Internal Monitoring Report

Policy #: O-2B Water Quality **Date**: April 23, 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 and 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 October and March, 1807 water samples were collected from routine monitoring points in the system including the entry point at well houses (403 samples). No sample tested positive for coliform bacteria. Thirty-nine raw water well samples were collected during this reporting period. All were found to be free of coliform bacteria.

Volatile Organic Compounds – Wells with previous VOC detections are sampled quarterly. They include Wells 6, 9, 11, 14, 15 and 18. PCE is the most commonly detected VOC; it is found at five wells with levels ranging from 0.4 to 2.0 µg/L. The maximum contaminant level (MCL) for PCE is 5 µg/L. A summary of test results at each well is shown in **Table 1**. Well 31 is currently tested on a quarterly basis to confirm that the source water is free of organic contaminants.

While PCE and TCE are both found in the source water at Well 15, the air stripper installed several years ago reduces these contaminants to below detectable levels (<0.28 and <0.30 µg/L, respectively). Low levels of ethyl benzene and xylene were detected in 2018 in water delivered from Well 9. These contaminants are not present in the source water rather they derive

from paint coatings applied to the interior surface of the reservoir. Testing in early 2019 did not find either of these two contaminants. Finally, PCE was detected at Well 7 in January. A follow-up sample was collected to confirm its presence. Those results are not yet available.

Radium - In accordance with GUIDE 8, seven wells were tested quarterly in 2018 for radium (226 + 228) because previous tests show that combined radium exceeds 2.5 pCi/L, or one-half the MCL. **Table 2** summarizes the results for samples collected during the monitoring period. Compliance with the MCL is based on a running annual average of quarterly samples rather than any single test result. Although results are variable from one sampling period to the next, radium concentrations appear stable at each of these seven wells. Because of this stability, changes to the Water Quality Monitoring & Treatment Policies will reduce the monitoring for radium to annually at most wells. Well 19 and Well 27 will continue to be tested on a quarterly basis.

Contaminants with a secondary MCL

Iron and Manganese - Monthly well samples are collected when iron and manganese are elevated. During the period from October to March, two samples from Well 19 either were at or exceeded the secondary MCL for manganese [50 µg/L]; no samples collected from any well during this period exceeded the iron standard [0.3 mg/L]. Test results are shown in **Tables 3 and 4**. Wells 8, 17, 23 and 27 are designated seasonal wells due to elevated iron and manganese levels and did not pump during this period.

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.

Filters at Well 7, Well 29, and Well 31 continue to show significant iron and manganese reductions. Test results are shown in **Tables 3 and 4**.

Iron and manganese monitoring also took place in the distribution system at all coliform sample locations. Test results, summarized in **Table 5**, show iron and manganese infrequently exceed the established benchmarks and over 95% of the samples are below one-half the policy goals. These results

demonstrate our effective management and control of iron and manganese accumulation in the distribution system. As a result, distribution system monitoring of iron and manganese is being reduced to semiannual from the current monthly testing.

Chloride - Monthly chloride testing continues at Well 14. Five samples were collected between October and March; the chloride level ranged from 150 to 160 mg/L, compared to the secondary MCL – 250 mg/L. Well 14 is the only Madison well with chloride above 80 mg/L.

Previous work identified the storm sewer outlet into Lake Mendota at Spring Harbor as a potential source of chloride contamination to Well 14. Two temporary monitoring wells were installed in Spring Harbor Park in December 2017 to investigate this potential source. Sampling takes place monthly and will continue through June 2019. **Table 6** summarizes those test results.

A data logger was installed in one monitoring well to continuously measure water level, temperature and conductivity (a proxy for chloride). These measurements will be compared to similar data gathered from a US Geological Survey monitoring station in Spring Harbor during rainfall and snowmelt runoff events. An initial review of the data suggested that stormwater drainage and municipal well pumping both influence the water level and water quality at the monitoring wells.

