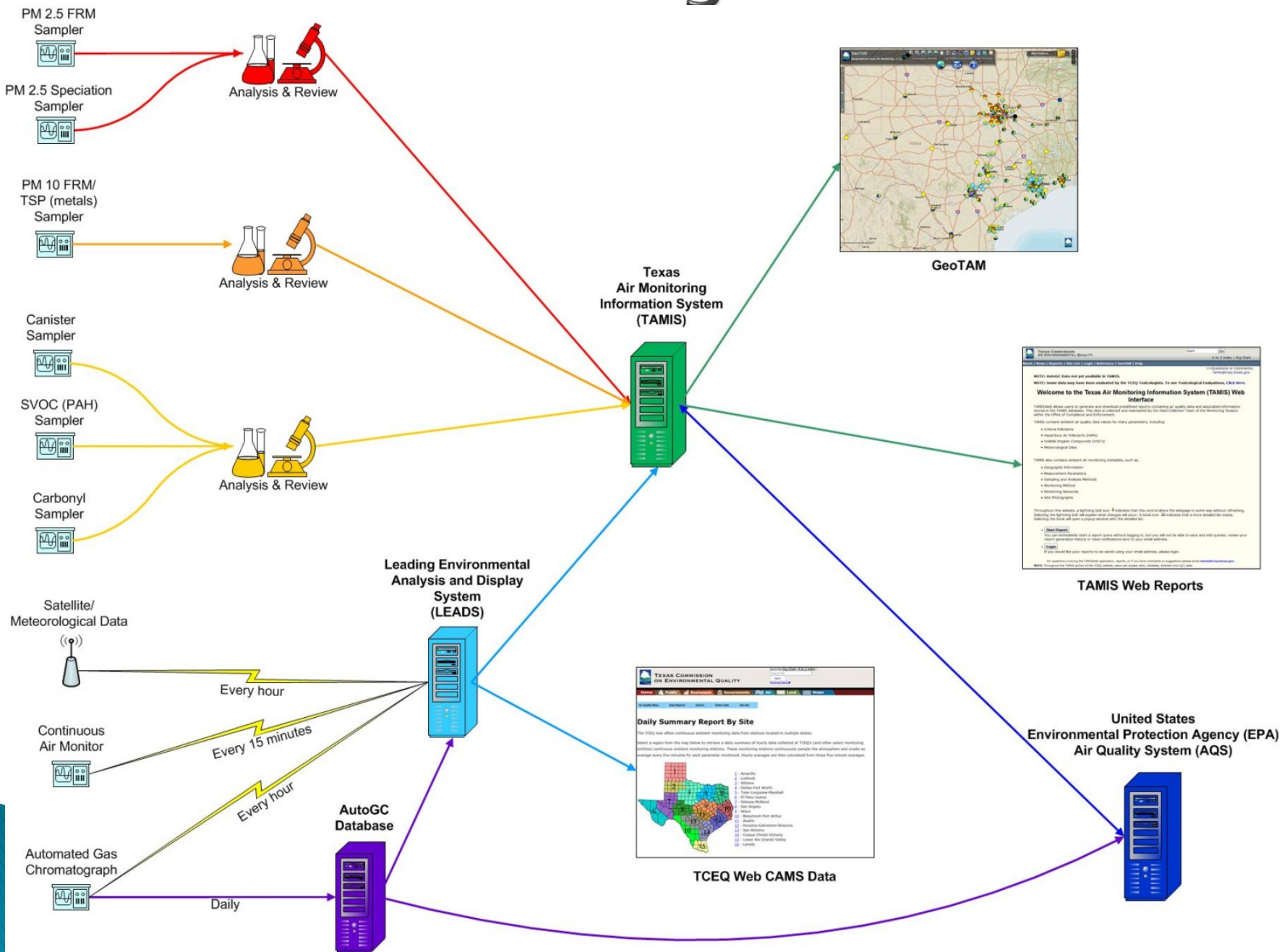
# Air Monitoring Data Flow Overview

James Janysek, TCEQ

# Texas Commission on Environmental Quality

- TCEQ collects, ingests, displays, validates, and reports data from a variety of air monitors
  - Continuous Gaseous (e.g., ozone, carbon monoxide)
    - Includes automated calibration and quality control checks
  - Continuous Meteorological (e.g. wind speed/direction, outdoor temperature)
    - No automatic quality control checks
  - Non-Continuous (e.g., $PM_{2.5}$ & $PM_{10}$ filter-based mass)

# Air Monitoring Data Flow



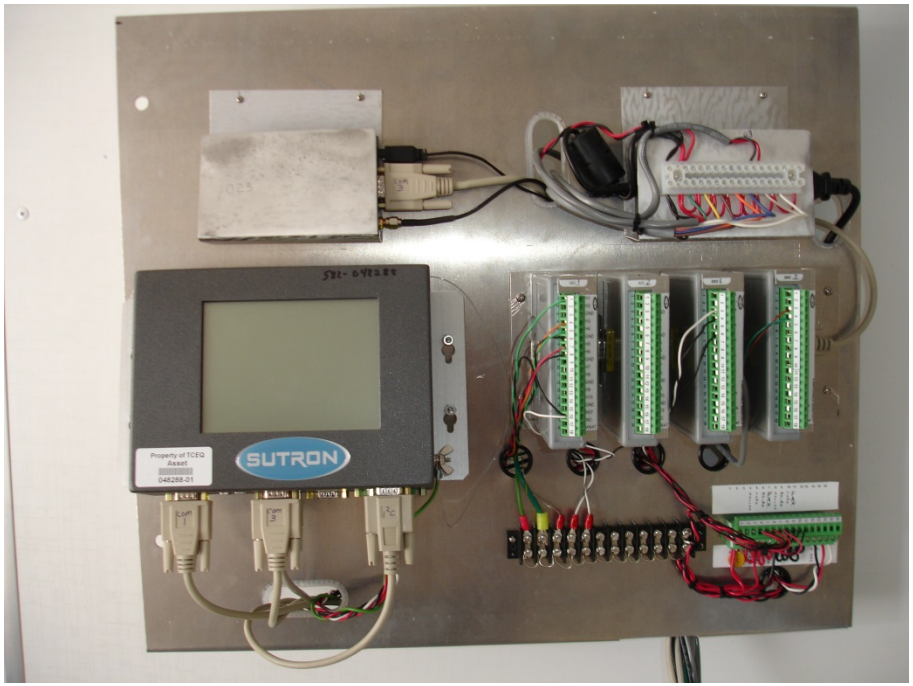
# Data for Non-Continuous Parameters

- Filters and/or samples are picked up from the air monitoring site and sent to a lab
- The lab analyzes the sample and submits the data electronically to the TCEQ in a standardized text file format.
- TCEQ loads the file to the Texas Air Monitoring Information System (TAMIS) and/or the United States Environmental Protection Agency's (EPA) Air Quality System (AQS).

# Continuous Parameters Data

- The MeteoStar Leading Environmental Analysis and Display System (LEADS®) collects and preliminarily analyzes continuously collected data.

