Internal Monitoring Report

Policy #: O-2B Water Quality **Date**: October 25, 2016

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.

Water Utility Board Procedural Guideline GUIDE 8 – Executive Summary of Water Quality Treatment Policies – establishes monitoring requirements and the utility's approach for responding to increasing contaminant levels. Generally, the policy establishes two thresholds – one when a contaminant exceeds 50% of a maximum contaminant level (MCL), secondary MCL, or other numerical guideline, and two when it surpasses 80% of this mark. The first triggers increased monitoring and an investigation into treatment alternatives, operational changes, or other actions to reduce contaminant levels while the second leads to implementation of a mitigation strategy.

The policy applies to any contaminant, regulated or not, that is capable of impairing the health, safety, or aesthetic quality of drinking water. 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 challenges in the future.

The utility will use multiple communication methods to adequately inform 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:

Contaminants with a primary MCL or Enforcement Standard

Coliform Bacteria - Between April and September, 1820 water samples were collected from routine monitoring points in the system including the entry point at the well houses (424 samples). Five well samples collected on the same day tested positive for coliform bacteria; follow-up samples including distribution sites served by those wells were free of coliform. These unsafe samples were attributed to sampler error. Otherwise, the remaining routine distribution samples all tested safe. Fifty raw water samples were also collected during this reporting period. Two samples tested positive for coliform – each following maintenance on the well. Both wells were shock chlorinated, re-tested and placed back into service after consecutive bacteriologically safe samples.

Inorganic Compounds – Each well was tested in the monitoring period for a suite of water quality parameters (conductivity, alkalinity, hardness) and inorganic chemicals. None of the following contaminants was found at any well – antimony, beryllium, cadmium, mercury, and nitrite. Except for barium and nitrate, detections of other contaminants were at low levels, often just above the level of detection. The range of results for regulated inorganic chemicals is shown below while complete results follow as an attachment.

Summary of Regulated Inorganic Chemical Detections

Parameter	MCL	Detects	Minimum	Median	Maximum

Arsenic	10	7	<0.2	<0.2	0.7
Barium	2000	22	8.6	21	59
Chromium	100	15	<0.4	0.5	2.0
Copper	1300	21	<1.2	5.5	30
Lead	15	11	<0.1	0.1	0.6
Nickel	100	20	0.5	1.0	2.9
Nitrate	10	22	0.1	0.9	4.0
Selenium	50	15	<0.4	0.8	1.5
Thallium	2	2	<0.2	<0.2	0.5

Note: The units are µg/L except for nitrate which is measured in mg/L

Volatile Organic Compounds - Ten wells were tested for volatile organic compounds (VOC) during the period from April to September. PCE is the most commonly detected VOC. Maximum detections are shown in the table below. None of over forty VOCs were found at five wells, including Well 27 and treated water at Well 15. In addition, raw and treated water samples from Well 8 were free of VOCs in August.

Summary of VOC Detections (in µg/L)

	Samples	DCE, cis	TCE	PCE	TCFM
MCL		70	5	5	NA
Well 6	2	<0.30	<0.30	**0.83**	<0.30
Well 9	2	<0.30	<0.30	**1.4**	<0.30
Well 11	2	**0.32**	**0.24**	**0.50**	**0.67**
Well 14	2	<0.30	<0.30	**0.50**	<0.30
Well 18	4	<0.30	**0.21**	**1.6**	<0.30
	TCFM = Trichlorofluoromethane				

Quarterly monitoring occurs at any well in which PCE exceeds 0.5 µg/L; otherwise, annual samples are collected at each well. The above table does not include results for disinfection by-products such as trihalomethanes.
Radium - In accordance with GUIDE 8, seven wells are tested quarterly for radium because previous tests show that combined radium (radium 226 + 228) exceeds 2.5 pCi/L, or one half the MCL. Compliance with the MCL is based on running annual average of quarterly samples rather than a single

test result. Results for samples collected during the monitoring period are summarized below.

