

2024 Chlorinated Conference - Denver

Sorbed PFAS under Weather Conditions: Resilient Enough?

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Photo: ch.hotels



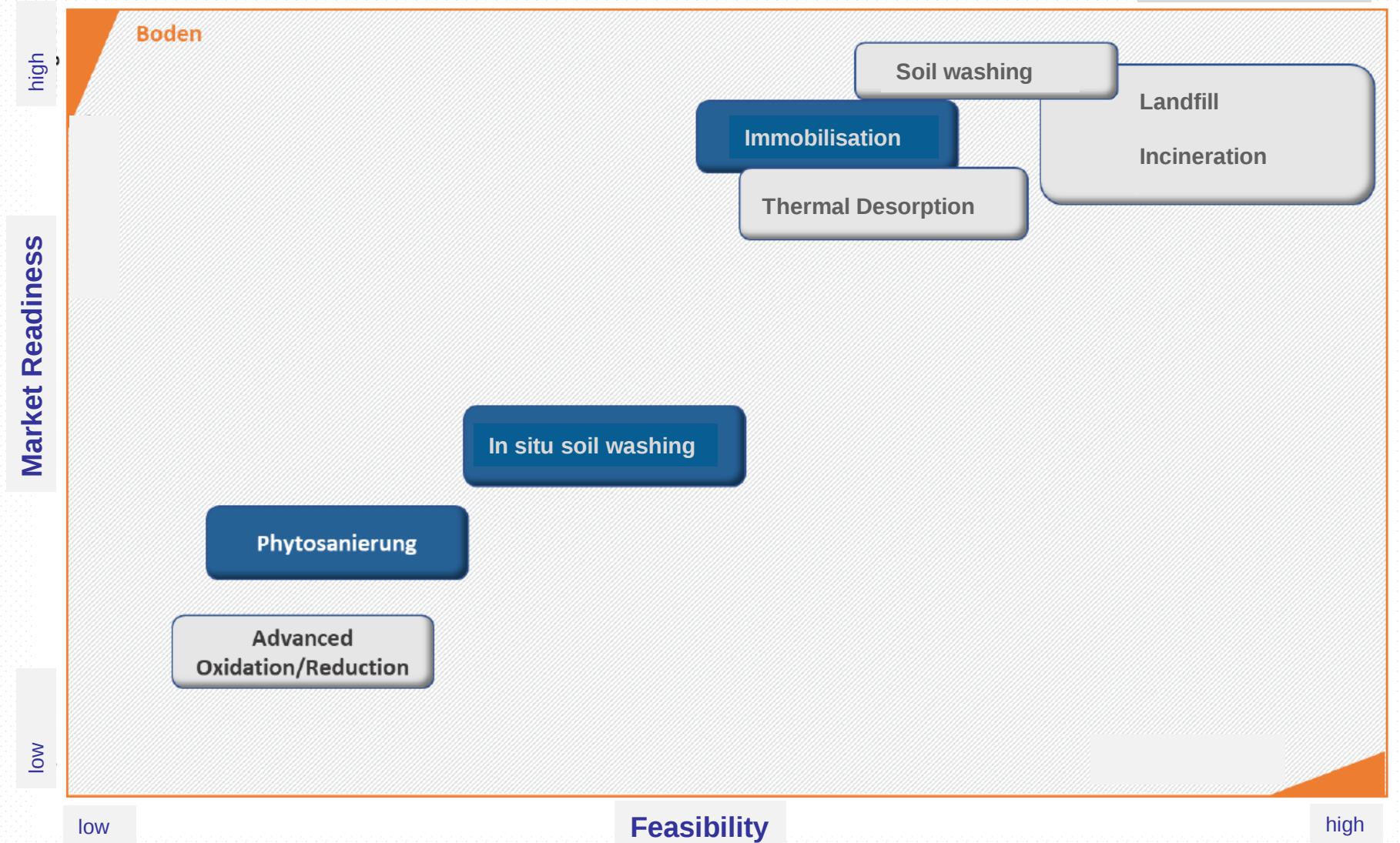
Content

- Techniques
- Alternative
- Application
- Results of Stress Test
- Conclusion



Treatment Techniques Soil

