PFAS: Regulatory Advancements and Lessons Learned on Assessment, Delineation, and Data Interpretation

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Presentation Overview

- PFAS sources and characteristics
- Regulatory framework and guidance documents
- Key considerations for designing an investigation
- Critical planning items and precautions for PFAS assessment
- Project Scenarios and Lessons Learned

Acknowledgements

Krista Barfoot

Infrastructure Sector Leader

A Contaminated Sites Specialist, Dr. Barfoot has over 25 years of experience with expertise spanning from the technical elements of project delivery to program management, risk management, policy development, and stakeholder communication. Her technical expertise includes strategic site planning, risk assessment, vapour intrusion assessment, management of excess soil, non-aqueous phase liquid, risk mitigation measures, and emerging contaminants – including per- and polyfluoroalkyl substances (PFAS). Experienced in PFAS investigative and analytical approaches, risk assessment considerations, and remediation techniques, her PFAS project experience includes brownfields, AFFF sites, and landfills.

Kate Lindfield

Senior Geologist

Kate Lindfield has 20 years of experience in the geo-environmental consulting industry. She has been involved with numerous ESA, remediation, and risk management projects, primarily at downstream petroleum facilities, upstream oil and gas facilities, active military bases, industrial facilities, airports, national parks, and residential and commercial properties located in Alberta, British Columbia, and the United Kingdom. Kate's experience includes project management, data analysis, senior technical review and support, fieldwork, contractor supervision, estimating, report authoring, remediation/risk management plan development, tender support, and client/regulatory liaison.

