

6^{ème} Congrès International – Gestion des Risques Environnementaux & Sanitaires

PFAS contamination of a water intake near a highway

Case analysis in Lavaux (Canton de Vaud – Switzerland)

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Geneva, November 27, 2025

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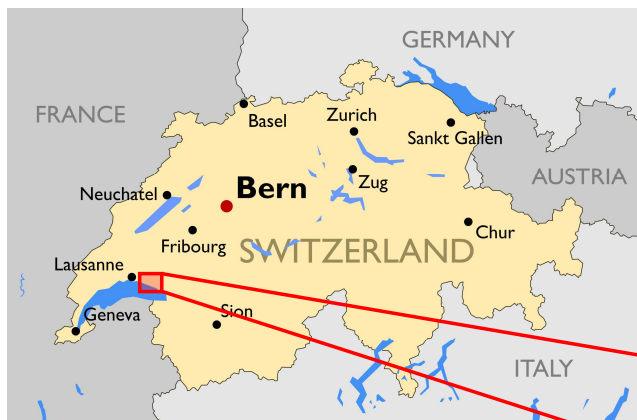
- **Context**
- **Historical Research**
- **Technical Investigations**
- **Reflections on the Origin of the Pollution**

Part 2

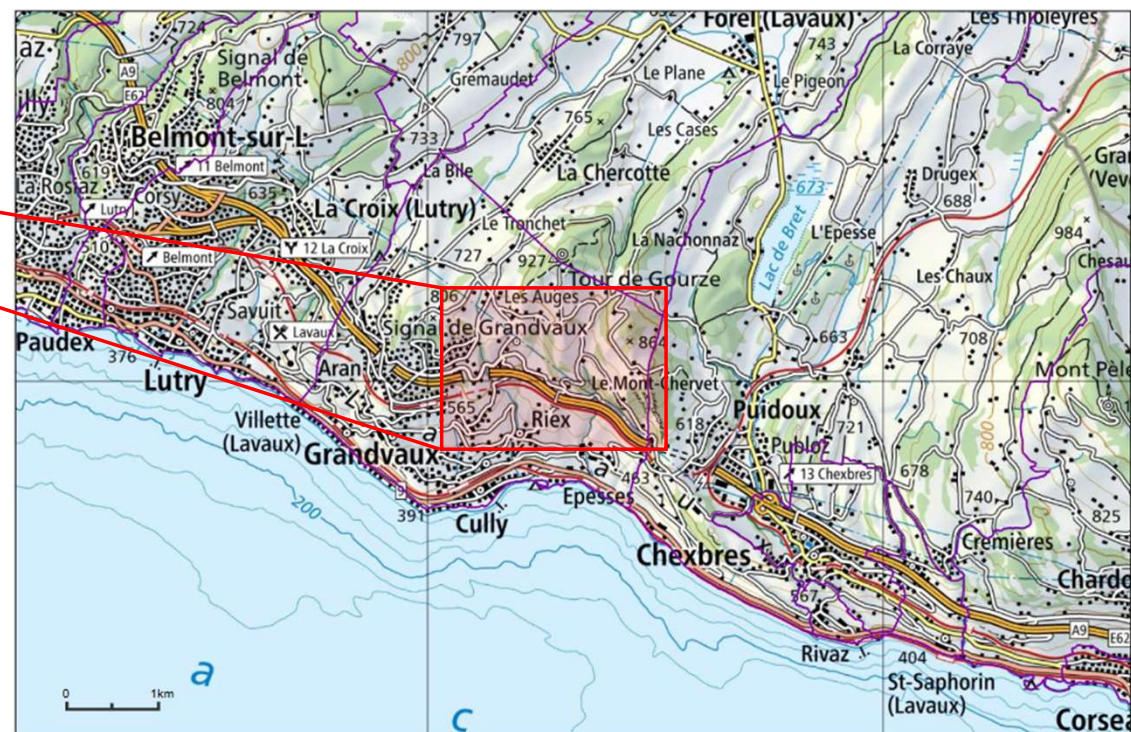
- **Investigations of the Structures**
- **Ongoing Investigations**
- **Consequences for Construction Site Practices**

Context – Location

Situation : Bourg-en-Lavaux – Canton of Vaud



Guichet professionnel - Etat de Vaud



Context – Location

Lavaux, a UNESCO World Heritage Site, with its terraced vineyards



Credit photographique : www.lavaux-unesco.ch

Context – Location

Transportation routes

- Lausanne-Fribourg-Bern railway line (ca. 1860)
- A9 motorway (ca. 1973)



