

## Fall River MVP Action Grant Case Study

**Municipality/Nonprofit Organization:** City of Fall River

**Project Title:** Water Supply Risk & Resilience (RRA) and Distribution System

**Grant Award:** \$154,300

**Match:** \$38,575

### **Community Overview:**

*Provide a general description of your community as a brief introduction to the project.*

The City of Fall River supplies drinking water to nearly 100,000 residents from two surface sources (and a third source for emergency supply) and sells water to other public water systems including the towns of Tiverton, Westport, and Freetown. Most of the water system infrastructure pre-dates 1930 and some as early as the late 1800's. The age of the water system renders it substantially susceptible to severe damage from increasingly frequent natural hazards. A 2019 Fall River MVP Report identified water infrastructure as a significantly vulnerable asset and water supply and watershed security as substantial concerns to Fall River residents, and listed as a priority action item to "Identify and leverage funding sources to implement recommendations of the Water Systems Master Plan, [and] complete [an] AWIA risk assessment and emergency response plan for the Water System." The City recognizes that a secure, reliable water supply is essential to emergency response capability in hazard events. For this reason, the City updated its Hydraulic Model and completed a Water System Risk and Resilience Assessment (RRA) as a first step toward securing its public water supply against hazard events and potential outside threats.

### **Description of Climate Impact:**

*Address the community's current and potential future vulnerability to climate change impacts. What are the specific threats to the project area/site and reasons for applying to the grant program?*

The City of Fall River, located in Bristol County and the Taunton River Watershed is one of Massachusetts' ten largest cities, with five miles of shoreline exposed to open ocean at Mount Hope Bay and the remainder fronting the mouth of the Taunton River. Approximately 25% of the City land area is home to Environmental Justice populations. As a waterfront community, Fall River faces the challenge of increasing impacts from climate change. Like many other coastal communities in the northeast, the City is experiencing more frequent and intense high wind events, rainfall, and snowstorms. In the past decade, severe storms have caused property damage, tree damage, utility disruptions, power outages, coastal erosion, and flash flooding. The climate pattern over the Bristol County area that includes Fall River shows a distinct trend of progressively more storm activity of rising intensity. According to the NOAA National Centers for Environmental Information Storm Events Database (NCEI SED), the number of severe storms

in Bristol County has increased steadily since 1980. From 1990-2000, 103 events were recorded for the County and included deaths, injuries and property damage; these 13 types of events included heavy rain and strong wind as well as winter weather. From 2000-2010, 135 events were reported, again with death/injury and increased property damage; 15 types of events occurred, including floods, high wind, thunderstorms and winter weather. Between 2010 and January 2019, 196 severe storms have resulted in death and injuries and property damages greater than the previous decade; 20 types of events were reported for this period, including thunderstorms, high wind, winter storm/hail, and excessive heat. The City's 2016 Hazard Mitigation Plan ranks flood, hurricane, severe winter storm, and Nor'easter/Coastal Storm as hazard events with the highest frequency and probability of impacting the community. The hydraulic modeling and detailed water system vulnerability assessment project is in direct response to County climate change data and citizen concerns regarding the resiliency of the City water supply system, as expressed in the MVP process.

**Project Goals:**

*What were the specific goals of the project?*

The City's goal was to develop a user-friendly, comprehensive plan that addresses climate vulnerabilities, meets EPA regulatory requirements, and can be readily integrated into community plans. Importantly, the final plan provides the City a roadmap to prioritize repair/replacement of specific critical water supply components and to inform development of a capital improvement plan for resiliency. The Resiliency Assessment will be reviewed by the Fall River Water Department every five years and will be updated if/as necessary on review.

**Approach and Result:**

*How did the project team implement the project? Describe the methodology or your approach to achieve the project goals. Describe, and quantify (where possible) project results (e.g. square footage of habitat restored or created). Provide web links, if available, to your project deliverables.*

The City of Fall River conducted a Risk and Resiliency Assessment (RRA) in compliance with America's Water Infrastructure Act. The project included an update to the City's distribution system hydraulic model to identify the most critical piping infrastructure. The RRA provides information to the water department to assist in allocating resources for repair, replacement, and expansion of existing system assets by considering the following: natural hazards and malevolent acts; resilience of water facility infrastructure (from pipes and facilities to software and cybersecurity); monitoring practices; financial systems (including billing); and chemical storage and handling. The report developed by Woodard & Curran, Inc. (Woodard & Curran) includes a development and analysis of the Utility Resilience Index (URI) score, objectives and

methodology for the qualitative and quantitative portions of the RRA, a countermeasures analysis, and discussion of the cybersecurity risk assessment.

