



IDENTIFY. RESOLVE.

PFAS flux measurement as an important line of evidence

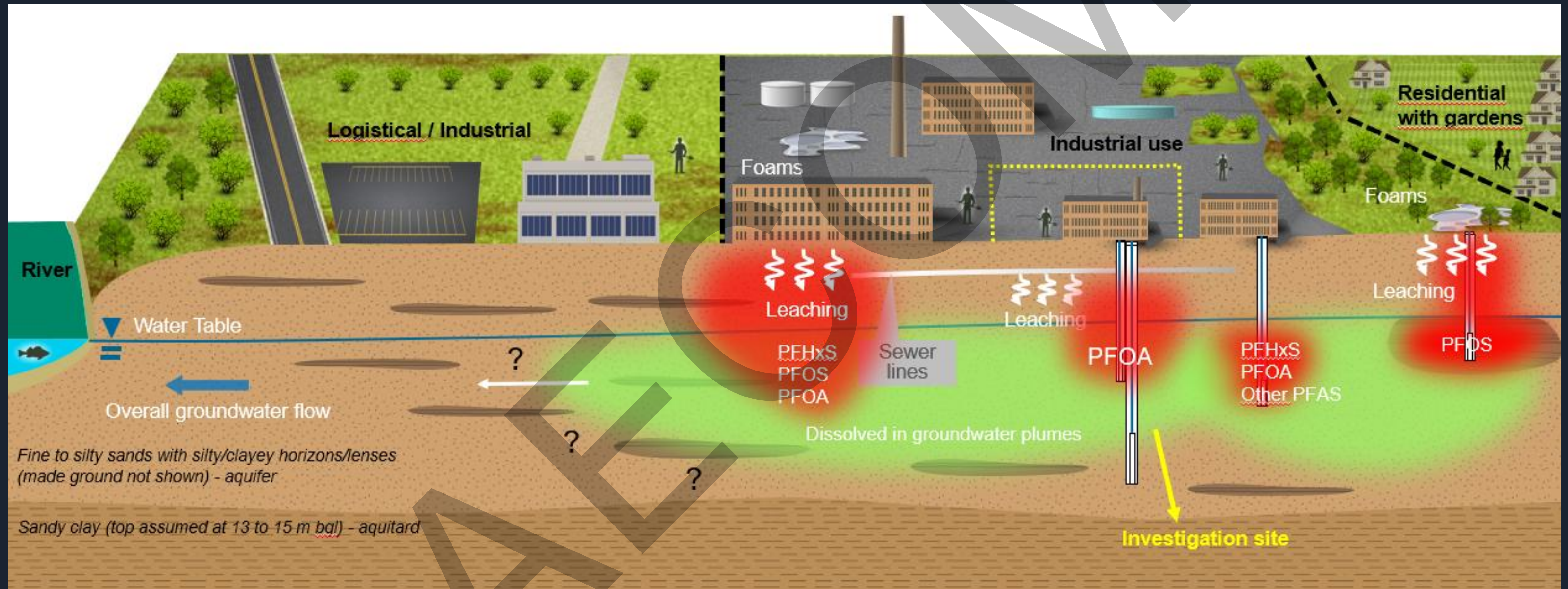
7th International PFAS Conference Paris
17 June 2026

William Leys
AECOM PFAS Lead Europe

AECOM Imagine it.
Delivered.

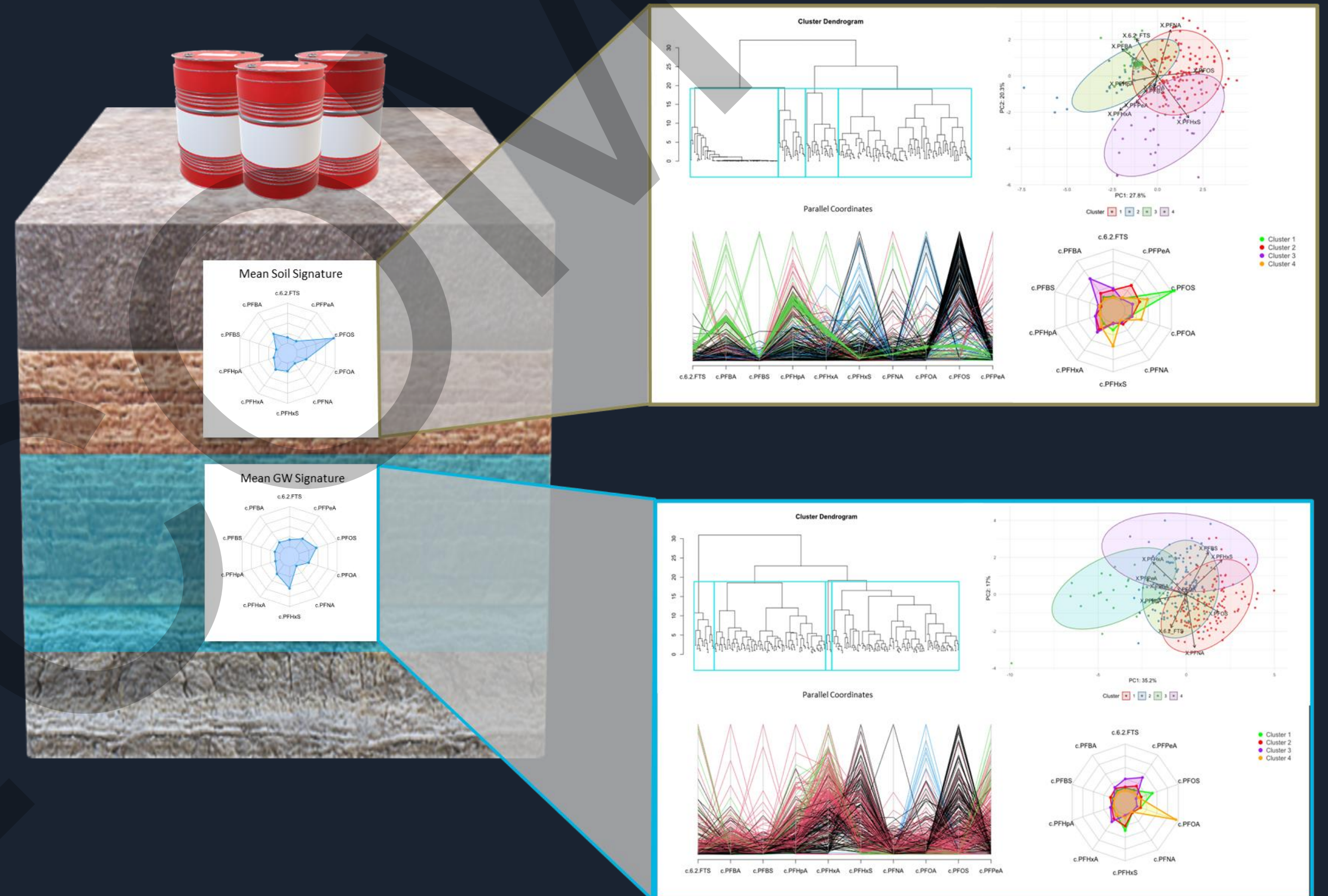
iFLUX 

Conceptual Site Model (CSM)



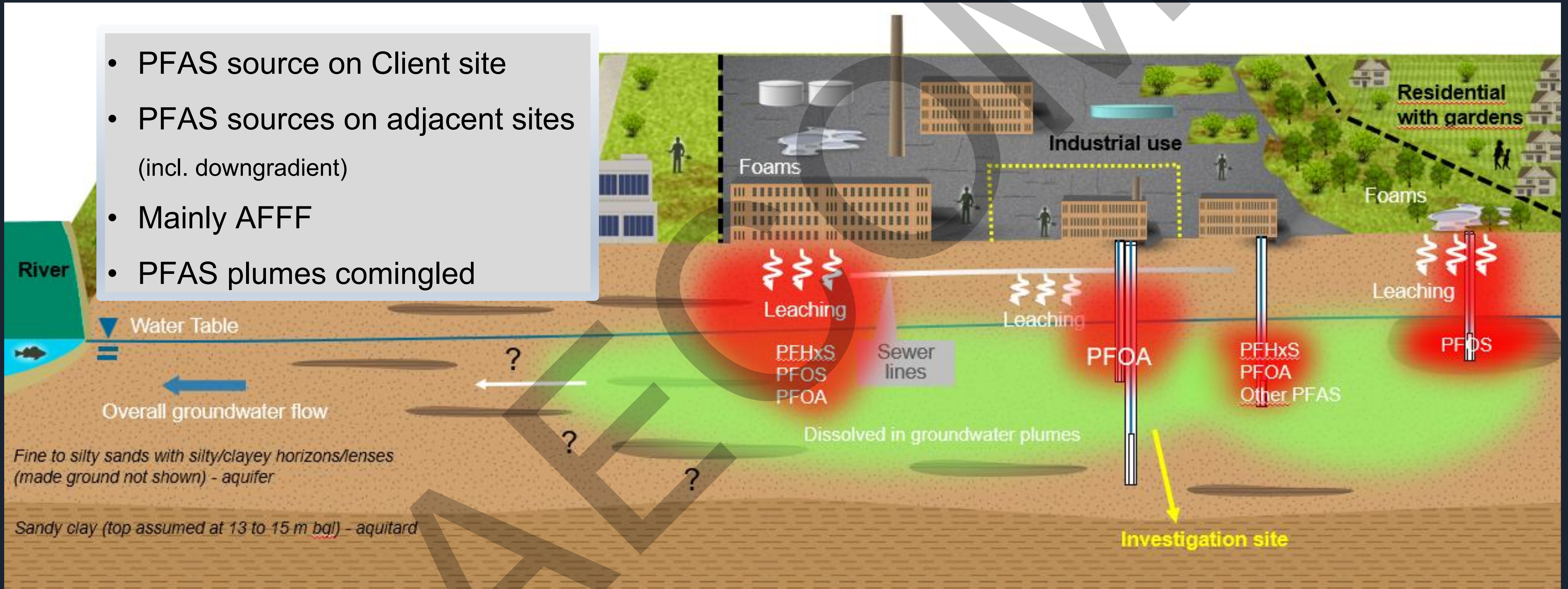
Refining the CSM

- Historical investigation
- Soil & groundwater sampling
- PFAS analysis (target analysis)
- Vertical delineation
- Horizontal delineation
- Chemometrics / Forensic Analysis



