

## Internal Monitoring Report

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

**Date:** November 26, 2013

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

Water levels in the aquifers beneath Madison continue to vary on a seasonal basis. Levels at a long term monitoring well located in the basement of the State Capitol indicate that overall levels appear to be holding relatively steady with an increase (10' - 12' of rebound) occurring over the last 10 years. 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 2013. Variations however were significantly less than those experienced during the 2012 year when we were subjected to an extremely hot and dry summer. Water levels in the 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, 2012, and 2013 are depicted in Table 1.

#### University Crossing/UW #14

A set of three shallow monitoring wells were installed at the University Crossing Development to observe groundwater quality during site re-development. The wells were installed in March of 2012 with the Utility paying 50% of the installation costs. These wells and UW #14 are being sampled and analyzed on a quarterly basis for a period of two years. All sampling costs are paid 100% by the Utility. There have been seven sampling rounds to date, the most recent in September of this year. To date, no Volatile Organic Compounds have been detected in any of the three monitoring wells. Elevated levels of several inorganic compounds exist in the wells (chloride and sodium) and have increased over the last 18 months. These compounds, however, do not appear to be increasing at similar rates in UW 14 as the site development nears completion.

#### Madison Kipp Corporation/UW #8 Sentinel Well

The Madison Kipp Corporation (MKC) submitted a groundwater remedial strategy plan for approval to the WDNR in October of 2013. The plan, compiled by their environmental consultant ARCADIS, outlines the remedial measures MKC is proposing to implement at their site to clean up the area's contaminated groundwater.

They are proposing:

1. The installation and operation of a groundwater extraction system. A groundwater recovery well would be installed in the facility's northern parking lot. The well, which will be approximately 170 deep, will be screened in the area of highest VOC concentrations and intersect the aquifer's primary fracture intervals. The well will remove volatile organic compound (VOC) mass and hydraulically contain VOC contaminated groundwater present in the upper bedrock aquifer. An initial pump test on the recovery well will help determine system design and the type of treatment system required. Recovery water will have to be treated and disposed of at the site. MKC is currently looking into whether or not the recovery water could be used in some phase of their manufacturing process.
2. The implementation of an In-Situ Chemical Oxidation (ISCO) injection system. They would inject sodium permanganate into the shallow unconsolidated

aquifer (30' - 60' depth) to treat the high concentrations of VOCs that are present there. A pilot test using this technology has already been completed here and results were favorable.

3. Install one additional offsite deep groundwater monitoring well. The well, equipped with two sampling intervals would be installed north of the site at the intersection of Oak and Milwaukee Streets. It would be used to delineate the northern edge of the PCE plume.

The well installations and pump test would be completed by the end of 2013. The design of the extraction and treatment system is expected to be completed this winter with installation and startup of the system occurring in the spring of 2014. In the meantime, groundwater at and near the facility continues to be monitored for VOCs.

Our installation of a sentinel well 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 nine samplings conducted to date. Results from the latest October 2013 sampling reveal one minor detect for toluene (0.49 ug/l in Port 1), which can be attributed to the coating on the well liner. The MCL for toluene is 1000 ug/l. Trichlorofluoromethane was also detected in the two shallowest ports at levels of 0.17 (Port 1) and 0.46 ug/l (Port 2). There is no MCL for this compound which occurs at the water table surface throughout the area. 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.

#### Zone 4 Production Well

The Utility recently acquired the Tradewinds Parkway site, gained approval from the WDNR to install a production well there, and hired a contractor to drill it. The well is currently being drilled. To date, the steel well casing (30" diameter) has been installed and grouted to a depth of 315'. This casing extends 15' through the Eau Claire Shale as required by the WDNR. Open hole drilling is underway and expected to terminate when granite is encountered at a depth of approximately 915'. Drilling is likely to continue throughout the month of December.

GE Healthcare continues to sample, on a semi-annual basis, the monitoring well located on Water Utility property at 5802 Femrite Drive. Trichloroethylene (TCE) is consistently found at the 10 ug/L level - twice the enforcement standard for groundwater quality. None of these volatile or synthetic organic compounds were

detected at the now abandoned test well located at the Tradewinds Parkway site. 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.

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

MWU 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. MWU recently contacted the WDNR and reminded them of 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.

*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
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. Overall, 2013 utilization rates were slightly lower than those experienced in 2012. Well repair/reconstruction projects continue to significantly influence individual well rates. Actual utilization rates for 2012 and 2013 are shown in Tables 2 and 3.

*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).

*Other Sustainability Initiatives*

Energy Conservation Assessment

UW Engineering Grad student, Nick Baniel, is completing his Master's Thesis in December on energy conservation and will be presenting his findings to the Water Board at their January 2014 meeting. Nick has been evaluating and developing a high level energy conservation assessment and a framework for data gathering, energy conservation improvement projects, and system optimization. He has monitored system operation at several wells and pumping stations with the assistance of utility staff. Using the data collected, he has evaluated pump and motor efficiency and developed data collection techniques and protocols. His thesis will recommend energy use metrics that can be used to identify areas for further study and the overall potential for energy conservation within the Madison Water Utility system.

