

Internal Monitoring Report

Policy #: O-2C Reliability

Date: November 26, 2019

Frequency: Annual

Policy Language:

The Water Utility General Manager shall not cause or allow conditions, procedures, or decisions that prevent Madison Water Utility from meeting its obligation to provide current and future generations of customers within the City of Madison and its authorized service areas with reliable water service that is consistent in its quality and availability.

Accordingly, the General Manager shall not cause or allow conditions, procedures, or decisions that:

1. Assure that residents experience only minimal unplanned service interruptions.
2. Provide residents with adequate notice of planned service interruptions.
3. Provide residents with adequate notice in the case of planned maintenance work that would significantly reduce water flow or pressure, and/or cause water discoloration.

General Manager's interpretation and its justification:

Madison Water Utility (MWU) shall plan for, budget for, fund, prioritize, and construct the necessary drinking water system improvements to replace and sustain the Utility's infrastructure both now and into the future. MWU shall build in the necessary system redundancy and reliability, shall maintain all components of the system, and shall develop operational procedures to ensure reliable water service to all customers. The objective shall be to meet established system level of service and key performance indicators 24/7/365.

To achieve this objective, MWU will develop, routinely update, and implement long-term facility, and system master plans to identify system long term needs. MWU will develop, refine, and implement a comprehensive Asset Management Program to monitor, assess and regularly renew all Utility assets. The Asset Management Program will identify the right project, for the right reasons, at the right time, for the right price. To support this objective, MWU will annually build capital and operating budgets supported by appropriate revenue streams approved by the Wisconsin Public Service Commission.

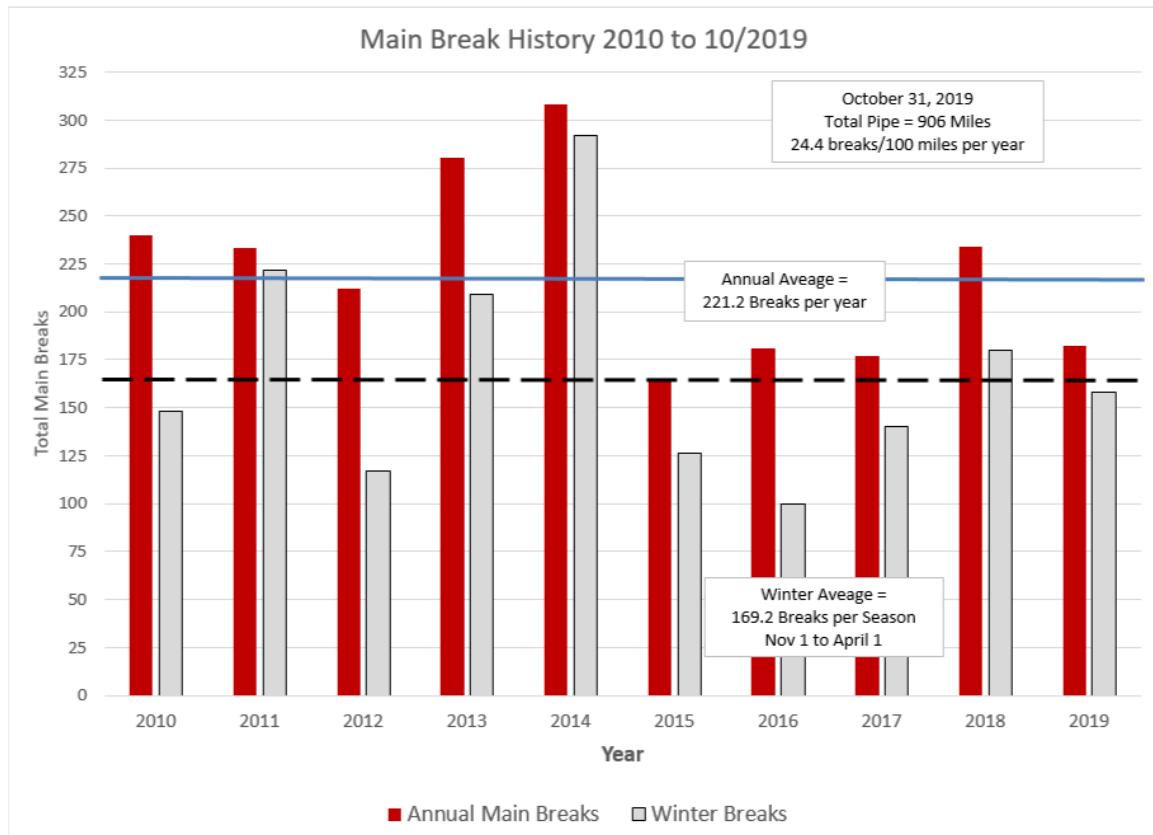
The Utility's maintenance program, built under the guidelines of the Asset Management Program, will be proactive and preventative to maximize component reliability, efficiency, and life cycle costs within the system. The Utility shall also establish work scheduling protocols and notification procedures that will minimize the impact to consumers during maintenance and repair work.

