

BONIFICA IN-SITU DEI PFAS NELLE ACQUE DI FALDA UTILIZZANDO CARBONI ATTIVI COLLOIDALI

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CONVEGNO
Assoreca
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OSSERVATORIO PFAS ASSORECA
RIFLESSIONI PER UN APPROCCIO
METODOLOGICO

19.09.2024 | H 14.00

REMTECH EXPO 24
FERRARA FIERE

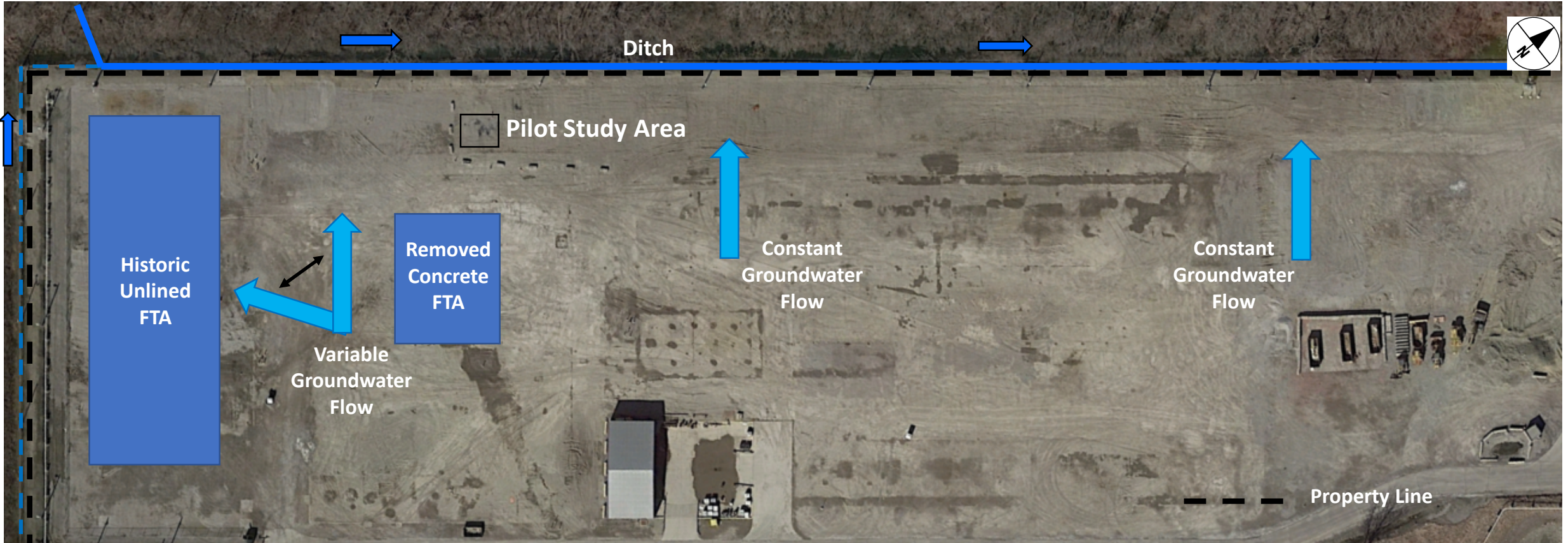
The poster features a blue background on the left with white text. On the right, there is a photograph of a stream with green plants growing from the bank. A white hexagonal graphic with the letters 'PFAS' is overlaid on the plants. The REMTECH EXPO logo is visible in the bottom right corner of the poster.