# Data Collection

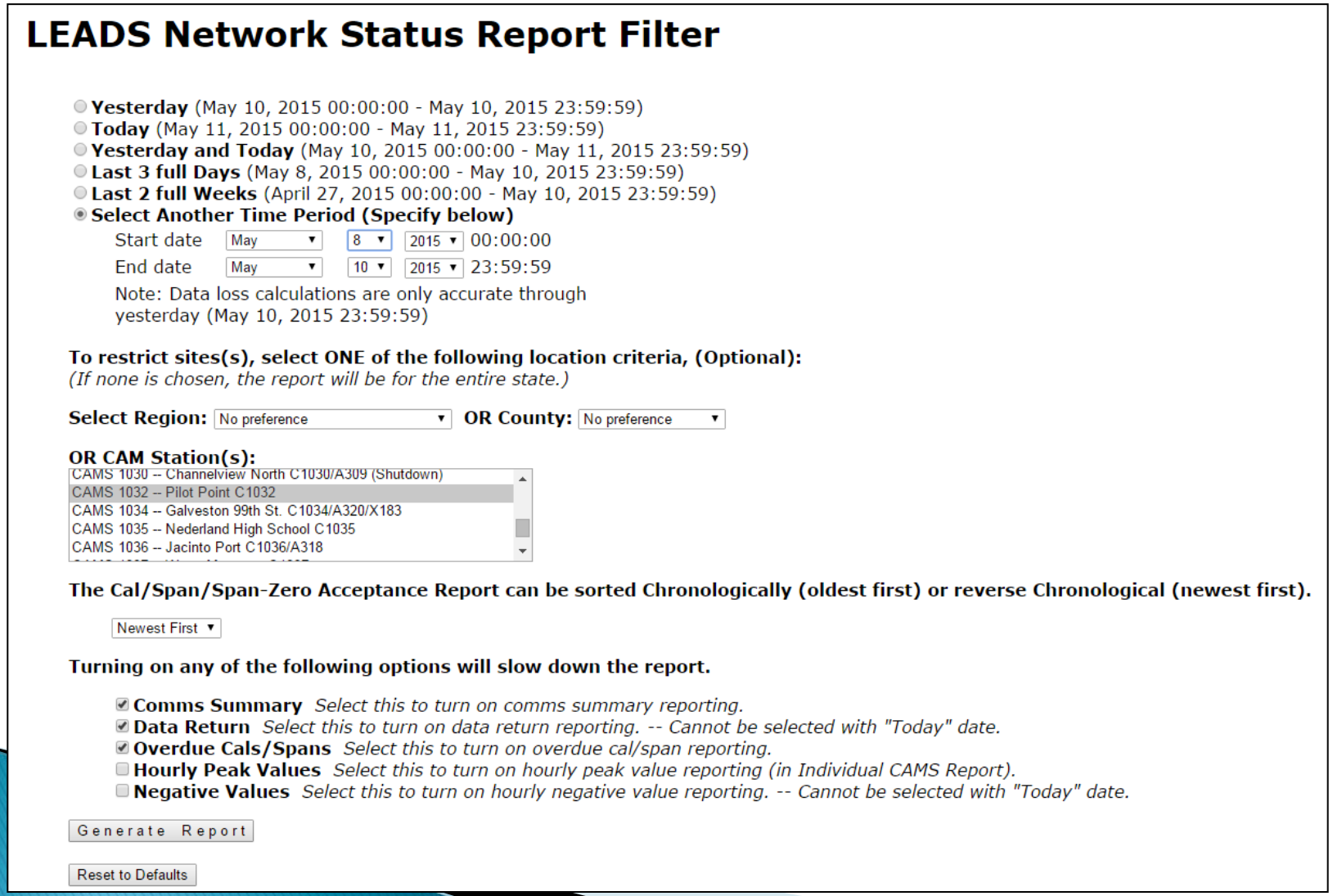



- Every 15 minutes, LEADS® collects the data from each site's data logger.
- Data collection uses one or more of the following:
  - wireless
  - wired

*Does not include AutoGC-related parameters

# Network Status Report

- Provides a summary of automatic quality control results, communication problems, and high value alerts.



## LEADS Network Status Report Filter

- **Yesterday** (May 10, 2015 00:00:00 - May 10, 2015 23:59:59)
- **Today** (May 11, 2015 00:00:00 - May 11, 2015 23:59:59)
- **Yesterday and Today** (May 10, 2015 00:00:00 - May 11, 2015 23:59:59)
- **Last 3 full Days** (May 8, 2015 00:00:00 - May 10, 2015 23:59:59)
- **Last 2 full Weeks** (April 27, 2015 00:00:00 - May 10, 2015 23:59:59)
- **Select Another Time Period (Specify below)**

Start date May 8 2015 00:00:00

End date May 10 2015 23:59:59

Note: Data loss calculations are only accurate through yesterday (May 10, 2015 23:59:59)

**To restrict sites(s), select ONE of the following location criteria, (Optional):**
*(If none is chosen, the report will be for the entire state.)*

**Select Region:** No preference **OR County:** No preference

**OR CAM Station(s):**

CAMS 1030 -- Channelview North C1030/A309 (Shutdown)
CAMS 1032 -- Pilot Point C1032
CAMS 1034 -- Galveston 99th St. C1034/A320/X183
CAMS 1035 -- Nederland High School C1035
CAMS 1036 -- Jacinto Port C1036/A318

**The Cal/Span/Span-Zero Acceptance Report can be sorted Chronologically (oldest first) or reverse Chronological (newest first).**

Newest First

**Turning on any of the following options will slow down the report.**

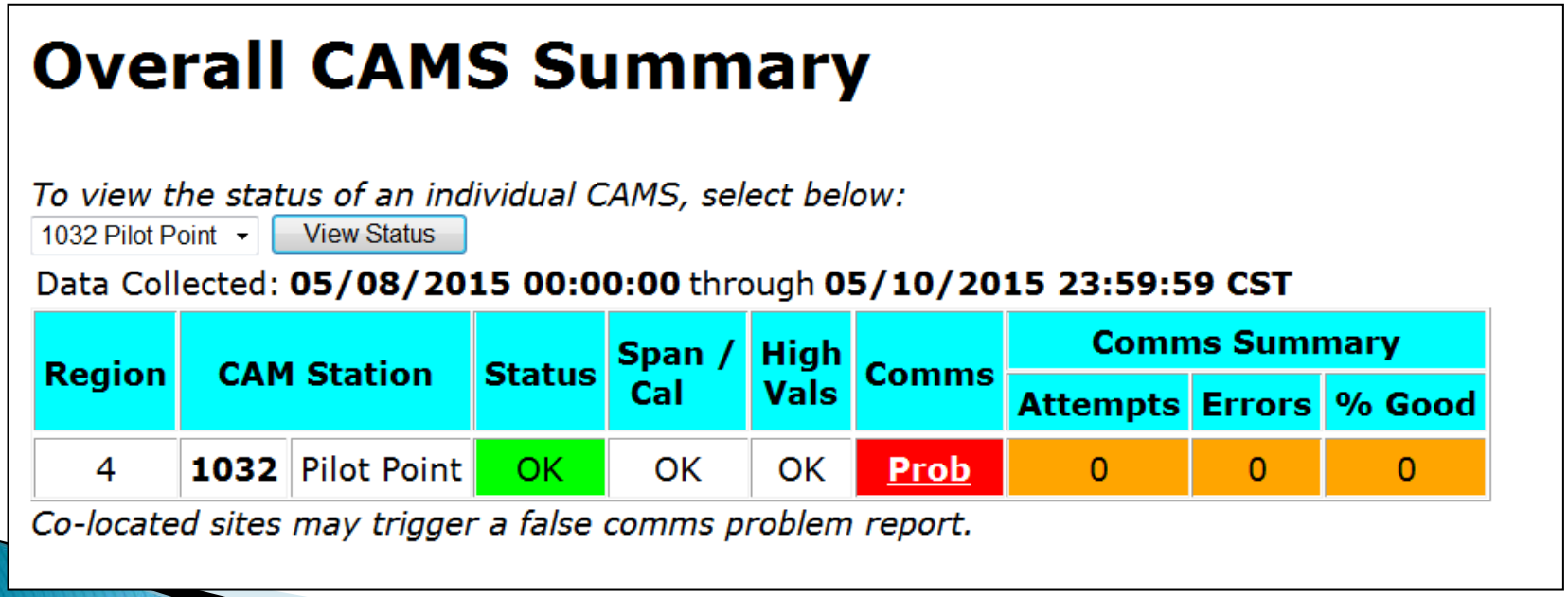
- ☑ **Comms Summary** *Select this to turn on comms summary reporting.*
- ☑ **Data Return** *Select this to turn on data return reporting. -- Cannot be selected with "Today" date.*
- ☑ **Overdue Cals/Spans** *Select this to turn on overdue cal/span reporting.*
- ☐ **Hourly Peak Values** *Select this to turn on hourly peak value reporting (in Individual CAMS Report).*
- ☐ **Negative Values** *Select this to turn on hourly negative value reporting. -- Cannot be selected with "Today" date.*

Generate Report

Reset to Defaults

# Network Status Reports

- Automatic quality control failures, communication issues, and high values are investigated by TCEQ personnel.



## Overall CAMS Summary

*To view the status of an individual CAMS, select below:*

1032 Pilot Point ▾ View Status

Data Collected: **05/08/2015 00:00:00** through **05/10/2015 23:59:59 CST**

| Region | CAM Station | | Status | Span / Cal | High Vals | Comms | Comms Summary | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Attempts | Errors | % Good |
| 4 | **1032** | Pilot Point | OK | OK | OK | **Prob** | 0 | 0 | 0 |

*Co-located sites may trigger a false comms problem report.*

# Communication Reports

- Detailed data collection attempts.

