DART Training for PAMS and CSN
(Data Analysis and Reporting Tool for Photochemical Assessment Monitoring Station and Chemical Speciation Network Data)

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Outline for Training Session

• DART overview
  – Accessing and navigating DART
  – Bringing data into DART
• Using DART as part of the new CSN data review process (with live demo)
• Using DART for PAMS (and other) data validation and analysis (with live demo)
• Future enhancements
• Q&A
• DART is a web-based data validation and analysis tool that allows monitoring agencies to manage, explore, validate, and flag data.
• DART includes automated screening, statistical summaries, and AQS-formatted data.
DART Features

• Manage data
  – Upload data files for validation
  – Request data from AQS
  – Convert units
  – Aggregate data
DART Features

• Explore data
  – Create time-series plots
  – Edit data
  – Create scatter plots
  – Create bar plots
DART Features

- Validate data
  - Screen data
  - “DART Smarts”

- Export data
  - Create AQS-ready files
  - Obtain summary statistics
Accessing DART
http://www.airnowtech.org

Requires an AirNow-Tech account
Navigating DART

Welcome to DART

DART is your personal platform for air quality data validation and analysis. You can upload your own air quality data or request it from AGS Data Mart. Create graphs and use custom screening checks for data validation. And use the DART export to prepare data for AGS submission. Watch an introductory webinar on DART from May 2015 here.

Here's how to get started...
Bringing Data into DART

Three ways to add data to DART

1. Upload data files from your computer
   - AQS format
   - CSV format
   - TX0 format

2. Request data from AQS

3. Receive data automatically from a laboratory transfer
   - Currently available for CSN data from UC Davis (UCD)
Bringing Data into DART

Choose "Upload" or "AQS Request"

Click the "add data" link from the "Manage" page
Your Data in DART

When you upload your PAMS (or other) data, or make an AQS Request:

- Currently, it’s unique to you
- In future, you will be able to share your data within your agency (and potentially with other AirNow-Tech users)
Your Data in DART

CSN data from UC Davis are available to approved CSN validators in your agency.

Agency data table with CSN data sets
CSN Data Review Process

1. UC Davis generates laboratory data; acquires mass data from continuous FEMs (as available) from AirNow-Tech.
2. UCD conducts data validation (details on next slide).
3. UCD sends the data batch to DART.
4. DART ingests the batch data, then automatically alerts CSN data reviewers (details on following slides) that data are available in DART.
5. CSN data reviewers then have 30 days to review and approve the data.
6. After 30 days, the data are sent back to UCD for final review and submission to AQS.
**UCD** sends data to **DART**

**Data Validation Contacts** are informed electronically of data available for review (30-day window)

**Data Validation Contacts** review data and any suggested flags in **DART**

**Data Validation Contacts** approve data, or suggest additional/different flagging, with option to include comments to **UCD**

**UCD** makes any necessary changes to the data and uploads the data to **AQS**
CSN Data Validators

- One agency is responsible for data validation for each site (e.g., New York DEC reviews Rochester site data).
- For each site, EPA provided a list of data validators and their associated agency.
- All listed data validators for an individual agency have access to the agency data in DART; they do not have access to data that are not for their agency.
- Once data are available in DART for review, the data validators will be contacted automatically via email.
CSN Data Review in DART

• Once data are in DART, validators have 30 days to review and approve the CSN batch.

• DART provides summary statistics
  – flags and comments that UCD applied
  – other data characteristics (percent complete, percent above detection limit, etc.)

• In DART, validators can flag and comment on data for UCD to review, and use sortable tables to review the CSN batch.

• Time-series and bar plots are linked to the data table so validators can also graph the data.
CSN Data Review in DART

From: Dart Email Notification [mailto:noreply@airnowtech.org]
Sent: Friday, June 24, 2016 10:33 AM
To: Angela L. Ekstrand
Subject: Current batch of CSN data expires in 14 days!

Dear DART User,

Please disregard this email if you have already completed your review.

