



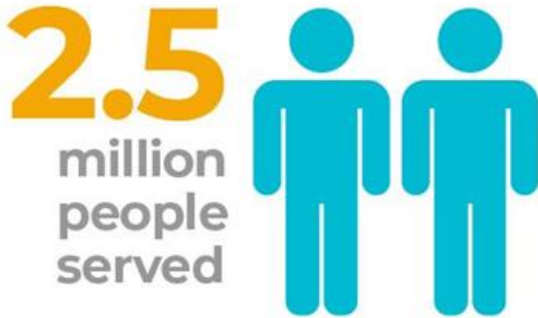
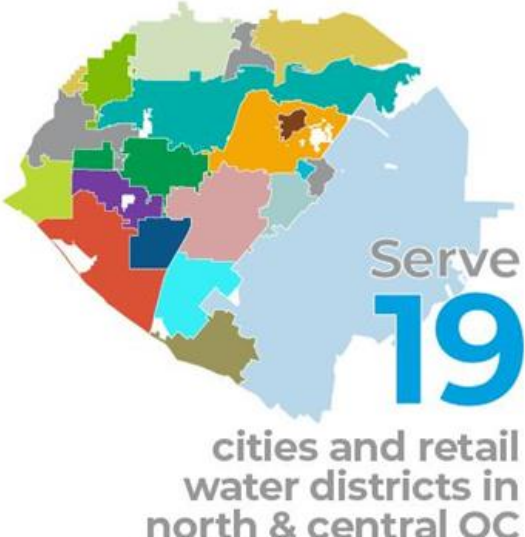
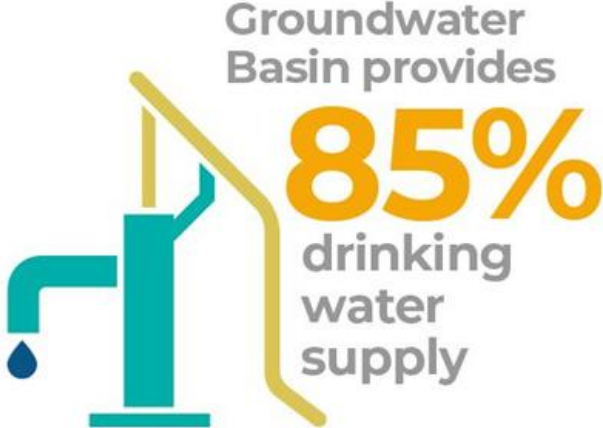
# Inline Filtration and Treatment for Ion Chromatographic (IC) Methods

