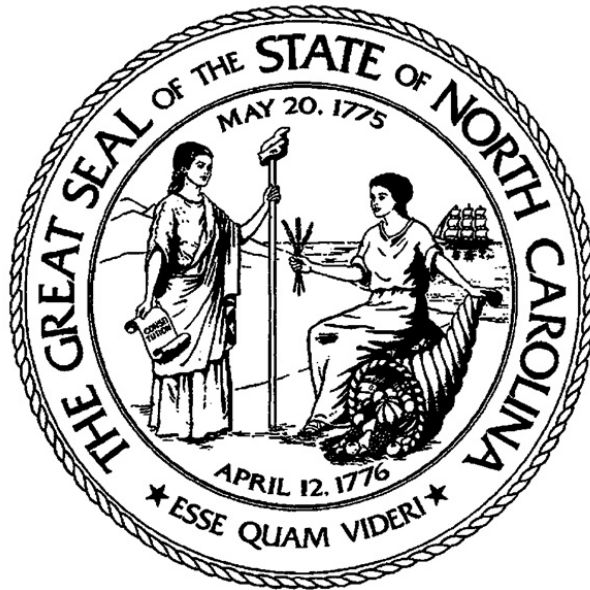


North Carolina Division of Air Quality
Quality Assurance Project Plan
Particulate Matter 2.5
2.24 Fine Particles
Section 3
Laboratory Responsibilities



Submitted by:
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QAPP Approval Sign-Off Sheet

I certify that I have read and approve of the contents of this revision of QAPP/SOP 2.42.3 with an effective date of 1/1/2011.

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2.24.3 PM_{2.5} FRM Gravimetric Laboratory QAP/SOP

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

- | | Section |
|---------------------------|---------|
| • Data reporting in IBEAM | 6.3 |

If you notice errors or omissions to this Standard Operating Procedure (SOP), please notify the Supervisor of the Projects and Procedures Branch at (919) 715-0672.

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 ($\mu\text{g}/\text{m}^3$). Using a Rupprecht & Patashnick Partisol[®]-Plus Model 2025 PM_{2.5} Sequential Sampler, particles are collected on 47mm diameter, 2 μm 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 $\mu\text{g}/\text{m}^3$ for 24 hours and 15 $\mu\text{g}/\text{m}^3$ annual arithmetic mean concentration.

This SOP details the operations of the 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

The United States Environmental Protection Agency (USEPA) provides the 47mm Teflon[®] PM_{2.5} filters to the NCDAQ Particulate Laboratory. The filters are

inspected, conditioned, and pre-weighed. A *PM_{2.5} Filter/Sampler Run Data Sheet* (Appendix A) is prepared for each filter, and accompanies that filter through the following sequence of events:

- At the lab, filter cassettes are loaded into a filter magazine. The filter magazine is then placed into a metal shipping container, along with a *PM_{2.5} Filter/Sampler Run Data Sheet* for each filter. The shipping container is packed in a cooler with blue ice and a min/max thermometer for transportation to regional offices.
- Operators must ensure that all sampled PM_{2.5} filters are collected from the sampler within 177 hours from the end of the sampling run.
- Operators are also responsible for completing the *PM_{2.5} Filter/Sampler Run Data Sheet* for each filter.
- 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 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.
- The filter id, site id, pre-sampling weight, post-sampling weight, and received temperature are entered into electronic workbooks and uploaded to the PM25 IBEAM module.
- The filters are archived at <4°C for one year after the final weighing. After one year, the filters will be discarded. The *PM_{2.5} Filter/Sampler Run Data Sheets* are archived according to the Headquarters file plan.

3.0 THE PARTICULATE LABORATORY

The PM_{2.5} gravimetric particulate laboratory is administered and operated by the NCDAQ. It serves the entire state, including local agencies, and regional offices, with gravimetric analysis of PM_{2.5} filters.

The funding for the laboratory is shared proportionally by all agencies. Funding for the setup and operation of the lab is through a United States Environmental Protection Agency (USEPA) 103 grant. The facility is located at the NCDAQ Headquarters at 2728 Capital Blvd., Raleigh, North Carolina.

