APPENDIX A-2

SOP 5100CSN

STANDARD OPERATING PROCEDURE FOR THE MET ONE SASS

1.0 Purpose and Applicability

This standard operating procedure (SOP) outlines procedures for field operations and quality control checks of the Met One SASS $PM_{2.5}$ speciation sampler. With the introduction of the URG 3000N into the CSN, the Met One SASS will be used for the mass, elements, and ions sampling. The URG 3000N will be used for the carbon sampling. For more detailed information regarding operation of this sampler, refer to the Met One SASS operator's manual.

2.0 Precautions

2.1 Read and thoroughly understand the operator's manual before beginning field operations. The flow rate and temperature calibrations of the sampler must be checked and, if necessary, adjusted to specifications prior to taking the first sample. Consult the operator's manual for calibration instructions.

2.2 Use only the sampling canisters, sent to you from the laboratory, for the designated sampler and location.

2.3 Exercise great care in placement and handling of sampling canisters to avoid contamination.

2.4 The sharp cut cyclone must be attached to the inlet of the sampling canister before sampling.

3.0 Equipment and Supplies

3.1 Have the CSN Custody and Field Data Form for the particular sampler, for the particular sampling day, with you when visiting the site. Have a CSN QA/QC Spreadsheet if a quality control check is due.

3.2 Sampler operator's manual and field notebook.

3.3 Met One SASS speciation sampler, accessories, and any tools needed.

3.4 SASS canisters, pre-loaded with filters and denuders for up to five channels and field blank canister(s). All these items will be supplied by the support laboratory.

3.5 Sharp cut cyclone for each sampling canister. Label the cyclone to correspond to a single sample channel position and dedicate the cyclone to use with this channel.

3.6 Shipping containers, frozen ice substitutes, and UPS labels for shipment of sampling modules and reports to analytical support laboratory. These will be supplied by the support laboratory.

3.7 Independent methods for quality control checks of sampler operation.

3.7.1 Date and time. Calendar check. Accurately set watch.

3.7.2 Leaks. Device to close sample flow pathway (plug for inlet to sharp-cut cyclone).
3.7.3 Temperature. Thermocouple or thermistor-based digital thermometer transfer standard, with current NIST traceability.
3.7.4 Pressure. Aneroid barometer or equivalent transfer standard with current NIST traceability.
3.7.5 Flow rate. A low pressure flow transfer standard with leak-tight connection tubing, with current NIST traceability. .

4.0 Sampler Operating Procedures

Record information about the sample, or the field blank on an individual $PM_{2.5}$ CSN Custody and Field Data Form (CAFDF) (see Figure 4-1).

4.1 Sample Preparation and Programming the Met One Sampler

1.Remove the protective end caps from the canister. Attach a dedicated sharp cut cyclone to each canister. Install loaded filter canisters in predetermined (color-coded) sampling channel locations according to the information given on the CAFDF sent from the support laboratory. When field blank canister(s) are loaded, do not activate flow to field blank channel(s). Place canister caps in a clean plastic bag and store for later use to seal used canisters for return to the laboratory.

2. Press F2 key to set up Start/Stop times in the sampler.
3. If possible, key in information (including the unique custody/data form number assigned by the laboratory) to the sampler memory to allow later matching of the stored data with the analytical results.
4. Edit START Date/Time, and END Date/Time using the arrow keys. The CSN collects 24-hour samples, beginning at midnight.
5. Select “SAVE” to save the programmed event.
6. Press F1 to review the programmed event, and then select “EXIT”.
7. Make entries to the CAFDF.

4.2 Data Retrieval

1. At the end of the sample run, select “SUMMARY” option from the main screen.
2. Record end date/time, sample retrieval date/time, specified post-sampling information, and free-form comments on the CAFDF. **Please double-check entries and write clearly!**
3. Download sampler data from RS232 port to laptop computer or to Met One SASS data transfer module.

4. Retain data file disk file for later use in data validation. Do not ship it to the support laboratory.

5. Select "EXIT" to complete the data retrieval.

4.3 Filter Canister Handling

The field operator will encounter filter canisters for several uses. These are for routine (every third day) sampling and field blanks (sent from the laboratory).

It is highly recommended that sampling modules (i.e. canisters, filter packs) be recovered from the sampler as soon as is practical, but no later than 120 hours.

Once the sampled canisters are removed, separate the sharp cut cyclone for reinstallation with the next set of canisters, cap or cover the canister openings, store the canisters in the shipping container, complete the CAFDF, and return all to the field office. *The sampled canisters and paperwork must be properly packaged in a shipping container, ready for pickup by UPS, within 96 hours after the sampling modules have been recovered. The support laboratory will provide specific directions for packaging and shipment and days for shipment.* Protect samples from direct sunlight and extreme heat during transport from the site to the field office; store them in a secure, air-conditioned area until just before packaging them in the shipping container.