Kyle Nash  
Senior Chemist

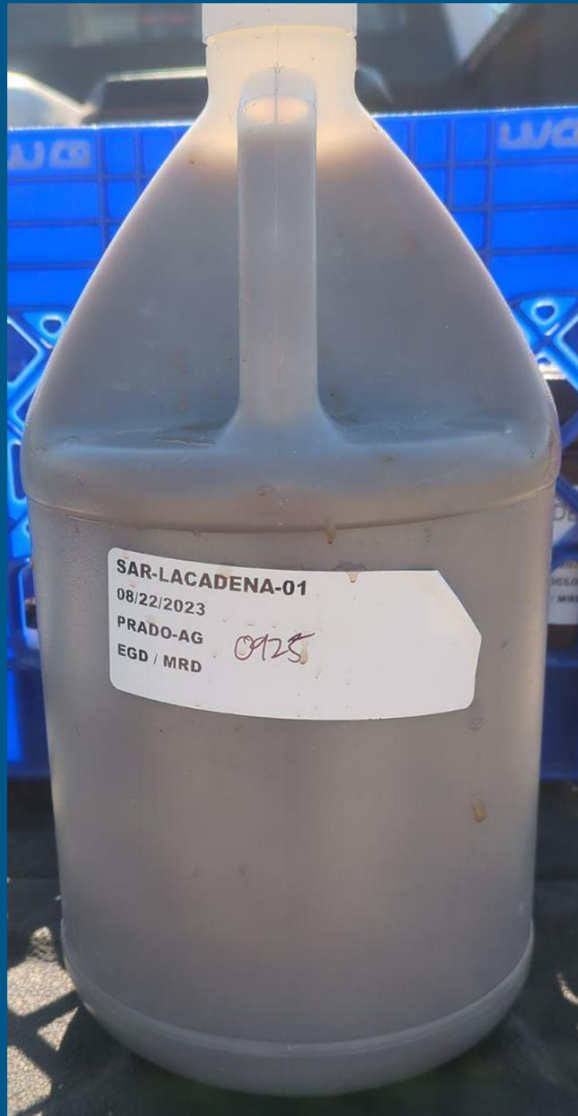
08/09/2024



# OCWD AT-A-GLANCE

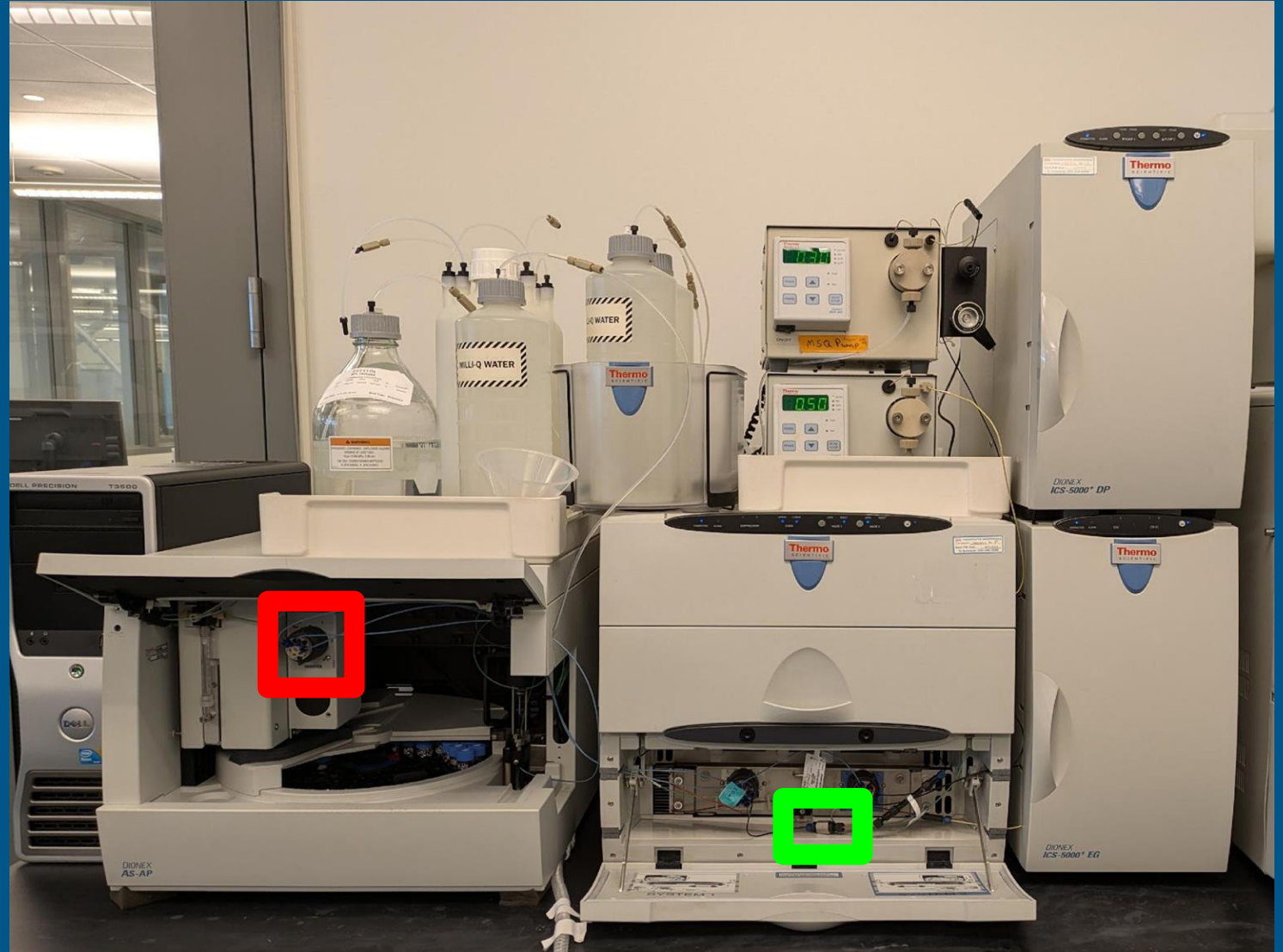


# Sample Matrix is the Enemy of Instruments



# Placing the Inline Filter

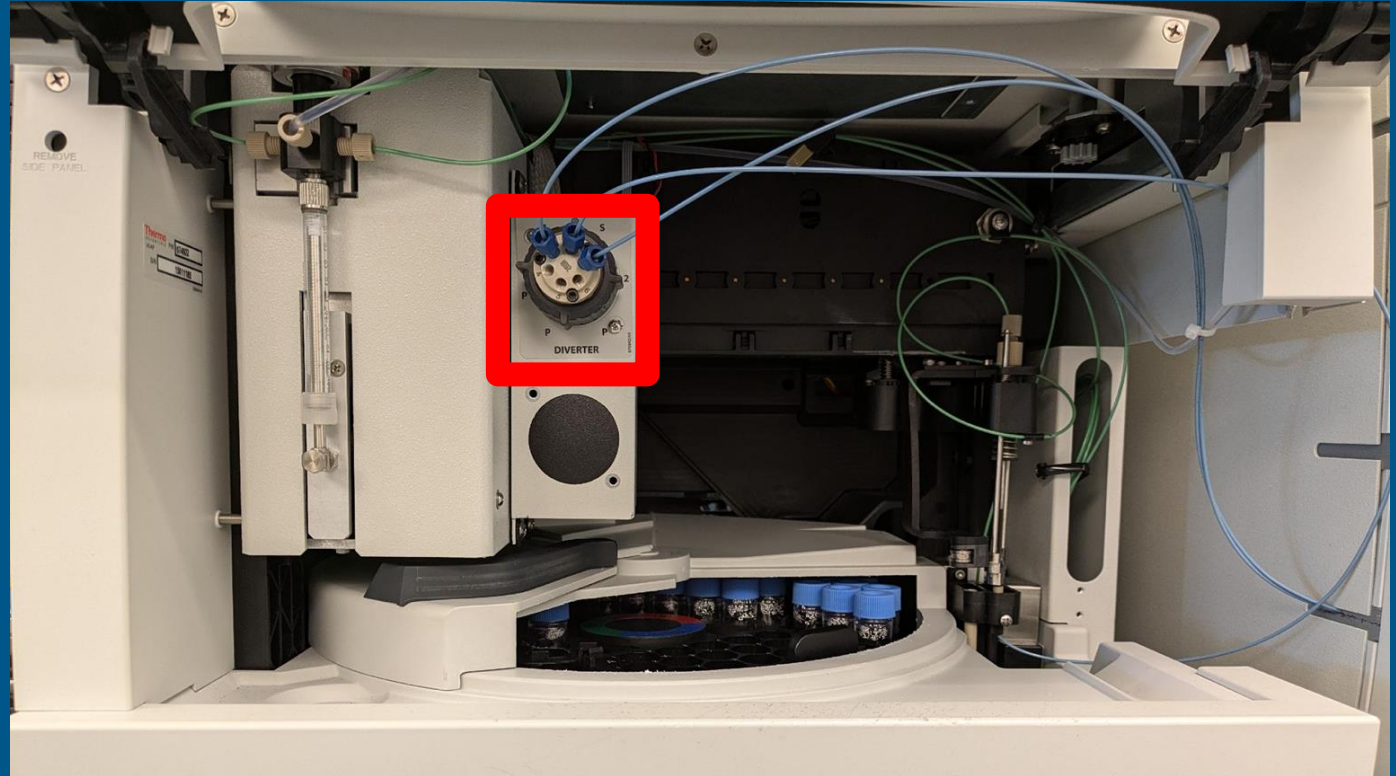
- In the autosampler (red square)
- Before the guard column (green square)





