North Carolina Division of Air Quality

Quality Assurance Project Plan

Particulate Matter 2.5

2.24 Fine Particles

Section 3

Laboratory Responsibilities

Version 2014

Submitted by:

North Carolina

Division of Air Quality

1641 Mail Service Center

Raleigh, NC 27699-1641

QAPP Approval Sign-Off Sheet

I certify that I have read and approve of the contents of this revision of QAPP/SOP 2.24.3 with an effective date of August 8, 2014.

Document Preparer; Quality Assurance Representative
Corey Mocka, Environmental Chemist
Signature: Corey A Mocka Date: 8-8-14

Gravimetric Laboratory Representative
Steven Walters, Chemist II
Signature: Steven Walters Date: 8/14/14

Gravimetric Laboratory Representative
Mary Boggs, Chemistry Technician III
Signature: Mary Boggs Date: 8/29/14

Project and Procedures Branch Supervisor
Joette Steger, Environmental Supervisor
Signature: Joette Steger Date: 8-8-14

Laboratory Analysis Branch Supervisor
Jim Bowyer, Environmental Supervisor
Signature: Jim Bowyer Date: 8/14/14

Ambient Monitoring Section Chief
Donnie Redmond, Ambient Monitoring Section Chief
Signature: [illegible] Date: 8/18/14

Table of Contents Section 2.24.3

1.0 SCOPE AND PURPOSE 6
2.0 METHOD SUMMARY 6
3.0 THE PARTICULATE LABORATORY 7
3.1 HVAC System 8
3.2 Filter Conditioning Rack 8
3.3 Analytical Microbalances 9
3.4 Mass Reference Standards 10
4.0 ELECTRONIC DATA RECORDING 10
4.1 Filter Tracking 10
4.2 Weights Original 11
4.3 Data Backup Procedures 11
5.0 OPERATIONAL PROCEDURES 11
5.1 Temperature and Relative Humidity Specifications 11
5.1.1 Calculating the Average and Standard Deviation 12
5.2 Filter Inventory, Inspection, and Conditioning Procedures 13
5.2.1 Filter Lot Stability Test 14
5.2.2 Pre-Sample Filter Exposure Batch Conditioning 14
5.3 Lot Blanks, Lab Blanks, Trip Blanks, & Field Blanks 14
5.3.1 Lot Blanks 14
5.3.2 Laboratory Blanks 15
5.3.3 Trip Blanks 15
5.3.4 Field Blanks 15
5.4 Microbalance Weight Check Procedures 15
5.4.1 Semi-Annual Weight Check Procedure 15
5.4.2 Quarterly Weight Check Procedure 15
5.4.3 Daily Weight Check Procedure 15
5.4.4 Duplicate Filter Weight Procedure 16
5.5 Pre-Sample Filter Weighing Procedures (Initial Weight) 16
5.5.1 Loading the Filter Cassettes 17

5.5.2 Printing Filter/Sampler Run Data Sheets 17
5.5.3 Shipping Filters 18
5.6 Receiving Sampled Filters 18
5.6.1 Receiving Coolers 18
5.6.2 Unpacking Sampled Filters 19
5.6.3 Receiving Lead Filters 20
5.7 Determine Deadline for Post Sample Weighing 21
5.8 Post Sample Weighing Procedure (Final Weight) 22
6.0 REFERENCES 23
Appendix A: 40 CFR Part 50 Appendix L, Section 8.0 24
Appendix B: Filter Tracking Form 26
Appendix C: Initial Weights Workbook Example 27
Appendix D: Final Weights Workbook Example 28
Appendix E: Laboratory Blanks Workbook Example 29
Appendix F: Standard Weights Workbook Example 30
Appendix G: Site Identification Codes 31
Appendix H: Blank Filter Data Sheet Example 32

List of Tables

Table 1. 24 Hour Average Environmental Specifications of the Particulate Laboratory 11
Table 2. Example Datalogger Spreadsheet 13

List of Figures

Figure 1. Filter Conditioning Rack 9
Figure 2. Mettler-Toledo Microbalance with Ionizer 10
Figure 3. Removing Filters from the Magazine 19
Figure 4. Filter Cassette Separator 20
Figure 5. Determination of Deadline of Post Weights 21

2.24.3 $PM_{2.5}$ FRM Gravimetric Laboratory QAP/SOP

Note: The following is a list of "significant" changes from Revision 2011

Specific Update	Section
NAAQS annual limit updated	1.0
Archive length of filters updated to reflect the new EPA guideline of 5 years	2.0
Laboratory information updated to reflect the new Green Square Location	3.0
New data logger procedure added	5.1
Detailed Pre-Sample Exposure Batch Conditioning section added	5.2.2
Duplicate filter weight procedure added	5.4.4
Filter data sheet generation procedure added	5.5.2
Handling lead filters procedure added	5.6.3
New post sample weighing procedure added	5.8
Appendix added to document 40 CFR Part 50 Appendix L, Section 8	Appendix A
Sections and Appendices rearranged	All
Sections and Appendices renamed	All

Note: The following is a list of "significant" changes from Revision 1

Specific Update	Section
Data Reporting in IBEAM	6.3

1.0 SCOPE AND PURPOSE

The goal of the North Carolina Division of Air Quality (NCDAQ) $PM_{2.5}$ program is the measurement of fine particles in units of micrograms per cubic meter ($\mu g/m^3$). Using a Rupprecht & Patashnick Partisol®-Plus Model 2025 $PM_{2.5}$ Sequential Sampler, particles are collected on 47mm diameter, 2µm pore-size Teflon® filters over a 24-hour time period. The concentrations are then compared to the National Ambient Air Quality Standard (NAAQS) of 35 $\mu g/m^3$ for 24 hours and 12 $\mu g/m^3$ annual arithmetic mean concentration.

This SOP details the operations of the NCDAQ $PM_{2.5}$ Gravimetric Laboratory. These operations include maintaining the environmental conditions in the laboratory, conditioning the filters, weighing the filters, distributing the filters, and reporting the results.