AGENDA

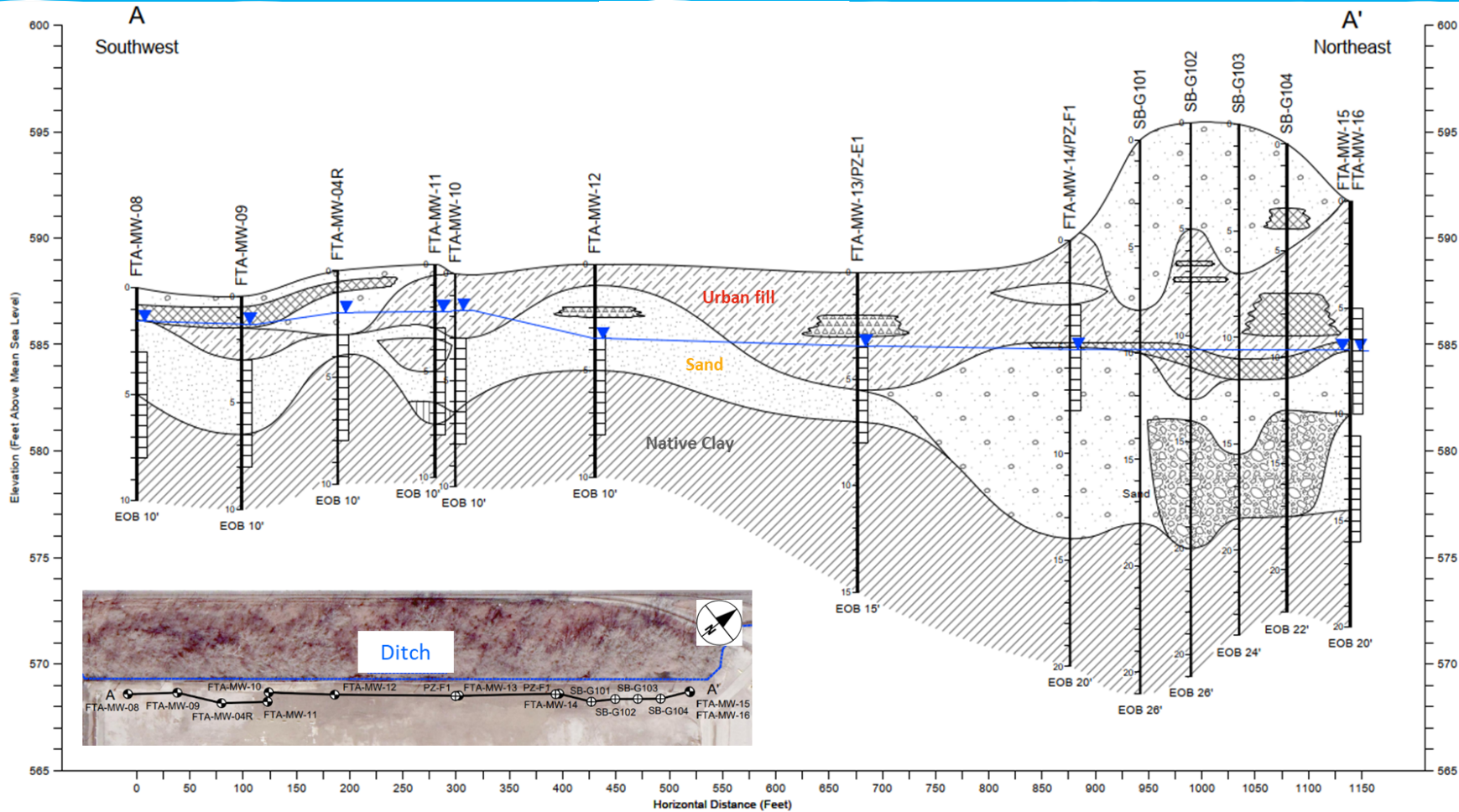


- 01 Site Background
- 02 Pilot Study / Full Scale Implementation
- 03 2-Year Results
- 04 Lessons Learned