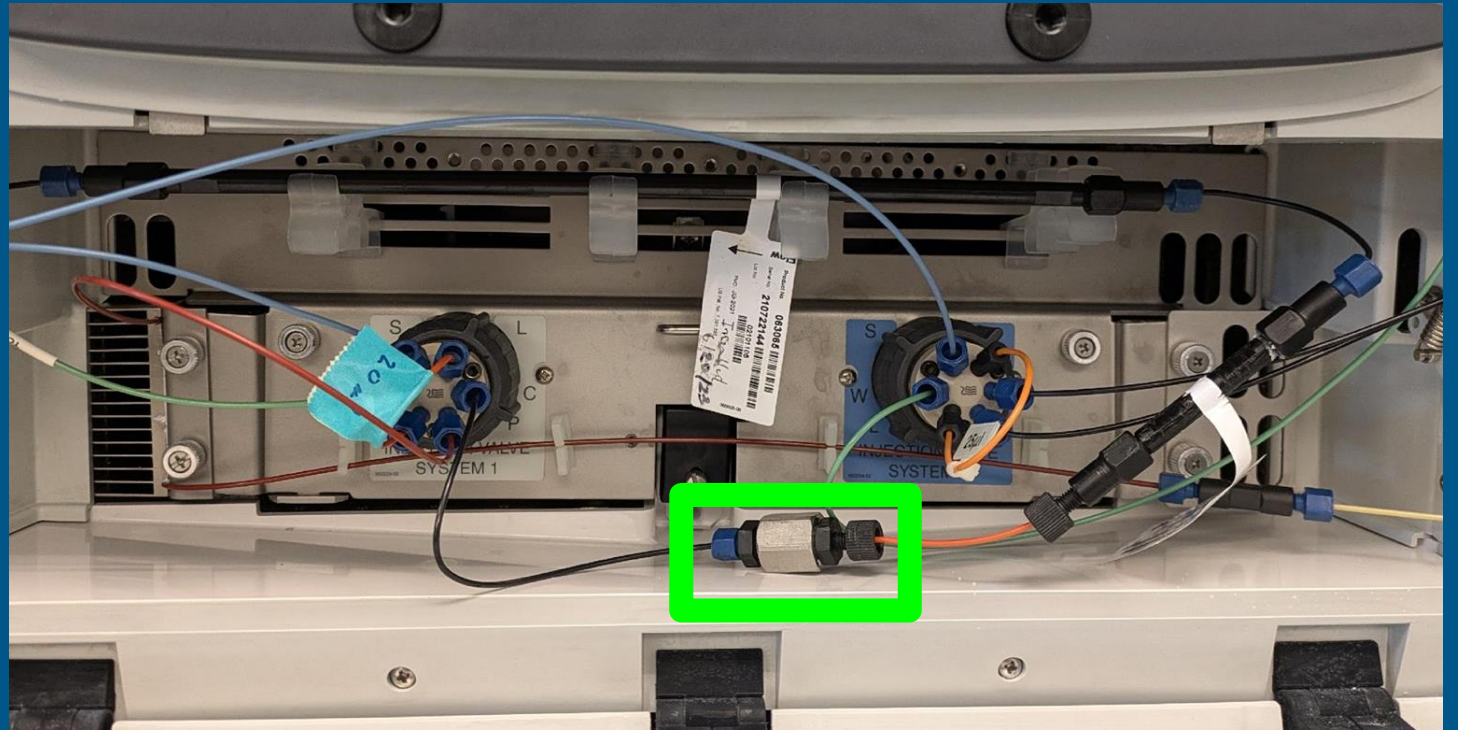
# Inline Filter Located in the Autosampler

- Pros:
  - Very close to autosampler
- Cons:
  - Risks breaking the syringe
  - Difficulty monitoring pressure
- Location was rejected