2.0 METHOD SUMMARY

Annually, the United Stated Environmental Protection Agency (USEPA) provides the 47mm Teflon® $PM_{2.5}$ filters to the NCDAQ Particulate Laboratory. Below is a generic outline of the overall sequence of events for each filter:

- Filters are inspected for deformities and conditioned at an average of 20-23 °C and 30-40 %RH.
- After conditioning, an initial weight of each filter is recorded in the Weights Original spreadsheet.
- The filters are loaded into cassettes and the cassettes are loaded into a filter magazine. The filter magazine is then placed into a metal shipping container. The shipping container is packed in a cooler with blue ice (not cold), a *$PM_{2.5}$ Filter/Sampler Run Data Sheet* for each filter and a min/max thermometer for transportation to regional offices.
- Operators distribute the filters to the chosen sites. The filters are sampled according to USEPA procedures.
- Once the filters have been collected, and the *$PM_{2.5}$ Filter/Sampler Run Data Sheet* completed, both are placed in a metal shipping container. The containers are placed in a cooler with icepacks and the temperature kept at or below 4°C. The coolers are supplied with a min/max thermometer, which are zeroed prior to shipping to the lab.
- Upon receipt at the lab, the filter temperatures are recorded on the *$PM_{2.5}$ Filter/Sampler Run Data Sheet.* The filters are then inventoried, inspected, conditioned, and analyzed.
- Laboratory personnel input the filter information from the *$PM_{2.5}$ Filter/Sampler Run Data Sheet* into the Filter Tracking spreadsheet.
- The information from the Filter Tracking and Weights Original spreadsheets are automatically uploaded to IBEAM daily.
- The filters are labeled and archived at <4°C for one year after the final weighing. After one year, the filters are removed from the refrigerator and stored at room temperature for an additional 4 years, unless the filters are requested to be further analyzed. The PM2.5 Filter/Sampler Run Data Sheets are archived according to the Headquarters file plan, which is currently archiving the sheets for 5 years.

3.0 THE PARTICULATE LABORATORY

The $PM_{2.5}$ gravimetric particulate laboratory is administered and operated by the NCDAQ. It provides the gravimetric analysis of $PM_{2.5}$ filters for seven NCDAQ regional offices (Asheville, Fayetteville, Mooresville, Raleigh, Washington, Wilmington, and Winston-Salem), three local programs (Forsyth County Office of Environmental Assistance and Protection, Mecklenburg County Air Quality, and the Western North Carolina Regional Air Quality Agency), and one tribal program (Eastern Band of Cherokee Indians Air Quality Control).

The funding for the laboratory is shared proportionally by all agencies. Funding for the setup and operation of the laboratory is through a United States Environmental Protection Agency (USEPA) 103

grant. The facility is located at the North Carolina Department of Environment and Natural Resources, Green Square Complex at 217 West Jones Street, Raleigh, North Carolina.

The particulate laboratory is designed to meet the regulatory requirements for $PM_{2.5}$ (40 CFR Part 50, Appendix L and the EPA Quality Assurance Guidance Document for $PM_{2.5}$ Measurements). The USEPA specified temperature (20-23°C) and humidity conditions (30-40 %RH) are maintained by a state of the art computerized HVAC system described in Section 3.1.

Additional control measures are used to create a dust free environment. A sticky, adhesive dust mat is located in the vestibule entrance and used by all entering the facility to help control outside contaminants. The flooring in the lab is made from an anti-static tile material.

The gravimetric chamber is a separate room within the laboratory where the filter conditioning and gravimetric analysis occur. This inner chamber is a further buffer to contamination as the entrance chamber acts as a vestibule. The temperature and relative humidity are monitored and recorded in an electronic format using a Dickson data logger.

3.1 HVAC System

The temperature and relative humidity are controlled and maintained by a Canatal computerized HVAC system. It is a programmable system that automatically adjusts for seasonal environmental variations. This unit is capable of providing temperature control, humidification, and dehumidification, but is physically incapable of dehumidifying down to lab set point (30-40% RH) on its own. A supplemental dehumidification unit, a Bry-Air MiniPAC desiccant dehumidifier, provides the trim down to setpoint for dehumidification. Maintenance is performed by the North Carolina Department of Administration's Facilities Management HVAC shop.

3.2 Filter Conditioning Rack

The 47mm Teflon® $PM_{2.5}$ filters are positioned on a conditioning rack that protects the filters from free-falling contaminants, but remains open on four sides. Multiple trays, each containing 55 filters in petri dishes, can be inserted into the rack. Unused filters are kept in the upper racks separated from the sampled filters in the lower racks. The bottom 12"-18" of the rack will not be used to avoid contaminants from the floor. Filters are conditioned with the petri slide uncovered. A cover is then placed over the filter once a weight, whether initial or final, is recorded.

Figure 1. Filter Conditioning Rack

3.3 Analytical Microbalances

The gravimetric laboratory is equipped with two Mettler-Toledo microbalances numbered #1 and #3. All $PM_{2.5}$ weights are obtained using the MT 5 microbalance (#3). The other microbalance is kept calibrated for emergency purposes (i.e. if the primary balance breaks and cannot be serviced within the necessary timeframe). It is mandatory that the same microbalance is used to obtain an initial and final weight of a filter. Both microbalances:

- Have a resolution of 1 µg and a repeatability of 1µg;
- Are calibrated and serviced on a semi-annual basis by a Mettler-Toledo representative;
- Are located in the same controlled environment in which the filters are conditioned;
- Are mounted on a marble table to dampen vibrations;
- Remain in a powered state to insure maximum stability;

For static control, a high voltage-low amperage Haug U-shaped ionizer (**Figure 2**) must be used during the weighing process. It is placed directly next to the microbalance. The technician passes the filter through the ionizer and then places it on the microbalance. The ionizer is cleaned every two weeks using a solution provided by the manufacturer.

Figure 2. Mettler-Toledo Microbalance with Ionizer

3.4 Mass Reference Standards

NCDAQ maintains a duplicate set of Class I standard weights for gravimetric analysis:

- Both sets of weights are annually certified by a NIST-traceable weights and measures laboratory.
- The *Working Mass Reference Standards* are verified semi-annually against the *Primary Mass Reference Standards* by lab personnel. This verification is stored in the *Weights Original* data file.
- The *Working Mass Reference Standards* are used for daily gravimetric analysis. Documentation of the standard weight certifications and verifications are kept on file in the laboratory.

4.0 ELECTRONIC DATA RECORDING

All laboratory records are contained within two Microsoft Excel workbooks*: Filter Tracking* and *Weights Original*. The two workbooks used by the gravimetric laboratory personnel are accessible on the P: drive in the PM2.5 directory. The spreadsheet data are automatically uploaded to the IBEAM module every day at 11:15 am. It is important that these two documents are not modified (file names, adding columns, etc.) because IBEAM references specific cells. Improper modification of the spreadsheets will result in an erroneous IBEAM upload. If a new spreadsheet field is needed, contact the Monitoring Services User Group representative.

4.1 Filter Tracking

The *Filter Tracking* spreadsheet (Appendix B) is filled out two different times: once when the filters are distributed to the regional staff and again when the filters are returned to the lab. The complete file name is “Filter Tracking Current.xls” and is located under P:\PM25. *Filter Tracking* records the filter identification number, the region to which the filters were assigned, the initial filter weighing date, the

site sampled, AQS number, the sample date, the return temperature, and comments received on the filter sheet from the monitoring technicians or laboratory personnel.