An alternatives evaluation study previously included in the Water Utility's 2018 Operating Budget has been deferred. The study was to identify and compare treatment solutions, and their corresponding costs, to mitigate increasing chloride and sodium levels at Well 14.

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

1,4-Dioxane – Any well which previously had a detection of 1,4 dioxane was again tested in 2018. Dioxane was found in five of the six wells tested. The results ranged from <0.07 to 0.31 µg/L with the highest level found at Well 11. Complete results are found in **Table 7**. All detections were below US EPA's health reference level of 0.35 µg/L – the 10^{-6} lifetime cancer risk level. Dioxane often co-exists with chlorinated solvents; however, it is not readily removed from water. Air stripping is not an effective treatment for removing dioxane from water.

Hexavalent Chromium – All Madison municipal wells were subjected to hexavalent chromium testing in 2018. The highest levels were found in Wells 6, 9, 13, 14, and 16 where hex chrome or chromium (VI) ranged from 1 – 2 µg/L. All other wells tested below 1 µg/L with nine wells not having a detectable level of hex chrome [<0.02 µg/L]. Complete 2018 results can be found in **Table 8**. Chromium levels have remained relatively consistent since monitoring began in 2011.

Per and Polyfluoroalkyl Substances [PFAS] – Limited testing of PFAS compounds took place in 2018. This testing was restricted to Well 15 and Well 16 – two wells in which PFAS compounds were previously found. A mixture of six PFAS compounds was found at Well 15 while a single PFAS compound was detected at Well 16 in 2018. The two wells were screened for 12 to 18 PFAS compounds. See **Table 9** for details.

Beginning in 2019, PFAS monitoring was expanded to include up to thirty PFAS compounds with detection limits at low single-digit part per trillion (ppt) levels. In February, a monitoring plan was developed to test all wells for PFAS. That plan is currently being implemented. All wells currently in operation have been sampled; however, test results are not yet available for all wells. **Table 10** contains a PFAS detection summary of results for tests that are now complete. Twenty PFAS compounds tested have not been found at any Madison well. In addition, no PFAS were detected at eight wells (12, 18, 19, 20, 25, 28, 30, and 31). A comprehensive report will be prepared for the board when the monitoring is complete later this year.

Limited toxicology data is available for many PFAS. Consequently, no federal drinking water standard has been developed. However, the US EPA did establish a lifetime health advisory for two PFAS compounds – PFOA and PFOS. That health guideline is set at 70 ng/L or parts per

trillion (ppt) for the combined concentration of those two PFAS. Some states adopted this level as a drinking water standard while others have promulgated lower limits or guidelines for other PFAS compounds. In Wisconsin, the Department of Health Services is currently reviewing the toxicology to recommend a groundwater standard for PFOA & PFOS. The department has also been asked to evaluate other PFAS compounds for potential standards. Recommendations are expected later this year.

PFAS compounds are manufactured chemicals that are used in industrial and consumer applications. They are responsible for the non-stick, stain-resistant and fire-retardant properties of cookware, clothing, fabrics, food packaging, and foams. Once in the environment, these chemicals are very stable and slow to degrade due to the strong carbon-fluoride bonds that make them resistant to microbial degradation. Conventional drinking water treatment is mostly ineffective at removing or destroying these widespread and persistent chemicals. However, studies show that activated carbon and ion exchange are two promising technologies for removing PFCs from drinking water.

Sodium - Six Madison wells produce water with sodium above 20 mg/L: four in the 20-25 mg/L range, one between 25 and 30 mg/L, and one in excess of 30 mg/L sodium. In accordance with GUIDE 8, monthly sodium testing continued at Well 14. Five samples were collected between October and March with samples measuring between 56 and 58 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, in January and April, since the last monitoring report. In both meetings, the committee focused on revisions to the Water Quality Monitoring & Treatment Policies and in-depth PFAS discussion. The Water Utility Board adopted the six recommendations offered by the committee at its February meeting. Final recommendations were shared with the committee in April. In January, the PFAS discussion focused on laboratory analytical capabilities including range of PFAS compounds quantified, method detection/reporting limits, and unit cost. In April, the committee reviewed recent PFAS test results and discussed some options for presenting the results, particularly when PFAS was detected but not above the reporting limit. The committee offered suggestions on possible ways to include the uncertainty in the results reporting. The committee was also updated on other PFAS activity including neighborhood public meetings hosted by the utility, the DNR PFAS Technical Advisory Group, a City resolution to form a local PFAS Task Force, and a partnership with the Wisconsin State Laboratory of Hygiene to develop their capability for PFAS testing.

