



iFLUX

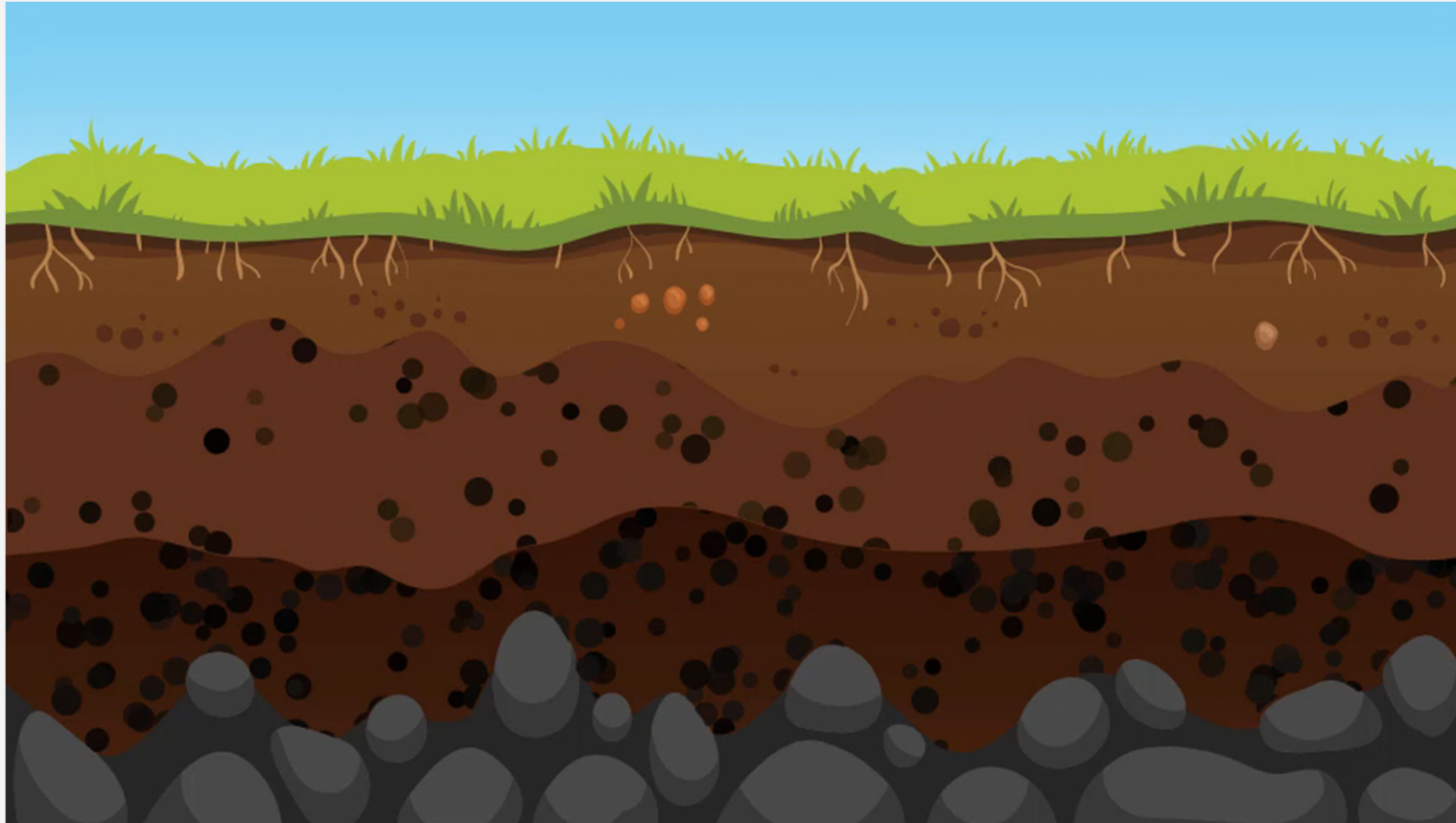
**Quantification de la dispersion de contaminations
de l'eau souterraine vers les eaux de surface
par mesure directe des flux**

INTERSOL - 23 juin 2022

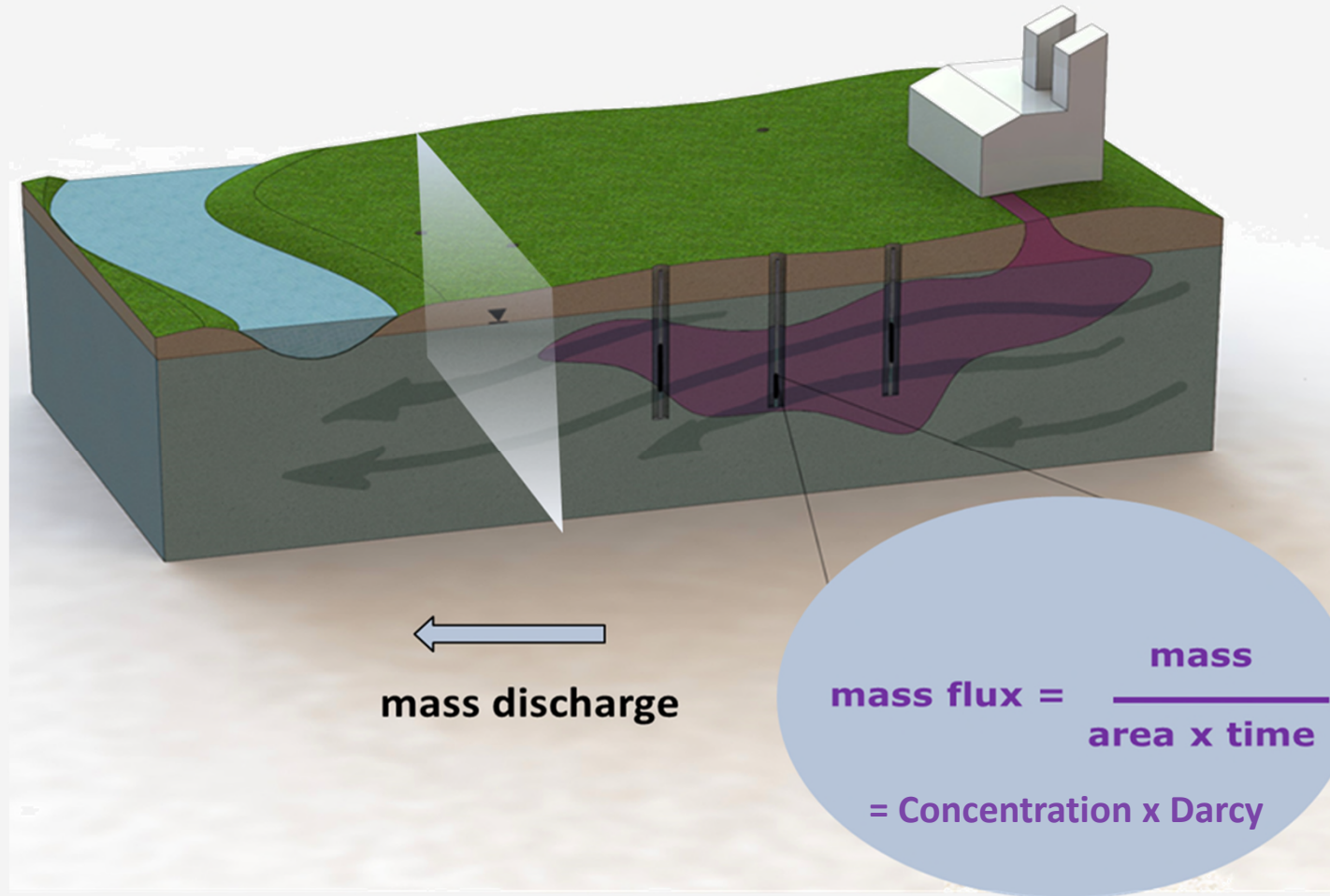
Erik Bosmans



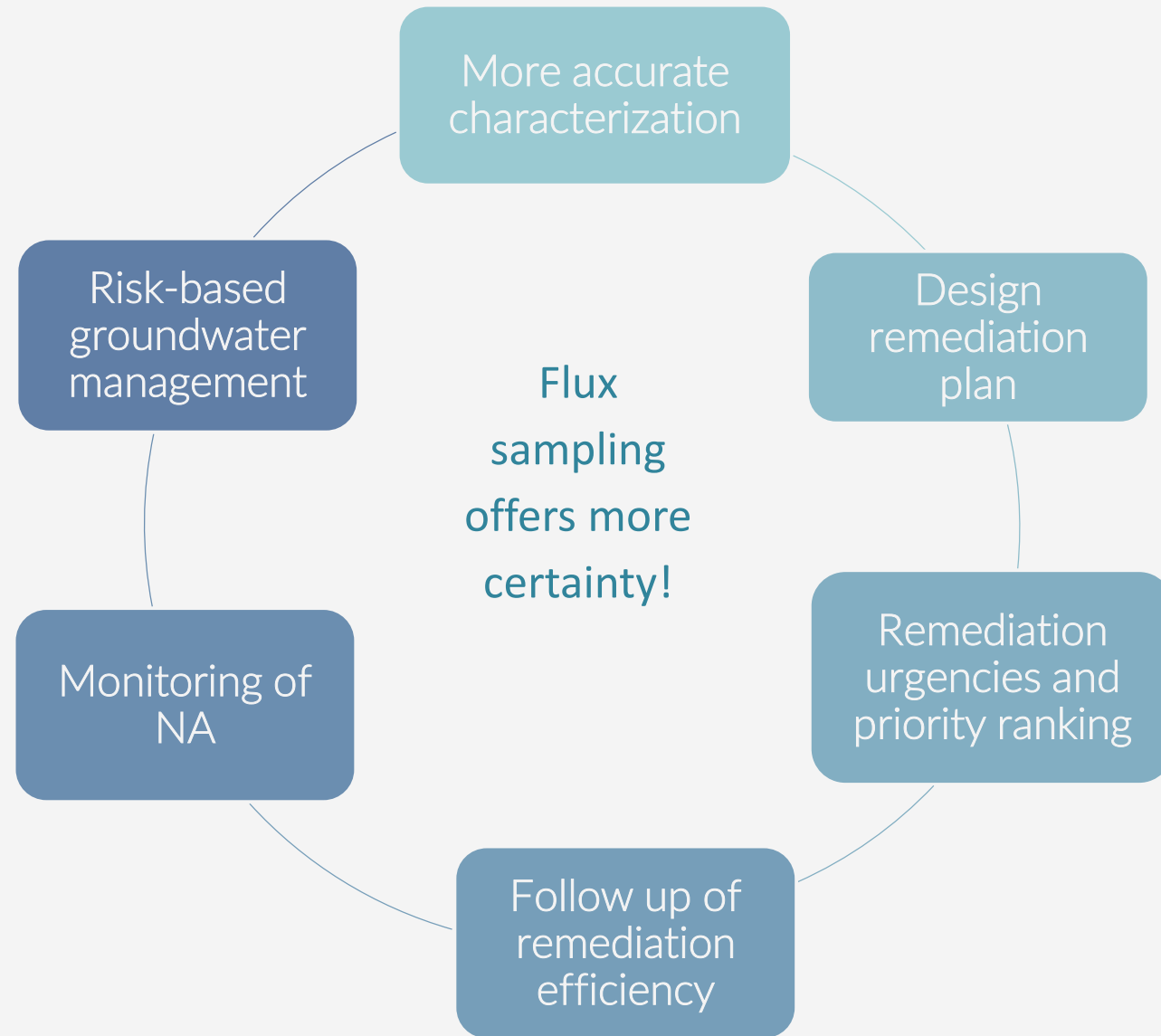
Dynamics of groundwater pollution is often underestimated



Groundwater & mass flux concept



<https://www.itrcweb.org/GuidanceDocuments/MASSFLUX1.pdf>



RESANAT PROJECT

Interreg 
EUROPESE UNIE
Vlaanderen-Nederland
Europees Fonds voor Regionale Ontwikkeling



