

Tony Evers  
Governor

Karen E. Timberlake  
Secretary



**State of Wisconsin**  
Department of Health Services

**DIVISION OF PUBLIC HEALTH**

1 WEST WILSON STREET  
PO BOX 2659  
MADISON WI 53701-2659

Telephone: 608-266-1251  
Fax: 608-267-2832  
TTY: 711 or 800-947-3529

5/27/22

Tom Kilian, Alderperson  
City of Wausau

RE: Review of PFAS contamination in Wausau Waterworks municipal system wells

Dear Alder Kilian,

Thank you for reaching out to the Wisconsin Department of Health Services (DHS) with your questions about per- and polyfluoroalkyl substances (PFAS) in the Wausau municipal drinking water system. I am writing today to provide you with our public health conclusions and recommendations regarding the samples taken in June 2019 and January 2022. In summary, the results indicate the following:

- In all samples from 2019 and 2022, the measured PFAS levels from the six wells and combined entry point exceeded DHS' PFAS health advisories.
- The main way people are exposed to PFAS is by drinking PFAS-contaminated water or eating food prepared using contaminated water. Studies have shown that if an exposure to PFAS is interrupted, PFAS levels in the body will decrease over time.
- Therefore, drinking unfiltered Wausau drinking water poses a health risk due to the PFAS levels measured. **DHS recommends that people limit their intake of PFAS compounds, which they can do by limiting their consumption of Wausau's municipal drinking water or appropriately filtering the water.**

## **Background and Statement of Issues**

In January 2022, Wausau Waterworks voluntarily collected water samples of the City of Wausau's drinking water at each of the six municipal wells and the combined entry point and tested them for per- and polyfluoroalkyl substances (PFAS), a large group of persistent human-made chemicals that are resistant to heat, water, and oil. This testing was a follow-up to a similar round of tests conducted in 2019. PFAS levels found in each of the six wells and the entry point in both the 2019 and 2022 samples exceeded all DHS health advisory levels for PFAS in drinking water (see Appendix, Table 1).

In February 2022, DHS issued recommendations to Wausau residents on the municipal drinking water system to reduce their intake of Wausau's municipal drinking water. Since then, there have been questions about whether Wausau's water poses a health risk to the community. This letter aims to clarify DHS' position and health recommendations and provide context from where those recommendations were derived.

## **Discussion**

### **Exposure Evaluation**

An evaluation of exposure pathways is performed to determine if an exposure or potential exposure to the contaminants is possible. For a contaminant to be a health concern, a completed

exposure pathway must exist, and the contaminant must be at a high enough concentration to cause potential harm to people. For a completed pathway to be present, all of the following elements must exist:

- a source of contamination
- media for the contaminant to travel
- a point of exposure where people actually come into contact with a contaminated material
- a route of exposure allowing the contaminants to enter or contact the body
- a receptor population or people who are exposed or potentially exposed to the contaminants

An evaluation of the exposure for PFAS within the Wausau municipal water supply is provided in Appendix Table 2. All of the pathway elements are present for current and past exposures, indicating a completed exposure pathway.

### Health Effects Evaluation

DHS developed recommended groundwater standards for PFAS following the process outlined in Ch. 160, Wisconsin State Statute.<sup>1</sup> This process involves three steps: a literature review, a determination of an acceptable daily intake (ADI), and determination of the recommended standard. Until the recommended standards are adopted into code, DHS is treating all groundwater standard recommendations as health advisory levels.

An ADI is defined as the dose of a substance that is not expected to pose a health risk if accepted daily over a lifetime. The first step in choosing an ADI involves a literature review of available scientific information, including existing federal numbers. US EPA published a health advisory of 70 ppt in 2016 for PFOS+PFOA combined, but upon reviewing additional toxicological studies published after 2016, DHS found sufficient evidence of adverse health impacts at lower levels, indicating a need to determine an ADI.

