

# Use of Qualifier Codes in AQS



# Use of Data Qualifiers in AQS

- Types of Qualifiers:
  - Request Exclusion (REQEX)
  - Informational (INFORM)
  - Null (NULL)
  - Quality Assurance (QA)
- Available qualifiers
- Look at an example & special cases:
  - Null qualifier “BG”
  - QA qualifier “9”
- How to submit data with qualifiers to AQS.
- References



# “Request Exclusion” Qualifier Type

- Use “REQEX” qualifier type for exceptional events.
- “REQEX” qualifiers begin with “R”.
- Use for criteria pollutants when air quality monitoring data shows an exceedance or violation because of an exceptional event.
- Requires documentation and EPA concurrence to exclude the flagged sample measurement(s) from design value calculations.
- REQEX qualifier chosen must be available for that pollutant; Check AQS website → “Parameters with allowed Qualifier Codes”.
- If not available, send request to [AQSTeam@epa.gov](mailto:AQSTeam@epa.gov) for consideration.



# “Informational” Qualifier Type

- Use “INFORM” qualifier type for informational purposes only, and when “REQEX” not appropriate.
- “INFORM” codes are duplicates of “REQEX” codes.
- “INFORM” codes begin with “I”.
- Document any event that might affect a measured concentration.
- Available for a pollutant as needed.
- Use of an “INFORM” qualifier does not require EPA concurrence and does not result in exceptional event exclusions.



# REQEX and INFORM Qualifier Codes

REQEX code	INFORM code	Description
RA	IA	African Dust
RB	IB	Asian Dust
RC	IC	Chemical Spills & Industrial Accidents
RD	ID	Cleanup After a Major Disaster
RE	IE	Demolition
RF	RF	Fire - Canadian
RG	IG	Fire - Mexico/Central America
RH	IH	Fireworks
RI	II	High Pollen Count
RJ	IJ	High Winds
RK	IK	Infrequent Large Gatherings
RL	IL	Other
RM	IM	Prescribed Fire
RN	IN	Seismic Activity
RO	IO	Stratospheric Ozone Intrusion
RP	IP	Structural Fire
RQ	IQ	Terrorist Act
RR	IR	Unique Traffic Disruption
RS	IS	Volcanic Eruptions
RT	IT	Wildfire-U. S.
RU	IU	Wildland Fire Use Fire-U. S.



# “Null” Qualifier Type

- Use the “NULL” qualifier type when a null value (i.e., no data point) is reported to AQS.
- Null qualifiers should be assigned when a scheduled sample is not usable or is not considered valid.
- Examples:
  - Sample was invalidated
  - Monitor was not operational
  - Calibration check is underway
  - Canister leaked, canister damaged in shipment, etc.
- All “NULL” qualifiers are available for all pollutants/parameters (currently).



# Null Data Qualifier Codes in AQS

AA	Sample Pressure out of Limits	BA	Maintenance/Routine Repairs
AB	Technician Unavailable	BB	Unable to Reach Site
AC	Construction/Repairs in Area	BC	Multi-point Calibration
AD	Shelter Storm Damage	BD	Auto Calibration
AE	Shelter Temperature Outside Limits	BE	Building/Site Repair
AF	Scheduled but not Collected	BF	Precision/Zero/Span
AG	Sample Time out of Limits	BG	Missing ozone data not likely to exceed level of standard
AH	Sample Flow Rate out of Limits	BH	Interference/co-elution/misidentification
AI	Insufficient Data (cannot calculate)	BI	Lost or damaged in transit
AJ	Filter Damage	BJ	Operator Error
AK	Filter Leak	BK	Site computer/data logger down
AL	Voided by Operator	BL	QA Audit
AM	Miscellaneous Void	BM	Accuracy check
AN	Machine Malfunction	BN	Sample Value Exceeds Media Limit
AO	Bad Weather	CS	Laboratory Calibration Standard
AP	Vandalism	DA	Aberrant Data (Corrupt Files, Aberrant Chromatography, Spikes, Shifts)
AQ	Collection Error	DL	Detection Limit Analyses
AR	Lab Error	FI	Filter Inspection Flag
AS	Poor Quality Assurance Results	MB	Method Blank (Analytical)
AT	Calibration	MC	Module End Cap Missing
AU	Monitoring Waived	SA	Storm Approaching
AV	Power Failure	SC	Sampler Contamination
AW	Wildlife Damage	ST	Calibration Verification Standard
AX	Precision Check	TC	Component Check & Retention Time Standard
AY	Q C Control Points (zero/span)	TS	Holding Time Or Transport Temperature Is Out Of Specs.
AZ	Q C Audit	XX	Experimental Data