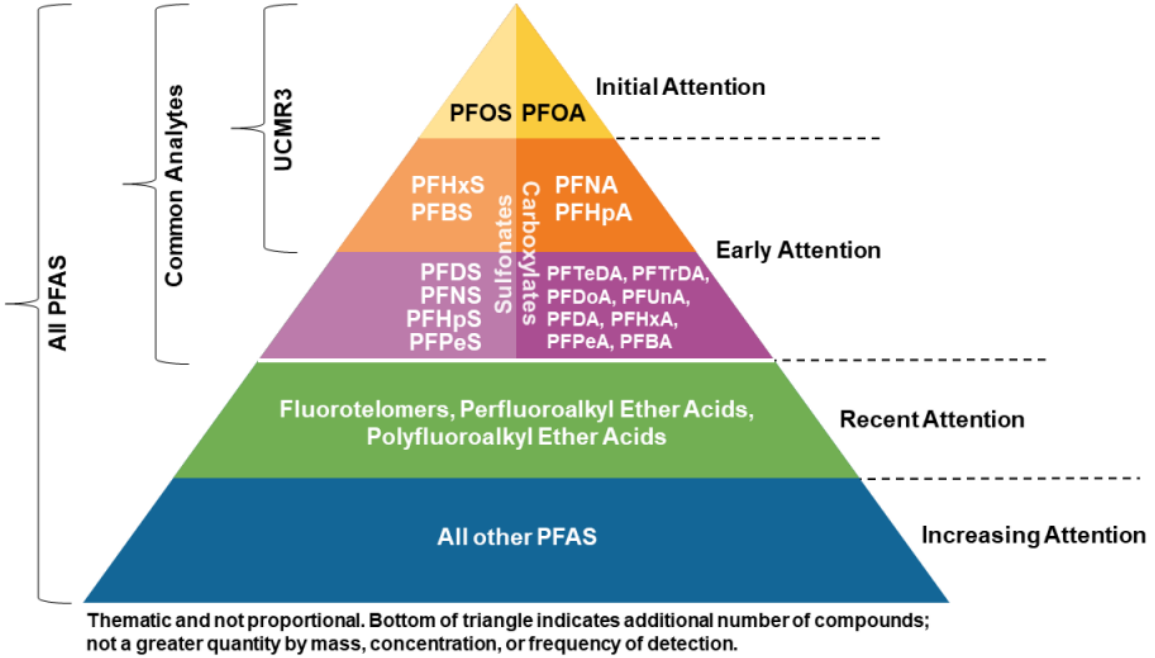
Lindsay Paterson

Senior Soil Scientist

Lindsay Paterson is a senior soil scientist and soil vapour specialist with over 19 years of experience in the environmental consulting industry. Lindsay is a member of SLR's Risk Assessment group and is a Professional Agrologist in the Provinces of British Columbia and Ontario. She has over 15 years of experience in investigating, remediating and risk managing sites contaminated by per- and polyfluoroalkyl substances (PFAS). She has provided technical direction for PFAS investigations conducted across Canada.

What is PFAS?

- Per- and polyfluoroalkyl substances (PFAS) are a class of over 4700 human-made substances.



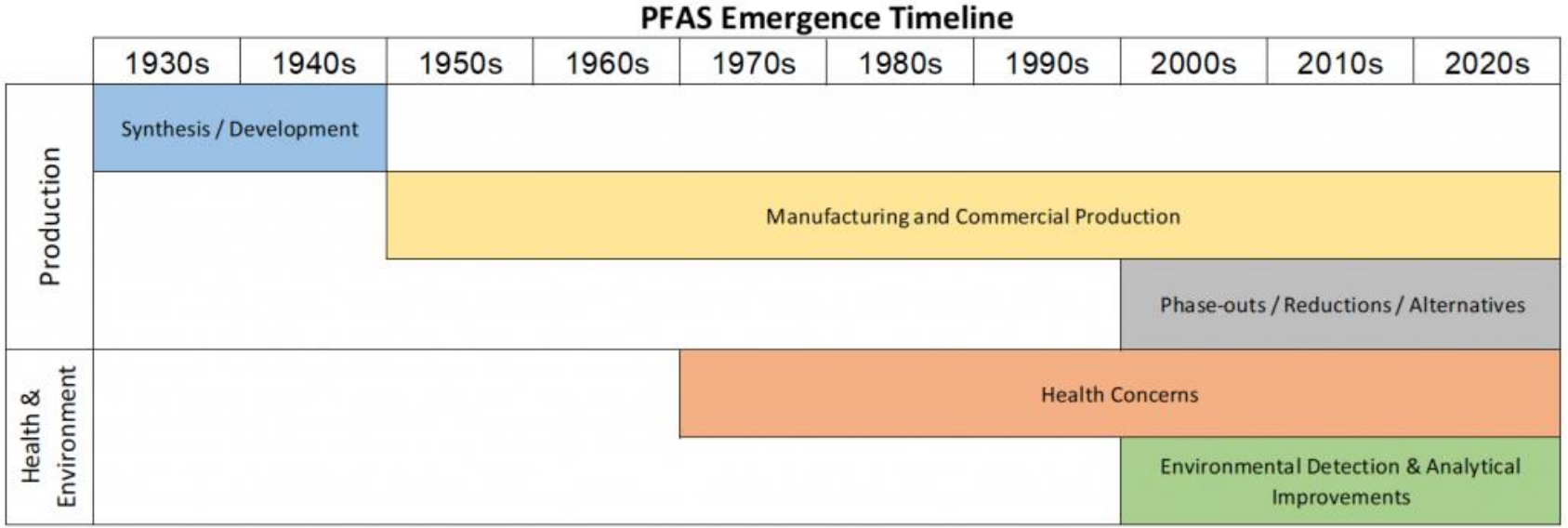
Source: IRTC. Fact Sheet - History and Use of PFAS Found in the Environment. September 2023

Sources of PFAS

- PFAS raw material manufacturing
- PFAS in production of processes
- PFAS in industrial products
- PFAS in consumer products

Source: Southeast Alaska Conservation Council, 2023

Timelines



Source: IRTC. Fact Sheet - History and Use of PFAS Found in the Environment. September 2023.

