Application Note

Environmental

# Comparison of Dual Sorbent Solid Phase Extraction for PFAS Applications

## Using dual-phase Agilent Bond Elut PFAS WAX/ Carbon S SPE cartridges for US EPA Method 1633


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## Abstract

Many laboratories have opted to combine polymeric weak anion exchange (WAX) and graphitized carbon black (GCB) into single solid phase extraction (SPE) cartridges to streamline sample preparation and facilitate automation for the determination of Per- and Polyfluoroalkyl Substances (PFAS) in environmental samples. This modification is acceptable under Section 1.5 of US EPA Method 1633, if the method's quality control metrics are met.[1] The Agilent PFAS WAX and Carbon S sorbents are specifically manufactured for PFAS applications and are lot-tested to ensure low PFAS residue and maximum recovery.[2,3] Packing these sorbents into standard 6 mL SPE cartridges with low PFAS residue frits makes them ideally suited for automated methods requiring both WAX extraction and carbon matrix reduction. The extraction performance of the dual-phase Agilent Bond Elut PFAS WAX/Carbon S SPE cartridges are comparable to other commercial cartridges. This ensures seamless integration into existing workflows while assuring optimal performance for PFAS applications.

## Experimental

Extraction recoveries using the Bond Elut layered 200 mg PFAS WAX (top)/50 mg Carbon S (bottom) SPE cartridges (part number 5610-2237) were compared to two other commercial 200 mg WAX/50 mg GCB dual-phase cartridges (Table 1). Four replicate extractions were performed with each sorbent, except for benchmark B, where only two replicates were extracted. The target compounds included the 40 listed in Method 1633, spiked at a low-level concentration of 4 ng/L in 250 mL of reagent water. Target recoveries were quantified using 24 isotope-labeled extracted internal standards (EIS). Extractions were carried out using automated SPE. Method details were described in a previous application note.[4]

## Results and discussion

Figure 1 shows the average target recoveries achieved, while Figure 2 displays the average EIS recoveries. For reference, low-level ongoing precision and recovery limits are included in Figure 1, and EIS recovery limits are shown in Figure 2. The Bond Elut PFAS WAX/Carbon S SPE cartridges demonstrate robust performance in PFAS extraction, comparable to other commercial dual-phase cartridges. Their design facilitates automation and adherence to US EPA Method 1633 quality control guidelines, ensuring reliable and efficient integration into existing laboratory workflows.

**Table 1.** Dual-sorbent SPEs tested.

| Description | Configuration | |
|---|---|---|
| | Top Sorbent | Bottom Sorbent |
| Agilent Bond Elut Layered PFAS WAX/Carbon S | 200 mg PFAS WAX | 50 mg Carbon S |
| Benchmark A | 200 mg WAX | 50 mg GCB |
| Benchmark B | 200 mg WAX | 50 mg GCB |

