Air Quality Data Validation

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Data is Validated by Bracketing in Time with QC or Calibration Checks

- Separate valid measurements from erroneous recordings and out of tolerance periods.
- As important as any other part of air monitoring.
Objectives of Presentation

• Define Terms
• Data Validation Criteria and Tools
• Data Validation Process
• Data Submittal and follow up
Data Processing Terms-EPA QA Handbook

- **Data Review**
  - “review of data as it proceeds from data collection in the field, as it is transmitted and stored in a database, and finally the transmission to AQS”

- **Data Validation**
  - “confirmation, through provision of objective evidence, that specified requirements have been fulfilled”

- **Data Verification**
  - “confirmation, through provision of objective evidence, that the particular requirements for a specific intended use are fulfilled”
Data Validation Concept

- Bracketing data in time
- Use of meta-data
- Erroneous recordings vs Out of Tolerance Conditions
- Three Levels of Review
- Document all
Data Bracketing Example #1

- Check 4 and 5 out of tolerance
- All data from end of Check 3 to Check 6 is invalid. *note unless compelling evidence shows that Cal system was bad. May be able to save data from 3-6.
Data Bracketing Example #2

- Precision out of tolerance Check 4-6
- Span only out of tolerance Check 4
- Data invalid from Check 3 to Check 7
Data Bracketing Example #3

- Precision and Span out of tolerance Check 4
- Span back in tolerance Check 5,6
- Data invalid from Check 1 through Check 7
Data Bracketing Example #4

- Ozone Span in tolerance Day 1 HR01, Out of tolerance Day 2 HR01
- Sample Flow in tolerance Day 1 HR00-19, Out of tolerance Day 1 HR20
- Data only needs to be invalidated back to Day 1 HR20
Sources of Data Validation Criteria

- Appendix D Templates
- QAPP/SOP
- Instrument Manual
- Common Sense
Tools Used in Data Review/Validation

- Site/Monitor Documents-Logs and Monthly QC Forms
- Auto-cal Results
- QC Checks
- Multi-point Calibrations
- Audit Results
- AQDA/CAN documents
- Automated Data Screening
- Comparison to nearby sites
  - Diurnal trends, expected results and parameters relationships (PM2.5 shouldn’t be higher than PM10)
- Visualize Data
Data Review/Validation Process-Overview

- **Level 1-** Identify erroneous readings and out of tolerance conditions.
- **Level 2-** Review Level 1 work. Perform data verification.
- **Level 3 –** Review previous levels work. Focus on high values/standard exceedances.
Automated Data Screening

• High, Low, rate of change, stuck values, more advanced between sites
• Not a substitute for manual review process
• Helpful in screening for real-time data
• Quick notification of a problem with email alarm
Level 1 Data Review

- Most important step
- Should be performed by someone involved with site operations (site tech)
- Identify missing, erroneous data values
- Out of tolerance conditions and time period
- Can apply null and other qualifier codes
- Need to document all actions taken
Level 2 Data Review

• Data Verification—Ensure QC tasks performed per QAPP/SOP
• Review all Level 1 work/action by “second set of eyes”
• QC check review if not performed by Level 1
• Calculate data statistics such as high, low, NAAQS/State Standard exceeds
• Compare to other nearby sites data
• Reach consensus with Level 1 reviewer on any differences in review
Level 3 Data Review

- Typically performed by management
- Review data completeness
- Review high values and/or standard exceeds
- Approve upload to AQS
AQS Data Submittal and Review

• AQS Submittal Process
  • Review of data once in AQS
    • Quarterly
      • AMP256 – Data Quality Indicator
      • AMP350 – Raw Data
      • AMP430 – Data Completeness
    • Annual
      • AMP600- Certification Evaluation
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- Documentation (logs, QC forms, etc)
- Data Review, Validation, and Verification Terms
- Validation Criteria and Tools
- Three Level Data Review Process
- Data Submittal and Review
Resources

• EPA/CARB
• Quality Documents
• I am always willing to Discuss Ideas
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