At the April meeting, the committee also reviewed the 2018 water quality monitoring results for ATP, inorganics, iron & manganese, radium, and volatile organics. The committee recommended reducing the amount of ATP and iron & manganese testing currently performed in the distribution system. ATP testing was recommended to continue at the wells and their entry points but no longer in the distribution system. The meeting notes for the January meeting are attached; the notes for the April meeting are not yet available.

Annual Water Quality Report – Consumer Confidence Report

The 2018 consumer confidence report (CCR) is currently being developed. No significant changes are planned for the layout; however, a discussion of PFAS testing and results is likely to be more prominent this year compared with previous years. The well-specific water quality reports available on our website are currently being updated. The CCR will be released once those revisions are posted to the website and the CCR is finalized, printed, and available for distribution. The release is planned for late May or early June. Postcards will again be utilized to direct customers to an electronic

CCR posted on our website. A statement announcing the availability of the annual water quality report will be included on the Municipal Services Bill. A limited number of copies will be printed for distribution at libraries and community centers around the city.

Additional Water Quality Outreach

Water Utility staff participated in three neighborhood and/or public meetings to discuss PFAS, Well 15, and Truax. Our partners at Public Health Madison and Dane County and Wisconsin Department of Health Services also attended these meetings to present information on potential health risks associated with PFAS in drinking water and how consumers could minimize PFAS exposures. In total, 120 – 150 participants attended the three meetings.

Joe Grande will speak at the Water@UW-Madison Spring Symposium, the Wisconsin Section of the American Water Works Association Regulatory Affairs Seminar, and the American Institute of Professional Geologists Wisconsin PFAS Workshop later this spring. His comments will focus on the need for standardization in PFAS testing, and Madison's experience with testing and finding PFAS in several community drinking water wells.

Attachments:

Tables 1-10
Water Quality Watch List
Water Quality Technical Advisory Committee Notes – January 2019

Table 1. Summary of VOC Detections (in µg/L), October to March

	Samples	DCE, cis	PCE	TCE	TCFM
MCL		70	5	5	n/a
Well 6	2	<0.3	**1.0 - 1.2**	<0.3	<0.3
Well 9	2	<0.3	**2.0**	<0.3	<0.3
Well 11	2	**0.4**	**0.6**	<0.3 **- 0.3**	**0.5 - 0.56**
Well 14	2	<0.3	**0.4**	<0.3	<0.3
Well 18	2	<0.3	**1.5**	**0.2**	<0.3
Well 31	2	<0.3	<0.2	<0.2	<0.3
	TCFM = Trichlorofluoromethane				

Table 2. Combined Radium Results (226+228) measured in pCi/L

	Nov 2018	Annual Average of Quarterly Samples	Number of Samples
Well 7	2.6	**2.3**	4
Well 8	Inactive	**3.0**	2
Well 19	3.3	**4.1**	4
Well 24	2.9	**2.7**	4
Well 27	Inactive	**4.6**	1
Well 28	3.5	**2.9**	4
Well 30	2.5	**2.8**	4
Well 31	2.2	**2.0**	3