# “Quality Assurance” Qualifier Type

- Use “QA” qualifier type with real observations, when a sample measurement is present and valid.
- QA flags denote a procedural or quality assurance issue that could possibly affect the uncertainty or concentration of the value.
- QA qualifier chosen must be available for that pollutant/parameter; Check AQS website → “Parameters with allowed Qualifier Codes”.
- If not available, send request to [AQSTeam@epa.gov](mailto:AQSTeam@epa.gov) for consideration.





# Quality Assurance (QA) Qualifier Codes

1	Deviation from a CFR/Critical Criteria Requirement
2	Operational Deviation
3	Field Issue
4	Lab Issue
5	Outlier
6	QUAPP Issue
7	Below Lowest Calibration Level
9	Negative value detected – zero reported
CB	Values have been Blank Corrected
CC	Clean Canister Residue
CL	Surrogate Recoveries Outside Control Limits due to analytical interference
EH	Estimated; Exceeds Upper Range
FB	Field Blank Value above Acceptable Limit
HT	Sample pick-up Hold Time exceeded
LB	Lab Blank value above acceptable limit
LJ	Identification of Analyte is Acceptable; Reported Value is an Estimate
LK	Analyte Identified; Reported Value may be Biased High
LL	Analyte Identified; Reported Value may be Biased Low
MD	Value Less than MDL
MX	Matrix effect
ND	No value Detected
NS	Influenced by Nearby Source
SQ	Values between SQL and MDL
SS	Value Substituted from Secondary monitor
SX	Does not meet Siting Criteria
TB	Trip Blank value above acceptable limit
TT	Transport Temperature is out of spec.
V	Validated Value
VB	Value Below normal; no reason to invalidate
W	Flow rate average out of spec.
X	Filter Temperature difference out of spec.
Y	Elapsed sample time out of spec.



# QA Codes

- Goal is to have data evaluated consistently and in an equivalent manner.
- Qualifiers for various situations:
  - Quantification and detection
  - Laboratory
  - Chain-of-custody
  - Field Maintenance and Operation
- Suggestions/Guidelines in the NATTS TAD  
“Technical Assistance Document for the National Air Toxics Trends Stations Program”.



# Quantification and Detection (QA qualifiers)

Qualifier Type	Qualifier Code	Qualifier Description
QA	SQ	Values greater than MDL and less-than-or-equal-to SQL
QA	MD	Values less-than-or-equal-to MDL
QA	ND	No value detected

# Field Operations/Maintenance (QA qualifiers)

Qualifier Type	Qualifier Code	Qualifier Description
QA	2	Operational Deviation
QA	3	Field Issue
QA	V	Validated value
QA	W	Flow rate average out of specs.
QA	X	Filter temperature difference out of specs.
QA	HT	Sample pick-up hold time exceeded; data questionable



