



Remedy effectiveness for the West Branch Grand Calumet River

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West Branch Grand Calumet River

- The Grand Calumet River is low gradient and comprises approximately 22 square miles of NW Indiana.
- The GCR comprises two east-west oriented branches that meet at the southern end of the IHC.
- The East Branch of the Grand Calumet River (EBGCR) originates at the Grand Calumet River Lagoons, just east of the United States Steel Gary Works facility and flows west for approximately 10 miles to the IHC.
- The WBGCR flows east/northeast through Lake County, Indiana, discharging into Lake Michigan via the IHC.
- The Grand Calumet AOC begins 15 miles south of downtown Chicago; a small segment of the West Branch is contained in the AOC.



Site history

- **A long history of industrial activities within the GCR basin, with the land located north of the river being one of the most heavily industrialized areas in the United States (Natural Resources Trustees, 1997; Bright, 1988; Brannon et al., 1989; Ryder, 1993).**
- **Some of the industries that operate, or have operated, in the area include steel mills, foundries, chemical plants, packing plants, a distillery, a concrete/cement fabricator, oil refineries, and milling and machining companies (Ryder, 1993).**
- **Permitted discharges from industrial operations, municipal wastewater treatment plants (WWTPs), and other sources contribute substantial quantities of wastewater to the river system.**
- **Nonpoint sources of contaminants to the system include urban and industrial runoff, combined sewer overflows (CSOs), leachate or overflow from a number of waste fills or ponds, and spills of pollutants in and around industrial operations (Brannon et al., 1989).**

Project Study Area: Reach 1 and 2 of the West Branch Grand Calumet River

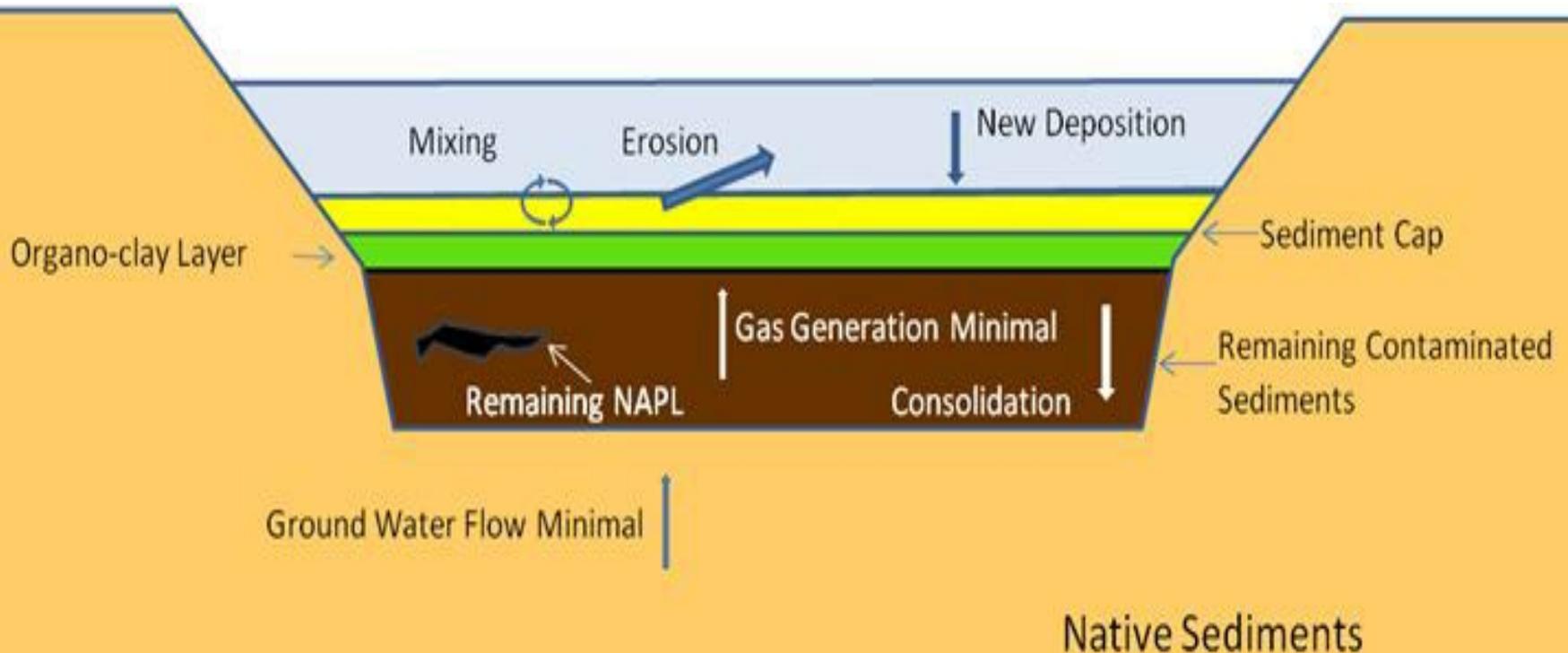
Reach 2

Reach 1



Dredge and Cap design and CSM

- Dredge ~ 3 ft of contaminated sediment
- Cap
 - 6 inches of reactive organo-clay
 - 12 inches of sand



Cap application





West Branch Grand Calumet River Cap Performance Monitoring

Pre-Cap, Baseline Post-Construction, and Annual Post-Cap Sampling and Evaluations Performed:

- Push core sampling for particle size analyses and physical core characterization of cap layers, organoclay analysis
- Porewater monitoring using in-situ monitoring approaches – SPME PW sampling, PED SW and sediment sampling, and horizontal transect samplers within and below cap
- Gas ebullition sampling and analysis
- Groundwater advection temperature monitoring
- Sediment surface deposition, PAH evaluation, comparison to below cap PAH compounds
- Sediment deposition evaluation tracer study
- Bathymetry
- CoCs in macrobenthos



