UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4

Science and Ecosystem Support Division
Field Services Branch
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June 6, 2018

Ms. Anna Lomasney
Florida Department of Environmental Protection (FDEP)
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

SESD Project Number: 17-0430

Ms. Lomasney:

We have reviewed the following document you submitted for approval:

Statewide Standard Operating Procedure (SOP) for the Determination of PM_{10} Particulates in Ambient Air By High Volume Filter Analysis, DEP 16-22, Revision 0, February 2018.

The quality assurance and technical elements within this SOP were compared to EPA regulations and current guidance. The stated procedures appear to be clear, sound, and appropriate as written, to the extent they can be evaluated. EPA approval of this document is granted. Please be aware that approval of this SOP does not constitute a waiver from any regulatory requirements, or the agency's QAPP requirements, that are not addressed within the body of this document. Your agency remains accountable for ensuring the PM_{10} gravimetric analysis procedures implemented adhere to all applicable requirements detailed in 40 CFR Parts 50, 53, and 58. This SOP should be revised when the stated procedures are modified.

If you have any questions, please contact Stephanie McCarthy at 706-355-8745 or via email at mccarthy.stephanie@epa.gov.

Sincerely,

Laura Ackerman, Chief
Superfund and Air Section

STATEWIDE STANDARD OPERATING PROCEDURE

FOR

THE DETERMINATION OF PM_{10} PARTICULATES IN AMBIENT AIR BY HIGH VOLUME FILTER ANALYSIS

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF AIR MONITORING

Prepared by: Florida PQAO Date: 2/8/2018

Approved by: Saphique Thomas Date: 3/9/2018
(Quality Assurance Manager)

Approved by:_____ Date:_____
(EPA Quality Assurance Manager)

DOCUMENT HISTORY

Revision	Date	Responsible Person	Description of Change
0	June 2016	FAMAC	Initial Draft
1	February 2018	FAMAC	Revised draft specified accuracy/precision in §6.0; clarified procedures in §§7.3, 7.4, and 7.6; clarified acceptance criteria in tables 1 and 2; clarified procedures in §§8.1 and 8.2; clarified procedures in §§9.2, 9.6, 9.8, and 9.9.

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1.0 PURPOSE

Suspended particulate matter is collected from ambient air samples for 24 hours on a filter as described in 40 CFR Part 50 Appendix J – Reference Method for the Determination of Particulate Matter as PM_{10} in the Atmosphere. The process to determine the mass concentration collected on the filter is specified in the US EPA Quality Assurance Handbook, Vol. II, Part II Method 2.11. This standard operating procedure (SOP) describes the gravimetric analysis for measuring the mass concentration of particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM_{1O}) for purposes of determining attainment and maintenance of the primary and secondary national ambient air quality standards for particulate matter.

2.0 SCOPE AND APPLICABILITY

This SOP covers PM_{10} weigh labs that are included in the State of Florida Ambient Air Monitoring Network for measurement of PM_{10} mass concentrations. It specifies the laboratory filter handling and quality assurance (QA) procedures for filter preparation prior to sampling as well as the post-sampling handling, QA, and data reporting procedures for laboratory personnel. The PM_{10} weigh labs work in coordination with the ambient air monitoring field operations to maintain sample integrity and data quality.

3.0 SUMMARY OF THE METHOD

PM_{10} is the designation for particulate matter in the atmosphere that has an aerodynamic diameter of 10 μm or less. A high-volume PM_{10} sampler draws a known volume of ambient air at a constant flow rate through a size-selective inlet and traps particles on a quartz filter. Particles in the PM_{10} size range are then collected on the filter during the specified 24 hour sampling period. Each sample filter is weighed before and after sampling to determine the net weight (mass) gain of the collected PM_{10} sample.

The total volume of air sampled is determined from the measured volumetric flow rate corrected to standard temperature, 25°C, and barometric pressure, 760 mmHg, (STP) and the sampling time. The concentration of PM_{10} in the ambient air is computed as the total mass of collected particles in the PM_{10} size range divided by the volume of air sampled. The PM_{10} measurement is expressed as micrograms per actual cubic meter ($\mu g/m^3$).

Quartz fiber filters are used for PM_{10} analysis.

4.0 DEFINITIONS

Quality Control (QC) - refers to the operational techniques and activities used to fulfill the requirements for quality.

Quality Assurance (QA) - refers to the planned or systematic activities used to provide confidence that the requirements for quality are fulfilled. An independent audit is an example of a QA activity.

Verification - review of interim work steps to ensure they are acceptable and to determine whether the system is consistent, adheres to standards, uses reliable techniques, and performs the selected functions in the correct manner.

Validation - determining whether the system complies with requirements, performs the functions for which it is intended, and meets the organization's goals and user needs. It is a determination of correctness of the data and is usually performed only periodically (e.g., quarterly) or at the end of a project.

Tare Weight – is the initial weight of the quartz fiber filter measured after initial filter conditioning and prior to providing filters for field sampling using a Hi-Volume PM sampler.

Gross Weight – is the final weight of the quartz fiber filter collected from the field sampler and measured after the post-sampling filter conditioning.

Record Management System (RMS) – is the laboratory system for storing the required recordkeeping information in electronic or hardcopy formats. The records include reports, forms, or logbooks which contain all information and calculations specified in this SOP.

5.0 PERSONNEL QUALIFICATIONS

It is the goal of the laboratory that all analysts have the education, training and skills needed to successfully perform all assigned analyses, their particular laboratory operations, test methods, QA/QC procedures, and records management. To this end, the laboratory has formulated the following goals with respect to education, training, and skills:

5.1 Each analyst will receive on-the-job-training (OJT) or instructional training from the vendor when new instrumentation is purchased;

5.2 Each new analyst will undergo laboratory training for laboratory procedures and quality controls;

5.3 Each new analyst will continue training until such time as the analyst can correctly perform all analyses for which he is responsible, including complying with all quality assurance/quality control requirements;

5.4 Each analyst will attend data integrity training[1], annually, provided by an experienced supervisor or professionally recognized self-instructional course or classroom instructor.

After a new analyst has completed training for the Determination of Particulate Matter as PM_{10} in the Atmosphere, the effectiveness of the analyst's training is evaluated through demonstration of capability in the method. Capability must also be demonstrated at any time there is a change in instrument type, personnel, or test method.

1 Data integrity or ethics training may be satisfied by review of the "Ethics in the Laboratory" presentation slides from the Policies and Procedures of the Department of Environmental Protection, Bureau of Laboratories, 2011 or the on-line interactive video, "The Lab", from the US Department of Health & Human Services, Office of Research Integrity.

6.0 EQUIPMENT AND SUPPLIES

The following equipment and supplies are necessary for this method:

6.1 Working Standard – Class 1 mass reference standard weights certified as being traceable to NIST mass standards. Used for balance checks and recertified annually.

6.2 Laboratory Primary Standard – Class 1 mass reference standard weights are certified as being traceable to NIST mass standards and ONLY used to check the working standards every 3 months. The primary standard is kept in a secure location away from balance area.

6.3 Tweezers – plastic, nylon or PTFE

6.4 Analytical Balance – capable of accurately weighing 0.0001 g, for use in weighing quartz filters (e.g. Mettler XS64).

