

Full Circle: PFAS Treatment with Ion Exchange

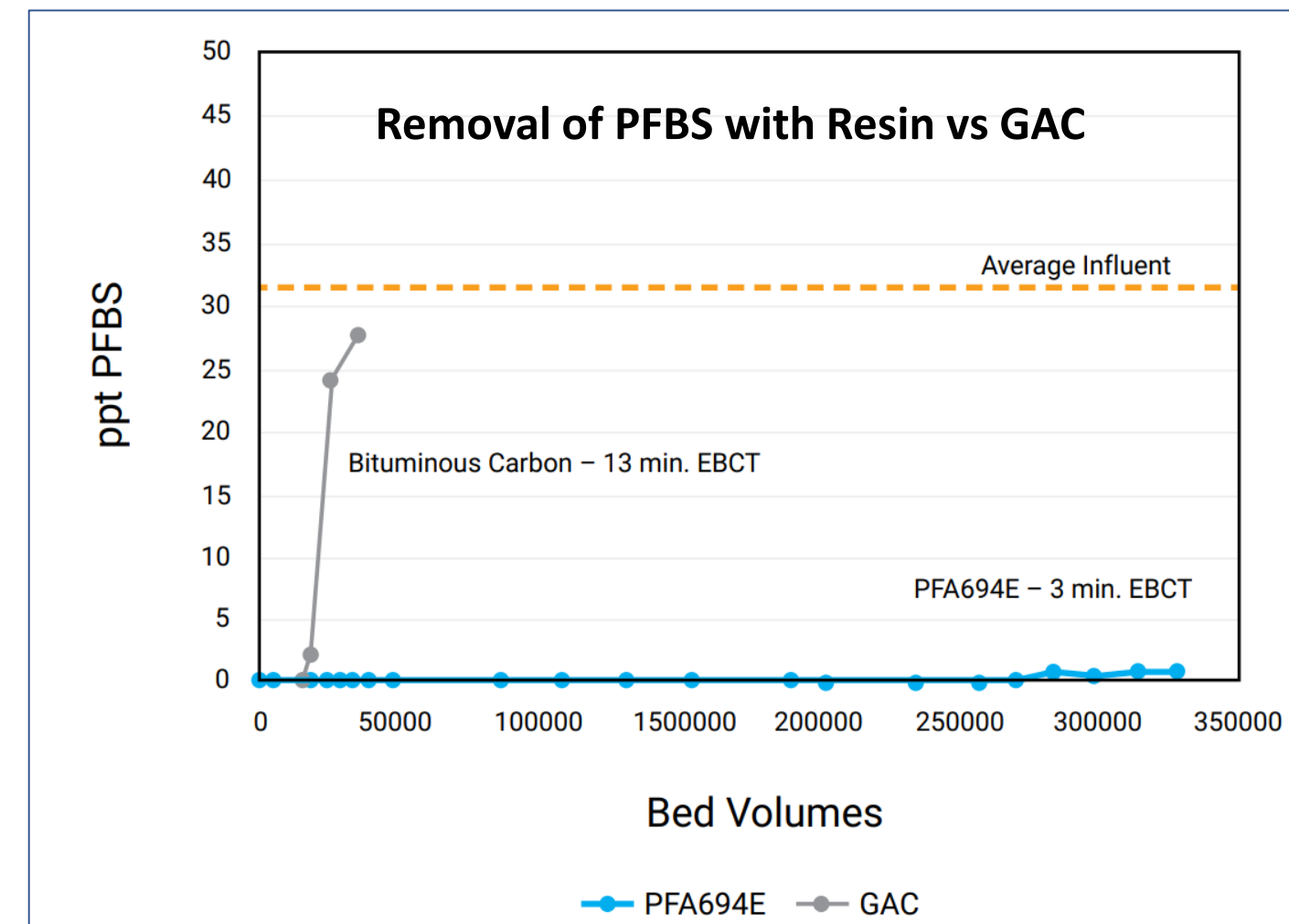
From your Water to Capture and Destruction

