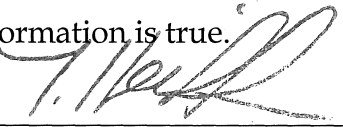


Internal Monitoring Report

Policy #: O-2B Water Quality

Date: January 28, 2014

I certify that the following information is true.

Signed  _____, General Manager

Policy Language:

Madison Water Utility consumers will receive high quality water that meets or is better than all primary and secondary drinking water standards, including their public notification requirements, and complies with board-adopted water quality goals, incorporated by attachment.

The Madison Water Utility recognizes that drinking water standards are subject to revision and that new compounds of concern will be determined. This dynamic is a result of health studies being conducted by health organizations and government agencies on the state, national and international level. The technology to quantify compounds at increasingly minute levels is constantly improving.

The Madison Water Utility shall maintain and promulgate a Watch List of compounds of concern by unit well of compounds that are increasing and may approach the primary and secondary drinking water standards. The Watch List shall identify which wells require action.

General Manager's interpretation and its justification:

Few things are more vital to a community than the availability of high quality drinking water. It promotes public health, public safety, and the economic interests of our community. To that end, the water utility will consistently deliver water that meets the primary, health-based drinking water standards, the secondary (aesthetic) standards, and the additional policy goals established by the Board. The Water Utility Procedural Guideline GUIDE 3, which establishes policies regarding iron and manganese, contains the following:

The Madison Water Utility, under normal operating conditions, shall provide water that contains less than the National Secondary Drinking Water Standard for Fe (currently 0.3 mg/L) and Mn (currently 0.05 mg/L) at the customer's tap.

I interpret this to mean that 95th percentile results from our routine distribution water quality monitoring program shall be less than these values for iron and manganese.

Utility staff will remain vigilant in following developments related to currently unregulated and emerging contaminants like pharmaceuticals, endocrine disruptors, and chromium-6 that may pose problems in the future. Furthermore, the utility will employ multiple methods to adequately inform its consumers of the safety and quality of their drinking water including the federally-required Consumer Confidence Report (CCR), the water utility website, e-mail distribution lists, neighborhood listservs, citizen meetings, and through staff contact in the field and office.

Data directly addressing the General Manager's interpretation:

Primary Drinking Water Contaminants:

None of the 927 water samples collected between October and December had coliform bacteria present. The samples were collected from routine monitoring points in the distribution system and showed satisfactory chlorine levels. In 2013, a total of 3559 water samples (2821 – distribution; 738 – wells) were tested for bacteria; none tested positive for coliform.

Four wells (6, 9, 15, and 18) are currently tested quarterly for volatile organic compounds (VOC) based on previous detections. Each well was sampled in October with results shown on the next page. PCE is found in all four wells while TCE is detected at Wells 15 and 18. The concentration of PCE ranged from 0.81 parts per billion [ppb] in Well 6 to 3.8 ppb in the untreated water at Well 15. The air stripper continues to reduce the PCE and TCE levels at Well 15 to below the detection limit. All VOC detections are below the regulatory limit.

The table that follows does not include the results for trihalomethanes, which are found at each well at very low levels. Trihalomethanes are substances that form as a result of drinking water chlorination.

Volatile Organic Compound	MCL, ppb	Well 6	Well 9	Well 15	Well 15	Well 18
		Untreated		Treated		
Tetrachloroethylene [PCE]	5	0.81	1.6	3.8	<0.18	3.1
1,1,1-Trichloroethane	200	<0.11	<0.11	<0.11	<0.11	[0.20]
Trichloroethylene [TCE]	5	<0.19	<0.19	[0.45]	<0.19	[0.39]

While the air stripper at Well 15 continues to successfully remove PCE and TCE from the source water, the process causes a shift in the pH which has increased the potential for calcium scale formation in the distribution system. Low water pressure reported by two customers in the Well 15 area was attributed to scale formation on water meter components. In addition, tracking software utilized in conjunction with Project H2O has found about a dozen locations where the meter has stopped reading. The meter shop is scheduling appointments to investigate and replace meters likely fouled by calcium scale. A pilot study has been planned to address this scaling issue and restore the pH to a range in which the potential for calcium precipitation is diminished. The subject of pH adjustment was discussed at the January meeting of the Water Quality Technical Advisory Committee (notes are attached).