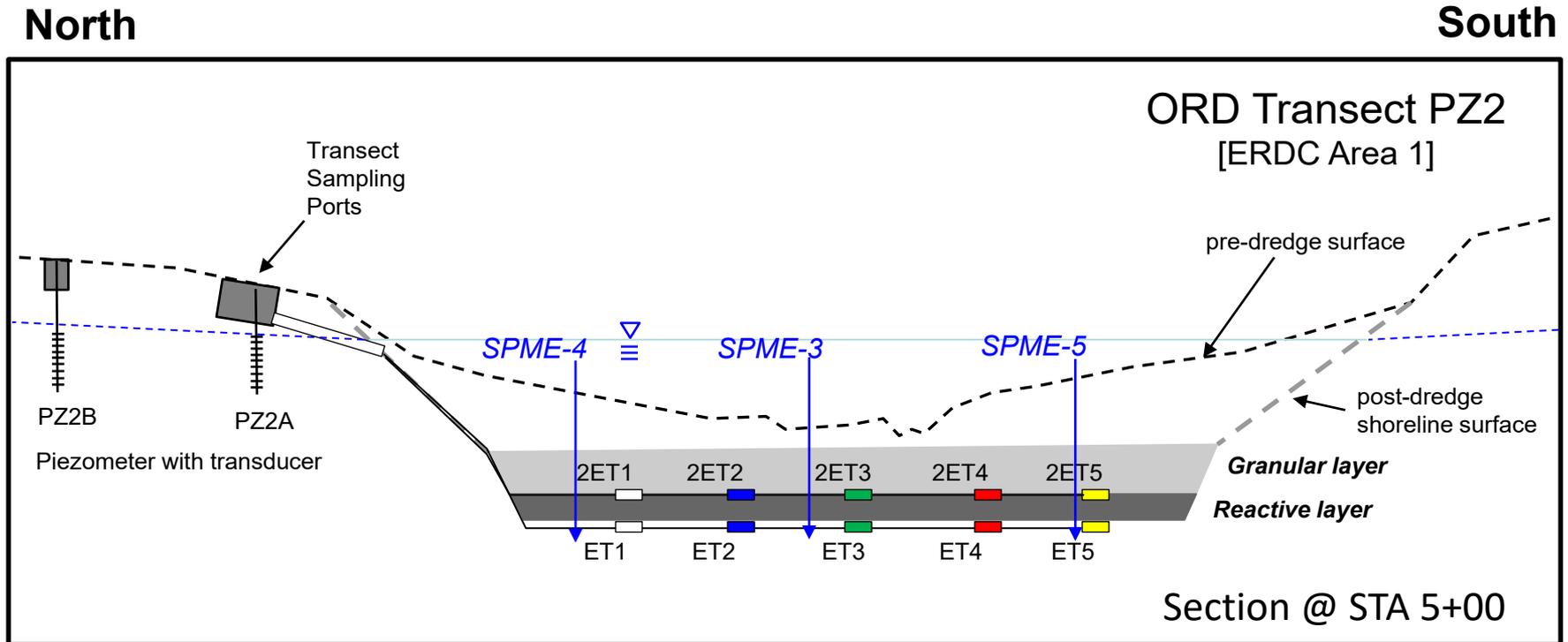
Long Term Monitoring stations on WBGCR

Reach 2

Reach 1



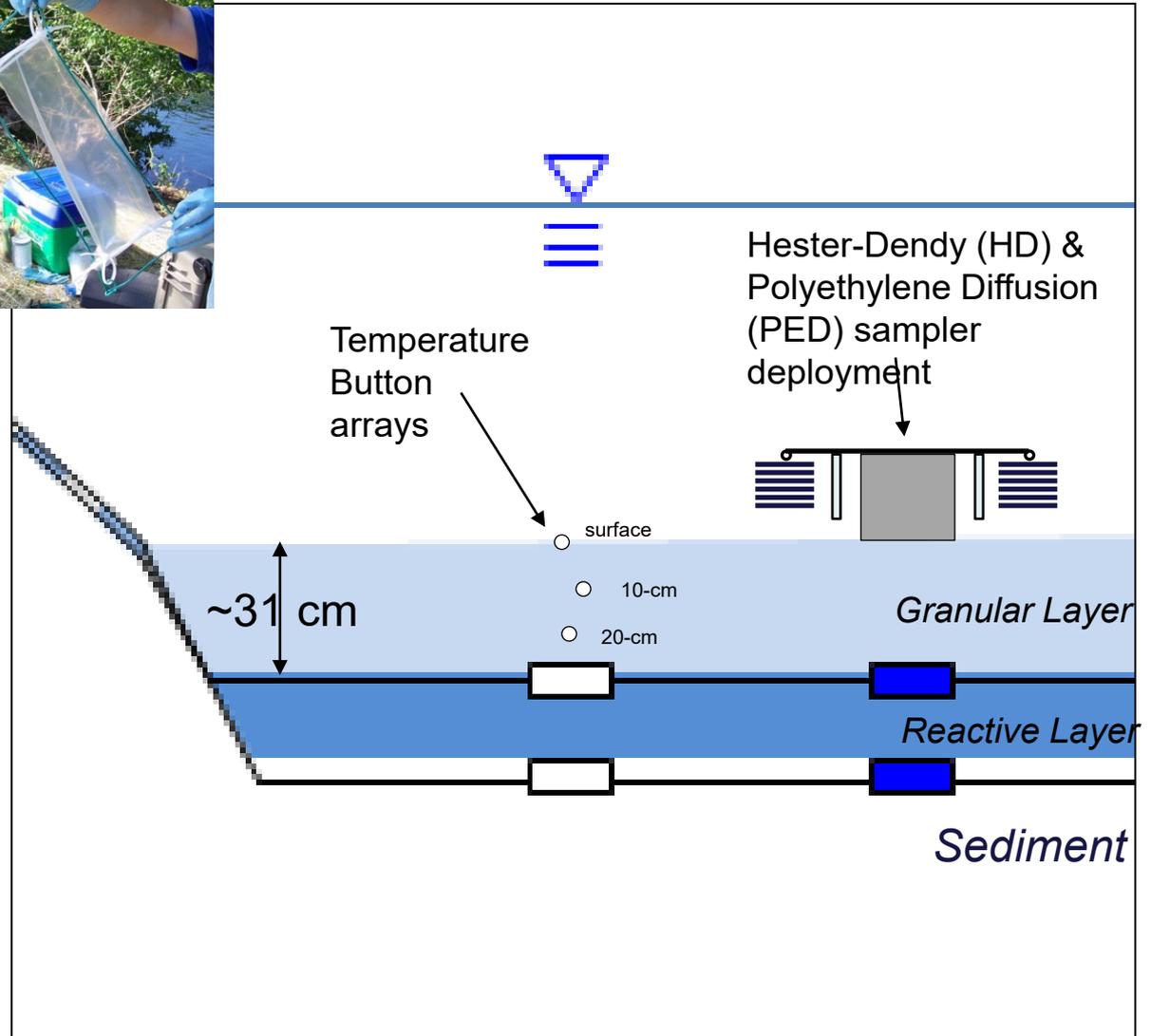
Cross-Sectional Layout of ORD Monitoring Transect



Note: Displayed SPME locations approximate – SPME4 & SPME5 are ~10 ft downstream of transect; SPME3 is ~15 ft upstream of transect

Layout of HD-PED Deployments at ORD Monitoring Transects

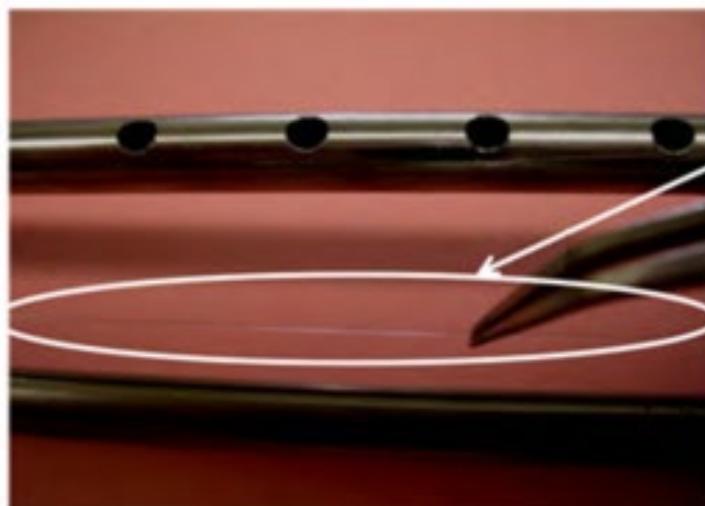
Each transect screen location had a temperature button array & HD-PED deployment



