Appendix A

Coal Collection Log

Boss)
Jason Ruhl at 208 0876

Need to Buy Tonight
Coffee Cups / & Plastic Cups / Spoons
5 gal Bucket.
Masking tape
Stapler
Double A Batteries

Joe Ball outside Tender
Charlie Utavitch Outside Tender

Tuesday 10/13/98 Tuesday
System was Cleaned Prior to Testing
9:48 Coal Sample from All Four mills taken
9:30 Stack - Air heater outlet - Air Heater outlet Clean
11:10 Check on Ash Build up in hoppers. No Ash yet.
11:12 Checked with Ron O. Regarding Test #'s
There 1st Test (10/13/98 @ 09:30) is Test #1
11:20 Economizer Samples taken. These Samples were "Coll". I did ask for economizer ash pull prior to Testing.
12:35 Matt (on the ash out) is taking longer than Ron (on the stack) Ron is effectively finished but is running longer so that his sample is at the same time as Matts.
11:40 Coal Sample Taken (all 4 Feeders)
1:30 2nd Consol Test not started yet
14:20 Wet Bottom ash Taken
14:22 Economizer ash Taken again. Had this time.
14: Testing. Sample 1-2 & 3 During Consol #1
14:26 Talked to Art Garcia Re: ash From Baghouse
14:30 Coal Sample Taken @ All Four mills
17:00 Ron Lost (Maybe) the 2nd stack Test
18:00 Release Unit.

OH1 — Start @ 9:30
OH2 — Start @ ~

We'nesday 10/14/98

6:30 on site

7:30 Control Room Still Pulling ash on Unit 2.
load is @ 360 mw gross
Testing today will consist of Ron oda on the Stack taking a duplicate Ontario hydro test.
This duplicate on the Stack is "insurance" due to the potential that the 2nd Stack Ontario-hydro Train Backflushed
The plan for today then is:
Matt Davis on AHO - ontario hydro - 1 Test
Leonard on AHO - Low Ash ontario hydro - 1 Test
Ron ODA on Stack - ontario hydro - *2 Test!

After Testing on the Stack and AHO, Move all the ~~equipment down to the ADA Baghouse unit.~~

Justin Ron 6 IC Traps at the Inlet of the PCM AND 6 IC Traps at the Outlet yesterday 10/13/98

Justins Nomenclature	Inlet Time	Outlet Time	
Con 1	10:19	10:20	
Con 2	11:10	11:11	
Con 3	12:05	12:08	Wesday Stuff
Con 4	14:46	14:47	
Con 5	15:45	15:46	
Con 6	16:47	16:48	

08:30 Ron AND Matt are Starting at the AHO/Stack.
Start Consul Test #3

10:36 Coal from Gravimetric Feeder/Stack Equipment Co.
12: To 16:00 Set up to Do Trains on PCM.

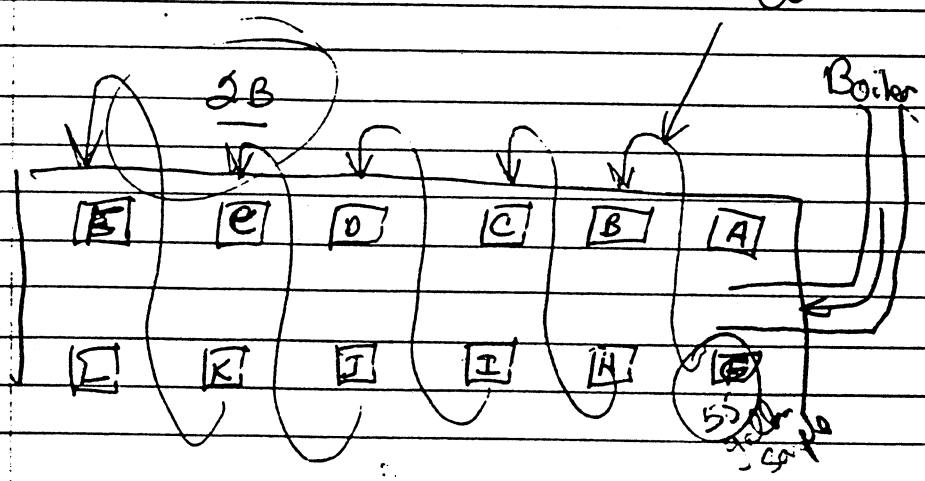
Wednesday 10/14/98
PSCC Comanche
Boiler @ Full Load.

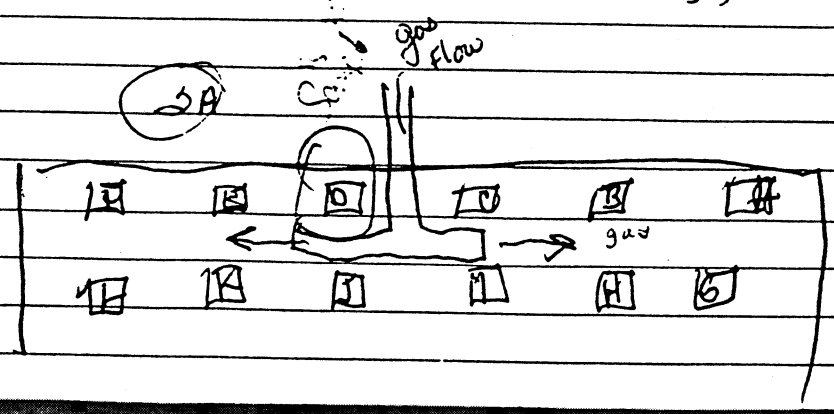
Time	Sample
0900	ECONOMIZER ASH EAST
0900	ECON ASH WEST
0915	Coal From 4 mile
1036	Coal From 4 mile
12:23	Coal From 4 mile
13:45	Wet - Bottom Ash 4" Sieve
13:45	Wet - Bottom Ash 3" Sieve
15:10.	Coal From 4 mile
16:30 to 17:30	Baghouse Ash Samples

Wednesday 10/14/98
PSCC Comanche
CONSOL'S Test ID's

Test #	Start Time	Stop Time	Descp.
Consol 3	8:30 A	10:45	AHO (Ontario Hydro Normal)
Consol 3	8:30	10:45	AHO (Ontario Hydro Low Ash)
Consol 3	8:30	9:40	Stack (Ontario Hydro)
Consol #3A	10:50	12:18	Stack
Consol #4	15:15	17:45	Ah O (Matt D.)
Consol #4	16:12	18:32	PCM Inlet (Ontario Hydro)
Consol #4	16:12	18:20	PCM Outlet (Ontario Hydro)

Clean Sequence Time & Process indicate





* See Plant Picture

Cleaning

Rm 209
N. Habek

Wednesday 10/14/98
PSCC Comanche
Justin's IC TRAP ID.

Test #	Start Time	Stop Time	Location
Con 7 in	0900	0945	Inlet PCM
Con 7 out	0900	0945	Outlet PCM
Con 8 in	10:50	11:17	Inlet Pcm
Con 8 out	10:50	11:17	outlet Pcm
Con 9 in	11:44	.20	~~Finished~~
Con 9 out	11:44	12:20	Finished

Wednesday 10/14/98
PSCC Comanche
Jason's Mesa Trains

	Test #	Start Time	Stop Time	Location	Com
(S)	M-1 - In	13:08	~~13:20~~ 13:55	PCM Inlet	Prior To Off #4
(S)	Mesa-2 - In	16:22	17:12	Pcm Inlet	During Off #4
(S)	Mesa-2 - out	16:15	17:19	Pcm outlet	During off #4
(A)	Mesa-3 - In	17:42	18:48	Pcm Inlet	Tail end of Off 4
(A)	Mesa-3 - Out	17:49	18:52	Pcm Outlet	Tail end of Off #4
(S)	Mesa-4 - In			Pcm	
(S)	Mesa-4 - out	12:45		Pcm out	

Wednesday 10/14

Thursday 10/15

Notes: Jason Ruhl has Documentation Regarding what is Standard and what is a alternate test.

~~[illegible]~~

(10/14/98)

Re Test
Unit @ 7 pm
Comanche Unit 2

Test # 4 Comparisons

	Matt	Lenny
Probe	0.7000	1.6650
Cyclone	3.932	1.0733
Filters	0.8864	1.0575
	5.5190	3.7958

Matt's Test is @ the Air Heater Outlet
Lenny's Test is @ the PCM Inlet.
This Should make a good Comparison as to what Hg is @ the Air heater outlet and what fraction of the ATO Mercury gets to our baghouse.

Comanche

Thursday 10/15/98

7:30 Am found the PCM off Line. Looks like Boiler Lead Signal was that the Cause.
Jason R. Started the test @ 8:04

8:30 George Rahman called, Reminded us that Cars are to be parked at the Contractors ~~lot~~ lot during the Testing. I said to him, I did get the Message yesterday, and I look Care of everything.

10:15 Still Not Testing! PCM is too Cold

10:16 Found the Baghouse in Bad condition. Talked to Outside Tender, he Stopped the System. (Hopefully this won't Prevent ash Samples)

10:16 Placed the Ash Drums from Tuesdays Test in Trailer Silo. (I may Move these Home!!)

11:43 Still not Testing, Temps are Still not quite there

12:00 Start Testing: Concurrent Ontario testing
1 @ AHO
1 @ PCM Inlet
1 @ PCM Outlet.

Thursday 10/15/9

12:00 Matt De Vito / Norm Haber Korn on AHO. Running air heater control Normal Ontario Hydro.
Ron ODA - Leonard - Justin Doing the PCM Ontario Hydro Test

CONSOL TEST ID'S 10/15/98

Test #	Start Time	Stop Time	Location	
CONSOL 5	12:00	14:10	AHO	(Matt / Norm
CONSOL 5	12:25	14:10	Pilot / INLET	Ron / Lenny
CONSOL 5	12:25	14:10	Pilot / outlet	Ron / Lenny
CONSOL 6	15:15	17:30	AHO	(Matt / Norm
CONSOL 6	16:06	17:55	Pcm / Inlet	Ron / Lenny
Consol 6	16:06	17:55	PCM / out	Ron / Lenny

Samples 10/15/98

Time	Location
12:25	Coal (4 mills)
14:25	Wet Bottom Ash A & B Unit. 2.
14:40	ECON. ASH "A" Side (East)
14:40	ECON ASH "B" Side (West)
14:45	Coal Sample (4 mills)
17:43	Coal Sample (4 mills
16:06	Baghouse ~~Ash~~ Sample

Appendix B

Comanche Unit #2 Ash Sampling Matrix

Unit	Sample Description	Date	Time	Bag/Box Number	Sample Number	Comments
Comanche #2	Coal Sample 2 / 2	10/13/98	17:50	6	40	
Comanche #2	Coal Sample 1 / 2	10/13/98	17:50	6	41	
Comanche #2	Ash/Hopper 2AA	10/13/98	18:13	7	42	
Comanche #2	Ash/Hopper 2AB			7	43	Hopper 2AB inaccessible--No sample collected
Comanche #2	Ash/Hopper 2AC	10/13/98	18:14	7	44	
Comanche #2	Ash/Hopper 2AD	10/13/98	18:15	7	45	
Comanche #2	Ash/Hopper 2AE	10/13/98	18:18	7	46	
Comanche #2	Ash/Hopper 2AF	10/13/98	18:19	7	47	
Comanche #2	Ash/Hopper 2AG	10/13/98	18:08	7	48	
Comanche #2	Ash/Hopper 2AH	10/13/98	18:07	7	49	
Comanche #2	Ash/Hopper 2AI	10/13/98	18:07	7	50	
Comanche #2	Ash/Hopper 2AJ	10/13/98	18:05	7	51	
Comanche #2	Ash/Hopper 2AK	10/13/98	18:04	7	52	
Comanche #2	Ash/Hopper 2AL	10/13/98	18:03	7	53	
Comanche #2	Ash/Hopper 2BA	10/13/98	15:52	7	54	
Comanche #2	Ash/Hopper 2BB	10/13/98	15:44	7	55	
Comanche #2	Ash/Hopper 2BC	10/13/98	15:40	7	56	
Comanche #2	Ash/Hopper 2BD	10/13/98	15:40	7	57	
Comanche #2	Ash/Hopper 2BE	10/13/98	15:54	7	58	
Comanche #2	Ash/Hopper 2BF	10/13/98	15:58	7	59	
Comanche #2	Ash/Hopper 2BG	10/13/98	16:20	7	60	
Comanche #2	Ash/Hopper 2BH	10/13/98	16:17	7	61	
Comanche #2	Ash/Hopper 2BI	10/13/98	16:15	7	62	
Comanche #2	Ash/Hopper 2BJ	10/13/98	16:09	7	63	
Comanche #2	Ash/Hopper 2BK	10/13/98	16:06	7	64	
Comanche #2	Ash/Hopper 2BL	10/13/98	16:01	7	65	
Comanche #2	Econ. Ash-East	10/13/98	11:20	6	66	
Comanche #2	Econ. Ash-West	10/13/98	11:20	6	67	
Comanche #2	Econ. Ash-East	10/13/98	14:20	6	68	
Comanche #2	Econ. Ash-West	10/13/98	14:20	6	69	
Comanche #2	Wet Btm Ash-East	10/13/98	14:20	6	70	
Comanche #2	Wet Btm Ash-West	10/13/98	14:20	6	71	

Comanche #2	Coal Sample 1 / 2	10/14/98		6	72	
Comanche #2	Coal Sample 2 / 2	10/14/98		6	73	
Comanche #2	Ash/Hopper 2AA	10/14/98	17:20	8	74	
Comanche #2	Ash/Hopper 2AB			8	75	Hopper 2AB inaccessible--No sample collected
Comanche #2	Ash/Hopper 2AC	10/14/98	17:23	8	76	
Comanche #2	Ash/Hopper 2AD	10/14/98	17:25	8	77	
Comanche #2	Ash/Hopper 2AE	10/14/98	17:27	8	78	
Comanche #2	Ash/Hopper 2AF	10/14/98	17:30	8	79	
Comanche #2	Ash/Hopper 2AG	10/14/98		8	80	
Comanche #2	Ash/Hopper 2AH	10/14/98	17:12	8	81	
Comanche #2	Ash/Hopper 2AI	10/14/98	17:09	8	82	
Comanche #2	Ash/Hopper 2AJ	10/14/98	17:06	8	83	
Comanche #2	Ash/Hopper 2AK	10/14/98	17:04	8	84	
Comanche #2	Ash/Hopper 2AL	10/14/98	17:06	8	85	
Comanche #2	Ash/Hopper 2BA	10/14/98	16:30	8	86	
Comanche #2	Ash/Hopper 2BB	10/14/98	16:34	8	87	
Comanche #2	Ash/Hopper 2BC	10/14/98	16:37	8	88	
Comanche #2	Ash/Hopper 2BD	10/14/98	16:38	8	89	
Comanche #2	Ash/Hopper 2BE	10/14/98	16:42	8	90	
Comanche #2	Ash/Hopper 2BF	10/14/98	16:44	8	91	
Comanche #2	Ash/Hopper 2BG	10/14/98	17:00	8	92	
Comanche #2	Ash/Hopper 2BH	10/14/98	16:57	8	93	
Comanche #2	Ash/Hopper 2BI	10/14/98	16:54	8	94	
Comanche #2	Ash/Hopper 2BJ	10/14/98	16:52	8	95	
Comanche #2	Ash/Hopper 2BK	10/14/98	16:50	8	96	
Comanche #2	Ash/Hopper 2BL	10/14/98	16:47	8	97	
Comanche #2	Econ. Ash-East	10/14/98	9:00	6	98	
Comanche #2	Econ. Ash-West	10/14/98	9:00	6	99	
Comanche #2	Wet Btm Ash-East	10/14/98	14:10	6	100	
Comanche #2	Wet Btm Ash-West	10/14/98	14:10	6	101	

Comanche #2	Coal Sample 1 / 2	10/15/98	16:00	6	102	
Comanche #2	Coal Sample 2 / 2	10/15/98	16:00	6	103	
Comanche #2	Ash/Hopper 2AA	10/15/98	16:50	9	104	
Comanche #2	Ash/Hopper 2AB	10/15/98		9	105	Hopper 2AB inaccessible-- No sample collected
Comanche #2	Ash/Hopper 2AC	10/15/98	16:48	9	106	
Comanche #2	Ash/Hopper 2AD	10/15/98	16:56	9	107	
Comanche #2	Ash/Hopper 2AE	10/15/98	16:57	9	108	
Comanche #2	Ash/Hopper 2AF	10/15/98	17:00	9	109	
Comanche #2	Ash/Hopper 2AG	10/15/98	16:47	9	110	
Comanche #2	Ash/Hopper 2AH	10/15/98	16:45	9	111	
Comanche #2	Ash/Hopper 2AI	10/15/98	16:43	9	112	
Comanche #2	Ash/Hopper 2AJ	10/15/98	16:40	9	113	
Comanche #2	Ash/Hopper 2AK	10/15/98	16:37	9	114	
Comanche #2	Ash/Hopper 2AL	10/15/98	16:35	9	115	
Comanche #2	Ash/Hopper 2BA	10/15/98	17:04	9	116	
Comanche #2	Ash/Hopper 2BB	10/15/98	17:07	9	117	
Comanche #2	Ash/Hopper 2BC	10/15/98	17:10	9	118	
Comanche #2	Ash/Hopper 2BD	10/15/98	17:12	9	119	
Comanche #2	Ash/Hopper 2BE	10/15/98	17:13	9	120	
Comanche #2	Ash/Hopper 2BF	10/15/98	17:17	9	121	
Comanche #2	Ash/Hopper 2BG	10/15/98	16:33	9	122	
Comanche #2	Ash/Hopper 2BH	10/15/98	16:31	9	123	
Comanche #2	Ash/Hopper 2BI	10/15/98	17:27	9	124	
Comanche #2	Ash/Hopper 2BJ	10/15/98	17:25	9	125	
Comanche #2	Ash/Hopper 2BK	10/15/98	16:23	9	126	
Comanche #2	Ash/Hopper 2BL	10/15/98	16:20	9	127	
Comanche #2	Econ. Ash-East	10/15/98	~ 14:00	6	128	
Comanche #2	Econ. Ash-West	10/15/98	~14:00	6	129	
Comanche #2	Wet Btm Ash-East	10/15/98	14:25	6	130	
Comanche #2	Wet Btm Ash-West	10/15/98	14:25	6	131	

Appendix C

Field Sampling Sheets

Air Preheater Outlet (Baghouse Inlet) Ontario Hydro Hg Sheets

Baghouse Outlet (Stack) Ontario Hydro Hg Sheets

Air Preheater Outlet (Baghouse Inlet) Pitot Sheets

Baghouse Outlet (Stack) Pitot Sheets

ADA/PSCO Hg SAMPLING DATA SHEET – AIR PRE-HEATER OUTLET

(ISO)

PLANT	Comanche Station, Pueblo, CO
LOCATION	AIR PRE-HEATER OUTLET
DUCT DIMENSIONS	34'-9" x 13'-4.5"
DUCT AREA	465 ft²
DATE	October 13, 1998
TIME	Start- 0930 Stop- 1210
METER BOX	NuTech # 2
OPERATOR(S)	MSD

AMBIENT TEMP [F°]	55	COLLECTED H_2O [grams]	
BAROMETRIC PRES ["Hg]	25.66	COLLECTED DUST [grams]	
$\%H_2O$ (Assumed)	8	DRY MOLE WT (Assumed)	29
PROBE LENGTH [ft]	5	WET MOLE WT (Assumed)	30
NOZZLE ID [inch]	1/4 A 0.252		
METER FACTOR: ΔH	1.844		
METER FACTOR: Y	1.000		
(E7) PITOT TUBE: C_p	0.834	PITOT ID #	E7
K	2.60	FILTER ID #	1
		IMPINGER BOX ID #	OH-1 APH inlet

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(OH #1)

DUCT-PORT	SAMPLE TIME [minute]	STATIC PRESSURE ["H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD ["H_2O]	ΔH METER SETTING ["H_2O]	METER READING [ft³]	METER TEMP [°F] (Assumed= 75) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM ["Hg]
			300				723.00			250						
WEST-A (4)	0-8	-14.0	309		0.43	1.12	728.84	62	57	249	267	6.8	13.4		59	6.5
WEST-B (E)	8-16	-13.7	307		0.27	0.70	732.76	64	59	280	267	4.6	15.5		55	5.0
WEST-C (D)	16-24	-13.9	290		0.24	0.62	736.55	65	61	287	266	5.2	14.9		54	5
WEST-D (C)	24-32	-13.2	290		0.24	0.62	740.50	67	63	275	265	3.5	16.5		55	5
WEST-E (B)	32-40	-13.9	268		0.52	1.35	745.74	68	64	280	266	5.2	14.9		51	9
WEST-F	—	O	B	S	T	R	U	C	T	I	O	N	—			
WEST-G (A)	40-48	-13.6	245		0.62	1.61	751.68	69	64	275	277	7.9	12.3		54	11
WEST-H	~~48-56~~						~~754.10~~									
EAST-A	48-56	-14.0	240		0.48	1.25	(752.40) 757.60	69	66	272	277	9.9	10.5		51	9
EAST-B	56-64	-14.0	275		0.42	1.09	762.52	70	67	275	282	4.4	15.7		53	8
EAST-C		O	B	S	T	R	U	C	T	I	O	N			—	—
EAST-D	64-72	-13.3	288		0.25	0.65	766.45	72	68	265	280	4.6	15.5		57	7
EAST-E	72-80	-13.8	298		0.25	0.65	770.35	74	70	265	281	4.9	15.2		59	7
EAST-F	80-88	-13.8	330		0.25	0.65	774.25	75	71	267	282	2.8	17.2		61	7
EAST-G	~~88-96~~															
EAST-H	88-96	-13.9	330		0.55	1.43	780.00	76	72	290	281	5.1	15.0		62	12
AVERAGE	96 min	-13.8	289	RMS	(0.365)	0.945	56.28	(67.2)				5.41	14.7			

Pre-Leak Check: OK. 6.02 CFM @ 12"Hg Post-Leak Check: 15" Hg - 6.02 CFM

POSITIVE YAW IS CLOCKWISE

[O:\APPRES\STACK\ADA-98\AIROUTSH;RLO;10/6/98]

Start @ last H

Gas flow started inadvertently @ start of test. Gas vol uncertainty will be determined

15 min Purge

ADA/PSCO Hg SAMPLING DATA SHEET--STACK

PLANT	Comanche Station, Pueblo, CO	AMBIENT TEMP [F°]		COLLECTED H_2O [grams]	
LOCATION	STACK	BAROMETRIC PRES ["Hg]	25.66	COLLECTED DUST [grams]	
STACK DIAMETER	~~21~~ ft = ~~252~~ inches	%H_2O (Assumed)	8	DRY MOLE WT (Assumed)	
STACK AREA	~~346~~ ft² 424	PROBE LENGTH [ft]		WET MOLE WT (Assumed)	
DATE	October 13, 1998	NOZZLE ID [inch]	0.248	1/4E	
TIME	Start- 0935 Stop- 1155	METER FACTOR: Δ H	1.888		
METER BOX	NuTech # 3	METER FACTOR: Y	1.060	PITOT ID #	[redacted]
		PITOT TUBE: C_p	0.827	FILTER ID #	6
OPERATOR(S)	(1) Rio, Norm NJH	829.20 (6) K	2.82 (4)	(2) IMPINGER BOX ID #	

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(Test #1)

pitot leak ck - OK

E-1A

E-1

(5)

TRAVRSE POINT [" from wall]	SAMPLE TIME [minute]	STATIC PRESSURE [" H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD [" H_2O]	ΔH METER SETTING [" H_2O]	METER READING [ft³]	METER TEMP [°F] (Assumed=) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM [" Hg]
	0 5		295		0.78	2.06	833.20	69	65	211	273	4.7	15.3		53	10
	10		296		0.80	2.10	837.21	73	66	211	271	4.7	15.3		52	10.5
South	15	~0.7	296		0.77	2.02	841.16	76	67	215	271	4.6	15.4		53	10
	20		297		0.81	2.12	845.15	78	67	219	266	4.5	15.5		56	10
8' in	25		298		.81	2.10	849.14	80	69	229	266	4.6	15.4		58	10
	30		298		.75	2.0	853.09	81	70	229	265	4.6	15.4		58	10
	* 35		299		.78	2.01	857.16	82	71	232	266	4.7	15.3		59	10
	40		300		.79	2.06	861.02	83	72	230	266	4.5	15.5		58	10
	45		299		.75	1.97	864.04	84	73	229	265	4.5	15.5		59	10
	* 50		301		.75	1.97	868.98	84	74	227	264	4.4	15.7		86	10
	55		300		.77	2.03	872.81	85	75	227	265	4.5	15.5		58	10
	60		300		.77	2.03	876.78	86	76	227	266	4.5	15.5		59	10
	* 65	~0.8	300		.78	2.05	880.77	87	77	230	267	4.4	15.6		60	10
	70		301		.76	2.0	884.73	88	78	234	268	4.7	15.3		58	10
	* 75		301		.79	2.08	888.71	88	78	234	266	4.5	15.5		57	10
	* 80		301		.78	2.05	892.71	90	80	236	275	4.3	15.7		58	10
	88		301		.76	2.0	896.71	95	80	235	276	4.4	15.6		58	10
	90		302		.78	2.05	900.71	90	81	237	276	4.5	15.5		60	10
	* 95		302		.78	2.05	904.76	90	82	233	276	4.6	15.4		60	10
	100		303		.79	2.09	908.78	92	83	236	276	4.7	15.3		56	10
	105		304		.76	2.0	912.78	93	83	238	277	4.4	15.6		57	10
	110		304		.77	2.03	916.88	94	85	238	276	4.6	15.4		58	10
	* 115		305		.81	2.10	920.81	95	85	240	277				59	10
	* 120		302		.75	1.98	924.92	96	86	240	276	4.4	156		60	10
AVERAGE																

Pre-Leak Check: OK <0.01 ft³/min @ 10" Hg Post-Leak Check: OK <0.01 ft³/min @ 10" Hg

A[illegible]PS[illegible] Hg [illegible]AMP[illegible]NG D[illegible]A S[illegible]ET—STA[illegible]

PLANT	Comanche Station, Pueblo, CO	AMBIENT TEMP [F°]		COLLECTED H_2O [grams]	
LOCATION	STACK	BAROMETRIC PRES ["Hg]	25.66	COLLECTED DUST [grams]	
STACK DIAMETER	~~21~~ ft = ~~252~~ inches	%H_2O (Assumed)	8	DRY MOLE WT (Assumed)	
STACK AREA	~~346~~ ft² 424	PROBE LENGTH [ft]		WET MOLE WT (Assumed)	
DATE	October 13, 1998	NOZZLE ID [inch]	0.248	1/4 E	
TIME	Start- 0935 Stop- 1155	METER FACTOR: Δ H	1.888		
METER BOX	NuTech # 3	METER FACTOR: Y	~~1.050~~	1.050	PITOT ID # E-1A
		PITOT TUBE: C_p	.827	E-1	FILTER ID # 6
OPERATOR(S)	① Rio, NJT	START → 829.09	⑥ K	2.62	② IMPINGER BOX ID #

Page 2 of 2

(Test #1)

TRAVRSE POINT [" from wall]	SAMPLE TIME [minute]	STATIC PRESSURE ["H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD ["H_2O]	ΔH METER SETTING ["H_2O]	METER READING [ft³]	METER TEMP [°F] (Assumed=) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM ["Hg]
	125		305		.77	2.02	928.83	97	87	234	277	4.6	15.4		61	10
South	130		306		.77	2.02	932.86	98	88	236	276	4.5	15.5		59	10
	135		306		0.77	2.02	936.90	98	89	238	277	4.4	15.6		60	10
8 11A	140		304		0.75	1.97	940.89	99	89	240	278	4.5	15.5		60	10
AVERAGE	140		301.1		0.775	2.035	111.69	82.1				4.44	15.47			

10 min purge

(4.53) (15.47)

Pre-Leak Check:

Post-Leak Check:

ADA/PSCO Hg SAMPLING DATA SHEET--AIR PRE-HEATER OUTLET

No. 1 ES

Test #2

Page 1 of 1

PLANT	Comanche Station, Pueblo, CO	AMBIENT TEMP [F°]	80	COLLECTED H_2O [grams]	
LOCATION	AIR PRE-HEATER OUTLET	BAROMETRIC PRES ["Hg]	25.55	COLLECTED DUST [grams]	
DUCT DIMENSIONS	34'-9" x 13'-4.5"	%H_2O (Assumed)	8	DRY MOLE WT (Assumed)	
DUCT AREA	465 ft^2	PROBE LENGTH [ft]	5'	WET MOLE WT (Assumed)	
DATE	October 13, 1998	NOZZLE ID [inch]	1/2"		
TIME	Start-(1423 Stop-1529)(1555-1658)	METER FACTOR: ΔH	1.948		
METER BOX	NuTech # 5	METER FACTOR: Y	1.015	PITOT ID #	
		PITOT TUBE: C_p		FILTER ID #	2
OPERATOR(S)	LLA	K		IMPINGER BOX ID #	Len

DUCT-PORT	SAMPLE TIME [minute]	STATIC PRESSURE [" H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD [" H_2O]	ΔH METER SETTING [" H_2O]	METER READING [ft^3]	METER TEMP [°F] (Assumed=) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM [" Hg]
			1			①	996.70	6	7	2	3				4	
WEST-A	0-8		260			1.2	1.90	81	82	273	258	7.7	9.8	476	55	-5
WEST-B	8-16		282			↓	6.91	84	83	257	259	5.0	11.8	673	54	-6
WEST-C	16-24		306				12.00	89	87	260	258	3.4	13.8	328	54	-6.5 ★✓
WEST-D	24-32		297				17.10	90	89	265	260	5.2	11.7	507	54	-7
WEST-E	32-40		323				22.40	91	90	272	259	4.7	12.2	507	56	-7.5
WEST-F	~	O	B	S	T	R	U	C	T	I	O	N				
WEST-G	~															★ 21.0
WEST-H	40-48		325				27.71	92	91	266	252	6.7	10.7	465	61	-8
							② Start 28.3									
EAST-A	48-56		250				33.63	91	93	281	260	9.5	8.5	863	63	-8.5
EAST-B	56-64		278				38.93	96	95	283	256	5.3	11.7	797	58	-8.5
EAST-C	~	O	B	S	T	R	U	C	T	I	O	N				
EAST-D	64-72		288				44.13	97	96	279	251	5.4	11.5	off	60	-8.5 ★
EAST-E	72-80		302				49.26	98	98	276	260	5.8	11.2	off	61	-8.5 21.0
EAST-F	80-88		341				54.30	98	98	273	259	3.4	13.0	off	62	-8.5
EAST-G	~															
EAST-H	88-96		338				59.40	99	98	275	260	6.2	10.9	873	64	-9.0
AVERAGE	(96)		(299)			(1.2)	(62.11)	(91.9)				(5.69)	(11.34)			

Pre-Leak Check: "0" @ 10" Hg. ① (< 0.02 / Min ② ↑10" Hg. (0.02 in 1.5 min)) Post-Leak Check: (0 in Hg @ 10) End → 0.02 Leakage 0.7 Min 0.025 " → 0.1 Min

POSITIVE YAW IS CLOCKWISE

[O:\APPRES\STACK\ADA-98\AIROUTSH.RLO,10/8/98]

Final O_2 Meter check: 21.0

★ O_2 Meter check

After Test → purged 10 Min

ADA/ SCO ng SAMPLING DATA SHEET — PRE HEATER OUTLET

Page 1 of 1

PLANT	Comanche Station, Pueblo, CO
LOCATION	AIR PRE-HEATER OUTLET
DUCT DIMENSIONS	34'-9" x 13'-4.5"
DUCT AREA	465 ft²
DATE	October 13, 1998
TIME	Start- 1420 Stop- 17.00
METER BOX	NuTech # 2
OPERATOR(S)	MSO

AMBIENT TEMP [F°]	75	COLLECTED H_2O [grams]	
BAROMETRIC PRES ["Hg]	25.55	COLLECTED DUST [grams]	
%H_2O (Assumed)	8	DRY MOLE WT (Assumed)	29
PROBE LENGTH [ft]	5	WET MOLE WT (Assumed)	30
NOZZLE ID [inch]	1/4 A	0.252	
METER FACTOR: ΔH	1.844		
METER FACTOR: Y	1.000	PITOT ID.#	5-7
PITOT TUBE: C_p	0.834	FILTER ID #	4
K	2.60	IMPINGER BOX ID #	014-2

OH-2 Air Preheater outlet

DUCT-PORT	SAMPLE TIME [minute]	STATIC PRESSURE ["H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD ["H_2O]	ΔH METER SETTING ["H_2O]	METER READING [ft³]	METER TEMP [°F] (Assumed=) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM ["Hg]
							803.00									
WEST-A	8	-14.2	266		0.60	1.00	863.70	85	83	250	280	5.7	14.4		62	18
WEST-B	8	-14.1	284		0.45	1.20/1.30	858.81		83	255	280	3.9	16.1		61	18
WEST-C	8	-13.9	305		0.25	0.65	853.86	85	83	275	280	3.1	17.0		62	10
WEST-D	8	-13.6	293		0.25	0.65	849.89	85	83	280	280	5.1	15.0		65	9
WEST-E	8	-13.5	326		0.28	0.73	845.88	85	83	290	282	4.0	16.0	—	60	10
WEST-F		O	B	S	T	R	U	C	T	I	O	N				
WEST-G		~~13.5~~	~~326~~		~~0.30~~	~~0.73~~	—	~~85~~	~~83~~	~~290~~	~~282~~	~~4.0~~	~~15.0~~	—	~~60~~	~~10~~
WEST-H	8	-13.9	323		0.48	1.25	836.61 841.67	84	83	290	286	6.8	13.4		59	18
EAST-A	8	-13.6	255		0.58	1.51	832.30	86	83	285	280	12.0	8.5	—	57	15
EAST-B	8	-13.63	286		0.42	1.09	826.15	85	82	265	285	8.1	12.1	—	60	8
EAST-C		O	B	S	T	R	U	C	T	I	O	N		—	—	—
EAST-D	8	-13.2	301		0.28	0.73	821.30	85	82	255	280	9.3	11.0	—	58	7
EAST-E	8	-13.6	306		0.30	0.78	816.94	84	81	275	285	9.3	11.0	—	61	7
EAST-F																
EAST-G	8	-14.0	340		0.25	0.65	812.50	83	81	268	283	5.5	14.6	—	68	7
EAST-H	8	-14.2	342 ~~0.56~~		0.56	1.46 0.98	808.50	82	80	268	267	5.0	15.2	—	68	17
AVERAGE	96	13.6	302	Rms	0.381	~~0.99~~	56.39	83.4				~~16.0~~	13.7			