For field blanks, laboratory personnel should write “field blank” in the comment area. For trip blanks, laboratory personnel should write “trip blank” in the comment area. Any other additional text in the comment area for blanks will result in an improper data upload to IBEAM.

4.2 Weights Original

The *Weights Original* spreadsheet includes four worksheets, *Initial Weights* (Appendix C), *Final Weights* (Appendix D), *Blanks* (Appendix E), and *Standard Checks* (Appendix F). The complete file name is “Weights Original Current.xls” and is located under P:\PM25.

4.3 Data Backup Procedures

The *Filter Tracking* and *Weights Original* workbooks are backed up daily by DENR ITS. No additional backup procedure for these files is required by the laboratory staff. The laboratory temperature and humidity files, however, need to be manually backed up by the laboratory staff monthly by copying them to the P drive.

5.0 OPERATIONAL PROCEDURES

5.1 Temperature and Relative Humidity Specifications

The required environmental conditions of the laboratory are outlined in **Table 1**. Lab personnel are prohibited from weighing if the temperature and/or humidity are not within the specifications. In addition, lab personnel should contact the Green Square building engineer, the Laboratory Analysis Branch supervisor, and the Ambient Monitoring Section Chief as soon as possible. While the facility management is troubleshooting the issue, there is a backup humidifier and dehumidifier in the laboratory storage room. Depending on the situation, the units should be installed in the laboratory as a backup method of bringing the laboratory within the desired specifications. Although the allowable relative humidity ranges from 30 to 40%, the CFR states that the filters must be conditioned at the same conditions (±5 relative humidity percent) before both the pre- and post-sampling weighings.

Table 1. 24 Hour Average Environmental Specifications of the Particulate Laboratory

Parameter	Range
Temperature	20-23 °C
Relative Humidity	30-40%
Standard Deviation	± 5.0

5.1.1 Calculating the Average and Standard Deviation

The Canatal HVAC system is checked daily to ensure it is functioning properly. The current temperature and relative humidity, as well as the 24 hour averages, are verified each morning. On Monday, or first day of the workweek, the last 72 hours of data are downloaded and reviewed. An example of the environmental data analysis is show in Table 1. The following procedures are used to download the files from the Dickson datalogger to determine the average temperature, relative humidity and standard deviation for the last 24 hours:

1. Open the **DicksonWare** program.
2. Click the **Download** button.
3. Click **Export**.
4. Save the file in the following format **MM-DD-YY** in the C:\dickson\dw directory.
5. Open the file that was just exported in MS Excel.
    a. If the file format is incorrect: **Right Click, Open With, MS Office Excel**
6. Scroll to the last cell of the data set.
7. Find the average and standard deviation of the previous 24 hours of data.
    a. Average formula: **=average(XX:XX)**
    b. Standard deviation formula: **=stdev(XX:XX)**
    c. Note: "XX" is the range of cells over the previous 24 hours.
8. The data should meet the following requirements. If it does not, filters cannot be weighed. There is a problem with the environmental conditions in the laboratory. Seek assistance from your supervisor and building engineer.
    a. Temperature: **20.0-23.0 °C**
    b. Humidity: **30-40% RH**
    c. Standard Deviation: **± 5.0**
9. Enter the average and standard deviation into the correct fields in the **Weights Original** file.
10. Exit the Excel file. You do not need to save your changes.
11. To exit the Dickson program push **Exit > Yes > Exit.**

The Dickson data logger needs to be reset every Friday afternoon because of its limited memory. To clear the logger memory:

1. Open **DicksonWare**.

2. Click **Download**.
3. Click **Save**.
4. Click **OK**.
5. The software automatically names the file. Click **Save** and save it in the dicksonware directory.
6. Click **Yes** to clear the logger and restart it.
7. Make sure that the computer Date/Time matches the logger date/time. Click **OK**.
8. After the download completes, click **Exit**, and **Exit** again.

Table 2. Example Datalogger Spreadsheet

Date	Time	Temp. (°C)	%RH	
7/30/2014	6:01:20	21.86	41.02	
7/30/2014	6:21:20	21.86	41.02	
7/30/2014	6:41:20	21.80	39.63	
7/30/2014	7:01:20	21.80	41.16	
7/30/2014	7:21:20	21.75	40.41	
7/30/2014	7:41:20	21.75	41.26	
		22.40	38.64	Avg Temp / RH row
		0.40	1.72	Standard Deviation Row

From **Table 2**, the average temperature is 22.4°C & the average RH is 38.6%. The Standard Deviation is 0.4 and 1.72% respectively.

5.2 Filter Inventory, Inspection, and Conditioning Procedures

A year's supply of filters is received from the USEPA (or its designated contractor). The Lot number, box number, and filter ID ranges should be organized in a sequential order, so the oldest filters are the next used.

The filters are received in batches of 50 per container. It is possible that some containers may have less than 50 filters due to the QA inspection by the contractor. All filters in a batch will be inspected by the Lab Technicians when the container is opened. A magnifying lamp is used for a visual inspection of the filters for pinholes, ring separation, chafe or fleshing, loose material, discoloration, identification number sequence, and non-uniformity. The filters are handled by the support ring using smooth forceps; the analyst should wear powder free gloves that act as a contamination barrier.

5.2.1 Filter Lot Stability Test

Each annual shipment of filters from the USEPA is analyzed for stability in weighing times using lot blanks. Lot blanks are conditioned, un-sampled filters used to determine stability time for a new lot of filters. Typically, nine randomly selected filters are used to validate the conditioning time of new filters. The initial weighing of the lot blanks begins after a 24-hour conditioning period. The lot blanks are then weighed daily until all weight changes are <15μg. The average time required for the lot blanks to reach a stable weight (<15μg) determines the conditioning time for the entire annual lot. At least a 48-hour conditioning period is necessary. There must be two consecutive weights for each lab blank so that no one blank is <15μg difference.

5.2.2 Pre-Sample Filter Exposure Batch Conditioning

Weighing of the entire batch can commence immediately after the conditioning time period has been determined. Pre-sampled filters are conditioned in batches of approximately TBD for 2015 which is approximately a 14 day supply. Each batch includes approximately:

- Six (6) laboratory blanks, one from each tray;
- Five (5) filters per 1 in 3 day sampler, two (2) filters per 1 in 6 day sampler, or fourteen (14) filters per daily sampler;
- One (1) filter blank per sampler which the technician can use either a trip blank or a field blank (note: this number may be adjusted based on historical and regional input); and,
- Approximately one (1) spare filter per sampler (note: this number may be adjusted based on historical and regional input).