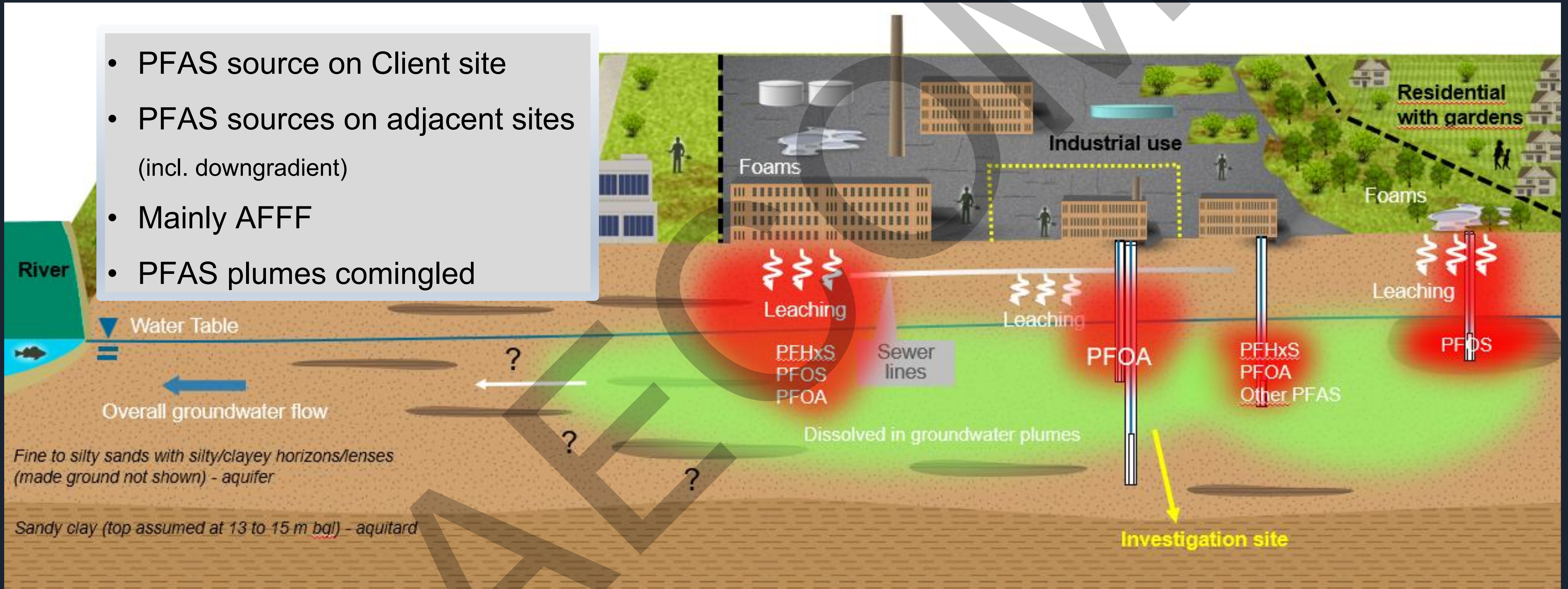
Conceptual Site Model

- PFAS source on Client site
- PFAS sources on adjacent sites (incl. downgradient)
- Mainly AFFF
- PFAS plumes comingled



Conceptual Site Model

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Question: Do we expect a migration risk from the Client's site to deeper groundwater and / or to the down-gradient river?

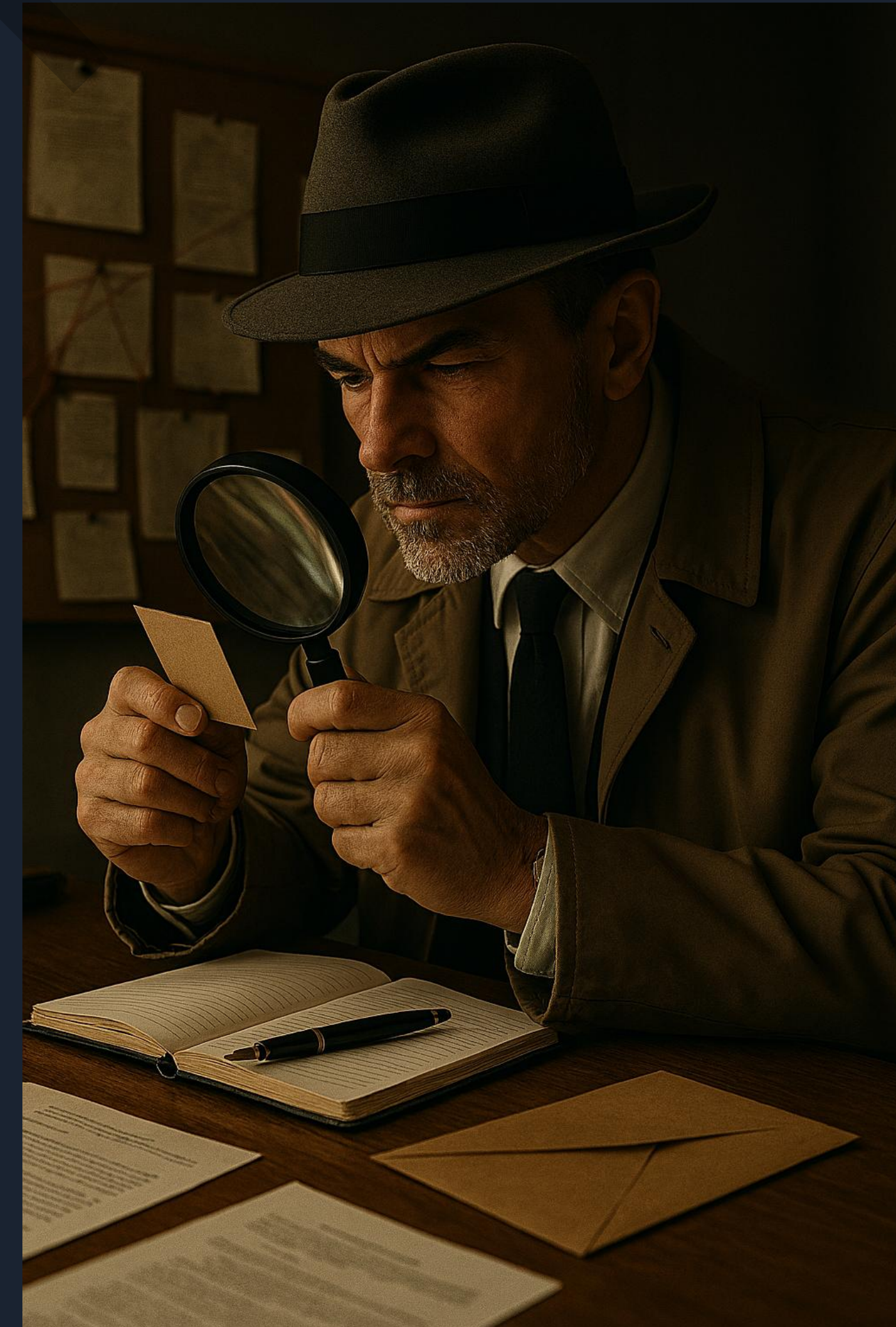
Migration Risk – additional lines of evidence? (1/2)

What do we already know?

- General groundwater characteristics (level, velocity & direction)
- Hydraulic conductivity based on grain size analysis
- Site specific soil structure & textures
- Risk receptors: deeper groundwater & river

What would help us to understand the migration risk?

- Detailed hydraulic conductivity along the vertical profile
- Detailed groundwater & mass flux along the vertical profile
- Potential seasonal variation
- What's the mass flux to:
 - ✓ Downgradient off-site existing PFAS impacts
 - ✓ Downgradient risk receptor (river)
 - ✓ Deeper groundwater



Source: generated with Copilot

Migration Risk – additional lines of evidence? (2/2)

How can we investigate?

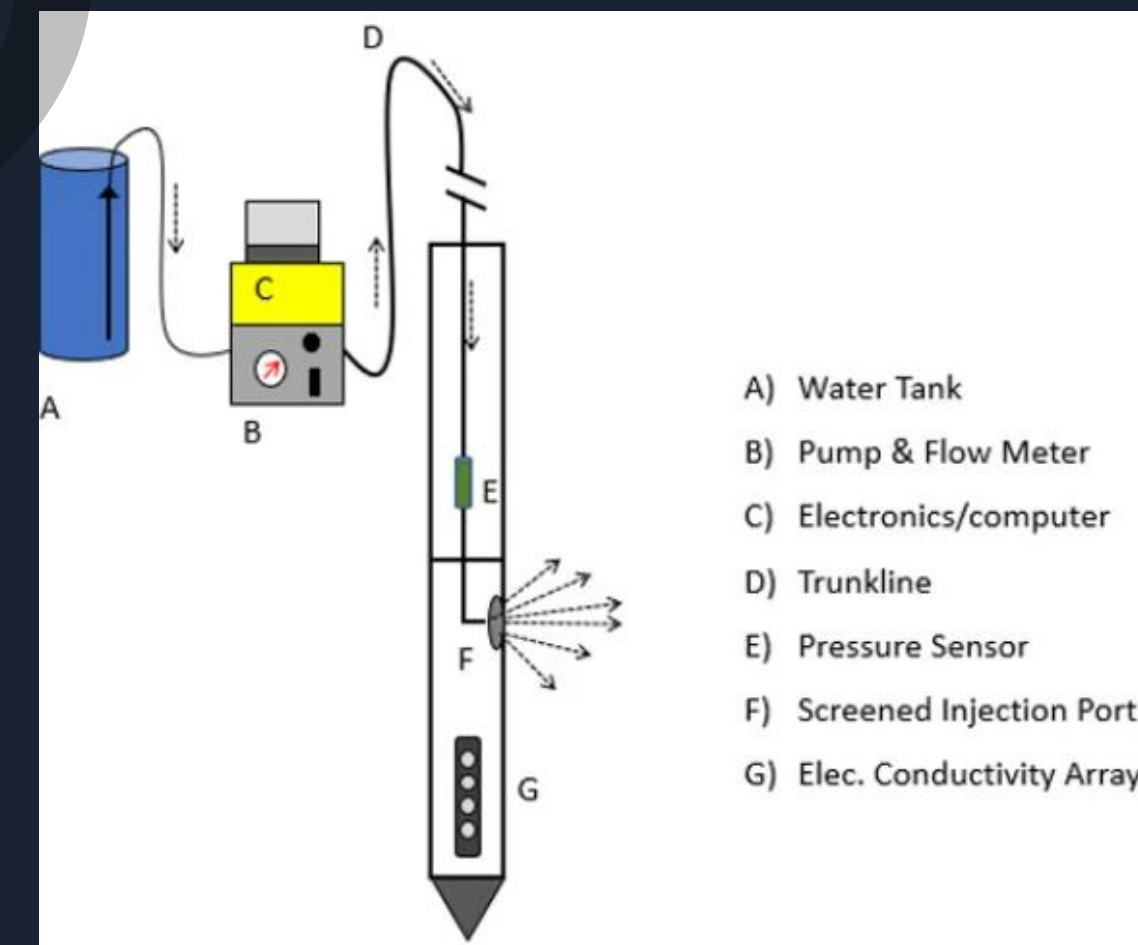
- Semi-annual groundwater sampling
- Groundwater level measurements via divers
- In-situ hydrological profiling via Hydraulic Profile Tool (HPT)
- Semi-annual mass flux measurements (iFLUX)