Combined Radium Results (226+228) measured in pCi/L

	May 17/18	May 31/Jun 1	Aug 17	Annual Average of Quarterly Samples
Well 7	**1.64**	No sample	**2.88**	**1.8**
Well 8	Inactive	Inactive	**3.3**	**NA**
Well 19	**3.2**	**2.33**	**4.3**	**3.6**
Well 24	**2.9**	No sample	**3.8**	**3.1**
Well 27	No sample	**3.1/3.3**	**2.94**	**3.9**
Well 28	No sample	**2.6**	**2.4**	**2.7**
Well 30	**2.7**	No sample	**4.9**	**3.4**

Contaminants with a secondary MCL

Iron and Manganese - Monthly well samples are collected when iron and manganese are elevated. During the period from April to September, two samples from Well 8 exceeded the secondary MCL for iron [0.3 mg/L] and four samples – two each from Well 8 and Well 19 – were at or exceeded the standard for manganese [50 µg/L]. Test results are shown below.

Monthly Iron Test Results, in mg/L

Source	Apr	May	Jun	Jul	Aug	Sep
Well 7 - filtered	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Well 8	n/s	n/s	n/s	**0.67**	**0.61**	n/s
Well 17	n/s	0.05	0.10	0.11	n/s	0.11
Well 19	n/s	0.25	n/s	n/s	0.22	0.20
Well 23	n/s	n/s	0.12	0.08	0.14	n/s
Well 24	0.21	0.19	0.21	0.20	0.21	0.20
Well 26	0.01	0.04	<0.01	0.28	n/s	0.05
Well 27	0.16	0.04	0.13	0.16	n/s	0.16
Well 28	n/s	0.16	0.17	0.17	0.14	0.15
Well 29 - filtered	0.01	<0.01	<0.01	0.03	<0.01	<0.01
Well 30	0.20	0.25	0.20	0.20	0.20	0.25

Monthly Manganese Test Results, in µg/L

Source	Apr	May	Jun	Jul	Aug	Sep
Well 7 - filtered	4.2	<0.2	<0.2	<0.2	0.4	<0.2

Well 8	n/s	n/s	n/s	**51**	**50**	n/s
Well 17	n/s	40	31	27	n/s	30
Well 19	n/s	**54**	n/s	n/s	**50**	49
Well 23	n/s	n/s	27	28	31	n/s
Well 24	31	28	27	23	29	31
Well 26	5.1	13	9.4	15	n/s	1.1
Well 27	29	32	29	26	n/s	31
Well 28	n/s	22	22	20	22	22
Well 29 - filtered	2.3	0.6	0.4	4.7	0.6	0.4
Well 30	14	18	14	14	15	18

Iron and manganese monitoring also occurs in the distribution system at all coliform sample locations. Test results, summarized in the table below, show iron and manganese infrequently exceed the established benchmarks and over 95% of the samples are below one half the policy goals.

Manganese, µg/L

	Apr - Sep	**2016**
Policy Goal	**50**	**50**
Median	1.3	1.5
Average	3.7	3.6
95th Percentile	***12***	***11***
Maximum	101	101
Count	170	254
>50	2	3

Iron, mg/L

	Apr - Sep	**2016**
Policy Goal	**0.3**	**0.3**
Median	<0.02	<0.02
Average	0.03	0.04
95th Percentile	***0.09***	***0.09***
Maximum	0.89	1.8
Count	170	254
>0.3	1	3

Chloride - Chloride levels have been steadily rising at a number of wells, especially those that are not cased through the Eau Claire shale layer. The increase has been attributed to road salt use of roadways and parking lots. Routine chloride monitoring continues at Well 14. Twelve samples were collected between April and September. In that time, the average chloride level was 127 mg/L with a maximum of 139 mg/L. Samples were also collected at Well 23. Chloride measured 119 mg/L at the start-up of this seasonal well. In July and August, the average chloride was 78 mg/L.

Unregulated and Emerging Contaminants

Sodium - In accordance with GUIDE 8, monthly sodium testing continues at Well 14. Seven samples were collected between April and September

with samples measuring between 44 and 45 mg/L sodium. Samples from Well 23 show the sodium level between 25 and 26 mg/L. The US EPA recommends that drinking water not exceed 20 mg/L. These guidelines are intended for high risk populations including individuals with high blood pressure or those on severe sodium restricted diets.

Hexavalent Chromium – As recommended by the Technical Advisory Committee, six wells were tested for hexavalent chromium this year. Detected amounts ranged from 0.57 to 2.0 µg/L. Although there is no federal MCL for hexavalent chromium, the state of California recently established a state-wide limit of 10 µg/L in drinking water. The six wells tested had the highest levels of hex chrome based on previous testing.

