Overlooked

Quality Assurance for non-criteria parameters

2019 MARAMA Air Quality Monitoring Training Workshop
November 21, 2019
EPA Region 3
Air Quality Analysis Branch
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Meteorology Monitoring Poll

Keep your hand up if…

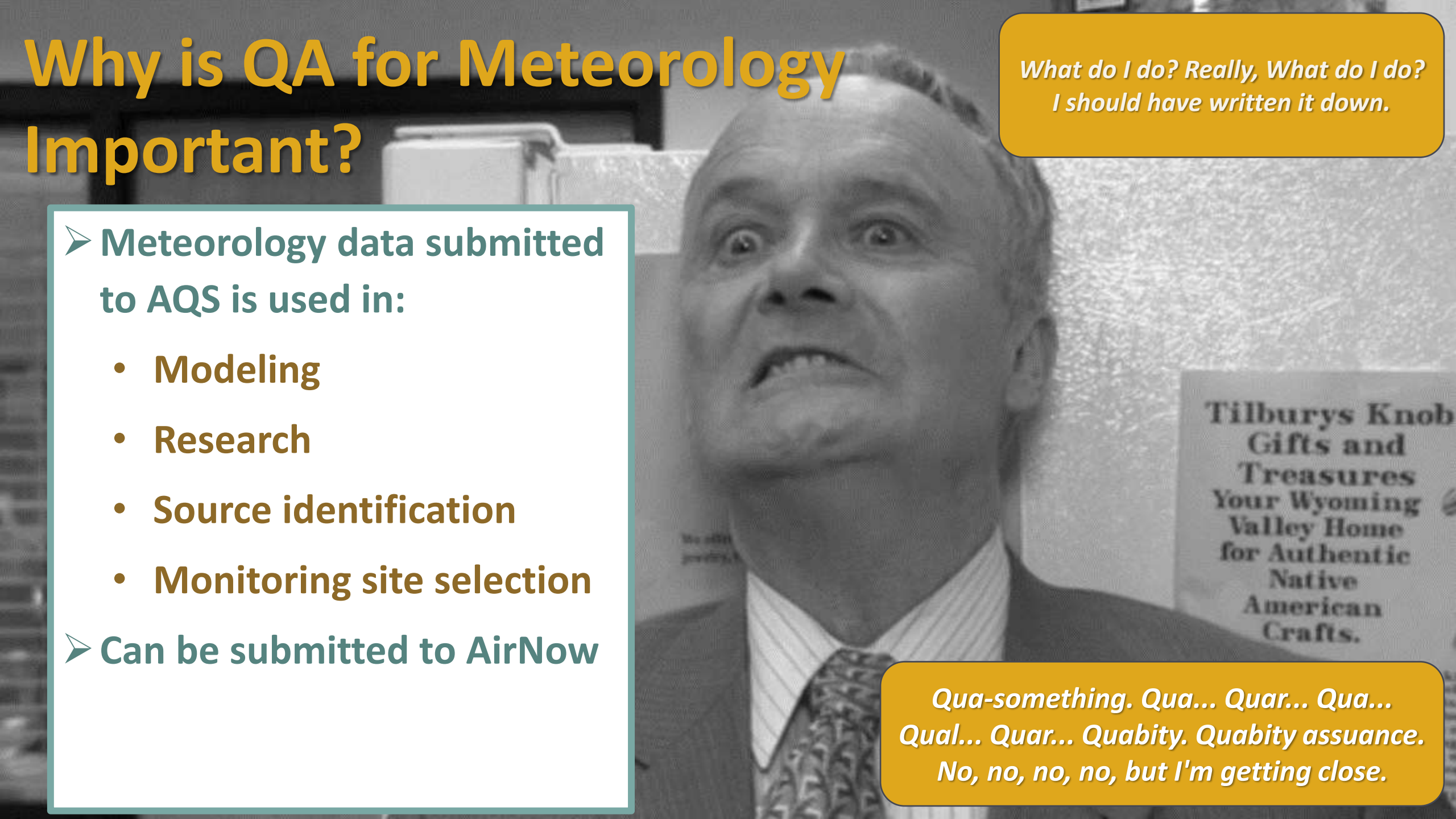
- ✓ Your agency collects meteorological data
- ✓ Your agency reports meteorological data to AQS
- ✓ Your agency's meteorological equipment is routinely calibrated/verified in-house, and/or sent back to the vendor for certification
- ✓ Someone in your agency reviews and quality assures the meteorological data before submitting to AQS
- ✓ Your agency uses Standard Operating Procedures for meteorological equipment
- ✓ Your agency has a Quality Assurance Project Plan that covers meteorological parameters and data (may be covered in existing NCore or PAMS QAPP)
- ✓ Your agency routinely checks meteorological equipment to ensure that it is properly sited