Source: Royal Eijkelpkamp



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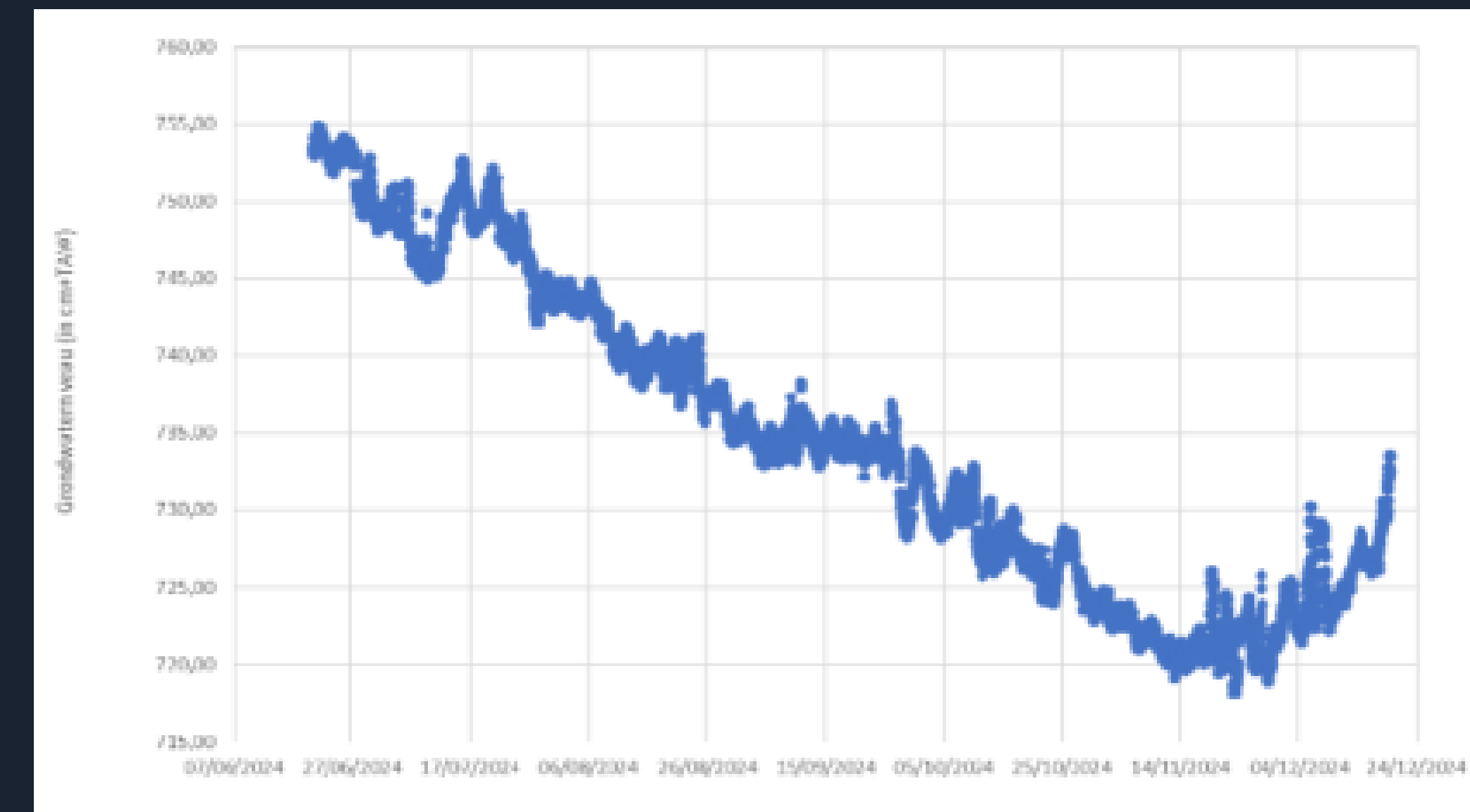
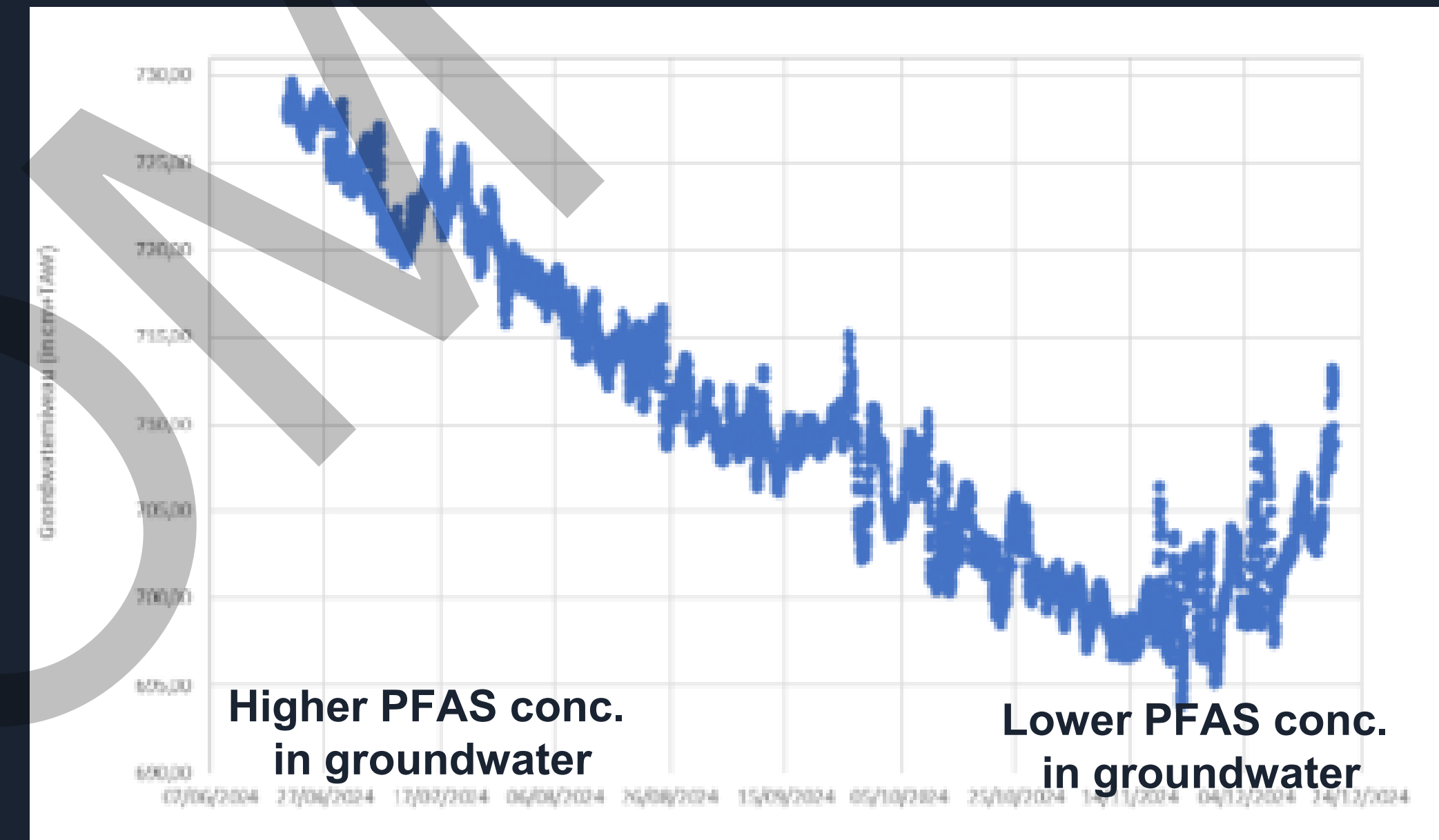
Source: Geoprobe



