

Source Identification and Mitigation of PFAS in Stormwater at Gerald Ford International Airport

Scott Bell, LimnoTech

June 6, 2024

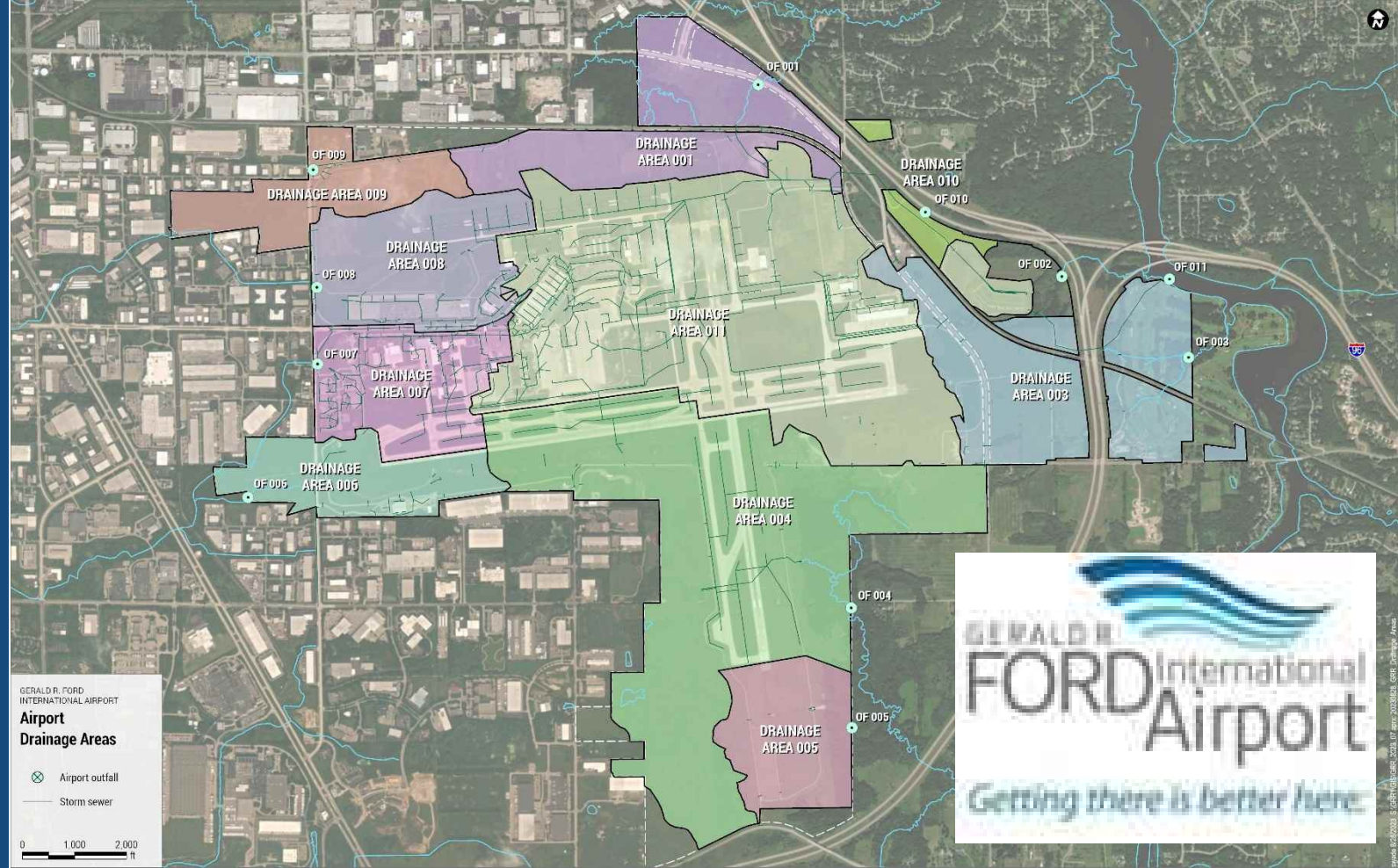
Session: E9. PFAS Site Characterization

Presentation Overview

- Background
- PFAS source identification
- Evaluation of solutions



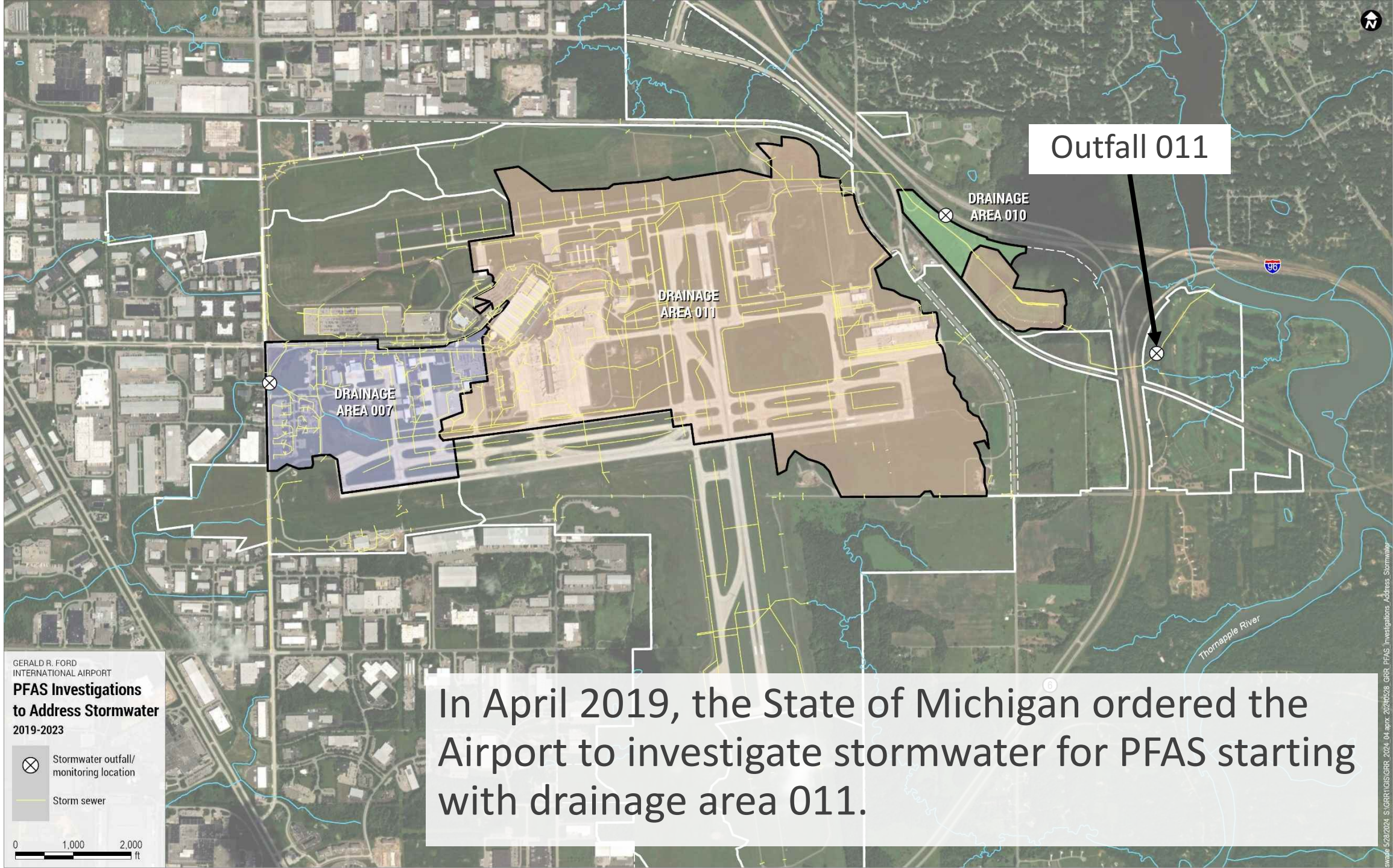