Removal Efficiency

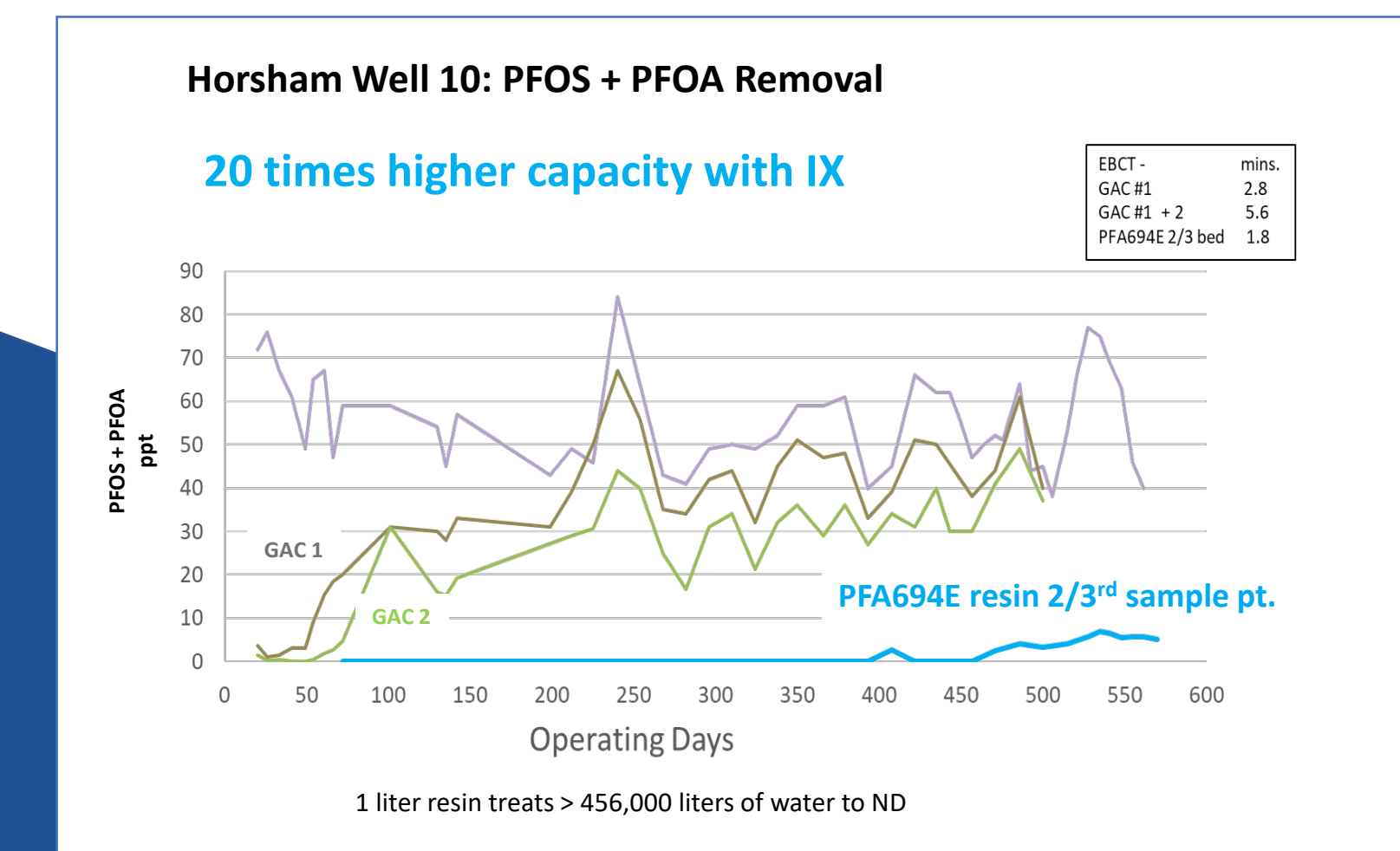
EPA has just set new proposed limits on each of these PFAS:

- PFOA – 4 ppt
- PFOS – 4 ppt
- PFBS – 2000 ppt
- GenX or HFPO-DA – 10 ppt
- PFHxS- 9 ppt
- PFNA – 10 ppt

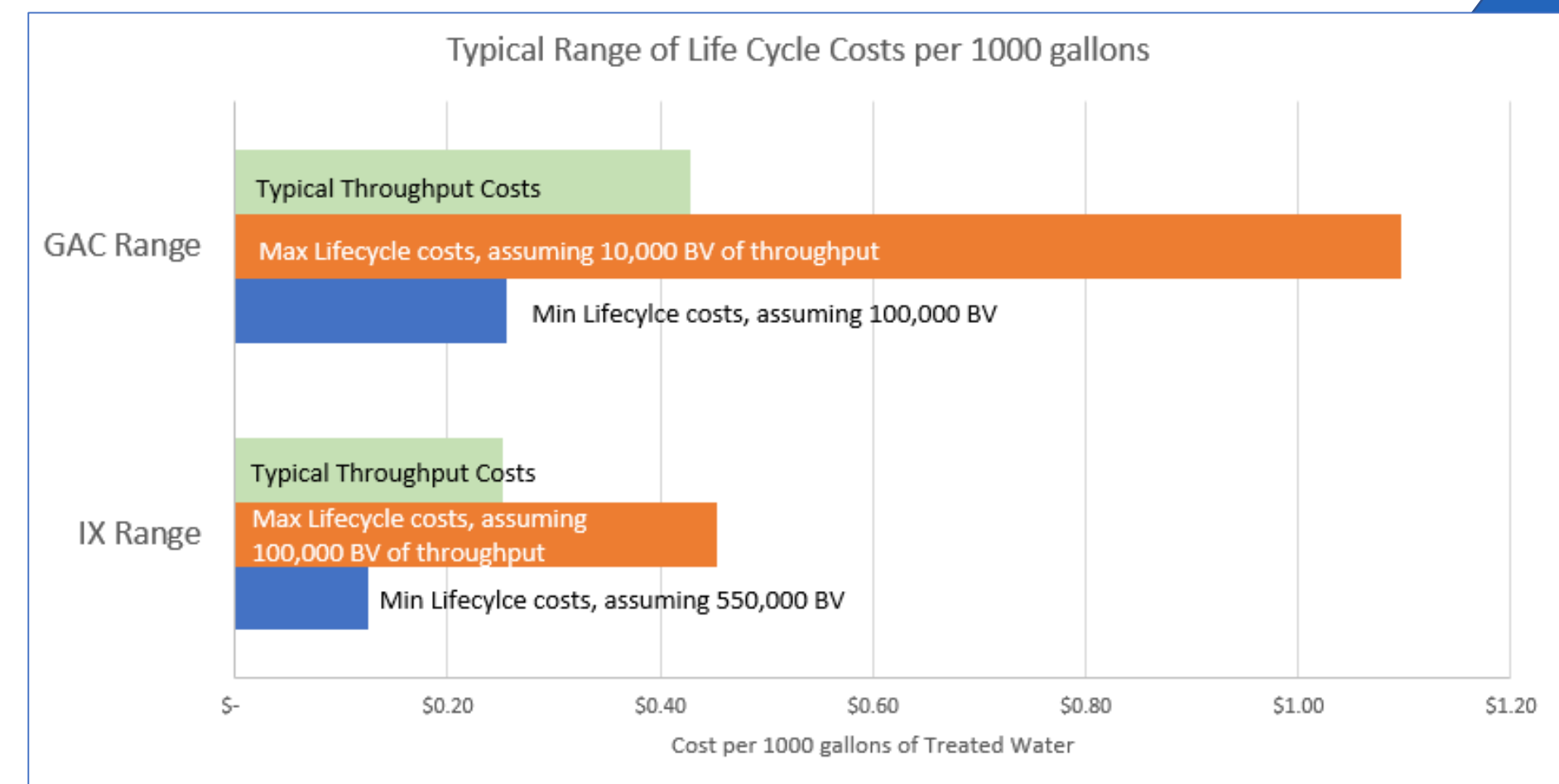
Single-use PFAS-Selective Ion Exchange Resin removes all of these PFAS for longer bed lives than GAC resulting in lower costs.