Data directly addressing the General Manager's interpretation:

1. *Assure that residents experience only minimal unplanned service interruptions.*
 - a. *Planned Infrastructure Renewal: To reduce the risk of unplanned service interruptions, the Utility shall budget for, fund, prioritize, and construct the necessary system improvements to replace and sustain the Utility's infrastructure.*

From 2010 to November 1, 2019, Madison Water Utility (MWU) experienced an average of 221.2 water main breaks per year. Over the current 906 mile distribution system, the average break rate is approximately 24.4 breaks per 100 miles of water main per year. The break rate is driven by the winter weather and will move up or down. Examining the break rate over several years will normalize the average and provide a better trend. The 9 year average break rate presented in the 2018 report was 25.1 breaks per 100 miles per year. There is no published universally accepted standard for annual main breaks due to a wide variance in pipe construction and climatic conditions. However, a commonly used goal for a well maintained system is to have no more than 20 breaks per 100 miles per year. Using this standard, the MWU goal would be no more than 180 main breaks per year for the Utility's 906 miles of pipeline. To reach the 20 breaks per 100 miles per year standard, MWU embarked on a program to replace or rehabilitate a majority of its aging water main system. In 2006, MWU identified over 400 miles of pipe that would need replacement in coming decades. MWU set a goal of replacing 10 miles of pipe per year for 40 years to update the system. In October 2017 the Utility celebrated completion of the 100th mile of main replacement since 2006.

Approximately 76% of all main breaks occur each winter from November to March. The annual total number of main breaks is driven by the severity of the winter weather and the depth of the frost. This fact was clearly illustrated during the polar vortex of 2013/2014 when 292 main breaks occurred from November 2013 through March 2014. Total and winter main breaks by year since 2010 is presented in the following chart.



In 2005, Madison Water Utility completed its first Infrastructure Management Plan. This was a comprehensive condition assessment of all facilities both buried and above ground. The report laid out a plan to systematically renew the system over several decades. To update this system infrastructure renewal plan, MWU has developed an Asset Management Program. Utility staff, with the assistance of a consultant, GHD, completed an Asset Management Strategic Plan and an Asset Management Pilot project. Asset management strategies are being used to prioritize projects developed as a part of the Master Plan update.

The 2005 Infrastructure Management Plan recommended that the Utility invest a minimum of \$9 million per year (2005 dollars) for pipe replacement and \$2.5 million per year (2005 Dollars) for facility upgrade and renewal. Adjusting for inflation to 2019, pipeline reinvestment goals are \$13.6 million per year for pipelines and \$3.8 million per year for facilities for an annual total need of \$17.4 million. MWU significantly increased its Capital Improvement Program for water main replacement in 2007 to start working toward this goal. Using debt financing during eleven years of declining water demand has resulted in a significant debt load for MWU. In 2018, the Utility significantly cut the capital pipe renewal budget to \$9.65 million and facility projects were delayed to future years. The 2019 pipe renewal budget was reduced to \$6.91

million and the 2020 pipe renewal budget was set at \$1.93 million due to a \$4.08 million new pipe construction commitment. The projected pipe renewal budget for 2021 is \$9.22 million. Facility projects have been delayed until 2021 when work will resume on several projects.

MWU engineering staff develop and implement the Capital Improvement Program based on the approved annual Capital Budget. Pipe replacement projects are identified and developed in conjunction with City Engineering based on operational criteria, maintenance history, and staff recommendations.

Utility engineers work closely with City Engineering to coordinate water main replacement projects with proposed street projects. Coordinating water projects with street work saves the Utility pavement restoration costs and minimizes disruption to neighborhoods. Pipe segments are selected for replacement based on their break history, hydraulic capacity, age, and material.

In an effort to repair system pipelines at lower cost and thus increase the impact of the total annual capital budget, a pipe lining program was started by MWU engineering staff in 2011. Working closely with Wisconsin DNR engineers, MWU successfully piloted and constructed the first water main lining project in the State of Wisconsin in the fall of 2011. Each year the program continues to grow as the Utility learns how to manage and process water main lining work. The cost of this operation, which rehabilitates the main to full pressure and structural capacity, is approximately 2/3 the cost of full replacement. It is expected that as competition for water main lining work increases in Wisconsin, the cost of lining will go down. We anticipate that savings will continue to grow as the cost of pipeline replacement continues to increase. Due to current overall debt considerations, the pipe lining budget for 2019 is \$0. In 2020, \$200,000 has been budgeted for the lining program to fund the purchase of bypass piping materials to develop in house capability to provide water bypass systems for lining projects. MWU providing the bypass water system will result in additional cost savings to the Utility. It is projected that pipe lining will be fully restored in the 2021 capital budget.

