APPENDIX A

ORIGINAL DATA SHEETS

A-1. Example of Sampling Data Sheets

A-2. Mercury Results

- **a. Flue Gas**
- **b. Liquid Samples**
- **c. Solid Samples**

A-3. Field Spikes and Blanks Data

Printed on Recycled Paper

A-1

Example of Sampling Data Sheets

Printed on Recycled Paper

Date _____ Time 16:55

CC-D1-FGDout-OH2

DATE 8/4/98

RUN # _____

FUND # _____

COST CENTER NUMBER _____

DUST LOADING DATA SHEET

Time at Start 16:55 Operators GF/RL

Sample Pt. FGD out Traverse Pt. _____

P_B(Barometric Pressure)= 28.35 in. Hg

P_s(Stack Pressure)= $P_B \pm$(1.5 in H_2O/13.6) = 28.46 in Hg

T_s(Stack Temp)= 150 °F+460= 610 °R

ΔP(Pitot)= .20 in H_2O _____Type S Cp=.84 _____Standard

D_n(Nozzle Diam)= .19 in Approx % H_2O= 20%

ΔH@= 1.56 in H_2O Cm= .98

V_s(Stack Velocity) = $951.6\ Cp \sqrt{\frac{Ts}{Ps}\Delta P}$ = 1655 ft/min

Q_n(Nozzle flow Rate)= $V_s \pi D_n^2/576$ = 0.3259 ACFM

Q_m(meter flow rate $\frac{Q_n T_m Qn}{CmT_s(P_B+\Delta H/13.6)}$ (1 - $\frac{\%H_2O}{100}$)= 0.2514 ACFM

ΔH(orifice)= $\frac{Qm^2 \Delta H@(P_B+\Delta H/13.6)}{0.03175 T_m}$ = 0.15 in H_2O

ΔH .5

TM-115

Second/Rev= 23.9 %CO_2_____ %O_2_____

Note: Standard Temperature and Pressure are 70 °F and 29.92 in Hg

S/R	Trav. Point	Time	Gas Meter	ΔP	ΔH	Pump Vac.	Stack Temp..	Probe Temp.	Meter In	Meter Out	Mcff			
23.9	6'2"	start	176.886	.20	.14	2.0	142	222	108	107	344			
	6'2"	10	179.00	.20	.14	2.0	143	195	111	109	346			
	6'2"	20	181.78	.20	.19	2.0	147	173	115	112	345			
	6'2"	30	184.51	.20	.14	2.0	150	157	119	116	345			
25.2	5'	40	186.94	.18	.14	2.0	150	150	121	119	345			
	5'	50	189.32	.18	.13	2.0	150	148	123	122	345			
28.2	5	60	191.76	.18	.13	2.0	150	146	124	123	345			
	3	70	193.98	.14	.11	2.0	151	142	126	125	345			
	3	80	196.14	.14	.11	2.0	151	143	126	126	346			
	3	90	198.273	.14	.11	2.0	151	144	127	127	345			

Comments: (21.387) Leaked Checked okay at 5.5 inches Before test

Leaked Checked Okay at 5.0 After test

.129 148.5 120 118.6 => 119

Sample Pt. _____

Train Type : **ONTARIO-HYDRO METHOD**

Date _____ Time _____

Date CC-D1-FGDout-OH2

Run _____

Fund # _____

Cost Center # _____

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	732.9	819.3	86.4
BUBBLER	KCl	720.8	725.8	5.0
IMPINGER	KCl	704.9	705.0	0.1
BUBBLER	H_2O_2/HNO_3	729.3	730.1	0.8
BUBBLER	$KMnO_4/H_2SO_4$	708.8	709.5	0.7
BUBBLER	$KMnO_4/H_2SO_4$	737.9	737.7	-0.2
IMPINGER	$KMnO_4/H_2SO_4$	712.4	712.2	-0.2
BUBBLER	SILICA GEL	822.9	830.8	7.9
			Total H_2O (g)	100.5
FILTER		.15504	.15664	.00160
			Total Dust (g)	

Vol Sampled 21.387

$V_w std = 0.0474 * (H_2O\ g)$ — 4.739 SCF

$V_m Corrected = V_m * C_m$ — 20.959 ACF

$V_m std = \frac{17.71\ V_m C (P_s + \Delta H/13.6)}{T_m}$ — 18.181 SCF

$V_t std = V_w std + V_m std$ — 22.919 SCF

$\%H_2O = (V_w std / V_t std) * 100$ — 20.7 $\%H_2O$

$Q_n std = 17.71\ Q_a P_s / T_s$ — .270 SCFM

% Isokinetic = $V_t std / (Q_n std * Time)$ — 94.3 %

DUST LOADING CALCULATIONS (Concentration Basis)

DCL = 15.432 (dust g) / $V_t std$ — .0011 grains/scf

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

$ACFM = V_s * \text{Pipe Area (ft}^2\text{)}$ — _____ ACFM

$SCFM = ACFM * P_s/29.92 * 530/T_s = ACFM * P_s/T_s * 17.71$ — _____ SCFM

lbs/hour = grains / scf * 0.000143 * SCFM * 60 — _____ lbs/hour

DATE 08/04/98
RUN # CC-D1-FGDout-OH2
FUND # 4428/5041
CST CTR #

DUST LOADING DATA SHEET

START TIME 16:55 OPERATORS FRERICK / LILLIBRIDGE
SAMPLE PORT FGD Outlet TRAVERSE POINT

Pb (BAROMETRIC PRESSURE) 28.35 in. Hg

Ps (STACK PRESSURE) = Pb +/- (1.5 in. H2O / 13.6)= 28.46 in. Hg

Ts (STACK TEMP) = 149 F +460F = 609 R

^P (PITOT)= 0.18 in. H20 0.84 TYPE S Cp = .84 STANDARD

Dn (NOZZLE DIA) = 0.19 in APPROX % H2O = 20

^H@ = 1.56 in H2O Cm = 0.98

Vs(STACK VELOCITY) = 1569 ft/min Tm (METER TEMP) = 115

Qn (NOZZLE FLOWRATE) = 0.3089 ACFM ^H ASSUMED = 0.5

Qm (METER FLOW RATE) = 0.2387 ACFM

^H (ORIFICE)= 0.14 in H2O

SECOND/REV = 25.8

TIME = 90 min

INITIAL GAS METER = 176.886 CF

FINAL GAS METER = 198.273 CF

GAS METER VOL = 21.387 CF

AVERAGE ^ H = 0.13

METER TEMP = 120

TRACE ELEMENTS

^H	T5	T6
in H20	METER IN	METER OUT
0.13	120	119

ONTARIO-HYDRO

STOPPER	SOLUTION	INITIAL WT (g)	FINAL WT(g)	NET
BUBBLER	KCl	732.9	819.3	86.4
BUBBLER	KCl	720.8	725.8	5.0
IMPINGER	KCl	704.9	705.0	0.1
BUBBLER	H2O2	729.3	730.1	0.8
BUBBLER	KMnO4	708.8	709.5	0.7
BUBBLER	KMnO4	737.9	737.7	-0.2
IMPINGER	KMnO4	712.4	712.2	-0.2
BUBBLER	SILICA GEL	822.9	830.8	7.9
		TOTAL H2O		100.5
FILTER		0.15504	0.15664	0.00160
		TOTAL DUST		0.00160