Background



Gerald Ford International Airport, Grand Rapids, Michigan

- Commercial service public airport
- Certified under Part 139 (required to use AFFF)
- Property area = 2,980 acres (~4.6 square miles)





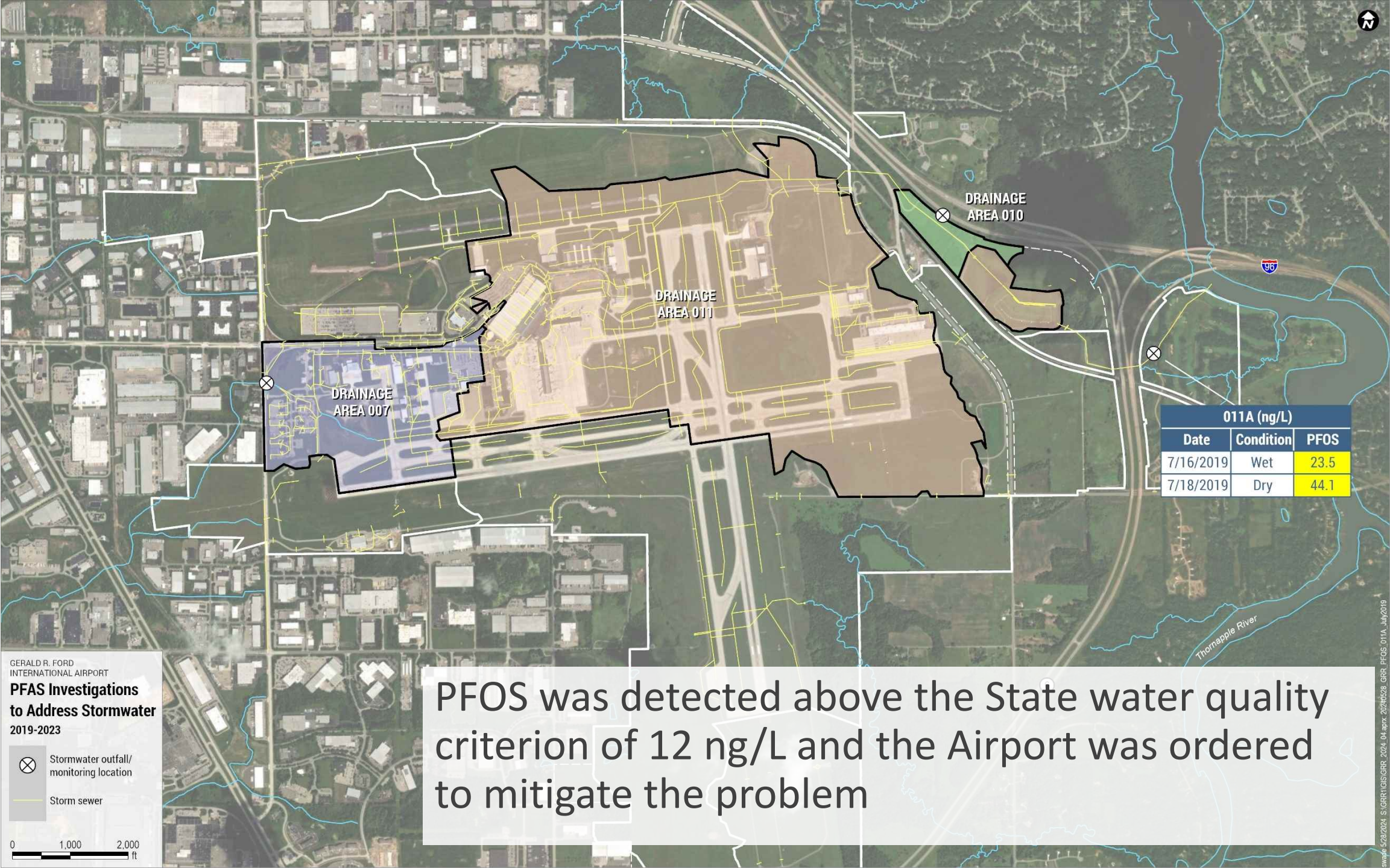
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**PFAS Investigations
to Address Stormwater
2019-2023**