3 sites for nature based remediation

RESANAT PROJECT



Reactive mat in
Ghent (Belgium) at
former Lumco-site



Phytoremediation in
Zeebrugge (Belgium)
at former Carcoke-
site



Biostimulation in 's-
Gravenmoer (The
Netherlands) at
former Cebeco-site

3 sites for nature based remediation

RESANAT PROJECT



Reactive mat in
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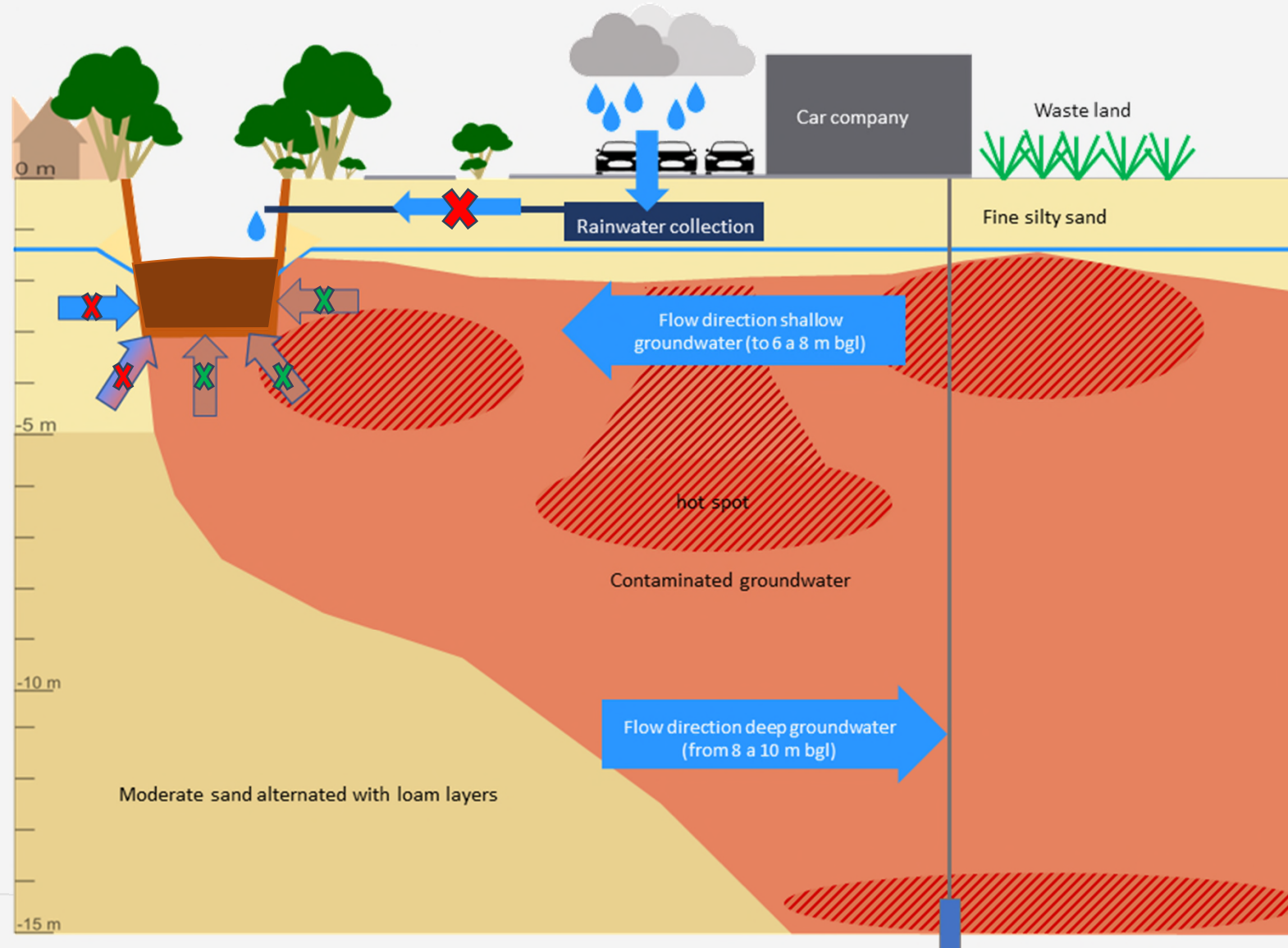


Phytoremediation in
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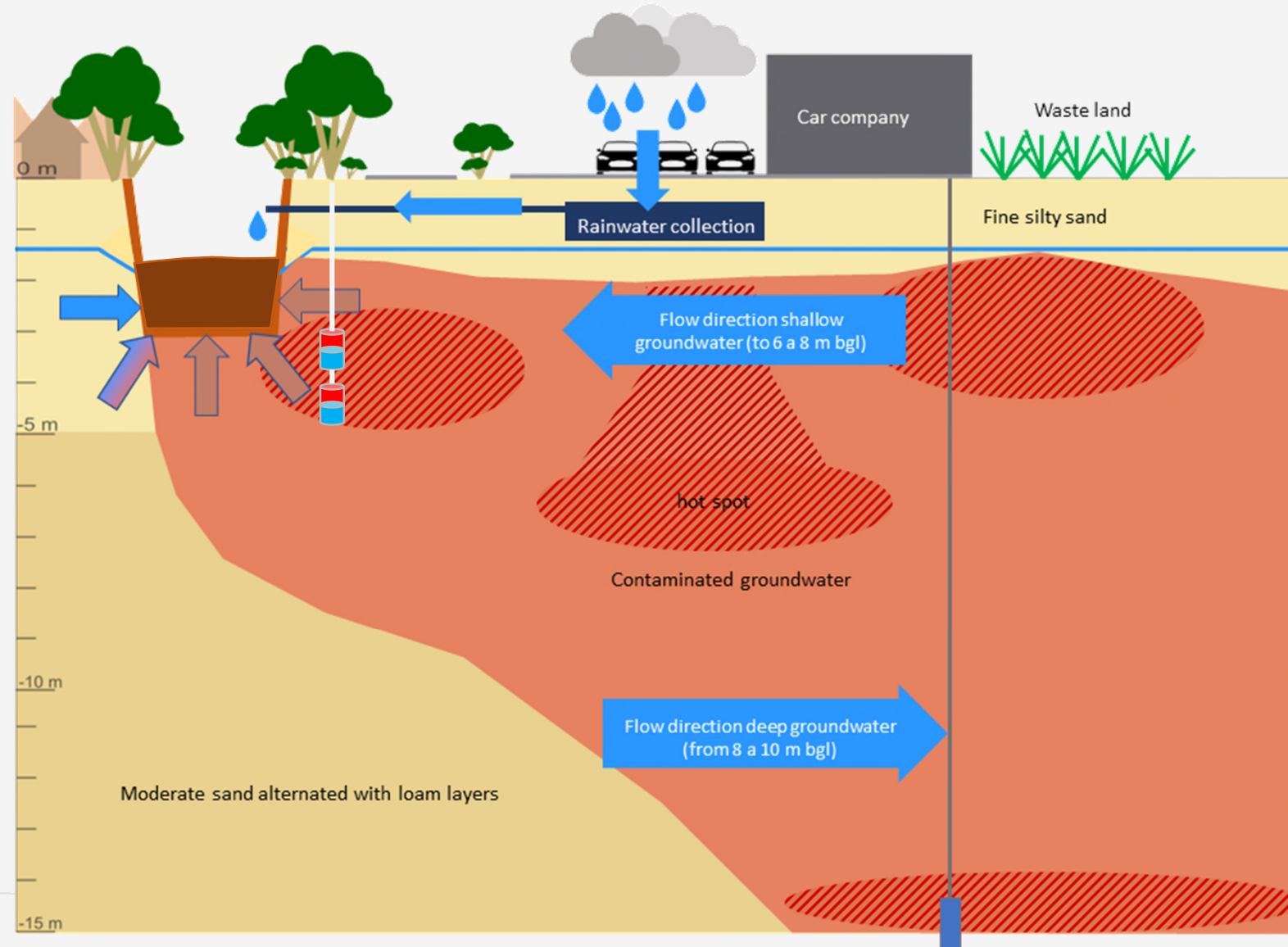