6.5 Thermometers and Hygrometers– Capable of measuring temperature and/or humidity, respectively, as well as recording minimum and maximum values for each. Thermometers should be capable of measuring temperatures ranging from 10 to 30°C with an accuracy of 0.1°C traceable to a NIST-certified thermometer or an ASTM thermometer. Hygrometers need to be within one (1) percentage point RH accuracy.

6.6 Light Table

6.7 Desiccator- capable of maintaining a RH of 20 to 45%

6.8 Filter Divider - one (1) sheet of clean paper

6.9 Filter Envelope - a clean jacket capable of containing a filter folded lengthwise

7.0 SAMPLE HANDLING AND PRESERVATION

7.1 Pre-numbered filters are purchased through and provided by the US EPA.

7.2 Visual Filter Inspection:

7.2.1 All filters must be visually inspected for defects before their initial weighing, and defective filters must be rejected if any are found. Document the date of inspection, the laboratory analyst and the sequence of filters inspected in the laboratory's record management system (RMS).

7.2.2 Document any findings of defective filters in the laboratory's RMS. Batches of filters containing numerous defects will be disposed of and EPA R4 will be notified of the defective filter numbers of lot number.

7.2.3 Specific defects to look for are:

7.2.4 Pinhole - A small hole appearing as (1) a distinct and obvious bright point of light when examined over the light table or screen, or (2) a dark spot when viewed over a black surface.

7.2.5 Loose material - Any extra loose material or fiber particles on the filter that require removal by brushing prior to weighing.

7.2.6 Discoloration - Any obvious visible discoloration that might be evidence of a contaminant.

7.2.7 Filter non-uniformity - Any obvious visible lighter and darker areas in the appearance of the filter when viewed over a light table or black surface that might indicate gradations in porosity across the face of the filter.

7.3 After weighing, the filters are stored between divider sheets in ambient room conditions and released to the air monitoring field personnel as needed for sampling. The transfer of filters is recorded with COC Form No., DEP 03-18-F, pursuant to the field sampling SOP DEP 03-18, and recorded in the laboratory RMS.

7.4 Air monitoring field personnel are responsible for the setup and collection of PM_{10} samples and delivering the filters, stored in a protective sleeve inside a filter envelope or in the covered filter cassette holder, to the laboratory. Field or lab personnel are responsible for entering the Filter #, Site AQS #, and sampling date on the filter Chain-Of-Custody (COC) form, DEP 16-22-A, which is signed and dated at the time of custody transfer.

7.5 The laboratory analyst documents the receipt of filters on the Chain-Of-Custody (COC) form, DEP 16-22-A, and assigns a unique Lab ID #, if applicable.

7.6 The laboratory analyst visually inspects each filter prior to gross weighing and then, records observations and filter information into the RMS. After a filter is analyzed, it is returned to the divider sheet and folded in half, lengthwise with particulates facing inward, then placed in the filter envelop or folder for storage.

7.7 After weighing, the analyst will record tare and gross weights, the name of the analyst performing the weighing, date weighed and mass concentration on the filter envelope or folder for storage with the sample.

7.8 After 1 year, filters are boxed and transferred to a climate controlled storage facility for a period of 5 years.

8.0 QUALITY ASSURANCE & QUALITY CONTROL

The laboratory is required to operate a formal quality control (QC) program. The following table summarizes the routine requirements for ongoing quality control. Filters must be equilibrated in a conditioning environment for at least 24 hours before being weighed. This conditioning can be done in an equilibration chamber or in an environmentally controlled weighing room. The laboratory is required to maintain performance records that define the quality of the data thus generated.

Table 1: QC Requirements

Parameter	Requirement	Acceptance Criteria
Report Units	$\mu g/m^3$	NA
Equilibration Period	24 hours	≥24 hours
Relative Humidity	Equilibration	Mean value between 20 – 45%; and a variability ≤± 5%
Weighing (outside equilibration chamber)	Weighing	Within 30 sec.
Temperature	Equilibration	Mean value between 15 -30 ºC; and a variability ≤± 3ºC
Initial Calibration Verification	3 weights prior to each batch	±0.5 mg of expected
Re-weight check	5 to 7 filters per batch	±2.8 mg tare/gross weights
Balance zero check	After every 10 filters	±0.5 mg
Continuing Calibration Verification	After every 10 filters	±0.5 mg
Tare Weights	All filters	Between 3.7 and 4.7 g
Mass Reference Standards	Every 3 to 6 months	±0.5 mg
Tare Weight Audit	Min. of 10% or 1 filter per batch	±5.0 mg

8.1 Internal Audits

8.1.1 Data Processing – Check the calculations of at least 7% of the samples in a batch by using the raw data compared to the reported PM_{10} value. If any checks fail to match the reported value, all sample calculations in the batch are checked.

8.1.2 Tare Weight Audit – Prior to releasing a batch of filters for use, at least 10% of the filters in the batch (i.e. 7 filters per box of 65) are taken through the entire weighing process by the supervisor or manager. If any of the tare weights fail to meet the criteria outlined in Section 8.0, the entire box is reweighed.

8.1.3 Mass Reference Standards – Every 3 months, the working weight standards are checked for accuracy using the Laboratory Primary weight set. This procedure is outlined in Section 8.2.2.

8.1.4 Thermometer and hygrometer calibration- The thermometer and hygrometer must be verified by calibration against a NIST traceable standard every 6 months.

8.1.5 System Audit – At least annually the filter weighing process is evaluated. The quality assurance staff (QA staff) will observe the entire weighing process, ensuring all required criteria are met and documented. All balance and weight certificates will be reviewed to ensure all calibrations are up to date. Records of the audit will be maintained by QA staff.

8.2 Equipment Maintenance

8.2.1 Analytical Balance- The balance is serviced and certified yearly. Records of service are kept with the Quality Assurance Coordinator or laboratory manager. The balance is cleaned and checked using standard weights with each use.

8.2.2 NIST Traceable Weights- The set of 1g, 2g, and 5g Class 1 weights that are certified every year. If the laboratory uses two (2) sets of weights, they are uniquely labeled and one is designated as the "Working Standard" used for daily calibration checks, the other set is designated as the "Laboratory Primary Standard" used to check the calibration of the working standard every 3 months. The primary standard is stored in a secure location away from any balance and is not used for routine weighing. As the working standard set nears the expiration of its certification, the primary standard becomes the working standard. When the former working standard is recertified and returned to the lab, it becomes the primary standard. Rotating the sets allows the lab to always have a certified set on hand. The NIST traceable weights must be handled only with plastic tweezers. If the weight is accidentally dropped, stop using the weight set and contact the lab supervisor or QA officer for corrective actions. These weights must be calibrated every year and must not leave the custody of the laboratory. The calibration is verified quarterly by weighing the Working Standards and comparing the weights to those of the Laboratory Primary Standards. All records of weight calibrations are kept by the primary analyst in the laboratory RMS.

8.2.3 Desiccator – Must be maintained within the required range of 20 to 45% RH. Ideally, it should be maintained within the range of 30 to 45% RH to better match the attainable weigh room conditions. This reduced range is accomplished by allowing the desiccant to become semi-saturated.

