APPENDIX A

RAW FIELD DATA SHEETS

Printed on Recycled Paper

Kerr

SAMPLE SUBMITTAL SHEET

PROJECT GRE-ICR DATE SUBMITTED 8/26/99

REQUESTOR Shulz FUND# 4189

RUN #	SAMPLE ID	SAMPLE TYPE	VOL/WT		WATER LAB	RESULTS
GRE-U10-D3	~~In-OH-1~~			Hg		
				Hg		
				Hg		
				Hg		
	STACK-OH-1	KCl 1+2 + ~~[illegible]~~ Ker	500	Hg		
		KCl #3	200	Hg		
		H_2O_2	250	Hg		
		$KMnO_4$	500			
		nozzle rinse ~~[illegible]~~	200	Hg		
				Hg		
				Hg		
				Hg		
				Hg		
	D3-IN-OH-1 8/26/99 Unit 10 Composite	COAL Sample	Bag	Hg		
				Hg		
				Hg		
				Hg		
	D3-IN-OH-1	Ash Sample	qt	Hg		
		Field #1		Hg		
		17:00		Hg		
				Hg		
	D3-FB-Spike	KCl	500	Hg		
		H_2O_2	250	Hg		
		$KMnO_4$	500	Hg		
				Hg		

Day 3

Page 1 of 2

Laura Wil

8/26/99 Day 3

SBMTL3O.WK4

Lemon Creek

SAMPLE SUBMITTAL SHEET

PROJECT CRE-ICL DATE SUBMITTED 8/26/99

REQUESTOR Schulz FUND# 4189

RUN #	SAMPLE ID	SAMPLE TYPE	VOL/WT		WATER LAB	RESULTS
CRE-U10-D3	D3-IN-OH-1-MC	KCl #1+2	500	Hg		
		KCl #3	200	Hg		
		H_2O_2	250	Hg		
		$KMnO_4$	500			
				Hg		
	D3-IN-OH-1	KCl #1+2 + probe	500	Hg		
		KCl #3	200	Hg		
		H_2O_2	250	Hg		
		$KMnO_4$	500			
		Nozzle rinse	200	Hg		
	D3-Dry Out OH-1	KCl #1+2 + probe	500	Hg		
		KCl #3	200	Hg		
		H_2O_2	250	Hg		
		$KMnO_4$	500	Hg		
		Nozzle rinse	200			
	D3-U10-D3 Dry Out OH-1-MC	KCl #1+2	500	Hg		
		KCl #3	200	Hg		
		H_2O_2	250	Hg		
		$KMnO_4$	500	Hg		
	D3-FB-IN	KCl	500	Hg		
		H_2O_2	250	Hg		
		$KMnO_4$	500	Hg		
				Hg		
	D3-FB-OUT	KCl	500	Hg		
		H_2O_2	250	Hg		
		$KMnO_4$	500	Hg		
				Hg		

8/26/99 Day 3

SBMTL3O.WK4

(replacement)

DATE 8/26/99
RUN #
FUND #
COST CENTER NUMBER

DUST LOADING DATA SHEET

Time at Start ~~15:08~~ 15:09 Operators Jeff T., Craig E.

Sample Pt. A, C, E, H, J, ~~K~~ Traverse Pt. 1-4

P_B(Barometric Pressure)= 28.423 in. Hg

P_s(Stack Pressure)= $P_B \pm$(-0.4 27.73 in H_2O/13.6) = 27.73 in Hg

T_s(Stack Temp)= 336 °F+460= 796 °R

ΔP(Pitot)= .392 in H_2O ✓ Type S Cp=.84 ____ Standard

D_n(Nozzle Diam)= .195 in Approx % H_2O= 14

ΔH@= 1.85 in H_2O Cm= 1.00

V_s(Stack Velocity) = $951.6\ Cp \sqrt{\frac{Ts}{Ps}} \Delta P$ = 2681 ft/min

Q_n(Nozzle flow Rate)= $V_s \pi D_n^2/576$= .5561 ACFM

Q_m(meter flow rate $\frac{Q_n T_m On}{CmT_s(p_B+\Delta H/13.6)}$ $(1 - \%H_2O)$= .3450 ACFM

ΔH(orifice)= $\frac{Qm^2 \Delta H@ (P_B+\Delta H/13.6)}{0.03175 T_m}$ = $\frac{100}{2.31.55}$ in H_2O

Second/Rev= 17.1 $\%CO_2$ ____ $\%O_2$ ____ (A) B (C) D (E) F G (H) I (J) (K) N←

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				
	~~Pt~~	~~5~~	J7	H	E	C	A		Avg					
	O_2	4.9	4.8	5.5	6.1	5.9	5.9		5.5					
	CO_2	14.5	14.6	14.0	13.4	13.6	13.6		14.0					

Comments: SPT Leak check passed
EPA leak check passed

DATE: 8/26/99 START TIME: 15:09

RUN NUMBER: Inlet Unit 10 Spray Dryer

SAMPLING SUMMARY

TOTAL SAMPLING TIME 120 MINUTES

MAXIMUM SYSTEM VACUUM 12.0 in Hg

AVERAGE STACK TEMPERATURE 336.63 °F

AVERAGE VELOCITY HEAD ΔP 0.392 in H_2O

AVERAGE STACK VELOCITY 43.93 FT/SEC

AVERAGE ORRIFICE PERSSURE ΔH 0.570 in H_2O

TOTAL VOLUME SAMPLED 40.175 FT^3

AVERAGE DGM INLET 133.60 °F

AVERAGE DGM OUTLET 127.86 °F

AVERAGE DGM TEMPERATURE 130.73 °F

FILTER TEMPERATURE NA °F

LAST IMPINGER TEMPERATURE 71.93 °F

METER PRESSURE Pm 28.423 in Hg

STACK PRESSURE Ps 27.73 in Hg

AREA OF NOZZLE 0.0299 IN^2

AVG SQRT ΔP 0.612

MOLECULAR WEIGHT 28.70

MOISTURE CONTENT 0.130

VmSTD = 34.073 SCF

% ISOKINETIC 97.22

Sample Pt. _____

Train Type : **ONTARIO-HYDRO METHOD**

Date 8/26/99

Run _____

Fund # _____

Cost Center # _____

IN-3

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	734.1	875.5	141.4
BUBBLER	KCl	743.2	754.9	11.7
IMPINGER	KCl	705.5	709.1	3.6
BUBBLER	H_2O_2/HNO_3	739.1	741.9	2.8
BUBBLER	$KMnO_4/H_2SO_4$	742.0	742.6	0.6
BUBBLER	$KMnO_4/H_2SO_4$	712.3	767.1	54.8
IMPINGER	$KMnO_4/H_2SO_4$	731.1	676.7	-54.4
BUBBLER	SILICA GEL	876.6	886.7	10.1
			Total H_2O (g)	-50 correct
FILTER	KW	3.01888	17.35274	120.6
			Total Dust (g)	14.33386

$V_w std = 0.0474 * (H_2O\ g)$ — 5.686 SCF

$V_m Corrected = V_m * C_m$ — 40.175 ACF

$V_m std = \frac{17.71\ V_m C\ (P_b + \Delta H/13.6)}{T_m}$ — 34.284 SCF

$V_t std = V_w std + V_m std$ — 39.971 SCF

$\%H_2O = (V_w std / V_t std) * 100$ — 14.2 $\%H_2O$

$Q_n std = 17.71\ Q_n P_s / T_s$ — 0.335 SCFM

% Isokinetic = $V_t std / (Q_n std * Time)$ — 99.4 %

DUST LOADING CALCULATIONS (Concentration Basis)

DCL = 15.432 (dust g) / $V_t std$ — 5.5341 grains/scf

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

CFM = V_s * Pipe Area (ft^2) — — ACFM

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

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

Date_____ Time_____
GRE-U10-D3-Stack-OH-1

DATE_____
RUN #_____
FUND #_____
COST CENTER NUMBER _____

DUST LOADING DATA SHEET

Time at Start 1441 Operators M Heid R Trewyn - WE

Sample Pt. Stack Traverse Pt. Mid - Tap - LeHan

P_B(Barometric Pressure)= 28.10 in. Hg

P_s(Stack Pressure)= P_B ±(1.01 in H_2O/13.6) = 28.89 in Hg

T_s(Stack Temp)= 200 °F+460= 660 °R

ΔP(Pitot)= .452 in H_2O X Type S Cp=.84 _____Standard

D_n(Nozzle Diam)= .195 in Approx % H_2O= ~~15~~ 20.2

ΔH@= 1.99 in H_2O Cm= .939 .939

V_s(Stack Velocity) = 951.6 Cp $\sqrt{\frac{Ts}{Ps}}\Delta P$ = ~~2358~~ 2601 ft/min

Q_n(Nozzle flow Rate)= $V_s \pi D_n^2/576$= ~~.4952~~ .5394 ACFM

Q_m(meter flow rate $\frac{Q_n T_m Q_n}{C_m T_s(P_B+\Delta H/13.6)}$ (1 - %H_2O)= ~~.3819~~ .3922 ACFM 0.3367

