

# Chemical Speciation Network

## *Data Validation & DART*

Alex Murrain

**UCDAVIS**

**AIR QUALITY RESEARCH CENTER**

Steve Brown

**STI**

Sonoma Technology, Inc.



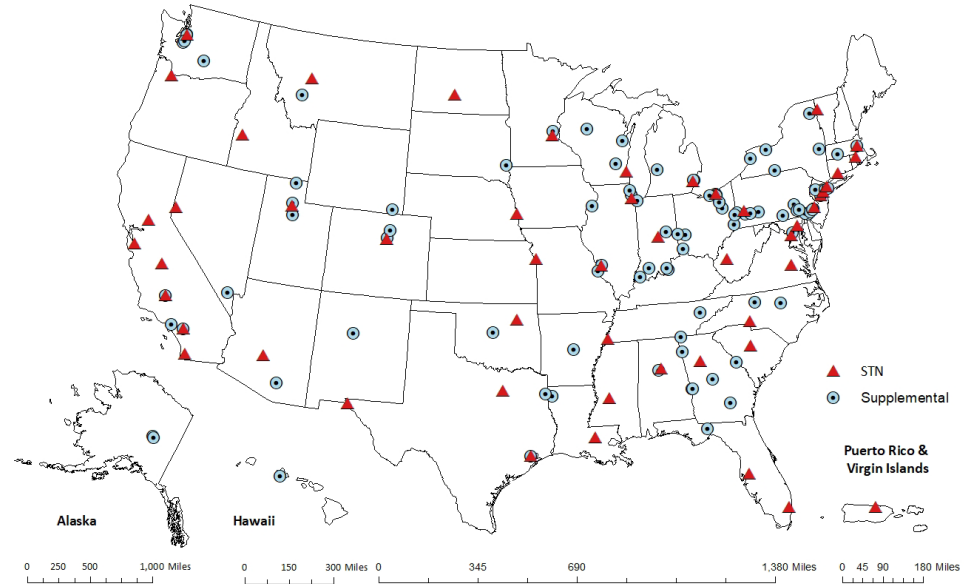
Effective 8/17/2021

**CSN Site Locations**

- + Collocated
- Routine
- Special Study

# CSN DART Validation Training Outline

- CSN Introduction/Background
- HIPS - Fabs
- DART Validation Tool Overview
- Validating CSN Data
- What to Check/Be Aware Of
- Final Notes & Tips
- Q&A



# CSN Sites – Samplers and Filters

Two samplers  
MetOne SASS / Super SASS  
URG3000N

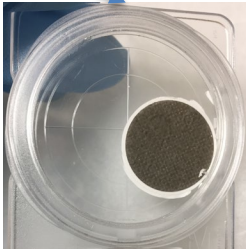
Three different filter types  
Polytetrafluoroethylene (PTFE)  
Nylon  
Quartz



PTFE (Teflon)



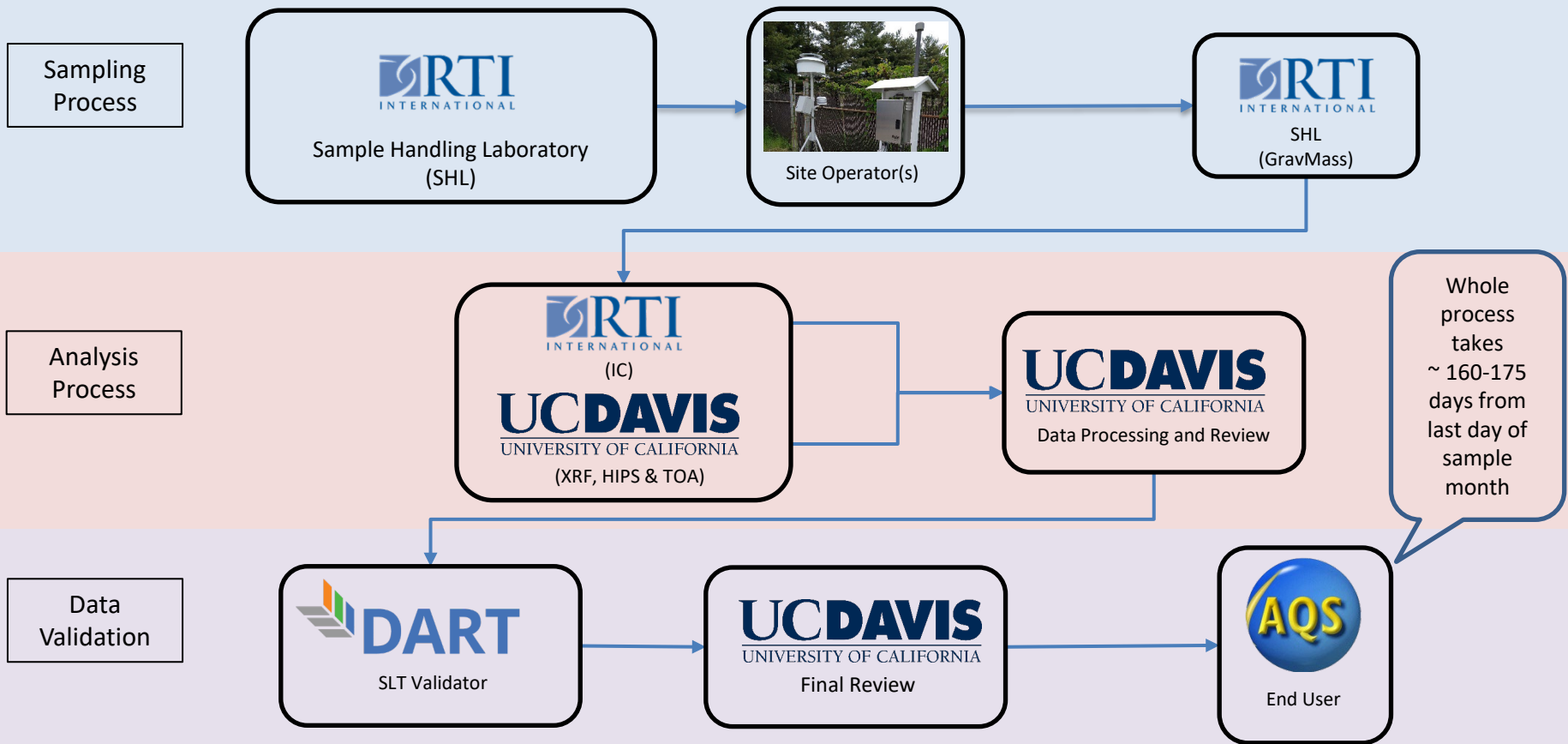
Nylon



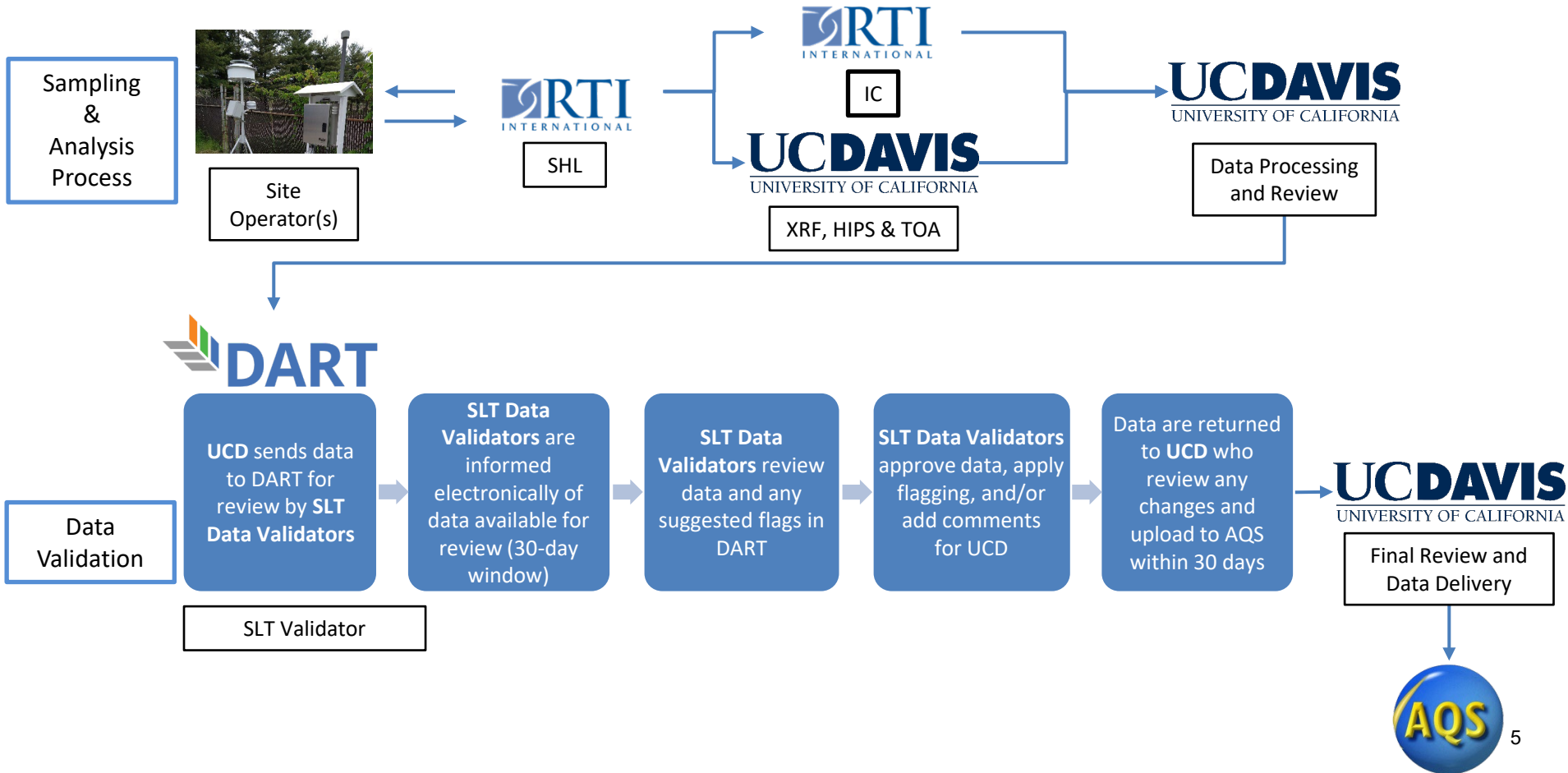
Quartz

All three filter types =  
“Complete Sample Event”

# CSN Data Pathway & Validation Process



# CSN Data Pathway & Validation Process



# CSN Measurements

## PTFE Filters



### **X-Ray Fluorescence**

33 Elements; *S, K, Mg,...*

Soil (*Fe, Al, Si,...*)

### **Hybrid Integrating Plate and Sphere (HIPS)**

Light absorption  
coefficient (*Fabs*)

### **Gravimetric Mass\***

*\*where available*

## Nylon Filters

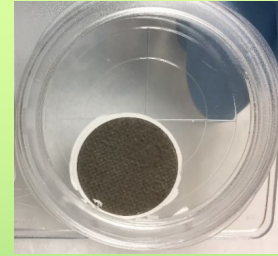


### **Ion Chromatography**

6 Ions

*Ammonium, sodium,  
potassium, nitrate,  
sulfate, chloride*

## Quartz Filters



### **Thermal/Optical Analysis**

Carbon

Organic and Elemental

Fractions

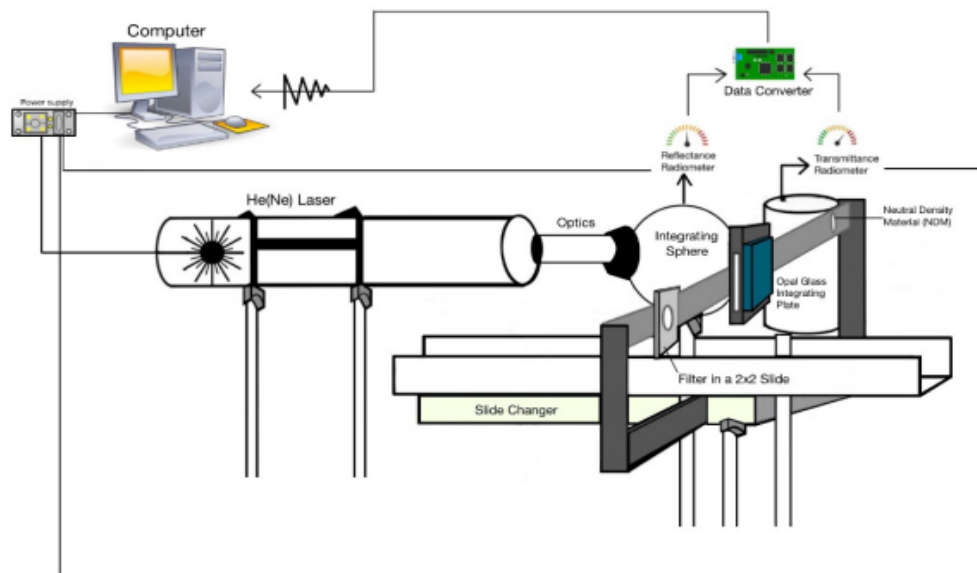
# HIPS - Hybrid Integrating Plate and Sphere system

Fabs – Light absorption measured of  $PM_{2.5}$  sample on PTFE filter

- Currently uses a single wavelength using red light of 633nm from a He(Ne) laser
- As of May 2022, data reported to DART and AQS.

