MERCURY SPECIATION TEST PROGRAM
RESULTS FROM
NEW YORK STATE ELECTRIC & GAS
CORPORATION'S MILLIKEN STATION
UNIT 2, LANSING, NEW YORK

CARNOT

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EXECUTIVE SUMMARY

To satisfy DOE's Clean Coal Technology Demonstration program requirements, NYSEG, through a competitive bidding process, selected Carnot to conduct a comprehensive measurement program to characterize the emissions of selected trace substances from Milliken Station's Unit 2 with the retrofit SO_2, NO_x, and particulate control systems in operation. In an effort to continue researching the viability and applicability of certain promising wet chemical techniques for the speciation of mercury in coal-fired utility boiler flue gas streams, Carnot, under an extended contract with NYSEG, and the Energy & Environmental Research Center (EERC) at the University of North Dakota, under a separate contract with EPRI, performed a full-scale field evaluation of the Ontario-Hydro and TRIS Buffer Mercury Speciation Sampling Methods at NYSEG's Milliken Station. The EERC also operated a mercury instrumental analyzer at the FGD outlet/stack location.

These methods, plus Frontier Geosciences' solid sorbent scrubber technique, have undergone and are currently undergoing an intensive bench-scale evaluation by the EERC at their University of North Dakota test center and also pilot-scale testing at DOE's High Sulfur Coal Test Center. The Ontario-Hydro method has seen only limited full-scale testing, while the TRIS Buffer technique has not been evaluated under full-scale conditions. The EERC has successfully demonstrated that the Ontario-Hydro and TRIS methods can accurately measure Hg(II) and Hg(0) in addition to total mercury in simulated coal-fired flue gas streams. The protocols for these methods developed by the EERC were used at NYSEG's Milliken Station in conjunction with the Unit 2 Post-Retrofit Chemical Emissions Characterization Program. This report presents the test results for the mercury speciation test program.

A summary of the mercury speciation results generated by this test program is given in Table ES-1. The total mercury mass balance results are summarized in Table ES-2. The following key observations were made in regards to this data:

- Although EPA Method 29 has been validated for total mercury in coal combustion flue gas, it is not an accepted method for mercury speciation. The method possess a high bias associated with measuring Hg(II), and therefore a low bias in measuring Hg(0), when in the presence of high levels of SO_2, which oxidizes the Hg(0) as it passes through the nitric acid/peroxide impingers. The EPA Method

29 data from this test program for the FGD inlet is consistent with this phenomenon.

- Excellent agreement (less than 0.5-0.6 ug/Nm^3 differences) to good agreement (between 0.6-1.0 ug/Nm^3 differences) between the mercury speciation methods performed at the FGD outlet location was seen. Hg(0) results ranged from 2.40-2.94 ug/Nm^3, Hg(II) results ranged from 0.15-0.62 ug/Nm^3, and total mercury results ranged from 2.66-3.29 ug/Nm^3.

- FGD removal efficiencies were consistently between 95-97% for Hg(II) (disregarding EPA Method 29 FGD inlet data) and 60-66% for total mercury.

- For the FGD inlet mercury speciation results, excellent agreement can be seen between valid Hg(0) measurements with values ranging between 2.28-2.70 ug/Nm^3. The Frontier Geoscience method yielded Hg(II), and therefore total mercury results, that were 2.0-2.1 ug/Nm^3 higher than average results from other comparable methods. The Frontier Geoscience method has been shown to possess a high bias for Hg(II) when sampling in the presence of high levels of SO_2 from the conversion of Hg(0) on the KCl/soda lime traps. This would mean, however, that Frontier's Hg(0) results should be biased low, which does not appear to be the case.

  TRIS Buffer and Ontario-Hydro values are in good agreement for Hg(II); and TRIS, Ontario-Hydro, and EPA Method 29 are in excellent agreement for total mercury.

- The Frontier Geoscience and EPA Method 29 results for the ESP inlet location matched at 7.0 lb/10^{12}Btu which amounts to 95% of the total mercury found in the coal. Boiler/ESP mass balance results using Frontier Geoscience, TRIS Buffer, Ontario-Hydro, and EPA Method 29 mercury values yielded 104%, 79%, 84%, and 86% agreement, respectively, between process streams.

- The Frontier Geoscience and EPA Method 29 results for the ESP inlet location matched at 7.0 lb/10^{12}Btu which amounts to 94% of the total mercury found in the coal. These two methods are not expected to match, however, at this location because of the significant levels of solid mercury present, and the fact that the Frontier sample train is not designed to representatively collect it. Solid-phase mercury accounted for approximately 10% of the total mercury found in the EPA Method 29 sample trains, suggesting that the Frontier Geoscience ESP inlet results may be biased high by at least 10%. Agreement between ESP inlet and outlet mercury levels is expected for the Frontier method, which suggests that the ESP outlet results are also biased high be at least 10%. Given this and the excellent agreement among wet chemical ESP outlet mercury levels, it appears that the coal mercury result is also biased high by 10-20%.

- Boiler/ESP mass balance results using Frontier Geoscience, TRIS Buffer, Ontario-Hydro, and EPA Method 29 mercury values yielded 104%, 79%, 84%, and 86% agreement, respectively, between process streams. FGD mass balance results for the same order of methods were 79%, 99%, 90%, and 93%, respectively.

- Excellent FGD mass balance results for the wet chemical mercury speciation methods, and the agreement between all FGD outlet values supports the conclusion that the Frontier Geoscience ESP outlet/FGD inlet and coal mercury levels are biased high by 10-20%.

TABLE ES-1
SUMMARY OF MERCURY SPECIATION TEST RESULTS
NYSEG POST-RETROFIT TEST PROGRAM – UNIT 2
AUGUST 1996

Mercury Species	Test Method	Emission Results, ug/Nm^3 ESP Inlet	ESP Outlet/ FGD Inlet	FGD Outlet	ESP Removal Efficiency	FGD Removal Efficiency
Hg(0) - Elemental						
	Frontier Geoscience	2.12	2.66	2.94	--	--
	TRIS Buffer	--	2.70	2.71	--	--
	Ontario-Hydro	--	2.28	2.45	--	--
	Semtech Hg 2000 Analyzer	--	NV	2.70	--	--
	EPA Method 29	**0.80**	**1.49**	**2.40**	--	--
Hg(II) - Oxidized						
	Frontier Geoscience	6.93	6.82	0.35	2%	95%
	TRIS Buffer	--	4.46	0.15	--	97%
	Ontario-Hydro	--	5.24	0.21	--	96%
	EPA Method 29	**7.52**	**6.23**	**0.62**	**17%**	**90%**
TOTAL Hg						
	Frontier Geoscience	9.11	9.56	3.29	--	66%
	TRIS Buffer	--	7.16	2.87	--	60%
	Ontario-Hydro	--	7.52	2.66	--	65%
	EPA Method 29	**9.18**	**7.72**	**3.02**	**16%**	**61%**

NV -- not valid. Tests performed at this location were deemed invalid due to detrimental ambient conditions (i.e. temperature and dust level) that were beyond instrument specifications.

TABLE ES-2A
SUMMARY OF TOTAL MERCURY MASS BALANCE RESULTS -- BOILER/ESP
NYSEG POST-RETROFIT TEST PROGRAM -- UNIT 2
AUGUST 1996

Test Method	Mass Balance Results, lb/10^{12}Btu					Boiler/ESP	ESP
	Coal	ESP Inlet	Bottom Ash	Fly Ash	ESP Outlet	Mass Balance$^{(1)}$	Mass Balance$^{(2)}$
	7.40		0.01	0.57			
Frontier Geosciences		6.97			7.04	103%	109%
TRIS Buffer		NP			5.22	78%	
Ontario-Hydro		NP			5.58	83%	
EPA Method 29		**6.96**			**5.74**	**85%**	**91%**

Notes:

(1) Boiler/ESP Mass Balance, Output/Input = (Bottom Ash + Flyash + ESP Outlet)/Coal

(2) Mass Balance, ESP = (Flyash + ESP Outlet)/ESP Inlet

TABLE ES-2B
SUMMARY OF TOTAL MERCURY MASS BALANCE RESULTS -- FGD
NYSEG POST-RETROFIT TEST PROGRAM -- UNIT 2
AUGUST 1996

Test Method	Mass Balance Results, lb/10^{12}Btu					FGD
	INPUTS		OUTPUTS			Mass Balance
	FGD Inlet	Limestone	FGD Sludge	Gypsum	FGD Outlet	(Outputs/Inputs)
		0.04	0.30	2.77		
Frontier Geosciences	7.04				2.49	79%
TRIS Buffer	5.22				2.14	99%
Ontario-Hydro	5.58				2.01	90%
EPA Method 29	**5.74**				**2.31**	**93%**

Note: No mercury was detected in FGD liquid streams.

SECTION 1.0

INTRODUCTION

1.1 TEST PROGRAM BACKGROUND

The Clean Air Act Amendments (CAAA) of 1990 require the Environmental Protection Agency (EPA) to conduct an assessment of health and environmental effects posed by the emissions of 189 trace chemicals from electric utility steam generating units. Although mercury is only one of the targeted trace chemicals potentially emitted to the atmosphere by utilities, EPA has singled it out for a separate emissions and risk assessment study.

Since 1990, the Electric Power Research Institute (EPRI) and the Department of Energy (DOE) have initiated programs to develop chemical emissions databases for the utility industry. More recently, however, both groups have focussed their efforts on developing a measurement technique for total and speciated mercury in utility combustion flue gas streams. Based on a formal validation study sponsored by EPRI, it was determined that EPA Method 29 can produce reliable measurements of total mercury concentrations in coal combustion flue gas. A major mercury speciation methods development program is currently being conducted by EPRI and DOE, in cooperation with EPA, that has involved intensive bench-scale and pilot-scale testing, in addition to limited full-scale evaluations, of certain promising measurement techniques.

As part of DOE's Clean Coal Technology Demonstration (CCTD) Program, New York State Electric & Gas (NYSEG) Corporation has installed and is operating a high-efficiency Flue Gas Desulfurization (FGD) system for SO_2 emissions control, low-NO_x burners for NO_x emissions control, and ESP and coal mill upgrades for particulate emissions control in an effort to demonstrate innovative emissions control technology. This demonstration program is being conducted at NYSEG's Milliken Station, Units 1 & 2, in the Town of Lansing, New York. The primary objective of this CCTD project is to show that a retrofit of energy-efficient SO_2, NO_x, and particulate control systems can be made without a significant impact on overall plant efficiency.

To satisfy DOE's CCTD program requirements, NYSEG, through a competitive bidding process, selected Carnot to conduct a comprehensive measurement program to characterize the emissions of selected trace substances from Milliken Station's Unit 2 with the retrofit SO_2, NO_x, and particulate control systems in operation. In an effort to continue researching the viability and applicability of certain promising wet chemical techniques for the speciation of mercury in coal-fired utility boiler flue gas streams, Carnot, under an extended contract with NYSEG, and the Energy & Environmental Research Center (EERC) at the University of North Dakota, under a separate contract with EPRI, performed a full-scale field evaluation of the Ontario-Hydro and TRIS Buffer Mercury Speciation Sampling Methods at NYSEG's Milliken Station. The EERC also operated a mercury instrumental analyzer at the FGD outlet/stack location.

These methods, plus Frontier Geosciences' solid sorbent scrubber technique, have undergone and are currently undergoing an intensive bench-scale evaluation by the EERC at their University of North Dakota test center and also pilot-scale testing at DOE's High Sulfur Coal Test Center. The Ontario-Hydro method has seen only limited full-scale testing, while the TRIS Buffer technique has not been evaluated under full-scale conditions. The EERC has successfully demonstrated that the Ontario-Hydro and TRIS methods can accurately measure Hg(II) and Hg(0) in addition to total mercury in simulated coal-fired flue gas streams. The protocols for these methods developed by the EERC were used at NYSEG's Milliken Station in conjunction with the Unit 2 Post-Retrofit Chemical Emissions Characterization Program. This report presents the test results for the mercury speciation test program.

1.2 TEST PROGRAM OBJECTIVES

The objectives of the NYSEG Milliken Unit 2 Mercury Speciation Test Program are:

- Perform a full-scale field evaluation of the Ontario-Hydro and TRIS Buffer Mercury Speciation Sampling Methods at NYSEG's Milliken Station.
- Operate the Semtech Hg 2000 analyzer, a real-time continuous emissions mercury analyzer, at the FGD outlet/stack sampling location.
- Compare daily and average Hg(0), Hg(II), and total Hg results from the Ontario-Hydro, TRIS Buffer, Semtech Hg 2000 analyzer, Frontier Geosciences' solid sorbent scrubber, and EPA Method 29 mercury measurement techniques.
- Provide ESP and FGD removal efficiencies for targeted mercury species.
- Calculate mercury material balances around the boiler, ESP and FGD process systems by examining the mercury distribution level across their various input and output process streams.

1.3 PROCESS DESCRIPTION

The NYSEG Milliken Station is composed of two identical tangentially-fired Combustion Engineering boilers with a designed generating capacity of 160 MW each and associated pollution abatement equipment. Unit 2 was evaluated in this program while it burns a 2.2-2.4% sulfur Western Pennsylvania bituminous coal. Low NO_x burners, an ESP, and an FGD provide Unit 2 with NO_x, particulate, and SO_2 emissions control, respectively. Up to 40% NO_x reduction is achieved using the low-NO_x burners, and the ESP and coal mills were recently upgraded reducing ESP outlet particulate levels by a factor of 10. The FGD uses a forced oxidation, formic acid-enhanced wet limestone system to reduce SO_2 emission by 90-98%. Commercial-grade gypsum and calcium chloride brine are marketable by-products of the FGD's zero wastewater discharge process. A detailed unit description can be found in Section 2.1.

1.4 SAMPLING APPROACH

Table 1-1 identifies the mercury speciation test program matrix. Representative samples were collected and analyzed for mercury from the targeted three flue gas streams, five solid streams, and three FGD liquid/sludge streams in triplicate (except for the FGD sludge) over the course of three days, August 7, 8, and 9, 1996. Mercury speciation was performed on the flue gas samples only, and solid/liquid/sludge process stream samples were analyzed for total mercury in an effort to show a mass balance around the boiler, ESP, and FGD process systems. Table 1-2 identifies which mercury speciation measurement procedures were performed at each of the three flue gas sampling locations.

1.5 PROGRAM ORGANIZATION

Carnot is the prime contractor for the NYSEG chemical emission field test program. The EERC, under a separate contract with EPRI, prepared, recovered, and performed the mercury speciation analysis of the Ontario-Hydro and TRIS sampling trains, in addition to operating the mercury instrumental analyzer. Zenon Environmental Laboratories was a major subcontractor to Carnot that provided a majority of the program's analytical services. Mr. Mehdi Rahimi and Mr. Walt Savichky are NYSEG's program managers for this study. EPRI serves as a technical consultant. The project team organization is identified in Figure 1-1.

TABLE 1-1
MERCURY SPECIATION TEST PROGRAM MATRIX
NYSEG POST-RETROFIT TEST PROGRAM
AUGUST 1996

Process Stream	Target Mercury Species		
	Hg(0) - Elemental	Hg(II) - Oxidized	Total Hg
Flue Gas Sample Streams			
ESP Inlet	X	X	X
ESP Outlet / FGD Inlet	X	X	X
FGD Outlet / Stack	X	X	X
Solid Sample Streams			
Coal Feed			X
Bottom Ash			X
ESP Flyash			X
Limestone Solids			X
Gypsum Solids			X
Liquid/Sludge Sample Streams			
PWRF Outlet			X
Brine Product			X
FGD Blowdown Sludge			X

TABLE 1-2
MERCURY SPECIATION MEASUREMENT METHODS
NYSEG POST-RETROFIT TEST PROGRAM
AUGUST 1996

Sample Location	Mercury Speciation Measurement Procedure
ESP Inlet	EPA Method 29 Frontier Geoscience -- MESA Method
ESP Outlet / FGD Inlet	EPA Method 29 Frontier Geoscience -- MESA Method Ontario-Hydro Mercury Speciation Method TRIS Buffer Mercury Speciation Method
FGD Outlet / Stack	EPA Method 29 Frontier Geoscience -- MESA Method Ontario-Hydro Mercury Speciation Method TRIS Buffer Mercury Speciation Method Semtech Hg 2000 Analyzer (elemental Hg only)

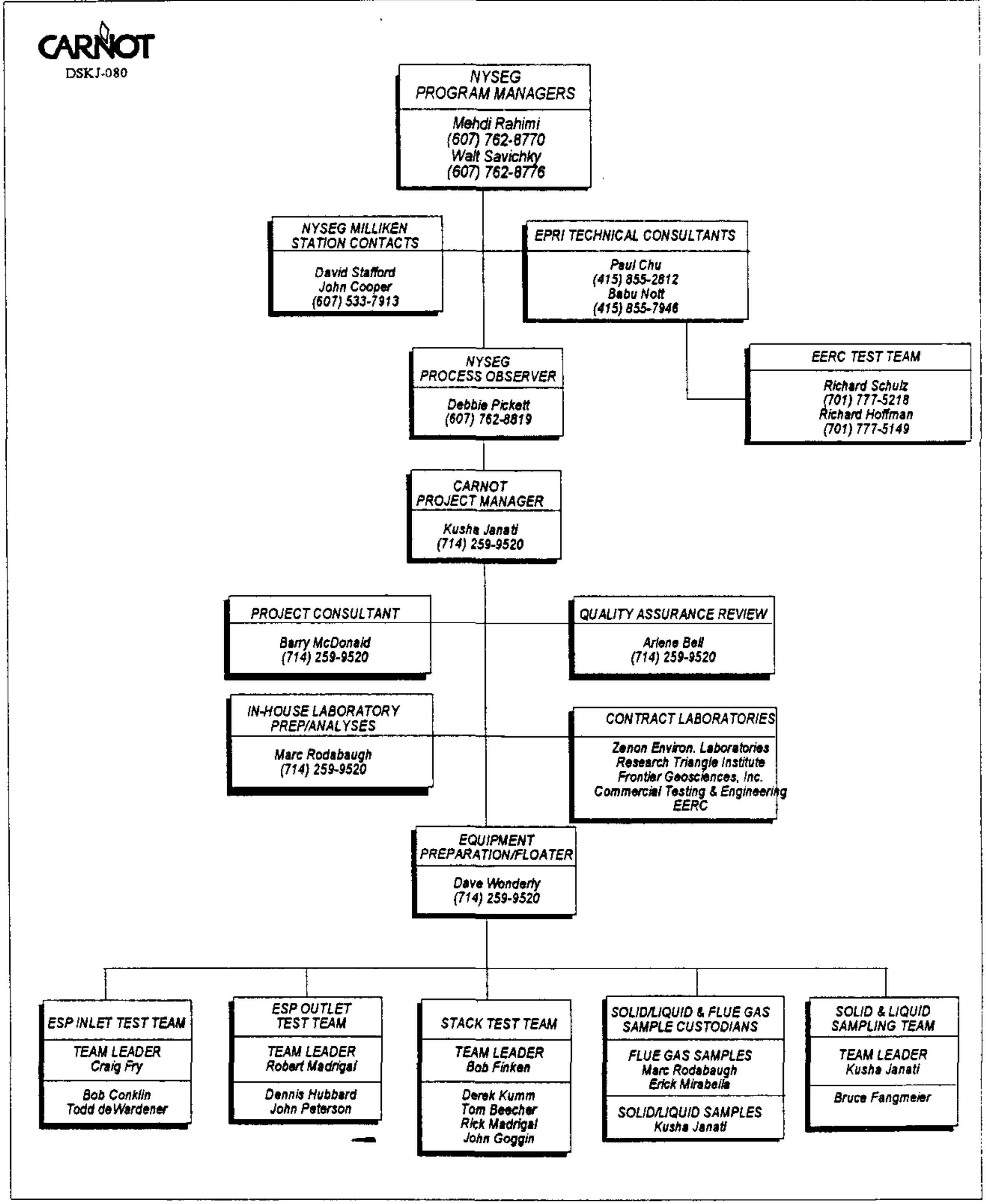


Figure 1-1. Project Team Organization Chart ((DSKJ-080))

1.6 DATA USE AND DATA CONFIDENTIALITY

The data generated from this test program is intended for use by NYSEG, DOE and EPRI for assessment and planning purposes. All sampling and analyses were conducted according to Carnot's approved July 1996 final test plan (Report Number NYS1A-11476/R107G264.T), which was developed using EPRI's established FCEM PISCES protocol and included EERC's mercury speciation method protocols. Results generated by this field study will be targeted to meet "compliance" quality standards.

The information generated on this program is treated by Carnot and its subcontract laboratories, and the EERC as confidential. It will only be released to other parties at the expressed wishes of NYSEG.

SECTION 2.0

TEST DESCRIPTION

This section presents a description of Milliken Station's Unit 2 and the different sample locations that will be used for the test program, followed by a review of the test schedule and process operation during testing.

2.1 UNIT DESCRIPTION

The Milliken Station is located in the Town of Lansing, New York and is owned and operated by the NYSEG Corporation. Milliken Station Unit 1 and 2 were built in the late 1950s. The units are Combustion Engineering designed tangentially-fired pulverized coal boilers. Unit 2 has a design capacity of 1,145,000 lbs/hr steam at 1900 psig and 1005°F with a capacity of approximately 160 MW. Unit 2 is typically operated at 150 MW. Up to 40% NO_x reduction is achieved using C-E LNCFS-III low-NO_x burners which were installed in 1994. The Unit 2 boiler is equipped with an ABB Heat Pipe air heater and two wide-plate spacing Research-Cottrell ESPs, which were also installed in 1994. In addition, a Saarberg-Holter Umwelttechnik GmbH (S-H-U) flue gas desulfurization (FGD) process was installed and began operating at Milliken Station Unit 2 in January, 1995. The process is a forced oxidation, formic acid-enhanced wet limestone scrubber designed to reduce SO_2 emissions by 90% to 98%. The exhaust gas is discharged to the atmosphere through a wet chimney. The plant has high dispatch priority and is generally base loaded. The capacity factor is typically >80%. This unit is among the most efficient in the United States.

The coal is delivered to Unit 2 from a common coal pile that serves both boilers. During this test program, Unit 2 burned a Western Pennsylvania bituminous coal containing 2.2% - 2.4% sulfur that was a 50/50 mix of raw and cleaned coal. The coal mills were upgraded in 1994 and produce no rejects.

Bottom ash is sluiced out to the bottom ash solids sedimentation basin where the solids are dewatered and removed from the plant site by truck. The bottom ash sluice water is recirculated in a closed loop. Make-up water from the lake intake is periodically added to maintain the liquid level of the sedimentation tank. The ESP flyash is pneumatically conveyed to a storage silo, then removed from the plant site by truck.

Commercial-grade gypsum and calcium chloride brine are marketable by-products of the S-H-U FGD's zero wastewater discharge process. During this test program, however, the brine concentrator was not in operation so the unconcentrated brine product was discharged to the PWRF for disposal to the lake. Gypsum is transported by conveyor belt to a gypsum storage building for subsequent loading onto trucks. Heavy metals are removed from the scrubber water blowdown, producing a sludge that is trucked to disposal.

The Milliken Station process wastewater generated from Units 1 and 2 is treated at the PWRF before returning to the lake. The coal pile runoff is collected in an equalization basin located near the coal pile. The collected coal pile runoff is treated in the metals treatment plant located adjacent to the PWRF. The out-fall of the metals treatment plant discharges to the PWRF before returning to the lake. Sludge generated by the PWRF and metals treatment plant are removed from the station by truck for on-site disposal.

2.2 SAMPLE LOCATIONS AND COLLECTION PROCEDURES

Figure 2-1 is a process flow diagram for Unit 2 depicting the boiler/ESP/FGD system. Figure 2-2 provides a more detailed process flow description of the FGD/Stack system. Solid dots represent sampling locations for the flue gas, solids, and liquid/sludge sample streams.

2.2.1 Flue Gas Sample Streams

The primary sample streams of interest for the NYSEG Milliken Unit 2 test program were the flue gas streams entering and exiting the ESP and FGD air pollution control devices (APCDs). An objective of this research study was to determine the effectiveness of these APCDs at removing mercury released during coal combustion.

Tests requiring a full traverse of the sampling location (i.e. EPA Method 29) collected flue gas at each of the prescribed sampling points. The number and location of sampling points that were used at the ESP inlet and outlet were based on the ESP inlet sampling grid used for the May, 1994 baseline test program given currently existing port obstructions. The stack sampling grid was based on EPA Method 1 criteria. Tests conducted within a single port (either 1-3 sample points) alternated between the North and South ducts of the ESP inlet and outlet (i.e. Frontier Geoscience, Ontario-Hydro and TRIS Buffer). Frontier Geoscience replicates at the ESP inlet and outlet traversed the entire sample port. Ontario-Hydro and TRIS Buffer tests at the ESP outlet sampled at a single point. Stack single point tests (i.e. Frontier Geoscience, Ontario-Hydro, TRIS Buffer, and Semtech Hg analyzer) were performed at the same representative sampling point for each replicate.

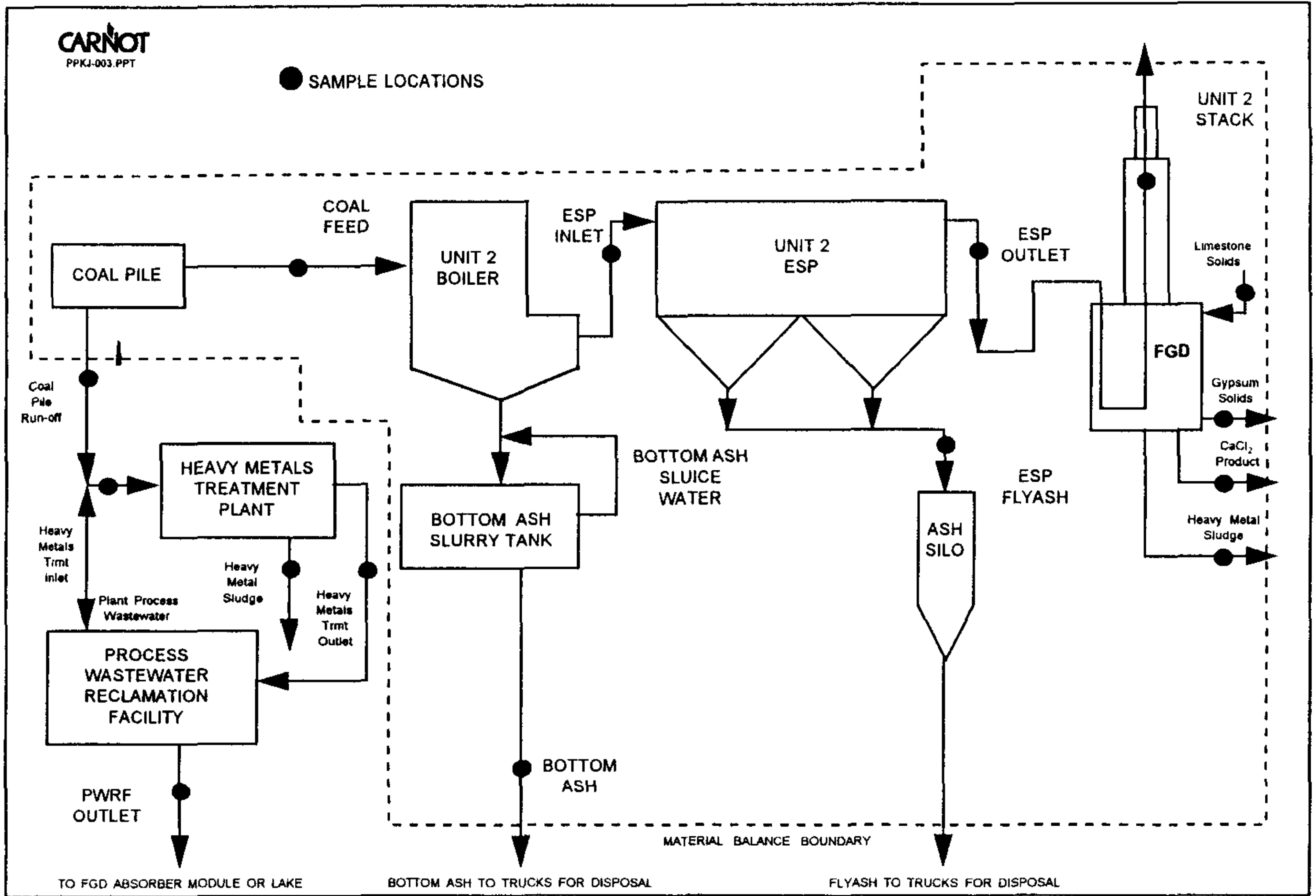


Figure 2-1. Process Flow Diagram and Sampling Locations for Milliken Power Station Unit 2

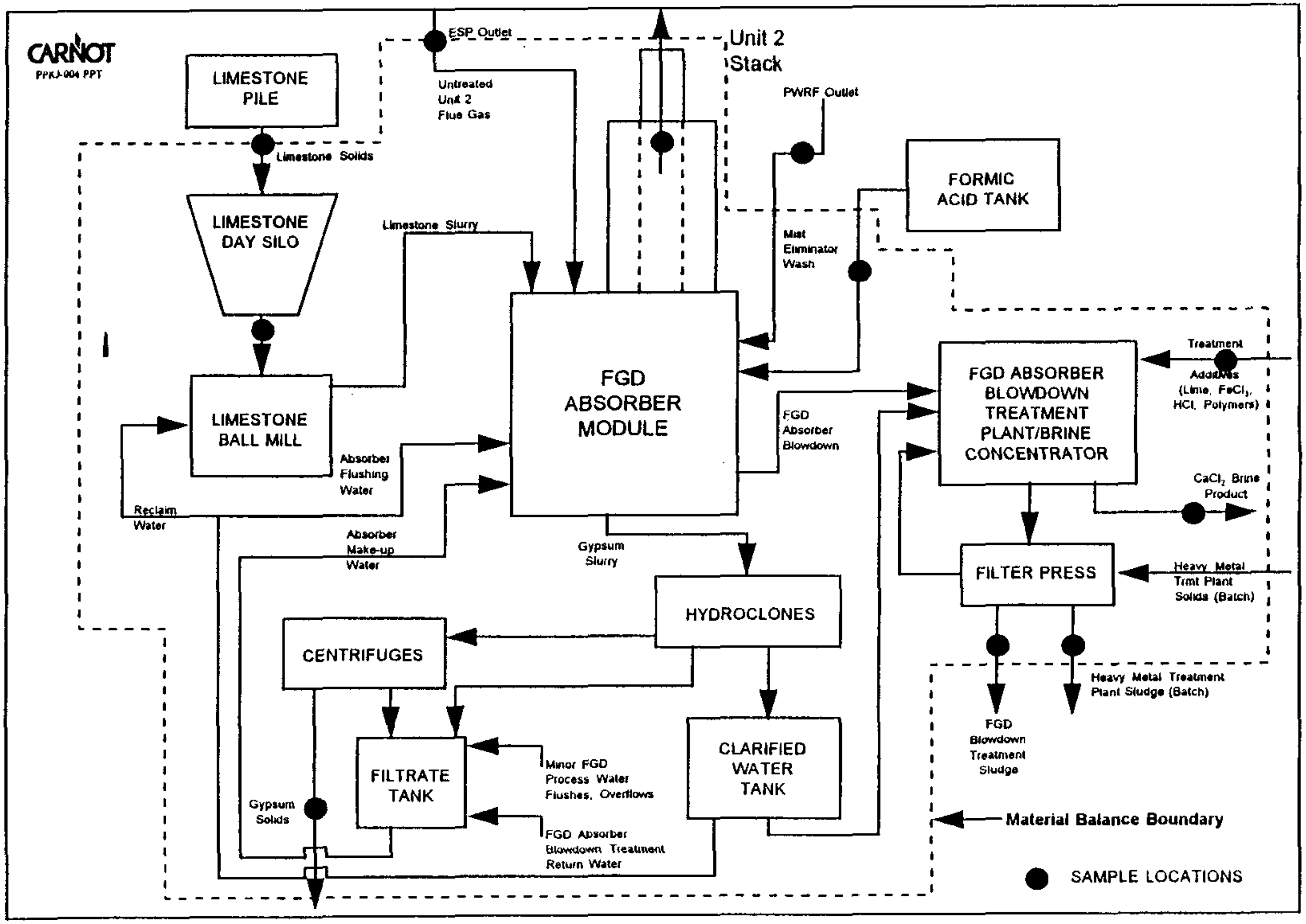


Figure 2-2. FGD/Stack Process Flow Diagram and Sample Locations

One replicate was performed for each method daily at each flue gas sample location for three days, with the exception of Frontier Geoscience, in which two replicates were performed on the third day to make-up for an invalid test on the first day.

2.2.1.1 Unit 2 ESP Inlet

The ESP inlet location consists of two vertical ducts, each one 3'6" deep by 33'9" wide. The sample ports are located 80' (12.7 diameters) downstream and 40' (6.3 diameters) upstream of the nearest flow disturbances, satisfying EPA Method 1 minimum requirements for an acceptable sample location. Figure 2-3 presents a side-view of the ESP inlet sample location. There are 24 ports total, 12 per duct, designated as Ports A through X as shown in Figure 2-4. Seven of the ports, E, K, N, O, T, V, and X, were not available for sampling due to port obstructions.

Prior to testing, a full velocity traverse was performed through all 24 sample ports. EPA Method 1 requires a minimum of 12 traverse points per duct or 24 points total. The decision to use three sample points per port was judged technically sound during Carnot's May 1994 baseline test program based on the duct depth, and is consistent with previous ESP performance testing conducted by CONSOL. The preliminary velocity data were analyzed to determine the location of the 8 minimum required sample ports (to provide a total of 24 points) that produce an average flue gas velocity that is representative of the overall duct velocity, but spaced-out enough to cover the duct length. Figure 2-4 identifies which ports were chosen for the full-traverse isokinetic tests. This 8-port grid resulted in an average velocity that was 2.5% different from the entire 24-port velocity. The sample grid used at the ESP inlet is similar to the one used for the May 1994 baseline tests. Exhaust gas flow rates from the pitot traverses of the 1994 baseline isokinetic tests agreed well (<10% average difference) with those calculated from fuel heat input and an EPA Method 19 stoichiometric F-factor. EPA Method 19 comparisons for this test program are not applicable due to the unavailability of accurate fuel flow data.

No cyclonic flow was found at this location.

2.2.1.2 Unit 2 ESP Outlet

The Unit 2 ESP outlet location (inlet of the FGD) is a mirror image of the ESP inlet location with identical measurements and sampling scheme. Figure 2-5 illustrates the sampling grid for the ESP outlet. Nine of the ports, A, C, E, I, M, N, Q, T, and X, were not available for sampling due to port obstructions.

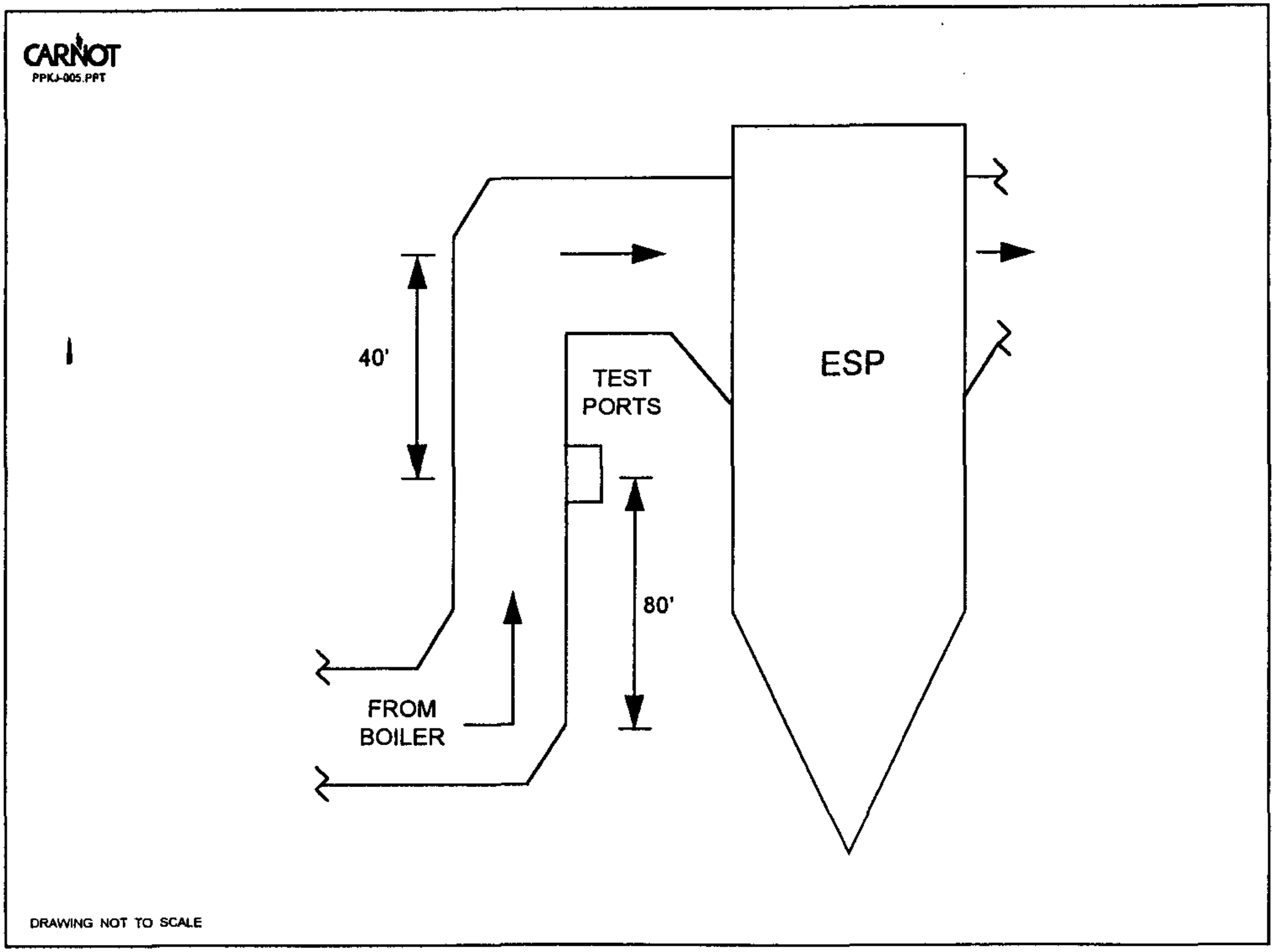
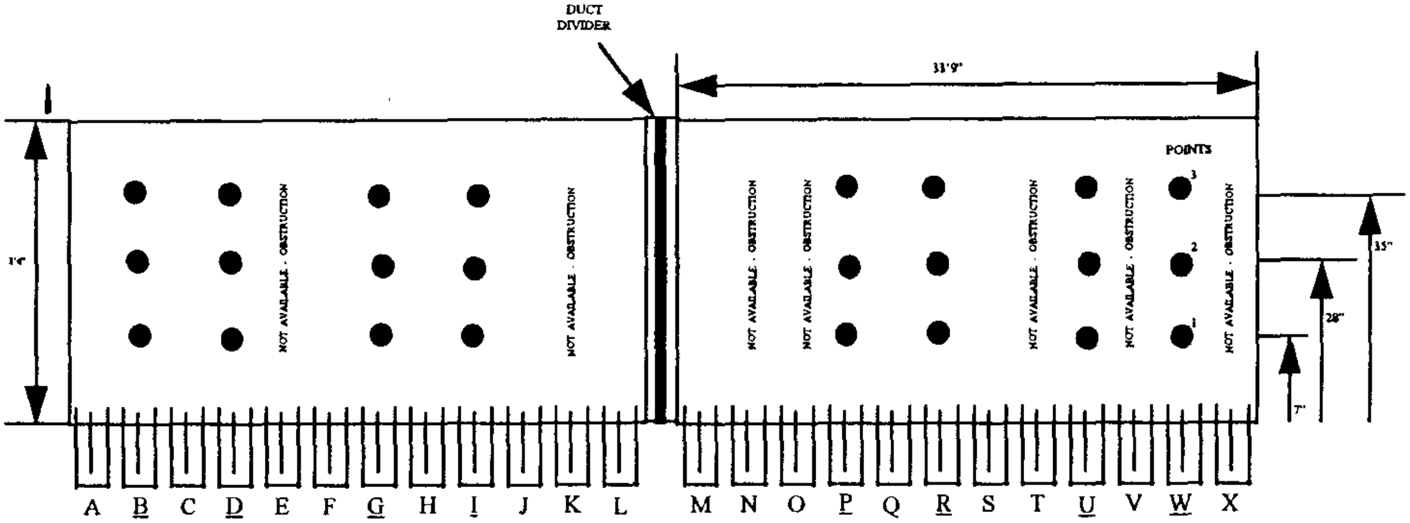


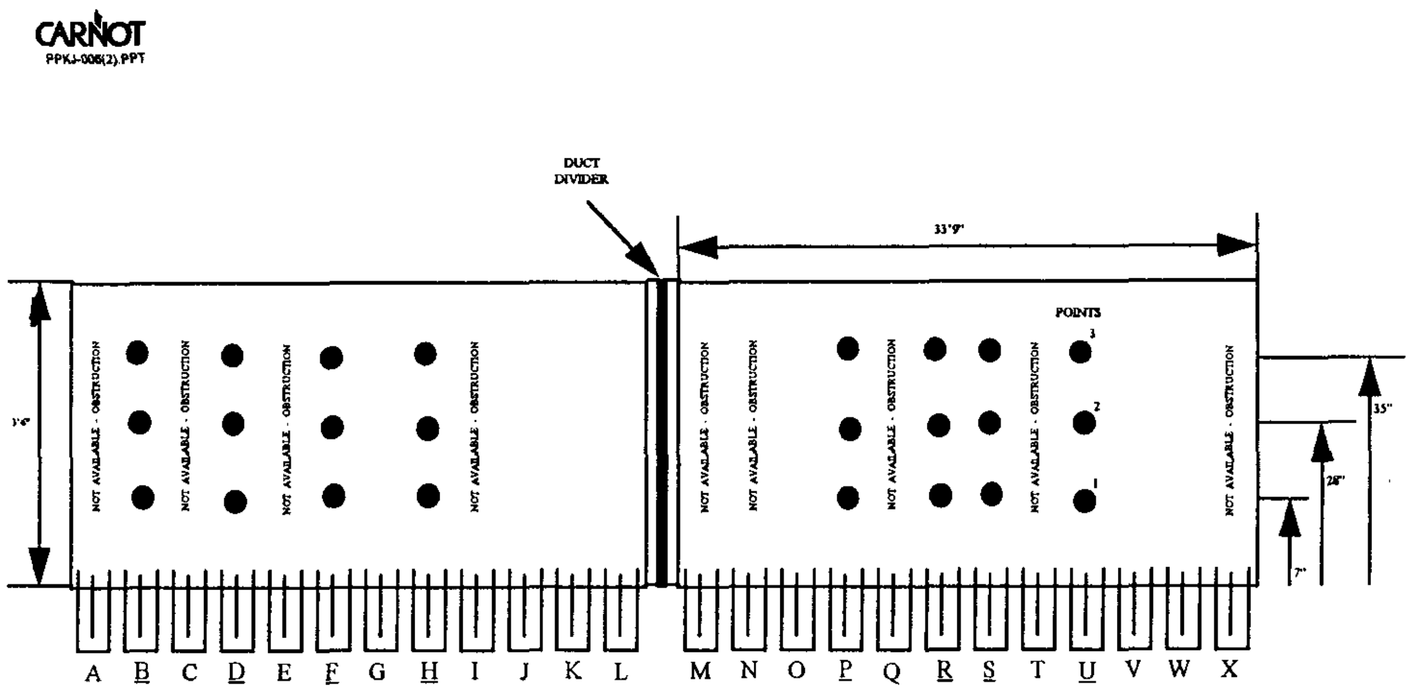
Figure 2-3. Unit 2 ESP Inlet Duct Test Site

PPKJ-008.PPT



● - Sample points chosen for full-traverse tests at the ESP inlet (port designation underlined)
Note: Single-port Frontier Geoscience mercury speciation tests performed in Ports I and W

Figure 2-4. Cross Section of ESP Inlet Sample Location



● - Sample points chosen for full-traverse tests at the ESP outlet (port designation underlined)

Note:

Single-port Tests	Ports used
TRIS Buffer	K,W
Ontario-Hydro	K,W
Sulfur Oxides	F,P
Particle Size Distribution	D,P
VOST	J
Frontier Geoscience	J,V

Figure 2-5. Cross Section of ESP Outlet Sample Location

A full velocity traverse was performed prior to testing through 23 of the 24 ports (one port cap was frozen tight). As identified on Figure 2-5, 8-ports were chosen for a 24-point total sample grid similar to the ESP inlet. This 8-port grid resulted in an average velocity that was 4.7% different from the overall 23-port velocity. Due to the numerous obstructions present at this location, no other port scheme for sampling could be found that provided a more representative velocity and still maintain satisfactory spacing across the ducts.

Less than one percent cyclonic flow was found at this location.

2.2.1.3 **Stack**

Figure 2-6 provides a profile of the Unit 2 stack test site and presents traverse point locations. The Unit 2 stack (FGD outlet stream) discharge point is approximately 375' from ground level and the stack sampling plane is located 304' from ground level. Figure 2-7 illustrates a cross-sectional view of the FGD stack location showing all three stacks within a larger shell. Two identical 12' diameter stacks each serving Unit 1 and 2, along with a smaller 10' diameter emergency bypass stack, are located inside the 40' diameter shell. Two sampling ports located at 90° offsets with coupling lengths of 6" were used for full traverse tests. A third sampling port offset 90° from one of the main sampling ports was used for single-point tests.

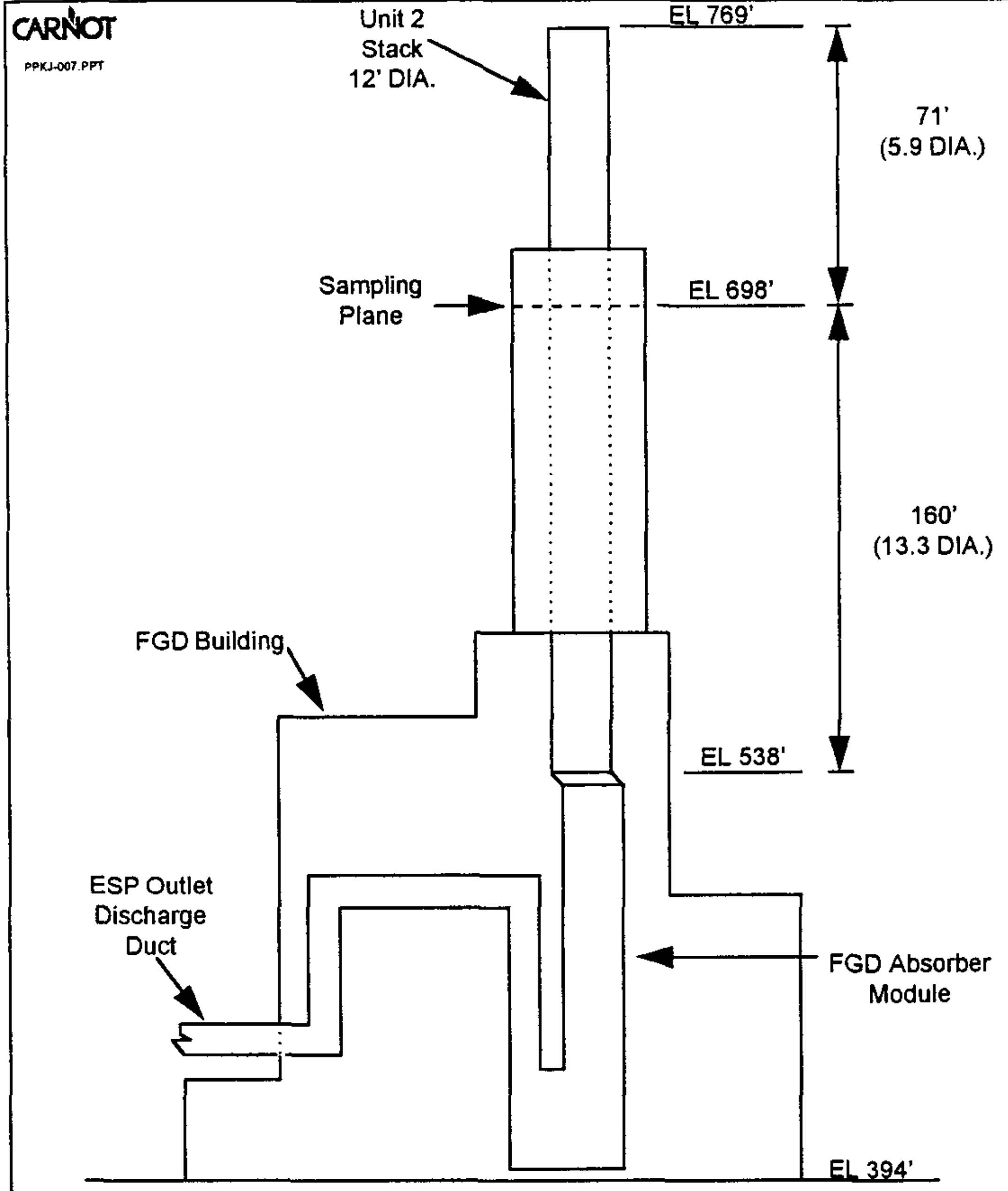
This location meets EPA Method 1 minimum requirements with almost 6 diameters upstream and 13 diameters downstream of the nearest flow disturbances; as a result, 12 sample points, 6 per port were used. Less than two percent cyclonic flow as found at this location.

2.2.2 Solid Sample Streams

In an effort to substantiate the flue gas data, coal feed, bottom ash, ESP flyash, limestone solids, and gypsum solids samples were collected throughout the test program. The samples were analyzed for target inorganic compounds and balanced with flue gas emissions data in an attempt to obtain mass balance closure. Table 2-1 provides a solid stream sampling schedule.

2.2.2.1 **Coal Feed**

Pulverized coal combined with combustion air is injected into the boiler through a series of burners supplied by four coal mills. Coal is supplied to each mill by belt feeders drawing feed from the coal bunkers. Only three mills are necessary for full-load operation. During this



Test Port and Traverse Point		Distance from Inside near Wall (Inches)
A, B -	1	6.3
	2	21.0
	3	42.6
	4	101.4
	5	123.0
	6	137.7

Port Length = 6 inches
Total Number of Traverse Points = 12

Figure 2-6. Stack Test Site and Traverse Point Location

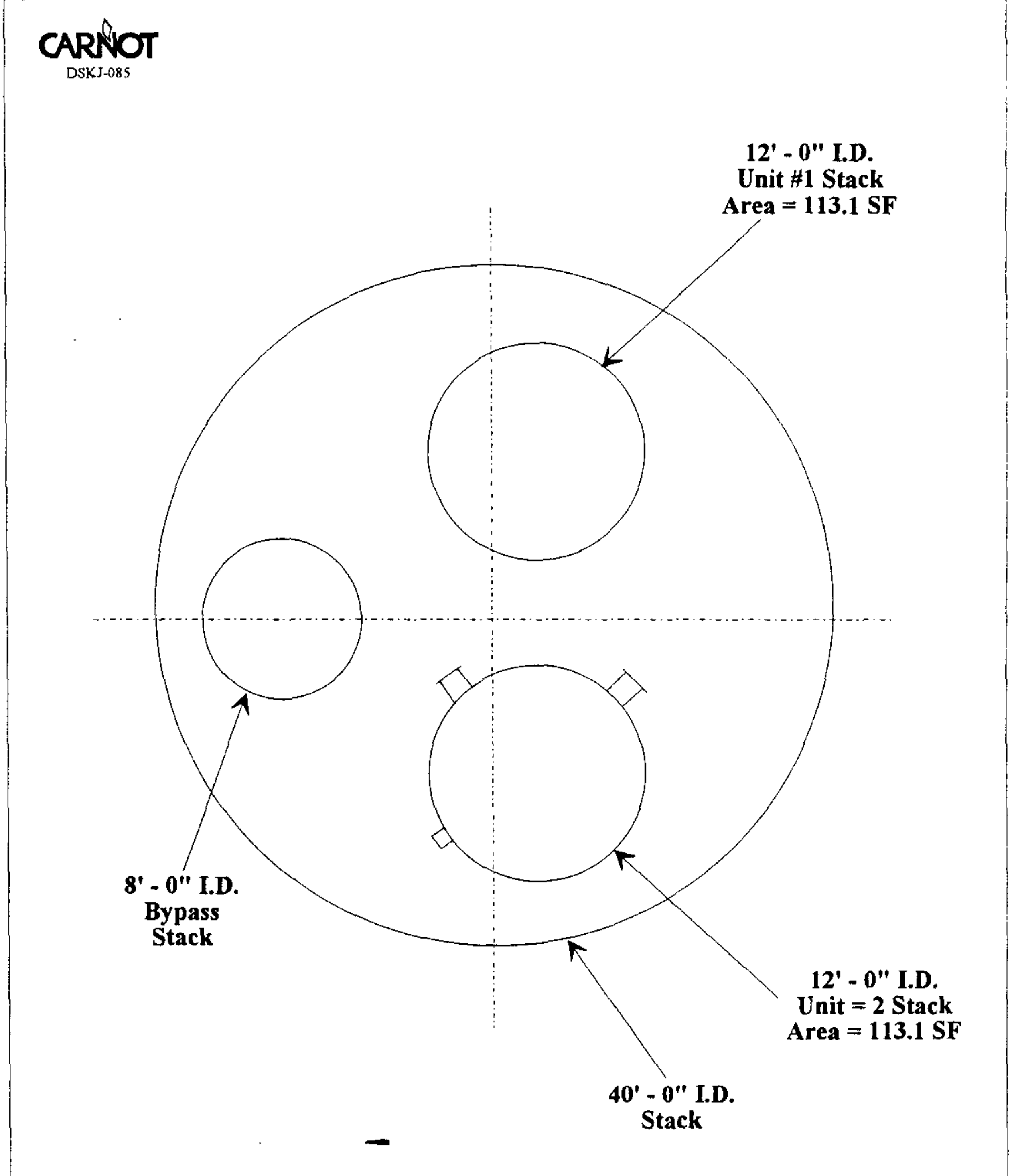


Figure 2-7. Cross-Sectional Area - Units 1 & 2 FGD Stack (DSKJ-085)

TABLE 2-1
SOLID AND LIQUID STREAM SAMPLING SCHEDULE
NYSEG POST-RETROFIT TEST PROGRAM
AUGUST 1996

Test Number	Date	Sample Time	Type of Sample	Sample Top Size, in. (1)	No. of Increments	Increment Size, lbs.	Gross Sample Weight, lbs.	Number of Splits	Sample Size to Lab, lbs. (2)	Sample Container	No. of Containers
1-COAL	8/7/96	815/1545	Raw/Clean Coal	<5/8	24	5	120	2	30	HDPE Bck.	1
2-COAL	8/8/96	805/1545	Raw/Clean Coal	<5/8	24	5	120	2	30	HDPE Bck.	1
3-COAL	8/9/96	805/1545	Raw/Clean Coal	<5/8	24	5	120	2	30	HDPE Bck.	1
4,5-COAL	*8/12/96*	*910/1900*	*Raw/Clean Coal*	*<5/8*	*18*	*5*	*90*	*1/3,2/3*	*30 each*	*HDPE Bck.*	*2*
6-COAL	8/13/96	910/1530	Raw/Clean Coal	<5/8	12	5	60	1	30	HDPE Bck.	1
1-BottomAsh	8/7/96	1800	Bottom Ash	<2	14	6.9	96	0	96	HDPE Bck.	2
2-BottomAsh	8/8/96	1830	Bottom Ash	<2	14	5.9	82	0	82	HDPE Bck.	2
3-BottomAsh	8/9/96	1645	Bottom Ash	<2	14	6.5	91	0	91	HDPE Bck.	2
1-Flyash	8/7/96	910/1610	ESP Flyash	-60 mesh	7	1-17 (3)	47	6	50 grams each	120 ml	6
2-Flyash	8/8/96	909/1620	*ESP Flyash*	-60 mesh	8	0.5-30	101.5	7	*50 grams each*	*glass jars*	*6*
3-Flyash	8/9/96	919/1500	ESP Flyash	-60 mesh	6	5-46	133	7	50 grams each	w/ plast. lids	6
1-Limestone	8/7/96	1830	Limest'n Solids	<2	25	4.3	107	0	107	HDPE Bck.	2
2-Limestone	8/8/96	1330	Limest'n Solids	<2	25	4.7	118	0	118	HDPE Bck.	2
3-Limestone	8/9/96	1430	Limest'n Solids	<2	24	4.3	104	0	104	HDPE Bck.	2
1-Gypsum	8/7/96	821/1429	Gypsum Solids	-8 mesh	7	10-11	74	3	9	Plastic Bag	1
2-Gypsum	8/8/96	930/1330	Gypsum Solids	-8 mesh	3	24-25	73	3	10	Plastic Bag	1
3-Gypsum	8/9/96	1005/1445	Gypsum Solids	-8 mesh	3	24-25	74	3	10	Plastic Bag	1
1-FGD Sludge	8/8/96	750/825	FGD Sludge	NA	8	1	8	0	8	Plastic Bag	2
2-FGD Sludge	8/9/96	810/830	FGD Sludge	NA	8	0.38	3	0	3	Plastic Bag	2
1-Brine	8/7/96	1446/1620	Brine Product	NA	3	400 ml	1.2 liters	0	500 ml. x 2	AW-500ml	2
2-Brine	8/8/96	808/1613	Brine Product	NA	9	400 ml	3.6 liters	0	500 ml. x 2	AW-500ml	2
3-Brine	8/9/96	800/1517	Brine Product	NA	8	400 ml	3.2 liters	0	500 ml. x 2	AW-500ml	2
1-PWRF	8/7/96	801/1610	PWRF Outlet	NA	9	400 ml	3.6 liters	0	500 ml. x 2	AW-500ml	2
2-PWRF	8/8/96	805/1610	PWRF Outlet	NA	9	400 ml	3.6 liters	0	500 ml. x 2	AW-500ml	2
3-PWRF	8/9/96	756/1513	PWRF Outlet	NA	8	400 ml	3.2 liters	0	500 ml. x 2	AW-500ml	2
1-WWTP IN	9/9/96	1600/2400	WWTP Inlet	NA	9	400 ml	3.6 liters	0	500 ml. x 2	AW-500ml	2
2-WWTP IN	9/9/96	1600/2400	WWTP Inlet	NA	9	400 ml	3.6 liters	0	500 ml. x 2	AW-500ml	2
1-WWTP OUT	9/9/96	*1600/2400*	*WWTP Outlet*	NA	9	*400 ml*	*3.6 liters*	0	*500 ml. x 2*	*AW-500ml*	2
2-WWTP OUT	9/9/96	1600/2400	WWTP Outlet	NA	9	400 ml	3.6 liters	0	500 ml. x 2	AW-500ml	2
1-Coalpile	9/9/96	1600/2400	Coalpile Run-Off	NA	9	400 ml	3.6 liters	0	500 ml x 2	AW-500ml	2
2-Coalpile	9/9/96	1600/2400	Coalpile Run-Off	NA	9	400 ml	3.6 liters	0	500 ml. x 2	AW-500ml	2
1-Sludge	9/10/96	1000	WWTP Sludge	NA	8	200 grams	3.5	0	3.5	Plastic Bag	2
2-Sludge	9/10/96	1030	WWTP Sludge	NA	8	200 grams	3.5	0	3.5	Plastic Bag	2

NA -- not applicable
HDPE -- high density polyethylene
AW -- acid-washed HDPE Nalgene sample bottles
All solid stream sample collection and preparation procedures were in accordance with ASTM D2234 and ASTM D2013.
Notes:
(1) Sample top size defined as smallest screen opening in which less than 5% of sample is retained.
(2) Minimum sample size for laboratory analysis based on ASTM D2234.
(3) Isokinetic sampling of the flyash resulted in varying increment sample sizes based on ESP hopper evacuation intervals. Each increment was riffled on-site to a sample size less than or equal to 50 grams and composited with other 50 gram increments from that test period to obtain a single 50 gram test sample.

test program coal mill 2A3 was not in service. As-fired coal samples representative of a complete cross-section of the unpulverized coal feed to the mills was obtained using each belt feeder's coal sampling system. After activating the coal sampling system, a 5 lb sample is provided within one minute.

The coal burned during this test program was a 50/50 split of raw and pre-cleaned Western Pennsylvania bituminous coal, pre-crushed to a top size of less than 5/8 inch and supplied by CONSOL from its Pittsburgh seam. The fact that 50% of the coal was raw and not pre-cleaned was revealed only after the program was completed. As a result, ASTM D2234 specifications for pre-cleaned coal was used (similar to the May 1994 baseline test program), which call for a minimum of 15 sampling increments of at least two pounds each for a total minimum sample size of 30 pounds to be taken. For the inorganic test period (8/7-9/96), each belt feeder sampler was activated once per hour over a seven to eight-hour period providing 24 increments and a gross sample size of approximately 120 pounds. For gross sample sizes of more than 30 pounds ASTM D2234 allows for the sample to be properly size reduced to 30 pounds, e.g. riffled, before any reduction in the sample top size is necessary. Two sample splits were made on-site using the plant's large rifflers in accordance with ASTM D2013. Coal samples obtained during the organic test period (8/12-13/96) were for ultimate/proximate analysis only and, as such, were not collected as frequently for a total of 12-18 increments.

COAL FLOW MEASUREMENTS. As the coal travels from the coal bunkers to the mills, a gravimetric scale on each mill belt feeder determines the weight of coal that passes over the belt scale section. A digital totalizer on each mill tracks the amount of coal supplied to the mills. Plant personnel, however, revealed that the belt scales have not been providing reliable fuel flow data since they were installed due to an inherent mechanical problem. As a result, an alternate method of calculating the fuel flow rates was performed. Pitot flow rates from the ESP outlet multi-metals and semi-VOST tests were determined to accurately represent flue gas flow rates at this location, and were combined with a calculated EPA Method 19 fuel "F" factor to obtain fuel flow rates.