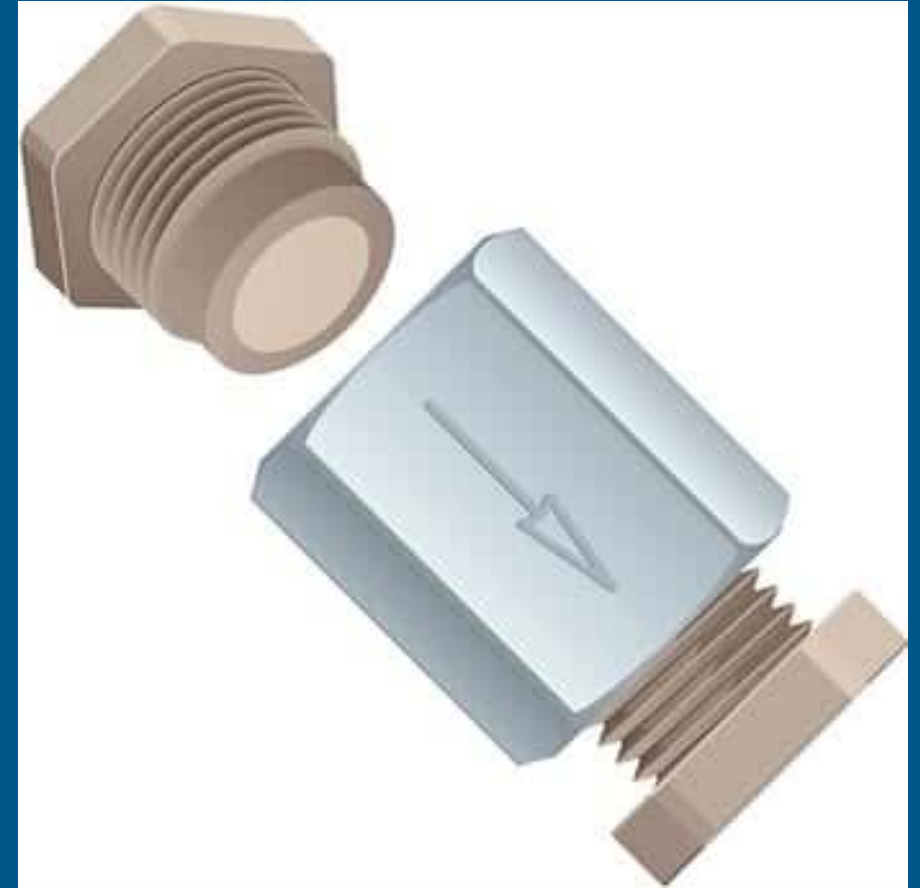
# Inline Filter Located Before the Guard Column

- Pros:
  - Analytical pump filters the samples
  - Pressure is easily monitored
- Cons
  - Autosampler exposed to sediment
- Chosen location



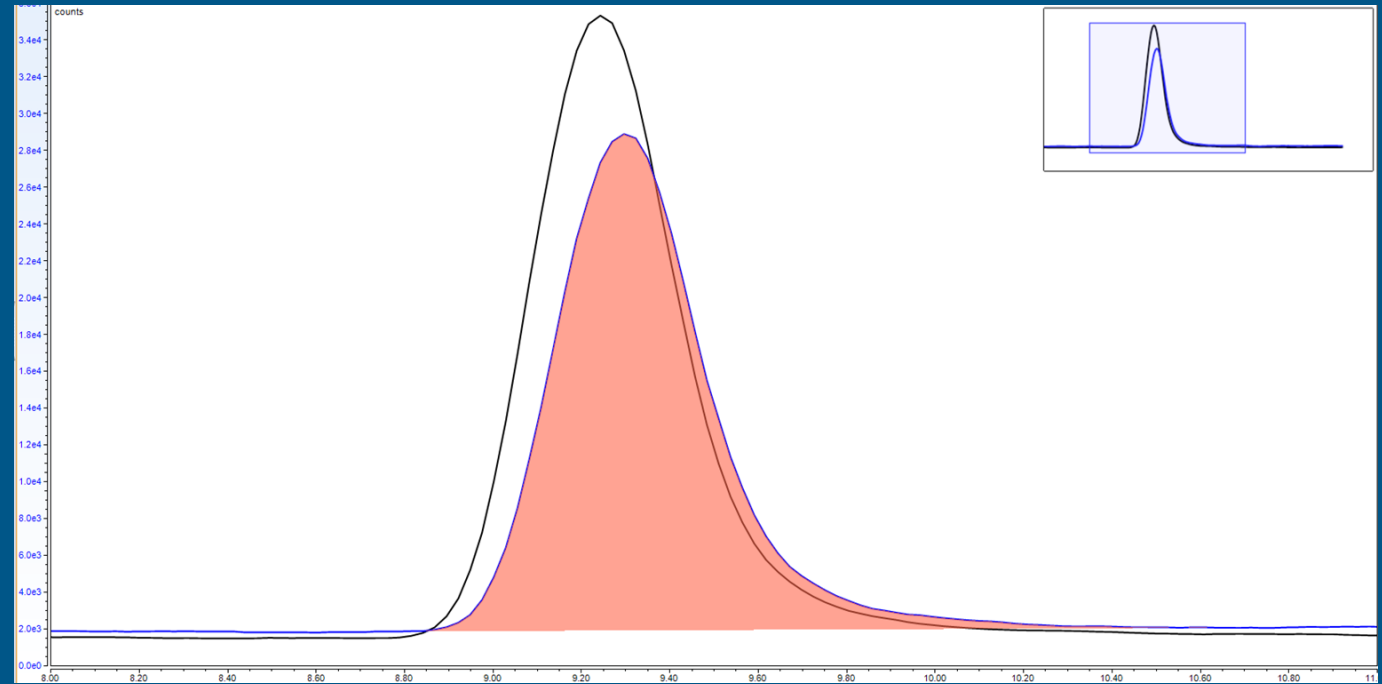
# Desired Traits for an Inline Filter

- Compatible with basic mobile phases
- Pore size  $< 0.45 \mu\text{m}$
- Easy to install and replace



# How Does Inline Filtration Change Perchlorate by 332.0?

- Concentration: 1.0 µg/L
- Slight delay in retention time
- Slight drop in sensitivity
- Pore size < 0.45 µm
- Easy to install and replace