CSN data available for cross filter comparisons with quartz filter samples (carbon data).

Fabs compares well with EC.  
(Fabs/10):EC  $\approx$  1



Source: <https://airquality.ucdavis.edu/hips>

# CSN Analytical Parameters

## Gravimetric Mass

PM2.5 Mass

## Elements

Aluminum	Cobalt	Selenium
Antimony	Copper	Silicon
Arsenic	Indium	Silver
Barium	Iron	Sodium
Bromine	Lead	Strontium
Cadmium	Magnesium	Sulfur
Calcium	Manganese	Tin
Cerium	Nickel	Titanium
Cesium	Phosphorus	Vanadium
Chlorine	Potassium	Zinc
Chromium	Rubidium	Zirconium

## Filter Optical Absorption

Light absorption coefficient (Fabs)

## Ions

Ammonium  
Chloride  
Potassium  
Sodium  
Sulfate  
Nitrate

## Carbon

### Reported to

### Parameter

DART and AQS	EC TOR
	OC TOR
	EC TOR (unadjusted)*
	OC TOR (unadjusted)*
AQS only	OC1
	OC2
	OC3
	OC4
	OP TOR
	OP TOT
	EC1
	EC2
	EC3
	OC TOT
EC TOT	

\* For FIELD BLANKS, only unadjusted data values are delivered to AQS; adjusted data are reported as invalid (with 'AI' null code).

For SAMPLES, values are delivered to AQS, where available, for both adjusted and unadjusted parameters.



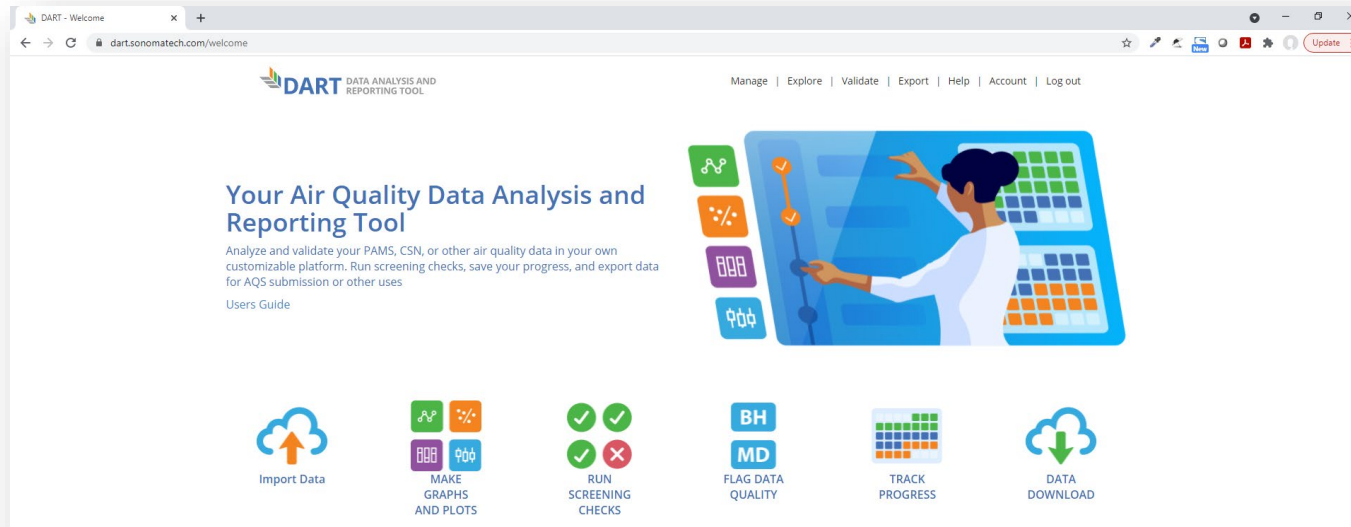
# CSN Parameter Reporting

Category	Parameter	Occurrence	Deliver to AQS
Operational	Avg. Ambient Parameters*	Per sampler	<input checked="" type="checkbox"/>
	Sample Volume	Per filter	<input checked="" type="checkbox"/>
	Sample Flow Rate CV		<input checked="" type="checkbox"/>
	Transport Temperature		<input type="checkbox"/>
Analytical	33 Elements	Per filter	<input checked="" type="checkbox"/>
	Light Absorption Coefficient (Fabs)		<input checked="" type="checkbox"/>
	6 Ions		<input checked="" type="checkbox"/>
	2 Carbon (OC & EC)		<input checked="" type="checkbox"/>
Calculated	Ammonium Nitrate	Per filter	<input type="checkbox"/>
	Ammonium Sulfate		<input type="checkbox"/>
	Organic Carbon Mass		<input type="checkbox"/>
	Soil		<input checked="" type="checkbox"/>
	Reconstructed Mass	Per sample event	<input checked="" type="checkbox"/>
Measured	PM2.5 Raw Data (AirNow 24-hr Mass)	(where available)	<input type="checkbox"/>
	PM2.5 Speciation Mass (88502)		<input checked="" type="checkbox"/>

\* Average values recorded from the sampler, not calculated from min & max values.

# CSN in DART

<https://dart.sonomatech.com/>



# Accessing DART <https://dart.sonomatech.com/>

The image shows a browser window at [dart.sonomatech.com/login/](https://dart.sonomatech.com/login/). The page features the DART logo and the text "Please Login to use DART!". Below this, there are input fields for "User Name:" and "Password:", followed by a "Log In" button. A red box highlights the "Request a DART Account" link, and a red arrow points from it to a separate screenshot of the account request form.

The account request form is titled "Sign up for a DART Account!". It contains the following fields and options:

- First Name:
- Last Name:
- Email:
- Agency:
- User Name:
- New Password:
- Confirm Password:
- Remaining characters:
- Request Account button

Request a DART account at <https://dart.sonomatech.com/requestAccount/>

# DART – Login and Welcome Page

<https://dart.sonomatech.com/welcome>

The image displays two screenshots of the DART (Data Analysis and Reporting Tool) web application. The top screenshot shows the login page at `dart.sonomatech.com/login/`. The page features the DART logo and navigation links: Manage, Explore, Validate, Export, Help, and Log in. A red arrow points to the 'Export' and 'Help' links. The main content area prompts the user to 'Please Login to use DART!' and includes input fields for 'User Name' and 'Password', a 'Login' button, and links for 'Request a DART Account' and 'Forgot your password?'. The bottom screenshot shows the welcome page at `dart.sonomatech.com/welcome`. It features the DART logo and navigation links: Manage, Explore, Validate, Export, Help, Account, and Log out. A red arrow points to the 'Account' link. The main content area is titled 'Your Air Quality Data Analysis and Reporting Tool' and describes the tool's capabilities: 'Analyze and validate your PAMS, CSN, or other air quality data in your own customizable platform. Run screening checks, save your progress, and export data for AQS submission or other uses'. A 'Users Guide' link is also present. Below the text is an illustration of a person interacting with a large screen displaying data. At the bottom, there are six icons representing key features: 'Import Data' (cloud with up arrow), 'MAKE GRAPHS AND PLOTS' (line and bar charts), 'RUN SCREENING CHECKS' (checkmarks and an X), 'FLAG DATA QUALITY' (BH and MD labels), 'TRACK PROGRESS' (grid with progress bar), and 'DATA DOWNLOAD' (cloud with down arrow).

# DART – Manage Page

<https://dart.sonomatech.com/manage>



[Manage](#) | [Explore](#) | [Validate](#) | [Export](#) | [Help](#) | [Log out](#)

## Your Air Quality Agency

## Data Sets

[Manage Users](#)

Date Received	Type	Data Set Name	Date Range (LST)	Data Status	Download	Approval Status
05/24/2018	Lab - CSN	CSN Data	01/04/2013 - 12/30/2017	Ready for use		
06/11/2018	Lab - CSN	CSN Data	01/04/2013 - 12/30/2017	Ready for use		
07/12/2018	Lab - CSN	CSN Data	01/01/2013 - 12/30/2017	Ready for use		
07/12/2018	Lab - CSN	CSN Data	01/04/2013 - 12/27/2017	Ready for use		

Show  entries

Previous Next



Batch Needs Approval



Approved Batch



Locked Batch

Batch Status

## My Data Sets

[add data](#)

Date Received	Type	Data Set Name	Date Range (LST)	Data Status	Download	Delete
04/04/2016	AQS	My Sample Data Set	11/18/2011 - 12/10/2011	Ready for use		

Show  entries

Previous **1** Next

# DART – Manage Page



## Manage CSN Validators for your Agency



[Manage](#) | [Explore](#) | [Validate](#) | [Export](#) | [Help](#) | [Log out](#)

### Your Air Quality Agency

### Data Sets

[Manage Users](#)

Date Received	Type	Data Set Name	Date Range (LST)	Data Status	Download	Approval Status
05/24/2018	Lab - CSN	CSN Data	01/04/2013 - 12/30/2017	Ready for use		
06/11/2018	Lab - CSN	CSN Data	01/04/2013 - 12/30/2017	Ready for use		
07/12/2018	Lab - CSN	CSN Data	01/01/2013 - 12/30/2017	Ready for use		
07/12/2018	Lab - CSN	CSN Data	01/04/2013 - 12/27/2017	Ready for use		

Show 10 entries

Previous 1 Next

### My Data Sets

[add data](#)

Date Received	Type	Data Set Name	Date Range (LST)	Data Status	Download	Delete
04/04/2016	AQS	My Sample Data Set	11/18/2011 - 12/10/2011	Ready for use		

Show 10 entries

Previous 1 Next

# DART – Manage Users Page

Sonoma Technology Table includes all DART users with accounts registered for your Agency.

Users Sites

Search:

Export

Filters Active - 0 Filter Users

CSN  
PAMS

Agency ^	Name ^	User Email	CSN Admin	CSN Validator	CSN Emails	PAMS Admin	PAMS Validator	PAMS Emails
Sonoma Technology	Angela Ekstrand	aekstrand@sonomatech.com	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sonoma Technology	Anthony Cavallaro (Dev)	acavallaro@sonomatech.com	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sonoma Technology	Bryan Penfold	bryan@sonomatech.com	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sonoma Technology	Data Editor	zyz44795@nbzmr.com	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sonoma Technology	Jennifer DeWinter	jdewinter@sonomatech.com	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sonoma Technology	Jennifer DeWinter	aekstrand@sonomatech.com	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sonoma Technology	Marcus Hylton	mhylton@sonomatech.com	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sonoma Technology	test test	test@test.com	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sonoma Technology	User Rights	xwl52321@nbzmr.com	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Three configurable settings:

- 1. CSN Admin:** Registered DART users that are Agency administrator(s) who can access this webpage and configure the CSN Validators for their Agency.
- 2. CSN Validator:** Registered DART users that can access Approval Mode to review CSN data
- 3. CSN Emails:** Registered DART users that receive automated emails from DART related to CSN data batches

# DART – Manage Users Page



California Air Resources Board

Table includes all CSN sites within the selected Agency.