2.2.2.2 Bottom Ash

Bottom ash from Unit 2 is batch sluiced approximately once per shift and conveyed to a hydrobin where the bottom ash solids are dewatered. The sluice procedure takes about 30 minutes. The liquids used in sluicing are continually recirculated in a closed-loop system that is assumed to be at equilibrium with the bottom ash solids and therefore an insignificant output stream of target trace elements. Solids are periodically emptied from the bottom ash storage silo into a transport truck and dumped at an off-site disposal area for utilization as an anti-skid material. Obtaining a "dry" bottom ash sample prior to the sluicing operation is not possible;

therefore, representative samples were collected from the pile after the bottom ash solids are dumped.

Prior to the start of each day's test activities for the inorganic test period, the bottom ash was sluiced and the solids in the hydrobin emptied. Throughout the test day, the ash was sluiced normally. Following testing, the sluiced bottom ash solids were emptied into the transport truck, dumped at the off-site disposal area, and sampled that day. The bottom ash pile was divided into 14 cross-sections and one 6-7 pound increment shovel full was removed from the center of each cross-section. The entire daily gross sample was sent to the laboratory in two plastic buckets.

BOTTOM ASH FLOW MEASUREMENTS. The total weight of bottom ash generated for each test day was determined by obtaining a tare and final weight of the transport truck. NYSEG and the truck company conducted the weighings.

2.2.2.3 ESP Flyash

The ESP is equipped with eight hoppers. The collected flyash from each hopper is periodically emptied and conveyed to a storage silo. An insitu sampler designed by CONSOL to collect a representative ash sample automatically extracts flyash isokinetically from the main discharge line between the ESP hoppers and storage silo. Prior to the start of each test day, the hoppers were emptied. Throughout the test day, the hoppers were evacuated into the silo in accordance with normal operation.

As hoppers discharge during each inorganic test day, representative flyash sample increments were collected into clean 5-gallon plastic buckets by the extractive sampling system. Following a 45-60 minute sampling interval, the bucket located inside the extractive system was replaced with an empty one. Increment sample sizes varied from 0.5 to 46 pounds depending on hopper discharge cycles. Six to 8 increments were collected over a 6-7 hour test period.

Each increment was size reduced as necessary and combined with the other daily increments. The flyash top size is assumed to be at most -60 mesh so daily samples were riffled according to ASTM D2013 to six 50 gram portions stored in 120 ml glass jars for each test day.

ESP FLYASH FLOW MEASUREMENTS. ESP flyash flow rates were calculated from the EPA Method 5 particulate test results from the ESP inlet and outlet.

2.2.2.4 Limestone Solids

From the limestone pile located outside of the FGD building, conveyor belts transport limestone to day silos that can store up to a 2-day supply of material. Limestone from the day silos are conveyed through belt feeders and dropped into ball mills where it is crushed and combined with reclaim water (gypsum slurry water) to obtain limestone slurry. Storage tanks provide a constant stream of limestone slurry to the absorber modules. Since the same limestone slurry is sent to both Unit 1 and Unit 2's absorbers, no attempt will be made to isolate the limestone solids intended for Unit 2 from those intended for Unit 1.

Samples of the limestone solids were collected from an intermediate pile located near the main limestone pile outside the FGD building. The intermediate pile was formed each day by tractor above a hopper supplying limestone to the day silo conveyor belts. The perimeter of the pile was divided into 24-25 cross-sections and 4-5 pound shovel full increments were removed from the center of each cross-section. The entire daily gross sample was sent to the laboratory in two plastic buckets.

The limestone is considered to be fairly uniform and homogeneous. As a result, the collection of limestone prior to the day silo as opposed to prior to the absorber is not expected to affect the representative nature of the limestone samples.

LIMESTONE SOLID FLOW RATE. Hourly limestone slurry flow rates into the Unit 2 absorber module and percent slurry solids values were averaged over each daily test period from FGD control room data logs. The limestone solids flow rate into the absorber was then calculated by combining the average slurry flow rate and density results.

2.2.2.5 Gypsum Solids

The gypsum slurry leaving the Unit 2 absorber is first treated by the primary hydroclones to separate out the larger particles (gypsum solids) which are dewatered in the centrifuges to produce the gypsum product. After primary hydroclone separation, gypsum water is treated by secondary hydroclones which produce clarified water (clear) consisting of only very fine particles. The clarified water may either return to the limestone ball mills as reclaim water, the absorber module as flushing water, or the FGD blowdown treatment plant as overflow. The medium size particles (untreated limestone) separated by the secondary hydroclones are combined with the gypsum water that was removed by the centrifuges and stored in the filtrate tank as make-up water for the absorber module.

Unit 2 gypsum product is removed from the FGD building by a conveyor to an enclosed building for off-site truck removal. Unit 2 centrifuges produce gypsum in batches every 15 minutes and was isolated from Unit 1's gypsum solids. The gypsum solids contained 14-16% moisture. A plastic scoop was used to collect a complete cross-section of the gypsum solids as they fell from the baskets onto the conveying system. For the first day of the inorganic test period, seven 10-11 pound increments were collected. For the second and third days, only three increments were collected at 24-25 pounds each due to intermittent gypsum solids production. Daily gross sample sizes of 73-74 pounds were coned, quartered and split using a large plastic tarp. Nine to 10 pound daily samples were sent to the laboratory in plastic bags.

GYPSUM SOLIDS FLOW RATE. The gypsum solids flow rate was calculated from the difference between the average flow rate of gypsum slurry entering the centrifuges and that leaving, combined with an average slurry percent solids value. There is no feasible method for ydetermining the amount of solids that are separated with the gypsum water by the centrifuges and sent to the filtrate tank. As a result, this means of calculating a gypsum solids flow rate slightly overestimates gypsum output. Based on a solids mass balance around the FGD process, this overestimation was considered negligible. Centrifuge flow rates and gypsum slurry density values were averaged over each daily test period from FGD control room data logs.

2.2.3 Liquid/Sludge Sample Streams

FGD input and output liquid process streams were sampled in an effort to close the mass balance for targeted water soluble elements. The following process streams are common to the desulfurization of both Unit 1 and Unit 2's flue gas. There was no way to isolate Unit 2 from Unit 1 for these process streams, as a result, flow rates were adjusted proportionally based on net MW output for both units.

2.2.3.1 PWRF Outlet Water

PWRF outlet samples were obtained from a pre-existing tap on the lake discharge line. A 400-ml increment sample was collected into a HDPE sample bottle approximately every hour during the inorganic test period over the course of an eight-hour test window (8 a.m. to 4 p.m.). Increments were combined into a HDPE 1-gallon container and 2-500 ml composites were removed for trace elements and anion analyses. The composite for trace elements was treated with nitric acid to obtain a pH level of 2. Both the metals and anion samples were stored at 4°C. Flow rates for this stream were taken from plant instrumentation.

2.2.3.2 Brine Product

Clarified water from the gypsum slurry secondary hydroclones is sent through a continuous treatment process that removes solids and metal hydroxides prior to being concentrated in a brine concentrator (if operating). The distillate water is recycled back to the

FGD absorber make-up water tank. For this test program, the brine concentrator was not in operation, as a result, samples of the unconcentrated $CaCl_2$ brine product feed water was collected prior to its discharge into the plant's PWRF system. Samples were collected in the same manner as the PWRF outlet water samples during the inorganic test period. Flow rates for this stream were taken from FGD control room data logs.

Daily samples of the treatment additives were also collected during the inorganic test period and archived for future consideration.

2.2.3.3 FGD Blowdown Treatment Heavy Metal Sludge

The solids contained in the clarified water and absorber blowdown streams entering the treatment system are removed by the treatment process and sent to a filter press that produces the heavy metal sludge. The sludge is deposited into a large bin and trucked off-site for landfill disposal. A single filter press operation produces one load of sludge in 4 hours. For this test program, sludge production was set-up to be a continuous operation that produced approximately 6 loads per day. FGD sludge production was suspended after the second day due to operational problems. Sludge samples were extracted from the sludge pile on the mornings of 8/8/96 and 8/9/96 corresponding to sludge produced the day before. Using a 1" PVC pipe approximately 10' long, four to six-inch long core samples were obtained at 4 sample points spaced along the center axis of the pile. Two core samples were taken at each sample point (for a total of eight core samples), first with the PVC pipe oriented vertically and second with the pipe at an angle of approximately 60°. Increment weights ranged from 0.4 to 1 pound based on sludge moisture levels. Increments were combined for a total daily sample size of 3-8 pounds and stored at <4°C before shipping to the laboratory. The sludge bin was emptied before the test program began and then weighed after the second day of sludge production. The flow rate for forty-eight hours of sludge was proportionally corrected to isolate Unit 2 production from Unit 1 based on unit load distribution.

2.2.4 Wastewater Treatment Plant Sample Steams

The heavy metal wastewater treatment plant inlet and outlet streams were sampled to determine the plant's heavy metal removal efficiency. The coal-pile runoff was sampled to determine its contribution to the heavy metals treatment plant inlet stream. Wastewater treatment sludge samples were taken to determine their general composition as a disposal stream. WWTP samples were taken by plant personnel on 9/9/96 and 9/10/96 following the completion of the main test program after heavy rains produced enough coal-pile run-off to bring the treatment plant on-line.

2.2.4.1 **Coal-Pile Runoff**

Coal-pile runoff drains into the first-stage catch basin (coal-pile runoff pond) before being sent to the maintenance cleaning water (MCW) holding pond. Samples of the coal-pile runoff were dipped out of the coal-pile runoff pond in the same manner as the PWRF outlet samples. Coal-pile runoff sent to the MCW basin occurs in batches only when needed, and therefore flow rates for this process stream are meaningless.

2.2.4.2 **Heavy Metal Treatment Plant Inlet/Outlet**

Inlet samples from the MCW holding pond were collected from a tap located on the metals treatment plant inlet line in the same manner as the PWRF outlet water samples.

Outlet samples to the PWRF were collected from the treatment plant outlet weir box in the same manner as the PWRF outlet water samples.

Flow rates for both process streams were obtained from plant data logs.

2.2.4.3 **Wastewater Treatment Sludge**

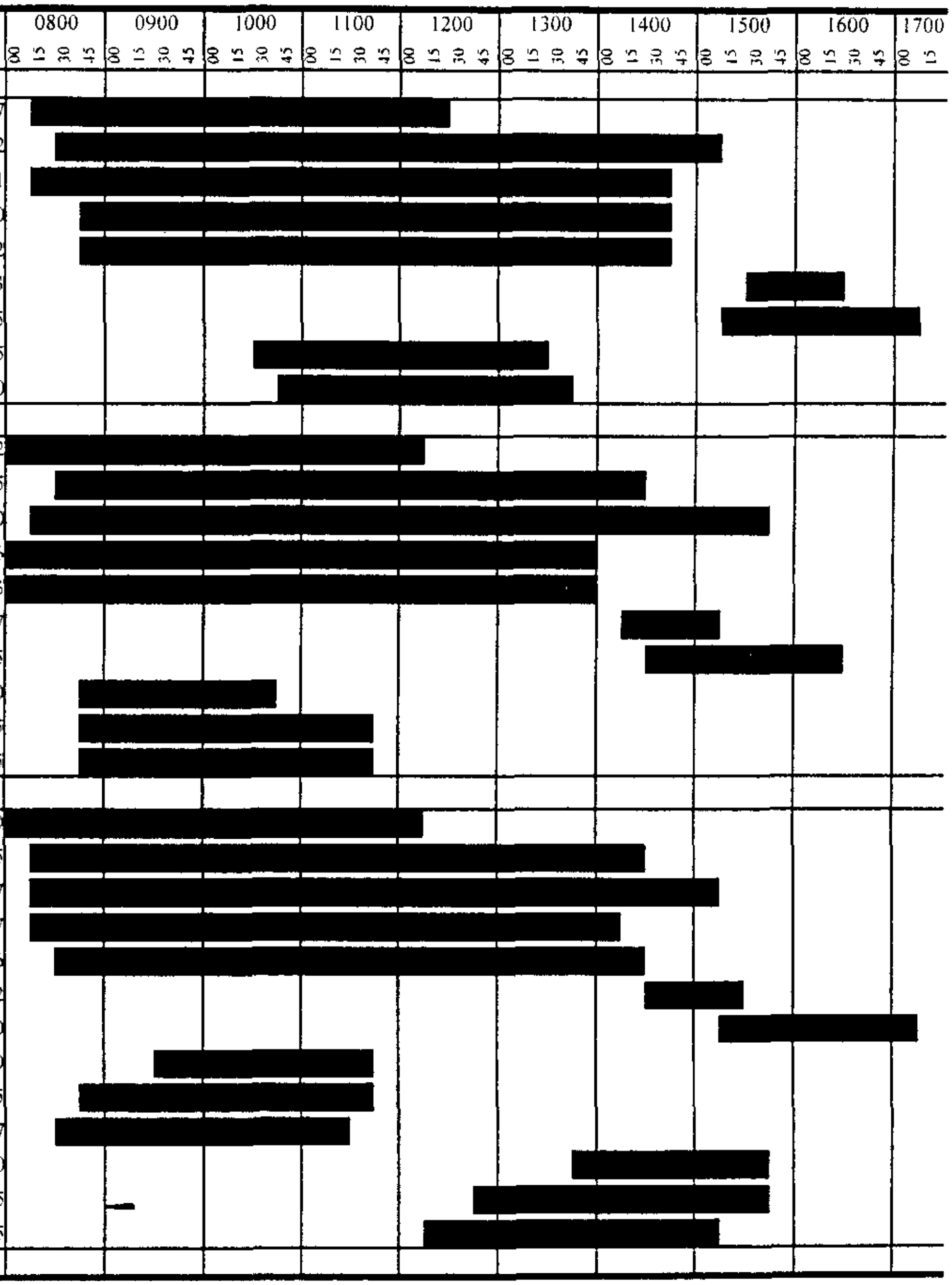
The wastewater treatment sludge is produced by the same filter press as the FGD blowdown sludge. Following treatment of the coal-pile runoff on 9/9/96, the treatment sludge was batch produced on 9/10/96 and sampled in the same manner as the FGD blowdown sludge. No flow rate for this stream was obtained.

2.3 TEST SCHEDULE

The test schedule for the mercury speciation test program is given on Table 2-2. All mercury speciation tests were performed on August 7, 8, and 9, 1996. EPA Method 29 and the Ontario-Hydro sampling trains were operated at the ESP outlet/FGD inlet and FGD outlet/stack locations simultaneously for 360 minutes. The TRIS Buffer sample trains were operated following the completion of the Ontario-Hydro testing. TRIS Buffer sampling was conducted for 120 minutes at the FGD outlet and 60 minutes at the FGD inlet due to higher SO_2 concentrations. The Semtech Hg 2000 analyzer was operated each day of the mercury measurements over time intervals that corresponded to Ontario-Hydro and TRIS Buffer sampling periods. Test 1-MESA-IN performed on August 7th was deemed invalid, so two Frontier Geoscience replicates were performed on August 9th at each location in order to have a complete set of simultaneous data.

TABLE 2-2
TEST SCHEDULE FOR MERCURY SPECIATION TESTING
NYSEG POST-RETROFIT TEST PROGRAM
AUGUST 1996

Test Number	Date	Time
1-MTLS-IN	08/07/96	0817/1227
1-MTLS-OUT	08/07/96	0833/1512
1-MTLS-STK	08/07/96	0817/1441
1-OH-OUT	08/07/96	0840/1440
1-OH-STK	08/07/96	0842/1442
1-TRIS-OUT	08/07/96	1533/1633
1-TRIS-STK	08/07/96	1515/1715
1-MESA-OUT	08/07/96	1025/1325
1-MESA-STK	08/07/96	1050/1350
2-MTLS-IN	08/08/96	0803/1212
2-MTLS-OUT	08/08/96	0822/1435
2-MTLS-STK	08/08/96	0811/1540
2-OH-OUT	08/08/96	0756/1356
2-OH-STK	08/08/96	0753/1353
2-TRIS-OUT	08/08/96	1417/1517
2-TRIS-STK	08/08/96	1425/1625
2-MESA-IN	08/08/96	0840/1040
2-MESA-OUT	08/08/96	0845/1145
2-MESA-STK	08/08/96	0845/1145
3-MTLS-IN	08/09/96	0803/1210
3-MTLS-OUT	08/09/96	0814/1435
3-MTLS-STK	08/09/96	0815/1507
3-OH-OUT	08/09/96	0817/1417
3-OH-STK	08/09/96	0826/1426
3-TRIS-OUT	08/09/96	1432/1532
3-TRIS-STK	08/09/96	1520/1720
3-MESA-IN	08/09/96	0930/1140
3-MESA-OUT	08/09/96	0845/1145
3-MESA-STK	08/09/96	0827/1127
3A-MESA-IN	08/09/96	1340/1540
3A-MESA-OUT	08/09/96	1245/1545
3A-MESA-STK	08/09/96	1215/1515



2.4 PROCESS OPERATION DURING TESTING

Table 2-3 summarizes the process operating conditions for the inorganic and organic test periods. Operation of Unit 2 during this test program was representative of normal daily operation at or near full load. Opacity levels were in compliance and no ESP operating problems were identified. To obtain maximum uniformity and the most representative samples, steady-state process conditions were maintained throughout each test day with variations in unit load, excess oxygen, and ESP power levels well within acceptable tolerances. Prior to each test day, key operating parameters were stabilized, the bottom ash storage silo was emptied, and the ESP hoppers evacuated.

Unit Load. Load on Unit 2 during this test program was steady within an average range of 147-150 net MW. Main steam flows were around 1100 Klb/hr and total FD fan air flows were between 1000-1100 Klb/hr.

Excess Oxygen. The target boiler O_2 level set prior to the test program was 3.8% ± 0.5%, which matches the target oxygen level set during the baseline test program in May 1994. Excess O_2 levels measured during the inorganic test period were steady at the low end of this target range averaging 3.3% each day. For the organic test period, however, Unit 2 was operated at a lower excess oxygen level averaging 2.8%. The reason for 0.5% lower excess O_2 during the second portion of the test program was not made clear to Carnot. May 1994's excess oxygen levels produced only a minimum amount of CO (8-11 ppm). The somewhat higher CO levels expected to be associated with 0.5% lower excess oxygen are not believed to have had a significant impact on hazardous organic emissions.

Sootblowing. Each morning after the unit load was stabilized and prior to the commencement of sampling, sootblowing was performed. During testing the normal sootblowing schedule was adhered to. Sootblowing schedules for this test program can be found in Appendix C.1.

ESP Operation. Unit 2's ESPs were operated at their peak efficiency with all fields in service. ESP power levels are documented in Appendix C.1.

FGD Operation. FGD SO_2 removal rate was maintained within the target range of 90-95% for the test program. The major process systems of the FGD were operated normally.

Unit operation was documented using plant instrumentation data logs. Data from Unit 2's CEM systems located at the ESP outlet/FGD inlet (SO_2, CO and opacity) and FGD outlet/stack (NO_x, SO_2, and CO_2) were also documented. Plant CO_2 measurements were used by Carnot for emission calculations. Unit operating data logs can be found in Appendix C.1. Unit CEMS data can be found in Appendix C.2.

TABLE 2-3
UNIT OPERATING CONDITIONS SUMMARY
NYSEG POST-RETROFIT TEST PROGRAM
AUGUST 1996

Test Period	Date	Time	Gross Output, MW	Net Output, MW	Main Steam Flow, Klb/hr	Feedwater Flow, Klb/hr	Total Air Flow (Fans A/B), Klb/hr	Coal Flow Rate, lb/hr$^{(1)}$	Temperatures, °F			Boiler O_2, %	Opacity, %	Plant CEMS					
									Main Steam	Air-Heater Inlet	Air-Heater Outlet			FGD Inlet		FGD Outlet/Stack			
														SO_2, ppm (raw)	SO_2, lb/hr	SO_2, ppm (raw)	SO_2, lb/hr	SO_2 Rem Eff	NO_X, ppm (raw)
Inorganic Test Period:																			
1	8/7/96	0800/1800	158.6	148.9	1,098	1,044	1,088	114,895	1,004	661	301	3.30	5.81	1,573	5,012	129.4	509.3	89.8%	182.2
2	8/8/96	0800/1800	159.4	149.6	1,105	1,042	1,104	120,199	1,005	662	299	3.29	5.74	1,556	4,989	126.7	502.92	89.9%	194.3
3	8/9/96	0800/1700	158.8	149.1	1,099	1,036	1,101	121,123	1,005	661	295	3.28	5.91	1,605	5,214	107.2	424.83	91.9%	203.1
Organic Test Period:																			
4	8/12/96	0800/1400	157.5	147.7	1,092	1,040	1,039	122,620	1,005	659	296	2.85	6.80	1,588	4,913	93.1	363.67	92.6%	231.0
5	8/12/96	1400/2000	156.6	146.7	1,081	1,012	1,058	120,358	1,005	659	298	2.89	4.99	1,540	4,853	83.1	325.15	93.3%	228.8
6	8/13/96	0800/1900	158.8	149.0	1,100	1,044	1,048	127,694	1,005	658	297	2.76	6.17	1,506	4,674	68.8	267.13	94.3%	240.4

Note
(1) Calculated from Carnot pitot flow rate data and EPA Method 19 F-Factor (reported on an as-received basis)

SECTION 3.0

SAMPLING AND ANALYTICAL METHODS

This section describes the mercury speciation sampling and analytical methods that were used for this test program. Section 3.6 discusses the analytical approach used for total mercury analysis of the solid and FGD liquid/sludge samples. Section 3.7 explains how non-detected values, blank results and uncertainty calculations were handled. Flow charts are presented in appropriate sections when complex analytical procedures for multi-fraction samples require illustration.

Table 3-1 lists the four sample trains that were used to conduct the mercury speciation flue gas sampling portion of the test program. Table 3-2 summarizes the sample train configurations including train materials and impinger contents. For the remainder of this report, "front-half" of the sample train refers to the section of train before and including the filter and any recovery portions from that section, and "back-half" refers to all train components and their recovery rinses downstream of the filter.

A "Method 5" style out-of-stack filtration sampling train was used at all locations. Borosilicate glass nozzles, probes, and filter holders were used for the mercury speciation tests. Six-foot probes were used at the ESP inlet and outlet locations for EPA Method 29. Four-foot probes were used for the single-point tests. At the stack, 12' probes were used for EPA Method 29 and 4' probes for the single-point tests. Teflon sample lines were used to connect the back of the filter holder to the impingers.

3.1 EPA METHOD 29

The back-half of the EPA Method 29 sample train used on this test program to collect volatile metals which passed through the filter consisted of a Teflon sample line followed by a series of six ice-water chilled impingers. Following an empty stub-stem impinger for moisture removal, the next two impingers contained a 5% nitric acid/10% hydrogen peroxide solution, followed by an empty "middle knockout" impinger to prevent the permanganate solution in the fifth impinger from contaminating the nitric acid impingers. The fifth and sixth impingers contained an acidified potassium permanganate solution to collect any mercury that was not removed by the nitric acid impingers.

TABLE 3-1
TEST PROCEDURES FOR MERCURY SPECIATION MEASUREMENTS NYSEG MILLIKEN UNIT 2 POST-RETROFIT TEST PROGRAM

Sample Train	Sampling Method	Species Measured	Isokinetic/ Constant Flow Rate	Test Duration*	Traverse Points
1) Multi-Metals	EPA Method 29	Note(1)	Isokinetic	A1: 240 A2,A3: 360	Full Traverse
2) Frontier Geosciences	MESA	Hg(0), Hg(II), Total Hg	Constant Flow Rate	A1: 120 A2,A3: 180	A1,A2: Multi-Point(2)(3) A3: Single Point
3) TRIS	TRIS Buffer Hg Spec. Train	Hg(0), Hg(II), Total Hg	Isokinetic	A2: 60 A3: 120	Single Point(2)
4) Ontario-Hydro	Ontario-Hydro Hg Spec. Train	Hg(0), Hg(II), Total Hg	Isokinetic	A2,A3: 360	Single Point(2)

Notes: During each test, an O_2 measurement was taken at every sampling point as per EPA 3A via a portable oxygen analyzer. In conjunction with each isokinetic test, velocity and moisture measurements were made according to EPA Methods 2 and 4.

* Key: A1 = ESP Inlet, A2 = ESP Outlet, A3 = Stack

Note:

(1) Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Si, Ti, and V.

(2) Replicates alternated ducts concurrently with opposite ESP location (if applicable).

(3) Each replicate traversed entire sample port.

EPA Method 29 samples were recovered into the following fractions:

1) Particulate filter - Container No. 1
2) Front-half fraction
    - 2a) Acetone rinse and brush - Container No. 2 (ESP inlet samples only)
    - 2b) Nitric acid rinse - Container No. 3
3) Back-half empty and nitric acid/peroxide impingers/rinse - Container No. 4
4) Nitric acid rinse of middle knockout impinger - Container No. 5A
5) Potassium permanganate/sulfuric acid impingers/rinses - Container No. 5B
6) Hydrochloric acid rinse of permanganate impingers - Container No. 5C (combined with Container No. 5B at laboratory).

Analytical procedures for trace element determination were based on EPA Method 29 as illustrated in Figure 3-3. Although not specified in the method, major ash elements were added to the list of trace elements required from the EPA 29 sample train in order to complete their

TABLE 3-2
MERCURY SPECIATION SAMPLE TRAIN CONFIGURATIONS
NYSEG MILLIKEN UNIT 2 POST-RETROFIT TEST PROGRAM

Sample Train	Nozzle	Probe	Filter	Out-of-Stack Filter Holder	Sample Line	Impinger Contents #1	#2	#3	#4	#5
EPA Multi-Metals	BSG	BSG	110 mm Ultrapure quartz fiber	Method 5 BSG, A3:Teflon frit	Teflon	Empty-stub stem	100 ml 5% HNO_3/10% H_2O_2	100 ml 5% HNO_3/10% H_2O_2 #4 Empty	#5: 100 ml 4% $KMnO_4$/10% H_2SO_4	#6: 100 ml 4% $KMnO_4$/10% H_2SO_4 #7:SG
Frontier Geoscience	N/A	Quartz w/quartz wool at tip	Two KCl/soda-lime traps followed by two iodated carbon traps	N/A	Teflon, 1/8"	Silica gel	N/A	N/A	N/A	N/A
Ontario-Hydro	BSG	BSG	110mm Ultrapure Quartz fiber	Method 5 BSG, Teflon frit	Teflon	#1, #2, #3: 100ml 1M KCl	#4: 100ml 5% HNO_3/ 10% H_2O_2	#5: 100ml 5% HNO_3/ 10% H_2O_2	#6, #7, #8: 100ml 4% $KMnO_4$/ 10% H_2SO_4	#9: 300-400g silica gel
TRIS	BSG	BSG	110mm Ultrapure Quartz fiber	Method 5 BSG, Teflon frit	Teflon	150ml 1M TRIS/ 10mM EDTA	150ml 1M TRIS/ 10mM EDTA	150ml 4% $KMnO_4$/ 10% H_2SO_4	150ml 4% $KMnO_4$/ 10% H_2SO_4	300-400g silica gel

Key: BSG = Borosilicate glass N/A = Not applicable material balance.

The front-half rinse is acidified with concentrated nitric acid to a pH of 2. Both the front-half and filter are decomposed separately using a nitric acid/hydrofluoric acid microwave digestion procedure to solubilize inorganic target elements and to remove organic constituents that may create analytic interferences. The empty and nitric acid containing impingers catch/rinse is acidified with concentrated HNO_3 to a pH of 2 then decomposed using a nitric acid/peroxide microwave digestion. Aliquots of the decomposed probe wash, filter and nitric-acid impinger catch rinse are combined to achieve the lowest detection limits possible and analyzed for target elements by either graphite furnace atomic absorption (GFAA), hydride generation atomic absorption (HGAA), or inductively coupled plasma-atomic emission spectroscopy (ICP-AES).

An aliquot of the combined probe wash and filter decomp along with an aliquot taken from the empty and nitric acid containing impinger catch/rinse are digested separately with nitric acid and permanganate and analyzed for mercury by cold vapor atomic absorption spectrophotometry (CVAAS). The middle knockout impinger rinse and the permanganate impinger catch/rinse are decomposed separately with nitric acid and permanganate and analyzed for mercury by CVAAS.

EPA Method 29 trace element results from previously sponsored EPRI and DOE toxic assessment programs for APCD inlet flue gas streams at coal-fired utility stations have shown poor agreement with fuel input and flyash levels. It appears that the generic digestion procedure specified in EPA 29 for the filter and front-half rinse fractions does not adequately solubilize solid-phase inorganic elements contained in large (gram quantity) amounts of particulate. Digesting the solid-portion of the sample train is further complicated when major ash elements are required. Oxides of silicon, aluminum and iron among others contribute 95-100% of Unit 2's flyash total ash content creating a complex refractory matrix. These elements exist in a variety of compounds, a number of which are difficult to solubilize.

To address the limitations of using EPA Method 29 for the ESP inlet samples, the method's recovery and analysis procedures were modified as illustrated in Figure 3-3 by asterisks. Although EPA Method 29 attempts to digest and analyze the entire sample train, when the front-half portion is in gram quantities it should be treated more like a flyash sample. ASTM ash methods allow for representative aliquots to be removed when the sample is less than 50 grams with a top size of -60 mesh or more. This would allow for smaller quantities of ash to be digested differently for different elements as necessary. EPA Method 29's option for obtaining a solid particulate weight from the train's front-half was exercised to correct ash aliquot concentrations to a total train basis. An acetone rinse while brushing was performed on the front-half train components prior to the nitric acid rinse. After placing any loose particulate

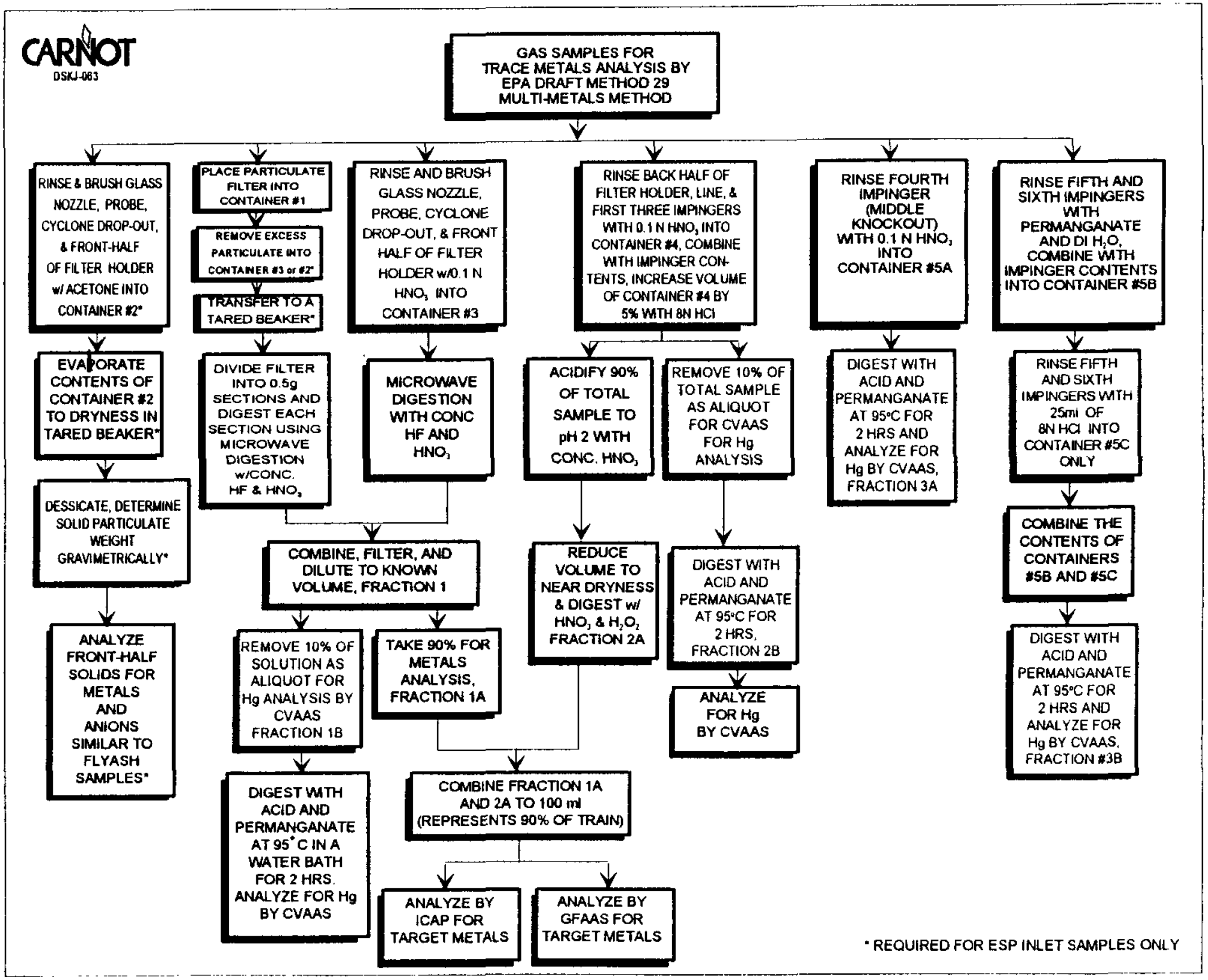


Figure 3-1. EPA Draft Method 29 Multi-Metals Analysis

found on the filter into the acetone front-half rinses (designated as "probe-rinse solids"), they were evaporated at ambient temperature, desiccated and weighed, as necessary, according to EPA Method 5. The evaporated probe-rinse solids were analyzed for trace and major elements after an EPA 29 nitric acid/HF microwave digestion.

The probe-rinse solids, which include the cyclone catch, constituted approximately 99% of the total collected particulate. The filter, containing the remaining 1%, and the other sample fractions were analyzed according to the same standard procedures used for the ESP outlet and stack samples.

Although EPA Method 29 was never intended as a test method for speciating mercury, Hg(0) and Hg(II) results were reported for informational purposes. The Hg(II) results were taken from the nitric acid front-half rinse, nitric acid/peroxide impingers/rinse, and middle knockout rinse sample fraction results. Results from the permanganate/HCl fraction were reported as Hg(0).

Three reagent blanks, one for each inorganic test day, that include the test filter were analyzed along with the flue gas samples. One field blank for the ESP inlet/outlet location and one for the stack location collected prior to the inorganic test period, in addition to two more field blanks (same locations) collected at the end of the inorganic test period to compare with the "clean glass" field blanks, were also analyzed. The "clean glass" field blank collected at the ESP inlet/outlet was inadvertently lost during analysis. One field blank spiked with all target elements (except mercury) was prepared in the field and submitted to the contract laboratory as a normal sample. Analysis of sample spikes and duplicates were performed for each metal species as required by Method 29 for both groups of ESP inlet/outlet and stack samples.

3.2 FRONTIER GEOSCIENCE MESA METHOD

Frontier Geoscience's mercury speciation absorption (MESA) sampling train selected for this test program is based generally on the sampling train and analytical procedures outlined in the Analytical and Sampling Methods for Mercury Speciation in Flue Gases, Nicolas Bloom, February 1993. This sampling train consists of the following components.

- A quartz sample probe with quartz wool at the tip (to trap excess particulates). The probe pre-packed with wool is supplied and recovered by Frontier Geoscience.

- A series of 2 pairs of tandem solid sorbent traps. The first series of traps contains potassium chloride (KCl) impregnated soda lime granules. The second series of traps contain iodated carbon.
- A section of Teflon tubing to connect the outlet of the final sorbent tube to a container of silica gel.
- A vacuum line to connect the outlet of the silica gel container to a control box.
- A control box containing a dry gas meter calibrated to 1-liter-per-minute, a sample pump, a temperature indicator and other components.

The quartz probe, with quartz wool and sorbent traps on opposite ends, was placed inside a borosilicate probe and heated to prevent moisture condensation prior to the traps. Non-isokinetic sampling was performed to determine only gas-phase mercury species. No field blanks (blank train recovery and analysis) were collected. Trip blank samples of the probe with quartz wool and sorbent tubes were retained for analysis.

Frontier Geosciences analyzed the MESA sample trains for elemental mercury or Hg(0), oxidized mercury or Hg(II), and total Hg. It should be noted that this method is still under evaluation and is considered only in a research and development stage. The KCl/soda lime and iodated charcoal traps were analyzed by a cold vapor atomic fluorescence spectroscopy (CVAFS) technique after appropriate sample treatment. The quartz probes and quartz wool were recovered by the lab (separate probe for each test) and analyzed for total Hg by CVAFS.

The analysis of the solid sorbent traps for mercury speciation was performed by closely following Frontier's standard operating procedures. The iodated carbon traps are leached with hot refluxing 7:3 solution of H_2SO_4:HNO_3 and then diluted with 5% (v/v) BrCl solution. An aliquot of the iodated carbon digest is analyzed for Hg(0) by aqueous phase $SnCl_2$ reduction, dual gold trap amalgamation and finally detected by CVAFS. The KCl/soda lime traps are first dissolved in a 5% (v/v) HNO_3/0.3 M citric acid solution. For the analysis of Hg(II) in the HNO_3/citrate digest, an additional 10 ml of HCl is added to the HNO_3:citrate digest to ensure all of the Hg(II) is in solution. Then aliquots of this digest is analyzed for Hg(II) by aqueous phase $SnCl_2$ reduction, dual gold trap amalgamation and finally detected by CVAFS. The analysis of the liquids for total Hg was accomplished by aqueous phase $SnCl_2$ reduction, dual gold amalgamation and CVAFS detection of appropriate sized aliquots.

All standards are ultimately traceable to the lab stock standard for total Hg supplied by the NIST (formerly NBS). Also, where possible, certified standard materials were analyzed along with the samples.

3.3 ONTARIO-HYDRO/TRIS BUFFER MERCURY SPECIATION METHODS

The Ontario-Hydro and TRIS Buffer sampling trains are modifications of EPA Method 29 with the only differences being the number and content of the impingers. For the Ontario-Hydro method, the first three impingers contain a potassium chloride (KCl) solution, the fourth and fifth impingers contain a 10% H_2O_2/5% HNO_3 solution, and the last three impingers contain 4% $KMnO_4$/10% H_2SO_4. For the TRIS Buffer technique, EPA 29's nitric acid/peroxide impinger contents are replaced with a tris(hydroxymethyl) aminomethane buffer solution. Table 3-2 provides the exact sample train configurations for both methods.

Operation of the Ontario-Hydro and TRIS sampling trains followed EPA Method 29 sampling procedures. Both trains were operated at a single-point. The Ontario-Hydro sampling time was six hours to match EPA Method 29's. The TRIS Buffer train was operated for one hour at the ESP outlet and two hours at the stack in order to maintain the pH of the buffer above 6.5. The Ontario-Hydro and TRIS methods were performed simultaneously at both sampling locations and conducted in series.

Samples collected using the Ontario-Hydro method were recovered into the following fractions as shown in Figure 3-2:

1) Particulate filter and ash - Container No. 1
2) Front-half nitric acid rinse - Container No. 2A
3) Back-half nitric acid rinse and potassium chloride impingers and rinses (permanganate, hydrochloric acid, nitric acid) - Container No. 2B (Container 2A was combined with 2B for analysis on the first replicate)
4) Nitric acid/peroxide impingers and rinses (nitric acid) - Container No. 3
5) Permanganate/sulfuric acid impingers and rinses (hydrochloric and nitric acids) - Container No. 4

Samples collected using the TRIS Buffer technique were recovered into the following fractions as shown in Figure 3-3:

1) Particulate filter and ash - Container No. 1
2) Front-half nitric acid rinse - Container No. 2A
3) Back-half nitric acid rinse and TRIS impingers and rinses (TRIS, DI H_20) - Container No. 2B
4) Permanganate/sulfuric acid impingers and rinses (hydrochloric and nitric acids) - Container No. 4

Potassium chloride sample fractions were digested using a potassium persulfate digest procedure. Nitric acid/peroxide sample fractions were preserved with 10% HCl, then combined with potassium permanganate until solution remains purple. At this point, hydroxylamine sulfate was added until the solution becomes clear. TRIS sample fractions are digested with potassium persulfate. Hydroxylamine sulfate is added to the potassium permanganate/sulfuric acid sample fractions until solution turns clear. All liquid sample fractions were then analyzed on-site for mercury by CVAAS.

The particulate filter fraction was HCl/HF microwave digested and analyzed at EERC's University of North Dakota laboratory.

For the Ontario-Hydro method, the KCl fraction results are reported as Hg(II), and the remaining fraction results are reported as Hg(0). For the TRIS Buffer technique, the TRIS impinger results are reported as Hg(II), and the $KMnO_4/H_2SO_4$ impinger results are reported as Hg(0). Any solid-phase mercury found on the filter is reported as total mercury. Any mercury found in the probe rinses for either method was added to the Hg(II) results from the first set of impingers. Mercury levels in the flyash were found to be just under 0.1 ppm. At this concentration, significant levels of solid phase mercury will not be collected on the front-half portions of the FGD inlet and outlet sample trains given such small levels of flue gas particulate. Mercury analyses of the filters from FGD inlet/outlet TRIS, Ontario-Hydro and EPA Method 29 sample trains found little or no mercury. As a result, any significant levels of mercury found in the front-half rinse of the trains was assumed to be Hg(II) that deposited on the probe/filter holder surfaces due to the lower than optimal probe/filter temperatures of approximately 250°F. Hg(II) is much more likely to deposit on front-half glassware surfaces than Hg(0) at this temperature range.

EERC prepared, recovered, and performed the mercury speciation analysis of the Ontario-Hydro and TRIS Buffer sampling trains. Appendix A contains EERC's protocols for sample train recovery, sample preparation, and analysis procedures.

3.4 SEMTECH HG 2000 ANALYZER

EERC provided a Semtech Hg 2000 instrumental analyzer manufactured by Semtech Metallurgy AB, Lund, Sweden for use at the stack location. The analyzer measures elemental Hg or Hg(0) on a real-time continuous basis using a Zeman-shifted ultraviolet sensor. The Semtech's Zeman-shifted detection technology eliminates interference from SO_2 absorption.

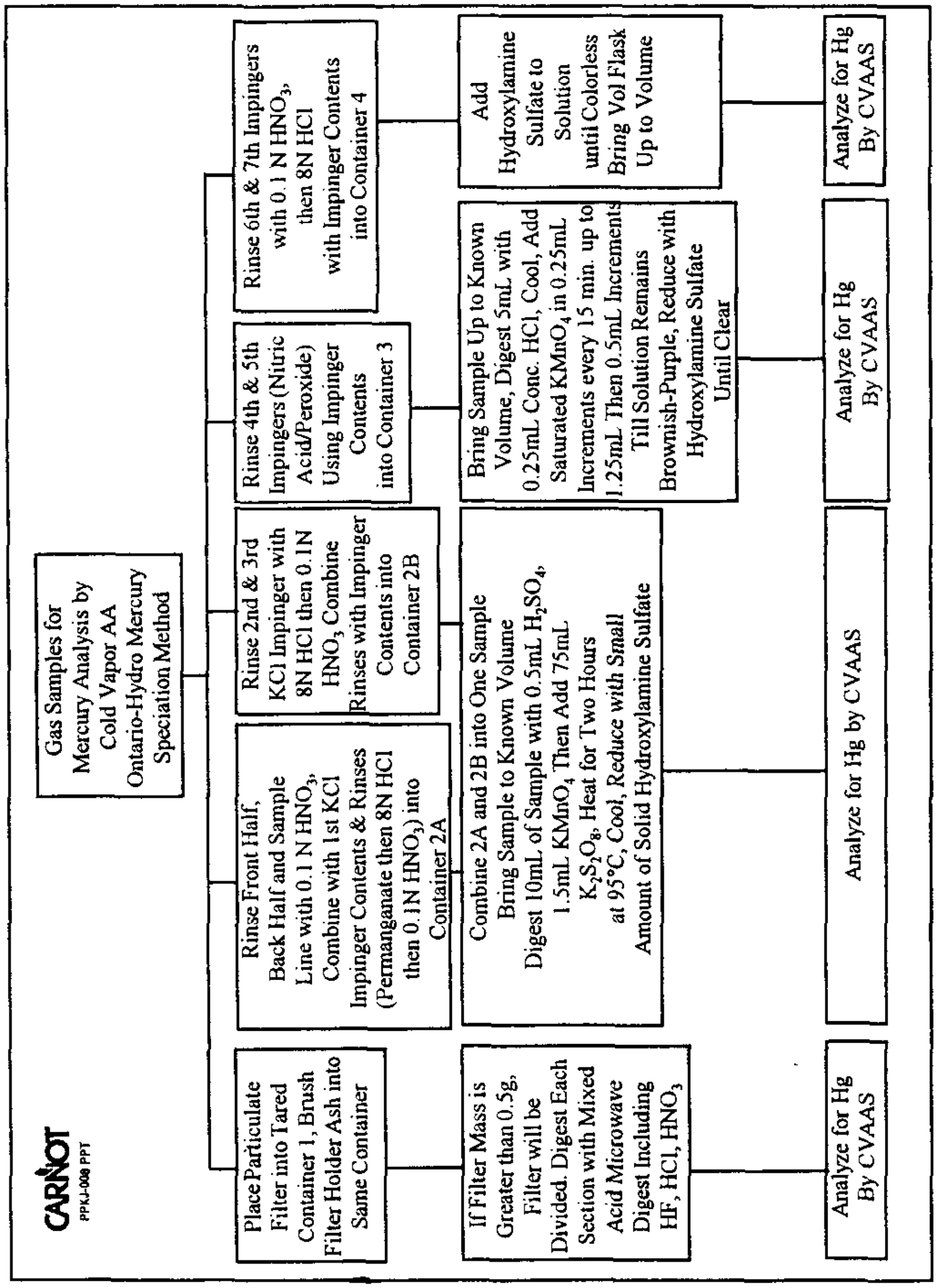


Figure 3-2. Ontario-Hydro Mercury Speciation Analysis

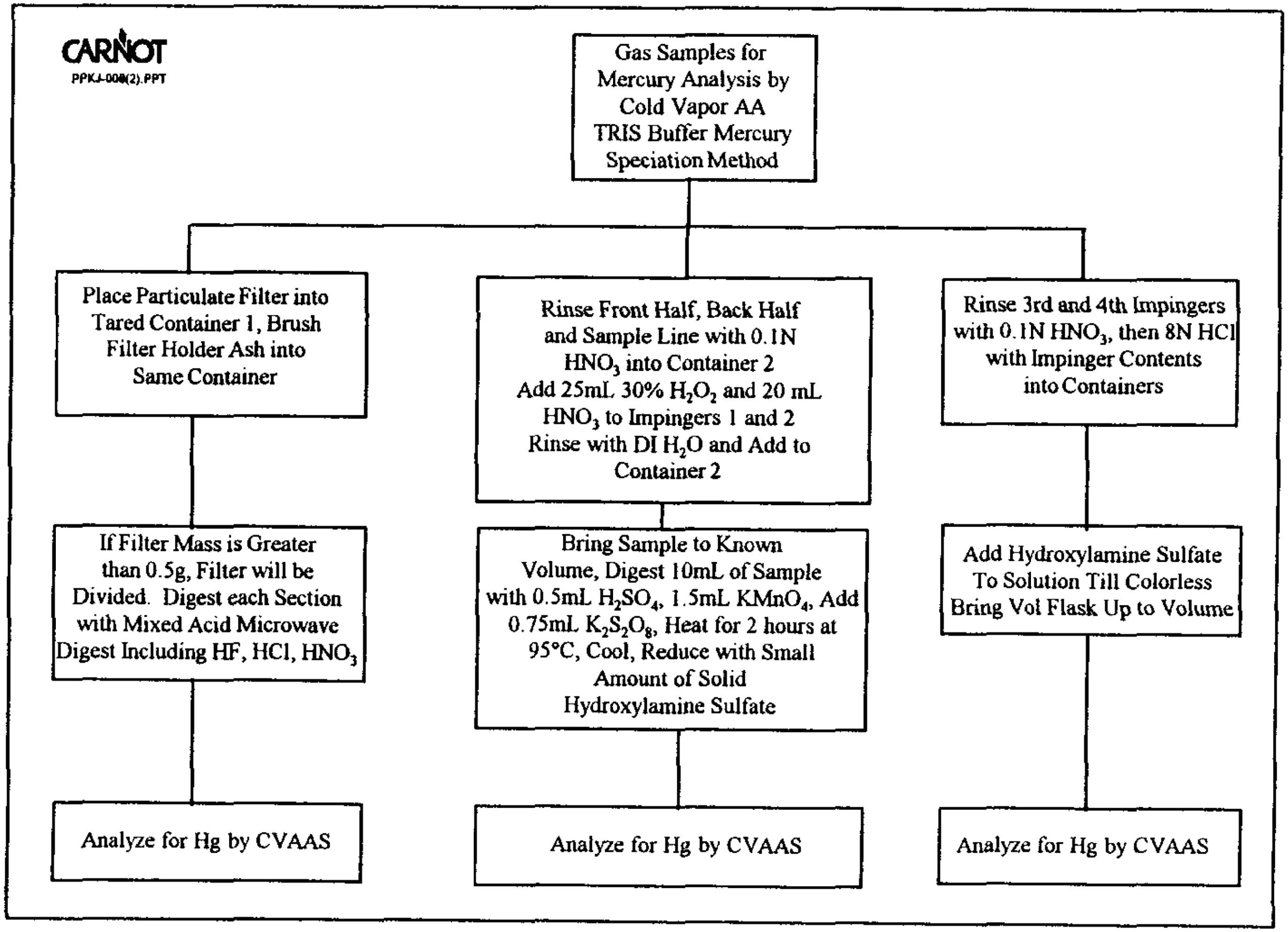


Figure 3-3. TRIS Buffer Mercury Speciation Analysis

A heated glass probe, a teflon sample line, and two ice-chilled TRIS impingers were used to provide dry, Hg(II)-free conditioned flue gas to the analyzer. The Semtech was auto-zeroed and zero-checked on ambient air daily. No span calibrations can be performed. The flow rate to the analyzer was set at approximately 3 L/min and data was logged in 1 minute intervals. Ambient air was used to purge the analyzer between test days. The analyzer was operated each day of the inorganic test period and instrument readings in ug/dscm were averaged over time intervals that corresponded to stack Ontario-Hydro and TRIS Buffer sampling periods.

The Semtech was also operated at the ESP outlet during the second-half of Day 3 (TRIS Buffer sampling period) of the inorganic test period, and for part of the following day; however, the instrument readings were deemed invalid due to detrimental ambient conditions (i.e. high temperature and dust level) at that location that were well beyond the instrument's specifications.

3.5 DILUENT GASES, FLUE GAS VELOCITY, AND MOISTURE

To determine the O_2 levels at each sample location and the integrity of each isokinetic, multi-point test train, a Teledyne portable O_2 analyzer using a paramagnetic cell sampled conditioned flue gas from the outlet of the calibrated orifice on each control box at every sample point. The portable O_2 analyzer's linearity was verified daily using EPA Protocol 1 certified gas standards.

For emission rate calculations, CO_2 levels at the stack were averaged from NYSEG's CEM system for corresponding stack test periods, and then corrected to ESP inlet and outlet test period O_2 values.

Flue gas velocity, moisture and flow rate determinations were performed according to EPA Methods 2 and 4 in conjunction with every full traverse isokinetic test. These methods are described in more detail in Appendix A. For single point tests (i.e. chromium speciation, Frontier Geoscience, Ontario-Hydro, TRIS Buffer, VOST, sulfur oxides, and particle sizing) flow rates for mass emission calculations were taken from corresponding full traverse isokinetic tests.

3.6 PROCESS SAMPLES

Solid samples were analyzed by EERC for total mercury and FGD liquid/sludge samples were analyzed by Zenon Environmental Laboratories for total mercury.

3.6.1 Solid Samples

Coal feed, bottom ash, flyash, limestone solids, and gypsum solids were analyzed for total mercury using EPA SW846-3051 modified for a closed vessel acid digestion and CVAAS. Sulfuric and nitric acids were used to digest the coal, and nitric acid, HF, and HCl were used to digest the ash and FGD solids. EERC has specially developed a complicated solids digestion procedure that consists of several microwave heating, cooling, and venting steps to obtain clear, solubilized solutions.

3.6.2 Liquid/Sludge Samples

FGD liquid/sludge samples were microwave-assisted acid digested according to EPA Methods 3015/3051 and analyzed for mercury by CVAAS.

3.7 TREATMENT OF NON-DETECTS, BLANK VALUES AND UNCERTAINTY CALCULATIONS

This section describes how blank and non-detect values were treated in presenting results in the test report. A description of how uncertainties were calculated concludes this section.

3.7.1 Non-Detects

The discussion presented below explains how averages, sums and reported emission values were calculated for all species given various combinations of detected and non-detected values.

All values detected. The arithmetic average or sum is taken, as appropriate. No special techniques required.

All values below the detection limit. For individual test runs or species, the data is reported as "ND < (detection limit)." For cases where all three runs are below the detection limit, the average is reported as "ND < (average detection limit)."

Some values are detected and some are non-detects. As an approximation, half of the detection limit will be used for non-detect values and the full value for detects. As an example of averaging, an average for three tests runs with results of 10, 8, and ND < 6 would be 7. As an example for summing (such as for anion fractions), individual species values of 5, 8, ND < 1, and ND < 2 would be summed to provide a value of 5+8+0.5+1, or 14.5. In reporting these types of sums or averages, no "<" sign is used. The only exception to this rule occurs when the average is less than the highest detection limit of the non-detected values. In this case, the average is reported as "ND < (the highest detection limit)." For example, 5, ND < 4 and ND < 3 would be reported as "ND < 4." For calculating APCD removal efficiencies when the inlet stream is reported above the detection limit but the outlet is below, a " > " sign is used with the percent removal value.

3.7.2 Blank Subtractions

The following types of blank subtractions were made from each group of sample trains:

EPA Method 29

A reagent blank including the filter was taken each day for a total three reagent blanks and analyzed separately. Average detected values were subtracted from sample results. No mercury was found in any reagent blanks.

Frontier Geoscience

An average value from two trip blanks were subtracted from detected sample results.

Ontario-Hydro/TRIS Bufffer

Daily field blanks taken for each method were subtracted from corresponding daily sample results.

Semtech Hg 2000 Analyzer

Detector and reference zero and span values were adjusted after setting-up the analyzer at the stack location. The analyzer was auto-zeroed and zero-checked on ambient air daily.

3.7.3 Uncertainty Calculations

A 95% confidence interval will be calculated for each average emissions value presented. The interval is expressed as a percentage of the mean. The confidence limits were calculated as follows:

$$\mathit{Uncertainty}\ @\ 95\%\ \mathit{CI},\% = \frac{S_{\bar{x}} * t_{N-1}/\sqrt{N}}{\bar{x}} * 100$$

where:

$\bar{x}$ = Average sample value three replicates;

$S_{\bar{x}}$ = Sample standard deviation;

t_{N-1} = Student "t" factor for a two-tailed distribution at 95% for N-1 degrees of freedom (4.3 for N=3); and

N = Number of replicates or measurements.

Uncertainty calculations assume the population distribution of each measurement is normally distributed and that the samples collected reflect the true population.

SECTION 4.0

MERCURY SPECIATION TEST RESULTS

This section presents the results of the mercury speciation test program performed at NYSEG's Milliken Station Unit 2. More detailed results including laboratory analysis summaries can be found in Appendix C. Support data for total mercury measurements in the solids and liquid/sludge process streams are not contained in this report, but can be found in the main report.

4.1 COMPARISON OF MERCURY SPECIATION RESULTS

Table 4-1 provides a summary of the mercury speciation test results and Table 4-2 summarizes the mass balance results. The following key observations were made in regards to this data:

- Although EPA Method 29 has been validated for total mercury in coal combustion flue gas, it is not an accepted method for mercury speciation. The method possess a high bias associated with measuring Hg(II), and therefore a low bias in measuring Hg(0), when in the presence of high levels of SO_2, which oxidizes the Hg(0) as it passes through the nitric acid/peroxide impingers. The EPA Method 29 data from this test program for the FGD inlet is consistent with this phenomenon.

- Excellent agreement (less than 0.5-0.6 ug/Nm^3 differences) to good agreement (between 0.6-1.0 ug/Nm^3 differences) between the mercury speciation methods performed at the FGD outlet location was seen. Hg(0) results ranged from 2.40-2.94 ug/Nm^3, Hg(II) results ranged from 0.15-0.62 ug/Nm^3, and total mercury results ranged from 2.66-3.29 ug/Nm^3.

- FGD removal efficiencies were consistently between 95-97% for Hg(II) (disregarding EPA Method 29 FGD inlet data) and 60-66% for total mercury.

TABLE 4-1
SUMMARY OF MERCURY SPECIATION TEST RESULTS
NYSEG POST-RETROFIT TEST PROGRAM -- UNIT 2
AUGUST 1996

Mercury Species	**Test Method**	**Emission Results, ug/Nm^3**			**ESP Removal**	**FGD Removal**
		ESP Inlet	**ESP Outlet/ FGD Inlet**	**FGD Outlet**	**Efficiency**	**Efficiency**
Hg(0) - Elemental						
	Frontier Geoscience	2.12	2.66	2.94	--	--
	TRIS Buffer	--	2.70	2.71	--	--
	Ontario-Hydro	--	2.28	2.45	--	--
	Semtech Hg 2000 Analyzer	--	NV	2.70	--	--
	EPA Method 29	**0.80**	**1.49**	**2.40**	--	--
Hg(II) - oxidized						
	Frontier Geoscience	6.93	6.82	0.35	2%	95%
	TRIS Buffer	--	4.46	0.15	--	97%
	Ontario-Hydro	--	5.24	0.21	--	96%
	EPA Method 29	**7.52**	**6.23**	**0.62**	**17%**	**90%**
TOTAL Hg						
	Frontier Geoscience	9.11	9.56	3.29	--	66%
	TRIS Buffer	--	7.16	2.87	--	60%
	Ontario-Hydro	--	7.52	2.66	--	65%
	EPA Method 29	**9.18**	**7.72**	**3.02**	**16%**	**61%**

NV -- not valid. Tests performed at this location were deemed invalid due to detrimental ambient conditions (i.e. temperature and dust level) that were beyond instrument specifications.

TABLE 4-2A
SUMMARY OF TOTAL MERCURY MASS BALANCE RESULTS -- BOILER/ESP
NYSEG POST-RETROFIT TEST PROGRAM -- UNIT 2
AUGUST 1996

Test Method	Mass Balance Results, lb/10^{12}Btu					Boiler/ESP	ESP
	Coal	ESP Inlet	Bottom Ash	Fly Ash	ESP Outlet	Mass Balance(1)	Mass Balance(2)
	7.40		0.01	0.57			
Frontier Geosciences		6.97			7.04	103%	109%
TRIS Buffer		NP			5.22	78%	
Ontario-Hydro		NP			5.58	83%	
EPA Method 29		**6.96**			**5.74**	**85%**	**91%**

Notes:

(1) Boiler/ESP Mass Balance, Output/Input = (Bottom Ash + Flyash + ESP Outlet)/Coal

(2) Mass Balance, ESP = (Flyash + ESP Outlet)/ESP Inlet

TABLE 4-2B
SUMMARY OF TOTAL MERCURY MASS BALANCE RESULTS -- FGD
NYSEG POST-RETROFIT TEST PROGRAM -- UNIT 2
AUGUST 1996

Test Method	Mass Balance Results, lb/10^{12}Btu					FGD
	INPUTS		OUTPUTS			Mass Balance
	FGD Inlet	Limestone	FGD Sludge	Gypsum	FGD Outlet	(Outputs/Inputs)
		0.04	0.30	2.77		
Frontier Geosciences	7.04				2.49	79%
TRIS Buffer	5.22				2.14	99%
Ontario-Hydro	5.58				2.01	90%
EPA Method 29	**5.74**				**2.31**	**93%**

Note: No mercury was detected in FGD liquid streams.

- For the FGD inlet mercury speciation results, excellent agreement can be seen between valid Hg(0) measurements with values ranging between 2.28-2.70 ug/Nm^3. The Frontier Geoscience method yielded Hg(II), and therefore total mercury results, that were 2.0-2.1 ug/Nm^3 higher than average results from other comparable methods. The Frontier Geoscience method has been shown to possess a high bias for Hg(II) when sampling in the presence of high levels of SO_2 from the conversion of Hg(0) on the KCl/soda lime traps. This would mean, however, that Frontier's Hg(0) results should be biased low, which does not appear to be the case.

  TRIS Buffer and Ontario-Hydro values are in good agreement for Hg(II); and TRIS, Ontario-Hydro, and EPA Method 29 are in excellent agreement for total mercury.

- The Frontier Geoscience and EPA Method 29 results for the ESP inlet location matched at 7.0 lb/10^{12}Btu which amounts to 94% of the total mercury found in the coal. These two methods are not expected to match, however, at this location because of the significant levels of solid mercury present, and the fact that the Frontier sample train is not designed to representatively collect it. Solid-phase mercury accounted for approximately 10% of the total mercury found in the EPA Method 29 sample trains, suggesting that the Frontier Geoscience ESP inlet results may be biased high by at least 10%. Agreement between ESP inlet and outlet mercury levels is expected for the Frontier method, which suggests that the ESP outlet results are also biased high be at least 10%. Given this and the excellent agreement among wet chemical ESP outlet mercury levels, it appears that the coal mercury result is also biased high by 10-20%.

- Boiler/ESP mass balance results using Frontier Geoscience, TRIS Buffer, Ontario-Hydro, and EPA Method 29 mercury values yielded 104%, 79%, 84%, and 86% agreement, respectively, between process streams. FGD mass balance results for the same order of methods were 79%, 99%, 90%, and 93%, respectively.

- Excellent FGD mass balance results for the wet chemical mercury speciation methods, and the agreement between all FGD outlet values supports the conclusion that the Frontier Geoscience ESP outlet/FGD inlet and coal mercury levels are biased high by 10-20%.