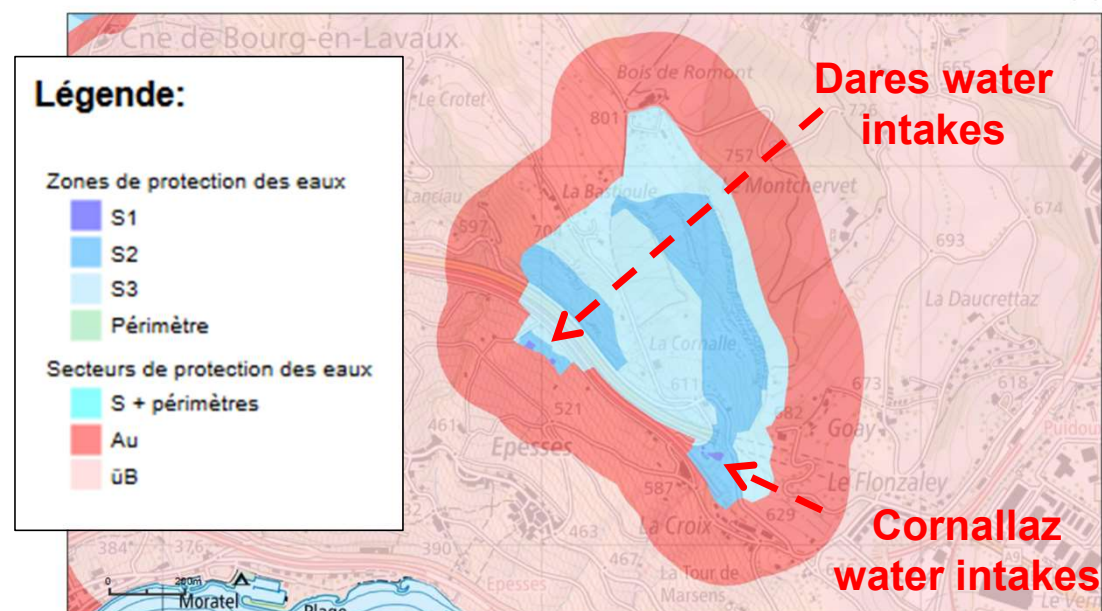
Context – Water protection

Drinking water intakes



Crédit photographique : Impact Concept SA

Protection zones

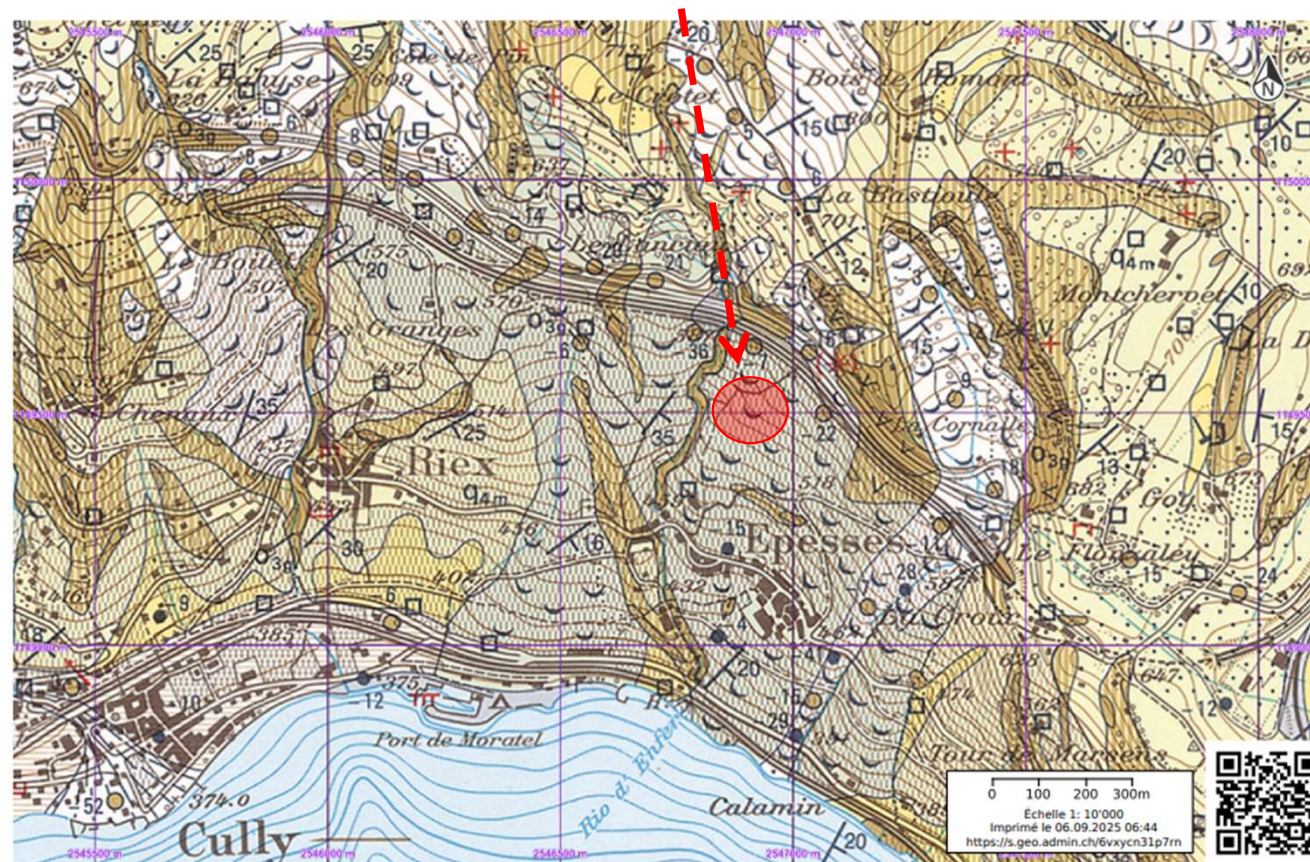


- Flow rate between 20 and 300 l/min
- Strong response to precipitation

Context – Water protection

Geology

Dares Intakes

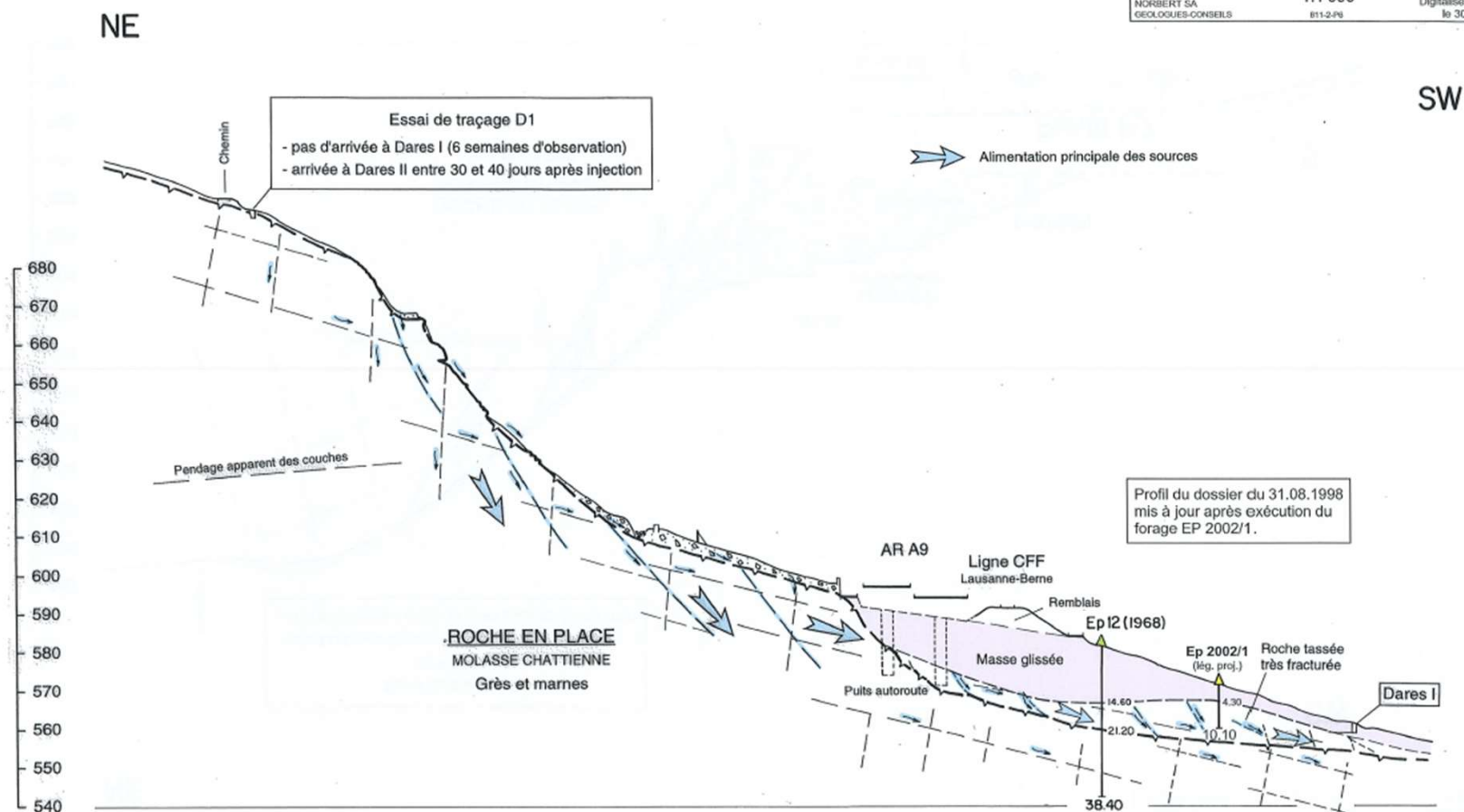


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Context – Water Protection

Hydrogeological profile



Source : Bureau technique Norbert Géologues-conseils SA

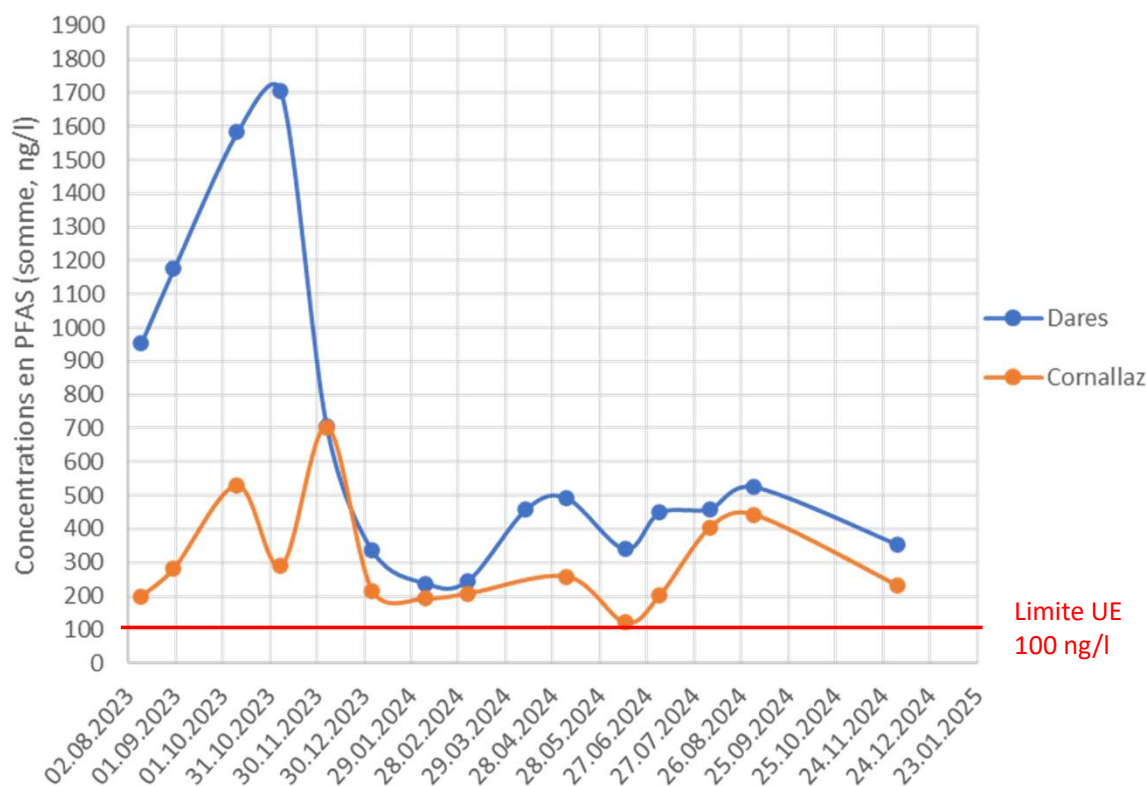
Context – Discovery of pollution