Table 3. Monthly Iron Test Results, in mg/L

Source	Oct	Nov	Dec	Jan	Feb	Mar
Well 7 - filtered	0.02	<0.05	<0.05	0.14	n/s	<0.05
Well 19	0.20	0.20	0.20	0.20	0.23	0.20
Well 24	0.21	0.20	0.20	0.20	0.21	0.19
Well 26 – deep well	<0.01	0.01	n/s	<0.01	<0.01	<0.01
Well 28	0.17	0.17	n/s	0.16	0.18	0.17
Well 29 - filtered	<0.02	<0.05	<0.05	<0.05	n/s	<0.05
Well 30	0.20	0.21	0.20	0.20	0.21	0.20
Well 31 – filtered	0.22	0.07	<0.05	<0.05	n/s	<0.05

Table 4. Monthly Manganese Test Results, in µg/L

Source	Oct	Nov	Dec	Jan	Feb	Mar
Well 7 - filtered	<1.0	<0.7	<0.7	16	n/s	1.5
Well 19	47	45	47	**50**	**54**	46
Well 24	31	32	31	30	32	28
Well 26 – deep well	18	11	n/s	<3.9	8.4	<3.9
Well 28	22	22	n/s	21	22	22
Well 29 - filtered	<1.0	<0.7	4.6	<0.7	n/s	<0.7
Well 30	14	15	14	14	14	14
Well 31	2.3	1.2	<0.7	<0.7	n/s	<0.7

Table 5. Summary of iron and manganese levels in the distribution system.

Manganese, µg/L

	Oct - Dec	2018
Policy Goal	**50**	**50**
Median	1.4	1.2
Average	3.0	3.8
95th Percentile	***7.5***	***19***
Maximum	21	100
Number of Samples	85	341
>50	0	1

Iron, mg/L

	Oct - Dec	2018
Policy Goal	**0.3**	**0.3**
Median	<0.02	<0.02
Average	0.02	0.03
95th Percentile	***0.04***	***0.10***
Maximum	0. 18	0.42
Number of Samples	85	341
>0.3	0	1

Table 6. Chloride and sodium levels at Well 14 and two monitoring wells located in Spring Harbor Park (MW-1 and MW-2)

	MW-1 (North)		MW-2 (South)		Well 14	
	Chloride, mg/L	Sodium, mg/L	Chloride, mg/L	Sodium, mg/L	Chloride, mg/L	Sodium, mg/L
Jan 2018	150	51	180	69	145	49
Feb 2018	160	57	200	91	137	50
Mar 2018	200	68	170	75	140	52
Apr 2018	160	66	180	72	140	50
May 2018	100	42	180	80	140	52
Jun 2018	180	67	200	91	140	53
Jul 2018	220	90	190	76	140	52
Aug 2018	67	60	180	80	140	55
Sep 2018	150	78	160	78	140	57
Oct 2018	110	52	180	70	160	58
Nov 2018	110	56	180	74	150	58
Dec 2018	86	43	170	72	150	56
Jan 2019	49	27	190	81	Not sampled	Not sampled
Feb 2019	90	40	240	100	150	56
Mar 2019	52	32	220	110	150	57

Table 7. 1,4 Dioxane test results

Source	1,4 Dioxane, µg/L
Well 09	0.09
Well 11	0.31
Well 14	0.12
Well 15	0.13
Well 17	<0.07
Well 18	0.08

Table 8. 2018 Hexavalent Chromium test results

	Chromium (VI), μg/L		Average Level, μg/L
	Sample 1	Sample 2	2011 - 2018
Well 6	1.8	1.8	1.85
Well 7	0.02	--	0.02
Well 8	0.02	--	0.02
Well 9	0.85	1.0	0.84
Well 11	0.75	--	0.88
Well 12	0.64	--	0.85
Well 13	1.3	1.3	1.22
Well 14	1.8	2.0	1.91
Well 15	0.58	--	0.53
Well 16	0.85	1.2	1.11
Well 17	0.02	--	0.02
Well 18	0.54	--	0.49
Well 19	0.02	--	0.02
Well 20	0.60	--	0.54
Well 23	--	--	0.97
Well 24	0.02	--	0.02
Well 25	0.55	--	0.49
Well 26	0.44	--	0.38
Well 27	0.02	--	0.02
Well 28	0.02	--	0.02
Well 29	0.05	--	0.04
Well 30	0.02	--	0.03
Well 31	0.02	--	0.02

Table 9. PFAS test results (2018).