Daily comparisons of mercury speciation method results are presented in Table 4-3 and illustrated in Figure 4-1 and Figure 4-2. Unit or ESP/FGD operation is not considered a factor in any apparent differences in daily mercury speciation results. In general, mercury speciation results are fairly consistent from day to day. An interesting trend can be seen for the FGD inlet TRIS Buffer and Ontario-Hydro results. For Hg(0) the TRIS method is consistently higher than the Ontario-Hydro with differences ranging from 8.5-24% for an average of 18%; but consistently lower than the Ontario-Hydro method for Hg(II) ranging from 83-88% of Ontario-Hydro values. Since total mercury for both methods agree, there appears to be a bias of some sort associated with one or both of the method's speciation capabilities. SO_2 interferences would be considered a likely candidate for such a bias; however, a similar trend can be seen for the FGD outlet Hg(0) data in which the TRIS Buffer results are 2-23% higher than Ontario-Hydro values (Hg(II) levels measured at the FGD outlet are too low for any comparative conclusions to be drawn).

Appendix C.7 contains the data trend charts for the Semtech Hg analyzer. For Test 1 on 8/7/96, Hg(0) Semtech results averaged 2.3 ug/Nm^3 but ranged between 1 and 5 ug/Nm^3. For Test 2, Semtech results averaged 3.2 ug/Nm^3 but only ranged between 1.5 and 4 ug/Nm^3; and for Test 3 average results were 2.6 ug/Nm^3 and the range was 1.5 to 3.5 ug/Nm^3.

4.2 DETAILED MERCURY SPECIATION METHOD RESULTS

The following tables present detailed mercury speciation test results for each method:

Table 4-4:	EPA Method 29 Mercury Emission Results
Table 4-5:	Frontier Geoscience Mercury Speciation Test Results -- ESP Inlet
Table 4-6:	Frontier Geoscience Mercury Speciation Test Results -- ESP Outlet
Table 4-7:	Frontier Geoscience Mercury Speciation Test Results -- Stack
Table 4-8:	TRIS Buffer and Ontario-Hydro Mercury Speciation Test Results -- ESP Outlet/FGD Inlet
Table 4-9:	TRIS Buffer and Ontario-Hydro Mercury Speciation Test Results -- FGD Outlet/Stack
Table 4-10:	Semtech Hg 2000 Analyzer Test Results

For almost all sets of mercury speciation measurements, agreement between replicates for the EPA Method 29, Frontier Geoscience, TRIS Buffer, and Ontario-Hydro methods was excellent (95% CI uncertainties of less than 50%) when emission levels were measured above 0.5 ug/Nm^3. Poor agreement (uncertainties above 150%) was seen for Frontier Geoscience

TABLE 4-3
DAILY COMPARISONS OF MERCURY SPECIATION RESULTS
NYSEG POST-RETROFIT TEST PROGRAM
AUGUST 1996

Parameter	Mercury Speciation Result, ug/Nm^3							
	Test 1, 8/7/96		Test 2, 8/8/96		Test 3, 8/9/96		Average	
	FGD Inlet	FGD Outlet	FGD Inlet	FGD Outlet	FGD Inlet	FGD Outlet	FGD Inlet	FGD Outlet
Hg(0) - Elemental								
Frontier Geoscience	NA(1)	2.79	1.49	2.88	3.25(3)	3.05(3)	2.66	2.94
TRIS Buffer	2.17	2.51	2.69	2.90	3.24	2.73	2.70	2.71
Ontario-Hydro	2.00	2.33	2.25	2.35	2.60	2.68	2.28	2.45
Semtech Hg 2000 Analyzer	NA(2)	2.34	NA(2)	3.12	NA(2)	2.63	NA	2.70
EPA Method 29	**1.06**	**2.27**	**1.66**	**2.69**	**1.75**	**2.23**	**1.49**	**2.40**
Hg(II) - Oxidized								
Frontier Geoscience	NA(1)	0.27	8.37	0.40	6.05(3)	0.36(3)	6.82	0.35
TRIS Buffer	4.64	0.18	4.71	0.23	4.03	0.03	4.46	0.15
Ontario-Hydro	5.25	0.31	5.59	0.16	4.88	0.16	5.24	0.21
EPA Method 29	**5.86**	**0.46**	**7.21**	**0.56**	**5.63**	**0.83**	**6.23**	**0.62**
TOTAL Hg								
Frontier Geoscience	NA(1)	3.06	9.87	3.29	9.37(3)	3.41(3)	9.56	3.29
TRIS Buffer	6.81	2.69	7.40	3.14	7.27	2.76	7.16	2.87
Ontario-Hydro	7.25	2.63	7.84	2.51	7.48	2.84	7.52	2.66
EPA Method 29	**6.92**	**2.74**	**8.86**	**3.25**	**7.38**	**3.07**	**7.72**	**3.02**

NA -- data not available

Notes:

(1) Test run invalid due to low mercury levels reported by the laboratory.

(2) Semtech tests performed at this location were deemed invalid due to detrimental ambient conditions.

(3) Results presented are an average of two sample runs performed on this day.

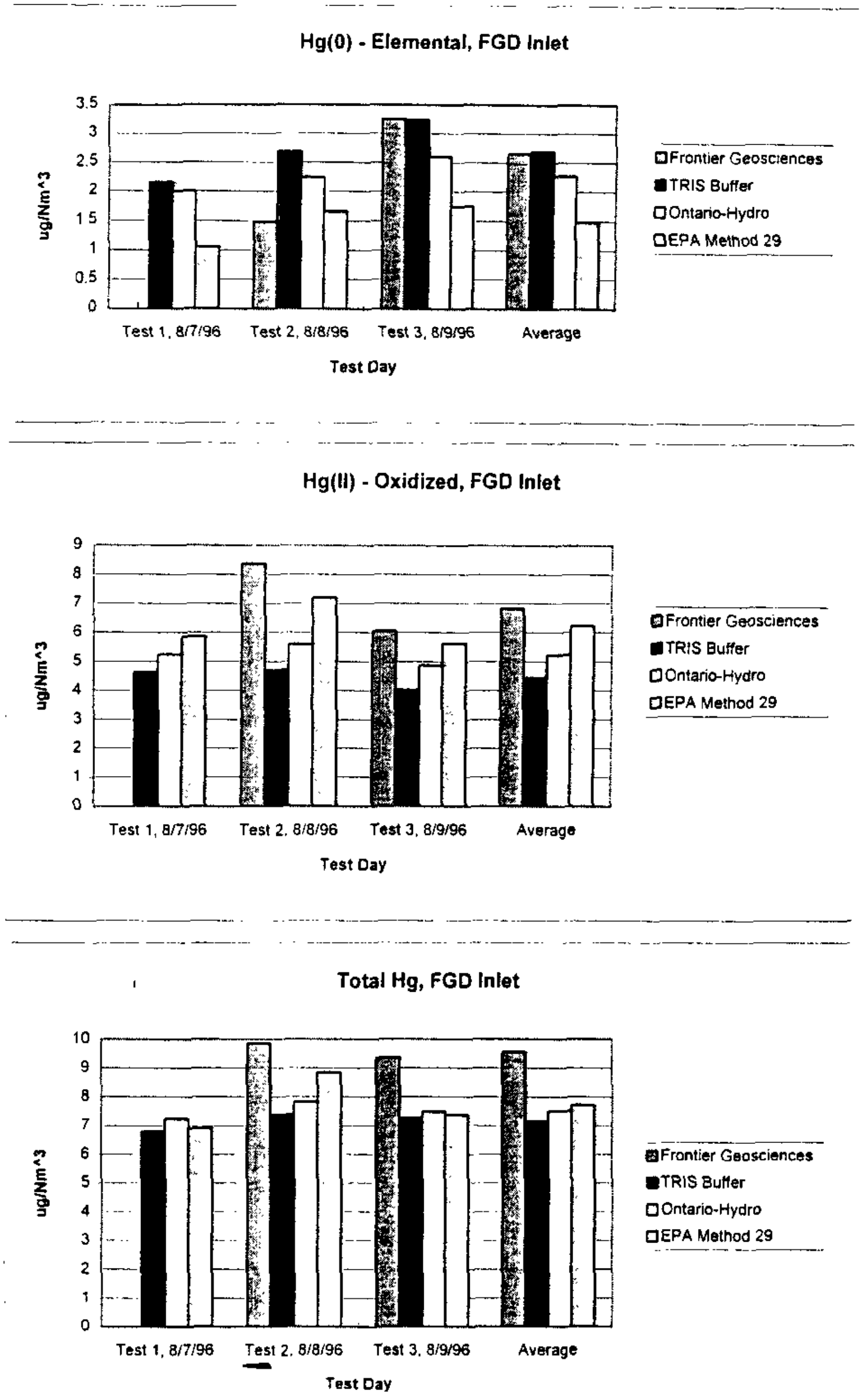


Figure 4-1. Comparison of Daily Mercury Speciation Method Results for FGD Inlet

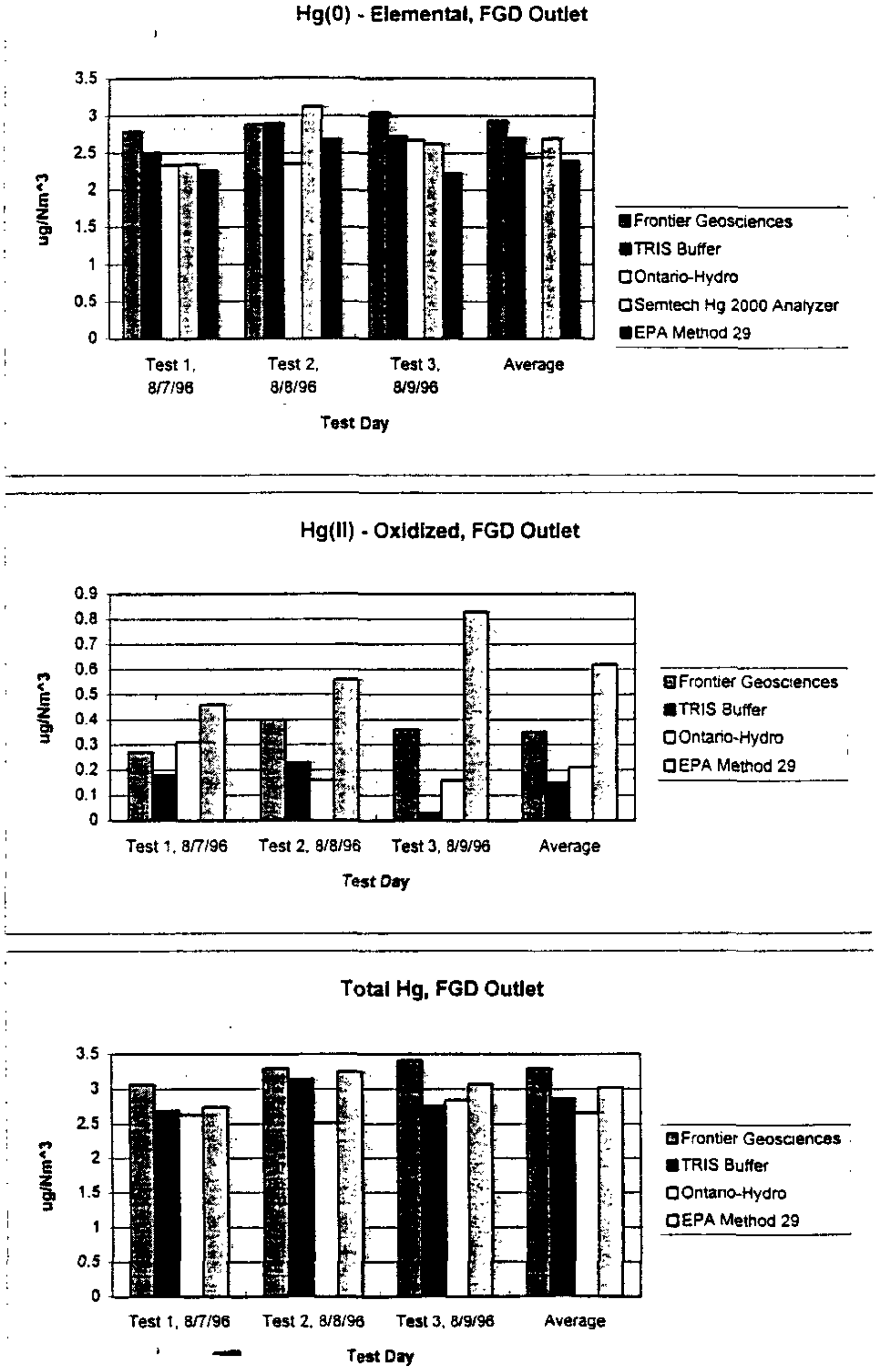


Figure 4-2. Comparison of Daily Mercury Speciation Method Results for FGD Outlet

replicate results for Hg(0) at the ESP inlet and ESP outlet/FGD inlet locations, which could be due to the high levels of SO_2 present at these locations.

4.3 MERCURY SPECIATION METHODS QUALITY ASSURANCE/QUALITY CONTROL DATA

Tables 4-11 and 4-12 present the quality assurance/quality control results for EPA Method 29, Frontier Geoscience, TRIS Buffer, and Ontario-Hydro test methods.

No significant levels of mercury were found in any of the method's trip, reagent or field blanks.

TABLE 4-4
EPA METHOD 29 MERCURY EMISSION RESULTS
NYSEG POST-RETROFIT TEST PROGRAM
AUGUST 1996

Parameter	ESP INLET				ESP OUTLET/FGD INLET				FGD OUTLET/STACK			
	1-MTLS-IN	2-MTLS-IN	3-MTLS-IN	AVERAGE	1-MTLS-OUT	2-MTLS-OUT	3-MTLS-OUT	AVERAGE	1-MTLS-STK	2-MTLS-STK	3-MTLS-STK	AVERAGE
Date	8/7/96	8/8/96	8/9/96		8/7/96	8/8/96	8/9/96		8/7/96	8/8/96	8/9/96	
Pitot Flow Rate, dscfm	325,318	340,247	327,659	331,075	323,354	331,647	330,081	328,361	358,667	358,779	362,692	360,046
Sample Volume, dscf	137.91	144.70	135.15	139.25	221.74	219.80	216.78	219.44	241.79	253.28	254.55	249.87
Fuel Factor, dscf/10^6Btu	13,106	12,740	13,355	13,067	12,920	12,740	12,723	12,794	13,157	13,088	13,328	13,191
O_2, %	5.60	5.10	5.79	5.50	5.38	5.10	5.04	5.17	5.66	5.52	5.76	5.65
CO_2, %	13.86	13.94	13.64	13.81	14.06	13.94	14.32	14.11	13.81	13.57	13.67	13.68
H_2O, %	8.5	8.7	8.5	8.6	8.3	8.4	8.1	8.3	14.4	14.8	14.3	14.5
Elemental Mercury -- Hg(0)												
ug/Nm^3	0.80	0.76	0.84	0.80	1.06	1.66	1.75	1.49	2.27	2.69	2.23	2.40
lb/hr	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.003	0.003
lb/10^{12}Btu	*0.61*	*0.56*	*0.65*	*0.61*	*0.80*	*1.23*	*1.29*	*1.10*	*1.74*	*2.05*	*1.73*	*1.84*
Oxidized Mercury -- Hg(II)												
ug/Nm^3	7.33	8.41	6.82	7.52	5.86	7.21	5.63	6.23	0.46	0.56	0.83	0.62
lb/hr	0.008	0.010	0.008	0.009	0.007	0.008	0.006	0.007	0.001	0.001	0.001	0.001
lb/10^{12}Btu	5.59	6.22	5.29	5.70	4.40	5.34	4.16	4.63	0.36	0.43	0.64	0.47
Total Mercury												
ug/Nm^3	**9.04**	**10.06**	**8.44**	**9.18**	**6.92**	**8.86**	**7.38**	**7.72**	**2.74**	**3.25**	**3.07**	**3.02**
lb/hr	**0.010**	**0.012**	**0.010**	**0.011**	**0.008**	**0.010**	**0.008**	**0.009**	**0.003**	**0.004**	**0.004**	**0.004**
lb/10^{12}Btu	**6.88**	**7.45**	**6.55**	**6.96**	**5.20**	**6.56**	**5.46**	**5.74**	**2.09**	**2.47**	**2.38**	**2.31**
Mercury Removal Efficiency					**23.4%**	**11.9%**	**12.6%**	**15.9%**	**60.4%**	**63.3%**	**58.4%**	**60.9%**
Uncertainty @ 95% CI				22.1%				32.7%				21.4%
Uncertainty @ 95% CI, ug/Nm^3				*2.02*				*2.52*				*0.65*

TABLE 4-5
FRONTIER GEOSCIENCE MERCURY SPECIATION TEST RESULTS
NYSEG POST-RETROFIT TEST PROGRAM -- ESP INLET
AUGUST 1996

Test Number	2-MESA-IN	3-MESA-IN	3A-MESA-IN	AVERAGE			Uncertainty @95%CI	
Date	8/8/96	8/9/96	8/9/96					
Pitot Flow Rate, dscfm	340,247	327,659	329,486					
Sample Volume, dscf	1.64	1.71	1.97					
Fuel Factor, dscf/10^6Btu	13,628	13,019	12,877					
O_2, %	6.13	5.40	5.23					
CO_2,%	12.93	13.64	13.75					
Element	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**lb/hr**	**lb/10^{12}Btu**		**ug/Nm^3**
Hg(0) - elemental	1.62	3.75	0.98	2.12	0.002	1.62	170%	3.59
Hg(II) - oxidized	7.03	6.15	7.62	6.93	0.008	5.31	26%	1.83
Hg(tot) - Quartz Wool Plug	0.08	0.08	0.01	0.06	6.7E-05	0.04	186%	0.11
Total Hg	**8.74**	**9.98**	**8.61**	**9.11**	**0.011**	**6.97**	21%	1.87

Note: The sample from test 1-MESA-IN performed on 8/7/96 was lost after the test was completed.

TABLE 4-6
FRONTIER GEOSCIENCE MERCURY SPECIATION TEST RESULTS
NYSEG POST-RETROFIT TEST PROGRAM -- ESP OUTLET
AUGUST 1996

Test Number	2-MESA-OUT	3-MESA-OUT	3A-MESA-OUT				Uncertainty	
Date	8/8/96	8/9/96	8/9/96	AVERAGE			@95%CI	
Pitot Flow Rate, dscfm	331,647	330,081	330,081					
Sample Volume, dscf	2.77	2.78	2.76					
Fuel Factor, dscf/10^6Btu	12,936	12,952	12,119					
O_2, %	5.34	5.32	4.25					
CO_2,%	13.62	13.71	14.61					
Element	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**lb/hr**	**lb/10^{12}Btu**		**ug/Nm^3**
Hg(0) - elemental	1.49	2.04	4.47	2.66	0.003	1.93	148%	3.94
Hg(II) - oxidized	8.37	7.05	5.06	6.82	0.008	5.05	61%	4.14
Hg(tot) - Quartz Wool Plug	0.01	0.14	ND	0.07	8.4E-05	0.06	264%	0.19
Total Hg	**9.87**	**9.22**	**9.52**	**9.56**	**0.011**	**7.04**	8%	0.80

ND -- mercury not detected above trip blank level in sample fraction (treated as zero).

Note: Test 1-MESA-OUT performed on 8/7/96 was deemed invalid due to the low mercury levels reported by the laboratory.

TABLE 4-7
FRONTIER GEOSCIENCE MERCURY SPECIATION TEST RESULTS
NYSEG POST-RETROFIT TEST PROGRAM -- STACK
AUGUST 1996

Test Number	1-MESA-STK	2-MESA-STK	3-MESA-STK	3A-MESA-STK				Uncertainty	
Date	8/7/96	8/8/96	8/9/96	8/9/96	AVERAGE			@95%CI	
Pitot Flow Rate, dscfm	358,667	358,779	362,692	362,692					
Sample Volume, dscf	1.80	1.67	3.23	2.86					
Fuel Factor, dscf/10^{6}Btu	13,131	12,928	12,977	12,960					
O_2, %	5.63	5.33	5.35	5.33					
CO_2,%	13.86	13.63	13.68	13.66					
Element	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**lb/hr**	**lb/10^{12}Btu**		**ug/Nm^3**
Hg(0) - elemental	2.79	2.88	3.19	2.91	2.94	0.004	2.22	9%	0.27
Hg(II) - oxidized	0.27	0.40	0.45	0.27	0.35	0.0004	0.26	42%	0.15
Hg(tot) - Quartz Wool Plug	NP	0.003	0.003	0.001	0.003	3.3E-06	0.002	121%	0.00
Total Hg	**3.06**	**3.29**	**3.64**	**3.18**	**3.29**	**0.004**	**2.49**	12%	0.39

NP -- analysis not performed

TABLE 4-8
TRIS BUFFER AND ONTARIO-HYDRO MERCURY SPECIATION TEST RESULTS NYSEG POST RETROFIT TEST PROGRAM -- FGD INLET AUGUST 1996

	TRIS BUFFER							
Test Number	1-TRIS-OUT	2-TRIS-OUT	3-TRIS-OUT	AVERAGE			Uncertainty	
Date	8/7/96	8/8/96	8/9/96				@95%CI	
Pitot Flow Rate, dscfm	323,354	331,647	330,081					
Sample Volume, dscf	35.83	39.46	39.22					
Fuel Factor, dscf/10^6Btu	12,355	12,821	12,433					
O_2, %	4.67	5.20	4.67					
CO_2,%	14.56	13.44	14.13					
Element	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**lb/hr**	**lb/10^{12}Btu**		**ug/Nm^3**
Hg(0) - elemental	2.17	2.69	3.24	2.70	0.003	1.97	49%	1.33
Hg(II) - oxidized	4.64	4.71	4.03	4.46	0.005	3.25	21%	0.92
Hg(tot) - filter	0.001	0.006	ND	0.002	2.6E-06	0.002	--	--
Hg (total)	**6.81**	**7.40**	**7.27**	**7.16**	**0.008**	**5.22**	11%	0.77

	ONTARIO-HYDRO							
Test Number	1-ONT-OUT	2-ONT-OUT	3-ONT-OUT	AVERAGE			Uncertainty	
Date	8/7/96	8/8/96	8/9/96				@95%CI	
Pitot Flow Rate, dscfm	323,354	331,647	330,081					
Sample Volume, dscf	261.06	224.41	209.72					
Fuel Factor, dscf/10^6Btu	12,532	12,837	12,739					
O_2, %	4.90	5.28	5.16					
CO_2,%	14.47	13.63	13.83					
Element	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**lb/hr**	**lb/10^{12}Btu**		**ug/Nm^3**
Hg(0) - elemental	2.00	2.25	2.60	2.28	0.003	1.69	33%	0.75
Hg(II) - oxidized	5.25	5.59	4.88	5.24	0.006	3.88	17%	0.87
Hg(tot) - filter	ND	0.0008	ND	0.0003	3.3E-07	0.0002	--	--
Hg (total)	**7.25**	**7.84**	**7.48**	**7.52**	**0.009**	**5.58**	10%	0.73

ND -- mercury not detected in fraction (treated as zero).

TABLE 4-9
TRIS BUFFER AND ONTARIO-HYDRO MERCURY SPECIATION TEST RESULTS
NYSEG POST RETROFIT TEST PROGRAM -- FGD OUTLET
AUGUST 1996

	TRIS BUFFER							
Test Number	1-TRIS-STK	2-TRIS-STK	3-TRIS-STK	AVERAGE			Uncertainty @95%CI	
Date	8/7/96	8/8/96	8/9/96					
Pitot Flow Rate, dscfm	358,667	358,779	362,692					
Sample Volume, dscf	71.83	73.71	73.58					
Fuel Factor, dscf/10^{6}Btu	12,953	12,780	12,877					
O_2, %	5.42	5.15	5.23					
CO_2,%	13.89	13.48	13.64					
Element	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**lb/hr**	**lb/10^{12}Btu**		**ug/Nm^3**
Hg(0) - elemental	2.51	2.90	2.73	2.71	0.003	2.03	18%	0.50
Hg(II) - oxidized	0.18	0.23	0.03	0.15	0.0002	0.11	175%	0.26
Hg(tot) - filter	0.005	0.003	0.004	0.004	4.8E-06	0.003	190%	0.00
Hg (total)	**2.69**	**3.14**	**2.76**	**2.87**	**0.004**	**2.14**	21%	0.59

	ONTARIO-HYDRO							
Test Number	1-ONT-STK	2-ONT-STK	3-ONT-STK	AVERAGE			Uncertainty @95%CI	
Date	8/7/96	8/8/96	8/9/96					
Pitot Flow Rate, dscfm	358,667	358,779	362,692					
Sample Volume, dscf	215.77	224.11	225.28					
Fuel Factor, dscf/10^{6}Btu	13,114	12,862	12,870					
O_2, %	5.61	5.31	5.32					
CO_2,%	13.83	13.60	13.69					
Element	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**ug/Nm^3**	**lb/hr**	**lb/10^{12}Btu**		**ug/Nm^3**
Hg(0) - elemental	2.33	2.35	2.68	2.45	0.003	1.85	20%	0.50
Hg(II) - oxidized	0.31	0.16	0.16	0.21	0.0003	0.16	101%	0.21
Hg(tot) - filter	ND	0.0010	0.0017	0.0009	1.1E-06	0.0007	--	--
Hg (total)	**2.63**	**2.51**	**2.84**	**2.66**	**0.003**	**2.01**	15%	0.41

ND -- mercury not detected in fraction (treated as zero).

TABLE 4-10
SEMTECH HG 2000 ANALYZER TEST RESULTS
NYSEG POST-RETROFIT TEST PROGRAM -- UNIT 2
AUGUST 1996

	Semtech Hg Analyzer Results		
Test Period	Ontario-Hydro	TRIS Buffer	Average
<u>Test 1, 8/7/96</u>			
Hg(0) - Elemental, ug/dscm	1.86	2.50	2.18
Hg(0) - Elemental, ug/Nm^3	2.00	2.68	2.34
<u>Test 2, 8/8/96</u>			
Hg(0) - Elemental, ug/dscm	2.73	3.08	2.91
Hg(0) - Elemental, ug/Nm^3	2.93	3.31	3.12
<u>Test 3, 8/9/96</u>			
Hg(0) - Elemental, ug/dscm	2.45	NA	2.45
Hg(0) - Elemental, ug/Nm^3	2.63	--	2.63
<u>Averages</u>			
Hg(0) - Elemental, ug/dscm	**2.35**	**2.79**	**2.51**
Hg(0) - Elemental, ug/Nm^3	**2.52**	**2.99**	**2.70**

NA -- data not available for this test period.

TABLE 4-11
QUALITY ASSURANCE/QUALITY CONTROL RESULTS EPA METHOD 29 AND FRONTIER GEOSCIENCE METHODS

Test Number	Train Fraction	Matrix Spike Analysis		Duplicate Analysis		
		Matrix Spike Recovery, %	Matrix Spike Duplicate Recovery, %	First Run	Second Run	Relative Difference, %
				ug/fraction		
1-MTLS-OUT	Front-Half	110	110	ND(0.090)	ND(0.090)	NC
	Back-Half	90	89	29	30	3.4
	MKO	85	85	4.8	4.7	2.1
	$KMnO_4$/HCl	100	100	6.3	6.1	
1-MTLS-STK	Front-Half	120	120	ND(0.030)	ND(0.030)	NC
	Back-Half	100	110	2.9	2.9	0.0
	MKO	110	100	0.056	0.046	19.6
	$KMnO_4$/HCl	100	100	15	14	6.9
MESA	Hg(0)	108	101	--	--	124
	Hg(II)	97	107	--	--	4.6

TABLE 4-12
QUALITY ASSURANCE/QUALITY CONTROL RESULTS
TRIS BUFFER AND ONTARIO-HYDRO METHODS

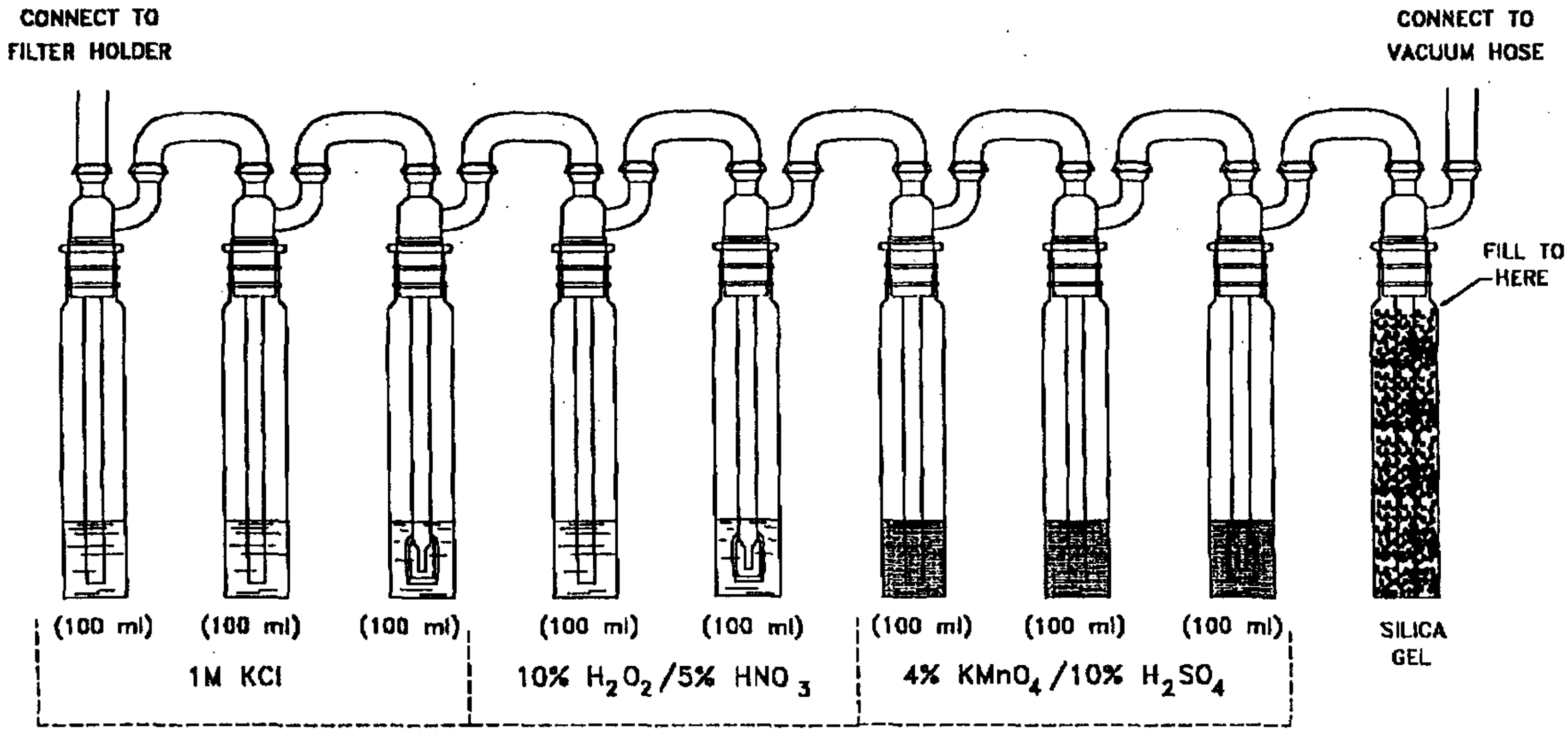
Test Number	Fraction	Spike Result	Spike Level	Spike Recovery, %
		ug/L		
DAY 1 -- 8/7/96				
TRIS-FB-SPK-1	TRIS	9.7	10	97
	KMnO4	9.8	10	98
OH-FB-SPK-1	KCl	9.8	10	98
	H2O2	9.6	10	96
	KMnO4	9.5	10	95
DAY 2 -- 8/8/96				
TRIS-FB-SPK-2	TRIS	9.5	10	95
	KMnO4	10.0	10	100
OH-FB-SPK-2	KCl	9.9	10	99
	H2O2	8.4	10	84
	KMnO4	9.8	10	98
DAY 3 -- 8/9/96				
TRIS-FB-SPK-3	TRIS	10.5	10	105
	KMnO4	9.1	10	91
OH-FB-SPK-3	KCl	9.9	10	99
	H2O2	9.2	10	92
	KMnO4	9.3	10	93

APPENDIX A

EERC ONTARIO-HYDRO AND TRIS BUFFER MERCURY SPECIATION METHODS ANALYTICAL PLAN

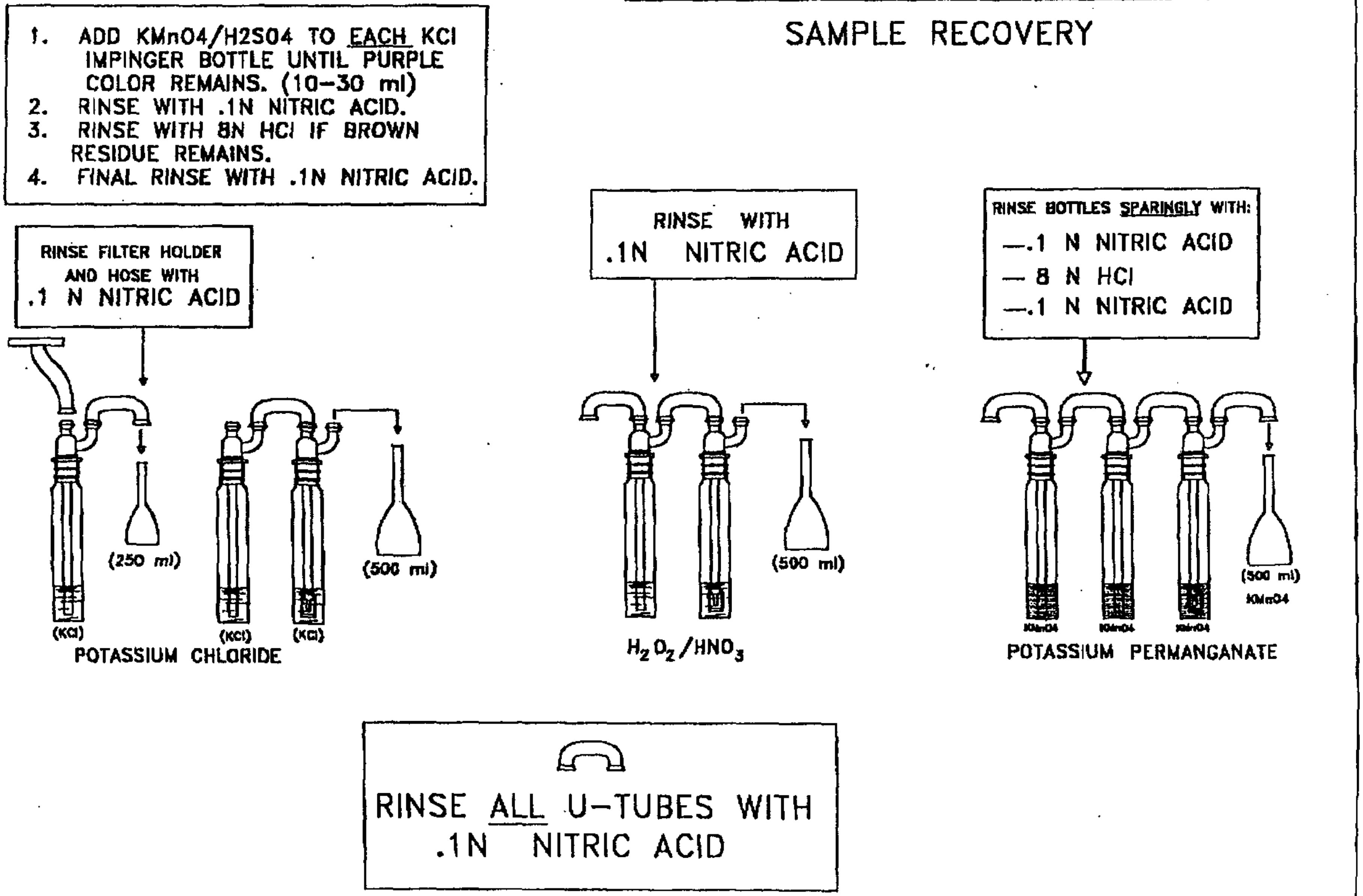
ONTARIO-HYDRO METHOD

TRAIN ASSEMBLY



ONTARIO–HYDRO METHOD

SAMPLE RECOVERY



1. ADD KMnO4/H2SO4 TO EACH KCl IMPINGER BOTTLE UNTIL PURPLE COLOR REMAINS. (10–30 ml)
2. RINSE WITH .1N NITRIC ACID.
3. RINSE WITH 8N HCl IF BROWN RESIDUE REMAINS.
4. FINAL RINSE WITH .1N NITRIC ACID.

RINSE FILTER HOLDER AND HOSE WITH .1 N NITRIC ACID

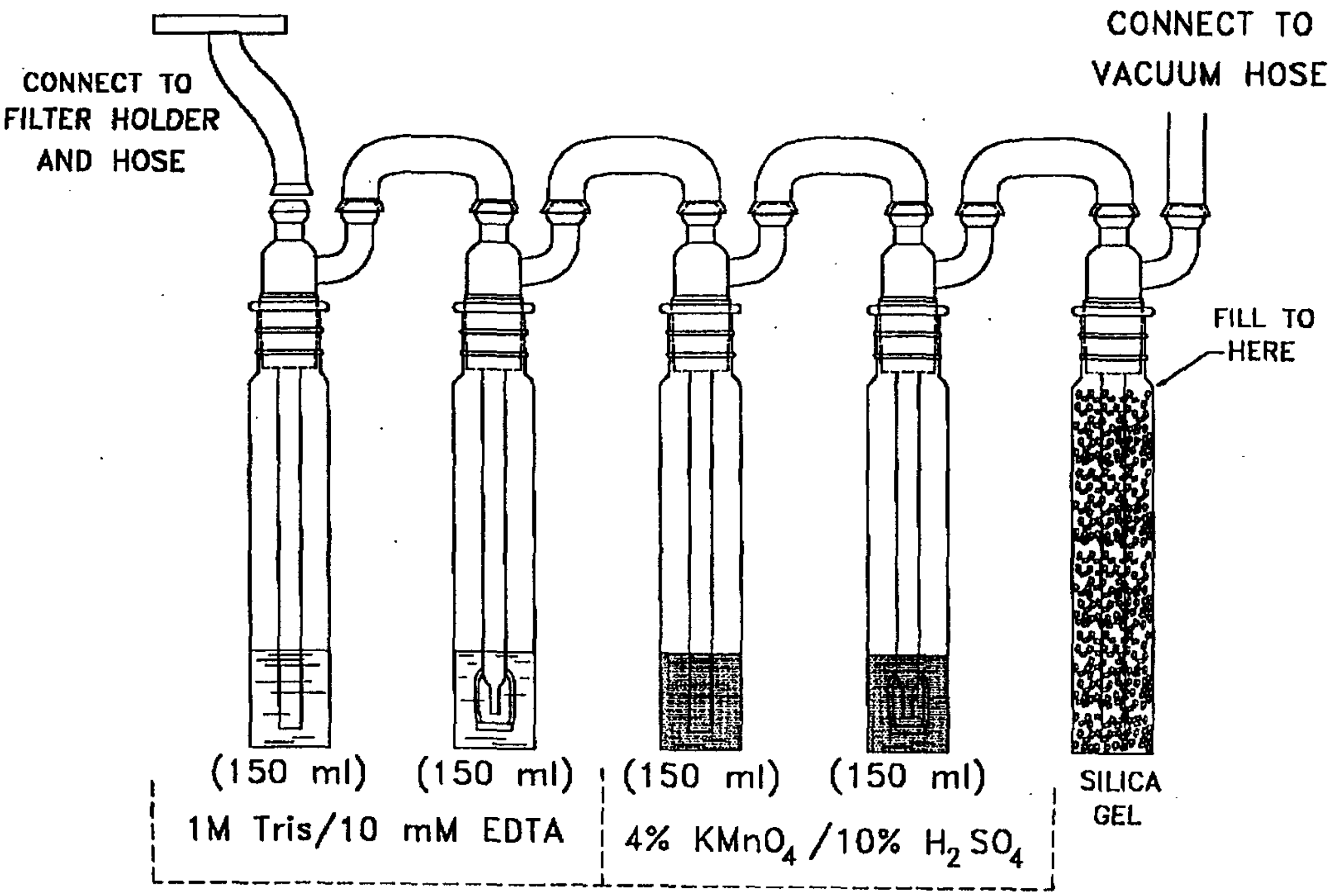
RINSE WITH .1N NITRIC ACID

RINSE BOTTLES SPARINGLY WITH:
- .1 N NITRIC ACID
- 8 N HCl
- .1 N NITRIC ACID

RINSE ALL U–TUBES WITH .1N NITRIC ACID

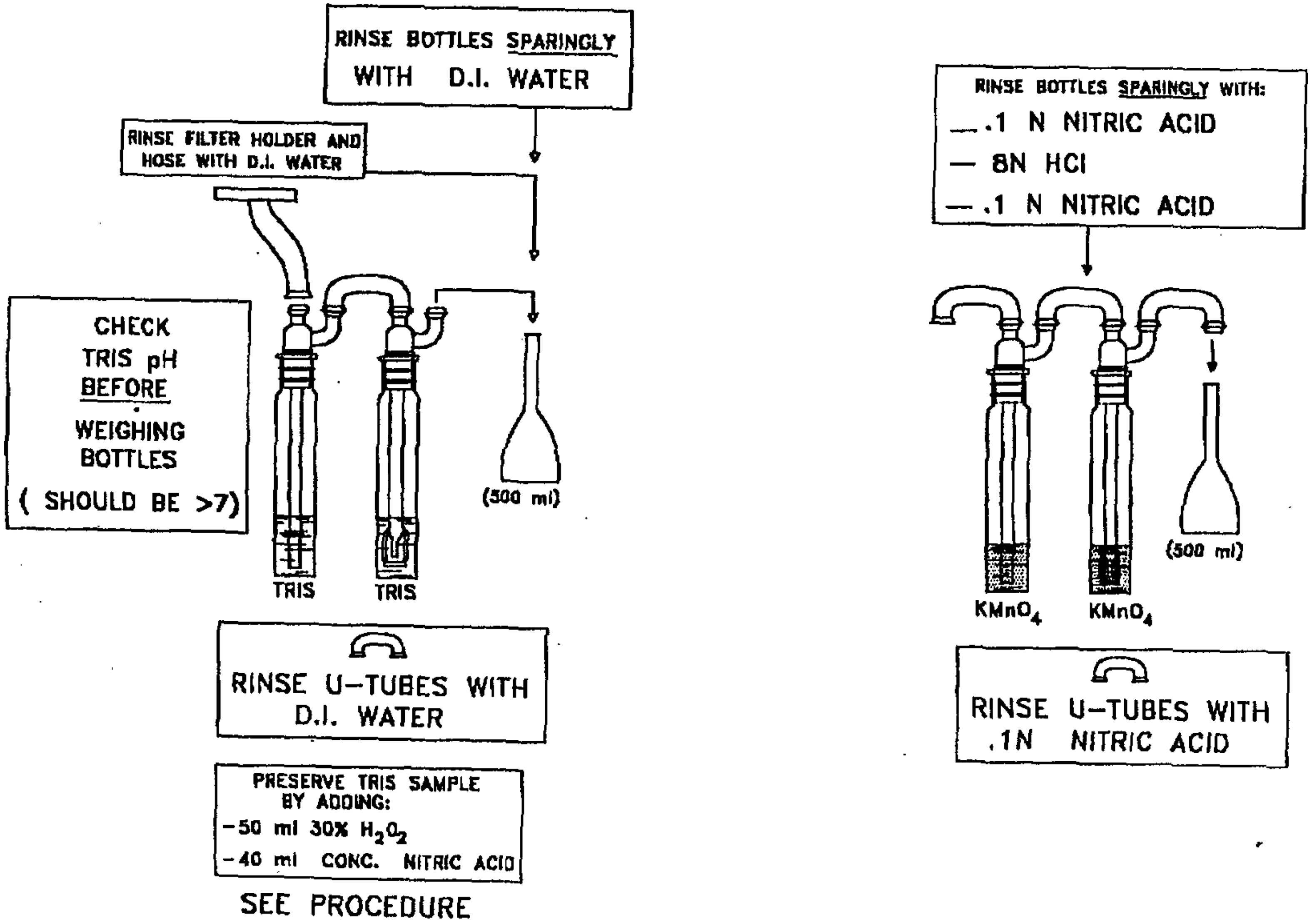
TRIS BUFFER METHOD

TRAIN ASSEMBLY



TRIS BUFFER METHOD

SAMPLE RECOVERY



RINSE BOTTLES <u>SPARINGLY</u> WITH D.I. WATER

RINSE FILTER HOLDER AND HOSE WITH D.I. WATER

CHECK TRIS pH <u>BEFORE</u> WEIGHING BOTTLES (SHOULD BE >7)

RINSE U-TUBES WITH D.I. WATER

PRESERVE TRIS SAMPLE BY ADDING:
-50 ml 30% H_2O_2
-40 ml CONC. NITRIC ACID

SEE PROCEDURE

RINSE BOTTLES <u>SPARINGLY</u> WITH:
- .1 N NITRIC ACID
- 8N HCl
- .1 N NITRIC ACID

RINSE U-TUBES WITH .1N NITRIC ACID

PRESERVATION OF TRIS BUFFER IMPINGERS

1. REMOVE THE GLASS CONNECTOR JOINING THE OUTLET OF THE FILTER TO THE FIRST IMPINGER. TURN THE PUMP ON TO ABOUT **10 SCFH**.

2. POUR 25mL **OF 30% PEROXIDE** INTO THE FIRST IMPINGER VERY SLOWLY WHILE DRAWING AMBIENT AIR INTO THE IMPINGERS.

3. REMOVE THE GLASS CROSSOVER JOINING THE FIRST AND SECOND IMPINGERS.

4. POUR 25 mL **OF 30% PEROXIDE** INTO THE SECOND IMPINGER.

5. REPLACE GLASS CROSSOVER JOINING THE FIRST AND SECOND IMPINGERS.

6. POUR 20 mL OF NITRIC ACID VERY SLOWLY INTO THE FIRST IMPINGER

   CO_2 IS EVOLVED FROM THIS SOLUTION DURING THIS STEP SO BE CAREFUL NOT TO ALLOW THE IMPINGER TO OVERFLOW WHILE OFF-GASSING.

7. REMOVE THE CROSSOVER JOINING THE FIRST AND SECOND IMPINGERS.

8. POUR 20 mL **NITRIC ACID** INTO THE SECOND IMPINGER.
   ADD THE NITRIC EVEN SLOWER THAN INTO THE FIRST IMPINGER.

9. REPLACE THE CROSSOVER AND INCREASE THE AMBIENT AIR SAMPLING RATE TO ABOUT **30 SCFH** TO CAUSE INCREASED OR COMPLETE MIXING.

10. AFTER ABOUT 30 SECONDS STOP THE AMBIENT AIR SAMPLING, RECOVER AS USUAL.

$KMnO_4$ Impinger Preparation Updated 5-20-96

Reagents:

Hydroxylamine Sulfate

Method:

Add hydroxylamine sulfate to potassium permanganate impinger until the solution remains colorless. Analyze by CVAA.

Notes:

Reaction is effervescent, use care when mixing.
One duplicate should be analyzed every 5 samples.
One triplicate and one spike should be analyzed every 10 samples.

Handling Procedures:

Corrosive- contains H_2SO_4
Hazardous- contains strong oxidizer, $KMnO_4$

H2O2 impinger preparation

updated 11-1-95

Reagents:

HCl conc.
$KMnO_4$ sat'd solution
Hydroxylamine Sulfate

Method:

Transfer 5 mL of sample to a 50 mL digestion tube,
Add 0.25 mL conc. HCl
Swirl, and let stand approximately 10 min.
Place tubes in a sample rack, and place in an ice bath,
Allow to cool for approximately 15 min.
Slowly add saturated potassium permanganate, waiting 15 min. between additions, to the samples in 0.25 mL increments, swirling between additions, up to 1.25 mL, then in 0.5 mL increments until the solution remains brownish-purple.
Reduce the excess potassium permanganate with solid hydroxylamine sulfate.
Analyze by CVAA.

Notes:

The overall addition of potassium permanganate takes approximately 4 hours.
One duplicate should be analyzed every 5 samples.
One triplicate and one spike should be analyzed every 10 samples.

Handling Procedures:

Corrosive- contains HNO3, HCl
Hazardous- contains strong oxidizers, $KMnO_4$, H_2O_2

KCl impinger digestion Updated 4-6-95

Reagents:

$KMnO_4$ sat'd solution
$K_2S_2O_8$ solution (5 g in 100 mL)
H_2SO_4 conc.
HNO_3 conc.
Hydroxylamine Sulfate

Method:

Transfer 10 mL of sample to a 50 mL digestion tube.
Add 0.5 mL of H_2SO_4,
Add 0.25 mL of HNO_3,
Add 1.5 mL of $KMnO_4$ solution.
Let the mixture stand for 15 minutes.
Add 0.75 mL of $K_2S_2O_8$ solution.
Place the samples in a dry block heater at 95°C for two hours. Cool to room temperature.
Reduce the excess potassium permanganate with solid hydroxylamine sulfate.
Analyze by CVAA.

Notes:

One duplicate should be analyzed every 5 samples.
One triplicate and one spike should be analyzed every 10 samples.

Handling Procedures:

Corrosive- contains HNO_3 and H_2SO_4.
Hazardous- contains strong oxidizers $KMnO_4$, and $K_2S_2O_8$.

TRIS Buffer impinger preparation updated 5-20-96

Reagents:

- $KMnO_4$ sat'd solution
- $K_2S_2O_8$ solution (5g in 100 mL)
- H_2SO_4 conc.
- HNO_3 conc.
- HCl conc.
- Hydroxylamine Sulfate

Method:

Transfer 5 mL of sample to a 50 mL digestion tube
Add 0.5 mL conc. H_2SO_4
Add 0.25 mL conc. HNO_3
Add 0.25 mL conc. HCl
Add 1.0 ml $K_2S_2O_8$ solution
Place sample tubes in a sample rack, and place in an ice bath, and allow to cool for approximately 15 min.
Slowly add potassium permanganate, waiting 15 min. between additions, to the samples in 0.25 mL increments, up to 1.25 mL swirling between additions, then in 0.5 mL increments until the solution remains brownish-purple.
Reduce the excess potassium permanganate with solid hydroxylamine sulfate.
Analyze by CVAA.

Notes:

The overall addition of potassium permanganate takes approximately 4 hours.
One duplicate should be analyzed every 5 samples.
One triplicate and one spike should be analyzed every 10 samples.

Handling Procedures:

Corrosive- contains H_2SO_4, HNO_3, HCl
Hazardous- contains strong oxidizers, KMnO4, $K_2S_2O_8$

ARL QUALITY ASSURANCE/QUALITY CONTROL PROTOCOL

Laboratory Glassware and Plasticware

All glass volumetric flasks and transfer pipets used in the preparation of analytical reagents and calibration standards are designated as class "A" to meet Federal specifications.

Special cleaning procedures are required for all laboratory glassware and plasticware related to mercury analysis. This procedure includes washing with hot soapy water, several rinses with tap water and several rinses with distilled deionized water. All vessels are then soaked in 5% bromine monochloride (BrCl) solution (see reagent preparation) for a minimum of 30 minutes followed by several rinses with distilled deionized water.

Any samples requiring mercury analysis that are stored for more than 24 hours are transferred to teflon FEP storage bottles that have undergone the above cleaning procedure.

Analytical Reagents

All acids used for the analytical methods that pertain to trace metal analysis including mercury are trace-metal-grade. Other chemicals used in the preparation of analytical reagents are analytical-reagent-grade.

The calibration standards used for instrument calibration and the quality control (QC) standards used for calibration verification are purchased commercially and certified to be accurate within ±0.5% and are traceable to NIST Standard Reference Materials.

Instrument Setup and Calibration

The instrument used for mercury determination in the ARL is a Leeman Labs PS200 cold vapor mercury analyzer. The instrument is set up for absorption at 253.7 nm with a carrier gas of nitrogen and 10% stannous chloride in 10% HCl as the reductant. The instrument is set up by daily replacing the drying tube and acetate trap, containing magnesium perchlorate and soda-lime respectively. The tubing is checked and replaced if necessary. The rinse container is rinsed and filled with fresh solution of 10% HCl. The pump and lamp are turned on. After a warm up time of 45 minutes, the aperture is set to the manufacturer specifications. A four point calibration curve, with matrix matched standards is used. The detector response for a given standard is logged and compared to specifications to insure proper instrument setup and response.

Calibration Verification

A quality control standard of a known analyte concentration must be analyzed immediately after an instrument is standardized in order to verify the calibration. This quality control standard must be prepared from a separate stock as was the calibration standards and the values obtained must read within 5% of the true value. The values obtained from the initial QC analyses are plotted in a quality control chart to monitor the precision of the instrument. After the initial QC standard, periodic check standards are run every five samples to check the slope of the calibration curve. The check standards must read within 5% of the expected value.

Duplicate Sample Analysis

In order to insure that adequate levels of precision are maintained by the ARL, duplicate samples selected on a random basis, must be performed on one of every ten samples analyzed with a minimum of one duplicate analysis per run. Any variation in the ten percent figure must be justified in the procedure. The results from duplicate analysis must read within 10%. The precision of the duplicate sample analyses are recorded and charted in a precision control chart. For the analysis of impinger samples, the practice in the ARL is that all samples are run in duplicate to help insure analytical precision and improve accuracy.

Spike Sample Analysis

In order to account for background contamination and/or sample interferences, spiked sample analysis, selected on a random basis, will be performed on ten percent of all samples including the first sample analyzed. Accuracy is reported as percent recovery of the spike added.

$$\%\text{Recovery} = \frac{(\text{Sample + Spike}) - (\text{Sample})}{(\text{Spike})} \times 100\%$$

Recoveries are plotted on an accuracy control chart.

It is recommended that on a mass basis, the spike added should be approximately equal to the mass of the constituent sought in the sample or sample aliquot. Spike volume, relative to the sample aliquot volume should be as small as possible, but not so small that it cannot be dispensed accurately. The solution used for spiking is from a separate stock as the calibration standards.

Reagent Blank

All acids, chemical reagents and deionized water used for mercury determination are analyzed for background levels of mercury. Each time a new batch of reagents is prepared an aliquot is immediately taken and analyzed for mercury. This includes both solutions prepared for the Method 29 impinger train as well as the acid mixture used for the microwave dissolution of solids.

Method blank

A method blank is prepared by following the procedure step by step adding all of the reagents in the quantities specified by the method. This is done to determine whether significant levels of mercury have accumulated during the procedures prior to analysis. If the method blank shows contamination above instrument background, steps must be taken to eliminate or reduce the contamination to below background levels. If the contamination cannot be eliminated, the magnitude of the contamination must be considered when calculating the concentration of mercury in the samples. The ARL has to date not produced a method blank that contained contamination above instrument background.

Reagent Preparation

Impinger Solutions

Potassium Permanganate/Sulfuric Acid solution

One hundred mL of concentrated sulfuric acid is added to approximately 700 mL of deionized water, mixed, and allowed to cool. Forty g of potassium permanganate is added, the solution is stirred until the solids are dissolved, and then the solution is diluted to 1 liter.

Hydrogen Peroxide/Nitric Acid solution

666 mL of 30% hydrogen peroxide is added to approximately 200 mL of deionized water and mixed. 35.1 mL of concentrated nitric acid is added and the solution is diluted to 1 liter.

Potassium Chloride solution

74.6g potassium chloride is added to approximately 200 mL H_2O and dissolved and the solution is diluted to 1 liter.

Aliquots of these solutions are taken and analyzed for mercury or other analytes of interest and the remainder is refrigerated and used within 24 hours of combustion time.

Bromine Monochloride (BrCl) Solution

The reagent is prepared by adding 11.0g of reagent grade $KBrO_3$ and 15.0g of reagent grade KBr to 200 ml of high purity water. This will not all dissolve, but all the solid must be wet. While swirling the bottle gently, 800 ml of low mercury Ultrex brand concentrated HCl are then slowly added. Caution must be shown, because of heat and toxic fumes generated during preparation. Once cooled, the reagent may be stored in a glass-stoppered bottle, in a cool place.

Spiking Solution

The spiking solution used to spike the impinger trains will be prepared in the ARL from a commercially purchased ICP stock standard at a concentration of 1000 mg Hg/L. This standard is traceable to NBS standard reference materials and consists of mercury metal in 10% HNO_3. The final spiking concentration has yet to be determined, however the concentration will be verified in the laboratory before being added to the impinger trains.

Analytical Equipment

Leeman Labs Mercury Analyzer

The PS200 automated mercury analyzer is based on cold vapor atomic absorption spectroscopy. The calculated quantitation level is 200 ng/L.

Analytical Balance

The analytical balance used in the ARL for weighing solid materials prior to acid digestion is a Sartorius 1601 MP8. The readability of this balance is 0.1 mg with a maximum capacity of 111 g. The calibration of the balance is checked routinely with standardized weights traceable to NBS. It is also maintained annually by Northern Balance and Scale.

Microwave Sample Preparation System

The CEM MDS-2100 has a power output of 950 watts with an in-board pressure controller for safe and efficient acid digestion of solid materials such as coal and coal combustion by-products. The digestion vessels used with this system are teflon lined and sealed during the digestion procedure to help insure zero loss of volatile analytes.

A recently purchased MDS-2100 equipped with temperature and pressure controllers as well as sealed heavy duty digestion vessels designed for high pressure applications such as coal dissolution is currently undergoing methods development. The ultimate goal is to increase the amount of solid material in the digestion which will in turn decrease the quantitation level in the sample.

External Quality Control

The ARL has U.S. Environmental Protection Agency (EPA) certification through the state of North Dakota by participating annually in their water pollution study. An on-site evaluation is conducted every three years by the state in order to maintain full certification.