PFAS Characteristics and Key Points

- Key PFAS are highly water-soluble and non-volatile, and will partition predominantly to water where they can mobilize.
- Some PFAS may be volatile and are more likely to be found in the atmosphere. For key PFAS this is often associates with particles in the atmosphere.
- Some PFAS can undergo transformation to form more stable PFAS that are extremely persistent in the environment under ambient conditions.
- Some shorter-chain PFAS have proven to be even more mobile on a local scale than longer chain PFAS.
- Some PFAS are also capable of undergoing long-range transport in the atmosphere or in global ocean currents, demonstrated by widespread distribution around the world.
- Experience with PFAS-contaminated sites has shown that remediation and management of these sites are very challenging and complex.

PFAS Regulation

Criteria Across Canada - Current

Agency	Water	Soil
Health Canada	DW Guidelines for 2 PFAS, and 9 DW Screening Values for 9 PFAS	Soil Screening Values 10 PFAS, defaults to CCME for PFOS
ECCC*	PFOS SW guideline (eco based)	None to date
CCME	PFOS GW guideline (DW based)	PFOS soil guideline (leaching to potable DW & eco based)
British Columbia (Regulated)	PFBS, PFOS, PFOA (DW); PFOS (aquatic life)	PFOS only (leaching to potable GW is driver)
Alberta (Regulated)	PFOS and PFOA SW and GW criteria	PFOS soil guideline (human and eco considerations)
Atlantic Canada (PIRI Regulated)	EQS for 9 PFAS in GW; 1 PFAS in SW	EQS for 9 PFAS
Quebec	PFOS and PFOA SW and GW criteria	None to date
Ontario	Potable GW criteria for sum of 11 PFAS	None to date

Proposed Drinking Water Criteria

- Primary exposure pathway of concern is ingestion of drinking water

Agency	Proposed Criteria	Notes
AEPA	• Total PFOS – 60 ng/L • Total PFOA – 20 ng/L	2022 Alberta Tier 1 Guidelines (August 2022) Additionally, the sum of the ratios of the detected concentrations to the corresponding MACs for PFOS and PFOA should not exceed 1.
Health Canada	• Total PFAS – 30 ng/L	2023 DW Objective (February 8, 2023); sum to include a minimum of 18 PFAS. Intended to replace the PFAS DW Guidelines and Screening Values.
USEPA	• PFOA – 4 ng/L • PFOS – 4 ng/L • PFNA, PFHxS, PFBS, GenX – Hazard Index 1.0	2023 MCLs (March 14, 2023)
	• PFOA – 0.004 ng/L • PFOS – 0.02 ng/L	2022 Interim HAs (June 15, 2022) (previously was 70 ng/L individually and as a sum of PFOA and PFOS)
	• GenX – 10 ng/L • PFBS – 2,000 ng/L	2022 Final HAs (June 15, 2022)

Assessment and Planning Considerations

Historical Data Review and Identification of APECs

- Records review
  - Previous environmental studies
  - Product storage records
  - Fire station records
  - Incident reports
  - Spill reports
  - Product storage and management practices
  - Maintenance activities
  - Utility drawings and as built plans
- Additional Searches
  - ERIS records
  - Aerial photos and satellite imagery
  - City directories
  - Fire insurance plans
  - Land titles and legal plans
  - Municipal records
  - Other database searches
- Interviews
- Site Visit

Work Plan Development

Things to Consider	PFAS Considerations	Example
Source Areas	Current and historical PFAS uses	*Fire Training Areas, Product Storage, Incident Locations*
Secondary Sources	Soil Relocation or Water Discharge Areas	*Spoil piles, soil reuse locations, landfarming, retention ponds, sewage lagoons, and discharge areas*
Overland Drainage	Surface Water Run-off and Ditches	*Overland flow to low lying areas, ditches, and water bodies*
Groundwater Migration	Groundwater Flow Direction and Gradient	Domestic use aquifers, water well users, discharge locations
Sensitive Receptors	Human and Ecological Receptors	Water bodies, water wells, gardens, homes,