Users **Sites**

Search:

Export

Filters Active - 0 Filter Sites

Clear All

CSN

PAMS

Agency ^	Name ^	AQS Code	CSN	PAMS
California Air Resources Board	Bakersfield-California	060290014	✓	
California Air Resources Board	Fresno - Garland	060190011	✓	

Users who do not appear in the table do not have a DART account or their DART account is assigned to a different agency. Please have such users **request a DART Account** for the correct agency.

If a user should no longer be affiliated with an agency, please contact CSN Support (csnsupport@sonomatech.com) via email.

- Display on the DART Manage Users webpage that displays the CSN sites in DART for your Agency
- Both the 'Users' and 'Sites' tabs also display information about PAMS administrator/validators/emails and sites in DART



# DART – Manage Users Page

- Please **regularly review and confirm the Admin(s), Validator(s) and email preferences for your Agency** using the Manage Users webpage.
- Steps for the Agency Admin to configure new CSN Validators:
  1. Register the new validator for a DART account for the desired Agency (if not already done)
  2. Login to DART and navigate to the new Manage Users webpage
  3. Find the appropriate row in the table for the new validator and check the boxes in the 'CSN Validator' and 'CSN Emails' columns
- Uncheck the same boxes to prevent the user from accessing CSN data in DART and/or receiving automated DART CSN emails.

# DART – Approval Mode Page

The screenshot shows the DART interface in Approval Mode. At the top, there's a navigation bar with 'Manage | Explore | Validate | Export | Help | Account | Log out'. Below that, the 'DART WORKSPACE' section includes a dropdown menu for 'Default CSN Workspace' and a 'Save' button. The main content area is titled 'Approval Mode | 060850005 CSN Data' and features a 'Select Batch' button. A 'BATCH SUMMARY' table is displayed, showing sample details and their status. The table has columns for Status, Date, Total Qualifiers, Total Null Codes, and Action. The data rows show samples from March 2021, all with a 100% status and 0 null codes. Each row has a three-dot action button in the 'Action' column.

Status	Date	Total Qualifiers	Total Null Codes	Action
100%	Mar-02	47 (J MD QP)	0	...
100%	Mar-05	46 (J MD)	0	...
100%	Mar-08	46 (J MD LJ)	0	...
100%	Mar-11	46 (J MD)	0	...

Configure and save custom workspaces

View data completeness and hover over the icon to view additional information

Select CSN batch to review

Use the action button to edit sample date(s)

# DART – Approval Mode Page: “Edit Date” Window

DART DATA ANALYSIS AND REPORTING TOOL

Manage | Explore | Validate | Export | Help | Account | Log out

DART WORKSPACE: Default CSN Workspace

ADD PLOTS: [Icons]

Save

Approval Mode | 060850005 CSN Data

BATCH CREATED: 16 Jul 2021 | REVIEW BY: 17 Aug 2021

BATCH SUMMARY: MARCH 2021

Total Samples: 10 | Total Qualifiers: J (501) LJ (3) MD (219) QP (1) QT (4) | Total Null Codes:

Status	Date	Total Qualifiers	Total Null Codes	Action
100%	Mar-02	47 (J MD QP)	0	...
100%	Mar-05	46 (J MD)	0	...
100%	Mar-08	46 (J MD LJ)	0	...
100%	Mar-11	46 (J MD)	0	...

Use the action button to leave a comment indicating that the sample date is incorrect as currently recorded and provide the correct date. Please **do not** use the "Edit Date" window to leave comments that are not related to the sample date; other comments can be applied using the "Edit Batch" window.

# DART – Approval Mode Page: “Edit Date” Window

**Edit Date**

Please note that no date changes will be performed by DART. A comment with the date change information will be applied to the selected data. Date changes will be processed by the laboratory.

Selected Date to Edit: 2021-03-02  
Correct Date:

Date change applies to all parameters (analytical and operational) for the selected filter(s):

POC:

Comment to be applied to the selected data:

Custom  
 The actual run date was not properly recorded on the field sheet, but it has been confirmed with the site operator and available data files that the filters were run on 2021-03-02.  
 No additional flags or null codes need to be applied, nor do any need to be removed.

Comment preview:  
*The date for Entire Sample Event needs to be updated from 2021-03-02 to 2021-03-02 because...*

Editing steps using the window:

← View sample date & enter the correct sample date

← Select parameters to apply date change comment to

← Select a commonly used comment or enter a custom comment

← Preview/edit comment to be applied

← Save the comment

# DART – Approval Mode Page: Batch Data Table

DART WORKSPACE

Default CSN Workspace

ADD PLOTS

Retain Parameters Across Batches

Save

Batch Data

Filter:

Reviewed	Date	Parameter	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
<input type="checkbox"/>	Dec-03	Aluminum PM2.5 LC	6	-0.0198	2	0.03218	0.02019	ug/m3	<input type="text" value=""/>	MD	<input type="text" value=""/>
<input type="checkbox"/>	Dec-03	Aluminum PM2.5 LC	7	-0.00975	7	0.03215	0.0197	ug/m3	<input type="text" value=""/>	MD	<input type="text" value=""/>
<input type="checkbox"/>	Dec-03	Ammonium Ion PM2.5 LC	6	1.58629	99	0.00835	0.11274	ug/m3	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
<input type="checkbox"/>	Dec-03	Ammonium Ion PM2.5 LC	7	1.74778	100	0.00835	0.1242	ug/m3	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
<input type="checkbox"/>	Dec-03	Ammonium Nitrate PM2.5 LC	6	3.74778	99	0.0539	0.28671	ug/m3	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
<input type="checkbox"/>	Dec-03	Ammonium Nitrate PM2.5 LC	7	3.55887	99	0.05391	0.27245	ug/m3	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
<input type="checkbox"/>	Dec-03	Ammonium Sulfate PM2.5 LC	6	3.9635	84	0.01532	0.24591	ug/m3	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
<input type="checkbox"/>	Dec-03	Ammonium Sulfate PM2.5 LC	7	4.52537	93	0.0153	0.28073	ug/m3	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
<input type="checkbox"/>	Dec-03	Antimony PM2.5 LC	6	-0.01856	4	0.03878	0.02403	ug/m3	<input type="text" value=""/>	MD	<input type="text" value=""/>

Select All Mark Reviewed

Undo Restore

Use the "Edit Batch" window to apply null and/or qualifier codes, and leave comments

## DART – Approval Mode: “Edit Batch” Window

- The “Edit Batch” window enables editing of null and/or qualifier codes, and leaving comments
- To edit null and/or qualifier codes using the “Edit Batch” window:
  - Click on the icon in the null code or qualifier code column in the row of the “Batch Data” table for the species and date that you would like to edit.
  - By default, edits will be made to the selected species for the date of the selected row.
  - Select or remove the null code and/or qualifier code(s) as needed, enter a comment, and click ‘Save’

# DART – Approval Mode Page: “Edit Batch” Window

Edit Batch Help

Recent Comment:  
Comment has not been added yet.

Sample Date(s):  
Jun 2, 2023 Advanced

Apply to:  
Apply to species in selected sample from the PTFE filter (Elements by XRF and Light Absorption by HIPS) ▼

Warning: You are editing the null code or qualifier code(s) for multiple species.

POC: 5 ▼

Ambient  Field Blanks  Both  
 Include operational parameters  
 XRF  HIPS  
 Overwrite Codes ⓘ

Edit Null Code:  
No null code ▼

Edit Qualifier Code:  
MD - Value less than MDL

Warning: You are editing the null code or qualifier code(s) for multiple species...  
Warning: You are editing composite or contributing parameter(s)...

Preview:

Original	New
Jun 2, 2023	Jun 2, 2023
Aluminum PM2.5 LC (5) : [], [MD]	Aluminum PM2.5 LC (5) : [], [MD]
Antimony PM2.5 LC (5) : [], [MD]	Antimony PM2.5 LC (5) : [], [MD]
Arsenic PM2.5 LC (5) : [], [MD]	Arsenic PM2.5 LC (5) : [], [MD]
Barium PM2.5 LC (5) : [], [MD]	Barium PM2.5 LC (5) : [], [MD]
Bromine PM2.5 LC (5) : [], [MD]	Bromine PM2.5 LC (5) : [], [MD]
Cadmium PM2.5 LC (5) : [], [MD]	Cadmium PM2.5 LC (5) : [], [MD]

Edit Comment:

Editing steps using the window:

← View latest comment

← Select date(s) to edit

← Select Parameter(s) to edit

← Select null or qualifier code(s)

← Preview code changes

← Enter comment

# DART – Approval Mode Page: “Edit Batch” Window

Options to select the parameter(s) to edit:

- One individual species
- All species from a particular filter (or a subset for the PTFE)
- All species from all filters
- Include/exclude operational parameters
- Ambient, blanks, or both
- A specific POC

**Edit Batch** [Help]

Recent Comment:  
Comment has not been added yet.

Sample Date(s):  
Jun 2, 2023 [Advanced]

Apply to:  
Apply to species in selected sample from the PTFE filter (Elements by XRF and Light Absorption by HIPS) ▼

Warning: You are editing the null code or qualifier code(s) for multiple species.

POC: 5 ▼

Ambient  Field Blanks  Both  
 Include operational parameters  
 XRF  HIPS  
 Overwrite Codes ⓘ

Edit Null Code:  
No null code ▼

Edit Qualifier Code:  
MD - Value less than MDL

Warning: You are editing the null code or qualifier code(s) for multiple species...  
Warning: You are editing composite or contributing parameter(s)...

Preview:

Original	New
Jun 2, 2023	Jun 2, 2023
Aluminum PM2.5 LC (5) : [], [MD]	Aluminum PM2.5
Antimony PM2.5 LC (5) : [], [MD]	Antimony PM2.5
Arsenic PM2.5 LC (5) : [], [MD]	Arsenic PM2.5 LC
Barium PM2.5 LC (5) : [], [MD]	Barium PM2.5 LC
Bromine PM2.5 LC (5) : [], [MD]	Bromine PM2.5 LC
Cadmium PM2.5 LC (5) : [], [MD]	Cadmium PM2.5 LC

Edit Comment:



## Selecting Parameters in the “Edit Batch” Window

- Null and/or qualifier codes, and comments, are editable for single or multiple parameters at one time using the “Edit Batch” window
- Null and/or qualifier code changes in the “Edit Batch” window can be applied to:
  - Only the selected species in the selected sample
  - All species for the selected sample event (applies to all analytical species for all three filter types)
  - All elements, ions, or carbon species in the selected sample (only applies to the analytical species for each filter type)
    - **NEW: select the analysis type for the PTFE filter**
  - All operational parameters for the selected sample

## Selecting Parameters in the “Edit Batch” Window

- Null and/or qualifier codes, and comments, are editable for a subset of the PTFE species based on analysis type
  - Edit only the elements from the XRF analysis
  - Edit only the light absorption coefficient (Fabs) from the HIPS analysis
  - Edit both the elements and the light absorption coefficient
- Only the elements from the XRF analysis are edited by default if this group of parameters is selected

Edit Batch Help

Recent Comment:  
Comment has not been added yet.

Sample Date(s):  
Jun 2, 2023 Advanced

Apply to:  
Apply to species in selected sample from the PTFE filter (Elements by XRF and Light Absorption by HIPS)

Warning: You are editing the null code or qualifier code(s) for multiple species.