⊗ Stormwater outfall/
monitoring location

— Storm sewer

0 1,000 2,000
ft

In April 2019, the State of Michigan ordered the Airport to investigate stormwater for PFAS starting with drainage area 011.



PFOS was detected above the State water quality criterion of 12 ng/L and the Airport was ordered to mitigate the problem

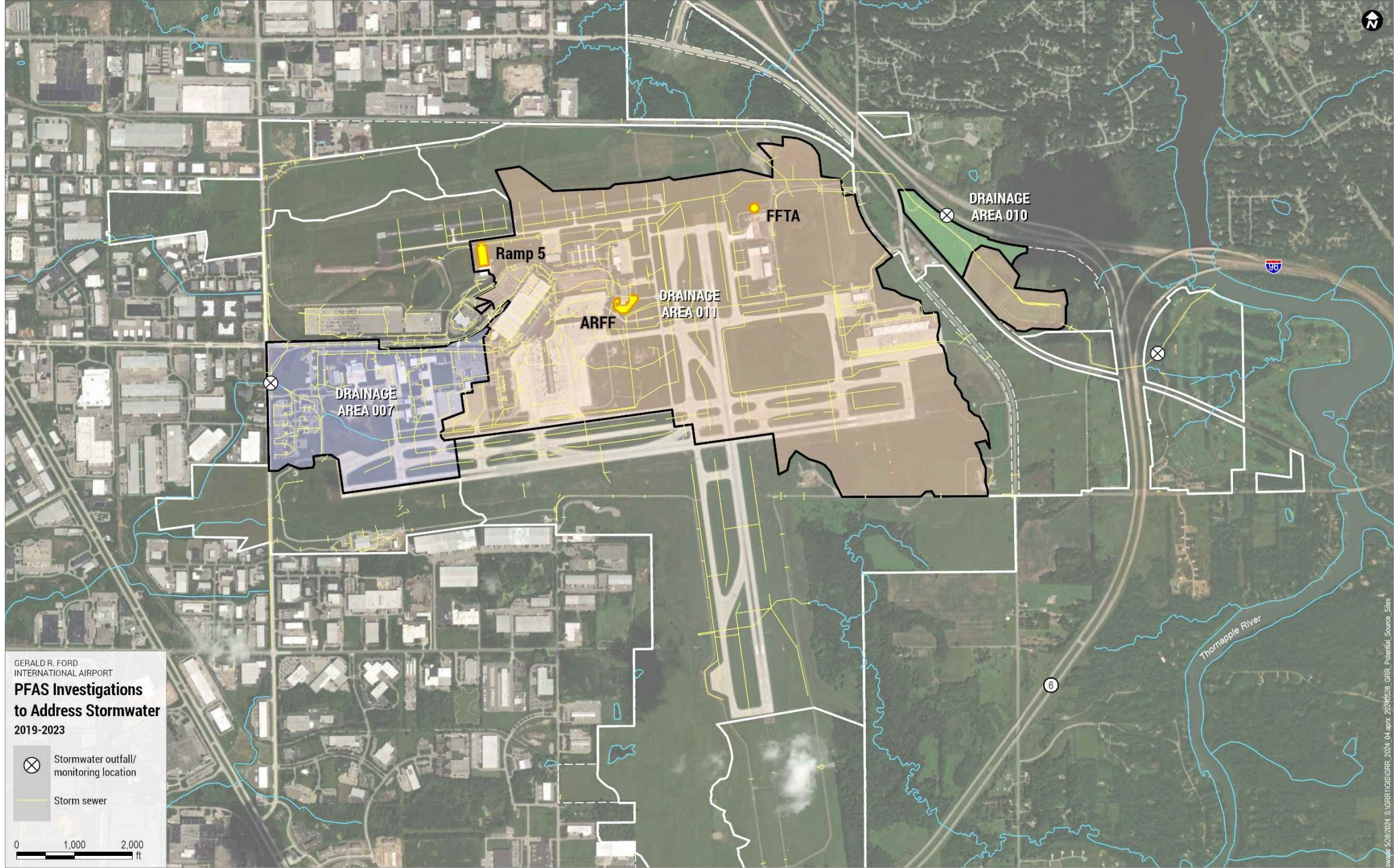
Source Identification

Where was the PFOS coming from?

