

Statement of Qualifications and Proposal

# Water System Master Plan Update and AWIA Risk and Resiliency/ Emergency Response Plan

Prepared for  
City of La Crosse Utilities

February 24, 2020



February 24, 2020

Mr. Bernard N. Lenz  
City of La Crosse Utilities Office  
400 La Crosse Street  
La Crosse, WI 54601

**Subject: Proposal for Water System Master Plan Update and AWIA Risk & Resilience/  
Emergency Response Plan**

Dear Mr. Lenz:

AECOM has developed a Water System Master Plan approach intended to culminate into a final Capital Improvements Plan that the City of La Crosse can use as a road map for future improvements to the water system infrastructure. AECOM's approach for the Risk and Resilience Assessment (RRA) and Emergency Response Plan provides a framework for the City to self-perform the required 5-year updates using the tools and training provided with our approach for the initial assessment.

Our attached proposal demonstrates our expertise and strong qualifications for the Water System Master Plan Update and AWIA Risk and Resiliency/Emergency Response Plan project.

AECOM can provide the **best value** to you on this project because:

- ◆ Our team completed your previous water system master plan and we have a strong knowledge of your water system.
- ◆ We have a master planning group that does only water system master planning, unlike other firms who focus on water system design and occasionally do master planning.
- ◆ We have completed master plans for many Wisconsin communities, including Green Bay, Sheboygan, Verona, New London, Janesville, West Bend, Waukesha, La Crosse, and Plover.
- ◆ Our Stevens Point Team is nationally recognized as experts in hydraulic model development and calibration.
- ◆ We have performed numerous modeling evaluations associated with pending La Crosse construction projects.
- ◆ Our systematic, repeatable, and defensible approach for prioritizing water main replacement needs was developed for Chicago, and, most recently, used to assist Green Bay, St. Paul, Milwaukee, Janesville, Appleton, Ann Arbor, and DuPage Water Commission.
- ◆ AECOM will guide La Crosse through a series of workshops to comply with new regulations to submit a RRA and ERP and provide guidance to City staff for the required 5-year updates.
- ◆ We have scaled RRA and ERP approaches for medium sized utilities, like La Crosse, and are currently completing RRA updates for American Water and Chicago Water.

These benefits offered by AECOM will ensure that maximum value is achieved for your budget.

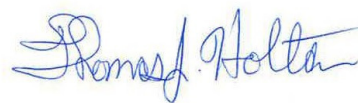
We truly enjoyed our history of working with the City of La Crosse and we look forward to assisting you on this project. If you have any questions or require additional information, please contact me.

Sincerely,

AECOM



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# 01

## Executive Summary



# Executive Summary

The Water Distribution Master Planning Update will provide the City of La Crosse with a prioritized capital improvements plan or “road map” designed to support growth and replace aging infrastructure in a cost-effective way.

The Risk and Resiliency Assessment and Emergency Response Plan will provide the City of La Crosse tools to complete the updates efficiently, a product to meet the AWIA requirements, a scalable review that provides value to the City, and training to City staff to complete future assessments and document updates.

Below we describe why the City of La Crosse will benefit from the services of the AECOM Stevens Point Team.

## Proven Team

The City of La Crosse will benefit with AECOM’s sound foundation of hydraulic modeling and master study experience. This experience is essential to performing a hydraulic analysis of a water system. AECOM’s Project Team consists of engineers who have dedicated their careers to the drinking water industry, especially to the analysis and design of water distribution systems. The Project Team members also serve as technical experts on master planning and modeling projects for AECOM throughout North America.

The Stevens Point based AECOM Project Team has created more than 25 models in the last 5 years and has worked on hydraulic models and system evaluations for communities such as Green Bay, Janesville, Verona, Sheboygan, Milwaukee, New London, La Crosse, Weston, West Bend, the greater Atlanta Area, Miami, Air Force bases, and others. The full list of modeling work is included as Attachment A.

## Specializes in Water System Master Planning

Many water design firms are occasionally asked to develop master plans. AECOM’s Stevens Point Master Planning Team works almost exclusively on water system master planning and is considered the national center of excellence for master planning and hydraulic modelling within AECOM.

The City of La Crosse can benefit from the lessons AECOM has learned while performing planning associated with many water systems, including the City of La Crosse’s water system.

The City of La Crosse will benefit from an engineer who:

- ✓ Proven Team
- ✓ Specializes in Water System Master Planning
- ✓ Superior Knowledge of Hydraulic Modeling’
- ✓ Understands your Water System
- ✓ Successful Calibration Approach
- ✓ Risk and Resiliency and ERP Expertise

*AECOM meets these needs!*

## Superior Knowledge of Modeling Technology

From experience with the latest state-of-the-art water system hydraulic modeling technologies, the AECOM Project Team offers the benefits of a modeling approach that best meets your needs.

The hydraulic model that is updated and calibrated for this project will take into consideration the long-term requirements of the City and integration with other systems. The hydraulic model control strategy will be updated to reflect the efforts made to reducing pumping costs by City staff. This will provide you with the greatest long-term value.

We own licenses and thoroughly understand all of the mainstream software packages. We can provide an experienced opinion to the City of La Crosse regarding the best software platform for your needs.

**Water system master planning is not a “hobby” for the AECOM Master Planning Team**

## Understanding of the City of La Crosse's Water System

The City of La Crosse will benefit from AECOM's understanding of the unique facets of your water system based on information we learned during the last master planning process, numerous practical evaluations throughout the years using your model, and based on our exposure to a multitude of water challenges experienced by other municipalities. Examples of the unique characteristics of the City of La Crosse's water system include:

- ◆ A primary large reservoir that needs to be "turned over".
- ◆ A variety of available wells, but a strategy that focusses on specific wells to meet hydraulic needs while minimizing electrical costs.
- ◆ The need to manage manganese in the raw water.
- ◆ Challenging elevation changes toward the east.
- ◆ Somewhat of a system divide presented by the La Crosse River Marsh Area.
- ◆ Potential water quality challenges associated with perfluorinated compounds on French Island.

## Proven Approach to Model Calibration

*A hydraulic model will only benefit the City of La Crosse if the model is properly calibrated.*

AECOM firmly believes that a properly calibrated model provides the confidence needed to make significant capital planning decisions.

The proper model calibration of a complex water distribution system is a true challenge that not many firms can achieve. The key to AECOM's success is our proven, structured approach; advanced testing equipment; and the experience of our engineers. AECOM has developed an approach that has been successfully adopted for model calibration in many communities. It relies on the following:

- ◆ Design of a structured field testing program
- ◆ A stringent field gauge calibration program
- ◆ Macro and micro model calibration
- ◆ An adequate number of field tests
- ◆ Utilization of C-Factor Aging Theory
- ◆ Use of 24 to 36 digital pressure logging devices

We have developed many techniques for streamlining the calibration data and importing data, such as importing calibration and other model data and customer billing data that can be linked to customer parcels, to automatically assign water demands in the model.

## Risk and Resiliency and ERP Expertise

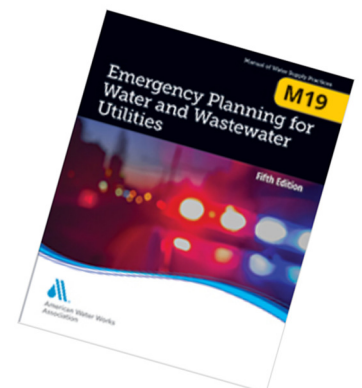
*AECOM understands many of the vulnerabilities of the La Crosse system from performing the previous vulnerability assessment that was required by the EPA.*

AECOM's lead water system risk assessor, Angel Gebeau, has assisted with over 40 projects including vulnerability assessments, emergency response plans, or America's Water Infrastructure Act Risk Assessments and Emergency Response Plans. She served as a reviewer for the 2003 La Crosse vulnerability assessment and most recently performed the RRA gap analysis for the City of Houston, Texas water utility.

The AECOM team understands the requirements of the America's Water Infrastructure Act and has developed several approaches while assisting similar municipal requirements with meeting this need.

Based on AECOM's local and national expertise, we have determined the **top ten** elements of successful Risk and Resiliency Assessment and ERP as follows:

1. Ensure clear management commitment and select an empowered internal project manager who will be a project champion.
2. Engage staff from across the City.
3. Brainstorm to identify risk tolerance early in the RRA.
4. Reduce the RRA threat / asset pairs to a manageable level.
5. Address cyber security in both the RRA and the ERP.
6. Be sure to address the new requirements of the AWIA, such as financial.
7. Anticipate worsening disaster events.
8. Address employee and family preparedness.
9. Provide for appropriate emergency measures for electrical power and address emergency transportation measures.
10. Include provisions for regular training and exercises.



# 02

## Project Understanding and Approach



# Project Understanding and Approach

The request for proposals (RFP) provides a scope of the services to be provided for this project for the Water System Master Plan Update and the detailed requirements for performing a Risk and Resilience Emergency Response Plan that AECOM will follow for this project. AECOM's end goal for the project is to provide a 20-year capital improvement plan that will serve as a road map for the City of La Crosse Utilities to follow during the next decade.

The City of La Crosse will benefit from the proven approach that AECOM has established from years of water system supply and distribution system master planning experience including the development of a detailed capital improvements plan.

AECOM's approach to the water system master plan is best explained by describing the tasks to be performed in support of the project. The following provides a detailed description of the services to be provided by AECOM.

## Phase 1: Water System Master Plan - Hydraulic Model Update and Calibration

Task	Description
1	Review Existing Model and Project Management Plan
2	Model Update
3	Field Tests
4	Model Calibration

## Phase 2: Water System Master Plan - Water System Evaluation and Projections

Task	Description
1	Population and Community Growth Projections
2	Water Requirements
3	Existing Water System Facilities
4	Existing and Future Water Supply and Storage Evaluation
5	Water System Evaluation
6	Reporting

## Phase 3: Water System Master Plan – Improvement and Capital Improvement Planning

Task	Description
1	Operational Improvements
2	Water System Improvement Planning
3	20-Year Capital Improvements Plan Development
4	Reporting

## Water System Master Plan Optional Tasks

Task	Description
1	Water Main Replacement Rate Analysis
2	Water Main Replacement Prioritization Analysis
3	Leak and Break Analysis
4	Water Loss Evaluation

## Phase 4: AWIA Risk and Resilience/Emergency Response Plan

Task	Description
1	Risk and Resilience Assessment (RRA)
2	Emergency Response Plan (ERP)

## AWIA Risk and Resilience/Emergency Response Plan Optional Tasks

Task	Description
1	Meeting Minutes
2	Spreadsheet Calculations and Updates
3	Cost Estimating

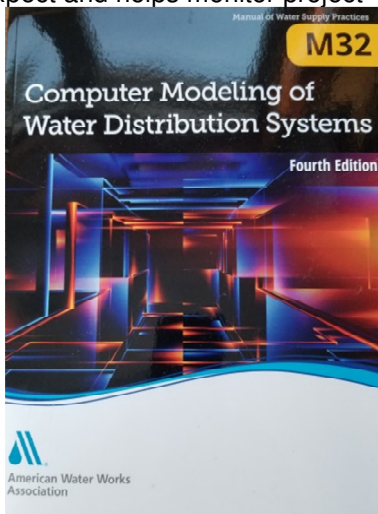


# Phase 1: Water System Master Plan – Hydraulic Model Update and Calibration

## Task 1: Review Existing Model and Project Management Planning

Understanding and meeting client requirements is the foundation for AECOM's quality through teamwork philosophy. The primary goals of the project planning component are to clearly define your requirements and expectations in terms of deliverables, project schedule, and budget; and to manage the project to meet those requirements. Communication is the key to this process and an important tool to facilitate this communication is the project management plan.

A project management plan will be prepared during project initiation. To develop the project management plan, key team members will complete an initial review of available information obtained from the City including the existing hydraulic model. Following the review, AECOM will discuss the findings and proposed plan with the City. From this discussion, an approach will be finalized, including agreeing on required deliverables and milestones. An approach focusing on specific deliverables helps everyone understand what to expect and helps monitor project progress. The project management plan will also clearly define individual team member responsibilities, including those team members from the City departments and others who may participate in the project. The project management plan sets out the road map for the project, but it is important for ongoing communication to occur throughout the duration of the project.



The purpose of this task is to understand the system, the current model, and the clearly define the requirements, expectations, and schedule as part of a project management plan to meet those requirements.

For this task, AECOM will provide the following services:

1. Prepare a project management plan that will identify team member responsibilities, lines of communication, schedule, and key milestones. The draft project plan and schedule will be submitted to the City for review and approval.
2. Review existing model and available water system data from City.
3. Prepare a data needs list.
4. Conduct a project kick-off meeting with key representatives of the City and AECOM and discuss the project management plan and information needed to complete the project.
5. Prepare a quality control/quality assurance plan.
6. Prepare a meeting schedule for project team members and City staff to review progress and project schedule.
7. Coordinate monthly conference calls to discuss status of project and any challenges.
8. Provide monthly written progress reports summarizing the status of project tasks and planned activities.

### Deliverables

- ◆ Data needs request.
- ◆ Meeting agendas and minutes of meetings.
- ◆ Monthly progress reports.
- ◆ Draft and final project management plan.
- ◆ Project schedule.
- ◆ Quality control/quality assurance plan.

## Task 2: Model Update

The City currently has an existing hydraulic water system model and GIS mapping of the existing distribution system. AECOM will work with City staff to obtain the information on the water system that is needed to update the existing hydraulic model.



For this task, AECOM will provide the following services:

1. Discuss modeling software options with City staff, which are compatible with GIS and help the City make a decision on which software should be used for the project.
2. Update existing water system model to ensure that it accurately represents the existing water system, including model pipes, elevations, pressure zones and closed valves.
3. Update water system facilities, such as pump stations, wells, and storage tanks, in the hydraulic model based on available information from City, as necessary.
4. Assign water demands to model junction nodes using automatic routines to link billing data and meter consumption to demand nodes in the model.
5. Automatically transfer ground elevations from available GIS contours or digital terrain models to the hydraulic model.
6. Modify control strategy in the hydraulic model based on current operating procedures based on discussions with the City.

*AECOM is a strong believer in using continuous pressure monitoring devices for model calibration and the Stevens Point office owns 36 pressure monitoring devices.*

### Assumptions

- ◆ Pump tests will not be performed as it is AECOM's understanding that the City has the information available for the water system model.
- ◆ City will provide 2 to 3 personnel to assist with field testing and who will operate all valves. AECOM will provide 1 person for 4 days.

## Task 3: Field Tests

The purpose of field testing is to provide information on pressures, flows, and operating characteristics of the system that will be used to assist AECOM with calibration of the hydraulic model.

The following tests are proposed as part of the study:

- ◆ Extended period pressure monitoring at key locations throughout the water distribution system (macro approach).
- ◆ Flow and pressure tests at fire hydrants (micro approach).
- ◆ C-factor tests.

AECOM owns all the equipment needed to perform these field tests, and AECOM's engineers are trained and experienced in performing these types of tests for utilities.

For this task, AECOM will provide the following services:

1. Prepare a field test work plan that will identify the following:
  - a. Test location.
  - b. Purpose of test.
  - c. Information to be collected at the test site and other monitoring locations.
  - d. Forms for recording test information.
  - e. Field testing schedule.
2. Submit field testing work plan to City staff for discussion and agreement prior to performing the field tests and finalize the work plan based on comments from City staff.
3. Perform a minimum of 5 c-factor tests.
4. Perform a minimum of 20 flow and pressure tests.
5. Identify locations for installation of 24 to 36 continuous pressure monitoring devices for installation.
  - a. During the flow testing period, the continuous pressure monitors will provide additional data locations to improve model calibration.
  - b. The devices will remain in the system for approximately 1 week to collect data every 15 seconds for macro calibration.
6. Summarize the results of the field tests and submit to the City.

## Task 4: Model Calibration

The purpose of the model calibration process is to ensure that the model represents the real system as accurately as possible. It is proposed that model calibration be performed using macro and micro approaches to ensure that the model most accurately represents the existing distribution system.

### Macro Calibration – Extended Period Calibration

Macro calibration compares how accurately the model represents the water system under normal operating conditions. This is usually performed over an extended time period, and the model will be operated under known demand and operating conditions and will be compared with field measurements gathered during field testing. Adjustments for doing this level of calibration usually address variations in water demands, and operation of pump stations and storage facilities.

For this subtask, AECOM will provide the following services:

1. Prepare modeling scenarios to reflect field testing operating conditions.
2. Perform model simulations under field test operating conditions.
3. Prepare time-related graphs comparing modeling results to SCADA and field testing measurements.
4. Adjust modeling parameters to improve macro calibration results.
5. Summarize results of model calibration in a technical memorandum and submit to the City.

### Micro Calibration – Steady-State Calibration

Micro calibration examines how accurately the model represents the water system under stressed (high flow) conditions such as fire demands. Adjustments to C-factors are most effective to achieve micro calibration. AECOM's approach using C-factor aging curves will be used during the micro calibration to ensure "global" calibration rather than local calibration.

For this subtask, AECOM will provide the following services:

1. Prepare modeling scenarios to reflect field testing operating conditions.
2. Perform model simulations under field test operational conditions.
3. Prepare table comparing model results to flow test data and continuous pressure monitors.
4. Adjust modeling parameters to improve micro calibration.
5. Summarize the results of calibration in a technical memorandum and submit to the City.