ΔH(orifice)= $\frac{Qm^2 \Delta H@(P_B+\Delta H/13.6)}{0.03175 T_m}$ = ~~.46~~ .48 in H_2O 0.36 (100)

Second/Rev= 15.7/15.3 %CO_2_____ %O_2_____ 17.8 45 105

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			
				CO_2	O_2								
				12.4	6.8								
				12.8	6.6								
				13.1	6.2								
				12.8	6.5								

Comments: _____

Time at Start _____

Operators _____

Date _____

Date_____ Time_____

GRE-U10-D3-Stack-OH-1

Port SAMPLE LOCATION

Sec/Rev	Traverse Point	Time	Gas Meter	Delta P	Delta H	Pump Vac.	Stack Temp.	Probe Temp.	Meter In. Temp.	Meter Out Temp.	$\sqrt{\Delta P}$			
M	0	0	696.573	0.39	0.36	–	193	268 247	91	91	.624			17.
	1	5	698.27	0.14	0.36	2.5	191	263	92	92	.500			29
	2	10	699.67	0.25	0.25	2.5	192	262	94	91	.500			27.
	3	15	701.39	0.27	0.25	2.0	192	259	94	92	.520			21.
	4	20	702.51	0.20		2.0	191	255	95	92	.447			15
	5	25	703.88	0.18		2.5	182	251	97	92	.424			15.
	6	30	705.84	0.14	0.23	2.75	184	248	100	93	.374			
	7	35	707.38	0.08	0.28	2.75	189	248	101	94	.283	AVE		39.
	8	40	708.655	0.45	.68		194	257	99	98	.671	$\sqrt{\Delta P}$	ΔP	16.
												.483	.232	
T	9	45	710.49	.44	.60	2.75	197	256	101	102	.663			16.
	10	50	712.31	.54	0.70	2.75	198	262	104	102	.735			15.1
	11	55	714.26	.64	.78	3.0	198	261	104	97	.800			13.
	12	60	716.38	.80	.93	3.0	202	264	106	97	.894			12.
	13	65	718.68	.81	0.93	3.5	205	264	109	97	.900			12.
	14	70	721.10	.65	0.79	3.5	206	262	112	98	.806			13
	15	75	723.38	.66	.80	3.5	205	258	111	98	.812	AVE		13
	16	80	725.550	.47	.63	3.5	200	244	102	98	.686	$\sqrt{\Delta P}$	ΔP	16.
												.787	.619	
B	17	85	727.39	.40	.57	3.0	200	261	104	109	.632			17.
	18	90	729.16	.48	.64	3.0	200	267	106	100	.693			16
	19	95	730.88	.62	.77	3.0	200	272	107	100	.787			14
	20	100	733.07	.67	.81	3.5	199	272	109	98	.819			13
	21	105	735.26	.60	.75	3.5	198	274	111	100	.775			14.
	22	110	737.39	.58	.74	3.5	199	271	113	101	.762			14.
	23	115	739.48	.58	.74	3.5	199	257	114	102	.762			14.
	24	120	741.551									$\sqrt{\Delta P}$	ΔP	
												.747	.558	
			44.978						2471	2334				
					0.61									
												.672	.452	
			44.978				1910		100					

0.13

0.46

0.46

ESP-DATA.WK4

Sample Pt. _____

Train Type : **ONTARIO-HYDRO METHOD**

Date _____ Date _____ Time _____
Run ~~GRE-U10-D3-Stack-OH-1~~
Fund # _____
Cost Center # _____

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	X KCl	696.9	875.7	178.8
BUBBLER	X KCl	725.6	738.4	12.8
IMPINGER	X KCl	705.7	706.8	1.1
BUBBLER	H_2O_2/HNO_3	741.3	742.5	1.2
BUBBLER	$KMnO_4/H_2SO_4$	751.2	751.0	-.2
BUBBLER	$KMnO_4/H_2SO_4$	745.4	745.9	.5
IMPINGER	$KMnO_4/H_2SO_4$	755.6	755.6	.0
BUBBLER	SILICA GEL	924.5	934.3	9.8
			Total H_2O (g)	204.0
FILTER				~~[illegible]~~
				~~[illegible]~~
		.16294	.18916	.02622
			Total Dust (g)	

X used 0.1 N nitric for rinse instead of 10% nitric (KW)

$V_wstd = 0.0474 * (H_2O\ g)$ — 9.619 SCF

$V_mCorrected = V_m * C_m$ — 42.234 ACF

$V_mstd = \frac{17.71\ V_mC\ (P_b + \Delta H/13.6)}{T_m}$ — 37.920 SCF

$V_tstd = V_wstd + V_mstd$ — ~~47.538~~ 47.211 KW SCF

$\%H_2O = (V_wstd / V_tstd) * 100$ — ~~20.5~~ 20.4 KW $\%H_2O$

$Q_nstd = 17.71\ Q_n\ P_s / T_s$ — ~~408~~ 409 KW SCFM

% Isokinetic = $V_tstd / (Q_nstd * Time)$ — ~~95.8~~ 96.2 KW %

DUST LOADING CALCULATIONS (Concentration Basis)

DCL = 15.432 (dust g) / V_tstd — 0.0086 grains/scf

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

ACFM = V_s * Pipe Area (ft^2) — _____ ACFM

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

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

SAMPLE SUBMITTAL SHEET

PROJECT GRE-ICI2 DATE SUBMITTED 8/27/99

REQUESTOR Schulz FUND# 4189

RUN #	SAMPLE ID	SAMPLE TYPE	VOL/WT		WATER LAB	RESULTS
GRE-U10	D4-IN-OH-1	KCl #1+2	50c	Hg		
		KCl #3	20c	Hg		
		H_2O_2	25c	Hg		
		KMnO4	50c			
		Nozzle rinse	20c	Hg		
	D4-DryCut-OH-1	KCl #1+2	50c	Hg		
		KCl #3	20c	Hg		
		H_2O_2	25c	Hg		
		KMnO4	50c			
		Nozzle rinse	20c	Hg		
	D4-IN-OH-1-MC	KCl #1+2	50c	Hg		
		KCl #3	20c	Hg		
		H_2O_2	25c	Hg		
		KMnO4	50c	Hg		
	D4-DryCut-OH-1-MC	KCl #1+2	50c	Hg		
		KCl #3	20c	Hg		
		H_2O_2	25c	Hg		
		KMnO4	50c	Hg		
	D4-STACK-OH-1	KCl #1+2	50c	Hg		
		KCl #3	20c	Hg		
		H_2O_2	25c	Hg		
		KMnO4	50c	Hg		
		Nozzle rinse	20c			
	D4-FB-in	KCl	50c	Hg		
		H_2O_2	25c	Hg		
		KMnO4	50c	Hg		
				Hg		

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Day 4 8/27/99

Karen Schulz

SBMTL30.WK4

SAMPLE SUBMITTAL SHEET

PROJECT GRE-ICR DATE SUBMITTED 8/27/99

REQUESTOR Schulz FUND# 4189

RUN #	SAMPLE ID	SAMPLE TYPE	VOL/WT		WATER LAB	RESULTS
GRE-010	D4-IN-OH-2	KCl #1+2	500	Hg		
		KCl #3	200	Hg		
		H_2O_2	250	Hg		
		KMnO4	500			
		Nozzle Rinse	200	Hg		
	D4-DRY OUT-OH-2	KCl #1+2	500	Hg		
		KCl #3	200	Hg		
		H_2O_2	250	Hg		
		KMnO4	500			
		Nozzle rinse	200	Hg		
	D4-IN-OH-2-MC	KCl #1+2	500	Hg		
		KCl #3	200	Hg		
		H_2O_2	250	Hg		
		KMnO4	500	Hg		
	D4-DRY OUT-OH-2-MC	KCl #1+2	500	Hg		
		KCl #3	200	Hg		
		H_2O_2	250	Hg		
		KMnO4	500	Hg		
	D4-STACK-OH-2	KCl #1+2	500	Hg		
		KCl #3	200	Hg		
		H_2O_2	250	Hg		
		KMnO4	500	Hg		
		Probe rinse	250			
	D4-FB-OUT	KCl	500	Hg		
		H_2O_2	250	Hg		
		KMnO4	500	Hg		
				Hg		

Day 4 8/27/99

Karen Uhrl

SBMTL3O.WK4

SAMPLE SUBMITTAL SHEET

PROJECT GRE-ICR DATE SUBMITTED 8/27/99

REQUESTOR Schulz FUND# 4189

RUN #	SAMPLE ID	SAMPLE TYPE	VOL/WT		WATER LAB	RESULTS
GRE-U10-D4	GRE-Coal Sample 8/27/99 unit 10 composite 9:30-11:30 test	Coal Sample	Bag	Hg		
				Hg		
				Hg		
				Hg		
	Spray Dryer A-2 Ash (line)	Small bottle		Hg		
				Hg		
				Hg		
				Hg		
	Scrubber Ash-1 (line)	Small bottle		Hg		
				Hg		
				Hg		
				Hg		
	Dry Out-CH-1 Ash Sample	Ash Sample	gt	Hg		
				Hg		
				Hg		
				Hg		
	Dry Out-CH-2 Ash Sample	Ash Sample	gt	Hg		
				Hg		
				Hg		
				Hg		
	D4-FB-Spike	KCl	500	Hg		
		H_2O	250	Hg		
		$KMnO_4$	500	Hg		
		Excess $KMnO_4$ rinse	200	Hg		

page 3 of 3 Karen Uhl

Day 4 8/27/99

SBMTL3O.WK4

DATE_____
RUN # _____ Date_____ Time_____
FUND # GRE-U10-D4-In-OH-1
COST CENTER NUMBER _____

DUST LOADING DATA SHEET

Time at Start 9:25 Operators Jeff T., Craig E.