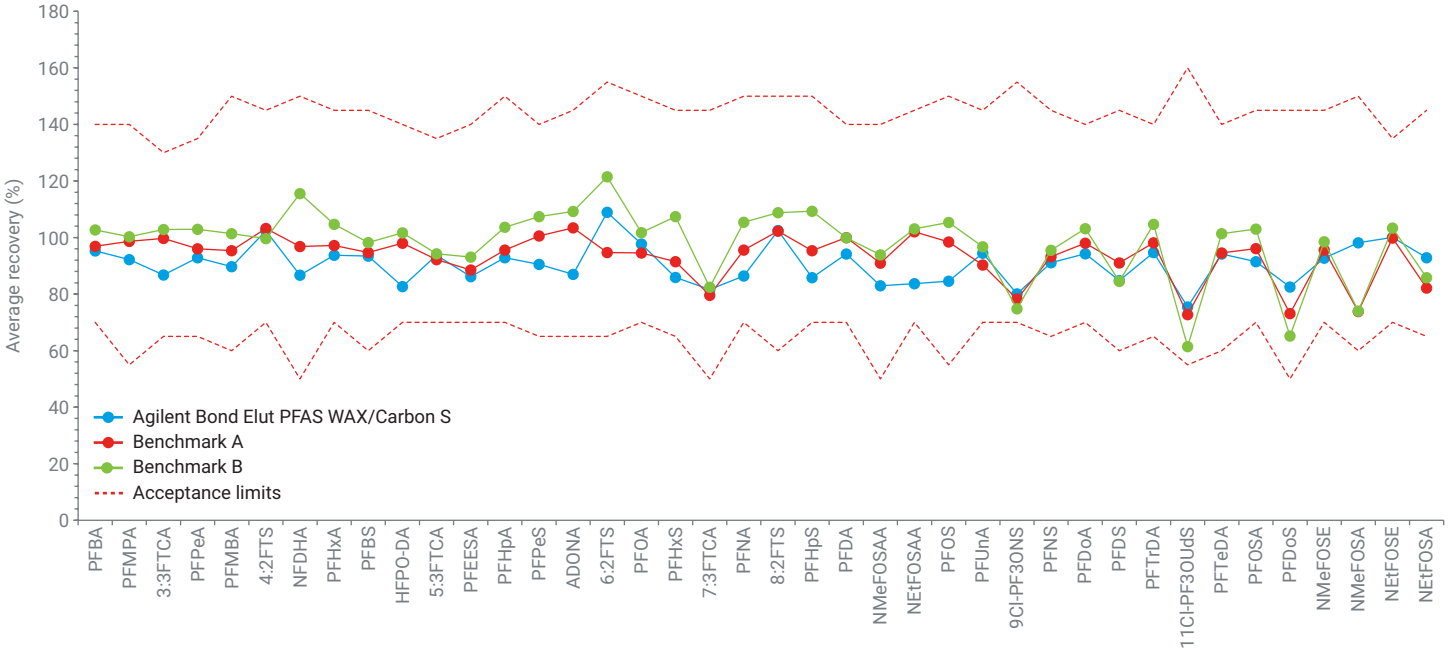


**Figure 1.** Average PFAS target recoveries for the three tested SPE cartridges.

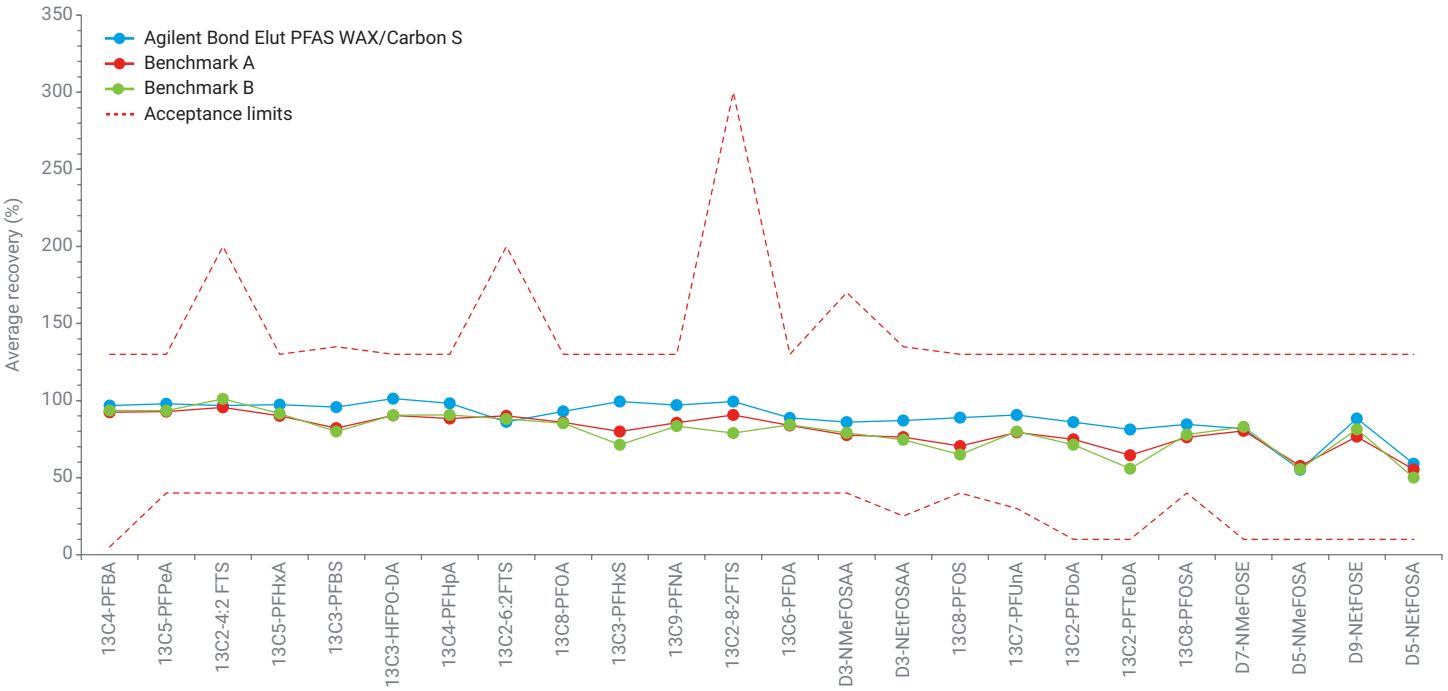


**Figure 2.** Average EIS recoveries for the three tested SPE cartridges.

## Conclusion

Dual-phase Agilent Bond Elut PFAS WAX/Carbon S SPE cartridges are specifically manufactured for PFAS applications, with rigorous lot testing to ensure PFAS cleanliness and recovery. They enable efficient streamlined sample preparation and automation for EPA Method 1633. PFAS target and extracted internal standards recoveries are comparable to other dual-phase SPE cartridges, facilitating easy integration into existing EPA Method 1633 workflows.

## References


1. EPA Method 1633A: Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS; U.S. Environmental Protection Agency, Office of Water, Engineering and Analysis Division, Washington, DC, December **2024**.
2. Giardina, M. Determination of Per- and Polyfluoroalkyl Substances in Drinking Water Using Agilent Bond Elut PFAS WAX SPE and LC/MS/MS. *Agilent Technologies application note*, publication number 5994-4960EN, **2024**.
3. Giardina, M. Determination of Per and Polyfluoroalkyl Substances in Soils Using Carbon S SPE by LC/MS/MS. *Agilent Technologies application note*, publication number 5994-4770EN, **2022**.
4. Novello, A.; Mihelich, B.; Giardina, M. Automated Solid Phase Extraction of PFAS from Aqueous Samples: Using Dual-phase Agilent Bond Elut PFAS WAX/Carbon S SPE Cartridges for US EPA Method 1633. *Agilent Technologies application note*, publication number 5994-8289EN, **2025**.


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