Investigation Plan

- Borehole and monitoring well locations
- Type of drilling methods and sampling methods
- Step into your source areas, start with delineation boreholes
- Subcontractor and staff availability and training
- Distribute PFAS expectations to the team
- Develop a field scope of work

Sampling and Analysis Plan

Organizes the PFAS considerations in one planning document that can be communicated to the client and shared with the field team

- Sampling locations and rationale
- Sample collection methods
- Media to be assessed and numbers of samples
- Analysis specifics
- Analytical program
- Data quality program
- Waste management plan

Analytical Program and Data Quality

- Develop a sampling plan and analytical program in advance
- Sample handling processes to be followed (labelling, packing, storing, and submission)
- Confirm the PFAS suite of analysis and detection limits
- Select laboratory TAT (regular vs rush) and confirm with lab
- Review hold times and consider extending sample hold time to 60 days
- Timely review of lab reports is critical, identify any data flags and follow up
- Check for blanks, duplicates, and surrogate recovery
- Request lab data checks and reanalysis as needed

Source Water Pre-Testing and Waste Program

Key considerations for any PFAS assessment program:

Advanced analysis of source water and wash water to be used during the work, with preservative where required.

Planning for wastes streams generated during the work. Coordinate waste characterization and disposal.

Field Guidance Documents

Clothing to be of natural fibres and well laundered	Nitrile gloves worn and changed frequently	PFAS-free field equipment	Avoid contact with products that could cause cross contamination
Record field notes on regular paper using masonite clipboards	Use laboratory supplied labels using a ballpoint pen.	Shower the night before and rinse with water only on the day of sampling	Limit visitors to the site
	Use only pre-tested PFAS free water supply	Follow decontamination procedures	

Transport Canada. PFAS Field Sampling Guidance. 2017.
ITRC. Sampling Precautions and Laboratory Analytical Methods for PFAS. August 2020.
Bureau Veritas. Sampling and Analysis for PFAS.

Project Scenarios and Lessons Learned

PROJECT PROFILE

PFAS Presence/Absence Assessment at an Active Facility

CLIENT

Confidential Midstream Client
Alberta
Canada

SERVICES

- Historical Data Review
- Assessment Plan
- PFAS Soil and Groundwater Assessment
- Regulatory Reporting

Client Needs

- Assessment for chemicals associated with historical fire training activities was requested by AER in January 2022, when Alberta Tier 1 Guidelines added PFOS and PFOA as regulated parameters.

SLR Role

- No previous testing for PFAS had been completed.
- Identify areas of potential environmental concern.
- Develop an assessment plan to confirm whether impacts were present.
- Include the results in the operational soil monitoring program.

Assessment and Delineation at a Former Fire Training Area

CHALLENGE

Assessment and delineation of previously identified PFAS impacts at a former fire training area with historical use of aqueous film forming foams. At the time it was common practice to remediate hydrocarbon impacts associated with the fire training areas with no testing for PFAS. PFAS impacts often extend beyond the hydrocarbon impacts due to their mobility and persistence in the subsurface, this results in residual PFAS plumes that require assessment.

SOLUTION

- Confirm concentrations in source areas
- Complete vertical delineation in areas of previously identified impacts
- Lateral delineation at property boundaries and upgradient on opposite side of the building
- Review of surface water drainage and asse
- Develop a conceptual site model for the site and the impacts
- Screening level risk assessment to determine whether complete exposure-pathway-receptor scenario identifies risks to human or ecological receptors

IMPACT

- Delineation of impacts to environmental and human health guidelines
- Assessment of risk to receptors where applicable
- Ability to move forward with implementing risk management or remedial action plans

Next Steps After Assessment

Once assessment and delineation are complete, and you have developed a comprehensive conceptual site model, you are ready to move on to the following:

- Exposure Controls
- Remedial Action Plan
- Risk Management Plan
- Risk Assessment

PFAS regulations are changing and evolving throughout jurisdictions as available research and scientific understanding advances.

Do you have any questions?

Making
Sustainability
Happen

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