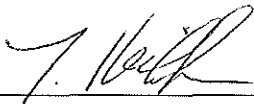


Internal Monitoring Report

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

Date: November 19, 2014

I certify that the following information is true.

Signed , General Manager

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 reduction per capita residential use of water by 20% by 2020, which is 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. 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 data indicates levels continue to vary on a seasonal basis, a result of demand (pumping) and recharge (precipitation.) As in past years, summer levels were approximately 10 to 12 feet lower than those experienced during the winter.

Overall, levels appear to be increasing or rebounding with an increase of approximately 12' – 13' since 2005. The water levels beneath the central part of our city during the last 30 years are displayed in Figure 1.

The static and pumping water levels in many of the Utility's wells varied slightly during 2014. Variations, however, were significantly less than those experienced during past years (i.e., 2012) when we were subjected to extremely hot and dry summer conditions. Water levels in the Utility's wells continue to fluctuate seasonally and are greatly influenced by precipitation events. A review of the water level data indicates that, with the exception of several wells, most of the water levels have recovered from their summer lows and are close to 2011 levels. Average static and pumping water levels for 2011 – 2014 are depicted in Table 1.

University Crossing/UW #14

Two of the three shallow monitoring wells installed at the University Crossing Development to observe groundwater quality during site re-development are in the process of being abandoned. The wells (MW-1 and MW-3), which were installed in March of 2012 by the Utility are no longer being used and will be abandoned by Badger State Drilling. The Utility is responsible for all costs. It had been hoped that the wells could be used for some future non related sampling. However, an agreement could not be reached with the property owners and it was decided that they should be abandoned. Well MW-2 resides in the City's ROW (Whitney Way) and will be used for some additional sampling. It has been permitted for another year.

The three monitoring wells underwent a total of eight sampling rounds, the most recent in November of 2013. No Volatile Organic Compounds were ever detected. Elevated levels of several inorganic compounds were found in the wells (chloride and sodium) and appeared to be increasing.

Madison Kipp Corporation/UW #8 Sentinel Well

The Madison Kipp Corporation (MKC) continues to implement a series of remedial measures at their site to clean up the area's contaminated groundwater.

They are in the process of installing an on-site groundwater extraction system. A groundwater recovery well was drilled in the facility's northern parking lot in January of this year. The 12 inch diameter well, which was drilled to a total depth of 186 feet, is screened from 60 to 175 feet below the surface. The screened interval covers the area of highest VOC concentrations and intersects the aquifer's primary fracture intervals. It is hoped that the recovery well will remove volatile organic compound (VOC) mass and hydraulically contain VOC contaminated groundwater present in the upper bedrock aquifer.

They plan to treat the recovery water with an on-site air stripper. City permits have been obtained and construction of the building that will house the unit has begun. The treated water (~45 gpm) will be discharged to the storm sewer under a WPDES Discharge Permit, which was recently granted. It is hoped that the recovery system will be complete and operational by early January.

The Utility continues to work with MKC, their consultant ARCADIS, the WDNR, and the WGNHS on the area's groundwater contamination issues. The Utility recently hired Jessica Meyer, a hydrogeologist and environmental consultant, to review the site work completed to date. In addition, she will evaluate the stability of the contaminant plume and the fate and transport modeling of PCE in the bedrock below and adjacent to the MKC site. Jessica will provide a summary of her findings and a recommendation of whether or not additional 3-D modeling is needed. Her study is expected to be complete in early December. The results are important as the Utility is proposing to invest in a filter at UW #8.

Groundwater at and adjacent to the facility continues to be monitored routinely for VOCs. The installation of the sentinel well, proposed to be installed adjacent to Elmside Circle Park, remains on hold.

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 conducted in April and October of each year with eleven samplings conducted to date. Results from the latest November 2014 sampling reveal some minor VOC detects.

- Chlorobenzene was detected in the shallowest port at 0.30 mg/l which is well below the MCL of 100 ug/l. It is thought that the source of this compound is the coating on the well liner.
- Trichlorofluoromethane was also detected in the shallowest port at a level of 0.39 ug/l (no MCL). This compound exists in the water table aquifer throughout the area and is not related to the landfill.
- Toluene, which can be attributed to the coating on the well liner, was detected at concentrations between 0.22 - 0.98 ug/l (MCL = 1000 ug/l) in all six of the ports.
- No VOCs were detected in water from UW #29

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.