- Red peak is inline filtration
- Black outline is the external filtration



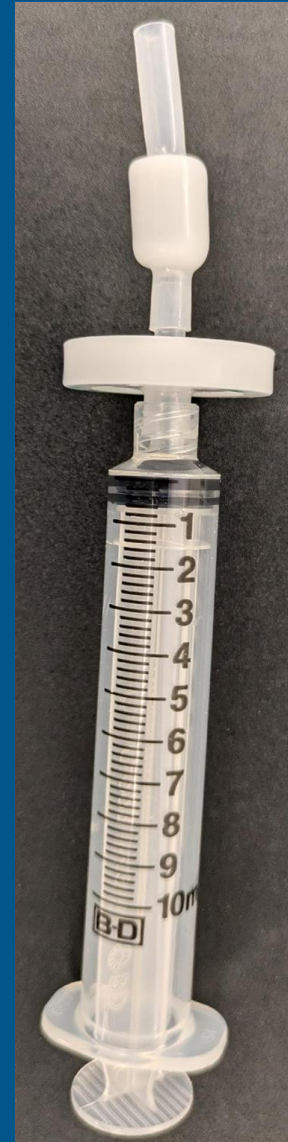
# Methods For C18 Treatment

## EPA 300.0

- Fluoride
- Chloride
- Sulfate
- Bromide
- Nitrate

## EPA 300.1

- Bromate
- Bromide
- Chlorite
- Chlorate

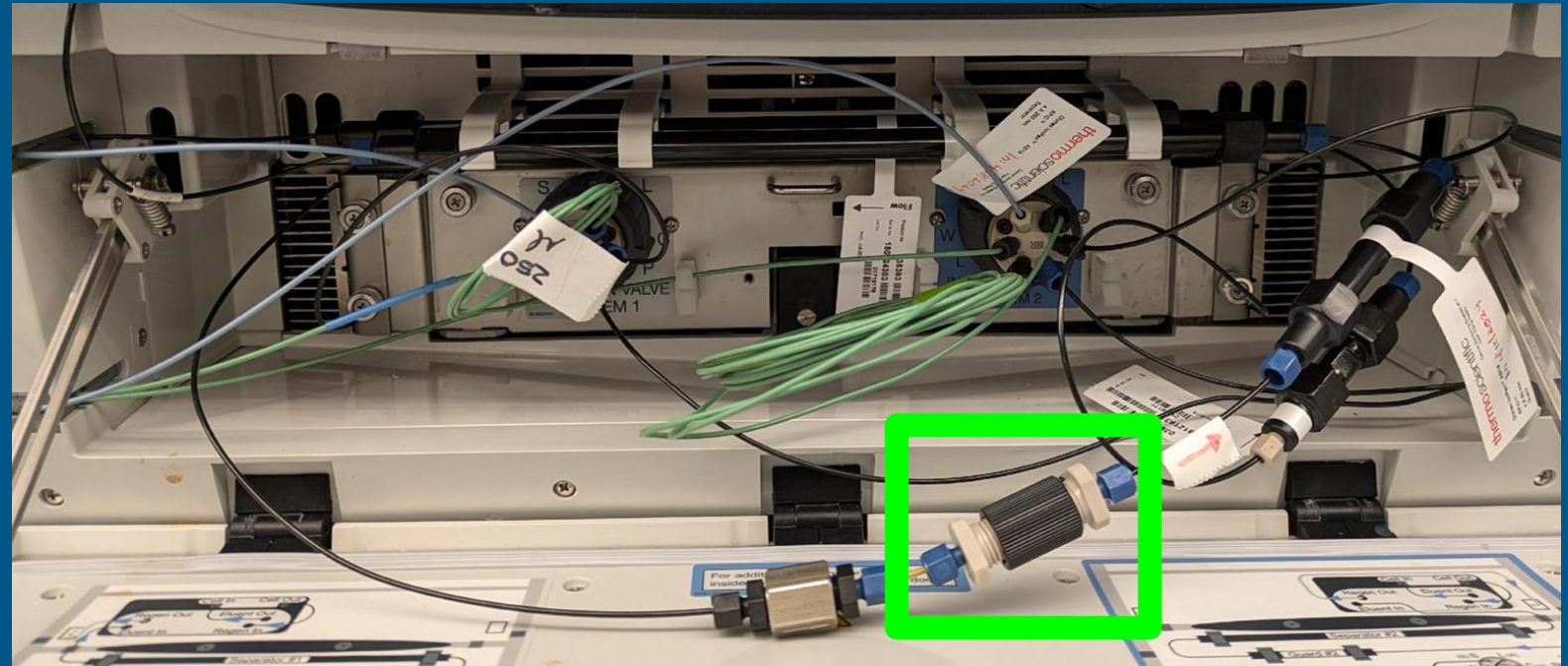


← C18 Cartridge

← 0.45 µm Filter

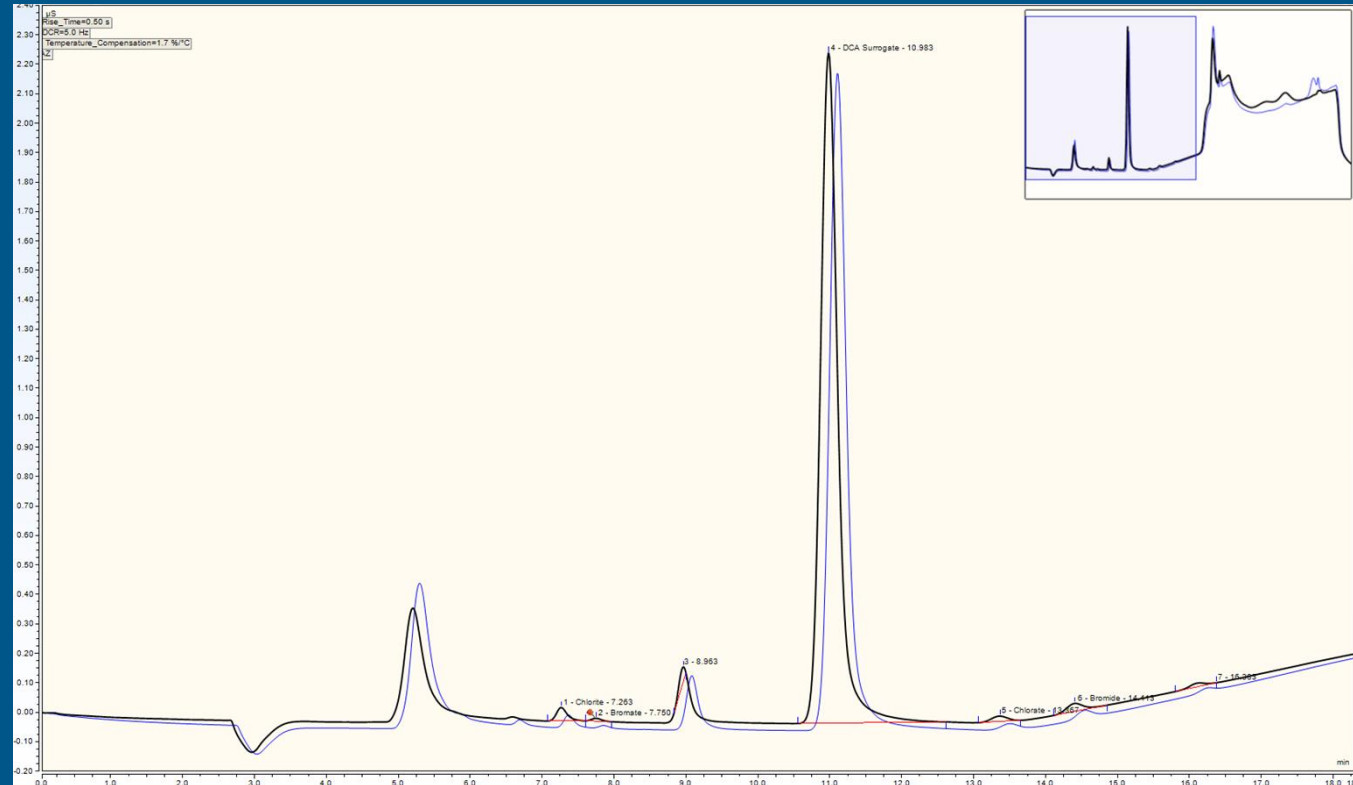