- 860 acres of drainage area
- 3 widely separated known AFFF release locations
- Potential unknown AFFF release locations
- 48 miles of storm sewer
- 1500 catch basins & manholes
- PFOS from stormwater runoff?
Groundwater infiltration? Both?



Background

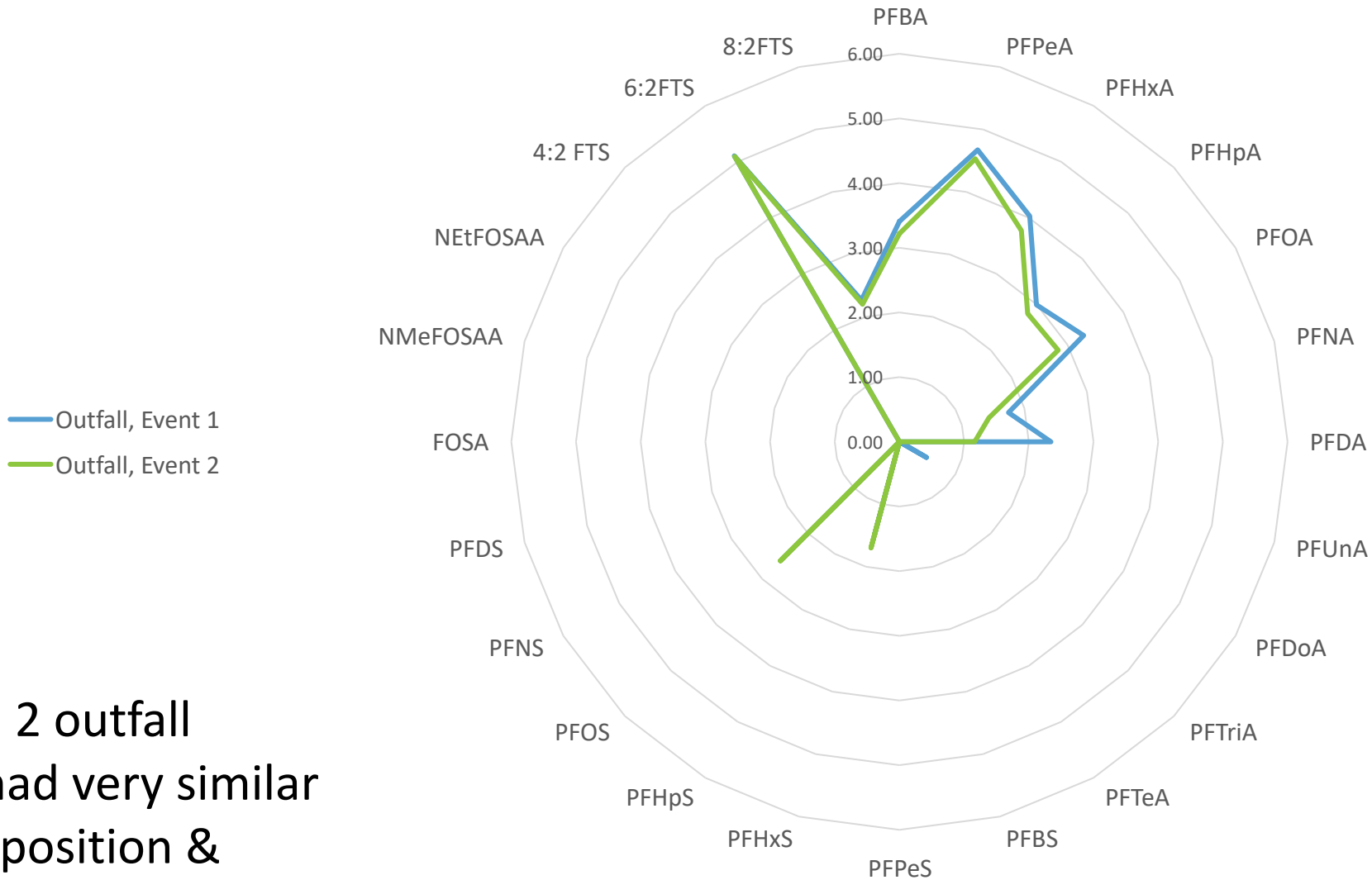


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0 1,000 2,000
ft

PFAS composition and distribution comparison



