

NAAMC 2022
Pittsburgh, PA
8/22/2022

Chemical Speciation Network

Data Validation & DART

Alex Murrain

UC DAVIS

AIR QUALITY RESEARCH CENTER

Jennifer DeWinter

STI

Sonoma Technology, Inc.



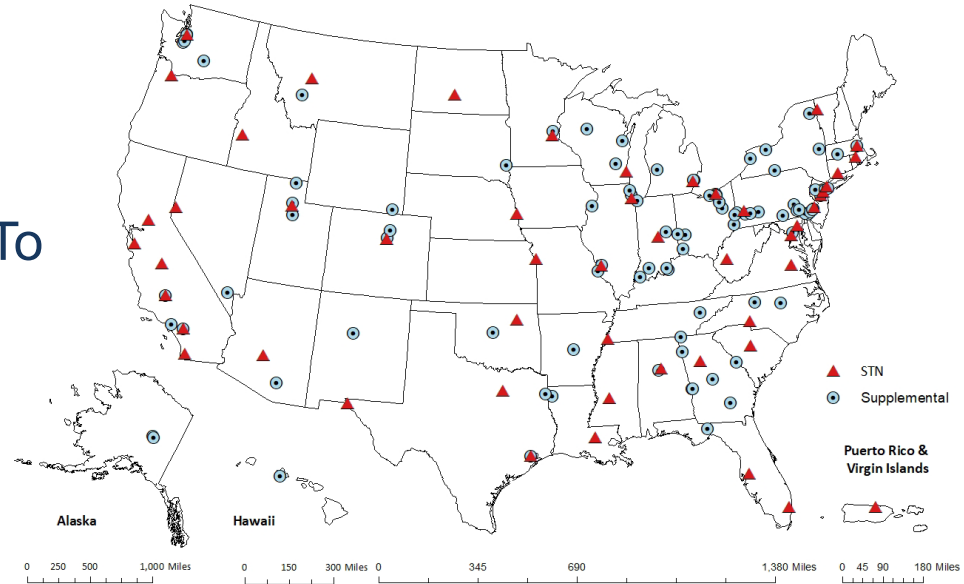
CSN Site Locations

- + Collocated
- Routine
- Special Study

Effective 8/17/2021

CSN DART Validation Training Outline

- CSN Introduction/Background
- Why Do We Validate?
- DART Validation Tool Overview
- Recommendations For How To Validate CSN Data
- Examples of Common Issues/Things to Check
- Final Notes & Tips
- Q&A



CSN Sites – Samplers and Filters

Two samplers
MetOne SASS / Super SASS
URG3000N

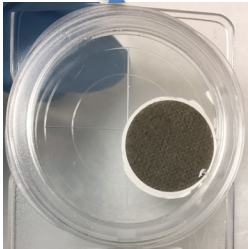
Three different filter types
Polytetrafluoroethylene (PTFE)
Nylon
Quartz



PTFE (Teflon)



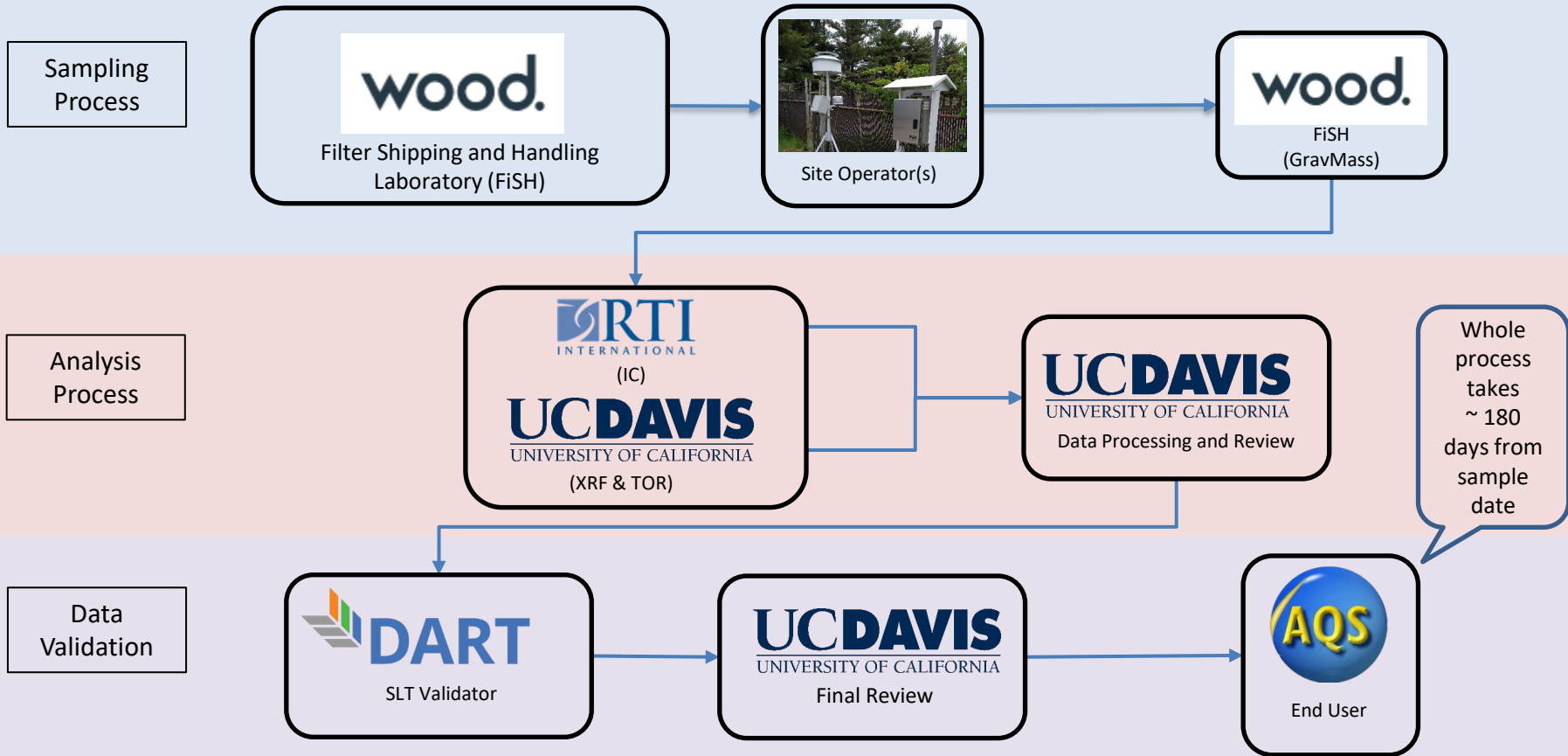
Nylon



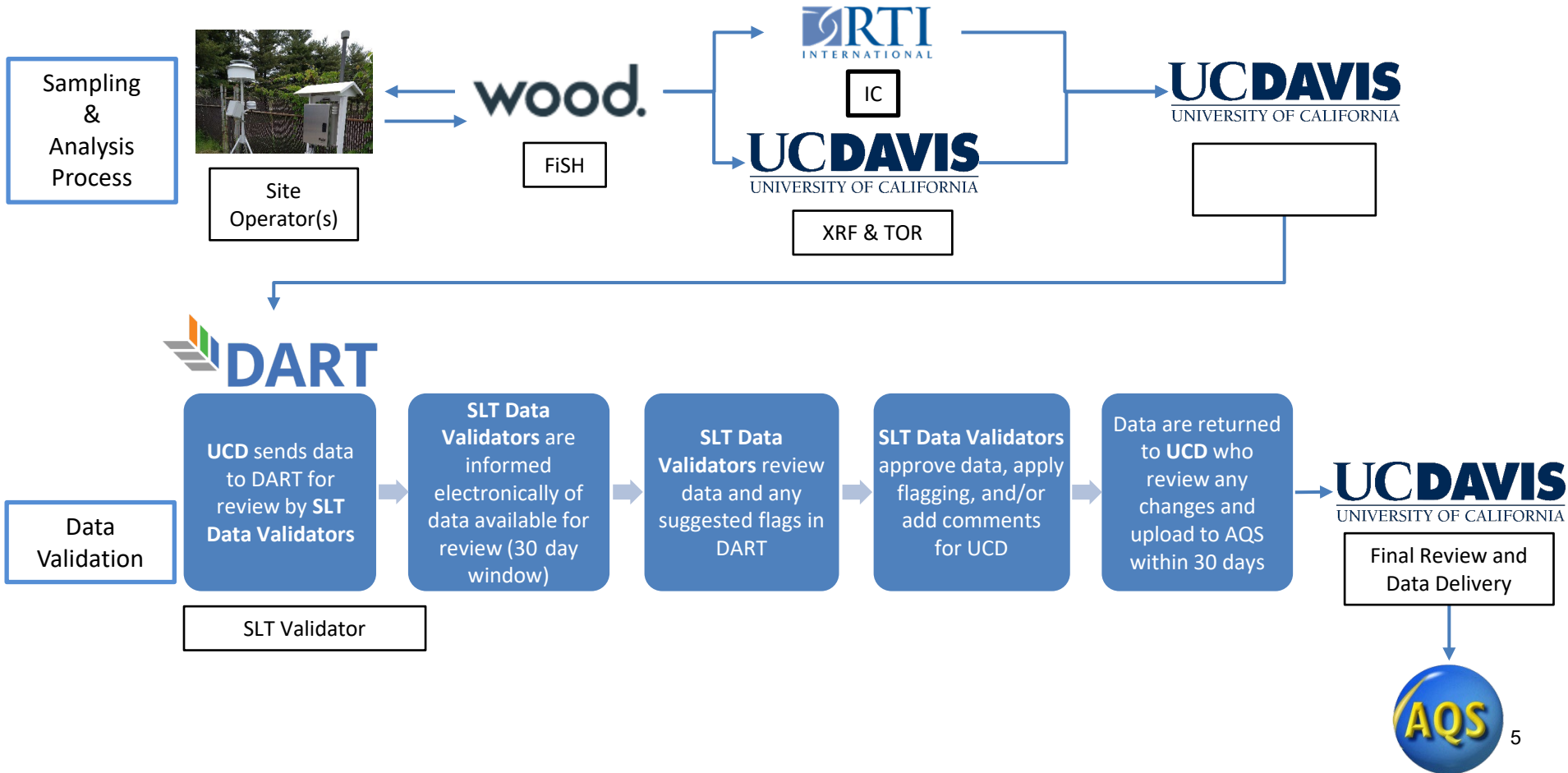
Quartz

All three filter types =
“Complete Sample Event”

CSN Data Pathway & Validation Process

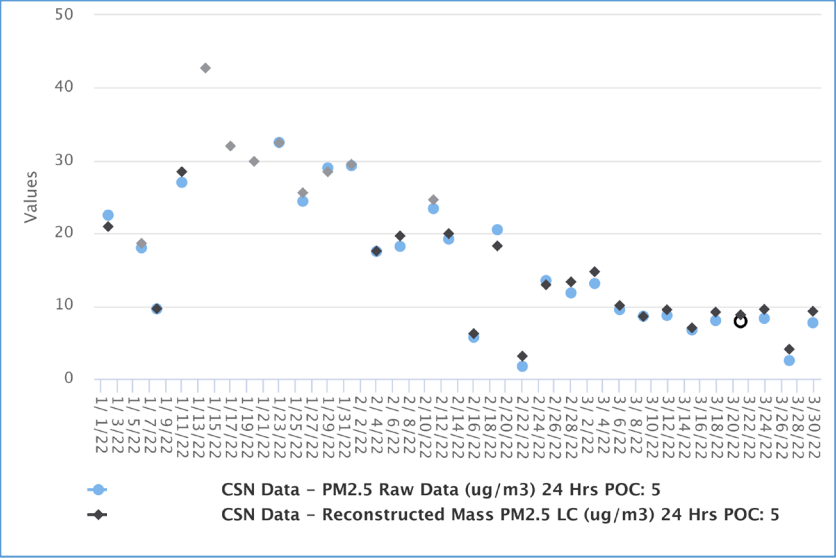


CSN Data Pathway & Validation Process

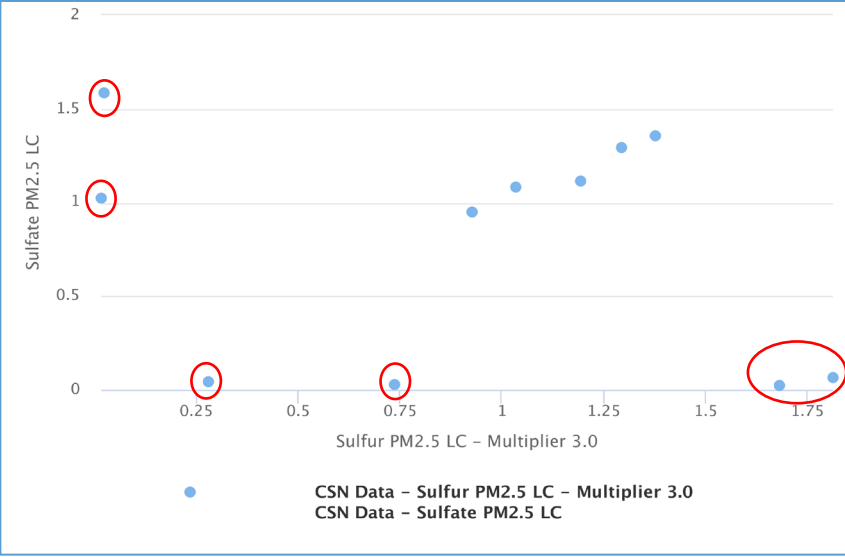


Why Do We Validate Data?

