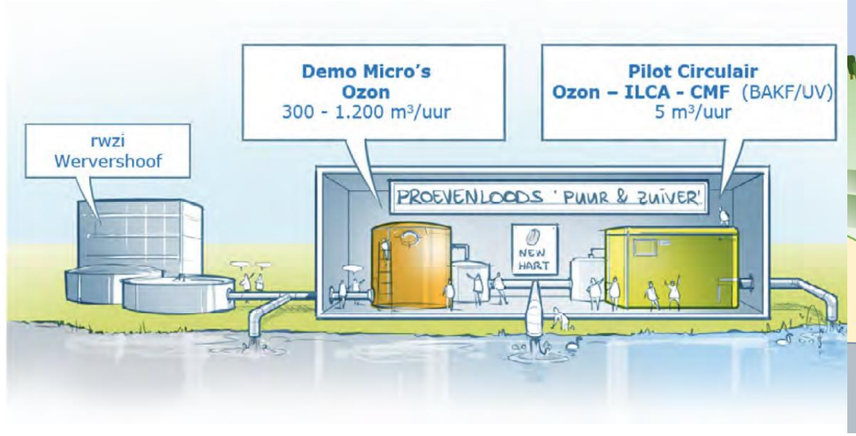
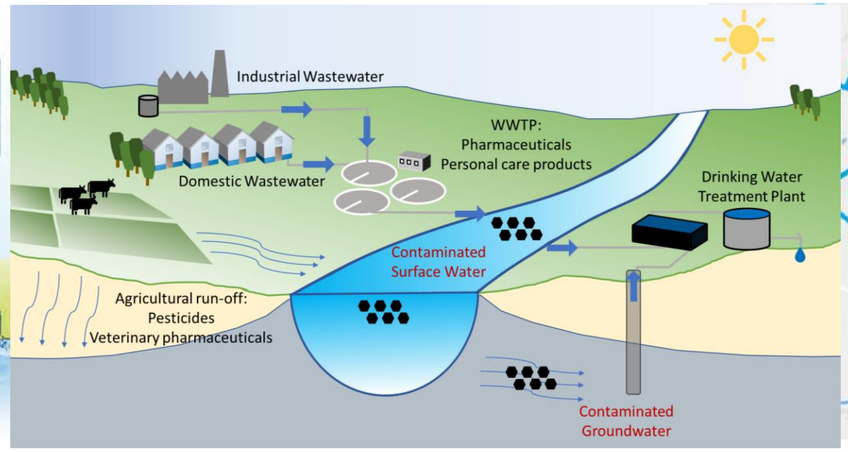
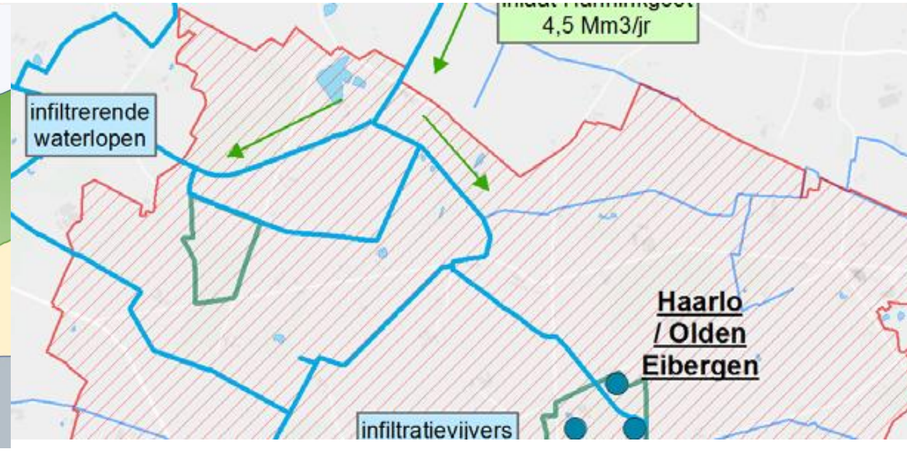
Work Package 3: Risk-assessment of re-use in cyclic water systems