10 HD & 3 PED samplers per deployment

Note: retrieval from RCS un-dredged reference site

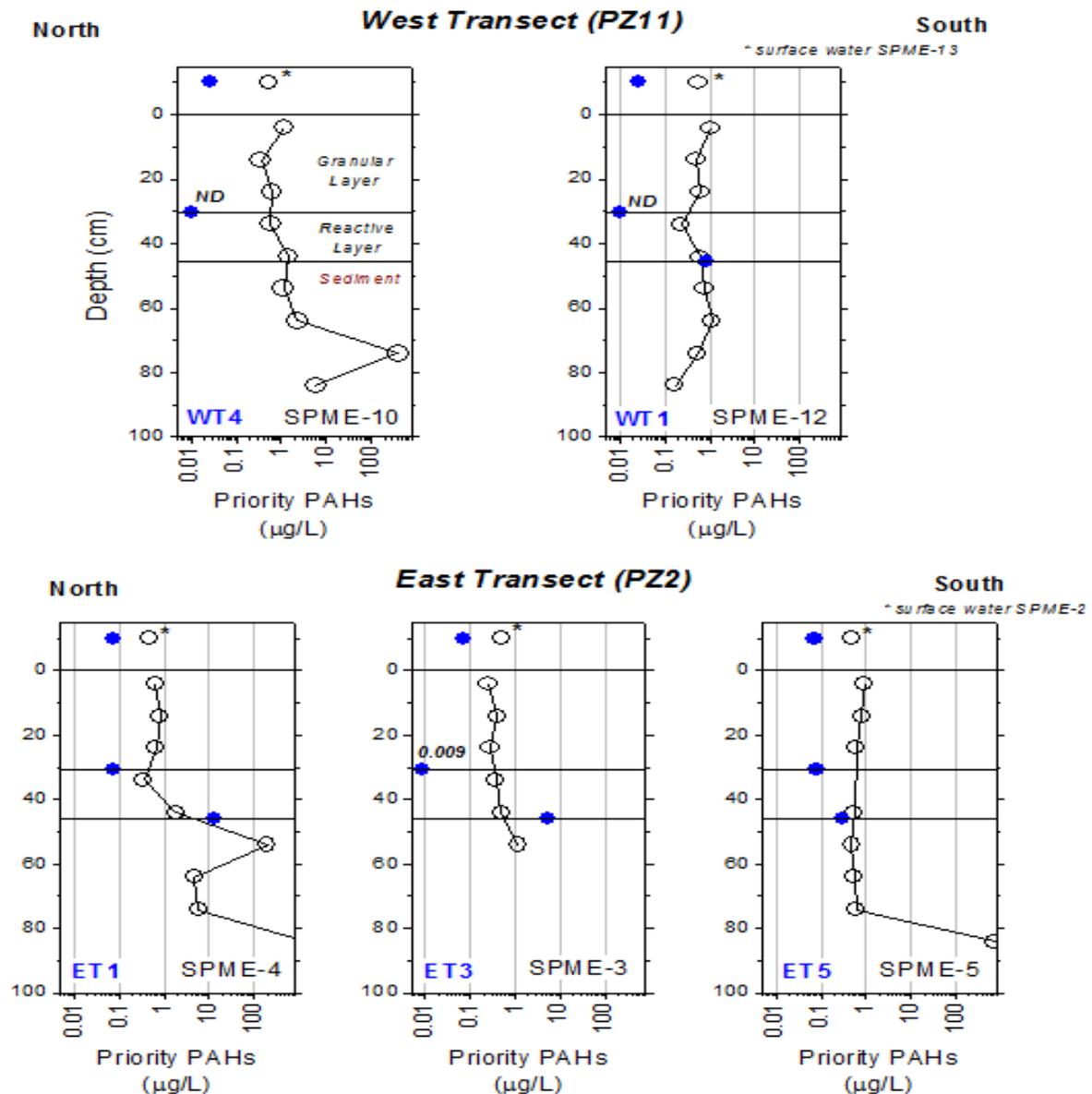
Large Shielded Sampler - 36"



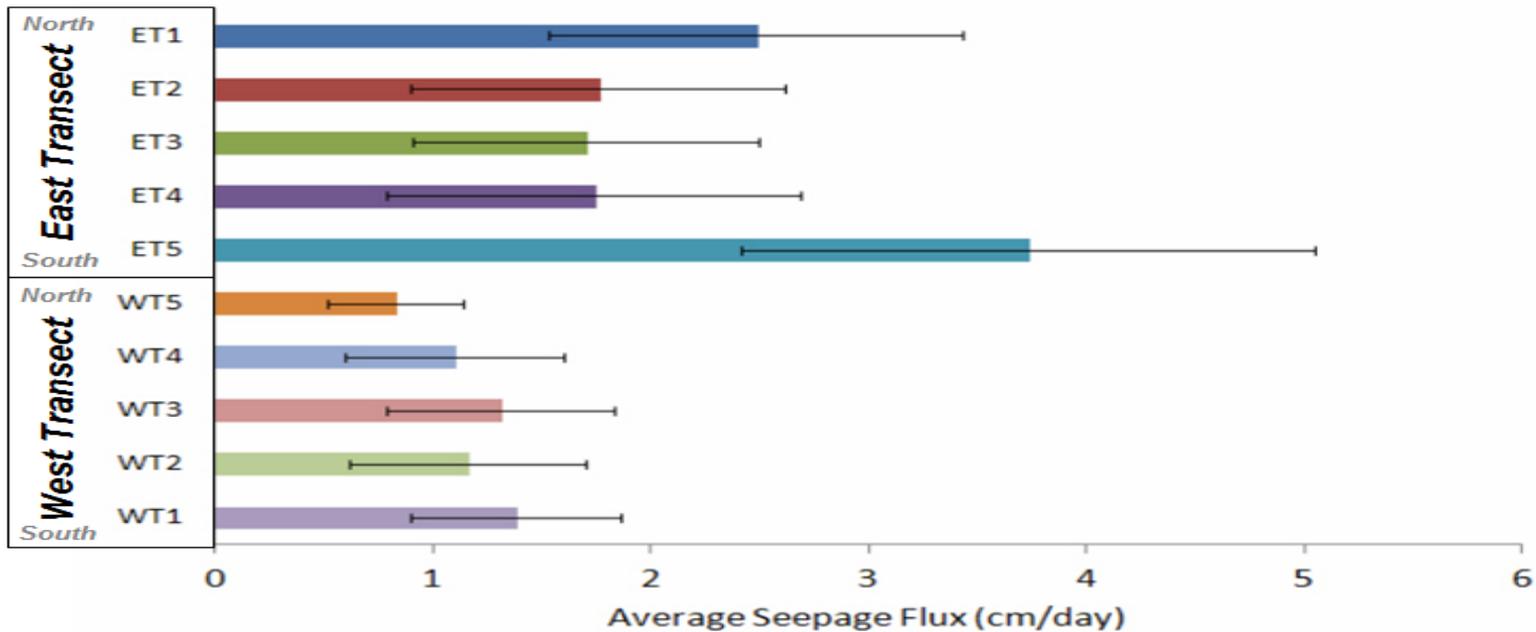
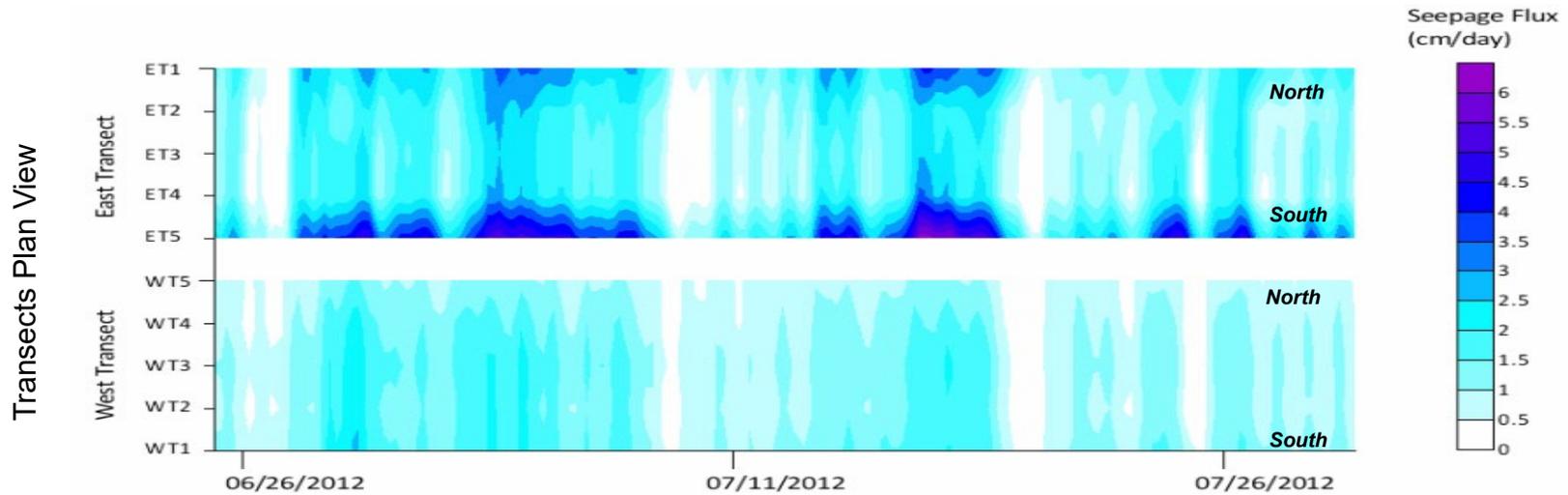
50 μm PDMS
500 μm Core