Report highest quality data

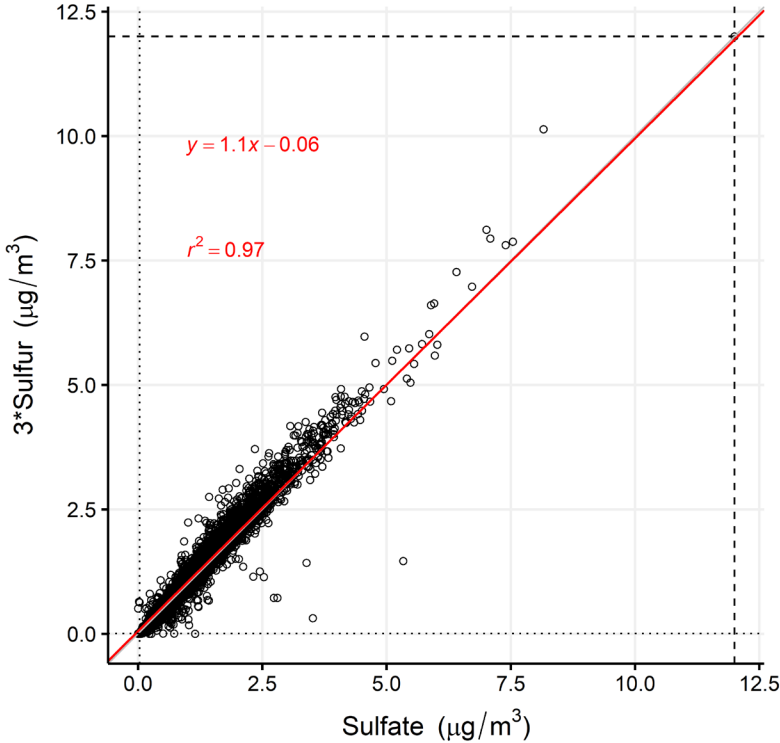


Identify and resolve issues



Why Do We Validate Data?

Consistency across network



Why Do We Validate Data?

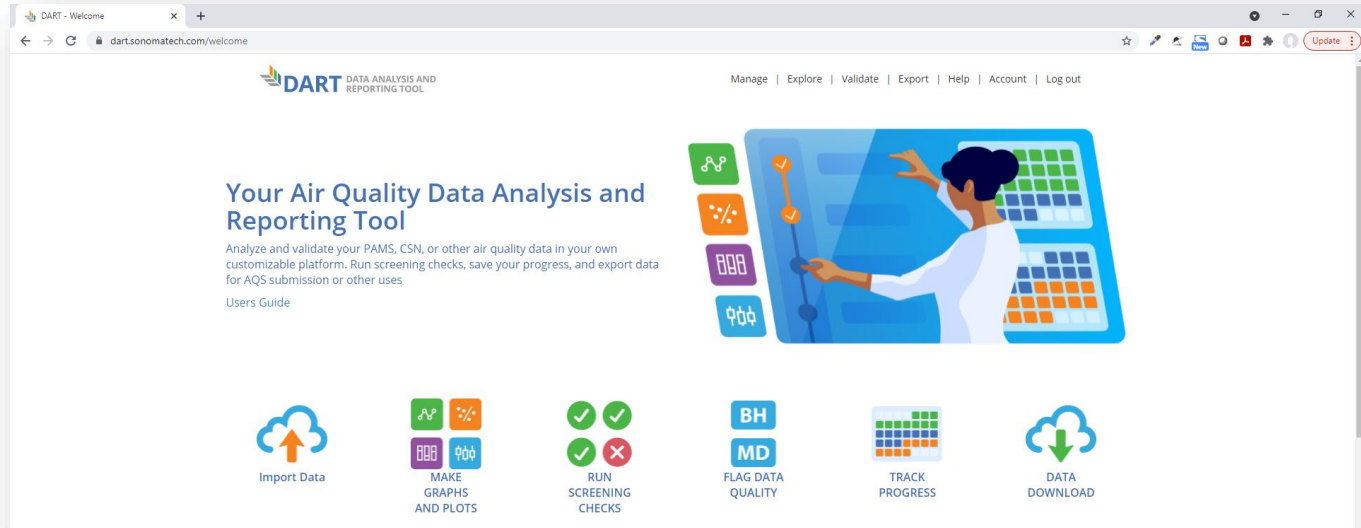
Provide information via flags for end users

- Flags, or qualifiers, help end users determine how to use data in their analysis

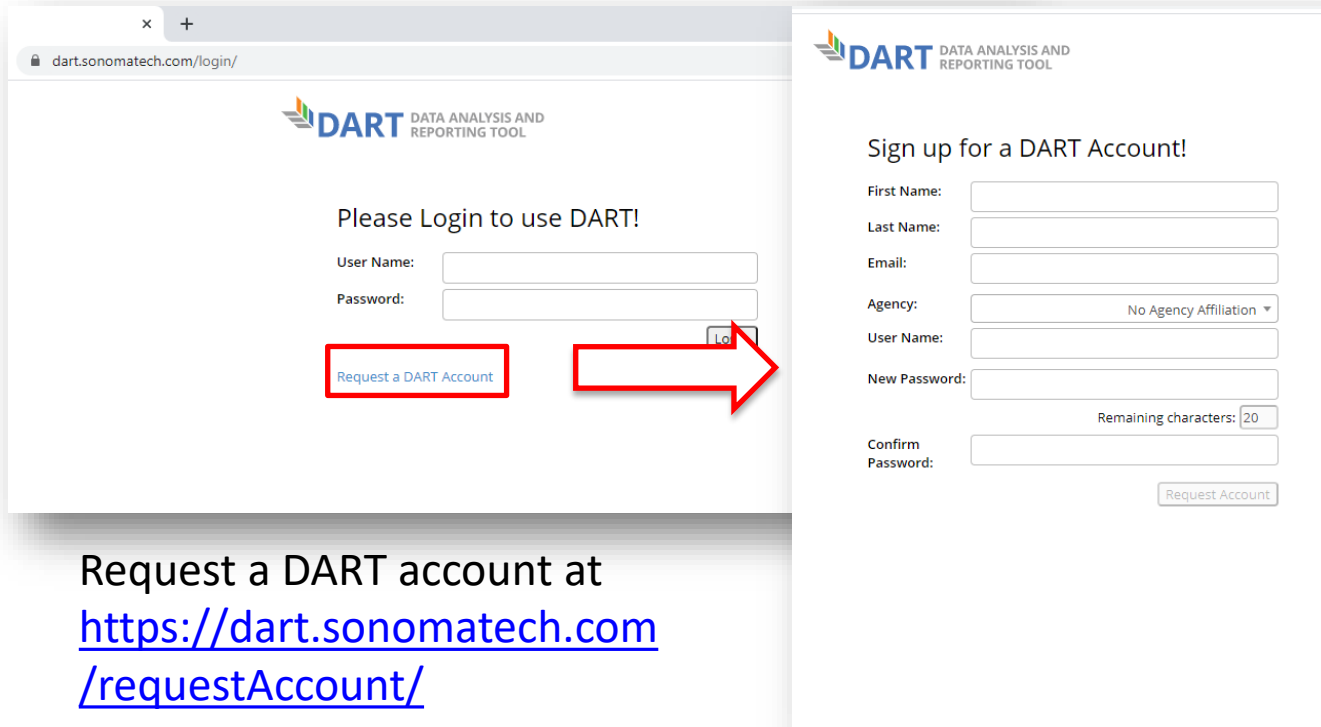
Reviewed	Date	Parameter	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
✓	Jun-27	Aluminum PM2.5 LC	5	0.15402	96	0.02319	0.03028	ug/m3		TT, IM	
✓	Jun-27	Ammonium Sulfate PM2.5 LC	5	1.40387	44	0.00321	0.07597	ug/m3		TT, IM	
✓	Jun-27	Calcium PM2.5 LC	5	0.03365	84	0.0106	0.00791	ug/m3		TT, IM	
✓	Jun-27	Chlorine PM2.5 LC	5	0.11794	98	0.00432	0.03887	ug/m3		TT, IM	
✓	Jun-27	Chromium PM2.5 LC	5	0.00223	75	0.00206	0.00137	ug/m3		TT, IM	
✓	Jun-27	EC PM2.5 LC Tor	5	0.128	4	3.0E-5	0.01406	ug/m3		TT, IM	
✓	Jun-27	Iron PM2.5 LC	5	0.08043	81	0.00856	0.0108	ug/m3		TT, IM	
✓	Jun-27	Magnesium PM2.5 LC	5	0.04232	94	0.03913	0.02603	ug/m3		TT, IM	
✓	Jun-27	OC PM2.5 LC Tor	5	1.10726	7	0.40943	0.26235	ug/m3		TT, IM	
✓	Jun-27	Organic Carbon Mass	5	1.55016	7	0.5733	0.26738	ug/m3		TT, IM	

CSN in DART

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



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



The image displays two screenshots of the DART (Data Analysis and Reporting Tool) website. The left screenshot shows the login page at <https://dart.sonomatech.com/login/>. It features the DART logo and the text "Please Login to use DART!". Below this are input fields for "User Name:" and "Password:", and a "Log In" button. A red box highlights the "Request a DART Account" link, and a red arrow points from it to the right screenshot.

The right screenshot shows the "Sign up for a DART Account!" page. It includes the following fields and options:

- First Name:
- Last Name:
- Email:
- Agency:
- User Name:
- New Password: (Remaining characters: 20)
- Confirm Password:

A "Request Account" button is located at the bottom right of the sign-up form.

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/`. It features the DART logo, a navigation menu with 'Export' and 'Help' highlighted by a red arrow, and a login form with 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 includes the DART logo, a navigation menu with 'Account' and 'Log out' added, and a main heading 'Your Air Quality Data Analysis and Reporting Tool'. Below the heading is a descriptive paragraph and a 'Users Guide' link. A large illustration shows a person interacting with a data dashboard. At the bottom, six feature icons are displayed: 'Import Data', 'MAKE GRAPHS AND PLOTS', 'RUN SCREENING CHECKS', 'FLAG DATA QUALITY', 'TRACK PROGRESS', and 'DATA DOWNLOAD'. A red arrow points from the 'Export' link in the top screenshot to the 'Export' link in the bottom screenshot.

Top Screenshot (Login Page):

- URL: `dart.sonomatech.com/login/`
- Navigation: Manage | Explore | Validate | **Export** | **Help** | Log in
- Text: Please Login to use DART!
- Form: User Name: Password: Login
- Links: Request a DART Account | Forgot your password?

Bottom Screenshot (Welcome Page):

- URL: `dart.sonomatech.com/welcome`
- Navigation: Manage | Explore | Validate | Export | Help | **Account** | Log out
- Section: Your Air Quality Data Analysis and Reporting Tool
- Text: 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. Users Guide
- Illustration: A person interacting with a data dashboard.
- Feature Icons: Import Data, MAKE GRAPHS AND PLOTS, RUN SCREENING CHECKS, FLAG DATA QUALITY, TRACK PROGRESS, DATA DOWNLOAD

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 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 entries

Previous 1 Next

DART – New Manage Users Page

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

Users Sites

Search: Export

Agency ^	Name	User Email	CSN Admin	CSN Validator	CSN Emails
Sonoma Technology	Bryan Penfold	bryan@sonomatech.com	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Sonoma Technology	Jennifer DeWinter	jdewinter@sonomatech.com	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sonoma Technology	Anthony Cavallaro (Dev)	acavallaro@sonomatech.com	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Sonoma Technology	Marcus Hylton	mhylton@sonomatech.com	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Sonoma Technology	User Rights	xw152321@nbzmr.com	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Sonoma Technology	Data Editor	zyz44795@nbzmr.com	<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"/>

Users who do not appear in the table do not have an AirNow-Tech account or their AirNow-Tech account is assigned to a different agency. Please have such users request an **AirNow-Tech 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.