# Field Operations/Maintenance (Null Qualifiers)

Qualifier Type	Qualifier Code	Qualifier Description
NULL	AA	Sample pressure out-of-limits
NULL	AB	Technician unavailable
NULL	AC	Construction repairs in the area
NULL	AD	Shelter storm damage
NULL	AE	Shelter temperature out of specification
NULL	AH	Sample flow rate out of limits
NULL	AI	Insufficient data to make calculation
NULL	AN	Machine malfunction
NULL	AO	Bad weather
NULL	AP	Vandalism
NULL	AT	Calibration
NULL	AU	Monitoring waived
NULL	AV	Power failure
NULL	AW	Wildfire damage
NULL	AX	Precision check performed
NULL	AY	QC Control points (Zero/Span)
NULL	AZ	QC Audit
NULL	BA	Maintenance/routine repairs
NULL	BB	Unable to reach site
NULL	BC	Multipoint calibration
NULL	BD	Auto calibration
NULL	BE	Building site repair
NULL	BF	Precision, zero, or span performed
NULL	BI	Lost or damaged in transit
NULL	BJ	Operator Error
NULL	BK	Site computer/data logger down



# Laboratory Generated (Null and QA)

Qualifier Type	Qualifier Code	Qualifier Description
NULL	AR	General lab error
NULL	AS	Poor quality assurance results
NULL	BH	Interference/co-elution
QA	FB	Field blank value
QA	TB	Trip blank value
QA	LB	Lab blank value
QA	LJ	Analyte identified; reported value estimated
QA	LK	Analyte identified; reported value may be biased high
QA	LL	Analyte identified; reported value may be biased low
QA	EH	Estimated; exceeds upper range
QA	CC	Clean canister residue
QA	7	Below lowest calibration level
QA	CB	Lot Blank corrected; PM10 Metals data
QA	HT	CR6+ Sample pick-up hold time specifications exceeded; data questionable.

Blank issue identifier flags should be used if reported blank values are above those set by the individual laboratories SOPs or QAPP. If high blank values are associated with samples, it is important that the values be reported but appropriately flagged. Do not invalidate values due to high blank values.

Note the field sample hold time flag has been added for Cr<sup>6+</sup>.



# Chain-of-Custody (Null Qualifiers)

Qualifier Type	Qualifier Code	Qualifier Description
NULL	MC	Module end cap missing
NULL	TS	Holding time or transport temperature out of spec
NULL	AF	Scheduled but not collected
NULL	AG	Sample time out of limits
NULL	AJ	Filter damage
NULL	AK	Filter or sample leak
NULL	AL	Voided by operator
NULL	AM	Miscellaneous void
NULL	AQ	Collection error
NULL	FI	Filter Inspection flag



# How to Find Available Qualifiers

The screenshot shows the EPA's Technology Transfer Network (TTN) Air Quality System (AQS) website. The main navigation bar includes 'Recent Additions', 'Contact Us', and a search box. The 'Quick Links' section is highlighted, with 'AQS Codes' circled in red. An arrow points from this link to a secondary screenshot of the 'AQS Codes and Descriptions' page. This page features a navigation sidebar, a search bar, and a list of Excel spreadsheets available for download. A second arrow points from this page to a list of specific spreadsheet titles.

**Technology Transfer Network (TTN) Air Quality System (AQS)**

**Quick Links**

- [Active User Registration](#)
- [AQS Codes](#)**
- [Recent Additions](#)
- [AQS App Change Log](#)

**Technology Transfer Network (TTN) Air Quality System (AQS)**

**AQS Codes and Descriptions**

Unless indicated otherwise, links on this page are to Excel spreadsheets created with Discover

Excel spreadsheets available

- [Parameters with allowed Qualifier Codes \(7/28/11, 2,343K\)](#)
- [Parameters with Exceptional Event Qualifiers \(8/23/10, 25K\)](#)

Use of Data Qualifiers in AQS



# Qualifier Info in the Works. . .

- Current internal review of QA qualifiers for NAAQS pollutants.
- Dynamic queries will keep a similar-looking QA qualifier table up-to-date.