You currently have a batch of CSN data waiting for you to approve in DART. These data are available until 11:59 pm on Saturday, July 23, 2016; upon expiration, the data are returned to the laboratory and submitted to AQS.

Your current batch has 2 sites.

QUEENS COLLEGE 2 (360810124) has 14 samples from 11/20/2015 00:00:00 to 12/29/2015 00:00:00.

PINNACLE STATE PARK (361010003) has 14 samples from 11/20/2015 00:00:00 to 12/29/2015 00:00:00.

Please email CSNsupport@sonomatech.com if you have questions or trouble accessing your data.

Thanks,
DART Support Team
CSN Data Review in DART

### New York Dept. of Environmental Conservation Data Sets

<table>
<thead>
<tr>
<th>Date Received</th>
<th>Type</th>
<th>Data Set Name</th>
<th>Date Range (LST)</th>
<th>Data Status</th>
<th>Download</th>
<th>Approval Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/27/2016</td>
<td>Lab - CSN</td>
<td>36001005 CSN Data</td>
<td>11/26/2015 - 12/26/2015</td>
<td>Ready for use</td>
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<td>Lab - CSN</td>
<td>360050110 CSN Data</td>
<td>11/20/2015 - 12/29/2015</td>
<td>Ready for use</td>
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<td>06/27/2016</td>
<td>Lab - CSN</td>
<td>360290005 CSN Data</td>
<td>11/26/2015 - 12/28/2015</td>
<td>Ready for use</td>
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<td>06/27/2016</td>
<td>Lab - CSN</td>
<td>360310003 CSN Data</td>
<td>11/26/2015 - 12/28/2015</td>
<td>Ready for use</td>
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<td>Lab - CSN</td>
<td>360810124 CSN Data</td>
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<td>06/27/2016</td>
<td>Lab - CSN</td>
<td>361010003 CSN Data</td>
<td>11/20/2015 - 12/29/2015</td>
<td>Ready for use</td>
<td></td>
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</table>

*Approval Mode for review of data from the lab*
**CSN Data Review in DART**

<table>
<thead>
<tr>
<th>Date</th>
<th>Species</th>
<th>Total Qualifiers</th>
<th>Total Null Codes</th>
<th>Data Completeness</th>
<th>Data Above Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/07/2016</td>
<td>47</td>
<td>32</td>
<td>11</td>
<td>77%</td>
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<tr>
<td>01/13/2016</td>
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<td>45</td>
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<td>98%</td>
<td>34%</td>
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<tr>
<td>01/19/2016</td>
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<td>28</td>
<td>1</td>
<td>98%</td>
<td>40%</td>
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<tr>
<td>01/25/2016</td>
<td>47</td>
<td>26</td>
<td>1</td>
<td>98%</td>
<td>45%</td>
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<tr>
<td>01/31/2016</td>
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<td>1</td>
<td>98%</td>
<td>36%</td>
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<tr>
<td>02/06/2016</td>
<td>47</td>
<td>25</td>
<td>1</td>
<td>98%</td>
<td>47%</td>
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</tbody>
</table>

**Flag as reviewed**

- **Review by** Date

[Image of a screenshot showing a data review interface with highlighted features: Batch Created: 07/29/2016 - Review By: 08/28/2016 23:59, Batch Data, and flagging options for reviewed data.]
CSN Data Review in DART

- Apply null or qualifier codes
- Changes and comments log
CSN Data Review in DART

