



allonnia[™]

Surface Active Foam Fractionation[®]

for PFAS Treatment

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SOLVING MARKET DRIVING ENVIRONMENTAL CHALLENGES



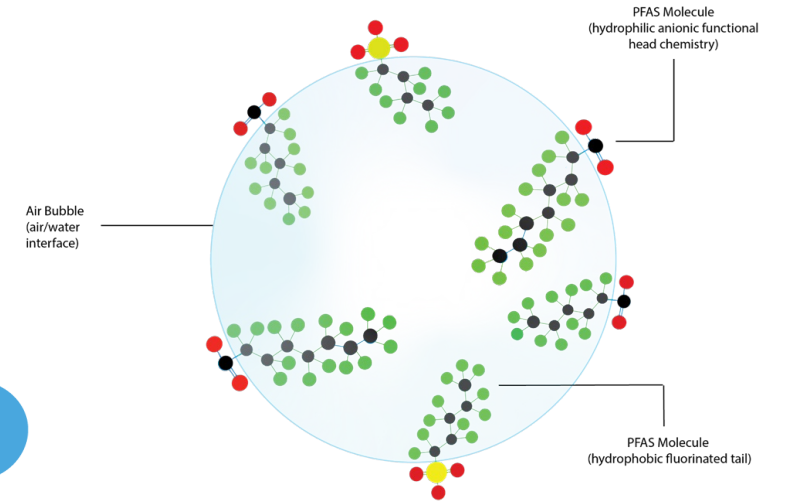
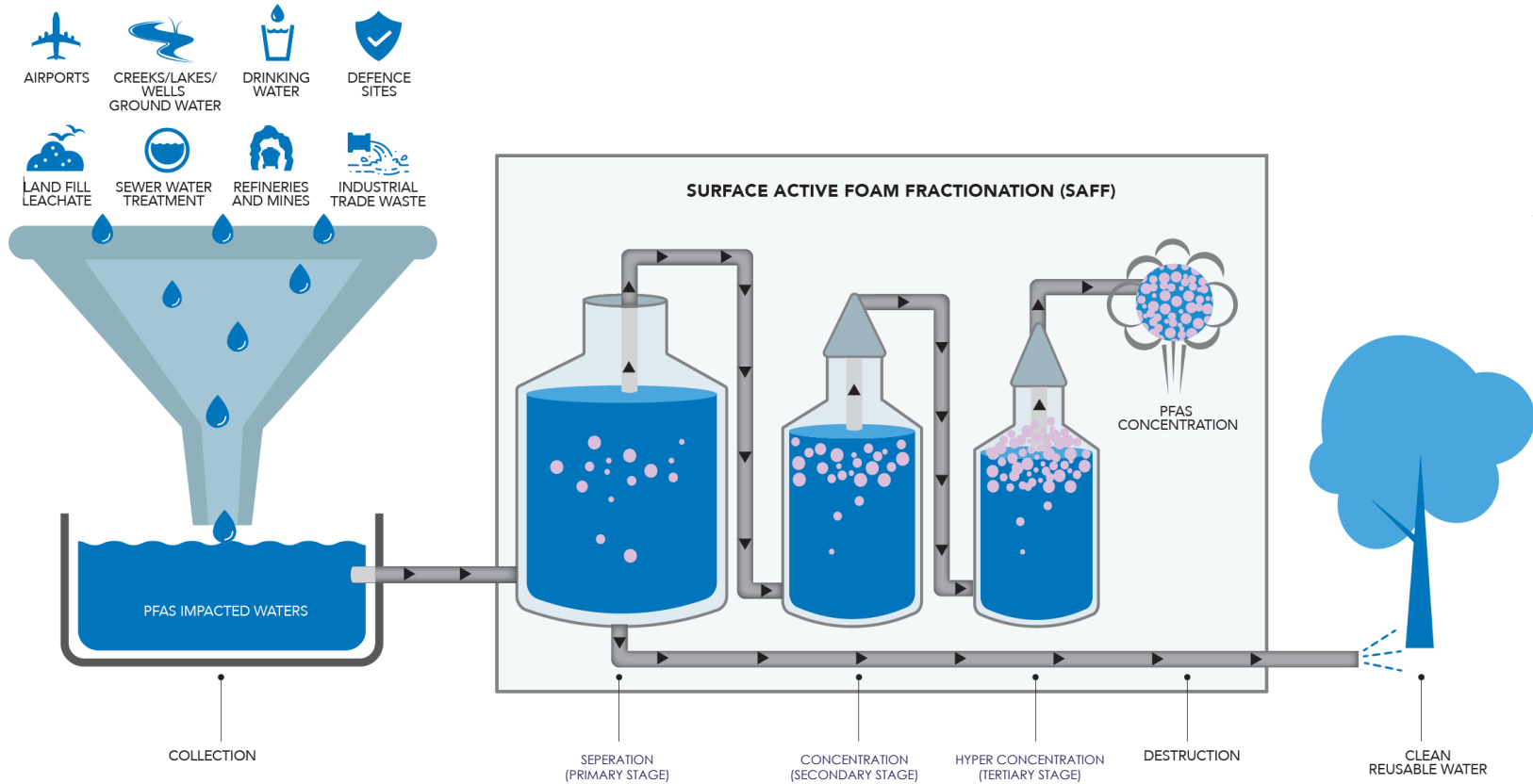
Mining Sustainability