The WGNHS is in the process of running the Dane County groundwater flow model for the area surrounding UW #29 and the adjacent Sycamore Landfill. The model is being run utilizing a series of different pumping rates at UW #29. It is hoped that these runs will determine if an increase in pumping at UW #29 will have an influence on the groundwater contaminants emanating from the Sycamore Landfill. An additional set of filters could be added at the Unit Well if the results suggest no impact.

UW #31 - Zone 4 Production Well

The production well at the Tradewinds Parkway site was completed this winter. After completion, it was test pumped for a period of two weeks. Water quality samples were collected and the well's specific capacity was calculated. The need for an iron and manganese

filter was confirmed. A portion of the bore hole was then dynamited to increase the specific capacity of the well. The well was redeveloped and pump tested again. Iron levels did increase but are expected to lessen with time and/or extended pumping. As a precaution, it was decided that the lower 40 feet of the well beginning with the Precambrian igneous rock and extending into the lower sandstone formation be filled with a concrete grout. This should reduce the impact of any radium bearing rock or deposits located near the bottom of the hole. The pump house and reservoir are scheduled to be constructed in 2015.

GE Healthcare continues to sample, on a quarterly basis, the monitoring well located on Water Utility property at 5802 Femrite Drive. Trichloroethylene (TCE) is consistently found at the 10 to 15 ug/L level - two to three times the enforcement standard for groundwater quality. No TCE or any other volatile organic compounds were detected at the recently completed production well located at the Tradewinds Parkway site (sampled 2/14 and 2/17.) The Tradewinds Parkway site is located about a mile southwest of the Femrite monitoring well and over 6000 feet from the source of the TCE contamination.

UW #24 - Adjacent Groundwater Contamination

Low levels of vinyl chloride were recently detected in the shallow groundwater beneath a property (710 E. Mifflin St.) located adjacent to the UW #24 site. The property, which is located across Livingston Street immediately to the west of the reservoir/booster station, is owned by the Reynolds Company and is used for the storage of crane equipment. A groundwater investigation originally detected vinyl chloride in several on-site water table observation wells at levels between 0.94 and 42 ug/l. In addition, it was detected at concentrations between 0.45 ug/l and 0.58 ug/l in a deeper piezometer located at the eastern edge of the site. Groundwater flow direction at the site is to the north east, in the direction of UW #24.

Two additional monitoring wells were installed in late October to further delineate the edge of the plume. One of the wells, a shallow piezometer, is located in the Livingston Street ROW in front of the booster station/reservoir building. Water samples were taken and we are awaiting the results. The study is being conducted by City Engineering and funded by the federal EPA Brownfields Program.

It is thought that these shallow occurring contaminants will have little to no impact on the water produced at UW #24. The well is cased to a depth of 235' and extends through the Eau Claire shale layer.

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

As previously mentioned, the Utility continues to work with the Mayor's office and the WDNR in monitoring the remediation of the PCE contaminated groundwater at the Madison Kipp site. At the request of the WDNR, the Madison Water Utility, City Engineering, and Public Health continue to review the remedial strategies and plans proposed by MKC and their consultants. The Utility has again contacted the WDNR and reminded them of the City's plans to upgrade UW #8 with an iron and manganese filter. An upgraded UW #8 would be pumped throughout the year at a much higher volume. A meeting with the WDNR to discuss local groundwater

modeling options has been proposed and will likely occur in January of next year.

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

Residential consumption in gallons per capita by year:

2002-2007	73.0
2008	69.8
2009	67.8
2010	65.0
2011	65.2
2012	70.1
2013	60.1
2014	
Goal: 2020	58.0

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 are being added to existing motors/pumps each year to optimize system flows.

Overall, 2014 to date utilization rates were slightly higher than those experienced in 2013. 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 variable speed drives at some of the sites has allowed the Utility to minimize rates. Actual utilization rates for 2014 are shown in Table 2.