Three configurable settings:

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

DART – New Manage Users Page



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

California Air Resources Board

Users **Sites**

Table includes all CSN sites within the selected Agency.

Search:

Export

Agency	Name	AQS Code
California Air Resources Board	BAKERSFIELD - CALIFORNIA AVENUE	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.

- New display on the DART Manage Users webpage that displays the CSN sites in DART for your Agency
- Both the 'Users' and 'Sites' tabs will be updated soon to display information about PAMS 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 for Approval Mode. At the top, there's a navigation bar with 'DART DATA ANALYSIS AND REPORTING TOOL' and user options like 'Manage', 'Explore', 'Validate', 'Export', 'Help', 'Account', and 'Log out'. Below this is a 'DART WORKSPACE' section with a dropdown menu set to 'Default CSN Workspace' and a 'Save' button. The main content area is titled 'Approval Mode | 060850005 CSN Data' and includes 'BATCH CREATED: 16 Jul 2021' and 'REVIEW BY: 17 Aug 2021' with a 'Select Batch' button. A 'BATCH SUMMARY' table is displayed for 'MARCH 2021', showing 'Total Samples: 90' and 'Total Qualifiers: J (501) LJ (3) MD (219) QP (1) QT (4)'. The table lists samples with their status (100%), dates, total qualifiers, and total null codes. Each row has an 'Action' button (three dots). Red arrows point to the workspace dropdown, the 'Select Batch' button, the 'Action' buttons, and the '100%' status icons.

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	...
	Mar-11	46 (J MD)	0	...

Configure and save custom workspace

Approval Mode | 060850005 CSN Data

Select CSN batch to review

and hover over the icon to view additional information

Use the action button to edit sample date(s)

DART – Approval Mode Page: “Edit Date” Window

The screenshot shows the DART (Data Analysis and Reporting Tool) interface in Approval Mode. The top navigation bar includes links for Manage, Explore, Validate, Export, Help, Account, and Log out. Below this, the workspace is set to 'Default CSN Workspace'. The main content area displays 'Approval Mode | 060850005 CSN Data' with 'BATCH CREATED: 16 Jul 2021' and 'REVIEW BY: 17 Aug 2021'. A 'BATCH SUMMARY' section for 'MARCH 2021' shows 10 total samples and 47 total qualifiers (J (501) LJ (3) MD (219) QP (1) QT (4)). A table lists individual samples with their status (100%), dates, total qualifiers, and total null codes. A red arrow points to the 'Action' button in the last row of the table.

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

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 checked="" 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

Null and/or qualifier codes are editable using the “Edit Batch” window

DART – Approval Mode: “Edit Batch” Window

- The “Edit Batch” window enables editing of null and/or qualifier codes, and also 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] [X]

Recent Comment:
"UCD: Filter is covered in dirt (appears to have been muddy at some point and is now dried to the filter), within XRF analysis area.-- SHAL: Site: Channel 1 void- high CV. Wood: Ch.1 teflon filter very soaking wet with lots of dirt on it. Site assigned AH flag for channel 1. - Given AH Flag because at least one channels CV value was out of spec"
05/06/2020 21:36

Sample Date(s): Dec 14, 2019 [Advanced]

Apply to:
Apply to Element species in selected sample (measured by XRF from the PTFE filter) ▼

Ambient Field Blanks Both
 Include operational parameters

POC: 5 ▼

Overwrite Codes

Edit Null Code:
AH - Sample Flow Rate out of Limits ▼

Edit Qualifier Code:
[Text Field]

Warning: You are editing the null code or qualifier code(s) for multiple species. The change will not be applied to any species without a concentration value. Missing concentrations (shown as -999) must have a null code.

Preview:

Original	New
Dec 14, 2019	Dec 14, 2019
Aluminum PM2.5 LC (5) : [AH], []	Aluminum PM2.5 LC (5) : [AH], []
Antimony PM2.5 LC (5) : [AH], []	Antimony PM2.5 LC (5) : [AH], []
Arsenic PM2.5 LC (5) : [AH], []	Arsenic PM2.5 LC (5) : [AH], []
Barium PM2.5 LC (5) : [AH], []	Barium PM2.5 LC (5) : [AH], []
Bromine PM2.5 LC (5) : [AH], []	Bromine PM2.5 LC (5) : [AH], []
Cadmium PM2.5 LC (5) : [AH], []	Cadmium PM2.5 LC (5) : [AH], []

Edit Comment:
[Text Field]

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

Edit Batch [Help]

Recent Comment:
"UCD: Filter is covered in dirt (appears to have been muddy at some point and is now dried to the filter), within XRF analysis area.-- SHAL: Site: Channel 1 void- high CV. Wood: Ch.1 teflon filter very soaking wet with lots of dirt on it. Site assigned AH flag for channel 1. - Given AH Flag because at least one channels CV value was out of spec"
05/06/2020 21:36

Sample Date(s): Dec 14, 2019 [Advanced]

Apply to:
Apply to Element species in selected sample (measured by XRF from the PTFE filter) ▼

Ambient Field Blanks Both
 Include operational parameters

POC: 5 ▼

Overwrite Codes

Edit Null Code: AH - Sample Flow Rate out of Limits

Edit Qualifier Code:

Warning: You are editing the null code or qualifier code(s) for multiple code(s). The change will not be applied to any species without a concentration value.

Preview:
Dec 14, 2019
Aluminum PM2.5 LC (5) : [AH]
Antimony PM2.5 LC (5) : [AH]
Arsenic PM2.5 LC (5) : [AH]
Barium PM2.5 LC (5) : [AH]
Bromine PM2.5 LC (5) : [AH]
Cadmium PM2.5 LC (5) : [AH]

Edit Comment:

Options to select the parameter(s) to edit:

- An individual species
- All species from a particular filter
- All species from all filters
- Include/exclude operational parameters
- Ambient, blanks, or both
- A specific POC

Apply to:
Apply to Element species in selected sample (measured by XRF from the PTFE filter) ▼

Ambient Field Blanks Both
 Include operational parameters

POC: 5 ▼

Selecting Parameters in the “Edit Batch” Window

- Null and/or qualifier codes, and comments, are editable for **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)
 - All operational parameters for the selected sample

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 Element species in selected sample (measured by XRF from the PTFE filter)"	all analytical parameters for the PTFE for single date, unless multiple dates are specified	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"	(this is a new group) edits all operational parameters for the filter of the selected row only, 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

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
<input type="checkbox"/>	Jan-20	Ammonium
<input type="checkbox"/>	Jan-20	Ammonium
<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 Amt 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

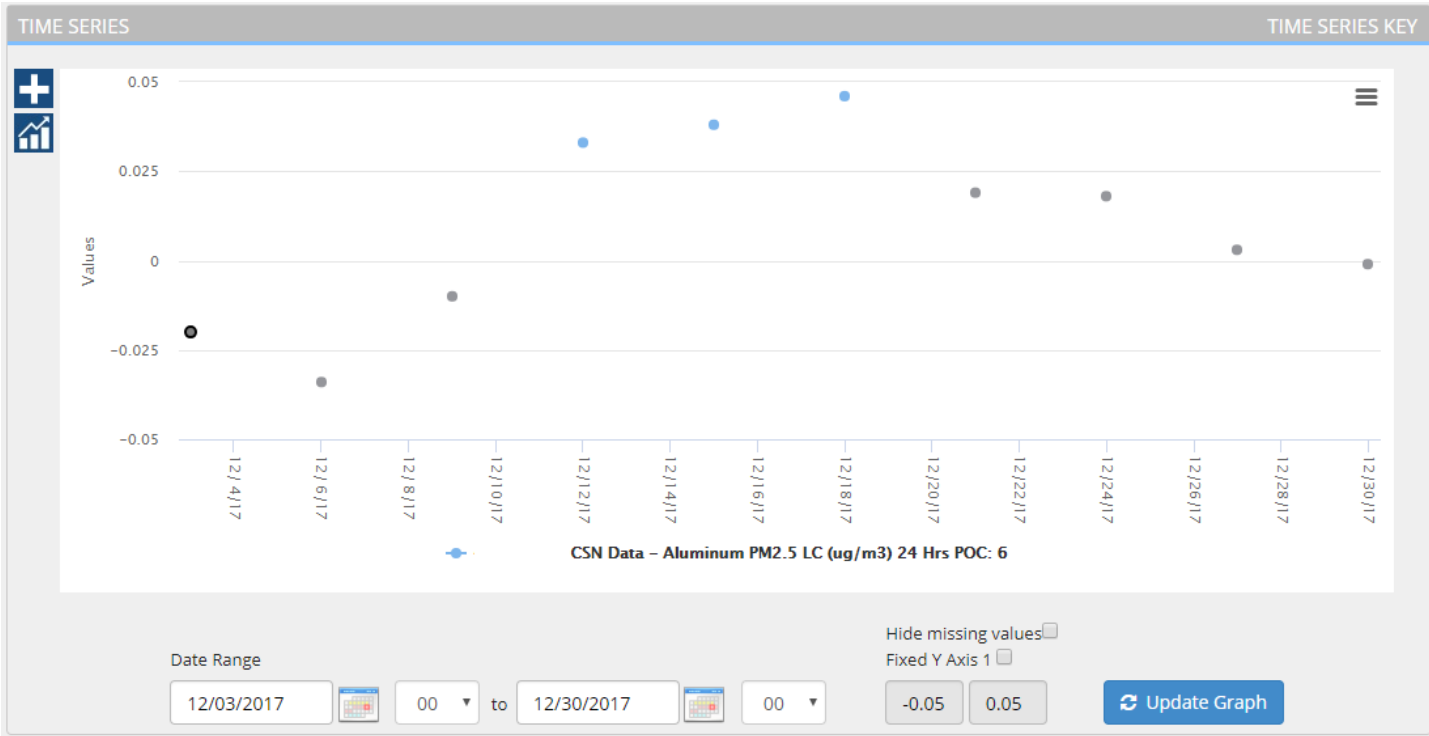
Batch Data

Filter:

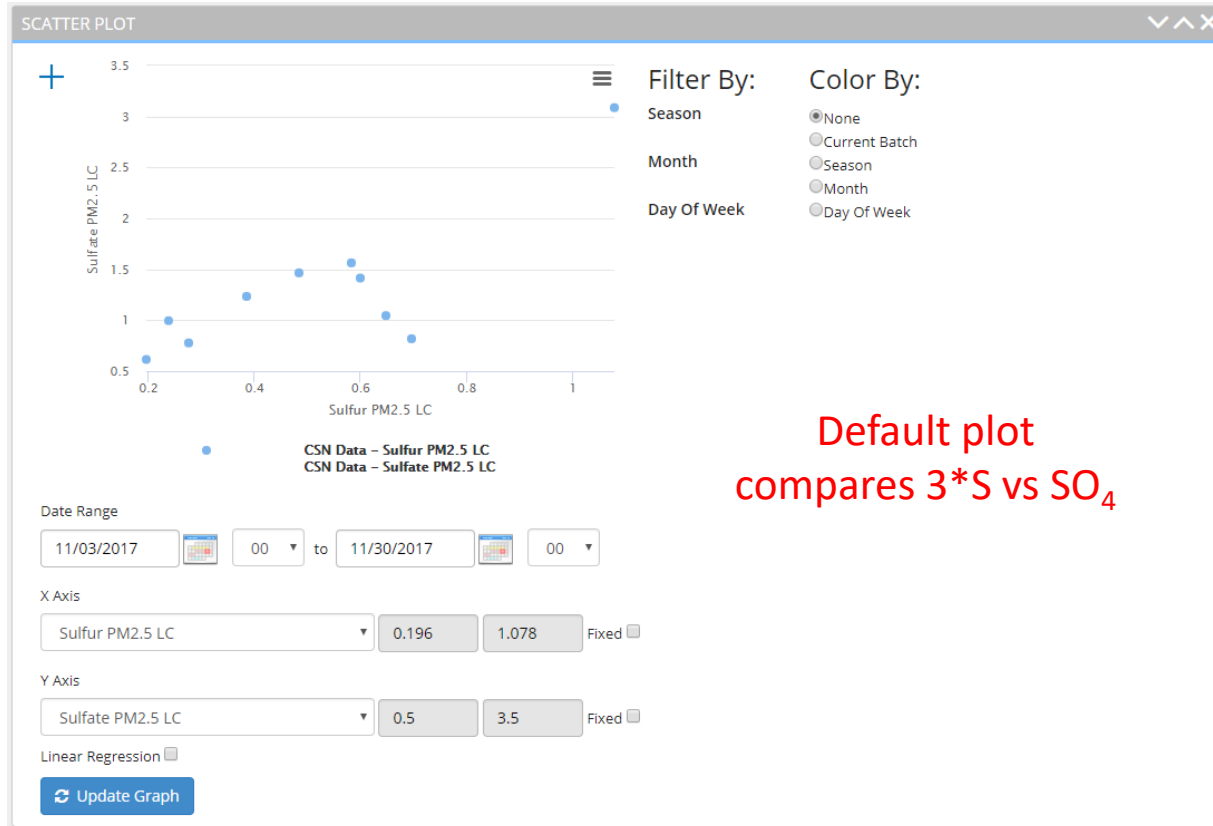
Reviewed	Date	Parameter	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
<input type="checkbox"/>	Dec-03	Arsenic PM2.5 LC	5	-1.1E-4	4	0.00186	0.00113	ug/m3		MD	
<input type="checkbox"/>	Dec-03	Average Ambient Pressure for URG3000N	5	<input type="text" value="-999"/>	41	0.0		mmHg	AJ		
<input 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

