



PFAS TEMPORARY WATER TREATMENT PLANT



2021 APWA PROJECT OF THE YEAR

Category: Disaster or Emergency Construction Repair

Division: \$5 million, but less than \$25 million

PROJECT DESCRIPTION

Faced with contaminated groundwater impacting its municipal potable water system, the City of Woodbury proactively responded by developing and successfully implementing a temporary gap solution to ensure the municipality could reliably provide drinking water that met all current state and federal standards and guidelines. This temporary solution was required to meet peak production needs for an estimated seven years until a long-term solution can be implemented. With a timeline of five months from design to operation, this effort was set to be challenging. It required a **declaration of local emergency, implementation of a new construction manager at risk (CMAR) process, continued delivery of safe water that met current water quality guidance values and standards during construction, and happened all during a global pandemic and local and national civil unrest.** With a passionate team, dedicated to collaboration and committed to the safety of the community, the city successfully designed, constructed, and brought online a temporary water treatment plant (TWTP). The TWTP produces up to 4.8 million gallons a day and successfully met the impending summer 2020 peak water demands. The new plant has positioned the community to successfully provide water until a long-term solution can be implemented.

Groundwater Contamination Concerns Lead to Lawsuit

In the early 2000s, per- and polyfluoroalkyl substances (PFAS) were found to have contaminated drinking water supplies in parts of the eastern Twin Cities. Over the last approximate decade and a half, PFAS have been discovered throughout



Aerial view of TWTP nearly constructed.

the eastern Twin Cities, including in Woodbury's groundwater supply. Research has been conducted to identify the source and level of contamination. Most of the contamination has been traced to four former disposal sites in Woodbury and surrounding communities as a result of byproducts from a 3M manufacturing facility.

In November 2017, the Minnesota Department of Health notified the City of Woodbury that of Woodbury's 19 municipal wells, water from five wells, based on the most current data, exceeded either a PFAS health-based guidance value (HBV) and/or a health risk index (HRI) value. By June 1, 2020, two additional wells (a total of seven of 19 wells) had received health-based advisories from the Minnesota Department of Health (MDH), with additional wells showing changes in detected PFAS concentration levels. The city was not alone. Multiple communities in the area faced similar concerns. Minnesota's attorney general sued 3M in 2010 alleging that the company's production of chemicals known as PFAS had damaged drinking water and natural resources in the southeast Twin Cities metro area. On February 20, 2018, the State of Minnesota settled a lawsuit against the 3M Company in return for a settlement of \$850 million.

Woodbury Temporary Water Treatment Plant

Chris Hartzell, City of Woodbury Engineering Director, speaking at a settlement meeting.

Lawsuit Leads to Action

In response to this settlement and the contamination of seven of its 19 production wells, the City of Woodbury retained the team of Advanced Engineering and Environmental Services (AE2S) and Jacobs Engineering (Jacobs) to begin responsibly planning to address the PFAS in Woodbury's drinking water system. The team began by reviewing Woodbury's population and water demand projections, evaluating current and future drinking water regulations, and completing a source water evaluation. At the same time, Woodbury successfully secured a grant from the state to develop a mixing model of their distribution system to better understand the potential impact the impaired wells may have on Woodbury's ability to provide clean drinking water to its residents.

Upon development of this mixing model, it was apparent that Woodbury was facing an impending challenge. While the city had been successfully operating its system and providing water that met current State of Minnesota and federal guidance values and standards for PFAS, the mixing model indicated a potential risk. The forecasted high summer water demands would require the use of one or more of the seven PFAS impaired wells, which were removed from service due to the PFAS contamination, to meet demand. Given the potential for this situation, staff at Woodbury felt strongly that

with seven wells offline and changing contaminant levels in the remaining wells, it was critical to develop a solution immediately. Together the city, AE2S, and Jacobs devised a plan that included the design, construction, and operation of a TWTP that would serve the city for an estimated five to seven years, meet near-term peak water use demands, while providing time for a well-thought-out, long-term treatment plant solution that would best serve the city far into the future. The TWTP would allow the city to provide short-term resiliency while keeping an eye on a long-term vision.