Copies of the 2019 and 2020 MWU Capital budget are attached for information and review. The 2011 level of service memo and the Asset Management Key Service Area and External Levels of Service Performance Measures are also attached for the readers' information.

- b. Redundancy and Reliability: The Utility shall build in the necessary system redundancy, shall maintain all components of the system, and shall develop operational procedures to ensure reliable water service to all points in the system.*

Using master planning, utility engineering standard practices, and regulatory requirements through the decades, a system of redundant pumping stations, standby power generators, and gravity storage reservoirs has been developed and constructed throughout the Madison Water Utility system. The 906 miles of pipe link the twenty-three operating wells to feed the ten pressure zones. Pressure zones are established and defined using topographic conditions and isolation valves in the system piping. In the event of an emergency, these zone isolation valves could be opened to move water from a higher zone to lower zone and maintain service. Pumping redundancy is designed and constructed into the system. If a pump in the system has a mechanical failure and is removed from service, pumping systems still have the capacity to meet anticipated system water demands. All pressure zones have a minimum of one gravity fed reservoir that provides emergency water supply. All system storage reservoirs are designed and sized to provide up to 12 hours of emergency supply based on the annual average demand. Reservoirs are also sized to provide firefighting capacity and peak demand supply.

The Utility currently has access to 16 standby power generators, 9 owned by MGE and 7 owned by the Utility. Fourteen generators provide power to well facilities providing reliable water supply to the system. Two generators power separate booster pumping stations to move water between zones. For new facilities not equipped with a generator, electric transfer switches have been installed that will allow the connection of a portable generator. The Utility does not currently own a portable standby generator and intends to rent or lease a generator if needed. The generators provide approximately 40 million gallons per day of well supply to the system.

- c) *Comprehensive Planning: The Utility will develop, routinely update, and implement long term facility and system comprehensive and master plans to identify system needs and funding opportunities.*

In 1964 MWU developed its first Water Master Plan to evaluate system needs, plan for the future, and establish projects needed to provide a reliable and robust water system, to expand the system to growing areas and to budget for those improvements. The most recent planning efforts completed by the Utility are 1) the 2006 update to the Water Master Plan and 2) the 2012 East Side Water Supply Project. These documents identify capital project needs based on system wide hydraulic analysis, water quality issues, identified deficiencies, and projected growth patterns.

The Water Master Plan establishes a list of capital projects necessary to meet the MWU established level of service. Level of service and key performance indicators are being further developed as a part of the Asset Management

Program to optimize existing facilities and to work toward a fully redundant and reliable water supply and distribution system. Copies of the current level of service criteria and the key performance indicators from the Asset Management Program are attached for information and use.

Utility engineering staff are working with SEH Inc. to update the MWU Water Master Plan. This work utilizes data from the AMI system to update and recalibrate the distribution system hydraulic computer model. Current and future water demand scenarios are being developed to evaluate the system using the distribution system computer model. Using the model with projected water demands will identify any deficiencies in the system. Projects will be developed to effectively mitigate identified deficiencies. Business case analysis will be used to prioritize and rank projects for the MWU Capital Improvement Program. The prioritized projects will be listed in the annual capital budget. Completion of the update of the Water Master plan is anticipated in early 2020.

For the last 3 years MWU staff has been working with GHD to develop the MWU asset management program. A system of asset condition assessment and rehabilitation or replacement planning is being developed to track utility assets and plan for restoration. This deliberate system of data collection and analysis will result in data driven decision making based on business case analysis and reduction in risk. The asset management program will be developed and refined over the next 2 to 3 years.

- d) Maintenance and Repair Programs: The Utility's maintenance program will be proactive and preventative to maximize component reliability, efficiency, and life cycle costs within the system.*

Wells, booster pumping stations, and reservoirs are routinely inspected, serviced, and maintained. System operation is monitored and recorded by the Utility SCADA system and by routine daily inspections by Utility Rounders. Well pumps are scheduled for removal, inspection, and rebuilding or replacing every 10 years. System reservoirs are inspected and cleaned every 5 to 10 years. MWU budgeted \$491,000 in 2019 for planned well and facility maintenance projects, upgrades, and additions.