Source: iFLUX

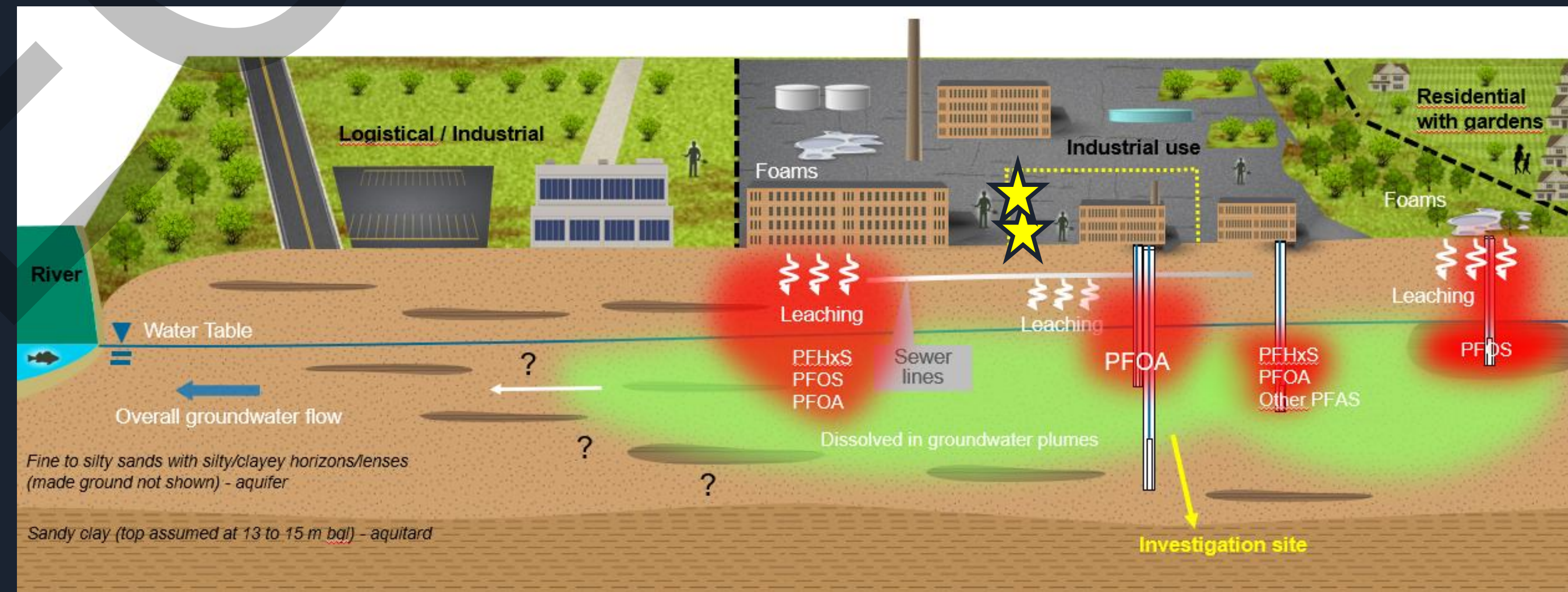
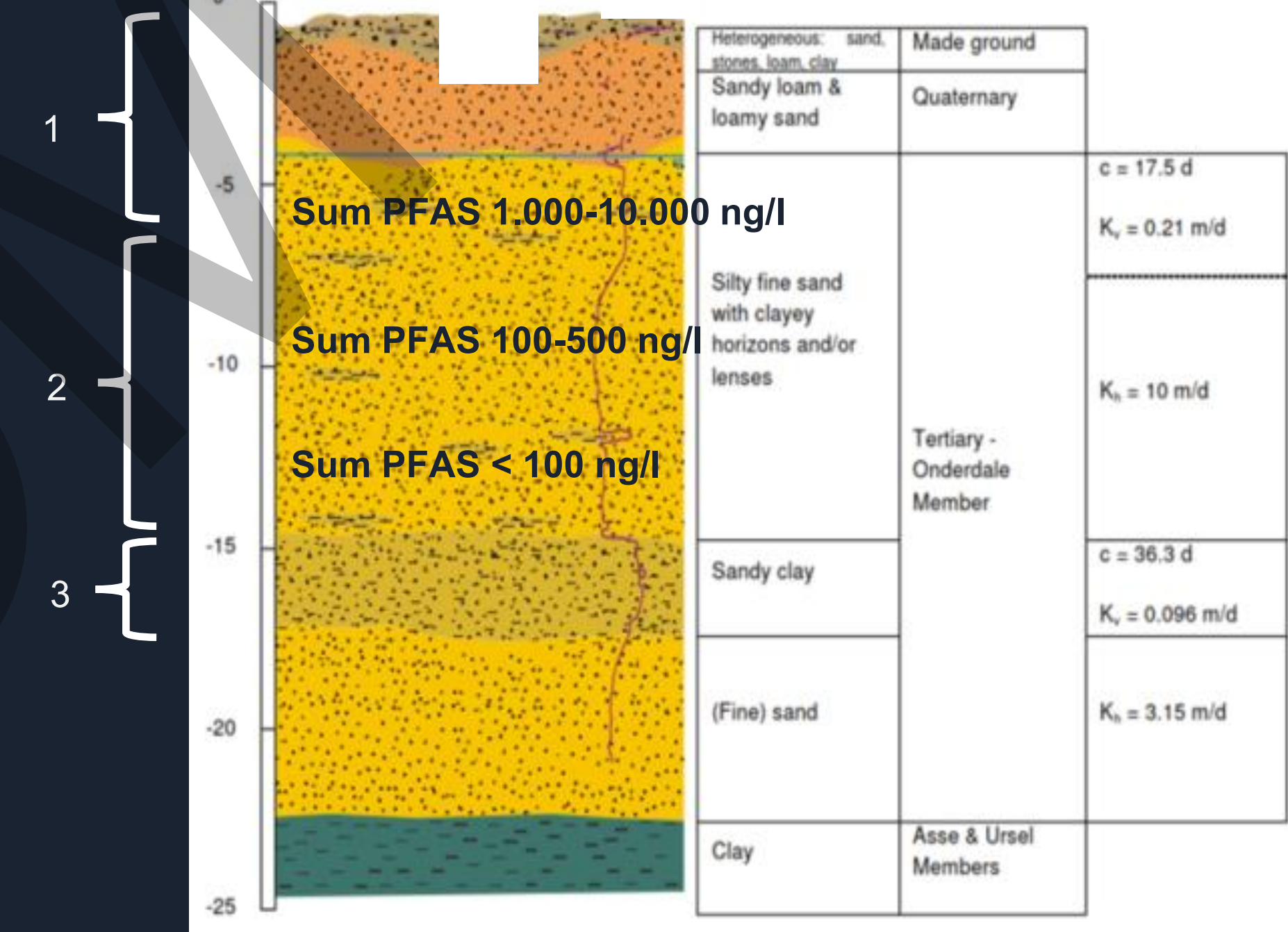
Seasonal effects

- Measure seasonal groundwater dynamics:
 - ✓ Groundwater level $\pm 4,5$ m-bgl
 - ✓ 2 semi-annual groundwater sampling events
 - ✓ 6 months diver measurements (June – December)
- Observations
 - ✓ Groundwater concentrations vary with groundwater level fluctuations
 - ✓ Higher PFAS concentrations when groundwater is high (leaching from soil impact)



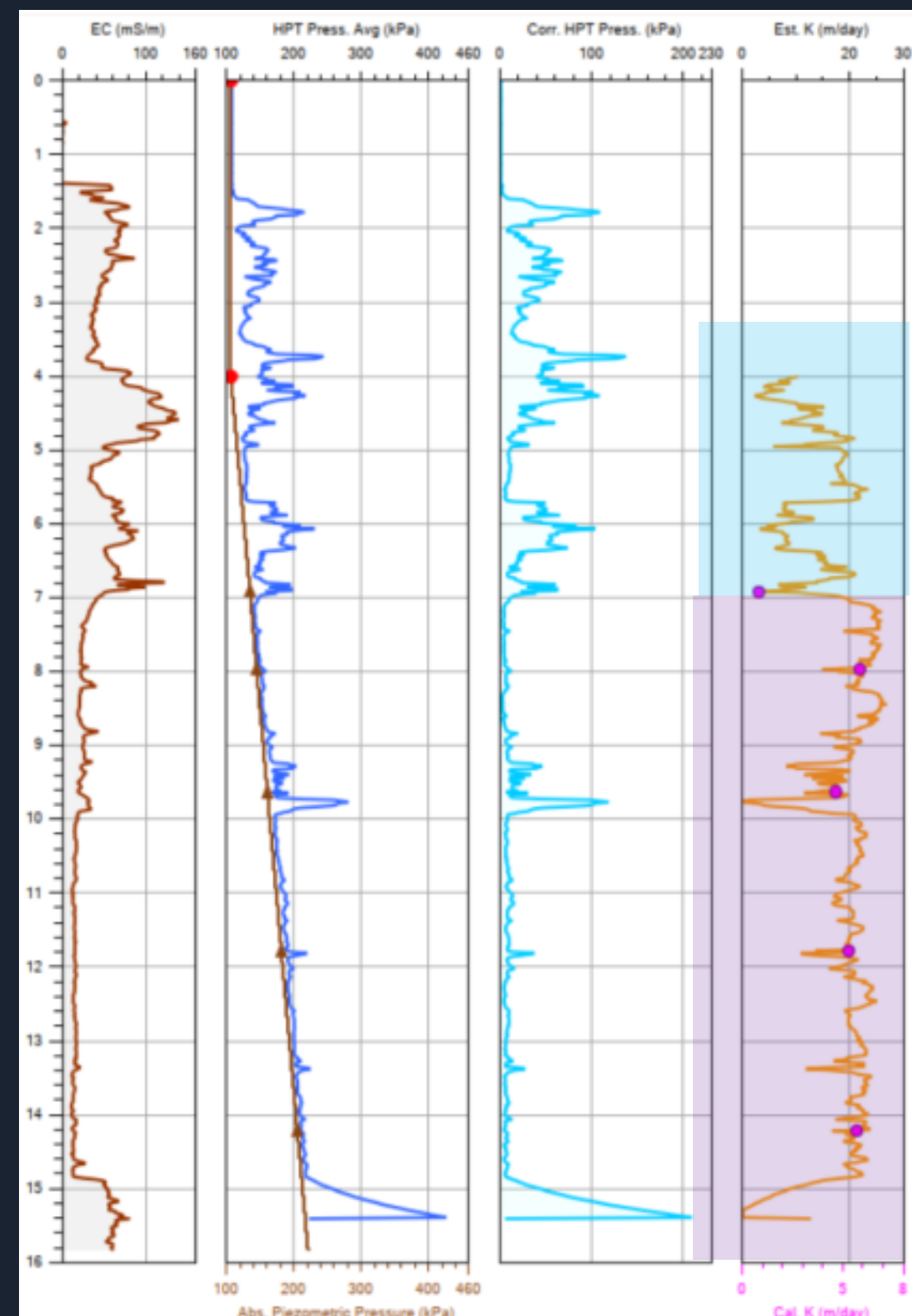
HPT – detailed geohydrology

- Regional
 - ✓ (Quaternary) soil until $\pm 7,0$ m-gl: $K_h < 1$ m/day (1)
 - ✓ Deeper (Tertiary) sandy soil: $K_h > 10$ m/day (2)
 - ✓ Deeper sandy clay (\sim Aquitard) (3)
- Western groundwater direction
- Detailed in-situ characterization on 2 locations