Days of the week for shipment will be arranged in coordination with the DOPO and laboratory. Do not ship on Fridays unless prior arrangements are made with the DOPO and laboratory.

Routine Samples

1. At the end of the sample run, lower the sampler's lower radiation shield.
2. Rotate each canister counterclockwise to remove from its sampling position. Remove the cyclone. Cap the canister inlet and outlet with yellow end caps. Place or store the cyclones in a clean spot. Reinstall cyclones on the canisters for the next sampling run. Every 30 days of use, clean the cyclone per instructions given in the operator's manual.
3. Place each filter canister into a zip-lock style bag and then place it in the proper location in the storage bin or shipping container.
4. Complete all paperwork.
5. Clean the area around the sample head; wipe connections with a clean cloth or paper towel. Install a new filter canister by aligning screws in slots and rotate it counterclockwise to secure. Take care to properly match the SASS canister to the correct sampler inlet.

Field Blank Filters

1. Field blank filters, loaded into canisters, will be shipped from the laboratory. They will have a separate CSN Custody and Field Data Form (CAFDF) with them. They are to be used during the same time interval as the routine sample canisters.

2. Visit site at the time regularly scheduled for setting up a new sampler run. Install the field blank canisters (and sharp-cut cyclones) in the channel locations as indicated by the CAFDF.
3. After a minute or two, remove the field blank canisters from the sampler, detach the cyclones, cap the canisters, and return them to their spot in the shipping bin or shipping container.
4. Proceed to install the routine sample canisters according to schedule.
5. Complete and sign the CAFDF for the field blank canisters and ship them back to the laboratory, in their own shipping container, at the same time as the routine samples.

1.

4.4 Denuder Handling

The support laboratory will change the denuder when it is due for replacement. The denuder is an integral part of the sampling canister.

5.0 Sampler QA/QC Procedures

Certain quality control checks must be conducted at the time of sampler startup and at monthly or quarterly intervals thereafter. The monthly checks are to be conducted by the site operator, while the quarterly audits are to be conducted by an independent third party. Carry out these checks before making any adjustments to the sampler. Record information about the site, the sampler, and the results of scheduled or special (unscheduled) quality control checks on the $PM_{2.5}$ CSN QA/QC Spreadsheet, Figure 5-1. The information on the spreadsheet is to be returned to the support laboratory, who will then upload the results into AQS. Any actions taken to service or calibrate the speciation sampler after the check must be recorded in brief on the form and in detail in the field operator's notebook.

5.1 Date and Time Checks

Conduct these checks monthly or whenever daylight savings time changes occur. Compare the date and time displayed on the sampler to the known date and to an accurately set watch. Record information on the QA/QC spreadsheet. Refer to Figure 5-1.

5.2 Monthly Leak Check

Performed upon startup, then monthly.

1. Place canister containing filter/denuder and attached sharp cut point cyclone at the channel location to be leak-checked. Use this canister assembly for leak checks and flow rate checks only. The canister must contain the type of filter (and denuder, if included in the canister) normally used at this sampling channel location.

2. Press F3 key, and select "PUMP ON".
3. Plug the Sample Inlet (e.g., Channel 1) with cap. Note the displayed flow. The indicated flow rate should drop to 0.0 L/min. If it does not, check for leaks and repeat the procedure until the leak check is completed successfully. Repeat for all channels in use.
4. Select "PUMP OFF" to stop the pump, and "EXIT".
5. Release the vacuum slowly to avoid damaging the leak check filter.

5.3 Monthly Temperature Control Check

Performed upon startup and then monthly. Check the ambient and filter temperature sensors of the sample by positioning the probe of a certified transfer standard digital thermometer in close proximity to the sampler sensors. Allow time to achieve stable readings and record the results in the field notebook and on the CSN QA/QC report form. If the sampler and control check temperature readings differ by more than $\pm$ 2°C, trouble-shoot the system and recheck. If still out of tolerance, conduct a multipoint calibration or replace the faulty sensor. Consult the manufacturer and the operator's manual for procedures.

5.4 Quarterly Temperature Control Check

Performed each calendar quarter. Follow the same steps as in Section 5.3, but use a temperature transfer standard that is independent of the one used for the monthly checks. Should a temperature sensor not maintain its calibration after the monthly or quarterly checks, maintenance and/or replacement of the faulty parts must occur.

5.5 Monthly Pressure Control Check

1. Compare the ambient barometric pressure readout from the sampler display screen with the reading from a certified transfer standard barometer.
2. If the pressure readings differ by more than $\pm$ 10 mm Hg, perform a multipoint calibration of the sensor or replace the faulty sensor.

