

Internal Monitoring Report

Policy # O-2E Sustainability
Frequency: Twice a year

Date: July 31, 2018

Policy Language:

Madison residents will benefit from a sustainably managed ground water supply to ensure that water is available to protect public health, and to maintain and improve the economy and environment in Madison, now and in the future.

Accordingly,

1. Aquifers and wells will be monitored and the data evaluated to identify trends in water levels and potential contaminants.
2. Appropriate city, county, state and federal agencies will be called upon to enforce all pollution control and prevention measures within their authority, in order to protect water quality in the well head protection area of each unit well.
3. The adopted Conservation Plan shall be monitored and evaluated regarding progress to fulfill the goal of a 20% reduction per capita residential use of water by 2020, which equates to 58 gallons/capita/day. (Residential is defined as single family and duplex dwellings.)
4. The water supply system shall be expanded so that the pumpage from individual unit wells shall not exceed 50% of the annual rated capacity of the unit well.
5. The Utility shall track the carbon footprint of Utility operations using quantitative tools (for example, energy intensity analysis) so that sustainability may be considered in planning for water treatment facilities, distribution system improvements, and other infrastructure projects.
6. Water rates will complement economic growth in Madison (as stated in 0-2D).

General Manager's interpretation and its justification:

This policy prescribes certain activities intended to ensure the long term environmental, public health, and economic sustainability of Madison's water supply. Our actions relating to these objectives are detailed below.

Data directly addressing the General Manager's interpretation:

1. Aquifers and wells will be monitored and the data evaluated to identify trends in water levels and potential contaminants.

Water Levels

The water levels in the aquifers beneath Madison continue to be monitored on a routine basis. A deep groundwater monitoring well located in the basement of the State Capitol has provided water levels since 1946. A review of the monthly data indicates levels continue to vary on a seasonal basis, a direct result of demand (pumping) and recharge (precipitation.)

As in past years, winter water levels were higher than those experienced during the summer months. Levels were as much as 11 feet higher during the months of November through April.

Overall, aquifer levels have increased or rebounded approximately 10 – 12 feet during the last 13 to 14 years. This is a good indication that the local aquifers are in the process of rebounding/recovering to pre-pumping levels. The most recent data suggest that this rebound has slowed or stabilized.

The static and pumping water levels in many of the Utility's wells varied slightly during the first six months of 2018. Variations however, were significantly less than those experienced during past years (i.e., 2012) when we were subject to extremely hot and dry summer conditions. Water levels in the Utility's wells continue to fluctuate seasonally and are greatly influenced by both pumping and precipitation events. A review of the recent water level data indicates that, with the exception of several wells, most of the water levels (static and pumping) are dropping as summer demands increase. The decrease in water levels is minor and consistent with those of last year at this time. Water levels in all of the wells appear to be sustainable for the near future.

Total precipitation during the first half of 2018 was above average. We received 22.5 inches of precipitation from January through June, 2018 which is about 6.2 inches more (38.0% more) than the six month average of 16.3 inches. It is anticipated that precipitation amounts in the Madison area will continue to be above average into the near future. This is important to note as the aquifers are recharged to a great extent by precipitation events.

UW 29 Sentinel Well

Water from the sentinel well located between UW 29 and the Sycamore Landfill continues to be monitored for both inorganic and volatile organic compounds on a semi-annual basis. Sampling is typically conducted in April and October of each year with eighteen samplings conducted to date.

The April 2018 sampling indicates that the migration of contaminants from the Sycamore landfill is not a significant threat to water quality at Unit Well 29 at this time. This well continues to pump at half capacity on a 24/7 basis.

Madison Kipp Corporation/UW #8 Sentinel Well

The Madison Kipp Corporation (MKC) continues to run its groundwater extraction and treatment system at its Waubesa Street site. The remedial system is being utilized to remove volatile organic compound (VOC) mass and hydraulically contain VOC contaminated groundwater present in the upper bedrock aquifer beneath the site.

The Utility continues to work with MKC, their consultant, the WDNR, and the WGNHS on the area's groundwater contamination issues. Groundwater at and adjacent to the facility continues to be monitored routinely for VOCs. The most recent groundwater results from an October, 2017 sampling, indicate that PCE levels in the groundwater between the site source and UW 8 remain relatively constant. The southeastern extent of the plume appears stable with the edge approximately 600 horizontal feet from UW 8. Levels within the extraction well's zone of contribution continue to decrease (improve).

The sentinel well planned for the UW 8 area this year has been postponed because of budgetary

constraints. This deep monitoring well was to be installed at a location between the Madison Kipp Corporation groundwater plume and UW 8. Initial sampling would have provided MWU with deep groundwater quality information immediately north of the unit well. Subsequent routine sampling would have provided an early warning for any migrating contaminants. It is hoped that this well can be installed in the near future.

UW 27 Radium Study

The subsurface radium study planned for UW 27 has also been postponed because of budgetary constraints. The study was to include geophysical logging at UW 27 and the installation of a deep test/groundwater monitoring well in the adjacent Klief Park. It was hoped that the logging, test hole and monitoring well would help in identifying the source of radium and where it might be entering the well. If successful, the Utility would then be able to prevent additional radium from entering the well. It is unknown when this study can be rescheduled.

UW 14 - Chloride Study

The investigation into potential sources of chloride contamination at Well 14 is ongoing. The two water table monitoring wells recently installed in Spring Harbor Park continue to be monitored on a monthly basis. The monitoring, which includes sampling for chloride and sodium, will continue through June of 2019. A [project page](#) and email distribution list have been developed to keep neighbors and customers informed about the progress of the project.