Site Background – Former Fire Training Area








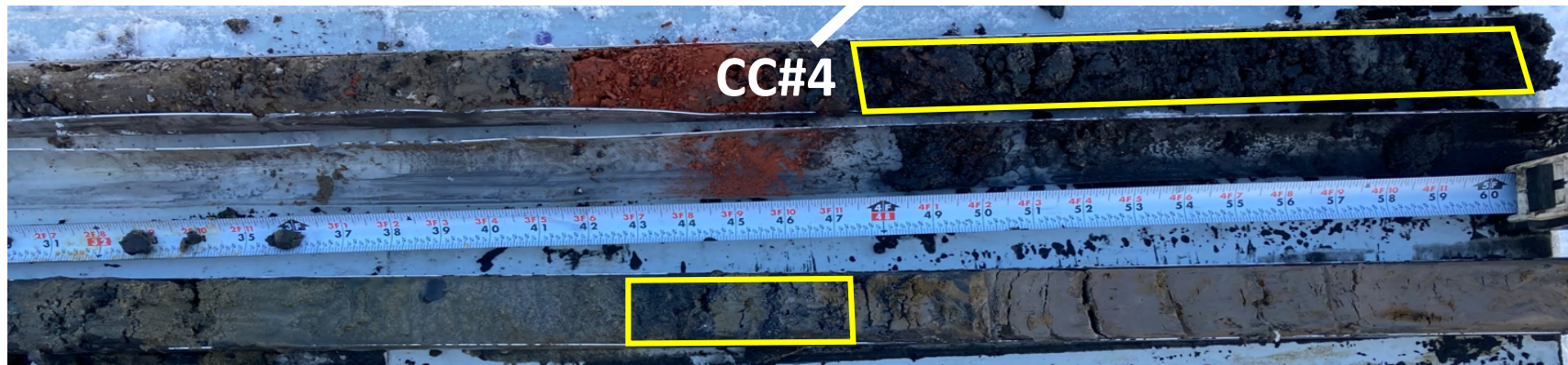
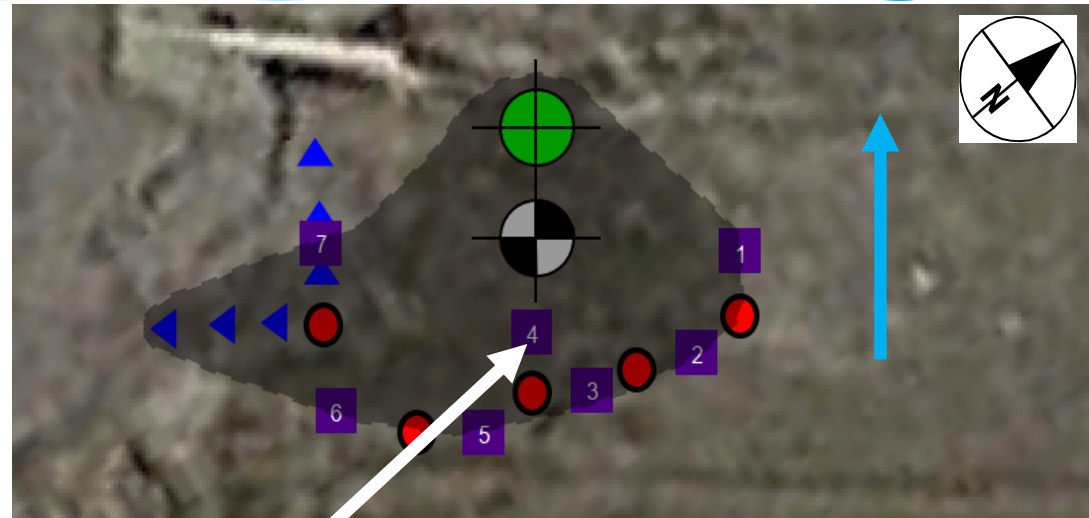
Cross-Section (perpendicular to groundwater flow)



- Perched water table: DTW 0.5-1.2 m bgs, but deeper towards north portion of FTA
- Top few feet is reworked urban fill (high k), then sand and sand/silt mixtures, followed by a thick continuous clay layer that starts around 1.8-2.4 m bgs. Favorable conditions for colloidal activated carbon.
- On the northern end of the site, there is deeper DTW and depth to clay (thicker saturated zone), also a 6-foot thick gravel deposit is present.