R3 TSA FINDINGS

- Not meeting siting criteria (ex. anemometer < 10 meters above ground)
- Meteorological equipment and data not quality assured and quality controlled.
- Meteorological equipment not verified/calibrated

Why is QA for Meteorology Important?

- Meteorology data submitted to AQS is used in:
  - Modeling
  - Research
  - Source identification
  - Monitoring site selection
- Can be submitted to AirNow



What do I do? Really, What do I do? I should have written it down.

Qua-something. Qua... Quar... Qua... Qual... Quar... Quabity. Quabity assuance. No, no, no, no, but I'm getting close.

Meteorological Monitoring & QA Requirements

PAMS & NCore

Meteorology in 40 CFR Part 58

- **§58.16** meteorological data and associated QA data from NCore and PAMS sites must be reported to AQS.
  - **§58.16(c)** The data submitted must be edited, **validated**, and entered into the AQS according to AQS Manual and **agency's QAPP**.
- **Appendix D §4.3** references ***Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV Meteorological Measurements*** for methods

NCore

40 CFR 58 Appendix D §3(b)

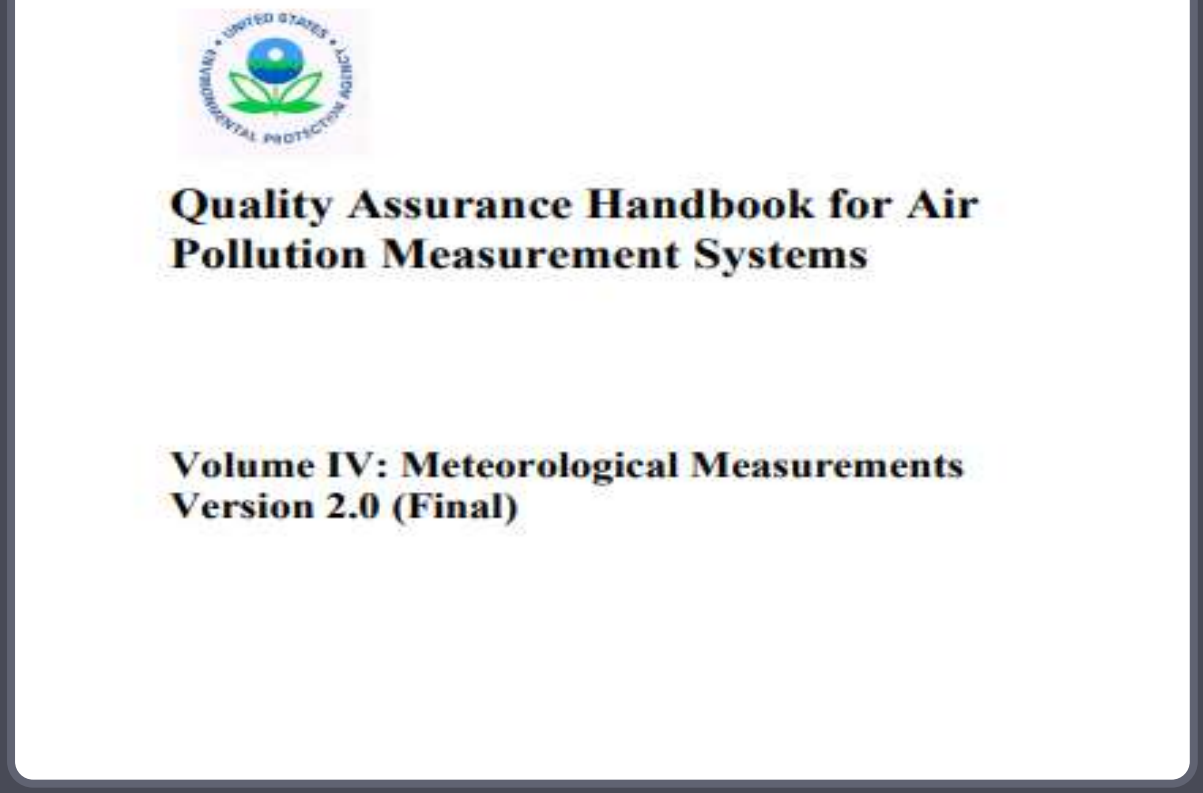
- wind speed
- wind direction
- relative humidity
- ambient temperature