After a visual inspection using a light table, each filter is placed into a petri dish and kept in numerical order on a conditioning tray. After an exposure lot of filters have been set out for conditioning, the filter numbers are entered into the *Filter Tracking* spreadsheet (Appendix B) and the *Initial Weights* spreadsheet (Appendix C) of the *Weights Original* file**.** The file directory for the spreadsheets is: P:\PM25 on the NCDAQ shared drive. The data contained in these spreadsheets are automatically uploaded to IBEAM every day.

5.3 Lot Blanks, Lab Blanks, Trip Blanks, & Field Blanks

5.3.1 Lot Blanks

These are conditioned, un-sampled filters used to determine filter weight stability for a new supply of filters. Typically nine randomly selected filters, from the manufacturer's lot sent by USEPA at the beginning of the year, are used to validate conditioning time of new filters.

5.3.2 Laboratory Blanks

Lab filter blanks are weighed with each batch of filters and must meet the criterion of ± 15 µg, compared to the original mass measurement made when the blank filter was first pre-conditioned. If the blanks are not within the specifications after weighing, check the balance and filter to see if there are any unusual debris. It is suggested to brush off the balance, perform an internal adjustment, and re-zero the balance.

5.3.3 Trip Blanks

Trip blanks are to determine any possible contamination from transportation to and from a sampling site. Laboratory Technicians will designate trip blanks on the *PM2.5 Filter/Sampler Run Data Sheet*. A trip blank is assigned to a region every other time a new batch of filters is distributed.

5.3.4 Field Blanks

Field blanks are conditioned, un-sampled filters that are used to determine sampler contamination. Field Technicians will designate field blanks on the *PM2.5 Filter/Sampler Run Data Sheet*.

5.4 Microbalance Weight Check Procedures

The following procedures will be followed by the laboratory personnel at the indicated time intervals to ensure that the microbalance meets all operational standards.

5.4.1 Semi-Annual Weight Check Procedure

Every six months, preferably in January and July, a weight span check needs to be performed on Balance #3 (MT-5). The span check uses both the *Primary Mass Reference Standards* and the *Working Mass Reference Standards*. The data is input into the *Weights Original* workbook using the format shown in Appendix F.

1. Weigh the following weights from each group of standards: 5 g, 2 g, 1 g, 500 mg, 200 mg, 100 mg, 50 mg
2. Compare the individual values of the *Primary Mass Reference Standards* to the *Working Mass Reference Standards*. If differences are greater than 5µg, visually check for nicks or dirt and clean if necessary. Re-weigh the standards. If the differences are still greater than 5µg, call the service technician. Note: be sure to use the offset values listed on the calibration certificates.

5.4.2 Quarterly Weight Check Procedure

At the beginning of each quarter, complete a weight span check with only the *Working Mass Reference Standards* using the procedure in Section 5.4.1.

5.4.3 Daily Weight Check Procedure

The following procedure must be followed each time the balance is used. Refer to the workbook examples in the appendices for where to record the weight checks.

1. Check the balance with 200 mg and 500 mg weights (±3 µg from the previous time the weight was used) at the beginning and end of each weighing session and record in the proper location in the *Weights Original* workbook.

2. The 200 mg weight should be weighed and recorded after every 10 filters. The mass must be within ±3 µg of the previous time the weight was used.

If the checks are not within specification, check the balance and the weights for any added debris. Clean the balance with the brush and wipe the weights with a Kimwipe. If the weights are still not within the desired range, take the necessary troubleshooting steps as listed in the microbalance user guide or other reference documents such as the CFR.

5.4.4 Duplicate Filter Weight Procedure

A duplicate filter weight must be recorded after every tenth filter. The duplicate filter weights should be within ±5 µg. If the duplicates are not within this range: remove the filter from the balance; zero the balance; and, reweigh the filter.

The technician should record a duplicate weight of the next filter in line if the second replicate measurement of the first filter is not within ±5 µg. If the filter duplicate of the second filter is within specifications, the set of filters meets the requirements and the laboratory technician can continue as planned. If the second filter in line, however, does not have an acceptable replicate mass, this typically indicates that there is a problem with the balance. All filters within that set of 10 filters are to be reweighed <u>after</u> troubleshooting possible issues with the balance (cleaning, internal adjustment, et cetera).

5.5 Pre-Sample Filter Weighing Procedures (Initial Weight)

1. Calculate the 24 hour average temperature and percent relative humidity according to the procedure in Section 5.1.1. Do not weight the filters if the environmental conditions are not within specifications.

2. Insure the balance is level and wipe the balance area with ethanol.

3. Initiate the Mettler *Balance Link* located either on the desktop or under programs, Mettler Toledo, Balance Link.

4. Press the power button on the balance keyboard to activate the balance from rest mode.

5. Zero the balance.

6. Place the 500 mg standard in the weighing pan. When a stable weight is indicated, remove the standard and allow the balance to return to zero.

7. Repeat step 6 three or four times to exercise the balance.

8. Clean the smooth non serrated, nonmetallic forceps with the ethanol.

9. Open the *Weights Original* workbook to the *Initial Weights Worksheet* (Appendix C).
10. Type the balance number with operator initial (ex. S3) and the weigh date in the appropriate cells.
11. Weigh the 200 mg and 500 mg working standards as the daily weight check (Section 5.4.3). Place the cursor in the appropriate cell and record these values on the spreadsheet by pressing the print button on the balance keypad.
12. Open the balance draft door, remove the filter from the petri dish with the forceps, and pass the filter through the ionizer.
13. Place the filter into the weighing pan.
14. Close the balance door. When the balance indicates a stabilized reading (approximately 5-10 seconds), record the weight in the appropriate cell by pressing the print button.
15. Open the balance draft door, remove the filter, and return it to the petri dish. Cover the petri dish, unless this filter is to be used for a duplicate weighing.
16. The filters are weighed in batches of ten (10). The first filter of each set is designated as the batch duplicate and reweighed after the tenth filter. Record the duplicate weight in the duplicate weight cell. The duplicate weights must be within 5 μg of each other. See Section 5.4.4 for troubleshooting information.
17. Weigh the 200 mg standard and record the value after every ten filters are weighed. (±3 μg of the last mass of the weight).
18. Weigh the 200 mg and the 500 mg standards at the end of the weighing session.

5.5.1 Loading the Filter Cassettes

Filters to be shipped are placed into individual filter cassettes with backing screens.

