

Florida Department of Environmental Protection

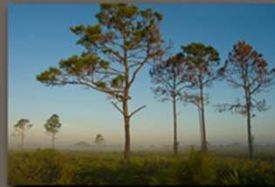


Office of Air Monitoring

Data Validation & Flagging

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OAM Data Validation Team

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Introduction

- The Data Validation Team purpose is to provide additional level of service to agencies and local programs with the data verification process.
- The Team also serves purpose of enhancing consistency statewide of documentation and data validation process.
- In addition, to provide objective review of process that air monitoring data was assimilated.



Importance of Validation

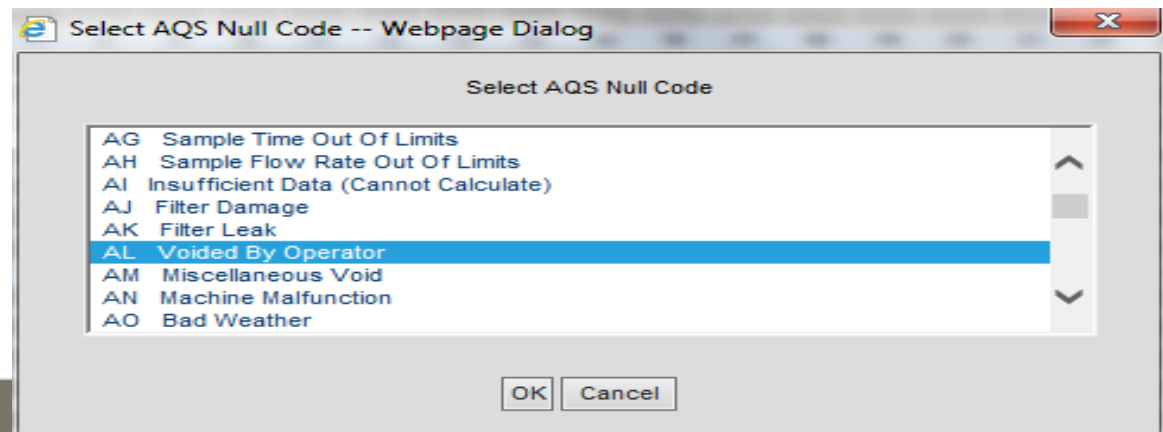
- It is the monitoring agency's responsibility to prevent, identify, correct and define the consequences of monitoring difficulties that might affect the precision and accuracy, and/or the validity of the data
- Serious errors in data analysis and procedural performance can cause erroneous data values
- Accurate information & precise attention to details provide a much higher quality in data collection rate of valid data





Data Validation & Flagging

- As one PQAO we all need to follow the same set of data validation rules.
- Data Handling SOP:
 - Use only the approved forms from the SOPs.
 - Null codes and qualifiers need to be used consistently across the state.
- When data coding is done differently by each agency, it sends red flags to EPA about the quality of Florida's data.





Data Validation & Flagging

- Data review starts in the field.
 - Field Technicians and QA staff are both involved in the data review process.
- Goes through several levels of review.
- QA staff sign off on paperwork saying they validate the work done in the field.
- Verified and validated data gets sent up to AQS and the process doesn't end until data entry into AQS is reviewed for completeness.



Data Validation & Flagging

- Once the data is in AQS, we're done right?!

NO WAY!

- The data must be **certified** annually.
- Certification signals that the state has loaded all data for the year to AQS and completed the validation process.
 - AMP600 is the data certification report used to correct anything that may be missing, incomplete, etc.
- EPA must review the certification package and concur with our assessment.
- Once the data is certified it can then be used by EPA to make (non)attainment designations.



Data Validation & Flagging

Having legally defensible data that can be used for attainment designations is our ultimate goal!





Data Validation & Flagging

- **Verification** –
Confirmation that a specified requirement has been fulfilled.
- **Validation** –
Confirmation that a particular requirement for a specified intended use are fulfilled.





Data Validation & Flagging

- Useful tools for data validation
 - CFR Requirements
 - QA Handbook (“the redbook”)
 - Pay attention to the critical criteria!
 - QAPPs, SOPs
 - These are your “contracts” with EPA.
 - 1-point QC checks
 - Check minute data to detect failing equipment before it gets to the point of invalidating data.
 - Audits
 - Remember, we do not invalidate data based on audits!