Improvements Through
Biomining, REE
upcycling and Legacy
Asset Remediation

Environmental
Contaminant
Remediation Solutions
(PFAS, 1,4 Dioxane,
Naphthenic Acids)

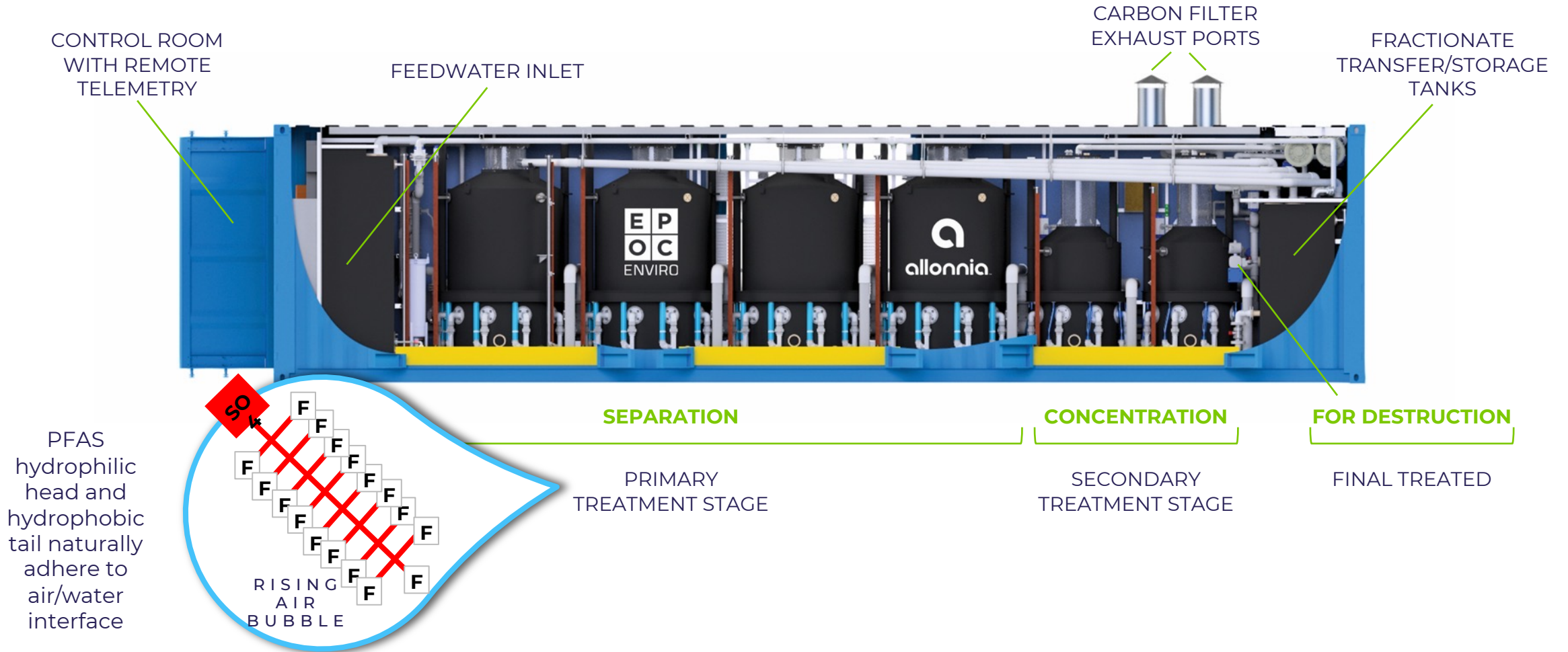
Plastics **Upcycling**
(Nylon, Polyurethane
Foam)