2018	MRL	EP 15	EP 15	EP 16
PFAS Compounds	(ng/L)	3/19	10/16	10/17
perfluorobutanesulfonic acid (PFBS)	2.0	**2.4**	**2.6**	<2.0
Perfluorohexanoic acid (PFHxA)	2.0	**5.2**	**5.3**	<2.0
perfluorohexanesulfonic acid (PFHxS)	2.0	**20**	**21**	**2.4**
perfluoroheptanoic acid (PFHpA)	2.0	<2.0	**2.2**	<2.0
perfluorooctanoic acid (PFOA)	2.0	**4.7**	**5.4**	<2.0
perfluorooctanesulfonic acid (PFOS)	2.0	**4.4**	**5.1**	<2.0
perfluorononanoic acid (PFNA)	2.0	<2.0	<2.0	<2.0
perfluorodecanoic acid (PFDA)	2.0	<2.0	<2.0	<2.0
perfluoroundecanoic acid (PFDA)	2.0	<2.0	<2.0	<2.0
perfluorododecanoic acid (PFDA)	2.0	<2.0	<2.0	<2.0
perfluorotridecanoic acid (PFDA)	2.0	<2.0	<2.0	<2.0
perfluorotetradecanoic acid (PFDA)	2.0	<2.0	<2.0	<2.0
N-Ethyl perfluorooctane sulfonamidoacetic acid	2.0	--	<2.0	--
N-Methyl perfluorooctane sulfonamidoacetic acid	2.0	--	<2.0	--
GenX	5	--	<5	--
ADONA	2.0	--	<2.0	--
F-53B Major	2.0	--	<2.0	--
F-53B Minor	2.0	--	<2.0	--
PFOA + PFOS	--	9.1	10.5	ND

Notes: MRL - method reporting limit
EP - entry point to distribution system; after treatment
DW - deep well; untreated well water
ng/L – nanogram per liter; equivalent to one part per trillion
ND – not detected

Table 10. PFAS Detection Summary as of April 23, 2019. Results in ng/L or parts per trillion (ppt)

March 2019

PFAS Compounds	Well 06	Well 09	Well 14	Well 15	Well 16
Perfluorobutanoic acid (PFBA)	**PRESENT**	not tested	**3.6**	**2.9**	**PRESENT**
Perfluorobutanesulfonic acid (PFBS)	**PRESENT**	**PRESENT**	**PRESENT**	**3.1**	**PRESENT**
Perfluoropentanoic acid (PFPeA)	not detected	not tested	**1.9**	**5.1 - 5.9**	**PRESENT**
Perfluoropentane sulfonic acid (PFPeS)	not detected	not tested	**PRESENT**	**2.7**	not detected
Perfluorohexanoic acid (PFHxA)	not detected	**PRESENT**	**2.3**	**6.1**	**PRESENT**
Perfluoroheptanoic acid (PFHpA)	not detected	not detected	**PRESENT**	**2.5**	**PRESENT**
Perfluorohexanesulfonic acid (PFHxS)	**PRESENT**	**1.2**	**4.8**	**20 - 21**	**2.5**
Perfluoroheptane sulfonic acid (PFHpS)	not detected	not tested	not detected	**PRESENT**	not detected
Perfluorooctanoic acid (PFOA)	**PRESENT**	**PRESENT**	**PRESENT**	**5.4 - 5.7**	**PRESENT**
Perfluorooctanesulfonic acid (PFOS)	not detected	**PRESENT**	**PRESENT**	**5.3 - 5.8**	**PRESENT**
Combined PFOA + PFOS	0.8*	0.8*	2.4* - 4.5*	11 - 12	2.3* - 2.7*

April 2019[#]