## Hub to Datalogger Comms Report For CAMS 1032 -- Pilot Point C1032

**Select a Comms Hub**

Rhcom | Select Comms Hub

**Select a CAMS** | **Days in Report**

CAMS 1032 -- Pilot Point C1032 | 3 | Generate Report

```
                    Communications Detail Report v6.0
                    Compiled May 11, 2015 at 15:28:13

CAMS    Date      Att Good Errs  Comp    Dial Busy  Ans Time Line Errs Zeno  Sys
1032 05/09/2015    96   40   56   42%       0    0    0    8    0    0   46    2
1032 05/10/2015    96    0   96    0%       0    0    2    1    0    0   91    2
1032 05/11/2015    62    1   61    2%       0    1    0    1    0    0   57    2
*** WARNING *** CAMS 1032 Overdue for phone call by more than 8 hours.
   02d 05h 24m 33s since last good connection made at 05/09/2015 10:03:40.

 Att = Number of calls attempted
Good = Number of calls successfully completed
Errs = Number of calls with errors
Comp = Percentage of successful calls
Dial = Regional Office phone line problem - No dial tone detected
Busy = Busy signal at CAMS station
 Ans = CAMS station modem did not answer
Time = Timeout during communications
Line = Poor phone line quality
Errs = Unidentified modem error
Zeno = Zeno not responding correctly (protocol error or non-response)
 Sys = System error (port locked, memory error, disk error, error in script)
```

# Operator Log Report

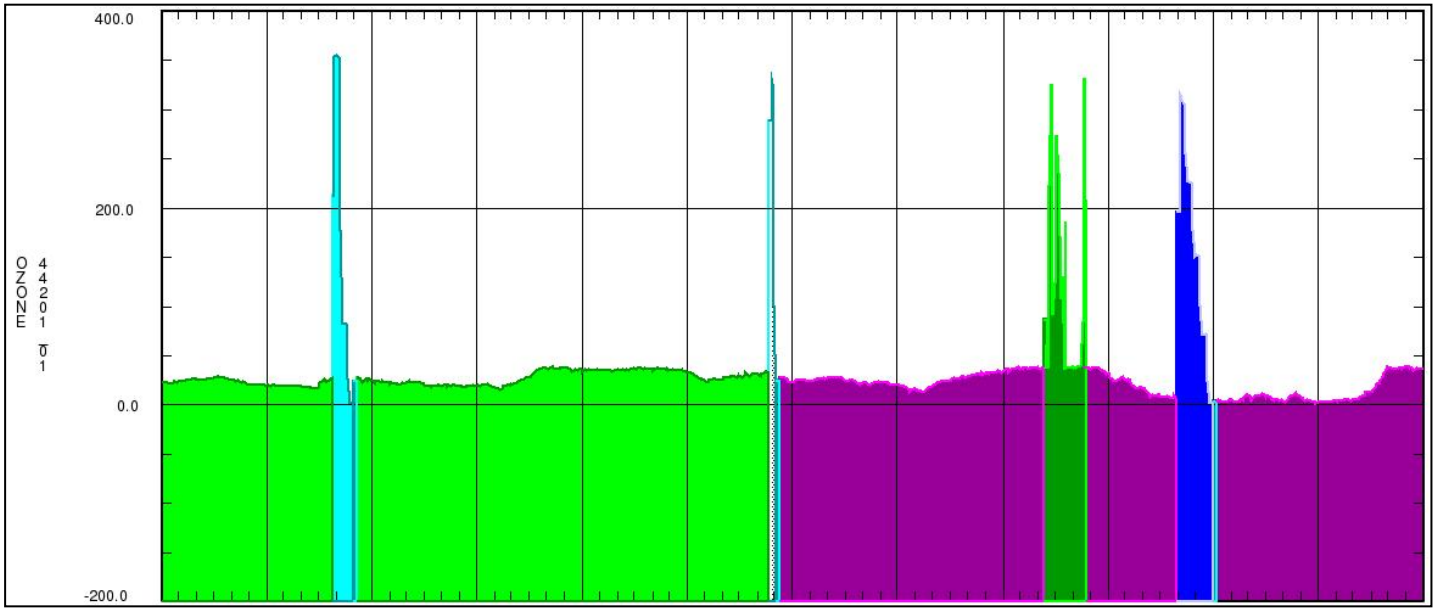
- Detailed activity at a site including maintenance, quality assurance/quality control activities, and system generated messages.

**Operator Logs for Italy C1044/A323**

| Date | Time (CST) | Operator | Visit Date | Log Entry |
|---|---|---|---|---|
| | | | | 05/05/2015 -- 05/12/2015 Italy C1044/A323 (48_139_1044) |
| Mon May 11, 2015 | 13:49:43 | | | Station Check. Reloaded the TEOM program bacause it was lost again due to a power outage. I emailed Paul Boydston this morning and he is sending me another UPS to see if it helps fix the issue. Cleared the error message on the SO2, O3, and NO analyzers due to power outage. PMI 4-360 complied with. SClements |
| Sat May 09, 2015 | 03:13:10 | | | Automatic time sync, |
| Thu May 07, 2015 | 14:13:36 | | | Station Check. TEOM Status before Monthly audit Status: OK; Mode: 4; Filter Load:23%; TEMPS:Case:50.0; Air:50.0; Cap:50.0; FLOWS: Main:3.00; Aux:13.67; Noise:0.044; Freq:249.40994. The TEOM lost it's program after completing the Monthly Verification. I reloaded it. I will contact Paul Boydston Monday to see what he'd like to do, if anything, to help fix this issue. Retrieved can #15158 and set toxic for 5-12-15 with can #N0415. Leak check passed. SClements |
| Tue May 05, 2015 | 03:13:07 | | | Automatic time sync, |

# Continuous Parameters Data

- Once the data is ingested into LEADS, it is available for review and validation.



# Continuous Parameters Data

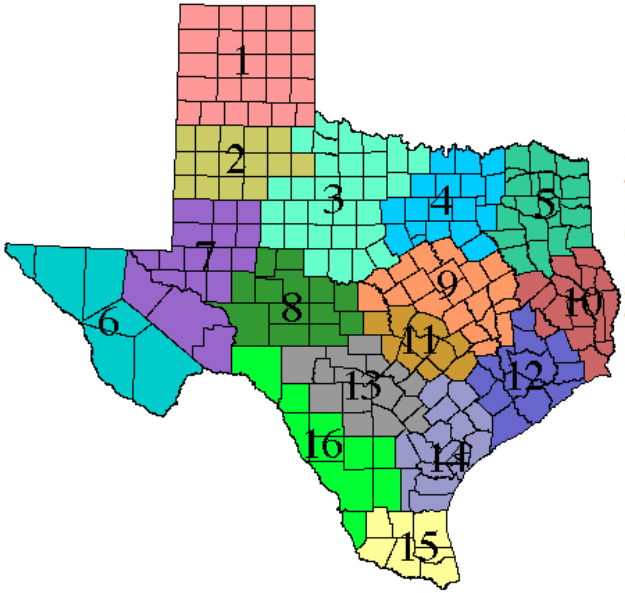
- In near-real time, the data collected by LEADS is made available on TCEQ's web pages:

http://www.tceq.texas.gov/agency/air_main.html

## Daily Summary Report by Site

The TCEQ now offers continuous ambient monitoring data from stations located at multiple sites.

Select a region from the map below to retrieve a daily summary of hourly data collected at continuous ambient monitoring stations operated by the TCEQ and partner authorities. These monitoring stations continuously sample the atmosphere and create an average every five minutes for each parameter monitored. Hourly averages are then calculated from these five-minute averages.