Sample Pt. A,C,E,H,J,L Traverse Pt. 1-4

P_B(Barometric Pressure)= 28.10 in. Hg

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

T_s(Stack Temp)= _____ °F+460= _____ °R

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

D_n(Nozzle Diam)= .219 in Approx % H_2O= 13

ΔH@=_____ in H_2O Cm= _____

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

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

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

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

Second/Rev=____ %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				
		A	C	E	H	J	L		Avg					
	O_2	6.2	6.0	6.0	5.7	4.9	5.1		5.7					
	CO_2	13.4	13.5	13.5	13.8	14.5	14.3		13.8					

Comments: SOT leak ✓ passed
EOT Leak ✓ passed

Date_____ Time_____

GRE-U10-D4-In-OH-1

DATE: 8/27/99 START TIME: 9:25

RUN NUMBER: Inlet Unit 10 Spray Dryer

SAMPLING SUMMARY

TOTAL SAMPLING TIME 120.0 MINUTES

MAXIMUM SYSTEM VACUUM 17.0 in Hg

AVERAGE STACK TEMPERATURE 342.31 °F

AVERAGE VELOCITY HEAD ΔP 0.582 in H_2O

AVERAGE STACK VELOCITY 54.65 FT/SEC

AVERAGE ORRIFICE PERSSURE ΔH 0.845 in H_2O

TOTAL VOLUME SAMPLED 53.990 FT^3

AVERAGE DGM INLET 101.55 °F

AVERAGE DGM OUTLET 94.53 °F

AVERAGE DGM TEMPERATURE 98.04 °F

FILTER TEMPERATURE NA °F

LAST IMPINGER TEMPERATURE 51.24 °F

METER PRESSURE Pm 28.311 in Hg

STACK PRESSURE Ps 27.63 in Hg

AREA OF NOZZLE 0.0377 IN^2

AVG SQRT ΔP 0.757

MOLECULAR WEIGHT 28.68

MOISTURE CONTENT 0.13

VmSTD = 48.083 SCF

% ISOKINETIC 88.36

Sample Pt. _____

Train Type : **ONTARIO-HYDRO METHOD**

Date Date Time

Run GRF-U10-D4-In-OH-1

Fund # _____

Cost Center # _____

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	737.7		
BUBBLER	KCl	698.6		
IMPINGER	KCl	718.3		
BUBBLER	H_2O_2/HNO_3	725.4		
BUBBLER	$KMnO_4/H_2SO_4$	729.0		
BUBBLER	$KMnO_4/H_2SO_4$	701.9		
IMPINGER	$KMnO_4/H_2SO_4$	735.2		
BUBBLER	SILICA GEL	926.0	943.2	
			Total H_2O (g)	180.0
FILTER				
		3.02376	12.49351	
			Total Dust (g)	9.46975

$V_w std = 0.0474 * (H_2O\ g)$ — 8.487 SCF

$V_m Corrected = V_m * C_m$ — 53.990 ACF

$V_m std = \frac{17.71\ V_m C\ (P_b + \Delta H/13.6)}{T_m}$ — 48.254 SCF

$V_t std = V_w std + V_m std$ — 56.741 SCF

$\%H_2O = (V_w std / V_t std) * 100$ — 15.0 $\%H_2O$

$Q_n std = 17.71\ Q_n P_s / T_s$ — 0.520 SCFM

% Isokinetic = $V_t std / (Q_n std * Time)$ — 90.9 %

DUST LOADING CALCULATIONS (Concentration Basis)

DCL = 15.432 (dust g) / $V_t std$ — 2.57555 grains/scf

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

ACFM = V_s * Pipe Area (ft^2) — ACFM

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

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

DATE ~~Date~~ ~~Time~~
RUN # ~~GRE-U10-D4-In-OH-2~~
FUND #
COST CENTER NUMBER

DUST LOADING DATA SHEET

Time at Start 14:24 Operators Jeff T., Craig E.

Sample Pt. A, C, E, H, J, L Traverse Pt. 1-4

P_B(Barometric Pressure)= 28.15 in. Hg

P_s(Stack Pressure)= $P_B \pm$(____ in H_2O/13.6) = 28.03 in Hg

T_s(Stack Temp)= 368 °F+460= 828 °R

ΔP(Pitot)= .608 in H_2O ✓ Type S Cp=.84 ____ Standard

D_n(Nozzle Diam)= .219 in Approx % H_2O= 13 14 17.5

ΔH@= ____ in H_2O Cm= ____

V_s(Stack Velocity) = 951.6 Cp $\sqrt{\frac{Ts}{Ps}}\Delta P$ = 3404 3394 ft/min

Q_n(Nozzle flow Rate)= $V_s \pi D_n^2/576$= .8905 .8879 ACFM

Q_m(meter flow rate $\frac{Q_n T_m Q_n}{C_m T_s(p_B+\Delta H/13.6)}$ (1 - $\%H_2O$)= .5243 .5026 ACFM

ΔH(orifice)= $\frac{Qm^2 \Delta H@(P_B+\Delta H/13.6)}{0.03175 T_m}$ = $\frac{100}{.79}$ .72 in H_2O

Second/Rev= 11.4 (11.9) $\%CO_2$ ____ $\%O_2$ ____

117 (A) B (C) D (E) F G (A) I (J) K

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

S/R	Trav. Point	Time	Gas Meter	ΔP	ΔH	Pump Vac.	Stack Temp.	Probe Temp.	Meter In	Meter Out				
		A	C	E	H	J	K		A-1					
	O_2	~~6.1~~	5.3	5.9	5.2	5.5	4.6		5.4					
	CO_2	~~13.4~~	14.2	13.6	14.3	14.0	14.8		14.1					

Comments: SOT leak check passed

Date_____ Time_____

GRE-U10-D4-In-OH-2

DATE: 8/27/99 START TIME: _____

RUN NUMBER: Inlet Unit 10 Spray Dryer

SAMPLING SUMMARY

TOTAL SAMPLING TIME 120.0 MINUTES

MAXIMUM SYSTEM VACUUM 17.1 in Hg

AVERAGE STACK TEMPERATURE 368.36 °F + 460 = 828.36

AVERAGE VELOCITY HEAD ΔP 0.614 in H_2O

AVERAGE STACK VELOCITY 57.01 FT/SEC

AVERAGE ORRIFICE PERSSURE ΔH 0.971 in H_2O

TOTAL VOLUME SAMPLED 55.895 FT^3

AVERAGE DGM INLET 119.41 °F

AVERAGE DGM OUTLET 113.90 °F

AVERAGE DGM TEMPERATURE 116.66 °F

FILTER TEMPERATURE NA °F

LAST IMPINGER TEMPERATURE 65.83 °F

METER PRESSURE Pm 28.400 in Hg

STACK PRESSURE Ps 27.72 in Hg

AREA OF NOZZLE 0.0377 IN^2

AVG SQRT ΔP 0.778

MOLECULAR WEIGHT 28.68

MOISTURE CONTENT 0.130

VmSTD = 48.489 SCF

% ISOKINETIC 87.94

Sample Pt. _____

Train Type : **ONTARIO-HYDRO METHOD**

Date _____
Run _____
Fund # _____ Date _____ Time _____
Cost Center # ~~GRE-U10-D4-In-OH-2~~

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	785.7	882.5	166.8
BUBBLER	KCl	719.5	745.5	26.0
IMPINGER	KCl	632.4	641.1	8.7
BUBBLER	H_2O_2/HNO_3	717.0	719.6	2.6
BUBBLER	$KMnO_4/H_2SO_4$	652.1	650.6	-1.5
BUBBLER	$KMnO_4/H_2SO_4$	719.5	720.1	.6
IMPINGER	$KMnO_4/H_2SO_4$	703.9	706.6	2.7
BUBBLER	SILICA GEL	809.6	830.2	20.6
			Total H_2O (g)	-45.0 (rinse)
FILTER				181.5
		3.04059	13.61987	10.57928
			Total Dust (g)	