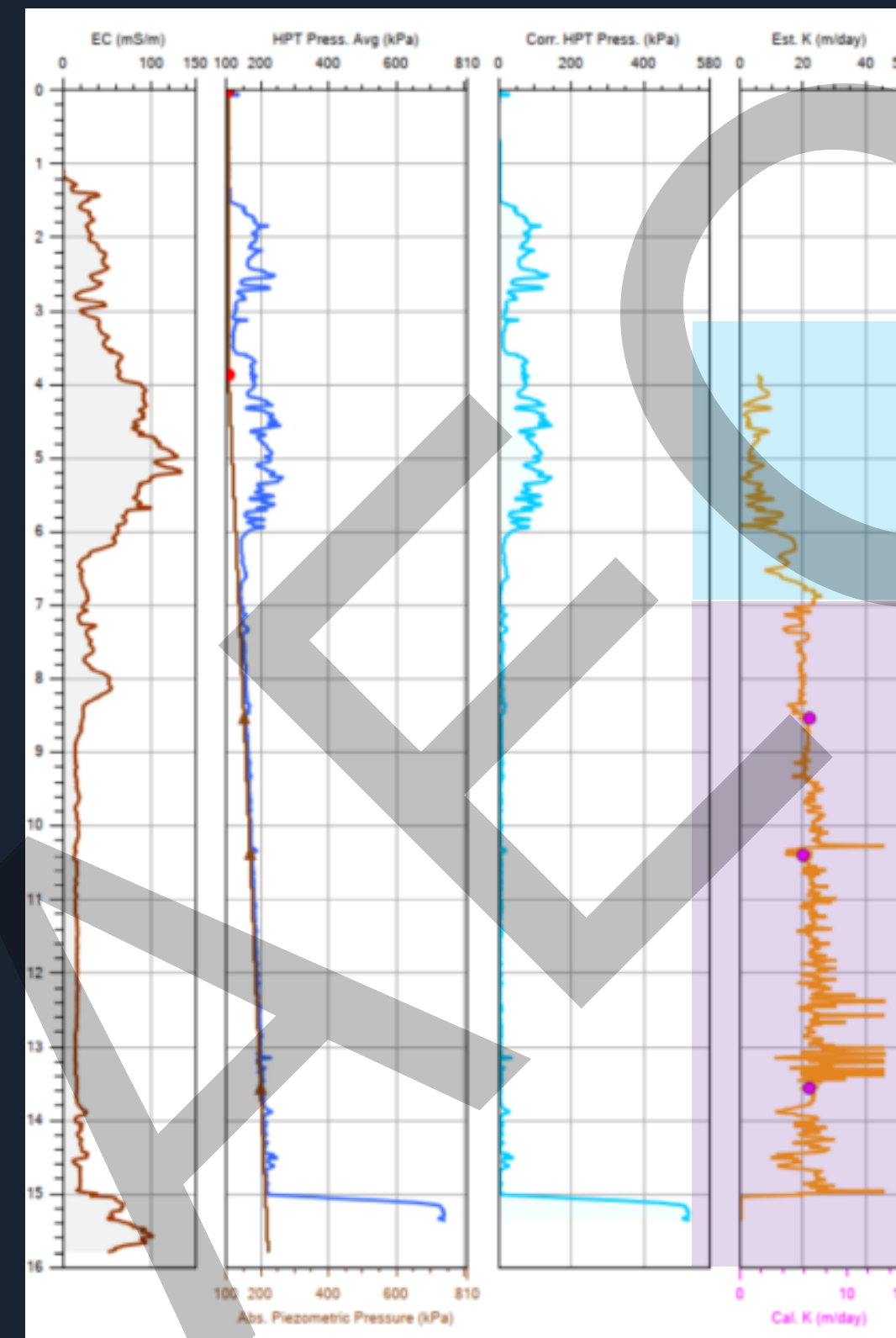


HPT – detailed geohydrology

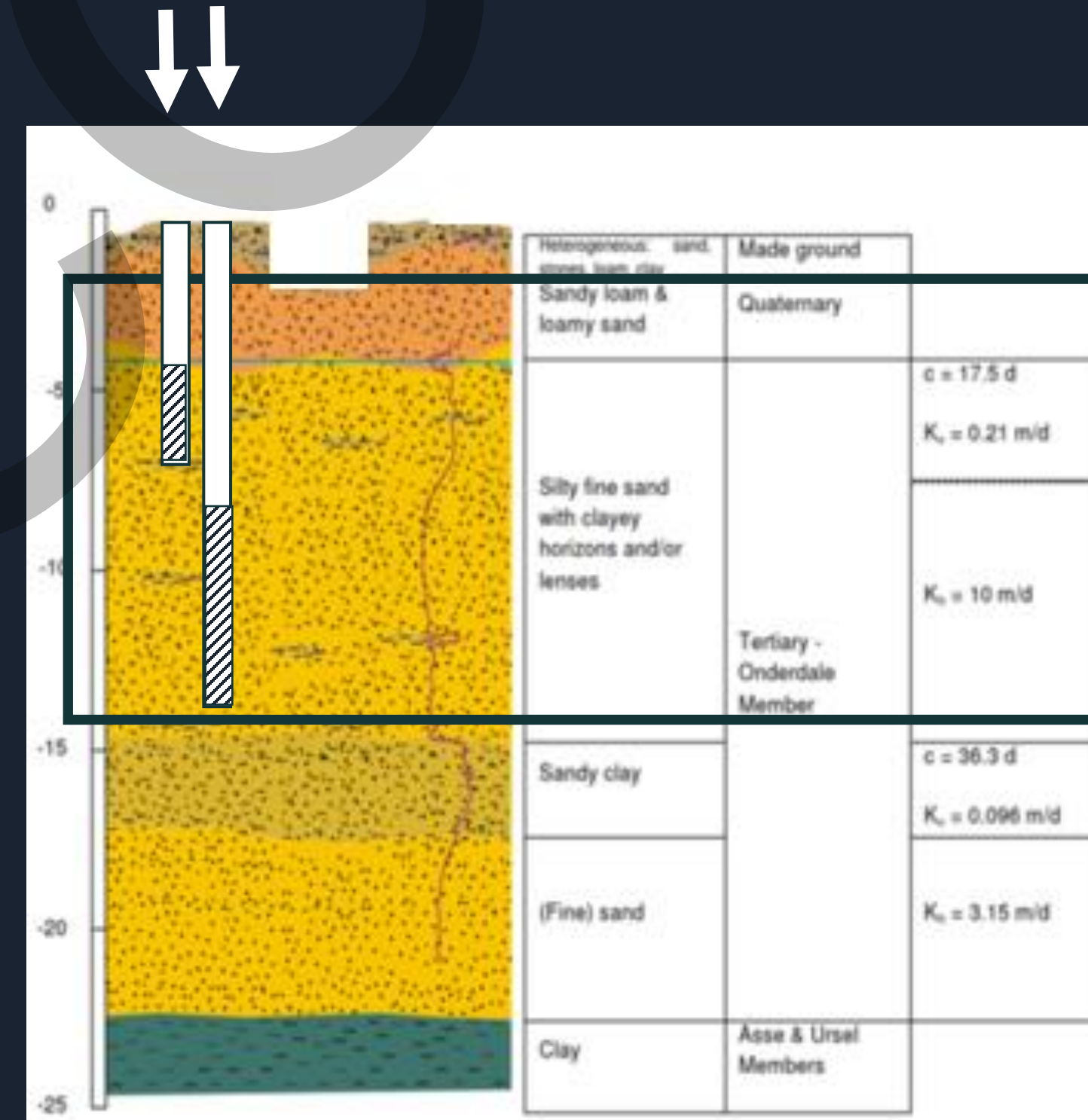
- In-situ hydrological profiling via Hydraulic Profiling Tool (HPT)
- Based on HPT, 2 monitoring well clusters with optimized filter depths were installed to perform Flux measurements



Location 1



Location 2



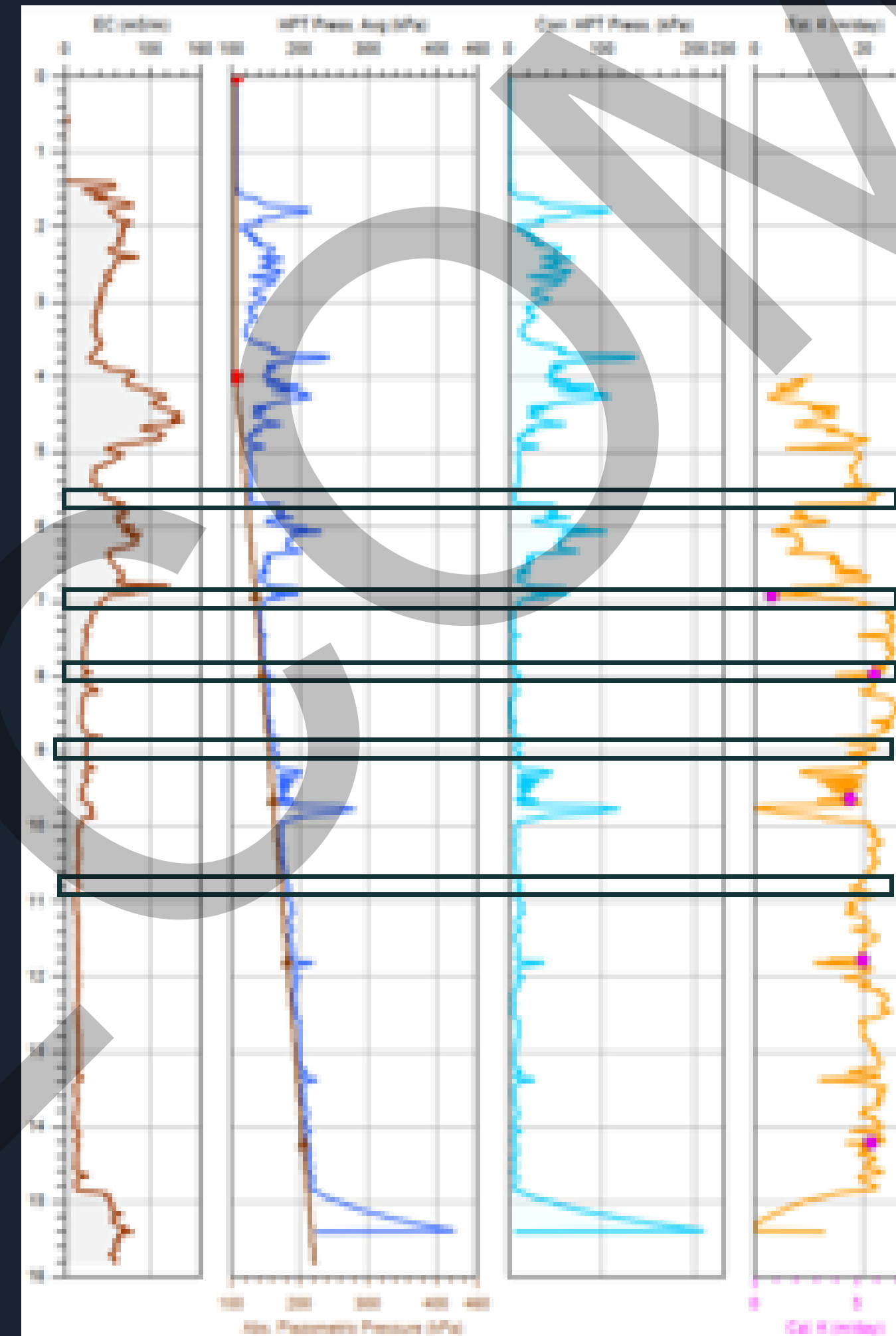
Learnings:

Higher K (± 3 m/d)
(heterogeneously sorted)

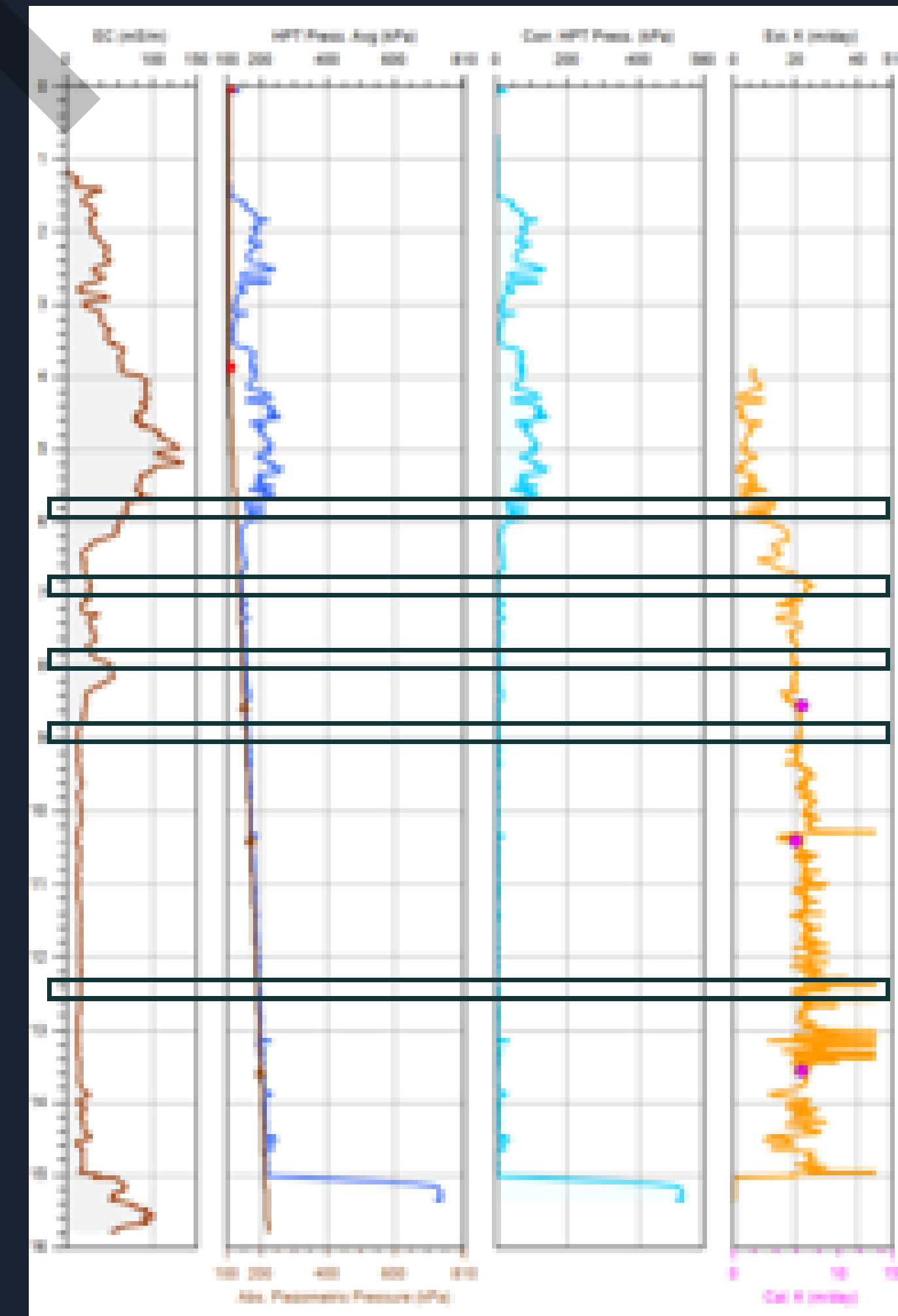
Lower K (± 7 m/d)
(homogeneously sorted)