Data Validation Checklist

- When looking at the paperwork from the field...
 - Are serial numbers of equipment accurate?
 - Are the preventative maintenance schedule due dates being met?
 - Do the dates on site visit forms, Z/S/P, calibration, PM schedules, etc all match?
 - Are the dates on the form of annually certified equipment correct?
 - Are the forms filled out completely? Are strikethroughs and N/A's used in required fields to indicate those fields will not be used?
 - If a correction was made on the form does the change have an initial and date next to it?
 - Are the control limits of the maintenance checks being met? If not, make sure the appropriate actions have been taken to bring the equipment back into optimal operating conditions.
 - Does a corrective action form need to be filled out?
 - Does data need to be invalidated? Flagged?



Data Validation Checklist (continued)

- Does the date on the form match the date in the database showing when the maintenance was performed?
- Are there enough comments on the paperwork for *anyone* to look at it and easily understand what took place?
- Is the form signed and dated by both the field tech and the reviewer? If electronic, is the form locked from editing after the final review?
- Have the proper null codes that accurately describe the work done in the field been applied to the data?
- Was the machine put in maintenance the entire time work was being performed? Did the machine stabilize properly before it was taken out of maintenance?
- If there were any exceedances, was an exceedance report filled out and comments added in FAMAS describing the cause?



- Shelter temp within range?!



Verification in FAMAS

- Before you “verify” your data in FAMAS...
 - Run the Verification Utility to help you:
 - Spot any blanks in the ambient data that need to be addressed
 - See if the data was outside the range or below Federal MDLs that AQS will accept
 - Check on persistence to see if a monitor was reading the same concentration for prolonged periods of time
 - Note failed precision checks and make sure actions were taken, if needed
 - Check that all precision and accuracy data (a.k.a. QA Transactions) have been entered



Data Validation & Flagging

- From 40 CFR 58, Appendix A:
 - “For each calendar quarter, each reporting organization shall report to AQS directly the results of all valid precision and accuracy tests it has carried out during the quarter...”
- EPA does not want results from invalid tests or tests that occurred during a time period for which ambient data immediately before or after was invalidated.
- However, in Florida, we want ALL checks to be in FAMAS so there is a record of why the data might have been invalidated.



Data Validation & Flagging

- Data Reporting
 - Null codes *invalidate* data.
 - QA Qualifiers do not invalidate data but *qualify* it to allow additional commentary about a concentration.
 - Use of both null codes and qualifiers allows you to more accurately describe the “story” of your data.

Highlight	[None]	Void Negatives	Fill Blanks	Null Code	QA Qualifier	Exclusion	Comment	Excel	Report	Audit Trail																						
Jan	NS	2.5	NS	NS	8.7	NS	NS	4.8	NS	NS	AR	NS	NS	AR	NS	NS	AR	NS	NS	AR	NS	NS	AR	NS	NS	AR	NS	NS	4.8	NS	NS	Jan
Feb	6.9	NS	NS	3.5	NS	NS	3.5	NS	NS	9.4	NS	NS	2.9	NS	NS	11.7	NS	NS	AF	NS	NS	7.0	6.6	6.9	9.2	NS	NS	7.2			Feb	
Mar	NS	NS	5.6	NS	NS	5.0	NS	NS	6.5	NS	NS	7.3	NS	NS	4.6	NS	NS	AN	NS	NS	11.2	NS	NS	10.8	NS	NS	4.0	NS	NS	3.0	NS	Mar
Apr	NS	5.0	NS	NS	6.4	NS	NS	7.4	NS	NS	5.6	NS	NS	4.0	NS	NS	4.5	NS	NS	3.8	NS	NS	8.5	NS	NS	8.9	NS	NS	5.7	NS	Apr	
May	NS	5.6	NS	NS	9.5	NS	NS	6.6	NS	NS	6.5	NS	NS	4.4	NS	NS	6.8	NS	NS	7.0	NS	NS	14.7	NS	NS	6.8	NS	NS	4.8	NS	NS	May
Jun	5.5	NS	NS	4.7	NS	NS	6.3	NS	NS	8.7	NS	NS	6.1	NS	NS	8.0	NS	NS	4.3	NS	NS	8.5	NS	NS	8.9	NS	NS	9.7	NS	NS	Jun	
Jul	3.6	NS	NS	8.0	NS	NS	4.5	NS	NS	7.5	NS	NS	6.6	NS	NS	3.9	NS	NS	7.7	NS	NS	2.9	NS	NS	5.5	NS	NS	8.8	NS	NS	9.6	Jul
Aug	NS	NS	2.2	NS	NS	6.9	NS	NS	3.6	NS	NS	4.0	NS	NS	2.5	NS	NS	6.0	NS	NS	11.3	NS	NS	11.3	NS	NS	3.5	NS	NS	AV	NS	Aug
Sep	NS	AV	NS	NS	AR	NS	NS	AR	NS	NS	AR	NS	NS	AR	NS	NS	AR	NS	NS	AR	NS	NS	AR	NS	NS	2.3	NS	NS	2.7	NS	Sep	
Oct	NS	3.1	NS	NS	5.2	NS	NS	6.0	NS	NS	5.5	NS	NS	3.5	NS	NS	AR	NS	NS	AR	NS	NS	AR	NS	NS	AR	NS	NS	4.7	NS	NS	Oct
Nov	5.6	NS	NS	4.7	NS	NS	6.4	NS	NS	5.2	NS	NS	16.7	NS	NS	6.9	NS	NS	6.1	NS	NS	6.4	NS	NS	3.5	NS	NS	6.5	NS	NS		Nov
Dec	3.5	NS	NS	2.9	NS	NS	5.6	NS	NS	12.9	NS	NS	15.3	NS	NS	7.8	NS	NS	14.3	NS	NS	5.3	NS	NS	6.6	NS	NS	6.5	NS	NS	2.7	Dec
(Double-click reading for more info.)																																
Legend: Invalid Valid w/flag Changed Exclusion QA Blank Not Scheduled																																