Note: If the humidity indicator shows the desiccant is spent, the filters weighed during a session are acceptable as long as the hygrometer stays within required ranges.

Table 2: Transfer Standard Performance Criteria

Equipment	Frequency	Criteria[1]
Mass Standard Calibration	annual	≤ ± 0.025 mg
Weight Set Check	3 months	≤ ± 0.5 mg
Thermometer Check	6 months	≤ ± 2 °C
Hygrometer Check	6 months	≤ ± 2.1 % RH
Analytical Balance Calibration	annual	≤ ± 0.1 mg

1 – The performance criteria are measured as the difference between the instrument and the NIST-traceable standard in the units, as shown, with the exception that the Mass Standard criteria is a measure of individual tolerance.

9.0 PROCEDURE

9.1 All filters should only be handled with vinyl, latex or nitrile gloves throughout the procedure.

Note: Elevated humidity levels in the weighing room can be reduced through the use of dehumidifiers prior to placing the filters in the desiccator. This action will minimize drastic fluctuations exceeding the conditioning criteria.

9.2 Place filters on racks inside desiccator for conditioning period.

9.2.1 Once humidity level has stabilized, reset min/max temperature and humidity values on hygrometer inside desiccator.

9.2.2 Record conditioning data (start time, temp and humidity in the desiccator) at the start of the conditioning period, in the lab RMS.

9.2.3 Allow filters to equilibrate, meeting all criteria outlined in Section 8.0, at least 24 hours. Filters must remain in desiccator until all criteria are met.

9.2.4 Record conditioning data using a hygrometer along with min/max values, at the end of the 24-hour conditioning period.

Note: The mean min/max RH values must be within 20–45 %RH and a variability ≤±5%. Similarly, the mean min/max temp values must be within 15-30 °C, and a variability ≤±3°C.

9.3 If using an environmentally controlled weigh room:

9.3.1 Adjust room environmental conditions to be within the acceptable range. If necessary, use room dehumidifiers to achieve appropriate conditions.

9.3.2 If the weigh lab uses a draft shield to maintain an acceptable balance measurement, the door to the draft shield must be kept open during this period.

9.3.3 Reset hygrometer after room humidity is adjusted to acceptable range. Then record the initial weighing conditions using the hygrometer.

9.4 Zero the balance according manufacturer's instructions.

9.5 Perform QC check. Using plastic tweezers, the NIST traceable weights (1g, 2g, and 5g) are placed on the balance and their current actual weights are recorded in the lab RMS along with balance zero. If the weights agree within the ± 0.0005 g of their certified weights, filter weighing can begin. If the NIST traceable weights differ by more than ± 0.0005 g, report the results to the laboratory supervisor immediately and do not proceed until a weight set meeting this QC check is available.

9.6 Tare/Gross Weights – The primary analyst, using vinyl, latex, or nitrile gloves, will place each filter on the balance. Close draft shield door, if applicable, and begin weighing within 30 seconds. Weigh the filter according to manufacturer's instructions, making sure to allow weight to settle before recording.

9.7 Tare/Gross Weight Re-Weights for QC Checks - The analyst randomly selects and weighs a minimum of 5 to 7 filters. If 5 or fewer filters are in the batch, all filters will be re-weighed. The analyst records each re-weight in the lab RMS for either the Tare or Gross Re-Weights, along with the date, filter number and the analyst's initials. The tare weights and the re-weights must agree within ± 0.0028g to be valid. If the weight differs by more than 0.0028g, the entire batch of filters must be reweighed. For gross re-weights, all filters in the batch must be reweighed if any of the re-weight checks differ by more than ± 0.0028g from the original

weight. Should it become necessary to terminate a weigh session because of humidity, the re-weights are also re-analyzed.

Note: Random selection of the first filter to re-weigh is achieved by a random number generator, six-sided dice, or a number drawn from a hat, and then select every 7th filter until the required number of re-weighs is achieved, restarting with the first filter if necessary.

9.8 Zero and Calibration checks – After every 10 filters, and after the last filter, check the balance zero and continuing calibration checks. The analyst will use a pair of working weights between 1g and 5g, inclusive, to check the balance calibration and record the results. Weights must be within ± 0.0005g of true value.

9.9 If using an environmentally controlled weigh room, record final temperature and humidity from the hygrometer, along with min and max values, once final filter and weight standard calibration check have been weighed.

9.10 Generate final filter weight and lab conditioning reports for supervisor approval.

10.0 CALCULATIONS

Calculate PM_{10} on Quartz Fiber Filters according to the following equation:

$$PM10\ \left(\frac{\mu g}{m^3}\right) = \frac{[Gross\ Weight\ (g) - Tare\ Weight\ (g)] * 10^6}{Flow\ Rate\ \left(\frac{m^3}{min}\right) * Total\ Elapsed\ Time\ (min)}$$

Where the flow rate is at standard temperature and pressure (STP), and the concentration is rounded to the nearest integer.

11.0 DATA ASSESSMENT

All results generated are submitted to the laboratory QA staff and reviewed for completeness and adherence to the acceptable QC criteria outlined in Section 8.0 for final approval.

12.0 CORRECTIVE ACTION FOR OUT-OF-CONTROL DATA

Any batch of filters not meeting acceptance criteria must be reanalyzed. If a problem persists, maintenance must be performed on the equipment per the manufacturer's recommendations until compliance with acceptance criteria can be met. Changes to the procedure may be necessary to meet the criteria.

13.0 CONTINGENCIES FOR OUT-OF-CONTROL DATA

Data that fail any of the criteria will be reanalyzed until the criteria are met. If reanalysis is not possible, data will be appropriately flagged.

14.0 WASTE MANAGEMENT

Once desiccant can no longer be regenerated, it is disposed of according to local environmental regulations.

15.0 REFERENCES

15.1 40 CFR Part 50 APPENDIX J - REFERENCE METHOD FOR THE DETERMINATION OF PARTICULATE MATTER AS PM10 IN THE ATMOSPHERE

15.2 Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, USEPA, May, 2013 (EPA-454/B-13-003)

Appendix A – Forms

1. DEP Form No. 16-22-A - PM10 Laboratory Exposed Sample Custody of Custody Log

PM10 Laboratory Exposed Sample COC Log

DEP Form No. 16-22-A
Revision No. 0
Revision Date: 5/31/2016

PM10 Laboratory Exposed Sample COC Log, DEP Form No. 16-22-A — Effective on: 7/1/2016

Filter #	Site AQS#	Sample Date	Submitting Field Operator	Date Submitted	Receiving Lab Analyst	Date Received	Lab Sample ID #

Instructions:

1. Record the Filter #
2. Record the Site AQS #
3. Record the date of sample (run date)
4. Record the name of the field operator submitting the sample and the date submitted
5. Record the name of the lab analyst receiving the sample and date of receipt
6. Record the Lab Sample ID #, if applicable.

