Task 8: Environment and Energy – Expedited Field Survey and Sampling Techniques for Polychlorinated Biphenyl (PCB) Congeners and Dioxins

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PORTS FUTURE

EXPEDITED PCB FIELD STUDY -OVERVIEW OF TASKS

Development of the mobile GC/MS unit to detect PCB congeners and dioxin on-site

Guardion 7, GC-MS system system

NEW Guardion 8, GC-MS

PORTS FUTURE

EXPEDITED PCB FIELD STUDY -OVERVIEW OF TASKS

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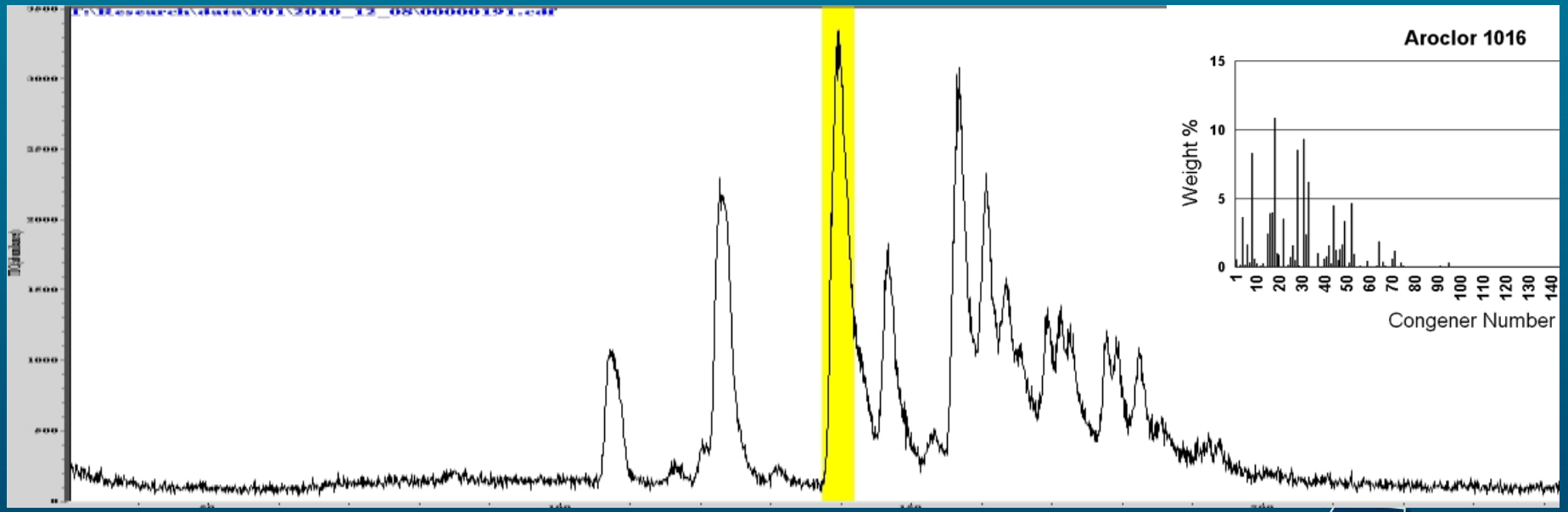
Aroclor 1016, 1mg/mL in hexane, 0.2 µL injected on Guardion 8 (courtesy of Torion) (Similar to EPA method 8082a). Contains ~20 congeners.



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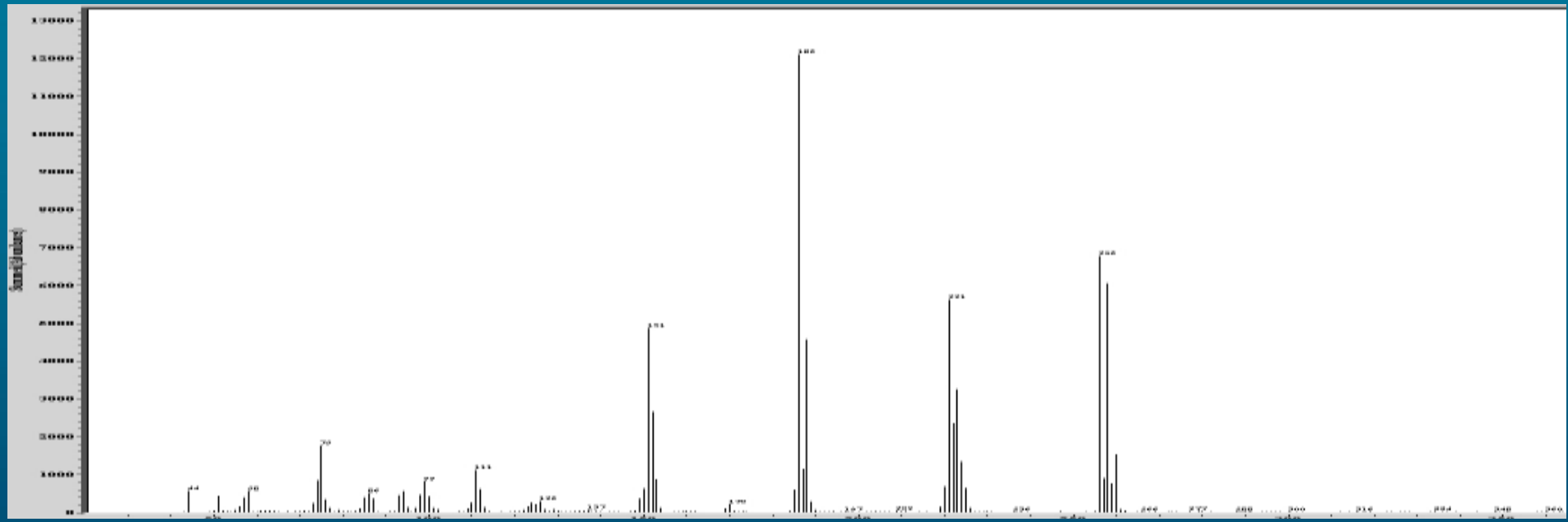