Chronology

- Discovery of PFAS in the network in July 2022
- Several analyses carried out in 2023 at the water intakes
- Dares water intake monitoring program integrating PFAS from 2024
- Research on the source of the pollution in 2024-2025

Context – Discovery of pollution

Evolution of PFAS concentrations in water intakes ($\Sigma 20$)



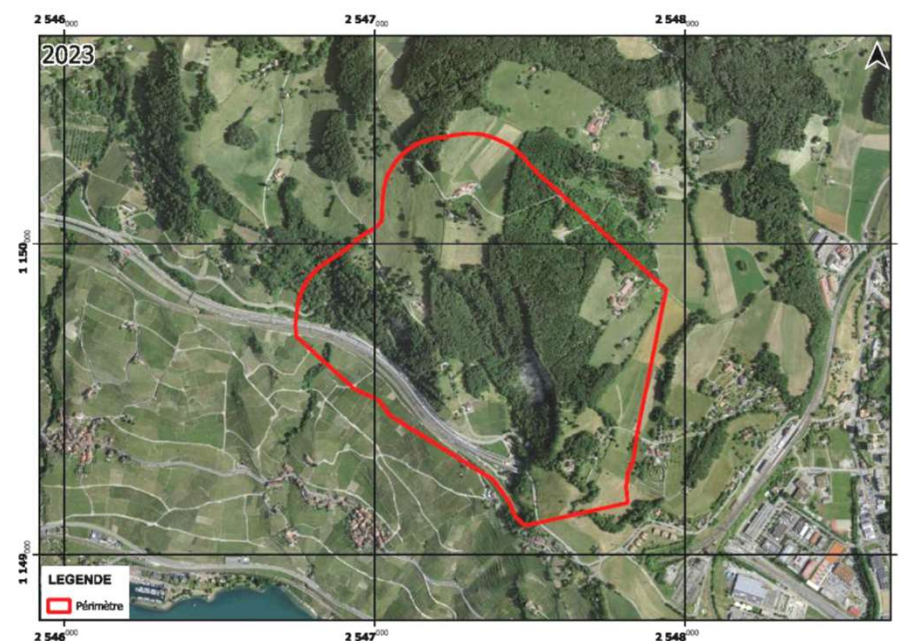
- Significant exceedances of the EU limit value of 100 ng/l for drinking water
- Highest levels in autumn 2023
- Stabilization expected in 2024
- Higher PFAS concentration in the Dares water intake