PAMS

40 CFR 58 Appendix D §5(b)

- hourly vector-averaged wind speed
- hourly vector-averaged wind direction
- hourly averaged relative humidity
- hourly averaged ambient temperature
- hourly average atmospheric pressure
- hourly precipitation
- hourly averaged mixing-height
- hourly averaged solar radiation
- hourly averaged ultraviolet radiation

QA Handbook Volume IV NCore



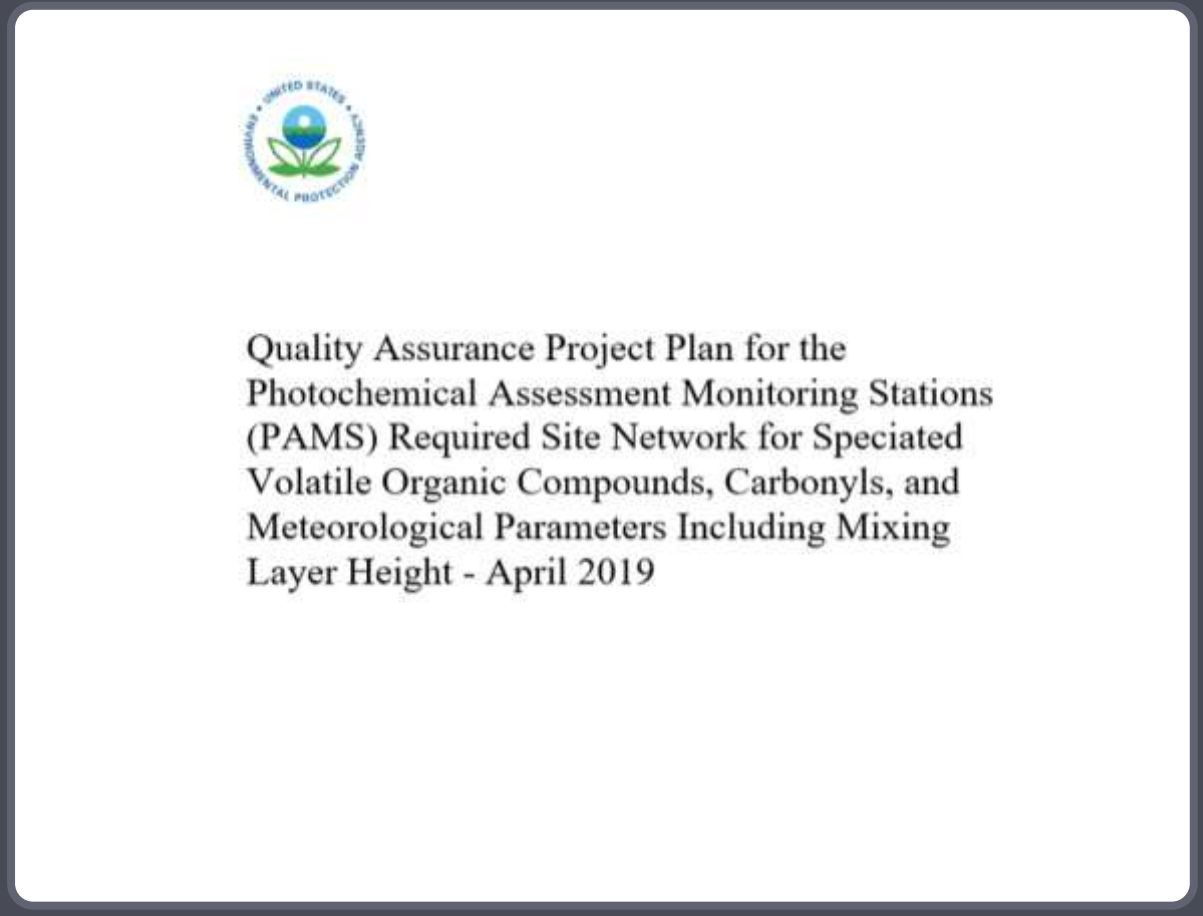
NCore Meteorological Measurement Quality Objectives