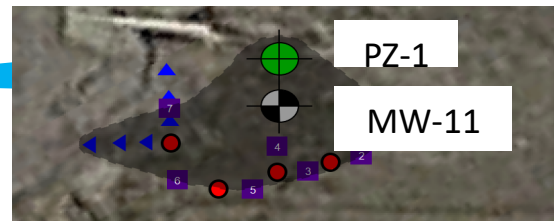
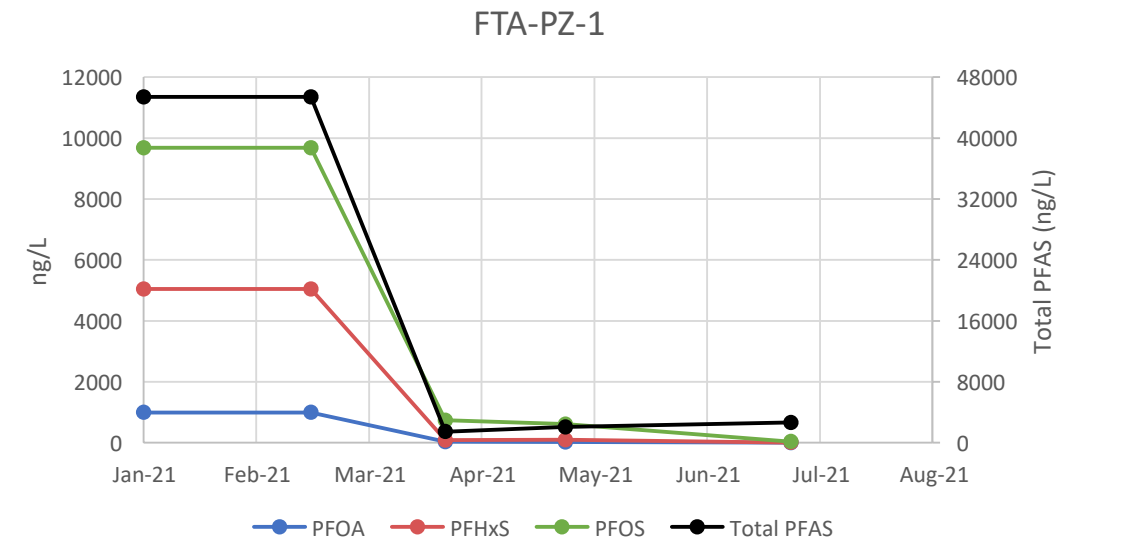
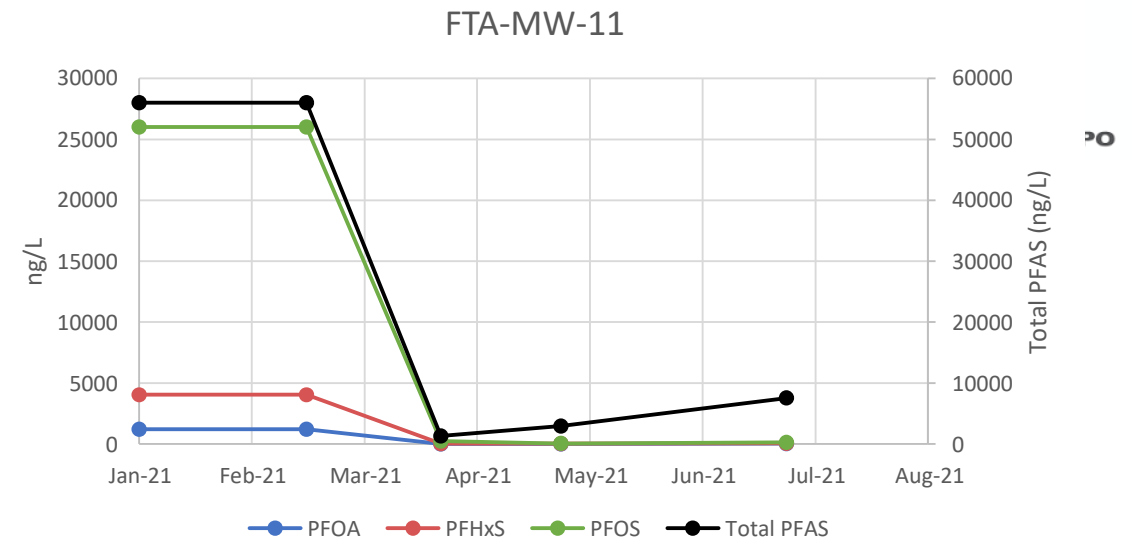
LEGEND

-  - 2" Performance MW
-  - 1" Temporary PZ
-  - Proposed Injection Points
-  - Temporary Piezometers
-  - Post Injection Soil Cores



| Well ID | Sampling Date | PFAS Concentration (in ng/L) | | | |
|---------|--------------------------|------------------------------|---------------|---------------|---------------|
| | | PFOA | PFHxS | PFOS | Total PFAS |
| MW-11 | 02/16/21 | 1210 | 4040 | 26000 | 56030 |
| | 03/25/21 | 4.43 | 15.7 | 218 | 1315 |
| | 04/27/21 | 4.6 | 22.9 | 32.9 | 2903 |
| | 06/28/21 | 5.87 | 32.8 | 117 | 7546 |
| | Month-4 Reduction | -99.5% | -99.2% | -99.6% | -86.5% |
| PZ-1 | 02/16/21 | 990 | 5050 | 9680 | 45385 |
| | 03/25/21 | 26.6 | 80.1 | 731 | 1443 |
| | 04/27/21 | 21.3 | 88.7 | 606 | 2065 |
| | 06/28/21 | 1.13 | 4.24 | 35.8 | 2643 |
| | Month-4 Reduction | -99.9% | -99.9% | -99.6% | -94.2% |