Pre-Leak Check: 14" Hg - <0.02 CFM Pitot OK Post-Leak Check: 13" Hg - <0.02 CFM

POSITIVE YAW IS CLOCKWISE

MSO

[O:\APPRES\STACK\ADA-98\AIROUTSH;RLO;10/6/98]

1420 hrs

Leak Test after Moving To west duct was unacceptable. Corrected

West Volume 836.61 → 863.70

East Volume 803.00 → 832.30

Leak suspect

ADA/PSCO Hg SAMPLING DATA SHEET — STACK

PLANT	Comanche Station, Pueblo, CO	AMBIENT TEMP [F°]		COLLECTED H_2O [grams]	
LOCATION	STACK	BAROMETRIC PRES [°Hg]	25.55	COLLECTED DUST [grams]	
STACK DIAMETER	~~21~~ ft = ~~252~~ inches	%H_2O (Assumed)	8	DRY MOLE WT (Assumed)	
STACK AREA	~~346~~ ft² 4.4	PROBE LENGTH [ft]		WET MOLE WT (Assumed)	
DATE	October 13, 1998	NOZZLE ID [inch]	0.248	1/4E	
TIME	Start- 1430 Stop- 1650	METER FACTOR: Δ H	1.088		
METER BOX	NuTech # 3.	METER FACTOR: Y	1.050	PITOT ID #	E-1A
		PITOT TUBE: C_p	0.827	FILTER ID #	3
OPERATOR(S)	RWR, NJH	949.80	2.61	IMPINGER BOX ID #	

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pitot leak ck of test #2

TRAVRSE POINT [" from wall]	SAMPLE TIME [minute]	STATIC PRESSURE [" H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD [" H_2O]	ΔH METER SETTING [" H_2O]	METER READING [ft³]	METER TEMP [°F] (Assumed=) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM [" Hg]
	5		314		.80	2.1	953.81	81	80	218	256	~~5.2~~	~~15.0~~		64	9
5 port	10		316		.83	2.202	957.89	82	80	244	279	4.6	15.4		52	9
	* 15		315		.81	2.15	961.97	84	81	254	287	4.6	15.4		53	9.1
8' in	20		315		.80	2.10	966.01	86	81	260	289	4.5	15.5		58	9.1
	25		315		.78	2.05	970.06	87	81	261	289	4.3	15.7		61	9.1
	* 30		315		.80	2.09	974.12	88	82	261	289	4.5	15.6		58	9.1
	35		316		.79	2.07	978.15	89	82	262	286	4.7	15.3		58	9.0
	40		316		.83	2.19	982.25	90	83	262	287	4.5	15.5		59	9.3
	* 45		316		.78	2.03	986.29	91	84	262	286	4.5	15.5		59	9.1
	50		316		.76	2.0	990.33	91	84	263	286	4.6	15.4		59	9.0
	55		316		.78	2.03	994.43	92	85	261	286	4.5	15.7		59	9
	* 60		316		.77	2.01	998.41	93	85	263	287	4.4	15.6		60	9
	65		316		.8	2.1	002.46	93	86	262	286	4.4	15.6		59	9
	70		316		.78	2.03	006.51	93	86	264	286	4.7	15.3		58	9
	* 75		316		.83	2.2	010.69	93	86	264	285	4.5	15.5		58	9
	80		316		.80	2.1	014.67	94	86	264	286	4.3	15.7		59	9.1
	~~85~~	SHUT DOWN FOR 15 MIN														
	* ~~85~~		316		.78	2.05	018.77	90	86	244	285	4.4	15.6		67	9
	90		317		.78	2.05	022.80	92	87	255	286	4.5	15.5		55	9
	95		317		.80	2.1	026.87	93	87	260	286	4.5	15.5		58	9
	* 100		316		.76	1.99	030.09	94	87	260	286	4.5	15.5		61	9
	105		317		.82	2.13	034.95	94	87	259	286	4.5	15.5		59	9
	110		317		.81	2.12	039.04	94	87	258	285	4.4	15.6		58	9
	115		316		.78	2.02	043.35	95	88	257	286	4.5	15.6		59	
AVERAGE																

Pre-Leak Check: OK <0.01 ft³/min @ 10" Hg Post-Leak Check: OK <0.01 ft³/min @ 10" Hg

POSITIVE YAW IS CLOCKWISE

IO:\APPRES\STACK\ADA 98\M5 12PT.RIO(20098)

A[illegible] PSC[illegible] Hg [illegible]MP[illegible]G D[illegible]A S[illegible]ET — STA[illegible]

PLANT	Comanche Station, Pueblo, CO
LOCATION	STACK
STACK DIAMETER	~~21~~ ft = ~~252~~ inches
STACK AREA	~~346~~ ft² 452
DATE	October 13, 1998
TIME	Start- 1430 Stop- 1650
METER BOX	NuTech # 3
OPERATOR(S)	[illegible]

AMBIENT TEMP [F°]	
BAROMETRIC PRES [°Hg]	25.55
%H_2O (Assumed)	8
PROBE LENGTH [ft]	
NOZZLE ID [inch]	0.248 1/4 E
METER FACTOR: Δ H	1.888
METER FACTOR: Y	1.050
PITOT TUBE: C_p	.827
K	2.61

COLLECTED H_2O [grams]	
COLLECTED DUST [grams]	
DRY MOLE WT (Assumed)	
WET MOLE WT (Assumed)	
PITOT ID #	E-1A
FILTER ID #	3
IMPINGER BOX ID #	

Test #2

TRAVRSE POINT [" from wall]	SAMPLE TIME [minute]	STATIC PRESSURE [" H_2O]	STACK TEMP [°F] (1)	NULL YAW [°]	PITOT HEAD [" H_2O]	ΔH METER SETTING [" H_2O]	METER READING [ft³]	METER TEMP [°F] (Assumed=) (6) inlet	(4) outlet	PROBE TEMP [°F] (2)	FILTER TEMP [°F] (3)	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F] (5)	METER VACUUM [" Hg]
	120		317		.81	2.12	047.26	95	88	256	286	4.8	15.2		61	9
	*125		316		.81	2.12	051.25	95	88	255	286	4.6	15.4		60	9.1
South port 8" IN	130		317		.81	2.12	055.40	95	88	254	284	4.6	15.4		59	9.2
AVERAGE	130		316		0.796	2.087 ~~2.12~~	105.60	87.9				4.5	15.50			

10 min purge

Pre-Leak Check:

Post-Leak Check:

ADA/PSCO Hg SAMPLING DATA SHEET -- AIR PRE-HEATER OUTLET

(N 3 5)

PLANT	Comanche Station, Pueblo, CO	AMBIENT TEMP [F°]	52	COLLECTED H_2O [grams]	
LOCATION	AIR PRE-HEATER OUTLET	BAROMETRIC PRES [°Hg]	25.40	COLLECTED DUST [grams]	
DUCT DIMENSIONS	34'-9" x 13'-4.5"	%H_2O (Assumed)		DRY MOLE WT (Assumed)	
DUCT AREA	465 ft^2	PROBE LENGTH [ft]	5'	WET MOLE WT (Assumed)	
DATE	October 14, 1998	NOZZLE ID [inch]	1/2		
TIME	(① Start-0830 Stop-0930)(.0948 -	) METER FACTOR: ΔH	1.948		
METER BOX	NuTech # 5	METER FACTOR: Y	1.015	PITOT ID #	
		PITOT TUBE: C_p		FILTER ID #	8
OPERATOR(S)	LLA	K		IMPINGER BOX ID #	Len

Page 1 of 1

(Test #3)

DUCT-PORT	SAMPLE TIME [minute]	STATIC PRESSURE [°H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD [°H_2O]	ΔH METER SETTING [°H_2O]	METER READING [ft^3]	METER TEMP [°F] (Assumed=) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM [°Hg]
			1				97.5	6	7	2	3				4	
WEST-A	88/96		254			1.2	128.42	87	86	264	261	7.2	10.2	476	58	-7.5
WEST-B	80/88		272			1.2	123.20	86	84	266	261	5.1	11.8	655	57	-7.5
WEST-C	72/80		293			1.2	118.06	85	84	269	260	3.0	13.0	814	56	-7.5
WEST-D	64/72		284			1.2	112.90	83	83	267	259	4.8	12.0	757	55	-7.5 ★20.8 ok
WEST-E	56/64		313			1.2	107.76	82	81	270	260	4.7	12.1	492	52	-7.5
WEST-F		O	B	S	T	R	U	C	T	I	O	N	Final O_2 check = 20.8			
WEST-G																
WEST-H	48/56		314			1.2	102.50	79	79	243	263	6.8	10.5	737	54	-7
EAST-A	0/8	~~230~~	230			1.2	~~66.50~~ 71.88	~~69~~	~~68~~	255	260	9.1	8.8	off	49	-6
EAST-B	8/16		258			1.2	76.77	72	70	264	261	4.8	12.0	off	52	-6
EAST-C		O	B	S	T	R	U	C	T	I	O	N		~~637~~		★20.5 calib
EAST-D	16/24		267			1.2	81.85	76	73	275	260	5.6	11.4	637	54	-6
EAST-E	24/32		284			1.2	86.86	77	75	280	260	5.6	11.4	off	52	-7
EAST-F	32/40		325			1.2	91.82	79	77	284	260	3.2	13.2	off	52	-7
EAST-G																★20.8 calib
EAST-H	40/48		320			1.2	97.02	81	80	288	260	6.4	10.8	906	52	-7
AVERAGE	96		285			1.2	61.44	79.0				5.53	1.43			

Pre-Leak Check: (① "0" @ 10" Hg) (② "0" @ 10" Hg) Post-Leak Check: (① "0" @ 10" Hg) (② "0" @ 10" Hg.

POSITIVE YAW IS CLOCKWISE

[O:\APPRES\STACK\ADA-98\AIROUTSH;RLO;10/6/98]

(Purged 10 Min.) After Test

★ = O_2 meter check

(ISC)

ADA/PSCO Hg SAMPLING DATA SHEET--AIR PRE-HEATER OUTLET

Page 1 of 1

OH #3
APH outlet

PLANT	Comanche Station, Pueblo, CO
LOCATION	AIR PRE-HEATER OUTLET
DUCT DIMENSIONS	34'-9" x 13'-4.5"
DUCT AREA	465 ft^2
DATE	October 14, 1998
TIME	Start-0820 Stop- 1045
METER BOX	NuTech # 2.
OPERATOR(S)	MSD

AMBIENT TEMP [F°]	52
BAROMETRIC PRES ["Hg]	25.40
$\%H_2O$ (Assumed)	10
PROBE LENGTH [ft]	5
NOZZLE ID [inch]	1/4A .252
METER FACTOR: ΔH	1.844
METER FACTOR: Y	1.000
PITOT TUBE: C_p	0.834
(2.6) K	2.50

COLLECTED H_2O [grams]	
COLLECTED DUST [grams]	
DRY MOLE WT (Assumed)	30.5
WET MOLE WT (Assumed)	29.0
PITOT ID #	E-7
FILTER ID #	7
IMPINGER BOX ID #	OH-APH-3

DUCT-PORT	SAMPLE TIME [minute]	STATIC PRESSURE [" H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD [" H_2O]	ΔH METER SETTING [" H_2O]	METER READING [ft^3]	METER TEMP [°F] (Assumed=75) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM [" Hg]
			360				872.00			300	285					
WEST-A	8	-14.5	246		0.65	1.60	900.69	66	61	265	286	7.0	13.2		51	12
WEST-B	8	-14.6	264		0.50	1.25	894.80	64	59	250	287	4.3	15.7		53	9
WEST-C	8	-14.0	290		0.27	0.68	889.69	63	59	255	283	2.6	17.4		52	6
WEST-D	8	-14.2	285		0.29	0.73	885.72	62	58	260	285	5.0	15.1		51	6
WEST-E	8	-14.2	306		0.29	0.73	881.69	60	57	250	283	4.3	15.7		49	5
WEST-F	0	O	B	S	T	R	U	C	T	I	O	N			—	—
WEST-G	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
WEST-H	8	-14.4	316		0.50	1.250	877.31	58	57	250	280	6.4	13.8		50	7
EAST-A	8	-14.4	248		0.58	0.45	929.96	77	70	288	289	8.3	12.0		56	14
EAST-B	8	-14.4	266		0.53	1.33	924.28	76	69	277	285	4.9	15.0		54	12
EAST-C	0	O	B	S	T	R	U	C	T	I	O	N	—	—	—	—
EAST-D	8	-14.7	280		0.27	0.68	918.72	72	66	292	285	5.2	14.9		58	7
EAST-E	8	-14.4	286		0.27	0.68	914.70	70	66	300	286	5.6	14.5		57	7
EAST-F	8	-14.1	330		0.27	0.68	910.68	70	64	300	288	3.0	17.0		55	7
EAST-G	0	—	—	—	~~0.27~~	~~0.68~~	—	—	—	—	—	—	—	—	—	—
EAST-H	8	-14.6	325		0.60	1.50	906.70	65	62	265	280	5.7	14.4		56	12
AVERAGE	96	-14.4	287	rms	0.405	1.05	57.65	64.6			5.19	~~5.0~~	~~18.1~~	14.89		

Pre-Leak Check: 14" H_g - <0.005 CFM MSD Post-Leak Check: 15" H_g <0.005 CFM- MSD

POSITIVE YAW IS CLOCKWISE

[O:\APPRES\STACK\ADA-98\AIROUTSH;RLO;10/6/98]

Started @ H Port.
West Start Volume: 872.00
West Final Volume = 900.69

Pitots OK

Between Ducts
11" H_g

East Start - 0945 Stop - 1045
Vol - 901.00 - 929.96

AMPSCO Hg SAMPLING DATA SHEET — STACK

PLANT	Comanche Station, Pueblo, CO	AMBIENT TEMP [F°]		COLLECTED H_2O [grams]	
LOCATION	STACK	BAROMETRIC PRES [°Hg]	25.40	COLLECTED DUST [grams]	
STACK DIAMETER	21 ft = 252 inches	%H_2O (Assumed)	11	DRY MOLE WT (Assumed)	
STACK AREA	424 ft²	PROBE LENGTH [ft]		WET MOLE WT (Assumed)	
DATE	October 14, 1998	NOZZLE ID [inch]	0.248		
TIME	Start- 0823 Stop- 1045	METER FACTOR: ΔH	1.888		
METER BOX	NuTech # 3	METER FACTOR: Y	1.050	PITOT ID #	E-1A
		PITOT TUBE: C_p	0.821	FILTER ID #	#9
OPERATOR(S)	(1)	K	2.48	(2) IMPINGER BOX ID #	(3)

Page 1 of 1

pitot leak ck OK

065.80 (4)

(5)

TRAVRSE POINT [" from wall]	SAMPLE TIME [minute]	STATIC PRESSURE [" H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD [" H_2O]	ΔH METER SETTING [" H_2O]	METER READING [ft³]	METER TEMP [°F] (Assumed=(7)) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM [" Hg]
	5		294		.82	2.01	069.73	71	70	219	286	—	—		60	10
	10		295		.80	2.0	073.65	73	70	235	289	4.7	15.3		52	10
SOUTH	15	.8002	295		.82	2.01	077.59	77	71	248	289	4.6	15.4		52	10
PORT	20		295		.82	2.02	081.54	80	72	252	289	4.7	15.3		54	10
8' IN	* 25		295		.81	2.01	085.52	83	73	256	289	4.6	15.4		56	10
	30	.8087	295		.79	1.98	089.49	85	74	256	287	4.6	15.4		57	10
	35		296		.84	2.0	093.48	86	76	254	286	4.6	15.4		58	10
	40		296		.82	2.01	097.47	88	77	258	285	4.6	15.4		59	10
	45		296		.82	2.02	101.47	89	78	253	285	4.6	15.4		58	10
	* 50		297		.85	2.06	105.47	89	79	256	287	4.4	15.6		59	10
	55		297		.84	2.05	109.52	90	80	253	284	4.6	15.4		60	10
	60		298		.80	2.01	113.57	92	81	254	285	4.4	15.6		62	10
	65		298		.83	2.05	119.26	92	82	254	285	4.4	15.6		57	10
	70		299		.82	2.04	121.69	94	84	253	285	4.5	15.5		56	10
	75		299		.83	2.05	125.73	94	84	253	286	4.5	15.5		55	10
	80		299		.82	2.01	129.75	95	85	252	284	4.4	15.6		56	10
	85		299		.83	2.05	133.81	95	85	250	285	4.6	15.4		56	10
AVERAGE	85		296.7		0.821	2.022	68.01	82.2				4.52	15.42			

Pre-Leak Check: < 0.02 ft³/min @ 10" Hg

Post-Leak Check: < 0.02 ft³/min @ 10" Hg

ADAPS Hg SAMPLING DATA SHEET — STACK

PLANT	Comanche Station, Pueblo, CO	AMBIENT TEMP [F°]		COLLECTED H_2O [grams]	
LOCATION	STACK	BAROMETRIC PRES ["Hg]	25.42	COLLECTED DUST [grams]	
STACK DIAMETER	21 ft = 252 inches	%H_2O (Assumed)	11	DRY MOLE WT (Assumed)	
STACK AREA	428 ft²	PROBE LENGTH [ft]		WET MOLE WT (Assumed)	
DATE	October 14, 1998	NOZZLE ID [inch]	0.248		
TIME	Start- 1050 Stop- 1225	METER FACTOR: ΔH	1.888		
METER BOX	NuTech # 3	METER FACTOR: Y	1.050	PITOT ID #	E-1A
		PITOT TUBE: C_p	0.827	FILTER ID #	10
OPERATOR(S)	[illegible]	K	2.47	IMPINGER BOX ID #	

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pitot leak ck OK

Test 3A

140.87

TRAVRSE POINT [" from wall]	SAMPLE TIME [minute]	STATIC PRESSURE ["H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD ["H_2O]	ΔH METER SETTING ["H_2O]	METER READING [ft³]	METER TEMP [°F] (Assumed=) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM ["Hg]
	5		304		.80	1.98	144.83	78	78	206	294	~~78~~	~~78~~		64	8.3
	10		305		.80	2.0	148.79	79	78	227	292	4.7	15.3		61	8.3
SOUTH	15	-0.7799	306		.80	1.98	152.75	81	78	242	288	4.7	15.3		62	8.3
port	20		307		.79	1.97	156.67	82	78	251	286	4.8	15.2		62	8.3
	* 25		307		.78	1.98	160.57	85	78	255	288	4.7	15.3		60	8.3
8 1/4"	30	-0.8523	307		.80	1.98	164.50	88	78	260	288	4.7	15.3		61	8.3
	35		308		.78	1.96	168.48	90	80	264	286	4.5	15.5		59	8.3
	40		308		.75	1.95	172.37	91	81	267	289				58	8.3
	* 45		309		.79	1.91	176.27	93	83	271	286	4.5	15.5		58	8.3
	50		308		.78	1.90	181.16	94	83	269	286	—	—		58	8.2
	55		308		.81	1.92	184.06	93	84	269	285	—	—		60	8.1
	60		308		.79	1.91	188.00	92	84	270	285	—	—		58	8.1
	65		308		.78	1.90	192.08	91	84	270	284	4.7	15.3		58	8.1
	70		309		.78	1.90	195.78	91	84	270	285	4.9	15.1		60	8.1
	75		310		.80	1.93	199.70	91	84	268	285	4.9	15.1		58	8.1
	80		310		.78	1.91	203.60	91	84	269	286	4.8	15.3		57	8.1
	85		310		.81	1.92	207.53	91	84	268	286	4.9	15.1		56	8.1
AVERAGE	85	-0.8061	307.8		0.7894	1.941	66.66	84.3				21.73	15.28			

purged for 10 min after test

Pre-Leak Check: < 0.02 cfm / min @ 10" Hg

Post-Leak Check: < 0.02 cfm / min @ 10" Hg

APPRES HEAMPLING DATA SHEET — AIR PRE-HEATER OUTLET

PLANT	Comanche Station, Pueblo, CO	AMBIENT TEMP [F°]	78	COLLECTED H_2O [grams]	
LOCATION	AIR PRE-HEATER OUTLET	BAROMETRIC PRES ["Hg]	25.30	COLLECTED DUST [grams]	
DUCT DIMENSIONS	34'-9" x 13'-4.5"	%H_2O (Assumed)	10	DRY MOLE WT (Assumed)	30.5
DUCT AREA	465 ft² (x2)	PROBE LENGTH [ft]	5	WET MOLE WT (Assumed)	29
DATE	October 14, 1998	NOZZLE ID [inch]	1/4 A (.252)		
TIME	Start- 1515 Stop- 1745	METER FACTOR: ΔH	1.844		
METER BOX	NuTech # 2	METER FACTOR: Y	1.000	PITOT ID #	E-7
		PITOT TUBE: C_p	0.834	FILTER ID #	#11
OPERATOR(S)	MSD	K	2.50	IMPINGER BOX ID #	01f

Stack west

AP1 outlet #4

DUCT-PORT	SAMPLE TIME [minute]	STATIC PRESSURE ["H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD ["H_2O]	ΔH METER SETTING ["H_2O]	METER READING [ft³]	METER TEMP [°F] (Assumed=) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM ["Hg]	
							937.10										
WEST-A	8	-14.6	272	–	0.58	1.45*	966.30 971.39	92	90	285	285	6.0	14.1		60	17*	Manual ok
WEST-B	8	-14.8	289	–	0.50	1.25	976.46	92	90	266	286	4.2	15.9		62	17	
WEST-C	8	-14.4	308	–	0.27	0.68	980.81	92	90	262	286	2.7	17.3		66	12	
WEST-D	8	-14.6	307	–	0.28	0.70	985.23	92	90	266	286	5.2	14.9		67	12	
WEST-E	8	-14.5	327	–	0.34	0.85	989.83	92	90	264	286	4.5	14.6		67	15	
WEST-F	O	O	B	S	T	R	U	C	T	I	O	N	—		–	–	
WEST-G	O	–	.	–	–	–	–	–	–	–	–	–	–		–	–	
WEST-H	8	-14.7	330	–	0.50	1.25*	995.02	93	90	267	286	6.5	13.7		67	18	Manual
EAST-A	8	-14.6	264	–	0.58	1.45	942.62	87	85	274	287	7.8	[illegible]		72	17	
EAST-B	8	-13.8	259	–	0.47	1.18	947.94	88	88	286	287	4.2	15.8		62	15	
EAST-C	–	O	B	S	T	R	U	C	T	I	O	N	—		–	–	
EAST-D	8	-14.1	297	–	0.25	0.65	952.10	88	86	292	286	5.1	15.0		62	8	
EAST-E	8	-14.4	312	–	0.30	0.75	956.41	90	87	291	286	5.2	14.9		63	9	
EAST-F	8	-14.4	345	–	0.27	0.68	960.61	92	88	280	286	5.0	17.0		60	9	
EAST-G	–	–	–	–	–	–	–	–	–	–	–	–	–		–	–	
EAST-H	8	-14.2	344	–	0.55	1.33*	965.83	93	89	290	288	5.1	15.0		60	17*	Manual out
AVERAGE	96	-14.43	307		0.39	1.0	957.45		89.1		4.96		15.02				

Pre-Leak Check: 12" Hg <0.002 cfm MSD

Post-Leak Check: 14" Hg - <0.002 cfm

POSITIVE YAW IS CLOCKWISE

[O:\APPRES\STACK\ADA-98\AIROUTSH;RLO;10/6/98]

EAST A Start Time = 1515 Volume Start = 937.10

Stop Time = 1412 Volume Stop = 965.83

Mid Leak Test

West A Start 966.30 Stop 995.02

Volume - 1650 hrs 1745 hrs

AMPS/PSCO HG SAMPLING DATA SHEET — AIR PRE-HEATER OUTLET

PLANT	Comanche Station, Pueblo, CO	AMBIENT TEMP [F°]	67	COLLECTED H_2O [grams]	
LOCATION	AIR PRE-HEATER OUTLET	BAROMETRIC PRES [°Hg]	25.31	COLLECTED DUST [grams]	
DUCT DIMENSIONS	34'-9" x 13'-4.5"	%H_2O (Assumed)	10	DRY MOLE WT (Assumed)	30.5
DUCT AREA	465 ft^2	PROBE LENGTH [ft]	5	WET MOLE WT (Assumed)	29.0
DATE	October 15, 1998	NOZZLE ID [inch]	V41A 0.252		
TIME	Start- 1200 Stop- 1403	METER FACTOR: ΔH	1.844		
METER BOX	NuTech # 2	METER FACTOR: Y	1.000	PITOT ID #	2-7
		PITOT TUBE: C_p	0.834	FILTER ID #	15
OPERATOR(S)	MSD	K	2.50	IMPINGER BOX ID #	

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OTH 5
APH outlet

DUCT-PORT	SAMPLE TIME [minute]	STATIC PRESSURE [°H_2O]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD [°H_2O]	ΔH METER SETTING [°H_2O]	METER READING [ft^3]	METER TEMP [°F] (Assumed=) inlet	outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	CO_2 [%]	CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM [°Hg]
							0.00									
WEST-A	8	-14.5	263	-	0.70	1.75	30.89	80	75	279	293	6.8	13.4	-	66	13
WEST-B	8	-14.2	230	-	0.50	1.25	24.95	79	74	291	294	4.8	15.3	-	55	8
WEST-C	8	-14.2	303	-	0.29	0.73	20.07	77	72	289	294	2.7	17.3	-	53	8
WEST-D	8	-14.6	298	-	0.29	0.73	15.51	76	71	283	294	5.0	15.1	-	53	8
WEST-E	8	-14.1	322	-	0.29	0.73	9.71	72	69	276	296	4.4	15.7	-	52	5
WEST-F	-	O	B	S	T	R	U	C	T	I	O	N	-	-	-	-
WEST-G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WEST-H	8	-14.1	320	-	0.50	1.25	5.54	69	66	253	291	6.6	13.6	-	55	7
EAST-A		-14.5	266	-	0.55	1.38	59.52	88	83	287	293	7.6	12.6	-	60	16
EAST-B	8	-15.2	265	-	0.49	1.23	54.01	87	82	283	293	4.0	16.0	-	59	13
EAST-C	-	O	B	S	T	R	U	C	T	I	O	N	-	-	-	-
EAST-D	8	-14.6	299	-	0.27	0.68	48.97	87	83	283	294	4.9	15.2	-	60	8
EAST-E	8	-13.7	312	-	0.29	0.73	45.00	85	80	297	294	4.9	15.2	-	59	8
EAST-F	8	-14.8	343	-	0.29	0.73	40.92	84	79	300	295	2.7	17.2	-	60	7
EAST-G	-	-	-	-	-	← START vol →	31.30	-	-	-	-	-	-	-	-	-
EAST-H	8	-14.8	340	-	0.55	1.38	36.72	81	77	285	290	5.2	14.8	-	56	12
AVERAGE	9.6	-14.42	301	RMS	0.406	~~1.02~~	~~58.51~~	78.2			4.9	~~8.10~~	15.12			

Pre-Leak Check: 14" Hg <0.002 CFM MSD

Post-Leak Check: 16" Hg <0.002 CFM MSD

POSITIVE YAW IS CLOCKWISE (-H)

[O:\APPRES\STACK\ADA-98\AIROUTSH;RLO;10/6/98]

Pitot OK MSD

59.11

1.040

West Start Time 1200
West Start Vol. 0.00
West Stop Time 1255

Leak Checked OK

East Start Time 1305
East Start Volume - 31.30
East Stop Time 1403

APA/PSCO Hg SAMPLING DATA SHEET — AIR PRE-HEATER OUTLET

PLANT	Comanche Station, Pueblo, CO
LOCATION	AIR PRE-HEATER OUTLET
DUCT DIMENSIONS	34'-9" x 13'-4.5"
DUCT AREA	465 ft^2
DATE	October 15, 1998
TIME	Start- 1515 Stop- 1720
METER BOX	NuTech # 2
OPERATOR(S)	MSD

AMBIENT TEMP [F°]	?	COLLECTED H_2O [grams]	
BAROMETRIC PRES [°Hg]	25.24	COLLECTED DUST [grams]	
$\%H_2O$ (Assumed)	10	DRY MOLE WT (Assumed)	30.5
PROBE LENGTH [ft]	5	WET MOLE WT (Assumed)	29.0
NOZZLE ID [inch]	1/4 1 0.252		
METER FACTOR: ΔH	1.844		
METER FACTOR: Y	1.000	PITOT ID #	E-7
PITOT TUBE: C_p	0.834	FILTER ID #	17
K	2.50	IMPINGER BOX ID #	

Page ____ of ____

APH outlet #6

Start @ East 1.

DUCT-PORT	SAMPLE TIME [minute]	STATIC PRESSURE [$°H_2O$]	STACK TEMP [°F]	NULL YAW [°]	PITOT HEAD [$°H_2O$]	ΔH METER SETTING [$°H_2O$]	METER READING [ft^3]	METER TEMP [°F] (Assumed= 80) Inlet	METER TEMP [°F] (Assumed= 80) outlet	PROBE TEMP [°F]	FILTER TEMP [°F]	METER EXHAUST O_2 [%]	METER EXHAUST CO_2 [%]	METER EXHAUST CO [ppm]	IMPINGER TEMP [°F]	METER VACUUM [°Hg]
							66.00			300	300					
WEST-A	8	-14.7	262		0.65	1.63	(95.80) 101.81	90	88	251	288	6.9	13.2	—	67	11
WEST-B	8	-15.0	258		0.55	1.38	107.75	90	88	262	294	4.8	15.3	-	62	12
WEST-C	8	-14.7	265		0.27	0.68	111.82	89	87	272	294	3.0	16.9	-	65	7
WEST-D	8	-14.6	304		0.27	0.68	115.92	89	87	261	293	5.0	15.1	-	63	7.5
WEST-E	8	-14.0	331		0.27	0.68	120.21	89	87	272	293	4.2	15.8	-	59	8
WEST-F	—	O	B	S	T	R	U	C	T	I	O	N	—	-	—	—
WEST-G	—	—	—	—	—	—	—	—	—	—	—	—	—	-	—	—
WEST-H	8	-14.2	328		0.50	1.25	125.55	89	87	273	292	6.4	13.7	-	61	12
EAST-A	8	-15.1	267		0.60	1.50	71.98	89	86	243	295	7.7	12.5	—	59	7
EAST-B	8	-14.4	290		0.40	1.00	76.95	90	86	256	295	4.1	15.9		57	6
EAST-C	—	O	B	S	T	R	U	C	T	I	O	N	—	—	—	—
EAST-D	8	-14.8	296		0.27	0.68	81.01	90	86	279	294	5.1	15.0	-	59	5
EAST-E	8	-14.3	311		0.30	0.75	85.31	90	87	272	294	4.9	15.2	-	59	6
EAST-F	8	-14.5	344		0.27	0.68	89.44	91	87	272	293	3.0	17.0	-	61	6
EAST-G	—	—	—	—	—	—	—	—	—	—	—	—	—	-	—	—
EAST-H	8	-15.0	343		0.60	1.50	95.34	92	88	282	293	4.9	15.2	—	59	10
AVERAGE	8	-14.6	300	RMS	0.399	1.034	59.09	88.4				5.00	15.07			

Pre-Leak Check: 15" Hg - <0.002 CFM mrd

Post-Leak Check: 14.5" Hg - <0.002 CFM

[O:\APPRES\STACK\ADA-98\AIROUTSH;RLO;10/6/98]

POSITIVE YAW IS CLOCKWISE

East Start Vol - 66.00
East Start Time = 1515 hrs
East Stop Time - 1610 hrs

pitot - ok

Midway Leak Check
15" Hg - <0.002 CFM

West Start Time - 1625 hrs
West Start Volume - 95.80
West Stop Time - 1720 hrs
West Stop Volume - [illegible]

Initial Traverse

ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Duct Ht, "		Bar, "Hg	25.68
Date	10/12/98	Duct ID, ft	23.2	Static, "H_2O	-0.85
Time	1330-1430	Duct Area, ft^2	423.72	Dry Bulb °F	
Tube I.D.	S-54A	% O_2		Wet Bulb °F	
C-Factor	0.809	% CO_2		% H_2O	
Operator(s)	RVO, GLA	% N_2		W.M.Wt	

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw [°CW]	Axial Vel [fps]
NORTH-1	12-1/4	297	0.45		-3	
NORTH-2	40-3/4	300	0.75		-1	
NORTH-3	82-1/2	301	0.75		0	
EAST-1	12-1/4	296	0.45		2	
EAST-2	40-3/4	298	0.70		0	
EAST-3	82-1/2	300	0.80		0	
SOUTH-1	12-1/4	300	0.55		3	
SOUTH-2	40-3/4	301	0.70		1	
SOUTH-3	82-1/2	298	0.80		1	
WEST-1	12-1/4	296	0.50		-3	
WEST-2	40-3/4	297	0.70		0	
WEST-3	82-1/2	298	0.75		0	
Average						
Maximum						
Minimum						
SDEV						

DATA SUMMARY				
	(Measured)	(Axial)	CEM Value	SCFM
Velocity, fps			% Diff	
Velocity, fpm				
ACFM				
SCFM				
DSCFM				
Ex Air Free				

Boiler 360 Me

STKPIT-A

O:\APPRES\STACK\ADA-98\STACKPIT

10/06/98

ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Duct Ht, "		Bar,"Hg	25.66
Date	10/13/98	Duct ID, ft	23.2	Static, "H_2O	-0.339
Time	1020-1025	Duct Area, ft^2	423.72	Dry Bulb °F	
Tube I.D.	S-54	% O_2		Wet Bulb °F	
C-Factor	0.809	% CO_2		% H_2O	
Operator(s)	RLO	% N_2		W.M.Wt	

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw [°CW]	Axial Vel [fps]
NORTH-1	12-1/4	294	0.4658			
NORTH-2	40-3/4	297	0.7020			
NORTH-3	82-1/2	297	0.7128			
EAST-1	12-1/4	295	0.5246			
EAST-2	40-3/4	295	0.7109			
EAST-3	82-1/2	295	0.7120			
SOUTH-1	12-1/4	297	0.5415			
SOUTH-2	40-3/4	298	0.7251			
SOUTH-3	82-1/2	298	0.7954			
WEST-1	12-1/4	295	0.4594			
WEST-2	40-3/4	296	0.6942			
WEST-3	82-1/2	296	0.7069			
Average						
Maximum						
Minimum						
SDEV						

DATA SUMMARY			CEM Value	SCFM
	(Measured)	(Axial)	% Diff	
Velocity, fps				
Velocity, fpm				
ACFM				
SCFM				
DSCFM				
Ex Air Free				

STKPIT-1

ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Duct Ht, "		Bar,"Hg	25.55
Date	10/13/98	Duct ID, ft	23.2	Static, "H_2O	-0.830
Time	1450 - 1525	Duct Area, ft^2	423.72	Dry Bulb °F	
Tube I.D.	5-54A	% O_2		Wet Bulb °F	
C-Factor	0.809	% CO_2		% H_2O	
Operator(s)	RW	% N_2		W.M.Wt	

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw [°CW]	Axial Vel [fps]
NORTH-1	12-1/4	311	0.4470			
NORTH-2	40-3/4	312	0.7171			
NORTH-3	82-1/2	313	0.7617			
EAST-1	12-1/4	311	0.5076			
EAST-2	40-3/4	313	0.7182			-0.6
EAST-3	82-1/2	314	0.7547			
SOUTH-1	12-1/4	312	0.4889			
SOUTH-2	40-3/4	314	0.7390			
SOUTH-3	82-1/2	315	0.7740			
WEST-1	12-1/4	312	0.4809			
WEST-2	40-3/4	312	0.7311			-0.64
WEST-3	82-1/2	313	0.7375			
Average						
Maximum						
Minimum						
SDEV						

DATA SUMMARY			CEM Value	SCFM
	(Measured)	(Axial)	% Diff	
Velocity, fps				
Velocity, fpm				
ACFM				
SCFM				
DSCFM				
Ex Air Free				

STKPIT-~~#~~ 2

ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Duct Ht, "		Bar,"Hg	25.42
Date	10/14/98	Duct ID, ft	23.2	Static, "H_2O	-0.834
Time	0845 - 0910	Duct Area, ft^2	423.72	Dry Bulb °F	
Tube I.D.	S-54A	% O_2		Wet Bulb °F	
C-Factor	0.809	% CO_2		% H_2O	
Operator(s)	RLO	% N_2		W.M.Wt	

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P ["H_2O]	Velocity [fps]	Null Yaw [°CW]	Axial Vel [fps]
NORTH-1	12-1/4	290	0.4915			
NORTH-2	40-3/4	291	0.7189			
NORTH-3	82-1/2	291	0.7452			
EAST-1	12-1/4	291	0.5663			
EAST-2	40-3/4	292	0.7448			
EAST-3	82-1/2	292	0.7216			
SOUTH-1	12-1/4	292	0.6328			
SOUTH-2	40-3/4	294	0.7986			
SOUTH-3	82-1/2	294	0.7862			
WEST-1	12-1/4	290	0.5073			
WEST-2	40-3/4	291	0.7436			
WEST-3	82-1/2	291	0.7785			
Average						
Maximum						
Minimum						
SDEV						

-0.