Biostimulation in 's-
Gravenmoer (The
Netherlands) at
former Cebeco-site

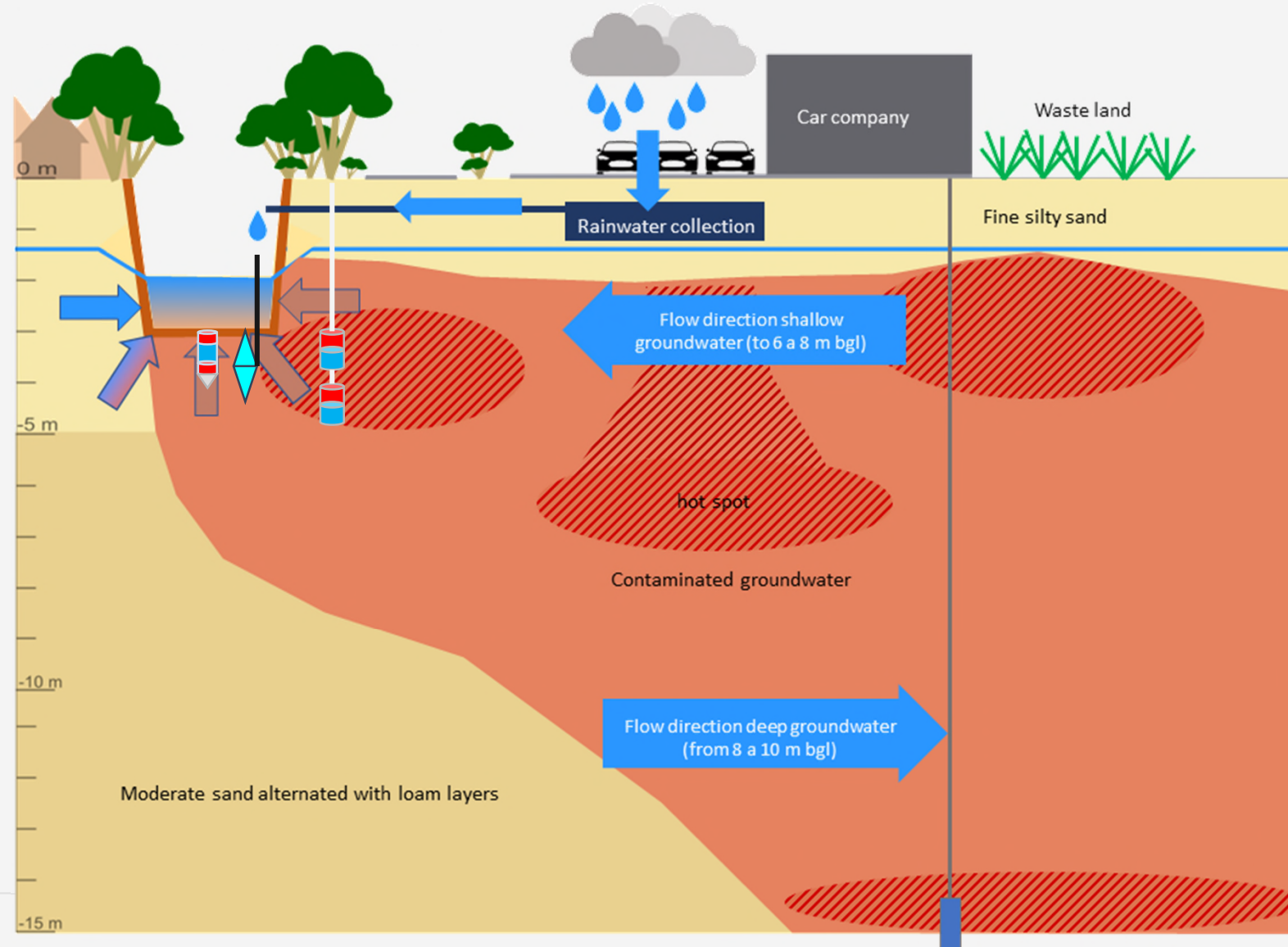
Case 1 – RESANAT: De Lieve Gent



Case 1: flux avant curage

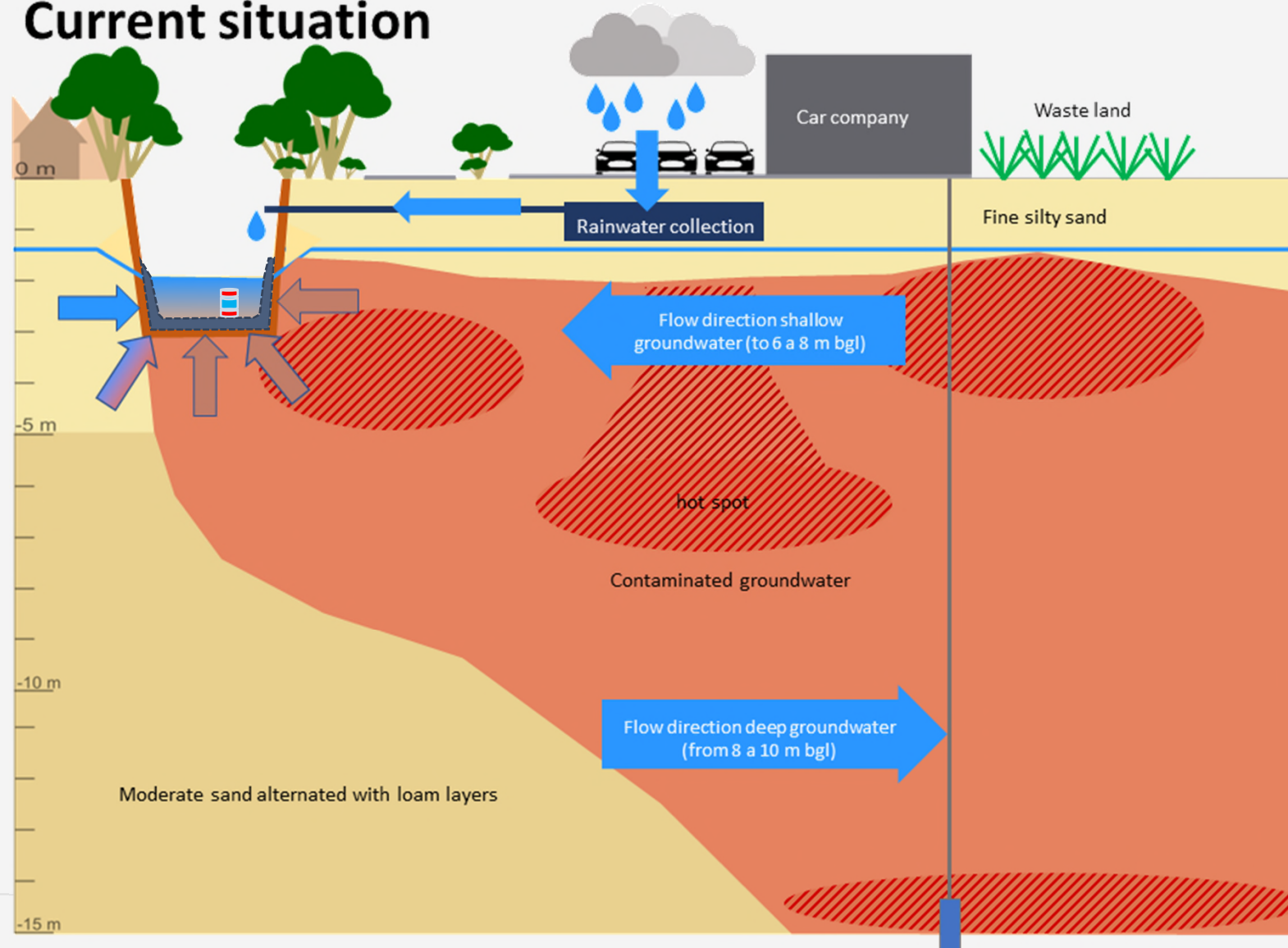


Case 1: flux après curage



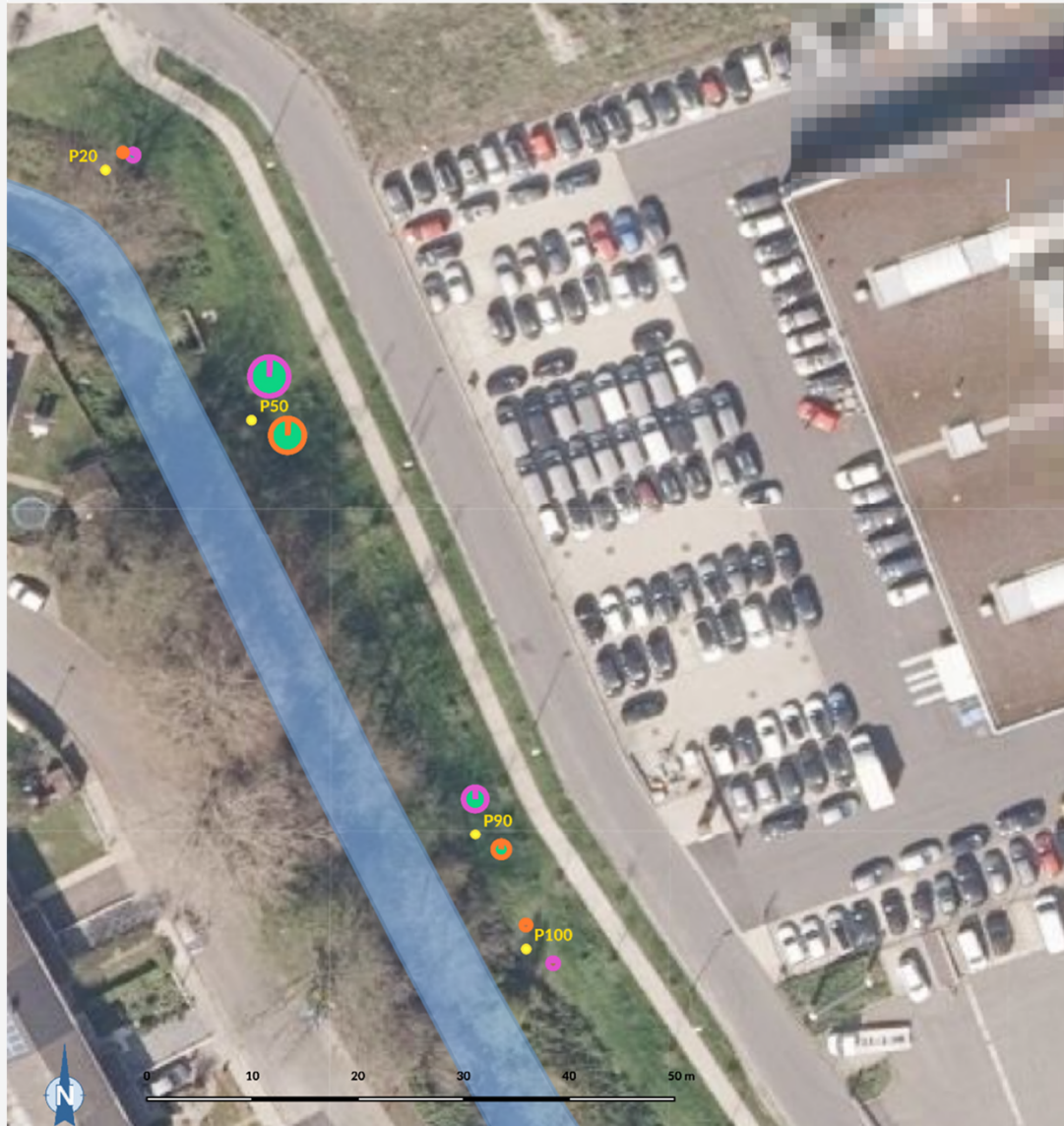
Case 1: Follow-up

Current situation



HORIZONTAL FLUX: BEFORE - AFTER

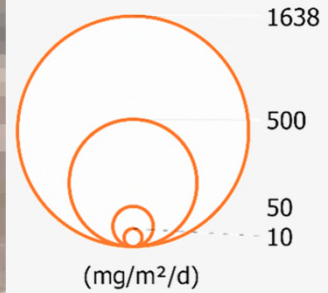
Horizontal Mass Fluxes: Before Dredging



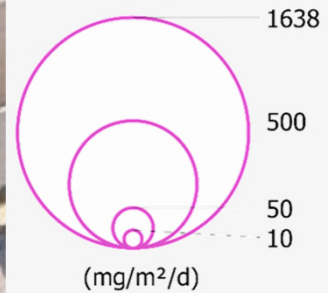
Mass Flux

- Wells
- Mass flux diagram
 - BTEXN
 - PAH (Sum less N)
 - Mineral oil (C6-C10)
 - Mineral oil (C10-C40)

