Internal Monitoring Report

Policy #: O-2B Water Quality **Date**: October 22, 2019

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.

CEO'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, per and polyfluoroalkyl substances [PFAS], chromium(VI), and 1,4 dioxane 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 direct staff contact in the field and office.

Data directly addressing the CEO'S interpretation:

Contaminants with a primary MCL, Action Level or Enforcement Standard

Coliform Bacteria - Between April and September, 1900 water samples were collected from routine monitoring points in the system including the entry point at well houses (398 samples). No sample tested positive for coliform bacteria. Forty-two raw water well samples also were collected during this reporting period. All were found to be free of coliform bacteria.

Inorganic Compounds – Twenty-one wells were 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, or nitrite. Except for barium and nitrate, detections of other contaminants were at low levels, often just above the level of detection. Arsenic and thallium were each detected at four wells. The total chromium level at each well was higher than in previous years and each well has been re-sampled; test results are not yet available. Some wells were re-sampled for chloride and selenium and will be tested with lower detection limits. **Table 1** summarizes the range of results for each regulated inorganic chemical while complete test results follow as an attachment.

Table 1. Summary of Regulated Inorganic Chemical Detections

Parameter	MCL	Detections	Minimum	Median	Maximum
Antimony	6	0	<0.24	<0.5	<0.5
Arsenic	10	4	<0.43	<0.5	0.6
Barium	2000	21	7.3	19	61
Beryllium	4	0	<0.04	<0.09	<0.09
Cadmium	5	0	<0.1	<0.5	<0.5
Chromium	100	21	2.1	12	14
Mercury	2	0	<0.02	<0.03	<0.03
Nickel	100	21	1.0	3.6	5.3
Nitrate	10	14	<0.1	0.8	3.8
Nitrite	1	0	<0.01	<0.01	<0.02
Selenium	50	7	<1.5	<1.5	3.1
Thallium	2	4	<0.1	<0.1	0.3

Note: The units are µg/L except for nitrate and nitrite, which are measured in mg/L

Lead and Copper Rule / Optimized Corrosion Control – In May, the Water Utility received a notice from DNR requesting information to confirm that the utility was optimizing its corrosion control treatment. Because the utility previously had removed all known lead service lines, the department determined that the utility had optimized corrosion control without the addition of a corrosion control inhibitor. The department is re-evaluating the validity of this determination and has requested information related to a materials inventory for both public and privately owned water service lines and household plumbing in single-family residences. Utility staff are gathering the information to satisfy the request and expect to have a formal response to the DNR by the deadline at the end of October.

Earlier this month, US EPA announced proposed revisions to the Lead and Copper Rule that would require new actions regarding lead service line replacement, corrosion control, sampling, and risk communication. Water utility staff are reviewing the proposed changes during the 60-day comment period. US EPA expects to finalize the rule revisions next year.

Volatile Organic Compounds – Wells with previous VOC detections are sampled quarterly. They include Wells 6, 9, 11, 14 and 18. PCE is the most commonly detected VOC; it was found at seven wells with levels ranging from 0.34 to 2.2 µg/L. The maximum contaminant level (MCL) for PCE is 5 µg/L. Of note is the detection of PCE at Well 7. It was found in all three samples collected this year at levels ranging from 0.45 to 0.73 µg/L. A summary of detections at each well is shown in **Table 2**. Well 31 has been removed from quarterly monitoring after a year-long confirmation that the source water is free of organic contaminants.

Low levels of ethyl benzene and xylene have been detected intermittently at Well 9 since 2018, after the painting of the interior surface of the reservoir. Testing in January 2019 did not find either of these two contaminants but they were both detected again in July.

Table 2. Summary of Maximum VOC Detections, January to September

Well #		#6	#7	#9	#11	#14	#18	#27
Number of Samples		3	3	3	3	3	3	1
VOC Contaminant	**MCL (ug/L)**	**Test Result (ug/L)**						
1,2 Dichloroethylene, cis	70	<0.30	<0.30	<0.30	**0.39**	<0.30	<0.30	<0.30
Ethyl benzene	700	<0.22	<0.22	**0.54**	<0.22	<0.22	<0.22	<0.22
Tetrachloroethylene (PCE)	Zero	**1.5**	**0.73**	**2.2**	**0.75**	**0.48**	**2.1**	**0.34**
Trichlorofluoromethane	--	<0.30	<0.30	<0.30	**0.56**	<0.30	<0.30	<0.30
Xylene	10,000	<0.68	<0.68	**3.0**	<0.68	<0.68	<0.68	<0.68

Radium – Radium monitoring follows the guidance provided in GUIDE 8. Well 19 and Well 27 have elevated radium levels and are tested quarterly; five other wells exceed 2.5 pCi/L radium (226 + 228), or one-half the MCL, and are subjected to annual testing. **Table 3** summarizes radium results for samples collected year-to-date.