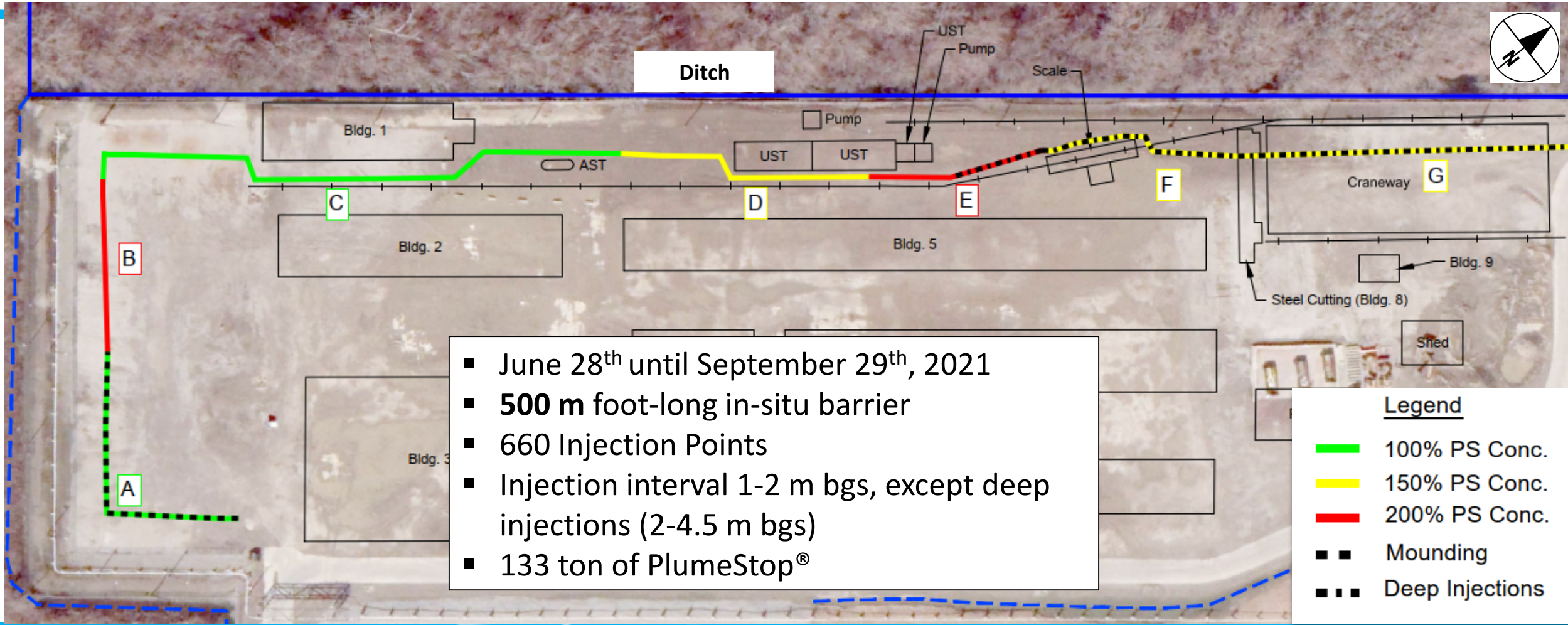
- More than 99% Reduction of PFOS, PFOA, and PFHxS
- Significant reduction in concentrations in both wells by first monitoring event (1-month after injections). A little more gradual reduction of PFOS observed in FTA-PZ-1 which is further downgradient from the injection sites.
- Increase in Total PFAS in MW-11 due to some rebound of short-chain PFAS compounds.
- After first event data received in April, client said they wanted full scale installed by June 2021.



A Few Words about going to Full-Scale

- Client interested in moving rapidly to full-scale
 - Perceived regulatory and public pressure
- Wanted to show action/be proactive
- **Objective: Reduce PFAS concentrations in groundwater migrating towards the nearby/off-site ditches**

