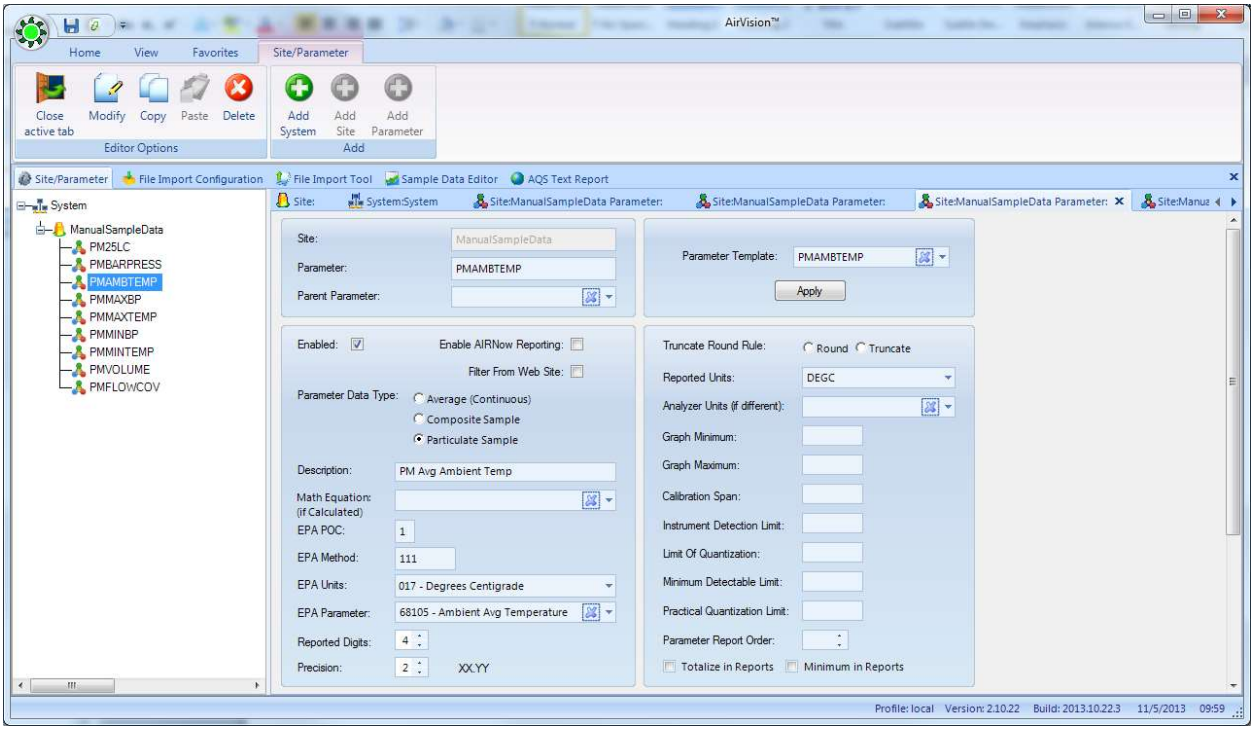
Methods for Sample Data Handling in AirVision

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.