APPENDIX B

QUALITY ASSURANCE AND QUALITY CONTROL

(TO BE ADDED FOR FINAL)

APPENDIX C

DATA SHEETS, CALCULATIONS, AND LABORATORY REPORTS

Appendix C.1

Unit Instrumentation Data Logs

DATE	FIT28720	DIT28711	FIT28478	DIT28700	LIT38615	FIT28391	FIT37812	FIT27812	U045X037
08/08/96	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG
TIME									
06:00:01 AM	23.86	37.59	1069.44	38.24	11.61	660.11	297.15	6.15	3724.02
07:00:01 AM	33.10	37.54	1077.60	40.81	11.66	651.61	232.65	4.54	4826.73
08:00:01 AM *	30.44	37.57	1072.99	43.11	11.94	643.24	246.03	6.83	4946.99
09:00:01 AM	29.86	37.56	1067.86	44.54	9.35	642.83	229.15	6.88	4995.01
10:00:01 AM	30.44	37.62	1063.03	45.94	9.00	642.26	232.94	7.99	4919.58
11:00:01 AM	36.61	37.68	1060.03	47.34	9.38	639.41	226.07	5.27	4975.61
12:00:01 PM	40.94	37.71	1060.22	48.72	8.62	640.12	217.47	5.03	5103.61
01:00:01 PM	43.80	37.66	1052.93	50.15	9.17	640.66	248.10	6.28	4939.88
02:00:01 PM	37.29	37.68	1054.75	50.21	10.05	701.97	253.90	8.22	4934.33
03:00:01 PM	29.13	37.66	1052.87	49.13	10.45	667.56	257.25	6.15	5062.35
04:00:01 PM	16.19	37.63	1057.03	48.74	9.78	674.11	256.00	5.09	5025.58
05:00:01 PM *	22.34	37.66	1060.05	48.50	10.70	675.30	250.86	4.45	4986.33
06:00:01 PM	32.46	37.70	1063.09	47.79	11.59	673.50	248.81	5.98	4969.27
07:00:01 PM	39.08	37.67	1066.39	47.11	11.81	672.28	254.26	5.63	5058.11
08:00:01 PM	36.86	37.74	1069.50	46.59	10.87	673.93	240.94	4.49	5008.48
AVGS:	31.70	37.64	1060.18	47.64					4,988.93

ppm = 1555.8

	Gypsum Basket	counts	Gross, MW	Net, MW	Steam Flow	% of 60	Steam Temp	AH GAS TEMP	
DATE 08/08/96	T4155101 TOT HOUR	T4155102 TOT HOUR	WT202 HRLY AVG	WT200 HRLY AVG	FI270 HRLY AVG	TOTFUEL HRLY AVG	TI270 HRLY AVG	TI5207 HRLY AVG	TI5208 HRLY AVG
TIME									
06:00:01 AM	2.27	1.08	112.31	104.29	775.12	63.59	983.69	623.00	614.21
07:00:01 AM	2.37	1.08	155.13	144.60	1061.68	78.56	1004.89	663.61	655.00
08:00:01 AM	0.53	0.24	* 160.36	*149.69	1102.44	* 86.18	1004.71	670.99	661.73
09:00:01 AM	-0.00	-0.00	159.68	149.82	1111.08	84.31	1004.74	670.64	662.01
10:00:01 AM	-0.00	-0.00	159.29	150.38	1113.67	85.39	1004.19	667.42	661.18
11:00:01 AM	-0.00	-0.00	160.28	150.29	1113.57	89.36	1005.53	661.09	659.08
12:00:01 PM	-0.00	-0.00	159.43	149.09	1108.31	90.09	1005.12	660.03	656.52
01:00:01 PM	-0.00	-0.00	159.73	150.12	1107.01	90.08	1004.75	660.31	658.45
02:00:01 PM	-0.00	0.00	160.35	150.84	1114.07	90.30	1004.81	662.49	660.86
03:00:01 PM	0.05	0.09	158.64	149.16	1094.44	89.17	1005.11	663.08	661.32
04:00:01 PM	0.19	0.22	158.01	148.56	1092.58	* 88.77	1005.05	663.85	661.71
05:00:01 PM	0.32	0.35	* 158.05	* 148.07	1089.10	88.22	1004.91	663.93	660.93
06:00:01 PM	0.46	0.49	157.57	147.84	1083.14	88.55	1004.33	662.94	660.55
07:00:01 PM	0.59	0.61	156.34	146.68	1071.71	88.81	1004.64	658.88	657.73
08:00:01 PM	0.71	0.73	152.05	142.73	1041.53	79.91	1005.12	657.08	655.77
					1104.63		1004.85	662.38	

88.18%
↓
52.91 tph = 105,820 lb/hr
✓
(DATA NOT USED)

Time Period:
800/1800

Avgs: 159.38 149.60

DATE	IT5209	IT5212	IT5303	IT5304	FI270	AI5709	FI271	AI250	U045X036
08/08/96	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG
TIME									
06:00:01 AM	291.94	297.97	134.52	131.94	775.12	5.38	742.92	4.19	249.19
07:00:01 AM	301.90	295.02	154.88	150.10	1061.68	5.77	999.12	3.21	310.29
08:00:01 AM *	303.00	295.64	159.36	153.85	1102.44	5.95	1031.18	3.28	319.75
09:00:01 AM	300.88	296.17	160.23	155.37	1111.08	5.69	1041.12	3.34	327.01
10:00:01 AM	306.85	295.45	158.14	154.62	1113.67	5.82	1046.26	3.27	324.27
11:00:01 AM	308.14	295.09	159.27	155.04	1113.57	5.58	1067.95	3.32	323.34
12:00:01 PM	306.03	296.69	158.55	154.47	1108.31	5.73	1056.61	3.29	322.44
01:00:01 PM	304.42	294.95	158.44	154.81	1107.01	5.04	1050.04	3.28	321.67
02:00:01 PM	303.42	294.02	158.63	154.59	1114.07	5.44	1054.75	3.27	320.93
03:00:01 PM	300.70	294.01	158.87	153.74	1094.44	5.85	1031.05	3.31	320.19
04:00:01 PM	299.09	294.00	157.96	152.62	1092.58	6.13	1020.61	3.26	319.45
05:00:01 PM *	302.20	293.07	158.71	152.66	1089.10	6.14	1022.39	3.32	318.52
06:00:01 PM	303.27	291.87	155.77	152.59	1083.14	6.60	1018.18	3.35	316.81
07:00:01 PM	300.90	292.91	154.37	152.39	1071.71	6.60	1008.25	3.27	311.93
08:00:01 PM	297.92	294.25	152.45	150.42	1041.53	6.65	987.74	3.30	310.72
	✓ 299.19					5.74	1042.20	3.29	321.76

BRINE FD FAN FLOWS ESP POWER LEVELS →

DATE 08/08/96	AII28766 HRLY AVG	FT38643 HRLY AVG	FT215AC HRLY AVG	FT215BC HRLY AVG	FT251AC HRLY AVG	FT251BC HRLY AVG	PRCP1021 HRLY AVG	PRCP1024 HRLY AVG	PRCP1028 HRLY AVG
TIME									
06:00:01 AM	311.85	0.22	94.48	102.63	404.72	382.88	32.12	190.25	116.00
07:00:01 AM	344.08	0.21	99.56	107.04	543.96	522.15	31.25	161.26	108.19
08:00:01 AM	363.19	* 0.23	99.83	106.23	562.41	540.58	30.37	155.87	104.63
09:00:01 AM	368.56	0.22	99.91	105.70	565.27	543.41	29.50	155.74	104.34
10:00:01 AM	312.22	0.22	99.03	105.27	562.96	543.91	28.62	155.61	104.71
11:00:01 AM	337.98	0.20	100.01	105.44	565.83	542.72	27.74	155.49	104.57
12:00:01 PM	314.08	0.34	99.86	106.11	562.56	541.12	26.87	155.36	103.12
01:00:01 PM	243.56	22.73	99.81	106.57	565.36	541.13	26.51	155.23	101.60
02:00:01 PM	221.62	22.54	100.03	105.95	568.33	544.46	29.06	155.10	101.22
03:00:01 PM	over range	23.35	100.61	106.27	563.66	541.26	32.05	156.42	105.39
04:00:01 PM	over range	23.91	100.88	106.63	557.80	535.47	35.05	161.73	107.55
05:00:01 PM	over range	* 23.96	100.80	106.65	557.40	535.43	38.04	167.27	114.10
06:00:01 PM	over range	23.87	101.15	107.06	551.17	532.82	41.04	172.81	120.66
07:00:01 PM	over range	23.88	101.04	106.80	546.24	527.04	44.03	178.37	127.21
08:00:01 PM	over range	23.57	99.27	106.51	531.39	508.56	47.03	217.16	133.77

TOTAL: 1,104.11

DATE	PRCP1031	PRCP1035	PRCP1038	PRCP1000	PRCP1003	PRCP1007	PRCP1010	PRCP1015	PRCP1017
08/08/96	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG
TIME									
06:00:01 AM	556.99	122.72	688.00	45.04	289.68	108.30	607.95	124.73	702.48
07:00:01 AM	487.00	120.11	670.55	44.31	235.27	107.42	558.21	124.95	702.73
08:00:01 AM	477.10	117.49	668.77	43.80	242.83	106.54	551.51	124.82	697.58
09:00:01 AM	493.50	114.87	668.00	43.30	227.43	105.67	555.02	124.70	673.92
10:00:01 AM	480.48	112.26	654.35	42.79	233.34	104.79	546.85	124.57	673.71
11:00:01 AM	462.74	109.64	649.53	42.29	242.66	103.91	531.20	124.45	673.50
12:00:01 PM	483.59	107.07	647.04	41.78	251.74	103.03	564.52	124.32	673.29
01:00:01 PM	495.32	109.46	661.12	41.28	260.71	102.32	571.00	124.20	672.12
02:00:01 PM	485.90	115.19	675.90	42.70	271.14	103.99	577.68	124.07	671.36
03:00:01 PM	496.28	118.71	665.85	46.60	286.02	106.41	584.91	124.26	672.42
04:00:01 PM	494.53	120.09	662.92	50.51	301.20	108.84	592.17	124.77	670.78
05:00:01 PM	504.99	121.47	666.74	54.42	300.87	111.26	599.44	125.27	674.70
06:00:01 PM	494.16	122.85	675.03	58.33	277.81	113.69	606.70	125.78	678.62
07:00:01 PM	516.82	124.23	675.49	62.23	263.02	116.11	613.96	126.29	682.57
08:00:01 PM	574.43	125.61	688.66	66.14	317.96	118.54	636.24	126.79	686.53

	ABS FLOW	DENSITY	GS CENT DISCH	DEN	Sludge Level	Flow			FGD Inlet
DATE	FIT28720	DT28711	FIT28478	DT28700	LIT38615	FIT28391	FT37812	FT27812	O045X037
08/09/96	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG
TIME									
06:00:01 AM	30.46	35.68	1075.32	28.10	11.65	522.55	311.98	4.60	3705.41
07:00:01 AM	62.24	35.68	1080.11	28.36	11.66	368.19	260.65	4.82	4963.58
08:00:01 AM *	70.92	35.70	1102.27	33.88	over range	569.91	278.66	5.95	5066.37
09:00:01 AM	49.59	35.69	1106.31	35.60	over range	655.51	264.79	5.54	5137.46
10:00:01 AM	10.23	35.60	1102.24	35.67	over range	655.40	257.46	6.95	5214.49
11:00:01 AM	3.53	35.76	1099.49	35.29	over range	656.96	268.72	7.38	5282.64
12:00:01 PM	12.56	35.61	1101.61	35.45	over range	654.70	261.12	4.36	5230.54
01:00:01 PM	29.32	35.62	1099.03	35.40	over range	658.36	247.76	5.27	5267.46
02:00:01 PM	34.47	35.57	1091.81	36.44	over range	661.67	248.85	4.29	5279.46
03:00:01 PM	34.15	35.60	1090.99	36.70	over range	657.61	241.21	5.10	5257.29
04:00:01 PM *	32.42	35.58	1084.59	37.20	over range	657.12	241.97	5.40	5193.14
05:00:01 PM	33.22	36.11	832.73	38.44	over range	658.12	223.42	6.27	5156.73
06:00:01 PM	22.94	36.73	63.45	50.13	over range	551.34	225.11	7.00	4870.13
07:00:01 PM	15.79	36.72	313.54	50.30	over range	730.49	223.29	6.98	3704.06
08:00:01 PM	18.90	36.74	666.69	50.29	over range	729.24	207.16	4.84	3248.43
AVGS:	30.80	35.64	1097.59	35.74					5,214.32

ppm = 1,604.6

DATE	14155101	14155102	WT202	WT200	FI270	TOTFUEL	TI270	TI5207	TI5208
08/09/96	TOT HOUR	TOT HOUR	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG
TIME									
06:00:01 AM	1.91	1.93	117.15	108.71	787.32	60.93	1003.63	623.25	620.41
07:00:01 AM	2.03	2.06	154.55	145.33	1066.03	62.51	1004.34	657.92	653.54
08:00:01 AM	0.03	0.09	* 157.45	* 147.85	1092.30	* 75.59	1004.72	663.01	658.86
09:00:01 AM	-0.00	0.20	157.94	148.34	1096.71	86.94	1005.22	663.66	660.43
10:00:01 AM	-0.00	0.34	160.81	150.86	1110.79	79.08	1004.20	663.79	659.96
11:00:01 AM	-0.00	0.48	158.52	149.42	1098.91	71.02	1005.00	660.77	657.06
12:00:01 PM	-0.00	0.61	157.94	148.33	1099.01	81.17	1005.20	661.33	658.56
01:00:01 PM	-0.00	0.76	159.47	149.88	1104.60	65.69	1004.59	661.58	660.21
02:00:01 PM	-0.00	0.89	158.46	148.46	1096.06	54.94	1005.14	660.93	659.07
03:00:01 PM	-0.00	1.03	159.32	149.60	1103.71	* 51.40	1005.16	661.24	658.29
04:00:01 PM	-0.00	1.17	* 159.37	* 148.99	1089.67	52.25	1005.29	663.18	660.23
05:00:01 PM	-0.00	1.31	155.64	144.52	1066.37	55.76	1004.81	659.76	657.61
06:00:01 PM	-0.00	1.33	142.31	133.02	970.33	60.35	1004.25	646.68	645.33
07:00:01 PM	-0.00	1.42	103.87	95.42	698.75	51.59	977.04	614.34	614.45
08:00:01 PM	-0.00	1.56	90.28	82.68	630.34	53.94	947.05	597.32	596.43
					1099.08	70.73%	1004.95	660.68	

↓

42.44 tph ✓

Time Period:
900|1700

(DATA NOT USED)

Avgs: 158.81 149.08

	LVG AH GAS TEMPS		ID FAN Amps			OPACITY	Feed-water	Boiler O_2	Flow
DATE	TI5209	TI5212	IT5303	IT5304	FI270	AT5709	FI271	AI250	O045X036
08/09/96	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG
TIME									
06:00:01 AM	278.81	306.01	136.69	135.13	787.32	4.38	747.73	4.16	258.56
07:00:01 AM	292.42	294.69	154.01	151.07	1066.03	5.07	998.07	3.26	314.84
08:00:01 AM *	294.67	291.82	156.88	153.98	1092.30	6.61	1020.33	3.27	322.91
09:00:01 AM	293.12	293.67	156.80	155.18	1096.71	6.72	1026.70	3.32	324.60
10:00:01 AM	295.62	295.27	158.02	155.49	1110.79	6.93	1042.82	3.28	325.06
11:00:01 AM	297.64	293.09	156.72	154.35	1098.91	6.70	1051.53	3.29	325.66
12:00:01 PM	297.58	292.29	156.29	154.78	1099.01	5.80	1036.66	3.23	327.02
01:00:01 PM	298.69	291.35	156.73	154.69	1104.60	6.32	1040.24	3.23	328.49
02:00:01 PM	299.05	294.47	157.59	156.29	1096.06	5.16	1039.20	3.33	329.70
03:00:01 PM	297.99	294.80	157.54	155.14	1103.71	4.57	1036.29	3.36	327.32
04:00:01 PM *	298.36	292.56	158.08	156.54	1089.67	4.35	1031.86	3.25	323.79
05:00:01 PM	297.45	293.51	154.79	151.86	1066.37	4.08	1010.62	3.30	313.68
06:00:01 PM	289.83	290.67	143.67	143.70	970.33	3.29	930.78	3.33	287.56
07:00:01 PM	279.69	284.84	125.77	128.56	698.75	2.91	684.09	4.43	230.06
08:00:01 PM	272.43	294.58	122.41	124.49	630.34	3.22	605.17	4.81	208.99
	295.11					5.91	1036.18	3.28	326.06

DATE 08/09/96	AI128700 HRLY AVG	FT58643 HRLY AVG	FT215AC HRLY AVG	FT215BC HRLY AVG	FT251AC HRLY AVG	FT251BC HRLY AVG	PRCP1021 HRLY AVG	PRCP1024 HRLY AVG	PRCP1028 HRLY AVG
TIME									
06:00:01 AM	175.19	0.16	95.88	103.41	419.14	399.12	49.19	285.80	131.94
07:00:01 AM	over range	0.15	101.63	107.95	541.61	522.01	47.80	261.67	127.81
08:00:01 AM	297.72	* 0.15	101.45	108.21	558.79	538.56	46.41	215.71	119.87
09:00:01 AM	282.37	0.15	102.14	108.18	561.97	540.38	45.02	192.58	112.20
10:00:01 AM	292.65	0.16	101.86	107.62	563.25	545.50	43.64	207.02	116.10
11:00:01 AM	359.25	0.17	101.54	107.39	561.31	539.83	44.75	213.75	120.38
12:00:01 PM	over range	0.18	101.44	107.26	560.99	537.70	48.02	191.63	133.18
01:00:01 PM	over range	0.21	101.73	107.48	558.61	536.60	51.26	281.89	141.38
02:00:01 PM	381.37	0.21	101.97	107.31	560.21	540.15	53.83	344.50	144.24
03:00:01 PM	385.77	0.21	101.78	106.93	561.40	543.75	56.16	320.60	146.92
04:00:01 PM	389.64	* 0.22	101.67	107.24	561.93	541.40	58.48	343.87	148.31
05:00:01 PM	347.25	0.23	99.76	105.77	542.77	520.75	60.81	312.11	149.71
06:00:01 PM	315.17	0.24	96.76	104.23	485.61	465.45	63.13	288.17	151.10
07:00:01 PM	142.54	0.23	88.85	98.55	364.98	344.29	65.40	357.72	152.49
08:00:01 PM	76.76	0.20	88.35	98.45	325.58	303.62	67.50	345.30	153.89

TOTAL: 1,101.37

ESP POWER LEVELS →

DATE	PRCP1031	PRCP1035	PRCP1038	PRCP1000	PRCP1003	PRCP1007	PRCP1010	PRCP1015	PRCP1017
08/09/96	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG
TIME									
06:00:01 AM	620.23	118.72	701.43	59.68	379.02	120.22	640.74	128.80	712.00
07:00:01 AM	614.37	116.19	709.88	57.70	350.62	120.40	636.67	125.19	696.00
08:00:01 AM	544.87	113.79	674.01	55.84	282.30	120.58	614.93	120.20	685.29
09:00:01 AM	521.58	114.65	668.76	54.40	256.54	120.77	590.80	115.21	684.47
10:00:01 AM	534.25	116.92	670.89	53.00	318.30	120.96	627.27	112.74	685.29
11:00:01 AM	567.86	119.19	668.95	51.64	332.10	121.35	635.08	114.57	683.28
12:00:01 PM	536.98	121.46	667.56	56.87	312.52	121.86	605.27	116.48	685.20
01:00:01 PM	629.38	123.73	694.05	66.63	387.81	122.36	657.55	118.39	689.13
02:00:01 PM	673.01	126.00	696.03	71.79	476.82	122.87	688.91	120.30	691.47
03:00:01 PM	671.93	128.27	688.32	75.33	431.05	123.38	677.60	122.21	689.63
04:00:01 PM	654.65	130.33	679.90	78.86	466.70	123.88	675.12	124.12	686.57
05:00:01 PM	636.38	129.05	686.57	82.21	426.56	124.39	676.35	126.03	687.46
06:00:01 PM	629.23	126.61	704.53	84.84	396.33	124.90	677.57	127.13	688.35
07:00:01 PM	648.59	124.16	699.54	86.59	474.72	125.60	680.58	127.38	689.24
08:00:01 PM	664.01	121.82	702.15	85.55	470.70	126.36	684.78	127.63	690.12

DATE 08/07/96	FIT28720 HRLY AVG	DT28711 HRLY AVG	FIT28478 HRLY AVG	DT28700 HRLY AVG	LIT38615 HRLY AVG	FIT28591 HRLY AVG	FT37812 HRLY AVG	FT27812 HRLY AVG	U045X037 HRLY AVG
TIME									
06:00:01 AM	23.69	40.78	1076.69	39.13	6.45	659.71	183.37	4.57	4635.15
07:00:01 AM	24.85	40.87	1072.75	38.78	3.93	659.51	184.46	5.53	4810.76
08:00:01 AM*	26.06	40.96	1073.07	38.09	2.42	527.00	192.01	4.20	4947.01
09:00:01 AM	29.50	40.99	1068.02	39.26	2.93	353.30	215.13	5.50	4993.30
10:00:01 AM	41.05	40.99	1069.54	41.29	3.26	344.08	415.73	4.86	5184.51
11:00:01 AM	41.54	40.97	1063.73	42.13	4.63	454.78	433.25	5.04	5063.84
12:00:01 PM	28.22	40.89	1057.30	42.66	5.83	658.37	275.70	5.15	5090.20
01:00:01 PM	12.00	40.81	1049.70	44.00	6.90	646.56	262.58	6.03	5068.77
02:00:01 PM	9.01	40.84	1048.15	41.67	7.74	704.42	260.59	5.98	4957.42
03:00:01 PM	23.47	40.78	1040.65	41.10	7.31	698.92	236.38	4.86	5011.87
04:00:01 PM	24.64	40.77	1037.26	42.37	7.45	653.82	206.71	4.36	4917.12
05:00:01 PM*	14.75	40.71	1040.84	41.44	8.69	656.68	246.99	8.89	4890.23
06:00:01 PM	28.42	40.79	1038.85	41.84	9.41	657.16	244.97	5.50	4797.58
07:00:01 PM	23.65	40.77	1034.80	42.89	9.36	652.48	250.93	6.40	4728.13
08:00:01 PM	25.31	40.78	1033.20	42.65	9.55	654.87	251.05	5.99	4790.35
AVGS	25.02	40.87	1054.83	41.40					5012.43

ppm = 1573.2

	Gypsum Basket Counts		Gross, MW	Net, MW	Steam Flow	% of 60	Stm Temp	AH Gas Temp	
DATE	T4155101	T4155102	WT202	WT200	FI270	TOTFUEL	TI270	TI5207	TI5208
08/07/96	TOT HOUR	TOT HOUR	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG
TIME									
06:00:01 AM	1.09	0.94	153.09	144.93	1058.05	84.00	1004.98	664.59	653.22
07:00:01 AM	1.15	0.98	159.17	148.08	1100.35	82.73	1005.74	666.33	658.66
08:00:01 AM	0.03	0.02	* 158.61	* 148.72	1100.74	* 86.63	1004.47	662.77	658.20
09:00:01 AM	0.11	0.11	157.72	148.37	1094.87	86.61	1005.35	663.60	657.41
10:00:01 AM	0.19	0.17	157.55	148.28	1101.75	86.89	997.18	661.60	656.56
11:00:01 AM	0.24	0.23	157.34	146.66	1085.49	87.28	1003.10	660.66	654.69
12:00:01 PM	0.31	0.29	158.21	148.59	1094.58	87.46	1005.35	662.76	656.56
01:00:01 PM	0.36	0.33	158.14	149.01	1089.86	85.65	1004.56	661.88	655.23
02:00:01 PM	0.43	0.35	160.04	149.90	1101.89	87.97	1004.73	667.66	658.64
03:00:01 PM	0.55	0.38	159.22	149.46	1106.92	* 86.41	1004.91	667.58	657.74
04:00:01 PM	0.68	0.38	159.37	149.55	1102.07	86.47	1005.25	670.00	659.99
05:00:01 PM	0.81	0.38	* 159.81	* 150.14	1101.03	86.58	1005.45	672.29	662.56
06:00:01 PM	0.95	0.38	158.91	149.40	1094.76	85.81	1004.94	671.29	661.66
07:00:01 PM	1.08	0.38	156.78	147.20	1079.27	84.73	1005.13	669.94	661.27
08:00:01 PM	1.22	0.38	156.07	146.87	1076.81	85.30	1004.40	669.15	660.43

1097.92 0800/1500 1064.04

↓

86.86%

↓

52.12tph = 104,240 lb/hr

(DATA NOT USED)

661.42

Time Period 800|1800

Avgs: 158.60 148.87

DATE 08/07/96 TIME	TI5209 HRLY AVG	TI5212 HRLY AVG	IT5303 HRLY AVG	TI5304 HRLY AVG	FI270 HRLY AVG	AI5709 HRLY AVG	FI271 HRLY AVG	AI250 HRLY AVG	O045X036 HRLY AVG
06:00:01 AM	302.48	295.41	154.41	151.54	1058.05	6.26	1001.74	3.26	311.28
07:00:01 AM	303.28	295.35	156.54	153.08	1100.35	6.68	1042.73	3.34	320.54
08:00:01 AM *	302.65	294.53	158.31	154.80	1100.74	7.57	1047.33	3.25	323.33
09:00:01 AM	297.84	296.19	158.92	154.89	1094.87	7.29	1032.78	3.28	323.61
10:00:01 AM	300.90	297.95	157.43	153.57	1101.75	6.67	1052.14	3.31	321.83
11:00:01 AM	304.30	299.46	156.66	152.52	1085.49	6.54	1047.04	3.29	317.09
12:00:01 PM	306.23	297.17	157.17	153.81	1094.58	6.22	1040.80	3.32	318.74
01:00:01 PM	305.91	293.39	155.77	153.60	1089.86	5.82	1031.16	3.30	319.88
02:00:01 PM	307.63	299.66	156.48	153.68	1101.89	5.05	1042.62	3.27	319.95
03:00:01 PM	306.90	298.74	157.01	153.70	1106.92	4.39	1068.01	3.33	319.19
04:00:01 PM	303.00	299.21	157.07	152.80	1102.07	4.35	1048.03	3.31	317.50
05:00:01 PM *	304.71	299.93	157.87	153.44	1101.03	4.22	1033.36	3.34	315.82
06:00:01 PM	307.29	298.88	156.44	152.86	1094.76	4.39	1036.61	3.29	314.18
07:00:01 PM	307.07	297.27	154.68	151.12	1079.27	4.92	1009.52	3.25	314.05
08:00:01 PM	307.79	296.77	154.28	151.56	1076.81	5.35	1008.87	3.32	314.64
	300.82					5.81	1044.33	3.30	319.69

BRINE FD FAN FLOWS ESP POWER LEVELS →

DATE	AII28766	FT38643	FT215AC	FT215BC	FT251AC	FT251BC	PRCP1021	PRCP1024	PRCP1028
08/07/96	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG
TIME									
06:00:01 AM	336.04	0.19	98.76	105.96	537.07	519.70	27.84	195.73	118.11
07:00:01 AM	No good d	0.21	98.93	106.24	550.66	530.05	27.71	194.35	116.12
08:00:01 AM	398.56	* 19.77	99.18	105.72	559.13	542.18	27.59	190.62	117.41
09:00:01 AM	No good d	29.02	98.72	105.21	556.02	537.91	27.46	185.72	115.24
10:00:01 AM	No good d	28.30	99.23	105.02	553.82	530.19	27.33	180.82	113.08
11:00:01 AM	386.96	17.73	98.39	104.79	553.47	528.72	27.21	175.92	110.91
12:00:01 PM	399.15	10.41	98.93	104.48	551.52	529.25	27.08	171.02	108.74
01:00:01 PM	396.79	23.20	97.98	104.61	548.54	527.41	26.96	183.34	106.57
02:00:01 PM	398.19	25.42	97.14	105.11	553.35	531.80	26.83	187.44	105.43
03:00:01 PM	No good d	25.16	97.28	104.93	555.28	534.58	26.70	184.98	106.61
04:00:01 PM	No good d	24.76	96.99	104.48	557.54	535.78	26.58	182.51	107.88
05:00:01 PM	No good d	* 24.65	96.72	104.97	555.94	535.13	26.45	180.04	109.15
06:00:01 PM	No good d	● 20.41	96.78	104.54	553.62	530.81	26.32	177.58	110.43
07:00:01 PM	No good d	2.53	96.28	104.08	544.84	522.95	26.19	175.11	111.70
08:00:01 PM	No good d	2.27	97.20	103.31	546.41	526.21	26.07	172.64	112.97

TOTAL: 1087.76

Avg = 22.84

DATE	PRCP1031	PRCP1035	PRCP1038	PRCP1000	PRCP1003	PRCP1007	PRCP1010	PRCP1015	PRCP1017
08/07/96	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG	HRLY AVG
TIME									
06:00:01 AM	511.65	123.49	663.90	43.18	258.74	108.36	609.38	125.61	684.41
07:00:01 AM	524.06	123.61	668.13	42.80	282.20	107.85	579.15	125.19	689.37
08:00:01 AM	503.85	123.74	659.36	42.41	257.88	107.35	563.93	123.09	681.95
09:00:01 AM	500.61	123.86	658.96	42.03	255.05	106.84	566.27	120.96	674.10
10:00:01 AM	501.59	123.54	666.69	41.65	255.91	106.34	570.53	118.83	666.25
11:00:01 AM	497.68	118.10	639.27	41.27	257.27	105.83	575.19	116.70	670.18
12:00:01 PM	493.71	111.23	653.75	40.89	272.64	105.33	592.07	114.57	693.26
01:00:01 PM	506.09	111.67	658.89	40.50	266.14	104.64	589.96	112.44	674.33
02:00:01 PM	489.74	119.42	661.57	40.12	244.76	103.65	550.44	110.32	663.20
03:00:01 PM	497.01	118.69	651.87	39.74	241.96	102.65	536.71	109.59	656.44
04:00:01 PM	476.87	117.67	674.26	39.36	239.16	101.65	538.85	111.07	661.78
05:00:01 PM	466.31	116.64	656.65	38.98	236.36	100.65	542.64	112.58	665.85
06:00:01 PM	470.44	115.62	648.62	38.60	233.56	99.64	540.30	114.09	669.53
07:00:01 PM	467.26	114.59	637.84	38.21	230.81	98.64	543.90	115.60	679.45
08:00:01 PM	476.88	113.57	632.99	40.60	229.48	97.64	543.63	117.11	654.61

Appendix C.2

Unit CEMS Data/Sample Train Diluent Gas Data

DILUENT GAS CONCENTRATIONS
NYSEG POST-RETROFIT TEST PROGRAM -- MILLIKEN UNIT 2
AUGUST 1996

		ESP Inlet		ESP Outlet		FGD Stack	
Test No	Date	O_2, %(1)	CO_2, %(3)	O_2, %(1)	CO_2, %(3)	O_2, %(1)	CO_2, %(2)
1-MTLS	8/7/96	5.60	13.86	5.38	14.06	5.66	13.81
1-PM/AN	8/7/96	5.66	13.84	5.38	14.09	5.77	13.74
1-SO3	8/7/96	--	--	5.57	13.86	5.52	13.91
1-PSD	8/7/96	--	--	5.68	13.76	5.52	13.90
1-MESA	8/7/96	--	--	5.20	14.25	5.63	13.86
1-TRIS	8/7/96	--	--	4.67	14.56	5.42	13.89
1-OH	8/7/96	--	--	4.90	14.47	5.61	13.83
2-MTLS	8/8/96	5.10	13.94	5.10	13.94	5.52	13.57
2-PM/AN	8/8/96	5.53	13.58	5.61	13.51	5.51	13.60
2-SO3	8/8/96	--	--	5.48	13.59	5.52	13.55
2B-SO3	8/8/96	--	--	--	--	5.40	13.42
2-PSD	8/8/96	--	--	5.24	13.73	5.52	13.48
2-MESA	8/8/96	6.13	12.93	5.34	13.62	5.33	13.63
2A-MESA	8/8/96	--	--	5.20	13.54	5.20	13.54
2-TRIS	8/8/96	--	--	5.20	13.44	5.15	13.48
2-OH	8/8/96	--	--	5.28	13.63	5.31	13.60
3-MTLS	8/9/96	5.79	13.64	5.04	14.32	5.76	13.67
3-PM/AN	8/9/96	5.74	13.70	4.98	14.38	5.76	13.68
3A-SO3	8/9/96	--	--	5.77	13.58	5.73	13.62
3B-SO3	8/9/96	--	--	--	--	5.81	13.66
3-PSD	8/9/96	--	--	5.50	13.86	5.73	13.65
3-MESA	8/9/96	5.40	13.64	5.32	13.71	5.35	13.68
3A-MESA	8/9/96	5.23	13.75	4.25	14.61	5.33	13.66
3-TRIS	8/9/96	--	--	4.67	14.13	5.23	13.64
3-OH	8/9/96	--	--	5.16	13.83	5.32	13.69
1-SV	8/12/96	5.40	14.00	4.40	14.90	5.45	13.95
2-SV	8/12/96	5.73	13.81	4.96	14.51	5.78	13.76
1-Cr	8/12/96	5.60	13.66	--	--	5.44	13.80
1-SE	8/12/96	6.00	13.61	4.95	14.57	5.78	13.81
1A-VOST	8/12/96	--	--	4.50	14.78	5.70	13.70
1B-VOST	8/12/96	--	--	4.50	14.78	5.70	13.70
1C-VOST	8/12/96	--	--	4.50	14.93	5.80	13.75
1D-VOST	8/12/96	--	--	4.70	14.81	5.80	13.80
2A-VOST	8/12/96	--	--	4.60	14.85	5.70	13.85
2B-VOST	8/12/96	--	--	4.70	14.81	5.70	13.90
2C-VOST	8/12/96	--	--	4.70	14.81	5.80	13.80
2D-VOST	8/12/96	--	--	4.70	14.41	5.50	13.70
3-SV	8/13/96	5.15	14.17	4.22	15.00	4.98	14.32
2-Cr	8/13/96	5.32	14.21	--	--	5.24	14.28
3-Cr	8/13/96	5.64	13.84	--	--	5.33	14.12
1-FORM	8/13/96	--	--	4.44	14.57	4.66	14.38
2-FORM	8/13/96	--	--	3.97	15.22	5.12	14.19
3-FORM	8/13/96	--	--	4.49	14.80	5.25	14.11
4-MESA	8/13/96	--	--	4.60	15.28	5.70	14.25
3A-VOST	8/13/96	--	--	4.70	14.77	5.00	14.50
3B-VOST	8/13/96	--	--	4.70	15.06	5.30	14.50
3C-VOST	8/13/96	--	--	4.70	14.57	5.00	14.30
3D-VOST	8/13/96	--	--	4.80	14.74	5.12	14.45
3E-VOST	8/13/96	--	--	--	--	5.80	14.20

Notes:

(1) From Teledyne portable O_2 meter.

(2) From Unit 2 CEMS located at the FGD stack.

(3) Calculated by using stack O_2 to correct stack CO_2 to the oxygen level found at this location.

O2CO2.XLS
12/21/96

```
                    CONTINUOUS EMISSIONS MONITORING DATA

 MILLIKEN STATION   UNIT #2                       FOR TIME PERIOD 96/07/08

    QTR        S O 2           N O X            C O 2           F L O W
 HR  HR     PPM  CODE       PPM  CODE          %  CODE        CFM  CODE
==============================================================================
  1  0      17.1    0     195.0    0        11.6    0    274364.     0
  1  1      50.6    0     201.3    0        11.8    0    272872.     0
  1  2      47.3    0     201.4    0        11.9    0    272365.     0
  1  3      31.1    0     197.5    0        12.0    0    273567.     0
  2  0      35.7    0     196.5    0        12.3    0    280611.     0
  2  1      53.3    0     192.4    0        12.9    0    315889.     0
  2  2      85.5    0     197.3    0        13.3    0    341813.     0
  2  3      95.4    0     218.4    0        13.6    0    369783.     0
  3  0     106.4    0     231.2    0        13.4    0    389706.     0
  3  1     106.9    0     230.7    0        13.3    0    396454.     0
  3  2     102.6    0     218.2    0        13.7    0    404164.     0
  3  3     113.8    0     229.5    0        13.4    0    401646.     0
  4  0      90.0    0     219.0    0        13.6    0    390611.     0
  4  1     113.3    0     230.1    0        13.5    0    397306.     0
  4  2      93.9    0     218.3    0        13.5    0    376305.     0
  4  3      95.5    0     221.8    0        13.6    0    387725.     0
  5  0     103.2    0     223.6    0        13.6    0    395728.     0
  5  1      91.2    0     210.8    0        13.5    0    389399.     0
  5  2      84.4    0     212.0    0        13.4    0    377413.     0
  5  3      75.5    0     210.5    0        13.3    0    379411.     0
  6  0      87.5    0     208.8    0        13.4    0    375283.     0
  6  1      97.0    0     217.0    0        13.4    0    387618.     0
  6  2     103.5    0     223.6    0        13.3    0    395473.     0
  6  3     112.0    0     218.6    0        13.4    0    400227.     0
  7  0     -99.0   16     -99.0   16       -99.0   16    397842.   256
  7  1     122.1  256     194.4  256        14.0  256    396618.     0
  7  2     115.1    0     191.5    0        13.8    0    393176.     0
  7  3     116.7    0     191.2    0        13.6    0    394438.     0
  8  0     117.7    0     193.5    0        13.7    0    398417.     0
  8  1     114.9    0     191.3    0        13.7    0    398589.     0
  8  2     114.1    0     195.1    0        13.5    0    405012.     0
  8  3     109.7    0     195.7    0        13.5    0    405665.     0
  9  0     108.3    0     185.1    0        13.4    0    405614.     0
~~9  1     119.1    0     178.5    0        13.5    0    407133.     0~~
  9  2     119.2    0     177.4    0        13.6    0    401205.     0
  9  3     119.6    0     177.8    0        13.5    0    397551.     0
 10  0     120.0    0     181.9    0        13.7    0    390680.     0
 10  1     123.9    0     180.3    0        13.7    0    394892.     0
 10  2     120.6    0     176.0    0        13.9    0    392348.     0
 10  3     121.2    0     169.8    0        13.7    0    393259.     0
                         Press RETURN to continue
```

16+256 ARE CALI

- DATA ATTAC TO 256 IS
- DATA ATTAC TO 16 IS NO

1-PM, 1-M
START

1-OH

```
0    116.2    0    170.9    0    13.9    0    389344.    0
1    113.3    0    171.1    0    13.7    0    382884.    0
2    105.1    0    174.8    0    13.9    0    392974.    0
3    115.1    0    176.3    0    13.9    0    396016.    0
0    121.9    0    178.1    0    13.8    0    397528.    0
1    114.0    0    176.8    0    13.7    0    404295.    0
2    108.0    0    178.4    0    13.8    0    399192.    0
3    115.7    0    179.1    0    13.8    0    396779.    0
0    119.5    0    177.2    0    13.7    0    402520.    0
1    116.8    0    180.6    0    13.8    0    403975.    0
2    123.1    0    181.8    0    13.9    0    396280.    0
3    122.4    0    184.4    0    14.0    0    383854.    0
0    129.2    0    186.1    0    13.9    0    382874.    0
1    128.2    0    185.8    0    14.0    0    384860.    0
2    142.3    0    188.3    0    14.0    0    389651.    0
3    160.9    0    187.5    0    14.0    0    388124.    0
0    169.7    0    184.2    0    13.8    0    399266.    0
1    158.6    0    182.8    0    13.8    0    396949.    0
2    157.7    0    186.3    0    14.0    0    391376.    0
3    144.3    0    186.2    0    13.9    0    393263.    0
0    135.3    0    185.7    0    13.9    0    394699.    0
1    134.7    0    186.1    0    13.9    0    399239.    0
2    137.3    0    187.3    0    13.8    0    396628.    0
3    136.5    0    187.6    0    13.9    0    396705.    0
0    132.5    0    188.8    0    13.9    0    397138.    0
1    129.6    0    189.4    0    13.9    0    391448.    0
2    137.7    0    189.5    0    13.9    0    392056.    0
3    157.9    0    189.3    0    13.9    0    395747.    0
0    143.6    0    191.0    0    13.9    0    392718.    0
1    129.0    0    189.0    0    14.0    0    395991.    0
2    120.8    0    190.8    0    13.9    0    393017.    0
3    113.1    0    188.8    0    14.0    0    388442.    0
0    121.5    0    187.7    0    13.8    0    388665.    0
1    115.5    0    187.1    0    13.8    0    390158.    0
2    118.3    0    188.5    0    13.8    0    387729.    0
3    130.3    0    188.8    0    13.9    0    386588.    0
0    125.9    0    186.4    0    13.8    0    387971.    0
1    119.8    0    184.9    0    13.8    0    389510.    0
2    117.8    0    186.5    0    13.7    0    389337.    0
3    123.1    0    187.2    0    13.7    0    387829.    0
0    117.8    0    186.6    0    13.7    0    388062.    0
1    102.8    0    187.7    0    13.8    0    383854.    0
2     93.7    0    182.7    0    13.8    0    385502.    0
3     94.9    0    182.9    0    13.8    0    381192.    0
0     98.9    0    180.2    0    13.7    0    387982.    0
1     99.9    0    182.4    0    13.5    0    390698.    0
2     95.6    0    180.7    0    13.6    0    384905.    0
                      Press RETURN to continue
```

1-MESA

1-OH

1-TRIS

1-PSD

1-SO3

1-PM END
CO_2 = 13.74
SO_2 = 116.2
NO_x = 176.2

1-MTRS END
CO_2 = 13.91
[illegible] = 124.5
NO_x = 179.5

1-TRIS
CO_2 = 13.89

1 - SO_3 -STK
CO_2 = 13.91
1 - PSD -STK
CO_2 = 13.90
1 - OH -STK
CO_2 = 13.83

800/1730, 8/7 → NO_x = 182.2
SO_2 = 129.4
FLOW = 394.92

22	3	100.2	0	179.4	0	13.5	0	373900.	0
23	0	109.4	0	185.2	0	13.8	0	393220.	0
23	1	103.6	0	181.1	0	13.5	0	385250.	0
23	2	100.3	0	180.8	0	13.5	0	383108.	0
23	3	98.3	0	180.5	0	13.5	0	379457.	0
24	0	94.9	0	181.1	0	13.6	0	377253.	0
24	1	81.4	0	173.6	0	13.4	0	364284.	0
24	2	82.3	0	185.4	0	13.3	0	356482.	0
24	3	96.2	0	201.1	0	13.3	0	357809.	0

```
           CONTINUOUS EMISSIONS MONITORING DATA

 LIKEN STATION    UNIT #2                    FOR TIME PERIOD 96/08/08

 QTR       S O 2           N O X           C O 2           F L O W
  HR    PPM  CODE       PPM  CODE          %  CODE        CFM  CODE
=================================================================================
  0   105.1     0     216.3     0       13.1     0   367093.     0
  1   102.4     0     211.0     0       13.2     0   365721.     0
  2   100.0     0     211.0     0       13.2     0   364417.     0
  3    92.1     0     210.0     0       13.3     0   362079.     0
  0    95.5     0     208.2     0       13.3     0   359795.     0
  1    91.0     0     211.4     0       13.3     0   365416.     0
  2    73.5     0     208.6     0       13.3     0   357452.     0
  3    62.4     0     198.3     0       13.2     0   342792.     0
  0    59.5     0     190.2     0       13.0     0   332761.     0
  1    41.9     0     176.4     0       12.4     0   309221.     0
  2    30.3     0     167.5     0       11.9     0   272292.     0
  3    55.4     0     166.3     0       12.0     0   253741.     0
  0   158.5     0     175.5     0       11.8     0   255188.     0
  1   158.9     0     190.2     0       11.7     0   260946.     0
  2   148.1     0     181.2     0       11.8     0   255941.     0
  3   150.2     0     175.6     0       11.8     0   255524.     0
  0   139.3     0     173.5     0       11.8     0   254317.     0
  1   154.3     0     170.4     0       11.9     0   256724.     0
  2   174.5     0     173.4     0       12.1     0   262493.     0
  3   149.8     0     175.7     0       11.8     0   259541.     0
  0   146.3     0     177.0     0       11.8     0   249904.     0
  1   200.2     0     173.0     0       12.4     0   272595.     0
  2    78.1     0     171.7     0       13.1     0   312721.     0
  3    91.4     0     187.3     0       13.5     0   350360.     0
  0   -99.0    16     -99.0    16      -99.0    16   369866.   256   16+256 ARE
  1    96.9   256     198.8   256       14.0   256   381401.     0   CALIBRATIONS
  2    92.0     0     197.8     0       13.8     0   389682.     0
  3    93.7     0     194.4     0       13.7     0   390803.     0   • DATA ATTACHED TO
  0    93.4     0     198.6     0       13.6     0   395030.     0     256 IS VALID
  1    98.8     0     201.0     0       13.6     0   398869.     0
  2    96.3     0     202.1     0       13.6     0   400641.     0   • DATA ATTACHED TO
  3    91.5     0     201.8     0       13.7     0   399551.     0     16 IS NOT VALID
  0    93.7     0     197.6     0       13.5     0   404845.     0
  1    93.0     0     198.0     0       13.4     0   405791.     0     2-PM
  2    95.1     0     194.4     0       13.5     0   405174.     0             START
  3    92.3     0     192.3     0       13.5  2-off  395384.     0     2-MTLS
  0    85.6     0     196.7     0       13.7     0   391815.     0
  1    79.2     0     196.3     0       13.7     0   390087.     0
  2    81.7     0     193.3     0       13.7     0   385605.     0
  3    84.0     0     194.1     0       13.7     0   389075.     0
                              Press RETURN to continue
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11  0     91.1     0   191.4     0    13.6     0  392502.      0
11  1     86.6     0   190.0     0    13.5     0  404177.      0
11  2     81.6     0   194.3     0    13.7     0  402827.      0
11  3     79.7     0   194.9     0    13.7     0  403263.      0
12  0     81.1     0   190.8     0    13.6     0  404631.      0
12  1     84.7     0   191.2     0    13.6     0  402597.      0
12  2     78.7     0   192.3     0    13.6     0  400268.      0
12  3     74.0     0   192.1     0    13.6     0  398966.      0
13  0     64.5     0   190.6     0    13.6     0  405628.      0
13  1     63.2     0   191.0     0    13.6     0  395745.      0
13  2     58.0     0   190.9     0    13.6     0  395542.      0
13  3     55.3     0   192.5     0    13.6     0  402964.      0
14  0    133.1     0   192.2     0    13.6     0  398515.      0
14  1    174.2     0   192.4     0    13.6     0  404968.      0
14  2    162.8     0   193.7     0    13.6     0  399856.      0
14  3    172.7     0   191.6     0    13.6     0  396779.      0
15  0    172.8     0   191.6     0    13.5     0  398209.      0
15  1    175.6     0   190.7     0    13.5     0  394887.      0
15  2    167.3     0   192.3     0    13.5     0  394566.      0
15  3    158.9     0   192.6     0    13.5     0  397810.      0
16  0    166.2     0   192.6     0    13.5     0  399145.      0
16  1    173.1     0   194.0     0    13.4     0  396049.      0
16  2    183.4     0   196.7     0    13.5     0  394335.      0
16  3    180.6     0   199.3     0    13.5     0  397787.      0
17  0    193.9     0   201.1     0    13.4     0  399864.      0
17  1    194.2     0   199.2     0    13.5     0  396472.      0
17  2    211.4     0   199.5     0    13.4     0  399384.      0
17  3    210.1     0   200.8     0    13.4     0  396154.      0
18  0    192.0     0   200.3     0    13.4     0  396898.      0
18  1    189.5     0   199.8     0    13.4     0  396030.      0
18  2    188.7     0   200.8     0    13.6     0  394426.      0
18  3    195.5     0   196.9     0    13.6     0  393047.      0
19  0    191.7     0   195.3     0    13.6     0  388646.      0
19  1    190.4     0   194.3     0    13.5     0  393273.      0
19  2    192.7     0   197.1     0    13.5     0  391541.      0
19  3    185.6     0   196.7     0    13.6     0  392845.      0
20  0    169.5     0   185.6     0    13.4     0  384703.      0
20  1    185.5     0   198.8     0    13.6     0  397167.      0
20  2    180.5     0   207.7     0    13.5     0  388047.      0
20  3    150.2     0   214.3     0    13.4     0  378450.      0
21  0    115.4     0   203.8     0    13.3     0  339349.      0
21  1     91.1     0   213.6     0    12.8     0  320131.      0
21  2     91.1     0   216.2     0    13.0     0  317121.      0
21  3    101.9     0   217.7     0    13.1     0  323764.      0
22  0    122.4     0   219.9     0    13.1     0  334959.      0
22  1     93.2     0   217.9     0    12.8     0  321659.      0
22  2     79.0     0   229.0     0    12.5     0  301740.      0
                                 Press RETURN to continue
```

2-MESA

2-OH

2-SO3

2A-SOx

2A-MESA

31

38

2-Tris

2-PSD

2B-SOx

← 2-PM [illegible]
CO_2 = 13
SO_2 = 53.
NO_x = [illegible]

← 2-MTR[illegible]
CO_2 = 13.5
SO_2 = 111.1
NO_x = 193.

2-TRIS
CO_2 = 13.48

2B-SOx
CO_2 = 13.4

2-OH
CO_2 = 13.6

2A-MESA
CO_2 = 13.54

2-MESA
CO_2 = 13.6.

8/8, 1800 / 1730
→ NOx, ppm = 194.3
SO2, ppm = 126.7
Flow = 398.28

2-PSD-STK
CO_2 = 13.48

2-SO3-STK
CO_2 = 13.55

```
3    86.5    0   225.8    0    12.6    0  299073.     0
0    76.2    0   224.7    0    12.5    0  293532.     0
1    72.8    0   230.1    0    12.3    0  282917.     0
2    40.5    0   245.0    0    11.8    0  256238.     0
3    41.7    0   234.6    0    11.9    0  255395.     0
0    41.8    0   233.5    0    11.9    0  259085.     0
1    51.6    0   208.6    0    11.9    0  265002.     0
2    64.6    0   201.7    0    12.2    0  281529.     0
3    35.8    0   196.2    0    11.7    0  268448.     0
```

```
              CONTINUOUS EMISSIONS MONITORING DATA

MILLIKEN STATION    UNIT #2                    FOR TIME PERIOD 96/09/08

   QTR      S O 2          N O X          C O 2          F L O W
HR  HR    PPM  CODE      PPM  CODE        %  CODE      CFM  CODE
============================================================================
 1  0     29.1    0     197.9    0      11.8    0   261900.     0
 1  1     29.2    0     201.0    0      11.9    0   258866.     0
 1  2     25.0    0     198.5    0      11.8    0   259304.     0
 1  3     29.2    0     198.0    0      11.9    0   264849.     0
 2  0     39.7    0     196.0    0      11.9    0   266594.     0
 2  1     48.1    0     196.3    0      12.0    0   269938.     0
 2  2     51.8    0     199.6    0      12.2    0   275468.     0
 2  3     43.5    0     200.0    0      12.1    0   272792.     0
 3  0     39.7    0     198.1    0      11.8    0   268437.     0
 3  1     28.6    0     200.4    0      11.8    0   257606.     0
 3  2     27.4    0     198.2    0      11.8    0   259485.     0
 3  3     47.6    0     201.1    0      12.1    0   272197.     0
 4  0     29.3    0     198.3    0      11.7    0   270087.     0
 4  1     28.0    0     196.8    0      11.9    0   261700.     0
 4  2     36.4    0     197.0    0      11.9    0   275314.     0
 4  3     25.5    0     198.8    0      11.8    0   263542.     0
 5  0     22.6    0     200.3    0      11.8    0   264449.     0
 5  1     48.4    0     200.8    0      12.1    0   279843.     0
 5  2     41.5    0     194.2    0      11.8    0   277515.     0
 5  3     30.4    0     195.0    0      11.6    0   259651.     0
 6  0     35.7    0     195.1    0      11.8    0   259787.     0
 6  1     79.1    0     196.2    0      12.3    0   294343.     0
 6  2    122.0    0     213.5    0      12.8    0   328616.     0
 6  3    161.0    0     223.2    0      13.4    0   364567.     0
 7  0    -99.0   16     -99.0   16     -99.0   16   377196.   256
 7  1    174.2  256     241.2  256      13.9  256   387681.     0
 7  2    164.7    0     242.7    0      13.8    0   388061.     0
 7  3    153.2    0     230.1    0      13.5    0   393473.     0
 8  0    153.6    0     230.9    0      13.5    0   396412.     0
 8  1     80.2    0     223.4    0      13.5    0   402316.     0
 8  2     73.9    0     220.9    0      13.6    0   396823.     0
 8  3     73.9    0     215.8    0      13.6    0   398233.     0
 9  0     71.2    0     219.1    0      13.4    0   404474.     0  3-PM , 3 [illegible]S
 9  1     73.6    0     220.8    0      13.6    0   405342.     0
 9  2     70.8    0     218.9    0      13.6    0   400038.     0        START
 9  3     66.9    0     216.9    0      13.6    0   394547.     0
10  0     68.4    0     218.6    0      13.6    0   392428.     0
10  1     78.4    0     218.6  3-[illegible]  13.6  3-OK  0   399658.     0
10  2     80.9    0     220.4    0      13.6    0   397277.     0
10  3     84.2    0     220.1    0      13.7    0   395036.     0
                       Press RETURN to continue
```

```
0    90.0    0   217.9    0    13.7    0   394782.     0
1    99.1    0   215.5    0    13.6    0   396189.     0
2   101.3    0   199.7    0    13.8    0   397618.     0
3   108.6    0   198.1    0    13.9    0   400625.     0
0   113.7    0   195.7    0    13.8    0   404257.     0
1   124.9    0   197.5    0    13.7    0   404890.     0
2   139.7    0   201:.5   0    13.8    0   398644.     0
3   155.2    0   202.4    0    13.8    0   400014.     0
0   160.7    0   201.8    0    13.8    0   400365.     0
1   164.0    0   201.1    0    13.7    0   397413.     0
2   155.5    0   200.1    0    13.7    0   402676.     0
3   147.7    0   196.1    0    13.7    0   402338.     0
0   148.6    0   195.5    0    13.6    0   401028.     0
1   101.5    0   1[illegible].7    0    13.6    0   395880.     0
2    97.1    0   198.1    0    13.5    0   395092.     0
3    99.7    0   195.6    0    13.7    0   394747.     0
0   104.9    0   195.0    0    13.7    0   398456.     0
1   110.7    0   197.4    0    13.7    0   400159.     0
2   116.5    0   199.8    0    13.7    0   398761.     0
3   117.7    0   197.7    0    13.7    0   402125.     0
0   115.0    0   197.0    0    13.6    0   399378.     0
1   113.8    0   199.7    0    13.6    0   400755.     0
2   112.7    0   201.1    0    13.7    0   397057.     0
3   112.7    0   202.0    0    13.8    0   399216.     0
0    93.0    0   197.8    0    13.6    0   403591.     0
1    96.7    0   197.5    0    13.6    0   399816.     0
2    87.4    0   192.1    0    13.6    0   392492.     0
3    85.6    0   185.4    0    13.6    0   375945.     0
0    97.0    0   185.6    0    13.6    0   369502.     0
1    92.5    0   185.3    0    13.7    0   368936.     0
2    86.6    0   184.0    0    13.7    0   367671.     0
3    67.2    0   171.5    0    13.6    0   343890.     0
0    59.9    0   182.5    0    13.0    0   325164.     0
1    53.4    0   182.4    0    12.6    0   309426.     0
2    36.2    0   185.8    0    12.1    0   270454.     0
3    27.4    0   192.2    0    11.9    0   253121.     0
0    28.2    0   186.3    0    12.1    0   255704.     0
1    30.2    0   208.7    0    12.4    0   262349.     0
2    27.7    0   217.0    0    12.2    0   269187.     0
3    37.0    0   210.9    0    12.5    0   274690.     0
0    69.5    0   210.9    0    12.4    0   276472.     0
1    76.1    0   213.6    0    12.4    0   279798.     0
2    49.0    0   219.6    0    12.0    0   261854.     0
3    48.3    0   223.2    0    11.9    0   254179.     0
0    49.9    0   222.3    0    11.9    0   255768.     0
1    50.7    0   225.2    0    11.9    0   258118.     0
2    45.6    0   230.7    0    12.0    0   253110.     0
                          Press RETURN to continue
```

3-MESA

3-OH

3A-TRESP

3-PSD

3A-SOx

29

3B-SO3

3B-TRIS

37

← 3-PM EMC
CO_2 = 13.68
SO_2 = 102.9
NO_x = 21?.2

3A-SO_x
CO_2 = 13.62

← 3-N?? -EMC
CO_2 = 13.67
SO_2 = 109.2
NO_x = 205.3

3-TRIS
CO_2 = 13.64

3B-SO_3
CO_2 = 13.66

3-PSD-STK
CO_2 = 13.65

3-OH
CO_2 = 13.69

8/9, ~~1~~800/17~~0~~6
NOx ppm = 203.1
SO_2 ppm = 107.2
FLOW = 397.64

3A-MESA
CO_2 = 13.66

3-MESA
CO_2 = 13.68

```
22  3    44.6      0   192.4      0     11.8      0  254266.      0
23  0    27.4      0   185.0      0     11.1      0  233331.      0
23  1    23.2      0   188.1      0     11.2      0  223235.      0
23  2    23.6      0   183.5      0     11.4      0  218750.      0
23  3    22.9      0   179.9      0     11.4      0  217223.      0
24  0    22.1      0   185.5      0     11.2      0  221040.      0
24  1    20.2      0   183.6      0     11.3      0  219914.      0
24  2    21.6      0   180.1      0     11.1      0  222784.      0
24  3    21.9      0   182.0      0     11.4      0  216947.      0
```

Appendix C.3

Sample Locations and Preliminary Velocity Traverses

CARNOT
VELOCITY TRAVERSE DATA

CLIENT/LOCATION: NYSEG

DATE:

SAMPLE LOCATION:

DATA TAKEN BY:

UNIT NO.:

TEST DESCRIPTION:

TEST NO.:

BARO. PRESS. (In. Hg):

PITOT TUBE COEFFICIENT ______ Cp

ABS. STATIC PRESS. IN STACK (In. Hg) -14.1 P_s SOUTH

② of ②

$$V_s = 2.90\ Cp\ \sqrt{\Delta P\ T_s}\ \sqrt{\frac{29.92}{P_s} \times \frac{28.95}{MW}}$$

ME	TRAVERSE POINT		VELOCITY HEAD, in. H_2O, ΔP	GAS TEMP., °F	TIME	TRAVERSE POINT		VELOCITY HEAD, in. H_2O, ΔP	GAS TEMP., °F
	PORT	POINT				PORT	POINT		
	M	3	.03	298	*	S	3	.21	302
	℄=0	2	.34	302		℄=0	2	.33	303
		1	.30	302			1	.27	304
*	N	3	.01	300	*	T	3	.05	296
	℄=0	2	.41	302		℄=0	2	.28	296
		1	.33	304			1	.27	287
*	O	3	.03	304		U	3	.30	294
	℄=0	2	.37	304		℄=0	2	.34	296
		1	.30	304			1	.32	294
	P	3	.20	304	*	V	3	.27	294
	℄=0	2	.37	304		℄=0	2	.20	306
		1	.32	305			1	.28	305
	Q	3	.20	292	*	W	3	.15	291
	℄=0	2	.29	293			2	.38	299
		1	.23	299		℄=0	1	.31	301
	R	3	.23	300	*	X	3	.45	299
		2	.36	302		℄=0	2	.35	299
	℄=0	1	.28	305			1	.20	302

Circled values considered invalid.

CARNOT

DUCT AVG: 0.2963

4-Port AVG: 0.3075

Difference: 3.8%

Overall AVG = 0.2725

~~2 PORT AVG = 0.2795~~

OVERALL DIFF = 2.5%

CARNOT
VELOCITY TRAVERSE DATA

CLIENT/LOCATION: NYSEG

DATE: 8/6/96

SAMPLE LOCATION: ESP IN

DATA TAKEN BY: BC

UNIT NO.: 2

TEST DESCRIPTION:

TEST NO.: PRELIM (REPEAT)

BARO. PRESS. (In. Hg):

PITOT TUBE COEFFICIENT .84 Cp

ABS. STATIC PRESS. IN STACK (In. Hg) -13.9 P_s NORTH

$$V_s = 2.90\, C_p \sqrt{\Delta P\ T_s} \sqrt{\frac{29.92}{P_s} \times \frac{28.95}{MW}}$$

TIME	TRAVERSE POINT		VELOCITY HEAD, in. H_2O, ΔP	GAS TEMP., °F	TIME	TRAVERSE POINT		VELOCITY HEAD, in. H_2O, ΔP	GAS TEM °F
	PORT	POINT				PORT	POINT		
1430	A	3	.12	275		G	3	.11	278
	℄=0	2	.27	275		℄=0	2	.22	278
		1	.20	270			1	.25	284
	B	3	.24	273		H	3	.16	293
	℄=0	2	.32	284		℄=0	2	.26	295
		1	.27	284			1	.21	297
	C	3	.12	286		I	3	.20	282
	℄=0	2	.32	292		℄=0	2	.28	282
		1	.24	293			1	.26	279
	D	3	.22	295		J	3	.18	300
	℄=0	2	.30	297		℄=0	2	.30	300
		1	.23	298			1	.26	299
*	E	3	.09	289	*	K	3	.04	296
	℄=0	2	.27	300		℄=0	2	.33	305
		1	.16	302			1	.28	306
	F	3	.10	300		L	3	.08	301
	℄=0	2	.26	300		℄=0	2	.27	305
		1	.22	301			1	.22	308

MF-003

DUCT AVG: 0.2497
4-PORT AVG: 0.2525
1.1% DIFF

Circled values considered invalid.

