STRATEGY AND METHOD FOR PASSIVE SAMPLING OF SETTLED DUST

MICRO-SCIENCES, LTD. METHOD 01

PREPARED FOR

POTOMAC RIVER GENERATING STATION

MIRANT MID-ATLANTIC, LLC

28 APRIL 2005

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ATTN: MS. D. KNIGHT
PROJECT MANAGER

28 APRIL 2005

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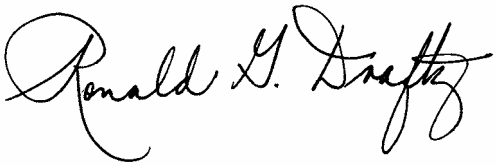
FOREWORD

The method described in this report was prepared for the Potomac River Generating Station, Mirant Mid-Atlantic, LLC, as part of a planned study of added emission controls for fugitive coal dust. The work was funded by Mirant Mid-Atlantic, LLC. The method details procedures for the passive sampling of settled dust.

Ms. Debra Knight of the Potomac River Generating Station serves as Project Manager for the Settled Dust Study.

Respectfully submitted,
Micro-Sciences, Ltd.
28 April 2005



Ronald G. Draftz
Principal Scientist

STRATEGY AND METHOD
FOR PASSIVE SAMPLING OF SETTLED DUST

MICRO-SCIENCES LTD. PROJECT 04-01/METHOD 01

1. STUDY GOALS & OVERVIEW

This method includes a strategy and procedure for sampling settled dusts with passive samplers located on the premises of the Potomac River Generating Station. The primary goals of this study are to:

1. Determine the frequency and intensity of settled dust accumulation from fugitive coal dust emissions from Plant operations, and,
2. Conclude from the data whether the fugitive dust control initiatives for specific sources are sufficient to minimize off-site soiling by coal particles.

Particles that cause soiling are predominantly large particles that cannot be respired and therefore pose no health hazards due to inhalation. These particles would not be captured using standard $PM_{2.5}$ and PM_{10} sampling methods for monitoring air quality and compliance with the National Ambient Air Quality Standards for atmospheric aerosols. Therefore, the method selected for sampling settled dusts closely mimics the same process in which personal property accumulates as settled dusts - gravitational deposition.

Another advantage of using passive sampling for settled dusts is that there is very little accumulation of particles in the $PM_{2.5}$ and PM_{10} size range. These small particles might otherwise obscure the detection of larger particles during analyses if sampled together.

Instructions for examining exposed sheets are part of this procedure. The method for quantitating coal dust collected on these passive samples is described in a separate document that is part of this study.

Samples will be collected on large (13” x 13”) clear plastic sheets that mimic common collection surfaces such as tables, window sills and car surfaces. Using large dust collection sheets minimizes bias from micro-turbulence caused by the sheet holder and support stand.

A network of seven sampling stations will be used for sampling settled dust. Three samplers are located at the east property line just south of the Plant building positioned to capture primary and secondary coal emissions from handling operations when the wind has a westerly component. Three more samplers are located at the west property line to capture fugitive emissions when the wind has an easterly component. The seventh sampling site is located near the south property line to capture emissions that might be transported with southerly winds.

Sampling will be conducted continuously until a total of thirty (30) days of valid 24-hour sample sets have been collected. Two criteria are used to determine whether a sample set is valid:

- Rainfall must be less than 0.1" cumulative during the sampling period based on meteorological data obtained from Reagan National Airport, and
- A complete set of seven samples must have been collected, i.e., one from each of the seven sampling sites. A sample set will be invalid if even one sample is lost due to high winds or becomes contaminated.

Daily samples will be collected from Monday through Friday morning. The samples installed starting Friday morning will be exposed continuously until Monday morning constituting the weekend sample set. These weekend sample sets will be analyzed for coal dust, if valid, but will not be grouped with the daily sample sets for determining the coal contributions from discrete fugitive sources within the Plant. The rationale for excluding these weekend samples is that the wind persistence is likely to show contributions from multiple directions that will confuse or obscure the determination of source contributions.

Holidays that occur as part of a weekend will also be included as part of the weekend set since Plant operations will also be reduced on holidays the same as for weekends.

The reason for collecting and analyzing weekend samples is to ensure emissions from upsets and unexpected sources are captured and documented to provide closure for this study along with the daily sampling sets.

Coal dust concentrations on each sample will be compared to selected wind angles for operations in the Plant that might be a source of fugitive coal dust. This will be done by evaluating the directional wind persistence, wind speed and time of day in which potential sources of fugitive coal dust are in operation.

2. EQUIPMENT LIST

The following table lists the equipment needed to perform passive settled dust sampling for this study.