In August, the radium sample from Well 19 measured 5.9 pCi/L. Although this result is above the MCL, compliance is based on the running annual average of quarterly samples rather than any single test result. Currently, the running annual average is just under 5.0 pCi/L. Staff will collect the next radium sample in November. The utility's Capital Improvement Plan includes construction of an iron and manganese filter at Well 19, currently

scheduled for construction in 2023, that is expected to reduce the radium level at the well.

Table 3. Combined Radium (226 + 228) Results Measured in pCi/L.

	Number of Samples	2019 Results	Annual Average of Quarterly Samples
Well 7	1	3.3	**n/a**
Well 8	1	3.4	**n/a**
Well 19	3	4.1 – 5.9	**4.6**
Well 24	1	2.1	**n/a**
Well 27	2	4.2 – 4.8	**4.5**
Well 30	1	3.2	**n/a**
Well 31	3	0.9 – 1.7	**1.5**

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, three samples from Well 8 exceeded the secondary MCL for iron [0.3 mg/L]; no sample collected from any well during this period exceeded the manganese standard [50 µg/L]. Test results are shown in **Tables 4 and 5**.

Seven wells have iron levels above the Board Policy level [0.1 mg/L] that mandates treatment. These wells include 8, 17, 19, 24, 27, 28 and 30. Six of these wells, not including Well 30, also exceed the Board Policy level for manganese [20 µg/L], the level above which treatment is required.

Table 4. Monthly Iron Test Results, in mg/L

Source	Apr	May	Jun	Jul	Aug	Sep
Well 7 - filtered	<0.05	<0.05	<0.05	<0.05	<0.05	
Well 8	n/s	n/s	n/s	**0.54**	**0.54**	**0.51**
Well 17	n/s	0.09	0.11	0.11	0.12	0.12
Well 19	0.20	0.19	0.20	0.19	0.20	0.18
Well 24	0.19	0.17	0.16	0.21	0.20	0.20
Well 26 – deep well	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Well 27	n/s	n/s	0.09	0.10	0.14	0.13
Well 28	0.17	0.17	0.17	0.17	0.18	0.17
Well 29 - filtered	<0.05	<0.05	<0.05	<0.05	<0.05	
Well 30	0.19	0.18	0.19	0.19	0.20	0.18
Well 31 – filtered	<0.05	<0.05	<0.05	<0.05	<0.05	

Table 5. Monthly Manganese Test Results, in µg/L

Source	Apr	May	Jun	Jul	Aug	Sep
Well 7 - filtered	1.4	1.1	<0.7	<0.7	<0.7	
Well 8	n/s	n/s	n/s	49	49	47
Well 17	n/s	33	29	30	30	29
Well 19	46	39	37	40	41	37
Well 24	30	24	17	28	28	26
Well 26 – deep well	<3.9	<3.9	12	14	24	18
Well 27	n/s	n/s	34	32	32	31
Well 28	21	21	21	22	22	21
Well 29 - filtered	<0.7	<0.7	<0.7	4.6	0.8	
Well 30	13	13	13	14	14	13
Well 31 - filtered	<0.7	<0.7	<0.7	<0.7	<0.7	

Filters at Well 7, Well 29, and Well 31 continue to show significant iron and manganese reductions. Test results are shown in **Tables 4 and 5**. In all cases, iron was reduced to below the detection limit, <0.05 mg/L, and manganese was often lowered to below detection, <0.7 µg/L.

Iron and manganese monitoring also takes place in the distribution system at all coliform sample locations. Test results, summarized in **Table 6**, show iron and manganese did not exceed the established benchmarks during this period and that over 95% of the samples are below one-half the policy goals. These results demonstrate our effective control and management of iron and manganese accumulation in the distribution system.

Table 6. Summary of iron and manganese levels in the distribution system.

Manganese, µg/L

	Apr - Sep
Policy Goal	**50**
Median	0.9
Average	2.2
95th Percentile	***14***
Maximum	20
Number of Samples	60
>50	0

Iron, mg/L

	Apr - Sep
Policy Goal	**0.3**
Median	<0.02
Average	0.03
95th Percentile	***0.15***
Maximum	0.18
Number of Samples	60
>0.3	0

Chloride - Monthly chloride testing continues at Well 14. Five samples were collected between April and September; the chloride level was consistently 160 mg/L, compared to the secondary MCL – 250 mg/L. Well 14 is the only Madison well with chloride above 100 mg/L; however, some wells (6, 9, 11, and 16) have experienced considerable increases in chloride in recent years.

Monitoring of the chloride level in two monitoring wells installed in Spring Harbor Park concluded in June. Monthly monitoring began in December 2017 and continued for eighteen months. A data logger was placed into one well to continuously record water level and conductivity (a surrogate for chloride). The data have been downloaded but have yet to be processed or interpreted by staff. The purpose of this data tracking was to evaluate the influence of the stormwater outfall at Spring Harbor on water quality, particularly chloride and sodium, at Well 14. An initial review of the earliest data suggested that stormwater drainage and municipal well pumping both influence the water level and water quality in the monitoring wells.

