## Methods for Sample Data Handling in AirVision

Manual filter/sample data can be handled in several different ways in AirVision, primarily depending on some of the options elected. These include:

- 1. Manual data entry of filter data through the Sample Data editor (base system)
- 2. Import of PM filter data files through File Import Tool, with follow-up editing for weights / lab data
- 3. Automatic polling of FRM samplers (using Direct Instrument Poll drivers) for Filter Data records, with follow-up editing for weights / lab data
- 4. Combining methods 2 or 3 with File Import Tool for final lab results.

This section will focus on methods 2 and 3, as the other methods follow easily from a study of the setups of these methods.

First, we consider the Site/Parameter setup. In most cases, we want to report to AQS the PM concentration value itself, as well as average ambient temperature, barometric pressure, and volume. We may also want to report min/max temperature, min/max barometric pressure, and flow covariance. For this document, we will call this "Extended AQS Reporting." We would set up site/parameter records for each entry we wish to report to AQS.

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ManualSampleData     ManualSampleData     MASSLC     MedApPRESS     MADYTEMP     MAXEP     MAXEP     MAXEP	Site: Parameter: Parent Parameter:	ManualSampleData PMAMBTEMP	Parameter Template: PMAMBTEMP		
	Enabled:		Truncate Round Rule: C Round C Truncate Reported Units: DEGC	e 🗸	Е
	(	Composite Sample	Analyzer Units (if different):	*	
		Particulate Sample	Graph Minimum:		
	Description: PM	Avg Ambient Temp	Graph Maximum:		
	Math Equation: (if Calculated)	- [ <u>8</u> ]	Calibration Span:		
	EPA POC: 1		Instrument Detection Limit:		
	EPA Method: 111	8	Limit Of Quantization:		
	EPA Units: 017	- Degrees Centigrade 🔹 👻	Minimum Detectable Limit:		
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Note: if you do not report average flow/temp/pressure to AQS, they can still be imported using the File Import Tool, but a Parameter record does not need to be configured at this point. For this document, we will call this the "Basic AQS Reporting." Next, we consider the File Import Template we will use for either manual file import, or connected to the Direct Instrument Poll of our FRM sampler. If we want to use the Basic AQS Reporting method, we can use the default Partisol templates already packaged in the system. These map the pressure, temperature, and flow fields to sub-records inside the PM sample record:

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Template Name /	File Schema							
	Template Name:	Partisol 2025 Filter Data_Ex	tended	Parameter Information				
API 100 Conc	File Layout			Parameter Matching				
API 200 Conc	Number of Header	Rows: 0 1		Match Parameter				
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API 400 O3REF	Maximum Num Columns:	ber of 🕴						
API 400 PNUMTC	Field D	elimiter: Comma						
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AQS Sample (RD)	Sample		•	Parameter Data Typ	e: C Average (Cont	tinuous)		
BAM_EBAM		Back Stamp Data	Time		C Composite Sa	mple		
BAM1020_Coarse					Particulate Sa	mple		
BAM1020_Coarse_FIT_Flags								
BAM1020_FIT_Flags				Duration Cod	le: 7 - 24 HOURS	<b>*</b>		
CPP_FAIRBANKS				Frequency Cod	e: 3 - EVERY 3RD D	YAY Y		
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MetOne_ESampler	File Column Mapping							
OldLegacyData	Column Number /	Data Field	Parar	meter Template	Parse Format	Flag Map	*	
Partisol 2000 Filter Data	6	Time			HH:mm			
Partisol 2000 Interval	11	Value	PMFLOWCOV	/				
Partisol 2025 Filter Data	12	Value	PMVOLUME				m	
Partisol 2025 Interval	13	Value	PMMINTEMP	•				
STANDARD_BAM1020	14	Value	PMAMBTEM	P				
TEOM 1400	15	Value	PMMAXTEM	P				
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Partisol 2025 Filter Data_Extended		Value	PMMAXBP					
	20	Malua	DEAC ABADTINA	()	i i i i i i i i i i i i i i i i i i i			

*Note: If you want to report PM10 instead of PM25, you can use the "Copy" function on the ribbon to create a duplicate parameter template and change the parameter template from PM25 to PM10.* 

Note that the flow, temperature, and pressure are data fields **within** the PM25LC sample record. They are not stored separately as parameter records, and thus in this method, AQS records cannot be generated independently for those measurements.