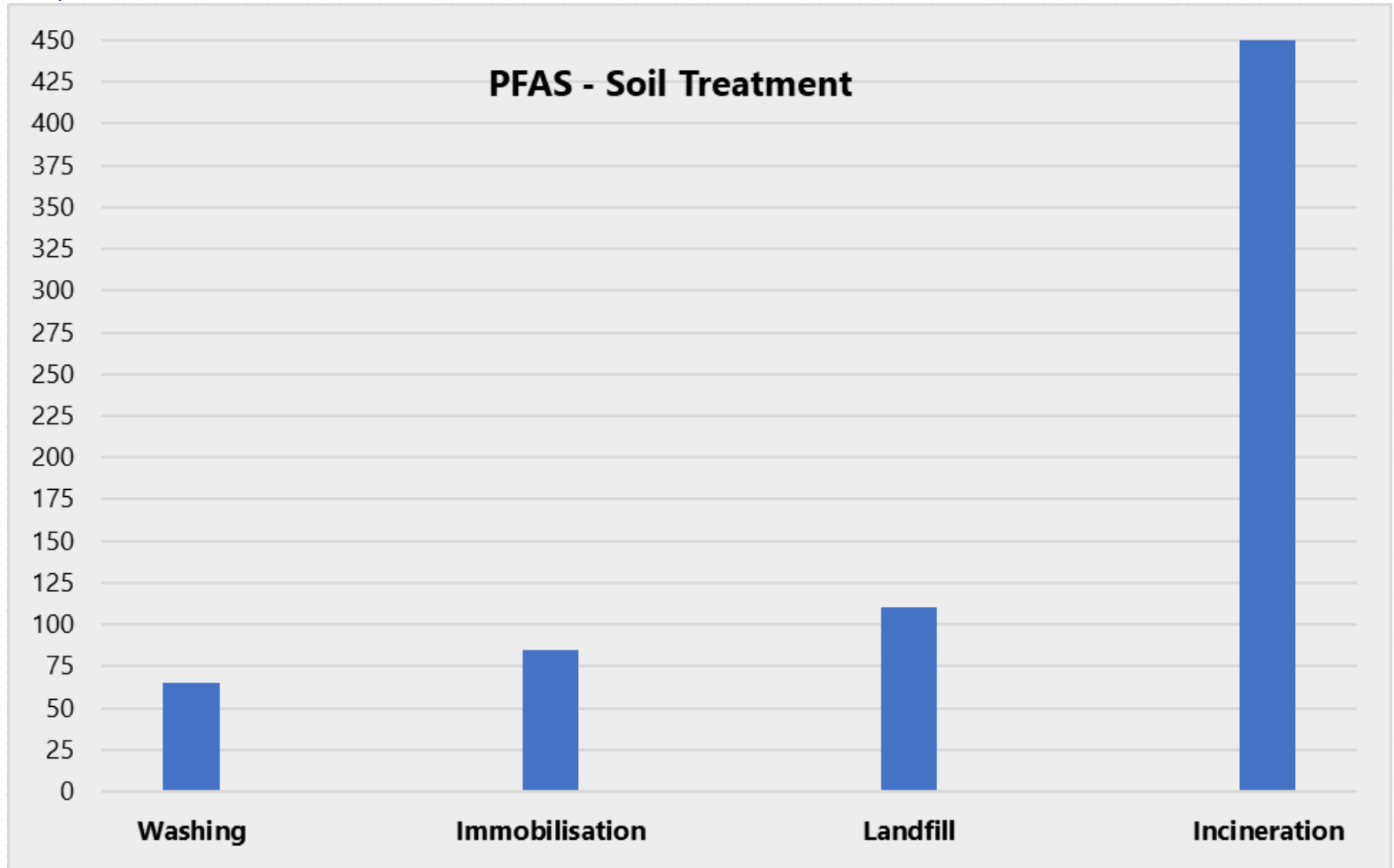
Source: UBA 2020



Treatment Techniques & Cost

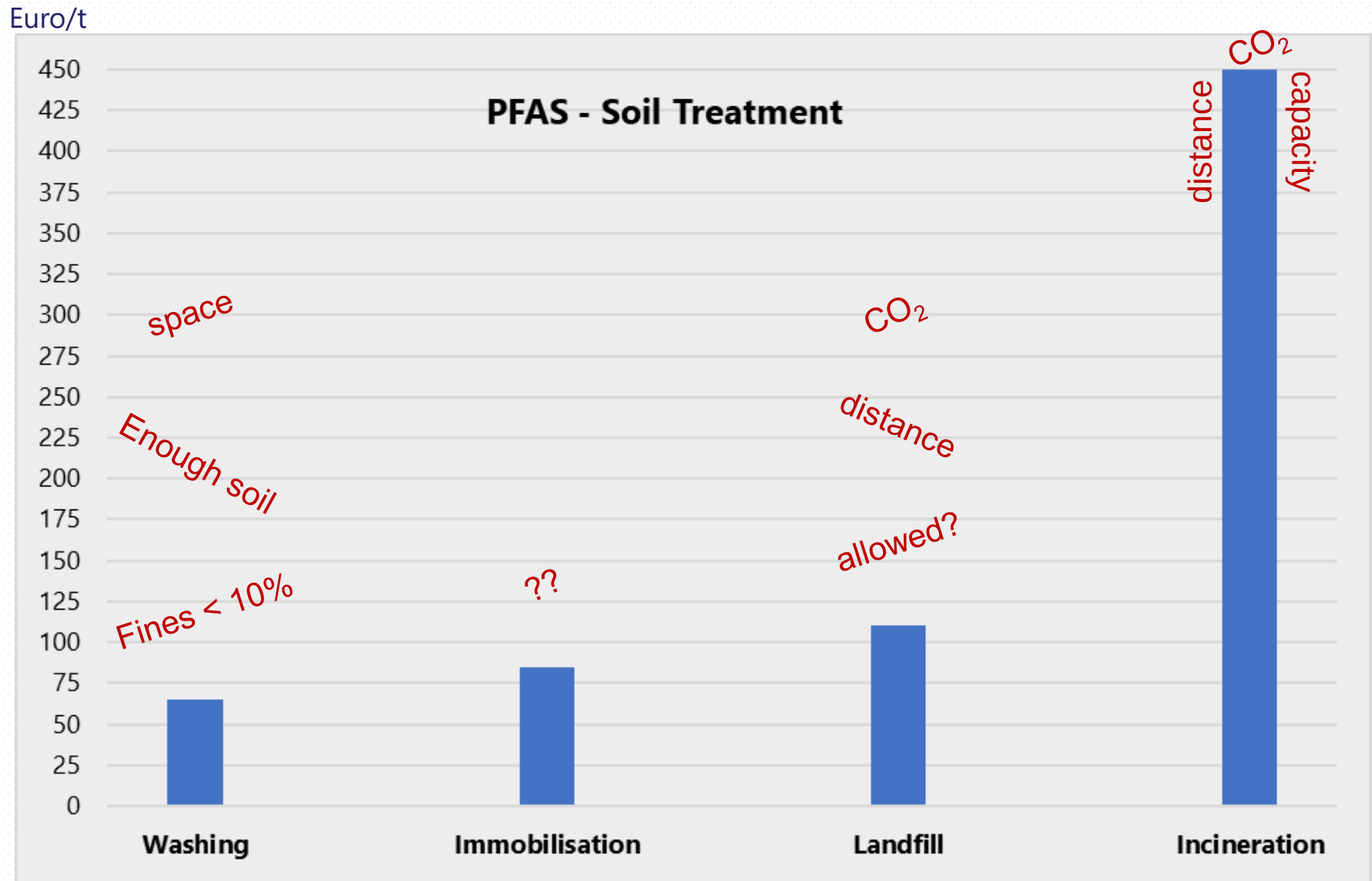
Euro/t

PFAS - Soil Treatment



Price level for Germany in 2021

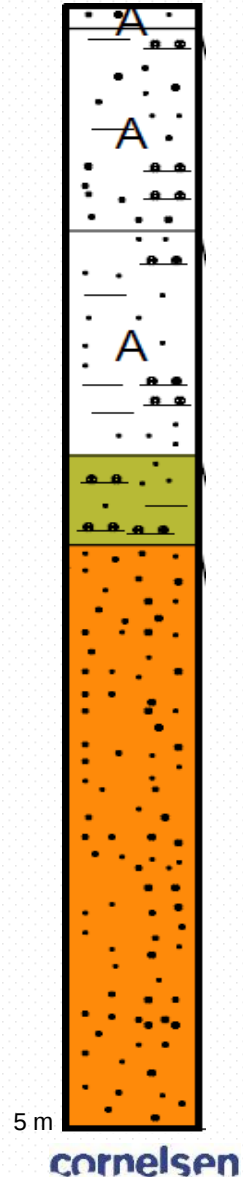
Treatment Techniques: ++ & --



Price level for Germany in 2021

Initial Situation

- industrial site
- former fire training pit
