Rijksinstituut voor Volksgezondheid
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Determination of PFAS limits in soil

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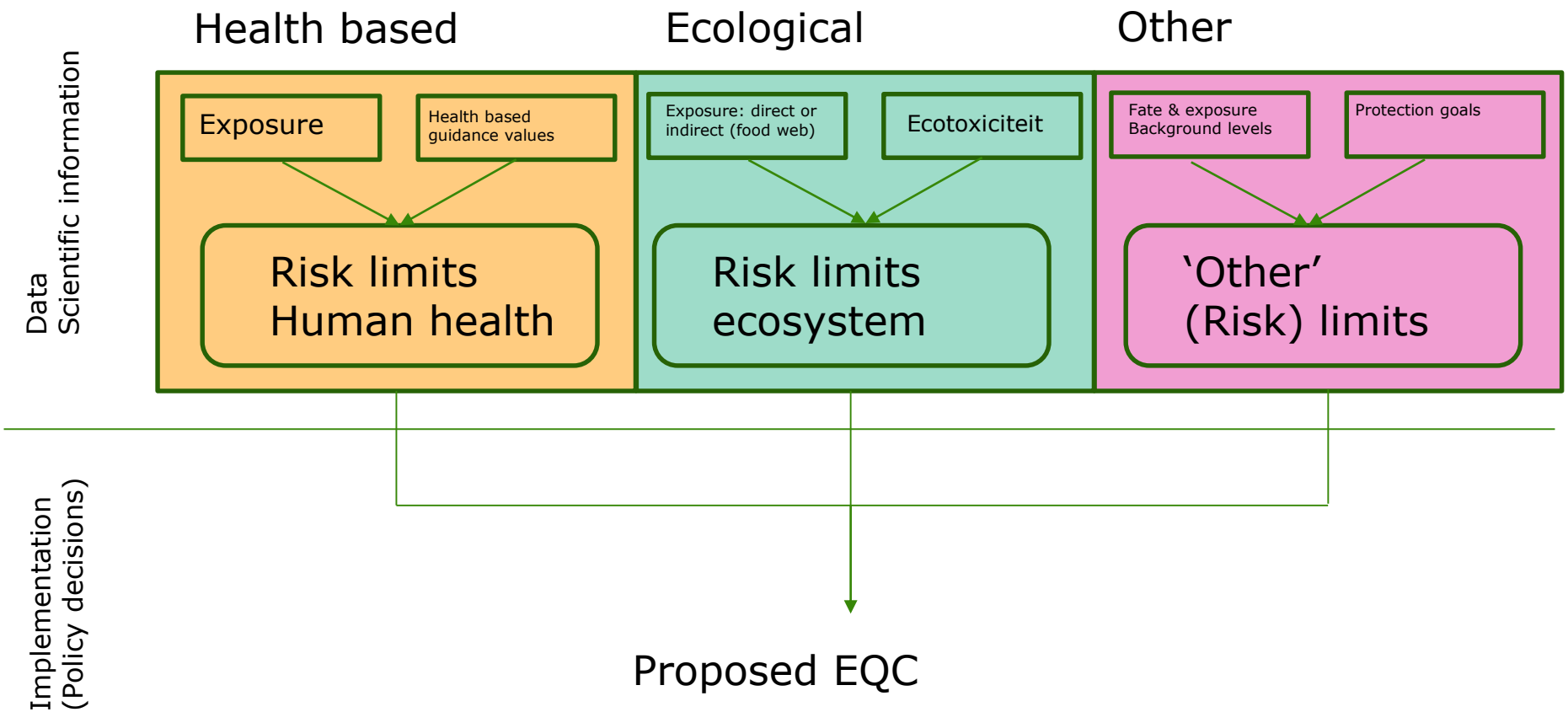
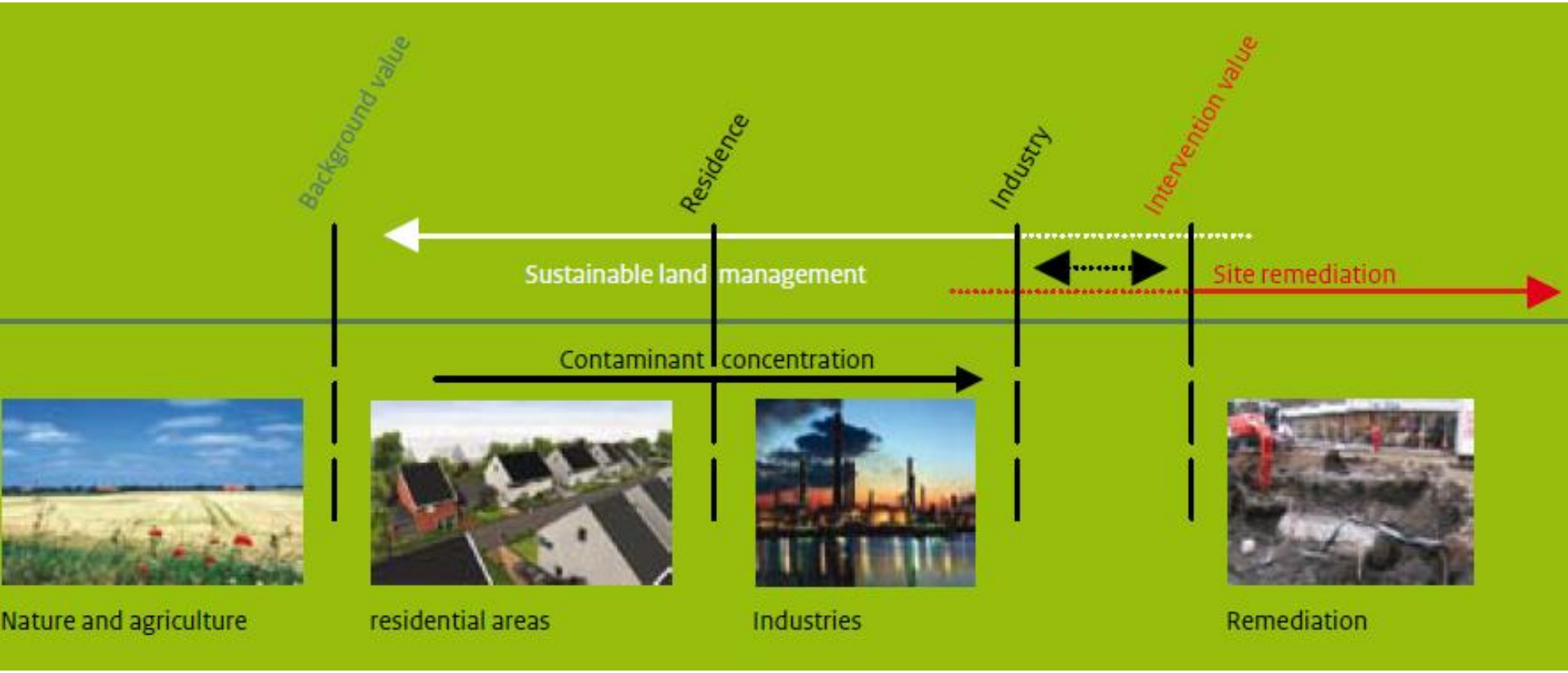
Environmental Quality Criteria for soil
Building blocks