To do so, we would use the Extended AQS Reporting method, and choose one of the new "Extended" file import templates:

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Home View Favorites	File Import Configurat	ion			
Site/Parameter + File Import Configuration	🔛 File Import Tool	🛃 Sample Data Editor 🛛 🎱 AQ	S Text Report		
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API 200 Conc	Number of Header Ro	ws: 0 ‡		er by Column Number	
API 400 Conc	Number of Footer Ro		C Match Paramet		
API 400 O3GEN			C Match Paramet	ers from Header	
API 400 O3REF	Maximum Number Columns:	of			
API 400 PNUMTC	Field Delim	iter: Comma	-		
AQS Blanks (RB)		commu	Verwrite Exis	Contraction of the second s	-
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BAM_EBAM		🔲 Back Stamp Data Time		C Composite Sample	
BAM1020_Coarse				Particulate Sample	
BAM1020_Coarse_FIT_Flags			During		
BAM1020_FIT_Flags				ode: 7 - 24 HOURS -	
CPP_FAIRBANKS			Frequency C	ode: 3 - EVERY 3RD DAY 🔻	
Magee MicroAeth					
MetOne_ESampler	File Column Mapping				
OldLegacyData	Column Number /	Data Field	Parameter Template	Parse Format Flag Mag	P
Partisol 2000 Filter Data	1 Sa 5 Di	ample Identifier	PM25LC		
Partisol 2000 Interval	71 (32)	C-84		yyyy/MM/dd	
Partisol 2025 Filter Data	6 Ti 11 Va		PMFLOWCOV	HH:mm	
Partisol 2025 Interval	(89.8)				
STANDARD_BAM1020	12 Va		PMVOLUME		
TEOM 1400	13 Va 14 Va	971140	PMMINTEMP		
TEOM_PINAL	14 Va 15 Va		PMAMBLEMP		
WI_TestLogger	19 Va		PMMIAXTEMP		
Partisol 2025 Filter Data_Extended	20 Va		PMMINBP		
	20 V2		PMDARPRESS		
	38 Va		PMSAMPTIM		
			Consecution (1999)		
	Add Add Colun	nn Mapping			
				Profile: local	Version: 2.10.22 Build: 2013.10.22.3 11/5/2013 10:05

Here, you can see in this case, each field is matched to the parameter template to direct imported data into the individual parameter. Once we have imported the data or polled the instrument to get the data in, we can open the Sample Data Editor and see the results.

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In this example, we have used the Basic mode template. You see that the pressure, temp, and flow are not available as individual records, but exist in the Extended Details of the PM25 record, and are available to the Sample Data calculator (but not to AQS reporting).

If we use the Extended template, our records would look like this:

Site/Parame	and a second	(A) onfiguration	File Import Tool	ample Data	Editor 🥥	AQS Text Report								
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Drag a colum	header here to grou	p by that co	lumn.											
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ManualSam	pl PMBARPRESS	MM/HG	11/01/2013 00:00	744.00				3 - EVERY 3RD D	7 - 24 HOURS		222	V	V	100
ManualSam	pl PMFLOWCOV	PERCEN	11/01/2013 00:00	0.0				3 - EVERY 3RD D	7 - 24 HOURS		444	V	V	1
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ManualSam	pI PMMAXTEMP	DEGC	11/01/2013 00:00	8.7				3 - EVERY 3RD D	7 - 24 HOURS		111	V		100
ManualSam	pl PMMINBP	MM/HG	11/01/2013 00:00	742				3 - EVERY 3RD D	7 - 24 HOURS		222	V	V	
ManualSam	pl PMMINTEMP	DEGC	11/01/2013 00:00	-4.7				3 - EVERY 3RD D	7 - 24 HOURS		111	V	V	1
ManualSam	pl PMVOLUME	M3	11/01/2013 00:00	24				3 - EVERY 3RD D	7 - 24 HOURS		444	V	V	
ample Details	Extended Details	Annotation	5			"								
End Time:			MDL:			Barometric Press:								
Analysis Time:			Uncertainty Value:			Ambient Temp:								
Retrieved Time			Tare Weight:			Total Flow:								
Canister Identi	ier		Final Weight:											

Here, the flow, pressure, temp data are all available for AQS reporting, but not stored as fields within the PM25 record. But that's OK, we can still access that data when using the Calculator.

