Internal Monitoring Report

Policy #: O-2C Reliability **Date**: January 31, 2017

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 City of Madison and its authorized service areas with reliable water service that is consistent in its availability and quality.

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 shall budget for, fund, prioritize, plan for, and construct the necessary system improvements to replace and sustain the Utility's infrastructure both now and into the future. 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. To achieve this objective, the Utility will develop, routinely update, and implement long term facility and system comprehensive and master plans to identify system needs and funding opportunities. The Utility's maintenance 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.

Planned Infrastructure Renewal: To reduce the risk of unplanned service interruption the Utility shall budget for, fund, prioritize, and construct the necessary system improvements to replace and sustain the Utility's infrastructure.

Madison Water Utility experiences an average of 240 water main breaks per year. This equates to approximately 28 breaks per 100 miles of water main per year. There is no published universally accepted standard for annual main breaks due to variance in construction and climatic conditions. However, a commonly used reference is a goal for a system to reach a level of no more than 20 breaks per 100 miles per year. This would result in a maximum of 172 main breaks in the Madison per year for the Utility's 860 miles of pipeline. To reach this goal the Utility embarked on a program to replace or rehabilitate a majority of its aging water main system. Over 400 miles or 46% of the system is in need of replacement over the next 4 decades.

In 2005 Madison Water Utility completed its first Infrastructure Management Plan. That Plan evaluated the condition of all facilities both buried and above ground and laid out a plan to systematically work through renewal of the system over the next 40 years. To continue to build on this and to maximize the value of all assets, the Utility is developing an asset management program.

The 2005 Infrastructure Management Plan recommended that the Utility invest a minimum of $9 million per year (2005 dollars) in pipe replacement and $2.5 million per year (2005 Dollars) in facility upgrade and renewal. In 2007 the Capital Improvement Program was significantly increased for water main replacement work to start working toward this goal. To lessen the impact on water rates, the Utility elected to ramp up the infrastructure replacement funding over the course of 13 years to the year 2020. This goal would result in a funding goal of $14 million for pipe rehabilitation and replacement and $3.9 million for facility rehabilitation in the year 2020. In 2016, the Utility budgeted $11.7 million for pipeline replacement and relining. For the year 2016, the Utility has budgeted $1.1 million for facility renewal and upgrades. The focus of the infrastructure renewal program over the past 10 years has been on pipeline renewal. Facility work has shifted to water quality and treatment improvements so budgets for facility renewal have lagged behind goals.

Due to budget size, water rate concerns, and Utility borrowing capacity, the proposed pipeline renewal budgets for 2017 and 2018 have been reduced by 20%. In 2019, an

annual inflation factor of 4% will be applied to the pipeline renewal line item to continue to grow this program.

Utility engineering staff develops the Capital Improvement Program to support the 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. The Utility is currently rehabilitating or replacing approximately 7 to 8 miles of pipe per year.

In an effort to repair decaying pipe at lower cost and thus increase the impact of the annual capital budget, a pipe lining program was started by Utility Engineers in 2011. Working closely with Wisconsin DNR engineers, the Utility 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. The Utility has budgeted $1,000,000 in 2017 for pipe lining projects.

A copy of the 2017 Executive Capital budget is attached for information and use. The approved budget includes carry over funding from 2016 to complete ongoing projects.

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 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. Using over 860 miles of pipe, twenty two operating wells are linked to feed the nine 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 demands. With the exception of Pressure Zone 11, all pressure zones have a minimum of one gravity fed reservoir that provides emergency water supply. An elevated 1.0 million gallon tank, the Blackhawk Reservoir, will start construction in 2017 and thus provide gravity fed storage for Pressure Zone 11. 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 fire fighting capacity and peak demand supply.

The Utility currently has access to 15 standby power generators, 9 owned by MGE and 6 owned by the Utility. A seventh Utility owned generator will be installed at new Well 31 in 2018. The 9 generators owned and maintained by MGE would each power a well facility providing reliable water supply to the system. 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 unit if needed.

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.

Starting in 1964 the Utility has used a 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 by the Utility are 1) the 2006 Water Master Plan and 2) the 2012 East Side Water Supply Project. These documents identify projects based on system wide hydraulic analysis, water quality issues, identified deficiencies, and projected growth patterns.

From the information developed in the Water Master Plan, a five year Capital Improvement Program (CIP) is developed and a Capital Budget is set. The projects are established to meet MWU established level of service criteria for the system. Criteria were established to optimize existing facilities and to work toward a fully redundant and reliable water supply and distribution system. A copy of the current level of service criteria is attached for information and use. The level of service criteria guidelines for the Utility is being expanded and updated as a part of the Water Master Planning process.

Utility engineering staff is currently in the process of updating the Madison Water Master Plan. This effort will implement data from the Utilities AMI system to update and recalibrate the distribution system hydraulic computer model. This will result in a more accurate representation of operating conditions. Evaluating the system with the computer model will identify deficiencies in the system. Using this information, projects will be developed to effectively correct those deficiencies. Project budgets are then

prioritized and scheduled in the Capital Improvement Program. It is anticipated that the update of the Water Master Plan will be completed by the end of 2017.

Madison Water Utility is also implementing an asset management program to maximize the value of all assets. A system of asset condition assessment and rehabilitation or replacement planning will be developed to track utility assets and plan for restoration. This deliberate system of data collection and analysis will result in data driven decision making. The asset management program will be developed and refined over the next 3 to 5 years.

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. The Utility budgeted $1.3 million in 2016 for existing facility maintenance projects, and upgrades/additions.

The Asset Management Program will assess the condition of all Utility assets and plan and budget for repair and replacement. A system of inspection, evaluation, and preventative maintenance procedures will maximize the value of each component. The Utility is in the process of implementing a Computerized Maintenance Management System (CMMS). This system will record all repair work and track maintenance operations. CMMS data will guide repair and maintenance work and extend the life of existing assets. The CMMS will be an integral part of the Asset Management Program.

Minimizing unplanned Service Interruptions: Notification and management

In the event of unplanned service outages due to water main breaks, either Utility repair crews or contractors working for the Utility notify impacted customers in person and inform them of the situation and the expected length of the outage. Utility employees work with impacted customers to the greatest extent possible to minimize the service disruption and will modify the 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.

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 Water Utility 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 working on the system are required to provide residents a minimum of 2 working days notice of any planned service interruptions. This work is monitored and controlled by Utility construction inspection staff. 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 is 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. The Utility's electronic listserv is also used to notify area residents. It is hoped that planned service interruptions are kept to no more than 4 to 8 hours in these instances. During the past year 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 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. During the past year there were no planned reductions in the level of service due to work at a well, pump station or reservoir.

Routine unidirectional flushing and cleaning of the distribution system does cause a temporary reduction in water pressure and flow. The annual unidirectional flushing program will flush up to 60% of the system from April to November. 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. Complaints received during the flushing operation are minimal.

I report compliance.

Attachments

1. 2017 Approved Water Utility Capital Budget
2. 2011 Level of Service Memo