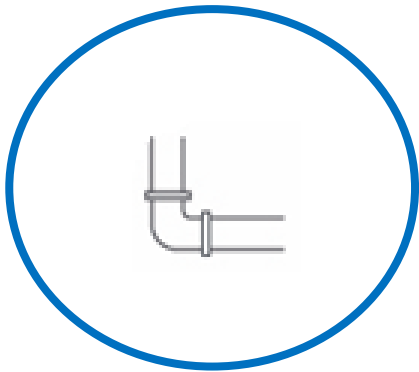




Calgary's Water Utility

2 DWTPs

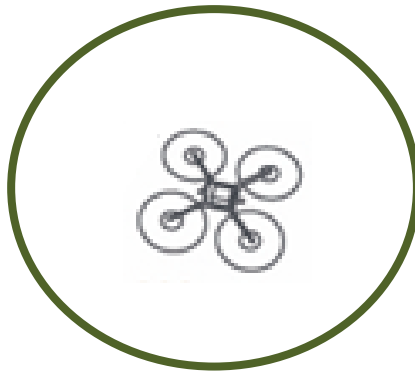
producing ~ 515 ML/day



- Your access to drinking water is **RELIABLE** and **AVAILABLE**.
- You have drinking water now and for **GENERATIONS TO COME**.
- Your drinking water is of high quality and **SAFE TO DRINK**.

3 WWTPs

treating ~ 430 ML/day



- You can rely on us to take care of your wastewater and **PROTECT the HEALTH OF THE RIVER**.