Full-scale – PlumeStop® Injection

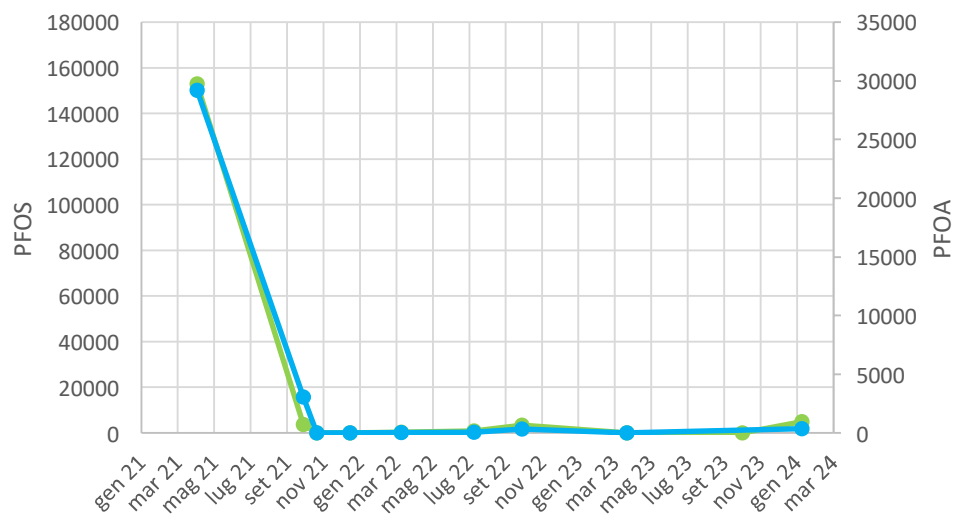


Full-scale – 2 Years Results

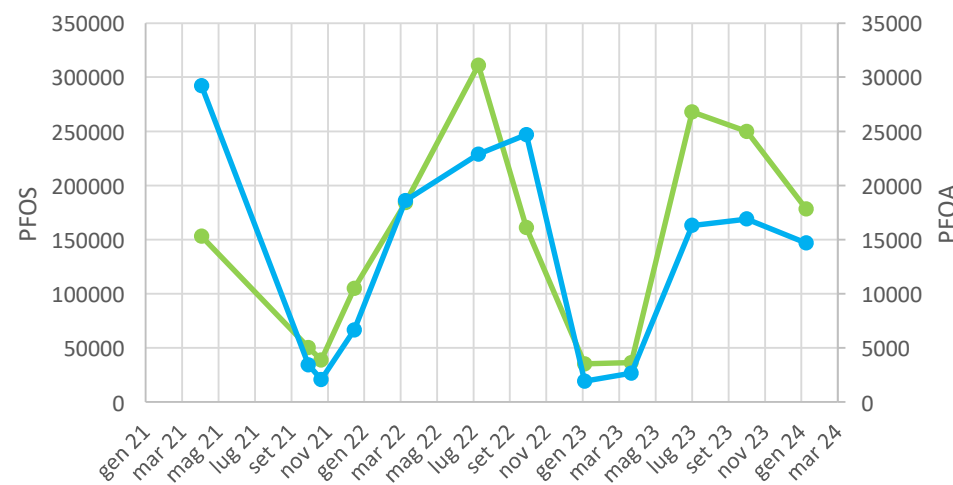
- **In-Barrier Good, Downgradient Fluctuates**
- Highest PFAS (550 ppb Total PFAS)
- In-barrier reduced ~100%, maintained 2 yrs
- Downgradient well significantly fluctuates, likely due to seasonal infiltration and leaching of PFAS source mass in the vadose zone downgradient of barrier



FTA-MW-07 (In-Barrier well)



FTA-MW-26 (54 ft downgradient)