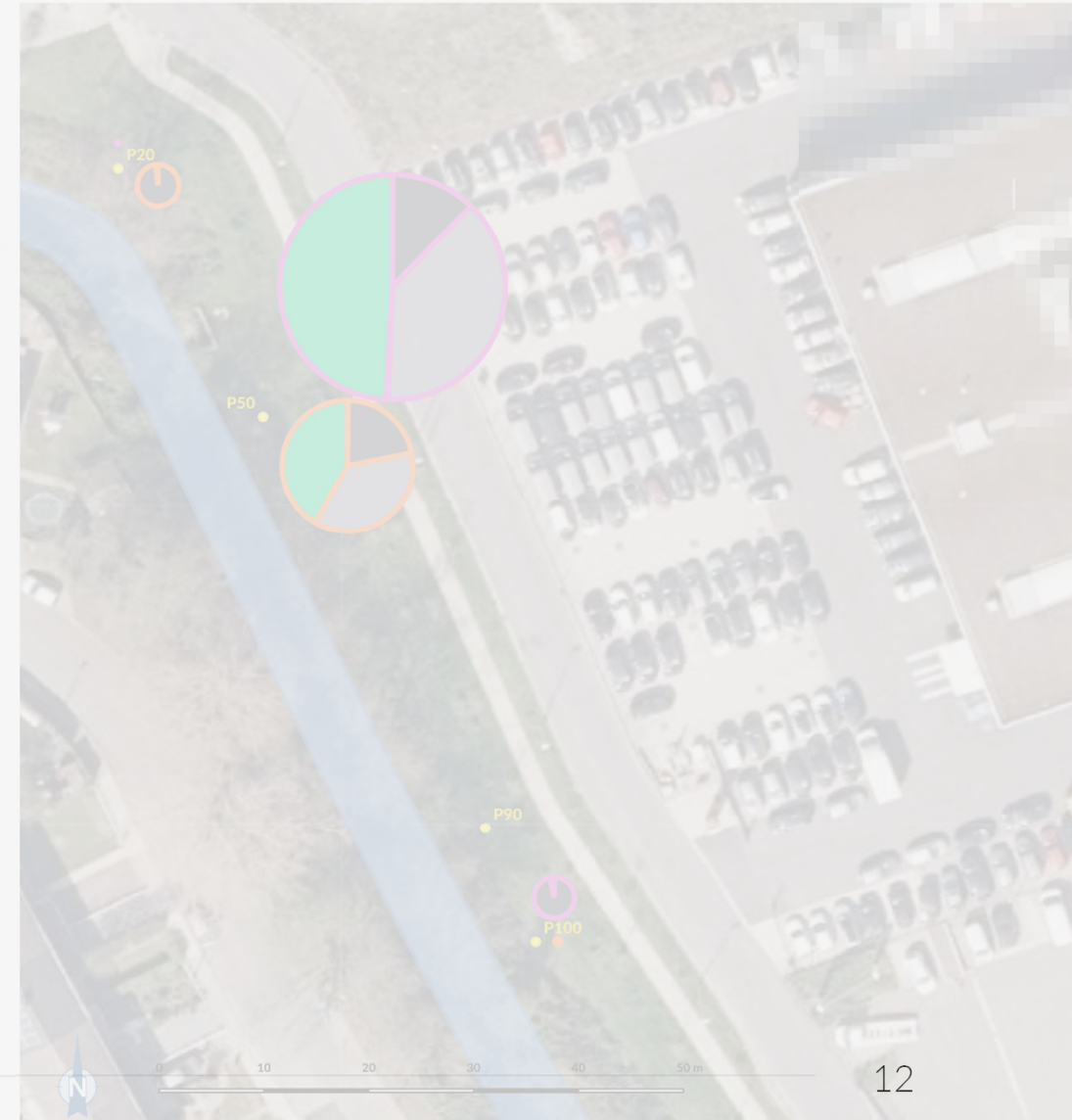
Shallow mass flux: -3,50 m-ns



Deep mass flux: -4,30 m-ns

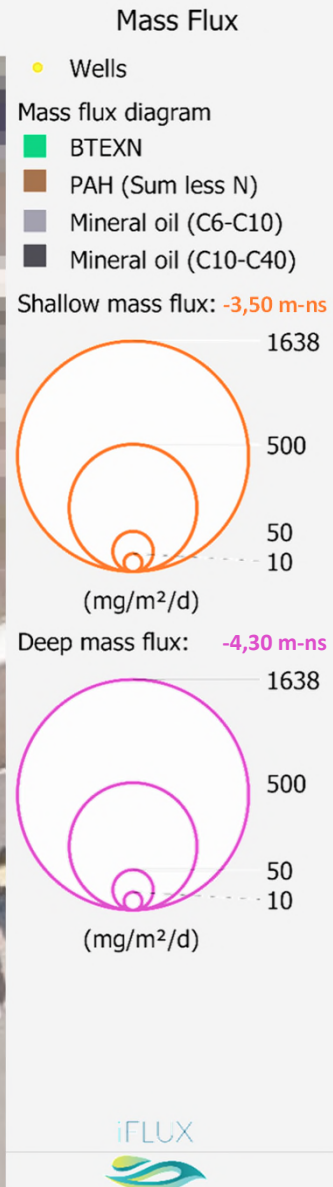
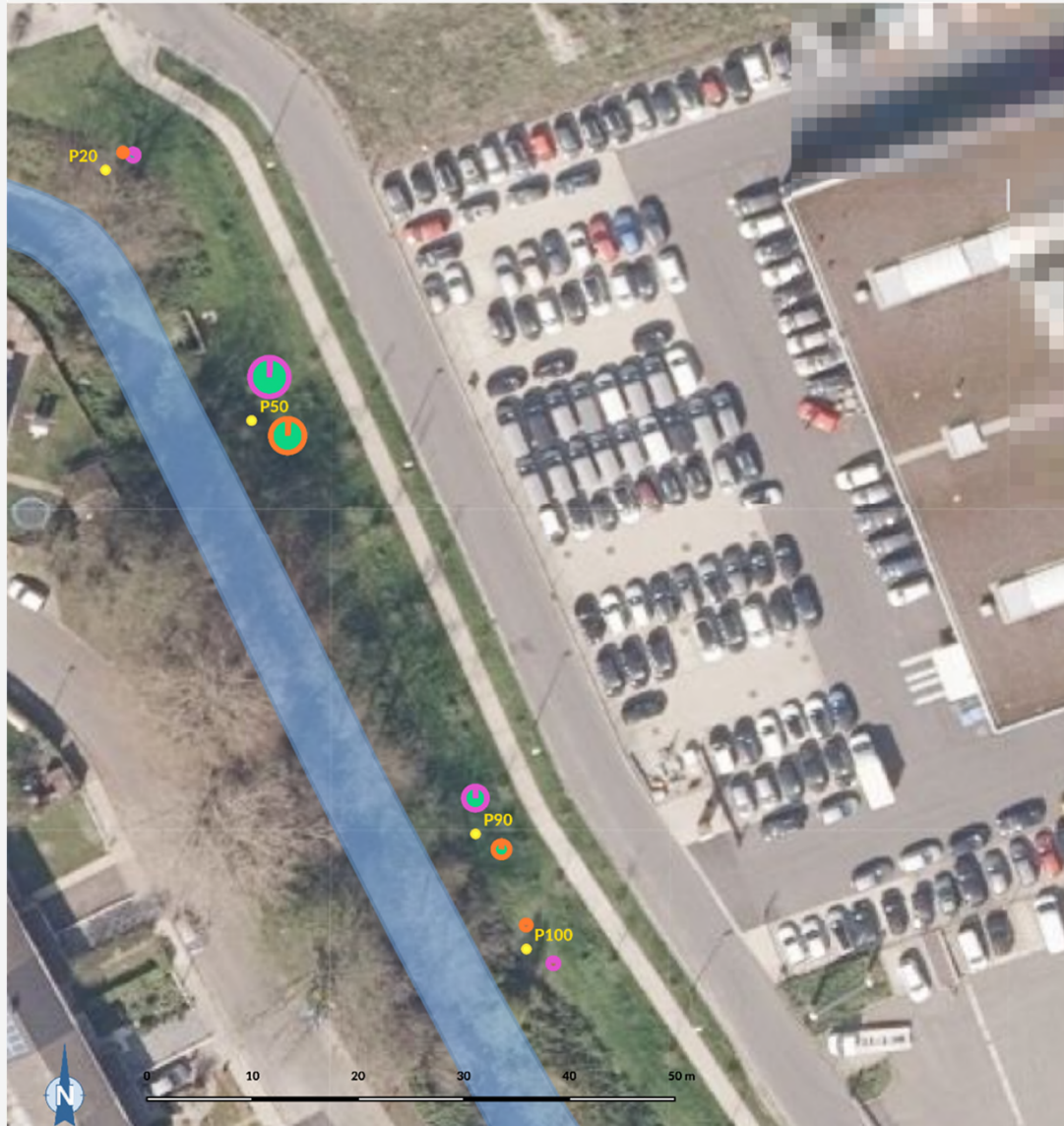