Legal Soil Quality Standards:

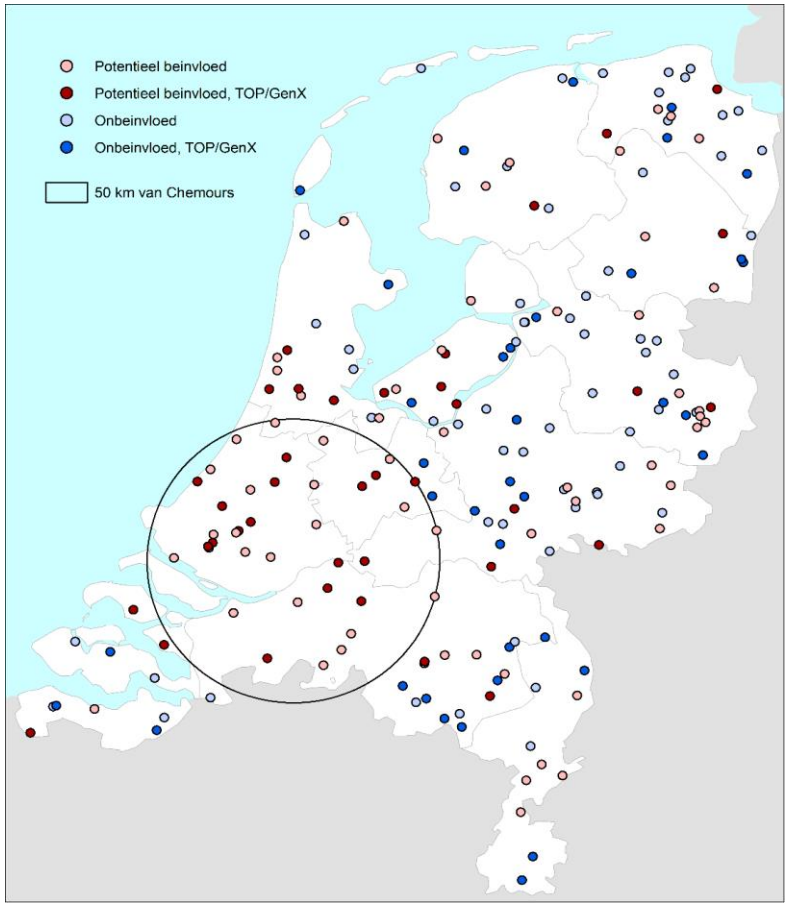
Background Values, Maximal Values and Intervention Value