### The Sample Calculator

The calculator allow the editor to determine PM concentration from volume, temperature, pressure, and tare/final weight data manually entered into the editor (users with the File Import Tool have the option, of course, to directly import the concentration data).

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Drag	a column h	eader here to group	o by that co	olumn.											
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N	/anualSampl	PM25LC	UG/M3	11/04/2013 16:02		°T8121974			3 - EVERY 3RD D	7 - 24 HOURS		333	V	V	17
N	lanualSampl	PM25LC	UG/M3	11/07/2013 00:00		"T8121975			3 - EVERY 3RD D	7 - 24 HOURS		333	V	V	
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Site:	N	lanualSampleData	Uni	ts: UG/M3		Frequency Code:	3 - EVERY 3RD DAY	*	Creditable Samp	le: 🔽	Qualifier Code				
Parar	neter: P	M25LC	San	nple 18121913		Duration Code:	7 - 24 HOURS	•	Scheduled Samp	e: 🔽	*				
Samp	ole Time: 1	1/01/2013 00:00		Method Code:	333	Blank Filter Type:		*	Exclude From Rep	oorting: 🕅					
Samp	ole Value:	- I I				Null Code:		-							

When you click the calculator button, a popup screen will appear for data entry:

ticulate Calculation	1		
Site-Parameter:	ManualSampleData : F	PM25LC 👻	
	11/01/2013 00:00		
alculation Input Par	ameters		
Final Weight:		(grams)	
Initial Weight:		(grams)	
Sample Weight:	0.00000	(grams)	
Time:	1440	(minutes)	
Site Environment	Parameters		
Formula Type	Populate fr	om Site Samples/Averages	
<ul> <li>Actual</li> <li>Theoretical</li> </ul>	Total Flow:		(cubic meter)
	Pressure:		(mm Hg)
	Temperature:		(K)
alculation			
Calculate Sample			

Here, all data can be manually entered, and "Calculate Sample" used to calculate the concentration. If using the Basic method, the flow, pressure, and temperature will already be populated from the meta data in the main PM data record.

For the Extended method, flow/pressure/temperature data can be filled using the "Populate from Site Samples/Averages" button. The algorithm AirVision uses to fill these records are as follows:

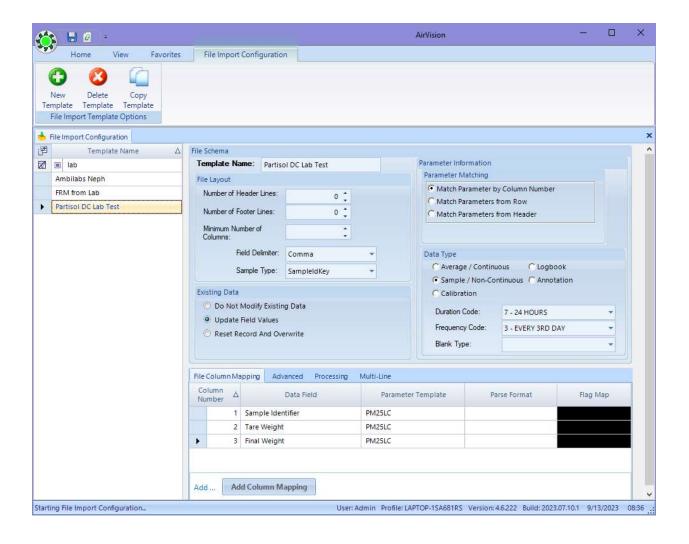
- 1. Try to find sample data records with the same date/time from parameters with the parameter templates PMVOLUME, PMBARPRESS, and PMAMBTEMP.
- 2. If these do not exist, try to find hourly data records for that day with parameter templates ??, ??, ??, and create 24-hour totals/averages from those parameters.

Once the flow, pressure, temperature, and tare/final weights have been entered, the "Calculate Sample" button will calculate the concentration value. "OK" will save the result.