- Extension of building planned
- Investigation reveals PFAS
- predominantly PFOS
- in eluate



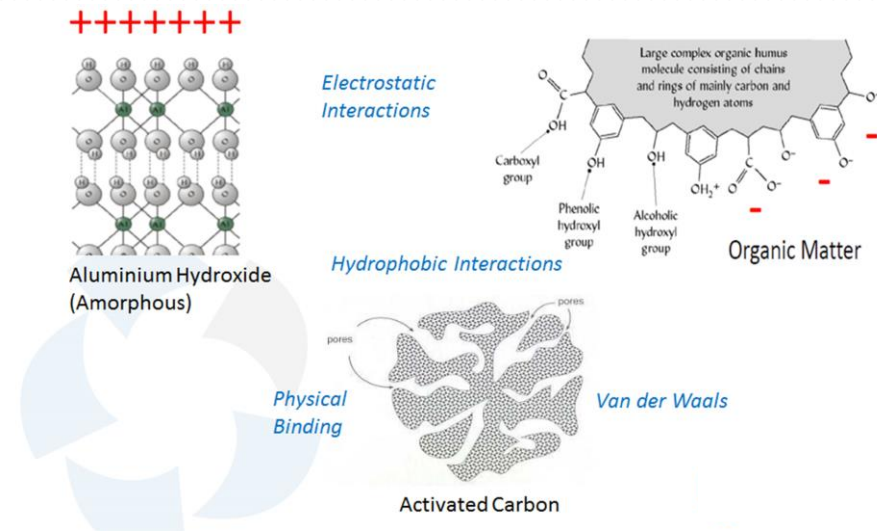
Remediation Approach

- about 3,000 t excavated
- limited space on site
- landfill preferred
- subset of 200 t used for study
 - ✓ alternative approach for future
 - ✓ sorption
 - ✓ stress test