Figure 4. SPME Fiber Assembly into a Modified Stainless Steel Push Point Sampler from Texas Tech University (Reible et al)

Comparison of Aqueous PAH Concentrations: Grab Samples (Transect Screens) & Passive Samplers (SPME)



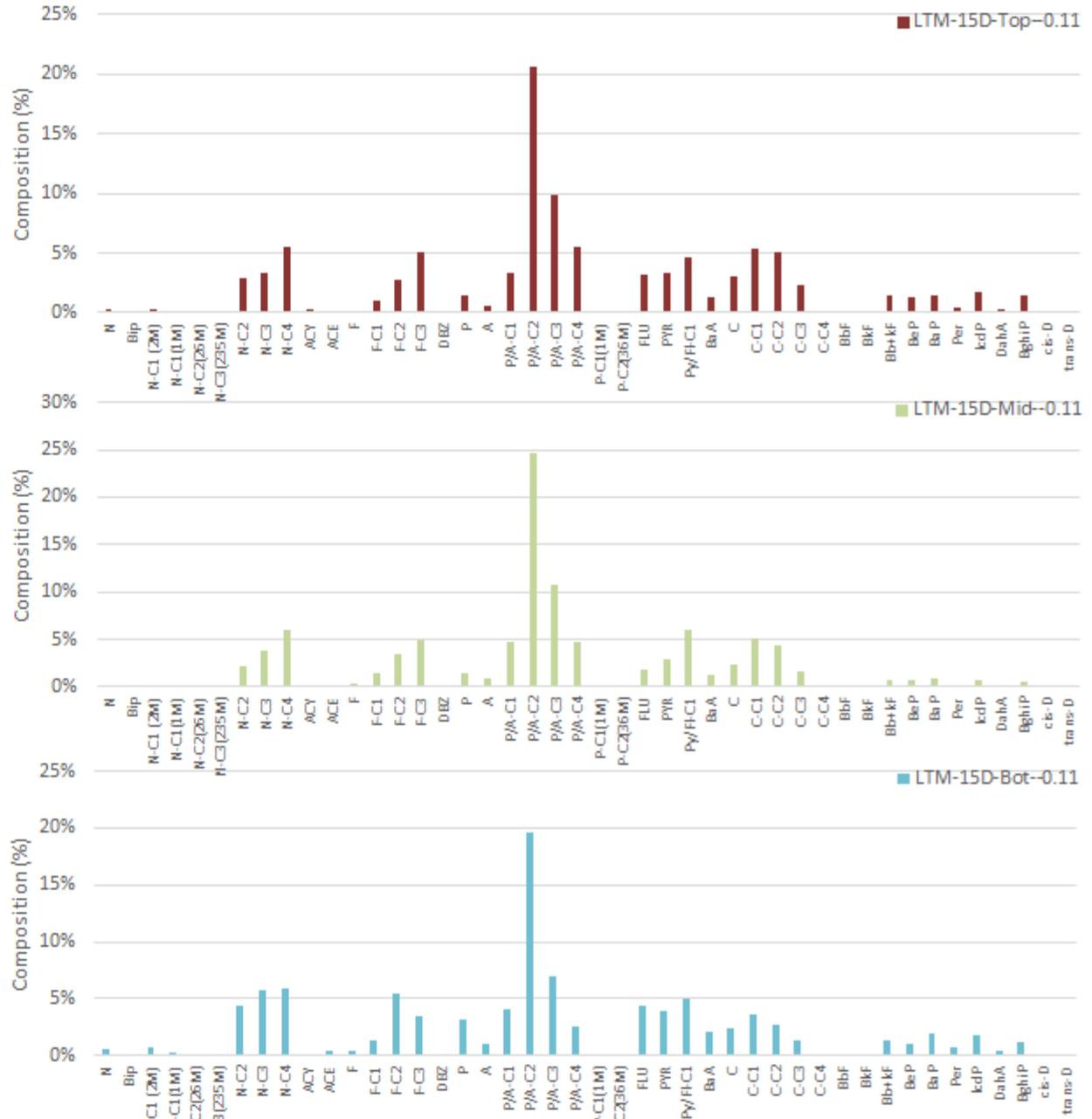
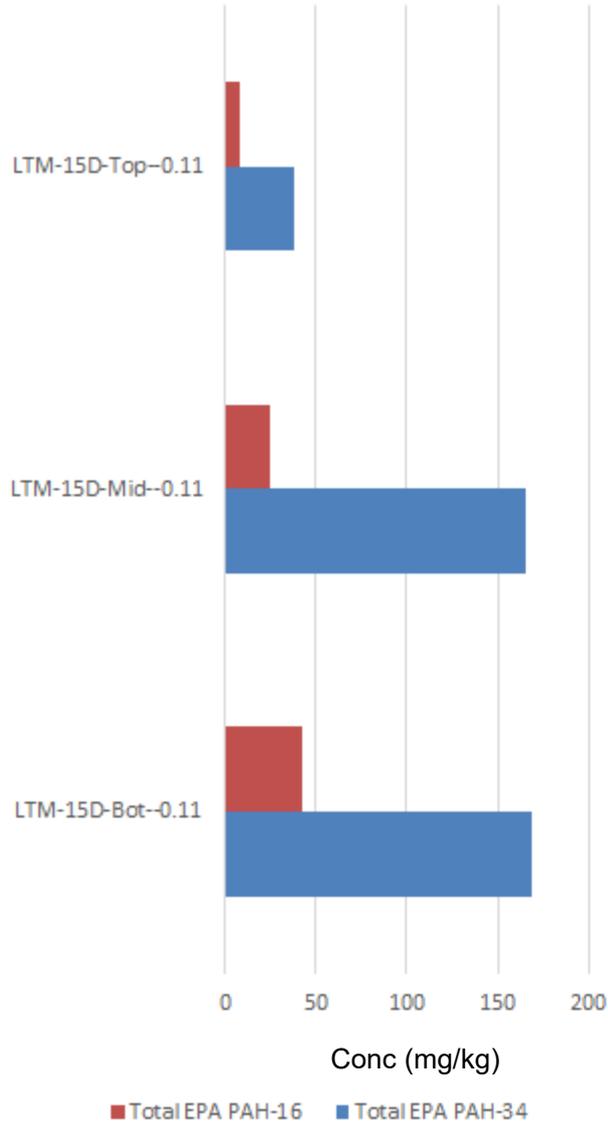
Spatial and Temporal Variability of Calculated Seepage Flux Transects