Horizontal Mass Fluxes: After Dredging

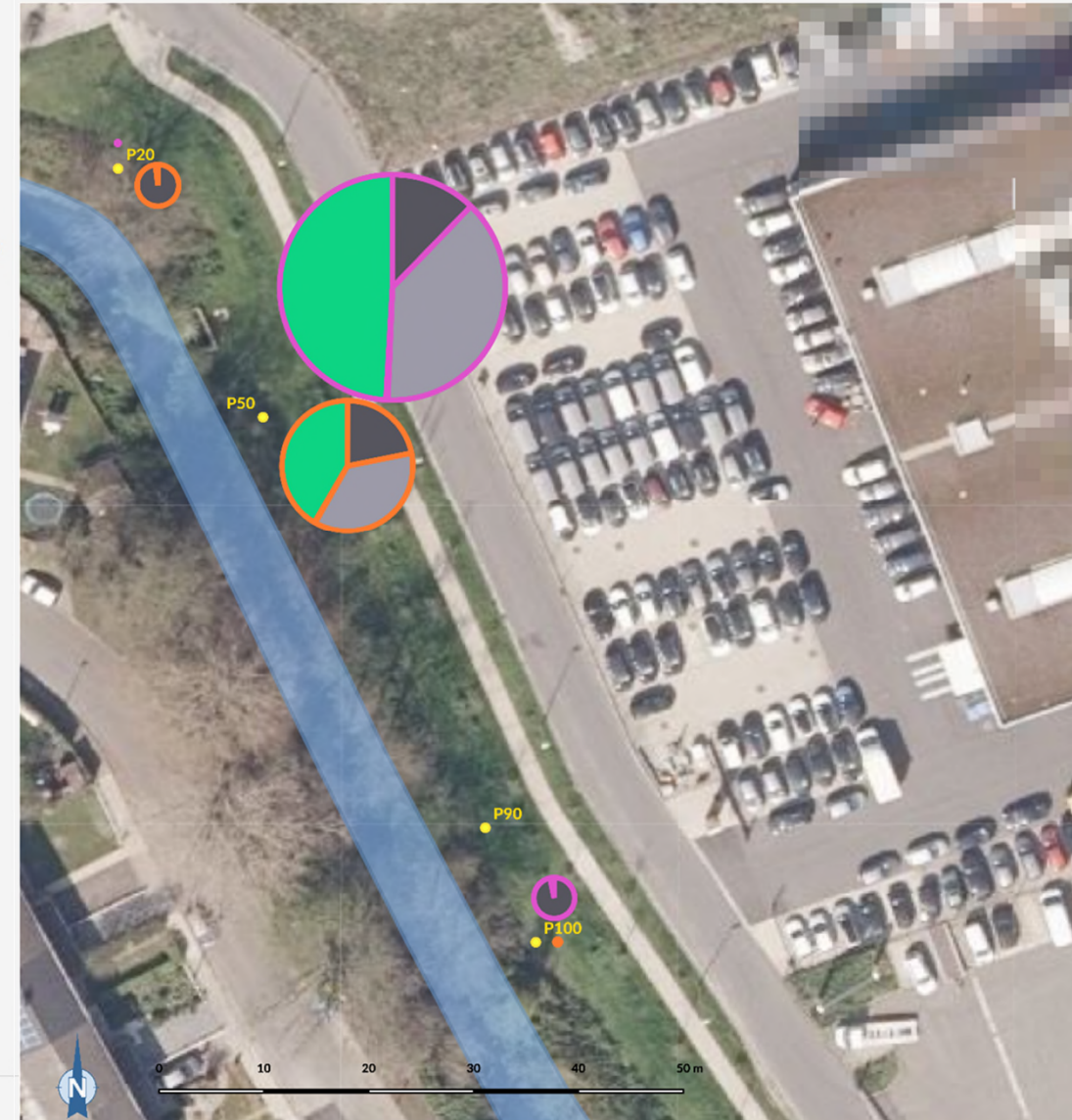


HORIZONTAL FLUX: BEFORE - AFTER

Horizontal Mass Fluxes: Before Dredging

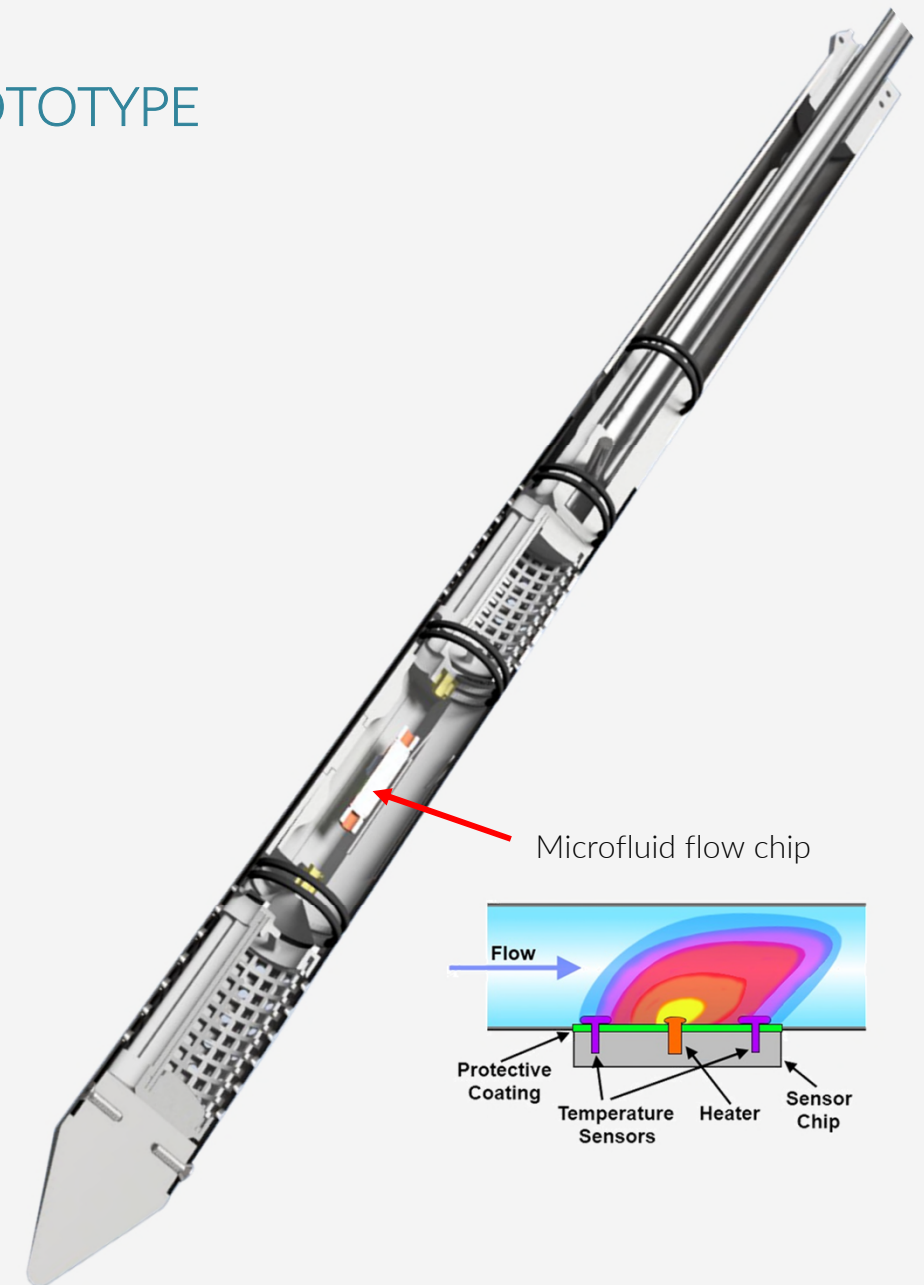


Horizontal Mass Fluxes: After Dredging

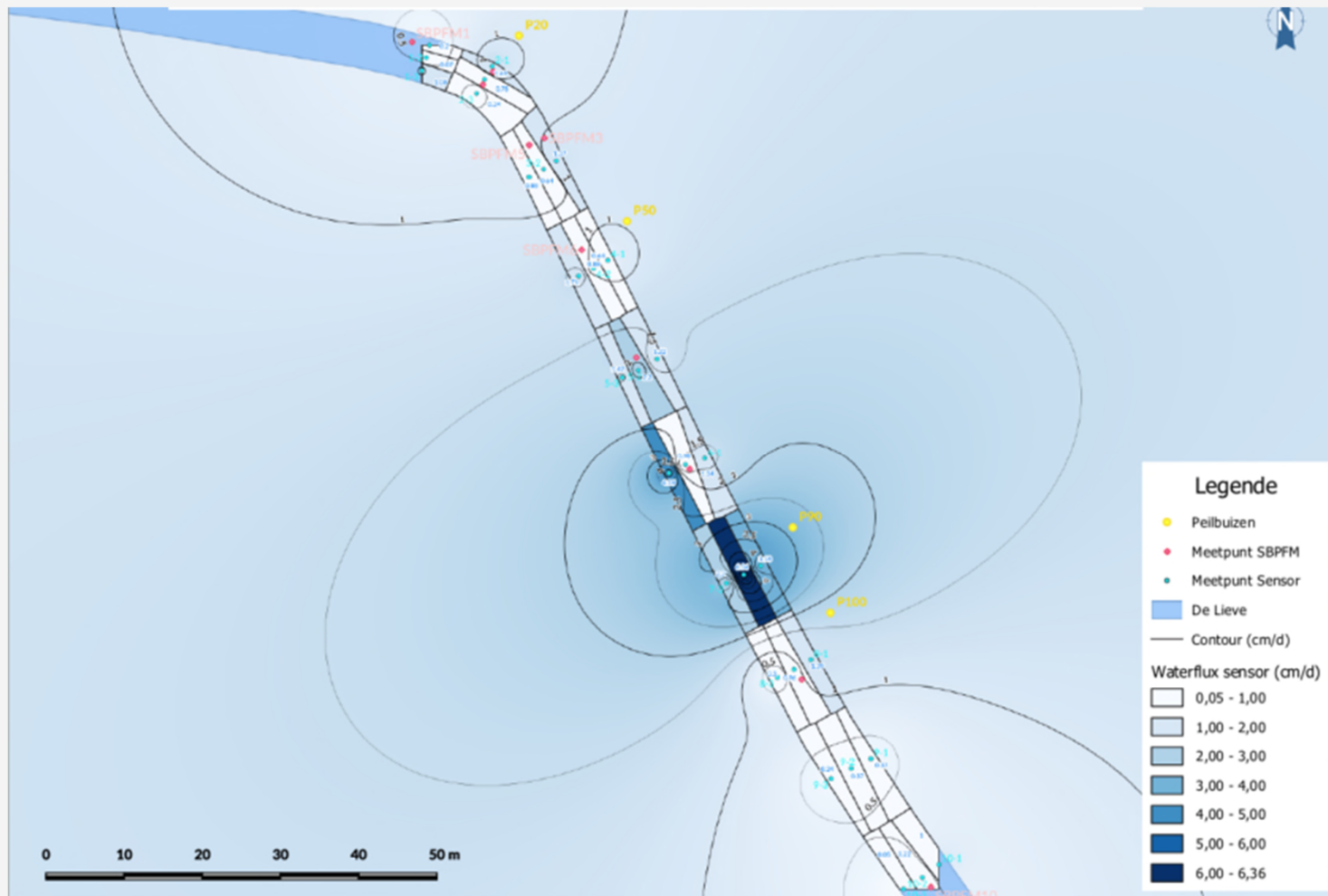


INNOVATIVE DIGITAL IFLUX SENSOR – PROTOTYPE

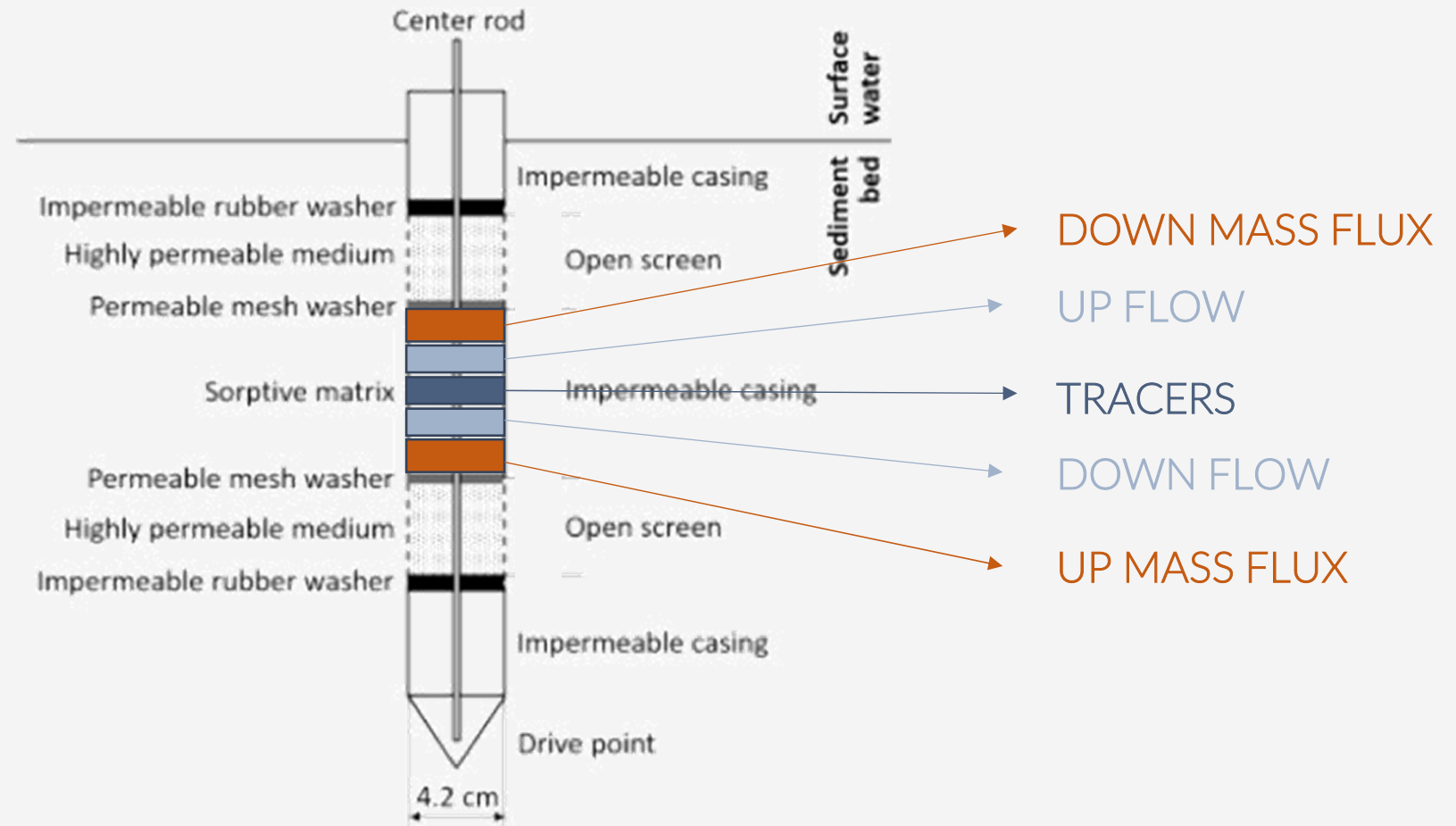
- Groundwater flow velocity and -direction
- Horizontal & vertical groundwater flux probes
- Real time
- Temperature based microfluid flow chip
- Expertise iFLUX : Flux in aquifer
 - Lab tests
 - CFD simulations
- In-well or direct in soil/sediment