Click on row in batch table to update the time-series graph

Data point for the selected row is circled in black
CSN Data Review in DART

FINGERPRINT PLOT

Regular Fingerprint
CSN Data Review in DART

Logarithmic Y-Axis
CSN Data Review in DART

FINGERPRINT PLOT

ROCHESTER 2

Select All
Select All CSN Species
Sort by CSN

Filter by Nylon
Filter by Quartz
Filter by Teflon

OC PM2.5 LC Tor
EC PM2.5 LC Tor
Sodium PM2.5 LC
Calcium PM2.5 LC
Zinc PM2.5 LC
Copper PM2.5 LC
Manganese PM2.5 LC
Barium PM2.5 LC
Zirconium PM2.5 LC
Cobalt PM2.5 LC
Rubidium PM2.5 LC
Sulfate PM2.5 LC
Sulfur PM2.5 LC
Iron PM2.5 LC
Chlorine PM2.5 LC
Magnesium PM2.5 LC
Bromine PM2.5 LC
Lead PM2.5 LC
Cesium PM2.5 LC
Arsenic PM2.5 LC
Phosphorus PM2.5 LC
Total Nitrate PM2.5 LC
Sodium Ion PM2.5 LC
Potassium PM2.5 LC
Aluminum PM2.5 LC
Antimony PM2.5 LC
Titanium PM2.5 LC
Indium PM2.5 LC
Nickel PM2.5 LC
Vanadium PM2.5 LC
Selenium PM2.5 LC
Ammonium PM2.5 LC
Silicon PM2.5 LC
Chloride PM2.5 LC
Chromium PM2.5 LC
Tin PM2.5 LC
Cadmium PM2.5 LC
Silver PM2.5 LC
Strontium PM2.5 LC
Cesium PM2.5 LC

Date Range
01/01/2016

Update Graph
Transition To PAMS Training
Time-Series Graphs

TIME SERIES

My Sample Data Set – Acetylene (ppbC) 1 Hr POC: 6 10.02
Qualifier Code(s):
Null Code:

Values

12/9/11 06:00
12/10/11 06:00
12/11/11 06:00

My Sample Data Set – Acetylene (ppbC) 1 Hr POC: 6 – My Sample Data Set – Benzene (ppbC) 1 Hr POC: 6

Date Range

12/09/2011 00:00 to 12/11/2011 00:00

Fixed Y Axis 1

0 17.5

Update Graph
Scatter Plots
Stacked Bar Charts
## Auto-Validation: Screening

<table>
<thead>
<tr>
<th>Check</th>
<th>Fails If ...</th>
<th>DART Smarts Action If Check Fails</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abundant Species</td>
<td>Any of Benzene, Propane, N-Butane, Isoprene, N-Hexane, Ethylbenzene are missing or 0</td>
<td>If two or more species missing or = 0, flag sample with code “AQ”</td>
</tr>
</tbody>
</table>
| TNMOC             | -TNMOC is missing or 0; or -Unidentified exceeds 50% of TNMOC; or -Sum of PAMS exceeds TNMOC                                                                                                                                 | -Flag TNMOC and Unidentified with code “AN”  
                      |                                                                                                                                             | -Flag Unidentified with code “DA”  
                      |                                                                                                                                             | -Flag TNMOC and Sum of PAMS with code “DA”                                                                                   |
| Variability       | Species concentration exceeds the mean + 4*standard deviation                                                                                                                                                  | None                                                                                                                     |
| Sticking          | Species has same non-zero value for 3 or more consecutive samples                                                                                                                                               | Flag species with code “DA”                                                                                               |
| Benzene : Toluene | Benzene exceeds 0.2 and exceeds Toluene                                                                                                                                                                      | Flag Benzene and Toluene with code “DA”                                                                                   |
| Ethylene : Ethane | Ethylene exceeds 0.5 and exceeds Ethane                                                                                                                                                                       | Flag Ethylene and Ethane with code “DA”                                                                                   |
| Propylene : Propane | Propylene exceeds 0.5 and exceeds Propane                                                                                                                                                                    | Flag Propylene and Propane with code “DA”                                                                                   |

*All checks done in ppbC. AQ = collection error; AN = machine malfunction; DA = aberrant data; BH = interference/coelution/misidentification.*
## Auto-Validation: Screening