iFlux cartridges

- 2 events (summer – fall)
 - ✓ event 1: 11 compounds
 - ✓ event 2: 41 compounds
- 5 depths in 2 wells based on HPT
 - ✓ 2 x PFAS flux : 5 to 7 m –bgl
 - ✓ 3 x PFAS flux : 7 to 13 m –bgl
- Exposure time
 - ✓ Based on observed groundwater concentrations and estimated groundwater velocity
 - ✓ ± 4 weeks to achieve sufficiently low detection values



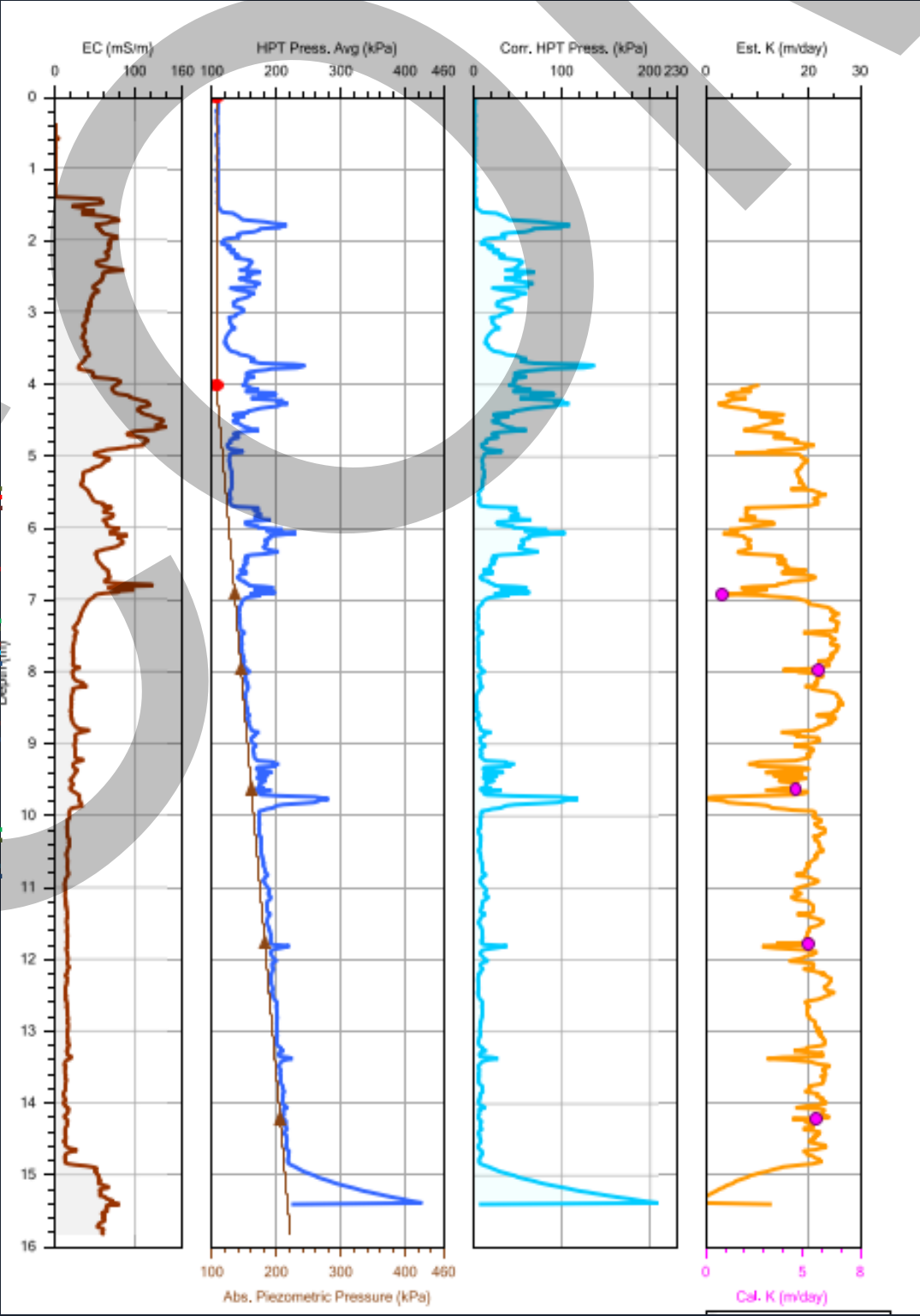
Location 1



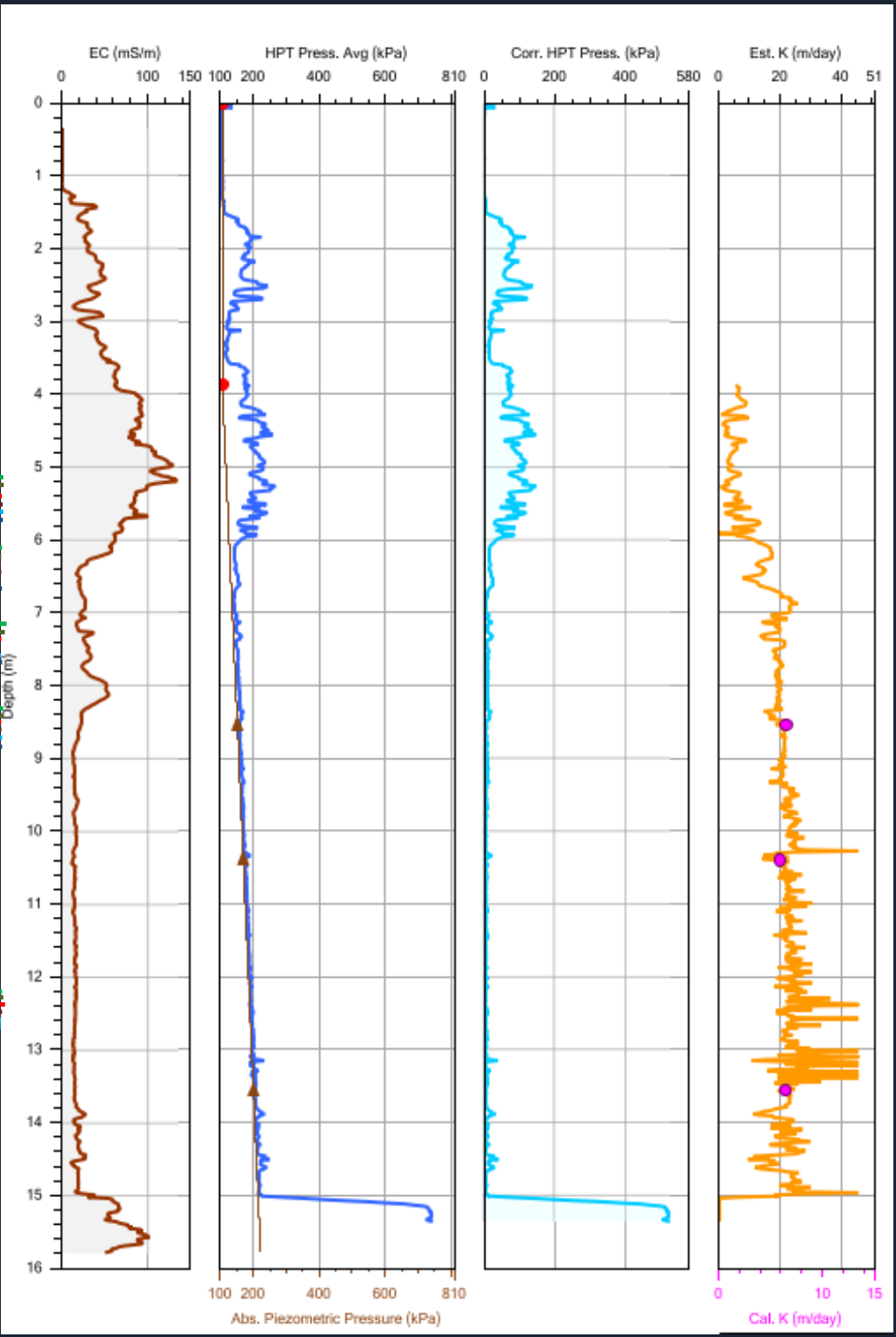
Location 2

Flux observations & evaluation

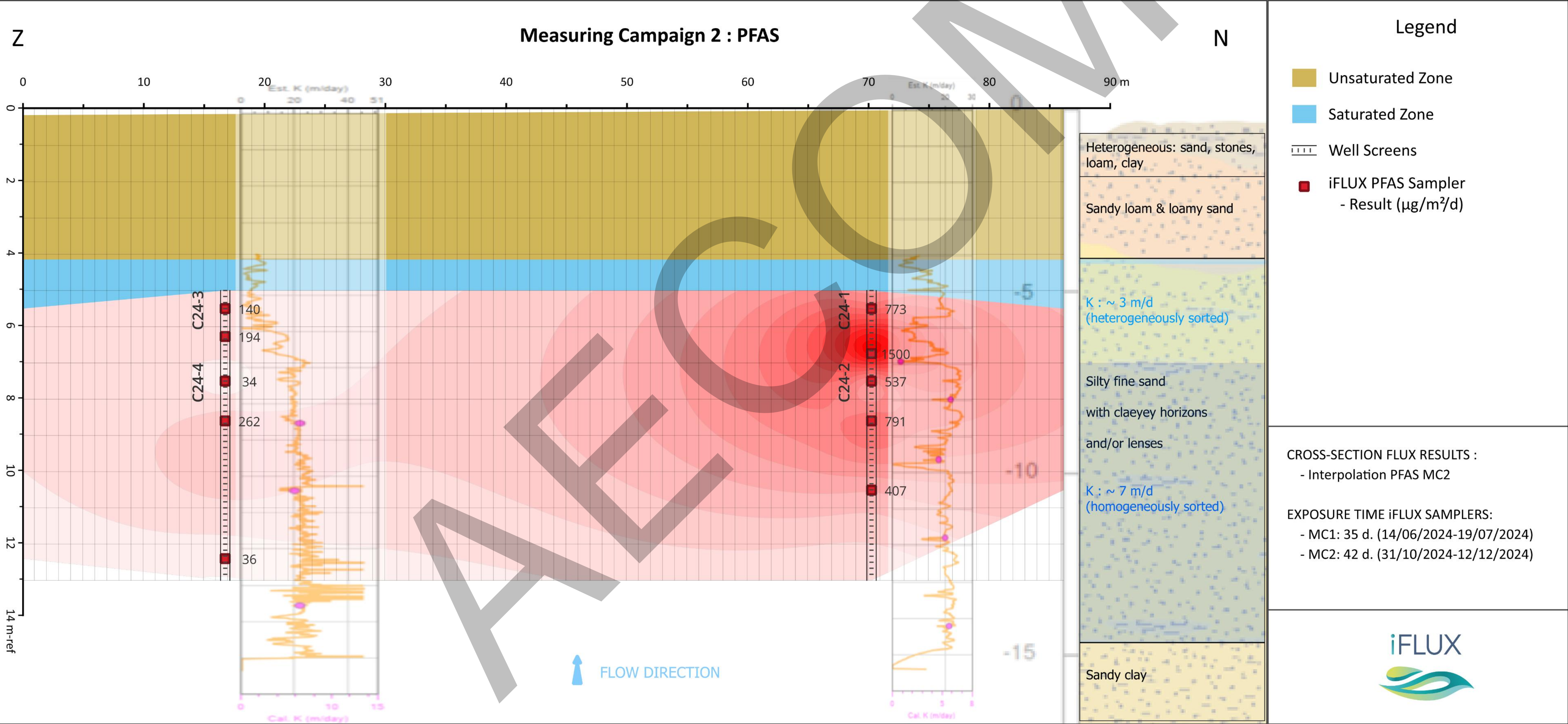
PFAS totaal voorjaar
PFAS totaal najaar
PFOA voorjaar
PFOA najaar
PFHxS voorjaar
PFHxS najaar



PFAS totaal voorjaar