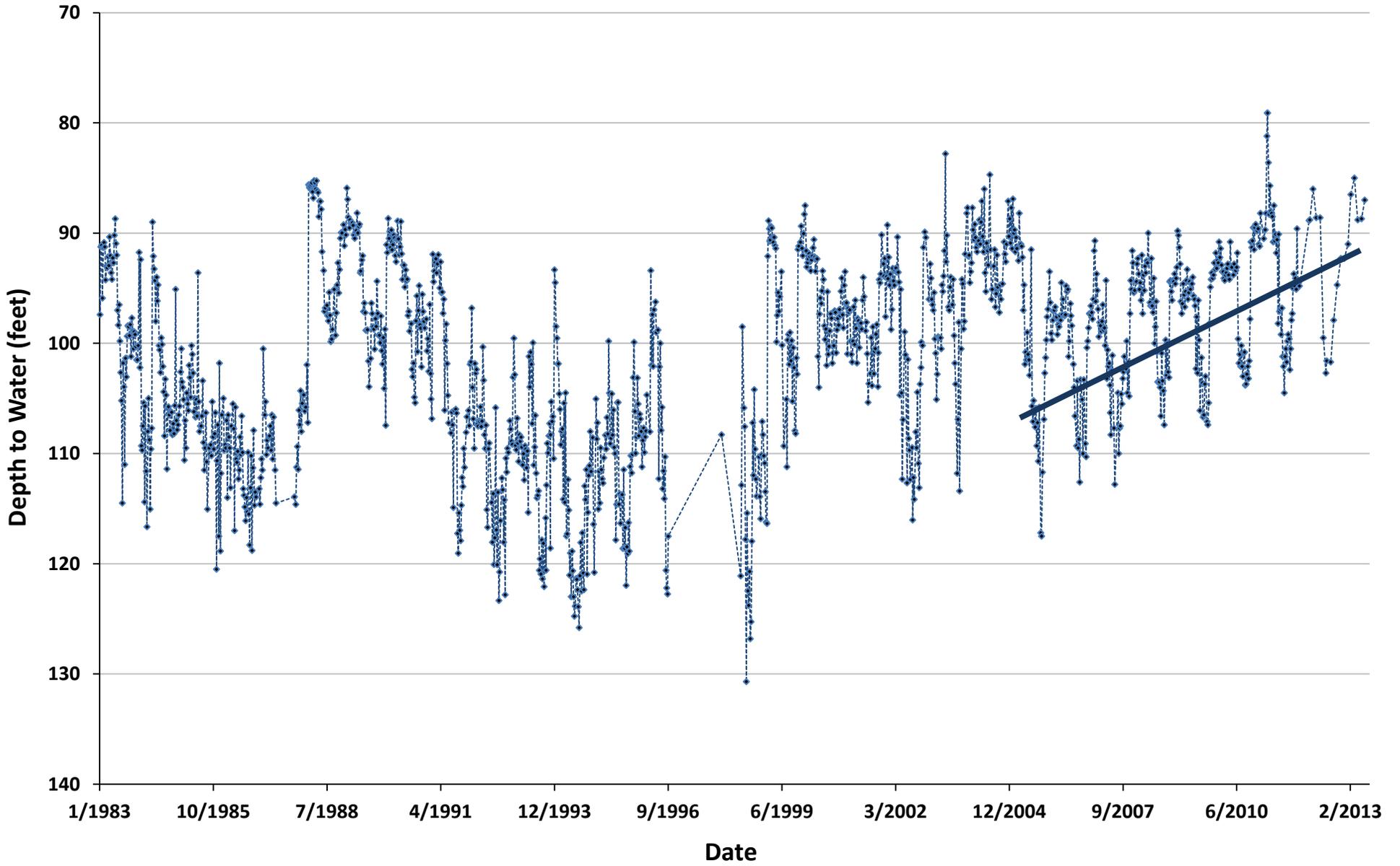
Objectives of this first energy conservation research project include: 1) the identification of data and metrics necessary to effectively monitor facility performance, 2) identification of potential areas of energy reduction; and 3) an outline of areas to be more fully developed as a part of an energy conservation program.