### Deliverables

- ◆ Field Testing and Model Calibration Summary (technical memorandum).
- ◆ Calibrated hydraulic model (electronic files).

### Assumptions

- ◆ The City will provide customer meter data in a format usable for demand allocation (link between customer billing data and location (parcel, customer meter, service, etc.)).
- ◆ SCADA data will be available in electronic format during the time period of field testing.
- ◆ If model calibration does not meet the general industry standards within the budgeted hours, AECOM will make recommendations to the City for additional field work and model calibration. For example, unknown closed valves can sometimes prevent the model from being calibrated accurately.



*The hydraulic model is only as good as the calibration effort.*

## Phase 2: Water System Evaluation and Projections

### Task 1: Population and Community Growth Projections

The purpose of this task is to clearly identify the water service area boundary and growth projections over the planning period. AECOM will achieve this by close communication between City staff to ensure an understanding of how the City of La Crosse is projected to grow over the planning period. This is of critical importance to the overall project, because the type of growth and its location will have a direct influence on overall water requirements that need to be provided.

For this task, AECOM will provide the following services:

1. Gather information on service area and historical and projected growth information available from City Planning Department staff. Include any growth as defined in boundary agreements with surrounding communities.
2. Evaluate ability and cost effectiveness to serve the Highway 14/61 corridor.
3. Review City of La Crosse future land use plans.

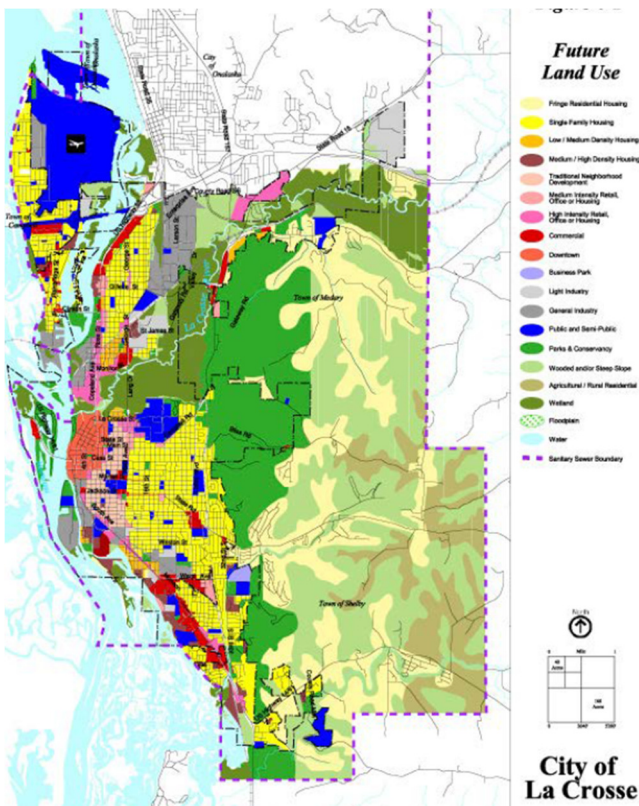
4. Summarize the information provided by the City and the City planners in the form of anticipated population growth over the planning period.
5. Work with planners to identify the 20 year buildout of areas to be potential expanded and developed in the City of La Crosse.
6. Develop a map showing likely land use and growth areas with associated timing and include potential interconnections with neighboring utilities.
7. Meet with City staff and City planners to discuss population growth and development in the City and projected growth along with future land use plans.
8. Prepare a Master Plan Update draft chapter on population and community growth for review by City staff.
9. Finalize the population and community growth report chapter based on comments from City staff.

#### Deliverables

- ◆ Draft and final report chapter.

#### Assumptions

- ◆ Future land use information will be available.



*Future growth planning projections form the backbone for projecting future (20-year) water consumption projections and reaching consensus regarding projections is essential for successful development of a master plan.*

## Task 2: Water Requirements

The purpose of this task is to establish the water requirements for the City of La Crosse over the planning period. The water requirements will be the driving force on determining whether the existing system has sufficient capacity to meet those needs and the types and locations of future improvements. AECOM will follow a well-established and approved process for determining existing and future water requirements.

For this task, AECOM will provide the following services:

1. Review existing historical water demands and characteristics by type (residential, multi-family, commercial, industrial, and public). Summarize this information in tables and figures to illustrate key characteristics of historical water demands.
2. Establish per capita water use for different categories of users and compare this with Wisconsin and national averages.
3. Review information provided by the City for high volume water customers. Provide the City with a survey form for use in soliciting input from high volume customers regarding their water need characteristics and potential future changes in business activity that may impact water consumption. Review the results of the survey and coordinate with the hydraulic model.
4. Perform a summary of historical non-revenue water (NRW) and provide an opinion on acceptable levels for non-revenue water.
5. Establish maximum day ratio to be used for water requirement projections. The maximum day water demand ratio will be established based on a historical analysis of average and maximum water demands.
6. Establish peak hour ratios to be used for water requirement projections. Diurnal demand curve (hourly demand fluctuations) will be developed from review of existing supervisory control and data acquisition (SCADA) data for each pressure zone to determine the peak hour ratio.

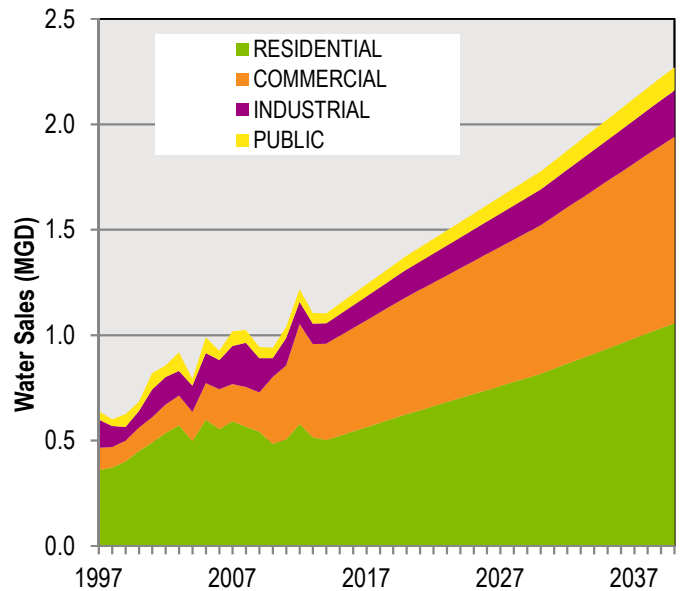
7. Project future water consumption and pumpage. These projections will be made based on the projection of population increase, as defined under Task 1 and the future land use throughout the service area to be provided with water over the planning period. In addition, information from existing large users will be requested in the form of a survey to establish their current water usage and potential increase or trends over the planning period to ensure that they are adequately included in the projections of water requirements. The water consumption and pumpage projections will be performed for each pressure zone.
8. Prepare a Master Plan Update draft chapter summarizing the water requirements, and discuss the requirements with City staff.
9. Finalize the chapter on water requirements based on comments from City staff.

### Deliverables

- ◆ Draft and final report chapters.

### Assumptions

- ◆ SCADA data will be available in electronic format.



Example Water Projections by Customer Classification

### Task 3: Existing Water System Facilities

The purpose of this task is to summarize the details of each water system facility operated and maintained by the City.

For this task, AECOM will provide the following services:

1. Request information on all existing water system facilities and proposed 5-year CIP projections through the City Engineering Department and Utility.
2. Prepare a summary of existing water system facility information in the form of tables and figures.
3. Prepare a water system map identifying the locations and types of key water system facilities and identifying proposed projects in the 5-year CIP plan.
4. Prepare a schematic of the overall water system.
5. Prepare a draft of the report chapter that discusses overall existing water system facilities.
6. Finalize the chapter based on comments from the City.



#### Deliverables

- ◆ Draft and final report chapters.



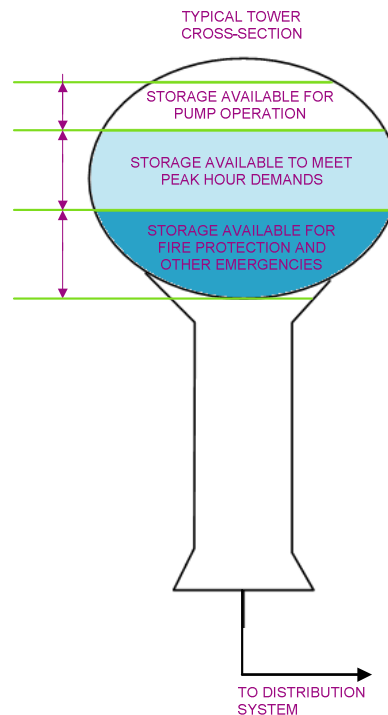
### Task 4: Existing and Future Water Supply and Storage Evaluation

The purpose of this task is to evaluate the water supply and storage available to the existing and future water system based on future demand projections and growth areas.

1. Perform a water supply analysis to determine the ability of the system to meet current and future water needs, and to identify any shortfalls.
2. Evaluate pumping facilities' capacities to ensure they are adequate to provide water to customers throughout the service area.
2. Perform both steady-state and EPS analyses to determine required water storage needs. Use the hydraulic model to assist in the overall supply and storage needs analysis.
3. Perform a supply and storage analysis to determine the required water storage capacity.
4. Prepare a Master Plan Update draft chapter summarizing the supply and storage analysis.
5. Discuss with City staff at Deficiency Workshop.
6. Finalize the report chapter based on comments from City staff.

#### Deliverables

- ◆ Draft and final report chapters.



## Task 5: Water System Evaluation

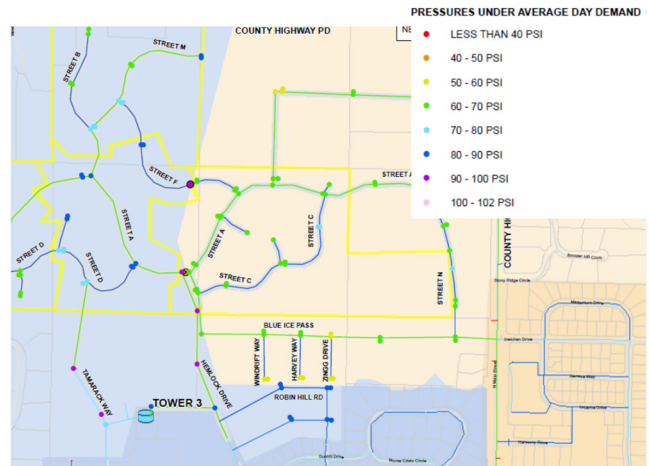
The purpose of this subtask is to evaluate the capacity of the existing water system to meet the current and future customer requirements of providing water at adequate flows and pressures.

For this task, AECOM will provide the following services:

1. Perform hydraulic model simulations to evaluate available pressures, fire flows, and water age throughout the water system. Use the hydraulic model to identify locations in the piping system with unusually high headlosses or high velocities.
2. Prepare color-coded maps illustrating water system pressures and available fire flows.
3. Evaluate and report on the system improvement, or lack thereof, of proposed 5-year CIP project (project by project). Make recommendation for keeping projects in the budget or for re-prioritizing spending.
4. Identify system deficiencies on a map and prioritize/rank significance of each.
5. Prepare a map of water age and identify points or areas of oldest water under various seasonal pumping scenarios.
6. Prepare exhibits and conduct a workshop with City staff to discuss the system deficiencies identified, evaluation of 5-year CIP, and solicit feedback on conceptual improvements.
7. Prepare a Master Plan Update draft chapter summarizing the water system evaluation.

### Deliverables

- ◆ Workshop presentation.
- ◆ Draft and final report chapters.



Example Map illustrating Water System Pressures from Hydraulic Model

## Task 6: Reporting

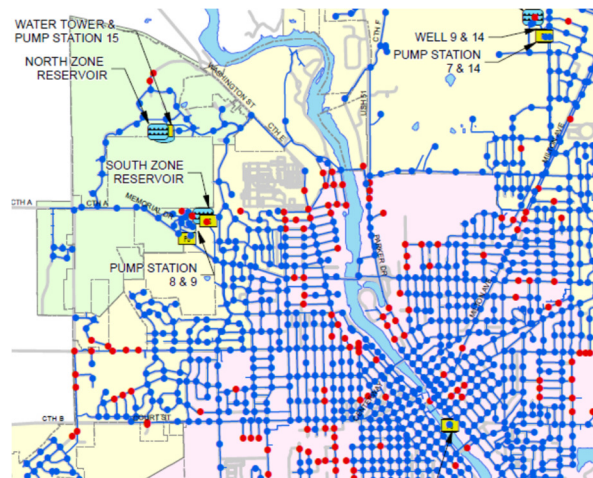
This task addresses the final report for the study.

For this task, AECOM will provide the following services:

1. Prepare a draft report.
2. Finalize the draft report based on the comments provided by the City.

### Deliverables

- ◆ Draft and final report chapters.



Example Map illustrating Pass/Fail of Fire Hydrants meeting Estimated Fire Flow Requirements Based on Land Use

## Phase 3: Improvement Engineering

### Task 1: Operational Improvements

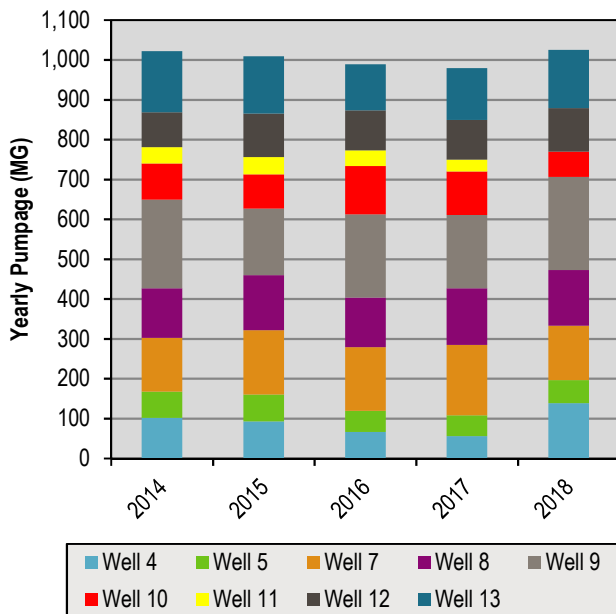
The purpose of the operational improvements subtask is to identify areas in current operational practices that may be leading to deficiencies in the system (low pressure, water age, etc.) and suggest alternate approaches to reduce or eliminate said deficiencies.

For this subtask, AECOM will provide the following services:

1. Compare operational practices to modeled deficiencies for correlation
2. Identify operational practices related to deficiencies and describe how they contribute
3. Propose alternate operational practices (in addition to infrastructure improvements) to help mitigate these deficiencies

#### Deliverables

- ◆ Draft and final report chapters.



Example Graph of Historical Well Pumpage

### Task 2: Improvement Planning

The purpose of this task is to outline water system improvements that are required over the planning period to ensure that both regulatory and customer requirements are met.

For this task, AECOM will provide the following services:

1. Identify current pressure zone boundaries to ensure that customer services are maintained or improved.
2. Identify future pressure zones that need to be created to ensure that future service areas can be adequately supplied with water.
3. Establish the number and tentative locations of additional water supply sources (wells) that are needed to meet existing and future water demands (if any).
4. Identify the need for upgrading the existing booster pump stations to ensure that water can be transferred from the wells to the current pressure zones and the identification of additional booster pump stations that may be required to service future pressure zones and to ensure reliability of supply to existing pressure zones.
5. Identify the capacity and location of additional storage needs, if needed.
6. Identify improvements to the water distribution system to ensure that adequate water can be transmitted to customers at required flows and pressures. This evaluation includes both the existing water distribution system and expansion of the water distribution system in areas of new development.
7. Develop a map and schematic that illustrates the recommended system improvements.
8. Conduct a workshop with City staff to discuss the recommended improvements and solicit their input on the recommended improvements.
9. Prepare a draft chapter summarizing the recommended water system improvements.
10. Meet with City staff to discuss the improvements and finalize the report based on comments from City staff.

#### Deliverables

- ◆ Workshop presentation.
- ◆ Draft and final report chapters.



### Task 3: 20-Year Capital Improvements Planning

The purpose of the 20-year capital improvement plan is to establish the short- and long-term improvements required to meet the growing water demands and growth in the City. The capital improvement plan will document both recommended timing and cost for system improvements that are required over the planning period.

For this task, AECOM will provide the following services:

1. Estimate costs and prepare a prioritized capital improvement plan for water system improvements for the 20-year planning horizon that is compatible with City policies and financial goals.
2. Discuss the capital improvement plan with City staff.
3. Finalize the capital improvement plan based on comments from City staff.

#### Deliverables

- ◆ Draft and final report.