Full-scale – 2 Years Results

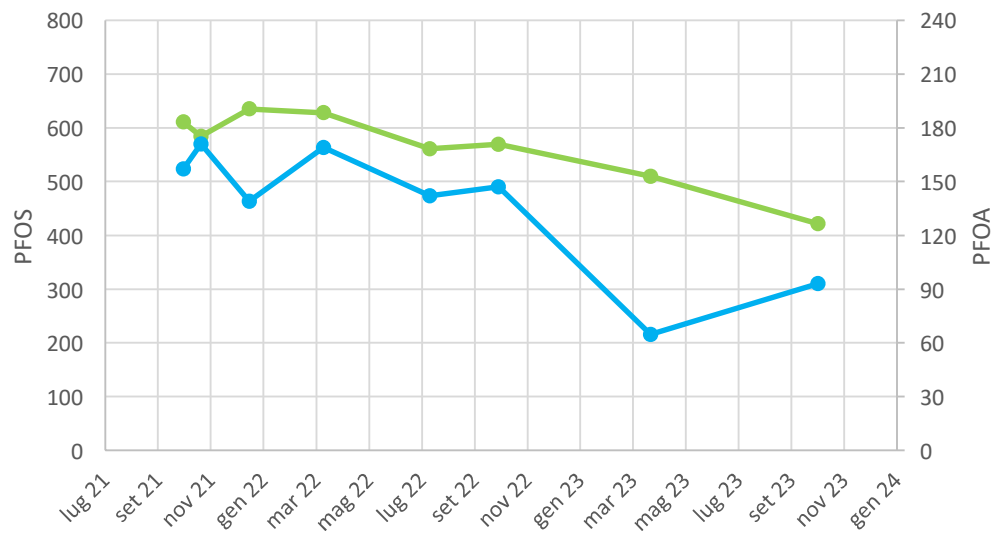


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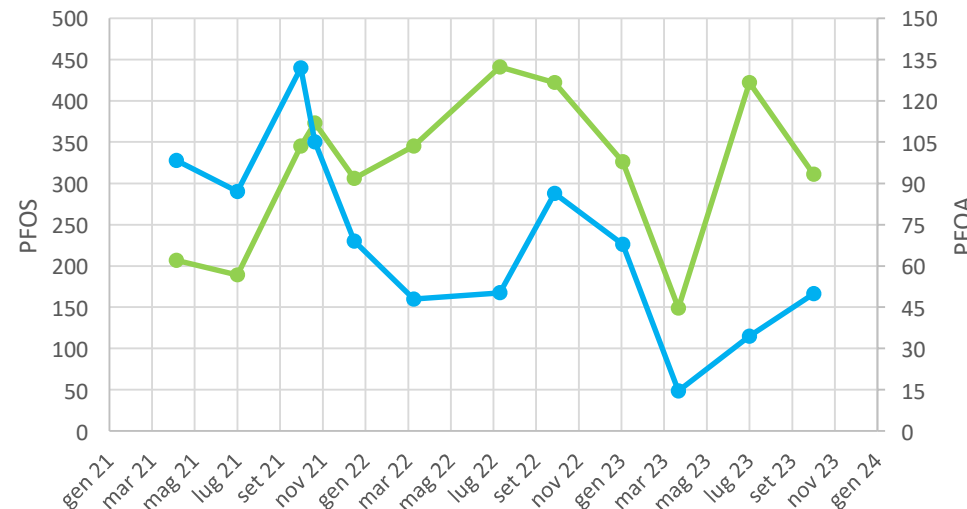
- **Slow/Limited Response Due to DRO**
- PFAS concentrations are significantly lower
- DRO (7 ppm) highest in this area; has been reduced 97%
- Presence of DRO may affect PFAS sorption
- May see limited PFAS reductions, but not as much risk



FTA-PZ-E1



FTA-MW-13 (27 ft downgradient)