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PFHxS voorjaar
PFHxS najaar



Flux - waarnemingen en evaluatie



Flux observations & evaluation

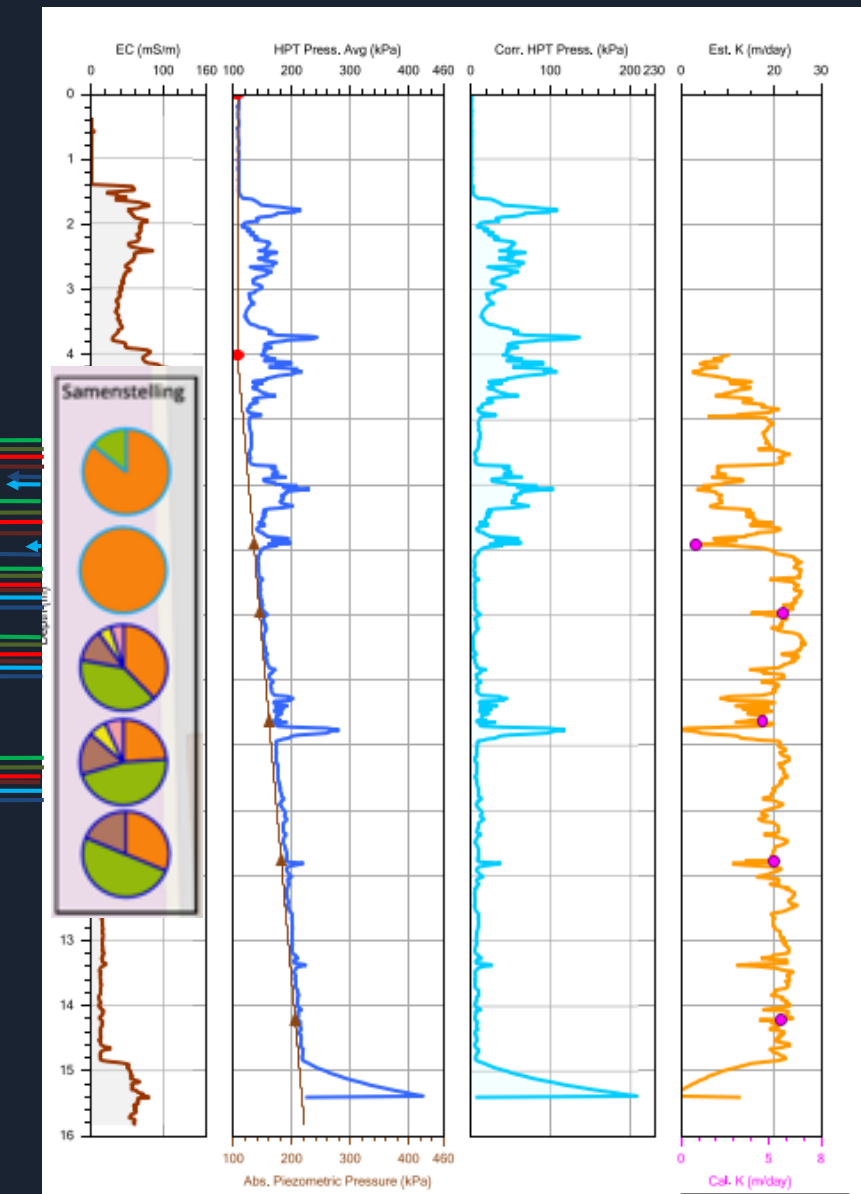
- Observations

- ✓ Seasonal variation, higher flux in autumn event
- ✓ Spatial variation, higher flux on one location
- ✓ Main CoC: PFOA and PFHxS

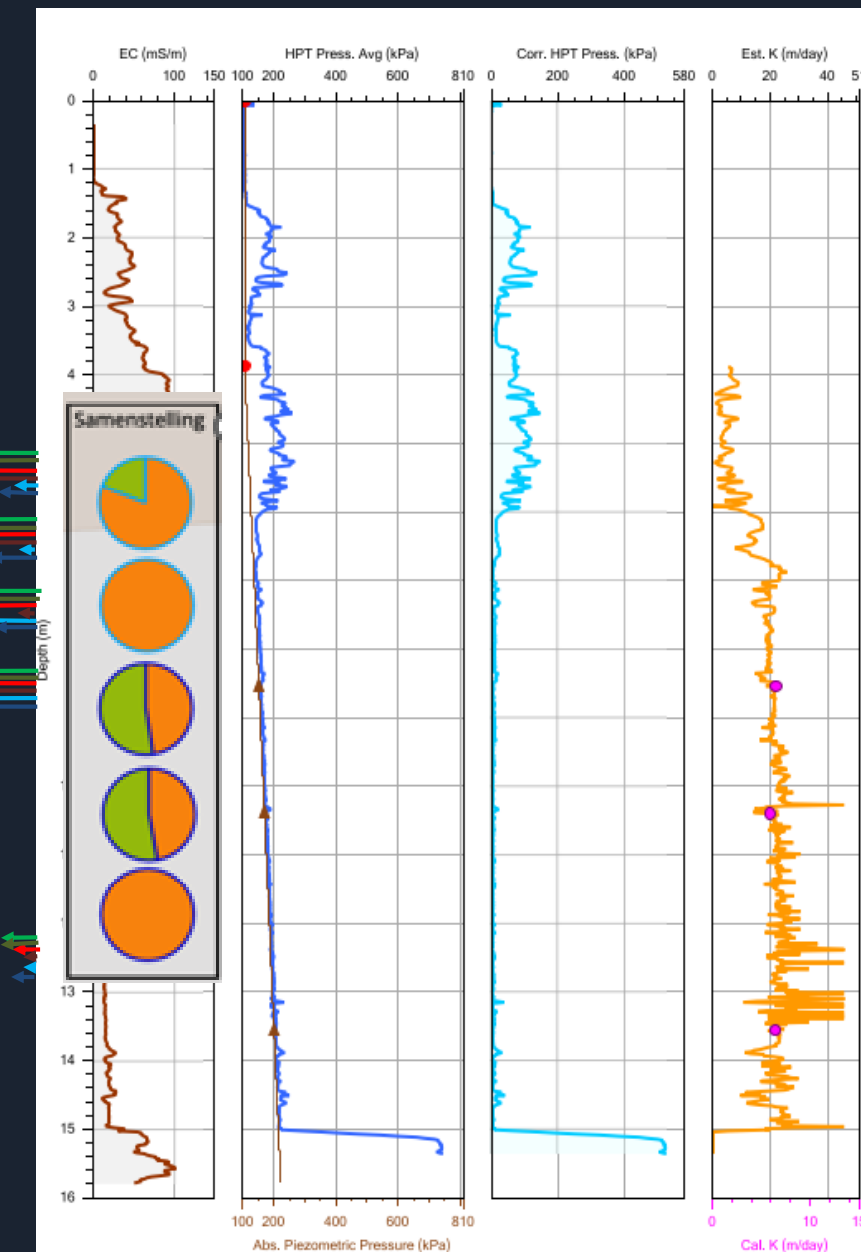
- Evaluation

- ✓ Shallow (lower permeable) aquifer
 - Non-negligible mass fluxes
 - Impact analysis on down-stream receptor
- ✓ Deeper (higher permeable) aquifer
 - Significantly lower (and more stable) flux in deeper aquifer
 - Correlated with lower PFAS concentrations
 - Migration to and via deeper sandy soil is negligible