-.8

DATA SUMMARY		
	(Measured)	(Axial)
Velocity, fps		
Velocity, fpm		
ACFM		
SCFM		
DSCFM		
Ex Air Free		

CEM Value

% Diff

SCFM

STKPIT-3

ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Duct Ht, "		Bar,"Hg	25.40
Date	10/14/98	Duct ID, ft	23.2	Static, "H_2O	− 0.806
Time	1115 − 1135	Duct Area, ft^2	423.72	Dry Bulb °F	
Tube I.D.	S-54A	% O_2		Wet Bulb °F	
C−Factor	0.809	% CO_2		% H_2O	
Operator(s)	RW	% N_2		W.M.Wt	

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw [°CW]	Axial Vel [fps]
NORTH−1	12−1/4	302	0.5093			
NORTH−2	40−3/4	302	0.7463			
NORTH−3	82−1/2	302	0.8135			
EAST−1	12−1/4	302	0.5038			
EAST−2	40−3/4	302	0.7566			
EAST−3	82−1/2	304	0.7776			
SOUTH−1	12−1/4	303	0.5183			
SOUTH−2	40−3/4	306	0.8078			
SOUTH−3	82−1/2	306	0.8239			
WEST−1	12−1/4	301	0.5251			
WEST−2	40−3/4	302	0.7898			
WEST−3	82−1/2	303	0.8451			
Average						
Maximum						
Minimum						
SDEV						

0.7

0.6

DATA SUMMARY		
	(Measured)	(Axial)
Velocity, fps		
Velocity, fpm		
ACFM		
SCFM		
DSCFM		
Ex Air Free		

CEM Value

% Diff

SCFM

STKPIT 3A

COMANCHE AIR PREHEATER OUTLET DUCTS
Velocity & Temperature Traverse

Location	West / East	Duct Wd, "	417.0	Barometric	25.68
Date	10-12-98	Duct ID, "	160.5	Static	-13.75
Time	1440-1540	Duct Area	464.78	Dry Bulb	
Tube I.D.		% O_2		Wet Bulb	
C-Factor		% CO_2		% H_2O	
Operator(s)	MSD	% N_2		W.M.Wt	

	PORT/ POINT		DISTANCE [" From Wall]	TEMP [Deg-F]	DELTA P [" H_2O]	VELOCITY [Ft/Sec]
West	A-1	A	27"	250	0.74	
	A-2	B	80"	280	0.49	
	A-3	C	134"	300	0.31	
	B-1	D	27"	302	0.30	
	B-2	E	80"	320	0.34	
	B-3	F	134"	—	—	
	C-1	G	27"	343	0.51	
	C-2	H	80"	318	0.46	
	C-3		134"			
East	D-1	A	27"	253	0.62	
	D-2	B	80"	282	0.35	
	D-3	C	134"	—	—	
	E-1	D	27"	292	0.29	
	E-2	E	80"	310	0.32	
	E-3	F	134"	330	0.28	
	F-1	G	27"	334	0.48	
	F-2	H	80"	332	0.51	
	F-3		134"			
	G-1		27"			
	G-2		80"			
	G-3		134"			
	H-1		27"			
	H-2		80"			
	H-3		134"			
	Average					
	Maximum					
	Minimum					
	SDEV					

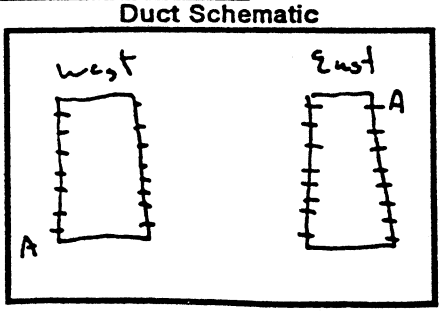
Initial Traverse

1/4 Nozzle

K ≃ 26

DATA SUMMARY	
Velocity, [fps]	47.5
Velocity, [fpm]	
ACFM	2,648,100
DSCFM	1,386,400
Ex Air Free	
Est. MM Btu/hr Heat Input	
Est. Firing Rate, lb/hr	

Duct Schematic



COMANCHE AIR PREHEATER OUTLET DUCTS
Velocity & Temperature Traverse

Location	West / East	Duct Wd, "	417.0	Barometric	25.25
Date	10-15-98	Duct ID, "	160.5	Static	-14.40
Time	1108-1150	Duct Area	464.78	Dry Bulb	
Tube I.D.	S-58	% O_2		Wet Bulb	
C-Factor		% CO_2		% H_2O	
Operator(s)	MSD	% N_2		W.M.Wt	

PORT/ POINT	DISTANCE [" From Wall]	TEMP [Deg-F]	DELTA P [" H_2O]	VELOCITY [Ft/Sec]
A-1	27"	263	0.855	
A-2	80"		0.144	
A-3	134"		0.046	
B-1	27"	280	0.604	
B-2	80"		0.123	
B-3	134"		0.110	
C-1	27"	303	0.278	
C-2	80"		0.171	
C-3	134"		0.125	
D-1	27"	298	0.270	
D-2	80"		0.167	
D-3	134"		0.152	
E-1	27"	322	0.287	
E-2	80"		0.162	
E-3	134"		0.141	
F-1	27"	330	0.324	
F-2	80"		0.183	
F-3	134"		0.150	
G-1	27"	330	0.563	
G-2	80"		0.092	
G-3	134"		0.122	
H-1	27"	320	0.650	
H-2	80"		0.082	
H-3	134"		0.009	
Average				
Maximum				
Minimum				
SDEV				

DATA SUMMARY	
Velocity, [fps]	
Velocity, [fpm]	
ACFM	
DSCFM	
Ex Air Free	
Est. MM Btu/hr Heat Input	
Est. Firing Rate, lb/hr	

Duct Schematic

COMANCHE AIR PREHEATER OUTLET DUCTS
Velocity & Temperature Traverse

Location	West / East	Duct Wd, "	417.0	Barometric	25.25
Date	10-15-98	Duct ID, "	160.5	Static	-14.6" wc
Time	1015-1105	Duct Area	464.78	Dry Bulb	
Tube I.D.	S-58	% O_2		Wet Bulb	
C-Factor		% CO_2		% H_2O	
Operator(s)	MSD	% N_2		W.M.Wt	

PORT/ POINT	DISTANCE [" From Wall]	TEMP [Deg-F]	DELTA P [" H_2O]	VELOCITY [Ft/Sec]
A-1	27"	270	0.837	
A-2	80"	270	0.120	
A-3	134"	274	0.061	
B-1	27"	278	1.431	
B-2	80"	277	0.744	
B-3	134"	274	0.763	
C-1	27"	288	1.064	
C-2	80"		0.888	
C-3	134"		0.834	
D-1	27"	299	1.064	
D-2	80"		0.962	
D-3	134"		0.833	
E-1	27"	312	1.104	
E-2	80"		0.648	
E-3	134"		0.516	
F-1	27"	343	0.715	
F-2	80"		0.341	
F-3	134"		0.270	
G-1	27"	343	0.906	
G-2	80"		0.390	
G-3	134"		0.371	
H-1	27"	340	0.830	
H-2	80"		0.277	
H-3	134"		0.182	
Average				
Maximum				
Minimum				
SDEV				

DATA SUMMARY	
Velocity, [fps]	
Velocity, [fpm]	
ACFM	
DSCFM	
Ex Air Free	
Est. MM Btu/hr Heat Input	
Est. Firing Rate, lb/hr	

Duct Schematic

Appendix D

Computer-Generated Field Data Summaries

Baghouse Inlet and Outlet Sampling Data (As Measured)

Baghouse Inlet and Outlet Sampling Data (Corrected to 3% O_2)

Baghouse Inlet and Outlet Flue Gas Flow Rate Data

PSCO, COMANCHE Hg SAMPLING PROGRAM

Host Baghouse Inlet (APH Out) vs Host Baghouse Outlet (Stack)

Location		APH OUT*	APH OUT	STACK	APH OUT*	APH OUT	STACK	APH OUT*	APH OUT	STACK	STACK
Date		10/13/98	10/13/98	10/13/98	10/13/98	10/13/98	10/13/98	10/14/98	10/14/98	10/14/98	10/14/98
Start Time		0930	0930	0935	1423	1420	1430	0830	0830	0823	1050
Stop Time		1220	1210	1155	1658	1700	1650	1048	1045	1000	1225
Test Number		1	1	1	2	2	2	3	3	3	3A
Sample Type		OH-Hg	OH-Hg	OH-Hg	OH-Hg	OH-Hg	OH-Hg	OH-Hg	OH-Hg	OH-Hg	OH-Hg
Y factor of dry gas meter	-	1.015	1.000	1.050	1.015	1.000	1.050	1.015	1.000	1.050	1.050
Gas Volume	- ft^3	55.39	56.28	111.69	62.11	56.39	105.60	61.44	57.65	68.01	66.66
Delta H of dry gas meter	- " H_2O	1.05	1.00	2.04	1.20	0.96	2.09	1.20	1.05	2.02	1.94
Meter Temperature	- ° F	78.6	67.2	82.6	91.9	83.4	87.9	79.0	64.6	82.2	84.8
C Factor of pitot tube	-	---	0.834	0.827	---	0.834	0.827	---	0.834	0.827	0.827
Nozzle Diameter	- inches	0.500	0.252	0.248	0.500	0.252	0.248	0.500	0.252	0.248	0.248
A n (area of nozzle)	- ft^2	0.00136	0.00035	0.00034	0.00136	0.00035	0.00034	0.00136	0.00035	0.00034	0.00034
Area of Stack	- ft^2	930	930	424	930	930	424	930	930	424	424
H_2O Weight	- gm	114.3	114.5	253.6	122.4	103.0	242.4	134.6	124.5	166.1	158.0
Sample Time	- minutes	96	96	140	96	96	130	96	96	85	85
Barometric Pressure	- " Hg	25.66	25.66	25.66	25.55	25.55	25.55	25.40	25.40	25.40	25.42
Static Pressure	- " H_2O	-13.80	-13.80	-0.84	-13.80	-13.80	-0.83	-14.40	-14.40	-0.83	-0.81
% Oxygen	-	5.6	5.4	4.5	5.7	6.5	4.5	5.5	5.2	4.5	4.7
% Carbon Dioxide	-	14.5	14.7	15.5	14.4	13.7	15.5	14.5	14.9	15.4	15.3
% N_2 + CO	-	79.9	79.9	80.0	79.9	79.8	80.0	80.0	79.9	80.1	80.0
Stack Temp (Dry Bulb)	- ° F	287	289	301	299	302	316	285	287	297	308
"S" sample (rms vel head)	- " H_2O	---	0.365	0.775	---	0.381	0.796	---	0.405	0.821	0.789
Dust Wt.	- gm	0.6984	8.0433	0.0000	0.8399	6.3464	0.0000	0.8588	7.2783	0.0000	0.0000
Sample Volume	- DSCF	47.39	48.46	98.40	51.66	46.90	91.76	52.02	49.39	59.36	57.93
Sample Volume	- DSm^3	1.252	1.280	2.600	1.365	1.239	2.424	1.374	1.305	1.568	1.531
ABS ST PRES	- " Hg	24.65	24.65	25.60	24.54	24.54	25.49	24.34	24.34	25.34	25.36
ABS ST TEMP	- ° R	747	749	761	759	762	776	745	747	757	768
H_2O - % by Vol	- vapor	10.2	10.0	10.8	10.0	9.4	11.1	10.9	10.6	11.6	11.4
Water Volume	- std ft^3	5.38	5.39	11.94	5.77	4.85	11.42	6.34	5.86	7.82	7.44
Dry Molecular Weight	- lb/lb-mole	30.54	30.57	30.66	30.53	30.45	30.66	30.54	30.59	30.65	30.63
Wet Molecular Weight	- lb/lb-mole	29.26	29.31	29.29	29.27	29.28	29.26	29.18	29.25	29.18	29.20
% EXCESS AIR	-	35.9	34.5	27.3	36.9	44.4	27.2	35.5	32.6	27.2	28.9
Dry Mole Frac.	-	0.898	0.900	0.892	0.900	0.906	0.889	0.891	0.894	0.884	0.886
Wet Mole Frac.	-	0.102	0.100	0.108	0.100	0.094	0.111	0.109	0.106	0.116	0.114
Gas Velocity @ OH Nozzle	- ft/sec	---	43.86	62.71	---	45.32	64.34	---	46.47	64.81	63.97
ACFM (based on pitot survey)	-	1403586	1403586	1403586	1431080	1431080	1431080	1455035	1455035	1455035	1478653
DSCFM (based on pitot survey)	-	733831	733392	742990	734410	736926	737728	747805	747895	759688	763779
DSCFM (rounded)		733800	733400	743000	734400	736900	737700	747800	747900	759700	763800
Normal Meter/Min		19387	19377	19630	19403	19469	19490	19757	19760	20071	20180
Excess Air Free DSCFM	-	537908	543552	581950	534468	508443	578181	549941	562174	595392	590924
PARTICULATE LOADING:											
Grains/DSCF	-	0.227	2.561	0.000	0.251	2.088	0.000	0.255	2.274	0.000	0.000
lb/hr	-	1431	16106	0.0	1580	13193	0.0	1633	14582	0.0	0.0
% ISOKINETIC	-	---	106	105	---	101	106	---	104	103	103

* Non-isokinetic sample with oversized nozzle directed opposite of flow

PSCO, COMANCHE Hg SAMPLING PROGRAM
Host Baghouse Inlet (APH Out) Ontario Hydro Sampling Data

Location		APH OUT	APH OUT	APH OUT
Date		10/14/98	10/15/98	10/15/98
Start Time		1515	1200	1515
Stop Time		1745	1403	1720
Test Number		4	5	6
Sample Type		OH–Hg	OH–Hg	OH–Hg
Y factor of dry gas meter	–	1.000	1.000	1.000
Gas Volume	– ft^3	57.45	59.11	59.09
Delta H of dry gas meter	– " H_2O	1.02	1.05	1.03
Meter Temperature	– ° F	89.7	78.2	88.4
C Factor of pitot tube	–	0.834	0.834	0.834
Nozzle Diameter	– inches	0.252	0.252	0.252
A n (area of nozzle)	– ft^2	0.00035	0.00035	0.00035
Area of Stack	– ft^2	930	930	930
H_2O Weight	– gm	118.2	127.0	128.6
Sample Time	– minutes	96	96	96
Barometric Pressure	– " Hg	25.30	25.31	25.24
Static Pressure	– " H_2O	–14.43	–14.42	–14.61
% Oxygen	–	5.0	5.0	5.0
% Carbon Dioxide	–	15.1	15.1	15.1
% N_2 + CO	–	80.0	79.9	79.9
Stack Temp (Dry Bulb)	– ° F	307	301	300
"S" sample (@ OH nozzle)	– " H_2O	0.397	0.406	0.399
Dust Wt.	– gm	5.519	5.561	6.114
Sample Volume	– DSCF	46.78	49.18	48.12
Sample Volume	– DSm^3	1.236	1.299	1.271
ABS ST PRES	– " Hg	24.24	24.25	24.17
ABS ST TEMP	– ° R	767	761	760
H_2O – % by Vol	– vapor	10.6	10.8	11.2
Water Volume	– std ft^3	5.57	5.98	6.06
Dry Molecular Weight	– lb/lb–mole	30.61	30.62	30.61
Wet Molecular Weight	– lb/lb–mole	29.27	29.25	29.20
% EXCESS AIR	–	30.7	30.8	31.1
Dry Mole Frac.	–	0.894	0.892	0.888
Wet Mole Frac.	–	0.106	0.108	0.112
Gas Velocity	– ft/sec	46.71	47.06	46.74
ACFM	–			
DSCFM	–			
Normal Meter/Min				
Excess Air Free DSCFM	–			
PARTICULATE LOADING:				
Grains/DSCF	–	1.820	1.745	1.961
lb/hr	–			
% ISOKINETIC	–	101	105	104

O:\APPRES\STACK\ADA–98\PILOT–OH

ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Test #	A	Bar, "Hg	25.68
Date	10/12/98	Duct ID,'	23.2	Static, "H_2O	−0.85
Time	1330−1430	Duct Area	423.72	Dry Bulb °F	298.5
Tube I.D.	S−54A	% O_2	4.5	Wet Bulb °F	124.4
C−Factor	0.809	% CO_2	15.4	% H_2O	11.30
Operator(s)	RLO	% N_2	80.0	W.M.Wt	29.65

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw [°CW]	Axial Vel [fps]
NORTH−1	12−1/4	297	0.450	46.33	−3	46.26
NORTH−2	40−3/4	300	0.750	59.92	−1	59.92
NORTH−3	82−1/2	301	0.750	59.96	0	59.96
EAST−1	12−1/4	296	0.450	46.30	2	46.27
EAST−2	40−3/4	298	0.700	57.82	0	57.82
EAST−3	82−1/2	300	0.800	61.89	0	61.89
SOUTH−1	12−1/4	300	0.550	51.32	3	51.25
SOUTH−2	40−3/4	301	0.700	57.93	1	57.92
SOUTH−3	82−1/2	298	0.800	61.81	1	61.80
WEST−1	12−1/4	296	0.500	48.80	−3	48.73
WEST−2	40−3/4	297	0.700	57.78	0	57.78
WEST−3	82−1/2	298	0.750	59.85	0	59.85
Average		298.5	0.658	55.81	0	55.79
Maximum		301.0	0.800	61.89	3	61.89
Minimum		296.0	0.450	46.30	−3	46.26
SDEV		1.8	0.127	5.67	2	5.69

DATA SUMMARY		
	(Measured)	(Axial)
Velocity, fps	55.81	55.79
Velocity, fpm	3348	3347
ACFM	1418804	1418261
SCFM	845282	844958
DSCFM	749777	749490
Ex Air Free	586638	586413

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ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Test #	1	Bar,"Hg	25.66
Date	10/13/98	Duct ID,'	23.2	Static, "H_2O	−0.839
Time	1020−1045	Duct Area	423.72	Dry Bulb °F	296.1
Tube I.D.	S−54A	% O_2	4.5	Wet Bulb °F	123.3
C−Factor	0.809	% CO_2	15.5	% H_2O	10.80
Operator(s)	RLO	% N_2	80.0	W.M.Wt	29.72

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw* [°CW]	Axial Vel [fps]
NORTH−1	12−1/4	294	0.466	47.00	0	47.00
NORTH−2	40−3/4	297	0.702	57.81	0	57.81
NORTH−3	82−1/2	297	0.713	58.26	0	58.26
EAST−1	12−1/4	295	0.525	49.91	0	49.91
EAST−2	40−3/4	295	0.711	58.10	0	58.10
EAST−3	82−1/2	295	0.712	58.15	0	58.15
SOUTH−1	12−1/4	297	0.542	50.78	0	50.78
SOUTH−2	40−3/4	298	0.725	58.79	0	58.79
SOUTH−3	82−1/2	298	0.795	61.58	0	61.58
WEST−1	12−1/4	295	0.459	46.71	0	46.71
WEST−2	40−3/4	296	0.694	57.45	0	57.45
WEST−3	82−1/2	296	0.707	57.98	0	57.98
Average		296.1	0.646	55.21	0	55.21
Maximum		298.0	0.795	61.58	0	61.58
Minimum		294.0	0.459	46.71	0	46.71
SDEV		1.3	0.109	4.89	0	4.89

* assumed "0" (axial flow), based upon results of Test #A conducted on 10/12/98

DATA SUMMARY		
	(Measured)	(Axial)
Velocity, fps	55.21	55.21
Velocity, fpm	3313	3313
ACFM	1403586	1403586
SCFM	838259	838259
DSCFM	747687	747687
Ex Air Free	585628	585628

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ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Test #	2	Bar,"Hg	25.55
Date	10/13/98	Duct ID,'	23.2	Static, "H_2O	−0.830
Time	1450−1525	Duct Area	423.72	Dry Bulb °F	312.7
Tube I.D.	S−54A	% O_2	4.5	Wet Bulb °F	124.5
C−Factor	0.809	% CO_2	15.5	% H_2O	11.10
Operator(s)	RLO	% N_2	80.0	W.M.Wt	29.68

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw* [°CW]	Axial Vel [fps]
NORTH−1	12−1/4	311	0.447	46.68	0	46.68
NORTH−2	40−3/4	312	0.717	59.17	0	59.17
NORTH−3	82−1/2	313	0.762	61.02	0	61.02
EAST−1	12−1/4	311	0.508	49.75	0	49.75
EAST−2	40−3/4	313	0.718	59.25	0	59.25
EAST−3	82−1/2	314	0.755	60.78	0	60.78
SOUTH−1	12−1/4	312	0.489	48.86	0	48.86
SOUTH−2	40−3/4	314	0.739	60.14	0	60.14
SOUTH−3	82−1/2	315	0.774	61.59	0	61.59
WEST−1	12−1/4	312	0.481	48.45	0	48.45
WEST−2	40−3/4	312	0.731	59.74	0	59.74
WEST−3	82−1/2	313	0.738	60.04	0	60.04
Average		312.7	0.655	56.29	0	56.29
Maximum		315.0	0.774	61.59	0	61.59
Minimum		311.0	0.447	46.68	0	46.68
SDEV		1.2	0.124	5.63	0	5.63

* assumed "0" (axial flow), based upon results of Test #A conducted on 10/12/98

DATA SUMMARY		
	(Measured)	(Axial)
Velocity, fps	56.29	56.29
Velocity, fpm	3377	3377
ACFM	1431080	1431080
SCFM	832765	832765
DSCFM	740288	740288
Ex Air Free	580187	580187

ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Test #	3	Bar,"Hg	25.42
Date	10/14/98	Duct ID,'	23.2	Static, "H_2O	−0.834
Time	0845−0910	Duct Area	423.72	Dry Bulb °F	291.6
Tube I.D.	S−54A	% O_2	4.5	Wet Bulb °F	125.4
C−Factor	0.809	% CO_2	15.4	% H_2O	12.20
Operator(s)	RLO	% N_2	80.1	W.M.Wt	29.53

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw* [°CW]	Axial Vel [fps]
NORTH−1	12−1/4	290	0.492	48.53	0	48.53
NORTH−2	40−3/4	291	0.719	58.74	0	58.74
NORTH−3	82−1/2	291	0.745	59.80	0	59.80
EAST−1	12−1/4	291	0.566	52.13	0	52.13
EAST−2	40−3/4	292	0.745	59.82	0	59.82
EAST−3	82−1/2	292	0.722	58.89	0	58.89
SOUTH−1	12−1/4	292	0.633	55.14	0	55.14
SOUTH−2	40−3/4	294	0.799	62.03	0	62.03
SOUTH−3	82−1/2	294	0.786	61.55	0	61.55
WEST−1	12−1/4	290	0.507	49.31	0	49.31
WEST−2	40−3/4	291	0.744	59.74	0	59.74
WEST−3	82−1/2	291	0.779	61.12	0	61.12
Average		291.6	0.686	57.23	0	57.23
Maximum		294.0	0.799	62.03	0	62.03
Minimum		290.0	0.492	48.53	0	48.53
SDEV		1.3	0.104	4.57	0	4.57

* assumed "0" (axial flow), based upon results of Test #A conducted on 10/12/98

DATA SUMMARY		
	(Measured)	(Axial)
Velocity, fps	57.23	57.23
Velocity, fpm	3434	3434
ACFM	1455035	1455035
SCFM	866005	866005
DSCFM	760310	760310
Ex Air Free	595879	595879

ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Test #	3A	Bar,"Hg	25.40
Date	10/14/98	Duct ID,'	23.2	Static, "H_2O	−0.806
Time	1115−1135	Duct Area	423.72	Dry Bulb °F	302.9
Tube I.D.	S−54A	% O_2	4.7	Wet Bulb °F	125.3
C−Factor	0.809	% CO_2	15.4	% H_2O	11.90
Operator(s)	RLO	% N_2	79.9	W.M.Wt	29.57

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw [°CW]	Axial Vel [fps]
NORTH−1	12−1/4	302	0.509	49.78	0	49.78
NORTH−2	40−3/4	302	0.746	60.26	0	60.26
NORTH−3	82−1/2	302	0.814	62.91	0	62.91
EAST−1	12−1/4	302	0.504	49.51	0	49.51
EAST−2	40−3/4	302	0.757	60.67	0	60.67
EAST−3	82−1/2	304	0.778	61.59	0	61.59
SOUTH−1	12−1/4	303	0.518	50.25	0	50.25
SOUTH−2	40−3/4	306	0.808	62.85	0	62.85
SOUTH−3	82−1/2	306	0.824	63.48	0	63.48
WEST−1	12−1/4	301	0.525	50.51	0	50.51
WEST−2	40−3/4	302	0.790	61.99	0	61.99
WEST−3	82−1/2	303	0.845	64.16	0	64.16
Average		302.9	0.701	58.16	0	58.16
Maximum		306.0	0.845	64.16	0	64.16
Minimum		301.0	0.504	49.51	0	49.51
SDEV		1.6	0.135	5.86	0	5.86

* assumed "0" (axial flow), based upon results of Test #A conducted on 10/12/98

DATA SUMMARY		
	(Measured)	(Axial)
Velocity, fps	58.16	58.16
Velocity, fpm	3490	3490
ACFM	1478653	1478653
SCFM	866375	866375
DSCFM	763274	763274
Ex Air Free	590533	590533

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ADA/PSCO, Comanche APH Outlet Volumetric Flow Data
Air Preheater Outlet Velocity & Temperature Traverse

Location	APH West	Duct Width."	417	Bar,"Hg	25.25
Date	10/15/98	Duct Depth,"	160.5	Static, "H_2O	−14.40
Time	1108−1150	Duct Area,ft^2	465	Dry Bulb °F	305.8
Tube I.D.	S−58	% O_2	5.1	Wet Bulb °F	121.9
C−Factor	0.818	% CO_2	15.1	% H_2O	10.80
Operator(s)	MSD,LLA	% N_2	79.9	W.M.Wt	29.68

Ports labelled from port wall to inside of duct

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]
A−1	27	263	0.855	64.90
A−2	80	263	0.144	26.63
A−3	134	263	0.046	15.05
B−1	27	280	0.604	55.18
B−2	80	280	0.123	24.90
B−3	134	280	0.110	23.55
C−1	27	303	0.278	38.02
C−2	80	303	0.171	29.82
C−3	134	303	0.125	25.49
D−1	27	298	0.270	37.34
D−2	80	298	0.167	29.37
D−3	134	298	0.152	28.02
E−1	27	322	0.287	39.10
E−2	80	322	0.162	29.38
E−3	134	322	0.141	27.41
F−1	27	330	0.324	41.76
F−2	80	330	0.183	31.38
F−3	134	330	0.150	28.41
G−1	27	330	0.563	55.05
G−2	80	330	0.092	22.25
G−3	134	330	0.122	25.63
H−1	27	320	0.650	58.77
H−2	80	320	0.082	20.88
H−3	134	320	0.009	6.92
Average		305.8	0.242	32.72
Maximum		330.0	0.855	64.90
Minimum		263.0	0.009	6.92
SDEV		22.9	0.209	13.70

DATA SUMMARY	
Velocity, fps	32.72
Velocity, fpm	1963
ACFM	912377
SCFM	508427
DSCFM	453541
Ex Air Free	343953

Skewed flow

ADA/PSCO, Comanche APH Outlet Volumetric Flow Data
Air Preheater Outlet Velocity & Temperature Traverse

Location	APH East	Duct Width."	417	Bar,"Hg	25.25
Date	10/15/98	Duct Depth,"	160.5	Static, "H_2O	−14.60
Time	1015−1105	Duct Area,ft^2	465	Dry Bulb °F	309.1
Tube I.D.	S−58	% O_2	4.9	Wet Bulb °F	122.0
C−Factor	0.818	% CO_2	15.2	% H_2O	10.80
Operator(s)	MSD,LLA	% N_2	80.0	W.M.Wt	29.69

Ports labelled from port wall to inside of duct

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]
A−1	27	270	0.837	64.53
A−2	80	270	0.120	24.43
A−3	134	274	0.061	17.47
B−1	27	278	1.431	84.84
B−2	80	277	0.744	61.13
B−3	134	274	0.763	61.78
C−1	27	288	1.064	73.65
C−2	80	288	0.888	67.28
C−3	134	288	0.834	65.20
D−1	27	299	1.064	74.19
D−2	80	299	0.962	70.54
D−3	134	299	0.833	65.64
E−1	27	312	1.104	76.21
E−2	80	312	0.648	58.39
E−3	134	312	0.516	52.10
F−1	27	343	0.715	62.55
F−2	80	343	0.341	43.20
F−3	134	343	0.270	38.44
G−1	27	343	0.906	70.42
G−2	80	343	0.390	46.20
G−3	134	343	0.371	45.06
H−1	27	340	0.830	67.27
H−2	80	340	0.277	38.86
H−3	134	340	0.183	31.54
Average		309.1	0.673	56.71
Maximum		343.0	1.431	84.84
Minimum		270.0	0.061	17.47
SDEV		28.1	0.349	17.05

DATA SUMMARY	
Velocity, fps	56.71
Velocity, fpm	3402
ACFM	1581364
SCFM	876871
DSCFM	782200
Ex Air Free	599437

Skewed flow

Summary of Ontario-Hydro test results at Comanche
Unit 2. O-H testing by Consol in 10/98

		Hg, ug/Nm3				
		Particulate	Oxidized	Elemental	Total	%O2
APH outlet	1	1.57	3.41	4.95	9.93	5.4
	2	2.09	1.17	4.65	7.91	6.5
	3	4.63	1.12	3.22	8.97	5.2
	4	3.75	2.02	7.19	12.96	5
	5	2.23	2.17	4.85	9.25	5
	6	3.72	1.78	4.45	9.95	5
6-Run Avg:		**3.0**	**1.9**	**4.9**	**9.83**	
3-Run Avg:		2.76	1.90	4.27	8.94	
6-Run Std dev:		1.20	0.84	1.29	1.71	
APH outlet Reverse	1	1.43	2.39	7.63	11.45	5.6
(nozzle reversed)	2	1.48	1.63	7.09	10.2	5.7
	3	1.88	1.8	4.07	7.75	5.5
Avg:		**1.6**	**1.9**	**6.3**	**9.8**	
Std dev:		0.25	0.40	1.92	1.88	
Stack	1	0	3.05	0.25	3.3	4.5
	2	0	3.66	0.6	4.26	4.5
	3	0	2.93	0.3	3.23	4.5
	3A	0	2.92	0.6	3.52	4.7
Avg:		**0.0**	**3.1**	**0.4**	**3.58**	
Std dev:		0.00	0.35	0.19	0.47	

Summary of Ontario-Hydro test results at Comanche
Unit 2. O-H testing by Consol in 10/98