$V_w std = 0.0474 * (H_2O\ g)$ — 8,558 SCF

$V_m Corrected = V_m * C_m$ — 55.895 ACF

$V_m std = \frac{17.71\ V_m C\ (P_b + \Delta H/13.6)}{T_m}$ — 48.446 SCF

$V_t std = V_w std + V_m std$ — 57.003 SCF

$\%H_2O = (V_w std / V_t std) * 100$ — 15.0 $\%H_2O$

$Q_n std = 17.71\ Q_n P_s / T_s$ — 0.530 SCFM

% Isokinetic = $V_t std / (Q_n std * Time)$ — 89.6 %

DUST LOADING CALCULATIONS (Concentration Basis)

DCL = 15.432 (dust g) / $V_t std$ — 2.8640 grains/scf

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

V_s CFM = V_s * Pipe Area (ft^2) — _____ ACFM

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

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

DATE ~~Date~~ ~~Time~~
RUN # ~~GRE-U10-D4-Stack~~-OH-1
FUND #
COST CENTER NUMBER

DUST LOADING DATA SHEET

Time at Start 0956 Operators Marlys Heidt, Steve Evans

Sample Pt. Traverse Pt. Top-Middle-Bottom

P_B(Barometric Pressure)= 28.10 in. Hg

P_s(Stack Pressure)= P_B ±(1 in H_2O/13.6) = 28.17 in Hg

T_s(Stack Temp)= 200 °F+460= °R

ΔP(Pitot)= in H_2O ✓ Type S Cp=.84 Standard

D_n(Nozzle Diam)= .198 in Approx % H_2O= 17

ΔH@= 1.99 in H_2O Cm= 0.939

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

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

Q_m(meter flow rate $\frac{Q_n T_m Q_n}{C_m T_s(p_B+\Delta H/13.6)}$ (1 - $\frac{\%H_2O}{100}$)= ACFM

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

Second/Rev= %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				
				CO2	C.2-									
				13.0	6.4									
				13.0	6.4									
				13.0	6.4									

Comments: Pre-test leak ✓ OK @ 5" Hg
EOT leak ✓ OK @ 6" Hg

Time at Start _____

Operators _____

Date _____

Date_____ Time_____

GRE-U10-D4-Stack-OH-1

SAMPLE LOCATION

Sec./ Rev.	Traverse Point	Time	Gas Meter	ΔP Delta P	Delta H	Pump Vac.	Stack Temp.	Probe Temp.	Meter In. Temp.	Meter Out Temp.	Cold Box	Hot Box	√ΔP	
Top	~~3~~	0	743.582	0.30	.25	—	170	291	70	70	64		0.55	21.
	1	5	745.00	.34	.29	2.5	195	285	72	70	55		0.58	20
	2	10	746.46	.47	.39	2.5	213	286	74	71	54	233	0.69	17.
	3	15	748.11	.56	.46	2.5	220	284	76	72	53	233	0.75	16.
	4	20	749.93	.51	.42	3.0	215	294	81	73	54	233	0.71	16
	5	25	751.75	.58	.49	3.0	204	300	83	74	51	233	0.76	15.
	6	30	753.70	.44	.37	3.0	204	301	86	75	52	237	0.66	17.
	7	35	755.48	.48	.41	3.0	204	297	77	88	53	236	0.69	17.
	8	40	757.237	.27	.23	2.5	202	290	82	78	56	239	0.52	22.
Mid	9	45	758.57	.35	.30	2.5	204	292	80	~~73~~ 87	58	236	0.59	19.
	10	50	760.07	.43	.37	2.5	204	289	~~88~~ 81	88	54	236	0.66	17.
	11	55	761.71	.49	.42	3.0	204	287	92	82	53	236	0.70	16.
	12	60	763.51	.48	.42	3.0	204	284	94	83	54	236	0.69	16.
	13	65	765.30	.53	.46	3.0	203	283	95	83	~~75~~ 54	236	0.73	15.
	14	70	767.16	.50	.43	3.0	203	283	95	84	54	236	0.71	16.
	15	75	769.00	.43	~~.33~~ .37	3.0	201	286	96	85	54	236	0.66	17.
	16	80	770.753	.51	.44	3.0	204	280	87	89	70	236	0.71	16.
Bot	17	85	772.57	.49	.43	3.0	204	276	94	88	57	236	0.70	16.
	18	90	774.43	.36	.31	3.0	202	274	96	87	56	235	0.60	19.
	19	95	776.07	.49	.43	3.0	202	277	96	88	58	236	0.70	16.
	20	100	777.82	.52	.46	3.0	202	283	98	88	57	236	0.72	15.9
	21	105	779.69	.54	0.47	3.0	202	292	100	89	57	236	0.73	15.
	22	110	781.60	.50	.44	3.0	202	294	101	89	57	236	0.71	16.
	23	115	783.48	.58	.51	3.0	202	287	102	90	~~102~~ 56	236	0.76	15.
	24	120	785.433	.57	.46	3.25	201	286	102	90	55	236	0.75	
									2210	2061			0.68	
			41.851		0.40		~~203~~							
				0.45										
									~~86~~ 85					
									~~84~~					

1790

ESP-DATA.WK4

Sample Pt. _____

Train Type : **ONTARIO-HYDRO METHOD**

Date _____
Run _____ Date _____ Time _____
Fund # ~~GRE-U10-D4-Stack-OH-1~~
Cost Center # _____

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	600.9		
BUBBLER	KCl	628.6		
IMPINGER	KCl	730.8		
BUBBLER	H_2O_2/HNO_3	640.7		
BUBBLER	$KMnO_4/H_2SO_4$	634.2		
BUBBLER	$KMnO_4/H_2SO_4$	723.7		
IMPINGER	$KMnO_4/H_2SO_4$	760.4		
BUBBLER	SILICA GEL	921.8	929.4	
			Total H_2O (g)	180.6
FILTER				
		.16122	.17304	
			Total Dust (g)	0.01182

$V_wstd = 0.0474 * (H_2O\ g)$ — 8.487 SCF

$V_mCorrected = V_m * C_m$ — 39.298 ACF

$V_mstd = \frac{17.71\ V_mC\ (P_b + \Delta H/13.6)}{T_m}$ — 35.921 SCF

$V_tstd = V_wstd + V_mstd$ — 44.408 SCF

$\%H_2O = (V_wstd / V_tstd) * 100$ — 19.1 $\%H_2O$

$Q_nstd = 17.71\ Q_n\ P_s / T_s$ — 0.391 SCFM

% Isokinetic = $V_tstd / (Q_nstd * Time)$ — 94.7 %

DUST LOADING CALCULATIONS (Concentration Basis)

DCL = 15.432 (dust g) / V_tstd — 0.0041 grains/scf

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

ACFM = V_s * Pipe Area (ft^2) — — ACFM

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

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

DATE ~~Date~~ ~~Time~~
RUN # ~~GRE-U10-D4-Stack~~-OH-2
FUND #
COST CENTER NUMBER

DUST LOADING DATA SHEET

Time at Start 1435 Operators M. Heidt, S. Evanson

Sample Pt. Stack Traverse Pt. Top - Middle - Bottom

P_B(Barometric Pressure)= 28.13 in. Hg

P_s(Stack Pressure)= P_B ±(1 in H_2O/13.6) = 28.22 in Hg

T_s(Stack Temp)= 200 °F+460= 660 °R

ΔP(Pitot)= .468 in H_2O ✓ Type S Cp=.84 ____ Standard

D_n(Nozzle Diam)= .198 in Approx % H_2O= 18

ΔH@= 1.99 in H_2O Cm= 0.939

V_s(Stack Velocity) = 951.6 Cp $\sqrt{\frac{Ts}{Ps}\Delta P}$ = 2644 2117 2644 ft/min

Q_n(Nozzle flow Rate)= $V_s \pi D_n^2/576$= .5207 0.4391 .5484 ACFM

Q_m(meter flow rate $\frac{Q_n T_m On}{CmT_s(P_B+\Delta H/13.6)}$ (1 - $\%H_2O$)= 0.2821 .3916 ACFM

ΔH(orifice)= $\frac{Qm^2 \Delta H@(P_B+\Delta H/13.6)}{1580.03175 T_m}$ = 0.26 in H_2O

Second/Rev= 21.3 $\%CO_2$ 15.3 $\%O_2$ ____

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

.5 ΔH .5
90 Tm 100 Tm

S/R	Trav. Point	Time	Gas Meter	ΔP	ΔH	Pump Vac.	Stack Temp.	Probe Temp.	Meter In	Meter Out				
				CO2	0.2									
				13.0	0.4									
				13.0	0.4									
				13.0	0.4									