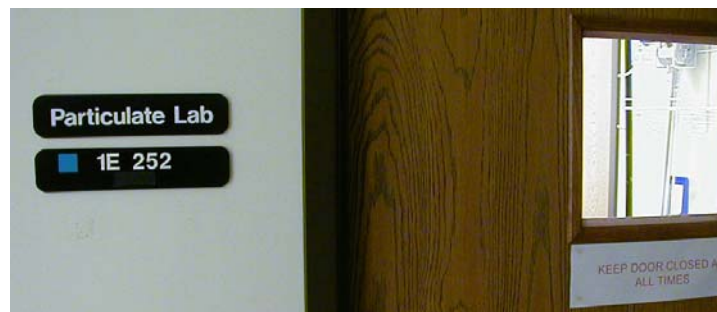


Figure 1. Gravimetric Particulate Laboratory

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 and humidity conditions are maintained by a state of the art computerized HVAC system. Critical parameters are: 22°C (72°F) ± 2°C, and 38% ± 5% relative humidity (RH).

Additional control measures are used to create a dust free environment. A sticky, adhesive dust mat is located in the hallway foyer, 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.



Figure 2. Dickson Temperature/Relative Humidity Data Logger

3.1 HVAC System

The temperature and relative humidity are controlled and maintained by a Liebhart computerized HVAC system. It is a programmable system that is adjusted for seasonal environmental variations. A preventive maintenance program is part of a service contract agreement handled by a subcontractor.

3.2 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 55-64 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.

Figure 3. Filter Conditioning Rack.



3.3 Analytical Microbalances

The gravimetric laboratory is equipped with two Mettler-Toledo MT 5 microbalances numbered #1 and #3. The microbalances:

- Have a resolution of 1 μ g and a repeatability of 1 μ g.
- Are calibrated and maintained on a semi-annual basis by a Mettler-Toledo representative.
- Are located in the same controlled environment in which the filters are conditioned.
- Balance #3, is mounted on a marble pedestal to dampen vibrations.
- Remain in a powered on state to insure maximum stability.
- For static control, a high voltage-low amperage Haug U-shaped ionizer is utilized. See the black, 3-sided rectangle in figure 4.



Figure 4. Mettler-Toledo MT 5 Microbalance with Ionizer.

3.4 Mass Reference Standards

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

- The *Primary Mass Reference Standards* are annually certified by the North Carolina Department of Agriculture, 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. 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 OPERATIONAL PROCEDURES

4.1 Temperature and Relative Humidity Control

The Leibhart HVAC system is checked daily to ensure it is functioning properly. The current temperature and RH, as well as the 24 hour averages are verified each morning. On Monday, or first day of the workweek, the last 72 hrs of data are downloaded and reviewed. 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. Initiate the Dickson Temperature/Humidity software program.
2. Update the current logger file, Monday's date
3. Go to file, Insert Logger file
4. @ the graph
5. Go to file, export file
6. Text file, comma delimited
7. Save file, A or C drive, name file
8. Open Excel
9. Open file saved above
10. Comma delimited, start row 5
11. Finish

After the file opens, four columns appear: (date, time, temp, RH).

1. Scroll down to the last entry at the end of sheet (See figure 5), note row number
2. Delete rows from the top to leave last 72 rows(last 24 hrs)
3. Temp column(3rd), select next open cell row, 73
4. Top Excel program section, =Average(C1:C72)
5. Temp column(3rd), select next open cell row, 74
6. Top program section, =STDEV(C1:C72)
7. RH column(4th), select next open cell row, 73
8. Top program section, =Average(D1:D72)
9. RH column(4th), select next open cell row, 74
10. Top program section, = STDEV(D1:D72)

00-06-05	6:01:20	21.86	41.02	
00-06-05	6:21:20	21.80	40.63	
00-06-05	6:41:20	21.80	39.63	
00-06-05	7:01:20	21.80	41.16	
00-06-05	7:21:20	21.75	40.41	
00-06-05	7:41:20	21.75	41.26	
		22.40	38.64	Avg Temp / RH row
		0.40	1.72	Standard Deviation Row

Figure 5. Bottom of Excel spreadsheet for week beginning 6-05-2000

From figure 6, the average temperature is 22.4°C & the average RH is 38.6% over 24 hours. The Standard Deviation is 0.4 and 1.72% respectively.

4.2 Filter Inventory, Inspection and Conditioning

Filters are received from the USEPA in large quantities. 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. This is a visual inspection for pinholes, ring separation, chafe or fleshing, loose material, discoloration, 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.

