Internal Monitoring Report

Policy #: O-2A Water Quantity

Monitoring Frequency: Annually **Date**: September 24, 2019

I certify that the following information is true.

Signed _____, General Manager

Policy Language:

Current and future customers will receive water that meets or exceeds industry-accepted levels of service for fire protection and pressure.

This includes:

1. *Water delivered to hydrants at proper flow rates for fire protection.*
2. *Water delivered to the customer tap at a pressure that meets industry-accepted low, high, and emergency operation criteria.*
3. *Water used for outdoor irrigation under drought-free conditions.*

General Manager's interpretation and its justification:

This Outcomes policy requires that MWU budget for, prioritize, plan for, design, and construct the necessary system improvements to provide adequate water quantity to all areas of the system. However, budget realities dictate that not all necessary system improvements are created equal. Therefore, MWU must identify and prioritize the list of required capital expenditures. The attached 2011 Level of Service Memo, developed as part of the East Side Water Supply project, established minimum standards for system supply, pressure, and fire protection capacity. These standards have guided system component design, evaluation, and expansion for the past 8 years. The Level of Service Memo formed the basis for broader, public facing, levels of service in the Utility's Strategic Asset Management Plan. In turn, the Level of Service Memo is being updated and further refined as a part of the current Master Plan and Asset Management Program. Finally, established Levels of Service will form the basis for the creation of key performance indicators (KPIs) that will measure how well capital expenditures are addressing water quantity issues.

KPIs measure the performance of the system in relation to Levels of Service. If the system cannot consistently meet the Level of Service, operational and capital improvements are identified, planned, prioritized and implemented. Asset Management processes manage utility risk. Projects are designed to reduce risk and

improve overall performance. Projects are scored based on their value and the risk reduction they provide. The projects with the largest reduction in risk receive the highest priority score.

MWU is implementing an Asset Management Program that identifies the right project for the right price at the right time for the right reasons to sustain the established level of service. For future capital expenditures and capital budgets, projects scored and prioritized will ensure a high return on investment.

A copy of the approved 2019 – 6 year capital budget (2019-2024) outlining planned capital projects to address identified deficiencies and growth areas is attached. The 2019 capital budget was developed from the list of projects identified in the Water Master Plan, the East Side Water Supply Plan, the Infrastructure Management Plan, and as defined by the Water Utility Board Water Quality Treatment Policy. The capital project list is reviewed and updated annually based on current system characteristics, operational records, and project priorities. Future CIP budgets will be developed and prioritized using an Asset Management Risk Reduction methodology.

The latest comprehensive update of the Water Master Plan is nearing completion and will be formally presented at the end of 2019. The current update will implement water use statistics based on AMI data and build future water demand projections for long term planning based on updated census and development data. Using the MWU water distribution system computer model, deficiencies in supply, pump capacity, pressure, and fire protection capacity are identified and projects are developed to mitigate those identified deficiencies.

In 2017 MWU worked closely with GHD, Inc. to develop a strategic asset management plan (SAMP). The SAMP provides a policy and framework for how MWU will implement asset management. MWU and GHD have completed a well facilities tactical asset management plan. This plan created a risk register for all well facilities as well as an investment profile for rehabilitation and maintenance for each well facility.

As part of the overall asset management program, MWU and GHD are developing a business case evaluation (BCE) process. A BCE provides a way to prioritize capital improvement projects. Other benefits of a BCE process are:

- A record of the issues identified and analysis performed to prepare and justify a project
- A framework for summarizing and reporting the results of the Project Validation, Risk Reduction, the Life Cycle Cost, and the Benefit/Cost for each project option considered
- A consistent way of receiving projects for consideration
- A basis for selecting the appropriate treatment option for a project

- A consistent way of considering and analyzing projects at a committee level, easily allowing comparison between projects
- Improved decision making based on project data
- A structured way of presenting a project's justification to stakeholders
- Improved basis to justify decisions/recommendations to the Water Utility Board

Data directly addressing the General Manager's interpretation:

1. *Water delivered to hydrants at proper flow rates for fire protection.*

Minimum required fire flow capacity for the Madison system is established in Table 5 of the attached Level of Service memo. Results from fire flow field tests are compared to these criteria based on property zoning to identify areas of deficiency with respect to available fire flow capacity.

In 2017 the Insurance Services Office (ISO) gave the City of Madison a rating of 1 as a result of a 2016 firefighting system evaluation. The ISO rating includes ratings of the Fire Department, the Water Utility, and the 911 center.

Using the 2006 Water Master Plan as a guide, over the past 13 years, MWU has developed and implemented capital improvement projects to mitigate identified areas of fire flow deficiency. The most notable projects include the Cannonball Pipeline project and Well 31. The current Water Master Plan update has updated the fire flow capacity map. The attached draft map, identified as Figure 2, illustrates areas of reduced fire flow capacity. Localized capital projects to mitigate identified fire protection deficiencies will be developed as the opportunity presents itself.

