TXU

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J. R. (Dick) Robertson, P.E.
Generation Environmental Manager

May 26, 2000

Mr. William Grimley
Emissions Measurement Center
Interstate 40 and Page Road
4930 Old Page Road
Room Number E-108
Durham, NC 27709
Attn: Electric Utility Steam Generating Unit Mercury Test Program

RE: Electric Utility Steam Generating Unit Information Collection Request

Dear Mr. Grimley,

Enclosed are three copies each of the speciated mercury emission test reports for TXU Electric's Monticello Units 1 and 3 as required in the Electric Utility Steam Generating Unit Information Collection Request. Please note that TXU Electric is a new company name and that previous EPA Mercury Information Collection Request information was submitted under the name of TU Electric.

If you require further information, please contact Mr. David Lamb at (214) 812-8482

Sincerely,

David Lamb

for J. R. Robertson

dwl

C: w/o enclosures

Steve Payton	EP18
John Carlson	EP16
Ken Smith	MOSES

C: with enclosures

Rob Holliday	MOSES
Paul Chu	EPRI

EP09 Route Copy

JRR
SHS
FCB
UAB
DWL

File: Air - MOSES - EPA - Mercury ICR

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METCO ENVIRONMENTAL
P.O. Box 598
Addison, TX 75001
(972) 931-7127

SOURCE EMISSIONS SURVEY
OF
TXU ELECTRIC
MONTICELLO STEAM ELECTRIC STATION
UNIT NUMBER 1 BAGHOUSE A INLET DUCT
AND OUTLET DUCT
MT. PLEASANT, TEXAS

FEBRUARY 2000

FILE NUMBER 99-184

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1 INTRODUCTION

1.1 Summary of Test Program

METCO Environmental, Dallas, Texas, conducted a source emissions survey of TXU Electric, Monticello Steam Electric Station, Unit Number 1 Baghouse A Inlet Duct and Outlet Duct, located near Mt. Pleasant, Texas, on February 21, 22, and 23, 2000. The purpose of these tests was to meet the requirements of the EPA Mercury Information Request. Speciated mercury concentrations at the Unit Number 1 Baghouse A Inlet Duct, speciated mercury emissions at the Unit Number 1 Baghouse A Outlet Duct, and mercury and chlorine content of the fuel were determined. The sulfur, ash, and Btu content of the fuel were also determined.

The sampling followed the procedures set forth in the Code of Federal Regulations, Title 40, Chapter I, Part 60, Appendix A, Methods 1, 2, 3B, 4, 5, 17, and 19; in the Ontario Hydro Method, Revised July 7, 1999; and ASTM Methods D2234, D6414-99, E776/300.0, D-4239, D-3174, and D-3286.

1.2 Key personnel

Mr. Steve Bornsen of METCO Environmental was the onsite project manager. Mr. Mike Bass, Mr. Shane Lee, Mr. Scott Hart, Mr. Jason Brown, Mr. Jason Conway, Mr. Jason Chessher, Mr. John Betz, and Mr. Kieran McGeagh, of METCO Environmental performed the testing.

Mr. David Lamb of TXU Electric acted as the utility representative. Mr. Rob Holiday of TXU Electric performed process monitoring and sampling.

Table 1-1
Test Program Organization

Organization	Individual	Responsibility	Phone Number
Project Management and Oversight			
METCO	Bill Mullins	Project Director	(972) 931-7127
Project Team			
METCO	Bill Hefley	Project Manager	(972) 931-7127
Utility			
TXU Electric	David Lamb	Utility Representative	(214) 812-8482
TXU Electric	Rob Holiday	Process Monitoring & Sampling.	(903) 577-5204
QA/QC			
METCO	Jim Monfries	Quality Assurance Manager	(972) 931-7127

2 SOURCE AND SAMPLING LOCATION DESCRIPTIONS

2.1 Process Description

Monticello Unit Number 1 was constructed by Combustion Engineering and placed into commercial operation on December 23, 1974. The boiler is a supercritical, combined circulation, radiant, reheat steam generator with a center wall dividing the furnace into two halves. The unit is designed to deliver superheated steam at a rate of 4,025,000 lbs/hr at maximum continuous rating at 1,005 °F and 3,825 psig (superheat outlet) to a 575 megawatt turbogenerator. The reheater is designed to provide 3,520,000 lbs/hr steam flow at maximum continuous rating, reheated from 572 °F to 1,005 °F.

Each half of the divided furnace has four tilting tangential (corner-fired) pulverized coal burners, eight total per unit. Each burner has eight elevations of pulverized coal nozzles. The characteristic cyclonic shape of the fireball created by tangential firing provides turbulence for effective mixing of the fuel and air. The burner nozzle tips can be tilted upward or downward through a total angle of 60 degrees. All eight windboxes have overfire air compartments. Eight oil ignitors fire number 2 fuel oil. Coal is fed by eight gravimetric feeders to eight 983 RP type pulverizers and then is pneumatically conveyed with heated primary air to the 64 tangential burners. Combustion gasses flow from the furnace(s) through the convection pass containing superheaters, reheater, and economizer, then through an air heater and particulate control devices prior to exiting the stack.

2.2 Control Equipment Description

The particulate control devices are composed of a Research Cottrell cold side weighted wire electrostatic precipitator (ESP) with 12 transformer rectifier sets, 3 fields. 186 SCA in a Chevron arrangement. Ammonia flue gas conditioning is provided at the ESP inlet ducts. In parallel with the ESP is a Wheelabrator-Frye fabric filter baghouse, retrofitted in the 1978-1980 period, with 36 compartments and a typical air to cloth ratio of 2.0 acfm/ ft^2. A and B sides of the baghouse are operated and cleaned independently. Ammonia flue gas conditioning is provided at the baghouse inlet ducts as needed.

2.3 Flue Gas and Process Sampling Locations

2.3.1 Inlet Sampling Location

The sampling location on the Unit Number 1 Baghouse A Inlet Duct is approximately 100 feet above the ground. The sampling locations are located 17 feet 6 inches (1.15 equivalent duct diameters) downstream from a bend in the duct and 39 feet 11 inches (2.63 equivalent duct diameters) upstream from a bend in the duct.