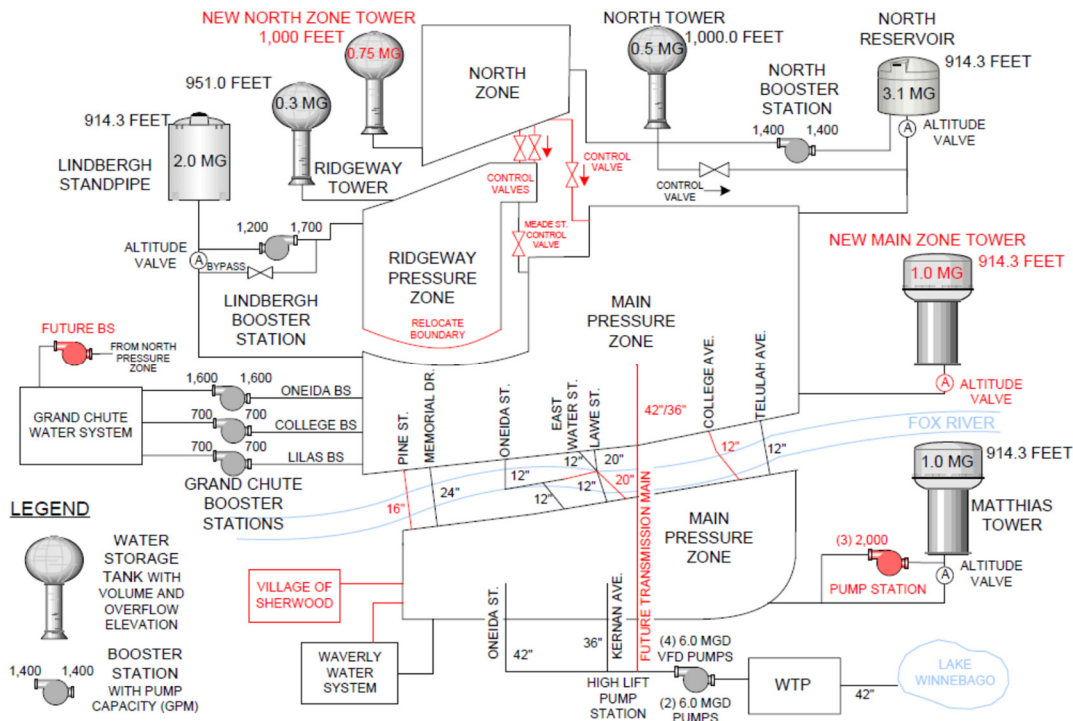
### Task 4: Reporting

This task addresses the final report for the study. For this task, AECOM will provide the following services:

1. Prepare a Master Plan outline for review by City staff.
2. Prepare a draft report including findings, recommendations, capital cost estimates and implementation schedule of recommended improvements.
3. Review the draft report with the City and finalize the report based on comments from City staff.
4. Provide a presentation of project results to City.

#### Deliverables

- ◆ Outline, draft and final report.
- ◆ One meeting.



**Example Future Water System Schematic with Recommended Improvements for the City of Appleton**

# Optional Tasks

## Task 1: Water Main Replacement Rate Analysis

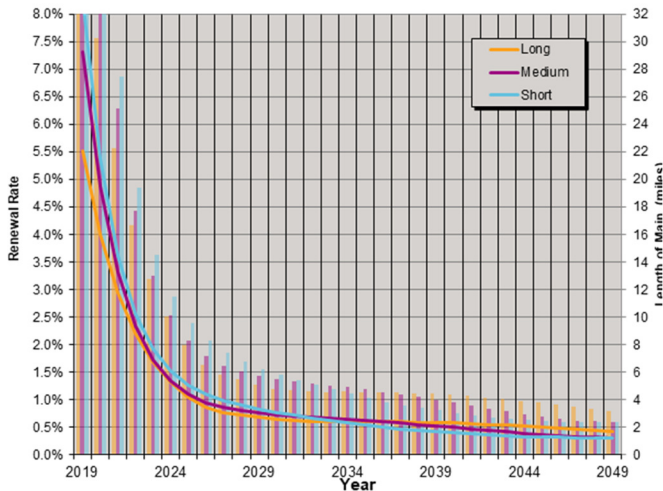
The purpose of this analysis is to provide the City of La Crosse with guidelines for long-range water main rehabilitation and replacement strategies.

For this task, AECOM will provide the following services:

1. Review survival curves and update as necessary.
2. Enter information on water main material, length, age, and diameter into AWWARF's KANEW model similar to the last Master Plan.
3. Perform macro analysis of needed replacement rate for water mains using the KANEW software.
4. Provide benchmarking information based on average retirement rates for the Class AB water systems in Wisconsin using the PSC annual report data.
5. Prepare a technical memorandum on the results and conclusions from the KANEW analysis.

### Deliverables

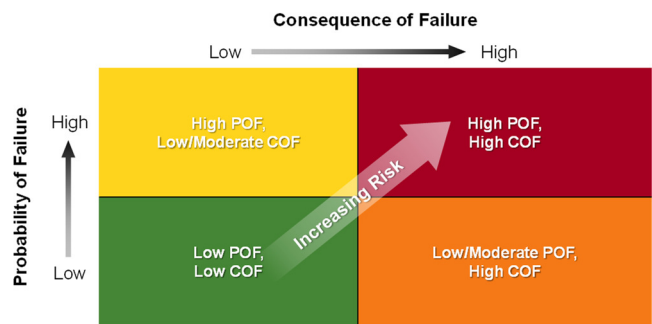
- ◆ Draft and final technical memorandums.



Example Annual Water Main Renewal Rates based on Short and Long Life Expectancies

## Task 2: Water Main Replacement Prioritization Analysis

The purpose of this task is to provide a systematic methodology for the prioritization of water main replacement based on the consequence of failure (COF) and probability of failure (POF) for each water main. AECOM will modify the previous prioritization analysis to be a risk-based approach and consider the pavement replacement program.



For this task, AECOM will provide the following services:

1. Request additional information required to perform risk analysis.
2. Present a risk-based approach for establishing COF and POF components for water mains to City staff based on previous prioritization analysis performed.
3. Determine COF and POF score and weight factors to be used in the prioritization analysis.
4. Create a prioritization model for the City of La Crosse water mains based on the agreed upon components and weighting factors.
5. Prepare a color-coded water system map to illustrate the location and timing of recommended water main replacements.
6. Conduct a workshop with City staff to discuss the results of the KANEW and prioritization analyses.
7. Prepare a technical memorandum based on the results and conclusions from the risk analysis.

### Deliverables

- ◆ Workshop presentation.
- ◆ Draft and final technical memorandums.

## Task 3: Leak/Break Analysis

The purpose of this task is to analyze historical water main leak and break trends based on available break and leak records to help identify age and material classes of pipes at higher risk of failure. Such data will be used to assist with the water main replacement program.

For this task, AECOM will provide the following services:

1. Analyze the frequency of leaks/breaks per 100 miles of water main per year historically and benchmark with other data available.
2. Evaluate leak and break history to assist in determining water failure trends and in identifying an appropriate water main replacement strategy. Trends to evaluate include:
  - a. Correlation with year reported.
  - b. Correlation with diameter.
  - c. Correlation with material.
  - d. Correlation with material and installation date.
  - e. Correlation with pressure zone.
  - f. Correlation with water system pressure.
  - g. Correlation with age of pipe.
3. Provide benchmarking information based other available data.
4. Prepare a draft report chapter summarizing the results of the evaluation.
5. Finalize the chapter based on comments from the City.

### Deliverables

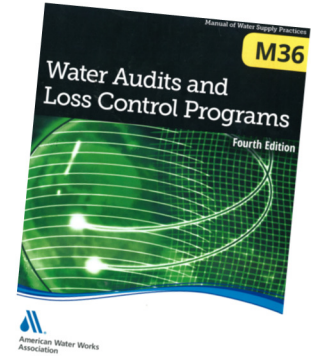
- ◆ Draft and final technical memorandums.

### Assumptions

- ◆ Historical leak and break data is available in an electronic format spatially (GIS) such that each leak/break event location can be accurately assigned to a location on a specific pipe segment.

## Task 4: Water Loss Evaluation

For the purpose of identifying opportunities to reduce water loss, including leak detection, AECOM will assist City staff with preparing a detailed water balance in accordance with AWWA Manual M36. The M36 process is similar to the water audit required by the PSC, but is more detailed and structured. AECOM believes that the process of developing the M36 water balance will help the City understand all the uses of water, may demonstrate less real water losses than currently reported, and will help understand the cost-effectiveness of real loss recovery options, such as leak detection.



For this task, AECOM will provide the following services:

1. Perform a water balance to establish key water loss parameters (non-revenue water, non-metered water, unavoidable annual real losses, current annual real losses (CARL), infrastructure leakage index (ILI), and cost of water losses).
2. Compare key indicators with other communities.
3. Evaluate alternative forms of active leakage control (ALC), including leak detection.
4. Evaluate the feasibility of early water leak indication techniques, such as minimum night flow trending.
5. Recommend categories of water use for which more detailed data collection efforts are warranted.
6. Recommend options for possibly improving the water audit, lowering non-revenue water, and lowering real water losses in the future.
7. Prepare a draft report chapter summarizing the results of the evaluation.
8. Finalize the chapter based on comments from the City.

### Deliverables

- ◆ Draft and final technical memorandums.

### Assumptions

- ◆ City staff will assist with the water balance data collection and completion.

## Phase 4: AWIA Risk and Resilience/Emergency Response Plan

On October 23, 2018, the president signed into law the American Water Infrastructure Act (AWIA) which amends the Safe Drinking Water Act (SDWA). AWIA is Public Law 115-270. The AWIA includes revisions for Community Water System (CWS) risk and resilience.

Section 1433 of the Safe Drinking Water Act titled - Community Water System Risk and Resilience was amended by the AWIA. The regulatory requirements from AWIA include:

1. Update Risk and Resilience Assessments (RRA)
2. Update Emergency Response Plans (ERP)
3. Submit a Certification Letter to EPA for each
4. Review, update, and record updates at a minimum every 5 years after the initial certified updates.

This scope will assist the City with the AWIA required updates to the RRA and ERP.

Updating the RRA and ERP will be an ongoing requirement for water systems; therefore, our proposed scope includes the City working with AECOM to prepare the RRA and ERP so they will be ready to complete updates in the future with occasional external support for the work in key areas of specialty such as cyber security reviews.

For the RRA and ERP updates, AECOM is proposing two tasks. **Task 1**, Updates for the RRA, will include 3 workshops that will serve as hands on training opportunities for City staff.

**Task 2**, Updates for the ERP will include 1 workshop and 1 meeting with City Staff.

**Optional tasks** are provided if the City would prefer to have AECOM perform more of the work to reduce the load on City staff to complete the project.

The following sections outlines the two tasks and the corresponding workshops/meeting.

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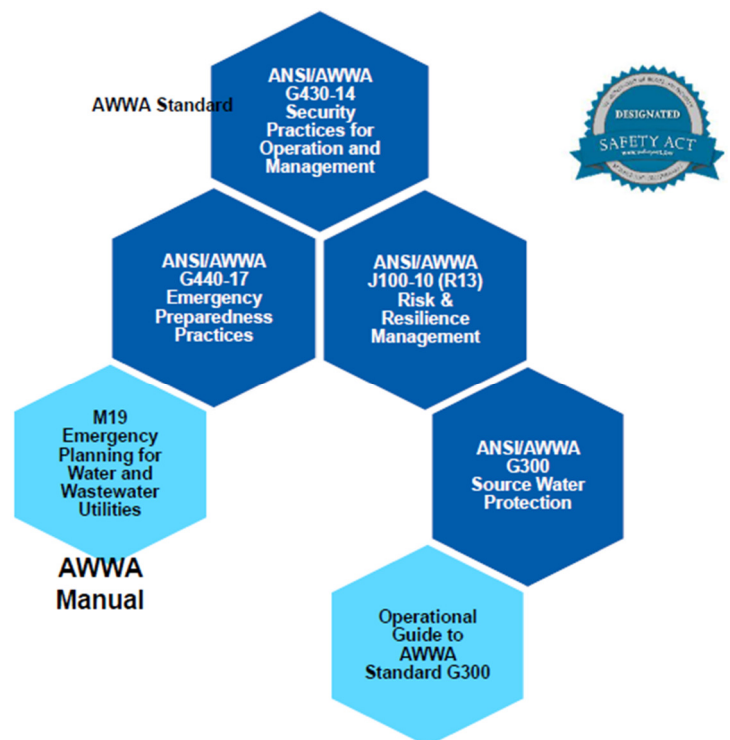
Note: This section addresses the RFP Task – Risk Setting in that the City requirements, expectations, and acceptable level or risk will be a part of the discussion in the capital improvement plan review and selection noted in Task 1 Updates for RRA Workshop 3.

### Task 1: Updates for RRA

The new AWIA requirements regarding RRAs include:

1. Threats from natural hazards are to be included with the original “malevolent acts” threats.
2. Cyber assets must be added for RRA review.
3. The financial infrastructure must be added for RRA Review.
4. A list of capital improvements based on RRA results should be included.

EPA is required to accept RRA documents completed using industry standard practices. Therefore, AECOM has provided an approach that generally follows the AWWA J100 standard. Another benefit to following the AWWA J100 standard is the standard has been “Designated” approved to meet Safety Act requirements. Use of “Designated Safety Act” standards reduces the potential liability and legal action against a water system after an adverse event.



The original RRA document was a Vulnerability Assessment (VA) created in 2003 by AECOM (formerly known as Earth Tech). The report has not been updated; however, the City remains engaged in monitoring and ensuring system security.

VAs are similar to RRAs in that a methodical approach is used to compare assets and threats to determine risk. RRAs are an improvement on the original VA in that risks associated with natural hazards are added into the review process and a new evaluation criterion has been added for resiliency. As such, an update to the previous VA alone will not meet the needs for the City; however, the previous VA can serve as a guideline for updates to be added into the system.

The proposed RRA would follow the AWWA J100 Methodology which includes:

1. Asset Characterization - identify critical assets
2. Threat Characterization - select appropriate threats and hazards
3. Consequence Analysis - determine consequences for each threat-asset (T-A) pair
4. Vulnerability Analysis - estimate effectiveness of existing mitigation measures
5. Threat Likelihood Analysis - determine threat likelihood
6. Risk/Resilience Analysis - determine baseline risk and resilience
7. Risk/Resilience Management - Apply mitigation measures and re-evaluate risk and resilience

The calculations used for the J100 process are:

$$R = C \times V \times T, \text{ where:}$$

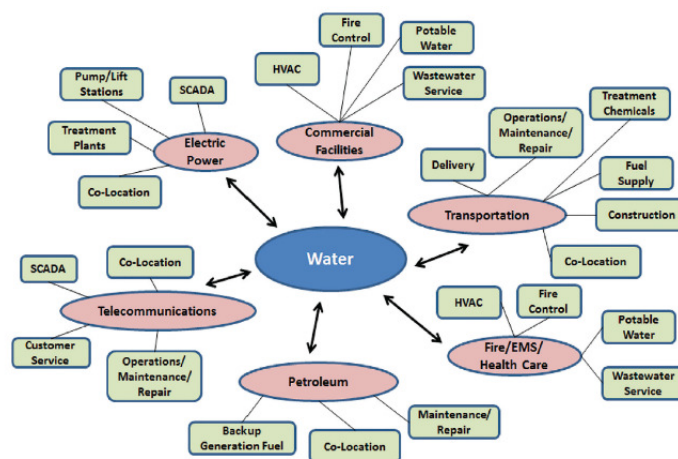
- R = Risk
- C = Consequences
- V = Vulnerability
- T = Threat Likelihood

$$Re = D \times S \times V \times T, \text{ where:}$$

- Re = Resilience
- D = Duration
- S = Service Denial
- V = Vulnerability
- T = Threat Likelihood

The J100 process will be modified slightly to remove direct calculations and use scoring measures of low, medium, and high to reduce the complexity of the review process and match the scope of the RRA to the community size.

AECOM will work through the RRA process with the City in a series of workshops that will provide a transparent process and a path for the City to self-perform the work at the recertification period in 5 years. Each workshop should be scheduled for 6 to 8 hours.



FMS: emergency, management system, HVAC: heating, ventilating, and air conditioning, SCADA: supervisory control and data acquisition  
 Source: Morley (2012)

**AWIA requires review of Water Utility interdependencies. Industry available lists such as provided in this figure, will help the team quickly evaluate the interdependencies for the RRA.**

**Workshop 1**

At the first workshop, AECOM and the City of La Crosse team will start with a quick training and review of the J100 process and why this process is approved by AWIA and protects the City from liability.

A discussion on acceptable risk and the VA selected risk values versus the J100 scoring will be discussed.

Following the short training the RRA team will review the asset characterization presented in the historic VA and confirm no changes in the asset ranking has occurred since the last review. Assets such as cyber assets will be added to meet AWIA requirements.

The AECOM and City of La Crosse team will review the threats and hazards listed in AWWA J100 and the provided threat likelihoods provided from EPA. Methods to source this information will be provided for future work. This will provide the “T” value for the risk review. Threats will include malevolent, natural disaster, and dependency and proximity threats to meet AWIA requirements following AWWA J100.

For the threat review portion of this workshop, it is helpful to have law enforcement as well as City personnel at the meeting. Law enforcement can provide updates to malevolent act potential that may adjust EPA scores or provide more detail to potential routes of access or focus of malevolent activity. The City should extend the request for law enforcement attendance.

AECOM will go through how threat-asset (T-A) pairs are evaluated and a generalized analysis will be conducted to arrive at the top T-A pairs. The list of top T-A pairs will be submitted to the team for use at the next RRA workshop.

**Workshop 2**

At the second workshop, AECOM and the City of La Crosse team begin more detailed review of the consequence and vulnerability of each asset by reviewing failure modes for the selected T-A pairs. This process will also yield options for improvements that will be discussed.