PFAS Compounds	Well 06	Well 09	Well 11
Perfluorobutanoic acid (PFBA)	**1.8**	**41**	**4.2**
Perfluorobutanesulfonic acid (PFBS)	**PRESENT**	**PRESENT**	**PRESENT**
Perfluoropentanoic acid (PFPeA)	**PRESENT**	**PRESENT**	**PRESENT**
Perfluoropentane sulfonic acid (PFPeS)	**PRESENT**	not detected	not detected
Perfluorohexanoic acid (PFHxA)	**PRESENT**	**PRESENT**	**PRESENT**
Perfluoroheptanoic acid (PFHpA)	**PRESENT**	**PRESENT**	**PRESENT**
Perfluorohexanesulfonic acid (PFHxS)	**4.5**	**2.0**	**1.9**
Perfluoroheptane sulfonic acid (PFHpS)	not detected	not detected	not detected
Perfluorooctanoic acid (PFOA)	**PRESENT**	**1.7**	**PRESENT**
Perfluorooctanesulfonic acid (PFOS)	**PRESENT**	**3.1**	**PRESENT**
Combined PFOA + PFOS	2.9*	4.8	1.6*

NOTES:

* estimated concentration

[#] results from one of three labs

PRESENT - PFAS was detected but not above the level at which it can be quantified precisely

Water Quality Technical Advisory Committee

Meeting Notes
Olin Avenue Conference Room
January 7, 2019 – 5:00 p.m.

Attending: Jocelyn Hemming; Sharon Long; Greg Harrington; Henry Anderson; Gene McLinn; Amy Barrilleaux; Al Larson; Joseph Grande

Absent: Janet Battista; Gary Krinke; Tom Heikkinen; Joe DeMorett

Guests: Three 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 April 15, July 15 and October 14.

2. Review of Meeting Notes

- The October 9, 2018 meeting notes were approved as presented.

3. Water Quality Monitoring & Treatment Policy Discussion

A. Testing Requirements

Recommendation #1, #2, #3 and #4

Recommended approval by the Water Utility Board.

Recommendation #3 (PFAS monitoring): monthly monitoring to continue indefinitely at Well 15; transition to triennial monitoring at Well 16, in line with policy recommendations for unregulated contaminants - the next monitoring will be in 2021. The group suggested possible monitoring wells that may be located near the landfill near Well 16 (Janet confirmed their presence in April).

B. Iron and Manganese Standards for Treatment

Recommendation #5 – Uniform Iron and Manganese Standards

1. Suggested adding: "Target date for completion will be re-evaluated every three years".

2. Include potential parameters to define how the order of importance will be determined for which well or wells are filtered first. Water quality may be the primary parameter but other asset management parameters may also be beneficial to include.

3. Include benefit analysis for operational savings that may be realized by implementing filtration:

- Reduced flushing
- Reduced biofilms
- Unrestricted use of all wells within the system

Note: It is important to retain flexibility to prioritize future emerging contaminants and/or concerns with greater health risks (i.e. radium) relative to iron and manganese.

C. Water Quality Treatment Goals

Recommendation #6 – Water Quality Treatment Targets

The group suggested the following modifications:

1. Remove Bullet #1 since Bullet #4 captures the same information.

2. Rephrase Bullet #4 to include the definition of cVOC. "Tune up" and add language that the removal of cVOC should be down to the detection limit if the MCLG is not zero. Current Bullet #4 will become new Bullet #1.

3. Retain Bullets #2, #3, #5 and #6.

The group discussed retaining flexibility in balancing complete removal versus partial removal for hard to treat compounds. For example, complete removal of radium significantly increases the investment, operational and disposal costs versus partial removal. An additional challenge is many compounds, including chlorinated VOCs, may co-occur but should not necessarily be treated equally in terms of importance.

The group also discussed which standard(s) might be used as the reference level – EPA? IARC? Independent Investigations? The committee encouraged the continued use of EPA standards (at a minimum) with possible augmentation of IARC recommendations.