		Hg, ug/Nm3 @ 3% O2			
		Particulate	Oxidized	Elemental	Total
APH outlet	1	1.81	3.94	5.72	11.47
	2	2.60	1.45	5.78	9.83
	3	5.28	1.28	3.67	10.23
	4	4.22	2.27	8.09	14.59
	5	2.51	2.44	5.46	10.41
	6	4.19	2.00	5.01	11.20
6-Run Avg:		**3.4**	**2.2**	**5.6**	**11.3**
3-Run Avg:		3.23	2.22	5.06	10.51
6-Run Std dev:		1.32	0.95	1.44	1.73
APH outlet Reverse	1	1.67	2.80	8.93	13.40
(nozzle reversed)	2	1.74	1.92	8.35	12.01
	3	2.19	2.09	4.73	9.01
Avg:		**1.9**	**2.3**	**7.3**	**11.5**
Std dev:		0.28	0.46	2.27	2.24
Stack	1	0.00	3.33	0.27	3.60
	2	0.00	3.99	0.65	4.65
	3	0.00	3.20	0.33	3.53
	3A	0.00	3.23	0.66	3.89
Avg:		**0.0**	**3.4**	**0.5**	**3.9**
Std dev:		0.00	0.38	0.21	0.51

Note: To correct Hg values to 3% O2, the following formula was used:

$$\frac{\text{As measured Hg } (\mu g/Nm3) * 17.9}{20.9 - \%\ O2}$$

Summary of Ontario-Hydro test results at Comanche Unit 2. O-H testing by Consol in 10/98

		Hg, ug/Nm3				
		Particulate	Oxidized	Elementa	Total	%O2
APH outlet		1.57	3.41	4.95	9.93	5.4
	2	2.09	1.17	4.65	7.91	6.5
	3	4.63	1.12	3.22	8.97	5.2
	4	3.75	2.02	7.19	12.96	5
	5	2.23	2.17	4.85	9.25	5
	6	3.72	1.78	4.45	9.95	5
6-Run Avg:		**3.0**	**1.9**	**4.9**	**9.83**	
3-Run Avg:		2.76	1.90	4.27	8.94	
6-Run Std dev:		1.20	0.84	1.29	1.71	
APH outlet Revers		1.43	2.39	7.63	11.45	5.6
ozzle reversed)	2	1.48	1.63	7.09	10.2	5.7
	3	1.88	1.8	4.07	7.75	5.5
Avg:		**1.6**	**1.9**	**6.3**	**9.8**	
Std dev:		0.25	0.40	1.92	1.88	
Stack	1	0	3.05	0.25	3.3	4.5
	2	0	3.66	0.6	4.26	4.5
	3	0	2.93	0.3	3.23	4.5
	3A	0	2.92	0.6	3.52	4.7
Avg:		**0.0**	**3.1**	**0.4**	**3.58**	
Std dev:		0.00	0.35	0.19	0.47	

Summary of Ontario-Hydro test results at Comanche Unit 2. O-H testing by Consol in 10/98

		Hg, ug/Nm3 @ 3% O2			
		Particulate	Oxidized	Elemental	Total
APH outlet		1.81	3.94	5.72	11.47
	2	2.60	1.45	5.78	9.83
	3	5.28	1.28	3.67	10.23
	4	4.22	2.27	8.09	14.59
	5	2.51	2.44	5.46	10.41
	6	4.19	2.00	5.01	11.20
6-Run Avg:		**3.4**	**2.2**	**5.6**	**11.3**
3-Run Avg:		3.23	2.22	5.06	10.51
6-Run Std dev:		1.32	0.95	1.44	1.73
APH outlet Reverse		1.67	2.80	8.93	13.40
nozzle reversed)	2	1.74	1.92	8.35	12.01
	3	2.19	2.09	4.73	9.01
Avg:		**1.9**	**2.3**	**7.3**	**11.5**
Std dev:		0.28	0.46	2.27	2.24
Stack		0.00	3.33	0.27	3.60
	2	0.00	3.99	0.65	4.65
	3	0.00	3.20	0.33	3.53
	3A	0.00	3.23	0.66	3.89
Avg:		**0.0**	**3.4**	**0.5**	**3.9**
Std dev:		0.00	0.38	0.21	0.51

Note: To correct Hg values to 3% O2, the following formula was used:

$$\frac{\text{As measured Hg (µg/Nm3)} * 17.9}{20.9 - \%\ O2}$$

Appendix E

Process Operations Unit Data

Unit Operation Data **ADA Technologies**

Tuesday 10/13 **PSCo Site and Unit Number** **Comanche Unit 2**

Test Number	CON #1	CON #1	CON #2	CONSOL #2
Date	10/13/98	10/13/98	10/13/98	10/13/98
Time	9:50 / 8:54 Computer	12:00	watch 14:25 / PSCC 13:25	watch 17:15 / PSCC Computer 16:14
Data Collected By	GA	GA.	GA.	G.A.
Unit Load, MW_{Gross}/MW_{net}	353 / 327	354 / 326	356 / 329	355 / 327
Fuel	Coal, Eagle Butte	Eagle Butte	Eagle Butte.	Eagle Butte
Excess O_2, % L/R	2.8 / 4.0 Right	3.6 / 4.0	3.0 / 4.3	2.8 / 4.0
Steam Flow, klb/hr	2550	2550	2550	2600
Air Flow	75	72	74	75
APH: Air In, °F 2A/2B	73 / 73	82 / 82	92 / 92	92.5 / 92.6
Air Out, °F 2A/2B	~~700~~ 691	698 / 694	703 / 698	705 / 697
Gas In, °F 2A/2B	778 / 767	772 / 768	777 / 774	778 / 774
Gas Out, °F 2A/2B	300 / 302	304 / 304	313 / 313	317.8 314.5
Furnace Draft, "H_2O	-.75" 4/20	-.68	-.67	-.48
Coal Feed, ton/hr	205 T/hr current	197.7	199.4	194.9
Opacity, % current	1.7	1.6	2.1	2.2
NO_x, ppm	179.4	168.5	161.5	166.0
SO_2, ppm	240.2	242.9	228.9	226.7
CO_2, %	11.06	11.33	11.22	10.74
H_2O, %	12%	12.2%	11.9	12.3%
Temperature, °F (stack)	295°	300	309	313
Stack: Velocity, fps	58.77	~~52.19~~ 58.48	61.5	54.78
Flow Rate, mscfh	50.91	52.19	54.24	47.94
Stack Static P, "Hg	~~24.98~~	~~24.83~~		
Baghouse Operation				
Delta P, "H_2O 2A/2B	3.0 / 3.5	3.9 / 4.0	4.8 / 4.7	3.6 / 3.8
Temperature in, °F 2A/2B	309 in / 306 in	312 / 313	321 / 324	324 / 326
Unit Operation Comments	During 1st Mercury Test.	1st Mercury Test complete	Start CONSOL 2nd Test.	CONSOL Finished Ash Samples From Baghouse ~16:30 To 17:00

Wednesday
10/14/98

Unit Operation Data

Wednesday

ADA Technologies

PSCo Site and Unit Number Comanche Unit 2

Test Number	Start CONSOL #3	CONSOL 3	CONSOL 3	CONSOL 3A*
Date	10/14/98	10/14/98	10/14/98	10/14/98
Time	7:47	0917	1037	12:14
Data Collected By	G.A.	GA	GA	GA
Unit Load, MW_{Gross}/MW_{net}	358 / 331	358 / 332	358 / 328	356 - 332
Fuel	Coal	Coal	Coal	Coal
Excess O_2, % L/R	2.8 / 4.3	2.8 / 4.1	3.0 / 4.0	3.0 - 4.1
Steam Flow, klb/hr	2500	2500	2500	2500
Air Flow	76	76	78	78
APH: Air In, °F 2A/2B	65.2 / 65.4	71 / 71	80 - 80	89 - 89
Air Out, °F 2A/2B	695 / 690	694 / 689	703 - 693	700 - 692
Gas In, °F 2A/2B	723 / 770	772 / 767	779 - 774	776 - 766
Gas Out, °F 2A/2B	295 / 294	296 / 296	306 - 306	311 - 308
Furnace Draft, "H_2O	-.55	-.6	-.7	-.85
Coal Feed, ton/hr	199.4	206.7	207	207
Opacity, %	2.4	2.6	2.0	2.1
NO_x, ppm	165.4	155	164	168
SO_2, ppm	237.4	236	226	228
CO_2, %	11.18	13.99	10.32	10.65
H_2O, %	12.5	13.3	12.7	13.0
Temperature, °F	290.5	308	302	308
Stack: Velocity, fps	51.92	52.49	60.0	51.72
Flow Rate, mscfh	47.06	46.37	53.26	45.28
Stack Static P, "Hg	~~0/B~~ 24.68	~~0/B~~ 24.68	24.68	24.53
Baghouse Operation				
Delta P, "H_2O 2A/2B	3.48 / 3.16	3.75 - 3.77	3.5 - 4.13	3.71 - 3.96
Temperature in, °F 2A/2B	301 / 301	302 - 305	313 - 313	317 - 317
Unit Operation Comments	Baghouse Finished Cleaning	Everything Running Smooth.	Stack Test Finish with 1st Test Matt Still Sampling	CONSOL Transitioning Between AHO & ADA Run

* 3A denotes AN ADDitional ONtario hydro performed at the Stack. This was Due To the potential loss of the Stack 2nd ONtario-hydro ON Tuesday 10/13.

Wednesday 10/14/98

Unit Operation Data **ADA Technologies**

PSCo Site and Unit Number Comanche Unit 2

Test Number	CONSOL 4	CONSOL 4	CONSOL 4	
Date	10/14	10/14/98	10/14/98	
Time	Water 15:05 / PSCC Com 13:53	17:43 / 16:33	19:10 / PSCC Computer 18:01	
Data Collected By	G.A	GA	GA	
Unit Load, MW_{Gross}/MW_{net}	354 / 328	358 / 328	357 – 329	
Fuel	Eagle Butte Coal	Eagle Butte Coal	From Gillette Wyo. Belleaire mine Coal	Belle AyR Mine — Correc Spellin
Excess O_2, % L/R	3.0 / 4.0	2.8 / 4.2	2.8 / 4.2	
Steam Flow, klb/hr	2550	2550	2550	
Air Flow	78	78	78	
APH: Air In, °F 2A/2B	97 — 97	98 — 98	92 — 92	
Air Out, °F 2A/2B	706 — 695	712 — 699	705 — 696	
Gas In, °F 2A/2B	778 — 772	788 — 779	778 — 771	
Gas Out, °F 2A/2B	319 — 315	323 — 317	315 — 310	
Furnace Draft, "H_2O	– .48	– .75	– .45	
Coal Feed, ton/hr	202	197	197.4	
Opacity, %	2.3	2.0	1.9	
NO_x, ppm	168.8	154.8	157	
SO_2, ppm	240	231	233	
CO_2, %	11.87	11.14	11.22	
H_2O, %	12.6	12.5	12.4	
Temperature, °F	316	318	318	
Stack: Velocity, fps	60.66	62.09	63.17	
Flow Rate, mscfh	55.53	53.48	54.41	
Stack Static P, "Hg	24.53	24.53	24.53	
Baghouse Operation Delta P, "H_2O 2A/2B	4.0 / 4.0	4.3 / 3.59	3.5 / 3.69	
Temperature in, °F 2A/2B	326 / 325	330.5 / 321	322 / 321	
Unit Operation Comments	Prior to Testing on PCM 10/14/98	During Ontario Hydro @ AHO and ADA PCM Inlet & outlet	Finish All Testing	

Thursday
10/15/98

Unit Operation Data

ADA Technologies

PSCo Site and Unit Number Comanche Unit 2

Test Number	Consol 5	Consol 5	Consol 5	Consol 6
Date	10/15/98	10/15/98	10/15/98	10/15/98
Time	0952	12:28	14:37 / PSCo Cem Time 13:38	15:29 / 14:29
Data Collected By	G.A.	G.A.	G.A	G.A.
Unit Load, MW_{Gross}/MW_{net}	357 - 330	356 / 329	357 / 331	359 / 330
Fuel	Coal	Coal	Coal	
Excess O_2, % L/R	3.0 / 4.0	3.0 / 4.0	3.0 / 4.0	3.0 / 4.0
Steam Flow, klb/hr	2450	2550	2550	2550
Air Flow	76	78	78	78
APH: Air In, °F 2A/2B	94.5 — 94.0	90 → 90	94 — 94	95 — 95
Air Out, °F 2A/2B	700 — 695	704 — 692	705 — 697	705 — 700
Gas In, °F 2A/2B	776 — 771	782 — 772	777 — 771	781 — 771
Gas Out, °F 2A/2B	301 — 302	313 — 311	317 — 314	318 — 316
Furnace Draft, "H_2O	-.7"	-.4"	-.79	-.71
Coal Feed, ton/hr	203.7	199	201.9	199.1
Opacity, %	2.8	2.2	2.5	2.4
NO_x, ppm	167	170	169	173
SO_2, ppm	235	228	230	226
CO_2, %	~~13.46~~ 11.12	10.86	11.33	11.12
H_2O, %	12.7	12.1	12.0	11.8
Temperature, °F	297	306	313	315
Stack: Velocity, fps	45.87	61.17	61.58	61.45
Flow Rate, mscfh	47.13	53.39	53.09	52.85
Stack Static P, "Hg	24.53	24.53	24.38	24.38
Baghouse Operation				
Delta P, "H_2O 2A/2B	3.47 — 3.10	4.0 — 4.15	4.05 — ~~3.24~~ 4.01	4.68 — 4.72
Temperature in, °F 2A/2B	3.76 — 310	320 — 320	324 — 323	325 — 325
Unit Operation Comments	Before Ontario hydro test on pem	Ontario-Hydro Started @ 12:00	Ontario-Hydro Finished	Start Ontario-Hydro #6

Unit Operation Data

ADA Technologies

PSCo Site and Unit Number **Comanche Unit 2**

Test Number	Consol #6			
Date	10/15/98			
Time	17:42 / 16:42 watch / pscc cem			
Data Collected By	G.A			
Unit Load, MW_{Gross}/MW_{net}	359 – 331			
Fuel	Coal			
Excess O_2, % L/R	3.0 – 4.0			
Steam Flow, klb/hr	2550			
Air Flow	78			
APH: Air In, °F 2A/2B	93 93			
Air Out, °F 2A/2B	706 696			
Gas In, °F 2A/2B	779 772			
Gas Out, °F 2A/2B	315 313			
Furnace Draft, "H_2O	–.60			
Coal Feed, ton/hr	203.9			
Opacity, %	2.4			
NO_x, ppm	168			
SO_2, ppm	225			
CO_2, %	10.61			
H_2O, %	11.7			
Temperature, °F	315			
Stack: Velocity, fps	61.91			
Flow Rate, mscfh	53.25			
Stack Static P, "Hg	24.38	24.?		
Baghouse Operation				
Delta P, "H_2O 2A/2B	4.04 4.39			
Temperature in, °F 2A/2B	323 322			
Unit Operation Comments	Ontario-Hydro's Finishes			

Appendix F

Coal Hg Analysis Results

Hazen Coal Analysis

Frontier GeoSciences Analysis

Computer Generated Coal Hg Analysis Spreadsheets

ADA Technologies, Inc.
Innovators In Measurement and Control Solutions

Memorandum

November 19, 1998

TO: Jerry Cunningham

COMPANY: Hazen Research

FROM: Sheila M. Haythornthwaite

RE: Coal analyses

Enclosed are four coal samples, numbered 1 to 4. As we discussed by phone today, please perform the following analyses:

Sample number	Analyses
1	Ultimate, proximate, Btu and Cl
2	Ultimate, proximate and Btu
3	Ultimate, proximate and Btu
4	Ultimate, proximate and Btu

ADA's PO number for this work is 981076.

I'll look for the results by fax on November 30. Our fax number is (303) 792-5633. Please call me if you have any questions at (303) 792-5615. Thank you,

Sheila Haythornthwaite

M111998BB

ADA Technologies, Inc.
Innovators In Measurement and Control Solutions

Memorandum

December 2, 1998

TO: Gerry Cunningham

COMPANY: Hazen Research

FROM: Sheila M. Haythornthwaite

RE: Coal pulverizing

Enclosed are four coal samples, Ch-3, Ar-1, Ar-4 and Co-2. Please pulverize each sample separately, and return all samples to me at ADA Technologies. Our Fedex shipping number is 1034-1115-7, please send the samples by overnight when they are pulverized. The chain of custody below should stay with these samples.

ADA's PO number for this work is 981124.

Our fax number is (303) 792-5633. Please call me if you have any questions at (303) 792-5615. Thank you for your help with this,

Sheila

Chain of Custody for Coal Samples

	Ch-3	Ar-1	Ar-4	Co-2
Sampled by ADA	GA	GA, SMH	GA	KC, GA
Shipped by ADA	SMH 12/2/98	SMH 12/2/98	SMH 12/2/98	SMH 12/2/98
Received by Hazen	JHC 120398	JHC 120398	JHC 120398	JHC 120398
Shipped by Hazen				
Received by ADA				

Hazen Research, Inc.
4601 Indiana St. • Golden, Colo. 80403
Tel: (303) 279-4501
FAX: (303) 278-1528

Date December 1 1998
HRI Project 009-407
HRI Series No. K288/98-1
Date Rec'd. 11/20/98
Cust. P.O.# 981076

ADA Environmental Solutions
Sheila M. Haythornthwaite
304 Inverness Way South, Suite 110
Englewood, Colorado 80112

Sample Identification
ADA Tech Coal Sample #1
COMANCHE UNIT 2
10/98

Reporting Basis >	As Rec'd	Dry	Eqm	Air Dry
Proximate (%)				
Moisture	27.10	0.00		7.82
Ash	4.70	6.44		5.94
Volatile	31.20	42.80		39.45
Fixed C	37.00	50.76		46.79
Total	100.00	100.00	100.00	100.00
Sulfur	0.31	0.42		0.39
Btu/lb (HHV)	8669	11893		10963
MMF Btu/lb	9133	12792		
MAF Btu/lb		12712		
Air Dry Loss (%)	20.92			
Ultimate (%)				
Moisture	27.10	0.00		7.82
Carbon	50.48	69.26		63.84
Hydrogen	2.61	3.57		3.29
Nitrogen	0.73	1.00		0.92
Sulfur	0.31	0.42		0.39
Ash	4.70	6.44		5.94
Oxygen*	14.07	19.31		17.80
Total	100.00	100.00	100.00	100.00
Chlorine**	<0.01	<0.01		<0.01

Forms of Sulfur (as S,%)

Sulfate		
Pyritic		
Organic		
Total	0.31	0.42

Water Soluble Alkalies (%)

Na2O
K2O

Lb. Alkali/MM Btu=
Lb. Ash/MM Btu= 5.42
Lb. SO2/MM Btu= 0.71
HGI= @ % Moisture
As Rec'd. Sp.Gr.=
Free Swelling Index=

Report Prepared By:

Fuels Laboratory Supervisor

* Oxygen by Difference.
** Not usually reported as part of the ultimate analysis.

Hazen Research, Inc.
4601 Indiana St. • Golden, Colo. 80403
Tel: (303) 279-4501
FAX: (303) 278-1528

Date	December 10, 1998
HRI Project #	009-407
HRI Series No.	L47/98
Date Rec'd	12/03/98
Cust. P.O. #	981124

ADA Technologies, Inc.
Sheila M. Haythornthwaite
304 Inverness Way South, Suite 110
Englewood, Colorado 80112

REPORT OF ANALYSIS

SAMPLE NUMBER	SAMPLE IDENTIFICATION	Air Dry Loss, %
L47/98-1	Ch-3	4.15
L47/98-2	Ar-1	12.91
L47/98-3	Ar-4	14.69
L47/98-4	Co-2	10.49

Report Prepared By:

Gerard H. Cunningham
Fuel Laboratory Manager

THESE AIR DRY LOSSES APPLY TO PULVERIZED COALS SUBMITTED TO FGS 12/98 FOR HG ANALYSIS.

INV:3048

From: "ericp@frontier.wa.com"
To: SheilaH
Date: 12/31/98 1:16am
Subject: New Improved Coal Hg Values

Hi Sheila,

See enclosed excel file with much more consistent and coherent coal Hg values.

<<Coal Hg 981227.xls>>
As I mentioned in a voice mail - I reran all the coal samples last Sunday and analyzed some in duplicate. In hindsight, the values from 981214 are poor. I had analytical difficulties that day, wheras all the runs on 981227 were up to our high standards.

First check that I have correctly identified the coal sample ID with the power plant sample ID. If not - you'll need to make the corrections to the "Overall Average" values I have calculated.

Also, I have used the strikout on most of the values for the 981214 analysis - if these strikeouts did not come through on your spreadsheet - let me know - otherwise you will be confused

One important note - to get the best overall average - you must first calculate the mean of multiple runs for a particular digested sample and then take the mean of the 3 separate digests. For example it would be wrong to take the overall mean of the 7 values for Arap-1 (C2, C10, C13). This would weight your values toward the C2 values since there are 3 good values and just 2 for the others. The difference between the wrong mean and the correct mean is nearly 5% - (76.9 vs 73.7 ng/g).

Most of the values for 981214 were thrown out. Based on historical performance - we usually do better than 10% on reruns of coal. Thus I tossed any 981214 data that was greater than 20% different than the 981227 data. Assuming my coal/plant ID are correct - the "data coherence" also helps to weed out suspect values. For example, I have thrown out sample C14 (Arap-4 >300 ng/g). It is clearly an outlier compared to other Arap-4 samples and also for this type of coal.

If you want me to further detail my justification for the tossing 981214 data - let me know.

Finally, as part of our efforts to support the upcoming EPA ICR for Hg in coal, we have developed a better digestion method for coal. I have digested all of your samples using this method (internal research) and will analyze them this weekend. I will share these results with you. I hope they will confirm what I am reporting here.

Finally, I would like to talk to you further about the mass balance. These results should tighten things up a bit for Arap-4 and Cher-3 (but not Arap-1).
How did you get the outlet ash value?? How did you get the coal Hg into ng/m3? When I have done mass balances - I have done it in units of ug/hour.

Happy New Year

-Eric

Eric Prestbo
Frontier Geosciences

ericp@frontier.wa.com
206 622 6960 voice
206 622 6870 fax

CC: "bobb@frontier.wa.com"

Hg in Coal
ADA Technologies - 981214 and 981227
Analyzed by EPA Method 1631 with Microwave Bomb Digest
Frontier Geosciences Inc

Coal Sample ID	Digest Gram	981214 r1 ng/g	981214 r2 ng/g	981227 r1 ng/g	981227 r2 ng/g	Site ID	Mean ng/g
C-Blk		0.270		0.161			
C1	0.192	~~98.758~~		68.56		Com-2	68.56
C1-Dup	0.242	70.465		69.99		Com-2	70.23
C2	0.205	98.576	92.195	99.01		Arap-1	96.59
C4	0.175	59.407		66.32		Com-2	62.86
C5	0.239	~~14.945~~	~~10.768~~	18.3		Cher-3	18.30
C7	0.174	~~9.747~~		18.83		Cher-3	18.83
C8	0.177	~~37.954~~		58.84	55.77	Com-2	57.31
C10	0.21	~~47.061~~		68.63	69.42	Arap-1	69.03
C11	0.175	~~40.983~~		53.72	51.35	Arap-4	52.54
C12	0.16	~~15.154~~		19.59		Cher-3	19.59
C13	0.209	50.388		55.35	55.37	Arap-1	55.36
C14	0.186	~~257.645~~		~~350.1~~	~~368.8~~	Arap-4	
C16	0.228	~~35.855~~		54.94	53.57	Arap-4	54.26

Sample ID	981214 % Rec	981227 %Rec
C-1630	104%	94%
C2-MS (100 ng)	92%	99%
C2-MS (100 ng)	81%	
C8 + 2.0 ng	na	103%

OVERALL AVERAGES

	Com-2 ng/g	Arap-1 ng/g	Arap-4 ng/g	Cher-3 ng/g
Mean	64.74	73.66	53.40	18.91
Std Dev	5.9	22.3		0.6
% RSD	9.1%	30.2%		3.4%

Correction for air dry loss:

	ng/g	% H_2O Loss	ng/g actual
Com-2	64.74	10.49	57.95
Cher-3	18.91	4.15	18.1
Arap-1	73.66	12.91	64.2
Arap-4	53.40	14.69	45.6

$$\frac{ng}{g} * (1 - \%H_2O) = ng/g \text{ actual}$$

n=2

SRM RECOVERY - NIST 1630 Trace Hg in Coal

SRM ID	SRM Certified @ 0.13 +/- 0.01 ug/g	SRM measured system blk cor ug/g	SRM Reagent blank correct ug/g	SRM % Recovery
NIST SRM 1630	0.13	0.122	0.121	93.2

SRM RECOVERY - NIST 1633a Trace Elements in Coal Fly Ash

SRM ID	SRM Certified @ 0.16 +/- 0.01 ug/g	SRM measured system blk cor ug/g	SRM Reagent blank correct ug/g	SRM % Recovery
NIST SRM 1633a	0.16	0.149	0.148	92.8

Notes:

Wet Bottom Ash samples 70 & 71 required homogenization in a ball mill followed by a bomb digest due to the large aggregate nature of this ash. We therefore followed the same homogenization and bomb digest procedures as that for coal analysis.

Comp (*1)	Dry Air by volume	Wet Air by volume
% N2	78.1%	
% O2	20.9%	
% Ar	0.9%	
% CO2	0.03%	
	100.0%	
% N2a (*2)	79.05%	77.4%
% O2	20.95%	20.5%
% H2O		2.0%
Air H2O (*3)	0.013	$lb/lb_{dry\ air}$
	0.021	$mole/mole_{dry}$

	Stoich. Air, mass lb/lb fuel		
	O2	N2a	Dry Air
To form:			
SO2	0.0055	0.01826	0.02376
CO2	1.6125192	5.3544838	6.967003
H2O	0.2333184	0.7747782	1.008126
O_2 in fuel	-0.10	-0.33	-0.43
TOTALS	1.75	5.82	7.57

Notes:

*1 Air composition of std atmosphere per CRC 1990

*2 N2a includes Argon, CO2 for avg MW=28.161

*3 Standard moisture per ABMA at 80F, 60% RH

ALL INPUTS IN BLUE

Fuel Composition, % by weight

Ultimate analysis, wet basis

	Btu/lb		Stoich. Products, mass: lb/lb_{fuel}						
			CO2	H2O	N2a	$N2_{fuel}$	SO2	Ash	Hg
	H2O	0.271		0.271					
	Ash	0.047						0.047	
	S	0.0031		0.000	0.01		0.01		
	C	0.5048	1.85	0.076	4.47				
	H	0.0261		0.245	0.69				
	N	0.0073				0.01			
	Hg	5.80E-08							0.000
O by difference		14.07%		-0.008	-0.47				
	TOTAL	85.93%							
			1.85	0.584	4.7	0.01	0.01	0.05	0
			Prod sum=		7.19	lb/lb_{fuel}			

Stoichiometric Products				
Species	MW	$mole/lb_{fuel}$	%vol, wet	ppm
CO2	44.0	0.0420	17.4%	
SO2	64.1	0.00010	0.0%	400
N2a	28.2	0.1668	69.0%	
$N2_{fuel}$	28.0	0.00026	0.1%	
Hg	200.6	0.0000	0.0%	0
H2O	18.0	0.0324	13.4%	
	Sums	0.2416	100.0%	
MW_{wet}	=	29.77	lb/mole	
Mw_{dry}	=	31.59	lb/mole	

WET FLUE GAS COMPOSITION				DRY FLUE GAS COMPOSITION				
	$O2,\%_{wet}$	moles O2	total moles		$O2,\%_{dry}$	moles O2	total moles	
xs O2	2.7%	0.00751	0.2782	xs O2	3.0%	0.007	0.2441	mol/# fuel
	% vol	ppm	ppb		% vol	ppm	ppb	
CO2	15.11%			CO2	17.2%			
SO2	0.03%	348		SO2	0.04%	396		
N2a	70.1%			N2a	79.6%			
$N2_{fuel}$	0.09%			$N2_{fuel}$	0.11%			
Hg			1.04	Hg			1.18	
H2O	11.9%			H2O	0.0%			
	100.0%				100.0%			

calculated gr/dscf 3.5467

Comanche 2	Mercury ug/Nm3	ng/g ash
Calc. from coal	10.01	
Measured Hg: RG inlet	10.51	
Measured Hg: RG ash	7.93	978
Measured Hg: Stack	3.92	
Ash + Stack	11.85	

Closure from coal to ash+stack=	1-((calc from coal)-(ash+stack))/(calc from coal)=	118%
Closure from coal to inlet=	1-((calc from coal)-(RG inlet))/(calc from coal)=	105%
Closure from inlet to ash+stack=	1-((RG inlet)-(ash+stack))/(RG inlet)=	113%

Hg removed, %= (RG inlet-Stack)/RG inlet * 100= 63 %

Appendix G

Ash Hg Analysis Results

Frontier GeoSciences Analysis Results

Computer Generated Ash Hg Analysis Spreadsheet

From: "bobb@frontier.wa.com"
To: GARYA , SheilaH
Date: 11/12/98 9:18am
Subject: Re: Coal and Special Ash Samples

Hi Sheila and Gary,

<<ADAComCoal-Ash.xls>>
Attached is a revised data table for Table 4 of the previous report. The revision involves the two Ash samples identified as #70 and #71. The ash from these samples were in large aggregates rather than fines, therefore they required homogenization in a ball mill followed by a bomb digest. We therefore followed the same procedures for these two ash samples as that done for coal samples

Also included is the one coal sample result as well as NIST Coal and Fly Ash Standard Reference Material Results.

Results from the IC and combined Cyclone/Filter samples (received on Monday 11/9) will be completed this afternoon and emailed to you both.

If you have any questions, please call or email.

Best Regards,

Bob Brunette

CC: "bobb@frontier.wa.com"

Site Comanche Results of Total Hg in
Frontier Geosciences Inc, November 10, 1998
Table 4: Total Hg in Bulk Ash

Sample ID	ng/digest	Sample Amt (g)	Conc (ng/g)	
ASH-45	264.25	0.253	1044.46	Baghouse Ash
ASH-45 MD	251.16	0.263	954.97	< Matrix Duplicate = 9.0%
ASH-47	222.47	0.239	930.83	Baghouse Ash
ASH-51	220.67	0.244	904.39	Baghouse Ash
ASH-53	245.32	0.287	854.77	Baghouse Ash
ASH-54	278.52	0.251	1109.64	Baghouse Ash
ASH-59	371.20	0.320	1160.00	Baghouse Ash
ASH-60	261.65	0.284	921.31	Baghouse Ash
ASH-65	237.68	0.252	943.19	Baghouse Ash
ASH-68	<MDL	0.220	<MDL	Econ Ash
ASH-69	<MDL	0.232	<MDL	Econ Ash

✓ Inv. 2953

Cyclone Laboratory Spike Recovery	
ASH-45 MD SPK=1.00ng	96.7%

Table 5: Total Hg In Coal & Select Ash - Bomb Digest Required

Sample ID	Bomb Digest ID	Grams/Digest (g)	FGS System Blank Correct (ng Hg/digest)	FGS System Blank Correct ng Hg/g	Reagent Blank Correct ng Hg/g
Bomb Prep Blank -1	B7	na	0.23		
Bomb Prep Blank -2	Dist-20	na	0.28		
ADA Coal Sample (Vial #41)	B1	0.225	11.77	52.31	52.31
Wet Bottom Ash (Vial 70)	B2	0.363	0.50	1.38	1.38
Wet Bottom Ash (Vial 71)	B13	0.321	0.07	0.22	<MDL
NIST SRM 1630	B3	0.251	30.65	122.11	122.11

✓ Inv. 2953

Bomb Digest Reagent Blank	0.26	(ng/digest)

n=2

SRM RECOVERY - NIST 1630 Trace Hg in Coal

SRM ID	SRM Certified @ 0.13 +/- 0.01 ug/g	SRM measured system blk cor ug/g	SRM Reagent blank correct ug/g	SRM % Recovery
NIST SRM 1630	0.13	0.122	0.121	93.2

SRM RECOVERY - NIST 1633a Trace Elements in Coal Fly Ash

SRM ID	SRM Certified @ 0.16 +/- 0.01 ug/g	SRM measured system blk cor ug/g	SRM Reagent blank correct ug/g	SRM % Recovery
NIST SRM 1633a	0.16	0.149	0.148	92.8

Notes:

Wet Bottom Ash samples 70 & 71 required homogenization in a ball mill followed by a bomb digest due to the large aggregate nature of this ash. We therefore followed the same homogenization and bomb digest procedures as that for coal analysis.