Research into the origin of pollution

Possible origins of PFAS

1. Landfill and industrial activities?
2. Fire drills in the area?
3. Accidents on the highway?
4. Plant protection products used in viticulture and treatments on railway lines?
5. Roadworks?

Scope of search



Source : Impact Concept SA

Historical research

Inventory of polluted sites and the use of extinguishing agents within the research area

- No landfill sites or small-scale localized fill (infrastructure)
- No past or present industrial activity
- No fire department interventions or exercises within the search area
- Several car accidents on the highway: water was drained outside the search area, and no known use of foam in case of fire before 2017



2017.05.21: car on fire at the entrance to the Flonzaley tunnel

Historical research

Use of herbicides on railway tracks

- Significant reduction in the quantity of herbicides used on railways (85% between 1971 and 1993)
- Banning of several substances over time (e.g., atrazine)
- Since 1993, exclusive use of glyphosate

=> Presence of PFAS in these products as additives is not well known or poorly understood.

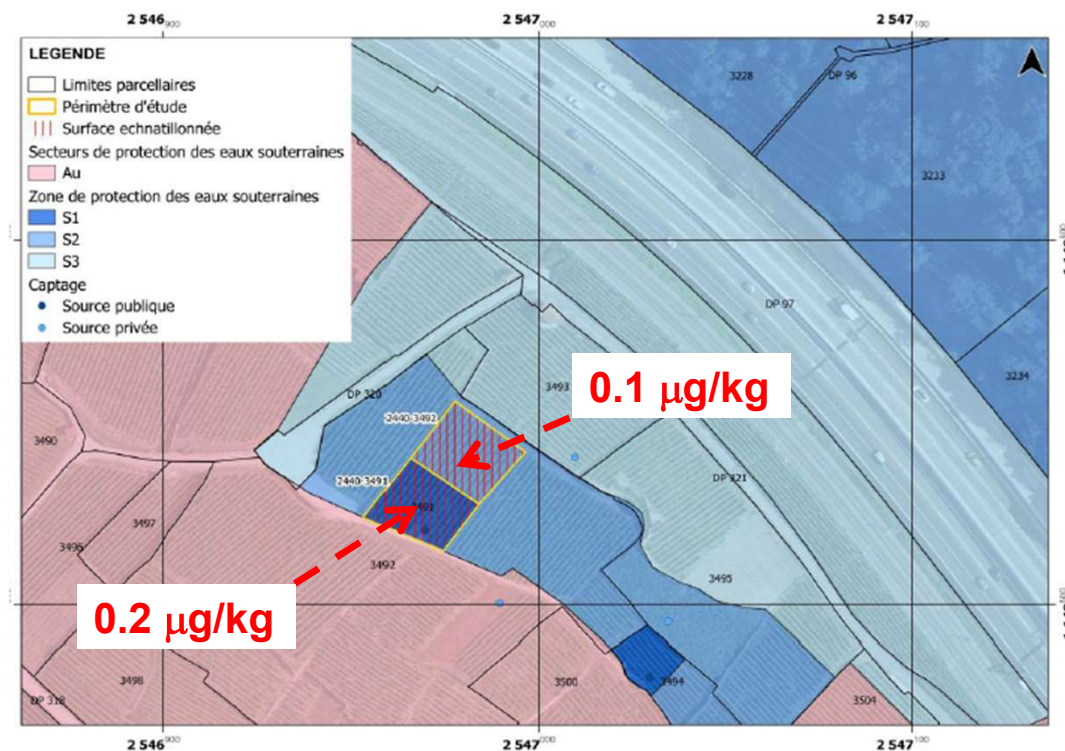
Technical investigations

Use of plant protection products in vineyards

- Vineyards in integrated production, limited use of synthetic chemicals
- Two composite samples (0-20 cm depth) were taken upstream of the Dares collection point
- Analysis of PFAS in the solid matrix ($\Sigma 9$)

Résultats:

=> Very low levels



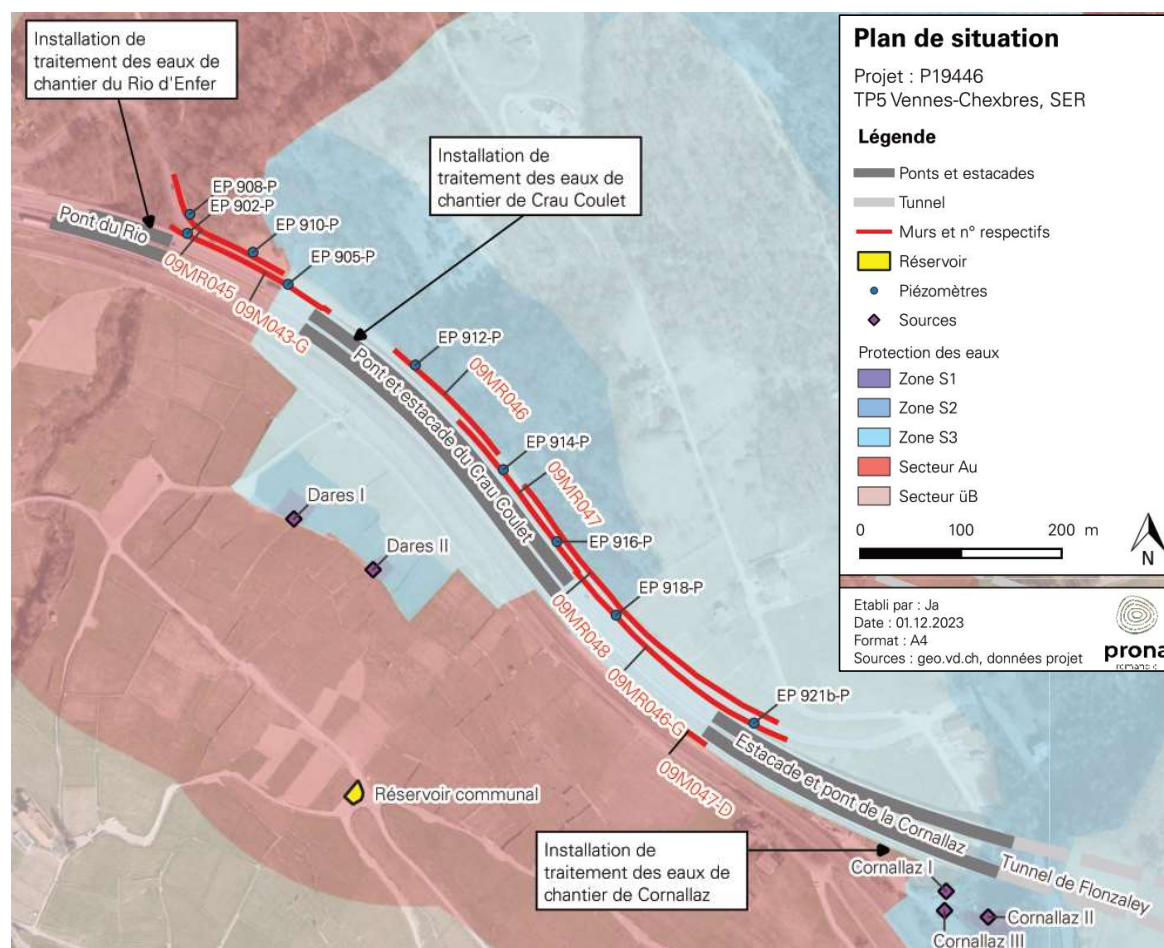
Source : Impact Concept SA

Technical Investigations

In connection with the A9 Vennes – Chexbres motorway works (TP5)

2020 - 2024 Works

- **Bridge rehabilitation**
(edges and decks, waterproofing, coatings, replacement of the water collection system)
- Rehabilitation and **anchoring** of upstream retaining walls
- **New unanchored retaining walls** downstream



Technical Investigations

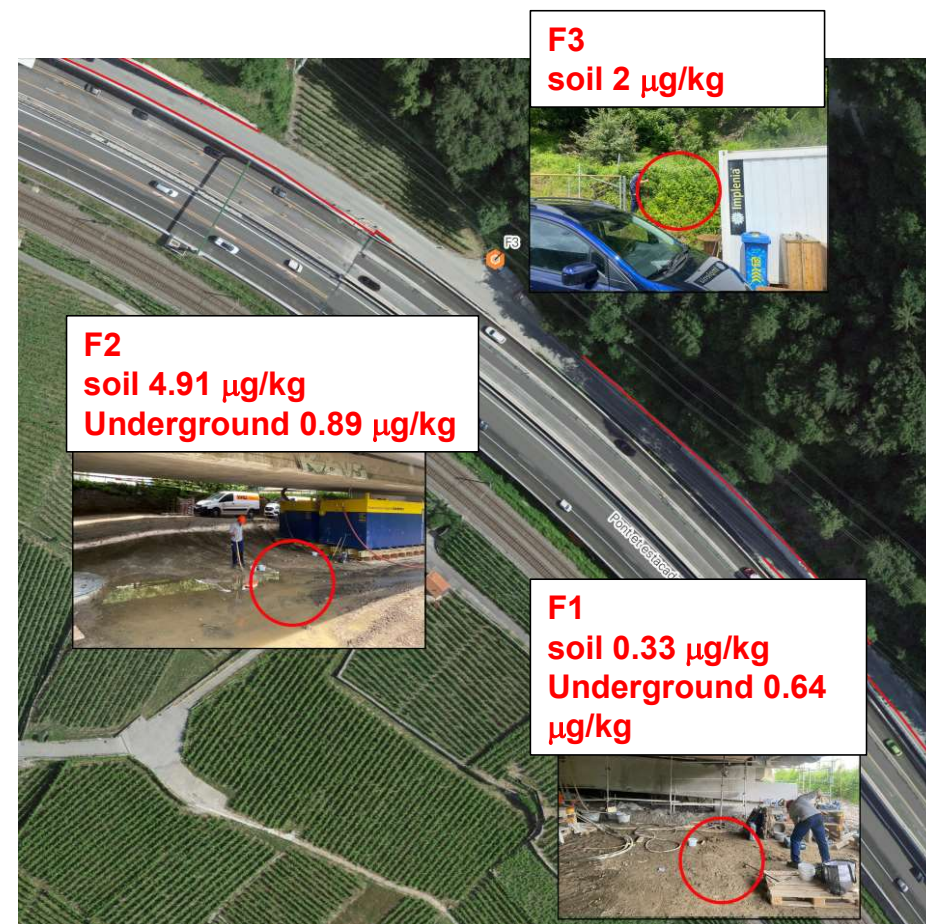
Soil analysis near the highway

- Preparation of composite samples at surface depth (0 to 20 cm) and depth (0.2 to 2 m)
- Analysis of PFAS in the solid matrix ($\Sigma 20$)

- **Results:**

⇒ **Soil pollution at the site of the former water treatment plant (overflows in 2020)**