VwSTD = 4.739 SCF

VmC = 20.959 ACF

VmSTD = 18.165 SCF

VtSTD = 22.904 SCF

%H2O = 20.7 %H2O

QnSTD = 0.256 SCFM

% ISO = 99.5 %

DUST LOADING CALCULATIONS (CONCENTRATION BASIS)

DCL = 0.0011 grains/SCF

INLET DCL = grains/SCF

%EFF = ERR %

08/04/98
CC-D1-FGDout-OH2

	Sec/Rev	Trav. Pt.	Time	Gas Meter	Delta P	P sq rt	Delta H	St. Temp.	Meter In	Meter Out
	23.9	6'2"	START	176.886	0.20	0.447	0.14	142	108	107
		6'2"	10	179.00	0.20	0.447	0.14	143	111	109
		6'2"	20	181.78	0.20	0.447	0.14	147	115	112
		6'2"	30	184.51	0.20	0.447	0.14	150	119	116
	25.2	5'	40	186.94	0.18	0.424	0.14	150	121	119
		5'	50	189.32	0.18	0.424	0.13	150	123	122
	28.2	5'	60	191.76	0.18	0.424	0.13	150	124	123
		3'	70	193.98	0.14	0.374	0.11	151	126	125
		3'	80	196.14	0.14	0.374	0.11	151	126	126
		3'	**90**	198.273	0.14	0.374	0.11	151	127	127
AVE.	**25.8**				**0.18**	**0.418**	**0.13**	**149**	**120**	**119**

(SQ.)
0.18

08/04/98
CC-D1-FGDout-OH2

	Sec/Rev	Trav. Pt.	Time	Gas Meter	Delta P	P sq rt	Delta H	St. Temp.	Meter In	Meter Out
	23.9	6'2"	START	176.886	0.20	0.447	0.14	142	108	107
		6'2"	10	179.00	0.20	0.447	0.14	143	111	109
		6'2"	20	181.78	0.20	0.447	0.14	147	115	112
		6'2"	30	184.51	0.20	0.447	0.14	150	119	116
	25.2	5'	40	186.94	0.18	0.424	0.14	150	121	119
		5'	50	189.32	0.18	0.424	0.13	150	123	122
	28.2	5'	60	191.76	0.18	0.424	0.13	150	124	123
		3'	70	193.98	0.14	0.374	0.11	151	126	125
		3'	80	196.14	0.14	0.374	0.11	151	126	126
		3'	**90**	198.273	0.14	0.374	0.11	151	127	127
AVE.	**25.8**				**0.18**	**0.418**	**0.13**	**149**	**120**	**119**