Data Validation & Flagging

AQS Raw Data Report - AMP350

	MONTH											
Day	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1		6.9				5.5	3.6				5.6	3.5
2	2.5			5.0	5.6				AV	3.1		
3			5.6					2.2				
4		3.5				4.7	8.0				4.7	2.9
5	8.7			6.4	9.5				AR	5.2		
6			5.0					6.9				
7		3.5				6.3	4.5				6.4	5.6
8	4.8			7.4	6.6				AR	6.0		
9			6.5					3.6				
10		9.4				8.7	7.5				5.2	12.9
11	AR			5.6	6.5				AR	5.5		
12			7.3					4.0				
13		2.9				6.1	6.6				16.7	15.3
14	AR			4.0	4.4				AR	3.5		
15			4.6					2.5				
16		11.7				8.0	3.9				6.9	7.8
17	AR			4.5	6.8				AR	AR		
18			AN					6.0				
19		AF				4.3	7.7				6.1	14.3
20	AR			3.8	7.0				AR	AR		
21			11.2					11.3				
22		7.0				8.5	2.9				6.4	5.3
23	AR	6.6		8.5	14.7				AR	AR		
24		6.9	10.8					11.3				
25		9.2				8.9	5.5				3.5	6.6
26	AR			8.9	6.8				2.3	AR		
27			4.0					3.5				
28		7.2				9.7	8.8				6.5	6.5
29	4.8			5.7	4.8				2.7	4.7 1		
30			3.0					AV				
31							9.6					2.7
NO.:	4	11	9	10	10	10	11	9	2	6	10	11
MAX:	8.7	11.7	11.2	8.9	14.7	9.7	9.6	11.3	2.7	6.0	16.7	15.3
MEAN:	5.20	6.80	6.44	5.98	7.27	7.07	6.24	5.70	2.50	4.67	6.80	7.58
ANNUAL OBSERVATIONS:	103		ANNUAL MEAN:	6.42	ANNUAL MAX:	16.7						

Note: Qualifier codes with regional concurrence are shown in upper case, and those without regional review are shown in lower case. An asterisk ("*") indicates that the region has reviewed the value and does not concur with the qualifier.



Data Validation & Flagging

How/when to use **Null Codes** Preferably Used

AE	Shelter temperature out of limits (19.5 -30.4)
AG	Sample Time out of limits
AH	Sample Flow rate out of limits
AN	Machine Malfunction – (used for equipment failure)
AV	Power Failure
AY	Q C Control Point (zero/span) checks
AZ	Q C Audit (Performance Audits)
BA	Maintenance/Routine Repairs (TEOM flow audits and such)
BF	Gaseous Analyzers zero, precision & span check
BC	Gaseous Analyzers Multi-Point Calibrations – (Don't use AT null code)
DA	Aberrant Data (Corrupt Files, Spikes, Shifts) – (used for TEOM negative data)



Data Validation & Flagging

Don't use the **AM** null code!