CARNOT

PAGE 2 OF 2

CARNOT
VELOCITY TRAVERSE DATA

CLIENT/LOCATION: NYSEG
DATE: 8-6-96
SAMPLE LOCATION: ESP OUTLET
DATA TAKEN BY: DH / JP / RM
UNIT NO.:
TEST DESCRIPTION:
TEST NO.: 1-VEL
BARO. PRESS. (In. Hg):
PITOT TUBE COEFFICIENT 0.84 Cp
ABS. STATIC PRESS. IN STACK (In. Hg) P_s

$$V_s = 2.90\ Cp\ \sqrt{\Delta P\ T_s}\ \sqrt{\frac{29.92}{P_s} \times \frac{28.95}{MW}}$$

PORT B STATIC -14.8

PORT O STATIC -14.0

ME	TRAVERSE POINT		VELOCITY HEAD, in. H_2O, ΔP	GAS TEMP., °F	TIME	TRAVERSE POINT		VELOCITY HEAD, in. H_2O, ΔP	GAS TEMP., °F
	PORT	POINT				PORT	POINT		
	O	3	0.36	280		I	3	0.31	282
	#5	2	0.38	282			2	0.33	286
		1	0.34	283			1	0.29	281
	B*	3	0.33	272		M	3	0.29	286
	#0	2	0.36	281			2	0.29	287
		1	0.32	283			1	0.24	283
50	A	3	0.19	284		N	3	0.27	288
		2	0.20	284			2	0.29	288
		1	0.22	281			1	0.23	288
	C	3	0.26	281		Q	3	0.21	282
		2	0.27	283			2	0.14	283
		1	0.26	280			1	0.16	277
	D	3	0.26	279		T	3	0.24	282
		2	0.31	283			2	0.23	285
		1	0.25	279			1	0.27	285
	E	3	0.28	285		U	3	0.33	286
		2	0.22	285			2	0.31	286
5		1	0.15	273			1	0.30	287
						X	NA		

* DIFFICULT

PORTS X FROZEN

CARNOT

ALL PORTS: 0.2856
8 PORTS: 0.2991

OVERALL DIFF = 4.7

PAGE 1 OF 2

CARNOT
VELOCITY TRAVERSE DATA

CLIENT/LOCATION: WILEN/MILLIKAN
DATE: 8-6-96
SAMPLE LOCATION: ESP OUTLET
DATA TAKEN BY: DH/JP/RM
UNIT NO.:
TEST DESCRIPTION:
TEST NO.: 1-VEL
BARO. PRESS. (In. Hg):
PITOT TUBE COEFFICIENT 0.84 Cp
ABS. STATIC PRESS. IN STACK (In. Hg) ________ P_s

$$V_s = 2.90\ Cp\ \sqrt{\Delta P\ T_s}\ \sqrt{\frac{29.92}{P_s} \times \frac{28.95}{MW}}$$

CYCLONIC CHECK PORT W ∡ = 0 - 5°

TIME	TRAVERSE POINT		VELOCITY HEAD, in. H_2O, ΔP	GAS TEMP., °F	TIME	TRAVERSE POINT		VELOCITY HEAD, in. H_2O, ΔP	GAS TEM °F
	PORT	POINT				PORT	POINT		
0915	W*	3	0.33	269	0938	L	3	0.30	277
		2	0.32	270	∡=0		2	0.37	281
		1	0.30	270			1	0.34	282
∡=0	V*	3	0.34	270		K*	3	0.37	277
		2	0.34	269			2	0.36	279
		1	0.27	269			1	0.33	282
∡=0	S	3	0.27	277	∡=5	J*	3	0.31	278
		2	0.26	278			2	0.41	281
		1	0.24	277			1	0.38	283
∡=0	R	3	0.29	271	∡=0	H	3	0.30	273
		2	0.29	273			2	0.33	276
		1	0.24	264			1	0.41	270
∡=0	P	3	0.33	271	∡=0	G	3	0.34	273
		2	0.35	273			2	0.28	280
		1	0.50	273			1	0.20	279
∡=0	O	3	0.50	279	0950	F	3	0.30	276
		2	0.34	280	∡=0		2	0.28	280
		1	0.33	277			1	0.25	276
0933									

* DIFFICULT

CARNOT

CARNOT
VELOCITY TRAVERSE DATA

CLIENT/LOCATION: NVSEGI

DATE: 8/6/96

SAMPLE LOCATION: STACK

DATA TAKEN BY: RAF

UNIT NO.: 2

TEST DESCRIPTION:

TEST NO.: Prelim. Velocity / Flow Angle

BARO. PRESS. (In. Hg):

PITOT TUBE COEFFICIENT 0.84 Cp

ABS. STATIC PRESS. IN STACK (In. Hg) P_s

$$V_s = 2.90\ C_p \sqrt{\Delta P\ T_s} \sqrt{\frac{29.92}{P_s} \times \frac{28.95}{MW}}$$

ME	TRAVERSE POINT		VELOCITY HEAD, in. H_2O, ΔP	GAS TEMP., °F	θ ~~TIME~~	TRAVERSE POINT		VELOCITY HEAD, in. H_2O, ΔP	GAS TEMP., °F
	PORT	POINT				PORT	POINT		
12	F2	6	1.20	121	0°				
		5	1.3	123	0°				
		4	.4	119	0°				
			.2	119	3°				
		2	.45	118	0°				
18		1	.81	114	0°				
41.	F3	6	1.35	120	0				
		5	1.30	11[illegible]	-3				
		4	1.3	119	3				
		3	1.3	121	3				
		2	1.3	121	2				
		1	1.1	121	-2				

Appendix C.4

EPA Method 29

TABLE 4-1
EPA METHOD 29 MERCURY EMISSION RESULTS
NYSEG POST-RETROFIT TEST PROGRAM
AUGUST 1996

Parameter	ESP INLET				ESP OUTLET/FGD INLET				FGD OUTLET/STACK			
	1-MTLS-IN	2-MTLS-IN	3-MTLS-IN	AVERAGE	1-MTLS-OUT	2-MTLS-OUT	3-MTLS-OUT	AVERAGE	1-MTLS-STK	2-MTLS-STK	3-MTLS-STK	AVERAGE
Date	8/7/96	8/8/96	8/9/96		8/7/96	8/8/96	8/9/96		8/7/96	8/8/96	8/9/96	
Pitot Flow Rate, dscfm	325,318	340,247	327,659	331,075	323,354	331,647	330,081	328,361	358,667	358,779	362,692	360,046
Sample Volume, dscf	137.91	144.70	135.15	139.25	221.74	219.80	216.78	219.44	241.79	253.28	254.55	249.87
Fuel Factor, dscf/10^6Btu	13,106	12,740	13,355	13,067	12,920	12,740	12,723	12,794	13,157	13,088	13,328	13,191
O_2, %	5.60	5.10	5.79	5.50	5.38	5.10	5.04	5.17	5.66	5.52	5.76	5.65
CO_2, %	13.86	13.94	13.64	13.81	14.06	13.94	14.32	14.11	13.81	13.57	13.67	13.68
H_20, %	8.5	8.7	8.5	8.6	8.3	8.4	8.1	8.3	14.4	14.8	14.3	14.5
Elemental Mercury -- Hg(0)												
ug/Nm^3	0.80	0.76	0.84	0.80	1.06	1.66	1.75	1.49	2.27	2.69	2.23	2.40
lb/hr	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.003	0.003
lb/10^{12}Btu	0.61	0.56	0.65	0.61	0.80	1.23	1.29	1.10	1.74	2.05	1.73	1.84
Oxidized Mercury -- Hg(II)												
ug/Nm^3	7.33	8.41	6.82	7.52	5.86	7.21	5.63	6.23	0.46	0.56	0.83	0.62
lb/hr	0.008	0.010	0.008	0.009	0.007	0.008	0.006	0.007	0.001	0.001	0.001	0.001
lb/10^{12}Btu	5.59	6.22	5.29	5.70	4.40	5.34	4.16	4.63	0.36	0.43	0.64	0.47
Total Mercury												
ug/Nm^3	**9.04**	**10.06**	**8.44**	9.18	**6.92**	**8.86**	**7.38**	**7.72**	**2.74**	**3.25**	**3.07**	**3.02**
lb/hr	**0.010**	**0.012**	**0.010**	0.011	**0.008**	**0.010**	**0.008**	**0.009**	**0.003**	**0.004**	**0.004**	**0.004**
lb/10^{12}Btu	**6.88**	**7.45**	**6.55**	6.96	**5.20**	**6.56**	**5.46**	**5.74**	**2.09**	**2.47**	**2.38**	**2.31**
Mercury Removal Efficiency					**23.4%**	**11.9%**	**12.6%**	**15.9%**	**60.4%**	**63.3%**	**58.4%**	**60.9%**
Uncertainty @ 95% CI				22.1%				32.7%				21.4%
Uncertainty @ 95% CI, ug/Nm^3				2.02				2.52				0.65

DRAFT RESULTS -- CONFIDENTIAL
DO NOT CITE OF QUOTE

MERCURY LABORATORY SUMMARY
EPA METHOD 29 ANALYSIS
NYSEG POST-RETROFIT TEST PROGRAM
AUGUST 1996

Mercury, ug/train:	Reagent Blank	1-MTLS-IN	2-MTLS-IN	3-MTLS-IN	1-MTLS-OUT	2-MTLS-OUT	3-MTLS-OUT	1-MTLS-STK	2-MTLS-STK	3-MTLS-STK
Sample Fraction										
(EPA Method 29):										
FH -- Probe Rinse Solids	ND< 0.030	3.3	3.4	2.8	NP$^{(1)}$	NP$^{(1)}$	NP$^{(1)}$	NP$^{(1)}$	NP$^{(1)}$	NP$^{(1)}$
FH -- No Probe Rinse Solids	ND< 0.030	ND< 0.030	1.0	ND< 0.030	ND< 0.090	ND< 0.030	ND< 0.030	ND< 0.030	ND< 0.030	0.10
BH	ND< 0.20	26	30	24	29.5	40	31	2.9	3.7	5.4
MKO	ND< 0.010	0.67	1.1	0.30	4.8	1.8	1.2	0.051	ND< 0.030	0.12
KMnO4 / HCl (combined)	ND< 0.055	2.9	2.9	3.0	6.2	9.6	10	14.5	18	15
Total Hg per train:										
RAW	ND< 0.33	32.9	38.4	30.1	40.5	51.4	42.2	17.5	21.7	20.6
CORR. FOR RB		32.9	38.4	30.1	40.5	51.4	42.2	17.5	21.7	20.6

NA -- not available

Notes:

(1) Probe rinse solids were not analyzed separately for the ESP outlet and stack samples.

Zenon Environmental Laboratories - Certificate of Analysis

Client ID:			1M-IN PR Solids	2M-IN PR Solids	3M-IN PR Solids	3M-IN PR Solids	3M-IN PR Solids
Zenon ID:			033668 96	033669 96	033670 96	033670 96	033670 96
Date Sampled:			96/08/07	96/08/08	96/08/09	96/08/09	96/08/09
Component	MDL	Units				Duplicate	M. Spike
Probe Rinse Residue	0.1	g	29.42	36.57	33.68	-	-
Metals via EPA Method 29(gfaa)							
Antimony	0.60	"	106	116	127	-	-
Arsenic	0.60	ug	2540	2770	2500	-	-
Beryllium	0.060	"	45.0	134	87.4	-	-
Cadmium	0.03	"	18.2	17.2	18.1	-	-
Lead	0.30	"	1510	1680	1780	-	-
Selenium (gfaa)	0.6	"	65.3	70.2	58.6	-	-
Mercury via SW846 Method 7421							
Mercury	0.030	"	3.35	3.36	2.77	2.71	27.0
Metals via Method 29 (ICP)							
Aluminum	9.0	ug	3280000	3880000	3780000	-	-
Barium	0.30	"	24900	27900	26000	-	-
Beryllium	0.15	"	263	310	273	-	-
Calcium	30.0	"	1010000	1450000	1260000	-	-
Cobalt	3.0	"	1130	1450	1360	-	-
Chromium	1.20	"	3350	3910	3870	-	-
Copper	1.8	"	2270	2800	2600	-	-
Iron	3.0	"	2820000	4060000	3340000	-	-
Potassium	300.0	"	424000	537000	530000	-	-
Magnesium	15.0	"	163000	245000	205000	-	-
Manganese	1.8	"	6400	8410	7520	-	-
Molybdenum	3.0	"	448	479	442	-	-
Sodium	30.0	"	193000	218000	204000	-	-
Nickel	6.0	"	2540	3130	2860	-	-
Phosphorus	18.0	"	79300	92300	102000	-	-
Titanium	6.0	"	167000	202000	191000	-	-
Vanadium	1.5	"	5570	6480	6150	-	-

ZENON LABORATORIES

5555 North Service Road
Burlington, Ontario, Canada L7L 5H7
Tel: (905) 332-8788
Fax: (905) 332-9169

Certificate of Analysis

CLIENT INFORMATION		LABORATORY INFORMATION	
Attention:	Marc Rodabaugh	**Contact:**	Ron McLeod
Client Name:	Carnot	**Project:**	AN960690
Project:	11476	**Date Received:**	96/08/15
Project Desc:	NYSEG	**Date Reported:**	96/09/16
Address:	110-15991 Red Hill Avenue Tustin, CA 92680-7388	**Submission No.:**	6H0748
		Sample No.:	033692-033712
Fax Number:	714-259-0372		
Phone Number:	714-259-9520		

NOTES: *'-' = not analysed '<' = less than Method Detection Limit (MDL) 'NA' = no data available*
LOQ can by determined for all analytes by multiplying the appropriate MDL X 3.33
Solids data is based on dry weight except for biota analyses.
Organic analyses are not corrected for extraction recovery standards except for isotope dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)

Methods used by Zenon are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', Seventeenth Edition. Other methods are based on the principles of MISA or EPA methodologies.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied. Your samples will be retained at Zenon for a period of three weeks from receipt of data or as per contract.

COMMENTS:

M29 Hg FH

Certified by: R.A. McLeod

Zenon Environmental Laboratories - Certificate of Analysis

Client ID:			1M-IN F.H.	2M-IN F.H.	3M-IN F.H.	FB-M-OUT	2FB M-OUT	1M-OUT F.H.	1M-OUT F.H.	1M-OUT F.H.	1M-OUT F.H.	1M-OUT F.H.	1M-OUT F.H.
Zenon ID:			033692 96	033693 96	033694 96	033695 96	033696 96	033697 96	033697 96	033697 96	033697 96	033697 96	033697 96
Date Sampled:			96/08/07	96/08/08	96/08/09	96/08/06	96/08/12	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07
Component	**MDL**	**Units**							Duplicate	M. Spike	MS % Rec.	MS Dup	MSD % Rec.
Mercury	0.030	ug	<	1.0	<	<	<	<0.090	<0.090	0.94	110	0.94	110

Zenon Environmental Laboratories - Certificate of Analysis

Client ID:			2M-OUT F.H.	3M-OUT F.H.	FB-M-STK F.H.	2FB-M-OUT F.H.	1M-STK F.H.	1M-STK F.H.	1M-STK F.H.	1M-STK F.H.	1M-STK F.H.	1M-STK F.H.
Zenon ID:			033700 96	033701 96	033702 96	033703 96	033704 96	033704 96	033704 96	033704 96	033704 96	033704 96
Date Sampled:			96/08/08	96/08/09	96/08/06	96/08/12	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07
Component	**MDL**	**Units**						Duplicate	M. Spike	MS % Rec.	MS Dup	MSD % Rec.
Mercury	0.030	ug	<	<	<	0.032	<	<	1.0	120	1.0	120

Zenon Environmental Laboratories - Certificate of Analysis

		Client ID:	2M-STK F.H.	3M-STK F.H.	4M-SPK F.H.	RB-M-1 F.H.	RB-M-2 F.H.	RB-M-3 F.H.
		Zenon ID:	033707 96	033708 96	033709 96	033710 96	033711 96	033712 96
		Date Sampled:	96/08/08	96/08/09	96/08/09	96/08/07	96/08/08	96/08/09
Component	**MDL**	**Units**						
Mercury	0.030	ug	<	0.10	0.045	<	<	<

Component	**MDL**	**Units**		
Batch Code:			**0910ASA1**	**0910ASA2**
Mercury	0.030	ug	<	<

ZEL Summary of Analysis Pre. Dates

Batch Code:	**0910ASA1**	**0910ASA2**
Mercury	033692 96	033704 96
	033693 96	033707 96
	033694 96	033708 96
	033695 96	033709 96
	033696 96	033710 96
	033697 96	033711 96
	033700 96	033712 96
	033701 96	
	033702 96	
	033703 96	
Date analysed	96/09/10	96/09/10
Date prepared	96/09/10	96/09/10

ZENON
LABORATORIES

Burlington, Ontario, Canada L7L 5H
Tel: (905) 332-878
Fax: (905) 332-916

Certificate of Analysis

CLIENT INFORMATION

Attention: Marc Rodabaugh
Client Name: Carnot
Project: 11476
Project Desc: NYSEG

Address: 110-15991 Red Hill Avenue
Tustin, CA
92680-7388
Fax Number: 714-259-0372
Phone Number: 714-259-9520

LABORATORY INFORMATION

Contact: Ron McLeod
Project: AN960690
Date Received: 96/08/15
Date Reported: 96/09/11

Submission No.: 6H0748
Sample No.: 033713-033776

NOTES: *'-' = not analysed '<' = less than Method Detection Limit (MDL) 'NA' = no data available*
LOQ can by determined for all analytes by multiplying the appropriate MDL X 3.33
Solids data is based on dry weight except for biota analyses.
Organic analyses are not corrected for extraction recovery standards except for isotope dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)

Methods used by Zenon are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', Seventeenth Edition. Other methods are based on the principles of MISA or EPA methodologies.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied. Your samples will be retained at Zenon for a period of three weeks from receipt of data or as per contract.

COMMENTS:

M29 MERCURY
(NO FH)

Certified by:

Zenon Environmental Laboratories - Certificate of Analysis

Client ID:			Method Blank	Blank Spike 1	Blank Spike 1	Blank Spike 2	Blank Spike 2	1M-IN B.H	2M-IN B.H	3M-IN B.H	FB-M-OUT B.H.
Zenon ID:			033713 96	033713 96	033713 96	033713 96	033713 96	033714 96	033715 96	033716 96	033717 96
Date Sampled:			96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/08	96/08/09	96/08/06
Component	**MDL**	**Units**		M. Spike	MS % Rec.	MS Dup	MSD % Rec.				
Impinger volume measured		ml	100	-	-	-	-	610	600	620	390
Mercury	0.010	ug	<	0.10	110	0.10	110	26	30	24	<0.19

Zenon Environmental Laboratories - Certificate of Analysis

Client ID:			2FB-M-OUT B.H.	1M-OUT B.H.	1M-OUT B.H.	1M-OUT B.H.	1M-OUT B.H.	1M-OUT B.H.	1M-OUT B.H.	2M-OUT B.H.	3M-OUT B.H.
Zenon ID:			033718 96	033719 96	033719 96	033719 96	033719 96	033719 96	033719 96	033722 96	033723 96
Date Sampled:			96/08/12	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/08	96/08/09
Component	**MDL**	**Units**			Duplicate	M. Spike	MS % Rec.	MS Dup	MSD % Rec.		
Impinger volume measured		ml	380	710	-	-	-	-	-	770	700
Mercury	0.010	ug	<0.19	29	30	46	90	46	89	40	31

29.5

Zenon Environmental Laboratories - Certificate of Analysis

Client ID:			2FB-M-OUT MKO	1M-OUT MKO	1M-OUT MKO.	1M-OUT MKO	1M-OUT MKO	1M-OUT MKO	1M-OUT MKO	2M-OUT MKO	3M-OUT MKO
Zenon ID:			033739 96	033740 96	033740 96	033740 96	033740 96	033740 96	033740 96	033743 96	033744 96
Date Sampled:			96/08/12	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/08	96/08/09
Component	**MDL**	**Units**			Duplicate	M. Spike	MS % Rec.	MS Dup	MSD % Rec.		
Impinger volume measured		ml	53	110	-	-	-	-	-	48	52
Mercury	0.010	ug	<	4.8	4.7	8.5	85	8.5	85	1.8	1.2

4.75

Zenon Environmental Laboratories - Certificate of Analysis

Client ID:			FB-M-STK B.H.	2FB-M-STK B.H.	1M-STK B.H.	1M-STK B.H.	1M-STK B.H.	1M-STK B.H.	1M-STK B.H.	1M-STK B.H.	2M-STK B.H.
Zenon ID:			033724 96	033725 96	033726 96	033726 96	033726 96	033726 96	033726 96	033726 96	033729 96
Date Sampled:			96/08/06	96/08/12	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/08
Component	**MDL**	**Units**				Duplicate	M. Spike	MS % Rec.	MS Dup	MSD % Rec.	
Impinger volume measured		ml	400	390	1100	-	-	-	-	-	1300
Mercury	0.010	ug	<0.20	<0.20	2.9	2.9	8.7	100	8.9	110	3.7

Zenon Environmental Laboratories - Certificate of Analysis

	Client ID:		3M-STK B.H.	4M-SPK B.H.	RB-M-1 B.H.	RB-M-2 B.H.	RB-M-3 B.H.	1M-IN MKO	2M-IN MKO	3M-IN MKO	FB-M-OUT MKO
	Zenon ID:		033730 96	033731 96	033732 96	033733 96	033734 96	033735 96	033736 96	033737 96	033738 96
	Date Sampled:		96/08/09	96/08/09	96/08/07	96/08/08	96/08/09	96/08/07	96/08/08	96/08/09	96/08/06
Component	**MDL**	**Units**									
Impinger volume measured		ml	1200	410	410	410	400	53	74	52	50
Mercury	0.010	ug	5.4	<0.20	<0.20	<0.20	<0.20	0.67	1.1	0.30	<

Zenon Environmental Laboratories - Certificate of Analysis

Client ID:			FB-M-STK MKO	2FB-M-STK MKO	1M-STK MKO	1M-STK MKO	1M-STK MKO	1M-STK MKO	1M-STK MKO	1M-STK MKO
Zenon ID:			033745 96	033746 96	033747 96	033747 96	033747 96	033747 96	033747 96	033747 96
Date Sampled:			96/08/06	96/08/12	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/07
Component	**MDL**	**Units**				Duplicate	M. Spike	MS % Rec.	MS Dup	MSD % Rec.
Impinger volume measured		ml	52	50	93	-	-	-	-	-
Mercury	0.010	ug	<	<	0.056	0.046	0.54	110	0.51	100

0.051

Zenon Environmental Laboratories - Certificate of Analysis

Client ID:			2M-STK MKO	3M-STK MKO	4M-SPK MKO	RB-M-1 MKO	RB-M-2 MKO	RB-M-3 MKO	1M-IN KMNO4/HCl	2M-IN KMNO4/HCl
Zenon ID:			033750 96	033751 96	033752 96	033753 96	033754 96	033755 96	033756 96	033757 96
Date Sampled:			96/08/08	96/08/09	96/08/09	96/08/07	96/08/08	96/08/09	96/08/07	96/08/08
Component	**MDL**	**Units**								
Impinger volume measured		ml	60	58	50	52	58	57	580	590
Mercury	0.010	ug	<0.030	0.12	<	<	<	<	2.9	2.9

96/09/20

Zenon Environmental Laboratories - Certificate of Analysis

	Client ID:			3M-IN	FB-M-OUT	2FB-M-OUT	1M-OUT	1M-OUT	1M-OUT	1M-OUT
				KMNO4/HCl	KMNO4/HCl	KMNO4/HCl	KMNO4/HCl	KMNO4/HCl	KMNO4/HCl	KMNO4/HCl
	Zenon ID:			033758 96	033759 96	033760 96	033761 96	033761 96	033761 96	033761 96
	Date Sampled:			96/08/09	96/08/06	96/08/12	96/08/07	96/08/07	96/08/07	96/08/07
								Duplicate	M. Spike	MS % Rec.
Component		**MDL**	**Units**							
Impinger volume measured			ml	570	630	570	540	-	-	-
Mercury		0.010	ug	3.0	<0.063	0.10	6.3	6.1	17	100

6.2

Zenon Environmental Laboratories - Certificate of Analysis

Client ID:			1M-OUT KMNO4/HCl	1M-OUT KMNO4/HCl	2M-OUT KMNO4/HCl	3M-OUT KMNO4/HCl	FB-M-STK KMNO4/HCl	2FB-M-STK KMNO4/HCl	1M-STK KMNO4/HCl
Zenon ID:			033761 96	033761 96	033764 96	033765 96	033766 96	033767 96	033768 96
Date Sampled:			96/08/07	96/08/07	96/08/08	96/08/09	96/08/06	96/08/12	96/08/07
Component	**MDL**	**Units**	MS Dup	MSD % Rec.					
Impinger volume measured		ml	-	-	560	560	530	570	590
Mercury	0.010	ug	17	100	9.6	10	0.22	0.092	15

Zenon Environmental Laboratories - Certificate of Analysis

			1M-STK	1M-STK	1M-STK	1M-STK	1M-STK	2M-STK	3M-STK
Client ID:			KMNO4/HCl	KMNO4/HCl	KMNO4/HCl	KMNO4/HCl	KMNO4/HCl	KMNO4/HCl	KMNO4/HCl
Zenon ID:			033768 96	033768 96	033768 96	033768 96	033768 96	033771 96	033772 96
Date Sampled:			96/08/07	96/08/07	96/08/07	96/08/07	96/08/07	96/08/08	96/08/09
Component	**MDL**	**Units**	Duplicate	M. Spike	MS % Rec.	MS Dup	MSD % Rec.		
Impinger volume measured		ml	-	-	-	-	-	570	550
Mercury	0.010	ug	14	27	100	26	100	18	15

14.5

Zenon Environmental Laboratories - Certificate of Analysis

Client ID:			4M-SPK KMNO4/HCl	RB-M-1 KMNO4/HCl	RB-M-2 KMNO4/HCl	RB-M-3 KMNO4/HCl
Zenon ID:			033773 96	033774 96	033775 96	033776 96
Date Sampled:			96/08/09	96/08/07	96/08/08	96/08/09
Component	**MDL**	**Units**				
Impinger volume measured		ml	540	550	540	550
Mercury	0.010	ug	0.077	<0.055	<0.054	<0.055

ZEL Summary of Analysis Pre. Dates

Batch Code:	**0906MGA1**	**0906MGA2**	**0906MGA3**	**0906MGA4**	**0906MGA5**	**0906MGA6**
Mercury	033713 96	033726 96	033738 96	033747 96	033761 96	033768 96
	033714 96	033729 96	033739 96	033753 96	033765 96	
	033715 96	033730 96	033740 96	033754 96	033766 96	
	033716 96	033731 96	033743 96	033755 96	033767 96	
	033717 96	033732 96	033744 96	033756 96	033771 96	
	033718 96	033733 96	033745 96	033757 96	033772 96	
	033719 96	033734 96	033746 96	033758 96	033773 96	
	033722 96	033735 96	033750 96	033759 96	033774 96	
	033723 96	033736 96	033751 96	033760 96	033775 96	
	033724 96	033737 96	033752 96	033764 96	033776 96	
	033725 96					
Date analysed	96/09/06	96/09/06	96/09/09	96/09/06	96/09/06	96/09/06
Date prepared	96/09/06	96/09/06	96/09/06	96/09/06	96/09/06	96/09/06

CARNOT SOURCE TEST DATA SUMMARY
MULTI-METALS -- EPA METHOD 29
ESP INLET

Client/Location	NYSEG/Milliken	**Reference Temp (F)**	68
Unit	2	**Fuel**	COAL
Sample Location	ESP INLET	**Data By**	DVK
Operating Condition	FULL LOAD	**Date of Data Entry**	10/1/96

Test No	**1-MTLS-IN**	**2-MTLS-IN**	**3-MTLS-IN**	**Average**
Date	8/7/96	8/8/96	8/9/96	*
Test Method	EPA 29	EPA 29	EPA 29	*
Sample Train	ES-42	ES-42	ES-42	*
Pitot Factor	0.840	0.840	0.840	*
Meter Cal Factor	1.0008	1.0008	1.0008	*
Stack Area (sq ft)	236.25	236.25	236.25	*
Sample Time (Min)	240	240	240	*
Bar Press (in Hg)	29.86	29.83	29.68	*
Nozzle Diam (in)	0.278	0.278	0.278	*
Start/Stop Time	0817/1227	0803/1212	0803/1210	*
Stack Press (iwg)	-13.85	-14.81	-14.53	-14.40
Stack Temp (F)	292.9	292.4	289.0	291.4
Velocity Head (iwg)	0.3017	0.3321	0.3063	0.3132
Stack O2 (%)	5.60	5.10	5.79	5.50
Stack CO2 (%)	13.86	13.94	13.64	13.81
Meter Vol (acf)	154.537	160.792	146.785	154.038
Meter Temp (F)	132.7	127.4	110.9	123.7
Meter Press (iwg)	1.25	1.37	1.14	1.25
Liquid Vol (ml)	272.6	293.2	265.0	276.9
Std Sample Vol (SCF)	137.908	144.702	135.145	139.251
Std Sample Vol (Nm^3)	3.639	3.818	3.566	3.674
Moisture Fraction	0.085	0.087	0.085	0.086
Stack Gas Mol Wt	29.38	29.35	29.36	29.36
Stack Gas Velocity (ft/sec)	37.12	39.02	37.47	37.87
Stack Flow Rate (wacfm)	526,226	553,149	531,154	536,843
Stack Flow Rate (dscfm)	325,318	340,247	327,659	331,075
Isokinetic Ratio (%)	98.96	99.28	96.29	98.18

CARNOT SOURCE TEST DATA SUMMARY
MULTI-METALS -- EPA METHOD 29
ESP OUTLET

Client/Location	NYSEG/Milliken	**Reference Temp (F)**	68
Unit	2	**Fuel**	COAL
Sample Location	ESP OUTLET	**Data By**	DVK
Operating Condition	FULL LOAD	**Date of Data Entry**	10/1/96

Test No	**1-MTLS-OUT**	**2-MTLS-OUT**	**3-MTLS-OUT**	**Average**
Date	8/7/96	8/8/96	8/9/96	*
Test Method	EPA 29	EPA 29	EPA 29	*
Sample Train	ES-55	ES-55	ES-55	*
Pitot Factor	0.840	0.840	0.840	*
Meter Cal Factor	0.9970	0.9970	0.9970	*
Stack Area (sq ft)	236.25	236.25	236.25	*
Sample Time (Min)	360	360	360	*
Bar Press (in Hg)	29.86	29.83	29.68	*
Nozzle Diam (in)	0.277	0.280	0.280	*
Start/Stop Time	0833/1512	0822/1435	0814/1435	*
Stack Press (iwg)	-14.50	-14.50	-14.50	-14.50
Stack Temp (F)	283.9	285.8	279.5	283.1
Velocity Head (iwg)	0.2940	0.3106	0.3058	0.3034
Stack O2 (%)	5.38	5.10	5.04	5.17
Stack CO2 (%)	14.06	13.94	14.32	14.11
Meter Vol (acf)	245.612	241.640	232.576	239.943
Meter Temp (F)	123.3	118.4	101.5	114.4
Meter Press (iwg)	1.01	1.04	0.97	1.00
Liquid Vol (ml)	425.4	426.5	405.9	419.3
Std Sample Vol (SCF)	221.735	219.798	216.781	219.438
Std Sample Vol (Nm^3)	5.851	5.800	5.720	5.790
Moisture Fraction	0.083	0.084	0.081	0.083
Stack Gas Mol Wt	29.43	29.39	29.48	29.43
Stack Gas Velocity (ft/sec)	36.43	37.53	37.12	37.03
Stack Flow Rate (wacfm)	516,354	532,048	526,240	524,881
Stack Flow Rate (dscfm)	323,354	331,647	330,081	328,361
Isokinetic Ratio (%)	107.49	101.68	100.76	103.31

OUTCALC.XLS
10/9/96
8:54 AM

CARNOT SOURCE TEST DATA SUMMARY
MULTI-METALS -- EPA METHOD 29
FGD STACK

Client/Location	NYSEG/Milliken	**Reference Temp (F)**	68
Unit	2	**Fuel**	COAL
Sample Location	FGD STACK	**Data By**	DVK
Operating Condition	FULL LOAD	**Date of Data Entry**	10/3/96

Test No.	**1-MTLS-STK**	**2-MTLS-STK**	**3-MTLS-STK**	**Average**
Date	8/7/96	8/8/96	8/9/96	*
Test Method	EPA 29	EPA 29	EPA 29	*
Sample Train	ES-19	ES-19	ES-19	*
Pitot Factor	0.840	0.840	0.840	*
Meter Cal Factor	1.0164	1.0164	1.0164	*
Stack Area (sq ft)	113.10	113.10	113.10	*
Sample Time (Min)	360	360	360	*
Bar Press (in Hg)	29.12	29.08	29.06	*
Nozzle Diam (in)	0.200	0.200	0.200	*
Start/Stop Time	0817/1441	0811/1540	0815/1507	*
Stack Press (iwg)	-0.65	-0.65	-0.71	-0.67
Stack Temp (F)	118.7	119.4	117.5	118.5
Velocity Head (iwg)	1.3594	1.3718	1.3859	1.3723
Stack O2 (%)	5.66	5.52	5.76	5.65
Stack CO2 (%)	13.81	13.57	13.67	13.68
Meter Vol (acf)	270.043	279.008	280.827	276.626
Meter Temp (F)	126.0	117.4	117.8	120.4
Meter Press (iwg)	1.81	1.95	1.95	1.90
Liquid Vol (ml)	864.7	933.1	900.1	899.3
Std Sample Vol (SCF)	241.791	253.275	254.550	249.872
Std Sample Vol (Nm^3)	6.380	6.683	6.717	6.593
Moisture Fraction	0.144	0.148	0.143	0.145
Stack Gas Mol Wt	28.64	28.56	28.64	28.61
Stack Gas Velocity (ft/sec)	69.69	70.21	70.37	70.09
Stack Flow Rate (wacfm)	472,937	476,412	477,557	475,635
Stack Flow Rate (dscfm)	358,667	358,779	362,692	360,046
Isokinetic Ratio (%)	97.04	101.62	101.03	99.90

STKCALC.XLS
10/9/96
8:05 AM

CARN

CLIENT NYSEG - Milliken
SAMPLE LOCATION Inlet
OPERATOR/ASSISTANT CHF/BC/TDW

UNIT ESP
TEST CONDITION Full Load
METER VOL. (START/END) 846.384 /

TEST NO. 1-MTLS-ID METHOD EPA 29
AMB. TEMP., °F 120

PAGE 1 OF 2
PROJECT # 476
DATE 5/7/96

PRE-TEST DATA:

Barometric Press., in. Hg.	29.86
Assumed Stack Temp. °F	
Assumed Meter Temp. °F	
Assumed ΔP	
Assumed Moisture %	
Stack Diameter, in.	
Sample Time: Total	240
per point	10
Total of Traverse Points	24
Teflon Connecting Line (Y/N)	Y

Isokinetic Factor
ΔH = 4.04 X ΔP
4.10

EQUIPMENT INFO:

Meter ID No.		ES-42
Meter, Yd.		1.0008
CFM @ ΔH = 1.0		0.594
Pitot:	ID	17
	Cp	.84
Probe:	Mat'l	Glass
	Length	6ft
Nozzle:	ID/Mat'l	Glass
	Diam.	.278
Filter:	No.	
	Tare Wt.	
TC Readout ID:	Meter	ES-42
	Aux.	

Imp.	Mat'l	Wt.(End)		Wt.(Start)		Wt.(g)
#1	K.O.	645.9	-	494.9	=	151.0
#2	5% HNO3	678.2		605.6		72.6
#3	10% H2O2	6388	-	633.6	=	6.2
#4	K.O	513.8	-	509.6	=	4.2
#5	4% KMnO4	655.5		653.5		2.0
#6	10% H2SO4	649.2	-	642.8	=	6.4
#7	S.G.	851.8	-	821.6	=	30.2
Total					=	272.6

POST TEST INFO:
Filter Appearance Heavy Grey - PM
Impinger Appearance CLEAR
Silica Gel Spent (Y/N) N

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	.005	12	BC	CHF
Post-Test	.005	13	✓	CHF

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
B3	817	.35	1.4	846.384	283	261	126	125	284	62	5.0	7	
2	827	.31	1.26	853.6	283	251	130	126	283	64	5.2	6	-13.8
1	837	.20	0.82	860.4	282	254	130	126	276	66	5.6	5.0	
	847			865.332									
D3	847	.39	1.6	865.332	297	252	130	127	282	67	5.2	7	
2	857	.31	1.27	872.5	305	259	135	130	283	65	5.4	6	-13.9
1	907	.24	0.98	879.4	294	252	130	127	272	58	5.3	6	
	917			884.388									
G3	918	.25	1.03	884.388	272	253	129	127	266	61	6.7	6	
2	928	.25	1.03	890.1	287	264	135	130	266	61	6.5	6	-14.1
1	938	.23	0.94	896.8	295	261	129	127	267	62	5.2	5	
	948			901.835	.005 @		15in						
	Leak	Check		901.929									
I3	950	0.34	1.37	901.929	287	259	132	129	264	64	5.5	8	
2	1000	0.27	1.11	908.7	271	261	133	129	271	58	7.2	8	-13.7
1	1010	.27	1.11	915.1	276	255	135	131	272	58	6.8	8	
	1020			920.904									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded EM
Impingers Recovered
Filter Loaded MR
Filter Recovered
Probe Wash

TEST SUMMARY
Calculated by: CHF
Checked by: DK
Stack Press.(iwg) -13.9
Stack Temp. (°F) 292.9 ✓
ΔP (iwg) 0.3017 ✓
O₂/CO₂ 5.6/1386 ✓
Meter Vol., (acf) 154.537
Meter Temp. (°F) 132.7 ✓
Meter Press. (iwg) 1.25 ✓
Liquid Vol (g) 272.6 ✓
Comments:

SAMPLE LOCATION ____

OPERATOR/ASSISTANT CHE

METER VOL. (START/END) /

DATE 0 / - 16

PRE-TEST DATA:

Barometric Press., in. Hg. ____

Assumed Stack Temp. °F ____

Assumed Meter Temp. °F ____

Assumed ΔP ____

Assumed Moisture % ____

Stack Diameter, in. ____

Sample Time: Total ____

per point ____

Total of Traverse Points ____

Teflon Connecting Line (Y/N) ____

Isokinetic Factor

ΔH = 4.10 X ΔP

EQUIPMENT INFO:

Meter ID No. ____

Meter, Yd. ____

CFM @ ΔH = 1.0 ____

Pitot: ID ____

Cp ____

Probe: Mat'l ____

Length ____

Nozzle: ID/Mat'l ____

Diam. ____

Filter: No. ____

Tare Wt. ____

TC Readout ID: Meter ____

Aux. ____

Imp.	Mat'l	Wt (End)	Wt (Start)	Wt (g)
#1		-	=	
#2		-	=	
#3		-	=	
#4		-	=	
#5		-	=	
Total			=	

POST TEST INFO:

Filter Appearance ____

Impinger Appearance ____

Silica Gel Spent (Y/N) ____

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS			TEMPERATURES, °F						O₂	VAC.	STATIC PRESS. iwg	CHAIN OF CUSTODY INFORMATION
		ΔP	ΔH	METER READING	STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT				
P3	1022	0.48	1.97	920.904	303	261	133	131	274	62	5.0	11		Impingers Loaded
2	1032	0.38	1.56	929.3	304	260	136	132	275	61	4.8	10	-13.6	Impingers Recovered
1	1042	0.28	1.15	936.0	305	254	137	132	277	62	4.7	8		Filter Loaded
	1052			942.924										Filter Recovered
R3	1053	0.36	1.48	942.924	304	279	137	133	256	50	5.3	10		Probe Wash
2	1103	0.32	1.31	948.4	305	280	138	134	257	50	5.8	10	-13.9	**TEST SUMMARY**
1	1113	0.20	0.82	955.8	302	262	139	135	280	53	5.2	8		Calculated by:
	1123			962.075										Checked by:
U3	1126	0.35	1.44	962.075	296	253	137	135	279	52	5.3	10		Stack Press (iwg)
2	1136	0.29	1.19	968.9	284	252	139	136	281	55	6.4	10	-13.9	Stack Temp. (°F)
1	1146	0.29	1.19	975.6	284	280	139	136	280	54	6.3	10		ΔP (iwg)
	1156			981.162										O_2/CO_2
W3	1157	0.33	1.35	981.162	299	264	140	138	279	56	5.4	10		Meter Vol. (acf)
2	1207	0.36	1.48	987.9	305	261	138	136	278	56	5.2	11	-13.9	Meter Temp. (°F)
1	1217	0.27	1.11	995.2	304	258	137	135	275	56	5.4	10		Meter Press. (iwg)
	1227			1001.015										Liquid Vol. (g)
														Comments:

CLIENT NYSEG Milliken
SAMPLE LOCATION ESP Inlet
OPERATOR/ASSISTANT CHF

UNIT ESP
TEST CONDITION
METER VOL. (START/END) /

TEST NO. 2-MMS-In
METHOD EPA-29
AMB. TEMP., °F

PAGE 1 OF 5
PROJECT # 11476
DATE 8/8/96

PRE-TEST DATA:

Barometric Press., in. Hg.	29.83
Assumed Stack Temp. °F	
Assumed Meter Temp. °F	
Assumed ΔP	
Assumed Moisture %	
Stack Diameter, in.	
Sample Time: Total	
per point	
Total of Traverse Points	
Teflon Connecting Line (Y/N)	

Isokinetic Factor

ΔH = 4.15 X ΔP
4.00

EQUIPMENT INFO:

Meter ID No.		ES-42
Meter, Yd.		1.0008
CFM @ ΔH = 1.0		.594
Pitot:	ID	17
	Cp	.84
Probe:	Mat'l	Glass
	Length	6ft
Nozzle:	ID/Mat'l	Glass
	Diam.	0.278
Filter:	No.	
	Tare Wt.	
TC Readout ID:	Meter	ES-42
	Aux.	

Imp.	Mat'l	Wt (End)		Wt (Start)		Wt (g)
#1	K.O	524.4	-	444.1	=	80.3
#2	5%HNO3	678.4		591.4		87.0
#3	10%H2O2	745.5	-	702.3	=	43.2
#4	K.O	587.9	-	563.4	=	24.5
#5	4%KMnO4	662.5		652.7		9.8
#6	10%H2SO4	683.4	-	673.9	=	9.5
#7	SG.	898.6	-	859.7	=	38.9
Total					=	293.2

POST TEST INFO:

Filter Appearance Heavy Grey-PM
Impinger Appearance Clear
Silica Gel Spent (Y/N) N

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	.004	15	DC	CHF
Post-Test	.004	16		CHF

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	METER CONDITIONS ΔH	METER CONDITIONS METER READING	TEMPERATURES, °F STACK	TEMPERATURES, °F PROBE	TEMPERATURES, °F METER IN	TEMPERATURES, °F METER OUT	TEMPERATURES, °F OVEN	TEMPERATURES, °F IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
~~W3~~	~~756~~			~~001.225~~										Impingers Loaded MR/EM
W3	803	0.44	1.82	001.766	308	251	129	128	285	62	5.3	9		Impingers Recovered
2	813	0.40	1.66	10.6	310	251	133	128	286	61	4.8	8	-15.0	Filter Loaded
1	823	0.31	1.29	16.8	306	252	134	129	285	61	5.2	6		Filter Recovered
	833			23.332										Probe Wash
U3	833	0.41	1.7	23.432	295	256	136	131	282	61	5.1	9		TEST SUMMARY
2	843	0.31	1.3	30.2	280	261	136	132	280	61	4.7	7	-15.0	Calculated by: CHF
1	853	0.31	1.3	37.2	275	261	134	131	264	63	5.8	7		Checked by: DK
	903	~~0.45~~	~~1.87~~	43.531				~~134~~						Stack Press (iwg) -14.8
R3	903	0.45	1.87	43.531	298	257	134	131	269	63	4.5	10		Stack Temp. (°F) 292.4
2	913	0.36	1.49	50.9	298	260	136	132	275	62	4.9	9	-15.0	ΔP (iwg) 0.3321
1	923	0.22	0.88	58.9	292	257	133	131	270	62	5.0	7		O₂/CO₂ 5.1 / 13.94
	933			63.658										Meter Vol. (acf) 160.792
P3	934	0.49	1.96	63.658	302	253	132	130	268	61	4.0	11		Meter Temp. (°F) 127.4
2	944	0.36	1.44	71.8	304	261	132	129	270	60	4.4	10	-15.0	Meter Press. (iwg) 1.37
1	954	0.30	1.2	78.6	304	252	132	129	269	60	4.5	10		Liquid Vol. (g) 293.2
	1004			85.674										Comments:

OPERATOR/ASSISTANT CHF/BC/TOW METER VOL. (START/END) / DATE 8/10/96

PRE-TEST DATA:

Barometric Press., in. Hg 29.83

Assumed Stack Temp. °F

Assumed Meter Temp. °F

Assumed ΔP

Assumed Moisture %

Stack Diameter, in.

Sample Time: Total

per point

Total of Traverse Points

Teflon Connecting Line (Y/N)

Isokinetic Factor

ΔH = ~~4.15~~ 4.08 X ΔP

EQUIPMENT INFO:

Meter ID No. ES.42

Meter, Yd. 1.2008

CFM @ ΔH = 1.0 .594

Pitot: ID 17

Cp .84

Probe: Mat'l 6

Length

Nozzle: ID/Mat'l

Diam. 0.278

Filter: No.

Tare Wt.

TC Readout ID: Meter

Aux.

Imp.	Mat'l	Wt (End)	- Wt (Start)	= Wt (g)
#1				
#2				
#3				
#4				
#5				
Total				

POST TEST INFO:

Filter Appearance

Impinger Appearance

Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	.004	15		CHF
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS			TEMPERATURES, °F						O₂	VAC.	STATIC PRESS. iwg	CHAIN OF CUSTODY INFORMATION
		ΔP	ΔH	METER READING	STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT				
I3	1006	0.39	1.59	85.674	289	261	132	129	268	61	4.9	11		Impingers Loaded
2	1016	0.27	1.10	92.5	270	260	133	130	262	60	7.0	10	-14.8	Impingers Recovered
1	1026	0.30	1.22	98.8	273	259	130	128	260	59	6.5	10		Filter Loaded
	1036			105.782										Filter Recovered
G3	1041	0.32	1.31	105.182	290	253	126	125	257	58	5.2	10		Probe Wash
2	1051	0.29	1.18	112.5	296	252	125	123	246	57	4.8	10	-14.5	TEST SUMMARY
1	1101	0.215	0.88	119.2	296	262	122	120	252	58	4.9	9		Calculated by:
	1112			123.718										Checked by:
D3	1111	0.38	1.55	123.718	292	261	124	121	260	59	5.2	13		Stack Press (iwg)
2	1121	0.34	1.38	131.4	292	261	123	119	262	59	5.3	12	-14.6	Stack Temp. (°F)
1	1131	0.24	0.98	136.9	294	261	121	117	268	59	5.1	10		ΔP (iwg)
	1141			143.096										O_2/CO_2
B3	1142	0.34	1.39	143.096	283	253	120	116	267	60	5.3	11		Meter Vol. (acf)
2	1152	0.33	1.34	150.4	285	256	118	115	264	59	5.4	13	-14.6	Meter Temp. (°F)
1	1202	0.28	1.14	156.8	286	260	119	115	261	58	5.3	12		Meter Press. (iwg)
	1212			162.558										Liquid Vol. (g)
														Comments:

CARN

CLIENT NYSEG
SAMPLE LOCATION Inlet
OPERATOR/ASSISTANT CHF / BC / TDW
UNIT ESP
TEST CONDITION Full Load
METER VOL. (START/END) /
TEST NO. 3-Mtls-In
METHOD EPA-29
AMB. TEMP., °F 100
PAGE 1 OF 9
PROJECT # 11976
DATE 8/9/96

PRE-TEST DATA:

Barometric Press., In. Hg. 29.68
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total
per point
Total of Traverse Points
Teflon Connecting Line (Y/N) Y
Isokinetic Factor
ΔH = ~~0~~3.7~~0~~ X ΔP
3.64

EQUIPMENT INFO:

Meter ID No. ES-42
Meter, Yd. 1.0008
CFM @ ΔH = 1.0 .576
Pitot: ID 17
Cp .84
Probe: Mat'l Glass
Length 6 ft
Nozzle: ID/Mat'l Glass
Diam. 0.278
Filter: No.
Tare Wt.
TC Readout ID: Meter ES-42
Aux.

Imp.	Mat'l	Wt.(End)		Wt.(Start)		Wt.(g)
#1	KO	644.4	-	495.2	=	
2	5% HNO3	679.3		608.5		
#3	10% H2O2	643.8	-	635.0	=	
#4	K.O.	512.5	-	510.0	=	
5	4% KMnO4	662.4		643.1		
#6	10% H2SO4	637.3	-	651.7	=	
#7	S.G.	892.4	-	863.6	=	
Total					=	

POST TEST INFO:

Filter Appearance
Impinger Appearance #6 Imp particle → #5
Silica Gel Spent (Y/N) N

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	.008	15	CHF	CHF
Post-Test	.008	16	CHF	CHF

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O_2	VAC.	STATIC PRESS. Iwg
B3	803	0.33	1.25	162.944	282	258	100	99	275	58	5.9	7	
2	813	0.33	1.25	169.0	284	252	105	101	258	49	5.8	7	-14.6
1	823	0.24	0.88	175.8	285	252	108	103	264	51	5.7	6	
	833			180.910									
D3	833	0.37	1.38	180.910	294	253	109	105	280	53	5.7	8	
2	843	0.29	1.07	187.8	294	261	109	105	290	54	5.4	7	-14.1
1	853	0.22	0.81	193.9	292	258	109	105	285	56	5.6	6	
	903			199.435									
G3	904	0.27	0.99	199.435	278	255	110	106	283	58	7.4	7	
2	914	0.29	1.07	204.3	293	254	110	106	283	58	5.8	6	-14.4
1	924	0.22	0.81	210.6	292	263	111	107	283	59	5.6	6	
	934			216.184									
I3	935	0.40	1.48	216.184	288	260	111	107	284	60	6.0	8	
2	945	0.30	1.09	223.3	267	257	113	108	285	61	7.4	7	-14.5
1	955	0.30	1.09	230.0	275	254	114	109	285	61	6.4	7	
	1005			235.798									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded EM
Impingers Recovered EM
Filter Loaded EM
Filter Recovered MR
Probe Wash DW

TEST SUMMARY

Calculated by: CHF
Checked by: -14.53
Stack Press.(iwg) ~~[illegible]~~
Stack Temp. (°F) 289.0
ΔP (iwg) 0.3063
O_2/CO_2 5.79/1364
Meter Vol., (acf) 146.785
Meter Temp. (°F) 110.9
Meter Press. (iwg) 1.14
Liquid Vol. (g) 265.0
Comments:

OPERATOR/ASSISTANT C HF
METER VOL. (START/END)
DATE

PRE-TEST DATA:
Barometric Press., in. Hg
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total
per point
Total of Traverse Points
Teflon Connecting Line (Y/N)
Isokinetic Factor
ΔH = 3.64 X ΔP

EQUIPMENT INFO:
Meter ID No.
Meter, Yd.
CFM @ ΔH = 1.0
Pitot: ID
Cp
Probe: Mat'l
Length
Nozzle: ID/Mat'l
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux.

Imp.	Mat'l	Wt (End)	-	Wt (Start)	=	Wt (g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
#5			-		=	
Total					=	

POST TEST INFO:
Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
P 3	1008	0.47	1.71	235.798	297	262	114	110	285	58	5.3	10		Impingers Loaded
2	1018	0.36	1.31	243.1	297	251	115	110	281	59	5.2	9	-15.0	Impingers Recovered
1	1028	0.28	1.02	249.6	289	261	116	111	281	60	5.4	8		Filter Loaded
	1038			254,996										Filter Recovered
R 3	1038	0.36	1.31	254,996	290	253	117	112	273	61	5.3	9		Probe Wash
2	1048	0.33	1.20	262.3	294	263	118	112	272	60	5.6	9	-14.8	TEST SUMMARY
1	1058	0.23	0.84	268,4	293	257	118	113	270	58	5.5	7		Calculated by:
	1108			273 190										Checked by:
W 3	1108	0.38	1.38	273.190	294	261	118	114	268	59	5.5	10		Stack Press (iwg)
2	1118	0.28	1.02	279,4	285	261	118	114	268	60	6.0	10	-14.5	Stack Temp. (°F)
1	1128	0.28	1.02	286.1	276	255	118	114	266	61	6.2	10		ΔP (iwg)
	1138			291,802										O₂/CO₂
W 3	1140	0.38	1.38	291,802	301	259	118	114	264	62	5.5	10		Meter Vol., (acf)
2	1150	0.34	1.24	298.5	302	263	117	113	264	61	5.2	10	-14.3	Meter Temp. (°F)
1	1200	0.20	0.73	305.7	294	256	116	113	264	61	5.5	8		Meter Press. (iwg)
	1210			309,729										Liquid Vol (g)
														Comments:

CARN

CLIENT NYSEG - MILIKEN
SAMPLE LOCATION ESP OUTLET
OPERATOR/ASSISTANT

UNIT 2
TEST CONDITION
METER VOL. (START/END) /

TEST NO. 1-MTLS-OUT METHOD EPA '29
AMB. TEMP., °F

PAGE 1 OF 2
PROJECT # 11476
DATE 8/7/96

PRE-TEST DATA:

Barometric Press., in. Hg.
Assumed Stack Temp. °F 290
Assumed Meter Temp. °F 110
Assumed ΔP 0.30
Assumed Moisture % 6.7
Stack Diameter, in.
Sample Time: Total
per point
Total of Traverse Points
Teflon Connecting Line (Y/N)
Isokinetic Factor

ΔH = 3.12 / 3.24 X ΔP

30.430

EQUIPMENT INFO:

Meter ID No. ES-55
Meter, Yd. 0.9970
CFM @ ΔH = 1.0
Pitot: ID
Cp
Probe: Mat'l
Length
Nozzle: ID/Mat'l 0.277
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux.

Imp.	Mat'l	Wt.(End)		Wt.(Start)		Wt.(g)
#1	—	615.2	-	439.4	=	175.8
#2	~~Spent~~	707.6		569.4		140.2
	HNO3/H2O2	623.7	-	599.0	=	24.7
#3	—	549.1	-	495.2	=	53.9
#4	KMnO4	666.0	-	615.4	=	50.6
#5	KMnO4	588.7	-	658.0	=	-69.3
~~Total~~	S.GEL	880.4		830.9	=	49.5

425.4

POST TEST INFO:

Filter Appearance Slightly Tan
Impinger Appearance KMnO4 into / clear
Silica Gel Spent (Y/N) N

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.062	16		DH
Post-Test	0.002	8		DA

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O2	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
B-3	0833	0.38	2.6	014.905	293	262	116	112	240	67	5.4	15		Impingers Loaded MC
B-STOP	0848			30.430									-14.5	Impingers Recovered EM
B-2	0910	0.34	1.1	35.727	292	261	116	113	247	65	5.2	9	15	Filter Loaded DW
B-1	0925	0.32	0.998	49.000	287	261	115	112	246	62	5.8	6	30	Filter Recovered EM
D-3	0940	0.38	1.19	60.0	281	240	120	114	247	56	5.4	6.5	45	Probe Wash DW
D-2	955	0.37	1.15	69.30	282	260	121	115	245	54	5.8	6.5	60	TEST SUMMARY
D-1	1010	0.20	0.37	79.60	259	251	123	117	241	53	5.8	5.5	75	Calculated by: OK
F-3	1025	0.29	0.90	88.75	233	257	124	119	247	53	5.6	5.9	90	Checked by: OK
F-2	1040	0.26	0.31	97.8	235	259	124	120	245	54	5.8	6.0	105	Stack Press (iwg) -14.5 ✓
F-1	1055	0.24	0.75	107.1	285	259	125	120	245	52	5.4	6.0	120	Stack Temp. (°F) 283.9 ✓
H-3	1110	0.30	0.97	115.5	287	258	126	121	244	54	5.4	6.0	135	ΔP (iwg) 0.2940 ✓
H-2	1125	0.29	0.95	126.0	238	257	128	122	245	56	5.6	6.0	150	O2/CO2 5.38/14.06
H-1	1140	0.29	0.95	136.0	290	256	128	123	244	54	5.4	6.0	165	Meter Vol. (acf) 245.612 ✓
STOP	1155			144.794									180	Meter Temp. (°F) 123.3 ✓
P-3	1159	0.32	1.04	144.80	284	257	127	123	243	53	5.8	6.5	180	Meter Press. (iwg) 1.01 ✓
P-2	1214	0.29	0.95	155.5	282	257	123	124	245	55	5.6	6.0	195	Liquid Vol (g) 425.4 ✓
P-1	1229	0.26	0.85	165.5	279	257	128	124	244	56	5.8	6.0	~~225~~ 210	Comments: 360 min ✓

OPERATOR/ASSISTANT ______ METER VOL. (START/END) ______ DATE ______

PRE-TEST DATA:

Barometric Press., in. Hg. ______

Assumed Stack Temp. °F ______

Assumed Meter Temp. °F ______

Assumed ΔP ______

Assumed Moisture % ______

Stack Diameter, in. ______

Sample Time: Total ______

per point ______

Total of Traverse Points ______

Teflon Connecting Line (Y/N) ______

Isokinetic Factor

ΔH = 3.26 X ΔP

EQUIPMENT INFO:

Meter ID No. ______

Meter, Yd. ______

CFM @ ΔH = 1.0 ______

Pitot: ID ______

Cp ______

Probe: Mat'l ______

Length ______

Nozzle: ID/Mat'l ______

Diam. ______

Filter: No. ______

Tare Wt. ______

TC Readout ID: Meter ______

Aux. ______

Imp.	Mat'l	Wt.(End)	-	Wt.(Start)	=	Wt.(g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
#5			-		=	
Total					=	

POST TEST INFO:

Filter Appearance ______

Impinger Appearance ______

Silica Gel Spent (Y/N) ______

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
R-3	1244	0.20	0.91	176.3	282	286	128	124	244	58	6.4	6.0	225	Impingers Loaded
R-2	1259	0.25	0.81	185.2	251	256	129	124	244	59	6.2	5.5	240	Impingers Recovered
R-1	1314	0.23	0.75	194.0	279	255	130	125	243	57	6.2	5.0	255	Filter Loaded
S-3	1329	0.24	0.85	202.7	261	251	130	125	246	63	4.8	6.0	270	Filter Recovered
S-2	1344	0.24	0.85	211.37	286	256	131	126	243	72	4.4	6.1	285	Probe Wash
S-1	1359	0.24	0.85	221.5	288	256	131	127	240	59	4.5	6.0	300	TEST SUMMARY
u-3	~~1414~~			231.55									315	Calculated by:
u-2	~~1429~~												330	Checked by:
u-1	~~1444~~			232.65										Stack Press.(iwg)
u-3	1427	0.33	1.08	231.65	236	257	126	125	237	78	4.2	7.0	315	Stack Temp. (°F)
u-2	1442	0.31	1.01	243.6	286	257	130	125	242	63	4.4	7.0	330	ΔP (iwg)
u-1	1457	0.30	0.98	2525	287	256	130	124	266	64	4.2	6.0	345	O_2/CO_2
	1512			260.623										Meter Vol., (acf)
														Meter Temp. (°F)
														Meter Press. (iwg)
														Liquid Vol. (g)
														Comments:

OPERATOR/ASSISTANT RAF/DK

METER VOL. (START/END)

DATE [illegible]

PRE-TEST DATA:

Barometric Press., in. Hg. 29.12

Assumed Stack Temp. °F

Assumed Meter Temp. °F

Assumed ΔP

Assumed Moisture %

Stack Diameter, in.

Sample Time: Total

per point

Total of Traverse Points

Teflon Connecting Line (Y/N)

Isokinetic Factor

ΔH = 1.2 X ΔP

EQUIPMENT INFO:

Meter ID No. ES-19

Meter, Yd. 1.0164

CFM @ ΔH = 1.0

Pitot: ID

Cp

Probe: Mat'l

Length

Nozzle: ID/Mat'l

Diam.

Filter: No.

Tare Wt.

TC Readout ID: Meter

Aux.

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1	SEE			
#2			PAGE	
#3				ONE
#4				
#5				
Total				

POST TEST INFO:

Filter Appearance

Impinger Appearance

Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS			TEMPERATURES, °F						O₂	VAC.	STATIC PRESS. Iwg
		ΔP	ΔH	METER READING	STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT			
N6	1300	1.5	2.2	904.25	119	249	144	121	264	64	5.6	13	
STOP	1330	4		928.949	Port	CHANGE							
W5	1341	1.4	2.14	928.949	119	262	138	120	268	68	5.1	14	
W6	1411	1.4	2.14	937.570	118	257	147	124	278	57	5.3	14	
END	1441			978.636									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded

Impingers Recovered

Filter Loaded

Filter Recovered

Probe Wash

TEST SUMMARY

Calculated by:

Checked by:

Stack Press (iwg)

Stack Temp. (°F)

ΔP (iwg)

O_2/CO_2

Meter Vol., (acf)

Meter Temp. (°F)

Meter Press. (iwg)

Liquid Vol. (g)

Comments:

0.72 0.547 0.762

CARR

CLIENT NYSEG - Milliken
SAMPLE LOCATION STACK
OPERATOR/ASSISTANT DK

UNIT 2
TEST CONDITION Full Load
METER VOL. (START/END) /

TEST NO. 2-MMCS-STK
AMB. TEMP., °F

METHOD EPA 29
PAGE 1 OF 2
PROJECT # 11476
DATE 8-8-96

PRE-TEST DATA:

Barometric Press., in. Hg 29.08
Assumed Stack Temp. °F 125
Assumed Meter Temp. °F 125
Assumed ΔP 1.2
Assumed Moisture % 14
Stack Diameter, in. 144
Sample Time: Total 360
per point 30
Total of Traverse Points 12
Teflon Connecting Line (Y/N) Y (25')
Isokinetic Factor
ΔH = ~~1.38~~ 1.40 X ΔP

EQUIPMENT INFO:

Meter ID No. ES-19
Meter, Yd. 1.0164
CFM @ ΔH = 1.0 0.558
Pitot: ID
Cp 0.84
Probe: Mat'l glass
Length 14'
Nozzle: ID/Mat'l glass
Diam. 0.200
Filter: No. VP QTZ
Tare Wt.
TC Readout ID: Meter ES-19
Aux. TC009

Imp.	Mat'l	Wt.(End)		Wt.(Start)		Wt.(g)
#1	—	1271.5	-	546.7	=	
#2	HNO3/H2O2	780.4		633.2		
#3	HNO3/H2O2	666.2	-	615.2	=	
#4	—	530.9	-	526.5	=	
#5	KMnO4	618.4	-	615.4	=	
#6	KMnO4	581.6	-	583.3	=	
~~Total~~ S.GEL		804.2		749.8	=	

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.006	15	OK	DK
Post-Test	0.009	13.5	ok	TB

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O2	VAC.	STATIC PRESS. iwg	CHAIN OF CUSTODY INFORMATION
W1	0811	1.00	1.38	983.926	118	274	124	101	280	61	5.5	4	-.055	Impingers Loaded MR/EM
		~~1.1~~		~~1004.3~~	~~11~~									Impingers Recovered MR
W2	0841	1.10	1.52	1004.35	118	239	124	105	263	49	5.5	4		Filter Loaded MR
														Filter Recovered MR
W3	0911	1.30	1.8	1025.48	118	260	127	108	260	47	5.7	5		Probe Wash DW
														TEST SUMMARY
W4	0941	1.55	2.18	1048.18	119	268	129	107	258	48	5.6	6		Calculated by: DK
stop	1011			1072.898	leak	✓ ok	@ 12"							Checked by: DK
		1.10												Stack Press (iwg) -.065 ✓
N1	1016	[illegible]	1.55	1073.059	120	275	129	108	253	46	5.5	4		Stack Temp. (°F) 119.4 ✓
														ΔP (iwg) 1.3718 ✓
N2	1046	1.40	1.97	1093.9	119	248	130	109	253	45	5.5	5		O2/CO2 5.52 ✓ 13.57 ✓
														Meter Vol., (acf) 279.008 ✓
N3	1116	1.55	2.18	116.454	122	277	131	109	256	43	5.3	6		Meter Temp. (°F) 117.4 ✓
														Meter Press. (iwg) 1.95 ✓
N4	1146	1.55	2.18	141.2	120	230	132	109	258	45	5.5	6		Liquid Vol. (g) 433.1 ✓
														Comments:

OPERATOR/ASSISTANT ______ METER VOL. (START/END) ______ / ______ DATE 8/18/16

PRE-TEST DATA:

Barometric Press., in. Hg. 29.08
Assumed Stack Temp. °F 125
Assumed Meter Temp. °F 120
Assumed ΔP 1.2
Assumed Moisture % 14
Stack Diameter, in. 144
Sample Time: Total 360
per point 20
Total of Traverse Points 12
Teflon Connecting Line (Y/N) Y (25')
Isokinetic Factor
ΔH = 1.45 X ΔP

EQUIPMENT INFO:

Meter ID No. ES-19
Meter, Yd. 1.0164
CFM @ ΔH = 1.0 ______
Pitot: ID ______
Cp ______
Probe: Mat'l ______
Length ______
Nozzle: ID/Mat'l ______
Diam. ______
Filter: No. ______
Tare Wt. ______
TC Readout ID: Meter ______
Aux. ______

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1	SEE			=
#2		PAGE		=
#3			ONE	=
#4				=
#5				=
Total				=

POST TEST INFO:

Filter Appearance ______
Impinger Appearance ______
Silica Gel Spent (Y/N) ______

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS			TEMPERATURES, °F						O₂	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
		ΔP	ΔH	METER READING	STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT				
N4	1216	1.50	2.10	164.85	120	277	131	106	258	46	5.7	6	-0.75	Impingers Loaded
		1.45												Impingers Recovered
N3	1246	~~1.55~~	2.1	1189.27	120	247	130	108	252	48	5.6	5		Filter Loaded
	stop 1316			1213.201	leak	✓ OK	15⁴							Filter Recovered
W5	1440	1.55	2.25	1213.443	120	274	130	103	280	47	5.4	6		Probe Wash
														TEST SUMMARY
W6	1510	1.50	2.17	1238.650	119	229	126	106	25.4	55	5.4	5		Calculated by:
														Checked by:
END	1540			1262.934										Stack Press.(iwg)
														Stack Temp. (°F)
														ΔP (iwg)
														O_2/CO_2
														Meter Vol., (acf)
														Meter Temp. (°F)
														Meter Press. (iwg)
														Liquid Vol. (g)
														Comments:

CARN

CLIENT NYSEG
UNIT Stack
TEST NO. 3-MTCS-STK
METHOD M-29
PAGE 1 OF 3
SAMPLE LOCATION Stack
TEST CONDITION
AMB. TEMP., °F
PROJECT #
OPERATOR/ASSISTANT
METER VOL. (START/END) 263.300 /
DATE 8/9/96

PRE-TEST DATA:

Barometric Press., in. Hg. 29.06
Assumed Stack Temp. °F 120
Assumed Meter Temp. °F 115
Assumed ΔP 1.35
Assumed Moisture % 14.3
Stack Diameter, in. 144
Sample Time: Total 6 hrs.
per point 30 min
Total of Traverse Points 12
Teflon Connecting Line (Y/N) Y
Isokinetic Factor
ΔH = 1.4 X ΔP

EQUIPMENT INFO:

Meter ID No. ES-19
Meter, Yd. 1.0164
CFM @ ΔH = 1.0 0.556 ~~.596~~
Pitot: ID 1A
Cp 0.84
Probe: Mat'l 141
Length glass
Nozzle: ID/Mat'l 0.200
Diam. glass
Filter: No. UP QTZ
Tare Wt. –
TC Readout ID: Meter ES-19
Aux. TC 009

Imp.	Mat'l	Wt.(End)		Wt.(Start)		Wt.(g)
#1	K.O.	864.5	-	493.5	=	
2	5% HNO3	818.4		573.9		
#3	10% H2O2	858.5	-	635.7	=	
#4	K.O.	488.0	-	481.6	=	6.4
5	4% KMnO4	576.8		585.6		
#6	10% H2SO4	626.7	-	630.4	=	
#7	S.G.	942.1	-	874.2	=	
Total					=	

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	.005	13"	dbc	~~BF~~
Post-Test	.006	20	BF	BF

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. iwg
W1	0815	1.0	1.4	263.300	117	258	112	88	266	52	5.8	8	0.61
	~~08~~												
W2	0845	1.15	1.6	283.65	117	271	120	97	271	46	5.8	8	
W3	0915	1.25	1.75	304.85	116	256	125	101	264	48	5.8	9	
W4	0945	1.55	2.17	327.2	117	249	128	103	255	40	5.8	13	
STOP	1015			351.663	leak	✓ OK	@	14"					
North 1	1030	1.3	1.82	351.780	118	263	125	104	257	47	5.8	10	
N-2	1100	1.50	2.10	374.15	117	249	135	109	253	45	5.8	12	
N-6	1130	1.50	2.10	398.8	119	241	137	112	250	48	5.6	12	
N-5	1200	1.6	2.25	422.765	118	275	138	113	268	51	5.7	14	

CHAIN OF CUSTODY INFORMATION

Impingers Loaded EM
Impingers Recovered MR
Filter Loaded MR
Filter Recovered MR
Probe Wash DIW

TEST SUMMARY

Calculated by: BF
Checked by: BF
Stack Press.(iwg) -.41
Stack Temp. (°F) ~~117.8~~ 117.5 ✓
ΔP (iwg) 1.3859 ✓
O₂/CO₂ 5.76 ✓ 13.67 ✓
Meter Vol., (acf) 280.824 ✓
Meter Temp. (°F) 117.8 ✓
Meter Press. (iwg) 1.95 ✓
Liquid Vol. (g) 900.1 ✓
Comments:

OPERATOR/ASSISTANT DK ______ METER VOL. (START/END) ______ / ______ DATE 0 [illegible]

PRE-TEST DATA:

Barometric Press., in. Hg. 29.06
Assumed Stack Temp. °F ______
Assumed Meter Temp. °F ______
Assumed ΔP ______
Assumed Moisture % ______
Stack Diameter, in. ______
Sample Time: Total ______
per point ______
Total of Traverse Points ______
Teflon Connecting Line (Y/N) ______
Isokinetic Factor
ΔH = 1.4 X ΔP

EQUIPMENT INFO:

Meter ID No. ES-19
Meter, Yd. 1.0164
CFM @ ΔH = 1.0 ______
Pitot: ID ______
Cp ______
Probe: Mat'l ______
Length ______
Nozzle: ID/Mat'l ______
Diam. ______
Filter: No. ______
Tare Wt. ______
TC Readout ID: Meter ______
Aux. ______

Imp.	Mat'l	Wt.(End)		Wt.(Start)		Wt.(g)
#1	SEE		-		=	
#2		PAGE	-		=	
#3			-	ONE	=	
#4			-		=	
#5			-		=	
Total					=	

POST TEST INFO:

Filter Appearance ______
Impinger Appearance ______
Silica Gel Spent (Y/N) ______

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O_2	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
N-4	1230	1.5	2.1	448.05	118	246	137	113	258	52	5.6	13	-0.8	Impingers Loaded
														Impingers Recovered
N-3	1300	1.5	2.1	472.45	117	264	137	112	250	49	5.8	13		Filter Loaded
stop	1330			496.667										Filter Recovered
		1.4												Probe Wash
W-5	14:07	~~0.90~~	1.96	496.710	119	303	131	106	251	49	5.8	12		TEST SUMMARY
														Calculated by:
W-6	14:37	1.45	2.03	518.965	117	269	135	110	252	56	5.8	13		Checked by:
														Stack Press (iwg)
END	1507			544.130										Stack Temp. (°F)
														ΔP (iwg)
														O_2/CO_2
														Meter Vol., (acf)
														Meter Temp. (°F)
														Meter Press. (iwg)
														Liquid Vol. (g)
														Comments:

CAR

CLIENT NYSEG-MILIKEN UNIT 2 TEST NO. F6-MTLS-A3 METHOD EPA 29 PAGE 1 OF 1

SAMPLE LOCATION STACK TEST CONDITION AMB. TEMP., °F PROJECT # 11476

OPERATOR/ASSISTANT METER VOL. (START/END) / DATE 8/6/96

PRE-TEST DATA:

Barometric Press., in. Hg

Assumed Stack Temp. °F

Assumed Meter Temp. °F

Assumed ΔP

Assumed Moisture %

Stack Diameter, in.