Summer Capacity Demands Expedite Timeline

With seven wells offline due to contamination exceeding one or more guidelines and standards, the city knew existing operations would be challenged by upcoming summer water demands. The team jumped into action in early January and set a goal of successfully treating and producing water for consumption by June 1, 2020. This goal not only required an operational treatment plant by this time, but the facility needed to be fully enclosed and secured, per the MDH, before operation could begin.

Getting Creative with Construction Techniques

To successfully accomplish designing and building a new water treatment plant in five months, a design-build/ CMAR process was required. However, the State of Minnesota currently does not allow this type of construction process for municipal organizations. Aware of the risks to the city, its citizens, and public health if the temporary treatment plant was not operational by summer peak demands, the city took the extraordinary step of declaring a local state of emergency on January 8, 2020. The declaration of a local state of emergency freed up resources and provided the city some flexibility in the design/construction process, **making it one of the most unique municipal construction projects to date.** Because time was of the essence, the city and its engineers had to work quickly. The team knew a top-of-the-line contracting partner in combination with CMAR would be required in order to succeed.

To engage various contracting partners, the City of Woodbury, AE2S, and Jacobs developed preliminary conceptual drawings and site plans of the TWTP. The team then conducted contractor interviews to make sure the best suited contractor was selected. Following interviews of three contractors, Woodbury selected Rice Lake Construction Group to join the project team as the primary contractor. The project team immediately began work to devise the best ultimate solution for the TWTP. Critical factors to making this solution a success included:



Collaboration and Communication



Creative Design/Scheduling



Flexible Materials Selection

"It can't be emphasized enough how important collaboration and communication were to the success of this project. It truly is the shiny apple of this whole project."

- Jim Westerman

Collaboration and Communication – Simply Put, It Was Critical

In order for this project to meet the city's impending needs, collaboration and communication had to be a major priority. Many factors went into this, including:

Internal City Coordination: The city realized this project had both major public health and safety impacts. To proactively position the city to best tackle the challenges ahead, the city reorganized internal resources to be able to put its best foot forward. Staff were specifically assigned to this project and responsible for championing its success.

Project Team Collaboration: Between city staff, AE2S, Jacobs, and Rice Lake Construction Group, all parties were, and had to be, involved in every aspect of the design. Decisions needed to fit the overall vision of the city, design had to meet current regulations, and there was no room for mistakes when it came to feasibility of construction. Not to mention, a few curve balls were thrown along the way that forced unprecedented challenges to communication and collaboration. The whole team worked together, in the same direction, every step of the way.