Nora Sutton, Annemarie van Wezel, Alessia Ore, Jan Specker, Antonia Praetorius







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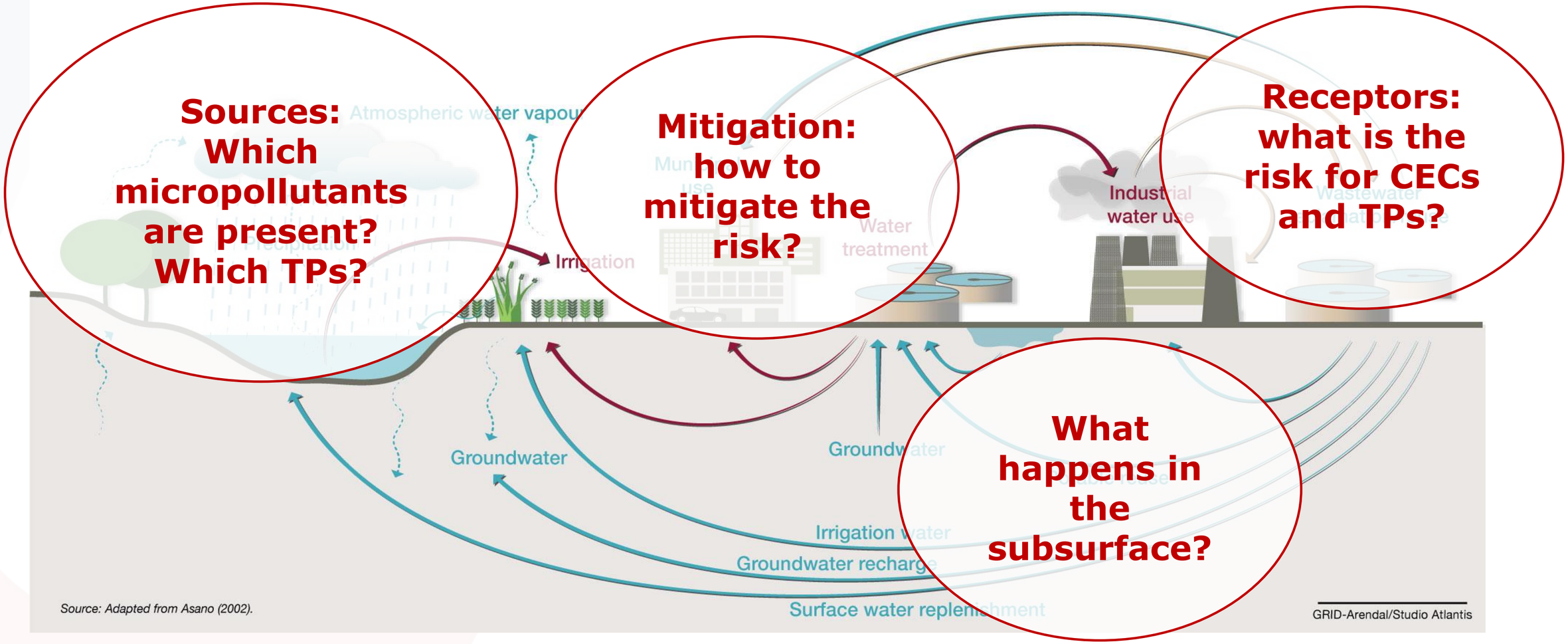
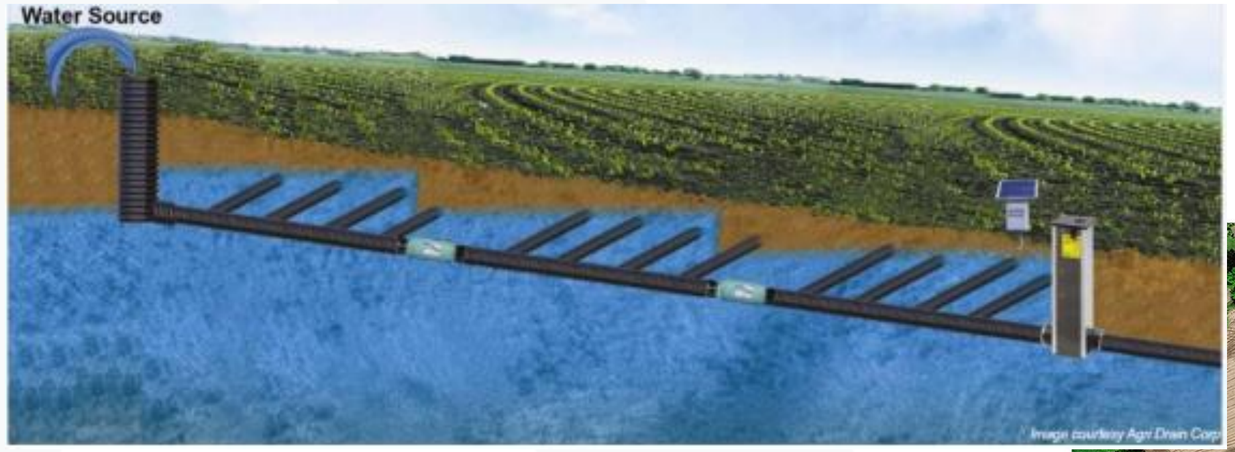
Challenging water (re)use