(SQ.)
0.18

A-2

Mercury Results

Flue Gas

Liquid Samples

Solid Samples

Printed on Recycled Paper

Shaded values are below LLQ

RUN NUMBER	ST. PRESS.	ST. TEMP.	PITOT	TEST TIME	GAS VOL.	TOT. H2O	TOT. DUST	VtSTD	% H2O	% ISO	DCL grains/SCF	FILTER CONC.(ug/m3)	KCl CONC.(ug/m3)	H2O2 CONC.(ug/m3)	KMnO4 CONC.(ug/m3)	PROBE CONC.(ug/m3)	TOTAL CONC.(ug/m3)
CC-D2-AHin-OH1	28.54 in Hg	834	0.19	112.6	42.639	133.6		43.216	14.6	214.4			0.27	0.46	10.14	0.00	10.87
CC-D3-AHin-OH1	28.43 in Hg	825	0.16	120.0	45.527	176.9		48.450	17.2	242.0			0.64	0.31	6.24	0.02	7.20
CC-D1-ESPin-OH1	-20.0	338	1.30	83.0	14.860	62.7	1.18693	16.012	18.5	90.3	1.1439		0.68	0.42	9.33	0.13	10.57
CC-D1-ESPin-OH2	-20.0	321	1.42	44.0	17.770	61.8	0.00450	18.001	16.2	98.5	0.0039		1.44	0.41	6.63	0.01	8.50
CC-D2-ESPin-OH1	-20.0	325	1.15	145.0	22.080	76.2	3.93419	23.141	15.5	42.8	2.6236		0.60	0.56	7.00	0.02	8.17
CC-D2-ESPin-OH2	-20.0	336	1.40	66.0	14.120	43.5	3.69020	14.212	14.4	104.0	4.0071		0.46	0.49	6.97	0.03	7.96
CC-D3-ESPin-OH1	-20.0	328	1.20	88.0	23.280	80.7	7.98731	24.367	15.6	105.0	5.0585		0.44	0.17	9.43	0.04	10.06
CC-D3-ESPin-OH2	-20.0	353	1.30	61.0	16.170	50.4	6.18257	16.259	14.6	98.6	5.8681		0.43	0.23	7.53	0.05	8.25
CC-D4-ESPin-OH1	-20.0	329	1.60	61.0	24.070	83.8		24.843	15.9	100.8			0.75	0.45	6.86	0.04	8.10
CC-D1-ESPout-OH1	4.5	283	0.74	90.3	18.163	57.3	0.00144	19.484	13.9	98.9	0.0011		1.57	0.09	6.12	0.15	7.94
CC-D1-ESPout-OH2	5.2	324	0.71	90.2	28.448	97.3	0.00188	30.253	15.2	93.2	0.0010		2.62	0.35	5.66	0.03	8.66
CC-D2-ESPout-OH1	4.8	296	0.76	90.1	31.136	104.1	0.00257	32.998	14.9	96.6	0.0012		2.07	0.31	5.73	0.003	8.11
CC-D2-ESPout-OH2	5.5	340	0.41	90.2	23.164	74.0	0.00245	34.219	14.4	99.0	0.0016		2.07	0.34	5.3	0.01	7.72
CC-D3-ESPout-OH1	5.3	272	0.79	89.9	31.578	104.4	0.00192	33.604	14.6	95.2	0.0009		2.43	0.10	5.52	0.03	8.08
CC-D3-ESPout-OH2	5.8	397	0.71	90.3	28.558	91.8	0.00280	30.340	14.3	97.6	0.0014		2.00	0.25	5.94	0.03	8.21
CC-D1-FGDout-OH1	1.5	150	0.16	90.0	14.080	68.9	0.00099	15.684	20.7	106.2	0.0010		0.002	0.10	5.94	0.06	6.10
CC-D1-FGDout-OH2	1.5	149	0.18	90.0	21.387	100.5	0.00160	22.904	20.7	99.5	0.0011		0.08	0.06	6.16	0.05	6.34
CC-D2-FGDout-OH1	1.5	148	0.17	90.0	20.815	102.3	0.00132	22.660	21.3	101.2	0.0009		0.15	0.02	5.27	0.09	5.53
CC-D2-FGDout-OH2	1.5	147	0.17	90.0	20.779	99.1	0.00083	22.297	21.0	99.5	0.0006		0.20	0.01	5.55	0.02	5.78
CC-D3-FGDout-OH1	1.5	147	0.21	90.0	25.365	119.8	0.00043	27.624	20.4	100.3	0.0002		0.11	0.06	5.54	0.03	5.74
CC-D3-FGDout-OH2	1.5	147	0.22	90.0	26.412	127.7	0.00070	28.664	21.0	101.6	0.0004		0.07	0.06	6.53	0.03	6.69
CC-D1-STACK-OH1	28.33 in Hg	266	1.49	90.0	26.043	103.4	0.00223	29.058	16.8	102.8	0.0012		1.2	0.03	5.96	0.03	7.23
CC-D1-STACK-OH2	28.33 in Hg	273	1.45	90.0	55.390	231.8	0.00430	61.697	17.7	103.9	0.0011		1.56	0.44	5.41	0.02	7.43
CC-D2-STACK-OH1	28.33 in Hg	280	1.57	90.0	58.295	237.9	0.00538	63.694	17.6	103.6	0.0013		1.32	0.15	6.77	0.00	8.27
CC-D2-STACK-OH2	28.29 in Hg	284	1.52	90.0	57.855	229.9	0.00510	62.441	17.4	103.4	0.0013		1.47	0.16	6.60	0.00	8.24
CC-D3-STACK-OH1	28.17 in Hg	259	1.52	90.0	46.655	193.7	0.00444	51.116	17.9	104.5	0.0013		1.3	0.08	4.84	0.02	6.24
CC-D3-STACK-OH2	28.14 in Hg	265	1.51	90.0	46.801	189.0	0.00483	50.641	17.6	83.4	0.0015		1.28	0.13	7.12	0.02	8.55
CC-D1-ESPout-M26-1	VOID																
CC-D1-ESPout-M26-2	4.5	302	0.80	60.0	18.273	42.4	0.00085	18.177	11.0	92.9	0.0007						
CC-D2-ESPout-M26-1	5.7	329	0.36	60.0	11.657	42.8	0.00174	12.771	15.8	98.8	0.0021						
CC-D2-ESPout-M26-2	4.0	278	1.20	60.0	25.528	84.0	0.00192	26.765	14.8	92.7	0.0011						

MERCURY ANALYSIS

DATE: 08/05/98
LOCATION: COAL CREEK POWER STATION

LAB #	SAMPLE ID	SAMPLE TYPE	VOLUME, ml	CONCENTRATION, ug/L
085-1	CC-D1-OH-FB	KCl	500	-0.13
085-2	CC-D1-OH-FB	H2O2	200	-0.21
085-3	CC-D1-OH-FB	KMnO4	500	-0.005
085-4	CC-D1-OH-FBsp	KCl	500	10.5
085-5	CC-D1-OH-FBsp	H2O2	200	10.91
085-6	CC-D1-OH-FBsp	KMnO4	500	8.95
085-7	CC-D1-ESPin-OH1	Probe rinse	250	-0.24
085-8	CC-D1-ESPin-OH1	KCl	500	0.62
085-9	CC-D1-ESPin-OH1	H2O2	200	0.95
085-10	CC-D1-ESPin-OH1	KMnO4	500	8.46
085-11	CC-D1-ESPin-OH2	Probe rinse	250	-0.03
085-12	CC-D1-ESPin-OH2	KCl	500	1.47
085-13	CC-D1-ESPin-OH2	H2O2	200	1.05
085-14	CC-D1-ESPin-OH2	KMnO4	500	6.76
085-15	CC-D1-ESPout-OH1	Probe rinse	250	0.34
085-16	CC-D1-ESPout-OH1	KCl	500	1.73
-17	CC-D1-ESPout-OH1	H2O2	200	0.26
085-18	CC-D1-ESPout-OH1	KMnO4	500	6.75
085-19	CC-D1-ESPout-OH2	Probe rinse	250	-0.1
085-20	CC-D1-ESPout-OH2	KCl	500	~~4.61~~ 4.49
085-21	CC-D1-ESPout-OH2	H2O2	200	1.52
085-22	CC-D1-ESPout-OH2	KMnO4	500	9.7
085-23	CC-D1-FGDout-OH1	Probe rinse	250	-0.11
085-24	CC-D1-FGDout-OH1	KCl	500	-0.0014
085-25	CC-D1-FGDout-OH1	H2O2	200	~~-0.53~~ -0.23
085-26	CC-D1-FGDout-OH1	KMnO4	500	5.27
085-27	CC-D1-FGDout-OH2	Probe rinse	250	-0.12
085-28	CC-D1-FGDout-OH2	KCl	500	-0.11
085-29	CC-D1-FGDout-OH2	H2O2	200	-0.18
085-30	CC-D1-FGDout-OH2	KMnO4	500	7.98
085-31	CC-D1-ST-OH1	Probe rinse	250	-0.11
085-32	CC-D1-ST-OH1	KCl	500	1.97
085-33	CC-D1-ST-OH1	H2O2	200	0.14
085-34	CC-D1-ST-OH1	KMnO4	500	9.81
085-35	CC-D1-ST-OH2	Probe rinse	250	-0.11
085-36	CC-D1-ST-OH2	KCl	500	5.31
-37	CC-D1-ST-OH2	KCl	200	0.33
085-38	CC-D1-ST-OH2	H2O2	200	3.84
085-39	CC-D1-ST-OH2	KMnO4	500	18.9