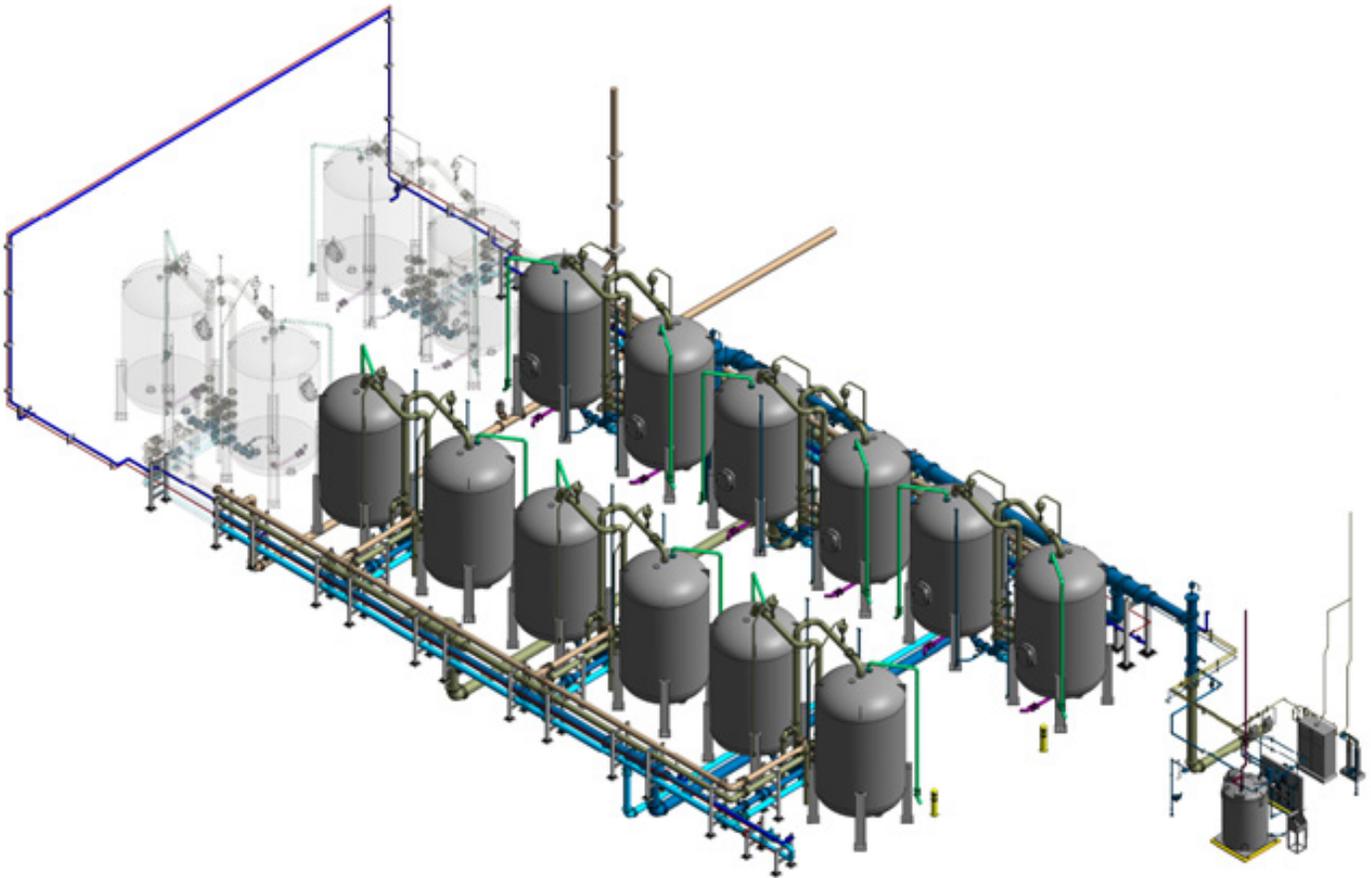
Coordination with State, Legal, and Local Stakeholders: This project was a part of a larger regional effort. All eyes were on every detail. The conditions of the project and the details that made up the temporary water treatment solution had to fit within a larger picture and meet both local and state expectations. The city, with the help of AE2S, was in constant coordination with outside stakeholders, examining every decision, and taking each turn of the wheel in stride. As the project and settlement evolve, effective coordination has been one of the most critical aspects of this effort.

Woodbury Temporary Water Treatment Plant

Public Communication: Water usage and conservation can evoke impassioned responses in people. While clean, safe water is the key to human health and community vitality, clean water production is often misunderstood and can be a contentious topic. Ever since PFAS was discovered in the city’s water supply in the mid-2000s, Woodbury has proactively communicated information to its residents and businesses about PFAS and its impacts through the city’s website, mailed newsletters and postcards, InTouch email notification service, YouTube channel, social media accounts, and news media. Sharing timely and accurate information about such a new and complex topic – using plain language – has been challenging, especially as health values established for PFAS by federal and state agencies continue to evolve. However, the many years of work communicating on this issue has built a strong level of community trust that was essential in the months leading up to the announcement of seven of Woodbury’s 19 wells being taken out of service, the associated emergency declaration by the City Council in early 2020, and the construction of the TWTP leading up to the high-peak water use months of summer.