Ambient Air Criteria Pollutant Data Qualifier Table (Revision Date 6/07/2011)

Parameter	Parameter Desc	Qualifier	1	2	3	4	5	6	7	9	CB	CC	CL
Symbol Definitions		Qualifier Desc	Deviation from a CFR-Critical Criteria Requirement	Operational Deviation	Field Issue	Lab Issue	Outlier	QA/P Issue	Below Lowest Calibration Level	Negative value detected - zero reported	Values have been Blank Corrected	Clean Canister Residue	Surrogate Recoveries Outside Control Limits due to analytical interferences
P- Presently in AQS for that parameter and OK X- Not appropriate A- Allow flag P-X- Allowed but discontinued P- Num - number of qualifiers used in last 2 years P Qualifier approved but not used in last 2 year P-X allowed but discontinued													
<b>NAAQS Parameters</b>													
44201	Ozone		A	A	A	X	A	A	A	P-X	X	X	X
42602	Nitrogen Dioxide		A	A	A	X	A	A	P	P-X	X	X	X
42101	Carbon Monoxide		A	A	A	X	A	A	P	P-X	X	X	X
42401	Sulfur Dioxide		A	A	A	X	A	A	P	P-X	X	X	X
88101	Pm2.5 - Local Conditions		P	P	P	P	P	P	P	P-X	X	X	X
81102	Pm10 Total 0-10um Stp		P	P	P	P	P	P	P	P-X	X	P-X	X
12128	Lead (Tsp) Stp		A	A	A	A	A	P	P	P-X	X	X	A
14129	Lead (Tsp) Lc Frm/Fem		A	A	A	A	A	P	A	X	P-X	P-X	A
85129	Lead Pm10 Lc Frm/Fem		A	A	A	A	A	P	A	X	P-X	P-X	A
<b>Potential-NAAQS Parameters</b>													
82128	Lead Pm10 Stp		A	A	A	A	A	P	P	P-X	P-4-X	X	A
88128	Lead Pm2.5 Lc		P	P	P	P	P	P	P	P-X	X	X	A
84128	Lead Pm2.5 Stp		A	A	A	A	A	P	A	X	X	X	A
85128	Lead Pm10 Lc		A	P	P	A	P	P	P	P-X	P-X	P-X	A
85101	Pm10 - Lc		A	P	P	A	P	P	P	P-X	X	P-X	X
86101	Pm10-2.5 - Local Conditions		P	A	A	A	A	P	A	X	X	X	X
86502	Acceptable Pm10-2.5 - Local Conditions		A	A	P	A	A	P	A	X	X	X	X
<b>Non-NAAQS Parameters</b>													
68104	Ambient Max Temperature		P	P	P	P-15	P	P	A	X	X	X	X
68103	Ambient Min Temperature		P	P	P	P-15	P	P	A	X	X	X	X
68105	Ambient Temperature		P	P	P	P-15	P	P	A	X	X	X	X
61102	Wind Direction		A	A	P	X	A	A	X	X	X	X	X
61101	Wind Speed		A	A	P	X	A	A	A	X	X	X	X
12129	Lead-210 (Tsp) Stp		A	A	A	A	A	P	A	X	X	X	A
14128	Lead (Tsp) Lc Non-Frm/Fem		A	A	A	A	A	P	A	X	P	P-X	A
83128	Lead Pm10-2.5 Stp		A	A	A	A	A	P	A	X	A	X	A
22128	Lead (Sp)		A	A	A	A	A	A	A	X	A	X	A
81103	Pm 10-2.5 Stp		A	A	P	A	A	A	A	X	A	X	X
88502	Acceptable Pm2.5 Aqi & Speciation Mass		P	P	P	P	P	P	A	X	A	X	X
88500	Pm2.5 Total Atmospheric		A	A	A	A	P	A	A	X	A	X	X
88503	Pm2.5 Volatile Channel		A	A	A	A	A	A	A	X	A	X	X
88501	Pm2.5 Raw Data		A	A	P	A	P	A	P	P-X	X	X	X
81104	Pm2.5 Stp		A	A	A	A	A	A	A	X	A	X	X

Questions Ambient Temp (68104, 103, 105) Are they strictly for temp at site or can they be used for the laboratory.