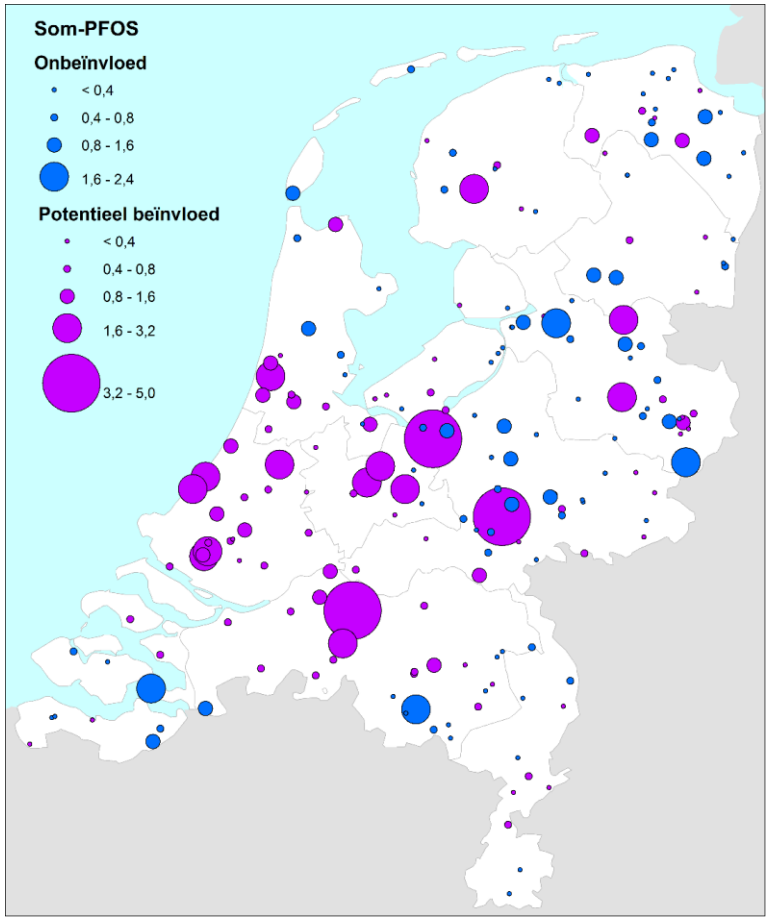
Background values of PFAS in soil

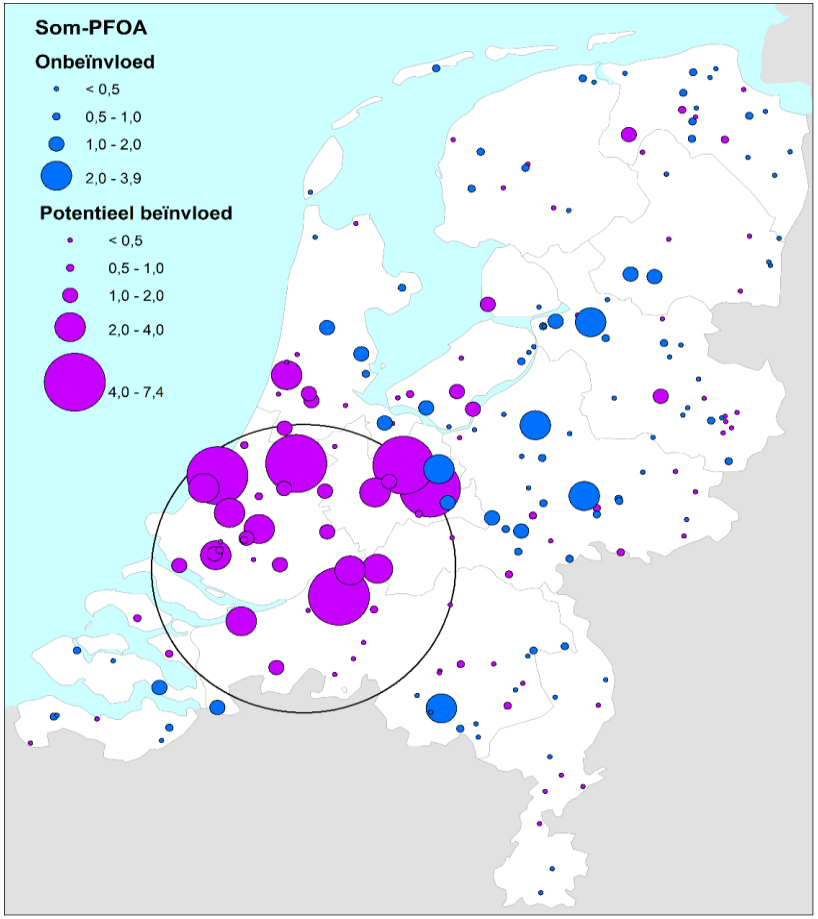
Based on:

100 locations agriculture/nature
100 locations diffusely polluted
2 depths: 0-20cm and 50-100cm
100 additional samples:
TOP and GenX