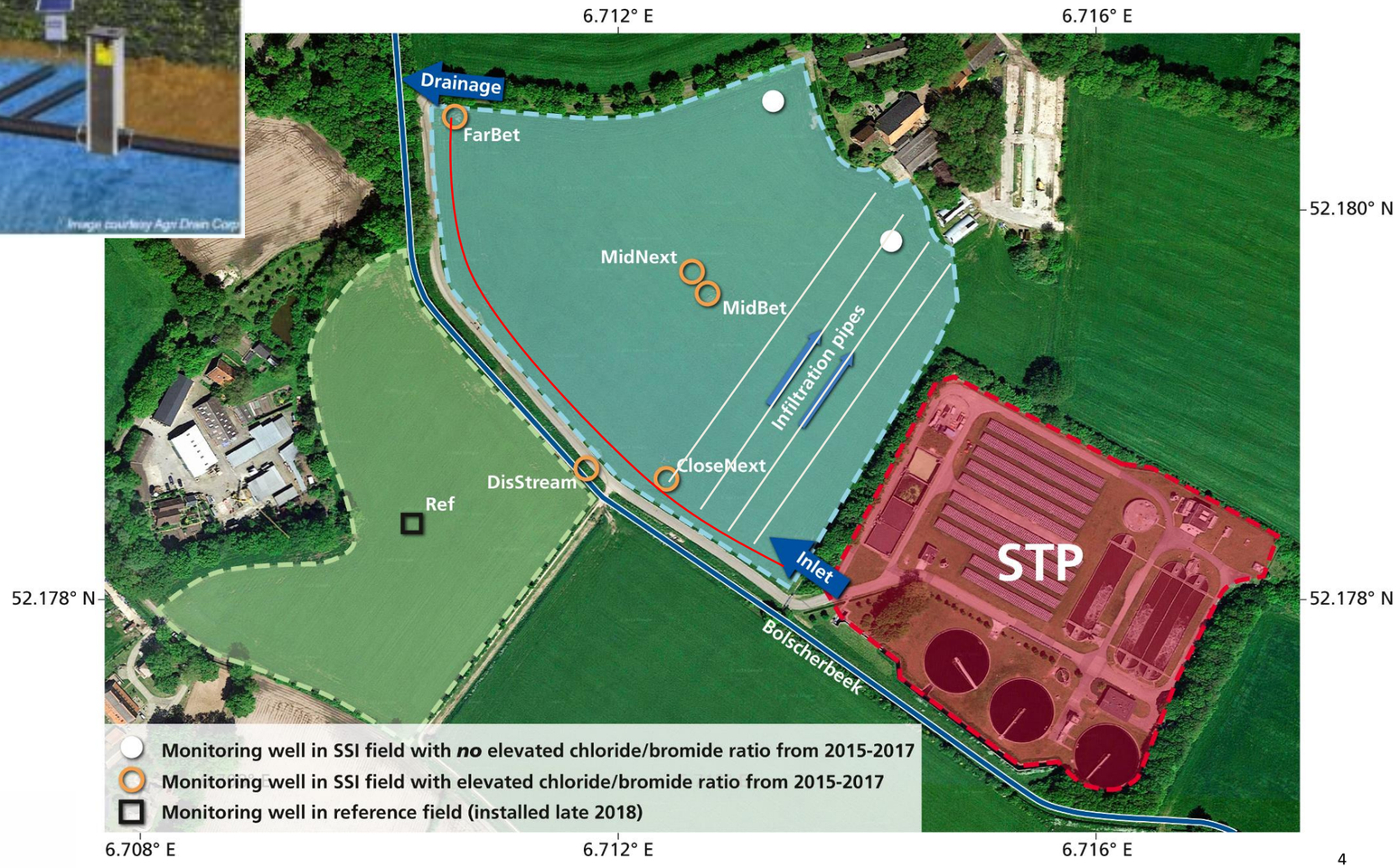


Haaksbergen case study

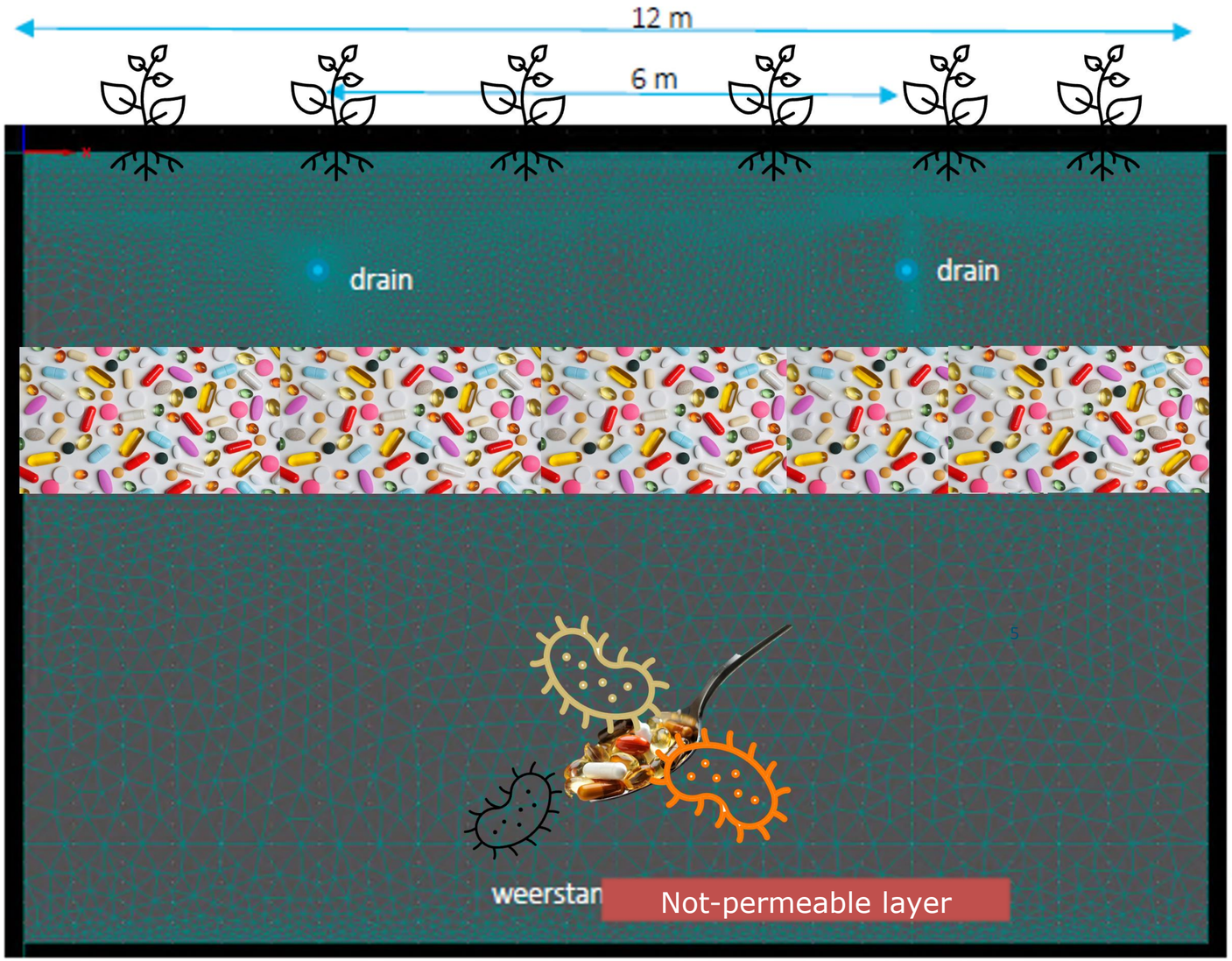
Subsurface irrigation



- Reuse of alternative water source for irrigation
- No direct contact with pollutants and pathogens
- Less evaporation
- Nutrients provision to the field (fewer fertilizers needed)



Risks of OMPs in subsurface irrigation



Ecotoxicology

Jan Specker
UvA

Abiotic processes (sorption of low degradable micropollutants)