KEY MESSAGES INCLUDED:

- To ensure there is enough clean water that continues to meet all state and federal guidelines and standards for PFAS, water usage restrictions may be needed for all Woodbury residents, businesses and city operations. We’re all in this together! These restrictions are necessary and prudent, and compliance is critical to ensure we all have water to drink.
- Due to seven wells being removed from service due to PFAS impacts, the City Council declared an emergency action in order to quickly and efficiently build a temporary water treatment facility in summer 2020 to provide clean water that continues to meet all state and federal guidelines and standards for PFAS and meet peak summer usage.
- **Clean water:** Woodbury’s water is regularly tested and monitored and meets all federal and state standards for safe human consumption.
- **Finite resource:** Water is a finite resource and the supply of clean, safe water requires ongoing management by the city and residents.
- **PFAS challenge:** The challenge of PFAS in the city’s water supplies is real and ongoing. This will be a long-term challenge for the city and other nearby cities.
- **We all play a part!:** The city, its residents and businesses all play a part in using water efficiently. Every drop counts!
- **Necessary and prudent:** Increased water restrictions may be necessary because of the impact of changing weather conditions, limited production capacity due to wells offline as a result of PFAS contamination, normal mechanical items, and ongoing construction of the new temporary water treatment facility.
- **“Be The First To Know”:** As a driver of signing up for CodeRed emergency text messages and calls to mobile devices and other systems, telling residents they can get information first was critical.
- **“We’re All Doing Our Part”:** As a driver of community-wide acceptance of standards and adoption of new measures, showcasing how we’re all doing things was a key driver of the city’s communications effort.
- **“We’re Water Wise”:** The city leveraged its previously implemented water efficiency branding campaign as a driver of self-directed community stewardship messages.
- **Compliance is critical:** Compliance is critical – we do not want to put PFAS contaminated wells back in service – or need boil water orders -- to meet peak summer demand.



3D Process Rendering of new TWTP GAC system.

Creative Design/Schedule to Meet Local Emergency

To fast-track the project timeline, the creative construction process developed by the project team was broken up into a three-component design process. The three components included foundation, building, and civil site design. By breaking up the design into these components, the design team was able to expedite shared information with the contractor and regulatory agencies. This unique process required true collaboration between the city, design team, contractor, and 3M who played a role in securing the pressurized vessels for the water treatment plant.

In addition to breaking up the design process, the AE2S/Jacobs team used Revit3D design software and a cloud based BIM360 design platform to streamline design processes and reduce time consuming design iterations. The entire design team, including architectural, structural, process, mechanical, electrical, and civil were aligned to allow for seamless communication between disciplines who were spread throughout the United States.



Initial concept rendering has striking resemblance to final design.

The unexpected impact of a global pandemic could have been disastrous for the project team had traditional design methods been used. However, the team was able to alter their work locations and work from home while still collaborating seamlessly with the team members.

The design team began conceptual design of the TWTP in early January and released the first set of drawings for review by the contractor and owner on February 7, 2020. This set was utilized by the contractor to establish a guaranteed maximum

price for the project and allow the City of Woodbury to approve the concept and finalize their grant for the construction of the TWTP with the Minnesota Pollution Control Agency (MPCA). Once a building concept was approved, the team worked towards a final design. In order to expedite the construction time frame, the design documents were broken into 3 packages. The first package was the *below-grade piping and foundation design package*. It was critical to accommodate the time sensitive delivery of the granulated activated carbon (GAC) vessel on April 1, 2020, by Calgon Carbon. This milestone in the project had the opportunity to cause delays if not successfully completed. The foundation design was finalized and delivered to Rice Lake Construction Group and the MDH on February 20, 2020. Before construction of the piping of foundation could begin, plan approval from MDH was required to ensure they met current federal and state code. Official MDH approval was received on March 3, 2020. City staff and Rice Lake Construction group finalized the construction contract, and the City issued the notice to proceed on February 24, 2020. Rice Lake began site clearing activities that same day.