1,4-Dioxane – Well 11 was tested twice this year for 1,4-dioxane. The level is stable around 0.4 µg/L. Dioxane often co-exists with other chlorinated solvents; however, it is not readily removed from water. Air stripping is largely ineffective.

PFOA/PFOS – Six perfluorinated compounds were included in UCMR3. Each Madison well was tested twice in 2015 for these compounds with no detections. The regulation has been criticized recently for having a method reporting limit (MRL) higher than what some analytical labs could achieve and above health levels suggested by human and animal health studies. The Water Quality Technical Advisory Committee recommended that the utility re-test a subset of wells that are close to potential sources of PFOA or PFOS – the airport/National Guard and former landfills – at detection limits below 0.02 µg/L, the MRL for UCMR3..

Water Quality Watch List

The Water Quality Watch List has been updated to include the 2016 test results for inorganic, organic, and radiological contaminants. Action plans have also been updated to reflect changes in the proposed Capital Budget and Capital Improvement Program. Installation of iron and manganese filtration at some wells has been delayed due to financial constraints.

Water Quality Technical Advisory Committee

This committee met twice (July 12 & October 11) since the last monitoring report. The group received updates on the Well 8 Groundwater Study that is being performed by Eric Oelkers from SCS Engineers. The PCE plume does not appear to be expanding south of the Madison Kipp property; however, relatively high PCE readings have been observed at MW17 at the edge of the south parking lot. Preliminary modeling suggests a 50-60 year travel time for contaminant transport from below the plant to Well 8, when the well is operated at 50% capacity on an annual basis, but a significantly longer travel time if the plume is entirely above the shale layer. Currently, this is no data suggesting that the contaminant is below the shale layer. Additional sentinel wells may be proposed to address this unknown.

Brynn Bemis from City Engineering reported on the landfill monitoring program in relation to the presence/absence of VOC detections at some wells – Well 16, Well 18, and Well 29.

The committee was also briefly updated on the status of the radium study at Well 27. The utility is planning to install a deep (~750 feet) monitoring well in a nearby park to investigate potential sources of radium. The hole will be logged, cuttings evaluated for radium precursors, and packer test performed to potentially identify regions of high radium.

The subject of annexations was proposed as a future agenda item due to its likely impact on water supply (need to expand water service) and water quality (possible lead services, more main breaks).

Wellhead Protection Activities

Water quality staff has been preparing the Wellhead Protection Plan for Unit Well 31. The text of the report is largely finished. Staff is currently working on formatting, tables, figures, and appendices before presenting the draft plan to the Water Quality Technical Advisory Committee at its January meeting.

Signs are being installed at the boundaries of the wellhead protection area for Unit Well 18 on S Park Street. These signs are identical to ones installed last year on S Whitney Way and University Avenue near Unit Well 14. As more funds become available, signs will mark the entrance to the wellhead protection area for other high-visibility wells adjacent to major roadways.

Attachments:

Annual Inorganic Results
Water Quality Watch List
Water Quality Technical Advisory Committee Meeting Notes