4.2.1 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.

4.2.2 Pre-Sample Filter Exposure Lot Conditioning

Weighing of the entire lot can commence immediately after the conditioning time period has been determined. Pre-sampled filters are conditioned in exposure lots of approximately 350. The exposure lot includes six (6) filters designated as laboratory blanks, some spare filters for each agency per month and one (1) field blank per site per month.

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 Form* (see Appendix B) and the *Initial Weights Worksheet* (See Appendix C) of the *Weights Original Spreadsheet*. The file directory for the spreadsheets is: P:\PM25 on the Division of Air Quality (DAQ) server. The data is automatically uploaded to IBEAM each night, and backed up nightly Monday through Thursday by the LAN administrator.

4.3 Micro-Balance Span Check Procedures

The Mettler-Toledo MT-5 Operational Procedures will be followed by the Laboratory Personnel at the time intervals described below.

4.3.1 Semi-Annually

Every six months, in January and July, a weight span check will be performed on balance #3. The span check will use both the working and reference standard weight sets.

1. Weigh the following standards on each balance: 5g, 2g, 1g, 500mg, 200mg, 100mg, 50mg
2. Compare the values of each weight on the balance to each other and the reference weight. If differences are greater than 5 μ g, visually check for nicks or dirt and clean if necessary. Re-weigh the standards. If the differences are still greater than 5 μ g, call the service technician.

4.3.2 Quarterly

At the beginning of each quarter, complete a weight span check with only the working standards as in 4.3.1.

4.3.3 Daily

On the days that the balance will be used:

1. Check the balance with 200mg and 500mg weights ($\pm 5\mu$ g).

4.4 Pre-Sample Filter Weighing Procedures

Check the Dickson datalogger to insure the conditioning parameters of the gravimetric lab are within limits for the last 24 hours.

1. Using the datalogger computer, initiate the Dickson program.
2. Under the logger menu, utilize "transfer" to the current weeks file. Then insert logger file into the current week, then "OK".
3. Select channel 1&2, C & RH, then "OK". Confirm Ch 2 is Relative Humidity. Then "OK". The graph of the week appears. Individual 20 minute data points are visible by clicking the mouse in the center of the graph. These data points can be printed if desired, but the week is archived each Monday.

4. Insure the balance is level and wipe the balance area with ethanol.
5. Initiate the Mettler *Balance Link* program by clicking the mouse on programs, Mettler Toledo, Balance Link v 2.50. After the program opens, File - open configuration – Balance / Bal
6. Press the bar on the balance keyboard to activate the balance from Rest mode.
7. Zero the balance.
8. 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.
9. Repeat step 8 three or four times to exercise the balance.
10. Clean the smooth non serrated, non metallic forceps with the ethanol.
11. Open the *Weights Original* spreadsheet to the *Initial Weights Worksheet*.
12. Type the balance number with operator initial (1P) and the weigh date in the appropriate cells.
13. Weigh the 200mg and 500mg working standards as a QC check. Place the cursor in the appropriate cell and record these values on the spreadsheet by pressing the print button on the balance keyboard.
14. Weigh the lab blank. The pre-weigh of the lab blank minus the current weight should be <15µg. If it is not <15µg, lab contamination is suspected and should be noted in the lab log.
15. Open the balance draft door, remove the filter from the petri dish with the forceps, and pass the filter through the Haug ionizer. The ionizer reduces static to an acceptable level.
16. Place the filter into the weighing pan.
17. Close the balance door. When the balance indicates a stabilized reading, wait approximately 10 seconds, and record the weight in the appropriate cell by pressing the print button.

18. 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
19. The filters are weighed in batches of ten (10). The first filter of each set is designated as the batch duplicate (BD) and reweighed after the tenth filter. Record the duplicate weight in the duplicate weight cell. The duplicate weights must be <math><5\mu\text{g}</math> difference.
20. Weigh the 200 mg standard and record the value after every ten filters are weighed. (<math><3\mu\text{g}</math>)

4.5 Lot Blanks, Lab Blanks, Trip Blanks, & Field Blanks

4.5.1 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.

4.5.2 Laboratory Blanks

Lab filter blanks are weighed with each batch of filters and must meet the criterion of $\pm 15\mu\text{g}$, compared to the original mass measurement made when the blank filter was first pre-conditioned.

