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MEMORANDUM

TO: Town of Kremmling

FROM: Element Engineering

DATE: June 17, 2024

SUBJECT: Drinking Water System - PFAS Sampling Analysis

BACKGROUND

Per- and polyfluoroalkyl substances, known together as PFAS, are a large group of man-made organic chemicals numbering in the thousands. PFAS has been used in a wide variety of industrial and consumer products since the 1940s due to their temperature, grease, and water-resistant chemical properties. These products include non-stick cookware, water-proof fabrics, firefighting foams, as well as many other products. PFAS chemicals are environmentally persistent because they do not naturally biodegrade and accumulate within organic materials. PFAS are present at low levels in a variety of food products, water, air, soils, and even the bloodstream of humans and animals across the globe.

The widespread use of PFAS over the years has caused contamination of drinking water supplies in several locations across the country and world, especially those with groundwater. The presence of PFAS in drinking water is a growing concern because they pose potential adverse health effects even at very low levels. Chronic exposure to PFAS has been associated with numerous health risks such as liver damage, immune system effects, increased risk of cancer, and developmental issues in infants and children.

PFAS chemicals that are of a growing concern in the United States due to their adverse health effects include:

- Perfluorooctanesulfonic Acid (PFOS)
- Perfluorooctanoic Acid (PFOA)
- Perfluorononanoic Acid (PFNA)
- Perfluorohexanesulfonic Acid (PFHxS)
- Perfluorobutanesulfonic Acid (PFBS)
- Hexafluoropropylene oxide dimer acid (HFPO-DA) and ammonium salt (Gen X Chemicals)

Historically, PFOS and PFOA are the two most widely used PFAS chemicals and have been studied extensively. The use of PFOS and PFOA in the US has been replaced with other PFAS chemicals in recent years. Ironically Gen X chemicals are considered a replacement for PFOA, and PFBS are considered a replacement for PFOS.

REGULATORY ACTIONS

As of April 2024, the Environmental Protection Agency (EPA) has released their final PFAS National Primary Drinking Water Regulation (NPDWR). The PFAS NPDWR includes monitoring requirements for all public water systems, public notifications, and legally enforceable Maximum Contaminant Levels (MCLs) for six (6) PFAS compounds in drinking water: PFOS, PFOA, PFNA PFHxS, PFBS, and HFPO-DA (Gen X).

Within the next three (3) years (by 2027), all public water systems will need to have completed initial monitoring for PFAS and begin providing the public with information on the levels in their drinking water.

Following the initial monitoring, ongoing compliance monitoring for PFAS compounds will be required. Public water systems will then have the next five (5) years (by 2029), to implement solutions to reduce these PFAS if monitoring shows the drinking water levels exceed the MCLs. After 2029, a public water system will be in violation of the NPDWR if PFAS MCLs are exceeded in drinking water.

The PFAS NPDWR has set individual MCLs for five (5) individual PFAS compounds (PFOS, PFOA, PFNA, PFHxS and HFPO-DO) due to their likely carcinogenicity. The NPDWR has also set a MCL with a Hazard Index (HI) approach for any mixture containing one or more of PFHxS, PFNA, PFBS, and/or HFPO-DO chemicals. To determine the HI, the level for each of these four (4) PFAS chemicals found in drinking water are divided by its associated individual MCL, and the fractions are added together to calculate the HI.

The EPA's final NPDWR MCLs for PFAS compounds are summarized below in Table 1.

Table 1: EPA PFAS NPDWR MCL Summary

PFAS Compound	MCL (ppt)	
PFOA	4	
PFOS	4	
PFNA	10	HI = 1.0 (unitless)
PFHxS	10	
PFBS	2,000	
HFPO-DA (Gen X Chemicals)	10	
ppt = parts per tillion, also expressed as ng/L Hazard Index (HI) a tool to evaluate potential health risks from exposure		

WATER QUALITY ANALYSIS

The Town of Kremmling completed PFAS sampling at their water treatment plant (WTP) in December 2022, and at both surface water sources (Sheep Creek and the Colorado River) in July 2023. The results of PFAS sampling with comparisons to their future enforceable MCLs are summarized below in Table 2.