### **Importing Filter Lab Data**

Obviously, if dealing with a lot of filter weight data, it is not necessarily viable to depend on manual entry for all of these. Most gravimetric lab data is kept in spreadsheets or can be generated to spreadsheets in LIMS software. So, we can use the File Import Tool to *merge* the above sampler data with weights, and then calculate the results in AirVision.

To do this, we select a particular Import Type in the File Import Template Editor: *SampleIDKey*. This selection tells the File Import tool that the incoming template will have a SampleID in the file, and to look for an existing matching record (that will have the date, time, parameter). So the incoming file could contain nothing more than tare weight and final weight (but could contain other meta data like null codes, qualifier codes, etc). Example:



#### **Co-Located Samplers**

In the Basic mode, it would be easy to copy a File Import Template and create alternate templates and alternate Parameter Templates (e.g., PM25LC\_2, PMAMBTEMP\_2, etc).

Because the calculator has some elements hard-coded to particular parameter templates, using the Extended mode can be problematic for co-located samplers configured at the same site.

For this reason, it may be easier for the user to configure a secondary "pseudo site" to represent a colocated sampler. The co-located site can have the same site/county code, and a similar list of parameters (and use the standard parameter templates). In this case, the only difference would be the Site Name, and the POC settings in the parameters. Example:

Home View Favorites	Site/Parameter		AirVision™		(and	
🖓 Site/Parameter 📥 File Import Configuration	10.007	Data Editor 🥥 AQS Text Report 🔗				>
⊡– <b>_1</b> System	💑 Site:ManualSampleData Param	neter: 🗸 Site:ManualSampleData I	Parameter: 💑 Site:Manua	ISampleData Parameter:	💑 Site:ManualSampleDa	ta Parameter: 🔺 🖡
	Site: Parameter: Parent Parameter:	Co-Located PM25LC	Parameter Template:	PM25LC	•	
PMNAXEMP     PMNINTEMP     PMVINTEMP     PMVIOLUME     PMFLOIVCOV     Cocceted		Enable AIRNow Reporting: 🛄 Filter From Web Site: 🛄 erage (Continuous)	Truncate Round Rule: Reported Units: Analyzer Units (if dfferent):	C Round @ Truncate	•	
A PMBARPRESS     MAMATEMP     MMAXEP     MMAXEP     MMAXTEMP     MMAXEP     MMINIEP     MMINIEP     MOUNTEMP     MOUNTEMP	Parameter Besone 2015 - Market States	imposite Sample riticulate Sample otal Mass Manual Method Local Co isi v isi v eograms/cubic meter (LC) v Pm25 - Local Conditions isi v	Graph Minimum: Graph Maximum: Calibration Span: Instrument Detection Limit: Limit Of Quantization: Minimum Detectable Limit: Practical Quantization Limit: Parameter Report Order:	0.00		F
e \$		XXXXY Parameter M Value		Minimum in Reports Profile: local Version: 2:	10.22 Build: 2013.10.22.3	11/5/2013 10:30

In this case, the parameter just appears in AQS as the same site, with a different POC code:

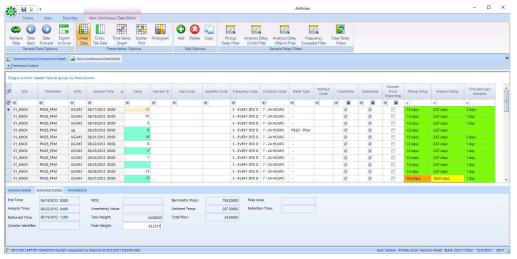
	iew Favorites AQS Text Report		Sample Data Edit	or AQS Text Report	<b>%</b> 6	AirVisio SI Driver Editor	on <sup>tw</sup>		
Date Range Start Date 10/01/20	13 00:00 🛟 👻		meter Selection					Record Type Selection	
End Date 11/02/20 Average Interval		ø	Site Name	Parameter Name	Para	Name	AQS Parameter	Sample Data Records     Composite Data Records	
Average Interval	Description 5 Minute 502		Co-Located	here to group by that column.  Parameter Template P					
eport Output									
D I 47 093 1144 8; D I 47 093 1144 8;	8101 2 7 7 105 333 20131001 00:00 8101 2 7 105 338 20131004 16:02 8101 2 7 105 338 20131004 16:02 8101 2 7 105 338 20131007 100:00 8101 1 7 105 338 20131004 16:02 8101 1 7 105 338 20131004 16:02 8101 1 7 105 338 2013100 100:00	22 3   22 3   22 3   22 3   22 3							