TWTP Under Construction



TWTP Under Construction

that would be required for the TWTP to operate and secure the treatment equipment. The final package was delivered on March 9, 2020, and received formal approval for construction by MDH on March 17, 2020. This design included full architectural, structural, process, mechanical, and electrical construction details that would typically be included in a fully bid construction set. It also included full process piping and instrumentation diagrams (P&ID) and 3D isometrics to assist Rice Lake in construction of process piping and chemical feed systems.

Unmatched Adversity

Unforeseen challenges threatened the success of the project from the start.

- **Global Pandemic**
- **Civil Unrest**
- **Emergency Pipeline Repair**

Global Pandemic Forces Flexible Material Selection and Preventative Measures

Meeting the June 1, 2020, production milestone was critical in ensuring the city could meet peak water use demands. A major concern with meeting this timeline was availability of materials. This is a concern for any project such as this; however, it was amplified due to the global pandemic. With nationwide shutdowns and a limited labor force, typical trusted materials were uncertain. Therefore, the project team had to have extra flexibility in the design of technologies and processes based on materials

that would maximize the schedule, remain in budget, and keep in context with the temporary nature of the effort. The project engineers were knowledgeable in many material alternatives and were able to develop and coordinate with stakeholders a solution that included accessible and schedule-supportive materials. Given the current state of the pandemic, much reliance was put on incorporating technologies that utilized materials that could be produced locally.

Global Pandemic - Extra Precautions and Limits Workers

The onset of Covid-19 threw a variety of challenges at every industry in the country. It changed the way many people did business and it threw curve balls daily at these efforts, resulting in changes to material procurement and project staffing. A project of this magnitude, completed in the needed timeframe, requires a reliable set of skilled professionals. The city knew the team assigned to this project would have to be smaller due to social distancing requirements, and it was critical to minimize the impacts of Covid-19 with the condensed team and condensed timeline. Therefore, the city and Rice Lake Construction group implemented an extensive safety training program covering standard site safety, but also Covid-19 specific safety measures and checks. After completion of the TWTP, the commitment the team had to this project was evident by not a single member of the project team testing positive for Covid-19.

Civil Unrest – Secured Building Required

At the end of May, during the midst of construction, the Twin Cities experienced unprecedented civil unrest that spanned the entire metro area and surrounding region. The civil unrest involved extreme destruction to thousands of properties in the Twin Cities, including some properties in Woodbury. With an open construction site, susceptible to the destructive activity happening, along with the vulnerable location, the city proactively developed a security plan to keep the site under control and safe from destruction. Beyond regular construction security activities, extra security cameras were installed, extensive measures were done to secure equipment, and police were on patrol to do hourly drivebys. In addition, passionate about what this project meant to their community, city staff took it upon themselves to do extra security checks and rounds.

"The health and safety of our community relied on this project and all hands were on deck to eliminate the threat of vandalism or riots setting the site on fire."