5. *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.

Other sustainability initiatives:

Energy Conservation Assessment

UW Engineering Grad student, Matt Hayes, is conducting research into energy use for Madison Water Utility. Matt has been further evaluating, refining, and developing the energy conservation assessment started by Nick Baniel. Matt is looking for operational trends and conditions that have the potential to save the Utility energy. He is also working to identify energy conservation improvement projects and system operational optimization protocols that have a significant potential to reduce energy use by the Utility.

Matt has been working extensively with the Utility distribution system computer model to evaluate energy use and to develop operational scenarios that could be used to reduce annual energy consumption. Utilizing information gathered from computer modeling in conjunction with the current MGE rate structure, operational conditions are evaluated and adjusted with the objective of reducing energy requirements and pumping costs.

Objectives of this energy conservation research project include:

- Identify operational conditions that will optimize energy conservation.
- Itemize areas of potential energy reduction.
- Evaluate and recommend energy conservation projects to the Utility.
- Develop an outline of areas to be more fully evaluated as a part of an overall Utility energy conservation program.

Attachments:

Aquifer Water Levels Graph
Unit Well Water Levels Table
Unit Well Capacity Table

Figure 1: Aquifer Water Levels - State Capitol Well

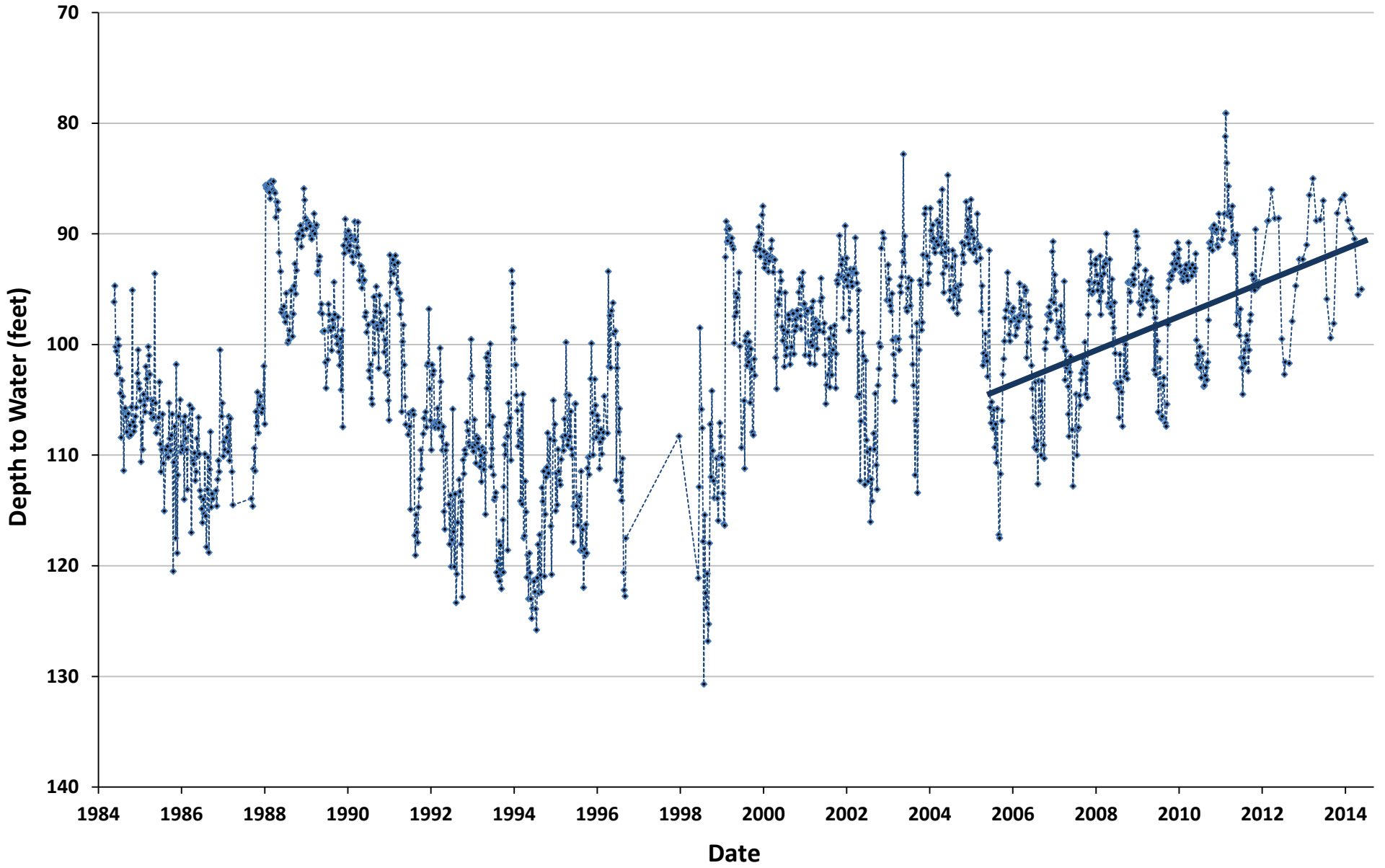


Table 2: 2014 Unit Well Capacity