# Inline C18 Cartridge Location

- C18 cartridge inline behind the inline filter
- C18 cartridge included for dissolved organic removal
- Consumable parts ordered from most expensive to least



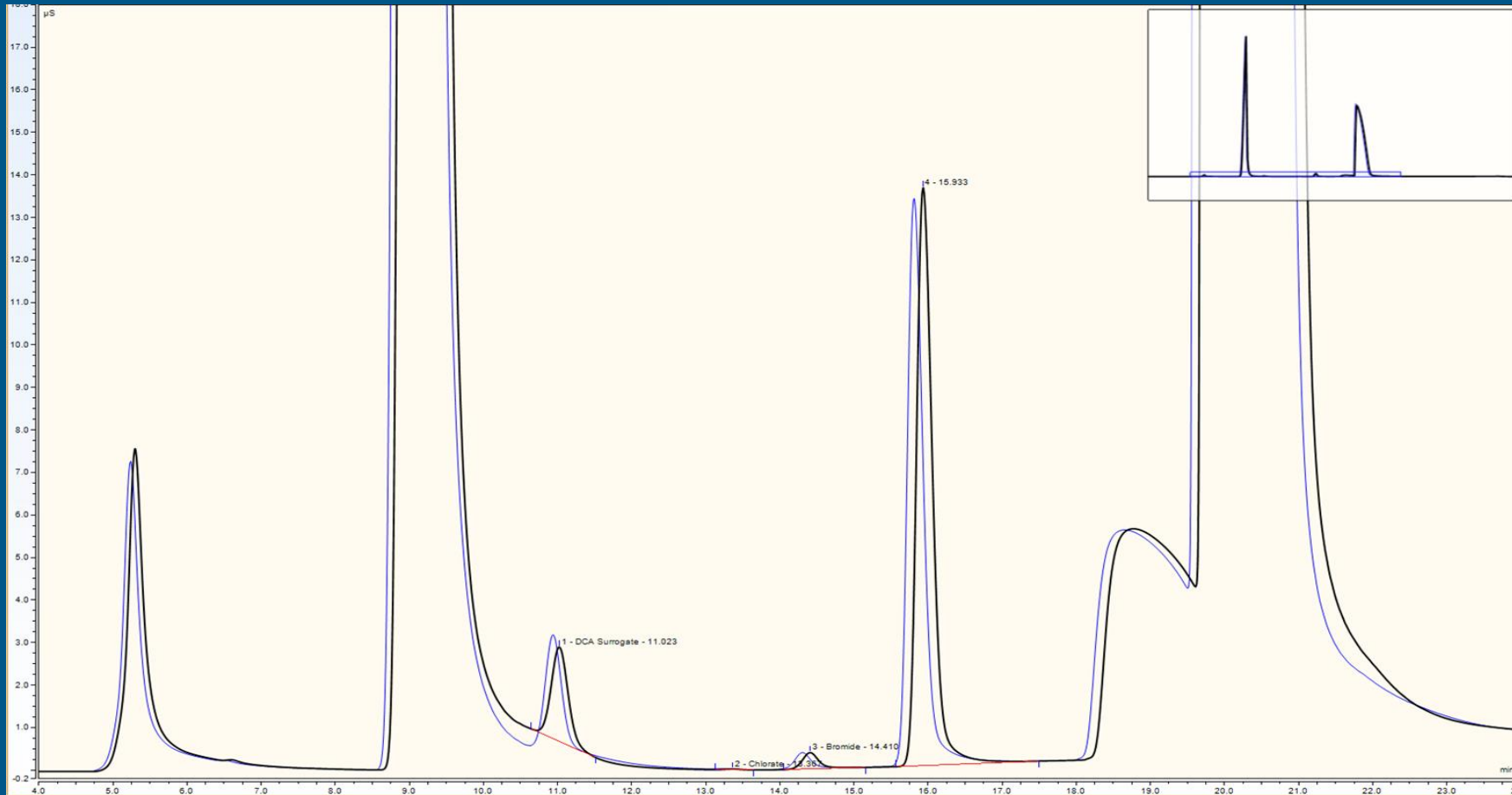
# 300.1 Low Levels

- Concentrations:
  - Bromate: 5 µg/L
  - Bromide: 5 µg/L
  - Chlorite: 10 µg/L
  - Chlorate: 10 µg/L