<table>
<thead>
<tr>
<th>Check</th>
<th>Fails If ...</th>
<th>DART Smarts Action If Check Fails</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-Xylene : M/P Xylene</td>
<td><strong>O-Xylene</strong> exceeds 0.5 and exceeds <strong>M/P Xylene</strong></td>
<td>Flag <strong>Xylenes</strong> with code “DA”</td>
</tr>
<tr>
<td>Methylpentanes</td>
<td><strong>3-Methylpentane</strong> exceeds 0.1 and exceeds <strong>0.6*2-Methylpentane</strong></td>
<td>If <strong>3-Methylpentane</strong> exceeds 0.1 and exceeds <strong>0.65*2-Methylpentane</strong>, then flag <strong>Methylpentanes</strong> with code “BH”</td>
</tr>
<tr>
<td>Undecane : Decane</td>
<td><strong>N-Undecane</strong> exceeds 0.5 and exceeds <strong>N-Decane</strong></td>
<td>Flag <strong>N-Undecane</strong> and <strong>N-Decane</strong> with code “DA”</td>
</tr>
<tr>
<td>Olefins : Paraffins</td>
<td><strong>Sum of Olefins</strong> exceeds <strong>Sum of Paraffins</strong></td>
<td>Flag <strong>Olefins</strong> and <strong>Paraffins</strong> with code “DA”</td>
</tr>
<tr>
<td>Carbon Tetrachloride</td>
<td><strong>Carbon Tetrachloride</strong> exceeds 0.16 ppb</td>
<td>Flag <strong>Carbon Tetrachloride</strong> with code “AQ”</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td><strong>Formaldehyde</strong> is less than 0.3 ppb</td>
<td>None</td>
</tr>
<tr>
<td>Nighttime Isoprene</td>
<td><strong>Isoprene</strong> increases between 8 pm and 3 am local time</td>
<td>Flag <strong>Isoprene</strong> with code “DA”</td>
</tr>
</tbody>
</table>

All checks done in ppbC, except carbon tetrachloride and formaldehyde checks, which use ppb. AQ = collection error; AN = machine malfunction; DA = aberrant data; BH = interference/coelution/misidentification.
Auto-Validation: Workflow

1. Select Screening Level
   - Basic
     Level 0-1
   - Intermediate
     Level 2
     Coming soon
   - Advanced
     Level 3
     Coming soon

2. Select Data
   - Select a task group
   - Enable DART Smarts
   - Select data set
   - Select site from User File 1

Set up custom screening checks
### Validation Sessions

<table>
<thead>
<tr>
<th>Task Group Name</th>
<th>Data Set</th>
<th>Site</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAMS Basic</td>
<td>My Sample Data</td>
<td>LIVERMORE - RINCON</td>
<td></td>
</tr>
</tbody>
</table>

#### Create New Task Group

1. **Check type**
   - **Abundant Species**
   - **Benzene**
   - **Ethylbenzene**
   - **Isoprene**
   - **N-Butane**
   - **N-Hexane**
   - **Propane**
   - **Check nickname**: Abundant Species
   - **Apply null code?**: No null code
   - **Fails when**:
     - Benzene
     - Ethylbenzene
     - Isoprene
     - N-Butane
     - N-Hexane
     - Propane
   - **Apply null code?**
     - Applies to whole sample for a failed hour
     - **Check nickname**: Abundant Species

2. **Check type**
   - **TNMOC**
   - **Check nickname**: TNMOC
   - **Apply null code?**
     - **Check nickname**: TNMOC
     - **Apply null code?**
     - AN
     - **Fails when**:
       - TNMOC
       - TNMOC
       - TNMOC
       - **Check nickname**: TNMOC

3. **Check type**
   - **Variability**
   - **Check nickname**: Variability
   - **Apply null code?**
     - **Check nickname**: Variability
     - **Apply null code?**
     - DA
     - **Fails when**:
       - 1,2,3-Trimethylbenzene
       - 1,2,4-Trimethylbenzene
       - 1,3,5-Trimethylbenzene
       - 1-Butene
       - 1-Pentene
       - 2,2,4-Trimethylpentane
       - **Check nickname**: Variability