Start Date: January 01, 2014

End Date: November 11, 2014

Unit Well	DW Capacity GPM	Total Daily Capacity MGD	Total Capacity To Date Mil Gal	Actual Pumpage To Date Mil Gal	% DW Utilization		DW Run Hours To Date	DW Rest Hours To Date	% DW At Rest To Date	% DW Running To Date
6	2,880	4.1	1,306.6	751.1	57.5%		4,346.0	3,214.0	42.5%	57.5%
7	2,552	3.7	1,157.5	132.2	11.4%		863.4	6,696.6	88.6%	11.4%
8	1,987	2.9	901.3	19.4	2.2%		162.6	7,397.4	97.8%	2.2%
9	1,807	2.6	819.7	397.4	48.5%		3,665.4	3,894.6	51.5%	48.5%
11	2,133	3.1	967.7	569.5	58.9%		4,449.3	3,110.7	41.1%	58.9%
12	2,389	3.4	1,083.6	574.4	53.0%		4,007.2	3,552.8	47.0%	53.0%
13	2,652	3.8	1,203.0	690.5	57.4%		4,339.5	3,220.5	42.6%	57.4%
14	2,165	3.1	982.2	746.3	76.0%		5,744.1	1,815.9	24.0%	76.0%
15 *	2,200	3.2	997.9	280.0	28.1%		4,105.0	3,455.0	45.7%	54.3%
16	2,442	3.5	1,107.8	369.3	33.3%		2,520.6	5,039.4	66.7%	33.3%
17	2,325	3.3	1,054.4	423.7	40.2%		3,037.5	4,522.5	59.8%	40.2%
18	1,790	2.6	811.8	304.8	37.5%		2,838.7	4,721.3	62.5%	37.5%
19	2,133	3.1	967.6	409.2	42.3%		3,196.9	4,363.1	57.7%	42.3%
20	2,112	3.0	958.1	569.4	59.4%		4,493.2	3,066.8	40.6%	59.4%
23	1,090	1.6	494.6	74.8	15.1%		1,143.4	6,416.6	84.9%	15.1%
24	2,020	2.9	916.4	257.0	28.0%		2,120.4	5,439.6	72.0%	28.0%
25 *	2,000	2.2	907.2	352.8	38.9%		3,920.3	3,639.7	48.1%	51.9%
26	2,111	3.0	957.4	643.4	67.2%		5,080.5	2,479.5	32.8%	67.2%
27	2,155	3.1	977.4	339.2	34.7%		2,624.0	4,936.0	65.3%	34.7%
28	2,366	3.4	1,073.3	187.1	17.4%		1,318.1	6,241.9	82.6%	17.4%
29 *	2,200	3.2	997.9	509.6	51.1%		7,386.0	174.0	2.3%	97.7%
30	2,513	3.6	1,139.7	602.8	52.9%		3,998.4	3,561.6	47.1%	52.9%

* Denotes Wells with Variable Speed Drives (VFDs)