5.6 Quarterly Pressure Control Check

Follow the same steps as in Section 5.5, but use a pressure standard that is independent of the one used for the monthly checks. Should the pressure sensor system not maintain its calibration after the monthly or quarterly checks, maintenance and/or replacement of the pressure sensor system must occur.

5.7 Monthly Flow Rate Control Check

Perform flow rate check upon startup, then monthly.

1. Use same canister assembly called for in monthly Leak Check Procedure (Section 5.2).

2. Connect an external flow audit device to the cyclone sample inlet (e.g., Channel 1). Use a low pressure drop certified flow transfer standard.
3. Press the F3 key, and select "PUMP ON".
4. Compare the flow rate measured by the external flow device with displayed value. (The sampler is preset at 6.7 L/min). If the flow deviation exceeds $\pm$ 4% ($\pm$ 0.27 L/min), perform a flow rate calibration as specified in the operations manual. If there are issues with the calibration, contact Met One for technical support.
5. Repeat the procedure for all flow channels in use.
6. Record the results on the CSN QA/QC spreadsheet (Fig. 5.1).

5.8 Quarterly Flow Rate Control Check

Performed each calendar quarter. Follow the same steps as in Section 5.7, but use a flow rate transfer standard that is independent of the one used for the monthly checks. Should the flowrate mechanism not maintain its calibration after the monthly or quarterly checks, maintenance and/or replacement of the flow controller system(s) must occur. Consult the manufacturer or the operator's manual for procedures for maintenance, adjustment, and calibration of sample flow rates.

6.0 Sampler Maintenance and Troubleshooting

1. Clean the solar radiation shield with wet cloth as required.
2. If flow rate falls off, or is variable, the unit may need factory servicing of the pump or of the particle filter/critical orifice flow controllers.
3. Check O-rings for wear or damage. Make a comment on the CAFDF to the laboratory of problems with canister assemblies.
4. Record all maintenance and troubleshooting activities in the site notebook. On the CAFDF, record activities that may affect the sample weight or analysis.

BAR CODE GOES HERE Custody/Data Form No.	**$PM_{2.5}$ CSN CUSTODY AND FIELD DATA FORM**	White – return to lab Yellow – site retains Pink – lab retains

. CUSTODY RECORD (Name, Date)

1. Laboratory, Out
2. Site, In
3. Site, Out _____
4. Lab, In _____

B. SITE AND SAMPLER INFORMATION

1. Site AIRS Code
2. Sampler S/N ____
3. Sampler Type ____
4. Sampler POC ____
5. Site Name _____
6. Intended date of use _____
7. Date of sampler set-up _____
8. Operator's name __

C. SAMPLER CHANNEL COMPONENTS

Channel Number	Component ID No.	Component Description
1	kept at site	SASS cyclone
1	I1234568	SASS canister (Teflon filter) (GREEN)
2	kept at site	SASS cyclone
2	I1234570	SASS canister (MgO denuder, nylon filter) (RED)

D. START, END, AND RETRIEVAL TIMES

Channel No.	Start date	Start time	End date	End time	Retrieval date	Retrieval time
1						
2						
3						

E. SAMPLER CHANNEL INFORMATION (Post-Sampling)

Channel No.	Run Time	Run Time, Flag	Sample Volume (m3)	Avg. flow (L/min)	Avg. flow CV (L/min)	Avg. ambient T (□C)	Max. ambient T (□C)	Min. ambient T (□C)
1								
2								
3								

Channel No.	□T Flag	Avg. Filter T (□C)	Max. Filter T (□C)	Min. Filter T (□C)	Avg. BP (mm Hg)	Max. BP (mm Hg)	Min. BP (mm Hg)
1							
2							
3							

Figure 4-1. CSN Custody and Field Data Form With Entries for the Met One SASS Sampler.

Chemical Speciation Network			**Version**	**US Environmental Protection Agency**	
Flow Check Worksheet			21		
MetOne SASS - Primary Sampler					
Note - Cyan fields are calculated - yellow fields are to be filled in here					
Location				Date	
AQS Site ID					
AQS Sampler POC	5				
Sampler Information					
Sampler Type (Model)		SASS			
Operator's Name				Organization	US Environmental Protection Age
Flow check type	Flow Verification by Site Operator				
				Sampler S/N	
				Head S/N	
				Pump S/N	
Last Calibration Date					
Reference Standards					
Flow Reference Std Model	Select From Dropdown Box			Standard S/N	
Specify if "Other"				Calibration Date	
Temperature Ref Std Model	Select From Dropdown Box			Standard S/N	
Specify if "Other"				Calibration Date	
BP Std Model	Select From Dropdown Box			Standard S/N	
Specify if "Other"				Calibration Date	
Significant Findings:					
General Findings:					