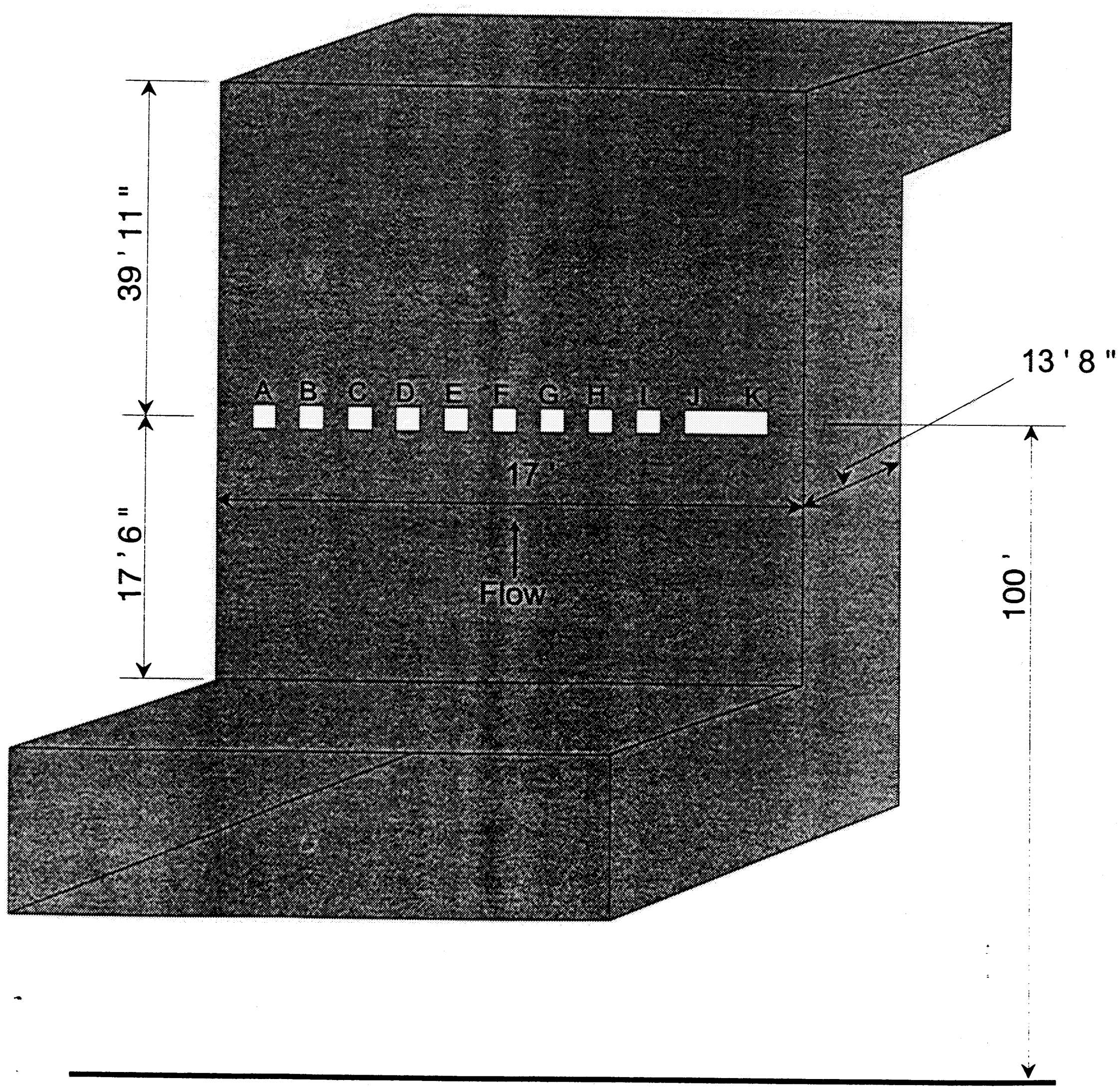
2.3.2 Outlet Sampling Location

The sampling location on the Unit Number 1 Baghouse A Outlet Duct is approximately 75 feet above the ground. The sampling locations are located 2 feet 3 inches (0.30 equivalent duct diameters) downstream from a constriction to the duct and 11 feet 1 inch (1.50 equivalent duct diameters) upstream from an expansion in the duct.

2.3.3 Lignite Sampling Location

The lignite sampling locations are located at the gravimetric feeders immediately downstream from the pulverizer silos.

Figure 2-1
Description of sampling locations at the Monticello Unit Number 1 Baghouse A Inlet Duct



Not to Scale

Figure 2-2
Description of sampling points at the Monticello Unit Number 1 Baghouse A Inlet Duct