Jill Soedarso
WUR

Micropollutants biodegradation

Alessia Ore
WUR

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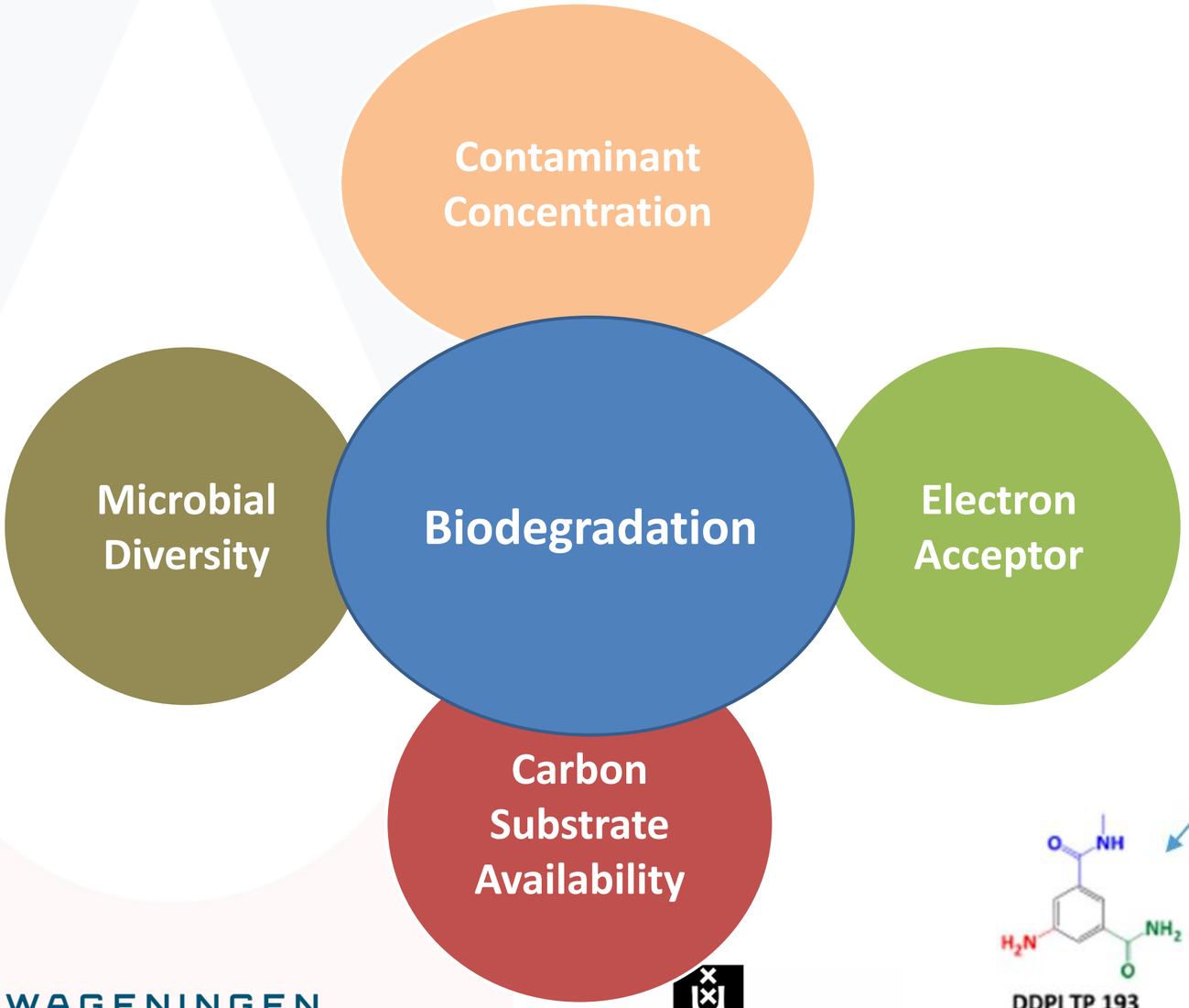
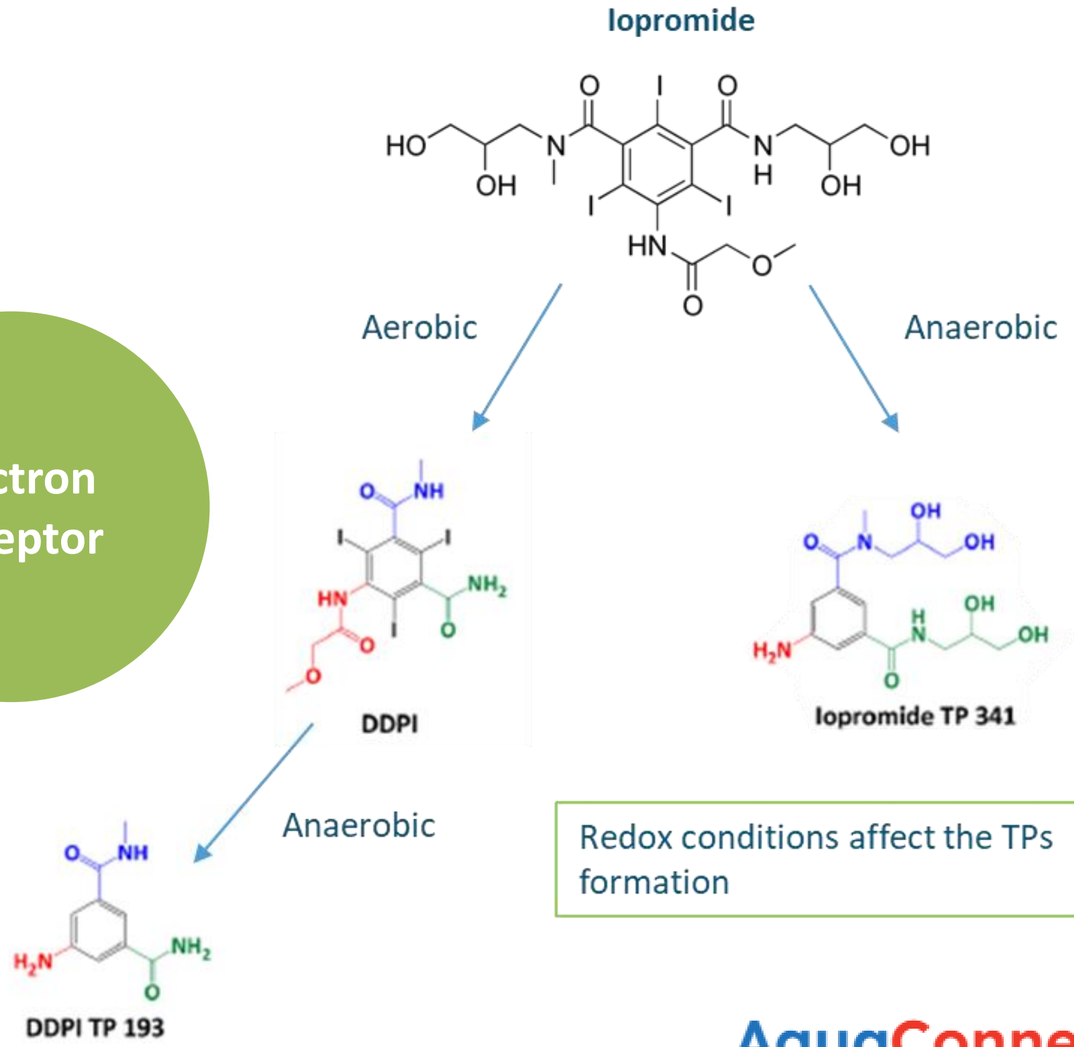
Biodegradation and TPs formation





