Investigation of PFAS Sources to Municipal Wastewater

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Poly- and Perfluoroalkyl Substances (PFAS)

PFOA

PFOS
To control PFAS, we must first turn off the tap
SF Bay Regional Study
Project Overview

Phase 1
Consistent approach to Statewide Investigation Order
- Monitor representative subset (n=15) of facilities
- Q4 2020

Phase 2
Investigate PFAS sources in sewershed
- Conduct more in-depth investigations (n=7)
- Summer of 2022
Project Team

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PFAS Analytical Methods

- **TOP (Total Oxidizable Precursors)**
- **Target PFAS**
  - Perfluorocarboxylates (e.g., PFOA)
- **PFAS**

**PFOA**
Perfluorooctanoic acid
PFAS levels comparable among sites
PFOS and PFOA
Comparable to other municipal wastewater
No clear trend from industrial discharges
PFAS Concentrations in Wastewater Matrices

- Sum of PFAS via TOP
  ~6Xs greater than target influent
PFAS Concentrations in Wastewater Matrices

- Comparable with other studies
- 50% reduction in sum of PFAS quantified via TOP between 2014 and 2022
  - Reduction in PFOA and PFOS
PFAS Concentrations in Wastewater Matrices

- Biosolids treated through anaerobic digestion comparable
- Levels comparable to PFAS content in consumer products, including cosmetics, food packaging, textiles
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Sewershed Monitoring

Residential

Industrial

Commercial

Sample

POTW
Residential Sewershed Discharge Sampling

• Diversity in neighborhoods
• Screening approach
Residential Sewershed Discharge (TOP)
Residential Sewershed Discharge

Median Concentration (ng/L)

Influent  Residential

TOP

Target
Residential Sewershed

- Residential discharges likely contribute the majority of PFAS loading received by municipal POTWs
Sewershed Monitoring

Residential

Industrial

Commercial

Sample

POTW
Industrial Discharge Screening Study

- Industrial laundry (n=5)
- Hospitals (n=4)
- Chrome-plating on-site (n=3)
- Semiconductor manufacturing (n=2)
- Military site (n=1)
- Car wash (n=3)
- Pulp paperboard manufacturing (n=1)
Industrial Laundry Dischargers

- Laundry service other businesses
- Top Laundered textiles
  - Restaurant linens
  - Floor mats
  - Refinery uniforms/rags
  - Medical uniforms and patient gowns, laboratory coats
- Discharge permit ~2.5 MGY
- Pre-treatment
Industrial Laundry Sewershed (TOP)

Aqueous Concentration (ng/L)

- 3Xs influent
  - Mean = 15,000 ng/L

- 14Xs influent

- 400Xs influent
Industrial Laundry Contribution to PFAS Loading at POTW

- Discharge permit ~2.5 MGY
- Mean = 15,000 ng/L sum of PFAS (TOP)
- One facility discharging 0.01% of flows could contribute 1% of PFAS loadings
Industrial Discharge Screening Study

- Industrial laundry (n=5)
- Chrome-plating on-site (n=3)
- Semiconductor manufacturing (n=2)
  - Hospitals (n=4)
  - Military site (n=1)
  - Car wash (n=3)
  - Pulp paperboard manufacturing (n=1)

POTW
Semiconductor Manufacturing and Chrome-Plating

- Discharges below average influent
Industrial Discharge Screening Study

- Industrial laundry (n=5)
- Chrome-plating on-site (n=3)
- Semiconductor manufacturing (n=2)
- Hospitals (n=4)
- Military site (n=1)
- Car wash (n=3)
- Pulp paperboard manufacturing (n=1)
Hospital Sewershed Discharge

- Discharges below average influent
Industrial Discharge Screening Study

- Industrial laundry (n=5)
- Chrome-plating on-site (n=3)
- Semiconductor manufacturing (n=2)
- Hospitals (n=4)
  - Military site (n=1)
  - Car wash (n=3)
  - Jail (n=1)
  - Pulp paperboard manufacturing (n=1)

POTW
Other Industrial Sewershed Discharges

- Discharges comparable with average influent
Findings and Lessons Learned

- Applying different analytical methods is important
- Sewershed monitoring is effective
  - Residential discharges are important
  - Industrial laundry discharges have high PFAS concentrations
- Temporal trends suggest declines
- Remaining analytical challenges
- Next steps
More Information

- Final report
- Website: https://www.sfei.org/projects/pfas
Questions?
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