Appendix B – Glossary

AQS	-	US EPA Air Quality System
CFR	-	Code of Federal Regulations
DEP	-	Florida Department of Environmental Protection
EPA	-	U. S. Environmental Protection Agency
NIST	-	National Institute of Standards and Technology
PM_{10}	-	Particulate Matter with an aerodynamic diameter ≤ 10 microns
PQAO	-	Primary Quality Assurance Organization
QA	-	Quality Assurance
QAPP	-	Quality Assurance Project Plan
QC	-	Quality Control
Rh	-	Relative Humidity
RMS	-	Records Management System
SOP	-	Standard Operating Procedure
STP	-	Standard Temperature (25°C) and Pressure (760 mmHg)

Appendix C – Lab Specific Sample Processing Procedures

1. Broward County Data Handling Procedures – PM_{10}

1.0 CALCULATION OF PM10 CONCENTRATIONS

1.1 Location of data

1.1.1 Forms DEP03-18-A along with the Conversion Sheet for PM10 are stored on the shared drive G:/air/monitoring/PM10/YYYY FDEP Sample Record Forms/ , where YYYY is current 4-digit year.

1.1.2 Unexposed and Exposed Filter Chain of Custody forms are located in a notebook in the PM10 laboratory.

1.1.3 Information on laboratory conditions, check weights, QC of filters, are located in the PM10 Laboratory Notebook covering the current time period. The Notebook is located in the PM10 laboratory.

1.2 The lab analyst verifies the Qa (average flow rate) value entered into DEP 08-18-A (from the appropriate PM10 sampler's look up table).

1.3 The lab analyst verifies elapsed timer data is entered into the Conversions Page of DEP 03-018-A and that the calculated elapsed time (in minutes) is entered in the corresponding block of DEP 03-18A.

1.3.1 The PM10 analyst unlocks Excel spreadsheet YYYY PM10 Data.xlsx using a password (where YYYY is current 4-digit year).

1.3.2 The PM10 lab analyst enters from forms DEP 03-18-A data (filter number, sample date, sampling site, AIRS ID, ambient temperature, ambient pressure, average flow rate, and standard flow rate) and DEP 03-18-H (gross and tare weights) in the proper location on the Excel spreadsheet YYYY PM10 Data.xlsx (see Figure X-1), where YYYY is the current 4-digit year.

1.3.3 The analyst also enters any notes from the field or lab that could potential void the samples.

1.3.4 The spreadsheet calculates the sample concentration, as well as the precision and coefficient of variation for collocated samples.

1.4 The PM10 lab analyst enters the flow rate, standard flow rate, and concentration data into form DEP 03-13-H.

1.5 The filters and laboratory notebook are presented to the PM QA coordinator.

1.6 The coordinator verifies the Chain of Custody forms in the PM10 laboratory.

Sample Date	Broward County Site No.	AIRS ID	FILTER	ACTUAL Temperature (°C)	ACTUAL Pressure (mmHg)	Latest Calibration Date	Calibration Due	Average Flow from EACH PM10 Instrument's LookUp Table (m^3/min)	Flow @ STP (m^3/min) QA limits: 1.02 -1.24	Initial Weight (g) QA limits 3.7-4.7	Final Weight (g)	Δ Weight (g)	Sample Time (min) QA limits 1440 ±60
1/1/2017	34A	12-011-0034	Q5532855	22.7	766.3	11/17/2016	11/16/2017	1.144	1.162	4.4926	4.526	0.0335	1446
1/1/2017	34B	12-011-0034	Q5532865	22.7	766.3	11/17/2016	11/16/2017	1.153	1.172	4.4893	4.521	0.0317	1446
1/1/2017	30	12-011-5005		25.1	765.4	2/26/2016	2/24/2017	1.147	1.155	4.5065	4.507	0.0009	0
1/7/2017	34A	12-011-0034	Q5532856	21.5	763.4	11/17/2016	11/16/2017	1.150	1.169	4.4893	4.503	0.0137	1446
1/7/2017	34B	12-011-0034	Q5532866	21.5	763.4	11/17/2016	11/16/2017	1.153	1.172	4.4661	4.48	0.0139	1446
1/7/2017	30	12-011-5005	Q5532832	22.0	762.4	2/26/2016	2/24/2017	1.149	1.164	4.511	4.525	0.0143	1445
1/13/2017	34A	12-011-0034	Q5532857	23.0	770.7	11/17/2016	11/16/2017	1.145	1.169	4.4786	4.497	0.0183	1446
1/13/2017	34B	12-011-0034	Q5532867	23.0	770.7	11/17/2016	11/16/2017	1.152	1.176	4.4781	4.495	0.0172	1446
1/13/2017	30	12-011-5005	Q5532833	24.1	769.9	2/26/2016	2/24/2017	1.149	1.167	4.5021	4.519	0.0167	1443

PM_{10} Concentration ($\mu g/m^3$)	Reported Concentration ($\mu g/m^3$) TRUNCATED	Comments	Analyst	Date	QA Officer	Date	Precission (%)	Coefficient of Variation CV ≤ 10% samples ≥ 15 µg/m3
19.930	19.9		A. Suarez	2/2/2017	B. Olson	2/5/2017	6.304	8.916
18.712	18.7		A. Suarez	2/2/2017	B. Olson	2/5/2017		\
VOID	VOID	Void - Operator Error - Operator left screen on diagnostics menu. Sampler did not run.	A. Suarez	2/2/2017	B. Olson	2/5/2017		
8.106	8.1		A. Suarez	2/2/2017	B. Olson	2/5/2017	1.189	1.681
8.203	8.2		A. Suarez	2/2/2017	B. Olson	2/5/2017		
8.499	8.4		A. Suarez	2/2/2017	B. Olson	2/5/2017		
10.826	10.8		A. Suarez	2/2/2017	B. Olson	2/5/2017	6.806	9.625
10.114	10.1		A. Suarez	2/2/2017	B. Olson	2/5/2017		
9.913	9.9		A. Suarez	2/2/2017	B. Olson	2/5/2017		

Figure X-1. Data entered into left side of YYYY PM10 Data.xlsx.xlsx, where YYYY is the current year, in this case 2017.

2.0 HANDLING OF VOIDED SAMPLES

2.1 The coordinator will apply the proper NULL codes to samples that are void by the field operator or PM10 lab analyst based upon their reason, e.g., GFI trip, filter torn, insects, etc.

2.2 The coordinator may apply a NULL code not otherwise noted by the field operator or PM10 lab analyst. Cases that are not clear cut are discussed with the principle QA coordinator, the Ambient Air Monitoring Supervisor or Manager, or any combination of these to ensure NULL codes applied are appropriate.

3.0 QUALITY ASSURANCE & QUALITY CONTROL

3.1 The PM QA coordinator verifies data on field form DEP Forms 03-18-A by:

3.1.1 Verifying all required data is entered.

3.1.2 All calculated "PASS/FAIL" fields show "PASS."

3.1.3 The start and end elapsed timer readings are on the Conversion page.

3.1.4 The correct Qa (average flow rate) value from each PM10 sampler's Look-Up table is entered.

3.1.5 DEP Form 03-18-A has been properly named following the Broward County Air Quality Program's file naming convention: YYYY-MM-DD_SiteXX_PM10M.xlsx

3.2 The coordinator also verifies PM10 Weighing Laboratory data by:

3.2.1 Verifying that CFR requirements for temperature and relative humidity were met during filter equilibration of both unexposed and exposed filters.