1. Record the agency to which the filter was shipped, as well as the weigh date into the *Filter Tracking* spreadsheet (Appendix B).
2. A group of filter cassettes, up to 16, is loaded into a cassette magazine, and sealed with an orange cap; the magazine is placed into a white, metal shipping container.

5.5.2 Printing Filter/Sampler Run Data Sheets

A filter data sheet (Appendix H) must accompany each filter. The filter data sheets act as a chain of custody. The field technicians write pertinent information on the form such as site number, sample date, and sample comments. To generate the filter data sheets:

1. Navigate to P:\PM25\FILTER_SAMPLER_DATASHEET_CURRENT.
2. Open “Doug’s filter_sampler_datasheet.doc”.

3. A dialogue box will appear with a question regarding running a SQL command. Click "**Yes**".
4. Click the "**Mailings**" tab in the ribbon.
5. Click "**Finish & Merge**" and select "**Edit Individual Documents**".
6. In the "from" field, enter the rows of filters from *Filter Tracking* that need to have data sheets generated. (Note: enter the row number **previous** to that of the one you need printed. For example, if you need to print filter data sheets for the filters in rows 5 to 10 of *Filter Tracking* you would actually enter rows 4 to 9 in this box).
7. The desired filter data sheets will be generated in a new window. **Print** all of the filter data sheets. **Discard** any "lab blank" or "voided" data sheets that were created based on the information in *Filter Tracking.*

5.5.3 Shipping Filters

A cooler is used to ship the filter containers to the regions or other local agencies. It is suggested that laboratory personnel begin retaining the coolers one week prior to the expected ship date.

1. Load the filter containers and data sheets into the cooler. A large cooler can hold up to three boxes of filters whereas a smaller cooler can only fit two boxes. It is unnecessary to split filters between two different coolers.
2. Fill the excess space with "blue ice" and a min/max thermometer. It is possible that some ice will need to be removed to fit all of the boxes. If so, save the ice packs and return them to the agency the next time they send a cooler to the laboratory.
3. Seal the cooler with duct tape.
4. Affix the appropriate address label to the container and ship by state courier.
5. Place the cooler in the shipping room for pickup by the state courier personnel prior to 12:30 PM.

5.6 Receiving Sampled Filters

5.6.1 Receiving Coolers

Coolers returning from the field with sampled filters will arrive by the state courier at approximately 10 am, Tuesday through Friday (no filters arrive on Monday because regions do not ship samples over the weekend). Upon arrival:

1. Record the date and the Min/Max temperature of the cooler upon arrival on each of the *PM2.5 Filter/Sampler Run Data Sheets* and on the Min/Max record log hanging on the wall next to the door.
2. If new filters are not being distributed within the next week, return the cooler to the region or agency.

3. Allow the white, metal filter container to equilibrate to the lab temperature before opening to prevent condensation.

5.6.2 Unpacking Sampled Filters

1. Remove the filters from the cassette magazine using the bulb pump (Figure 3).

Figure 3. Removing Filters from the Magazine

2. Match each filter and cassette with their corresponding *PM2.5 Filter/Sampler Run Data Sheets*. Notify the appropriate region or agency of any discrepancies.
3. Inspect the filters for damage. If damaged, make a comment on the *PM2.5 Filter/Sampler Run Data Sheet.*
4. Separate the samples based on weigh date (batch). Pick one laboratory blank from the corresponding batch number to be uncovered along with the samples. There may be more than one batch and, therefore, more than one blank for the weighing session.
5. Select a tray from the filter conditioning rack (Figure 1). Set out the number of petri slides to match the number of filters received.
6. Remove the covers from the petri slides and place them in a plastic storage bag.
7. Open the cassette using the filter cassette separator (Figure 4), being careful not to touch or otherwise disturb the filter and its contents.

Figure 4. Filter Cassette Separator

8. Using a pair of forceps that have been cleaned with diluted ethanol, transfer the filter into a clean petri dish. Refer to Section 5.6.3 for the special handling of lead filters.
9. Clean the filter cassette with diluted ethanol. Put the cassette back together and store it in the plastic storage bin. Note: it is important to keep the pieces of the cassettes the same because of the cassette manufacturing process. Do not switch the tops and bottoms of the cassettes.
10. Inspect and clean the filter magazines and shipping containers as necessary.
11. Adhere a piece of red label tape to the conditioning tray. Write the time and date that the tray is moved to the conditioning rack.
12. Place the tray back on the conditioning rack.
13. Allow filters to condition for a minimum of 24 hours.
14. Open the *Filter Tracking* workbook and enter the site name, site identification number, sample date, shipping temperature, and comments for each filter from the information on the *Filter Data Sheet.* File the *Filter Data Sheets* in a separate folder for each site and quarter.

5.6.3 Receiving Lead Filters

There are two sites that annually send filters to an outside laboratory for lead analysis: Millbrook PM10 (MLP) and Garinger PM10. All filters from these sites are designated as “lead filters” which require special handling in addition to the procedure listed in Section 5.6.2.

1. Label the petri slide with a permanent marker based on the site:
    a. Millbrook PM10 Filter: label the petri slide “ML Pb”.
    b. Garinger PM10 Filter: label the petri slide “MC Pb”.
    c. Store the filters on the lead conditioning tray on the conditioning rack. Do not leave the lead filers on the same conditioning tray as the normal filters. Note: the lead conditioning tray should be underneath the normal conditioning trays.

5.7 Determine Deadline for Post Sample Weighing

This procedure is in accordance with the correspondence from J. David Mobley (USEPA) on January 19, 2000. The pre and post-sampled filters must be weighed on the same analytical balance. It is desirable that post-sampled weights be measured within ten days of the sample end date. However, the EPA's *"Determination of Deadline for Post Weighing"* states that if the post-sampled filter temperature is maintained at or below 4°C, the filter may be weighed within 30 days of the sample date (Figure 5). If the filter was not maintained at <4°C, it must be conditioned and weighed within the number of days determined by application of Equation 1 and 2:

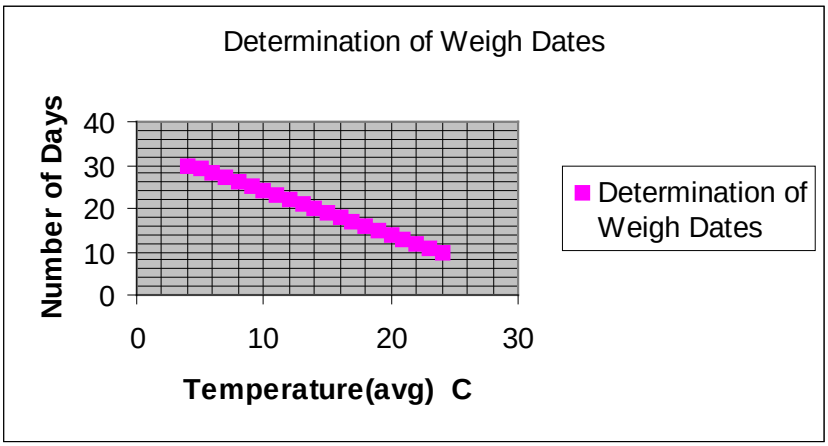
$$T_{AVE} = (T_{max} + T_{min})/2 \qquad (1)$$

$$D = 34 - T_{AVE} \qquad (2)$$

D= Days from the end of the sample period (where 10≥ **D**≤0).
T_{AVE} **=** Average temperature of the samples in transit in degrees C.