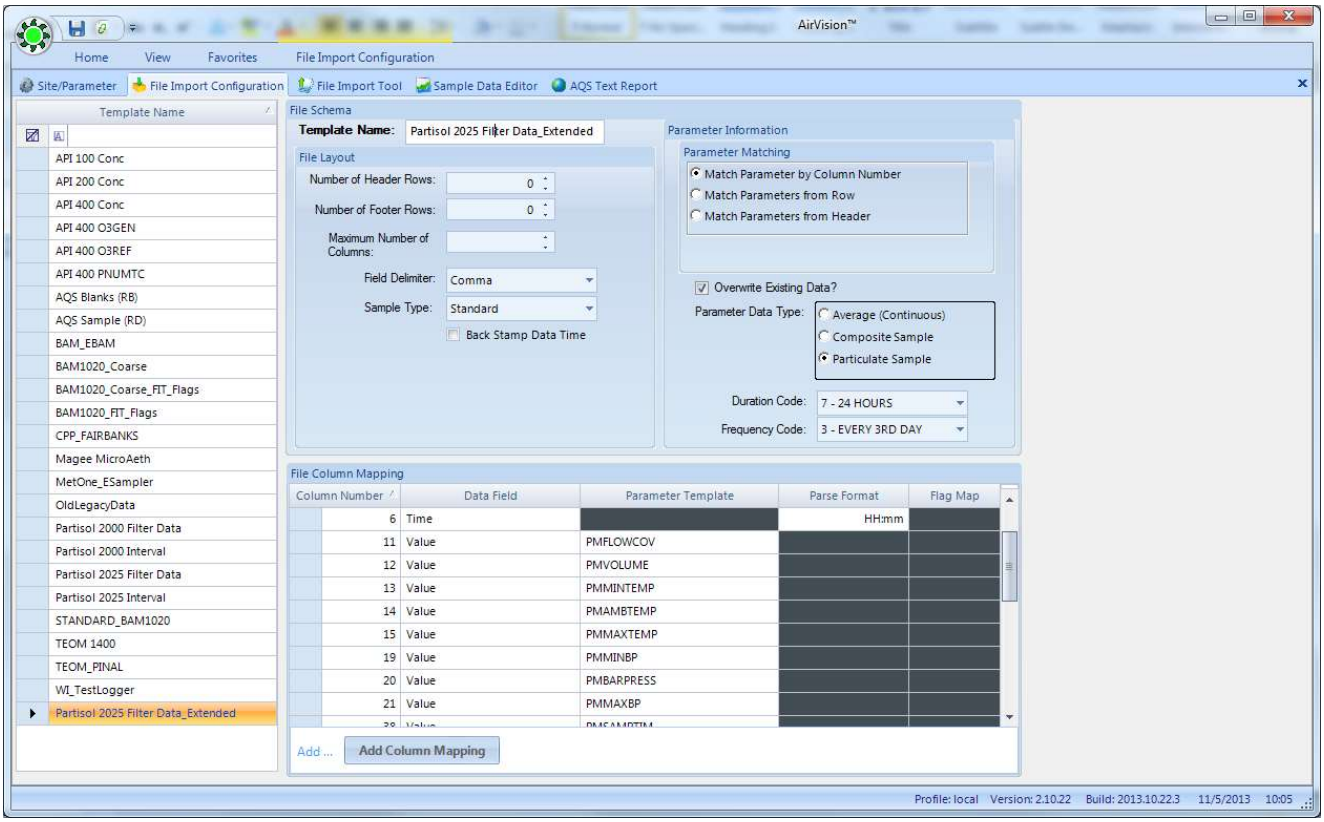
This section will focus on methods 2 and 3, as the other methods follow easily from a study of the setups of these methods.

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.



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."

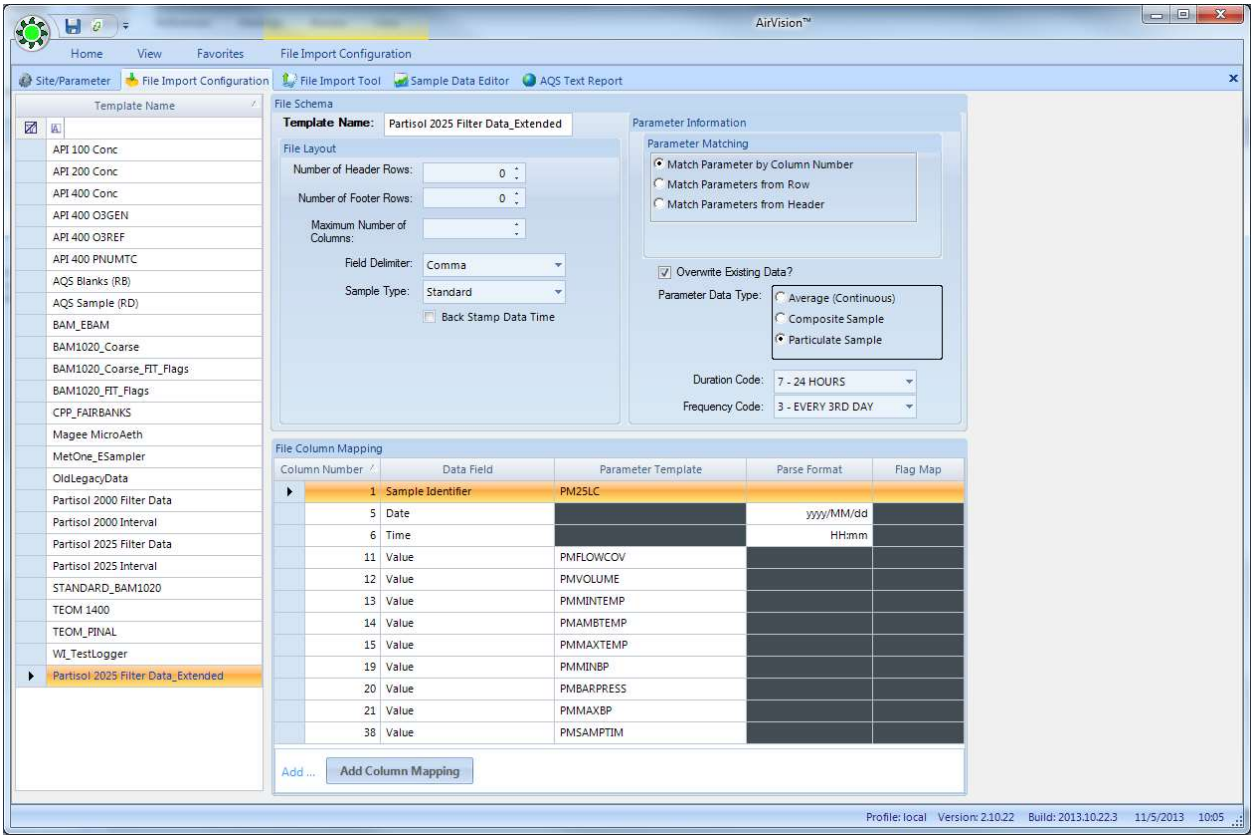
Next, we consider the File Import Template we will use for either manual file import, or connected to the Direct Instrument Poll of our FRM sampler. If we want to use the Basic AQS Reporting method, we can use the default Partisol templates already packaged in the system. These map the pressure, temperature, and flow fields to sub-records inside the PM sample record:



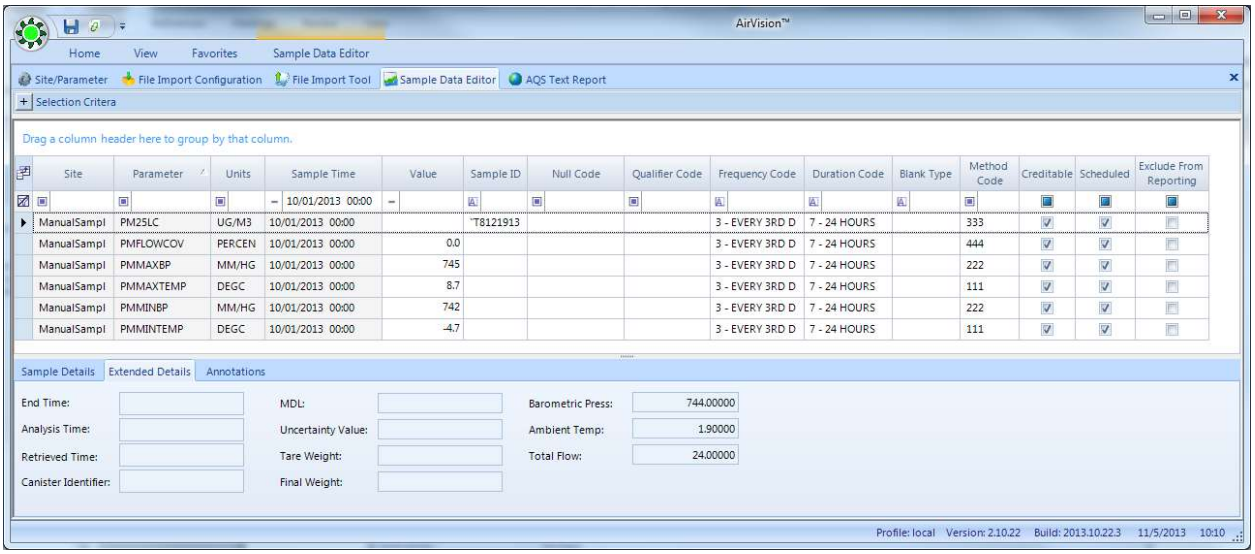
Note: If you want to report PM10 instead of PM25, you can use the "Copy" function on the ribbon to create a duplicate parameter template and change the parameter template from PM25 to PM10.

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:

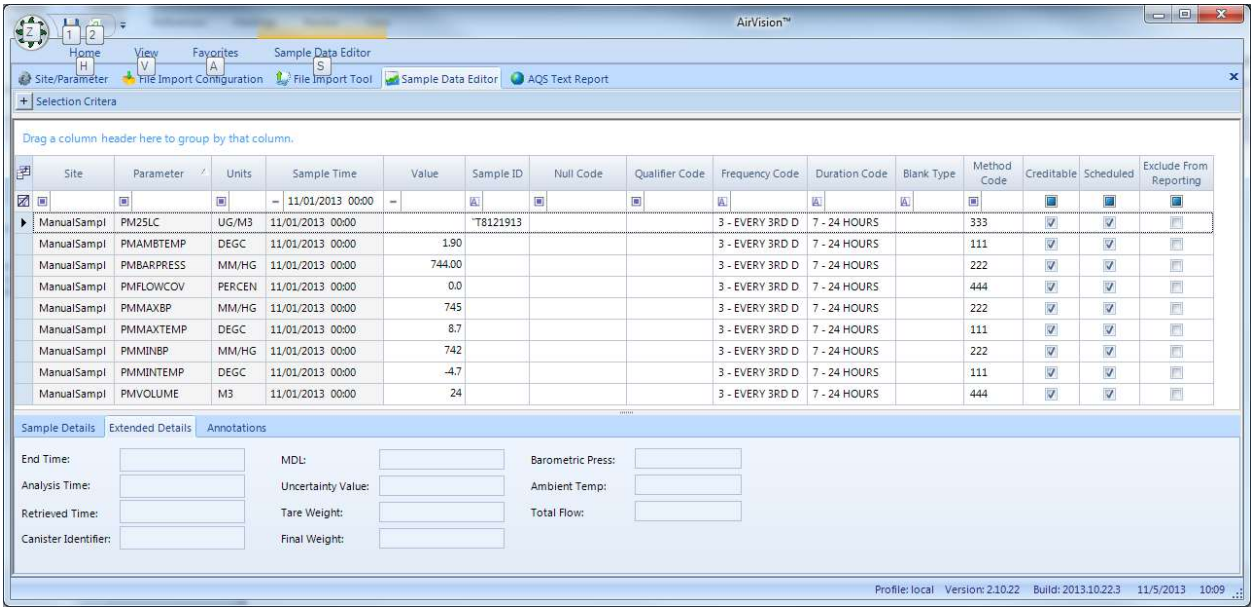


Here, you can see in this case, each field is matched to the parameter template to direct imported data into the individual parameter. Once we have imported the data or polled the instrument to get the data in, we can open the Sample Data Editor and see the results.



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).

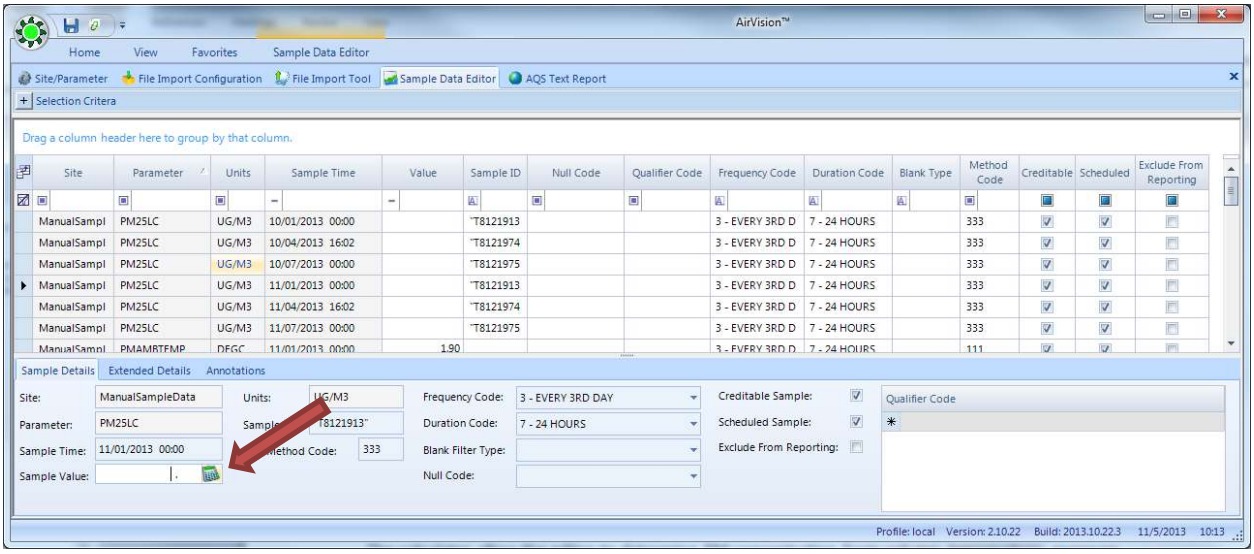
If we use the Extended template, our records would look like this:



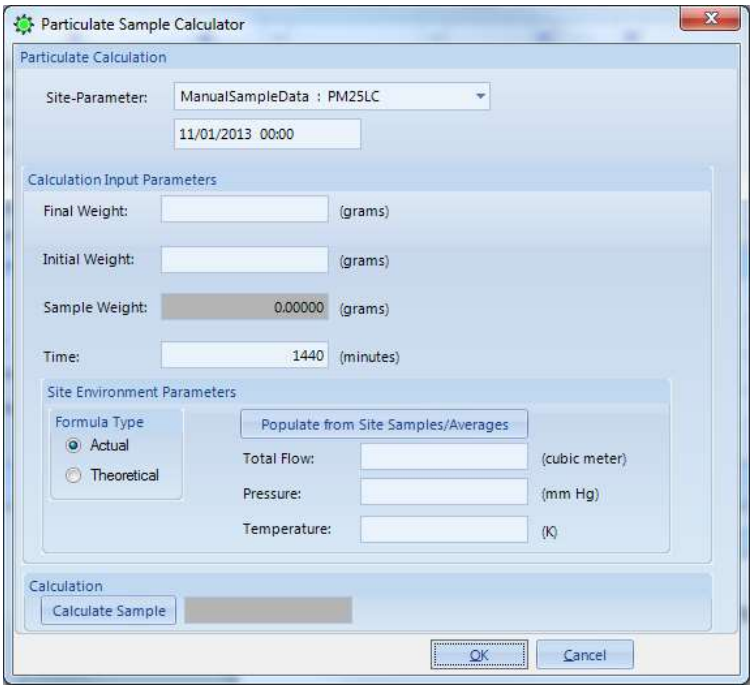
Here, the flow, pressure, temp data are all available for AQS reporting, but not stored as fields within the PM25 record. But that's OK, we can still access that data when using the Calculator.