Comments: SOT leak ✓ OK @ 5" Hg
EOT leak ✓ OK @ 5" Hg

Time at Start 1435

Operators

Date

Date_____ Time_____

GRE-U10-D4-Stack-OH-2

ΔP

SAMPLE LOCATION

Sec./ Rev.	Traverse Point	Time	Gas Meter	Delta P	Delta H	Pump Vac.	Stack Temp.	Probe Temp.	Meter In. Temp.	Meter Out Temp.	Cold Box	Hot Box	Sec Re
Top	#	0	785.536	.30	.26	2.5	201	269	89	93	~~88~~	236	21.
	#1	5	786.90	.34	.28	2.5	215	283	92	91	—	236	20.
	2	10	788.27	.44	.38	2.5	202	287	93	91	—	236	17.
	3	15	789.90	.60	.51	2.75	202	283	95	92	63	236	15.
	4	20	791.80	.55	.47	3.0	202	282	97	91	61	237	15
	5	25	793.74	.44	.38	3.0	201	280	100	to 92	62	235	17.
	6	30	795.61	.48	0.41	3.0	200	285	102	92	59	236	16.
	7	35	797.47	.52	.45	3.0	200	284	103	93	57	237	15.
	8	40	799.317	.25	.22	2.25	200	278	100	94	70	234	23
Mid	9	45	800.60	.34	0.29	2.25	197	281	99	94	64	237	19.
	10	50	802.10	.44	.38	3.0	199	280	103	95	59	236	17.
	11	55	803.77	.52	.45	3.0	200	277	102	95	58	236	15.
	12	60	805.62	.48	.42	3.0	201	275	103	95	56	236	16.
	13	65	807.47	.50	.43	3.0	200	280	104	95	57	236	16.
	14	70	809.33	.58	.50	3.0	201	287	104	95	58	237	15.
	15	75	811.19	.38	.33	3.0	201	289	104	95	57	237	18
	16	80	812.872	.45	.39	3.0	198	283	103	95	62	236	17.
Bot	17	85	814.62	.50	.43	3.0	200	287	106	96	58	238	16.
	18	90	816.45	.40	.35	3.0	201	280	101	96	55	237	18.
	19	95	818.15	.52	.45	3.0	201	278	102	95	58	238	15.
	20	100	819.97	.53	.46	3.0	201	290	103	95	58	238	15.
	21	105	821.86	.54	.47	3.0	201	292	105	96	57	238	15.
	22	110	823.75	.50	.43	3.0	201	289	105	96	59	239	16.
	23	115	825.62	.57	.49	3.0	201	287	105	96	60	238	15.
	24	120	826.695	.57	.45	3.0	201	280	106	96	60	239	(17.
			(41.159)	(.47)	(.40)	(2.9)	(201)	(283)	(101)	(94)	(59)	(237)	
										(98)			

0.47 201

41.159 0.40 .97

Avg $\sqrt{\Delta P}$ = 0.68

ESP-DATA

Sample Pt. _____

Train Type : **ONTARIO-HYDRO METHOD**

Date_____ Time_____

Date GRE-U10-D4-Stack-OH-2

Run _____

Fund # _____

Cost Center # _____

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	725.0	880.3	155.3
BUBBLER	KCl	703.4	716.7	13.3
IMPINGER	KCl	708.5	709.6	1.1
BUBBLER	H_2O_2/HNO_3	709.2	709.6	0.4
BUBBLER	$KMnO_4/H_2SO_4$	705.1	705.3	0.2
BUBBLER	$KMnO_4/H_2SO_4$	753.1	753.6	0.5
IMPINGER	$KMnO_4/H_2SO_4$	752.1	752.2	0.1
BUBBLER	SILICA GEL	884.6	893.7	9.1
			Total H_2O (g)	No rinse added
FILTER				180.0
		.15842	.16829	
			Total Dust (g)	0.00987

$V_w std = 0.0474 * (H_2O\ g)$ — 8.487 SCF

$V_m Corrected = V_m * C_m$ — 38.648 ACF

$V_m std = \frac{17.71\ V_m C\ (P_b + \Delta H/13.6)}{T_m}$ — 34.628 SCF

$V_t std = V_w std + V_m std$ — 43.115 SCF

$\%H_2O = (V_w std / V_t std) * 100$ — 19.7 $\%H_2O$

$Q_n std = 17.71\ Q_n P_s / T_s$ — 0.392 SCFM

% Isokinetic = $V_t std / (Q_n std * Time)$ — 91.7 %

DUST LOADING CALCULATIONS (Concentration Basis)

DCL = 15.432 (dust g) / $V_t std$ — 0.0035 grains/scf

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

ACFM = V_s * Pipe Area (ft^2) — — ACFM

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

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

SAMPLE SUBMITTAL SHEET

PROJECT GRE-ICR DATE SUBMITTED 8/28/99

REQUESTOR Schulz FUND# 4189

RUN #	SAMPLE ID	SAMPLE TYPE	VOL/WT		WATER LAB	RESULTS
GRE-U10	D5-1N-OH-1	KCl #1+2	500	Hg		
		KCl #3	200	Hg		
		H_2O_2	250	Hg		
		$KMnO_4$	500			
		Nozzle rinse	200	Hg		
	D5-STACK-OH-1	KCl #1+2	500	Hg		
		KCl #3	250	Hg		
		H_2O_2	250	Hg		
		$KMnO_4$	500			
		Probe rinse	250	Hg		
	D5-M26A-1-1N	H_2SO_4	500	Hg		
		NaOH	500	Hg		
				Hg		
				Hg		
	D5-M26-2	H_2SO_4	500	Hg		
		NaOH	500	Hg		
				Hg		
				Hg		
	1N-OH-1 Ash Sample	BH ASH		Hg		
		Lime Sample (slurry ash)		Hg		
				Hg		
				Hg		
	Stack OH-1 8/28/99 09:00 Coal Sample	Coal Sample #102		Hg		
				Hg		
				Hg		
				Hg		

Day 5 — 8/28/99

Page 1 of 2 Karen Uhl

SBMTL3O.WK4

SAMPLE SUBMITTAL SHEET

PROJECT GRE-ICR DATE SUBMITTED 8/28/99

REQUESTOR Schulz FUND# 4198

RUN #	SAMPLE ID	SAMPLE TYPE	VOL/WT		WATER LAB	RESULTS
GRE-U10-	D5-IN-OH-2	KCl #1+2	500	Hg		
		KC #3 No sample	(250)	Hg		
		H_2O_2	250	Hg		
		$KMnO_4$	500			
				Hg		
8/28/99 09:02 #101	STACK-M26A-1	Coal Sample	60g	Hg		
				Hg		
				Hg		
				Hg		
				Hg		
				Hg		
				Hg		
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				Hg		
				Hg		
				Hg		

Day 5 8/28/99

Page 2 of 2 Karen Whey

SBMTL3O.WK4

Date_____ Time_____

DATE GRE-U10-D5-In-OH-1

RUN #_____

FUND #_____

COST CENTER NUMBER _____

DUST LOADING DATA SHEET

Time at Start 8:31 Operators Jeff T., Craig E

Sample Pt. A, C, E, H, J, L Traverse Pt. 1-4

P_B(Barometric Pressure)= 28.27 in. Hg

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

T_s(Stack Temp)= _____ °F+460= _____ °R

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

D_n(Nozzle Diam)= .195 in Approx % H_2O= _____

ΔH@=_____ in H_2O Cm= _____

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

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

Q_m(meter flow rate $\frac{Q_n T_m Q_n}{C_m T_s (p_B + \Delta H/13.6)}$ (1 - $\frac{\%H_2O}{100}$)=_____ACFM

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

Second/Rev=_____ $\%CO_2$_____ $\%O_2$_____

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				
		A	C	E	H	J	L		Avg					
	O_2	5.9	6.3	6.2	5.6	4.9	4.7		5.6					
	CO_2	13.6	13.3	13.4	13.9	14.5	14.7		13.9					

Comments: SOT leak check passed
EOT Leak check passed

Date_____ Time_____
GRE-U10-D5-In-OH-1

DATE: 8/28/99 START TIME: 8:31

RUN NUMBER: Inlet Unit 10 Spray Dryer

SAMPLING SUMMARY

TOTAL SAMPLING TIME 144.0 MINUTES

MAXIMUM SYSTEM VACUUM 15.1 in Hg

AVERAGE STACK TEMPERATURE 364.08 °F

AVERAGE VELOCITY HEAD ΔP 0.575 in H_2O

AVERAGE STACK VELOCITY 55.00 FT/SEC

AVERAGE ORRIFICE PERSSURE ΔH 0.878 in H_2O

TOTAL VOLUME SAMPLED 54.725 FT^3

AVERAGE DGM INLET 87.84 °F

AVERAGE DGM OUTLET 82.75 °F

AVERAGE DGM TEMPERATURE 85.29 °F +460 = 545.29

FILTER TEMPERATURE NA °F

LAST IMPINGER TEMPERATURE 54.66 °F

METER PRESSURE Pm 28.392 in Hg

STACK PRESSURE Ps 27.78 in Hg

AREA OF NOZZLE 0.0299 IN^2

AVG SQRT ΔP 0.752

MOLECULAR WEIGHT 28.56

MOISTURE CONTENT 0.14

VmSTD = 50.128 SCF

% ISOKINETIC 99.43

Sample Pt. _____

Train Type : **ONTARIO-HYDRO METHOD**

Date_____ Time_____

Date GRE-U10-D5-In-OH-1

Run _____

Fund # _____

Cost Center # _____

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	737.5	920.3	182.8
BUBBLER	KCl	699.5	720.7	21.2
IMPINGER	KCl	726.8	732.9	6.1
BUBBLER	H_2O_2/HNO_3	743.4	746.7	3.3
BUBBLER	$KMnO_4/H_2SO_4$	623.2	623.4	0.2
BUBBLER	$KMnO_4/H_2SO_4$	716.9	716.9	—
IMPINGER	$KMnO_4/H_2SO_4$	715.9	716.3	0.4
BUBBLER	SILICA GEL	893.4	906.1	12.7
			Total H_2O (g)	-50 ml
FILTER				176.7
	3.01711	11.35478		
			Total Dust (g)	8.33767

