Plan, Anne Arundel County, MD
- Water System Master Plan, Prince William County, VA
- Water and Wastewater Master Plan, Carroll County, MD
- Water Distribution System Analysis, Allentown, PA
- Water System Facility Plan, Washington Suburban Sanitary Commission, Laurel, MD
- Water Pumping Station Evaluation, Washington Suburban Sanitary Commission, Laurel, MD
- Water Pumping Station and Storage Facility Evaluation, Washington Suburban Sanitary Commission, Laurel, MD
- Water Distribution System Analysis, Norfolk, VA
- Water System Master Plan, Rivanna Water & Sewer Authority, Charlottesville, VA
- Water and Wastewater Master Plan, Boy Scouts of America, Goshen, VA
- Water and Wastewater Bond Feasibility Study, DC Water & Sewer Authority, Washington, DC
- Water Reservoir Optimization Study, City of Rochester, NY



SECTION 4 –NOT-TO-EXCEED COST FOR TASKS 1-11

In accordance with the Village of Croton-on-Hudson's RFP, this section concludes with a not-to-exceed cost for the completion of Scope of Work tasks 1 through 11 for this project. The cost is broken down by individual tasks, associated effort and includes man hours, hourly rates and all ancillary costs.



05-Jul-11

Fee Estimate
Development of a Digital Computer Model for Village's Water Supply System
Croton-on-Hudson, New York

	Lowell Kachalsky, PE	Rick Gell, PE	Thomas Dumm, PE	Brian Edwards, PE			
Title	Project Officer	Project Manager	QA/QC	Lead Modeler	Total Hours	Direct Expenses	Fee
Hourly Billing Rate	\$227	\$180	\$183	\$101			
Task 1 - Data Collection				12	12		\$1,212
Task 2 - Kick-off Meeting/Work Session 1				8	8	100	\$908
Task 3 - Software Selection				2	2		\$202
Task 4 - Model Development			2	24	26		\$2,790
Task 5 -Water Demand Allocation			1	8	9		\$991
Task 6- Work Session 2				8	8	\$100	\$908
Task 7- Model Calibration			3	16	19		\$2,165
Task 8- Work Session 3				8	8	\$100	\$908
Task 9- System Analyses			4	36	40		\$4,368
Task 10- Deliverables			2	28	30	\$500	\$3,694
Task 11- Project Management	16	35				\$200	\$10,132
TOTAL HOURS	16	35	12	150	162		
TOTAL COST	\$3,632	\$6,300	\$2,196	\$15,150		\$1,000	\$28,278

See note 1.	-\$3,632
	\$24,646
10% fee waived on labor	-\$2,150
Final Not to Exceed Cost	\$22,496

There will be no mark-up on direct out of pocket costs.

Note 1: Mr. Kachalsky will not bill for his time charged to this project.

Hourly Billing Rates	
Lowell Kachalsky	\$227
Rick Gell	\$180
Tom Dumm	\$183
Brian Edwards	\$101





CERTIFICATE OF LIABILITY INSURANCE

Page 1 of 1
DATE (MM/DD/YYYY)
01/05/2011

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an **ADDITIONAL INSURED**, the policy(ies) must be endorsed. If **SUBROGATION IS WAIVED**, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Willis of Pennsylvania, Inc. 26 Century Blvd. P. O. Box 305191 Nashville, TN 37230-5191	CONTACT NAME: PHONE (A/C, NO., EXT): 877-945-7378 FAX (A/C, NO.): 888-467-2378 E-MAIL: certificates@willis.com ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	
INSURED O'Brien & Gere Engineers, Inc. O'Brien & Gere, Inc. of North America and O'Brien & Gere Operations, LLC 333 W. Washington Street P.O. Box 4873 Syracuse, NY 13221-4873	INSURER A: Zurich American Insurance Company	16535-020
	INSURER B: Steadfast Insurance Company	26387-003
	INSURER C: Zurich American Insurance Company	16535-005
	INSURER D: Zurich American Insurance Company	16535-006
	INSURER E:	
	INSURER F:	

COVERAGES**CERTIFICATE NUMBER: 15387717****REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN. THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