MERCURY ANALYSIS

DATE: 08/06/98
LOCATION: COAL CREEK POWER STATION

LAB #	SAMPLE ID	SAMPLE TYPE	VOLUME, ml	CONCENTRATION, ug/L
086-1	CC-D2-OH-FB	KCl	500	0.09
086-2	CC-D2-OH-FB	H2O2	200	0.02
086-3	CC-D2-OH-FB	KMnO4	500	0.05
086-4	CC-D2-OH-FBsp	KCl	500	9.77
086-5	CC-D2-OH-FBsp	H2O2	200	11.13
086-6	CC-D2-OH-FBsp	KMnO4	500	9.56
086-7	CC-D2-AHin-OH1	Probe rinse	250	-0.02
086-8	CC-D2-AHin-OH1	KCl	500	0.65
086-9	CC-D2-AHin-OH1	H2O2	200	2.8
086-10	CC-D2-AHin-OH1	KMnO4	500	24.8
086-11	CC-D2-ESPin-OH1	Probe rinse	250	-0.05
086-12	CC-D2-ESPin-OH1	KCl	500	0.78
086-13	CC-D2-ESPin-OH1	H2O2	200	1.82
086-14	CC-D2-ESPin-OH1	KMnO4	500	9.17
086-15	CC-D2-ESPin-OH2	Probe rinse	250	-0.05
086-16	CC-D2-ESPin-OH2	KCl	500	0.37
086-17	CC-D2-ESPin-OH2	H2O2	200	0.99
086-18	CC-D2-ESPin-OH2	KMnO4	500	5.61
086-19	CC-D2-ESPout-OH1	Probe rinse	250	-0.01
086-20	CC-D2-ESPout-OH1	KCl	500	3.86
086-21	CC-D2-ESPout-OH1	H2O2	200	1.44
086-22	CC-D2-ESPout-OH1	KMnO4	500	10.7
086-23	CC-D2-ESPout-OH2	Probe rinse	250	-0.02
086-24	CC-D2-ESPout-OH2	KCl	500	2.84
086-25	CC-D2-ESPout-OH2	H2O2	200	1.17
086-26	CC-D2-ESPout-OH2	KMnO4	500	7.27
086-27	CC-D2-FGDout-OH1	Probe rinse	250	0.24
086-28	CC-D2-FGDout-OH1	KCl	500	0.19
086-29	CC-D2-FGDout-OH1	H2O2	200	0.05
086-30	CC-D2-FGDout-OH1	KMnO4	500	6.76
086-31	CC-D2-FGDout-OH2	Probe rinse	250	-0.04
086-32	CC-D2-FGDout-OH2	KCl	500	0.25
086-33	CC-D2-FGDout-OH2	H2O2	200	0.03
086-34	CC-D2-FGDout-OH2	KMnO4	500	7.01
086-35	CC-D2-ST-OH1	Probe rinse	250	0.01
086-36	CC-D2-ST-OH1	KCl	500	4.77
086-37	CC-D2-ST-OH1	KCl	200	0.25
086-38	CC-D2-ST-OH1	H2O2	200	1.35
086-39	CC-D2-ST-OH1	KMnO4	500	24.4
086-40	CC-D2-ST-OH2	Probe rinse	250	-0.01
086-41	CC-D2-ST-OH2	KCl	500	5.21
086-42	CC-D2-ST-OH2	H2O2	200	1.42
086-43	CC-D2-ST-OH2	KMnO4	500	23.33

CC898.WK3

MERCURY ANALYSIS

DATE: 08/07/98
LOCATION: COAL CREEK POWER STATION

LAB #	SAMPLE ID	SAMPLE TYPE	VOLUME, ml	CONCENTRATION, ug/L
087-1	CC-D3-OH-FB	KCl	500	0.04
087-2	CC-D3-OH-FB	H2O2	250	-0.4
087-3	CC-D3-OH-FB	KMnO4	500	-0.0
087-4	CC-D3-OH-FBsp	KCl	500	9.45
087-5	CC-D3-OH-FBsp	H2O2	250	9.24
087-6	CC-D3-OH-FBsp	KMnO4	500	8.96
087-7	CC-D3-AHin-OH1	Probe rinse	250	-0.1
087-8	CC-D3-AHin-OH1	KCl	500	1.76
087-9	CC-D3-AHin-OH1	H2O2	250	1.68
087-10	CC-D3-AHin-OH1	KMnO4	500	17.1
087-11	CC-D3-ESPin-OH1	Probe rinse	250	-0.1
087-12	CC-D3-ESPin-OH1	KCl	500	0.6
087-13	CC-D3-ESPin-OH1	H2O2	250	0.46
087-14	CC-D3-ESPin-OH1	KMnO4	500	13
087-15	CC-D3-ESPin-OH2	Probe rinse	250	-0.1
087-16	CC-D3-ESPin-OH2	KCl	500	0.4
087-17	CC-D3-ESPin-OH2	H2O2	250	0.43
087-18	CC-D3-ESPin-OH2	KMnO4	500	6.93
087-19	CC-D3-ESPout-OH1	Probe rinse	250	0.11
087-20	CC-D3-ESPout-OH1	KCl	500	4.62
21	CC-D3-ESPout-OH1	H2O2	250	0.37
087-22	CC-D3-ESPout-OH1	KMnO4	500	10.5
087-23	CC-D3-ESPout-OH2	Probe rinse	250	-0.1
087-24	CC-D3-ESPout-OH2	KCl	500	3.43
087-25	CC-D3-ESPout-OH2	H2O2	250	0.85
087-26	CC-D3-ESPout-OH2	KMnO4	500	10.2
087-27	CC-D3-FGDout-OH1	Probe rinse	250	-0.1
087-28	CC-D3-FGDout-OH1	KCl	500	0.17
087-29	CC-D3-FGDout-OH1	H2O2	250	-0.2
087-30	CC-D3-FGDout-OH1	KMnO4	500	8.66
087-31	CC-D3-FGDout-OH2	Probe rinse	250	-0.1
087-32	CC-D3-FGDout-OH2	KCl	500	0.11
087-33	CC-D3-FGDout-OH2	H2O2	250	-0.2
087-34	CC-D3-FGDout-OH2	KMnO4	500	10.6
087-35	CC-D3-ST-OH1	Probe rinse	250	-0.1
087-36	CC-D3-ST-OH1	KCl	500	3.77
087-37	CC-D3-ST-OH1	~~KCl~~ H_2O_2	250	0.48
087-38	CC-D3-ST-OH1	~~H2O2~~ $KMnO_4$	~~200~~ 500	14
087-39	CC-D3-ST-OH2	Probe rinse	250	-0.1
087-40	CC-D3-ST-OH2	KCl	500	3.68
087-41	CC-D3-ST-OH2	H2O2	250	0.73
087-42	CC-D3-ST-OH2	KMnO4	500	20.4
43	CC-D4-ESPin-OH1	Probe rinse	250	-0.1
087-44	CC-D4-ESPin-OH1	KCl	500	1.05
087-45	CC-D4-ESPin-OH1	H2O2	250	1.27
087-46	CC-D4-ESPin-OH1	KMnO4	500	9.65