$V_w std = 0.0474 * (H_2O\ g)$ — 8.331 SCF

$V_m Corrected = V_m * C_m$ — 54.725 ACF

$V_m std = \frac{17.71\ V_m C\ (P_b + \Delta H/13.6)}{T_m}$ — 50.360 SCF

$V_t std = V_w std + V_m std$ — 58.692 SCF

$\%H_2O = (V_w std / V_t std) * 100$ — 14.2 $\%H_2O$

$Q_n std = 17.71\ Q_n\ P_s / T_s$ — 0.405 SCFM

% Isokinetic = $V_t std / (Q_n std * Time)$ — 100.5 %

DUST LOADING CALCULATIONS (Concentration Basis)

DCL = 15.432 (dust g) / $V_t std$ — 2.1922 grains/scf

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

ACFM = V_s * Pipe Area (ft^2) — _____ ACFM

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

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

Date 8/28/99 Time

DATE GRE-U10-D5-Stack-OH-1

RUN #

FUND #

COST CENTER NUMBER

DUST LOADING DATA SHEET

Time at Start 0945 Operators M. Heidt, S. Evanson

Sample Pt. Stack Traverse Pt. Top-Middle-Bottom

P_B(Barometric Pressure)= 28.27 in. Hg

P_s(Stack Pressure)= $P_B \pm$(1 in H_2O/13.6) = 28.34 in Hg

T_s(Stack Temp)= 200 °F+460= 660 °R

ΔP(Pitot)= ____ in H_2O ✓ Type S Cp=.84 ____ Standard

D_n(Nozzle Diam)= .190 in Approx % H_2O= 18

ΔH@= 1.99 in H_2O Cm= 0.939

V_s(Stack Velocity) = $951.6\ Cp \sqrt{\frac{Ts}{Ps}\Delta P}$ = 0.939 2148 ft/min

Q_n(Nozzle flow Rate)= $V_s \pi D_n^2/576$= 0.4229 ACFM

Q_m(meter flow rate $\frac{Q_n T_m Q_n}{C_m T_s (p_B + \Delta H/13.6)}$ (1 - $\frac{\%H_2O}{100}$)= 0.2969 ACFM

ΔH(orifice)= $\frac{Qm^2 \Delta H @ (P_B + \Delta H/13.6)}{0.03175 T_m}$ = 0.30 in H_2O

T_m = 70

Second/Rev= 20.2 $\%CO_2$ ____ $\%O_2$ ____

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				
				CO_2	O_2									
				12.5	6.9									
				12.5	6.9									
				12.5	6.9									
				12.8	6.6									
				12.6	6.8									

Comments: SOT leak ✓ OK @ 5" Hg

EOT leak ✓

Time at Start _____

Operators _____

Date _____

Date 8/28/97 Time 0945
GRE-U10-D5-Stack-OH-1

SAMPLE LOCATION ΔP

Sec./ Rev.	Traverse Point	Time	Gas Meter	Delta P	Delta H	Pump Vac	Stack Temp	Probe Temp.	Meter In Temp.	Meter Out Temp.	Cold Box	Hot Box	
~~Top~~	~~Top~~	0	827.789	.31	0.30	2.75	200	300	69	69	50	238	20.
		5	829.27	.34	.32	2.75	201	298	70	69	50	238	19.
		10	830.80	.44	.42	2.75	201	298	72	69	48	238	17.
		15	832.52	.61	.58	2.75	201	299	74	69	47	238	14.
		20	834.53	.56	.54	3.0	202	300	78	70	46	238	14.
		25	836.58	.63	.61	2.75	202	289	80	71	45	238	14.
		30	838.69	.46	.44	3.0	201	283	83	72	45	238	16.
		35	840.61	.53	.52	3.0	201	278	84	72	46	238	14.
		40	842.57	.30	0.29	3.0	201	276	85	73	46	238	20.
Mid		45	844.06	.36	.32	2.25	264	270	82	75	49	239	19.
		50	845.59	.46	.42	3.0	245	281	82	75	47	239	16.
		55	847.29	.51	.49	2.75	200	281	84	76	45	238	15.
		60	849.20	.45	.44	2.75	200	284	86	76	44	239	16.
		65	851.06	.50	.49	2.75	201	285	88	77	45	239	15.
		70	852.97	.44	.43	2.75	201	280	89	78	45	239	16.
		75	~~854.8~~ 854.80	.38	.37	2.75	200	277	90	79	45	239	17.
		80	856.555	.46	.45	2.75	199	293	84	~~88~~ 80	60	239 &	16.
Bot		85	858.38	.45	.44	2.75	199	286	87	82	49	238	16.
		90	860.23	.40	.39	2.75	200	280	90	81	47	239	17.
		95	861.98	.53	.52	2.75	200	278	91	81	47	239	15.
		100	863.89	.52	.51	3.0	201	282	93	81	46	238	15.
		105	865.90	.50	.49	3.0	200	278	94	82	46	238	15.
		110	867.85	.47	.46	3.0	200	270	95	83	47	238	15.
		115	869.74	.50	.49	3.0	200	265	96	83	50	238	15.
		120	871.666			3.0	200	274	96	83	51	238	

43.877 205

0.45 81

0.46

$\sqrt{\Delta P} = 0.68$

Sample Pt. _____

Train Type : **ONTARIO-HYDRO METHOD**

Date _____ Date _____ Time

Run GRE-U10-D5-Stack-OH-1

Fund # _____

Cost Center # _____

Stopper Type	Type Of Solution	Initial Wt. (g)	Final Wt. (g)	Net Wt. (g)
BUBBLER	KCl	697.0	857.9	160.9
BUBBLER	KCl	715.5	727.8	12.3
IMPINGER	KCl	709.0	710.1	1.1
BUBBLER	H_2O_2/HNO_3	734.3	735.7	1.4
BUBBLER	$KMnO_4/H_2SO_4$	710.4	710.1	-0.3
BUBBLER	$KMnO_4/H_2SO_4$	629.1	629.2	0.1
IMPINGER	$KMnO_4/H_2SO_4$	726.8	726.8	—
BUBBLER	SILICA GEL	931.4	939.8	8.4
			Total H_2O (g)	
FILTER		0.15715		183.9
			0.16456	
			Total Dust (g)	0.00751

$V_w std = 0.0474 * (H_2O\ g)$ — 8.671 SCF

$V_m Corrected = V_m * C_m$ — 41.219 ACF

$V_m std = \frac{17.71\ V_m C\ (P_b + \Delta H/13.6)}{T_m}$ — 38.191 SCF

$V_t std = V_w std + V_m std$ — 46.861 SCF

$\%H_2O = (V_w std / V_t std) * 100$ — 18.5 $\%H_2O$

$Q_n std = 17.71\ Q_n P_s / T_s$ — 0.391 SCFM

% Isokinetic = $V_t std / (Q_n std * Time)$ — 99.8 %

DUST LOADING CALCULATIONS (Concentration Basis)

DCL = 15.432 (dust g) / $V_t std$ — 0.0025 grains/scf

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

V_sCFM = V_s * Pipe Area (ft^2) — — ACFM

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

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

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APPENDIX B

ANALYTICAL LAB REPORTS

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Unit 10 Day 3

Sample ID	Sample Type	Volume, mL	Hg, µg/L
KCl Reagent Blank	KCl	100	<0.03
H_2O_2 Reagent Blank	H_2O_2/HNO_3	100	<0.03
$KMnO_4$ Reagent Blank	$KMnO_4/H_2SO_4$	100	<0.03
5% $KMnO_4$ Blank	$KMnO_4$	100	<0.03
10% HNO_3 Blank	HNO_3	100	<0.03
0.1 N HNO_3 Blank	HNO_3	100	<0.03
GRE-U10-D3-IN-OH-1	Nozzle rinse	200	<0.03
GRE-U10-D3-IN-OH-1	KCl Nos. 1 and 2	500	0.35
GRE-U10-D3-IN-OH-1	KCl No. 3	200	<0.03
GRE-U10-D3-IN-OH-1	H_2O_2	250	0.36
GRE-U10-D3-IN-OH-1	$KMnO_4$	500	14.48
GRE-U10-D3-STACK-OH-1	Nozzle rinse	200	<0.03
GRE-U10-D3-STACK-OH-1	KCl Nos. 1 and 2	500	0.54
GRE-U10-D3-STACK-OH-1	KCl No. 3	200	<0.03
GRE-U10-D3-STACK-OH-1	H_2O_2	250	<0.03
GRE-U10-D3-STACK-OH-1	$KMnO_4$	500	13.96
GRE-U10-D3-FB-SPIKE	KCl	500	9.91
GRE-U10-D3-FB-SPIKE	H_2O_2	250	1.73
GRE-U10-D3-FB-SPIKE	$KMnO_4$	500	8.95
GRE-U10-D3-FB-IN	KCl	500	<0.03
GRE-U10-D3-FB-IN	H_2O_2	250	<0.03
GRE-U10-D3-FB-IN	$KMnO_4$	500	<0.03
GRE-U10-D3-FB-OUT	KCl	500	<0.03
GRE-U10-D3-FB-OUT	H_2O_2	250	<0.03
GRE-U10-D3-FB-OUT	$KMnO_4$	500	<0.03

