Chemical Speciation Network (CSN): Updates and Overview

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August 24, 2022

National Ambient Air Monitoring Conference, Pittsburgh, PA
Today’s Discussion

• Current Network:
  • Samplers & Sites
  • Roles and Responsibilities – EPA and Contractors
  • Contract Status

• Recent Improvements:
  • Annual Site Reports
  • New AQS Parameters
  • Data Advisories

• Current Projects:
  • Sampler Flow Rate Verifications & AQS
  • Elements and MDLs

• What’s ahead
CSN Sampler and Filter Types

Two samplers
  MetOne SASS or SuperSASS – 6.7 LPM
  URG – 22 LPM

Three different filter types
  47-mm Teflon
  MgO Denuded 47-mm Nylon
  25-mm Quartz

24-hour PM$_{2.5}$ samples every 3 or 6 days
Current CSN Network

145 Total Sites
- 6 collocated
- 79 1-in-3
- 66 1-in-6
- 66 NCore
- 51 Speciation Trends Sites
# CSN National Program Contacts

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Contact the team: [CSNsupport@sonomatech.com](mailto:CSNsupport@sonomatech.com)
CSN Contract Status

• CSN operations transitioned with the November 2015 samples to:
  • Wood – Filter Handling and Shipment; Gravimetric Mass
  • UC Davis – Lab Analysis and Data Review, Validation, and Submission

• Next CSN Contract: Request for Proposals was open in March – April 2022.

• We’ll communicate outcomes with you all once new contract is awarded (expected to be awarded later in 2022).
Typically, available 12-18 months after the end of the sampling year.

https://aqrc.ucdavis.edu/csn-field-sites-maps
Annual Site Reports

CSN 2019 Site Reports: Lawrenceville (Pittsburgh)

AQS ID: 42-003-0008, POC 6 (40.65432, -79.96076) 1-3 Day Schedule

The Chemical Speciation Network (CSN) is a routine air monitoring network designed to complement the PEP’s monitoring network, support the implementation of PEP’s National Ambient Air Quality Standards (NAAQS), assist in developing and tracking emission control strategies, and provide data to aid in health studies. CSN sites are primarily located in urban areas and complement the largely rural Interagency Monitoring of Protected Visual Environments (IMPROVE) network. The CSN target analyses are trace elements, ions, and carbon.

Sampling Success Rate: 2012: 60.6% 2013: 41.3% 2014: 49.7% 2015: 42.7% 2016: 48.5% 2017: 45.6% 2018: 49.3% 2019: 44.1%

The plots below show temporal trends for site 42-003-0008 from 2011 to 2019. The top plot shows the variability of the measured mass (PM2.5, PM10) concentrations during 2019. The bottom plot illustrates the long-term trend of ambient concentrations; the shaded region represents the range of values measured each year at this site. Illustrated using the 10th and 90th percentile values.

Daily Reconstructed Fine Mass in 2019

Long-Term Trends in Reconstructed Fine Mass

The following table summarizes the chemical composition of particulates collected at this site. The monthly averaged compositions calculated from 2015-2019 data are shown in the left while compositions for the day with the highest measured concentrations during 2018 are shown on the right.

Average Monthly Particle Composition

Highest Day

Components Calculation Natural Sources Anthropogenic Sources

To view and download CSN data: https://www.epa.gov/airnow/quality-data
EPA real-time air monitoring data: https://www.epa.gov/clean-air-quality
The Data Center: https://www.epa.gov/clean-air-quality

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New CSN Parameters

- CSN now reporting **Soil** and **Reconstructed Mass (RCM)** parameters to AQS
- Started with 2019 data, then went back and added 2018.

Soil (88348) = 2.2*Aluminum + 2.49*Silicon + 1.63*Calcium + 2.43* Iron + 1.94* Titanium

RCM (88401) = 4.125*Sulfur + 1.29*Nitrate + Soil + 1.8*Chloride + EC = 1.4*OC

- Qualifiers codes from individual parameters are added to the calculated parameter; if one individual parameter has a null code, then the calculated parameter will have a null code.
- List of all reported parameters [here](#).
Recent Data Advisories

• Chromium and Nickel Contamination – documents intermittent contamination and processes for data treatment [Sean Raffuse – last presentation of this morning’s session]

• Carbon Analyzer Change – documents the change to Sunset EC/OC analyzers and impact on the data, especially subfractions (i.e., OC4, EC1, EC2, etc.)

• CSN Analysis Lab Contract Transition – documents the transition from RTI to UCD and processes and data treatment that may have changed. [Sean Raffuse – poster]
Sampler Flow Rate Verifications and AQS

• When assessing the sampler QC check criteria, we looked at the monthly flow verification data available in AQS.

• Currently, 30-50% of expected monthly flow verification data are being loaded to AQS.

• Configuring AQS to accept flow verifications for additional SuperSASS channels seems to be one reason.

• See 2022 newsletter for more details.

• Contact EPA AQS Regional Rep, Doug, or Melinda if you need help entering these data.
Ambient Element Concentrations vs MDLs

- Ambient PM$_{2.5}$ concentrations have been declining over time.
- CSN reports concentrations for 33 elements by EDXRF analysis.
- Many network samples are below the MDL.
- Two projects underway to decrease the amount of data flagged as “below detection limit.”
Ambient Element Concentrations vs MDLs

Projects

• #1: 25mm filters instead of 47mm filters
  • Currently use 47mm diameter PTFE filters.
  • Since 2019, we’ve been field testing (at the 6 collocated sites) the use of 25mm filters to increase the particle density per cm² (~factor of 3).
  • Currently working to understand the comparisons between the 47mm and 25mm filters.
  • Stay tuned.

• #2: ICP-MS vs XRF
  • ICP-MS has lower MDLs for some elements.
  • Hear more about an investigation between the two later in this session [Dr. Colleen Rosales – An Interlaboratory Comparison of Elemental Loadings on PM2.5 Samples via Energy-Dispersive XRF and Single Quadrupole ICP-MS].
What’s Ahead for CSN

- CSN national contract award
- Complete the CSN Field Operations QAPP revision
- Continue methods evaluations
- Data review and validation support and development
- Laboratory Performance Evaluation (Mega PE)

- Thank you!!

https://www.epa.gov/amtic/chemical-speciation-network-csn
CSNsupport@sonomatech.com
Extra Slides
COVID-19 Impacts on CSN

Field Operations:
• In 2020, approximately 40 sites paused sampling for varying periods of time due to COVID (uncertainty in stay-at-home orders, staffing, illness, etc.).
• Maximum of 27 sites down at once.
• Additional impacts in early 2021 (not shown here).

Analysis Lab Operations:
• UC Davis labs closed for approximately 6 weeks in March – April 2020.
• AQS data deliveries were delayed up to 30 days for the samples in the analysis pipeline during March-June 2020 (January – April 2020 network samples).

Thanks to everyone for minimizing impacts on the network!
CSN Field QAPP

• OAQPS is working to update the **CSN Field Operations QAPP** (first created in 2000; addendum in 2014).

• Revisions Include:
  • NCore requirement to conduct PM$_{2.5}$ speciation
  • Consolidation of samplers to SASS/SuperSASS and URG 3000N
  • CSN Assessment
  • Sequential Sampling
  • COC
  • Sampler QC Checks
  • Field Blank Collection

• Targeting mid-2023 for review and finalization.