Final Results

August 18, 1998

Set Number: 49711
Fund#: 4428
PI: Dennis Laudal
Request Date: Monday, August 17, 1998
Due Date: Monday, August 31, 1998
Set Description: Coal Creek FIELD TRIP M26A SOLUTIONS

Contact Person: Richard Schulz

Sample 49711-01

49711-01	**CC-D1-ESPOUT-M26A-1 H2SO4 500mL**	
Chloride		< 1 mg/L
49711-02	**CC-D1-ESPOUT-M26A-1 NaOH 500mL**	
Chloride		< 1 mg/L
49711-03	**CC-D1-ESPOUT-M26A-2 H2SO4 500mL**	
Chloride		< 1 mg/L
49711-04	**CC-D1-ESPOUT-M26A-2 NaOH 500mL**	
Chloride		< 1 mg/L
49711-05	**CC-D2-ESPOUT-M26A-1 H2SO4 500mL**	
Chloride		< 1 mg/L
49711-06	**CC-D2-ESPOUT-M26A-1 NaOH 500mL**	
Chloride		< 1 mg/L
49711-07	**CC-D2-ESPOUT-M26A-1 PROBE RINSE 250mL**	
Chloride		< 1 mg/L
49711-08	**CC-D2-ESPOUT-M26A-2 H2SO4 500mL**	
Chloride		1.0 mg/L
49711-09	**CC-D2-ESPOUT-M26A-2 NaOH 500mL**	
Chloride		< 1 mg/L
49711-10	**CC-D2-ESPOUT-M26A-2 PROBE RINSE 250mL**	
Chloride		< 1 mg/L
49711-11	**CC-D1-ESPOUT-M26A PROBE RINSE 500mL**	
Chloride		< 1 mg/L

Distribution 35 Date 8/18/98

Final Results

September 22, 1998

Set Number: 49738
Fund#: 4558
PI: Stan Miller
Request Date: Friday, September 18, 1998
Due Date: Friday, October 02, 1998
Set Description: Slurry, Liquid, Ash from Coal Creek Trip

Contact Person: G. Schelkoph

Sample 49738-01

49738-01	CC-D3-1 8/6/98-842 River Water	
Mercury		< 0.1 µg/L
49738-02	CC-D3-1 8/6/98-745 Service Water	
Mercury		< 0.1 µg/L
49738-03	CC-D3-1 8/6/98-748 Make-up Water Recive	
Mercury		< 0.1 µg/L
49738-04	CC-D3-1 8/6/98-740 Lime Slurry (Liquid 162mL)	
Mercury		< 0.1 µg/L
49738-05	CC-D3-1 8/6/98-749 Scrubber Recycle Slurry (Liquid 440mL)	
Mercury		0.95 µg/L
49738-06	CC-D3-2 8/6/98-1336 Service Water	
Mercury		< 0.1 µg/L
49738-07	CC-D3-2 8/6/98-1335 Make-up Water Recive	
Mercury		0.15 µg/L
49738-08	CC-D3-2 8/6/98-1415 Ash Pond Water	
Mercury		< 0.1 µg/L
49738-09	CC-D3-2 8/6/98-1333 Lime Slurry (liquid 233mL)	
Mercury		< 0.1 µg/L
49738-10	CC-D3-2 8/6/98-1340 Scrubber Recycle Slurry (liquid470mL)	
Mercury		0.53 µg/L
49738-11	CC-D3-1 8/6/98-740 Lime Slurry (solid320g wet,69.2%M,reported dry basis)	
Mercury		< 0.009 µg/g 316.5g
49738-12	CC-D3-1 8/6/98-749 Scrubber Recycle Slurry (solid 623.3g wet,53.5%M,reported dry ba	
Mercury		0.656 µg/g
49738-13	CC-D3-2 8/6/98-1333 Lime Slurry (solid 250g wet, 66.3%M, reported dry basis)	
Mercury		< 0.009 µg/g
49738-14	CC-D3-2 8/6/98-1340 Scrubbr Recycle Slurry (solid626g wet, 55.3%M, reported dry bas	
Mercury		0.646 µg/g
49738-15	CC-D3-1 ESP21 NUVA2119	
Mercury		< 0.01 µg/g
49738-16	CC-D3-1 ESP21 NUVA2120	
Mercury		< 0.01 µg/g
49738-17	CC-D3-2 ESP21 NUVA2119	
Mercury		< 0.01 µg/g

Distribution GS Date 9-22-98

Sample	49738-18	
49738-18	CC-D3-2 ESP21 NUVA2120	
Mercury		< 0.01 µg/g

Distribution_____ Date_____

Final Results

September 17, 1998

Set Number: 49733
Fund#: 4905
PI: Dennis Laudal
Contact Person: Dennis Laudal

Request Date: Wednesday, September 16, 1998
Due Date: Wednesday, September 30, 1998
Set Description: MRY,CC filter ash

Sample 49733-01

49733-01	**MRY-D4-ESPin OH-1 FILTER**		
Mercury		0.049	µg/g
49733-02	**MRY-D4-ESPin OH-2 FILTER**		
Mercury		0.073	µg/g
49733-03	**MRY-D5-ESPin OH-1 FILTER**		
Mercury		0.088	µg/g
49733-04	**MRY-D5-ESPin OH-2 FILTER**		
Mercury		0.109	µg/g
49733-05	**CC-D1-ESPin OH-1 FILTER**		
Mercury		0.024	µg/g
49733-06	**CC-D1-ESPin OH-2 FILTER**		
Mercury		0.027	µg/g
49733-07	**CC-D2-ESPin OH-1 #1 FILTER**		
Mercury		< 0.01	µg/g
49733-08	**CC-D2-ESPin OH-1 #2 FILTER**		
Mercury		< 0.01	µg/g
49733-09	**CC-D2-ESPin OH-1 #3 FILTER**		
Mercury		0.01	µg/g
49733-10	**CC-D2-ESPin OH-2 FILTER**		
Mercury		< 0.01	µg/g
49733-11	**CC-D3-ESPin OH-1 #1 FILTER**		
Mercury		0.020	µg/g
49733-12	**CC-D3-ESPin OH-1 #2 FILTER**		
Mercury		< 0.01	µg/g
49733-13	**CC-D3-ESPin OH-2 #1 FILTER**		
Mercury		< 0.01	µg/g
49733-14	**CC-D3-ESPin OH-2 #2 FILTER**		
Mercury		< 0.01	µg/g
49733-15	**CC-D4-ESPin OH-1 FILTER**		
Mercury		< 0.01	µg/g