4.5.3 Trip Blanks

Trip blanks are to determine any possible contamination from transportation to and from a sampling site. A trip blank criterion is $\pm 30 \mu\text{g}$ as compared to the original mass measurement made when the trip blank was first weighed.

Laboratory Technicians will designate trip blanks on the *PM_{2.5} Filter/Sampler Run Data Sheet* and the Filter Tracking spreadsheet.

4.5.4 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*. One field blank per site, per sampler, per month will be designated and sent to the monitoring agencies. A field blank criterion is $\pm 30 \mu\text{g}$ as compared to the original mass measurement made when the field blank was first weighed.

4.6 Loading the Filter Cassettes

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

1. Insure the top and bottom of the cassette snap together.
2. Record the number of the cassette with the corresponding filter on the *PM2.5 Filter/Sampler Run Data Sheet* that accompanies the filter.
3. Record the filter number and the cassette number in the spreadsheets; record the agency to which the filter was shipped, as well as the weigh date into the *Filter Tracking Form*.
4. 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, along with the *PM2.5 Filter/Sampler Run Data Sheets*.

4.7 Shipping

A cooler is used to ship the filter containers to the regions or agency.

1. Load the filter containers into a cooler and fill the excess space with “blue ice” and a min/max thermometer.
2. Seal the cooler with duct tape.
3. Affix the appropriate address label to the container and ship by state courier.

4. Place the cooler in the shipping room for pickup by the state courier personnel prior to 10:30 AM.

4.8 Receiving

Coolers returning from the field with sampled filters will arrive by the state courier. Upon arrival:

1. Record the date and the Min/Max temperature of the cooler upon arrival on each of the *PM_{2.5} Filter/Sampler Run Data Sheets*.
2. Examine each of the *PM_{2.5} Filter/Sampler Run Data Sheets* for completeness.
3. Allow the white, metal filter container to equilibrate to the lab temperature before opening to prevent condensation.

4.8.1 Post-Sampling Filter Handling

Remove the filters from the cassette magazine using the R&P bulb pump. See figure 6.

Figure 6. Filter Magazine bulb Pump



1. Match each filter and cassette with their corresponding *PM_{2.5} Filter/Sampler Run Data Sheets*. Notify the appropriate region or agency of any discrepancies

2. Remove the filter from the cassette using the special tool provided (see figure 7), being careful not to touch or otherwise disturb the filter and its contents.

Figure 7. Filter cassette separator



3. Using a pair of forceps, transfer the filter into a clean petri dish.

4.8.2 Filter Inspection

1. Inspect the filters for damage, if damaged; flag the sample as questionable on the *PM_{2.5} Filter/Sampler Run Data Sheet* and the Filter Tracking spreadsheet.
2. Save the damaged filter for later inspection. Transfer the filter in its petri dish to the conditioning rack.
3. 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.
4. Allow filters to condition for at least 24 hours.

4.8.3 Cleaning

After filter removal, the cassettes and magazines are wiped clean with diluted ethanol. The metal shipping containers are inspected and cleaned as necessary.

4.9 Post Sampling Filter Weighing

This procedure is in accordance with the attachment to the J. David Mobley letter (USEPA) of 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. 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:

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

$$D = 34 - T_{AVE}$$

D= Days from the end of the sample period (where $10 \geq D \geq 0$).

T_{AVE} = Average temperature of the samples in transit in degrees C.

Equation 1. Determination of Deadline for Post Weighing

If the filter was subjected to temperatures >25°C after removal from the sampler, the filter is void, but documented and weighed. Weigh filters using the procedures described under Filter Weighing in Section 4.4.

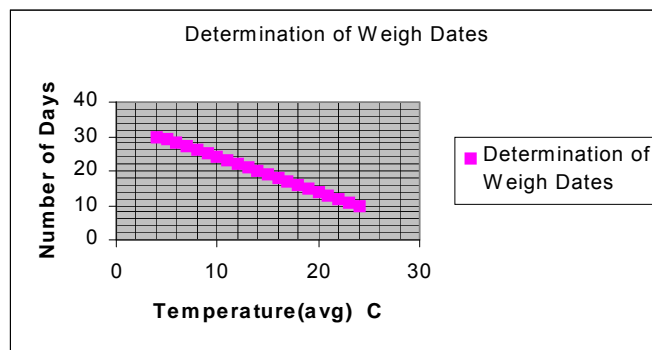


Figure 8. Graph of Determination of Post Weighing

5.0 Quality Control

The quality control items discussed below have already been described in the text of this document. They are presented here as a summation.