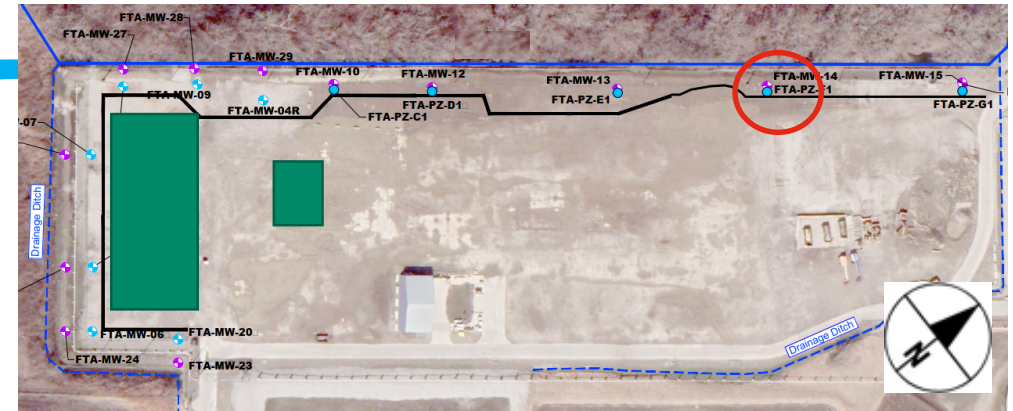


Full-scale – 2 Years Results

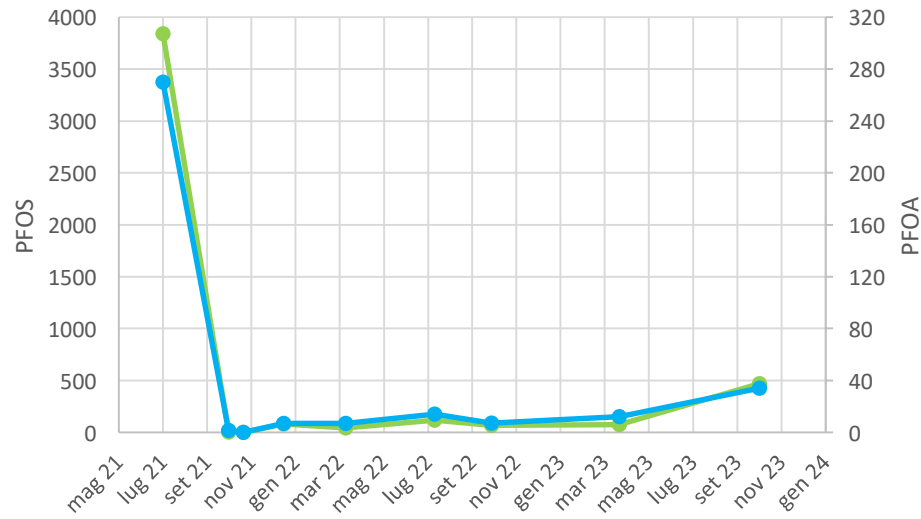


REMTECH EXPO

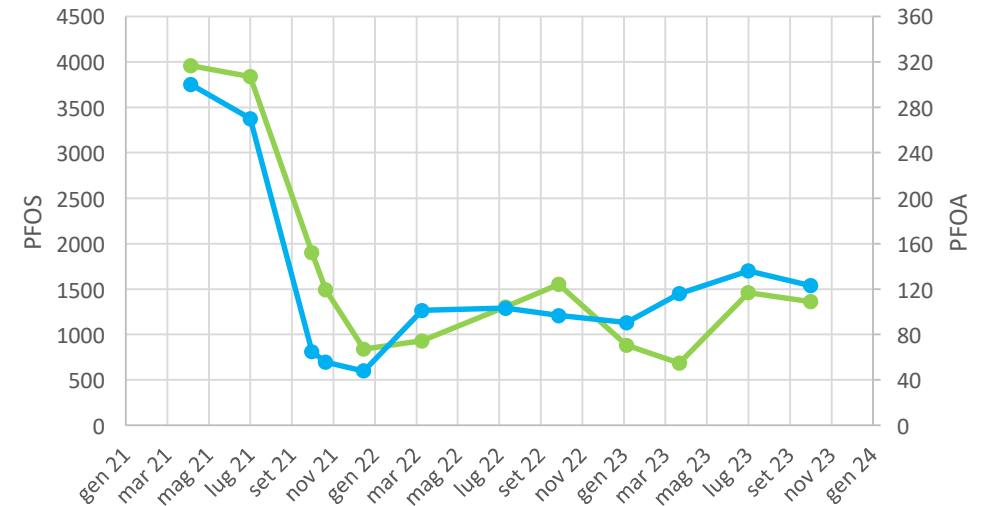
- In-Barrier well 99% reduction; slight uptick at 2 yr
- Downgradient well 80% reduction
- This area of barrier doing well; away from source



FTA-PZ-F1



FTA-MW-14 (18 ft Downgradient)



Results Summary

- Based on 2 years of monitoring data, barrier appears to be holding with no evidence of breakthrough, even in areas with >500,000 ppt Total PFAS
- In-barrier wells responded more immediately
- Downgradient well response depends on:
 - Distance from the barrier
 - Presence of residual PFAS mass already downgradient of the barrier
 - Downgradient wells located in areas away from historical source areas are performing best
 - DRO can compete with PFAS for sorption to PlumeStop
 - Monitoring will continue to further evaluate barrier longevity, improvement in downgradient water quality, and the need for any further injections

Lesson Learned Summary

- Co-contaminants compete with PFAS for sorption sites on the carbon. If co-contaminant demand is affecting your ability to meet your treatment objective, supplemental injections may be needed.
- If early results are not as expected, revisit lithology and PlumeStop distribution (including collection of additional cores). May need supplemental injections if there are gaps in distribution or installation of new monitoring wells if not screened appropriately.
- PlumeStop barrier is performing best away from source areas, which is more typical for PlumeStop applications.
- However, increased concentrations of PlumeStop have been effective at addressing high PFAS concentrations for at least 2 years. Could be applicable to source area control objectives.
- While challenging, we learned that it is feasible to design and implement a rapid full-scale PlumeStop barrier installation that is successful at significantly reducing PFAS migration towards a receptor.