The initial 2 outfall samples had very similar PFAS composition & distribution



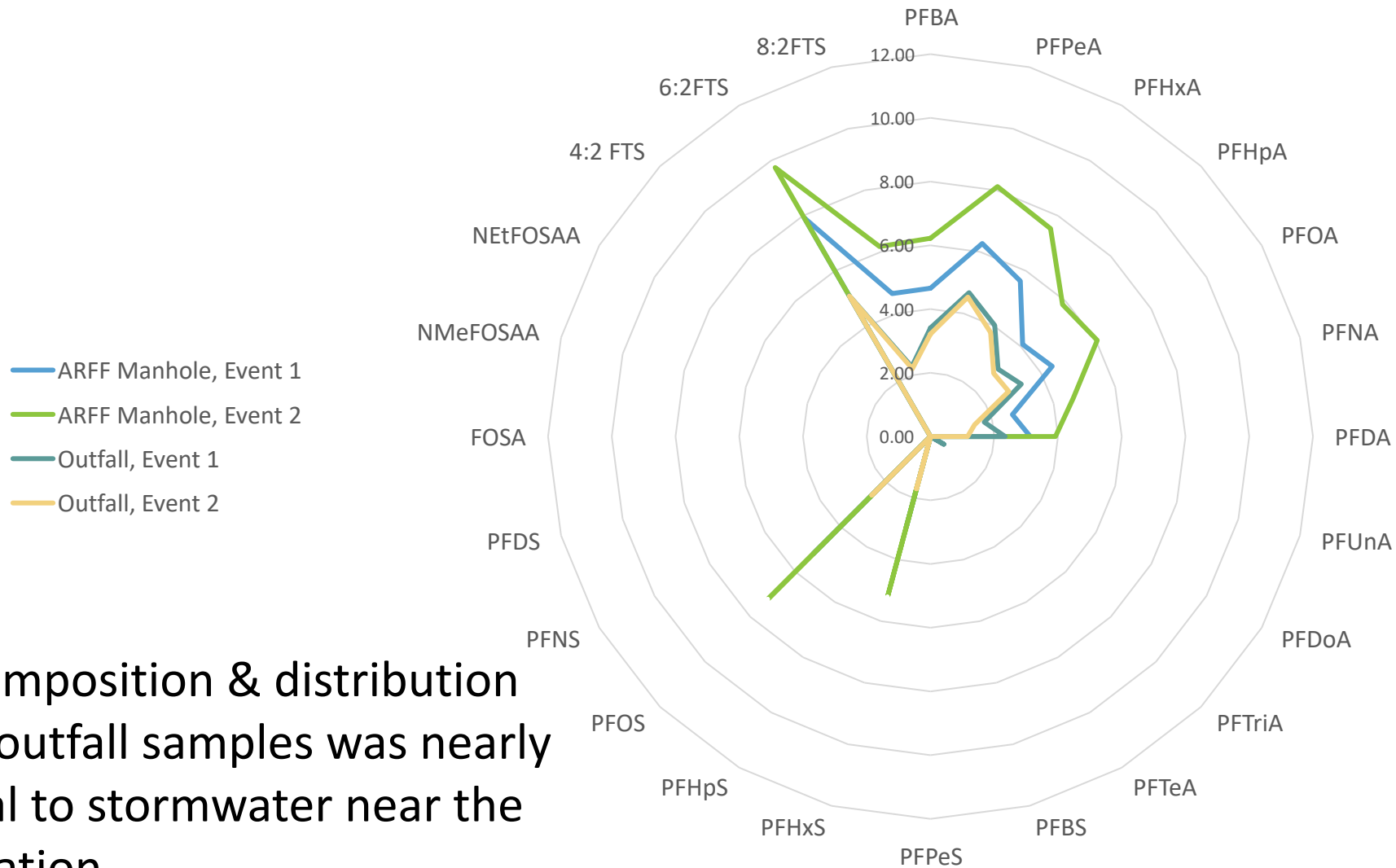
PFAS composition and distribution comparison



PFAS composition & distribution for the outfall samples was different than shallow groundwater at the former FFTA



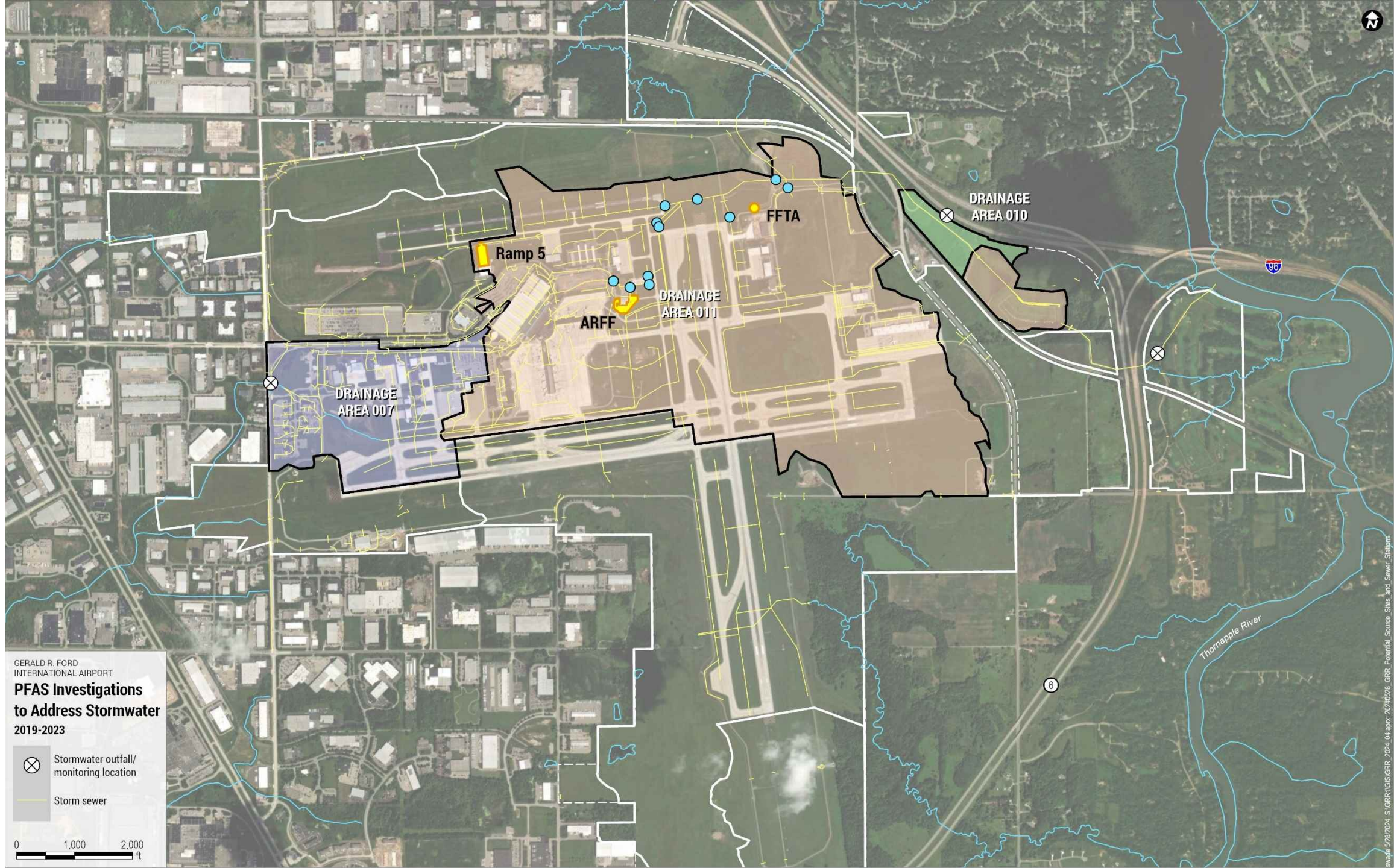
PFAS composition and distribution comparison