The MWU Asset Management Program will use a system of inspection, evaluation, and preventative maintenance procedures to maximize return on investment of all assets. To continue to track investment in operating and maintaining MWU assets, MWU implemented CityWorks, a Computerized Maintenance Management System (CMMS). This system will record all repair work and track maintenance operations providing operational data on the system.

e) *Minimizing unplanned Service Interruptions: Notification and management*

Unplanned service outages are typically due to water main breaks or mechanical breakdowns. When an outage occurs, MWU repair crews respond to the area and contact impacted customers in person and inform them of the situation and the expected length of the outage. When a water main break is identified, valves will be closed to minimize the impact of the break to the smallest area possible. Crews work with impacted customers to minimize the service disruption and will modify the repair work as needed. When water service is restored, utility crews check with area residents to make sure that there are no further complications resulting from the water outage.

During calendar year 2019 from January 1st to October 31st there have been 182 main breaks. During this time, an average of 13.9 customers are out of water for approximately 2.8 hours during each break. Each break is unique and may require more time to complete repairs or impact more customers.

I report compliance.

2. *Provide residents with adequate notice of planned service interruptions.*

Planned service interruptions are necessary in the vicinity of pipe line replacement projects, valve and hydrants repairs, and many other maintenance and construction operations. Procedures established in construction contracts set the requirements for working with customers to minimize the disruption of their water service. Similar procedures are utilized by MWU crews during the various maintenance procedures that they perform throughout the year.

Prior to starting any planned work that will require an interruption of service; customers are individually notified. Either the contractor or a Water Utility employee contacts all impacted residents and explains the need for the work and the expected duration of the water outage. Contractors provide residents a minimum of 2 working days' notice of any planned service interruptions during their work. Planned service interruptions are typically 4 to 6 hours in length. If the resident is unnecessarily inconvenienced by the planned outage, the work crew will modify the work plan to accommodate the customer to the greatest extent possible. When the work is completed and water service has been restored, customers are notified and asked to flush their services to minimize the risk of problems.

Due to the interconnected nature of the system, service interruptions due to maintenance of wells, pump stations, and reservoirs are rare and localized in nature. If an interruption of service due to work on a well, pumping station or reservoir is unavoidable, those impacted customers are notified by post card

or door hanger a minimum of 7 to 10 days in advance of the planned interruption. Planned service interruptions are kept to no more than 4 to 8 hours. During 2019 there were no planned service interruptions due to work at a well, pump station or reservoir.

Consumers generally accept the inconvenience of water service interruption when proper notification is provided. Complaints resulting from planned service interruptions are generally caused by delays in re-establishing water service. Utility field personnel are diligent in minimizing the impacts of such delays. If a re-establishment of service is delayed, impacted customers will be notified of the additional delay as soon as possible.

I report compliance.

3. *Provide residents with adequate notice in the case of planned maintenance work that would significantly reduce water flow or pressure, and/or cause water discoloration.*

When a facility is taken out of service for planned maintenance work, the operation of other Water Utility facilities is modified to ensure that water service is not interrupted and pressures are stable. The water distribution system is interconnected and allows operating wells to provide service to all parts of a pressure zone.

In the event that the removal of a facility from service has the potential of reducing water capacity and/or pressure and poses the risk of water discoloration, those impacted customers are notified by post card a minimum of 7 to 10 days in advance of the planned interruption. The Utility may also use other electronic means such as social media and email listserv to notify area residents of an anticipated reduction in service. Madison Fire Department is notified whenever a reservoir is taken out of service for maintenance. While we do not anticipate a reduction in fire protection capacity, the MFD notification is considered a worthwhile precaution.

Since 2006, MWU has conducted annual unidirectional flushing of the system to maintain water quality and reduce the risk of colored water events. The annual unidirectional flushing program has a goal of flushing up to 500 miles of the system from April to November. Routine unidirectional flushing and cleaning of the distribution system does cause a temporary reduction in water pressure and flow. Flushing operations also include the risk of causing water discoloration. Residents are notified of routine flushing operations in their neighborhood by yard signs, phone calls and an electronic listserv. Annual flushing schedules are published and posted on the Utility web page in the spring and a detailed schedule is maintained throughout the flushing

work. During the 2019 flushing season, 304 miles of main were unidirectionally flushed. Complaints received during the flushing operation are minimal and the general population considers flushing a routine maintenance operation.

I report compliance.

Attachments

1. 2019 Water Utility Capital Budget
2. 2020 Water Utility Capital Budget
3. 2011 Level of Service Memo
4. 2018 MWU_Samp_4.2 - Asset Management Key Service Area and External Levels of Service Performance Measures