If the filter was subjected to temperatures >25°C after removal from the sampler, the filter is void, but still documented and weighed.

Figure 5. Determination of Deadline of Post Weights



5.8 Post Sample Weighing Procedure (Final Weight)

1. Calculate the 24 hour average temperature and percent relative humidity according to the procedure in Section 5.1.1. Do not weight the filters if the environmental conditions are not within specifications.
2. Insure the balance is level and wipe the balance area with ethanol.
3. Initiate the Mettler *Balance Link* located either on the desktop or under programs, Mettler Toledo, Balance Link.
4. Press the power button on the balance keyboard to activate the balance from rest mode.
5. Zero the balance.
6. Place the 500 mg standard in the weighing pan. When a stable weight is indicated, remove the standard and allow the balance to return to zero.
7. Repeat step 6 three or four times to exercise the balance.
8. Clean the smooth non serrated, nonmetallic forceps with the ethanol.
9. Open the *Weights Original* workbook to the *Final Weights Worksheet* (Appendix D).
10. Type the balance number with operator initial (ex. S3), the weigh date, and the filter ID numbers in the appropriate cells.
11. Weigh the 200 mg and 500 mg working standards as the daily weight check (Section 5.4.3). Place the cursor in the appropriate cell and record these values on the spreadsheet by pressing the print button on the balance keypad.
12. Open the balance draft door, remove the filter from the petri dish with the forceps, and pass the filter through the ionizer.
13. Place the filter into the weighing pan.
14. Close the balance door. When the balance indicates a stabilized reading (approximately 5-10 seconds), record the weight in the appropriate cell by pressing the print button.
15. Open the balance draft door, remove the filter, and return it to the petri dish. Cover the petri dish, unless this filter is to be used for a duplicate weighing.
16. The filters are weighed in batches of ten (10). The first filter of each set is designated as the batch duplicate and reweighed after the tenth filter. Record the duplicate weight in the duplicate weight cell. The duplicate weights must be within 5 μg of each other. See Section 5.4.4 for troubleshooting information.
17. Weigh the 200 mg standard and record the value after every ten filters are weighed. (±3 μg of the last mass of the weight).
18. Weight the 200 mg and the 500 mg standards at the end of the weighing session.

19. Label the petri dishes that contain the filter with the printed, sticky, labels. If a printed label is missing, it indicates that a previous sample filter has been labeled incorrectly. The lab technician must find the mislabeled filter. **Never hand write a filter label.**

20. Store the filters in the white petri slide trays. Label the trays with the start date and end date of the filter weigh dates of the filters contained in the tray. Once a tray is filled, place it in the large cooler in the storage room. The storage room cooler is organized based on month.

6.0 REFERENCES

EPA. 1998. Quality Assurance Guidance Document 2.12. Monitoring $PM_{2.5}$ in Ambient Air Using Designated Reference or Class I Equivalent Methods. U.S. Environmental Protection Agency. National Exposure Research Lab. Research Triangle Park, NC 1998.

EPA. 1997. Reference Method for the Determination of Fine Particulate Matter as $PM_{2.5}$ in the Atmosphere. U.S. EPA. 40 CFR Part 50, Appendix L. (as amended at FR 19719, April 22, 1999, 71 FR 61226, Oct. 17, 2006.)

EPA. 2008. Quality Assurance Handbook for Air Pollution Measurement Systems. Volume II, Ambient Air Quality Monitoring Program. U.S. Environmental Protection Agency. Publication EPA-454/B-08-003, Office of Air Quality Planning and Standards, Research Triangle Park, NC. December, 2008.

EPA. 1995. Guidance for the Preparation of Standard Operating Procedures (SOPs). U.S. Environmental Protection Agency. Publication QA/G-6, U.S. EPA Quality Assurance Division, Washington, DC. November, 1995.

Appendix A: 40 CFR Part 50 Appendix L, Section 8.0

8.0 *Filter Weighing.* See reference 2 in section 13.0 of this appendix, for additional, more detailed guidance.

8.1 *Analytical balance.* The analytical balance used to weigh filters must be suitable for weighing the type and size of filters specified, under section 6.0 of this appendix, and have a readability of ±1 µg. The balance shall be calibrated as specified by the manufacturer at installation and recalibrated immediately prior to each weighing session. See reference 2 in section 13.0 of this appendix for additional guidance.

8.2 *Filter conditioning.* All sample filters used shall be conditioned immediately before both the pre- and post-sampling weighings as specified below. See reference 2 in section 13.0 of this appendix for additional guidance.

8.2.1 *Mean temperature.* 20 - 23 °C.

8.2.2 *Temperature control.* ±2 °C over 24 hours.

8.2.3 *Mean humidity.* Generally, 30-40 percent relative humidity; however, where it can be shown that the mean ambient relative humidity during sampling is less than 30 percent, conditioning is permissible at a mean relative humidity within ±5 relative humidity percent of the mean ambient relative humidity during sampling, but not less than 20 percent.

8.2.4 *Humidity control.* ±5 relative humidity percent over 24 hours.

8.2.5 *Conditioning time.* Not less than 24 hours.

8.3 *Weighing procedure.*

8.3.1 New filters should be placed in the conditioning environment immediately upon arrival and stored there until the pre-sampling weighing. See reference 2 in section 13.0 of this appendix for additional guidance.

8.3.2 The analytical balance shall be located in the same controlled environment in which the filters are conditioned. The filters shall be weighed immediately following the conditioning period without intermediate or transient exposure to other conditions or environments.

8.3.3 Filters must be conditioned at the same conditions (humidity within ±5 relative humidity percent) before both the pre- and post-sampling weighings.

8.3.4 Both the pre- and post-sampling weighings should be carried out on the same analytical balance, using an effective technique to neutralize static charges on the filter, under reference 2 in section 13.0 of this appendix. If possible, both weighings should be carried out by the same analyst.