3.2.2 Verifying balance stability by reviewing weights of 1 g, 2 g, and 5 g standard at the beginning of the weighing session, after every 10th filter, and at the end of the weighing session.

3.2.3 Verifying that the tare weighting procedure (unexposed filters) passed the manager's review.

3.2.4 Verifying that QC checks of filters (both exposed and unexposed) was performed and was passed.

3.2.5 Verifying that chain of custody forms (DEP Forms 03-18-F and 16-22-A) have been filled out completely.

3.2.6 Verifying that the sample envelope form (DEP Form 03-18-H) has been filled out completely.

3.3 The coordinator verifies data on Excel PM10 spreadsheet YYYY PM10 Data.xlsx, where YYYY is the current 4-digit year by

3.3.1 Verifying that the data pertaining to each sample is entered correctly based on DEP Forms 03-18-A and 03-18-H.

3.3.2 To verify spreadsheet calculations, the coordinator manually calculates the PM10 concentration following the steps outlined in the PM10 sampler's Look-Up table and compares it to the value calculated in the Excel spreadsheet.

3.3.3 The coordinator also verifies entry of flow rate, standard flow rate, and final concentration on DEP Form 03-18-H.

3.4 The coordinator enters the appropriate NULL code for void or questionable data.

4.0 DATA ENTRY

4.1 Monthly PM Data Table is automatically populated with the final concentration or NULL code for each sample from the data on the left hand side of the spreadsheet YYYY PM10 Data.xlsx (See Figure X-2)

4.2 The PM QA coordinator manually enters PM10 data into EDAS and FAMAS and documents the date each action was performed.

4.2.1 Note that until we upgrade from version 2.10.13 of AirVision, we cannot enter manual data into AirVision and enter it instead into the older system EDAS

PM_{10} Concentration ($\mu g/m^3$)	Reported Concentration ($\mu g/m^3$) TRUNCATED	Comments	Analyst	Date	QA Officer	Date	Precission (%)	Coefficient of Variation CV ≤ 10% samples ≥ 15 µg/m3
19.930	19.9		A. Suarez	2/2/2017	B. Olson	2/5/2017	6.304	8.916
18.712	18.7		A. Suarez	2/2/2017	B. Olson	2/5/2017		\
VOID	VOID	Void - Operator Error - Operator left screen on diagnostics menu. Sampler did not run.	A. Suarez	2/2/2017	B. Olson	2/5/2017		
8.106	8.1		A. Suarez	2/2/2017	B. Olson	2/5/2017	1.189	1.681
8.203	8.2		A. Suarez	2/2/2017	B. Olson	2/5/2017		
8.499	8.4		A. Suarez	2/2/2017	B. Olson	2/5/2017		
10.826	10.8		A. Suarez	2/2/2017	B. Olson	2/5/2017	6.806	9.625
10.114	10.1		A. Suarez	2/2/2017	B. Olson	2/5/2017		
9.913	9.9		A. Suarez	2/2/2017	B. Olson	2/5/2017		

Figure X-2. Final PM10 data and QA checks from right side of YYYY PM10 Data.xlsx, where YYYY is the current 4-digit year.

2. Miami Dade County PM_{10} Lab Procedures – Amendment 2

1. Equipment and Supplies

1.1 Electronic Analytical Balance- Sartorius A 200, accurate to 0.0001 g, calibrated annually

1.2 Working Standard- Class 1 (1g, 2g, 5g), traceable to NIST mass standard, certified annually

1.3 Primary Standard- Class 1 (1g, 2g, 5g), traceable to NIST mass standard and certified annually. Primary Standard is used to check working standards every 6 months. The Working and Primary Standard weight sets are rotated every six months. The Working Weights QC Check form is used to make the comparison as stated in Steps 8.2.2 of the DEP-16-22 PM10-Lab SOP.

1.4 Tweezers (plastic) used to handle the weights

1.5 NIST Traceable Digital hygrometer- can measure temperature and humidity but used to measure humidity only, calibrated annually in-house. The form used is the Relative Humidity Indicator Calibration Form and the data is entered into the Relative Humidity Linear Regression template.

1.6 MIN/MAX thermometer- primary standard

1.7 Light box

1.8 Desiccator

1.9 Camel hair brushes

2. Filter handling and Preservation

2.1 Pre-numbered PM10 quartz filters are visually inspected and weighed as per DEP-16-22-PM10-Lab SOP in Section 7.0.

2.2 Ten tare filters are inspected and weighed. The Lab Technician keeps the individual tare filter in a separate manila folder and placed in individual slots in the accordion folder.

2.3 The individual tare filters are logged in the PM10/Pb-TSP Tared Filter COC Log (DEP Form No. 03-18-F) Excel template when transferred to field technician.

3. Filter Handling and Preservation

The PM10 filters are handled with vinyl or nitrile gloves throughout the procedure as per DEP-16-22- PM10-Lab SOP Section 9.0 for the tare and gross filters.

3.1 The Sartorious Balance Weight Check form is used to perform the QC check. The following information is notated on the form: Day, Weight Set id, Check Type (Beginning, >10 Filters, End), the balance readings for the 0.0000g, 1.0000g, 2.0000g, 5.0000g, Pass/Fail, and the Analyst initials. After the last filter, the Check Type "End" is performed. The zero reading is checked followed by the 1g, 2g, and 5g weights. Steps 9.4, 9.5, and 9.6 of the DEP-16-22 PM10-Lab SOP are being followed.

3.2 The Lab Technician selects 10 tare filters and puts them in the desiccator. The PM10 Filters Tare Weight Log is used during this procedure. All initial pertinent information is written on the form: Desiccator #, Desiccator Thermometer ID, Time Standard ID and the time standard Last Checked/Calibrated date. The Pre-Condition Date, Time, Min/Max Temp, Min/Max %RH and Min/Max Actual %RH are written on the form. The Min/Max actual %RH is written based on the hygrometer's Relative Humidity Linear Regression. The Start Date and Time will indicate the start of the 24-hour conditioning of the tare filters. The Out Date and Time will indicate the end of the $\geq$ 24 hours conditioning period of the tare filters. Steps 9.2 and 9.3 of the DEP-16-22 PM10-Lab SOP are being followed.

3.3 Chemist 1 uses the quality control check form (Filter Weights Quality Control Checks Tare Filters) for the tare batch. Steps 9.7 thru 9.10 of the DEP-16-22 PM10-Lab SOP are being followed.

3.4 The Lab Technician uses the PM10 Filters Gross Weight Log for logging the weights for the gross filters. The same procedure as in step 3.2 above is followed.

3.5 The Chemist 1 uses the Filter Weights Quality Control Checks Gross Filter form for logging the quality control check.

4. Calculations

4.1 The concentration for the PM10 Quartz filters follows the formula as stated in DEP-16- 22-PM10-Lab SOP Section 10.0. Miami-Dade uses a PM10 Sample Run (Year) Excel template where the flow rate is stated as standard temperature and pressure and the final concentration is rounded to the nearest integer.