>400 outfalls

discharging stormwater

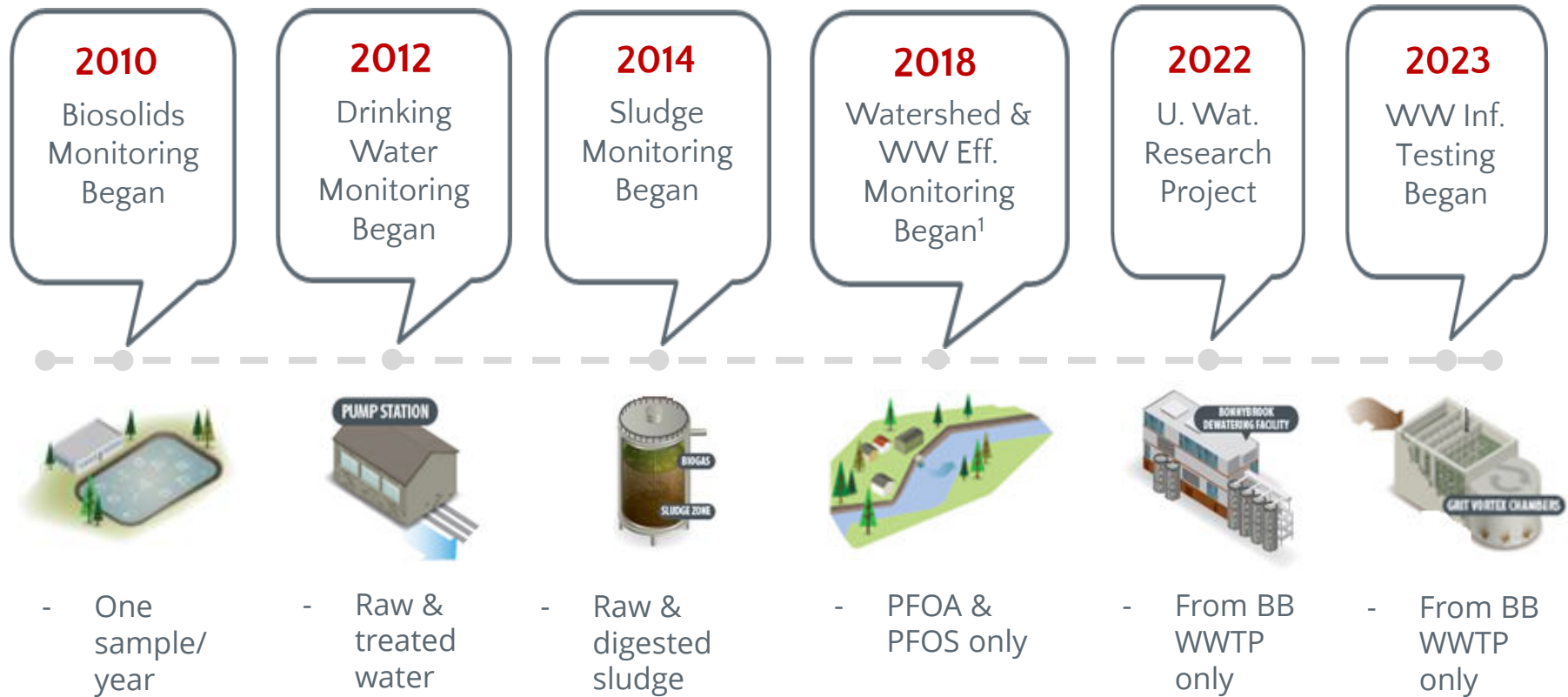


- You can count on us to manage stormwater to **PROTECT PUBLIC SAFETY** and **REDUCE DAMAGE** to property.
- You can **TRUST** we will work with the community and partners to ensure our **WATERSHEDS ARE HEALTHY**.





PFAS Monitoring Timeline



Increasing # PFAS compounds tested & testing frequency over time

1. Arlos, M.J., Arnold, V.I., et al. 2023. *Wat. Res.* 244: 120454. <https://doi.org/10.1016/j.watres.2023.120454>.



Drinking Water Treatment

- Conventional processes that are not effective for removing PFAS
 - Source water protection is key