To start, the 2003 standard operating procedures form completed with the vulnerability assessment will be reviewed and updated so any operational procedures that may improve resiliency are included in vulnerability review of the T-A pairs.

The AECOM and City team will complete a financial assessment checklist to meet the AWIA requirements. It is recommended that at least one person of the

financial team that completes the Public Service Commission (PSC) annual reporting on behalf of the City be available to assist with answering these questions. AECOM will provide the Financial Resilience Index Worksheet for this workshop.

At this workshop, the historic consequence of asset loss for a specific undesired event (T-A pair) will be reviewed to confirm the overall low, medium, or high characterization of that T-A pair. New T-A pairs will be added as developed in Workshop 1.

Following the consequence analysis, the vulnerability of each asset is reviewed to determine the ability of the system to prevent the event from occurring (system effectiveness evaluation). This workshop will look at the ability of the system to detect, delay, and respond to malevolent acts. The review is conducted on the T-A pairs with the highest consequences and likelihood.

Historic review of vulnerability to T-A pairs will be reviewed and new, high ranking T-A pairs will be added into the review. Additional criteria for resiliency will be added to the review to meet the improvements to the RRA process.

Availability of key asset drawings, system drawings, and key staff will assist with this analysis and provide the best quality product.

Following this meeting, the overall risk and resiliency value of low, medium, and high will be selected.



**AWWA J100 Methodology**

### Workshop 3

At the third workshop, AECOM and the City of La Crosse team will review options for improvements that will reduce risk and improve resiliency. Historic upgrades from the previous VA will be reviewed; however, no previous risk reduction evaluations will be carried forward and this review will be a fresh review of improvements.

Options that reduce the risk and improve overall resiliency will be evaluated across all the major T-A pairs (scenarios). For each improvement the AECOM and City team will review the measures of consequence, the system effectiveness (vulnerability), the threat likelihood, the duration, and service denial. Each risk reduction or resiliency improvement option will be provided a valuation of low, medium, or high.

Following the meeting, the recommend improvements list would be available. The cost for the improvements would be developed by the City with an option for AECOM to complete this task.

The City should incorporate the best value risk reduction and resiliency improvement measures in their capital improvements plan (CIP) and use the high priority items in the RRA to drive key updates for the ERP.

The selection process for improvements will document the acceptable level of risk as required in the RFP - Phase 4 item 1.

After the completion of the CIP, the City must send a certification letter noting the RRA is complete.

### Task 1 Deliverables

- ◆ Working files including spreadsheets for T-A pair review and risk and resiliency calculation, training power point slides, workshop agendas, forms for procedural reviews, and key reference tables and figures.
- ◆ A draft certification letter which highlights the scope of work completed will be provided to the City.



### Task 1 Assumptions

1. Each workshop will be one trip and up to 8 hours in length.
2. City will maintain minutes and update spreadsheets from each workshop. This reduces the needed consulting staff and provides more hands-on training for City staff. AECOM can review the workshop minutes to confirm the information at the meeting was properly conveyed and documented and the City staff have a working understanding of the concepts to prepare them for future work on these tasks. The minutes of the meeting will serve as documentation for the RRA work. – **Option 1** is for AECOM to complete this task. With this option, a second staff member from AECOM will attend all workshops to allow the trainer to focus on the discussion while the second person documents the discussion.
3. AECOM will provide the format for the spreadsheets, direction for completing the spreadsheets, and review of the completed spreadsheets. The City will populate the spreadsheets and provide the populated spreadsheets for review at least a week prior to the next workshop. **Option 2** is for AECOM to complete the spreadsheet updates at the meetings and workshops and the associated follow-up after the workshops.
4. The City will complete cost estimates for the improvement plans. **Option 3** is for AECOM to complete cost estimates for the top 10 improvements.
5. Training on RRA and the J100 format will be completed within Workshop 1 and will be less than 1 hour in length. Longer training would take away from the Workshop time and should be completed using other training tools.
6. The AWWA J100 methodology within this scope has been modified to use the low, medium, high review criteria verses numeric scores. As such, RRA modeling programs such as VSAT and PARRE will not be utilized. Upon request, AECOM will provide a cost estimate and further scope details to create a numeric score review using the PARRE program.
7. Detailed cyber security review is completed by others.

## Task 2: Updates for ERP

The AWIA updates to 1433 regarding the Emergency Response Plan (ERP) include:

1. Linking the RRA results for physical security and cybersecurity in the ERP.
2. Plans and equipment in events of malevolent act or natural hazard that threaten the ability to deliver safe water.
3. Development of alternative water source options as detailed in AWIA.
4. Strategies to aid in detection of malevolent acts or natural hazards.
5. Coordination with existing local emergency planning committees.

The following includes AECOM's approach to Task 2.

AECOM will review the existing ERP to determine where it does and does not meet the new AWIA requirements and the following 7 AWWA standard G440 major principles of ERPs:

1. Preparedness
2. Resilience
3. All-hazards approach
4. Scalability
5. Regular updates
6. Stakeholder engagement
7. Staff preparation

Following this review, AECOM will prioritize the ERP updates needed to meet the AWIA and AWWA G440 standards. AECOM will provide the gap analysis prior to Meeting 1 to aid in discussion and prioritization.

One meeting and one workshop will be held for this task.

### ERP Gap Review – Meeting 1

AECOM will meet with the City of La Crosse leadership to discuss the ERP gap analysis sent prior to the meeting and provide a proposed plan to address those gaps. Key elements from the RRA will be reviewed to discuss the most important ERP updates to improve resiliency and make a timeline to create a robust ERP document; properly scaled for the Utility size and assets.

The ERP must address the highest risk items from the RRA. Typically, distribution system contamination is a very high risk scenario for water utilities. To

address this risk in the ERP, AECOM will provide a contamination response protocol based on EPA contamination tool for the City to review and incorporate into their ERP to address this high risk item.

### Workshop 1

AECOM and City staff will hold an 8-hour workshop. At a minimum, the workshop will:

1. Coordinate a Hazard-Specific plan response related for the highest T-A pair,
2. Create a framework for alternative water supply in an emergency,
3. Update backup power plans,
4. Add cyber security emergency plans by others into the ERP document by reference,
5. Discuss lessons learned from historic emergencies such as excessive freezing services or flooding to capture in the ERP.

Based on the discussion at the ERP Gap Review - Meeting 1 other items for ERP updates may include:

- ◆ Contact updates,
- ◆ Crisis communication plans,
- ◆ Equipment lists and rental equipment companies list,
- ◆ Critical customer documentation and communication plan,
- ◆ Vendor and supplier back-up contracts,
- ◆ Additional hazard specific plans,
- ◆ Coordination of other emergency response plans such as spill response within the ERP,
- ◆ Review financial response to emergency events,
- ◆ Discuss employee preparation for emergency events.

The number of items updated in the workshop is variable and AECOM will develop the workshop agenda to prioritize training on items of key importance to the ERP meeting the AWIA requirements and allow the City to finalize items outside the workshop as needed.

The ERP is a document that will require ongoing review and updates. As such, this document is never completed, but is updated and revised to meet the City's needs.

Upon completion of items determined at the ERP Gap Review - Meeting 1 that need to be addressed to meet the AWIA requirements, the City of La Crosse Water Utilities will submit a certification letter noting the ERP is updated.

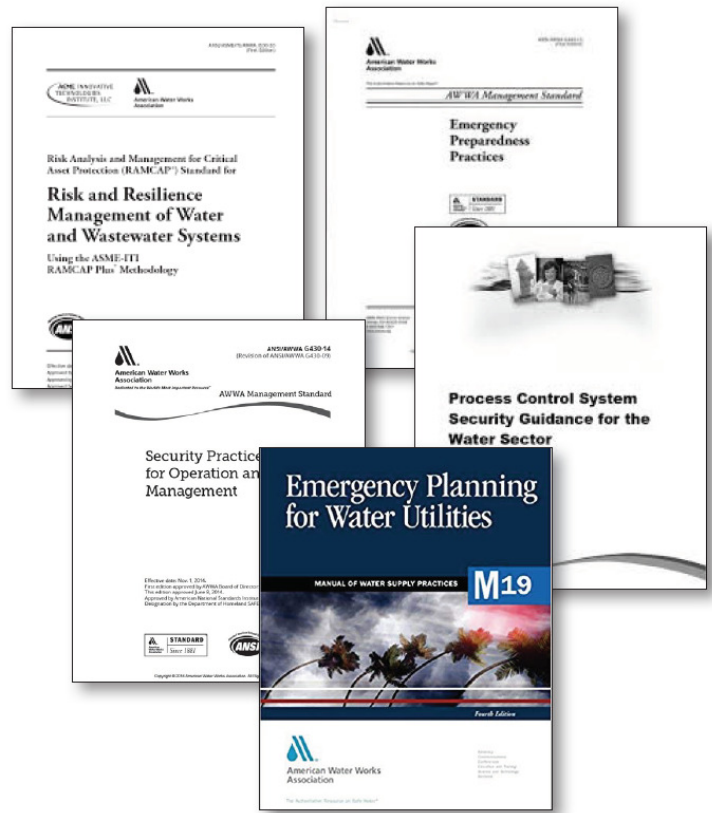


**Task 2 Deliverables**

- ◆ List of items to be completed to meet AWIA criteria.
- ◆ Contamination response plan.
- ◆ Draft certification letter for the City to utilize in the final certification letter documentation.

**Task 2 Assumptions**

- ◆ The City will provide the existing ERP at least 2 weeks in advance of the ERP Gap Review - Meeting 1.
- ◆ Meeting 1 will be a teleconference with shared screen review of common documents.
- ◆ City staff will maintain minutes and update the ERP based on the workshop discussion. This reduces the needed consulting staff and provides more hands-on training for City staff. AECOM can review the workshop minutes and ERP updates to confirm the information at the meeting was properly conveyed and documented and the city staff have a working understanding of the concepts to prepare them for future work on ERP updates. The minutes of the meeting will serve as documentation for the ERP work. – Cost for AECOM to complete these items may be provided following the ERP Gap Review - Meeting 1.



# 03

## Project Team



# Project Team

The Project Team consists of professionals throughout Wisconsin that are ready to complete a successful project. A summary of the team is provided below. Resumes for the key technical staff are included in Attachment B.

## Kathy Beduhn, P.E.

Project Manager and Water System Master Plan  
23 years of experience

MS, Civil Engineering, Michigan Technological University



BS, Environmental Engineering, Michigan Technological University

Kathy has experience in planning and design of water supply projects, including water system master planning, water system hydraulic and water quality modeling, hydraulic analysis, water loss evaluations, and water main replacement/asset management projects. For this project, Kathy will serve as the water system master plan technical lead. Kathy recently worked on the Green Bay water system master plan, water system model, and unidirectional flushing plan; and DeKalb County, Georgia, model and master plan. She has also worked on Appleton, Verona, Weston, West Bend, Plover, Sheboygan, Janesville, Miami-Dade Sewer and Water Authority, and numerous military base hydraulic models and master plans.

## Tom Degen, P.E.

Lead Technical Advisor, Quality Control  
38 years of experience

BS, Civil Engineering, University of Wisconsin - Platteville



Tom serves as a senior water engineer (part time) for the Stevens Point office and is experienced in a variety of drinking water projects. His responsibilities include project management and detailed design for a diversity of projects and clients. For this project, Tom will provide review and technical oversight of the work produced. Tom specializes in evaluation and design of water distribution systems, water system master planning, capital improvement planning, KANEW analysis, water main prioritization studies, water system vulnerability assessments, and hydraulic modeling. He recently worked on the Appleton water system master plan and has worked on studies for Janesville, City of Sheboygan, St. Paul, and Milwaukee and 16 military bases.

## Angel Gebeau, P.E., BCEE

Risk & Resiliency and Emergency Response Plan  
19 years of experience

BS, Environmental Engineering, Michigan Technological University



Angel is a senior engineer with broad experience in water utility system support from source water assessments to distribution system contamination response. Angel specializes in water quality analysis and water treatment options. Her work with the Department of Defense water utilities led to several projects for Risk and Resiliency Assessments that included All-Hazards approaches matching the new AWIA requirements. Her work on over 40 RRA and ERP projects make her especially suited to help the City develop an RRA and ERP program to meet the City's ongoing needs. She is a leading professional in the AECOM's Water Technical Practice Network and has access to a team of technical experts and support staff as needed to meet project requirements.

## Tom Holtan, P.E.

Principal-in-Charge  
30 years of experience

BS, Civil Engineering, University of Wisconsin - Platteville



Tom is the Water Business Line Manager in the Green Bay office and is responsible for the overall performance and resource management of the local operations. For this project, Tom will ensure staff are aligned to support the project scope and serves as an additional contact for the project work. He has 30 years of experience in municipal/civil engineering including project management, public involvement, planning, financing, design, and construction administration. He is the current manager for water operations throughout Minnesota and Wisconsin. Tom's projects include urban and rural streets, downtown redevelopment, site development, water mains, stormwater management, and storm and sanitary sewers.

**Steve Parse, P.E.**  
Project Engineer  
9 years of experience



BS Civil Engineering,  
Michigan State University

MBA, Business Administration/  
Management, University of Toledo

**Kyle Priest, E.I.T.**  
Project Engineer  
1 year of experience



BS, Civil Engineering,  
University of Wisconsin -  
Platteville

Steve is a project engineer with nine years of consulting engineering experience working in Wisconsin, Michigan, Ohio, and Pennsylvania performing civil engineering and municipal engineering services. He has completed a number of water system hydraulic model updates using GIS based software. In his work in Pennsylvania, before moving to Wisconsin, Steve worked on three water system master plans and updated hydraulic modeling for review on three other systems. He has performed flow testing and chlorine residual testing for model calibration for hydraulics and chlorine decay review..

Kyle has experience with water system master planning, hydraulic model development, hydraulic model demand allocation, field testing, model calibration, unidirectional flushing plans, and water system analysis, and improvement planning. For this work, Kyle will provide water system master planning, hydraulic water system development, calibration, and evaluation support. He has worked on Verona, Green Bay, and Appleton hydraulic water system models and master plans. He is currently working on the West Bend and the Village of Weston water system hydraulic models, system evaluations, and improvement planning for the water system master plans.

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*AECOM has been located in Wisconsin and served Wisconsin municipalities since 1910. We have five offices with more than 240 Wisconsin-based staff.*

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**“With over 1,000 members in the hydraulic modeling technical practice group and over 600 in our water system master planning group within AECOM, there is a large group to back up our local team as needed.”**



# 04

## Project Experience



# Project Experience

The following summarizes some of AECOM’s experience in preparing **Water System Master Plans** and **Risk and Resiliency/Emergency Response Plans**, including creating and calibrating hydraulic models, field testing developing demand projections, water system evaluations, capital improvement planning, and water main replacement rate and prioritization analysis.

Additionally, we have included a matrix of our experience in modeling and planning studies throughout the United States in Attachment A.

**AECOM’s experience in Risk and Resiliency and Emergency Response Plans stems from projects performed for the following clients:**

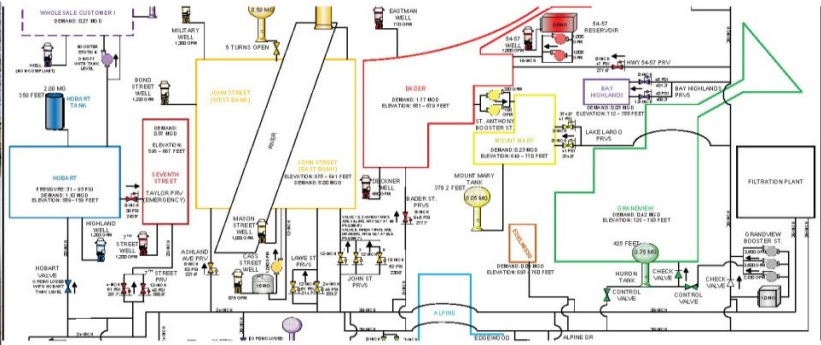
- |             |              |                  |                         |
|-------------|--------------|------------------|-------------------------|
| ✓ La Crosse | ✓ Racine     | ✓ American Water | ✓ Department of Defense |
| ✓ Chicago   | ✓ Janesville | ✓ Kenosha        | ✓ Houston               |

AECOM is familiar with the City of La Crosse water system. We have completed the following projects for the City:

<ul style="list-style-type: none"> <li>◆ Water System Master Plan</li> <li>◆ Smith Valley Pressure Zone Model</li> <li>◆ Sanitary and Storm Sewer Digital Mapping</li> <li>◆ Water System Facility Planning – Manganese Control Review</li> <li>◆ Water Discoloration Evaluation</li> <li>◆ Aquifer Restoration Evaluation – Well 13H</li> <li>◆ Water Vulnerability Assessment</li> </ul>	<ul style="list-style-type: none"> <li>◆ Wellhead Protection Plan</li> <li>◆ Pumping Energy Optimization Study</li> <li>◆ Model Training</li> <li>◆ Midwest Industrial Fuels – Water System Modeling</li> <li>◆ Fire Flow Evaluations (Pettibone and others)</li> <li>◆ Barron Island Model</li> <li>◆ Groundwater Flow Model Updates</li> </ul>
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AECOM believes that the best testament to professional and quality service is a referral from existing clients. AECOM invites the City of La Crosse to contact our references.