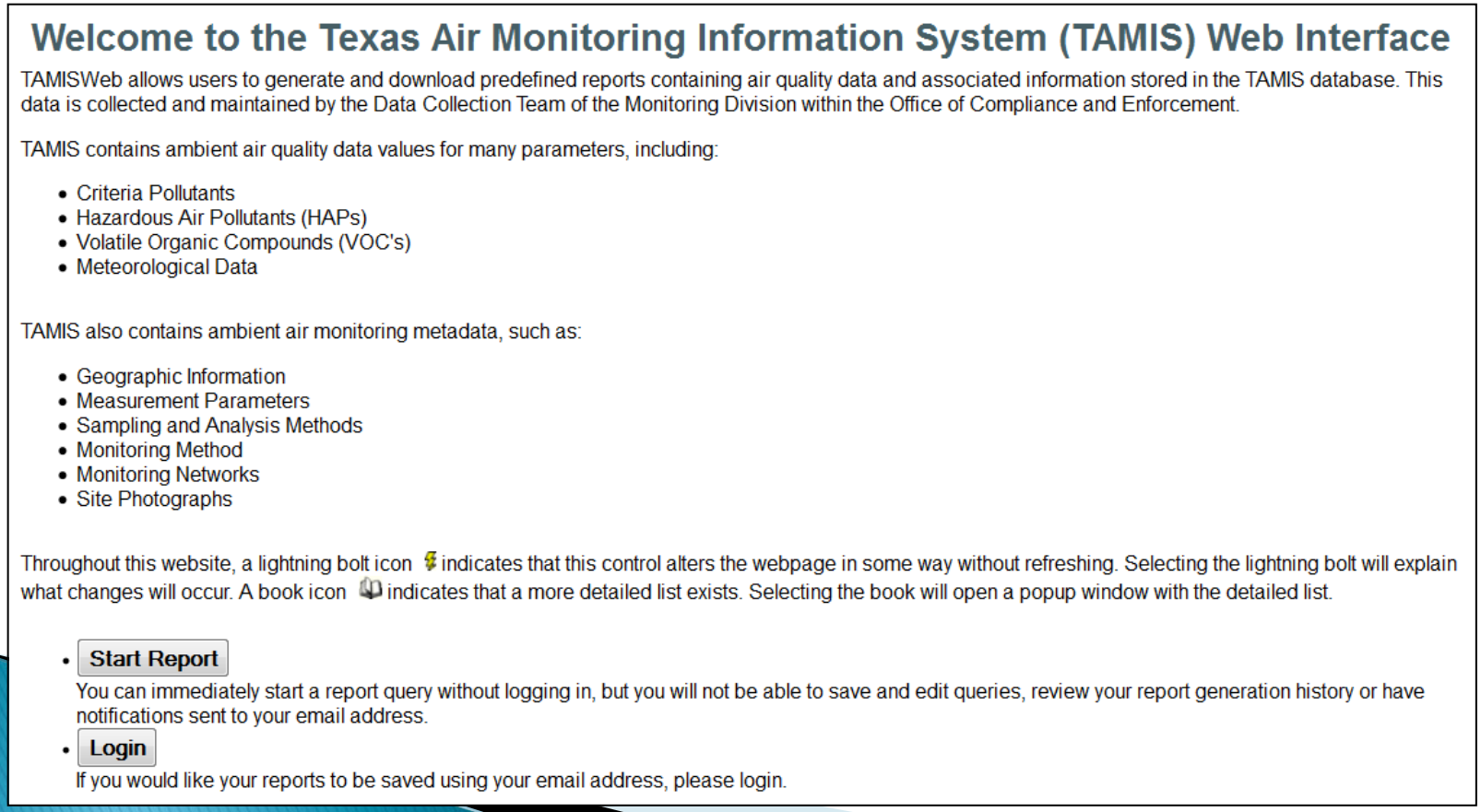



1 - Amarillo
2 - Lubbock
3 - Abilene
4 - Dallas-Fort Worth
5 - Tyler-Longview-Marshall
6 - El Paso-Juarez
7 - Odessa-Midland
8 - San Angelo
9 - Waco
10 - Beaumont-Port Arthur
11 - Austin
12 - Houston-Galveston-Brazoria
13 - San Antonio
14 - Corpus Christi-Victoria
15 - Lower Rio Grande Valley
16 - Laredo

# Continuous Parameters Data

- The validated data is available to the public online through TAMIS reports:

http://www17.tceq.texas.gov/tamis/index.cfm?fuseaction=home.welcome



## Welcome to the Texas Air Monitoring Information System (TAMIS) Web Interface

TAMISWeb allows users to generate and download predefined reports containing air quality data and associated information stored in the TAMIS database. This data is collected and maintained by the Data Collection Team of the Monitoring Division within the Office of Compliance and Enforcement.

TAMIS contains ambient air quality data values for many parameters, including:

- Criteria Pollutants
- Hazardous Air Pollutants (HAPs)
- Volatile Organic Compounds (VOC's)
- Meteorological Data

TAMIS also contains ambient air monitoring metadata, such as:

- Geographic Information
- Measurement Parameters
- Sampling and Analysis Methods
- Monitoring Method
- Monitoring Networks
- Site Photographs

Throughout this website, a lightning bolt icon indicates that this control alters the webpage in some way without refreshing. Selecting the lightning bolt will explain what changes will occur. A book icon indicates that a more detailed list exists. Selecting the book will open a popup window with the detailed list.

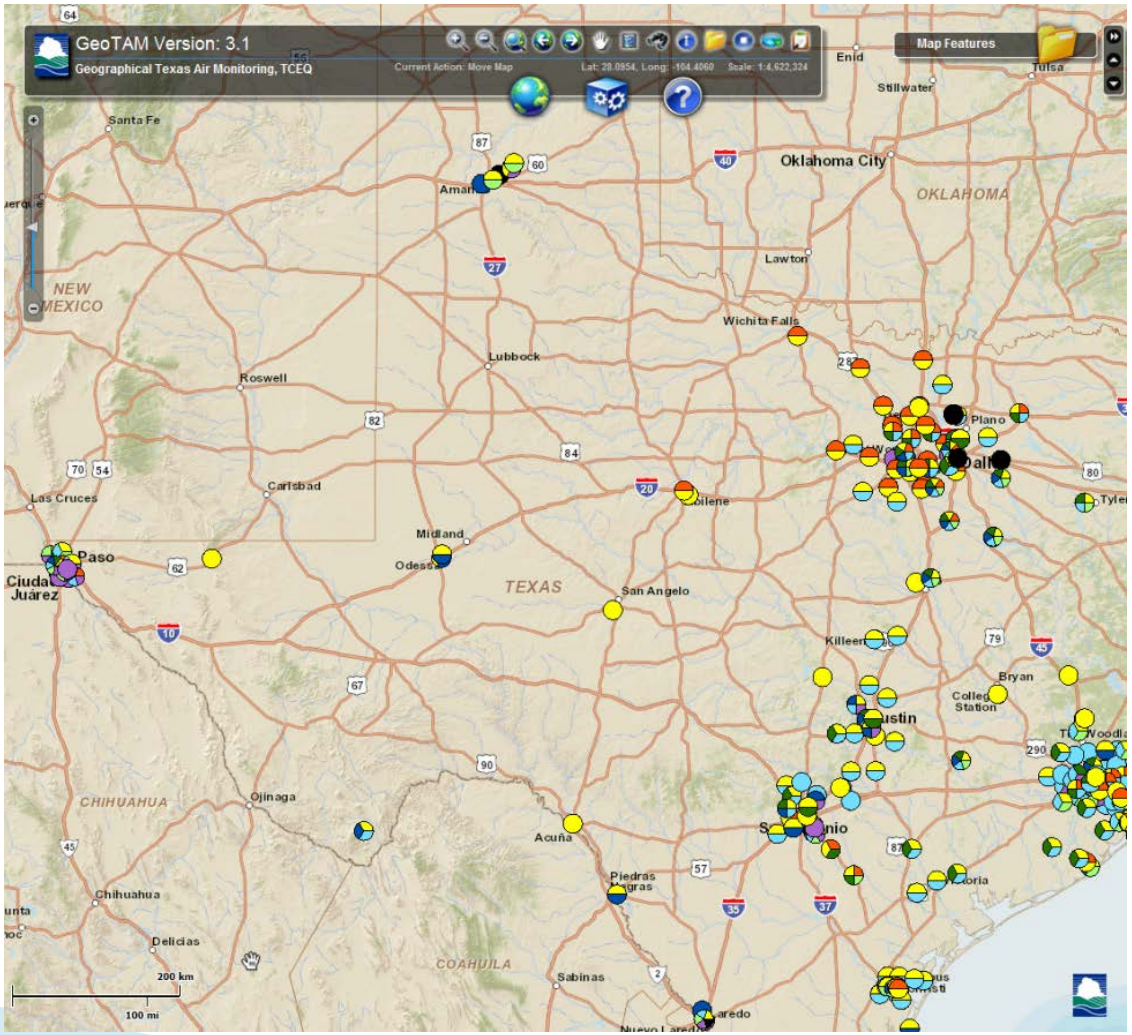
- **Start Report**
  You can immediately start a report query without logging in, but you will not be able to save and edit queries, review your report generation history or have notifications sent to your email address.
- **Login**
  If you would like your reports to be saved using your email address, please login.