Redox conditions affect the TPs formation

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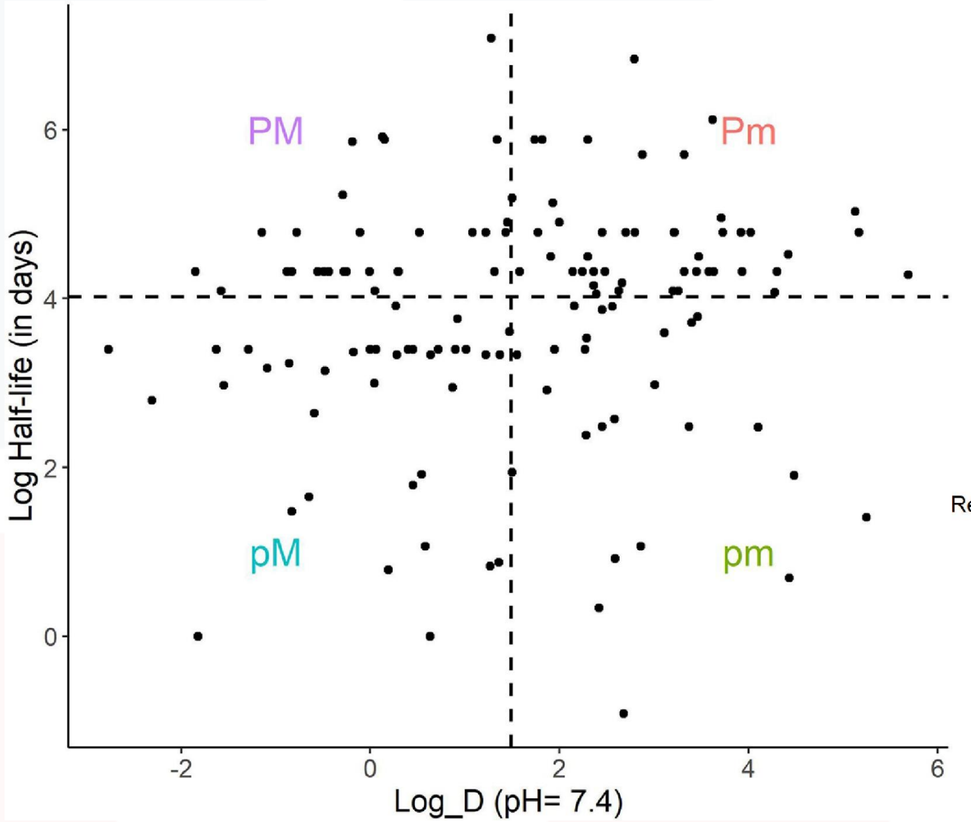
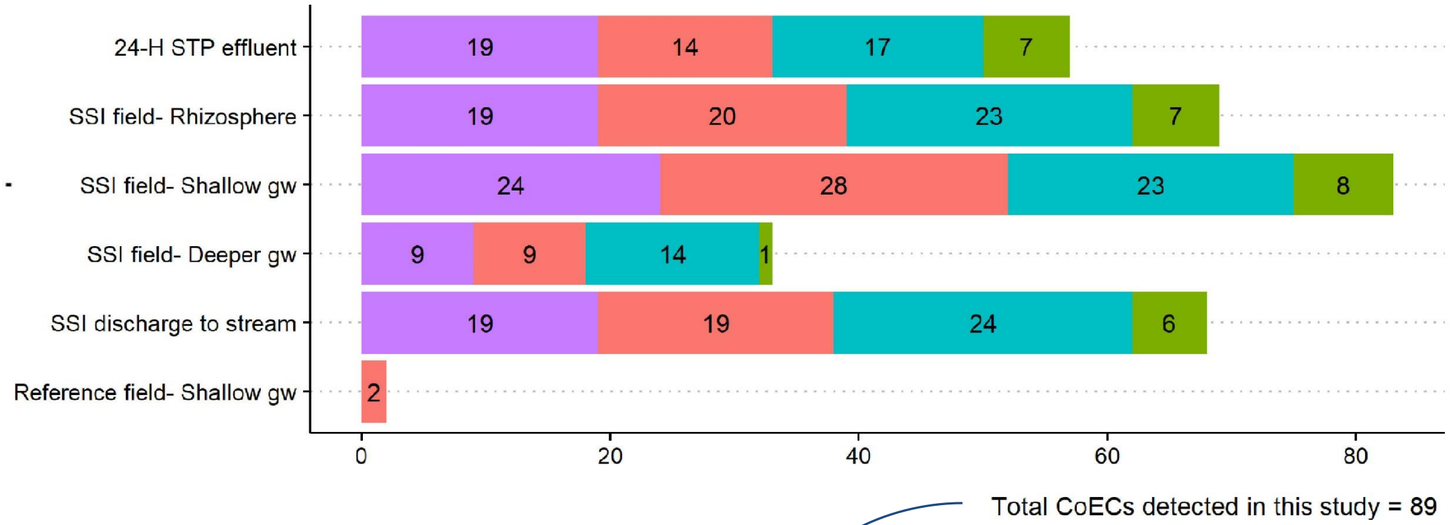
Micropollutants behaviour from a previous study





Total CoECs detected in this study = 89

Pharmaceuticals, PFAS, pesticides, artificial sweeteners, ...

Narain-Ford et al., 2022

CoECs: contaminants of emerging concern
PM: high persistency and mobility
pm: low persistency and mobility
Pm: high persistency, low mobility
pM: low mobility, high persistency