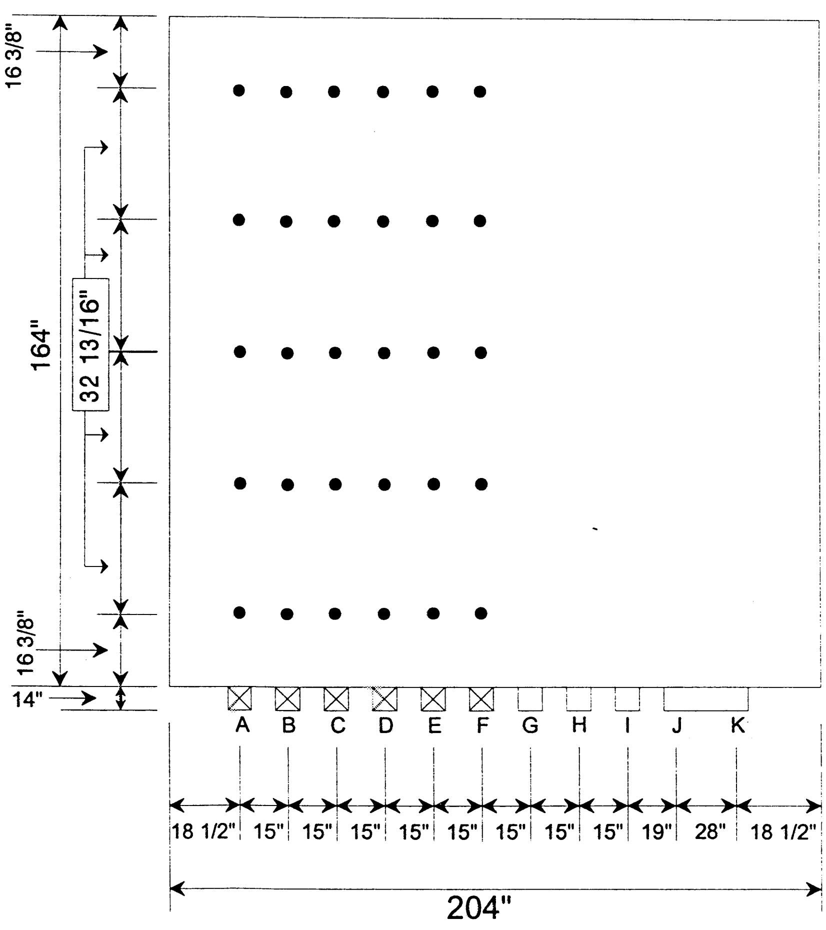
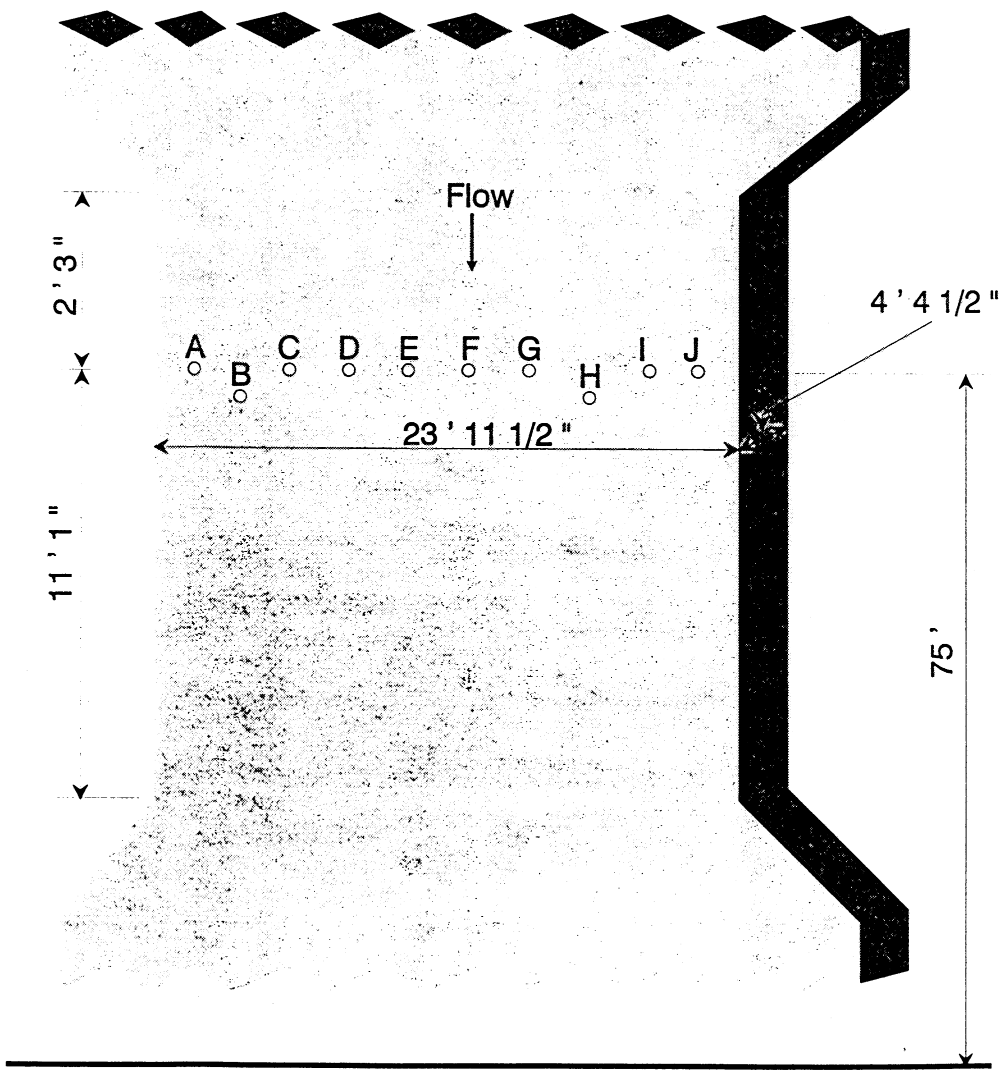


Figure 2-3
Description of sampling locations at the Monticello Unit Number 1 Baghouse A Outlet Duct



Not to Scale

Figure 2-4
Description of sampling points at the Monticello Unit Number 1 Baghouse A Outlet Duct