# **Options for Managing Filter-based PM Meta Data**

AiVision offers two main approaches for handling the meta data (sampler volume, pressures, temps, etc) associated with filter-based samplers:

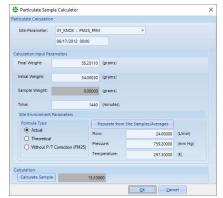
- Store the data as meta data as part of a single Sample record
- Store the data as additional parameters in AirVision

There are pros and cons to each, so let's review the approaches. Looking at the sample data editor, we can see that a single PM record can have meta data as part of the sample record:



Note, however, that only the *average* pressure and temperature are stored, max and min values are not available as meta data- those must always be stored as additional parameters if the user wants to keep that data for other reports, graphing, etc. Note also that this approach assumes press/temp/flow kept only as the 24-hour sampler values, and not as hourly data potentially acquired via a data logger connected to the sampler.

When the user runs the calculator to get the final concentration, the calculator can draw from the meta data, or the user can request the data be queried from other parameters ("Populate from Site Averages"):



If the populate button is used, the system will seek either a sample record of the same time, or 24 x 1hour averages from the same day, identifying the parameters using the parameter templates PMVOLUME, PMBARPRESS, and PMAMBTEMP. This creates a problem if you want to have two co-located samplers at the same site, as one site cannot have to instances of the same parameter templates (for volume, press, temp). So, for a co-located site, we must either create a second site (e.g., NORTH\_COL) and put all the parameters for the second sampler in that site, or forgo the parameter approach, and only keep the values in the meta data of the single PM parameter.

Also, note that the 'batch calculate' function in the Sample Data Editor (drag-select, left-click, "Recalculate Sample" can't do the "Populate" step, forcing the user to manually populate each record and calculate. However, this shortcoming can be worked around by having the File Import Template 'double-import' the average pressure and temperature (and flow) parameters, both as a parameter at the site, and in the meta data part of the record:

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ample/Hourly Comparison Graph 🛛 🥃 N	on-Continuous Data Editor	+ File Import Configuration				
Template Name △	File Schema					
🛙 par	Template Name: Parti	sol 2025 Filter Data_2Ximport	Parameter Information			
Partisol 2000 Filter Data	File Layout		Parameter Matching			
Partisol 2000 Interval	Number of Header Lines:	0 📜	Match Parameter     Match Parameter			
Partisol 2025 Filter Data	Number of Footer Lines:	0 🛟	C Match Parameter			
Partisol 2025 Filter Data_2Ximport	Minimum Number of		materrarameter			
Partisol 2025 Interval	Columns:	•				
Partisol DC Lab Test	Field Delimiter:	Comma 👻	Data Type			
Partisol i-Series FREC	Sample Type:	Standard 🔹	C Average / Contin	nuous <mark>C</mark> Logbook		
Partisol i-Series LRECS				ontinuous CAnnotati	on	
	Existing Data		C Calibration			
	O Do Not Modify Exist		Duration Code:	7 - 24 HOURS	-	
	<ul> <li>Update Field Values</li> <li>Reset Record And O</li> </ul>		Frequency Code:	3 - EVERY 3RD DAY	-	
	Reset Record And O	verwrite	Blank Type:			
	File Column Mapping Ac	dvanced Processing Multi-Line				
	Column A	Data Field Para	meter Template	Parse Format	Flag Map	
	▶ 1 Sample	Identifier PM25LC				
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	6 Time			HH:mm 💌		
	11 Value	PMFLOWCOV				
	12 Sample	Total Flow PM25LC				
	12 Value	PMVOLUME				
	13 Value	PMMINTEMP				
	14 Value	PMAMBTEMF				
	14 Sample	Ambient Temp PM25LC				
	15 Value	PMMAXTEM				
	19 Value	PMMINBP				
	20 Value	PMBARPRESS				
	20 Sample	Barometric Press PM25LC				
	21 Value	PMMAXBP				

So, the pros and cons of the two approaches can be summarized as follows:

	Store as Parameter	Store as Meta Data
Using reports and charts for average, min, max press, temp, flow	Yes	Not available
Using average press/temp in calculations	Yes, but 'fill' button must be used OR File Import template can be set to 'double-import'	Yes, can 'batch' calculate
Store min/max pressure, temp	Yes	No
Co-Located data in same site	No, must be separate site	Yes

So, in short, the general recommendation is to store as parameters and use the 'double import' approach, unless the customer has a particular objection to co-located samplers being represented as secondary sites in AirVision.