8.3.5 The pre-sampling (tare) weighing shall be within 30 days of the sampling period.

8.3.6 The post-sampling conditioning and weighing shall be completed within 240 hours (10 days) after the end of the sample period, unless the filter sample is maintained at temperatures below the average ambient temperature during sampling (or 4 °C or below for average sampling temperatures less than 4 °C) during the time between retrieval from the sampler and the start of the conditioning, in which case the period shall not exceed 30 days. Reference 2 in section 13.0 of this appendix has additional guidance on transport of cooled filters.

8.3.7 *Filter blanks.*

8.3.7.1 New field blank filters shall be weighed along with the pre-sampling (tare) weighing of each lot of $PM_{2.5}$ filters. These blank filters shall be transported to the sampling site, installed in the sampler, retrieved from the sampler without sampling, and reweighed as a quality control check.

8.3.7.2 New laboratory blank filters shall be weighed along with the pre-sampling (tare) weighing of each set of $PM_{2.5}$filters. These laboratory blank filters should remain in the laboratory in protective containers during the field sampling and should be reweighed as a quality control check.

8.3.8 Additional guidance for proper filter weighing and related quality assurance activities is provided in reference 2 in section 13.0 of this appendix.

13.0 References.

1. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I, Principles. EPA/600/R-94/038a, April 1994. Available from CERI, ORD Publications, U.S. Environmental Protection Agency, 26 West Martin Luther King Drive, Cincinnati, Ohio 45268.

2. Quality Assurance Guidance Document 2.12. Monitoring PM2.5 in Ambient Air Using Designated Reference or Class I Equivalent Methods. U.S. EPA, National Exposure Research Laboratory. Research Triangle Park, NC, November 1988 or later edition. Currently available at: http://www.epa.gov/ttn/amtic/pmqainf.html.

3. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements, (Revised Edition) EPA/600/R-94/038d, March, 1995. Available from CERI, ORD Publications, U.S. Environmental Protection Agency, 26 West Martin Luther King Drive, Cincinnati, Ohio 45268.

4. Military standard specification (mil. spec.) 8625F, Type II, Class 1 as listed in Department of Defense Index of Specifications and Standards (DODISS), available from DODSSP-Customer Service, Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 1911-5094.

Appendix B: Filter Tracking Form

Filter ID	Cassette ID (RP)	Region	Date Weighed	Site	AIRS No.	Sample Date	Temp.	QA Temp. Flag	Comments
T4630546		WSRO	06/25/14	LX	37-057-0002	07/10/14	7	****	
T4630547		WSRO	06/25/14	LX	37-057-0002	07/13/14	7	****	
T4630548		WSRO	06/25/14	LX	37-057-0002	07/14/15	7	****	field blank
T4630549	blank								
T4630550		WSRO	06/25/14	LX	37-057-0002	07/16/15	3		
T4630551		WSRO	06/25/14	BN	37-189-0003	07/04/14	7	****	filter torn via shipping
T4630552		WSRO	06/25/14	BN	37-189-0003	07/07/14	7	****	
T4630553		WSRO	06/25/14	BN	37-189-0003	07/10/14	3		
T4630554		WSRO	06/25/14	BN	37-189-0003	07/11/14	3		field blank
T4630555		WSRO	06/25/14	BN	37-189-0003	07/14/14	3		make up for 7/13/14
T4630556		WSRO	06/25/14	BN	37-189-0003				void dropped filter
T4630557		WSRO	06/25/14	MH	37-081-0013	07/04/14	4		
T4630558		WSRO	06/25/14	MH	37-081-0013	07/10/14	7	****	
T4630559		WSRO	06/25/14	MH	37-081-0013	07/16/14	3		
T4630560		WSRO	06/25/14	MH	37-081-0013	07/27/14	3		field blank
T4630561		WSRO	06/25/14	BN	37-189-0003	07/17/14	3		Code P, S
T4630562		WARO	06/26/14	JV	37-117-0001	07/04/14	1		
T4630563		WARO	06/26/14	JV	37-117-0001	07/07/14	1		
T4630564		WARO	06/26/14	JV	37-117-0001	07/10/14	3		
T4630565		WARO	06/26/14	JV	37-117-0001	07/22/14	2		
T4630566	void								
T4630567		WARO	06/26/14	JV	37-117-0001	07/16/14	3		
T4630568		WARO	06/26/14	JV	37-117-0001	07/19/14	2		
T4630569		WARO	06/26/14	DM	37-191-0005	07/04/14	1		
T4630570		WARO	06/26/14	DM	37-191-0005	07/05/14	1		trip blank
T4630571		WARO	06/26/14	DM	37-191-0005	07/07/14	1		

Appendix C: Initial Weights Workbook Example

Initial Weigh Date	200 mg	500 mg	Filter No.	Balance	Initial Weight	Duplicate Weight
07/28/14	199.973	499.985	T4630909	S3	380.818	380.818
07/28/14			T4630910	S3	377.348	
07/28/14			T4630911	S3	379.888	
07/28/14			T4630912	S3	376.759	
07/28/14			T4630913	S3	373.954	
07/28/14			T4630914	S3	366.993	
07/28/14			T4630915	S3	365.007	
07/28/14			T4630916	S3	367.641	
07/28/14			T4630917	S3	367.604	
07/28/14			T4630918	S3	363.625	
07/28/14	199.972		T4630919	S3	365.527	365.528
07/28/14			T4630920	S3	364.73	
07/28/14			T4630921	S3	365.473	
07/28/14			T4630922	S3	369.258	
07/28/14			T4630923	S3	363.908	
07/28/14			T4630924	S3	376.106	
07/28/14			T4630925	S3	void	
07/28/14			T4630926	S3	blank	
07/28/14			T4630927	S3	371.618	
07/28/14			T4630928	S3	372.958	
07/28/14			T4630929	S3	376.288	
07/28/14			T4630930	S3	379.478	
07/28/14	199.974		T4630931	S3	368.803	368.803
07/28/14			T4630932	S3	371.52	
07/28/14			T4630933	S3	365.619	
07/28/14			T4630934	S3	364.183	
07/28/14			T4630935	S3	365.487	
07/28/14			T4630936	S3	362.961	
07/28/14			T4630937	S3	363.642	
07/28/14			T4630938	S3	364.681	
07/28/14			T4630939	S3	364.3	
07/28/14	199.974	499.986	T4630940	S3	363.509	