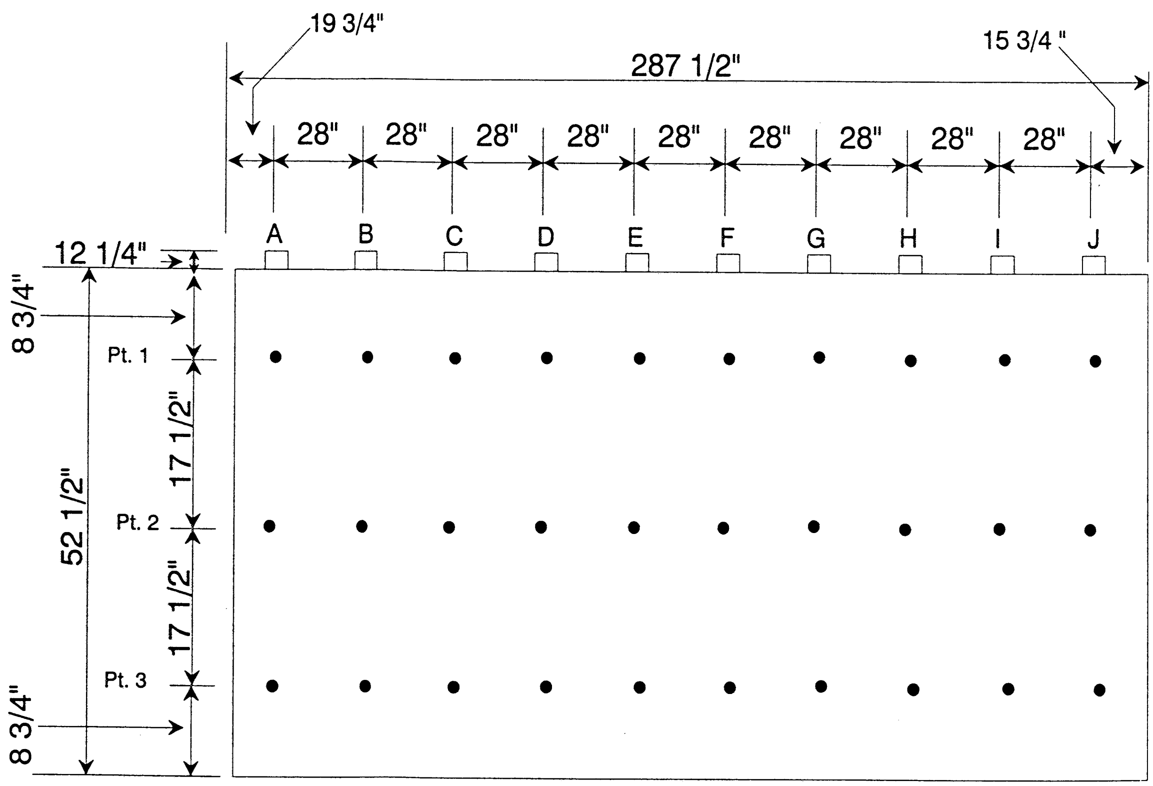
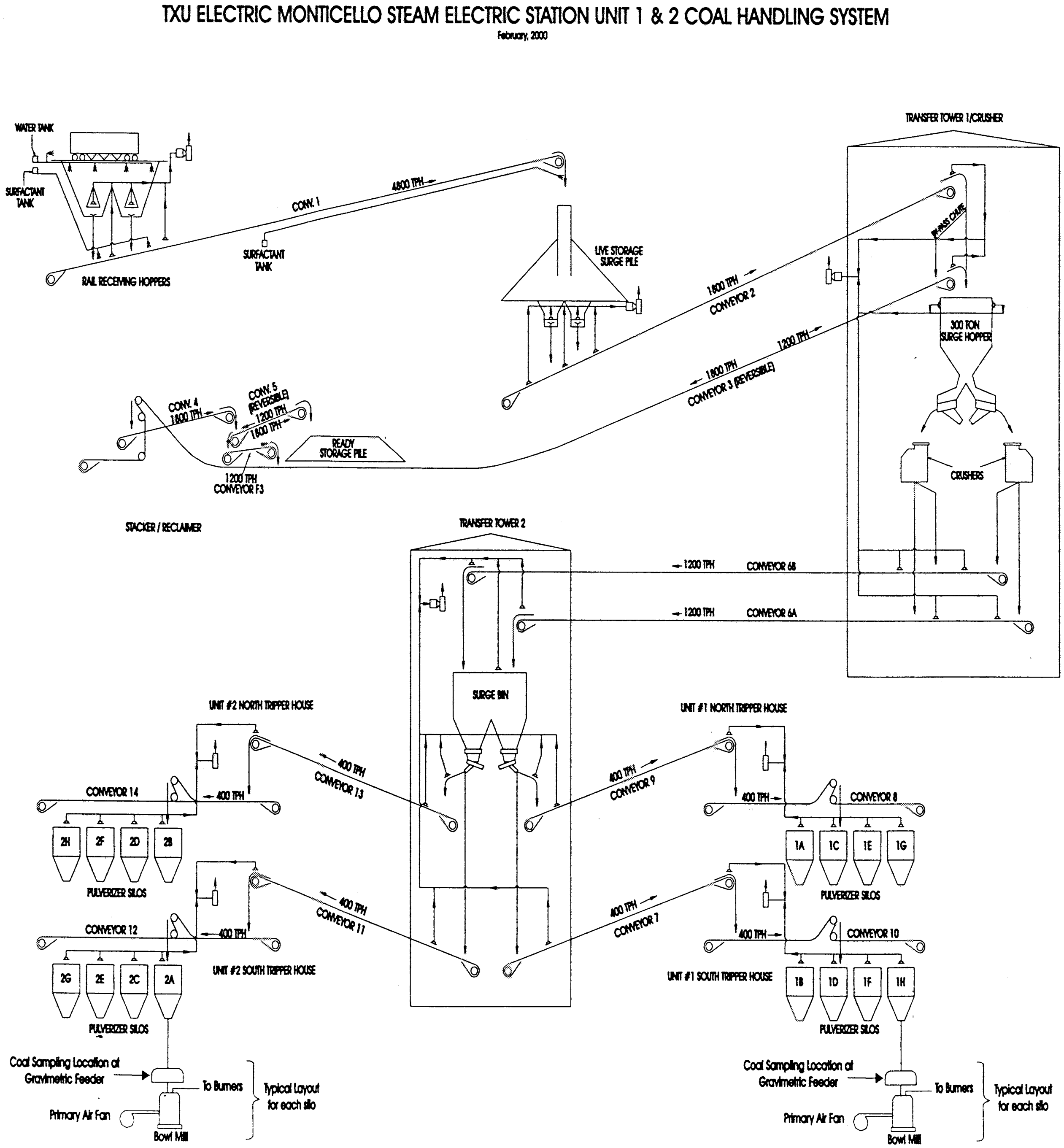


Figure 2-5
Description of lignite sampling locations at Monticello Unit Number 1



3 SUMMARY AND DISCUSSION OF RESULTS

3.1 Objectives and Test Matrix

3.1.1 Objective

The objective of the tests was to collect the information and measurements required by the EPA Mercury ICR. Specific objectives listed in order of priority are:

1. Quantify speciated mercury emissions at the outlet.
2. Quantify speciated mercury concentrations in the flue gas at the inlet.
3. Quantify fuel mercury and chlorine content during the outlet and inlet tests.
4. Provide the above information for use in developing boiler, fuel, and specific control device mercury emission factors.

3.1.2 Test Matrix

The test matrix is presented in Table 1. The table includes a list of test methods to be used. In addition to speciated mercury, the flue gas measurements include moisture, flue gas flow rates, carbon dioxide, and oxygen.

Table 3-1
Test Matrix for Mercury ICR Tests at Monticello Unit Number 1

Sampling Location	No. of Runs	Species Measured	Sampling Method	Sample Run Time	Analytical Method	Analytical Laboratory
Outlet	3	Speciated Hg	Ontario Hydro	150 min	Ontario Hydro	TestAmerica
Outlet	3	Moisture	EPA 4	Concurrent	Gravimetric	METCO
Outlet	3	Flue Gas Flow	EPA 1 & 2	Concurrent	Pitot Traverse	METCO
Outlet	3	O_2 & CO_2	EPA 3B	Concurrent	Orsat	METCO
Inlet	3	Speciated Hg	Ontario Hydro	150 min	Ontario Hydro	TestAmerica
Inlet	3	Moisture	EPA 4	Concurrent	Gravimetric	METCO
Inlet	3	Flue Gas Flow	EPA 1 & 2	Concurrent	Pitot Traverse	METCO
Inlet	3	O_2 & CO_2	EPA 3B	Concurrent	Orsat	METCO
Gravimetric Feeders	3	Hg, Cl, Sulfur, Ash, and Btu/lb in coal	ASTM D2234	1 grab sample every 60-minutes per mill per run	ASTM D6414-99 (Hg), ASTM E776/300.0 (Cl), ASTM D-4239 (S), ASTM D-3174 (Ash), and ASTM D-3286 (Btu/lb)	TestAmerica and Philip Services

3.2 Field Test Changes and Problems

No deviations were made from the approved sampling and analytical test plan.