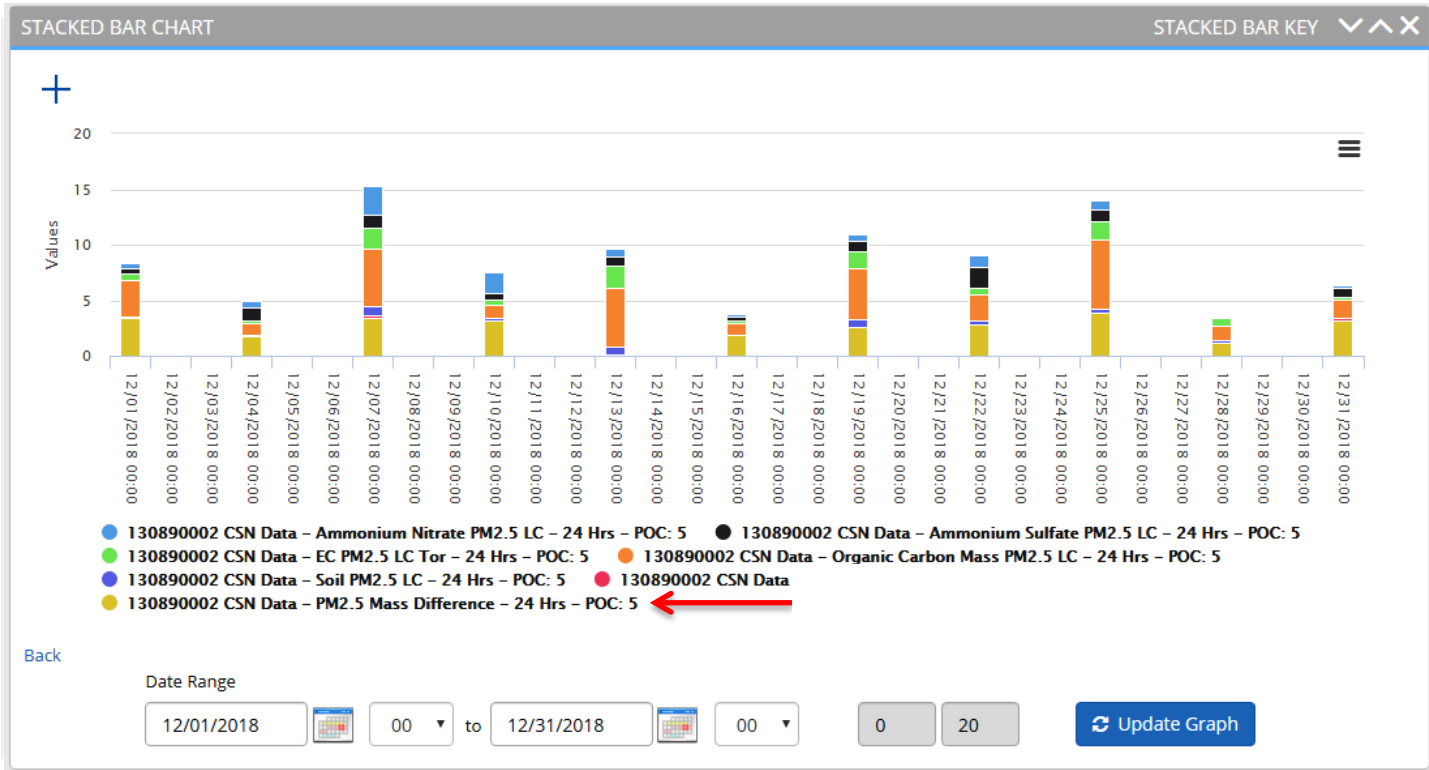


DART – Graphs



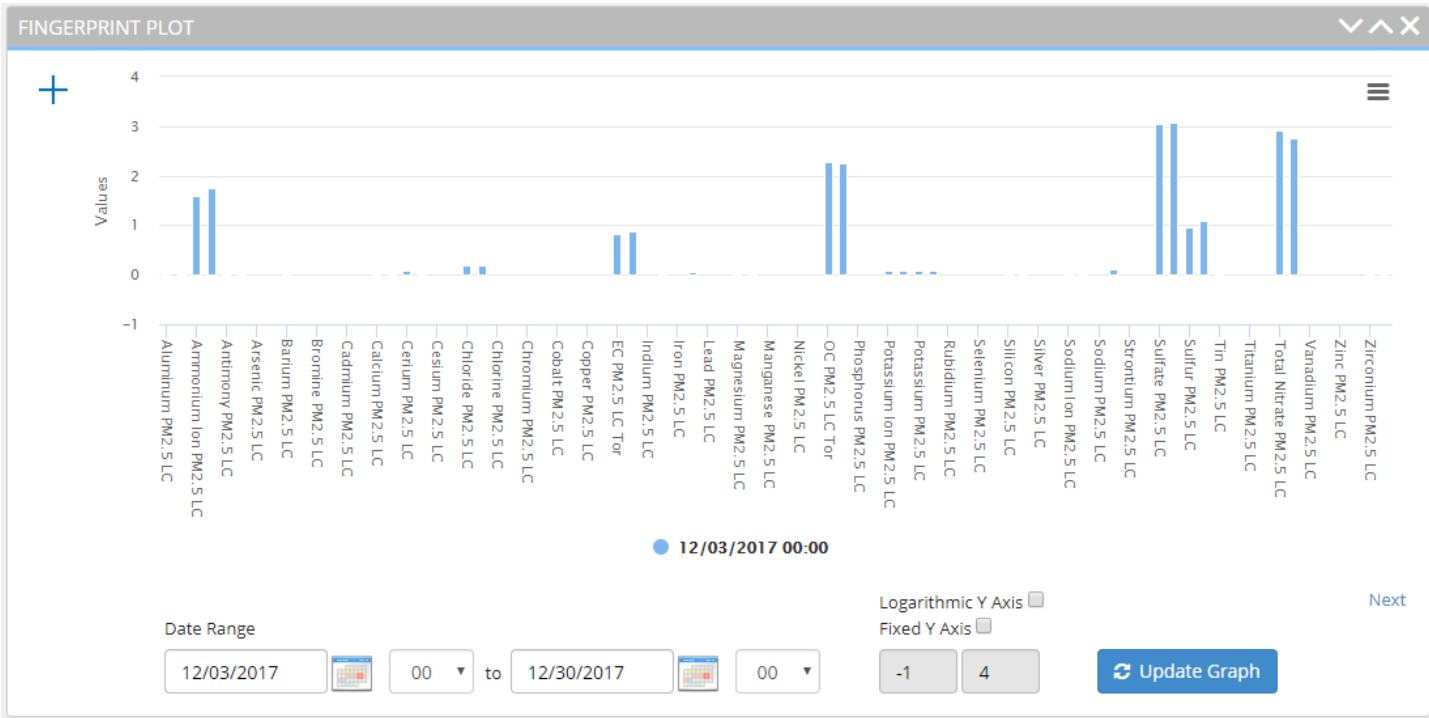
Default plot compares 3*S vs SO₄

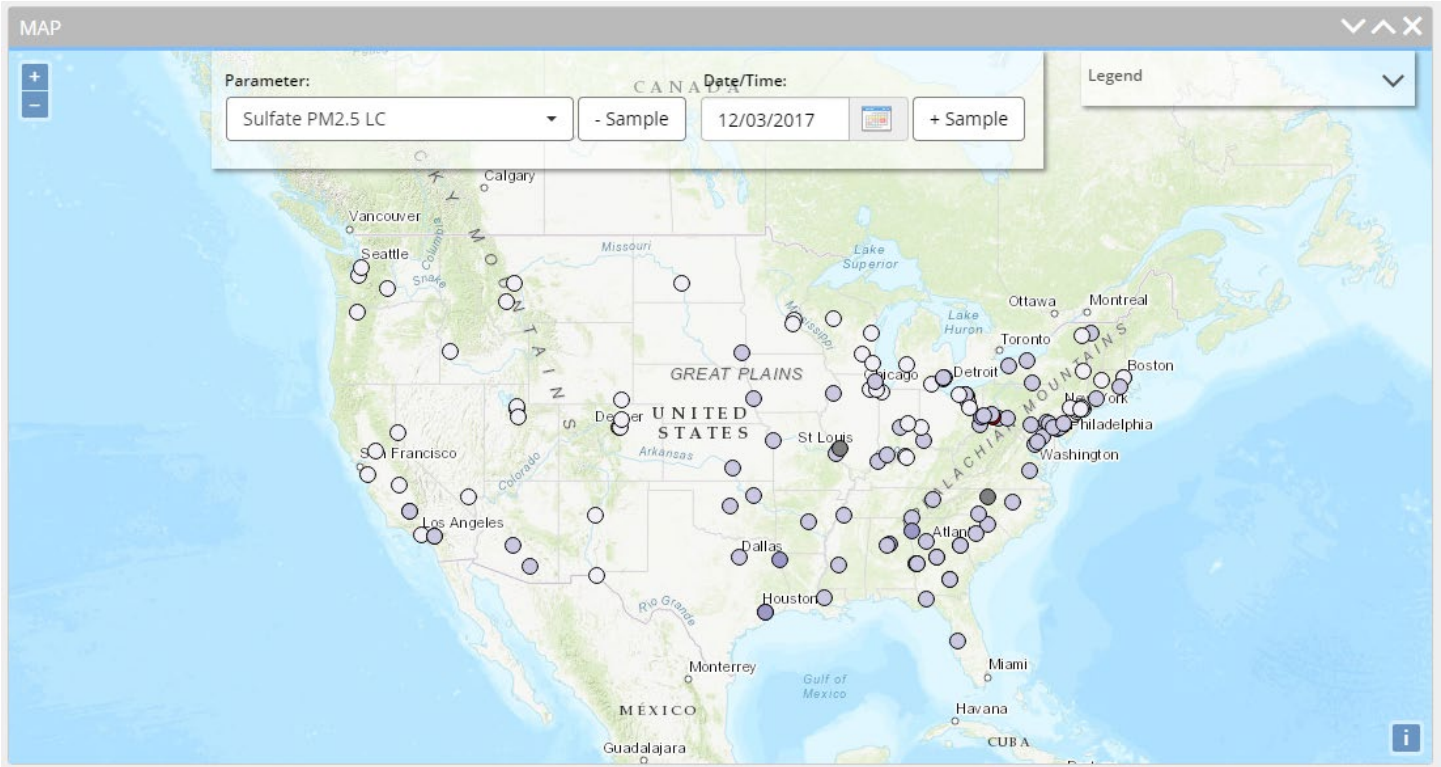
DART – Graphs



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

HOW TO VALIDATE DATA

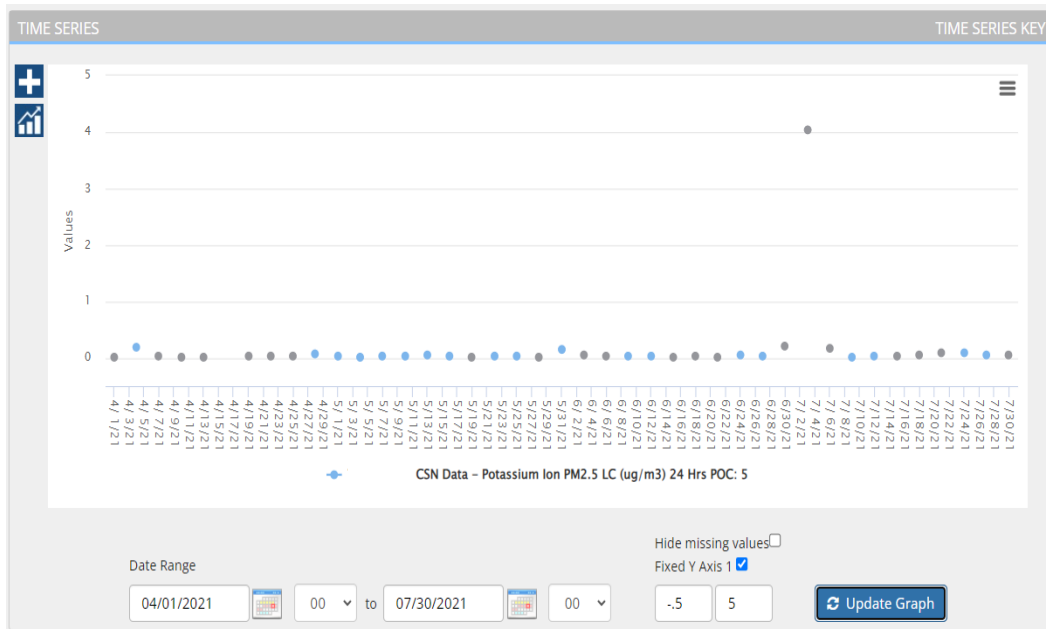
Visual Tools, Time Series, Map (Regional Mode), Scatter Plot, Cross-Filter Comparisons*