3. Environmental Protection Commission of Hillsborough County Data Handling Procedures – PM_{10}

1.0 **LOCATION OF DATA**

1.1 All log-in, COC and report forms for PM10 are stored on the shared drive I:/Water/Lab/Air Programs folder or within the Filter Database.

1.2 Completed hardcopies are located in a notebook in the PM10 laboratory.

1.3 Information on laboratory conditions, check weights, QC of filters, are located in the PM10 Laboratory Notebook covering the current time period. The Notebook is located in the PM10 laboratory.

2.0 **FILTER HANDLING / DATA ENTRY**

2.1 Upon exposed filter receipt into the lab, Filter #, Sample Date, Submitter, Date Submitted, Receiving Analyst and Site are entered into the Laboratory Database and a unique lab ID number is assigned.

2.2 During weighing process, all weighing conditions, weights, flows, run times and any comments are entered into the Access Filter Database.

2.3 All calculations are performed by the Access Filter Database.

2.4 The filter analyst uses the Filter Database to generate a Particulate Report and a final PM10 Report.

2.5 The Particulate Report contains all weighing conditions, including repeat weights. All Pass/Fail criteria are noted on the Particulate Report.

2.6 The final PM10 Report lists filter information including site, run date, flow rate, sample time, gross and tare weights along with the final report value.

2.7 The filters and reports are presented for QC to the Laboratory Manager

3.0 **QUALITY CONTROL PROCESS**

3.1 The Laboratory Manger verifies all quality control criteria have been met including:

- 3.1.1 Temperature and humidity conditions
- 3.1.2 Equilibration time
- 3.1.3 Balance Checks
- 3.1.4 Repeat Weights

3.2 The Laboratory Manager verifies all sample information is correct on the Final Report and has been recorded on the filter envelope, including:

- 3.2.1 Filter Number
- 3.2.2 Elapsed Time
- 3.2.3 Flow Rates
- 3.2.4 Tare and Gross Weights
- 3.2.5 Final PM10 value

3.3 The laboratory manager then manually calculates and confirms 4 random results to ensure the filter database accurately calculated the final result.

Calculating PM10 on Quartz Fiber Filters:

$$\text{PM10 in } \mu g/m^3 = \frac{(\text{Gross Weight(g)} - \text{Tare Weight(g)})(1{,}000{,}000)}{\text{Flow Rate}(m^3/\text{min}) \times \text{Total Elapsed Time(min)}}$$

3.4 The Laboratory Manager then passes the Final Report to the Laboratory QA Officer.

3.5 The Laboratory QA Officer reviews the report and delivers it to the Air Division.

4. Pinellas County Standard Procedure for Processing PM_{10} High Volume Filters, March 2017, Revision 0 (includes PM_{10} SOP Forms)

TABLE OF CONTENTS

List of Forms

1. **Accept filter batch from EPA**

1.1 Complete the Annual PM10 EPA filter shipment Log sheet (Pin_PM10Form 1) documenting which filters were received from EPA for the upcoming calendar year. Analyst signs and dates the form.
1.2 Store filters in the balance room.

2. **Inspect Filters for Acceptance Criteria**

2.1 Inspect one box of filters as needed as described in DEP SOP 16-22 (July 2016) section 7.2 using a light box.
2.2 Record the filter inspection on the Filter Inspection Log sheet (Pin_PM10Form 2).

3. **Desiccate Clean Filters**

3.1 Using approved gloves, select 20 filters from the box that has been inspected and place them in the filter holder rack.
3.2 Open Excel file PM10 Template 2017 (Pin_PM10Form 4) and **Save As** T followed by the range of filters to be weighed and enter all filter numbers to be conditioned. Condition the clean filters as described in DEP SOP 16-22 Sections 9.1 and 9.2
3.3 Reset the min/max thermometer at the time filters are placed in the desiccator. Allow at least 30 minutes and a difference of no more than 5% RH from stabilization before starting the 24 hour conditioning period. Reset the min/max hygrometer immediately prior to the start of the 24 hour conditioning period. Record the required information on the PM10 Filter Desiccation Log (Pin_PM10Form 3).
3.4 Be sure to adhere to the QC requirements in DEP SOP 16-22 Table 1.

4. **Weigh Clean Filters**

4.1 After filter conditioning, begin weighing clean filters as described in DEP SOP 16-22 Sections 9.4 through 9.10.
4.2 Optional: If re-tare is needed after a successful unadjusted zero check and 5.0000g weight check, indicate in the comments section that an adjusted zero (tare) and 5.0000g weight check were performed and met the QC requirements in DEP SOP 16-22 Table 1.
4.3 Store the tared (clean and weighed) filters in the designated manila folder, with each filter separated by an 8” x 10” sheet of printer paper. Store the manila folder inside plastic desiccator “B”, to minimize filter exposure to dust or damage.

5. **QA Section Tare Weight Audit**

5.1 An internal filter audit performed by the QA officer or manager must be done on the tared filters as described in DEP SOP 16-22 Section 8.1.2. See the PM10 QA audit procedure, attached.
5.2 Record the QA audit information on Unexposed Filters form (Rev 5 dp 11/02/16).

6. **Clean Filter Storage**

6.1 Once the QA Tare filter audit is successfully completed, store the batch of filters in the white storage box labeled “weighed, Field ready”, and place the entire batch in order, but below all other filters in the box. All filters must be the order in which they were weighed, from top to bottom.

7. **Clean Filter Assignment and Distribution**

7.1 Open Excel file H:\USERS\PM\PM10\PM 10 Run Logs\Pin_PM10 Sample Record TEMPLATE.xls and **Save As** Pin_PM10 Form 03_18_A_yymmdd where yymmdd is the scheduled EPA run date for manual sampler, normally a 1/6 day schedule.
7.2 Open the Initial Filter Weight Excel file, (Pin_PM10Form 4) that matches the actual filter number at the top of the clean filter storage box from section 6.1.
7.3 Open the PM10 Filter Distribution.xls file (Pin_PM10Form7) and assign filters to all sites for the upcoming run date. Paste the filter number and tare weight by copying from the Initial Filter weight Excel file from Step 7.2.
7.4 From the PM10 Filter Distribution.xls file (Pin_PM10Form7), copy the run date, filter number and initial weight to the Pin_PM10 Form 03_18_A_yymmdd file, Raw Data tab for all sites to be sampled for that run date. (Motor Pool Collocated runs 1/12 days).
7.5 Enter Not Scheduled and NA for any site that is not being sampled for that run date.
7.6 On the DEP 03-18-F tab, enter the tare weight date in cell C4. Enter the lab analyst and release date in the blue cells for each site. The filter number and site ID are prepopulated.
7.7 Close but do not save the Filter Weight file.
7.8 Install each filter into their respective filter cassettes as described in DEP SOP 03-18 Section 9.2. Verify that the actual filter number and site cassette match exactly with the filter number site ID on the Tare COC form DEP 03-18-F.
7.9 Save and close both the PM10 Form 03_18_A_yymmdd file and the PM10 Filter Distribution.xls file.
7.10 Leave the clean filter cassettes laid out on the lab counter so field operators can sign the filters out from the lab.