3.3 Handling of Non-Detects

This section addresses how data will be handled in cases where no mercury is detected in an analytical fraction. It should be noted that the analytical method specified in the Ontario Hydro Method has a very low detection limit, which is expected to be well below flue gas levels for most cases if the laboratory uses normal care and state of the art analytical equipment. However, there were cases where certain fractions of a test did not show detectable mercury levels. This section addresses how non-detects were handled in calculating and reporting mercury levels.

3.3.1 A single analytical fraction representing a subset of a mercury species is not detected.

When more than one sample component is analyzed to determine a mercury species (such as analyzing the probe rinse and filter catch separately to determine total particulate mercury) and one fraction is not detected, it will be counted as zero. Total mercury for that species will be the sum of the detected values of the remaining fraction(s). For example, if the probe rinse had ND < 0.05 µg and the filter had 1.5 µg, total particulate mercury would be reported as 1.5 micrograms.

3.3.2 All fractions representing a mercury species are not detected.

If all fractions used to determine a mercury species are not detected, the total mercury for that species will be reported as not detected, at the sum of the detection limits of the individual species.

For example, if the probe rinses were not detected at 0.003 µg and the filter catch were not detected at 0.004 µg, the reported particulate mercury would be reported as ND <0.007 µg. This is expected to represent a small fraction (<1%) of the total mercury, even under worse case scenario of 1 µg/Nm^3.

3.3.3 No mercury is detected for a species on all three test runs.

When all three test runs show no detectable levels of mercury for a mercury species, that mercury species will be reported as not detected at less than the average detection limit. For example, if three results for elemental mercury are ND < 0.10, ND <0.13, and ND < 0.10, the results would be reported as ND < 0.13 (the highest of the three detection levels).

In calculating total mercury, a value of zero will be used for that species. For example, if particulate mercury were ND < 0.11 µg, oxidized mercury were 2.0 µg, and elemental mercury were 3.0 µg, total mercury would be reported as 5.0 µg.

In calculating the percentage of mercury in the other two species, a value of zero will be used. For the example listed in the preceding paragraph, the results would be reported as 0% particulate mercury, 40% oxidized mercury, and 60% elemental mercury.

3.3.4 Mercury is detected on one or two of three runs.

If mercury is detected on one or two of three runs, average mercury will be calculated as the average of the detected value(s) and half of the detection limits for the non-detect(s).

Example 1: The results for three runs are 0.20, 0.20, and ND < 0.10. The reported value would be calculated as the average of 0.20, 0.20, and 0.05, which is 0.15 μg. Example 2: The results for three runs are 0.14, ND < 0.1, and ND < 0.1. The average of 0.14, 0.05, and 0.05 is calculated to be 0.08. Since this is below the detection limit of 0.1, the reported value is ND < 0.1.

3.4 Summary of Results

The results of the tests performed at Monticello Unit Number 1 are listed in the following tables.

Table 3-2
Monticello Unit Number 1 Source Emissions Results

Run Number	**1**	**2**	**3**
Test Date	02/22/00	02/22/00	02/22/00
Test Time	0835-1113	1200-1530	1610-1847
Inlet Gas Properties			
Flow Rate - ACFM	553,640	541,589	544,652
Flow Rate – DSCFM*	299,284	288,775	290,862
% Water Vapor - % Vol.	14.78	14.55	14.50
CO_2 - %	15.0	13.8	12.2
O_2 - %	3.6	5.4	7.4
% Excess Air @ Sampling Point	20	34	53
Temperature - °F	352	362	360
Pressure – "Hg	29.08	28.96	28.92
Percent Isokinetic	104.2	98.8	97.8
Volume Dry Gas Sampled – DSCF*	60.440	55.278	55.104
Outlet Gas Properties			
Flow Rate – ACFM	223,585	222,120	218,841
Flow Rate – DSCFM*	125,857	123,764	121,490
% Water Vapor - % Vol.	12.73	13.01	13.59
CO_2 - %	9.2	7.8	8.0
O_2 - %	10.4	11.4	12.2
% Excess Air @ Sampling Point	95	114	136
Temperature - °F	330	330	328
Pressure – "Hg	28.77	28.57	28.58
Percent Isokinetic	109.7	92.5	101.1
Volume Dry Gas Sampled – DSCF*	58.263	48.337	51.873

* 29.92 "Hg, 68 °F (760 mm Hg, 20 °C)

Note: Unit Number 1 Baghouse A has one inlet duct and two outlet ducts. Only the South Outlet Duct was sampled due to physical restrictions at the North Outlet Duct.

Table 3-3
Monticello Unit Number 1 Mercury Removal Efficiency

Run Number	1	2	3	Average
Test Date	02/22/00	02/22/00	02/22/00	
Test Time	0835-1113	1200-1530	1610-1847	
Total mercury				
Inlet - $lb/10^{12}$ Btu	34.07	44.23	53.94	44.08
Outlet - $lb/10^{12}$ Btu	24.36	67.29	76.32	55.99
Removal efficiency - %	28.5	-----	-----	-----
Particulate mercury				
Inlet - $lb/10^{12}$ Btu	11.49	0.27	5.74	5.83
Outlet - $lb/10^{12}$ Btu	0.12	0.08	0.06	0.09
Removal efficiency - %	99.0	70.4	99.0	89.5
Oxidized mercury				
Inlet - $lb/10^{12}$ Btu	16.21	10.66	16.37	14.41
Outlet - $lb/10^{12}$ Btu	23.10	56.40	62.83	47.44
Removal efficiency - %	-----	-----	-----	-----
Elemental mercury				
Inlet - $lb/10^{12}$ Btu	6.34	33.30	31.82	23.82
Outlet - $lb/10^{12}$ Btu	1.14	10.79	13.39	8.44
Removal efficiency - %	82.0	67.6	57.9	69.2

Note: A negative removal efficiency is not calculated when the inlet concentrations are not equal to or greater than the outlet concentrations. This unit is equipped with an ESP in parallel with a baghouse. Mercury testing was conduced only on the last control device (baghouse) and the data above does not reflect total removal efficiency of all control equipment.