Alternative - Ingredients

powdered adsorbents RemBind

- activated carbon
- Aluminium hydroxide
- Kaolin
- Additives



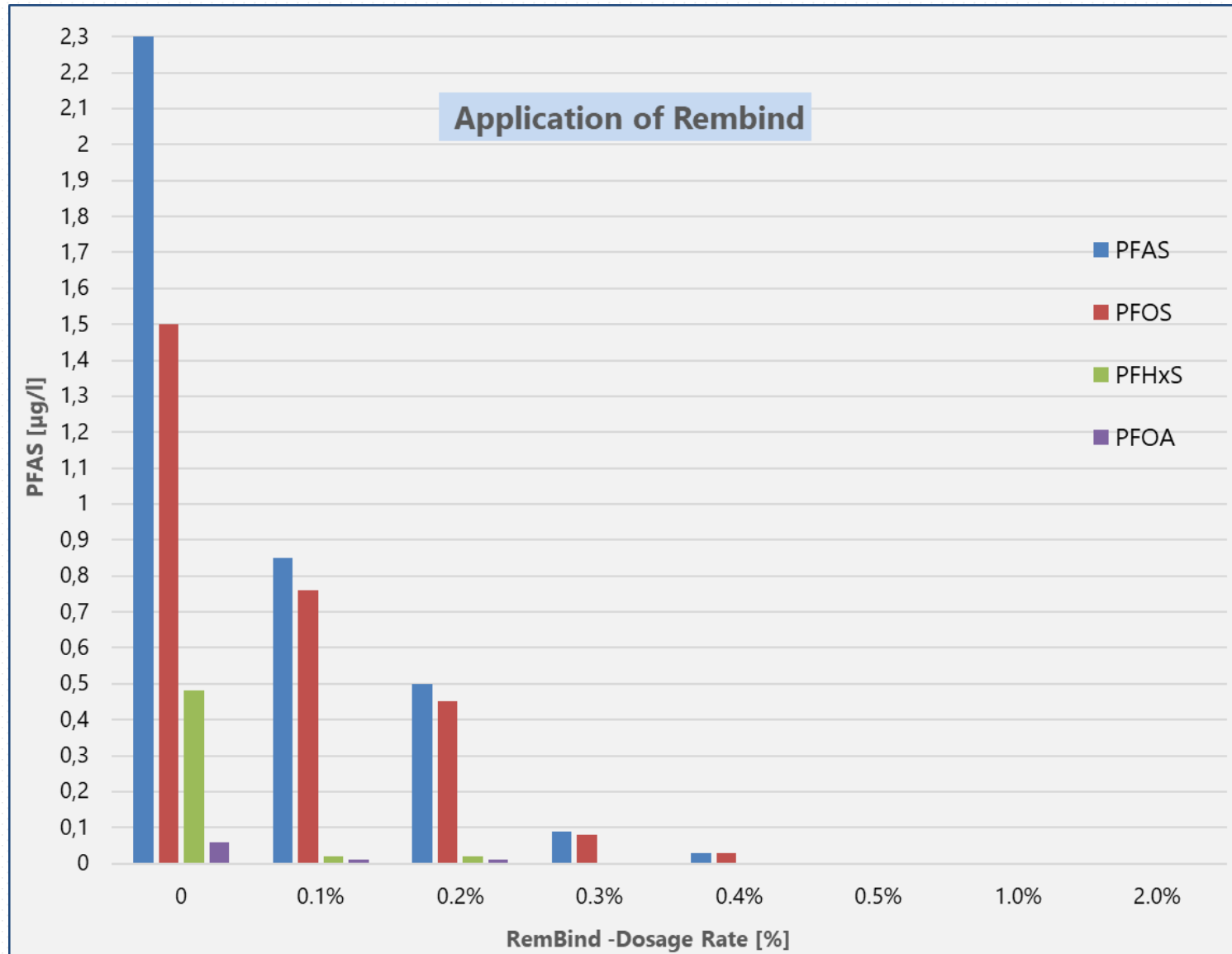
Alternative - Application

- dosing based on mass
- about 1% to 2.5%
- moisture about 20%
- proper mixing (contact)
- 24 hrs fixation
- bench test in advance



Photo: EnvyTech

Result of Bench Test



0,05 ppb PFHxA + PFHpS each / 0,04 PFBS / 0,03 PFOSA + PFPeS + 6:2 FTS each / 0,02 PFPeA / 0,01 PFHpA



Application in the Field

Application in the Field



PFAS < 0,01 µg/l (ppb)

Interim Conclusion

- Dosage rate adjustable
- Mixing manageable
- Sorption of PFAS
- utilisation improved
- CO₂-footprint low
- but durable??