# Qualifiers Available for Ozone (44201)

44201	Ozone	INFORM	IA	African Dust
44201	Ozone		IB	Asian Dust
44201	Ozone		IC	Chem. Spills & Indust Accidents
44201	Ozone		ID	Cleanup After a Major Disaster
44201	Ozone		IE	Demolition
44201	Ozone		IF	Fire - Canadian
44201	Ozone		IG	Fire - Mexico/Central America
44201	Ozone		IH	Fireworks
44201	Ozone		II	High Pollen Count
44201	Ozone		IJ	High Winds
44201	Ozone		IK	Infrequent Large Gatherings
44201	Ozone		IL	Other
44201	Ozone		IM	Prescribed Fire
44201	Ozone		IN	Seismic Activity
44201	Ozone		IO	Stratospheric Ozone Intrusion
44201	Ozone		IP	Structural Fire
44201	Ozone		IQ	Terrorist Act
44201	Ozone		IR	Unique Traffic Disruption
44201	Ozone		IS	Volcanic Eruptions
44201	Ozone		IT	Wildfire-U. S.
44201	Ozone		IU	Wildland Fire Use Fire-U. S.
44201	Ozone	QA	1	Deviation from a CFR/Critical Criteria Requirement
44201	Ozone		2	Operational Deviation
44201	Ozone		3	Field Issue
44201	Ozone		EH	Estimated; Exceeds Upper Range
44201	Ozone		NS	Influenced by nearby source
44201	Ozone		SS	Value substituted from secondary monitor
44201	Ozone		VB	Value below normal; no reason to invalidate
44201	Ozone	REQEXC	RF	Fire - Canadian
44201	Ozone		RG	Fire - Mexico/Central America
44201	Ozone		RL	Other
44201	Ozone		RM	Prescribed Fire
44201	Ozone		RO	Stratospheric Ozone Intrusion
44201	Ozone		RQ	Terrorist Act
44201	Ozone		RT	Wildfire-U. S.
44201	Ozone		RU	Wildland Fire Use Fire-U. S.



# Special Cases

- NULL qualifier “BG/Missing ozone data not likely to exceed level of standard”
- QA qualifier “9/Negative value detected – zero reported”



# Ozone and null qualifier “BG”

- Special usage of the NULL code “BG/Missing ozone data not likely to exceed level of standard”
- Can request concurrence from the EPA Regional office when using “BG”
- Null data points flagged with “BG” and with EPA Regional Office concurrence will count towards the 75% data capture/completeness requirement



# QA Qualifier “9”

- “9/Negative value detected – zero reported”.
- Not available for:

12128	Lead (Tsp) Stp
42101	Carbon Monoxide
42401	Sulfur Dioxide
42406	SO2 max 5-minute average
42600	Reactive Oxides of Nitrogen (NOy)
42601	Nitric Oxide (NO)
42602	Nitrogen Dioxide
42603	Oxides of Nitrogen (NOx)
44201	Ozone
81102	Pm10 Total 0-10um Stp
82128	Lead Pm10 Stp
85101	Pm10 - Lc
85128	Lead Pm10 Lc
88101	Pm2.5 - Local Conditions
88128	Lead Pm2.5 Lc

14129	Lead (Tsp) Lc Frm/Fem
84128	Lead Pm2.5 Stp
85129	Lead Pm10 Lc Frm/Fem
86101	Pm10-2.5 - Local Conditions
86502	Acceptable Pm10-2.5 - Local Conditions

- Recommendation: replacement with “0” introduces statistical bias. Keep “small” negative numbers.
- AQS accepts down to the negative of the MDL for gaseous parameters.
- Report values no lower than the -MDL; do not zero substitute.
- Null values lower than the -MDL and report null value with null qualifier “DA/Aberrant Data”.