## Enhancements To The Sample Data Editor (Version 2.10)

The following enhancements were made to the Sample Data Editor:

- Additional fields were added to the meta data of the records, and to the File Import Tool:
  - Tare/Final Weight
  - o End Time
  - o Analysis Time
  - o Cannister ID
  - o MDL, Uncertainty Values

Note that the Sample Data Editor supports sorting and filtering on these fields in the Linear Mode:

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ManualSampl	PM25LC	UG/M3 1	1/04/2013 16:02	44.2	'T8121974		3	3 - EVERY 3RD DAY	7 - 24 HOURS		333	V	V	10	
ManualSampl	PM25LC	UG/M3 1	1/07/2013 00:00	38.5	'T8121975			3 - EVERY 3RD DAY	7 - 24 HOURS		333	V	V		
ManualSampl	PM25LC	UG/M3 1	1/10/2013 00:00	32.9	'T8121913			3 - EVERY 3RD DAY	7 - 24 HOURS		333	V	V		
ManualSampl	PM25LC	UG/M3 1	2/20/2013 00:00	44.5	T8121975			3 - EVERY 3RD DAY	7 - 24 HOURS		333	V	V		
ManualSampl	PM25LC	UG/M3 1	2/23/2013 00:00	34.1	'T8121913			3 - EVERY 3RD DAY	7 - 24 HOURS		333	V	V		
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Site:	danualSampleData	Units:	UG/M3	Frequency Co	de: 3 . EVE	RY 3RD DAY	- Cr	editable Sample:	V Oualifier (	ode					
										ditava					
Parameter: P	M25LC	Sampl		Duration Coo	le: 7 - 24 H	IOURS		heduled Sample:							
Sample Time: 1	1/04/2013 16:02	AQS N	lethod Code: 3	Blank Filter T	ype:		👻 Ex	clude From Reporting:							
	44.20000	3		Null Code:											

Thus, the user can easily search for PMFLOW under a certain value, flow covariance over a certain limit, etc, or just filter the samples based on Blank Type or Null Code.

The editor also supports selection of data points and the ability to add annotations to the data, much like the Average Data Editor, including italic marking of data points, and mouse-hover over to see the annotations:

P	Site	Parameter /	Units	Sample Time	Value		Sample ID	Null Code	Qualifier Code		Frequency Code	Duration Code	Blank Type	Method Code	Creditable	Scheduled	Exclude From Reporting
				-	>	30	M.			A		60	60				
	ManualSampl	PM25LC	UG/M3	11/04/2013 16:02		44.2	'T8121974		3	3 -	EVERY 3RD DAY	7 - 24 HOURS		333	V	V	
	ManualSampl	PM25LC	UG/M3	11/07/2013 00:00		38.5	'T8121975			3 -	EVERY 3RD DAY	7 - 24 HOURS		333	1	<b>V</b>	
	ManualSampl	PM25LC	UG/M3	11/10/2013 00:00		32.9	'T8121913			3 -	EVERY 3RD DAY	7 - 24 HOURS		333	1	V	
•	ManualSampl	PM25LC	UG/M3	12/20/2013 00:00		44.5	'T8121975			3 -	EVERY 3RD DAY	7 - 24 HOURS		333	1	1	
	ManualSampl	PM25LC	UG/M3	12/23/2013 00:00		34.1	'T8121913			3 -	EVERY 3RD DAY	7 - 24 HOURS		333	7	V	
	ManualSampl	PM25LC	UG/M3	12/26/2013 00:00		Ma	anualSamp	leData : PM25LC	12/20/2013 00:	:00:0	O AY 3RD DAY	7 - 24 HOURS		333	V	V	

The Sample Data Editor also provides right-click options on selected data points for several functions like the Average Data Editor, including a Batch Edit function.