Stress test at Eurofins/D

- Durability of sorption process
- Idea: Weathering / Landfill / Chemical
- Eluate 2:1 & 10:1

Freeze - Thaw

Wet - Dry

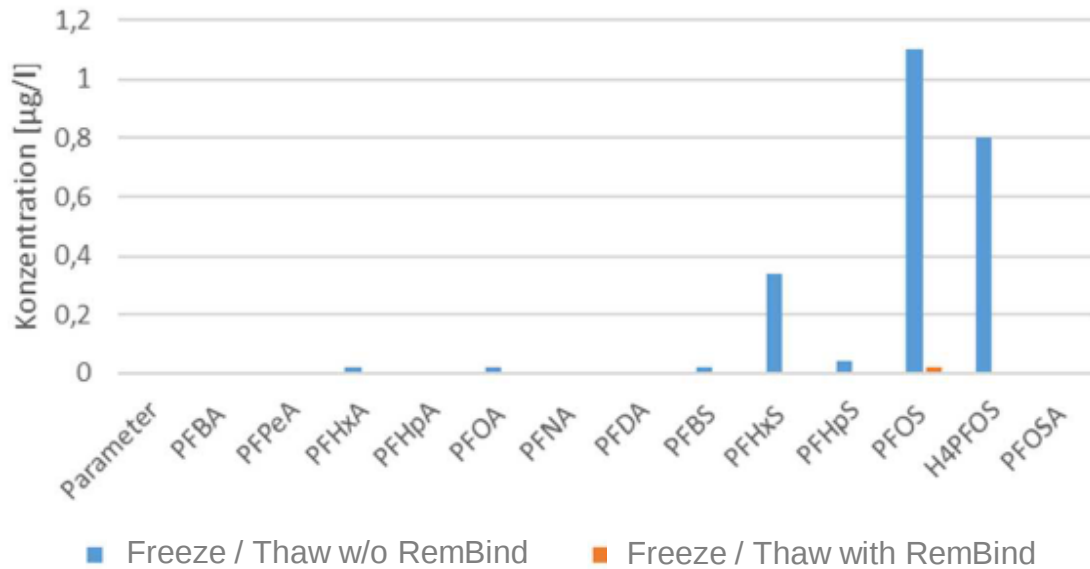
?