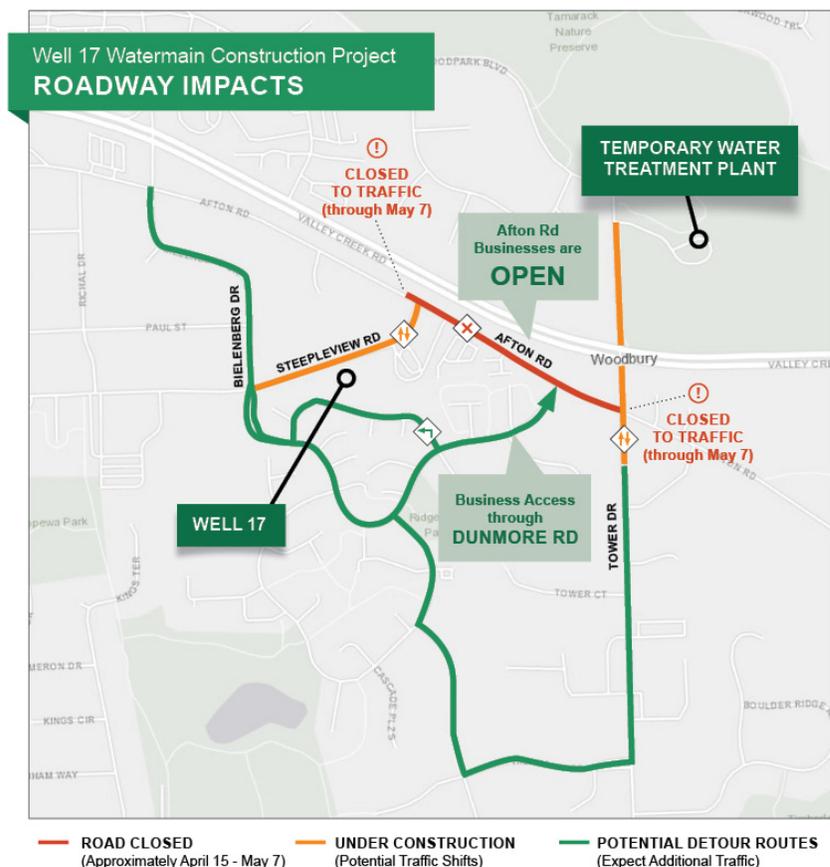
- Jim Westerman

The threat and uncertainty lasted weeks. Therefore, the team was forced to get creative with the schedule in order to minimize risk and develop a plan that included completely securing the building before starting up the facility.

Emergency Trunk Water Line – Unexpected Potential Health Crisis

Throughout the project, the city staff kept a close eye on PFAS levels in their remaining operational wells. Approximately a month after

project implementation began, Woodbury's Well 17 exceeded health index levels for PFAS. The city was faced with thinking quickly to develop an action plan. The solution involved a new trunk water line dedicated to Well 17, extending from the well to approximately a half mile to the new TWTP. After finalizing trunk water line details and agreeing to a horizontal boring installation solution, which minimized impact to the local roads and businesses, a strategic communications plan was developed and implemented targeting both local stakeholders and the greater public. Unfortunately, during the Well 17 trunk water line effort, a mistake in a utility locate resulted in the rupture of a 12-inch high-pressure gas main. The project team sprang into action and worked diligently through the middle of the night, collaborating with public safety and the local gas utility to correct the mistake, inform the public, and keep everyone safe. The diligent work by each of the team members helped get everything back on track by morning, avoiding a potential major catastrophe.





Inside of the new TWTP GAC tanks.

Success! Now and for the Future

Faced with unprecedented adversity, the city accomplished the goals it set out to reach and the new TWTP was operational by June 1. The new TWTP includes a compact facility just big enough to accommodate both blending and GAC treatment, but flexible enough to bridge the gap of the City's near-term water needs and a long-term solution to PFAS contamination. The innovative blending combination treatment technique maximizes the capacity of the small-sized plant while also extending the life of the GAC.

The TWTP is the first WTP in the city. This new adventure will come with new challenges for the city, as none of the staff have operated a WTP in the past. Aware of this factor, the project team invested in both

training operators, as well as implementing the most intuitive operating tools, such as OpWorks dashboards and 3D SCADA screens to make day-to-day operations of the new plant as efficient and effective as possible.

The new TWTP, successfully completed in time for peak demands, more than overcame all the challenges it faced. It has positioned the city to continue to provide water that meets all state and federal guidelines and standards for PFAS.

"We are confident the solutions developed will successfully serve our community in the near-term, and bridges the gap between now and implementation of a long-term solution."

- Jim Westerman
