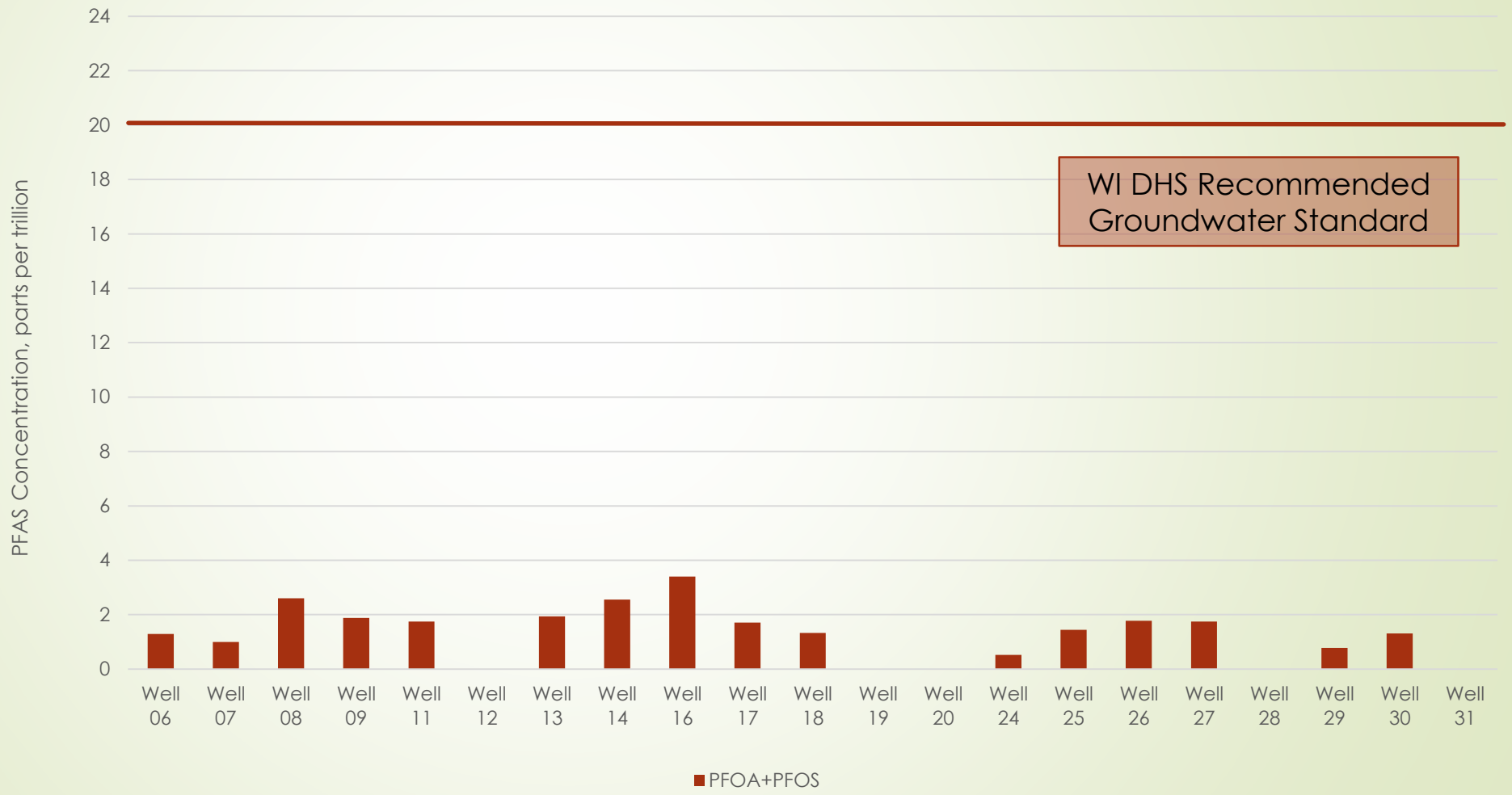
PFAS Update & Discussion

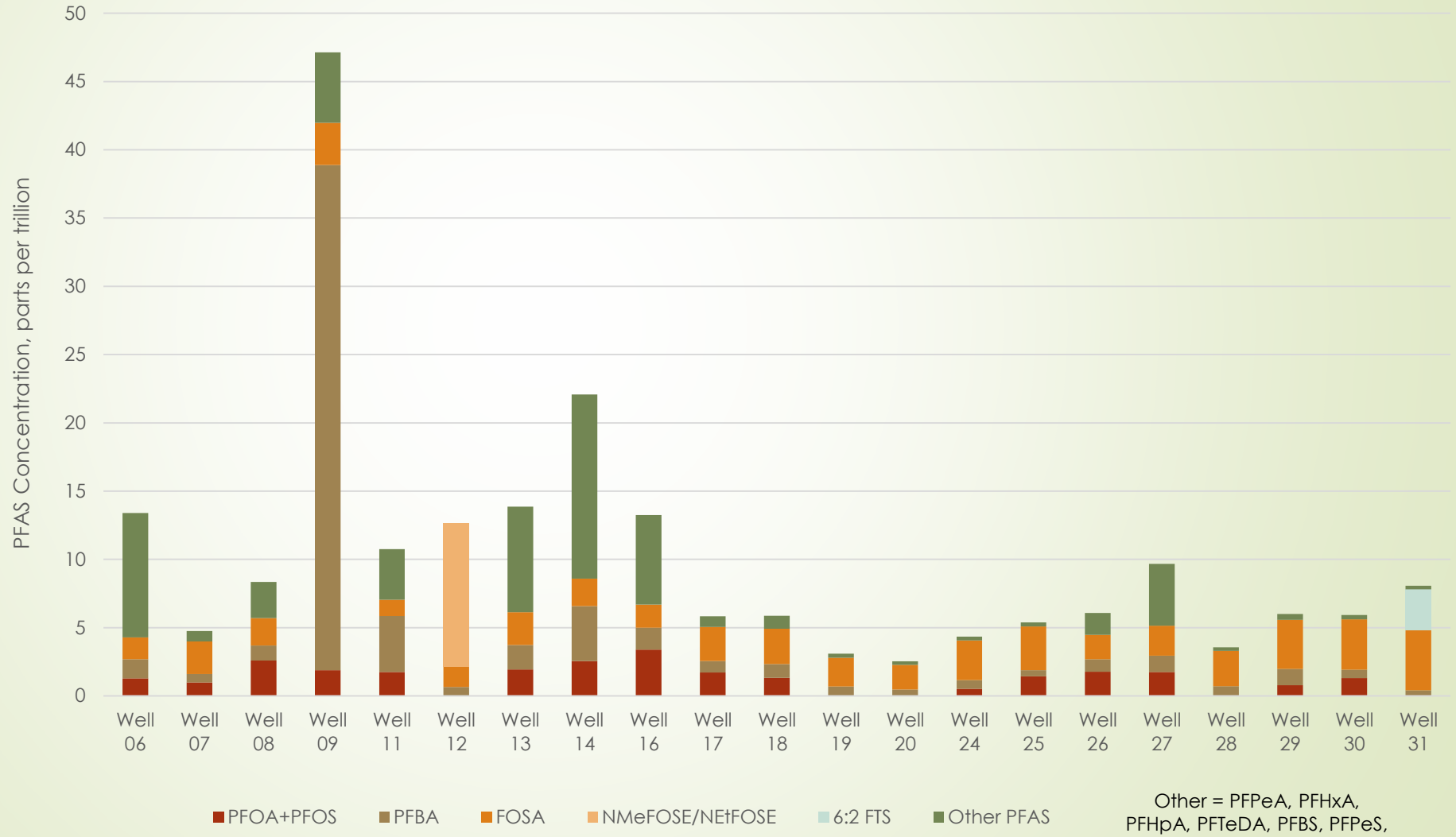
Water Utility Board Meeting

4/27/2021

2020 Results – PFOA + PFOS



2020 PFAS TEST RESULTS



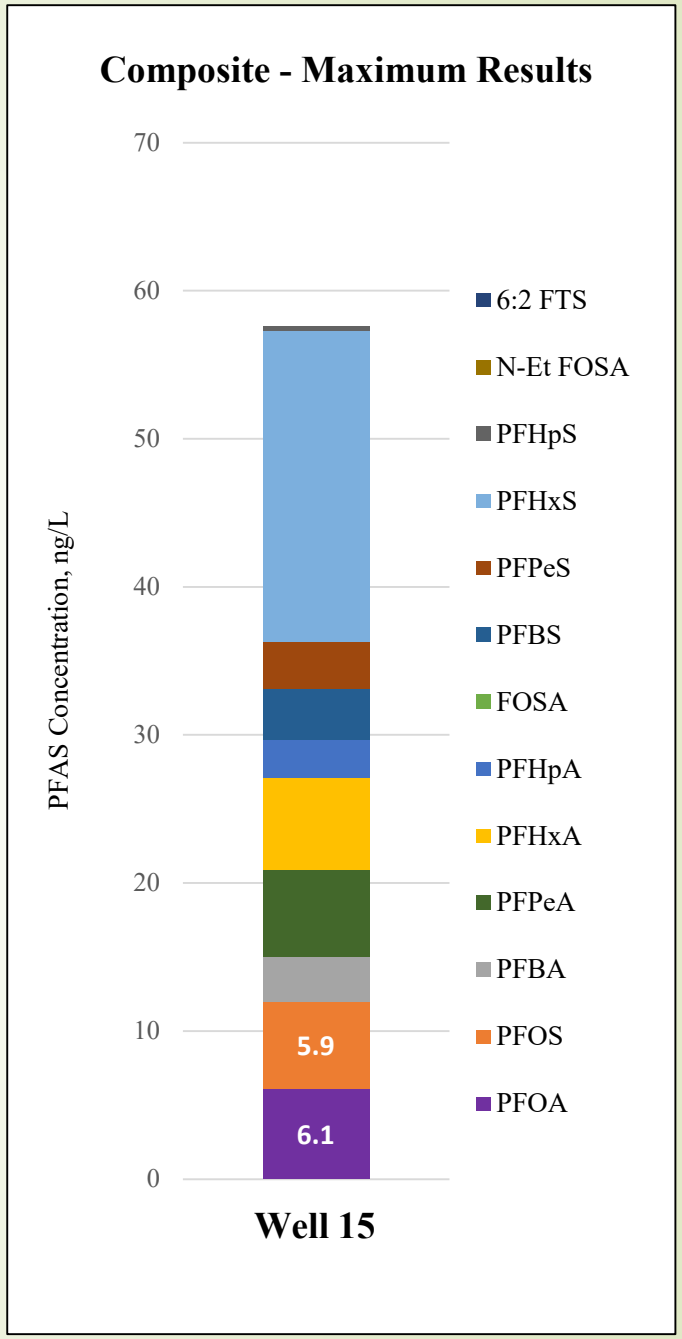
Other = PFPeA, PFHxA, PFHpA, PFTeDA, PFBS, PFPeS,

Some Recent PFAS Developments

- US EPA Announces it Will Regulate PFOA & PFOS in Drinking Water
- US EPA Proposes Inclusion of 29 PFAS in the Fifth Round of the Unregulated Contaminants Monitoring Rule (UCMR5)
- WI DHS Recommends Health-Based Groundwater Standards for an Additional 16 PFAS
- WI DNR Adopts WI DHS Recommendation to Consider Cumulative Impacts of PFAS on Human Health – **Hazard Index**
- US EPA Releases Final Toxicity Health Assessment for PFBS; Revises Chronic Reference Dose Downward by Factor of 30

Madison Well #15

- Taken out of service: March 2019
- Combined PFAS: ~55 ng/L
- PFOA + PFOS: 12 ng/L
- **Hazard Index: 1.13**
- PCE: ~4.0 µg/L
- TCE: ~0.4 µg/L