Finally, water utility staff continue to work with regional partners to help raise awareness on the issue of chloride contamination of the lakes and our ground and drinking water resources. The partnership helped develop and implement a Winter Salt Certification program emphasizing training, equipment calibration, and record keeping. Outreach efforts promote the training workshops that are a prerequisite to individual or organization-level certification.

Unregulated and Emerging Contaminants

In June, WI Department of Health Services released its recommendations for health-based, groundwater enforcement standards (ES) for a number of contaminants that currently are not regulated in ground or drinking water. Importantly, the department made the following recommendations:

Contaminant	**Proposed ES**	**Estimated 10^{-6} cancer risk level**
1,4-Dioxane	0.35 µg/L	0.35 µg/L
Hexavalent chromium	70 ng/L	70 ng/L
PFOA	20 ng/L*	500 ng/L
PFOS	20 ng/L*	Not established

* Either individually or the combined concentration of PFOA + PFOS

These recommendations now are being considered by DNR for inclusion in the Groundwater Law, Chapter NR 140. The rule-making process is anticipated to take 24-30 months.

1,4-Dioxane – A sample was collected in June from Well 11 and tested for dioxane; the result was 0.41 µg/L. A second sample was recently collected; however, results are not available. Semi-annual tests have been conducted at Well 11 since 2013. Over the last four years, the level of dioxane varied from 0.26-0.41 µg/L, with the average concentration over this period being 0.35 µg/L. Five other wells are tested once every three years, most recently in 2018.

Per and Polyfluoroalkyl Substances [PFAS] – There has been a lot activity around PFAS in ground, surface, and drinking water. In addition to DHS releasing its recommendations for a groundwater enforcement standard for PFOA & PFOS, the occurrence of PFAS in Starkweather Creek, in storm water outfalls at the airport and in storm sewers after an MGE transformer fire have been reported. The Water Utility has also continued monitoring PFAS in drinking water. A complete report on that monitoring is included as a separate item on the Water Utility Board agenda.

Unregulated Contaminants Monitoring Regulation, Cycle 4 [UCMR4] – Madison completed in August the second and final round of sampling in support of this US EPA requirement. Samples were collected in January, March, and August. Every five years the EPA promulgates a list of up to thirty currently unregulated contaminants for sampling to determine the nationwide occurrence of these biological or chemical contaminants in drinking water. This occurrence data, combined with human toxicology information, helps federal regulators determine whether a drinking water regulation is warranted to reduce the public health risk associated with exposure to contaminants in drinking water.

The fourth cycle of UCMR required Madison to test each well twice for seventeen chemical contaminants that include metals, pesticides, semi-volatiles, and alcohols. The regulation also required testing for a broad range of disinfection by-products (DBP) that can form following the chlorination process. Except for manganese and disinfection by-products, none of the unregulated chemicals were found at any well. Manganese ranged from 0.4 to 47 µg/L. Also, similar to current testing by the utility, these tests show very low levels of DBPs since the precursors to DBP

formation are mostly absent or found in very small amounts in Madison's groundwater source.

Sodium - Six Madison wells produce water with sodium above 20 mg/L: three in the 20-25 mg/L range, two between 25 and 35 mg/L, and one in excess of 50 mg/L sodium. In accordance with GUIDE 8, monthly sodium testing continued at Well 14. Five samples were collected between April and September with samples measuring between 57 and 61 mg/L sodium. 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.

Water Quality Watch List

The Water Quality Watch List has been updated with current test results for inorganic, organic, radiological, and unregulated contaminants. Minor changes were made to the list since the last reporting period, particularly in the regulated and unregulated organic contaminants [PFAS].

Water Quality Technical Advisory Committee

This committee met twice since the last monitoring report. The August meeting centered on the DHS recommended groundwater standards, alternatives for Well 15 operations, and PFAS testing. Meeting notes are included as an attachment. At the October meeting, Principal Engineer Al Larson presented the Master Plan update process to the committee. He also described the process by which Capital Improvement Projects are prioritized and incorporated into the annual Capital Budget and CIP. Finally, the committee compared the merits of the lab methods used for PFAS analysis to inform future monitoring by the utility. Draft meeting notes are included as an attachment.

Annual Water Quality Report – Consumer Confidence Report

The 2018 consumer confidence report (CCR) was released in late June. Over 130,000 postcards were printed and mailed using the US Postal

Service "Every Door Direct" saturation mailing lists. The postcards contained a direct link (URL) to the report and encouraged customers to view the report to learn more about their drinking water. The report and information in the notice was also translated into Spanish to reach our Spanish-speaking customers. Copies of the report, in English and in Spanish, were delivered to all local public library branches and many community and neighborhood centers located throughout the City. A notice also appeared on the monthly municipal services bill. Finally, an announcement was posted to our social media platforms to encourage readership of this important report.

One significant change this year was that information about PFAS testing and results was placed more prominently on the front page of the report. Otherwise, the report was similar in content, format, and layout to reports from previous years.

Finally, Water Quality Manager Joe Grande made a presentation entitled *Electronic Distribution of the Consumer Confidence Report* at the Wisconsin section of AWWA Annual Meeting, which was held at Monona Terrace.