# Coding for Submittal to AQS

- See AQS transaction format for Raw Data

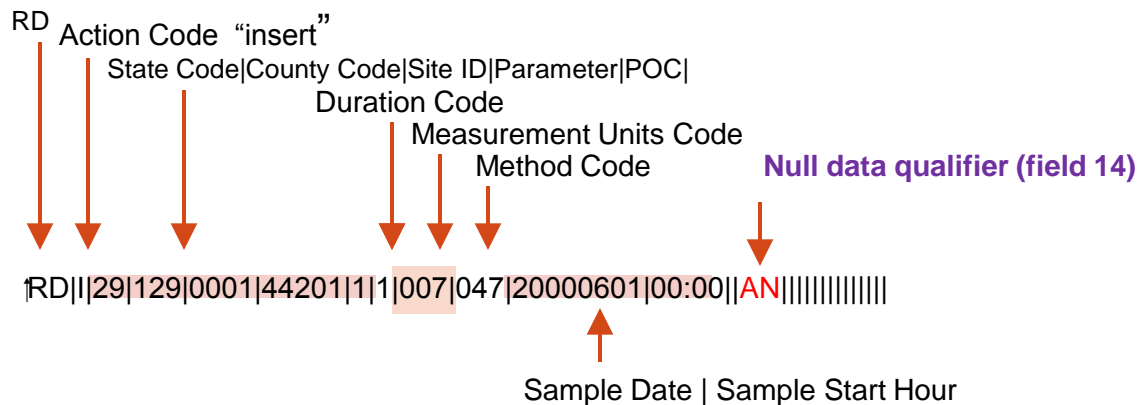
## RD Hourly, Daily, and Sub Hourly Raw Data

#	Field Name	Formatting Rule
1	Transaction Type <sup>R</sup>	RD = Raw Data Type
2	Action Indicator <sup>R</sup>	Must = I, U, or D
3	State Code / Tribal Indicator <sup>R</sup>	Must exist in STATES Reference Table or be 'TT' for Tribal Site
4	County Code / Tribal Code <sup>R</sup>	Must exist in COUNTIES or TRIBAL_AREAS Reference Table
5	Site ID <sup>R</sup>	Must exist in SITES table with the {State Code, County Code} or Tribal Code
6	Parameter <sup>R</sup>	Must exist in PARAMETERS Reference Table
7	POC <sup>R</sup>	Must exist in MONITOR table with Parameter
8	Duration Code <sup>R(I)</sup>	Must exist in SAMPLE_DURATIONS Reference Table
9	Reported Unit <sup>R(I)</sup>	Must exist in UNITS Reference Table
10	Method Code <sup>R(D)</sup>	Must exist in SAMPLING_METHODOLOGIES Reference Table
11	Sample Date <sup>R</sup>	YYYYMMDD format
12	Sample Time <sup>R</sup>	hh:mm format
13	Reported Sample Value <sup>X(I,U)</sup>	Number - 5.5 format
14	Null Data Code <sup>X(I,U)</sup>	Must exist in QUALIFIERS Reference Table, if valued
15	Collection Frequency Code	Must exist in COLLECTION_FREQUENCIES Reference Table
16	Monitor Protocol ID (MP ID)	Must exist in Monitor Protocols Table for the Monitor
17	Qualifier Code -1	Must exist in QUALIFIERS Reference Table, if valued
18	Qualifier Code -2	Must exist in QUALIFIERS Reference Table, if valued
19	Qualifier Code -3	Must exist in QUALIFIERS Reference Table, if valued
20	Qualifier Code -4	Must exist in QUALIFIERS Reference Table, if valued
21	Qualifier Code -5	Must exist in QUALIFIERS Reference Table, if valued
22	Qualifier Code -6	Must exist in QUALIFIERS Reference Table, if valued
23	Qualifier Code -7	Must exist in QUALIFIERS Reference Table, if valued
24	Qualifier Code -8	Must exist in QUALIFIERS Reference Table, if valued
25	Qualifier Code -9	Must exist in QUALIFIERS Reference Table, if valued
26	Qualifier Code -10	Must exist in QUALIFIERS Reference Table, if valued
27	Alternate Method Detectable Limit	Number - 5.5 format
28	Uncertainty Value	Number - 6.5 format



# Coding Null Data for Submittal to AQS

- When reporting a null sample measurement:
  - On RD (Hourly, Daily, and Sub Hourly Raw Data) transaction:
    - Report blank sample value (field 13).
    - Use a null data code (field 14).
  - Can submit only one null data qualifier.