ITEM	QUANTITY	DESCRIPTION
1	1/site	Sampling Stand with Sampling Frame Support Platform
2	1/site	NACE[1]Sheet Holder and Frame
3	1/period[2]/site	NACE sheets, 13” x 13” x 0.005”
4	1/period/site	18” x 18” x 2” Transport Box for Frame with Mounted NACE Sheet
5	1/period/site	13” x 13” x 1” (or larger) Cardboard Storage Box for NACE Sheets
6	as needed	½” or ¾” Double-sided Adhesive Tape to fasten exposed NACE Sheets to its storage box for shipment
7	as needed	Felt-tip pen with waterproof ink to mark sample number on NACE Sheet & Box
8	as needed	Sample Log showing dates and times of sample exposure for each site
9	daily	Meteorological data
10	1	Light box for inspection of particle loading after exposure

2.1. Discussion of Equipment List

2.1.1. Items 1& 2: Sampling Stand and Frame

Information on the sampling stand, sampling frame support platform and sheet holder frame were based on a design prepared by Micro-Sciences, Ltd., for the Potomac River Generating Station (PRGS). That design will not be repeated here.

2.1.2. NACE Sheets Sampling Media

[1] NACE = Non-Aluminized Cellulose Ester (sampling media)
[2] A “period” is the duration of sampling which will be approximately 1, 3, or 4 days long.

The NACE sampling medium provides a one-foot square sampling area for settled dusts when used with the sampling frames designed for this project. This large sampling area is intended to minimize the effects of minor turbulence on aerosol deposition by the sampling frame.

The sheets should be ordered and cut to a size of 13” x 13” x 0.005”. This thickness is needed to permit direct microscopical analysis of the settled dusts by polarized light microscopy (PLM). This thickness minimizes the contribution of polarization colors from the sheet that might otherwise interfere with the identification of transparent particles by PLM. However, the specified sheet thickness results in a sheet that is not rigid and therefore, must be supported once settled dusts have been collected.

This medium is also amenable to analysis by scanning electron microscopy (SEM) though that method of analysis is not part of the current analytical plan.

A source for this material is:

Catalina Graphic Films, Inc.
870 Greenleaf Avenue
Elk Grove Village, IL 60007
847-806-1340

2.1.3. Item 4: Transport Box

NACE Sheets are mounted in the Sample Sheet Frame during transport to and from each sampling site to minimize the chance of having the sheet lost in a gust of wind or by dropping the sheet during handling to exchange exposed and new sheets. The deposits collected on the exposed sheets are still susceptible to contamination or smearing that might invalidate part or all of the sample. A transport box will be used to reduce the chance of damaging or contaminating the collected sample.

A thick-walled cardboard box with cover flap, approximately 18” x 18” x 2” should be sufficiently large enough to hold the Sampling Frame with sheet as it is transported to and from each sampling site from the sample preparation and evaluation area within the building. This box is reuseable but should be cleaned and inspected between each use.

2.1.4. Item 5: Cardboard Storage Boxes for Exposed NACE Sheets

These boxes are the primary containers used for storing exposed samples once they have been removed from the holders. Low-cost pizza boxes or similar are adequate for this purpose.

The primary feature of the storage box is that its sidewalls are tall and sturdy enough to keep the cover from making contact with the exposed sampling surface. A box that is approximately one inch deep and just large enough to contain the 13” x 13” wide sheet should be adequate.

2.1.5. Item 6: Double-Sided Adhesive Tape

This tape is placed on a diagonal at the bottom corners of each Storage Box to hold the NACE Sheet so it won’t make contact with the inside lid of the Storage Box during shipment.

2.1.6. Item 7: Waterproof Felt Tip Pen

This pen is used to place an identifying and unique sample number at the edge of each NACE sheet prior to sampling. Any brand of pen with waterproof ink is suitable.

2.1.7. Item 8: Sample Log

A sample log is needed to record the dates and times of exposure for each sample. The log should also provide space for comments on sample anomalies. An example sample log is presented in Appendix A.

2.1.8. Item 9: Meteorological Data

Daily meteorological data are needed for each sample. These met data include wind direction and speed recorded as five minute averages at Ronald Reagan Washington National Airport. This weather data will be used to calculate directional wind persistence for each source of coal at the Generating Station relative to each sampling site. This wind persistence will then be used to evaluate the potential by source for release and deposition of coal particles.

Daily met data will be divided into daytime and nighttime periods corresponding to activities done only during the day such as car dumping and reclaiming.

2.1.9. Item 11: Light Box

A light box is used to examine the exposed NACE sheets once sampling is completed to estimate the approximate particle loading of each sample. The surface of the light box should be large enough to support the entire NACE sheet.

3. COLLECTION AND STORAGE OF SAMPLES

3.1. Preparations for Sampling

The following steps cover the inspection and cleaning of the NACE Sheet Holder Frame and installation of the NACE sheet.

1. Inspect and clean the frame with compressed air or by wiping all the surfaces with a cloth or paper towel wetted with window cleaning solution or a similar cleaning liquid that evaporates quickly. Examine the internal corners of the upper frame section to be sure that no particles have accumulated from a previous sample collection period. Also clean the hold-down gasket on the underside of the upper frame section carefully. There should be no visible signs of particles and there should also be no dark streaks seen on the cloth or paper towel after wiping the gasket with the wetted rag. The gasket should be wiped as needed until streaks from particles are no longer seen on the cloth or paper towel.
2. Write the sample number at the bottom edge of the NACE sheet just outside the active collection area. The sample number should be a unique, sequential number and preferably one that does not contain site or date information. That information will be recorded on the sample log record.