Additional Water Quality Outreach

Water Utility staff continue to remain active in sharing our experiences with PFAS with the drinking water industry, regulators, City staff, as well as the public.

Water Quality Manager Joe Grande has given several talks on PFAS including at the Water@UW-Madison Spring Symposium, the Wisconsin Section of the American Water Works Association Regulatory Affairs Seminar and Annual Meeting, and the American Institute of Professional Geologists Wisconsin PFAS Workshop. He has also been asked to speak at the Wisconsin Utility Policy Institute later this month and to a group of directors of public works later in December.

The talks focus on PFAS regulations, testing, and occurrence in Wisconsin.

Attachments:

Water Quality Watch List
Water Quality Technical Advisory Committee Notes – April 2019
Water Quality Technical Advisory Committee Notes – August 2019
Water Quality Technical Advisory Committee Notes (Draft) – October 2019

MADISON WATER UTILITY
WATER QUALITY WATCH LIST

Organics - Regulated

Contaminant	Maximum*	Units	MCLG	PAL	MCL	Detects Below PAL%	Watch List	Action Plan	Reference
Atrazine	0.03	µg/L	3	0.3	3	#29	none		NR 809.20
1,2-Dichloroethane	0.1	µg/L	zero	0.5	5	#17	none		NR 809.24
1,2-Dichloroethylene (cis)	0.6	µg/L	70	7	70	#8, #9, #11, #27	none		NR 809.24
Ethylbenzene	0.7	µg/L	700	140	700	#9	none		NR 809.24
Tetrachloroethylene [PCE]	3.5	µg/L	zero	0.5	5	#27	#6, #7, #9, #11, #14, #18	Quarterly Monitoring	NR 809.24
Toluene	0.2	µg/L	1000	160	1000	#9, #31	none		NR 809.24
1,1,1-Trichloroethane	0.3	µg/L	200	40	200	#9, #18	none		NR 809.24
Trichloroethylene [TCE]	0.4	µg/L	zero	0.5	5	#11, #14, #18	none		NR 809.24
Xylene, Total	4.5	µg/L	10000	400	10000	#9, #31	none		NR 809.24

* Maximum detection observed at any Madison well from 2015 through 2019 % Detected in at least one sample collected from 2015 through 2019

Organics - Unregulated

Contaminant	Maximum*	Units	HAL	PAL	ES	Detects Below PAL%	Watch List	Action Plan	Reference
1,1-Dichloroethane	0.08	µg/L	n/a	85	850	#9	none		NR 140.10
1,4-Dioxane	0.43	µg/L	0.35~	0.3	3	#9, #14, #15, #17, #18	#11	Semi-Annual Monitoring	NR 140.10
Metolachlor	0.01	µg/L	n/a	10	100	#14	none		NR 140.10
PFAS: PFOA, PFOS, PFHxS, PFHxA, PFBS, PFBA, PFHpA, PFHpS, PFPeA, PFPeS	0.06	µg/L	0.07^	n/a	n/a	#6, #7, #8, #9, #11, #13, #14, #16, #17, #23, #26, #27, #29	#15	Monthly Monitoring	US EPA
Trichlorofluoromethane	1.1	µg/L	n/a	698	3490	#11	none		NR 140.10

* Maximum detection observed at any Madison well from 2015 through 2019 % Detected in at least one sample collected from 2015 through 2019 ~ 10^{-6} Cancer Risk Level ^ PFOA + PFOS

Radionuclides (2018 & 2019)

Contaminant	Maximum	Units	MCLG	Watch	MCL	Wells with Detects	Watch List	Action Plan	Reference
Gross alpha	12	pCi/L	zero	5	15	All Except Well #14	#7, #8, #19, #24 #27, #28, #30	Annual or Quarterly Monitoring	NR 809.50
Gross beta	13	pCi/L	zero	10	50	All Except Well #14	#19, #28		NR 809.50
Combined Radium	5.9	pCi/L	zero	2.5	5	All Wells	#7, #8, #19, #24 #27, #28, #30	Annual or Quarterly Monitoring	NR 809.50

ES - Enforcement Standard (NR 140 - Groundwater Quality) **HAL** - Health Advisory Level **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	0.6	µg/l	zero	1	10	#8, #11, #14, #30	none		NR 809.11
Barium	61	µg/l	2000	400	2000	All Wells	none		NR 809.11
Chromium, Total	14	µg/l	100	10	100	All Wells	none		NR 809.11
Nickel	5.3	µg/l	100	20	100	All Wells	none		NR 809.11
Nitrogen-Nitrate	4.8	mg/l	10	2	10	#12, #18, #20, #25, #27, #29	#6, #9, #11, #13, #14, #16, #23, #26	Annual Monitoring	NR 809.11
Selenium	3.1	µg/l	50	10	50	#6, #9, #11, #12, #13, #14, #16	none		NR 809.11
Thallium	0.3	µg/l	0.5	0.4	2	#11, #17, #19, #27	none		NR 809.11