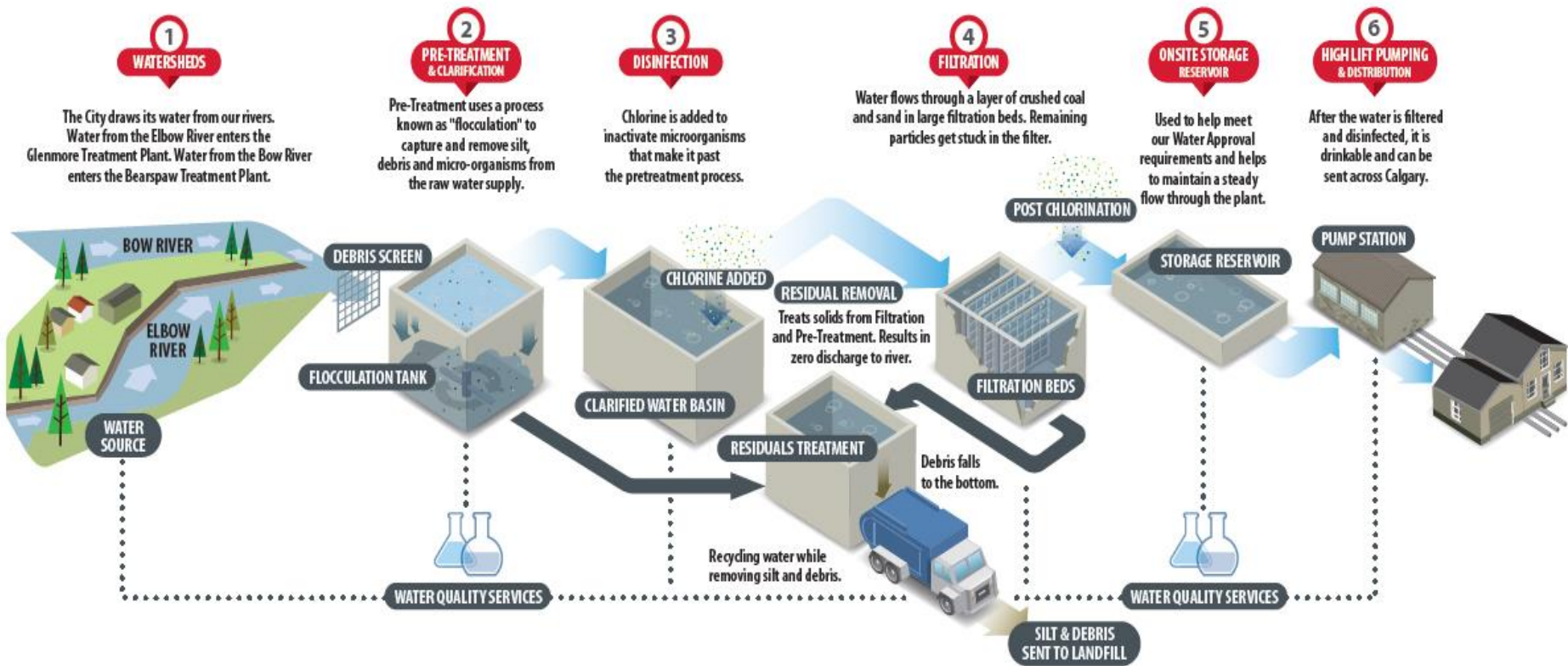
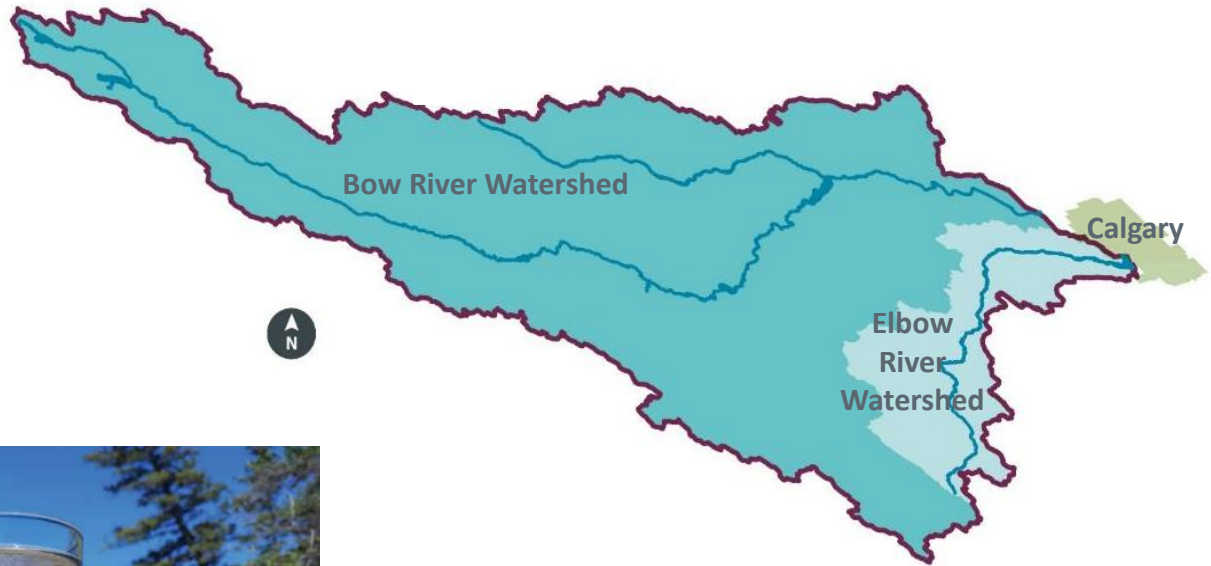


Figure: City of Calgary.



Source Water Protection & AFFF

- Source Water Protection Plan created in 2018, included risk characterization process



→ Is AFFF used in our upstream watershed, how is it used & how much?