Typically, projects identified to mitigate fire flow deficiencies require significant capital investment and are budgeted for and implemented over the course of several years. We have reported to the Board on fire flow capacity mitigation projects in previous reports as the projects were developed, budgeted, and implemented.

Areas of fire flow deficiency identified in the 2006 Water Master Plan and 2012 ESWS plan and mitigated in the Utility's Capital Improvement Program include but are not necessarily limited to: 1) Arbor Hills or Cannonball Pipeline; 2) Pressure Zone 4; 3) Lake View Zone 5; and 4) North Sherman Avenue commercial area.

Current status of each project area is as follows:

Arbor Hills:

Identified Need: A single 8" water main supplied the Arbor Hills Neighborhood. This situation resulted in limited water supply reliability and low fire flow capacity that did not meet the minimum level of service.

Identified Project Alternative: Review of several alternatives resulted in the recommendation to construct a 2,000 gpm booster pumping station and 16-inch transmission main between Zones 6 & 7 in the Arbor Hills area. The pump station is designed to deliver 1,000 gpm of supply from Zone 6W to Zone 7 and provide 2,000 gpm of reliable firefighting capacity to the Arbor Hills neighborhood.

Project Status:

A pumping station and pipeline to Zone 7 are fully operational.

Phase 6: 2019: Construction of approximately 2,000 feet of 12-inch transmission main from Fish Hatchery Road to North Avenue. Phase 7 of this project has been delayed for two construction seasons due to routing and easement acquisition. Once completed, Phase 6 will complete the Project.

Results:

The Cannonball pipeline and BPS 118 system accomplished two main objectives. The transfer of water between Pressure Zone 6 and Pressure Zone 7, and the provision of increased fire protection capacity and improved drinking water supply system reliability to the Arbor Hills area.

Pressure Zone 4:

Identified Need: Well 9 was the only source of supply to Pressure Zone 4. This severely limited Zone 4 supply reliability and fire flow capacity in the southern reaches of Zone 4.

Identified Project Alternative: Construct a second well, pumping station and reservoir within Zone 4 to provide redundancy and improve fire protection. This work brings the southern portion of Pressure Zone 4 into compliance with MWU level of service standards.

Project Status:

The construction of Well 31 was completed and put into service in 2018. Well 31 is located south of the Beltline Highway on Tradewinds Parkway. The addition of Well 31 provides needed supply redundancy and improved firefighting capacity to the southern reaches of Zone 4.

Results:

Well 31 provides the required additional fire flow capacity and water supply redundancy to Zone 4 needed to bring it into compliance with the established utility level of service. The additional supply point and reservoir capacity

provides the additional benefit of supporting time of day pumping. Only pumping at night when electric rates are lowest saves MWU money.

Lake View and Northport Drive Area Zone 5 and 6E:

Identified Need: Zone 5 and the north end of Zone 6E had a storage deficiency that resulted in fire flow capacity deficiencies. Fire flow deficiencies were identified in Zone 6E around Northport Drive in the Green Avenue/Troy Drive area, on Packers Avenue, and near the Dane County Airport. In Zone 5 fire flow deficiencies have been identified around the Dane County Human Services building and throughout the Zone 5 residential area served by a system of 6-inch diameter pipe.

Identified Project Alternative: To mitigate these fire flow deficiencies, the 2006 Water Master Plan identified the need for additional storage in Zones 5 and 6E. A two zone reservoir was constructed in 2016/2017 that replaced the undersized Zone 5 Lake View Reservoir and provided a new 1.0 MG reservoir for Zone 6E. The 2020 capital budget request calls for an upgrade to the existing pumping station in the Lake View Park area beginning in 2025. The upgrade includes several pipe capacity improvement projects within Zone 5. These improvements will bring the fire flow capacity and reliability of the supply system for Zones 5 & 6E into compliance with MWU standards.

Project Status:

A dual zone reservoir to serve Zones 5 and 6E was completed and put into service at the end of 2016. The upper 300,000-gallon reservoir replaced an aging 55,000 gallon structure that has served the area since 1938. The new Zone 5 tank provides the necessary fire flow capacity and emergency backup supply for the area. The larger reservoir allows Zone 5 to be expanded improving service to residents on the top of the hill.

The lower tank has a capacity of 1,000,000 gallons for Zone 6E. The lower reservoir provides additional emergency water storage capacity, pressure stability, and operational flexibility.

A new larger pipeline connecting Northport Drive with the new Zone 6E reservoir and the pumping station feeding Zone 5 was completed in late 2017. This additional hydraulic capacity benefits reservoir operations.