Figure 5-1. CSN QA/QC Spreadsheet

MetOne SASS - Primary Sampler

Clock Test:

If Local Time is under daylight savings, convert Ref Std to Local Standard Time. Daylight Saving Time begins for most of the United States at 2:00 a.m. on the first Sunday of April. Time reverts to standard time at 2:00 a.m. on the last Sunday of Octobe

	Time (hh:mm)				Difference		5 minutes or less?	
	Ref Std		SASS		Minutes		Pass	Fail
Audit								
Recalibrated								
Date								

Leak Test

	Initial Check			After Correction		0.10 L/min or greater fails		
	A L/min			B L/min		Fail A	Fail B	Pass
Channel 1			Channel 1					
Channel 2			Channel 2					
Channel 3			Channel 3					
Channel 4			Channel 4					
Channel 5			Channel 5					
Channel 6			Channel 6					
Channel 7			Channel 7					
Channel 8			Channel 8					

Flow Test **Calibration**

For the reference standard, enter "UR" for under range and "OR" for over range flow readings.

		L/min					Less than 10%?	
	Lower Limit	Ref Std	Upper Limit	SASS	% Difference		Pass	Fail
Channel 1	NA		NA					
Channel 2	NA		NA					
Channel 3	NA		NA					
Channel 4	NA		NA					
Channel 5	NA		NA					
Channel 6	NA		NA					
Channel 7	NA		NA					
Channel 8	NA		NA					

Retest after Calibration

		L/min					Less than 10%?	
	Lower Limit	Ref Std	Upper Limit	SASS	% Difference		Pass	Fail
Channel 1	NA		NA					
Channel 2	NA		NA					
Channel 3	NA		NA					
Channel 4	NA		NA					
Channel 5	NA		NA					
Channel 6	NA		NA					
Channel 7	NA		NA					
Channel 8	NA		NA					

Figure 5-1. CSN QA/QC Spreadsheet (cont'd)

MetOne SASS - Primary Sampler

Reference Standard vs Design Flow

		L/min					Less than 10%?	
	Lower Limit	SASS	Upper Limit	Ref Std	% Difference		Pass	Fail
Channel 1	6.03	6.7	7.37					
Channel 2	6.03	6.7	7.37					
Channel 3	6.03	6.7	7.37					
Channel 4	6.03	6.7	7.37					
Channel 5	6.03	6.7	7.37					
Channel 6	6.03	6.7	7.37					
Channel 7	6.03	6.7	7.37					
Channel 8	6.03	6.7	7.37					
Retest after Calibration								
		L/min					Less than 10%?	
	Lower Limit	SASS	Upper Limit	Ref Std	% Difference		Pass	Fail
Channel 1	6.03	6.7	7.37					
Channel 2	6.03	6.7	7.37					
Channel 3	6.03	6.7	7.37					
Channel 4	6.03	6.7	7.37					
Channel 5	6.03	6.7	7.37					
Channel 6	6.03	6.7	7.37					
Channel 7	6.03	6.7	7.37					
Channel 8	6.03	6.7	7.37					

Ambient Temperature Test

		Degrees C					Less than 2 degrees?	
	Lower Limit	Ref Std	Upper Limit	SASS	Difference		Pass	Fail
	NA		NA					
Retest After Recalibration								
	NA		NA					

MetOne SASS - Primary Sampler

Filter Temperature Test

		Degrees C					Less than 2 degrees?	
	Lower Limit	Ref Std	Upper Limit	SASS	Difference		Pass	Fail
Channel 1	NA		NA					
Channel 2	NA		NA					
Channel 3	NA		NA					
Channel 4	NA		NA					
Channel 5	NA		NA					
Channel 6	NA		NA					
Channel 7	NA		NA					
Channel 8	NA		NA					
Retest After Recalibration								
Channel 1	NA		NA					
Channel 2	NA		NA					
Channel 3	NA		NA					
Channel 4	NA		NA					
Channel 5	NA		NA					
Channel 6	NA		NA					
Channel 7	NA		NA					
Channel 8	NA		NA					

Pressure Test

		mm Hg					Less than 10 mm?	
	Lower Limit	Ref Std	Upper Limit	SASS	Difference		Pass	Fail
	NA		NA					
Retest after recalibration								
	NA		NA					

Figure 5-1. CSN QA/QC Spreadsheet (cont'd).

7.0 References

1. Operation Manual (Draft). Spiral Aerosol Speciation Sampler SASS. Met One Instruments. June 8, 1998.
2. Met One SASS (Chemical Speciation) Sampler "Quick Operation." Met One Instruments. Not dated.