* Based on 2019 annual test data

Inorganics - Unregulated

Substance	Maximum*	Units	MCLG	Watch	SMCL	Wells with Detects	Watch List	Action Plan	Reference
Aluminum	6.5	µg/l	n/a	50	200	#6, #14, #20, #25, #26	none		NR 809.70
Chloride	170	mg/l	n/a	125	250	#6, #8, #9, #11, #13, #16, #17, #18, #26, #27	#14	GW Investigation; Mitigation (2028)	NR 809.70
Iron	0.54	mg/l	n/a	0.15	0.3	All Wells	#8, #19, #24, #28 #30	Install Filtration: Well #8 (2032) Well #19 (2025) Well #24 (2030) Well #28 (2026) Well #30 (2027)	NR 809.70
Manganese	49	µg/l	n/a	25	50	All Except Wells #6, #12, #14, #16, #20, #31	#8, #17, #19, #24, #27, #28		NR 809.70
Sodium	52	mg/l	n/a	20	n/a	All Wells	#6, #9, #11, #13, #14, #16	Annual Monitoring	EPA DWEL
Sulfate	43	mg/l	n/a	125	250	All Wells	none		NR 809.70
Zinc	21	µg/l	n/a	2500	5000	All Wells	none		NR 809.70

* Based on 2019 annual test data

DWEL - Drinking Water Equivalency Level **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)

Water Quality Technical Advisory Committee

Meeting Notes
Olin Avenue Conference Room
April 15, 2019 – 5:00 p.m.

Attending: Henry Anderson, Janet Battista, Greg Harrington, Jocelyn Hemming, Gary Krinke, Sharon Long; Al Larson; Joseph Grande

Guests: Two members of the public

1. Agenda Repair/Announcements

- Committee meetings will be held on Monday evening from 5 to 6:30 p.m.
- Future 2019 meetings include July 15 and October 14.

2. Review of Meeting Notes

- Recommended change to the January 7, 2019 meeting notes was noted; Item #3A – "nest of deep monitoring wells" should be changed to possible sentinel well located intermediate to municipal well. Joe D would have information about specific location. Otherwise, no other changes recommended.

3. Water Quality Monitoring & Treatment Policy Review

- Discussed the final version of Revisions to Water Quality Monitoring and Treatment Policies previously developed by committee and adopted by Water Utility Board. Addressed question about Decision Tree flow chart (Figure 1), specifically how it applies to contaminants such as calcium where it is impractical to treat to non-detect. Clarified that the diagram illustrates a framework for identifying treatment objectives after the decision to add treatment is selected.
- Thanked committee for thoughtful discussion that improved earlier versions of the treatment policies.

4. 2018 Water Quality Monitoring Results Review

- Reviewed 2018 results for ATP, inorganics, iron & manganese, radium, and volatile organics (VOCs).
- Overall, the committee voiced concerns about radium levels at Well 19 and Well 27. Otherwise, there were no problems reported.
- The committee recommended reducing ATP and iron & manganese testing due to effective disinfection and flushing practices. ATP no longer will be measured in the distribution system; testing will continue at the wells. Iron & manganese testing will occur at least semi-annually at distribution locations.

5. PFAS Discussion

- Reviewed recent test results (February & March sampling) for Wells 6, 9, 14, 15 and 16. Discussed options for presenting results, particularly when an individual PFAS was detected but not above the reporting limit. Committee offered suggestions on possible ways to report uncertainty of results.
- The committee was updated on utility outreach (neighborhood public meetings) hosted by the utility, the DNR PFAS Technical Advisory Group, a City resolution to form a local Task Force, and a partnership with the State Lab of Hygiene to help develop their capability for PFAS testing.
- Committee members expressed concern about the high level of understanding needed to make informed recommendations identified in the draft resolution to form the local Task Force. Another member asked if funds were available for biomonitoring; such study could be informative.

6. Future Agenda Items

- MWU Master Plan & Capital Improvement Plan (Al Larson – 7/15/19)
- Annexations – Town of Madison; Town of Blooming Grove
- Private Well Program Policies

7. Adjournment

The next meeting will be on Monday, October 14 from 5 to 6:30 p.m. at the Water Utility, 119 E. Olin Avenue.

Water Quality Technical Advisory Committee

Meeting Notes
Olin Avenue Conference Room
August 19, 2019 – 5:00 p.m.

Attending: Henry Anderson, Janet Battista, Jocelyn Hemming, Gary Krinke; Al Larson, Joe Demorett, Joseph Grande, Ald. Marsha Rummel, John Hausbeck - PHMDC

Absent: Greg Harrington, Sharon Long, Tom Heikkinen, Amy Barrilleaux

Guests: Two members of the public, two members of the press

1. Agenda Repair/Announcements/Administration

- Next meeting is Monday, October 14 @ 5 p.m.

2. Review of Meeting Notes

- No changes recommended to the April 15, 2019 meeting notes; adopted as final.