The existing water pumping station that fills the upper Zone 5 reservoir needs to be upgraded in conjunction with piping upgrades on Lake View Avenue and Sherman Avenue. With the upgrade of the Lake View Booster Pumping Station, BPS 213, Zone 5 fire protection will be in compliance with the MWU Level of Service.

Results:

Replacing and enlarging the Zone 5 reservoir, adding a 1.0 million gallon reservoir to Zone 6E, and constructing a new 16" connection to Zone 6E have improved overall water system operation and reliability in the north part of the system. Upgrading BPS 213 and water transmission piping will bring the area into compliance with stated levels of service for fire protection capacity.

North Sherman Avenue commercial area:

Identified Need: A fire capacity deficiency has been identified in the commercial area around North Sherman Avenue, the Aberg Avenue area and around the closed Oscar Meyer plant.

Identified Project Alternative: Fire flow deficiencies in the North Sherman commercial area will be addressed with planned hydraulic improvements to the distribution system.

Project Status: Well 7 was reconstructed and upgraded in 2015. The pumping station at Well 7 provides a capacity of approximately 3 million gallons per day for normal operation and 3,500 gpm for fire protection. Well 7 has a 500,000 gallon ground level reservoir and a standby generator to provide reliable drinking water supply to the area.

To improve distribution system hydraulics and firefighting capacity, water transmission main projects will be developed to move water east, south, and north from Well 7. Pipe replacement projects that will upsize key pipe segments in the Aberg Avenue and Oscar Meyer Plant area will increase capacity and mitigate the identified fire flow deficiencies.

Results:

Upgrading Well 7 with a filtration system and VFD driven booster pumps improved water quality, station capacity, and provides operational flexibility to the system. Well 7 is situated in the north central area of Pressure Zone 6E and provides an excellent hydraulic location for water supply to the north and east sides. Replacing key pipe segments will result in improved system hydraulics and will maximize the benefit of upgrading Well 7.

Hydrant and Valve Maintenance and Testing: MWU currently maintains approximately 9,232 hydrants in the system. Between August 2018 and September 2019, MWU crews inspected and serviced 3,073 hydrants as a part of the routine maintenance of the system. MWU crews also service and maintain 15,489 system valves, 6,684 hydrant valves, and 3,965 service valves. Between August 2018 and August 2019

MWU crews inspected and turned 6,791 system valves as a part of routine maintenance of the system.

MWU works closely with Madison Fire Department to ensure firefighting capacity meets current and future needs. Hydrant flow testing is performed as requested on fire hydrants and recorded in the GIS database. From August 2018 to August 2019 MWU crews completed 42 requested hydrant flow tests. Other flow tests are also conducted by MWU crews during the course of routine maintenance and flushing operations.

The Utility's unidirectional flushing program systematically operates and exercises the a significant number of the Utility's hydrants annually. From August 2018 to August 2019 approximately 782 miles of pipe were flushed unidirectionally using 2,950 hydrants. Some spot flushing is also conducted in response to complaints and water quality concerns. This program of hydrant maintenance and testing meets and exceeds WDNR requirements.

I report non-compliance with mitigation projects ongoing, budgeted, and scheduled.

2. *Water delivered to the customer tap at a pressure that meets industry-accepted low, high, and emergency operation criteria.*

   During the period from August 2018 to August 2019 MWU received 28 low pressure complaints. The majority of these complaints were the result of service interruptions during construction, flushing operations, or minor adjustments in system operation.

   Pressure planning and design criteria for MWU are established in Table 2 of the attached Level of Service Memo. A query of the system indicated that approximately 244 fire hydrants indicate a static pressure reading above 100 psi. For areas with pressures greater than 100 psi, customer owned pressure reducing valves may be used on individual services to reduce pressures to acceptable levels.

   High pressure areas are evaluated as to the feasibility of moving them to a lower pressure zone or creating another pressure sub-zone using system pressure reducing valves as opportunities come up. Maintaining adequate fire flow in the area will remain a prime objective in considering any changes to pressure zone boundaries.

   Approximately 31 hydrants are recorded as having pressure below 35 psi. Over the past 10 years, MWU has successfully mitigated significant areas of chronic low pressure on the east side along I-90 and in the Bunker Hill area. The remaining few areas with low pressure are typically small and are located on the tops of hills or ridges and would be difficult to move to other pressure zones.

   I report non-compliance with mitigation projects in progress and scheduled.

3. *Water used for outdoor irrigation under drought-free conditions*

During the 2018/2019 reporting period, Madison Water MWU was not required to and did not issue any irrigation restrictions due to water supply limitations within the system.

I report compliance.

Attachments:

1. 2019 City of Madison Water Utility approved capital budget
2. January 10, 2011 Level of Service Memo
3. Draft 2016 Master Plan Fire Flow Capacity Map Figure 2
4. Sections 4.2 and 4.3 of Madison Water Utility Strategic Asset Management Plan
5. Well Summary Sheet, Unit Well 11