Comp (*1)	Dry Air by volume	Wet Air by volume
% N2	78.1%	
% O2	20.9%	
% Ar	0.9%	
% CO2	0.03%	
	100.0%	
% N2a (*2)	79.05%	77.4%
% O2	20.95%	20.5%
% H2O		2.0%
Air H2O (*3)	0.013	$lb/lb_{dry\ air}$
	0.021	$mole/mole_{dry}$

	Stoich. Air, mass lb/lb fuel		
	O2	N2a	Dry Air
To form:			
SO2	0.0031	0.010292	0.013392
CO2	1.3447872	4.4654608	5.810248
H2O	0.2071296	0.6878133	0.894969
O_2 in fuel	-0.14	-0.47	-0.61
TOTALS	1.41	4.70	6.11

Notes:

*1 Air composition of std atmosphere per CRC 1990

*2 N2a includes Argon, CO2 for avg MW=28.161

*3 Standard moisture per ABMA at 80F, 60% RH

ALL INPUTS IN BLUE

Fuel Composition, % by weight

Ultimate analysis, wet basis

	Btu/lb		CO2	H2O	N2a	$N2_{fuel}$	SO2	Ash	Hg
	H2O	0.271		0.271					
	Ash	0.047						0.047	
	S	0.0031		0.000	0.01		0.01		
	C	0.5048	1.85	0.076	4.47				
	H	0.0261		0.245	0.69				
	N	0.0073				0.01			
	Hg	5.80E-08							0.000
O by difference		14.07%		-0.008	-0.47				
	TOTAL	85.93%							
			1.85	0.584	4.7	0.01	0.01	0.05	0
			Prod sum=		7.19	lb/lb_{fuel}			

Stoich. Products, mass: lb/lb_{fuel}

Stoichiometric Products

Species	MW	$mole/lb_{fuel}$	%vol, wet	ppm
CO2	44.0	0.0420	17.4%	
SO2	64.1	0.00010	0.0%	400
N2a	28.2	0.1668	69.0%	
$N2_{fuel}$	28.0	0.00026	0.1%	
Hg	200.6	0.0000	0.0%	0
H2O	18.0	0.0324	13.4%	
	Sums	0.2416	100.0%	
MW_{wet}	=	29.77	lb/mole	
Mw_{dry}	=	31.59	lb/mole	

WET FLUE GAS COMPOSITION				DRY FLUE GAS COMPOSITION				
	$O2,\%_{wet}$	moles O2	total moles		$O2,\%_{dry}$	moles O2	total moles	
xs O2	2.7%	0.00751	0.2782	xs O2	3.0%	0.007	0.2441	mol/# fuel
	% vol	ppm	ppb		% vol	ppm	ppb	
CO2	15.11%			CO2	17.2%			
SO2	0.03%	348		SO2	0.04%	396		
N2a	70.1%			N2a	79.6%			
$N2_{fuel}$	0.09%			$N2_{fuel}$	0.11%			
Hg			1.04	Hg			1.18	
H2O	11.9%			H2O	0.0%			
	100.0%				100.0%			

calculated gr/dscf 3.5467

Comanche 2	Mercury ug/Nm3	ng/g ash
Calc. from coal	10.01	
Measured Hg: RG inlet	10.51	
Measured Hg: RG ash	7.93	978
Measured Hg: Stack	3.92	
Ash + Stack	11.85	

Closure from coal to ash+stack=	1-((calc from coal)-(ash+stack))/(calc from coal)=	118%
Closure from coal to inlet=	1-((calc from coal)-(RG inlet))/(calc from coal)=	105%
Closure from inlet to ash+stack=	1-((RG inlet)-(ash+stack))/(RG inlet)=	113%

Hg removed, %= (RG inlet-Stack)/RG inlet * 100= 63 %

Appendix H

Field Recovery Sheets

ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-13-98 Test ID: #1

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	70.2 g.	4.51	
300 3 /150	KCl Impingers 450 +	99 549 mL	7.37	
100 4 75	HNO_3/H_2O_2 Impinger/175	+0 175	2.41	
200 5 50	$KMnO_4$ Impingers 250	-10 240	23.5	
6 /100	Acid Rinse of $KMnO_4$/100	100	2.70	

Total Particulate Wt. 8.0433 grams (.25 ppm H_2S) Condensate Total 114.5 mL

~~PILOT PLANT BAGHOUSE INLET~~: air preheater outlet Low

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	96.2 g.	2.97	
300 3 /150	KCl Impingers 450 +	102 562 mL (562)	4.82	
100 4 75	HNO_3/H_2O_2 Impinger/175	175	12.1	
200 5 50	$KMnO_4$ Impingers 250	-7 243	29.6	
6 /100	Acid Rinse of $KMnO_4$/100	100	2.32	

Total Particulate Wt. 0.6984 grams (2.56 ppm H_2S) Condensate Total 114.3 mL

BAGHOUSE OUTLET (STACK) TRAIN: Low

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	90.3 g	1.34	
300 3 /150	KCl Impingers 450 +	228 678 mL	11.5	
100 4 75	HNO_3/H_2O_2 Impinger/175	+3 178	0.95	
200 5 50	$KMnO_4$ Impingers 250	-6 244	1.21	
6 /100	Acid Rinse of $KMnO_4$/100	100	1.82	

Total Particulate Wt. -0.0019 grams Condensate Total 253.6 mL

Recovered By: [signature] Date: 10-13-98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-13-98 Matt Test ID: #2

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	69.5	4.03	
300 3 150	KCl Impingers 450 + 90	540 mL	2.15	
100 4 75	HNO_3/H_2O_2 Impinger 175 -1	174	<0.5	
200 5 50	$KMnO_4$ Impingers 250 -11	239	23.2	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.26	

Total Particulate Wt. 6.3464 grams Condensate Total 103.0 mL

~~PILOT PLANT BAGHOUSE INLET~~: Air Pre Heater Low

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	88.3	1.17	
300 3 150	KCl Impingers 450 + 116	566 mL 566	3.73	
100 4 75	HNO_3/H_2O_2 Impinger 175 +0	175	3.19	
200 5 50	$KMnO_4$ Impingers 250 -8	242	36.8	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.20	

Total Particulate Wt. 6.8399 grams Condensate Total 122.4 mL

BAGHOUSE OUTLET (STACK) TRAIN: Low Back flush

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	131.4	<0.5	
300 3 150	KCl Impingers 450	409 mL	21.5	
100 4 75	HNO_3/H_2O_2 Impinger 175	458	2.70	
200 5 50	$KMnO_4$ Impingers 250	226	<0.5	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.03	

Total Particulate Wt. -0.0016 grams Condensate Total 242.4 mL

Recovered By: Jim Bedellion Date: 10-13-98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-14-98 Matt Test ID: 3

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	78.0 gr	6.50	
300 3 150	KCl Impingers 450 +114	564 mL	1.70	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	0.75	
200 5 50	$KMnO_4$ Impingers 250-4	246	15.5	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.64	

Total Particulate Wt. 7.2783 grams Condensate Total 124.5 mL

PILOT PLANT ~~BAGHOUSE~~ INLET: ~~Ho~~ Lee

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	81.5 gr	4.29	
300 3 150	KCl Impingers 450 +122	572 mL	3.69	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	2.11	
200 5 50	$KMnO_4$ Impingers 250-1	249	20.6	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.00	

Total Particulate Wt. 0.8588 grams Condensate Total 134.6 mL

~~Pilot Plant~~ Stack

~~BAGHOUSE~~ OUTLET ~~(STACK)~~ TRAIN: Lee

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	128.4 gr	<0.5	
300 3 150	KCl Impingers 450+149	599 mL	7.57	
100 4 75	HNO_3/H_2O_2 Impinger 175+1	176	1.46	
200 5 50	$KMnO_4$ Impingers 250-3	247	<0.5	
6 100	Acid Rinse of $KMnO_4$ 100	100	0.96	

Total Particulate Wt. -0.0025 grams Condensate Total 166.1 mL

Recovered By: [signature] Date: 10-14-98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-14-98 Test ID: 3A

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse			
~~300~~ 3	KCl Impingers			
4	HNO_3/H_2O_2 Impinger			
5	$KMnO_4$ Impingers			
6	Acid Rinse of $KMnO_4$			

Total Particulate Wt._____ grams Condensate Total_____ mL

PILOT PLANT BAGHOUSE INLET:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse			
3	KCl Impingers			
4	HNO_3/H_2O_2 Impinger			
5	$KMnO_4$ Impingers			
6	Acid Rinse of $KMnO_4$			

Total Particulate Wt._____ grams Condensate Total_____ mL

~~Pilot Plant~~ ~~BAGHOUSE~~ OUTLET (STACK) TRAIN: Pm

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	129.4 gr	<0.5	
300 3 150	KCl Impingers 450+144	594 mL	7.43	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	1.81	
200 5 50	$KMnO_4$ Impingers 250-3	247	1.41	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.52	

Total Particulate Wt. -0.0029 grams Condensate Total 158.0 mL

Recovered By: [signature] Date: 10-14-98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-14-98 Test ID: #4

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	175.0 g	2.52	
300 3 150	KCl Impingers 450+104	554 mL	3.71	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	1.25	
200 5 50	$KMnO_4$ Impingers 250-7	243	34.9	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.86	

Total Particulate Wt. 5.5190 grams Condensate Total 118.2 mL

PILOT PLANT ~~BAGHOUSE~~ INLET:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	189.8 g	<0.5	
300 3 150	KCl Impingers 450+120	570	4.24	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	174	1.51	
200 5 50	$KMnO_4$ Impingers 250+1	249	21.7	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.00	

Total Particulate Wt. 3.7958 grams Condensate Total 130.2 mL

Pilot Plant ~~BAGHOUSE~~ OUTLET (STACK) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	111.7 g	2.33	
300 3 150	KCl Impingers 450+149	598 mL	2.61	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	0.66	
200 5 50	$KMnO_4$ Impingers 250-2	248	39.6	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.11	

Total Particulate Wt. -0.0015 grams Condensate Total 160.0 mL

Recovered By: [signature] Date: 10-14-98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-15-98 Test ID: # 5

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	160.6 gr	2.51	
300 3 150	KCl Impingers 450+113	563 mL	4.29	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	2.23	
200 5 50	$KMnO_4$ Impingers 250+4	246	22.1	
6 100	Acid Rinse of $KMnO_4$ 100	100	4.64	

Total Particulate Wt. 5.5611 grams Condensate Total 127.0 mL

PILOT PLANT ~~BAGHOUSE~~ INLET: Lem

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse ~~450~~	1.01.0 gr	6.14	
300 3 150	KCl Impingers 450 + 126	576 mL	4.71	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	2.54	
200 5 50	$KMnO_4$ Impingers 250+2	248	27.4	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.78	

Total Particulate Wt. 3.1814 grams Condensate Total 134.6 mL

Pilot Plant

~~BAGHOUSE~~ OUTLET (~~STACK~~) TRAIN: Flow

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	114.3	3.55	
300 3 150	KCl Impingers 450+136	586	5.32	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	1.20	
200 5 50	$KMnO_4$ Impingers 250+0	250	25.4	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.66	

Total Particulate Wt. -0.0024 grams Condensate Total 159.9 mL

Recovered By: [signature] Date: 10-15-98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-15-98 Test ID: #6

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	230.3 gr	1.37	
300 3 150	KCl Impingers 450 +115	565 mL	3.44	
100 4 75	HNO_3/H_2O_2 Impinger 175 0	175	1.43	
200 5 50	$KMnO_4$ Impingers 250 -1	249	21.2	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.21	

Total Particulate Wt. 6.1139 grams Condensate Total 128.6 mL

PILOT PLANT ~~BAGHOUSE~~ INLET:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	120.1 gr	0.76	
300 3 150	KCl Impingers 450 +116	566 mL	3.87	
100 4 75	HNO_3/H_2O_2 Impinger 175 +2	177	1.63	
200 5 50	$KMnO_4$ Impingers 250 -1	249	28.8	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.76	

Total Particulate Wt. 3.7253 grams Condensate Total 127.0 mL

Pilot Plant ~~BAGHOUSE~~ OUTLET (STACK) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	104.7 gr	<0.5	
300 3 150	KCl Impingers 450 +142	592 mL	6.68	
100 4 75	HNO_3/H_2O_2 Impinger 175 +1	176	<0.5	
200 5 50	$KMnO_4$ Impingers 250 -2	248	23.1	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.42	

Total Particulate Wt. -0.0017 grams Condensate Total 155.9 mL

Recovered By: [signature] Date: 10-15-98

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Appendix I

Sample Log In Sheets

Laboratory Log In Sheets for Solids

Laboratory Log In Sheets for Liquids

Laboratory Database Log In Record

ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Test #	1	Bar, "Hg	25.66
Date	10/13/98	Duct ID, '	23.2	Static, "H_2O	−0.839
Time	1020−1045	Duct Area	423.72	Dry Bulb °F	296.1
Tube I.D.	S−54A	% O_2	4.5	Wet Bulb °F	123.3
C−Factor	0.809	% CO_2	15.5	% H_2O	10.80
Operator(s)	RLO	% N_2	80.0	W.M.Wt	29.72

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw* [°CW]	Axial Vel [fps]
NORTH−1	12−1/4	294	0.466	47.00	0	47.00
NORTH−2	40−3/4	297	0.702	57.81	0	57.81
NORTH−3	82−1/2	297	0.713	58.26	0	58.26
EAST−1	12−1/4	295	0.525	49.91	0	49.91
EAST−2	40−3/4	295	0.711	58.10	0	58.10
EAST−3	82−1/2	295	0.712	58.15	0	58.15
SOUTH−1	12−1/4	297	0.542	50.78	0	50.78
SOUTH−2	40−3/4	298	0.725	58.79	0	58.79
SOUTH−3	82−1/2	298	0.795	61.58	0	61.58
WEST−1	12−1/4	295	0.459	46.71	0	46.71
WEST−2	40−3/4	296	0.694	57.45	0	57.45
WEST−3	82−1/2	296	0.707	57.98	0	57.98
Average		296.1	0.646	55.21	0	55.21
Maximum		298.0	0.795	61.58	0	61.58
Minimum		294.0	0.459	46.71	0	46.71
SDEV		1.3	0.109	4.89	0	4.89

* assumed "0" (axial flow), based upon results of Test #A conducted on 10/12/98

DATA SUMMARY		
	(Measured)	(Axial)
Velocity, fps	55.21	55.21
Velocity, fpm	3313	3313
ACFM	1403586	1403586
SCFM	838259	838259
DSCFM	747687	747687
Ex Air Free	585628	585628

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ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Test #	2	Bar,"Hg	25.55
Date	10/13/98	Duct ID,'	23.2	Static, "H_2O	−0.830
Time	1450−1525	Duct Area	423.72	Dry Bulb °F	312.7
Tube I.D.	S−54A	% O_2	4.5	Wet Bulb °F	124.5
C−Factor	0.809	% CO_2	15.5	% H_2O	11.10
Operator(s)	RLO	% N_2	80.0	W.M.Wt	29.68

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw* [°CW]	Axial Vel [fps]
NORTH−1	12−1/4	311	0.447	46.68	0	46.68
NORTH−2	40−3/4	312	0.717	59.17	0	59.17
NORTH−3	82−1/2	313	0.762	61.02	0	61.02
EAST−1	12−1/4	311	0.508	49.75	0	49.75
EAST−2	40−3/4	313	0.718	59.25	0	59.25
EAST−3	82−1/2	314	0.755	60.78	0	60.78
SOUTH−1	12−1/4	312	0.489	48.86	0	48.86
SOUTH−2	40−3/4	314	0.739	60.14	0	60.14
SOUTH−3	82−1/2	315	0.774	61.59	0	61.59
WEST−1	12−1/4	312	0.481	48.45	0	48.45
WEST−2	40−3/4	312	0.731	59.74	0	59.74
WEST−3	82−1/2	313	0.738	60.04	0	60.04
Average		312.7	0.655	56.29	0	56.29
Maximum		315.0	0.774	61.59	0	61.59
Minimum		311.0	0.447	46.68	0	46.68
SDEV		1.2	0.124	5.63	0	5.63

* assumed "0" (axial flow), based upon results of Test #A conducted on 10/12/98

DATA SUMMARY		
	(Measured)	(Axial)
Velocity, fps	56.29	56.29
Velocity, fpm	3377	3377
ACFM	1431080	1431080
SCFM	832765	832765
DSCFM	740288	740288
Ex Air Free	580187	580187

ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Test #	3	Bar,"Hg	25.42
Date	10/14/98	Duct ID,'	23.2	Static, "H_2O	−0.834
Time	0845−0910	Duct Area	423.72	Dry Bulb °F	291.6
Tube I.D.	S−54A	% O_2	4.5	Wet Bulb °F	125.4
C−Factor	0.809	% CO_2	15.4	% H_2O	12.20
Operator(s)	RLO	% N_2	80.1	W.M.Wt	29.53

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw* [°CW]	Axial Vel [fps]
NORTH−1	12−1/4	290	0.492	48.53	0	48.53
NORTH−2	40−3/4	291	0.719	58.74	0	58.74
NORTH−3	82−1/2	291	0.745	59.80	0	59.80
EAST−1	12−1/4	291	0.566	52.13	0	52.13
EAST−2	40−3/4	292	0.745	59.82	0	59.82
EAST−3	82−1/2	292	0.722	58.89	0	58.89
SOUTH−1	12−1/4	292	0.633	55.14	0	55.14
SOUTH−2	40−3/4	294	0.799	62.03	0	62.03
SOUTH−3	82−1/2	294	0.786	61.55	0	61.55
WEST−1	12−1/4	290	0.507	49.31	0	49.31
WEST−2	40−3/4	291	0.744	59.74	0	59.74
WEST−3	82−1/2	291	0.779	61.12	0	61.12
Average		291.6	0.686	57.23	0	57.23
Maximum		294.0	0.799	62.03	0	62.03
Minimum		290.0	0.492	48.53	0	48.53
SDEV		1.3	0.104	4.57	0	4.57

* assumed "0" (axial flow), based upon results of Test #A conducted on 10/12/98

DATA SUMMARY		
	(Measured)	(Axial)
Velocity, fps	57.23	57.23
Velocity, fpm	3434	3434
ACFM	1455035	1455035
SCFM	866005	866005
DSCFM	760310	760310
Ex Air Free	595879	595879

ADA/PSCO, Comanche Stack Volumetric Flow Data
Stack Velocity & Temperature Traverse

Location	Stack	Test #	3A	Bar, "Hg	25.40
Date	10/14/98	Duct ID,'	23.2	Static, "H_2O	−0.806
Time	1115−1135	Duct Area	423.72	Dry Bulb °F	302.9
Tube I.D.	S−54A	% O_2	4.7	Wet Bulb °F	125.3
C−Factor	0.809	% CO_2	15.4	% H_2O	11.90
Operator(s)	RLO	% N_2	79.9	W.M.Wt	29.57

Ports labelled from port wall to inside of stack

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]	Null Yaw [°CW]	Axial Vel [fps]
NORTH−1	12−1/4	302	0.509	49.78	0	49.78
NORTH−2	40−3/4	302	0.746	60.26	0	60.26
NORTH−3	82−1/2	302	0.814	62.91	0	62.91
EAST−1	12−1/4	302	0.504	49.51	0	49.51
EAST−2	40−3/4	302	0.757	60.67	0	60.67
EAST−3	82−1/2	304	0.778	61.59	0	61.59
SOUTH−1	12−1/4	303	0.518	50.25	0	50.25
SOUTH−2	40−3/4	306	0.808	62.85	0	62.85
SOUTH−3	82−1/2	306	0.824	63.48	0	63.48
WEST−1	12−1/4	301	0.525	50.51	0	50.51
WEST−2	40−3/4	302	0.790	61.99	0	61.99
WEST−3	82−1/2	303	0.845	64.16	0	64.16
Average		302.9	0.701	58.16	0	58.16
Maximum		306.0	0.845	64.16	0	64.16
Minimum		301.0	0.504	49.51	0	49.51
SDEV		1.6	0.135	5.86	0	5.86

* assumed "0" (axial flow), based upon results of Test #A conducted on 10/12/98

DATA SUMMARY		
	(Measured)	(Axial)
Velocity, fps	58.16	58.16
Velocity, fpm	3490	3490
ACFM	1478653	1478653
SCFM	866375	866375
DSCFM	763274	763274
Ex Air Free	590533	590533

Rw

ADA/PSCO, Comanche APH Outlet Volumetric Flow Data
Air Preheater Outlet Velocity & Temperature Traverse

Location	APH West	Duct Width,"	417	Bar,"Hg	25.25
Date	10/15/98	Duct Depth,"	160.5	Static, "H_2O	−14.40
Time	1108−1150	Duct Area,ft^2	465	Dry Bulb °F	305.8
Tube I.D.	S−58	% O_2	5.1	Wet Bulb °F	121.9
C−Factor	0.818	% CO_2	15.1	% H_2O	10.80
Operator(s)	MSD,LLA	% N_2	79.9	W.M.Wt	29.68

Ports labelled from port wall to inside of duct

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]
A−1	27	263	0.855	64.90
A−2	80	263	0.144	26.63
A−3	134	263	0.046	15.05
B−1	27	280	0.604	55.18
B−2	80	280	0.123	24.90
B−3	134	280	0.110	23.55
C−1	27	303	0.278	38.02
C−2	80	303	0.171	29.82
C−3	134	303	0.125	25.49
D−1	27	298	0.270	37.34
D−2	80	298	0.167	29.37
D−3	134	298	0.152	28.02
E−1	27	322	0.287	39.10
E−2	80	322	0.162	29.38
E−3	134	322	0.141	27.41
F−1	27	330	0.324	41.76
F−2	80	330	0.183	31.38
F−3	134	330	0.150	28.41
G−1	27	330	0.563	55.05
G−2	80	330	0.092	22.25
G−3	134	330	0.122	25.63
H−1	27	320	0.650	58.77
H−2	80	320	0.082	20.88
H−3	134	320	0.009	6.92
Average		305.8	0.242	32.72
Maximum		330.0	0.855	64.90
Minimum		263.0	0.009	6.92
SDEV		22.9	0.209	13.70

DATA SUMMARY	
Velocity, fps	32.72
Velocity, fpm	1963
ACFM	912377
SCFM	508427
DSCFM	453541
Ex Air Free	343953

Skewed flow

ADA/PSCO, Comanche APH Outlet Volumetric Flow Data
Air Preheater Outlet Velocity & Temperature Traverse

Location	APH East	Duct Width."	417	Bar,"Hg	25.25
Date	10/15/98	Duct Depth,"	160.5	Static, "H_2O	−14.60
Time	1015−1105	Duct Area,ft^2	465	Dry Bulb °F	309.1
Tube I.D.	S−58	% O_2	4.9	Wet Bulb °F	122.0
C−Factor	0.818	% CO_2	15.2	% H_2O	10.80
Operator(s)	MSD,LLA	% N_2	80.0	W.M.Wt	29.69

Ports labelled from port wall to inside of duct

PORT/ POINT	Distance [" From Wall]	Temp [°F]	Delta P [" H_2O]	Velocity [fps]
A−1	27	270	0.837	64.53
A−2	80	270	0.120	24.43
A−3	134	274	0.061	17.47
B−1	27	278	1.431	84.84
B−2	80	277	0.744	61.13
B−3	134	274	0.763	61.78
C−1	27	288	1.064	73.65
C−2	80	288	0.888	67.28
C−3	134	288	0.834	65.20
D−1	27	299	1.064	74.19
D−2	80	299	0.962	70.54
D−3	134	299	0.833	65.64
E−1	27	312	1.104	76.21
E−2	80	312	0.648	58.39
E−3	134	312	0.516	52.10
F−1	27	343	0.715	62.55
F−2	80	343	0.341	43.20
F−3	134	343	0.270	38.44
G−1	27	343	0.906	70.42
G−2	80	343	0.390	46.20
G−3	134	343	0.371	45.06
H−1	27	340	0.830	67.27
H−2	80	340	0.277	38.86
H−3	134	340	0.183	31.54
Average		309.1	0.673	56.71
Maximum		343.0	1.431	84.84
Minimum		270.0	0.061	17.47
SDEV		28.1	0.349	17.05

DATA SUMMARY	
Velocity, fps	56.71
Velocity, fpm	3402
ACFM	1581364
SCFM	876871
DSCFM	782200
Ex Air Free	599437

Skewed flow

Summary of Ontario-Hydro test results at Comanche
Unit 2. O-H testing by Consol in 10/98

		Hg, ug/Nm3				
		Particulate	Oxidized	Elemental	Total	%O2
APH outlet	1	1.57	3.41	4.95	9.93	5.4
	2	2.09	1.17	4.65	7.91	6.5
	3	4.63	1.12	3.22	8.97	5.2
	4	3.75	2.02	7.19	12.96	5
	5	2.23	2.17	4.85	9.25	5
	6	3.72	1.78	4.45	9.95	5
6-Run Avg:		**3.0**	**1.9**	**4.9**	**9.83**	
3-Run Avg:		2.76	1.90	4.27	8.94	
6-Run Std dev:		1.20	0.84	1.29	1.71	
APH outlet Reverse	1	1.43	2.39	7.63	11.45	5.6
(nozzle reversed)	2	1.48	1.63	7.09	10.2	5.7
	3	1.88	1.8	4.07	7.75	5.5
Avg:		**1.6**	**1.9**	**6.3**	**9.8**	
Std dev:		0.25	0.40	1.92	1.88	
Stack	1	0	3.05	0.25	3.3	4.5
	2	0	3.66	0.6	4.26	4.5
	3	0	2.93	0.3	3.23	4.5
	3A	0	2.92	0.6	3.52	4.7
Avg:		**0.0**	**3.1**	**0.4**	**3.58**	
Std dev:		0.00	0.35	0.19	0.47	

Summary of Ontario-Hydro test results at Comanche
Unit 2. O-H testing by Consol in 10/98

		Hg, ug/Nm3 @ 3% O2			
		Particulate	Oxidized	Elemental	Total
APH outlet	1	1.81	3.94	5.72	11.47
	2	2.60	1.45	5.78	9.83
	3	5.28	1.28	3.67	10.23
	4	4.22	2.27	8.09	14.59
	5	2.51	2.44	5.46	10.41
	6	4.19	2.00	5.01	11.20
6-Run Avg:		**3.4**	**2.2**	**5.6**	**11.3**
3-Run Avg:		3.23	2.22	5.06	10.51
6-Run Std dev:		1.32	0.95	1.44	1.73
APH outlet Reverse	1	1.67	2.80	8.93	13.40
(nozzle reversed)	2	1.74	1.92	8.35	12.01
	3	2.19	2.09	4.73	9.01
Avg:		**1.9**	**2.3**	**7.3**	**11.5**
Std dev:		0.28	0.46	2.27	2.24
Stack	1	0.00	3.33	0.27	3.60
	2	0.00	3.99	0.65	4.65
	3	0.00	3.20	0.33	3.53
	3A	0.00	3.23	0.66	3.89
Avg:		**0.0**	**3.4**	**0.5**	**3.9**
Std dev:		0.00	0.38	0.21	0.51

Note: To correct Hg values to 3% O2, the following formula was used:

$$\frac{\text{As measured Hg (µg/Nm3)} * 17.9}{20.9 - \%\ O2}$$

Summary of Ontario-Hydro test results at Comanche Unit 2. O-H testing by Consol in 10/98

		Hg, ug/Nm3				
		Particulate	Oxidized	Elementa	Total	%O2
APH outlet		1.57	3.41	4.95	9.93	5.4
	2	2.09	1.17	4.65	7.91	6.5
	3	4.63	1.12	3.22	8.97	5.2
	4	3.75	2.02	7.19	12.96	5
	5	2.23	2.17	4.85	9.25	5
	6	3.72	1.78	4.45	9.95	5
6-Run Avg:		**3.0**	**1.9**	**4.9**	**9.83**	
3-Run Avg:		2.76	1.90	4.27	8.94	
6-Run Std dev:		1.20	0.84	1.29	1.71	
APH outlet Revers		1.43	2.39	7.63	11.45	5.6
ozzle reversed)	2	1.48	1.63	7.09	10.2	5.7
	3	1.88	1.8	4.07	7.75	5.5
Avg:		**1.6**	**1.9**	**6.3**	**9.8**	
Std dev:		0.25	0.40	1.92	1.88	
Stack	1	0	3.05	0.25	3.3	4.5
	2	0	3.66	0.6	4.26	4.5
	3	0	2.93	0.3	3.23	4.5
	3A	0	2.92	0.6	3.52	4.7
Avg:		**0.0**	**3.1**	**0.4**	**3.58**	
Std dev:		0.00	0.35	0.19	0.47	

Summary of Ontario-Hydro test results at Comanche Unit 2. O-H testing by Consol in 10/98

		Hg, ug/Nm3 @ 3% O2			
		Particulate	Oxidized	Elemental	Total
APH outlet		1.81	3.94	5.72	11.47
	2	2.60	1.45	5.78	9.83
	3	5.28	1.28	3.67	10.23
	4	4.22	2.27	8.09	14.59
	5	2.51	2.44	5.46	10.41
	6	4.19	2.00	5.01	11.20
6-Run Avg:		**3.4**	**2.2**	**5.6**	**11.3**
3-Run Avg:		3.23	2.22	5.06	10.51
6-Run Std dev:		1.32	0.95	1.44	1.73
APH outlet Reverse		1.67	2.80	8.93	13.40
nozzle reversed)	2	1.74	1.92	8.35	12.01
	3	2.19	2.09	4.73	9.01
Avg:		**1.9**	**2.3**	**7.3**	**11.5**
Std dev:		0.28	0.46	2.27	2.24
Stack		0.00	3.33	0.27	3.60
	2	0.00	3.99	0.65	4.65
	3	0.00	3.20	0.33	3.53
	3A	0.00	3.23	0.66	3.89
Avg:		**0.0**	**3.4**	**0.5**	**3.9**
Std dev:		0.00	0.38	0.21	0.51

Note: To correct Hg values to 3% O2, the following formula was used:

$$\frac{\text{As measured Hg } (\mu g/Nm3) * 17.9}{20.9 - \%\ O2}$$

Appendix E

Process Operations Unit Data

Unit Operation Data **ADA Technologies**

Tuesday 10/13 **PSCo Site and Unit Number** Comanche Unit 2

Test Number	CON #1	CON #1	CON #2	CONSOL #2
Date	10/13/98	10/13/98	10/13/98	10/13/98
Time	9:50 / 8:54 Computer	12:00	watch 14:25 / PSCC 13:25	watch 17:15 / PSCC Computer 16:14
Data Collected By	GA	GA.	GA.	G.A.
Unit Load, MW_{Gross}/MW_{net}	353 / 327	354 / 326	356 / 329	355 / 327
Fuel	Coal / Eagle Butte	Eagle Butte	Eagle Butte.	Eagle Butte
Excess O_2, % L/R	2.8 / 4.0 Right	3.6 / 4.0	3.0 / 4.3	2.8 / 4.0
Steam Flow, klb/hr	2550	2550	2550	2600
Air Flow	75	72	74	75
APH: Air In, °F 2A/2B	73 / 73	82 / 82	92 / 92	92.5 / 92.6
Air Out, °F 2A/2B	~~700~~ / 691	698 / 694	703 / 698	705 / 697
Gas In, °F 2A/2B	778 / 767	772 / 768	777 / 774	778 / 774
Gas Out, °F 2A/2B	300 / 302	304 / 304	313 / 313	317.8 314.5
Furnace Draft, "H_2O	-.75" 4/20	-.68	~~-~~ .67	-.48
Coal Feed, ton/hr	205 T/hr current	197.7	199.4	194.9
Opacity, % current	1.7	1.6	2.1	2.2
NO_x, ppm	179.4	168.5	161.5	166.0
SO_2, ppm	240.2	242.9	228.9	226.7
CO_2, %	11.06	11.33	11.22	10.74
H_2O, %	12%	12.2%	11.9	12.3%
Temperature, °F (stack)	295°	300	309	313
Stack: Velocity, fps	58.77	~~52.19~~ 58.48	61.5	54.78
Flow Rate, mscfh	50.91	52.19	54.24	47.94
Stack Static P, "Hg	~~24.98~~	~~24.83~~		
Baghouse Operation				
Delta P, "H_2O 2A/2B	3.0 / 3.5	3.9 / 4.0	4.8 / 4.7	3.6 / 3.8
Temperature in, °F 2A/2B	309 in / 306 in	312 / 313	321 / 324	324 / 326
Unit Operation Comments	During 1st Mercury Test.	1st Mercury Test complete	Start CONSOL 2nd Test.	CONSOL Finished Ash Samples From Baghouse ~16:30 To 17:00

Wednesday
10/14/98

Unit Operation Data

Wednesday

ADA Technologies

PSCo Site and Unit Number Comanche Unit 2

Test Number	Start CONSOL #3	CONSOL 3	CONSOL 3	CONSOL 3A*
Date	10/14/98	10/14/98	10/14/98	10/14/98
Time	7:47	0917	1037	12:14
Data Collected By	G.A.	GA	GA	GA
Unit Load, MW_{Gross}/MW_{net}	358 / 331	358 / 332	358 / 328	356 - 332
Fuel	Coal	Coal	Coal	Coal
Excess O_2, % L/R	2.8 / 4.3	2.8 / 4.1	3.0 / 4.0	3.0 - 4.1
Steam Flow, klb/hr	2500	2500	2500	2500
Air Flow	76	76	78	78
APH: Air In, °F 2A/2B	65.2 / 65.4	71 / 71	80 - 80	89 - 89
Air Out, °F 2A/2B	695 / 690	694 / 689	703 - 698	700 - 692
Gas In, °F 2A/2B	723 / 770	772 / 767	779 - 774	776 - 766
Gas Out, °F 2A/2B	295 / 294	296 / 296	306 - 306	311 - 308
Furnace Draft, "H_2O	-.55	-.6	-.7	-.85
Coal Feed, ton/hr	199.4	206.7	207	207
Opacity, %	2.4	2.6	2.0	2.1
NO_x, ppm	165.4	155	164	168
SO_2, ppm	237.4	236	226	228
CO_2, %	11.18	13.99	10.32	10.65
H_2O, %	12.5	13.3	12.7	13.0
Temperature, °F	290.5	308	302	308
Stack: Velocity, fps	51.92	52.49	60.0	51.72
Flow Rate, mscfh	47.06	46.37	53.26	45.28
Stack Static P, "Hg	~~0/B~~ 24.68	~~0/B~~ 24.68	24.68	24.53
Baghouse Operation				
Delta P, "H_2O 2A/2B	3.48 / 3.16	3.75 - 3.77	3.5 - 4.13	3.71 - 3.96
Temperature in, °F 2A/2B	301 / 301	302 - 305	313 - 313	317 - 317
Unit Operation Comments	Baghouse Finished Cleaning	Everything Running Smooth.	Stack Test Finish with 1st Test Matt Still Sampling	CONSOL Transitioning between AMO & ADA Run

* 3A denotes AN ADDitional ONtario hydro performed at the Stack. This was Due To the potential loss of the stack 2nd ONtario-hydro

Wednesday
10/14/98

Unit Operation Data **ADA Technologies**

PSCo Site and Unit Number Comanche Unit 2

Test Number	CONSOL 4	CONSOL 4	CONSOL 4	
Date	10/14	10/14/98	10/14/98	
Time	Water 15:05 / PSCC Com 13:53	17:43 / 16:33	19:10 / PSCC Computer 18:01	
Data Collected By	G.A	GA	GA	
Unit Load, MW_{Gross}/MW_{net}	354 / 328	358 / 328	357 — 329	
Fuel	Eagle Butte Coal	Eagle Butte Coal	From Gillette Wyo. Bolleaire mine Coal	Belle AyR — Correct Spelling Mine
Excess O_2, % L/R	3.0 / 4.0	2.8 / 4.2	2.8 / 4.2	
Steam Flow, klb/hr	2550	2550	2550	
Air Flow	78	78	78	
APH: Air In, °F 2A/2B	97 — 97	98 — 98	92 — 92	
Air Out, °F 2A/2B	706 — 695	712 — 699	705 — 696	
Gas In, °F 2A/2B	778 — 772	788 — 779	778 — 771	
Gas Out, °F 2A/2B	319 — 315	323 — 317	315 — 310	
Furnace Draft, "H_2O	-.48	-.75	-.45	
Coal Feed, ton/hr	202	197	197.4	
Opacity, %	2.3	2.0	1.9	
NO_x, ppm	168.8	154.8	157	
SO_2, ppm	240	231	233	
CO_2, %	11.87	11.14	11.22	
H_2O, %	12.6	12.5	12.4	
Temperature, °F	316	318	318	
Stack: Velocity, fps	60.66	62.09	63.17	
Flow Rate, mscfh	55.53	53.48	54.41	
Stack Static P, "Hg	24.53	24.53	24.53	
Baghouse Operation Delta P, "H_2O 2A/2B	4.0 / 4.0	4.3 / 3.59	3.5 / 3.69	
Temperature in, °F 2A/2B	326 / 325	330.5 / 321	322 / 321	
Unit Operation Comments	Prior to Testing on PCM 10/14/98	During Ontario Hydro @ AHO and ADA PCM Inlet & outlet	Finish All Testing	

Thursday
10/15/98

Unit Operation Data

ADA Technologies

PSCo Site and Unit Number Comanche Unit 2

Test Number	Consol 5	Consol 5	Consol 5	Consol 6
Date	10/15/98	10/15/98	10/15/98	10/15/98
Time	0952	12:28	14:37 / PSCo Com Time 13:38	15:29 / 14:29
Data Collected By	G.A.	G.A.	G.A	G.A.
Unit Load, MW_{Gross}/MW_{net}	357 - 330	356 / 329	357 / 331	359 / 330
Fuel	Coal	Coal	Coal	
Excess O_2, % L/R	3.0 / 4.0	3.0 / 4.0	3.0 / 4.0	3.0 / 4.0
Steam Flow, klb/hr	2450	2550	2550	2550
Air Flow	76	78	78	78
APH: Air In, °F 2A/2B	94.0 — 74.0	90 → 90	94 — 94	95 — 95
Air Out, °F 2A/2B	700 — 695	704 — 692	705 — 697	705 — 700
Gas In, °F 2A/2B	776 — 771	782 — 772	777 — 771	781 — 771
Gas Out, °F 2A/2B	301 — 302	313 — 311	317 — 314	318 — 316
Furnace Draft, "H_2O	-.7"	-.4"	-.79	-.71
Coal Feed, ton/hr	203.7	199	201.9	199.1
Opacity, %	2.8	2.2	2.5	2.4
NO_x, ppm	167	170	169	173
SO_2, ppm	235	228	230	226
CO_2, %	~~13.46~~ 11.12	10.86	11.33	11.12
H_2O, %	12.7	12.1	12.0	11.8
Temperature, °F	297	306	313	315
Stack: Velocity, fps	45.87	61.17	61.58	61.45
Flow Rate, mscfh	47.13	53.39	53.09	52.85
Stack Static P, "Hg	24.53	24.53	24.38	24.38
Baghouse Operation				
Delta P, "H_2O 2A/2B	3.47 — 310	4.0 — 4.15	4.05 — ~~324~~ 4.01	4.68 — 4.72
Temperature in, °F 2A/2B	3.76 — 310	320 — 320	324 — 323	325 — 325
Unit Operation Comments	Before Ontario Hydro lost power	Ontario-Hydro started @ 12:00	Ontario-Hydro Finished	Start Ontario-Hydro #6

Unit Operation Data

ADA Technologies

PSCo Site and Unit Number Comanche Unit 2

Test Number	Consol #6			
Date	10/15/98			
Time	17:42 / 16:42 watch / pscc cem			
Data Collected By	G.A			
Unit Load, MW_{Gross}/MW_{net}	359 – 331			
Fuel	Coal			
Excess O_2, % L/R	3.0 – 4.0			
Steam Flow, klb/hr	2550			
Air Flow	78			
APH: Air In, °F 2A/2B	93 93			
Air Out, °F 2A/2B	706 696			
Gas In, °F 2A/2B	779 772			
Gas Out, °F 2A/2B	315 313			
Furnace Draft, "H_2O	–.60			
Coal Feed, ton/hr	203.9			
Opacity, %	2.4			
NO_x, ppm	168			
SO_2, ppm	225			
CO_2, %	10.61			
H_2O, %	11.7			
Temperature, °F	315			
Stack: Velocity, fps	61.91			
Flow Rate, mscfh	53.25			
Stack Static P, "Hg	24.38	24.?		
Baghouse Operation				
Delta P, "H_2O 2A/2B	4.04 4.39			
Temperature in, °F 2A/2B	323 322			
Unit Operation Comments	Ontario-Hydro's Finishes			

Appendix F

Coal Hg Analysis Results

Hazen Coal Analysis

Frontier GeoSciences Analysis

Computer Generated Coal Hg Analysis Spreadsheets

ADA Technologies, Inc.
Innovators in Measurement and Control Solutions

Memorandum

November 19, 1998

TO: Jerry Cunningham

COMPANY: Hazen Research

FROM: Sheila M. Haythornthwaite

RE: Coal analyses

Enclosed are four coal samples, numbered 1 to 4. As we discussed by phone today, please perform the following analyses:

Sample number	Analyses
1	Ultimate, proximate, Btu and Cl
2	Ultimate, proximate and Btu
3	Ultimate, proximate and Btu
4	Ultimate, proximate and Btu

ADA's PO number for this work is 981076.