- Black trace external filtration
- Blue trace internal filtration

# 300.1 Sample

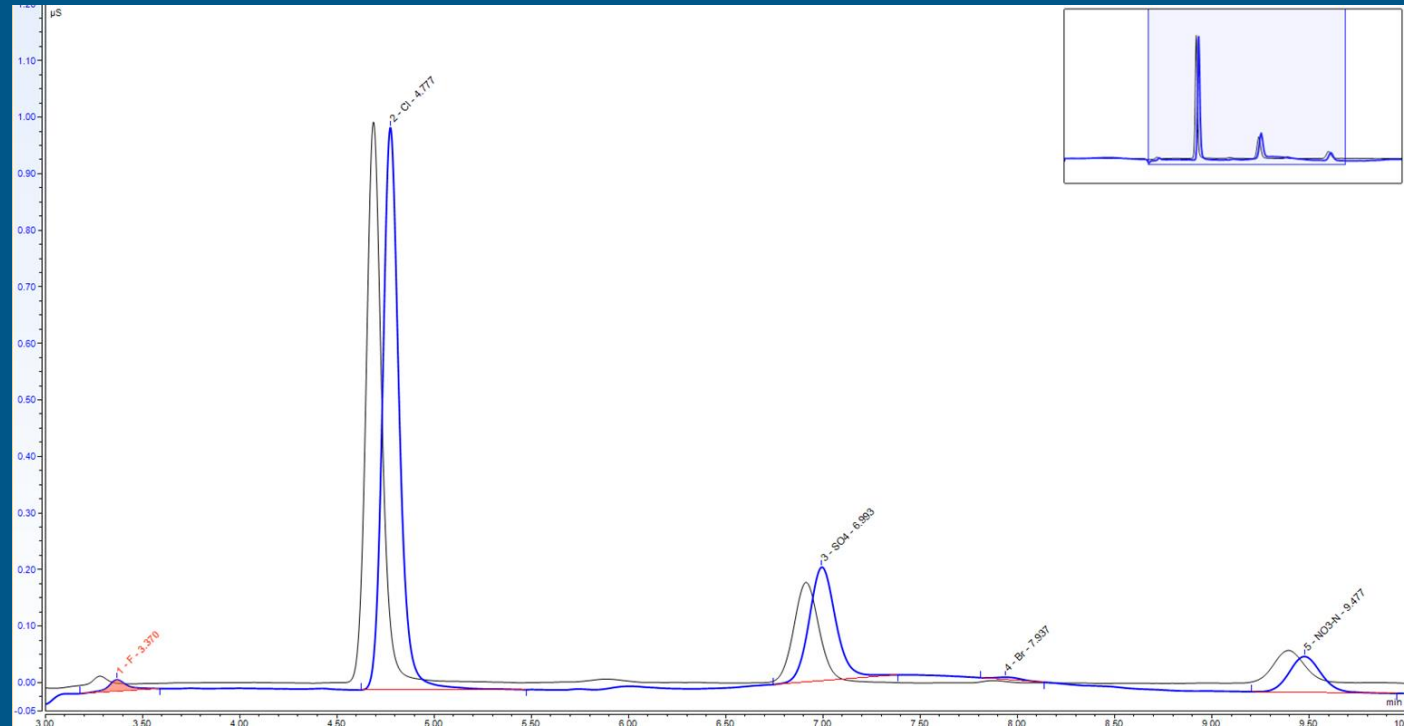


- Black trace external filtration
- Blue trace internal filtration



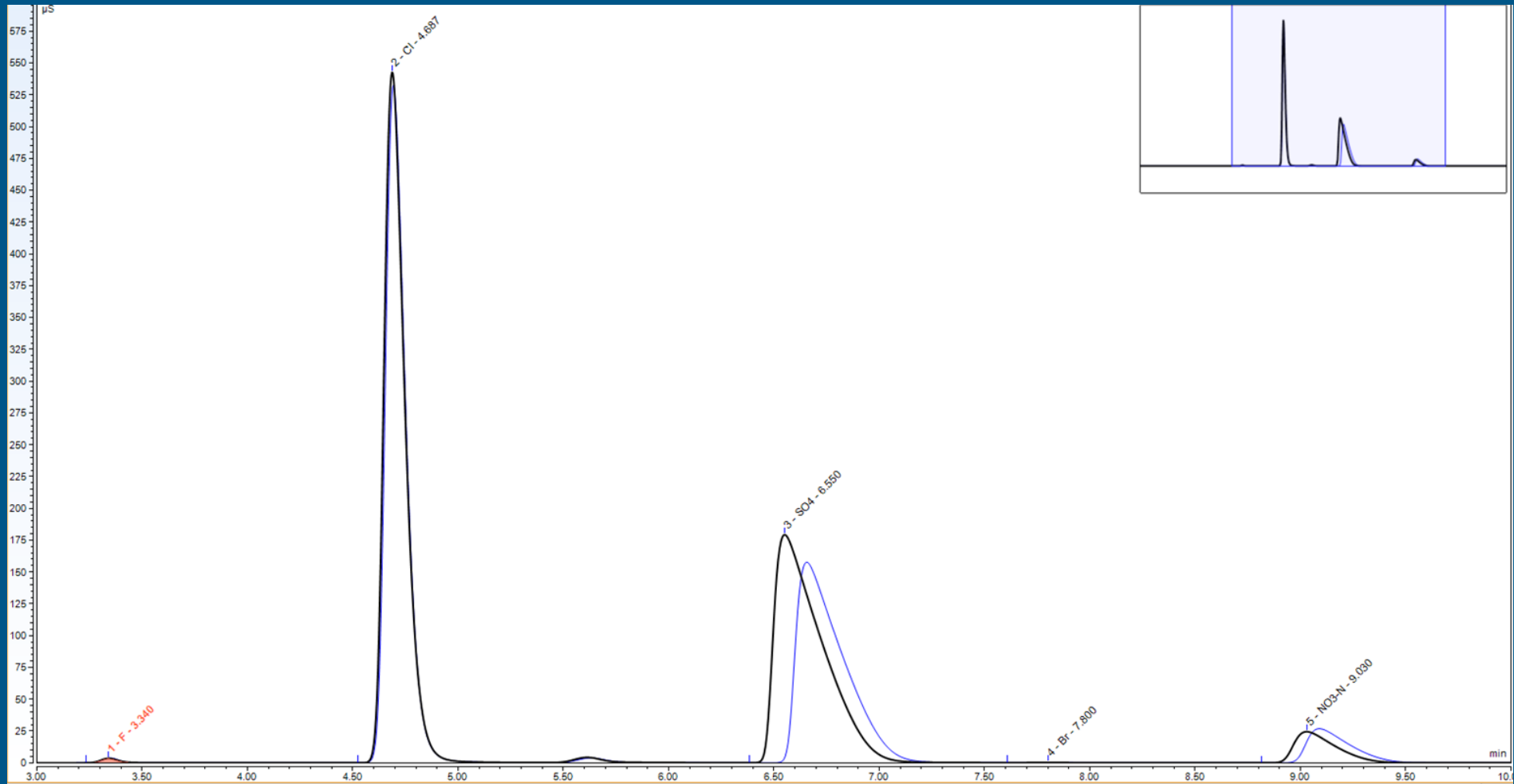
# 300.0 Low Levels

- Concentrations:
  - Fluoride: 100 µg/L
  - Chloride: 500 µg/L
  - Sulfate: 250 µg/L
  - Bromide: 10 µg/L
  - Nitrate as N: 100 µg/L



- Black trace external filtration
- Blue trace internal filtration

# 300.0 Sample



- Black trace external filtration
- Blue trace internal filtration

# How Fast Will It Pay For Itself?

- Perchlorate by 332.0
  - Inline filter assembly and cartridge: \$82.79
  - Manual sample (syringe + syringe filter): \$5.57
  - ROI in 15 samples
  
- Inorganic Anions by 300.0 & Inorganic Disinfection By-Products by 300.1
  - Inline filter assembly and cartridge: \$310.43
  - Manual sample (syringe + syringe filter + C18 cartridge): \$10.79
  - ROI in 29 samples

# Summary

- Upsides
  - Easy to install/maintain
  - Relatively little effect upon chromatography
  - Cost effective and saves time
  
- Downsides
  - Some parts of plumbing exposed to unfiltered samples
  - System relatively untested for extremely dirty samples
  - Requires physical installation





# Questions?



# Acknowledgements

Prem Parmar  
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Phuong Lam  
Sterling Vamvas



Stay informed

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# Thank You!