Appendix D: Final Weights Workbook Example

Final Weigh Date	Balance	200 mg	500 mg	Lab blank No.	Weight	Filter No.	Final Weight	200 mg	500 mg	Duplicate Weight
07/28/14	S3	199.971	499.984	T4630503	379.579	T4630344	371.957			371.957
07/28/14	S3					T4630345	376.084			
07/28/14	S3					T4630364	373.995			
07/28/14	S3					T4630511	377.189			
07/28/14	S3					T4630527	378.124			
07/28/14	S3					T4630531	380.5			
07/28/14	S3			T4630868	377.932	T4630591	377.23			
07/28/14	S3					T4630592	380.078			
07/28/14	S3					T4630603	381.935			
07/28/14	S3					T4630604	383.42			
07/28/14	S3	199.97				T4630612	374.624			374.624
07/28/14	S3					T4630681	379.855			
07/28/14	S3					T4630697	377.789			
07/28/14	S3			T4630457	376.385	T4630489	374.861			
07/28/14	S3					T4630490	373.312			
07/28/14	S3					T4630491	375.737			
07/28/14	S3					T4630500	377.889			
07/28/14	S3					T4630501	382.185			
07/28/14	S3					T4630502	383.862			
07/28/14	S3					T4630505	381.116			
07/28/14	S3	199.972				T4630581	377.48			377.477
07/28/14	S3					T4630565	377.572			
07/28/14	S3					T4630568	377.749			
07/28/14	S3					T4630575	380.444			
07/28/14	S3			T4630817	371.082	T4630822	370.978			
07/28/14	S3					T4630802	377.781			
07/28/14	S3					T4630803	380.982			
07/28/14	S3					T4630804	371.726			
07/28/14	S3					T4630805	377.249			
07/28/14	S3					T4630806	377.143			
07/28/14	S3	199.969				T4630774	375.083			375.083
07/28/14	S3					T4630786	375.384			
07/28/14	S3					T4630785	374.063			
07/28/14	S3					T4630784	372.444			
07/28/14	S3					T4630898	372.481	199.969	499.983	

Appendix E: Laboratory Blanks Workbook Example

PM 2.5 Lot Blanks for Batch 12 2014 set out 7/23/2014							
	Initial					Final	
Date	200 mg Wt	500 mg. Wt	Filter No.	Weight 1	Weight2	200 mg Wt	500 mg. Wt
7/24/2014	199.971	499.983	T4630926	375.578	375.578		
			T4631017	360.618	360.618		
			T4631075	372.818	372.816		
			T4631113	377.455	377.455		
			T4631192	368.557	368.558		
			T4631227	372.535	372.535	199.97	499.983
7/25/2014	199.971	499.985	T4630926	375.574			
			T4631017	360.617			
			T4631075	372.813			
			T4631113	377.45			
			T4631192	368.554			
			T4631227	372.531		199.974	499.985

Appendix F: Standard Weights Workbook Example

Standard Weight Checks				Primary Weight Checks		
8/13/2013	50 mg	49.997		8/13/2013	50 mg	49.998
	100 mg	99.953			100 mg	99.985
	200 mg	199.977			200 mg	200
	500 mg	499.993			500 mg	499.977
	1 g	999.998			1 g	999.973
	2 g	1999.998			2 g	1999.987
	5 g	4999.979			5 g	5000.02
Standard Weight Checks						
12/9/2013	50 mg	49.996				
	100 mg	99.958				
	200 mg	199.976				
	500 mg	499.992				
	1 g	999.997				
	2 g	1999.995				
	5 g	4999.982				
Standard Weight Checks				**Primary Weight Checks**		
2/25/2014	50 mg	49.995		8/13/2013	50 mg	50.001
	100 mg	99.956			100 mg	99.986
	200 mg	199.977			200 mg	200.003
	500 mg	499.993			500 mg	499.98
	1 g	1000.001			1 g	999.976
	2 g	1999.995			2 g	2000.002
	5 g	4999.982			5 g	5000.023

Appendix G: Site Identification Codes

SITE	SITE Code	SITE_ID1(AQS)	SITE_ID2
ARO			
Blue Ridge Regional Hospital	SH	371210004	115
Marion	MJ	371110004	105
Marion A	MJ A	371110004	106
Waynesville Rec Center	MR	370870012	111
FRO			
Candor	CN	371230001	603
Fayetteville	WO	370510009	601
MRO			
Hickory	HC	370350004	307
Hickory A	HCA	370350004	308
Rockwell	UR	371590021	313
Rockwell A	URA	371590021	314
RRO			
Durham Armory	DA	370630015	517
Durham Armory PM10	DAP	370630015	525
West Johnston rural Clayton	JW	371010002	521
Millbrook	ML	371830014	509
Millbrook PM10	MLP	371830014	523
WARO			
Jamesville	JV	371170001	709
Lenoir College	LC	371070004	701
Pitt Co. Agricultural Center	PG	371470006	711
WIRO			
Castle Hayne	CH	371290002	807
Kenansville	KE	370610002	801
WSRO			
Boone	BN	371890003	411
Lexington	LX	370570002	409
Mendenhall	MH	370810013	413

Appendix H: Blank Filter Data Sheet Example

WSRO

PM 2.5 Filter / Sampler Run Data Sheet

Date/time of Setup visit_____ Date/time of Postsampling Visit_____

Set up operator_____ **End operator**_____

Site Identification #_____ Site Name_____

Filter ID T4631171 Cassette ID RP

Filter Weigh Date 7/31/2014 (Actual Start Date – Weigh Date <= 30 days)

Scheduled Date _____/_____/_____ Set Start time always 00: 00

Actual Start Date _____/_____/_____ This is run #_____ on WINS impactor well(<13)
(Must be cleaned after every 12th run)

Leak check initial pass/fail (pres)_____2nd pass/fail (pres)_____
3rdpass/fail (pres)_____ STOP at a pass

_____ (initials) Sampler record states the proper filter ran as scheduled OR
_____ (initials) Sampler record states the proper filter did not run as scheduled (comment required)

☐ Filter damaged (comment required)
☐ Filter should be considered for void (comment required)
☐ Filter Supply canister pumped up (required action)
☐ Used Filter canister pumped up (required action)

Required sample parameters
Flow cv _____
Sample volume _____
Status code _____

Site conditions at time of initial visit that may affect results (smoke, fires, etc.).
_____
_____

Site conditions at time of final visit that may have affected results (smoke, fires, etc.).
_____
_____

Filter removed from sampler (<168hrs. from end of run) YES NO

Sample Ship Date (to lab) ____/____/____

LABORATORY

Sample Receipt Date_____

Was the sample received < 4°C_____ < 25°C _____ >25°C _____ (Min/Max Temp received in space)
Comments by either the Field or Lab Technicians:
_____
_____
_____
_____
_____
_____
_____
_____use the back of form for further comments.