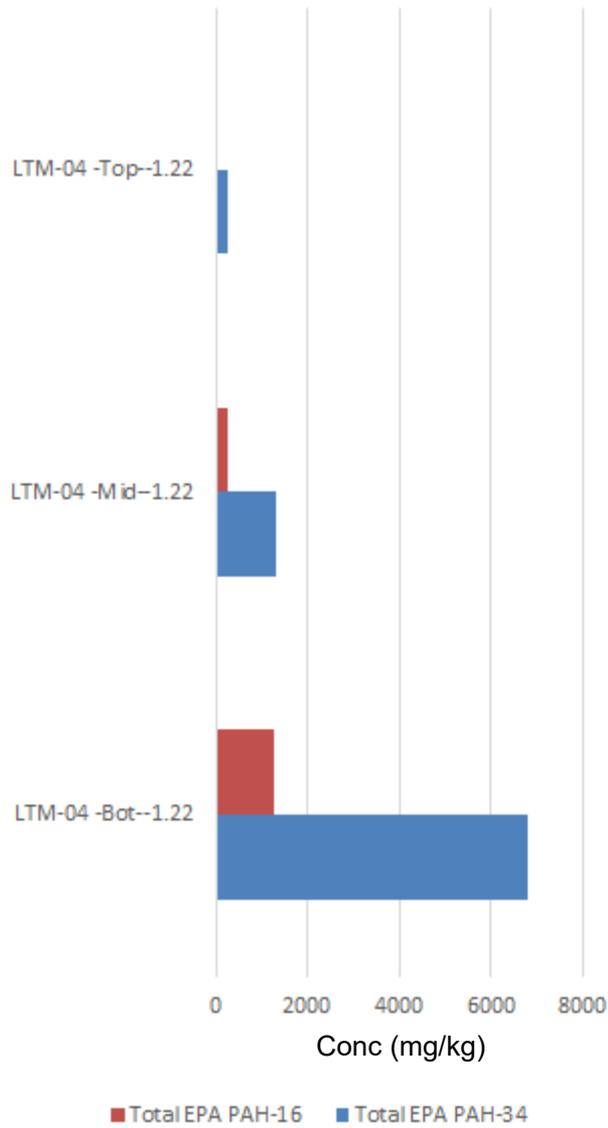




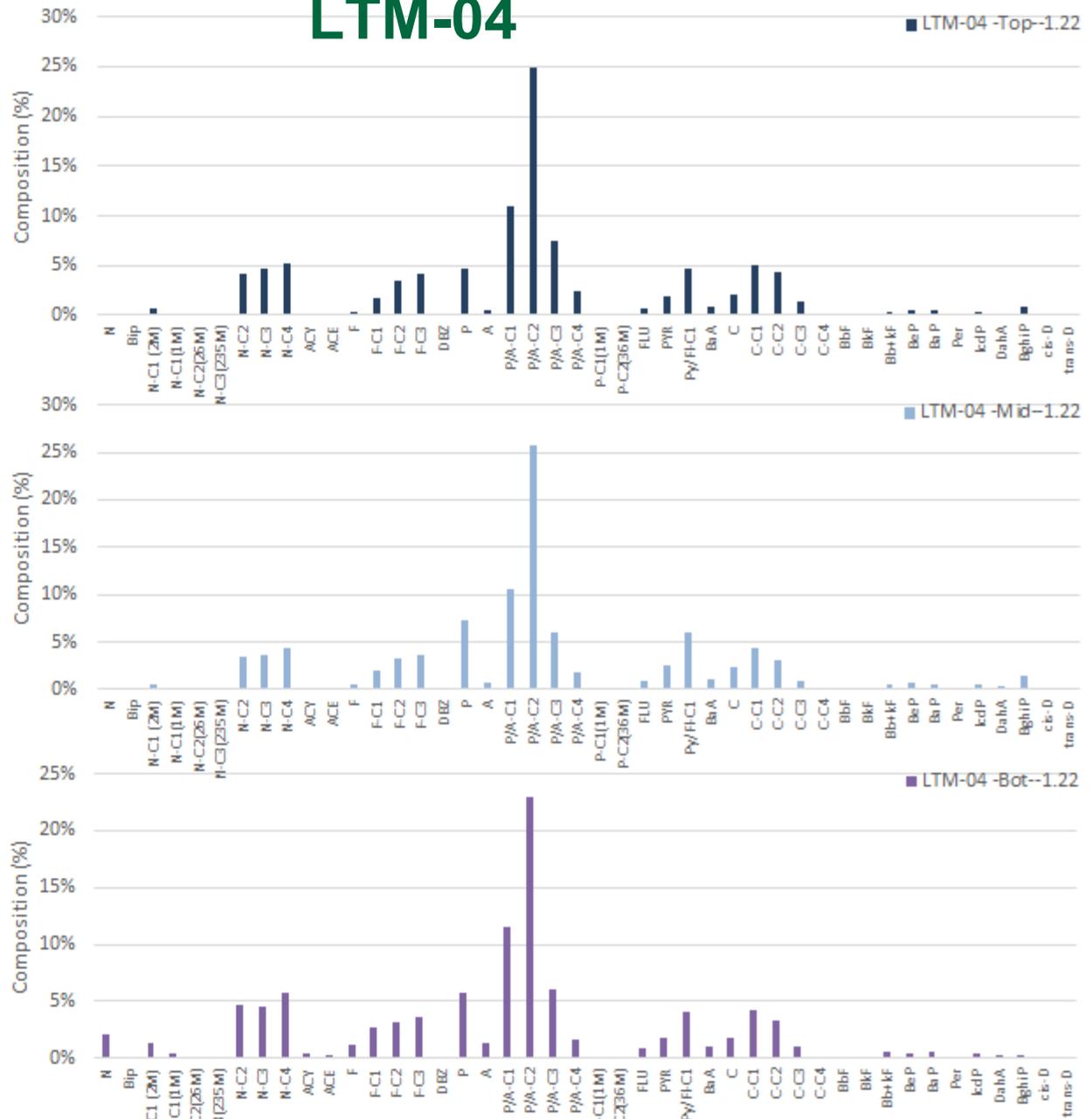
SEDIMENT CHEMISTRY – TOTALS AND DISTRIBUTIONS