Activated
Sludge

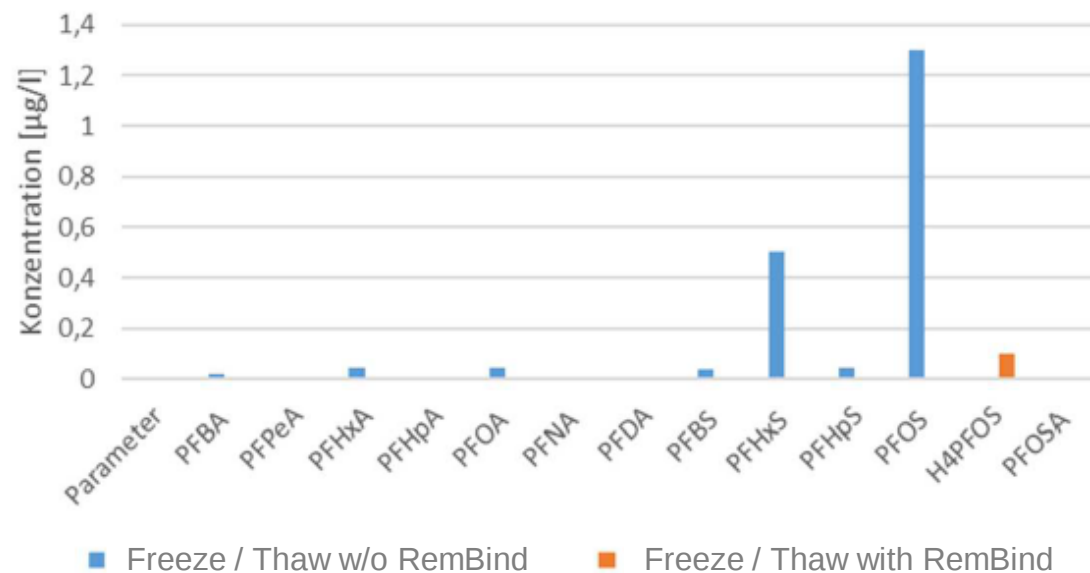
chemical
with ASE

1,2 means 1.2

Eluat: W/F = 10:1

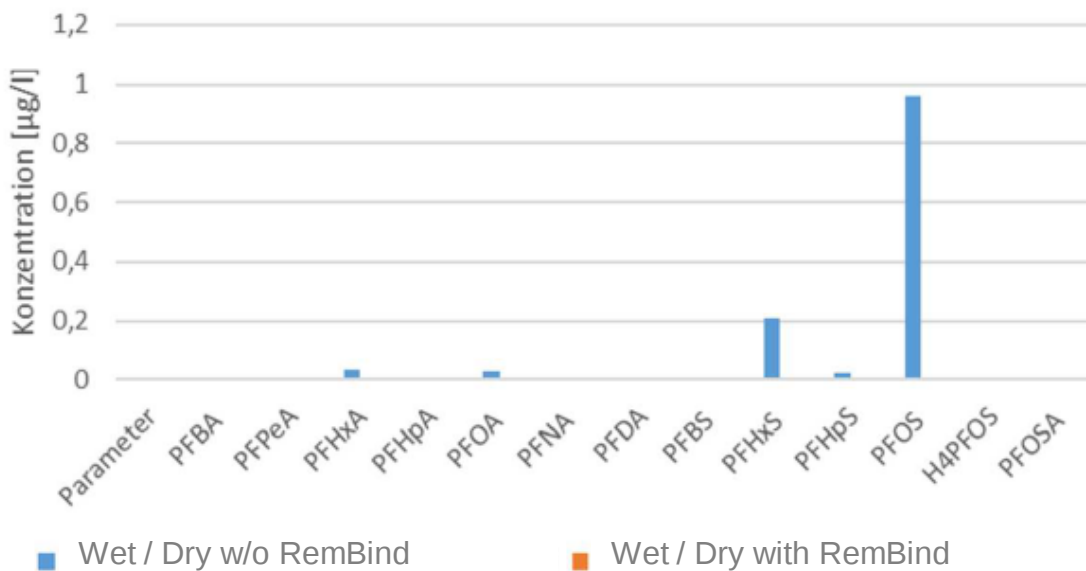


Eluat: W/F = 2:1

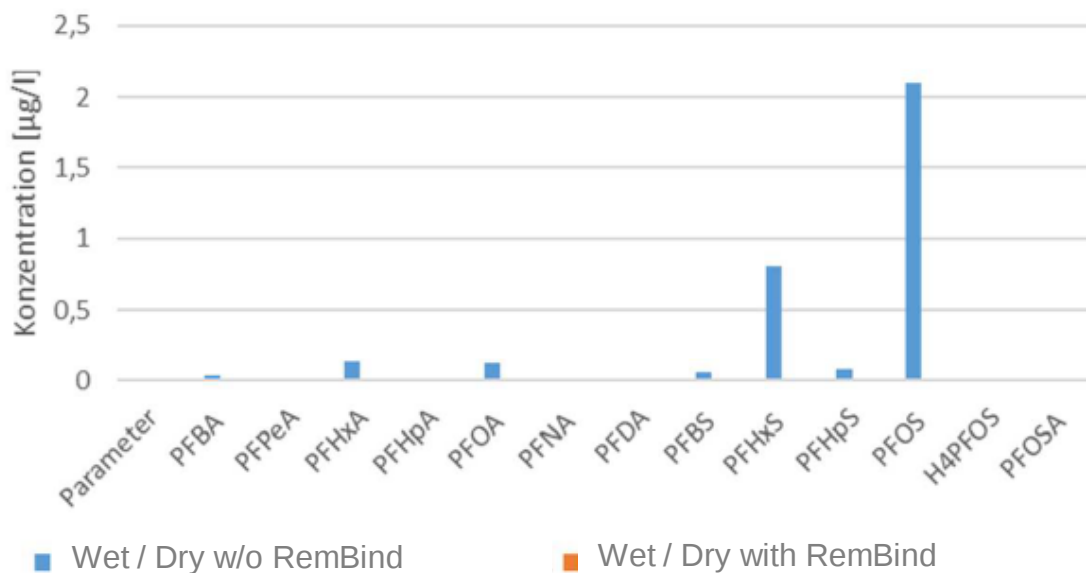


1,2 means 1.2

Eluat: W/F = 10:1

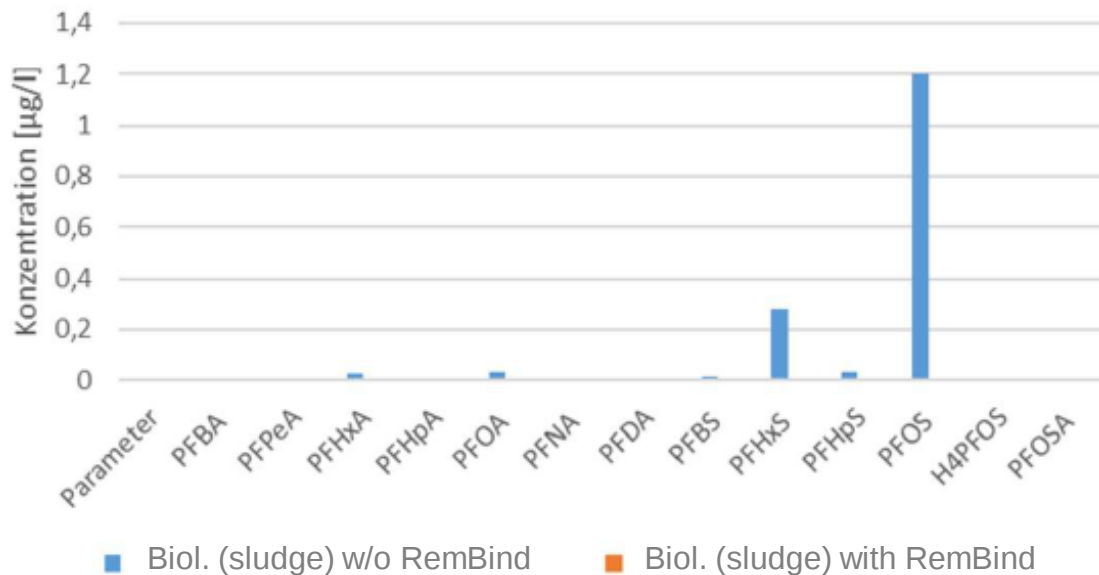


Eluat: W/F = 2:1

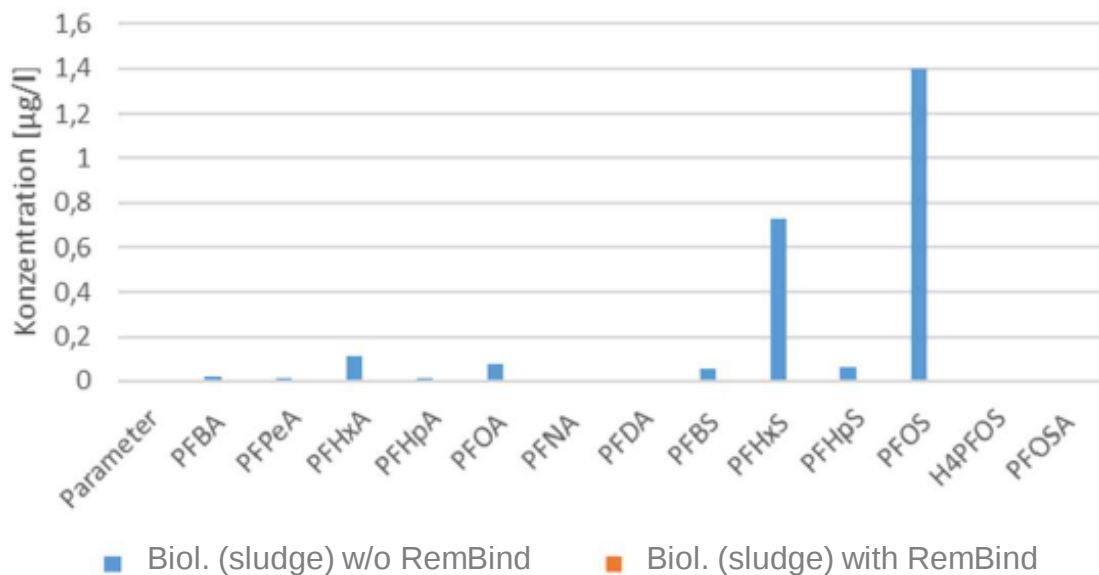


1,4 means 1.4

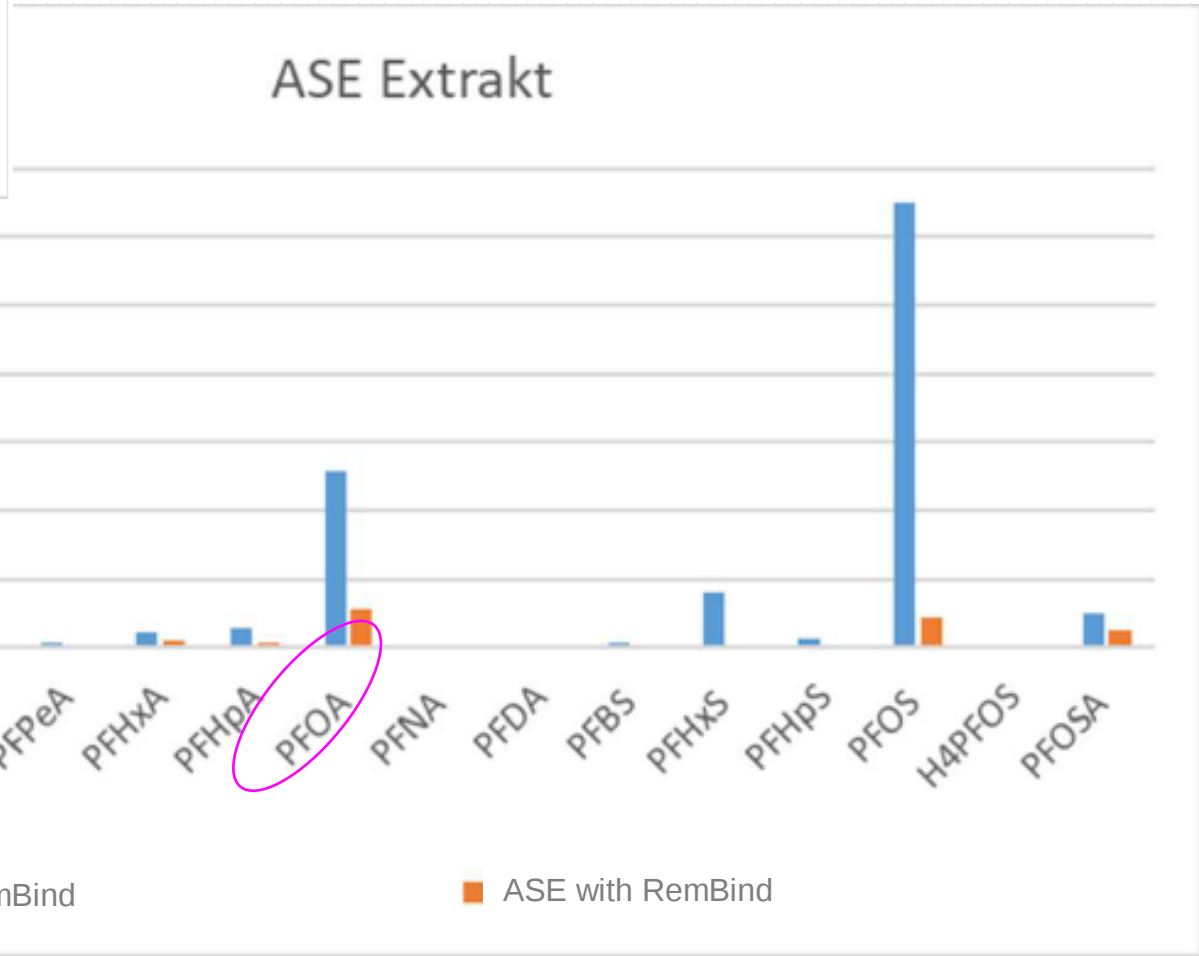
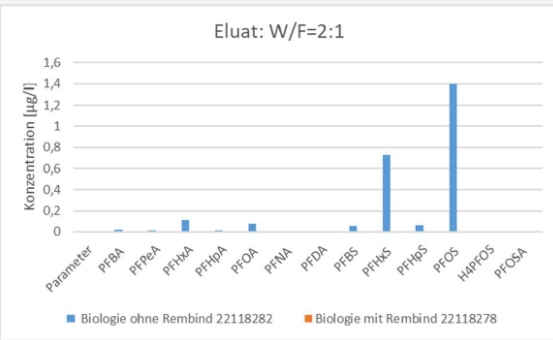
Eluat: W/F = 10:1



Eluat: W/F=2:1



Chemical Attack (ASE)



Acc. Solvent Extraction: organic solvent + 10 bar pressure + 100°C

Interim Conclusion

- easy to use
- target-oriented dosage
- PFAS fixed
- simplified utilization (soil)
- CO₂-footprint low
- durable



Conclusions

