



ALKYLATED PAH TESTING

WHAT STANDARD ANALYSIS LEAVES BEHIND

The Gap in Standard Frameworks

The CCME's 13 priority PAHs and the EPA's 16 priority pollutants cover well-characterized parent compounds, but at petroleum-impacted sites, alkylated homologues frequently dominate in both concentration and persistence, particularly at aged and weathered sites. Studies show parent-only analysis underestimates contamination, persistence, and toxicity, and these compounds aren't covered by standard regulations.

What are Alkylated PAHs?

	Parent PAHs	Alkylated PAHs
Examples	Naphthalene, phenanthrene, fluoranthene	C1-C4 homologues of parent compounds
Regulatory Coverage	CCME 13 and EPA 16 frameworks	Not explicitly covered by standard regulations
Degradation	More susceptible to microbial degradation and photolysis	Resist breakdown pathways and persist longer in soils, sediments, and groundwater
Behavior at Aged Sites	Decrease as a proportion of total PAH load as sites age	Become dominant form remaining in soil, sediment, and groundwater as parent compounds degrade

Four Risks of Parent-Only Analysis

1. Missed Contamination

Alkylated variants dominate both in concentration and persistence at petroleum-impacted sites, especially as contamination weathers, yet they go entirely undetected by standard methods.

2. Unreliable Source Identification

The C0 through C4 homologue distribution pattern is what distinguishes petrogenic, pyrogenic, and natural background sources, and as weathering shifts these ratios, parent-only fingerprinting becomes increasingly indefensible.

3. Flawed Remediation Planning

Alkylated PAHs are more resistant to degradation than parent compounds and persist longer in soils and sediments. Contamination that appears resolved on parent PAH results may not be.

4. A Weaker Evidence Base

Site closure, regulatory submissions, NRDA proceedings, and litigation all require homologue distribution patterns, parent-to-alkyl ratios, and weathering indicators that parent-only data cannot provide.

Health and Environmental Impacts

Several parent PAHs are classified by the US EPA and IARC as known, probable, or possible human carcinogens, with chronic exposure linked to genotoxicity, reproductive impacts, immune suppression, and developmental effects. Alkylated PAHs occur at higher concentrations at petroleum sites and both classes bioaccumulate through aquatic food webs.

Where Expanded Analysis Matters Most

Aged Spill Sites

Standard analysis no longer reflects actual conditions.

Former Refineries, Pipelines, and Oil Sands Operations

Alkylated forms dominate weathered historical residues.

Sediment Cores and Soil Profiles

For historical deposition and long-term exposure studies.

Multi-Source Sites

Supports liability allocation at mixed-source sites.

3 Field Considerations

1. Replicate Sampling

Focus on sediments and fine soils

2. Background Samples

Separate natural from petroleum-derived

3. Weathering Effects

Track shifting homologue ratios

Contact Element to discuss expanded alkylated PAH testing for your next site investigation. Scan or click the QR code to start the conversation.