**I report compliance.**

**Attachments:**

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

**Figure 1: Aquifer Water Levels - State Capitol Well**







## Table 2: 2012 Unit Well Capacity

Start Date: January 01, 2012

End Date: December 31, 2012

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	2,703	3.9	1,424.5	634.5	44.5%		3,999.8	4,784.2	54.5%	45.5%
7	2,052	3.0	1,081.2	285.5	26.4%		2,801.9	5,982.1	68.1%	31.9%
8	1,960	2.8	1,033.0	10.3	1.0%		178.2	8,605.8	98.0%	2.0%
9	1,746	2.5	920.2	498.6	54.2%		4,780.8	4,003.2	45.6%	54.4%
11	2,030	2.9	1,069.9	572.1	53.5%		4,714.1	4,069.9	46.3%	53.7%
12	2,317	3.3	1,221.0	560.8	45.9%		4,051.5	4,732.5	53.9%	46.1%
13	2,713	3.9	1,429.6	760.2	53.2%		4,800.1	3,983.9	45.4%	54.6%
14	2,377	3.4	1,252.8	800.2	63.9%		5,607.9	3,176.1	36.2%	63.8%
15	2,202	3.2	1,160.6	651.4	56.1%		4,975.9	3,808.1	43.4%	56.6%
16	2,496	3.6	1,315.6	494.5	37.6%		3,313.2	5,470.8	62.3%	37.7%
17	2,367	3.4	1,247.3	425.5	34.1%		3,014.9	5,769.1	65.7%	34.3%
18	1,808	2.6	952.7	434.8	45.6%		4,014.5	4,769.5	54.3%	45.7%
19	2,285	3.3	1,204.3	765.1	63.5%		5,601.7	3,182.3	36.2%	63.8%
20	2,055	3.0	1,083.0	680.4	62.8%		5,536.8	3,247.2	37.0%	63.0%
23	1,120	1.6	590.2	152.2	25.8%		2,293.5	6,490.5	73.9%	26.1%
24	1,567	2.3	825.7	379.9	46.0%		4,066.9	4,717.1	53.7%	46.3%
25	1,520	2.2	801.3	491.8	61.4%		5,369.4	3,414.6	38.9%	61.1%
26	2,033	2.9	1,071.3	570.2	53.2%		4,687.4	4,096.6	46.6%	53.4%
27	1,959	2.8	1,032.5	193.2	18.7%		1,655.7	7,128.3	81.2%	18.8%
28	2,249	3.2	1,185.1	329.5	27.8%		2,456.5	6,327.5	72.0%	28.0%
29	2,200	3.2	1,159.5	383.3	33.1%		5,581.0	3,203.0	36.5%	63.5%
30	2,409	3.5	1,269.7	724.1	57.0%		5,021.9	3,762.1	42.8%	57.2%

### Table 3: 2013 Unit Well Capacity

Start Date: January 01, 2013

End Date: November 18, 2013

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	2,738	3.9	1,265.5	553.3	43.7%		3,396.9	4,307.1	55.9%	44.1%
7	2,452	3.5	1,133.6	333.5	29.4%		2,288.7	5,415.3	70.3%	29.7%
8		0.0	0.0	0.0	0.0%		223.3	7,480.7	97.1%	2.9%
9	1,767	2.5	816.7	417.6	51.1%		3,944.4	3,759.6	48.8%	51.2%
11	2,084	3.0	963.3	458.1	47.6%		3,689.2	4,014.8	52.1%	47.9%
12	2,250	3.2	1,040.1	396.1	38.1%		2,940.9	4,763.1	61.8%	38.2%
13	2,687	3.9	1,242.0	594.3	47.8%		3,790.0	3,914.0	50.8%	49.2%
14	2,222	3.2	1,027.3	764.2	74.4%		5,733.4	1,970.6	25.6%	74.4%
15	1,620	2.3	749.0	420.0	56.1%		4,806.4	2,897.6	37.6%	62.4%
16	2,477	3.6	1,145.1	332.4	29.0%		2,247.6	5,456.4	70.8%	29.2%
17	2,344	3.4	1,083.3	248.6	22.9%		1,772.4	5,931.6	77.0%	23.0%
18	1,773	2.6	819.5	333.5	40.7%		3,166.3	4,537.7	58.9%	41.1%
19	2,268	3.3	1,048.6	533.3	50.9%		3,929.2	3,774.8	49.0%	51.0%
20	2,044	2.9	945.0	623.8	66.0%		5,115.6	2,588.4	33.6%	66.4%
23	1,054	1.5	487.4	97.9	20.1%		1,656.5	6,047.5	78.5%	21.5%
24	1,998	2.9	923.5	377.0	40.8%		3,180.9	4,523.1	58.7%	41.3%
25	1,551	2.2	716.9	402.0	56.1%		4,345.5	3,358.5	43.6%	56.4%
26	2,067	3.0	955.2	742.9	77.8%		5,997.5	1,706.5	22.2%	77.8%
27	2,066	3.0	954.8	279.0	29.2%		2,269.8	5,434.2	70.5%	29.5%
28	2,160	3.1	998.4	74.7	7.5%		577.0	7,127.0	92.5%	7.5%
29	2,200	3.2	1,058.0	410.3	38.8%		5,999.0	1,705.0	22.1%	77.9%
30	2,419	3.5	1,118.2	630.9	56.4%		4,347.9	3,356.1	43.6%	56.4%