# GeoTAM

- Online searchable mapping application for ambient air monitoring sites and samplers:

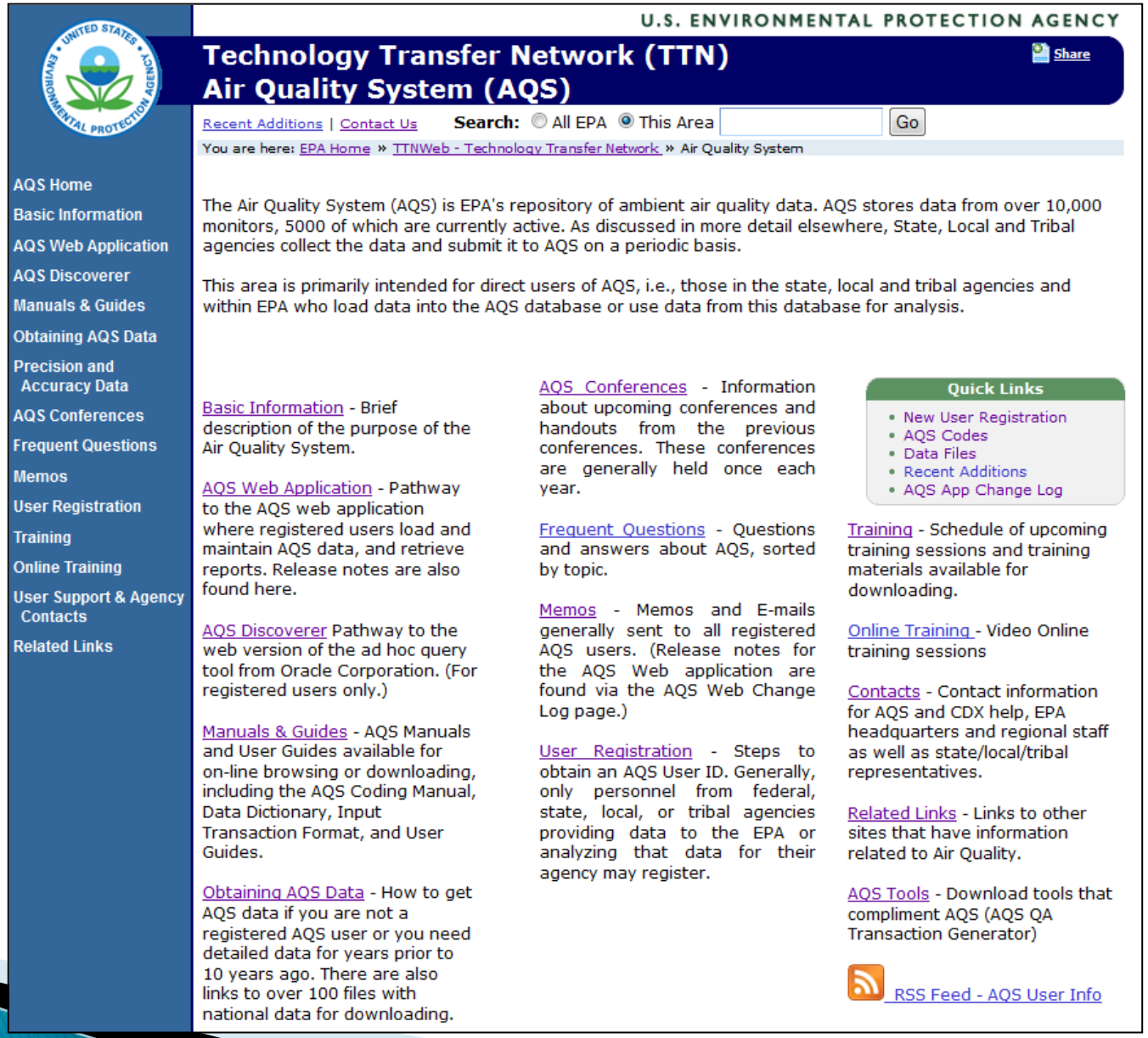
http://gisweb.tceq.texas.gov/geotam3/index.html

- Automatically updated nightly from site and monitor information stored in TAMIS.



# Continuous Parameters Data

- Once the review and validation is finalized, data is reported from TAMIS as a pipe-delimited text file and uploaded into AQS.

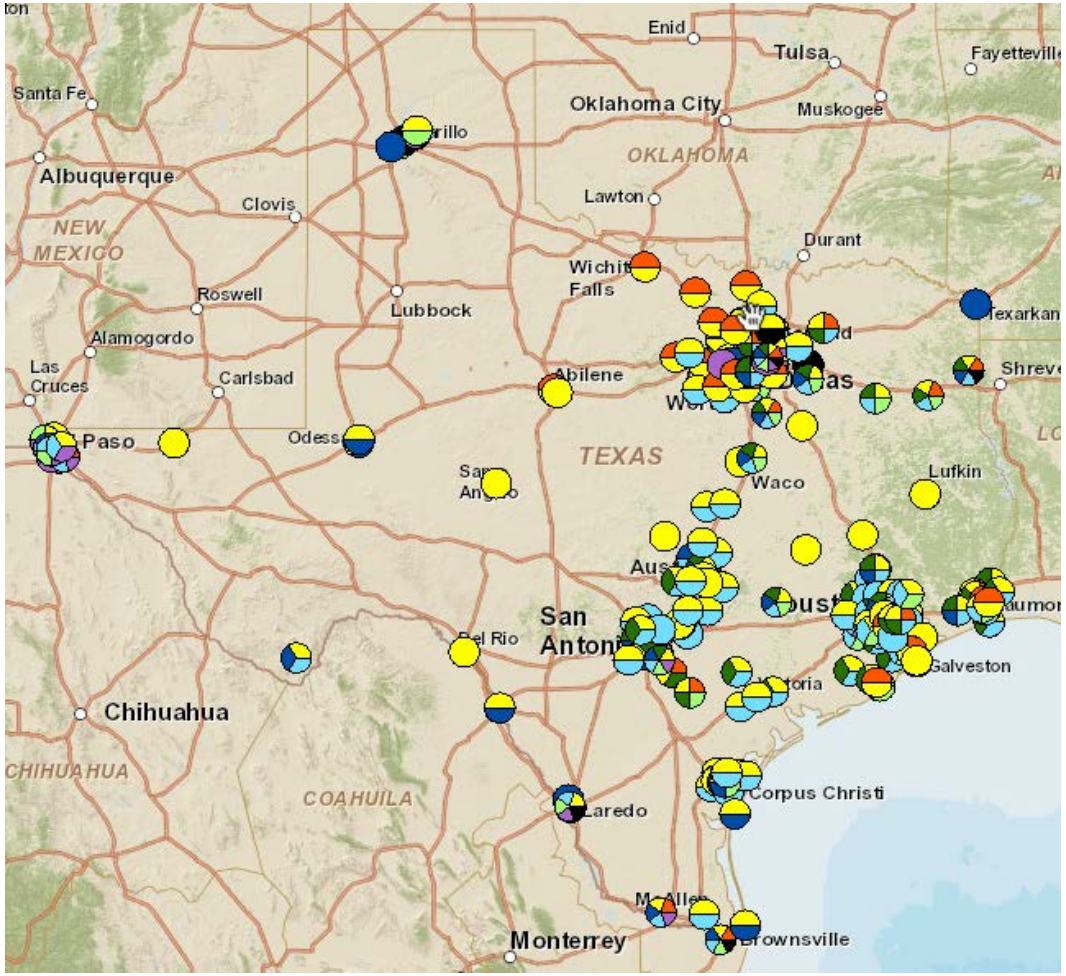


# Air Monitoring Data Validation Overview

Patricia De La Cruz, TCEQ

# Texas Commission on Environmental Quality

- TCEQ collects, ingests, displays, validates, and reports data from a variety of air monitors
  - Continuous Gaseous
  - Continuous Meteorological
  - Non-Continuous



# Texas Commission on Environmental Quality

- Continuous parameters include:
  - ozone
  - carbon monoxide
  - sulfur dioxide
  - oxides of nitrogen ($NO/NO_2/NO_x$)
  - hydrogen sulfide
  - meteorological

| Monitor Type | Samplers | Sites | Number of measurements in 2014* |
|---|---|---|---|
| Gaseous | 231 | 105 | >3,000,000 |
| Meteorological | 337 | 115 | >6,700,000 |

*Does not include AutoGC-related parameters

# Texas Commission on Environmental Quality

- Non-continuous monitor types include:

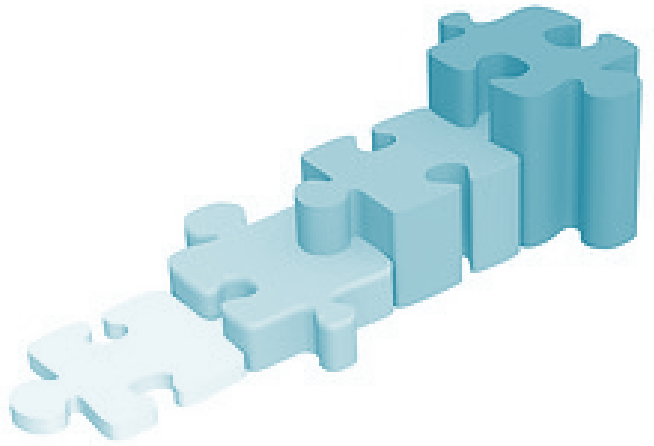
| Monitor Type | Samplers | Sites | Approximate Number of measurements in 2014* |
|---|---|---|---|
| $PM_{10}$ filter-based mass | 31 | 24 | 1,700 |
| $PM_{2.5}$ filter-based mass | 20 | 17 | 2,000 |
| $PM_{10}$ metals** | 5 | 4 | 4,300 |
| $PM_{2.5}$ metals** | 10 | 9 | 43,900 |
| Lead | 18 | 15 | 1,100 |
| Canisters** | 40 | 30 | 194,000 |
| SVOC/PAH** | 6 | 5 | 5,400 |
| Carbonyl** | 6 | 6 | 6,700 |

* Values have been rounded.