Sample Time: Total

per point

Total of Traverse Points

Teflon Connecting Line (Y/N)

Isokinetic Factor

ΔH = X ΔP

EQUIPMENT INFO:

Meter ID No. ES-19

Meter, Yd.

CFM @ ΔH = 1.0

Pitot: ID

Cp

Probe: Mat'l

Length

Nozzle: ID/Mat'l

Diam.

Filter: No.

Tare Wt.

TC Readout ID: Meter

Aux.

Imp.	Mat'l	Wt (End)		Wt (Start)		Wt (g)
#1	K.O.		-		=	
#2	5% HNO_3					
#3	10% H_2O_2		-		=	
#4	K.O.		-		=	
#5	4% $KMnO_4$					
#6	10% H_2SO_4		-		=	
#7	S.G.		-		=	
Total					=	

POST TEST INFO:

Filter Appearance

Impinger Appearance

Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.008	13	Bf	Bf
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O_2	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
														Impingers Loaded CM
														Impingers Recovered
														Filter Loaded
														Filter Recovered
														Probe Wash
														TEST SUMMARY
														Calculated by:
														Checked by:
														Stack Press (iwg)
														Stack Temp. (°F)
														ΔP (iwg)
														O_2/CO_2
														Meter Vol , (acf)
														Meter Temp. (°F)
														Meter Press. (iwg)
														Liquid Vol (g)
														Comments:

Appendix C.5

Frontier Geoscience

FRONTIER GEOSCIENCES MERCURY SPECIATION TEST RESULTS
NYSEG POST-RETROFIT TEST PROGRAM -- ESP INLET
AUGUST 1996

Fuel Type:	COAL			**Test Method:**	MESA
Avg. Trip Blank (ng/train):	0.46	Hg(0) - Trap A only		**Analytical Method:**	CVAFS
	0.91	Hg(II) - Traps A&B		**Laboratory:**	Frontier Geosciences
	0.134	Hg (tot) - Probe		**Date Analyzed:**	August 1996
F-factor @0%O2:	9594	9631 9655	dscf/MMBtu	**Reference Temp., F:**	68

Test No.	**ng/train**	**ug/m^3**	**ug/Nm^3**	**O_2, %**	**CO_2, %**	**Sample Volume, dscf**	**Pitot Flowrate, dscfm$^{(1)}$**	**lb/hr**	**lb/ 10^{12}Btu**
2-MESA-IN				6.13	12.93	1.642	340,247		
Hg(0) - elemental	70.3	1.51	1.62					0.002	1.29
Hg(II) - oxidized	304.8	6.55	7.03					0.008	5.57
Hg(tot) - Quartz Wool Plug	3.68	0.08	0.08					1.0E-04	0.07
Hg (total)	**378.8**	**8.15**	**8.74**					**0.010**	**6.92**
3-MESA-IN				5.40	13.64	1.705	327,659		
Hg(0) - elemental	168.5	3.49	3.75					0.004	2.83
Hg(II) - oxidized	276.8	5.73	6.15					0.007	4.65
Hg(tot) - Quartz Wool Plug	3.59	0.07	0.08					9.1E-05	0.06
Hg (total)	**448.9**	**9.30**	**9.98**					**0.011**	**7.55**
3A-MESA-IN				5.23	13.75	1.966	329,486		
Hg(0) - elemental	51.0	0.92	0.98					0.001	0.74
Hg(II) - oxidized	395.2	7.10	7.62					0.009	5.70
Hg(tot) - Quartz Wool Plug	0.40	0.01	0.01					0.000	0.01
Hg (total)	**446.6**	**8.02**	**8.61**					**0.010**	**6.44**
AVERAGE:				5.59	13.44	1.771	332,464		
Hg(0) - elemental	96.64	1.97	2.12					0.002	1.62
Hg(II) - oxidized	325.56	6.46	6.93					0.008	5.31
Hg(tot) - Quartz Wool Plug	2.554	0.05	0.06					6.7E-05	0.04
Hg (total)	**424.7**	**8.49**	**9.11**					**0.011**	**6.97**

ND -- mercury not detected above trip blank level in sample fraction (treated as zero).
Trip blank levels subtracted from sample values.

Notes:
(1) Pitot flow rate from corresponding isokinetic tests.

CALCULATIONS:
ug/m^3 = ng/train * ng/1000ug * 35.31/sample volume, dscf
lb/hr = ng/train * lb/454*10^9 ng 1/sample volume, dscf * Qsd * 60 min/hr
lb/10^12Btu = ng/train * lb/454*10^9 ng * 1/sample volume,dscf * F-factor@0%O2,dscf/mmBtu *10^6* 20.9/(20.9-%O2)

FRONTIER GEOSCIENCES MERCURY SPECIATION TEST RESULTS
NYSEG POST-RETROFIT TEST PROGRAM -- ESP OUTLET
AUGUST 1996

Fuel Type:	COAL				**Test Method:**	MESA
Avg. Trip Blank (ng/train):	0.46	Hg(0) - Trap A only			**Analytical Method:**	CVAFS
	0.91	Hg(II) - Traps A&B			**Laboratory:**	Frontier Geosciences
	0.134	Hg (tot) - Probe			**Date Analyzed:**	August 1996
F-factor @0%O2:	9594	9631	9655	dscf/MMBtu	**Reference Temp., F:**	68

Test No.	**ng/train**	**ug/m^3**	**ug/Nm^3**	**O$_2$, %**	**CO$_2$, %**	**Sample Volume, dscf**	**Pitot Flowrate, dscfm$^{(1)}$**	**lb/hr**	**lb/ 10^{12}Btu**
2-MESA-OUT				5.34	13.62	2.765	331,647		
Hg(0) - elemental	108.5	1.39	1.49					0.002	1.12
Hg(II) - oxidized	610.8	7.80	8.37					0.010	6.29
Hg(tot) - Quartz Wool Plug	0.56	0.01	0.01					8.9E-06	0.01
Hg (total)	**719.9**	**9.19**	**9.87**					**0.011**	**7.42**
3-MESA-OUT				5.32	13.71	2.782	330,081		
Hg(0) - elemental	149.5	1.90	2.04					0.002	1.53
Hg(II) - oxidized	517.4	6.57	7.05					0.008	5.31
Hg(tot) - Quartz Wool Plug	10.2	0.13	0.14					1.6E-04	0.10
Hg (total)	**677.1**	**8.59**	**9.22**					**0.011**	**6.94**
3A-MESA-OUT				4.25	14.61	2.762	330,081		
Hg(0) - elemental	325.5	4.16	4.47					0.005	3.15
Hg(II) - oxidized	368.6	4.71	5.06					0.006	3.56
Hg(tot) - Quartz Wool Plug	ND	ND	ND					ND	ND
Hg (total)	**694.1**	**8.87**	**9.52**					**0.011**	**6.71**
AVERAGE:				4.97	13.98	2.770	330,603		
Hg(0) - elemental	194.54	2.48	2.66					0.003	1.93
Hg(II) - oxidized	498.89	6.36	6.82					0.008	5.05
Hg(tot) - Quartz Wool Plug	5.36	0.07	0.07					8.4E-05	0.06
Hg (total)	**698.8**	**8.91**	**9.56**					**0.011**	**7.04**

ND -- mercury not detected above trip blank level in sample fraction (treated as zero).
Trip blank levels subtracted from sample values.

Notes:
(1) Pitot flow rate from corresponding isokinetic tests.

CALCULATIONS:
ug/m^3 = ng/train * ng/1000ug * 35.31/sample volume, dscf
lb/hr = ng/train * lb/454*10^9 ng 1/sample volume, dscf * Qsd * 60 min/hr
lb/10^12Btu = ng/train * lb/454*10^9 ng * 1/sample volume,dscf * F-factor@0%O2,dscf/mmBtu *10^6* 20.9/(20.9-%O2)

FRONTIER GEOSCIENCES MERCURY SPECIATION TEST RESULTS
NYSEG POST-RETROFIT TEST PROGRAM -- STACK
AUGUST 1996

Fuel Type:	COAL				**Test Method:**	MESA
Avg. Trip Blank (ng/train):	0.46	Hg(0) - Trap A only			**Analytical Method:**	CVAFS
	0.91	Hg(II) - Traps A&B			**Laboratory:**	Frontier Geosciences
	0.134	Hg (tot) - Probe			**Date Analyzed:**	August 1996
F-factor @0%O2:	9594	9631	9655	dscf/MMBtu	**Reference Temp., F:**	68

Test No.	ng/train	ug/m^3	ug/Nm^3	O_2, %	CO_2, %	Sample Volume, dscf	Pitot Flowrate, dscfm$^{(1)}$	lb/hr	lb/ 10^{12}Btu
1-MESA-STK				5.63	13.86	1.802	358,667		
Hg(0) - elemental	*132.5*	2.60	2.79					*3.5E-03*	*2.13*
Hg(II) - oxidized	12.9	0.25	0.27					3.4E-04	0.21
Hg(tot) - Quartz Wool Plug	NP	NP	NP					NP	NP
Hg (total)	**145.4**	**2.85**	**3.06**					**3.8E-03**	**2.33**
2-MESA-STK				5.33	13.63	1.674	358,779		
Hg(0) - elemental	127.3	2.68	2.88					3.6E-03	2.16
Hg(II) - oxidized	17.8	0.38	0.40					5.0E-04	0.30
Hg(tot) - Quartz Wool Plug	0.15	0.003	0.003					4.2E-06	0.003
Hg (total)	**145.2**	**3.06**	**3.29**					**4.1E-03**	**2.47**
3-MESA-STK				5.35	13.68	3.226	362,692		
Hg(0) - elemental	271.5	2.97	3.19					4.0E-03	2.41
Hg(II) - oxidized	38.1	0.42	0.45					5.7E-04	0.34
Hg(tot) - Quartz Wool Plug	0.28	0.003	0.003					4.2E-06	0.002
Hg (total)	**309.9**	**3.39**	**3.64**					**4.6E-03**	**2.75**
3A-MESA-STK				5.33	13.66	2.862	362,692		
Hg(0) - elemental	219.5	2.71	2.91					3.7E-03	2.19
Hg(II) - oxidized	20.3	0.25	0.27					3.4E-04	0.20
Hg(tot) - Quartz Wool Plug	0.09	0.001	0.001					1.5E-06	0.001
Hg (total)	**239.9**	**2.96**	**3.18**					**4.0E-03**	**2.39**
AVERAGE:				5.34	13.66	2.587	361,388		
Hg(0) - elemental	187.72	2.74	2.94					3.7E-03	2.22
Hg(II) - oxidized	22.26	0.32	0.35					4.4E-04	0.26
Hg(tot) - Quartz Wool Plug	0.17	0.002	0.003					3.3E-06	0.002
Hg (total)	**210.2**	**3.07**	**3.29**					**4.1E-03**	**2.49**

ND -- mercury not detected above trip blank level in sample fraction (treated as zero).
Trip blank levels subtracted from sample values.

Notes:
(1) Pitot flow rate from corresponding isokinetic tests.

FRONTIER GEOSCIENCES
MERCURY SPECIATION LABORATORY SUMMARY

Test Number	Raw Laboratory Data		Corrected Data(1)			Total Mercury, ng/trap	% of TripBlnk to Reported Lab Data
	Trap A, ng/trap	Trap B, ng/trap	Trap A, ng/trap	Trap B, ng/trap			
ELEMENTAL MERCURY -- Hg(0)							
TRIP BLANK 1	0.362	0.307	--	--		0.362	--
TRIP BLANK 2	0.56	0.398	--	--		0.56	--
2-MESA-IN	70.8	0.591	70.3	NB	(2)	70.3	0.7%
3-MESA-IN	169	0.344	168.5	NB	(2)	168.5	0.3%
3A-MESA-IN	51.5	0.475	51.0	NB	(2)	51.0	0.9%
1-MESA-OUT	1.9	0.254	1.4	NB	(2)	1.4	32.0%
2-MESA-OUT	109	0.356	108.5	NB	(2)	108.5	0.4%
3-MESA-OUT	150	0.277	149.5	NB	(2)	149.5	0.3%
3A-MESA-OUT	326	0.456	325.5	NB	(2)	325.5	0.1%
1-MESA-STK	133	0.353	132.5	NB	(2)	132.5	0.3%
2-MESA-STK	127	1.08	126.5	0.728		127.3	0.6%
3-MESA-STK	272	0.384	271.5	NB	(2)	271.5	0.2%
3A-MESA-STK	220	0.353	219.5	NB	(2)	219.5	0.2%
OXIDIZED MERCURY -- Hg(II)							
TRIP BLANK 1	0.245	0.984	--	--		1.23	--
TRIP BLANK 2	1.57	1.69	--	--		3.26	--
2-MESA-IN	283	24	282.1	22.7		304.8	0.7%
3-MESA-IN	175	104	174.1	102.7		276.8	0.8%
3A-MESA-IN	306	91.4	305.1	90.1		395.2	0.6%
1-MESA-OUT	0.546	0.173	0.55	NB	(2)	0.55	
2-MESA-OUT	441	172	440.1	170.7		610.8	0.4%
3-MESA-OUT	461	58.6	460.1	57.3		517.4	0.4%
3A-MESA-OUT	295	75.8	294.1	74.5		368.6	0.6%
1-MESA-STK	13.8	0.635	12.9	NB	(2)	12.9	17.4%
2-MESA-STK	18.7	0.137	17.8	NB	(2)	17.8	12.6%
3-MESA-STK	30.1	10.2	29.2	8.9		38.1	5.9%
3A-MESA-STK	21.2	0.208	20.3	NB	(2)	20.3	11.1%
OXIDIZED MERCURY ON QUARTZ WOOL FILTER, ng/probe							
TRIP BLANK 1	2.39 (3)	NA	--	--		2.39	--
TRIP BLANK 2	0.134	NA	--	--		0.134	--
2-MESA-IN	3.81	NA	3.68	--		3.68	4%
3-MESA-IN	3.72	NA	3.59	--		3.59	4%
3A-MESA-IN	0.534	NA	0.400	--		0.400	34%
2-MESA-OUT	0.696	NA	0.562	--		0.562	24%
3-MESA-OUT	10.3	NA	10.2	--		10.2	--
3A-MESA-OUT	0.130	NA	ND	--		ND	
2-MESA-STK	0.284	NA	0.150	--		0.150	89%
3-MESA-STK	0.416	NA	0.282	--		0.282	--
3A-MESA-STK	0.221	NA	0.087	--		0.087	154%

NA - not applicable

NB - no significant breakthrough past Trap A was detected.

ND - not detected, sample value below trip blank level.

Notes:

(1) Average of trip blanks subtracted from sample values.

(2) Trap B mercury levels less than twice average trip blank value, therefore Trap B is treated as zero.

(3) Trip Blank 1 not subtracted from sample results, high value is anomalous.

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September 10, 1996
Eric M. Prestbo Ph.D.

Kusha Janati
Carnot
15991 Red Hill Avenue
Suite 110
Tustin, California 92680

Dear Kusha,

Enclosed you will find the formal report on the analysis of Mercury Speciation Adsorption (MESA) method samples at the NYSEG facility.

I have only included results for those samples which Carnot is paying for, contrary to what I indicated at the outset of this project. I expect that you will get all the results eventually when I get accurate sample volumes. I also hope to get one of the funding sources involved to pay for these important results.

One flag - based on the qualitative volumes you provided to me - it seems that the inlet is higher than the outlet for samples 3 and 3A based on my calculations.

Please call if you have further questions.

Sincerely,
Eric M. Prest
Eric M. Prestbo

Report on Mercury Speciation in a NYSEG Coal Burning Facility

prepared for

Kusha Janati
Carnot

prepared by

Eric M. Prestbo Ph.D.
Frontier Geosciences Inc.
414 Pontius Avenue North, Suite B
Seattle, Washington 98109

206 622 6960 voice
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September 10, 1996

Case Narrative

SAMPLE COLLECTION

MESA method samples were collected by Carnot personnel for this series of experiments. Further details about the MESA sampling effort should be addressed to Carnot personnel. It is assumed that the MESA method samples were collected following standard operating procedure (SOP) for sample collection (FGS-023). Appendix A includes our observations of the sample trains during receipt and digestion.

SAMPLE C.O.C.

Sample 3A-MESA-STK on the COC was assumed to be the field labeled sample 3B-MESA-OUT as discussed with Kusha Janati. Samples 1-MESA-OUT, 1-MESA-STK and 2-MESA-IN were void (do not analyzed) on the COC. These samples were analyzed anyway.

SAMPLE ANALYSIS

The analysis of the solid sorbent traps for mercury speciation was completed by closely following SOP FGS-024 and FGS-031 for MESA method sample analysis and the peer reviewed article by Prestbo and Bloom, 1995.

The iodated carbon traps (Hg^O and quartz wool particulate plug (Hg_p) were leached with hot refluxing 7:3 solution of HNO_3:H_2SO_4 and then diluted with 5% (v/v) BrCl solution. An aliquot of the digest was analyzed for Hg by aqueous phase $SnCl_2$ reduction, dual gold trap amalgamation and finally detected by cold vapor atomic fluorescence spectroscopy (CVAFS).

The entire contents of the KCl/lime traps (Hg(II))were dissolved in 100 mL of 6%/4% BrCl/HCl (v/v) solution. An aliquot of the digest was analyzed for Hg by aqueous phase $SnCl_2$ reduction, dual gold trap amalgamation detection by CVAFS.

A large number of quality assurance measurements were made during the analysis of the MESA method samples. A 4-point standard curve was generated at the beginning of each day and check standards were analyzed approximately every 10 samples. Most of the sorbent trap digests were analyzed in duplicate. Analysis spike recoveries were performed on both KCl/lime, iodated carbon and quartz wool plug digests at a rate of approximately 1 per 10 samples analyzed. A laboratory internal reference standard, DORM-2, was analyzed each analysis day to test for method control. Two field blanks trains were also analyzed for quality control. For your information, we are not currently doing any spike recoveries directly into a sample digest. All of the above QA information is reported for each Hg species in Tables 2-4.

Overall the analysis of the MESA method sorbent traps was under control at all times and thus were well within the acceptable QA boundaries. There were approximately 6 transcription errors which were discovered and reconciled by recalculation and/or sample reruns.

All original lab bench sheets, calculations and other pertinent information will be kept on file at Frontier Geosciences for 3 years and is available if needed.

RESULTS - DISCUSSION

All of the results of analysis are found in Tables 2-4. Only ng/trap are reported because we were not provided with accurate sample volume data. The values of ng/trap are not field blank corrected.

A method detection limit is reported for each species of mercury measured. For Hg^{0} the field blank and B-trap values were combined to arrive at a mean blank and standard deviation of the blank for the purpose of calculating a more meaningful method detection limit. For Hg(II) only the trip blank values are used to calculate a blank. For Hg_{P}, only the single low value was used for the blank value.

Note that the values reported for Hg on the wool plug/quartz probe are only qualitatively indicative of the amount of particulate Hg. The MESA method does not sample isokinetically.

Total Hg is the sum of Hg(II), Hg^{0} and Hg_{P}

Site Carnot Results of Hg Speciation in Combustion Flue Gas
Frontier Geosciences, August-1996, Eric M. Prestbo

Table 2: Elemental Hg

Sample ID	Stream/ Run	A Trap ng/trap	RPD A Trap ng/trap (n)	B Trap ng/trap	RPD B Trap ng/trap (n)	Sample Volume liters#	Hg(0) ug/m3
1-MESA	OUT	1.90	1.58 (2)	0.254			
1-MESA	STACK	133		0.353			
2-MESA	IN	70.8	3.95 (2)	0.591			
2-MESA	OUT	109		0.356			
2-MESA	STACK	127		1.08	124 (2)		
2A-MESA	IN						
2A-MESA	OUT						
2A-MESA	STACK						
3-MESA	IN	169	4.73 (2)	0.344			
3-MESA	OUT	150	2.01 (2)	0.277			
3-MESA	STACK	272	0.74 (2)	0.384			
3A-MESA	IN	51.5	5.05 (2)	0.475			
3A-MESA	OUT	326	1.53 (2)	0.456			
3A-MESA	STACK	220	4.55 (2)	0.353			
4-MESA	OUT						
4-MESA	STACK						
TRIP BLANK 1		0.362		0.307			
TRIP BLANK 2		0.56		0.398			

Detection limit (3 X sigma field blank/0.060 cubic meters)	
Hg(0) ug/m^3	0.010

Mean Blank* ng/trap	Std Dev ng/trap
0.437	0.202

Laboratory Spike Recovery - 1.0 ng

pg expect	pg recovered	%Rec
5.070	5.455	108
4.191	4.251	101

SRM DORM-2 (Expect 4.64 ng/ml)
4.85
4.94

* Grand average of field blank and B Trap values

Example Calculation for Field Blank Correct Elemental Hg ug/m^3

(TrapA-Mean Blank)/Volume

#ug/m3 - volume qualitative by Carnot

RPD = Relative Percent Difference - when n>2 then %RSD is calculated

Site Carnot Results of Hg Speciation in Combustion Flue Gas
Frontier Geosciences, August-1996, Eric Prestbo Ph.D.

Table 3: Oxidized Hg(II)

Sample ID	Stream/ Run	A Trap ng/trap	RPD A Trap ng/trap (n)	B Trap ng/trap	RPD B Trap ng/trap (n)	Sample Volume liters#	Hg(II) ug/m3
1-MESA	OUT	0.546	78.1 (2)	0.173	72.8 (2)		
1-MESA	STACK	13.8	49.3 (2)	0.635			
2-MESA	IN	283	6.82 (3)	24	1.67 (2)		
2-MESA	OUT	441	4.08 (2)	172	4.08 (2)		
2-MESA	STACK	18.7	18.2 (2)	0.137			
2A-MESA	IN						
2A-MESA	OUT						
2A-MESA	STACK						
3-MESA	IN	175	5.71 (2)	104	5.77 (2)		
3-MESA	OUT	461	5.21 (2)	58.6	1.19 (2)		
3-MESA	STACK	30.1	15.2 (2)	10.2	10.7 (2)		
3A-MESA	IN	306	2.28 (2)	91.4	16.0 (2)		
3A-MESA	OUT	295	6.78 (2)	75.8	2.51 (2)		
3A-MESA	STACK	21.2	1.42 (2)	0.208			
4-MESA	OUT						
4-MESA	STACK						
TRIP BLANK 1		0.245		0.984			
TRIP BLANK 2		1.57		1.69			

Detection limit (3 X sigma field blank/0.060 cubic meters)	
Hg(II) ug/m^3	0.033

Mean Blank* ng/trap	Std Dev ng/trap
1.12	0.66

Laboratory Spike Recovery - 1.0 ng

pg expect	pg recovered	%Recovery
1.252	1.103	88.1
1.114	1.175	105
3.266	3.597	110
1.319	1.366	104

SRM DORM-2 (Expect 4.64 ng/ml)
4.97
4.85

* Grand average of trip blank trap values
Example Calculation for Field Blank Correct Oxidized Hg (II) ug/m^3
((TrapA+Trapb)-2*Mean Blank)/Volume
# Volume not available from Carnot
RPD = Relative Percent Difference - when n>2 then %RSD is calculated

Site Carnot Results of Hg Speciation in Combustion Flue Gas
Frontier Geosciences, August-1996, Eric Prestbo Ph.D

Table 4: Probe Total Hg

Sample ID	Stream/ Run	Probe ng/probe	RPD Probe ng/probe (n)	Sample Volume liters	Probe Hg ug/Nm3#
1-MESA	OUT	not analyzed - can be if requested			
1-MESA	STACK	not analyzed - can be if requested			
2-MESA	IN	3.81	12.1 (3)		
2-MESA	OUT	0.696			
2-MESA	STACK	0.284			
2A-MESA	IN				
2A-MESA	OUT				
2A-MESA	STACK				
3-MESA	IN	3.72			
3-MESA	OUT	10.3	6.05 (3)		
3-MESA	STACK	0.416			
3A-MESA	IN	0.534			
3A-MESA	OUT	0.130			
3B-MESA (A?)	OUT (STACK?)	0.221			
4-MESA	OUT				
4-MESA	STACK				
TRIP BLANK 1		2.39 X			
TRIP BLANK 2		0.134			

Detection limit (3 X sigma field blank/0.060 cubic meters)	
Probe Hg ug/m^3	Est. 0.005

Mean Blank* ng/trap	Std Dev ng/trap
0.134	

Laboratory Spike Recovery - 1.0 ng

ng expect	ng recovered	%Recovery
1.034	1.056	102
1.583	1.534	97

SRM DORM-2 (Expect 4.64 ng/ml)
4.85
4.94

* Grand average of field blank and B Trap values
Example Calculation for Field Blank Correct Elemental Hg ug/m^3
(TrapA-Mean Blank)/Volume
#ug/Nm3 @ 1 Atm and 70 degrees F
RPD = Relative Percent Difference - when n>2 then %RSD is calculated

Site Carnot Results of Hg Speciation in Combustion Flue Gas
Frontier Geosciences, August-1996, Eric M. Prestbo

Table 2: Elemental Hg

of 10/14/96

Sample ID	Stream/ Run	A Trap ng/trap	RPD A Trap ng/trap (n)	B Trap ng/trap	RPD B Trap ng/trap (n)	Sample Volume liters#	Hg(0) ug/m3
2 ~~1~~-MESA	IN	70.8	3.95 (2)	0.591			
1-MESA	OUT						
1-MESA	STACK						
2-MESA	IN						
2-MESA	OUT	109		0.356			
2-MESA	STACK	127		1.08	124 (2)		
2A-MESA	OUT						
2A-MESA	STACK						
3-MESA	IN	169	4.73 (2)	0.344			
3-MESA	OUT	150	2.01 (2)	0.277			
3-MESA	STACK	272	0.74 (2)	0.384			
3A-MESA	IN	51.5	5.05 (2)	0.475			
3A-MESA	OUT	326	1.53 (2)	0.456			
3B-MESA (A?)	OUT (STACK?)	220	4.55 (2)	0.353			
4-MESA	OUT						
4-MESA	STACK						
TRIP BLANK 1		0.362		0.307			
TRIP BLANK 2		0.56		0.398			

Detection limit (3 X sigma field blank/0.060 cubic meters)

Hg(0) ug/m^3 0.010

Mean Blank* ng/trap	Std Dev ng/trap
0.457	0.209

Laboratory Spike Recovery - 1.0 ng

pg expect	pg recovered	%Rec
5.070	5.455	108
4.191	4.251	101

SRM DORM-2 (Expect 4.64 ng/ml)
4.85
4.94

* Grand average of field blank and B Trap values
Example Calculation for Field Blank Correct Elemental Hg ug/m^3
(TrapA-Mean Blank)/Volume
#ug/m3 - volume qualitative by Carnot
RPD = Relative Percent Difference - when n>2 then %RSD is calculated

Site Carnot Results of Hg Speciation in Combustion Flue Gas
Frontier Geosciences, August-1996, Eric Prestbo Ph.D.

Table 3: Oxidized Hg(II)

10/14/96

Sample ID	Stream/ Run	A Trap ng/trap	RPD A Trap ng/trap (n)	B Trap ng/trap	RPD B Trap ng/trap (n)	Sample Volume liters#	Hg(II) ug/m3
2 ~~1~~-MESA	IN	283	6.82 (3)	24	1.67 (2)		
1-MESA	OUT						
1-MESA	STACK						
2-MESA	IN						
2-MESA	OUT	441	4.08 (2)	172	4.08 (2)		
2-MESA	STACK	18.7	18.2 (2)	0.137			
2A-MESA	OUT						
2A-MESA	STACK						
3-MESA	IN	175	5.71 (2)	104	5.77 (2)		
3-MESA	OUT	461	5.21 (2)	58.6	1.19 (2)		
3-MESA	STACK	30.1	15.2 (2)	10.2	10.7 (2)		
3A-MESA	IN	306	2.28 (2)	91.4	16.0 (2)		
3A-MESA	OUT	295	6.78 (2)	75.8	2.51 (2)		
3B-MESA (A?)	OUT (STACK?)	21.2	1.42 (2)	0.208			
4-MESA	OUT						
4-MESA	STACK						
TRIP BLANK 1		0.245		0.984			
TRIP BLANK 2		1.57		1.69			

Detection limit (3 X sigma field blank/0.060 cubic meters)	
Hg(II) ug/m^3	0.033

Mean Blank* ng/trap	Std Dev ng/trap
1.12	0.66

Laboratory Spike Recovery - 1.0 ng

pg expect	pg recovered	%Recovery
1.252	1.103	88.1
1.114	1.175	105
3.266	3.597	110
1.319	1.366	104

SRM DORM-2 (Expect 4.64 ng/ml)
4.97
4.85

* Grand average of trip blank trap values

Example Calculation for Field Blank Correct Oxidized Hg (II) ug/m^3

((TrapA+Trapb)-2*Mean Blank)/Volume

Volume not available from Carnot

RPD = Relative Percent Difference - when n>2 then %RSD is calculated

Site Carnot Results of Hg Speciation in Combustion Flue Gas
Frontier Geosciences, August-1996, Eric Prestbo Ph.D

Table 4: Probe Total Hg

pf 10/14/96

Sample ID	Stream/ Run	Probe ng/probe	RPD Probe ng/probe (n)	Sample Volume liters	Probe Hg ug/Nm3#
2 ~~1~~-MESA	IN	3.81	12.1 (3)		
1-MESA	OUT				
1-MESA	STACK				
2-MESA	IN				
2-MESA	OUT	0.696			
2-MESA	STACK	0.284			
2A-MESA	OUT				
2A-MESA	STACK				
3-MESA	IN	3.72			
3-MESA	OUT	10.3	6.05 (3)		
3-MESA	STACK	0.416			
3A-MESA	IN	0.534			
3A-MESA	OUT	0.130			
3B-MESA (A?)	OUT (STACK?)	0.221			
4-MESA	OUT				
4-MESA	STACK				
TRIP BLANK 1		2.39 X			
TRIP BLANK 2		0.134			

Detection limit (3 X sigma field blank/0.060 cubic meters)	
Probe Hg ug/m^	Est. 0.005

Mean Blank* ng/trap	Std Dev ng/trap
0.134	

Laboratory Spike Recovery - 1.0 ng

ng expect	ng recovered	%Recovery
1.034	1.056	102
1.583	1.534	97

SRM DORM-2 (Expect 4.64 ng/ml)
4.85
4.94

* Grand average of field blank and B Trap values

Example Calculation for Field Blank Correct Elemental Hg ug/m^3

(TrapA-Mean Blank)/Volume

#ug/Nm3 @ 1 Atm and 70 degrees F

RPD = Relative Percent Difference - when n>2 then %RSD is calculated

MESA SAMPLE TRAIN STANDARD VOLUMES
NYSEG POST-RETROFIT TEST PROGRAM
AUGUST 1996

Test No.	Test Type	Sample Volume, liters	Barometric Pressure, "Hg	Meter Press., iwg	Meter Temp., deg. F	Yd	Stnd. Vol., dscf	Sample Train Information			
								O2, %	CO2, %	Pitot Flow Rate, dscfm	Corresponding Iso. Test
2-MESA-IN	Normal	52.5	29.83	1.0	122.2	0.977	1.642	6.13	12.93	340,247	2-MTLS-IN
3-MESA-IN	Normal	52.1	29.68	1.0	93.5	0.977	1.705	5.40	13.64	327,659	3-MTLS-IN
3A-MESA-IN	Normal	61.7	29.68	1.0	108.4	0.977	1.966	5.23	13.75	329,486	3-PM/AN-IN
1-MESA-OUT	Normal	73.46	29.86	1.0	126.0	1.031	2.411	5.20	14.25	323,354	1-MTLS-OUT
2-MESA-OUT	Normal	82.42	29.83	1.0	112.6	1.031	2.765	5.34	13.62	331,647	2-MTLS-OUT
2A-MESA-OUT	Low Temp	84.77	29.83	1.0	101.8	1.031	2.899	5.20	13.54	331,647	2-MTLS-OUT
3-MESA-OUT	Normal	81.04	29.68	1.0	96.8	1.031	2.782	5.32	13.71	330,081	3-MTLS-OUT
3A-MESA-OUT	Normal	81.32	29.68	1.0	102.7	1.031	2.762	4.25	14.61	330,081	3-MTLS-OUT
4-MESA-OUT	High Temp	53.42	29.79	1.0	104.4	1.031	1.816	4.60	15.28	321,047	3-SV-OUT
1-MESA-STK	Normal	55.14	29.12	0.5	106.8	1.02	1.802	5.63	13.86	358,667	1-MTLS-STK
2-MESA-STK	Normal	50.18	29.08	1.0	95.5	1.020	1.674	5.33	13.63	358,779	2-MTLS-STK
2A-MESA-STK	Low Temp	50.11	29.08	1.0	90.3	1.020	1.687	5.20	13.54	358,779	2-MTLS-STK
3-MESA-STK	Normal	96.26	29.07	1.0	92.6	1.020	3.226	5.35	13.68	362,692	3-MTLS-STK
3A-MESA-STK	Normal	85.86	29.07	1.0	95.7	1.020	2.862	5.33	13.66	362,692	3-MTLS-STK
4-MESA-STK	High Temp	49.91	29.08	1.0	93.5	1.020	1.671	5.70	14.25	328,348	3-SV-STK

CARN

CLIENT NYSEG
SAMPLE LOCATION ESP INLET
OPERATOR/ASSISTANT BC
UNIT #2
TEST CONDITION Full LOAD
METER VOL. (START/END) /
TEST NO. 2-MESA-W
METHOD Frontgeo
AMB. TEMP., °F
PAGE (1) OF (1)
PROJECT #
DATE 8/8/96

PRE-TEST DATA:
Barometric Press., in. Hg. 29.83
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total
per point
Total of Traverse Points
Teflon Connecting Line (Y/N)
Isokinetic Factor
ΔH = ________ X ΔP

EQUIPMENT INFO:
Meter ID No. Low Flow
Meter, Yd. 0.977
CFM @ ΔH = 1.0
Pitot: ID
Cp
Probe: Mat'l Quartz
Length 4'
Nozzle: ID/Mat'l
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux.

Imp.	Mat'l	Wt.(End)	-	Wt.(Start)	=	Wt.(g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
#5			-		=	
Total					=	

POST TEST INFO:
Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	.000	16"	0	BC
Post-Test	.000	16"	0	BC

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS meter press	 ΔH	 METER READING	TEMPERATURES, °F ~~STACK~~ CART	 PROBE	METER IN	 OUT	 OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
I-3	840	1.0	.54/n	644.7	217	195	125	127				6.5	
	850		"	650.2	223	195	123	125				6.5	
	900		"	654.9	226	195	122	124				6.5	
	910		"	660.1	235	199	123	125				6.5	
I-2	920		"	665.0	236	197	122	124				8	
	930		"	670.0	234	196	120	123				8	
	940		"	675.0	235	196	120	123				10	
	950		"	679.3	232	195	120	122				15	
I-1	1000		"	682.8	233	196	120	122				15	
	1010		"	686.0	232	196	121	123				15	
	1020		"	690.6	234	196	121	124				15	
	1030		"	694.0	230	197	115	119				15	
STOP	1040			697.2									
				52.5	230.6		121	123					

CHAIN OF CUSTODY INFORMATION
Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY
Calculated by: DK
Checked by: DK
Stack Press (iwg)
Stack Temp. (°F)
ΔP (iwg) 6.13* / 12.93
O₂/CO₂
Meter Vol., (acf) 52.5 liters
Meter Temp. (°F) 122.2
Meter Press. (iwg) 1.0
Liquid Vol. (g)
Comments: 0.434 l/min

OPERATOR/ASSISTANT BC

METER VOL. (START/END)

DATE 4/4/[illegible]

PRE-TEST DATA:

Barometric Press., in. Hg. 29.68
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total
per point
Total of Traverse Points
Teflon Connecting Line (Y/N)
Isokinetic Factor
ΔH = ______ X ΔP

EQUIPMENT INFO:

Meter ID No. mini pump/[illegible]
Meter, Yd. 0.977
CFM @ ΔH = 1.0
Pitot: ID
Cp
Probe: Mat'l Quartz
Length 4'
Nozzle: ID/Mat'l
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux.

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1		-		=
#2		-		=
#3		-		=
#4		-		=
#5		-		=
Total				=

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	.000	16"	0	BC
Post-Test	.000	16"	0	BC

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS meter pres ΔP	 ΔH	 METER READING	TEMPERATURES, °F STACK	 PROBE	METER IN	 OUT	 OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
W-3	930	1.0	.5 l/m	736.8	299	196	92	93				6	
	940		″	741.8	301	204	92	94				8.5	
	950		″	746.2	302	205	91	93				12.5	
	1000		″	749.2	296	200	91	92				16	
W-2	1010		″	751.0	301	196	91	92				16	
	1020		″	752.4	300	197	92	93					
STOP TEST	~~1030~~ 1022		″	752.6	Remove ½ [illegible] from nozzle - packed w/ flyash								
START	~~1040~~ 1032		″	752.6	300	206	92	93				5	
~~W-4~~	~~1050~~ 1040		″	757.2	300	207	93	93				5	
	~~1100~~ 1050		″	762.1	299	195	95	94				6	
W-1	~~1110~~ 1100		″	765.0	298	201	~~98~~	96				7	
	~~1120~~ 1110		″	772.2	299	202	94	93				8	
~~STOP~~	~~1130~~ 1120			778.1	293	198	93	93				12	
	1130			783.5	299	203	98	99					
STOP	1140			788.9									
					299								

CHAIN OF CUSTODY INFORMATION

Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY
Calculated by: DK
Checked by: DK
Stack Press (iwg)
Stack Temp. (°F)
ΔP (iwg) 5.40R / 13.64
O₂/CO₂ ~~[illegible]~~
Meter Vol., (acf) 52.1 liters
Meter Temp. (°F) 93.5 ✓
Meter Press. (iwg) 1.0
Liquid Vol. (g)
Comments: 0.434 l/min

* FROM 3-[illegible] PORT W

CLIENT NYSEG
SAMPLE LOCATION ESP INLET
OPERATOR/ASSISTANT Blommel
UNIT #2
TEST CONDITION Full Load
METER VOL. (START/END) /
TEST NO. SA-MESA-IN
METHOD
AMB. TEMP., °F
PAGE 4 OF 4
PROJECT #
DATE 8/9/96

PRE-TEST DATA:
Barometric Press., in. Hg. 29.68
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total
per point
Total of Traverse Points
Teflon Connecting Line (Y/N)
Isokinetic Factor
ΔH = ______ X ΔP

EQUIPMENT INFO:
Meter ID No. mini amplmeter
Meter, Yd. 0.977
CFM @ ΔH = 1.0
Pitot: ID
Cp
Probe: Mat'l Quartz
Length 41
Nozzle: ID/Mat'l
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux.

Imp.	Mat'l	Wt.(End)	-	Wt.(Start)	=	Wt.(g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
#5			-		=	
Total					=	

POST TEST INFO:
Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	.000	17"	0	BC
Post-Test	.000	12"	0	BC

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS Meter res ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
W-3	1340	1.0	.54	789.8	214	204	106	106				5	
	1350		"	795.2	214	148	106	106				5	
	1400		"	801.2	215	200	107	107				5	
	1410		"	807.8	214	203	107	108				6	
W-2	1420		"	811.6	214	200	107	109				6.5	
	1430		"	815.8	213	199	109	109				6.5	
	1440		"	820.7	214	199	108	109				7	
	1450		"	826.2	212	197	108	110				8	
W-1	1500		"	831.7	213	196	109	110				9	
	1510		"	835.2	213	196	109	110				9	
	1520		"	840.9	213	193	110	111				10	
	1530		"	845.4	212	197	110	112				10.5	
STOP	1540			851.5									
					2734								

CHAIN OF CUSTODY INFORMATION
Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY
Calculated by: QL
Checked by: DK
Stack Press. (iwg)
Stack Temp. (°F)
ΔP (iwg) 5.23* 13.75
O₂/CO₂ [illegible]
Meter Vol., (acf) 61.7 liters
Meter Temp. (°F) 108.4
Meter Press. (iwg) 1.0
Liquid Vol. (g)
Comments: 0.514 l/min

OPERATOR/ASSISTANT JP METER VOL. (START/END) / DATE [illegible]

PRE-TEST DATA:

Barometric Press., in. Hg. 29.86
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total 3
per point 1
Total of Traverse Points 3
Teflon Connecting Line (Y/N)
Isokinetic Factor
ΔH = ______ X ΔP

EQUIPMENT INFO:

Meter ID No. NCC 2
Meter, Yd. 1.021
CFM @ ΔH = 1.0
Pitot: ID
Cp
Probe: Mat'l Quartz
Length 4'
Nozzle: ID/Mat'l
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux.

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1			-	=
#2			-	=
#3			-	=
#4			-	=
#5			-	=
Total				=

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	15"	—	JP
Post-Test	0.000	15"	—	

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔH	l/m ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER °C IN	OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
V3	1025	1.0	.45	1725.56	274	180		47				3	
V3	1040	1.0	.42	1731.81	274	186		46				2.5	
V3	1055	1.0	.40	1737.95	275	204		49				2.5	
V3	1100	1.0	.50	1744.70	274	204		51				3	
V2	1125	1.0	.50	1750.92	275	204		52				2.5	
V2	1140	1.0	.50	1757.22	278	201		53				3.0	
V2	1155	1.0	.48	1764.01	278	180		54				2.5	
V2	1210	1.0	.45	[illegible]	276	202		54				2.5	
V[illegible]	1225	1.0	.45	1775.61	276	202		54				2.5	
V[illegible]	1240	1.0	.45	1781.41	275	206		55				2.5	
V1	255	1.0	.45	1787.51	275	198		55				2.5	
V1	1300	1.0	.45	1793.11	274	201		56				2.5	
V1	1325			1799.02				STOP					
	[illegible]												
				73.46		197.3	[illegible]						

CHAIN OF CUSTODY INFORMATION

Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY

Calculated by: DK
Checked by:
Stack Press (iwg)
Stack Temp (°F)
ΔP (iwg) * 5.20 / 14.25
O₂/CO₂ [illegible]
Meter Vol, (al) 73.46 l ✓
Meter Temp. (°F) 52.2 °C ✓
Meter Press. (iwg) 1.0 ✓
Liquid Vol (g) 125.96
Comments: 0.41 l/min

* From 1-OH-OUT @1310

[illegible]

CARI

CLIENT N4SEG
SAMPLE LOCATION ESP OUTLET
OPERATOR/ASSISTANT JP
UNIT #2
TEST CONDITION Full Load AESA
METER VOL. (START/END) /
TEST NO. Z-~~MB~~-001
METHOD ILUNI OEU
AMB. TEMP., °F
PAGE 1 OF 1
PROJECT #
DATE 8/8/96

PRE-TEST DATA:
Barometric Press., in. Hg. 29.83
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total 3
per point 1hr
Total of Traverse Points 3
Teflon Connecting Line (Y/N)
Isokinetic Factor
ΔH = ________ X ΔP

EQUIPMENT INFO:
Meter ID No. NCC 2
Meter, Yd. 1.031
CFM @ ΔH = 1.0
Pitot: ID
Cp
Probe: Mat'l Quartz
Length 4'
Nozzle: ID/Mat'l
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux.

Imp.	Mat'l	Wt.(End)	-	Wt.(Start)	=	Wt.(g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
#5			-		=	
Total					=	

POST TEST INFO:
Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	10"		JP
Post-Test	0.000	10"		JP

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS L/m ~~ΔP~~	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER °C IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
V3	0845	.45	1.0	1801.74	277	181	46	—	—	—	—	5	*
V3	0900	.45	1.0	1807.79	277	192	46	—	—	—	—	5	*
V3	0915	.45	1.0	1813.95	277	204	47	—	—	—	—	5	*
V3	0930	.40	1.0	1819.83	278	195	47	—	—	—	—	5.5	*
V2	0945	.42	1.0	1826.69	279	201	47	—	—	—	—	6.0	*
V2	1000	.42	1.0	1833.70	279	210	47	—	—	—	—	6.0	*
V2	1015	.42	1.0	1841.05	278	210	48	—	—	—	—	6.0	*
V2	1030	.42	1.0	1848.05	279	198	46	—	—	—	—	6.0	*
V1	1045	.42	1.0	1855.40	279	188	43	—	—	—	—	6.0	*
V1	1100	.42	1.0	1862.74	282	200	41	—	—	—	—	6.0	*
V1	1115	.42	1.0	1869.85	281	208	40	—	—	—	—	6.0	*
V1	1130	.42	1.0	1877.00	281	205	40	—	—	—	—	6.0	*
	1145			1884.16			STOP						
							JP						
				82.42		199.3	44.83						

CHAIN OF CUSTODY INFORMATION
Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash
TEST SUMMARY
Calculated by: DK
Checked by: DK
Stack Press.(iwg)
Stack Temp. (°F)
ΔP (iwg) 5.34* / 13.62
O₂/CO₂ ~~[illegible]~~
Meter Vol., (a~~cf~~) l 82.42
Meter Temp. (°F) 44.8 °C / 112.6
Meter Press. (iwg) 1.0
Liquid Vol. (g)
Comments: 0.46 l/min

OPERATOR/ASSISTANT Jdm

METER VOL. (START/END)

DATE

PRE-TEST DATA:

Barometric Press., in. Hg. 29.68
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total 3hr
per point 1hr
Total of Traverse Points 3
Teflon Connecting Line (Y/N)
Isokinetic Factor
ΔH = ________ X ΔP

EQUIPMENT INFO:

Meter ID No. NCC2
Meter, Yd. 1.031
CFM @ ΔH = 1.0
Pitot: ID
Cp
Probe: Mat'l Quartz
Length 4'
Nozzle: ID/Mat'l
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux.

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1				
#2				
#3				
#4				
#5				
Total				

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	10"	–	JP
Post-Test	0.000	10"	–	JP

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS l/m	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
J3	0845	.45	1.0	1968.96	281	210	31	~	~	~	~	7	*
J3	0800	.45	1.0	1976.56	281	179	32	~	~	~	~	6	*
J3	0915	.45	1.0	1983.42	279	181	34	~	~	~	~	6	*
J3	0930	.45	1.0	1990.36	280	179	34	~	~	~	~	6	*
J2	0945	.45	1.0	1996.63	282	183	35	~	~	~	~	6	*
J2	1000	.45	1.0	2003.21	282	185	35	~	~	~	~	6	*
J2	1015	.45	1.0	2009.73	284	212*	36	~	~	~	~	6	*
J2	1030	.45	1.0	2016.13	282	212*	37	~	~	~	~	6	*
J1	1045	.45	1.0	2023.00	283	212*	38	~	~	~	~	6	*
J1	1100	.45	1.0	2029.55	286	197	39	~	~	~	~	6	*
J1	1115	.45	1.0	2036.21	287	184	39	~	~	~	~	6	*
J1	1130	.45	1.0	2043.53	287	185	39	~	~	~	~	6	*
	1145	.45	1.0	2050.00				STOP					
						193.2							

CHAIN OF CUSTODY INFORMATION

Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY

Calculated by: DK
Checked by: DK
Stack Press (iwg)
Stack Temp. (°F)
ΔP (iwg) *5.32 / 13.71
O_2/CO_2 ↑ ~~[illegible]~~
Meter Vol., (acf) 81.04
Meter Temp. (°F) 36.0 / 46.8
Meter Press. (iwg) 1.0
Liquid Vol. (g)
Comments: *Temp as high as 280°F

*From 3-OH-OUT
0902/1202 ~~[illegible]~~

0.45l/min

CLIENT N4SEG
SAMPLE LOCATION ESP1 OUTLET
OPERATOR/ASSISTANT Jm
UNIT 2
TEST NO. 5A-MESA-OUT
METHOD [illegible]
PAGE 1 OF 1
TEST CONDITION FULL LOAD
AMB. TEMP., °F
PROJECT #
METER VOL. (START/END) /
DATE 8/9/96

PRE-TEST DATA:
Barometric Press., in. Hg 29.68
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total 3hr
per point 1hr
Total of Traverse Points 3
Teflon Connecting Line (Y/N)
Isokinetic Factor
ΔH = ______ X ΔP

EQUIPMENT INFO:
Meter ID No. NCC 2
Meter, Yd. 1.031
CFM @ ΔH = 1.0
Pitot: ID
Cp
Probe: Mat'l Quartz
Length 4'
Nozzle: ID/Mat'l
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux.

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1		-	=	
#2		-	=	
#3		-	=	
#4		-	=	
#5		-	=	
Total			=	

POST TEST INFO:
Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	10"	—	SP
Post-Test	0.000	10"	—	SP

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS 4m ~~ΔP~~	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
J3	1245	.45	1.0	2050.13	282	190	36	~	~	~	~	7	*
J3	1300	.45	1.0	2056.79	283	191	37	~	~	~	~	7	*
J3	1315	.45	1.0	2063.55	284	191	37	~	~	~	~	7	*
J3	1330	.45	1.0	2070.31	283	191	38	~	~	~	~	7	*
J2	1345	.45	1.0	2077.01	283	191	39	~	~	~	~	7	*
J2	1400	.45	1.0	2083.81	283	191	40	~	~	~	~	7	*
J2	1415	.45	1.0	2090.29	284	191	40	~	~	~	~	7	*
J2	1430	.45	1.0	2096.85	284	191	40	~	~	~	~	7	*
J1	1445	.45	1.0	2103.41	286	193	41	~	~	~	~	7	*
J1	1500	.45	1.0	2110.34	286	193	41	~	~	~	~	7	*
J1	1515	.45	1.0	2117.45	286	193	41	~	~	~	~	7	*
J1	1530	.45	1.0	2124.45	286	193	42	~	~	~	~	7	*
	1545			2131.45				STOP					
								JR					
						191.6							

CHAIN OF CUSTODY INFORMATION
Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY
Calculated by: DL
Checked by: DL
Stack Press.(iwg)
Stack Temp. (°F)
ΔP (iwg) 4.25R | 14.61
O₂/CO₂ ~~[illegible]~~
Meter Vol., ~~(acf)~~ 81.32 l
Meter Temp. ~~(°F)~~ 39.3°C ✓
Meter Press. (iwg) 1.0 ✓ /102.7
Liquid Vol. (g)
Comments: 0.45 l/min

OPERATOR/ASSISTANT Rm. METER VOL. (START/END) 551,832 / 557,347 DATE 8-[illegible]

PRE-TEST DATA:

Barometric Press., in. Hg.	29.12
Assumed Stack Temp. °F	120
Assumed Meter Temp. °F	111.5
Assumed ΔP	1.2
Assumed Moisture %	13%
Stack Diameter, in.	
Sample Time: Total	180
per point	30
Total of Traverse Points	Single Point.
Teflon Connecting Line (Y/N)	Y.
Isokinetic Factor	X ΔP
ΔH =	1.0

EQUIPMENT INFO:

Meter ID No.		Nec 1
Meter, Yd.		1.020
CFM @ ΔH = 1.0		
Pitot:	ID	
	Cp	
Probe:	Mat'l	Qtz/Teflon
	Length	4'
Nozzle:	ID/Mat'l	
	Diam.	
Filter:	No.	
	Tare Wt.	
TC Readout ID:	Meter	
	Aux.	Tc 021

Imp.	Mat'l	Wt.(End)	-	Wt.(Start)	=	Wt.(g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
#5			-		=	
Total					=	

POST TEST INFO:

Filter Appearance

Impinger Appearance

Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	15"	—	Rm.
Post-Test	0.000	5"	—	Rm

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS .45/min [redacted]	ΔH	METER READING	STACK	TEMPERATURES, °F PROBE	METER IN	[redacted]	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
SP	1030	.45	8.45	550.883		203	104				5.7	1.0	
South													
	1120	.45	8.45	552,725		197	108				5.7	1.0	
	1150	.45	6.45	553.769		197	107				5.6	1.0	
	1220	.45	2.45	554,595		198	107				5.6	1.0	
	1250	.45	1.45	555,507		203	107				5.6	1.0	
	1320	.45	3.45	556.439		201	108				5.6	1.0	
End	1330			557,347									
											[illegible]		
				5,511		199.8	106.83						

CHAIN OF CUSTODY INFORMATION

Impingers Loaded	
Impingers Recovered	
Filter Loaded	
Filter Recovered	
Probe Wash	

TEST SUMMARY

Calculated by:	OK
Checked by:	OK
Stack Press.(iwg)	[redacted]
Stack Temp. (°F)	
ΔP (iwg)	
O_2/CO_2	5.63 ✓ / 13.96
Meter Vol., (acf)	55.14 lv ✓
Meter Temp. (°F)	106.83 ✓
Meter Press. (iwg)	0.45
Liquid Vol. (g)	
Comments:	

5573.47

CLIENT NYSEG-Milliken Station
SAMPLE LOCATION Stack
OPERATOR/ASSISTANT RM.