POC: 5

Ambient  Field Blanks  Both

Include operational parameters

XRF  HIPS

Overwrite Codes

## Selecting Parameters in the “Edit Batch” Window

- Choose whether to **also** apply edits to operational parameters for the selected sample
  - PTFE: temperature, pressure, flow rate, volume transport temperature
  - Nylon: flow rate, volume transport temperature
  - Quartz: Temperature, pressure, flow rate, volume transport temperature
- Other options for editing:
  - Select whether to edit ambient data, field blank data, or both for the selected parameter(s) and date(s)
  - Select the parameter occurrence code (POC) to edit

# Selecting Parameters in the “Edit Batch” Window: Summary of options

Group Name in DART	Edits Apply to ("Include operational parameters" option is NOT checked):	If "Include operational parameters" box IS checked
"Apply to Selected Species"	Single parameter for single date (date of row that is selected in the table), unless multiple dates are specified	N/A
"Apply to Entire Sample Event (includes all filter types)"	all analytical parameters for all three filters for single date, unless multiple dates are specified	Edits also apply to all operational parameters for all 3 filters
"Apply to species in selected sample from the PTFE filter (Elements by XRF and Light Absorption by HIPS)"	all analytical parameters for the PTFE filter for single date, unless multiple dates are specified; only Elements measured by XRF are included by default (option to also/only select Fabs measured by HIPS) - <b>NEW</b>	Edits also apply to all operational parameters for PTFE
"Apply to Ion species in selected sample (measured by IC from the Nylon filter)"	all analytical parameters for the Nylon filter for single date, unless multiple dates are specified	Edits also apply to all operational parameters for Nylon
"Apply to Carbon species in selected sample (measured by TOA from the Quartz filter)"	all analytical parameters for the Quartz filter for single date, unless multiple dates are specified	Edits also apply to all operational parameters for Quartz
"Apply to Operational parameters in selected sample"	all operational parameters for single date, unless multiple dates are specified	N/A

Additional options are available to further select specific POC and ambient or field blank data for editing

# DART – Approval Mode Page: “Edit Batch” Window

**DART WORKSPACE**  
Default CSN Workspace

**Edit Batch** [Help] [X]

**Recent Comment:**  
"Site: Disposed of one leaking ice pack - UCD: After reviewing the data, the S/SO4 time series suggested that one of the teflon or nylon filters had been swapped between 1/20/18 and 1/23/18. UCD checked various details and discussed with Wood and it appears that the teflon was swapped in their labs. The filter and analysis data should now be correct."  
07/21/2018 01:50

**Sample Date(s):**  
Jan 20, 2018  
Jan 23, 2018

**Advanced**

**Apply to:**  
Apply to Selected Species [v] [Overwrite Codes] [x]

**Edit Null Code:**  
No null code [v]

**Edit Qualifier Code:**  
[ ]

**Preview:**

Original	New
Jan 20, 2018 Aluminum PM2.5 LC: [ ], [ ]	Jan 20, 2018 Aluminum PM2.5 LC: [ ], [ ]
Jan 23, 2018 Aluminum PM2.5 LC: [ ], [ ]	Jan 23, 2018 Aluminum PM2.5 LC: [ ], [ ]

**Edit Comment:**  
[ ]

[Cancel] [Save]

**Batch Data**  
Filter: Jan-20

Reviewed	Date	Parameter
<input checked="" type="checkbox"/>	Jan-20	Aluminum PM2.5
<input type="checkbox"/>	Jan-20	Ammonium Nitrate
<input type="checkbox"/>	Jan-20	Ammonium Nitrate
<input type="checkbox"/>	Jan-20	Ammonium Nitrate
<input type="checkbox"/>	Jan-20	Ammonium Nitrate
<input type="checkbox"/>	Jan-20	Antimony PM2.5
<input type="checkbox"/>	Jan-20	Arsenic PM2.5
<input type="checkbox"/>	Jan-20	Average Amt for URG3000
<input type="checkbox"/>	Jan-20	Average Ambient Temperature
<input type="checkbox"/>	Jan-20	Avg Ambient MetOne SAS

[Select All] [Mark Reviewed]

**January 2018**

Sun	Mon	Tue	Wed	Thu	Fri	Sat
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3
4	5	6	7	8	9	10

[Undo] [Restore]

**TIME SERIES** [TIME SERIES.KEY]

Preview edits before clicking "Save"

Click "Advanced" to view a calendar and select additional dates for editing.

## DART – “Edit Batch” Reminders

- A data record can have either a null code or qualifier code(s), but not both:
  - To apply a null code to a selected parameter that already has a qualifier code(s), first remove the qualifier code(s) by clicking the “x” next to the code in the qualifier drop-down menu.
  - To apply a qualifier code(s) to a selected parameter that already has a null code, first remove the existing null code by selecting “No null code” from the null code drop-down.
- If a parameter value is missing, which displays as the value - 999 in DART, a null code is required.
- If a null data code has been applied (e.g. AM – misc void) but you have additional information available, please update to a more specific null code (e.g. AV – power failure)
- If composite variables Reconstructed Mass and/or Soil are invalid, please use the AI - Insufficient Data (cannot calculate) null code.

# DART – Batch Data Table: Edit Values

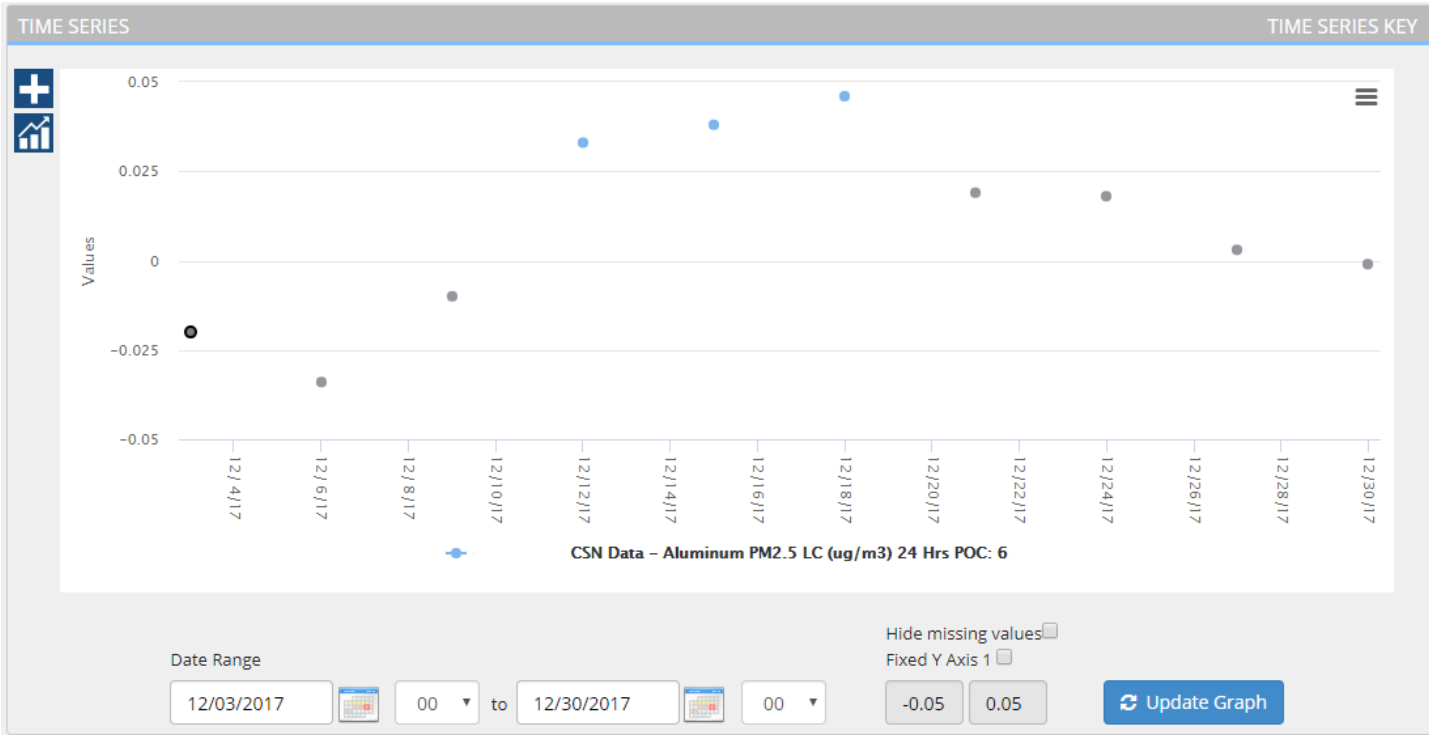
Batch Data

Filter:

Reviewed	Date	Parameter	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
<input type="checkbox"/>	Dec-03	Arsenic PM2.5 LC	5	-1.1E-4	4	0.00186	0.00113	ug/m3		MD	
<input type="checkbox"/>	Dec-03	Average Ambient Pressure for URG3000N	5	<input type="text" value="-999"/>	41	0.0		mmHg	AJ		
<input checked="" type="checkbox"/>	Dec-03	Average Ambient Temperature for URG3000N	5	<input type="text" value="-999"/>	29	0.0		°C	AJ		
<input type="checkbox"/>	Dec-03	Avg Ambient Pressure for MetOne SASS/SuperSASS	5	<input type="text" value="749.0"/>	11	0.0		mmHg			
<input type="checkbox"/>	Dec-03	Avg Ambient Temperature for MetOne SASS/SuperSASS	5	<input type="text" value="16.2"/>	33	0.0		°C			
<input type="checkbox"/>	Dec-03	Barium PM2.5 LC	5	-0.01484	8	0.08	0.0487	ug/m3		MD	
<input type="checkbox"/>	Dec-03	Bromine PM2.5 LC	5	0.00819	100	0.00454	0.00302	ug/m3			
<input type="checkbox"/>	Dec-03	Cadmium PM2.5 LC	5	-0.00145	16	0.01577	0.0096	ug/m3		MD	
<input type="checkbox"/>	Dec-03	Calcium PM2.5 LC	5	0.0431	81	0.02498	0.01683	ug/m3			