5.1 Conditioning Environmental Records

The average minimum and maximum temperature and relative humidity are recorded with each weighing session. The conditioning room temperature is maintained at 20-22°C and 30-40% relative humidity. Permanent records are maintained in the lab and at a remote facility.

5.2 Lot Filter Exposure Test

The Lot Exposure Test filters are conditioned for a minimum of 24 hours. The weight difference between successive 24 hour measurements is made until the difference between the weighings is less than 15µg. The time determined to reach the Lot Exposure Test is the conditioning time for the specific lot of filters.

5.3 Laboratory Filter Blanks

Lab filter blanks are weighed with every batch of filters and must meet the criterion of ±15µg, compared to the original mass measurement made when the blank filter was first pre-conditioned.

5.4 Batch Duplicate Filter Weighing

A duplicate filter is weighed with each batch of ten filters. The first filter of each weighing session is designated as the batch filter (BD). The criteria for the weight difference are ±5µg.

5.5 Working Standards

Mass reference standards of 200 mg and 500mg are weighed at the beginning and end of each weighing session. Mass reference standard records are entered into the Filter Tracking spreadsheet. The difference between the initial and final weights must be $\leq 3\mu\text{g}$.

6.0 Electronic Data Recording

The two spreadsheets used by the gravimetric laboratory personnel are accessible from the air.ncdenr.net on the P: drive. Each night, the spreadsheet data is automatically uploaded to the IBEAM module. The spreadsheets themselves are saved on a quarterly basis.

6.1 Filter Tracking

The Filter Tracking spreadsheet records the filter identification, the cassette identification, the region, the initial filter weighing date, the site sampled, AIRS number, sampled date, the return Min/Max temperatures, and comments received on the filter sheet from the monitoring technicians.

6.2 Weights Original

The *Weights Original* spreadsheet includes four worksheets, *Initial Weights*, *Final Weights*, *Blanks*, and *Standard Checks*.

6.2.1 Initial Weights

The *Initial Weights* workbook contains the initial weigh date and weight for each filter. An example page of this workbook is presented in Appendix C.

6.2.2 Final Weights

The *Final Weights* workbook contains the final weigh date, the weight, blank weights, and comments about the filter condition. An example page of this workbook is presented in Appendix D.

6.2.3 Blanks

The *Blanks* workbook is where the weights of the Lot Filter Exposure Test from each batch of approximately 350 filters are recorded. An example page of this workbook is presented in Appendix E.

6.2.4 Standard Checks

The *Standard Checks* workbook documents the standard weight checks with the weighing sessions, lab experiments, and miscellaneous information. An example page of this workbook is presented in Appendix F.

6.3 Data Backup Procedures

The electronic data will be backed up daily. The files for the current and last quarter are to be maintained on the P:\PM25 drive of the DAQ server. This drive is backed up regularly to protect the data by the ITS group of DENR. The last copy in each area will be swapped out weekly for the newest copy.

Appendix A

Sampler Run Data Sheet

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 **T0602737**

Cassette ID **RP016204**

Filter Weigh Date **08/06/10**

(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 (<11)
(Must be cleaned after every 10th run)

____ (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)
- Used Filter canister pumped up (required action)

Required sample parameters
Sample volume _____
Flow cv _____
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 (<177hrs. 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.