An ADI is calculated by dividing a toxicity value by a composite uncertainty factor. The toxicity value is obtained from available dose-response data from animal studies. Uncertainty factors account for scientific uncertainty that is inherent in the type of data used to establish human health standards, including variations in people and animals, the dose-response relationship, and the quality and quantity of data.

For PFOA, a human-equivalent dose of 540 ng/kg/d was chosen as the critical toxicity value from animal studies. This was divided by an uncertainty factor of 300 to account for differences between people and research animals (3), differences among people (10), and the fact that the critical dose identified still produced health effects (10), resulting in an ADI of 1.8 ng/kg/day (see eq. 1 for PFOA example). For PFOS, an ADI was identified from ATSDR's intermediate oral minimum risk level of 2 ng/kg/d.<sup>2</sup>

$$\text{Eq 1: Acceptable Daily Intake (ADI)} = \frac{\text{Human Equivalent Dose}}{\text{Uncertainty Factors}} = \frac{\frac{540 \text{ ng}}{\text{kg/day}}}{3 \times 10 \times 10} = \frac{1.8 \text{ ng}}{\text{kg/day}}$$

<sup>1</sup> <https://docs.legis.wisconsin.gov/statutes/statutes/160>, see <https://www.dhs.wisconsin.gov/publications/p02816.pdf>

<sup>2</sup> <https://dnr.wisconsin.gov/sites/default/files/topic/Groundwater/NR140/DHSLetter20220201.pdf>, see pp. 176-177

To create the health advisory, the ADIs are applied to a standard exposure scenario assuming a child weighing 10 kg consumes 1 liter of water per day, and that this is 100% of their PFAS exposure (see eq. 2 for PFOA example). This exposure scenario is intended to be protective of the most vulnerable populations, young children.

$$\text{Eq. 2: Health Advisory (HA)} = \frac{\frac{1.8 \text{ ng}}{\text{kg/day}} * 10 \text{ kg} * 100\%}{1 \text{ L/day}} = \frac{18 \text{ ng}}{\text{L}}$$

Since the critical effects identified for the ADI for PFOS and PFOA were both a developmental endpoint, DHS issued a combined health advisory of 20 ng/L for PFOS, PFOA, and their chemical precursors (FOSA, NETFOSE, NETFOSA, NETFOSAA).

In November 2020, DHS issued a letter to DNR indicating that an appropriate health-protective approach to assess the cumulative impact of PFAS would be to utilize a hazard index approach when assessing PFAS test results.<sup>3</sup> This approach was chosen because all PFAS for which DHS has developed health advisories have reproductive and/or developmental health effects, suggesting a shared endpoint. Additionally, PFAS typically occur as a mixture in groundwater; exposures do not happen to one chemical alone. Recent EPA documentation has indicated support for utilizing a hazard index approach to assess PFAS mixtures.<sup>4</sup>

This approach, outlined in equation 3, compares the observed concentrations within a sample to the health advisory for each PFAS identified, then sums those quotients. If the total sum of the quotients meets or exceeds 1.0, then the hazard index is considered exceeded, and a potential health risk exists. Note that this approach includes a comparison to the combined advisory of 20 ppt for PFOS, PFOA, and their precursors.

$$\text{Eq. 3: Hazard Index (HI)} = \sum_{i=1}^n \frac{\text{Observed Concentration}_i}{\text{HA}_i}$$

If an individual health advisory is exceeded or the hazard index meets or exceeds a threshold of 1.0 (i.e.,  $\text{HI} \geq 1.0$ ), then DHS considers there to be a potential risk to health, and issues health recommendations.

## Conclusions and Limitations

January 2022 PFAS results for the two entry points into Wausau's municipal distribution system indicated exceedances of the health advisory for the combined total of PFOS, PFOA, and their precursors (EP200 = 41.64 ppt, EP300 = 41.5 ppt). Similar exceedances were seen in each of the six individual wells that contribute to the entry point, both in the 2019 and 2022 sampling, with hazard indices ranging from 1.0 to 2.5 (see Appendix Table 1).