Water quality drives
Throughput
5 to 20 times more volume
than GAC



Life Cycle Costs



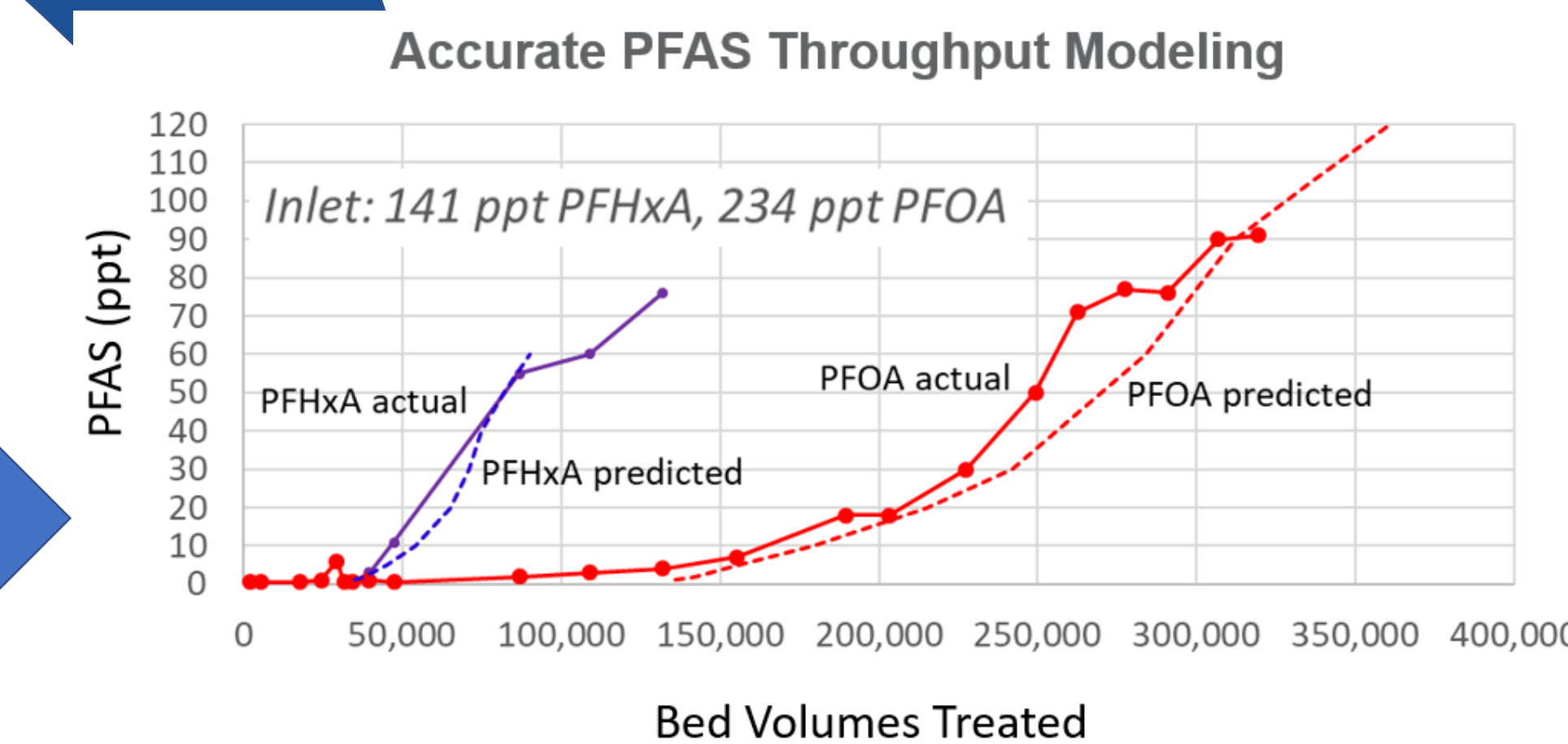
Harmful Parameters:	Pretreatment may be needed for RO / NF or GAC or IX
Suspended Solids	
TOC	
Oxidants	
Oil & Grease	
Iron/manganese	
Scaling compounds	
Microbes	