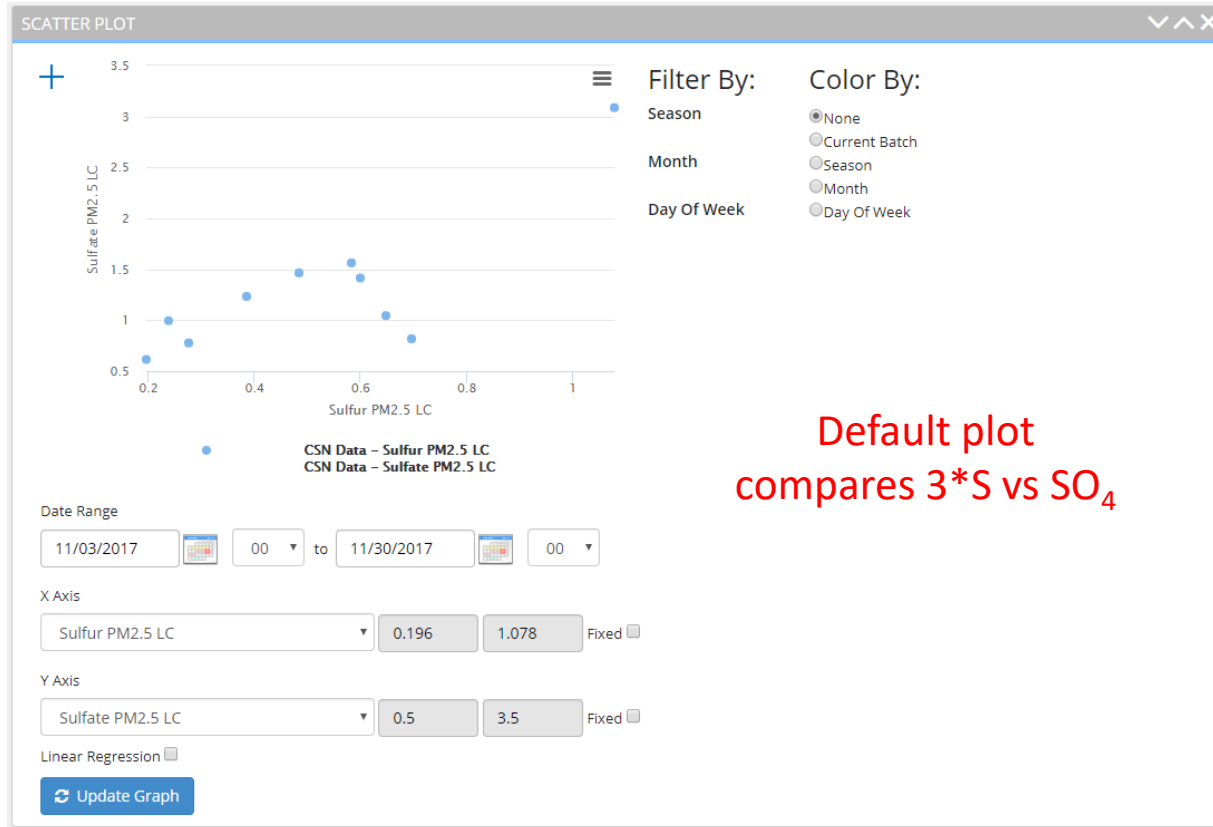
Select All

# DART – Graphs

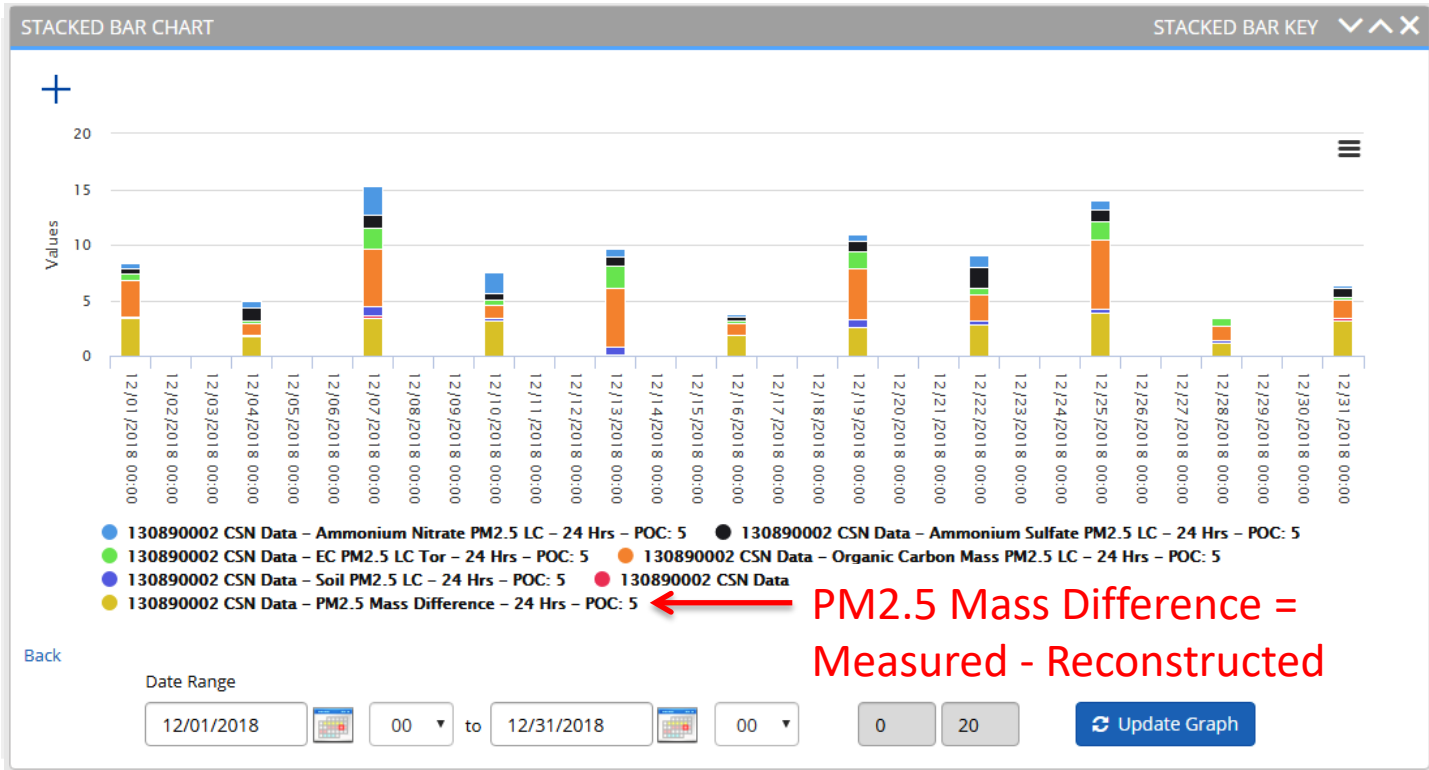




# DART – Graphs

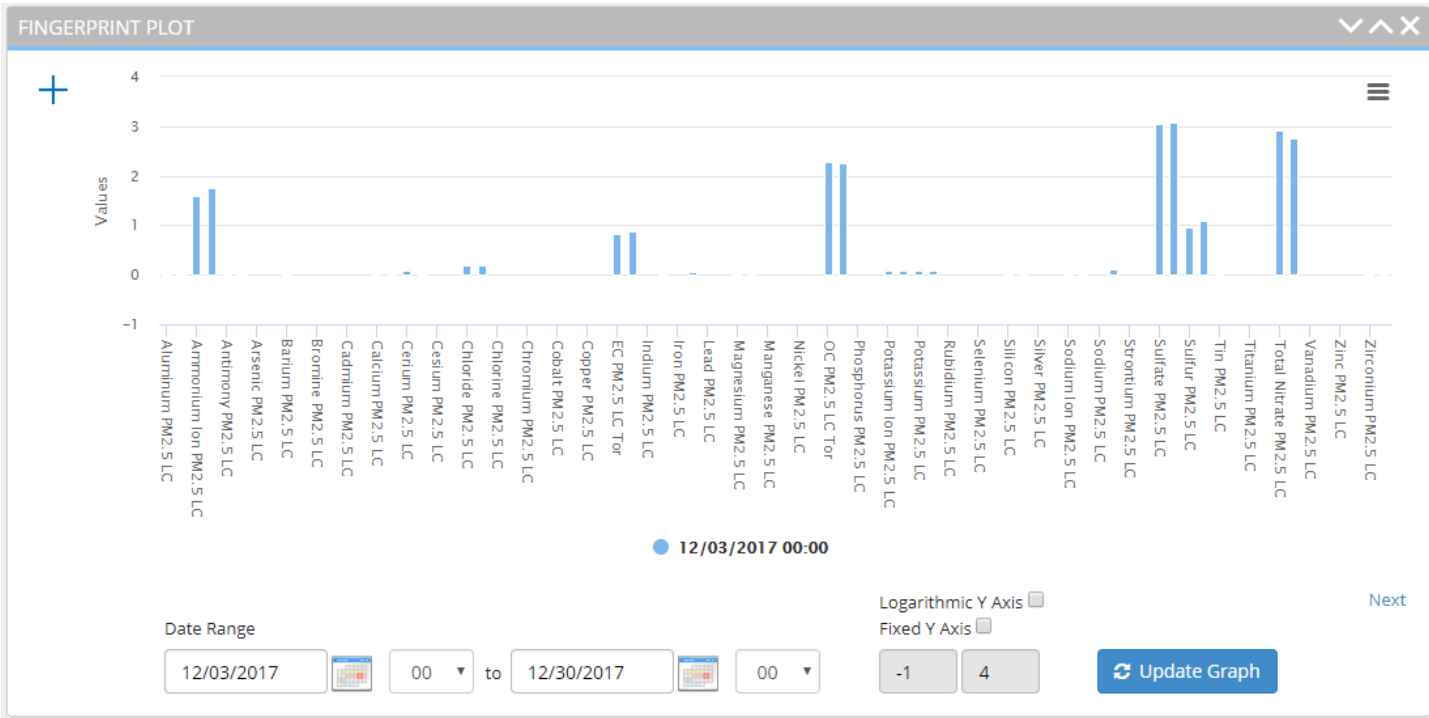


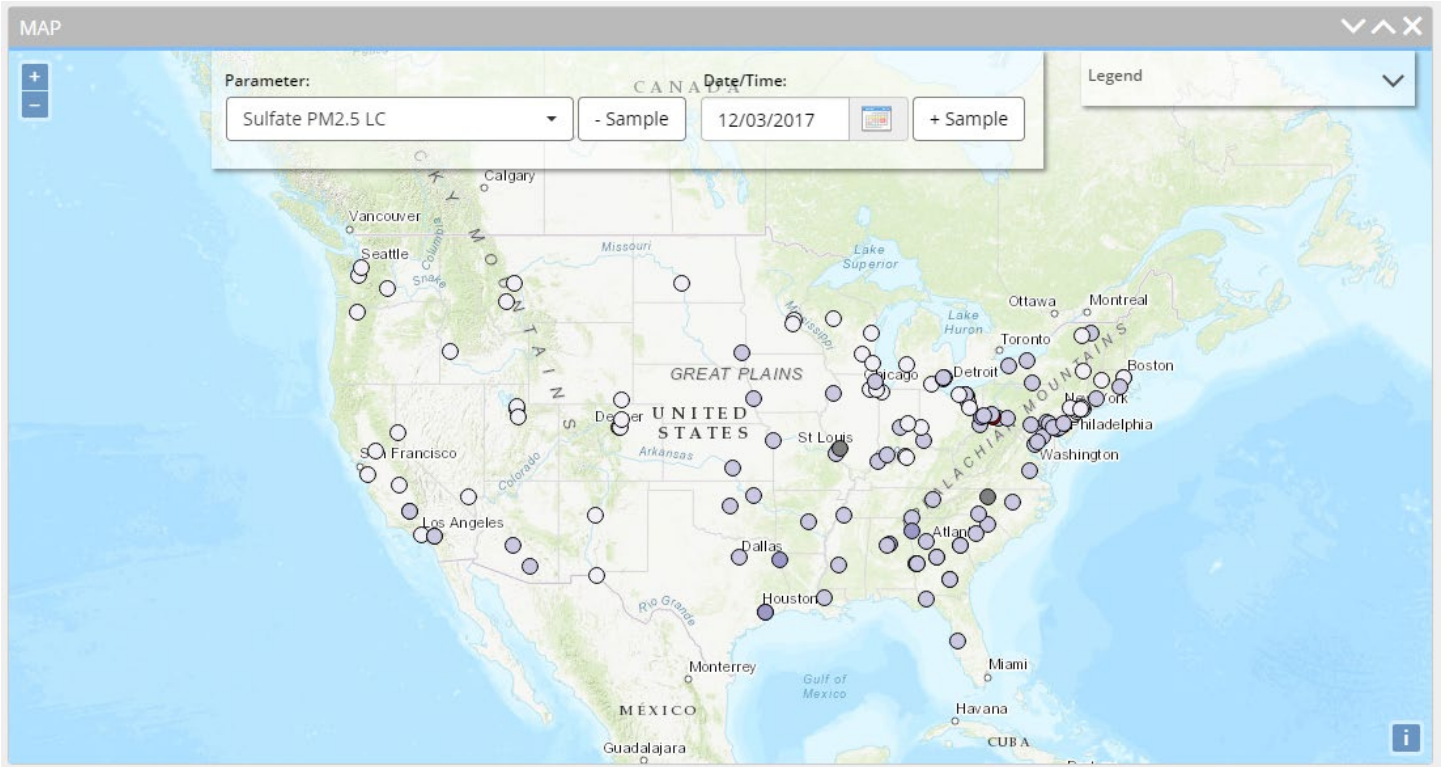
# DART – Graphs



Default plot includes major components of reconstructed mass:  
Ammonium Sulfate, Ammonium Nitrate, Soil, OCM,  
Chloride \* 1.8, EC, Mass Difference

# DART – Graphs





- Default map displays Sulfate concentrations across the network
- Toggle parameter and sample date
- Hover over or click on points to view additional information and time series

# DART – Multiple Batches

**DART DATA ANALYSIS AND REPORTING TOOL** Manage | Explore | Validate | Export | Help | Account | Log out

DART WORKSPACE: Default CSN Workspace

ADD PLOTS: [Icons for various plots]

Save

Approval Mode | 060850005 CSN Data

BATCH CREATED: 16 Jul 2021 [Select Batch] REVIEW BY: 17 Aug 2021 ←

**BATCH SUMMARY** MARCH 2021

Total Samples: 10 Total Qualifiers: J (501) LJ (3) MD (219) QP (1) QT (4) Total Null Codes:

Status	Date	Total Qualifiers	Total Null Codes	Action
100%	Mar-02	47 (J MD QP)	0	...
100%	Mar-05	46 (J MD)	0	...
100%	Mar-08	46 (J MD LJ)	0	...
100%	Mar-11	46 (J MD)	0	...