3. DHS Recommended Groundwater Standards Review

- Discussed the recommended standards for PFOA & PFOS, 1,4-dioxane, and hexavalent chromium; described them in the context of regulated contaminants including radium, PCE, and TCE and their estimated 10^{-6} cancer risk levels and MCLs; and presented well data comparing current contaminant levels to water quality targets – MCL, WUB policy, or new recommended enforcement standard
- Do other states regulate 1,4-dioxane? What uncertainty is associated with hex chrome measurements? Do drinking water concentrations constitute an unreasonable risk? What next steps? Recommendations to go through the DNR rule-making process
- Good long-term data for hex chrome; less complete record for other emerging contaminants. Need to better understand the feasibility of treatment – alternatives, costs, risk reduction, etc.
- How rank or prioritize risk? **Ask DHS staff**. Difficulty in understanding effects at low levels, for example, comparing radium to PFAS. For some (i.e. volatiles) there is an inhalation and ingestion risk. Testing is usually limited to wellhead and does not occur in distribution system or at consumer tap. Typically look at risks in isolation, focus on one contaminant at a time. Good studies and data for radium. Information is limited and emerging for PFAS, which comes from animal models, occupational exposures, extensively found in fish, water, food, and dust due to widespread use. Risks from 1,4-dioxane less well understood. EPA does not consider radon in water a high risk because water is a small contributor to exposure.

4. Evaluating Alternatives for Well 15 Operations

- Presented alternatives ranging from using EPA's health advisory level (70 ng/L) as a standard to requiring treatment to remove PFAS before delivering Well 15 water to the distribution system. Most conservative approach would involve adding treatment – up to $5 million in capital cost plus annual operating cost to include periodic disposal/regeneration of carbon; ionic exchange resins are available but currently more costly than carbon. Expect recommendations for additional PFAS by end of 2020; however, the toxicology data for most PFAS is limited. Summed approach to regulation makes sense if the PFAS species share a common toxicity pathway; however, mode of action unknown for many PFAS. Some forms may be less toxic than the currently regulated one.
- Individual polling conducted after the meeting showed broad support for employing the Vermont standard of 20 ng/L for 5 PFAS chemicals as an interim standard until the DHS evaluates the expected toxicity of a broader range of PFAS. The outcome of this choice is identical to keeping the well off-line until DHS staff completes its toxicological review of other PFAS compounds.
- Well 15 remains off-line with no immediate plans to bring it back into service.

5. PFAS Testing Review and Recommendations

- Introduced four charts comparing results from EPA Method 537.1 (18 PFAS compounds) to the modified methods (24-30 PFAS) employed by contract labs. Asked the committee to consider future testing to be conducted by the water utility.
- WU staff stated a desire to use the standard drinking water method (EPA Method 537.1) for future testing. Committee members expressed a concern for what might be lost by not testing for the broader suite of PFAS species. Could learn more about the limitations of the existing method and potential alternatives by inviting staff from the State Lab of Hygiene – Dr. Martin Shafer and lab analyst (Erin) – to future meeting.

6. Future Agenda Items

- MWU Master Plan & Capital Improvement Plan (Al Larson – 10/14/19)
- Annexations – Town of Madison; Town of Blooming Grove

7. Adjournment

The next meeting will be on Monday, October 14 from 5 to 6:30 p.m. at the Water Utility, 119 E. Olin Avenue.

Water Quality Technical Advisory Committee - DRAFT

Meeting Notes
Olin Avenue Conference Room
October 14th, 2019 – 5:00 p.m.

Attending: Henry Anderson, Janet Battista, Jocelyn Hemming, Al Larson, Joe Demorett, Joseph Grande, Greg Harrington, Sharon Long, Isabel Marrah

Absent: Tom Heikkinen, Amy Barrilleaux, Gary Krinke,

Guests: Two members of the public

1. Agenda Repair/Announcements/Administration

- Next meeting is Monday, January 13th @ 5 p.m.
    - Staff from DHS will attend to go through reasoning behind the 20 ppt drinking water standard and also talk about other concerns such as Chromium XI.
- Proposed 2020 dates: April 13th, July 27th, October 12th
- 5 – 6:30 pm time change approved to continue for 2020

2. Review of Meeting Notes

- No changes recommended to the August 19, 2019 meeting notes; adopted as final.

3. MWU Master Plan & Prioritizing Capitol Improvements

- Discussed the Master Plan and outlined our priorities (supply, water quality, and fire protection). Shared spreadsheet for ranking projects and making funding decisions. (See power point)
- Planning for demand: While the population has increased, demand has decreased. We plan for enough water in our reservoirs for the ten peak days of a drought year. Models show if we have three wells offline we cannot keep the reservoirs full. Currently we have two wells off line (15 and 23).
- Past master plans in 2006, 2012, this current one is for 2018/2019.
- The decision making spread sheet analyses the “triple bottom line”, creating categories for the environment, the community, and economics. Added a fourth category for engineering. This helps the master plan fit in with the sustainability plan and other plans from the board and City.
    - How do we predict demand from industry and agriculture? Population projections from the city include predictions about businesses.
    - Why are Water Quality and Public Health separate lines? Public health covers public perception and fire protection, Water Quality covers contaminates and regulations.
    - Takeaways: Flexible decision making tool; confident we won’t run out of water; flexible enough to respond to new contaminates or future needs.
- WU budget, which can be found on the city website, reflects the rankings from the spreadsheet.