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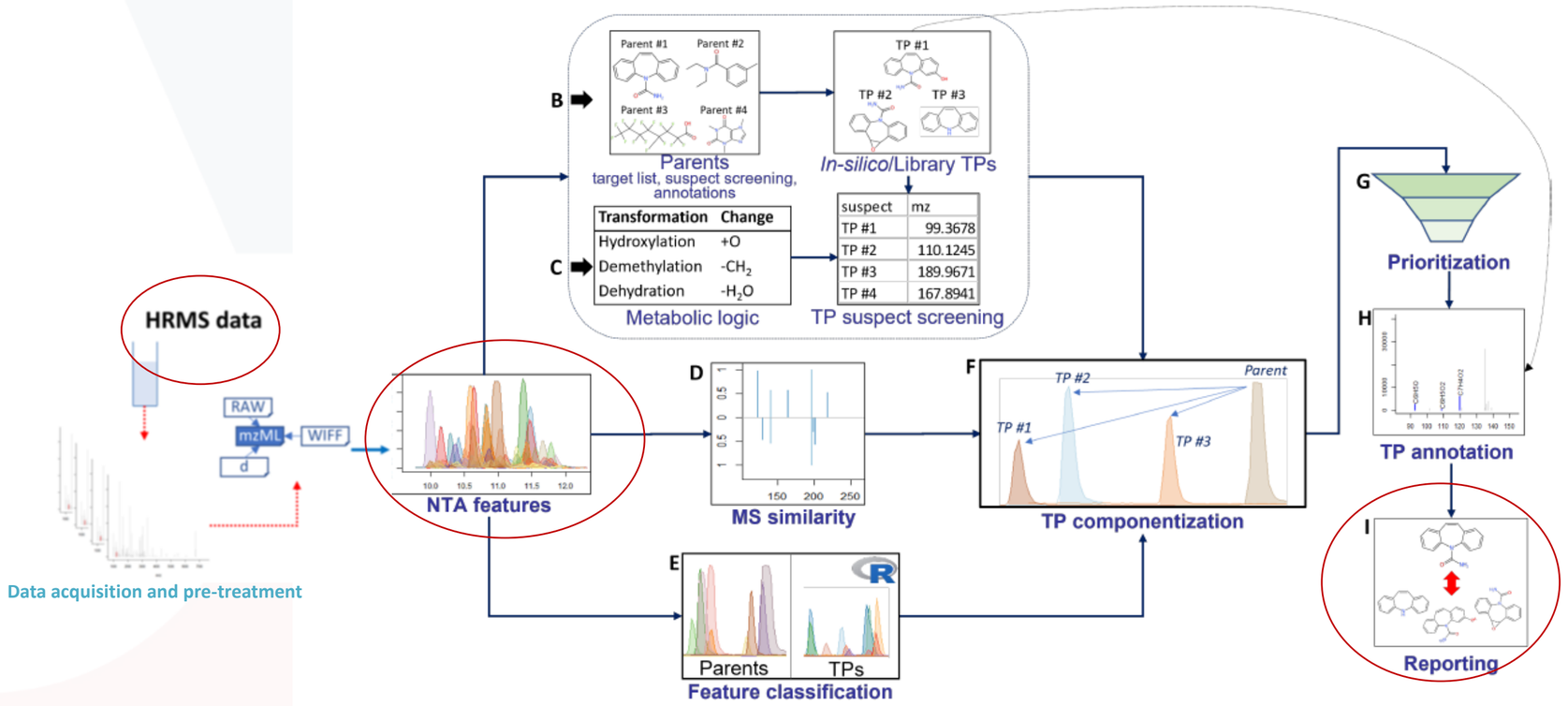
Focus of my study: Transformation Products

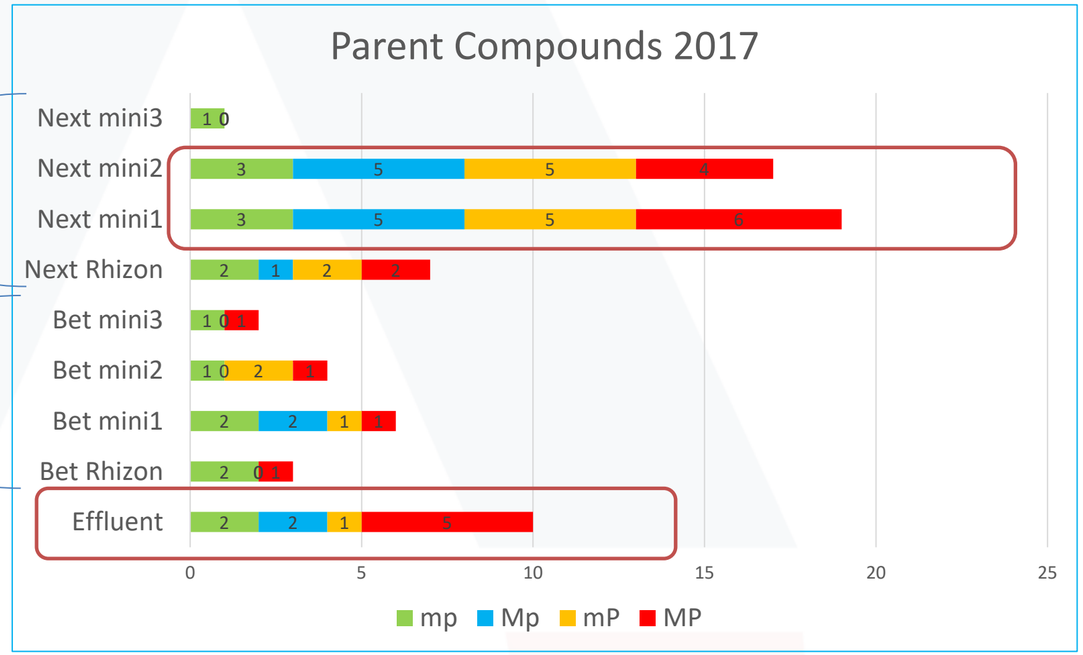
- Research focus: biodegradation of micropollutants and transformation products (TPs) formation in the subsurface
- Methodology: application of patRoon to non-target screening data from the field

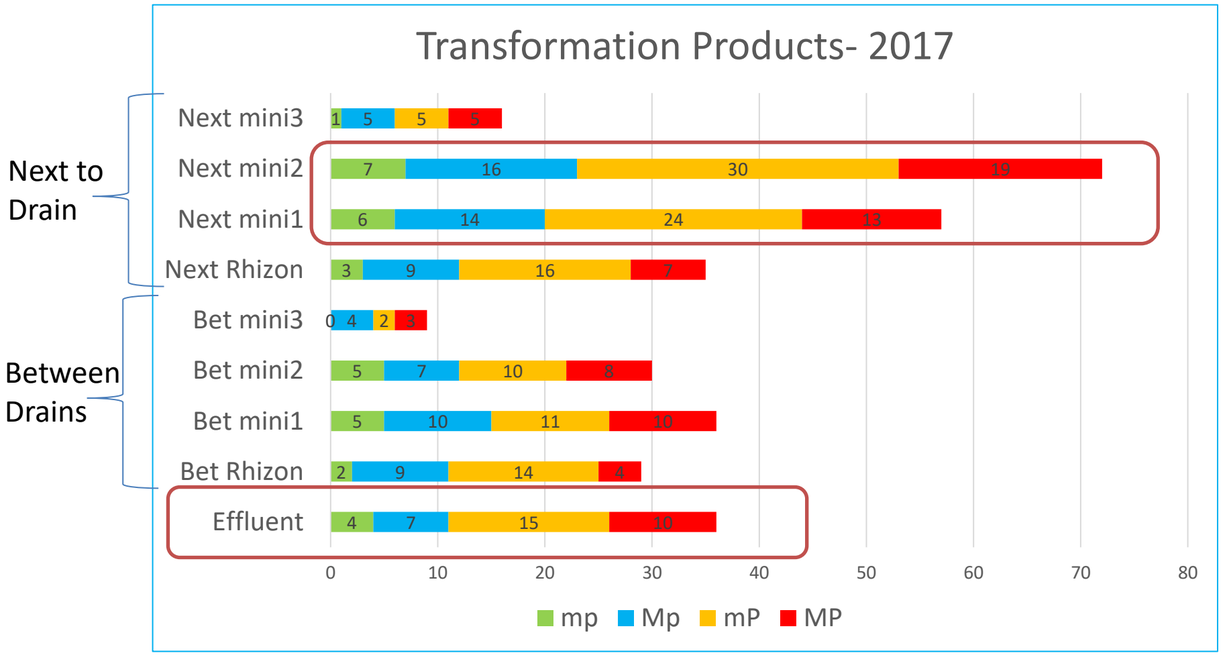


patRoon workflow for TPs identification (Helmus et al., 2022)