** Monitor type group consists of multiple parameters (chemical species)

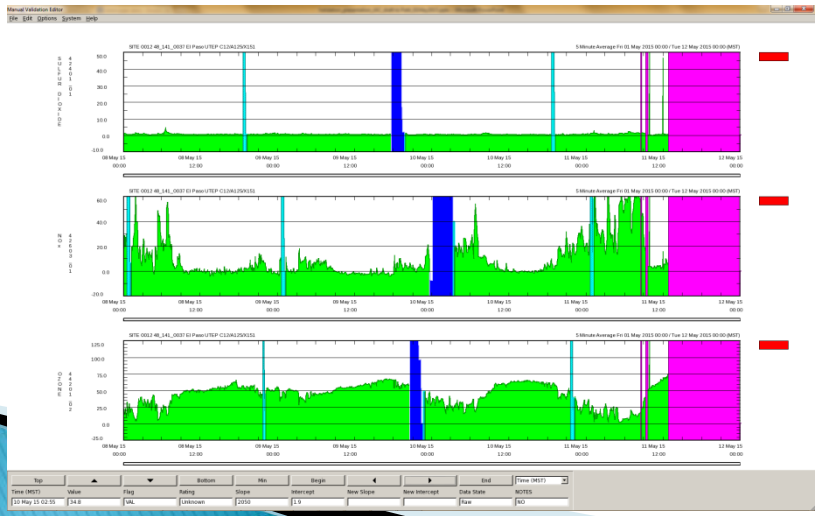
# Data Validation

Data validation is a routine, multi-stage process designed to ensure that reported values meet the quality and completeness goals of the program.



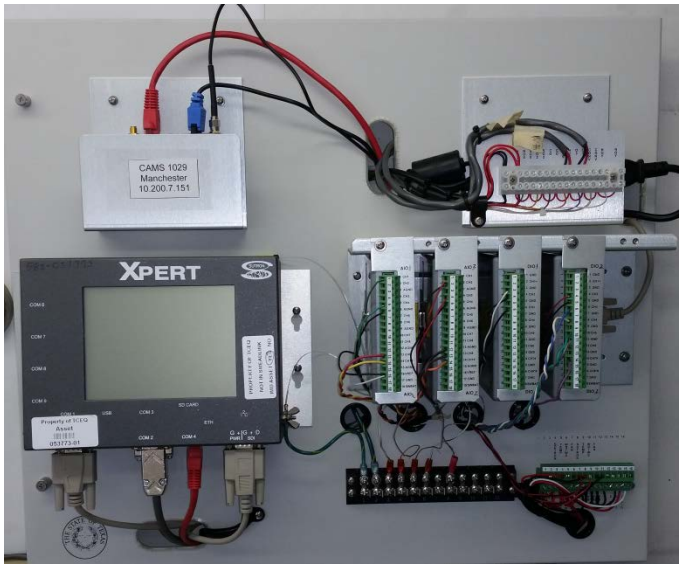
# Data Validation

- During validation, data is assessed in an objective and consistent manner.
- Validation is performed using:
  - Continuous: graphical interface tool – LEADS Manual Validation
  - Non-continuous: Excel



# Continuous Parameters

- TCEQ electronically receives continuous air monitoring data from the monitors at the site.
- Data are automatically processed and stored in a database.

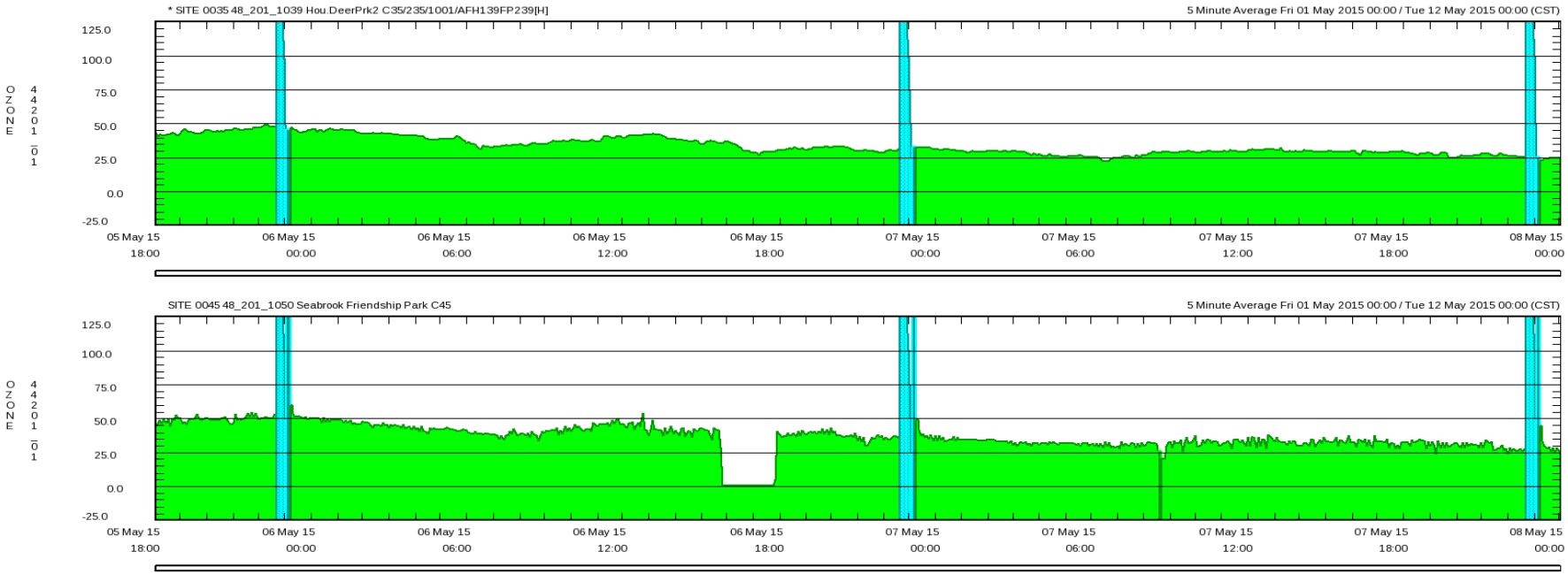
# Continuous Parameters

- Data validation includes:
  - Checking for failing, incomplete, or missing automatic quality control checks.
  - Checking that all manual quality assurance/quality control checks, including annual performance audits, have passed.

| Criteria Pollutants | QCs / Audits | Frequency | Performed by |
|---|---|---|---|
| Gaseous Samplers<br>• $SO_2$<br>• CO<br>• $O_3$<br>• $NO/NO_2/NO_x$ | SpanZero | Daily | LEADS -- Automated |
| | Span | Weekly | LEADS -- Automated |
| | Calibration | Monthly | LEADS -- Automated |
| | Laboratory Control Checks | 2 per Quarter | Site Operators/Contractors |
| | Annual Performance Audits | Annual | Data Quality Team Auditors |