⇒ **Limited spread of deep pollution**

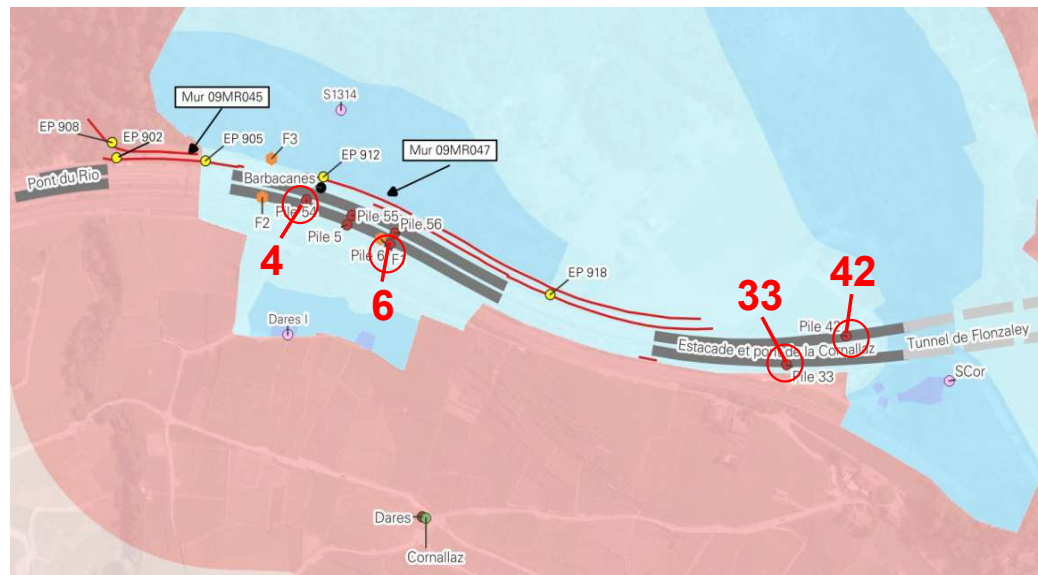


Source : Prona SA

Technical Investigation

Water samples

- Analysis of the sum of 20 PFAS, 3 campaigns
- 4 **bridge piers** (4, 6, 33, 42)
- Flow in pier 4, otherwise stagnant water



Source : Prona SA



Technical Investigation

Water samples

- 4 **piezometers** (EP 902, EP 905, EP 908, EP 912) Low water renewal in the piezometers

EP 902



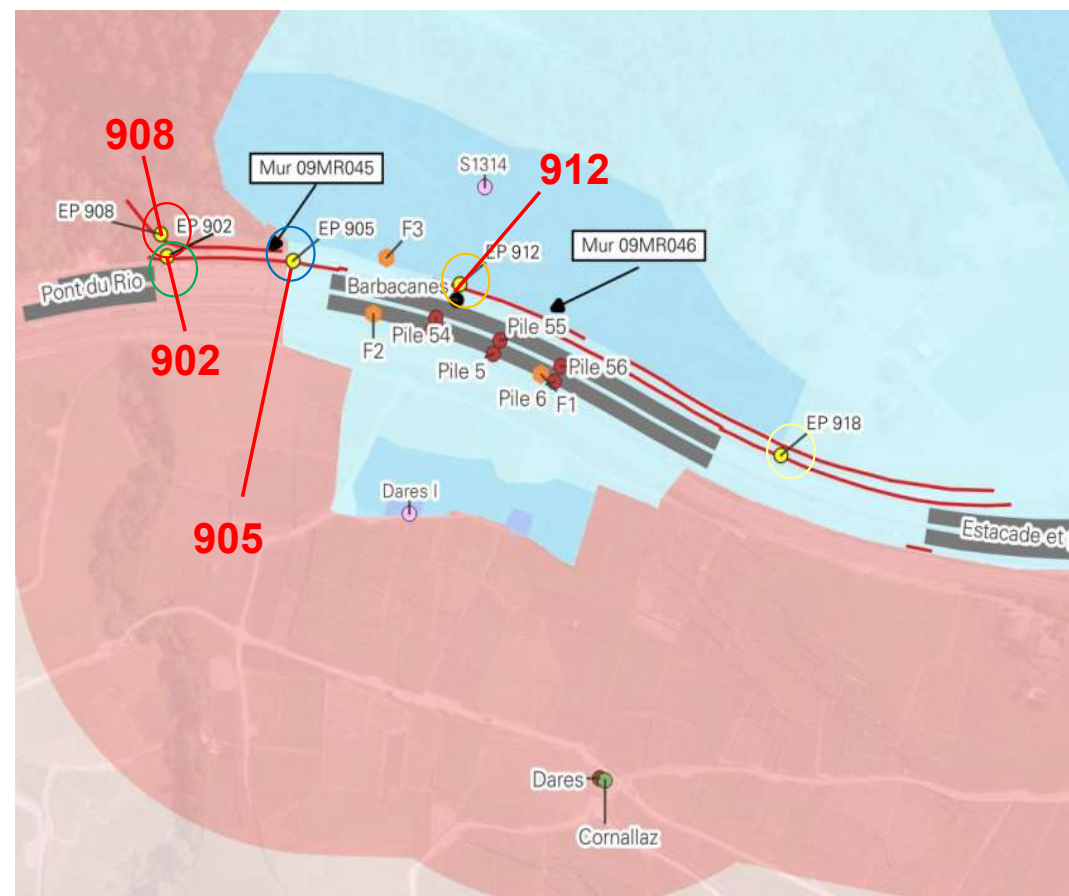
EP 905



EP 908 (mur 45)



EP 912 (mur 46)