- **Check nickname**: Variability
- **Apply null code?**
- **Fails when**:
  - Average
  - **Check nickname**: Variability
  - **Apply null code?**
- **Fails when**:
  - Average
  - **Check nickname**: Variability
  - **Apply null code?**
Auto-Validation: Workflow

![DART Auto-Validation Workflow](image-url)

### Summary

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Site</th>
<th>Total Samples</th>
<th>Passes</th>
<th>Missing</th>
<th>Failures</th>
<th>Null Codes</th>
<th>Date Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Sample Data Set</td>
<td>LIVERMORE - RINCON</td>
<td>562</td>
<td>0</td>
<td>376</td>
<td>420</td>
<td>455</td>
<td>11/18/2011 - 12/10/2011</td>
</tr>
</tbody>
</table>

### Summary

<table>
<thead>
<tr>
<th>Date Time (LST)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
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<td><img src="image-url" alt="Flag" /></td>
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Auto-Validation: Workflow
4.1.2 Agency Data Sets from a Laboratory

In addition to ingesting file uploads and AQS requests, DART can ingest data directly from an air quality laboratory. Data from a laboratory can be provided to DART via File Transfer Protocol (FTP) and are automatically made available in the correct DART user accounts.

Currently, PM$_{2.5}$ speciation data collected as part of the Chemical Speciation Network (CSN) program are transferred to DART from the Crocker Nuclear Laboratory at the University of California, Davis. CSN data are listed in the **Agency** table on the **Manage** screen, in the DART user accounts that are registered to the appropriate agency. Data are received from the laboratory in batches and are available for review and validation using the DART **Approval Mode** screen.

- View the date of the most recent batch from the laboratory.
- Click the icon to enter Approval Mode and review data from the laboratory.
- View the data set name; each data set includes data for one monitoring site.
- Note the green check mark for data that do not require review.
Getting Help

Feedback button

[Image of a web page showing a scatter plot with data points and options for highlighting, pen, note, blackout, arrow, and pixel ruler. There is also a feedback button with a QR code and a note about adding comments.]

[Website shown with options: Dashboard, Data, Navigator, Forecasts, Polling, Notifier, Tools, Help. The page is for DART with a scatter plot showing data for 1,2,3-Trimethylbenzene and 1,2,4-Trimethylbenzene.]
# Important CSN Contacts

CSNsupport@sonomatech.com

<table>
<thead>
<tr>
<th>Role</th>
<th>Contact</th>
<th>Phone Number</th>
<th>Email</th>
</tr>
</thead>
<tbody>
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<td></td>
<td><a href="mailto:steveb@sonomatech.com">steveb@sonomatech.com</a></td>
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</tbody>
</table>

## CSN Regional Representatives

- **R1** - Alan VanArsdale & Catie Taylor
- **R2** – Mazeeda Khan
- **R3** – Lori Hyden
- **R4** – Keith Harris
- **R5** – Scott Hamilton
- **R6** – Frances Verhalen
- **R7** – Leland Grooms
- **R8** – Joshua Rickard
- **R9** – Anna Mebust & Dena Vallano
- **R10** – Chris Hall & Keith Rose
Potential New DART Features

- Interactive map for Data Mart AQS requests
- Suite of automated screening checks for air toxics, CSN data
- Compare site data to national statistics
- New analyses and plot types
Potential New DART Features

- Plot concentrations with MDL values
- Plot concentrations with annual averages
- Support for more import file formats
- Connection to AirNow-Tech features
- Pollution and wind roses
Potential CSN Features in DART

- Plot concentrations with MDL values
- Plot concentrations with annual averages
- Compare site data to national statistics
- Stacked bar and scatter plots in approval mode
- Pollution and wind roses
Acknowledgments

• Joann Rice, CSN Program Support, EPA
• National Association of Clean Air Agencies Steering Committee
• Nick Mangus and Robert Coats, AQS Support, EPA
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