Data Validation & Flagging

How/when to use QA Qualifiers:

- Should be applied whenever questionable issues regarding sampling data is noted, however no critical criteria limits have been exceeded.

Select QA Qualifier Code

[Remove]
1 Deviation From A Cfr/Critical Criteria Requirement
2 Operational Deviation
3 Field Issue
4 Lab Issue
5 Outlier
6 Qapp Issue
7 Below Lowest Calibration Level
CB Values Have Been Blank Corrected

OK Cancel



PM_{2.5} Validation Template

Continuous PM_{2.5} Local Conditions Validation Template

NOTE: There may be a number of continuous monitors that may be designated as an FEM or an ARM. These monitors may have different measurement or sampling attributes that cannot be identified in this validation template. Monitoring organizations should review specific instrument operating manuals to augment this validation template as necessary. In general, 40 CFR Part 58 App A and 40 CFR Part 50 App L requirements apply to Continuous PM_{2.5}

1) Criteria (PM _{2.5} Cont)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- PM_{2.5} Continuous, Local Conditions			
<i>Sampling Period 24 hour estimate</i>	<i>every sample period</i>	$\geq 75\%$ (18) of hourly averages	1,2 and 3) 40 CFR Part 50 App N Sec 3 (c) See additional details for sample periods less than 18 hours.
Hourly estimates	Every hour	Instrument dependent	See operators manual
Sampling Instrument			
Average Flow Rate	<i>every 24 hours of op</i>	average within 5% of 16.67 liters/minute	1, 2 and 3) Part 50 App L Sec 7.4.3.1
Variability in Flow Rate	<i>every 24 hours of op</i>	$CV \leq 2\%$	1, 2 and 3) 40 CFR Part 50, App.L Sec 7.4.3.2
One-point Flow Rate Verification	1/mo	+ 4% of transfer standard + 5% of flow rate design value	1, 2 and 3) 40 CFR Part 50, App.L, Sec 9.2.5, 40 CFR Part 58, Appendix A Sec 3.2.3 & 3.3.2
BAM Specific Critical Criteria			
Reference Membrane Span Foil Verification (BAM)	Hourly	$\pm 4\%$ of ABS Value	1,2 and 3) BAM 1020 Operation Manual
OPERATIONAL CRITERIA- PM_{2.5} Continuous, Local Conditions			
Annual Multi-point Verifications/Calibrations			
<i>Leak Check</i>	every 30 days	< 1.0 lpm BAM (Not Thermo BAMS) ± 0.15 lpm TEOM	1) 40 CFR Part 50 App L, Sec 7.4.6.1 2) Recommendation 3) BAM SOP Sec 10.1.2 TEOM SOP Sec 10.1.6 Thermo BAM leak check should not be attempted. Foil could be ruptured.
<i>Temperature multi-point Verification/Calibration</i>	on installation, then 1/yr	$\pm 2^\circ\text{C}$	1) 40 CFR Part 50, App.L, Sec 9.3 2 and 3) Method 2.12 sec 6.4
<i>One-point Temp Verification</i>	1/mo	$\pm 2^\circ\text{C}$	1) 40 CFR Part 50, App.L, Sec 9.3 2) Method 2.12, Table 6-1 3) Recommendation
<i>Pressure Verification/Calibration</i>	on installation, then 1/yr	± 10 mm Hg	1) 40 CFR Part 50, App.L, Sec 9.3 2 and 3) Method 2.12 sec 6.5 BP verified against independent standard verified against a lab primary standard that is certified NIST traceable 1/year



Data Validation & Handling

- Data Validation due dates:
 - Monthly data uploaded to FAMAS within 30 days from the end of each month.
 - This includes entering 1-point QC checks, flow checks, and any audits that occurred within the month.
 - By 40 days after the end of each quarter, all data must be validated with appropriate null codes, qualifiers, and comments and then verified in FAMAS with an email sent to the Data Validation email (data.validation@dep.state.fl.us).



Data Validation Team

If you have any questions/concerns, please
contact the data validation team at:

Data.Validation@dep.state.fl.us