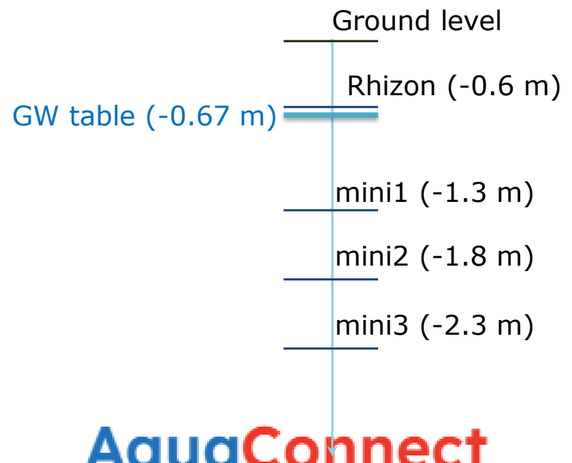
Wet Year 2017

Bet: in between infiltration pipes
Next: close to an infiltration pipe
PC: parent compound
TP: transformation product





- Many TPs in effluent
- Most PCs and TPs detected next to infiltration pipe at ~1-2 m depth
- High persistency classes produce the most TPs



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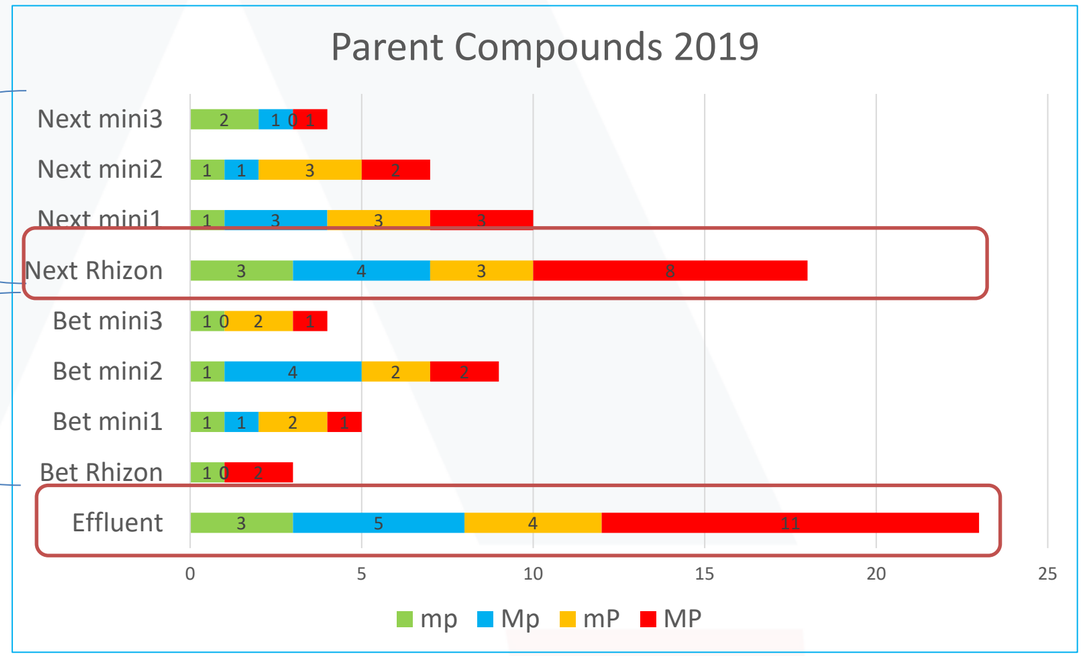
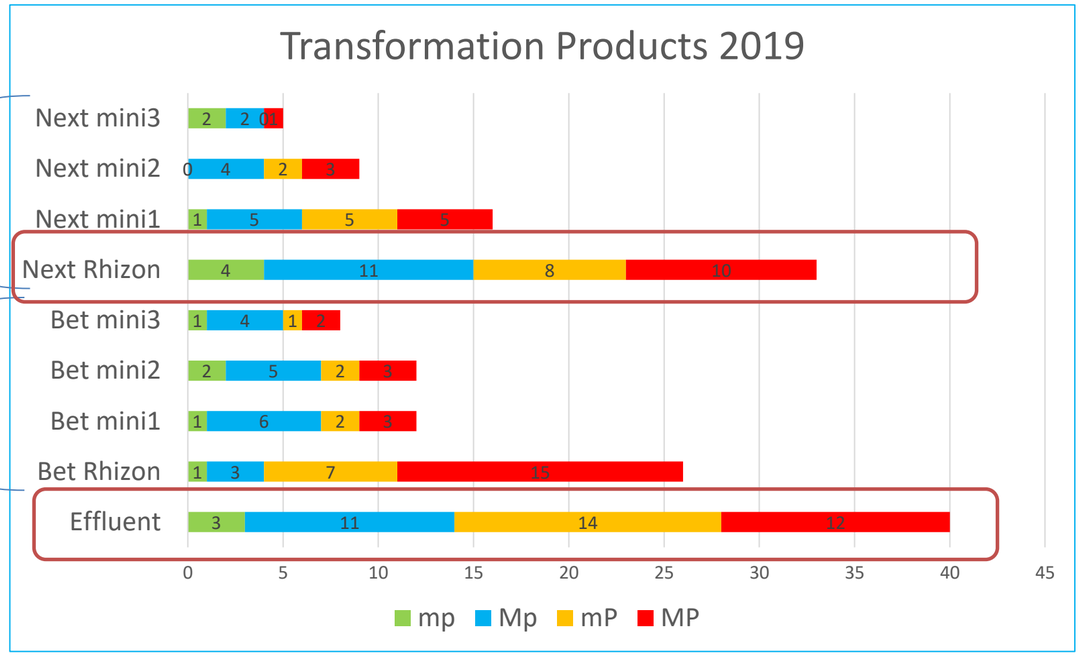
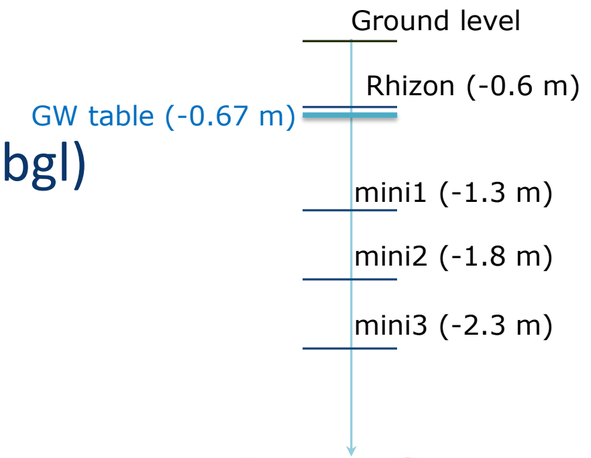
Dry Year 2019