Source Water Protection Plan

Protecting our source watershed through proactive collaboration



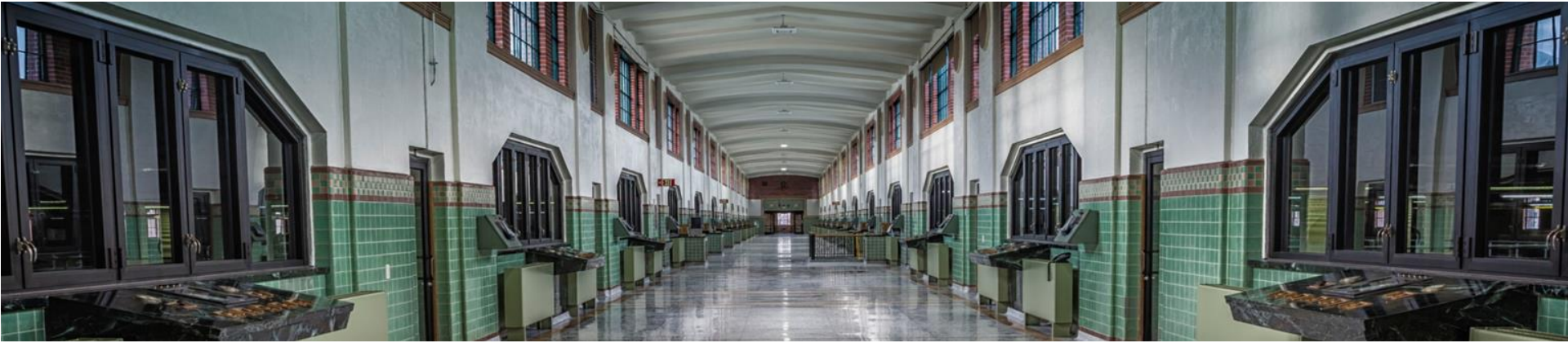
Project Findings & Outcomes

Product Name	Product Description	# of Upstream Fire Agencies Using
Chemguard 3%/6% AR-AFFF C-361	AFFF for Class B and polar solvent fires, wetting agent for Class A fire	1
FireAde Class A	Fluorine-free Class A firefighting foam	3
FireAde [2000] Fire Fighting Foam	AFFF for Class A, B, C, D and K and polar solvent fires	5
Hi-Combat A	Fluorine-free Class A firefighting foam	1
Niagara 1-3 AR-FFFP	AFFF for Class A, B, C, D and K and polar solvent fires	1
Phos-Chek LC95A	Long-term wildland fire retardant	1
Phos-Chek WD881 Class A Foam Concentrate	Fluorine-free Class A firefighting foam	2
Phos-Chek WD881C Class A Foam Concentrate	Fluorine-free Class A firefighting foam	1
T-Storm SFFF Class A	Fluorine-free Class A firefighting foam	1

2 agencies have switched to fluorine-free foams

- Info sharing highlighting mutual benefits
- Budgetary constraints & performance concerns main barriers to switching

Other Potential DW Risks



- **Contamination from skiing activities upstream**

- Has created need for treatment elsewhere:

<https://www.parkcity.org/departments/public-utilities/water-division/water-quality>