Feasibility Study – Objectives

Evaluate treatment technologies to develop capital and annual operating cost estimates for PFAS removal that

- Reduce PFAS, PCE, & TCE by >90%
- Restore production rate of 1000 gallons per minute
- Eliminate the use of the air stripper

Feasibility Study – Approach

Perform Rapid Small-Scale Column Testing (RSSCT) on two granular activated carbon (GAC) media

Use computer modeling to assess predictive performance of ion exchange (IX) resin

RSSCT column loaded with 1240 Plus GAC

Feasibility Study – Results (GAC)

Removal of TCE & PCE to below detectable levels for duration of RSSCT (100,000 bed volumes = 1 billion gallons of treated water = 2 years of treatment @ UW 15)

Both GACs removed all PFAS to below detectable levels for some time

- Similar effectiveness of two GACs in achieving treatment objective
  - **>90% reduction** achieved for ~30,000 bed volumes (218 – 225 days; 315 MG)
- Fast breakthrough of shorter chain carboxylic acid PFAS (PFBA & PFPeA)
- Alternate treatment objectives can decrease replacement frequency
  - **20 ng/L total PFAS**: 70,000 to 85,000 bed volumes treated (735 – 892 MG)
  - **PFOA + PFOS < 2 ng/L**: 90,000 to 99,000 bed volumes treated (945 MG – 1.04 BG)

Feasibility Study – Results (IX)

IX resin estimated to treat 42,000 bed volumes (93 days; 133 MG)

- Advantage: smaller vessels, shorter contact time (3 vs. 10 minutes for GAC)
- Disadvantage: Does not remove PCE or TCE (uncharged molecules)
- Would require continued use of air stripper or addition of GAC polishing vessel
- Similar to GAC, performance limited by shorter chain PFAS
- IX media is significantly more expensive (~10X)

Feasibility Study – Cost Comparison

Proposed Operation	GAC-1	GAC-2	IX
Total Beds (lead – lag)	2	2	2
Bed Depth, feet	12.38	12.38	3.75
Bed Volume, cubic feet	1400	1400	424
Empty Bed Contact Time, minutes	10.47	10.47	3.17
Bed Volumes treated	30,000	31,000	42,000
Service Life, days	218	225	93
Ceiling Clearance, feet	30	30	22
Life Cycle Treatment Cost			
Equipment Capital Cost	$670,000	$875,000	$812,250
System Construction Cost	$155,000	$155,000	$115,000
Media cost, $/cf	53.93	127.32	$434.79
Rebed Service Cost	$75,500	$178,250	$184,330
Annual O&M Cost	$136,000	$299,000	$733,000
O&M Cost (50 year NPV)	$3,499,000	$7,693,000	$18,860,000
Life Cycle Cost (50 year NPV)	**$4,664,000**	**$9,148,000**	**$20,169,000**

Annual O&M Cost Comparison

	Treatment Objective #2	Treatment Objective #1	Treatment Objective #3	Treatment Objective #4
Carbon 1:	$301,000	$136,000	$54,000	$48,000
Carbon 2:	$698,000	$299,000	$137,000	$109,000

More Strict **Baseline** Less Strict

Feasibility Study – Cost Comparison

Consider a range of treatment objectives:

	Treatment Goal	Service Life, days	Annual O&M	50-year Net Present Value
Primary Objective	>90% reduction total PFAS	218	$136,000	$4,664,000
Alternative #1	>90% reduction all PFAS	95	$301,000	$8,910,000
Alternative #2	Total PFAS < 20 ng/L	618	$54,000	$2,554,000
Alternative #3	PFOA & PFOS < 2 ng/L	720	$48,000	$2,400,000

Feasibility Study – Next Steps

Continue to evaluate criticality of supply lost from Well #15

Apply asset management principles to determine whether treatment is the best and most cost-effective option for meeting water supply needs on Madison's east side.

Community engagement

Questions???