I'll look for the results by fax on November 30. Our fax number is (303) 792-5633. Please call me if you have any questions at (303) 792-5615. Thank you,

Sheila Haythornthwaite

M111998BB

ADA Technologies, Inc.
Innovators In Measurement and Control Solutions

Memorandum

December 2, 1998

TO: Gerry Cunningham

COMPANY: Hazen Research

FROM: Sheila M. Haythornthwaite

RE: Coal pulverizing

Enclosed are four coal samples, Ch-3, Ar-1, Ar-4 and Co-2. Please pulverize each sample separately, and return all samples to me at ADA Technologies. Our Fedex shipping number is 1034-1115-7, please send the samples by overnight when they are pulverized. The chain of custody below should stay with these samples.

ADA's PO number for this work is 981124.

Our fax number is (303) 792-5633. Please call me if you have any questions at (303) 792-5615. Thank you for your help with this,

Sheila

Chain of Custody for Coal Samples

	Ch-3	Ar-1	Ar-4	Co-2
Sampled by ADA	GA	GA, SMH	GA	KC, GA
Shipped by ADA	SMH 12/2/98	SMH 12/2/98	SMH 12/2/98	SMH 12/2/98
Received by Hazen	JHC 120398	JHC 120398	JHC 120398	JHC 120398
Shipped by Hazen				
Received by ADA				

Hazen Research, Inc.
4601 Indiana St. • Golden, Colo. 80403
Tel: (303) 279-4501
FAX: (303) 278-1528

Date December 1 1998
HRI Project 009-407
HRI Series No. K288/98-1
Date Rec'd. 11/20/98
Cust. P.O.# 981076

ADA Environmental Solutions
Sheila M. Haythornthwaite
304 Inverness Way South, Suite 110
Englewood, Colorado 80112

Sample Identification
ADA Tech Coal Sample #1
COMANCHE UNIT 2
10/98

Reporting Basis >	As Rec'd	Dry	Eqm	Air Dry
Proximate (%)				
Moisture	27.10	0.00		7.82
Ash	4.70	6.44		5.94
Volatile	31.20	42.80		39.45
Fixed C	37.00	50.76		46.79
Total	100.00	100.00	100.00	100.00
Sulfur	0.31	0.42		0.39
Btu/lb (HHV)	8669	11893		10963
MMF Btu/lb	9133	12792		
MAF Btu/lb		12712		
Air Dry Loss (%)	20.92			
Ultimate (%)				
Moisture	27.10	0.00		7.82
Carbon	50.48	69.26		63.84
Hydrogen	2.61	3.57		3.29
Nitrogen	0.73	1.00		0.92
Sulfur	0.31	0.42		0.39
Ash	4.70	6.44		5.94
Oxygen*	14.07	19.31		17.80
Total	100.00	100.00	100.00	100.00
Chlorine**	<0.01	<0.01		<0.01

Forms of Sulfur (as S,%)

Sulfate		
Pyritic		
Organic		
Total	0.31	0.42

Water Soluble Alkalies (%)

Na2O
K2O

Lb. Alkali/MM Btu=
Lb. Ash/MM Btu= 5.42
Lb. SO2/MM Btu= 0.71
HGI= @ % Moisture
As Rec'd. Sp.Gr.=
Free Swelling Index=

Report Prepared By:

Fuels Laboratory Supervisor

* Oxygen by Difference.
** Not usually reported as part of the ultimate analysis.

Hazen Research, Inc.
4601 Indiana St. • Golden, Colo. 80403
Tel: (303) 279-4501
FAX: (303) 278-1528

Date	December 10, 1998
HRI Project #	009-407
HRI Series No.	L47/98
Date Rec'd	12/03/98
Cust. P.O. #	981124

ADA Technologies, Inc.
Sheila M. Haythornthwaite
304 Inverness Way South, Suite 110
Englewood, Colorado 80112

REPORT OF ANALYSIS

SAMPLE NUMBER	SAMPLE IDENTIFICATION	Air Dry Loss, %
L47/98-1	Ch-3	4.15
L47/98-2	Ar-1	12.91
L47/98-3	Ar-4	14.69
L47/98-4	Co-2	10.49

Report Prepared By:

Gerard H. Cunningham
Fuel Laboratory Manager

THESE AIR DRY LOSSES APPLY TO PULVERIZED COALS SUBMITTED TO FGS 12/98 FOR HG ANALYSIS.

INV:3048

From: "ericp@frontier.wa.com"
To: SheilaH
Date: 12/31/98 1:16am
Subject: New Improved Coal Hg Values

Hi Sheila,

See enclosed excel file with much more consistent and coherent coal Hg values.

<<Coal Hg 981227.xls>>
As I mentioned in a voice mail - I reran all the coal samples last Sunday and analyzed some in duplicate. In hindsight, the values from 981214 are poor. I had analytical difficulties that day, wheras all the runs on 981227 were up to our high standards.

First check that I have correctly identified the coal sample ID with the power plant sample ID. If not - you'll need to make the corrections to the "Overall Average" values I have calculated.

Also, I have used the strikout on most of the values for the 981214 analysis - if these strikeouts did not come through on your spreadsheet - let me know - otherwise you will be confused

One important note - to get the best overall average - you must first calculate the mean of multiple runs for a particular digested sample and then take the mean of the 3 separate digests. For example it would be wrong to take the overall mean of the 7 values for Arap-1 (C2, C10, C13). This would weight your values toward the C2 values since there are 3 good values and just 2 for the others. The difference between the wrong mean and the correct mean is nearly 5% - (76.9 vs 73.7 ng/g).

Most of the values for 981214 were thrown out. Based on historical performance - we usually do better than 10% on reruns of coal. Thus I tossed any 981214 data that was greater than 20% different than the 981227 data. Assuming my coal/plant ID are correct - the "data coherence" also helps to weed out suspect values. For example, I have thrown out sample C14 (Arap-4 >300 ng/g). It is clearly an outlier compared to other Arap-4 samples and also for this type of coal.

If you want me to further detail my justification for the tossing 981214 data - let me know.

Finally, as part of our efforts to support the upcoming EPA ICR for Hg in coal, we have developed a better digestion method for coal. I have digested all of your samples using this method (internal research) and will analyze them this weekend. I will share these results with you. I hope they will confirm what I am reporting here.

Finally, I would like to talk to you further about the mass balance. These results should tighten things up a bit for Arap-4 and Cher-3 (but not Arap-1).
How did you get the outlet ash value?? How did you get the coal Hg into ng/m3? When I have done mass balances - I have done it in units of ug/hour.

Happy New Year

-Eric

Eric Prestbo
Frontier Geosciences

ericp@frontier.wa.com
206 622 6960 voice
206 622 6870 fax

CC: "bobb@frontier.wa.com"

Hg in Coal
ADA Technologies - 981214 and 981227
Analyzed by EPA Method 1631 with Microwave Bomb Digest
Frontier Geosciences Inc

Coal Sample ID	Digest Gram	981214 r1 ng/g	981214 r2 ng/g	981227 r1 ng/g	981227 r2 ng/g	Site ID	Mean ng/g
C-Blk		0.270		0.161			
C1	0.192	~~98.758~~		68.56		Com-2	68.56
C1-Dup	0.242	70.465		69.99		Com-2	70.23
C2	0.205	98.576	92.195	99.01		Arap-1	96.59
C4	0.175	59.407		66.32		Com-2	62.86
C5	0.239	~~14.945~~	~~10.768~~	18.3		Cher-3	18.30
C7	0.174	~~9.747~~		18.83		Cher-3	18.83
C8	0.177	~~37.954~~		58.84	55.77	Com-2	57.31
C10	0.21	~~47.061~~		68.63	69.42	Arap-1	69.03
C11	0.175	~~40.983~~		53.72	51.35	Arap-4	52.54
C12	0.16	~~15.154~~		19.59		Cher-3	19.59
C13	0.209	50.388		55.35	55.37	Arap-1	55.36
C14	0.186	~~257.645~~		~~350.1~~	~~368.8~~	Arap-4	
C16	0.228	~~35.855~~		54.94	53.57	Arap-4	54.26

Sample ID	981214 % Rec	981227 %Rec
C-1630	104%	94%
C2-MS (100 ng)	92%	99%
C2-MS (100 ng)	81%	
C8 + 2.0 ng	na	103%

OVERALL AVERAGES

	Com-2 ng/g	Arap-1 ng/g	Arap-4 ng/g	Cher-3 ng/g
Mean	64.74	73.66	53.40	18.91
Std Dev	5.9	22.3		0.6
% RSD	9.1%	30.2%		3.4%

Correction for air dry loss:

	ng/g	% H_2O loss	ng/g actual
Com-2	64.74	10.49	57.95
Cher-3	18.91	4.15	18.1
Arap-1	73.66	12.91	64.2
Arap-4	53.40	14.69	45.6

$$\frac{ng}{g} * (1 - \%H_2O) = ng/g \text{ actual}$$

n=2

SRM RECOVERY - NIST 1630 Trace Hg in Coal

SRM ID	SRM Certified @ 0.13 +/- 0.01 ug/g	SRM measured system blk cor ug/g	SRM Reagent blank correct ug/g	SRM % Recovery
NIST SRM 1630	0.13	0.122	0.121	93.2

SRM RECOVERY - NIST 1633a Trace Elements in Coal Fly Ash

SRM ID	SRM Certified @ 0.16 +/- 0.01 ug/g	SRM measured system blk cor ug/g	SRM Reagent blank correct ug/g	SRM % Recovery
NIST SRM 1633a	0.16	0.149	0.148	92.8

Notes:

Wet Bottom Ash samples 70 & 71 required homogenization in a ball mill followed by a bomb digest due to the large aggregate nature of this ash. We therefore followed the same homogenization and bomb digest procedures as that for coal analysis.

Comp (*1)	Dry Air by volume	Wet Air by volume
% N2	78.1%	
% O2	20.9%	
% Ar	0.9%	
% CO2	0.03%	
	100.0%	
% N2a (*2)	79.05%	77.4%
% O2	20.95%	20.5%
% H2O		2.0%
Air H2O (*3)	0.013	$lb/lb_{dry\ air}$
	0.021	$mole/mole_{dry}$

	Stoich. Air, mass lb/lb fuel		
	O2	N2a	Dry Air
To form:			
SO2	0.0055	0.01826	0.02376
CO2	1.6125192	5.3544838	6.967003
H2O	0.2333184	0.7747782	1.008126
O_2 in fuel	-0.10	-0.33	-0.43
TOTALS	1.75	5.82	7.57

Notes:

*1 Air composition of std atmosphere per CRC 1990

*2 N2a includes Argon, CO2 for avg MW=28.161

*3 Standard moisture per ABMA at 80F, 60% RH

ALL INPUTS IN BLUE

Fuel Composition, % by weight

Ultimate analysis, wet basis

	Btu/lb	Stoich. Products, mass: lb/lb_{fuel}						
		CO2	H2O	N2a	$N2_{fuel}$	SO2	Ash	Hg
H2O	0.271		0.271					
Ash	0.047						0.047	
S	0.0031		0.000	0.01		0.01		
C	0.5048	1.85	0.076	4.47				
H	0.0261		0.245	0.69				
N	0.0073				0.01			
Hg	5.80E-08							0.000
O by difference	14.07%		-0.008	-0.47				
TOTAL	85.93%							
		1.85	0.584	4.7	0.01	0.01	0.05	0
		Prod sum=		7.19	lb/lb_{fuel}			

Stoichiometric Products				
Species	MW	$mole/lb_{fuel}$	%vol, wet	ppm
CO2	44.0	0.0420	17.4%	
SO2	64.1	0.00010	0.0%	400
N2a	28.2	0.1668	69.0%	
$N2_{fuel}$	28.0	0.00026	0.1%	
Hg	200.6	0.0000	0.0%	0
H2O	18.0	0.0324	13.4%	
	Sums	0.2416	100.0%	
MW_{wet}	=	29.77	lb/mole	
Mw_{dry}	=	31.59	lb/mole	

WET FLUE GAS COMPOSITION					DRY FLUE GAS COMPOSITION				
	$O2,\%_{wet}$	moles O2	total moles			$O2,\%_{dry}$	moles O2	total moles	
xs O2	2.7%	0.00751	0.2782		xs O2	3.0%	0.007	0.2441	mol/# fuel
	% vol	ppm	ppb			% vol	ppm	ppb	
CO2	15.11%				CO2	17.2%			
SO2	0.03%	348			SO2	0.04%	396		
N2a	70.1%				N2a	79.6%			
$N2_{fuel}$	0.09%				$N2_{fuel}$	0.11%			
Hg			1.04		Hg			1.18	
H2O	11.9%				H2O	0.0%			
	100.0%					100.0%			

calculated gr/dscf 3.5467

Comanche 2	Mercury ug/Nm3	ng/g ash
Calc. from coal	10.01	
Measured Hg: RG inlet	10.51	
Measured Hg: RG ash	7.93	978
Measured Hg: Stack	3.92	
Ash + Stack	11.85	

Closure from coal to ash+stack= 1-((calc from coal)-(ash+stack))/(calc from coal)= 118%

Closure from coal to inlet= 1-((calc from coal)-(RG inlet))/(calc from coal)= 105%

Closure from inlet to ash+stack= 1-((RG inlet)-(ash+stack))/(RG inlet)= 113%

Hg removed, %= (RG inlet-Stack)/RG inlet * 100= 63 %

Appendix G

Ash Hg Analysis Results

Frontier GeoSciences Analysis Results

Computer Generated Ash Hg Analysis Spreadsheet

From: "bobb@frontier.wa.com"
To: GARYA , SheilaH
Date: 11/12/98 9:18am
Subject: Re: Coal and Special Ash Samples

Hi Sheila and Gary,

<<ADAComCoal-Ash.xls>>
Attached is a revised data table for Table 4 of the previous report. The revision involves the two Ash samples identified as #70 and #71. The ash from these samples were in large aggregates rather than fines, therefore they required homogenization in a ball mill followed by a bomb digest. We therefore followed the same procedures for these two ash samples as that done for coal samples

Also included is the one coal sample result as well as NIST Coal and Fly Ash Standard Reference Material Results.

Results from the IC and combined Cyclone/Filter samples (received on Monday 11/9) will be completed this afternoon and emailed to you both.

If you have any questions, please call or email.

Best Regards,

Bob Brunette

CC: "bobb@frontier.wa.com"

Site Comanche Results of Total Hg in
Frontier Geosciences Inc, November 10, 1998
Table 4: Total Hg in Bulk Ash

Sample ID	ng/digest	Sample Amt (g)	Conc (ng/g)	
ASH-45	264.25	0.253	1044.46	Baghouse Ash
ASH-45 MD	251.16	0.263	954.97	< Matrix Duplicate = 9.0%
ASH-47	222.47	0.239	930.83	Baghouse Ash
ASH-51	220.67	0.244	904.39	Baghouse Ash
ASH-53	245.32	0.287	854.77	Baghouse Ash
ASH-54	278.52	0.251	1109.64	Baghouse Ash
ASH-59	371.20	0.320	1160.00	Baghouse Ash
ASH-60	261.65	0.284	921.31	Baghouse Ash
ASH-65	237.68	0.252	943.19	Baghouse Ash
ASH-68	<MDL	0.220	<MDL	Econ Ash
ASH-69	<MDL	0.232	<MDL	Econ Ash

✓ Inv. 2953

Cyclone Laboratory Spike Recovery	
ASH-45 MD SPK=1.00ng	96.7%

Table 5: Total Hg In Coal & Select Ash - Bomb Digest Required

Sample ID	Bomb Digest ID	Grams/Digest (g)	FGS System Blank Correct (ng Hg/digest)	FGS System Blank Correct ng Hg/g	Reagent Blank Correct ng Hg/g
Bomb Prep Blank -1	B7	na	0.23		
Bomb Prep Blank -2	Dist-20	na	0.28		
ADA Coal Sample (Vial #41)	B1	0.225	11.77	52.31	52.31
Wet Bottom Ash (Vial 70)	B2	0.363	0.50	1.38	1.38
Wet Bottom Ash (Vial 71)	B13	0.321	0.07	0.22	<MDL
NIST SRM 1630	B3	0.251	30.65	122.11	122.11

✓ Inv. 2953

Bomb Digest Reagent Blank	0.26	(ng/digest)

n=2

SRM RECOVERY - NIST 1630 Trace Hg in Coal

SRM ID	SRM Certified @ 0.13 +/- 0.01 ug/g	SRM measured system blk cor ug/g	SRM Reagent blank correct ug/g	SRM % Recovery
NIST SRM 1630	0.13	0.122	0.121	93.2

SRM RECOVERY - NIST 1633a Trace Elements in Coal Fly Ash

SRM ID	SRM Certified @ 0.16 +/- 0.01 ug/g	SRM measured system blk cor ug/g	SRM Reagent blank correct ug/g	SRM % Recovery
NIST SRM 1633a	0.16	0.149	0.148	92.8

Notes:

Wet Bottom Ash samples 70 & 71 required homogenization in a ball mill followed by a bomb digest due to the large aggregate nature of this ash. We therefore followed the same homogenization and bomb digest procedures as that for coal analysis.

Comp (*1)	Dry Air by volume	Wet Air by volume
% N2	78.1%	
% O2	20.9%	
% Ar	0.9%	
% CO2	0.03%	
	100.0%	
% N2a (*2)	79.05%	77.4%
% O2	20.95%	20.5%
% H2O		2.0%
Air H2O (*3)	0.013	$lb/lb_{dry\ air}$
	0.021	$mole/mole_{dry}$

	Stoich. Air, mass lb/lb fuel		
	O2	N2a	Dry Air
To form:			
SO2	0.0031	0.010292	0.013392
CO2	1.3447872	4.4654608	5.810248
H2O	0.2071296	0.6878133	0.894969
O_2 in fuel	-0.14	-0.47	-0.61
TOTALS	1.41	4.70	6.11

Notes:

*1 Air composition of std atmosphere per CRC 1990

*2 N2a includes Argon, CO2 for avg MW=28.161

*3 Standard moisture per ABMA at 80F, 60% RH

ALL INPUTS IN BLUE

Fuel Composition, % by weight

Ultimate analysis, wet basis

	Btu/lb		CO2	H2O	N2a	$N2_{fuel}$	SO2	Ash	Hg
			Stoich. Products, mass: lb/lb_{fuel}						
	H2O	0.271		0.271					
	Ash	0.047						0.047	
	S	0.0031		0.000	0.01		0.01		
	C	0.5048	1.85	0.076	4.47				
	H	0.0261		0.245	0.69				
	N	0.0073				0.01			
	Hg	5.80E-08							0.000
O by difference		14.07%		-0.008	-0.47				
	TOTAL	85.93%							
			1.85	0.584	4.7	0.01	0.01	0.05	0
			Prod sum=		7.19	lb/lb_{fuel}			

Stoichiometric Products				
Species	MW	$mole/lb_{fuel}$	%vol, wet	ppm
CO2	44.0	0.0420	17.4%	
SO2	64.1	0.00010	0.0%	400
N2a	28.2	0.1668	69.0%	
$N2_{fuel}$	28.0	0.00026	0.1%	
Hg	200.6	0.0000	0.0%	0
H2O	18.0	0.0324	13.4%	
	Sums	0.2416	100.0%	
MW_{wet}	=	29.77	lb/mole	
Mw_{dry}	=	31.59	lb/mole	

WET FLUE GAS COMPOSITION				DRY FLUE GAS COMPOSITION				
	$O2,\%_{wet}$	moles O2	total moles		$O2,\%_{dry}$	moles O2	total moles	
xs O2	2.7%	0.00751	0.2782	xs O2	3.0%	0.007	0.2441	mol/# fuel
	% vol	ppm	ppb		% vol	ppm	ppb	
CO2	15.11%			CO2	17.2%			
SO2	0.03%	348		SO2	0.04%	396		
N2a	70.1%			N2a	79.6%			
$N2_{fuel}$	0.09%			$N2_{fuel}$	0.11%			
Hg			1.04	Hg			1.18	
H2O	11.9%			H2O	0.0%			
	100.0%				100.0%			

calculated gr/dscf 3.5467

Comanche 2	Mercury ug/Nm3	ng/g ash
Calc. from coal	10.01	
Measured Hg: RG inlet	10.51	
Measured Hg: RG ash	7.93	978
Measured Hg: Stack	3.92	
Ash + Stack	11.85	

Closure from coal to ash+stack=	1-((calc from coal)-(ash+stack))/(calc from coal)=	118%
Closure from coal to inlet=	1-((calc from coal)-(RG inlet))/(calc from coal)=	105%
Closure from inlet to ash+stack=	1-((RG inlet)-(ash+stack))/(RG inlet)=	113%

Hg removed, %= (RG inlet-Stack)/RG inlet * 100= 63 %

Appendix H

Field Recovery Sheets

ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-13-98 Test ID: #1

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	70.2 g.	4.51	
300 3 /150	KCl Impingers 450 + 99	549 mL	7.37	
100 4 75	HNO_3/H_2O_2 Impinger 175 + 0	175	2.41	
200 5 50	$KMnO_4$ Impingers 250	-10 240	23.5	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.70	

Total Particulate Wt. 8.0433 grams (.25 ppm H_g) Condensate Total 114.5 mL

~~PILOT PLANT BAGHOUSE INLET~~: air preheater outlet Low

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	96.2 g.	2.97	
300 3 /150	KCl Impingers 450 + 112	562 mL (562)	4.82	
100 4 75	HNO_3/H_2O_2 Impinger 175	175	12.1	
200 5 50	$KMnO_4$ Impingers 250	-7 243	29.6	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.32	

Total Particulate Wt. 0.6984 grams (2.56 ppm H_g) Condensate Total 114.3 mL

BAGHOUSE OUTLET (STACK) TRAIN: Low

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	90.3 g	1.34	
300 3 /150	KCl Impingers 450 + 228	678 mL	11.5	
100 4 75	HNO_3/H_2O_2 Impinger 175 + 3	178	0.95	
200 5 50	$KMnO_4$ Impingers 250	-6 244	1.21	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.82	

Total Particulate Wt. -0.0019 grams Condensate Total 258.6 mL

Recovered By: [signature] Date: 10-13-98

O:\appres\stack\ocdo98\recform

ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-13-98 Matt Test ID: #2

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	69.5	4.03	
300 3 150	KCl Impingers 450 +90	540 mL	2.15	
100 4 75	HNO_3/H_2O_2 Impinger 175 -1	174	<0.5	
200 5 50	$KMnO_4$ Impingers 250 -11	239	23.2	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.26	

Total Particulate Wt. 6.3464 grams Condensate Total 103.0 mL

~~PILOT PLANT BAGHOUSE INLET~~: Air Preheater Leak

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	88.3	1.17	
300 3 150	KCl Impingers 450 + 116	566 mL 566	3.73	
100 4 75	HNO_3/H_2O_2 Impinger 175 +0	175	3.19	
200 5 50	$KMnO_4$ Impingers 250 -8	242	36.8	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.20	

Total Particulate Wt. 6.8399 grams Condensate Total 122.4 mL

BAGHOUSE OUTLET (STACK) TRAIN: Flow Back flush

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	131.4	<0.5	
300 3 150	KCl Impingers 450	409 mL	21.5	
100 4 75	HNO_3/H_2O_2 Impinger 175	458	2.70	
200 5 50	$KMnO_4$ Impingers 250	226	<0.5	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.03	

Total Particulate Wt. -0.0016 grams Condensate Total 242.4 mL

Recovered By: Jim Bedellion Date: 10-13-98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-14-98 Matt Test ID: 3

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	78.0 gr	6.50	
300 3 150	KCl Impingers 450 +114	564 mL	1.70	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	0.75	
200 5 50	$KMnO_4$ Impingers 250-4	246	15.5	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.64	

Total Particulate Wt. .7-2783 grams Condensate Total 124.5 mL

PILOT PLANT ~~BAGHOUSE~~ INLET: ~~Jo~~ Len

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	81.5 gr	4.29	
300 3 150	KCl Impingers 450 +122	572 mL	3.69	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	2.11	
200 5 50	$KMnO_4$ Impingers 250-1	249	20.6	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.00	

Total Particulate Wt. 0.8588 grams Condensate Total 134.6 mL

~~Baghouse~~ Stack

~~BAGHOUSE~~ OUTLET (~~STACK~~) TRAIN: Len

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	128.4 gr	<0.5	
300 3 150	KCl Impingers 450+149	599 mL	7.57	
100 4 75	HNO_3/H_2O_2 Impinger 175+1	176	1.46	
200 5 50	$KMnO_4$ Impingers 250-3	247	<0.5	
6 100	Acid Rinse of $KMnO_4$ 100	100	0.96	

Total Particulate Wt. -0.0025 grams Condensate Total 166.1 mL

Recovered By: [signature] Date: 10-14-98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-14-98 Test ID: 3A

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse			
~~20~~ 3	KCl Impingers			
4	HNO_3/H_2O_2 Impinger			
5	$KMnO_4$ Impingers			
6	Acid Rinse of $KMnO_4$			

Total Particulate Wt._____ grams Condensate Total_____ mL

PILOT PLANT BAGHOUSE INLET:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse			
3	KCl Impingers			
4	HNO_3/H_2O_2 Impinger			
5	$KMnO_4$ Impingers			
6	Acid Rinse of $KMnO_4$			

Total Particulate Wt._____ grams Condensate Total_____ mL

~~Pilot Plant~~ ~~BAGHOUSE~~ OUTLET (STACK) TRAIN: Pm

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	129.4 gr	<0.5	
300 3 150	KCl Impingers 450+144	594 ml	7.43	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	1.81	
200 5 50	$KMnO_4$ Impingers 250-3	247	1.41	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.52	

Total Particulate Wt. -0.0029 grams Condensate Total 158.0 mL

Recovered By: J. Bullen Date: 10-14-98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-14-98 Test ID: #4

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	175.0 gr	2.52	
300 3 150	KCl Impingers 450+104	554 mL	3.71	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	1.25	
200 5 50	$KMnO_4$ Impingers 250-7	243	34.9	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.86	

Total Particulate Wt. 5.5190 grams Condensate Total 118.2 mL

PILOT PLANT ~~BAGHOUSE~~ INLET: Ron

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	189.8 gr	<0.5	
300 3 150	KCl Impingers 450+120	570	4.24	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	174	1.51	
200 5 50	$KMnO_4$ Impingers 250+1	249	21.7	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.00	

Total Particulate Wt. 3.7958 grams Condensate Total 130.2 mL

Pilot Plant ~~BAGHOUSE~~ OUTLET (STACK) TRAIN: Ron

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	111.7 gr	2.33	
300 3 150	KCl Impingers 450+149	598 mL	2.61	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	0.66	
200 5 50	$KMnO_4$ Impingers 250-2	248	39.6	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.11	

Total Particulate Wt. -0.0015 grams Condensate Total 160.0 mL

Recovered By: [signature] Date: 10-14-98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-15-98 Test ID: # 5

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	160.6 gr	2.51	
300 3 150	KCl Impingers 450+113	563 mL	4.29	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	2.23	
200 5 50	$KMnO_4$ Impingers 250+4	246	22.1	
6 100	Acid Rinse of $KMnO_4$ 100	100	4.64	

Total Particulate Wt. 5.5611 grams Condensate Total 127.0 mL

PILOT PLANT ~~BAGHOUSE~~ INLET: Lem

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse ~~450~~	1.01.0 gr	6.14	
300 3 150	KCl Impingers 450 + 126	576 mL	4.71	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	2.54	
200 5 50	$KMnO_4$ Impingers 250+2	248	27.4	
6 100	Acid Rinse of $KMnO_4$ 100	100	2.78	

Total Particulate Wt. 3.1814 grams Condensate Total 134.6 mL

Pilot Plant ~~BAGHOUSE~~ OUTLET (~~STACK~~) TRAIN: Lem

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	114.3	3.55	
300 3 150	KCl Impingers 450+136	586	5.32	
100 4 75	HNO_3/H_2O_2 Impinger 175+0	175	1.20	
200 5 50	$KMnO_4$ Impingers 250+0	250	25.4	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.66	

Total Particulate Wt. -0.0024 grams Condensate Total 159.9 mL

Recovered By: J. Bellon Date: 10-15-98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-15-98 Test ID: #6

AIR PREHEATER OUTLET (BAGHOUSE INLET) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	230.3 gr	1.37	
300 3 150	KCl Impingers 450 +115	565 mL	3.44	
100 4 75	HNO_3/H_2O_2 Impinger 175 0	175	1.43	
200 5 50	$KMnO_4$ Impingers 250 -1	249	21.2	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.21	

Total Particulate Wt. 6.1139 grams Condensate Total 128.6 mL

PILOT PLANT ~~BAGHOUSE~~ INLET:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	120.1 gr	0.76	
300 3 150	KCl Impingers 450 +116	566 mL	3.87	
100 4 75	HNO_3/H_2O_2 Impinger 175 +2	177	1.63	
200 5 50	$KMnO_4$ Impingers 250 -1	249	28.8	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.76	

Total Particulate Wt. 3.7253 grams Condensate Total 127.0 mL

~~BAGHOUSE~~ Pilot Plant OUTLET (STACK) TRAIN:

Bottle #	Description	Final Vol, mL	ppb Hg	Total ug Hg
1	Filter			
2	Probe Rinse	104.7 gr	<0.5	
300 3 150	KCl Impingers 450 +142	592 mL	6.68	
100 4 75	HNO_3/H_2O_2 Impinger 175 +1	176	<0.5	
200 5 50	$KMnO_4$ Impingers 250 -2	248	23.1	
6 100	Acid Rinse of $KMnO_4$ 100	100	1.42	