*These do not cover all plots available in DART and are recommendations, not a comprehensive list of ways to validate data

Visual Tools - Time Series

Provides historical context for unusual concentrations

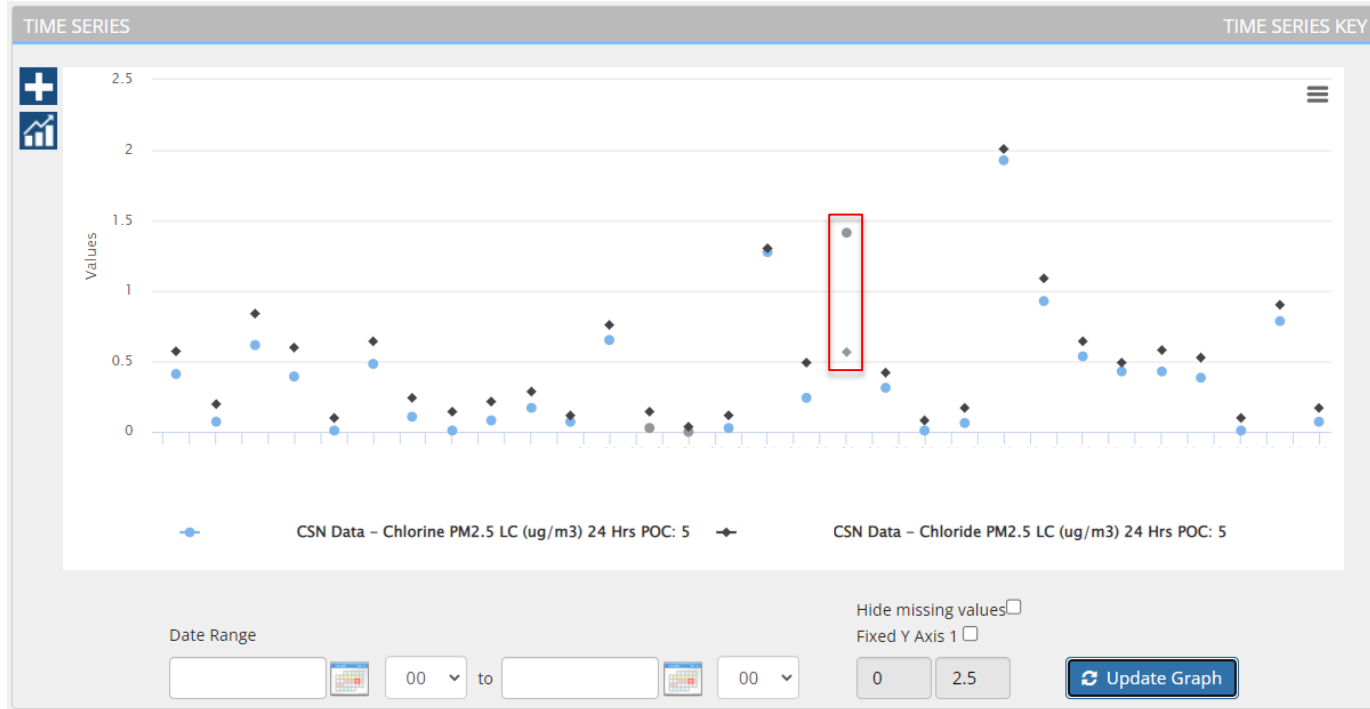
- Compare unusual values or trends with previously measured values at site
 - High or low values
- Tip: Expand date range for larger selection of data for reference



Visual Tools - Time Series

Compare trends of similar species from multiple filters

- Validates quality of sampling, analysis and even the trends



Other species to look at:

Potassium/Potassium Ion

Sodium/Sodium Ion

Sulfur/Sulfate

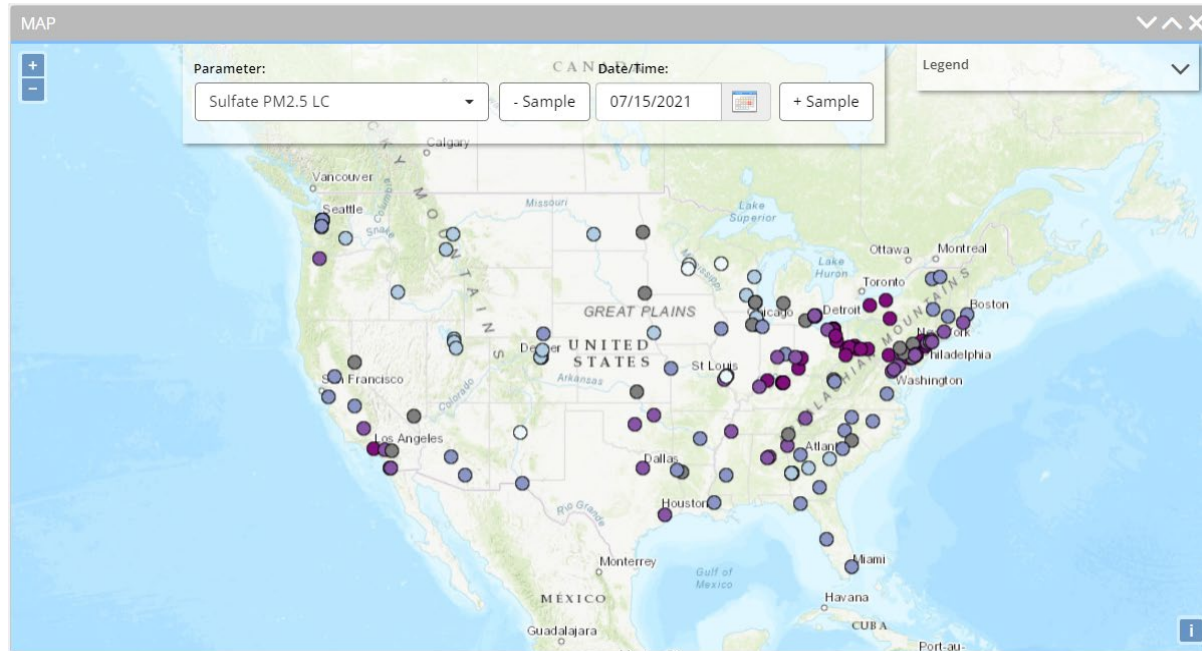
*Fabs/EC

*coming soon

Visual Tools – Map (Regional Mode)

Provides context for concentrations throughout region on sample date

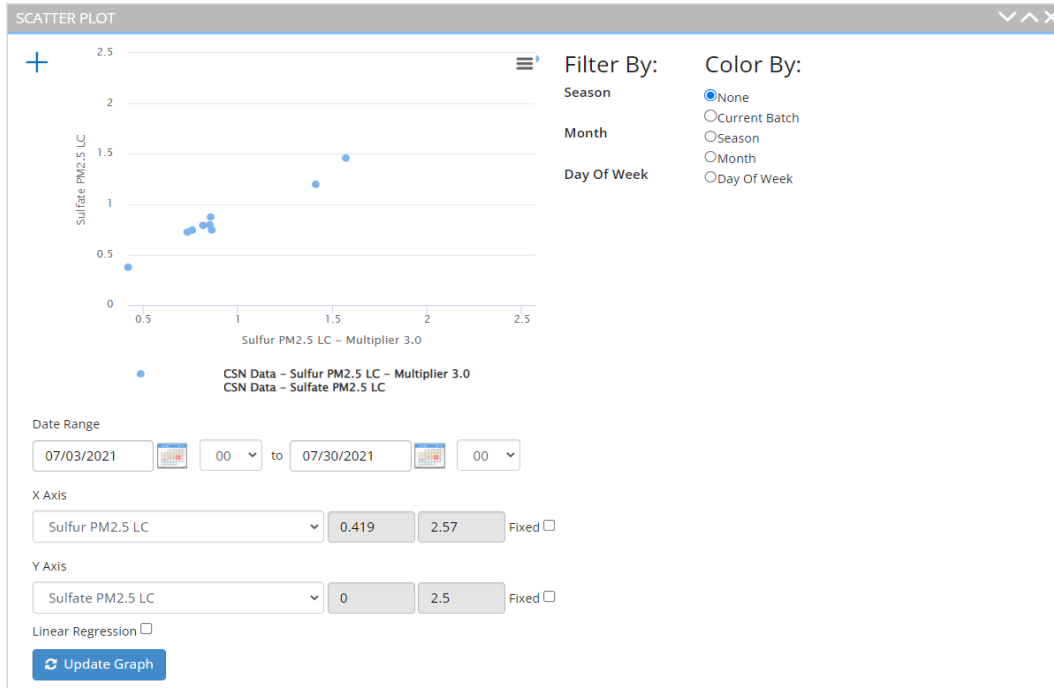
- Compare unusual values or trends with values measured at nearby site(s)



Visual Tools – Scatter Plot

Provides comparison of similar species from multiple filters

- Validates quality of sampling and analysis



Other species to look at:

Potassium/Potassium Ion

Chlorine/Chloride

Sodium/Sodium Ion

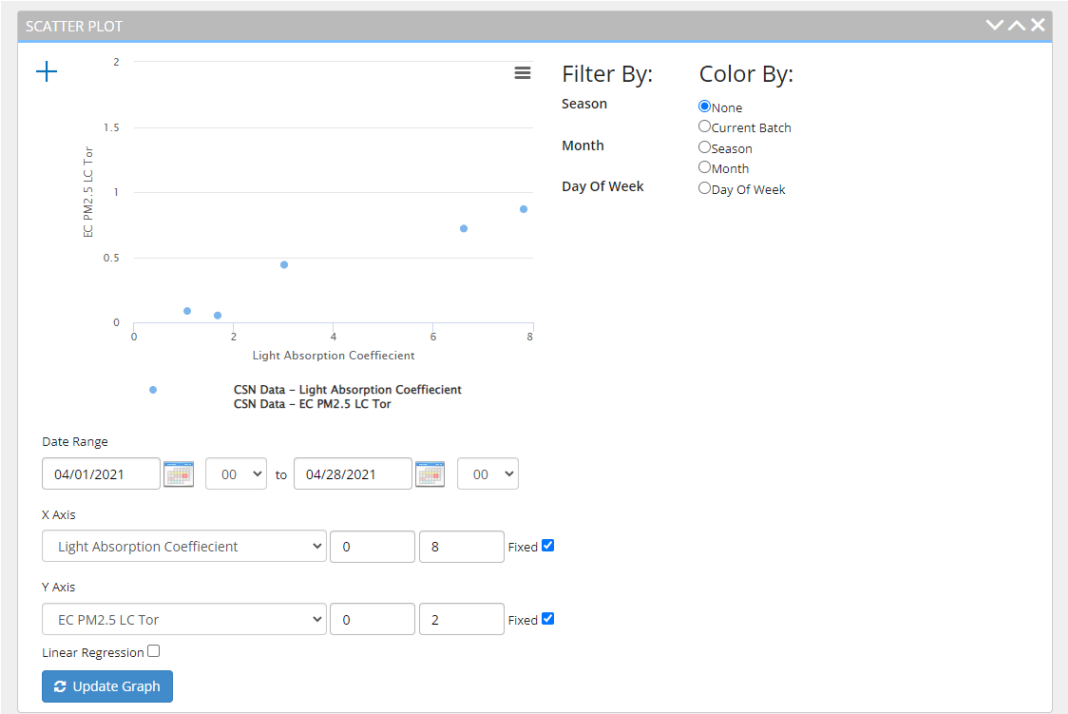
*Fabs/EC

*coming soon

Visual Tools – Scatter Plot

Coming Soon!

- Fabs compares well with EC for validation of PTFE (HIPS) and quartz (TOA) filters



More on HIPS analysis and Fabs later

EXAMPLES OF COMMON ISSUES/THINGS TO CHECK

C1 Flags, Elevated measurements from Field Blanks, Near zero measurements from Sample, Poor S/SO₄ relationship

Qualifiers, Sampler QA/QC Check Fail

Common Issues: Highlighted by C1 flag

C1 flag indicates data flagged by UCD for further review


- Manually applied to communicate to SLT Validators of potential issues

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 flags used to communicate changes from site Field Sheet. Flags not reported to AQS.