Information Requested for PFAS Treatment			
Description	Units	Influent Water	
		Min	Max
Operational Flow Rate	gpm		
Operational Schedule	hour/day		
Daily Volume (average)	Gallons		
Sulfate	mg/L (ppm)		
Nitrate (as N)	mg/L as N		
Nitrate (as NO3)	mg/L as NO3		
Alkalinity (as CaCO3)	mg/L as CaCO3		
Chloride	mg/L (ppm)		
Fluoride	mg/L (ppb)		
Perchlorate	ug/L (ppb)		
Arsenate (As (V))	ug/L (ppb)		
Hexavalent chromium (chromate) Cr(VI)	ug/L (ppb)		
Uranium	ug/L (ppb)		
Calcium (as CaCO3)	mg/L as CaCO3		
Magnesium (as CaCO3)	mg/L as CaCO3		
Sodium	mg/L (ppm)		
Potassium	mg/L (ppm)		
Iron	mg/L (ppm)		
Manganese	mg/L (ppm)		
pH			
ORP			
TDS	mg/L (ppm)		
Suspended Solids	mg/L (ppm)		
Oil & Grease	mg/L (ppm)		
Total Organic Carbon	TOC mg/L (ppm)		
Perfluorobutanoic acid	PFBA ug/L (ppt)		
Perfluoropentanoic acid	PFPeA ug/L (ppt)		
Perfluorohexanoic acid	PFHxA ug/L (ppt)		
Perfluoroheptanoic acid	PFHpA ug/L (ppt)		
Perfluorooctanoic acid	PFOA ug/L (ppt)		
Perfluorononanoic acid	PFNA ug/L (ppt)		
Perfluorodecanoic acid	PFDoA ug/L (ppt)		
Perfluorotridecanoic acid	PFTrA ug/L (ppt)		
Perfluorotetradecanoic acid	PFTeA ug/L (ppt)		
Perfluorohexanesulfonic acid	PFHxS ug/L (ppt)		
Perfluorooctanesulfonic acid	PFOS ug/L (ppt)		
Perfluorodecane sulfonic acid	PFDS ug/L (ppt)		
Perfluorododecane sulfonic acid	PFDDA ug/L (ppt)		
Perfluorotetradecane sulfonic acid	PFTEA ug/L (ppt)		
Perfluorohexanesulfonamide	PFHxS ug/L (ppt)		
Perfluorooctanesulfonamide	PFOS ug/L (ppt)		
Perfluorodecane sulfonamide	PFDS ug/L (ppt)		
Perfluorododecane sulfonamide	PFDDA ug/L (ppt)		
Perfluorotetradecane sulfonamide	PFTEA ug/L (ppt)		
4:2 FTS (fluorotelomer sulfonate)	4:2 FTS ug/L (ppt)		
6:2 FTS (fluorotelomer sulfonate)	6:2 FTS ug/L (ppt)		
8:2 FTS (fluorotelomer sulfonate)	8:2 FTS ug/L (ppt)		
GenX	GenX ug/L (ppt)		
VOC	ug/L (ppb)		