SAFF: The Basic Concept of Foam Fractionation



PFAS hydrophilic head and hydrophobic tail naturally adhere to air/water interface

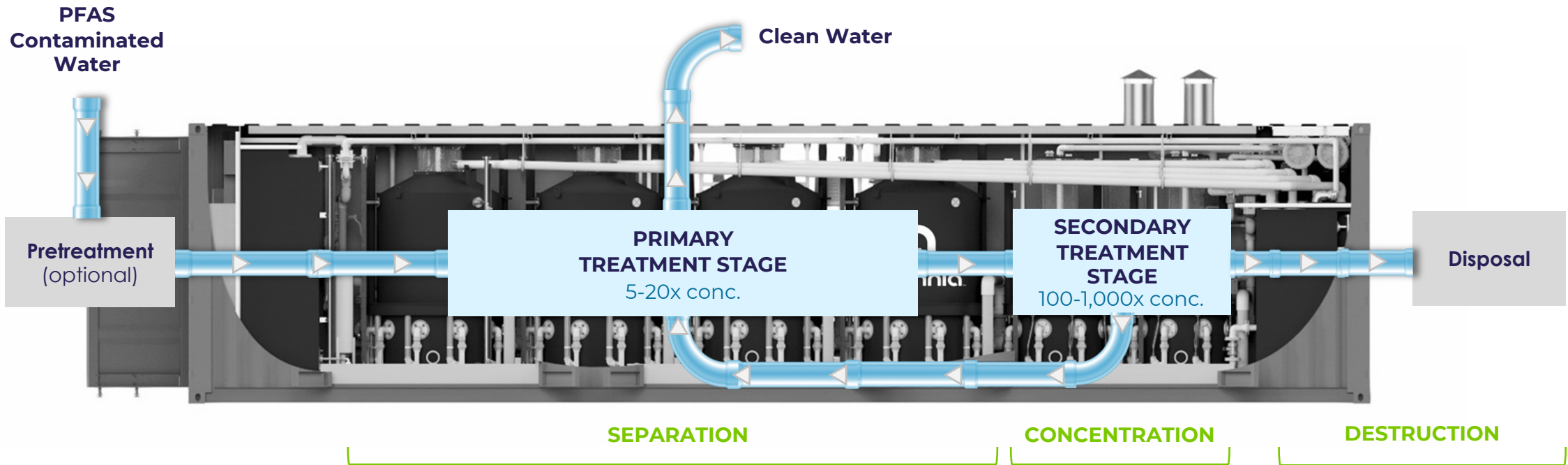
Concept of Foam Fractionation



Concentration Before Destruction: SAFF® Performance

Volume of water before SAFF: 1M gal

Concentrated PFAS solution after SAFF: 100 gal



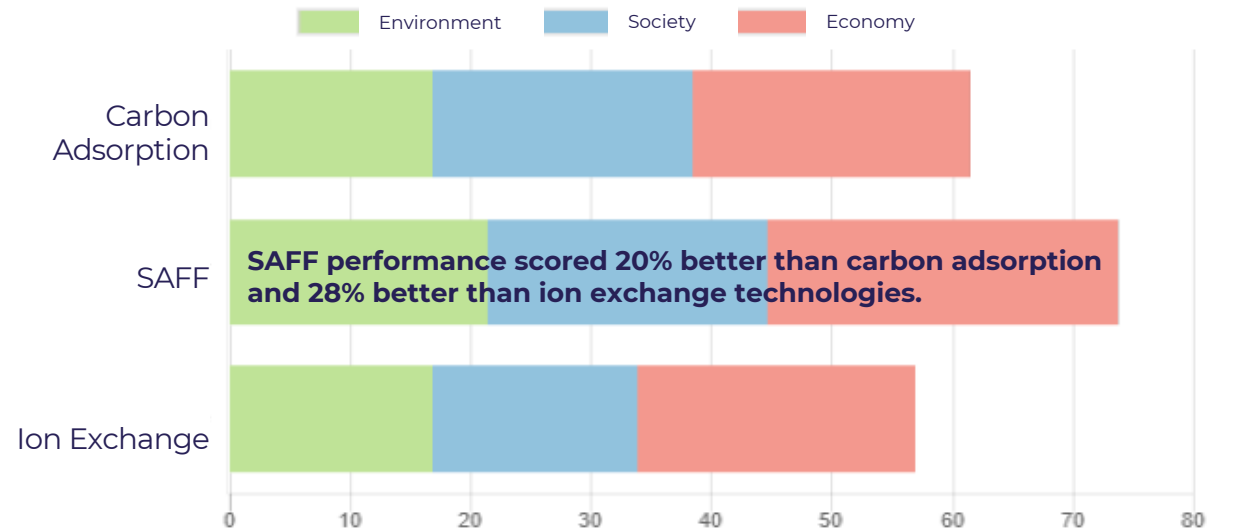
For every 1 million gallons of groundwater into SAFF, you have only 100 gallons of concentrated PFAS for destruction

SAFF vs. 'Conventional' PFAS Separation Treatment

Conventional Treatment ¹	SAFF Treatment
High volume of spent media or waste stream requiring waste management	No spent media or additional waste stream
Significant pretreatment often required to remove competing solutes	No pretreatment required
High concentrations of PFAS can lead to inefficient removal	Removal efficiencies not impacted by high PFAS concentrations
Overall high costs for removing small mass of contamination	Lowest average cost per gallon of PFAS treatment

¹ Carbon Adsorption and Ion Exchange technologies

Sustainability Performance²:



² **SURE by Ramboll**: Independent, 3rd party Sustainability Score incorporating metrics relevant to environment, society and economy.