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).



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



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:

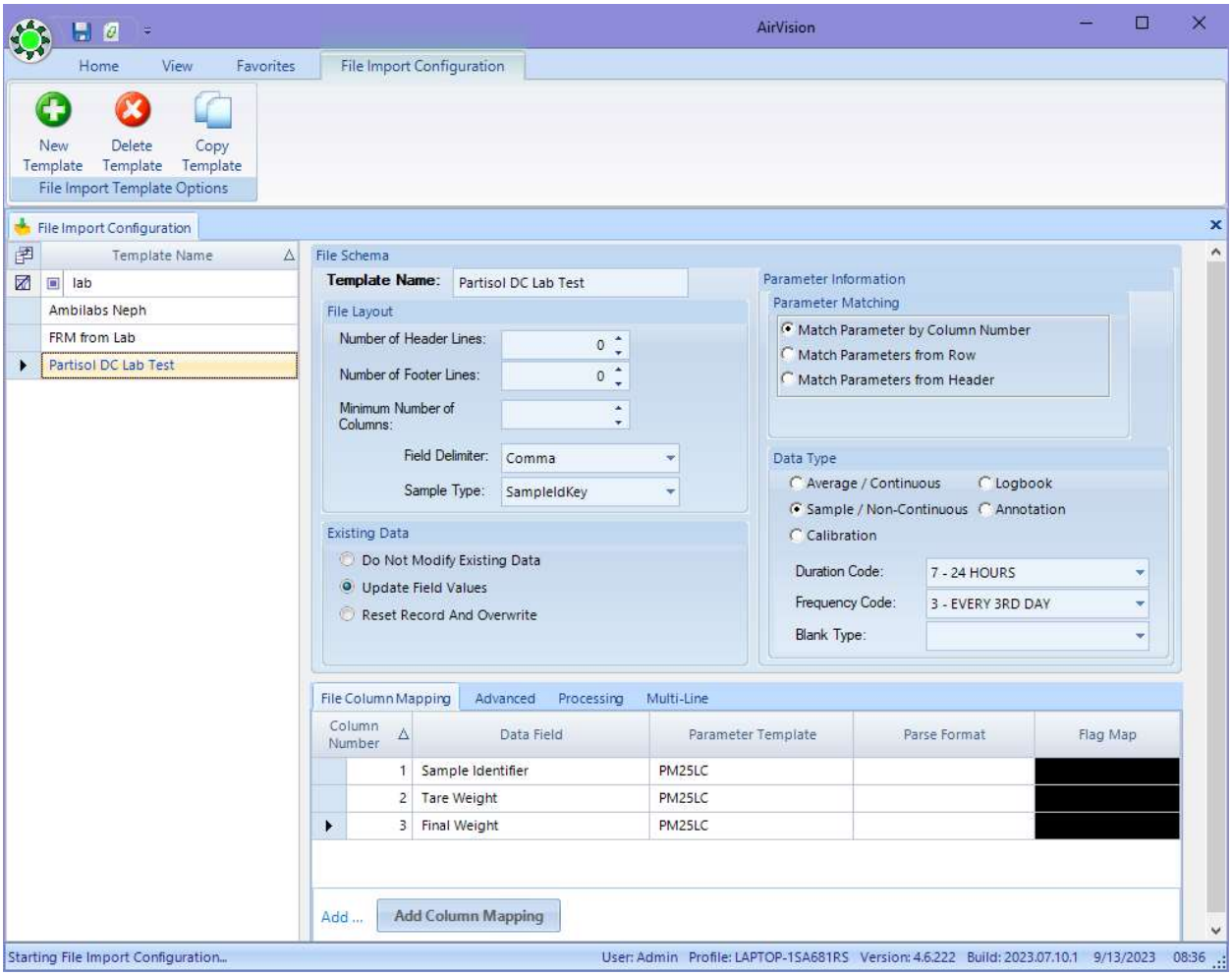
1. Try to find sample data records with the same date/time from parameters with the parameter templates PMVOLUME, PMBARPRESS, and PMAMBTEMP.
2. If these do not exist, try to find hourly data records for that day with parameter templates ??, ??, ??, and create 24-hour totals/averages from those parameters.