Policy Goals for Iron and Manganese:

Routine distribution testing from October through December showed all 84 samples met the iron and manganese policy goals. See the table below for summary statistics for the fourth quarter as well as the entire year.

Manganese, ug/L

	Oct - Dec	2013
Policy Goal	50	50
Median	2.8	2.4
Average	3.4	4.0
95th	13	14
Maximum	20	44
Count	84	343
>50	0	0

Iron, mg/L

	Oct - Dec	2013
Policy Goal	0.3	0.3
Median	0.01	0.01
Average	0.02	0.03
95th	0.06	0.14
Maximum	0.30	0.52
Count	84	343
>0.3	0	7

For the year, the 95th percentile iron and manganese levels were 0.14 mg/L and 14 µg/L, respectively – well below the policy goals. For the year, no sample was above the manganese policy goal while seven exceeded the iron goal. Each of these samples was collected at a location likely served by Well 7 at the time of sampling. Construction of a filtration plant to remove iron and manganese from water at Well 7 is scheduled to begin later this year.

Unregulated and Emerging Contaminants:

In 2013, the water utility continued semi-annual testing of each well for hexavalent chromium. Three out of four samples test below 1 µg/L and nine wells are at or below the detection limit (0.02 µg/L). Highest levels are observed at Well 6 and Well 14 which test just below 2 µg/L. Results remain largely unchanged since 2011 when testing was initiated although seasonal variations may be present at some wells.

All wells have now been tested for 1,4 dioxane. This contaminant was found at four wells (Wells 9, 11, 14, and 15) and air stripping does not remove it. These four wells will be tested annually and were sampled earlier this month.

Public Outreach on Water Quality:

Routine updates are made to the website when new water quality data become available. These updates include inorganic, volatile organic, radionuclide, and chromium-6 test results. Content on the water quality pages of our website is being reorganized to make it more user-friendly.

The water quality reports for each well, which are updated annually, are currently being revised to reflect 2013 water quality monitoring results. These reports will be posted to the website when they are complete.

I report compliance.

Attachments:

Water Quality Technical Advisory Committee Meeting Notes- 1/14/2014
Water Quality Watch List

Water Quality Technical Advisory Committee – Notes for WUB Report

Meeting Date – January 14, 2014

A. Sustainability Policy

- Policy seems to lack consideration for connection between groundwater and surface water – apparently does not consider springs or wetlands
- An established pumping strategy might violate statement #4 (not to exceed 50% of the well's annual rated capacity) but protect surface water features
- Policy requires determining trends, with no mention of time-scale, but says nothing about how to respond to a negative trend, for example
- Groundwater pumping is a complex, interagency challenge; once the DNR approves a high-capacity well there are no requirements to monitor the well's impact on other water resources after construction of the well
- As an alternative to revising this board policy, staff might incorporate these concerns into the semi-annual monitoring report addressing this policy

B. Well 15 – pH Adjustment

- Each acid (organic, hydrochloric, nitric, sulfuric, phosphoric) has a potential for secondary effect – energy / nutrient source for microbes, chloride, etc.
- Strongly advised against using an organic acid, e.g. acetic or citric acid
- Should be mindful of shifting from carbonate to sulfate precipitates and other co-precipitating solids (e.g. barium, radium, other metals)
- Scaling/precipitation at the injection site is likely, otherwise below sulfate saturation; periodic maintenance required to prevent plugging of injector, use a pressure gage as means to monitor amount of scale formation
- Adjustments to pH are common in drinking water treatment, especially after lime softening or as part of conventional water treatment; reduces potential for corrosion (low pH) or scale formation (high pH); sulfuric acid often chemical of choice – easier to handle and less off-gassing
- Committee asked for an update on the 30-day pilot test at a future meeting