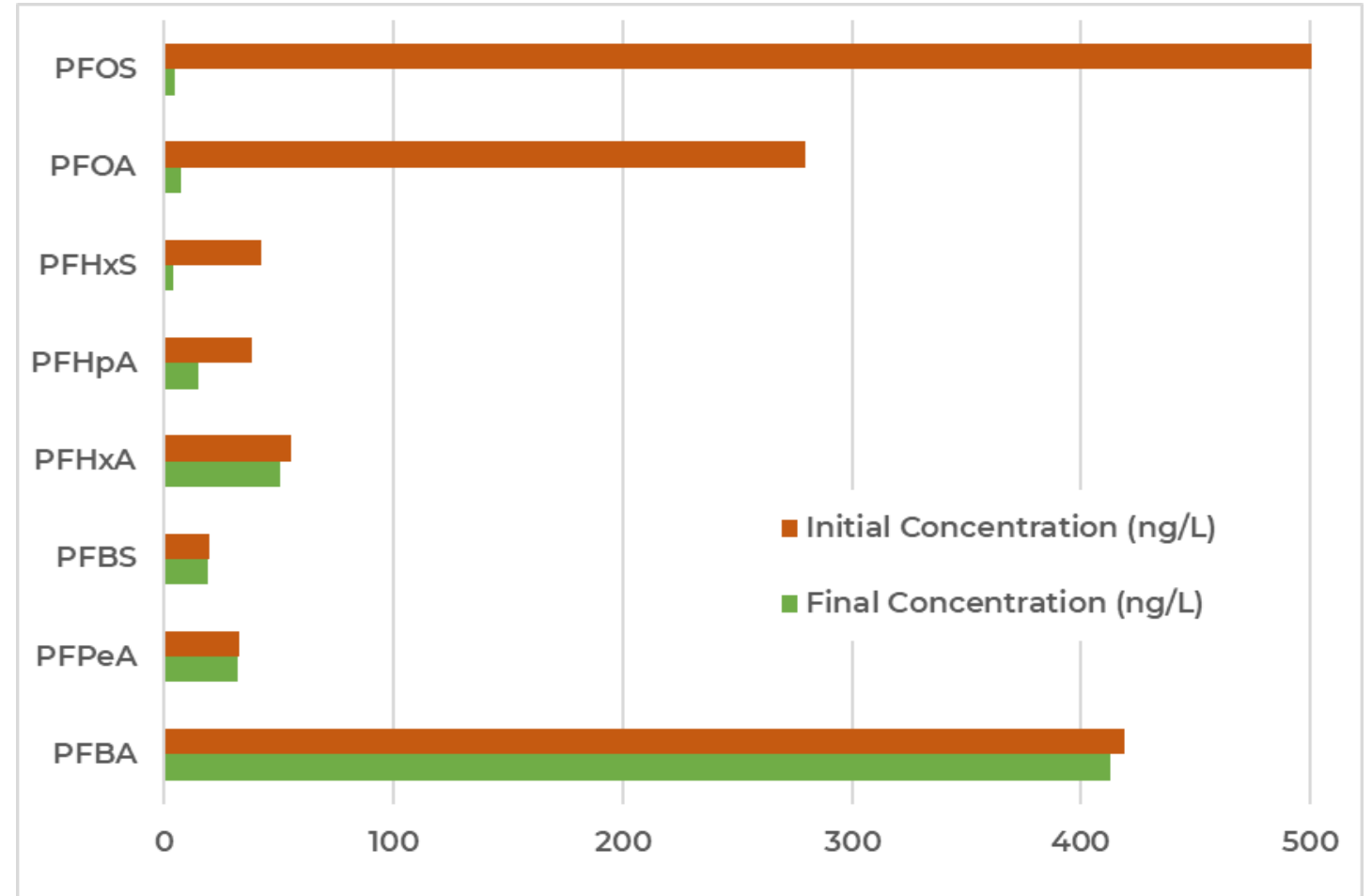
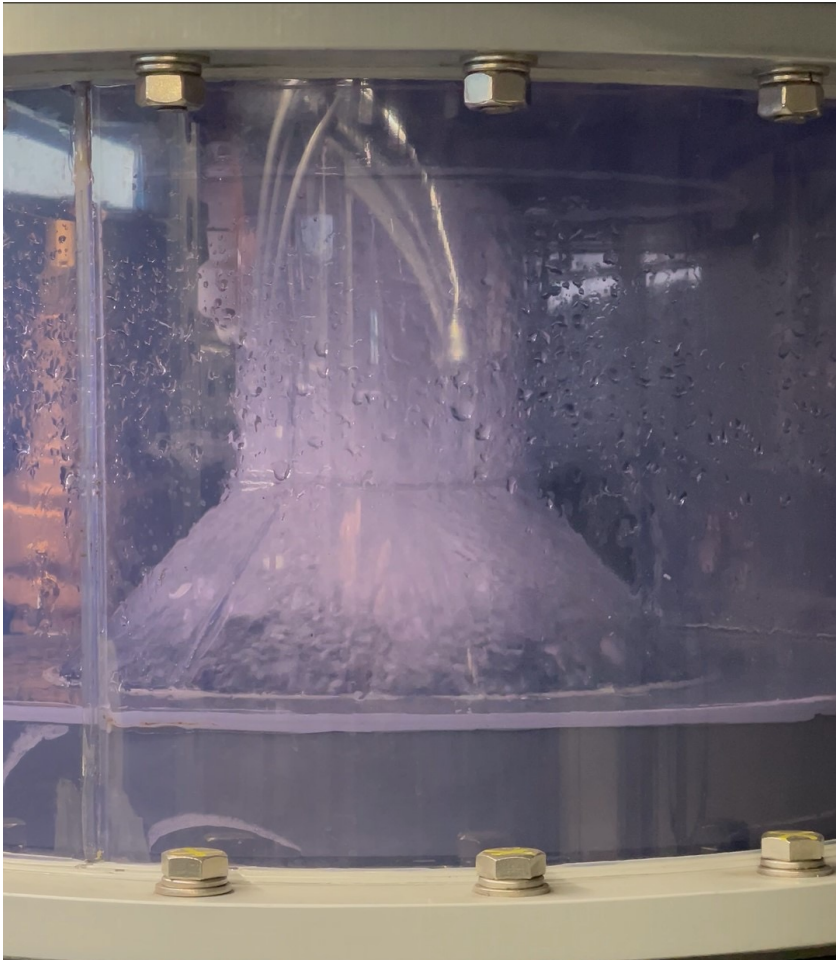
US SAFF[®] Groundwater Treatment with Destruction, Minnesota