8. **Exposed Filter Receipt (No action needed by Lab)**

8.1 Field operators will collect and return the exposed filters as described in DEP SOP 03-18 Section 9.3 and will store the filters, covered in their cassettes, on the lab counter.
8.2 Field operators will open the Excel file Pin_PM10 Form 03_18_A_yymmdd for the exposed filter run date.
8.3 Field operators will go to the raw data tab and enter all information in the green highlighted cells. They will also save and close the file.
8.4 The Air Monitoring supervisor will review the field operator entries and document the review on the PM10 Validation Sheet tab in the pink cells.
8.5 The Air Monitoring supervisor calculates the actual flowrate in m3/min, from the Qa interpolator tool that is on the raw data tab.
8.6 **NOTE:** All PM10 calculations that are on the raw data tab are performed as defined in DEP SOP 03-18 Section 9.3. A more detailed description of calculations on the raw data tab is at the end of this procedure.
8.7 **NOTE:** Review of Form DEP 03-18-A, PM10/Pb-TSP Sample Record, is not addressed in this laboratory –based procedure.

9. **Exposed Filter Storage**

9.1 Remove the exposed filters as described in DEP SOP 03-18 Section 9.6. by using a clean, 8”x10” piece of white printer paper that is stored in the balance room. Do not store the filters in an envelope at this time.

9.2 Open Excel file Pin_PM10 Form 03_18_A_yymmdd for the exposed filter run date.
9.3 On the PM10 Laboratory Exposed Sample COC log Form (DEP 16-22-A tab), enter the analyst name and date that each filter was received.
9.4 On the Raw Data tab, column AA, enter any lab comments for individual filters.
9.5 Store the folded, exposed filters in their protective paper sleeve, lying flat, inside Desiccator B, until the filters are to be conditioned and weighed.
9.6 On the PM10 Validation tab, document that the lab validation and review criteria has been met. Do not sign that the lab documentation is complete. This will be done at a later date. Save and close Excel file Pin_PM10 Form 03_18_A_yymmdd for the exposed filter run date.

10. **Desiccate Exposed Filters**

10.1 Using approved gloves, remove as many as 40 exposed filters from Desiccator B.
10.2 Remove the metal filter holder rack from Desiccator A and fill the rack with each folded filter, removing each paper protective sleeve. Store the paper sleeve inside Desiccator B.
10.3 Open Excel file PM10 Template 2017 (Pin_PM10 Form5) and **Save As** G followed by the range of filters to be weighed and enter all filter numbers to be conditioned.
10.4 Reset the min/max thermometer and hygrometer as described in Section 3.3
10.5 Condition the exposed filters as described in DEP SOP 16-22 Sections 9.1 and 9.2

11. **Weigh Exposed Filters**

11.1 After filter conditioning, open the file created in Step 10.3 and begin weighing exposed filters as described in DEP SOP 16-22 Sections 9.4 through 9.10.Optional: If re-tare is needed after a successful unadjusted zero check and 5.0000g weight check, indicate in the comments section that an adjusted zero (tare) and 5.0000g weight check were performed and met the QC requirements in DEP SOP 16-22 Table 1. Save the file.
11.2 After filter weighing is complete, place each exposed (gross wt.) filter in a folded protective paper sleeve from Step 10.2, lying flat, inside Desiccator B, until the filters are to be archived in individual envelopes. Open the PM10 Filter Distribution.xls file (Pin_PM10Form7) and copy the gross weight from the Gross Filter Weight Excel file (Pin_PM10Form 5) from Step 11.1. and paste the gross weight for each filter, in the PM10 Filter Distribution.xls file (Pin_PM10Form7).
11.3 Open Excel file H:\USERS\PM\PM10\PM 10 Run Logs\Pin_PM10 03_18_A_yymmdd for each exposed filter run date and all field blank runs. Copy the filter gross weight for each filter for each run date from the PM10 Filter Distribution.xls file and paste it in the Raw Data tab for each site.
11.4 For each run date file, on the DEP 03-18-F tab, enter the gross weight date in cell C6.

12. C**alculate PM10 concentration**

12.1 Open the Excel file Pin_PM10 Form 03_18_A_yymmdd for the exposed filter run dates. Verify that the PM10 concentration has been automatically calculated on the Raw Data sheet in column U. If not, notify the Air Monitoring Supervisor to enter any missing data.

12.2 **NOTE:** All PM10 calculations that are on the raw data tab are performed as defined in DEP SOP 03-18 Section 9.3. A more detailed description of calculations on the raw data tab is at the end of this procedure, Supplemental A.

13. **Filter Envelope Preparation**

13.1 Open Excel file H:\USERS\PM\PM10\Envelopes\Envelope Data.
13.2 Delete all data from rows 2 through the last row of data.
13.3 Open all Pin_PM10 Form 03_18_A Excel files for a completed calendar month, which must have the gross filter weights and final PM10 concentrations.
13.4 From the envelope tab in each file, copy all the data and Paste Special Value into the Envelope Data spreadsheet. Make sure that all the data is matched with the correct header names in row 1. Delete all unscheduled run rows in the Envelope Data spreadsheet.
13.5 Since all the data is in text format, ending zeros must manually be added to flow rates, filter weights, and concentrations, for those values that calculate with having ending zeros.
13.6 Save and close all Excel files.
13.7 GO TO STEP 14.2
13.8 Open Word document H:\USERS\PM\PM10\Envelopes\Avery template 5168-PM10. This file is mail merged with the envelope spreadsheet from Step 13.2. The label is formatted using Form No. DEP 03-18-H Filter Envelope. To create the envelope label sheet, select Mailings/Finish and Merge/Edit individual records/all.
13.9 Print using Avery 5168 labels.
13.10 Remove all exposed filters for the month from Desiccator B, touching only the protective sleeve, and individually place the exposed filter inside a 5 1/4" x 9 1/2" kraft envelope. Match the filter number on the filter with the correct label. Affix the label to the envelope.
13.11 Place initials by the analyst name. Obtain signatures of the operator for each filter.
13.12 Store the exposed filters in their envelopes in the Balance Room.
13.13 Send metals filters to EPC lab using chain of custody.

14. **Reporting the Calculated PM10 Concentration**

14.1 Open Excel file H:\USERS\PM\PM10\Envelopes\Envelope Data.
14.2 Open Excel file H:\USERS\PM\PM10\Envelopes\Monthly PM10 conc which is Pin_PM10form6. There are tabs for each month.
14.3 Copy the entire monthly data from the Envelope Data file and paste into the correct month of the PM10 conc spreadsheet.
14.4 Review the monthly PM10 conc spreadsheet. Enter the analyst and date. Select only the tab for the month of interest. Set the print area to include all cells that contain information/data.
14.5 Save the file, then Save As the file as a pdf. Name the file Pin_PM10concMonthYear. E-sign and date at the top of the pdf. Save the file. **This is the file that has the official/final/reported PM10 concentration that has been calculated by the lab.** PM10 concentrations can be hand calculated and verified since the filter weights, elapsed time and flow rate @ stp are all documented on the form.
14.6 Enter the PM10 concentrations into AirVision and print out a text file.