4. PFAS Testing Review and Recommendations

- Discussed range of PFAS results from three different labs. Charts were provided comparing detections and concentrations of PFAS using EPA Method 537.1 and modified methods. Modified methods are able to detect a wider variety of compounds as well as a higher total concentrations. Data provided illustrated difference in detection and reporting limits between the three labs.

- Due to the variety of results between the three labs, water utility staff would prefer to stick to one lab for future testing, in order to make valid comparisons. It is also desirable to use a lab we have used in the past to be able to use past testing for historical comparisons.
- Water utility staff pointed out labs variations in results are more significant when reporting concentrations below the labs reporting limits. Results below reporting limits are less reliable as confidence of exact concentrations below that level is low. Should we even bother with results below the reporting limits? As long as results are above detection limits, we know traces of the compound exists. Regulatory standards and health advisories for PFAs continue to get lower and closer to the detection limits of these PFAS.
- Water utility staff prefer lab 2, citing reliable results and ease of use. Lab 2 has reported the highest range of PFAS, as well as the highest total concentration. Lab 2 uses a Modified Method but analyze using EPA Method 537.1 if requested. Lab 2 covers a more narrow suite of compounds (24) compared to lab 1 (30) however, the 24 it does cover include those we see in our system.
- Staff from the State Lab of Hygiene – Dr. Martin Shafer and lab analyst (Erin) – are confident with results obtained from Method 537.1, however, whether it will remain the preferred method used by EPA or DNR is uncertain.
- Could the water utility continue to use the modified method for continued testing and use Method 537.1 on selected wells of concern (ie UW 15)? The advantages for Method 537.1, would be that regulatory agencies may ask for this method in the future.
- Can modified methods be proven just as good or better than Method 537.1? Would these regulatory agencies accept modified method results, if proof of as good or better exists?

6. Future Agenda Items

- DHS Staff will attend next meeting (1/13). Send questions to Joe G. ahead of time to help DHS staff prepare for the meeting.

7. Adjournment

The next meeting will be on Monday, January 13th from 5 to 6:30 p.m. at the Water Utility, 119 E. Olin Avenue.