Common Issues: Elevated measurements from Field Blank

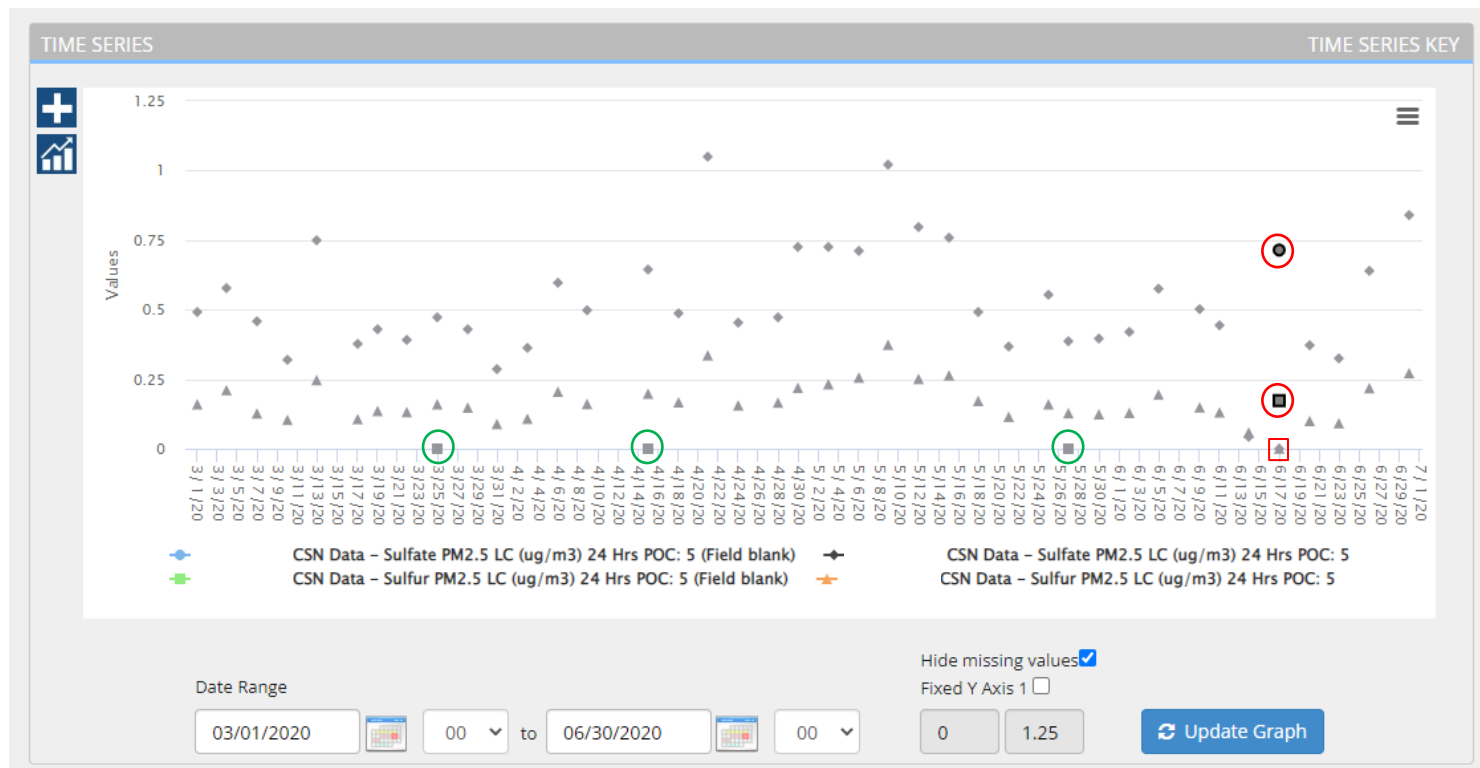
Why might we see elevated measurements from Field Blank?

- Field Blank channel ran with flow
- Field Blank swapped with Sample
 - Change in intended purpose
- Contamination

How to Investigate:

- Compare with Sample (Nominal concentrations for Field Blanks)
- Read comments
- Check local conditions
- Check site documentation
 - Flow Data
 - QA/QC Checks
- Is this valid? Or no evidence to prove otherwise?

Common Issues: Elevated measurements from Field Blank



Common Issues: Near zero measurements from Sample

Why might we see near zero measurements from Sample?

- No flow ran through channel with sample filter
- Field Blank swapped with Sample filter

Investigate:

- Check key species
 - PTFE – Sulfur
 - Nylon – Sulfate
 - Quartz – EC, OC
- Check cross-filter species comparisons
- Read comments
- Check local conditions
- Check nearby sites
- Check site documentation
- Is this valid? Or no evidence to prove otherwise?

Common Issues: Near zero measurements from sample

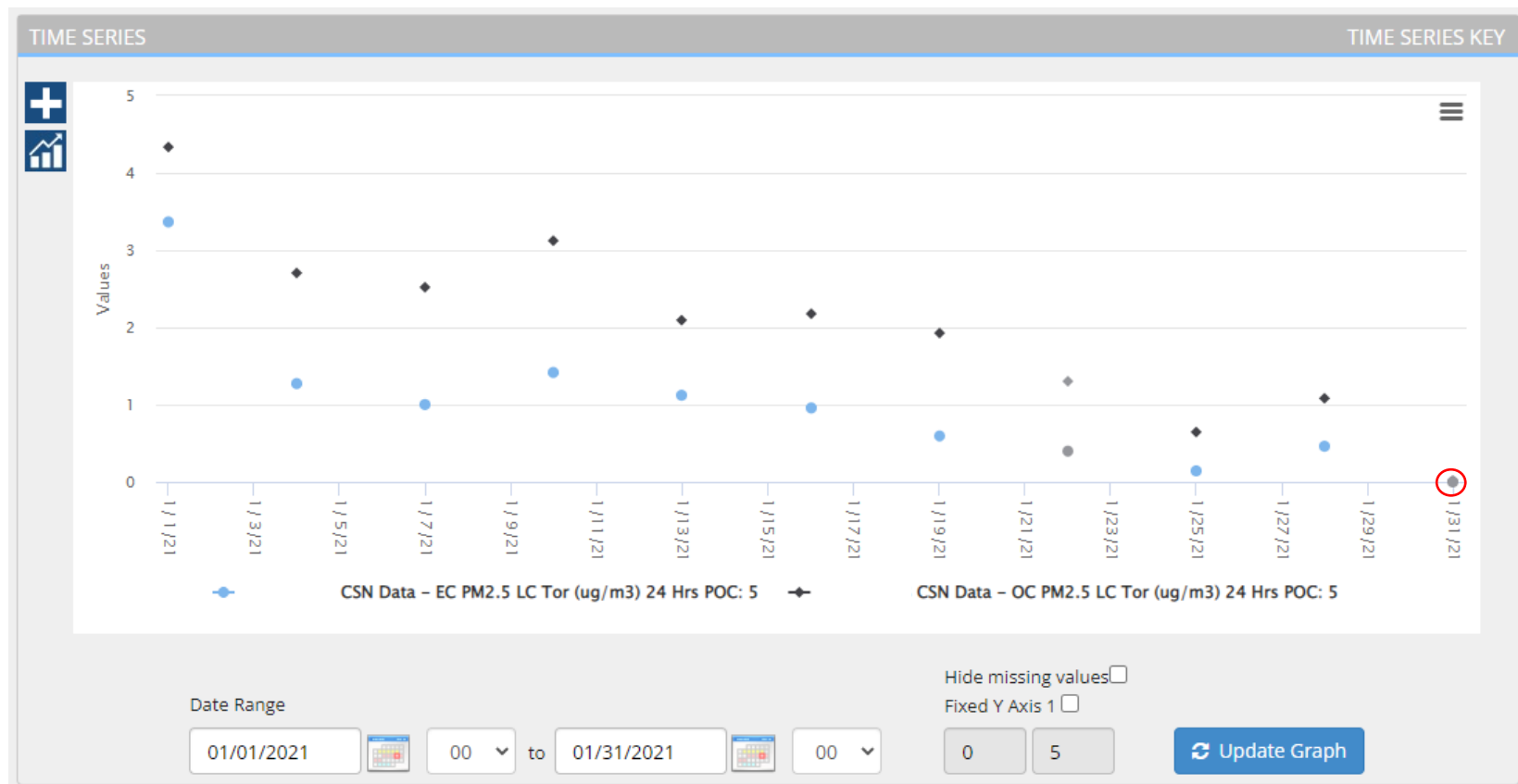
Batch Data

Filter:

Reviewed	Date	Parameter	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
✓	Jan-31	EC PM2.5 LC Tor	5	-3.0E-5	1	3.0E-5	2.0E-5	ug/m3		3, C1, MD	
✓	Jan-25	EC PM2.5 LC Tor	5	0.14342	5	3.0E-5	0.01576	ug/m3			
✓	Jan-22	EC PM2.5 LC Tor	5	0.39755	37	3.0E-5	0.04367	ug/m3		FX	
✓	Jan-28	EC PM2.5 LC Tor	5	0.46203	45	3.0E-5	0.05076	ug/m3			
✓	Jan-19	EC PM2.5 LC Tor	5	0.59531	60	3.0E-5	0.0654	ug/m3			
✓	Jan-16	EC PM2.5 LC Tor	5	0.95796	86	3.0E-5	0.10524	ug/m3			
✓	Jan-07	EC PM2.5 LC Tor	5	1.00168	88	3.0E-5	0.11004	ug/m3			
✓	Jan-13	EC PM2.5 LC Tor	5	1.12214	90	3.0E-5	0.12327	ug/m3			
✓	Jan-04	EC PM2.5 LC Tor	5	1.27318	94	3.0E-5	0.13986	ug/m3			

Select All

Common Issues: Near zero measurements from sample



Common Issues: Poor S/SO₄ relationship

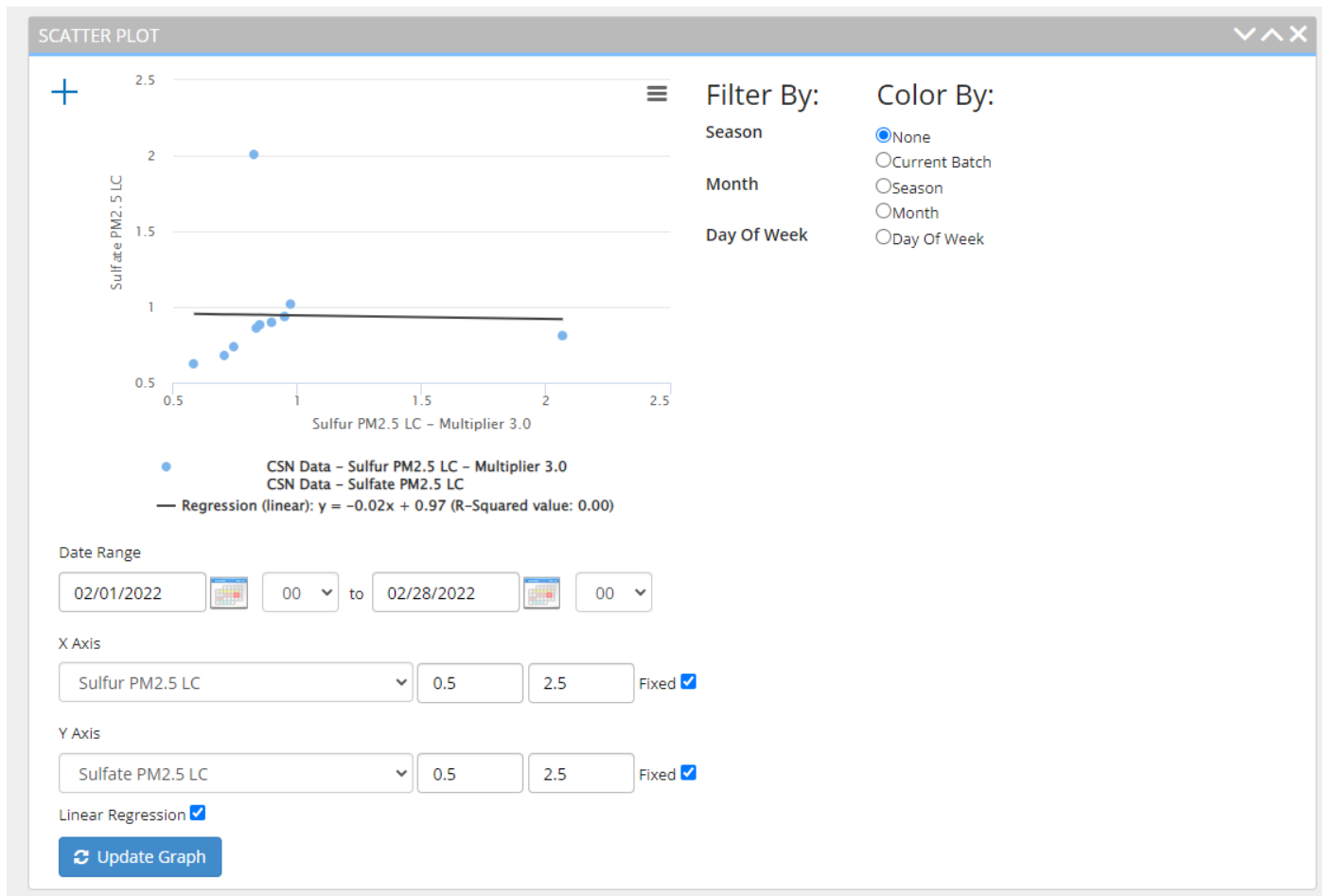
Why might S/SO₄ not compare well?