Table 3-4
Monticello Unit Number 1 Mercury Speciation Results

Run Number	**1**	**2**	**3**	**Average**
Test Date	02/22/00	02/22/00	02/22/00	
Test Time	0835-1113	1200-1530	1610-1847	
Inlet Mercury Speciation				
Particulate mercury – µg	26.43	0.50	9.40	-----
µg/dscm	15.44	0.32	6.02	7.26
lb/10^{12} Btu	11.49	0.27	5.74	5.83
% of total Hg	33.7	0.6	10.6	15.0
Oxidized mercury – µg	37.3	20.1	26.8	-----
µg/dscm	21.79	12.84	17.18	17.27
lb/10^{12} Btu	16.21	10.66	16.37	14.41
% of total Hg	47.6	24.1	30.3	34.0
Elemental mercury - µg	14.6	62.8	52.1	-----
µg/dscm	8.53	40.12	33.39	27.35
lb/10^{12} Btu	6.34	33.30	31.82	23.82
% of total Hg	18.6	75.3	59.0	51.0
Total mercury – µg	78.4	83.4	88.3	-----
µg/dscm	45.81	53.28	56.59	51.89
lb/10^{12} Btu	34.07	44.23	53.94	44.08
Outlet Mercury Speciation				
Particulate mercury – µg	0.160	0.085	0.058	-----
µg/dscm	0.10	0.06	0.04	0.07
lb/10^{12} Btu	0.12	0.08	0.06	0.09
% of total Hg	0.5	0.1	0.1	0.2
Oxidized mercury – µg	31.1	57.0	62.4	-----
µg/dscm	18.85	41.64	42.48	34.32
lb/10^{12} Btu	23.10	56.40	62.83	47.44
% of total Hg	94.8	83.8	82.3	87.0
Elemental mercury – µg	1.53	10.9	13.3	-----
µg/dscm	0.93	7.96	9.05	5.98
lb/10^{12} Btu	1.14	10.79	13.39	8.44
% of total Hg	4.7	16.0	17.5	12.7
Total mercury – µg	32.8	68.0	75.8	-----
µg/dscm	19.88	49.68	51.60	40.39
lb/10^{12} Btu	24.36	67.29	76.32	55.99
Lignite Analysis				
Mercury - ppm dry	0.318	0.325	0.472	-----
Mercury - lb/10^{12} Btu	50.81	51.00	79.76	60.52
Chlorine - ppm dry	200	100	200	167
Moisture - %	22.8	22.9	23.3	23.0
Sulfur - % dry	0.58	0.64	1.55	0.92
Ash - % dry	21.2	19.5	27.5	22.7
HHV - Btu/lb as fired	6,350	6,440	5,940	6,243
Coal flow - lb/hr as fired	898,800	913,400	907,600	906,600
Total Heat Input – 10^6 Btu/hr	5,707	5,882	5,391	5,660
Total Mercury Mass Rates				
lb/hr input in coal	0.29	0.30	0.43	0.34
lb/hr at Baghouse inlet*	0.19	0.26	0.29	0.25
lb/hr at Baghouse outlet*	0.14	0.40	0.41	0.32

* Calculated based on the Total Heat Input (10^6 Btu/hr)

Table 3-5
Monticello Unit Number 1 Process Data

Run Number	**1**	**2**	**3**
Test Date	02/22/00	02/22/00	02/22/00
Test Time	0835-1113	1200-1530	1610-1847
Unit Operation			
Unit Load - MW net	576.7	576.8	575.4
Coal Mills in Service	All	All	All
Coal Flow - tons/hr	449.4	456.7	453.8
CEMS data			
NO_x – ppm	214.2	212.9	210.7
SO_2 – ppm	672.0	650.3	650.5
CO_2 - %	12.8	12.6	12.6
O_2 - %	6.0	6.5	6.4
Stack Gas Flow – mcfh	100.6	103.4	102.4
Stack Gas Temperature - °F	367.5	373.5	373.3
Stack Gas Moisture - % H_2O	12.3	12.3	13.1
Fabric Filter data			
Baghouse A Δ Pressure - "H_2O	3.5	3.5	3.6
Baghouse B Δ Pressure - "H_2O	4.9	5.3	5.4
Baghouse A Gas Inlet Temperature - °F	340.4	341.1	341.8
Baghouse A Gas Outlet Temperature - °F	410.6	412.8	412.3
Baghouse B Gas Inlet Temperature - °F	341.1	343.8	344.7
Baghouse B Gas Outlet Temperature - °F	404.4	409.1	407.9

4 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Emission Test Methods

The sampling followed the procedures set forth in the Code of Federal Regulations, Title 40, Chapter I, Part 60, Appendix A, Methods 1, 2, 3B, 4, 5, 17, and 19; in the Ontario Hydro Method, Revised July 7, 1999; and ASTM Methods D2234, D6414-99, E776/300.0, D-4239, D-3174, and D-3286.

A preliminary velocity traverse was made at each of the six accessible ports sampled at the inlet sampling location, in order to determine the uniformity and magnitude of the flow prior to testing. All traverse points were checked for cyclonic flow and the average angle was equal to 3.7 degrees. Alternate procedures would be required if the angle of cyclonic flow were greater than 20 degrees. Five traverse points were sampled from each of the six of the eleven ports, for a total of thirty traverse points.

A preliminary velocity traverse was made at each of the ten ports at the outlet sampling locations, in order to determine the uniformity and magnitude of the flow prior to testing. All traverse points were checked for cyclonic flow and the average angle was equal to 10.7 degrees. Alternate procedures would be required if the angle of cyclonic flow were greater than 20 degrees. Three traverse points were sampled from each of the ten ports for a total of thirty traverse points.

The sampling trains were leak-checked at the end of the nozzle at 15 inches of mercury vacuum before each test, and again after each test at the highest vacuum reading recorded during each test. This was done to predetermine the possibility of a diluted sample.

The pitot tube lines were checked for leaks before and after each test under both a vacuum and a pressure. The lines were also checked for clearance and the manometer was zeroed before each test.

Integrated orsat samples were collected and analyzed according to EPA Method 3B during each test.

4.1.1 Mercury

Triplicate samples for mercury were collected. The samples were taken according to EPA Methods 1, 2, 3B, 4, 5, and 17; and the Ontario Hydro Method, Revised July 7, 1999. For each run at the inlet sampling location, samples of five-minute duration were taken isokinetically at each of the thirty traverse points for a total sampling time of 150 minutes. For each run at the stack sampling location, samples of five-minute duration were taken isokinetically at each of the thirty traverse points for a total sampling time of 150 minutes. Reagent blanks and field blanks were submitted.