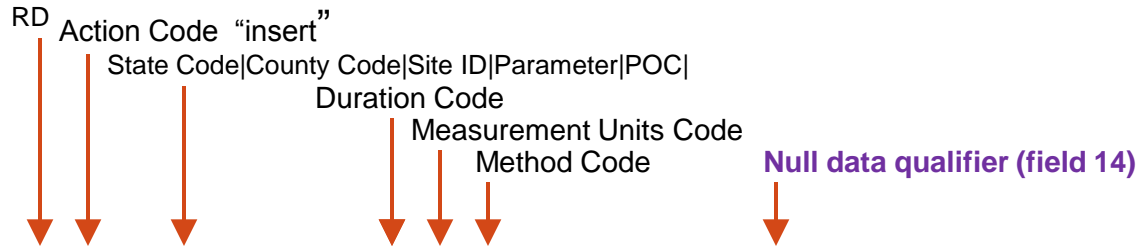


# Coding QA-Flagged Data for Submittal to AQS

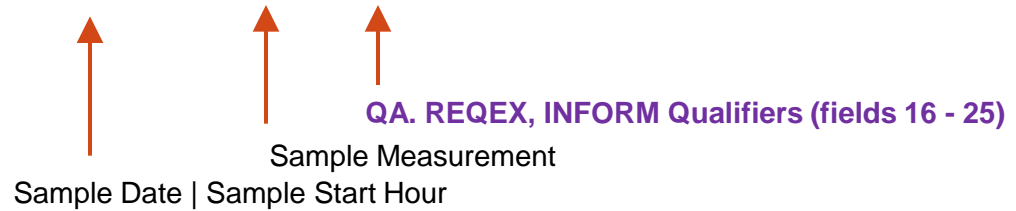
- When reporting a sample measurement:
  - On RD (Hourly, Daily, and Sub Hourly Raw Data) transaction:
    - Ten fields available for data qualifiers.
    - Use ten fields (delimited fields 16-25) in sequence: place the first qualifier in field 16, the second in field 17, etc.
  - Can submit only one exceptional data qualifier + add'l QA qualifiers.
  - Can submit up to 10 QA qualifiers.



# RD Transaction with Null and QA Qualifiers



```
RD||29|129|0001|44201|1|1|007|047|20000601|00:00||AN|||||||
RD||29|129|0001|44201|1|1|007|047|20000601|01:00|0.0086|||3|2|||||
RD||29|129|0001|44201|1|1|007|047|20000601|02:00||AT|||||||
RD||29|129|0001|42604|1|1|007|051|20000601|03:00|0.0061|||||||
RD||29|129|0001|42604|1|1|007|051|20000601|04:00||BG|||||||
RD||29|129|0001|42604|1|1|007|051|20000601|05:00|0.0029|||||||
RD||29|129|0001|42604|1|1|007|051|20000601|06:00|0.0221|||||||
```





# References

- AQS website:

<http://www.epa.gov/ttn/airs/airsaqs/>

- AQS Codes → “Parameters with allowed Qualifier Codes” (Excel file).
- AQS Coding Manual.
- Data Input Formats for the Re-engineered Air Quality Subsystem.

- AMTIC website:

<http://www.epa.gov/ttn/amtic/>

- Technical Assistance Document for the National Air Toxics Trends Stations Program – Revision 2 - April 1, 2009.
- Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II.