- **Contamination during DW distribution**

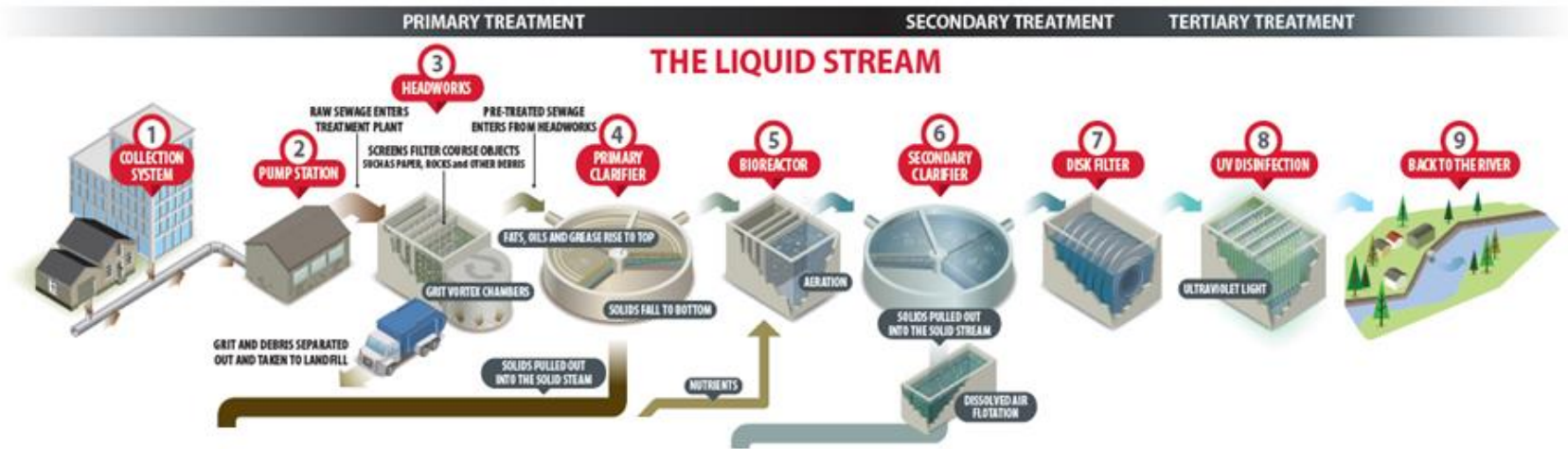
- From materials used in the distribution system and/or premise-plumbing:

<https://link.springer.com/article/10.1007/s11356-022-23085-7#Sec15>

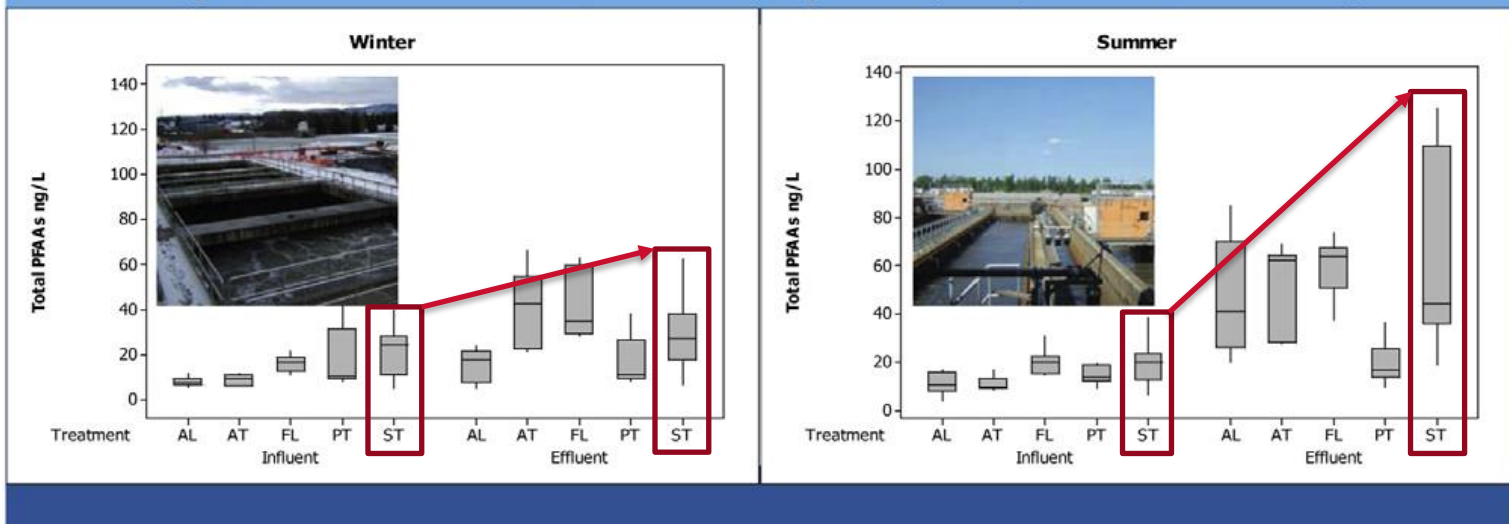


WW Liquid Treatment

- PFAS precursors → PFAAs during biological treatment



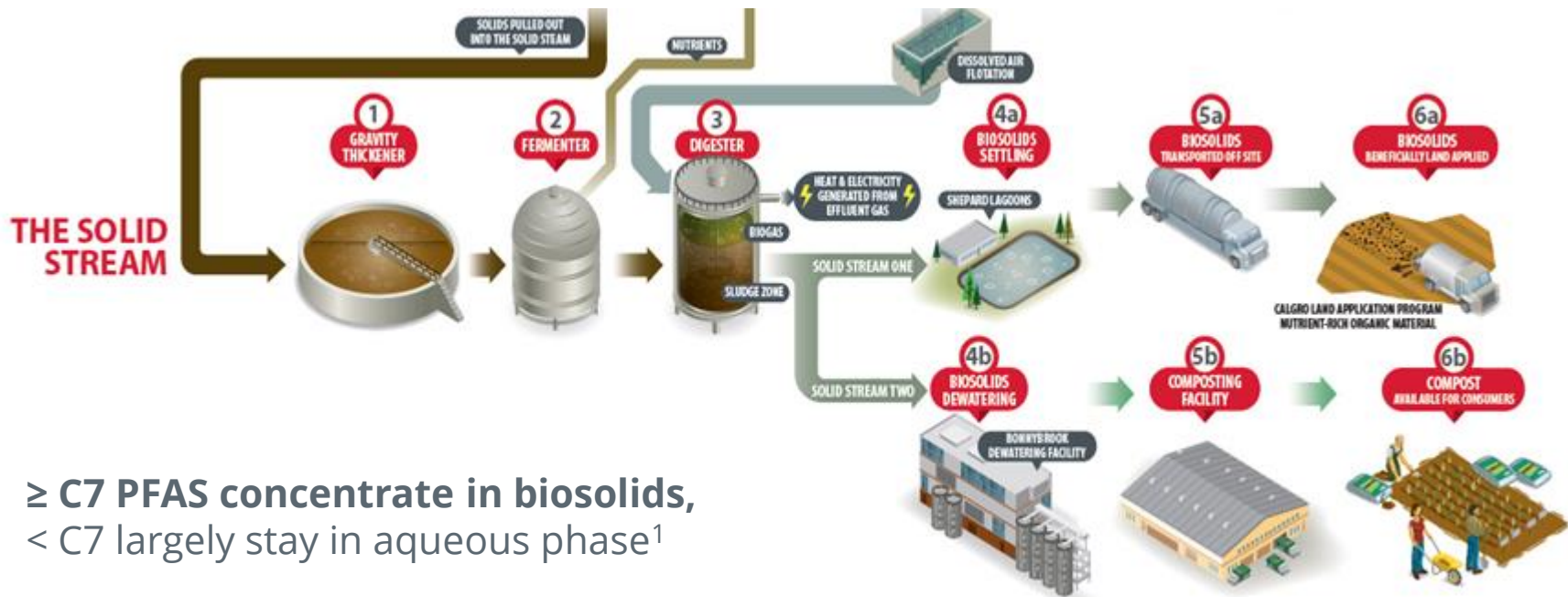
1 AL: aerated lagoon; AT: advanced treatment; FL: facultative lagoon; PT: primary treatment; ST: secondary treatment





WW Solids Treatment & Beneficial Reuse

- Beneficial reuse of biosolids supported by the CCME & regulated by AEPA



- \geq C7 PFAS concentrate in biosolids,
 $<$ C7 largely stay in aqueous phase¹



PFAS in Biosolids

- Land application programs in Europe & Maine cancelled d.t. PFAS
 - Landfilling & incineration → ↑ GHG emissions & costs
- Michigan Dept. of Env't Interim Strategy, PFOS¹:



< 20 ppb

No further actions required.