The "front-half" of the sampling train at the inlet sampling location contained the following components:

Teflon Coated Nozzle
In-stack Quartz Fiber Thimble and Backup Filter and Teflon Coated Support
Heated Glass Probe @ > 248°F

The "front-half" of the sampling train at the outlet sampling location contained the following components:

Teflon Coated Nozzle
In-stack Quartz Fiber Filter and Teflon Coated Support
Heated Glass Probe @ > 248°F

The "back-half" of the sampling train at both sampling locations contained the following components:

Impinger Number	Impinger Type	Impinger Contents	Amount	Parameter Collected
1	Modified Design	1 mol/L KCL	100 ml	Oxidized Mercury and Moisture
2	Modified Design	1 mol/L KCL	100 ml	Oxidized Mercury and Moisture
3	Greenburg-Smith Design	1 mol/L KCL	100 ml	Oxidized Mercury and Moisture
4	Modified Design	5% HNO_3 and 10% H_2O_2	100 ml	Elemental Mercury and Moisture
5	Modified Design	4% $KMnO_4$ and 10% H_2SO_4	100 ml	Elemental Mercury and Moisture
6	Modified Design	4% $KMnO_4$ and 10% H_2SO_4	100 ml	Elemental Mercury and Moisture
7	Greenburg-Smith Design	4% $KMnO_4$ and 10% H_2SO_4	100 ml	Elemental Mercury and Moisture
8	Modified Design	Silica	200 g	Moisture

All glassware was cleaned prior to use according to the guidelines outlined in EPA Method 29, Section 5.1.1 and the Ontario Hydro Method, Revised July 7, 1999, Section 13.2.15. All glassware connections were sealed with Teflon tape.

At the conclusion of each test, the filter and impinger contents were recovered according to procedures outlined in the Ontario Hydro Method, Revised July 7, 1999, Section 13.2.

Mercury samples were analyzed by Cold Vapor Atomic Absorption and Fluorescence Spectroscopy.

4.2 Process Test Methods

A modified ASTM D2234 method of coal sampling was followed. For each test run, a grab sample of coal was collected from each coal feeder to each of the individual mills at thirty-minute intervals. One composite sample was prepared for analysis from the individual feeder samples. Each sample was analyzed for mercury, chlorine, sulfur, ash, and Btu content by ASTM Methods D6414-99, E766/300.0, D-4239, D-3174, and D-3286, respectively.

4.3 Sample Tracking and Custody

Samples and reagents were maintained in limited access, locked storage at all times prior to the test dates. While on site, they were at an attended location or in an area with limited access. Off site, METCO and TestAmerica provided limited access, locked storage areas for maintaining custody.

Chain of custody forms are located in Appendix F. The chain of custody forms provide a detailed record of custody during sampling, with the initials noted of the individuals who loaded and recovered impinger contents and filters, and performed probe rinses.

All samples were packed and shipped in accordance with regulations for hazardous substances.

5 QA/QC ACTIVITIES

The major project quality control checks are listed in Table 5-1. Matrix Spike Summaries are listed in Table 5-2. Duplicate and Triplicate Analyses Summaries are listed in Table 5-3. Additional method-specific QC checks are presented in Table 5-4 (Methods 1 and 2), Table 5-5 (Method 5/17 sampling), and Table 5-6 (Ontario Hydro sample recovery and analysis). These tables also include calibration frequency and specifications.

Table 5-1
Major Project Quality Control Checks

QC Check	*Information Provided*	*Results*
Blanks		
Reagent blank	Bias from contaminated reagent	Low Mercury was detected
Field blank	Bias from handling and glassware	No Mercury was detected
Spikes		
Matrix spike	Analytical bias	Sample results were between 75% - 125% recovery
Replicates		
Duplicate analyses	Analytical precision	Results were < 10% RPD
Triplicate analyses	Analytical precision	Results were < 10% RPD

Table 5-2
Unit Number 1 Matrix Spike Summary

Sampling Location	*Run Number*	*Container*	*Results (µg)*	*True Value (µg)*	*Recovery (%)*
Inlet	3	3	21.4	27.2	102
Outlet	3	3	64.6	56.7	114
Outlet	3	4	0.489	0.462	106
Outlet	3	5	8.8	9.00	98

Table 5-3 Unit Number 1 Duplicate and Triplicate Analyses Summary

Sampling Location	*Run Number*	*Container*	*Results (µg)*	*Duplicate Results (µg)*	*RPD*	*Triplicate Results (µg)*	*RPD*
Inlet	1	1A	19.4	19.7	1.5	-----	-----
		1A	6.91	7.02	1.7	-----	-----
		1B	0.038	0.038	<1.0	-----	-----
		1B	0.013	0.013	4.7	0.012	2.0
		2	0.073	0.072	2.1	-----	-----
		3	37.3	38.0	1.7	-----	-----
		4	0.116	0.113	2.8	-----	-----
		5	14.5	14.4	<1.0	-----	-----
	2	1A	0.483	0.466	5.5	-----	-----
		1B	0.012	0.011	6.0	-----	-----
		2	<0.009	<0.009	<1.0	-----	-----
		3	20.1	20.1	<1.0	-----	-----
		4	1.12	1.10	1.6	-----	-----
		5	61.7	61.2	<1.0	------	------
	3	1A	9.11	8.80	3.4	-----	-----
		1A	0.116	0.117	1.0	-----	-----
		1B	0.082	0.084	<1.0	-----	-----
		1B	0.019	0.018	4.8	-----	-----
		2	0.077	0.075	2.2	-----	-----
		3	26.8	26.1	2.4	-----	-----
		4	1.10	1.10	<1.0	-----	-----
		5	51.0	52.2	2.4	-----	-----
Outlet	1	1A	0.147	0.149	1.4	-----	-----
		2	0.013	0.013	1.2	-----	-----
		3	31.1	31.4	<1.0	-----	-----
		4	<0.023	<0.023	<1.0	-----	-----
		5	1.53	1.54	1.0	-----	-----
	2	1A	0.077	0.076	1.3	0.076	2.0
		2	0.008	0.008	1.3	-----	-----
		3	57.0	58.0	1.8	-----	-----
		4	0.416	0.417	<1.0	0.432	3.8
		5	10.5	10.6	<1.0	10.3	1.6
	3	1A	0.058	0.057	1.8	-----	-----
		2	<0.004	<0.004	<1.0	<0.004	<1.0
		3	62.4	64.6	3.6	-----	-----
		4	0.449	0.442	1.6	-----	-----
		5	12.9	12.7	2.1	-----	-----

Table 5-4
QC Checklist and Limits for Methods 1 and 2

Quality Control Activity	Acceptance Criteria and Frequency	Reference
Measurement site evaluation	>2 diameters downstream and 0.5 diameters upstream of disturbances*	Method 1, Section 2.1
Pitot tube inspection	Inspect each use for damage, once per program for design tolerances	Method 2, Figures 2-2 and 2-3
Thermocouple	+/- 1.5% (°R) of ASTM thermometer, before and after each test mobilization	Method 2, Section 4.3
Barometer	Calibrate each program vs. mercury barometer or vs. weather station with altitude correction	Method 2, Section 4.4