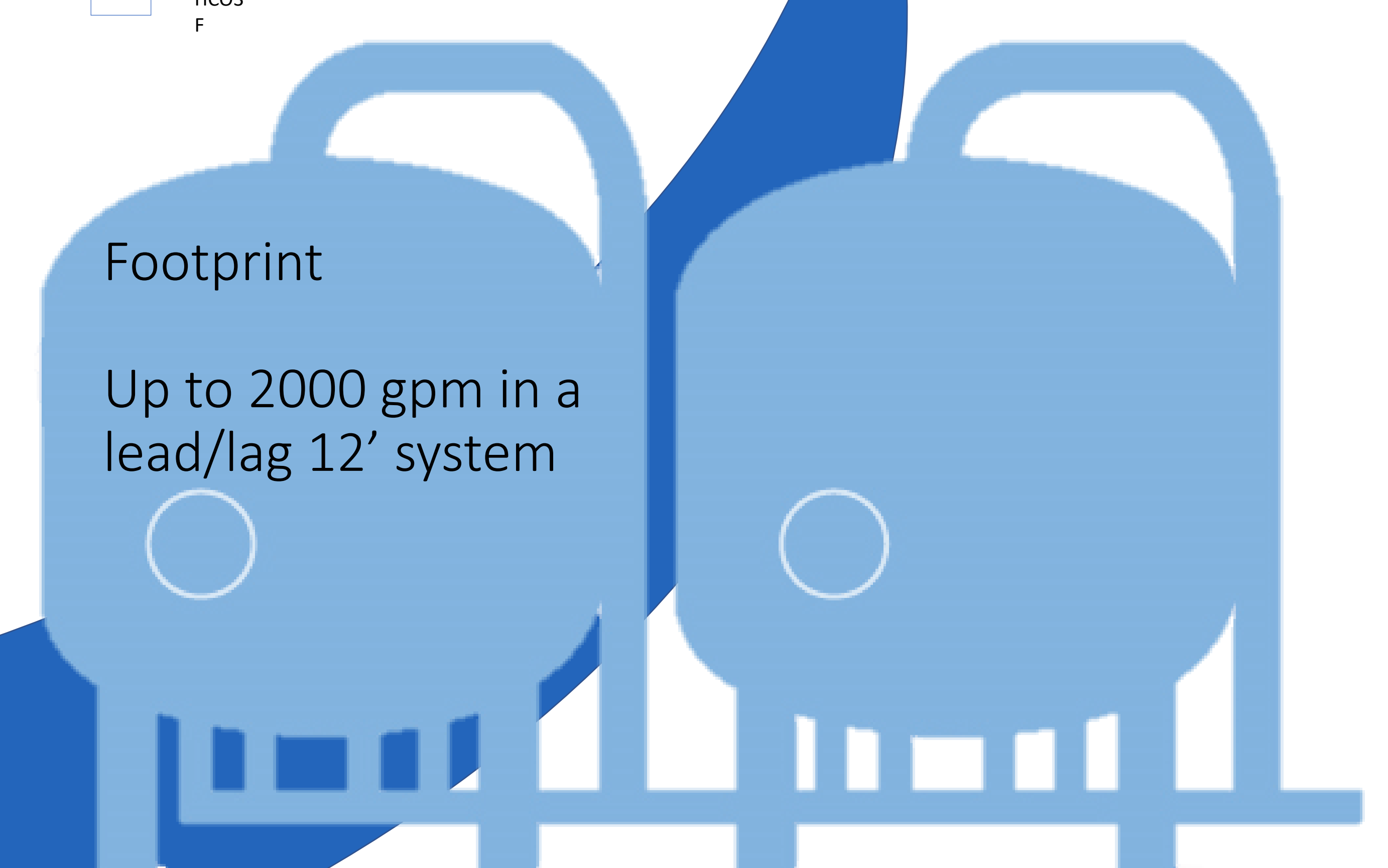
Resin Selectivity

- PFOS
- PFHxS
- PFBS
- PFTrDA
- PFTrA
- PFDoA
- PFUnA
- PFDA
- PFNA
- PFOA
- ADONA
- GenX
- PFHpA
- ClO4
- PFHxA
- PFPeA
- PFBA
- NO3
- SO4
- Cl
- HCO3
- F