PFAS composition & distribution for the outfall samples was nearly identical to stormwater near the ARFF station



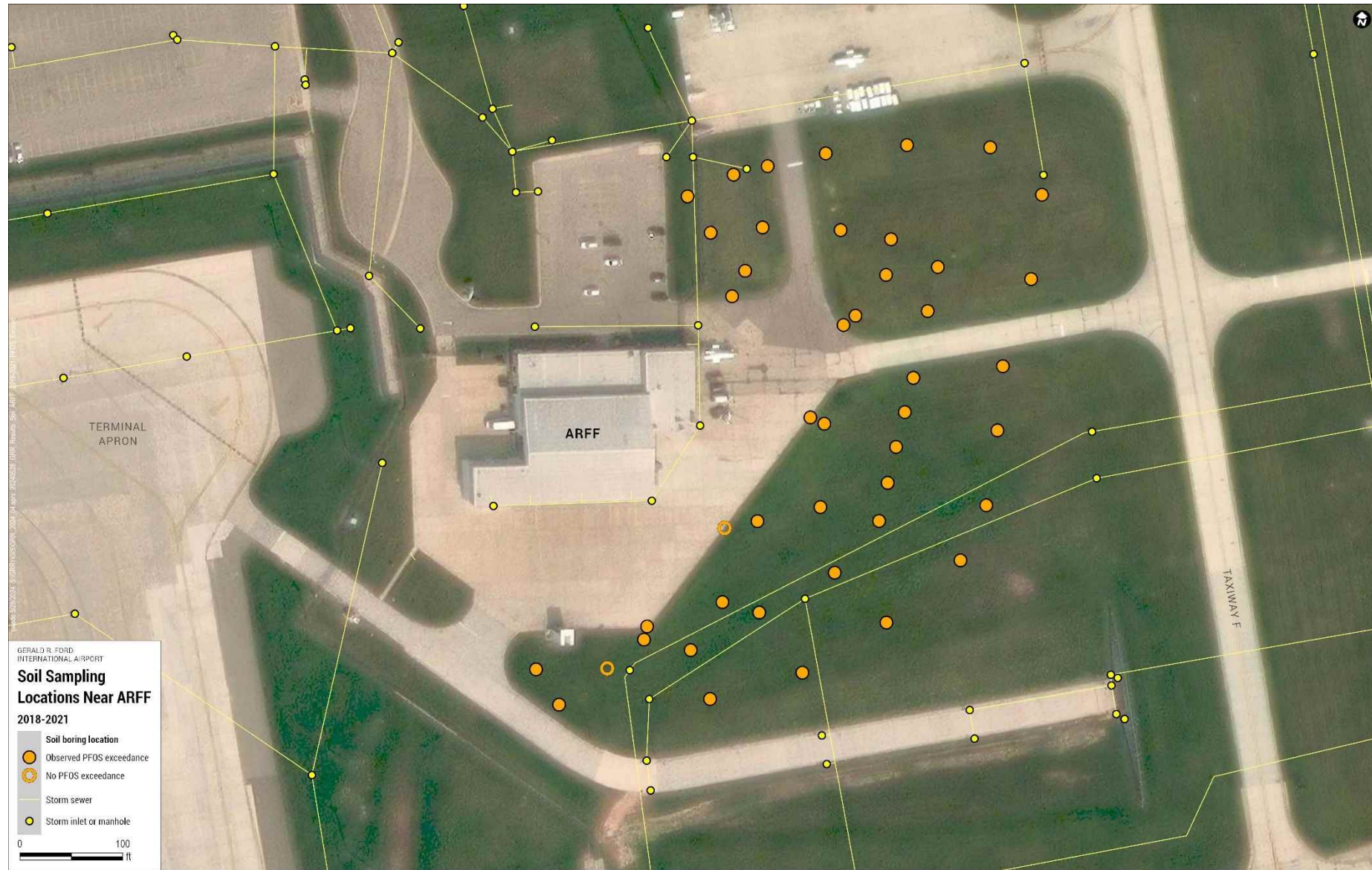
Source Identification



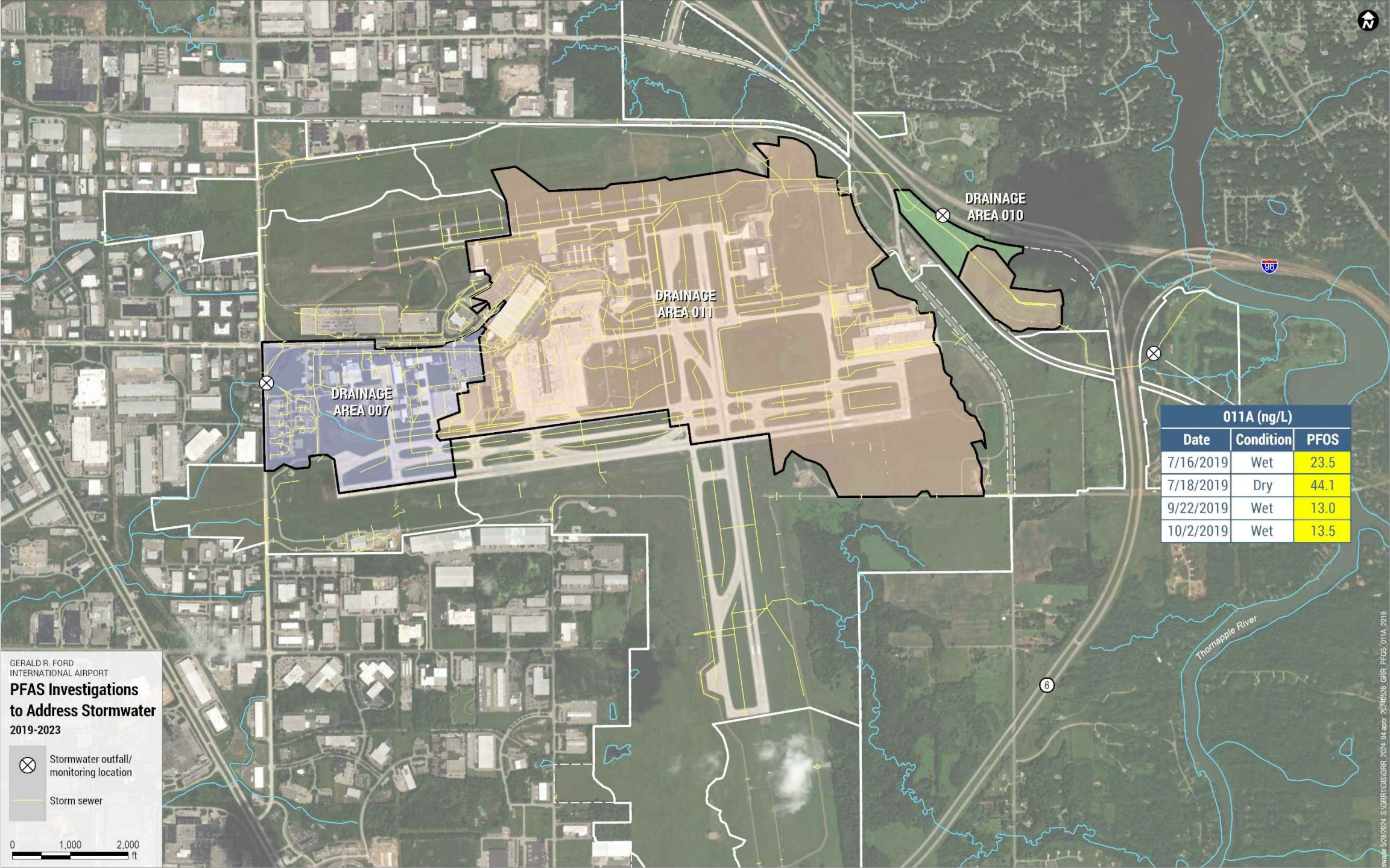
- Sewer sampling showed PFAS concentrations increased nearer the ARFF station
- Ruled out other major sources



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- Ruled out other major sources



Source Identification



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0 1,000 2,000
ft

011A (ng/L)		
Date	Condition	PFOS
7/16/2019	Wet	23.5
7/18/2019	Dry	44.1
9/22/2019	Wet	13.0
10/2/2019	Wet	13.5

Evaluation of Solutions

Identifying and verifying the source did not mean the problem was solved:

- More than 28,000 c.y. of impacted soil covering nearly 6 acres
- Removal of impacted soil difficult due to slopes, infrastructure, and airfield location
- Disposal is expensive
- Needed to consider other options:
 - Soil stabilization
 - Stormwater treatment



Soil Stabilization

- The Airport applied for an *Environmental Mitigation Pilot Program* grant from the FAA
 - Initial application in 2021
 - Final application and approval in 2022
- Study objective is to determine effectiveness of selected additives for stabilization of PFAS in soil
 - Rembind
 - Fluorosorb
- Team led by CDM Smith (presentation by CDM Smith earlier this week)
- Moving forward with field pilot using Rembind, based on bench testing results and field data
- Currently working on construction of field pilot test cells



Stormwater Treatment

Evaluation of stormwater treatment potential, in parallel with stabilization testing

- Alternative or supplement to soil stabilization
- Key question: Is in-stream treatment of stormwater feasible?