Total Particulate Wt. -0.0017 grams Condensate Total 155.9 mL

Recovered By: [signature] Date: 10-15-98

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Appendix I

Sample Log In Sheets

Laboratory Log In Sheets for Solids

Laboratory Log In Sheets for Liquids

Laboratory Database Log In Record

ADA Ontario Hydro Hg Samples – SOLIDS

Date	Location	Test ID		Analytical #		Sample Mass, g	Hg µg/g
10/13	APH IN	Test–1 Matt	Filter	985667	985667	8.0430	
10/13	APH IN	Test–1 Len	Filter	985668	985668	0.6984	
10/13	Stack	Test–1 Stack	Filter	985669	985669	0.0000	
10/13	APH IN	Test–2 Matt	Probe	985670	985670	0.7673	
10/13	APH IN	Test–2 Matt	Cyclone	985671	985671	4.5935	
10/13	APH IN	Test–2 Matt	Filter	985672	985672	0.9856	
10/13	APH IN	Test–2 Len	Filter	985673	985673	0.8399	
10/13	Stack	Test–2 Ron	Filter	985674	985674	0.0000	
10/14	APH IN	Test–3 Matt	Probe	985675	985675	1.4972	
10/14	APH IN	Test–3 Matt	Cyclone	985676	985676	4.7564	
10/14	APH IN	Test–3 Matt	Filter	985677	985677	1.0265	
10/14	APH IN	Test–3 Len	Filter	985678	985678	0.8588	
10/14	Stack	Test–3 Ron	Filter	985679	985679	0.0000	
10/14	Stack	Test–3A Ron	Filter	985680	985680	0.0000	
10/14	APH IN	Test–4 Matt	Probe	985681	985681	0.7000	
10/14	APH IN	Test–4 Matt	Cyclone	985682	985682	3.9326	
10/14	APH IN	Test–4 Matt	Filter	985683	985683	0.8864	
10/15	APH IN	Test–5 Matt	Probe	985688	985688	1.0225	
10/15	APH IN	Test–5 Matt	Cyclone	985689	985689	3.6484	
10/15	APH IN	Test–5 Matt	Filter	985690	985690	0.8902	
10/15	APH IN	Test–6 Matt	Probe	985695	985695	0.4593	
10/15	APH IN	Test–6 Matt	Cyclone	985696	985696	4.6570	
10/15	APH IN	Test–6 Matt	Filter	985697	985697	0.9973	

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10/13/98 Test ID: # 1

Air Preheater Outlet (Baghouse Inlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse	0	70.2	985703	4.51
3	KCl Impingers	300	549	985704	7.37
4	HNO_3/H_2O_2 Impinger	100	175	985705	2.41
5	$KMnO_4$ Impingers	200	240	985706	23.5
6	Acid Rinse of $KMnO_4$	0	100	985707	2.70

Total Particulate Wt. 8.0433 grams Condensate Total 114.5 ml

Stack (Baghouse Outlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse	0	90.4	985713	1.34
3	KCl Impingers	300	678	985714	11.5
4	HNO_3/H_2O_2 Impinger	100	178	985715	0.95
5	$KMnO_4$ Impingers	200	244	985716	1.21
6	Acid Rinse of $KMnO_4$	0	100	985717	1.82

Total Particulate Wt. - 0.0019 grams Condensate Total 253.6 ml

Recovered By: [illegible] Date: 10-13-98

Checked By: M.S. DeVito Date: 10/13/98

Shipped By: CONSOL Truck Date: 10/16/98

Logged By: MS DeVito Date: 10/21/98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10/13/98 Test ID: # 1

Air Preheater Outlet (Baghouse Inlet): (Reverse Nozzle)

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse	0	96.2	985708	2.97
3	KCl Impingers	300	562	985709	4.82
4	HNO_3/H_2O_2 Impinger	100	175	985710	12.1
5	$KMnO_4$ Impingers	200	243	985711	29.6
6	Acid Rinse of $KMnO_4$	0	100	985712	2.32

Total Particulate Wt. 0.6984 grams Condensate Total 114.3 mL

Stack (Baghouse Outlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse				
3	KCl Impingers				
4	HNO_3/H_2O_2 Impinger				
5	$KMnO_4$ Impingers				
6	Acid Rinse of $KMnO_4$				

Total Particulate Wt. _____ grams Condensate Total _____ mL

Recovered By: [illegible] Date: 10-13-98

Checked By: M. S. DiVito Date: 10/13/98

Shipped By: CONSOL Truck Date: 10/16/98

Logged By: MS DiVito Date: 10/21/98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-13-98 Test ID: # 2

Air Preheater Outlet (Baghouse Inlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse	0	69.5	985785	4.03
3	KCl Impingers	300	540	985786	2.15
4	HNO_3/H_2O_2 Impinger	100	174	985787	20.5
5	$KMnO_4$ Impingers	200	239	985788	23.2
6	Acid Rinse of $KMnO_4$	0	100	985789	1.26

Total Particulate Wt. 6.3464 grams Condensate Total 103.0 ml

Stack (Baghouse Outlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse	0	131.4	985795	< 0.5
3	KCl Impingers	300	409	985796	21.5
4	HNO_3/H_2O_2 Impinger	100	458	985797	2.70
5	$KMnO_4$ Impingers	200	226	985798	< 0.5
6	Acid Rinse of $KMnO_4$	0	100	985799	1.03

Total Particulate Wt. -0.0016 grams Condensate Total 242.4 ml

Recovered By: [signature] Date: 10-13-98

Checked By: MS DeVito Date: 10/13/98

Shipped By: CONSOL Truck Date: 10/16/98

Logged By: MS DeVito Date: 10/21/98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-13-98 Test ID: # 2

Air Preheater Outlet (Baghouse Inlet): (Reverse Nozzle)

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse	0	88.3	985790	1.17
3	KCl Impingers	300	566	985791	3.73
4	HNO_3/H_2O_2 Impinger	100	175	985792	3.19
5	$KMnO_4$ Impingers	200	242	985793	36.8
6	Acid Rinse of $KMnO_4$	0	100	985794	2.20

Total Particulate Wt. 0.8399 grams Condensate Total 122.4 mL

Stack (Baghouse Outlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse				
3	KCl Impingers				
4	HNO_3/H_2O_2 Impinger				
5	$KMnO_4$ Impingers				
6	Acid Rinse of $KMnO_4$				

Total Particulate Wt. _____ grams Condensate Total _____ mL

Recovered By: J. Bullen Date: 10-13-98

Checked By: M. S. DiVito Date: 10/13/98

Shipped By: CONSOL Truck Date: 10/16/98

Logged By: MS DiVito Date: 10/21/98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-14-98 Test ID: # 3

Air Preheater Outlet (Baghouse Inlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse	0	78.0	985800	6.50
3	KCl Impingers	300	564	985801	1.70
4	HNO_3/H_2O_2 Impinger	100	175	985802	0.75
5	$KMnO_4$ Impingers	200	246	985803	15.5
6	Acid Rinse of $KMnO_4$	0	100	985804	2.64

Total Particulate Wt. 7.2783 grams Condensate Total 124.5 mL

Stack (Baghouse Outlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse	0	128.4	985810	< 0.5
3	KCl Impingers	300	599	985811	7.57
4	HNO_3/H_2O_2 Impinger	100	176	985812	1.46
5	$KMnO_4$ Impingers	200	247	985813	< 0.5
6	Acid Rinse of $KMnO_4$	0	100	985814	0.96

Total Particulate Wt. -0.0025 grams Condensate Total 166.1 mL

Recovered By: [illegible] Date: 10-14-98

Checked By: M. S. DiVito Date: 10/14/98

Shipped By: CONSOC Truck Date: 10/16/98

Logged By: MS DiVito Date: 10/21/98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-14-98 Test ID: H 3 A

Air Preheater Outlet (Baghouse Inlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse				
3	KCl Impingers				
4	HNO_3/H_2O_2 Impinger				
5	$KMnO_4$ Impingers				
6	Acid Rinse of $KMnO_4$				

Total Particulate Wt._____ grams Condensate Total_____ mL

Stack (Baghouse Outlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse	0	129.4	985815	< 0.5
3	KCl Impingers	300	594	985816	7.43
4	HNO_3/H_2O_2 Impinger	100	175	985817	1.81
5	$KMnO_4$ Impingers	200	247	985818	1.41
6	Acid Rinse of $KMnO_4$	0	100	985819	2.52

Total Particulate Wt. ~0.0029 grams Condensate Total 158.0 mL

Recovered By: Jim Bedellion Date: 10-14-98

Checked By: M.S. DeVito Date: 10/14/98

Shipped By: CONSOL Truck Date: 10/16/98

Logged By: MS DeVito Date: 10/21/98

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ADA MERCURY SAMPLING PROGRAM AT COMANCHE STATION

Ontario Hydro Hg Sampling Train Recovery Data

Date: 10-14-98 Test ID: # 4

Air Preheater Outlet (Baghouse Inlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse	0	175.0	985820	2.52
3	KCl Impingers	300	554	985821	3.71
4	HNO_3/H_2O_2 Impinger	100	175	985822	1.25
5	$KMnO_4$ Impingers	200	243	985823	34.9
6	Acid Rinse of $KMnO_4$	0	100	985824	1.86

Total Particulate Wt. 5.5190 grams Condensate Total 118.2 mL

Stack (Baghouse Outlet):

Bottle #	Description	Impinger Volume, mL		Analytical #	ppb Hg
		Start	Final		
1	Filter				
2	Probe Rinse				
3	KCl Impingers				
4	HNO_3/H_2O_2 Impinger				
5	$KMnO_4$ Impingers				
6	Acid Rinse of $KMnO_4$				

Total Particulate Wt. _____ grams Condensate Total _____ mL

Recovered By: [illegible] Date: 10-14-98

Checked By: M. S. DeVito Date: 10/14/98

Shipped By: CONSOL Truck Date: 10/16/98

Logged By: M S DeVito Date: 10/21/98

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Anal No	Date	Sample Number	Submitted By	Project No.	Description
985699	10/19/98	TEST-6 LEN	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET CYCLONE SOLIDS
985700	10/19/98	TEST-6 LEN	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 1-FILTER SOLIDS
985701	10/19/98	TEST-6 RON	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 1-FILTER SOLIDS
985702	10/20/98	BT-33	T. JONES	1353- 5- 60	CATERPILLAR 988B #1 LOADER ENGINE
985703	10/19/98	HCl/HNO3	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 2-PROBE RINSE
985704	10/19/98	KCl/HCl	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 3-KCl IMPINGERS
985705	10/19/98	HNO3/H2O2	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 4-NITRIC/PEROXIDE IMP.
985706	10/19/98	KMNO4/NAOH T-1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN KMNO4 IMPINGERS
985707	10/19/98	HCl TEST-1 MATT	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 6-ACID RINSE OF KMNO4
985708	10/19/98	HCl/HNO3 TEST-1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 2-PROBE RINSE
985709	10/19/98	KCl/HCl TEST-1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 3-KCL IMPINGERS
985710	10/19/98	HNO3/H2O2 TEST-	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 4-NITRIC/PEROXIDE IMP.
985711	10/19/98	KMNO4/NAOH T-1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 5-KMNO4 IMPINGERS
985712	10/19/98	HCL TEST-1 LEN	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 6-ACID RINSE OF KMNO4
985713	10/19/98	HCL/HNO3 TEST 1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 2-PROBE RINSE
985714	10/19/98	KCL/HCL TEST 1-	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 3-KCL IMPINGERS
985715	10/19/98	HNO3/H2O2 TEST-	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 4-NITRIC/PEROXIDE IMP.
985716	10/19/98	KMNO4/NAOH T-1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 5-KMNO4 IMPINGERS
985717	10/19/98	HCL TEST-1 RON	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 6-ACID RINSE OF KMNO4
985718	10/21/98	LM-900	J. MARTIN	1350- 20- 63	SLOPE BELT MARLAND BACKSTOP-TRACK SIDE
985719	10/21/98	LM-901	J. MARTIN	1350- 20- 63	SLOPE BELT MARLAND BACKSTOP-HILL SIDE
985720	10/21/98	RM-131	R. EDDY	1350- 20- 64	11D HEADGATE CONVEYOR RT-ANGLE KPL GBOX
985721	10/21/98	RM-132	R. EDDY	1350- 20- 64	11D HEADGATE CONVEYOR #2 ST-LINE GBOX
985722	10/21/98	RM-133	R. EDDY	1350- 20- 64	11D TAILGATE CONVEYOR GEARBOX
985723	10/21/98	RM-134	R. EDDY	1350- 20- 64	11D STAGELOADER GEARBOX
985724	10/21/98	RM-135	R. EDDY	1350- 20- 64	11D HEADGATE RANGING ARM GEARBOX
985725	10/21/98	RM-136	R. EDDY	1350- 20- 64	11D TAILGATE RANGING ARM GEARBOX
985726	10/21/98	LM-58	M. MCBRIDE	1350- 20- 63	8N 5 LEFT HEAD CONVEYOR #1 RT ANGLE GBOX

Anal No	Date	Sample Number	Submitted By	Project No.	Description
985755	10/20/98	MM-19	R. BARSCH	1350- 1- 66	#7 DRIVE PRIMARY REDUCER
985756	10/20/98	MM-20	R. BARSCH	1350- 1- 66	#7 DRIVE SECONDARY REDUCER
985757	10/20/98	MM-21	R. BARSCH	1350- 1- 66	#5 DRIVE PRIMARY REDUCER
985758	10/20/98	MM-22	R. BARSCH	1350- 1- 66	#5 DRIVE SECONDARY REDUCER
985759	10/20/98	MM-23	R. BARSCH	1350- 1- 66	#3 DRIVE PRIMARY REDUCER
985760	10/20/98	MM-24	R. BARSCH	1350- 1- 66	#3 DRIVE SECONDARY REDUCER
985761	10/20/98	MM-37	R. GALLENTINE	1350- 1- 66	#1 PRIMARY DRIVE GEARBOX
985762	10/20/98	MM-38	R. GALLENTINE	1350- 1- 66	#1 SECONDARY DRIVE GEARBOX
985763	10/20/98	MM-39	R. GALLENTINE	1350- 1- 66	#2 OUTBY DRIVE GEARBOX
985764	10/20/98	MM-40	R. GALLENTINE	1350- 1- 66	#2 INBY DRIVE GEARBOX
985765	10/20/98	B2-61	R. SMITH	1350- 20- 62	CAT 637D PAN #2 FRONT ENGINE
985766	10/20/98	B2-62	R. SMITH	1350- 20- 62	CAT 637D PAN #2 REAR ENGINE
985767	10/21/98	10-20-98	G. ROBBINS	1362-10 -	DAW-1 ACID TREATED BUCHANAN - FINAL PRODUCT
985768	10/21/98	27684	D. LOWENHAUPT	1351-10 -2	BAILEY M/C COAL
985769	10/21/98	27685	D. LOWENHAUPT	1351-10 -2	BAILEY M/C COAL
985770	10/21/98	COBO-1	R. HULICK	1365-4 -	COBON PELLETS
985771	10/21/98	10-20-98	W. ROSENHOOVER	1362-12 -	FEED TO PASSIVE ARDEN
985772	10/21/98	10-20-98	W. ROSENHOOVER	1362-12 -	MID DECANT
985773	10/21/98	10-20-98	W. ROSENHOOVER	1362-12 -	FAR DECANT
985774	10/21/98	10-20-98	W. ROSENHOOVER	1362-12 -	POND SIDE OF ROCK FILTER ARDEN
985775	10/21/98	10-20-98	W. ROSENHOOVER	1362-12 -	POND 4 DISC
985776	10/21/98	10-13-98	M. DEVITO	1621-60 -	KCl BLANK
985777	10/21/98	10-14-98	M. DEVITO	1621-60 -	KCl BLANK
985778	10/21/98	10-13-98	M. DEVITO	1621-60 -	H2O2/HNO3 BLANK
985779	10/21/98	10-13-98	M. DEVITO	1621-60 -	DI BLANK
985780	10/21/98	10-14-98	M. DEVITO	1621-60 -	DI BLANK
985781	10/21/98	10-15-98	M. DEVITO	1621-60 -	DI BLANK
985782	10/21/98	10-13-98	M. DEVITO	1621-60 -	KMNO4 BLANK

Anal No	Date	Sample Number	Submitted By	Project No.	Description
985783	10/21/98	10-14-98	M. DEVITO	1621-60 -	KMNO4 BLANK
985784	10/21/98	10-15-98	M. DEVITO	1621-60 -	HNO3 BLANK
985785	10/21/98	TEST-2 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 2-PROBE RINSE HCl/HNO3
985786	10/21/98	TEST-2 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 3-KCl IMPINGERS KCl/HC
985787	10/21/98	TEST-2 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 4-NITRIC/PEROXIDE IMP.
985788	10/21/98	TEST-2 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 5-KMNO4 IMPINGERS
985789	10/21/98	TEST-2 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 6-ACID RINSE OF KMNO4
985790	10/21/98	TEST-2 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 2-PROBE RINSE HCl/HNO3
985791	10/21/98	TEST-2 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 3-KCl IMPINGERS KCl/HC
985792	10/21/98	TEST-2 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 4-NITRIC/PEROXIDE IMP.
985793	10/21/98	TEST-2 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 5-KMNO4 IMPINGERS
985794	10/21/98	TEST-2 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 6-ACID RINSE OF KMNO4
985795	10/21/98	TEST-2 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 2-PROBE RINSE HCl/HNO3
985796	10/21/98	TEST-2 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 3-KCl IMPINGERS KCl/HCl
985797	10/21/98	TEST-2 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 4-NITRIC/PEROXIDE IMP.
985798	10/21/98	TEST-2 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 5-KMNO4 IMPINGERS
985799	10/21/98	TEST-2 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 6-ACID RINSE OF KMNO4
985800	10/21/98	TEST-3 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 2-PROBE RINSE HCl/HNO
985801	10/21/98	TEST-3 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 3-KCl IMPINGERS KCl/H
985802	10/21/98	TEST-3 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 4-NITRIC/PEROXIDE IMP
985803	10/21/98	TEST-3 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 5-KMNO4 IMPINGERS
985804	10/21/98	TEST-3 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 6-ACID RINSE OF KMNO4
985805	10/21/98	TEST-3 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 2-PROBE RINSE HCl/HNO
985806	10/21/98	TEST-3 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 3-KCl IMPINGERS KCl/H
985807	10/21/98	TEST-3 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 4-NITRIC/PEROXIDE IMP
985808	10/21/98	TEST-3 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 5-KMNO4 IMPINGERS
985809	10/21/98	TEST-3 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 6-ACID RINSE OF KMNO4
985810	10/21/98	TEST-3 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 2-PROBE RINSE HCl/HNO3

Anal No	Date	Sample Number	Submitted By	Project No.	Description
985811	10/21/98	TEST-3 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 3-KCl IMPINGERS KCl/HCl
985812	10/21/98	TEST-3 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 4-NITRIC/PEROXIDE IMP.
985813	10/21/98	TEST-3 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 5-KMNO4 IMPINGERS
985814	10/21/98	TEST-3 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 6-ACID RINSE OF KMNO4
985815	10/21/98	TEST-3A RON 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 2-PROBE RINSE HCl/HNO3
985816	10/21/98	TEST-3A RON 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 3-KCL IMPINGERS KCl/HCl
985817	10/21/98	TEST-3A RON 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 4-NITRIC/PEROXIDE IMP.
985818	10/21/98	TEST-3A RON 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 5-KMNO4 IMPINGERS
985819	10/21/98	TEST-3A RON 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO STACK 6-ACID RINSE OF KMNO4
985820	10/21/98	TEST-4 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 2-PROBE RINSE HCl/HNO3
985821	10/21/98	TEST-4 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 3-KCl IMPINGERS KCl/HC
985822	10/21/98	TEST-4 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 4-NITRIC/PEROXIDE IMP.
985823	10/21/98	TEST-4 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 5-KMNO4 IMPINGERS
985824	10/21/98	TEST-4 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 6-ACID RINSE OF KMNO4
985825	10/21/98	TEST-4 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 2-PROBE RINSE
985826	10/21/98	TEST-4 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 3-KCl IMPINGERS
985827	10/21/98	TEST-4 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 4-NITRIC/PEROXIDE IM
985828	10/21/98	TEST-4 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 5-KMNO4 IMPINGERS
985829	10/21/98	TEST-4 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 6-ACID RINSE OF KMNO
985830	10/21/98	TEST-4 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 2-PROBE RINSE
985831	10/21/98	TEST-4 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 3-KCl IMPINGERS
985832	10/21/98	TEST-4 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 4-NITRIC/PEROXIDE
985833	10/21/98	TEST-4 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 5-KMNO4 IMPINGERS
985834	10/21/98	TEST-4 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 6-ACID RINSE OF
985835	10/21/98	TEST-5 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 2-PROBE RINSE HCl/HNO3
985836	10/21/98	TEST-5 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 3-KCl IMPINGERS KCl/HC
985837	10/21/98	TEST-5 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 4-NITRIC/PEROXIDE IMP.
985838	10/21/98	TEST-5 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 5-KMNO4 IMPINGERS

Anal No	Date	Sample Number	Submitted By	Project No.	Description
985839	10/21/98	TEST-5 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH IN 6-ACID RINSE OF KMNO4
985840	10/21/98	TEST-5 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 2-PROBE RINSE
985841	10/21/98	TEST-5 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 3-KCl IMPINGERS
985842	10/21/98	TEST-5 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 4-NITRIC/PEROXIDE IM
985843	10/21/98	TEST-5 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 5-KMNO4 IMPINGERS
985844	10/21/98	TEST-5 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 6-ACID RINSE OF KMNO
985845	10/21/98	TEST-5 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 2-PROBE RINSE
985846	10/21/98	TEST-5 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 3-KCl IMPINGERS
985847	10/21/98	TEST-5 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 4-NITRIC/PEROXIDE
985848	10/21/98	TEST-5 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 5-KMNO4 IMPINGERS
985849	10/21/98	TEST-5 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 6-ACID RINSE OF
985850	10/21/98	TEST-6 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH INLET 2-PROBE RINSE
985851	10/21/98	TEST-6 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH INLET 3-KCl IMPINGERS
985852	10/21/98	TEST-6 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH INLET 4-NITRIC/PEROXIDE
985853	10/21/98	TEST-6 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH INLET 5-KMNO4 IMPINGERS
985854	10/21/98	TEST-6 MATT 10/	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO APH INLET 6-ACID RINSE OF
985855	10/21/98	TEST-6 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 2-PROBE RINSE
985856	10/21/98	TEST-6 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 3-KCl IMPINGERS
985857	10/21/98	TEST-6 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 4-NITRIC/PEROXIDE
985858	10/21/98	TEST-6 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 5-KMNO4 IMPINGERS
985859	10/21/98	TEST-6 LEN 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP INLET 6-ACID RINSE OF
985860	10/21/98	TEST-6 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 2-PROBE RINSE
985861	10/21/98	TEST-6 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 3-KCl IMPINGERS
985862	10/21/98	TEST-6 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 4-NITRIC/PEROXIDE
985863	10/21/98	TEST-6 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 5-KMNO4 IMPINGERS
985864	10/21/98	TEST-6 RON 10/1	M. DEVITO	1621-60 -	ADA ONTARIO HYDRO PP OUTLET 6-ACID RINSE OF
985865	10/22/98	27682	D. LOWENHAUPT	1621-3 -23	TERRY EAGLE COAL
985866	10/22/98	97335	R. STRONG	1350-1 -1	BAILEY 10/18/98 UDM-576

Appendix J

Laboratroy Data

CVAA Run for Probe Rinse Samples

CVAA Run for KCl Impingers

CVAA Run for Nitric Acid/Peroxide Impingers

CVAA Run for Permanganate minger

CVAA Run for HCl Rinse of Permangante Impingers

CVAA Run for Impinger Checks and Repeats

CVAA Run for Solid Samples – Set 1

CVAA Run for Solid Samples – Set 2

Certification of Hg Standard Solution

Certification of Hg Standard Reference Material 1641C

ADA Ontario Hydro Sampling Train Impinger Mercury Analysis

Calibration curve, sample, duplicates, spike analyses, and QC checks

Front–Half (Probe) Rinse

Sample ID	Description	Absorbance	Dilution Factor	Hg Conc. ng/mL
Blank	0.0 ng/mL Hg	0.000	1	0.00
Standard 1	1.00 ng/mL Hg	0.007	1	1.00
Standard 3	5.00 ng/mL Hg	0.036	1	5.00
Standard 4	10.00 ng/mL Hg	0.076	1	10.00
Standard 5	20.00 ng/mL Hg	0.147	1	20.00
Blank	10% HCl	0.001	1	0.16
NIST SRM	**1641C 7.35 ng/mL Hg**	**0.057**	**1**	**7.73**
Field Blank	Matrix Blank	0.001	1	0.87
Field Blank	Matrix Blank	0.000	1	0.00
985703	HCl Sample Rinse	0.003	10	4.51
985708	HCl Sample Rinse	0.002	10	2.98
985713	HCl Sample Rinse	0.001	10	1.33
985785	HCl Sample Rinse	0.003	10	4.03
985790	HCl Sample Rinse	0.001	10	1.17
985795	HCl Sample Rinse	0.000	10	0.49
Blank	10% HCl	0.001	1	0.08
QC Check	**10 ppb Hg QC Check**	**0.074**	**1**	**9.53**
985800	HCl Sample Rinse	0.005	10	6.50
985800–Spike	5 ppb Hg Spike	0.039	1	5.22
985805	HCl Sample Rinse	0.005	10	6.26
985805–Dup	Sample Duplicate	0.002	10	2.32
985810	HCl Sample Rinse	0.000	10	0.00
985815	HCl Sample Rinse	0.000	10	0.00
985820	HCl Sample Rinse	0.002	10	2.52
985825	HCl Sample Rinse	0.000	10	0.00
Blank	10% HCl	0.000	1	0.00
QC Check	**10 ppb Hg QC Check**	**0.074**	**1**	**9.95**
985830	HCl Sample Rinse	0.002	10	2.33
985835	HCl Sample Rinse	0.002	10	2.51
985840	HCl Sample Rinse	0.005	10	6.14
985840–Spike	5 ppb Hg Spike	0.036	1	4.91
985845	HCl Sample Rinse	0.003	10	3.72
985845–Dup	Sample Duplicate	0.002	10	3.67
985850	HCl Sample Rinse	0.001	10	1.37
985855	HCl Sample Rinse	0.001	10	0.76
985860	HCl Sample Rinse	0.000	10	0.00
Blank	10% HCl	0.000	1	0.00
QC Check	**10 ppb Hg QC Check**	**0.073**	**1**	**9.93**

O:\APPRES\STACK\ADA–98\QC–PR

ADA Ontario Hydro Sampling Train Impinger Mercury Analysis

Calibration curve, sample, duplicates, spike analyses, and QC checks

KCl Impingers

Sample ID	Description	Absorbance	Dilution Factor	Hg Conc. ng/mL
Blank	0.0 ng/mL Hg	0.000	1	0.00
Standard 1	1.00 ng/mL Hg	0.007	1	1.00
Standard 3	5.00 ng/mL Hg	0.039	1	5.00
Standard 4	10.00 ng/mL Hg	0.076	1	10.00
Standard 5	20.00 ng/mL Hg	0.153	1	20.00
Blank	10% HCl	0.000	1	0.05
NIST SRM	**1641C 7.35 ng/mL Hg**	**0.059**	**1**	**7.72**
Field Blank	Matrix Blank	0.000	1	0.27
Field Blank	Matrix Blank	0.000	1	0.70
985704	KCl Impinger Sample	0.006	10	7.37
985709	KCl Impinger Sample	0.004	10	4.82
985714	KCl Impinger Sample	0.009	10	11.47
985786	KCl Impinger Sample	0.001	10	1.96
985791	KCl Impinger Sample	0.003	10	3.73
985796	KCl Impinger Sample	0.016	10	21.49
Blank	10% HCl	0.000	1	0.00
QC Check	**10 ppb Hg QC Check**	**0.077**	**1**	**10.03**
985801	KCl Impinger Sample	0.002	10	2.22
985801–Spike	5 ppb Hg Spike	0.038	1	5.01
985806	KCl Impinger Sample	0.003	10	4.36
985806–Dup	Sample Duplicate	0.002	10	3.02
985811	KCl Impinger Sample	0.006	10	7.57
985816	KCl Impinger Sample	0.006	10	7.43
985821	KCl Impinger Sample	0.003	10	3.71
985826	KCl Impinger Sample	0.003	10	4.24
Blank	10% HCl	0.000	1	0.00
QC Check	**10 ppb Hg QC Check**	**0.077**	**1**	**10.14**
985831	KCl Impinger Sample	0.002	10	2.53
985836	KCl Impinger Sample	0.003	10	4.29
985841	KCl Impinger Sample	0.004	10	4.71
985841–Spike	5 ppb Hg Spike	0.041	1	5.37
985846	KCl Impinger Sample	0.004	10	4.84
985846–Dup	Sample Duplicate	0.004	10	5.79
985851	KCl Impinger Sample	0.003	10	3.44
985856	KCl Impinger Sample	0.003	10	3.87
985861	KCl Impinger Sample	0.005	10	6.68
Blank	10% HCl	0.000	1	0.00
QC Check	**10 ppb Hg QC Check**	**0.076**	**1**	**9.99**

O:\APPRES\STACK\ADA–98\QC–KCL

ADA Ontario Hydro Sampling Train Impinger Mercury Analysis

Calibration curve, sample, duplicates, spike analyses, and QC checks

HNO_3/H_2O_2 Impingers

Sample ID	Description	Absorbance	Dilution Factor	Hg Conc. ng/mL
Blank	0.0 ng/mL Hg	0.000	1	0.00
Standard 1	1.00 ng/mL Hg	0.007	1	1.00
Standard 3	5.00 ng/mL Hg	0.038	1	5.00
Standard 4	10.00 ng/mL Hg	0.082	1	10.00
Standard 5	20.00 ng/mL Hg	0.159	1	20.00
Blank	10% HCl	0.000	1	0.05
NIST SRM	**1641C 7.35 ng/mL Hg**	**0.062**	**1**	**7.83**
Field Blank	Matrix Blank	0.001	1	1.76
Field Blank	Matrix Blank	0.000	1	0.54
985705	Nitric Impinger Sample	0.001	10	2.41
985710	Nitric Impinger Sample	0.009	10	12.12
985715	Nitric Impinger Sample	0.000	10	0.95
985787	Nitric Impinger Sample	0.000	10	0.00
985792	Nitric Impinger Sample	0.002	10	3.19
985797	Nitric Impinger Sample	0.002	10	2.70
Blank	10% HCl	0.000	1	0.00
QC Check	**10 ppb Hg QC Check**	**0.081**	**1**	**10.10**
985802	Nitric Impinger Sample	0.000	10	0.75
985802–Spike	5 ppb Hg Spike	0.039	1	4.97
985807	Nitric Impinger Sample	0.001	10	1.44
985807–Dup	Sample Duplicate	0.002	10	2.77
985812	Nitric Impinger Sample	0.001	10	1.46
985817	Nitric Impinger Sample	0.001	10	1.81
985822	Nitric Impinger Sample	0.000	10	1.25
985827	Nitric Impinger Sample	0.001	10	1.51
Blank	10% HCl	0.001	1	0.18
QC Check	**10 ppb Hg QC Check**	**0.086**	**1**	**10.73**
985832	Nitric Impinger Sample	0.000	10	0.66
985837	Nitric Impinger Sample	0.001	10	2.32
985842	Nitric Impinger Sample	0.001	10	2.54
985842–Spike	5 ppb Hg Spike	0.040	1	5.11
985847	Nitric Impinger Sample	0.001	10	1.91
985847–Dup	Sample Duplicate	0.000	10	0.00
985852	Nitric Impinger Sample	0.001	10	1.43
985857	Nitric Impinger Sample	0.001	10	1.63
985862	Nitric Impinger Sample	0.000	10	0.05
Blank	10% HCl	0.002	1	0.28
QC Check	**10 ppb Hg QC Check**	**0.080**	**1**	**10.02**

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ADA Ontario Hydro Sampling Train Impinger Mercury Analysis

Calibration curve, sample, duplicates, spike analyses, and QC checks

$KMnO_4$ Impingers

Sample ID	Description	Absorbance	Dilution Factor	Hg Conc. ng/mL
Blank	0.0 ng/mL Hg	0.000	1	0.00
Standard 1	1.00 ng/mL Hg	0.008	1	1.00
Standard 3	5.00 ng/mL Hg	0.038	1	5.00
Standard 4	10.00 ng/mL Hg	0.081	1	10.00
Standard 5	20.00 ng/mL Hg	0.160	1	20.00
Blank	10% HCl	0.000	1	0.02
NIST SRM	**1641C 7.35 ng/mL Hg**	**0.063**	**1**	**7.88**
Field Blank	Matrix Blank	0.000	1	0.00
985706	$KMnO_4$ Impinger Sample	0.018	10	23.6
985711	$KMnO_4$ Impinger Sample	0.023	10	29.2
985716	$KMnO_4$ Impinger Sample	0.000	10	0.85
985788	$KMnO_4$ Impinger Sample	0.018	10	23.2
985793	$KMnO_4$ Impinger Sample	0.029	10	36.8
985798	$KMnO_4$ Impinger Sample	0.000	10	0.00
Blank	10% HCl	0.001	1	0.15
QC Check	**10 ppb Hg QC Check**	**0.083**	**1**	**10.33**
~~*985803*~~	~~*$KMnO_4$ Impinger Sample*~~	~~*0.006*~~	~~*10*~~	~~*7.80*~~
~~985803–Spike~~	~~5 ppb Hg Spike~~	~~0.051~~	~~1~~	~~6.38~~
985808	$KMnO_4$ Impinger Sample	0.016	10	20.3
985808–Dup	Sample Duplicate	0.016	10	20.9
~~*985813*~~	~~*$KMnO_4$ Impinger Sample*~~	~~*0.008*~~	~~*10*~~	~~*10.5*~~
~~*985818*~~	~~*$KMnO_4$ Impinger Sample*~~	~~*0.025*~~	~~*10*~~	~~*31.7*~~
985823	$KMnO_4$ Impinger Sample	0.028	10	34.8
985828	$KMnO_4$ Impinger Sample	0.017	10	21.7
Blank	10% HCl	0.000	1	0.05
QC Check	**10 ppb Hg QC Check**	**0.081**	**1**	**10.14**
985833	$KMnO_4$ Impinger Sample	0.031	10	39.6
985838	$KMnO_4$ Impinger Sample	0.015	10	19.4
985843	$KMnO_4$ Impinger Sample	0.022	10	27.4
985843–Spike	5 ppb Hg Spike	0.061	1	7.65
985848	$KMnO_4$ Impinger Sample	0.021	10	27.0
985848–Dup	Sample Duplicate	0.019	10	23.7
985853	$KMnO_4$ Impinger Sample	0.016	10	20.2
985858	$KMnO_4$ Impinger Sample	0.023	10	28.8
985863	$KMnO_4$ Impinger Sample	0.018	10	23.1
Blank	10% HCl	0.000	1	0.11
QC Check	**10 ppb Hg QC Check**	**0.083**	**1**	**10.32**

Samples in italics are invalid and not used in gas phase calculations.