# Water Distribution System Model, Water System Master Plan, and Unidirectional Flushing Plan Green Bay, Wisconsin



## Project Description

### Hydraulic Model Development and Calibration

AECOM created a GIS-based model for the water distribution and supply system. The hydraulic model included updates to the GIS and transformation of GIS information into the modeling software (InfoWater), allocation of water demands for customer meter records, and development of time-of-day demand patterns.

Field testing included continuous pressure monitoring at 36 locations, 15 c-value tests, and 45 flow and pressure tests. Model calibration consisted of macro calibration, a comparison of how accurately the model represents the water system under normal operating conditions; and micro calibration, how accurately the model represents the water system under stressed high flow conditions.

### Unidirectional Flushing Program

AECOM developed a unidirectional flushing (UDF) program. The hydraulic model was used to develop the UDF sequences, including maintaining system pressures and obtaining targeted flushing velocities. For each UDF sequence a map was created, including:

- ✓ Location of flushing water main segment
- ✓ Location of previously flushed water main segments
- ✓ Flowing hydrant(s)
- ✓ Valves to be closed and/or opened during flushing
- ✓ Previously closed valves

The flushing log for each sequence includes:

- ✓ Valves to be closed and/or opened
- ✓ Hydrant flow rate and velocity
- ✓ Estimated flushing time
- ✓ Water quality and other information

AECOM provided assistance in the field for implementation and on-call support to address challenges that arise during the implementation in the field.

### Water System Master Plan

The primary tasks of the Water System Master Plan project included the following:

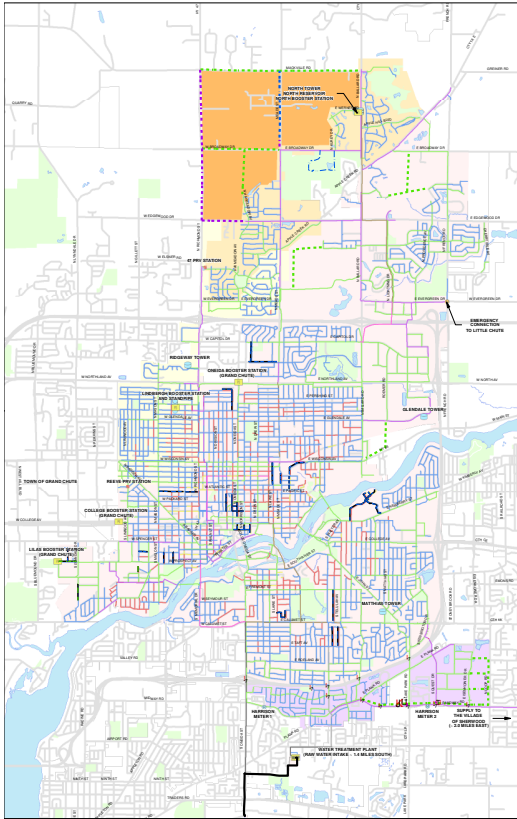
- ✓ Population and Community Growth Projections
- ✓ Water Requirements
- ✓ Existing Water System Facilities
- ✓ Existing and Future Pumping and Hydraulic Capacity and Storage Evaluation
- ✓ Water System Evaluation (system pressures, fire flows, and water age)
- ✓ Evaluation of Water Loss
- ✓ Risk and Criticality Analysis of Water System
- ✓ Water System Improvements
- ✓ Capital Improvements Plan

The master plan included a detailed leak and break analysis, KANEW analysis to determine an annual water main replacement rate and water main prioritization analysis.

### Reference

Green Bay Water Utility  
 Brian Powell, Engineering Services Manager  
 920.448.3497  
 brianpo@greenbaywi.gov

## Water System Master Plan (2007 and 2019 Update) and AWIA Gap Analysis Meeting Facilitation Appleton, Wisconsin



Recommended water system master plan.

### Master Plan Project Description

AECOM conducted a water distribution master plan study in 2007 and updated it in 2019 to provide the City of Appleton with a prioritized capital improvements plan designed to support growing customer demands cost effectively. The City identified the following key issues addressed in the study:

- ✓ Proactive water main replacement program
- ✓ Water quality and turnover in storage tanks
- ✓ Compliance with Disinfectant Byproduct Stage 2 Rule
- ✓ System pressures and pressure zone boundaries
- ✓ Service to wholesale customers
- ✓ Creation of a calibrated extended period simulation model integrated with existing and future GIS

AECOM provided the following services:

- ✓ Project and community planning
- ✓ Water requirements
- ✓ Hydraulic model and deficiency analysis
- ✓ Water main replacement/rehabilitation strategy
- ✓ Improvement planning
- ✓ Capital improvement planning
- ✓ Reporting

The hydraulic model included the creation of the model from existing mapping, field tests (continuous pressure monitoring and flow and pressure testing), and model calibration (both macro and micro calibration). The water system master plan included population and community growth projections, water requirements, existing and future facilities and storage evaluation, quality and treatment evaluation and improvements, a 20-year capital improvements plan, and reporting.

In addition, AECOM performed a water age and tank turnover evaluation for the City of Appleton. The evaluation included modelling for varying hydraulic conditions in the Appleton water system and how the conditions affected the tank water age.

### Other Services

AECOM also provided water treatment services, including:

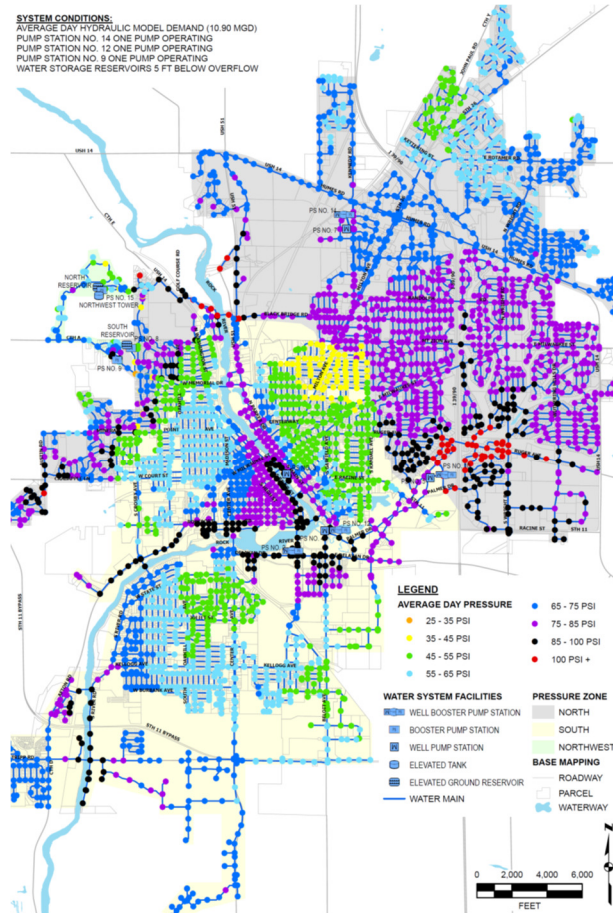
- ✓ AWIA RRA Gap Analysis Workshop Facilitation
- ✓ Lime sludge alternatives
- ✓ Phase 1b - lime feed system, membrane feed well weir installation, LRV membrane program improvements, regulatory audit for LRV compliance, and Phase 2 planning
- ✓ 12th membrane skid installation
- ✓ Phase 1a design – three chemical feed system designs, converting GAC contactors to dual sand/GAC media including underdrain system redesign, design of air scour blowers

### Reference

City of Appleton  
Chris Shaw, Director of Utilities  
920.832.2362  
chris.shaw@appleton.org



## Water System Master Plan and Water Main Prioritization Analysis Janesville, Wisconsin



Model simulated water system pressures under average day demand

### Project Description

The Janesville Water Utility's water system was impacted by growth, and by iron and radium water quality challenges. The Utility selected AECOM to prepare a water system master plan and a capital improvements plan (CIP). A hydraulic model was developed and calibrated, and was used as the basis for evaluating pressures, head loss, fire flows, water age, and simulations of various water system improvement options. Challenges that were studied included the transfer of water from storage tanks across the Rock River, pumping restrictions resulting from the need to blend shallow wells (high iron) and deep rock wells (radium), and transferring water across pressure zone boundaries. AECOM also developed a water main replacement prioritization tool based on the probability of failure

and the consequences of failure associated with each pipe segment. AECOM used the AWWARF KANEW model to perform a statistical evaluation of the annual replacement needs (miles of pipe per year to be replaced) to try to avoid the aging infrastructure failures. The Utility uses the prioritization tool to develop annual water main project lists and recently asked AECOM to update the prioritization analysis.

AECOM prepared a Wellhead Protection Plan for the existing wells and identified areas for potential new wells that would minimize the impacts of nitrates and cross well hydraulic interferences. A MODFLOW model was created by AECOM to evaluate pumping impacts on water resources and for wellhead protection planning. A contaminant source inventory of the city of Janesville was performed, along with a survey of nitrate loading information for areas within the City limits and resulting from farming operations upstream of the well sites.

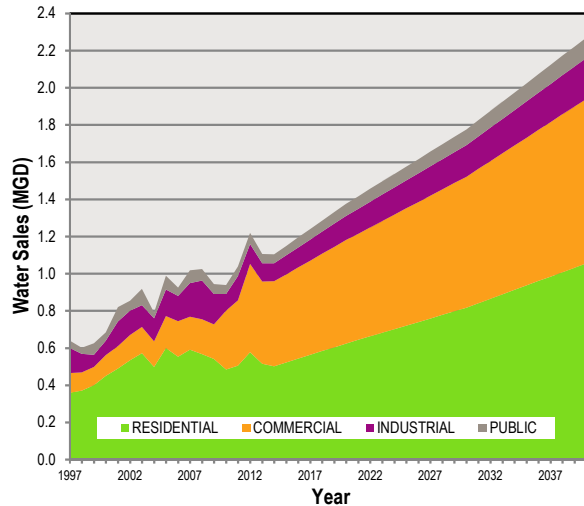
As a result of the master planning activities, Janesville Water Utility contracted AECOM to perform other water study and design projects, including:

- ✓ Water System Master Plan Review, 2013
- ✓ Water Main Prioritization Update, 2017
- ✓ Northeast Water Tower Siting and Design
- ✓ Water System Security Plan
- ✓ Blackbridge Road Water Main Sizing
- ✓ Blackhawk Tech Water Main Planning
- ✓ Janesville Schools Lead Study
- ✓ Enterprise Drive Water Main Evaluation

### Reference

City of Janesville  
 Dave Botts, Utility Director  
 608.755.3115  
 bottsd@ci.janesville.wi.us

# Water System Master Plan and Updates Verona, Wisconsin



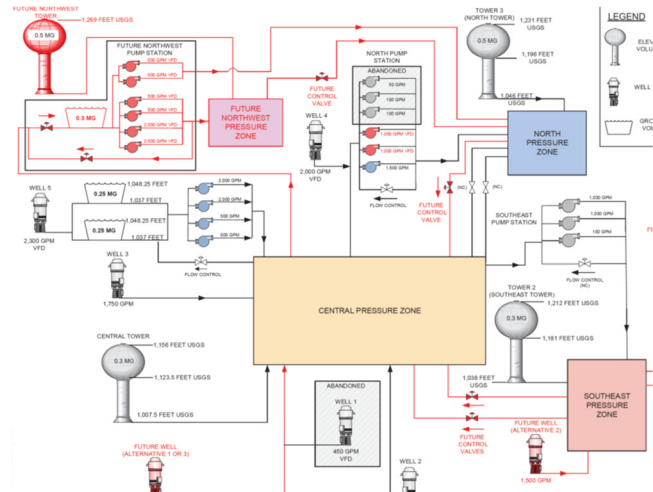
## Project Description

AECOM has been doing Water System Master Planning (1997, 2006, and 2015) and hydraulic modeling for nearly 20 years. AECOM has also completed the following water system design projects for the City of Verona:

- ✓ North Booster Pump Station
- ✓ Southeast Pump Station
- ✓ North Tower
- ✓ Southeast Tower
- ✓ Well 4 Siting, Design
- ✓ Well 5 Siting, Design, Permitting, Reservoir, and Booster Station
- ✓ Well 6 Siting and Permitting

Currently, AECOM is working on a Well Siting and Permitting study for the City.

The Verona water system consists of 5 groundwater supply wells, 3 elevated water storage tanks, one ground storage tank, 3 booster pump stations, 3 pressure zones, and nearly 69 miles of transmission and distribution water mains ranging in size up to 16 inches in diameter. As part of the master plans, a computerized hydraulic model of the water distribution was updated and calibrated to allow simulations of hydraulic conditions in the water system.



The purpose of the water system master plans was to evaluate the water needs and system expansion required to serve current and future customers. The present and future water needs of the City were evaluated, and recommendations made concerning improvements necessary to maintain an adequate level of water service. The master plan continues to serve as a comprehensive plan to guide future expansion of the water system, including pressure zones, storage tanks, well capacities, and booster stations. The capital improvements plans are a single plan that prioritizes capital spending for water system improvements.

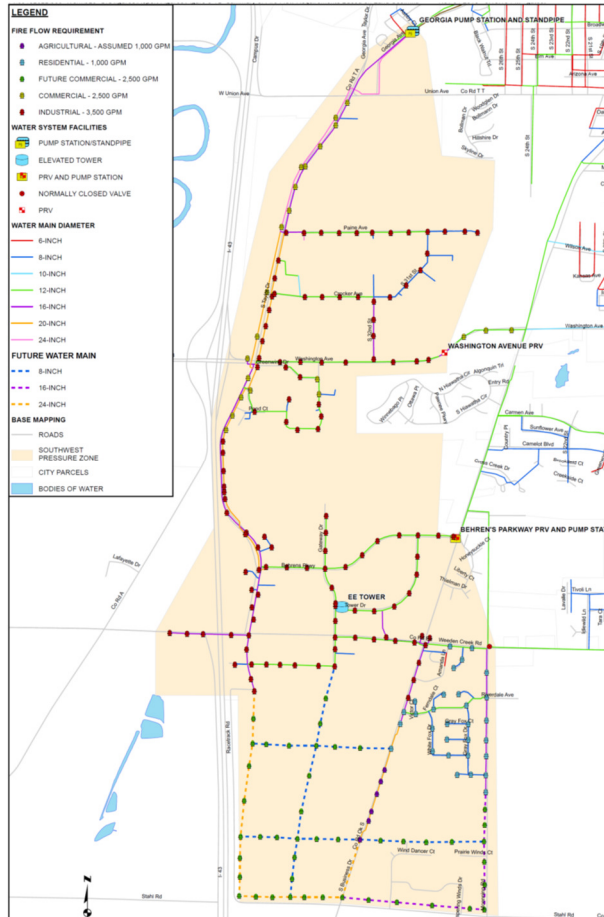
AECOM evaluated alternatives for providing water service to an area of the City where future development was being planned. AECOM recommended construction of a new booster pumping station and tower to serve the expansion area.

AECOM assisted when residential development occurred to the north of the City by designing pump improvements at the booster station and a new tower in the pressure zone.

## Reference

Theran Jacobson, Director of Public Works  
City of Verona  
608.845.6695  
theran.jacobson@ci.verona.wi.us

## Water System Master Plan and Evaluations City of Sheboygan, Wisconsin



### Project Description

AECOM provided master planning services for the Sheboygan Water Utility, including a water model update and water tower siting in 2015. The work continued into the South Water Tower design and the Georgia Avenue Pump Station updates.

### Hydraulic Model

The hydraulic model was developed by AECOM in 1996 (formerly Rust Environment & Infrastructure), was updated in 2003, and was recalibrated in 2015. The model was then used to evaluate the demolition of a water tower and the construction of larger diameter mains and looping mains to improve fire flows.

### 2015 Master Plan Update

AECOM completed a Water System Analysis Report for the Utility in 2003. The report included analysis of six additional storage alternatives in the Southwest Pressure Zone. The Utility decided that the existing 500,000-gallon EE Tower should remain in place and a new tower should be constructed in the Southwest Pressure Zone. The new tower will have the same overflow elevation as the existing tower. This new tower (South Water Tower) is currently under design.

### South Water Tower Location Evaluation

AECOM performed a preliminary evaluation for the South Water Tower location in the Southwest Pressure Zone using the Hydraulic Model and completed the Elevated Tower Site Screening Report, prepared by AECOM in 2016. From this report, AECOM concluded that the Georgia Avenue Pump Station's reliable supply capacity is deficient to meet the Southwest Pressure Zone maximum day demand (approximately 4,286 gpm).

### Georgia Avenue Pump Station Design

AECOM is currently designing modifications to the Georgia Avenue Pump Station. The hydraulic model is set up to simulate the Georgia Avenue Pump Station using future pumping capacities.

### South Water Tower Design

AECOM is also designing the 500,000-gallon South Water Tower, which will provide needed storage to a proposed business park. The project includes final hydraulic evaluations using the hydraulic model, geotechnical investigations and design, tower design and performance specifications, and construction related services.