Occasionally, more than one data batch may be available for review. In DART's Approval Mode webpage, use the arrows or the "Select Batch" button to access different batches. You can also access specific batches using the links in the DART automated emails.

## Historical Data in DART

- DART includes an archive of CSN data (~2013 to the latest batch for many CSN sites)
- CSN data in DART are preliminary; final data is available from AQS
- Historical data archive in DART is periodically updated to match AQS (~monthly)
- Any updates to data values, null codes, or qualifier codes will be indicated with a comment in the comment log if you view closed batches



# Updated DART User's Guide

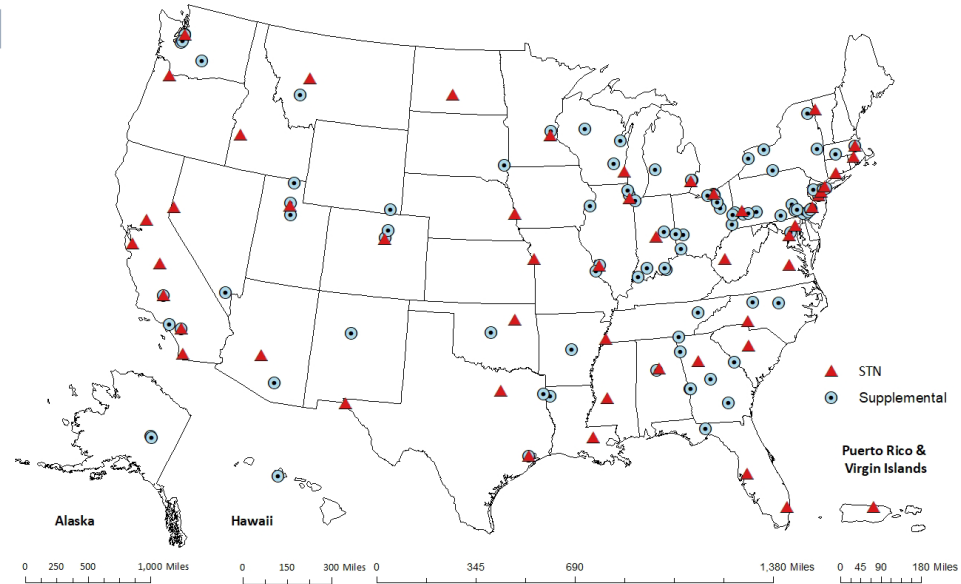
- Redesigned DART Help webpage <https://dart.sonomatech.com/help/>
- Distinct User's Guide for CSN (and PAMS)
- Additional resources

Data Analysis and Reporting Tool (DART)  
User's Guide for Validation of Data from  
the Chemical Speciation Network  
Version 1



# CSN DART Validation Training Outline

- CSN Introduction/Background
- HIPS - Fabs
- DART Validation Tool Overview
- Validating CSN Data
- What to Check/Be Aware Of
- Final Notes & Tips
- Q&A





# Validating CSN Data - Make Changes in DART

## Reasons to Make Changes:

- Incorrect operational data value
- Add informational qualifier (see right for examples)
- Address failing Sampler Audit/Check (see appendix)
- Ensure data are reported how agency wants

IF	Fire - Canadian
IG	Fire - Mexico/Central America
IH	Fireworks
II	High Pollen Count
IJ	High Winds
IK	Infrequent Large Gatherings
IL	Other
IM	Prescribed Fire
IN	Seismic Activity
IO	Stratospheric Ozone Intrusion
IP	Structural Fire
IQ	Terrorist Act
IR	Unique Traffic Disruption
IS	Volcanic Eruptions
IT	Wildfire-U. S.
J	Construction

**NOTE:** Add comments for all changes made in DART

# Validating CSN Data - Check CSN Operational data values

- Compare with Field Sheet COC
- Check reporting (Null/Qual. Codes)

Batch Data

Filter:

Reviewed	Date	Parameter	▲	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
✓	Sep-06	Sample Flow Rate CV - Nylon Filter		5	0.7	21	null		%			
✓	Sep-06	Sample Flow Rate CV - Quartz Filter		5	0.1	85	null		%			
✓	Sep-06	Sample Flow Rate CV - Teflon Filter		5	0.8	41	null		%			
✓	Sep-06	Sample Volume - Nylon Filter		5	9.712	98	null		m3			
✓	Sep-06	Sample Volume - Quartz Filter		5	31.66	25	null		m3			
✓	Sep-06	Sample Volume - Teflon Filter		5	9.7	67	null		m3			

# Validating CSN Data - CSN Operational criteria and flagging

Parameter	URG 3000N	Met One SASS/Super SASS	AQS Flag	Flag Type	URG 3000N	Met One SASS/Super SASS	AQS Flag <sup>†</sup>	Flag Type
	Acceptable Range for CSN				Acceptable Range for AQS			
Average Ambient Temperature	-20 to 45 °C	-30 to 50 °C	QT	Qualifier	-40 to 55 °C	-40 to 55 °C	AN	Null Code
Average Ambient Pressure	600 to 810 mmHg	600 to 810 mmHg	QP	Qualifier	450 to 1000 mmHg	450 to 850 mmHg	AN	Null Code
Sample Flow Rate*	19.8 to 24.2 LPM	6.0 to 7.4 LPM	AH	Null Code	N/A	N/A	N/A	N/A
Sample Flow Rate CV	0 to 2 %	0 to 5 %	AH	Null Code	0 to 20 %	0 to 20 %	AN	Null Code
Sample Volume	28.5 to 34.9 m <sup>3</sup>	8.6 to 10.6 m <sup>3</sup>	SV	Null Code	0 to 35 m <sup>3</sup>	0 to 25 m <sup>3</sup>	AN	Null Code
Sample Time*	1380 to 1500 minutes	1380 to 1500 minutes	AG	Null Code	N/A	N/A	N/A	N/A

Some applications are specific parameters or most parameters of filter sample.

\* Specific parameter not reported to DART/AQS

† Null code applied if not already invalid

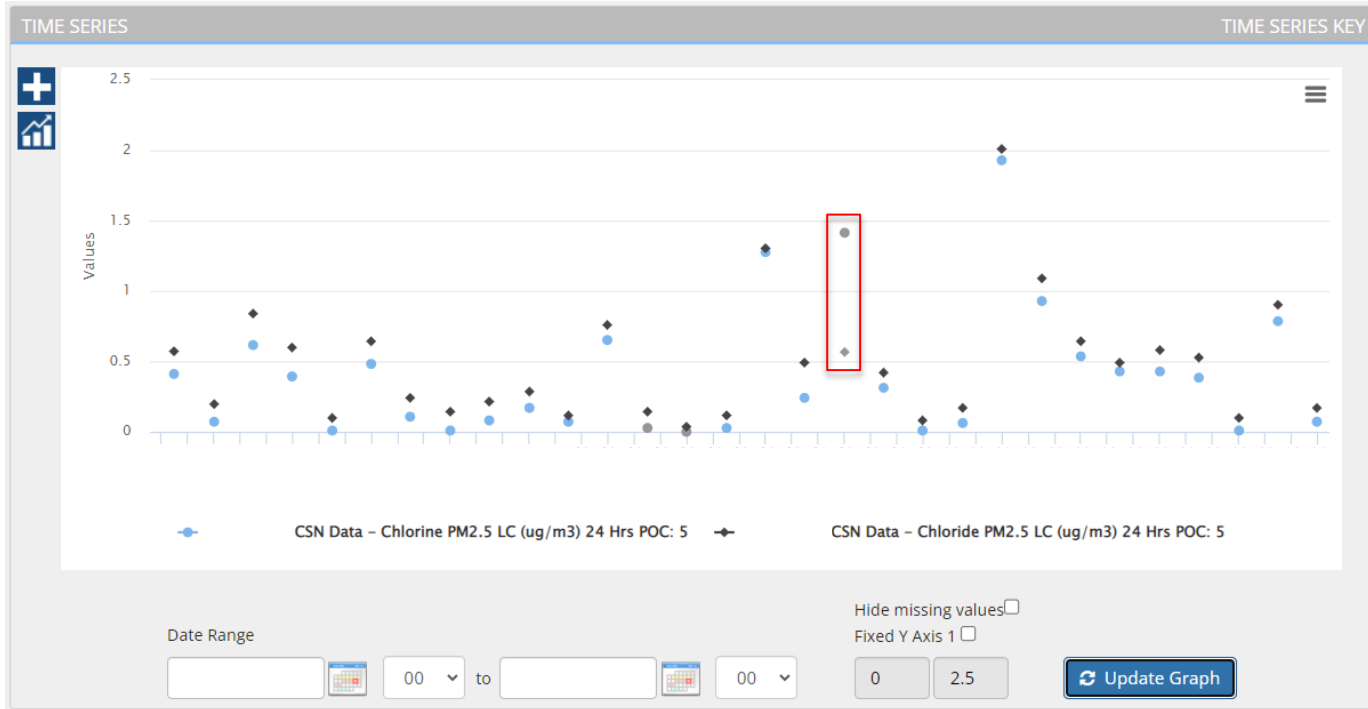
# Validating CSN Data - CSN Operational criteria and flagging

Code	AQS Qualifier/Null Code Description	Parameter(s)
QT	Pressure Sensor Questionable	Avg. Ambient Pressure Only
QP	Temperature Sensor Questionable.	Avg. Ambient Temperature Only
AH	Sample Flow Rate or CV out of Limits.	All – except both Avg. Ambient parameters
SV	Sample Volume out of limits.	All - except both Avg. Ambient parameters
AG	Sample Time out of Limits.	All
AN	Machine Malfunction.	All
Y	Elapsed Sample Time out of Spec.	All – except Avg. Ambient Temperature