ANNUAL INORGANIC ANALYSIS - 2016

PARAMETER	UNITS	MCL	Well 6	Well 7	Well 8	Well 9	Well 11	Well 12	Well 13	Well 14	Well 15	Well 16	Well 17	Well 18	Well 19	Well 20	Well 23	Well 24	Well 25	Well 26	Well 27	Well 28	Well 29	Well 30	PARAMETER
Sample Date			6/13	6/14	8/17	6/14	6/14	7/25	6/14	6/13	6/14	6/13	6/14	6/13	8/17	6/13	7/25	6/14	6/14	6/13	6/14	6/13	6/14	6/13	*Sample Date*
Alkalinity ($CaCO_3$)	mg/L		326	328	308	341	342	280	320	343	311	291	287	283	283	278	343	279	325	288	315	285	322	273	Alkalinity ($CaCO_3$)
Aluminum	µg/L		0.44	0.36	< 4.50	0.22	0.89	< 4.50	0.25	0.25	< 0.206	0.38	0.39	0.26	< 4.50	0.23	< 4.50	0.63	0.27	0.45	0.21	0.32	< 0.206	0.38	Aluminum
Antimony	µg/L	6	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	Antimony
Arsenic	µg/L	10	< 0.206	< 0.206	0.74	< 0.206	< 0.206	0.21	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	0.26	< 0.206	0.62	0.23	< 0.206	< 0.206	< 0.206	0.27	< 0.206	0.28	Arsenic
Barium	µg/L	2000	26	36	37	30	21	15	35	59	9.8	21	24	16	19	11	51	14	8.6	20	27	16	53	18	Barium
Beryllium	µg/L	4	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	Beryllium
Cadmium	µg/L	5	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	< 0.103	Cadmium
Calcium	mg/L		90	77	68	80	85	63	77	101	83	74	69	64	65	59	93	59	63	66	79	65	72	61	Calcium
Chloride	mg/L		67	18	22	45	66	2.9	40	126	55	61	41	12	8.1	1.9	76	6.2	3.2	15	38	2.5	5.7	5.5	Chloride
Chromium	µg/L	100	1.91	< 0.412	0.47	0.80	0.88	0.87	1.22	1.98	0.55	0.95	< 0.412	0.52	0.57	0.47	1.20	< 0.412	0.52	0.42	< 0.412	< 0.412	< 0.412	< 0.412	Chromium
Conductivity	µmhos / cm		856	699	626	793	887	526	750	1100	825	758	722	581	551	506	517	531	586	589	736	535	604	531	Conductivity
Copper	µg/L	1300	1.4	6.1	3.5	18	8.3	3.1	9.2	9.0	8.2	6.2	< 1.20	7.2	30	5.0	2.3	2.0	11.2	9.0	1.5	1.6	1.4	3.3	Copper
Fluoride	mg/L	4	0.76	0.86	0.75	0.78	0.80	0.79	0.86	0.85	0.68	0.75	0.64	0.74	0.58	0.69	0.45	0.82	0.77	0.73	0.75	0.70	0.74	0.70	Fluoride
Hardness ($CaCO_3$)	mg/L		414	372	335	384	422	293	369	466	391	350	356	306	297	282	429	287	328	307	366	298	328	291	Hardness ($CaCO_3$)
Iron	mg/L		0.01	< 0.002	0.61	< 0.002	0.00	0.00	0.02	< 0.002	< 0.002	< 0.002	0.10	< 0.002	0.22	< 0.002	0.08	0.21	0.06	< 0.002	0.13	0.17	0.00	0.20	Iron
Lead	µg/L	15	< 0.103	< 0.103	0.50	< 0.103	0.20	0.17	0.13	< 0.103	0.22	< 0.103	< 0.103	< 0.103	0.64	0.21	0.29	< 0.103	0.11	0.14	< 0.103	0.15	< 0.103	< 0.103	Lead
Magnesium	mg/L		46	44	40	45	51	33	43	52	45	40	44	36	33	33	48	34	42	34	41	33	36	34	Magnesium
Manganese	µg/L		2.4	< 0.206	49	3.6	0.6	0.3	3.7	0.2	1.1	< 0.206	31	1.1	50	1.6	28	27	3.9	9.4	29	22	0.4	14	Manganese
Mercury	µg/L	2	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	< 0.0206	Mercury
Nickel	µg/L	100	2.85	0.86	1.25	0.86	1.01	< 1.00	0.84	1.09	0.97	0.98	0.89	0.58	< 1.00	0.52	2.47	0.46	0.51	2.50	2.48	0.98	0.96	0.47	Nickel
Nitrogen-Nitrate	mg/L	10	2.65	0.32	0.08	1.81	2.82	1.04	3.95	3.64	2.44	2.58	0.12	0.76	0.08	0.35	3.41	0.09	0.80	1.99	0.44	0.08	1.33	0.06	Nitrogen-Nitrate
Nitrate&Nitrite	mg/L		2.65	0.32	< 0.100	1.81	2.82	1.04	3.95	3.64	2.44	2.58	< 0.200	0.76	< 0.100	0.35	3.41	< 0.100	0.80	1.99	0.44	< 0.100	1.33	< 0.100	Nitrate&Nitrite
Nitrogen-Nitrite	mg/L	1	< 0.08	< 0.04	< 0.04	< 0.08	< 0.08	< 0.04	< 0.04	< 0.04	< 0.08	< 0.08	< 0.08	< 0.04	< 0.04	< 0.04	< 0.08	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	Nitrogen-Nitrite
pH (Lab)	s.u.		7.48	7.51	7.60	7.49	7.47	7.67	7.50	7.39	7.82	7.50	7.54	7.54	7.57	7.57	7.65	7.60	7.56	7.53	7.49	7.58	7.47	7.69	pH (Lab)
Selenium	µg/L	50	1.48	0.42	< 0.412	1.03	0.86	< 0.412	1.19	1.29	0.93	1.08	0.43	< 0.412	< 0.412	< 0.412	0.92	< 0.412	0.99	0.87	0.77	< 0.412	0.91	0.45	Selenium
Silver	µg/L		< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	Silver
Sodium	mg/L		24	7.0	9.4	17	23	2.2	15	46	21	23	17	5.5	4.0	2.0	25	4.9	3.0	7.0	16	2.2	3.3	3.6	Sodium
Strontium	µg/L		76	93	70	71	89	55	79	81	77	63	89	85	91	52	87	70	64	52	90	48	76	104	Strontium
Sulfate	mg/L		29	40	18	19	28	10	19	25	44	17	45	17	8.0	9.6	29	14	7.0	12	41	22	10	20	Sulfate
Thallium	µg/L	2	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	0.24	< 0.206	0.49	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	< 0.206	Thallium
Total Solids	mg/L		590	424	390	476	553	305	454	779	512	501	460	334	309	287	606	296	331	348	466	318	349	307	Total Solids
Zinc	µg/L		16	16	17	18	16	17	17	17	19	18	17	16	11	18	12	17	18	39	23	20	17	16	Zinc