Measurement	Method	Reporting Units	Operating Range	Resolution	Minimum Sample Frequency	Raw Data Collection Frequency	Completeness
Ambient Temperature	Thermistor	ºC	-30 – 50	0.1	Hourly	1 minute	75%
Relative Humidity	Psychrometer/ Hygrometer	%	0 – 100		Hourly	1 minute	75%
Wind Speed	Cup, prop or sonic anemometer	m/s	0.5 – 50.0	0.1	Hourly	1 minute	75%
Wind Direction	Vane or sonic anemometer Degrees 0 – 360 (540) 1.0 Hourly 1 minute 75%	Degrees	0 – 360 (540)	1.0	Hourly	1 minute	75%
Vector Data **Wind Speed** **Wind Direction**	Data Acquisition System Calculations	m/s degrees	50.0 0 – 360	0.1 1.0	Hourly	1 minute	75%

NCore Calibration and Accuracy Criteria

Measurement	Verification/Calibration			Accuracy (Audit)		
	Type	Acceptance Criteria	**Frequency**	Type	Acceptance Criteria	**Frequency**
Ambient Temperature	3 pt. Water Bath with NIST traceable thermistor or thermometer	±0.5 ºC		3 pt. Water Bath With NIST-traceable thermistor or thermometer	±0.5 ºC	
Relative Humidity	NIST-traceable Psychrometer or standards solution	±7% RH	**Semi Annually**	NIST-traceable Psychrometer or standards solution	±7% RH	**Annually**
Wind Speed	NIST-traceable Synchronous Motor, CTS method	±0.25m/s ≤5m/s; 5%>2m/s not to exceed 2.5m/s		NIST-traceable Synchronous Motor	±0.25m/s ≤5m/s; 5%>2m/s not to exceed 2.5m/s	
Wind Direction	Solar Noon, GPS Magnetic Compass, CTS methoda	±5 degrees; includes orientation error		Solar Noon, GPS or Magnetic Compass	±5 degrees; includes orientation error	

PAMS Model QAPP



Quality Assurance Project Plan for the Photochemical Assessment Monitoring Stations (PAMS) Required Site Network for Speciated Volatile Organic Compounds, Carbonyls, and Meteorological Parameters Including Mixing Layer Height - April 2019