- Sorption withstands normal exposure..
- .. & activated sludge
- different studies published

long term, comparisons, bioavailability, etc....

Both
Apr 2021

Durability of sorption of per- and polyfluorinated alkyl substances in soils immobilised using common adsorbents: 1. Effects of perturbations in pH
Shervin Kabiri^{a,*}, Marc Centner^b, Michael J. McLaughlin^{a,*}

Durability of sorption of per- and polyfluorinated alkyl substances in soils immobilized using common adsorbents: 2. Effects of repeated leaching, temperature extremes, ionic strength and competing ions
Shervin Kabiri^{*}, Michael J. McLaughlin^{*}

Influence of a commercial adsorbent on the leaching behaviour and bioavailability of selected perfluoroalkyl acids (PFAAs) from soil impacted by AFFFs

Jennifer Bräunig, [Christine Baduel](#) and Jochen Mueller

Application of soil amendments for reducing PFAS leachability and bioavailability[☆]

Albert L. Juhasz^{a,*}, Farzana Kastury^a, Carina Herde^b, Wayne Tang^a

Field-Scale Demonstration of PFAS Leachability Following In Situ Soil Stabilization

Jeffrey T. McDonough^{*,} Richard H. Anderson, Johnsie R. Lang, David Liles, Kasey Matteson, and Theresa Olechiv

Stabilization and solidification remediation of soil contaminated with poly- and perfluoroalkyl substances (PFASs)

Mattias Söregård^{a,*}, Dan B. Kleja^b, Lutz Ahrens^a

Many Thanks!

- Questions or more information ??

brand-new



brand-new



Photo:
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