Stormwater Treatment

- Initial bench testing performed using a product called “AquaGate+RemBind” produced by AquaBlok
- Samples of stormwater collected from airport stormwater channels
- Bench testing performed:
 - Adsorption kinetics tests to determine time required to achieve the desired removal of PFAS
 - Adsorption capacity tests to determine the amount of PFAS that can be adsorbed to a given mass of treatment media

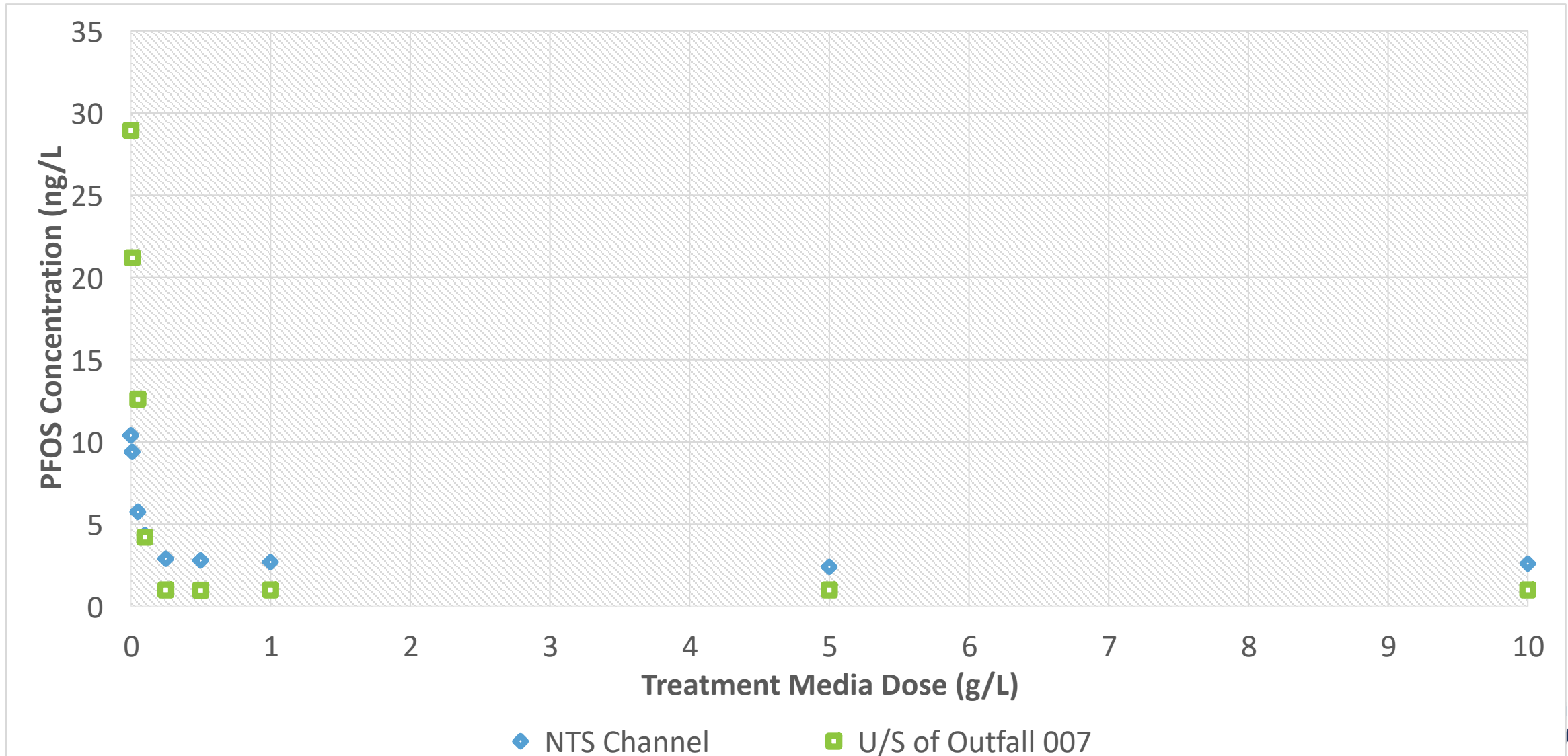


Initial Bench Testing Results (Kinetic)

Testing Contact Time	PFOS Concentration in stormwater from NTS upstream of Outfall 011 (ng/L)	PFOS Concentration in stormwater from drainage channel upstream of Outfall 007 (ng/L)
0.0 hour	15.0	39.3
0.17 hour (10 minutes)	ND (MDL = 0.98 ng/L)	1.3
0.5 hour	ND (MDL = 1.0 ng/L)	ND (MDL = 0.98 ng/L)
1 hour	ND (MDL = 1.0 ng/L)	ND (MDL = 0.98 ng/L)
24 hours	ND (MDL = 0.98 ng/L)	ND (MDL = 0.98 ng/L)



Initial Bench Testing Results (Sorption Capacity)



Stormwater Treatment

Bench test findings:

- < 10 minutes contact time required for treatment of PFOS
- Media dose of 0.25 g/L sufficient for treatment

Next steps:

- Currently performing bench tests with another product (AquaGate+Fluorosorb), also produced by AquaBlok
- Field pilot testing planned with one of the products used in bench tests



Thank you!

Scott Bell

sbell@limno.com

www.limno.com

LinkedIn: @Scott Bell