UNIT 2
TEST CONDITION Full Load.
METER VOL. (START/END) 557.445 / 562.463

TEST NO. 2 [illegible] METHOD
AMB. TEMP., °F 92°

PAGE 1 OF 1
PROJECT # 1176
DATE 8-8-96

PRE-TEST DATA:

Barometric Press., in. Hg.	29.08
Assumed Stack Temp. °F	~~125~~ 123
Assumed Meter Temp. °F	~~100~~ 95
Assumed ΔP	
Assumed Moisture %	14%
Stack Diameter, in.	121
Sample Time: Total	180
per point	30
Total of Traverse Points	Single Pt.
Teflon Connecting Line (Y/N)	Y.
Isokinetic Factor	

ΔH = 1.0 X ΔP

EQUIPMENT INFO:

Meter ID No.		NCC 1
Meter, Yd.		1.020
CFM @ ΔH = 1.0		
Pitot:	ID	
	Cp	
Probe:	Mat'l	Qtz/Teflon
	Length	4'
Nozzle:	ID/Mat'l	
	Diam.	
Filter:	No.	
	Tare Wt.	
TC Readout ID:	Meter	
	Aux.	TC 021

Imp.	Mat'l	Wt.(End)		Wt.(Start)		Wt.(g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
#5			-		=	
Total					=	

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.008	15"	—	RM
Post-Test	0.002	5"	—	RM

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS			TEMPERATURES, °F						O₂	VAC.	STATIC PRESS. Iwg
		.45/min ΔP	ΔH	METER READING	STACK	PROBE	METER IN	METER [illegible]	OVEN	IMP. OUT			
SP.	0845	.45	1.[illegible]	557.445		206	93				5.3	2.5	
South													
	0915	.45	[illegible]	558.273		202	95				5.3	2.5	
	0945	.45	[illegible]	559.112		206	96				5.5	2.5	-.76
	1015	.45	[illegible]	560.002		207	97				5.5	2.8	
	1045	.45	[illegible]	560.801		208	96				5.2	2.8	
	1115	.45	[illegible]	561.632		203	96				5.2	2.8	
End	1145			562.463									
				5.018		205.3	95.5				5.3		

CHAIN OF CUSTODY INFORMATION	
Impingers Loaded	
Impingers Recovered	
Filter Loaded	
Filter Recovered	
Probe Wash	
TEST SUMMARY	
Calculated by:	DK
Checked by:	DK
Stack Press.(iwg)	
Stack Temp. (°F)	
ΔP (iwg)	
O₂/CO₂	5.33 / 13.63
Meter Vol., (acf)	5.018
Meter Temp. (°F)	95.5 ✓
Meter Press. (iwg)	~~[illegible]~~ 1.0 ✓
Liquid Vol. (g)	
Comments:	Keep Probe

OPERATOR/ASSISTANT Rm. METER VOL. (START/END)

PRE-TEST DATA:

Barometric Press., in. Hg. 89.07
Assumed Stack Temp. °F 125
Assumed Meter Temp. °F 90
Assumed ΔP .45/min
Assumed Moisture % 14
Stack Diameter, in. 121
Sample Time: Total 180
per point 30
Total of Traverse Points Single Pt.
Teflon Connecting Line (Y/N) Y.
Isokinetic Factor
ΔH = 1.0 X ΔP

EQUIPMENT INFO:

Meter ID No. NCC1
Meter, Yd. 1.020
CFM @ ΔH = 1.0
Pitot: ID
Cp
Probe: Mat'l Qtz/Teflon
Length 4'
Nozzle: ID/Mat'l
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux. TC 021

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1		-	=	
#2		-	=	
#3		-	=	
#4		-	=	
#5		-	=	
Total			=	

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	15"	—	Rr
Post-Test	0.000	8"	—	Rm

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS .45/min	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	~~OUT~~	OVEN	IMP. OUT	O_2	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
SP.	0827	.45	[illegible]	5691.75		210	86				5.4	5.0		Impingers Loaded
South			1.0											Impingers Recovered
	0857	.45	[illegible]	5705.52		202	89				5.4	5.9		Filter Loaded
														Filter Recovered
	0927	.49	[illegible]	5721.84		204	90				5.3	6.3		Probe Wash
													-.73	TEST SUMMARY
	0957	.49	[illegible]	5738.67		205	94				5.3	7.0		Calculated by: DL
														Checked by: DL
	1027	.48	[illegible]	5755.658		200	97				5.4	6.9		Stack Press (iwg)
														Stack Temp (°F)
	1057	.48	[illegible]	5772.77		205	100				5.3	6.3		ΔP (iwg)
														O_2/CO_2 5.35 ✓ | 13.68
End	1127			5788.01										Meter Vol., (acf) 96.26 l ✓
							92.6667				5.35			Meter Temp. (°F) 92.6 ✓
AVG.	180		0.47	96.26										Meter Press. (iwg) ~~[illegible]~~ 1.0
														Liquid Vol. (g)
														Comments: Probe Temp

20 194—212

~~5 MDS 5.35/13.62 O2 / CO2~~

CLIENT NYSEG - Milliken Station
SAMPLE LOCATION STACK
OPERATOR/ASSISTANT RM

UNIT
TEST CONDITION Full Load
METER VOL. (START/END) 5788.89 / 5874.75

TEST NO. 5
METHOD
AMB. TEMP., °F

PAGE OF
PROJECT # 11476
DATE 8-9-96

PRE-TEST DATA:

Barometric Press., in. Hg.	29.07
Assumed Stack Temp. °F	123
Assumed Meter Temp. °F	90
Assumed ΔP	.47/min
Assumed Moisture %	14%
Stack Diameter, in.	121
Sample Time: Total	180
per point	30
Total of Traverse Points	SP.
Teflon Connecting Line (Y/N)	Y

Isokinetic Factor

ΔH = 1.0 X ΔP

EQUIPMENT INFO:

Meter ID No.		NCC-1
Meter, Yd.		1.020
CFM @ ΔH = 1.0		
Pitot:	ID	
	Cp	
Probe:	Mat'l	Qtz/Teflon
	Length	4'
Nozzle:	ID/Mat'l	
	Diam.	
Filter:	No.	
	Tare Wt.	
TC Readout ID:	Meter	
	Aux.	TC021

Imp.	Mat'l	Wt (End)	Wt (Start)	Wt (g)
#1				
#2				
#3				
#4				
#5				
Total				

POST TEST INFO:
Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.002	15"	—	RM
Post-Test	0.000	8"	—	RM

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS			TEMPERATURES, °F						O₂	VAC.	STATIC PRESS. Iwg
		.45/min ΔP	ΔH	METER READING	STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT			
Single Pt South	1215	.46	.46	5788.89		196	96				5.4	6.1	
	1245	.49	.49	5803.29		203	97				5.4	6.6	
	1315	.50	.50	5817.76		203	96				5.3	6.5	
	1345	.50	.50	5832.38		205	95				5.3	6.5	-.61
	1415	.50	.50	5846.65		200	95				5.3	6.5	
End	1445	.50	.50	5860.57		202	95				5.3	6.5	
End	1515			5874.75									
						201.5							

CHAIN OF CUSTODY INFORMATION

Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY
Calculated by: DK
Checked by: DK
Stack Press.(iwg)
Stack Temp. (°F)
ΔP (iwg)
O₂/CO₂ 5.33 / 13.66
Meter Vol., (acf) 85.86 l
Meter Temp. (°F) ~~100~~ 95.7
Meter Press. (iwg) 0.49
Liquid Vol. (g)
Comments: Probe Temp

Appendix C.6

Ontario Hydro/TRIS Buffer

TRIS BUFFER AND ONTARIO-HYDRO MERCURY SPECIATION TEST RESULTS
NYSEG POST RETROFIT TEST PROGRAM -- FGD INLET
AUGUST 1996

Fuel Type:	COAL			**Test Method:**	TRIS Buffer/Ontario-Hydro
Detection Limits (ug/L):	0.3	TRIS Buffer		**Analytical Method:**	CVAAS
	0.1	KMnO4 & KCl		**Laboratory:**	EERC
	0.2	H2O2		**Date Analyzed:**	August 1996
F-factor @0%O2:	9594	9631 9655	dscf/MMBtu	**Reference Temp., F:**	68

Test No.	ng/train	ug/m^3	ug/Nm^3	O_2, %	CO_2, %	Sample Volume, dscf	Pitot Flowrate, dscfm$^{(1)}$	lb/hr	lb/ 10^{12}Btu
1-TRIS-OUT				4.67	14.56	35.832	323,354		
Hg(0) - elemental	2.05	2.02	2.17					0.002	1.56
Hg(II) - oxidized	4.39	4.33	4.64					0.005	3.34
Hg(tot) - filter	*0.001*	*0.001*	*0.001*					*1.2E-06*	*0.0008*
TOTAL Hg	**6.44**	**6.35**	**6.81**					**0.008**	**4.89**
2-TRIS-OUT				5.20	13.44	39.461	331,647		
Hg(0) - elemental	2.80	2.51	2.69					0.003	2.00
Hg(II) - oxidized	4.90	4.38	4.71					0.005	3.51
Hg(tot) - filter	0.006	0.005	0.006					6.7E-06	0.0043
TOTAL Hg	**7.71**	**6.90**	**7.40**					**0.009**	**5.51**
3-TRIS-OUT				4.67	14.13	39.219	330,081		
Hg(0) - elemental	3.35	3.02	3.24					0.004	2.34
Hg(II) - oxidized	4.18	3.76	4.03					0.005	2.92
Hg(tot) - filter	ND<0.005	ND	ND					ND	ND
TOTAL Hg	**7.53**	**6.77**	**7.27**					**0.008**	**5.25**
AVERAGE:				4.85	14.04	38.171	328,361		
Hg(0) - elemental	2.73	2.51	2.70					0.003	1.97
Hg(II) - oxidized	4.49	4.16	4.46					0.005	3.25
Hg(tot) - filter	0.004	0.002	0.002					2.6E-06	0.0017
Hg (total)	**7.23**	**6.67**	**7.16**					**0.008**	**5.22**
1-ONT-OUT				4.90	14.47	261.060	323,354		
Hg(0) - elemental	13.80	1.87	2.00					0.002	1.46
Hg(II) - oxidized	*36.15*	*4.89*	*5.25*					*0.006*	*3.82*
Hg(tot) - filter	ND<0.005	ND	ND					ND	ND
TOTAL Hg	**49.95**	**6.76**	**7.25**					**0.008**	**5.28**
2-ONT-OUT				5.28	13.63	224.406	331,647		
Hg(0) - elemental	13.32	2.10	2.25					0.003	1.68
Hg(II) - oxidized	*33.08*	*5.20*	*5.59*					*0.006*	*4.18*
Hg(tot) - filter	0.005	0.0008	0.0008					9.8E-07	0.0006
TOTAL Hg	**46.40**	**7.30**	**7.84**					**0.009**	**5.87**
3-ONT-OUT				5.16	13.83	209.721	330,081		
Hg(0) - elemental	14.40	2.42	2.60					0.003	1.94
Hg(II) - oxidized	*27.03*	*4.55*	*4.88*					*0.006*	*3.64*
Hg(tot) - filter	ND<0.005	ND	ND					ND	ND
TOTAL Hg	**41.43**	**6.97**	**7.48**					**0.009**	**5.58**
AVERAGE:				5.11	13.98	231.729	328,361		
Hg(0) - elemental	13.84	2.13	2.28					0.003	1.69
Hg(II) - oxidized	*32.08*	*4.88*	*5.24*					*0.006*	*3.88*
Hg(tot) - filter	0.003	0.0003	0.0003					3.3E-07	0.0002
Hg (total)	**45.93**	**7.01**	**7.52**					**0.009**	**5.58**

Field blank levels subtracted from sample values

Note: (1) Pitot flow rates from EPA Method 29 multi-metals tests (full traverse).

DRAFT RESULTS -- CONFIDENTIAL
DO NOT CITE OR QUOTE

TRIS BUFFER AND ONTARIO-HYDRO MERCURY SPECIATION TEST RESULTS
NYSEG POST RETROFIT TEST PROGRAM -- FGD OUTLET
AUGUST 1996

Fuel Type:	COAL				**Test Method:**	TRIS Buffer/Ontario-Hydro
Detection Limits (ug/L):	0.3	TRIS Buffer			**Analytical Method:**	CVAAS
	0.1	KMnO4 & KCl			**Laboratory:**	EERC
	0.2	H2O2			**Date Analyzed:**	August 1996
F-factor @0%O2:	9594	9631	9655	dscf/MMBtu	**Reference Temp., F:**	68

Test No.	**ng/train**	**ug/m^3**	**ug/Nm^3**	**O_2, %**	**CO_2, %**	**Sample Volume, dscf**	**Pitot Flowrate, dscfm$^{(1)}$**	**lb/hr**	**lb/ 10^{12}Btu**
1-TRIS-STK				5.42	13.89	71.828	358,667		
Hg(0) - elemental	4.75	2.34	2.51					3.1E-03	1.89
Hg(II) - oxidized	0.35	0.17	0.18					2.3E-04	0.14
Hg(tot) - filter	0.009	0.004	0.005					5.9E-06	0.0036
TOTAL Hg	**5.11**	**2.51**	**2.69**					**3.4E-03**	**2.03**
2-TRIS-STK				5.15	13.48	73.709	358,779		
Hg(0) - elemental	5.65	2.71	2.90					3.6E-03	2.16
Hg(II) - oxidized	0.45	0.22	0.23					2.9E-04	0.17
Hg(tot) - filter	0.006	0.003	0.003					3.9E-06	0.0023
TOTAL Hg	**6.11**	**2.93**	**3.14**					**3.9E-03**	**2.33**
3-TRIS-STK				5.23	13.64	73.577	362,692		
Hg(0) - elemental	5.30	2.54	2.73					3.5E-03	2.04
Hg(II) - oxidized	ND<0.06	ND<0.03	ND<0.03					ND<3.9E-05	ND<0.02
Hg(tot) - filter	0.007	0.003	0.004					4.6E-06	0.0027
TOTAL Hg	**5.37**	**2.58**	**2.76**					**3.5E-03**	**2.07**
AVERAGE:				5.27	13.67	73.038	360,046		
Hg(0) - elemental	5.23	2.53	2.71					3.4E-03	2.03
Hg(II) - oxidized	0.29	0.14	0.15					1.9E-04	0.11
Hg(tot) - filter	0.008	0.004	0.004					4.8E-06	0.0028
Hg (total)	**5.53**	**2.67**	**2.87**					**3.6E-03**	**2.14**
1-ONT-STK				5.61	13.83	215.765	358,667		
Hg(0) - elemental	13.25	2.17	2.33					2.9E-03	1.77
Hg(II) - oxidized	1.75	0.29	0.31					3.8E-04	0.23
Hg(tot) - filter	ND<0.005	ND	ND					ND	ND
TOTAL Hg	**15.00**	**2.45**	**2.63**					**3.3E-03**	**2.01**
2-ONT-STK				5.31	13.60	224.112	358,779		
Hg(0) - elemental	13.88	2.19	2.35					2.9E-03	1.76
Hg(II) - oxidized	0.98	0.15	0.16					2.1E-04	0.12
Hg(tot) - filter	0.006	0.0009	0.0010					1.3E-06	0.0008
TOTAL Hg	**14.86**	**2.34**	**2.51**					**3.1E-03**	**1.89**
3-ONT-STK				5.32	13.69	225.284	362,692		
Hg(0) - elemental	15.95	2.50	2.68					3.4E-03	2.02
Hg(II) - oxidized	0.93	0.14	0.16					2.0E-04	0.12
Hg(tot) - filter	0.010	0.0016	0.0017					2.1E-06	0.0013
TOTAL Hg	**16.89**	**2.65**	**2.84**					**3.6E-03**	**2.14**
AVERAGE:				5.41	13.71	221.720	360,046		
Hg(0) - elemental	14.36	2.28	2.45					3.1E-03	1.85
Hg(II) - oxidized	1.22	0.19	0.21					2.6E-04	0.16
Hg(tot) - filter	0.005	0.0008	0.0009					1.1E-06	0.0007
Hg (total)	**15.58**	**2.48**	**2.66**					**3.3E-03**	**2.01**

Field blank levels subtracted from sample values.

Note. (1) Pitot flow rates from EPA Method 29 multi-metals tests (full traverse)

DRAFT RESULTS -- CONFIDENTIAL
DO NOT CITE OR QUOTE

SUMMARY OF EERC LABORATORY RESULTS
TRIS BUFFER AND ONTARIO-HYDRO MERCURY SPECIATION METHODS
NYSEG POST-RETROFIT TEST PROGRAM

Test Number	Fraction	Field Blank			Sample Result			Field Blank Corrected Results, ug/train
		Vol., ml	ug/L	ug/train	Vol., ml	ug/L	ug/train	
DAY 1 -- 8/7/96								
1-TRIS-OUT	TRIS -- Hg(II)	502	0.3	0.15	502	8.5	4.27	**4.12**
	KMnO4 -- Hg(0)	500	0.1	0.05	500	4.2	2.10	**2.05**
	Probe Rinse -- Hg(II)(1)	250	ND(0.1)	ND(0.03)	250	1.1	0.28	**0.28**
1-TRIS-STK	TRIS -- Hg(II)	502	0.3	0.15	1000	0.5	0.50	**0.35**
	KMnO4 -- Hg(0)	500	0.1	0.05	500	9.6	4.80	**4.75**
	Probe Rinse -- Hg(II)(1)	250	ND(0.1)	ND(0.03)	250	ND(0.1)	ND(0.03)	**ND(0.03)**
1-ONT-OUT	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	35.2	35.20	**36.15**
					500	1.9	0.95	
	H2O2 -- Hg(0)	500	0.3	0.15	500	2.8	1.40	**1.25**
	KMnO4 -- Hg(0)	500	0.3	0.15	500	25.4	12.70	**12.55**
	Probe Rinse -- Hg(II)(2)	--	--	--	Combined with KCl fraction			--
1-ONT-STK	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	1.6	1.60	**1.75**
					500	0.3	0.15	
	H2O2 -- Hg(0)	500	0.3	0.15	500	0.3	0.15	**0.00**
	KMnO4 -- Hg(0)	500	0.3	0.15	500	26.8	13.40	**13.25**
	Probe Rinse -- Hg(II)(2)	--	--	--	Combined with KCl fraction			--
DAY 2 -- 8/8/96								
2-TRIS-OUT	TRIS -- Hg(II)	500	ND(0.3)	ND(0.15)	500	5.2	2.60	**2.60**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	5.6	2.80	**2.80**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	9.2	2.30	**2.30**
2-TRIS-STK	TRIS -- Hg(II)	500	ND(0.3)	ND(0.15)	1000	0.4	0.40	**0.40**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	11.3	5.65	**5.65**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	0.2	0.05	**0.05**
2-ONT-OUT	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	28.5	28.50	**28.50**
	H2O2 -- Hg(0)	500	ND(0.2)	ND(0.1)	500	3.4	1.70	**1.70**
	KMnO4 -- Hg(0)	505	ND(0.1)	ND(0.05)	503	23.1	11.62	**11.62**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	18.3	4.58	**4.58**
2-ONT-STK	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	0.9	0.90	**0.90**
					500	ND(0.1)	ND(0.05)	
	H2O2 -- Hg(0)	500	ND(0.2)	ND(0.1)	500	ND(0.2)	ND(0.1)	**ND(0.1)**
	KMnO4 -- Hg(0)	505	ND(0.1)	ND(0.05)	501	27.7	13.88	**13.88**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	0.3	0.08	**0.08**

SUMMARY OF EERC LABORATORY RESULTS
TRIS BUFFER AND ONTARIO-HYDRO MERCURY SPECIATION METHODS
NYSEG POST-RETROFIT TEST PROGRAM

Test Number	Fraction	Field Blank			Sample Result			Field Blank Corrected Results, ug/train
		Vol., ml	ug/L	ug/train	Vol., ml	ug/L	ug/train	
DAY 3 -- 8/9/96								
3-TRIS-OUT	TRIS -- Hg(II)	500	0.6	0.30	500	5.7	2.85	**2.55**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	6.7	3.35	**3.35**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	6.5	1.63	**1.63**
3-TRIS-STK	TRIS -- Hg(II)	500	0.6	0.30	1000	0.3	0.30	**0.00**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	10.6	5.30	**5.30**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	ND(0.1)	ND(0.03)	**ND(0.03)**
3-ONT-OUT	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	17.4	17.40	**17.40**
	H2O2 -- Hg(0)	500	ND(0.2)	ND(0.1)	500	3.7	1.85	**1.85**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	25.1	12.55	**12.55**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	38.5	9.63	**9.63**
3-ONT-STK	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	0.8	0.80	**0.80**
					500	ND(0.1)	ND(0.05)	
	H2O2 -- Hg(0)	500	ND(0.2)	ND(0.1)	500	0.6	0.30	**0.30**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	31.3	15.65	**15.65**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	0.5	0.13	**0.13**

Notes:

(1) Probe rinse field blank for Day 1 was not performed, results from Day 2.

(2) Probe rinses for the Ontario-Hydro samples were combined with the KCl impinger solution for Day 1 only.

SUMMARY OF EERC LABORATORY RESULTS
TRIS BUFFER MERCURY SPECIATION METHOD
NYSEG POST-RETROFIT TEST PROGRAM

Test Number	Fraction	Field Blank			Sample Result			**Field Blank Corrected Results, ug/train**
		Vol., ml	ug/L	ug/train	Vol., ml	ug/L	ug/train	
DAY 1 -- 8/7/96								
1-TRIS-OUT	TRIS -- Hg(II)	502	0.3	0.15	502	8.5	4.27	**4.12**
	KMnO4 -- Hg(0)	500	0.1	0.05	500	4.2	2.10	**2.05**
	Probe Rinse -- Hg(II)(1)	250	ND(0.1)	ND(0.03)	250	1.1	0.28	**0.28**
1-TRIS-STK	TRIS -- Hg(II)	502	0.3	0.15	1000	0.5	0.50	**0.35**
	KMnO4 -- Hg(0)	500	0.1	0.05	500	9.6	4.80	**4.75**
	Probe Rinse -- Hg(II)(1)	250	ND(0.1)	ND(0.03)	250	ND(0.1)	ND(0.03)	**ND(0.03)**
DAY 2 -- 8/8/96								
2-TRIS-OUT	TRIS -- Hg(II)	500	ND(0.3)	ND(0.15)	500	5.2	2.60	**2.60**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	5.6	2.80	**2.80**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	9.2	2.30	**2.30**
2-TRIS-STK	TRIS -- Hg(II)	500	ND(0.3)	ND(0.15)	1000	0.4	0.40	**0.40**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	11.3	5.65	**5.65**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	0.2	0.05	**0.05**
DAY 3 -- 8/9/96								
3-TRIS-OUT	TRIS -- Hg(II)	500	0.6	0.30	500	5.7	2.85	**2.55**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	6.7	3.35	**3.35**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	6.5	1.63	**1.63**
3-TRIS-STK	TRIS -- Hg(II)	500	0.6	0.30	1000	0.3	0.30	**0.00**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	10.6	5.30	**5.30**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	ND(0.1)	ND(0.03)	**ND(0.03)**

Notes:

(1) Probe rinse field blank for Day 1 was not performed, results from Day 2.

SUMMARY OF EERC LABORATORY RESULTS
ONTARIO-HYDRO MERCURY SPECIATION METHOD
NYSEG POST-RETROFIT TEST PROGRAM

Test Number	Fraction	Field Blank			Sample Result			Field Blank Corrected Results, ug/train
		Vol., ml	ug/L	ug/train	Vol., ml	ug/L	ug/train	
DAY 1 -- 8/7/96								
1-ONT-OUT	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	35.2	35.20	**36.15**
					500	1.9	0.95	
	H2O2 -- Hg(0)	500	0.3	0.15	500	2.8	1.40	**1.25**
	KMnO4 -- Hg(0)	500	0.3	0.15	500	25.4	12.70	**12.55**
	Probe Rinse -- Hg(II)(1)	--	--	--	Combined with KCl fraction			**--**
1-ONT-STK	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	1.6	1.60	**1.75**
					500	0.3	0.15	
	H2O2 -- Hg(0)	500	0.3	0.15	500	0.3	0.15	**0.00**
	KMnO4 -- Hg(0)	500	0.3	0.15	500	26.8	13.40	**13.25**
	Probe Rinse -- Hg(II)(1)	--	--	--	Combined with KCl fraction			**--**
DAY 2 -- 8/8/96								
2-ONT-OUT	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	28.5	28.50	**28.50**
	H2O2 -- Hg(0)	500	ND(0.2)	ND(0.1)	500	3.4	1.70	**1.70**
	KMnO4 -- Hg(0)	505	ND(0.1)	ND(0.05)	503	23.1	11.62	**11.62**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	18.3	4.58	**4.58**
2-ONT-STK	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	0.9	0.90	**0.90**
					500	ND(0.1)	ND(0.05)	
	H2O2 -- Hg(0)	500	ND(0.2)	ND(0.1)	500	ND(0.2)	ND(0.1)	**ND(0.1)**
	KMnO4 -- Hg(0)	505	ND(0.1)	ND(0.05)	501	27.7	13.88	**13.88**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	0.3	0.08	**0.08**
DAY 3 -- 8/9/96								
3-ONT-OUT	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	17.4	17.40	**17.40**
	H2O2 -- Hg(0)	500	ND(0.2)	ND(0.1)	500	3.7	1.85	**1.85**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	25.1	12.55	**12.55**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	38.5	9.63	**9.63**
3-ONT-STK	KCl -- Hg(II)	500	ND(0.1)	ND(0.05)	1000	0.8	0.80	**0.80**
					500	ND(0.1)	ND(0.05)	
	H2O2 -- Hg(0)	500	ND(0.2)	ND(0.1)	500	0.6	0.30	**0.30**
	KMnO4 -- Hg(0)	500	ND(0.1)	ND(0.05)	500	31.3	15.65	**15.65**
	Probe Rinse -- Hg(II)	250	ND(0.1)	ND(0.03)	250	0.5	0.13	**0.13**

Notes:

(1) Probe rinses for the Ontario-Hydro samples were combined with the KCl impinger solution for Day 1 only

Analysis Report Form (Hg)

Requestor	Richard Schulz
Fund #	4819
Sample Info.	Hg Analysis at NYSEG / Milliken Station
Date Submitted	August 14, 1996

Day One	**TRIS Buffer**							
TRIS-	FB-spk-1	FB-1	FGD-in-1	FGD-out-1	FB-spk-1	FB-1	FGD-in-1	FGD-out-1
CARNOT SAMPLE #			1-TRIS-OUT	1-TRIS-STACK			1-TRIS-OUT	1-TRIS-STACK
IMPINGER SOLN	Tris	Tris	Tris	Tris	KMnO4	KMnO4	KMnO4	KMnO4
Lab #	**49231-1**	**49231-2**	**49231-3**	**49231-4**	**49231-5**	**49231-6**	**49231-11**	**49231-12**
Vol (mL)	500	502	502	1000	500	500	500	500
Units ug/L	**9.7**	**0.3**	**8.5**	**0.5**	**9.8**	**0.1**	**4.2**	**9.6**

Day One	**Ontario Hydro**							
OH-	FB-spk-1	FB-1	FGD-in-1	FGD-In-1	FGD-out-1	FGD-out-1	FB-spk-1	FB-1
CARNOT SAMPLE #			1-ONT-OUT	1-ONT-OUT	1-ONT-STACK	1-ONT-STACK		
IMPINGER SOLN	KCl	KCl	KCl	KCl	KCl	KCl	H2O2	H2O2
Lab #	**49231-13**	**49231-14**	**49231-15**	**49231-16**	**49231-17**	**49231-18**	**49231-19**	**49231-20**
Vol (mL)	500	500	1000	500	1000	500	500	500
Units ug/L	**9.8**	**< 0.1**	**35.2**	**1.9**	**1.6**	**0.3**	**9.6** (4.6)	**0.3**

Day One							**TRIS**	**TRIS**
OH-	FGD-in-1	FGD-out-1	FB-spk-1	FB-1	FGD-in-1	FGD-out-1	FGD-in-1	FGD-out-1
CARNOT SAMPLE #	1-ONT-OUT	1-ONT-STACK			1-ONT-OUT	1-ONT-STACK	1-TRIS-OUT	1-TRIS-STACK
IMPINGER SOLN	H2O2	H2O2	KMnO4	KMnO4	KMnO4	KMnO4	**Probe Rns**	**Probe Rns**
Lab #	**49231-21**	**49231-22**	**49231-7**	**49231-8**	**49231-9**	**49231-10**	**49231-23**	**49231-24**
Vol (mL)	500	500	505	500	500	500	250	250
Units ug/L	**2.8**	**0.3**	**9.5**	**0.3**	**25.4**	**26.8**	**1.1**	**< 0.1**

NOTE: SPIKED FIELD BLANKS WERE SPIKED WITH 10 ug/L.
REGULAR FIELD BLANKS SHOULD READ A LESS THAN NUMBER.
NOTE: PROBE RINSES FOR THE ONTARIO-HYDRO WERE COMBINED WITH THE KCl IMPINGER SOLUTION.

NYSEG

Day Two	TRIS Buffer							
TRIS-	FB-spk-2	FB-2	FGD-In-2	FGD-out-2	FB-spk-2	FB-2	FGD-In-2	FGD-out-2
CARNOT SAMPLE #			2-TRIS-OUT	2-TRIS-STACK			2-TRIS-OUT	2-TRIS-STACK
IMPINGER SOLN	Tris	Tris	Tris	Tris	KMnO4	KMnO4	KMnO4	KMnO4
Lab #	49231-25	49231-26	49231-27	49231-28	49231-29	49231-30	49231-35	49231-36
Vol (mL)	500	500	500	1000	500	500	500	500
Units ug/L	9.5	< 0.3	5.2	0.4	10.0	< 0.1	6.6 (5.6)	11.3
Day Two	Ontario Hydro							
OH-	FB-spk-2	FB-2	FGD-in-2	FGD-out-2	FGD-out-2	FB-spk-2	FB-2	
CARNOT SAMPLE #			2-ONT-OUT	2-ONT-STACK	2-ONT-STACK			
IMPINGER SOLN	KCl	KCl	KCl	KCl	KCl	H2O2	H2O2	
Lab #	49231-37	49231-38	49231-39	49231-40	49231-41	49231-42	49231-43	
Vol (mL)	500	500	1000	1000	500	500	500	
Units ug/L	9.9	< 0.1	28.5	0.9	< 0.1	8.4	< 0.2	
Day Two								
OH-	FGD-In-2	FGD-out-2	FB-spk-2	FB-2	FGD-In-2	FGD-out-2		
CARNOT SAMPLE #	2-ONT-OUT	2-ONT-STACK			2-ONT-OUT	2-ONT-STACK		
IMPINGER SOLN	H2O2	H2O2	KMnO4	KMnO4	KMnO4	KMnO4		
Lab #	49231-44	49231-45	49231-31	49231-32	49231-33	49231-34		
Vol (mL)	500	500	500	505	503	501		
Units ug/L	3.4	< 0.2	9.8	< 0.1	23.1	27.7		
Day Two	TRIS-				OH-	FB-FGD-In		
Probe Rinses	FB-FGD-In-2		FGD-In-2	FGD-out-2		-2	FGD-In-2	FGD-out-2
CARNOT SAMPLE #			2-TRIS-OUT	2-TRIS-STACK			2-ONT-OUT	2-ONT-STACK
IMPINGER SOLN		Probe Rns	Probe Rns	Probe Rns		Probe Rns	Probe Rns	Probe Rns
Lab #		49231-49	49231-48	49231-51		49231-50	49231-47	49231-46
Vol (mL)		250	250	250		250	250	250
Units ug/L		< 0.1	9.2	0.2		< 0.1	18.3	0.3

NOTE: SPIKED FIELD BLANKS WERE SPIKED WITH 10 ug/L.
REGULAR FIELD BLANKS SHOULD READ A LESS THAN NUMBER.

Day Three	TRIS Buffer							
TRIS-	FB-spk-3	FB-3	FGD-In-3	FGD-out-3	FB-spk-3	FB-3	FGD-In-3	FGD-out-3
CARNOT SAMPLE #			3-TRIS-OUT	3-TRIS-STACK			3-TRIS-OUT	3-TRIS-STACK
IMPINGER SOLN	Tris	Tris	Tris	Tris	KMnO4	KMnO4	KMnO4	KMnO4
Lab #	49231-52	49231-53	49231-54	49231-65	49231-56	49231-57	49231-62	49231-63
Vol (mL)	500	500	500	1000	500	500	500	500
Units ug/L	10.5	0.6	5.7	0.3	9.1	< 0.1	6.7	10.6
Day Three	Ontario Hydro							
OH-	FB-spk-3	FB-3	FGD-In-3	FGD-out-3	FGD-out-3	FB-spk-3	FB-3	
CARNOT SAMPLE #			3-ONT-OUT	3-ONT-STACK	3-ONT-STACK			
IMPINGER SOLN	KCl	KCl	KCl	KCl	KCl	H2O2	H2O2	
Lab #	49231-64	49231-65	49231-66	49231-67	49231-68	49231-69	49231-70	
Vol (mL)	500	500	1000	1000	500	500	500	
Units ug/L	9.9	< 0.1	17.4	0.8 (1.8)	< 0.1	9.2	< 0.2	
Day Three								
OH-	FGD-In-3	FGD-out-3	FB-spk-3	FB-3	FGD-In-3	FGD-out-3		
CARNOT SAMPLE #	3-ONT-OUT	3-ONT-STACK			3-ONT-OUT	3-ONT-STACK		
IMPINGER SOLN	H2O2	H2O2	KMnO4	KMnO4	KMnO4	KMnO4		
Lab #	49231-71	49231-72	49231-58	49231-59	49231-60	49231-61		
Vol (mL)	500	500	500	500	500	500		
Units ug/L	3.7	0.6	9.3	< 0.1	25.1	31.3		
Day Three	TRIS-				OH-	FB-FGD-In		
Probe Rinses	FB-FGD-In-3		FGD-In-3	FGD-out-3		-3	FGD-In-3	FGD-out-3
CARNOT SAMPLE #			3-TRIS-OUT	3-TRIS-STACK			3-ONT-OUT	3-ONT-STACK
IMPINGER SOLN		Probe Rns	Probe Rns	Probe Rns		Probe Rns	Probe Rns	Probe Rns
Lab #		49231-76	49231-76	49231-78		49231-77	49231-74	49231-73
Vol (mL)		250	250	250		250	250	250
Units ug/L		< 0.1	6.5	< 0.1		< 0.1	38.5	0.5

NOTE: SPIKED FIELD BLANKS WERE SPIKED WITH 10 ug/L.
REGULAR FIELD BLANKS SHOULD READ A LESS THAN NUMBER.

ASH

Analysis Report Form (Hg)

Requestor	Richard Schulz
Fund #	4819
Sample Info	Hg Analysis at NYSEG / Milliken Station
Date Submitted	8/14/96

Day One							
Ash							
CARNOT SAMPLE #		1-ONT-OUT	1-TRIS-OUT	1-ONT-STACK	1-TRIS-STACK		
Lab #		49235-1	49235-2	49235-3	49235-4		
Units ug		<0.005	0.001	<0.005	0.009		
Day Two							
Ash							
CARNOT SAMPLE #		2-ONT-OUT	2-TRIS-OUT	2-ONT-STACK	2-TRIS-STACK		
Lab #		49235-5	49235-6	49235-7	49235-8		
Units ug		0.005	0.006	0.006	0.006		
Day Three							
Ash					TRIS		
CARNOT SAMPLE #		3-ONT-OUT	3-TRIS-OUT	3-ONT-STACK	3-~~ONT~~-STACK		
Lab #		49235-13	49235-14	49235-11	49235-12		
Units ug		<0.005	<0.005	0.010	0.007		
FIELD BLANKS							
Ash							
CARNOT SAMPLE #		2-ONT-FB	3-TRIS-FB				
Lab #		49235-9	49235-10				
Units ug		<0.005	<0.005				

NOTE: THE NUMBER FOR EACH ASH IS THE TOTAL AMOUNT OF MERCURY IN THE SAMPLE.
THE TOTAL SAMPLE WAS DIGESTED.

ID	ACL #	Vol (ml)	DF	Read µg/L	Reported µg/L
Buffer					
B-Spk-1	DI-1	500	2.75	3.55, 3.47, 3.58	9.7
FB-1-1	DI-2	500 + ~2	2.75	.100	0.3
GD-IN-1	DI-3	500 + ~2	2.55	3.32	8.5
GD-OUT-1	DI-4	1000	2.16	.223	0.5
B-Spk-1	DI-5	500	1.0	9.77	9.8
B-1	DI-6	500	1.0	.128	0.1
-Spk-1	DI-7	500 + ~5	1.0	9.54	9.5
-1	DI-8	500	1.0	.287	0.3
D-IN-1	DI-9	500	2.0	12.7	25.4
D-OUT-1	DI-10	500	2.0	13.4	26.8
GD-IN-1	DI-11	500	1.0	4.17	4.2
GD-OUT-1	DI-12	500	1.0	9.61, 9.54, 9.55	9.6
-Spk-1	DI-13	500	1.3	7.52, 7.58, 7.46	9.8
-1	DI-14	500	1.3	.005	< 0.1
D-IN-1	DI-15	1000	1.3	27.1	35.2
GD-IN-1	DI-16	500	1.3	1.47	1.9
FGD-OUT-1	DI-17	1000	1.3	1.21, 1.22, 1.21	1.6
FGD-OUT-1	DI-18	500	1.3	.225	0.3
D-Spk-1	DI-19	500	2.1	4.61, 4.62, 4.53	9.6
-1	DI-20	500	2.1	.145	0.3
D-IN-1	DI-21	500	1.7	1.66	2.8
GD-OUT-1	DI-22	500	2.2	.122	0.3
Rinse-1					
GD-IN-1	DI-23	250	1.3	.998, .837, .512	1.1
GD-OUT-1	DI-24	250	1.3	.005	< 0.1

Spk = $\frac{(50\text{ ml})(1000\text{ ppb})}{13,800\text{ ml}} = 3.$

read @ $\frac{6.44 - 3.53}{3.62} \times 1$

$= 94.2$

→ Spk = $\frac{(40\text{ ml})(1000\text{ ppb})}{12,790\text{ ml}} = 3.1$

read @ $\frac{6.55 - 3.32}{3.12} \times 100$

$= 103\%$

$\frac{(100\text{ ml})(1000\text{ ppb})}{10,100\text{ ml}} = 9.9$

read @ $\frac{18.1 - 9.57}{9.9} \times 100$ $= 86.$

→ Spk = $\frac{(100\text{ ml})(1000\text{ ppb})}{13,100\text{ ml}} = 7.$

read @ $\frac{14.6 - 7.52}{7.63} \times 100$

$= 92.5\%$

→ Spk = $\frac{(20\text{ ml})(1000\text{ ppb})}{13,020\text{ ml}} = 1.5$

read @ $\frac{2.78 - 1.21}{1.54} \times 100\%$

$= 102\%$

→ Spk = $\frac{(50\text{ ml})(1000\text{ ppb})}{10,550\text{ ml}} = 4.$

read @ $\frac{8.83 - 4.57}{4.74} \times 100\%$

$= 59.9\%$

Spk = $\frac{(20\text{ ml})(1000\text{ ppb})}{8520\text{ ml}} = 2.34\text{ p}$

read @ $\frac{4.04 - 1.66}{2.34} \times 100\% = 104$

→ Spk = $\frac{(100\text{ ml})(1000\text{ ppb})}{13,100\text{ ml}} = 7.$

read @ $\frac{8.00 - .882}{7.65} \times 10$

$= 93.3\%$

Sample ID	ARL #	Vol (mL)	DF	Read mg/L	Reported mg/L	
RIS Buffer						
RIS-FB-Spk-2	DJ-1	500	2.55	3.80, 5.68	9.5	
RIS-FB-2	DJ-2	500	2.55	-.009	<0.3	
RIS-FGD-IN-2	DJ-3	500	2.65	1.97	5.2	
RIS-FGD-OUT-2	DJ-4	1000	2.65	.149, .154, .294	0.4	Spk = $\frac{(50ml)(1000ppb)}{10,300 ml}$ →
$Vi.O_4$						read = $\frac{4.97 - 0.194}{4.85}$ ×
RIS-FB-Spk-2	DJ-5	500	1.0	10.1, 9.99	10.0	= 98
RIS-FB-2	DJ-6	500	1.0	-.006	<0.1	
H-FB-Spk-2	DJ-7	500	1.0	9.87, 9.75	9.8	
H-FB-2	DJ-8	+~5 500	1.0	-.014	<0.1	
H-FGD-IN-2	DJ-9	+~3 500	1.0	23.1	23.1	
H-FGD-OUT-2	DJ-10	+~1 500	1.0	27.7	27.7	
RIS-FGD-IN-2	DJ-11	500	1.0	5.56	5.6	
RIS-FGD-OUT-2	DJ-12	500	1.0	11.2, 11.3, 11.4	11.3	Spk = $\frac{(50ml)(1000ppb)}{8050 ml}$ →
KCl						read @ $\frac{16.8 - 11.3}{6.21}$ ×
OH-FB-Spk-2	DJ-13	500	1.3	7.61, 7.59	9.9	=
H-FB-2	DJ-14	500	1.3	-.075	<0.1	
H-FGD-IN-2	DJ-15	1000	1.3	21.9	28.5	
OH-FGD-OUT-2	DJ-16	1000	1.3	.735, .634, .744	0.9	Spk = $\frac{(100ml)(1000ppb)}{13,100 ml}$ = →
OH-FGD-OUT-2	DJ-17	500	1.3	.048	<0.1	read @ $\frac{8.25 - 0.706}{7.63}$ ×
H_2O_2						= 9
OH-FB-Spk-2	DJ-18	500	2.0	4.49, 3.90	8.4	
OH-FB-2	DJ-19	500	2.0	-.005	<0.2	
OH-FGD-IN-2	DJ-20	500	1.7	2.00, 1.98, 1.96	3.4	Spk = $\frac{(50ml)(1000ppb)}{8650}$ = →
OH-FGD-OUT-2	DJ-21	500	2.0	-.001	<0.2	read @ $\frac{7.56 - 1.98}{5.85}$ × = 9.
Probe Rinse-2						
TRIS-FGD-OUT-2	DJ-27	250	1.3	.135	0.2	Spk = $\frac{(100ml)(1000ppb)}{13,100 ml}$ →
OH-Stack-2	DJ-22	250	1.3	.246, .227, .231	0.3	
OH-ESP-OUT-2	DJ-23	250	1.3	14.1	18.3	read @ $\frac{7.63 - 0.235}{7.63}$
TRIS-ESP-OUT-2	DJ-24	250	1.3	7.11	9.2	=
TRIS-FB-ESP-OUT-2	DJ-25	250	1.3	-.054	<0.1	
FB-ESP-OUT-2	DJ-26	~~250~~	1.3	-.016, -.037	<[illegible]	

Id	ATL #	Vol (mL)	DF	Read mg/L	Reported mg/L	
uffer						
-Spk-3	D3-1	500	2.75	3.86, 3.81	10.5	
3-3	D3-2	500	2.75	.203	0.6	
-IN-3	D3-3	500	2.45	2.46, 2.32, 2.26	5.7	→ Spk = $\frac{(50 mL)(1000 ppb)}{12,300 mL}$ = 4.06,
D-OUT-3	D3-4	1000	2.25	.146	0.3	read @ $\frac{6.58 - 2.35}{4.06}$ ×100%
						= 104%
-Spk-3	D3-5	500	1.0	9.08, 9.21	9.1	
B-3	D3-6	500	1.0	.043	<0.1	
-Spk-3	D3-7	500	1.0	9.38, 9.23	9.3	
-3	D3-8	500	1.0	.009	<0.1	
-IN-3	D3-9	500	1.0	25.1	25.1	
-OUT-3	D3-10	500	1.0	31.3	31.3	
D-IN-3	D3-11	500	1.0	6.69	6.7	
D-OUT-3	D3-12	500	1.0	10.6, 10.6, 10.7	10.6	→ Spk = $\frac{(50 mL)(1000 ppb)}{8050 mL}$ = 6
						read @ $\frac{16.3 - 10.6}{6.21}$ ×100%
Spk-3	D3-13	500	1.3	7.57, 7.60	9.9	= 91.8%
-3	D3-14	500	1.3	-.032	<0.1	
-IN-3	D3-15	1000	1.3	13.4	17.4	
D-OUT-3	D3-16	1000	1.3	.629, .642, .665	0.8	→ Spk = $\frac{(100 mL)(1000 ppb)}{13,100 mL}$ = 7.6
D-OUT-3	D3-17	500	1.3	.004, .062	<0.1	read @ $\frac{8.08 - .645}{7.63}$ ×100%
						= 97.4%
-Spk-3	D3-18	500	2.1	4.41, 4.31	9.2	
-3	D3-19	500	2.1	.014	<0.2	
-IN-3	D3-20	500	1.8	2.08, 2.05, 2.06	3.7	→ Spk = $\frac{(50 mL)(1000 ppb)}{9050 mL}$ = 5.
-OUT-3	D3-21	500	2.3	.288	0.6	read @ $\frac{7.61 - 2.06}{5.52}$ ×100% = 10
inse						
-OUT-3	D3-22	250	1.3	.435, .408, .414	0.5	→ Spk = $\frac{(100 mL)(1000 ppb)}{13,100 mL}$ = 7.
-IN-3	D3-23	250	1.3	29.6	38.5	
D-IN-3	D3-24	250	1.3	4.97	6.5	read @ $\frac{7.78 - .49}{7.63}$ ×100%
-FGD-IN-3	D3-25	250	1.3	.027	<0.1	
-FGD-IN-3	D3-26	250	1.3	-.019	<0.1	= 96.5%
GD-OUT-3	D3-27	250	1.3	.070	<0.1	

CARNOT SOURCE TEST DATA SUMMARY
ONTARIO HYDRO METHOD
ESP OUTLET

Client/Location	NYSEG/Milliken	**Reference Temp (F)**	68
Unit	2	**Fuel**	COAL
Sample Location	ESP OUTLET	**Data By**	DVK
Operating Condition	FULL LOAD	**Date of Data Entry**	10/10/96

Test No	**1-OH-OUT**	**2-OH-OUT**	**3-OH-OUT**	**Average**
Date	8/7/96	8/8/96	8/9/96	*
Test Method	Ontario Hydro	Ontario Hydro	Ontario Hydro	*
Sample Train	Box # 1	Box # 1	Box # 1	*
Pitot Factor	0.840	0.840	0.840	*
Meter Cal Factor	0.9900	0.9900	0.9900	*
Duct Area (sq ft)	236.25	236.25	236.25	*
Sample Time (Min)	360	360	360	*
Bar Press (in Hg)	29.86	29.83	29.68	*
Nozzle Diam (in)	0.278	0.278	0.278	*
Start/Stop Time	0840/1440	0756/1356	0817/1417	*
Stack Press (iwg)	-14.50	-14.50	-14.50	-14.50
Stack Temp (F)	274.6	278.6	284.6	279.27
Velocity Head (iwg)	0.4358	0.3087	0.3116	0.3497
Outlet O2 (%)	4.90	5.28	5.16	5.11
Outlet CO2 (%)	14.47	13.63	13.83	13.98
Meter Vol (acf)	291.652	245.938	226.749	254.780
Meter Temp (F)	125.2	112.8	102.1	113.4
Meter Press (iwg)	1.70	1.20	1.09	1.33
Liquid Vol (ml)	480.5	420.2	389.8	430.2
Std Sample Vol (SCF)	261.060	224.406	209.721	231.729
Std Sample Vol (Nm^3)	6.888	5.921	5.534	6.114
Moisture Fraction	0.080	0.081	0.081	0.081
Stack Gas Mol Wt	29.51	29.39	29.42	29.44
Stack Gas Velocity (ft/sec)	44.01	37.24	37.64	39.63
Stack Flow Rate (wacfm)	623,848	527,878	533,607	561,778
Stack Flow Rate (dscfm)	396,941	333,249	332,608	354,266
Isokinetic Ratio (%)	102.36	104.80	98.13	101.76

OPERATOR/ASSISTANT ______ METER VOL. (START/END) ______ / ______ DATE 2/7/10

PRE-TEST DATA:

Barometric Press., in. Hg. ______
Assumed Stack Temp. °F ______
Assumed Meter Temp. °F ______
Assumed ΔP ______
Assumed Moisture % ______
Stack Diameter, in. ______
Sample Time: Total ______
per point ______
Total of Traverse Points ______
Teflon Connecting Line (Y/N) ______
Isokinetic Factor
ΔH = ______ X ΔP

EQUIPMENT INFO:

Meter ID No. ______
Meter, Yd. ______
CFM @ ΔH = 1.0 ______
Pitot: ID ______
Cp ______
Probe: Mat'l ______
Length ______
Nozzle: ID/Mat'l ______
Diam. ______
Filter: No. ______
Tare Wt. ______
TC Readout ID: Meter ______
Aux. ______

Imp.	Mat'l	Wt (End)		Wt (Start)		Wt (g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
#5			-		=	
Total					=	

See Page #1

POST TEST INFO:

Filter Appearance ______
Impinger Appearance ______
Silica Gel Spent (Y/N) ______

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
	1240	.44	1.75	978.81	271	245	131	123	244	ICE	—	7.0	*
	1255	.45	1.79	991.42	272	245	133	124	245	ICE	[illegible]	7.0	*
	1310	.51	2.02	1003.21	271	245	132	124	244	ICE	5.2	7.5	*
	1325	.44	1.75	1016.44	272	245	136	125	245	ICE	—	7.0	*
	1340	.44	1.75	1028.90	274	245	135	127	244	ICE	—	7.0	*
	1355	.42	1.67	1041.62	275	245	134	127	244	ICE	4.6	7.0	*
	1410	.45	1.79	1053.31	276	245	133	126	245	ICE	—	7.0	*
	1425	.46	1.83	1065.42	277	245	131	126	244	ICE	—	7.0	*
	1440			1077.971			STOP						
		15.8431											
		.6601	1.7004	291.652	275.04		129.3	121.2					

AVG

CHAIN OF CUSTODY INFORMATION

Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY

Calculated by:
Checked by:
Stack Press.(iwg)
Stack Temp. (°F)
ΔP (iwg)
O₂/CO₂ 4.9
Meter Vol. (acf)
Meter Temp. (°F)
Meter Press. (iwg)
Liquid Vol. (g)
Comments:

Sample Pt. ______________________

Train Type : **ONTARIO-HYDRO METHOD**

Date Day 1 8-7-96

Run **OH FGD IN**

Fund # ______________________

Cost Center # ______________________

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	609.8	756.8	147.0
BUBBLER	KCl	605.4	825.8	220.4
IMPINGER	KCl	601.6	619.7	18.1
BUBBLER	H_2O_2/HNO_3	740.5	766.3	25.8
BUBBLER	$KMnO_4/H_2SO_4$	611.0	612.6	1.6
BUBBLER	$KMnO_4/H_2SO_4$	699.5	708.5	9.0
IMPINGER	$KMnO_4/H_2SO_4$	611.8	607.4	-4.4
BUBBLER	SILICA GEL	856.8	919.8	63.0
			Total H_2O (g)	480.5 ✓
FILTER				
			Total Dust (g)	

'$_w$std = 0.0474 * (H_2O g) ______________________ SCF

'$_m$Corrected = V_m * C_m ______________________ ACF

'$_m$std = $\frac{17.71\ V_m C\ (P_b + \Delta H/13.6)}{T_m}$ ______________________ SCF

'$_t$std = $V_w$std + $V_m$std ______________________ SCF

ₒH_2O = ($V_w$std / $V_t$std)*100 ______________________ %H_2O

)$_n$std = 17.71 Q_n P_s / T_s ______________________ SCFM

ₒ Isokinetic = $V_t$std / ($Q_n$std * Time) ______________________ %

'UST LOADING CALCULATIONS (Concentration Basis)

)CL = 15.432 (dust g) / $V_t$std ______________________ grains/scf

ₒ Efficiency = $\frac{\text{(Inlet DCL - Outlet DCL)}}{\text{Inlet DCL}}$ * 100 ______________________ %

.CFM = V_s * Pipe Area (ft^2) ______________________ ACFM

CFM = ACFM * P_s/29.92 * 530/T_s = ACFM * P_s/T_s* 17.71 ______________________ SCFM

›s/hour = grains / scf * 0.000143 * SCFM * 60 lbs/hour

OPERATOR/ASSISTANT ______ METER VOL. (START/END) ______ / ______ DATE [illegible]

PRE-TEST DATA:

Barometric Press., in. Hg. 24.96
Assumed Stack Temp. °F ______
Assumed Meter Temp. °F ______
Assumed ΔP ______
Assumed Moisture % ______
Stack Diameter, in. ______
Sample Time: Total 6hrs
per point 6hrs
Total of Traverse Points 5P
Teflon Connecting Line (Y/N) ______
Isokinetic Factor
ΔH = ~~3.97~~ ~~3.9~~ 3.85 X ΔP

EQUIPMENT INFO:

Meter ID No. Box#1 SN#7275
Meter, Yd. .99
CFM @ ΔH = 1.0 1.44
Pitot: ID ______
Cp ______
Probe: Mat'l ______
Length ______
Nozzle: ID/Mat'l ______
Diam. ______
Filter: No. ______
Tare Wt. ______
TC Readout ID: Meter ______
Aux. ______

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1			-	=
#2			-	=
#3			-	=
#4			-	=
#5			-	=
Total				=

POST TEST INFO:

Filter Appearance ______
Impinger Appearance ______
Silica Gel Spent (Y/N) ______

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.00	15"	✓	JP
Post-Test	0.002	9"	✓	JP

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. iwg
	0756	.30	1.19	120.918	267	246	116	118	241	ICE	—	6	*
	0811	.30	1.19	131.62	278	245	124	119	244	ICE	5.2	6	*
	0826	.31	1.23	142.00	278	245	124	119	244	ICE	—	5.5	*
	0841	.31	1.23	152.83	279	245	125	120	244	ICE	5.4	5.5	*
	0856	.31	1.23	164.01	279	245	123	119	244	ICE	—	6.0	*
	0911	.31	1.23	173.39	279	245	124	119	244	ICE	5.4	6.0	*
W-2	0926	.31	1.23	184.62	280	245	124	118	244	ICE	—	6.0	*
	0941	.31	1.23	194.62	280	245	123	119	244	ICE	5.2	6.0	*
	0956	.31	1.23	204.79	279	245	124	119	244	ICE	—	6.0	*
	1011	.31	1.23	217.01	279	245	125	120	244	ICE	5.6	6.0	*
	1026	.31	1.23	225.79	279	240	120	119	240	ICE	—	6.0	*
	1041	.31	1.21	236.31	278	244	113	112	243	ICE	5.4	6.0	*
	1056	.30	1.17	246.72	280	244	108	107	243	ICE	—	6.0	*
	1111	.30	1.17	256.60	280	244	109	105	243	ICE	5.2	6.0	*
	1126	.30	1.17	272	281	244	109	104	243	ICE	—	6.0	*
	1141	.30	1.15	276.38	281	244	109	104	243	ICE	5.2	6.0	*

DAY 2 8-8-96

CHAIN OF CUSTODY INFORMATION

Impingers Loaded ______
Impingers Recovered ______
Filter Loaded ______
Filter Recovered ______
Probe Wash ______

TEST SUMMARY

Calculated by: BAF
Checked by: - DV
Stack Press (iwg) -14.5
Stack Temp (°F) 278.6 ✓
ΔP (iwg) 0.3087 ✓
O_2/CO_2 5.28 ✓ / 13.63
Meter Vol., (acf) 245.938
Meter Temp. (°F) 112.8 ✓
Meter Press. (iwg) 1.2033 ✓
Liquid Vol. (g) 420.2 ✓
Comments:

OH FGD IN

FGD OUT

CAR

CLIENT NYSEG - Milliken Station UNIT 2 TEST NO. 2-~~[illegible]~~-~~[illegible]~~ Out METHOD On+ Hg PAGE 2 OF 5
SAMPLE LOCATION ESP - Outlet TEST CONDITION Full Load AMB. TEMP., °F ______ PROJECT # 11476
OPERATOR/ASSISTANT ______ METER VOL. (START/END) ______ / ______ DATE 8-8-96

PRE-TEST DATA:

Barometric Press., in. Hg. ______
Assumed Stack Temp. °F ______
Assumed Meter Temp. °F ______
Assumed ΔP ______
Assumed Moisture % ______
Stack Diameter, in. ______
Sample Time: Total ______
per point ______
Total of Traverse Points ______
Teflon Connecting Line (Y/N) ______
Isokinetic Factor
ΔH = 3.80 X ΔP

EQUIPMENT INFO:

Meter ID No. ______
Meter, Yd. ______
CFM @ ΔH = 1.0 ______
Pitot: ID ______
Cp ______
Probe: Mat'l ______
Length ______
Nozzle: ID/Mat'l ______
Diam. ______
Filter: No. ______
Tare Wt. ______
TC Readout ID: Meter ______
Aux. ______

Imp.	Mat'l	Wt (End)	Wt (Start)	Wt (g)
#1			-	=
#2	See		-	=
#3	Page		-	=
#4	3		-	=
#5			-	=
Total				=

POST TEST INFO:

Filter Appearance ______
Impinger Appearance ______
Silica Gel Spent (Y/N) ______

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
|	1156	0.32	1.22	288.72	280	243	107	102	244	68	—	6.0	*	Impingers Loaded
|	1211	.31	1.18	296.89	280	244	106	101	243	ICE	5.3	6.0	*	Impingers Recovered
	1226	.31	1.18	306.88	280	244	107	101	243	ICE	—	6.0	*	Filter Loaded
	1241	.31	1.18	316.83	279	244	107	101	243	ICE	5.2	6.0	*	Filter Recovered
W2	1256	.31	1.18	326.44	278	244	107	100	244	ICE	—	6.0	*	Probe Wash
|	1311	.31	1.18	336.42	278	244	107	102	243	ICE	5.1	6.0	*	TEST SUMMARY
|	1326	.32	1.22	346.37	278	244	106	102	243	ICE	—	6.0	*	Calculated by:
|	1341	.32	1.22	356.63	277	244	112	103	243	ICE	5.2	6.0	*	Checked by:
	1356			366.856			STOP			ICE	—			Stack Press (iwg)
													-14.5	Stack Temp. (°F)
														ΔP (iwg)
														O_2/CO_2
														Meter Vol., (acf)
														Meter Temp. (°F)
														Meter Press. (iwg)
														Liquid Vol. (g)
										DAY 2	8-8-96			Comments:

Sample Pt. ESP - Outlet

Train Type : **ONTARIO-HYDRO METHOD**

DAY 2 8 - 8

Date ~~OH FGD IN~~

Run ESP Out

Fund #

Cost Center #

3 of 3

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	568.4	844.9	276.5
BUBBLER	KCl	591.3	648.1	56.8
IMPINGER	KCl	604.6	602.3	(2.3)
BUBBLER	H_2O_2/HNO_3	811.9	834.8	22.90
BUBBLER	$KMnO_4/H_2SO_4$	609.0	605.4	(3.6)
BUBBLER	$KMnO_4/H_2SO_4$	628.4	651.3	22.9
IMPINGER	$KMnO_4/H_2SO_4$	689.7	678.6	(11.1)
BUBBLER	SILICA GEL	861.4	919.5	58.1
			Total H_2O (g)	420.2
FILTER				
			Total Dust (g)	

$V_w std = 0.0474 * (H_2O\ g)$ ______ SCF

$V_m Corrected = V_m * C_m$ ______ ACF

$V_m std = \frac{\underline{17.71\ V_m C\ (P_b + \Delta H/13.6)}}{T_m}$ ______ SCF

$V_t std = V_w std + V_m std$ ______ SCF

$\%H_2O = (V_w std / V_t std)*100$ ______ $\%H_2O$

$Q_n std = 17.71\ Q_n\ P_s / T_s$ ______ SCFM

$\%\ Isokinetic = V_t std / (Q_n std * Time)$ ______ %

DUST LOADING CALCULATIONS (Concentration Basis)

$DCL = 15.432\ (dust\ g) / V_t std$ ______ grains/scf

$\%\ Efficiency = \frac{\underline{(Inlet\ DCL - Outlet\ DCL)}}{Inlet\ DCL} * 100$ ______ %

$ACFM = V_s * Pipe\ Area\ (ft^2)$ ______ ACFM

$SCFM = ACFM * P_s/29.92 * 530/T_s = ACFM * P_s/T_s * 17.71$ ______ SCFM

$lbs/hour = grains / scf * 0.000143 * SCFM * 60$ ______ lbs/hour

CAR

CLIENT NYSEG- Milliken Station UNIT 2 TEST NO. 5-UHg-OUT METHOD Ont Hyd PAGE 1 OF 2
SAMPLE LOCATION ESP-Outlet TEST CONDITION Full Load AMB. TEMP., °F PROJECT # 11476
OPERATOR/ASSISTANT METER VOL. (START/END) / DATE 8-~~10~~ 9-98

PRE-TEST DATA:

Barometric Press., in. Hg.
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total 6
per point —
Total of Traverse Points SP
Teflon Connecting Line (Y/N)
Isokinetic Factor
ΔH = ~~3.9~~ 3.4 X ΔP

EQUIPMENT INFO:

Meter ID No. Bx#1 - 7275
Meter, Yd. .99
CFM @ ΔH = 1.0 1.44
Pitot: ID
Cp
Probe: Mat'l
Length
Nozzle: ID/Mat'l .278
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux.