PFAS totaal voorjaar
PFAS totaal najaar
PFOA voorjaar
PFOA najaar
PFHxS voorjaar
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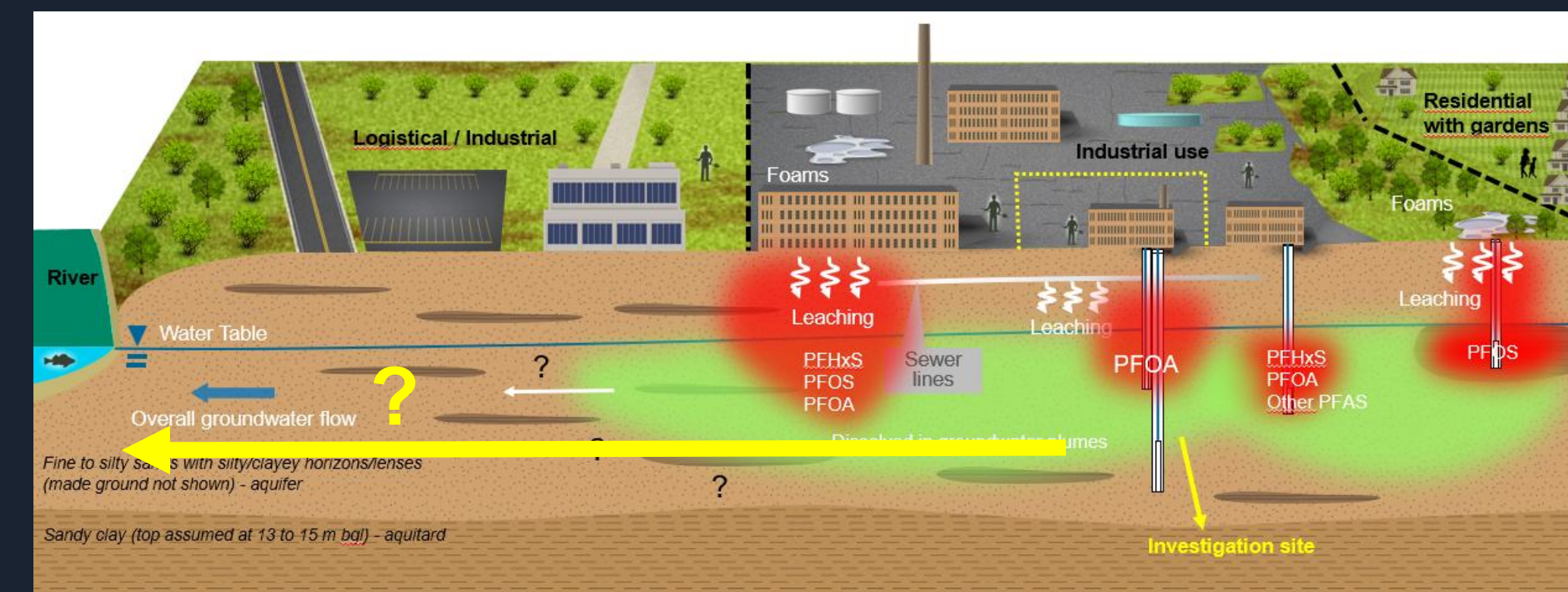
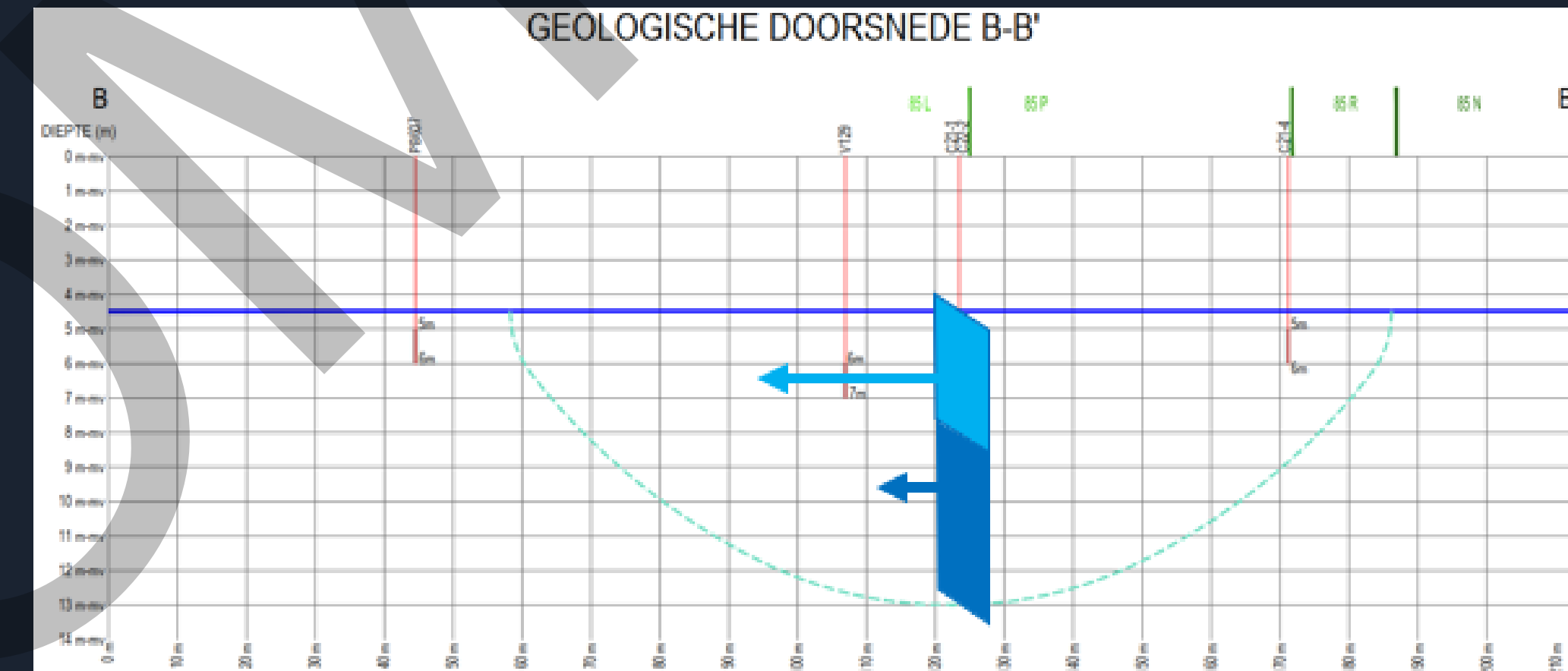
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PFHxS voorjaar
PFHxS najaar



Flux – river as receptor

- Conservative theoretical flux
- Based on measured flux at site border (worst case)
- Current average PFAS in the river 200 ng/l
- Calculate surface water impact in addition to current PFAS concentration in the river
 - ✓ Theoretically < 0,5 ng/l PFAS
 - ✓ Lower than current reporting limits
 - ✓ Lower than current guideline and/or threshold values

→ No 'unacceptable risks' expected from site-specific PFAS impact



Conclusions

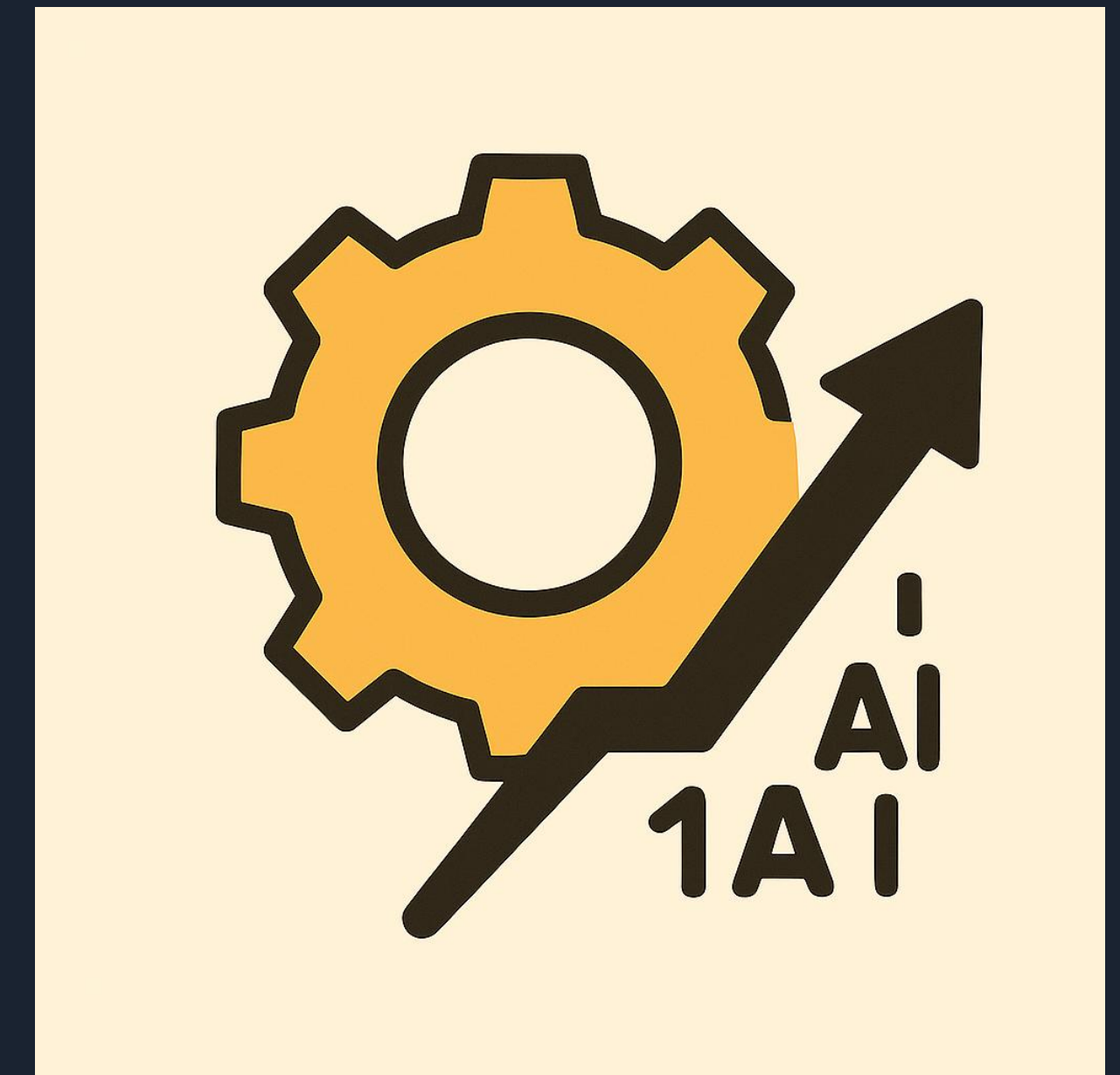
- Migration (flux) to and via the deeper aquifer is negligible
- No measurable impact on the downgradient river expected



Source: generated with Copilot

Added value of a detailed CSM and Flux based approach (1/2)

- Limits uncertainty
- Avoid conservative assumptions (overestimate or underestimate)
- Identifying mass flux variabilities
- Allows for a flux based remedial approach (if applicable)
 - ✓ aim on tackling highest fluxes
 - ✓ flux based monitoring during active remediation



Source: generated with Copilot

Added value of a detailed CSM and Flux based approach (2/2)

- Case specific
 - ✓ Site specific flux measurements and calculations helped to objectify the migration risk and discuss with the regulator
 - ✓ Limit liability
 - ✓ No Further Action (NFA)
 - ✓ Reduced Costs



Source: shutterstock

THANK YOU

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