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:

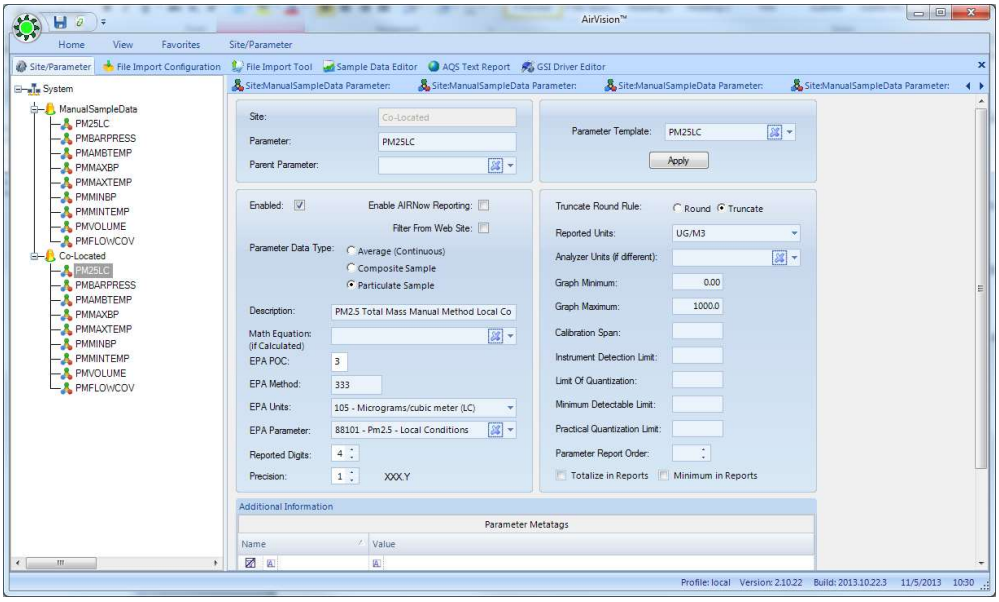


Co-Located Samplers

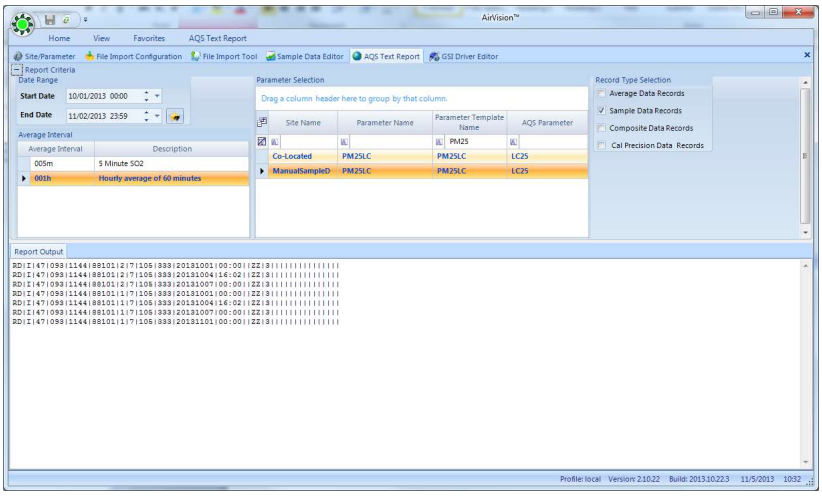
In the Basic mode, it would be easy to copy a File Import Template and create alternate templates and alternate Parameter Templates (e.g., PM25LC_2, PMAMBTEMP_2, etc).

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 co-located 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:



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

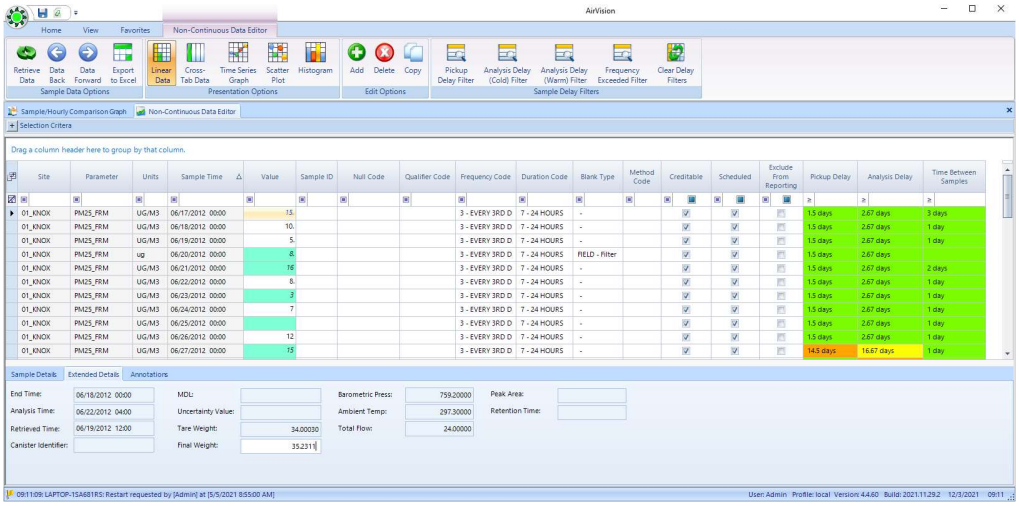


Options for Managing Filter-based PM Meta Data

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

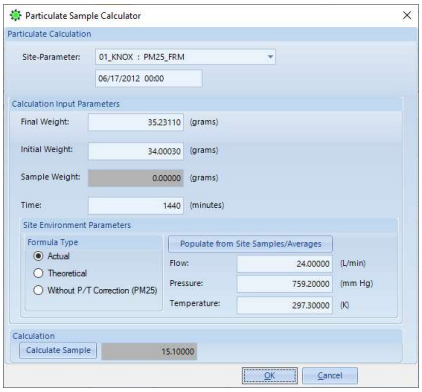
- Store the data as meta data as part of a single Sample record
- Store the data as additional parameters in AirVision

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.

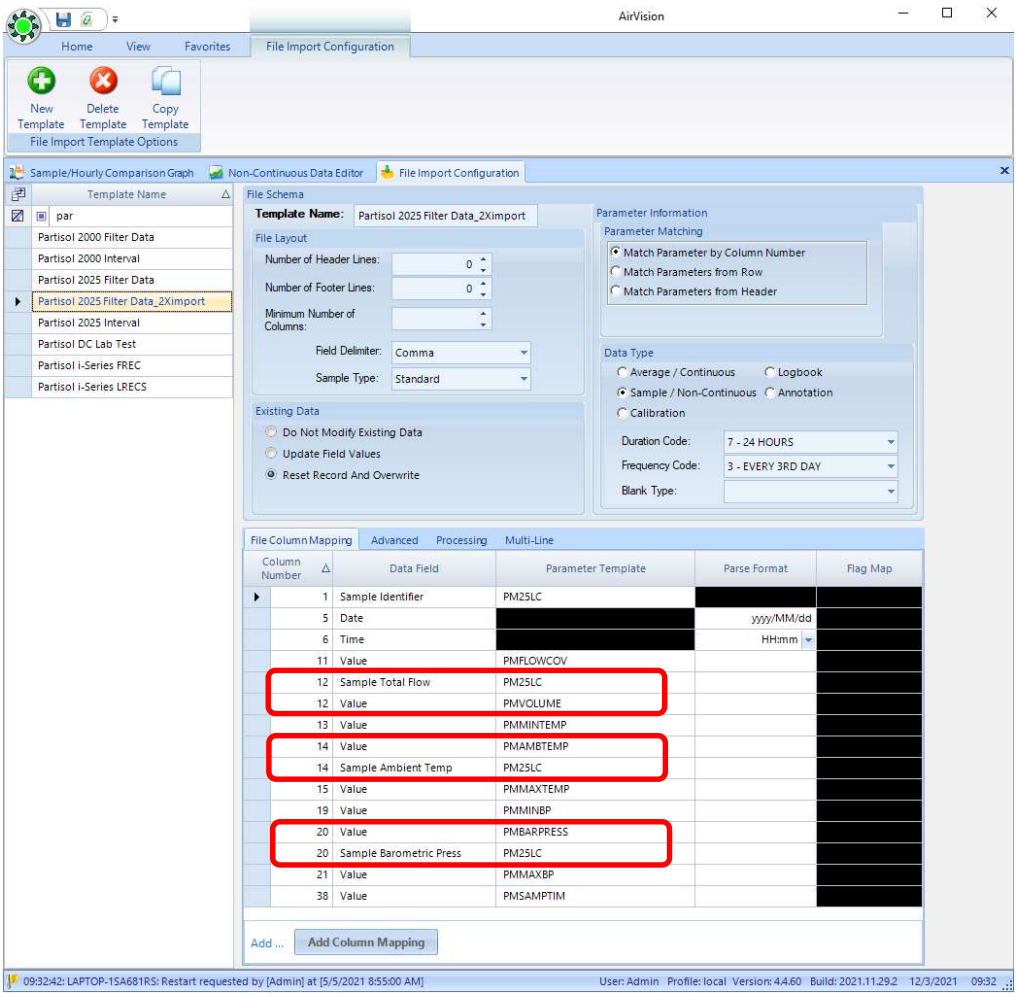
When the user runs the calculator to get the final concentration, the calculator can draw from the meta data, or the user can request the data be queried from other parameters ("Populate from Site Averages"):