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Stay informed

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# Appendix A: 332.0 Details

- Ion Chromatograph: Thermo ICS-5000
- Eluent: EG 500 KOH Cartridge (Cat # 075778)
- MS: MSQ Plus
- Guard Column: Thermo IonPac AG20 (Cat # 063066)
- Analytical Column: Thermo IonPac AS20 (Cat # 063065)
- Inline Filter: IDEX 0.5  $\mu\text{m}$  Inline Filter Assembly (Part # A-431)
- Inline Filter Insert: IDEX 0.5  $\mu\text{m}$  PEEK End Fitting (Part # A-428X)



## Appendix B: 300.0 Details

- Ion Chromatograph: Thermo Integrion HPIC with Conductivity Detector
- Eluent: EG 500 KOH Cartridge (Cat # 075778)
- Guard Column: Thermo IonPac AG18 (Cat # 060551)
- Analytical Column: Thermo IonPac AS18 (Cat # 088666)
- Inline Filter: IDEX 0.5  $\mu\text{m}$  Inline Filter Assembly (Part # A-431)
- Inline Filter Insert: IDEX 0.5  $\mu\text{m}$  PEEK End Fitting (Part # A-428X)
- Hamilton Guard Cartridge (Part # 79477)
- Hamilton Analytical Guard Cartridge: (Part # 79688)

# Appendix C: 300.1B Details

- Ion Chromatograph: Thermo ICS-6000 Dual Channel HPIC with Conductivity Detectors
- Guard Column: Thermo IonPac AG19 (Cat # 039567)
- Analytical Column: Thermo IonPac AS19 (Cat # 062885)
- Inline Filter: IDEX 0.5  $\mu\text{m}$  Inline Filter Assembly (Part # A-431)
- Inline Filter Insert: IDEX 0.5  $\mu\text{m}$  PEEK End Fitting (Part # A-428X)
- Hamilton Guard Cartridge (Part # 79477)
- Hamilton Analytical Guard Cartridge: (Part # 79688)