Combination of retention time (index) and EI fragmentation pattern can confirm identity of each congener.

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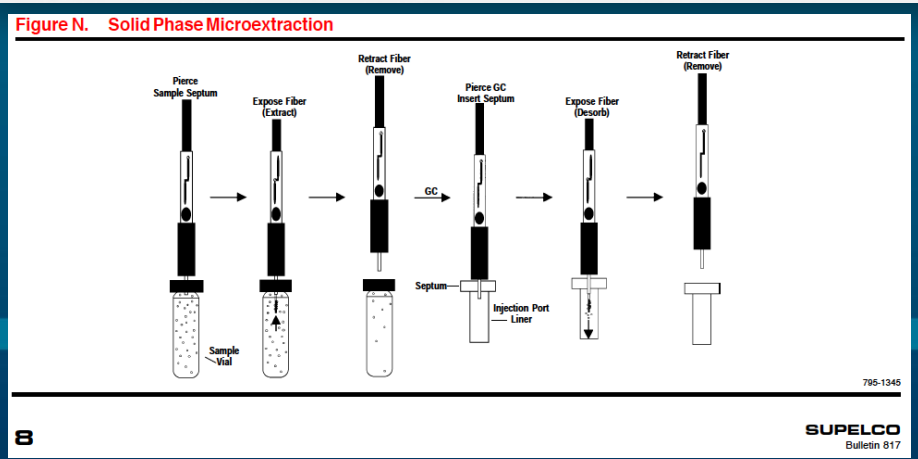
EXPEDITED PCB FIELD STUDY -OVERVIEW OF TASKS

Development of the mobile GC/MS unit to detect PCB congeners and dioxin on-site

How to get PCBs out of the soil/sediment/water and into the GC/MS?
Solid Phase Microextraction (SPME) or organic extraction (EPA Method 8082a)

Table 1. Comparison of RSDs Achieved Using SPME with U.S. EPA Method 525

		U.S. EPA method 525 (n = 7)	
	SPME (n = 8) (250 pg/mL)	C18-cartridge (200 pg/mL)	C18-dish (200 pg/mL)
naphthalene	8		
anthracene	8	7.7	13.7
benz[a]anthracene	10	7.1	33.2
benzo[a]pyrene	11	33	21.7
trichlorobiphenyl	19	15	21.4
pentachlorobiphenyl	16	15	15.1



Environ. Sci. Technol. **1994**, *28*, 298–305

Rapid Determination of Polyaromatic Hydrocarbons and Polychlorinated Biphenyls in Water Using Solid-Phase Microextraction and GC/MS

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EXPEDITED PCB FIELD STUDY -OVERVIEW OF TASKS

Characterization of PCBs in the soil and sediment along Little Beaver Creek and near switch yard X-533:

- 25 sites identified for sampling soil and stream sediments, see map
- Split-sampling with third party laboratory, TBD
- Vertical depth sampling , less than 12 inches, collected along stream bed to characterize PCB tranformations (i.e. aging)
- Map characterizing PCB contamination

EXPEDITED PCB FIELD STUDY -DELIVERABLES

- Written procedure for using the Guardion mobile GC/MS
- Geo-referenced database and map of areas with PCB contamination along Little Beaver Creek and near x-533 switchyard
- Draft and final report summarizing the method development and characterization

PORTS FUTURE

EXPEDITED PCB FIELD STUDY – RELEVANT WORK

- Co-PI Jackson has experience with SPME coupled with GC
  - G. P. Jackson, A. R. J. Andrews, "New Fast Screening Method for Organochlorine Pesticides in Water by Using Solid-Phase Microextraction with Fast Gas Chromatography and a Pulsed-Discharge Electron Capture Detector" *Analyst* 1998, 123(5), 1085-1090
  - C. M. Zimmermann, G. P. Jackson, "Gas Chromatography Tandem Mass Spectrometry for Biomarkers of Alcohol Abuse in Human Hair" *Ther. Drug Monit*. 2010, 32(2), 216-223.
- Co-PI Jackson has vast experience with mass spectrometry instrumentation development
  - More than 25 publications in this area
  - E.g. O. L. Collin, C. M. Zimmermann, G. P. Jackson, "Fast Gas Chromatography Negative Chemical Ionization Mass Spectrometry of Explosive Compounds" *Int. J. Mass Spectrom*. 2009, 279, 93-99.

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