Appendix B

Filter Tracking Form

Filter ID	Cassette ID (RP)	Region	Date Weighed	Site	AIRS No.	Sample Date	Temperature
T7120136	081876	RRO	10/06/08	UP	37-037-0004	10/21/08	-4
T7120137	005873	RRO	10/06/08	UP	37-037-0004	10/24/08	0
T7120138	009661	RRO	10/06/08	UP	37-037-0004	10/27/08	0
T7120139	064565	RRO	10/06/08				
T7120140	006162	RRO	10/06/08				
T7120141	005661	RRO	10/06/08				
T7120142	021751	RRO	10/06/08				
T7120143	010979	RRO	10/06/08	UP	37-037-0004	11/05/08	-2
T7120144	discarded						
T7120145	005871	RRO	10/06/08	DA	37-063-0015	10/24/08	0
T7120146	106213	RRO	10/06/08	DA	37-063-0015	10/27/08	0
T7120147	037012	RRO	10/06/08	DA	37-063-0015	10/30/08	-2
T7120148	005822	RRO	10/06/08	DA	37-063-0015	11/02/08	-2
T7120149	000588	RRO	10/06/08				
T7120150	022039	RRO	10/06/08				
T7120151	005673	RRO	10/06/08				
T7120152	016307	RRO	10/06/08				
T7120153	008510	RRO	10/06/08	UP	37-037-0004	11/05/08	-2
T7120154	007783	RRO	10/06/08	SR	37-065-0004	10/18/08	-1
T7120155	006092	RRO	10/06/08	SR	37-065-0004	10/21/08	-14
T7120156	019683	RRO	10/06/08	SR	37-065-0004	10/24/08	-14
T7120157	033292	RRO	10/06/08	SR	37-065-0004	10/27/08	-13
T7120158	002410	RRO	10/06/08	SR	37-065-0004	10/30/08	-13
T7120159	005811	RRO	10/06/08	SR	37-065-0004	11/02/08	-13
T7120160	007729	RRO	10/06/08	SR	37-065-0004	11/03/08	-13
T7120161	001013	RRO	10/06/08	SR	37-065-0004	11/05/08	-10

Appendix C

Initial Weights Workbook

Initial Weigh Date	100 mg	200 mg	Filter No.(T)	Balance	Initial Weight	Duplicate wt. 1
02/11/08	99.992	200.002	T7115122	F1	142.485	142.48
02/11/08			T7115123	F1	145.401	
02/11/08			T7115124	F1	146.259	
02/11/08			T7115125	F1	145.705	
02/11/08			T7115126	F1	148.494	
02/11/08			T7115127	F1	140.91	
02/11/08			T7115128	F1	145.849	
02/11/08			T7115129	F1	146.376	
02/11/08			T7115130	F1	144.131	
02/11/08	99.991		T7115131	F1	148.806	
02/11/08			T7115132	F1	145.112	145.115
02/11/08			T7115133	F1	144.646	
02/11/08			T7115134	F1	147.93	
02/11/08			T7115135	F1	146.574	
02/11/08			T7115136	F1	145.874	
02/11/08			T7115137	F1	147.142	
02/11/08			T7115138	F1	145.492	
02/11/08			T7115139	F1	149.445	
02/11/08			T7115140	F1	146.075	
02/11/08			T7115141	F1	blank	
02/11/08	99.992		T7115142	F1	146.216	
02/11/08			T7115143	F1	145.521	145.521
02/11/08			T7115144	F1	140.117	
02/11/08			T7115145	F1	143.741	
02/11/08			T7115146	F1	143.449	
02/11/08			T7115147	F1	142.99	
02/11/08			T7115148	F1	141.854	

Appendix D

Final Weights Workbook

Final Weigh Date	Balance	100 mg	200 mg	Lab blank No.	Weight	Filter No.	Final Weight	100 mg	200 mg	Duplicate weight
03/03/08	M3	99.971	199.994	T7115010	146.017	T7115084	145.381			145.382
03/03/08	M3					T7115083	145.343			
03/03/08	M3					T7115069	147.929			
03/03/08	M3					T7115089	145.353			
03/03/08	M3					T7115077	141.762			
03/03/08	M3					T7115070	147.666			
03/03/08	M1			T7115324	145.97	T7115396	144.467			
03/03/08	M1					T7115403	145.195			
03/03/08	M1					T7115404	145.452			
03/03/08	M1					T7115402	145.981			
03/03/08	M1					T7115395	144.722	99.971	199.993	
03/05/08	F1	99.973	199.994	T7115259	144.171	T7115149	141.258			141.261
03/05/08	F1					T7115150	145.901			
03/05/08	F1					T7115151	149.081			
03/05/08	F1					T7115157	149.642			
03/05/08	F1					T7115158	147.683			
03/05/08	F1					T7115134	148.365			
03/05/08	F1					T7115136	146.006			
03/05/08	F1					T7115135	146.88	99.971	199.993	
03/06/08	M3	99.972	199.995	T6189727	146.877	T6189794	148.498			148.496
03/06/08	M3					T6189791	149.344			
03/06/08	M3					T6189790	148.615			
03/06/08	M3			T7115058	141.305	T7115103	144.179			
03/06/08	M3					T7115101	143.366			
03/06/08	M3					T7115100	139.756			
03/06/08	M3					T7115104	145.59			
03/06/08	M1			T7115675	143.508	T7115435	142.186			
03/06/08	M1					T7115434	143.08			
03/06/08	M1	99.971				T7115433	142.731			
03/06/08	M1					T7115448	143.91			143.909
03/06/08	M1					T7115447	150.35			
03/06/08	M1					T7115506	146.622			
03/06/08	M1					T7115505	145.342			
03/06/08	M1					T7115504	148.688			
03/06/08	M1					T7115503	146.33			
03/06/08	M1					T7115507	146.954			
03/06/08	M1					T7115555	142.533			
03/06/08	M1					T7115554	140.818			
03/06/08	M1	99.973		T7115214	143.695	T7115342	147.034			