14.7 Open each Excel Run log file (Pin_PM10 Form 03_18_A_yymmdd) and **verify that the PM10 concentrations from the AirVision text file printout match the concentrations in the RawData tab for each run date and site.** Also document on the PM10 Validation tab, that all lab documentation is complete.
14.8 GO TO STEP 13.8
14.9 Notify the QA section that the monthly PM10 data is complete.

Supplement A
Pinellas County Air Monitoring Section
Procedure to Calculate PM_{10} Concentration
Date: 2/15/17 Revision 3
NOTE: Rounding is used during certain calculations so displayed values in the spreadsheet will match hand calculated values.

1. Calculate the delta filter weight, in grams =

Delta filter weight = Mass of gross weight – mass of tare weight, in grams.

2. Calculate the average of initial and final relative stagnation pressure, APstg, for the sampling period, in inches H2O. **Use manometer readings to the nearest 0.1 inches H2O**

$$\text{APstg, inches } H_2O = \frac{\text{(Initial manometer reading + final manometer reading)}}{2}$$

3. Convert the average relative stagnation pressure, APstg, from inches H_2O to mmHg

APstg, mmHg = APstg, H_2O x (25.4/13.6) **ROUNDED to the nearest 0.01mmHg**

4. Obtain the average barometric pressure, Pa, and average temperature, Ta, from the 24 hour sampling period average at the Skyview site (12-103-0026).

Pa = average barometric pressure during sampling period, **recorded to the nearest 0.1 mmHg**

Ta = average temperature during sampling period, **recorded to the nearest 0.1 ^{o}C.**

5. Calculate the average absolute stagnation pressure, Po, in mmHg

Po = (average barometric pressure, Pa,) – (average relative stagnation pressure, APstg)

6. Calculate the average stagnation pressure ratio, Po/Pa

Average stagnation pressure ratio = Po/Pa

7. Use the manufacture's lookup table that is specific to the VFC serial number for each sampler. If the average temperature, Ta, is an even-whole number, match the average temperature, Ta, in ^{o}C, with the Po/Pa ratio to determine the average actual flow rate, Qa, in m^3/min. If the average temperature, Ta, is not an even-whole number, interpolate the average flowrate using linear regression (slope and intercept) of the 2 temperatures and flowrates bracketing Ta, in the look up table. Note that the PM10 raw data spreadsheet will do the interpolation.

Qa = determined from manufactures lookup table for specific sampler, using Ta and Po/Pa. **ROUNDED to the nearest 0.001 m3/min.**

8. Calculate the average flowrate, corrected to EPA standard temperature and pressure (STP), Qstd

Qstd = Qa x [Pa/(Ta+273)] x [298/760] **ROUNDED to the nearest 0.001 m3/min.**

Where:

Ta, ^{o}C + 273 = Ta, ^{o}K

298 ^{o}K is EPA standard temperature and 760 mmHg is EPA standard pressure.

9. Calculate the total volume of air sampled, Vol_{std}, in m^3

Vol_{std} = Qstd x Elapsed time (hours) x 60

10. Calculate the mass concentration of PM_{10}, in ug/ std m^3

$$PM10\ @STP = \frac{(\text{Delta filter weight} \times 10^6)}{Vol_{std}}$$

Report the final calculated PM_{10} concentration **TRUNCATED to the nearest 0.1 ug/m3.**
(See QA Handbook Table 14-1 AQS data reporting requirements)

Supplement B
Pinellas County Air Monitoring Section
PM10 QA audit Procedure (Rev 2, 3/13/17)
To be done after each clean batch (tare) of filters is weighed

DAY 1 (page 1 of 2)

1. Use gloves.
2. Carefully remove the manila folder from plastic desiccator that contains 20 clean and weighed filters.
3. Remove the rack from metal desiccator (Desiccator A).
4. Randomly select 3 filters from the folder and place them in the rack.
5. Place the rack and filters in desiccator A.
6. Reset the Min/Max THERMOMETER (big Reset button in center) on TOP SHELF of Desiccator A.
7. Close door on Desiccator A.
8. Return the manila folder back into the plastic desiccators.
9. Open Excel file Drylog for the current year. Ex 2017Drylog.xls and use the format revised 3-9-17.
10. Go to the next available row and in column A, enter the same set of 20 filters that are listed in the row directly above it.
11. Verify that the 3 filters in Desiccator A are of that set.
12. Enter QA audit in column B
13. Record the current % humidity from the min/max HYGROMETER on the outside of the desiccator and enter it in the spreadsheet in Column C. There are no corrections to the reading, but the humidity reading must be between 25 and 45% before proceeding.
14. Hit <F9>, then COPY the date and time in cells A11 and B11 and PASTE SPECIAL, VALUE in column D of the row you are working in. This will copy the date and time in columns D and E.
15. Enter your initials in column F.
16. Wait at least 30 minutes.
17. Repeat Steps 13, 14 and 15 but enter the data in columns G, H, I and J, respectively.
18. Check column U and make sure it says PASS, before proceeding.
19. **SAVE THE FILE.**
20. Reset the min and max HYGROMETER %RH by toggling the min/max button and pressing and holding the reset button for each display. When finished resetting the %RH, toggle the min/max button until the current %RH is displayed.
21. Wait at least 24 hours before proceeding to Day 2.

DAY 2 (Page 2 of 2) Continue on the same row as DAY 1

1. Record the current % humidity from the min/max HYGROMETER on the outside of the desiccator and enter it in the spreadsheet in Column K. There are no corrections to the reading, but the humidity reading must be between 25 and 45% before proceeding.
2. Hit <F9>, then COPY the date and time in cells A11 and B11 and PASTE SPECIAL, VALUE in column L of the row you are working in. This will copy the date and time in columns L and M.
3. Enter your initials in column N.

4. Record the Min and Max % RELATIVE HUMIDITY (toggle the min/max button for the correct display) in columns O and P, respectively, and your initials in column Q.
5. Record the Min and Max TEMPERATURES in columns R and S, respectively and your initials in column T.
6. Verify columns U, V, W, X, Y, and Z all say PASS.
7. Prior to filter weighing, a weight check of 0.0000 (press the tare key), and 5.0000 gram weights must be done using the certified weight set. Weight check must be within +/- 0.0005 grams of true weight.
8. Perform the QA filter audit for the 3 filters.
9. The difference between the analyst and the auditor weights must not exceed +/- 0.0028 grams.
10. After the filter audit, do an unadjusted zero check and a 5.0 gram check. Both readings must be within +/- 0.0005 grams of true weight.
11. Record the current %RH in column AA. There is no control limit on this final %RH. Enter your initials in column AB.
12. SAVE THE FILE.
13. Leave the 3 filters in Desiccator A.
14. Inform the analyst that the audit is complete and if it passed or failed (was no more than +/- 0.0028g)

Other tasks

1. Working weight set comparison against primary weight set (every 3 to 6 months)
2. Recertification of primary weight set (annually per Certificate of Analysis)
3. Calibration of desiccator and psychrometer thermometers (every 6 months)
4. Calibration of desiccator hygrometer (every 6 months)
5. Outside source balance calibration (annually)
6. Submit filter order to EPA (annually)