These exceedances of DHS health advisories indicate a potential health hazard for residents that continue to use unfiltered water from the Wausau Waterworks as their sole source of drinking

<sup>3</sup> <https://dnr.wisconsin.gov/sites/default/files/topic/PFAS/peag/DHSHazIndexLetter20201117.pdf>

<sup>4</sup> [https://sab.epa.gov/ords/sab/f?p=100:18:16490947993::RP,18:P18\\_ID:2601](https://sab.epa.gov/ords/sab/f?p=100:18:16490947993::RP,18:P18_ID:2601)

water. PFAS levels in the body have been found to decrease once exposure is interrupted, which decreases individuals' risk of adverse health effects.

It is important to consider the limitations of these conclusions. Scientists are still learning about the health effects that different PFAS can have on the body. Different PFAS may impact the body in similar ways at different levels, which is why the hazard index methodology to assess cumulative impacts is health-protective. Additionally, due to differences among people, different people may experience health effects at different levels. DHS' health advisories are intended to be protective of the most vulnerable populations, even considering this variability.

## Recommendations

DHS recommends that Wausau residents on the municipal drinking water system take action to use an alternative water source for drinking and preparing foods which take up a lot of water (e.g., rice or oatmeal), have water as a main ingredient (e.g., soups, coffee, or tea), and preparing infant formula. Reducing or replacing this water with an alternative source will interrupt the exposure and reduce any potential health risks. Alternate sources of drinking water include:

- Bottled water that has been purified or filtered.
- Filtered water from a pitcher, sink, or whole-house filter system with a certified filter technology. A granular activated carbon (GAC) filter that meets ANSI/NSF Standard 53 or a reverse osmosis (RO) filter with an included GAC component can filter out PFAS. These numbers will be printed on the filter and/or packaging. More information about filtering out PFAS from drinking water is available here: [Reducing PFAS in Your Drinking Water](#).
- Other sources of water that have been tested for PFAS and do not have levels above health advisories.

It is important to note that the primary method of exposure is through ingesting contaminated water. PFAS do not easily cross through the skin, so it does not pose a health risk to continue to use the water for washing vegetables or dishes, showering, brushing teeth, doing laundry, general household cleaning, or filling a swimming pool.

Additional health information about the health effects of PFAS can be found at the DHS' PFAS website (<https://www.dhs.wisconsin.gov/chemical/pfas.htm>) or the Agency for Toxic Substances and Disease Registry's (ATSDR) PFAS website (<https://www.atsdr.cdc.gov/pfas/index.html>).

Please contact me at 608.867.4448 or [nathan.kloczko@dhs.wisconsin.gov](mailto:nathan.kloczko@dhs.wisconsin.gov) if you have any questions about the health recommendations made in this letter.

Sincerely,



Nathan Kloczko, MPH  
Site Evaluation Program Coordinator

Bureau of Environmental and Occupational Health

Cc: Laura Scudiere, Health Officer, Marathon County  
Kyle Burton, DNR Field Operations Director, Bureau of Drinking Water and  
Groundwater