DIGITAL VERTICAL FLUX SENSOR: FLOW RANGE

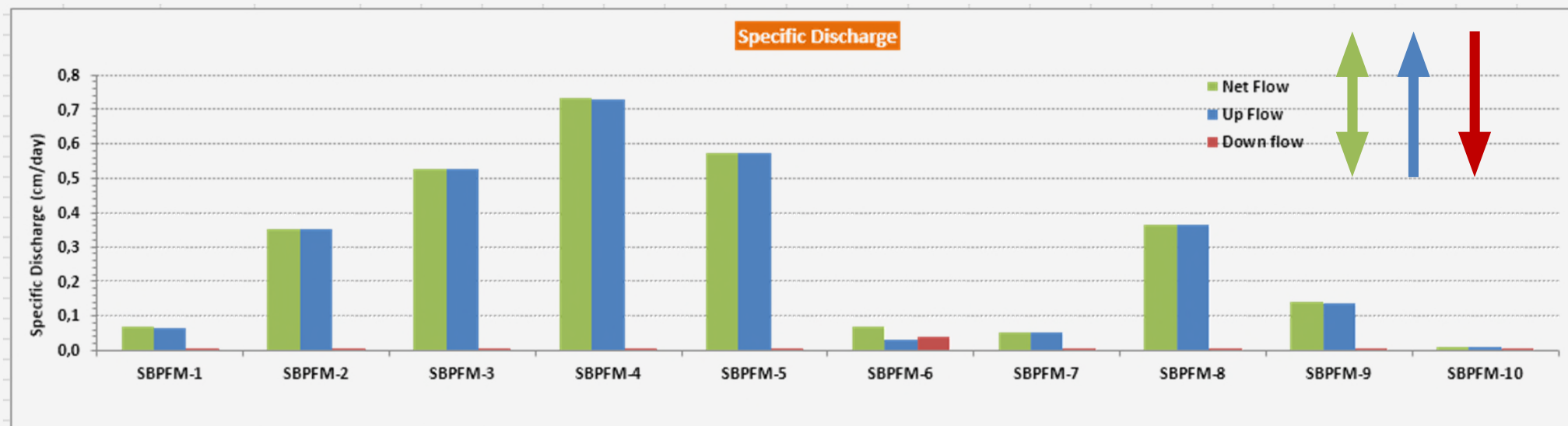


PASSIVE VERTICAL FLUX: Sediment Bed Sampler

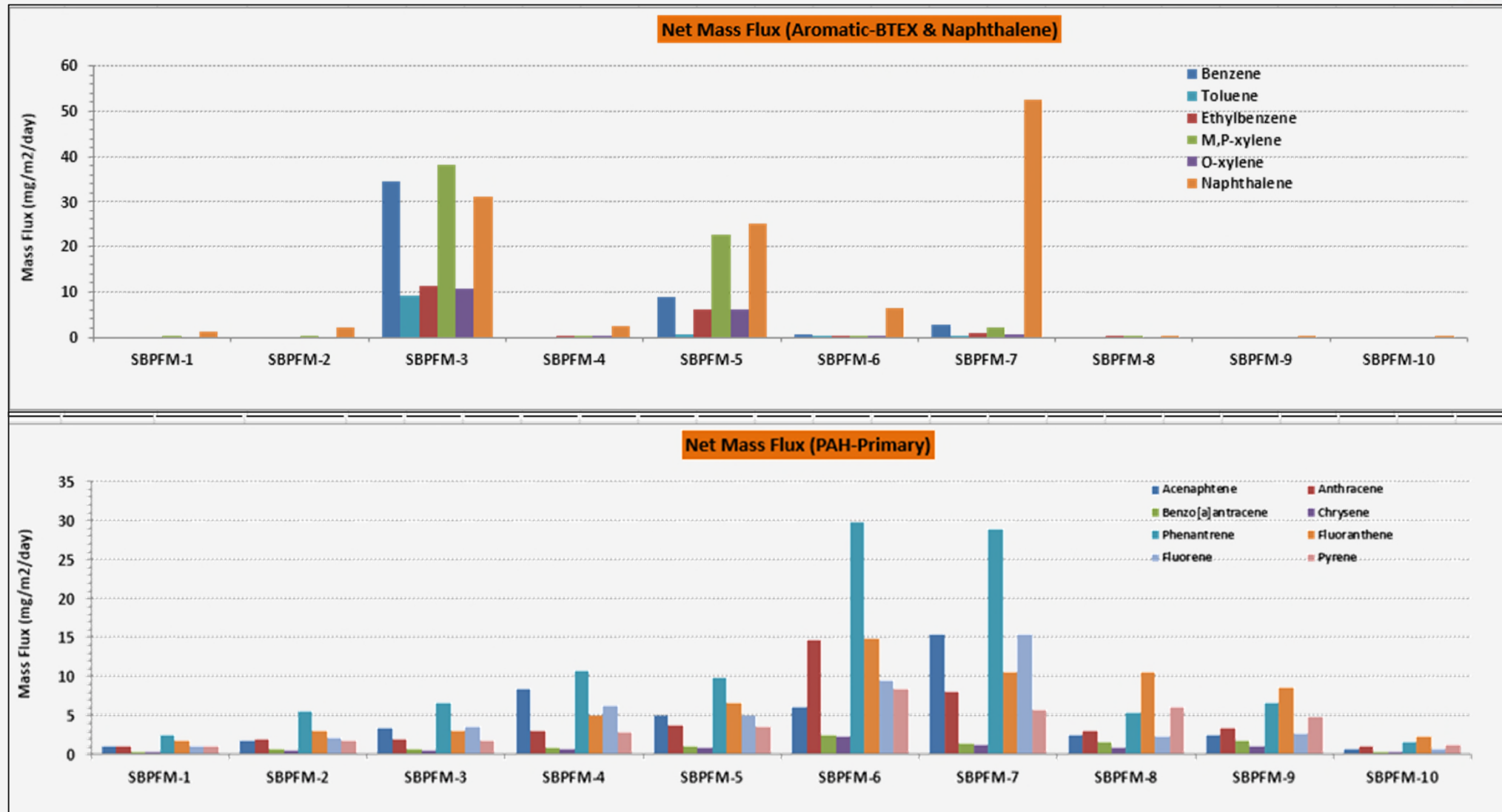


Sediment Bed Passive Flux Meter™ (EnviroFlux, FL)

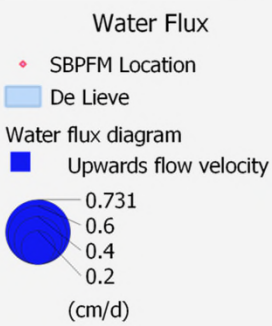
VERTICAL FLUX: FLOW RESULTS



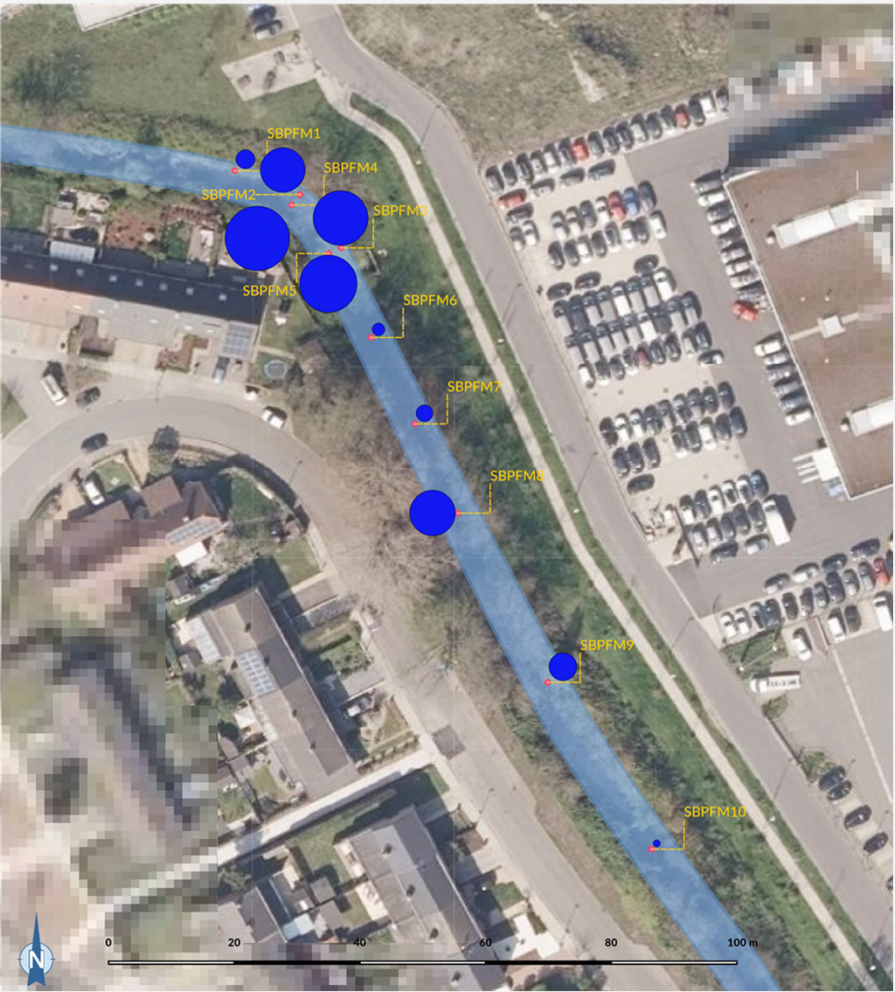
VERTICAL FLUX: MASS FLUX RESULTS



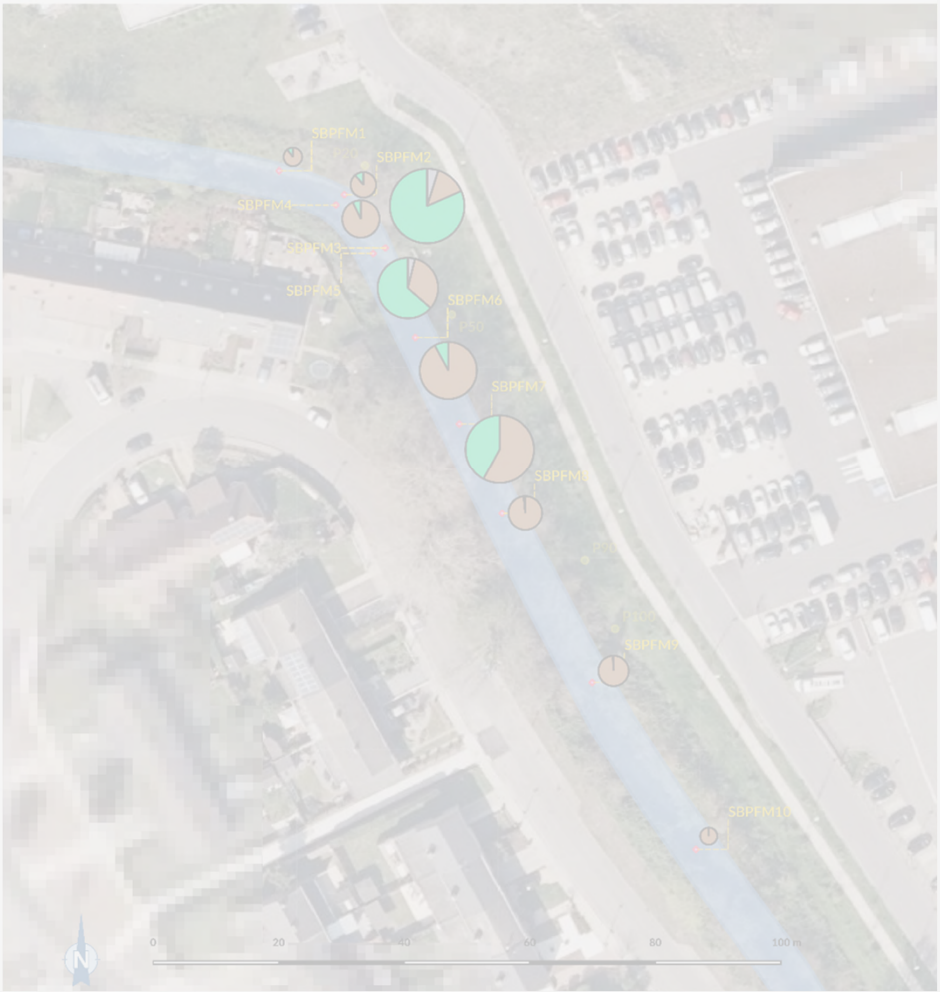
VERTICAL UPWARDS FLUX: AFTER



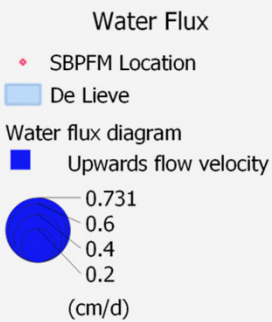
Vertical Upwards Flow Velocity: After Dredging



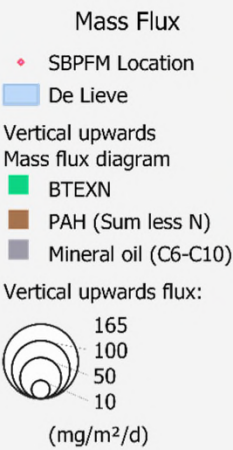
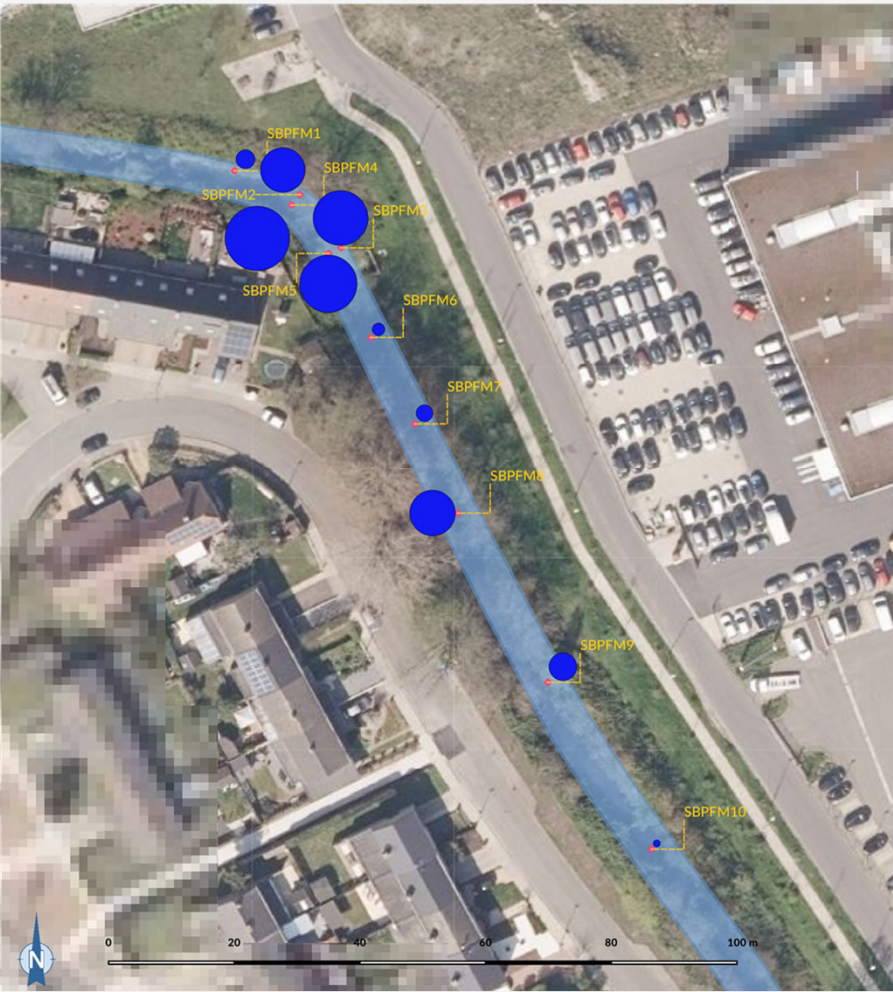
Vertical Upwards Mass Fluxes: After Dredging