Source : Prona SA

Technical Investigations

Water samples

- **Barbican** of a wall upstream of the highway

Barbacane



Source : Prona SA



Source : Prona SA

Technical Investigations

Water samples

- Sources S1314 and Scor upstream and downstream near the highway

S1314



Source : Prona SA

SCor



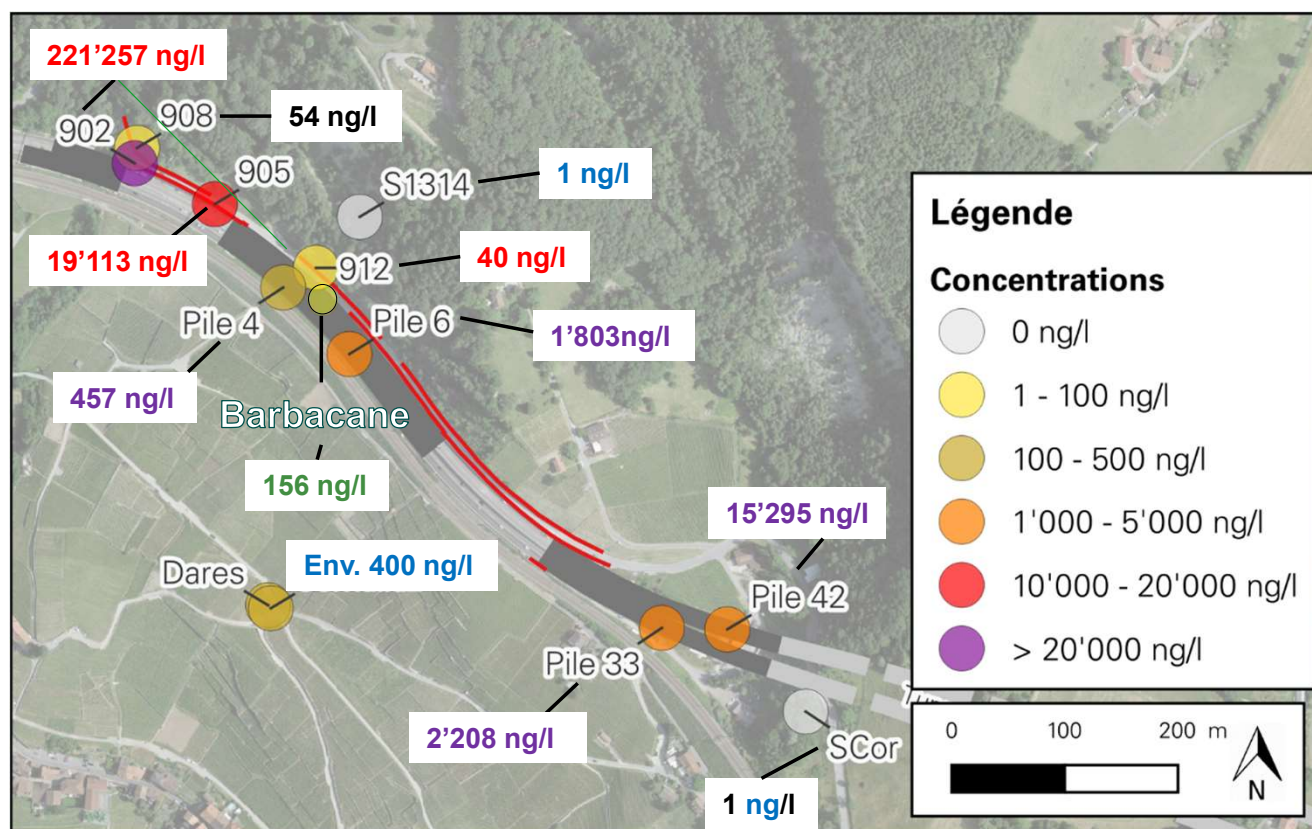
Source : Prona SA

Technical Investigations

Water samples

Results:

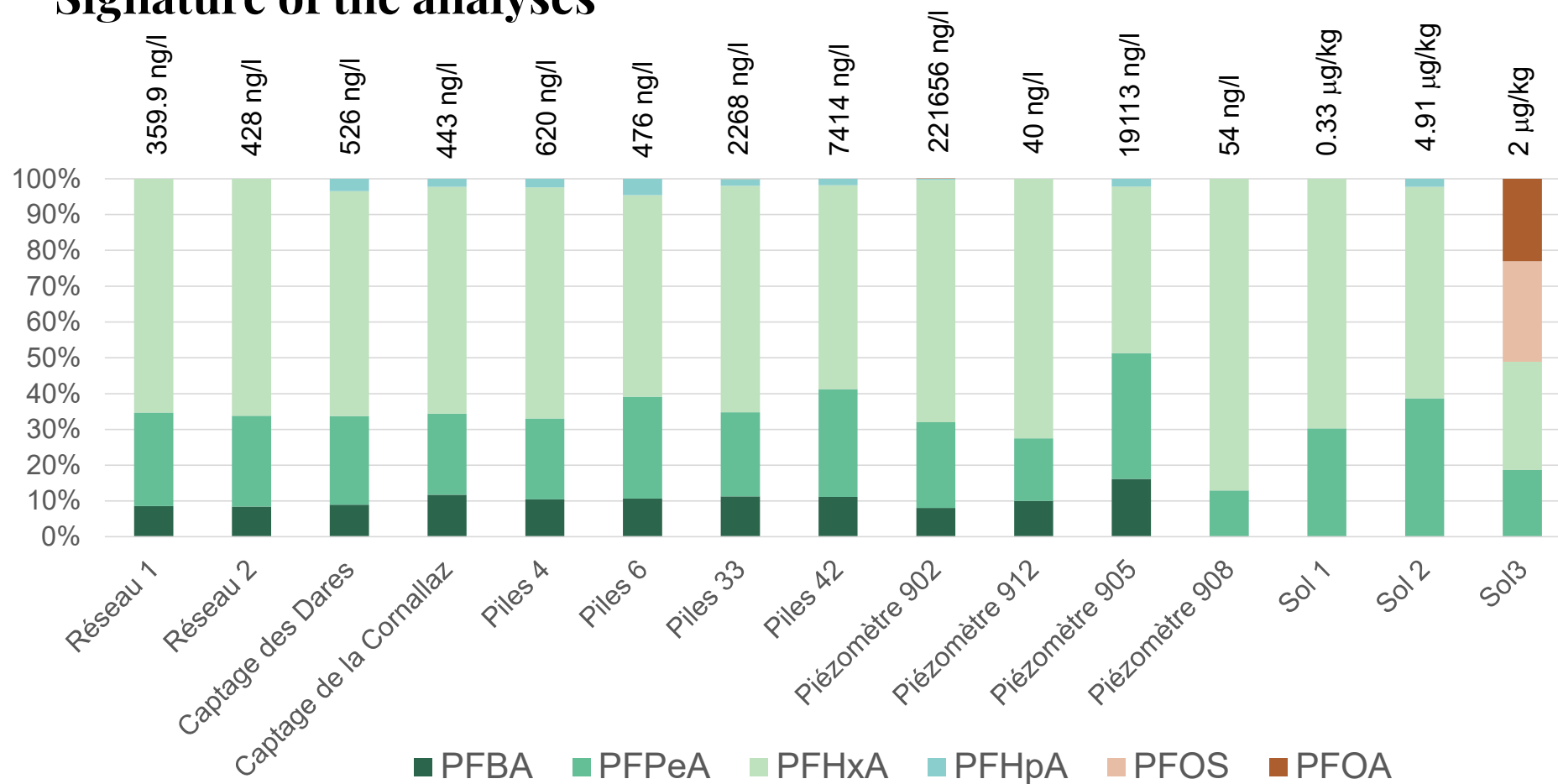
- **Little or no PFAS upstream**
- **High concentrations**
=> in the foundation piers of the viaducts
=> in the piezometers upstream of the retaining walls