C. Well Microbiology

- State Laboratory of Hygiene now has capability to perform ATP tests for measuring bacterial activity, is developing means of interpreting results
- Technique of ATP testing was not sufficiently developed until recently
- Carbon-phosphorus-nitrogen ratio being developed by Andy Jacque in Mosinee water system still needs some refining
- BART tests are inexpensive and fairly easy to read; not aware of other utilities routinely using the tests, but may be a useful test to see if growth is occurring; regular weekly testing of a recently treated source may shed a positive light on this technique

D. Wellhead Protection Planning – Well 16

- Plan should include reference to consultant report (RMT) on pump test and groundwater response at nearby landfill; the pump test found that there was limited vertical flow – positive outcome for water supply
- Recommend that Contaminant Source Inventory map outline the entire source (i.e. landfill, retention pond, etc.) rather than placing a single point on map
- Recommend adding microbiology and radiochemistry test results to the water quality section, should not limit to inorganic and volatile organic compounds

**MADISON WATER UTILITY
WATER QUALITY WATCH LIST**

Organics - Regulated

Contaminant	Maximum*	Units	MCLG	PAL	MCL	Detects Below PAL%	Watch List	Action Plan	Reference
1,2-Dichloroethane	[0.17]	µg/L	zero	0.5	5	#17	none		NR 140.10
1,2-Dichloroethylene (cis)	[0.40]	µg/L	70	7	70	#8, #9, #11, #14	none		NR 140.10
Ethylbenzene	[0.14]	µg/L	700	140	700	#225	none		NR 140.10
Tetrachloroethylene [PCE]	3.9	µg/L	zero	0.5	5	#11, #14, #27	#6, #9, #15, #18	Budget one GW Inv per Year; Air Stripper at #15 (2013)	NR 140.10
Toluene	2.2	µg/L	1000	160	1000	#15, #18, #25	none		NR 140.10
1,1,1-Trichloroethane	[0.29]	µg/L	200	40	200	#9, #18	none		NR 140.10
Trichloroethylene [TCE]	0.43	µg/L	zero	0.5	5	#11, #14, #15, #18, #27	none		NR 140.10
Xylene, Total	1.5	µg/L	10000	400	10000	#225	none		NR 140.10

* Maximum detection observed at any Madison well from 2009 through 2013

% Detected in at least one sample collected from 2009 through 2013

Organics - Unregulated

Contaminant	Maximum*	Units	MCLG	PAL	ES	Wells with Detects%	Watch List	Action Plan	Reference
Dichlorodifluoromethane	[0.23]	µg/L	n/a	200	1000	#14	none		NR 140.10
1,1-Dichloroethane	0.07	µg/L	n/a	85	850	#9	none		NR 140.10
1,4-Dioxane	0.63	µg/L	n/a	0.3	3	#9, #11, #14, #15	#11, #14	Monitor	NR 140.10
Methyl t-butyl ether [MTBE]	[0.14]	µg/L	n/a	12	60	#15	none		NR 140.10
Trichlorofluoromethane	1.3	µg/L	n/a	698	3490	#11	none		NR 140.10
1,2,4-Trimethylbenzene	0.64	µg/L	n/a	96	480	#7, #15	none		NR 140.10
1,3,5-Trimethylbenzene	[0.20]	µg/L	n/a	96	480	#15	none		NR 140.10