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	0.20	µg/L	zero	0.5	5	#17	none		NR 809.24
1,2-Dichloroethylene (cis)	0.54	µg/L	70	7	70	#8, #11	none		NR 809.24
Tetrachloroethylene [PCE]	3.9	µg/L	zero	0.5	5	#27	#6, #9, #11, #14, #18	Quarterly Monitoring	NR 809.24
1,1,1-Trichloroethane	0.28	µg/L	200	40	200	#18	none		NR 809.24
Trichloroethylene [TCE]	0.43	µg/L	zero	0.5	5	#11, #14, #18, #27	none		NR 809.24
Xylene, Total	1.5	µg/L	10000	400	10000	#225	none		NR 809.24

* Maximum detection observed at any Madison well from 2012 through 2016

% Detected in at least one sample collected from 2012 through 2016

Organics - Unregulated

Contaminant	Maximum*	Units	MCLG	PAL	ES	Detects Below PAL%	Watch List	Action Plan	Reference
Dichlorodifluoromethane	0.20	µg/L	n/a	200	1000	#14	none		NR 140.10
1,1-Dichloroethane	0.08	µg/L	n/a	85	850	#9	none		NR 140.10
1,4-Dioxane	0.63	µg/L	n/a	0.3	3	#9, #14, #15, #17, #18	#11	Monitor	NR 140.10
Trichlorofluoromethane	1.0	µg/L	n/a	698	3490	#11	none		NR 140.10

* Maximum detection observed at any Madison well from 2012 through 2016

% Detected in at least one sample collected from 2012 through 2016

Radionuclides

Contaminant	Maximum	Units	MCLG	Watch	MCL	Wells with Detects	Watch List	Action Plan	Reference
Gross alpha	11.5	pCi/L	zero	5	15	All Except Well#14	#7, #19, #24, #27, #28, #30	Monitor	NR 809.50
Gross beta	8.8	pCi/L	zero	10	50	All Except Well#14	none		NR 809.50
Combined Radium	6.2	pCi/L	zero	2.5	5	All Wells	#7, #8, #19, #24 #27, #28, #30	Quarterly Monitoring	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
Arsenic	0.7	µg/l	zero	1	10	#8, #12, #19, #23, #24, #28, #30	none		NR 809.11
Barium	59	µg/l	2000	400	2000	All Wells	none		NR 809.11
Chromium, Total	2.0	µg/l	100	10	100	All Except #7, #17, #24, #27, #28, #29, #30	none		NR 809.11
Nickel	2.9	µg/l	100	20	100	All Except #12 & #19	none		NR 809.11
Nitrogen-Nitrate	4.0	mg/l	10	2	10	All Wells	#6, #11, #13, #14, #15, #16, #23	Monitor	NR 809.11
Selenium	1.5	µg/l	50	10	50	All Except #8, #12, #18, #19, #20, #24, #28	none		NR 809.11
Thallium	0.5	µg/l	0.5	0.4	2	#19	#23	Monitor	NR 809.11