If the populate button is used, the system will seek either a sample record of the same time, or 24 x 1-hour 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:



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

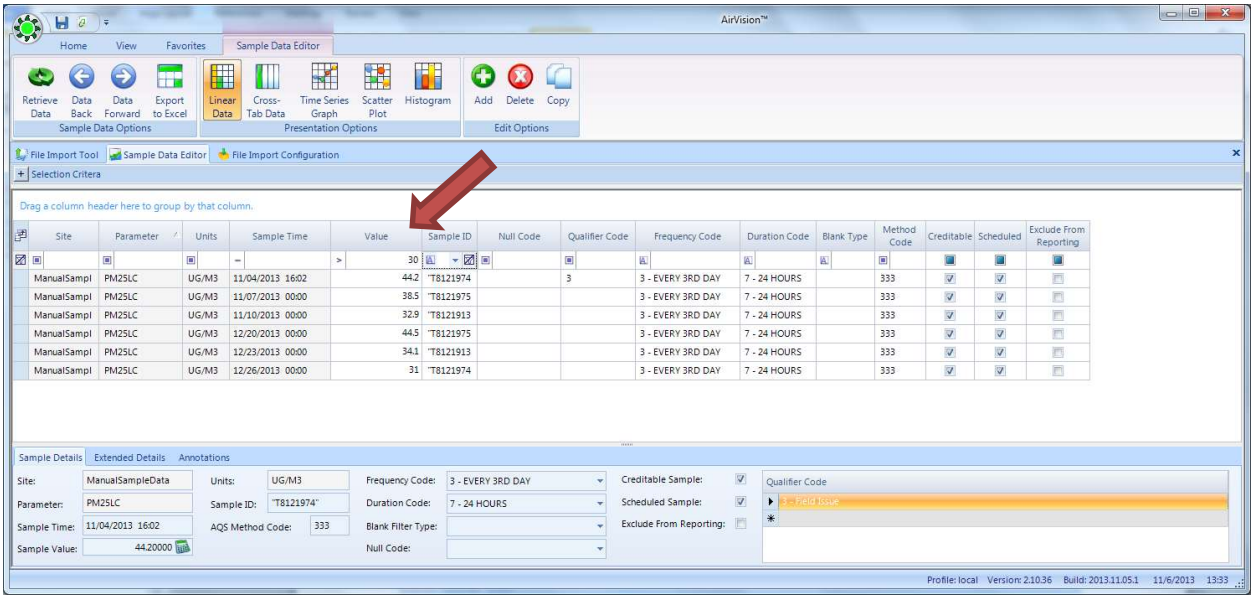
So, in short, the general recommendation is to store as parameters and use the 'double import' approach, unless the customer has a particular objection to co-located samplers being represented as secondary sites in AirVision.

Enhancements To The Sample Data Editor (Version 2.10)

The following enhancements were made to the Sample Data Editor:

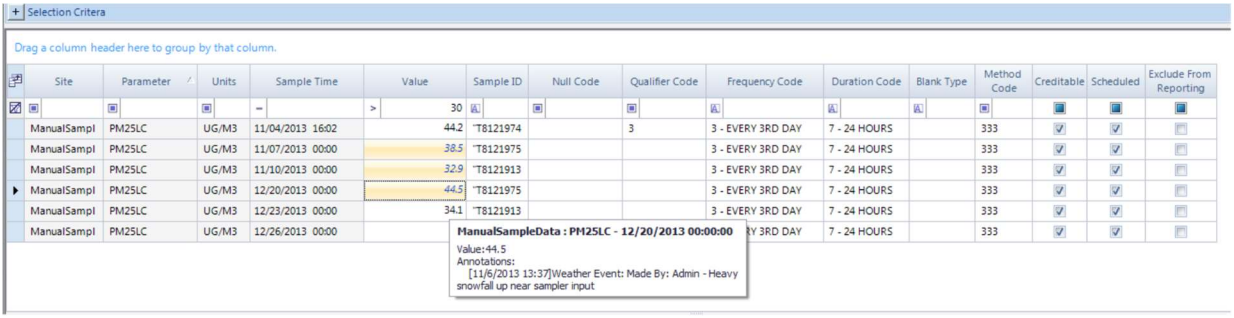
- Additional fields were added to the meta data of the records, and to the File Import Tool:
  - Tare/Final Weight
  - End Time
  - Analysis Time
  - Cannister ID
  - MDL, Uncertainty Values

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



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:



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.