UW 31 - Zone 4 Production Well

Construction of the well facility at 4901 Tradewinds Parkway is almost complete. This well is set to begin providing up to 2.5 – 3.0 million gallons of water a day into Zone 4. The WDNR continues to monitor the groundwater monitoring and remedial activities associated with the GE Health care site, a contaminated site located to the northeast. There are no new updates to report for this site. To date, no TCE or any other volatile organic compounds have been detected at the Tradewinds Parkway well. The Tradewinds Parkway site is located over 6000 feet from the source of the TCE contamination.

2. Appropriate city, county, state and federal agencies will be called upon to enforce all pollution control and prevention measures within their authority...

The Utility continues to work with the Mayor's office, City Engineering, Public Health, the WDNR, and the WGNHS in addressing contaminated groundwater issues within the City limits.

3. The adopted Conservation Plan shall be monitored and evaluated regarding progress to fulfill the goal of a 20% reduction per capita residential use of water by 2020...

MWU pumped a total of 4,526,942,000 gallons of water to the distribution system during the first half of 2018. This is approximately 3.1% less than the 4,672,276,000 gallons pumped during the first half of last year (2017).

Average Day: 25,011,000 gpd (last year 25,814,000 gpd)

Max Day: 34,750,000 gpd on May 30 (last year 38,887,000 gpd on June 16)

Min Day: 19,880,000 gpd on January 7 (last year 19,430,000 gpd on January 14)

As mentioned earlier in this report, precipitation for the year is currently above average. In addition, rainfall events have occurred on a fairly regular basis limiting the number of heavy pumpage days.

Residential consumption in gallons per capita by year:

1980–2000	81.5 *		
2002–2007	71.8 *		
2008	69.8 *		
2009	67.8 *		
2010	65.0 *		
2011	65.2 *		
2012	70.3 *		
2013	61.0 *		
2014	62.2 *		
2015	60.9 *	55.0 **	
2016	55.4 *	46.7 **	51.4 ***
2017	55.4 *	46.0 **	51.1 ***

Goal: 2020 58.0 *

* Average per-person daily consumption for Single family only (includes duplexes).

** Average per-person daily consumption for multi-family residents only (includes apartments).

*** Average per-person daily consumption for **all** Madison residents - includes people living in both single family homes and apartments.

4. The water supply system shall be expanded so that the pumpage from individual unit wells shall not exceed 50% of the annual rated capacity of the unit well.

Our service level for capacity planning is 50% utilization and system expansion is being planned to accomplish this level. The Utility continues to propose and build additional booster stations and new well facilities to help achieve this goal. In addition, variable speed drives (VFDs) are being added to existing motors/pumps each year to optimize system flows.

Overall, utilization rates during the first half of 2018 were very similar to those experienced in 2017. Through June 30, 2018, four different wells exceeded the 50% utilization rate (11, 12, 14, and 30). The rates at two of the wells (11 and 12) can be decreased by increasing pumpage at adjacent sites. Rates at the other two well sites however, cannot be lessened without improvements to the Utility's infrastructure. Well repair/reconstruction projects and the necessary use of seasonal wells on a year round basis continue to significantly influence individual well rates.

The addition of VFDs on the deep wells at a number of its sites has allowed the Utility to directly minimize the utilization rates of these wells. In addition, they will help in lowering the Utility's electrical costs. Eight deep wells currently have VFDs - 7, 15, 17, 23, 25, 29, 30, and 31. Well 12 is scheduled to get a VFD on it's deep well in the future. Indirectly, VFDs on booster

pumps have also allowed us to minimize deep well pumping at some sites. MWU is in the process of installing VFDs on the booster pumps at Wells 12 and 25. The booster pumps at Wells 19 and 27 will have VFDs installed on their booster pumps in the near future.

MWU is also currently planning/working on several construction projects which will affect utilization rates:

- The addition/construction of UW 31 in mid 2018. The addition of this well will significantly lower the utilization rate of UW 9, the only other well in Zone 4.
- The connection of Zone 11 to Zone 10 and the construction of the Blackhawk Tower (228) on the far west side will help reduce the utilization rate of UW 26/Tower 126. This project will be complete in late 2018.
- The reconstruction of UW 12, making it a two zone well, will reduce utilization rates in the far west pressure zones (UW 12, UW 20, and UW 26). This project is scheduled for 2022.
- The construction of Booster Station 129 on the far east side of the city. The addition of this facility will reduce utilization rates on UW 25, the only well site located in Zone 3. This project is scheduled for 2023.

Energy Conservation Assessment

Adam Luthin, a graduate student with MWU, has continued his work on his energy conservation and system optimization project. He has made significant progress with the following:

- Identifying pumping design criteria that optimize energy conservation.
- Identifying projects with the highest potential for energy reduction.
- Evaluating, recommending, and demonstrating energy conservation projects to MWU.
- Laying the framework for system operational optimization.

5. The Utility shall track the carbon footprint of Utility operations using quantitative tools (for example, energy intensity analysis) so that sustainability may be considered in planning...

The City of Madison (COM) calculates the carbon footprint of all of its departments every two years. The Utility is in the process of tracking down the 2014 and 2016 MWU analysis results. The software and tools utilized in calculating the footprint are provided by ICLEI (International Council for Local Environmental Initiatives), an international organization dedicated to urban sustainable thinking. Because it is part of the City, the Utility also has access to this software. Obtaining it will allow MWU to complete an in-house analysis using 2017 numbers, the results of which will be reported separately.

6. Water rates will complement economic growth in Madison (as stated in O-2D).

Please refer to the Monitoring report for the Affordability Outcomes Policy (O2-D).

I report compliance.