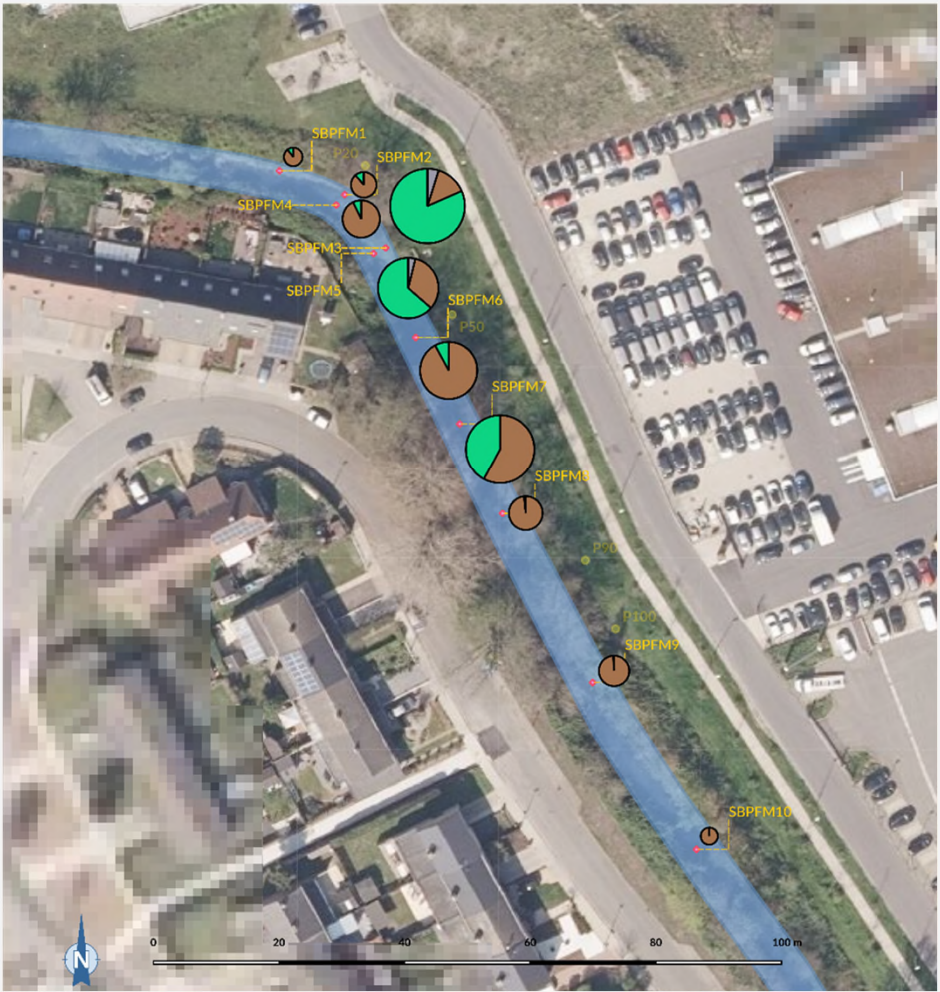
VERTICAL UPWARDS FLUX: AFTER



Vertical Upwards Flow Velocity: After Dredging



Vertical Upwards Mass Fluxes: After Dredging



NATURAL CATCH DESIGN



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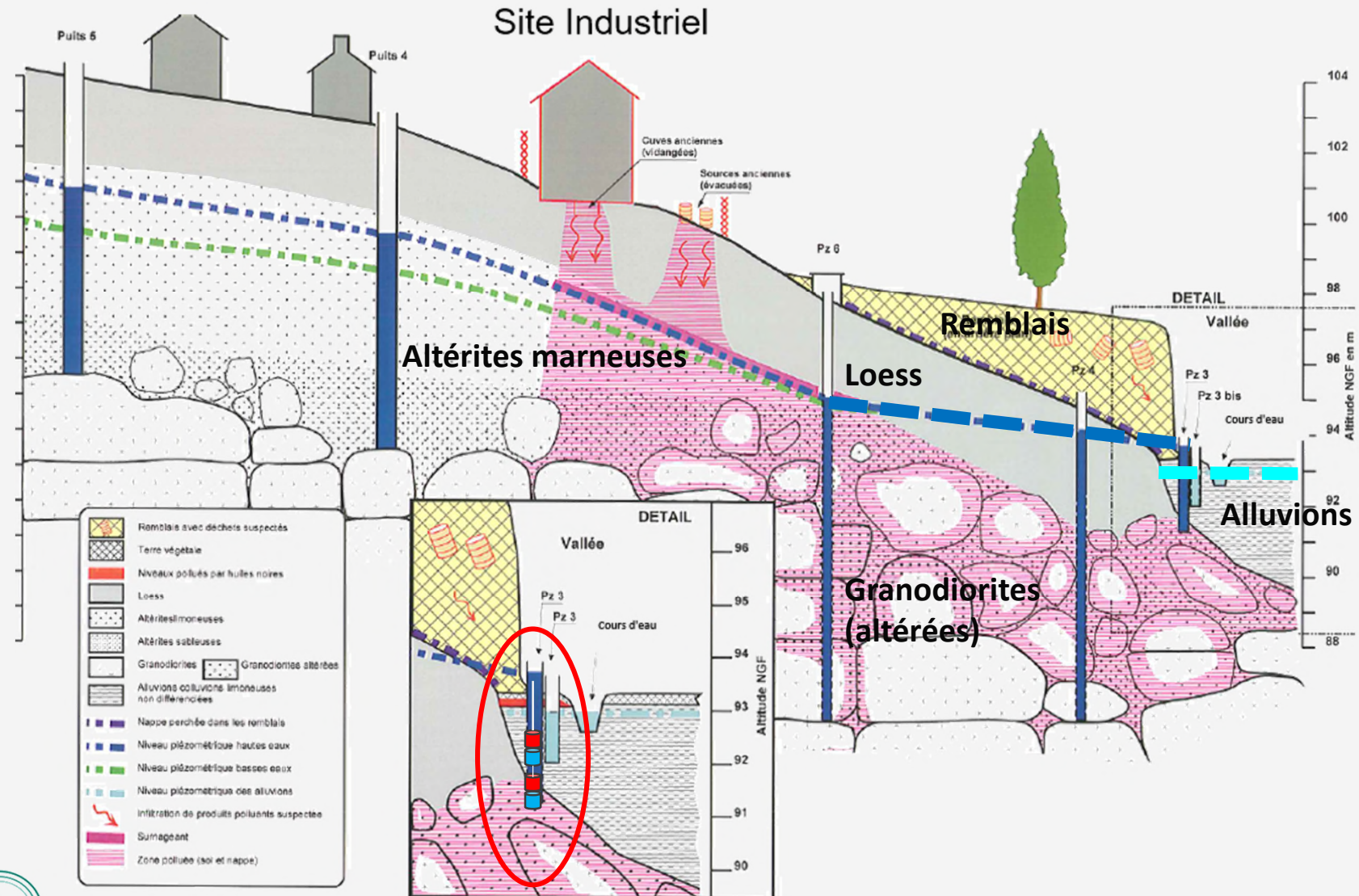


J_{Benzene} (vertical ascendant):

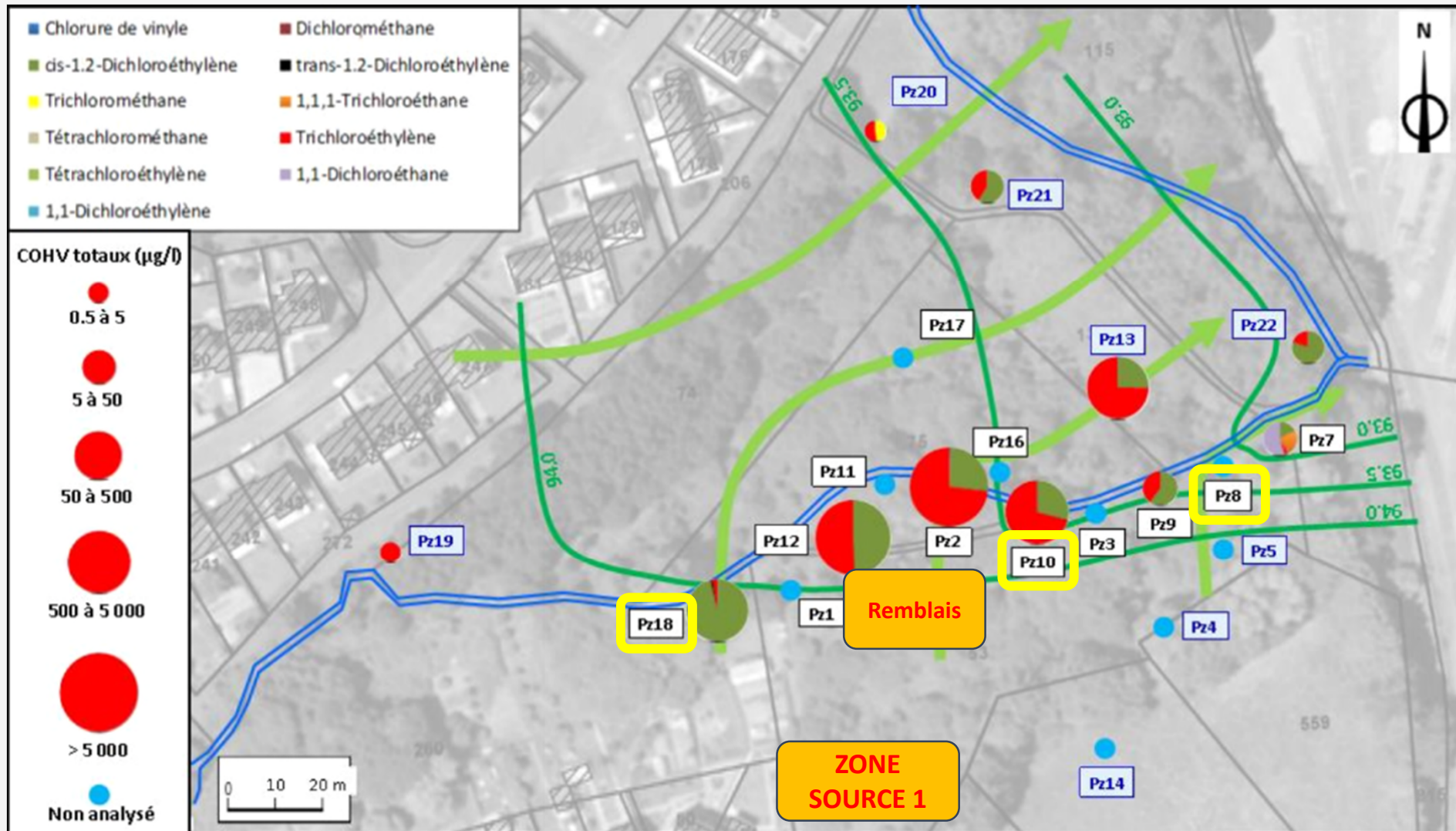
- Initial: 5-35 mg/m²/j
- Actuel: 0-0,25 mg/m²/j