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ADA Ontario Hydro Sampling Train Impinger Mercury Analysis

Calibration curve, sample, duplicates, spike analyses, and QC checks

HCl Rinse of $KMnO_4$ Impingers

Sample ID	Description	Absorbance	Dilution Factor	Hg Conc. ng/mL
Blank	0.0 ng/mL Hg	0.000	1	0.00
Standard 1	1.00 ng/mL Hg	0.007	1	1.00
Standard 3	5.00 ng/mL Hg	0.035	1	5.00
Standard 4	10.00 ng/mL Hg	0.072	1	10.00
Standard 5	20.00 ng/mL Hg	0.146	1	20.00
Blank	10% HCl	0.001	1	0.18
NIST SRM	**1641C 7.35 ng/mL Hg**	**0.056**	**1**	**7.82**
Field Blank	Matrix Blank	0.000	1	0.09
DI Water	DI Water Blank	0.000	1	0.00
985707	Acid Rinse Sample	0.001	10	2.70
985712	Acid Rinse Sample	0.001	10	2.32
985717	Acid Rinse Sample	0.001	10	1.82
985789	Acid Rinse Sample	0.000	10	1.26
985794	Acid Rinse Sample	0.001	10	2.20
985799	Acid Rinse Sample	0.000	10	1.03
Blank	10% HCl	0.001	1	0.24
QC Check	**10 ppb Hg QC Check**	**0.077**	**1**	**10.59**
985804	Acid Rinse Sample	0.001	10	2.64
985804–Spike	5 ppb Hg Spike	0.036	1	5.06
985809	Acid Rinse Sample	0.000	10	0.00
985809–Dup	Sample Duplicate	0.001	10	2.52
985814	Acid Rinse Sample	0.000	10	0.96
985819	Acid Rinse Sample	0.001	10	2.52
985824	Acid Rinse Sample	0.001	10	1.86
985829	Acid Rinse Sample	0.000	10	1.00
Blank	10% HCl	0.001	1	0.19
QC Check	**10 ppb Hg QC Check**	**0.072**	**1**	**9.23**
985834	Acid Rinse Sample	0.001	10	2.11
985839	Acid Rinse Sample	0.003	10	4.64
985844	Acid Rinse Sample	0.001	10	2.78
985844–Spike	5 ppb Hg Spike	0.034	1	4.78
985849	Acid Rinse Sample	0.001	10	2.03
985849–Dup	Sample Duplicate	0.000	10	1.29
985854	Acid Rinse Sample	0.000	10	1.21
985859	Acid Rinse Sample	0.001	10	1.76
985864	Acid Rinse Sample	0.000	10	1.42
Blank	10% HCl	0.000	1	0.16
QC Check	**10 ppb Hg QC Check**	**0.073**	**1**	**10.08**

ADA Ontario Hydro Sampling Train Impinger Mercury Analysis

Calibration curve, sample, duplicates, spike analyses, and QC checks

Impinger Checks and Repeats

Sample ID	Description	Absorbance	Dilution Factor	Hg Conc. ng/mL
Blank	0.0 ng/mL Hg	0.000	1	0.00
Standard 1	1.00 ng/mL Hg	0.009	1	1.00
Standard 3	5.00 ng/mL Hg	0.035	1	5.00
Standard 4	10.00 ng/mL Hg	0.071	1	10.00
Standard 5	20.00 ng/mL Hg	0.142	1	20.00
Blank	10% HCl	0.000	1	0.00
NIST SRM	**1641C 7.35 ng/mL Hg**	**0.056**	**1**	**7.81**
Blank	10% HCl	0.000	1	0.00
985716	$KMnO_4$ Impinger Sample	0.002	10	1.56
985786	KCl Impinger Sample	0.002	10	2.34
985798	$KMnO_4$ Impinger Sample	0.000	10	0.00
985801	KCl Impinger Sample	0.002	10	1.17
985803	$KMnO_4$ Impinger Sample	0.012	10	16.02
Blank	10% HCl	0.000	1	0.00
QC Check	**5 ppb Hg QC Check**	**0.034**	**1**	**4.75**
Blank	10% HCl	0.000	1	0.00
985813	$KMnO_4$ Impinger Sample	0.000	10	0.00
985818	$KMnO_4$ Impinger Sample	0.001	10	0.44
985831	KCl Impinger Sample	0.001	10	0.12
985838	$KMnO_4$ Impinger Sample	0.018	10	24.7
985853	$KMnO_4$ Impinger Sample	0.016	10	22.2
Blank	10% HCl	0.001	10	0.00
QC Check	**5 ppb Hg QC Check**	**0.036**	**1**	**4.98**
Blank	0.0 ng/mL Hg	0.000	1	0.00
Standard 1	1.00 ng/mL Hg	0.006	1	1.00
Standard 3	5.00 ng/mL Hg	0.032	1	5.00
Standard 4	10.00 ng/mL Hg	0.065	1	10.00
Standard 5	20.00 ng/mL Hg	0.130	1	20.00
Blank	10% HCl	0.000	1	0.01
NIST SRM	**1641C 7.35 ng/mL Hg**	**0.051**	**1**	**7.90**
Blank	10% HCl	0.001	1	0.18
985803	$KMnO_4$ Impinger Sample	0.010	10	15.06
985813	$KMnO_4$ Impinger Sample	0.000	10	0.52
985818	$KMnO_4$ Impinger Sample	0.001	10	2.38
985831	KCl Impinger Sample	0.001	10	2.70
Blank	10% HCl	0.001	1	0.17
QC Check	**5 ppb Hg QC Check**	**0.031**	**1**	**4.75**

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ADA Ontario Hydro Sampling Train Solids Analysis

Calibration curve, sample, duplicates, spike analyses, and QC checks

Filter/Filter Solids Analysis

Sample ID	Description	Abs	Dilution Factor	Hg Concentration ng/mL	ppb solids[1]
Blank	0.0 ng/mL Hg	0.000	1	0.00	NA
Standard 1	1.00 ng/mL Hg	0.004	1	1.00	NA
Standard 3	5.00 ng/mL Hg	0.023	1	5.00	NA
Standard 4	10.00 ng/mL Hg	0.046	1	10.00	NA
Standard 5	20.00 ng/mL Hg	0.890	1	20.00	NA
Blank	10% HCl	0.000	1	0.00	NA
NIST SRM	**1641C 7.35 ng/mL H**	**0.033**	**1**	**7.24**	**NA**
Blank	10% HCl	0.000	1	0.00	NA
Filter Blank	Quartz Blank	0.000	1	0.00	0
985667	Inlet Filter	0.023	1	5.07	257
985667– Dup	Inlet Filter	0.022	1	4.87	244
Blank	10% HCl	0.000	1	0.00	NA
QC–Check	**10 ppb QC Check**	**0.045**	**1**	**10.05**	**NA**
Blank	10% HCl	0.000	1	0.00	NA
985668	Inlet Filter	0.117	1	26.32	2560
985669	Stack Filter	0.003	1	0.50	BDL
985670	Inlet Probe	0.010	1	2.21	157
985671	Inlet Cyclone	0.010	1	2.04	103
985671– Dup	Inlet Cyclone	0.010	1	2.17	110
985672	Inlet Filter	0.102	1	22.86	1980
985673	Inlet Filter	0.128	1	28.78	2400
985674	Stack Filter	0.002	1	0.37	BDL
Blank	10% HCl	0.001	1	0.07	NA
QC–Check	**10 ppb QC Check**	**0.046**	**1**	**10.20**	**NA**
Blank	10% HCl	0.000	1	0.00	NA
985675	Inlet Probe	0.018	1	4.06	293
985675– Dup	Inlet Probe	0.016	1	3.61	259
985676	Inlet Cyclone	0.015	1	3.16	140
985676– Dup	Inlet Cyclone	0.012	1	2.71	137
985677	Inlet Filter	0.270	1	60.85	4850
985678	Inlet Filter	0.149	1	33.54	3000
985679	Stack Filter	0.003	1	0.46	BDL
985680	Stack Filter	0.001	1	0.16	BDL
Blank	10% HCl	0.001	1	0.17	NA
QC–Check	**10 ppb QC Check**	**0.048**	**1**	**10.69**	**NA**

1 – ppb solids concentrated calculated from total filter mass and sample wt.

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ADA Ontario Hydro Sampling Train Solids Analysis

Calibration curve, sample, duplicates, spike analyses, and QC checks

Filter/Filter Solids Analysis

Sample ID	Description	Abs	Dilution Factor	Hg Concentration ng/mL	Hg Concentration ppb solids[1]
Blank	0.0 ng/mL Hg	0.000	1	0.00	NA
Standard 1	1.00 ng/mL Hg	0.006	1	1.00	NA
Standard 3	5.00 ng/mL Hg	0.025	1	5.00	NA
Standard 4	10.00 ng/mL Hg	0.052	1	10.00	NA
Standard 5	20.00 ng/mL Hg	0.098	1	20.00	NA
Blank	10% HCl	0.000	1	0.00	NA
NIST SRM	**1641C 7.35 ng/mL Hg**	**0.038**	**1**	**7.47**	**NA**
Blank	10% HCl	0.000	1	0.00	NA
985681	Inlet Probe	0.017	1	3.21	240
985682	Inlet Cyclone	0.016	1	2.99	147
985682– Dup	Inlet Cyclone	0.015	1	2.79	139
985683	Inlet Filter	0.229	1	46.57	4370
985684	PP Inlet Probe	0.024	1	4.69	293
985684– Dup	PP Inlet Probe	0.021	1	4.09	250
985685	PP Inlet Cyclone	0.012	1	2.32	113
985686	PP Inlet Filter	0.050	1	9.97	481
985687	PP Outlet Filter	0.001	1	0.00	BDL
985688	Inlet Probe	0.015	1	2.83	143
Blank	10% HCl	0.001	1	0.00	NA
QC–Check	**10 ppb QC Check**	**0.050**	**1**	**10.01**	**NA**
Blank	10% HCl	0.000	1	0.00	NA
985689	Inlet Cyclone	0.012	1	2.31	114
985689– Dup	Inlet Cyclone	0.011	1	2.03	101
985690	Inlet Filter	0.145	1	29.35	2640
985691	PP Inlet Probe	0.038	1	7.58	339
985692	PP Inlet Cyclone	0.011	1	2.01	101
985693	PP Inlet Filter	0.036	1	7.19	367
985694	PP Outlet Filter	0.002	1	0.19	BDL
985695	Inlet Probe	0.011	1	1.94	223
Blank	10% HCl	0.003	1	0.35	NA
QC–Check	**10 ppb QC Check**	**0.050**	**1**	**10.04**	**NA**
Blank	10% HCl	0.000	1	0.00	NA
985696	Inlet Cyclone	0.011	1	1.95	98
985696– Dup	Inlet Cyclone	0.014	1	2.57	129
985697	Inlet Filter	0.243	1	49.47	4080
985698	PP Inlet Probe	0.040	1	7.98	257
985699	PP Inlet Cyclone	0.009	1	1.56	79
985700	PP Inlet Filter	0.044	1	8.82	407
985701	PP Outlet Filter	0.000	1	0.00	BDL
Blank	10% HCl	0.000	1	0.00	NA
QC–Check	**10 ppb QC Check**	**0.049**	**1**	**9.80**	**NA**

1 – ppb solids concentrated calculated from total filter mass and sample wt.

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VHG LABS
180 Zachary Road
Manchester, NH 03109
Tel: (888) 822-7660
Fax: (603) 622-5180

Laboratory Report - Certificate of Analysis

Plasma Emission Standard

Element: **Mercury (Hg)**

Product No: PHGN-500

Concentration: **1,000 ± 3 μg/mL***

Lot No.: PHGN61

Matrix: 5% HNO_3

Expires: November 1999

This solution is intended for use as a calibration standard for plasma emission spectroscopy (ICP or DCP). It is a single element solution, that was prepared gravimetrically to contain 1,000 μg of mercury per mL of solution. The certified value is based upon gravimetric procedures, ie., weight per volume composition of 99.9994% pure mercury (Hg) metal dissolved in high purity nitric acid (HNO_3) and diluted with filtered (0.22μm) 18 megohm deionized water. The uncertainty associated with the certified value is approximated by summing the estimated errors due to the purity of the Hg, the gravimetric preparation of the solution, and transpiration of the solution through the container wall.

Traceability: The balance used to weigh the Hg is accurate to ± 0.0001g and is calibrated regularly using mass standards, which are traceable to NIST according to ME Report No. 12996-01 and NIST Test No. 39760. All volumetric dilutions are performed in class A glassware which is recalibrated regularly according to NIST recommended procedures. In order to verify the concentration, the final solution was checked by plasma emission spectrometry (ICP or DCP) against **NIST SRM 3133**. All trace level elements and impurities, in the final solution, were also determined by ICP or DCP.

Concentrations are given in μg/mL unless noted otherwise.

Al	<.04	Ag	<.02	As	<.2	Au	<.08	B	<.02	Ba	<.003	Be	<.003	Bi	<.2	**Ca**	**0.05**	Cd	<.02
Ce	<.3	Co	<.02	Cr	<.02	Cs	<100	Cu	<.02	Dy	<.03	Er	<.02	Eu	<.02	Fe	<.02	Ga	<.03
Gd	<.07	Ge	<.1	Hf	<.05	**Hg**	*	Ho	<.02	In	<.2	Ir	<.2	K	<.5	**La**	**0.10**	Li	<.02
Lu	<.02	**Mg**	**0.007**	Mn	<.02	Mo	<.04	**Na**	**0.28**	Nb	<.05	Nd	<.05	Ni	<.02	Os	<.2	P	<.1
Pb	<.1	Pd	<.1	Pr	<.06	Pt	<.2	Rb	<50	Re	<.1	Rh	<.01	Ru	<.05	S	<.05	Sb	<.2
Sc	<.01	Se	<.5	Si	<.04	Sm	<.04	Sn	<.1	Sr	<.003	Ta	<.1	Tb	<.06	Te	<.5	Th	<.2
Ti	<.02	Tl	<.1	Tm	<.04	U	<.4	V	<.02	W	<.2	Y	<.02	Yb	<.01	Zn	<.02	Zr	<.04

Recommendations: VHG guarantees the accuracy of this solution until the expiration date shown above, provided it is kept tightly capped and stored under normal laboratory conditions. To achieve the highest accuracy, the analyst should prepare fresh working solutions daily, by making serial dilutions. We recommend that the solution be thoroughly mixed, by shaking the bottle, immediately prior to use. Never pipet directly from the bottle. All glass or plastic surfaces, which come into contact with the solution, must have been previously cleaned. Dilutions should be made with certified volumetric class A flasks and pipets. Always dilute with the same matrix as the original standard.

VHG Labs, Inc.

Q. A. Manager

VHG Labs, Inc. waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Materials 1641c

Mercury in Water

(Acidified with 2% HNO_3)

This Standard Reference Material (SRM) is intended for use in the primary calibration of instruments and techniques used for the determination of mercury in natural waters. It is designed for the preparation of calibration solutions and for use as a "spike" sample in a "method-of-additions" type analytical procedure. A unit of SRM 1641c consists of six ampoules, each ampoule containing 20 mL of solution containing a trace amount of mercury in 2% (v/v) HNO_3, initially stabilized with 1 mg/L gold.

The mercury content in this SRM was certified using flow injection analysis cold vapor atomic absorption (FIA-CVAA) and inductively coupled plasma mass spectrometry (ICP-MS). The certified mercury content and its estimated uncertainty is given below.

Mercury concentration: 1.47 ± 0.04 mg/L

The certified value, minus and plus the uncertainty, gives a 95% confidence interval for the true concentration of mercury in this material, with an allowance for differences between the analytical methods used.

Notice to users: The certification of this SRM is considered valid for one year from the date of shipment from NIST. At or below the mg/mL level, mercury solutions are not adequately stabilized with mineral acid alone. The addition of trace quantities of gold to the nitric acid solution of mercury provides greater stability. However, the gold which stabilizes the mercury content may plate out on the ampoule wall during the period for which the certification is valid. Experience with the three previous issues of this SRM indicates that this has no affect on the mercury concentration. The stability of this SRM will continue to be monitored and any substantive change in the certified value will be reported to customers. Please return the enclosed registration card to facilitate the notification.

This SRM was prepared by J.R. Moody, and certification analyses were performed by M.S. Epstein, R. Saraswati, R.A. Tores, and G.C. Turk of the NIST Inorganic Analytical Research Division.

The overall direction and coordination of technical measurements leading to certification were performed by J.D. Fassett of the NIST Inorganic Analytical Research Division.

The statistical evaluation of certification data was performed by S.B. Schiller of the NIST Statistical Engineering Division.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.S. Kane.

Gaithersburg, MD 20899
June 14, 1993
(Revision of certificate dated 4-6-93)

Thomas E. Gills, Acting Chief
Standard Reference Materials Program

(over)

Appendix K

Computer-Generated Hg Concentration Spreadsheets

SUMMARY OF ONTARIO HYDRO IMPINGER ANALYSES
(Units are ug/m^3)

		Hg in Solids				Oxidized Hg			Elemental Hg				TOTAL
Date	Location	Probe	Cyclone	Filter	Total	PR	KCl	Hg^{++}	H_2O_2	$KMnO_4$	HCl Rinse	Hg^0	Hg^{TOT}
10/13	APH Outlet N	---	---	1.57	**1.57**	0.25	3.16	**3.41**	0.33	4.41	0.21	**4.95**	**9.93**
	APH Outlet R	---	---	1.43	**1.43**	0.23	2.16	**2.39**	1.69	5.75	0.19	**7.63**	**11.45**
	STACK	---	---	0.00	**0.00**	0.05	3.00	**3.05**	0.07	0.11	0.07	**0.25**	**3.30**
10/13	APH Outlet N	0.10	0.41	1.58	**2.09**	0.23	0.94	**1.17**	0.07	4.48	0.10	**4.65**	**7.91**
	APH Outlet R	---	---	1.48	**1.48**	0.08	1.55	**1.63**	0.41	6.52	0.16	**7.09**	**10.20**
	STACK	---	---	0.00	**0.00**	0.03	3.63	**3.66**	0.51	0.05	0.04	**0.60**	**4.26**
10/14	APH Outlet N	0.31	0.51	3.81	**4.63**	0.39	0.73	**1.12**	0.10	2.92	0.20	**3.22**	**8.97**
	APH Outlet R	---	---	1.88	**1.88**	0.26	1.54	**1.80**	0.27	3.73	0.07	**4.07**	**7.75**
	STACK	---	---	0.00	**0.00**	0.04	2.89	**2.93**	0.16	0.08	0.06	**0.30**	**3.23**
	STACK	---	---	0.00	**0.00**	0.04	2.88	**2.92**	0.21	0.23	0.16	**0.60**	**3.52**
10/14	APH Outlet N	0.14	0.48	3.13	**3.75**	0.36	1.66	**2.02**	0.18	6.86	0.15	**7.19**	**12.96**
10/15	APH Outlet N	0.11	0.31	1.81	**2.23**	0.31	1.86	**2.17**	0.30	4.19	0.36	**4.85**	**9.25**
10/15	APH Outlet N	0.08	0.44	3.20	**3.72**	0.25	1.53	**1.78**	0.20	4.15	0.10	**4.45**	**9.95**

APH Outlet N denotes sampling at air preheater outlet (baghouse inlet), normal isokinetic nozzle orientation.
APH Outlet R denotes sampling at air preheater outlet (baghouse inlet), reversed nozzle orientation.
STACK denotes sampling at the stack or baghouse outlet.

ADA Hg Sampling Program – Ontario Hydro Analysis Spreadsheet
Testing Conducted on October 13, 1998

Date	10/13	10/13	10/13	10/13	10/13	10/13
Location	APH Out	APH Out	STACK	APH Out	APH Out	STACK
Nozzle	Normal	Reverse	Normal	Normal	Reverse	Normal
dsm^3	1.280	1.252	2.600	1.239	1.365	2.424
SOLIDS:						
Probe						
mass, g				0.7673		
ppm Hg				0.16		
$\mu g/m^3$				0.10		
Cyclone						
mass, g				4.5935		
ppm Hg				0.11		
$\mu g/m^3$				0.41		
Filter						
mass, g	8.0430	0.6984	0.0000	0.9856	0.8399	0.0000
ppm Hg	0.25	2.56	0.00	1.98	2.40	0.00
$\mu g/m^3$	1.57	1.43	0.00	1.58	1.48	0.00
RINSES:						
Probe						
liq. vol. mL	70	96	90	70	88	131
ppb Hg	4.51	2.97	1.34	4.03	1.17	0.5
$\mu g/m^3$	0.25	0.23	0.05	0.23	0.08	0.03
KCl						
liq. vol. mL	549	562	678	540	566	409
ppb Hg	7.37	4.82	11.5	2.15	3.73	21.5
$\mu g/m^3$	3.16	2.16	3.00	0.94	1.55	3.63
HNO_3/H_2O_2						
liq. vol. mL	175	175	178	174	175	458
ppb Hg	2.41	12.1	0.95	0.5	3.19	2.70
$\mu g/m^3$	0.33	1.69	0.07	0.07	0.41	0.51
$KMnO_4$						
liq. vol. mL	240	243	244	239	242	226
ppb Hg	23.5	29.6	1.21	23.2	36.8	0.5
$\mu g/m^3$	4.41	5.75	0.11	4.48	6.52	0.05
HCl Rinse						
liq. vol. mL	100	100	100	100	100	100
ppb Hg	2.70	2.32	1.82	1.26	2.20	1.03
$\mu g/m^3$	0.21	0.19	0.07	0.10	0.16	0.04
Total $\mu g/m^3$	**9.93**	**11.44**	**3.29**	**7.89**	**10.19**	**4.25**

Underlined values for impinger analysis (0.5 ppb) indicate "less than" value

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ADA Hg Sampling Program – Ontario Hydro Analysis Spreadsheet

Testing Conducted on October 14 & 15, 1998

Date	10/14	10/14	10/14	10/14	10/14	10/15	10/15
Location	APH Out	APH Out	STACK	STACK	APH Out	APH Out	APH Out
Nozzle	Normal	Reverse	Normal	Normal	Normal	Normal	Normal
dsm^3	1.305	1.374	1.568	1.531	1.236	1.299	1.271
SOLIDS:							
Probe							
mass, g	1.4972				0.7000	1.0225	0.4593
ppm Hg	0.27				0.24	0.14	0.22
$\mu g/m^3$	0.31				0.14	0.11	0.08
Cyclone							
mass, g	4.7564				3.9326	3.6484	4.657
ppm Hg	0.14				0.15	0.11	0.12
$\mu g/m^3$	0.51				0.48	0.31	0.44
Filter							
mass, g	1.0265	0.8588	0.0000	0.0000	0.8864	0.8902	0.9973
ppm Hg	4.85	3.00	0.00	0.00	4.37	2.64	4.08
$\mu g/m^3$	3.81	1.88	0.00	0.00	3.13	1.81	3.20
RINSES:							
Probe							
liq. vol. mL	78	82	128	129	175	161	230
ppb Hg	6.50	4.29	0.5	0.5	2.52	2.51	1.37
$\mu g/m^3$	0.39	0.26	0.04	0.04	0.36	0.31	0.25
KCl							
liq. vol. mL	564	572	599	594	554	563	565
ppb Hg	1.70	3.69	7.57	7.43	3.71	4.29	3.44
$\mu g/m^3$	0.73	1.54	2.89	2.88	1.66	1.86	1.53
HNO_3/H_2O_2							
liq. vol. mL	175	175	176	175	175	175	175
ppb Hg	0.75	2.11	1.46	1.81	1.25	2.23	1.43
$\mu g/m^3$	0.10	0.27	0.16	0.21	0.18	0.30	0.20
$KMnO_4$							
liq. vol. mL	246	249	247	247	243	246	249
ppb Hg	15.5	20.6	0.5	1.41	34.9	22.1	21.2
$\mu g/m^3$	2.92	3.73	0.08	0.23	6.86	4.19	4.15
HCl Rinse							
liq. vol. mL	100	100	100	100	100	100	100
ppb Hg	2.64	1.00	0.96	2.52	1.86	4.64	1.21
$\mu g/m^3$	0.20	0.07	0.06	0.16	0.15	0.36	0.10
Total $\mu g/m^3$	**8.98**	**7.74**	**3.24**	**3.52**	**12.96**	**9.24**	**9.94**

Underlined values for impinger analysis (0.5 ppb) indicate "less than" value

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Appendix L

Equipment Calibration Data

Wet Test Meter

Dry Test Meters

Field Barometer

Nozzles

Pitot Tubes

CERTIFICATE OF CALIBRATION

This certifies that your AL-20 American Wet Test Meter
Serial No. P-1460
Has been calibrated with an American 10' Bell Prover
Serial No. 3157
It is traceable to the N.I.S.T., reference no. 1289411

Rate of Flow	%Proof
60 CFH	100.0

Calibration by Carl Poe Co., Inc.
99 Reinerman Houston, TX 77007
713-861-3816

April 15, 1997
Date

Mark Poe
Signature

METER CALIBRATION DATA

DATE – 2/18/98 BAR – 28.26
METER – Nutech–2 OPERATOR – OCB

ΔH	V_w	V_d	T_w	T_{in}	T_{out}	TIME	Y	$\Delta H_@$
0.35	3.00	2.96	79.4	77.0	75.3	8.55	1.007	1.744
0.50	5.00	4.98	77.0	78.7	76.7	12.03	1.004	1.757
1.00	5.00	5.01	78.8	84.0	78.3	8.68	1.000	1.836
2.00	5.00	5.03	78.8	86.7	79.7	6.25	0.997	1.898
3.00	10.00	10.08	78.8	92.3	81.7	10.20	0.999	1.888
4.00	10.00	10.14	78.8	95.0	83.0	8.97	0.995	1.941
	Y =	1.000		$\Delta H_@$ =	1.844	AVG	1.000	1.844
	STD DEV =	0.004		STD DEV =	0.073	MIN	0.995	1.744
						MAX	1.007	1.941
						RANGE	0.006	0.098

PREVIOUS CALIBRATION:

DATE = 1/29/96
Y = 0.970 –3.11 % CHANGE
$\Delta H_@$ = 1.959 5.88 % CHANGE

DATE = 2/6/97
Y = 0.969 –3.22 % CHANGE
$\Delta H_@$ = 1.941 5.00 % CHANGE

[N2–2–98;RLO;2/26/98]

Y = 1.000 $\Delta H_@$ = 1.844
N–2 Calibration Date= 2/18/98

Sampling meter used on APH outlet (baghouse inlet)

METER CALIBRATION DATA

DATE – 2/18/98 BAR – 28.27
METER – NuTech–5 OPERATOR – OCB

ΔH	V_w	V_d	T_w	T_{in}	T_{out}	TIME	Y	$\Delta H_@$
0.35	4.00	3.90	77.0	76.0	75.3	11.75	1.022	1.836
0.50	5.00	4.93	78.8	79.0	79.0	12.33	1.013	1.848
1.00	5.00	4.85	78.8	83.0	82.3	8.95	1.036	1.935
2.00	5.00	4.98	78.8	85.7	83.0	6.43	1.009	1.997
3.00	10.00	9.94	78.8	88.3	83.0	10.57	1.011	2.021
4.00	10.00	10.04	78.8	90.0	83.0	9.22	1.000	2.050
	Y =	1.015		$\Delta H_@$ =	1.948	AVG	1.015	1.948
	STD DEV =	0.011		STD DEV =	0.083	MIN	1.000	1.836
						MAX	1.036	2.050
						RANGE	0.018	0.107

PREVIOUS CALIBRATION:

DATE = 4/1/96
Y = 1.012 –0.31 % CHANGE
$\Delta H_@$ = 1.924 –1.24 % CHANGE

DATE = 2/7/97
Y = 1.008 –0.71 % CHANGE
$\Delta H_@$ = 1.928 –1.03 % CHANGE

[N5–2–98;RLO;2/26/98]

Y = 1.015 $\Delta H_@$ = 1.948
N–5 Calibration Date= 2/18/98

– sampling meter used on APH out (baghouse inlet)
– sampling meter used on pilot plant outlet

METER CALIBRATION DATA

DATE – 2/17/98 BAR – 28.34
METER – Nutech–3 OPERATOR – OCB

ΔH	V_w	V_d	T_w	T_{in}	T_{out}	TIME	Y	$\Delta H_@$
0.35	3.00	2.84	77.0	79.3	79.0	8.63	1.060	1.746
0.50	5.00	4.75	77.0	82.0	80.0	12.22	1.059	1.794
1.00	5.00	4.82	77.0	86.7	83.0	8.87	1.050	1.880
2.00	5.00	4.84	77.0	91.3	84.7	6.37	1.049	1.933
3.00	10.00	9.71	78.8	95.0	85.7	10.43	1.044	1.956
3.90	10.00	9.76	80.6	98.0	87.7	9.28	1.037	2.019
	Y =	1.050		$\Delta H_@$ =	1.888	AVG	1.050	1.888
	STD DEV =	0.008		STD DEV =	0.094	MIN	1.037	1.746
						MAX	1.060	2.019
						RANGE	0.011	0.137

PREVIOUS CALIBRATION:

DATE =	1/29/96		
Y =	1.014	–3.52	% CHANGE
$\Delta H_@$ =	1.953	3.34	% CHANGE
DATE =	2/10/97		
Y =	1.021	–2.81	% CHANGE
$\Delta H_@$ =	1.943	2.84	% CHANGE

[N3–2–98;RLO;2/26/98]

Y = 1.050 $\Delta H_@$ = 1.888
N–3 Calibration Date= 2/17/98

sampling meter used on baghouse outlet (stack)

Calibration of Field Barometers

8-3-98

Brass #1 - 29.13
Brass #2 - 29.15
Hg Column - 29.16

No adjustments made MSD

9-1-98

Brass #1 28.80
Brass #2 28.80

Hg Column - 28.86

Bothe Brass Barometers were Reset

MSD/ OCB

11-13-98

Brass #1 28.86
Brass #2 28.89

Hg Column 28.89

Large S.S. Bore Neck Tap Calibration

.500	1/2	A	.501	.502	.501		.156	5/32	A	.153	.153	.153
		B	.502	.502	.503				B	.156	.156	.156
7/16 .4375		one	.437	.436	.437				C	.149	.149	.149
.375	3/8	A	.373	.373	.374				D	.153	.154	.153
		B	373	373	374							
		C	.367	.367	.368		.125	1/8	A	.143	.143	.143
									B	.143	.143	.143
.344	11/32	A	.336	.336	.336							
		B	.337	.336	.336							
.3125	5/16	A	.311	.312	.312							
		B	.313	.313	.314							
		C	.314	.313	.314							
		D	.313	.313	.313							
		E	.309	.309	.310							
						June 1, 1998						
.281	9/32	A	.268	.268	.269	.270	.269	.269				
		B	.268	.268	.269	.268	.270	.271				
		C	.267	.268	.268	.273	.270	.272				
.266	17/64	Lost										
.250	1/4	A	.249	.249	.249	.252	.250	.252				
		B	.252	.252	.253	.252	.250	.252				
		C	.269	.270	.270	.260	.260	.261				
		D	.250	.250	.249	.251	.248	.249				
		E	.247	.247	.247	.247	.250	.248				
.219	7/32	A	.213	.213	.212	.211	.213	.212				
		B	.213	.214	.214	.214	.214	.215				
		C	.212	.213	.213	.214	.214	.213				
.1875	3/16	A	.188	.189	.188							
		B	.189	.188	.188							
		C	.193	.193	.194							
		D	.192	.192	.192							
		E	.185	.186	.186							

API out nozzle

Stack nozzle

PITOT TUBE CALIBRATIONS

PITOT TUBE ID NUMBER– S–54
PITOT TUBE DESCRIPTION– 11', 1" OD, SS
DATE CALIBRATED– 4/2/98
CALIBRATED BY– OJB,JRM

VELOCITY RANGE	SAMPLE NUMBER	SIDE	STANDARD READINGS [" of H_2O]	S–TUBE READINGS [" of H_2O]	INDIVIDUAL C FACTOR	AVG OF INDIVIDUAL C FACTOR	DEVIATION	APPROX VELOCITY [ft/sec]
LOW	1	A	0.17	0.28	0.787	0.802	0.010	29
	2		0.18	0.28	0.810			
	3		0.18	0.28	0.810			
LOW	1	B	0.17	0.28	0.787	0.802	0.010	29
	2		0.18	0.28	0.810			
	3		0.18	0.28	0.810			
MEDIUM	1	A	0.43	0.66	0.799	0.801	0.001	44
	2		0.44	0.67	0.802			
	3		0.44	0.67	0.802			
MEDIUM	1	B	0.43	0.67	0.793	0.799	0.004	44
	2		0.44	0.67	0.802			
	3		0.44	0.67	0.802			
HIGH	1	A	0.90	1.29	0.823	0.824	0.001	64
	2		0.90	1.28	0.826			
	3		0.90	1.29	0.823			
HIGH	1	B	0.90	1.35	0.812	0.814	0.002	64
	2		0.91	1.35	0.817			
	3		0.90	1.35	0.812			

AVERAGE CALCULATIONS OVER ENTIRE VELOCITY RANGES

SIDE	C–FACTOR	DEVIATION
A	0.809	0.010
B	0.805	0.006

[PITS–54E;RLO;4/20/98;1540]

pitot used on baghouse outlet (stack)