Woodard & Curran utilized a combination of documents provided by the City including the 2014 Water System Master Plan, the 2004 Emergency Response Plan, tank inspection reports, historic water usage, system-wide geographic information system (GIS) information, and a series of workshops to fully understand the utility's operations, assets, and potential risks. Through the development of the RRA, a list was developed to identify critical assets and threats that posed the greatest consequence to the utility with respect to economic losses, safety, and public confidence. An economic risk indicator (dollars/year) was developed to prioritize those threats that could have a large consequence on the City. Additionally, countermeasures were developed for the threats corresponding to the highest economic risk, which created a list of prioritized projects that will have the largest impact by decreasing the economic risk associated with each threat. This list of prioritized projects will help the City in planning for future water system improvements.

The steps taken to complete the RRA include:

- *Utility Resilience Index:* Assessed the general preparedness of the City's water utility to respond to events which threaten their ability to continue providing safe, reliable drinking water. The URI for a community can range from 0% to 100% and represents the utility's ability to respond and recover from an incident that impacts critical operations. The URI is calculated based on a series of 12 questions and multiple-choice answers provided by the U.S. Environmental Protection Agency (EPA). A low URI score indicates a lower capability of a utility to respond and recover from an incident, whereas a high URI indicates a greater capability to do so. The URI for the City of Fall River Water Division (Water Division) is 31%, indicating that the Water Division has an opportunity to improve its ability to recover from an incident.
- *Critical Asset Threat Pair Risk Quantification:* Created a list of critical assets and corresponding threats that, should they occur, have the potential for a large economic, safety or public confidence consequence and the corresponding economic risk in dollars/year associated with each. In accordance with AWIA requirements, the qualitative assessment included creating a list of the City's water system assets and performing a criticality analysis. Woodard & Curran defined a critical asset as one which the loss or degradation of the asset would require utility action in order to continue providing safe, reliable drinking water to all customers. From this analysis it was determined that the Water Division has 48 critical assets to be assessed further. The purpose of assigning these scores is to screen the list of critical assets and focus assessment resources on those assets which are most susceptible to natural hazards, malevolent acts and dependency/proximity

threats. Those asset-threat pairs which received a “Critical” consequence score are considered “Critical Asset-Threat Pairs” and are the scenarios that are included in the quantitative RRA.

- *Cybersecurity Controls:* Developed a list of prioritized cybersecurity controls to protect the utility’s process control, electronic and enterprise systems. Woodard & Curran completed the cybersecurity risk assessment utilizing the American Water Works Association (AWWA) cybersecurity risk management tool. AWWA generates a list of recommended controls based on how the Water Division utilizes their process control and enterprise systems. A summary of the 89 cyber-risk management controls identified for the Water Division, and the status of each, is summarized in the report.
- *Prioritized Projects:* Developed a prioritized list of improvement projects to mitigate risk associated with the critical asset threat pairs of highest consequence, including both physical and cybersecurity controls. Woodard & Curran identified five threat scenarios, associated with critical asset-threat pairs, that would represent the highest likelihood of occurrence and consequence to the Water Division. These threat scenarios were the focus of the quantitative risk and countermeasure analysis. For each identified threat scenario Woodard & Curran developed a countermeasure to minimize the risk to the Water Division associated with the critical asset-threat pair. The countermeasure may include operational changes, infrastructure upgrades, cybersecurity upgrades, etc. A conceptual cost estimate has been provided for each countermeasure to serve as a feasibility planning cost for capital investment. A post-countermeasure quantitative risk analysis was then performed to theorize the potential risk savings in dollars utilizing the VSAT tool and to assist the Water Division in prioritizing projects.

#### **Lessons Learned:**

*What lessons were learned as a result of the project? Focus on both technical matter of the project and process-oriented lessons learned.*

The loss of Fall River’s WTP would put many customers out of water therefore it is a critical asset. Currently the City does not have established local-local or regional water mutual aid agreements. The City is investigating additional water mutual aid options and looking at a regional study to help identify the response if such an event were to occur.

Due to the nature of the raw water intake, source water contamination could cause a problem for operation of the water treatment plant. The potential to treat water in the South Watuppa pond was identified as well as looking at additional source water protection projects.

After the Cybersecurity Assessment and reviewing the controls recommended by AWWA that were not fully implemented, Woodard & Curran identified seven projects that, once completed, will increase the Water Division’s cyber-resilience and reduce the risk of a cyberattack. Projects

include policy changes, infrastructure improvements, and networking and software improvements.

**Partners and Other Support:**

*Include a list of all project partners and describe their role in supporting/assisting in the project.*

Project partners include City staff and the engineering consultant, Woodard & Curran.

**Project Photos:**

*In your electronic submission of this report, please attach (as .jpg) a few representative photos of the project. Photos cannot show persons who can be easily identified, and avoid inclusion of any copyrighted, trademarked, or branded logos in the images.*