PAMS – AQS Codes

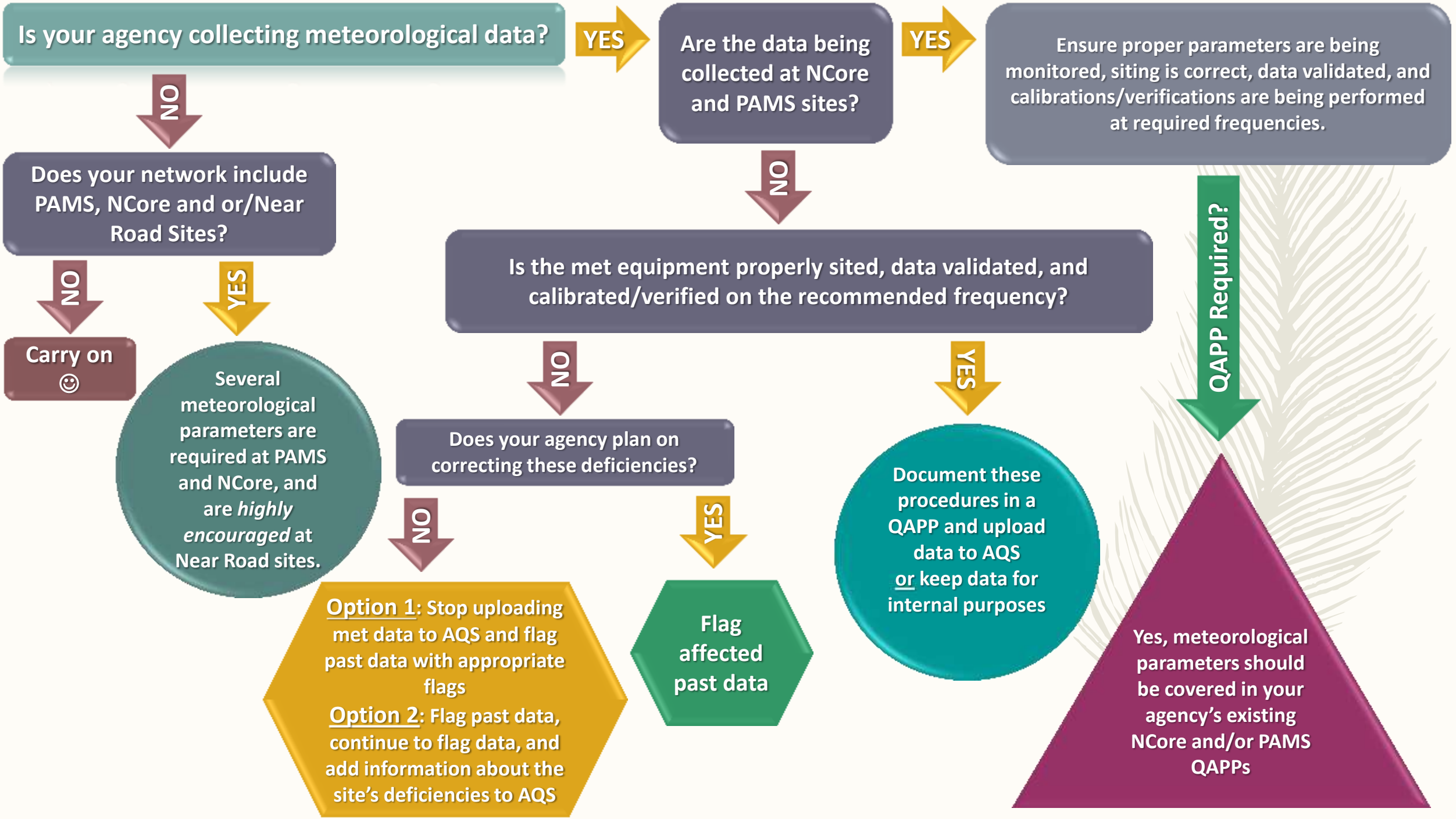
Parameter	AQS Parameter Code	Duration	AQS Duration Code	Example Reported Unit	AQS Unit Code
Ambient Temperature	62101	hourly average	1	°C	17
Relative Humidity	62201	hourly average	1	% relative humidity	19
Barometric Pressure	64101	hourly average	1	millibar (hPa)	16
Wind Speed	61103	hourly average	1	m/s	11
Wind Direction	61104	hourly average	1	degrees compass	14
Solar Radiation	63301	hourly average	1	Watt/m^2	79
Ultraviolet Radiation	63302	hourly average	1	Watt/m^2	79
Precipitation	65102	hourly average	1	mm	29
Mixing Layer Height	61301	hourly average	1	m	58