Imp.	Mat'l	Wt.(End)		Wt.(Start)		Wt.(g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
#5			-		=	
Total					=	

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	15"	✓	ΔP
Post-Test	0.000	10"	✓	ΔP

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
	0817	.31	1.21	411.70	282	230	98	93	242	ICE	6.2	5.5	*	Impingers Loaded
	0832	.31	1.21	414.88	282	240	99	93	243	ICE	—	5.5	*	Impingers Recovered
	0847	.31	1.18	424.43	282	244	100	94	242	ICE	—	5.0	*	Filter Loaded
	0902	.31	1.18	434.64	284	244	100	95	243	ICE	4.9	5.0	*	Filter Recovered
	0917	.31	1.18	444.63	281	244	100	96	243	ICE	—	5.0	*	Probe Wash
	0932	.32	1.09	455.72	282	244	101	96	243	ICE	—	5.0	*	TEST SUMMARY
	0947	.31	1.05	465.18	284	244	102	97	243	ICE	5.4	5.0	*	Calculated by: DL
K	1002	.31	1.05	474.95	285	244	103	98	243	ICE	—	5.0	*	Checked by: DL
	1017	.31	1.05	484.41	285	245	103	99	244	ICE	—	5.0	*	Stack Press.(iwg) -14.5
	1032	.32	1.09	493.68	284	244	104	99	243	ICE	5.4	5.0	*	Stack Temp. (°F) 284.6 ✓
	1047	.32	1.09	503.96	285	244	106	101	243	ICE	—	5.5	*	ΔP (iwg) 0.3116 ✓
	1102	.32	1.09	513.69	285	245	107	102	243	ICE	—	5.5	*	O₂/CO₂ 5.16 ✓ / 13.83
	1117	.32	1.09	523.53	286	244	108	103	243	ICE	5.6	5.5	*	Meter Vol. (acf) 226.749 ✓
	1132	.32	1.09	533.22	286	244	106	103	243	ICE	—	5.5	*	Meter Temp. (°F) 102.1 ✓
	1147	.30	1.02	543.31	286	244	106	103	243	ICE	—	5.5	*	Meter Press. (iwg) 1.09 ✓
	1202	.30	1.02	552.59	285	244	105	102	243	ICE	5.2	5.5	*	Liquid Vol. (g) 389.8 ✓
														Comments:

DAY 3 8-10-98

SAMPLE LOCATION [illegible] 7
OPERATOR/ASSISTANT ______ METER VOL. (START/END) ______ DATE 8-10-96

PRE-TEST DATA:
Barometric Press., in. Hg. ______
Assumed Stack Temp. °F ______
Assumed Meter Temp. °F ______
Assumed ΔP ______
Assumed Moisture % ______
Stack Diameter, in. ______
Sample Time: Total ______
per point ______
Total of Traverse Points ______
Teflon Connecting Line (Y/N) ______
Isokinetic Factor
ΔH = ______ X ΔP

EQUIPMENT INFO:
Meter ID No. ______
Meter, Yd. ______
CFM @ ΔH = 1.0 ______
Pitot: ID ______
Cp ______
Probe: Mat'l ______
Length ______
Nozzle: ID/Mat'l ______
Diam. ______
Filter: No. ______
Tare Wt. ______
TC Readout ID: Meter ______
Aux. ______

Imp.	Mat'l	Wt (End)	Wt (Start)	Wt (g)
#1		-	=	
#2		-	=	
#3		-	=	
#4		-	=	
#5		-	=	
Total			=	

POST TEST INFO:
Filter Appearance ______
Impinger Appearance ______
Silica Gel Spent (Y/N) ______

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
	1217	.30	1.02	561.00	285	244	105	101	244	ICE	—	5.5	*	Impingers Loaded
	1232	.30	1.02	571.30	285	244	105	101	244	ICE	—	5.5	*	Impingers Recovered
	1247	.31	1.05	580.64	286	244	104	101	243	ICE	4.2	5.5	*	Filter Loaded
	1302	.31	1.05	590.09	286	244	105	101	244	ICE	—	5.5	*	Filter Recovered
	1317	.31	1.05	599.54	286	244	107	102	243	ICE	—	5.5	*	Probe Wash
	1332	.31	1.05	608.97	286	245	108	103	243	ICE	4.3	5.5	*	TEST SUMMARY
	1347	.32	1.09	618.46	286	244	109	104	244	ICE	—	5.5	*	Calculated by:
	1402	.32	1.09	628.29	286	244	110	105	244	ICE	—	5.5	*	Checked by:
	1417			637.919				STOP						Stack Press (iwg)
														Stack Temp. (°F)
														ΔP (iwg)
														O_2/CO_2
														Meter Vol., (acf)
														Meter Temp. (°F)
														Meter Press. (iwg)
														Liquid Vol. (g)
														Comments:

DAY 3 8-10-96
OH FGD IN
ESP Out

Sample Pt. ESP OUT

Train Type : **METHOD** OH

Date DAY 3 8-10-96

Run OH FGD ~~IN~~

Fund # ESP OUT

Cost Center #

3 of 3

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl ~~H_2O_2/HNO_3~~	564.5	736.4	
IMPINGER	KCl ~~H_2O_2/HNO_3~~	599.4	735.7	
BUBBLER	KCl ~~DRY~~	608.9	612.2	
BUBBLER	H_2O_2 ~~$KMnO_4/H_2SO_4$~~	734.3	753.8	
IMPINGER	$KMnO_4/H_2SO_4$	626.2	629.8	
BUBBLER	KMn ~~SILICA GEL~~	613.4	617.7	
	$KMnO_4$	605.6	604.2	
	SIL Gel	821.9	874.2	
			Total H_2O (g)	389.8 ✓
FILTER				
			Total Dust (g)	

$V_w std = 0.0474 * (H_2O\ g)$ ______ SCF

$V_m Corrected = V_m * C_m$ ______ ACF

$V_m std = \frac{17.71\ V_m C\ (P_b + \Delta H/13.6)}{T_m}$ ______ SCF

$V_t std = V_w std + V_m std$ ______ SCF

$\%H_2O = (V_w std / V_t std)*100$ ______ $\%H_2O$

$Q_n std = 17.71\ Q_n\ P_s / T_s$ ______ SCFM

$\%\ Isokinetic = V_t std / (Q_n std * Time)$ ______ %

DUST LOADING CALCULATIONS (Concentration Basis)

$DCL = 15.432\ (dust\ g) / V_t std$ ______ grains/s

$\%\ Efficiency = \frac{(Inlet\ DCL - Outlet\ DCL)}{Inlet\ DCL} * 100$ ______ %

$ACFM = V_s * Pipe\ Area\ (ft^2)$ ______ ACFM

$SCFM = ACFM * P_s/29.92 * 530/T_s = ACFM * P_s/T_s * 17.71$ ______ SCFM

$lbs/hour = grains / scf * 0.000143 * SCFM * 60$ ______ lbs/hour

OPERATOR/ASSISTANT ______ METER VOL. (START/END) ______ DATE ______

PRE-TEST DATA:

Barometric Press., in. Hg. 29.83

Assumed Stack Temp. °F ______

Assumed Meter Temp. °F ______

Assumed ΔP ______

Assumed Moisture % ______

Stack Diameter, In. ______

Sample Time: Total ______

per point ______

Total of Traverse Points ______

Teflon Connecting Line (Y/N) ______

Isokinetic Factor

ΔH = ______ X ΔP

EQUIPMENT INFO:

Meter ID No. 7275

Meter, Yd. 0.99

CFM @ ΔH = 1.0 0.62

Pitot: ID ______

Cp 0.84

Probe: Mat'l Glass

Length 4'

Nozzle: ID/Mat'l Glass

Diam. 0.278

Filter: No. ______

Tare Wt. ______

TC Readout ID: Meter ______

Aux. ______

Imp.	Mat'l	Wt.(End)		Wt.(Start)		Wt.(g)
#1 pH 7.5	TRIS	774.4	-	739.5	=	34.9
#2 pH 8.1	TRIS	682.0	-	668.9	=	13.1
#3	KMnO4	680.6	-	676.5	=	4.1
#4	KMnO4	702.0	-	700.9	=	1.1
#5	Silica	871.8	-	851.1	=	20.7
Total					=	73.9 ✓

POST TEST INFO:

Filter Appearance ______

Impinger Appearance ______

Silica Gel Spent (Y/N) ______

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.008	15"	✓	JP
Post-Test	0.005	9"	✓	JP

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O2	VAC.	STATIC PRESS. iwg
W2	1533	.28	1.11	79.964	276	245	120	123	237	ICE	4.6	3.5	*
	1543	.29	1.15	87.62	278	245	127	124	244	ICE	—	3.5	*
	1553	.29	1.15	93.37	278	245	126	124	244	ICE	4.8	3.5	*
	1603	.29	1.15	100.28	278	245	126	123	244	ICE	—	3.5	*
	1613	.29	1.15	107.00	278	245	126	122	244	ICE	4.6	3.5	*
	1623	.29	1.15	114.92	278	245	126	124	244	ICE	—	3.5	*
	1633			120.029		STOP							
						8							-14.5
		3.22											
		.5361											
		.2882	1.143		277.67								

CHAIN OF CUSTODY INFORMATION

Impingers Loaded

Impingers Recovered

Filter Loaded

Filter Recovered

Probe Wash

TEST SUMMARY

Calculated by: DK

Checked by: DK

Stack Press. (iwg) -14.5 ✓

Stack Temp. (°F) 277.7 ✓

ΔP (iwg) .2883 ✓

O2/CO2 4.67 ✓ 14.56

Meter Vol., (acf) 40065 ✓

Meter Temp. (°F) 124.3 ✓

Meter Press. (iwg) 1.14 ✓

Liquid Vol. (g) 73.9 ✓

Comments:

Day 1 8-7-96

TRIS FGD IN

TRIS BUFFER R. SCHULZ

CAR

CLIENT NYSEG - Milliken Station UNIT 2 TEST NO. 2-TRIS-Out METHOD TRIS - BUFF PAGE 1 OF 1
SAMPLE LOCATION ESP-Outlet TEST CONDITION Full Load AMB. TEMP., °F ______ PROJECT # 11476
OPERATOR/ASSISTANT ______ METER VOL. (START/END) / DATE 8-8-96

PRE-TEST DATA:
Barometric Press., in. Hg. 29.86
Assumed Stack Temp. °F ______
Assumed Meter Temp. °F ______
Assumed ΔP ______
Assumed Moisture % ______
Stack Diameter, in. ______
Sample Time: Total ______
per point ______
Total of Traverse Points ______
Teflon Connecting Line (Y/N) ______
Isokinetic Factor
ΔH = ~~2.8~~ 3.9 X ΔP

EQUIPMENT INFO:
Meter ID No. 7275 PH
Meter, Yd. 0.99 7.2
CFM @ ΔH = 1.0 0.62 8.
Pitot: ID ______
Cp 0.84
Probe: Mat'l Glass
Length 41
Nozzle: ID/Mat'l Glass
Diam. 0.278
Filter: No. ______
Tare Wt. ______
TC Readout ID: Meter ______
Aux. ______

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1	TRIS	692.3	672.4	= 19.9
#2	TRIS	662.0	617.6	= 44.4
#3	KMnO4	762.4	758.8	= 3.6
#4	KMnO4	699.4	698.1	= 1.3
#5	Si Gel	855.9	842.6	= 13.3
Total				= 82.5

POST TEST INFO:
Filter Appearance ______
Impinger Appearance ______
Silica Gel Spent (Y/N) ______

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	15"	✓	JP
Post-Test	0.000	6"	✓	JP

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O2	VAC.	STATIC PRESS. Iwg	CHAIN OF CUSTODY INFORMATION
W2	1417	.35	1.33	367.468	275	250	112	108	243	ICE	–	3	*	Impingers Loaded
	1427	.35	1.33	374.51	277	247	112	108	243	ICE	–	3	*	Impingers Recovered
	1437	.35	1.33	381.74	278	250	115	109	242	ICE	5.2	3	*	Filter Loaded
	1447	.35	1.37	389.16	279	260	114	109	243	ICE	–	3	*	Filter Recovered
	1457	.35	1.37	396.08	277	262	113	108	243	ICE	–	3	*	Probe Wash
	1507	.35	1.37	404.21	278	263	112	107	243	ICE	5.2	3	*	TEST SUMMARY
	1517			410.490			STOP							Calculated by: BAF
													-14.5	Checked by: BAF
														Stack Press.(iwg) -14.5 ✓
														Stack Temp. (°F) 277.3 ✓
														ΔP (iwg) 0.35 ✓
														O2/CO2 5.20 / 13.44 ✓
														Meter Vol., (acf) 43.022 ✓
														Meter Temp. (°F) 110.6 ✓
														Meter Press. (iwg) 1.35 ✓
														Liquid Vol. (g) 82.5 ✓
														Comments:

DAY 2 8-8-96

OR/ASSISTANT ____________ METER VOL. (START/END) DH

PRE-TEST DATA:

Barometric Press., in. Hg ______

Assumed Stack Temp. °F ______

Assumed Meter Temp. °F ______

Assumed ΔP ______

Assumed Moisture % ______

Stack Diameter, in. ______

Sample Time: Total 1hR

per point –

Total of Traverse Points 5P

Teflon Connecting Line (Y/N) ______

Isokinetic Factor

ΔH = 3.6 X ΔP

EQUIPMENT INFO:

Meter ID No. Bx #1-7275

Meter, Yd. .99

CFM @ ΔH = 1.0 1.44

Pitot: ID ______

Cp ______

Probe: Mat'l ______

Length ______

Nozzle: ID/Mat'l ______

Diam. ______

Filter: No. ______

Tare Wt. ______

TC Readout ID: Meter ______

Aux. ______

Imp.	Mat'l	Wt.(End)		Wt.(Start)		Wt.(g)
#1	TRIS 8.0	695.6	-	646.2	=	
#2	TRIS	668.8	-	654.2	=	
#3	KMnO4	668.2	-	665.7	=	
#4	KMnO4	681.4	-	680.0	=	
#5	Sil Gel	946.3	-	935.9	=	
Total					=	

POST TEST INFO:

Filter Appearance ______

Impinger Appearance ______

Silica Gel Spent (Y/N) ______

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	10"	✓	JF
Post-Test	0.000	7"	✓	JP

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. iwg
	1432	.37	1.33	638.281	286	244	105	105	234	ICE	–	3.5	*
	1442	.37	1.33	646.39	286	244	112	105	242	ICE	4.8	3.0	*
	1452	.37	1.33	653.28	285	245	113	106	243	ICE	–	3.6	*
	1502	.37	1.33	660.15	286	245	113	106	243	ICE	4.6	3.5	*
K2	1512	.36	1.29	668.01	286	245	114	106	244	ICE	–	3.5	*
	1522	.30	1.29	674.52	285	245	113	107	244	ICE	4.6	3.5	*
	1532			681.165		STOP							

CHAIN OF CUSTODY INFORMATION

Impingers Loaded

Impingers Recovered

Filter Loaded

Filter Recovered

Probe Wash

TEST SUMMARY

Calculated by: DK

Checked by: DK

Stack Press (iwg) -14.5 ✓

Stack Temp. (°F) 285.7 ✓

ΔP (iwg) 0.3667 ✓

O_2/CO_2 4.67 ✓ 14.13

Meter Vol., (acf) 42.884 ✓

Meter Temp. (°F) 108.8 ✓

Meter Press. (iwg) 1.32 ✓

Liquid Vol. (g) 78.3 ✓

Comments:

TRIS FGD IN

ESP out

CARI

CLIENT NYSEG/Milliken Station
SAMPLE LOCATION STACK
OPERATOR/ASSISTANT RM

UNIT 2 TEST NO. 1-OH-STK METHOD ONT HYD PAGE 1 OF 2
TEST CONDITION Full Como AMB. TEMP., °F
METER VOL. (START/END) 475.251 / 715.888
PROJECT # 11476
DATE 8/7/96

PRE-TEST DATA:

Barometric Press., in. Hg.	29.12
Assumed Stack Temp. °F	120
Assumed Meter Temp. °F	111.5
Assumed ΔP	1.2
Assumed Moisture %	13%
Stack Diameter, in.	
Sample Time: Total	360
per point	30
Total of Traverse Points	Single Point
Teflon Connecting Line (Y/N)	Y

Isokinetic Factor
ΔH = 1.0 X ΔP

EQUIPMENT INFO:

Meter ID No.		Box #6 serial # 7243
Meter, Yd.		1.000
CFM @ ΔH = 1.0		0.5978
Pitot:	ID	#27
	Cp	0.84
Probe:	Mat'l	Qtz.
	Length	4'
Nozzle:	ID/Mat'l	#17/Qtz.
	Diam.	0.190
Filter:	No.	
	Tare Wt.	
TC Readout ID:	Meter	Box #6
	Aux.	

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1			-	=
#2			-	=
#3			-	=
#4			-	=
#5			-	=
Total				=

See Next page

POST TEST INFO:
Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.005	15"	✓	RM
Post-Test	0.000	7"	✓	RM

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. iwg
SP,	0842	1.5	1.5	475.251	122	247	103	96	265	65	5.6	3.0	
South	[illegible]												
	0912	1.5	1.5	496.225	122	247	117	100	242	60	5.6	3.0	-.75
	0942	1.5	1.5	518.204	122	249	120	103	249	60	56	3.0	
	1012	1.4	1.4	538.255	121	249	122	106	250	61	5.6	3.0	
	1042	1.3	1.3	558.363	121	250	125	108	250	61	5.7	3.0	-.75
	1112	1.3	1.3	578.223	122	250	125	109	251	62	5.7	3.0	
	1'												
	1142	1.3	1.3	598.264	121	250	126	110	251	62	5.6	3.3	-.75
	1212	1.3	1.3	618.228	122	250	126	110	251	62	5.6	3.3	
										63	5.6	3.3	-.65
	1242	1.3	1.3	638.283	121	250	127	111	:25/Day 1	8-7-96			

CHAIN OF CUSTODY INFORMATION

Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY

Calculated by:	DK
Checked by:	DK
Stack Press.(iwg)	-0.71 ✓
Stack Temp. (°F)	121.8 ✓
ΔP (iwg)	1.3392 ✓
O₂/CO₂	5.61 ✓ / 13.83
Meter Vol., (acf)	240.689
Meter Temp. (°F)	115.0 ✓
Meter Press. (iwg)	1.34 ✓
Liquid Vol. (g)	754.5 ✓
Comments:	

OPERATOR/ASSISTANT KM. METER VOL. (START/END) / DATE 8/7/10

PRE-TEST DATA:

Barometric Press., in. Hg. 29.12

Assumed Stack Temp. °F

Assumed Meter Temp. °F

Assumed ΔP

Assumed Moisture %

Stack Diameter, in.

Sample Time: Total

per point

Total of Traverse Points

Teflon Connecting Line (Y/N)

Isokinetic Factor

ΔH = 1.0 X ΔP

EQUIPMENT INFO:

Meter ID No. Box #6 7243

Meter, Yd.

CFM @ ΔH = 1.0

Pitot: ID

Cp

Probe: Mat'l

Length

Nozzle: ID/Mat'l

Diam

Filter: No.

Tare Wt.

TC Readout ID: Meter

Aux.

SEE PAGE #1

Imp.	Mat'l	Wt.(End)	- Wt.(Start)	= Wt.(g)
#1				
#2				
#3				
#4				
#5				
Total				

POST TEST INFO:

Filter Appearance

Impinger Appearance

Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
SP.	1312	1.3	1.3	658.332	123	250	127	111	249	63	5.7	3.5	
South				[illegible]									
	1342	1.2	1.2	678.012	123	250	127	112	250	62	5.5	3.8	-.85
	1412	1.2	1.2	696.998	122	250	127	112	250	61	5.5	3.8	
↓													
End.	1442			715.880									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded

Impingers Recovered

Filter Loaded

Filter Recovered

Probe Wash

TEST SUMMARY

Calculated by:

Checked by:

Stack Press.(iwg)

Stack Temp. (°F)

ΔP (iwg)

O₂/CO₂

Meter Vol., (acf)

Meter Temp. (°F)

Meter Press. (iwg)

Liquid Vol. (g)

Comments: Santech = 2.5 lpm

Day 1 8-7-98

Sample Pt. ______________________

Train Type : **ONTARIO-HYDRO METHOD**

Date **OH FGD OUT**

Run STACK

Fund # ______________________

Cost Center # ______________________

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	615.5	866.6	251.1
BUBBLER	KCl	632.0	964.2	332.2
IMPINGER	KCl	649.6	758.1	108.5
BUBBLER	H_2O_2/HNO_3	732.1	733.6	1.5
BUBBLER	$KMnO_4/H_2SO_4$	730.1	728.5	-1.6
BUBBLER	$KMnO_4/H_2SO_4$	613.3	618.5	5.2
IMPINGER	$KMnO_4/H_2SO_4$	612.2	607.9	-4.3
BUBBLER	SILICA GEL	875.9	937.8	61.9
			Total H_2O (g)	754.5 ✓
FILTER				
			Total Dust (g)	

$V_w std = 0.0474 * (H_2O\ g)$ ______________________ SCF

$V_m Corrected = V_m * C_m$ ______________________ ACF

$$V_m std = \frac{17.71\ V_m C\,(P_b + \Delta H/13.6)}{T_m}$$ ______________________ SCF

$V_t std = V_w std + V_m std$ ______________________ SCF

$\%H_2O = (V_w std / V_t std)*100$ ______________________ $\%H_2O$

$Q_n std = 17.71\ Q_n\ P_s / T_s$ ______________________ SCFM

$\%\ Isokinetic = V_t std / (Q_n std * Time)$ ______________________ %

DUST LOADING CALCULATIONS (Concentration Basis)

$DCL = 15.432\ (dust\ g) / V_t std$ ______________________ grains/s

$$\%\ Efficiency = \frac{(Inlet\ DCL - Outlet\ DCL)}{Inlet\ DCL} * 100$$ ______________________ %

$ACFM = V_s * Pipe\ Area\ (ft^2)$ ______________________ ACFM

$SCFM = ACFM * P_s/29.92 * 530/T_s\ = ACFM * P_s/T_s * 17.71$ ______________________ SCFM

lbs/hour = grains / scf * 0.000143 * SCFM * 60 ______________________ lbs/hour

OPERATOR/ASSISTANT KM.

METER VOL. (START/END)

PRE-TEST DATA:

Barometric Press., in. Hg 29.08
Assumed Stack Temp. °F 125
Assumed Meter Temp. °F 130
Assumed ΔP ~1.2
Assumed Moisture % 14
Stack Diameter, in. 121
Sample Time: Total 360
per point 30
Total of Traverse Points Single Pt.
Teflon Connecting Line (Y/N) Y.
Isokinetic Factor
ΔH = 1.08 X ΔP

EQUIPMENT INFO:

Meter ID No. Box #6 serial 7243
Meter, Yd. 1.000
CFM @ ΔH = 1.0 0.5978
Pitot: ID #27
Cp 0.84
Probe: Mat'l Qtz.
Length 4'
Nozzle: ID/Mat'l #17/Qtz
Diam. 0.190
Filter: No.
Tare Wt.
TC Readout ID: Meter Box #6.
Aux.

Imp.	Mat'l	Wt.(End)	Wt.(Start)		Wt.(g)
#1				=	
#2		See		=	
#3		page		=	
#4		#3		=	
#5				=	
Total				=	

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	15"	✓	
Post-Test	0.000	7"		

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. Iwg
SP.	0753	1.3	1.34	797.362	124	249	101	90	246	63	5.3	2.7	-.74
South													
	0823	1.42	1.46	817.445	123	250	111	95	249	62	5.3	2.7	
	0853	1.40	1.44	837.486	123	250	114	98	249	63	5.3	2.9	
	0923	1.40	1.44	858.353	122	250	115	99	250	61	5.3	2.9	-.76
	0953	1.40	1.44	878.702	122	262	116	100	260	60	5.5	3.0	
	1023	1.40	1.44	899.458	122	264	117	101	264	60	5.5	3.0	
	1053	1.40	1.44	920.023	123	264	116	100	264	59	5.5	3.0	-.75
	1123	1.40	1.44	940.402	123	264	115	99	264	59	5.2	3.0	

CHAIN OF CUSTODY INFORMATION

Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY

Calculated by: DK
Checked by:
Stack Press.(iwg) -0.75
Stack Temp (°F) 122.8
ΔP (iwg) 1.3932
O₂/CO₂ 5.31 | 13.60
Meter Vol., (acf) 245.958
Meter Temp. (°F) 105.2
Meter Press. (iwg) 1.43
Liquid Vol (g) 800.9
Comments:

DAY 2 8-8-96

OH FGD OUT

STACK

CLIENT NYSEG- Millikan Station UNIT 2 TEST NO. 2-OAT-STACK METHOD Ont Hydro PAGE 2 OF 2
SAMPLE LOCATION Stack TEST CONDITION Full load AMB. TEMP., °F ____ PROJECT # 11476
OPERATOR/ASSISTANT RM. METER VOL. (START/END) / DATE 8-8-96

PRE-TEST DATA:
Barometric Press., in. Hg. 29.08
Assumed Stack Temp. °F ____
Assumed Meter Temp. °F ____
Assumed ΔP ____
Assumed Moisture % ____
Stack Diameter, in. ____
Sample Time: Total ____
per point ____
Total of Traverse Points ____
Teflon Connecting Line (Y/N) ____
Isokinetic Factor
ΔH = 1.03 X ΔP

EQUIPMENT INFO:
Meter ID No. Box #6
Meter, Yd. 1.000
CFM @ ΔH = 1.0 0.5918
Pitot: ID ____
Cp ____
Probe: Mat'l ____
Length ____
Nozzle: ID/Mat'l ____
Diam. ____
Filter: No. ____
Tare Wt. ____
TC Readout ID: Meter ____
Aux. ____

Imp.	Mat'l	Wt.(End)	-	Wt.(Start)	=	Wt.(g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
#5			-		=	
Total					=	

SEE PAGE #1

POST TEST INFO:
Filter Appearance ____
Impinger Appearance ____
Silica Gel Spent (Y/N) ____

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O₂	VAC.	STATIC PRESS. iwg	CHAIN OF CUSTODY INFORMATION
SP.	1153	1.4	1.44	961.112	123	263	114	98	264	59	5.2	3.0		Impingers Loaded
South.														Impingers Recovered
	1223	1.4	1.44	981.4	123	263	113	97	264	66	5.2	3	[illegible]	Filter Loaded
		1.4	1.44											Filter Recovered
	1253	[illegible]	[illegible]	1002.012	123	263	112	97	264	63	5.2	3.0	-.75	Probe Wash
														TEST SUMMARY
	1323	1.4	1.44	1022.702	123	263	112	96	263	60	5.2	3.0		Calculated by:
														Checked by:
End.	1353			1043.320										Stack Press (iwg)
														Stack Temp. (°F)
														ΔP (iwg)
														O_2/CO_2
														Meter Vol. (acf)
														Meter Temp. (°F)
														Meter Press. (iwg)
														Liquid Vol. (g)
											DAY 2	8-8-96		Comments:

Sample Pt. Stack

Train Type : **ONTARIO-HYDRO METHOD**

Date **OH FGD OUT**
Run STACK
Fund #
Cost Center #

3 of 3

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	572.1	785.6	
BUBBLER	KCl	627.4	898.2	
IMPINGER	KCl	599.4	843.3	
BUBBLER	H_2O_2/HNO_3	763.9	773.5	
BUBBLER	$KMnO_4/H_2SO_4$	605.7	609.9	
BUBBLER	$KMnO_4/H_2SO_4$	599.4	604.9	
IMPINGER	$KMnO_4/H_2SO_4$	577.8	573.6	
BUBBLER	SILICA GEL	866.2	923.8	
			Total H_2O (g)	800.9 ✓
FILTER				
			Total Dust (g)	

$V_wstd = 0.0474 * (H_2O\ g)$ _______ SCF

$V_mCorrected = V_m * C_m$ _______ ACF

$V_mstd = \frac{17.71\ V_mC\ (P_b + \Delta H/13.6)}{T_m}$ _______ SCF

$V_tstd = V_wstd + V_mstd$ _______ SCF

$\%H_2O = (V_wstd / V_tstd)*100$ _______ $\%H_2O$

$Q_nstd = 17.71\ Q_n\ P_s / T_s$ _______ SCFM

% Isokinetic = $V_tstd / (Q_nstd * Time)$ _______ %

DUST LOADING CALCULATIONS (Concentration Basis)

DCL = 15.432 (dust g) / V_tstd _______ grains/scf

% Efficiency = $\frac{(Inlet\ DCL - Outlet\ DCL)}{Inlet\ DCL} * 100$ _______ %

ACFM = V_s * Pipe Area (ft^2) _______ ACFM

SCFM = ACFM * $P_s/29.92 * 530/T_s$ = ACFM * $P_s/T_s * 17.71$ _______ SCFM

lbs/hour = grains / scf * 0.000143 * SCFM * 60 _______ lbs/hour

CARI

CLIENT NYSEG- Milliken Station
SAMPLE LOCATION Stack
OPERATOR/ASSISTANT RM

UNIT 2
TEST CONDITION Full load
METER VOL. (START/END) 124.979 / 271.912

TEST NO. 3-OH-STACK METHOD Ont Hyd
AMB. TEMP., °F 92°

PAGE 1 OF 2
PROJECT # 11476
DATE 8-10-96

PRE-TEST DATA:

Barometric Press., in. Hg. 29.07
Assumed Stack Temp. °F 125
Assumed Meter Temp. °F 106
Assumed ΔP 1.3
Assumed Moisture % 14%
Stack Diameter, in. 121
Sample Time: Total 360
per point 30
Total of Traverse Points Single Pt.
Teflon Connecting Line (Y/N) Y.
Isokinetic Factor
ΔH = 1.04 X ΔP

EQUIPMENT INFO:

Meter ID No. Box #6 Serial 7243
Meter, Yd. 1.000
CFM @ ΔH = 1.0 0.5978
Pitot: ID #27
Cp 0.84
Probe: Mat'l Qtz
Length 4'
Nozzle: ID/Mat'l #17 / Qtz
Diam. 0.190
Filter: No.
Tare Wt.
TC Readout ID: Meter Box #6
Aux.

Imp.	Mat'l	Wt.(End)		Wt.(Start)		Wt.(g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
#5			-		=	
Total					=	

SEE PAGE #3

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	15"	✓	RM
Post-Test	0.000	7"	✓	RM

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS			TEMPERATURES, °F						O₂	VAC.	STATIC PRESS. Iwg
		ΔP	ΔH	METER READING	STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT			
SP. South.	0826	1.4	1.46	124.979	123	256	83	82	264	60	5.4	3.3	-.72
	0856	1.4	1.46	144.364	124	261	105	88	263	63	5.4	3.3	
	0926	1.4	1.46	165.183	122	261	110	92	263	63	5.3	3.3	
	0956	1.4	1.46	185.487	122	261	113	96	264	62	5.3	3.3	-.73
	1026	1.4	1.46	206.028	122	263	116	99	264	63	5.4	3.5	
	1056	1.4	1.46	226.781	122	263	118	101	264	62	5.3	3.5	
	1126	1.4	1.46	247.565	121	263	120	103	264	61	5.3	3.6	-.70
	1156	1.4	1.46	269.2	122	264	118	103	263	65	5.2	4	

DAY 3 8-10-96

CHAIN OF CUSTODY INFORMATION

Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY

Calculated by: DK
Checked by: DK
Stack Press (iwg) -0.70 ✓
Stack Temp. (°F) 121.9 ✓
ΔP (iwg) 1.4000 ✓
O₂/CO₂ 5.32 / 13.69 ✓
Meter Vol., (acf) 246.933 ✓
Meter Temp. (°F) 104.3 ✓
Meter Press. (iwg) 1.46 ✓
Liquid Vol. (g) 779.1 ✓
Comments:

OPERATOR/ASSISTANT KM. METER VOL. (START/END)

PRE-TEST DATA:

Barometric Press., in. Hg. 29.07
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total
per point
Total of Traverse Points
Teflon Connecting Line (Y/N)
Isokinetic Factor
ΔH = 1.04 X ΔP

EQUIPMENT INFO:

Meter ID No. Box # 6.
Meter, Yd. 1.000
CFM @ ΔH = 1.0 0.5978
Pitot: ID
Cp
Probe: Mat'l
Length
Nozzle: ID/Mat'l
Diam.
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux.

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1		-	=	
#2		-	=	
#3		-	=	
#4		-	=	
#5		-	=	
Total			=	

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test				
Post-Test				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O_2	VAC.	STATIC PRESS. Iwg
SP. South	1226	1.4	1.46	288.863	121	263	117	101	264	60	5.4	4.0	~~[illegible]~~
	1256	1.4	1.46	309.886	122	263	116	100	264	63	5.3	4.1	-.66
	1326	1.4	1.46	330.478	121	263	114	98	264	63	5.3	4.1	
	1356	1.4	1.46	351.289	121	263	114	97	264	60	5.3	4.3	
End	1426			371.912									
	~~[illegible]~~												

CHAIN OF CUSTODY INFORMATION

Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY

Calculated by:
Checked by:
Stack Press.(iwg) -0.70
Stack Temp. (°F)
ΔP (iwg)
O_2/CO_2 5.32
Meter Vol., (acf)
Meter Temp. (°F)
Meter Press. (iwg)
Liquid Vol. (g)
Comments:

DAY 3 5-10-96
OH FGD OUT
STACK

Sample Pt. STACK

Train Type : **ONTARIO-HYDRO METHOD**

Date DAY 3 8-10-96
Run OH FGD OUT
Fund #
Cost Center # STACK
3 of 3

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	572.3	832.6	
BUBBLER	KCl	601.1	868.5	
IMPINGER	KCl	612.0	803.2	
BUBBLER	H_2O_2/HNO_3	721.3	721.3	
BUBBLER	$KMnO_4/H_2SO_4$	607.9	603.3	
BUBBLER	$KMnO_4/H_2SO_4$	607.6	627.9	
IMPINGER	$KMnO_4/H_2SO_4$	591.3	578.9	
BUBBLER	SILICA GEL	834.9	891.3	
			Total H_2O (g)	779.1 ✓
FILTER				
			Total Dust (g)	

$V_w std = 0.0474 * (H_2O\ g)$ ________ SCF

$V_m Corrected = V_m * C_m$ ________ ACF

$V_m std = \frac{17.71\ V_m C (P_b + \Delta H/13.6)}{T_m}$ ________ SCF

$V_t std = V_w std + V_m std$ ________ SCF

$\%H_2O = (V_w std / V_t std)*100$ ________ $\%H_2O$

$Q_n std = 17.71\ Q_n\ P_s / T_s$ ________ SCFM

$\%$ Isokinetic = $V_t std / (Q_n std * Time)$ ________ %

DUST LOADING CALCULATIONS (Concentration Basis)

$DCL = 15.432 (dust\ g) / V_t std$ ________ grains/

$\%\ Efficiency = \frac{(Inlet\ DCL - Outlet\ DCL)}{Inlet\ DCL} * 100$ ________ %

$ACFM = V_s * Pipe\ Area (ft^2)$ ________ ACFM

$SCFM = ACFM * P_s/29.92 * 530/T_s = ACFM * P_s/T_s * 17.71$ ________ SCFM

$lbs/hour = grains / scf * 0.000143 * SCFM * 60$ ________ lbs/hour

OPERATOR/ASSISTANT RM METER VOL. (START/END) 716.170 / 1161.801 DATE [illegible]

PRE-TEST DATA:

Barometric Press., in. Hg. 29.12
Assumed Stack Temp. °F 122
Assumed Meter Temp. °F 107
Assumed ΔP 1.3
Assumed Moisture % 14%
Stack Diameter, in.
Sample Time: Total 120
per point 30
Total of Traverse Points Single Pt.
Teflon Connecting Line (Y/N) Y.
Isokinetic Factor
ΔH = ~~1.0~~ * 1.03 X ΔP

EQUIPMENT INFO:

Meter ID No. Box #6 S 2414/7243
Meter, Yd. 1.000
CFM @ ΔH = 1.0 0.5978
Pitot: ID
Cp 0.84
Probe: Mat'l Qtz
Length 4'
Nozzle: ID/Mat'l Qtz
Diam. 0.191
Filter: No.
Tare Wt.
TC Readout ID: Meter
Aux. Box #6

Imp.	Mat'l	Wt (End)	Wt (Start)		Wt (g)
#1	TRIS	951.4	746.3	=	205.1
#2	TRIS	687.6	658.5	=	29.1
#3	KMnO	671.2	665.3	=	5.9
#4	KMnO4	779.6	780.4	=	-0.8
#5	Silica	963.6	915.9	=	47.7
Total				=	287.0

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.003	15.4	✓	RM
Post-Test	0.009	5"	✓	RM

PRE-TEST CALIBRATION CHECK: ✓

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O_2	VAC.	STATIC PRESS. iwg
SP.	1515	1.35	1.35	716.170	123	250	118	109	252	63	5.4	2.5	
South													
*	1545	1.3	1.34	736.638	123	250	128	112	250	63	5.4	2.5	-.68
	1615	1.3	1.34	756.751	122	250	129	114	251	61	5.4	2.5	
	1645	1.35	1.39	776.786	120	250	130	115	251	60	5.5	2.5	
End	1715			796.887									

Day I 8-7-96

TRIS FGD OUT

CHAIN OF CUSTODY INFORMATION

Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY

Calculated by: DK
Checked by: DK
Stack Press (iwg) -0.68
Stack Temp. (°F) 122 ✓
ΔP (iwg) 1.3249 ✓
O_2/CO_2 5.42 ✓ / 13.89
Meter Vol. (acf) 80.717 ✓
Meter Temp. (°F) 119.4 ✓
Meter Press. (iwg) 1.35 ✓
Liquid Vol. (g) 287.0 ✓
Comments:

TRIS BUFFER R. SCHULZ

CARN

CLIENT NYSEG - Milliken Station
SAMPLE LOCATION Stack
OPERATOR/ASSISTANT RM.

UNIT 2
TEST CONDITION Full Load
METER VOL. (START/END) 1043, 886 , 123, 811

TEST NO. 2-TRIS-STACK METHOD TRIS- BUFF
AMB. TEMP., °F
PAGE 1 OF 1
PROJECT # 11476
DATE 8-8-96

PRE-TEST DATA:

Barometric Press., in. Hg. 29.08
Assumed Stack Temp. °F 125
Assumed Meter Temp. °F 107
Assumed ΔP 1.2
Assumed Moisture % 14%
Stack Diameter, in. 121
Sample Time: Total 120
per point 30
Total of Traverse Points Single Pt.
Teflon Connecting Line (Y/N) Y.
Isokinetic Factor
ΔH = 1.03 X ΔP

EQUIPMENT INFO:

Meter ID No. Box #6 Serial 7243
Meter, Yd. 1.000
CFM @ ΔH = 1.0 0.5978
Pitot: ID
Cp 0.84
Probe: Mat'l Qtz
Length 4'
Nozzle: ID/Mat'l Qtz
Diam. 0.191
Filter: No.
Tare Wt.
TC Readout ID: Meter Box #6
Aux.

DH

Imp.	Mat'l	Wt.(End)	Wt.(Start)	Wt.(g)
#1	80 TRIS	822.1	646.7	=
#2	80 TRIS	777.9	707.1	=
#3	KMnO4	762.2	756.6	=
#4	KMnO4	612.5	612.8	=
#5	S Gel	873.9	853.8	=
Total				= 271.6

POST TEST INFO:

Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.000	15"	✓	RM
Post-Test	0.000	5"	✓	RM

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O2	VAC.	STATIC PRESS. Iwg
SP.	1425	1.3	1.34	1043.886	124	262	101	89	260	60	5.1	2.1	
South	~~1450~~												
	1455	1.3	1.34	1064.135	123	263	107	90	263	60	5.1	2.1	
	1525	1.3	1.34	1083.902	123	262	108	92	263	60	5.2	2.1	~~-.63~~
	1555	1.3	1.34	1104.252	123	263	107	92	264	61	5.2	2.1	
End.	1625			123,811									

DAY 2 8-8-96

CHAIN OF CUSTODY INFORMATION

Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

TEST SUMMARY

Calculated by: DK
Checked by: DK
Stack Press (iwg) -063 ✓
Stack Temp. (°F) 123.3 ✓
ΔP (iwg) 1.3000 ✓
O2/CO2 5.15 ✓ 13.43
Meter Vol., (acf) 79.925 ✓
Meter Temp. (°F) 98.3 ✓
Meter Press. (iwg) 1.34 ✓
Liquid Vol. (g) 271.6 ✓
Comments:

SAMPLE LOCATION
OPERATOR/ASSISTANT RM
METER VOL. (START/END) 372,387 / 752,920 PH
DATE 8-9-98

PRE-TEST DATA:
Barometric Press., In. Hg. 29.07
Assumed Stack Temp. °F
Assumed Meter Temp. °F
Assumed ΔP
Assumed Moisture %
Stack Diameter, in.
Sample Time: Total 120
per point 30
Total of Traverse Points Single Pt.
Teflon Connecting Line (Y/N) Y.
Isokinetic Factor
ΔH = 1.04 X ΔP

EQUIPMENT INFO:
Meter ID No. Box #6 Serial 7243 8.0
Meter, Yd. 1.000 8.5
CFM @ ΔH = 1.0 0.5978
Pitot: ID
Cp 0.84
Probe: Mat'l Qtz.
Length 41
Nozzle: ID/Mat'l 0.191
Diam. 0.191
Filter: No.
Tare Wt.
TC Readout ID: Meter Box #6
Aux.

Imp.	Mat'l	Wt.(End)	Wt.(Start)		Wt.(g)
#1	TRIS	815.9	676.2	=	
#2	TRIS	868.1	773.9	=	
#3	KMnO4	684.2	679.3	=	
#4	KMnO4	771.9	770.1	=	
#5	Sil Gel	893.5	873.0	=	
Total				=	

POST TEST INFO:
Filter Appearance
Impinger Appearance
Silica Gel Spent (Y/N)

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac	Pitot	Init
Pre-Test	0.002	15"	✓	RM
Post-Test	0.000	5"	✓	RM

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Reading	Meter In	Temp Out
Init					
Final					

SAMPLE POINT	TIME	METER CONDITIONS ΔP	ΔH	METER READING	TEMPERATURES, °F STACK	PROBE	METER IN	METER OUT	OVEN	IMP. OUT	O2	VAC.	STATIC PRESS. iwg
SP1	1520	1.4	1.46	372,387	122	262	105	90	260	64	5.2	2.6	
South													
	1550	1.3	1.352	393,265	122	263	113	96	258	63	5.2	2.5	
	1620	1.3	1.352	412,987	121	263	113	98	265	63	5.2	2.5	-.54
	1650	1.3	1.352	432.852	122	263	114	98	265	57	5.3	2.6	
End	1720			452,920									

CHAIN OF CUSTODY INFORMATION
Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash

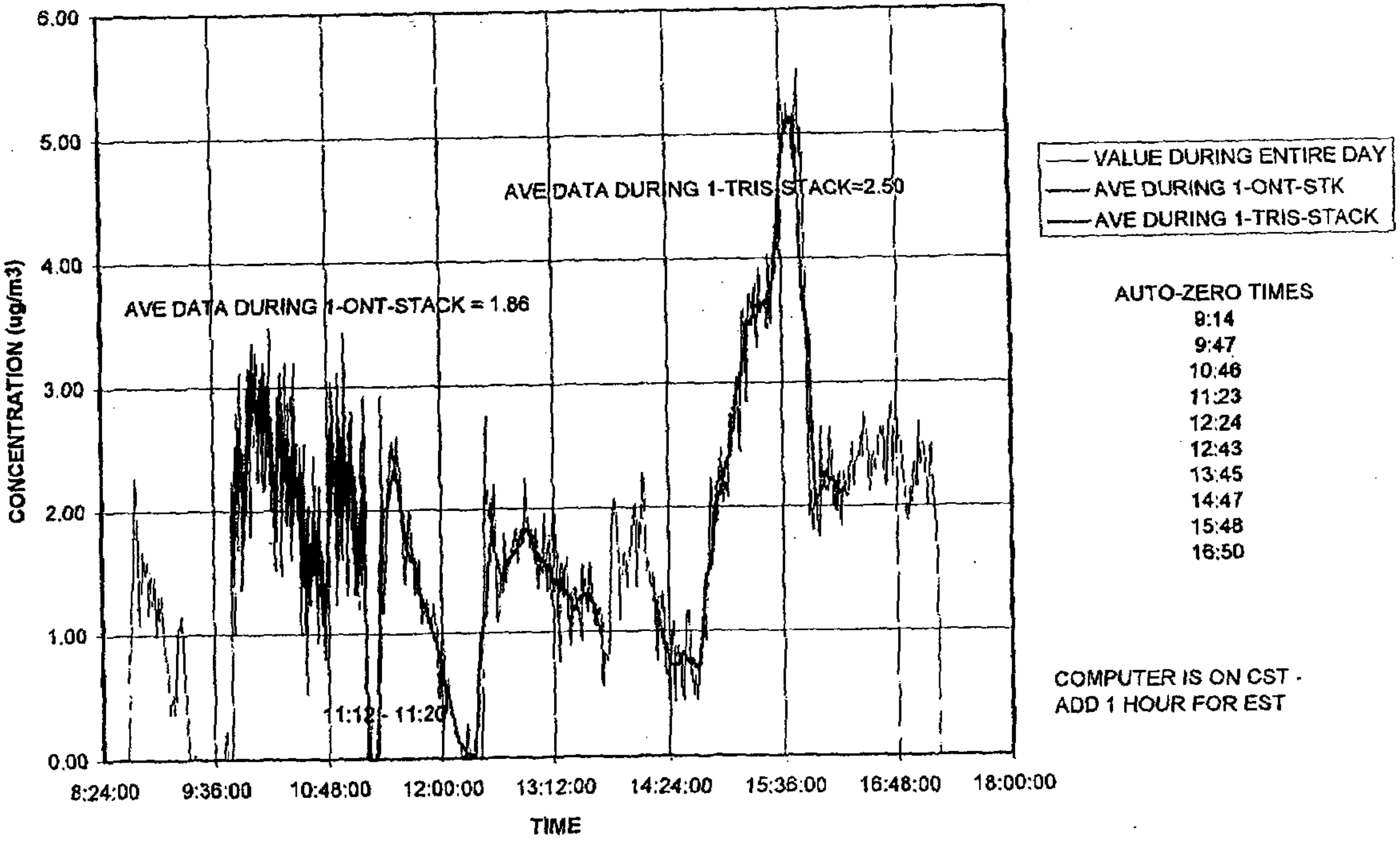
TEST SUMMARY
Calculated by: DK
Checked by: DK
Stack Press.(iwg) -0.54
Stack Temp. (°F) 121.75 ✓
ΔP (iwg) 1.3249 ✓
O2/CO2 5.23 ✓ 13.64
Meter Vol., (acf) 80.531 ✓
Meter Temp. (°F) 103.4 ✓
Meter Press. (iwg) 1.38 ✓
Liquid Vol (g) 261.1 ✓
Comments:

DATE 8-5-98
TRIS FGD OUT
STACK

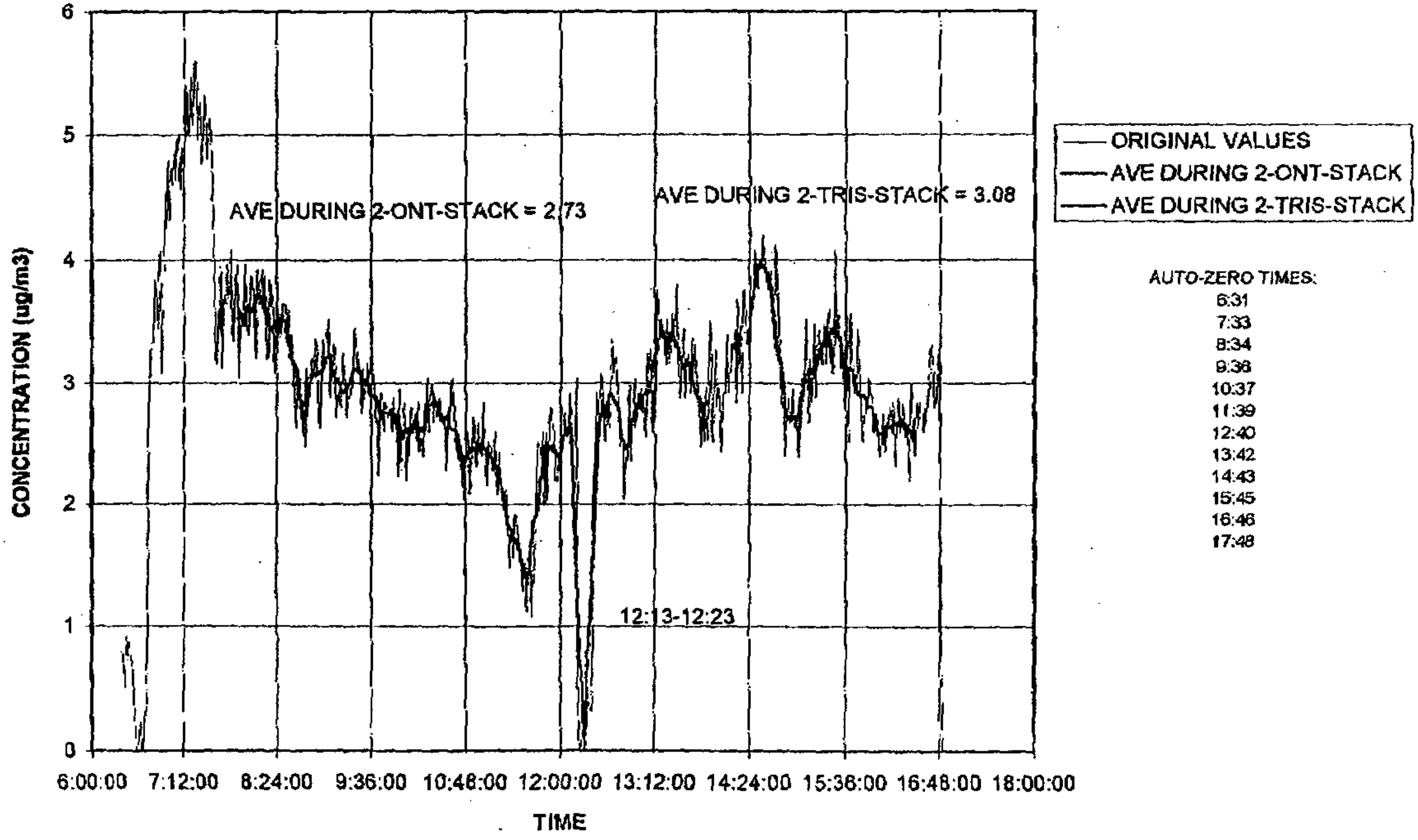
Appendix C.7

Semtech Hg 2000 Analyzer

NYSEG 1
8-7-96

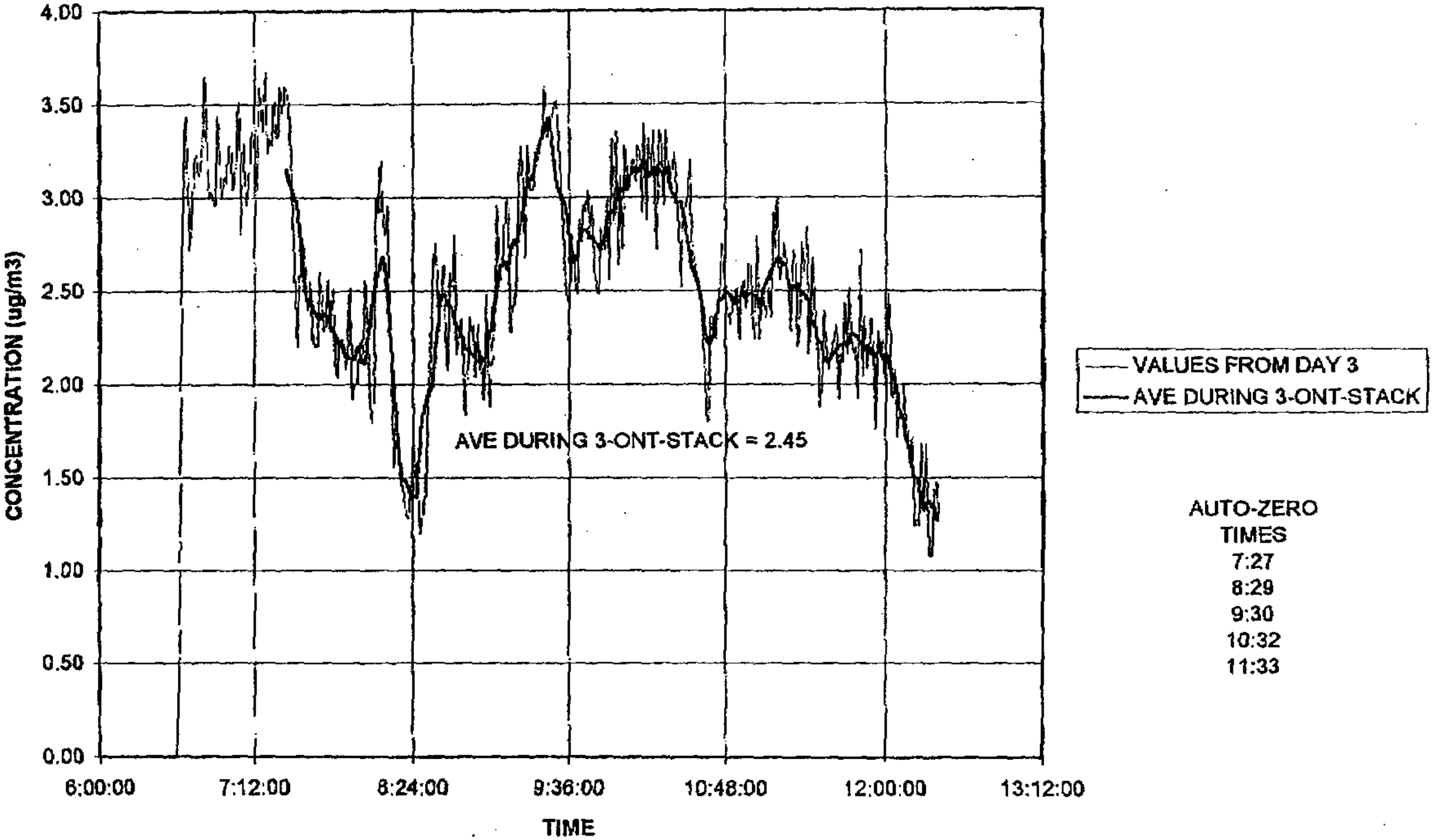

6.00
5.00
4.00
3.00
2.00
1.00
0.00
CONCENTRATION (ug/m3)
8:24:00
9:36:00
10:48:00
12:00:00
13:12:00
14:24:00
15:36:00
16:48:00
18:00:00
TIME
AVE DATA DURING 1-ONT-STACK = 1.86
AVE DATA DURING 1-TRIS-STACK=2.50
11:12 - 11:20
VALUE DURING ENTIRE DAY
AVE DURING 1-ONT-STK
AVE DURING 1-TRIS-STACK
AUTO-ZERO TIMES
9:14
9:47
10:46
11:23
12:24
12:43
13:45
14:47
15:48
16:50
COMPUTER IS ON CST -
ADD 1 HOUR FOR EST

NYSEG 2
8-8-96



AUTO-ZERO TIMES:
6:31
7:33
8:34
9:36
10:37
11:39
12:40
13:42
14:43
15:45
16:46
17:48

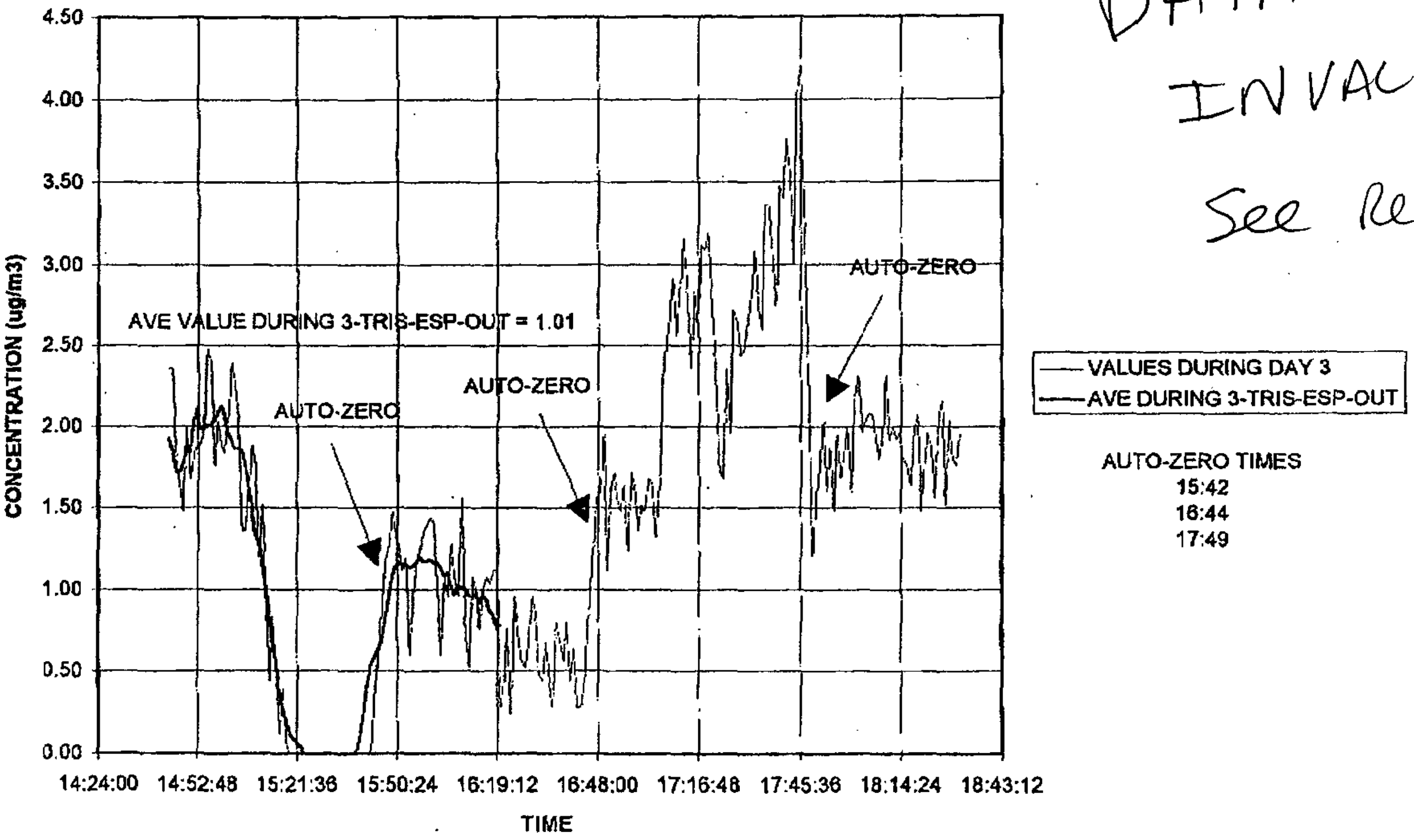
NYSEG 3
8-9-96



AUTO-ZERO
TIMES
7:27
8:29
9:30
10:32
11:33

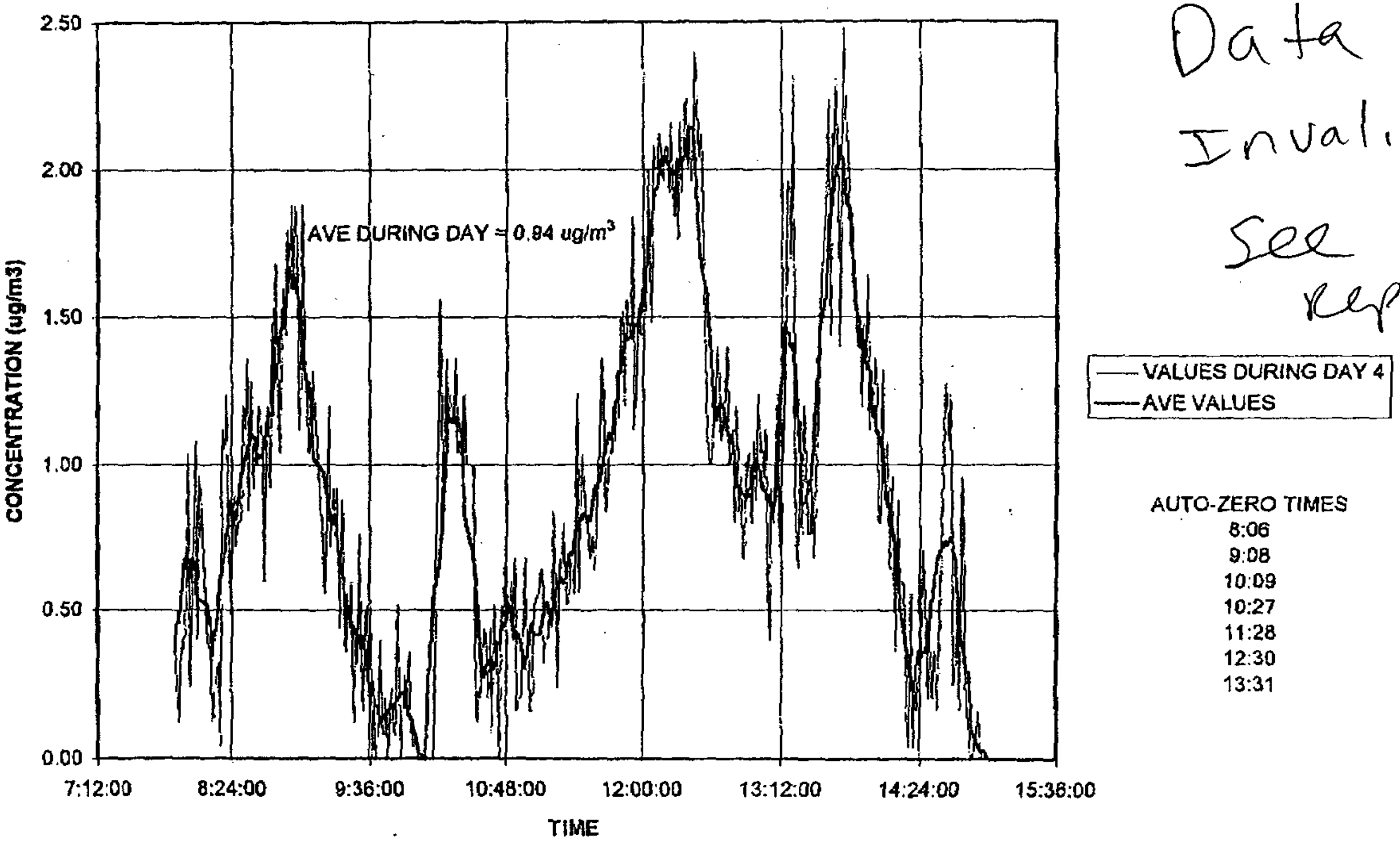
Chart1

NYSEG 3.8
8-9-96



DATA
INVALID –
See Report

NYSEG 4
8-10-96



AUTO-ZERO TIMES
8:06
9:08
10:09
10:27
11:28
12:30
13:31

Data
Invalid,
See
report

Laboratory Notes Transcribed from the notebook of Richard Schulz.

NYSEG-Milliken Station Unit No.2 Stack SE Port

8-7-96

Computer times

08:05 Adjusting Detector and Reference zero values.

08:13 Adjusting Detector and Reference span values. Tris impinger used for H_2O knockout.

08:32 Starting computer logging at 60 second integration times
Note: Computer time is 1 hour earlier than Eastern Daylight Savings Time, so 6:00 computer time is 7:00 EDT.

09:45 Auto-zeroed the Semtech.

09:46 Changing the sample integration time to 10 seconds.

09:48 Power was off to the computer, computer was powering down. Log since 08:32 not complete. Plugged power in at an alternate location. Computer is logging okay now.

11:12 Added ice to the impinger knockout box.
Disconnected Semtech inlet line from impinger train, checking for Semtech to zero on ambient air.

11:20 Flow back through impinger.

11:24 Changing to 60 second integration time.

12:43 Auto-zeroed Semtech manually.

17:12 Semtech line open to ambient air for zero check.

17:16 Unit off line for the day. Terminated logging of NYSEG 1. The impingers need to be changed.
Hg° levels appear to be ≈ 2.7 ug/m^3. (Dry)
Highest value ≈ 3.2 ug/m^3.
Lowest value ≈ 2.2 ug/m^3.

8-8-96

06:22	Start Semtech logging. Changed out Tris impingers and added ice. Checked detector and reference signal values and they are okay. Sampling ambient air.
06:28	Starting sample flow through impingers - stack line is not connected to analyzer. Performed manual auto-zero.
06:35	Auto-zero complete. Sampling air through impinger still.
06:40	Leak checked impingers and Semtech - everything is okay.
06:42	Started sampling stack gases. Flow rate ≈ 3 l/min.
12:09	Disconnected Semtech from stack tp change out first impinger for a fresh one.
12:12	Leak check is good. Unit is drawing ambient air through the impingers.
12:21	Stack gases flowing through impingers to Semtech. Ave Hg° ≈ 3.0 ug/m^3 at this point. Highest reading ≈ 5.5 ug/m^3. Lowest reading ≈ 1.5 ug/m^3.
16:46	Disconnecting Semtech from flue gas stream, will allow it to sample ambient air overnight.

8-9-96

06:10	Changing out tris impingers and adding ice. Reference and detector outputs are okay.
06:25	Leak check of impingers and Semtech is okay.
06:30	Terminated logging from overnight ambient air sampling.
06:31	Started logging NYSEG 3.
06:35	Connected impingers to flue gas sample line.
12:23	Shutting system down, we are going to move to the ESP outlet location. Semtech set up at ESP outlet , unit is leak checked and is okay. The reference and detector values are okay. Started logging NYSEG 3.5.

14:44 Floating point error, so rebooting. Computer time is correct. Logging is restarted as NYSEG 3.8, unit is auto-zeroed. Static pressure is 14.5 inches of H_2O.

18:29 Shutting Semtech logger off.
Hg° levels ≈ 2 ug/m^3. Ranging from 1-4 ug/m^3.

8-10-96

07:51 Installed new impingers and iced box down. Started logging as NYSEG 4. Manually auto-zeroed unit.

08:06 Checked reference and detector outputs and they are okay. Auto-zeroed unit again.

08:16 Leak checked Semtech and impingers which are okay.

08:17 Connecting sample line from ESP Outlet Port T to impingers.

08:30 80% load increasing to 100%.

10:27 Manually auto-zeroed.

15:34 Took Semtech off-line.

Note: This location was very hot and dirty. The instrument was operating out of its specified temperature range. Hg° numbers from this test location may not be valid.