50ml

.05 mg L

.05 mg/L

.05 mg L

.05

.01

.05

Distribution SS Date 9-17-98

Final Results

October 6, 1998

Set Number: 49740
Fund#: 4805
PI: Dennis Laudal
Contact Person: Dennis Laudal

Request Date: Friday, September 18, 1998
Due Date: Friday, October 02, 1998
Set Description: Coal Creek Coal

Sample **49740-01**

49740-01	**Coal Creek Coal Unit 2**	**8/5/98 10:00**	**day2**
Mercury		0.093	µg/g
49740-02	**Coal Creek Coal Unit 2**	**8/5/98 15:00**	**day2**
Mercury		0.098	µg/g

Distribution _____ Date 10-6-98

Final Results

October 6, 1998

Set Number: 49739
Fund#: 4426
PI: Dennis Laudal
Contact Person: Dennis Laudal

Request Date: Friday, September 18, 1998
Due Date: Friday, October 02, 1998
Set Description: Coal Creek Coal

Sample **49739-01**

49739-01	**Coal Creek Coal Unit 2**	**8/4/98 10:00**	**day1**	
Mercury		0.098	µg/g	
49739-02	**Coal Creek Coal Unit 2**	**8/4/98 15:00**	**day1**	
Mercury		0.088	µg/g	

Distribution 35 Date 10-6-98

Final Results

October 6, 1998

Set Number: 49736
Fund#: 4558
PI: Stan Miller
Contact Person: G. Schelkoph

Request Date: Friday, September 18, 1998
Due Date: Friday, October 02, 1998
Set Description: Coal Creek Coal

Sample **49736-01**

49736-01	**Coal Creek Coal Unit 2 10:00**		
	Mercury	0.10	µg/g
49736-02	**Coal Creek Coal Unit 2 15:00**		
	Mercury	0.11	µg/g

Distribution 3S Date 10-6-98

UND ENERGY RESEARCH CENTER
COAL ANALYSIS REPORT

GF NUMBER: 98-0472 LAB NUMBER: 4050

DATE SAMPLED : 08/06/98 RUN NUMBER:
DATE RECEIVED : 09/16/98
DATE OF REPORT: 09/21/98

SAMPLE DESCRIPTION: COAL CREEK UNIT 2 10:00

SUBMITTER: SCHELKOPH

AIR DRY LOSS: 0.90 %

	AS DET. (%)	AS RECD. (%)	MOIST FREE (%)	MOIST/ASH FREE (%)
PROXIMATE ANALYSIS				
MOISTURE	16.44	17.20	N/A	N/A
VOLATILE MATTER	38.12	37.78	45.62	55.40
FIXED CARBON (IND)	30.69	30.41	36.73	44.60
ASH	14.75	14.62	17.65	N/A
ULTIMATE ANALYSIS				
HYDROGEN	5.42	5.47	4.30	5.22
CARBON	48.04	47.61	57.49	69.81
NITROGEN	1.14	1.13	1.36	1.66
SULFUR	0.77	0.76	0.92	1.12
OXYGEN (IND)	29.88	30.42	18.27	22.19
ASH	14.75	14.62	17.65	N/A
HEATING VALUE (BTU/LB)				
BTU	7983	7911	9554	11601
CALC.CALORIFIC VALUE	8452	8375		

AS RECEIVED HYDROGEN NOT INCLUDING HYDROGEN FROM MOISTURE: 3.56 %
AS RECEIVED OXYGEN NOT INCLUDING OXYGEN FROM MOISTURE : 15.13 %

SULFUR FORMS		ASH FUSION (DEGREES F)	
SULFATE	N/A	INIT. DEFORM. TEMP.	N/A
PYRITIC	N/A	SOFTENING TEMP.	N/A
ORGANIC	N/A	HEMISPH. TEMP.	N/A
		FLUID TEMP.	N/A

COMMENTS : Final Report

A-3

Field Spikes and Blanks Data

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SPIKE RECOVERIES FOR MERCURY ANALYSIS

DATE: 08/05/98

ibration Standards: 0, 1, 5, 10, 20 ppb R=0.9999 QC= 4.01 (4)

SPIKE RECOVERIES

KCl

Field Blank Spike	(10 ppb)	Sample 085-4	Spike =	10.5	((10.49-0)/10) * 100 = 104.90 %
			Sample =	0	
Lab Spike					
Field Blank Spike	(5 ppb)	Sample 085-4	Spike =	15.7	((15.68-10.49)/5) * 100 = 103.88%
			Sample =	10.5	
Lab Spike					
Field Blank Spike	(10 ppb)	Sample 085-4	Spike =	21.1	((21.14-10.49)/10) * 100 = 106.54%
			Sample =	10.5	
Lab Spike Sample	(5 ppb)	Sample 085-16	Spike =	7.35	((7.35-1.72)/5) * 100 = 112.56%
			Sample =	1.72	
Lab Spike Sample	(10 ppb)	Sample 085-16	Spike =	12.9	((12.94-1.72)/10) * 100 = 112.14%
			Sample =	1.72	

H2O2

Field Blank Spike	(10 ppb)	Sample 085-5	Spike =	10.9	10.91/10 * 100 = 109.10%
			Sample =	0	
Lab Spike					
Field Blank Spike	(10 ppb)	Sample 085-5	Spike =	20.7	((20.71-10.91)/10) * 100 = 98%
			Sample =	10.9	
Lab Spike Sample	(5 ppb)	Sample 085-38	Spike =	9.46	((9.46-3.84)/5) * 100 = 112.4%
			Sample =	3.84	

KMnO4

Field Blank Spike	(10 ppb)	Sample 085-6	Spike =	8.94	8.94/10 * 100 = 89.40%
			Sample =	0	
Lab Spike					
Field Blank Spike	(5 ppb)	Sample 085-6	Spike =	13.5	((13.5-8.94)/5) * 100 = 91.20%
			Sample =	8.94	
Lab Spike Sample	(5 ppb)	Sample 085-10	Spike =	12.6	((12.6-8.46)/5) * 100 = 82.80%
			Sample =	8.46	