   Alternately, use a sampling number that corresponds to lab procedures established for the Potomac River Generating Station. Either side of the NACE sheet may be used for sample collection.
3. Install the NACE sheet by laying it on the bottom plate of the Frame Sheet Holder approximately in the center of the Velcro strips. Lower the top frame section onto the sheet and check that the two sections of the Frame are tightly bound to each other by the Velcro strips.

4. Test to see that the Sheet is immobilized by using a end of clean pencil eraser or a clean section of Tygon tubing to test if the Sheet can be moved and is gripped tightly by the gaskets.
5. Place the Frame with NACE sheet in the Transport Box.

3.2. Installing & Removing the Frame with NACE Sheet on the Sampling Platform

1. Remove the locking key and lower the Unistrut/Telestrut support tubes so the Sheet Holder Frame can be removed.
2. Prior to removing the exposed sheet examine it and record any foreign deposits, defects, water or contamination of the sheet on the sample log.
3. Remove the Sheet Holder Frame with exposed NACE sheet from the Sampling Frame Platform by loosening the wingnuts on the upper movable Lockdown Bar that forces the Frame against the fixed Lockdown Bar at the bottom.
4. Place the Frame with the exposed NACE sheet into an empty Transport Box.
5. Record the date and time of removal from the sampling platform on the sample log.
6. Install an unexposed NACE sheet that has been pre-mounted in a Sheet Holder Frame onto the Sampling Frame Platform. The hinges of the Frame should face outward not the middle of the Platform and Center Divider. Push the upper, movable Lockdown Bar tightly against the Frame and tighten the wing nuts.
7. Record the date and time of installation along with the sample number on the sample log.
8. Raise and lock the Telestrut tube to a height of approximately 10 feet above ground level. This is done to improve the likelihood of capturing particles that drift from active operations. Any particles passing beneath this height will most likely settle or be intercepted by nearby foliage.
9. Follow steps 1- 8 for any additional sampling sites.

3.3. Inspection and Storage of Exposed NACE Sheets

1. The exposed NACE sheets should be returned to the lab for inspection, data recording and storage prior to microscopical analysis.

2. Remove the Frame with NACE sheet from the Transport Box and carefully open and remove the sheet without contacting the collection surface. Put the Frame aside for cleaning.
3. Place the sheet in a clean Storage Box for temporary storage prior to visual inspection.
4. Repeat steps 2 and 3 for all NACE sheets that were returned to the lab for processing.
5. Remove one of the samples from its storage box and place the sample on the light box.
6. Examine the sample and estimate the total surface loading as a percentage of the area covered by all particles, not just coal. The obvious range is from 0 (no particles) to 100% (fully loaded). The estimates should be listed as a range such as < 1%, 1-5%, 5-10%, 10-20%, etc., in 10% increments up to 50%. Any samples with estimated loadings over 50% should be shown as > 50%.
7. Record the estimated value.
8. Place a strip of double-sided adhesive tape on the bottom of the storage box at each corner of the box. Place the examined NACE sheet in the storage box and gently press the borders of the sheet so it sticks to the tape. The double-sided tape is sufficient to hold the sheet against the bottom of the box during shipment.
9. Close the cover and mark the box with the sample number and date.
10. Store the samples where they will not become contaminated by coal partilces from other plant operations or track-in, preferably in a room dedicated for storage of these samples.
11. Enter the sample log data and notes into a spreadsheet.

4. SAMPLING FREQUENCIES AND DURATION

Sampling will be near-continuous (24 x 7) for the duration of the study until a total of thirty sampling days with no rain or rainfall under 0.1” have been collected. If a sample is lost or contaminated then the entire set of samples will be considered invalid. The following strategy will be used for the study.

1. The NACE samples at each site will be exposed daily and continuously for a period of approximately 24 hours.

2. The 24 hour samples should be changed every morning from Monday through Friday. The sheets installed on Friday will remain exposed over the weekend and will be removed Monday morning and replaced with a 24-hr sample. If a holiday occurs over any a weekend, such as 4 July, the NACE sheets will remain exposed for another day.
3. The sampling platforms will be elevated to a maximum stable height of approximately 10 feet utilizing the sliding support tubes.

Appendix A

Sample Log

For

MICRO-SCIENCES 04-01/METHOD 02

SAMPLE LOG											
SAMPLE #	**SITE #**	**DATE ON**	**TIME ON**	**DATE OFF**	**TIME OFF**	**Wet Surface**	**Foreign Deposits**	**Sheet Lost**	**Deposit Smeared**	**Notes**	**Est. Dust Coverage**
	1										
	2										
	3										
	4										
	5										
	6										
	7										

NOTE #	NOTES
1	