Source : Prona SA

Technical Investigations

Signature of the analyses



Reflections on the origin of pollution

Summary and interpretation

Likely link to highway construction

- No pollution in water points analyzed upstream of the highway
- High PFAS levels in piezometers upstream of the retaining walls
- Identical PFAS signature between piezometers at the highway, piers, and intakes
- Peak pollution during wall anchoring work in 2023

Reflections on the origin of pollution

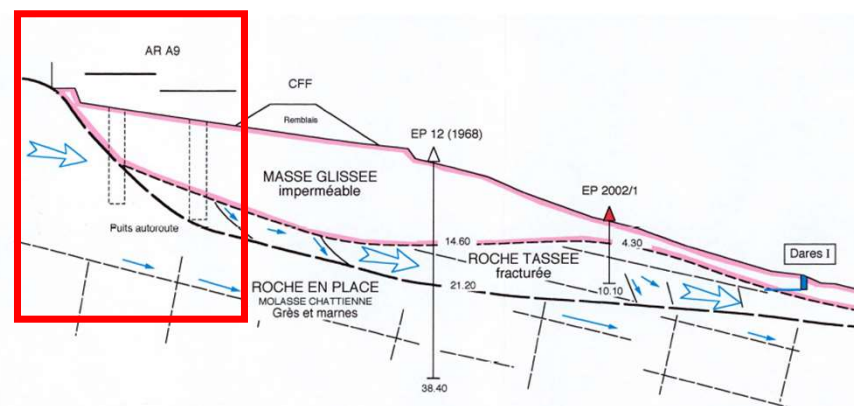
Synthèses and interpretation

Likely origin:

- Foundation anchors and piles intercept the water flow supplying the catchment area
- PFBA probably used as an additive in the anchor cements

Unlikely origin:

- Concrete in retaining walls: moderate PFAS levels at the rear
- Construction site runoff and cement product storage: limited deep pollution propagation (low permeability of the sloughed mass).
- Herbicides used for railway track treatment: possible but unknown contribution.



Source : Bureau technique Norbert Géologues-conseils SA

Technical Investigations

Concrete samples

- Existing concrete
 - Highway construction
 - Concrete waste sampling
 - Detection of PFHxA (0.57 mg/kg, $\mu 20$)
- New concrete
 - 2020-2023 works
 - Sample taken with a hammer and chisel at a depth of approximately 2-3 cm
 - No PFAS detected

Existing concrete



New concrete



Source : Prona SA

Further investigations

Further investigations planned

Themes	Methods
Water circulation	Confirm the link between the water in the piezometers (flow behind the walls) and the deep flows feeding the intakes (trace tests planned)
Delineation of the pollution source	Add piezometers at the base of the walls with anchors to clarify the link with pollution
Demolition of an anchor	Demolishing an anchor by drilling to analyze the products used by companies

Consequences for construction site practices

Contractual documents valid for FEDRO in Switzerland

- **Monthly monitoring** of PFAS in construction site water treatment units is mandatory.
- The use of **PFAS-free** building materials is **recommended**. If measurements show the presence of PFAS, samples of the suspect products should be taken. If there is a correlation between water contamination and product composition, a product change should be considered.
- The contractor is required to work carefully. The client reserves the right not to recognize the consequential costs incurred by the elimination of avoidable anthropogenic pollution (e.g. PFAS).

Consequences for construction site practices

PFAS testing before work begins

Image OFROU



Supply source

Image OFROU



Potentially contaminated materials



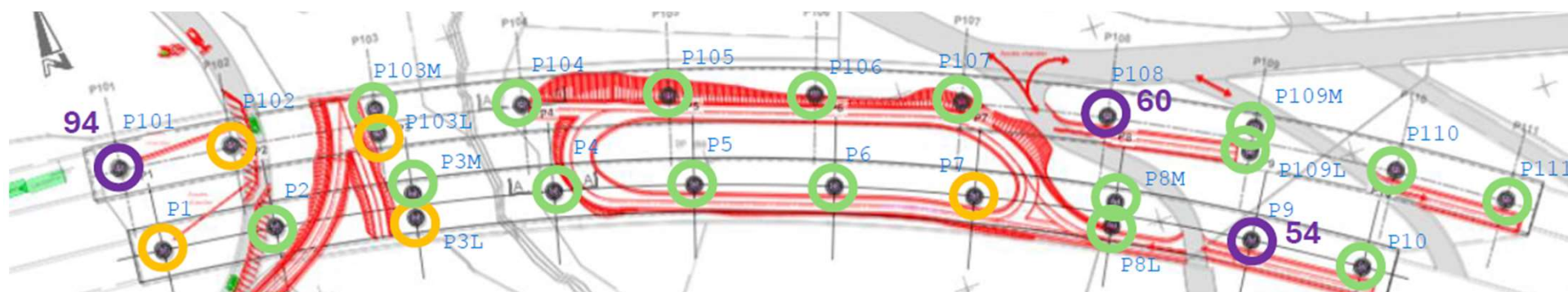
Sensitive receiving medium

Image OFROU

Consequences for construction sites practices

On-site treatment: The Bahyse bridges Case

Presence of water with PFAS in the well water of the bridge piers



Légende: teneurs en PFAS (somme pondérée de 9 PFAS) dans les eaux des fûts des puits
(avant pompage, date de prélèvement : 17 juillet 2024) :

- $x < 20 \text{ ng TEQ / l}$
- $< 20 \text{ ng } x < 50 \text{ ng TEQ / l}$
- $x > 50 \text{ ng TEQ / l}$ (somme indiquée vers le point)

- OFROU/OFEV Decision: Treat PFAS $> 20 \text{ ng/L}$
- Treatment based on current best practices, no guarantee of a specific outcome.

Consequences for construction site practices

On-site treatment: The Bahyse bridges Case

Chosen method:
Activated carbon
on site



Image OFROU

Charbon actif - Bahyse

Advantages	Limitations	Results
<ul style="list-style-type: none"> • Compact installation • Proven technology 	<ul style="list-style-type: none"> • No real-time measurements (7 days). Results known after treatment. • Activated carbon quality over time • Treatment of activated carbon in landfill • Limits the treatment speed • Significant cost (CHF 40,000 for 160 m³ = CHF 250/m³) 	<ul style="list-style-type: none"> • Effective treatment of PFAS (0 ng/l) Empty wells refill following pumping (groundwater) • PFAS are still present.

Questions / Discussions