# Validating CSN Data - Check CSN Concentration values

## Time Series - Cross-filter Comparisons

- Validates quality of sampling, analysis and trends



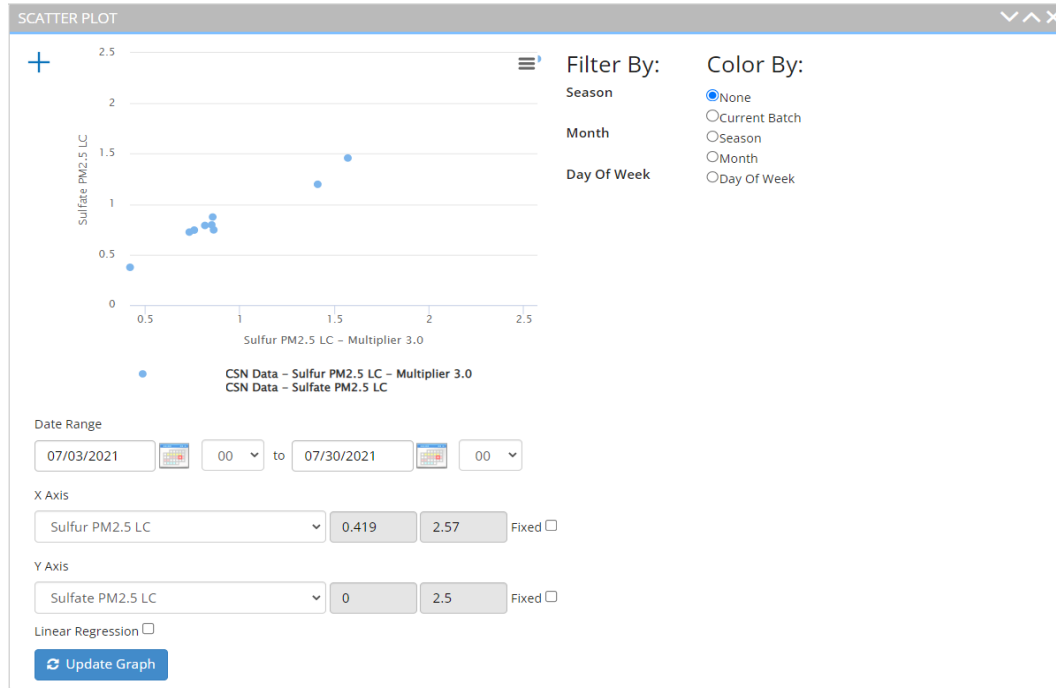
## Species to check:

- Sulfur/Sulfate  
( $3 \cdot S / SO_4$ )
- Fabs/EC  
( $Fabs / 10$ ) / EC
- Potassium/  
Potassium Ion
- Sodium/  
Sodium Ion

# Validating CSN Data - Check CSN Concentration values

## Scatter Plot - Cross-filter Comparisons

- Validates quality of sampling, analysis and trends



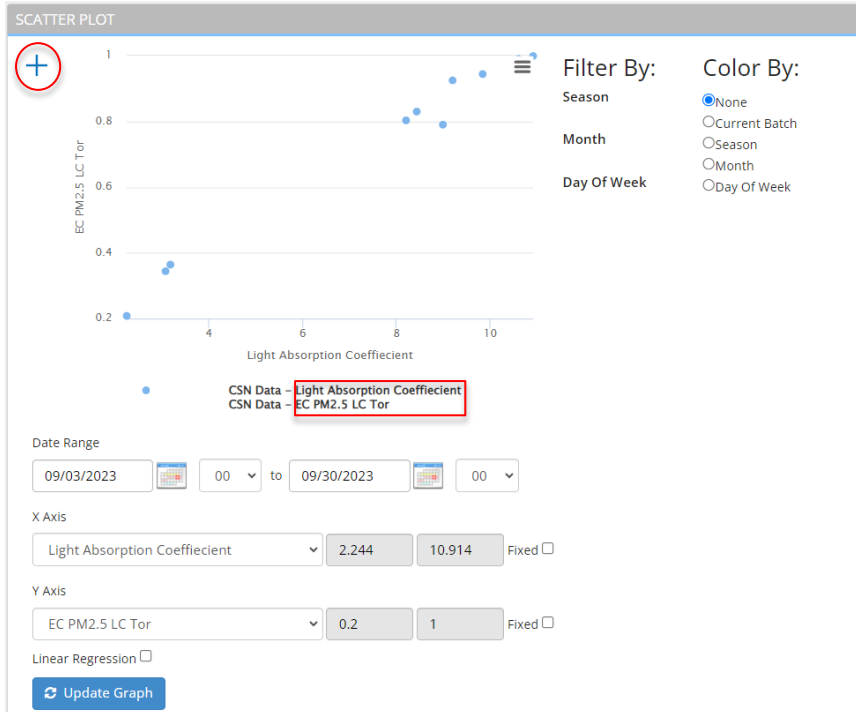
## Species to check:

- Sulfur/Sulfate (3\*S/SO4)
- Fabs/EC (Fabs/10) / EC
- Potassium/Potassium Ion
- Sodium/Sodium Ion

# Validating CSN Data - Check CSN Concentration values

## Scatter Plot - Cross-filter Comparisons

- Validates quality of sampling, analysis and trends



### Species to check:

- Sulfur/Sulfate  
( $3 * S / SO_4$ )
- Fabs/EC  
( $(Fabs/10) / EC$ )
- Potassium/  
Potassium Ion
- Sodium/  
Sodium Ion

# What to Check/Be Aware Of

## Data with C1 flag flagged by UCD for further review


BATCH SUMMARY JUNE 2021

---

Total Samples: **10**      Total Qualifiers: **A1 (44) C1 (59) MD (206) TT (369)**      Total Null Codes: **AI (6) BJ (155)**

Status	Date	Total Qualifiers	Total Null Codes	Action
100%	Jun-03	46 (TT MD)	0	...
100%	Jun-06	54 (TT MD C1)	0	...
100%	Jun-09	46 (TT MD)	0	...
0%	Jun-12	0	59 (BJ AI)	...
15%	Jun-15	8 (TT MD C1)	51 (BJ AI)	...
15%	Jun-18	3 (TT)	51 (BJ AI)	...
100%	Jun-21	46 (TT MD)	0	...
100%	Jun-24	46 (TT MD)	0	...
100%	Jun-27	46 (TT MD)	0	...
100%	Jun-30	90 (TT A1 MD)	0	...

MESSAGES

 Additional Review Requested

▶ 2021-06-06

▶ 2021-06-15

A1 & B1 also used to communicate changes from site Field Sheet. These flags not reported to AQS.

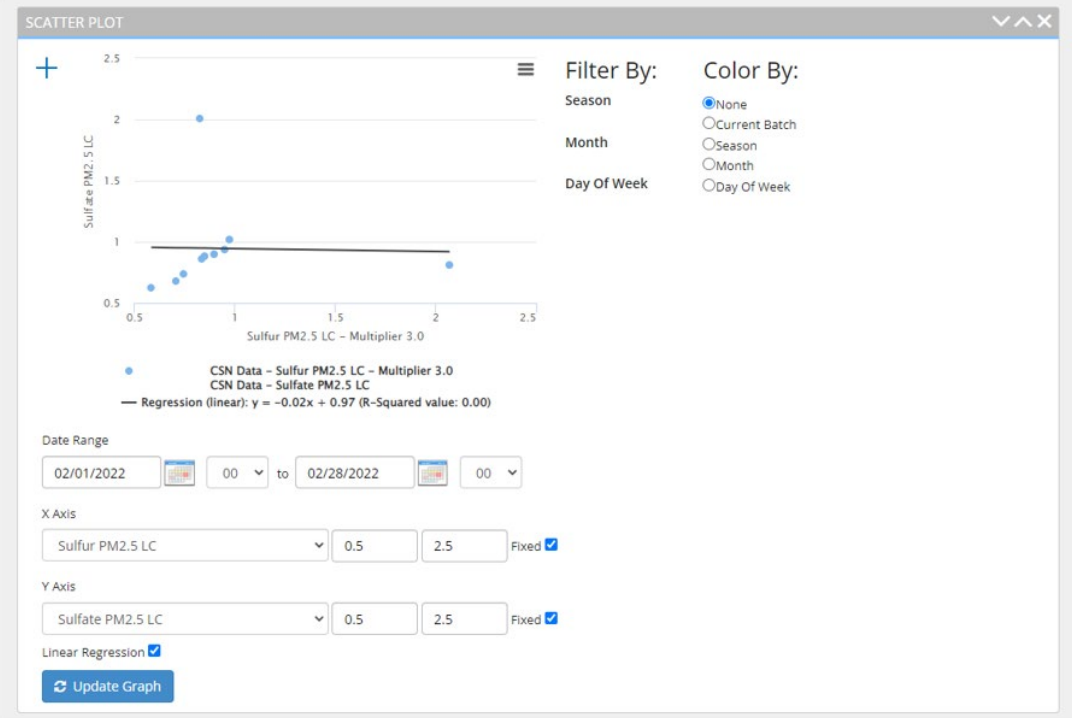


# What to Check/Be Aware Of

## Reasons for C1 flag

- Reanalysis/investigation didn't resolve data anomaly
- Observation across network – request for information
- Request for decision making

Example:  
Possible swap  
Suggested in  
S/SO4



# What to Check/Be Aware Of – Invalid Br & Cl

When reanalysis results are reported for PTFE filter samples, original Bromine and Chlorine results are invalid due to high volatility

97% Jan-29 19 (MD) 2 (AL)

Batch Data

Filter: Jan-29

Reviewed	Date	Parameter	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
✓	Jan-29	Bromine PM2.5 LC	5	0.00294	1.0E-4	0.00157	ug/m3	AL			
✓	Jan-29	Chlorine PM2.5 LC	5	0.01334	0.00468	0.00559	ug/m3	AL			
✓	Jan-29	Aluminum PM2.5 LC	5	0.00382	39	0.03117	0.01896	ug/m3		MD	
✓	Jan-29	Ammonium Ion PM2.5 LC	5	0.59467	72	0.01289	0.04918	ug/m3			

Bromine and Chlorine invalidated with 'AR – Lab Error' AQS null code beginning with October 2023 data.

No action is required from SLT Validator.

# What to Check/Be Aware Of – Intermittent SASS Sampler Contamination

Chromium, Cobalt, Copper, Iron and Nickel are invalid with 'SC – Sampler Contamination' AQS null code

The screenshot displays a data review interface. At the top, a summary table shows four sampling events with completion percentages (88%, 100%, 100%, 100%) and null codes (7 (SC AI), 0, 0, 0). Below this is a 'Batch Data' section with a filter set to 'Jan-20'. A detailed table lists five parameters: Chromium PM2.5 LC, Cobalt PM2.5 LC, Copper PM2.5 LC, Iron PM2.5 LC, and Nickel PM2.5 LC. All parameters have a 'Reviewed' status of 'No' (indicated by a lock icon) and a 'Null Code' of 'SC'.

Reviewed	Date	Parameter	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
No	Jan-20	Chromium PM2.5 LC	6	0.01238	0.0028	0.00353	ug/m3	SC			
No	Jan-20	Cobalt PM2.5 LC	6	-5.6E-4	0.00153	9.4E-4	ug/m3	SC			
No	Jan-20	Copper PM2.5 LC	6	-0.00213	0.00319	0.00201	ug/m3	SC			
No	Jan-20	Iron PM2.5 LC	6	0.07345	0.00994	0.01005	ug/m3	SC			
No	Jan-20	Nickel PM2.5 LC	6	0.0033	0.00117	0.00109	ug/m3	SC			

## Intermittent Contamination of Chromium and Nickel Criteria

- $Cr > 0.01 \mu\text{g}/\text{m}^3$
- $1.5 < Cr/Ni < 6$
- $1.75 < Fe/Cr < 7$

Implemented beginning with 2020 data

No action is required from SLT Validator.

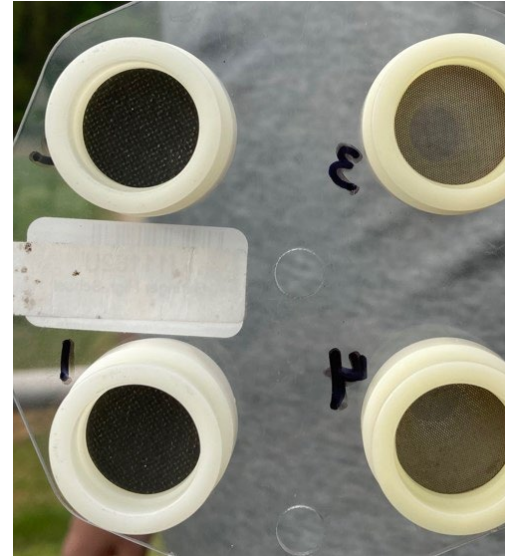
# What to Check/Be Aware Of – URG ‘Black Dust’

Site: Contamination from rotating sample head cap.