* Although the inlet and outlet sampling locations did not meet the requirements of EPA Method 1, three-dimensional flow testing as described in EPA Method 1 was not performed. A preliminary velocity traverse was made at six of the eleven ports at the inlet sampling location, in order to determine the uniformity and magnitude of the flow prior to testing. All traverse points were checked for cyclonic flow and the average angle was equal to 3.7 degrees. A preliminary velocity traverse was made at each of the ten ports at the outlet sampling location, in order to determine the uniformity and magnitude of the flow prior to testing. All traverse points were checked for cyclonic flow and the average angle was equal to 10.7 degrees

Table 5-5
QC Checklist and Limits for Method 5/17 Sampling

Quality Control Activity	Acceptance Criteria and Frequency	Reference
Pre-mobilization checks		
Gas meter/orifice check	Before test series, Y_D +/- 5% (of original Y_D)	Method 5, Section 5.3
Probe heating system	Continuity and resistance check on element	
Nozzles	Note number, size, material	
Glassware	Inspect for cleanliness, compatibility	
Thermocouples	Same as Method 2	
On-site pre-test checks		
Nozzle	Measure inner diameter before first run	Method 5, Section 5.1
Probe heater	Confirm ability to reach temperature	
Pitot tube leak check	No leakage	Method 2, Section 3.1
Visible inspection of train	Confirm cleanliness, proper assembly	
Sample train leak check	$\leq$0.02 cf at 15" Hg vacuum	Method 5, Section 4.1.4
During testing		
Probe and filter temperature	Monitor and confirm proper operation	
Manometer	Check level and zero periodically	
Nozzle	Inspect for damage or contamination after each traverse	Method 5, Section 5.1
Probe/nozzle orientation	Confirm at each point	
Post test checks		
Sample train leak check	$\leq$0.02 cf at highest vacuum achieved during test	Method 5, Section 4.1.4
Pitot tube leak check	No leakage	Method 2, Section 3.1
Isokinetic ratio	Calculate, must be 90-110%	Method 5, Section 6
Dry gas meter calibration check	After test series, Y_D +/- 5%	Method 5, Section 5.3
Thermocouples	Same as Method 2	
Barometer	Compare w/ standard, +/- 0.1" Hg	

Table 5-6 QC Checklist and Limits for Ontario Hydro Mercury Speciation

Quality Control Activity	Acceptance Criteria and Frequency	Reference
Pre-mobilization activities		
Reagent grade	ACS reagent grade	Ontario Hydro Section 8.1
Water purity	ASTM Type II, Specification D 1193	Ontario Hydro Section 8.2
Sample filters	Quartz; analyze blank for Hg before test	Ontario Hydro Section 8.4.3
Glassware cleaning	As described in Method	Ontario Hydro Section 8.10
On-site pre-test activities		
Determine SO_2 concentration	If >2500 ppm, add more HNO_3-H_2O_2 solution	Ontario Hydro Section 13.1.13
Prepare KCl solution	Prepare batch as needed	Ontario Hydro Section 8.5
Prepare HNO_3-H_2O_2 solution	Prepare batch as needed	Ontario Hydro Section 8.5
Prepare H_2SO_4-$KMnO_4$ solution	Prepare daily	Ontario Hydro Section 8.5
Prepare HNO_3 rinse solution	Prepare batch as needed; can be purchased premixed	Ontario Hydro Section 8.6
Prepare hydroxylamine solution	Prepare batch as needed	Ontario Hydro Section 8.6
Sample recovery activities		
Brushes and recovery materials	No metallic material allowed	Ontario Hydro Section 13.2.6
Check for $KMnO_4$ Depletion	If purple color lost in first two impingers, repeat test with more HNO_3-H_2O_2 solution	Ontario Hydro Section 13.1.13
Probe cleaning	Move probe to clean area before cleaning	Ontario Hydro Section 13.2.1
Impinger 1,2,3 recovery.	After rinsing, add permanganate until purple color remains to assure Hg retention	Ontario Hydro Section 13.2.8
Impinger 5,6,7 recovery.	If deposits remain after HNO_3 rinse, rinse with hydroxylamine sulfate. If purple color disappears after hydroxylamine sulfate rinse, add more permangante until color returns	Ontario Hydro Section 13.2.10
Impinger 8	Note color of silica gel; if spent, regenerate or dispose.	Ontario Hydro Section 13.2.11
Blank samples		
0.1 N HNO_3 rinse solution	One reagent blank per batch.	Ontario Hydro Section 13.2.12
KCl solution	One reagent blank per batch.	Ontario Hydro Section 13.2.12
HNO_3-H_2O_2 solution	One reagent blank per batch.	Ontario Hydro Section 13.2.12
H_2SO_4-$KMnO_4$ solution	One reagent blank per batch.	Ontario Hydro Section 13.2.12
Hydroxylamine sulfate solution	One reagent blank per batch.	Ontario Hydro Section 13.2.12
Unused filters	Three from same lot.	Ontario Hydro Section 13.2.12
Field blanks	One per set of tests at each test location.	Ontario Hydro Section 13.4.1
Laboratory activities		
Assess reagent blank levels	Target <10% of sample value or <10x instrument detection limit. Subtract as allowed.	Ontario Hydro Section 13.4.1
Assess field blank levels	Compare to sample results. If greater than reagent blanks or greater than 30% of sample values, investigate. Subtraction of field blanks not allowed.	Ontario Hydro Section 13.4.1
Duplicate/triplicate samples	All CVAAS runs in duplicate; every tenth run in triplicate. All samples must be within 10% of each other; if not, recalibrate and reanalyze.	Ontario Hydro Section 13.4.1

6 DESCRIPTION OF TESTS

Personnel from METCO Environmental arrived at the plant at 12:30 p.m. on Monday, February 21, 2000. After meeting with plant personnel and attending a brief safety meeting, the equipment was moved onto the Unit Number 1 Baghouse A Inlet Duct and Outlet Duct. The preliminary data was collected. The equipment was secured for the night. All work was completed at 6:00 p.m.

On Tuesday, February 22, work began at 7:00 a.m. The equipment was prepared for testing. The first set of tests for mercury began at 8:35 a.m. Testing continued until the completion of the third set of tests at 6:47 p.m. The samples were recovered. The equipment was secured for the night. All work was completed at 7:15 p.m.

On Wednesday, February 23, work began at 7:00 a.m. The equipment was moved off of the sampling locations and loaded into the sampling van. The samples and the data were transported to METCO Environmental's laboratory in Dallas, Texas, for analysis and evaluation.

Operations at TXU Electric, Monticello Steam Electric Station, Unit Number 1 Baghouse A Inlet Duct and Outlet Duct, located near Mount Pleasant, Texas, were completed at 9:00 a.m. on Wednesday, February 23, 2000.

Billy J. Mullins, Jr.

Billy J. Mullins, Jr. P.E.
President