### Reference

Joe Trueblood, Superintendent  
Sheboygan Water Utility  
920.459.3805  
joetrueblood@sheboyganwater.org

# Water System Master Plan, Vulnerability Assessment and Evaluations

## La Crosse, Wisconsin

### Project Descriptions

#### Water System Master Plan

This study focused on water supply and storage, and long-term planning for future pressure zones to serve areas of higher elevations. AECOM performed field testing, hydraulic computer modeling, digital water system mapping, and capital improvements planning to address pressure and flow deficiencies. Results of the study included preparing a capital improvements plan with cost estimates and schedules for system improvements. Since the Master Plan, AECOM has used the hydraulic model for several evaluations including sizing water main replacements.

#### Water System Vulnerability Assessment (VA)

AECOM prepared a VA prioritizing criterion and the facilities integral to the Utility, screened critical water system facilities for vulnerabilities based on potential threats and identified means to reduce risks associated with malevolent acts. After inspecting all water facilities, AECOM's VA focused efforts and resources on reducing risk to high-risk facilities, providing La Crosse with a plan for cost-effective improvements where needed the most.

#### Facility Planning for Manganese Control and Treatment

Through an analysis of EPA and DNR water treatment regulations, a review of available pilot testing data, and an evaluation of the City's water treatment quality goals and objectives, AECOM developed a comprehensive facility plan that documented steps for the City to take, meeting the budget and schedule considerations. AECOM's services included additional sampling and alternatives analysis and development. The facility plan incorporated sequencing, funding sources, and utility rate impacts.

#### Wellhead Protection Plan

AECOM prepared the wellhead protection plan for the City of La Crosse. The study included delineation of the wellhead protection areas (WHPAs) for each of the City's 16 water supply wells, identification and characterization of potential contamination sources within each WHPA, and recommendations on appropriate management strategies to minimize the risk of contamination of the City's water supply wells.

#### Water Quality Investigation

Due to numerous dirty water complaints, AECOM investigated water discoloration complaints on the north side of the City, inspected hydrant flushing tests, interviewed residents, collected and analyzed raw water samples and solids residue from flushing samples, and reviewed laboratory results. AECOM used the water distribution model outputs to evaluate water age in the water system and prepared a report, which concluded that the most likely source of discoloration (primarily black) was an increase in manganese in the French Island wellfield due to a reduction of organics in the aquifer under the influence of a nearby river.

#### Well 13 Contamination Investigation

AECOM studied methods to restore a contaminated aquifer near Well 13H, which had a history of tetrachloroethene (PCE). In 1998, the well was removed from service to avoid violations. The source(s) and extent of PCE and a dense non-aqueous phase liquid (DNAPL) were unknown. Site investigations identified 2 former dry cleaning sites as sources of contamination. The study was used to develop a plan to bring Well 13H back into service and protect other municipal wells in the area.

#### Water, Stormwater, and Sanitary Sewer Mapping

AECOM created a digital map of the water system used to create a model of the entire distribution system, which included 205 miles of pipe, and all distribution system valves and hydrant locations. The also map defined an accuracy that allowed the City to use it as an additional layer for its planned GIS. AECOM also created digital system maps for the City's storm sewer and sanitary sewer systems, which included attribute links to the City's Access database and preparation for future conversion to ARCVIEW.

#### Stormwater Study and Management Plan

AECOM provided the City of La Crosse with stormwater management planning services.

#### Modeling Evaluations

AECOM provided the City of La Crosse numerous modeling evaluations for construction projects.

# 05

## Project Schedule



# Project Schedule

## Water System Master Plan

On the following page is AECOM’s proposed schedule for the Water System Master Plan. AECOM developed the schedule so Master Plan report chapters are completed as we progress through growth and demand projections, deficiency analysis, and improvement planning. The City staff can, therefore, review components throughout the project, which will aid in successfully completing the project on schedule.

## Risk and Resiliency Assessment and Emergency Response Plan

The American Water Infrastructure Act (AWIA) established deadlines for compliance for the Risk and Resiliency Assessments (RRA) and Emergency Response Plan (ERP) based on the population served by the water system. The AWIA compliance deadlines for communities serving between 50,000 and a 100,000 people are December 31, 2020 for the RRA and six months later or typically June 30, 2021 for the ERP. With no incentives for completing the certification for the RRA and ERP early, the schedule deadlines for this work will follow the regulatory framework as shown below.

### Risk and Resiliency Assessment and Emergency Response Plan Schedule

Task	2020									2021					
	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	
<b>4.1 Risk and Resilience Assessment</b>															
Workshop 1															
Workshop 2															
Workshop 3															
Certification Letter to EPA															
<b>4.2 Emergency Response Plan</b>															
Gap Review - Meeting 1															
Workshop 1															
Certification Letter to EPA															

- EPA compliance deadline
- Workshops

Water System Master Plan Task	2020											2021	
	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	
<b>1.1 Review Existing Model and Project Management</b>													
Project Administration													
Project Planning, Data Needs List, Schedule													
Review Data and Hydraulic Model													
Kick-Off Meeting													
<b>1.2 Model Creation/Update</b>													
Update Hydraulic Model Pipes and Facilities													
Update Elevations													
Update Model Demands													
Update Control Strategy													
<b>1.3 Field Testing</b>													
Planning													
Testing													
Documentation													
<b>1.4 Model Calibration</b>													
Setup Calibration Scenario(s)													
Macro Calibration													
Micro Calibration													
<b>2.1 Population and Community Growth Projections</b>													
Population Projections													
Growth Development Projections/Land Use													
Meeting with City and Planners													
Draft Chapter													
<b>2.2 Water Needs Analysis</b>													
Review Historical Sales and Pumpage Data													
Determine Maximum Day and Peak Hour Factors													
Determine Demand Projections													
Discuss with City Staff													
Draft Chapter													
<b>2.3 Existing Water System Facilities</b>													
Review Available Data													
Draft Chapter													
<b>2.4 Existing &amp; Future Supply/Storage Evaluation</b>													
Supply/Storage Evaluation													
Draft Chapter													
<b>2.5 Water System Evaluation</b>													
Modeling Evaluations													
Draft Chapter													
<b>2.6 Reporting</b>													
Workshop													
Address Comments on Draft Chapters													
<b>3.1 Operational Improvements</b>													
Evaluate Operational Strategies with Model													
Discuss with City Staff													
Draft Chapter													
<b>3.2 Water System Improvement Planning</b>													
Improvement Planning													
Draft Chapter													
Workshop													
<b>3.3 20-Year Capital Improvements Plan</b>													
Develop Capital Improvements Plan													
Review with City													
Draft Chapter													
<b>3.4 Reporting</b>													
Address Comments on Draft Chapters													
Present to City													

Task Schedule      Workshop/Meeting

# 06

## Project Budget





# Project Budget

The budget, including hours and average hourly rate for the Water System Master Plan and R&R/ERP along with the optional tasks for each are summarized in the tables below.

Project Tasks	Water System Master Plan Estimated Hours					Total Hours	Total Cost
	Project Manager/ Technical Advisor	Senior Engineer	Project Engineer	Technician	Admin Staff		
<b>Phase 1: Hydraulic Model Update &amp; Calibration</b>							
Review Existing Model & Plan	27	4	8	4	18	61	\$8,838
Model Creation/Update	-	6	34	12	-	52	\$4,717
Field Tests	2	4	53	22	10	91	\$7,825
Model Calibration	1	7	64	28	2	102	\$8,748
<b>Phase 2: Water System Evaluation &amp; Projections</b>							
Population & Community Growth Projections	9	7	15	9	2	42	\$5,162
Water Requirements	2	10	27	17	16	72	\$7,056
Existing Water System Facilities	3	3	22	30	6	64	\$5,330
Existing & Future Water Supply & Storage Evaluation	2	5	20	5	2	34	\$3,531
Water System Evaluation	10	6	52	26	4	98	\$9,452
Reporting	4	7	18	16	10	55	\$5,524
<b>Phase 3: Improvement Planning and Capital Improvement Plan</b>							
Operational Improvements	2	8	16	8	8	42	\$4,495
Water System Improvement Planning	13	12	56	22	4	107	\$11,333
Capital Improvements Plan Development	7	11	16	5	2	41	\$5,380
Reporting	13	12	28	18	18	89	\$10,017
<b>Expenses</b>							
Expenses							\$2,410
<b>Total</b>							<b>\$99,818</b>

Optional Task	Project Manager/ Technical Advisor	Senior Engineer	Project Engineer	Technician	Admin Staff	Total Hours	Total Cost
Water Main Replacement Rate	4	9	24	2	4	43	\$5,059
Water Main Prioritization	16	18	91	28	4	157	\$16,400
Leak & Break Analysis	3	6	32	10	4	55	\$5,410
Water Loss Evaluation	4	5	28	1	3	41	\$4,472

Project Tasks	Risk and Resiliency/ERP Estimated Hours					Travel	Total Hours	Total Cost
	Quality Reviewer	Senior Engineer	Project Engineer	Admin Staff				
<b>Risk &amp; Resilience/ERP</b>								
Risk and Resilience Task	11	47	12	4	260	74	\$11,491	
ERP Task	6	34	10		130	50	\$7,496	
<b>Total</b>	<b>17</b>	<b>81</b>	<b>22</b>	<b>4</b>		<b>124</b>	<b>\$18,987</b>	

**Optional Task Item**

Optional Task	Quality Reviewer	Senior Engineer	Project Engineer	Admin Staff	Travel	Total Hours	Total Cost
Minutes Preparation	6	-	54	2		62	\$5,728
Spreadsheet Updates	8	16	48			72	\$8,045
Cost Estimates	1	4	20			25	\$2,467

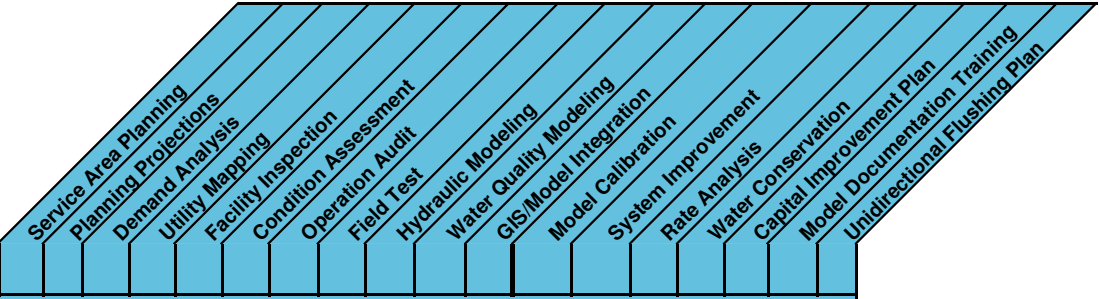
# 07

## Attachments



**STEVENS POINT OFFICE**

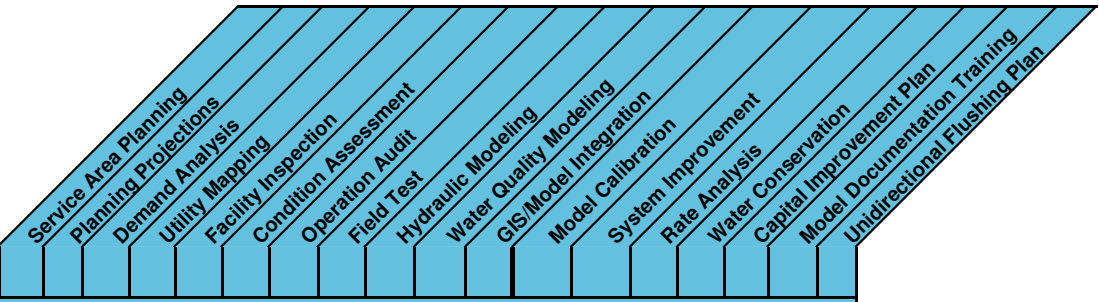
**PARTIAL LIST OF COMPREHENSIVE WATER SYSTEM PLANNING AND COMPUTER MODELING PROJECTS**



Client	Year	Population	Modeling Software	Service Area Planning	Planning Projections	Demand Analysis	Utility Mapping	Facility Inspection	Condition Assessment	Operation Audit	Field Test	Hydraulic Modeling	Water Quality Modeling	GIS/Model Modeling	Model Integration	System Calibration	Rate Improvement	Water Analysis	Water Conservation	Model Improvement Plan	Unidirectional Flushing Plan
<b>Wisconsin</b>																					
Appleton	2007/2019	70,000	H2OMAP	•	•						•										
Berlin	1995	5,500	H2ONet	•	•	•			•	•			•	•							
Cedarburg	1967/1977/ 1987/1997	11,000	KYPipe WaterCAD H2ONet	•	•	•	•	•					•	•							•
Fort Atkinson	1999	14,000	H2ONet		•	•	•	•		•	•			•	•				•	•	
Grafton	1994/2004	10,000	WaterCAD	•	•	•	•	•		•	•			•	•				•	•	
Green Bay	2014-2019	100,000	InfoWater	•	•	•	•			•	•			•	•	•					•
Hartford	1995/2005	10,000	WaterCAD	•	•	•	•	•		•	•			•	•				•		
Janesville	2009 / 2013	55,000	WaterGEMS	•	•	•	•	•		•	•		•	•	•	•			•	•	
La Crosse	1999/2008	49,000	H2ONet	•	•	•	•	•		•	•		•	•	•	•					•
Lakeland College	2004	1,400	WaterCAD	•	•	•					•				•				•		
Madison	2000	209,000	H2OMap	•	•	•				•	•		•	•							•
Manitowoc	2005/2006	30,000	H2ONet	•	•	•	•	•		•	•			•	•				•	•	
Mayville	1989/2004	5,000	H2ONet	•	•	•				•	•			•	•				•		
McNaughton Correctional Institute	1993	N/A	WaterCAD	•	•	•	•	•		•	•			•	•				•		
Medford	1990/2016	4,000	KYPipe / WaterCAD	•	•	•	•	•		•	•			•	•	•			•		
Milwaukee	2005/2006	500,000	InfoWater	•			•			•	•			•							
Mosinee	2013	5,000	WaterCAD			•				•	•			•							•
Neillsville	1998	27,000	WaterCAD	•	•	•	•	•		•	•			•	•						
New London	Ongoing 1985/1992/2005/ 2012	7,000	KYPipe WaterCAD H2ONet	•	•	•	•	•		•	•	•	•	•	•	•				•	•
Oregon	1988/1990/ 1996	7,000	KYPipe WaterCAD H2ONet	•	•	•	•	•		•	•			•	•	•					
Pewaukee	1984/1994	7,000	H2ONet	•	•	•	•	•		•	•			•	•	•			•		
Platteville	1997	10,000	EPANET	•	•	•			•	•	•			•	•						
Plover	1980/1989/1998/2 006	10,000	WaterCAD	•	•	•	•	•		•	•			•	•	•					
Port of Milwaukee	1995	N/A	H2ONet	•	•	•	•	•		•	•	•		•	•				•		
Ripon	2013	7,000	WaterCad			•				•	•			•							•
Sheboygan	1988/1996/2003	49,000	KYPipe EPANET WaterCAD	•		•	•	•		•	•	•		•	•						•
South Milwaukee	1994	21,000	H2ONet	•	•	•	•	•		•	•			•	•				•	•	
Stevens Point	1991/1996	22,000	KYPipe WaterCAD	•	•	•	•	•		•	•	•	•	•	•	•			•		
Superior	1998	27,000	H2ONet	•	•	•				•	•			•	•	•					•
Town of Greenville	2005/2006	5,000	H2OMap	•	•	•	•	•		•	•			•	•				•		
Town of Sheboygan	1985/2006/2015	4,000	KYPipe/ WaterCAD	•	•	•								•	•	•			•		
U.S. Army - Fort McCoy	1993	12,000	H2ONet	•	•	•	•	•		•	•			•	•				•		
Verona	Ongoing 1995/2006/2014	9,000	WaterCAD	•	•	•	•	•		•	•			•	•				•		
Watertown	1982/1990	21,000	KYPipe H2ONet	•	•	•	•	•		•	•		•	•	•	•			•	•	
Waukesha	1993/2000/2006/2 008 /2014	62,000	H2OMap/ InfoWater	•	•	•	•	•		•	•		•	•	•	•	•		•		
Weston	2014 / 2019	14,900	WaterCAD							•	•			•							•
West Bend	1985/1988/2006/2 019	29,000	KYPipe/ InfoWater	•	•	•					•		•	•	•				•	•	
<b>Alabama</b>																					
Maxwell AFB	2012	6,000	H2OMAP		•	•	•	•		•	•	•		•	•						
<b>Alaska</b>																					
Joint Base Elmendorf Richardson	2013 / 2018	20,000	H2OMap		•	•	•	•		•	•	•	•	•	•	•			•		
<b>Arizona</b>																					
Chandler	1995	160,000	WaterCAD	•	•	•				•	•			•	•				•	•	
Davis-Monthan Air Force Base	2008	7,000	H2OMap		•	•	•			•	•			•	•				•	•	
<b>Arkansas</b>																					
Little Rock AFB	2008	8000	H2OMap	•	•	•	•	•		•	•	•	•	•	•				•	•	
<b>California</b>																					
Beale AFB	2006/2008	8,000	H2OMAP		•	•	•			•	•			•	•						•
Escondido	2002	150,000	H2ONet		•					•					•						
South Coast Water (Laguna Beach)	2007	40,000	InfoWater	•	•	•	•	•		•	•		•	•							
Travis AFB	2018	12,000	H2OMAP		•	•	•			•	•	•	•	•	•						
<b>Colorado</b>																					
Peterson AFB	2014	8,000	H2OMAP		•	•	•			•	•	•	•	•	•						
<b>District of Columbia</b>																					
Dept. of the Navy, Anacostia Naval Station	1996 / 2010	2,000	KYPipe WaterCAD H2ONet	•	•	•	•	•	•	•	•			•	•				•	•	•
Dept. of the Navy, Washington Navy Yard	1996	8,000	KYPipe WaterCAD H2ONet	•	•	•	•	•	•	•	•			•	•				•	•	•
Department of the Navy, National Observatory	2008	1,000	WaterCAD		•	•	•			•	•			•	•						•
Dept. of the Navy, Navy Security Station, Nebraska Avenue Complex	2005	1,500	H2ONet	•	•	•	•	•		•	•	•		•	•				•	•	•
Navy Research Laboratory	2011	4,000	WaterGEMS		•	•	•			•	•	•		•	•				•	•	
<b>Florida</b>																					
Cape Canaveral Air Force Station	2005 / 2013	6,000	H2OMap	•	•	•	•	•		•	•	•	•	•	•	•			•	•	•
Charlotte County	2014	160,000	WaterGEMS	•	•	•	•	•		•	•			•	•				•		
Collier County	2014	330,000	WaterGEMS	•	•					•	•			•	•				•		
Hialeah Gardens	2008	10000	H2OMap	•	•	•	•	•		•	•			•	•				•		
Miami-Dade	Ongoing	2,000,000	InfoWater	•	•	•				•	•		•	•	•				•	•	
Miami International Airport	2006	N/A	WaterCAD	•	•	•	•	•		•	•			•	•				•	•	
Patrick Air Force Base	2007 / 2012 / 2016	6,000	H2OMap	•	•					•	•	•	•	•	•				•		•