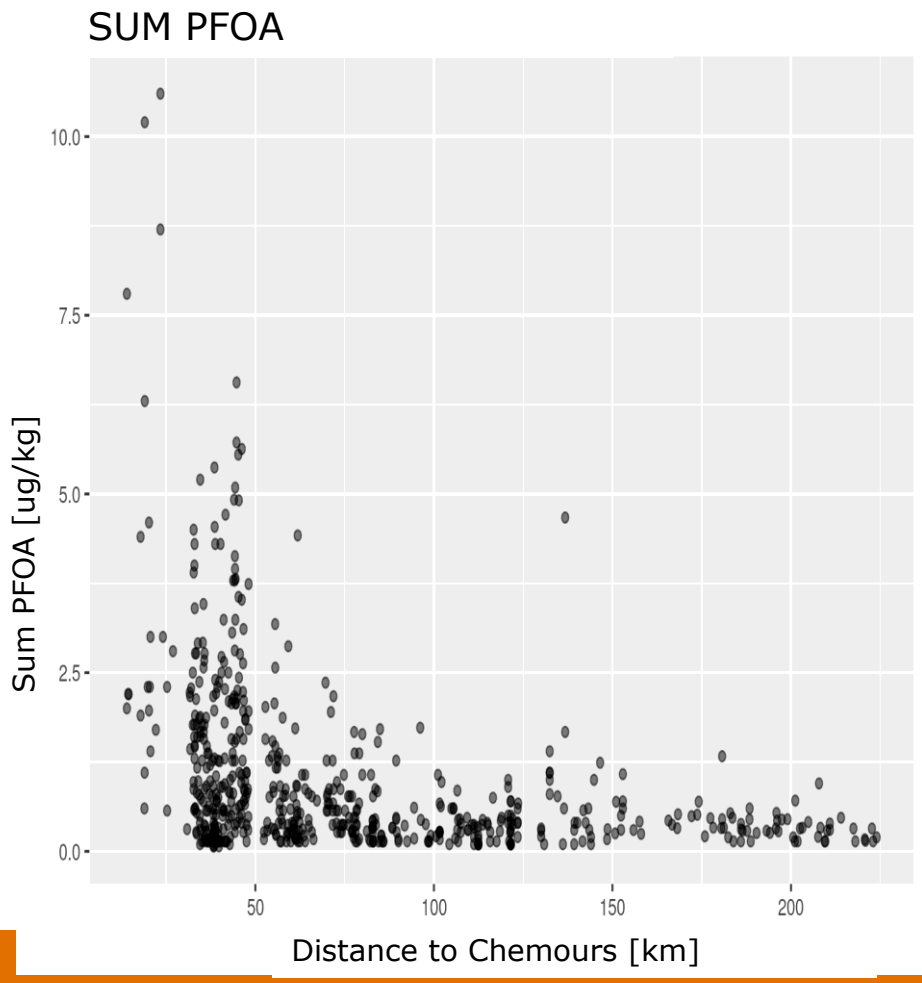


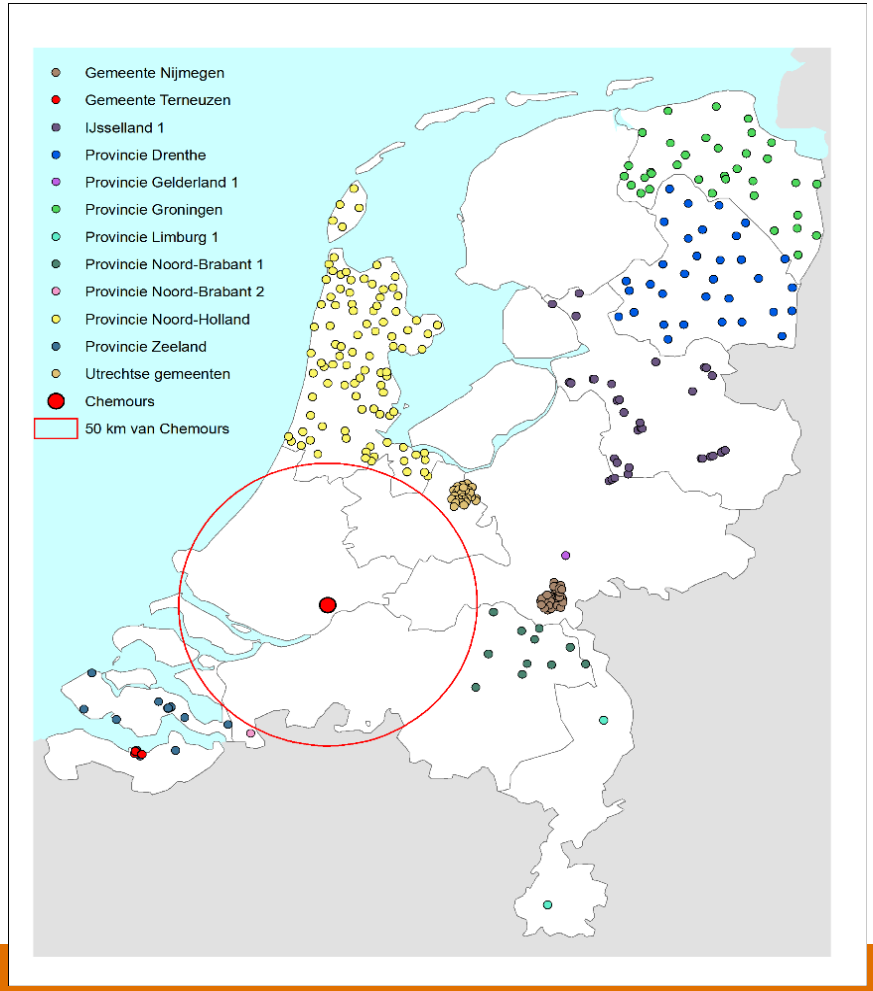
Results (concentrations in top soil layer)