# Continuous Parameters

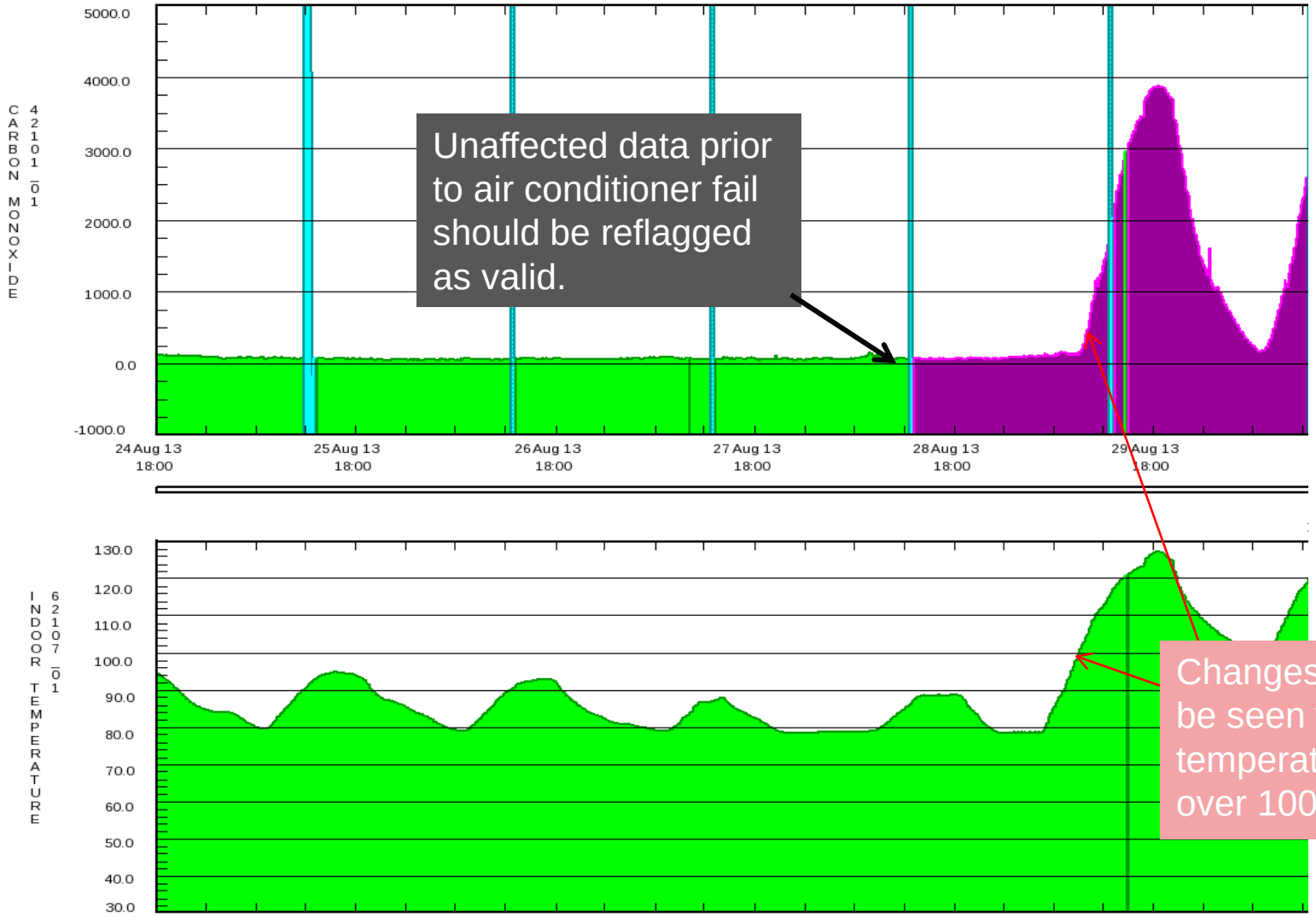
- Data validation includes (cont'd):
  - Investigating any unusual events like unexpected spikes, negative data, unusually high values, or irregular patterns.



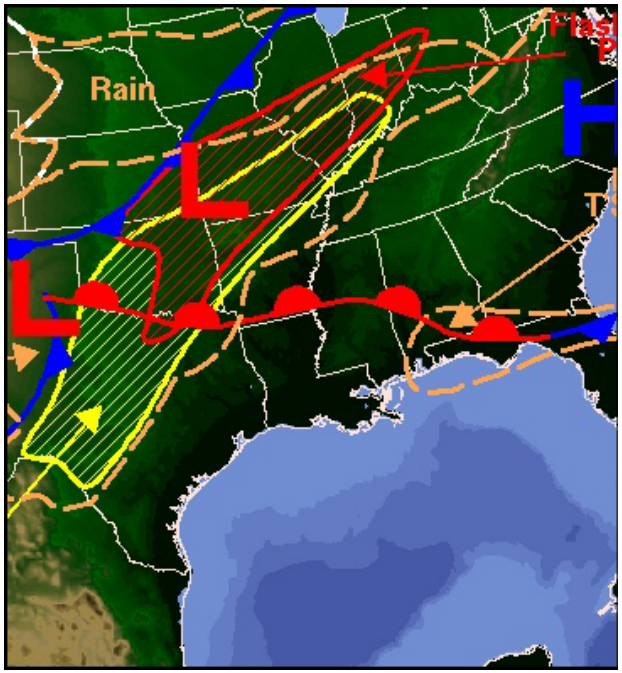
# Continuous Validation Example: Air Conditioning Failure

- Monitoring stations are kept between 78–83°F (26–28°C).
- Different instruments show different responses to high/low temperature extremes.
- In the following example, the air conditioner had struggled for several days before completely failing.

# High Temperature effect on Carbon Monoxide



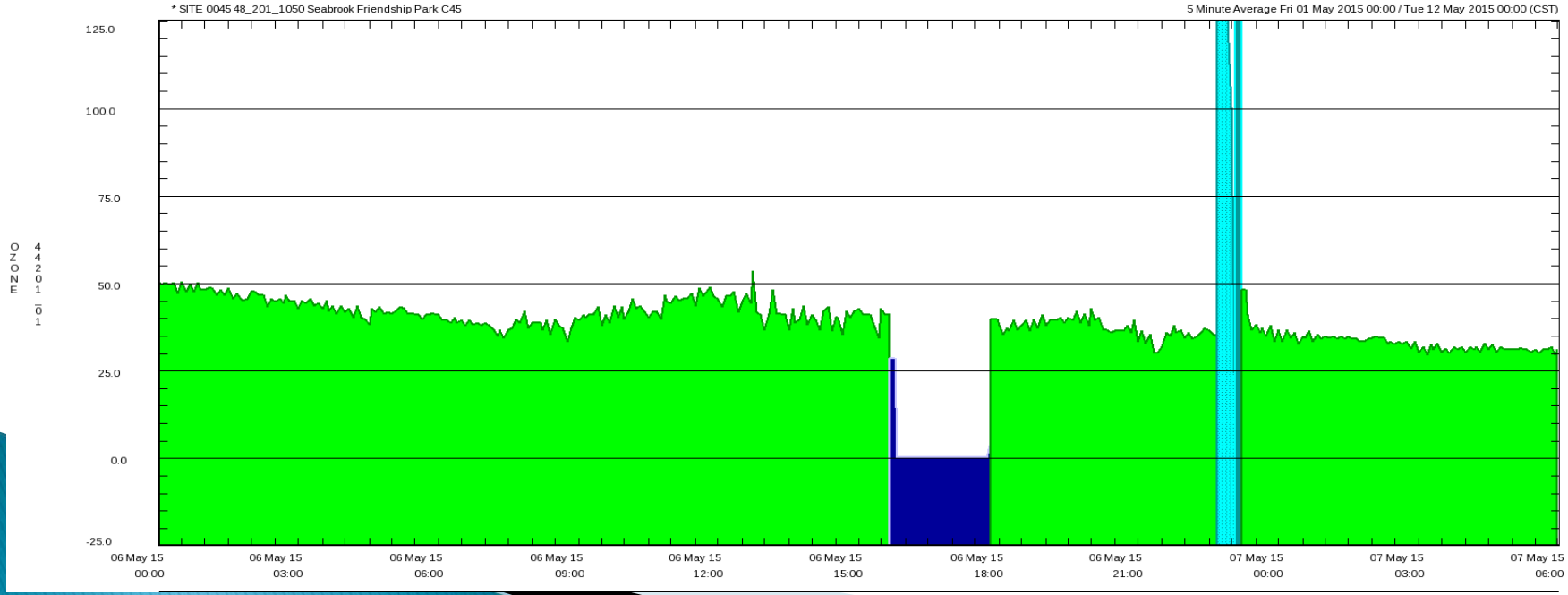
# Validation of Meteorological Data




- Primary meteorological parameters include wind speed/direction and outdoor temperature.
- Performance audits are conducted annually (no automated QC checks).
- Compare data with nearby stations (including National Weather Service) and with related parameters.