- Fall 2022, operating at Lake Elmo, MN operated by Minnesota Pollution Control Agency and EPOC Enviro
- Successful treatment of non-foaming water without surfactant use
- Now treating surface water with similar PFAS, which is foaming
- Concentrate is generated and stored onsite for later destruction

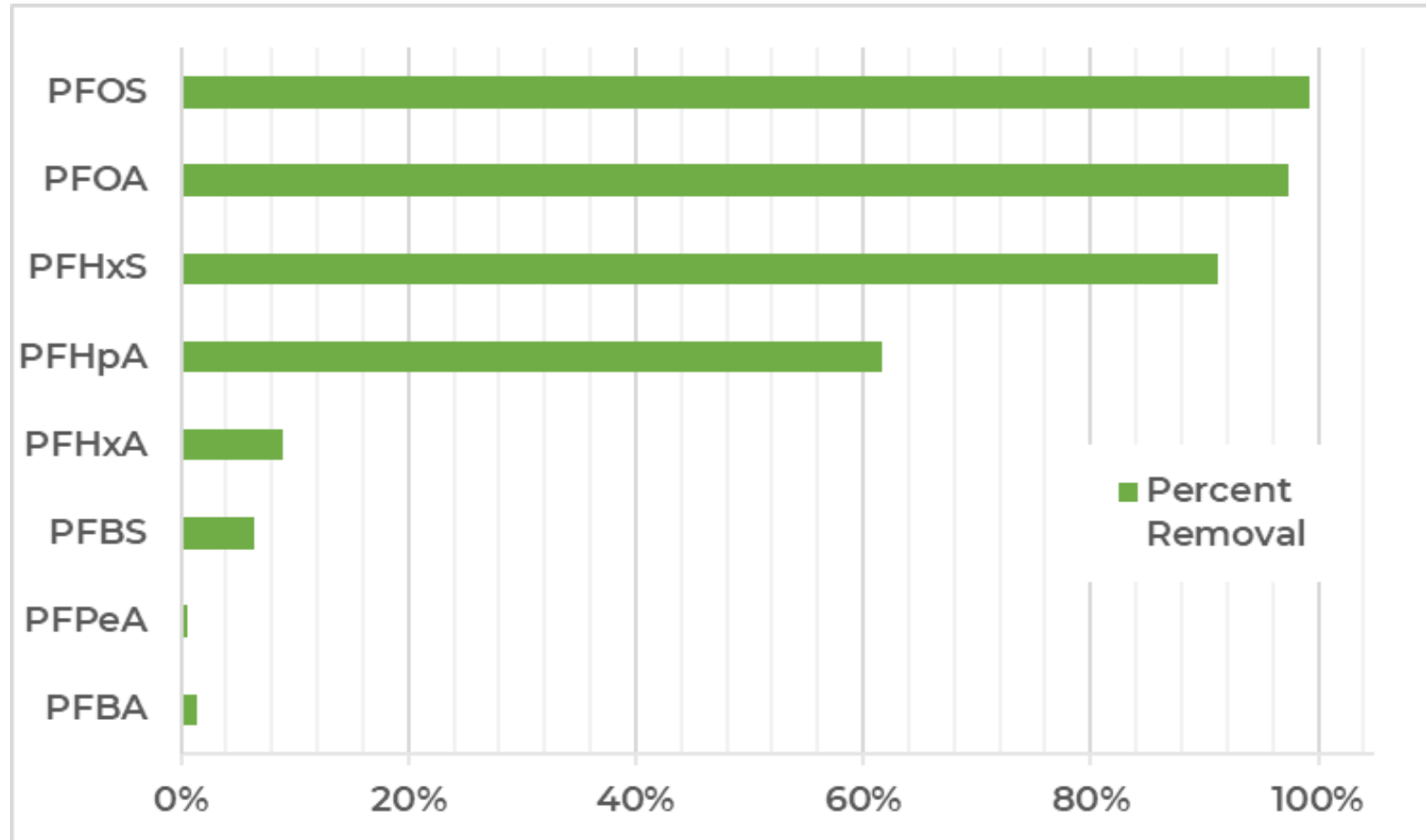




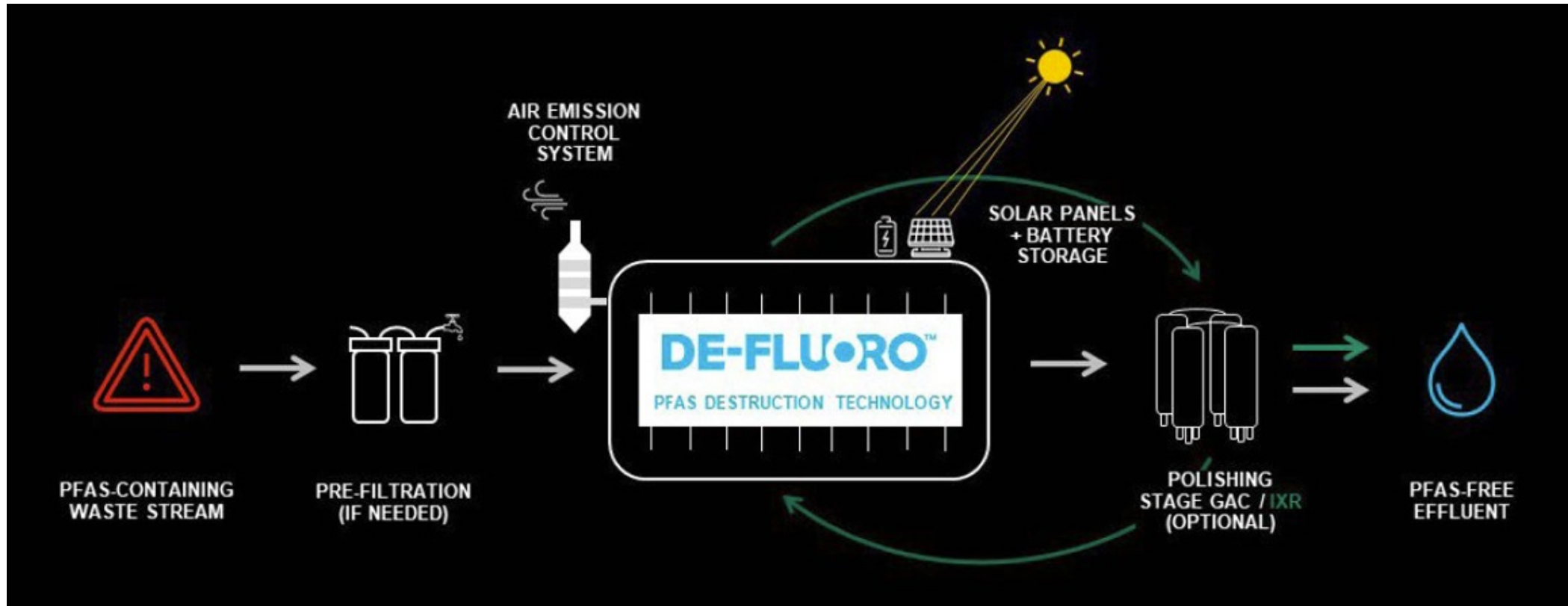
US SAFF[®] Groundwater Treatment with Destruction, Minnesota