**STEVENS POINT OFFICE**

**PARTIAL LIST OF COMPREHENSIVE WATER SYSTEM PLANNING AND COMPUTER MODELING PROJECTS**



Client	Year	Population	Modeling Software	Service Area Planning	Planning Projections	Demand Analysis	Utility Mapping	Facility Inspection	Condition Assessment	Operation Audit	Field Test	Hydraulic Modeling	Water Quality Modeling	GIS/Model Integration	Model Calibration	System Improvement	Rate Analysis	Water Conservation	Capital Improvement	Model Documentation Plan	Unidirectional Flushing Plan
<b>Georgia</b>																					
DeKalb County	2017-2020	734,871	InfoWater	•	•	•				•	•		•	•							
Hunter Army Airfield	1995	10,000	H20Net	•	•	•	•		•	•	•		•	•						•	
Robins AFB	2014	25,000	H20MAP			•	•	•		•	•	•	•	•	•						
Fort Stewart	1995	45,000	H20Net	•	•	•	•		•	•	•		•	•						•	
Moody AFB	2008	7,000	H20MAP			•	•	•		•	•		•	•							•
<b>Kansas</b>																					
McConnell AFB	2015	7,500	H20MAP		•	•	•		•	•	•	•	•	•	•						
<b>Illinois</b>																					
Chicago	1997	4,000,000	H20Net		•	•	•				•				•	•				•	
Lake in the Hills	1997	21,000	H20Net	•	•	•	•	•		•	•	•		•	•	•				•	
Lake Zurich	2005	20,000	H20Net	•	•	•	•	•		•	•		•	•	•					•	•
Niles	1989/1997	30,000	H20Net	•	•	•	•	•		•	•		•	•	•	•				•	•
Riverside	1998	8,500	WaterCAD	•	•	•	•	•		•	•		•	•	•	•				•	
Wheeling	1991/1998	31,000	WaterCAD	•	•	•	•	•		•	•		•	•	•					•	•
<b>Louisiana</b>																					
Barksdale AFB	2008	8,000	H20Map		•	•	•		•	•			•	•							•
<b>Maryland</b>																					
Dept. of the Navy, National Naval Medical Center Bethesda	2004 / 2011	12,000	H20Net WaterGEMS	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•	•
Dept. of the Navy, Naval Support Facility Indian Head	2011	6,000	WaterGEMS		•	•	•		•	•	•	•	•	•	•			•	•	•	•
Dept. of the Navy, Naval Air Warfare Center, Patuxent River	1997	15,000	WaterCAD	•	•	•	•	•		•	•	•	•	•	•			•	•	•	•
<b>Mississippi</b>																					
Columbus AFB	2012	6,000	H20MAP		•	•	•	•		•	•	•	•	•	•						
Keesler AFB	2012	6,000	H20MAP		•	•	•	•		•	•	•	•	•	•						
<b>Missouri</b>																					
Whiteman Air Force Base	2005	6,000	H20Map		•	•	•		•	•			•	•							•
<b>Montana</b>																					
Malmstrom AFB	2015	8,000	H20Map		•	•	•		•	•	•	•	•	•	•						
<b>Nebraska</b>																					
Offutt Air Force Base	2008	6,000	H20Map		•	•	•		•	•			•	•							•
<b>Nevada</b>																					
Creech Air Force Base	2008	1,000	H20Map		•	•	•		•	•			•	•							
Nellis Air Force Base	2008 / 2014	8,000	H20Map		•	•	•		•	•	•	•	•	•	•						•
Tonopah Test Range	2008	1,000	H20Map		•	•	•		•	•			•	•							
<b>New Jersey</b>																					
Lakehurst NAES - Dedicated Fire System	2014	2,500	H20MAP		•	•			•	•		•	•	•							
McGuire AFB	2014	8,000	H20MAP		•	•	•		•	•	•	•	•	•	•						
<b>New Mexico</b>																					
Holloman AFB	2008	8,000	H20Map		•	•	•		•	•			•	•							•
<b>North Carolina</b>																					
Aqua North Carolina, Fayetteville	2008	200,000	EPANET																		
Brunswick County Water	2008 / 2014	112,000	WaterCAD/ EPANet	•	•	•	•	•		•	•	•	•	•	•					•	
Orange Water, Raleigh	2007	200,000	EPANET WaterCAD																		
Seymour-Johnson AFB	2008	8,000	H20Map		•	•	•		•	•	•	•	•	•	•						•
<b>North Dakota</b>																					
Minot Air Force Base	2008	5,000	H20Map		•	•	•		•	•			•	•							•
<b>Ohio</b>																					
Wright - Patterson AFB	2002 / 2015	25,000	H20Map		•	•	•	•	•	•	•	•	•	•	•						•
<b>Oklahoma</b>																					
Altus AFB	2014	8,000	H20Map	•	•	•			•	•	•	•	•	•	•						•
Tinker AFB	2014	26,000	H20Map		•	•	•		•	•	•	•	•	•	•						
Vance AFB	2012	8,000	H20Map		•	•			•	•	•	•	•	•	•						
<b>South Carolina</b>																					
McEntire ANG	2001	800	H20Net	•	•	•	•	•		•	•	•	•	•	•			•	•	•	•
Shaw AFB	2015	5,500	H20Map		•	•	•		•	•	•	•	•	•	•						
<b>South Dakota</b>																					
Ellsworth Air Force Base	2008 / 2015	6,000	H20Map		•	•	•		•	•	•	•	•	•	•						•
<b>Texas</b>																					
Brownsville	2015	180,000	WaterCAD		•				•	•	•	•	•	•							
Donna	1997	15,000	WaterCAD	•	•	•	•	•		•	•		•	•						•	
Ellington ANG	2001	800	H20Net	•	•	•	•	•		•	•	•	•	•	•			•	•	•	•
Goodfellow AFB	2012	6,000	H20MAP		•	•	•	•		•	•	•	•	•	•						
McAllen	1998	107,000	WaterCAD	•	•	•	•	•		•			•	•							•
Raymondville	1999	9,500	WaterCAD	•	•	•	•		•	•			•	•							•
San Benito	1999	23,000	WaterCAD	•	•	•	•	•		•	•		•	•							•
Sheppard AFB	2012	6,000	H20MAP		•	•	•	•		•	•	•	•	•	•						
<b>Virginia</b>																					
Langley AFB	2017	1,400	H20MAP		•	•	•		•	•	•	•	•	•	•						
Marine Corps Base Quantico	2001 / 2008 / 2012	20,000	WaterCAD		•	•	•	•	•	•	•	•	•	•	•						•
<b>Wyoming</b>																					
FE Warren Air Force Base	2003	6,000	H20Map	•	•	•	•	•		•	•	•	•	•	•					•	•
<b>International</b>																					
Kadena AB, Japan	2017	22,000	H20Map		•	•	•		•	•	•	•	•	•	•						•
Lajes AFB Azores	2001	6,000	H20Net	•	•		•		•	•			•	•							•
Yokota AB, Japan	2017	11,000	H20Map		•	•	•		•	•	•	•	•	•	•						•

## Kathy Beduhn, P.E. Project Manager/Water System Master Planning



*Kathy has dedicated the majority of her career to water system modeling projects in our Stevens Point, Wisconsin office. She has extensive experience in model development, field testing, improvement planning, system analysis, and water quality analysis. She has also been involved in water main prioritization analysis and water audit studies.*

### Education

MS, Civil Engineering, Michigan Technological University

BS, Environmental Engineering, Michigan Technological University

### Professional Registrations

Professional Engineer – Wisconsin

### Years of Experience

23

### Professional Affiliations

American Water Works Association  
Wisconsin Water Association

### Relevant Experience

**La Crosse Water Utility, Water System Fire Flow Analysis, La Crosse, Wisconsin.** Project engineer responsible for hydraulic analysis of available fire flows on city's south side.

**City of La Crosse, Sanitary and Storm Sewer Digital Mapping, La Crosse, Wisconsin.** Project engineer responsible for preparation of digital maps of the city's sanitary and storm sewer system. AutoCAD maps include attribute links to the city's Access database and preparation for future conversion to ARCVIEW.

**La Crosse Water Utility, Comprehensive Water System Study and Master Plan, La Crosse, Wisconsin.** Project engineer responsible for preparation of a calibrated hydraulic model of the water distribution system. Performed analysis of system deficiencies, supply and storage analysis, identification of water system improvements, and system analysis to serve future service areas with new high pressure zones. Responsible for identification of future growth, preparation of projected water needs, and preparation of a water system master plan report.

**Green Bay Water Utility, Water Distribution System Master Plan, Modeling and Unidirectional Flushing Plan, Green Bay, Wisconsin.** Development of water system master planning, including water demand projections, system improvement plan, water main and facility water system risk analysis, water main reinvestment plan, leak/break analysis, water audit, and capital improvements plan. Responsible for developing a GIS-based all-pipe water system model; field testing, including continuous pressure monitoring, c-value testing, and flow and pressure tests; and model calibration under both steady state (flow testing) and extended period (24-hour) conditions. Based on the hydraulic model, responsible for developing a system-wide unidirectional flushing program. For each sequence a field log and map will be created indicating which valves and hydrants need to be operated.

### US Department of Defense, Distribution System Models, Various Locations.

Assisted with hydraulic model developments at several Air Force bases, including field testing, model calibration system evaluations, supply and storage evaluations, fire flow analysis, and recommended improvements.

**City of Verona, Water System Master Plan, Verona, Wisconsin.** Water system master plan included updating and calibrating the hydraulic model based on field testing, service area planning, water needs analysis, supply and storage evaluation, water system deficiency analysis, improvement planning and developing a capital improvements plan.

**City of Appleton, Water System Master Plan, Appleton, Wisconsin.** Assistant project manager for developing a calibrated hydraulic model of the water distribution system and preparing a water system master plan. The water system master plan includes population and community growth projections, water requirements, existing and future facilities and storage evaluation, water main replacement program (KANEW) and improvements, a capital improvements plan, and reporting.

**Miami-Dade Water and Sewer Department, Hydraulic Computer Modeling - Water Model Field Testing and Calibration, Miami, Florida.** Assisted with project involving field testing and calibration of the MDWASD water system hydraulic computer model. Project included a field testing program of the entire distribution and transmission system. The calibrated model assisted MDWASD in evaluating the water system to meet the growing needs of the county and in performing capacity evaluations for new developments wanting to connect to the existing system.

**St. Paul Regional Water Services, Water Main Replacement Prioritization Project, St. Paul, Minnesota.** Assisted with the development of a water main replacement program. Project included KANEW analysis (annual renewal rate), leak/break analysis, and development of service level criteria and weighting factors for water main prioritization analysis based on risk.

**DeKalb County Distribution Model Development and Master Plan, DeKalb County, Georgia.** Lead engineer providing technical guidance on the distribution system model development and calibration. The distribution system model (InfoWater) includes 3,000 miles of water mains, one treatment plant, 17 storage tanks, and 15 pump stations. Will perform extensive model verification and calibration using SCADA information and hydrant pressure-flow testing. Will ultimately use the calibrated model to develop a long-term master plan for the distribution system.

**City of Janesville, Water System Master Plan, Janesville, Wisconsin.** Provided technical assistance for developing a calibrated hydraulic model of the water system and preparing a water system master plan. The water system master plan includes population and community growth projections, water requirements, existing and future facilities and storage evaluation, water main replacement prioritization analysis, staffing level survey, capital improvements plan, and reporting.

**Milwaukee Department of Public Works, Waterworks Hydraulic Modeling, Milwaukee, Wisconsin.** Project engineer for evaluating the accuracy of the existing skeletonized model and providing recommendations for improvements; providing training in InfoWater; and assisting MWW with selecting, performing, and documenting various field tests and calibration of the model.

**Milwaukee Department of Public Works, Water Main Capital Planning Study, Milwaukee, Wisconsin.** Project includes review of system characteristics that may affect capital planning strategies, recommended process for prioritizing water main replacements, benchmarking water main replacement and operational strategies, and water main replacement evaluation. The water main replacement evaluation included distribution system summary, leak/break analysis, development of water main replacement rates using AWWA RF's KANEW software and water main prioritization methodology.

**City of Ann Arbor, Water Main Replacement and Rehabilitation Prioritization Study, Ann Arbor, Michigan.** Responsible for developing the water main prioritization analysis based on risk. Project included data gap analysis, leak/break evaluation, development of probability of failure and consequence of failure scoring components and weighting factors, KANEW analysis, and water main reinvestment plan.

## Tom Degen, P.E. Lead Technical Advisor/Quality Control



*Tom was project manager on the previous Appleton Water System Master Plan and numerous other modeling and master plan projects throughout his career. He has extensive experience with hydraulic modeling and model calibration, supply and deficiency analysis, master planning, and asset management.*

### Education

BS, Civil Engineering, University of Wisconsin - Platteville

### Professional Registrations

Professional Engineer – Wisconsin

### Years of Experience

29

### Professional Affiliations

American Water Works Association  
Wisconsin Water Association

### Presentations

“Determining the Right Level of Water Model Calibration,” 2006 AWWA Annual Conference & Exposition, San Antonio, Texas June 14, 2006.

“Modeling of Water Distribution Systems,” Air Force Environmental Symposium, Louisville, Kentucky, February 2005

“Water Distribution System Management – Lessons Learned”, 2009 Air Force Symposium Proceedings, St. Louis, Missouri, March, 2009.

“A Water Utility Primer for Conversions to Renewable Energy Sources” 2006 AWWA Annual Conference & Exposition, Washington, D.C. June 14, 2011

### Relevant Experience

**City of Appleton, Water Distribution Master Plan, Appleton, Wisconsin.** Project manager for water distribution master plan study to provide a prioritized capital improvements plan designed to support growing customer demands cost effectively. Responsibilities include project planning, determination of water requirements, hydraulic model and deficiency analysis, development of a water main replacement and rehabilitation strategy, improvement planning, capital improvement planning, and reporting.

**City of La Crosse, Water System Facility Planning, La Crosse, Wisconsin.** Project manager for study to evaluate treatment options for manganese removal at wells and identified and recommended maintenance actions for controlling manganese deposition in the water distribution system. The city was experiencing fairly chronic problems with dirty water in the northern areas of the city. Managed evaluation of test results; alternatives analysis, evaluation of non-treatment methods (including sequestering), review of treatment technologies, review of alternatives, screening workshop and consolidation of data into a comprehensive facility plan.

**City of La Crosse, Aquifer Restoration Evaluation, Well 13, La Crosse, Wisconsin.** Project manager for investigation of perchloroethylene (PCE) contamination in the aquifer feeding Well 13. Identified the probable source of contamination as being a former dry cleaning operation upgradient from the municipal well. Prepared draft action plans and cost estimates for actions required to delineate the contaminated plume and install recovery wells to treat the water prior to entering Well 13.

**City of La Crosse, Water Vulnerability Assessment, La Crosse, Wisconsin.** Project manager for a vulnerability assessment of the water system following the RAM-W&trade; approach. Facilitated several workshops with the vulnerability assessment team consisting of AECOM specialists, utility operations and management staff, and local law enforcement. Workshops focused on evaluating the potential threat, reviewed potential impacts of attacks on the water system, and reviewed the ability to defend such an attack.

**City of La Crosse, Water System Hydraulic Model Training, La Crosse, Wisconsin.** Project manager for training city staff on the use, application, updating, and maintenance of the model.



**City of La Crosse, Water Discoloration Evaluation, La Crosse, Wisconsin.** Project manager for investigation of water discoloration complaints on the north side of the city. Inspected hydrant flushing tests, interviewed residents, collected and analyzed samples of raw water and solids residue from flushing samples. Used the water distribution system model to evaluate water age in the water system. A report was prepared concluding that the most likely source of discoloration (primarily black) was an increase of manganese in the north wellfield resulting from reduction of organics in the aquifer that is under the influence of the nearby river.