PAMS Meteorological Data Quality Indicators

PAMS Meteorology DQIs					
Meteorology Parameter	**Representativeness (Sampling Frequency)[a]**	**Bias (%)**	**Precision (%)**	**Sensitivity (Detection Limit)**	**Completeness (%)**
Ambient Temperature	Continuous, hourly average	≤ ± 0.5 ºC	not specified	≤ 0.1 ºC	≥ 75
Relative Humidity		≤ ± 5% RH		≤ 0.5% RH	
Barometric Pressure		≤ ± 3 hPa		≤ 0.1 hPa	
Wind Speed		≤ ± 0.2 m/s or ± 5%, whichever is greater		≤ 0.1 m/s	
Wind Direction		≤ ± 5 degrees		≤ 1 degree	
Solar Radiation		≤ ± 5%		≤ 1 Watt/m^2	
UV Radiation		≤ ± 5%		≤ 0.01 Watt/m^2	
Precipitation		≤ ± 10%		≤ 0.25 mm/hr	
Mixing Layer Height		≤ ± 5 m or ± 1%, whichever is greater		≤ 10 m	

PAMS Calibration Criteria & Corrective Action

Meteorology Parameter	Calibration Check Standard	Required Frequency	Acceptance Criteria	Recommended Corrective Action
Ambient Temperature	Verification in a water bath against a NIST-traceable thermistor or thermometer at three points bracketing the temperature range of use	Semi Annually	≤ ± 0.5ºC at each of the three temperatures checked	Inspect instrument for damage or worn components. Correct data where possible (e.g. wind direction). Recalibrate instrument. Qualify all collected data since the most recent calibration or acceptable calibration check as "QX" in AQS, as applicable. Potentially invalidate data since last most recent calibration or acceptable calibration check.
Relative Humidity	Compared to a NIST-traceable psychrometer or standard solutions		≤ ± 5% RH of the hourly average from the certified standard over the duration of comparison	
Barometric Pressure	Compared to a NIST-traceably certified barometer or pressure transducer over the course of several consecutive hours		≤ ± 3 hPa	
Wind Speed	Compared to a NIST-traceable synchronous motor or CTS[a] method			
Wind Direction	Compared to solar noon, GPS, magnetic compass, or CTS[a] method		≤ ± 5 degrees	
Solar Radiation	Compared to a NIST-traceable pyranometer		≤ ± 5% [b]	
UV Radiation	Compared to a NIST-traceable radiometer		≤ ± 5% [b]	
Precipitation	Add water at a constant rate such that the gauge tips every 15 seconds and measure output with a graduated cylinder		≤ ± 10% of input volume	
Mixing Height	Altitude determination verified against a hard target of known distance		≤ ± 5 m or ± 1%, whichever is greater	


Is your agency collecting meteorological data?
YES
Are the data being collected at NCore and PAMS sites?
YES
Ensure proper parameters are being monitored, siting is correct, data validated, and calibrations/verifications are being performed at required frequencies.
NO
Does your network include PAMS, NCore and or/Near Road Sites?
NO
Carry on ☺
YES
Several meteorological parameters are required at PAMS and NCore, and are *highly encouraged* at Near Road sites.
NO
Is the met equipment properly sited, data validated, and calibrated/verified on the recommended frequency?
NO
Does your agency plan on correcting these deficiencies?
NO
Option 1: Stop uploading met data to AQS and flag past data with appropriate flags
Option 2: Flag past data, continue to flag data, and add information about the site's deficiencies to AQS
YES
Flag affected past data
YES
Document these procedures in a QAPP and upload data to AQS or keep data for internal purposes
QAPP Required?
Yes, meteorological parameters should be covered in your agency's existing NCore and/or PAMS QAPPs

Air Toxics Need QA Too!

- We are continuously improving the quality of criteria pollutant data…Now, we can put more effort into air toxics!
- EPA Region 3 AQAB has deployed new efforts concerning QA of air toxics:
  - Emphasis on non-NATTS style laboratory audits on TSAs
  - New checklists for auditing air toxics field sampling sites
  - Routine reviews of air toxics data in AQS

APTI 470 TRAINING IN 2020

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