Appendix E

Blanks Workbook

PM 2.5 Lot Blanks for Batch 19-08 set out 10/15/08							
	Initial						
Date	100 mg Wt	200 mg. Wt	Filter No.	M1	M3	100 mg Wt	200 mg. Wt
10/17/08	99.968	199.994	T7120534	141.726	141.728		
			T7120580	143.416	143.416		
			T7120643	143.216	143.209		
			T7120709	143.853	143.857		
			T7120739	146.914	146.913		
			T7120798	142.877	142.874	99.967	199.994
#####	99.967	199.993	T7120534	141.723	141.72		
			T7120580	143.415	143.414		
			T7120643	143.21	143.209		
			T7120709	143.86	143.857		
			T7120739	146.91	146.913		
			T7120798	142.879	142.876	99.968	199.994

Appendix F

Standard Weights Workbook

Standard Weight Checks			Primary Weight Checks		
7/10/2003	50 mg	49.999	7/10/2003	50 mg	50.002
	100 mg	99.985		100 mg	99.994
	200 mg	199.999		200 mg	200.005
	500 mg	500.001		500 mg	499.995
	1 g	999.999		1 g	999.974
	2 g	2000.001		2 g	1999.989
	5 g	5000.002		5 g	5000.018
Standard Weight Checks					
10/23/2003	50 mg	49.999			
	100 mg	99.985			
	200 mg	200			
	500 mg	500.002			
	1 g	1000			
	2 g	1999.997			
	5 g	4999.997			
Standard Weight Checks					
2/9/2004	50 mg	49.999			
	100 mg	99.985			
	200 mg	200			
	500 mg	500.005			
	1 g	1000.001			
	2 g	1999.995			
	5 g	5000			
Standard Weight Checks					
5/17/2004	50 mg	50			
	100 mg	99.986			
	200 mg	200			
	500 mg	500.004			
	1 g	1000			
	2 g	2000			
	5 g	4999.995			

Appendix G

Site Identification Codes

SITE	SITE code	SITE_ID1(AQS)	SITE_ID2
ARO			
Bryson City	BY	371730002	109
Marion	MJ	371110004	105
Marion A	MJ A	371110004	106
Waynesville Rec Center	MR	370870012	111
Spruce Pine	SP	371210001	108
FRO			
Candor	CN	371230001	603
Linkhaw	LH	371550005	605
Fayetteville	WO	370510009	601
MRO			
Grier Sch, Gastonia	GM	370710016	305
Hickory	HC	370350004	307
Hickory A	HCA	370350004	308
Rockwell	UR	371590021	313
RRO			
Durham Armory	DA	370630015	517
Lake Wheeler Rd Field Lab	FF	371830020	519
West Johnston rural Clayton	JW	371010002	521
Millbrook	ML	371830014	509
Millbrook A	ML A	371830014	510
Rocky Mt	SR	370650004	513
Pittsboro	UP	370370004	501
WARO			
Dillard School	DM	371910005	707
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
Colfax	CX	370810014	419
Burlington	HD	370010002	401
Lexington	LX	370570002	409
Mendenhall	MH	370810013	413
Mendenhall A	MHA	370810013	414
Cherry Grove	UC	370330001	403

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