Comment from Site Operator



URG Inlet Tee

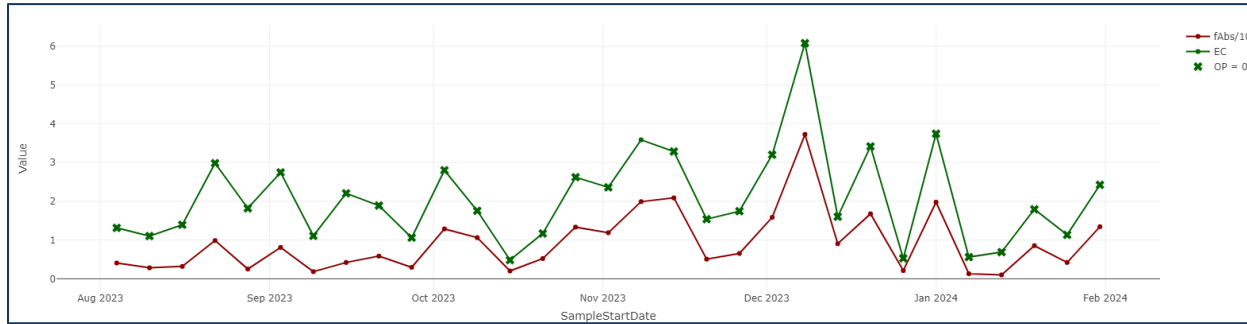


URG Audit Cartridge

\*Snapshots from three different sites\*

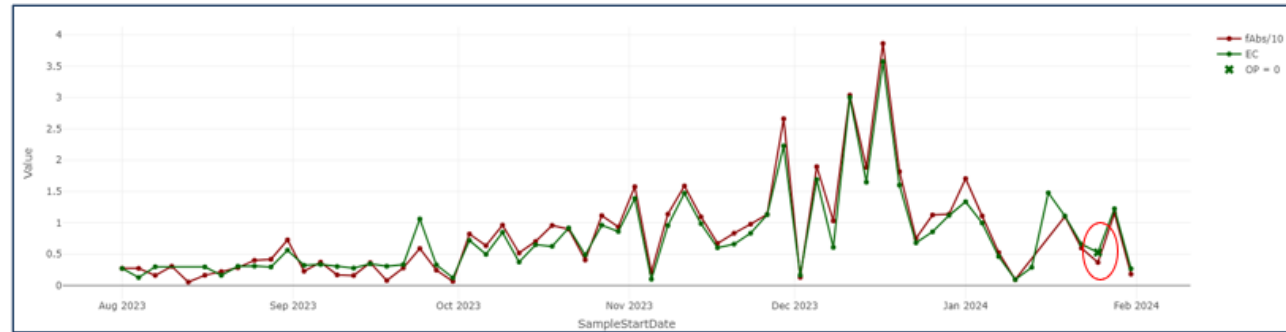
# What to Check/Be Aware Of – URG ‘Black Dust’

How will data be reported?



EC will be invalid with ‘SC – Sampler Contamination’ null code.

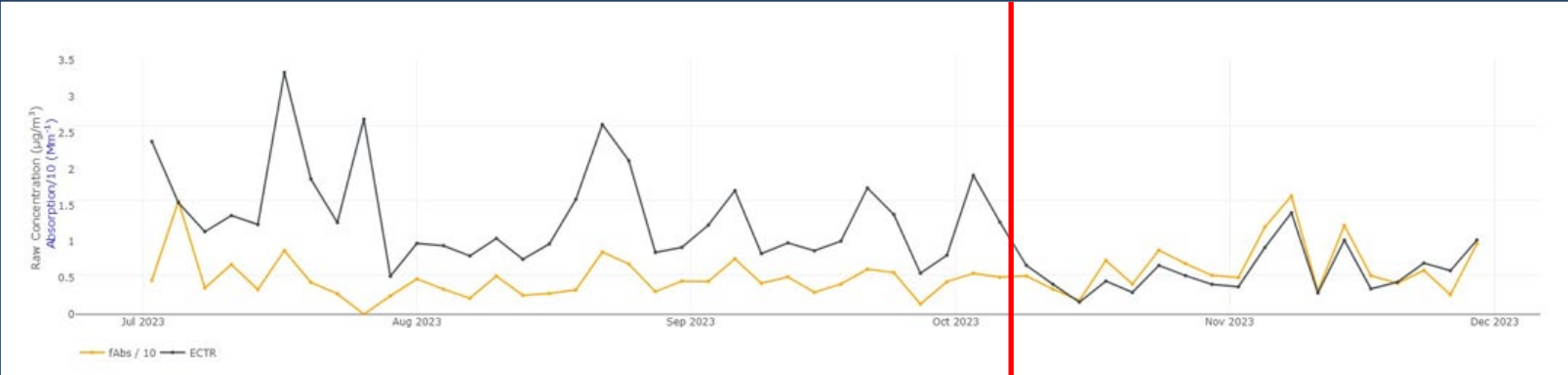
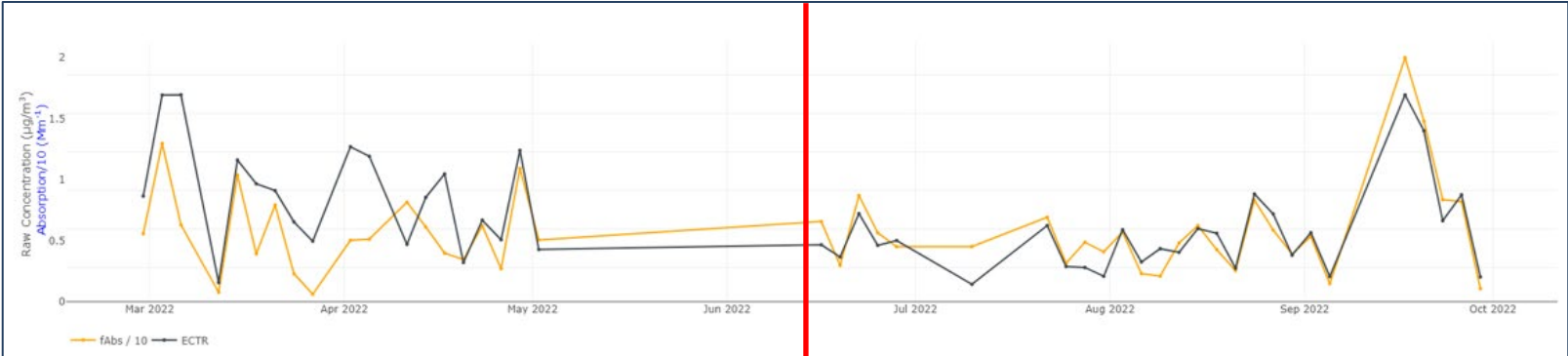
When EC is invalid, but contamination not likely, EC will be invalid with ‘BH –...misidentification’ null code.



National Ambient Air Monitoring Conference (NAAMC) Presentation Wednesday, PM – Speciation @ 1:30pm

# What to Check/Be Aware Of – URG ‘Black Dust’

## Improved Cases



# CSN Data Validation in DART: final notes

## Items to Check

- ✓ Qualifier & Null codes
- ✓ Operational parameter values
- ✓ Cross-Filter Comparisons
- ✓ Data anomalies
- ✓ Field blanks
- ✓ Comments & flags from labs & UCD (A1, B1, C1)
- ✓ Recurring issues

## Please...

- Update operational parameter values & add qualifiers where applicable
- Write clear & detailed comments (dates, parameters/filters, actions)
- Be careful when applying flags to multiple parameters
- Get in touch if you have a question!

# Q & A

## CSN AND DART SUPPORT

You can reach the entire CSN team (EPA, UC Davis, Sonoma Tech) at [CSNSupport@sonomatech.com](mailto:CSNSupport@sonomatech.com) for questions, support, and recommendations for changes to DART.



**UC DAVIS**  

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**AIR QUALITY RESEARCH CENTER**

**STi**  
Sonoma Technology, Inc.



# Acknowledgements

EPA

UC Davis Air Quality Research Center and STI  
Collaborators and colleagues RTI

Thank you!

Alex Murrain

[ammurrain@ucdavis.edu](mailto:ammurrain@ucdavis.edu)

Steve Brown

[jdewinter@sonomatech.com](mailto:jdewinter@sonomatech.com)

[CSNsupport@sonomatech.com](mailto:CSNsupport@sonomatech.com)

# Appendix: DART and Data Validation Resources

Users' Guides		
Data Validation	<a href="https://airquality.ucdavis.edu/sites/g/files/dgvnsk1671/files/inline-files/ValidationGuide_v2.0_update_20190916_0.pdf">https://airquality.ucdavis.edu/sites/g/files/dgvnsk1671/files/inline-files/ValidationGuide_v2.0_update_20190916_0.pdf</a>	Data Validation for CSN
	<a href="https://airquality.ucdavis.edu/sites/g/files/dgvnsk1671/files/inline-files/QuickReferenceGuide_v2.0.pdf">https://airquality.ucdavis.edu/sites/g/files/dgvnsk1671/files/inline-files/QuickReferenceGuide_v2.0.pdf</a>	Quick Reference Guide
DART	<a href="https://dart.sonomatech.com/help/csnguide">https://dart.sonomatech.com/help/csnguide</a>	DART for CSN User's Guide

Webinars	
Data Validation & DART – August 2021 & February 2024	Webinar video – from August 2021 webinar <a href="https://www.youtube.com/watch?v=f0lo1-OUMVw">https://www.youtube.com/watch?v=f0lo1-OUMVw</a> Webinar slides – from February 2024 webinar <a href="https://www.epa.gov/system/files/documents/2024-02/csn_webinar_feb2024_final_508.pdf">https://www.epa.gov/system/files/documents/2024-02/csn_webinar_feb2024_final_508.pdf</a>

NAAMC Data Validation Training	
2022	<a href="https://www.epa.gov/system/files/documents/2022-10/CSN_DART_Training_NAAMC_v3_508.pdf">https://www.epa.gov/system/files/documents/2022-10/CSN_DART_Training_NAAMC_v3_508.pdf</a>

Other Documentation	
CSN Annual Site Reports	<a href="https://airquality.ucdavis.edu/csn-field-sites-maps">https://airquality.ucdavis.edu/csn-field-sites-maps</a>
UCD Annual Reports, Data Advisories, SOPs	<a href="https://www.epa.gov/amtic/chemical-speciation-network-data-reporting-and-validation">https://www.epa.gov/amtic/chemical-speciation-network-data-reporting-and-validation</a>

# Appendix: Sampler QC Checks and Data Validation

	Acceptance Criteria	Impact on Validation*	Parameters
<b>Monthly Flow Rate Verification</b>	± 5% sampler indicated or design flow vs NIST-traceable transfer standard	Add "QX" QA qualifier – Does not meet QC criteria; calibrate sampler	Species by channel/filter
	± 10% sampler indicated or design flow vs NIST-traceable transfer standard	Use "AS" null data qualifier – Poor Quality Assurance Results; calibrate sampler	Species by channel/filter
<b>Monthly Leak Check – SASS or SuperSASS</b>	≤0.1 L/min	Use "AS" null data qualifier – Poor Quality Assurance Results; troubleshoot sampler	Species by channel/filter
<b>Monthly Leak Check – URG3000N</b>	<225 mmHg increase over 35 seconds	Use "AS" null data qualifier – Poor Quality Assurance Results; troubleshoot sampler	Species by channel/filter

\* Back to last passing check

# Appendix: Sampler QC Checks and Data Validation

	Acceptance Criteria	Impact on Validation*	Parameters
<b>Ambient Temperature (°C)</b>	± 2°C of a NIST-traceable transfer standard	Add "QT" QA qualifier – Temperature Sensor Questionable	Avg. Ambient Temp Only
		None, unless flow rate verification fails; calibrate	Species by channel/filter - see flow check rules
<b>Ambient Pressure (mmHg)</b>	± 10 mmHg of a NIST-traceable transfer standard	Add "QP" QA qualifier – Pressure Sensor Questionable	Avg. Ambient Pressure Only
		None, unless flow rate verification fails; calibrate	Species by channel/filter - see flow check rules

\* Back to last passing check