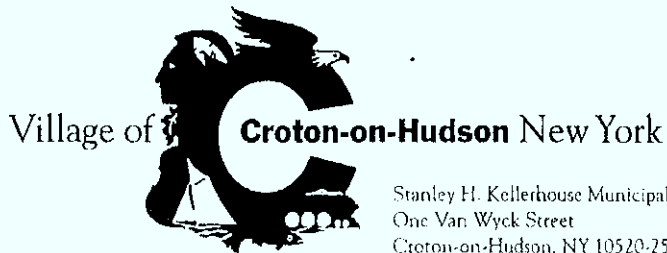
INSR LTR	TYPE OF INSURANCE	ADD'L INSRD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	GENERAL LIABILITY			GLO386738703	1/1/2011	1/1/2012	EACH OCCURRENCE \$ 1,000,000
	☒ COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 300,000
	☐ CLAIMS-MADE ☒ OCCUR						MED EXP (Any one person) \$ 10,000
							PERSONAL & ADV INJURY \$ 1,000,000
							GENERAL AGGREGATE \$ 3,000,000
							PRODUCTS - COMP/OP AGG \$ 3,000,000
A	AUTOMOBILE LIABILITY			BAP386738702	1/1/2011	1/1/2012	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000
	☒ ANY AUTO						BODILY INJURY (Per person) \$
	☐ ALL OWNED AUTOS	☐ SCHEDULED AUTOS					BODILY INJURY (Per accident) \$
	☒ HIRED AUTOS	☒ NON-OWNED AUTOS					PROPERTY DAMAGE (Per accident) \$
							\$
B	☒ UMBRELLA LIAB ☒ OCCUR			AUC594587402	1/1/2011	1/1/2012	EACH OCCURRENCE \$ 5,000,000
	☐ EXCESS LIAB ☐ CLAIMS-MADE						AGGREGATE \$ 5,000,000
	☐ DED ☐ RETENTION \$						\$
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY			WC386738903	1/1/2011	1/1/2012	☒ WC STATUTORY LIMITS ☐ OTHER
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? ☐ Y/N	N/A	E.L. EACH ACCIDENT \$ 1,000,000				
	(Mandatory in NH)		E.L. DISEASE - EA EMPLOYEE \$ 1,000,000				
	If yes, describe under DESCRIPTION OF OPERATIONS below		E.L. DISEASE - POLICY LIMIT \$ 1,000,000				
D	Professional & Pollution Liability			PEC968347304	1/1/2011	1/1/2012	\$5,000,000 Each Claim \$5,000,000 Aggregate

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach Acord 101, Additional Remarks Schedule, if more space is required)

Automobile Liability, General Liability and Employers Liability are the underlying policies to the Excess/Umbrella Liability policy

CERTIFICATE HOLDER**CANCELLATION**

Sample Certificate :	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.
	AUTHORIZED REPRESENTATIVE



Stanley H. Kellerhouse Municipal Building
One Van Wyck Street
Croton-on-Hudson, NY 10520-2501

Dear Vendor:

Please take a moment to fill out and return the enclosed W-9 form. We are required to keep updated information on file.

In addition to W-9 information, we are also required to keep our vendor files up-to-date with current telephone numbers, fax numbers and mailing address information for remittance.

We would appreciate your cooperation in providing us with the following information:

Telephone Number(s)	914 - 345-1616	O'Brien & Gere Engineers, Inc.
		22 Saw Mill River Road
		1st Floor
		Hawthorne, NY 10532
Fax Number(s)	914 - 345-1611	

We will be unable to release any further payments without this information on file.

If you have any questions, please feel free to call us at the number listed below.

Thank you.

Very truly yours,

Finance Department

Enc.

Request for Taxpayer Identification Number and Certification

Give form to the
requester. Do not
send to the IRS.

Print or type
See Specific Instructions on page 2.

Name (as shown on your income tax return)

O'BRIEN & GERE ENGINEERS, INC.

Business name, if different from above

Check appropriate box: ☐ Individual/Sole proprietor ☒ Corporation ☐ Partnership
☐ Limited liability company. Enter the tax classification (D=disregarded entity, C=corporation, P=partnership) ▶
☐ Other (see instructions) ▶

☐ Exempt
payee

Address (number, street, and apt. or suite no.)

333 W. WASHINGTON ST

City, state, and ZIP code

SYRACUSE, NY 13202

Requester's name and address (optional)

List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on Line 1 to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number

or

Employer identification number

16 0980138

Part II Certification

Under penalties of perjury, I certify that:

- The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
- I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
- I am a U.S. citizen or other U.S. person (defined below).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the Certification, but you must provide your correct TIN. See the instructions on page 4.

Sign
Here

Signature of
U.S. person ▶

Date ▶ **6/27/11**

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

- Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
- Certify that you are not subject to backup withholding, or
- Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

The person who gives Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States is in the following cases:

- The U.S. owner of a disregarded entity and not the entity,