LTM-15D





LTM-04

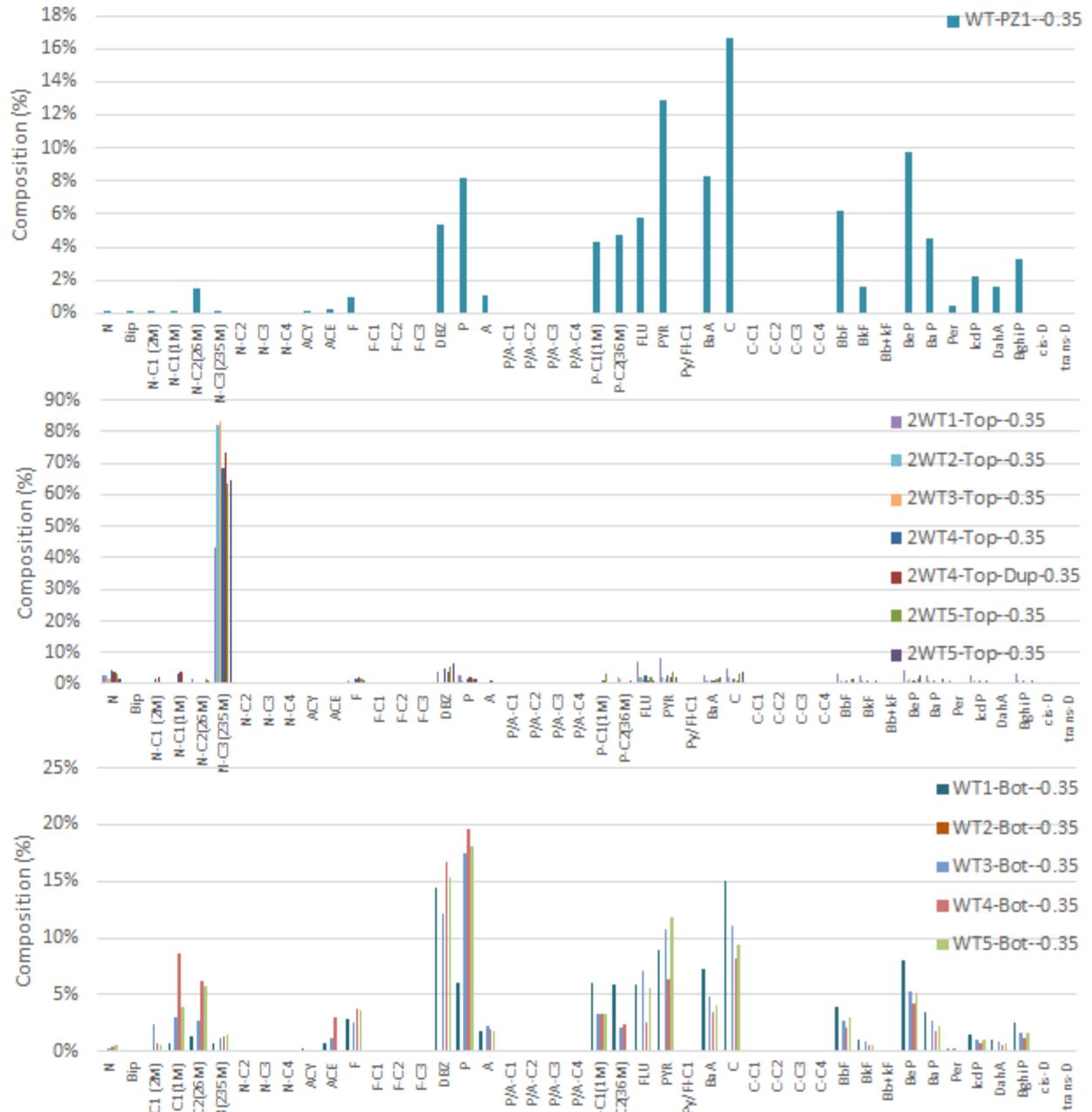




POREWATER STATIONS



Reach 2 – WT Fixed Stations

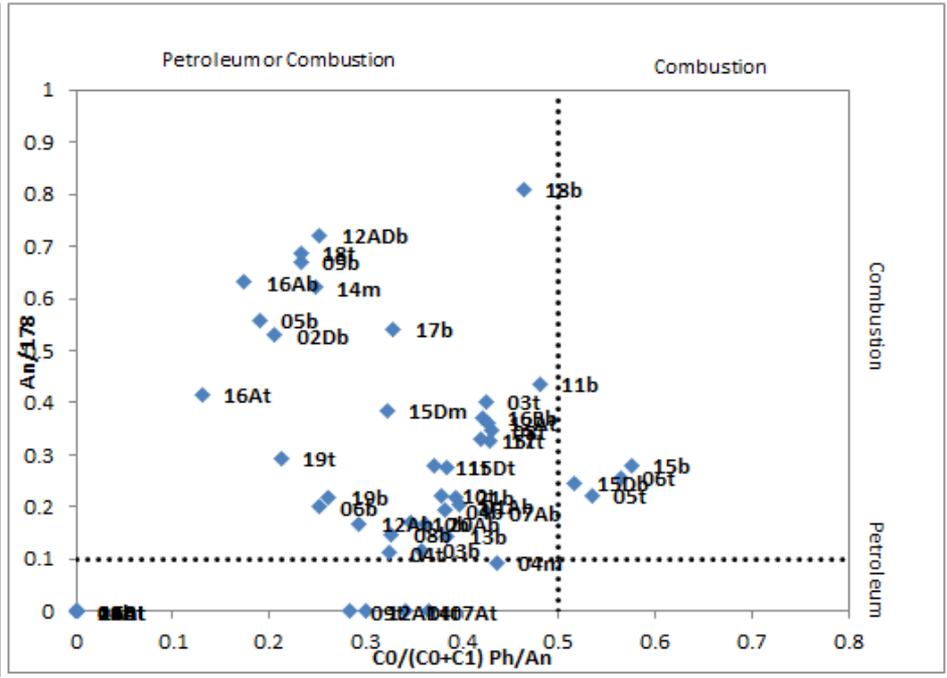