Rendements : > 95%

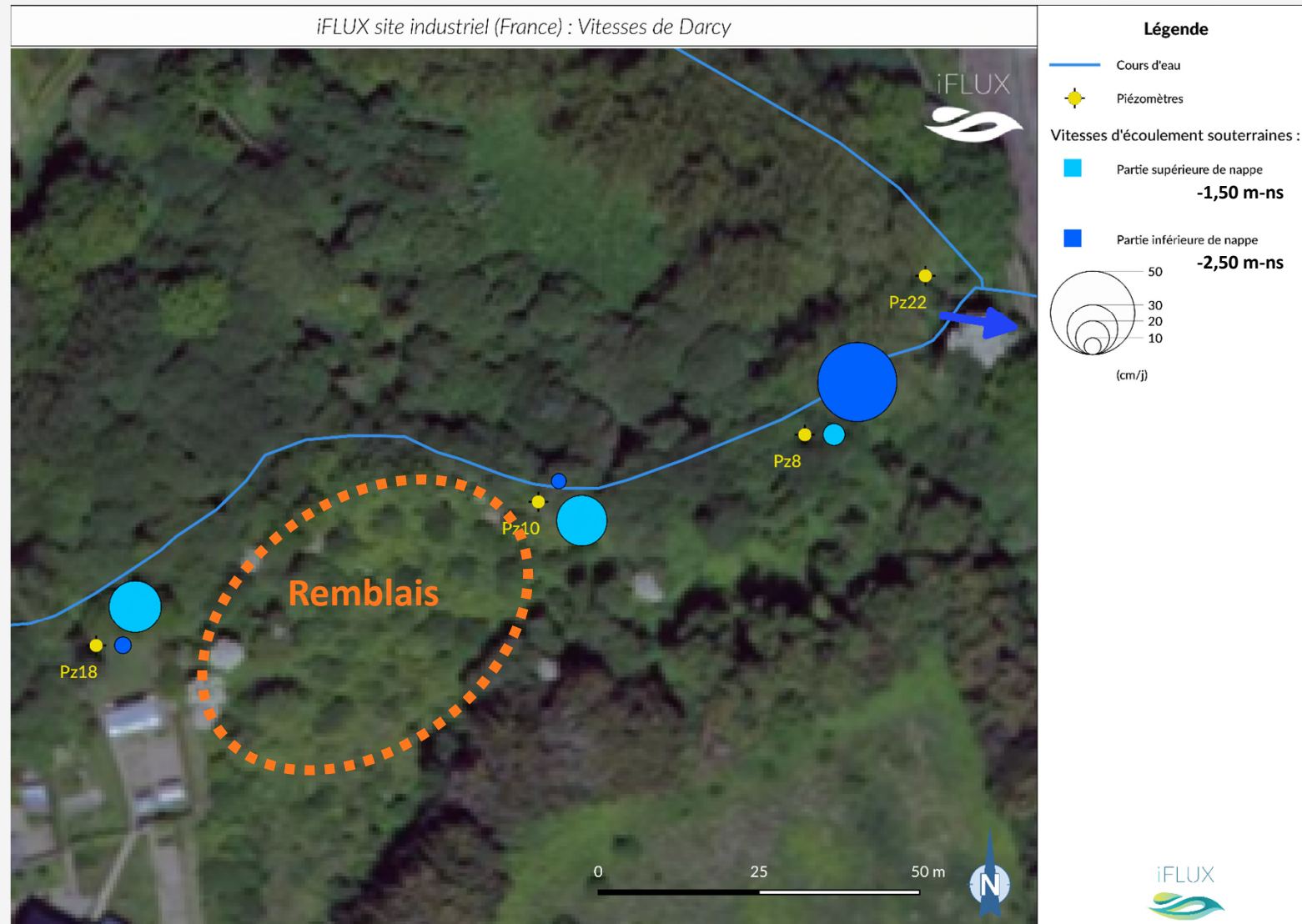
Case 2 – France: Industrial site on a riverbank



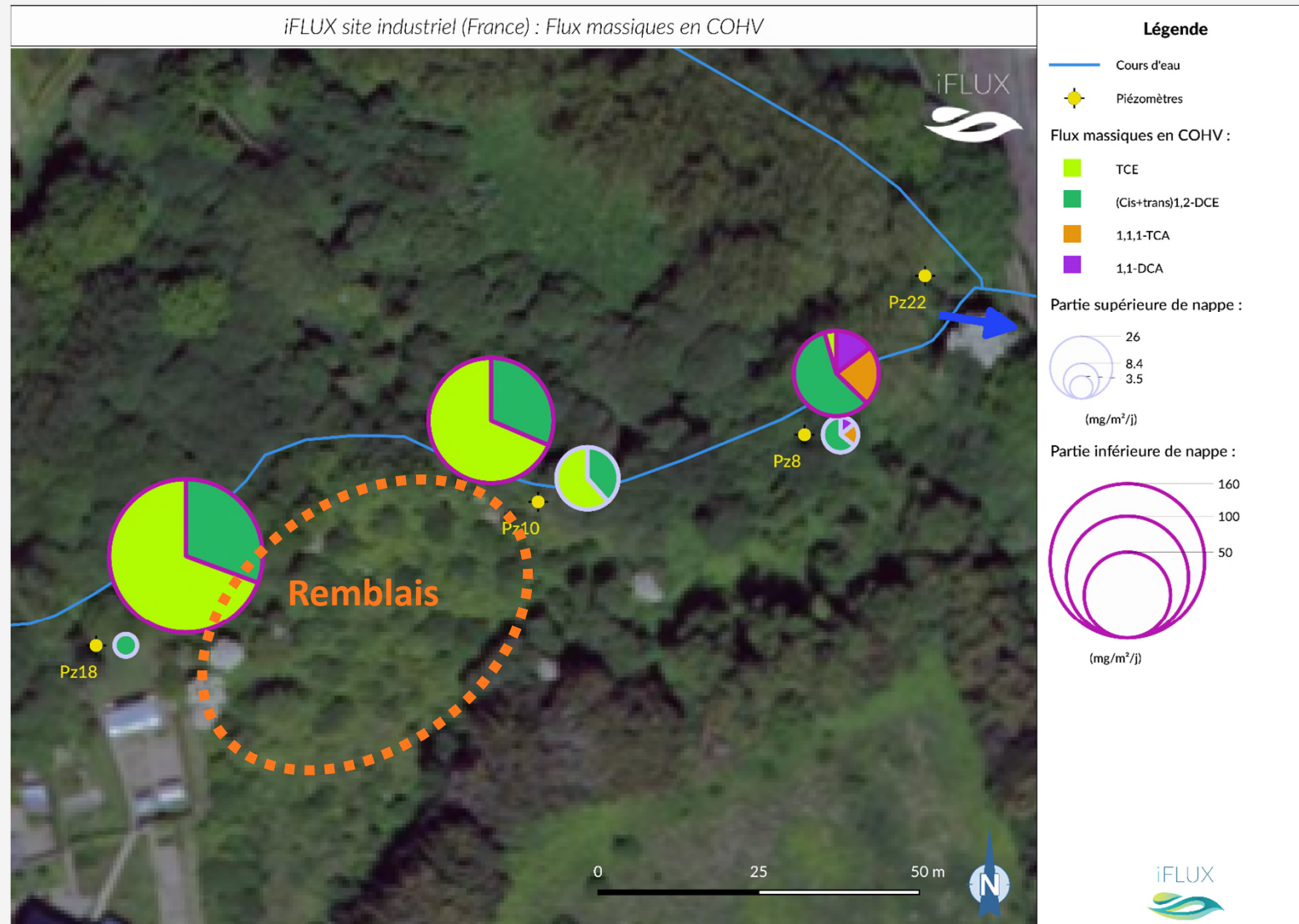
Case 2: Concentrations dans l'eau

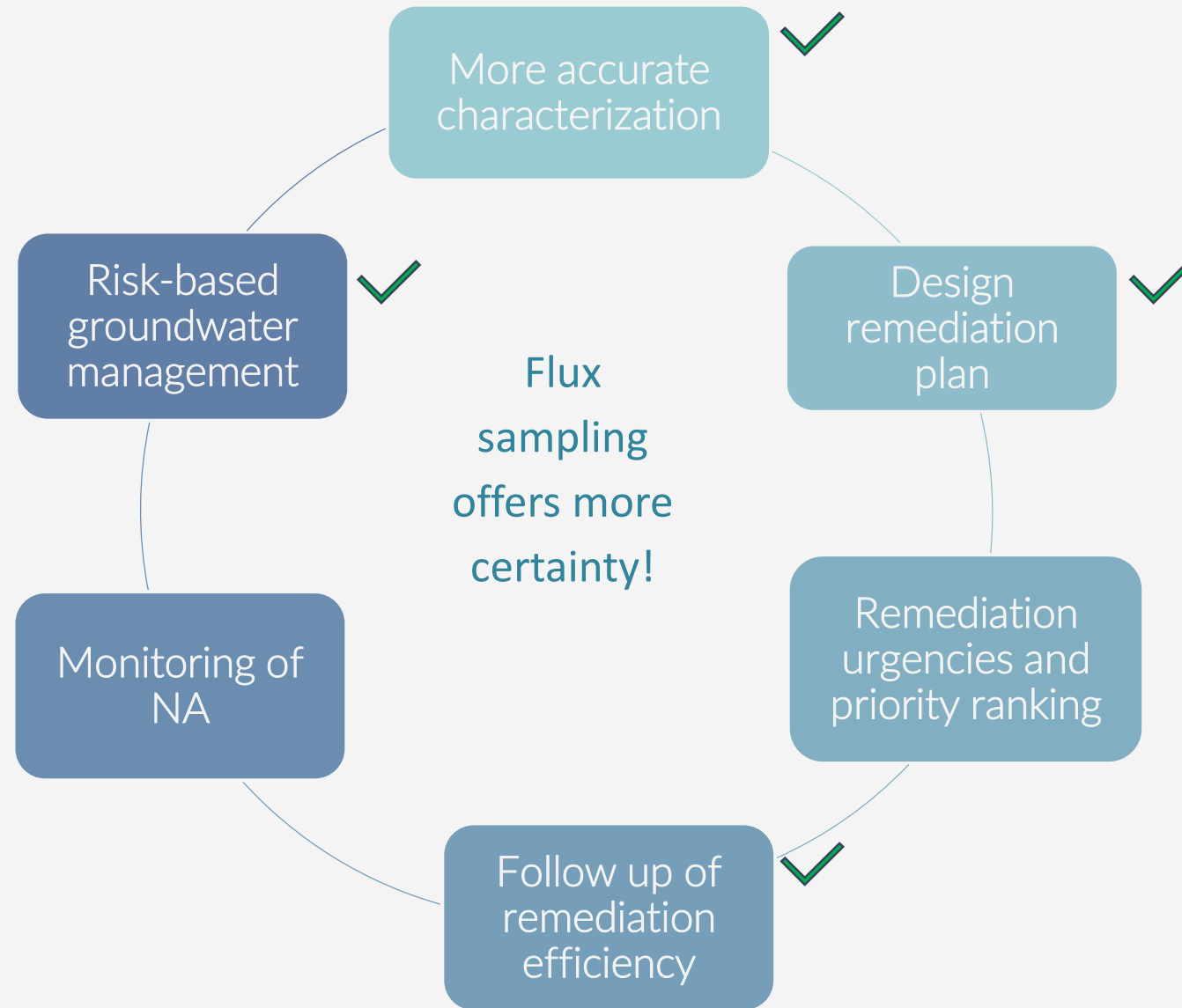


Case 2: Vitesses de Darcy



Case 2: Flux massiques





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Thank you! Questions?



erik@ifluxsampling.com



+32 471 90 41 12

www.ifluxsampling.com