Results background values: PFOA

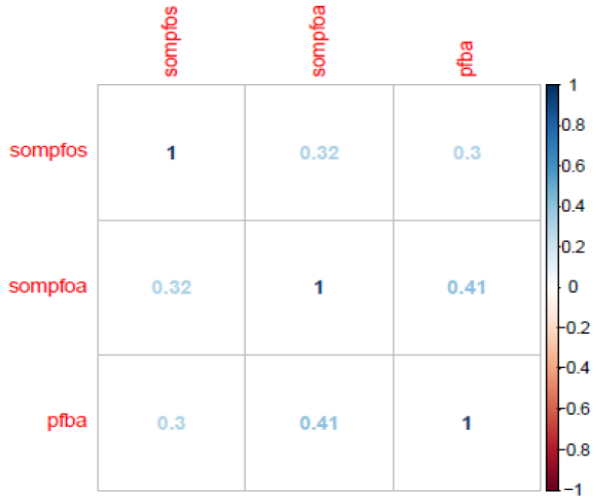




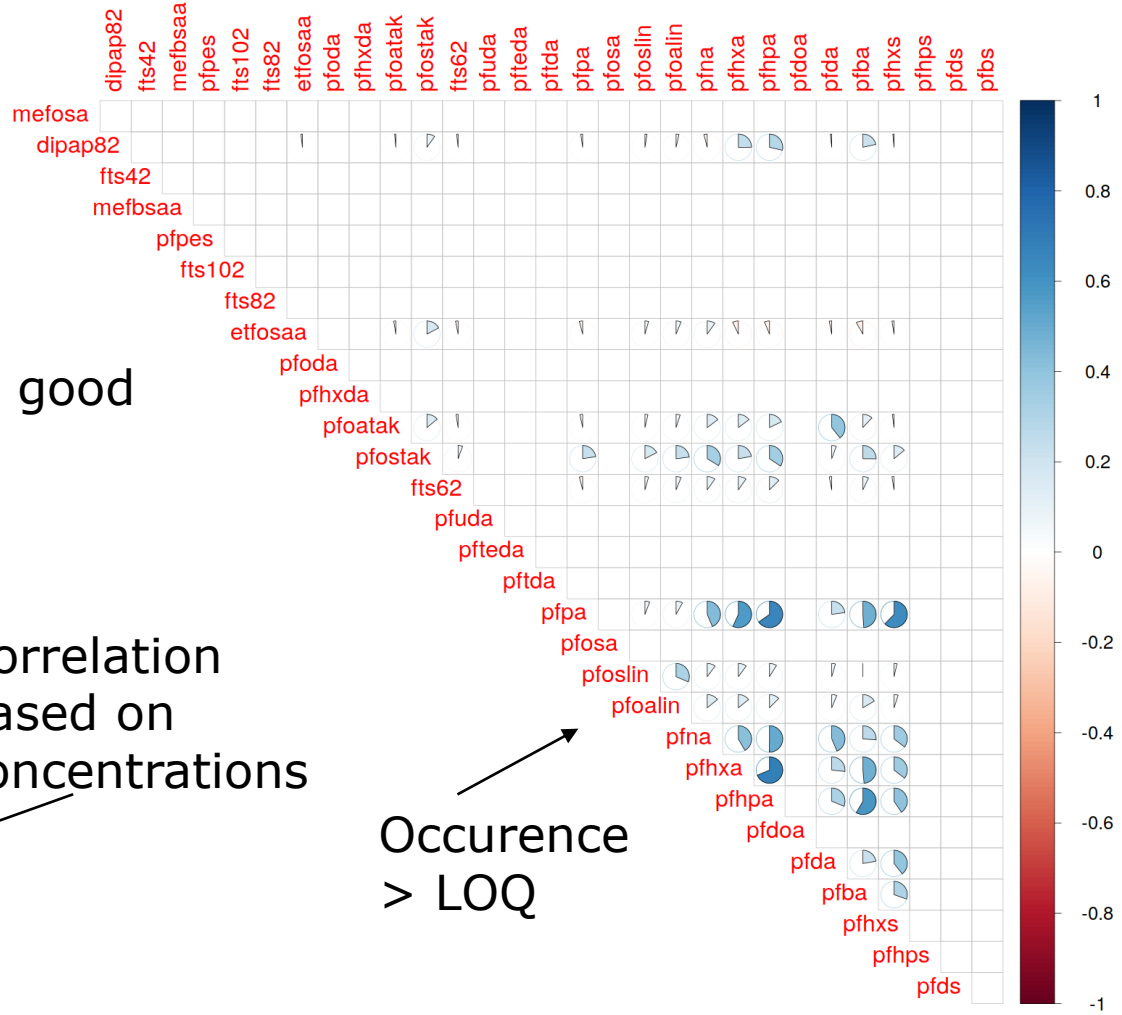
Correlation of occurence PFAS in soil

Beside PFOS and PFOA
No other PFAS structurally Present

Occurence of one PFAS is not a good predictor of other PFAS



Correlation based on concentrations



Occurence > LOQ

New background levels of PFAS in Dutch soil

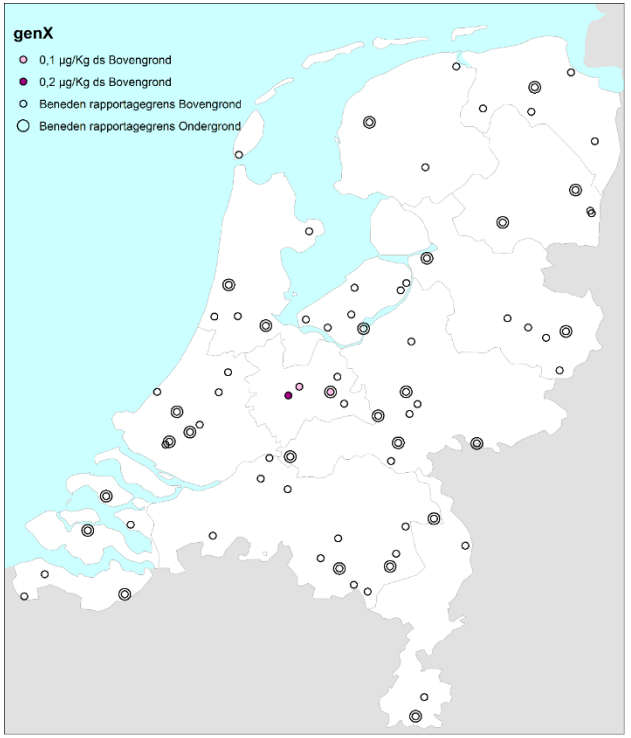
PFOS: **1,4 µg/kg ds**

PFOA: **1,9 µg/kg ds**

Other conclusions:

- Conc. top soil > conc. sub soil
- Conc. built area > conc. rural/nature
- GenX/TOP: no indication that other

PFAS are structurally present



Human health based Risk Limits soil

Compound	Soil use	Risk Limit	
PFOS	Infrastructure and industry	19000	ug/kg ds
	Residential	1200	ug/kg ds
	Vegetable plots	92	ug/kg ds
PFOA	Infrastructure and industry	37000	ug/kg ds
	Residential	1100	ug/kg ds
	Vegetable plots	86	ug/kg ds
GenX	Infrastructure and industry	25000	ug/kg ds
	Residential	97	ug/kg ds
	Vegetable plots	8	ug/kg ds

Based on revised CSOIL exposure model

Human health: Tolarable Daily/Weekly Intake

- TDI values RIVM:
  - PFOS: 6.25 ng/kg_{bw}/day (RPF method)
  - PFOA: 12.5 ng/kg_{bw}/day (Zeilmaker et al. 2016)
  - GenX: 21 ng/kg_{bw}/day (Janssen et al. 2017)

Used for the derivation of current Soil standards