Footprint

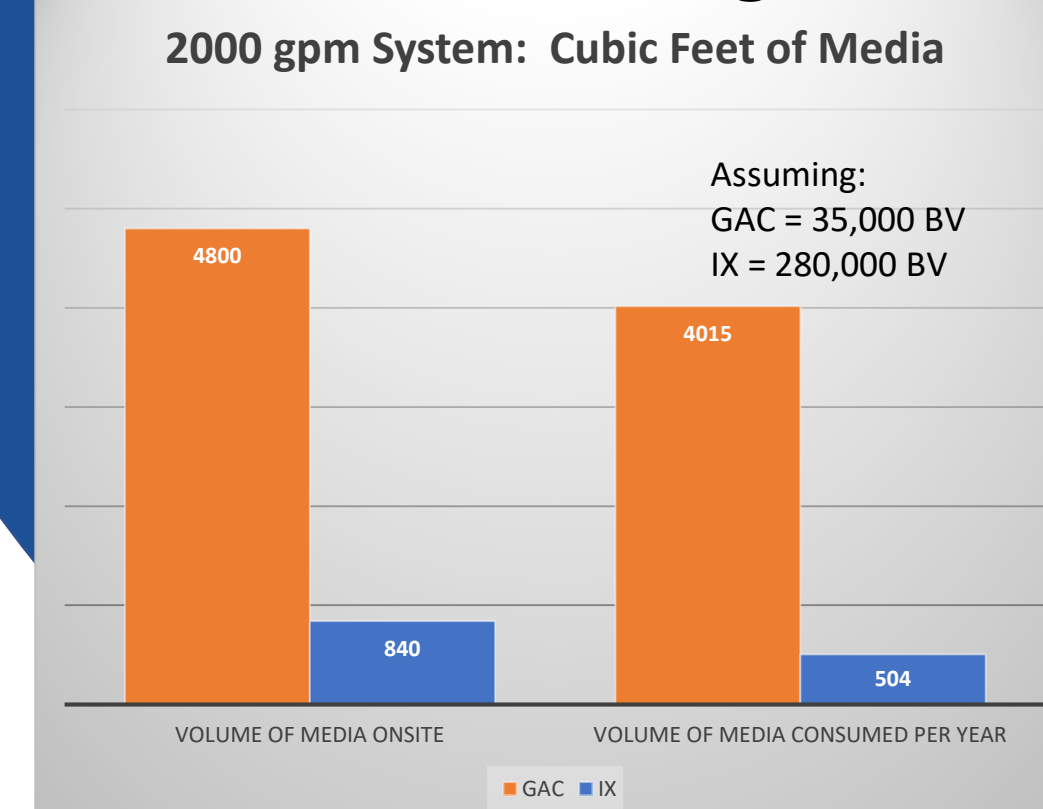
Up to 2000 gpm in a lead/lag 12' system



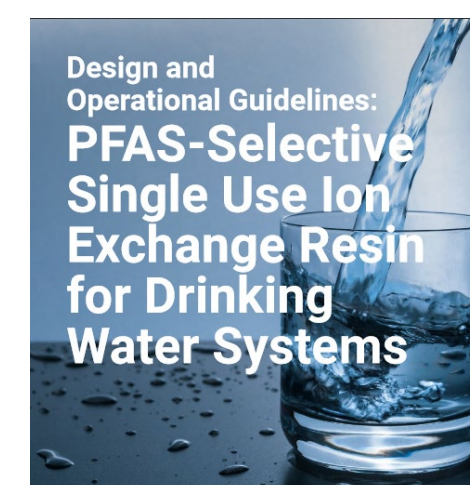
PFAS Waste Management

- Landfill
 - Incineration
 - Reactivation (GAC)
 - Mechanochemical
 - Supercritical Water Oxidation
 - Electrochemical
 - Chemical
 - Biological
 - Plasma
 - Sonolysis
 - Ebeam
 - UV
 - Deep Well injection
 - Sorption / stabilization
 - Land application
- Currently Commercial
- Promising Technologies
- Technologies also being developed

Less Waste Generation With Ion Exchange Resin



PFAS Design/Op Guide



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