SPIKE RECOVERIES FOR MERCURY ANALYSIS

DATE: 08/06/98

Calibration Standards: 0, 1, 5, 10, 20 ppb R=0.9999 QC= 3.84 (4)

SPIKE RECOVERIES

KCl

Field Blank Spike	(10 ppb)	Sample 086-4	Spike =	9.77	((9.77-0)/10) * 100 = 97.70 %
			Sample =	0	
Lab Spike Field Blank Spike	(5 ppb)	Sample 086-4	Spike =	14	((14.0-9.77)/5) * 100 = 84.56%
			Sample =	9.77	
Lab Spike Field Blank Spike	(10 ppb)	Sample 086-4	Spike =	17.1	((17.08-9.77)/10) * 100 = 73.10%
			Sample =	9.77	
Lab Spike Sample	(10 ppb)	Sample 086-8	Spike =	10	((10.01-0.64)/10) * 100 = 93.70%
			Sample =	0.64	
Lab Spike Sample	(5 ppb)	Sample 086-41	Spike =	10	((10.01-5.21)/5) * 100 = 96.00%
			Sample =	5.21	
Lab Spike Sample	(10 ppb)	Sample 086-41	Spike =	14.7	((14.70-5.21)/10) * 100 = 94.90%
			Sample =	5.21	

H2O2

Field Blank Spike	(10 ppb)	Sample 086-5	Spike =	10.6	10.57/10 * 100 = 105.70%
			Sample =	0	
Lab Spike Field Blank Spike	(10 ppb)	Sample 086-5	Spike =	21.4	((21.35-10.57)/10) * 100 = 107.80%
			Sample =	10.6	
Lab Spike Sample	(5 ppb)	Sample 086-9	Spike =	8.46	((8.46-2.8)/5) * 100 = 113.2%
			Sample =	2.8	
Lab Spike Sample	(10 ppb)	Sample 086-42	Spike =	10.7	((10.68-1.42)/10) * 100 = 92.60%
			Sample =	1.42	

SPIKE RECOVERIES FOR MERCURY ANALYSIS

DATE: 08/07/98

Calibration Standards: 0, 1, 5, 10, 20 ppb R=0.9998 QC= 3.96 (4)

SPIKE RECOVERIES

KCl

Field Blank Spike	(10 ppb)	Sample 087-4	Spike =	9.45	((9.45-0.027)/10) * 100 = 94.23 %
			Sample =	0.03	
Lab Spike					
Field Blank Spike	(5 ppb)	Sample 087-4	Spike =	13.7	((13.65-9.45)/5) * 100 = 84.00%
			Sample =	9.45	
Lab Spike					
Field Blank Spike	(10 ppb)	Sample 087-4	Spike =	16.2	((16.24-9.45)/10) * 100 = 67.90%
			Sample =	9.45	
Lab Spike Sample	(5 ppb)	Sample 087-12	Spike =	5.53	((5.53-0.60)/5) * 100 = 98.60%
			Sample =	0.6	
Lab Spike Sample	(10 ppb)	Sample 087-12	Spike =	9.76	((9.76-0.60)/10) * 100 = 91.60%
			Sample =	0.6	
Lab Spike Sample	(10 ppb)	Sample 087-40	Spike =	12.1	((12.10-3.68)/10) * 100 = 84.20%
			Sample =	3.68	
Lab Spike Sample	(5 ppb)	Sample 087-46	Spike =	6.75	((6.75-1.05)/5) * 100 = 114.00%
			Sample =	1.05	
Lab Spike Sample	(10 ppb)	Sample 087-46	Spike =	11.8	((11.84-1.05)/10) * 100 = 107.94%
			Sample =	1.05	

H2O2

Field Blank Spike	(8 ppb)	Sample 087-5	Spike =	8.78	8.78/8 * 100 = 109.70%
			Sample =	0	
Lab Spike					
Field Blank Spike	(10 ppb)	Sample 087-5	Spike =	19.5	((19.50-8.78)/10) * 100 = 107.20%
			Sample =	8.78	
Lab Spike Sample	(5 ppb)	Sample 087-13	Spike =	5.92	((5.92-0.46)/5) * 100 = 109.20%
			Sample =	0.46	
Lab Spike Sample	(5 ppb)	Sample 087-45	Spike =	6.82	((6.82-1.27)/5) * 100 = 111.00%
			Sample =	1.27	

SPIKE RECOVERIES FOR MERCURY ANALYSIS

DATE: 08/07/98 (Continued)

KMnO4

Field Blank Spike	(10 ppb)	Sample 087-6	Spike =	9.25	9.25/10 * 100 = 92.50%
			Sample =	0	
Lab Spike					
Field Blank Spike	(5 ppb)	Sample 087-6	Spike =	9.13	((9.13-4.48)/5) * 100 = 93.00%
			Sample =	4.48	
Lab Spike Sample	(5 ppb)	Sample 087-14	Spike =	10.9	((10.9-6.49)/5) * 100 = 88.20%
			Sample =	6.49	
Lab Spike Sample	(5 ppb)	Sample 087-34	Spike =	9.77	((9.77-5.30)/5) * 100 = 89.40%
			Sample =	5.3	
Lab Spike Sample	(5 ppb)	Sample 087-42	Spike =	14	((14.00-10.2)/5) * 100 = 76.00%
			Sample =	10.2	

APPENDIX B

EXAMPLES OF CALCULATIONS USED IN THE REPORT

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EXAMPLES OF CALCULATIONS USED IN THE REPORT

1. Concentration of Mercury in Flue Gas ($\mu g/Nm^3$)

Measured concentration in H_2SO_4–$KMnO_4$ solution (Hg^0) – 23.33 µg/L
Volume of sample – 500 mL
Gas volume samples – 62.441 scf
Convert 62.441 scf to Nm^3 = 1.768 Nm^3*
Calculated Hg^0 concentration at the stack: (23.33)(500/1000)/(1.768) = <u>6.60 $\mu g/Nm^3$</u>

* Nm^3 for purposes of this report is defined as 20°C and 1 atmosphere pressure. This is the same as standard conditions for the English system, 68°F and 1 atmosphere.

Note: The mercury concentration on the sample filters is calculated in the same manner, except the units are µg of Hg/g of dust. Therefore, the total weight of dust on the filter must be known rather than the volume of sample.