**US Department of Defense, Distribution System Models, Various Locations.** Managed projects related to hydraulic modeling and master planning at 26 U.S. Air Force and Navy facilities over a 15-year period. Assisted Air Force managers with developing a program for tracking the costs and benefits of hydraulic modeling.

**Condition Assessment and Asset Management of the Drinking Water System for St. Paul, Minnesota.** Project manager for developing a program to manage water main assets after a major pipe failure resulted in a loss of water in the downtown area of St. Paul. Used condition indicators and criticality factors associated with their GIS database to develop a quantitative scoring system for each of the pipe segments. Estimated the replacement cost of their linear assets and developed a 25-year financial plan based on Weibull function statistics.

**City of La Crosse, Water System Energy Saving Estimating, La Crosse, Wisconsin.** Project manager for a water system energy saving estimate related to a planned 24-inch pipe leading up to the Granddad Reservoir to relieve a restriction leading to the reservoir. Lower pumping pressures when filling the reservoir may result in energy savings, which may qualify for a Focus On Energy grant. Evaluated affects of connecting individual wells to the distribution grid and disconnecting from a restrictive header pipe. Reviewed plans for managing flow rates while utilizing variable frequency drives (VFDs). Managed use of the existing hydraulic model of the water system to predict flow rate and pressure changes due to improved hydraulics and calculate annual energy saved.

**City of La Crosse, Fire Flow Evaluation, La Crosse, Wisconsin.** Project manager for water system modeling and fire flow evaluations on Milwaukee Street and Saint Andrew Street near Midwest Industrial Fuels.

**City of Janesville, Water System Master Plan, Janesville, Wisconsin.** Project manager for water distribution master plan study to evaluate distribution system capacity, supply adequacy, future water supply, vulnerability to nitrate and radium contamination, potential well sites, energy efficiency, water main replacement prioritization and asset management, workforce staffing, system controls, and system operations.

**Water Main Capital Planning Study, Milwaukee Water Works, Milwaukee, Wisconsin.** Project manager for an ongoing project to evaluate asset management practices associated with buried water mains. The project includes using the AWW RF KANEW forecasting model to recommend the length of pipe to be replaced or refurbished annually. Provided recommendations for prioritizing specific pipe segments; cost-benefit analysis of replacement/rehabilitation strategies other than open cut; benchmarking MWW's replacement practices and operational strategies; recommending a cost-effective approach to maintenance, rehabilitation, and replacement; and recommending operational strategies to prolong water main life.

**Sheboygan Water Utility, Water System Evaluation, Sheboygan, Wisconsin.** Project manager for updating and recalibrating the 1996 water system computer model, and hydraulic analysis of the water system to evaluate system storage and hydraulic capacity of transmission mains to the expanding Southwest High Level Pressure Zone. Water system demands were projected based on predicted expansion areas and zoning designations. Evaluated options to supply and store water in the southwest zone and in the entire water system to meet peak requirements.

# Angel Gebeau, P.E., BCEE

## Risk and Resiliency/Emergency Response Plan



*Angel is a drinking water project manager with 19 years of experience in the drinking water industry. She has been involved in vulnerability assessments for the design of new drinking water treatment facilities and the evaluation of current facilities.*

### Education

BS, Environmental Engineering, Michigan Technological University

### Professional Registrations

Professional Engineer – Wisconsin, Minnesota, Virginia, North Dakota, Texas (Environmental Engineer)

Board Certified Environmental Engineer (BCEE)

### Years of Experience

21 total – 19 drinking water

### Professional Affiliations

American Academy of Environmental Engineers and Scientists  
American Society of Civil Engineers  
American Water Works Association  
Wisconsin Rural Water Association  
Wisconsin Water Association

### Relevant Experience

**AWIA RRA and ERP Gap Analysis, City of Houston, Texas.** Project engineer responsible for comparison of City of Houston Texas existing documents with RRA and ERP requirements from AWIA regulatory changes. Included review against AWWA and ANSI standards J100, G440, G430 and others.

**AWIA RRA and ERP Gap Analysis, Appleton Water Utility, Wisconsin.** Facilitator for AWIA Gap Analysis Workshop to review existing documentation, RRA requirements, J100 standards, and VSAT. Provided support for development of a completion plan.

**Marstel-Day - US Air Force, Water Resources Management and Sustainment Plan, Various Locations.** Project engineer responsible for plans at Mountain Home AFB, Altus AFB, and Beale AFB. Reviewer for Vandenberg AFB. Plans supported HAF and AFCEC in developing an AF enterprise water rights and water resource management and sustainment program including triage of bases based on selected water sustainment criteria.

**US Air Force, Water System Vulnerability Assessments and Emergency Response Planning, Various Locations.** Project engineer for water system vulnerability assessments at Air Force PACAF bases in the U.S. and overseas under a contract with the Air Force Institute of Operational Health. Water supplies include large, small, community and non-community systems.

**La Crosse Water Utility, Water System Vulnerability Assessment, La Crosse, Wisconsin.** Engineer assisting with a vulnerability assessment following the RAM-W<sup>SM</sup> approach for the La Crosse Water Utility. AECOM prepared a vulnerability assessment to identify the core mission of the client, prioritize the criteria and the facilities integral to completing this mission, screen critical water system facilities for vulnerabilities based upon the design basis threats, and identify means of reducing the risks associated with malevolent acts. The overall goal was to help the client focus efforts and resources on reducing the risk to high-risk facilities. The assessment provided a plan for cost-effective improvements where needed the most.

**US Air National Guard, Water System Vulnerability Assessments and Emergency Response Planning, Various Locations.**

Project engineer assisting with water system vulnerability assessments at 29 Air National Guard bases in the United States under a contract with the Air Force Institute of Operational Health. Utilized template report.

**Hialeah Water Treatment Facility, Treatment Facility Design-Build – Vulnerability Assessment, Hialeah, Florida.**

Project engineer the vulnerability assessment of the facility during the design stage of the water treatment facility construction. Provided optimization strategies before final design and construction to best minimize vulnerabilities in the final treatment facility.

**Pearl Harbor Air Force Base, Contingency Response Plan, Pearl Harbor, Hawaii.**

Project engineer for the contingency response plan for potential contamination of water system. Completed a grab-and-go book used to assist in an emergency contamination situation.

**Various Clients, Contamination Emergency Response Plans, Wisconsin.**

Created an emergency response plan (ERP) for contamination events included in La Crosse and Janesville and various military ERPs. The contamination plan is based on EPA guidelines and site specific requirements

**Racine Water Utility, Water System Vulnerability Assessment and Emergency Response Planning, Racine, Wisconsin.**

Project engineer for a vulnerability assessment and emergency response planning project. Racine operates a surface water treatment plant, and remote pumping and storage facilities that supply an average daily demand of approximately 20 MGD. The vulnerability assessment team identified assets that are critical to meeting utility goals and screened options for improving protection of critical assets. Emergency response plans were being developed to address potential critical incidents identified using the RAM-W<sup>SM</sup> method for vulnerability assessments.

**Kenosha Water Utility, Water System Vulnerability Assessment and Emergency Response Planning, Kenosha, Wisconsin.**

Project engineer for a vulnerability assessment completed following the RAM-W<sup>SM</sup> approach. Kenosha serves over 100,000 customers and uses Lake Michigan as a supply source. She facilitated several workshops with the vulnerability assessment team consisting of AECOM specialists, utility operations and management staff, and local law enforcement. Workshops focused on evaluating the potential threat, and reviewing potential impacts of attacks on the water system and the ability to defend such an attack. Utilized the results of the vulnerability assessment to develop and emergency response plan.

**Honeywell Sensing and Control, Emergency Response Plan Review, Freeport, Illinois.**

Reviewed and updated the emergency response plan for five plants located in North-Central Illinois. Included researching regulations, developing contact lists, evaluating potential threats, document preparation, and distribution.

**Des Plaines Water Utility, Water System Vulnerability Assessment and Emergency Operations Plan, Des Plaines, Illinois.**

Engineer assisting with vulnerability assessment and emergency operations plan. AECOM used the RAM-W methodology for small and medium water systems to help the city water utility examine its water system for security risks.

**West Bend Water Utility, Water System Vulnerability Assessment and Emergency Operations Plan, West Bend, Wisconsin.**

Engineer assisting with vulnerability assessment and emergency operations plan. AECOM conducted a vulnerability assessment based on the RAM-W methodology for small and medium utilities, developed by Sandia National Laboratories for AWWARF.

## Tom Holtan, P.E. Principal-in-Charge



*Tom is AECOM's Upper Midwest Water Business Line Manager and is responsible for the overall performance and resource management of the water operations. Tom has over 30 years' experience in municipal/civil engineering including project management, public involvement, planning, financing, design and construction administration. Projects include urban and rural streets, downtown redevelopment, parking lots, sidewalks, recreational trails, park facilities, boat facilities, buildings, industrial/business parks, industrial facilities, wastewater treatment facilities, environmental remediation, brownfield development, site development, water main, stormwater management, storm and sanitary sewers.*

### Education

BS, Civil Engineering, University of Wisconsin - Platteville

### Professional Registrations

Professional Engineer – Wisconsin, Ohio, South Dakota

LEED Accredited Professional

### Years of Experience

36

### Professional Affiliations

American Public Works Association

### Relevant Experience

**Green Bay Metropolitan Sewerage District, Interceptor Rehabilitation, Green Bay, Wisconsin.** Project engineer for the Ninth Street and West Side sanitary interceptor sewer rehabilitation, which included cured-in-place lining of 6500 feet of 36-inch interceptor, relaying 680 feet of 30-inch interceptor, abandoning structures and rehabilitating 28 manholes.

**City of Sheboygan, Downtown Revitalization, Sheboygan, Wisconsin.** Involved in project planning, public informational meetings, design and reconstruction of several downtown streets, underground infrastructure, sidewalks, lighting, alleys, parks, landscaping and parking lots.

**City of Sheboygan, Harbor Centre Marina, Sheboygan, Wisconsin.**

Design team member and project manager for an \$11 million development, which included rock revetments, dredging, installation of 464 slips at full build out, parking lots, promenades, festival park and administration and park buildings, fueling dock and a youth boating facility.

**City of Sheboygan, Public Works and City Engineering, Sheboygan, Wisconsin.** Director of public works and city engineer responsible for 140 employees and an \$18 million budget as well as all public works projects and associated services.

**Alterations and Additions to the Watertown Wastewater Treatment Facility, Watertown, South Dakota.**

Site civil design including demolition, grading, stormwater management, 42-inch interceptor sewer, new facilities and new piping. Also provide civil support for the construction phase responding to requests for information, contract modifications and shop drawing review.

**Green Bay Metropolitan Sewerage District, Interceptor Rehabilitation, Green Bay, Wisconsin.**

Project engineer for the design and construction administration for the Ninth Street and Ashwaubenon Creek sanitary interceptor sewer rehabilitation, which included cured-in-place lining of 3700 feet of 48-inch and 600 feet of 36-inch interceptor sewer, abandoning structures and rehabilitating 41 manholes.

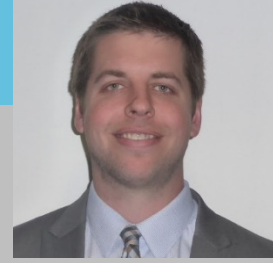
**City of Sheboygan, Sanitary Sewer Overflow Evaluation, Sheboygan, Wisconsin.**

Project manager for investigation and evaluation of a sewer overflow site location in Union Avenue and South Business Drive to determine the feasibility of eliminating the overflow which discharged into the adjacent storm sewer system.

**City of Sheboygan, North 5th Street and New York Avenue Flood Control Design, Sheboygan, Wisconsin.**

Project manager for preparation of construction plans and specifications for the North 5th Street and New York Avenue flood control..

## Steve Parse, P.E. Project Engineer



*Steve is a civil engineer with more than 9 years of experience in planning, modeling, and designing water, stormwater, wastewater, and site developments for public and private clients. His water background includes using programs such as WaterGEMS, WaterHammer, and WaterCAD to build water system models, plan system-wide and local upgrades, design new distribution main and water system/treatment facilities, and create water system master plans. As a municipal engineer, Mr. Parse has experience evaluating the operations of a proposed water system project while analyzing the effects of the project on the larger system and finding solutions to potential issues.*

### Education

BS, Civil Engineering, Michigan State University

MBA, University of Toledo

### Professional Registrations

Professional Engineer, Wisconsin, Pennsylvania, New York

Certified Professional Municipal Stormwater Manager, Envirocert International

### Years of Experience

9

### Relevant Experience

**Carlisle Water System Master Plan, Carlisle, PA [Prior to AECOM]:** Responsibilities included leading the development and analysis of a water model for the water system using ArcGIS and WaterGEMS including the development of a water system master plan. The model development included developing and conducting hydrant flow tests and chlorine residual tests needed to calibrate the model, collecting existing water system data and demands, and using future growth reports to determine future system demands. The master plan included a 5-year water main replacement and improvement plan, an operations and maintenance plan including a valve exercising plan and water tank maintenance plan, and a 40-year plan based on future system demands.

**Water System Planning - Lehigh County Authority, Allentown, PA [Prior to AECOM]:** Project involved analyzing the necessary water system upgrades needed extend service to a proposed industrial park outside of Allentown, PA. Responsibilities included collecting necessary data, using a WaterGEMS model of the system to analyze system upgrades needed to maintain or increase the level of service in the existing system while providing the necessary level of service to the proposed industrial park, and provide a report to the authority including a preliminary engineering opinion of probable costs.

**Water System Study - Schuylkill County Authority, Pottsville, PA [Prior to AECOM]:** Project included creating a water system model using WaterGEMS software to analyze the system for a water tank painting project which would have an important water tank taken out of service during the project. Responsibilities include conducting hydrant flow tests to calibrate the model, creating the model, and writing a report to establish the effects of taking the water tank out of the system, and establishing new emergency responses during that time.

**Water System Master Plan - Grove City, PA [Prior to AECOM]:** Grove City, PA was planning a new water treatment plant located in a different part of the City from the existing water treatment plant; project included establishing a water system master plan establishing necessary water main replacement projects needed for the proposed water treatment plant and to replace aging infrastructure. Responsibilities included updating the water system model using WaterGEMS software, calibrating the model by conducting hydrant flow tests, and creating the master plan by establishing a list of project necessary prior to construction of the proposed water treatment plant.

## Kyle Priest

### Project Engineer



*Kyle has experience with water system master planning, hydraulic model development, hydraulic model demand allocation, field testing, model calibration, unidirectional flushing plans, and water system analysis, and improvement planning.*

#### Education

BS, Civil Engineering, University of Wisconsin - Platteville

#### Professional Registrations

EIT – Wisconsin

#### Years of Experience

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#### Professional Affiliations

American Water Works Association  
American Society of Civil Engineers

#### Relevant Experience

##### **Water System Master Plan, West Bend, Wisconsin.**

Responsible for developing a calibrated hydraulic model of the water system and preparing a water system master plan including population and community growth projections, water requirements, existing and future facilities and storage evaluation, system evaluation and improvements, a capital improvements plan, and reporting.

##### **Water System Master Plan, Weston, Wisconsin.**

Responsible for developing a calibrated hydraulic model of the water distribution system and preparing a water system master plan. The master plan includes population and community growth projections, water requirements, existing and future facilities and storage evaluation, system evaluation and improvements, a capital improvements plan, and reporting.

##### **City of Verona, Water System Model Update and EPIC Evaluation, Verona, Wisconsin.**

Assisted with the water system model update including updating pipe geometry based on GIS. Assisted with determining if the water system could supply high demand to a large user. Evaluation included water system pressure and hydraulics analysis.

##### **NAVFAC Mid-Atlantic, Wellhead Protection Planning and Surface Water Assessment and Protection Plan Update, NSA Crane.**

Project engineer involved with developing a wellhead protection plan and surface water assessment and protection plan update.

##### **City of Appleton, Water System Master Plan, Appleton, Wisconsin.**

Responsible for developing a calibrated hydraulic model of the water distribution system and preparing a water system master plan. The water system master plan includes population and community growth projections, water requirements, existing and future facilities and storage evaluation, water main replacement program (KANEW), prioritization and improvements, a capital improvements plan, and reporting.

##### **Green Bay Water Utility, Unidirectional Flushing Plan, Green Bay, Wisconsin.**

Project engineer for the development of a system-wide unidirectional flushing program based on a calibrated hydraulic model. For each sequence a field log and map will be created indicating which valves and hydrants need to be operated.

##### **Miami-Dade Water and Sewer Department, Model Development, Miami, Florida**

Project engineer assisting in model development including pipe geometry and connectivity.

### **About AECOM**

AECOM is the world's premier infrastructure firm, delivering professional services throughout the project - from planning, design, and engineering to consulting and construction management. We partner with our clients in the public and private sectors to solve their most complex challenges and build legacies for generations to come. On projects spanning transportation, buildings, water, governments, energy, and the environment, our teams are driven by a common purpose to deliver a better world. AECOM is a Fortune 500 firm with revenue of approximately \$20.2 billion during fiscal year 2019. See how we deliver what others can only imagine at [aecom.com](http://aecom.com) and [@AECOM](https://twitter.com/AECOM).

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