* Based on 2016 annual test data

Inorganics - Unregulated

Substance	Maximum*	Units	MCLG	Watch	SMCL	Wells with Detects	Watch List	Action Plan	Reference
Aluminum	0.9	µg/l	n/a	50	200	All Except #8, #12, #15, #19, #23, #29	none		NR 809.70
Chloride	126	mg/l	n/a	125	250	All Wells	#14	GW Investigation	NR 809.70
Iron	0.61	mg/l	n/a	0.15	0.3	All Except #7, #9, #14, #15, #16, #18, #20, #26	#8, #19, #24, #28 #30	Install Filtration: Well #8 (2026) Well #19 (2018) Well #28 (2021) Well #30 (2022)	NR 809.70
Manganese	50	µg/l	n/a	25	50	All Except #7 & #16	#8, #17, #19, #23, #24, #27		NR 809.70
Sodium	46	mg/l	n/a	20	n/a	All Wells	#6, #11, #14, #15, #16, #23	Monitor	EPA DWEL
Sulfate	45	mg/l	n/a	125	250	All Wells	none		NR 809.70
Zinc	39	µg/l	n/a	2500	5000	All Wells	none		NR 809.70

* Based on 2016 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

Water Quality Technical Advisory Committee

Meeting Notes
Olin Avenue Conference Room
July 12, 2016 – 1:00 p.m.

Attending: Janet Battista, Greg Harrington, Jocelyn Hemming, Gary Krinke, Joe Grande, Joe DeMorett, Al Larson

Absent: Sharon Long, Amy Barrilleaux, Tom Heikkinen

Guests: Brynn Bemis, City Engineering; Eric Oelkers, SCS Engineers; 1 citizen

1. Agenda Repair/Announcements

2. Review of Meeting Notes – Notes form the April 12, 2016 meeting accepted as presented.

3. Landfill Monitoring Program – presented by Brynn Bemis, City Engineering

Brynn described the monitoring program for the closed landfills located within the City limits; none meet modern codes for construction. City engineering staff collects monitoring well samples plus a deep well sample from the nearest municipal well twice a year. With the exception of Sycamore landfill, monitoring may decrease due to contamination from landfills being stable over the past 20 to 25 years. At Sycamore, VOC monitoring may expand to the north, away from Well 29, due to trends.

4. Madison Kipp, Well 8 Groundwater Study Update – presented by Eric Oelkers, SCS Engineers (2 handouts)

Eric provided an update to the on-going groundwater study. The current work is evaluating conclusions drawn by Arcadis including additional test results since April 2014. Several assumptions made by Arcadis have been fleshed out and a closer look at the conceptual model has been undertaken. Eight monitoring intervals show increasing trends (statistically significant); however, these points suggest expansion is towards the north (away from Well 8). The recovery well on the property has been operating and the capture zone can be established. The "theoretical" model suggests contamination may already be below the shale layer. No empirical data supports this suggestion. The groundwater model suggests a 50-60 year travel time from below the shale at MKC to Well 8 when pumping at 50% capacity.

Several tasks were suggested:

- Model the capture zone of the recovery well
- Evaluate reverse particle tracking from MW25
- Determine the head distribution in the borehole
- Refine Craflush model to reduce uncertainty
- Continue to update and refine the conceptual model as additional data becomes available
- Install at least one, if not a nest of, sentinel wells. Possible locations include a deeper well near MW25 (penetrating the Eau Claire shale) and/or between MW17 and MW25 (an intermediate location)
- Perform an open borehole log, possibly between MW17 and MW25, to locate potential fracture zones
- Model groundwater flow to validate selection of MW25 location or other monitoring/sentinel well locations

The utility has budgeted $100,000 for the installation of a sentinel well. Eric will continue his analysis, work with WGNHS staff and report back at the October 11 meeting.

5. Future Agenda Items

- **MWU Master Plan & Capital Improvement Plan – January 2017 meeting, Al Larson**
- **Program Update – Private Well Surveys in Wellhead Protection Areas**
- **Oscar Mayer closing – Impact on water quality for the north side**

6. Adjournment

Next meeting: Tuesday, October 11, 2016 at 1 p.m. in the Olin Avenue Conference Room.