4. PFAS Monitoring Plans

Well 15 will continue to be monitored monthly in 2019. Well 16 will transition to triennial monitoring, in line with policy recommendations; the next monitoring will be in 2021.

Handout 1: Requests for cost and breadth of PFAS testing was extended to nine national labs. Five labs submitted information, including one lab offering two different PFAS analysis profiles. The six profile options all contain the six compounds included in UCMR3 along with variations of additional PFAS compounds. One lab is able to achieve a reporting threshold below 1 nanogram/L. The cost for the basic analysis ranges between $190 and $250 per sample.

Jocelyn mentioned staff at the WSLH have been working on the ISO extraction method for 34 PFAS compounds. No pricing information is available currently but the method should be ready in March 2019.

The group discussed the parallel PFAS fish study being conducted by Beth Murphy, DNR Region 5. Depending upon the level of PFCs detected in fish, public health advisories for consumption of local fish may be issued.

Handout 2: Three of the labs also provided options to analyze a broader list (30 – 40) of PFAS compounds. The cost for analysis ranges between $325 and $750 per sample.

The group is supportive of additional testing but encouraged more background of the broader list of compounds be completed before undertaking testing.

Joe will send the 2 - 3 page summary of updated state websites with links to PFOS information to the committee.

5. 2018 Water Quality Monitoring Results Review

Item deferred to the April meeting. The data will be updated to include December 2018 results.

6. Future Agenda Items

- MWU Master Plan & Capital Improvement Plan
- Annexations – Town of Madison; Town of Blooming Grove
- Private Well Program Policies

Before adjourning, the group was asked to look at ATP and monthly iron & manganese monitoring prior to the next meeting for input on increasing, decreasing or retaining the current monitoring schedule.

7. Adjournment

The next meeting will be on Monday, April 15 from 5 to 6:30 p.m. at the Water Utility, 119 E. Olin Avenue.

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, #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, #9, #11, #14, #16	#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)

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, #31	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	4.9	pCi/L	zero	2.5	5	All Wells	#7, #8, #19, #24 #27, #28, #30, #31	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
Antimony	1.1	µg/l	6	1.2	6	#6, #13, #24	none		NR 140.10
Barium	61	µg/l	2000	400	2000	All Wells	none		NR 809.11
Chromium, Total	4.3	µg/l	100	10	100	All Except Well #31	none		NR 809.11
Nickel	2.7	µg/l	100	20	100	All Except Well #31	none		NR 809.11
Nitrogen-Nitrate	4.0	mg/l	10	2	10	#9, #12, #16, #18, #20, #25, #27, #29	#6, #11, #13, #14, #15, #26	Annual Monitoring	NR 809.11
Selenium	2.0	µg/l	50	10	50	#9, #11, #13, #14 #15, #16, #25, #29	none		NR 809.11
Thallium	0.3	µg/l	0.5	0.4	2	#11, #15, #16, #17, #19, #27, #28	none		NR 809.11

* Based on 2018 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	140	mg/l	n/a	125	250	#6, #9, #11, #13, #15, #16, #17, #26, #27	#14	GW Investigation; Mitigation (2028)	NR 809.70
Chromium, Hexavalent	1.8	µg/l	n/a	1	n/a	#11, #12, #15, #18, #20, #25, #26, #29	#6, #9, #13, #14, #16	Annual Monitoring	n/a
Iron	0.54	mg/l	n/a	0.15	0.3	All Except Wells #9, #14, #16, #20, #31	#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	45	µg/l	n/a	25	50	All Wells	#8, #17, #19, #24, #27		NR 809.70
Sodium	51	mg/l	n/a	20	n/a	All Wells	#6, #9, #11, #14, #15, #16	Annual Monitoring	EPA DWEL
Sulfate	114	mg/l	n/a	125	250	All Wells	none		NR 809.70
Zinc	12	µg/l	n/a	2500	5000	All Except #31	none		NR 809.70

* Based on 2018 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)