Unit 10 Day 4

Sample ID	Sample Type	Volume, mL	Hg, µg/L
GRE-U10-D4-IN-OH-1	Nozzle rinse	200	<0.03
GRE-U10-D4-IN-OH-1	KCl Nos. 1 and 2	500	0.72
GRE-U10-D4-IN-OH-1	KCl No. 3	200	<0.03
GRE-U10-D4-IN-OH-1	H_2O_2	250	0.39
GRE-U10-D4-IN-OH-1	$KMnO_4$	500	19.3
GRE-U10-D4-IN-OH-2	Nozzle rinse	200	<0.03
GRE-U10-D4-IN-OH-2	KCl Nos. 1 and 2	500	1.43
GRE-U10-D4-IN-OH-2	KCl No. 3	200	<0.03
GRE-U10-D4-IN-OH-2	H_2O_2	250	0.64
GRE-U10-D4-IN-OH-2	$KMnO_4$	500	19.2
GRE-U10-D4-STACK-OH-1	Nozzle rinse	200	<0.03
GRE-U10-D4-STACK-OH-1	KCl Nos. 1 and 2	500	0.23
GRE-U10-D4-STACK-OH-1	KCl No. 3	200	<0.03
GRE-U10-D4-STACK-OH-1	H_2O_2	250	<0.03
GRE-U10-D4-STACK-OH-1	$KMnO_4$	500	14.1
GRE-U10-D4-STACK-OH-2	Nozzle rinse	200	<0.03
GRE-U10-D4-STACK-OH-2	KCl Nos. 1 and 2	500	<0.03
GRE-U10-D4-STACK-OH-2	KCl No. 3	200	<0.03
GRE-U10-D4-STACK-OH-2	H_2O_2	250	<0.03
GRE-U10-D4-STACK-OH-2	$KMnO_4$	500	13.9
GRE-U10-D4-FB-SPIKE	KCl	500	9.97
GRE-U10-D4-FB-SPIKE	H_2O_2	250	1.5
GRE-U10-D4-FB-SPIKE	$KMnO_4$	500	9.95
GRE-U10-D4-FB-SPIKE	Excess $KMnO_4$	200	<0.03
GRE-U10-D4-FB-IN	KCl	500	<0.03
GRE-U10-D4-FB-IN	H_2O_2	250	<0.03
GRE-U10-D4-FB-IN	$KMnO_4$	500	<0.03
GRE-U10-D4-FB-OUT	KCl	500	<0.03
GRE-U10-D4-FB-OUT	H_2O_2	250	<0.03
GRE-U10-D4-FB-OUT	$KMnO_4$	500	<0.03

Unit 10 Day 5

Sample ID	Sample Type	Volume, mL	Hg, µg/L
GRE-U10-D5-IN-OH-1	Nozzle rinse	200	<0.03
GRE-U10-D5-IN-OH-1	KCl Nos. 1 and 2	500	0.35
GRE-U10-D5-IN-OH-1	KCl No. 3	200	<0.03
GRE-U10-D5-IN-OH-1	H_2O_2	250	1.3
GRE-U10-D5-IN-OH-1	$KMnO_4$	500	17.3
GRE-U10-D5-STACK-OH-1	Probe rinse	200	<0.03
GRE-U10-D5-STACK-OH-1	KCl Nos. 1 and 2	500	0.1
GRE-U10-D5-STACK-OH-1	KCl No. 3	200	<0.03
GRE-U10-D5-STACK-OH-1	H_2O_2	250	0.77
GRE-U10-D5-STACK-OH-1	$KMnO_4$	500	12.57

8/27/99

Calibration Standards: 0, 1, 5, 10, 20 ppb R = 0.9999 QC = 3.92(4)

Sample ID	Sample Type	Spike Amount	Sample Reading, µg/L	Spike Reading, µg/L	Spike Location	Spike Recovery, %
GRE-U10-D3-IN-OH-1	KCl	5	0.35	4.97	Lab	92.40
GRE-U10-D3-IN-OH-1	KCl	10	0.35	9.04	Lab	86.90
GRE-U10-D3-FB-SPIKE	KCl	10	0	9.91	Field	99.10
GRE-U10-D3-FB-SPIKE	KCl	5	9.91	14.42	Lab	90.20
GRE-U10-D3-FB-SPIKE	KCl	10	14.42	23.27	Lab	88.50
GRE-U10-D3-FB-SPIKE	H_2O_2	2	0	1.73	Field	86.46
GRE-U10-D3-FB-SPIKE	H_2O_2	5	1.73	6.6	Lab	97.40
GRE-U10-D3-FB-SPIKE	H_2O_2	10	1.73	11.62	Lab	98.90
GRE-U10-D3-IN-OH-1	$KMnO_4$	5	15.4	20	Lab	92.00
GRE-U10-D3-FB-SPIKE	$KMnO_4$	10	0	8.95	Field	89.50
GRE-U10-D3-FB-SPIKE	$KMnO_4$	5	8.95	13.29	Lab	86.80

8/28/99

Calibration Standards: 0, 1, 5, 10, 20 ppb R = 0.9994 QC = 4.09(4)

Sample ID	Sample Type	Spike Amount	Sample Reading, µg/L	Spike Reading, µg/L	Spike Location	Spike Recovery, %
GRE-U10-D4-IN-OH-1	KCl	5	0.72	6.06	Lab	106.80
GRE-U10-D4-IN-OH-1	KCl	10	0.72	11.01	Lab	102.90
GRE-U10-D4-FB-SPIKE	KCl	10	0	9.97	Field	99.70
GRE-U10-D4-FB-SPIKE	KCl	5	9.97	14.98	Lab	100.20
GRE-U10-D4-FB-SPIKE	KCl	10	14.98	24.47	Lab	94.90
GRE-U10-D4-IN-OH-1	H_2O_2	5	0.39	5.67	Lab	105.60
GRE-U10-D4-IN-OH-1	H_2O_2	10	0.39	11.13	Lab	107.40
GRE-U10-D4-FB-SPIKE	$KMnO_4$	10	0	9.95	Field	99.50
GRE-U10-D4-FB-SPIKE	$KMnO_4$	5	9.95	14.5	Lab	91.00

Final Results

October 26, 1999

Set Number: 49909
Fund#: 4891
PI: Richard Schulz
Contact Person: Richard Schulz

Request Date: Monday, October 25, 1999
Due Date: Monday, November 08, 1999
Set Description: Great River Energy Site Coal

Sample **49909-01**

	49909-01	**GRE-Coal Sx Unit1 Day1**		GREU1D1OH-1
	Chloride		< 70 µg/g	
	Mercury		0.0855 µg/g	
2	**49909-02**	**GRE-Coal Sx Unit1 14-1600**		GREU1D2OH-1
	Chloride		< 70 µg/g	
	Mercury		0.105 µg/g	GREU1D2OH-2
3	**49909-03**	**GRE-Coal Sx Unit1 RUN2**		
	Chloride		81 µg/g	
	Mercury		0.0558 µg/g	
1	**49909-04**	**GRE-Coal Sx Unit10 Comp.**		GREU10D3OH-1
	Chloride		< 60 µg/g	
	Mercury		0.0865 µg/g	
	49909-05	**GRE-Coal Sx Unit10 9:30-11:30**		GREU10D4OH-2
3	Chloride		< 50 µg/g	
	Mercury		0.0630 µg/g	
	49909-06	**GRE-Coal Sx Unit10 14-1600Hrs**		GREU10D4OH-1
2	Chloride		< 60 µg/g	
	Mercury		0.101 µg/g	
	49909-07	**Mill 1&2 Composite**		GREU10D5OH-1
4	Chloride		< 70 µg/g	
	Mercury		0.0422 µg/g	

Distribution 33 Date 10-26-99

Final Results

September 15, 1999

Set Number: 49890
Fund#: 4891
PI: Richard Schulz
Contact Person: Richard Schulz

Request Date: Thursday, September 09, 1999
Due Date: Thursday, September 23, 1999
Set Description: Great River Energy Site