Table 2: PFAS Sampling Summary – Town of Kremmling Water System

Sample Location	PFOA (ng/L)	PFOS (ng/L)	PFBS (ng/L)	PFNA (ng/L)	HFPO / Gen X (ng/L)	PFHxS (ng/L)	HI
MCL / MCLG	**4**	**4**	**2000**	**10**	**10**	**9**	
Water Treatment Plant (Entry Point)	**ND**	**ND**	ND	ND	ND	ND	N/A
Colorado River	**ND**	**ND**	0.42	ND	ND	ND	0.00
Sheep Creek	**ND**	**ND**	ND	ND	ND	ND	N/A

As shown in Table 2, only the Colorado River sampling set detected the presence of a future regulated PFAS compound – PFBS. However, the level of PFBS found in the Colorado River is far lower than the respective MCL and has a negligible effect on the HI calculation.

FUTURE WATER TREATMENT PLANT

The design of the town's future water treatment plant (WTP) has accommodated space for a future treatment process, granular activated carbon (GAC) filters, to be installed for the purpose of PFAS removal and compliance with the PFAS NPDWR. After receiving and reviewing the PFAS sampling data from 2022 and 2023, these future treatment improvements do not appear to be necessary for the town to remain in compliance with the NPDWR. The Town of Kremmling will still be required to collect PFAS sampling data each year until 2027 but may become eligible for reduced monitoring assuming the PFAS levels remain non-detectable or below ½ of the enforceable MCL. Reduced monitoring for the PFAS NPDWR includes sampling for PFAS every three years. The town is also recommended to continue utilizing Sheep Creek as the primary water supply, as the Colorado River is more susceptible to PFAS contamination due to a higher number of potential sources upstream prior to their intake.

Town of Kremmling Water System
PFAS Sampling Results Raw Data

PFAS Compound	Units	RL[1]	MDL[2]	WTP	Sheep Creek	CO River
Sampling Date		--	--	12/5/2022	7/31/2023	7/31/2023
PFOA	ng/L	*1.8*	*0.46*	ND	ND	ND
PFOS	ng/L	*1.8*	*0.46*	ND	ND	ND
PFBS	ng/L	*1.8*	*0.46*	ND	ND	0.42
GenX	ng/L	*1.8*	*0.46*	ND	ND	ND
PFNA	ng/L	*1.8*	*0.46*	ND	ND	ND
PFHxS	ng/L	*1.8*	*0.46*	ND	ND	ND
PFBA	ng/L	*4.6*	*2.2*	--	ND	4.4
PFPeA	ng/L	*1.8*	*0.45*	--	ND	ND
PFPeS	ng/L	*1.8*	*0.28*	--	ND	ND
PFHxA	ng/L	*1.8*	*0.46*	ND	ND	0.59
PFHxS	ng/L	*1.9*	*0.53*	--	ND	ND
PFTeA	ng/L	*1.8*	*0.46*	ND	ND	ND
PFHpS	ng/L	*1.8*	*0.46*	--	ND	ND
PFHpA	ng/L	*1.9*	*0.23*	--	ND	0.26
PFDA	ng/L	*1.8*	*0.46*	ND	ND	ND
PFDS	ng/L	*1.8*	*0.29*	--	ND	ND
PFUnA	ng/L	*1.8*	*0.46*	--	ND	ND
PFDoA	ng/L	*1.8*	*0.46*	ND	ND	ND
11Cl-PF3OUdS	ng/L	*1.8*	*0.46*	ND	--	--
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ng/L	*1.8*	*0.46*	ND	--	--
9Cl-PF3ONS	ng/L	*1.8*	*0.46*	ND	--	--
Perfluorotridecanoic acid (PFTriA)	ng/L	*1.8*	*0.46*	ND	ND	ND
Perfluoroundecanoic acid (PFUnA)	ng/L	*1.8*	*0.46*	ND	ND	ND
NMeFOSAA	ng/L	*1.8*	*0.46*	ND	ND	ND
NEtFOSAA	ng/L	*1.8*	*0.46*	ND	ND	ND
PFNS	ng/L	*1.8*	*0.34*	--	ND	ND
FOSA	ng/L	*1.8*	*0.9*	--	ND	ND
4:2 FTS	ng/L	*1.8*	*0.22*	--	ND	ND
6:2 FTS	ng/L	*4.6*	*2.3*	--	ND	ND
8:2 FTS	ng/L	*1.8*	*0.22*	--	ND	ND

[1]Reporting Limit (RL) = the practical level of accurate quantitation supported by calibration curve. Levels higher than the RL must be used for determining future PFAS MCL compliance.

[2] Method Detection Limit (ML) = The "best" the lab instrument can detect statistically.