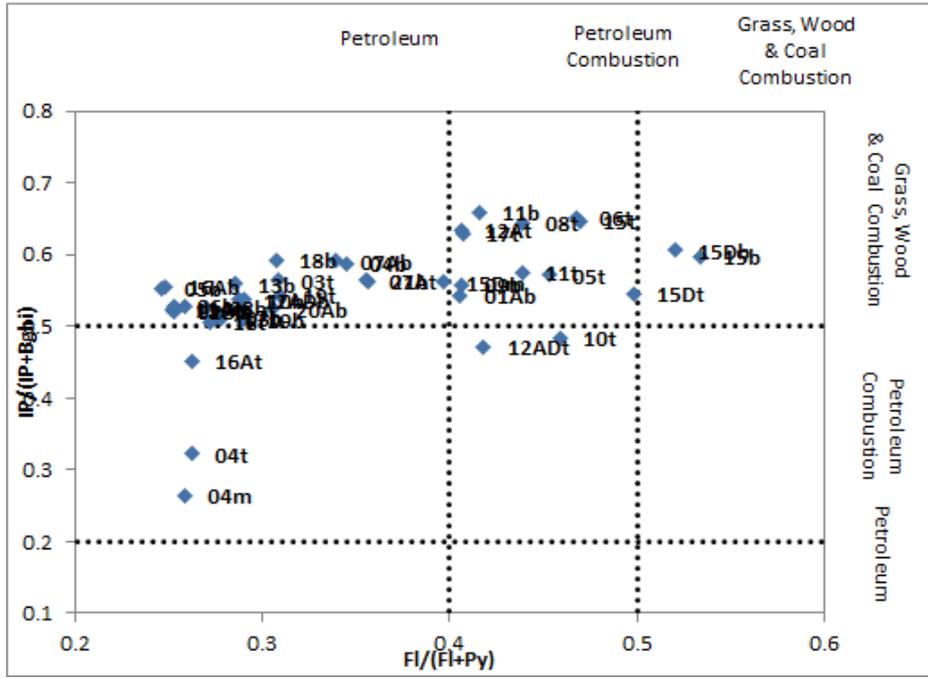
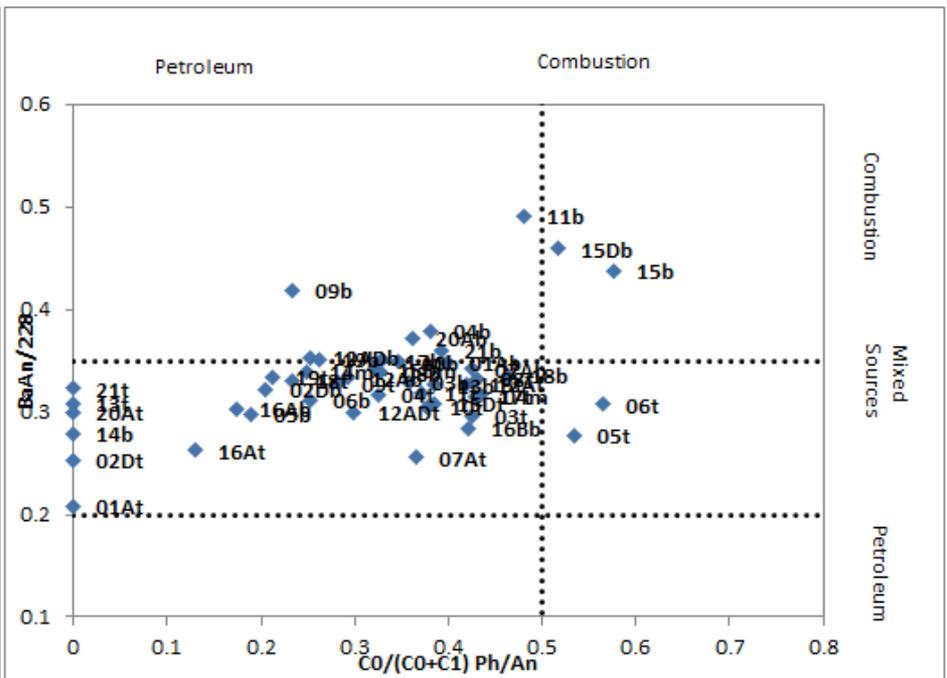
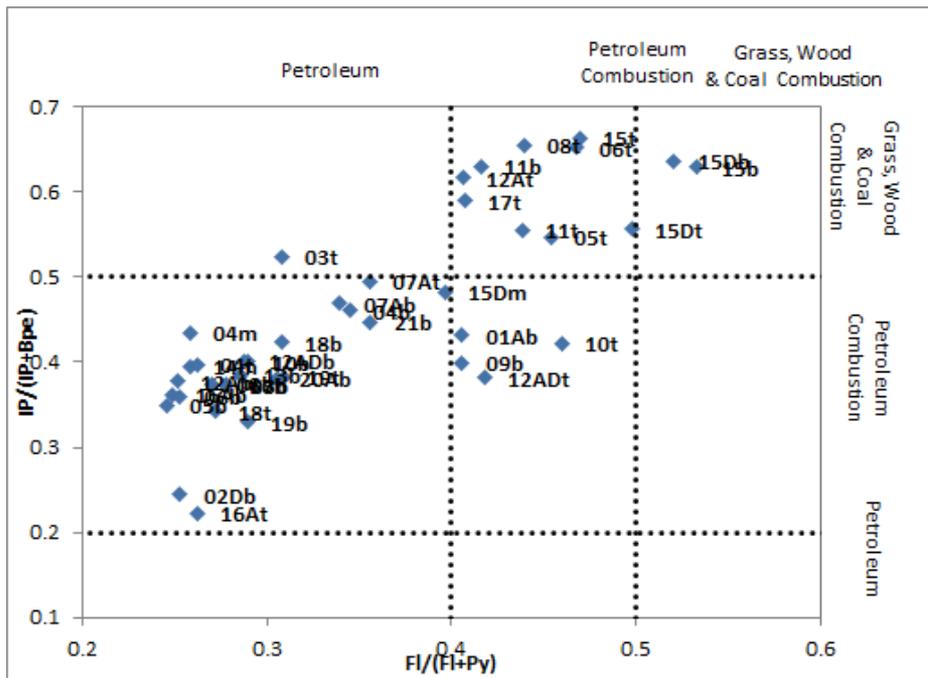