- Contamination on one filter
- Swap of filters between consecutive sampling dates
- Low concentrations exaggerate discrepancies between species

Investigate:

- Look at Scatter plot
- Look at Time Series with Sulfur and Sulfate selected
- Look at map to compare with nearby sites
- Look at Scatter plot and/or Time Series for how Fabs and EC compare
 - Can rule out or confirm PTFE filter as suspect
- Read comments
- Check local conditions
- Is this valid? Or no evidence to prove otherwise?

Common Issues: Poor S/SO4 relationship

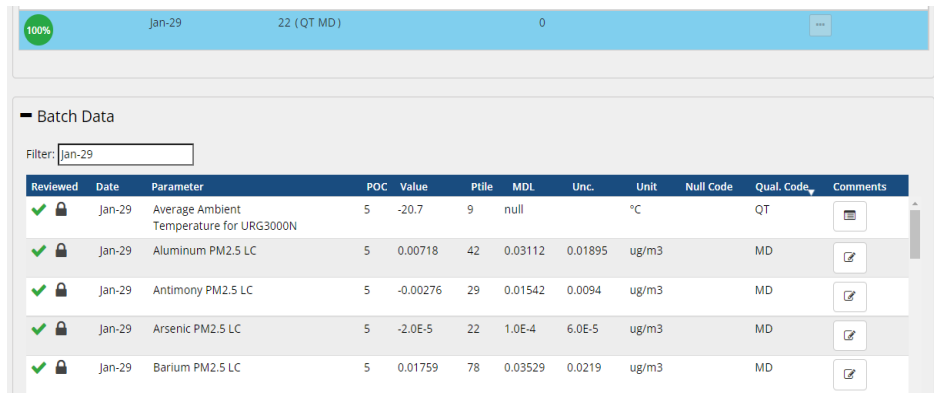


Things to Check: QT vs X qualifier

‘QT - Temperature Sensor Questionable.’

QT is typically applied when average ambient temperature sensor is questionable or outside manufacturer specs

Applied only to the Average Ambient Temperature parameter



100% Jan-29 22 (QT MD) 0

Batch Data

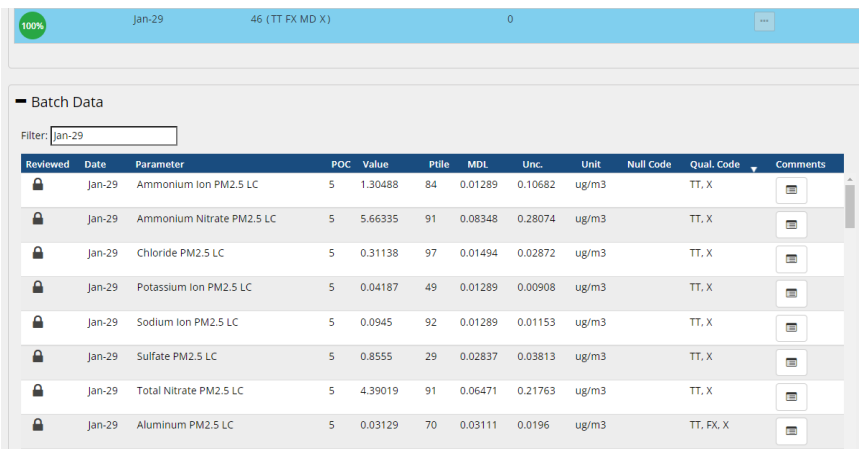
Filter: Jan-29

Reviewed	Date	Parameter	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
✓	Jan-29	Average Ambient Temperature for URG3000N	5	-20.7	9	null		°C		QT	
✓	Jan-29	Aluminum PM2.5 LC	5	0.00718	42	0.03112	0.01895	ug/m3		MD	
✓	Jan-29	Antimony PM2.5 LC	5	-0.00276	29	0.01542	0.0094	ug/m3		MD	
✓	Jan-29	Arsenic PM2.5 LC	5	-2.0E-5	22	1.0E-4	6.0E-5	ug/m3		MD	
✓	Jan-29	Barium PM2.5 LC	5	0.01759	78	0.03529	0.0219	ug/m3		MD	

‘X - Filter Temperature Difference or Average out of Spec.’

X is typically applied when filter temperature sensor or measurement is questionable or does not meet NIST criteria

Applied only the species parameters from the filter which channel sensor was impacted



100% Jan-29 46 (TT FX MD X) 0

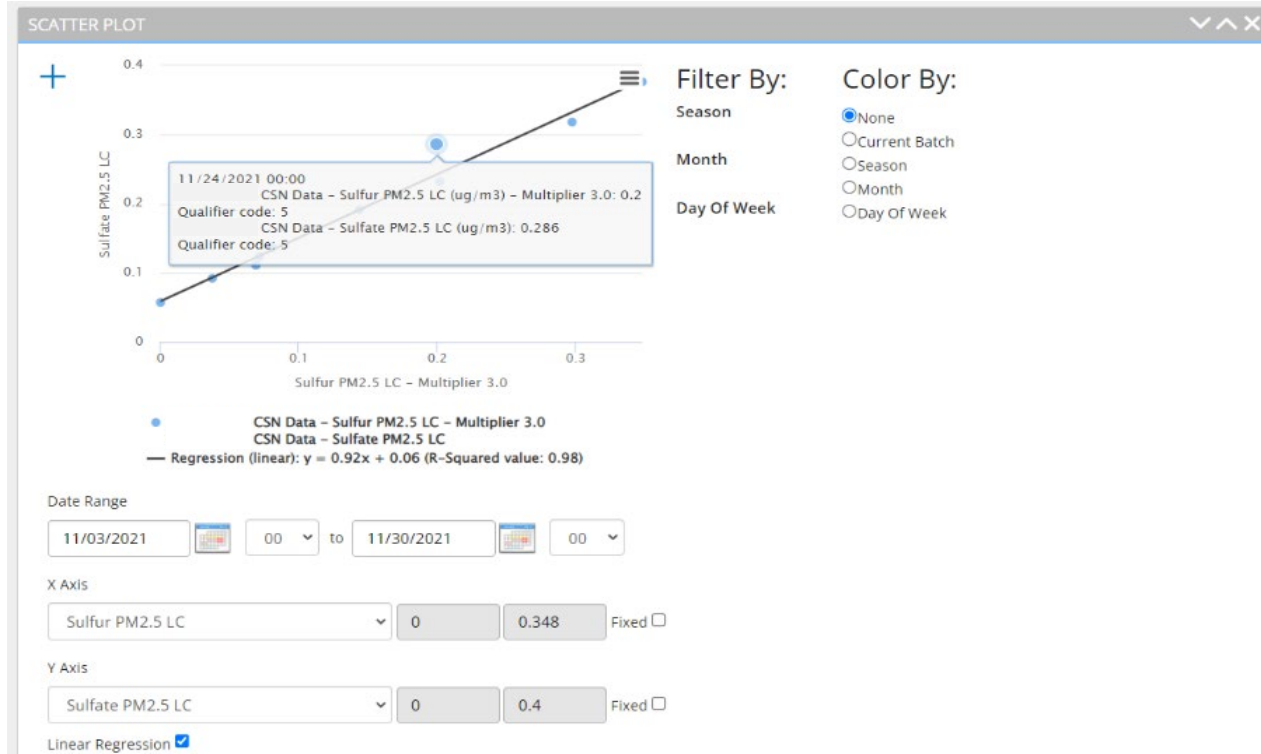
Batch Data

Filter: Jan-29

Reviewed	Date	Parameter	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
✓	Jan-29	Ammonium Ion PM2.5 LC	5	1.30488	84	0.01289	0.10682	ug/m3		TT, X	
✓	Jan-29	Ammonium Nitrate PM2.5 LC	5	5.66335	91	0.08348	0.28074	ug/m3		TT, X	
✓	Jan-29	Chloride PM2.5 LC	5	0.31138	97	0.01494	0.02872	ug/m3		TT, X	
✓	Jan-29	Potassium Ion PM2.5 LC	5	0.04187	49	0.01289	0.00908	ug/m3		TT, X	
✓	Jan-29	Sodium Ion PM2.5 LC	5	0.0945	92	0.01289	0.01153	ug/m3		TT, X	
✓	Jan-29	Sulfate PM2.5 LC	5	0.8555	29	0.02837	0.03813	ug/m3		TT, X	
✓	Jan-29	Total Nitrate PM2.5 LC	5	4.39019	91	0.06471	0.21763	ug/m3		TT, X	
✓	Jan-29	Aluminum PM2.5 LC	5	0.03129	70	0.03111	0.0196	ug/m3		TT, FX, X	

Things to Check: 5 qualifier – ‘Outlier’

Applied automatically to all Elements and Ions species when the 3*S/SO4 ratio is outside of range
Outlier Range is updated every two years to incorporate recent data and changes in trends



Effective 1/1/2021, the current 3*S/SO4 ratio limits are 0.725 to 1.334

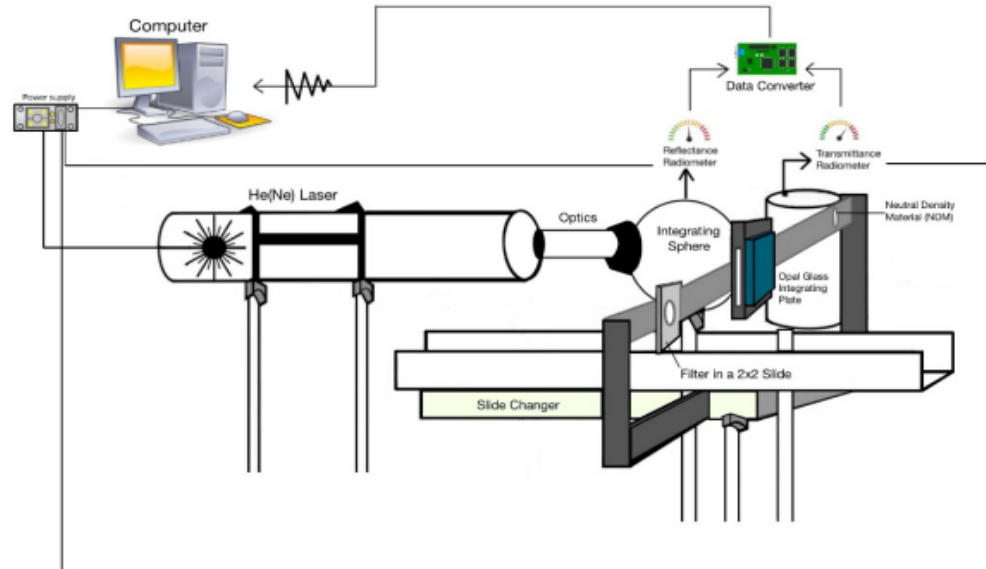
New Things: Hybrid Integrating Plate and Sphere system (HIPS)

Measures light absorption (Fabs) by particulate matter collected on PTFE filter

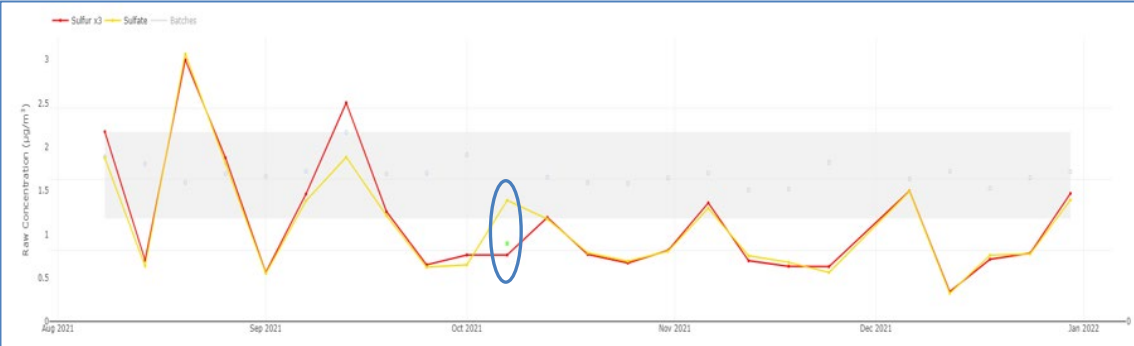
- Currently uses a single wavelength using red light of 633nm from a He(Ne) laser

Fabs compares well with EC measured from quartz filters.