Bet: in between infiltration pipes
Next: close to an infiltration pipe
PC: parent compound
TP: transformation product





- Most PCs and TPs in effluent
- Most PCs and TPs detected next to infiltration pipe at Rhizosphere (0.6 m bgl)



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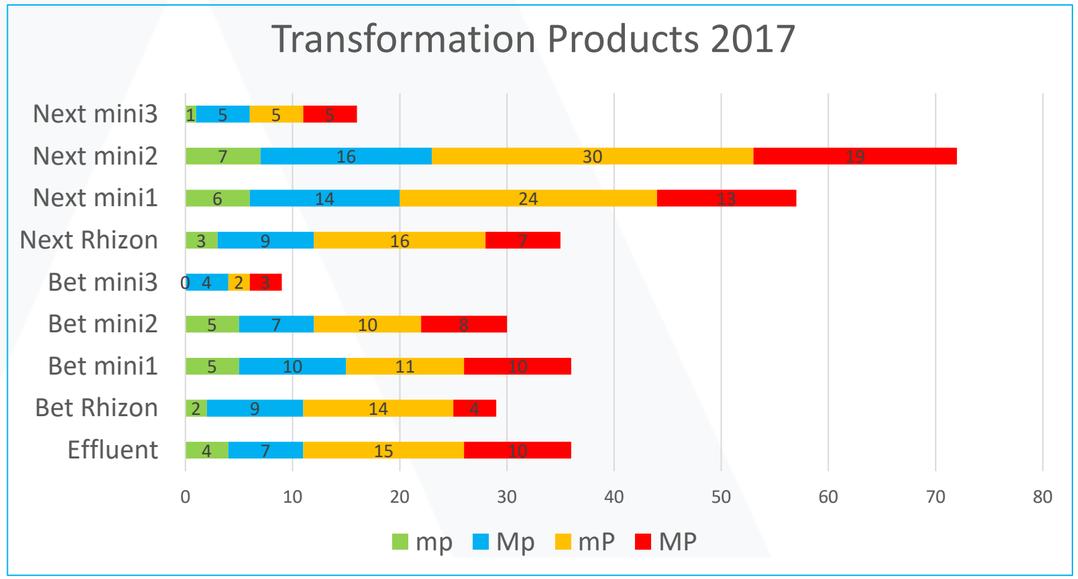
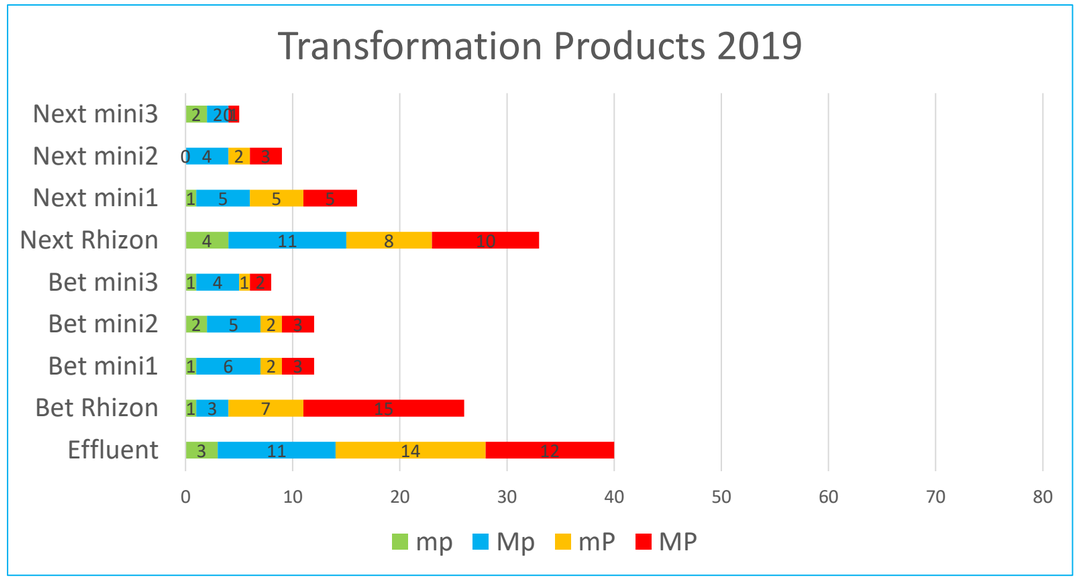
Take home messages

Bet: in between infiltration pipes
Next: close to an infiltration pipe
PC: parent compound
TP: transformation product





- TPs are a large blind spot in our understanding of organic micropollutant transformation
- Position in field and weather conditions important
  - Many more TPs accumulate in 2017 than in 2019
  - Depth of TPs depends on precipitation
- Next step: identify transformation pathways and try to link this to environmental conditions
- Overall goal: steer towards mineralization and away from persistent TPs

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Thank you for your attention

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Other authors and acknowledgments:

D.M. Narain-Ford, R. Helmus, R.P. Bartholomeus, A.P. van Wezel, N.B. Sutton

AquaConnect, funded by NWO (grant-ID P19-45) and public and private partners, coordinated by Wageningen University and Research