	EP200			EP300		Well #11		Well #10		Well #9		Well #7		Well #6		Well #3	
	PFAS Compound	Recommend ed Standard (ppt) <sup>a</sup>	Lab LOD <sup>b</sup>	Lab Results		Lab Results		Lab Results		Lab Results		Lab Results		Lab Results		Lab Results	
				(ppt)	HQ <sup>c</sup>	(ppt)	HQ	(ppt)	HQ	(ppt)	HQ	(ppt)	HQ	(ppt)	HQ	(ppt)	HQ
5/17/2019	PFBA	10000	<0.96			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
	PFHxA	150000	<0.94			3.77	2.51E-05	4.64	3.09E-05	2.4	0.000016	3.39	2.26E-05	3.33	2.22E-05	3.02	2.01E-05
	PFNA	30	<0.93				0		0		0		0		0		0
	PFDA	300	<1.4				0		0		0		0		0	0.9	0.003
	PFUnA	3000	<1.8				0		0		0		0		0		0
	PFDoA	500	<1.7				0		0		0		0		0		0
	PFTeA	10000	<1.2			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
	PFBS	450000	<0.63				0		0		0		0		0		0
	PFHxS	40	<0.93				0		0	3.98	0.0995		0	3.4	0.085		0
	HFPO-DA (GenX)	300	<0.72			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
	DONA	3000	<0.73			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
	PFOS	20	<1.1			8.65		12.6		8.65		14.3		14.1		15.1	
	PFOA		<0.75			14.4		14.1		9.36		11.5		13.4		9.82	
	FOSA		<0.97				23.1	1.1525	26.7	1.335	18	0.9005	25.8	1.29	27.5	1.375	24.9
	NetFOSE		<1.0														
	NetFOSA		<1.0														
	NetFOSAA		<1.7														
	Hazard index						1.2		1.3		1.0		1.3		1.5		1.2
1/10/2022	PFBA	10000	<0.96	2.94	0.000294	2.86	0.000286	3.14	0.000314	2.95	0.000295	2.03	0.000203	3.22	0.000322	2.87	0.000287
	PFHxA	150000	<0.94	6.03	4.02E-05	4.12	2.75E-05	7.1	4.73E-05	6.11	4.07E-05	1.89	1.26E-05	4.89	3.26E-05	4.63	3.09E-05
	PFNA	30	<0.93		0		0		0		0		0		0		0
	PFDA	300	<1.4		0		0		0		0		0		0		0
	PFUnA	3000	<1.8		0		0		0		0		0		0		0
	PFDoA	500	<1.7		0		0		0	1.7	0.0034		0		0		0
	PFTeA	10000	<1.2		0		0		0		0		0		0		0
	PFBS	450000	<0.63	1.08	2.4E-06	2.37	5.27E-06		0	5.04	1.12E-05	0.86	1.91E-06	2.24	4.98E-06	2.88	6.4E-06
	PFHxS	40	<0.93	1.03	0.02575	1.7	0.0425		0	3.85	0.09625		0	3.37	0.08425	1.44	0.036
	HFPO-DA (GenX)	300	<0.72		0		0		0		0		0		0		0
	DONA	3000	<0.73		0		0		0		0		0		0		0
	PFOS	20	<1.1	9.24		12		8.73		8.7		7.67		11.7		13.2	
	PFOA		<0.75	21.7		16.8		23		20.6		16.1		19.1		22.1	
	FOSA		<0.97	2.49	41.6	2.43	41.5	1.88	42.3	1.58	38.7	2.14	42.2	2.87	49	3.87	39.8
	NetFOSE		<1.0														
	NetFOSA		<1.0	1.19		1.67		1.77		7.78		2.03		1.75		3.07	
	NetFOSAA		<1.7	7.02		8.6		6.88				7.25		9.06			
	Hazard index				2.1		2.1		2.1		1.9		1.3		2.1		2.0

<sup>a</sup> ppt = parts per trillion

<sup>b</sup> LOD = limit of detection

<sup>c</sup> HQ = hazard quotient

**Table 1:** PFAS sample results from 2019 and 2022. HI exceedances are shown with orange highlight, individual advisory level exceedances are shown with yellow highlight.

Pathway Name	Elements of an Exposure Pathway					Time Frame	Pathway Conclusion
	Contaminant Source	Environmental Fate and Transport	Exposure Point	Exposure Route	Potentially Exposed Population		
Wausau Municipal Water Supply	Groundwater	Water	Municipal Well Water	Ingestion	Residents on municipal system	Past	<b>Completed</b> Potential Eliminated
						Current	<b>Completed</b> Potential Eliminated
						Future	Completed <b>Potential</b> Eliminated

**Table 2:** Documenting exposure pathways in the Wausau municipal water supply