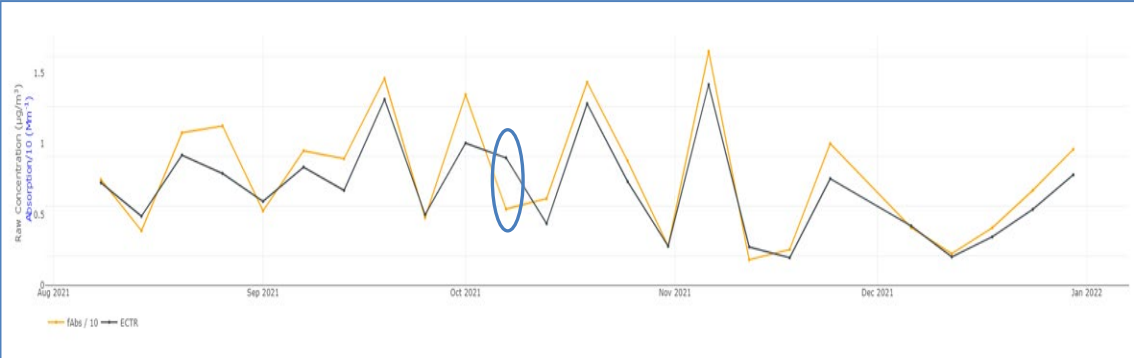
For the first time, data will be available to perform cross filter comparisons with the CSN quartz filters (carbon data).



New Things: Absorption (Fabs) compares well with EC



3*Sulfur (XRF) & Sulfate (IC) from MetOne SASS/SuperSASS



Fabs/10 (HIPS) from MetOne SASS/SuperSASS & EC (TOA) from URG3000N

PTFE Filter – XRF analysis measures Sulfur
Nylon Filter – IC analysis measures Sulfate

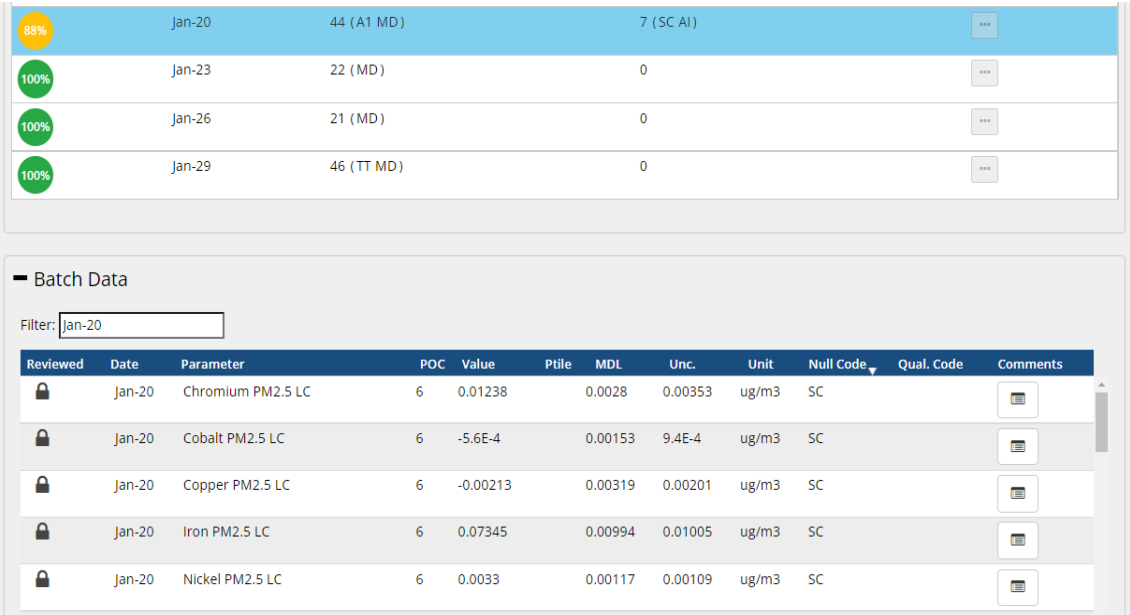
- Discrepancies can indicate possible issue with sampling or analysis.

PTFE Filter – HIPS analysis measures Absorption (Fabs)
Quartz Filter – TOA analysis measures EC

- Discrepancies can indicate possible issue with sampling or analysis.

New Things: Intermittent Sampler Contamination

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



Completion	Date	Count	Code	Action
88%	Jan-20	44 (A1 MD)	7 (SC AI)	...
100%	Jan-23	22 (MD)	0	...
100%	Jan-26	21 (MD)	0	...
100%	Jan-29	46 (TT MD)	0	...

Batch Data

Filter:

Reviewed	Date	Parameter	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
🔒	Jan-20	Chromium PM2.5 LC	6	0.01238	0.0028	0.00353	ug/m3	SC			📄
🔒	Jan-20	Cobalt PM2.5 LC	6	-5.6E-4	0.00153	9.4E-4	ug/m3	SC			📄
🔒	Jan-20	Copper PM2.5 LC	6	-0.00213	0.00319	0.00201	ug/m3	SC			📄
🔒	Jan-20	Iron PM2.5 LC	6	0.07345	0.00994	0.01005	ug/m3	SC			📄
🔒	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.

New Things: Invalid Br & Cl

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

Batch Data

Filter:

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 are invalidated with 'AL – Voided by Operator' AQS null code.

No action is required from SLT Validator.

New Things: AI & CI XRF Issue

Some Aluminum and Chlorine measurements are affected by intermittent lab/instrument issues; investigation is ongoing and data will be handled accordingly.

100%	Dec-21	46 (TT MD 4)	0	...
100%	Dec-24	46 (TT MD 5 4)	0	...
100%	Dec-27	46 (TT MD 5 4)	0	...
100%	Dec-30	26 (MD)	0	...

Batch Data

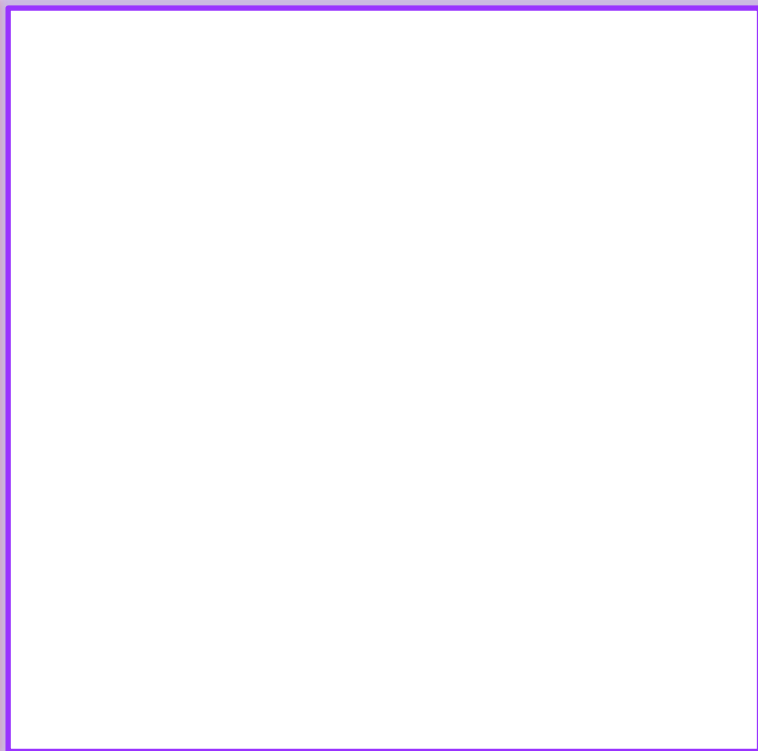
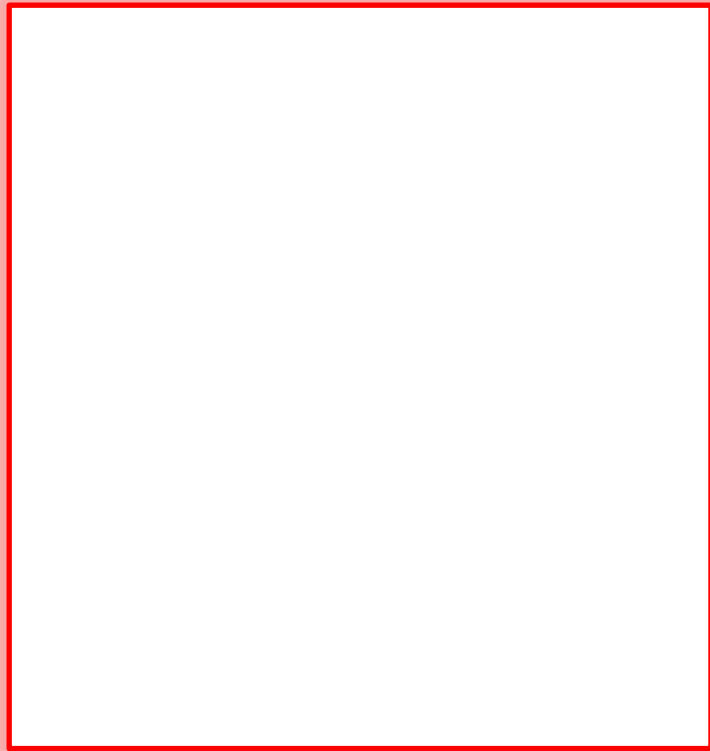
Filter:

Reviewed	Date	Parameter	POC	Value	Ptile	MDL	Unc.	Unit	Null Code	Qual. Code	Comments
	Dec-21	Aluminum PM2.5 LC	5	0.43104	100	0.02751	0.07682	ug/m3		TT, 4	
	Dec-21	Chlorine PM2.5 LC	5	0.55149	63	0.00432	0.18135	ug/m3		TT, 4	
	Dec-21	Reconstructed Mass PM2.5 LC	5	2.8773	51	0.70393	0.47655	ug/m3		TT, 4	
	Dec-21	Soil PM2.5 LC	5	1.22077	96	0.08449	0.17275	ug/m3		TT, 4	
	Dec-21	Sulfur PM2.5 LC	5	0.04966	4	3.1E-4	0.00269	ug/m3		TT, 4	

Species flagged with '4 – Lab Issue' qualifier include:
Aluminum, Chlorine, Phosphorus, Sulfur and Silicon, as well as parameters calculated using these species. (e.g.. Soil and Reconstructed mass)

No action is required from SLT Validator.

CSN Data Validation in DART: final notes



Q & A

CSN AND DART SUPPORT

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



UC DAVIS

AIR QUALITY RESEARCH CENTER

STi
Sonoma Technology, Inc.

Acknowledgements

EPA

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

Thank you!

Alex Murrain

ammurrain@ucdavis.edu

Jennifer DeWinter

jdewinter@sonomatech.com

CSNsupport@sonomatech.com

Appendix: DART and Data Validation Resources

Users' Guides		
Data Validation	https://airquality.ucdavis.edu/sites/g/files/dgvnsk1671/files/inline-files/ValidationGuide_v2.0_update_20190916_0.pdf	Data Validation for CSN
	https://airquality.ucdavis.edu/sites/g/files/dgvnsk1671/files/inline-files/QuickReferenceGuide_v2.0.pdf	Quick Reference Guide
DART	https://dart.sonomatech.com/	Accessible only to CSN Data Validators with DART account

Webinars		
Data Validation & DART – June 2020	Webinar video https://www.youtube.com/watch?v=f0lo1-OUMVw	
	Webinar slides https://www.epa.gov/system/files/documents/2021-09/csn_webinar_aug2021_final_qa_0.pdf	

NAAMC Data Validation Training		
2018	https://projects.erg.com/conferences/ambientair/conf18/Young_Chemical%20Speciation%20Network.pdf	

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

Appendix: Sampler QC Checks and Data Validation

	Acceptance Criteria	Impact on Validation*	Parameters
Monthly Flow Rate Verification	± 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
Monthly Leak Check – SASS or SuperSASS	≤0.1 L/min	Use "AS" null data qualifier – Poor Quality Assurance Results; troubleshoot sampler	Species by channel/filter
Monthly Leak Check – URG3000N	<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
Ambient Temperature (°C)	± 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
Ambient Pressure (mmHg)	± 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