2. Correction to Dry Conditions and 3% Oxygen

Measured O_2 concentration at the stack – 5.7%
Assumed to be air (O_2) leaking in – 21%
Measured water – 17.5%

Calculation of the correction factor for O_2 at stack:
Let x = volume of gas leaking into system
Assume volume of gas measured = 1
Then: (0.03)(1 - x) + 0.21 = (0.057)(1)
x = 0.150
$O_{2\ \text{correction Factor}}$ = 1 - 0.150 = 0.850

Calculation of factor for dry conditions:
1 - (0.175) = 0.825

Corrected Hg^0 concentration in the flue gas: (6.60 $\mu g/Nm^3$)/(0.850)(0.825) = <u>9.41 $\mu g/Nm^3$</u>

3. Calculation of Emission Factors

Total Hg concentration at the stack – 8.23 μg/Nm^3 (uncorrected value)
Stack gas flow gate (from plant) – 1,657,700 scfm
Coal heating value (as received) – 6175 Btu/lb
Coal feed rate (from plant) – 887.8 klb/hr or 14,797 lb/min
Convert: 1,657,700 scf to Nm^3 = 46,941 Nm^3
Conversion factor for μg to lb: multiply by 2.2026×10^{-9}
Calculate Hg^0 emission factor at the stack:
$(8.23)(2.2026 \times 10^{-9})(46{,}941)/(14{,}797)(6175) = 9.31 \times 10^{-12}$ lb/Btu or $\underline{9.31\ lb/10^{12}\ Btu}$

4. Calculation of Mercury Flow Rates (lb/min)

Coal

Measured Hg concentration in coal = 98 ppb or 0.098 μg/g
Coal feed rate = 14,797 lb/min
Coal moisture content = 39.1%
Dry coal feed rate (to put on the same basis as flue gas mercury flow rate)
= (14,797)(1-0.391) = 9011 lb/min
Convert: 0.098 μg Hg/g coal to lb Hg/lb coal = 9.80×10^{-8} lb Hg/lb coal
Mercury flow from coal is $(9.60 \times 10^{-8})(9011) = \underline{8.83 \times 10^{-4}\ lb\ Hg/min}$

ESP Hopper Ash

Measured Hg concentration in the ash = 0.01 ppb or 0.00001 μg/g
Measured ESP inlet dust loading = 4.0071 grains/scf (dry basis)
Measured ESP outlet dust loading = 0.0016 grains/scf
Ash removed by ESP: 4.0071 - 0.0016 = 4.0055 grains/scf
Flue gas moisture content = 17.5% (0.175)
Flue gas flow rate = 1,657,700 scfm
Dry flue gas flow rate at 3% O_2: (1,657,700)(0.850)(0.825) = 1,162,462 scfm
Convert: 0.00001 μg Hg/g ash to lb Hg/lb ash = 1×10^{-11} lb Hg/lb ash
Convert: grains/scf to lb/scf = (4.0055)/7000 = 5.722×10^{-4} lb/scf
Calculate ESP ash removal rate: $(5.722 \times 10^{-4})(1{,}162{,}462) = 665.2$ lb/min
Mercury flow from the ash is $(1 \times 10^{-11})(665.2) = \underline{0.000652 \times 10^{-4}\ lb\ Hg/min}$

Note: This is insignificant; little if any mercury is removed by the ESP.

Flue Gas

Average measured mercury concentration at the stack = 10.88 μg/Nm^3

Dry stack gas flow rate =1,162,462 scfm

Convert: 9.97 μg/Nm^3 mercury to lb/scf = 6.78 × 10^{-10} lb/scf

Calculate mass flow rate of Hg: (6.78 × 10^{-10})(1,162,462) = 7.88× 10^{-4} lb Hg/min

Scrubber Slurry

Measured mercury concentration in the reacted FGD slurry solids = 0.656 μg/g

Estimated slurry flow rate = 40 gal/min

Total volume of slurry collected = 773 mL

Amount of filtered solids = 623.3 g

Moisture content of filter solids = 53.5% by weight

Amount of dry solids in slurry collected = (623.3)(1-0.535) = 290 g

Convert: 0.656 μg Hg/g solid to lb Hg/g solid = 1.44 × 10^{-9} lb/g solid

Calculate mass flow rate of Hg:

(1.44 × 10^{-9} lb/g)(290g/773 mL)(3785.4 mL/gal)(40gal/min) = 0.82 × 10^{-4} lb/min

5. Calculation of FGD Bypass

Flue gas flow rate = 1,657,700 scfm

Convert scfm to kg/min using Ideal Gas Law, which at 68°F and 1 atmosphere

= 387 ft^3 / 28.84 lb (assuming molecular weight of flue gas is the same as air)

= (1,657,700)(28.84) / (2.2)(387) = 56,152 kg/min

Thermodynamic data for flue gas are shown in Table B-1.

TABLE B-1

Thermodynamic Data for Flue Gas

Location	Water Vapor, %	Flue Gas Temp., °F	Enthalpy of Water Vapor, kJ/kg	Enthalpy of Air, kJ/kg
Stack	17.5	238	2698.1	387.8
FGD Inlet	14.3	368	2757.5	433.8
FGD Outlet	18.9	140	2617.3	337.7

6.0 Calculation of Stack Enthalpy

Enthalpy at the stack: (0.175)(56,152)(2698.1) + (0.825)(56,152)(387.8) = 45,159,518 kJ/kg

An iteration process was done comparing different fractions of flue gas bypass to determine which give fraction of the bypass gives the same total enthalpy as calculated at the stack.

55% FGD bypass:

(0.55)(0.146)(56,152)(2757.5) + (0.55)(0.854)(56,152)(433.8) = 24,240,630 kJ/kg

(0.45)(0.209)(56,152)(2617.3) + (0.45)(0.791)(56,152)(337.7) = 20,887,073 kJ/kg

Total = 45,127,703 kJ/kg

Enthalpy comparison to the stack value = (45,127,703)/(45,159,518)(100%) = 99.93%

Therefore, for purposes of the mercury balance calculations, a FGD flue gas bypass of 55% was used.

April 13th Mary Jo Roth and Diane Stockdill discussed the "Mercury Formation and Fate" study with you. As requested Great River is submitting the "Mercury Formation and Fate" final project report. This report is being submitted in lieu of further testing. If you have any additional questions, please contact Diane Stockdill (701) 442-3211 ext. 400.

Sincerely,

GREAT RIVER ENERGY

Diane Stockdill

Diane Stockdill
Environmental Coordinator

Mary Jo Roth
Nathan Domyahn
File: Air/CC/FR/Mercury Speciation Testing