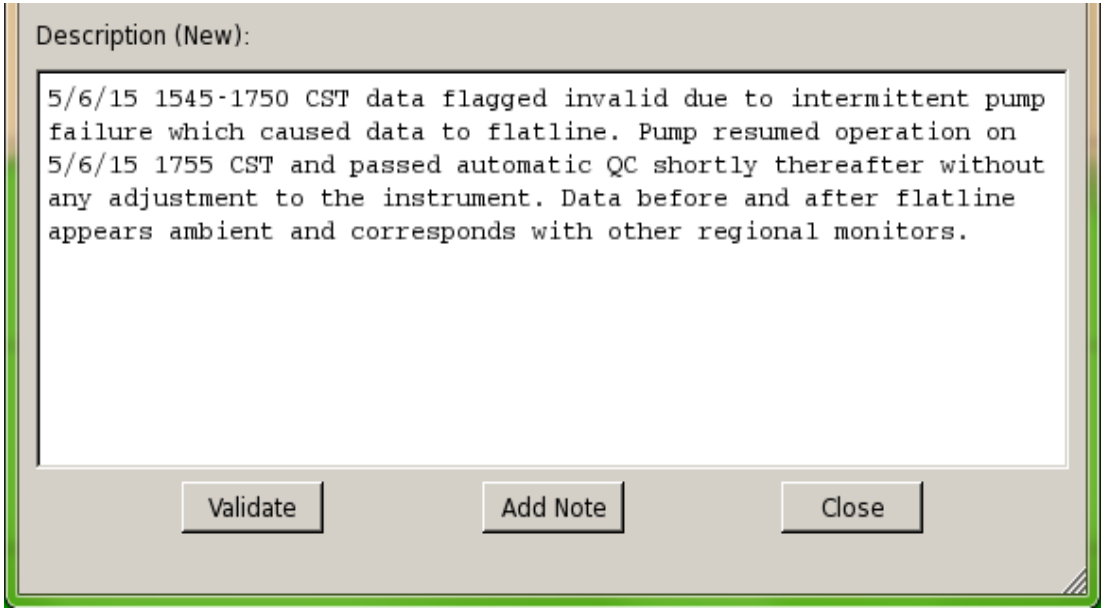
# Data Flagging

- Apply Qualifier Codes to the Data:
  - Invalidate any non-ambient data.
  - Invalidate data due to QA/QC failures.
  - Recover any ambient data from incorrect automatic flagging.



# Documentation

- Record any validation change
  - Validator notes are required after any changes are made in order to document date, time, and the reason for the validation changes.



# Non-Continuous Parameters

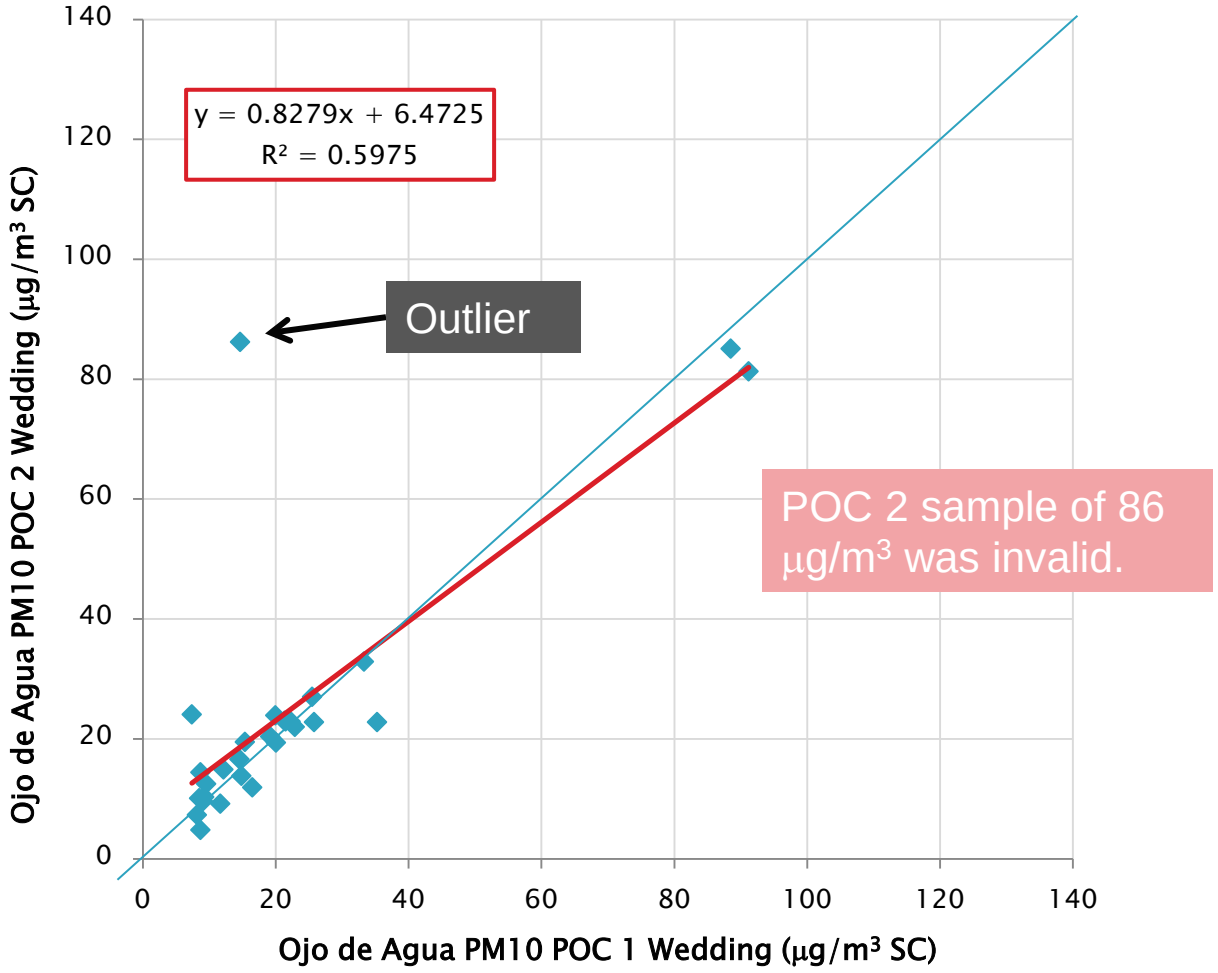
- Validation for discrete non-continuous data is a manual process.
- Data validation includes checking for any failing, incomplete, or missing quality control checks.

| Criteria Pollutants | QCs / Audits | Frequency | Performed by |
|---|---|---|---|
| Non-Continuous PM Samplers<br>• $PM_{2.5}$<br>• $PM_{10}$<br>• Lead | Leak Checks | Monthly | Site Operators/Contractors |
| | Temperature and Pressure Sensor Checks | Monthly | Site Operators/Contractors |
| | Flow Rate Verifications | Monthly | Site Operators/Contractors |
| | Calibrations/Flow Rate Audits | Quarterly | Site Operators/Contractors |
| | Annual Performance Audits | Annual | Data Quality Team Auditors |

# Non-Continuous Parameters

- Data validation includes (cont'd):
  - Investigating any unusual events like unexpected spikes, negative data, unusually high values, or irregular patterns.

# Non-Continuous Validation Example: $PM_{10}$ Outlier



# Data Reporting

- Submit final data to EPA's AQS database.
  - For continuous and meteorological parameters, hourly averages are submitted to AQS in a text delimited file
  - For non-continuous parameters, discrete sample measurements are reported to AQS in a text delimited file

```
RD|I|48|141|1021|81102|1|7|001|062|20140105|00:00|8.3||6|||||||||||
RD|I|48|141|1021|81102|1|7|001|062|20140111|00:00||AG|6|||||||||||
RD|I|48|141|1021|81102|1|7|001|062|20140117|00:00|30.6||6|||||||||||
RD|I|48|141|1021|81102|1|7|001|062|20140123|00:00|35.3||6|||||||||||
RD|I|48|141|1021|81102|1|7|001|062|20140129|00:00|37.2||6|||||||||||
RD|I|48|141|1021|81102|1|7|001|062|20140204|00:00|7.4||6|||||||||||
RD|I|48|141|1021|81102|1|7|001|062|20140210|00:00|2.4||6|||||||||||
RD|I|48|141|1021|81102|1|7|001|062|20140216|00:00||AJ|6|||||||||||
```

# Data Reporting

- Submit final data to EPA's AQS database.

| Data Type | AQS deadline |
|---|---|
| Continuous parameters | 90 days after end of quarter |
| Non-continuous parameters | 90 days after end of quarter |
| AutoGC parameters | 180 days after end of quarter |

# Thank you!

*Contact information:*
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*patricia.delacruz@tceq.texas.gov*