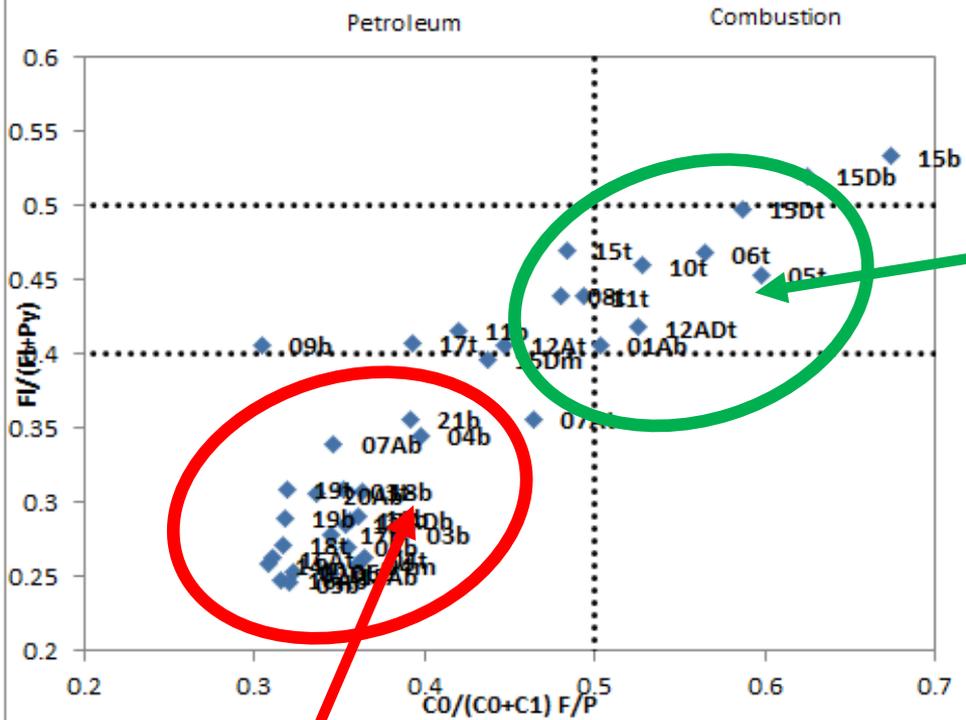


FORENSIC RATIOS TO EVALUATE RECONTAMINATION

Upland sources



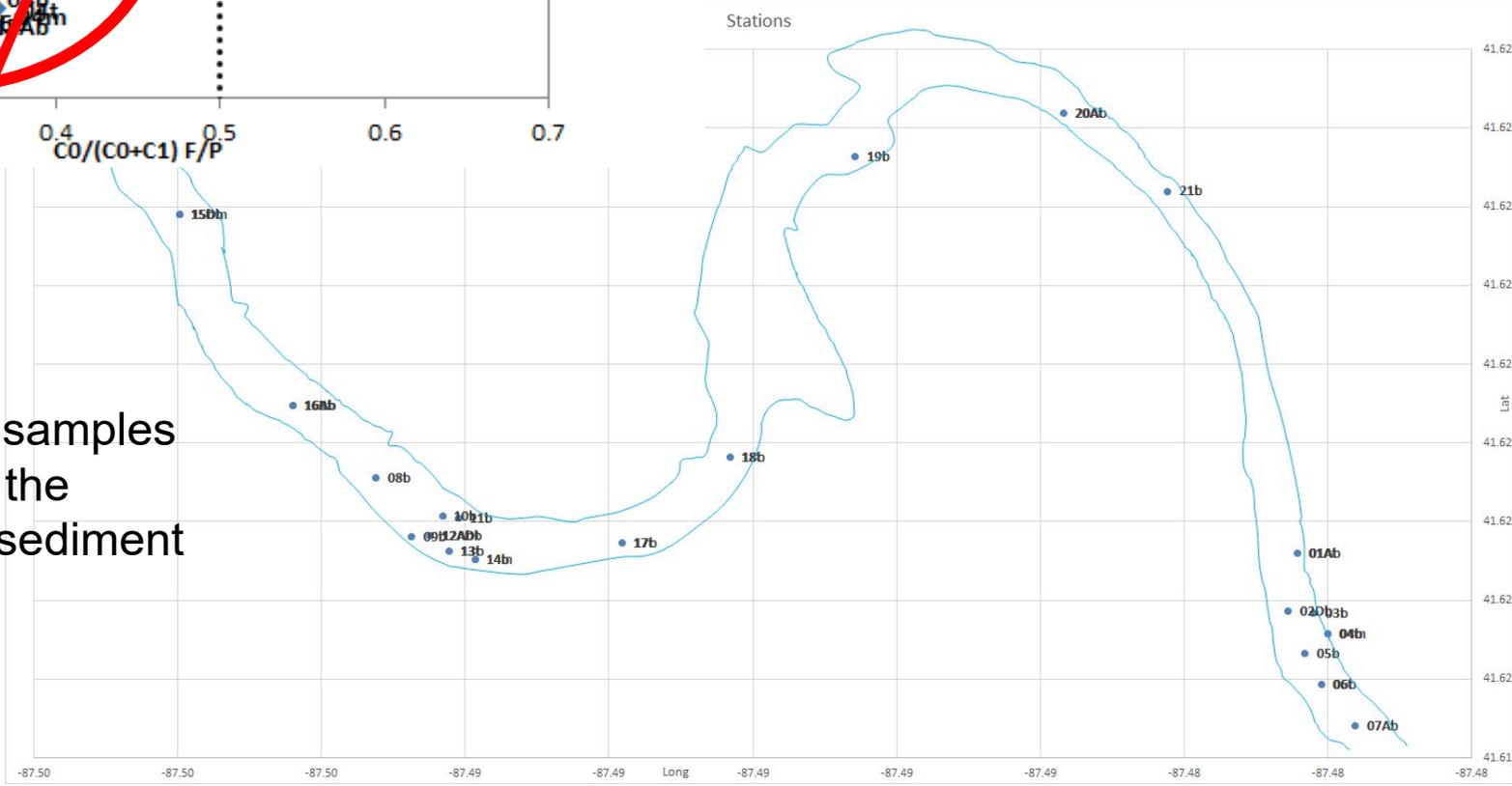


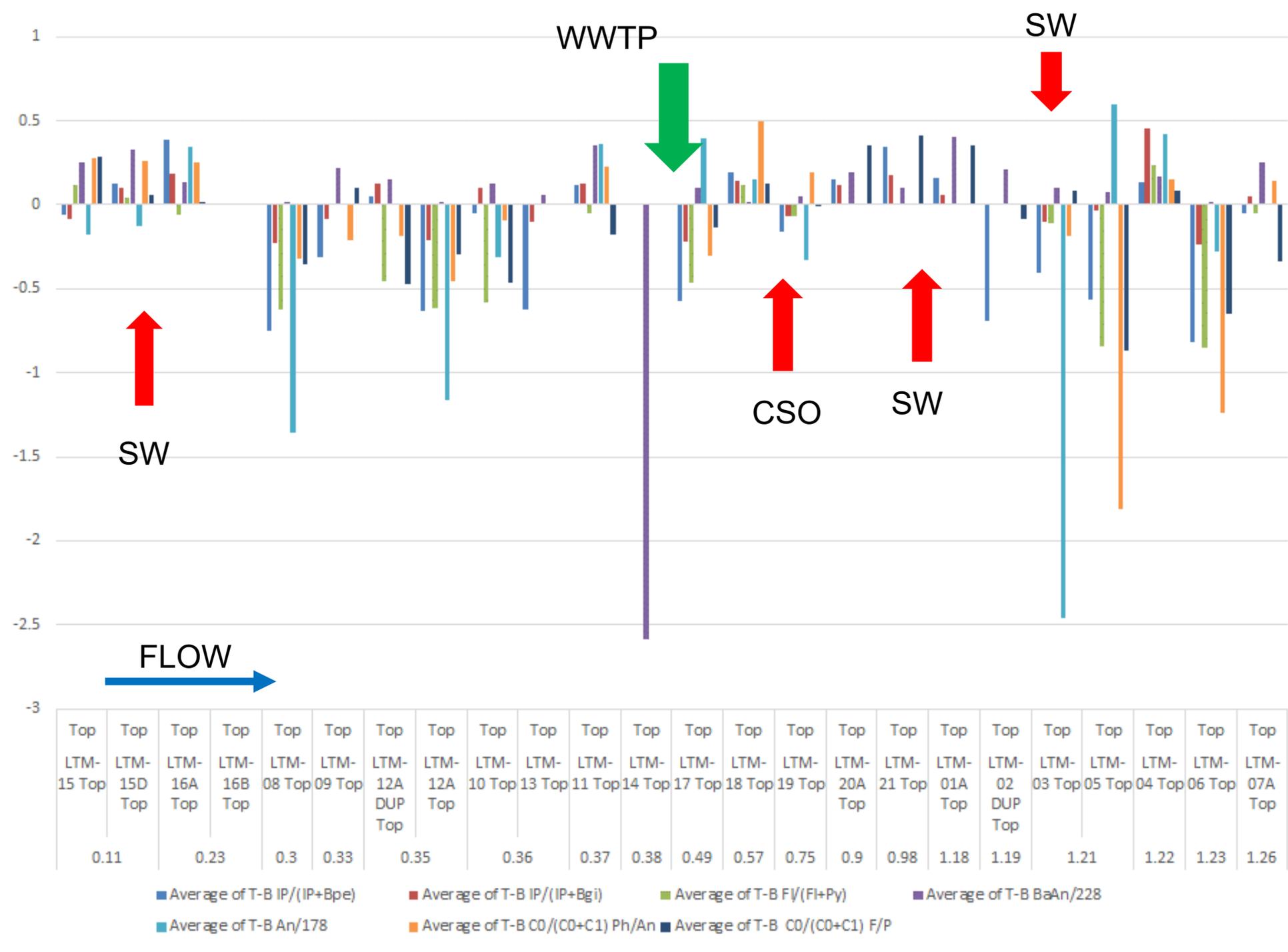


Grass, Wood
Combustion & Coal
Combustion
Petroleum
Combustion
Petroleum

Dominated by samples collected from the newly deposited contaminated sediment above the Cap

Dominated by samples collected from the contaminated sediment below the Cap





CONCLUSIONS

- **More information on the movement of PAHs through the cap under evaluation from recent sampling using passive samplers and core sample comparisons**
- **Low level contamination on top of the cap may be from mixed, relatively low-level sources compared to high-level, historic contamination at depth.**
- **Further statistical approaches (PCA, HCA, etc) is currently underway to better differentiate end members (sources)**
- **These forensic approaches will be used to compare between metrics, such as sediment, porewater, biota, passive samplers, etc.**
- **Remedy effectiveness assessment is underway to use the cap monitoring data to evaluate the remedy.**



QUESTIONS