* Maximum detection observed at any Madison well from 2009 through 2013

% Detected in at least one sample collected from 2009 through 2013

Radionuclides

Contaminant	Maximum	Units	MCLG	Watch	MCL	Wells with Detects	Watch List	Action Plan	Reference
Gross alpha	13.8	pCi/L	zero	5	15	All Wells	#7, #13, #19, #25, #27, #28, #30	Monitor	NR 809.50
Gross beta	14.8	pCi/L	zero	10	50	All Wells	#19, #28	Monitor	NR 809.50
Combined Radium	5.8	pCi/L	zero	2.5	5	All Wells	#7, #8, #15, #19, #27, #28, #30	Monitor	NR 809.50
Uranium	2.0	µg/L	zero	3	30	All Wells	none		NR 809.50

ES - Enforcement Standard (NR 140 - Groundwater Quality)

MCL - Maximum Contaminant Level Legal Limit

MCLG - MCL Goal (Public Health Goal)

PAL - Preventive Action Limit (NR 140 - Groundwater Quality)

MADISON WATER UTILITY WATER QUALITY WATCH LIST

Inorganics - Regulated

Substance	Maximum*	Units	MCLG	PAL	MCL	Detects Below PAL	Watch List	Action Plan	Reference
Antimony	0.2	µg/l	6	1.2	6	#11	none		NR 140.10
Arsenic	0.7	µg/l	zero	1	10	#7, #8, #14, #17, #19, #23, #24, #26, #27, #28, #29, #30	none		NR 140.10
Barium	66	µg/l	2000	400	2000	All Wells	none		NR 140.10
Chromium	2.2	µg/l	100	10	100	All Wells	none		NR 140.10
Copper	60	µg/l	1300	130	1300	All Wells	none		NR 140.10
Lead	0.6	µg/l	zero	1.5	15	All Except #14, #16, #19, #27, #29, #30	none		NR 140.10
Nickel	3.0	µg/l	100	20	100	All Wells	none		NR 140.10
Nitrogen-Nitrate	4.3	mg/l	10	2	10	#9, #12, #18, #20, #25, #27, #29	#6, #11, #13, #14, #15, #16, #23, #26	Monitor	NR 140.10
Selenium	1.5	µg/l	50	10	50	#6, #9, #11, #13, #14, #15, #16 #17, #23, #25, #26, #27, #29	none		NR 140.10
Thallium	0.3	µg/l	0.5	0.4	2	#11, #17, #19, #23, #26, #27	none		NR 140.10

* Based on 2013 annual test data

Inorganics - Unregulated

Substance	Maximum*	Units	MCLG	Watch	SMCL	Wells with Detects	Watch List	Action Plan	Reference
Aluminum	3.3	µg/l	n/a	50	200	All Wells	none		NR 809.70
Chloride	106	mg/l	n/a	125	250	All Wells	none		NR 809.70
Iron	0.39	mg/l	n/a	0.1	0.3	All Except #6, #9, #11, #12, #14, #16, #18, #20	#7, #8, #17, #19, #24, #27, #28, #30	#7 - Install Filtration (2014), #8 - Install Filtration (2020), #19 - Install Filtration (2015), #30 - Install Filtration (2017)	NR 809.70
Manganese	42	µg/l	n/a	20	50	All Except #16	#7, #8, #17, #19, #23, #24, #26, #27, #28	#7 - Install Filtration (2014), #8 - Install Filtration (2020), #19 - Install Filtration (2015)	NR 809.70
Sodium	37	mg/l	n/a	20	20	All Wells	#14, #15, and #23	Monitor	EPA DWEL
Sulfate	51	mg/l	n/a	125	250	All Wells	none		NR 809.70
Zinc	15	µg/l	n/a	2500	5000	All Wells	none		NR 809.70

* Based on 2013 annual test data

MCL - Maximum Contaminant Level (Legal Limit)

MCLG - MCL Goal Public Health Goal

PAL - Preventive Action Limit (NR 140 - Groundwater Quality)

SMCL - Secondary MCL (Aesthetic Guideline)

DWEL - Drinking Water Equivalency Level