US SAFF® Groundwater Treatment with Destruction, Minnesota



SAFF Paired + De-Fluoro = Full-Cycle



Thanks AECOM
& Rosa Gwinn

Installation of SAFF



Delivery



Lift onto trailer



Fence and protection for sledders

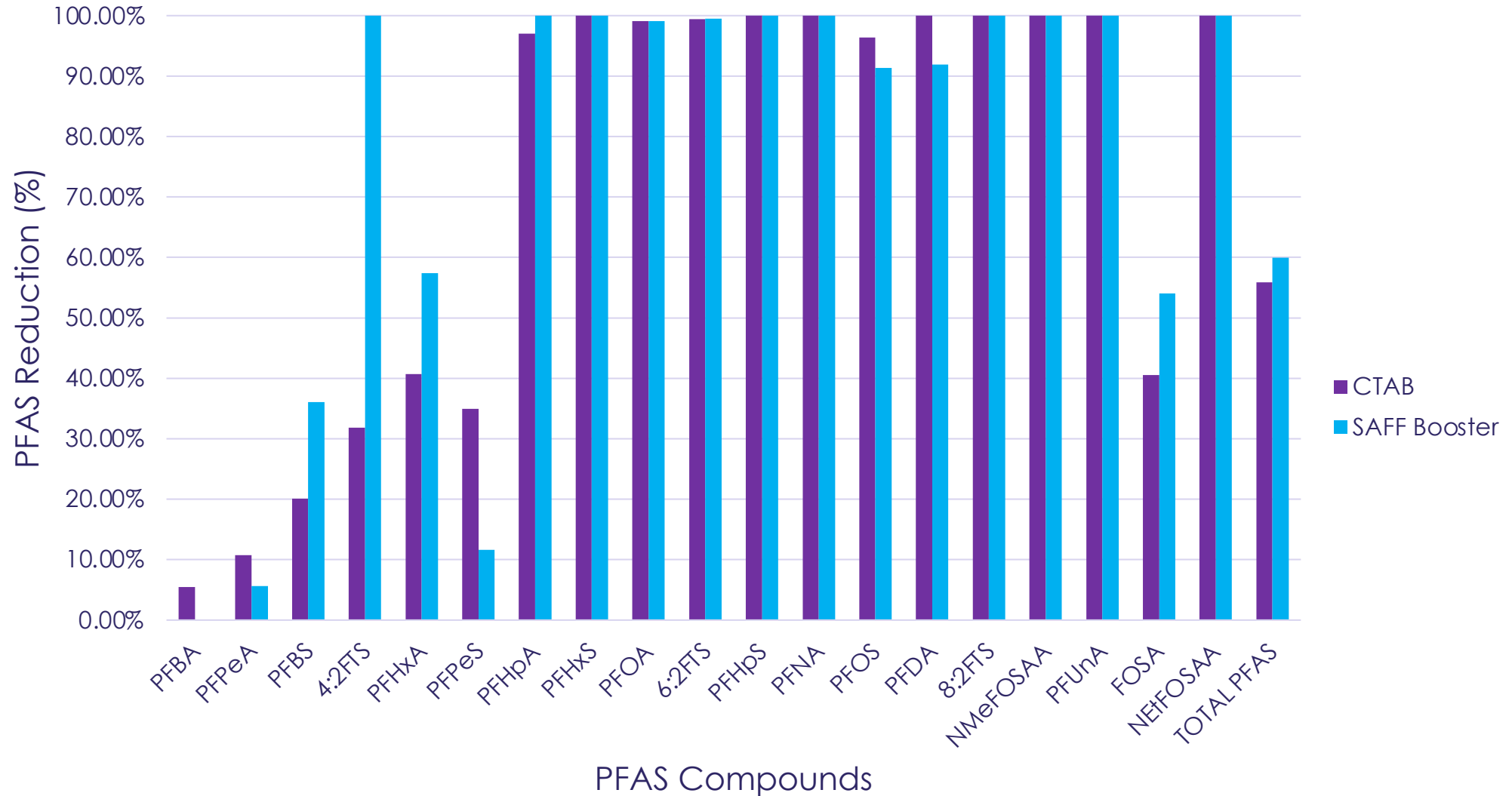


Piping



Generators prior to power drop

Landfill Leachate Short Chain PFAS: Conventional Booster vs. Allonnia Booster



Thank you

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