20-50 ppb

Source investigation recommended.
Increased testing frequency.



50-125 ppb

Notification, testing & source reduction program required.
Reduced application rates.



>125 ppb

Industrially impacted.
Land application prohibited.

ECCC median: <15 ppb
COC median: ~10 ppb

CFIA Proposed Limit: 50 ppb
for biosolids **imported** into Canada

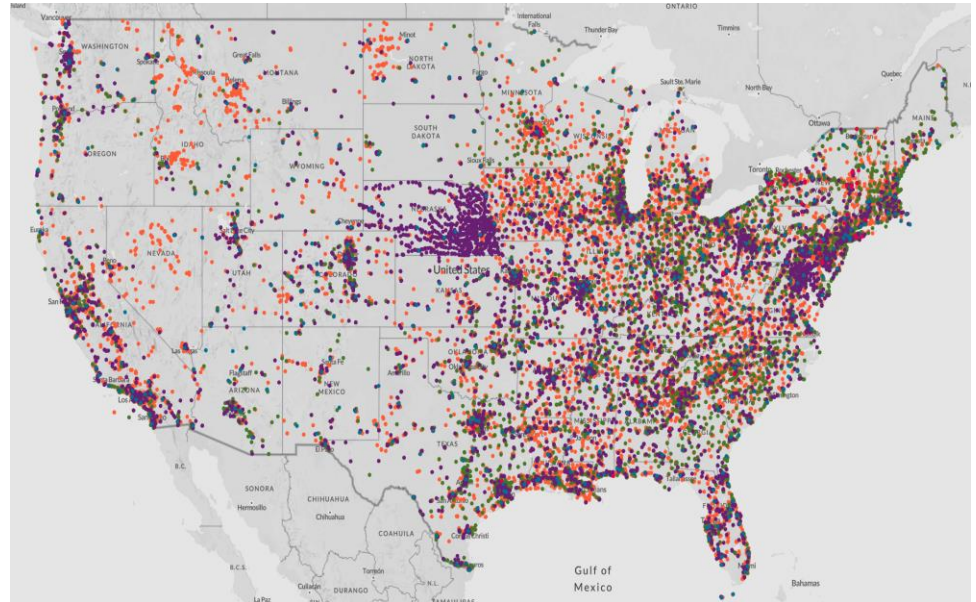


Industrial Sources of PFAS



- Several industries & companies = known emitters of PFAS
 - Lists available from many sources, including EWG:

Industry
Electroplating, plating, polishing, anodizing and coloring
Petroleum bulk stations and terminals
All other miscellaneous chemical product and preparation manufacturing
All other miscellaneous fabricated metal product manufacturing
Commercial printing (except screen and books)
Plastics material and resin manufacturing
Paint and coating manufacturing
Semiconductor and related device manufacturing
Other chemical and allied products merchant wholesalers
Other electronic component manufacturing
Other airport operations
Gold ore mining
Petroleum lubricating oil and grease manufacturing





PFAS in Stormwater



- PFAS detected in stormwater in San Francisco & Saskatoon
 - [PFAS Synthesis and Strategy.pdf \(sfei.org\)](#)
 - [Metals and PFAS in stormwater and surface runoff in a semi-arid Canadian city subject to large variations in temperature among seasons | SpringerLink](#)
- 60% stormwater samples + for microbial indicators of human fecal contamination
 - Stormwater often contaminated with raw sewage @ 0.1-10% ¹
- Looking into opportunities to conduct testing and research



Key Messages

Monitoring



PFAS monitoring has been ongoing **since 2010** and is *critical for assessing potential risk.*

Drinking Water



Source water protection is key to *minimizing PFAS* in drinking water but must also *consider water quality at consumer taps.*

Wastewater



Source control is key to *minimizing PFAS* in WWTP effluents & biosolids, and there are *many known industrial sources.*

Stormwater



Stormwater likely contains PFAS, and we are *looking into opportunities for research & testing.*