Inorganic Test Results - 2019

PARAMETER	UNITS	MCL	Well 6	Well 7	Well 8	Well 9	Well 11	Well 12	Well 13	Well 14	Well 16	Well 17	Well 18	Well 19	Well 20	Well 24	Well 25	Well 26	Well 27	Well 28	Well 29	Well 30	Well 31
Sample Date			6/12/2019	6/13/2019	8/15/2019	6/13/2019	6/13/2019	6/12/2019	6/13/2019	6/12/2019	6/12/2019	6/13/2019	6/12/2019	6/12/2019	6/12/2019	6/13/2019	6/13/2019	6/12/2019	8/16/2019	6/12/2019	6/13/2019	6/12/2019	6/12/2019
Alkalinity (CaCO3)	mg/l		315	339	316	354	352	285	345	337	285	295	286	281	297	286	337	314	316	273	335	275	365
Aluminum	ug/l	50	<1.6249	<1.6249	3.55	<1.6249	<1.6249	<1.6249	<1.6249	<1.6249	<1.6249	<1.6249	<1.6249	<1.6249	<1.6249	<1.6249	<1.6249	<1.6249	<1.682	<1.6249	<1.6249	<1.6249	<1.6249
Antimony	ug/l	6	<0.5	<0.5	<0.238	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.238	<0.5	<0.5	<0.5	<0.5
Arsenic	ug/l	10	<0.5	<0.5	0.532	<0.5	0.546	<0.5	<0.5	0.592	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.425	<0.5	<0.5	0.56	<0.5
Barium	ug/l	2000	26.3	36.8	34.7	37.4	18.8	15.8	36.6	61.2	20.1	19.8	14.6	16.7	9.69	12.3	7.25	19.3	26.3	14.4	49.9	16.4	18.2
Beryllium	ug/l	4	<0.0928	<0.0928	<0.038	<0.0928	<0.0928	<0.0928	<0.0928	<0.0928	<0.0928	<0.0928	<0.0928	<0.0928	<0.0928	<0.0928	<0.0928	<0.0928	<0.038	<0.0928	<0.0928	<0.0928	<0.0928
Cadmium	ug/l	5	<0.5	<0.5	<0.108	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.108	<0.5	<0.5	<0.5	<0.5
Calcium	mg/l		86.6	73.4	64.5	83.7	81.2	58.3	77.2	99.9	70.6	61.5	62.2	61.5	52.8	54.2	58.9	65.4	73.8	60.6	69	56.1	59.7
Chloride	mg/l		85	ND	25	81	78	ND	58	170	93	74	21	ND	ND	ND	ND	38	43	ND	ND	ND	ND
Chromium, Total	ug/l	100	13.5	11.6	2.07	14.1	13.9	10.5	13.5	14.3	11.7	8.94	10.6	9.92	10.5	9.89	11.9	12.2	2.13	11.5	12.5	10.3	9.92
Conductivity	umhos/cm		931	689	655	853	888	530	806	1200	828	661	617	559	507	467	584	675	749	546	613	534	631
Copper	ug/l	1300	13.3	2.73	5.47	17.8	2.3	3.28	3.59	7.07	6.88	2.6	5.03	9.29	1.87	1.71	0.64	2.47	4.19	1.37	2.72	1.45	19.7
Fluoride	mg/l	4	0.62	0.56	0.84	0.64	0.6	0.75	0.76	0.6	0.71	0.64	0.67	0.71	0.68	0.76	0.69	0.64	0.83	0.72	0.74	0.67	0.72
Hardness ($CaCO_3$)	mg/l		396	355	319	392	401	274	370	454	335	314	298	282	259	268	311	307	345	281	320	270	325
Iron	mg/l	SMCL 0.3	0.00535	0.0413	0.538	0.0136	0.0248	0.00317	0.0191	0.00257	0.00395	0.119	0.00951	0.198	0.00288	0.156	0.0518	0.027	0.143	0.171	0.0154	0.194	0.00567
Lead	ug/l	15	<0.0967	<0.0967	0.168	0.204	0.21	<0.0967	0.212	<0.0967	<0.0967	0.147	0.195	0.977	0.11	<0.0967	<0.0967	0.122	0.095	0.206	<0.0967	<0.0967	<0.0967
Magnesium	mg/l		43.7	42	38.3	44.5	48.1	31.1	42.9	49.7	38.5	38.9	34.8	31.3	31	32.2	39.9	34.8	39	31.4	35.8	31.5	42.8
Manganese	ug/l	SMCL 50	<1.0811	1.71	49	1.48	12.1	<1.0811	1.44	<1.0811	<1.0811	28.2	2.76	37.4	<1.0811	16.7	2.89	4.15	31.9	20.8	1.63	13.3	<1.0811
Mercury	ug/l	2	<0.0252	<0.0252	<0.019	<0.0252	<0.0252	<0.0252	<0.0252	<0.0252	<0.0252	<0.0252	<0.0252	<0.0252	<0.0252	<0.0252	<0.0252	<0.0252	<0.019	<0.0252	<0.0252	<0.0252	<0.0252
Nickel	ug/l	100	4.88	3.95	0.999	4.41	4.95	3.26	4.56	5.33	3.67	3.63	3.39	3.35	2.81	2.66	2.86	4.27	2.45	3.74	3.77	3.04	3.27
Nitrogen, Nitrate	mg/l	10	3.29	<0.095	<0.089	2.2	2.48	1.66	3.7	3.82	2.83	<0.095	1.08	<0.095	0.39	<0.095	0.763	2.36	0.24	<0.095	1.32	<0.095	<0.095
Nitrogen, Nitrite	mg/l	1	<0.012	<0.012	<0.015	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.015	<0.012	<0.012	<0.012	<0.012
pH (Lab)	s.u.		7.69	7.46	7.76	7.28	7.46	7.61	7.42	7.99	7.98	7.43	7.81	8.09	7.63	7.58	7.67	7.52	7.38	7.75	7.43	7.66	7.89
Selenium	ug/l	50	2.96	<1.5288	<1.659	2.26	2.67	1.61	1.66	3.06	1.85	<1.5288	<1.5288	<1.5288	<1.5288	<1.5288	<1.5288	<1.5288	<1.659	<1.5288	<1.5288	<1.5288	<1.5288
Silver	ug/l	2	<0.1	<0.1	<0.087	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.087	<0.1	<0.1	<0.1	<0.1
Sodium	mg/l		26	7.21	9.98	23.7	23.1	2.56	20.1	52.2	30.5	14.5	7.26	4.39	2.14	4.84	3.2	15.4	17.5	2.43	3.77	3.95	3.3
Strontium			76.8	91.5	74.7	76.8	90	54.1	78	88	65.1	80.2	80.9	88.1	51.5	68.8	62.1	58.2	92.2	48.3	74.5	100	70.8
Sulfate	mg/l	250	31.3	34.9	21.2	24.9	30	5.73	20.9	29.2	13.9	38.3	21.3	9.68	9.49	14.7	6.67	15.9	42.7	24.6	12.1	23.3	7.34
Thallium	ug/l	2	<0.1	<0.1	<0.097	<0.1	0.275	<0.1	<0.1	<0.1	<0.1	0.124	<0.1	0.123	<0.1	<0.1	<0.1	<0.1	0.154	<0.1	<0.1	<0.1	<0.1
Total Solids	mg/l		508	374	388	476	510	200	392	684	454	404	266	328	122	258	288	258	364	208	316	246	280
Zinc	ug/l	5000	3.19	5.42	9.27	2.06	5.61	15	4.33	3.24	14.1	20.5	4.73	3.07	2.55	6.47	2.49	12.6	4.59	8.58	4.43	5.68	1.1