Sample 49890-01

49890-01	**GRE-U1 D1-In-OH-1 ash**	
Mercury		0.005 µg/g
49890-02	**GRE-U1 D1-Stack-OH-1 ash (total ug)**	
Mercury		0.0395 µg
49890-03	**GRE-U1 D2-In-OH-1 ash**	
Mercury		0.016 µg/g
49890-04	**GRE-U1 D2-In-OH-2 ash**	
Mercury		0.0079 µg/g
49890-05	**GRE-U1 D2-Stack-OH-1 ash (total ug)**	
Mercury		0.023 µg
49890-06	**GRE-U1 D2-Stack-OH-2 ash (total ug)**	
Mercury		0.0060 µg
49890-07	**GRE-U10 D3-In-OH-1 ash**	
Mercury		0.011 µg/g
49890-08	**GRE-U10 D3-Stack-OH-1 ash (total ug)**	
Mercury		0.016 µg
49890-09	**GRE-U10 D4-In-OH-1 ash**	
Mercury		0.028 µg/g
49890-10	**GRE-U10 D4-In-OH-2 ash**	
Mercury		0.049 µg/g
49890-11	**GRE-U10 D4-Stack-OH-1 ash (total ug)**	
Mercury		0.0050 µg
49890-12	**GRE-U10 D4-Stack-OH-2 ash (total ug)**	
Mercury		0.0090 µg
49890-13	**GRE-U10 D5-In-OH-1 ash**	
Mercury		0.016 µg/g
49890-14	**GRE-U10 D5-Stack-OH-1 ash (total ug)**	
Mercury		0.0050 µg
49890-15	**GRE-U10 Blank Thimble (total ug)**	
Mercury		< 0.002 µg
49890-16	**GRE-U10 Blank Filter Paper (total ug)**	
Mercury		< 0.002 µg

Distribution TS Date 9-15-99

UND ENERGY RESEARCH CENTER
COAL ANALYSIS REPORT

GF NUMBER: 99-0461 LAB NUMBER: 4684

DATE SAMPLED : 08/26/99 RUN NUMBER: GREU10D3INOH-1
DATE RECEIVED : 10/04/99
DATE OF REPORT: 10/08/99

SAMPLE DESCRIPTION: GRE-COAL UNIT 10 COMP.

SUBMITTER: LAUDAL

AIR DRY LOSS: 23.23 %

	AS DET. (%)	AS RECD. (%)	MOIST FREE (%)	MOIST/ASH FREE (%)
PROXIMATE ANALYSIS				
MOISTURE	17.77	36.90	N/A	N/A
VOLATILE MATTER	39.54	30.36	48.09	53.73
FIXED CARBON (IND)	34.06	26.12	41.42	46.27
ASH	8.63	6.62	10.49	N/A
ULTIMATE ANALYSIS				
HYDROGEN	5.33	6.67	4.08	4.56
CARBON	50.44	38.72	61.34	68.53
NITROGEN	1.11	0.85	1.35	1.51
SULFUR	1.09	0.84	1.33	1.49
OXYGEN (IND)	33.40	46.29	21.41	23.92
ASH	8.63	6.62	10.49	N/A
HEATING VALUE (BTU/LB)				
BTU	8734	6705	10621	11866
CALC.CALORIFIC VALUE	8621	6619		

AS RECEIVED HYDROGEN NOT INCLUDING HYDROGEN FROM MOISTURE: 2.58 %
AS RECEIVED OXYGEN NOT INCLUDING OXYGEN FROM MOISTURE : 13.52 %

SULFUR FORMS

SULFATE	N/A
PYRITIC	N/A
ORGANIC	N/A

ASH FUSION (DEGREES F)

INIT. DEFORM. TEMP.	N/A
SOFTENING TEMP.	N/A
HEMISPH. TEMP.	N/A
FLUID TEMP.	N/A

COMMENTS :

UND ENERGY RESEARCH CENTER
COAL ANALYSIS REPORT

GF NUMBER: 99-0463 LAB NUMBER: 4686

DATE SAMPLED : 08/27/99 RUN NUMBER: GREU10D4INOH-1
DATE RECEIVED : 10/04/99
DATE OF REPORT: 10/08/99

SAMPLE DESCRIPTION: GRE-COAL UNIT 10 [redacted]

SUBMITTER: LAUDAL

AIR DRY LOSS: 21.50 %

	AS DET. (%)	AS RECD. (%)	MOIST FREE (%)	MOIST/ASH FREE (%)
PROXIMATE ANALYSIS				
MOISTURE	19.55	36.80	N/A	N/A
VOLATILE MATTER	36.77	28.87	45.71	51.65
FIXED CARBON (IND)	34.42	27.07	42.79	48.35
ASH	9.25	7.26	11.50	N/A
ULTIMATE ANALYSIS				
HYDROGEN	5.31	6.56	3.90	4.41
CARBON	49.40	38.78	61.40	69.38
NITROGEN	1.11	0.87	1.38	1.56
SULFUR	1.05	0.82	1.31	1.48
OXYGEN (IND)	33.88	45.71	20.51	23.18
ASH	9.25	7.26	11.50	N/A
HEATING VALUE (BTU/LB)				
BTU	8524	6691	10595	11972
CALC.CALORIFIC VALUE	8427	6616		

AS RECEIVED HYDROGEN NOT INCLUDING HYDROGEN FROM MOISTURE: 2.46 %
AS RECEIVED OXYGEN NOT INCLUDING OXYGEN FROM MOISTURE : 12.96 %

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 :

UND ENERGY RESEARCH CENTER
COAL ANALYSIS REPORT

GF NUMBER: 99-0462 LAB NUMBER: 4685

DATE SAMPLED : 08/27/99 RUN NUMBER: GREU10D4INOH-2
DATE RECEIVED : 10/04/99
DATE OF REPORT: 10/09/99

SAMPLE DESCRIPTION: GRE-COAL UNIT 10 ~~9:30-11:30~~

SUBMITTER: LAUDAL

AIR DRY LOSS: 24.02 %

	AS DET. (%)	AS RECD. (%)	MOIST FREE (%)	MOIST/ASH FREE (%)
PROXIMATE ANALYSIS				
MOISTURE	16.25	36.40	N/A	N/A
VOLATILE MATTER	39.02	29.65	46.59	53.17
FIXED CARBON (IND)	34.37	26.08	41.04	46.83
ASH	10.36	7.87	12.37	N/A
ULTIMATE ANALYSIS				
HYDROGEN	5.09	6.54	3.92	4.47
CARBON	50.64	38.48	60.47	69.01
NITROGEN	1.14	0.87	1.36	1.55
SULFUR	0.92	0.70	1.10	1.26
OXYGEN (IND)	31.85	45.55	20.78	23.71
ASH	10.36	7.87	12.37	N/A
HEATING VALUE (BTU/LB)				
BTU	8750	6648	10448	11923
CALC.CALORIFIC VALUE	8577	6517		

AS RECEIVED HYDROGEN NOT INCLUDING HYDROGEN FROM MOISTURE: 2.49 %
AS RECEIVED OXYGEN NOT INCLUDING OXYGEN FROM MOISTURE : 13.22 %

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 :

UND ENERGY RESEARCH CENTER
COAL ANALYSIS REPORT

GF NUMBER: 99-0464 LAB NUMBER: 4687

DATE SAMPLED : 08/28/99 RUN NUMBER: GREU10D5INOH-1
DATE RECEIVED : 10/04/99
DATE OF REPORT: 10/08/99

SAMPLE DESCRIPTION: MILL 1 & 2 COMPOSITE

SUBMITTER: LAUDAL

AIR DRY LOSS: 14.80 %

	AS DET. (%)	AS RECD. (%)	MOIST FREE (%)	MOIST/ASH FREE (%)
PROXIMATE ANALYSIS				
MOISTURE	26.70	37.50	N/A	N/A
VOLATILE MATTER	34.34	29.26	46.85	51.57
FIXED CARBON (IND)	32.24	27.52	43.99	48.43
ASH	6.71	5.72	9.16	N/A
ULTIMATE ANALYSIS				
HYDROGEN	5.88	6.65	3.97	4.37
CARBON	45.02	38.36	61.42	67.61
NITROGEN	1.04	0.89	1.42	1.56
SULFUR	0.70	0.60	0.95	1.05
OXYGEN (IND)	40.65	47.78	23.08	25.41
ASH	6.71	5.72	9.16	N/A
HEATING VALUE (BTU/LB)				
BTU	8007	6822	10924	12025
CALC.CALORIFIC VALUE	7770	6620		

AS RECEIVED HYDROGEN NOT INCLUDING HYDROGEN FROM MOISTURE: 2.48 %
AS RECEIVED OXYGEN NOT INCLUDING OXYGEN FROM MOISTURE : 14.41 %

SULFUR FORMS

SULFATE	N/A
PYRITIC	N/A
ORGANIC	N/A

ASH FUSION (DEGREES F)

INIT. DEFORM. TEMP.	N/A
SOFTENING TEMP.	N/A
HEMISPH. TEMP.	N/A
FLUID TEMP.	N/A

COMMENTS :