- EFSA 2018:
  - PFOS: tolerable weekly intake of 1.9 ng/kg_{bw}/day
  - PFOA: tolerable weekly intake of 0.9 ng/kg_{bw}/day

- EFSA 2020:
  - TWI for PFOS, PFOA, PFNA & PFHxS combined of 4.4 ng/kg_{bw}/day
  - POD = BMDL of 17.5 ng in blood serum of breast fed children

Ecological risk limits

Direct toxicity

Compound	Risk level	Risk Limit (ug/kg)
PFOS	HC5	16
	Intermediate/HC20	380
	HC50	9100
PFOA	HC5	500
	Intermediate/HC20	5000
	HC50	50000

Indirect toxicity

Compound	Risk level	Risk Limit (ug/kg)
PFOS	HC5	3
	Intermediate/HC20	18
	HC50	110
PFOA	HC5	7
	Intermediate/HC20	89
	HC50	1137
GenX	HC5	3
	Intermediate/HC20	54
	HC50	964

What do we still want to know?

- Sources and distribution of PFAS in the environment:
  - PFAS in products
  - PFAS in water and waste streams related to emissions
  - Background values in groundwater (2021)
  - PFAS in river sediments
- Environmental behavior
  - Leaching tests from soil and sediment
  - Risk limits in soil protecting groundwater
- International network: align with international developments
- substances of emerging concern in soil and groundwater:
  - quick read across assessments
  - early warning
  - Monitoring
- Uptake and accumulation of PFAS in crops and farm animals (meat and dairy)
- Work towards improved generic methods for assessing